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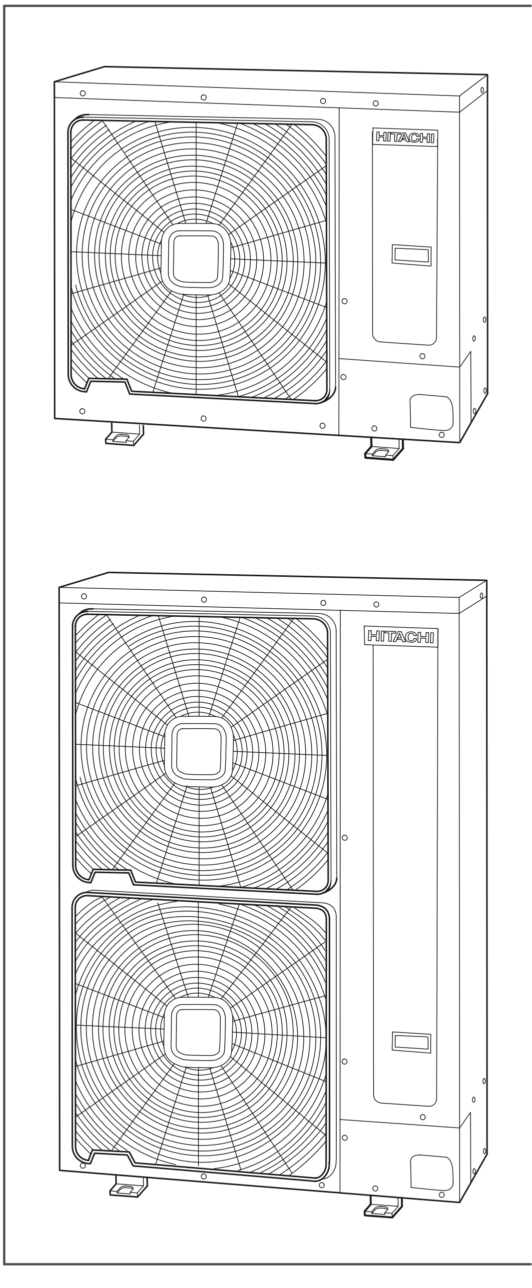
# UTOPIA DC-INVERTER IVX/(2/2.5)HP/ES SERIES
H(V)RN(S)(2)(E)
H(V)RNM(2)(E)



Service Manual

RAS-(3-6)HVRNM2E
RAS-(4-12)HRNM(2)(E)
RAS-(2-3)HVRN(S)(2)
RAS-(4-6)HVRNS2E
RAS-(4-10)HRNS(2)E

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1. General information

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1.1 General information

1.1.1 General note

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

1.1.2 Introduction

Hitachi UTOPIA series is an outdoor unit series designed with the goal to cover the requirements of the split and multisplit systems, for installations where from one indoor unit (single system) to up to four indoor units (quad system) are connected to the same outdoor unit.
UTOPIA series consists in three different outdoor unit series: IVX, (2/2.5)HP and ES. All of them incorporate the Hitachiinverter technology, which makes possible to adapt automatically and without the user operation the capacity of the unit, so the power input, to the real demand of the installation, increasing the system efficiency to unattainable levels with other technologies. All UTOPIA units are equipped with a heat pump, resulting in an air conditioning system valid for the whole year, in which the installation of additional and specific systems a not necessary.

2/2.5HP
Series composed by the smallest capacity units, specially designed for installation where a single combination is the most suitable solution.

IVX
With nominal capacities from 7.1 kW to 30.0 kW (cooling mode), IVX series is the series with the highest efficiency inside UTOPIA range, allowing the installation with up to four different indoor units (quad system). In addition, to reduce as much as possible the energy consumption and improve the energy efficiency, IVX outdoor units include the “individual operation” mode, performing an individual control over the connected indoor units to create a zone-based control.

ES
ES(Eco&Small) series stands out because of its efficiency with outdoor units of small dimensions. The series is composed by units with nominal capacities from 7.1 kW to 25.0 kW (cooling mode), allowing also the installation of up to four different indoor units.

IU
One of the main merits of Hitachi units range is the combinability and flexibility of its indoor units SYSTEM FREE. This outstanding technology makes possible to use the same indoor units with both UTOPIA and SET FREE outdoor units, making easier the design, installation and control of the air conditioning installations.

1.1.3 Environment-friendly units

This range of HITACHI outdoor units uses environmentally-friendly R410A gas refrigerant, and the RoHS and Green Dot regulations are applied throughout the manufacturing and installation process to reflect HITACHI’s awareness of environmental respect and commitment.

R410A is totally environmentally-friendly since it does not contain any substances that damage the ozone layer:
ODP (ozone depleting product) =0.
HITACHI’s UTOPIA series are very efficient and allow significant energy savings compared with conventional systems.
This energy efficiency means less production of CO2, which causes the greenhouse effect.

1.2 Applied symbols

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 damage to the unit, the installation or 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.

ℹ **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 IVX series outdoor unit models

Unit type (Outdoor unit): RAS
Position-separating hyphen (fixed)
Capacity (HP): 3, 4, 5, 6, 8, 10, 12
H = Heat Pump
V = Single phase unit (1~ 230V 50Hz)
- = Three phase unit (3N~ 400V 50Hz)
R= Inverter system
N=R410A refrigerant
M=IVX
Series
E = Made in Europe
– = Made in Japan

RAS	–	XX	H	(V)	R	N	M	(2)	(X)

1.3.2 Classification of ES series outdoor unit models

Unit type (outdoor unit): RAS
Position-separating hyphen (fixed)
Capacity (HP): 2, 2.5, 3, 4, 5, 6, 8, 10
H = Heat Pump
V = Single phase unit (1~ 230V 50Hz)
- = Three phase unit (3N~ 400V 50Hz)
R= Inverter system
N=R410A refrigerant
S= ES
Series
E = Made in Europe
– = Made in Japan

RAS	–	XX	H	(V)	R	N	(S)	(2)	(X)

1.3.3 Product guide: Outdoor units

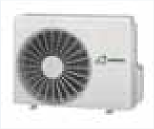
◆ IVX series

Outdoor Units IVX ❄ ☀							
Single phase (1~)				Three phase (3~)			
HVRNM2E				HRNM1E		HRNM	
							
Unit	Code	Unit	Code	Unit	Code	Unit	Code
RAS-3HVRNM2E NEW	7E305018						
		RAS-4HVRNM2E NEW	7E305020	RAS-4HRNM2E NEW	7E305120		
		RAS-5HVRNM2E NEW	7E305021	RAS-5HRNM2E NEW	7E305121		
		RAS-6HVRNM2E NEW	7E305022	RAS-6HRNM2E NEW	7E305122		
						RAS-8HRNM	60278972
						RAS-10HRNM	60278973
						RAS-12HRNM	60278974

NOTE

- *Check the exact classification for each unit (model, type, power and series) in Classification of IVX series outdoor unit models, see on page 4.*

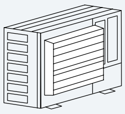
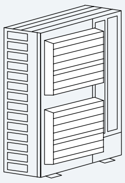
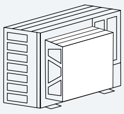
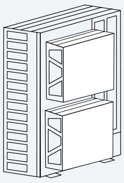
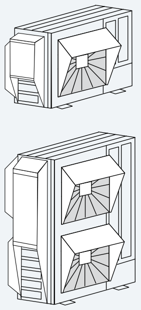
◆ ES series

Outdoor Units ES ❄ ☀							
Single phase (1~)				Three phase (3~)			
HVRN(2)(E)						HRNSE	
 NEW							
Unit NEW	Code	Unit	Code	Unit		Unit	Code
RAS-2HVRN2 NEW	60288390				7E306107		
RAS-2.5HVRN2	60288391				7E306108		
RAS-3HVRNS2	60288392				7E306109		
		RAS-4HVRNS2E NEW	7E306020	RAS-4HRNS2E NEW			
		RAS-5HVRNS2E NEW	7E306021	RAS-5HRNS2E NEW			
		RAS-6HVRNS2E NEW	7E306022	RAS-6HRNS2E NEW			
						RAS-8HRNSE	7E314110
						RAS-10HRNSE	7E314111

NOTE

- *Check the exact classification for each unit (model, type, power and series) in Classification of ES series outdoor unit models, see on page 4 .*

1.3.4 Accessory code list

Name	Description	Code	Figure
DBS-26	Drain discharge connection	60299192	
AG-264	Air flow guide (For 2/2.5HP and 3HP ES)	-	
AG-335A	Air flow guide (For 3-12HP IVX and 4-10HP ES)	60291431	
WSP-264	Wind guard (For 2/2.5HP and 3HP ES)	60291728	
WSP-335A	Wind guard (For 3-12HP IVX and 4-10HP ES)	60291432	
ASG-NP80F	Snow protection hood; air outlet (Zinc plate) (For 2/2.5HP and 3HP ES)	-	
ASG-NP80FS2	Snow protection hood; air outlet (Stainless plate) (For 2/2.5HP and 3HP ES)	-	
ASG-NP335F	Snow protection hood; air outlet (Zinc plate) (For 3-12HP IVX and 4-10HP ES)	60291433	
ASG-NP335FS2	Snow protection hood; air outlet (Stainless plate) (For 3-12HP IVX and 4-10HP ES)	-	
ASG-NP56B	Snow protection hood; air inlet of rear side (Zinc plate) (For 2/2.5HP and 3HP ES)	-	
ASG-NP63BS2	Snow protection hood; air inlet of rear side (Stainless plate) (For 2/2.5HP and 3HP ES)	-	
ASG-NP80B	Snow protection hood; air inlet of rear side (Zinc plate) (For 3HP IVX and 4-6HP ES)	-	
ASG-NP160BS2	Snow protection hood; air inlet of rear side (Stainless plate) (For 3HP IVX and 4-6HP ES)	-	
ASG-NP280B	Snow protection hood; air inlet of rear side (Zinc plate) (For 4-6HP IVX and 8/10HP ES)	-	
ASG-NP280BS2	Snow protection hood; air inlet of rear side (Stainless plate) (For 4-6HP IVX and 8/10HP ES)	-	
ASG-NP335B	Snow protection hood; air inlet of rear side (Zinc plate) (For 8-12HP IVX)	60291434	
ASG-NP335BS2	Snow protection hood; air inlet of rear side (Stainless plate) (For 8-12HP IVX)	-	
ASG-NP56L	Snow protection hood; air inlet of left side (Zinc plate) (For 2/2.5HP and 3HP ES)	-	
ASG-NP63LS2	Snow protection hood; air inlet of left side (Stainless plate) (For 2/2.5HP and 3HP ES)	-	
ASG-NP80L	Snow protection hood; air inlet of left side (Zinc plate) (For 3HP IVX and 4-6HP ES)	-	
ASG-NP160LS2	Snow protection hood; air inlet of left side (Stainless plate) (For 3HP IVX and 4-6HP ES)	-	
ASG-NP280L	Snow protection hood; air inlet of left side (Zinc plate) (For 4-6HP IVX and 8/10HP ES)	-	
ASG-NP280LS2	Snow protection hood; air inlet of left side (Stainless plate) (For 4-6HP IVX and 8/10HP ES)	-	
ASG-NP335L	Snow protection hood; air inlet of left side (Zinc plate) (For 8-12HP IVX)	60291435	
ASG-NP335LS2	Snow protection hood; air inlet of left side (Stainless plate) (For 8-12HP IVX)	-	

NOTE

HITACHI has a range of accessories and remote control systems that can be used with the UTOPIA outdoor units. Please, refer to the Controls Technical Catalogue.+

2. Unit Installation

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2.1 Safety summary

⚠ **DANGER**

- *Install the outdoor unit with sufficient clearance around it for operation and maintenance as shown in the next pages.*
- *Install the outdoor unit where good ventilation is available.*
- *Do not install the outdoor unit where exists a high level of oil mist salty air or sulphurous atmosphere.*
- *Install the outdoor unit as far as practical (being at least 3 meters) from electromagnetic wave radiator such as medical equipment.*
- *Keep clearance between units of more than 50 mm and avoid obstacles that could hamper air intake when installing more than one unit together.*
- *Install the outdoor unit in the shade or not exposed to direct sunshine or direct radiation from high temperature heat source.*
- *Do not install the outdoor unit in a place where a seasonal wind directly blows into the outdoor fan.*
- *For cleaning use non-inflammable and nontoxic cleaning liquid. Use of inflammable agent may cause explosion or fire.*
- *Work with sufficient ventilation for working in an enclosed space could cause oxygen deficiency. Toxic gas may be produced when cleaning agent is heated to high temperature by e.g. being exposed to fire.*
- *Cleaning liquid shall be collected after cleaning.*
- *Pay attention not to clamp cables when attaching the service cover to avoid electric shock or fire.*

⚠ **CAUTION**

- *Check the foundation to be flat leveled and strongly enough.*
- *Install the unit in a restricted area not accessible by the general public.*
- *Aluminium fins have very sharp edges. Pay attention to the fins in order to avoid injury.*
- *Do not install the indoor units in a flammable environment to avoid a fire or an explosion.*
- *Check to ensure that the ceiling slab is strong enough. If not strong enough the indoor unit may fall down on you.*
- *Do not install the indoor units outdoor unit remote control switch and cable within approximately 3 meters from strong electromagnetic wave radiators such as medical equipment.*
- *Do not install the indoor units in a machinery shop or kitchen where vapour from oil or mist flows to the indoor units. The oil will deposit on the heat exchanger thereby reducing the indoor unit performance and may deform. In the worst case the oil damages the plastic parts of the indoor unit.*
- *To avoid any corrosive action to the heat exchangers do not install the indoor units in an acid or alkaline environment.*
- *When lifting or moving the indoor unit use appropriate slings to avoid damage and be careful not to damage the insulation material on units surface.*
- *This appliance must be used only by adult and capable people having received the technical information or instructions to handle properly and safely this appliance.*
- *Turn OFF all power switches before maintenance is performed.*
- *Do not start the cleaning procedures before 5 minutes of the stop of the unit.*

⚠ **DANGER**

- *Avoid obstacles which may hamper the air intake or the air discharge flow.*
- *Children must be supervised to ensure that they do not play with the electrical appliances.*
- *Before obtaining access to terminals all supply circuits bust be disconnected.*

2.2 Transportation of outdoor unit

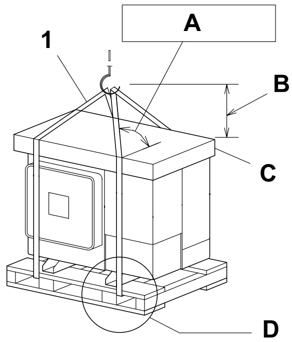
DANGER

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

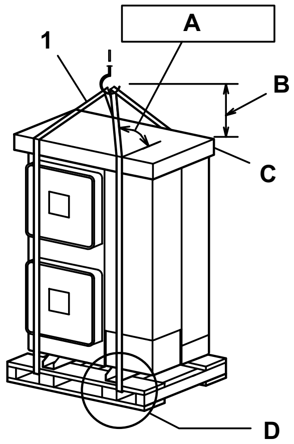
Hanging Method

When hanging the unit ensure the balance of the unit check safety and lift it up smoothly. Do not remove any packing materials and hang the unit under packing condition with two ropes as shown below.

RAS-3HVRNM2E
RAS-(2-3)HVRN(S)2
RAS-(4-6)H(V)RNS2E



RAS-(4-6)H(V)RNM2E
RAS-(8-12)HRNM
RAS-(8/10)HRNSE



1. Wire rope.

A. Over 60º.

B. 0.7 to 1.0 m.

C. Do not remove the plastic band or the corrugate paper frame.

D. Pass the wire ropes through each lifting hole in the wooden base as shown.

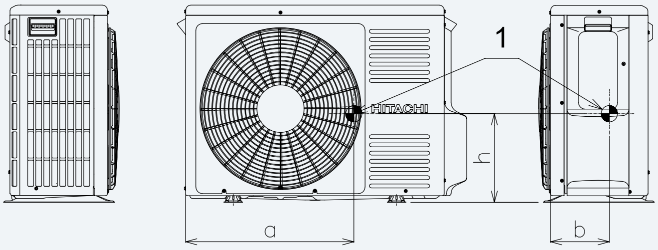
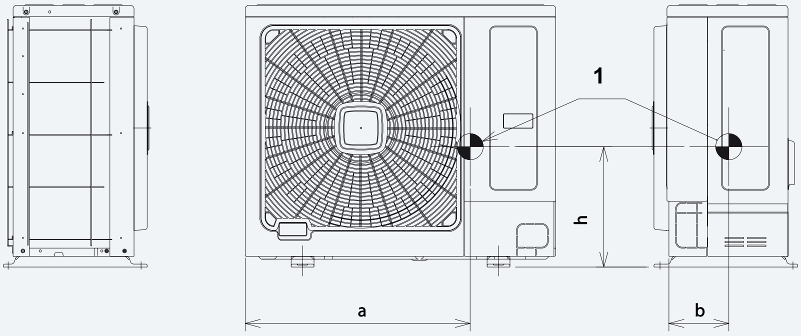
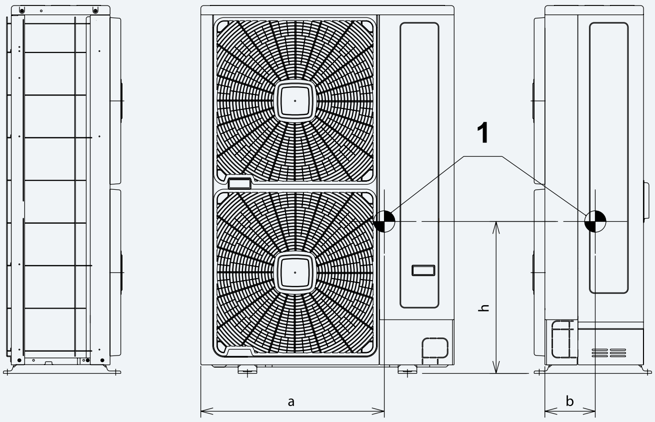
CAUTION

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

2.3 Center of gravity

Hanging Method

When hanging the unit ensure the balance of the unit check safety and lift it up smoothly. Do not remove any packing materials and hang the unit under packing condition with two ropes as shown below. At leat two persons are needed to move the unit.

RAS-(2-3)HVRN(S)2	a. 515 mm b. 180 mm h. 275 mm	
RAS-3HVRNM2E	a. 590 mm b. 185 mm h. 370 mm	
RAS-(4-6)H(V)RNS2E	For 4 HP: a. 635 mm b. 180 mm h. 335 mm	
	For 5-6 HP: a. 630 mm b. 190 mm h. 360 mm	
RAS-(4-6)H(V)RNM2E	a. 615 mm b. 190 mm h. 570 mm	
RAS-(8-12)HRNM	a. 615 mm b. 190 mm h. 570 mm	
RAS-(8/10)HRNSE	For 8 HP: a. 325 mm b. 206 mm h. 565 mm	
	For 10HP: a. 325 mm b. 213 mm h. 585 mm	

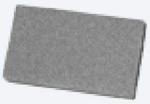
1 Center of gravity

2.4 Factory-supplied accessories for RAS-(8-12)HRNM

Make sure that the following accessories are packed with the unit.

NOTE

- ***If any of these accessories are not packed with the unit please contact your dealer.***

Accessory	Appearance	Quantity		
		RAS-8HRNM	RAS-10HRNM	RAS-12HRNM
Gasket		1	1	1
Pipe flange for refrigerant gas piping		1	1	1
Ring core		1	1	1
Cable tie		1	1	1
Compressed sheet		1	1	1

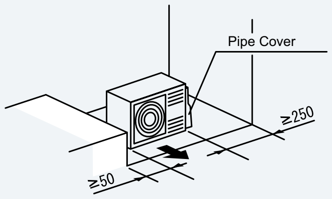
2.5 Installation space (Initial ckeck)

2.5.1 RAS-3HVRNM2E / RAS-(2-3)HVRN(S)2 / RAS-(4-10)H(V)RNS2E

Blocked in Inlet Side

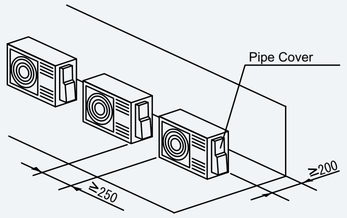
Upper Side Open

Single Installation



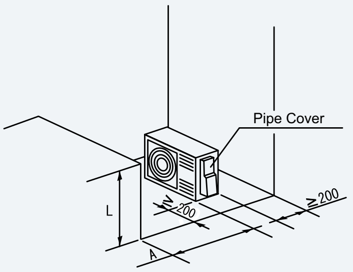
Ensure 250 mm or more of the side space on the pipe cover side.

Multiple Installation (Two units or more)



Allow 250 mm of space between units. Leave open both right and left sides.

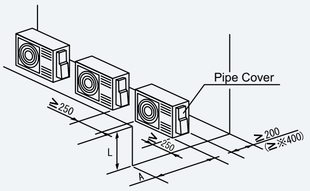
Single Installation



Be sure to use the fan direction guide. Leave open both right and left sides.

Ensure 250 mm or more of the side space on the pipe cover side.

Multiple Installation (Two units or more)



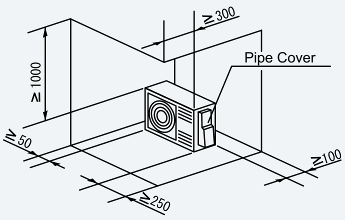
Be sure to use the fan direction guide.

Allow 250 mm of service space between units. Leave open both right and left sides. When subject to direct sunlight on the back wall ensure the length marked with ※ be 400 or greater.

Ensure 250 mm or more of the side space on the pipe cover side.

Upper Side Blocked

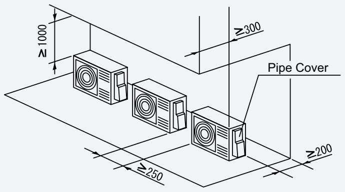
Single Installation



Fifteen mm of space is acceptable for one of the lateral sides.

Ensure 250 mm or more of the side space on the pipe cover side.

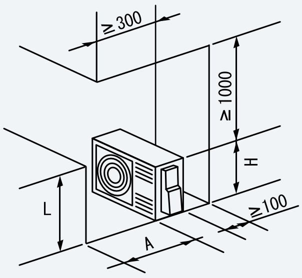
Multiple Installation (Two units or more)



Allow 250 mm of service space between units. Leave open both right and left sides.

Ensure 250 mm or more of the side space on the pipe cover side.

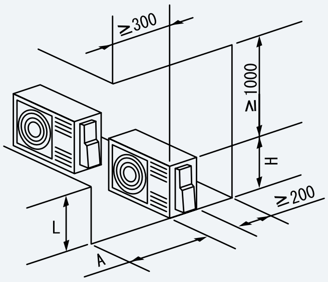
Single Installation



Be sure to use the fan direction guide. Leave open both right and left sides.

Ensure 250 mm or more of the side space on the pipe cover side.

Multiple Installation (Two units or more)



Be sure to use the fan direction guide.

Allow 250 mm of service space between units. Leave open both right and left sides. Serial installation allowed up to two units.

Ensure 250 mm or more of the side space on the pipe cover side.

Blocked in Inlet Side

The length A is as show in the following table:

L	A
0<L=1/2H	500 or greater
1/2H<L≤H	1000 or greater

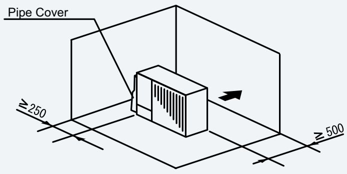
When L > H use a base for outdoor unit to make L ≤ H.

Close the base not to allow the outlet air bypassed.

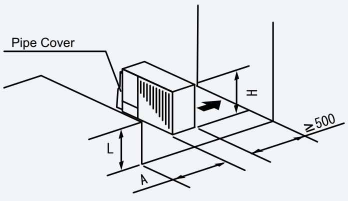
Outlet Side Blocked

Upper Side Open

Single Installation



Ensure 250 mm or more of the side space on the pipe cover side.



Be sure to use the fan direction guide. Leave open both right and left sides.

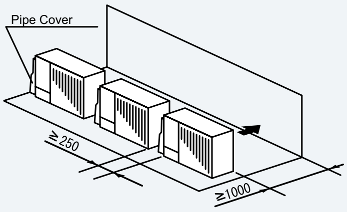
The length A is as show in the following table:

L	A
0<L=1/2H	100 or greater
1/2H<L≤H	200 or greater

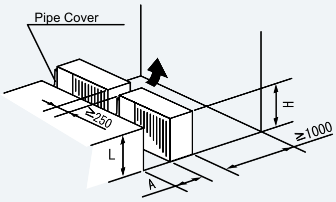
When L > H use a base for outdoor unit to make L ≤ H.

Close the base not to allow the outlet air bypassed.

Multiple Installation (Two units or more)



Allow 250 mm of service space between units. Both right and left sides shall be open.



Be sure to use the fan direction guide. Allow 250 mm of service space between units. Serial installation allowed up to two units.

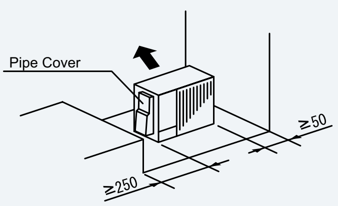
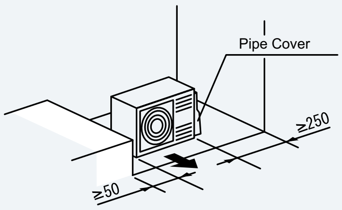
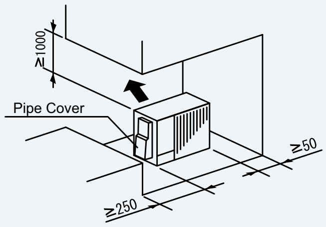
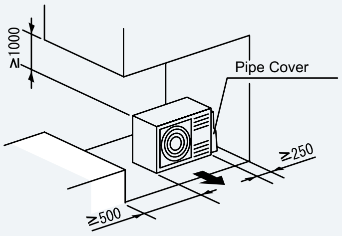
Leave open both right and left sides.

The length A is as show in the following table:

L	A
0<L=1/2H	150 or greater
1/2H<L≤H	250 or greater

When L > H use a base for outdoor unit to make L ≤ H.

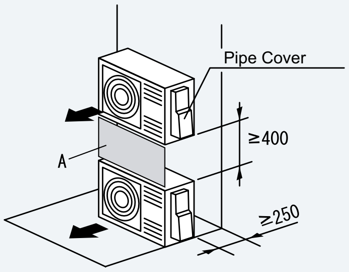
Close the base not to allow the outlet air bypassed.

<table>
<tr><th colspan="2">Lateral Side Blocked</th></tr>
<tr><td colspan="2">Upper Side Open</td></tr>
<tr><td colspan="2">Single Installation</td></tr>
<tr><td> </td><td> </td></tr>
<tr><td>Ensure 250 mm or more of the side space on the pipe cover side.</td><td>Ensure 250 mm or more of the side space on the pipe cover side.</td></tr>
<tr><td colspan="2">Upper Side Blocked</td></tr>
<tr><td> </td><td> </td></tr>
<tr><td>Ensure 250 mm or more of the side space on the pipe cover side.</td><td>Ensure 250 mm or more of the side space on the pipe cover side.</td></tr>
</table>

Single Installation	Multiple Installation

Blocked in Inlet Side

Single Installation

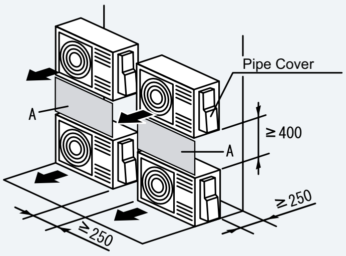


Close the part A not to allow the outlet air bypassed. Install to avoid the drain water from upper unit falling on the lower unit.

Ensure 250 mm or more of the side space on the pipe cover side.

Allow 400 mm of service space above the top board.

Multiple Installation



Allow 250 mm of service space between units. Serial sideways installation allowed up to two units.

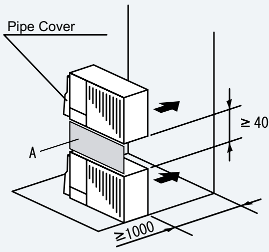
Leave open both right and left sides. Close the part A not to allow the outlet air bypassed. Install to avoid the drain water from upper unit falling on the lower unit.

Ensure 250 mm or more of the side space on the pipe cover side.

Allow 400 mm of service space above the top board.

Outlet Side Blocked

Single Installation

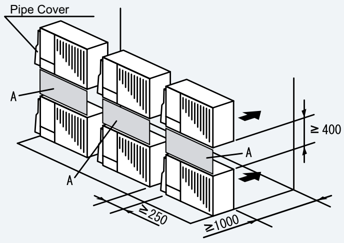


Be sure to use the fan direction guide. Close the part A not to allow the outlet air bypassed. Install to avoid the drain water from upper unit falling on the lower unit.

Ensure 250 mm or more of the side space on the pipe cover side.

Allow 400 mm of service space above the top board.

Multiple Installation

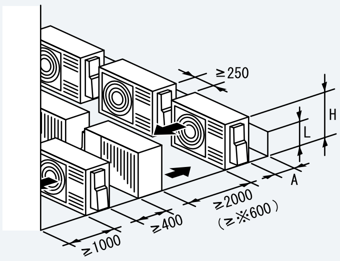


Be sure to use the fan direction guide. Allow 250 mm of service space between units. Serial side way installation allowed but leave open both right and left sides. Close the part A not to allow the outlet air bypassed. Install to avoid the drain water from upper unit falling on the lower unit.

Ensure 250 mm or more of the side space on the pipe cover side.

Allow 400 mm of service space above the top board.

Multiple Installation in Multiple Rows



Ensure 250 mm or more of the side space on the pipe cover side. Allow 400 mm of service space above the top board.

The length A is as show in the following table:

L	A
0<L=1/2H	150 or greater
1/2H<L≤H	250 or greater

When L > H use a base for outdoor unit to make L ≤ H. Close the base not to allow the outlet air bypassed. Be sure to use the fan direction guide in order to ensure the length marked with ※.

NOTE

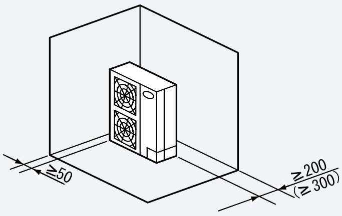
- ***All units are in (mm).***
- ***Do not stack more than two units in height.***
- ***Close gap (*) to avoid recirculating discharge air flow.***

2.5.2 RAS-(4-6)H(V)RNM2E / RAS-(8/10)HRNSE

Blocked in Inlet Side

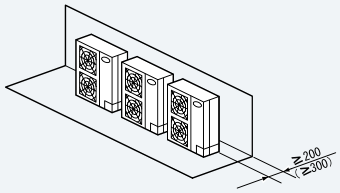
Upper Side Open

Single Installation



100 mm or more of the side space is acceptable on the service cover side. Dimensions in ( ) shows numbers especially for IVX 4-10 HP and ES 8/10 HP. 150 or more (200 or more) of the back space is acceptable when the right and left sides are open.

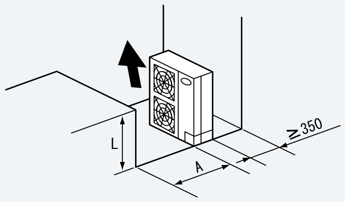
Multiple Installation (Two units or more)



Allow 100 mm of space between units. Leave open both right and left sides.

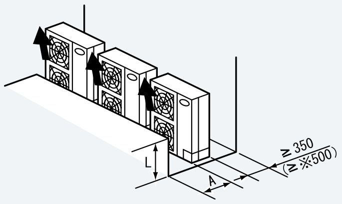
Dimensions in ( ) shows numbers especially for IVX 4-10 HP and ES 8/10 HP.

Single Installation



Be sure to use the fan direction guide. Leave open both right and left sides.

Multiple Installation (Two units or more)

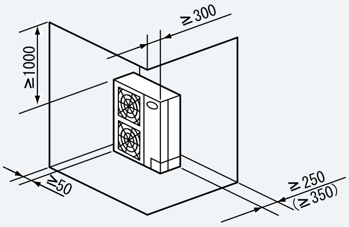


Be sure to use the fan direction guide. Allow 100 mm of space between units. Leave open both right and left sides.

When subject to direct sunlight on the back wall ensure the length marked with ※ be 500 or greater.

Upper Side Blocked

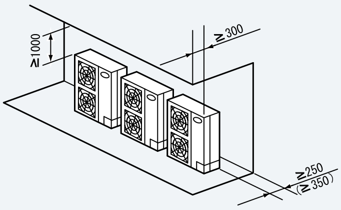
Single Installation



100 mm or more of the side space is acceptable on the service cover side.

Dimensions in ( ) shows numbers especially for IVX 4-10 HP and ES 8/10 HP.

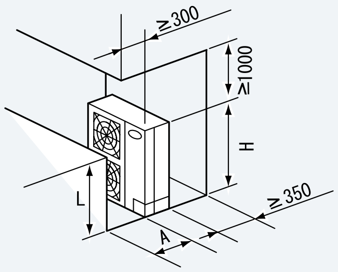
Multiple Installation (Two units or more)



Allow 100 mm of space between units. Leave open both right and left sides.

Dimensions in ( ) shows numbers especially for IVX 4-10 HP and ES 8/10 HP.

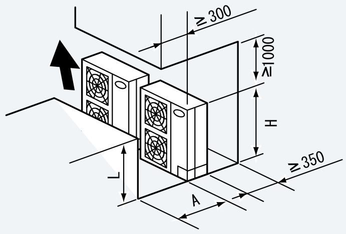
Single Installation



Be sure to use the fan direction guide.

Leave open both right and left sides.

Multiple Installation (Two units or more)



Be sure to use the fan direction guide. Allow 100 mm of space between units. Leave open both right and left sides.

Serial installation allowed up to two units.

Blocked in Inlet Side

The length A is as shown in the following table:

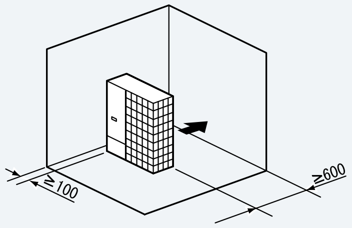
L	A
0 < L ≤ 1/2H	600 or greater
1/2H < L≤ H	1200 or greater

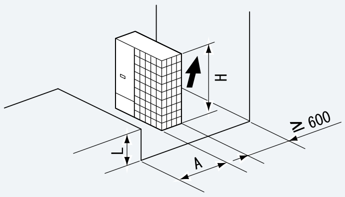
Be sure to use the fan direction guide. Allow 100 mm of space between units. Leave open both right and left sides. Serial installation allowed up to two units.

Outlet Side Blocked

Upper Side Open

Single Installation





Be sure to use the fan direction guide. Leave open both right and left sides.

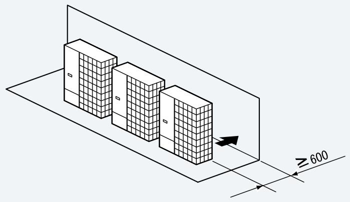
The length A is as shown in the following table:

L	A
0 < L ≤ 1/2H	≤ 200
1/2H < L≤ H	≤ 300

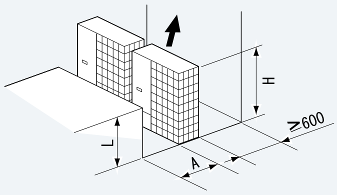
When L > H use a base for outdoor unit to make L ≤ H.

Close the base not to allow the outlet air bypassed.

Multiple Installation (Two units or more)



Allow 100 mm of space between units. Both right and left sides shall be open.



Be sure to use the fan direction guide. Allow 100 mm of space between units. Serial installation allowed up to two units. Leave open both right and left sides.

The length A is as shown in the following table:

L	A
0 < L ≤ 1/2H	≤ 250
1/2H < L≤ H	≤ 350

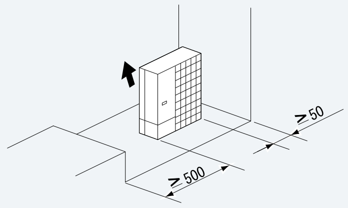
When L > H use a base for outdoor unit to make L ≤ H.

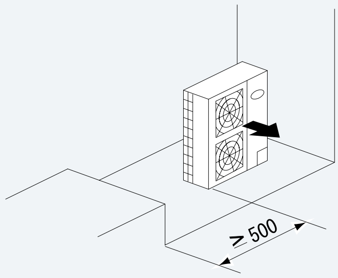
Close the base not to allow the outlet air bypassed.

Lateral Side Blocked

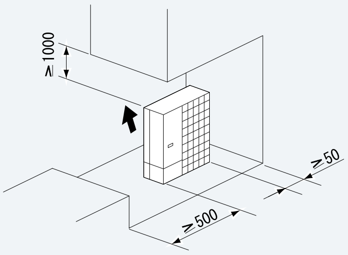
Upper Side Open

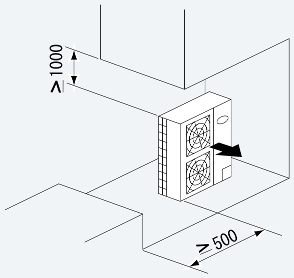
Single Installation





Upper Side Blocked

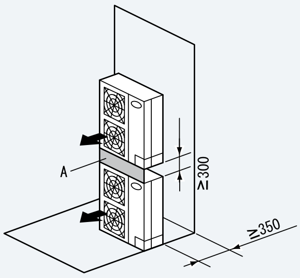




Stack installation (allowed up to 2 Units)

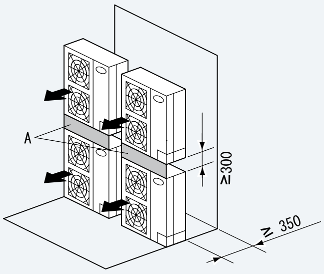
Upper Side Open

Single Installation



Close the part A not to allow the outlet air bypassed. Install to avoid the drain water from upper unit falling on the lower unit.

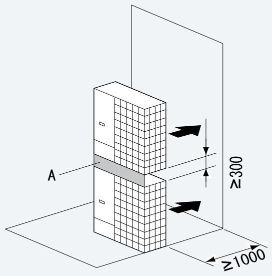
Multiple Installation



Allow 100 mm of space between units. Serial sideways installation allowed up to two units. Leave open both right and left sides. Close the part A not to allow the outlet air bypassed. Install to avoid the drain water from upper unit falling on the lower unit.

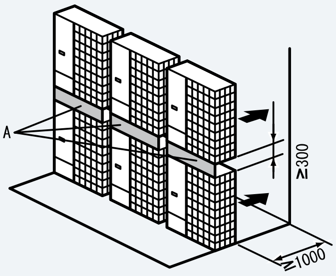
Upper Side Blocked

Single Installation



Be sure to use the fan direction guide. Close the part A not to allow the outlet air bypassed. Install to avoid the drain water from upper unit falling on the lower unit.

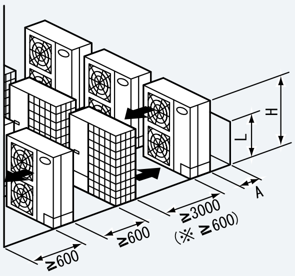
Multiple Installation



Be sure to use the fan direction guide. Allow 100 mm of space between units. Serial side way installation allowed. but leave open both right and left sides. Close the part A not to allow the outlet air bypassed. Install to avoid the drain water from upper unit falling on the lower unit.

Multiple Installation in Multiple Rows

Serial Installation in Multiple Rows (E.g. Rooftop)



Allow approx. 100 mm of space from the side unit. Leave open both right and left sides.

The length A is as shown in the following table:

L	A
0 < L ≤ 1/2H	≤ 200
1/2H < L≤ H	≤ 300

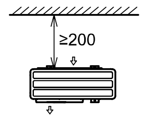
NOTE

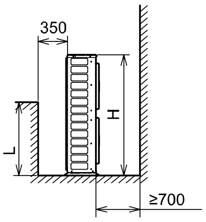
When L > H use a base for outdoor unit to make L = H. Close the base not to allow the outlet air bypassed. Be sure to use the fan direction guide in order to ensure the length marked with ※.

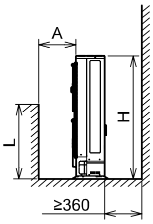
2.5.3 RAS-(8-12)HRNM

Single installation

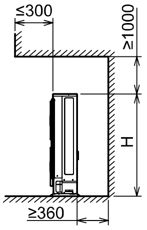
Around sides are open

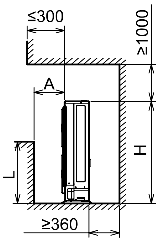




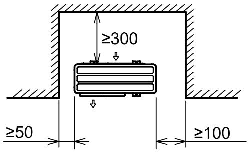


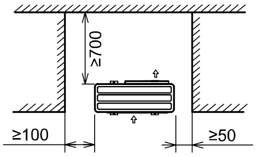
Around sides are open with obstacles above

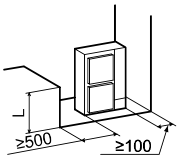


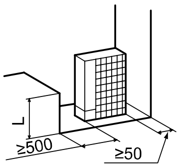


Around sides are closed

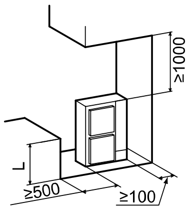


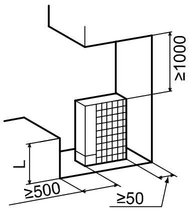






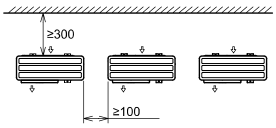
Around sides are open with obstacles above

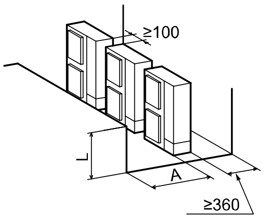


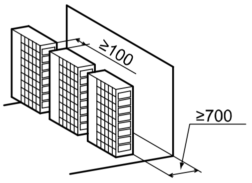


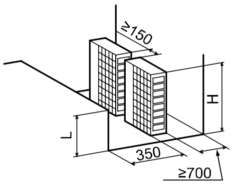
Multiple installation

Around sides are open

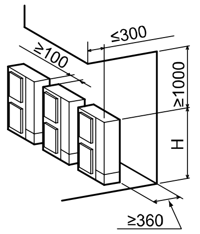


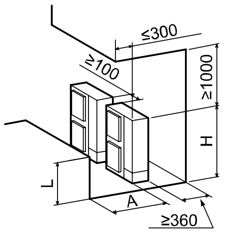




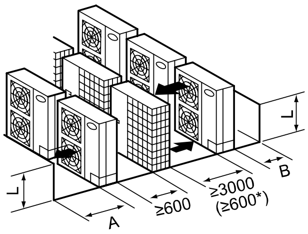


Around sides are open with obstacles above





Multi-Row



NOTE

- ***All units are in mm.***
- ***Do not stack more than two units in the height.***
- ***If L is larger than H mount the units on a base so that H is equal or greater than L.***
  - ***H: Unit height (1650 mm) + base concret height***

L	A	B
0 < L ≤ 1/2 H	600 or more	300 or more
1/2H < L ≤ H	—	—

- ***In this situation ensure that the base is closed and does not allow the airflow to short circuit.***
- ***In each case install the outdoor unit so that the discharge flow is not short-circuited.***
- ***When the installation dimension results the one marked with an (*) mount the air flow guide.***

2.6 Place provision

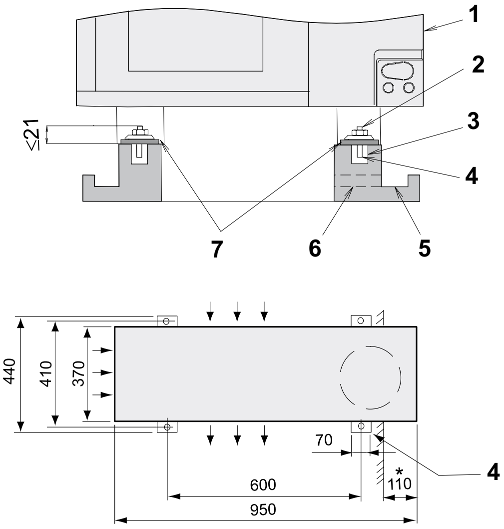
2.6.1 Place provision for RAS-(3-12)H(V)RNM(2)(E) and RAS-(4-10)H(V)RNS(2)E

◆ **Concrete foundation**

- Foundation could be on flat and it is recommended to be 100-300 mm higher than ground level.
- Install a drainage around foundation for smooth drain.
- When installing the outdoor unit fix it by M10 anchor bolts.
- When installing the unit on a roof or a veranda drain water sometimes turns into ice on a cold morning. Therefore avoid draining in an area that people often use because it may become slippery.

Metal plate for RAS-(3-6)H(V)RNM2E and RAS-(4-10)H(V)RNS(2)E

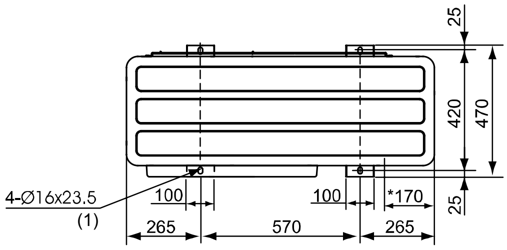
1 Outdoor unit.
2 Cut this portion of bolt If not it’s difficult to remove Service cover.
3 Mortar hole (Ø100 x Depth 150).
4 Anchor bolt M10 (Ø12.5 Hole).
5 Drainage (Wide 100 x Depth 150).
6 Drainage.
7 Vibration-proof rubber.



NOTE

- ***(*): Space for downward piping space.***

Anchor bolt location in case of RAS-(8–12)HRNM(1).



(mm)

The whole base of the outdoor unit should be installed on a foundation. When using vibration-proof material it should also be positioned in the same place. When installing the outdoor unit on a fieldsupplied frame use metal plates to adjust the frame width for stable installation as shown in the figure below.

1. Outdoor unit is unstable

2. Frame.

3. Outdoor unit is stable.

4. Metal plate.

A. For RAS-(3-6)H(V)RNM2E 57 mm. Base width for outdoor unit.

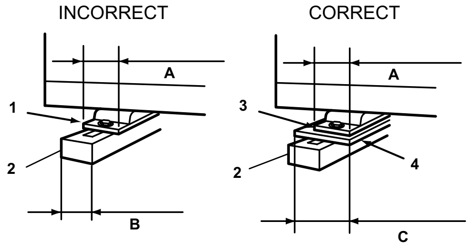
For RAS-(4-10)H(V)RNS(2)E 70 mm. Base width for outdoor unit.

For RAS-(8-12)HRNM: 100 mm. Base width for outdoor unit.

B. 60 mm. Frame width (Field supplied).

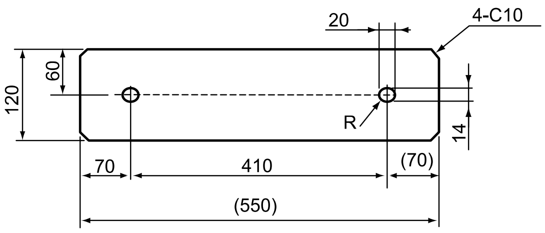
C. For RAS-(3-12)H(V)RNM(2)(E) 100 mm or more Metal plate.

For RAS-(4-10)H(V)RNS(2)E: 70 mm or more Metal plate.



Recommended Metal Plate Size

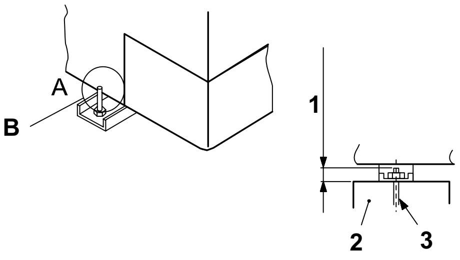
- (Field-Supplied) Material: Hot-Rolled Mild Steel.
- Plate (SPHC) Plate Thickness: 4.5 T.



◆ Example of fixing outdoor unit by anchor bolts

1. Max. 21 mm (After cut "A")
2. Concrete
3. Anchor bolt

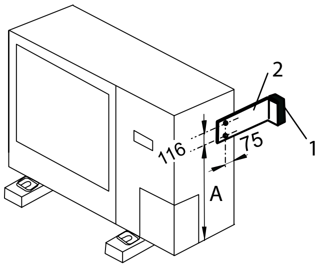
B. Cut this portion when this type of anchor bolt is used. If not done it will be dificult to remove the service cover



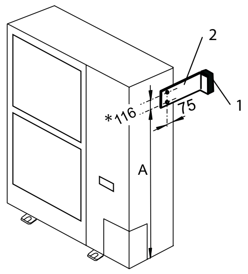
◆ Fix unit to the wall

1 Fix the unit onto the wall as shown in the figures (Field supplied bracket).
2 Secure the foundation to avoid noise and warping
3 To avoid vibrations transferring to the building use a rubber mat.

RAS-3HVRNM2E
RAS-(4-6)H(V)RNS2E



RAS-(4-6)H(V)RNM2E
RAS-(8-12)HRNM
RAS-(8/10)HRNSE



1. Rubber material
2. Fixing plate

NOTE

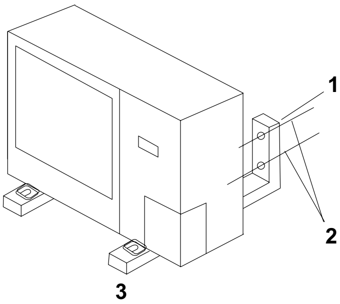
- ***(*): In RAS-(8-12)HRNM are 110 mm***

Model	RAS-3HVRNM2E	RAS-(4-6)H(V)RNS2E	RAS-(4-6)H(V)RNM2E	RAS-(8-12)HRNM	RAS-(8/10)HRNSE
A (mm)	529	796	529	1173	1109

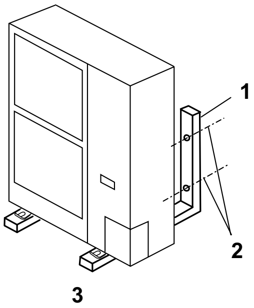
◆ Suspended unit

1 Suspend the unit as shown in the figures.
2 Ensure that wall can withstand the weight of the outdoor unit indicated on the specifications plate.
3 It is advisable that each foot support should bear the full weight of the unit (in order take account of applied stress fatigue when unit is operating).

RAS-3HVRNM2E
RAS-(4-6)H(V)RNS2E



RAS-(4-6)H(V)RNM2E
RAS-(8-12)HRNM
RAS-(8/10)HRNSE



1. Wall support
2. Anchor bolts
3. Supplied by the installer

CAUTION

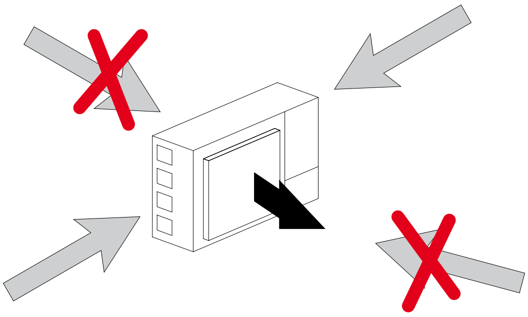
- ***Follow these installation procedures carefully***
  - ***The installation must be done so as to ensure that the outdoor unit does not lean vibrate make a noise or fall in the event of strong gusts of wind or earthquakes. Calculate the resistance to vibration (caused by earthquakes) to guarantee that the installation is sturdy enough to prevent falls. Secure the unit with cables (field-supplied) when installing the unit in a place without walls or wind protection and where it is likely to be exposed to gusts of wind.***
  - ***When using the vibration-proof rubber mat secure it at four points on the front and back.***

◆ Installing location where the unit will be exposed to strong wind

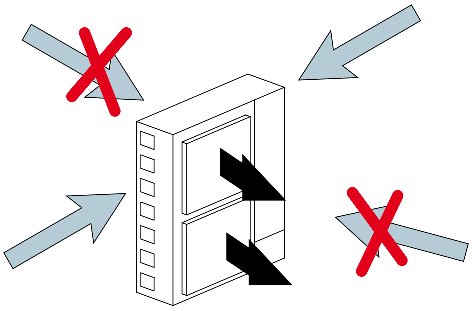
Follow the instructions below to install on the roof or in a place which is not surrounded by buildings and where the product may be buffeted by strong winds.

1 Select a place where the input or outlet side of the product is exposed to strong winds.
2 When the outlet is exposed to strong winds: Strong direct winds may cause a lack of air flow and negative effects on the unit operation.

RAS-3HVRNM2E
RAS-(4-6)H(V)RNS2E



RAS-(4-6)H(V)RNM2E
RAS-(8-12)HRNM
RAS-(8/10)HRNSE

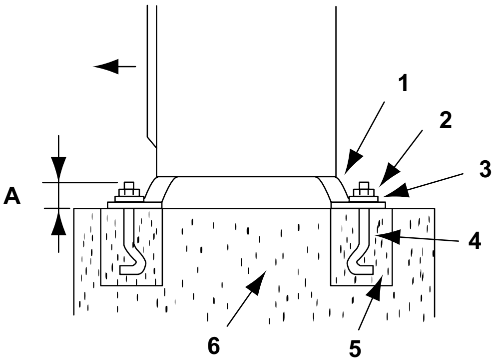


CAUTION

An excessively strong wind blowing against the outlet of the outdoor unit may cause reverse rotation and damage to the fan motor.

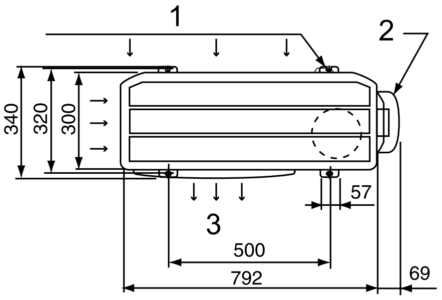
2.6.2 Place provision only for RAS-(2-3)HVRN(S)2

1 Secure the outdoor unit with the anchor
1. Base of outdoor unit
2. Nut
3. Special washer (M12)
4. Anchor bolts
5. Filled mortar
6. Concrete
A. Max. 17 mm



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

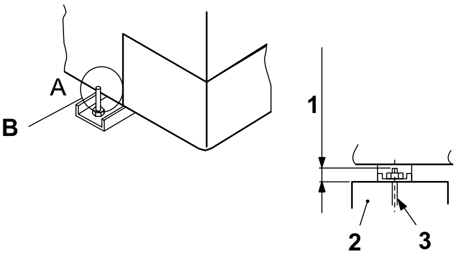
2 When installing the outdoor unit fix the unit by anchor bolts.Regarding the location of fixing holes.
1. M10 Hole for anchor bolt (Ø12)
2. Pipe cover
3. Front side



3 Example of fixing outdoor unit by anchor bolts.

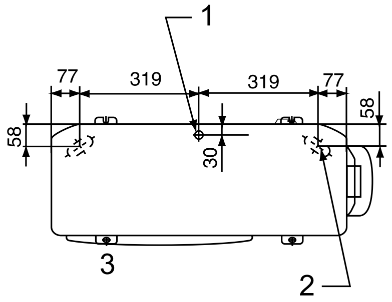
1. Max. 17 mm (After cut “A”)
2. Concrete
3. Anchor bolt

B: Cut this portion when this type of anchor bolt is used. If not done it will be difficult to remove the service cover



4 Provide an adequate drainage around the foundation. When installing the unit on a roof or a veranda drain water may turn to ice in a cold morning. Therefore avoid draining in an area where people often use because it is slippery. In case of installing such a place provide the additional drainage around the foundation.

1. Drain hole (30x80)
2. Drain hole (3-30x80)
3. Front side



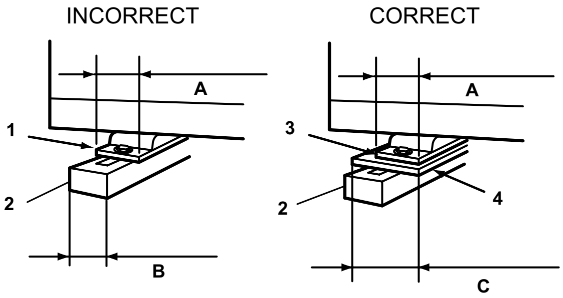
5 The whole of the base of the outdoor unit should be installed on a foundation. When using vibration-proof mat it should also be positioned the same way. When installing the outdoor unit on a field-supplied frame use metal plates to adjust the frame width for stable installation as shown in Figure.

1. Outdoor unit is unstable
2. Frame
3. Outdoor unit is stable
4. Metal plate

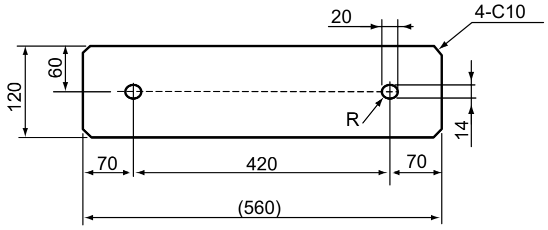
A. 57 mm. Base width of outdoor unit

B. 40 mm Frame width (Field-supplied)

C. 100 mm or more Metal plate



- Recommended Metal Plate Size:
  - (Field-Supplied) Material: Hot-Rolled Mild Steel.
  - Plate (SPHC) Plate Thickness: 4.5 T

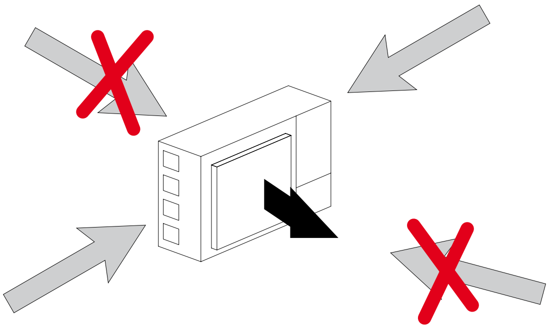


Installing location where the unit will be exposed to strong wind

Follow the instructions below to install on the rooftop or a location without surrounding buildings where strong wind is expected against the product.

1 Choose a location where the outlet or inlet side of the product will not be exposed to strong wind.

2 When the outlet is exposed to strong wind: Direct strong wind may cause lack of air flow and adversely affect to normal function.



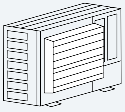
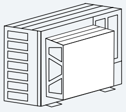
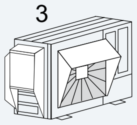
CAUTION

Excessive strong wind against the outdoor unit outlet may cause inverse rotation and damage the fan and motor.

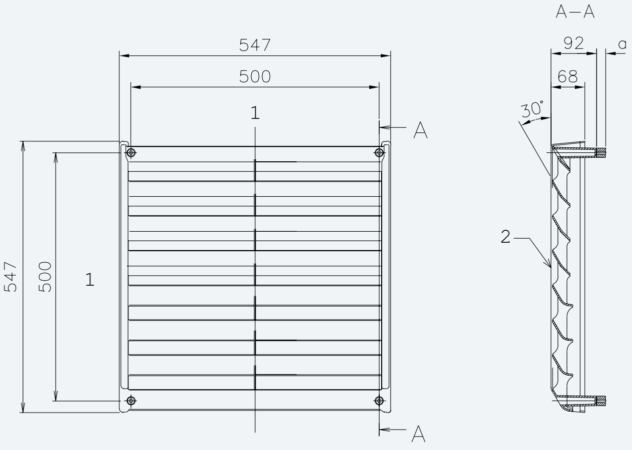
2.7 Optional parts and installation

2.7.1 Optional parts and installation for RAS-(2-3)HVRN(S)2

◆ Air flow guide wind guard and snow protection hood

Optional parts			Model	
Air flow guide			AG-264	1  2  3  **1** Air flow guide **2** Wind Guard **3** Snow protection hood
Wind guard			WSP-264	
Snow protection hood	Zinc Plate	Air outlet	ASG-NP80F	
		Air inlet of rear side	ASG-NP56B	
		Air inlet of side face	ASG-NP56L	
	Stainless plate (NSSC180)	Air outlet	ASG-NP80FS2	
		Air inlet of rear side	ASG-NP63B52	
		Air inlet of side face	ASG-NP63LS2	

◆ Air flow guide

Model	AG-264	
Quantity	1 per unit	 **1** Mounting dimension **2** Air flow guide
Air discharge direction	Upward (downward) left & right	
Material	Weather proof polypropylene resin	
Color	Gray	
Weight	1.4 kg	
Accessories	Fixing screw 4x [M5 (SUS) x 12]+4x [M5 (SUS) x 30] Installation manual Self-screw 2x [M4 x 13]	
Installation restriction	“Wind Guard” or “Snow protection hood” is not available to install with air flow guide. (“Guard net” is available to be installed together.)	

Attaching example of air flow guide

- Attach the air flow guide to the air discharge grille with four (4) screws (supplied).
- The fixing holes are located at 4 positions on the grille. (Screw tightening torque 2.4 3.1 N.m)
- Do not remove the air discharge grille for air flow guide installation.

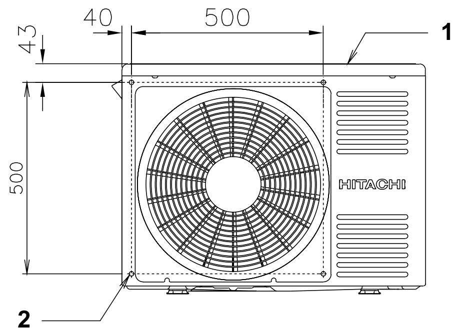
CAUTION

If the air guide is installed without discharge grille it may cause injury due to rotating fan.

Locations of fixing holes

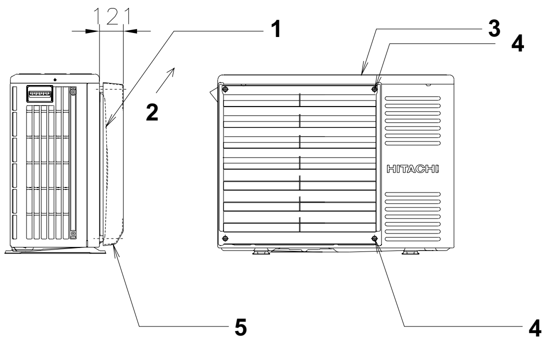
The holes Location shall be made by using self-screws (M4x13) and later shall be used SUS screw (M5x12) for fixing air flow guide.

1 Outdoor Unit
2 Hole (4 locations)



One flow guide installation

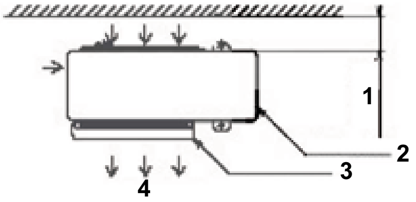
1 Air discharge grille
2 Air flow
3 Outdoor unit
4 M5 fixing screw x4 (Accessories)
5 Air flow guide



Service space (In case of upward air discharge)

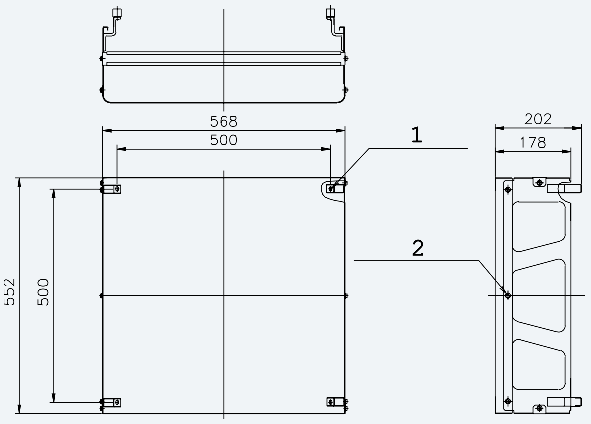
- In case of right and left sides air discharge enough space for air discharge is required.
- The downward air discharge is also available. In such case install the base under the unit to secure enough space for air discharge.
- In case of serial units installation air discharge should be upward.

1 Min.150 mm
2 Outdoor unit
3 Air flow guide
4 Passage side



◆ Wind guard

Specifications

Model	WSP-264	
Quantity	1 per unit	
Material	Galvanized sheet metal + baked painting	
Color	UTOPIA Beige	
Weight	4.0 kg	
Accessories	Fixing screw x 4 [M5 (SUS) x 30]- Unit Fixing Screw x 10 [M5 (SUS) x 12]- Wind Ward Installation manual	
Installation restriction	“Guard net” “Air flow guide” or “Snow protection hood” is not available to install with Wind guard	**1** 4-6x10 Long Hole **2** 5 (Both Sides) - M5 Screw (attachement)

Attaching example of air wind guard

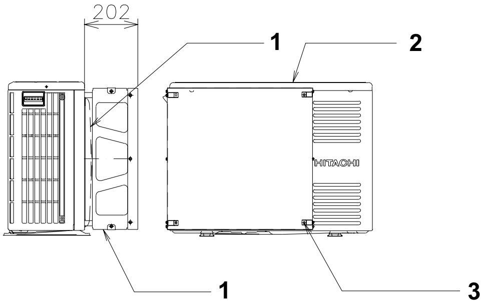
- Attach the air flow guide to the air discharge grille with four (4) screws (supplied).
- The fixing holes are located at 4 positions on the grille. (Screw tightening torque 2.4 3.1 N.m)
- Do not remove the air discharge grille for air flow guide installation.

CAUTION

- ***If the air guide is installed without discharge grille it may cause injury due to rotating fan.***

Two windguard covers installation

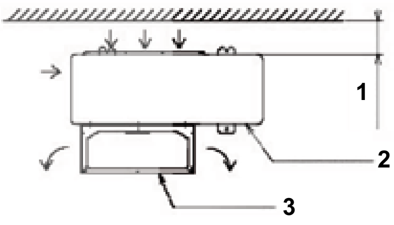
1 Air discharge grille
2 Outdoor unit
3 M5 fixing screw x4 (Accessories)



Service space

- Both sides of the outdoor unit should be open.
- No obstacles should be placed in the air discharge side.

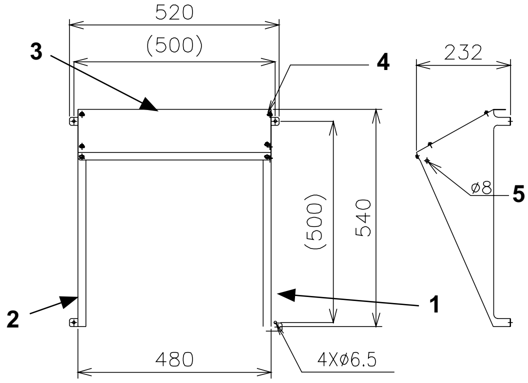
1 Min.150 mm
2 Outdoor unit
3 Wind guard



◆ Snow protection hood

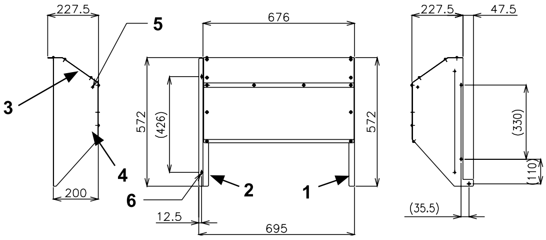
Air discharge hood

Nº	Part name	Quantity
1	Right side plate	1
2	Left side plate	1
3	Front panel	1
4	Fixing screw (Accessories)	
5	Hole for safety wire rope to prevent overturning	



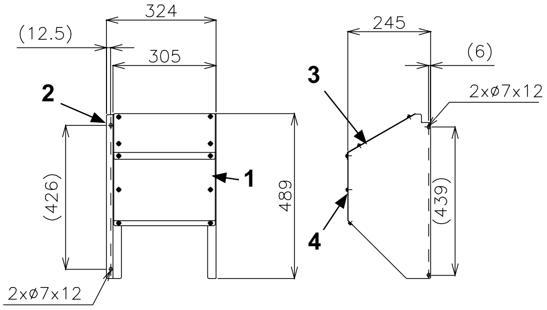
Rear suction hood

Nº	Part name	Quantity
1	Right side plate	1
2	Left side plate	1
3	Upper front panel (Upside)	1
4	Upper front panel (Downside).	1
5	Hole for safety wire rope to prevent overturning	
6	Fixing screw (Accessories)	

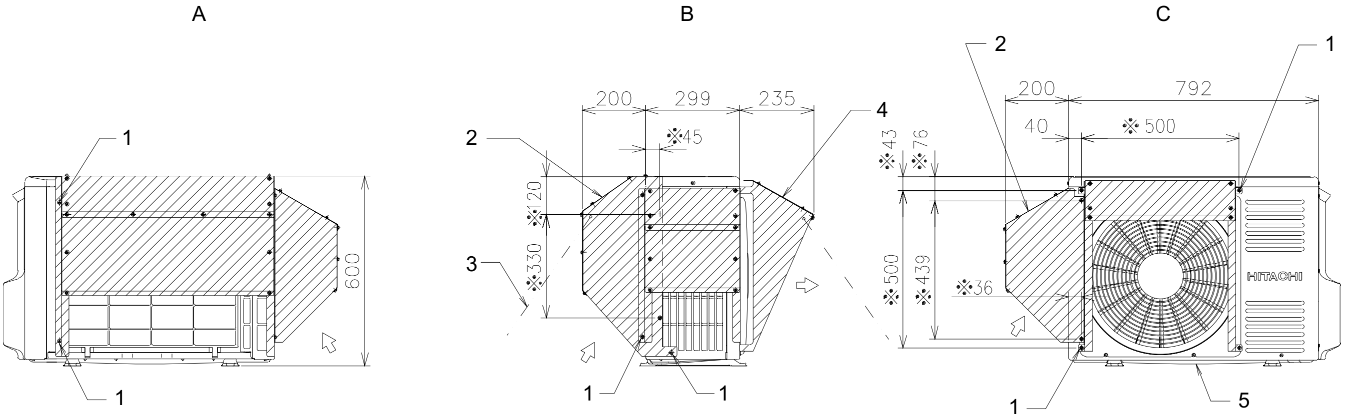


Left suction hood

Nº	Part name	Quantity
1	Right side plate	1
2	Left side plate	1
3	Upper front panel (Upside)	1
4	Upper front panel (Downside).	1



Attaching example of snow protection hood



1. Fixing screw (accessories)
2. Air inlet hood
3. Wire rope (optional for over turning protection)
4. Air discharge hood
5. Outdoor unit

A. Rear side

B. Left side

C Front side

NOTE

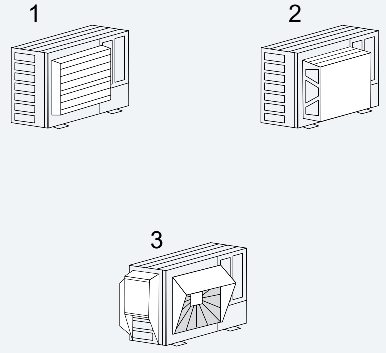
- ***The holes locations marked with a mark shall be made by using sel screw (M4X13) and later shall be used SUS Screw for fixing protection hood.***

Specifications of snow protection hood

Product name		Air discharge hood		Rear suction hood		Left suction hood	
Model		ASG-NP80F	ASG-NP80FS	ASG-NP56B	ASG-NP63BS2	ASG-NP56L	ASG-NP63LS2
Quantity		1 per unit					
Material		Bonderized steel sheet Iron	Stainless (NSSC180)	Bonderized steel sheet Iron	Stainless (NSSC180)	Bonderized steel sheet Iron	Stainless (NSSC180)
Color		Gray (1.0Y8.5/0.5 or approximation)	—	Gray (1.0Y8.5/0.5 or approximation)	—	Gray (1.0Y8.5/0.5 or approximation)	—
Weight		3 kg		6 kg		3 kg	
Assembling		Knockingdown parts (assembled at field)					
Components	Hood	For air discharge part x 1		For rear side air intake x 1		For left side air intake x 1	
	Unit Fixing screw	4 (M5x12 tapping screw)		5 (M5x12 tapping screw)		4 (M5x12 tapping screw)	
	Hood Fixing screw (SUS)	6 (M5x12 tapping screw)	6 (M5x14)	14 (M5x12 tapping screw)	14 (M5x14)	10 (M5x12 tapping screw)	10 (M5x14)
	Self-screw	2 (M4x13)		2 (M4x13)		2 (M4x13)	
		Installation manual					
Installation restriction		Installation with “Guard net” “Wind guard” or is not available		Installation with “Guard net” is not available			
Safety wire rope for overturning prevention (optional parts)		ASG-SW20A					

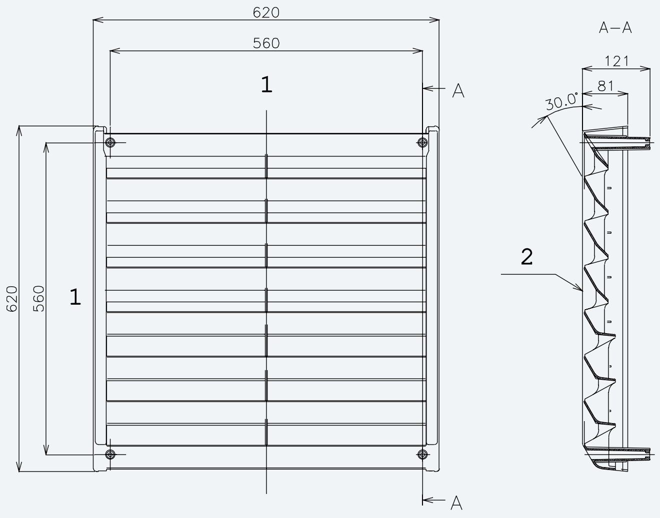
2.7.2 Optional parts and installation RAS-3HVRNM2E / RAS-(4-6)H(V)RNS2E

◆ Air flow guide wind guard and snow protection hood

Optional parts			Model	
Air flow guide			AG-335A	 **1** Air flow guide **2** Wind Guard **3** Snow protection hood
Wind guard			WSP-335A	
Snow protection hood	Zinc plate	Air outlet	ASG-NP335F	
		Air inlet of rear side	ASG-NP80B	
		Air inlet of side face	ASG-NP80L	
	Stainless plate (SUS304)	Air outlet	ASG-NP335F52	
		Air inlet of rear side	ASG-NP160BS2	
		Air inlet of side face	ASG-NP160LS2	

◆ Air flow guide

Specifications

Model	AG-335A	
Quantity	1 per unit	 **1** Mounting dimension **2** Air flow guide
Air discharge direction	Upward (downward) left & right	
Material	Weather proof polypropylene resin	
Color	Gray	
Weight	1.9 kg	
Accessories	Fixing screw x 4 [M5 (SUS) x 20] Installation manual	
Installation restriction	“Wind Guard” or “Snow protection hood” is not available to install with air flow guide. (“Guard net” is available to be installed together.)	

Attaching example of air flow guide

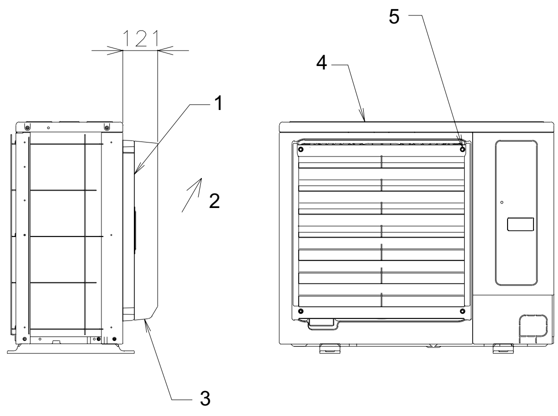
- Attach the air flow guide to the air discharge grille with four (4) screws (supplied).
- The fixing holes are located at 4 positions on the grille. (Screw tightening torque 2.4 3.1 N.m)
- Do not remove the air discharge grille for air flow guide installation.

⚠CAUTION

- ***If the air guide is installed without discharge grille it may cause injury due to rotating fan.***

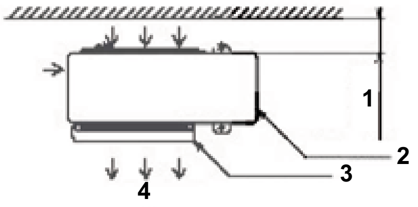
One flow guide installation

1 Air discharge grille
2 Air flow
3 Air flow guide
4 Outdoor unit
5 M5 fixing screw x4 (Accessories)



Service space (In case of upward air discharge)

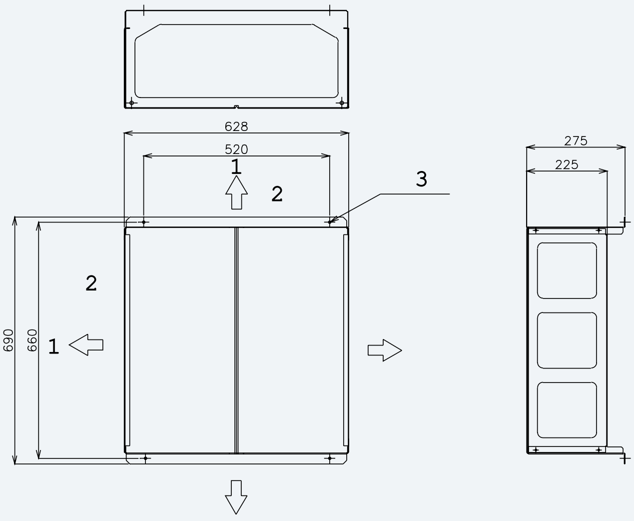
- In case of right and left sides air discharge enough space for air discharge is required.
- The downward air discharge is also available. In such case install the base under the unit to secure enough space for air discharge.
- In case of serial units installation air discharge should be upward.



1 Min. 200 mm
2 Outdoor unit
3 Air flow guide
4 Passage side

◆ **Wind guard**

Specifications

Model	WSP-335A	
Quantity	1per unit	 **1** Mounting dimension **2** Air flow **3** 3 4xØ7
Material	Galvanized sheet metal + baked painting	
Color	Gray (1.0Y8.5/0.5)	
Weight	5.5 kg	
Accessories	Fixing screw x 4 [M5 (SUS) x 12] Installation manual	
Installation restriction	“Guard net” “Air flow guide” or “Snow protection hood” is not available to install with Wind guard	

Attaching example of air wind guard

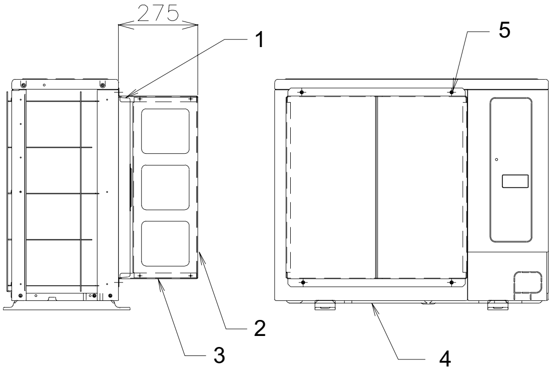
- Attach the air flow guide to the air discharge grille with four (4) screws (supplied).
- The fixing holes are located at 4 positions on the grille. (Screw tightening torque 2.4 3.1 N.m)
- Do not remove the air discharge grille for air flow guide installation.

CAUTION

- ***If the air guide is installed without discharge grille it may cause injury due to rotating fan.***

One windguard cover installation

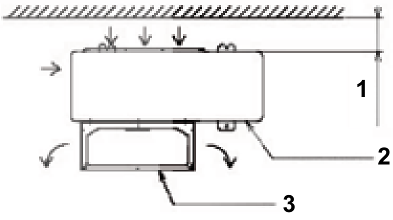
1 Air discharge grille
2 Wind guard
3 Air discharge grille
4 Outdoor unit
5 M5 fixing screw x4 (Accessories)



Service space

- Both sides of the outdoor unit should be open.
- No obstacles should be placed in the air discharge side.

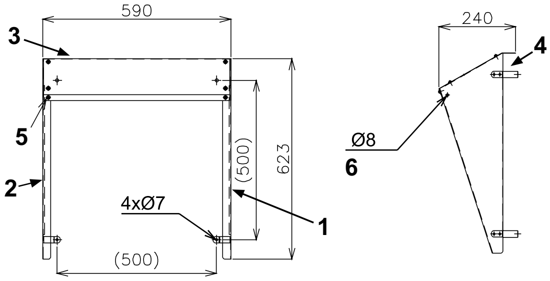
1 Min. 200 mm
2 Outdoor unit
3 Wind guard



◆ Snow protection hood

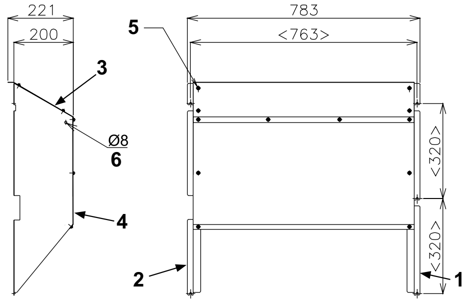
Air discharge hood

Nº	Part name	Quantity
1	Right side plate	1
2	Left side plate	1
3	Front panel	1
4	Stay	4
5	Fixing screw (Accessories)	
6	Hole for safety wire rope to prevent overturning	



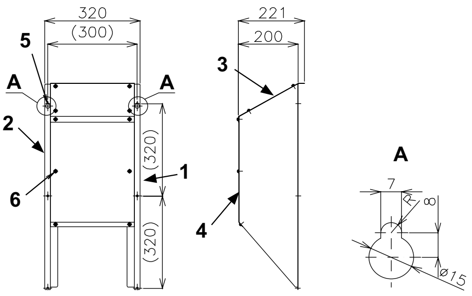
Rear suction hood

Nº	Part name	Quantity
1	Right side plate	1
2	Left side plate	1
3	Upper front panel (Upside)	1
4	Upper front panel (Downside)	1
5	Fixing screw (Accessories)	
6	Hole for safety wire rope to prevent overturning	

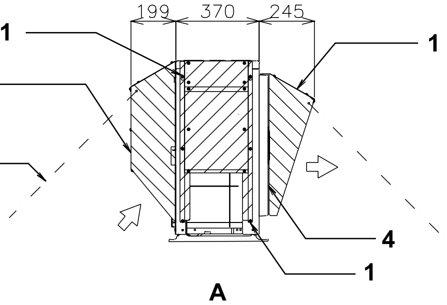


Left suction hood

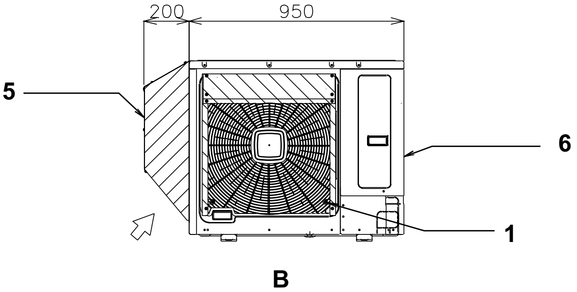
Nº	Part name	Quantity
1	Right side plate	1
2	Left side plate	1
3	Front panel (Upside)	1
4	Front panel (Downside)	1
5	Fixing hole x 2	
6	Fixing screw (Accessories)	
A	Enlarged view of A (Fixing Hole)	



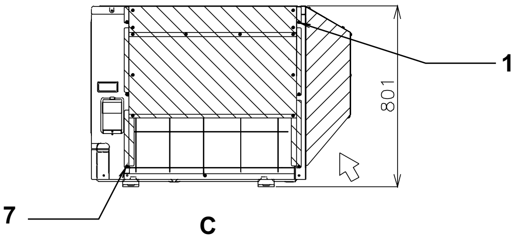
Attaching example of snow protection hood



A



B



C

1. Fixing screw (Accessories).
2. Rear suction hood
3. Wire rope (Optional. For overturning protection)
4. Air discharge grille
5. Left suction hood
6. Air discharge hood

A. Left side

B. Front side

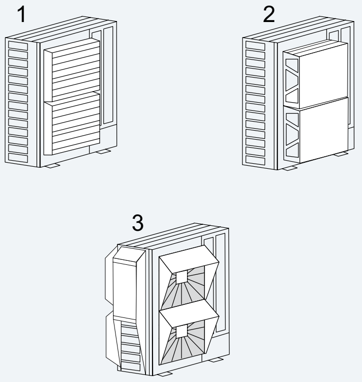
C. Rear side

Specifications of snow protection hood

Product name		Air discharge hood		Rear suction hood		Left suction hood	
Model		ASG-NP335F	ASG-NP335FS2	ASG-NP80B	ASG-NP160BS2	ASG-NP80L	ASG-NP160LS2
Quantity		2 per unit		1 per unit			
Material		Bonderized steel sheet Iron	Stainless (NSSC 180)	Bonderized steel sheet Iron	Stainless (NSSC 180)	Bonderized steel sheet Iron	Stainless (NSSC 180)
Color		Gray (1.0Y8.5/0.5 or approximation)	—	Gray (1.0Y8.5/0.5 or approximation)	—	Gray (1.0Y8.5/0.5 or approximation)	—
Weight		3 kg		14 kg		8 kg	
Assembling		Knockingdown parts (assembled at field)					
Components	Hood	For air discharge part x 1		For rear side air intake x 1 (Upper side x 1 lowe side x 1)		For left side air intake x 1	
	Unit Fixing screw	4 (M5x12 tapping screw)		5 (M5x14 tapping screw)		6 (M5x12 tapping screw)	
	Unit Fixing screw (SUS)	6 (M5x12 tapping screw)	6 (M5x14)	12 (M5x12 tapping screw)	12 (M5x14)	10 (M5x12 tapping screw)	10 (M5x14)
		Installation manual					
Installation restriction		Installation with “Guard net” or “Wind guard” is not available		Installation with “Guard net” is not available			
Safety wire rope for overturning prevention (optional parts)		ASG-SW20A					

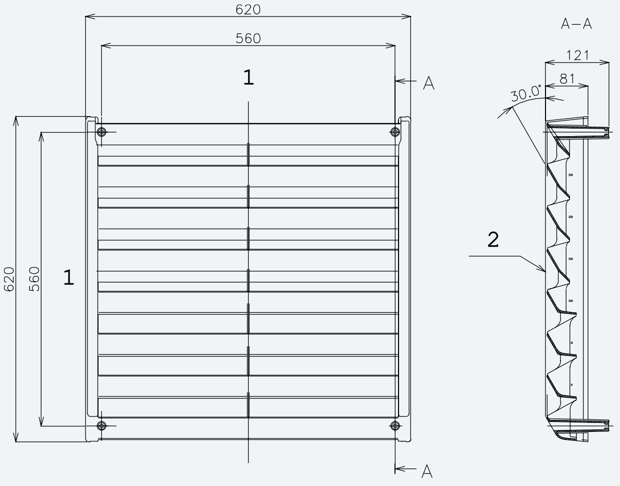
2.7.3 Optional parts and installation RAS-(4-6)H(V)RNM2E / RAS-(8/10)HRNSE

◆ Air flow guide wind guard and snow protection hood

Optional parts			Model	
Air flow guide			AG-335A X 2	 **1** Air flow guide **2** Wind Guard **3** Snow protection hood
Wind guard			WSP-335A X 2	
Snow protection hood	Zinc plate	Air outlet	ASG-NP335F X 2	
		Air inlet of rear side	ASG-NP280B	
		Air inlet of side face	ASG-NP280L	
	Stainless plate (NSSC 180)	Air outlet	ASG-NP335FS 2X 2	
		Air inlet of rear side	ASG-280BS2	
		Air inlet of side face	ASG-NP280LS2	

◆ Air flow guide

Specifications

Model	AG-335A	Image
Quantity	2 per unit	 **1** Mounting dimension **2** Air flow guide
Air discharge direction	Upward (downward) left & right	
Material	Weather proof polypropylene resin	
Color	Gray	
Weight	1.9 kg	
Accessories	Fixing screw x 4 [M5 (SUS) x 20] Installation manual	
Installation restriction	“Wind Guard” or “Snow protection hood” is not available to install with air flow guide. (“Guard net” is available to be installed together.)	

Attaching example of air flow guide

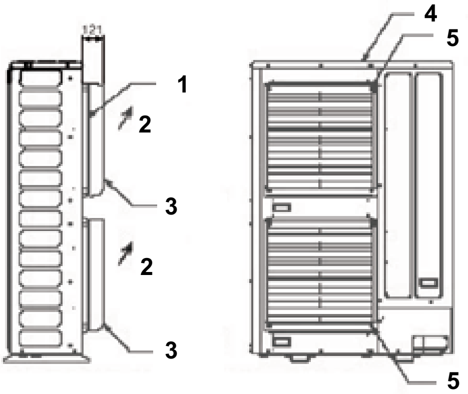
- Attach the air flow guide to the air discharge grille with four (4) screws (supplied).
- The fixing holes are located at 4 positions on the grille. (Screw tightening torque 2.4 3.1 N.m)
- Do not remove the air discharge grille for air flow guide installation.

CAUTION

- ***If the air guide is installed without discharge grille it may cause injury due to rotating fan.***

Two flow guides installation

1 Air discharge grille
2 Air flow
3 Air flow guide (see the note)
4 Outdoor Unit
5 M5 fixing screw x4 (Accessories)

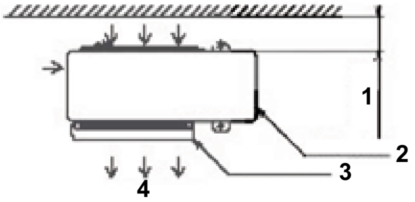


NOTE

- ***Air flow direction of both air flow guides should be the same.***

Service space (In case of upward air discharge)

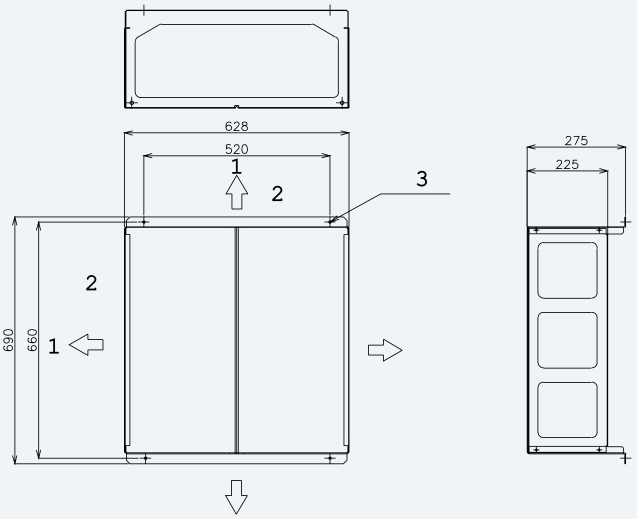
- In case of right and left sides air discharge enough space for air discharge is required.
- The downward air discharge is also available. In such case install the base under the unit to secure enough space for air discharge.
- In case of serial units installation air discharge should be upward.



1 Min. 200 mm
2 Outdoor unit
3 Air flow guide
4 Passage side

◆ Wind guard

Specifications

Model	WSP-335A	
Quantity	2 per unit	 **1** Mounting dimension **2** Air flow
Material	Galvanized sheet metal + baked painting	
Color	Gray (1.0Y8.5/0.5)	
Weight	5.5 kg	
Accessories	Fixing screw x 4 [M5 (SUS) x 12] Installation manual	
Installation restriction	“Guard net” “Air flow guide” or “Snow protection hood” is not available to install with Wind guard	

Attaching example of air wind guard

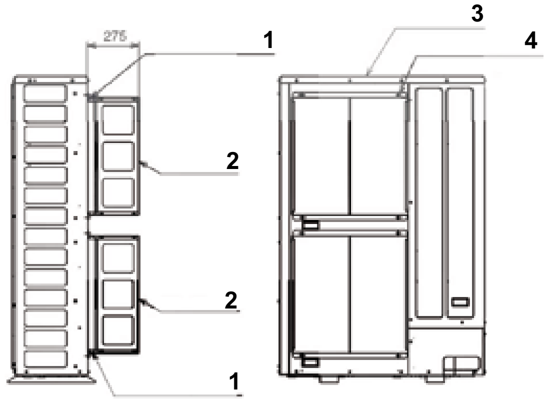
- Attach the air flow guide to the air discharge grille with four (4) screws (supplied).
- The fixing holes are located at 4 positions on the grille. (Screw tightening torque 2.4 3.1 N.m)
- Do not remove the air discharge grille for air flow guide installation.

CAUTION

If the air guide is installed without discharge grille it may cause injury due to rotating fan.

Two windguard covers installation

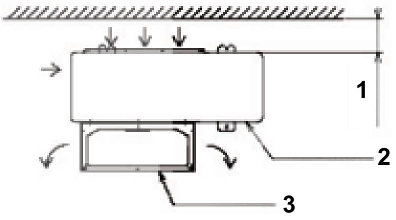
1 Air discharge grille
2 Wind guard
3 Outdoor unit
4 M5 fixing screw x4 (Accessories)



Service space

- Both sides of the outdoor unit should be open.
- No obstacles should be placed in the air discharge side.

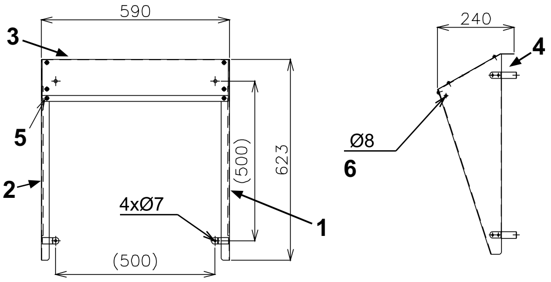
1 Min. 200 mm
2 Outdoor unit
3 Wind guard



◆ Snow protection hood

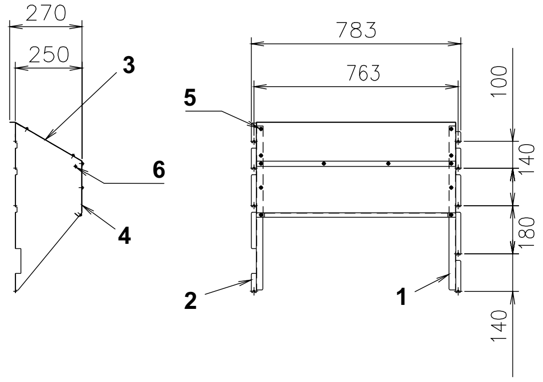
Air discharge hood

Nº	Part name	Quantity
1	Right side plate	1
2	Left side plate	1
3	Front panel	1
4	Stay	4
5	Fixing screw (Accessories)	
6	Hole for safety wire rope to prevent overturning	



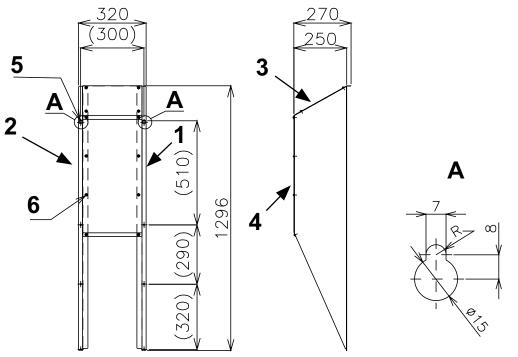
Rear suction hood

Nº	Part name	Quantity
1	Right side plate	1
2	Left side plate	1
3	Upper front panel (Upside)	1
4	Upper front panel (Downside)	1
5	Fixing screw (Accessories)	
6	Hole for safety wire rope to prevent overturning	

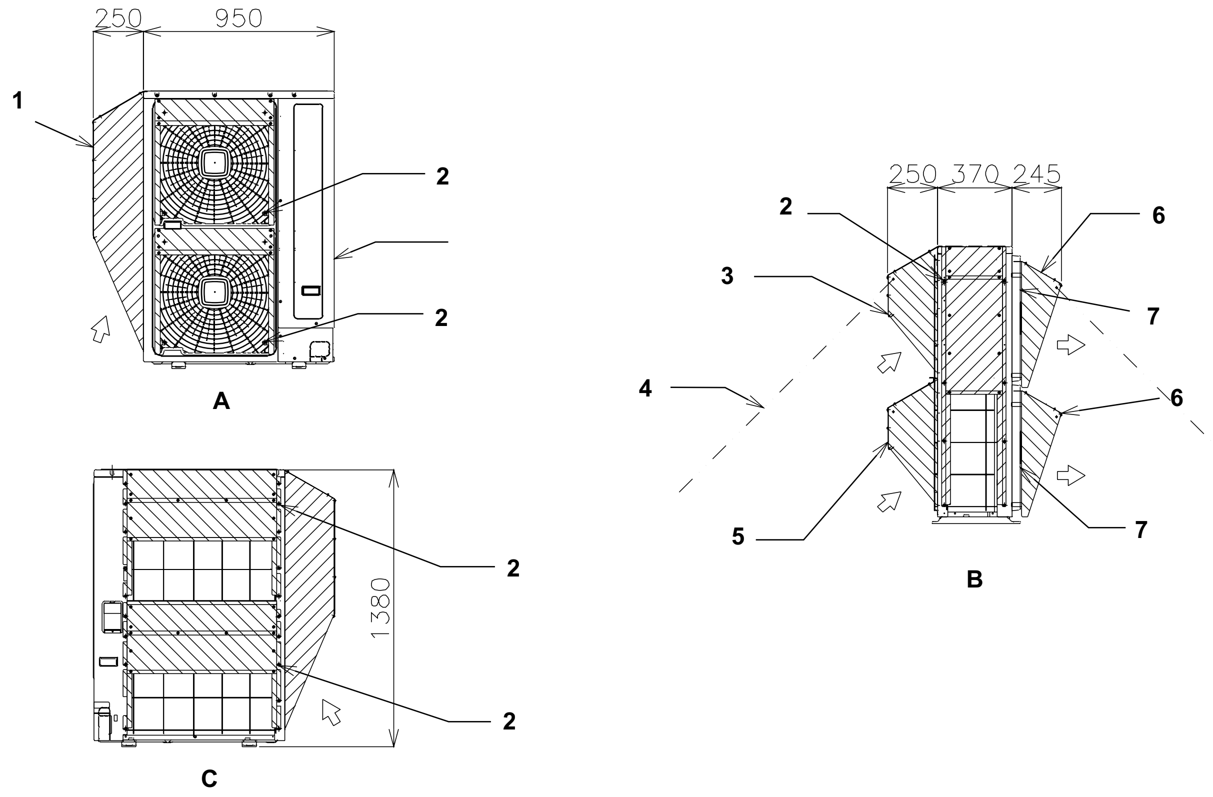


Left suction hood

Nº	Part name	Quantity
1	Right side plate	1
2	Left side plate	1
3	Front panel (Upside)	1
4	Front panel (Downside)	1
5	Fixing hole x 2	
6	Fixing screw (Accessories)	
A	Enlarged view of A (Fixing Hole)	



Attaching example of snow protection hood



1. Left suction hood
2. Fixing screw (Accessories)
3. Rear suction hood Upper side
4. Wire rope (Optional. For overturning protection)
5. Rear suction hood Lower side
6. Air discharge hood
7. Air discharge grille
8. Air discharge grille

A. Front side

B. Left side

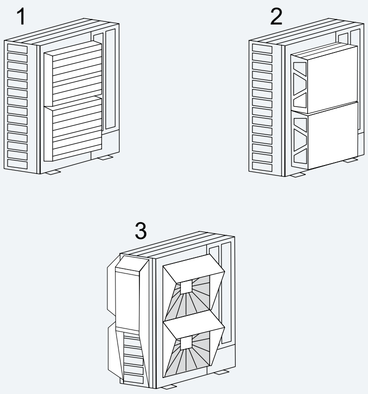
C. Rear side

Specifications of snow protection hood

Product name		Air discharge hood		Rear suction hood		Left suction hood	
Model		ASG-NP335F	ASG-NP335FS2	ASG-NP280B	ASG-NP280BS2	ASG-NP280L	ASG-NP280LS2
Quantity		2 per unit		1 per unit			
Material		Bonderized steel sheet Iron	Stainless (NSSC 180)	Bonderized steel sheet Iron	Stainless (NSSC 180)	Bonderized steel sheet Iron	Stainless (NSSC 180)
Color		Gray (1.0Y8.5/0.5 or approximation)	—	Gray (1.0Y8.5/0.5 or approximation)	—	Gray (1.0Y8.5/0.5 or approximation)	—
Weight		3 kg		14 kg		8 kg	
Assembling		Knockingdown parts (assembled at field)					
Components	Hood	For air discharge part x 1		For rear side air intake x 1 (Upper side x 1 lowe side x 1)		For left side air intake x 1	
	Fixing screw	4 (M5x12 tapping screw)		11 (M5x14 tapping screw)		8 (M5x12 tapping screw)	
	Fixing screw (SUS)	6 (M5x14 tapping screw)	6 (M5x14)	24 (M5x14 tapping screw)	24 (M5x14)	12 (M5x12 tapping screw)	12 (M5x14)
		Installation manual					
Installation restriction		Installation with “Guard net” “Wind guard” or “Air flow guide” is not available		Installation with “Guard net” is not available			
Safety wire rope for overturning prevention (optional parts)		ASG-SW20A					

2.7.4 Optional parts and installation RAS-(8-12)HRNM

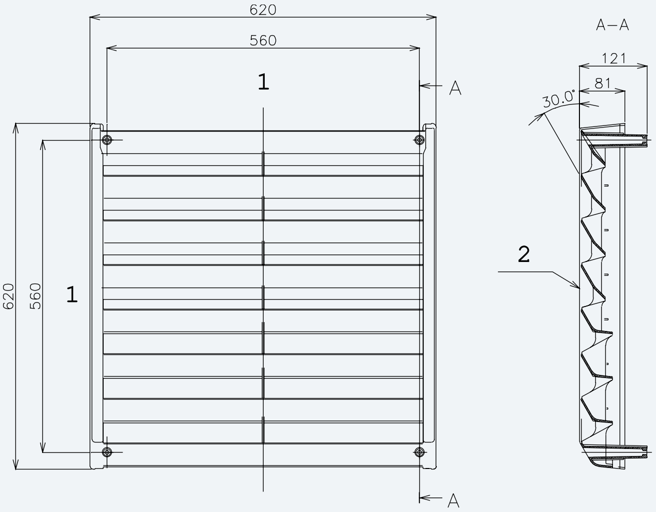
◆ Air flow guide wind guard and snow protection hood

Optional parts			Model	
Air flow guide			AG-335A X 2	 **1** Air flow guide **2** Wind Guard **3** Snow protection hood
Wind guard			WSP-335A X 2	
Snow protection hood	Zinc plate	Air outlet	ASG-NP335F X 2	
		Air inlet of rear side	ASG-NP335B	
		Air inlet of side face	ASG-NP335L	
	Strainless plate(NSSC 180)	Air outlet	ASG-NP335FS2 X 2	
		Air inlet of rear side	ASG-335BS2	
		Air inlet of side face	ASG-NP335LS2	

◆ Air flow guide

Specifications

Model	AG-335A
Quantity	2 per unit
Air discharge direction	Upward (downward) left & right
Material	Weather proof polypropylene resin
Color	Gray
Weight	1.9 kg
Accessories	Fixing screw x 4 [M5 (SUS) x 20] Installation manual
Installation restriction	"Wind Guard" or "Snow protection hood" is not available to install with air flow guide. ("Guard net" is available to be installed together.)



1 Mounting dimension
2 Air flow guide

Attaching example of air flow guide

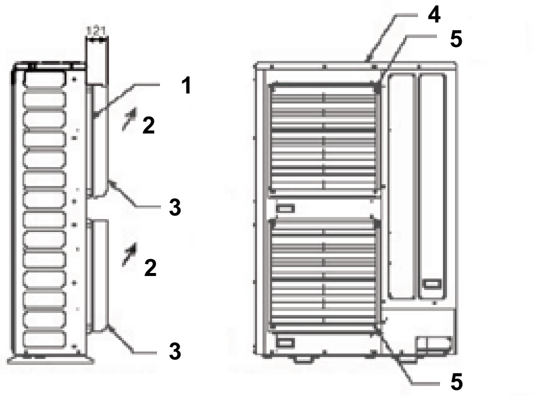
- Attach the air flow guide to the air discharge grille with four (4) screws (supplied).
- The fixing holes are located at 4 positions on the grille. (Screw tightening torque 2.4 3.1 N.m)
- Do not remove the air discharge grille for air flow guide installation.

⚠ CAUTION

- ***If the air guide is installed without discharge grille it may cause injury due to rotating fan.***

Two flow guides installation

1 Air discharge grille
2 Air flow
3 Air flow guide (see the note)
4 Outdoor Unit
5 M5 fixing screw x4 (Accessories)

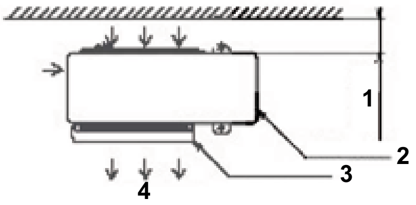


NOTE

Air flow direction of both air flow guides should be the same.

Service space (In case of upward air discharge)

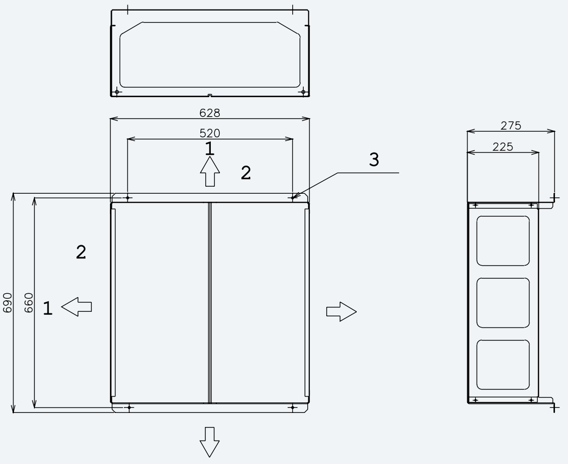
- In case of right and left sides air discharge enough space for air discharge is required.
- The downward air discharge is also available. In such case install the base under the unit to secure enough space for air discharge.
- In case of serial units installation air discharge should be upward.



1 Min. 200 mm
2 Outdoor unit
3 Air flow guide
4 Passage side

◆ Wind guard

Specifications

Model	WSP-335A	
Quantity	2 per unit	 **1** Mounting dimension **2** Air flow
Material	Galvanized sheet metal + baked painting	
Color	Gray (1.0Y8.5/0.5)	
Weight	5.5 kg	
Accessories	Fixing screw x 4 [M5 (SUS) x 12] Installation manual	
Installation restriction	“Guard net” “Air flow guide” or “Snow protection hood” is not available to install with Wind guard	

Attaching example of air wind guard

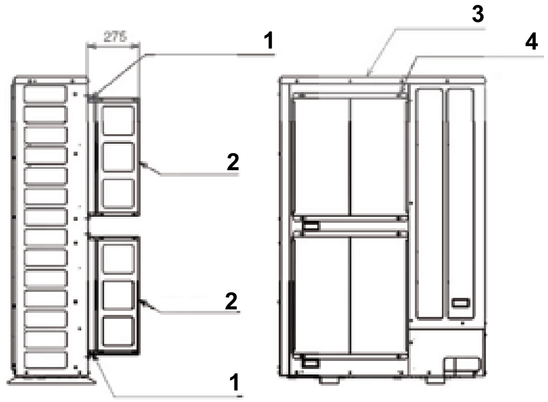
- Attach the air flow guide to the air discharge grille with four (4) screws (supplied).
- The fixing holes are located at 4 positions on the grille. (Screw tightening torque 2.4 3.1 N.m)
- Do not remove the air discharge grille for air flow guide installation.

CAUTION

If the air guide is installed without discharge grille it may cause injury due to rotating fan.

Two windguard covers installation

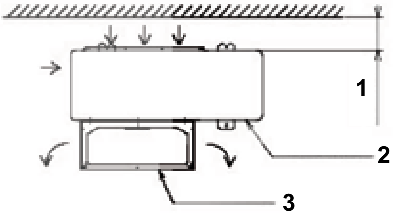
1 Air discharge grille
2 Wind guard
3 Outdoor unit
4 M5 fixing screw x4 (Accessories)



Service space

- Both sides of the outdoor unit should be open.
- No obstacles should be placed in the air discharge side.

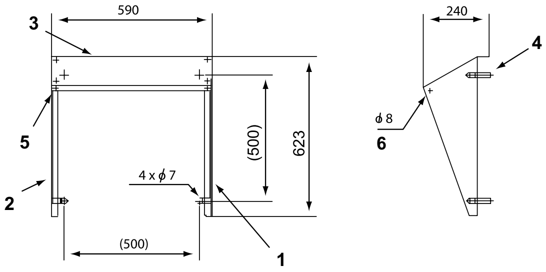
1 Min. 200 mm
2 Outdoor unit
3 Wind guard



◆ **Snow protection hood**

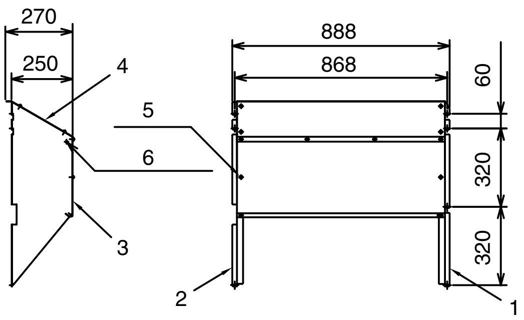
Air discharge hood

Nº	Part name	Quantity
1	Right side plate	1
2	Left side plate	1
3	Front panel	1
4	Stay	4
5	Fixing screw (Accessories)	
6	Hole for safety wire rope to prevent overturning	



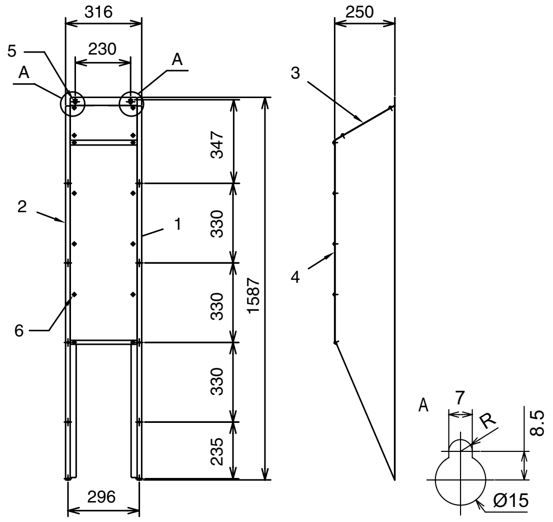
Rear suction hood

Nº	Part name	Quantity
1	Right side plate	1
2	Left side plate	1
3	Upper front panel (Downside)	1
4	Upper front panel (Upside)	1
5	Fixing screw (Accessories)	
6	Hole for safety wire rope to prevent overturning	

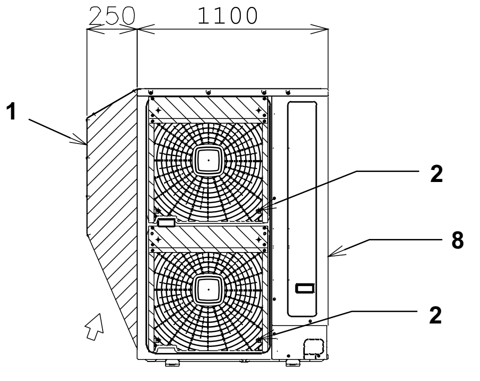


Left suction hood

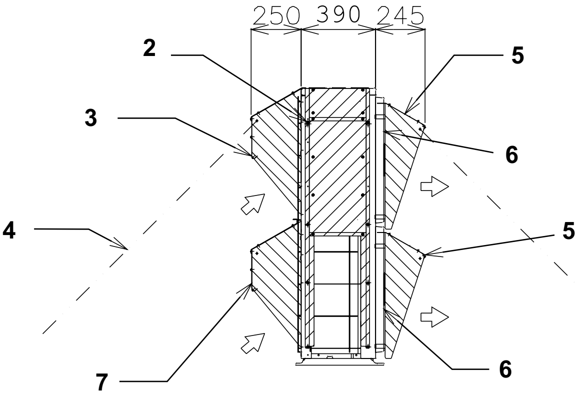
Nº	Part name	Quantity
1	Right side plate	1
2	Left side plate	1
3	Front panel (upside)	1
4	Front side (downside)	1
5	Fixing hole x 2	
6	Fixing screw (Accessories)	



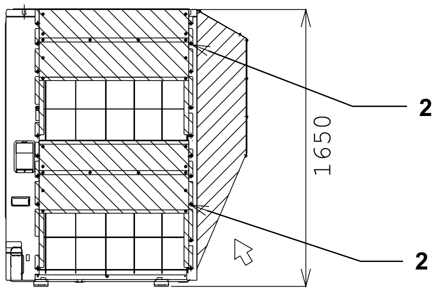
Attaching example of snow protection hood



A



B



C

1. Left suction hood
2. Fixing screw (Accessories)
3. Rear suction hood Upper side
4. Wire rope (Optional. For overturning protection)
5. Air discharge hood
6. Air discharge grille
7. Rear suction hood Lower side
8. Outdoor unit

A. Front side

B. Left side

C. Rear side

Specifications of snow protection hood

Product name		Air discharge hood		Rear suction hood		Left suction hood	
Model		ASG-NP335F	ASG-NP335FS2	ASG-NP335B	ASG-NP335BS2	ASG-NP335L	ASG-NP335LS2
Quantity		2 per unit		1 per unit			
Material		Bonderized steel sheet Iron	Stainless (NSSC180)	Bonderized steel sheet Iron	Stainless (NSSC180)	Bonderized steel sheet Iron	Stainless (NSSC180)
Color		Gray (1.0Y8.5/0.5 or approximation)	—	Gray (1.0Y8.5/0.5 or approximation)	—	Gray (1.0Y8.5/0.5 or approximation)	—
Weight		3 kg		14 kg		8 kg	
Assembling		Knockingdown parts (assembled at field)					
Components	Hood	For air discherge part x 1		For rear side air intake x 1 (Upper side x 1 lowe side x 1)		For left side air intake x 1	
	Fixing screw	4x(M5x12 l tapping screw)		10x (M5x14 l tapping screw)		8x (M5x12 l tapping screw)	
	Fixing screw (SUS)	6x (M5x12 l tapping screw)	6x (M5x14 l)	24x (M5x14 l tapping screw)	24x (M5x14l)	14x (M5x12 tapping screw)	14x (M5x14)
		Installation manual					
Installation restriction		Installation with “Guard net” “Wind guard” or “Air flow guide” is not available		Installation with “Guard net” is not available			
Safety wire rope for overturning prevention (optional parts)		ASG-SW20A					

3. Piping work and refrigerant charge

Index

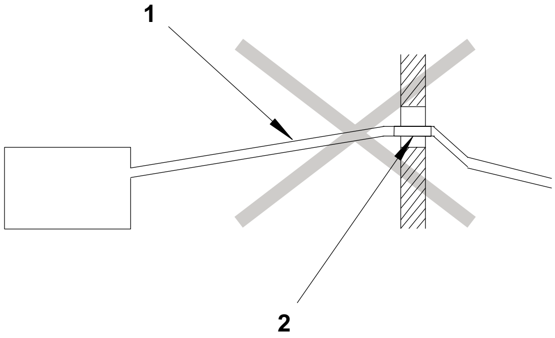
3.1 General notes

CAUTION

Do not install the drain-pipe in an up-slope position. Installing it like this, the drain water cannot be evacuated and will flow back to the unit, causing a possible leakage when the operation is stopped. Always install the unit higher than the exit of the pipe. Making this so, the water will flow easily to the outside.

INCORRECT

2. Up slope.



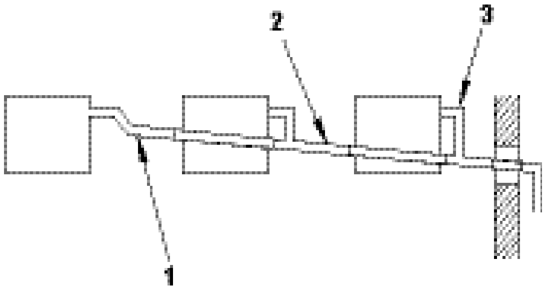
- ***Do not connect the drain pipe with the sanitary piping, the sewage piping or any other drainage piping.***
- ***When the common drain piping is connected with other indoor units, the connected position of each indoor unit must be higher than the position of the common drain piping. The pipe section of the common drain pipe must be wide enough according to the unit size and the unit number.***

CORRECT

1. Common drain piping.

2. Pitch of 4% (1/25) to 1% (1/100).

3. Drain piping connection.



- ***The drain pipe will require insulation if it is installed in a location where the ambient humidity may condensate on the drain pipe outer surface. This condensation could drop and cause damage. The insulation for the drain pipe must be selected in order to ensure that the vapour is sealed and in order to prevent the condensation forming.***
- ***The drain trap should be installed next to the indoor unit, designed according to good practice and must be checked with charged water in order to test the correct flow. Do not tie or clamp the drain pipe and the refrigerant pipe together.***

NOTE

- ***The installation of a drain tap is mandatory for the RPI/10.***
- ***Install the drainage in accordance with national and local codes.***

After installing the drain piping and the electrical wiring, make sure that the water flows smoothly as the following procedure explains:

Checking the unit without the drain-up mechanism

1 Pour approximately 1.8 litres of water into the drain pan.
2 Make sure that the water flows smoothly and that no water leakage occurs. If you cannot find water at the end of the drain pipe, once again pour approximately 1.8 litres of water into the drain pan.

Checking the unit with the drain-up mechanism and the float switch

1. Turn the power supply on.
2. Pour approximately 1.8 litres of water into the drain pan. Then, the float switch will be activated. Next, the drain pump will start working automatically.
3. Make sure that the water flows smoothly and that no water leakage occurs. If you cannot find water at the end of the drain pipe, pour again approximately 1.8 litres of water into the drain pan.
4. Turn the power supply off.

NOTE

Pay attention to the insulation material thickness when the left-side piping is installed. If the insulation material is too thick, you will not be able to install the piping in the unit.

3.2 Piping work connection considerations

3.2.1 Piping Materials

1 In order to avoid supply problems in terms of local regulations and quality, prepare locally-supplied copper pipes.

NOTE

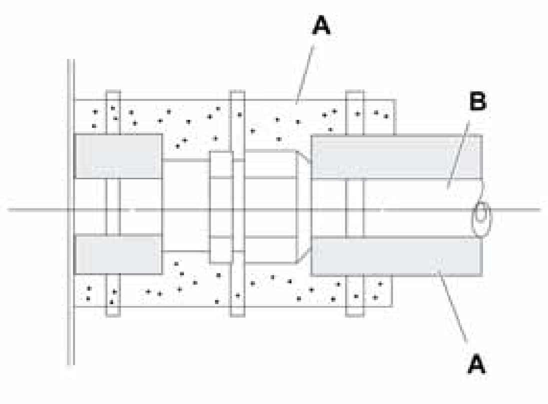
In case of using copper pipes for piping sections bigger than Ø19.05 mm (3/4 inches), flaring work cannot be performed. If necessary, use a joint adapter.

2 Select clean copper pipes. Make sure there is no dust and moisture inside. Blow the inside of the pipes through with oxygen-free nitrogen to remove any dust and foreign materials before connecting pipes.

3 After connecting the refrigerant piping, seal the open space between the knockout hole and refrigerant pipes by using insulation material as shown below:

A. Insulator material.

B. Field-supplied refrigeration pipe.



CAUTION

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

Piping Connection

When connecting liquid piping for units with piping longer than 15 meters, apply a piping size of Ø9.53 mm (3/8 inches). Fix the connecting pipe as shown in the following figure using the insulation attached to the Indoor Unit.

A. Use the flare nut of the indoor unit.

B. Insulate this part with the attached insulation.

C. Fix this part with the attached cord band or with tape.

D. Field-supplied refrigerant piping.

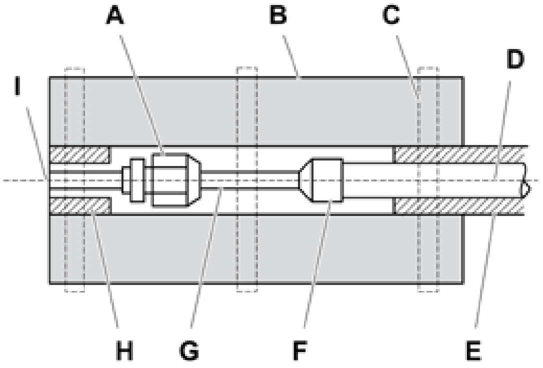
E. Field-supplied insulation.

F. Brazing.

G. Make flares after attaching flare nut to the connecting pipe in the Multi-kit package.

H. Insulation attached to indoor unit.

I. Indoor unit.



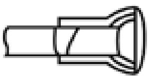
NOTE

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

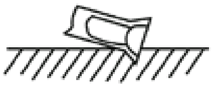
CAUTION

- ***When inserting a pipe through any hole protect the end with a cap.***
- ***Do not put pipes on the ground directly without a cap or vinyl tape at the end of the pipe***

Correct



Incorrect

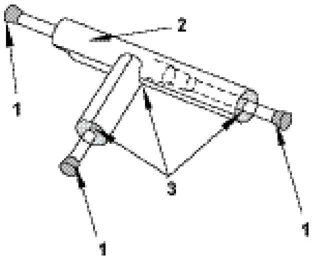


- If the piping installation is not completed until the next day or even over a longer period of time, braze off the ends of the piping and charge the pipe with oxygen-free nitrogen through a Schrader-valve-type access-fitting, to prevent moisture and particle contamination entering.
- Do not use insulation material that contents NH3. NH3 can damage the cooper pipe material and can be a source of future leakages.

Insulation

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

1. Cap.
2. Field supplied insulation.
3. Do not make a gap.



NOTE

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

CAUTION

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

3.2.2 Three principles on refrigerant piping work

In case of using refrigerant R410A in the refrigeration cycle, the refrigeration oil should be of a synthetic type one.

In order to avoid oxidation, pay much careful attention to basic piping work control to avoid infiltration of moisture or dust during the refrigerant piping work.

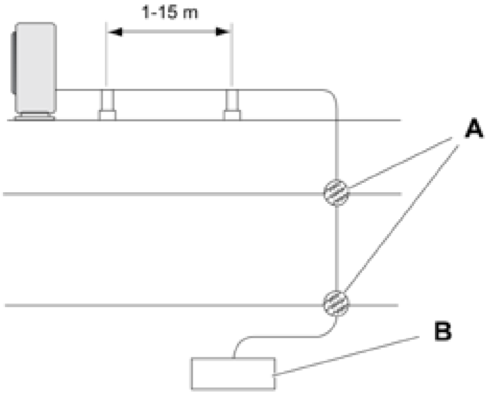
Three principles	Cause of failure	Presumable failure	Preventive action
1. Dry Keep good dryness	• Water infiltration due to insufficient protection at pipe ends • Dewing inside of pipes • Insufficient vacuum pumping time	Icing inside tube at ex. valve (Water choking) + Generation of hydration and oxidation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

3.2.3 Suspension of refrigerant piping

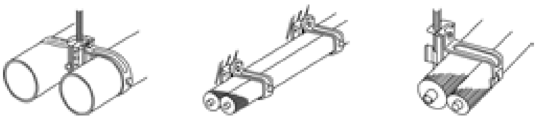
Suspend the refrigerant piping at certain points and prevent the refrigerant piping from touching weak parts of the building such as walls, ceiling, etc. (If touched, abnormal noises may occur due to the vibration of the piping. Pay special attention in case of short piping length).

A. Fire-proof section treatment.

B. Indoor unit.



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

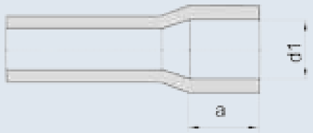


3.2.4 Brazing work

The most important work in the refrigerant piping installation work is the brazing of the pipes. If it accidentally occurs a leakage due to a careless brazing process, it will cause clogged capillary pipes or serious compressor failure.

In order to guarantee a proper brazing neck between different pipes surfaces, accurate pipe dimensions after the expansion process (see the table below):

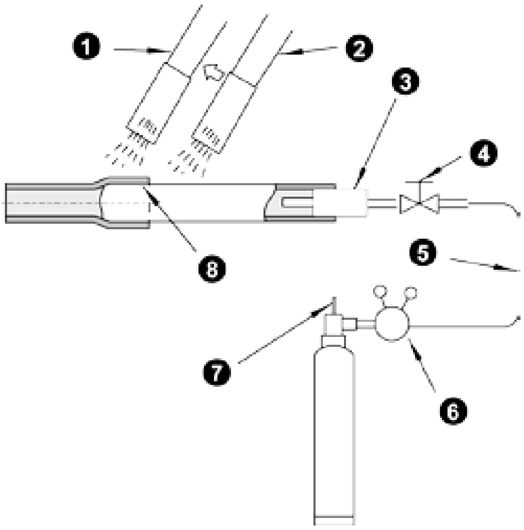
It is important to control the clearance of the pipe fitting portion as shown below. In the case that a cooper tube expansion jig is used, following dimensions should be secured.



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

A basic brazing method is shown below.

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



CAUTION

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

3.2.5 Refrigerant charge

CAUTION

- ***Do not charge OXYGEN, ACETYLENE, or other flammable and poisonous gases into the refrigerant because an explosion will occur. It is recommended that oxygen free nitrogen be charged for these types of tests cycle when performing a leakage test or an airtight test. These types of gases are extremely dangerous.***
- ***Insulate the unions and flare-nuts at the piping connection part completely.***
- ***Insulate the liquid piping completely to avoid a decrease of performance; if not, it will cause sweating on the surface of the pipe.***
- ***Charge refrigerant correctly. Overcharging or insufficient charging could cause a compressor failure.***
- ***Check for refrigerant leakage in detail. If a large refrigerant leakage occurred, it would cause difficulty with breathing or harmful gases would occur if a fire were being used in the room.***
- ***If the flare nut is tightened too hard, the flare nut may crack after a long time and cause refrigerant leakage.***

3.2.6 Caution of the pressure by check joint

When the pressure is measured, use the check joint of gas stop valve (A), and use the check joint of liquid piping (B) in the figure below.

At that time, connect the pressure gauge according to the following table because of high pressure side and low pressure side changes by operation mode.

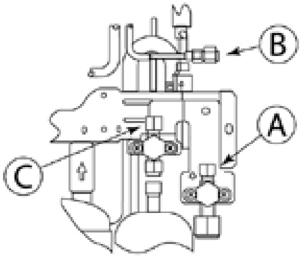
	Cooling operation	Heating operation
Check joint for gas stop valve -A-	Low pressure	High pressure
Check joint for piping -B-	High pressure	Low pressure
Check joint for liquid stop valve -C-	Exclusive for vacuum pump and refrigerant charge	

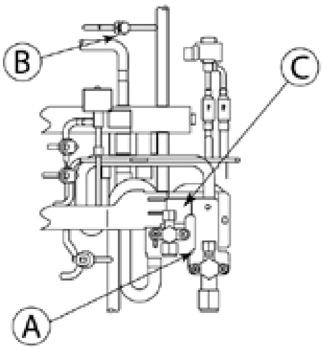
NOTE

Be careful that refrigerant and oil do not splash to the electrical parts at removing the charge hoses.

The below figures show examples of 3 HP and 5 HP:

- The one on the right is an RAS-5H(V)RNM2E case and the one in the left is an RAS-3HVRNM2E in case for IVX Series.
- The one on the right is an RAS-5HVRNS2E case and the one in the left is an RAS-3HVRNS2 in case of ES Series.





3.2.7 Refrigerant charge quantity

◆ Refrigerant charge quantity for IVX series

Outdoor units has been charged with refrigerant for ℓ(m) of actual piping length. An additional refrigerant charged is required in systems with actual piping length longer than ℓ(m).

1. Determine an additional refrigerant quantity according to the following procedure, and charge it into the system.
2. Record the additional refrigerant quantity to facilitate service activities thereafter.

CAUTION

- ***When charging refrigerant accurately measure refrigerant to be charged.***
- ***Overcharging or undercharging of refrigerant can cause compressor trouble.***
- ***In case of actual piping length less than 5 m, consult your distributor.***

Outdoor unit Factory Refrigerant charge (Wo Kg) is the next:

MODEL	Wo (Kg)	Chargeless Length ℓ(m)	Additional Charge Factor (P)
RAS-3HVRNM2E	2.4	30	0.04
RAS-4H(V)RNM2E	3.8	30	0.06
RAS-5H(V)RNM2E	4.0	30	0.06
RAS-6H(V)RNM2E	4.0	30	0.06
RAS-8HRNM	7.3	30	
RAS-10HRNM	7.8	30	
RAS-12HRNM	8.5	30	

1. Refrigerant shall be added if **L** is longer than the chargeless length shown in the table above. Calculate the additional amount as follows:

   A. 30 m.

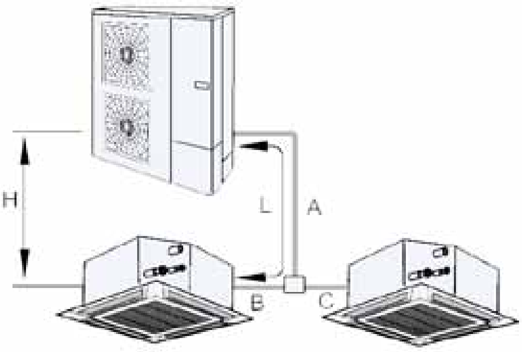
   B. 8 m.

   C. 8 m.

   - Chargeless Length **ℓ**: for 4HVRNM2E is 30 m according to the table before.
   - Additional Correction Value **P** : for 4HVRNM2E, "0.06" according to the table above.
   - Additional Charge amount **W** will be:

   W = (L-ℓ) x P

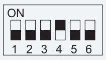
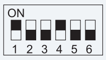
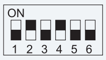
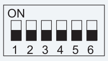
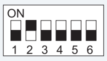
   Example: W_1= (46-30) x 0.06 = **0.96 (kg)**



2. Charge the amount **W** calculated by point 1.
3. Setting of pipe length DSW.

   DSW2 setting will be required only when the refrigerant pipe length is shorter than 5 m or longer than 30 m. Pipe length setting shall be performed as shown below.

   (The ■ side in the DIP switch show the position.)

DSW2 on outdoor PCB1			
Model	Factory setting Piping length between 5 m and ℓ(m)	Pipe Length 5 m or shorter	Pipe Length 30 m or longer
RAS-(4-6)H(V)RNM2E			
RAS-3HVRNM2E RAS-(8-12)HRNM			

◆ Refrigerant charge quantity for ES series

Outdoor units has been charged with refrigerant for ℓ(m) of actual piping length. An additional refrigerant charged is required in systems with actual piping length longer than ℓ(m).

- Determine an additional refrigerant quantity according to the following procedure, and charge it into the system.
- Record the additional refrigerant quantity to facilitate service activities thereafter.

CAUTION

- ***When charging refrigerant accurately measure refrigerant to be charged.***
- ***Overcharging or undercharging of refrigerant can cause compressor trouble.***
- ***In case of actual piping length less than 5 m, consult your distributor.***

Outdoor unit Factory Refrigerant charge (Wo Kg) is the next:

O/U MODEL	Wo (Kg)	Chargeless Length ℓ(m)	Additional Charge Factor (P)
RAS-2HVRN2	1.6	30	0.03
RAS-2.5HVRN2	1.6	30	0.03
RAS-3HVRNS2	1.9	20	0.03
RAS-4H(V)RNS2E	2.8	20	0.04
RAS-5H(V)RNS2E	2.9	30	0.06
RAS-6H(V)RNS2E	2.9	30	0.06
RAS-8HRNSE	6.0	30	0.065
RAS-10HRNSE	6.2	30	0.12

1 Refrigerant shall be added if **L** is longer than the chargeless length shown in the table above. Calculate the additional amount as follows:

A. 30 m.

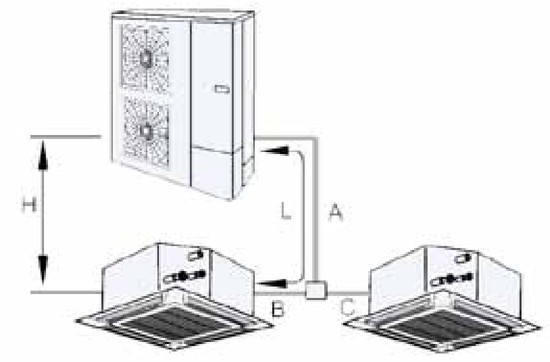
B. 8 m.

C. 8 m.

- Chargeless Length **ℓ**: for 4HVRNS2E is 30 m according to the table before.
- Additional Correction Value **P** : for 4HVRNS2E, “0.04” according to the table above.
- Additional Charge amount **W** will be:

W= (L-ℓ) x P

Example: W= (36-20) x 0.04 = **0.64 (kg)**



2 Charge the amount **W** calculated by point 1.

3 Setting of pipe length DSW.

DSW2 setting will be required only when the refrigerant pipe length is shorter than 5 m or longer than 30 m. Pipe length setting shall be performed as shown below.

(The ■ side in the DIP switch show the position.)

DSW2 on outdoor PCB1		
Factory setting	Factory setting	Factory setting
		
Piping length between 5 m and ℓ(m)	Pipe Length 5 m or shorter	Pipe Length ℓ(m) or longer

3.2.8 Pump down refrigerant

When the refrigerant should be collected into the outdoor unit due to indoor/outdoor unit relocation, collect the refrigerant as follows:

1 Attach the manifold gauge to the gas stop valve and the liquid stop valve.
2 Turn ON the power source.
3 Set the DSW1-1 pin of the outdoor unit PCB at the "ON" side for cooling operation. Close the liquid stop valve and collect the refrigerant.
4 When the pressure at lower pressure side (gas stop valve) indicates -0.01 MPa (-100 mmHg), perform the following procedures immediately.

- Close the gas stop valve.
- Set the DSW1-1 pin at the "OFF" side (To stop the unit operation).

5 Turn OFF the power source.

⚠ **CAUTION**

Measure the low pressure by the pressure gauge and keep it in a measurement higher than -0.01 MPa. If the pressure is lower than -0.01 MPa, the compressor may be faulty.

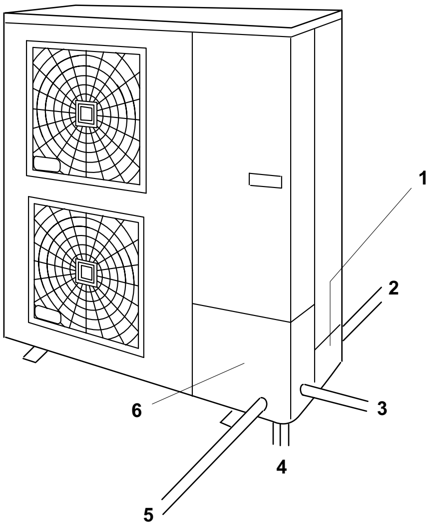
3.3 Outdoor Units IVX Series

3.3.1 Piping connection

For a list of factory-supplied accessories, please refer to *Accessory code list*, ***see on page 6***.

1 The pipes can be connected from any of the following four directions: front, rear, bottom or right side, when facing the outdoor unit.

1. Rear side piping cover.
2. Rear side piping work (Knock-out hole).
3. Right side piping work (Knock-out hole).
4. Bottom side piping work (Piping cover).
5. Front side piping work (Knock-out hole).
6. Front side piping cover.

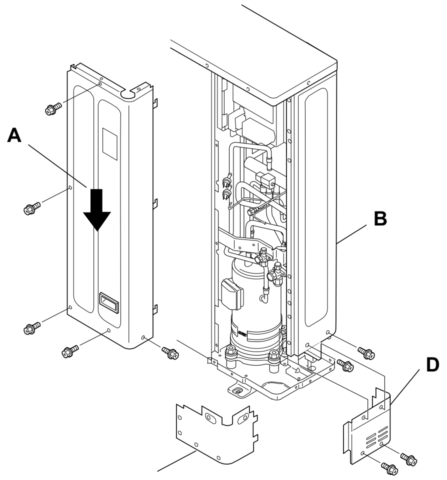


A. Push down the cover slowly.

B. Rear cover.

C. Front side piping cover.

D. Rear side piping cover.

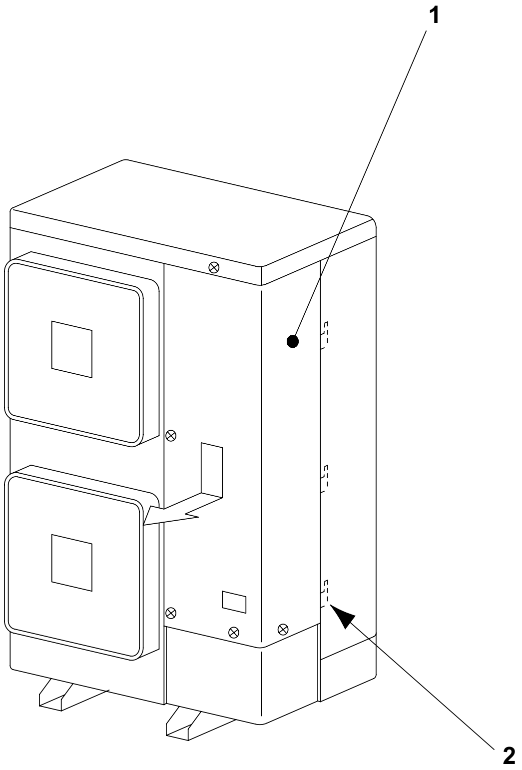


Make holes in the piping cover or cabinet for taking the pipes out. Take the piping cover away from the unit, and make holes by cutting along the guideline at the rear of the cover or punching it with a driver. Remove the burr with a cutter.

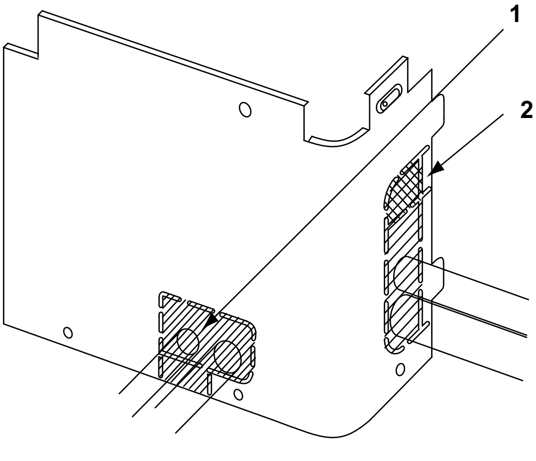
NOTE

Hold the cover with a hand at the same time while removing the screws as the cover may fall down.

1. Service cover.
2. Hook (three places): two fan.
2. Hook (two places): one fan.



- **For the front and side piping**
  1. Front piping hole.
  2. Side piping hole.



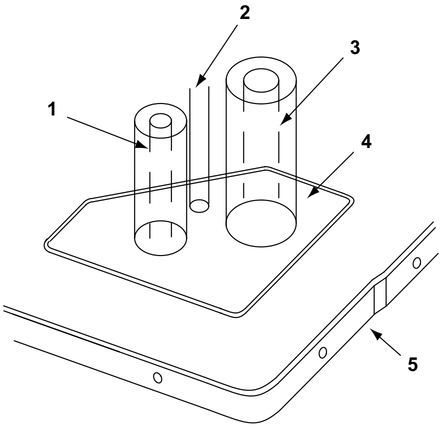
To use racking or conduit tubes, check the size and remove the stiped parts, following the slit.

NOTE

Place insulation (field supplied) to protect cables and pipes from being damaged by plate edges.

- **For the downward piping**

1. Liquid piping.
2. Wiring.
3. Gas piping.
4. Knock-out hole.
5. Bottom base.

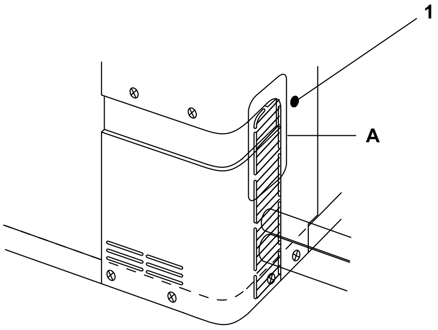


NOTE

The wiring must not be in contact directly with the pipes.

- **For the rear side piping**

1. Rear cover.



NOTE

Remove the rear pipe cover under the rear cover and remove the stipped part following the slit.

2 Mount the piping cover in order to avoid water entering into the unit. Seal the holes where pipes and wires are inserted, by using an insulation (field-supplied).

3 If the field-supplied piping is connected with stop valves directly, it is recommended to use a tube bender.

4 Check that the stop valves are closed completely before connecting pipes.

5 Connect the field supplied refrigerant pipes to the indoor unit and outdoor unit. Apply the oil thinly at the seat flare nut and pipe before tightening.

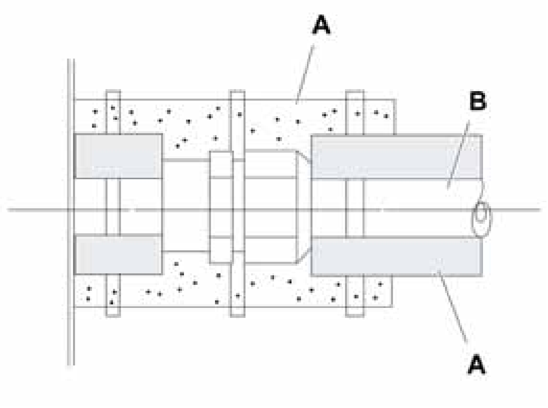
The required tightening torque is as follows:

Pipe Size	Tightening Torque (Nm)
Ø 6.35 mm	20
Ø 9.53 mm	40
Ø 12.70 mm	60
Ø 15.88 mm	80

6 After connecting the refrigerant piping, seal the open space between knockout hole and refrigerant pipes by using the insulation material.

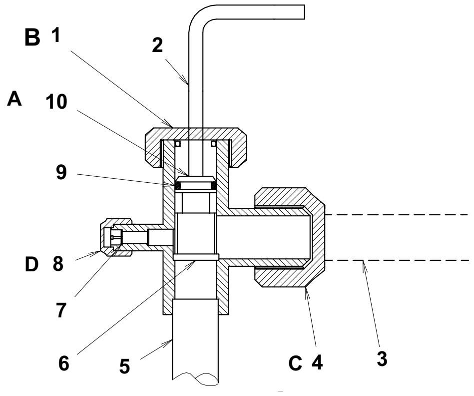
A. Insulation material.

B. Field supplied.



7 Operation of stop valve should be performed according to the figure.

No.	Description	Remarks
1	Cap	—
2	Allen wrench	Hex 4/5/10 mm
3	Refrigerant Piping	Field supplied
4	Cap	—
5	Refrigerant Pressure	To outdoor unit
6	Seat Surface	Fully closed position
7	Check Joint	Only the charging those can be connected
8	Cap	—
9	O-Ring	Rubber
10	Spindle valve	Open – Counterclockwise
		Close – Clockwise



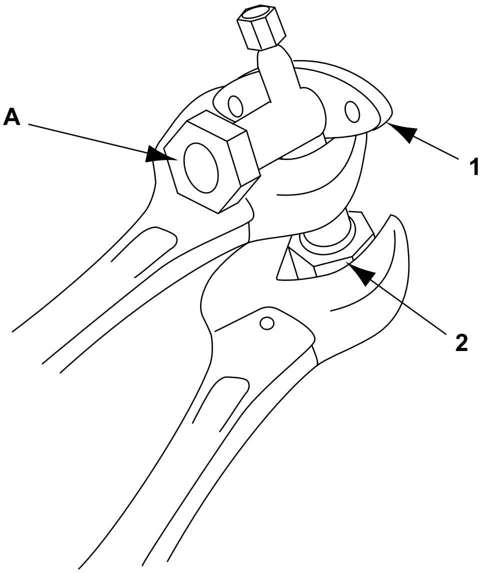
Tighten torque (Nm)					
Valve type / Model		A	B	C	D
Liquid valve	3-6HP	7-9	34-42	34-42	14-18
Gas valve	3-6HP	9-11	34-42	68-82	14-18
Liquid valve	8HP	7-9	37	40	16
	10-12HP	7-9	37	60	16
Gas valve	8-12HP	9-11	49	53-75	9.8

- **Outdoor unit stop valve**

1. Stop valve

2. Flare nut

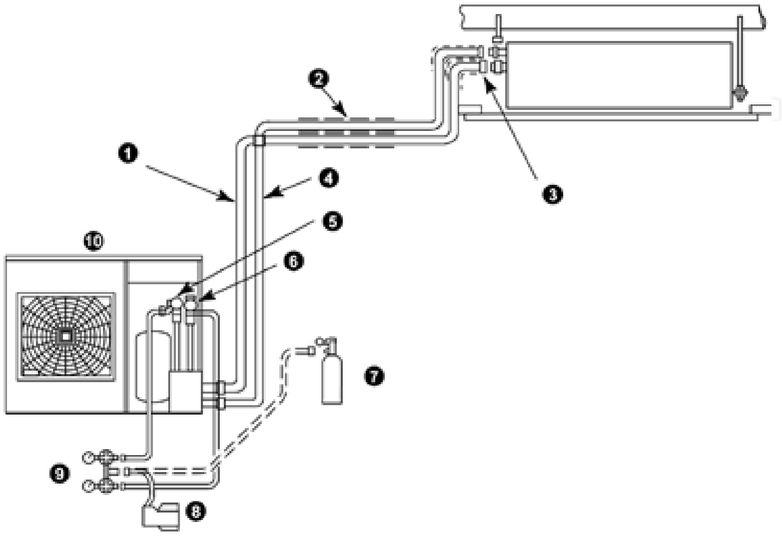
A. Do not apply two spanners at this position. If applied, leakage will occur



⚠ **CAUTION**

- ***At the test run, fully open the spindle. If not fully opened, the devices will be damaged.***
- ***Do not attempt to turn service valve rod beyond its stop.***
- ***Do not loosen the stop ring. If the stop ring is loosened, it is dangerous since the spindle will hop out.***
- ***Do not apply force to the spindle valve at the end of opening (5 Nm or smaller). The back seat construction.***

- **Evacuation and refrigerant charge**
  - Connect the gauge manifold using charging hoses with a vacuum pump or a nitrogen cylinder to the check joints of the liquid line and the gas line stop valve.
  - Check for any gas leakage at the flare nut connection, by using nitrogen gas to increase the pressure at 4.15 MPa for outdoor units inside of the field-supplied piping.
  - Operate the vacuum pump for 1 to 2 hours until the pressure decreases lower than a pressure of 756 mmHg in vacuum.
  - For charging refrigerant, connect the gauge manifold using charging hoses with a refrigerant charging cylinder to the check joint of the liquid line stop valve.
  - Charge the proper quantity of refrigerant according to the piping length (Calculate the quantity of the refrigerant charge).
  - Fully open the gas line stop valve, and slightly open the liquid line stop valve.
  - Charge refrigerant by opening the gauge manifold valve.
  - Charge the required refrigerant within the difference range of ±0.5 kg by operating the system in cooling.
  - Fully open the liquid line stop valve after completing refrigerant charge.
  - Continue cooling operation for more than 10 minutes to circulate the refrigerant.
  - See the example below.



① Gas line
② Thermal insultaion
③ Cover the flare nut and union of the piping connection with thermal insulation
④ Liquid line
⑤ Liquid stop valve
⑥ Gas stop valve
⑦ Nitrogen tank. For air thight test & nitrogen blow durin brazing.
⑧ Vacuum cylinder
⑨ Mainfold gauge
⑩ Outdoor unit

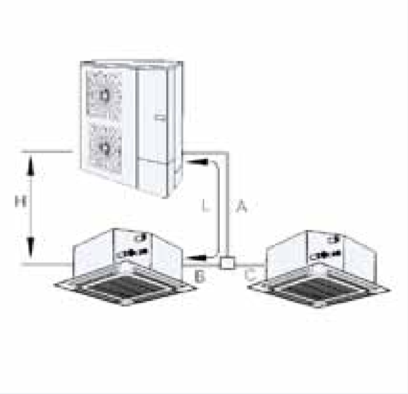
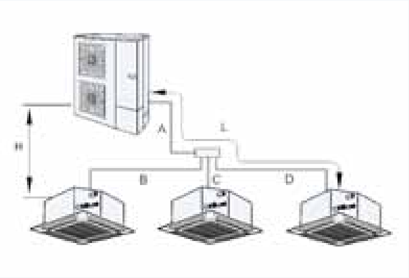
3.3.2 Refrigerant piping length

The refrigerant piping between the indoor unit and the outdoor unit should be designed using the following table.

- **Piping length specification:**

Unit	Maximum piping length between Outdoor and each indoor unit (L) Actual/Equivalent	Maximum Height difference. Outdoor unit is higher than indoor unit Indoor unit is higher than Outdoor unit (H)
RAS-3HVRNM2E	50/70	30/20
RAS-4H(V)RNM2E	70/90	
RAS-5H(V)RNM2E	75/95	
RAS-6H(V)RNM2E		

The possible combination between Outdoor Unit and Indoor Unit are the following:

Single System	Twin System	Triple System
		
—	L = A + Longest of B & C	L = A+ Longest of B, C & D

NOTE

- ***L & H are the length & height indicated in the above chart.***
- ***For twin, the length is the distance between the outdoor unit and the farthest indoor unit.***
- ***Piping length after branch pipe (B,C & D):***

1. ***After branch pipe B,C & D, the pipe length should be shorter than 10 m.***
2. ***All branch pipe, B, C & D (it depend of case), should be balanced.***

Twin	*Triple*
B & C difference	***B,C & D difference***
≤ 8 m	***≤ 6 m***

3.3.3 Refrigerant piping selection

Select the piping connection sizes according to the following procedures

- Between outdoor unit and branch pipe: Select the same pipe connection size as the pipe size of the outdoor unit.
- Between branch pipe and indoor unit: Select the same pipe connection size as the pipe size of the indoor unit.

Piping connection size of outdoor unit, indoor unit and distributor

Outdoor Unit	Pipe Size		Multikit & Distributor		
	Liquid Piping	Gas Piping	Twin	Triple	Quad
RAS-3HVRNM2E	Ø9.53	Ø15.88	TE-03N / E-102SN2	—	—
RAS-4H(V)RNM2E	Ø9.53	Ø15.88	TE-56N / E-102SN2	TRE-06N	—
RAS-5H(V)RNM2E	Ø9.53	Ø15.88	TE-56N / E-102SN2	TRE-06N	TRE-56N+(TE-03N or TE-56N) (3)
RAS-6H(V)RNM2E	Ø9.53	Ø15.88	TE-56N	TRE-06N	TRE-56N+(TE-03N or TE-56N) (3)
RAS-8HRNM	Ø9.53(1)	Ø25.40(2)	TE-08N / E-162SN2	TRE-810N	QE-810N
RAS-10HRNM	Ø12.70	Ø25.40(2)	TE-10N / E-162SN2	TRE-810N	QE-810N
RAS-12HRNM	Ø12.70	Ø25.40(2)	TE-10N / E-162SN2	TRE-810N	QE-810N

NOTE

The sizes of the indoor and outdoor units are different. Adjust the flare adapter (accessories) to the joint part of the indoor piping.

- ***(1) Select the size of piping ø12.7 when the length is over 70 m (only for RAS-8HRNM).***
- ***(2) If using ø28.60, the actual length is reduced to 75 m.***
- ***If using ø22.20, the actual length is reduced to 100 m., but with a significant reduction in capacity.***

The following Multikits can also be used for RAS-(8-12)HRNM.

Outdoor Unit	Multikits
RAS-8HRNM	E-162SN2-102SN2
RAS-10HRNM	E-162SN2-102SN2
RAS-12HRNM	E-162SN2-102SN2

3.3.4 Twin and triple system installation

Height difference between indoor units and distributor

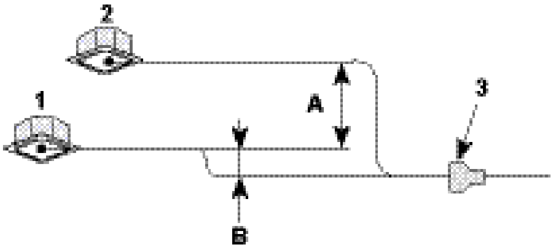
Install all indoor units at the same height. When the height difference between the indoor units due to building construction is necessary, this should be less than H_{in}(m). Install the branch pipe at the same height of indoor units or lower, but never higher.

Example: Twin system

1. Indoor unit
2. Indoor unit
3. Branch pipe

A. Height difference between two indoors smaller than H_{in} (m)

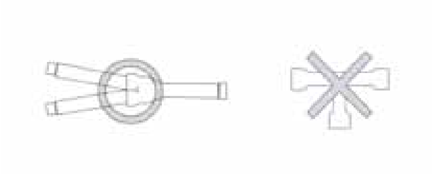
B. Smaller than H_{in} (m)



Maximum height between indoor units	H_{in} (m)
H(V)RNM(2)(E)	3.0

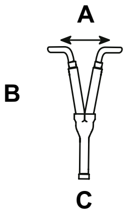
Installing distributor

1 Install the distributor supplied by HITACHI on request. A tee can not be installed instead of a branch pipe.**Example: Twin system**



2 Installing the Distributor. Fix the branch pipe horizontally to the pillar, wall or celling. Piping must not be fixed rigidly to the wall as thermal expansion and contraction can cause pipe fracture.

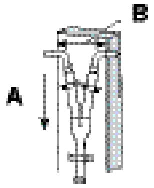
Example: Twin system



A. Horizontal.

B. To indoor unit.

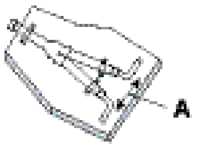
C. To outdoor unit.



A. Vertical.

B. To indoor unit

Fix the branch pipe to the surface of pillar or wall.



A. Horizontal.

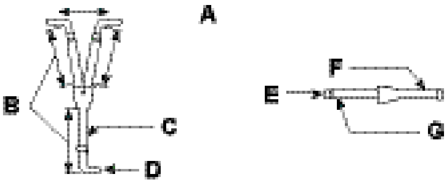
Fixing the branch pipe to ceiling or beam.

NOTE

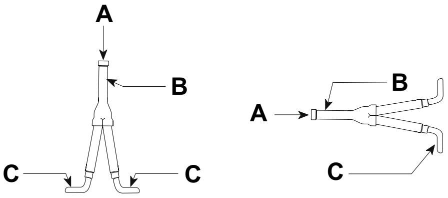
Fix the piping from outside of insulation or inserting absorber between the pipe and a fixing metal.

3 Correct position of twin distributor

Correct position of twin branch pipe



Wrong position of twin branch pipe



A. Up.

B. Greater than 0.5 m.

C. Main pipe.

D. Refrigerant direction.

E. Refrigerant direction.

F. Branch pipe.

G. Main pipe.

A. Refrigerant direction

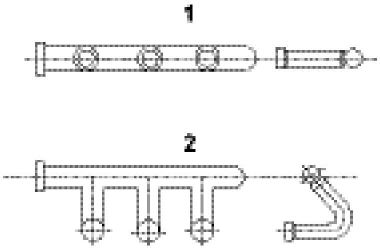
B. Main pipe

C. Branch pipe

4 Correct position of triple branch pipeInstall the header horizontally**Example: Triple Branch pipe**

1. Gas piping.

2. Liquid piping.



3.3.5 Drain discharging boss

When the base of the outdoor unit is temporarily used as a drain receiver and the drain water in it is discharged, this drain boss is used to connect the drain piping.

Model	Applicable Model
DBS-26	H(V)RNM(2)(E)

Connection procedure

1 Insert the rubber cap into the drain boss up to the extruded portions.
2 Insert the boss into the unit base and turn approximately 40 degree counterclockwise.
3 The outer diameter section of the drain boss is 32 mm.
4 A drain pipe should be field-supplied.

NOTE

- ***Do not use this drain boss set in a cold area, because the drain water may freeze.***
- ***This drain boss may not be sufficient to collect drain water. If collecting a big amount of drain water should be necessary, provide a drain-pan bigger than the unit base supplied one, and install it under the unit with drainage.***

Bottom base view

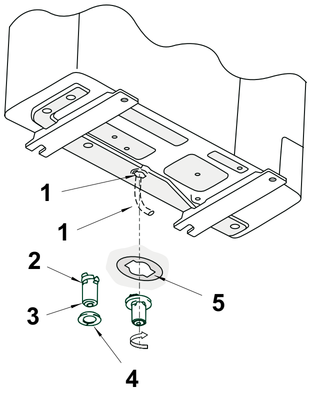
1. Drain pipe.

2. Extruded portion.

3. Drain boss.

4. Rubber cap.

5. Drain hole of base.



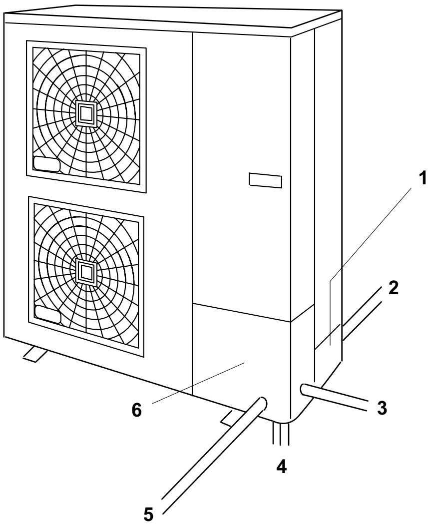
3.4 Outdoor Units ES Series

3.4.1 Piping connection

For a list of factory-supplied accessories, please refer to *Accessory code list****, see on page 6***.

1 The pipes can be connected from any of the following four directions: front, rear, bottom or right side, when facing the outdoor unit.

1. Rear side piping cover.
2. Rear side piping work (Knock-out hole).
3. Right side piping work (Knock-out hole).
4. Bottom side piping work (Piping cover).
5. Front side piping work (Knock-out hole).
6. Front side piping cover.

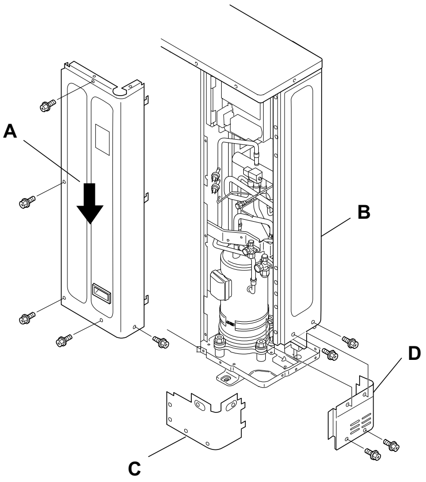


A. Push down the cover slowly.

B. Rear cover.

C. Front side piping cover.

D. Rear side piping cover.

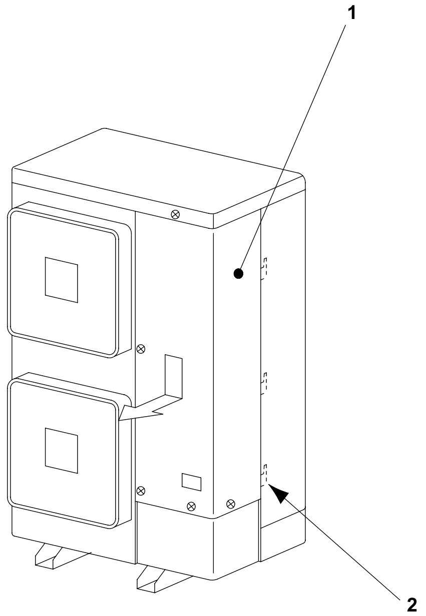


Make holes in the piping cover or cabinet for taking the pipes out. Take the piping cover away from the unit, and make holes by cutting along the guideline at the rear of the cover or punching it with a driver. Remove the burr with a cutter.

NOTE

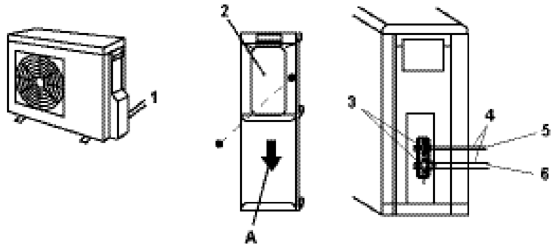
Hold the cover with a hand at the same time while removing the screws as the cover may fall down.

1. Service cover.
2. Hook (three places): two fan.
2. Hook (two places): one fan.



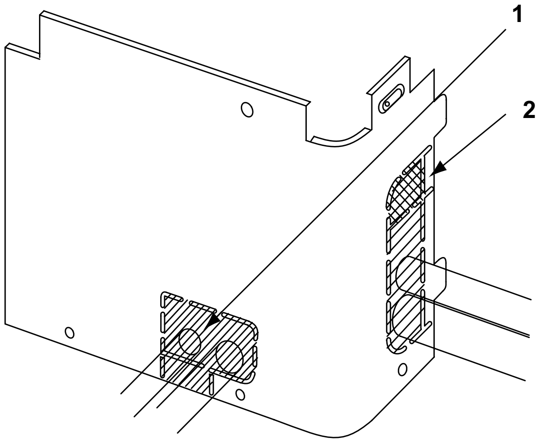
1. Rear side piping.
2. Pipe cover.
3. Stop valve.
4. Connecting piping.
5. Liquid.
6. Gas.

A. Direction to remove Pipe Cover.



- **For the front and side piping**

1. Front piping hole.
2. Side piping hole.



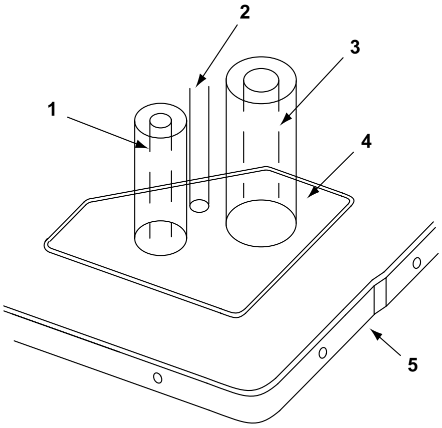
To use racking or conduit tubes, check the size and remove the stiped parts, following the slit.

NOTE

Place insulation (field supplied) to protect cables and pipes from being damaged by plate edges.

- **For the downward piping**

  1. Liquid piping.
  2. Wiring.
  3. Gas piping.
  4. Knock-out hole.
  5. Bottom base.

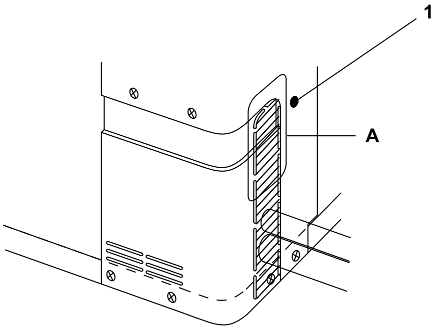


NOTE

The wiring must not be in contact directly with the pipes.

- **For the rear side piping**

  1. Rear cover.



NOTE

Remove the rear pipe cover under the rear cover and remove the stipped part following the slit.

2 Mount the piping cover in order to avoid water entering into the unit. Seal the holes where pipes and wires are inserted, by using an insulation (field-supplied).

3 If the field-supplied piping is connected with stop valves directly, it is recommended to use a tube bender.

4 Check that the stop valves are closed completely before connecting pipes.

5 Connect the field supplied refrigerant pipes to the indoor unit and outdoor unit. Apply the oil thinly at the seat flare nut and pipe before tightening.

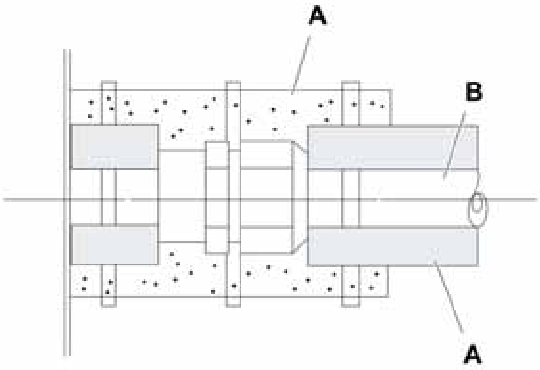
The required tightening torque is as follows:

Pipe Size	Tightening Torque (Nm)
Ø 6.35 mm	20
Ø 9.53 mm	40
Ø 12.70 mm	60
Ø 15.88 mm	80

6 After connecting the refrigerant piping, seal the open space between knockout hole and refrigerant pipes by using the insulation material.

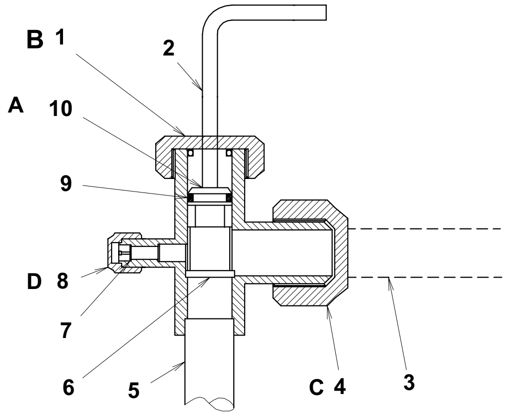
A. Insulation material.

B. Field supplied.

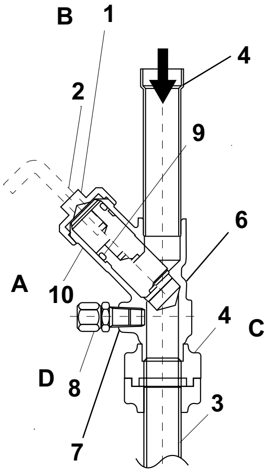


7 Operation of stop valve should be performed according to the figure below.

Closed before shipment



Gas valve (RAS-(8/10)HRNSE) only



1	Cap	—
2	Allen wrench	Hex 5 mm / 4 mm / 10 mm
3	Refrigerant Piping	Field supplied
4	Cap	—
5	Refrigerant Pressure	To outdoor unit
6	Seat Surface	Fully closed position
7	Check Joint	Only the charging those can be connected
8	Cap	—
9	O-Ring	Rubber
10	Spindle valve	Open – Counterclockwise Close – Clockwise

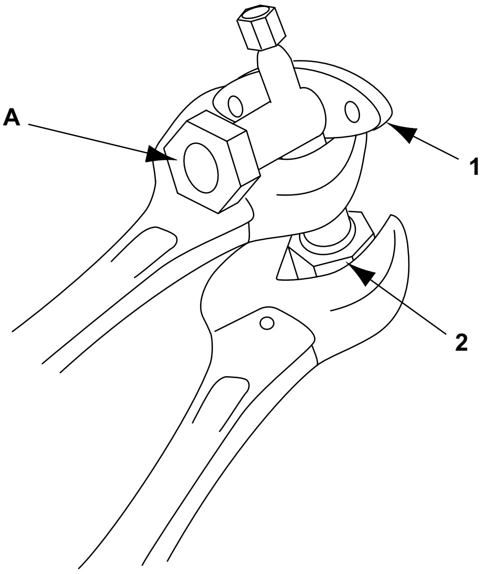
Tighten torque (Nm)					
Valve type / Model		A	B	C	D
Liquid valve	2-6HP	7-9	34-42	34-42	14-18
Gas valve	2-6HP	9-11	34-42	68-82	14-18
Liquid valve	8/10HP	8	40	40	16
Gas valve	8/10HP	13	45	100	9

- **Outdoor unit stop valve**

  1. Stop valve.

  2. Flare nut.

  A. Do not apply two spanners at this position. If applied, leakage will occur.

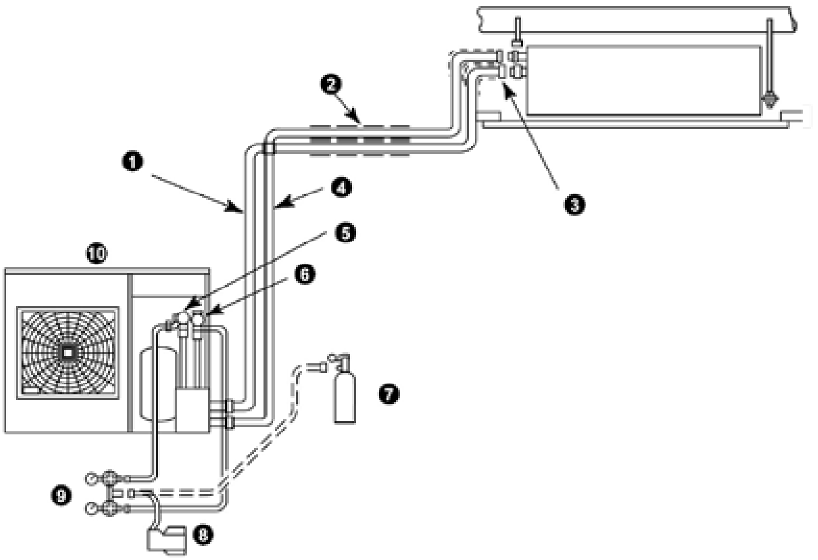


CAUTION

- ***At the test run, fully open the spindle. If not fully opened, the devices will be damaged.***
- ***Do not attempt to turn service valve rod beyond its stop.***
- ***Do not loosen the stop ring. If the stop ring is loosened, it is dangerous since the spindle will hop out.***
- ***Do not apply force to the spindle valve at the end of opening (5 Nm. or smaller). The back seat construction.***

- **Evacuation and refrigerant charge**
  - Connect the gauge manifold using charging hoses with a vacuum pump or a nitrogen cylinder to the check joints of the liquid line and the gas line stop valve.
  - Check for any gas leakage at the flare nut connection, by using nitrogen gas to increase the pressure at 4.15 MPa for outdoor units inside of the field-supplied piping.
  - Operate the vacuum pump for 1 to 2 hours until the pressure decreases lower than a pressure of 756 mmHg in vacuum.
  - For charging refrigerant, connect the gauge manifold using charging hoses with a refrigerant charging cylinder to the check joint of the liquid line stop valve.
  - Charge the proper quantity of refrigerant according to the piping length (Calculate the quantity of the refrigerant charge).
  - Fully open the gas line stop valve, and slightly open the liquid line stop valve.
  - Charge refrigerant by opening the gauge manifold valve.
  - Charge the required refrigerant within the difference range of ±0.5 kg by operating the system in cooling.
  - Fully open the liquid line stop valve after completing refrigerant charge.
  - Continue cooling operation for more than 10 minutes to circulate the refrigerant.
  - See the example below.

❶ Gas line
❷ Thermal insultaion
❸ Cover the flare nut and union of the piping connection with thermal insulation
❹ Liquid line
❺ Liquid stop valve
❻ Gas stop valve
❼ Nitrogen tank. For air thight test & nitrogen blow durin brazing.
❽ Vacuum cylinder
❾ Mainfold gauge
❿ Outdoor unit



3.4.2 Refrigerant piping length

The refrigerant piping between the indoor unit and the outdoor unit should be designed using the following table.

- **Piping length specification:**

Unit	Maximum piping length between Outdoor and each indoor unit (L) Actual/Equivalent	Maximum Height difference. Outdoor unit is higher than indoor unit/ Indoor unit is higher than Outdoor unit (H)
RAS-2HVRN2	50	30/20
RAS-2.5HVRN2		
RAS-3HVRNS2	30	
RAS-4H(V)RNS2E	50	
RAS-5H(V)RNS2E		
RAS-6H(V)RNS2E		
RAS-8HRNSE	50/70	
RAS-10HRNSE		

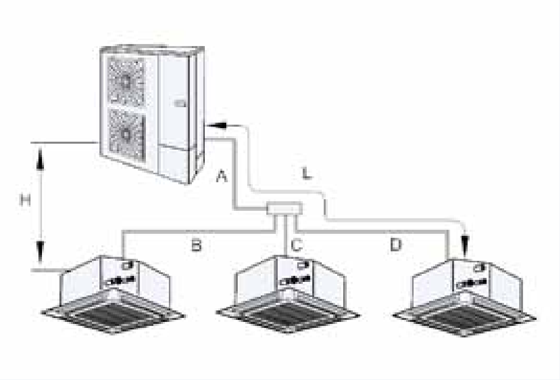
The possible combination between Outdoor Unit and Indoor Unit are the following:

Single System

Twin System

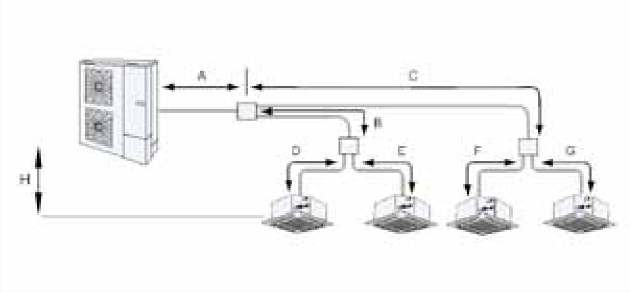
L= A + the longest of B & C

Triple System



L= A + the longest of B, C & D

Quad System



L= A + (the longest of B + the longest of D & E) & (C + the longest of F & G)

NOTE

- ***L & H are the length & height indicated in the above chart.***
- ***For twin, the length is the distance between the outdoor unit and the farthest indoor unit.***
- ***Piping length after branch pipe (B,C & D):***

  1. ***After branch pipe B,C & D, the pipe length should be shorter than 10 m.***
  2. ***All branch pipe, B, C & D (it depend of case), should be balanced.***

Twin	Triple	Quad
B & C difference	B,C & D difference	B-C, B-D, B-E, C-D, C-E, D-E
≤ 8 m	≤ 6 m	≤ 8 m

3.4.3 Refrigerant piping selection

Select the piping connection sizes according to the following procedures

- Between outdoor unit and branch pipe: Select the same pipe connection size as the pipe size of the outdoor unit.
- Between branch pipe and indoor unit: Select the same pipe connection size as the pipe size of the indoor unit.

Piping connection size of outdoor unit, indoor unit and distributor

Outdoor Unit	Pipe Size		Multikit & Distributor		
	Liquid Piping	Gas Piping	Twin	Triple	Quad
RAS-2HVRN2	—	—	—	—	—
RAS-2.5HVRN2	—	—	—	—	—
RAS-3HVRNS2	Ø9.53	Ø15.88	TE-03N	—	—
RAS-4H(V)RNS2E	Ø9.53	Ø15.88	TE-04N	—	—
RAS-5H(V)RNS2E	Ø9.53	Ø15.88	TE-56N	—	—
RAS-6H(V)RNS2E	Ø9.53	Ø15.88	TE-56N	TRE-06N	—
RAS-8HRNSE	Ø9.53	Ø25.4	TE-08N	TRE-810N	TE-08N + TE-04N + TE-04N
RAS-10HRNSE	Ø9.53 (*2)	Ø25.4	TE-08N	—	TE-08N + TE-56N + TE-56N

NOTE

The sizes of the indoor and outdoor units are different. Adjust the flare adapter (accessories) to the joint part of the indoor piping.

Piping connection size of indoor units

Indoor Unit	Gas piping size (mm)	Liquid piping size (mm)
1.5HP	12.7	6.35
2HP	15.88	6.35
2.5–6HP	15.88	9.53
8HP*	19.05→25.4 (1*)	9.53
10HP*	22.2→ 25.4 (1*)	9.53 (2*)

NOTE

If using different piping from the standard values, piping reducers will be supplied by the installer.

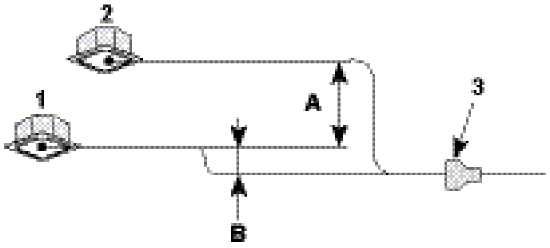
- ***(*1) Ø19.05→ Ø25.4 and Ø22.2→ Ø25.4 indoor pipe adapters are factory supplied with the indoor unit.***
- ***(*2) Change the liquid piping size to Ø12.7 when the piping length is more than 30 m. Indoor unit pipe adapter is factory supplied with the indoor unit.***

3.4.4 Twin and triple system installation

Height difference between indoor units and distributor

Install all indoor units at the same height. When a height difference is unavoidable between the indoor units due to the construction of the building, it should always be less than H_{in} (m). Install the branch pipe at the same height or lower than the indoor units, but never higher.

Example: Twin system



1. Indoor unit
2. Indoor unit
3. Branch pipe

A. Height difference between two indoors smaller than H_{in} (m)

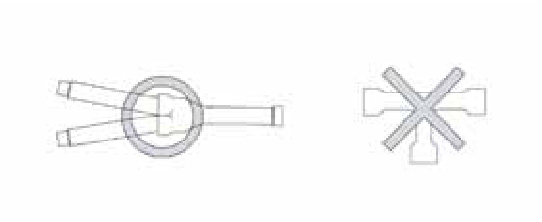
B. Smaller than H_{in} (m)

Maximum height between indoor units	H_{in} (m)
H(V)RNS(E)(2)	0.5

Installing distributor

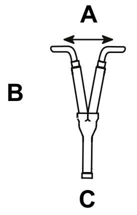
1 Install the distributor supplied by HITACHI on request. A tee can not be installed instead of a branch pipe.

Example: Twin system



2 Installing the distributor. Fix the branch pipe horizontally to the pillar, wall or ceiling. The piping must not be fixed rigidly to the wall as thermal expansion and contraction can cause pipe fracture.

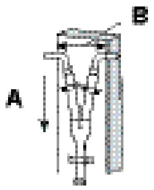
Example: Twin system



A. Horizontal.

B. To indoor unit.

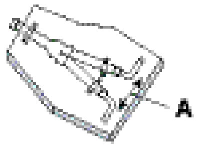
C. To outdoor unit.



A. Vertical.

B. To indoor unit.

Fix the branch pipe to the surface of pillar or wall.



A. Horizontal.

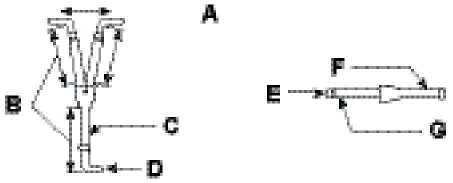
Fixing the branch pipe to ceiling or beam.

NOTE

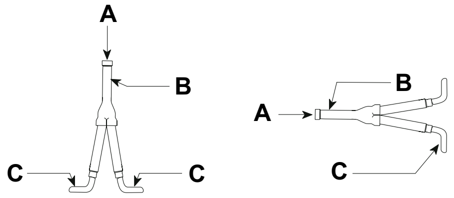
Fix the piping from outside of insulation or inserting absorber between the pipe and a fixing metal.

3 Correct position of twin distributor

Correct position of twin branch pipe



Wrong position of twin branch pipe



A. Up.

B. Greater than 0.5 m.

C. Main pipe.

D. Refrigerant direction.

E. Refrigerant Main pipe direction.

F. Branch pipe.

G. Main pipe.

A. Refrigerant direction.

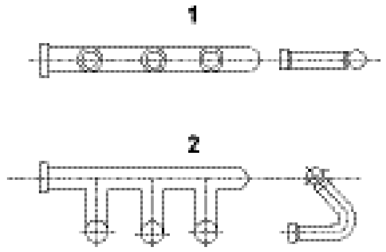
B. Main pipe.

C. Branch pipe.

4 Correct position of triple branch pipeInstall the header horizontally

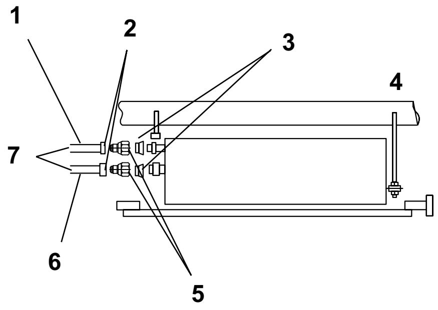
Example: Triple Branch pipe

1. Gas piping.
2. Liquid piping.



3.4.5 Connecting flare adapter (only for RAS-(2/2.5)HVRN2)

1. Liquid line.
2. Flare nut (Accessories).
3. Pipe (Accessories).
4. Indoor unit.
5. Flare adapter (Accessories).
6. Gas line.
7. Pipe (Field supplied).



The piping sizes for indoor unit and outdoor unit are different. Attach the flare adapter (accessories) at the indoor piping union part.

Use the adequate flare adapter as follows:

Indoor unit	Flare adapter	
	Gas pipe	Liquid pipe
2.0 HP	Big size (Ø15.88→Ø12.70)	—
2.5 HP	Big size (Ø15.88→Ø12.70)	Small size (Ø9.53→Ø6.35)

3.4.6 Drain discharging boss

When the base of the outdoor unit is temporarily used as a drain receiver and the drain water in it is discharged, this drain boss is used to connect the drain piping.

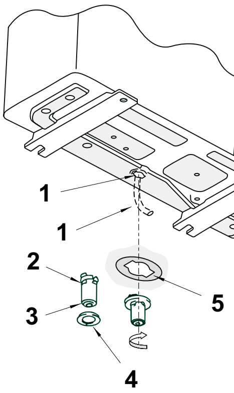
Model	Applicable Model
DBS-12L	RAS-(2-3)HVRN(S)2
DBS-26/DBS-26L	RAS-(4-6)H(V)RNS2E / RAS-(8/10)HRNSE

Connection procedure

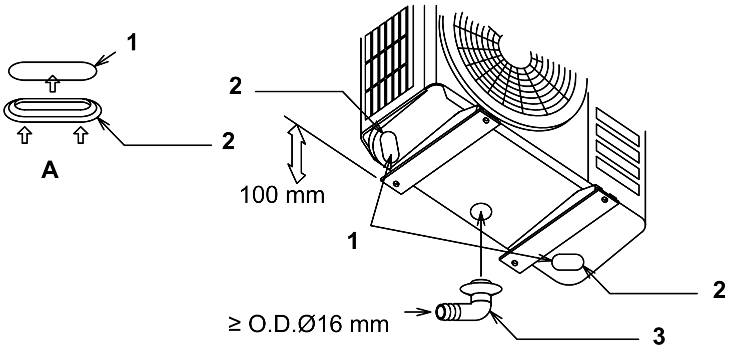
1 Insert the rubber cap into the drain boss up to the extruded portions.
2 Insert the boss into the unit base and turn approximately 40 degree counterclockwise.
3 The outer diameter section of the drain boss is 32 mm.
4 A drain pipe should be field-supplied.

NOTE

- ***Do not use this drain boss set in a cold area, because the drain water may freeze.***
- ***This drain boss may not be sufficient to collect drain water. If collecting a big amount of drain water should be necessary, provide a drain-pan bigger than the unit base supplied one, and install it under the unit with drainage.***



1. Drain pipe
2. Extruded portion
3. Drain boss
4. Rubber cap
5. Drain hole of base



1. Drain hole
2. Plastic cap
3. Drain pipe

A. Push

4. Electrical Wiring

Index

4.1 General check

⚠ **DANGER**

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

ℹ **NOTE**

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

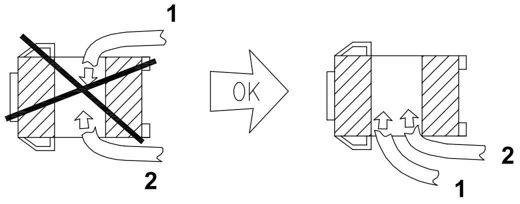
4.2 Electrical wiring for the outdoor unit IVX Series

4.2.1 Electrical wiring connection for the outdoor unit

The correct electrical wiring connection for the outdoor unit is shown below.

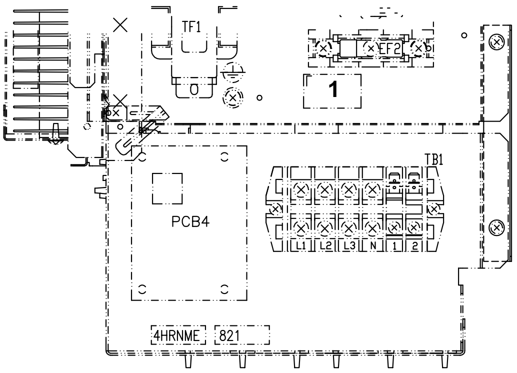
1 Insert the power source cables L1, L2, L3 and N (for 400V/50Hz) or L1 and N (for 230V/50Hz) and the ground cable into the ring core, coiling them with two turns and fix the cables using the cable tie (accessory). As shown in next figure, do not insert the cables from different sides into the ring core.

1. N/(L2) Wire.
2. L1 Wire.

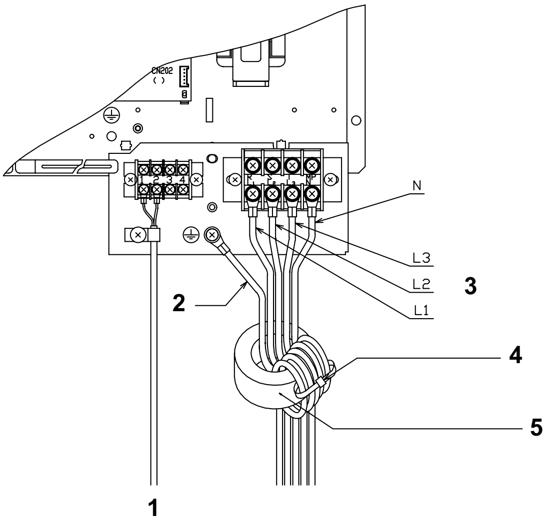


2 Connect the three-phase power supply source wires L1, L2, L3 and N (for 400V/50Hz) to the terminal board. Connect the ground wire to the plate in the electrical box.

Model RAS-(4-6)HRNM2E

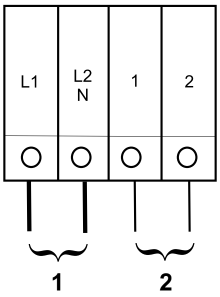


Model RAS-(8-12)HRNM



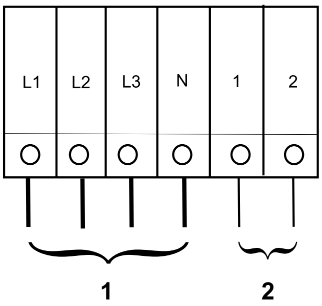
1. Signal wire.
2. Earth.
3. Power source wires..
4. Cable tie (accessory).
5. Ring core (accessory) 2 turns.

RAS-(3-6)HVRNM2E



1. Power supply 1~ 230V.
2. Control cable (5V).

RAS-(4-6)HRNM2E

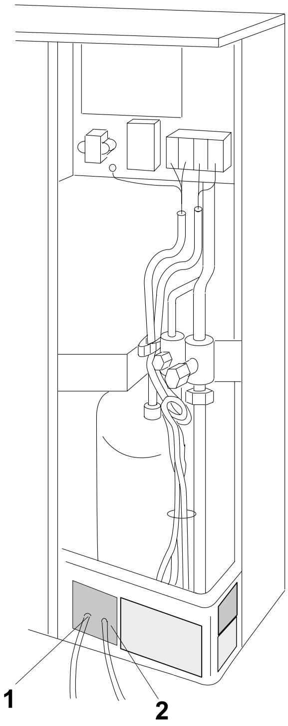


1. Power supply 3N~ 400V.
2. Control cable (5V).

3 Connect the wires between the outdoor unit and the indoor unit to the terminals 1 and 2 on the terminal board.

4 Do not run the wires in front of the fixing screw of the service access panel. If you do so, you will not be able to remove the fixing screw.

1. Power wires.
2. Signal wires.



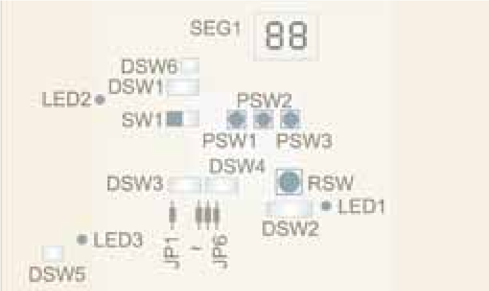
4.2.2 Setting the DIP switches for the outdoor unit

Quantity and position of DIP switches

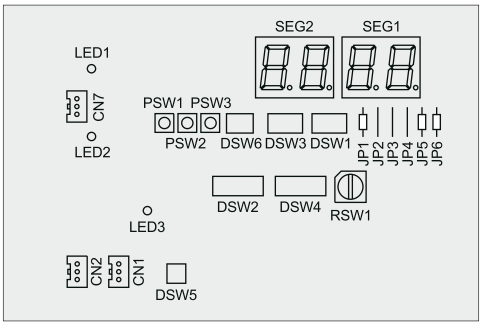
The PCB1 (see the electrical wiring diagram - plane a) in the outdoor unit is operated with 6 types of dip switches, one rotary switch and 3 types of push switch.

Position of DIP switches (DSW) at the PCB1:

3 HP / (8-12) HP



(4-6) HP)



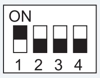
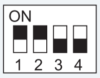
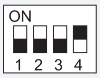
NOTE

- ***The mark "■" indicates the position of dips switches.***
- ***No mark "■" indicates pin position is not affecting.***
- ***The figures show the settings before shipment or after selection.***

DANGER

- ***Before setting dips switches, first turn the power source off and then set the position of the dips switches. In case of setting the switches without turning the power source off, the contents of the setting are invalid.***

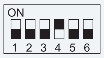
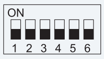
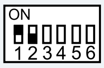
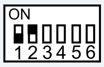
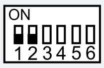
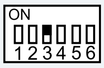
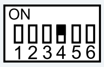
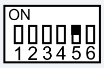
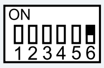
DSW1: Test Run

Function	Setting position
Setting before shipment	
Test run for cooling	
Test Run for heating	
Forced stop of compressor (1) - The compressor is OFF during this operation.	

NOTE

- ***It is possible to select the cancellation of the outdoor hot start control by pushing both PSW1 & PSW3 simultaneously during 3 seconds.***
- ***This operation is reset once the compressor is in Thermo-ON mode.***
- ***During the test run operation the units will operate continuously during 2 hours without Thermo-OFF and the 3-minute guard for compressor protection will be effective.***

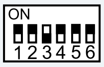
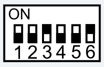
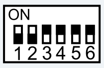
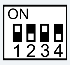
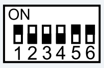
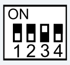
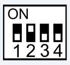
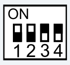
DSW2: Piping length/selection function

Function		Setting position	
		RAS-(4-6)H(V)RNM2E	RAS-3HVRNM2E RAS-(8-12)HRNM
Setting before shipment			
Piping length	5 m < Lt		
	Lt > 30 m		
	5 m < Lt < 30 m		
Cancellation of outdoor hot start control. (Not recommended, only available for special testing cases) (RAS-(4-6)H(V)RNM2E: pin 3 is OFF)			
Cancellation of outdoor air temperature control. (RAS-(4-6)H(V)RNM2E: pin 4 is OFF)			
Optional function selection setting (set by PSW)			
External input/output selection signals (set by PSW)			

⚠ **CAUTION**

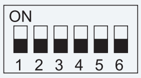
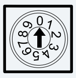
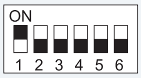
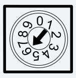
The cancellation of the outdoor hot start control configuration could damage the compressor if it is usually used. In that case the unit warranty will be void.

• DSW3: Capacity setting

Unit	Setting position	Unit	Setting position	Unit	Setting position
RAS-8HRNM		RAS-3HVRNM2E		—	—
RAS-10HRNM		RAS-4HVRNM2E		RAS-4HRNM2E	
RAS-12HRNM		RAS-5HVRNM2E		RAS-5HRNM2E	
—	—	RAS-6HVRNM2E		RAS-6HRNM2E	

DSW4 / RSW1: Refrigerant cycle setting

In case of using an H-Link II net it is required to set the refrigerant cycle number.

	Setting position (DSW4)		Setting position (RSW1)
Setting for tens (second digit)		Setting for units (first digit)	
Example for 16		and	

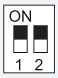
Rotary switche's positions (RSW1) are set by inserting a screw driver into the groove.

DSW5: Transmission setting of end terminal resistance

- Before shipment, No. 1 pin of DSW5 is set at ON.
- In case of having 2 or more outdoor units connected to the same H-link, set for the second unit the pin number 1 of DSW5 at OFF.
- If only one outdoor unit is used, no setting is required.

Function	Setting position
Setting before shipment	
Cancellation	

DSW6: Power source setting / individual operation

Function	3 HP	(4/5/6) HP	(8/10/12) HP
230V (Setting before shipment)			
400V (setting before shipment)			
380-415V (setting before shipment)			
In case of multiple operation, must activated to OFF position pin No. 1			

DSW1 (PCB2): Cancellation of electrical current detection. Only for RAS-(8-12)HRNM

Function	Setting position
Setting before shipment	
Cancellation of electrical current detection (only for PCB2 test)	

Jumper lead setting (JP1~6)

Setting before shipment:

JP1	JP2	JP3	JP4	JP5	JP6
1	0	0	1	1	1

NOTE

- ***0: Open***
- ***1: Short circuit***

The function selection using the jumper lead setting is shown in the table below.

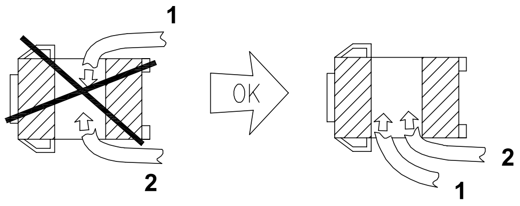
Setting	Function	Details
JP1 (Only for RAS-(8-12)HRNM)	Cooling -15 ºC & Heating.	When JP1 is set to “open”, temperature range for cooling mode is fixed until -15 ºC. Not available for individual indoor control.
JP2	Not used	—
JP3	Not used	—
JP4	Fixing for Cooling Only	When JP4 is set to “open”, operation mode is fixed for cooling. Thermo-ON is available only by “COOL” or “DRY” mode at indoor unit.
JP5	Alternative Defrosting Mode	When JP5 is set to “open”, alternative defrosting mode is available. When one of the outdoor units connected by H-LINK II is under defrosting, the other outdoor units defrosting is cancelled. After one outdoor unit defrosting is completed, another outdoor unit starts defrosting operation.
JP6	R407C pipes	When JP6 is set to “open”, existing piping system control is available. High pressure control is performed depending on existing piping strength.

4.3 Electrical wiring for the outdoor unit ES Series

4.3.1 Electrical wiring connection for the outdoor unit

The correct electrical wiring connection for the outdoor unit is shown below.

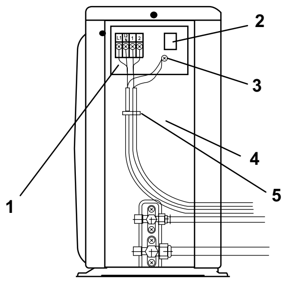
1 Insert the power source cables L1 and N (for 230V/50Hz) and the ground cable into the ring core, coiling them with two turns and fix the cables using the cable tie (accessory). As shown in next figure, do not insert the cables from different sides into the ring core.



1. N/(L2) Wire.
2. L1 Wire.

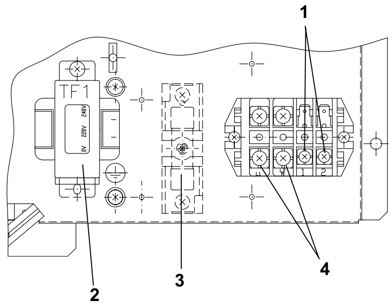
2 Connect the power supply source wires L1 and N (for 230V/50Hz) and L1, L2, L3 and N (for 400V/50Hz) to the terminal board. Connect the ground wire to the plate in the electrical box.

RAS-(2-3)HVRN(S)2



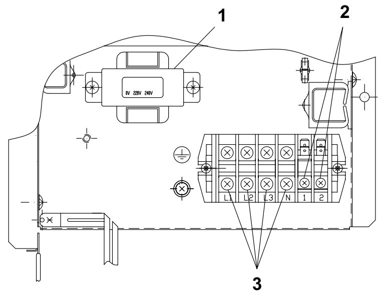
1. Power wires.
2. PCB.
3. Earth terminal.
4. Side cover.
5. Transmission wires.

RAS-(4-6)HVRNS2E



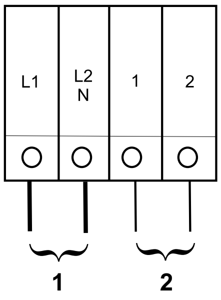
1. Transmission wires.
2. Transformer.
3. Fuse.
4. Power wires.

Model RAS-(8/10)HRNSE



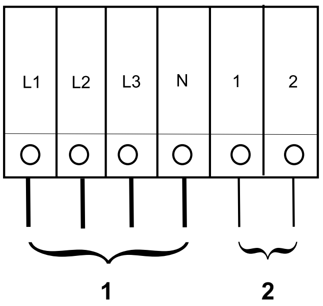
1. Transformer.
2. Transmission wires.
3. Power wires.

RAS-(2-3)HVRN(S)2
RAS-(4-6)HVRNS2E



1. Power supply AC230V.
2. Control cable (5 V).

RAS-(8/10)HRNSE
RAS-(4-6)HRNS2E



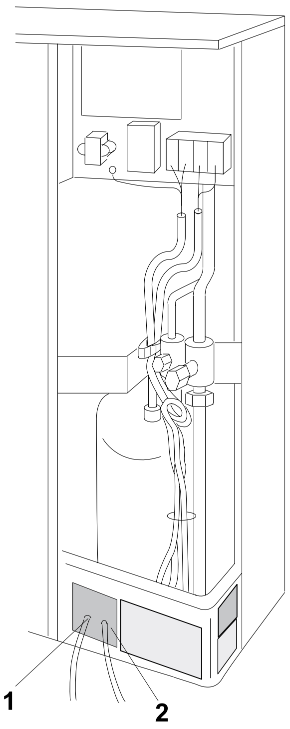
1. Power supply AC400V.
2. Control cable (5V).

3 Connect the wires between the outdoor unit and the indoor unit to the terminals 1 and 2 on the terminal board.

4 Do not run the wires in front of the fixing screw of the service access panel. If you do so, you will not be able to remove the fixing screw.

1: Power wires

2: Signal wires



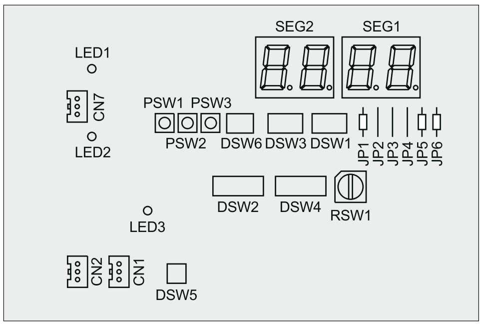
4.3.2 Setting the DIP switches for the outdoor unit

Quantity and position of DIP switches

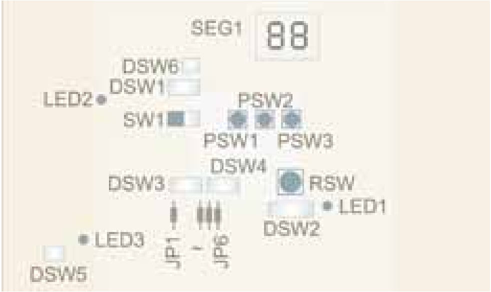
The PCB1 (see the electrical wiring diagram - plane a) in the outdoor unit is operated with 6 types of dip switches, one rotary switch and 3 types of push switch.

Position of DIP switches (DSW) at the PCB1:

RAS-(4-6)HVRNS2E



RAS-(8/10)HRNSE



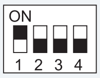
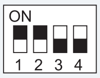
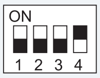
NOTE

- ***The mark "■" indicates the position of dips switches.***
- ***No mark "■" indicates pin position is not affecting.***
- ***The figures show the settings before shipment or after selection.***

NOTE

- ***Before setting dips switches, first turn the power source off and then set the position of the dips switches. In case of setting the switches without turning the power source off, the contents of the setting are invalid.***

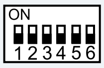
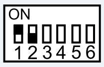
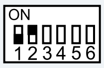
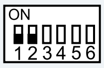
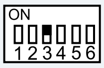
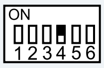
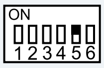
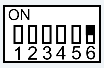
DSW1: Test Run

Function	Setting position
Setting before shipment	
Test run for cooling	
Test Run for heating	
Forced stop of compressor (1) - The compressor is OFF during this operation.	

NOTE

- ***It is possible to select the cancellation of the outdoor hot start control by pushing both PSW1 & PSW3 simultaneously during 3 seconds.***
- ***This operation is reset once the compressor is in Thermo-ON mode.***
- ***During the test run operation the units will operate continuously during 2 hours without Thermo-OFF and the 3-minute guard for compressor protection will be effective.***

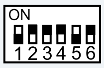
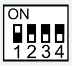
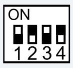
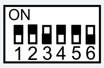
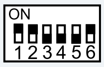
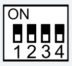
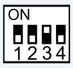
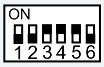
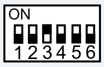
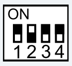
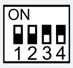
DSW2: Piping length/selection function

Function		Setting position
Setting before shipment		
Piping length	5 m < Lt	
	Lt > 30 m	
	5 m < Lt < 30 m	
Cancellation of outdoor hot start control. (Not recommended, only available for special testing cases) RAS-(2/6)HVRN(1)(S)(E)		
Cancellation of outdoor air temperature control.		
Optional function selection setting (set by PSW) ON: set OFF: no set		
External input/output selection signals (set by PSW) ON: set OFF: no set		

⚠ CAUTION

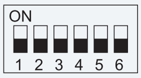
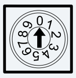
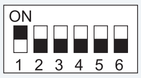
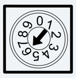
- ***The cancellation of the outdoor hot start control configuration could damage the compressor if it is usually used. In that case the unit warranty will be void.***

DSW3: Capacity setting

Unit	Setting position	Unit	Setting position	Unit	Setting position	Unit	Setting position
RAS-2HVRN2		RAS-4HVRNS2E		RAS-4HRNS2E		RAS-8HRNSE	
RAS-2.5HVRN2		RAS-5HVRNS2E		RAS-5HRNS2E		RAS-10HRNSE	
RAS-3HVRNS2		RAS-6HVRNS2E		RAS-6HRNS2E		—	—

DSW4 / RSW1: Refrigerant cycle setting

In case of using an H-Link II net it is required to set the refrigerant cycle number.

	Setting position (DSW4)		Setting position (RSW1)
Setting for tens (second digit)		Setting for units (first digit)	
Example for 16		and	

Rotary switches positions (RSW1) are set by inserting a screw driver into the groove.

DSW5: Transmission setting of end terminal resistance

- Before shipment, No. 1 pin of DSW5 is set at ON.
- In case of having 2 or more outdoor units connected to the same H-link, set for the second unit the pin number 1 of DSW5 at OFF.
- If only one outdoor unit is used, no setting is required.

Function	Setting position
Setting before shipment	
Cancellation	

DSW6: Power source setting

Function	(2/2.5/3) HP	(4/5/6) HP	(8/10) HP
230V (Setting before shipment)			
400V (setting before shipment)			

Jumper lead setting (JP1~6)

Setting before shipment:

JP1	JP2	JP3	JP4	JP5	JP6
1	0	0	1	1	1

NOTE

- ***0: Open***
- ***1: Short circuit***

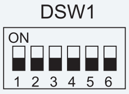
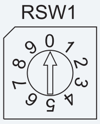
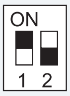
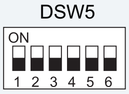
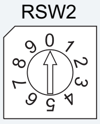
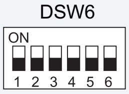
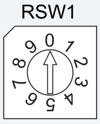
The function selection using the jumper lead setting is shown in the table below.

Setting	Function	Details
JP1	Not used	—
JP2	Not used	—
JP3	Not used	—
JP4	Fixing for Cooling Only	When JP4 is set to “open”, operation mode is fixed for cooling. Thermo-ON is available only by “COOL” or “DRY” mode at indoor unit.
JP5	Not used	—
JP5	R407C pipes	When JP6 is set to “open”, existing piping system control is available. High pressure control is performed depending on existing piping strength.

4.4 Electrical wiring between indoor unit and outdoor unit

Connect the electrical wires between the indoor unit and the outdoor unit, as shown in next figure.

Double-check that the terminal for power source wiring (terminals "L1" to "L1", "L2" to "L2", "L3" to "L3" and "N" to "N" of each terminal board: 3N~ 380-415 V) and the intermediate wires (Operating line: terminals "1" to "1" and "2" to "2" of each terminal board: DC5 V) between the indoor unit and the outdoor unit coincide correctly. If not, some component will be damaged.

Unit	Name of Dip Switch	Mark	Setting Before Shipment	Function
Outdoor unit	Refrigerant cycle	DSW4 RSW1	 	For setting refrigerant cycle address of outdoor unit. Set the DSW4 and RSW1 not to overlap the setting of other outdoor units in the same H-LINK system.
Indoor unit	Terminating resistance	DSW5		For matching impedance of transmission circuit, set the DSW5 according to the quantity of outdoor units in the H-LINK system.
	Refrigerant cycle	DSW5 RSW2	 	For setting refrigerant cycle address of indoor units. Set the DSW5 and RSW2 corresponding to the address of outdoor unit in the same refrigerant cycle.
	Indoor unit address	DSW6 RSW1	 	For setting indoor unit address. Set the DSW6 and RSW1 not to overlap the setting of other indoor units in the same refrigerant cycle. (If not set, the automatic address function is performed).

NOTE

- ***Follow the local codes and regulations when performing the electrical wiring (field and equipment).***
- ***Use twisted shielded pair wires for transmission wiring between the outdoor unit and the indoor unit and also for the transmission wiring between the indoor units (in case of an H-Link connection). It can be also used shielded pair wiring.***
- ***Shield shall be connected to the ground only from one cable side.***
- ***Do not use more than 3 ring cores to coil transmission wiring (in case of an H-Link connection). Core ring sizes must be selected according to the national regulations.***

Connect the transmission wiring to the units belonging to the same refrigerant cycle (the refrigerant piping and the transmission wiring should be connected to the same indoor units).

Open a hole near the connection terminal of the power source wiring when multiple outdoor units are connected from one single power source line.

NOTE

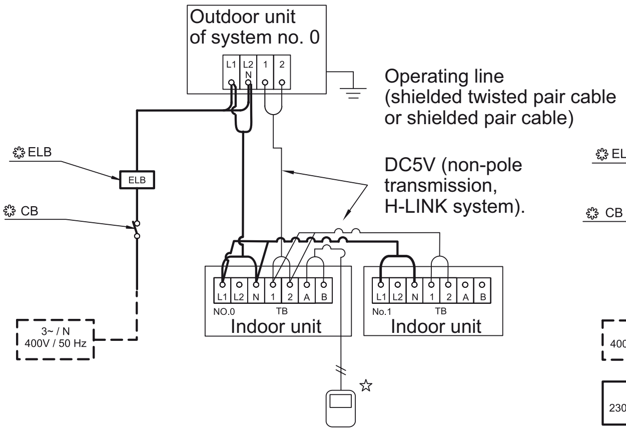
- ***If the refrigerant piping and the control wiring are connected to the units in the different refrigerant cycle, it will cause an abnormal operation.***
- ***Fix rubber bushes with an adhesive on the panel when a conduit pipe for field-wiring is not used.***

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

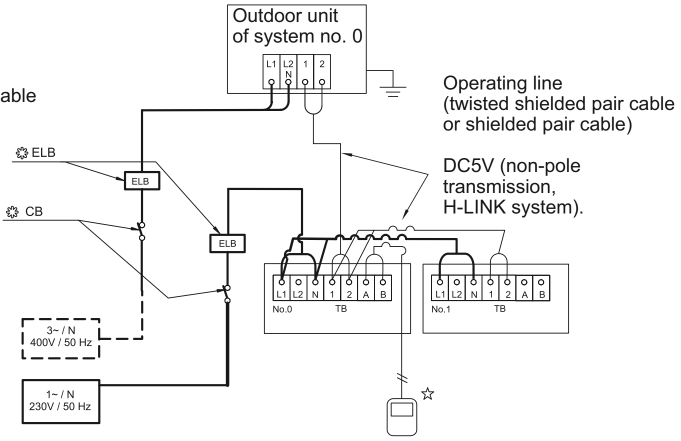
CAUTION

- ***Pay attention to the connection of the operating line. An incorrect connection will cause the failure of the PCB.***

Power source from the outdoor unit to the indoor unit



Independent power source of outdoor unit and indoor unit



TB	Terminal board
CB	Circuit breaker
ELB	Earth leakage breaker
——	Fiel d wiring
❃	Field-supplied
☆	Optional accessory

4.5 Wire sizes

4.5.1 Wire sizes for IVX Series

Field minimum wire sizes for the power source

Model	Power Source	Max. Current (A)	Power supply cable size	Transmitting Cable Size
			EN60 335-1 (2*)	EN60 335-1 (2*)
All Indoor Units (1*)	1~ 230V 50Hz	5	0.75 mm^2	0.75 mm^2
RPI-8-10		10	1.5 mm^2	
RAS-3HVRNM2E	1~ 230V 50Hz	18.5	4.0 mm^2	
RAS-4HVRNM2E		26	6.0 mm^2	
RAS-5HVRNM2E		26	6.0 mm^2	
RAS-6HVRNM2E		26	6.0 mm^2	
RAS-4HRNM2E	3N~ 400V 50Hz	13	4.0 mm^2	
RAS-5HRNM2E		13	4.0 mm^2	
RAS-6HRNM2E		13	2.5 mm^2	
RAS-8HRNME	3N~ 380/415V 50Hz	13.2	2.5 mm^2	
RAS-10HRNME		17.1	4.0 mm^2	
RAS-12HRNME		21.2	4.0 mm^2	

NOTE

- *(1*): Except RPI-8.0-10.0*
- *Follow local codes and regulations when selecting field wires.*
- *The above wire sizes marked with (2*) are selected at the maximum current of the unit according to the European standard, EN60 335-1. Use wires not lighter than the ordinary neoprene (polychloroprene) sheathed flexible cord (code designation H05RN-F).*
- *In the case that the power cables are connected in series, add each unit maximum current and select the wire sizes in next table.*
- *The ground cable size must comply local code: IEC 245, No. 571.*

Wire size in relationship to the intensity

In case that the power cables are connected in series, add each unit maximum current and select according to the next table.

Selection according to EN60 335-1		Selection according to LFC (at cable Temp. Of 60 °C)	
Current I(A)	Wire Size (mm^2)	Current I(A)	Wire Size (mm^2)
I ≤ 6	0.75	1 ≤ 15	0.5
6 < I ≤ 10	1	15 ≤ I < 18	0.75
10 < I ≤ 16	1.5	18 < I ≤ 24	1.25
16 < I ≤ 25	2.5	24 < I ≤ 34	2
25 < I ≤ 32	4	34 < I ≤ 47	3.5
32 < I ≤ 40	6	47 < I ≤ 62	5.5
40 < I ≤ 63	10	62 < I ≤ 78	8
63 < I	(3*)	78 < I ≤ 112	14
—	—	112 < I ≤ 147	22

NOTE

- ***(3*): In case that the current exceeds 63 A do not connect cables in series.***

CAUTION

- ***Use shielded wires for transmission wires between the indoor and the outdoor units and connect the shielded part to the ground screw in the electrical box of the indoor unit as shown below.***
- ***Use wires not lighter than the ordinary neoprene (polychloroprene) sheathed flexible cord (code designation H05RN-F).***

Main switches types

Select the main switches (current breaker) in according to the next table:

Model	Power Source	Max. Current (A)	CB (A)	ELB (no. poles/A/Ma)
All Indoor Units (1*)	1~ 230V 50Hz	5	6	2/40/30
RPI-8-10		10	10	
RAS-3HVRNM2E	1~ 230V 50Hzz	18.5	25	
RAS-4HVRNM2E		26	32	
RAS-5HVRNM2E		26	32	
RAS-6HVRNM2E		26	32	
RAS-4HRNM2E	1~ 230V 50Hz	13	20	4/40/30
RAS-5HRNM2E		13	20	
RAS-6HRNM2E		13	20	
RAS-8HRNME	3N~ 380/415V 50Hz	13.2	20	
RAS-10HRNME		17.1	20	
RAS-12HRNME		21.2	30	

NOTE

- ***(1*): (Except RPI-8.0-10.0).***
- ***ELB: Earth leakage breaker.***
- ***CB: Circuit breaker***

4.5.2 Wire sizes for ES Series

Field minimum wire sizes for the power source

Model	Power Source	Max. Current (A)	Power Source Cable Size	Transmitting Cable Size
			EN60 335-1 (2*)	EN60 335-1 (2*)
All Indoor Units (1*)	1~ 230V 50Hz	5	0.75 mm^2	0.75 mm^2
RAS-2HVRN2		11	2.5 mm^2	
RAS-2.5HVRN2		18,5	4.0 mm^2	
RAS-3HVRNS2		18,5	4.0 mm^2	
RAS-4HVRNS2E		26	6.0 mm^2	
RAS-5HVRNS2E		26	6.0 mm^2	
RAS-6HVRNS2E		26	6.0 mm^2	
RAS-4HRNS2E	3N~ 400V 50Hz	13	4.0 mm^2	
RAS-5HRNS2E		13	4.0 mm^2	
RAS-6HRNS2E		13	4.0 mm^2	
RAS-8HRNSE		20	6.0 mm^2	
RAS-10HRNSE		23	6.0 mm^2	

NOTE

- *(1*): Except RPI-8.0-10.0*
- *Follow local codes and regulations when selecting field wires.*
- *The above wire sizes marked with (2*) are selected at the maximum current of the unit according to the european standard, EN60 335-1. Use wires not lighter than the ordinary neoprene (polychloroprene) sheathed flexible cord (code designation H05RN-F).*
- *In the case that the power cables are connected in series, add each unit maximum current and select the wire sizes in next table.*
- *The ground cable size must comply local code: IEC 245, No. 571.*

Wire size in relationship to the intensity

In case that the power cables are connected in series, add each unit maximum current and select according to the next table.

Selection according to EN60 335-1		Selection according to LFC (at cable Temp. Of 60 °C)	
Current I(A)	Wire Size (mm^2)	Current I(A)	Wire Size (mm^2)
I ≤ 6	0.75	1 ≤ 15	0.5
6 < I ≤ 10	1	15 ≤ I < 18	0.75
10 < I ≤ 16	1.5	18 < I ≤ 24	1.25
16 < I ≤ 25	2.5	24 < I ≤ 34	2
25 < I ≤ 32	4	34 < I ≤ 47	3.5
32 < I ≤ 40	6	47 < I ≤ 62	5.5
40 < I ≤ 63	10	62 < I ≤ 78	8
63 < I	(3*)	78 < I ≤ 112	14
—	—	112 < I ≤ 147	22

NOTE

- ***(3*): In case that the current exceeds 63 A do not connect cables in series.***

CAUTION

- ***Use shielded wires for transmission wires between the indoor and the outdoor units and connect the shielded part to the ground screw in the electrical box of the indoor unit as shown below.***
- ***Use wires not lighter than the ordinary neoprene (polychloroprene) sheathed flexible cord (code designation H05RN-F).***

Main switches types

Select the main switches (current breaker) in according to the next table:

Model	Power Source	Max. Current (A)	CB (A)	ELB (no. poles/A/Ma)
All Indoor Units (1*)	1~ 230V 50Hz	5	6	2/40/30
RAS-2HVRN1E		13	16	2/20/30
RAS-2.5HVRN1		16	25	
RAS-3HVRNS		18	25	2/40/30
RAS-4HVRNS1E		18/24	32	
RAS-5HVRNS1E		26	32	
RAS-6HVRNS1E		26	32	
RAS-4HRNS2E	3N~ 400V 50Hz	13	20	4/40/30
RAS-5HRNS2E		13	20	
RAS-6HRNS2E		13	20	
RAS-8HRNSE		20	40	
RAS-10HRNSE		23		

NOTE

- ***(1*): (Except RPI-(8.0/10.0)).***
- ***ELB: Earth leakage breaker.***
- ***CB: Circuit breaker***

4.5.3 H-LINK II System

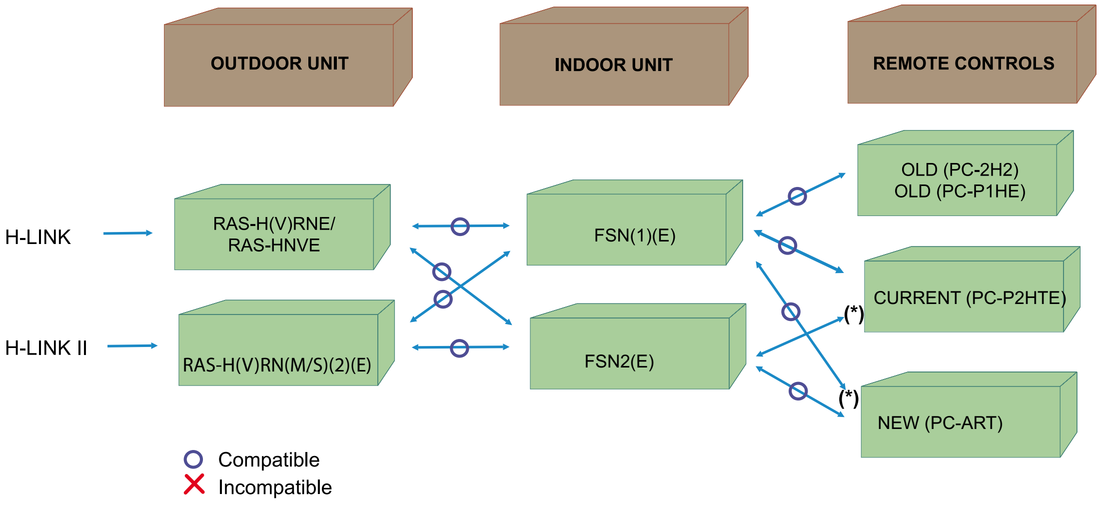
Compatibility

The H-LINK II is the wiring connection system between units.

The H-LINK II wiring system only needs:

• Two transmission wires connecting each indoor and outdoor unit for a total of 64 refrigerant cycles.

• Connection wiring for all indoor and outdoor units in series.

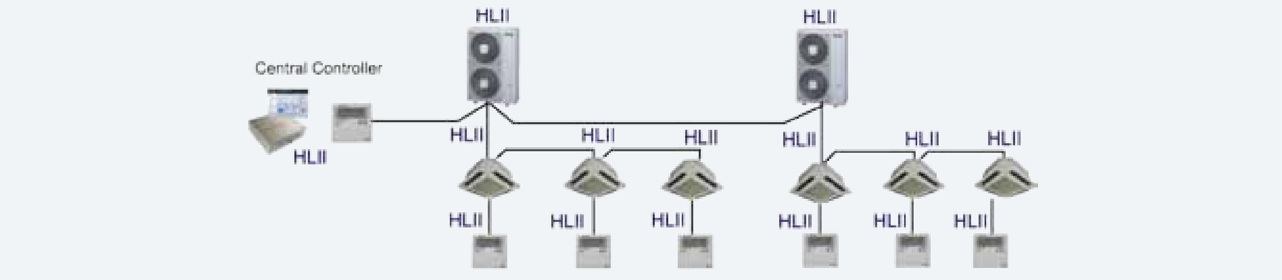


NOTE

- The RCI-FSN(2/3)E unit can be connected to the P-G23WA2 panel (cutting bridge J4).
- (*) In both combinations, some of the functions of the indoor unit cannot be used.

Examples with H-LINK Y H-LINK II systems

1 System with indoor units, outdoor units, remote control and central control type H-LINK II

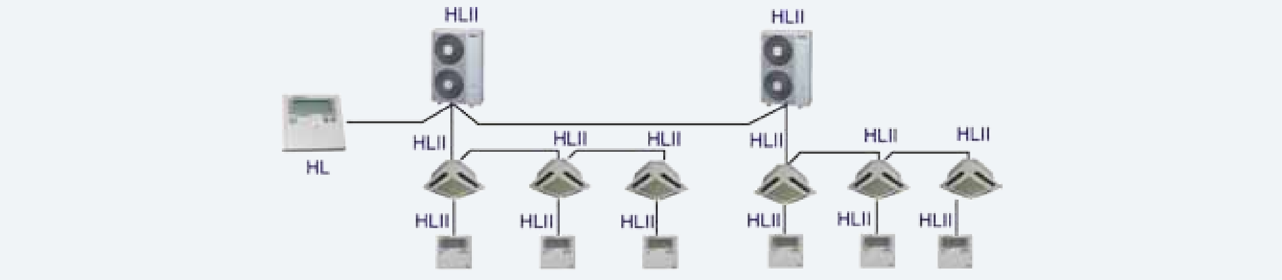


Range number of refrigerant circuits	0-63
Range number of indoor units	0-63
Max. number of indoor units	160
Max. number of sets (*)	200

NOTE

- ***(*) Sets = Indoor units + outdoor units + central control***
- ***HL: H-LINK***
- ***HL II: H-LINK II***

2 System with indoor units, outdoor units, H-LINK II remote control and H-LINK central control.

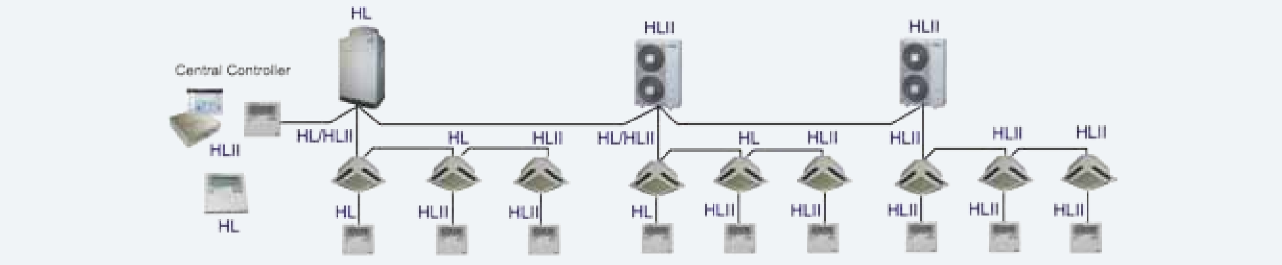


Range number of refrigerant circuits	0-15
Range number of indoor units	0-15
Max. number of indoor units	128
Max. number of sets (*)	145

NOTE

- ***(*) Sets = Indoor units + outdoor units + central control***
- ***HL: H-LINK***
- ***HL II: H-LINK II***

3 System with indoor units, outdoor units, H-LINK remote controls and H-LINK II with H-LINK II central control.

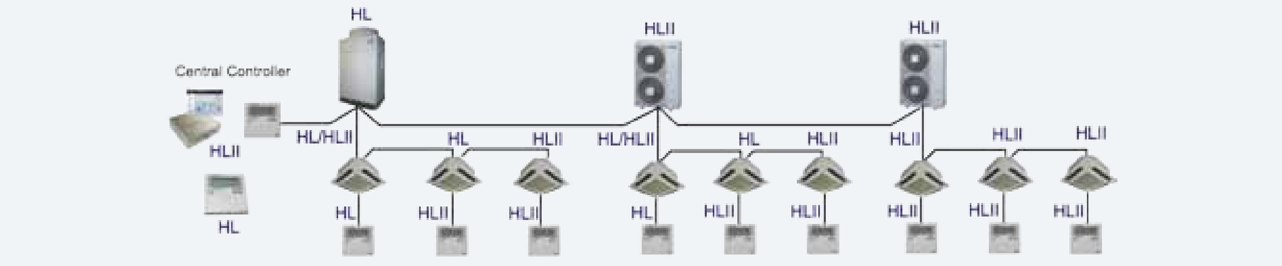


Range number of refrigerant circuits	0-15	0-15		0-63
Range number of indoor units	0-15	0-15	0-63	0-63
Max. number of indoor units	128			
Max. number of sets (*)	145			

NOTE

- ***(*) Sets = Indoor units + outdoor units + central control***
- ***HL: H-LINK***
- ***HL II: H-LINK II***

4 System with indoor units, outdoor units, H-LINK and H-LINK II remote control and H-LINK central control.

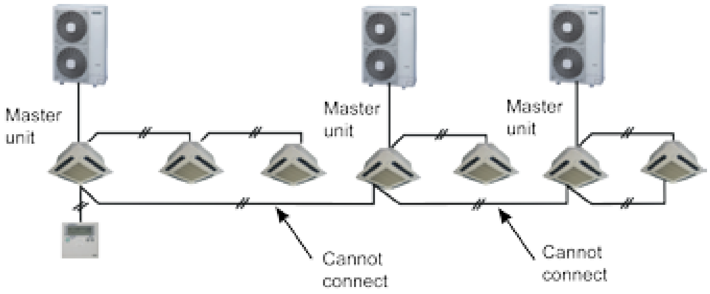


Range number of refrigerant circuits	0-15
Range number of indoor units	0-15
Max. number of indoor units	128
Max. number of sets (*)	145

NOTE

- ***(*) Sets = Indoor units + outdoor units + central control***
- ***HL: H-LINK***
- ***HL II: H-LINK II***

The following settings are not available:



NOTE

- ***It is not possible to connect diferent indoor units from diferent systems with the same remote control, once the remote control function wiring has been selected not to be used.***
- ***All optional units connected to CN3 can only be used with master unit with remote control connected to it.***

Application

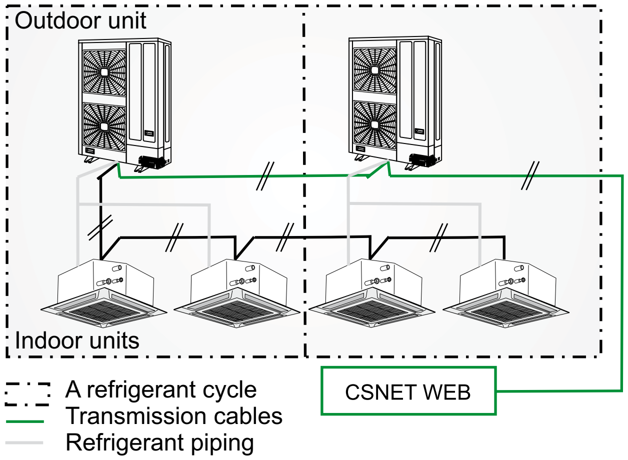
The H-LINK II wiring system requires only two transmission cables that connect each indoor unit and the outdoor unit for up to 64 refrigerant cycles. This wiring system also requires the connect wires for all the indoor units and all the outdoor units in series. You can apply this H-LINK II system to following models:

Indoor Unit	Outdoor Unit
RCI(M)	RAS-(3-12)H(V)RNM2(E) RAS-(2-10)H(V)RN(S)(2)(E)
RDC	
RPI(M)	
RPK	
RPF	
RPFI	
RPC	

H-LINK II features

- It is possible to control up to 160 indoor units (64 groups of indoor units) with only one control panel (using the PSC-64S controller). It is possible to control up to 200 units (indoor unit, outdoor unit and central control).
- The total wiring length is remarkably reduced.
- Only one (1) connection is required for the wiring between the indoor unit and the outdoor unit.
- Easy wiring connection to the central control panels.

Example of an H-LINK II system:



H-LINK II specifications:

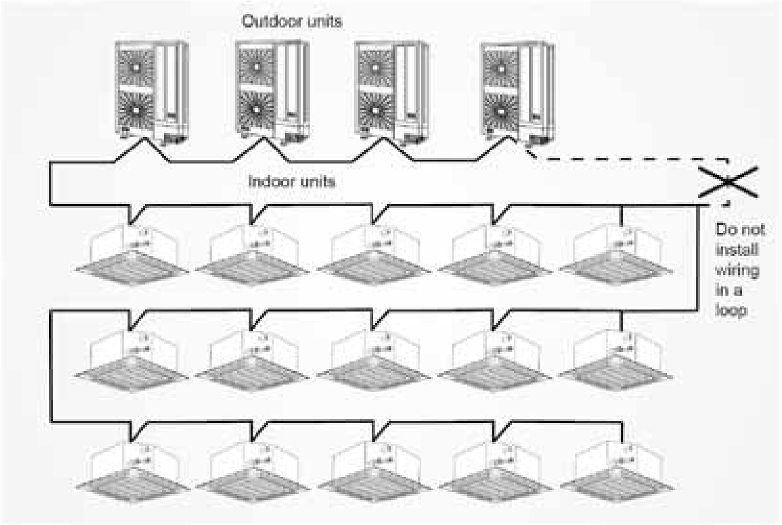
- Transmission wire: 2-wire
- Polarity of transmission wire: non-polar wire
- Maximum outdoor units that can be connected: 64 units per H-LINK system.
- Maximum indoor units that can be connected: 4 units per cycle and 160 units per H-LINK II system (in case of SET FREE series will be added).
- Maximum wiring length: total 1000 m (including CS-NET WEB).
- Recommended cable: twist shielded pair cable or shielded pair cable with a section over 0.75 mm
- Voltage: DC5V

System example of H-LINK II

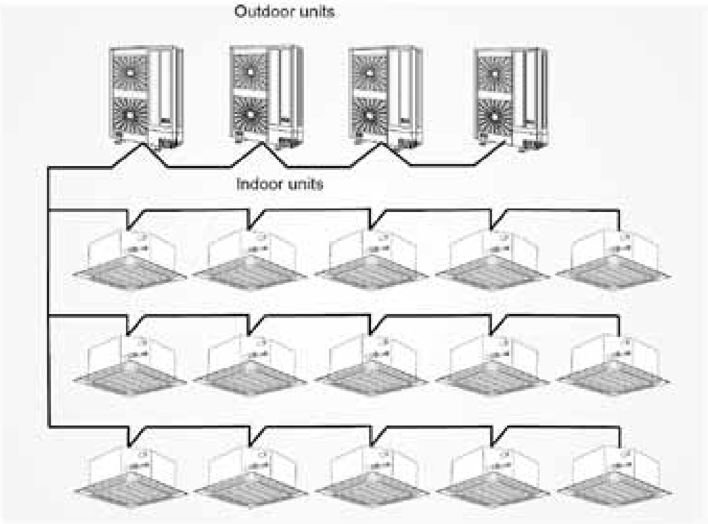
There are two typical cases of using H-LINK system:

1 Using H-LINK system with air conditioners only
2 Using H-LINK system with air conditioners with a central control device. The system examples are shown below.

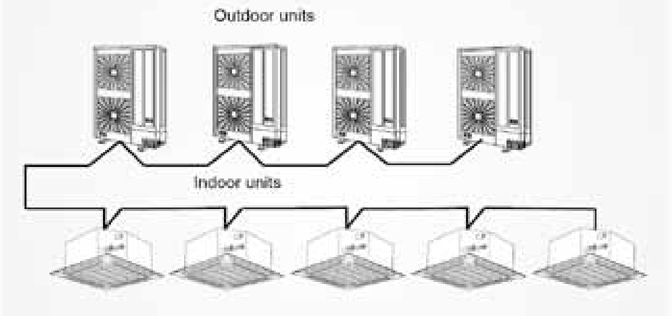
a. Using H-LINK system for air conditioning systems without a central control device (CSNET WEB or PSC-5S).Line connection for all units (including Utopia and DC inverter).



Line connection for each floor

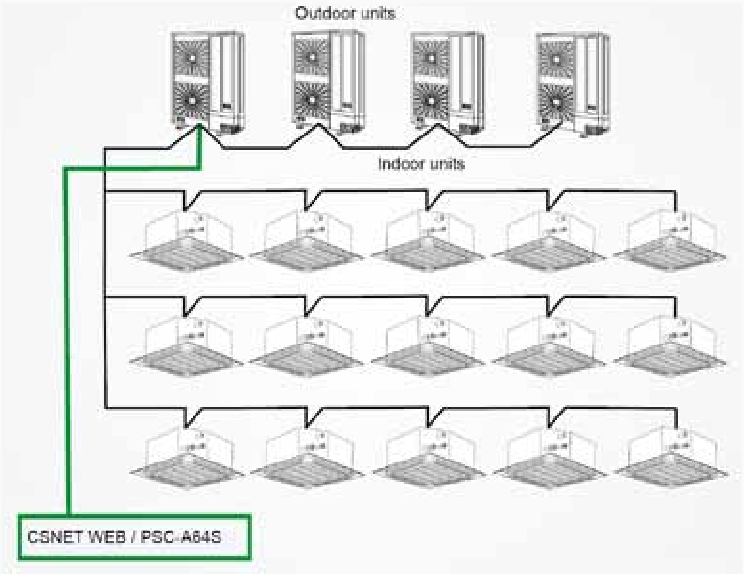


Connection with one main line and with the branch lines for the units

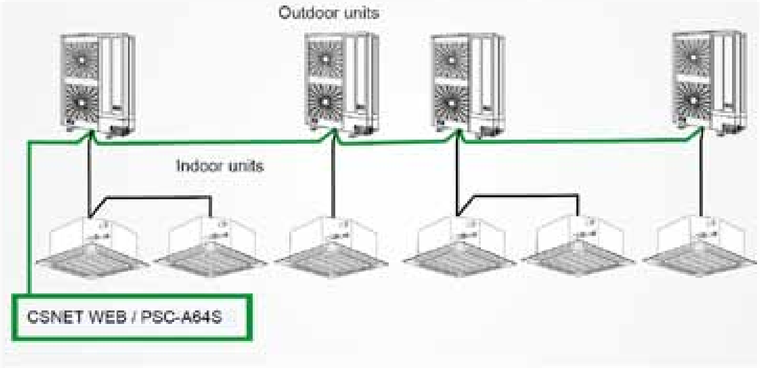


b. Using an H-LINK II system for air conditioning systems with a central control panel (CSNET WEB or PSC-64S).In case of using a central control panel, you must connect the H-Link II wiring to all the systems. The easiest way of connection to the H-LINK II system is usually to connect the available outdoor units.

In this case, the CS-NET WEB wiring can be connected at any point of the H-LINK II wiring.



In case of not using a central control device when the electrical wiring is performed. In this case, you must connect the H-LINK II wiring to all the systems. Usually, to connect the outdoor units is the easiest implementation to connect them in the system.

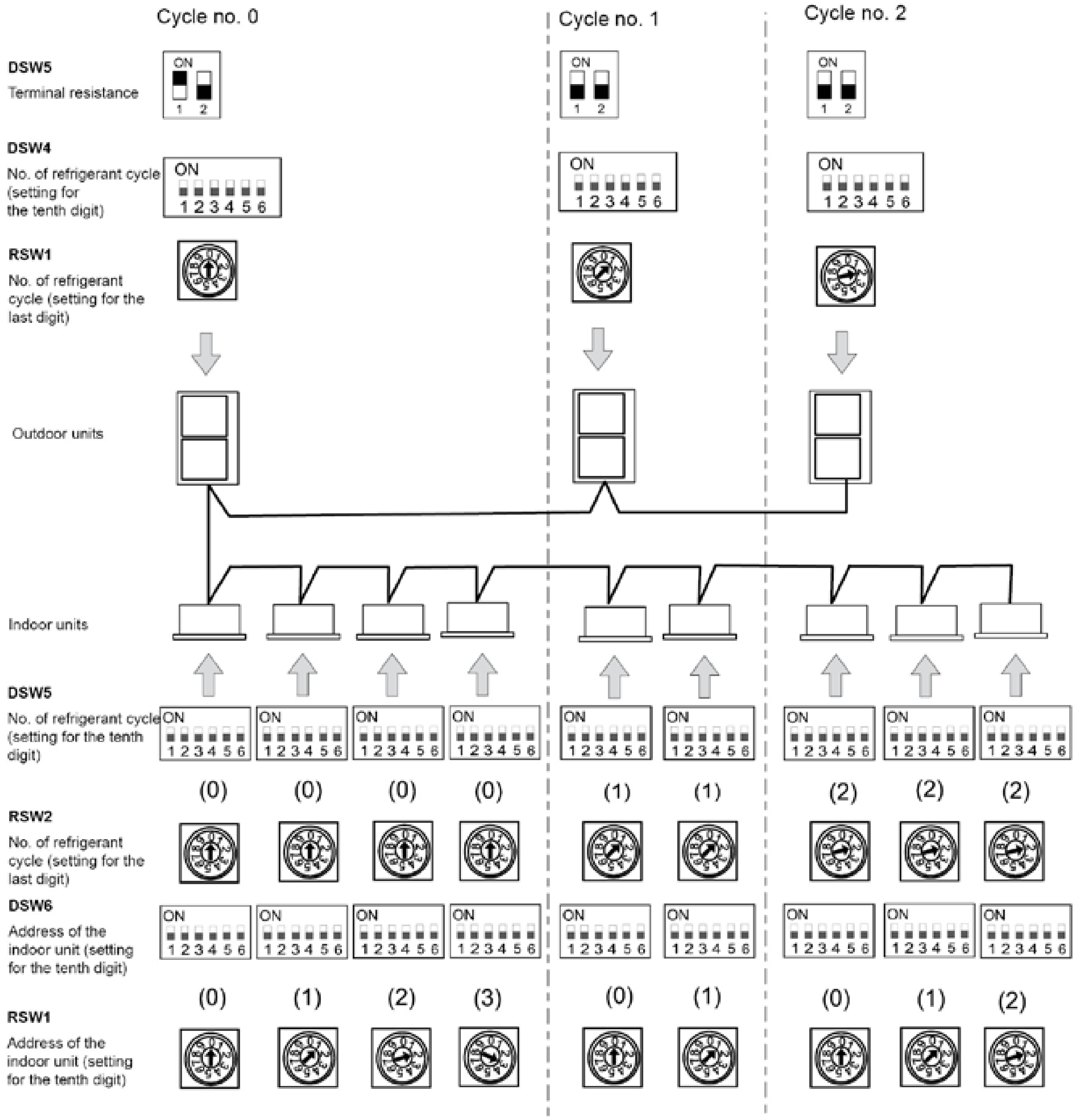


NOTE

- ***Do not make wiring in a loop. in order to avoid malfunctions of the system.***

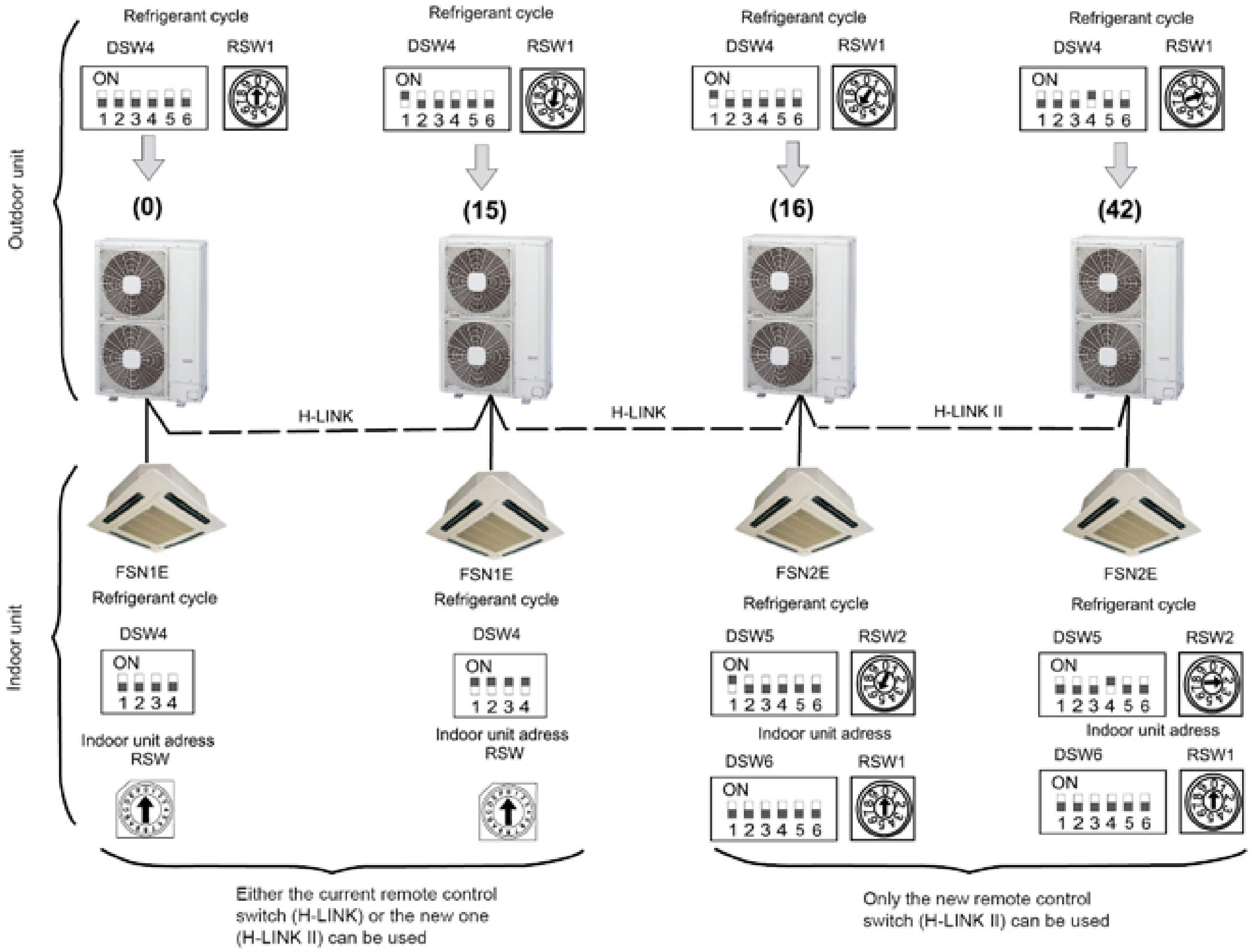
DIP Switch setting of indoor PCB and Outdoor PCB

It is required to set DIP switches of every indoor unit and outdoor unit.



Connection example between H-LINK and H-LINK II units

In case of mixed H-LINK and H-LINK II systems, set H-LINK units in the first 16 system positions, as shown in the following figure. There are 42 systems, 16 with FSN1E indoor units type and 26 with FSN3E indoor units type.



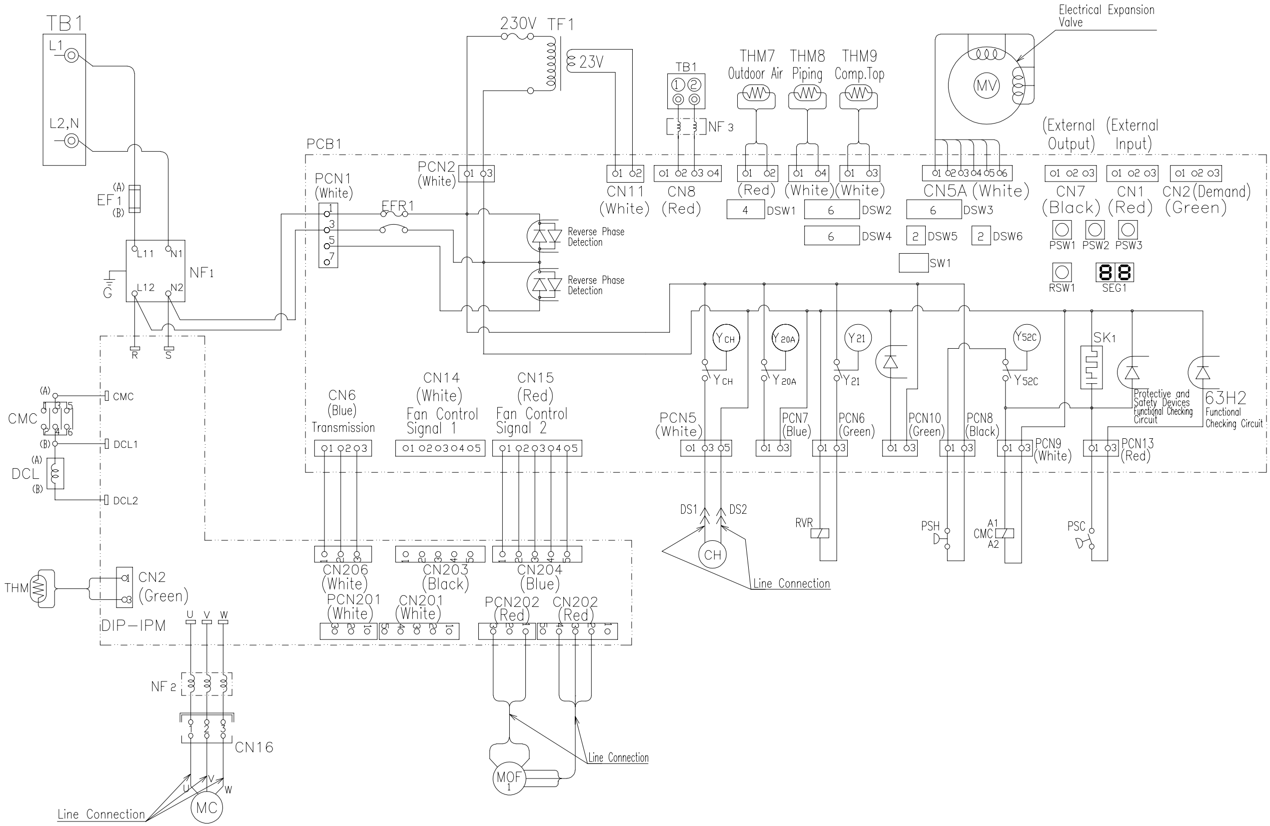
NOTE

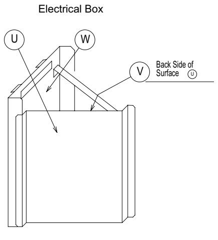
- ***An H-LINK II is capable of controlling up to 160 indoor units.***
- ***If using PSC-5S and CSNET WEB 2.0 (only compatible with H-LINK), take into account that it will only recognize 16 indoor units and 16 outdoor units.***

4.6 Electrical wiring diagrams

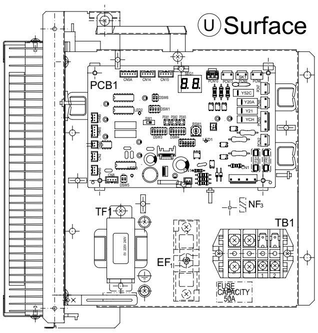
4.6.1 Electrical wiring diagrams for IVX Series

RAS-3HVRNM2E

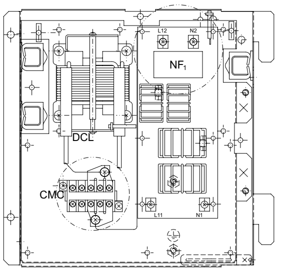




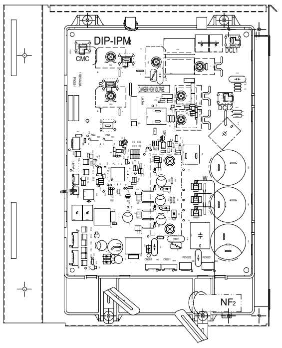
Ⓤ Surface



Ⓥ Surface



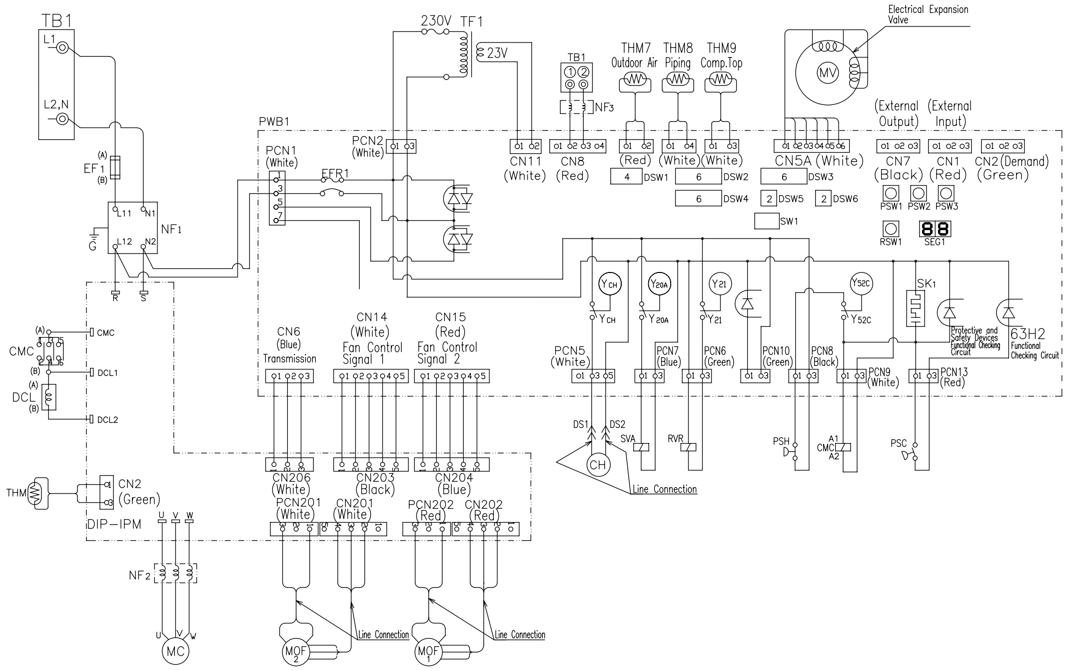
Ⓦ Surface

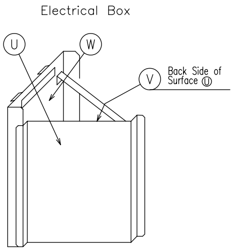


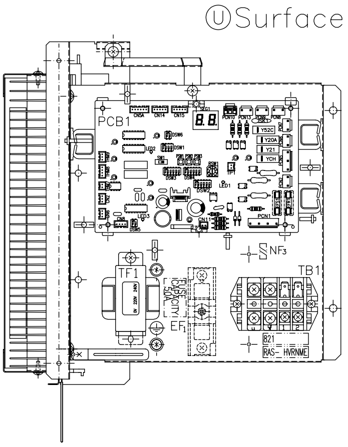
Mark	Name of Parts	Remarks
MC	Motor (for Compressor)	
MOF1	Motor (for Fan)	
EF1	Power Fuse	
CMC	Magnetic Contactor (for Compressor)	
RVR	Magnetic 4 Way Valve	
MV	Electrical Expansion Valve	
TB1,2	Terminal Board	
TF1	Transformer	
PCB 1	Printed Circuit Board	
EFR1	Fuse	
Y_{52C}	Aux.Relay (For Compressor,Magnetic Contactor)	DC Coil
Y_{21}	Aux.Relay(For Magnetic 4 Way Valve)	DC Coil
Y_{20A}	Aux.Relay(For Magnetic Valve)	DC Coil
Y_{CH}	Aux.Relay(For C Heater)	DC Coil
THM7	Thermistor (for Outdoor Air)	
THM8	Thermistor (for Piping)	
THM9	Thermistor (for Comp. Top)	

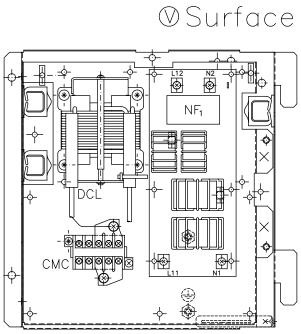
Mark	Name of Parts	Remarks
PSH	High Pressure Switch(for Protection)	
PSC	High Pressure Switch(for Control)	
DCL	Reactor	
DIP-IPM	Inverter Module	
NF1~3	Noise Filter	
PSW1	Switch(Forced Defrosting)	On PWB
PSW2	Switch(Checking)	On PWB
PSW3	Switch(Checking)	On PWB
DSW1	Switch(Test Run)	On PWB
DSW2	Switch(Auxiliary Option Setting)	On PWB
DSW3	Switch(Outdoor Capacity Setting)	On PWB
DSW4	Switch(Refrigerant Cycle Setting)	On PWB
DSW5	Switch	On PWB
DSW6	Switch (Power Source Setting)	On PWB
SW1	Switch(Transmission Changeover)	On PWB
CH	Crankcase Heater	
DS 1,2	Inserting Type Connector	
G	Ground	

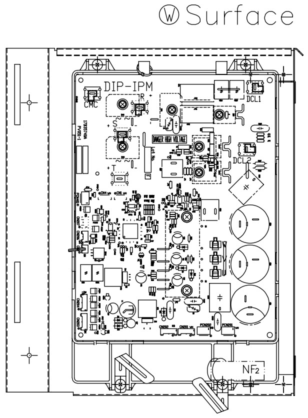
RAS-(4-6)HVRNM2E





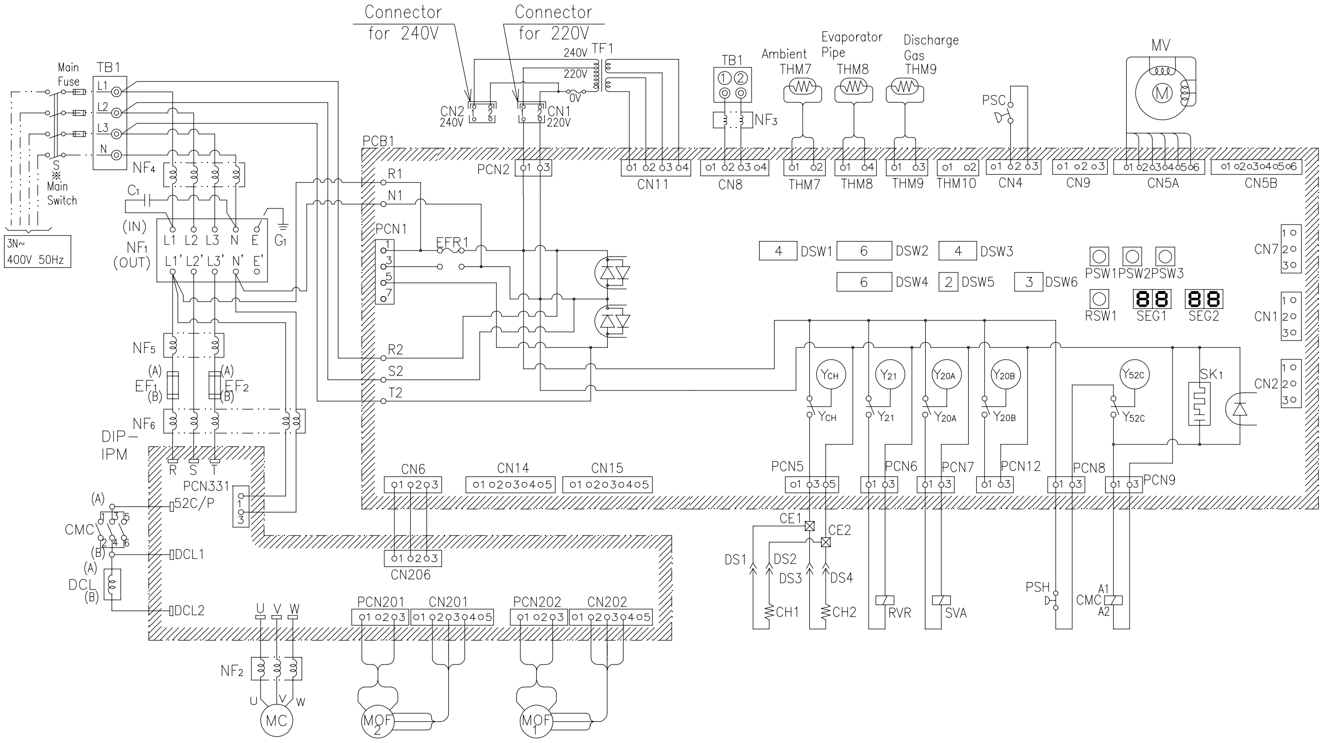


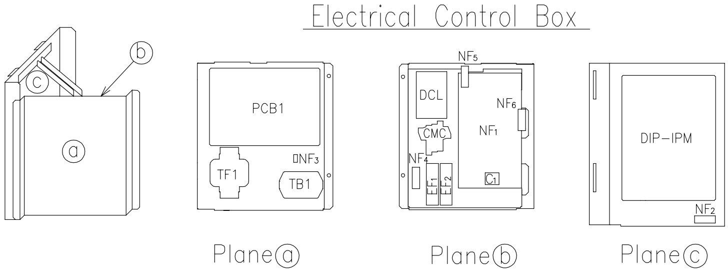


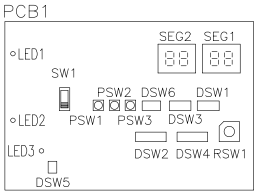


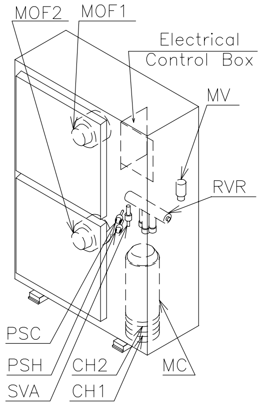
Mark	Name of Parts	Remarks
MC	Motor (for Compressor)	
MOF1,2	Motor (for Fan)	
EF1	Power Fuse	
CMC	Magnetic Contactor (for Compressor)	
RVR	Magnetic 4 Way Valve	
SVA	Solenoid Valve	
MV	Electrical Expansion Valve	
TB1	Terminal Board	
TF1	Transformer	
PCB_1	Printed Circuit Board	
EFR1	Fuse	
Y_{52C}	Aux.Relay (For Compressor,Magnetic Contactor)	DC Coil
Y_{21}	Aux.Relay(For Magnetic 4 Way Valve)	DC Coil
Y_{20A}	Aux.Relay(For Magnetic Valve)	DC Coil
Y_{CH}	Aux.Relay(For C Heater)	DC Coil
THM7	Thermistor (for Outdoor Air)	
THM8	Thermistor (for Piping)	
THM9	Thermistor (for Comp. Top)	
PSH	High Pressure Switch(for Protection)	
PSC	High Pressure Switch(for Control)	
DCL	Reactor	
DIP-IPM	Inverter Module	
NF1~3	Noise Filter	
PSW1	Switch(Forced Defrosting)	On PWB
PSW2	Switch(Checking)	On PWB
PSW3	Switch(Checking)	On PWB
DSW1	Switch(Test Run)	On PWB
DSW2	Switch(Auxiliary Option Setting)	On PWB
DSW3	Switch(Outdoor Capacity Setting)	On PWB
DSW4	Switch(Refrigerant Cycle Setting)	On PWB
DSW5	Switch	On PWB
DSW6	Switch (Power Source Setting)	On PWB
SW1	Switch(Transmission Changeover)	On PWB
DS1,2	Inserting Type Connector	
G	Ground	
CH	Crankcase Heater	

RAS-(4-6)HRNM2E



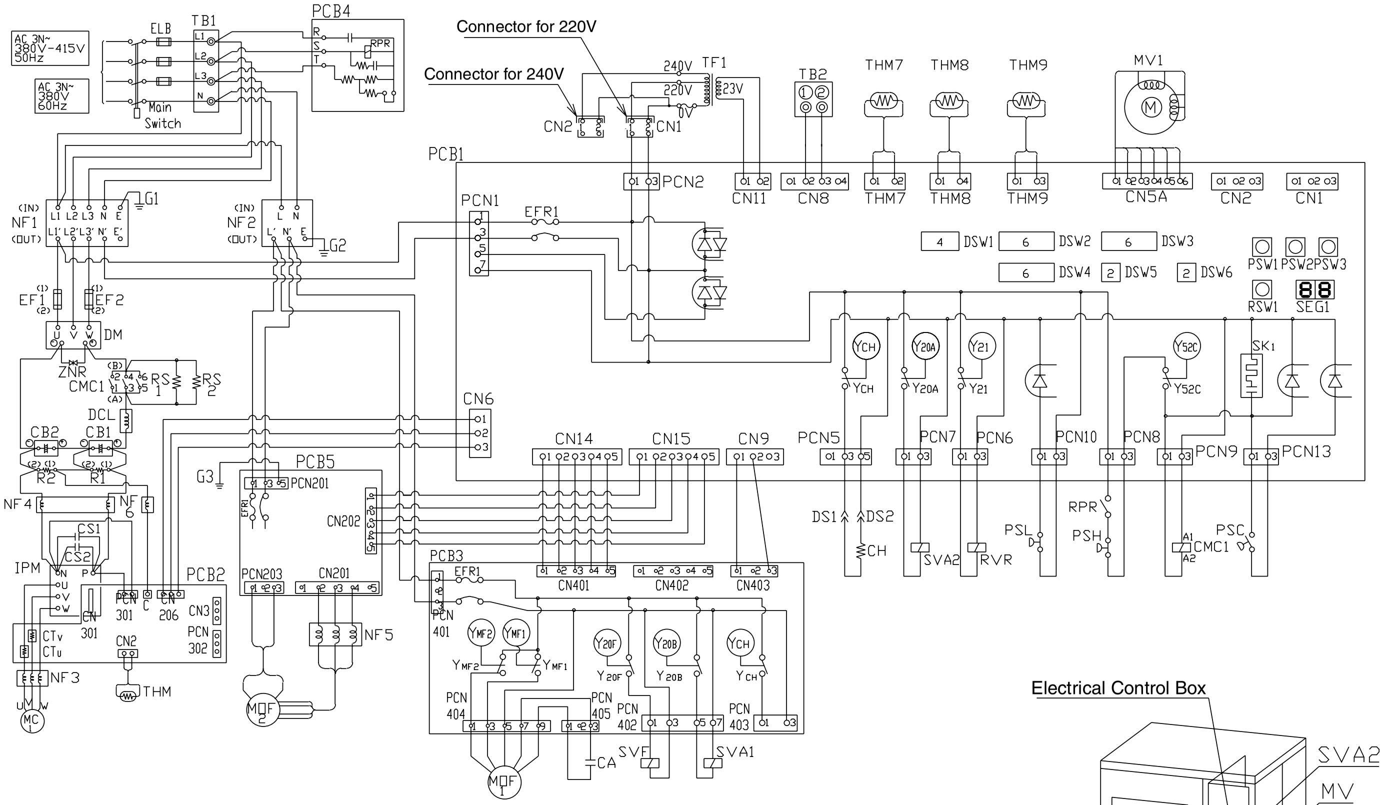




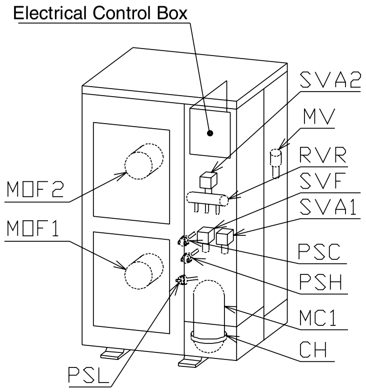


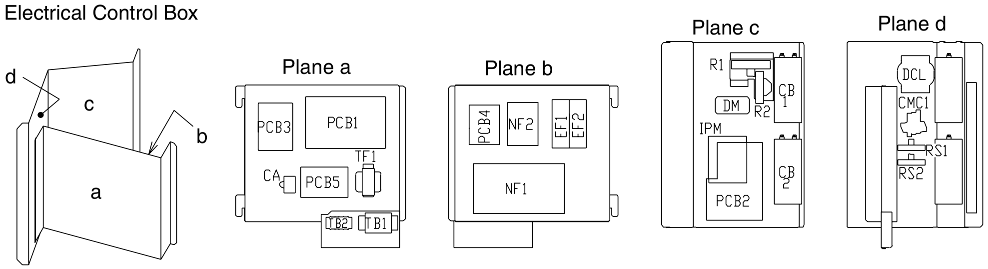
Mark	Name	Mark	Name
C1	Capacitor	PCB1	Printed Circuit Board
CH1,2	Crankcase Heater	PSC	Pressure Switch for Control
CMC	Contactor for Compressor Motor	PSH	High Pressure Switch for Protection
DCL	Reactor	PSW1~3	Push Switch on PCB1
DIP-IPM	Inverter Module	RVR	Reversing Valve Relay
DS1~4	I.F Connector	SVA	Solenoid Valve
DSW1~6	Dip Switch on PCB1	SW1	Switch
EF1,2	Fuse	TB1	Terminal Board
MC	Motor for Compressor	TF1	Transformer
MOF1,2	Motor for Outdoor Fan	THM7~9	Thermistor
MV	Micro-Computer Control Expansion Valve	THM	Thermistor for Fin Temperature
NF1~6	Noise Filter		

RAS-(8-12)HRNM



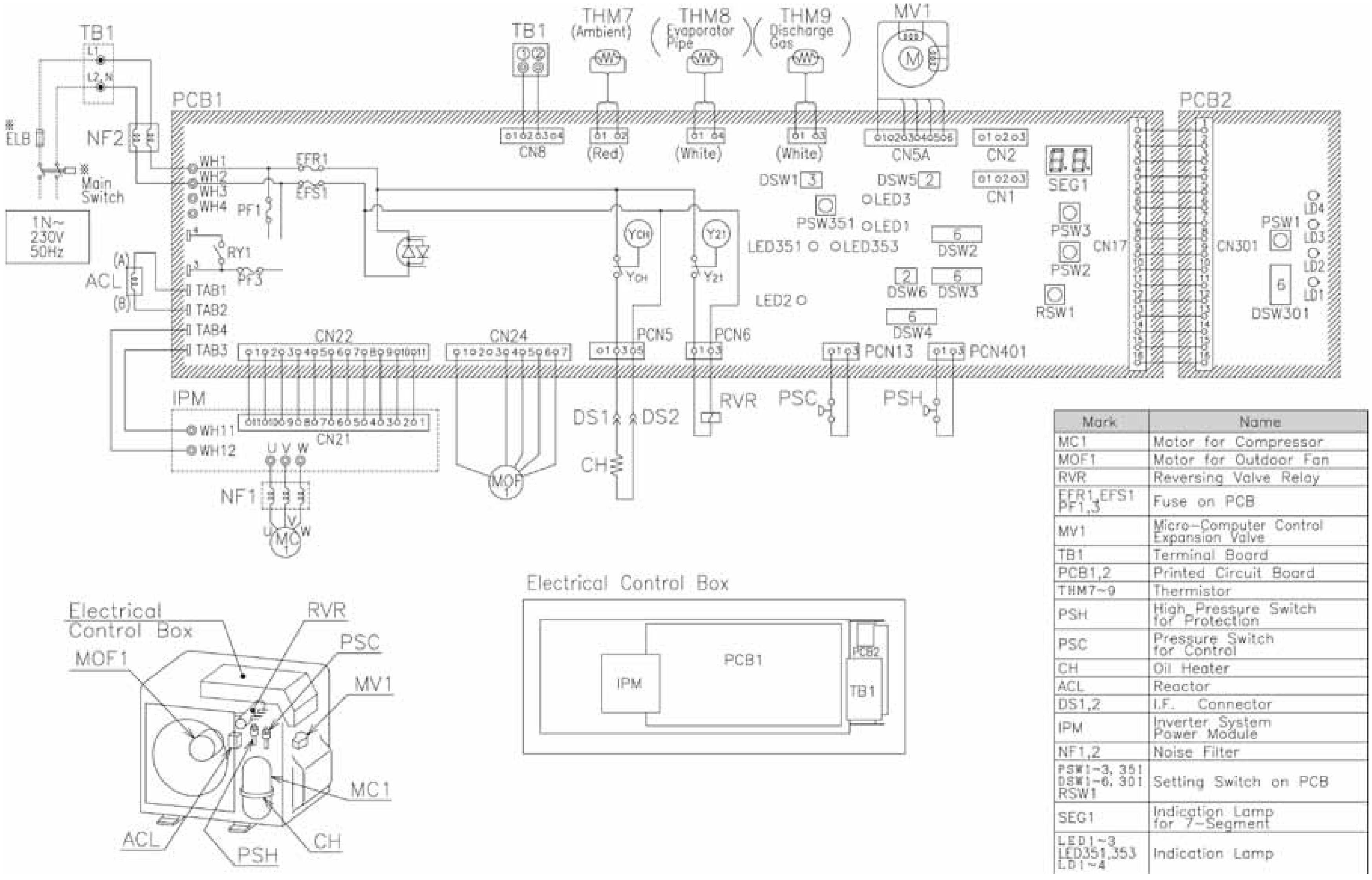
Mark	Part Name
CA CS1.2	Capacitor
CB1.2	Capacitor
CH	Crankcase heater
CMC1	Contactor for compressor motor
DCL	Reactor
DS 1.2	I.F Connector
DM	Diode module
DSW1~6	Dip switch on PCB1
EF1.2	Fuse
IPM	Inverter system power module
MC1	Motor for compressor
MOF1.2	Motor for outdoor fan
MV1	Micro-computer control expansion valve
NF1~6	Noise filter
PCB1~5	Printed circuit board
PSC. PSL	Pressure switch for control
PSH	High pressure switch for protection
PSW1~3	Push switch on PCB1
RS1.2	Resistor for starting
R1.2	Resistor
RVR	Reversing valve relay
SVA1. A2 SVF	Solenoid valve for hot gas bypass
TB1.2	Terminal board
TF1	Transformer
THM	Thermistor for fin temperature
THM 7~9	Thermistor
ZNR	Surge absorber





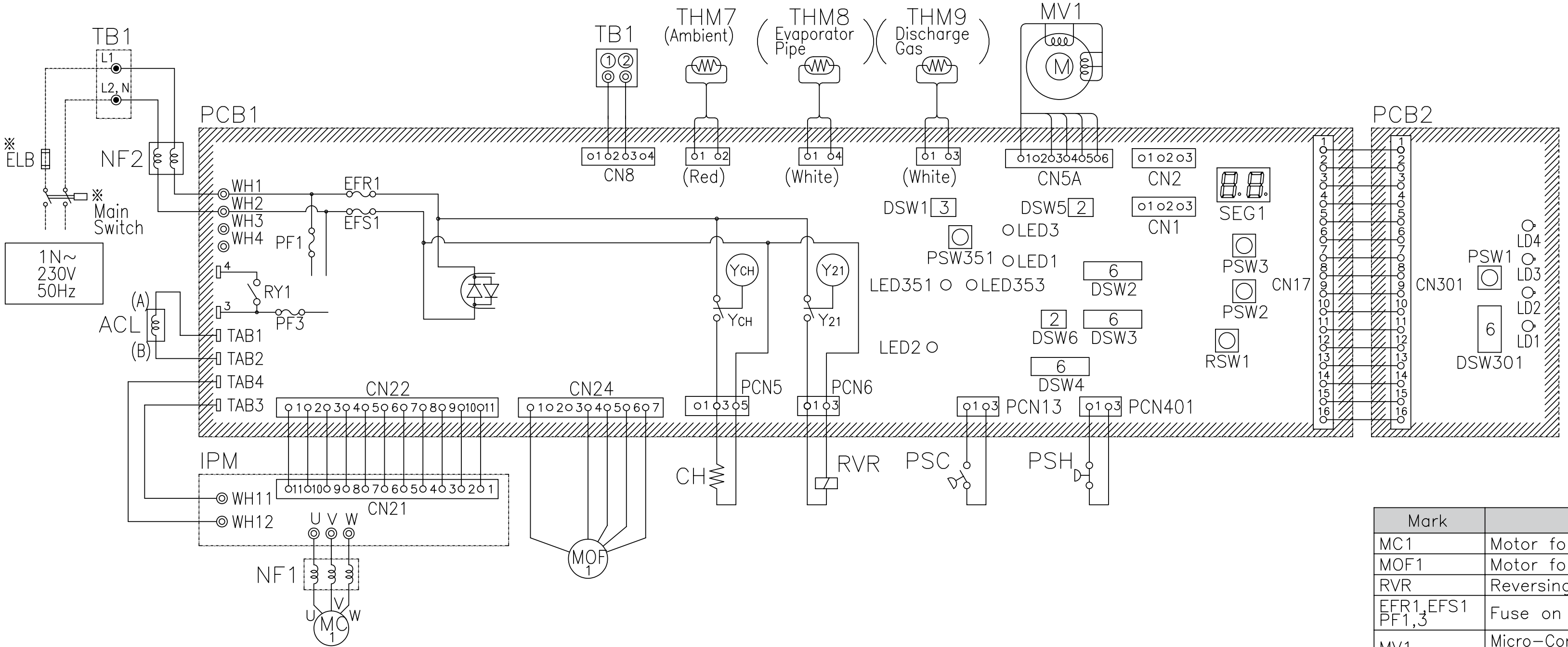
4.6.2 Electrical wiring diagrams for ES Series

RAS-(2/2.5)HVRN2

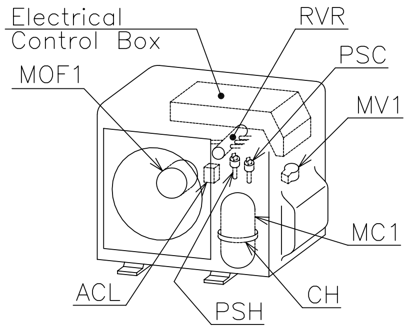


Mark	Name
MC1	Motor for Compressor
MOF1	Motor for Outdoor Fan
RVR	Reversing Valve Relay
EFR1,EFS1 PF1,3	Fuse on PCB
MV1	Micro-Computer Control Expansion Valve
TB1	Terminal Board
PCB1,2	Printed Circuit Board
THM7~9	Thermistor
PSH	High Pressure Switch for Protection
PSC	Pressure Switch for Control
CH	Oil Heater
ACL	Reactor
DS1,2	I.F. Connector
IPM	Inverter System Power Module
NF1,2	Noise Filter
PSW1~3, 351 DSW1~6, 301 RSW1	Setting Switch on PCB
SEG1	Indication Lamp for 7-Segment
LED1~3 LED351,353 LD1~4	Indication Lamp

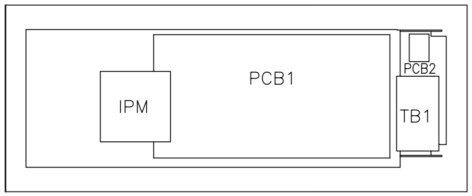
RAS-3HVRNS2



Mark	Name
MC1	Motor for Compressor
MOF1	Motor for Outdoor Fan
RVR	Reversing Valve Relay
EFR1,EFS1 PF1,3	Fuse on PCB
MV1	Micro-Computer Control Expansion Valve
TB1	Terminal Board
PCB1,2	Printed Circuit Board
THM7~9	Thermistor
PSH	High Pressure Switch for Protection
PSC	Pressure Switch for Control
CH	Oil Heater
ACL	Reactor
IPM	Inverter System Power Module
NF1,2	Noise Filter
PSW1~3,351 DSW1~6,301 RSW1	Setting Switch on PCB
SEG1	Indication Lamp for 7-Segment
LED1~3 LED351,353 LD1~4	Indication Lamp



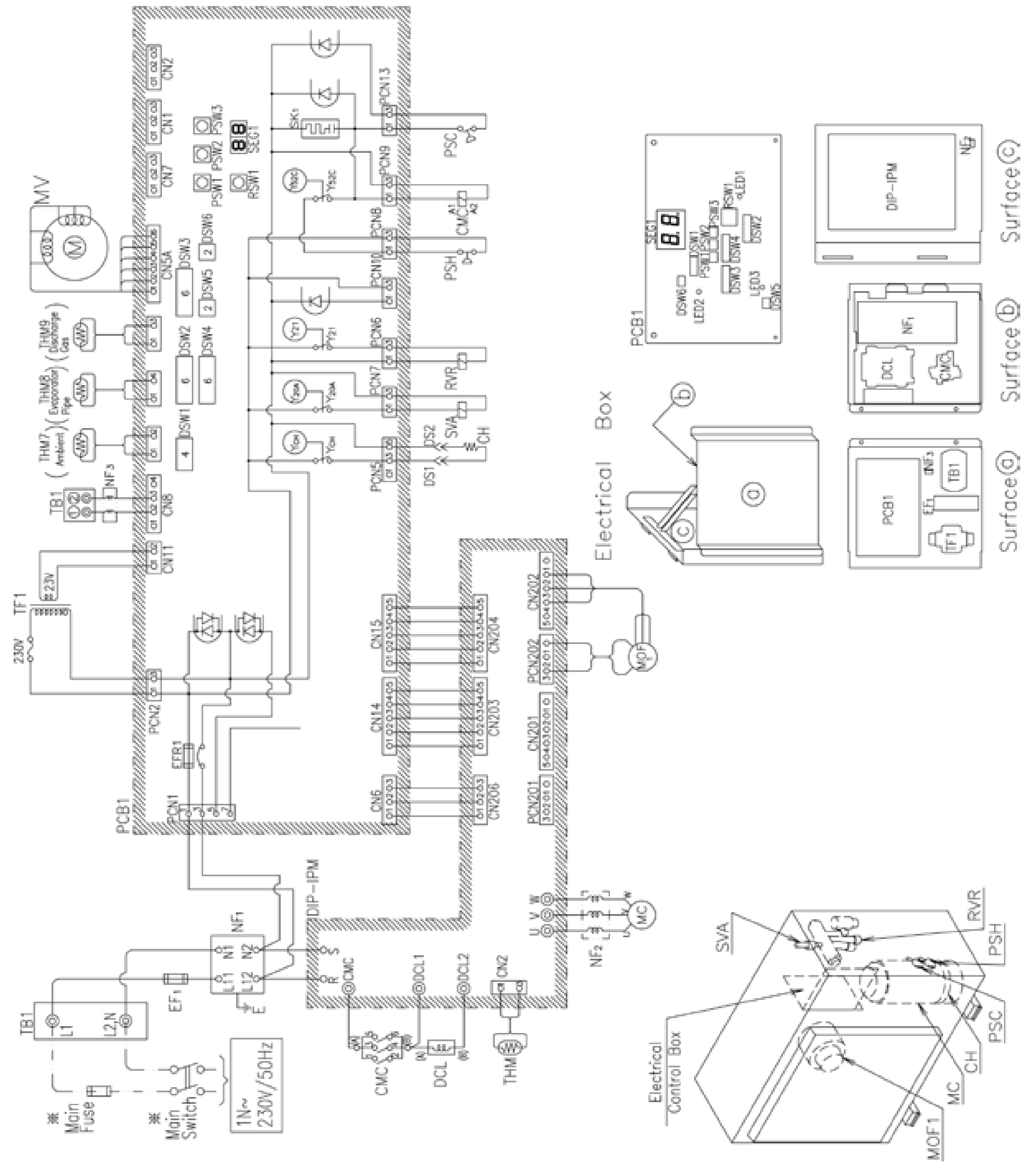
Electrical Control Box



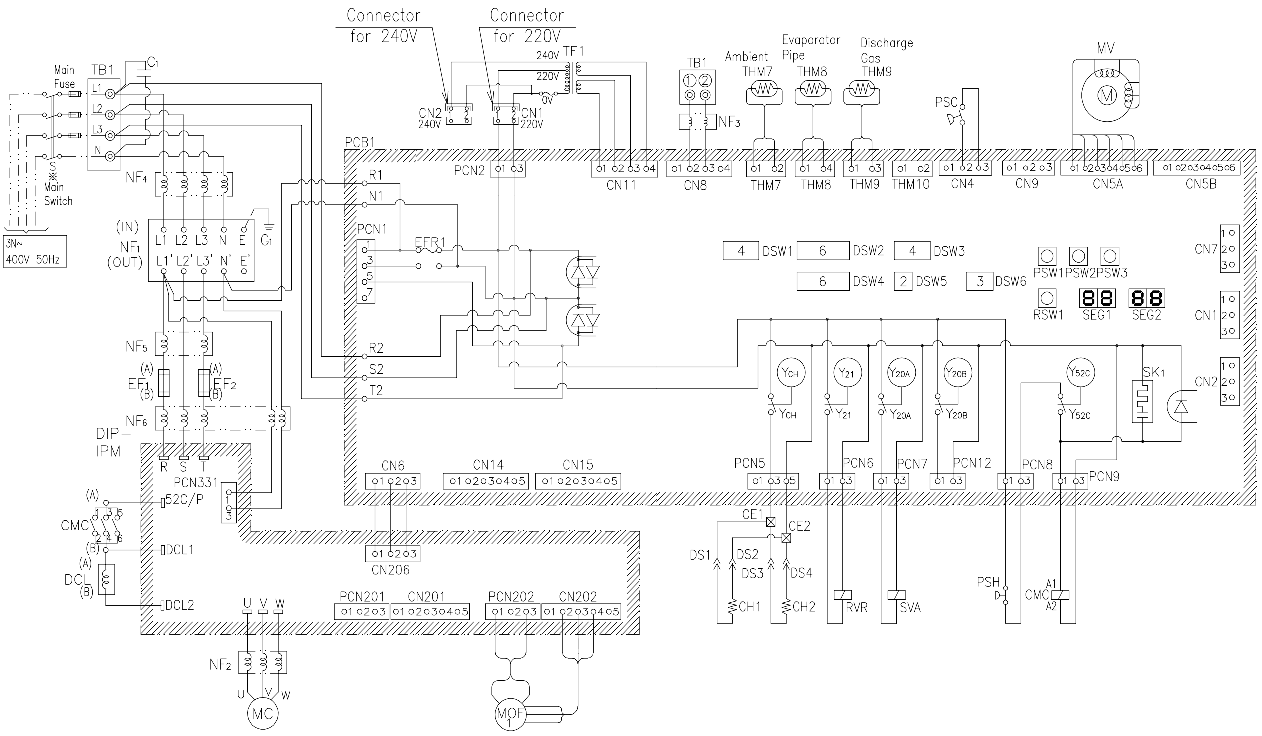
4

RAS-(4-6)HVRNS2E

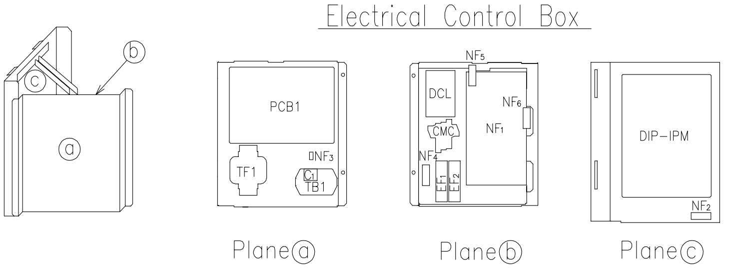
Mark	Name
CH	Crankcase Heater
CMC	Contactor for Compressor Motor
DCL	Reactor
DIP-IPM	Inverter Module
DS1,2	I.F Connector
DSW1~6	Dip Switch on PCB1
EF1	Fuse
MC	Motor for Compressor
MOF1,2	Motor for Outdoor Fan
MV	Micro-Computer Control Expansion Valve
NF1,2,3	Noise Filter
PCB1	Printed Circuit Board
PSC	Pressure Switch for Control
PSH	High Pressure Switch for Protection
PSW1~3	Push Switch on PCB1
RVR	Reversing Valve Relay
SVA	Solenoid Valve
SW1	Switch
TB1,2	Terminal Board
TF1	Transformer
THM7~9	Thermistor



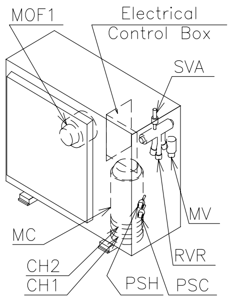
RAS-(4-6)HRNS2E

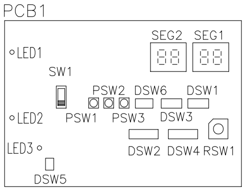


Electrical Control Box



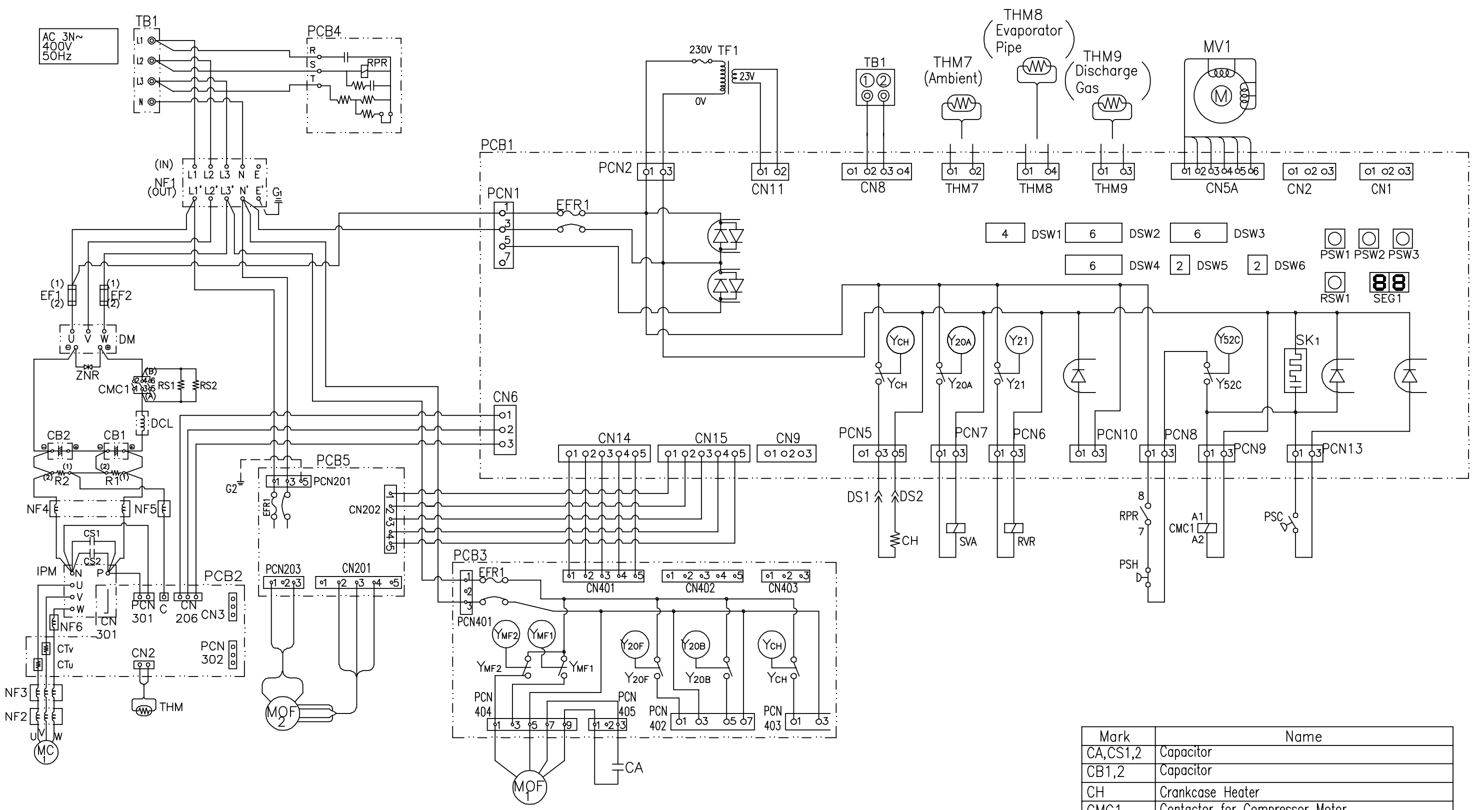
Plane ⓐ Plane ⓑ Plane ⓒ

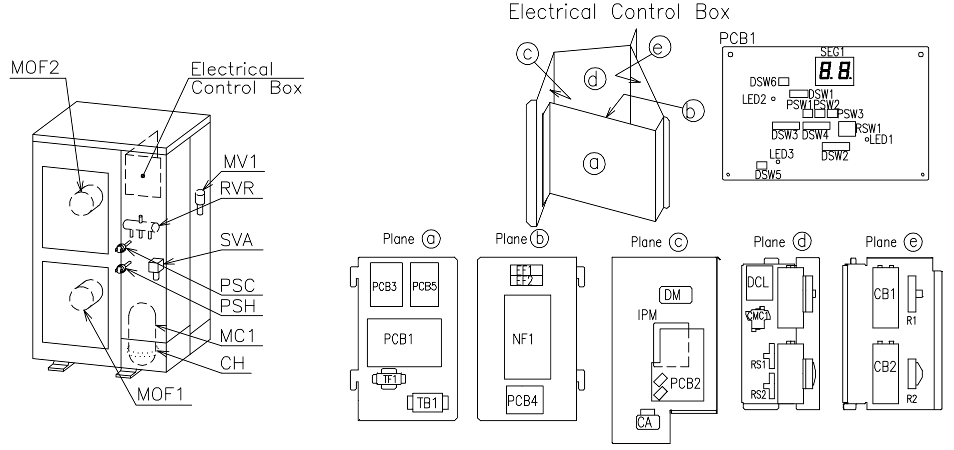




Mark	Name	Mark	Name
C1	Capacitor	PCB1	Printed Circuit Board
CH1,2	Crankcase Heater	PSC	Pressure Switch for Control
CMC	Contactor for Compressor Motor	PSH	High Pressure Switch for Protection
DCL	Reactor	PSW1~3	Push Switch on PCB1
DIP-IPM	Inverter Module	RVR	Reversing Valve Relay
DS1~4	I.F Connector	SVA	Solenoid Valve
DSW1~6	Dip Switch on PCB1	SW1	Switch
EF1,2	Fuse	TB1	Terminal Board
MC	Motor for Compressor	TF1	Transformer
MOF1,2	Motor for Outdoor Fan	THM7~9	Thermistor
MV	Micro-Computer Control Expansion Valve	THM	Thermistor for Fin Temperature
NF1~6	Noise Filter		

RAS-(8/10)HRNSE





Mark	Name
CA,CS1,2	Capacitor
CB1,2	Capacitor
CH	Crankcase Heater
CMC1	Contactor for Compressor Motor
DCL	Reactor
DM	Diode Module
DS1,2	I.F Connector
DSW1~6	Dip Switch on PCB1
EF1,2	Fuse
IPM	Inverter System Power Module
MC1	Motor for Compressor
MOF1,2	Motor for Outdoor Fan
MV1	Micro-Computer Control Expansion Valve
NF1~6	Noise Filter
PCB1~5	Printed Circuit Board
PSC	Pressure Switch for Control
PSH	High Pressure Switch for Protection
PSW1~3	Push Switch on PCB1
R1,2	Resistor
RS1,2	Resistor for Starting
RVR	Reversing Valve Relay
SVA	Solenoid Valve
TB1	Terminal Board
TF1	Transformer
THM7~9	Thermistor
ZNR	Surge Absorber

5. Control System

Index

5.1 Device control system

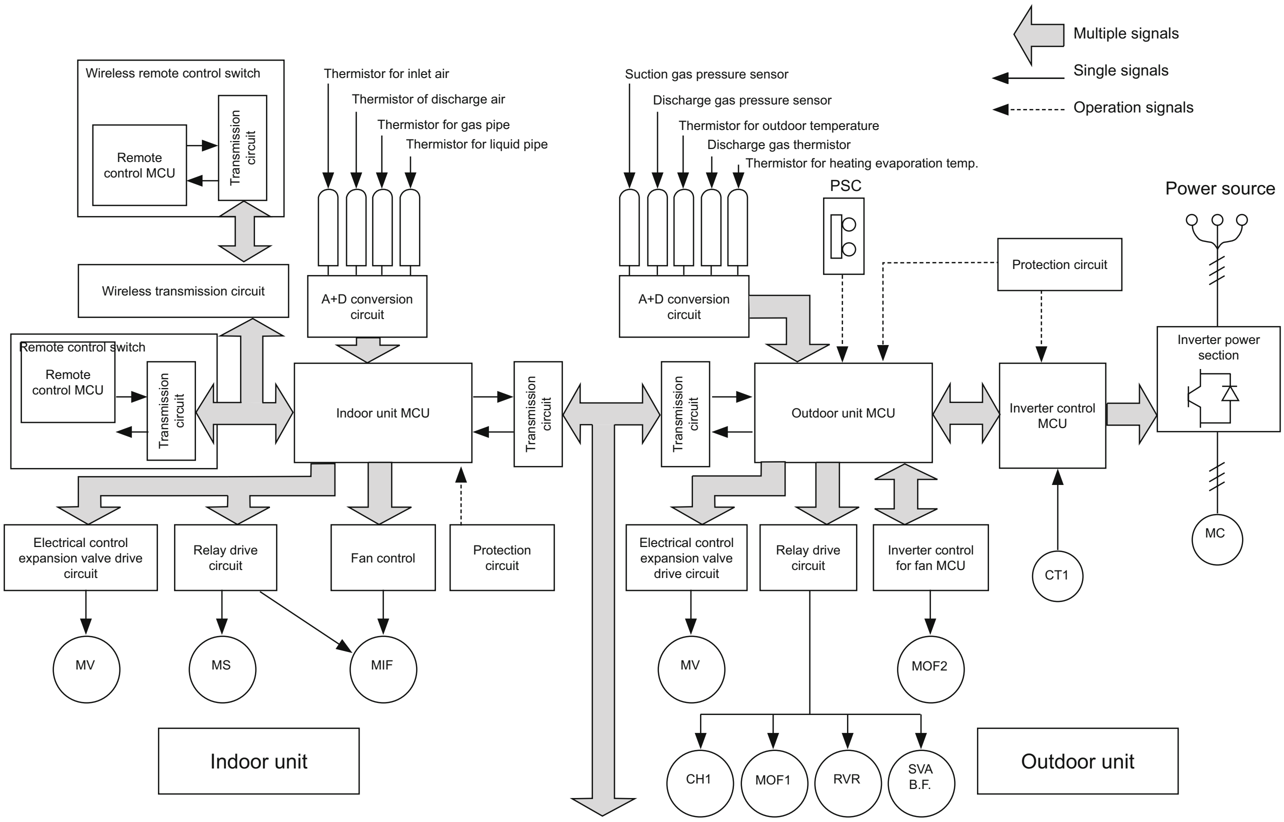
5.1.1 Device control system for IVX Series

Control subject	Purpose		
	Cooling operation	Heating operation	Defrost operation
Control frequency of inverter compressor	The frequency control is determined with the next parameters: • Ratio (I.U. capacity/O.U. capacity). • Temperature difference between air inlet temperature and setting air temperature.	The frequency control is determined with the next parameters: • Ratio (I.U. capacity/O.U. capacity) • Temperature difference between air inlet temperature and setting air temperature.	Fixed frequency (stop compressor during 30 sec. After defrosting condition was completed)
Opening degree expansion valve of outdoor unit	Fully open	• Control range of expansion valve opening degree is determined to optimize temperature. on the top of compressor. • When number of I.U. is decreased, determined with I.U. capacity. Ratio of (before/after decrease or with above condition).	Fully open
Opening degree expansion valve of indoor unit	• Control range of expansion valve opening degree is determined to optimize I.U. gas pipe temp. (Tg) - I.U. liquid pipe temp. (Tl) difference. • The expansion valve opening degree is controlled according to the number of connected I.U.	• Specified opening degree at normal control starting. Afterward, controlled to optimize I.U. liquid pipe temp. (Tl) • The expansion valve opening degree is controlled according to the number of connected I.U.	Specified opening degrees controlled by temp. on the top of compressor. (Td).
Outdoor fan	• Fan step is operated for O.U. liquid pipe temp. (Te) stabilization control increased number of I.U.: step-up decreased number of I.U.: step-down	• Fan Step is controlled according to O.U. liquid pipe temp. and temp. on the top of compressor. • Increased number of I.U.: step-up decreased number of I.U.: step-down (limited the lowest by outdoor temp.)	Fan stop.
4-Way valve (RVR)	OFF	ON	OFF
Solenoid valve (SVA) (Equalised pressure valve)	• Turn ON at starting • Turn ON for 1 min. at low pressure switch activation. RAS-(3-12)H(V)RNM(2)(E)	• Turn ON at starting • Turn ON for 1 min. at low pressure switch activation • Turn ON at pressure control switch activation.	Turn ON a defrosting
Solenoid valve (SVB) (Liquid return)	Turn ON at starting RAS-(3-12)H(V)RNM(2)(E)	Turn ON at starting	Turn ON at starting
Solenoid Valve (SVF) (Oil return)	Turn ON at compressor operation RAS-(3-12)H(V)RNM(2)(E)	Turn ON at compressor operation	Turn ON at staring
High/Low pressure balance	Turn ON SVA or SVB before compressor starting RAS-(8-12)HRNM	—	—

NOTE

- ***I.U.: Indoor unit***
- ***O.U.: Outdoor unit***
- ***Tc / Te: Condensing temperature / Evaporating temperature***
- ***Td: Discharge temperature***
- ***Tl: Liquid temperature***
- ***Tg: Gas temperature***
- ***Cap: Capacity***
- ***Temp.: Temperature***

The figure below shows the outline of the control system



To the transmission of the next indoor unit or the next outdoor unit (H-Link)

Symbol	Name	Symbol	Name
MC	Motor (for compressor)	CH	Crankcase heater
MIF	Motor (for indoor fan)	CT1	Current transformer
MOF1, 2	Motor (for outdoor fan)	RVR	4-Way valve
MS	Motor (for auto-louver)	SVA,B,F	Solenoid valve
MV	Electronic expansion valve	PSC	Pressure switch for control
CMC	Compressor magnetic contactor	EHW	Electric heater

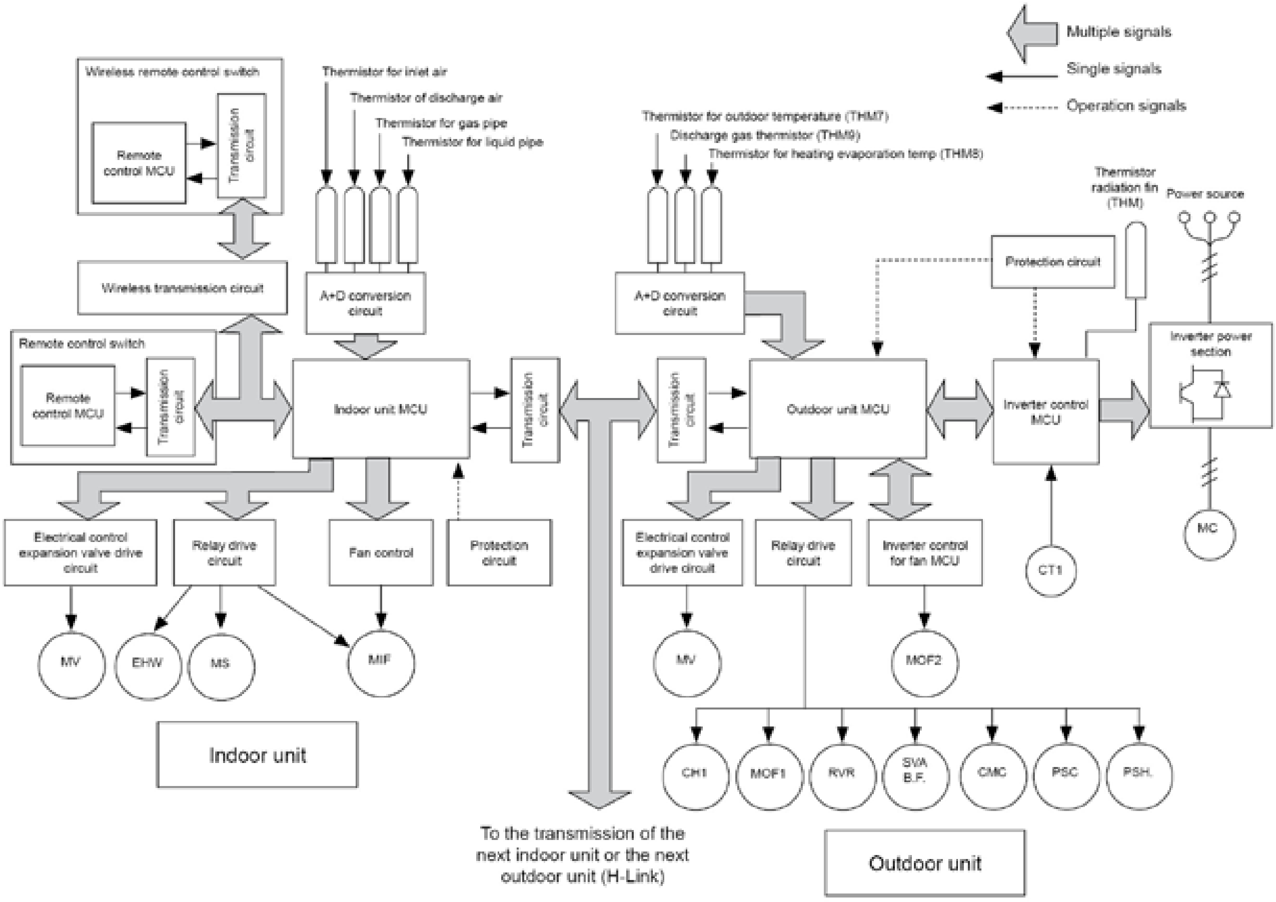
5.1.2 Device control system for ES Series

Control subject	Purpose		
	Cooling operation	Heating operation	Defrost operation
Control frequency of inverter compressor	The frequency control is determined with the next parameters: • Temperature difference between air inlet temperature and setting air temperature. • Calculate the width of the change by amount of change.	The frequency control is determined with the next parameters: • Temperature difference between air inlet temperature and setting air temperature. • Calculate the width of the change by amount of change.	Fixed frequency (stop compressor during 30 sec). After defrosting condition was completed.
Opening degree expansion valve of outdoor unit	Fully open	• Control range of expansion valve opening degree is determined to optimize temperature. on the top of compressor.	Fully open
Opening degree expansion valve of indoor unit	• Control range of expansion valve opening degree is determined to optimize I.U. gas pipe temp. (Tg) - I.U. liquid pipe temp. (Tl) difference.	• Specified opening degree at normal control starting. Afterward, controlled to optimize I.U. liquid pipe temp. (Tl).	Specified opening degrees controlled by temp. on the top of compressor. (Td).
Outdoor fan	• Fan step is operated for O.U. liquid pipe temp. (Te) stabilization control	• Fan step is controlled according to O.U. liquid pipe temp. and temp. on the top of compressor.	Fan stop.
4-Way valve (RVR)	OFF	ON	OFF
Solenoid valve (SVA) (Equalised pressure valve)	• Turn ON at starting RAS-(4-10)H(V)RNS(2)E	• Turn ON at starting RAS-(4-10)H(V)RNS(2)E	Turn ON at defrosting
High/Low pressure balance	• Control by indoor expansion valve RAS-(2-3) HVRN(S)2 • Turn ON SVA before compressor starting RAS-(4-10)H(V)RNS(2)E	• Control by outdoor expansion valve RAS-(2-3) HVRN(S)2 • Turn ON SVA before compressor starting RAS-(4-10)H(V)RNS(2)E	—

NOTE

- ***I.U.: Indoor unit***
- ***O.U.: Outdoor unit***
- ***Tc / Te: Condensing temperature / Evaporating temperature***
- ***Td: Discharge temperature***
- ***Tl: Liquid temperature***
- ***Tg: Gas temperature***
- ***Cap: Capacity***
- ***Temp.: Temperature***

The figure below shows the outline of the control system



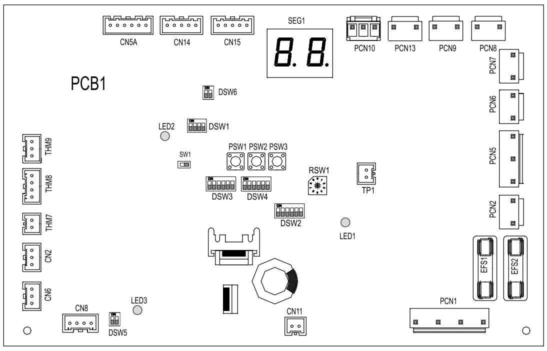
Symbol	Name	Symbol	Name
MC	Motor (for compressor)	CT1	Current transformer
MIF	Motor (for indoor fan)	PSH	High pressure switch
MOF1, 2	Motor (for outdoor fan)	RVR	4-Way valve
MS	Motor (for auto-louver)	SVA,B,F	Solenoid valve
MV	Electronic expansion valve	PSC	Pressure switch for control
CMC	Compressor magnetic contactor	EHW	Electric heater
CH	Crankcase heater	MCU	Micro Computer

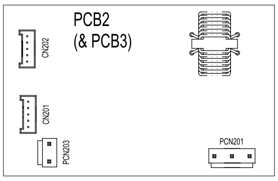
5.2 Outdoor units PCB

5.2.1 Outdoor units PCB for IVX Series

RAS-(3-12)H(V)RNM(2)(E)

LED indication		
LED1	Red	This LED indicates the transmission status between the indoor unit and the RCS
LED2	Yellow	This LED indicates the transmission status between the indoor unit and the outdoor unit
LED3	Green	Power source for the PCB





Connector indication	
PCN1	Fuse
PCN2	PCB1 connection from outdoor to indoor unit
PCN5	Crankcase heater of compressor (oil)
PCN6	Output optional function
PCN7	Output optional function
PCN8	Pressure switch protection
PCN9	Compressor contactor
PCN13	Pressure switch control
THM7	Outdoor air temperature thermistor
THM8	Pipe temperature thermistor
THM9	Compressor temperature thermistor
CN2	Current transformer
CN5A	Micro electronic expansion valve
CN8	Transmission from outdoor to indoor unit
CN14	Transmission between PCB1 and ISPM
EFS1, 2	Power protection

Switch indication	
DSW1 (PCB1)	Test run
DSW2	Piping length and selection function
DSW3	Capacity code
DSW4/RSW1	Ref. cycle number
DSW5	End terminal resistor
DSW6	Power source setting

NOTE

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

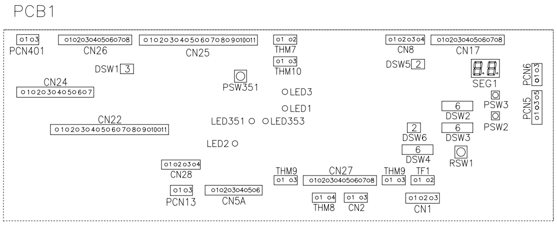
CAUTION

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

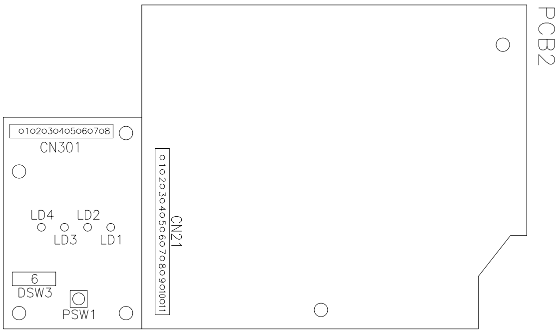
5.2.2 Outdoor units PCB for ES Series

RAS-(2-3)HVRN(S)2

PCB1 LED indication		
LED1	Red	Power source for the PCB
LED2	Green	This LED indicates the inverter transmission status
LED3	Yellow	This LED indicates the transmission status between the indoor unit and the outdoor unit
LED351	Red	For inspection
LED353	Red	For inspection



PCB2 LED indication		
LED1	Red	These LEDS indicate the cause of unit stoppages
LED2	Red	
LED3	Red	
LED4	Red	

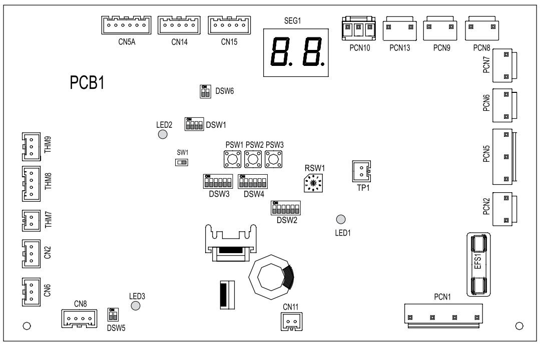


Connector indication		
PCN5	CH	Crankcase heater of compressor (oil)
PCN6	RVR	Reversing valve relay
PCN13	PSC	Pressure switch control
PCN401	PSH	High pressure switch protection
THM7	AIR	Outdoor air temperature thermistor
THM8	PIPE	Pipe temperature thermistor
THM9	COMP	Compressor temperature thermistor
THM10	—	—
CN1	—	Input function
CN2	—	Demand input
CN5A	MV	Micro electronic expansion valve
CN7	—	Output function
CN8	H-LINK	Transmission from outdoor unit to indoor unit
CN17	—	Transmission to PCB2
CN21	—	Transmission to PCB1
CN22	—	Transmission to IPM
CN24	MOF	Motor for outdoor fan
CN25	—	For inspection
CN26	—	For inspection
CN27	—	For inspection
CN28	—	For inspection
CN301	—	Transmission to PCB1

Switch indication	
DSW1	Test run
DSW2	Piping length
DSW3	Capacity
DSW4	Ref. cycle number
DSW5	End terminal resistance
DSW6	Optional function
RSW1	Ref. cycle number
PSW1	Manual defrost operation switch. The defrost option is manually available under the forced defrost area
PSW2	Available optional function. Setting can be selected using the 7-segment display
PSW3	
PSW351	The inverter micro-computer checking

RAS-(4-10)H(V)RNS(2)E

PCB1 LED indication		
LED1	Red	This LED indicates the transmission status between the indoor unit and the RCS
LED2	Yellow	This LED indicates the transmission status between the indoor unit and the outdoor unit
LED3	Green	Power source for the PCB



Connector indication	
PCN1	Fuse
PCN2	PCB1 connection for transformer
PCN5	Crankcase heater of compressor (oil)
PCN6	Output optional function
PCN7	Output optional function
PCN8	Pressure switch protection
PCN9	Compressor contactor
PCN13	Pressure switch control
THM7	Outdoor air temperature thermistor
THM8	Pipe temperature thermistor
THM9	Compressor temperature thermistor
CN2	Current transformer (DIP-IPM)
CN5A	Micro electronic expansion valve
CN6	Transmission between PCB1 and DIP-IPM
CN8	Transmission from outdoor to indoor unit

Connector indication	
CN11	Transformer (230V)
CN14	Transmission between PCB1 and DIP-IPM
CN15	Transmission between PCB1 and DIP-IPM
EFS1	Power protection

Switch indication	
DSW1 (PCB1)	Test run
DSW2	Piping length and selection function
DSW3	Capacity code
DSW4/RSW1	Ref. cycle number
DSW5	End terminal resistor
DSW6	Power source setting
PSW1/2/3	Push switch on PCB

NOTE

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

CAUTION

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

5.3 Protection and safety control

5.3.1 Protection and safety control for IVX Series

Compressor protection

The following devices and their combinations protect the compressor

High-pressure switch	This switch cuts out the operation of the compressor when the discharge pressure exceeds the setting.
Oil heater	This band heater protects against the oil carry-over during the cold starting, as the band heater is energized while the compressor is stopped.
Fan motor protection	Internal thermostat that is embedded in the fan motor winding: this internal thermostat cuts out the operation of the fan motor when the temperature of the fan motor winding exceeds the setting.

Safety and control device setting for the outdoor units

RAS-(3-6)H(V)RNM2E

Model			RAS-3HVRNM2E	RAS-4H(V)RNM2E	RAS-5H(V)RNM2E	RAS-6H(V)RNM2E
For compressor High pressure switch	Cut-out	MPa	4.15		–0.05 –0.15	
	Cut-in		3.20±0.15			
For control	Fuse	A				
	1φ 230V, 50Hz		40	40	50	50
	3φ 400V, 50Hz			2X20	2X20	2X20
	CCP timer setting time	min	Non adjustable 3			
For condenser fan motor Internal thermostat	Cut-out	°C	Automatic reset, non-adjustable (each one for each motor)			
For control circuit Fuse capacity on PCB		A	5			

RAS-(8-12)HRNM

Model			RAS-8HRNM	RAS-10HRNM	RAS-12HRNM
For compressor			Automatic reset, non-adjustable (each one for each compressor)		
High pressure switch	Cut-out	MPa	4.15		–0.05 –0.15
	Cut-in		3.20±15		
For control	Fuse	A			
	3 φ400V, 50Hz		40		
	CCP timer setting time	min	Non adjustable 3		
For condenser fan motor Internal thermostat			Automatic reset, non-adjustable (each one for each compressor)		
DC	Cut-out	°C	120±5		
	Cut-out		120±5		
AC	Cut-in		96±15		
For control circuit		A			
Fuse capacity on PCB 1.5			5		
Fuse capacity on PCB 3			10		

5.3.2 Protection and safety control for ES Series

Compressor protection

The following devices and their combinations protect the compressor

High-pressure switch	This switch cuts out the operation of the compressor when the discharge pressure exceeds the setting.
Oil heater	This band heater protects against the oil carry-over during the cold starting, as the band heater is energized while the compressor is stopped.
Fan motor protection	Internal thermostat that is embedded in the fan motor winding: this internal thermostat cuts out the operation of the fan motor when the temperature of the fan motor winding exceeds the setting.

Safety and control device setting for the outdoor units

RAS-(2-6)H(V)RN(S)2(E)

Mode			RAS-(2/2.5)HVRN2	RAS-3HVRNS2	RAS-4HVRNS2E	RAS-5HVRNS2E	RAS-6HVRNS2E
For compressor High pressure switch	Cut-out	MPa	$4.15^{-0.05}_{-0.15}$				
	Cut-in		3.20±15				
For control	Fuse 1φ 230V, 50Hz	A	25	25	40	50	50
	CCP timer setting time	min	Non adjustable 3				
For condenser fan motor Internal thermostat	Cut-out	°C	Automatic reset, non-adjustable (each one for each motor)				
For control circuit Fuse capacity on PCB		A	3		5		

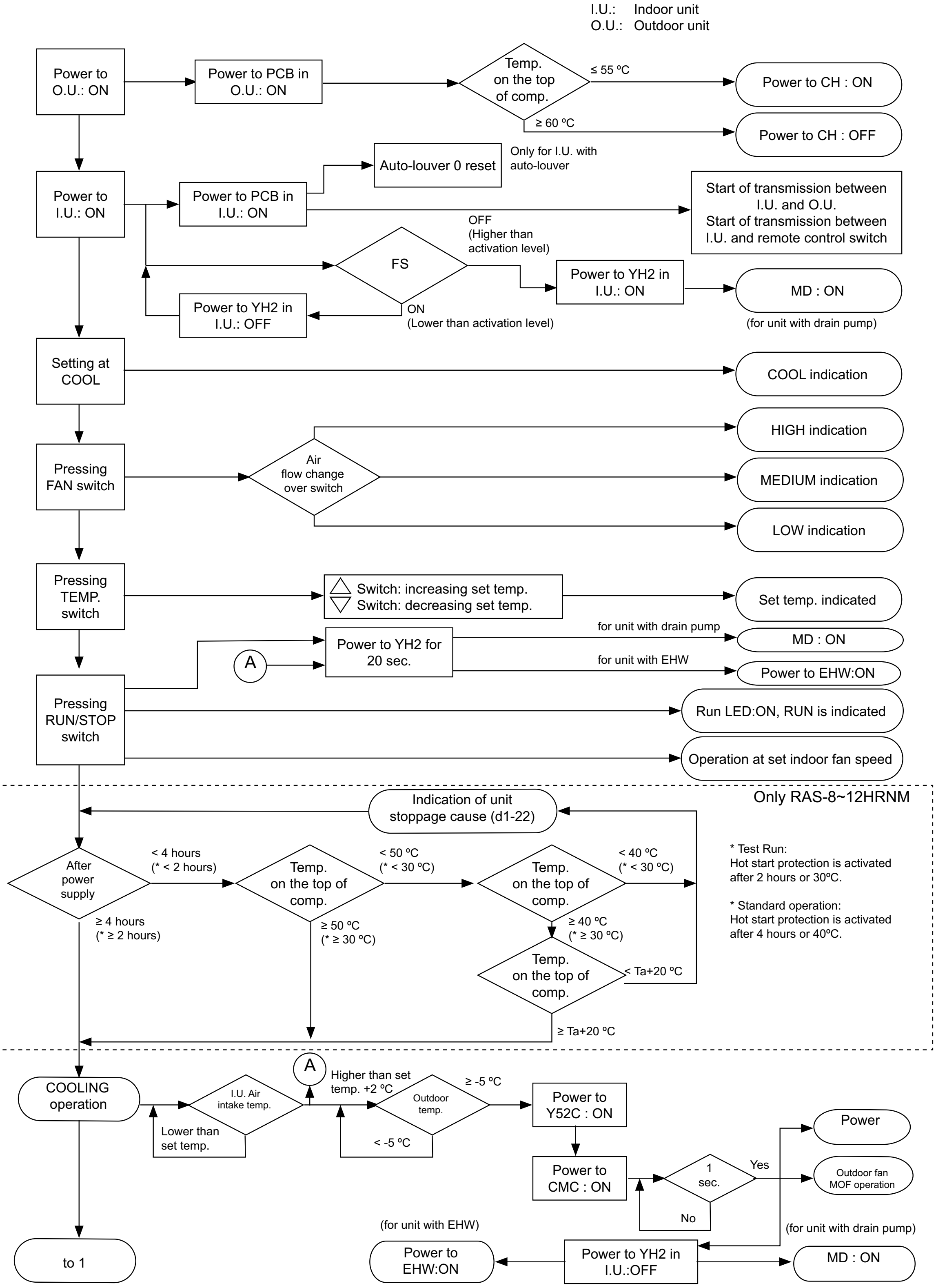
RAS-(8/10)HRNSE

Model			RAS-8HRNSE	RAS-10HRNSE
For compressor			Automatic reset, non-adjustable (each one for each compressor)	
High pressure switch	Cut-out	MPa	$4.15^{-0.05}_{-0.15}$	
	Cut-in		3.20±15	
For control pressure switches	Cut-out	MPa	$3.6^{0}_{-0.15}$	
	Cut-in		2.85±0.10	
For control	Fuse 3 φ400V, 50Hz	A	40	
	CCP timer setting time	min	Non adjustable 3	
For condenser fan motor Internal thermostat			Automatic reset, non-adjustable (each one for each compressor)	
DC	Cut-out	°C	120±5	
	Cut-out		120±5	
AC	Cut-in		83±15	
For control circuit Fuse capacity on PCB		A	5	

5.4 Standard operation sequence

5.4.1 Standard operation sequence for IVX Series

Cooling operation



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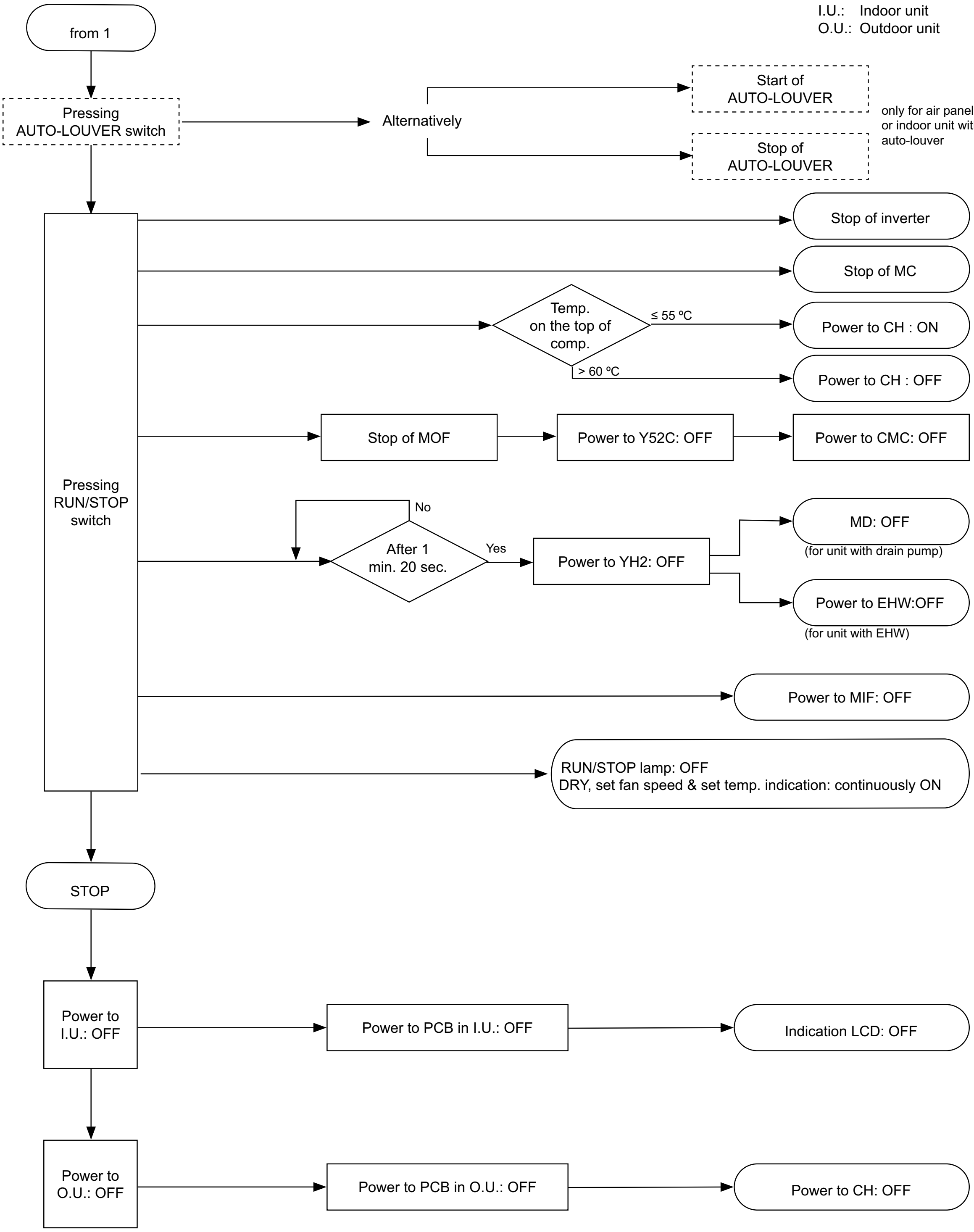
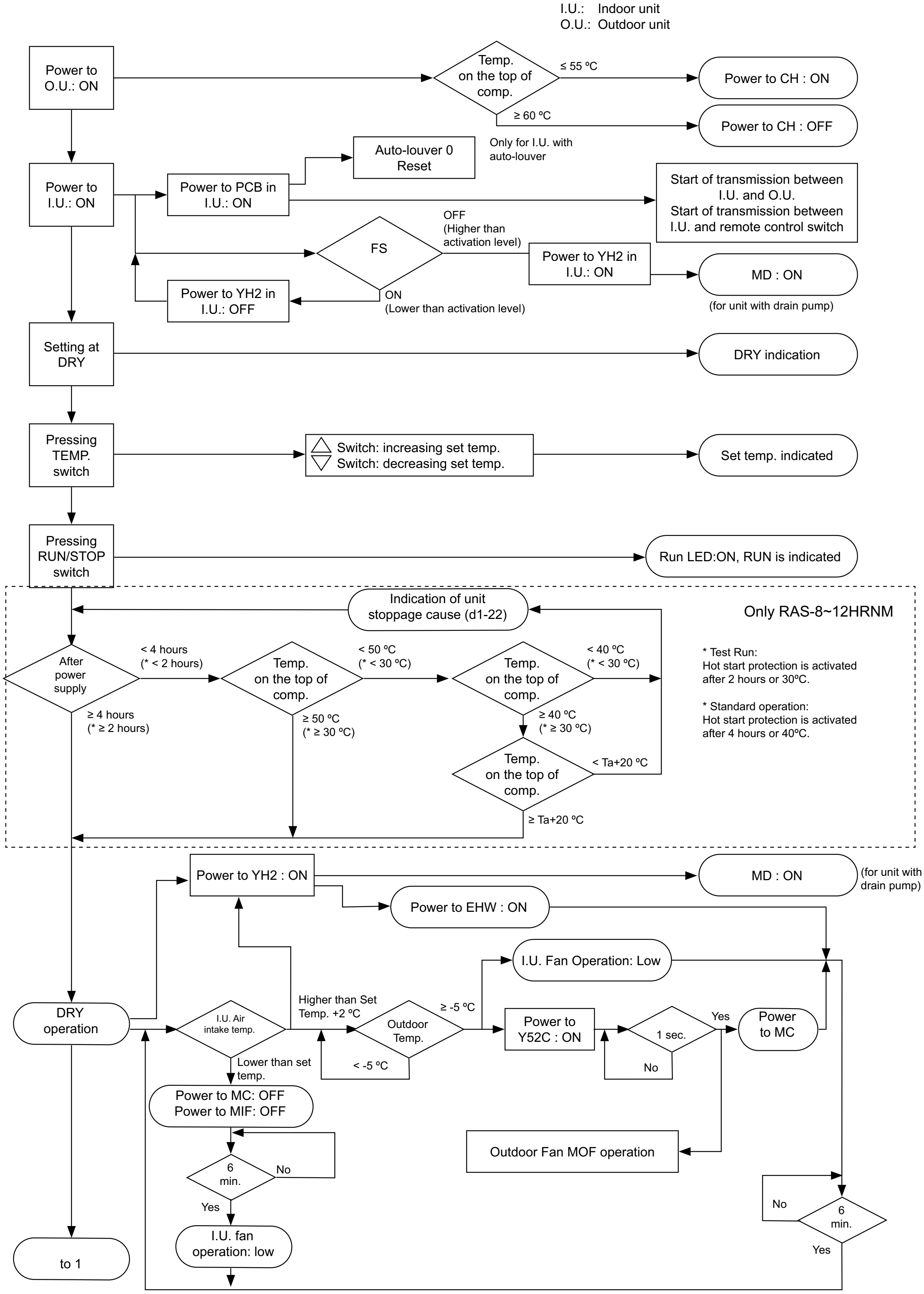
I.U.: Indoor unit
O.U.: Outdoor unit



Dry operation



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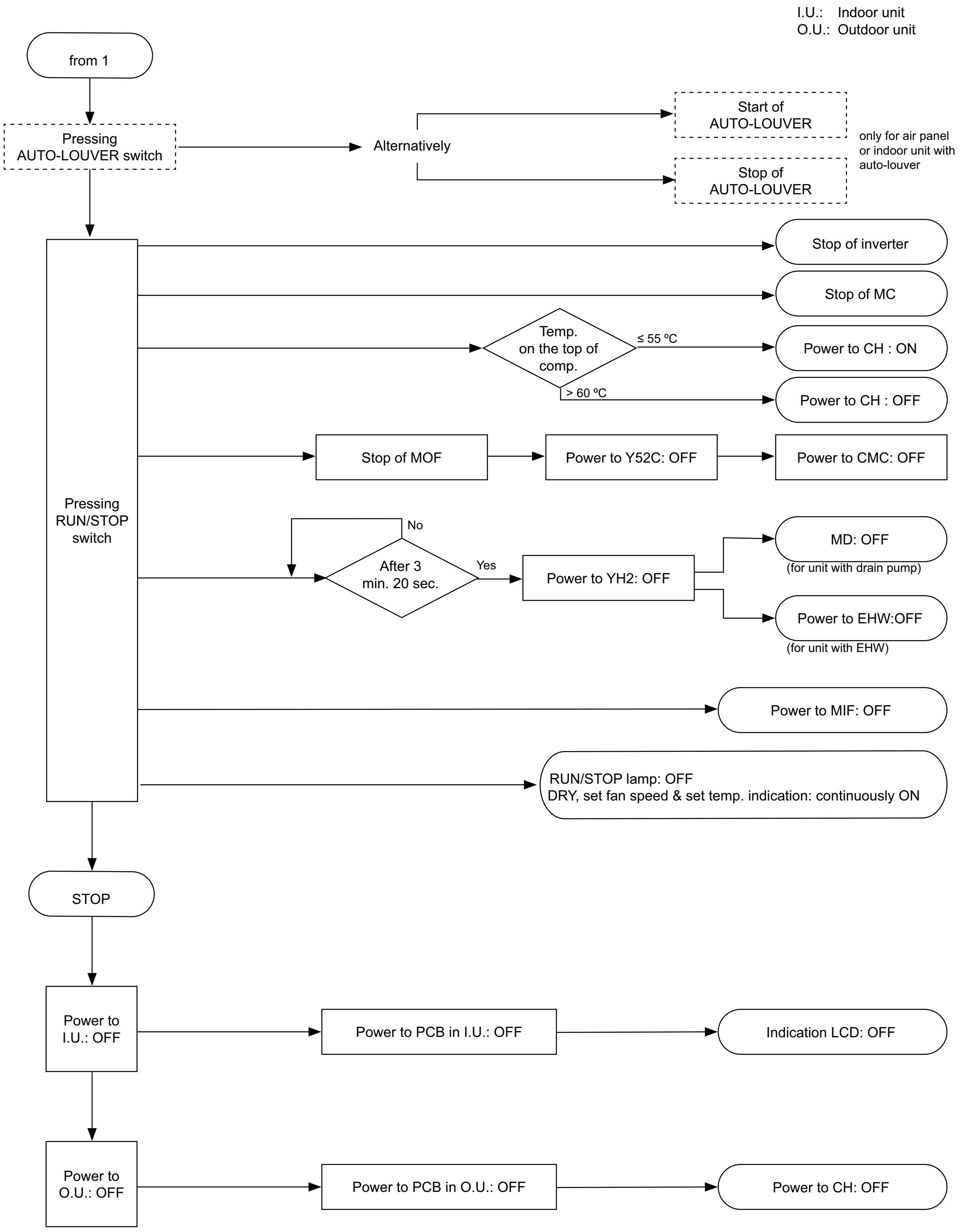
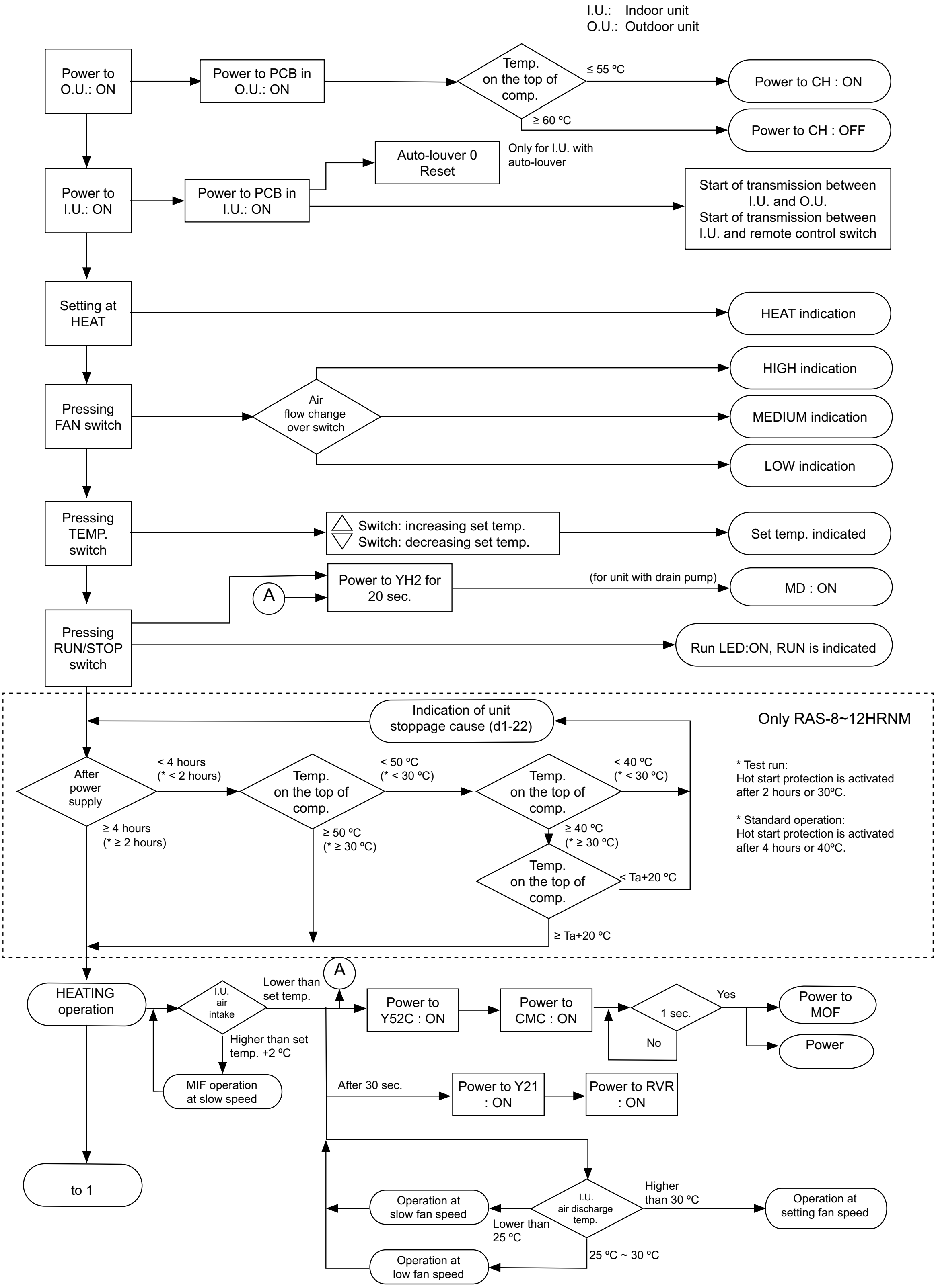

I.U.: Indoor unit
O.U.: Outdoor unit
from 1
Pressing AUTO-LOUVER switch
Alternatively
Start of AUTO-LOUVER
Stop of AUTO-LOUVER
only for air panel or indoor unit with auto-louver
Pressing RUN/STOP switch
Stop of inverter
Stop of MC
Temp. on the top of comp.
≤ 55 ºC
> 60 ºC
Power to CH : ON
Power to CH : OFF
Stop of MOF
Power to Y52C: OFF
Power to CMC: OFF
No
After 3 min. 20 sec.
Yes
Power to YH2: OFF
MD: OFF
(for unit with drain pump)
Power to EHW:OFF
(for unit with EHW)
Power to MIF: OFF
RUN/STOP lamp: OFF
DRY, set fan speed & set temp. indication: continuously ON
STOP
Power to I.U.: OFF
Power to PCB in I.U.: OFF
Indication LCD: OFF
Power to O.U.: OFF
Power to PCB in O.U.: OFF
Power to CH: OFF

Heating operation



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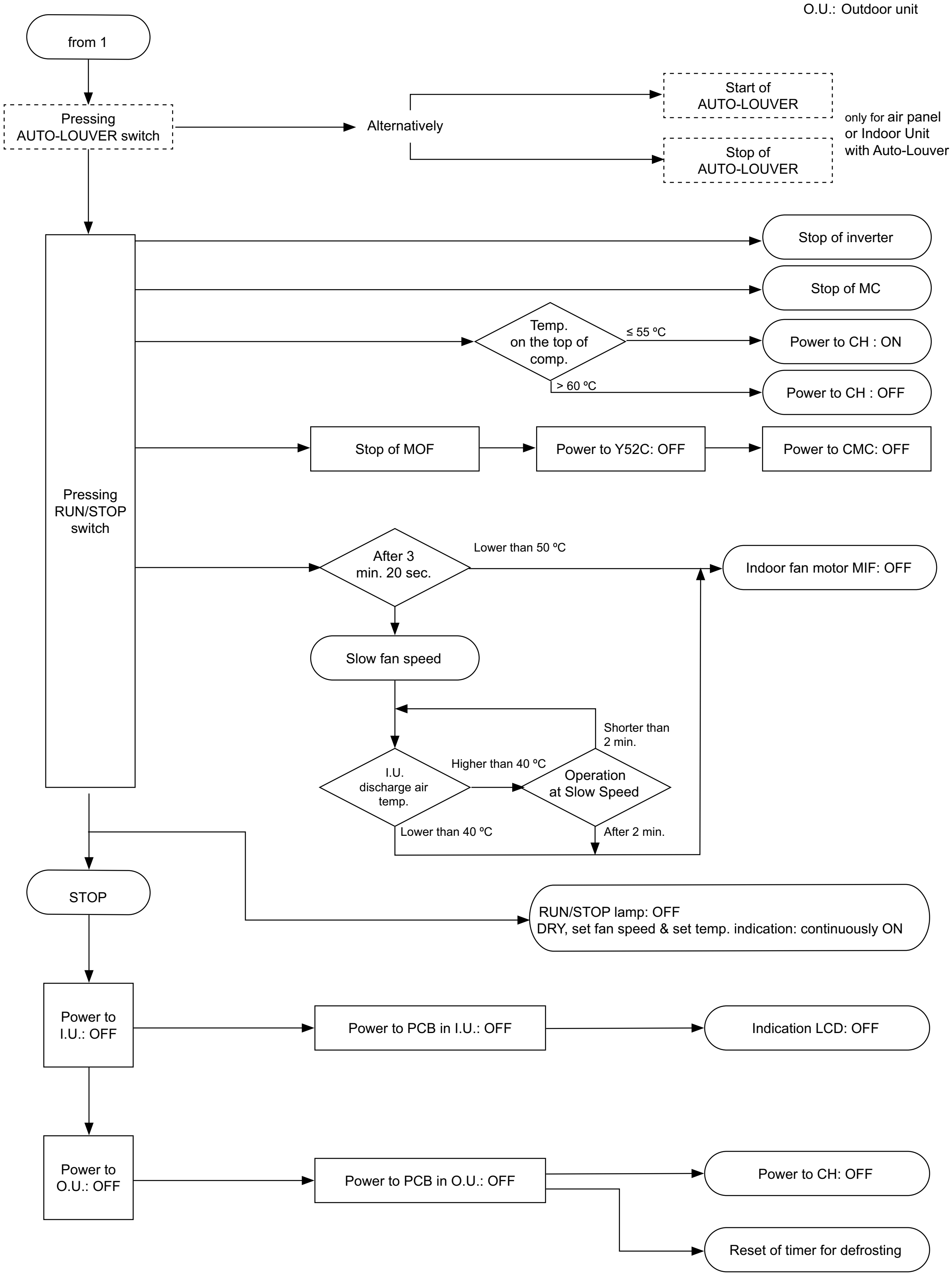
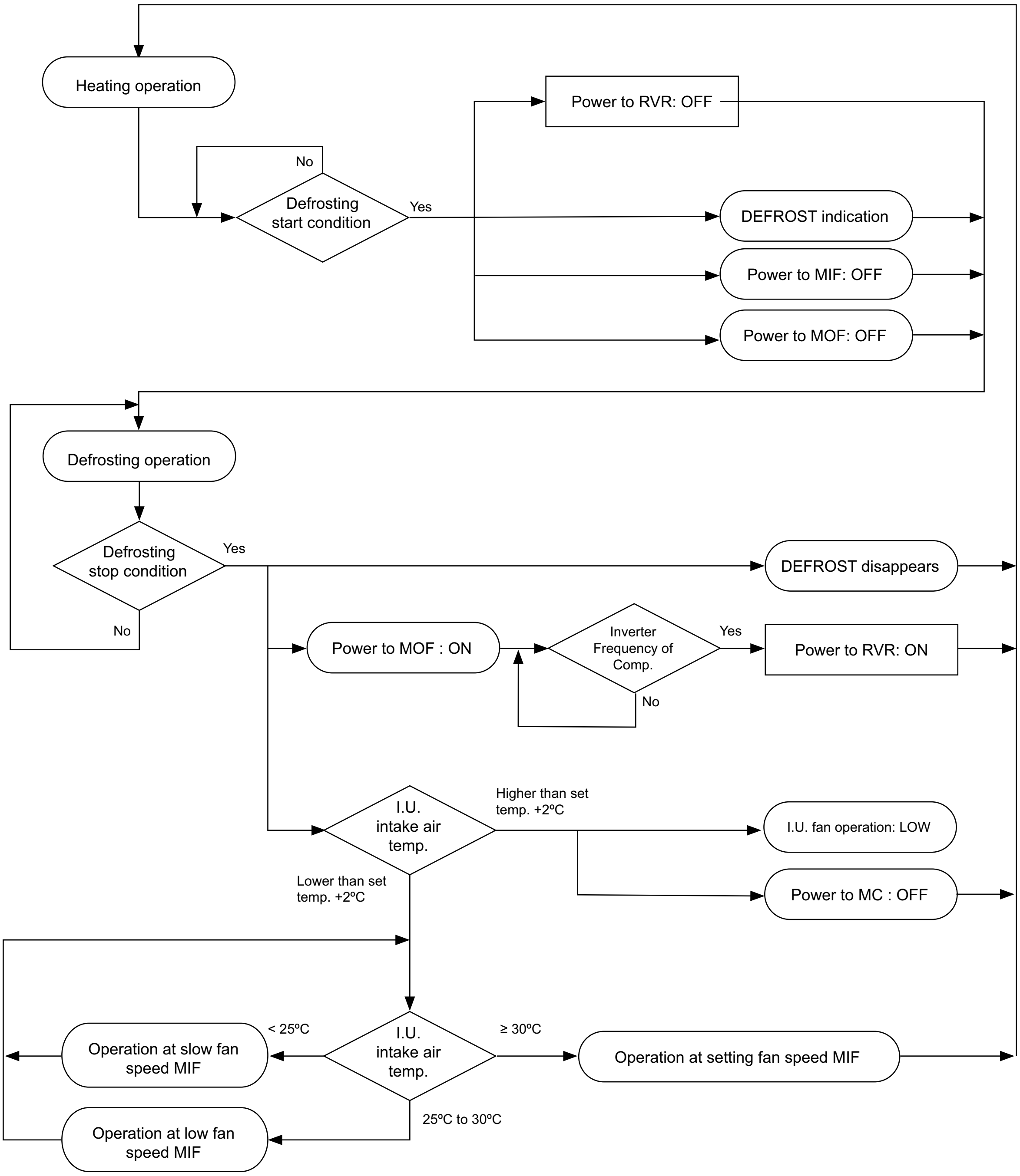
I.U.: Indoor unit
O.U.: Outdoor unit



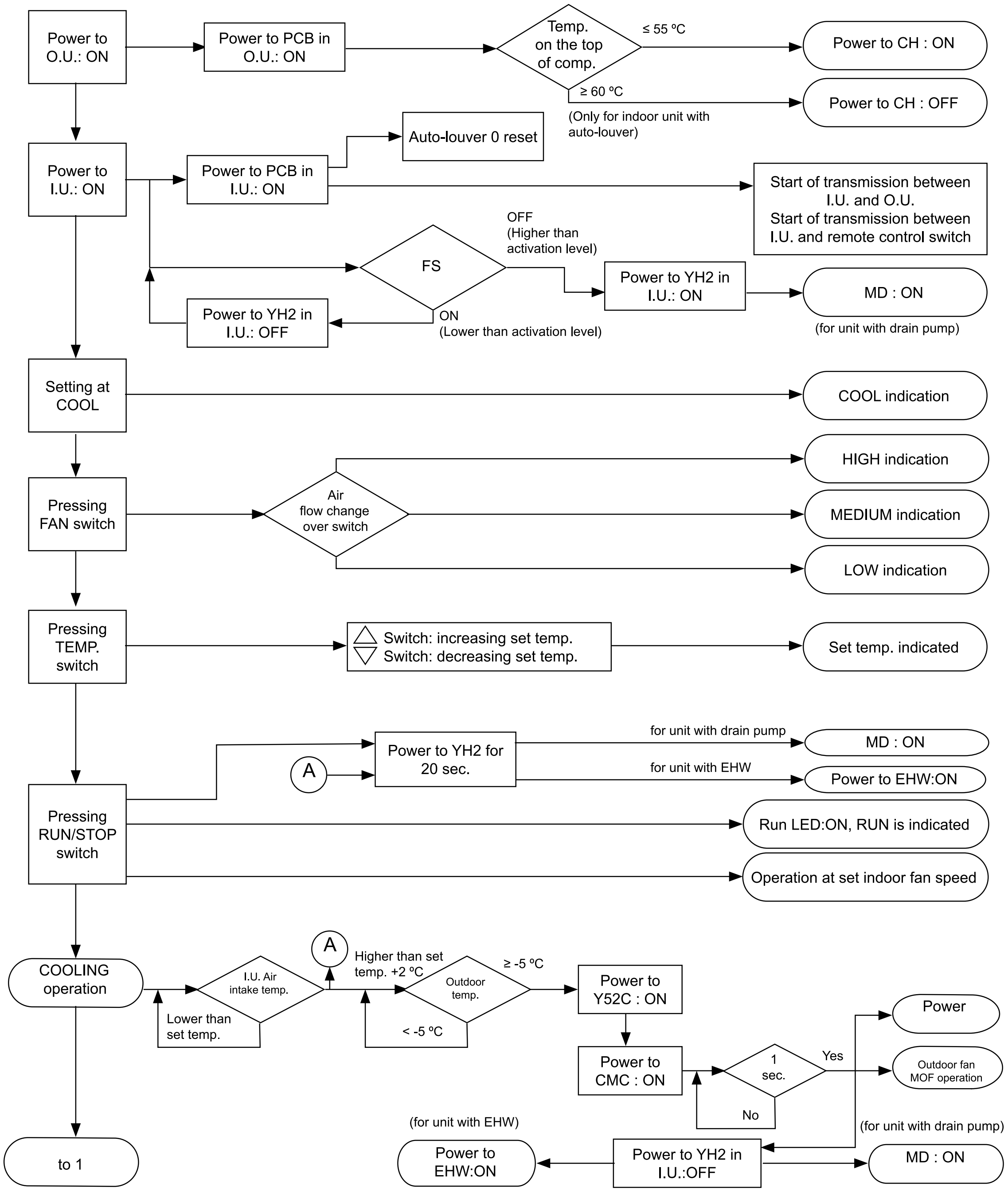
Defrost operation control



5.4.2 Standard operation sequence for ES Series

Cooling operation

I.U.: Indoor unit
O.U.: Outdoor unit



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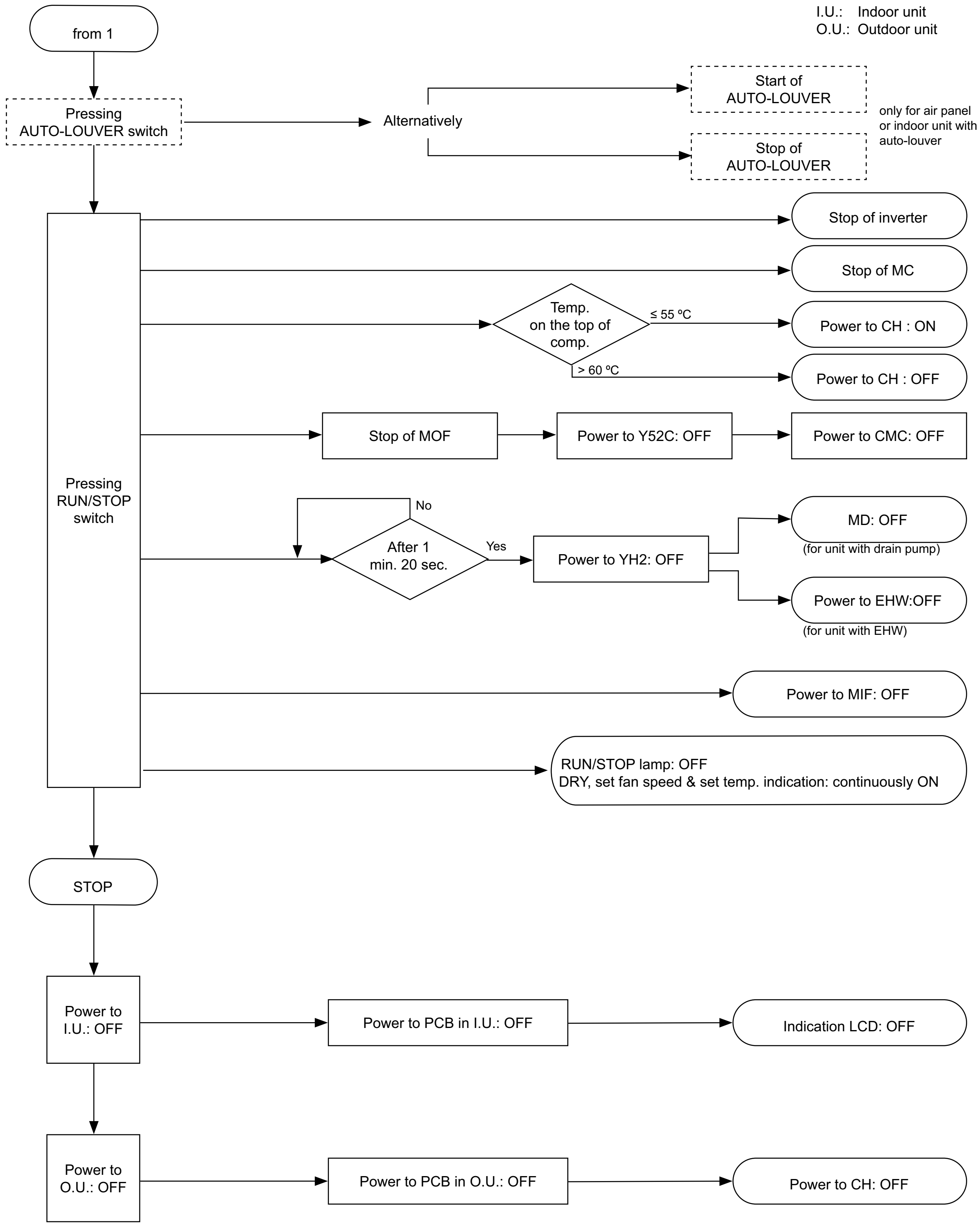
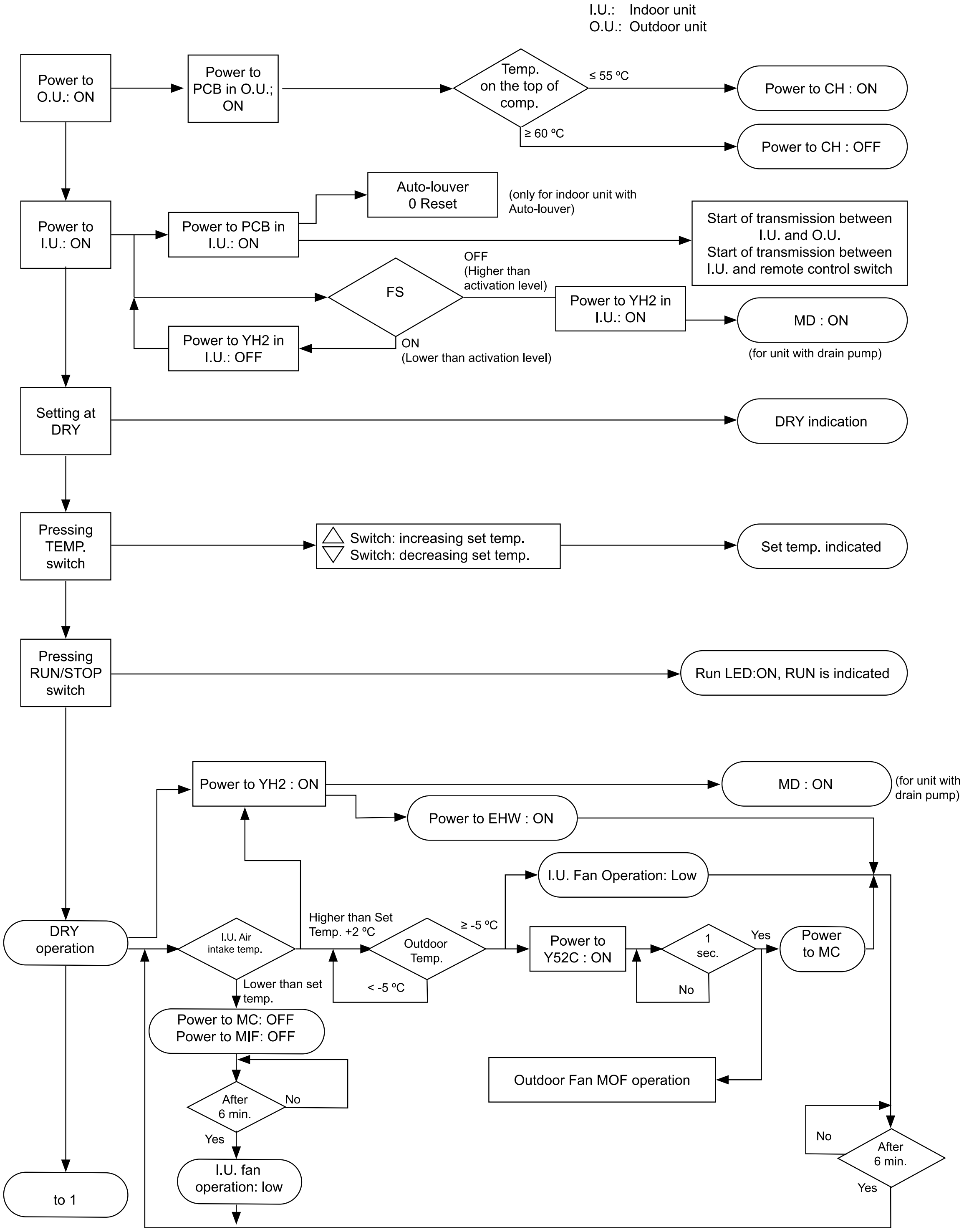

I.U.: Indoor unit
O.U.: Outdoor unit
from 1
Pressing AUTO-LOUVER switch
Alternatively
Start of AUTO-LOUVER
Stop of AUTO-LOUVER
only for air panel or indoor unit with auto-louver
Pressing RUN/STOP switch
Stop of inverter
Stop of MC
Temp. on the top of comp.
≤ 55 ºC
> 60 ºC
Power to CH : ON
Power to CH : OFF
Stop of MOF
Power to Y52C: OFF
Power to CMC: OFF
No
After 1 min. 20 sec.
Yes
Power to YH2: OFF
MD: OFF
(for unit with drain pump)
Power to EHW:OFF
(for unit with EHW)
Power to MIF: OFF
RUN/STOP lamp: OFF
DRY, set fan speed & set temp. indication: continuously ON
STOP
Power to I.U.: OFF
Power to PCB in I.U.: OFF
Indication LCD: OFF
Power to O.U.: OFF
Power to PCB in O.U.: OFF
Power to CH: OFF

Dry operation



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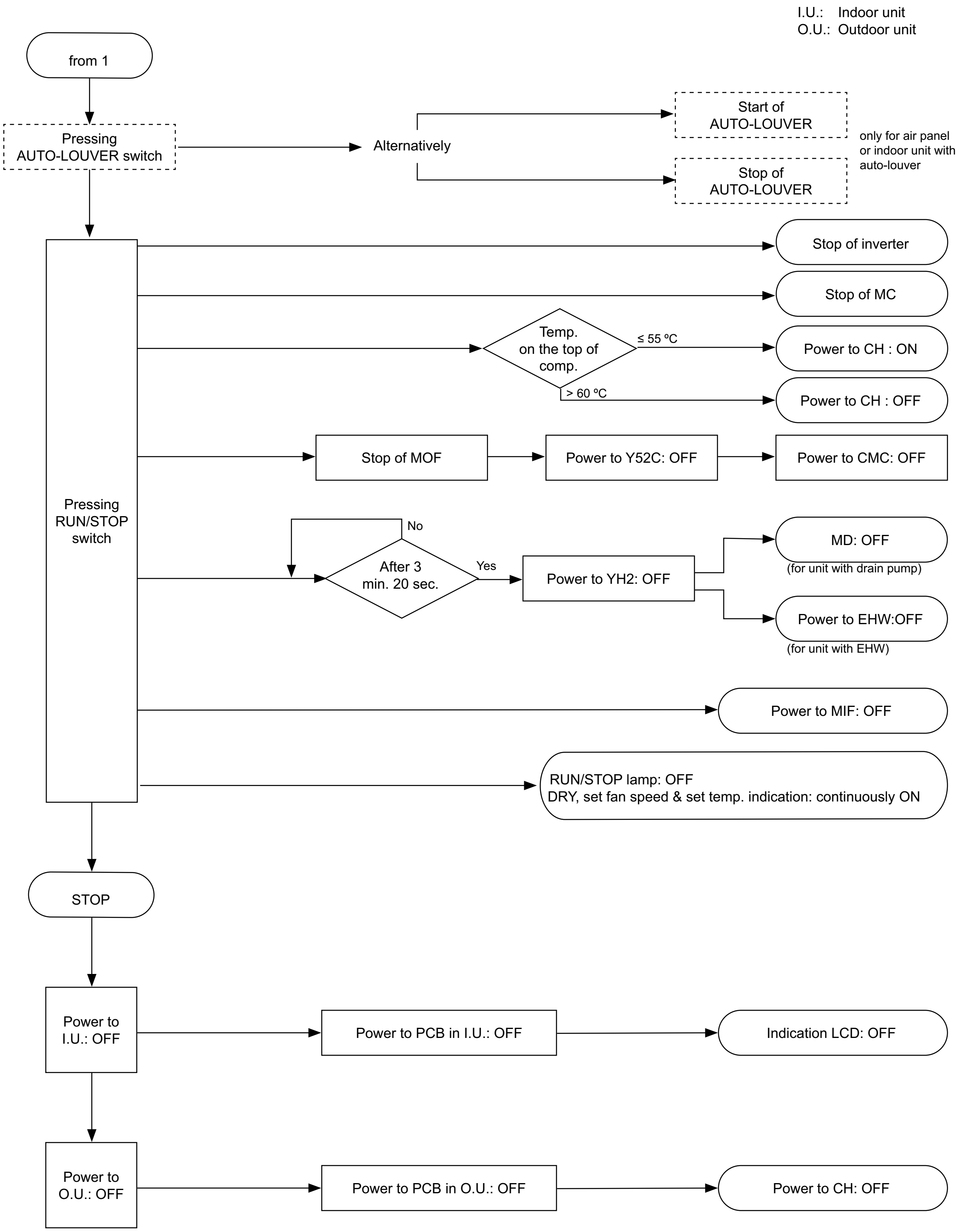
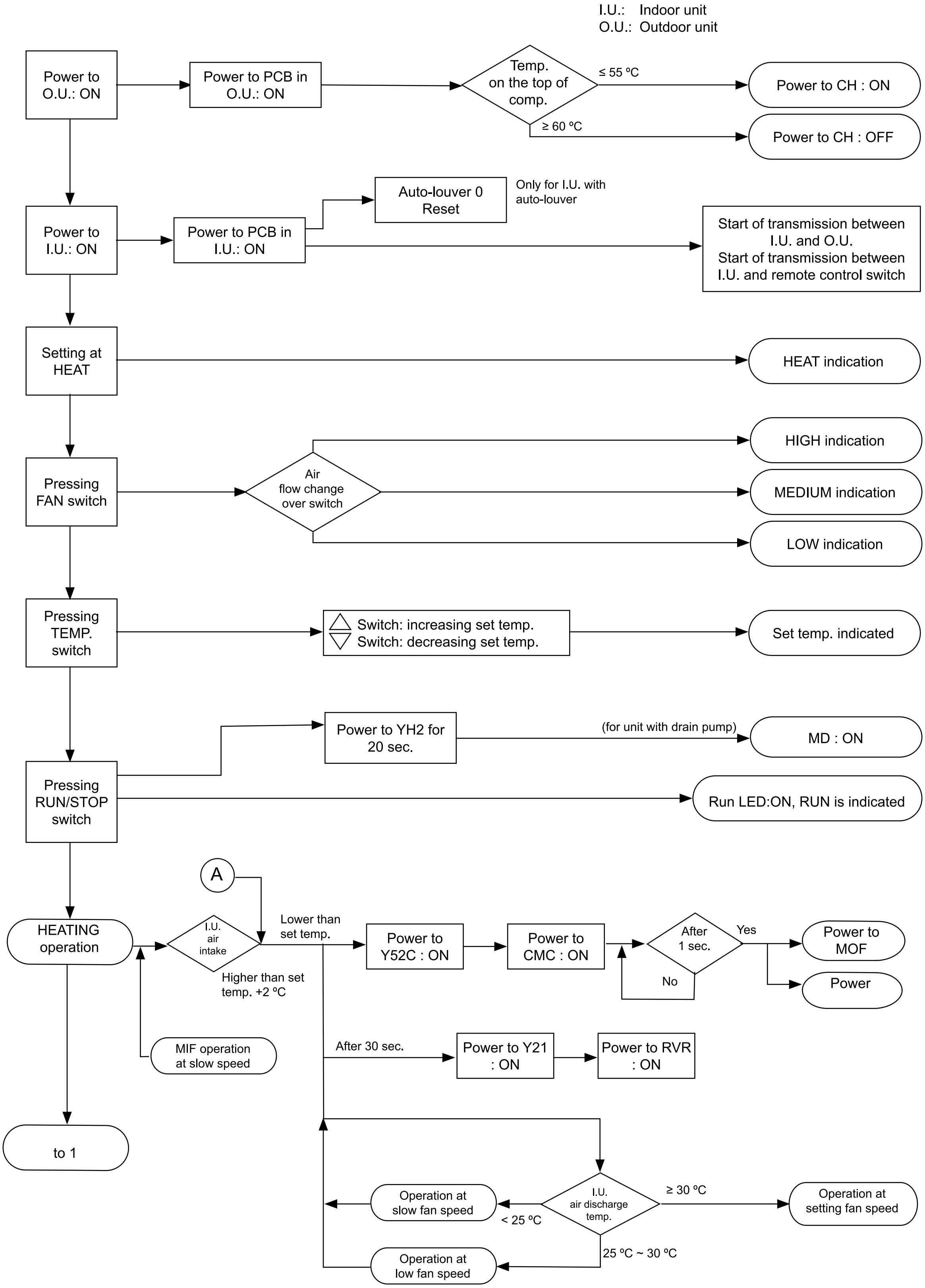

I.U.: Indoor unit
O.U.: Outdoor unit
from 1
Pressing AUTO-LOUVER switch
Alternatively
Start of AUTO-LOUVER
Stop of AUTO-LOUVER
only for air panel or indoor unit with auto-louver
Pressing RUN/STOP switch
Stop of inverter
Stop of MC
Temp. on the top of comp.
≤ 55 ºC
> 60 ºC
Power to CH : ON
Power to CH : OFF
Stop of MOF
Power to Y52C: OFF
Power to CMC: OFF
No
After 3 min. 20 sec.
Yes
Power to YH2: OFF
MD: OFF
(for unit with drain pump)
Power to EHW:OFF
(for unit with EHW)
Power to MIF: OFF
RUN/STOP lamp: OFF
DRY, set fan speed & set temp. indication: continuously ON
STOP
Power to I.U.: OFF
Power to PCB in I.U.: OFF
Indication LCD: OFF
Power to O.U.: OFF
Power to PCB in O.U.: OFF
Power to CH: OFF

Heating operation



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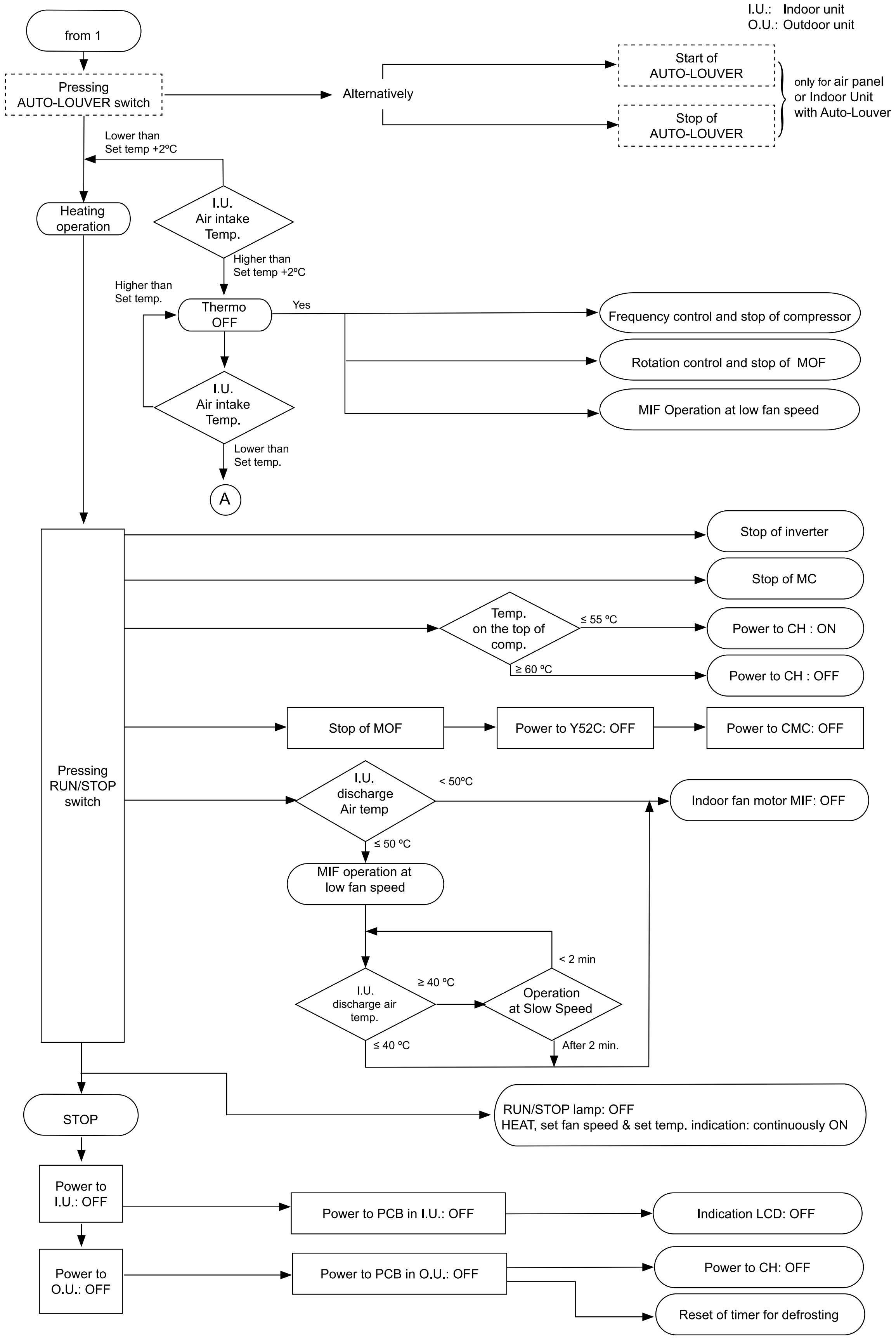
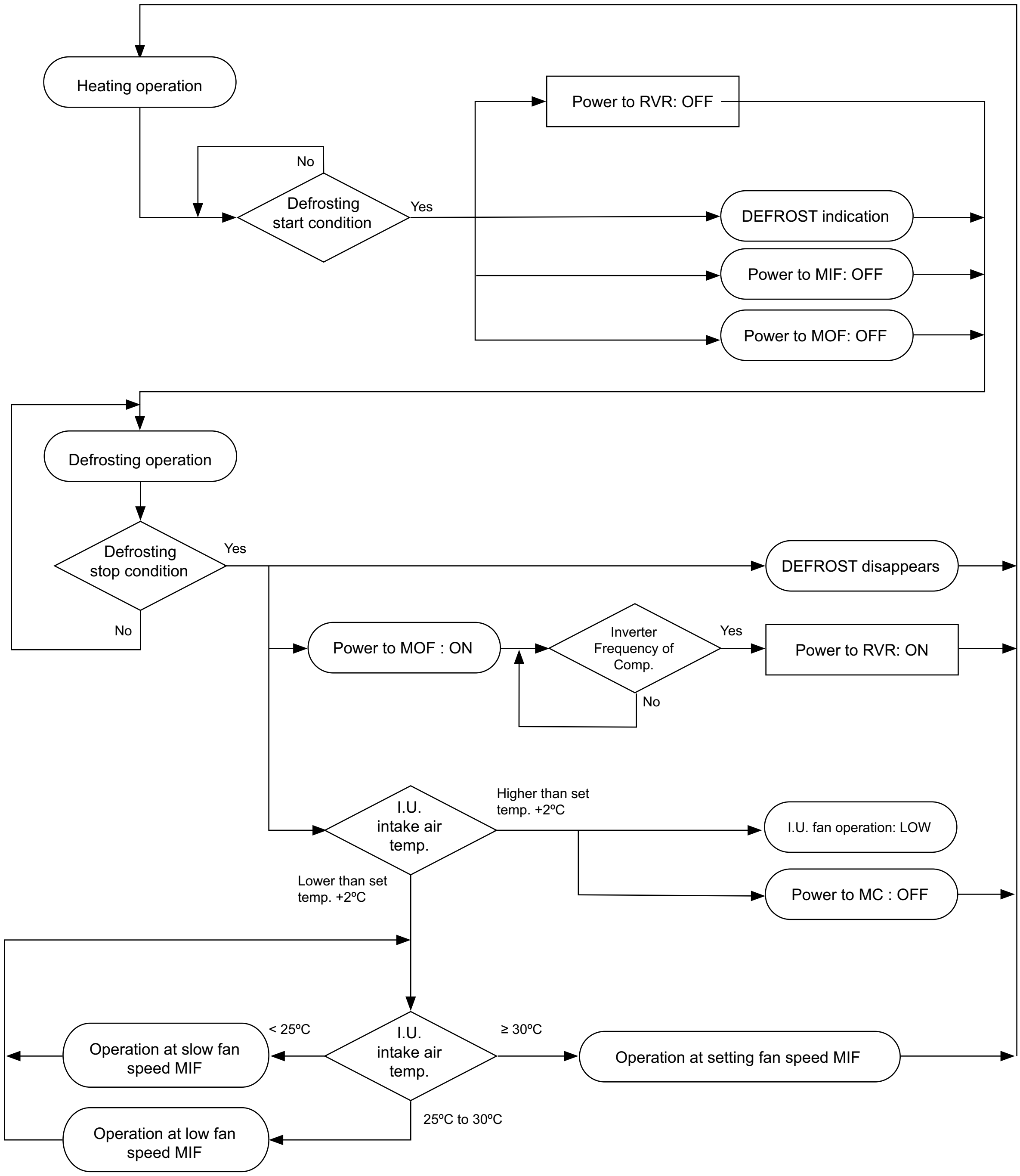

I.U.: Indoor unit
O.U.: Outdoor unit
from 1
Pressing AUTO-LOUVER switch
Alternatively
Start of AUTO-LOUVER
Stop of AUTO-LOUVER
only for air panel or Indoor Unit with Auto-Louver
Lower than Set temp +2ºC
Heating operation
I.U. Air intake Temp.
Higher than Set temp +2ºC
Higher than Set temp.
Thermo OFF
Yes
Frequency control and stop of compressor
Rotation control and stop of MOF
MIF Operation at low fan speed
I.U. Air intake Temp.
Lower than Set temp.
A
Pressing RUN/STOP switch
Stop of inverter
Stop of MC
Temp. on the top of comp.
≤ 55 ºC
Power to CH : ON
≥ 60 ºC
Power to CH : OFF
Stop of MOF
Power to Y52C: OFF
Power to CMC: OFF
I.U. discharge Air temp
< 50ºC
Indoor fan motor MIF: OFF
≤ 50 ºC
MIF operation at low fan speed
< 2 min
I.U. discharge air temp.
≥ 40 ºC
Operation at Slow Speed
≤ 40 ºC
After 2 min.
STOP
RUN/STOP lamp: OFF
HEAT, set fan speed & set temp. indication: continuously ON
Power to I.U.: OFF
Power to PCB in I.U.: OFF
Indication LCD: OFF
Power to O.U.: OFF
Power to PCB in O.U.: OFF
Power to CH: OFF
Reset of timer for defrosting

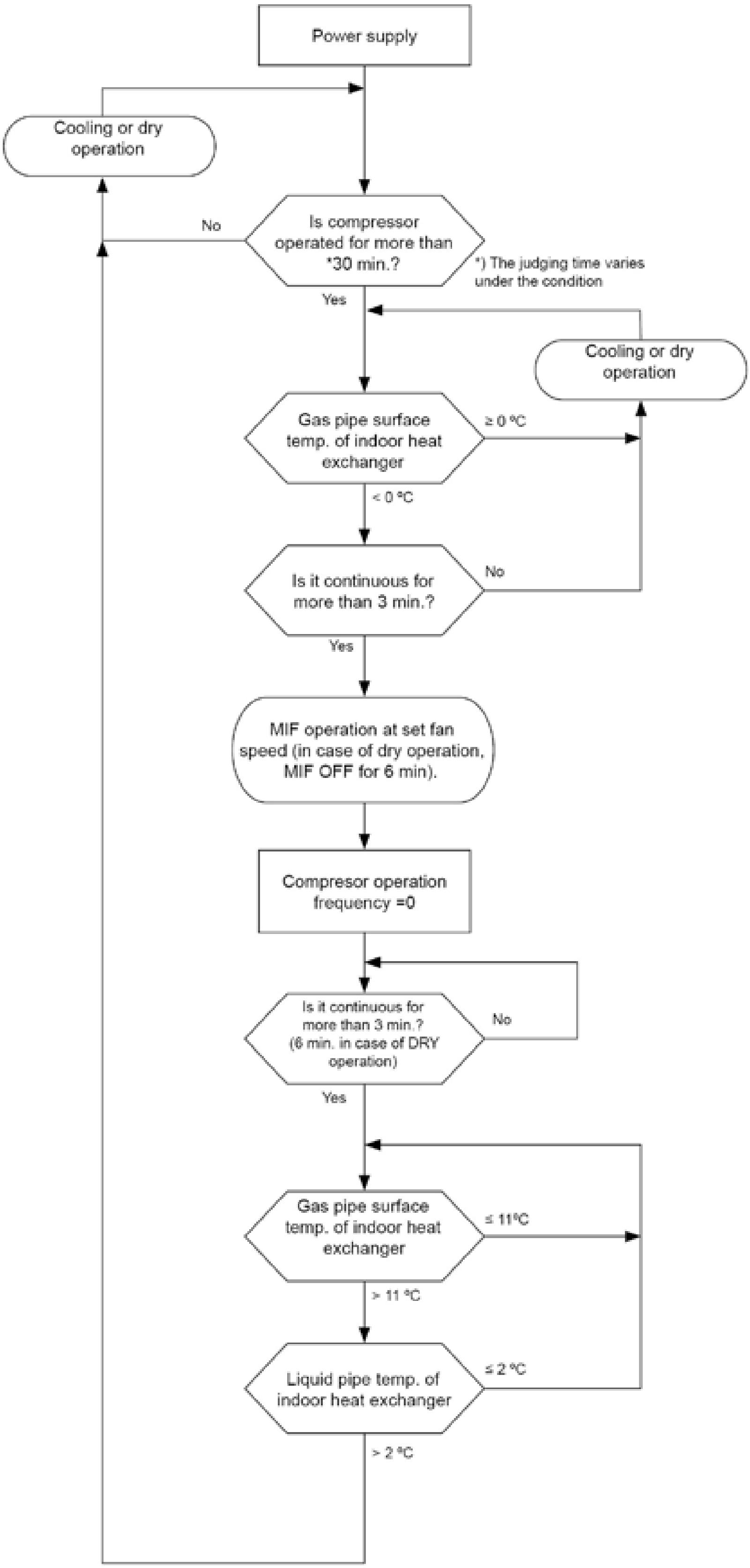
Defrost operation control



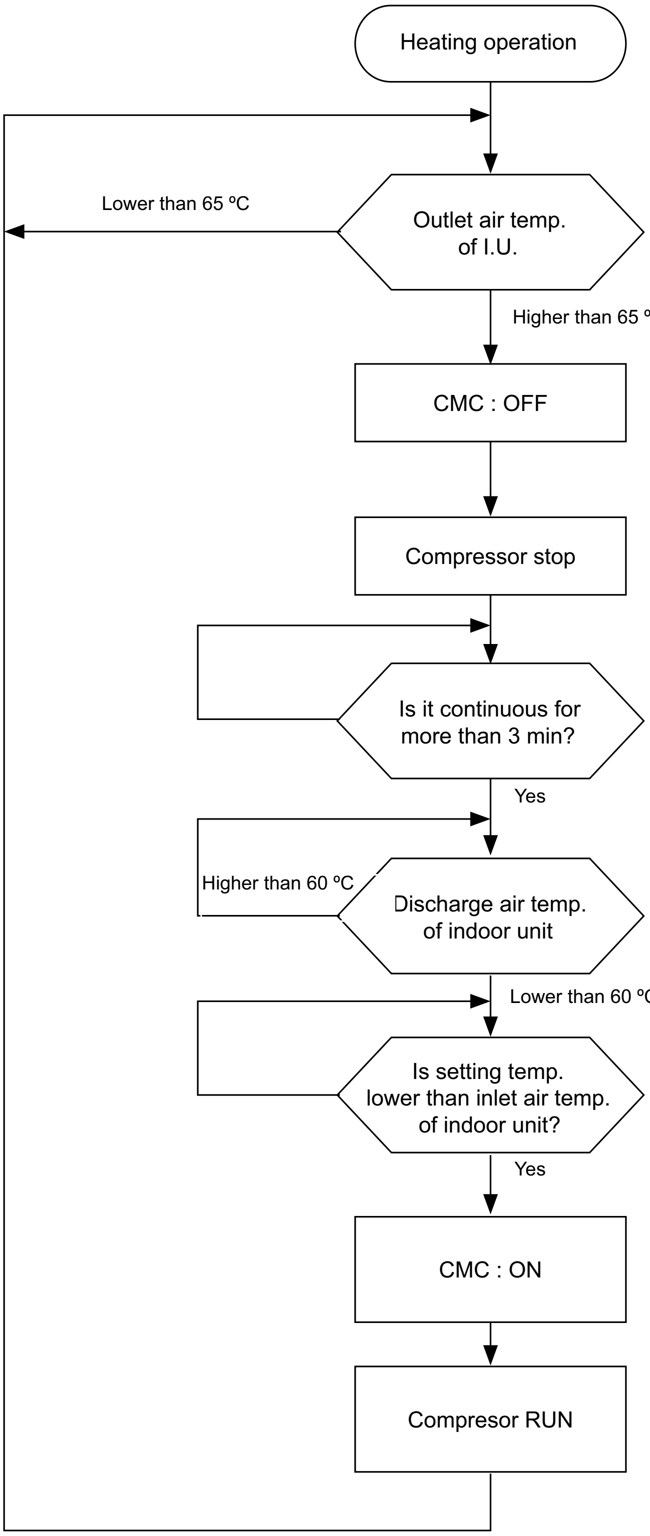
5.5 Standard control functions

5.5.1 Standard control functions for IVX Series

Freezing protection during cooling process or dry operation



Prevention control for excessively high discharge gas temperature



Outdoor unit electrical expansion valve control

1 After supplying power source, the electronic expansion valve is completely opened.
2 When the compressor is stopped, the electronic expansion valve is completely closed to adjust its opening.
3 At starting operation (compressor is operated), opening of the electronic expansion valve is set at a specified opening.
  a. Specified opening during heating operation: 1 minute

4 During the cooling and the defrosting operations, the electronic expansion valve is set at the specified opening.
5 Normal opening of the electronic expansion valve.

- **Coling operation**
  - 480 pulse (100%)
- **Heating operation**

  a. Set of target temperature

  TdSH = 20-25 ºC

  b. Simulation PI control for the electronic expansion valve. The electronic expansion valve opening is controlled so that the thermistor temperatures for the compressor can reach the target temperature.

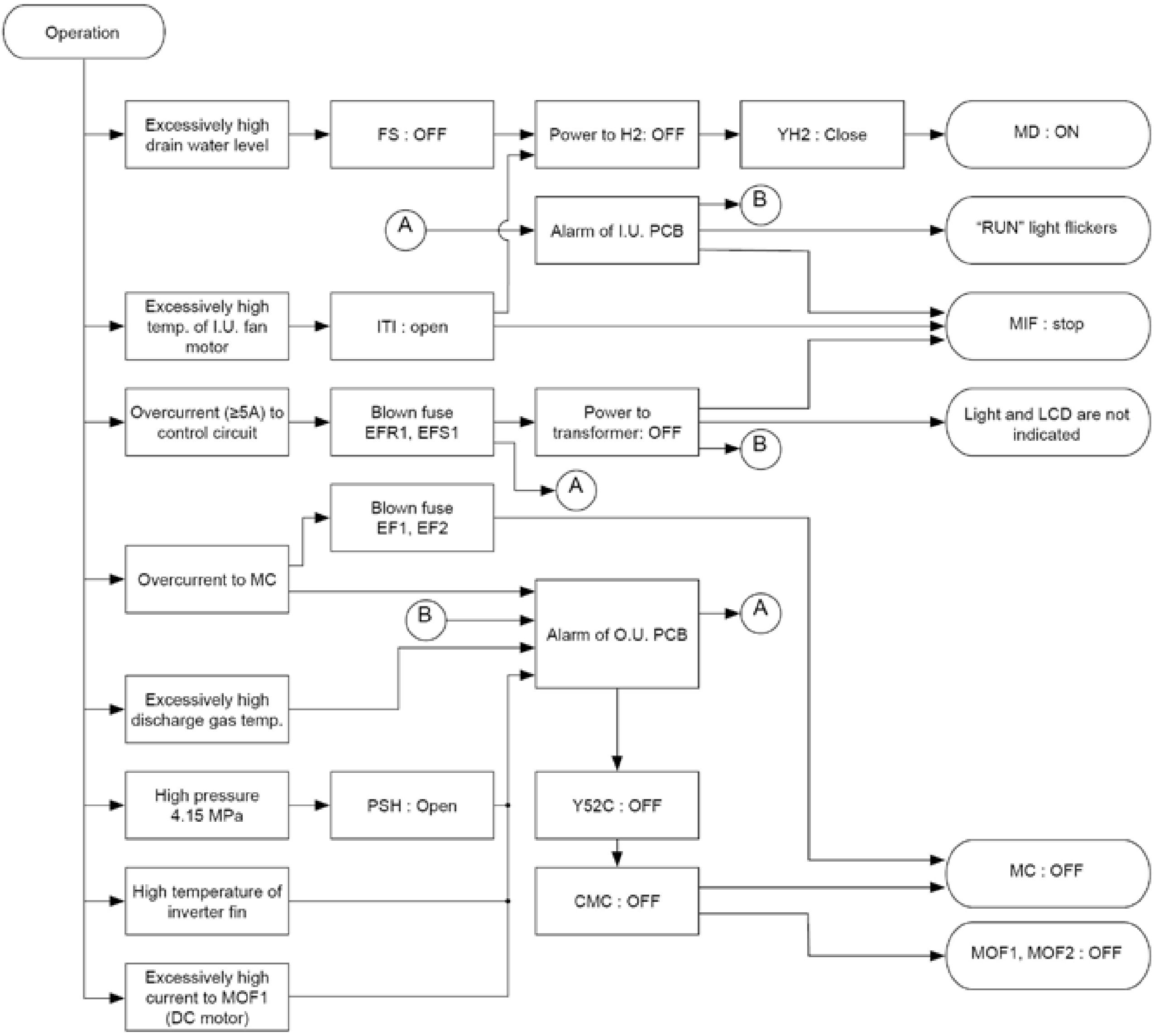
  The electronic expansion valve opening is controlled as shown in the below table when the unit is operated under the test run (heating operation: indoor temperature 20 ºC / outdoor temperature 7 ºC).

H(V)RNM(2)(E)	3.0HP	4.0HP	5.0HP	6.0HP	8.0HP	10HP	12HP
Expansion valve opening pulse (%)	130 (27)	110 (22)	130 (27)	150 (34)	160 (33)	200 (41)	240 (50)

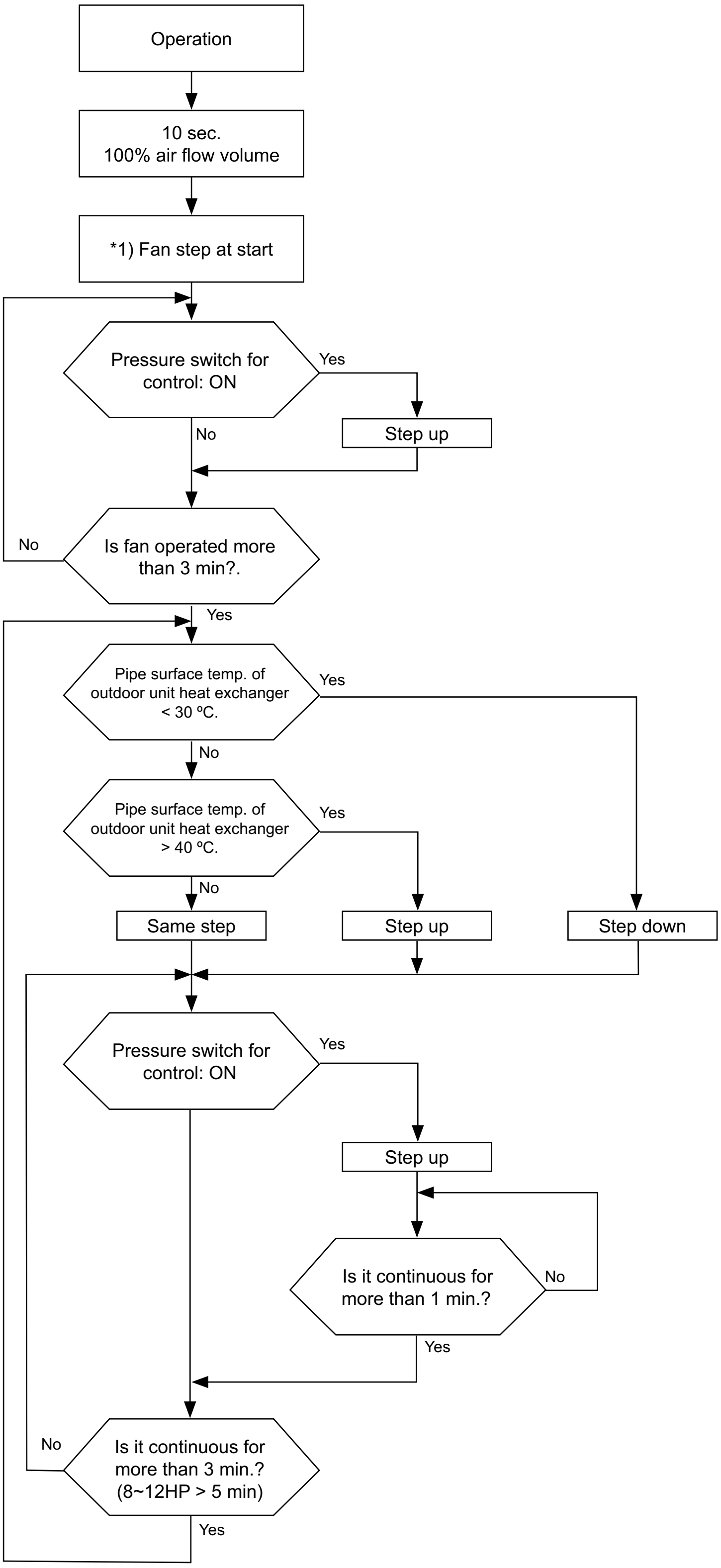
NOTE

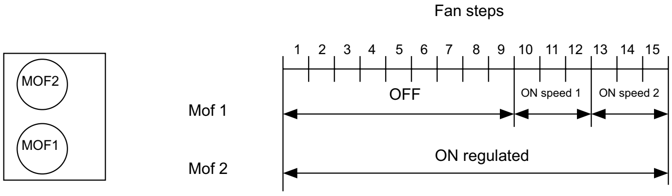
- ***The above target is for one of the indoor units at the twin connection with 7.5m piping length.***

Activation for protection device control



Outdoor fan control during cooling operation





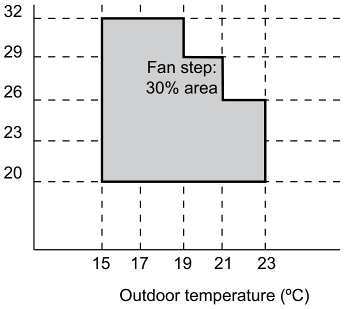
NOTE

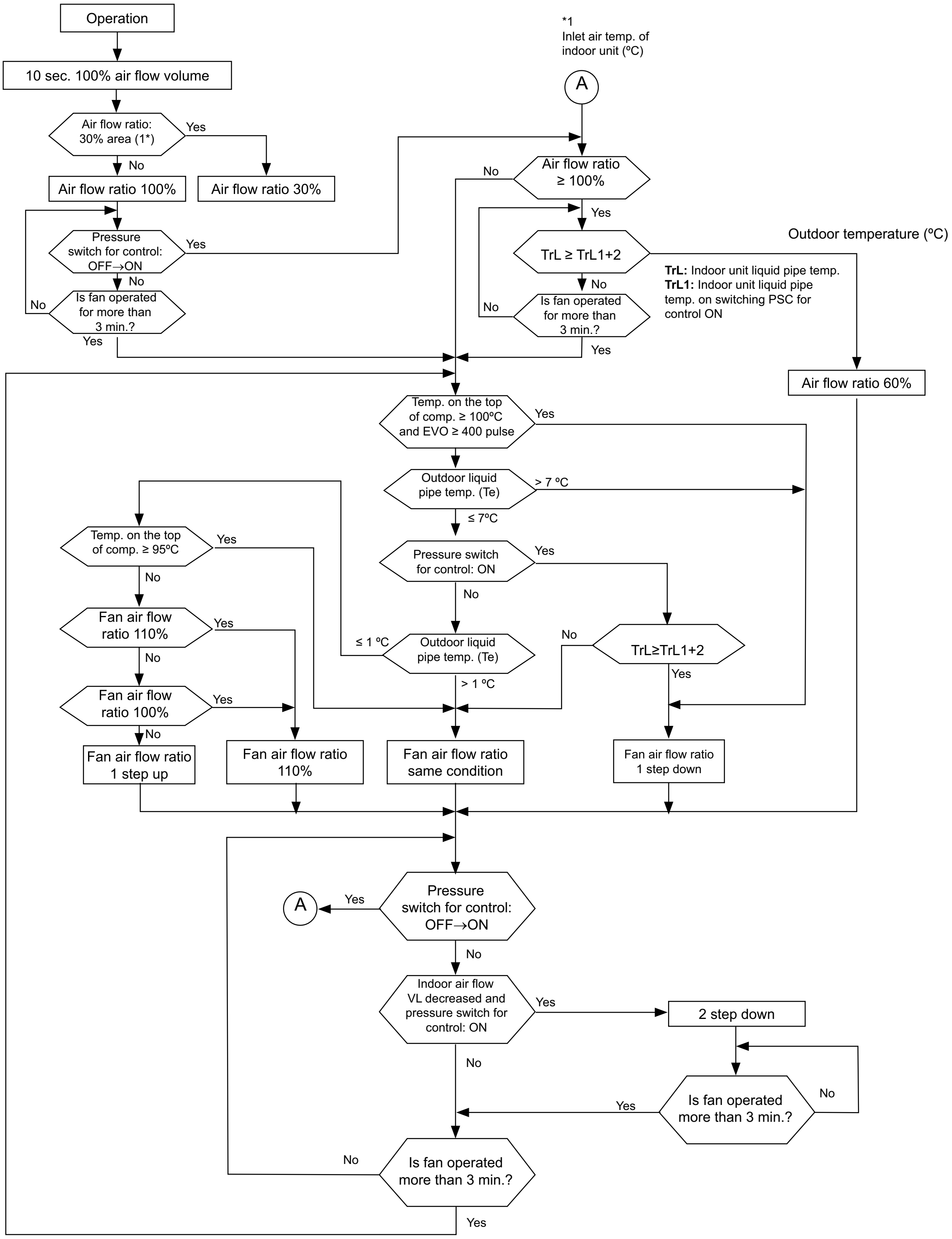
- ***This sequence is for the standard operation.***

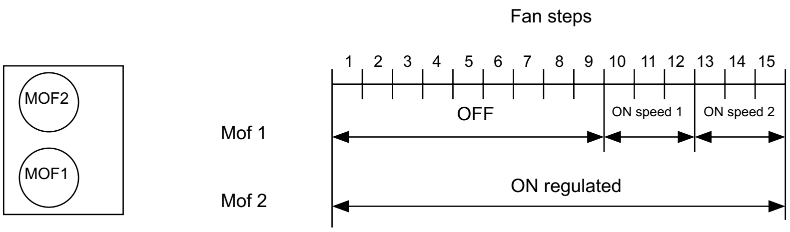
*1) Fan step at start

Outdoor temp. (Tao)	Air flow ratio
Tao ≤ 2 °C	15%
2 °C < Tao ≤ 12 °C	25%
12 °C < Tao ≤ 22 °C	40%
22 °C < Tao ≤ 27 °C	60%
27 °C < Tao ≤ 32 °C	80%
32 °C < Tao ≤ 37 °C	100%
37 °C < Tao	110%

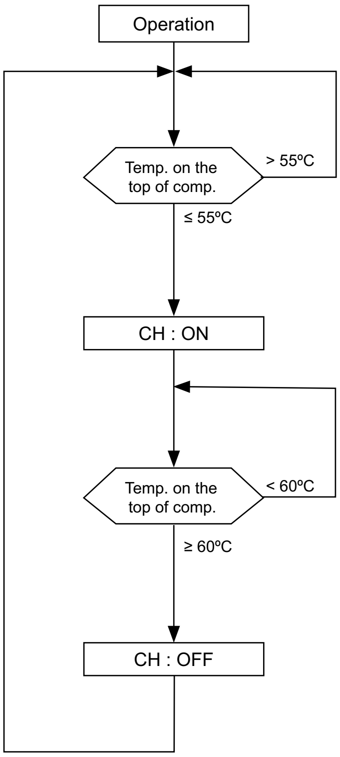
Outdoor fan control during heating operation






Fan steps
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
MOF2
MOF1
Mof 1
OFF
ON speed 1
ON speed 2
Mof 2
ON regulated

Preheating control of compressor



Prevention control for high pressure increase

This function is performed to prevent the abnormal condition (Alarm: 02) when the outdoor air flow is decreased by a seasonal wind against air outlet.

When the **CMC** is ON during cooling operation, **PSC** is ON and Tc is higher than Tc1+4 °C, forced thermo-off operation will be performed.

Tc: Outdoor piping temperature.

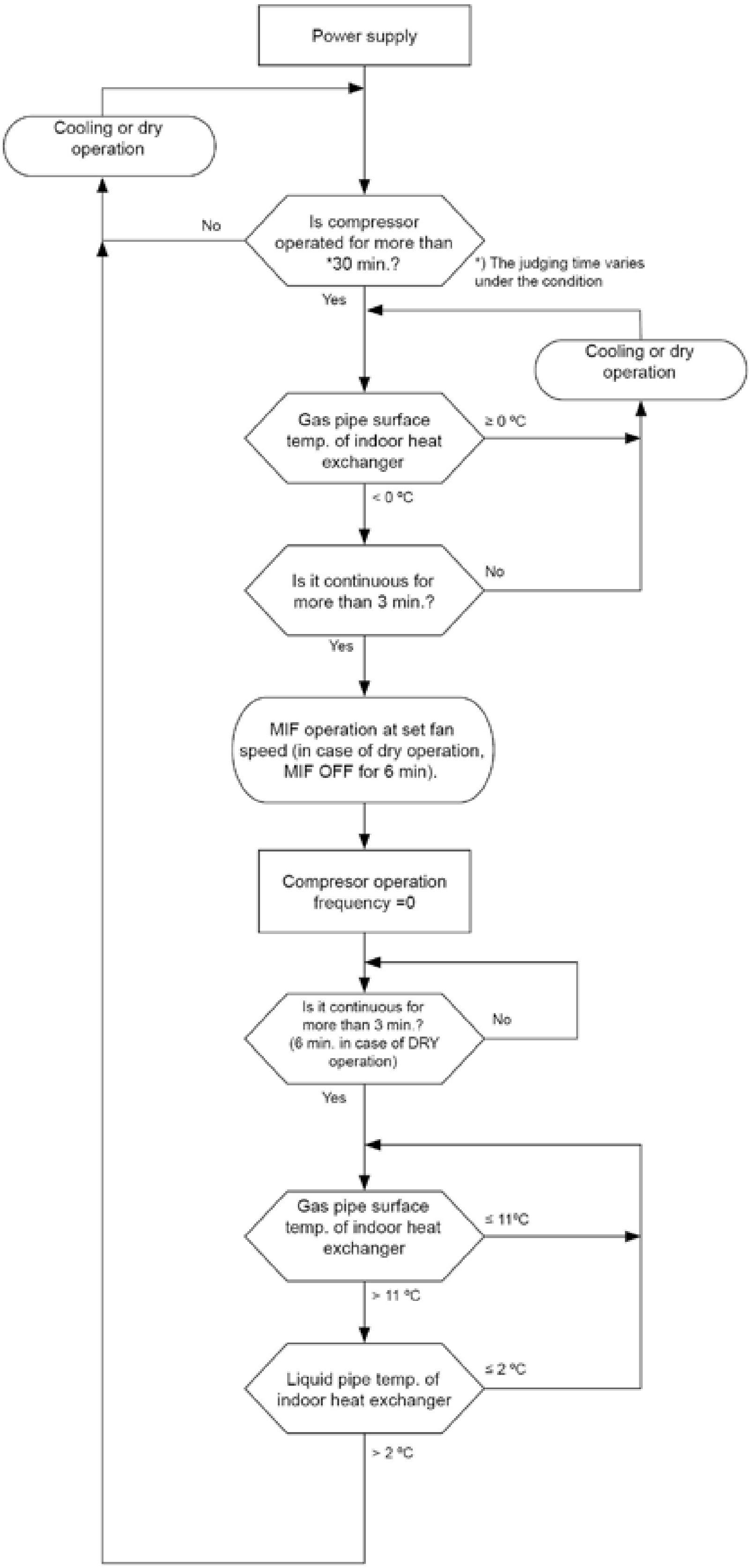
Tc1: Outdoor piping temperature when **PSC** is ON.

PSC ON: 3.60 MPa.

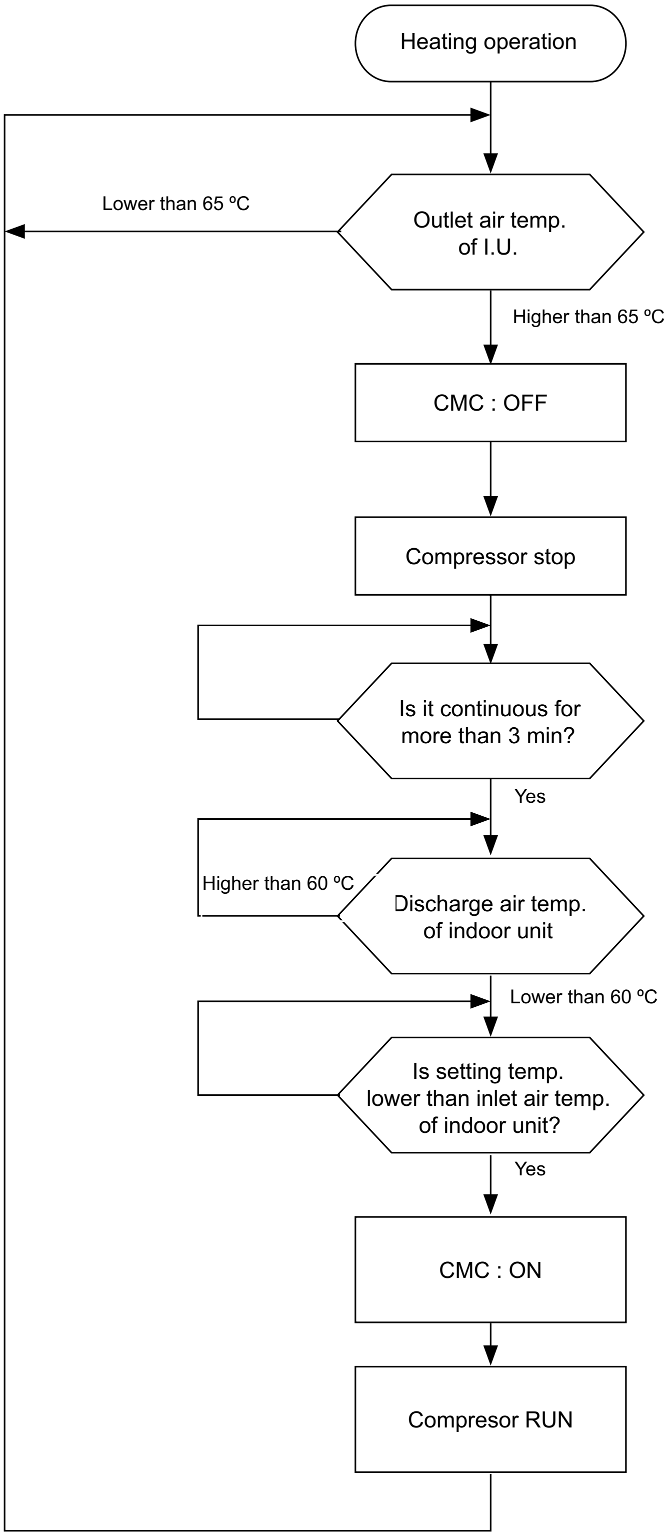
However, if it occurs more than 6 times during operation, forced thermo-off operation will not be performed. Cause of stoppage will be 13.

5.5.2 Standard control functions for ES Series

Freezing protection during cooling process or dry operation



Prevention control for excessively high discharge gas temperature



Outdoor unit electrical expansion valve control

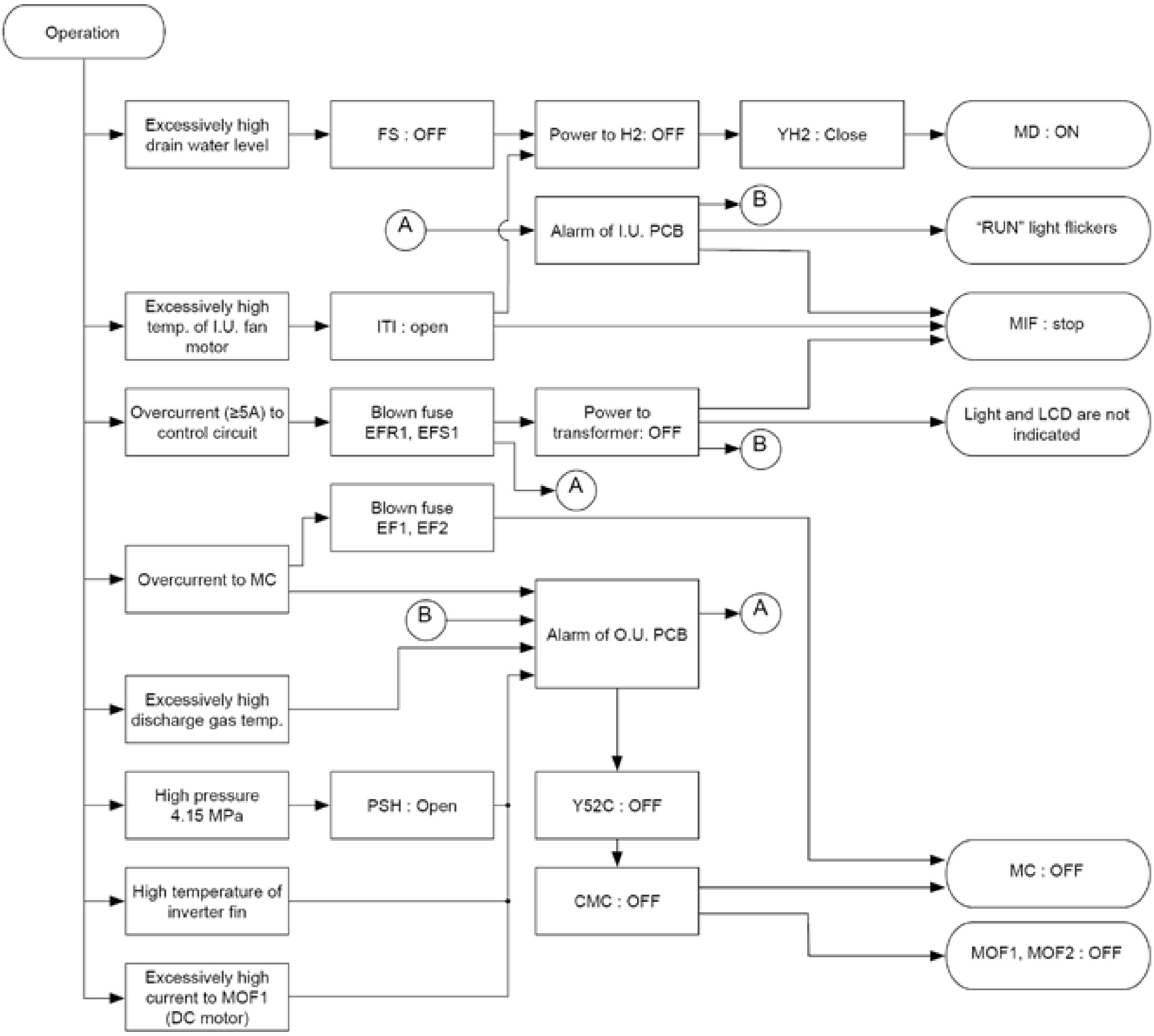
1. After supplying power source, the electronic expansion valve is completely opened.
2. When the compressor is stopped, the electronic expansion valve is completely closed to adjust its opening.
3. At starting operation (compressor is operated), opening of the electronic expansion valve is set at a specified opening.
   - **a.** Specified opening during heating operation: 1 minute
4. During the cooling and the defrosting operations, the electronic expansion valve is set at the specified opening.
5. Normal opening of the electronic expansion valve.

- **Coling operation**
  - 480 pulse (100%)
- **Heating operation**
  - **a.** Set of target temperature

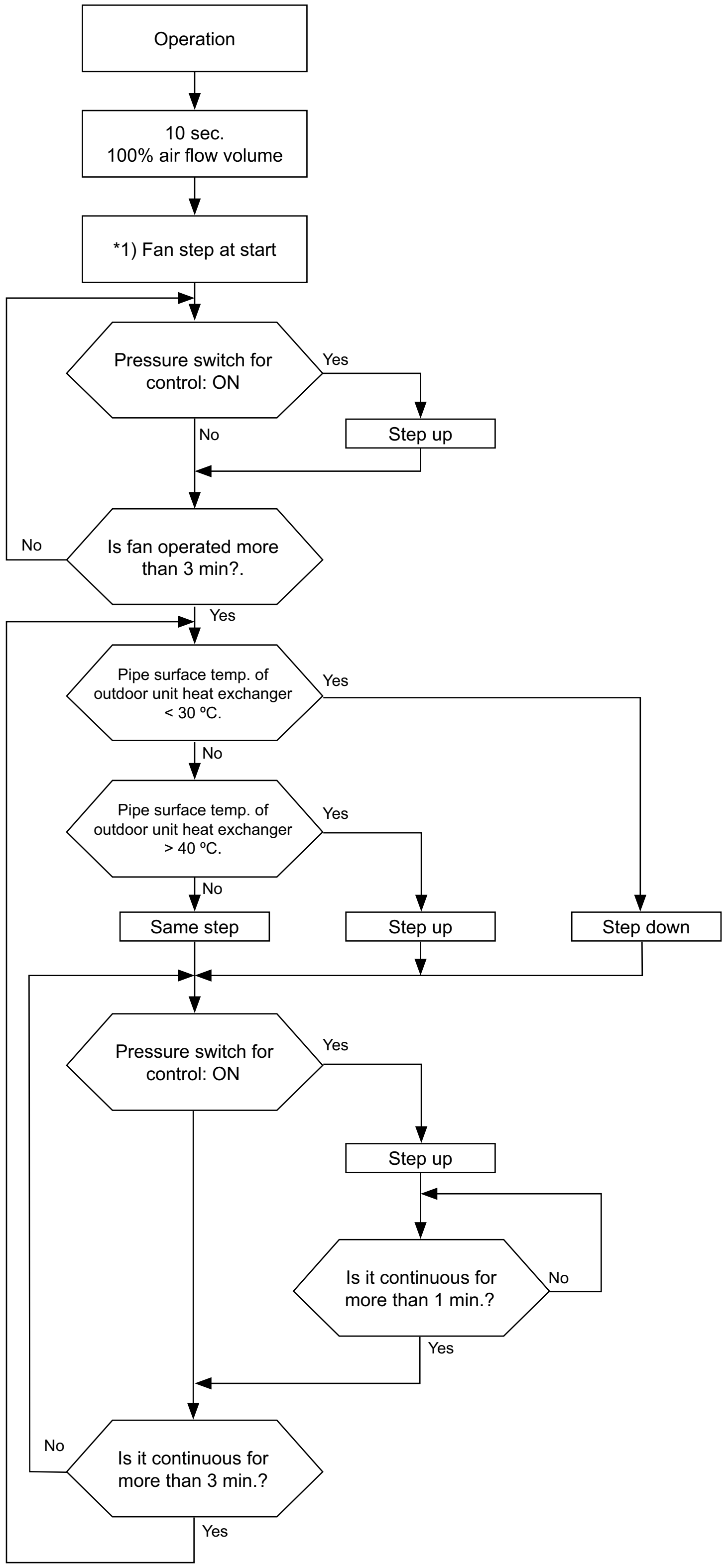
    TdSH = 20-25 ºC

  - **b.** Simulation PI control for the electronic expansion valve. The electronic expansion valve opening is controlled so that the thermistor temperatures for the compressor can reach the target temperature.

Activation for protection device control



Outdoor fan control during cooling operation



NOTE

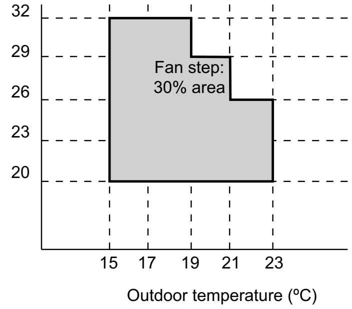
- ***This sequence is for the standard operation.***

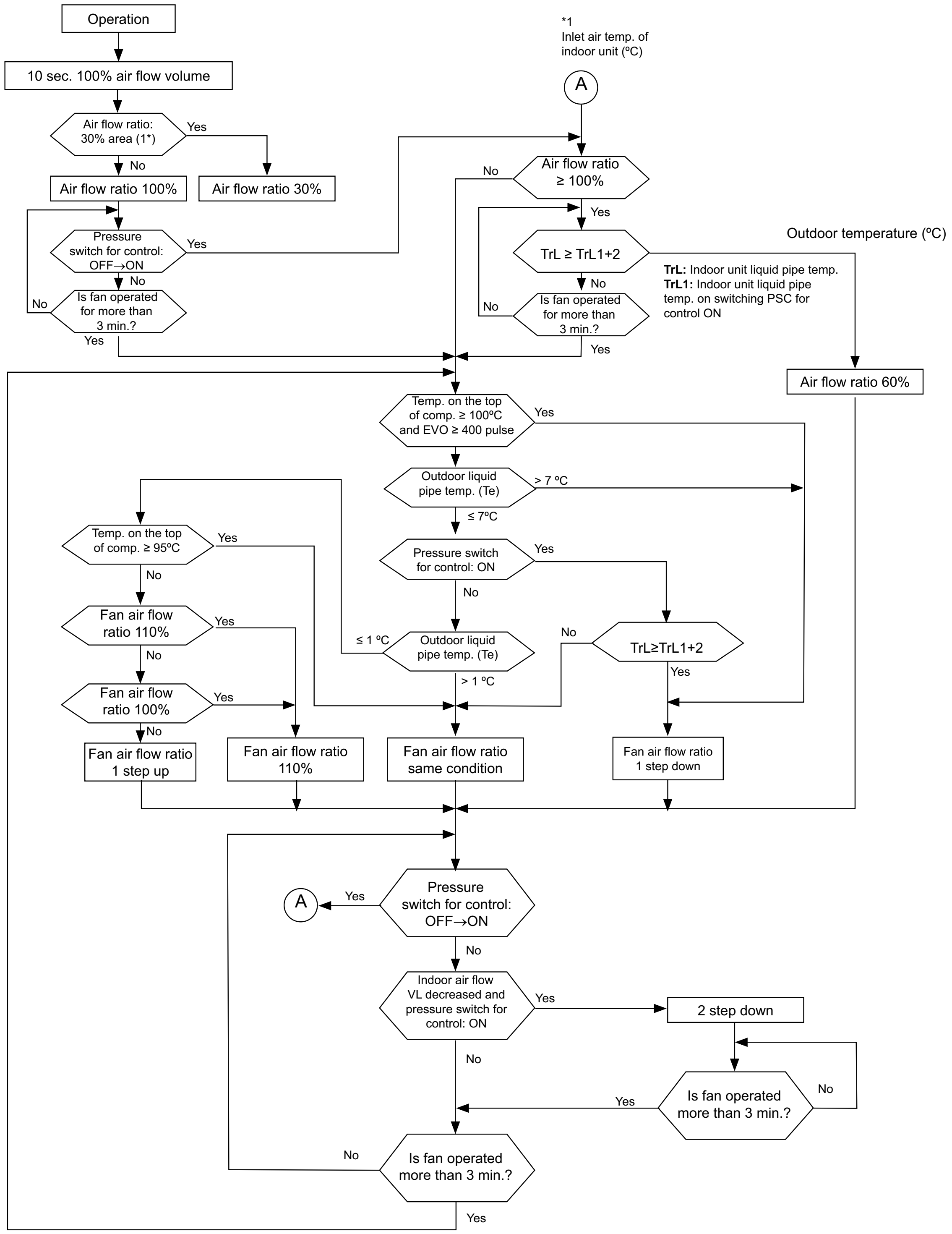
*1) Fan step at start

Outdoor temp. (Tao)	Air flow ratio
Tao ≤ 2 °C	15%
2 °C < Tao ≤ 12 °C	25%
12 °C < Tao ≤ 22 °C	40%
22 °C < Tao ≤ 27 °C	60%
27 °C < Tao ≤ 32 °C	80%
32 °C < Tao ≤ 37 °C	100%
37 °C < Tao	110%

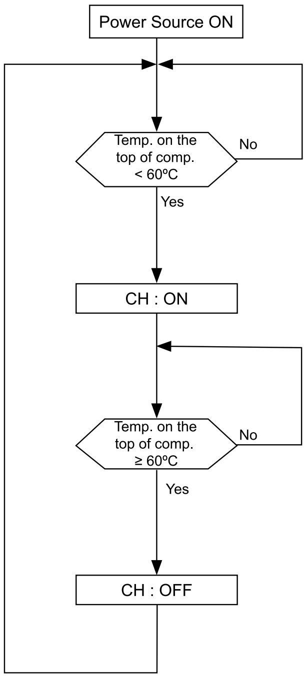
*2) Temp. diference ±5 °C

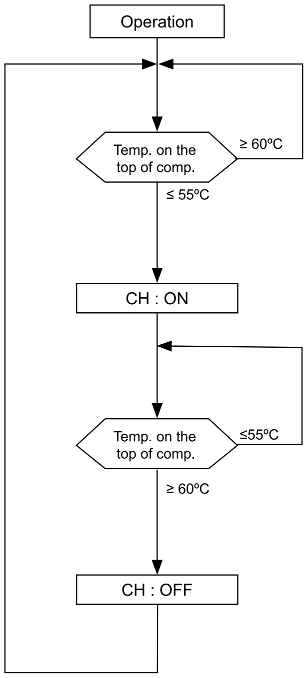
Outdoor fan control during heating operation

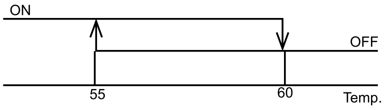




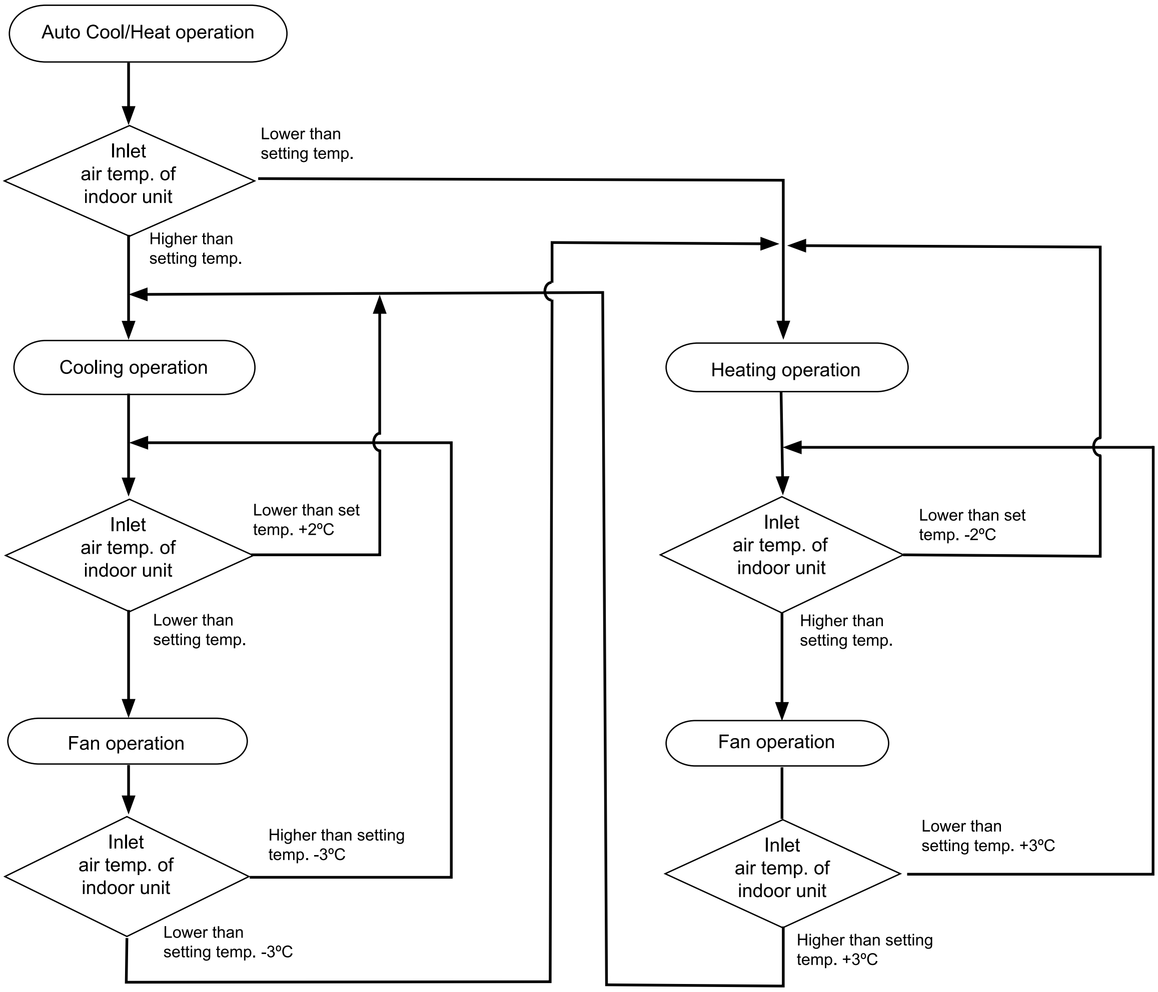
Preheating control of compressor







Control for auto cool/heat operation



Prevention control for high pressure increase

This function is performed to prevent the abnormal condition (Alarm: 02) when the outdoor air flow is decreased by a seasonal wind against air outlet.

When the **CMC** is ON during cooling operation, **PSC** is ON and Tc is higher than Tc1+4°C, forced thermo-off operation will be performed.

Tc: Outdoor piping temperature

Tc1: Outdoor piping temperature when **PSC** is ON

PSC ON: 3.60 MPa

However, if it occurs more than 6 times during operation, forced thermo-off operation will not be performed. Cause of stoppage will be 13.

6. Optional functions

Index

6.1 Outdoor units IVX and ES series

The system has eight input and five output signals that are programmed in the PCB of the outdoor unit using connectors CN1 and CN2 for the input signals and CN7 for the output signal.

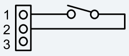
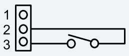
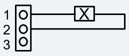
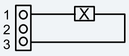
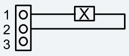
Connectors CN1 and CN2 have two and one ports respectively to configure three input options out of the eight options the system has.

Input connector CN1 has two ports to configure two input options out of the five options the system has.

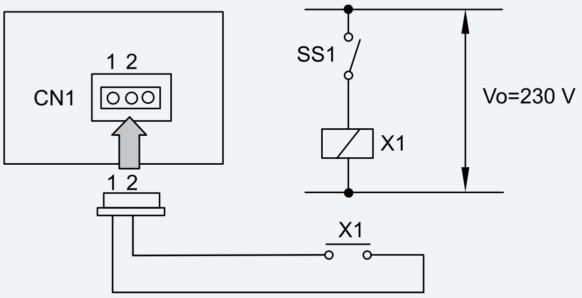
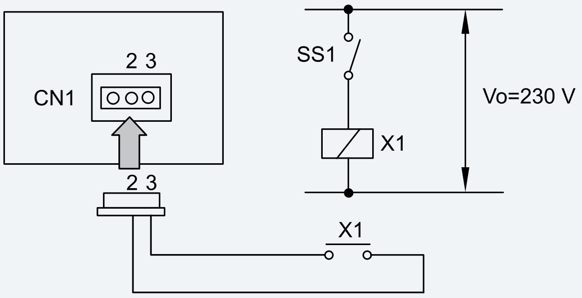
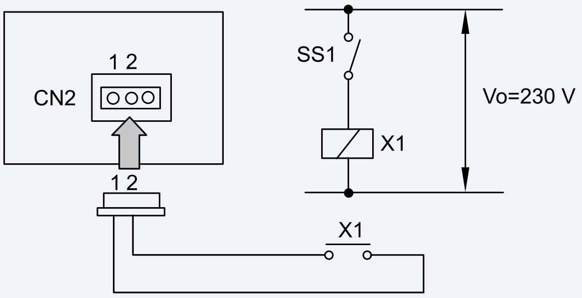
The system has ten optional functions that are programmed in the PCB of the outdoor unit.

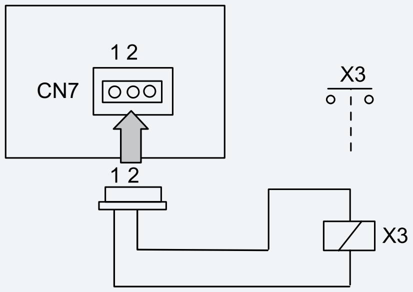
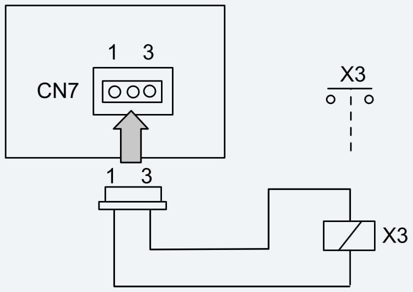
6.1.1 Available ports

The system has the following input and output ports.

Content		Setting of the port in the PCB of the indoor unit	Remarks	Outlet
Inputs	i1	1-2 of CN1		Contact
	i2	2-3 of CN1		Contact
	i3	1-2 of CN2		Contact
Outputs	o1	1-2 of CN7		DC 12V
	o2	1-3 of CN7	 	DC 12V

Connection:
The system has the following connections.

Input connections	
Indication	**Connections**
i1	
i2	
i3	

Output connections	
Indication	**Connections**
o1	
o2	

Specification of the components for a correct installation

Component		Manufacturer or specifications	Remarks
Auxiliary relay (X3)		OMRON mini power relay model: MY1F or equivalent	Voltage between relay terminals 12 Vdc - 75 mA
(SS1) (x1), (x2) contact example		Manual type	Voltage between terminals of the 230V - 5 mA contactor
3P connector cable		Optional part PCC-1A (capable of connecting the JST XHP -3 connector)	Five wires with connectors as one set
Wire (control)	Voltage: 12V DC.	0.5 mm^2	—
Wire (power)	Voltage 230V	2.0 mm^2	—

NOTE

- ***The connection of the input signal is only an example.***
- ***Keep the CN1 and CN2 wires as short as possible.***
- ***Do not run the wires along 230 V/400 V ac power cables separately install them at a distance of more than 30 cm. (The cables may intersect).***
- ***If you install the wires along a power supply wire, insert the wires in a metal conduit tube and ground one end of the tube.***
- ***The maximum wiring length is 70 m. If you use this function, it is recommended that you use safety devices such as an electrical leakage breaker or a smoke detector.***

6.1.2 Configuration

Available optional signals

The units have the following signals that are described in the following table.

These signals are set up through the PCB of the outdoor unit.

- **Input signals**

Ind.	Input signal	Application	Port
0	N° setting application	N° setting	—
1	Fixing the heating mode	This signal allows to pre-fix the operation mode, in this case the heating mode, independently of what the indoor unit requests. If the indoor units request the oposite mode than the outdoor unit, the compressor will not start. This is very useful to set up a unique operation mode.	CN1 and CN2
2	Fixing the cooling mode	This signal allows to pre-fix the operation mode, in this case the cooling mode, independently of what the indoor unit requests. If the indoor units request the oposite mode than the outdoor unit, the compressor will not start. This is very useful for computer rooms where the cooling mode is fixed throughout the year.	CN1 and CN2
3	Demand thermo OFF	This signal allows to stop the compressor if it reaches a certain power as well as to put the indoor unit in Thermo-OFF. This is very useful for installations with high power consumption.	CN1 and CN2
4	Forced stoppage	This signal allows to control the stoppage of the compressor and the fans of the indoor as well as outdoor units. This is very useful when used with the alarm signals of the fire prevention systems.	CN1 and CN2
5	Current control demand 50%	This signal allows to regulate current consumption and establish an average consumption of 50% of the rate point. This is very useful for installations that run 24 hours a day.	CN1 and CN2
6	Current control demand 75%	This signal allows to regulate current consumption and establish an average consumption of 75% of the rate point.This is very useful for installations that run 24 hours a day.	CN1 and CN2
7	Current control demand 100%	This signal allows to regulate current consumption and establish an average consumption of 100% of the rate point. This is very useful for installations that run 24 hours a day.	CN1 and CN2

- **Output signals**

Ind.	Output signal	Application	Port
0	N° setting application	N° setting	—
01	Operation signal	This signal allows to pick up the machine's operation signal. This is very useful to start up additional systems such as humidifiers, fans and other additional air-conditioning systems.	CN7
02	Alarm signal	This signal picks up the machine's alarm. This is very useful to warn that an alarm has been tripped.	CN7
03	Compressor ON signal	This single allows to pick up the compressor's operation signal. It is very useful for checking signals during remote-control operation and for the interlock of the outdoor unit.	CN7
04	Defrost operation signal	This signal allows to pick up the defrosting of the unit. This is very useful to know how the indoor unit is operating if there is an abnormal situation.	CN7

NOTE

- ***Do not set same function (01-04) to multiple input port.***

Programming

The optional signals are programmed through the PCB of the outdoor unit.

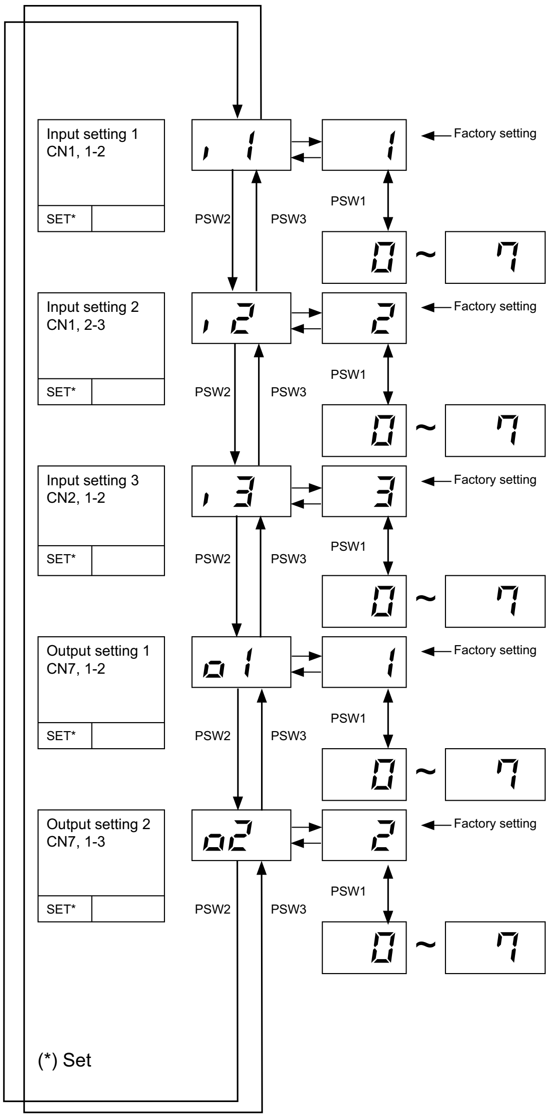
Setting of the optional signals

Setting of the optional signals The optional signals of the outdoor unit are set up from the PCB of the outdoor unit and push switches PSW1, PSW2 and PSW3

- **Selection of the input signal**

If the below setting change is required on-site, perform the following instructions:

1. While the outdoor unit is ON, set the following DIP switches on the printed circuit board of the outdoor unit as follows: set pin 6 of DSW2 to ON. Because of these settings, the function selection mode becomes available and the following indication appears on the 7-segment display.



Input/output terminal			Function N°
i	1	→ ←	1

This indicates that function No.1 (set heating mode) is set at input 1.

2. By pressing the push switches PSW1, PSW2 and PSW3, you change the input/output terminal name. The flowchart shown on the side reflects the changes on the 7-segment display when you press PSW2 and PSW3.
3. After selecting the input/output terminal name, select your required function by pushing the PSW1.
4. After setting the pin 6 of DSW2 to OFF, the selected contents are memorized in the PCB of the outdoor unit, and, immediately afterwards, the function selection mode is set to OFF. The memorized data is maintained even when the power supply wires are disconnected. The connection details of each function, as well as the required parts, are described in the first section.

6.1.3 Description of optional input signals

Fixing operation mode (heating / cooling)(1/2)

This input function is fixed in terminals CN1 or CN2 of the PCB of the outdoor unit, to use it as a cooling and heating mode. CN1 must be set up as follows.

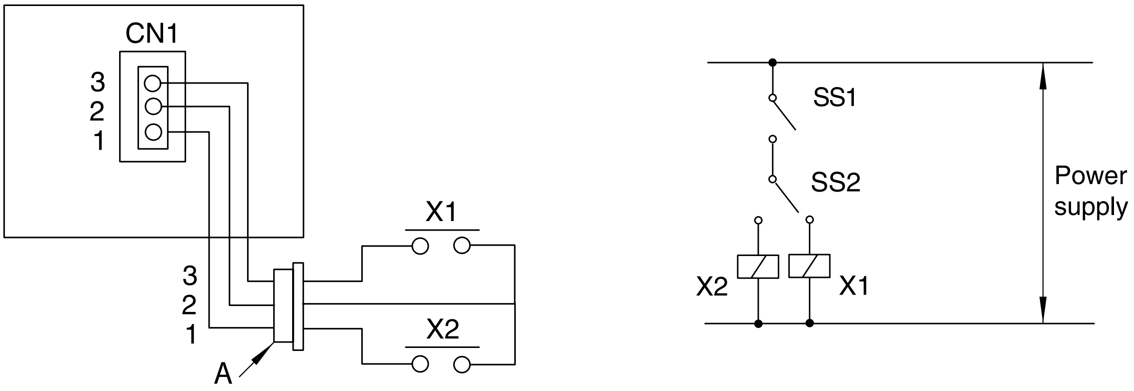
Short circuit between the terminals 1 and 2 of CN1: set heating mode.

Short circuit between the terminals 2 and 3 of CN1: set cooling mode.

After having pre-fixed the established mode, the remote control can only be used to adjust the temperatures. Stoppage

code “d1” “20” will be displayed if an attempt is made to change the operation mode of any of the indoor units with the remote control.
Example of wiring diagram of fixing the operation mode.

Outdoor unit PCB



- A: 3P connector cable.
- X1: Cooling.
- X2: Heating.
- SS1: Fixing operation mode switch.
- SS2: Change over switch

Demand thermo OFF (3)

This is an input function to control the maximum power that the compressor can consume. When this option is turned on, the outdoor units are stopped completely, and the indoor units go into thermo-OFF. Alarm “10” is displayed on the remote control. If the switch of this function is disconnected it becomes available again.

Connect the cabling and use the materials as shown in *Available ports, see on page 162*

Forced stoppage (4)

This is an input function that turns on when the switch receives a signal that causes the compressor and the fan motor of the indoor unit to stop; alarm “10” displays on a remote-controlled when this option turns on. If the switch of this function is disconnected it becomes available again.

Connect the cabling and use the materials as shown in *Available ports, see on page 162*

Current control demand (5/6/7)

This is an input function that turns on when it detects that the frequency of the compressor reaches 50%, 75% or 100%.

The frequency of the compressor is determined when the maximum current reaches the established limit.

Connect the cabling and use the materials as shown in *Available ports, see on page 162*

If the running current of the outdoor unit exceeds the maximum limit, the unit changes to the thermo-OFF condition. Stoppage cause code “10” will appear. When the input terminal is opened during the demand current control, the control of the input terminal is reset.

6.1.4 Description of optional output signals

Operation signal (01)

This optional signal is used to pick up the operation signal. It can be used to turn on or off complementary units of the air-conditioning system,such as fans, humidifiers, etc.

Connect the cabling and use the materials as shown in *Available ports, see on page 162*

Note that the contact of auxiliary relay X3 is closed when an operation signal is issued.

Alarm signal (02)

This optional signal is used to pick up the activation of safety devices.

Connect the cabling and use the materials as shown in *Available ports, see on page 162*

Note that the contact of auxiliary relay X3 is closed when an operation signal is issued.

Compressor on signal (03)

This optional signal is used to pick up the signal when the compressor is ON. It can be used to check how the compressor is running at all times. It is very useful for locking the compressor when the fans are locked.

Connect the cabling and use the materials as shown in *Available ports, see on page 162*

Note that the contact of auxiliary relay X3 is closed when an operation signal is issued.

Defrost operation signal (04)

This optional signal is used to pick up when defrosting turns on. It is very useful to check if the indoor unit is in thermo-OFF.

Connect the cabling and use the materials as shown in *Available ports, see on page 162*

Note that the contact of auxiliary relay X3 is closed when an operation signal is issued.

6.1.5 Optional functions

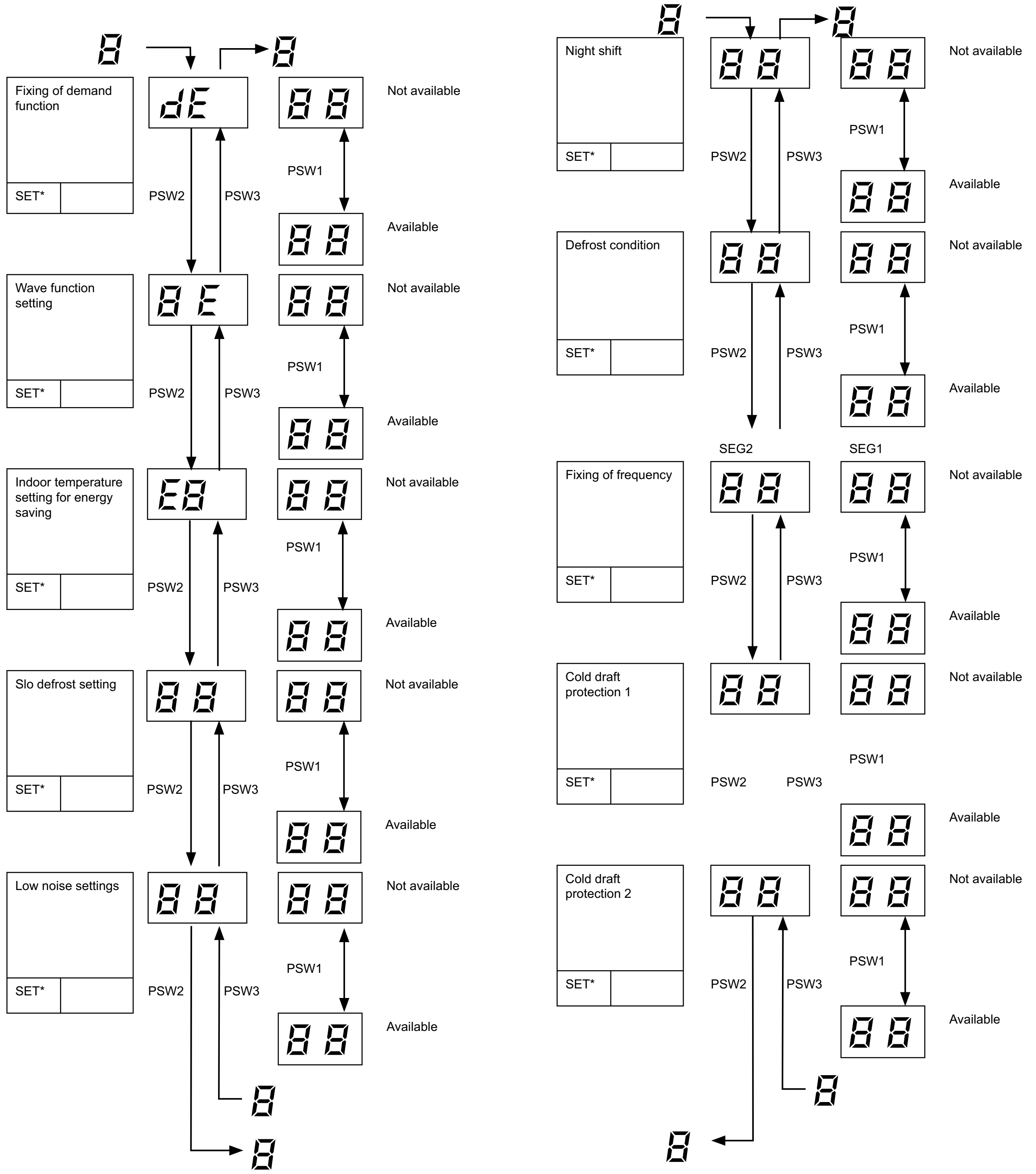
Programming

The optional signals are programmed through the PCB of the outdoor unit.

Setting of the optional signals

The optional signals of the outdoor unit are set up from the PCB of the outdoor unit and push switches PSW1, PSW2 and PSW3.

- **Selecting the optional function**



1. While the outdoor unit is ON, set the following DIP switches on the printed circuit board of the indoor unit as follows: set pin 5 of DSW2 to ON. Because of these settings, the function selection mode becomes available and the following indication appears on the 7-segment display.

   Fixing of demand function **Available**

   d E → ← 1

   This indicates that the “fixing of demand” function is available.
2. By pressing push switches PSW2 and PSW3, you change the input/output terminal name. The flowcharts shown on the figure reflects the changes on the 7-segment display when you press PSW2 and PSW3. (See the flowcharts).
3. After selecting the terminal of the function setting, select the availability function by pressing the PSW1.
4. After setting the pin 5 of DSW2 to OFF, the selected contents are memorized in the PCB of the outdoor unit, and, immediately afterwards, the function selection mode is set to OFF. The memorized data is maintained even when the power supply wires are disconnected.

- **Fixing of demand function**
  This function regulates the running current of the outdoor unit. If the demanded current is above the set current, the indoor unit capacity is reduced. The running current can be regulated both from internal signal. The capacity regulation is 50%, 75%, 100%.This function can be activated when the demand is selected at one of input terminal indications i1 i2, and i3In case that multiple demand functions are set the input terminal indications, i1 i2, and i3The demand running current is selected with 5, 6, 7. PSW1.
- **Wave function setting**
  This function regulates the power consumption of the outdoor unit. While this function is activated, the maximum limit of running is changed as shown:

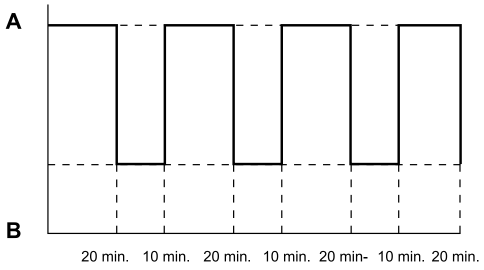
  A. Electricity consumption at cooling (100%)

  B. Electricty consumption at cooling (50, 75%)

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

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

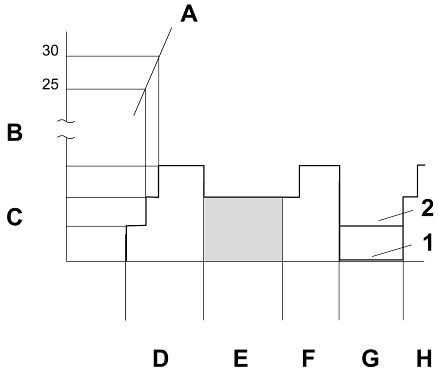
  If the demand function is not set at the input terminal indication, this function can not be activated.



- **Indoor temperature setting for energy saving**
  This function can be activated when the customer wants to reduce the system power consumption. The setting temperature will be increased or decreased depends if it is in cooling or heating mode.
- **Setting defrosting at low-speed**
  Using this option, you can select the speed of the indoor unit fan during the defrost period.
  1. Standard situation: Indoor unit fan stoppage during defrosting.
  2. Optional situation: Speed of the indoor unit fan at slow mode during the defrosting.

Fan speed during defrosting

A: Discharge air temperature (°C)
B: Setting airflow
C: Low Slow Stoppage
D: Heating
E: Comp.stop by thermostat
F: Heating
G: Defrosting
H: Heating

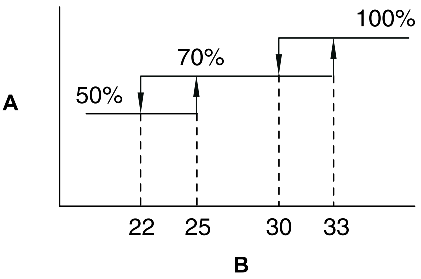


- **Low noise setting**
  This function can be activated and then the compressor frequency is set lower than the normal setting. This function can activate in cooling or heating mode.
- **Night-shift (low noise)**
  When you set the operation mode to night mode (low noise), which is used especially during the nighttime, the cooling capacity is decreased to 60%. You should use the night shift operation only when the remaining cooling capacity can supply the requested temperature.

- **Outdoor fan**

  A. Maximum rotation (rotating speed)

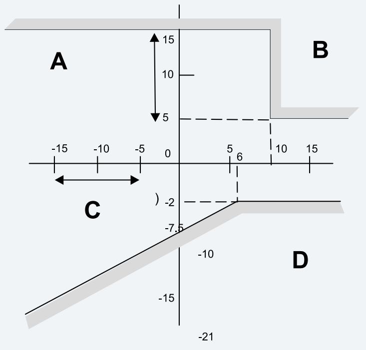
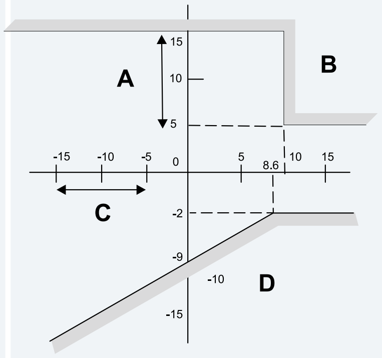
  B. Outdoor temp (ºC)



NOTE

- ***The maximum rotation (rotating speed) is always 100% for the standard unit. (No limitation of the outdoor temperature).***

- **Change of defrost operation conditions**
  This function allows to change the operation conditions in defrosting mode.
  The change is shown in the following illustrations:

Normal defrosting condition		Optional defrosting condition	
Temperature conditions under defrost operation. When change of defrost condition is NOT set.		Temperature conditions under defrost operation. When change of defrost condition is set	

A. Outdoor evaporator temperature ºC (pipe).
B. Defrosting operation stop area.C. Outdoor temperature (ºC).D. Defrosting operation start area.

- **Fixing of frequency**
  No setting for this function is available.

- **Cool draft protection 1**
  This function can be activated, when the minimum discharge Air temperature falls down to 8 ºC in cooling operation. Outdoor fan stop and compressor frequency forcibly declines to prevent discharge air temperature from dropping.

- **Cool draft protection 2**
  This function can be activated, when the minimum discharge Air temperature falls down to 10 ºC in cooling operation. Compressor stop. In this case stoppage code Nº 24 is given.

- **Optional functions (jumper).**

  - **New working range temperature in cooling mode (Only for RAS-(8–12)HRNM).**
    When this function is activated, the working range in cooling mode will increase until –15 ºC. (Not available the individual indoor control).
    To activate this option the jumper JP1 of the outdoor unit PCB1 must be cut.

  - **Fixing cooling mode**
    When this function is activated, the operation mode is fixed in cooling mode. Thermo ON is only available for

COOL or DRY mode at indoor unit. The minimum temperature is -5 ºC.
To activate this option the jumper JP4 of the outdoor unit PCB1 must be cut.

- **Alternative defrost mode**
  When one outdoor unit is connected with one H-LINK system with other outdoor units, is under defrosting, the other outdoor units defrosting is cancelled.
  After one outdoor unit defrosting is completed, another outdoor unit starts defrosting operation.
  To activate this option the jumper JP5 of the outdoor unit PCB1 must be cut.
- **R407C piping**
  If you are using conventional R410A refrigerant instead of R407C refrigerant pressure will be increased. To avoid pressure increase will activate this function.
  To activate this option the jumper JP6 of the outdoor unit PCB1 must be cut.

7. Test Run

Index

7.1 Checking procedure before the test run

When you have finished the installation, perform the test run according to the following procedure. After performing the test run, hand over the system to the customer.

Perform the test run of the indoor units one by one in order.

Make sure that the electrical wiring and the refrigerant piping are correctly connected.

Start the indoor units one by one in order to make sure that the indoor units are correctly numbered.

You should perform the test run according to *Test run procedure using the remote control switch, see on page 176*

DANGER

- ***Do not operate the system until all the check points have been cleared.***
  - ***Measure the resistance between the ground and the terminal of the electrical components. Make sure that the electrical resistance is more than 1 MΩ. Otherwise, do not operate the system until you find the electrical leakage and you repair the electrical leakage. Do not impress the voltage on the terminals for transmission 1 and 2.***
  - ***Make sure that the stop valves of the outdoor unit are fully open. Then, start the system.***
  - ***Make sure that the switch on the main power source has been ON for more than twelve hours in order to warm the compressor oil by means of the oil heater.***
- ***Pay attention to the following items while the system is running.***
  - ***Do not touch any of the parts at the discharge gas side with your hands because the compressor chamber and the pipes at the discharge gas side are hot at a temperature that is higher than 90 °C.***
  - ***DO NOT PUSH THE BUTTON OF THE MAGNETIC SWITCH(ES). If you do, you will cause a serious accident.***
- ***Do not touch any electrical components for more than three minutes after turning OFF the main switch. Make sure that the stop valve of the gas line and the stop valve of the liquid line are fully open.***

Checking procedure

1 Make sure that the stop valve of the gas line and the stop valve of the liquid line are fully open.
2 Make sure that there is no refrigerant leakage. The flare nuts sometimes loosen because of the vibration during the transportation.
3 Make sure that the refrigerant piping and the electrical wiring belong to the same system Make sure that the setting of the unit number of DSW1, DSW6 and RSW1 of indoor units correspond to the system.
4 Make sure that the setting of the DIP switches on the printed circuit board of the indoor units and the outdoor units are correct. Especially, pay attention to the setting of the lift between the indoor units and the outdoor units. Refer to chapter 4 “Electrical Wiring” for details.
5 Make sure that the switch on the main power source has been ON for more than twelve hours in order to warm the compressor oil by means of the oil heater.
6 Check whether or not the electrical wiring of the indoor units and the outdoor units are connected as shown in chapter 4 “Electrical Wiring”.
7 Make sure that each wire terminal (L1,L2,L3 and N or L1 and N) is correctly connected at the power source.

NOTE

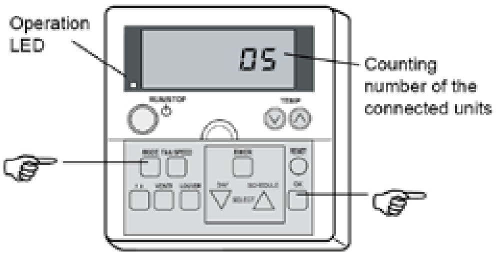
- ***Make sure that the field-supplied electrical components (main switch fuse, fuse-free breaker, earth leakage breaker, wires, conduit connectors and wire terminals) have been properly selected according to the electrical data in the technical catalogue of the unit. Also, make sure that the field-supplied electrical components comply with the national codes and the local codes.***
- ***Use the shielded cables for the field wiring in order to avoid the electrical noise. (The length of the shielded cable should be less than 1000 m. The size of shielded cable should comply with the local codes).***
- ***Make sure that the terminals for the power supply wiring (“L1” to “L1” and “N” to “N” of each terminal board for AC 230 V and the terminals for the intermediate wires between the indoor unit and the outdoor unit (Operating Line: terminals of each terminal board for DC 12 V) match correctly. Otherwise, you may damage some components.***
- ***Check to ensure that the crankcase heater is turned ON for more than 4 hours. The operation is not available within 4 hours after turning ON the power supply.***

- ***Check to ensure that the main source has been ON for more than 12 hours to warm the compressor oil by the oil heater.***
- ***Check to ensure the operating temperature:***
    - ***Cooling operation:***
        - ***Indoor DB 21.5 ºC and above,***
        - ***Indoor WB 16 ºC and above,***
        - ***Outdoor DB 0 ºC and above***
    - ***Heating operation:***
        - ***Indoor DB 27 ºC and below.***

NOTE

- ***Stoppage of compressor operation.***
- ***The compressor is NOT available within 4 hours after turning ON the power supply.***
- ***(Stoppage code: d1-22) If the compressor should be within 4 hours, turn ON the power and wait for more than 30 seconds. Press PSW1 and PSW3 on the outdoor PCB simultaneously for more than 3 seconds. The forced thermo-OFF function (d1-22) is cancelled and the compressor operation is available.***

7.2 Test run procedure using the remote control switch



1 Turn ON the power source to the indoor and outdoor units.

2 Select the TEST RUN mode by using the remote control switch: press MODE switch and the OK switch simultaneously for more than 3 seconds.

a. If the TEST RUN indication and the counting number of the connected units to the remote control switch (for example 05) are displayed on the remote control switch, the connection of remote control cable is correct. Go to point 4.

b. If no indication or 00 appears or if the number of the units that is displayed is smaller than the actual number of the units, there is some abnormal operation. Go to point 3.

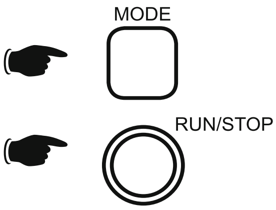
Remote control switch indication	Fault	Inspection points after the power source is OFF
No indication	• The power source is not turned ON. • The connection of the remote control cable is incorrect. • The connect wires of the power supply line are incorrect or loosened.	**a** The connection between the remote control and the unit is correct **b** Connecting points of the remote control cable. **c** The contact of the connectors of the remote cable. **d** The screw fastening of each terminal board.
The counting number of the connected units is incorrect	• The setting of the unit number is incorrect. • The connection of the control cables between each indoor unit is incorrect. (When multiple units are controlled by one remote control switch).	**a** Settings of the DIP switches on the printed circuit board. **b** Wire connection order of the bridge cable. **c** Connecting points of the bridge cable. **d** The contact of the connectors of the bridge cable.
Go back to point 1 after the check.		

3 Select the TEST RUN mode by pressing MODE (COOL or HEAT).

4 Press RUN/STOP switch.

a. The TEST RUN operation will start. (The TEST RUN operation will be finish after two hours. You can also finish the TEST RUN operation by pressing the RUN/STOP switch again).

b. If the unit does not start or if the operation LED on the remote control switch is flickering, there is some abnormal operation. Go to point 6.



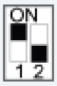
Indication on the remote control	Unit status	Fault	Inspection points after switching off the power supply
The operation LED flickers (1 time/1 sec.) and the unit number and the alarm code 03 flicker	The unit does not start.	The connect wires of the operating line are incorrect or loosened	a. The connection order of each terminal board. The fuse on the PCB may have blown out due to an incorrect wiring. (The fue can be recovered only once by DSW on the PCB). Go to point 7. b. The screw fastening of each terminal board. c. The connection order of the power supply wire between the indoor unit and the outdoor unit
The operation LED flickers (1 time/2 sec.)	The unit does not start.	The connection of the remote control cable is incorrect.	This is the same as the point 3.
The flickering indicator is different from the one above.	The unit does not start. The unit starts once and then stops.	The connection of the thermistor or other connectors is incorrect. There is tripping of the protector	Check the alarm code in chapter 8. (Service personnel should do the checking).
The operation lamp flashes (1 time/1 sec.). And the unit N° 00. Alarm code dd and Unit code E.00 flash.	The unit does not start.	The connection of the remote control cable between indoor units is incorrect.	Check by the abnormality mode table in the Technical Catalogue (do it by service people).
Check the indication on the remote control: Go back to point 1 after the check.			

5 Instructions for the recovery when the fuse of transmission circuit is blown out:

- **a.** Correct the wiring to the terminal board.
- **b.** Set the 1st pin on DSW7 of the indoor unit PCB to ON.

NOTE

Only for RPK-(1.0/1.5): Set the pin on DSW7 of the indoor unit PCB to ON.

Except RPK-(1.0/1.5)FSN(H)2M	Only for RPK-(1.0/1.5)FSN(H)2M
	

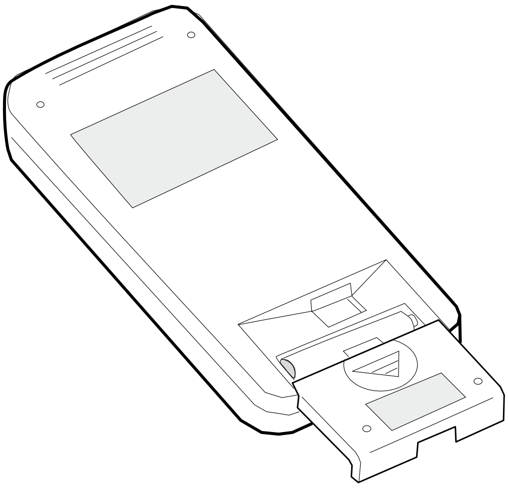
7.3 Test run procedure using the wireless remote control switch

NOTE

If the wired remote control switch is used or if multiple units (SET-FREE, DC INVERTER and UTOPIA series) are operating simultaneously, you cannot perform the test run by means of the remote control swirch. If that is the case, perform the test run by means of the wired remote control switch.

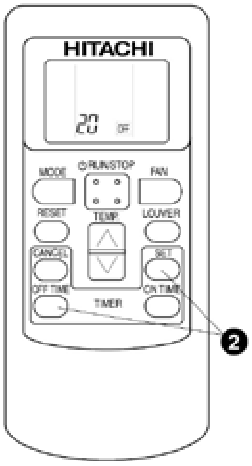
1 : Perform the test run after completing the installation.

- Set the batteries for the remote control switch.
- Turn ON the power source of the indoor and outdoor units.
- The yellow LED on the receiver of the the indoor unit flickers (0.25 seconds ON - 0.25 seconds OFF). Then, the yellow LED turns OFF. While the LED is flickering, the unit will not operate because the unit is initializing.



2 : Set the TEST RUN mode

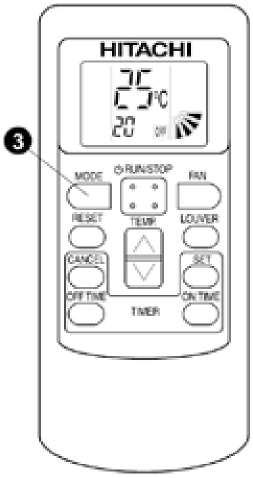
- By pressing the SET switch and the OFF TIME switch simultaneously for more than three seconds. The LCD should look like the LCD on the right figure.
  The TEST RUN mode is not operating.



3 : Set the operating mode by pressing the MODE switch. The TEST RUN mode is operating.

4 : Operate the test run by pointing the transmitter towards the receiver of the indoor unit. Then, press the RUN/STOP switch. When the indoor unit receives the command, the yellow LED of the receiver will turn on briefly.

Make sure that the commands are received well and the selected mode 3) is set correctly.



In the TEST RUN mode, the red RUN LED of the receiver is turned ON and the green TIMER LED flickers (0.5 seconds ON ↔ 0.5 seconds OFF) (*2). Then, the timer switches off for two hours.

NOTE

If the yellow LED does not turn ON, the commands from the remote control switch may not have reached the receiver. Send the commands again.

(*2) In the case of the RPK model, the TIMER LED is turned OFF.

5 : Adjust the angle of the air grille as follows. The air louver has a mechanism for the auto-swing function. Do not move the louver by hand forcefully.

- Select the FAN mode by pressing the MODE switch.
- Set the louver angle by pressing the LOUVER switch.

6 : Stop the test run (normal)

- The test run stops automatically after two hours.
- You stop the test run by pressing the RUN/STOP switch again.
  After the test run has finished, check that the red RUN LED and the green TIMER LED turn OFF.

7 : Stop the test run (abnormal) for the PC-ALHD / PC-ALHZ.

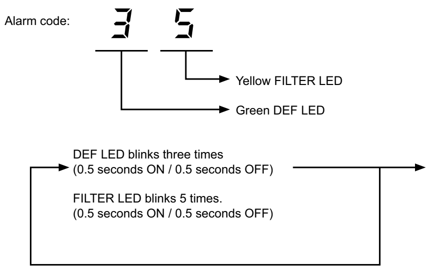
If you cannot use the PC-LH3A because of battery shortage or any other reason, perform the emergency operation as follows.

- COOL switch: Press the COOL switch in order to start the cooling process.
  Press the COOL switch again in order to stop the cooling process.
- HEAT switch: Press the HEAT switch in order to start the heating process.
  Press the HEAT switch again in order to stop the heating process.

NOTE

During the emergency operation, the yellow LED blinks (0.5 seconds ON / 0.5 seconds OFF).

- Alarm code display
  - If some malfunction occurs because of the activation of a safety device or any other reason, the red RUN LED blinks (0.5 seconds ON / 0.5 seconds OFF).
  - Refer to the chapter 8 for the alarm code table.
  - The alarm code displays the number of blinks of the green DEF LED and the yellow FILTER LED as shown bellow:
    Green DEF LED: Digit 2 of the alarm code blinks.
    Yellow FILTER LED: Digit 1 of the alarm code blinks. (Alphabet code: A=10 blinks, B=11 blinks, C=12 blinks, etc.).
  - The red RUN LED (1 second ON / 1 second OFF) means that there is an abnormal transmission between the indoor units and the outdoor unit.

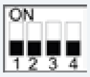


7.4 Test run procedure from the outdoor unit side

The test run procedure from the outdoor unit side is shown below.

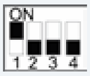
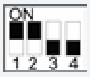
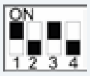
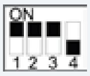
You can set this DIP switch while the power source is ON.

Setting of dip switch

DSW1		
	1	Cooling: Pin 1 ON
	2	Heating: Pin 1, 2 ON
	3	Cooling intermediate season: Pin 1, 3 ON
	4	Heating intermediate season: Pin 1, 2, 3 ON
	5	Manual compressor OFF: Pin 4 ONe

DANGER

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

	Dip switch seting		Operation	Remarks
Test run	1. Setting operation mode		• The indoor unit automatically starts to operate when the test run of the outdoor unit is set. • You can perform the ON/OFF operation from the remote control switch or the DSW1 of the outdoor unit. • Continuous operation during 2 hours is performed without the Thermo-OFF condition.	• Make sure that the indoor units start to operate in accord with the test run of the outdoor unit. • If you start the test run from the outdoor unit and you stop the test run from the remote control switch, the test run function of the remote control switch is cancelled. However, the test run function of the outdoor unit is not cancelled. • If the more than one indoor unit is connected with one remote control switch, all the units start the test run at the same time. Therefore, turn OFF the power source so that the indoor units do not perform the test run. If this is the case, the TEST RUN indication of the remote control switch may flicker. This is not abnormal. • The setting of DSW1 is not required for the test run from the remote control switch.
	(a) Cooling: Set DSW1-1 ON			
	(b) Heating SET DSW1-1 and 2 ON			
	(c) Cooling intermediate season: Set DSW1-1 and 3 ON			
	(d) Heating intermediate season: Set DSW1-1, 2 and 3 ON			
Manual OFF of compressor	2. Forced stoppage of compressor:		• When DSW1-4 is ON during the compressor operation, the compressor stops operating immediately and the indoor unit is under the Thermo-OFF condition. • When DSW1-4 is OFF, the compressor starts to operate after the cancellation of the 3-minute guard.	• Do not turn ON and OFF the compressor frequently
	Set DSW1-1 ON			

7.5 Check list

7.5.1 Check list for IVX Series

Check list on test run

MODEL:	
SERIAL No.	
COMPRESSOR MFG No.	
NAME AND ADDRESS OF CUSTOMER:	
DATE:	

1 Is the rotating direction of the indoor coil fan correct? __________

2 Is the rotating direction of the outdoor coil fan correct? __________

3 Is there any abnormal compressor sound? __________

4 Has the unit been operating for at least twenty (20) minutes? __________

5 Check the room temperature:

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 temperature:

Inlet	DB____ °C WB ____ °C
Outlet	DB____ °C WB ____ °C

7 Check the refrigerant temperature: Operating mode (cool or heat).

Discharge gas temperature	Td = _____ °C
Liquid pipe temperature	Te = _____ °C

8 Check the pressure:

Discharge pressure	Pd = _____kg/cm^{2}G
Suction pressure	Ps = _____kg/cm^{2}G

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 adequate? __________

12 Do the operation control devices operate correctly? __________

13 Do the safety devices operate correctly? __________

14 Has the unit been checked for refrigerant leakage? __________

15 Is the unit clean inside and outside? __________

16 Are all the cabinet panels fixed? __________

17 Are all the cabinet panels free from rattles? __________

18 Is the filter clean? __________

19 Is the heat exchanger clean? __________

20 Are the stop valves open? __________

21 Does the drain water flow smoothly from the drain pipe? __________

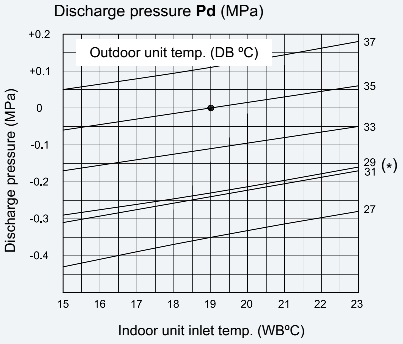
Normal operation pressure

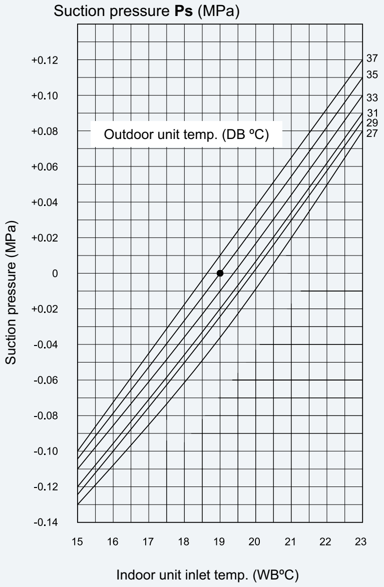
You can check the excess or the deficiency of the refrigerant in comparision with the following charts and actual pressure measurement.

The following checking procedure is useful during test run and maintenance work.

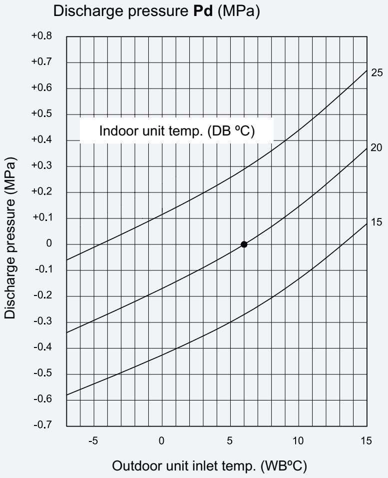
RAS-(3-6)H(V)RNM2E

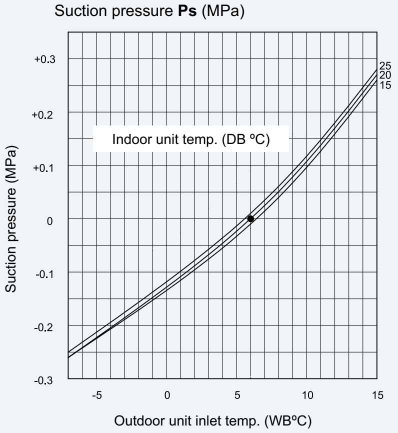
Cooling operation





Heating operation





NOTE

- ***(*) When ambient temperature is less than 30 ºC, outdoor fan volume decrease.***
- ***The above curves indicate pressures under the following conditions:***
  - ***Indoor fan speed: HIGH***
  - ***Indoor total capacity: 100% compared with the capacity of the outdoor unit. (Connected 4 indoor units.)***
  - ***Piping length: 7.5 m (main piping: 5m, branch piping: 2.5 m x 4)***
- ***Do not use the above data for the refrigerant charge procedure.***
  - ***These data should be used as a reference for the checking of operating conditions.***

NOTE

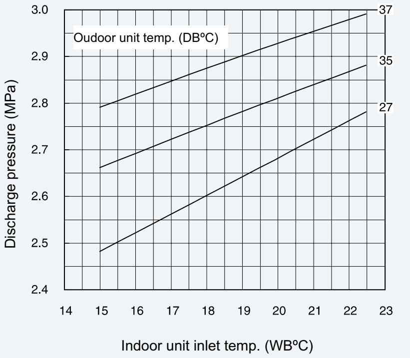
- ***Nominal Pd and Ps Indoor unit combination:***

Nominal value (MPa)			RCI	RCD	RPC	RPI	RPK
Cooling	3 HP	Pd	2.76	2.74	2.76	2.77	2.77
		Ps	0.89	0.84	0.84	0.85	0.85
Heating		Pd	2.56	2.54	2.56	2.57	2.57
		Ps	0.74	0.70	0.70	0.70	0.70
Cooling	4 HP	Pd	2.58	2.56	2.54	2.55	2.52
		Ps	0.87	0.85	0.83	0.83	0.78
Heating		Pd	2.32	2.52	2.68	2.57	2.57
		Ps	0.70	0.70	0.70	0.70	0.70
Cooling	5 HP	Pd	2.70	2.69	2.68	2.69	2.58
		Ps	0.82	0.79	0.83	0.83	0.79
Heating		Pd	2.49	2.55	2.63	2.40	2.40
		Ps	0.68	0.68	0.68	0.68	0.68
Cooling	6 HP	Pd	2.75	2.74	2.73	2.76	2.76
		Ps	0.78	0.76	0.80	0.80	0.78
Heating		Pd	2.64	2.64	2.72	2.72	2.72
		Ps	0.66	0.66	0.66	0.66	0.66

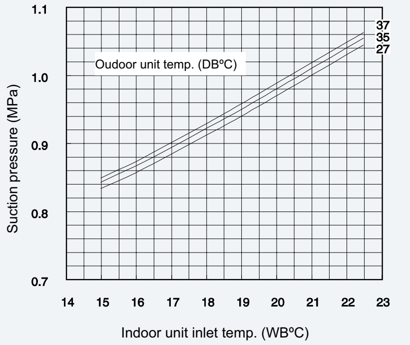
Model RAS-8HRNM

Cooling operation

Discharge pressure **Pd** (MPa)

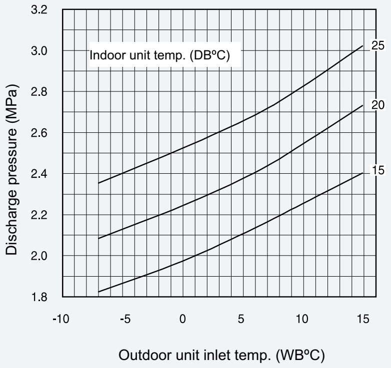


Suction pressure **Ps** (MPa)

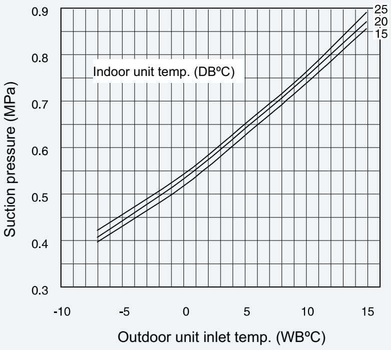


Heating operation

Discharge pressure **Pd** (MPa)



Suction pressure **Ps** (MPa)



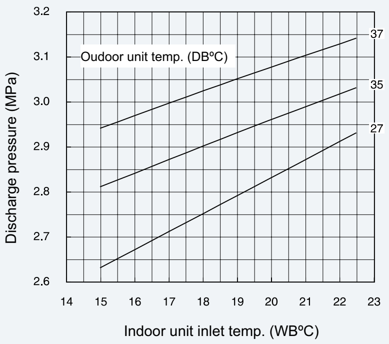
NOTE

- ***The above curves indicate pressures under the following conditions:***
  - ***Indoor fan speed: HIGH***
  - ***Indoor total capacity: 100% compared with the capacity of the outdoor unit. (Connected 4 indoor units.)***
  - ***Piping length: 7.5 m (main piping: 5m, branch piping: 2.5 m x 4)***
- ***Do not use the above data for the refrigerant charge procedure.***
  - ***These data should be used as a reference for the checking of operating conditions.***

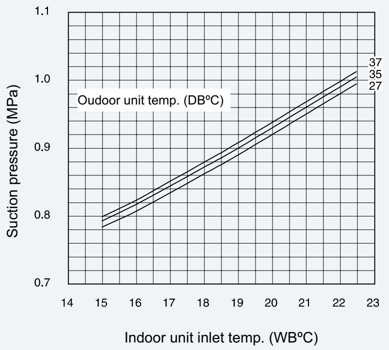
Model RAS-10HRNM

Cooling operation

Discharge pressure **Pd** (MPa)

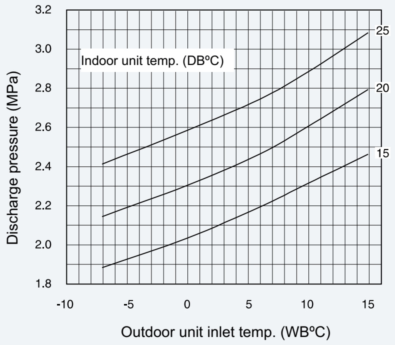


Suction pressure **Ps** (MPa)

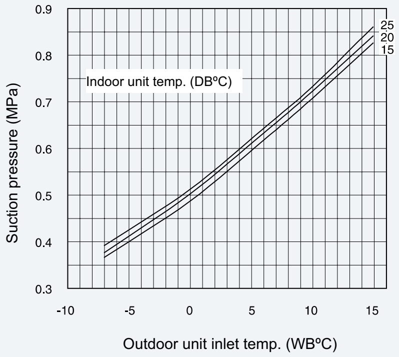


Heating operation

Discharge pressure **Pd** (MPa)



Suction pressure **Ps** (MPa)



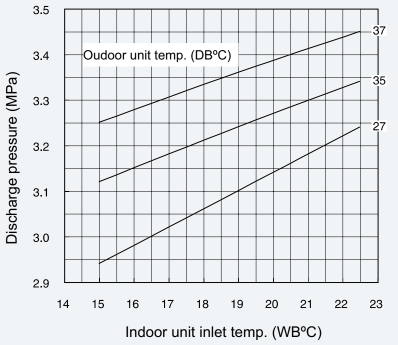
NOTE

- *The above curves indicate pressures under the following conditions:*
  - *Indoor fan speed: HIGH*
  - *Indoor total capacity: 100% compared with the capacity of the outdoor unit. (Connected 4 indoor units.)*
  - *Piping length: 7.5 m (main piping: 5 m, branch piping: 2.5 m x 4)*
- *Do not use the above data for the refrigerant charge procedure.*
  - *These data should be used as a reference for the checking of operating conditions.*

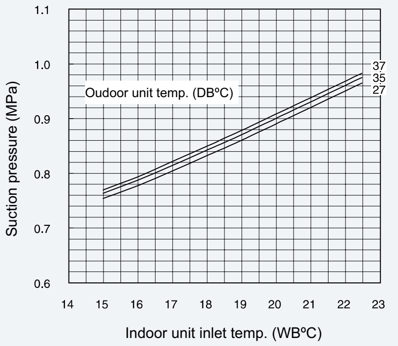
Model RAS-12HRNM

Cooling operation

Discharge pressure **Pd** (MPa)

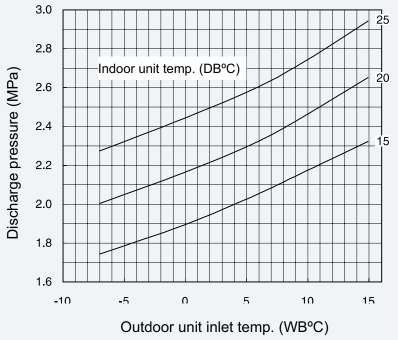


Suction pressure **Ps** (MPa)

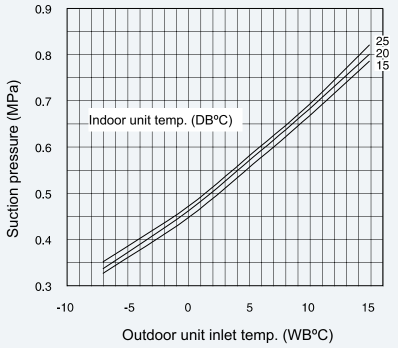


Heating operation

Discharge pressure **Pd** (MPa)



Suction pressure **Ps** (MPa)



NOTE

- ***The above curves indicate pressures under the following conditions:***
  - ***Indoor fan speed: HIGH***
  - ***Indoor total capacity: 100% compared with the capacity of the outdoor unit. (Connected 4 indoor units.)***
  - ***Piping length: 7.5 m (main piping: 5 m, branch piping: 2.5 m x 4)***
- ***Do not use the above data for the refrigerant charge procedure.***
  - ***These data should be used as a reference for the checking of operating conditions.`***

Check list on compressor

CLIENT:	MODEL:	DATE:
Serial N°:	Production date:	Checker:

N°	Check item	Check method	Result	Remarks
1	Is THM9 correctly connected? THM9: Discharge gas thermistor	(1) Is wire of thermistor correctly connected by viewing? (2) Check to ensure the 7-segment indication of Td when comp. is operating. Td: Temperature of THM9		
2	Is thermistor THM9 disconnected?	(1) Check to ensure that thermistor on the top of comp. is correctly mounted by viewing? (2) Check to ensure that actually measured temp. is the same as the indication during check mode.		
3	Is current sensor faulty?	(1) Check to ensure that indication A1 and A2 are 0 during compressor stopping. (2) Check to ensure that indication A1 and A2 are not 0 during compressor running.		
4	Is current sensing part on PCB2 faulty?			
5	Is the direction of current sensor (CTU, CTV) reverse?	Check the direction => by viewing.		
6	Are power source wires, U and V inserted correctly into current sensor?	Check to ensure that wires are correctly inserted.		
7	Is exp. valve (MV1) correctly connected?	Check to ensure that MV1 to CN5A is correctly connected.		
8	Is exp. valve (MV1) coil correctly connected?	Check to ensure that each coil is correctly mounted on the valve.		
9	Are the refrigeration cycle and electrical wiring system incorrectly connected?	Check to ensure that refrigerant is flowing into indoor units by operating one refrigerating cycle only from the outdoor unit.		
10	Is opening of exp. valve completely closed (locked)?	Check the following by the check mode of outdoor units. (1) Liquid pipe temp. (TL) < air intake temp. (Ti) during cooling operation (2) Liquid pipe temp. (TL) > air intake temp. (Ti) during heating operation		
11	Is opening of exp. valve fully opened (locked)?	Check to ensure that liquid pipe temp. is lower than air intake temp. of stopping indoor unit when other indoor units are operating under cooling operation		
12	Are the contacts for comp. magnetic switch CMC1 faulty?	Check the surface of each contact (L1, L2 and L3) by viewing.		
13	Is there any voltage abnormality among L1-L2, L2-L3 and L3- L1?	Check to ensure that voltage imbalance is smaller than 3%. Please note that power source voltage must be within 380V or 220V+10%.		
14	Is the comp. oil acidified during compressor motor burning?	Check to ensure that the oil color is not black.		

Additional information for “Check list on compressor”

Check item	Additional information (mechanism of compressor failure)
1 & 2	The liquid refrigerant return volume to the compressor is controlled by the discharge gas temperature Td when compressor is operating. If Td thermistor is disconnected, the liquid refrigerant return volume will become small by detecting the temperature even if the actual discharge gas temperature is high. Therefore, this abnormal overheating by detecting the temperature operation will result in insulation failure of the motor winding.
3 & 4	Overcurrent control (operating frequency control) is performed by detecting current by the PCB2. In this case, winding insulation failure will occur, since control is not available in spite of actually high current.
5 & 6	The current sensor checks phase and adjusts output electrical wave in addition to the above mentioned items. If fault occurs, the output electrical wave becomes unstable giving stress to the motor winding, resulting in winding insulation failure.
7 & 8	During a cooling operation, SH is controlled by MV of each indoor units. During a heating operation, Td is controlled by MV1. If expansion valves are incorrectly connected, correct control is not available, resulting in compressor seizure depending on liquid refrigerant returning conditions or motor winding insulation failure depending on overheating conditions.
9	If the refrigeration cycle and electrical system are incorrectly connected, abnormally low suction pressure operation is maintained or abnormally high discharge pressure operation is maintained, resulting in giving stress to the compressor, since their correct control is not available.
10	If the expansion valve and electrical system are incorrectly connected, abnormally low suction pressure operation is maintained or abnormally high discharge pressure operation is maintained, resulting in giving stress to the compressor, since their correct control is not available.
11	The compressor may be locked due to the liquid return operation during the cooling operation .
12	In the case that the contacting resistance becomes big, voltage imbalance among each phase will cause abnormal overcurrent.
13	In this case, overcurrent will occur, efficiency will decrease or the motor winding will be excessively heated.
14	In the case, it will result in motor burning or compressor failure

7.5.2 Check list for ES Series

Check list on test run

MODEL:	
SERIAL No.	
COMPRESSOR MFG No.:	
NAME AND ADDRESS OF CUSTOMER:	
DATE:	

1 Is the rotating direction of the indoor coil fan correct? __________

2 Is the rotating direction of the outdoor coil fan correct? __________

3 Is there any abnormal compressor sound? __________

4 Has the unit been running for at least twenty (20) minutes? __________

5 Check the temperature of the room:

Inlet	N° 1	DB____ °C WB ____ °C	N° 2	DB____ °C WB ____ °C	N° 3	DB____ °C WB ____ °C	N° 4	DB____ °C WB ____ °C
Outlet		DB____ °C WB ____ °C		DB____ °C WB ____ °C		DB____ °C WB ____ °C		DB____ °C WB ____ °C
Inlet	N° 5	DB____ °C WB ____ °C	N° 6	DB____ °C WB ____ °C	N° 7	DB____ °C WB ____ °C	N° 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 outside temperature:

Inlet	DB____ °C WB ____ °C
Outlet	DB____ °C WB ____ °C

7 Check the temperature of the refrigerant: Operating mode (cooling or heating).

Discharge gas temperature	Td = _____ °C
Liquid pipe temperature	Te = _____ °C

8 Check the pressure:

Discharge pressure	Pd = _____kg/cm^{2}G
Suction pressure	Ps = _____ kg/cm^{2}G

9 Check the voltage:

Nominal voltage	_____V	—	—
Service voltage	L1–L2______V	L1–L3______V	L2–L3______V
Initial voltage	_____V	—	—
Phase imbalance	1-(V/Vm) =	—	—

10 Check the compressor input running current

Input	_____kW
Running current	______A

11 Is the refrigerant charge adequate? __________

12 Do the operating control devices operate correctly? __________

13 Do the safety devices operate correctly? __________

14 Has the unit been checked for refrigerant leaks? __________

15 Is the unit clean inside and outside? __________

16 Are all the cabinet panels fixed? __________

17 Are all the cabinet panels free from rattles? __________

18 Is the filter clean? __________

19 Is the heat exchanger clean? __________

20 Are the stop valves open? __________

21 Does the drain water flow smoothly from the drain pipe? __________

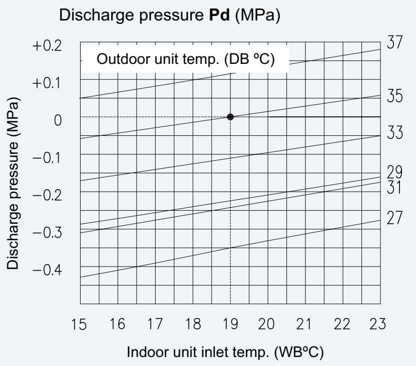
Normal operation pressure

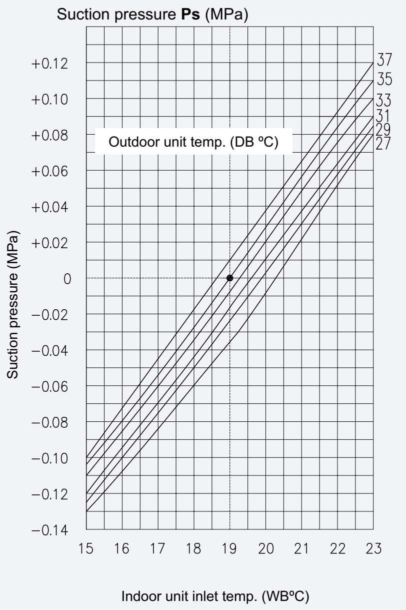
You can check the excess or the deficiency of the refrigerant in comparision with the following charts and actual pressure measurement.

The following checking procedure is useful during test run and maintenance work.

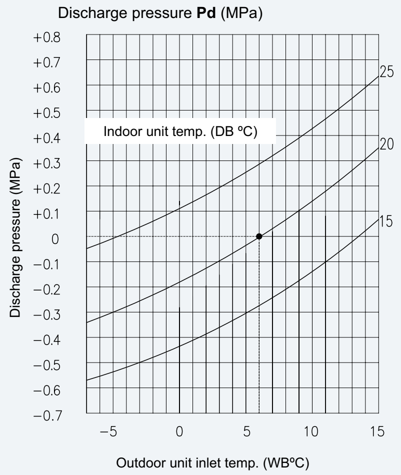
MODEL RAS-(2-6)H(V)RN(S)2(E)

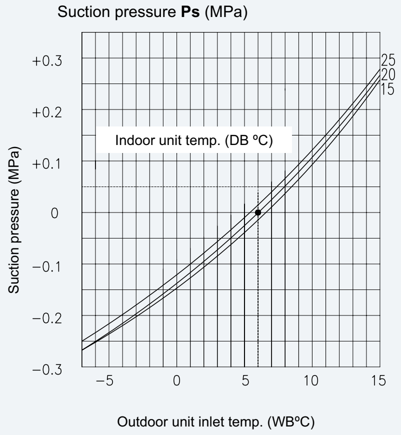
Cooling operation





Heating operation





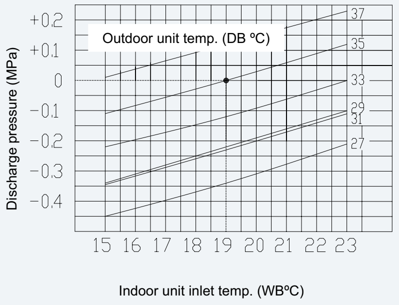
NOTE

- ***(*) When ambient temperature is less than 30 °C, outdoor fan volume decrease.***

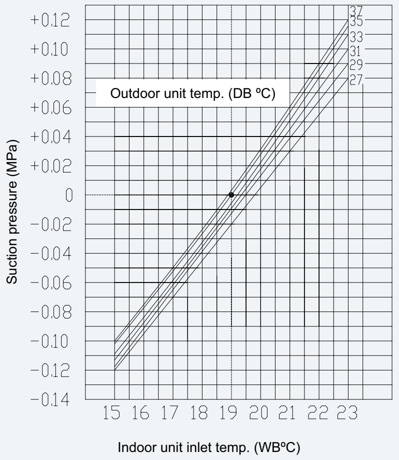
MODEL RAS-(8/10)HRNSE

Cooling operation

Discharge pressure **Pd** (MPa)

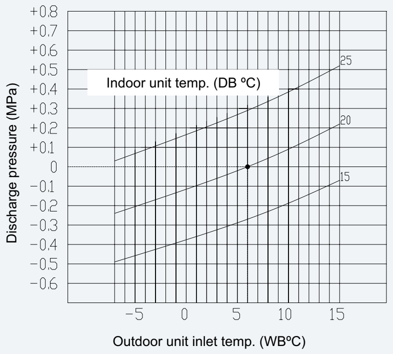


Suction pressure **Ps** (MPa)

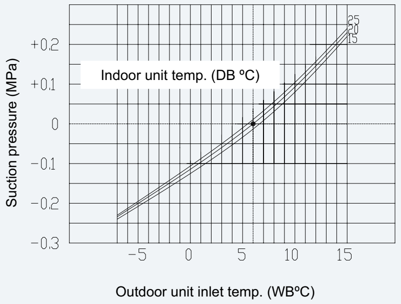


Heating operation

Discharge pressure **Pd** (MPa)



Suction pressure **Ps** (MPa)



NOTE

- ***(*) When ambient temperature is less than 30 ºC, outdoor fan volume decrease.***
- ***The above curves indicate pressures under the following conditions:***
  - ***Indoor fan speed: HIGH***
  - ***Indoor total capacity: 100% compared with the capacity of the outdoor unit. (Connected 1indoor unit for RAS-(2-6)H(V)RN(S)2(E) and connected to two indoor for RAS-(8/10)HRNSE)***
  - ***Piping length: 7.5 m (main piping: 5m, branch piping for RAS-(2-6)H(V)RN(S)2(E): 2.5 m x 4, branch piping for RAS-(8/10)HRNSE): 2.5 m x 2).***
- ***Do not use the above data for the refrigerant charge procedure.***
  - ***These data should be used as a reference for the checking of operating conditions.***
  - ***Nominal Pd and Ps Indoor unit combination:***

Nominal value (MPa)			RCI	RCD	RPC	RPI	RPK	RPF(I)
Cooling	2 HP	Pd	2.73	2.88	2.85	2.89	2.84	2.78
		Ps	0.88	0.78	0.82	0.80	0.81	0.80
Heating		Pd	2.37	2.83	2.51	2.65	2.68	2.54
		Ps	0.66	0.67	0.67	0.67	0.67	0.67
Cooling	2.5 HP	Pd	2.79	2.91	2.90	2.93	2.95	2.88
		Ps	0.87	0.81	0.84	0.81	0.78	0.78
Heating		Pd	2.37	2.53	2.35	2.50	2.72	2.58
		Ps	0.66	0.66	0.66	0.66	0.66	0.66
Cooling	3 HP	Pd	2.79	3.13	2.98	2.98	2.95	—
		Ps	0.99	0.78	0.78	0.80	0.81	—
Heating		Pd	2.20	2.68	2.61	2.80	2.67	—
		Ps	0.66	0.63	0.63	0.63	0.63	—
Cooling	4 HP	Pd	2.83	2.91	2.92	2.92	2.91	—
		Ps	0.88	0.82	0.77	0.79	2	—
Heating		Pd	2.32	2.68	2.86	2.73	3.11	—
		Ps	0.65	0.68	0.64	0.63	0.64	—
Cooling	5 HP	Pd	2.87	2.90	2.91	2.92	—	—
		Ps	0.88	0.82	0.77	0.79	—	—
Heating		Pd	2.50	2.84	2.63	2.37	—	—
		Ps	0.65	0.66	0.66	0.66	—	—
Cooling	6 HP	Pd	2.95	—	3.00	2.99	—	—
		Ps	0.77	—	0.73	0.79	—	—
Heating		Pd	2.65	—	2.71	2.38	—	—
		Ps	0.65	—	0.65	0.65	—	—
Cooling	8 HP	Pd	2.93	2.97	2.97	2.98	2.97	—
		Ps	0.87	0.82	0.77	0.79	0.71	—
Heating		Pd	2.31	2.68	2.86	2.73	3.21	—
		Ps	0.65	0.62	0.63	0.63	0.63	—
Cooling	10 HP	Pd	2.95	2.98	3.01	3.00	—	—
		Ps	0.82	0.79	0.76	0.81	—	—
Heating		Pd	2.47	2.54	3.00	2.35	—	—
		Ps	0.65	0.65	0.65	0.65	—	—

Check list on compressor

CLIENT:	MODEL:	DATE:
Serial No.:	Production date:	Checker:

N°	Check item	Check method	Result	Remarks
1	Is THM9 correctly connected? THM9: Discharge gas thermistor	(1) Is wire of thermistor correctly connected by viewing? (2) Check to ensure the 7-segment indication of Td when comp. is operating. Td: Temperature of THM9		
2	Is thermistor THM9 disconnected?	(1) Check to ensure that thermistor on the top of comp. is correctly mounted by viewing? (2) Check to ensure that actually measured temp. is the same as the indication during check mode.		
3	Is current sensor faulty?	(1) Check to ensure that indication A1 and A2 are 0 during compressor stopping. (2) Check to ensure that indication A1 and A2 are not 0 during compressor running.		
4	Is current sensing part on PCB2 faulty?			
5	Is the direction of current sensor (CTU, CTV) reverse?	Check the direction => by viewing.		
6	Are power source wires, U and V inserted correctly into current sensor?	Check to ensure that wires are correctly inserted.		
7	Is exp. valve (MV1) correctly connected?	Check to ensure that MV1 to CN5A is correctly connected.		
8	Is exp. valve (MV1) coil correctly connected?	Check to ensure that each coil is correctly mounted on the valve.		
9	Are the refrigeration cycle and electrical wiring system incorrectly connected?	Check to ensure that refrigerant is flowing into indoor units by operating one refrigerating cycle only from the outdoor unit.		
10	Is opening of exp. valve completely closed (locked)?	Check the following by the check mode of outdoor units. (1) Liquid pipe temp. (TL) < air intake temp. (Ti) during cooling operation (2) Liquid pipe temp. (TL) > air intake temp. (Ti) during heating operation		
11	Is opening of exp. valve fully opened (locked)?	Check to ensure that liquid pipe temp. is lower than air intake temp. of stopping indoor unit when other indoor units are operating under cooling operation		
12	Are the contacts for comp. magnetic switch CMC1 faulty?	Check the surface of each contact (L1, L2 and L3) by viewing.		
13	Is there any voltage abnormality among L1-L2, L2-L3 and L3- L1?	Check to ensure that voltage imbalance is smaller than 3%. Please note that power source voltage must be within 380 V or 220 V+10%.		
14	Is the comp. oil acidified during compressor motor burning?	Check to ensure that the oil color is not black.		

Additional information for “Check list on compressor”

Check item	Additional information (mechanism of compressor failure)
1 & 2	The liquid refrigerant return volume to the compressor is controlled by the discharge gas temperature Td when compressor is operating. If Td thermistor is disconnected, the liquid refrigerant return volume will become small by detecting the temperature even if the actual discharge gas temperature is high. Therefore, this abnormal overheating by detecting the temperature operation will result in insulation failure of the motor winding.
3 & 4	Overcurrent control (operating frequency control) is performed by detecting current by the PCB2. In this case, winding insulation failure will occur, since control is not available in spite of actually high current.
5 & 6	The current sensor checks phase and adjusts output electrical wave in addition to the above mentioned items. If fault occurs, the output electrical wave becomes unstable giving stress to the motor winding, resulting in winding insulation failure.
7 & 8	During a cooling operation, SH is controlled by MV of each indoor units. During a heating operation, Td is controlled by MV1. If expansion valves are incorrectly connected, correct control is not available, resulting in compressor seizure depending on liquid refrigerant returning conditions or motor winding insulation failure depending on overheating conditions.
9	If the refrigeration cycle and electrical system are incorrectly connected, abnormally low suction pressure operation is maintained or abnormally high discharge pressure operation is maintained, resulting in giving stress to the compressor, since their correct control is not available.
10	If the expansion valve and electrical system are incorrectly connected, abnormally low suction pressure operation is maintained or abnormally high discharge pressure operation is maintained, resulting in giving stress to the compressor, since their correct control is not available.
11	The compressor may be locked due to the liquid return operation during the cooling operation .
12	In the case that the contacting resistance becomes big, voltage imbalance among each phase will cause abnormal overcurrent.
13	In this case, overcurrent will occur, efficiency will decrease or the motor winding will be excessively heated.
14	In the case, it will result in motor burning or compressor failure

8. Troubleshooting

Index

8.1 Initial troubleshooting for IVX an ES Series

8.1.1 Checking by means of the 7-segment display

Simple checking procedure by means of the 7-segment display

1. Turn on all the indoor units which are connected to the outdoor unit.
2. Turn on the outdoor unit
3. Auto-addressing starts. (Outdoor unit printed circuit board PCB1).

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

- Disconnection of the power supply to the Indoor Unit.
- Disconnection of the operating line between the outdoor and the indoor units.
- Duplication of the Indoor Unit number.
- **Normal case:**
  The 7-segment display of the outdoor unit is not indicated.
- **Abnormal case:**
  If there is something wrong, the 7-segment display of the outdoor unit displays the following indications:

Cause	Indication	Remarks
A. The indoor units are not supplied with power.	03	continues to flash after 30 seconds.
B. Disconnection of the operating line between the outdoor units and the indoor units.	03	continues to flash after 30 seconds.
C. Duplicated settings of the indoor unit number on the rotary switch RSW (Refer to the section *Troubleshooting by alarm code*, *see on page 207* for the description of the alarm code “35”).	—	—

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

- **The LED and the LCD are not indicated.**
- **Not operated**

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

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

NOTE

- *1): Refer to section **Self-checking of the remote control switch**, see on page 301.
- *2): Refer to section **Self-checking procedure of PCB by means of the Remote Control Switch**, see on page 299.

8.1.3 Abnormal transmission between the remote control switch and the indoor unit

- **RUN LED on the remote control switch:**

Flickering every 2 seconds.

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

NOTE

- ***1): Refer to section *Self-checking of the remote control switch*, see on page 301.**
- ***2): Refer to section *Self-checking procedure of PCB by means of the Remote Control Switch*, see on page 299.**

8.1.4 Abnormal operation of the devices

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
RUN LED is ON and the LCD is indicated. However, the system does not operate (For example, the indoor fan, the outdoor fan or the compressor does not operate)	Failure of the indoor unit fan motor	Disconnected coil	Measure the coil resistance by means of the tester	Replace the Indoor unit fan motor
		Burnt-out coil	Measure the insulation resistance	
	Failure of the outdoor unit fan motor	Disconnected coil	Measure the coil resistance by means of the tester	Replace the outdoor unit fan motor
		Burnt-out coil	Measure the insulation resistance	
	Failure of the magnetic switch for the outdoor unit fan motor	Insufficient contacting	Measure the voltage between the contacting parts	Replace PCB for the outdoor unit
	Failure of the comp. motor		Measure the resistance between two wires	Replace the compressor
	Failure of the comp.		Check for an abnormal sound from the Comp.	
	Failure of the magnetic switch for comp.	Insufficient contacting	Check that the magnetic switch activates correctly or not	Replace the magnetic switch
	Failure of one of PCBs	Disconnected wiring to PCB	Check the connections	Correctly connect the wiring
		Failure of PCB	Check PCB by means of the self-check mode *1)	Replace PCB if it failed

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
The Comp. does not stop or start even if the setting temperature on the LCD changes to *3)	Failure of air inlet thermistor	Failure of thermistor	Check it by self-checking *2)	Replace or correctly connect the wires if Abnormal Operation exists
		Disconnection of thermistor		
	Abnormal operation of the remote control switch cord			
	Failure of the indoor unit PCB		Check PCB by means of the self-check mode *1)	Replace PCB if it failed
	Incorrect optional setting		Check the setting condition of “remote control thermostat” by means of the optional setting Setting and control: “00”: Control by means of the indoor thermistor for the suction air “01”: Control by means of the thermostat of the remote control switch “02”: Control by means of the average value of the indoor thermistor for the suction air and the thermostat of the remote control switch	If the thermostat of the remote control switch is not used, set at “00”
	Incorrect Input/Output setting		Check setting condition of “i1” and “i2” by Input/Output setting. * Setting and Control: “01”: Room thermostat (Cooling) “02”: Room thermostat (Heating)	In case that room thermostat is not used, set for input signal actually used. If no signal is used, set at “00”
Indoor fan speed does not change	Failure of the Discharge Air Temp. Thermistor	Failure of the Thermistor	Check the Thermistor by means of the self-check mode *2)	Replace or Correctly connect the wiring when it is abnormal
		Disconnected Wire of the Thermistor		
	Failure of the Remote Control Switch		Check it by means of the self-check mode *1)	Replace if it failed
	Failure of PCB for the indoor unit			Replace if PCB fails
No defrost operation mode is available during the heating process or the defrost operation continues	Failure of thermistor for outdoor evaporating temp. during heating	Failure of thermistor	Replace or correctly connect when it is abnormal	
		Disconnected wire of thermistor		
	Failure of 4-way valve	Disconnected 4-way valve coil	Measure the resistance of coil	Replace the 4-way valve
		Incorrect activation of 4-way valve	Enforced power supply	
	Disconnected control wires between indoor unit and outdoor unit		Check the connectors	Correctly connect the wiring
	Failure of the outdoor units of PCB	Disconnected wiring to PCB	Check the connectors	Correctly connect the wiring
		Failure of PCB	Check PCB by means of the self-check mode *1)	Replace PCB when the check mode is not available
	Failure of the Indoor Unit of PCB	Disconnected wiring to PCB	Check the connectors	Correctly connect the wiring
		Failure of the PCB	Check PCB by means of the self-check mode *1)	Replace if PCB fails
The LED and the LCD on the remote control switch remain ON	Failure of PCB in the indoor unit or the remote control switch			

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

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

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Insufficient heating process	Indoor heat load is greater than the heating capacity		Calculate the heat load	Replace the unit with a bigger unit
	Excessively low suction pressure	Gas leakage or insufficient refrigerant charge	Measure superheat	Correctly charge the refrigerant after the gas leakage check and repairing
		Excessively small diameter or long piping	Measure the field supplied piping	Use the specified pipes
		Failure or malfunction of the expansion valve	Check for clogging	Remove the clogging
			Check the connection cord and the connector	Replace the connector
			Is there an operation sound from the coil?	Replace the coil
			Is the thermistor on the compressor normal?	Replace the thermistor
			Is the thermistor installed correctly on compressor?	Correctly install the thermistor
		Clogging of I.U./O.U. strainer	Check the temp. difference between the inlet and the outlet of strainer	Replace the strainer for the outdoor unit or the indoor unit
		Clogging of suction piping	Check the temp. difference of each part	Remove the clogging
		Insufficient air flow through the outdoor unit heat exchanger	Is the outdoor unit heat exchanger clogged?	Remove the clogging
			Are there any obstacles at the inlet or the outlet of outdoor unit?	Remove the obstacles
			Is the service area for the outdoor unit sufficient?	Secure a sufficient service area
			Check the speed of the outdoor unit fan	Replace the fan motor
		Excessively low air temp. through the outdoor unit heat exchanger	Check for any short-circuited air to the outdoor unit	Remove the cause of the short-circuited air
		Defrosting is insufficiently completed	Check the thermistor for the defrost operation	Replace the thermistor for the defrost operation
	Excessively high discharge pressure	Insufficient air flow to the indoor unit heat exchanger	Check the filter for a clogging	Remove the clogging
			Check for any obstacles at the inlet or the outlet of the indoor unit	Remove the obstacles
			Check the indoor fan speed	Replace the fan motor
		Excessively high air temp. to the indoor unit heat exchanger	Check whether or not the short-circuited air exists	Remove the cause of the short-circuited air
		Excessively charged refrigerant	Check the refrigerant quantity *4)	Correctly charge the refrigerant
		Non-condensate gas in ref. cycle	Check the refrigerant quantity *4)	Recharge the refrigerant after the vacuum pumping
		Clogging of the discharge pr. piping	Check for clogging	Remove the clogging
	Malfunction or internal leakage of the 4-way valve		Check the temp. difference at the inlet and the outlet of the 4-way valve	Replace the 4-way valve
	Malfunction of the check valve of the outdoor unit		Check the temp. difference at the inlet and the outlet of the check valve	Replace the check valve
	Excessively high suction pressure	Malfunction or internal leakage of 4-way valve	Check the temp. difference at the inlet and the outlet of the 4-way valve	Replace the 4-way valve
	Discharge temp. of the indoor unit is unstable		Check the expansion valve of the indoor unit in the same system	Replace the failed expansion valve of the indoor unit

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Cooling or heating process with an abnormal sound	Foreign particles inside of the fan casing		Visually inspect it	Remove the foreign particles
	Indoor unit fan runner is hitting the casing		Visually inspect it	Adjust the position of the fan runner
	Outdoor unit propeller fan is hitting the shroud		Visually inspect it	Adjust the position of the propeller fan
	Abnormal sound from the compressor	Faulty Installation	Check that each part is tightly fixed	Tightly fix each part
		Liquid ref. compression	Adjust the suction gas temp. and pressure	Ensure superheat
		Wear or breakage of the internal comp. parts	Abnormal Sound from the Inside of the Compressor	Replace the compressor
		No heating by the oil heater	Check the Resistance (Oil Heater, Fuse)	Replace the oil heater or the fuse
	Humming sound from the magnetic conductor		Check the surface of the contacts	Replace the magnetic switch
	Abnormal vibration of the cabinets		Check each fixing screw	Tightly fix each screw
Outdoor fan does not operate when the compressor operates	Obstacle at the outdoor fan		Check the obstacles	Remove the obstacles
	Watching condition for the heating process		Wait for the switching of the 4-Way Valve (1 ~ 3 minutes)	If the 4-Way Valve does not switch, check for insufficient refrigerant
Indoor fan does not operate when the compressor operates	Discharge pressure does not increase higher than 1.5 Mpa due to the insufficient refrigerant		Check the operation pressure *5)	Add the refrigerant
	Disconnected Wiring for the Indoor Fan		Check the wiring	Connect the wiring correctly

NOTE

- ***1): Refer to section Self-checking of the remote control switch,*** *see on page 301*
- ***2): Refer to section Self-checking procedure of PCB by means of the Remote Control Switch,*** *see on page 299.*
- ***3): Even if the remote control switches are normal, the compressor does not operate under the following conditions:***
  1. ***Indoor temp. is lower than 21 °C or outdoor temp. Is lower than -5 °C during the cooling process (DB).***
  2. ***Indoor temp. is higher than 27 °C (DB) or outdoor temp. is higher than 15 °C (WB) during the heating process.***
  3. ***When a cooling (or heating) process signal is given to the outdoor unit and a different mode as heating (or cooling) process signal is given to the indoor units.***
  4. ***When an emergency stop signal is given to outdoor unit.***
- ***4): Refer to chapter 7 of "Technical Catalogue".***
- ***5): Refer to chapter 10 of "Technical Catalogue".***

8.2 Troubleshooting procedure for IVX an ES Series

8.2.1 Alarm code

On-screen displays during abnormal operation

- Malfunction

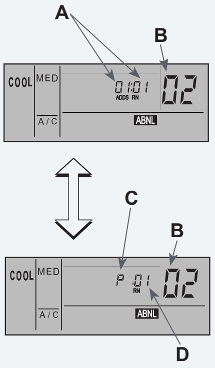
The RUN (red) indicator flashes.The ALARM indicator appears on the liquid crystal display.The screen also displays the indoor unit number -A-, the alarm code -B- and the model code -C-. If there are various indoor units connected, the above mentioned information is shown for each one of them -D-.Write down the indications and contact your HITACHI service supplier.

- Power supply failure

All displays disappear.If the unit stops due to a power shortage, it will not start again, even though the power comes back on. Carry out the start-up operations again.If the power failure lasts less than 2 seconds, the unit will start again automatically.

- Electrical noise

The displays can disappear from the screen and the unit can stop. This is because the microcomputer has been activated to protect the unit from electrical noise.



NOTE

If the wireless remote control is used for the wall-type indoor unit, remove the connectors (CN25) that are connected to the indoor PCB. Otherwise the unit will not work. The stored data cannot be erased unless the remote control is initialised.

Alarm codes for IVX and ES Series

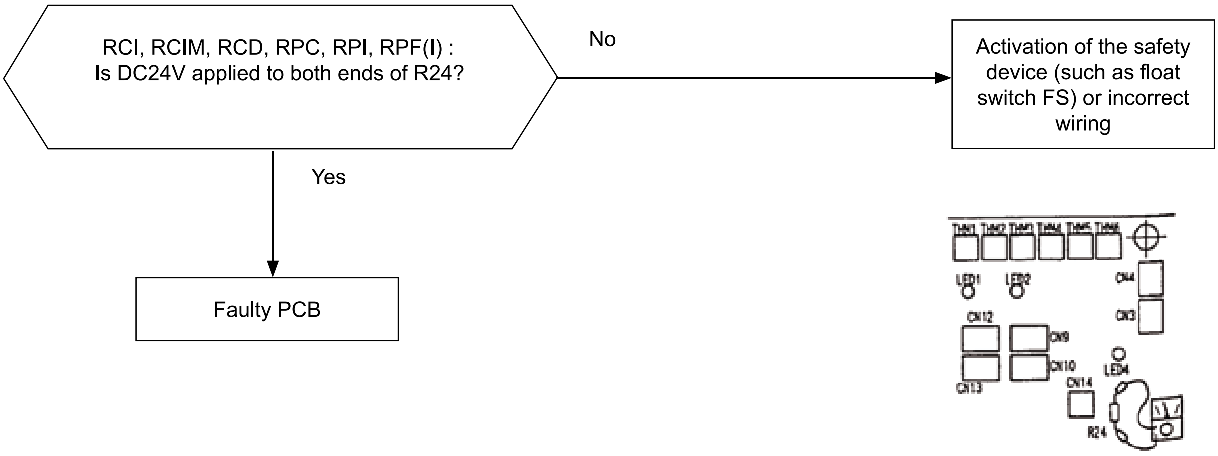
Code No.	Category	Type of Abnormality	Main cause
01	Indoor unit	Activation of protection device	Failure of fan motor, drain discharge, PCB, relay, float switch activated.
02	Outdoor unit	Activation of protection device	Activation of PSH, locked motor, abnormal operation in the power supply phase.
03	Transmission	Abnormality between indoor (or outdoor) and outdoor (or indoor) units	Incorrect wiring. Failure of PCB. Tripping of fuse. Power supply OFF.
04		Abnormal operation between inverter and control PCB	Transmission failure between inverter PCBs
05	Power supply	Abnormal power supply	Power source with abnormal wave pattern.
06	Voltage drop	Voltage drop due to excessively low or high voltage in outdoor unit	Voltage drop in power supply. Incorrect wiring or insufficient capacity of power supply wiring.
07	Cycle	Drop in discharge gas overheating	Excessive refrigerant charge. Expansion valve lock open.
08		Increase in discharge gas temperature	Insufficient refrigerant charge, refrigerant leakage. Expansion valve closed or clogged.
11	Sensor in indoor unit	Inlet air thermistor	Failure of thermistor, sensor, connection.
12		Outlet air thermistor	
13		Anti-freeze thermistor	
14		Gas pipe thermistor	
15		Fresh Outdoor Air Thermistor (Econofresh)	
19		Protection device for fan motor is triggered	Failure of fan motor
20	Outdoor unit sensor	Compressor thermistor	Failure of thermistor, sensor, connection.
22		Outside air thermistor	
24		Evaporation thermistor	
31	System	Incorrect setting of outdoor and indoor units	Incorrect setting of capacity code.
35		Incorrect setting of indoor unit number	Duplication of indoor unit number.
38		Abnormality of protective circuit in outdoor unit	Failure of indoor unit PCB; incorrect wiring; connection to indoor unit PCB.
41	Pressure	Cooling overload (possible activation of high pressure device)	O.U. pipe thermistor temp. is higher than 55 ºC and the compressor top temp. is higher than 95 ºC, O.U. protection device is activated.
42		Heating overload (high-pressure device may be activated)	If I.U. freeze protection thermistor temp. is higher than 55 ºC and compressor top temp. is higher than 95 ºC, O.U. protection device is activated.
47		Activation of protection device for low pressure drop	Stoppage due to excessive decrease of evaporating temperature (Temp < -35 ºC) is activated 3 times in one hour, motor locked in heating mode.
48	Inverter	Activation of overcurrent protection	Overload, overcurrent. Failure of DIP IPM, IPM or PCB2, heat exchanger clogged, locked compressor.
51		Abnormality in inverter current sensor	Incorrect wiring of current sensor. Failure of control PCB, DIP IPM, IPM or PCB2.
52		Abnormal thermistor of inverter fin (for inverter fin temperature)	Shorcircuit or incorrect wiring
53		Activation for protection of DIP IPM, IPM or PCB2	Abnormality of DIP IPM or PCB2 Compressor failure, heat exchanger clogged.
54		Increase in inverter fin temperature	Abnormal inverter fin thermistor Heat exchanger clogged. Abnormal outdoor fan.
55		Abnormality of DIP IPM, IPM or PCB2	Failure of DIP-IPM, IPM or PCB2.
57	Outdoor fan	Fan motor abnormality	Disconnected wire or incorrect wiring between control PCB and inverter PCB. Incorrect wiring or abnormality in fan motor.
59	Inverter	Abnormal inverter fin thermistor (for the temperature of inverter fin)	Lost terminals, disconnected wire, failure of inverter thermistor.
EE	Compressor	Compressor protection alarm	Compressor failure.

Code No.	Category	Type of Abnormality	Main cause
b1	IU No. setting	Incorrect unit No. setting	Over 64 indoor units, setting by no. or indoor unit address.
96	Sensor on KPI Unit	Room temperature thermistor	Failure of thermistor, sensor, connection.
97		Outdoor temperature thermistor	

◆ Troubleshooting by alarm code

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

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



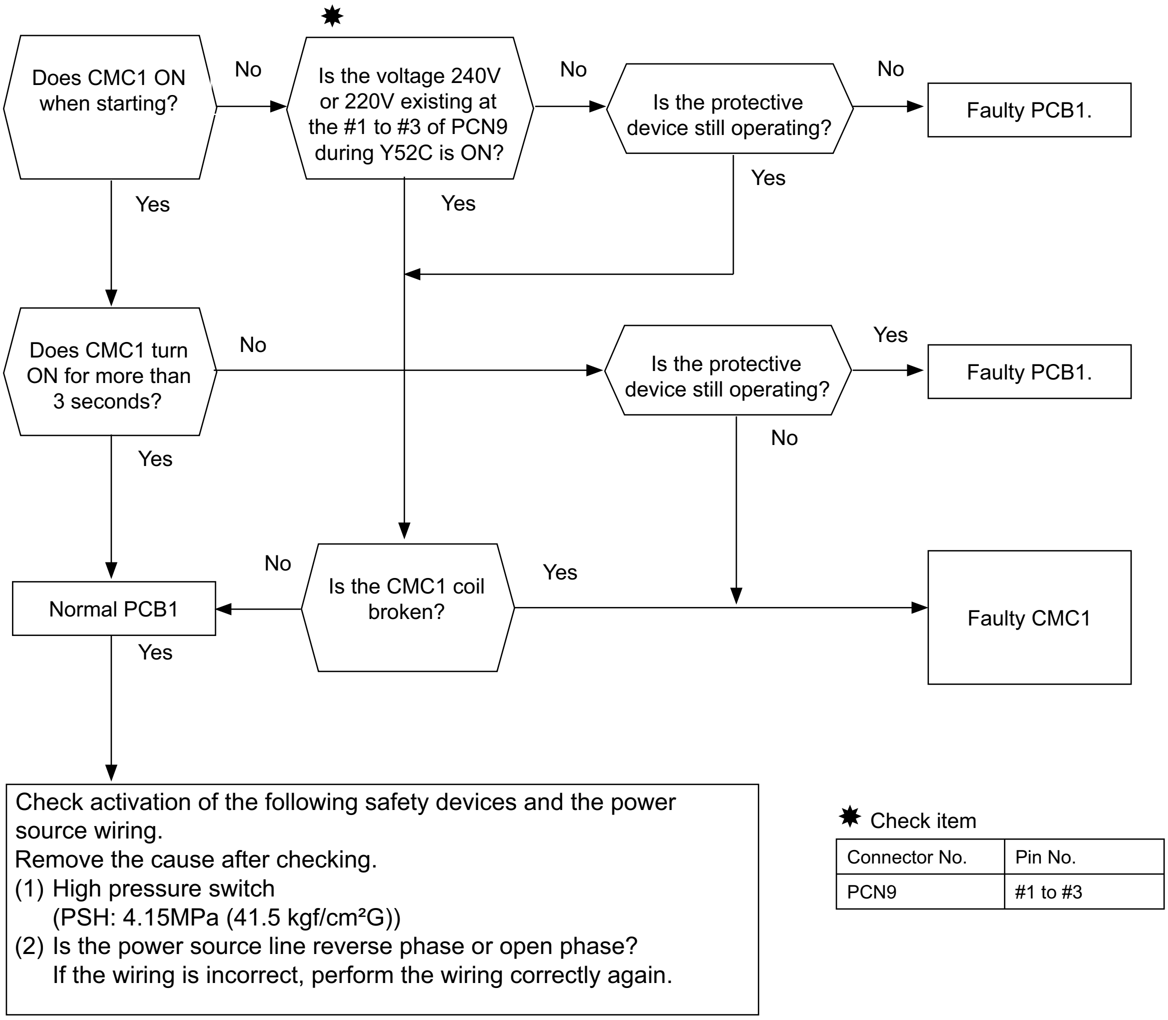
Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Activation of the float switch	High Drain Level	Clogging of the drainage	Check the drain pan	Remove the clogged foreign particles
	Faulty float switch	Fault	Check the continuity when the drain level is low	Replace the float switch if faulty
		Faulty contacting	Measure the resistance by means of the tester	Fix the looseness and Replace the connector
		Faulty connection	Check the connections	Repair the connection
Faulty indoor unit PCB			Check PCB by means of the self-check mode *1)	Replace PCB if faulty

NOTE

- ***1): Refer to section** 7.3.1, see on page 299 **and Self-Checking procedure of the Indoor Unit PCB (only for RPK)**, see on page 303.*
- ***Alarm code “01” is not displayed at the RPK series.***

Alarm code	02	Activation of the safety device in the outdoor unit for IVX series

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



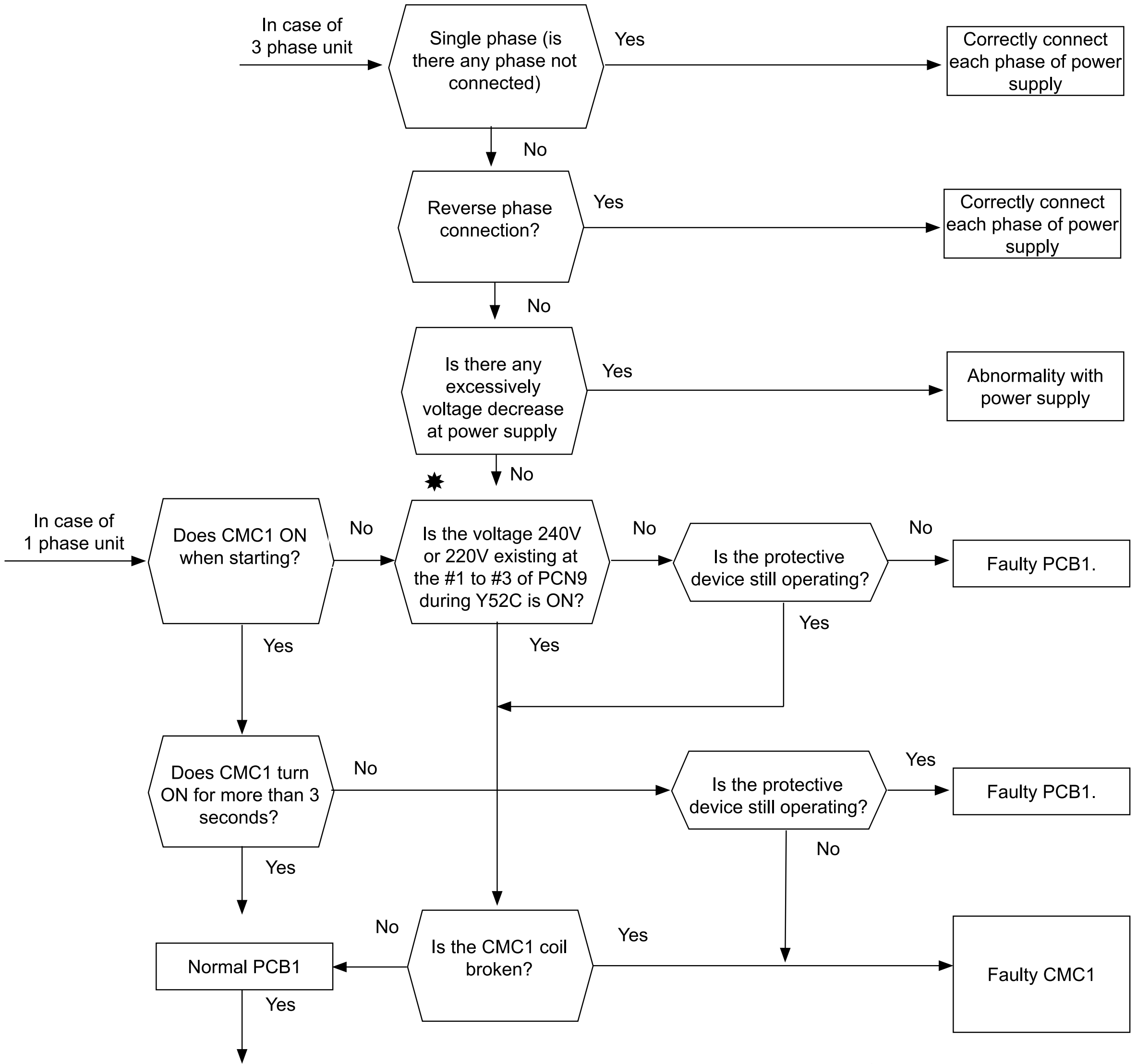
✸ Check item

Connector No.	Pin No.
PCN9	#1 to #3

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Activation of the high-pressure switch due to the excessively high discharge pressure	Insufficient Air Flow to the Heat Exchanger (Outdoor Heat Exchanger during the Cooling Process or Indoor Heat Exchanger during the Heating Process)		Check the heat exchanger for dust or for clogging	Remove the dust or the clogging
			Check the air filter for dust	Remove the dust
			Check for any obstacles at the inlet or the outlet of the heat exchanger	Remove the obstacles
			Check the service area	Secure service area
			Check the speed (Outdoor Fan: Cooling / Indoor Fan: Heating)	Replace the fan motor if faulty
	Malfunction of the Expansion Valve		Disconnected of the Connector	Fix the looseness or reconnect the connector
			Fully closed and locked	Replace the expansion valve
	Excessively High Temp. Air to the Indoor Unit		Calculate the heat load	Reduce the heat load or use a bigger unit
			Check for hot air near the ceiling (Heating)	Provide good circulation
			Check for short-circuited air (Heating)	Remove the short-circuited air
			Check for other heat source	Remove the heat source
	Faulty High-Pressure Switch	Faulty Pressure Switch	Measure the discharge pressure. Check the continuity after the decrease of the pressure	Replace the pressure switch if faulty
		Insufficient Contacting	Measure the resistance by means of the tester	Fix the looseness. Replace the connector
		Incorrect Connection	Check the connections	Repair the connections
Activation of the high-pressure switch due to the excessively high discharge pressure	Faulty or malfunction of the expansion valve		Check for clogging	Remove the clogging
			Check the connect wiring and the connectors	Replace the connector
			Check the operation sound from the coil	Replace the coil
			Check the discharge gas thermistor	Replace the thermistor
			Check the attaching state of the discharge gas thermistor	Reattach the thermistor
	Faulty gas bypass solenoid valve		Check for clogging	Replace the gas bypass solenoid valve
	Overcharged refrigerant		Check the cycle operation temp.	Charge the refrigerant correctly
	Mixture of the non-condensate gas in the refrigerant cycle		Check the air temp. and the pressure	Recharge the refrigerant after the vacuum pumping
	Clogging of the discharge piping		Check for clogging	Remove the clogging
	Liquid line stop valve or gas line stop valve is not in operation		Check the stop valves	Fully Open the stop valves
	Clogging of the check valve		Check for clogging	Replace the check valve

Alarm code 02 Activation of the safety device in the outdoor unit for ES series

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

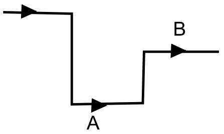


Check activation of the following safety devices and the power source wiring.
Remove the cause after checking.
(1) High Pressure Switch
(PSH: 4.15MPa (41.5 kgf/cm²G))
(2) Is the power source line reverse phase or open phase?
If the wiring is incorrect, perform the wiring correctly again.

✸ Check item

Connector No.	Pin No.
PCN9	#1 to #3

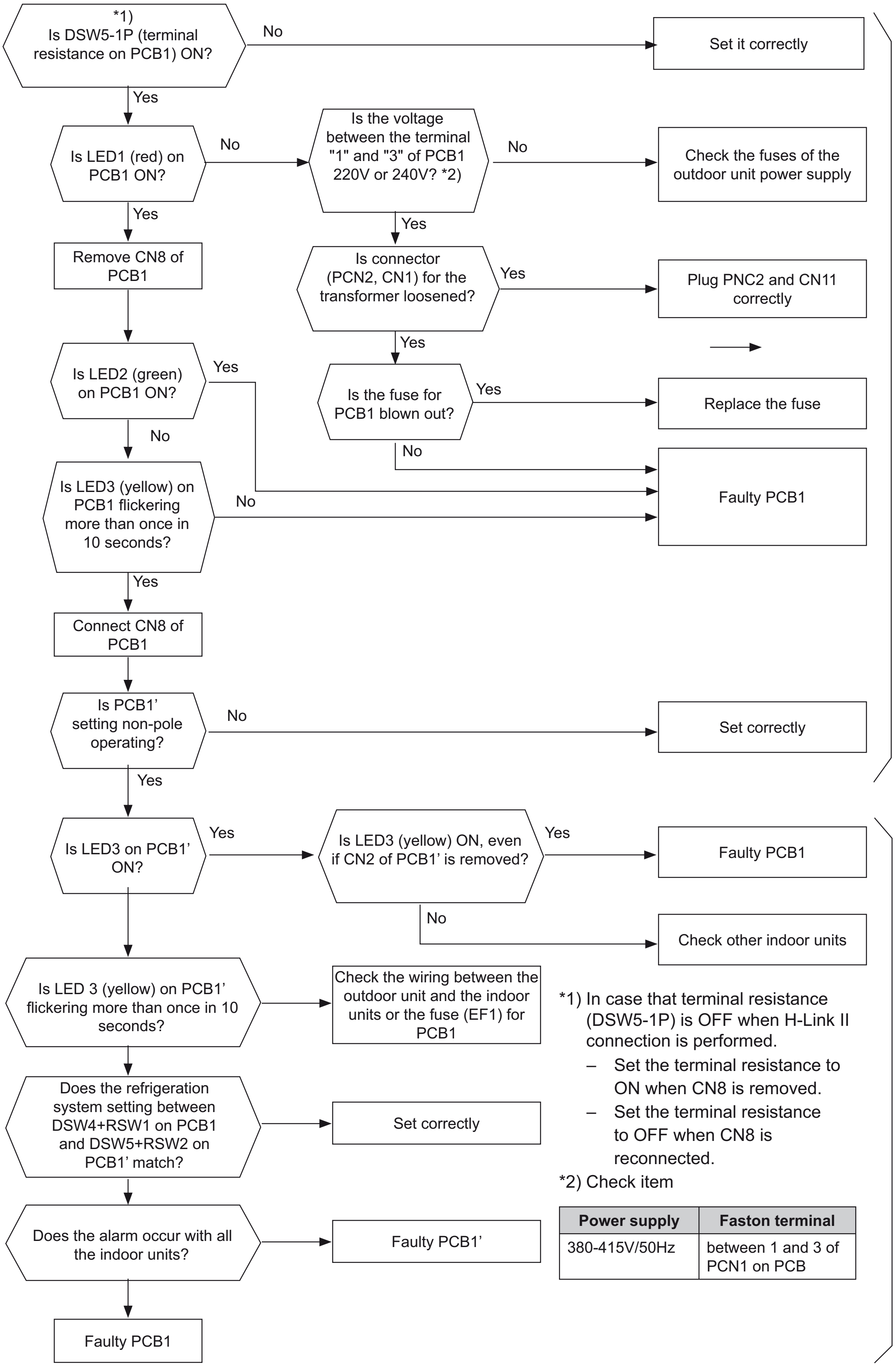
Power supply	A	B
400V	323	342 to 456
230V	189	198 to 2421



Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Activation of the high-pressure switch due to the excessively high discharge pressure	Insufficient Air Flow to the Heat Exchanger (Outdoor Heat Exchanger during the Cooling Process or Indoor Heat Exchanger during the Heating Process)		Check the heat exchanger for dust or for clogging	Remove the dust or the clogging
			Check the air filter for dust	Remove the dust
			Check for any obstacles at the inlet or the outlet of the heat exchanger	Remove the obstacles
			Check the service area	Secure service area
			Check the speed (Outdoor Fan: Cooling / Indoor Fan: Heating)	Replace the fan motor if faulty
	Malfunction of the Expansion Valve		Disconnected of the Connector	Fix the looseness or reconnect the connector
			Fully closed and locked	Replace the expansion valve
	Excessively High Temp. Air to the Indoor Unit		Calculate the heat load	Reduce the heat load or use a bigger unit
			Check for hot air near the ceiling (Heating)	Provide good circulation
			Check for short-circuited air (Heating)	Remove the short-circuited air
			Check for other heat source	Remove the heat source
	Faulty High-Pressure Switch	Faulty Pressure Switch	Measure the discharge pressure. Check the continuity after the decrease of the pressure	Replace the pressure switch if faulty
		Insufficient Contacting	Measure the resistance by means of the tester	Fix the looseness. Replace the connector
		Incorrect Connection	Check the connections	Repair the connections
Faulty Magnet Switch	Incorrect Connection		Check wiring	Repair connections. Replace Magnet Switch
	Malfunction A Contact		Check connections	
Activation of the high-pressure switch due to the excessively high discharge pressure	Faulty or malfunction of the expansion valve		Check for clogging	Remove the clogging
			Check the connect wiring and the connectors	Replace the connector
			Check the operation sound from the coil	Replace the coil
			Check the discharge gas thermistor	Replace the thermistor
			Check the attaching state of the discharge gas thermistor	Reattach the thermistor
	Faulty gas bypass solenoid valve		Check for clogging	Replace the gas bypass solenoid valve
	Overcharged refrigerant		Check the cycle operation temp.	Charge the refrigerant correctly
	Mixture of the non-condensate gas in the refrigerant cycle		Check the air temp. and the pressure	Recharge the refrigerant after the vacuum pumping
	Clogging of the discharge piping		Check for clogging	Remove the clogging
	Liquid line stop valve or gas line stop valve is not in operation		Check the stop valves	Fully Open the stop valves
	Clogging of the check valve		Check for clogging	Replace the check valve
Activation of Reverse Phase Sensor in Outdoor Unit	Reverse or single phase		Check it according to electrical wiring	Replacing wires, repair, tightening screws or correct wiring
	Faulty Outdoor unit PCB1		Replace PCB1 if faulty	

Alarm code	03	Abnormal transmission between the indoor units and the outdoor unit for IVX series

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



*1) In case that terminal resistance (DSW5-1P) is OFF when H-Link II connection is performed.
- Set the terminal resistance to ON when CN8 is removed.
- Set the terminal resistance to OFF when CN8 is reconnected.

*2) Check item

Power supply	Faston terminal
380-415V/50Hz	between 1 and 3 of PCN1 on PCB

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

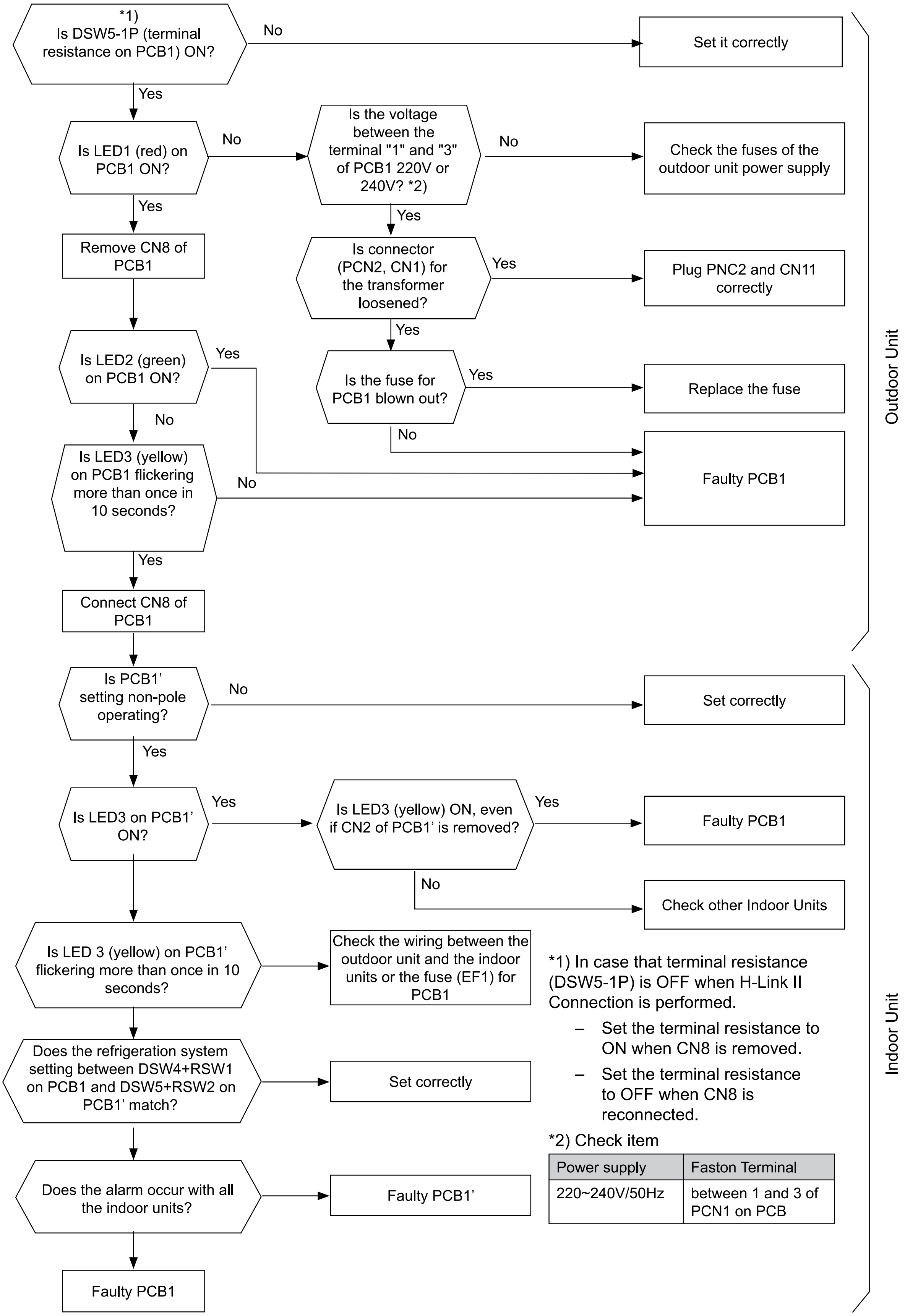
NOTE

- ***1)***

PCB1 output voltage	Voltage
Vcc 12 – GND2	12 VDC
Vcc 05 – GND1	5 VDC
Vcc 15 – GND1	15 VDC
Vcc 24 – GND1	24 VDC
Vcc 12T– GND1	12 VDC

Alarm code	03	Abnormal transmission between the indoor units and the outdoor unit for ES series

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



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

- Set the terminal resistance to ON when CN8 is removed.
- Set the terminal resistance to OFF when CN8 is reconnected.

*2) Check item

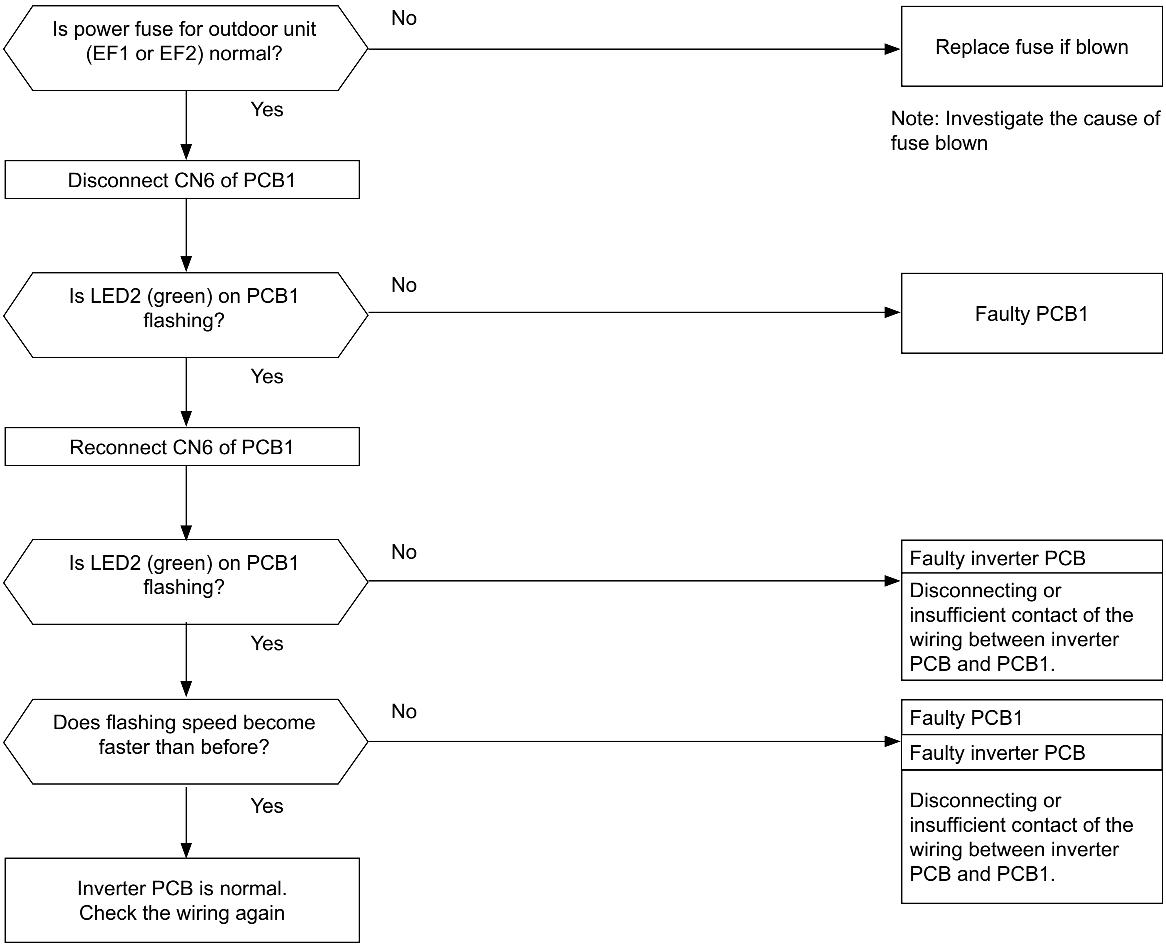
Power supply	Faston Terminal
220~240V/50Hz	between 1 and 3 of PCN1 on PCB

Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Power failure or power is not ON		Measure the voltage by means of the tester	Supply the power
Blown out fuse for the power source or activation of the outdoor unit breaker	Short-circuit between the wires	Check the insulation material for breaks	Remove the short-circuit and replace the fuse
	Short-circuited wire to ground	Measure the insulation resistance	Remove short-circuit to ground and replace the fuse
	Faulty comp. motor	Measure the resistance between the wires and the insulation resistance	Replace the comp. and the fuse
	Failure of outdoor unit fan motor	Measure resistance between wires and insulation resistance	Replace the unit fan motor and the fuse
Blown out fuse for control circuit or activation of outdoor unit breaker	Short-circuit between the wires	Check the insulation material for breaks	Remove the short-circuit and replace the fuse
	Short-circuit of the control circuit (to ground)	Measure the insulation resistance	Remove the short-circuit and replace the fuse
	Faulty solenoid coil for the magnetic switch for the comp. motor	Measure the resistance of coil	Replace the magnetic switch and the fuse
	Failure of outdoor unit fan motor	Measure the resistance between the wires and the insulation resistance	Replace the outdoor unit fan motor and fuse
PCB1 Power circuit failure		PCB1 Measure output voltage *1)	Replace PCB1
Disconnected wires insufficient contacting or incorrect connection	Between outdoor unit and indoor unit	Check the continuity of the wires Check for looseness of the connection screws Check the terminal Nos.	Replacing wires repairing and tightening the Power source wiring for the screws and the correct wiring
	Power source wiring for the screws and the correct wiring outdoor unit		
Faulty PCB (outdoor unit, indoor unit)	Disconnected wires to PCB	Check the connections	Correctly connect the wires
	Faulty PCB	—	Replace PCB if faulty
Incorrect wiring	Disconnected wire; insufficient contacting	Check the continuity and the looseness of connection screws	Replacing wires, repairing and tightening the screws
	Incorrect wiring	Check the terminal Nos.	Correctly connect the wires

PCB1 output voltage	Voltage
Vcc 12 – GND2	12 VDC
Vcc 05 – GND1	5 VDC
Vcc 12 – GND1	12 VDC
Vcc 15 – GND1	15 VDC
Vcc 24 – GND1	24 VDC
Vcc 12T– GND1	12 VDC

Alarm code	04	Abnormal transmission between Inverter PCB and Outdoor PCB1 for IVX Series

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



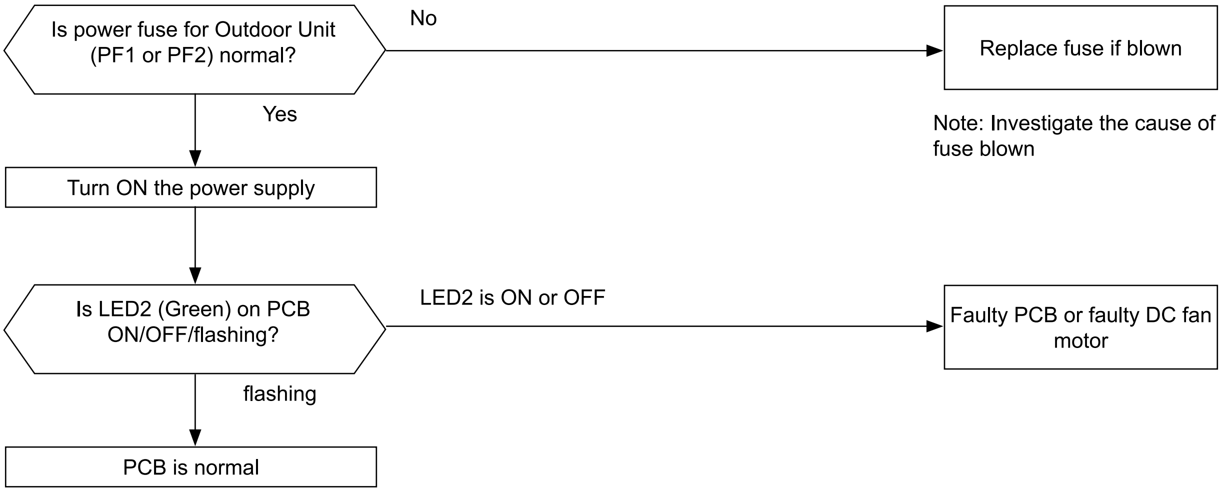
PCB1: Control PCB in outdoor unit
Inverter dipIPM RAS-(3-6)HVRNM(1)E
Inverter ISPM RAS-(4-6)HRNM1E
Inverter IPM RAS (8-12HRNM)

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

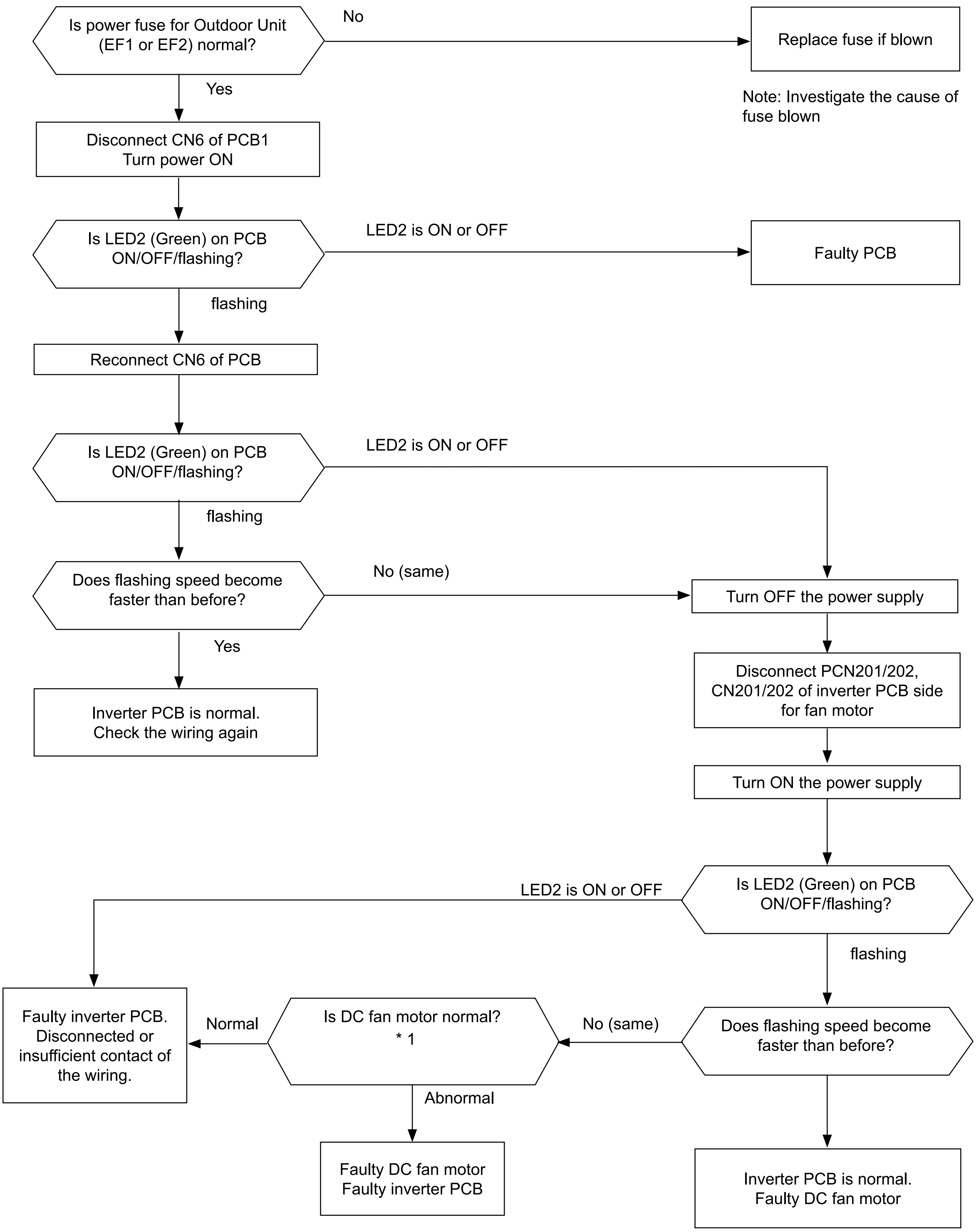
Alarm code	04	Abnormal transmission between Inverter PCB2 and Outdoor PCB1 for ES Series

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

RAS-(2-3)HVRN(S)2



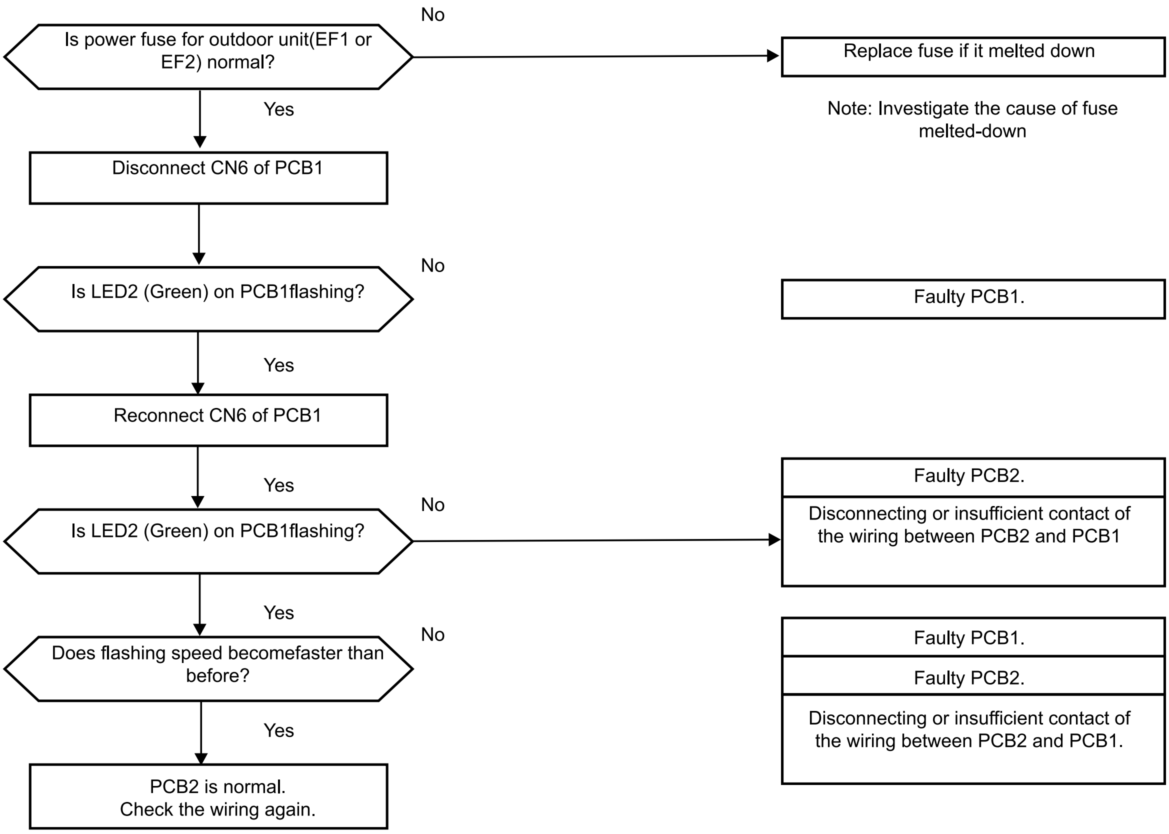
RAS-(4–6)H(V)RNS2E



NOTE

***Regarding the checking of DC fan motor, refer to section Procedure of checking other main parts for ES Series**, see on page 312*

RAS-(8/10)HRNSE

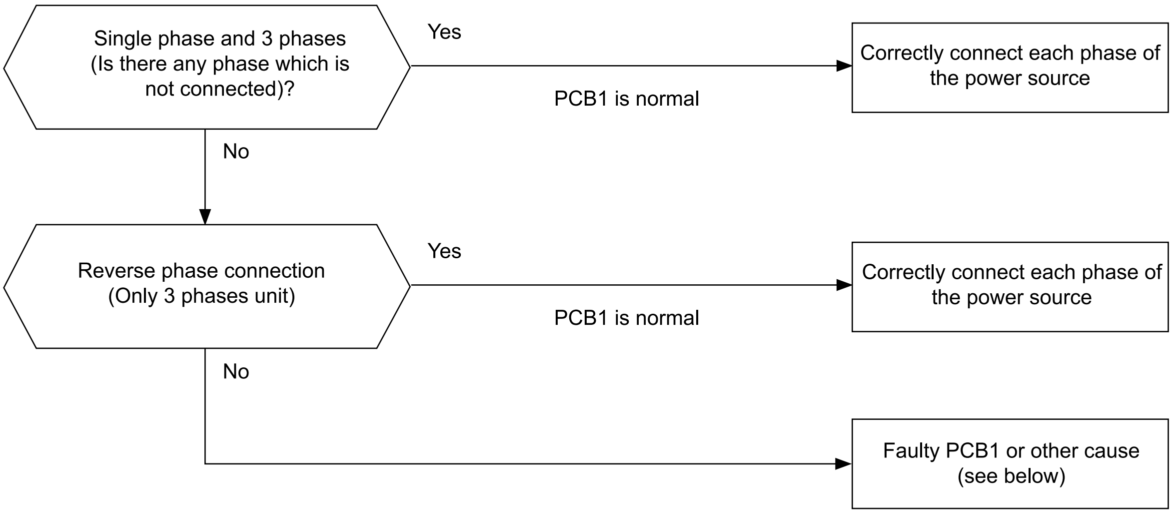


RAS-(4–10)H(V)RNS(2)E

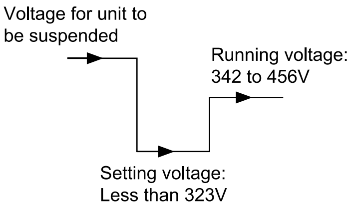
Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Disconnected wires, insufficient contacting or incorrect connection	Between control PCB, inverter PCB2	Check the continuity of wires. Check for looseness of the connection screws. Check the connection No.	Replacing wires, repairing, tightening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

Alarm code	05	Code abnormal operation of picking up phase signal for IVX Series

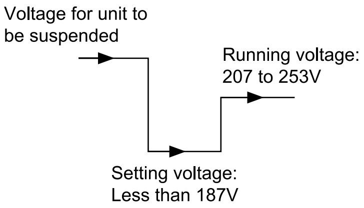
- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - This alarm is displayed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



RAS-(4-12)H(V)RNM(1)E



RAS-(3-6)HVRNM(1)E

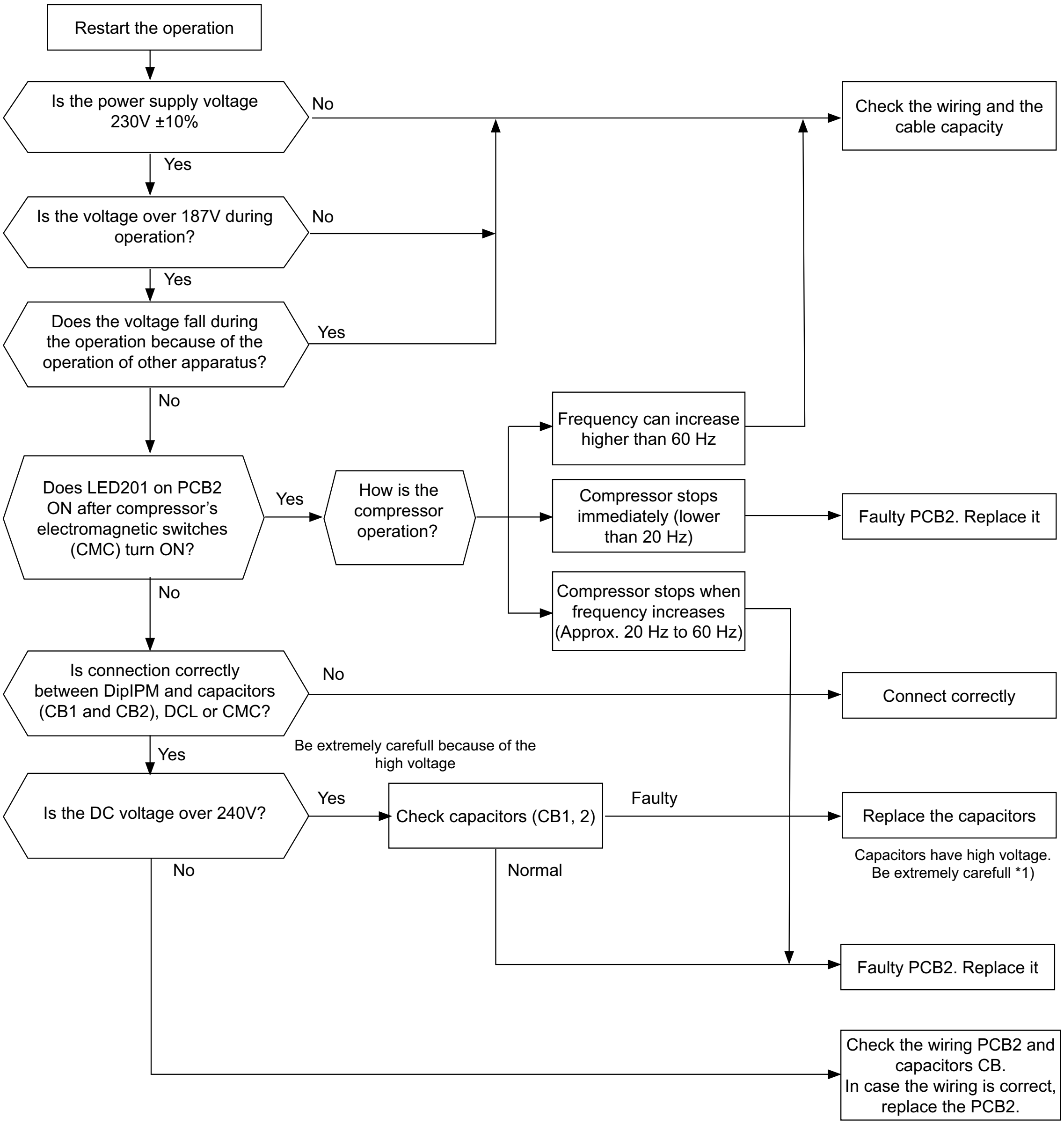


Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Activation of reverse phase sensor in the outdoor unit	Reverse or single phase	Check it according to the electrical wiring	Replacing wires, repair, tightening screws or correct wiring
	Faulty outdoor unit PCB	–	Replace PCB if faulty

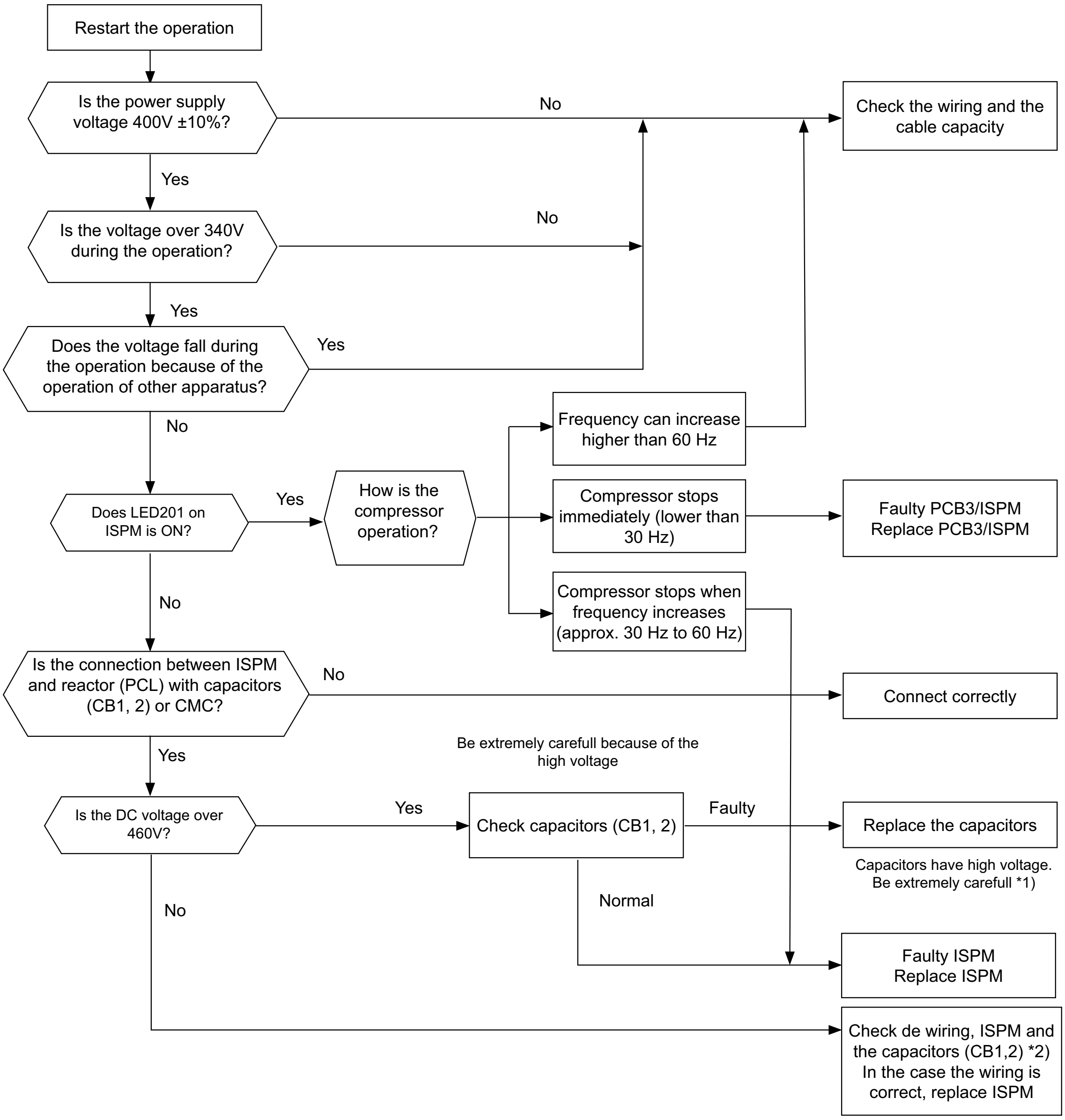
Alarm code	06	Excessively low voltage or excessively high voltage for the inverter for IVX Series

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
- The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - This alarm code is displayed when the voltage between terminal “P” and “N” of IPM is insufficient and the alarm has three occurrences in 30 minutes. If the number of occurrences is smaller than two, the retry operation is performed. The alarm code “06.” Means fan controller abnormal operation.

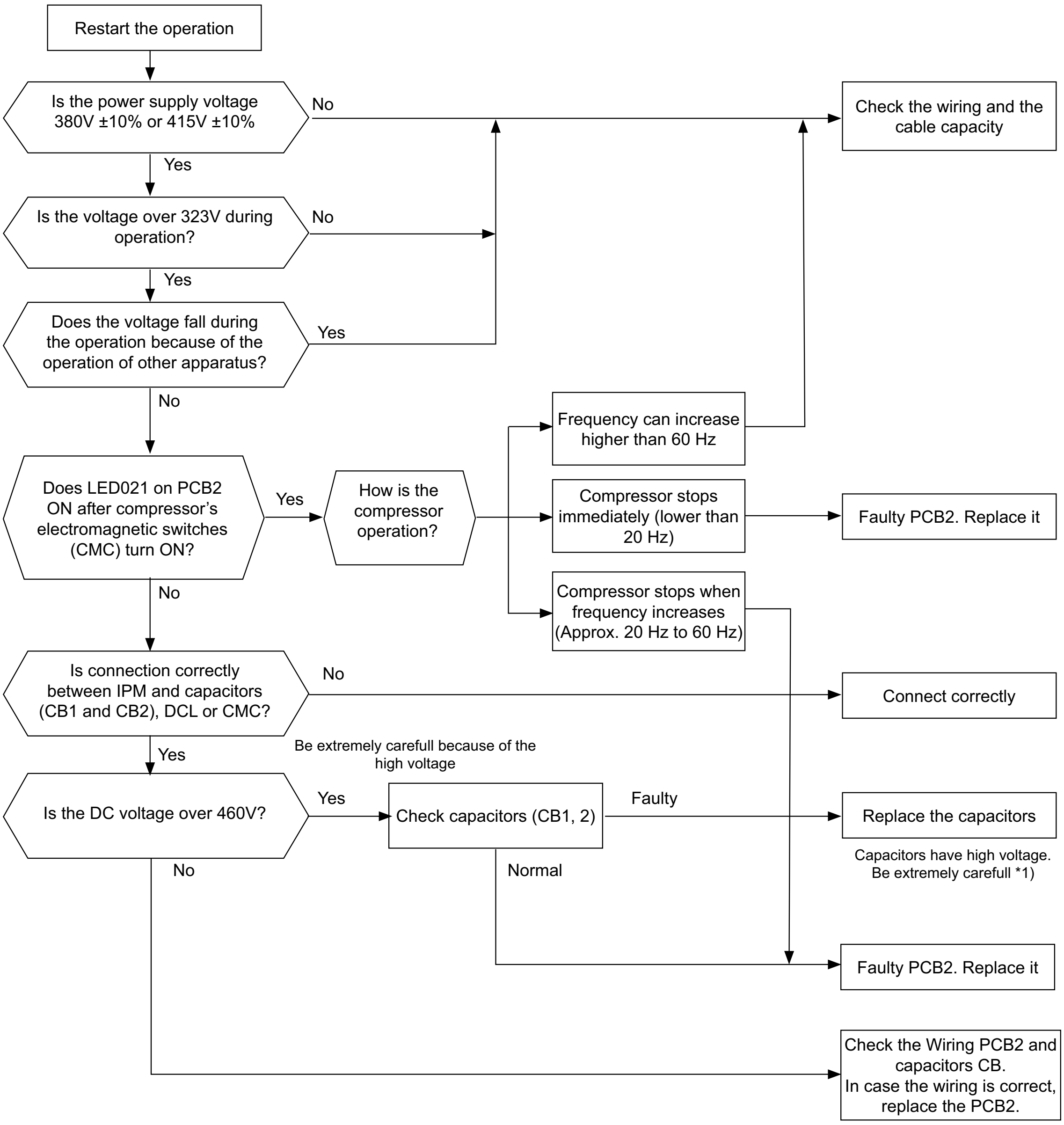
RAS-(3-6)HVRNM2E



RAS-(4-6)HRNM2E



RAS-(8-12)HRNM



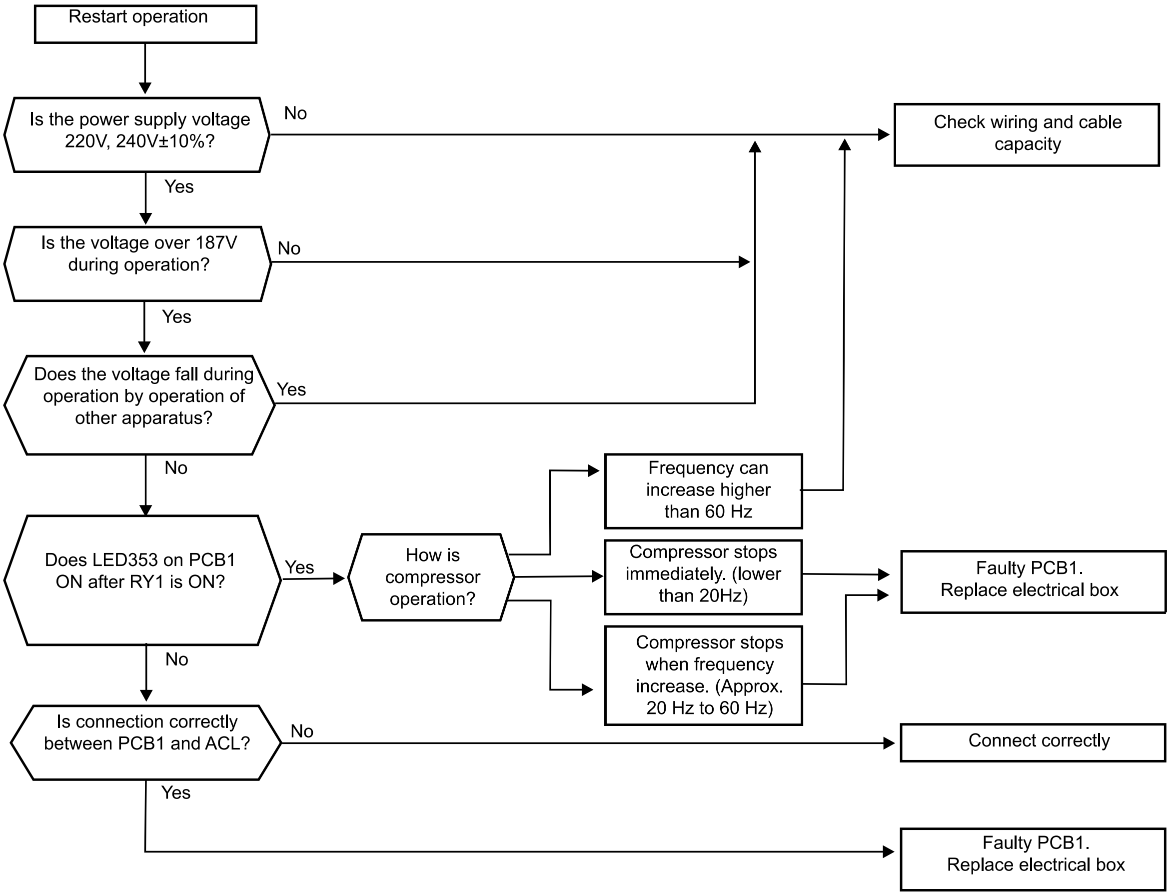
NOTE

- ***1) If the capacitor has a high voltage, perform the high-voltage discharge procedure. Refer to section Procedure of checking other main parts for ES Series**, see on page 312*
- ***2) Checking procedures of the diode module are displayed in item Procedure of checking other main parts for ES Series**, see on page 312.*
- ***3) DC voltage measuring position:**
  ISPM "P" terminal "+" terminal of tester, "N" terminal to "–" terminal of tester measuring position: DC 1000V.*

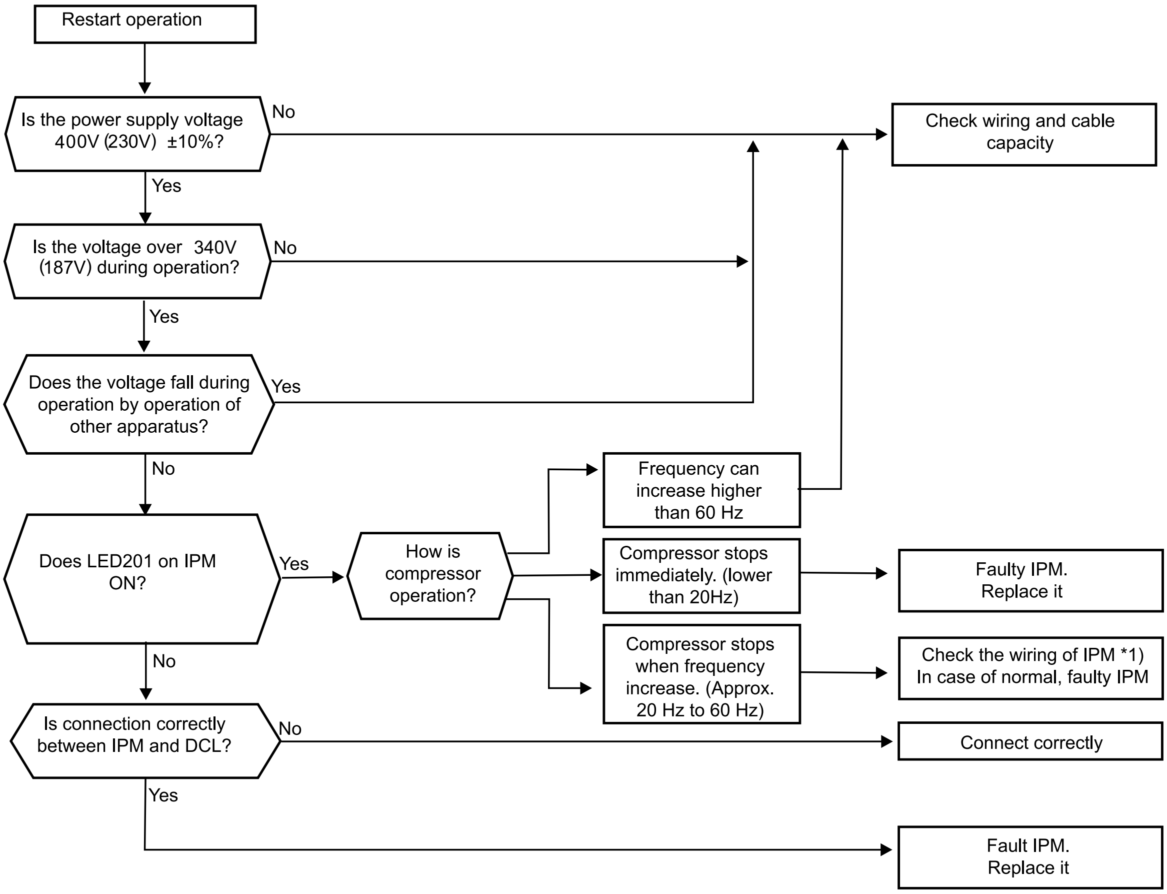
Alarm code	06	Excessively low voltage or excessively high voltage for the inverter for ES Series

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
- The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - This alarm code is displayed when the voltage between terminal “P” and “N” of DIP-IPM is insufficient and the alarm has three occurrences in 30 minutes. If the number of occurrences is smaller than two, the retry operation is performed. The alarm code “06.” Means fan controller Abnormal Operation.

RAS-(2/2.5)HVRN2 and RAS-3HVRNS2



RAS-(4-6)H(V)RNS2E

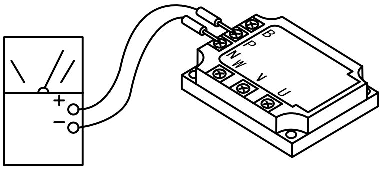


NOTE

- ***1): Checking procedures of IPM is indicated in item** Procedure of checking other main parts for ES Series**, see on page 312*

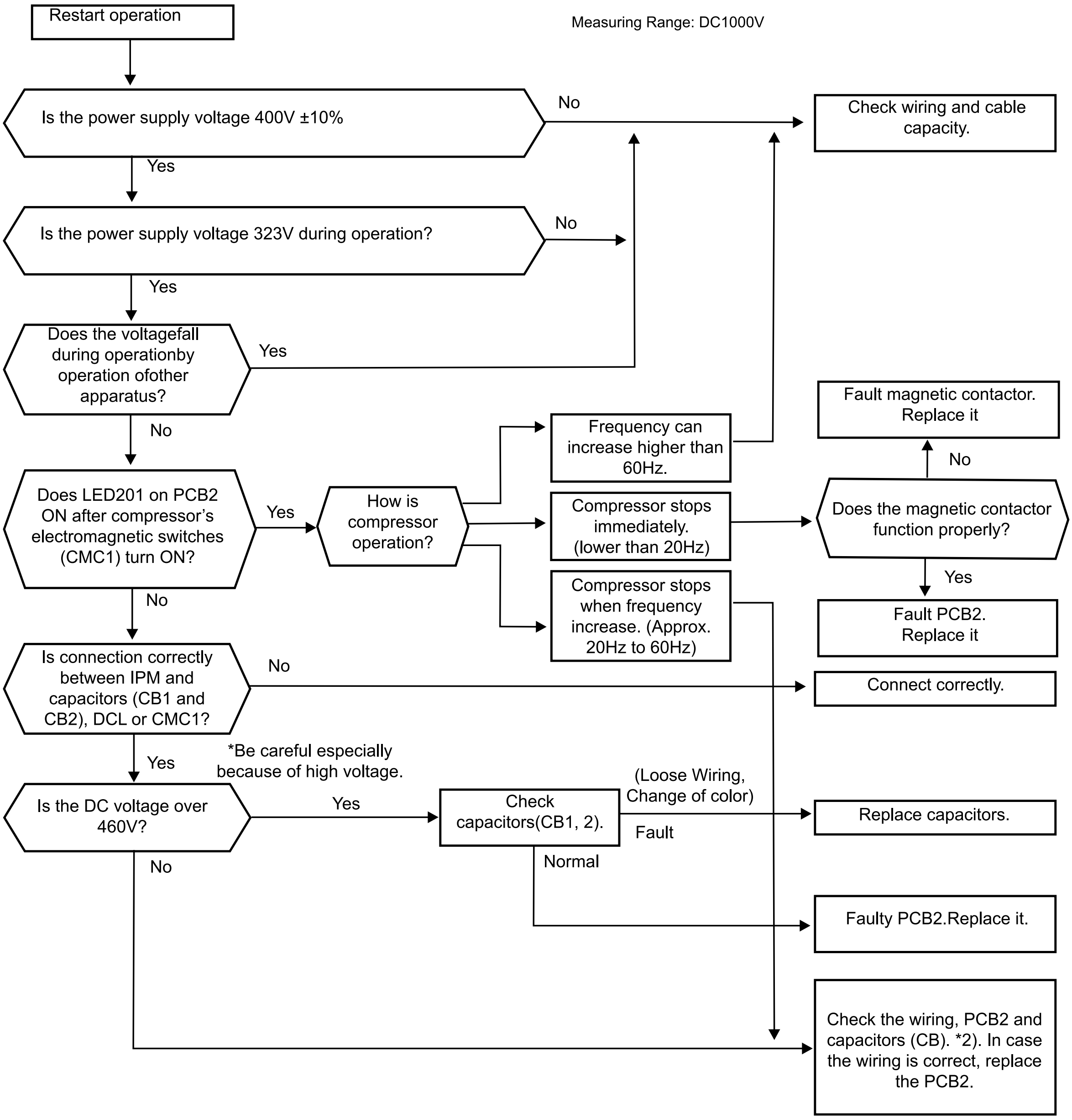
RAS-(8/10)HRNSE

PCB1: Control PCB in Outdoor unit
PCB2: Inverter PCB in Outdoor unit



Direct current
Measuring position

Measuring Range: DC1000V

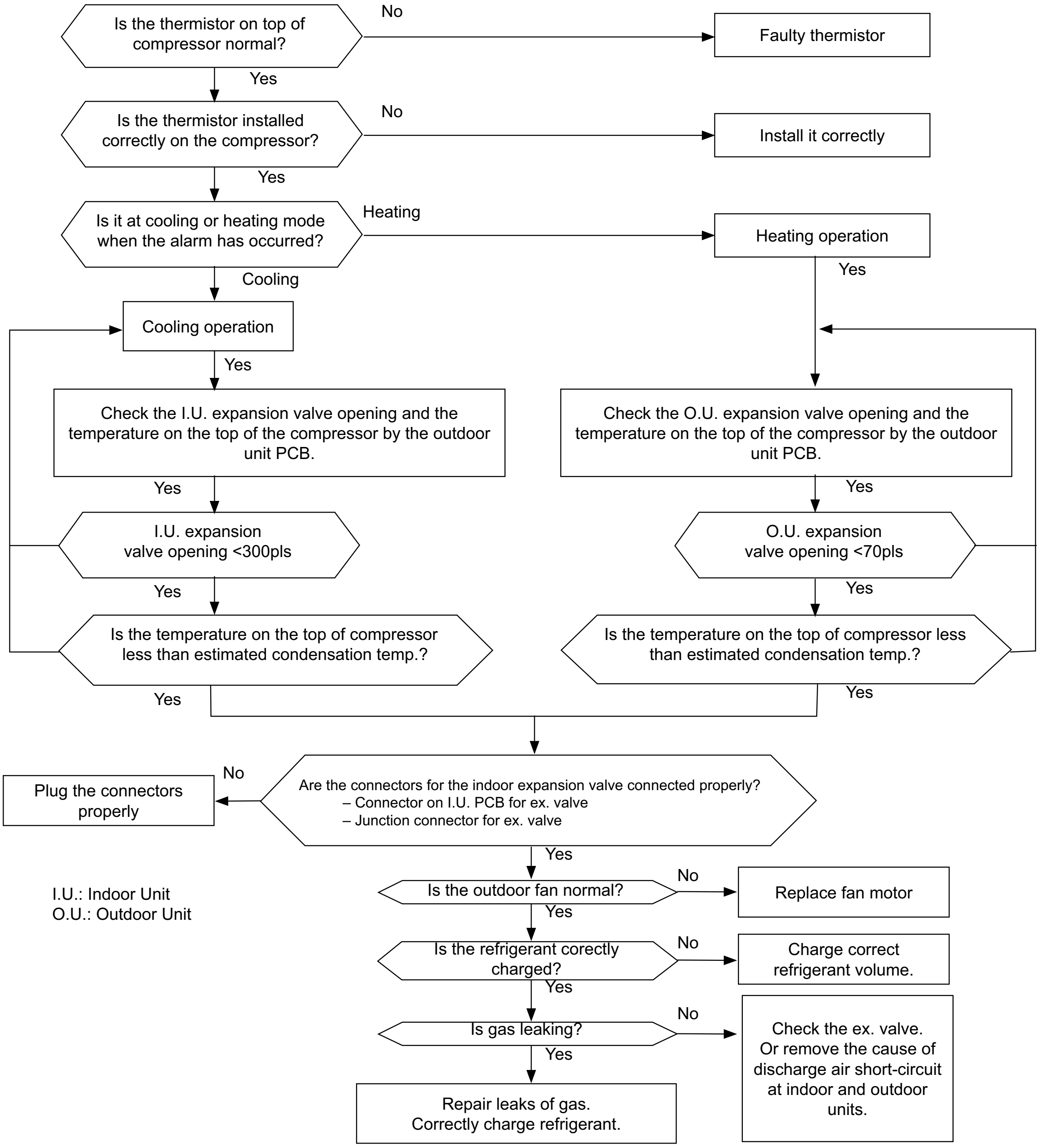


NOTE

- ***1): If capacitor has high voltage, perform the high voltage discharge work refer to the item Procedure of checking other main parts for ES Series**, see on page 312.*
- ***2): Regarding replacing or checking method for the inverter PCB, refer to the item Procedure of checking other main parts for ES Series**, see on page 312.*

Alarm code	07	Decrease of Discharge Gas Superheat for IVX Series

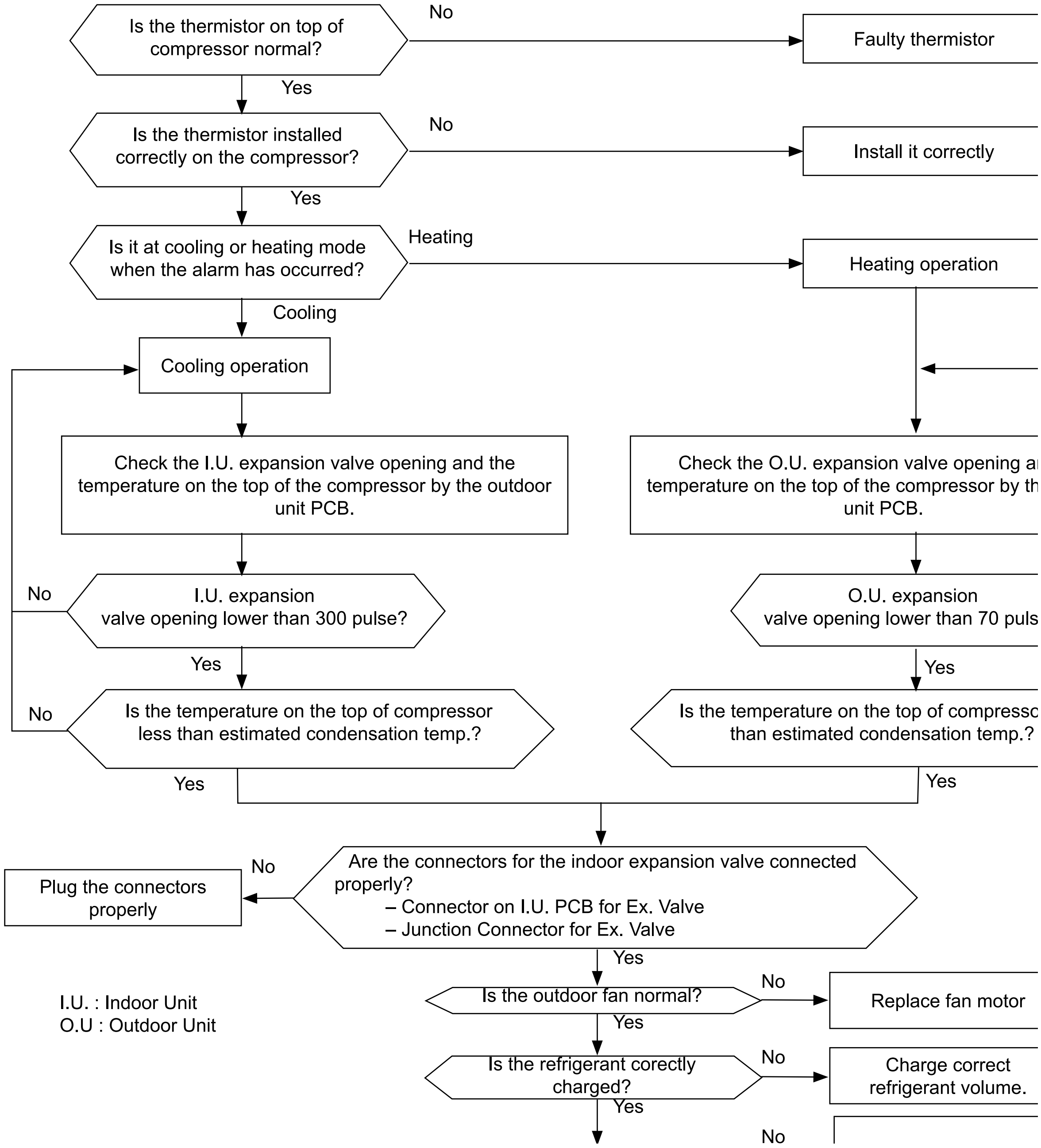
- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
- This alarm code is indicated as follows:
  - When the temperature at the top of the compressor is lower than condensing temperature and indoor expansion valve opening is lower than 300 pulse for 30 minutes in cooling operation, retry operation will be performed once. When outdoor expansion valve opening is lower than 70 pulse for 30 minutes in heating operation, retry operation will be performed once. If these occurs again within 120 minutes after the retry, the alarm code will be indicated.



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

Alarm code 07 Decrease of Discharge Gas Superheat for ES Series

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
- This alarm code is indicated as follows:
  - When the temperature at the top of the compressor is lower than condensing temperature and indoor expansion valve opening is lower than 300 pulse for 30 minutes in cooling operation, retry operation will be performed once. When outdoor expansion valve opening is lower than 70 pulse for 30 minutes in heating operation, retry operation will be performed once. If these occurs again within 120 minutes after the retry, the alarm code will be indicated.



Phenomenon	Cause		Check item	Action (Turn OFF the 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		Measure pressure	Correctly charge refrigerant
	Faulty Expansion Valve		Check expansion valve *1)	Replace expansion valve if faulty
	Faulty PCB	Fault	Replace PCB and check operation	Replace PCB if faulty
		Disconnected Wires for Ex.Valve Control	Check connections.	Repair wiring connections
	Faulty Discharge Gas Thermistor	Fault	Measure resistance.	Replace thermistor if faulty
		Incorrect Mounting	Check mounting state .(See “Alarm Code 08”.)	Correctly mount thermistor.
		Incorrect Connection	Check connections.	Remove looseness, replace connector or repair connections.

NOTE

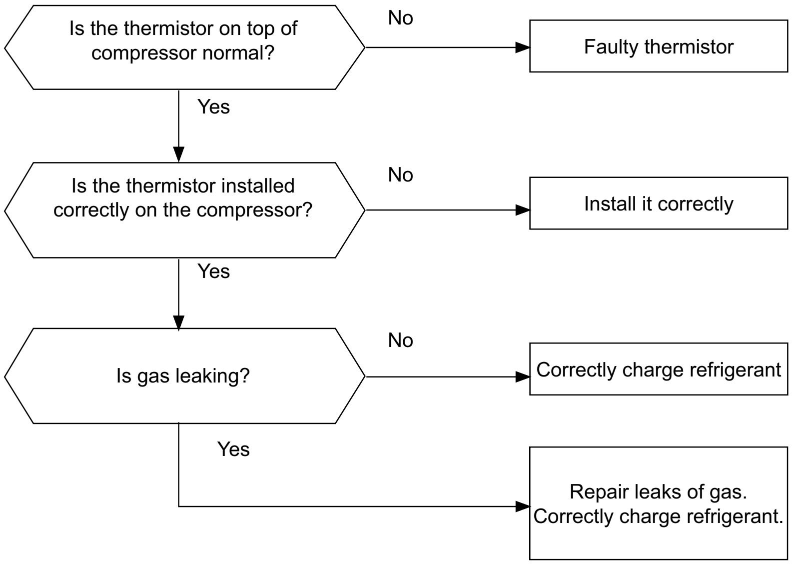
- ***1) Refer to section Procedure of checking other main parts for ES Series**, see on page 312 **in part “Checking procedure for the electronic expansion valve”.***

Alarm code	08	Excessively High Discharge Gas Temperature at the Top of Compressor for IVX Series

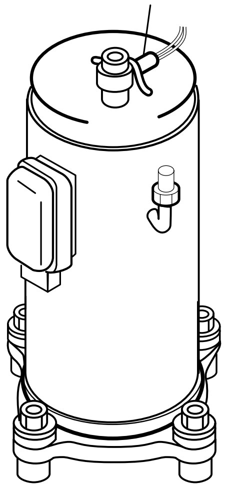
- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - This alarm is indicated when the temperature of the thermistor on the top of the compressor is maintained higher than 127 °C for 10 minutes or higher than 140 °C for 5 seconds under cooling operation (1).
  - This alarm is indicated when the temperature of the thermistor on the top of the compressor is maintained higher than 120 °C for 10 minutes or higher than 140 °C for 5 seconds under heating operation (1)

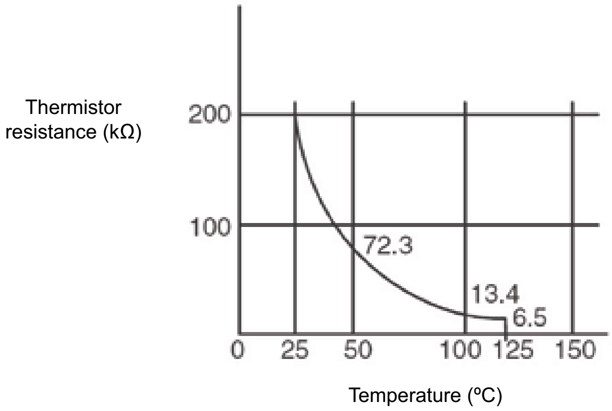
NOTE

(1) For RAS-3HVRNM2E the temperature is 115 ºC and 125 ºC in cooling and heating mode



Thermistor for high discharge gas temperature at the top of compressor chamber (TH9)

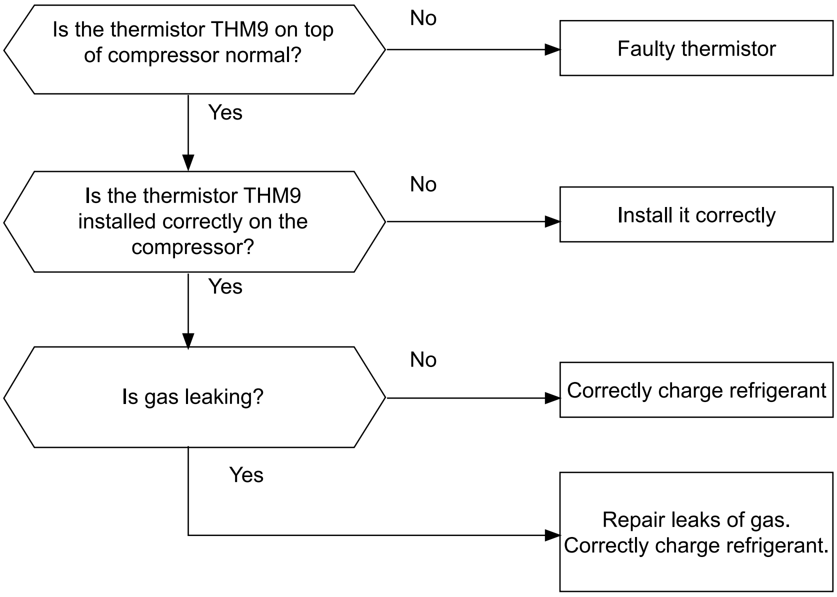


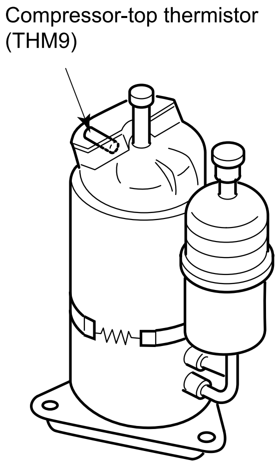


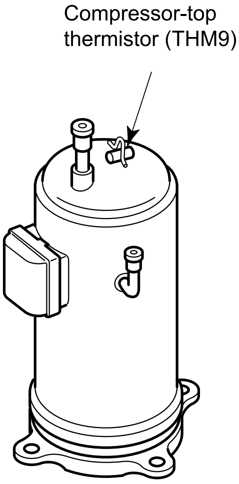
Thermistor resistance characteristics

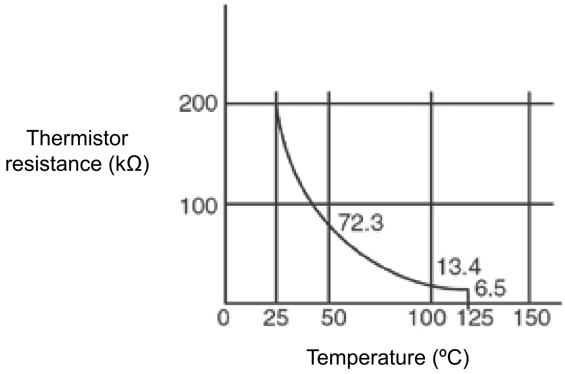
Alarm code 08 Excessively High Discharge Gas Temperature at the Top of Compressor for ES Series

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - The alarm appears during cooling operation when the compressor-top thermistor remains at Tdc 1 °C or above for 10 minutes, or at Tdc 2 °C or above for 5 seconds.
  - The alarm appears during heating operation when the compressor-top thermistor remains at Tdh 1 °C or above for 10 minutes, or at Tdh 2 °C or above for 5 seconds.







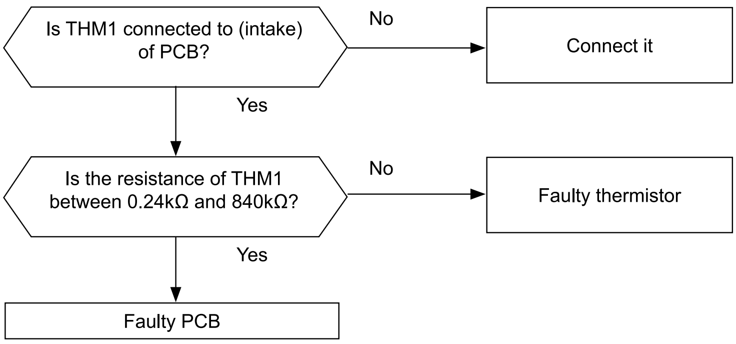


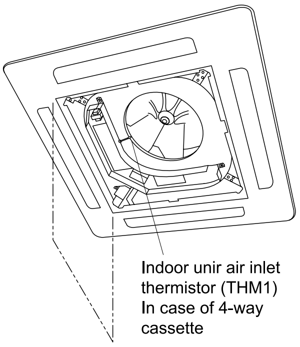
Thermistor resistance characteristics

Outdoor capacity	Tdc1	Tdc2	Tdh1	Tdh2
3HP or below	115	125	115	125
4HP or Above	127	140	120	140

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

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

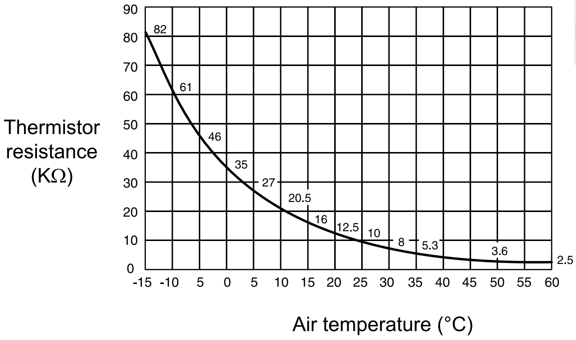




Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty air inlet thermistor	Fault	Check the resistance	Replace the thermistor if faulty
	Incorrect connection	Check the connection	Repair the wiring and the connections
Faulty PCB		Replace PCB and check the operation	Replace PCB if faulty

NOTE

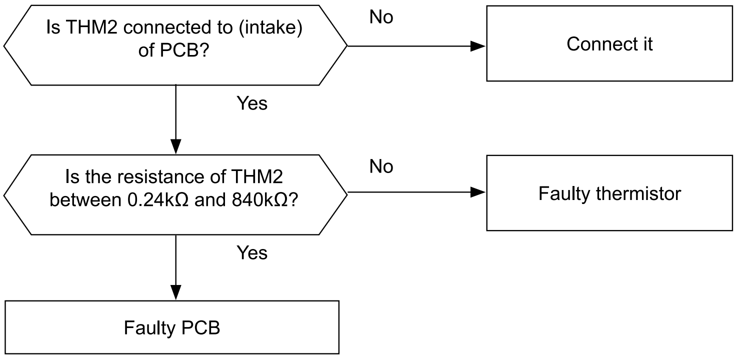
- ***This data is applicable to the following thermistors:***
  - ***Indoor unit discharge air temperature***
  - ***Indoor unit liquid refrigerant temperature***
  - ***Indoor unit air inlet temperature***
  - ***Outdoor temperature***
  - ***Outdoor unit evaporating temperature***
  - ***Indoor unit gas piping***

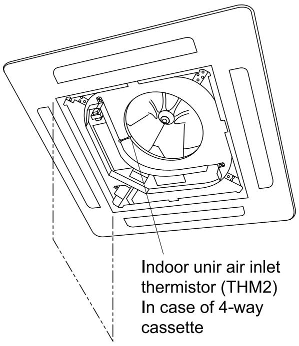


Thermistor characteristics

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

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

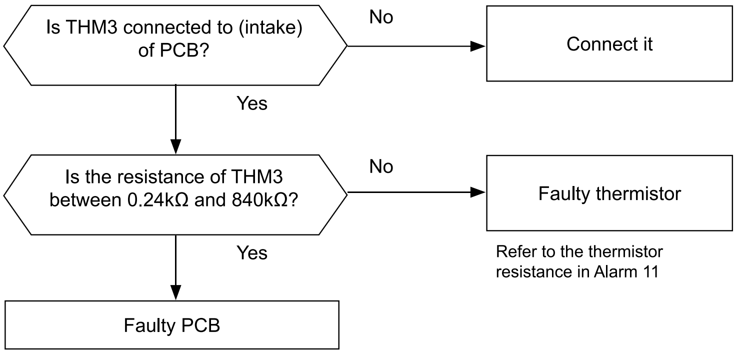



Indoor unir air inlet thermistor (THM2)
In case of 4-way cassette

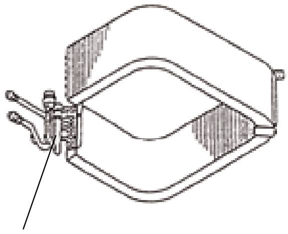
Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty air outlet thermistor	Fault	Check the resistance	Replace the thermistor if faulty
	Incorrect connection	Check the connection	Repair the wiring and connections
Faulty PCB		Replace PCB and check the operation	Replace PCB if faulty

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

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



Refer to the thermistor resistance in Alarm 11

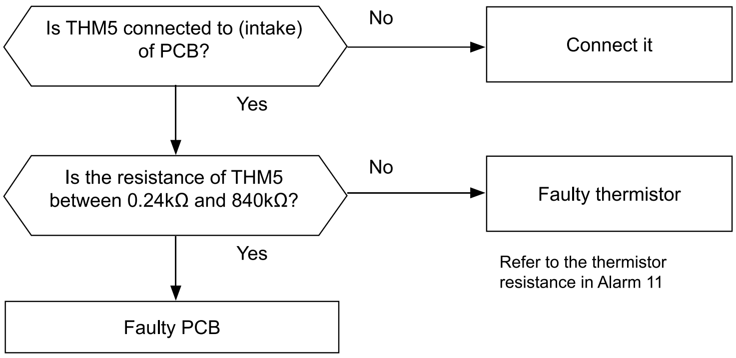


Freeze protection thermistor (THM3)
In case of 4-way cassette

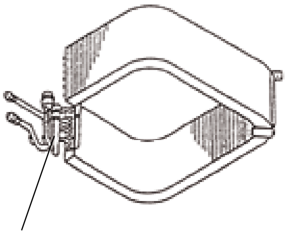
Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty freeze protection thermistor	Fault	Check the resistance	Replace the thermistor if faulty
	Incorrect connection	Check the connection	Repair the wiring and connections
Faulty PCB		Replace PCB and check the operation	Replace PCB if faulty

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

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



Refer to the thermistor resistance in Alarm 11

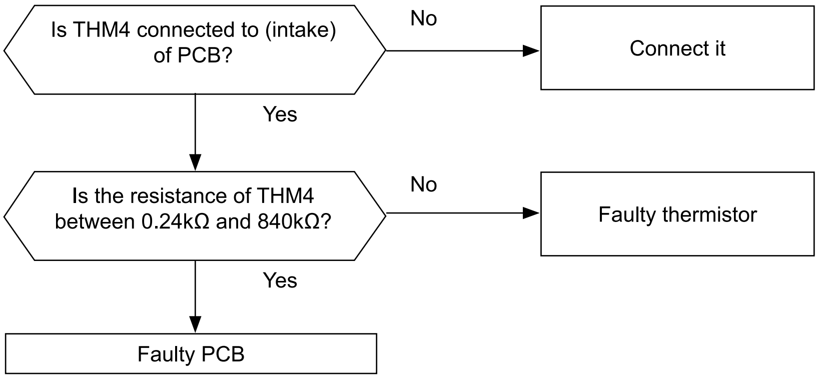


Heat exchanger gas pipe thermistor (THM3)
In case of 4-way cassette

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

Alarm code	15	Abnormal operation of thermistor for fresh outdoor air (Econofresh)

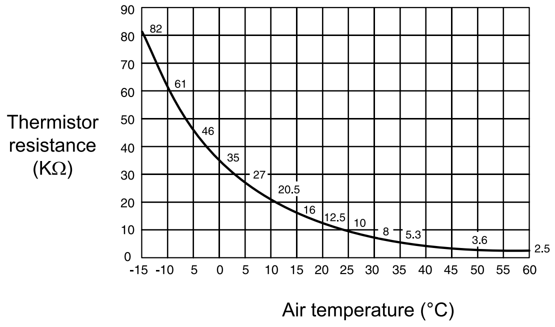
- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
  The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - This alarm code is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



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

NOTE

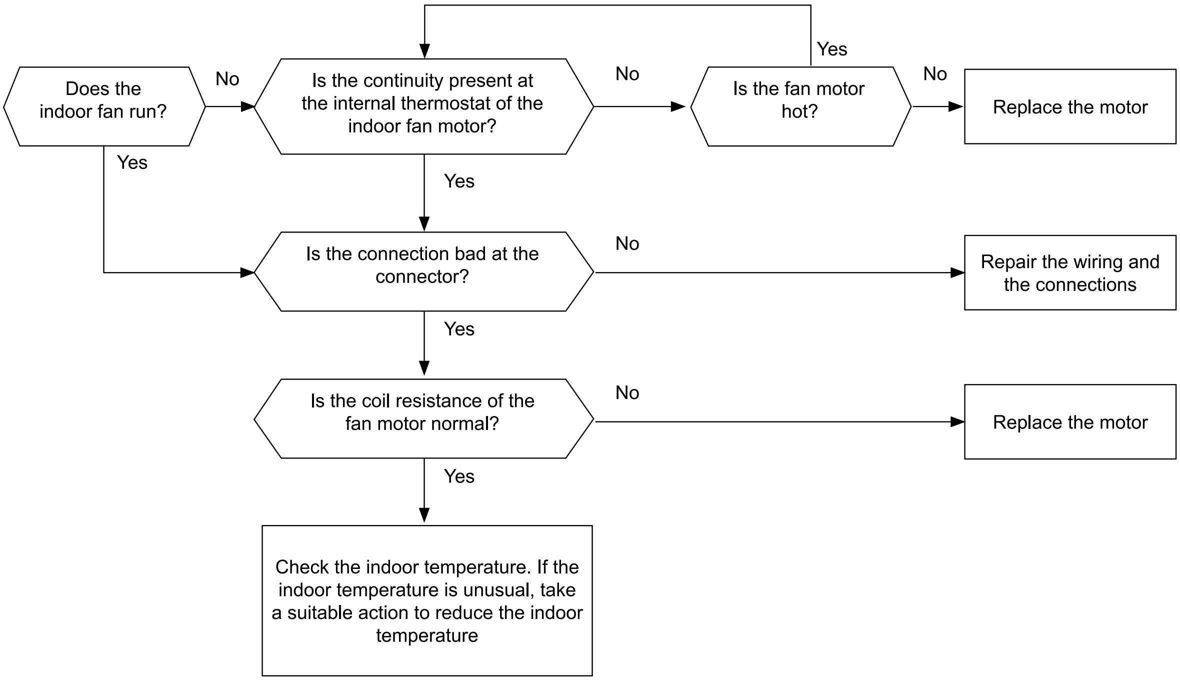
- ***This data is applicable to the following thermistors:***
  - ***Indoor unit discharge air temperature***
  - ***Indoor unit liquid refrigerant temperature***
  - ***Indoor unit air inlet temperature***
  - ***Outdoor temperature***
  - ***Outdoor unit evaporating temperature***
  - ***Indoor unit gas piping***



Thermistor characteristics

Alarm code	14	Activation of the protection device for the indoor fan motor (except RCI, RCIM and RPK)

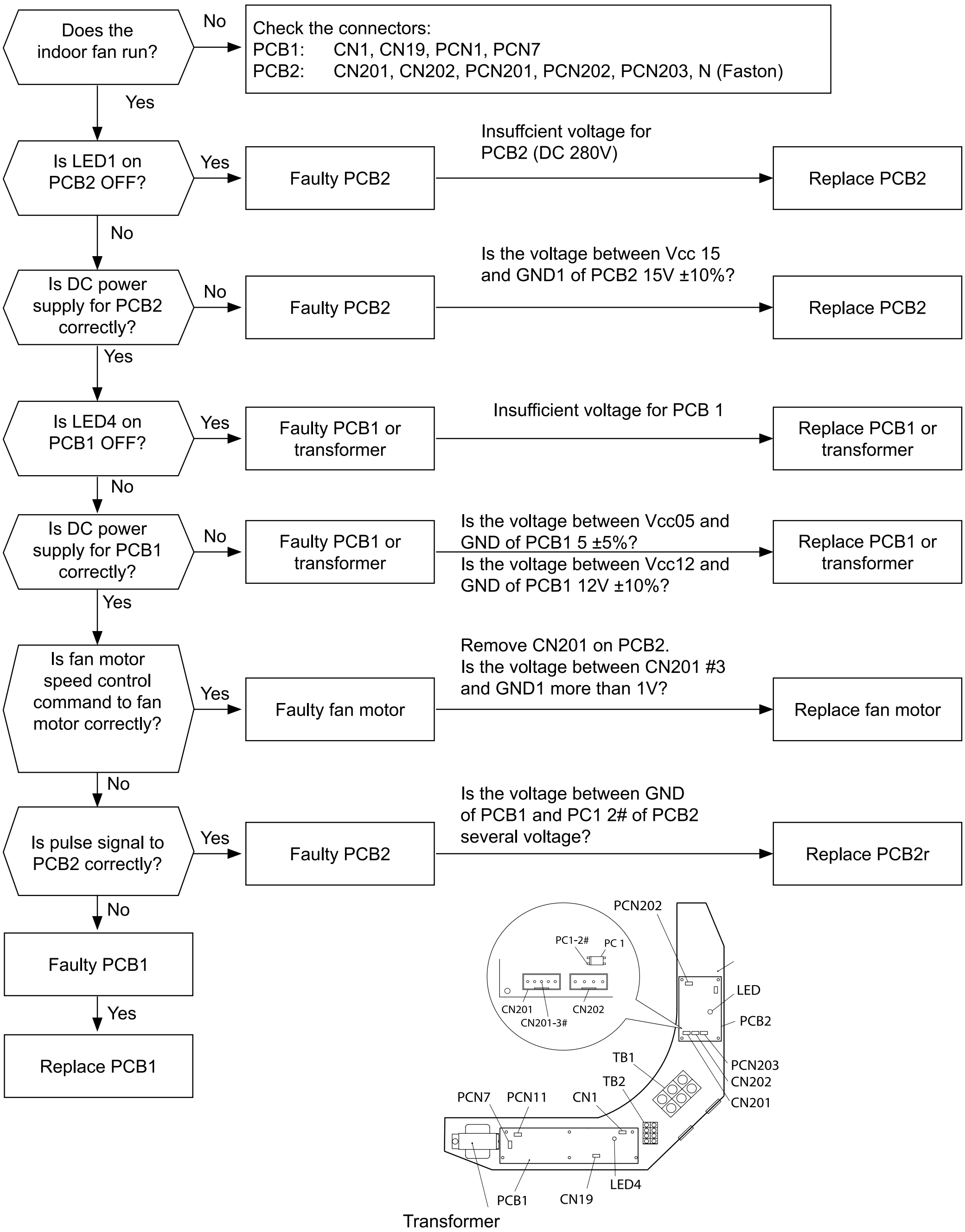
- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
  The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - This alarm code is displayed when the temperature of the internal thermostat for the indoor fan motor is higher than 130 °C.



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

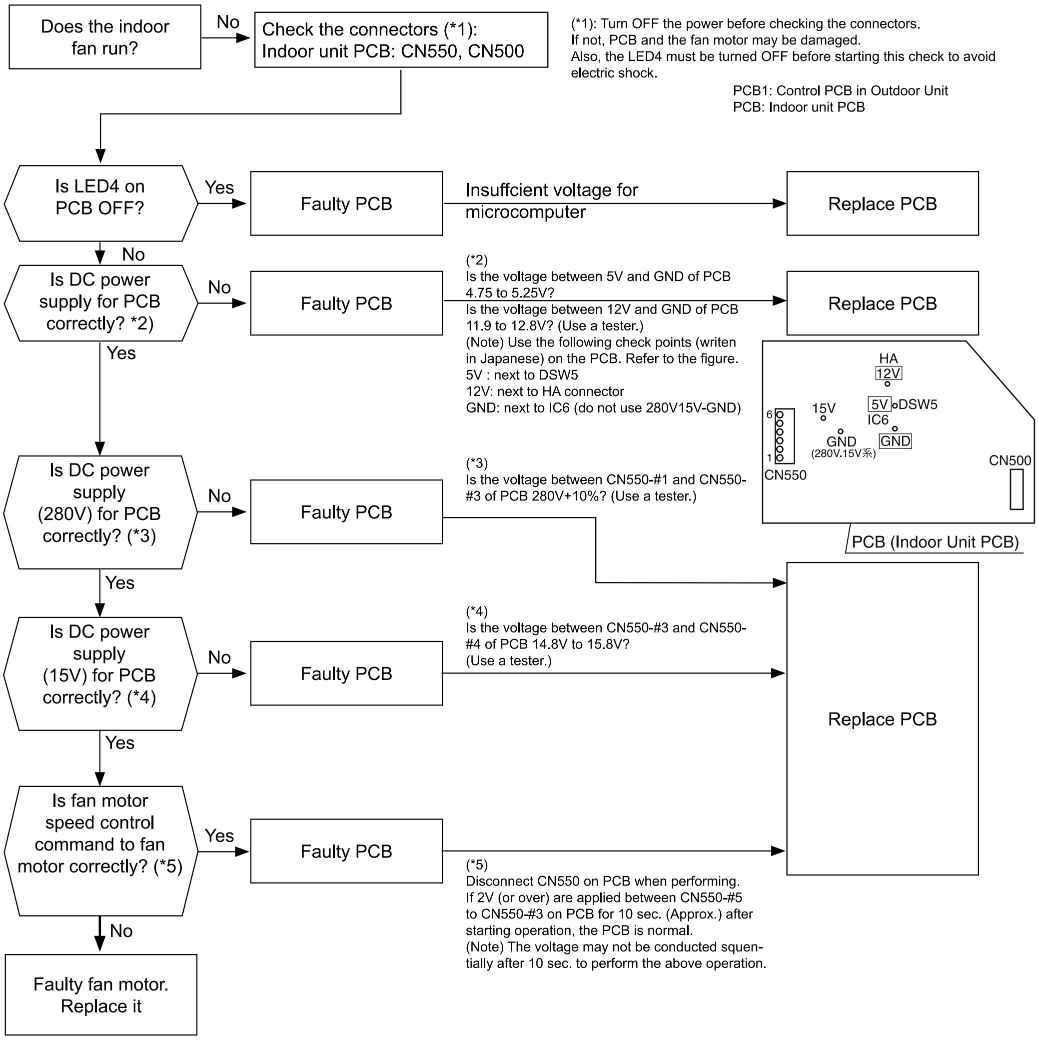
Alarm code	19	Activation of the protection device for the indoor fan motor (RCI, RCIM)

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
- The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  - This alarm code is displayed when the following conditions occurs three times in 30 minutes. Indoor fan rotates less than 70 rpm for 5 seconds during operation.
- When the cause is checked by means of this flow chart, confirm that fan speed setting is Hi



Alarm code	14	Activation of the protection device for the indoor fan motor (RPK)

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
  The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  - This alarm code is displayed when the following conditions occurs three times in 30 minutes. Indoor fan rotates less than 70 rpm for 5 seconds during operation.
- Set air flow volume “Hi” before starting this check.



(*1): Turn OFF the power before checking the connectors.
If not, PCB and the fan motor may be damaged.
Also, the LED4 must be turned OFF before starting this check to avoid electric shock.

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

(*2)
Is the voltage between 5V and GND of PCB 4.75 to 5.25V?
Is the voltage between 12V and GND of PCB 11.9 to 12.8V? (Use a tester.)
(Note) Use the following check points (writen in Japanese) on the PCB. Refer to the figure.
5V : next to DSW5
12V: next to HA connector
GND: next to IC6 (do not use 280V15V-GND)

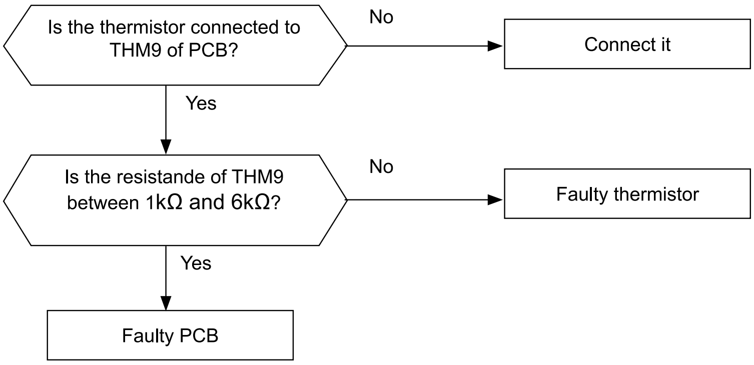
(*3)
Is the voltage between CN550-#1 and CN550-#3 of PCB 280V+10%? (Use a tester.)

(*4)
Is the voltage between CN550-#3 and CN550-#4 of PCB 14.8V to 15.8V?
(Use a tester.)

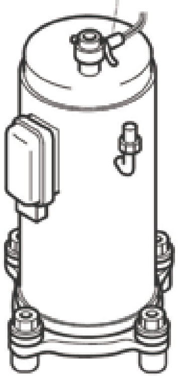
(*5)
Disconnect CN550 on PCB when performing.
If 2V (or over) are applied between CN550-#5 to CN550-#3 on PCB for 10 sec. (Approx.) after starting operation, the PCB is normal.
(Note) The voltage may not be conducted squentially after 10 sec. to perform the above operation.

Alarm code	20	Abnormality of Thermistor for Discharge Gas Temperature (Compressor Thermistor)

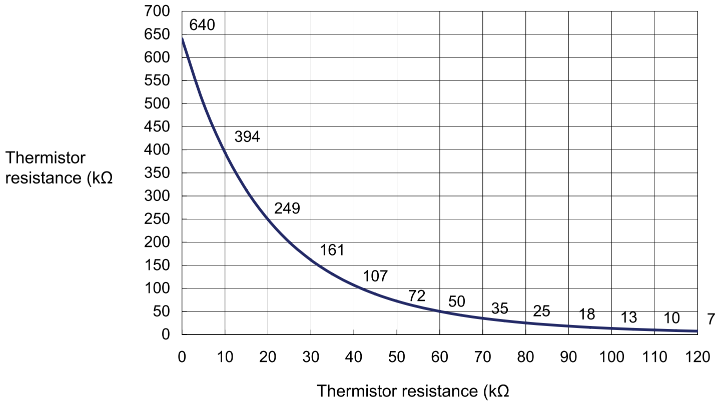
- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - This alarm code is indicated when the thermistor is short-circuited (less than 1 kΩ) or cut (greater than 6 MΩ) during the cooling or heating operation.



Thermistor onTop of Compressor



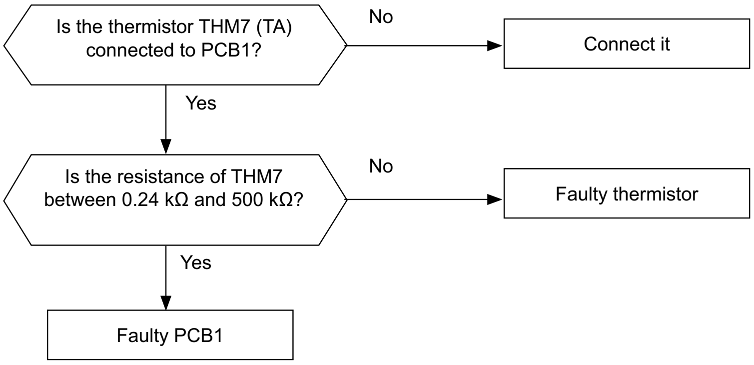
Phenomenon	Cause	Check item	Action (Turn OFF Main Switch)
Faulty top of compressor thermistor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to PCB1	Repair wiring and connections
Faulty PCB1		Replace PCB1 and check operation	Replace PCB1 if faulty

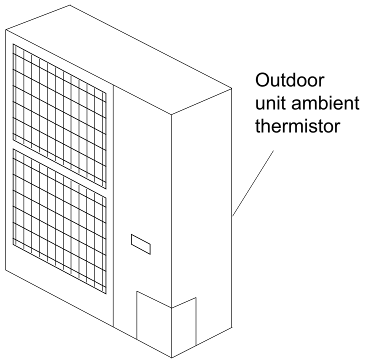


The resistance value have fudge factor (+10%).

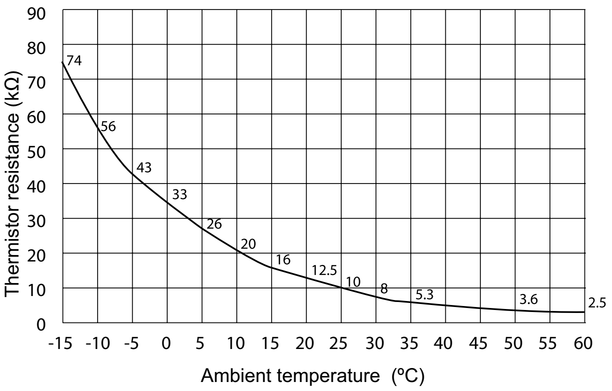
Alarm code	22	Abnormal operation of the thermistor for the outdoor temperature (outdoor unit ambient thermistor) for IVX Series

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
  The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - This alarm code is displayed when the thermistor is short-circuited (less than 0.2 kΩ) or cut (greater than 500 kΩ) during the operation. However, this alarm occurs during the test run mode only. In the case that the thermistor is abnormal during the operation, the operation continues based on the assumption that the outdoor temperature is 35 °C (cooling) / 6 °C (heating).





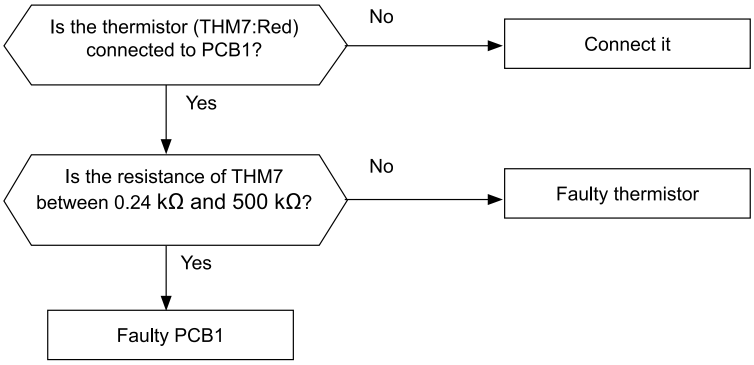
Thermistor characteristics

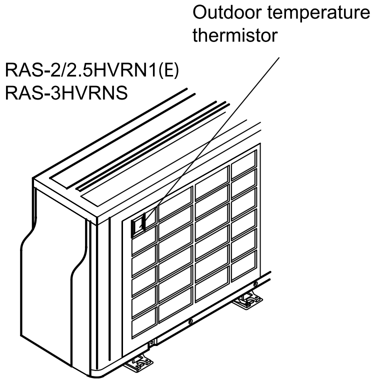


Phenomenon	Cause	Check item	Action (Turn OFF Main Switch)
Faulty thermistor for the outdoor unit ambient	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to PCB	Repair wiring and connections
Faulty PCB1		Replace PCB1 and check operation	Replace PCB if faulty

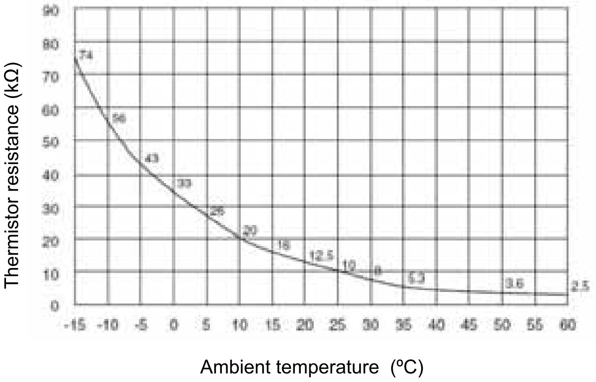
Alarm code	22	Abnormal operation of the thermistor for the outdoor temperature (outdoor unit ambient thermistor) for ES Series

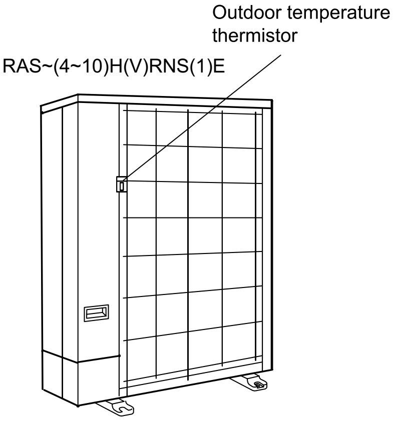
- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - This alarm code is displayed when the thermistor is short-circuited (less than 0.2 kΩ) or cut (greater than 500 kΩ) during the operation. However, this alarm occurs during the test run mode only. In the case that the thermistor is abnormal during the operation, the operation continues based on the assumption that the outdoor temperature is 35 °C (Cooling) / 6 °C (Heating).





Thermistor characteristics

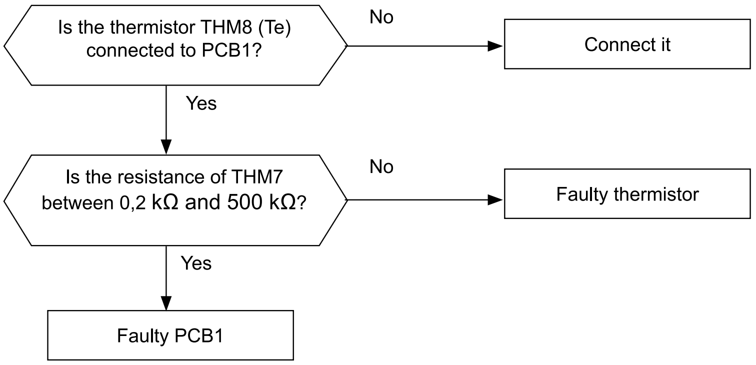


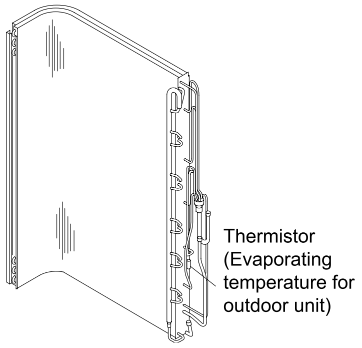


Phenomenon	Cause	Check item	Action (Turn OFF Main Switch)
Faulty thermistor for the outdoor unit ambient	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to PCB	Repair wiring and connections
Faulty PCB1		Replace PCB1 and check operation	Replace PCB if faulty

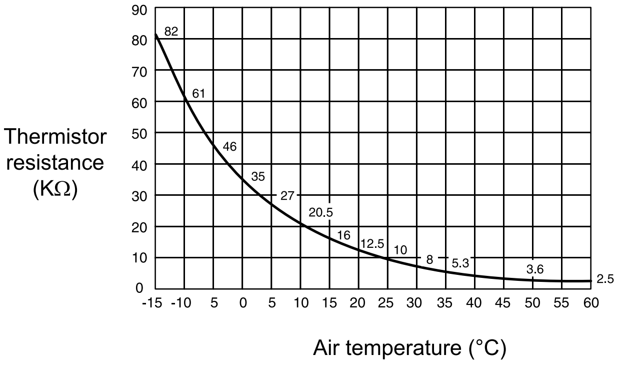
Alarm code	24	Abnormal operation of the thermistor for the evaporating temperature during the heating process (outdoor unit)

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB. (*1)
  If you find an abnormal operation of the thermistor, check all the thermistors as shown below.
  - The evaporating thermistor during the heating process is attached to the heat exchanger as shown in the figure below. If this the thermistor is faulty, such as short-circuit (less than 0,2kΩ) or cut (more than 500kΩ) during operation, this alarm is displayed. The position is indicated below.





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



Thermistor characteristics

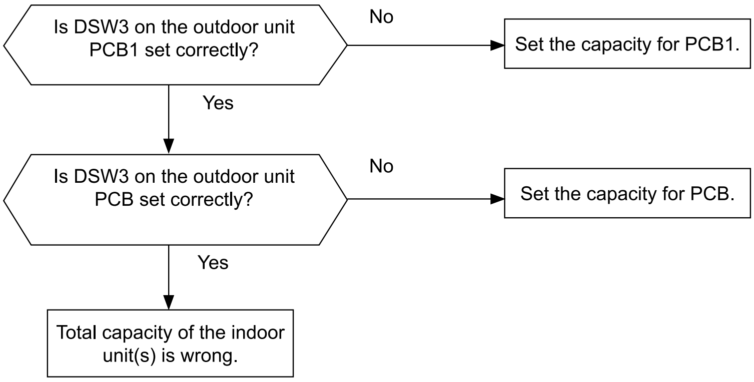
Alarm code	31	Incorrect Capacity Setting or Combined Capacity between Indoor Units and Outdoor Unit

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - This alarm code is indicated when the total indoor unit capacity is not equal to the combined outdoor unit capacity. Outdoor unit capacity setting is not correct

Conditions: Total I.U. Capacity < 80% of O.U. Capacity

or

Total I.U. Capacity > 125% of O.U. Capacity



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 PCB.	Correctly set dip switch, DSW3.
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 80% to 120%.

NOTE

- ***In case of H-LINK system, this alarm code is indicated when DSW4, RSW1 (for refrigerant system setting) on the outdoor unit PCB and DSW5, RSW2 (for refrigerant system setting) on the indoor unit PCB are incorrectly set.***
- ***In this case, set correctly DSW4, RSW1, DSW5 and RSW2 after turning OFF main switch.***
- ***(RSW2 is not equipped with some models.)***

Alarm code	35	Incorrect Indoor number setting

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, alarm code and unit model code appear alternately on the Set Temperature display of the remote control switch. The alarm code also appears on the outdoor unit PCB display.
  - The alarm code appears three minutes after the outdoor unit power activation if duplication is detected in indoor unit numbers connected to an outdoor unit (one refrigerant system). This applies when indoor unit numbers are configured using the rotary switch (RSW1).
  - The alarm code appears when five or more indoor units are connected to one outdoor unit.
  - The alarm code appears when the indoor and outdoor unit refrigerant system and address are set to 64 or above. (In such a case, the alarm code “b1” appears on the remote control switch.)

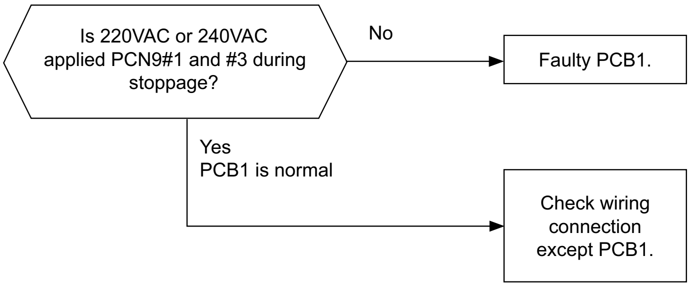
NOTE

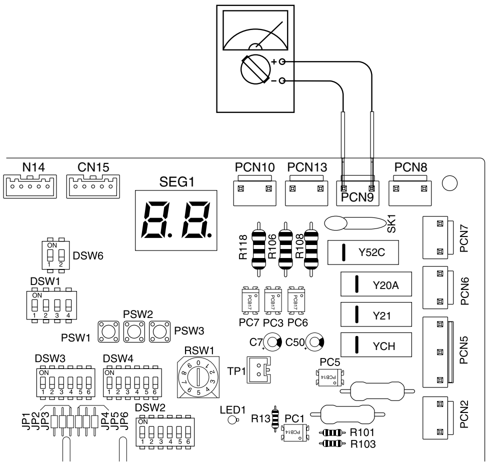
The alarm code may appear when H-LINK system is employed for indoor–outdoor unit transmission, if there is any incorrect setting in DSW4/RSW1 on the outdoor unit PCB and DSW5/RSW2 on the indoor unit PCB; which are dip switches used for refrigerant system setting. In such a case, turn OFF the power and correctly set DSW4/RSW1 on the outdoor unit PCB and DSW5/RSW2 on the indoor unit PCB before reactivating the power.

(Some indoor unit models do not have RSW2.)

Alarm code	38	Abnormality of Protective Circuit for Protection (Outdoor Unit) for IVX Series

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
    - This alarm code is indicated when AC 220V or 240V is supplied to voltage PCN9#1 and #3 on PCB1 in the outdoor unit during CMC is opened.





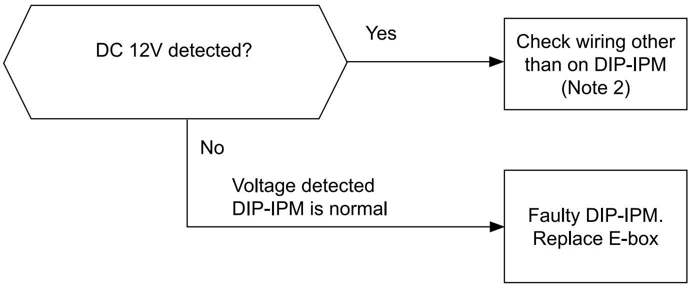
Phenomenon	Cause	Check item	Action (Turn OFF main switch)
Faulty PCB1		Check PCB1 by seft-checking	Replace PCB1

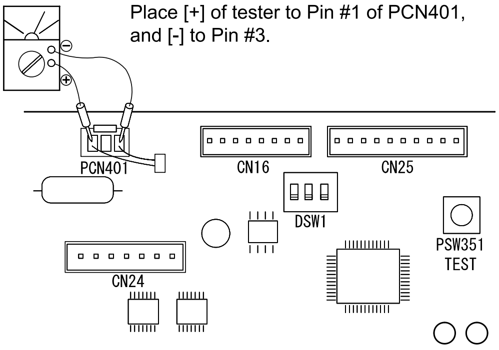
Alarm code	38	Abnormality of Protective Circuit for Protection (Outdoor Unit) for ES Series

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - The alarm code appears if approx. DC12V is supplied to the DIP-IPM connector (see table below) when the inverter operation is commanded (after five seconds following activation of the remote control switch).

Place the tester as shown in the diagram below to check the connector of PCN401. The connector shall remain inserted. DC12V will constantly be detected and disturb the diagnosis if the connector of PCN401 is pulled out.

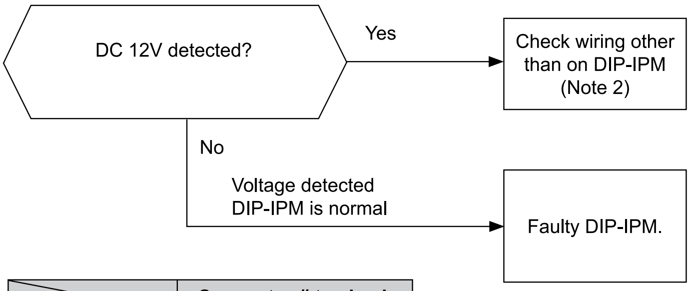
RAS-(2/2.5)HVRN2



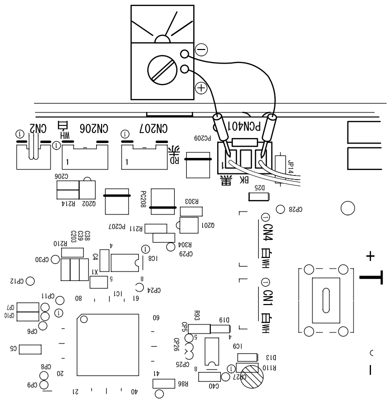


Place [+] of tester to Pin #1 of PCN401, and [-] to Pin #3.

RAS-3HVRNS2



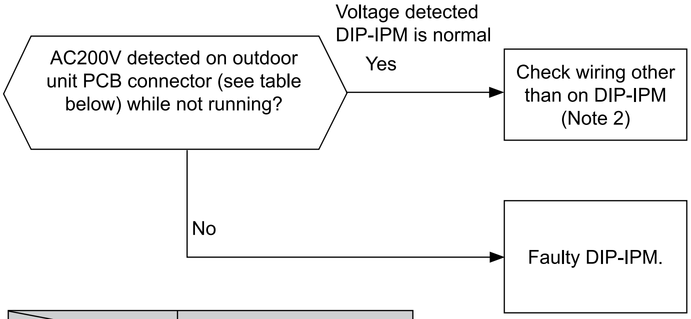
Place [+] of tester to Pin #1 of PCN401, and [-] to Pin #3.

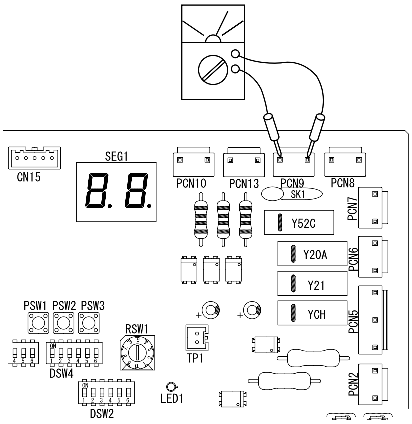


	Connector # to check
Connector	PCN401
Pin #	#1, #3

RAS-(4-10)H(V)RNS(2)E

- The alarm code appears if AC 200V or AC 240V is supplied to the connector on the outdoor unit PCB (see table below) while Y52C is OFF or CMC1 is open.





	Connector # to check
Connector	PCN9
Pin #	#1, #3

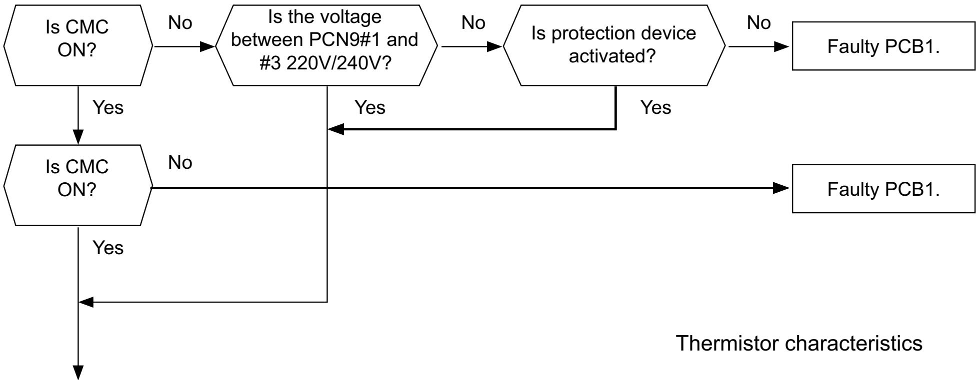
Phenomenon	Cause	Check item	Action (Turn OFF Main Switch)
Faulty DIP-IPM		Check DIP-IPM by seft-checking	Replace DIP-IPM

NOTE

- ***For PCB self diagnosis, see Page 420 of "Technical Catalogue/Service Manual".***
- ***This alarm (Alarm Code: 38) may appear when the operation is started, if the Faston terminal of the high pressure switch (63H1) is improperly connected or damaged (open-circuit fault). See also "Alarm Code: 02 Activation of Outdoor Unit Protection Device"***

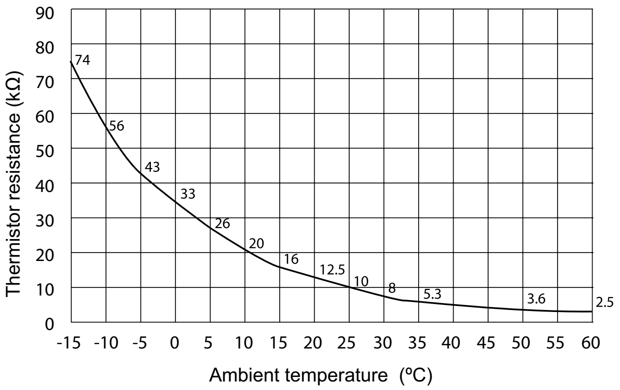
Alarm code	41	Cooling Overload (High pressure switch will be activated) for IVX Series

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - This alarm code is indicated when the protection device is activated at following condition. Evaporation temperature of outdoor unit is more than 55 degree and top of compressor temperature is more than 95 degree.



Check the following value by remote control switch.
1. Top of compressor temperature: 95ºC or less
2. Liquid refrigerant piping temperature of indoor unit: 55ºC or less If exceeding the above value, repair it.

Thermistor characteristics



<table>
<tr><th>Phenomenon</th><th colspan="2">Cause</th><th>Check item</th><th>Action
(Turn OFF main switch)</th></tr>
<tr><td rowspan="20">Activation of high pressure switch due to excessively high discharge pressure during cooling operation</td><td colspan="2" rowspan="4">Insufficient air flow to heat exchanger of outdoor unit</td><td>Clogging of heat exchanger?</td><td>Remover clogging</td></tr>
<tr><td>Check for dust on air filter</td><td>Remove dust</td></tr>
<tr><td>Check the service space</td><td>Secure service space</td></tr>
<tr><td>Check for speed:
Outdoor fan: cooling
Indoor fan: heating</td><td>Replace fan motor if faulty</td></tr>
<tr><td colspan="2" rowspan="3">Excessively high temp. air to outdoor unit heat exchanger</td><td>Check for hot air near the ceiling</td><td>Make good circulation</td></tr>
<tr><td>Check for short circuited air</td><td>Remove short-circuited air</td></tr>
<tr><td>Check for other heat source</td><td>Remove heat source</td></tr>
<tr><td rowspan="3">Faulty high pressure switch</td><td>Faulty pressure switch</td><td>Measure discharge pressure.
Check continuity after decreasing of pressure</td><td>Replace it if faulty</td></tr>
<tr><td>Insufficient contacting</td><td>Measure resistance by tester</td><td>Repair looseness.
Replace connector</td></tr>
<tr><td>Incorrect connection</td><td>Check connections</td><td>Repair connections</td></tr>
<tr><td colspan="2">Overcharged refrigerant</td><td>Check cycle operating temp.</td><td>Charge refrigerant correctly</td></tr>
<tr><td colspan="2">Mixture of non-condensable gas in refrigerant cycle</td><td>Check ambient temp. and pressure</td><td>Recharge refrigerant after vacuum pumping</td></tr>
<tr><td colspan="2">Clogging of discharge piping</td><td>Check for clogging.</td><td>Remove clogging</td></tr>
<tr><td colspan="2" rowspan="5">Faulty or malfunction of expansion valve</td><td>Check for clogging</td><td>Remove clogging</td></tr>
<tr><td>Check connecting wiring and connectors</td><td>Replace connector</td></tr>
<tr><td>Check operating sound from coil</td><td>Replace coil.</td></tr>
<tr><td>Check discharge gas thermistor</td><td>Replace thermistor</td></tr>
<tr><td>Check attaching state of discharge gas thermistor</td><td>Reattach thermistor</td></tr>
<tr><td colspan="2">Liquid line stop valve or gas line stop valve are not in operation</td><td>Check stop valves</td><td>Fully open stop valve</td></tr>
<tr><td colspan="2">Locking up outdoor unit expansion valve closure</td><td>Check expansion valve actuation</td><td>Replace outdoor
expansion valve</td></tr>
</table>

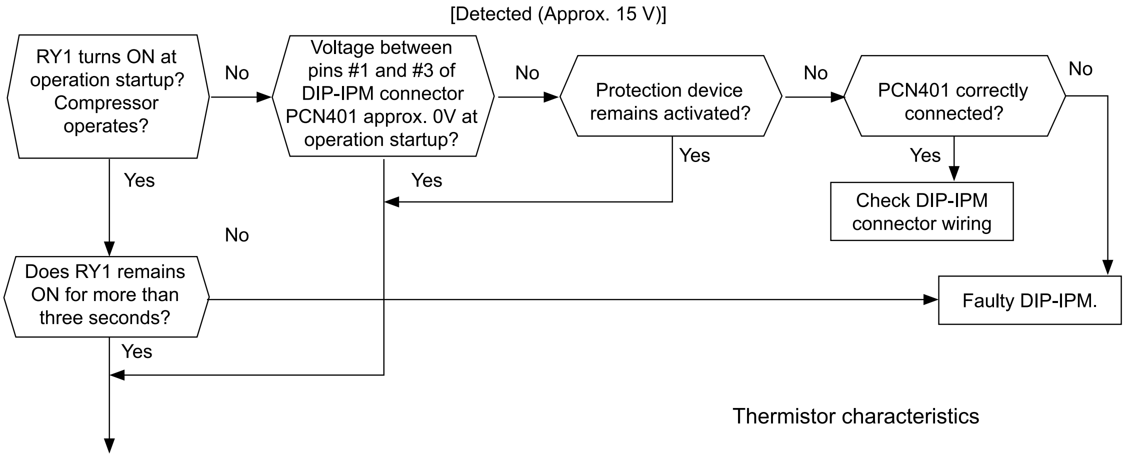
NOTE

- ***This alarm code is indicated when the outdoor unit protective device is activated by high discharge pressure during cooling operation. Accordingly, when this alarm code is indicated, there is high possibility of high pressure switch actuation and the above troubleshooting actions are based on such cases.***

Alarm code	41	Cooling Overload (High pressure switch will be activated) for ES Series

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - Abnormality indication will appear when the protection device is activated during compressor operation at cooling (see Note), with the outdoor unit evaporation temperature higher than 55 °C AND the compressor-top temperature higher than 95 °C.

RAS-(2-3)HVRN(S)2



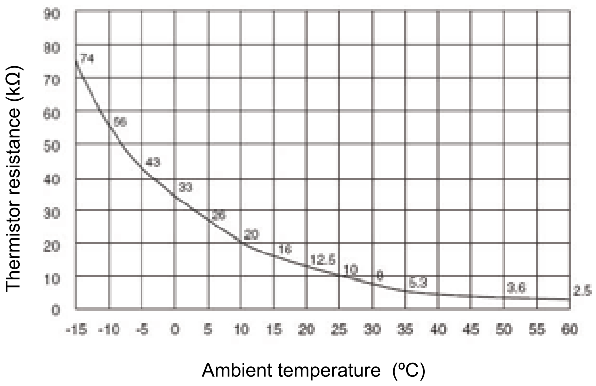
Check the temperature of the following places with the remote control switch in checking mode.

Check the temperature of [1] compressor-top temperature and [2] outdoor unit evaporation (piping). Examine the cause and address the problem if the measurements surpass the preset temperature. (See Note)

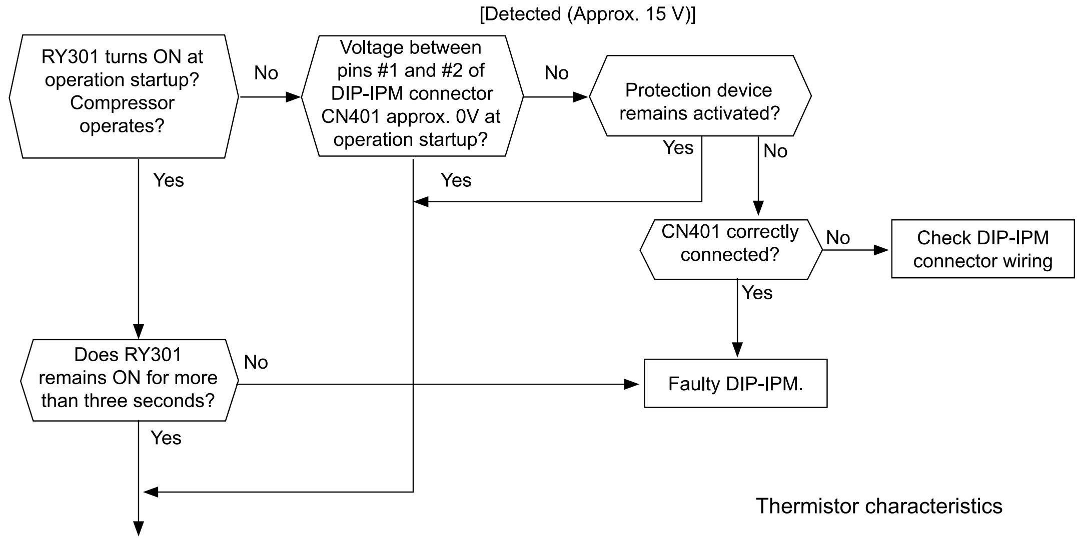
1 Compressor-Top Temp.Preset Temp. 95°C

2 Outdoor Unit Evaporation (Piping) Temp. Preset Temp. 55°C

Thermistor characteristics



RAS-(4-6)H(V)RNS2E



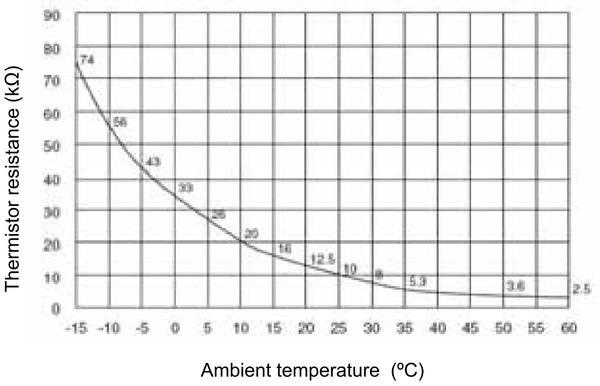
Check the temperature of the following places with the remote control switch in checking mode.

Check the temperature of [1] compressor-top temperature and [2] outdoor unit evaporation (piping). Examine the cause and address the problem if the measurements surpass the preset temperature. (See Note)

1 Compressor-Top Temp. Preset Temp. 95°C

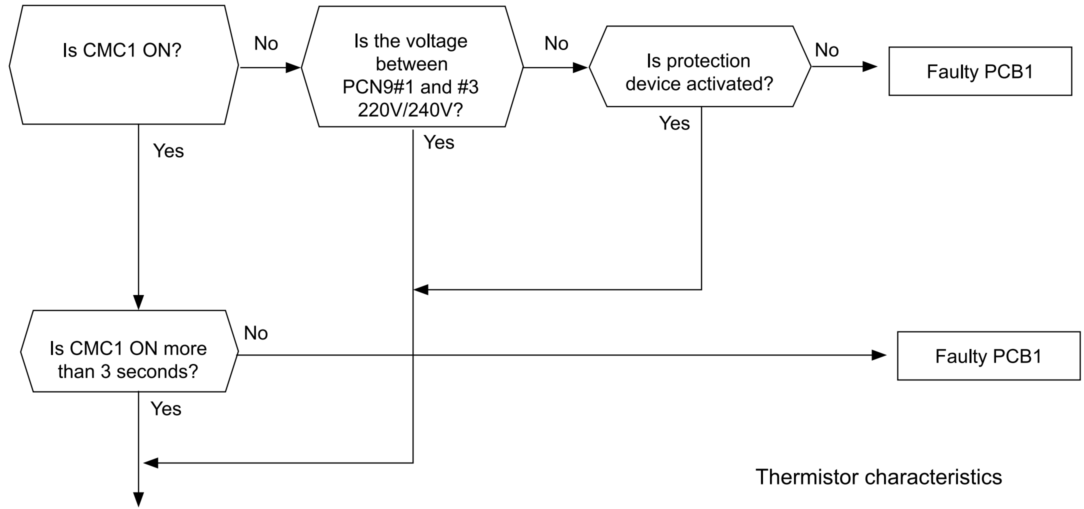
2 Outdoor Unit Evaporation (Piping) Temp. Preset Temp. 55°C

Thermistor characteristics



RAS-(8/10)HRNSE

PCB1: Control PCB in Outdoor Unit



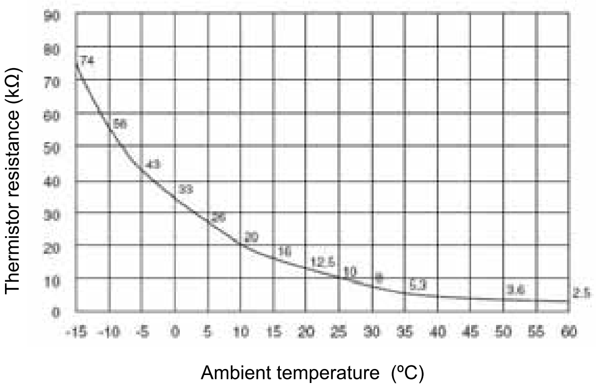
Check the temperature of the following places with the remote control switch in checking mode.

Check the temperature of [1] compressor-top temperature and [2] outdoor unit evaporation (piping). Examine the cause and address the problem if the measurements surpass the preset temperature. (See Note)

1 Compressor-Top Temp. Preset Temp. 95°C

2 Outdoor Unit Evaporation (Piping) Temp.
Preset Temp. 55°C

Thermistor characteristics



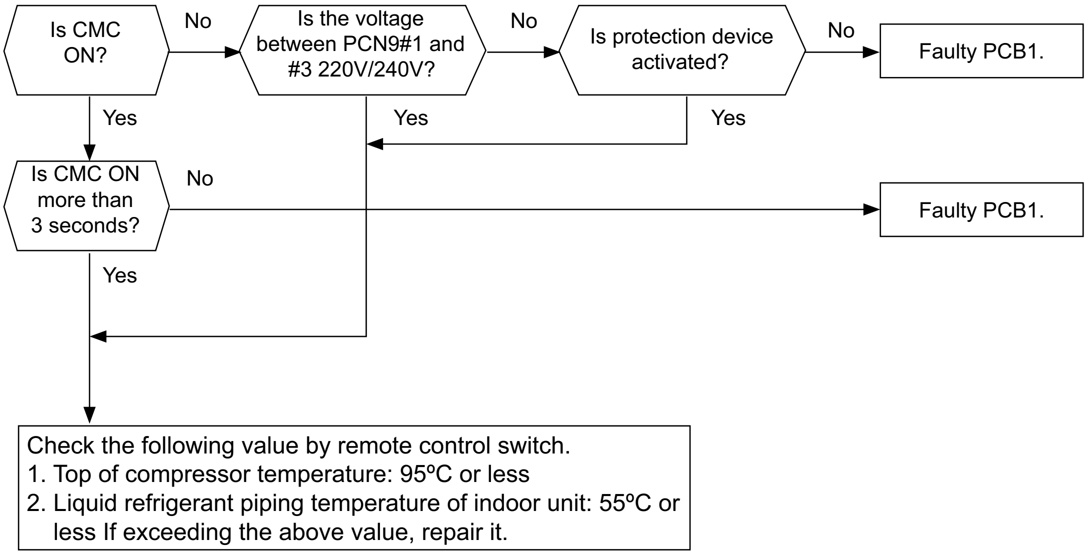
Phenomenon	Cause		Check item	Action (Turn OFF main switch)
Activation of High Pressure Switch due to Excessively High Discharge Pressure during Cooling Operation	Insufficient Air Flow to Heat Exchanger of Outdoor Unit		Clogging of Heat Exchanger?	Remover clogging
			Check for dust on air filter	Remove dust
			Check the service space	Secure service space
			Check for speed: Outdoor Fan: Cooling Indoor Fan: Heating	Replace fan motor if faulty
	Excessively High Temp. Air to Outdoor Unit Heat Exchanger		Check for hot air near the ceiling	Make good circulation
			Check for short circuited air	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
		Insufficient Contacting	Measure resistance by tester	Repair looseness. Replace connector
		Incorrect Connection	Check connections	Repair connections
	Overcharged Refrigerant		Check cycle operating temp.	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
	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
	Liquid Line Stop Valve or Gas Line Stop Valve are not in Operation		Check stop valves	Fully open stop valve
	Locking up Outdoor Unit Expansion Valve Closure		Check expansion valve actuation	Replace outdoor expansion valve

NOTE

This alarm code is indicated when the outdoor unit protective device is activated by high discharge pressure during cooling operation. Accordingly, when this alarm code is indicated, there is high possibility of high pressure switch actuation and the above troubleshooting actions are based on such cases.

Alarm code	42	Heating Overload (High pressure switch will be activated) for IVX Series

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
    - This alarm code is indicated when the protection device is activated at following condition. Liquid refrigerant piping temperature of indoor unit is more than 55 ºC and top of compressor temperature is more than 95 ºC.



Check the following value by remote control switch.
1. Top of compressor temperature: 95ºC or less
2. Liquid refrigerant piping temperature of indoor unit: 55ºC or less If exceeding the above value, repair it.

Phenomenon	Cause		Check item	Action (Turn OFF main switch)
Activation of high pressure switch due to excessively high discharge pressure during heating operation	Insufficient air flow to heat exchanger of indoor unit		Clogging of Heat exchanger	Remove it
			Check for dust on air filter	
			Check for any obstacle at inlet or outlet of heat exchanger	
			Check the service space	Secure service space
			Check for fan speed. (Cooling: outdoor fan heating: indoor fan)	Replace fan motor if faulty
	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	Make good circulation
			Check for short circuited air	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
		Insufficient contacting	Measure resistance by tester	Repair looseness. Replace connector
		Incorrect connection	Check connections	Repair connections
	Faulty of outdoor fan control		Check decreasing air flow volume at pressure switch for control activative	Replace thermistor for evaporating temp. if faulty
	Faulty of pressure switch for control		Check activated pressure and connecting wire	Replace it if pressure switch for control is faulty
	Overcharged refrigerant		Check cycle operating temp.	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
	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
	Liquid line stop valve or gas line stop valve are not in operation		Check stop valves	Fully open stop valve

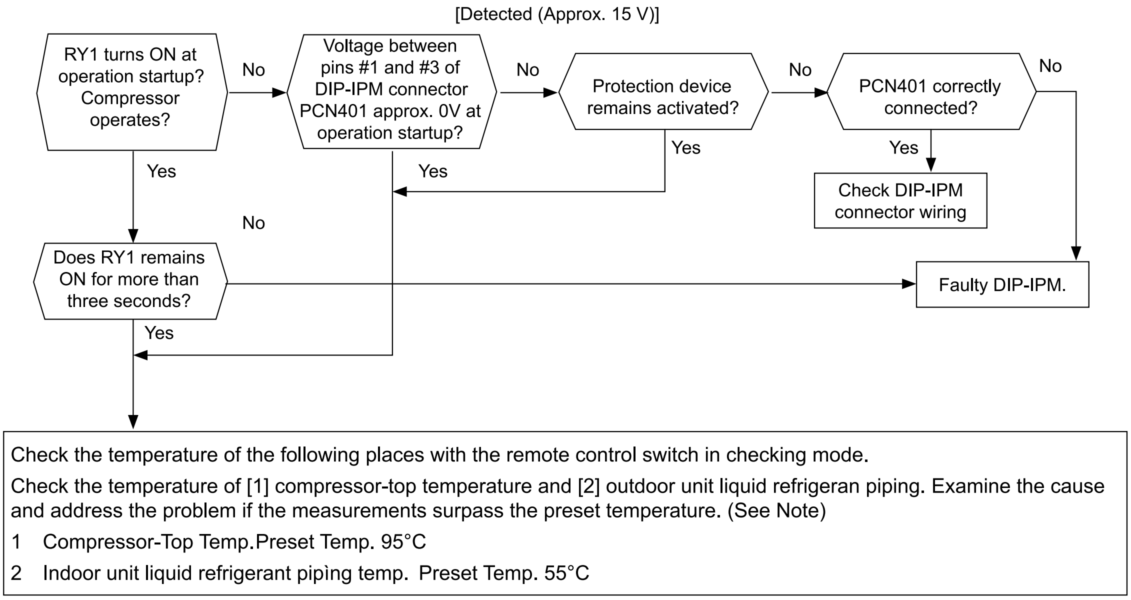
NOTE

This alarm code is indicated when the outdoor unit protective device is activated by high discharge pressure during heating operation. Accordingly, when this alarm code is indicated, there is high possibility of high pressure switch actuation and the above troubleshooting actions are based on such cases.

Alarm code	42	Heating Overload (High pressure switch will be activated) for ES Series

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - Abnormality indication will appear when the protection device is activated during compressor operation at heating (see Note), with the outdoor unit evaporation temperature higher than 55 °C and the compressor-top temperature higher than 95 °C.

RAS-(2-3)HVRN(S)2



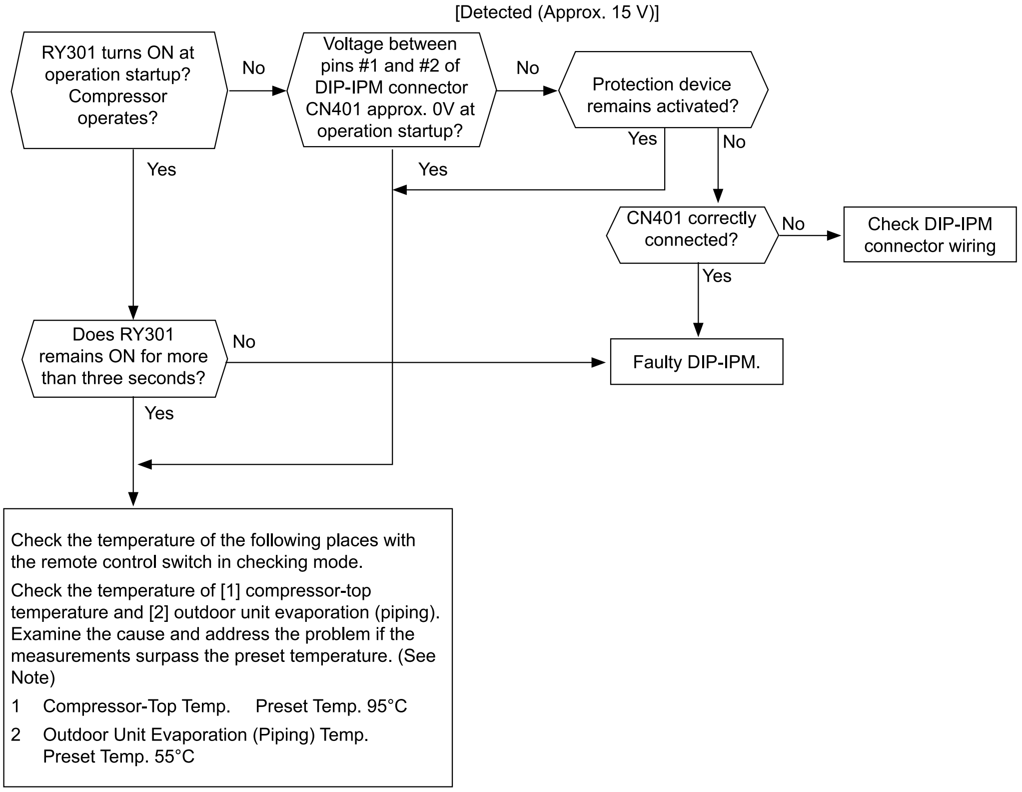
Check the temperature of the following places with the remote control switch in checking mode.

Check the temperature of [1] compressor-top temperature and [2] outdoor unit liquid refrigeran piping. Examine the cause and address the problem if the measurements surpass the preset temperature. (See Note)

1 Compressor-Top Temp.Preset Temp. 95°C

2 Indoor unit liquid refrigerant piping temp. Preset Temp. 55°C

RAS-(4-6)H(V)RNS2E



Check the temperature of the following places with the remote control switch in checking mode.

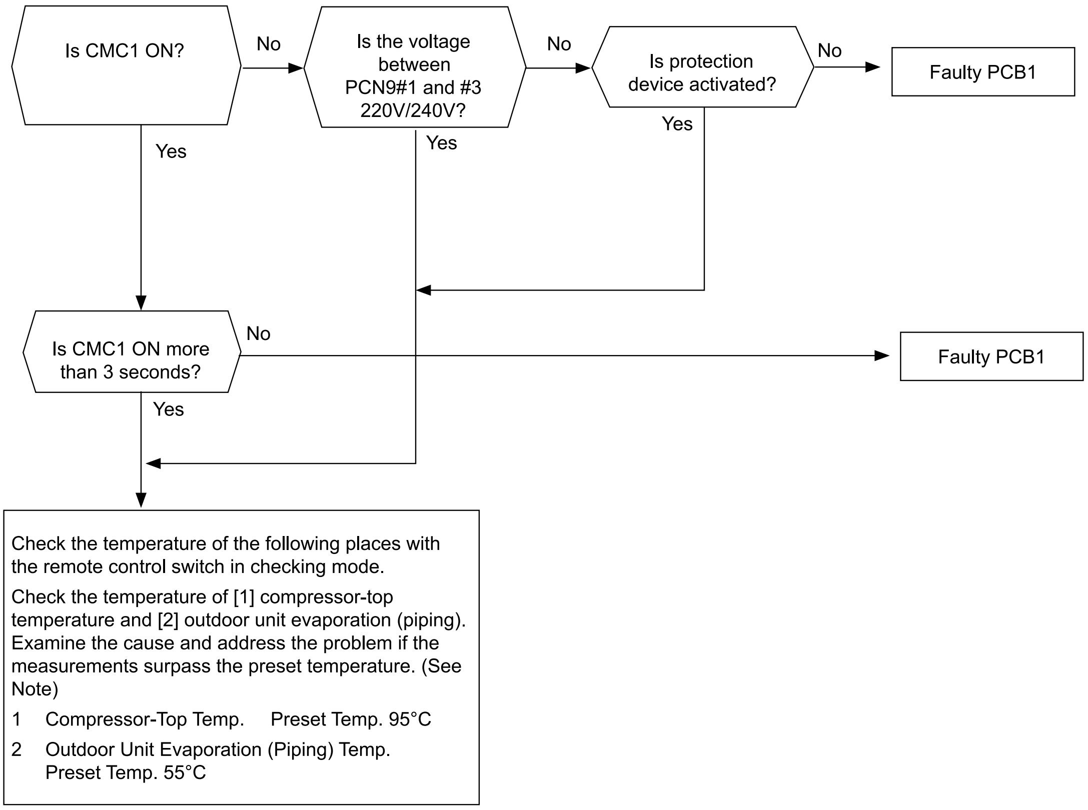
Check the temperature of [1] compressor-top temperature and [2] outdoor unit evaporation (piping). Examine the cause and address the problem if the measurements surpass the preset temperature. (See Note)

1 Compressor-Top Temp. Preset Temp. 95°C

2 Outdoor Unit Evaporation (Piping) Temp. Preset Temp. 55°C

RAS-(8/10)HRNSE

PCB1: Control PCB in Outdoor Unit



Check the temperature of the following places with the remote control switch in checking mode.

Check the temperature of [1] compressor-top temperature and [2] outdoor unit evaporation (piping). Examine the cause and address the problem if the measurements surpass the preset temperature. (See Note)

1 Compressor-Top Temp. Preset Temp. 95°C

2 Outdoor Unit Evaporation (Piping) Temp. Preset Temp. 55°C

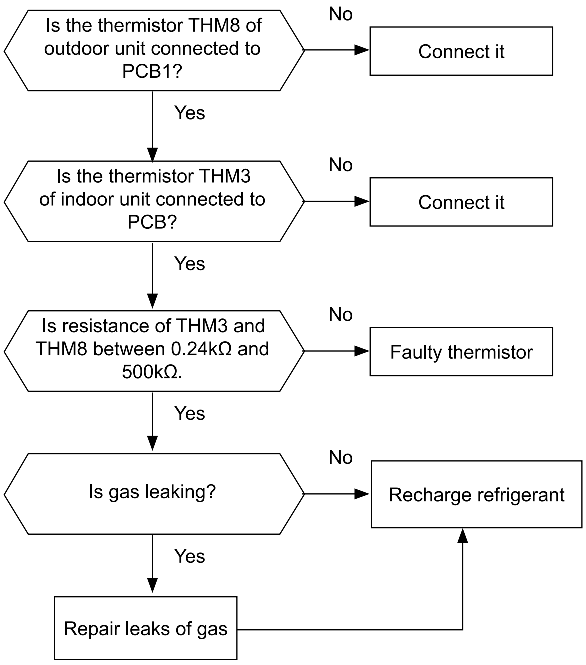
Phenomenon	Cause		Check item	Action (Turn OFF Main Switch)
Activation of High Pressure Switch due to Excessively High Discharge Pressure during Heating Operation	Insufficient Air Flow to Heat Exchanger of Indoor Unit		Clogging of Heat Exchanger	Remove it
			Check for dust on air filter	
			Check for any obstacle at inlet or outlet of heat exchanger	
			Check the service space	Secure service space
			Check for fan speed. (Cooling: Outdoor Fan Heating: Indoor Fan)	Replace fan motor if faulty
Activation of High Pressure Switch due to Excessively High Discharge Pressure during Heating Operation	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	Make good circulation
			Check for short circuited air	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
		Insufficient Contacting	Measure resistance by tester	Repair looseness. Replace connector
		Incorrect Connection	Check connections	Repair connections
	Faulty of Outdoor Fan Control		Check decreasing air flow volume at pressure switch for control activative	Replace thermistor for evaporating temp. if faulty
	Faulty of Pressure Switch for Control		Check activated pressure and connecting wire	Replace it if pressure switch for control is faulty
	Overcharged Refrigerant		Check cycle operating temp.	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
	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
	Liquid Line Stop Valve or Gas Line Stop Valve are not in Operation		Check stop valves	Fully open stop valve

NOTE

This alarm code is indicated when the outdoor unit protective device is activated by high discharge pressure during heating operation. Accordingly, when this alarm code is indicated, there is high possibility of high pressure switch actuation and the above troubleshooting actions are based on such cases.

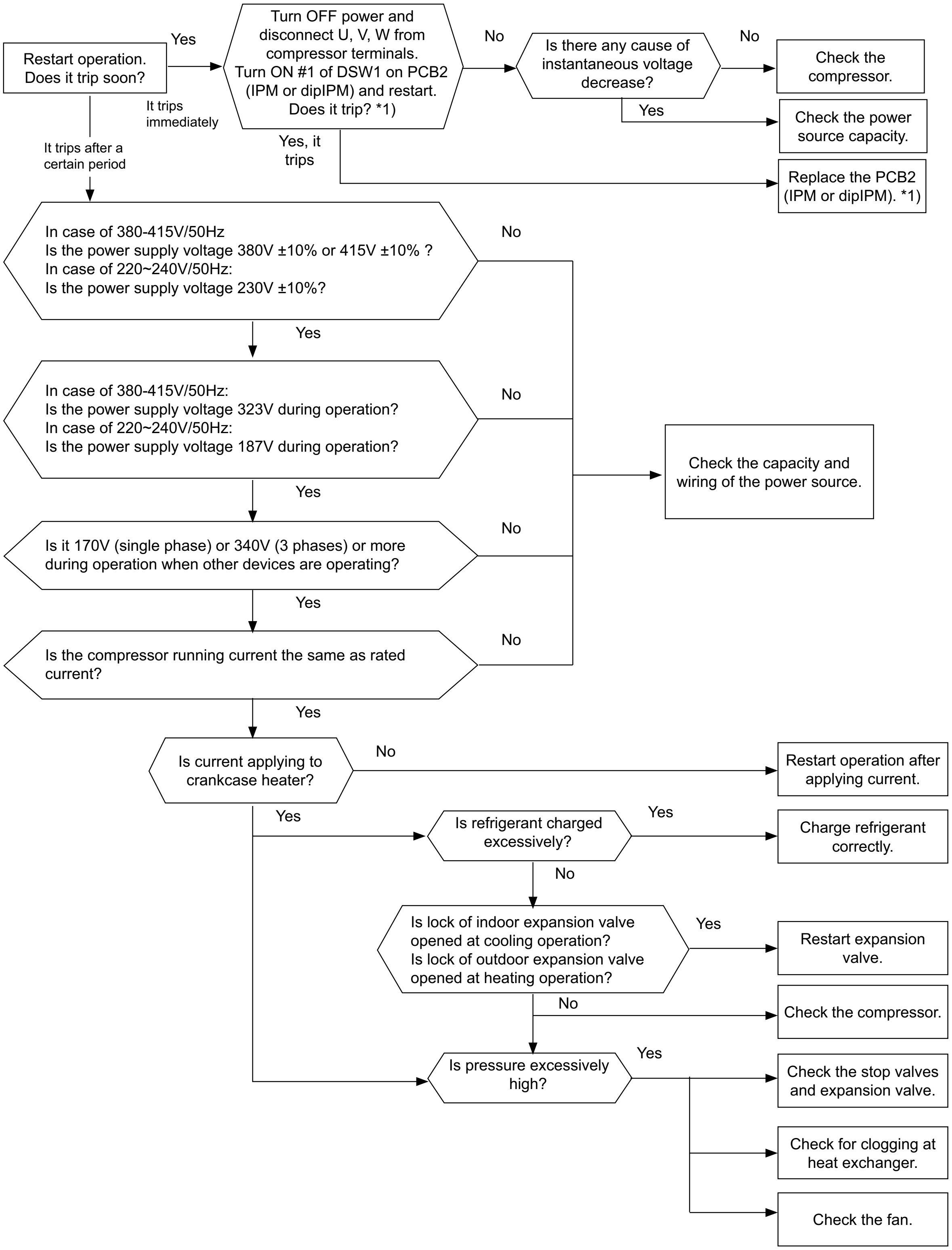
Alarm code	47	Activation to Protect System from Excessively Low Suction Pressure (Protection from Vacuum Operation) for ES Series

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
    - In the case that the evaporating temperature (Cooling: Liquid Refrigerant Piping Temp. of Indoor Unit, Heating: Evaporating Temp. of Outdoor Unit) is lower than -37 °C (250~350 kΩ) and the thermistor on top of compressor is higher than 90 °C. for 10 minutes, retry operation is performed 3 minutes after compressor stoppage.However, when the state occurs more than 3 times including 3 in one hour, this alarm code is indicated.



Phenomenon	Cause	Check item	Action (Turn OFF Main Switch).
– Faulty indoor unit liquid refrigerant temp. thermistor – Faulty outdoor unit evaporating temp. thermistor	Fault	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to PCB.	Repair wiring and connections.
Faulty PCB (Outdoor Unit, Indoor Unit)		Replace PCB and check operation.	Replace PCB if faulty.
Excessively Low Suction Pressure (in Vacuum)	Liquid Line Stop Valve is not open before Operation	Check stop valve.	Fully open stop valve.
	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.
	Refrigerant Leakage	Check each temp. and pressure.	Charge refrigerant after vacuum pumping.
		Check gas leakage part.	Correctly charge refrigerant after repairing gas leakage.
Faulty Outdoor Fan at heating Operation	Faulty Outdoor Fan Motor	Measure coil resistance and insulating resistance.	Replace outdoor fan motor if faulty.

Alarm code	48	Overcurrent protection activation for IVX series

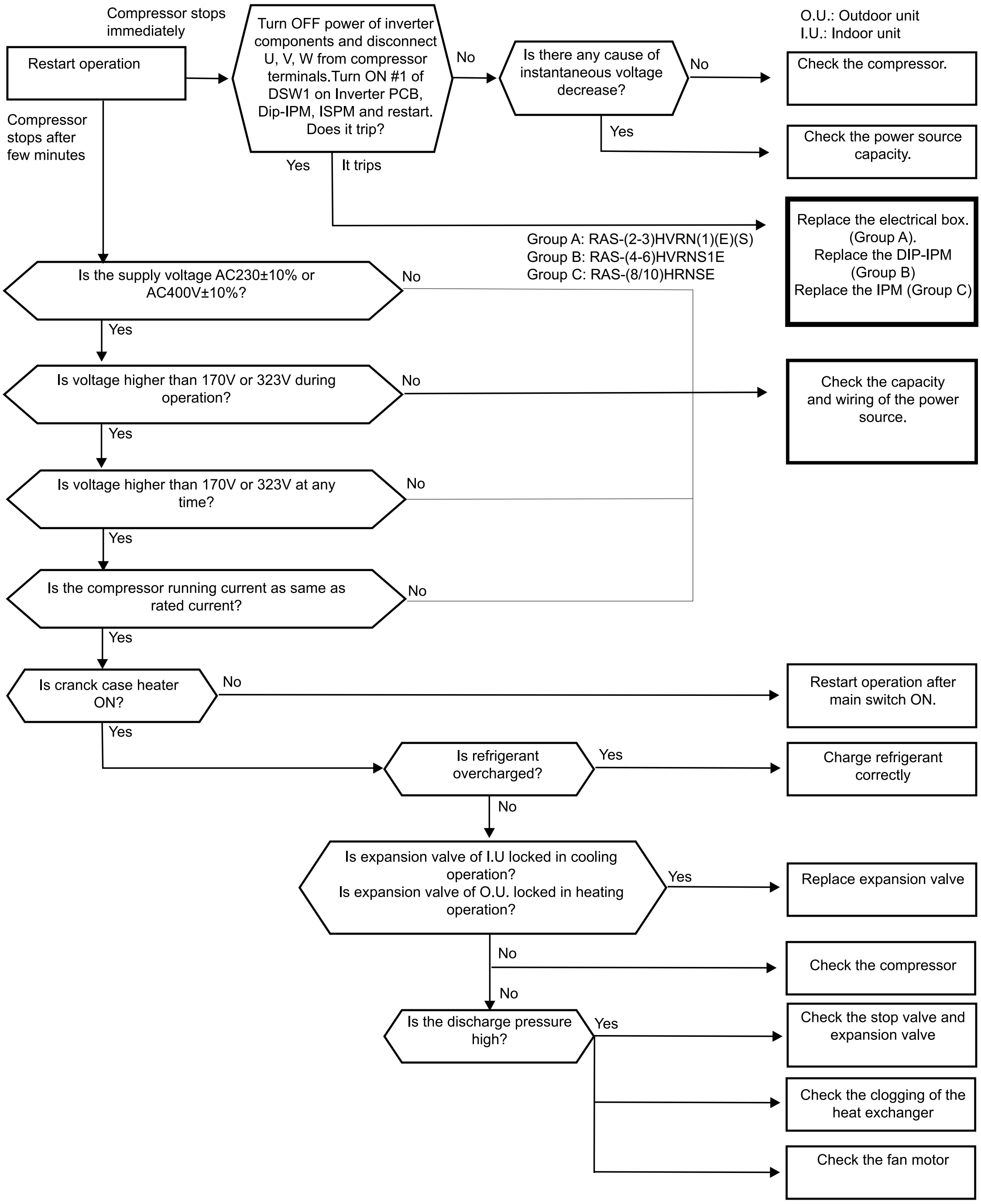


NOTE

****1) Perform the high voltage discharge work by referring to section Procedure of checking other main parts for ES Series**, see on page 312* ***before checking and replacing the inverter PCB.***

Alarm code	48	Activation Protection Against Instantaneous Overcurrent of Inverter for ES Series

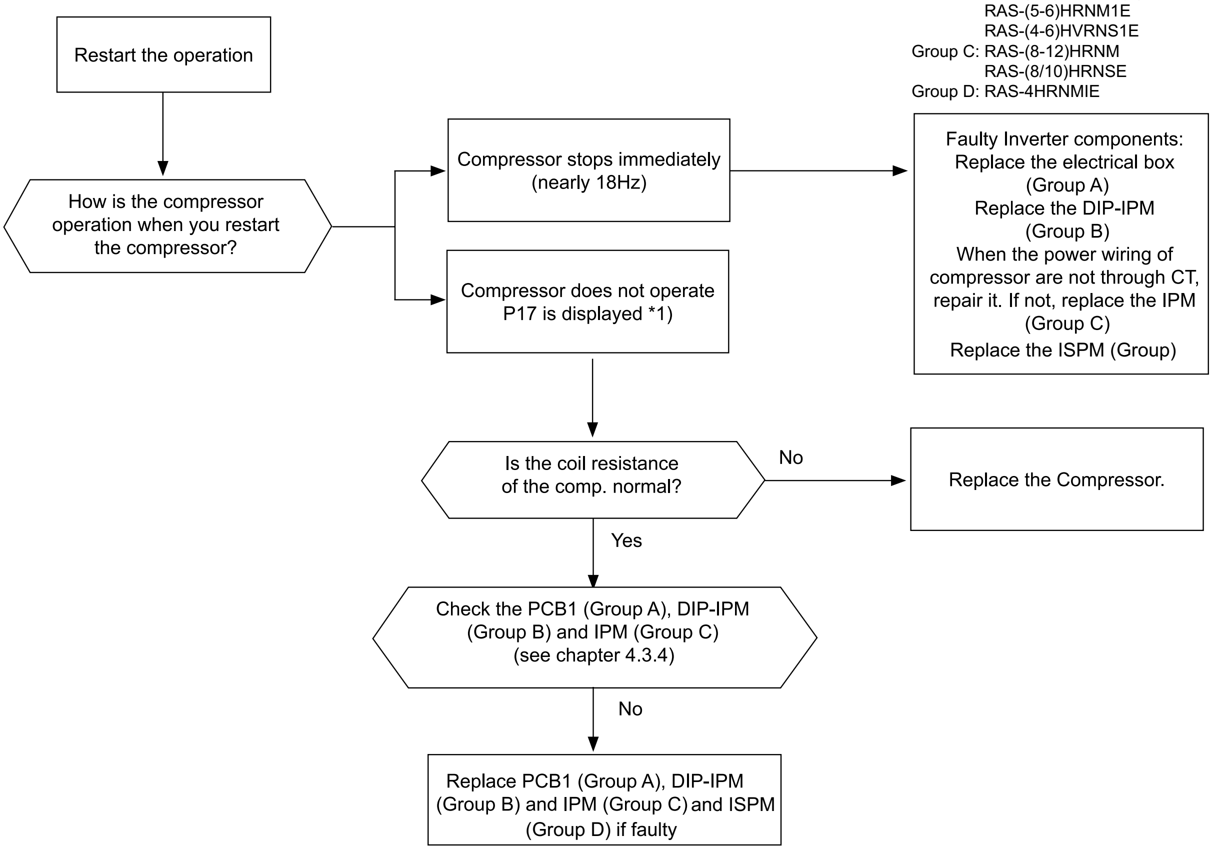
- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - In the case that the evaporating temperature (Cooling: Liquid Refrigerant Piping Temp. of Indoor Unit, Heating: Evaporating Temp. of Outdoor Unit) is lower than -37 °C (250~350 kΩ) and the thermistor on top of compressor is higher than 90 °C. for 10 minutes, retry operation is performed 3 minutes after compressor stoppage.However, when the state occurs more than 3 times including 3 in one hour, this alarm code is indicated.



Alarm code	51	Abnormal operation of the current sensor

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - This alarm code is displayed when the current transformer is abnormal (0 A detection or 5 A alarm condition) and the alarm has more than three occurrences in 30 minutes.
  - Condition of Activation:
    - When the frequency of the compressor is maintained at 15~18 Hz after the compressor is started, one of the absolute values of the running current at each phase U+, U-, V+ and V- is less than 1.5 A (including 1.5A)
    - Before the compressor is operated (at the end of position control), the current wave value is less than 5.0 A

Group A: RAS-(2-3)HVRN(1)(E)(S)
Group B: RAS-(3-6)HVRNM(S)E
RAS-(5-6)HRNM1E
RAS-(4-6)HVRNS1E
Group C: RAS-(8-12)HRNM
RAS-(8/10)HRNSE
Group D: RAS-4HRNMIE



NOTE

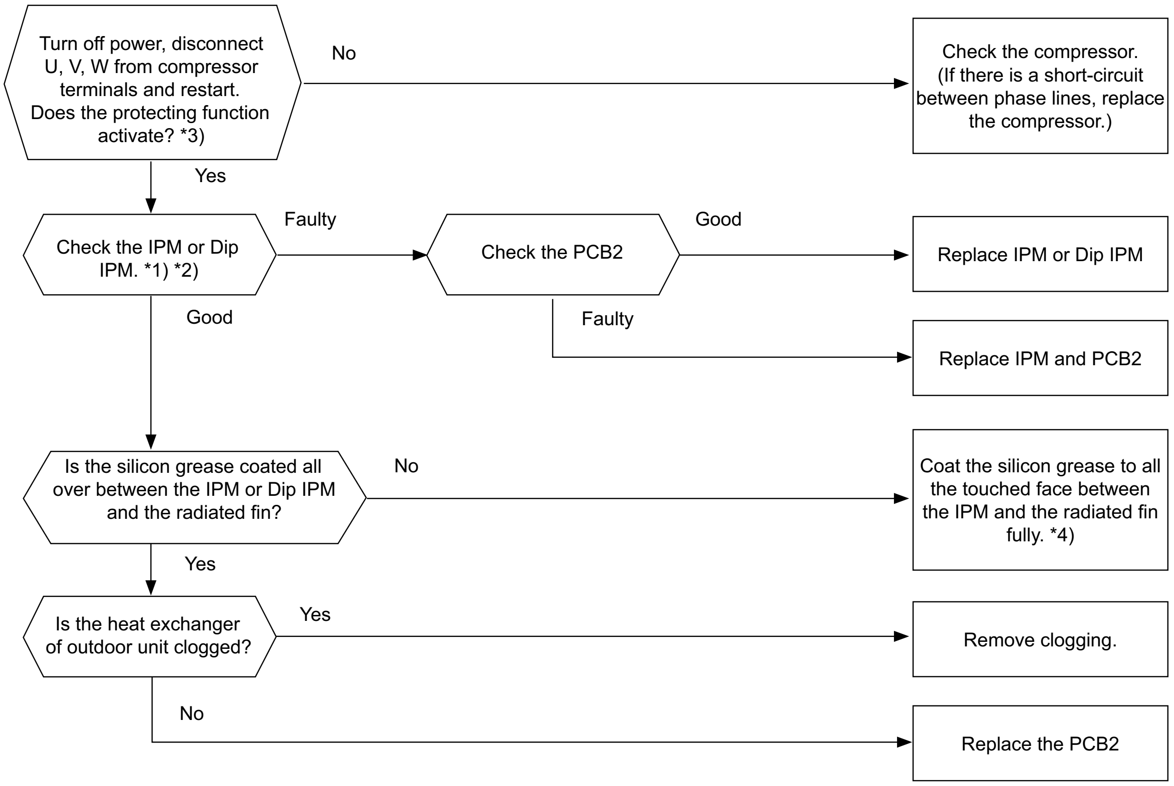
- ***1) P17 is shown at 7-segment on the outdoor unit PCB.***
- ***2) Perform the high voltage discharge work by referring to the item** *Procedure of checking other main parts for ES Series*, *see on page 312* ***in part “Checking procedure for the electronic expansion valve” before checking and replacing the inverter parts.***

Alarm code	53	Protection activation of IPM or DipIPM and PCB2 (RAS-(3-6)HVRNM2E and RAS-(8-12)HRNM) for IVX Series

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
    - IPM or Dip IPM and PCB2 have detecting function of abnormality. This alarm is indicated when the transistor module detect the abnormality 7 times in 30 minutes including 7. Retry operation is performed up to the occurrence of 6 times.

Conditions:

- Abnormal current to the transistor module such as
    - Short circuited or grounded
      or
    - Abnormal temperature of the IPM or Dip IPMand PCB2
      or
    - Control voltage decrease



NOTE

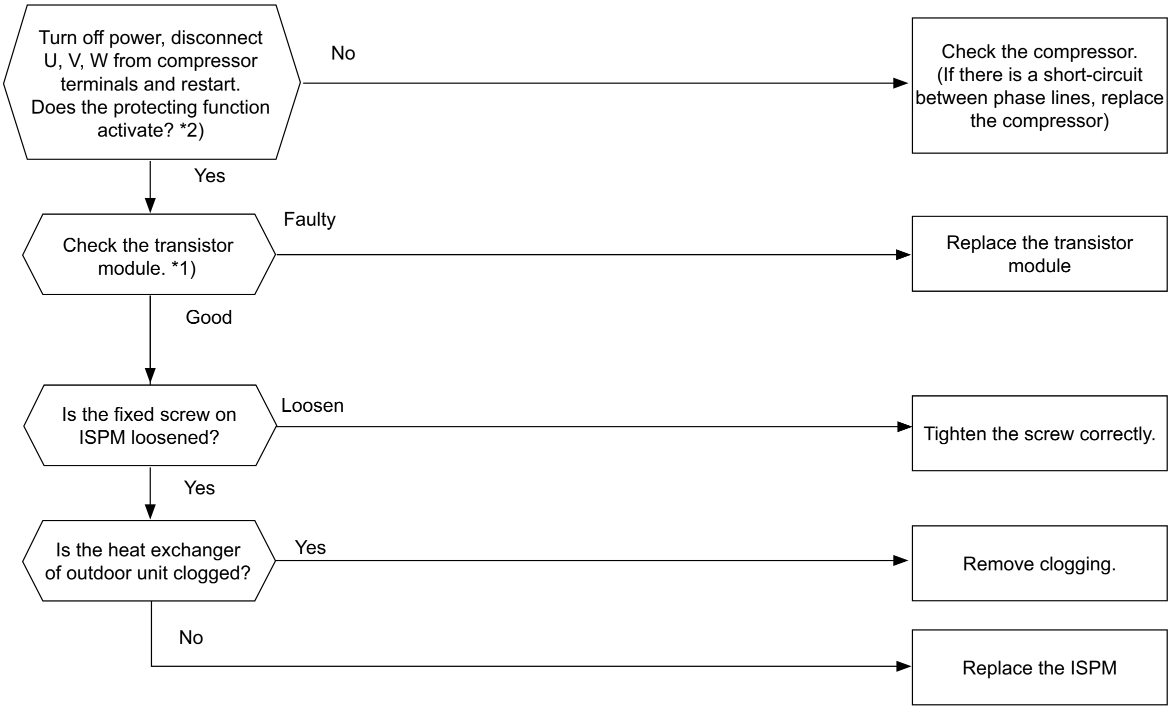
- ****1) Perform the high voltage discharge work by referring to the item Procedure of checking other main parts for ES Series**, see on page 312 **before checking and replacing the inverter components.***
- ****2) Regarding replacing or checking method for inverter components, refer to item Procedure of checking other main parts for ES Series**, see on page 312.*
- ****3) Turn ON the No.1 switch of the dip switch DSW1 on PCB2 when restarting with disconnecting the terminals of the compressor. After troubleshooting, turn OFF the No.1 switch of the dip switch DSW1 on PCB2.***
- ****4) Use the silicon grease provided as accessory (Service parts No. P22760).***
- ***When the alarm code “53” is indicated, the outdoor fan motor (DC motor) ensure that DC fan motor is checked according to the item Procedure of checking other main parts for ES Series**, see on page 312.*

Alarm code	53	Activation for protecting the ISPM (RAS-(3-6)HRNM2E for IVX Series

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - ISPM has a detection function of the abnormal operation. This alarm is displayed when the ISPM module detects the abnormal operation 7 times or more than 7 times in 30 minutes. The retry operation is performed six times.

Conditions:

- The abnormal current to the ISPM, such as short-circuited, grounded, overcurrent or control voltage decrease.



NOTE

- ***1) Regarding replacing or checking method for ISPM, refer to item Procedure of checking other main parts for ES Series, see on page 312.***
- ***2) Set the #1 pin of DIP switch on ISPM to ON when you are restarting with the terminals of the compressor disconnected. After the troubleshooting, set #1 pin of DIP switch DSW1 on ISPM to OFF.***

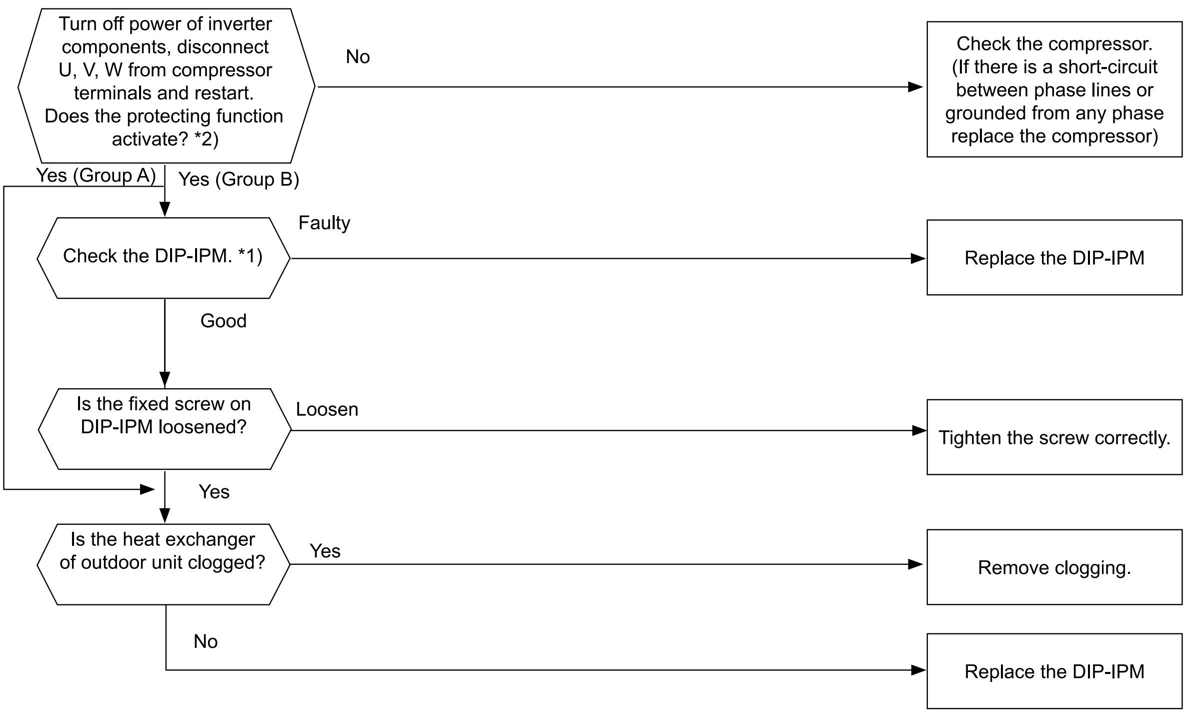
Alarm code	53	Transistor module protection activation for ES Series

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - This alarm is displayed when the inverter PCB or DIP-IPM module detects the abnormal operation 7 times or more than 7 times in 30 minutes. The retry operation is performed six times.

Conditions:

The abnormal current to the inverter PCB or DIP-IPM, such as short-circuited, grounded, overcurrent or control voltage decrease.

Group A: RAS-(2~3)HVRN(S)(E)(1)
Group B: RAS-(4~6)HVRNS1E



NOTE

- ***1) Regarding replacing or checking method for the DIP-IPM refer to section Procedure of checking other main parts for ES Series,*** *see on page 312.*
- ***2) Set the #1 pin of DIP switch DSW1 on inverter PCB or DIP-IMP to ON when you are restarting with the terminals of the compressor disconnected. After the troubleshooting, set the #1 pin of DIP switch DSW1 on Inverter PCB or DIP-IPM to OFF.***

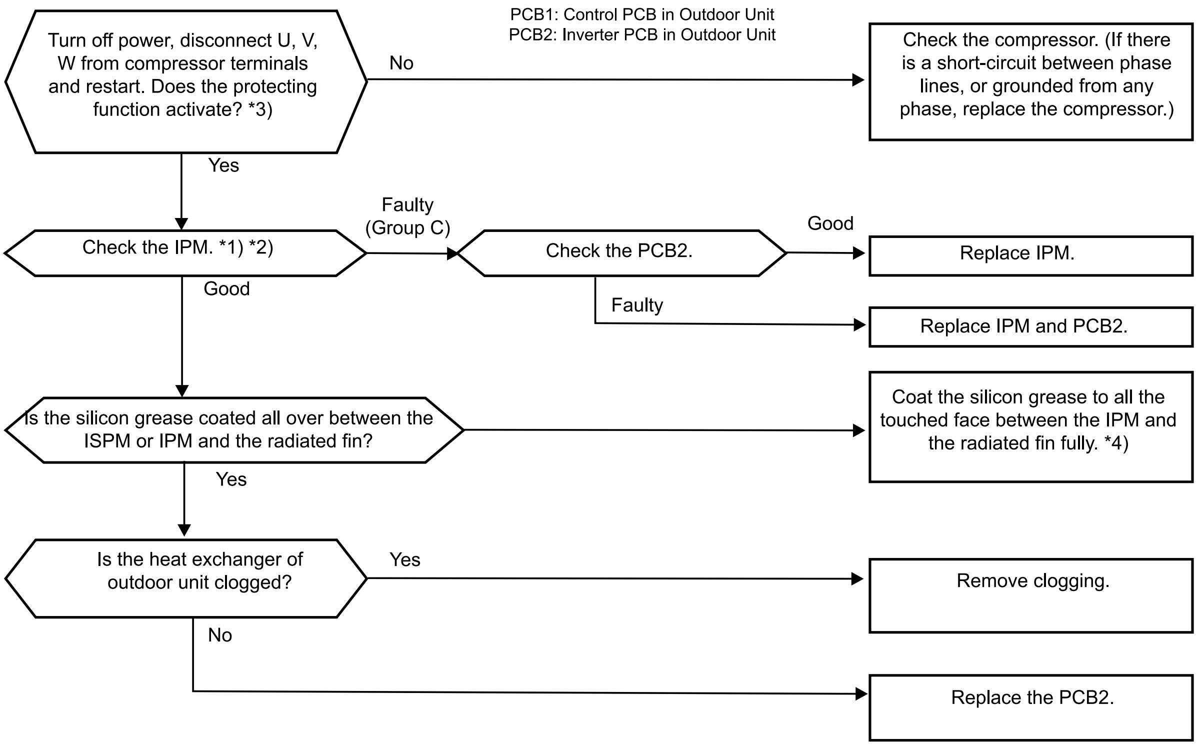
Alarm code	53	Protection activation of IPM or PCB2 for ES Series

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  - IPM and PCB2 have detecting function of abnormality.
  - This alarm is indicated when the transistor module detect the abnormality 7 times in 30 minutes including 7. Retry operation is performed up to the occurrence of 6 times:

Conditions:

- Short Circuited or Grounded
- Abnormal Temperature of the IPM and PCB2
- Control Voltage Decrease

Group C: RAS-(8/10)HRNSE



NOTE

- ****1): Perform the high voltage discharge work by referring to the item Procedure of checking other main parts for ES Series**, see on page 312* ***before checking and replacing the inverter components.***
- ****2): Regarding replacing or checking method for inverter components, refer to the item Procedure of checking other main parts for ES Series**, see on page 312.*
- ****3): Turn ON the No.1 switch of the dip switch DSW1 on PCB2 when restarting with disconnecting the terminals of the compressor. After troubleshooting, turn OFF the No.1 switch of the dip switch DSW1 on PCB2.***
- ****4): Use the silicon grease provided as accessory (Service parts No. P22760).***
- ***When alarm code “53” is indicated, the outdoor fan motor (DC motor) may be faulty. Check to ensure that DC fan motor is checked according to the item Procedure of checking other main parts for ES Series**, see on page* ***312.***

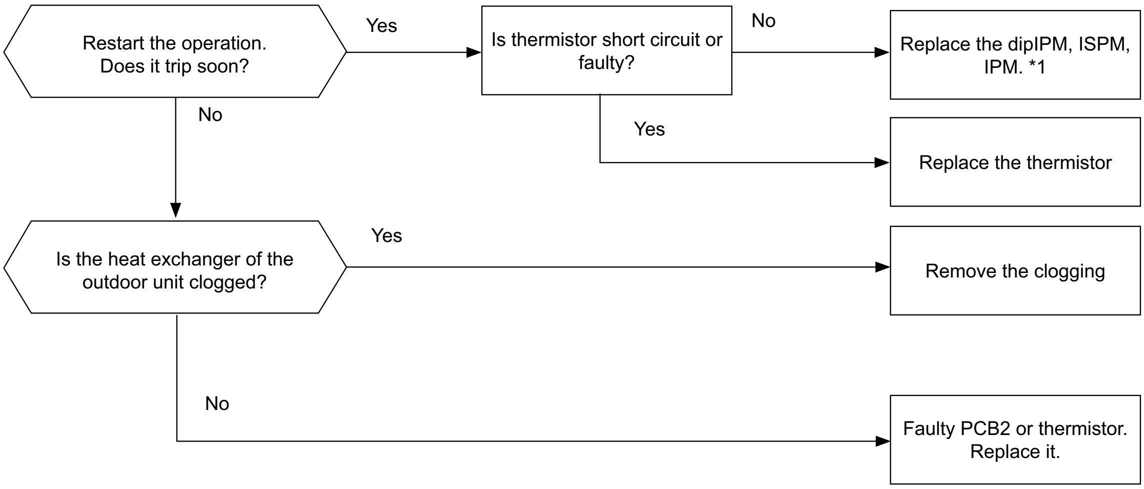
  If DC motor is damaged, normal inverter IPM will be damaged

Alarm code	54	Increase in the inverter fin temperature IVX Series

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - If the alarm code “51” or “54” occurs three times within 30 minutes, the alarm code which occurred for the third time is displayed. The retry operation is performed twice.

Conditions:

- When the temperature of the thermistor for inverter fin excess 100 °C (RAS-(4-12)HRNM(2)(E)) or 80 °C (RAS-(3-6) HVRNM2E), 3 times in 30 minutes, this alarm is indicated and the operation is stopped. In the case the occurrence is smaller than 2 times, retry is performed.



NOTE

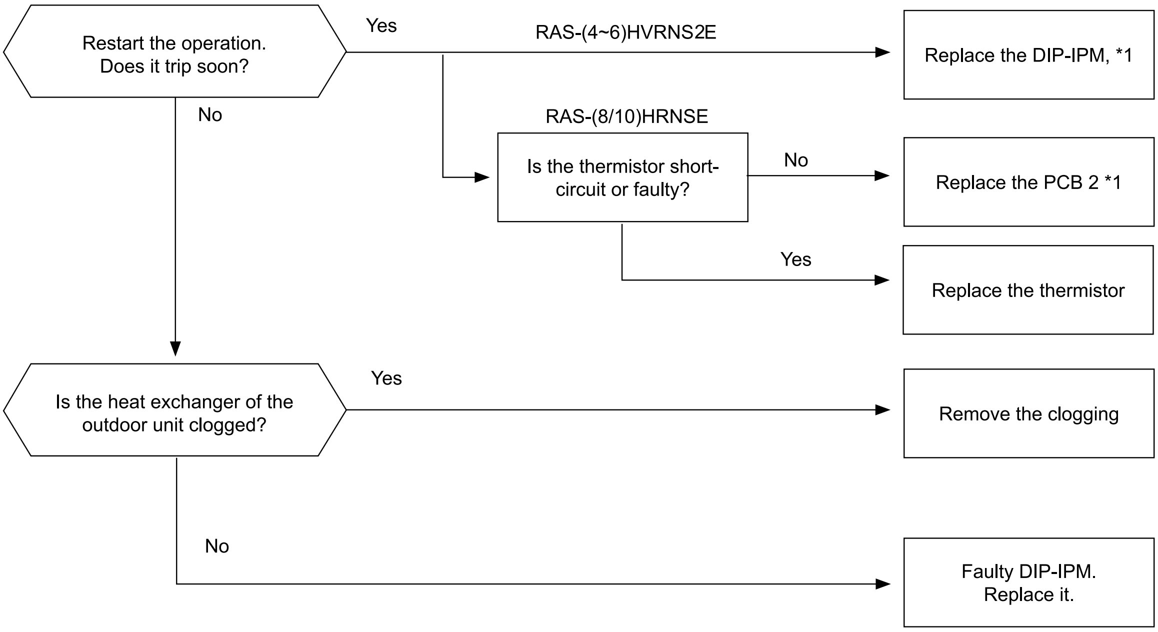
1*): Perform the high voltage discharge work by referring to the item Procedure of checking other main parts for ES Series,** see on page 312 **before checking and replacing the inverter components.

Alarm code	54	Increase in the inverter fin temperature for ES Series

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - This alarm is displayed when the inverter fin temperature increases the abnormal value three times within 30 minutes. The retry operation is performed twice.

Conditions:

- When the temperature of the thermistor for inverter fin excess 80 ºC (RAS-(4-6)HVRNS2E) or 100 ºC (RAS-(8/10) HRNSE) 3 times in 30 minutes, this alarm is indicated and the operation is stopped. In the case the occurrence is smaller than 2 times, retry is performed.`



NOTE

1*): Perform the high voltage discharge work by referring to the item Procedure of checking other main parts for ES Series, *see on page 312* ***before checking and replacing the inverter components.***

Alarm code	55	IPM or PCB2 abnormality for IVX Series

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
    - In case that the abnormality of alarm code 55 occurs four times within 30 minutes, the alarm code of abnormality occurred for the fourth time is indicated. Retry operation is performed up to third time of abnormality occurrence.

Conditions:

When the transmitting abnormality occurs between dipIPM (or IPM) and PCB2), this alarm is indicated and the operation is stopped.

Troubleshooting:

Replace the PCB2.

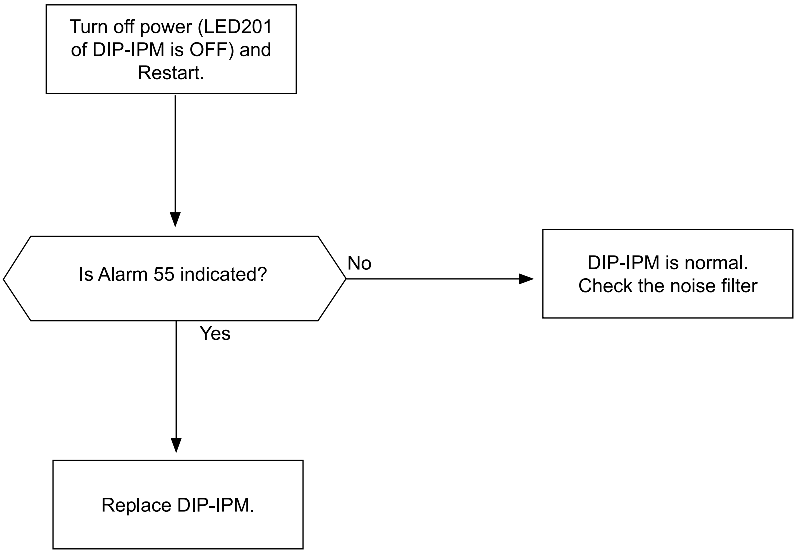
Alarm code	55	Abnormality of Inverter Module for ES Series

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
    - This alarm is displayed when below condition is activated 3 times including 3 in 30 minutes. Retry operation is performed up to the occurrence of 2 times.

Condition of Activation:

When the PCB1 does not receive the frequency signal from Inverter Module, this alarm is indicated.

RAS-(4-6)HVRNS2E



Alarm Code	55	Inverter Failure for ES series

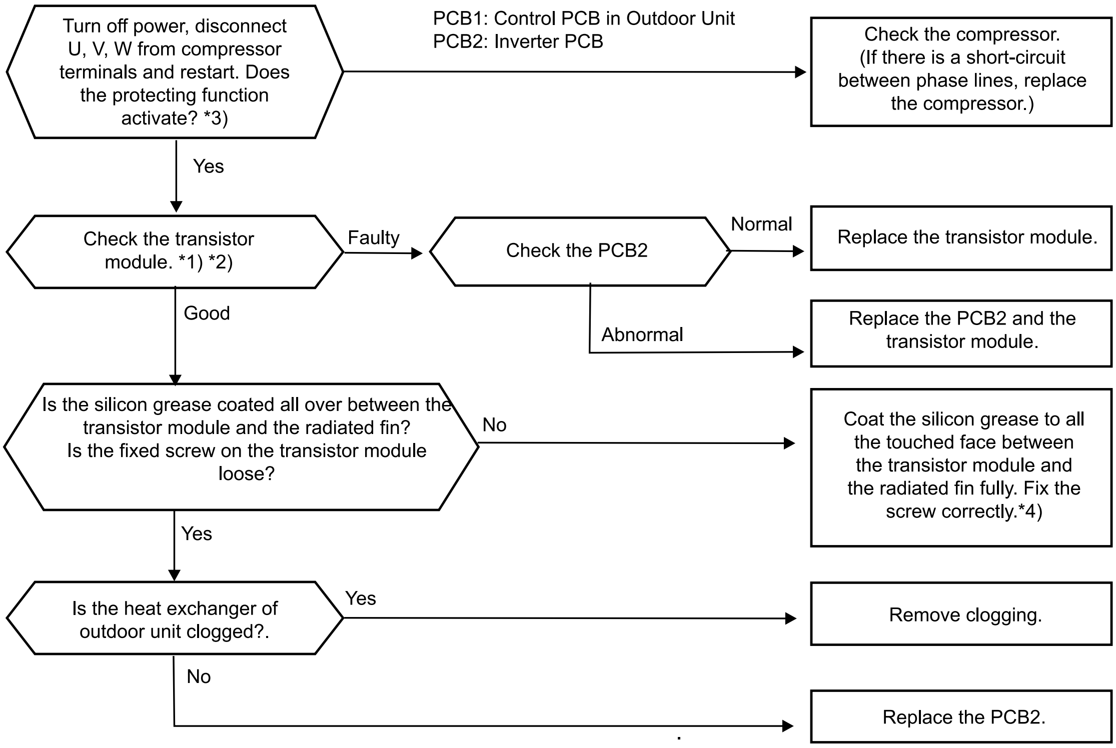
- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1
  - This alarm is displayed when the following phenomenon occurs 3 times in 30 minutes including 3: (Retry operation is performed up to the occurrence of 2 times.)
  - Actual frequency from PCB2 is less than 10 Hz (after inverter frequency output form PCB1).

Condition of Activation:

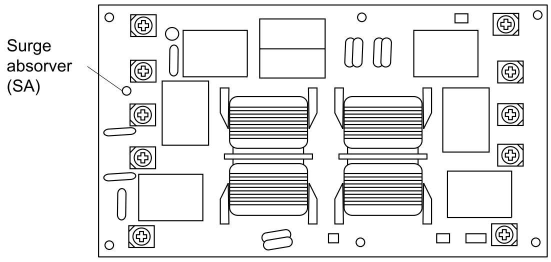
This alarm is indicated when PCB2 is not performed normally.

RAS-(8/10)HRNSE

RAS-8/10HRNSE



Position of surge absorber



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

NOTE

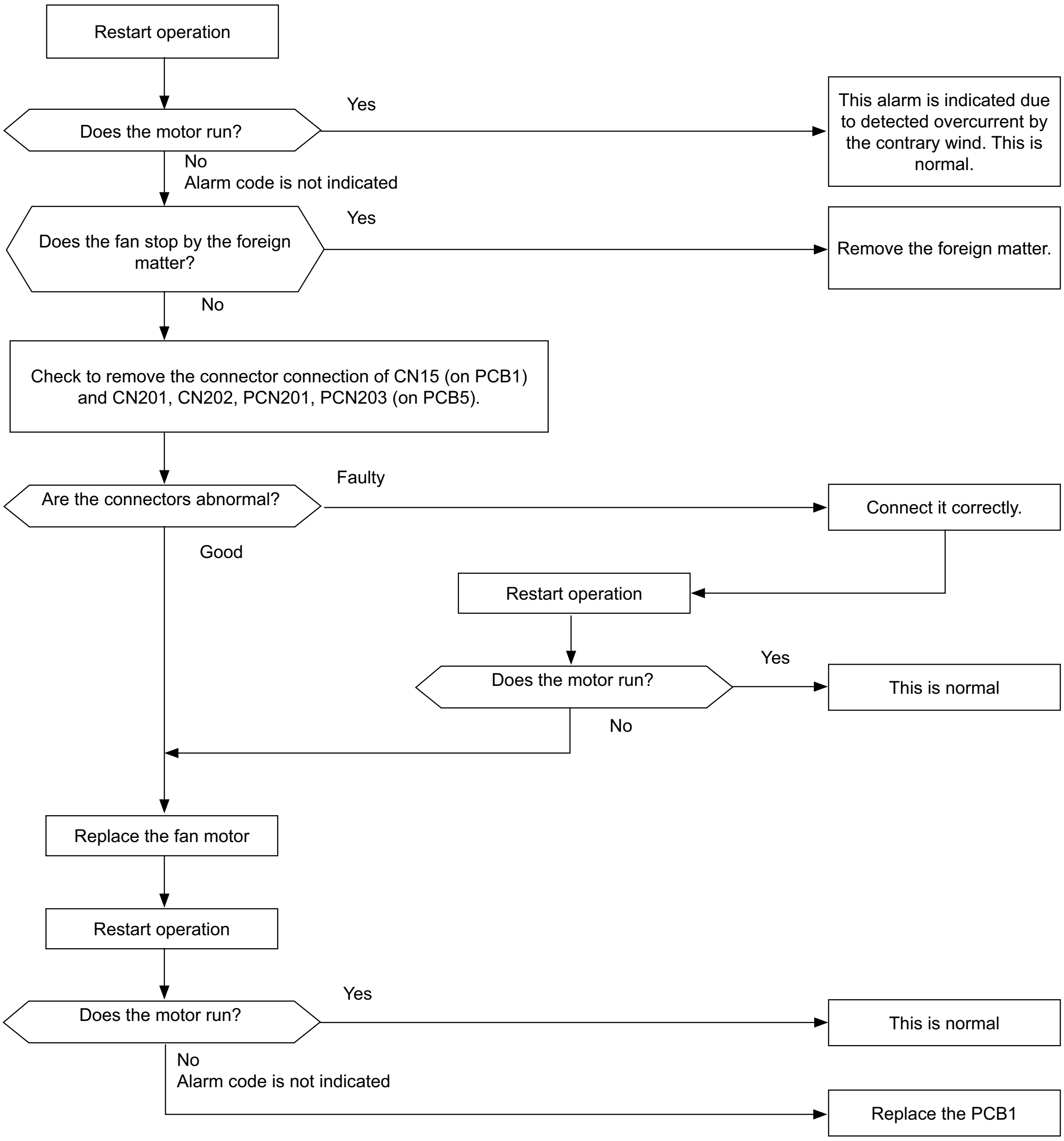
***1): Regarding replacing or checking method for the inverter components, refer to the item Procedure of checking other main parts for ES Series**, see on page 312*

2): Before the checking of transistor module, refer to the item regarding electrical discharge.

- ***3): Turn ON the No.1 switch of the dip switch DSW1 on PCB2 when restarting with disconnecting the terminals of the compressor. After troubleshooting, turn OFF the No.1 switch of the dip switch DSW1 on PCB2.***
- ***4): Use the silicon grease provided as accessory (Service Parts No.: P22760).***

Alarm code	57	Abnormality of fan motor protection (DC fan motor) for IVX series

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - This alarm is indicated when the revolution pulse output from the fan motor is 10 rpm or less and the reverse revolution signal is detected. The fan motor is stopped once, and restarted after 10 seconds.
    If it occurs more than 10 times in 30 minutes, this alarm is indicated. The abnormality occurs when the fan motor is stopped.

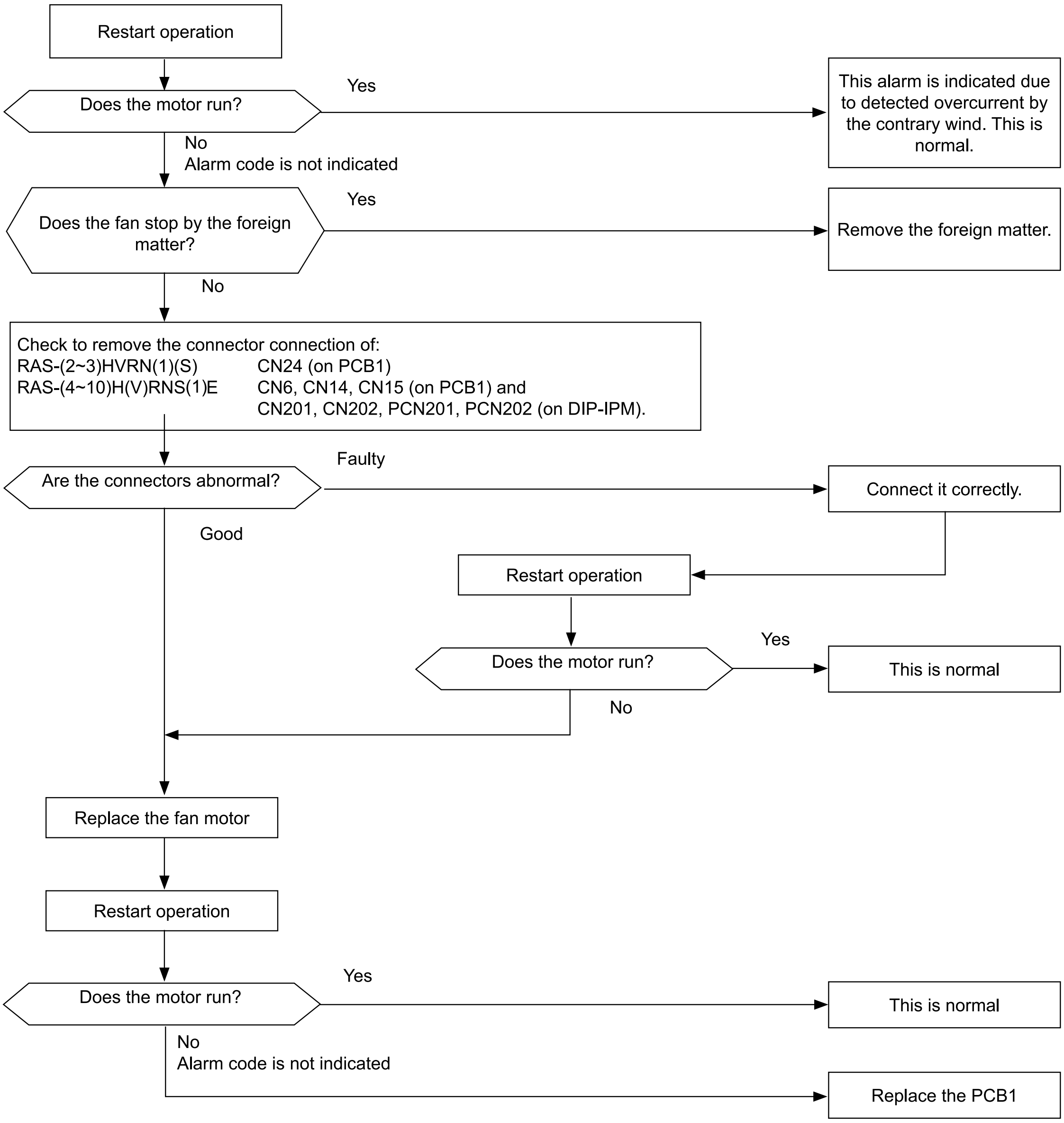


NOTE

- ***In the case that the fan motor does not run even the PCB1 is replaced, replace PCB5.***
- ***Check to ensure that DC Fan Motor is checked according to the item Procedure of checking other main parts for ES Series, see on page 312.***

Alarm code	57	Abnormality of fan motor protection (DC fan motor) for ES Series

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - The fan motor stops when the revolution output from the fan motor is 20 rpm for RAS-(2-3)HVRN(S)2 / 10 rpm for RAS-(4-10)H(V)RNS(2)E or lower during 30 seconds after the fan motor activation.
  - The alarm is indicated when the abnormality is repeated 4 times for RAS-(2-3)HVRN(S)2 / 10 times for RAS-(4-10) H(V)RNS(2)E within 5 minutes after the first detection.



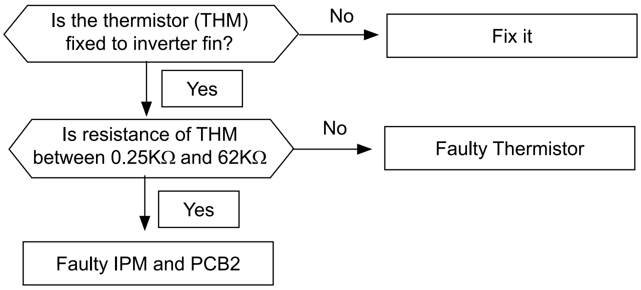
NOTE

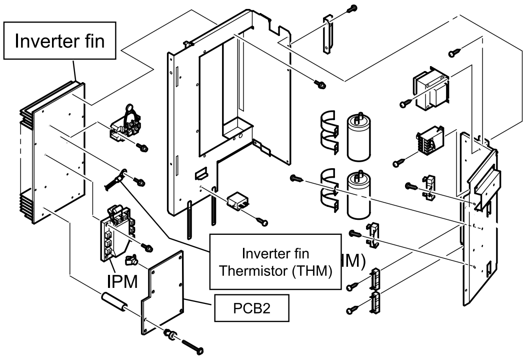
- ***In the case that the fan motor does not run even the PCB1 is replaced, replace PCB5.***
- ***Check to ensure that DC Fan Motor is checked according to the item Procedure of checking other main parts for ES Series**, see on page 312*

Alarm code	59	Inverter Fin Temp. Thermistor Abnormality (Only for RAS-(8/10)HRNSE) for ES series

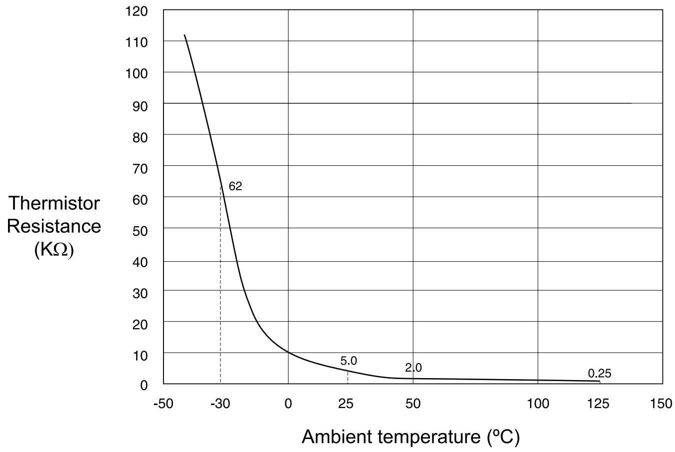
- “RUN” light flashes and “ALARM” is indicated on the remote control switch.
- The unit No, alarm code and the unit code is alternately indicated on the set temperature section, and the unit No. and alarm code are indicated on the display of the outdoor unit PCB1.
  - This alarm is indicated when the thermistor detects inverter fin temperature greater than 100 °C or less than -10 °C during the cooling operation or heating operation.

PCB1:Control PCB in Outdoor Unit
PCB2:Inverter PCB in Outdoor Unit





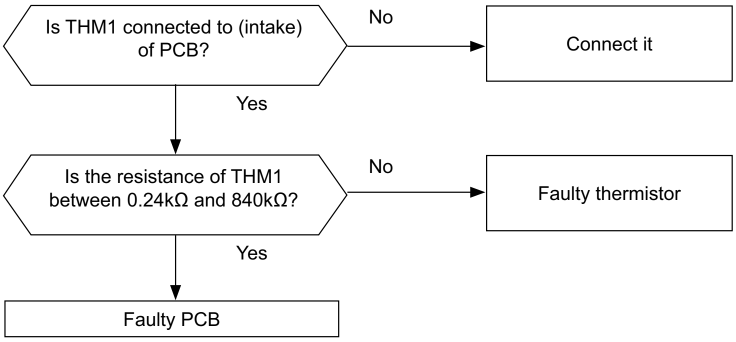
Phenomenon	Cause	Check item	Action (Turn OFF Main Switch)
Faulty inverter Fin thermistor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to inverter fin	Repair wiring and connections
Faulty IPM and PCB2		Replace IPM and PCB2 and check operation	Replace IPM and PCB2 if faulty



Thermistor Characteristics

Alarm code	96	Abnormal operation of Thermistor for the KPI (room Temperature Thermistor) for IVX series

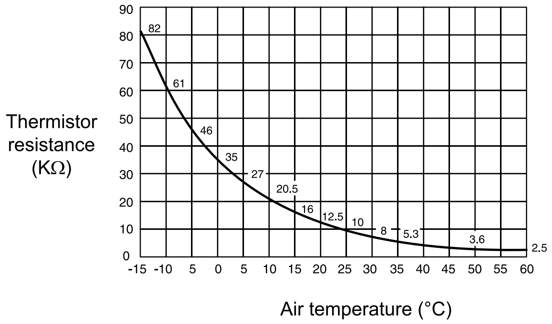
- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - This alarm code is displayed when the thermistor is short-circuited or cut during the KPI operation. The system is automatically restarted when the fault is removed



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

NOTE

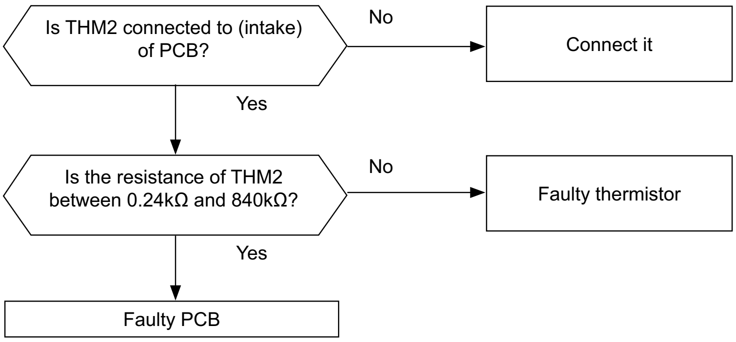
- ***This data is applicable to the following thermistors:***
  - ***Indoor unit discharge air temperature***
  - ***Indoor unit liquid refrigerant temperature***
  - ***Indoor unit air inlet temperature***
  - ***Outdoor temperature***
  - ***Outdoor unit evaporating temperature***
  - ***Indoor unit gas piping***



Thermistor characteristics

Alarm code	97	Abnormal operation of thermistor for the KPI (outdoor temperature thermistor) for IVX Series

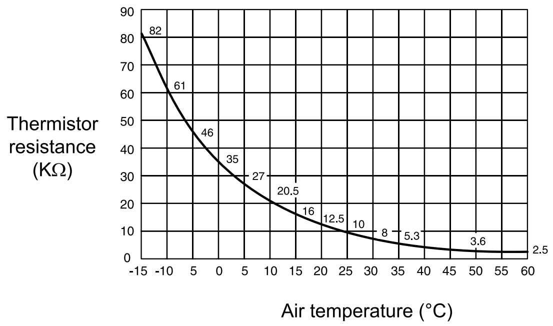
- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - This alarm code is displayed when the thermistor is short-circuited or cut during the KPI operation. The system is automatically restarted when the fault is removed



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

NOTE

- ***This data is applicable to the following thermistors:***
  - ***Indoor unit discharge air temperature***
  - ***Indoor unit liquid refrigerant temperature***
  - ***Indoor unit air inlet temperature***
  - ***Outdoor temperature***
  - ***Outdoor unit evaporating temperature***
  - ***Indoor unit gas piping***



Thermistor characteristics

Alarm code	EE	Compressor protection for IVX Series

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

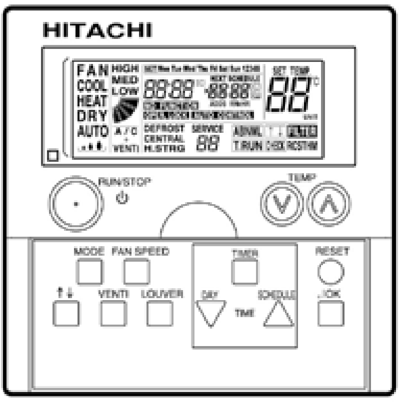
Alarm code	Content of abnormality
02	Tripping of protection device in outdoor unit
07	Decrease in discharge gas superheat
08	Increase in discharge gas temperature
41	Cooling overload
42	Heating overload
47	Low pressure decrease protection activating

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

8.2.2 Troubleshooting in check mode

Use the “OK” switch of the remote control in the following cases:

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



Check mode

Check mode 1: Current data will be displayed

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

Pres "OK" for more than 3 seconds

Normal mode

– The indication will delay as the transmission between the remote control switch and the indoor unit takes about ten seconds.

– All the data may be displayed as "FF" or " 1" or "255".
These transient data, which are produced temporarily by the software, do not affect the device functions at all. (The alarm code may also be displayed as "FF".)

Unit number and alarm code displayed

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

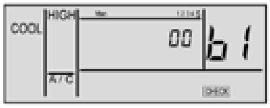
ADDS: Number of the Indoor Unit in No. ** Cycle
RN: No. ** Refrigerant Cycle

After seven seconds ← (A)

Within seven seconds to check another unit

Forward:
Press the "∧" switch to increase from 00 to 01 to 02 ···
Backward:
Press the "∨" switch to decrease from 15 to 14 to 13 ···

Check mode 1



Press "∨" to see the previous indication
Press "∧" to see the next indication

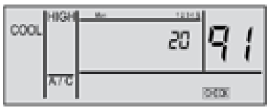
Pres "OK" for more than 3 seconds

Unit number and alarm code displayed

Press "∧" to see the next data
Press "∨" to see the previous data

After seven seconds ← See (A)

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



Press "∧"

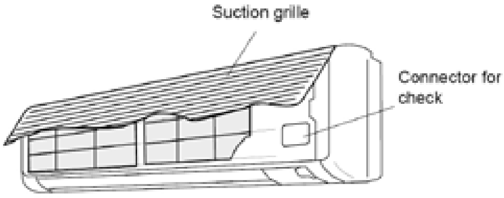
– In the Check mode 2, the data of the first three units that are connected serially to a remote control switch are available.

– You can press the "OK" switch to disable the Check mode 2. Check mode 1 cannot be disabled even if you press the "OK" switch.

Pres "OK" for more than 3 seconds

Check mode disabled

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



NOTE

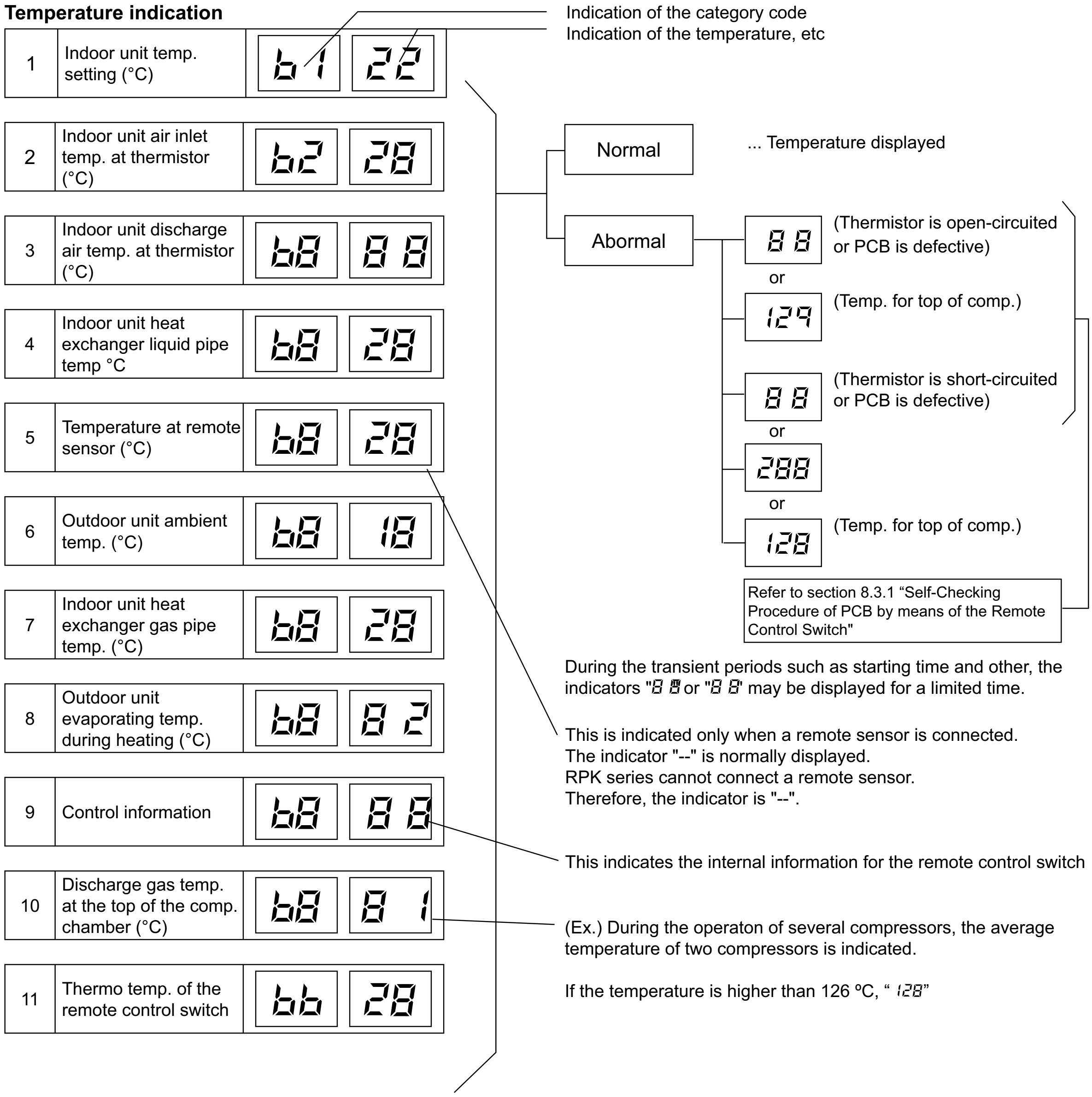
- ***The unit does not operate by pressing the operation switch.***
- ***The above function is available only when the alarm occurs.***
- ***The PCB check by means of the remote control switch is not available.***
- ***The indication is the data when you are connecting PC.ART.***

  The indication is not the data before the alarm occurs.

Contents of the Check mode 1

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

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



Temperature indication

Indication of the category code
Indication of the temperature, etc

1	Indoor unit temp. setting (°C)	b1	22
2	Indoor unit air inlet temp. at thermistor (°C)	b2	28
3	Indoor unit discharge air temp. at thermistor (°C)	b8	8 8
4	Indoor unit heat exchanger liquid pipe temp °C	b8	28
5	Temperature at remote sensor (°C)	b8	28
6	Outdoor unit ambient temp. (°C)	b8	18
7	Indoor unit heat exchanger gas pipe temp. (°C)	b8	28
8	Outdoor unit evaporating temp. during heating (°C)	b8	8 2
9	Control information	b8	8 8
10	Discharge gas temp. at the top of the comp. chamber (°C)	b8	8 1
11	Thermo temp. of the remote control switch	bb	28

Normal ... Temperature displayed

Abormal

8 8 (Thermistor is open-circuited or PCB is defective)
or
129 (Temp. for top of comp.)

8 8 (Thermistor is short-circuited or PCB is defective)
or
288
or
128 (Temp. for top of comp.)

Refer to section 8.3.1 "Self-Checking Procedure of PCB by means of the Remote Control Switch"

During the transient periods such as starting time and other, the indicators "8 8 or "8 8' may be displayed for a limited time.

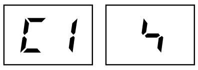
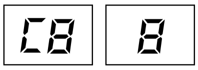
This is indicated only when a remote sensor is connected.
The indicator "--" is normally displayed.
RPK series cannot connect a remote sensor.
Therefore, the indicator is "--".

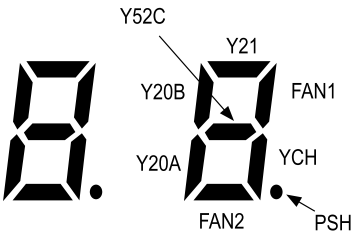
This indicates the internal information for the remote control switch

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

If the temperature is higher than 126 ºC, " 128"

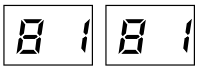
Indication of micro-computer input/output

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



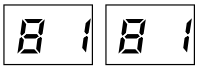
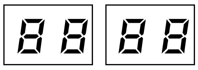
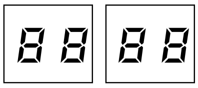
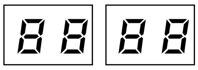
PCB Relay	Part name
YH2:	Relay for drain pump (MD) and/or dew heater (EHW).
52H:	Relay for electric heater (CEH)
Y21:	Relay for 4-way valve
Y52C:	Relay for compressor
Y20A:	Relay for Selonoid Valve (SVA2)
Y20B:	Relay for Selonoid Valve (SVA1)
Y20F:	Relay for Selonoid Valve (SVF)
Outdoor Fan:	Relay for Outdoor Fan.
YCH:	Relay for Cranckcase heater

Indication of unit stoppage cause

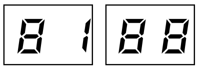
14	Cause of stoppage	

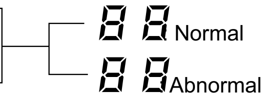
(Note 1)

Abnormal operation occurrence counter

15	Abnormal operation occurrence counter	
16	Instantaneous power failure occurrence counter in indoor unit	
17	Transmission error occurrence counter between remote control switch and indoor unit	
18	Abnormal operation occurrence counter on inverter	

Indication of automatic louver condition

19	Louver sensor	



00	Operation OFF, Power OFF
01	Thermo - OFF (Note 1)
02	Alarm (Note 2)
03	Freeze protection, overheating protection
05	Instantaneous power failure at outdoor unit, reset (Note 3)
06	Instantaneous power failure at indoor unit, reset (Note 4)
07	Stoppage of Cooling operation due to Low Outdoor Air Temperature (<=-7 ºC), Stoppage of Heating Operation due to high Outdoor Air Temperature, and high indoor air temperature, stoppage of heating operation due to low Outdoor Air Temperature (<=-20 ºC)
10	Demand, enforced stoppage
13	Retry due to high pressure increase
15	Retry due to abnormal high temperature of discharge gas, excessive low suction pressure
16	Retry due to decrease of discharge gas superheat
17	Retry due to inverter tripping
18	Retry due to voltage decrease
19	Expansion valve opening change protection
20	Operation mode change over of indoor unit (Note 5)
21	Enforced thermo-off, when other indoor unit thermo-off
22	Hot start after 4 hours switch on the outdoor unit
24	Cold draft protection 2

NOTE

- ***Explanation of Terms***
  - ***Thermo-ON: A condition where an indoor unit is requesting the compressor to operate.***
  - ***Thermo-OFF: A condition where an indoor unit is not requesting the compressor to operate.***
- ***Even if stoppage is caused by “Alarm”, “02” is not always displayed.***
- ***If the transmission between the inverter printed circuit board and the control printed circuit board is not performed during 30 seconds, the stoppage cause is d1-05 and the alarm code “04” may be displayed.***
- ***If the transmission between the indoor unit and the outdoor unit is not performed during three minutes, the Indoor Units are stopped.***

  In this case, the stoppage cause is d1-06 and the alarm code “03” may be displayed.
- ***In the system “20” will be indicated at the difference between indoor units.***

NOTE

- ***If a transmission error continues for three minutes, one is added to the occurrence counter.***
- ***The memorized data can be cancelled by the method which is explained in section 8.3.1 “Self-checking Procedure of PCB by means of the Remote Control Switch”.***

Compressor pressure/frequency indication

20	Discharge pressure (high) (x 0.1 MPa)	H 1	18
21	Suction pressure (low) (x 0.01 MPa)	H2	04
22	Control information	H3	44
23	Operation frequency (Hz)	H4	44

20–22: This is an indication for internal information for the remote control switch. This does not have any specific meaning

23: The total frequency is displayed when several compressors are running.

Indoor unit capacity indication

24	Indoor unit capacity	J 1	08
25	Outdoor unit code	J2	Fn
26	Refrigerant cycle number	J3	0 1
27	Refrigerant cycle number	J4	00

24: This is an indication for frequency inverter

Capacity code of indoor unit

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

25–27: "n" indicates the total number of Indoor Units: 1 ~ 4

J3: 01 ~ 16 (01: when shipment (DSW5+RSW2), Decimal indication

J4: 00 ~ 0F (00: when shipment (DSW5+RSW2), Indication with 16 numbers

Expansion opening indication

28	Indoor unit expansion valve opening (%)	L 1	20
29	Outdoor unit expansion valve MV1 opening (%)	L2	99

29: The indication of 255 is normal

Estimated electric current indication

30	Compressor Running Current (A)	P 1	25

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

☛ Returns to **Temperature indication**

Contents for Check mode 2

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

If you press the part "▲" of the TEMP switch, the next display appears. If you press the past "▼" of the TEMP switch, the previous display appears.

Temperature indication

Indication of the category code
Indication of the temperature, etc

1	Indoor unit air inlet temp. at thermistor (°C)	91	23	Corresponds to check mode 1 "8 2"
2	Indoor unit discharge air temp. at thermistor (°C)	92	88	Corresponds to check mode 1 "8 3"
3	Indoor unit heat exchanger liquid pipe temp. (freeze protection) (°C)	93	28	Corresponds to check mode 1 "8 8"
4	Outdoor temperature (°C)	98	12	Corresponds to check mode 1 "8 8"
5	Indoor unit heat exchanger gas pipe temp. (°C)	98	28	Corresponds to check mode 1 "8 8"
6	Evaporating temp. at heating (°C)	98	8 3	Corresponds to check mode 1 "8 8"
7	Control information	98	8 8	Corresponds to check mode 1 "8 9"
8	Discharge gas temp. at the top of comp. chamber (°C)	98	8 8	Corresponds to check mode 1 "8 8"

Compressor pressure/frequency indication

9	Discharge pressure (high) (x 0.1 MPa)	99	18	Corresponds to check mode 1 "8 1"
10	Suction pressure (low) (x 0.01 MPa)	98	8 8	Corresponds to check mode 1 "8 2"
11	Control information	98	8 8	Corresponds to check mode 1 "8 3"
12	Operating frequency (Hz)	98	8 8	Corresponds to check mode 1 "8 8"

Expansion opening indication

13	Indoor unit expansion valve opening (%)	9d	20	Corresponds to check mode 1 "8 2"
14	Outdoor unit expansion valve mv1 opening (%)	98	8 8	Corresponds to check mode 1 "8 8"

Estimated electric current indication

15	Compressor running current (A)	98	20	Corresponds to check mode 1 "8 8" The total value is displayed when several compressors are running

8 Returns to **temperature indication**

8.2.3 Troubleshooting by means of the 7-segment display

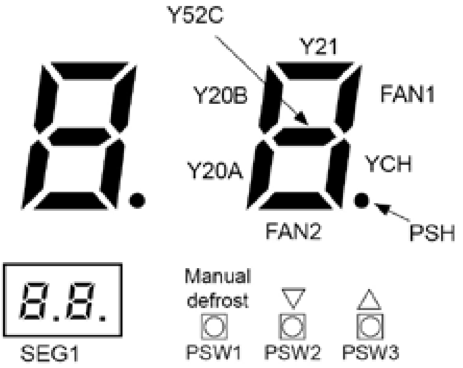
Simple checking by 7-segment display

- During auto-addressing, the following items can be checked using the outdoor unit's on-board 7-segment LED display:
  1. Disconnection of power supply to the indoor unit.
  2. Reverse connection of the operating line between the outdoor and indoor units.
  3. Duplication of indoor unit number.
- Outdoor Unit, Circuit Board, PCB1
  1. Turn ON all Indoor Units connected to the Outdoor Unit
  2. Turn ON the Outdoor Unit
  3. Auto-addressing starts

Checking method by 7-segment display

Operating conditions and each part of refrigeration cycle can be checked by 7-segment and push switches (PSW) on the PCB in the outdoor unit. During checking data, do not touch the electric parts except for the indicated switches because 220-240 V (400 V in case of RAS-(4-6)HRN(M/S)2E, RAS-(8-12)HRNM and RAS-(8/10)HRNSE) is applied to them. Pay attention not to contact the tools with electrical parts. If contacted, electrical parts will be damaged.

- To start checking, press PSW2 switch for more than three seconds.
- To proceed checking, press the PSW2 switch.
- To back to the previous item, press the PSW3 switch.
- To cancel this checking, press the PSW2 switch for more than 3 seconds



Item	Item		Indication data		
	Check No.	Inidic.	Indic	Contents	
Total capacity of indoor unit connected	01	CP	22	00~96 (00~80 in case of ≤6 HP)	
Input / output state of outdoor micro-computer	02	SC	8 =	Indicates only for the segments corresponding to the equipment in the figure. (See figure above)	
Alarm code for abnormal stoppage of compressor	03	AC	02	Alarm Code on Compressor	
Inverter order frequency to compressor	04	H 1	90	0~115 (Hz) In case that frequency is higher than 100 Hz, the last two digits flicker	
Indoor order frequency to compressor	05	H2	90	0~115 (Hz) In case that Frequency is higher than 100 Hz, last two digits flicker	
Air flow ratio	06	Fo	80	00~100 (%) In case that air flow ratio is 100%, “00” flashes	
Outdoor unit expansion valve opening	07	Eo	50	00~100 (%) In case that Expansion Valve Opening is 100%, “00” flashes	
Temperature at the top of compressor	08	8 d	82	00~142 (ºC) In case that temperature is higher than 100 ºC, the last two digits flash	
Evaporating temperature at heating	09	8 E	-3	-19~80 ºC	
Ambient air temperature	10	8 o	- 12	-19~80 ºC	
Cause of stoppage at inverter	11	i8	9	(See table at the next page)	
Inverter fin temperature	12	8 F	82	-10~100 ºC	
Inverter fin temperature	13	A 1	10	0~199 ºC	
Inverter secondary current	14	A2	10	00~199 (A)	
Outdoor unit address	15	nA	00	00~64	In case of twin/triple/quad-type unit, the information of 2nd to the 4th indoor units is indicated repeatedly. The right character of the indication represents the indoor unit setting no. Single: A Twin: A, b Triple: A, b, c Quad: A, b, c, d
Indoor unit expansion valve opening	16	EA	20	00~100 (%) In case that opening is 100%. “00” flashes	
Liquid pipe temperature of indoor unit (freeze protection)	17	LA	05	-19~127 (ºC)	
Indoor unit intake air temperature	18	iA	28	-19~127 (ºC)	
Indoor unit discharge air temperature	19	oA	20	-19~127 (ºC)	
Cause of indoor unit stoppage	20	dA	05	00~24 ºC	

Cause of inverter stoppage (11)

Indication	Contents
1	IPM, ISPM, DIP-IPM error
2	Instantaneous Over Current
3	Inverter Fin Thermistor Protection Activation
4	Electronic Thermal Activation
5	Inverter Voltage Decrease
6	Over Voltage
7	Abnormal Transmission
8	Abnormal Current Detection
9	Instantaneous Power Failure Detection
11	Reset of Micro-Computer for Inverter
12	Earth Fault Detection from Compressor
13	Open Phase Detection
14	Inverter Malfunction
15	Inverter Malfunction
16	Inverter Malfunction
17	Transmission Error
18	Abnormal Current Detection
19	Abnormal Protective Device

NOTE

- ***To finish checking: Press the PSW2 switch for more than 3 seconds.***

Cause of Indoor Unit stoppage (20)

Indication	Contents
00	Operation OFF, Power OFF
01	Thermo-OFF
02	Alarm
03	Freeze Protection Overheating Protection
05	Instantaneous Power Failure at Outdoor Unit
06	Instantaneous Power Failure at Indoor Unit
07	Stoppage of Cooling Operation due to Low Outdoor Air Temperature Stoppage of Heating Operation due to High Outdoor Air Temperature
10	Demand thermo OFF
13	Retry for Pd Increase Prevention
15	Vacuum / Discharge Gas Temperature Increase Retry
16	Retry Due to Discharge Gas SUPERHEAT Decrease
17	IPM Error Retry, Instantaneous Over Current of Inverter Retry, Electronic Thermal Activation of Inverter Retry, Abnormal Current Sensor of Inverter Retry
18	Retry due to Inverter Voltage Decrease Retry due to Inverter Overvoltage
19	Other Retry
20	Different Operation Mode between Indoor / Outdoor Units (Only for Individual Twin / Triple / Quad Types)
21	Forced Thermo-OFF (Only for Simultaneous Twin / Triple / Quad Types)
22	Forced Thermo-OFF (During Compressor Pre-heating)
24	Thermo-OFF during Energy Saving Operation Mode

Cancellation of Forced Thermo OFF

Turn ON the power source and wait for more than 30 seconds. Then press PSW1 and PSW3 simultaneously for more than 3 seconds.

Forced Thermo-OFF (Indoor Unit Error Code 22) will be cancelled.

However, this function may damage the compressor, use only on inevitable occasion.

- In case of using the remote control switch (PC-ART), the cancellation is also available with it.
- When “Operation Lock” indication flashes on the remote control LCD, press FAN SPEED and LOUVER switches simultaneously for more than 3 seconds.
- “Operation Lock” Indication is disappeared and operation is available.

8.2.4 Troubleshooting by means of the flashing alarm LEDs for RPK-FSN2M

The red LED located on the panel indicates the following alarms:

Code	Cause	Indication
Alarm 02	Unit protection	This alarm is activated when the blinks sequence is two times ON / two seconds OFF
Alarm 03	Transmission error	This alarm is activated when the blinks sequence is three times ON / two seconds OFF
Alarm 04	Inverter outdoor unit error	This alarm is activated when the blinks sequence is four times ON / two seconds OFF

For the rest of the alarms, the blink sequence is one second ON / one second OFF.

8.2.5 Cause of inverter stoppage

Code	Cause	Cause of Stoppage for Corresponding Unit	Remark	
			Indication during Retry	Alarm Code
1	Automatic Stoppage of Transistor Module (DIP-IPM Error) (Overcurrent, Undercurrent, Temperature increase)	17	P7	53
2	Instantaneous Over Current	17	P7	48
3	Abnormal Inverter Fin Thermistor	17	P7	54
4	Electronic Thermal Activation (Inverter overcurrent)	17	P7	48
5	Inverter Voltage Decrease (Undervoltage)	18	P8	06
6	Over Voltage	18	P8	06
7	Abnormal Inverter Transmission	18	-	-
8	Abnormal Current Detection	17	P7	51
9	Instantaneous Power Failure Detection	18	-	-
11	Reset of Micro-Computer for Inverter	18	-	-
12	Earth Fault Detection from Compressor (Only Starting)	17	P7	53
13	Phase detection abnormality	18	-	-
14	Inverter Non-Operation	18	-	55
15	Inverter Non-Operation	18	-	55
16	Inverter Non-Operation	18	P8	55
17	Communication Abnormality	18	P8	55
18	Protection Device Activation (63H1)	-	-	02
19	Protection Detection Device Abnormality	-	-	38

Protection control code on 7-segment display

1. Protection control code is displayed on 7-segment when a protection control is activated.
2. Protection control code is displayed while function is working, and goes out when released.
3. When several protection control are activated, code number with higher priority will be indicated (see below for the priority order).
    - **a.** Higher priority is given to protection control related to frequency control than the other.
        - Priority order
            - High-Pressure Increase Protection
            - Over Current Protection
            - Cold Draft Protection
            - Low-Pressure Ratio Control at Cooling Operation
    - **b.** In relation to retry control, the latest retrial will be indicated unless a protection control related to frequency control is indicated.

Code		Protection Control
P	0	Low-Pressure Ratio Control at Cooling Operation
P	1	High-Pressure Ratio Control at Heating Operation
P	2	High-Pressure Increase Protection
P	3	Over Current Protection
P	4	IPM Fin Temperature Increase Protection
P	5	Discharge Gas Temperature Increase Protection

Code		Protection Control
P	7	Inverter-Trip Retry Control
P	8	Voltage Drop (or Overvoltage) Retry Control
P	9	Protection Control for Power Source Voltage Unbalance Detection
P	A	Current Demand Control
P	b	Suction Pressure Decrease Prevention Control

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

Code		Protection control
P	7	Inverter Retry
P	8	

NOTE

- ***The protection control code being indicated on 7.segment display is changed to an alarm code when the abnormal operation occurs. Also, the same alarm code is indicated on the remote control switch***

Activating condition of protection control code

For following the conditions as the temperature change, etc., the control of frequency, etc. is performed to prevent the abnormal conditions by the protection control.

The activating conditions of protection control are shown in the table below

Code	Protection Control	Activating Condition	Remarks
P0	Low-Pressure Ratio Control at Cooling Operation	Compression Ratio ε < 2.2 => Frequency Increase	ε = (Pd+0.1)/(Ps+0.1)
P1	High-Pressure Ratio Control at Heating Operation	Compression Ratio ε > 7.5 => Frequency Decrease	ε = (Pd+0.1)/(Ps+0.1)
P2	High-Pressure Increase Protection	High Pressure Switch for Control is activated => Frequency Decrease	—
P3	Over Current Protection	Inverter Output Current > (*1)A => Frequency Decrease	—
P4	DIP-IPM, ISPM or IPM Temperature Increase Protection	Inverter Fin Temperature RAS-8~10HRNSE > 100 ºC RAS-3~6HVRNS2(E) > 80 ºC => Frequency Decrease	—
P5	Discharge Gas Temperature Increase Protection	Temperature at the top of compressor is high => Frequency Decrease Temperature at the top of compressor > 107 ºC => Indicate P5	—
P6	Frost Formation Protection	TL ≤ 2 °C Over 3 minutes => Frequency Decrease	TL: Liquid Piping, Temperature of Indoor Unit
P9	Unbalance Power Source Detecting	Inverter Output Current > (*3)A => Frequency Decrease	—
PA	Current Demand Control	Inverter Output Current > (*2)A => Frequency Decrease	In case of Demand Control Setting
Pb	Low-Pressure Decrease Protection	Low Pressure Switch for Control is activated. => Frequency Decrease	—
PC	Cold Draft Protection	TO ≤ 10 ºC and ε ≥ 2.6 => Frequency Decrease	ε = (Pd+0.1)/(Ps+0.1) TO: Outlet Temperature of Indoor Unit
P7	Inverter Retry	Automatic Stoppage of Transistor Module, Activation of Electronic Thermal or Abnormal Current Sensor	When activating 3 times in 30 minutes, “48”, “51”, “53” or “54” alarm is indicated.
P8	Inverter Retry	Insufficient/Excessive Voltage at Inverter Circuit or PCB Connector Part	When activating 3 times in 30 minutes, “06” or “55” alarm is indicated.

NOTE

- ***During protection control (except during alarm stoppage), the protection control code is indicated.***
- ***The protection control code is indicated during protection control and turns off when cancelling the protection control.***
- ***After retry control, the condition of monitoring is continued for 30 minutes.***
- ***The Maximum value of IVX series (*1) and (*2) are as follows:***
- ***The Maximum value of ES series (*3), (*4) and (*5) are as follows:***

(1*)

HP	380-415V						220-240V			
	4	5	6	8	10	12	3	4	5	6
Current (A)	8.0	12.0	12.0	17.5	20.0	21.0	16.0	16.0	24.0	24.0

(2*)

	HP	380-415V						220-240V			
Demand setting		4	5	6	8	10	12	3	4	5	6
Current (A)	100%	4.0	5.5	20.0	8.5	10.0	12.0	11.5	13.0	17.0	20.0
	75%	3.0	4.0	15.0	6.0	8.0	12.0	8.5	10.0	13.0	15.0
	50%	2.0	2.0	10.0	4.0	5.0	7.5	5.5	6.5	8.5	10.0

(3*)

HP	**230V**				**400V**	
	3	**4**	**5**	**6**	**8**	**10**
Current (A)	10.5	16.0	24.0	24.0	17.5	20.0

(4*)

	HP	**230V**				**400V**	
Demand setting		**3**	**4**	**5**	**6**	**8**	**10**
Current (A)	100%	11.5	13.0	17.0	20.0	8.5	11.0
	75%	8.5	10.0	13.0	15.0	6.0	8.0
	50%	5.5	6.5	8.5	10.0	4.0	5.0

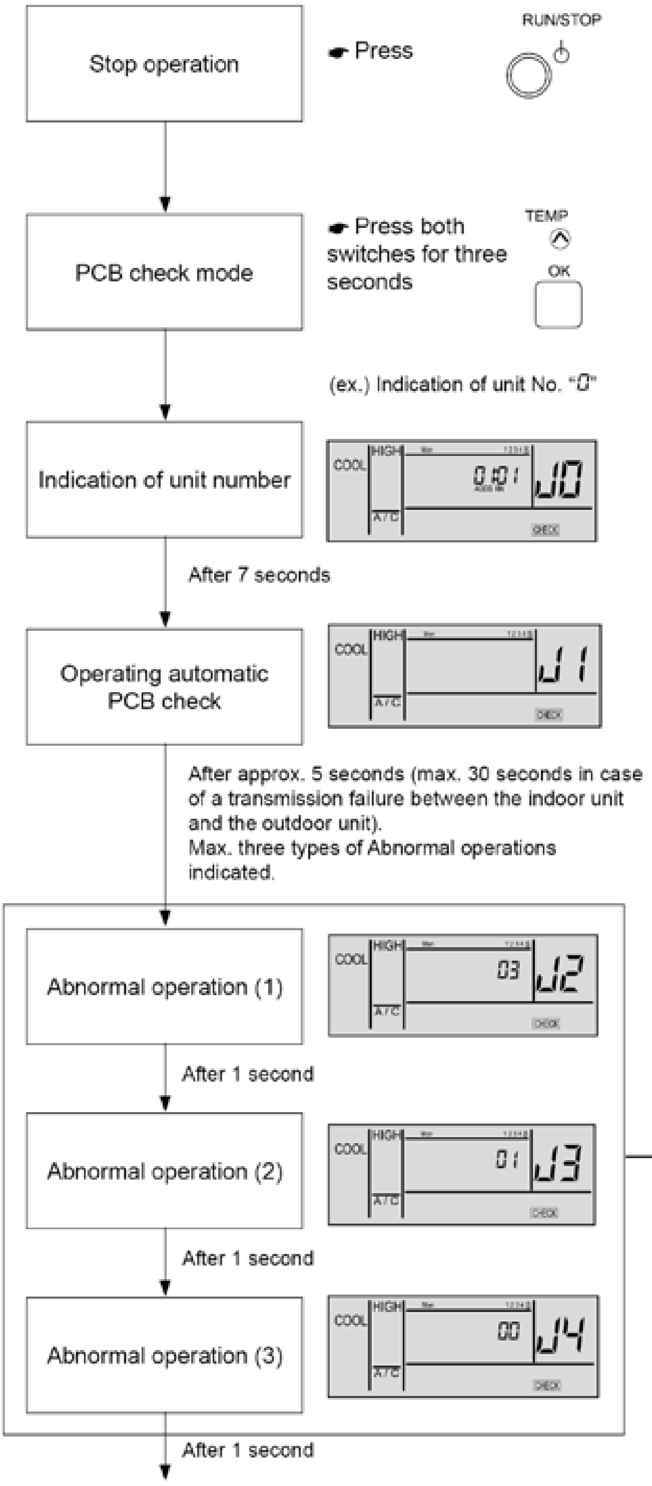
(5*)

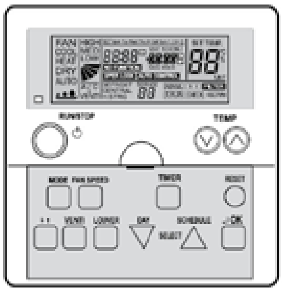
HP	**230V**				**400V**	
	3	**4**	**5**	**6**	**8**	**10**
Current (A)	8.0	12.0	15.0	18.5	13.0	13.0

8.3 Procedure for checking each main part

8.3.1 Self-checking procedure of PCB by means of the Remote Control Switch

Use the following troubleshooting procedure for testing the PCB in the indoor unit and outdoor unit:





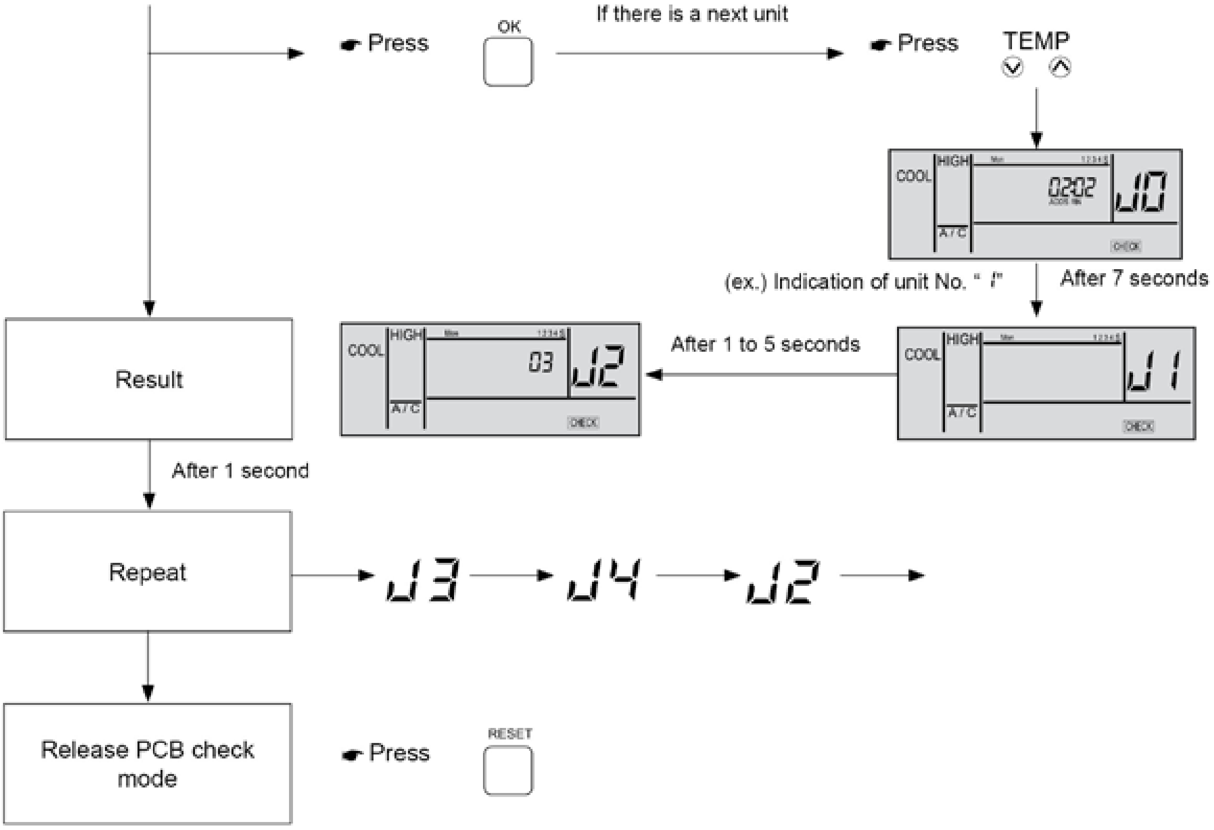
Indi-cation	Contents	
00	Normal	
Abnormality (open-circuit, short-circuit, etc.) in circuit for:		
01	Air inlet temp. thermistor	Indoor unit PCB
02	Discharge air. temp. thermistor	
03	Liquid pipe temp. thermistor	
04	Remote thermistor abnormality	
05	Gas pipe temp. thermistor	
06	Remote sensor	
08	Transmission of central station	
0A	EEPROM	
0b	Zero cross input failure	
EE	Transmission of indoor units during this checking operation	
07	Transmission of outdoor unit	Outdoor unit PCB
F4	Internal thermostat fan input failure	
F5	PSW input failure	
F6	PSH 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	

If you are using a wireless remote control switch with the built-in receiver part of the wall-type indoor unit and you need to perform the above checking, perform the following procedure:

1. Turn OFF the power supply.
2. Disconnect the connector (CN25) on PWB(M).
3. Connect the PC-ART.

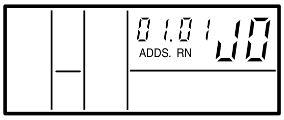
4 Turn ON the power supply.

After finishing the checking, turn OFF the power supply again and reconnect the connectors according to the previous situation before the checking.



NOTE

- ***If this indication continues and the alarm code J1 is not displayed, this means that each one of indoor unit is not connected to the remote control switch.***
- ***Check the wiring between the remote control switch and the indoor unit.***



- ***In this troubleshooting procedure, checking of the following parts of the PCB is not available.***
  - ***PCB in Indoor Unit: Relay circuit, DIP switch, option circuit, fan circuit, protection circuit.***
  - ***PCB in Outdoor Unit: Relay circuit, DIP switch, option circuit.***
- ***If this troubleshooting is performed in the system by means of the central station, the indication of the central station may change during this procedure. However, this is not abnormal.***
- ***After this troubleshooting, the memory of the abnormal operation occurrence counter, which was described before, will be deleted.***

8.3.2 Self-checking of the remote control switch

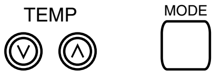
Cases where the CHECK switch is used:

1 If the remote control switch displays a malfunction.

2 For the regular maintenance check.

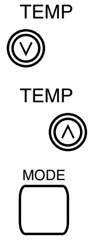
1 Turn ON the power source.

2 Simultaneously depress the following 3 switches. (During operation, they can be depressed.)



3 The LCD indication changes as shown in the right figure.

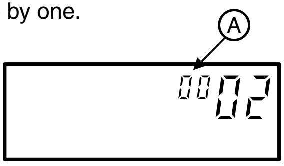
Only for cancellation of EEPROM, depress the following 3 switches simultaneously during changing LCD indication.



To 11

4 After the LCD indication changes as shown in the right figure, the RUN indicator flashes twice.

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.



NOTES:
1. Any order of depressing switches is available.
2. Depressing 2 or more switches simultaneously is invalid and not counted.

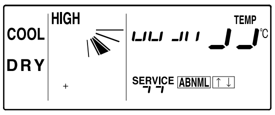
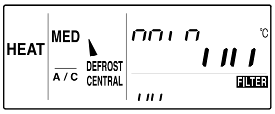
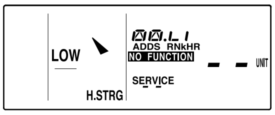
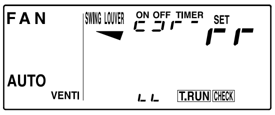
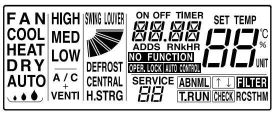
Unless all the switches are depressed, the checking do not proceed to the next item.

6 The LCD indication changes as shown below.
The remote control switch automatically starts to check the transmission circuit.

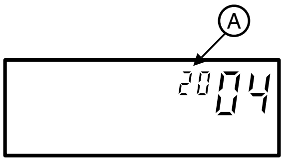
In case that the transmission circuit is abnormal, the LCD indication remains as the left figure and the checking do not proceed to the next item.

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

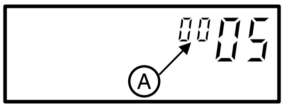
7 The LCD indication changes as shown below.
The detected temperature of remote control thermostat is indicated at the part (A) in the figure below.



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.

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.



The number indicated at the (A) part is "99", the checking do not proceed to the next item.

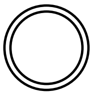
In case that EEPROM is not canceled, depress the CHECK switch.

9 The LCD indication changes as shown below.

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.

12 The LCD indication changes as shown below.

After several seconds are passed, the remote control switch is automatically activated again.
In this case, the operation is not started automatically.

8.3.3 Self-Checking procedure of the Indoor Unit PCB (only for RPK)

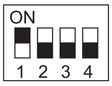
Self-checking procedure by means of the relays on the indoor unit PCB

- To check the abnormal operation on the indoor unit PCB due to a malfunction.
- To check the abnormal operation on the indoor unit PCB according to the results of the checking procedure by means of the CHECK switch on the remote control switch and the self-checking function.

Procedure

1 Turn OFF the main power switch.
2 Disconnect the connectors CN7 and CN8.
3 Set the DIP switch DSW2 as shown below.

Set the #1 switch to ON and #2 switch to OFF

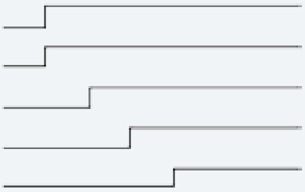


4 Turn ON the main power switch. Check Mode starts. (Refer to the next page.)

- **a.** Analog Test
- **b.** Relay Test

5 After finishing the self-checking procedure, turn OFF the power and reset the DIP switch as before.

Self-checking procedures in the check mode for RPK-FSN2M

Check item	State of mode	Confirmation method
(A) Initialize Exp. valve and auto-louver	Exp. Valve fully open → fully closed Auto-louver is horizontally stopped.	—
(B) Analog test	If the thermistors for the inlet air temperature, for the discharge air temperature and for the freeze protection are normal, proceed to the next step.	—
(C) Each relay test Perform repeatedly	52H1, 2, 3 Fan (Low) Wireless receiver part (Red) Wireless receiver part (Green) Wireless receiver part (Yellow) 	Check the ON/OFF sound of the relays and the LED.
Termination	Turn OFF and reset all the DIP switches as before.	—

◆ **Procedure of checking other main parts**

Procedure of checking other main parts for IVX Series

1. High voltage discharge work for replacing parts

DANGER

- ***Perform this high voltage discharge work to avoid an electric shock***
- **DIP-IPM**

Procedure:

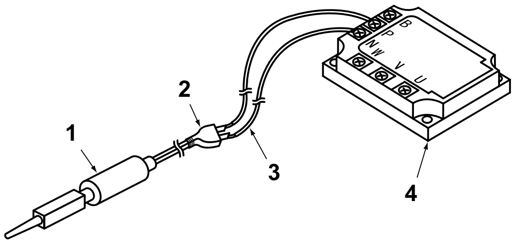
a. Turn OFF the main switches and wait for three minutes. Check to ensure that no high voltage exists. If LED201 is ON after start-up and LED201 is OFF after turning OFF power source, the voltage will decrease lower than DC50V.

b. Connect connecting wires to an electrical soldering iron.

c. Connect the wires to terminals, P and N on DIP-IPM. => Discharging is started, resulting in hot soldering iron. Pay attention not to short-circuit between terminal P(+) and N(-).

d. Wait for 2 or 3 minutes and measure the voltage once again. Check to ensure that no voltage is charged.

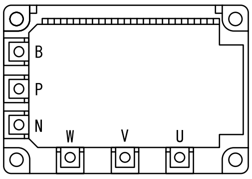
1. Solder bit.
2. Plug.
3. Connecting wires.
4. Transistor module (IPM).

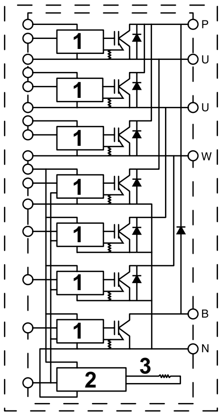


2. Checking method of transistor module

- **Outer appearance and internal circuit of transistor module**

1. Drive circuit.
2. Overheating protection circuit.
3. Sensor.

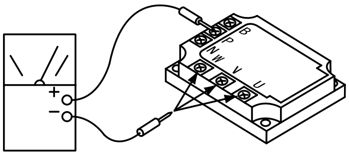




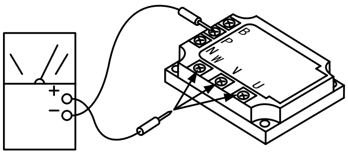
- Procedure:

  Remove all the terminals of the transistor module before check. If items (a) to (d) are performing and the results are satisfactory, the transistor module is normal. Measure it under 1kΩ range of a tester. Do NOT use a digital tester.

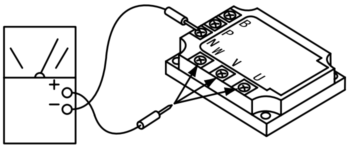
  a. By touching the + side of the tester to the P terminal of transistor module and the - side of tester to U, V and W of transistor module, measure the resistance. If all the resistances are from 1 to 5kΩ, it is normal.



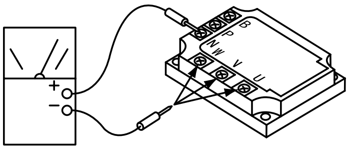
  b. By touching the - side of the tester to the P terminal of transistor module and the + side of tester to U, V and W of transistor module, measure the resistance. If all the resistances are greater than 100kΩ, it is normal.



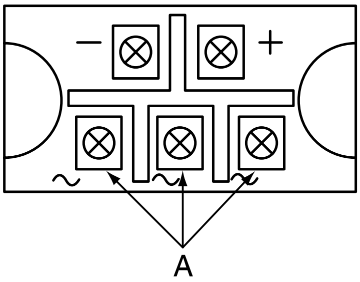
  c. By touching the - side of the tester to the N terminal of transistor module and the + side of tester to U, V and W of transistor module, measure the resistance. If all the resistances are from 1 to 5kΩ, it is normal.

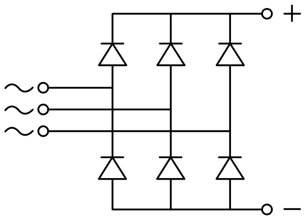


  d. By touching the + side of the tester to the N terminal of transistor module and the - side of tester to U, V and W of transistor module, measure the resistance. If all the resistances are greater than 100kΩ, it is normal.



3. Checking method of diode module



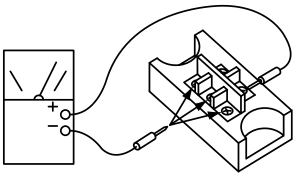


If items (a) to (d) are performing and the results are satisfactory, the diode module is normal.

Measure it under 1kΩ range of a tester. Do NOT use a digital tester.

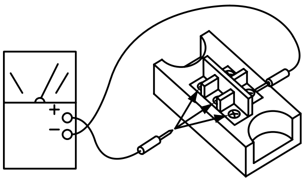
a. By touching the + side of the tester to the + terminal of diode module and the - side of tester to the ~ terminals (3 NOs.) of the diode module, measure the resistance.

If all the resistances are from 5 to 50kΩ, it is normal.



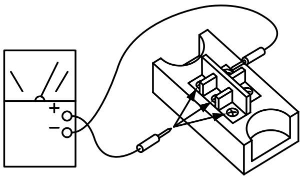
b. By touching the - side of the tester to the + terminal of diode module and the + side of tester to the ~ terminals (3 NOs.) of the diode module, measure the resistance.

If all the resistances are greater than 500kΩ, it is normal.



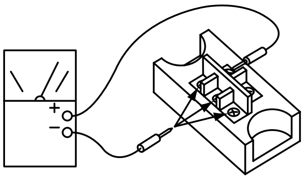
c. By touching the - side of the tester to the - terminal of diode module and the + side of tester to the ~ terminals (3 NOs.) of the diode module, measure the resistance.

If all the resistances are from 5 to 50kΩ, it is normal.



d. By touching the + side of the tester to the - terminal of diode module and the - side of tester to the ~ terminals (3 NOs.) of the diode module, measure the resistance.

If all the resistances are greater than 500kΩ, it is normal.



- **Fault diagnosis procedure**

Fault diagnosis of DC fan motor. About fan motor fault diagnosis:

When ISPM/DIP-IPM is faulty and Alarm 53 appears, the fan motor may also be damaged. After replacing the new ISPM/DIP-IPM, ISPM/DIP-IPM will be damaged again if it operates with a damaged fan motor. Check also if the fan motor is not damaged when IPM/DIP-IPM is replaced.

CAUTION

- ***Turn OFF main power before start working.***
- ***Working/checking with the power ON may disturb correct diagnosis and may result in failure.***

Models for IVX:

DC motor(s) included in different models:

Model	Pieces
RAS-3HVRNM2E	1
RAS-(4-6)HVRNM2E	2
RAS-(4-6)HRNM2E	2
RAS-(8-12)HRNM	1 (Upper Motor)

1. Remove fan motor connectors from the control PCB ISPM or DIP-IPM and turn the fan motor shaft by hand.

Normal:	Fan motor shaft turns smoothly.
Faulty:	No continuous rotary torque movement felt when turning the motor by hand. This occurs because the internal magnet of the fan motor breaks the movement when the internal electronic circuit of the fan motor has a short-circuit fault.

2. Measure the fan motor resistance using a tester.

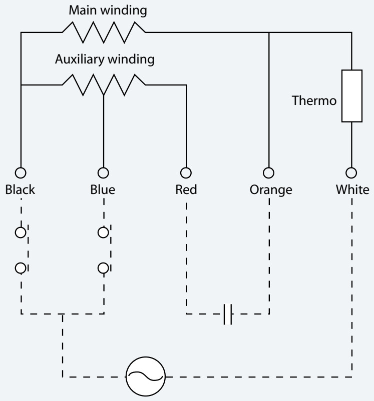
Measurement procedure:	
1.	Remove the fan motor connector from the control PCB, ISPM or DIP-IPM.
2.	Connect the black test lead of the tester to the black wire pin of the fan motor connector
3.	Connect the red test lead to the wire connector pin to be checked
Results	
Normal:	Observed values will be close to the normal values in the table below
Faulty:	Observed values will be deviated from the normal values in the table below. (Generally an open-circuit fault shows ∞, and a short-circuit fault shows several Ω-kΩ.) Internal electronic circuit fault of the fan motor including short-circuit and breakage can be checked

Model	Motor model	Wire color for checking (normal value)			
		Red-Black	White-Black	Yellow-Black	Blue-Black
RAS-4H(V)RNM2E (upper) RAS-(4-6)H(V)RNM2E (lower)	SIC-65FV-D840-1	1 MΩ or greater	26~50kΩ	168~312kΩ	1 MΩ or greater
RAS-3HVRNM2E RAS-(5-6)HVRNM2E (upper) RAS-(5-6)HRNM2E (upper)	SIC-68FV-D851-7	1 MΩ or greater	42-78kΩ	168~312Ω	1 MΩ or greater
RAS-(8-12)HRNM (upper)	SIC-61FV-D8138-1	1 MΩ or greater	42-78kΩ	168~312Ω	1 MΩ or greater

NOTE

- ***(*) Values are shown for referential purpose. While actual values may vary depending on the type of the tester; any tester can be used to determine any short-circuit or breakage based on ∞ or several Ω/several kΩ or 0Ω or ∞.***

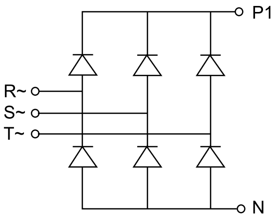
3. Coil resistance of electrical parts (Lower fan motor)

Part Name	Model	Fan motor model/ Rated power	Wiring diagram	Lead wire color	Resistance (Ω) (at 20°)
Outdoor unit lower fan motor	RAS-(8-10)HRNM	SC121HSA/120W		Bet.Black-White Bet.Blue-Red Bet.Black-Blue	23.3 ± 10% 0.8 ± 10% 12.8 ± 10%
	RAS-(8-12)HRNM	SC230HSA/200W		Bet.Black-White Bet.Blue-Red Bet.Black-Blue	14.3 ± 10% 8.5 ± 10% 12.5 ± 10%

- **Checking procedure for the ISPM**

  Rectification parts of internal circuit of ISPM (Common)

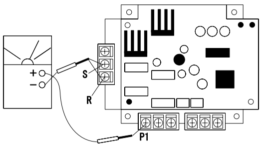
  Remove all the terminals of the ISPM before check. If items (a) to (h) are performed and the results are satisfactory, ISPM is normal. Measure it under 1 kΩ range of a tester.



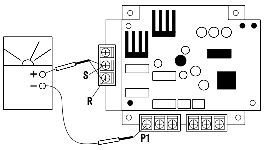
CAUTION

- ***Perform the high voltage discharge procedure as described***
- ***Do not use a digital tester.***

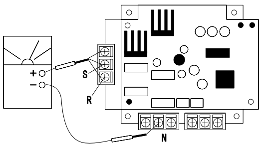
a. By touching the + side of the tester to the P1 terminal of ISPM and the - side of the tester to R and S of ISPM, measure the resistance. If all the resistances are more than 1 kΩ, it is normal.



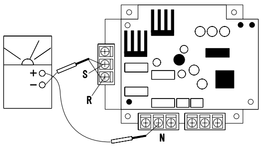
b. By touching the - side of the tester to the P1 terminal of ISPM and the + side of the tester to R and S of ISPM, measure the resistance. If all the resistances are more than 100 kΩ, it is normal.



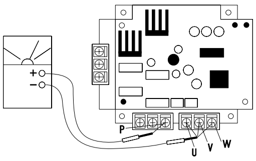
c. By touching the - side of the tester to the N terminal of ISPM and the + side of the tester to R and S of ISPM, measure the resistance. If all the resistances are more than 1 kΩ, it is normal.



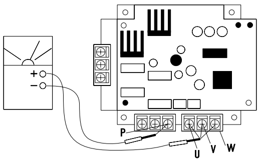
d. By touching the + side of the tester to the N terminal of ISPM and the - side of the tester to R and S of ISPM, measure the resistance. If all the resistances are more than 100 kΩ, it is normal.



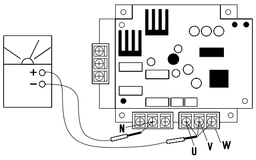
e. By touching the + side of the tester to the P terminal of ISPM and the - side of the tester to U, V and W of ISPM, measure the resistance. If all the resistances are more than 1 kΩ, it is normal.



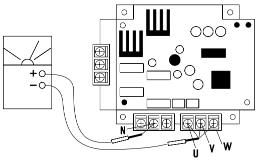
f. By touching the - side of the tester to the P terminal of ISPM and the + side of the tester to U, V and W of ISPM, measure the resistance. If all the resistances are more than 100 kΩ, it is normal.



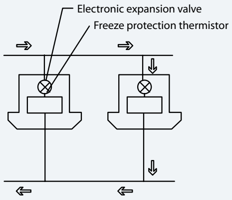
g. By touching the - side of the tester to the N terminal of ISPM and the + side of the tester to U, V and W of ISPM, measure the resistance. If all the resistances are more than 100 kΩ, it is normal.



h. By touching the + side of the tester to the N terminal of ISPM and the - side of the tester to U, V and W of ISPM, measure the resistance. If all the resistances are more than 1 kΩ, it is normal.



- **Checking procedure for the electronic expansion valve**

Valve position	Electronic expansion valve	Outdoor unit electronic expansion valve
Locked fully closed	Check the temperature of the piping in the heating process. Failure of the temperature to rise indicates a fault.	It is abnormal if the liquid pipe pressure does not increase during the cooling process.
Locked slightly open	The following conditions indicate a fault: • Where the freeze protection thermistor temperature is lower than the intake air temperature.	It is abnormal if the liquid pipe pressure does not increase and the outlet temperature of the expansion valve decreases after the cooling process starts.
Locked fully open	Where the unit being inspected stops and other units continue operating in cooling mode. 	It is abnormal under the following conditions: after the heating process for more than 30 minutes, the discharge gas temperature of the compressor is not 10 °C higher than the condensing temperature and there is no other faults, such as an excessive charge of refrigerant and others.}

- **Other parts**

Part name	Unit models	Model code	Resistance (Ω)
Drain up motor	RCI-1.0-FSN3E RCIM-1.5-.5FSN2 RPI-2.0-6.0FSN3E	ADP-1403	139.00 at 21 ºC
	RCD.1.0~6.0FSN2	KJV-1004	347.00 at 20 ºC
Solenoid gas for gas bypass	RAS-8HRNM to RAS-12HRNM	105-52-52 (50Hz)	1540.00 at 20 ºC
		105-52-51 (60Hz)	1250.00 at 20 ºC
Solenoid gas for gas bypass (1/4)		VPV-MOAJ502B1 (50Hz)	1435.00 at 20 °C
		VPV-MOAG579A1 (60Hz)	952.00 at 20 ºC
Reversing valve		STF-01AJ502D1 (50Hz)	1435.00 at 20 ºC
		STF-01AI511A1 (60Hz)	1358.00 at 20 ºC
Compressor motor		E655DHD-65D2 (380-415V)	0.839 at 20 ºC
		E655DHD-65A2 (220V)	0.199 at 20 ºC

- **Checking procedure for the compressor**

CHECK LIST ON COMPRESSOR

Client:	**Model:**	**Date:**
Serie No.	**Production Date:**	**Checker:**

No.	Check item	Check method	Result	Remarks
1	Is THM9 correctly connected? THM9: Discharge Gas Thermistor	1. Is wire of thermistor correctly connected by viewing? 2. Check to ensure the 7-segment indication of Td when comp. is operating. Td: Temperature of THM9		
2	Is thermistor THM9 disconnected?	1. Check to ensure that thermistor on the top of comp. is correctly mounted by viewing? 2. Check to ensure that actually measured temp. is the same as the indication during check mode.		
3	Is current sensor faulty?	1. Check to ensure that indication A1 and A2 are 0 during compressor stopping. 2. Check to ensure that indication A1 and A2 are not 0 during compressor running.		
4	Is current sensing part on PCB2 faulty?			
5	Is the direction of current sensor CTU, CTV) reverse?	Check the direction => by viewing.		
6	Are power source wires, U and V inserted correctly into current sensor? .	Check to ensure that wires are correctly inserted		
7	Is exp. valve (MV1) correctly connected?	Check to ensure that MV1 to CN5A is correctly connected		
8	Is exp. valve coil (MV1) correctly connected?	Check to ensure that each coil is correctly mounted on the valve.		
9	Are the refrigeration cycle and electrical wiring system incorrectly connected?	Check to ensure that refrigerant is flowing into indoor units by operating one refrigerating cycle only from the outdoor unit.		
10	Is opening of exp. valve completely closed (locked)?	Check the following by the check mode of outdoor units. 1. Liquid Pipe Temp. (TL) < Air Intake Temp. (Ti) during Cooling Operation 2. Liquid Pipe Temp. (TL) > Air Intake Temp. (Ti) during Heating Operation		
11	Is opening of exp. valve fully opened locked)?	Check to ensure that liquid pipe temp. is lower than air intake temp. of stopping indoor unit when other indoor units are operating under cooling operation.		
12	Are the contacts for comp. magnetic switch CMC1 faulty?	Check the surface of each contact (L1, L2 and L3) by viewing.		
13	Is there any voltage abnormality among L1-L2, L2-L3 and L3-L1?	Check to ensure that voltage imbalance is smaller than 3%. Please note that power source voltage must be within 380V or 220V+10%.		
14	Is the comp. oil acidified during compressor motor burning?	Check to ensure that the oil color is not black.		

Additional Information for “CHECK LIST ON COMPRESSOR”

Check item	Additional information (mechanism of the compressor failure)
1 & 2	The liquid refrigerant return volume to the compressor is controlled by the discharge gas temperature Td when compressor is operating. If Td thermistor is disconnected, the liquid refrigerant return volume will become small by detecting the temperature even if the actual discharge gas temperature is high. Therefore, this abnormal overheating by detecting the temperature operation will result in insulation failure of the motor winding.

Check item	Additional information (mechanism of the compressor failure)
3 & 4	Overcurrent control (operating frequency control) is performed by detecting current by the PCB2. In this case, winding insulation failure will occur, since control is not available in spite of actually high current.
5 & 6	The current sensor checks phase and adjusts output electrical wave in addition to the above mentioned items. If fault occurs, the output electrical wave becomes unstable giving stress to the motor winding, resulting in winding insulation failure.
7 &8	During a cooling operation, SH is controlled by MV of each indoor units. During a heating operation, Td is controlled by MV1. If expansion valves are incorrectly connected, correct control is not available, resulting in compressor seizure depending on liquid refrigerant returning conditions or motor winding insulation failure depending on overheating conditions.
9	If the refrigeration cycle and electrical system are incorrectly connected, abnormally low suction pressure operation is maintained or abnormally high discharge pressure operation is maintained, resulting in giving stress to the compressor, since their correct control is not available.
10	ditto
11	The compressor may be locked due to the liquid return operation during the cooling operation.
12	In the case that the contacting resistance becomes big, voltage imbalance among each phase will cause abnormal overcurrent.
13	In this case, overcurrent will occur, efficiency will decrease or the motor winding will be excessively heated.
14	In the case, it will result in motor burning or compressor seizure.

Procedure of checking other main parts for ES Series

1. High voltage discharge work for replacing parts

⚠ **DANGER**

- *Perform this high voltage discharge work to avoid an electric shock*
- **DIP-IPM**

Procedure:

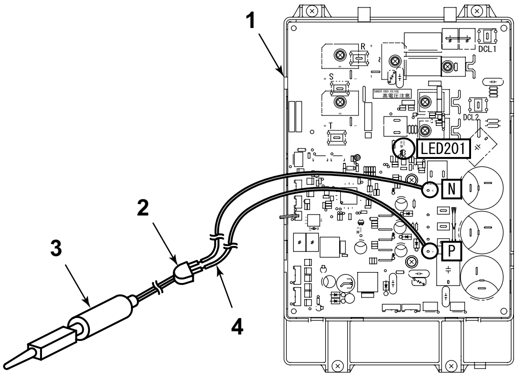
a. Turn OFF the main switches and wait for three minutes. Check to ensure that no high voltage exists. If LED201 is ON after start-up and LED201 is OFF after turning OFF power source, the voltage will decrease lower than DC50V.

b. Connect connecting wires to an electrical soldering iron.

c. Connect the wires to terminals, P and N on DIP-IPM. => Discharging is started, resulting in hot soldering iron. Pay attention not to short-circuit between terminal P(+) and N(-).

d. Wait for 2 or 3 minutes and measure the voltage once again. Check to ensure that no voltage is charged.

1. DIP-IPM.
2. Plug.
3. Electrical soldering iron.
4. Connecting Wires.



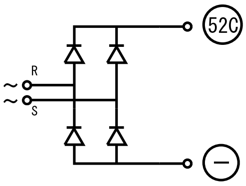
2. Inverter module checking procedure

- **Internal Circuit of Rectified Part of DIP-IPM**

Non-faulty if [1] – [8] are checked and satisfied. (Measure with 1 kΩ range of a tester.)

NOTE

DO NOT use a digital tester



1. Touch [+] of the tester to DIP-IPM 52C terminal, and [-] to DIP-IPM R, S terminals to measure the resistance. Normal if all three terminals have 1 kΩ or greater.

2. Contrary to [1], touch [-] of the tester to DIP-IPM 52C terminal, and [+] to DIP-IPM R, S terminals to measure the resistance.

Normal if all three terminals have 100 kΩ or greater.

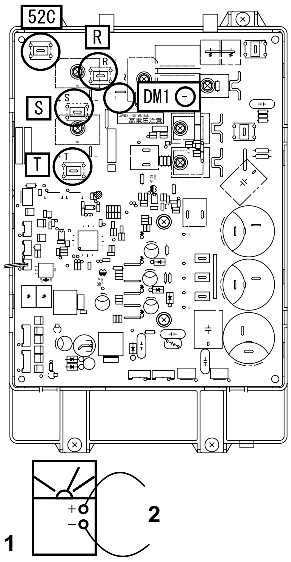
3. Touch [-] of the tester to [-] of DIP-IPM DMI (soldered part), and [+] of the tester to DIP-IPM R, S terminals to measure the resistance.

Normal if all three terminals have 1 kΩ or greater

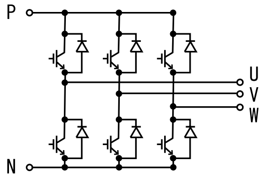
4. Contrary to [3], touch [+] of the tester to [-] of DIP-IPM DMI, and [-] of the tester to DIP-IPM R, S terminals to measure the resistance.

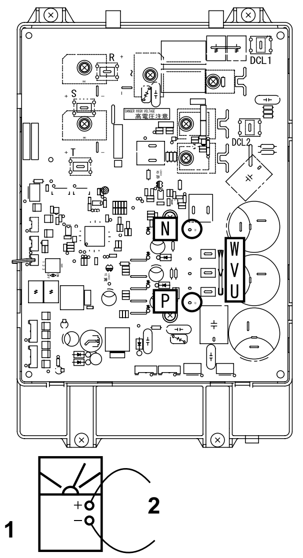
Normal if all three terminals have 100 kΩ or greater

1. Tester.
2. Contact with specified terminals to measure.



- **Internal Circuit of Rectified Part of Inverter Module (Cont.)**





5. Touch [+] of the tester to [P] of DIP-IPM (soldered part), and [-] to DIP-IPM U, V, W terminals to measure the resistance.

Normal if all three terminals have 1 kΩ or greater.

6. Contrary to [5], touch [-] of the tester to [P] of DIP-IPM (soldered part), and [+] to DIP-IPM U, V, W terminals to measure the resistance

. Normal if all three terminals have 30 kΩ or greater. (Resistance gradually increases during measurement.)

7. Touch [-] of the tester to [N] of ISPM (soldered part), and [+] to ISPM U, V, W terminals to measure the resistance.

Normal if all three terminals have 1 kΩ or greater.

8. Contrary to [7], touch [+] of the tester to [N] of DIP-IPM (soldered part), and [-] to DIP-IPM U, V, W terminals to measure the resistance.

Normal if all three terminals have 30 kΩ or greater.

(Resistance gradually increases during measurement.)

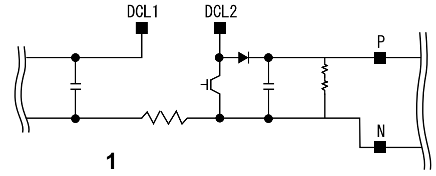
1. Tester.
2. Contact with specified terminals to measure.

Non-faulty if [9] – [13] are checked and satisfied.

(Measure with 1 kΩ range of a tester.)

- **Internal Circuit of ACT Part of Inverter Module**

1. External Appearance and Internal Circuit of Transistor Module .



NOTE

DO NOT use a digital tester

9. Check items [1] – [8].

10. Touch [+] of the tester to DIP-IPM DCL2 terminal, and [-] to [P] of ISPM/DIP-IPM (soldered part) to measure the resistance. Normal if all three terminals have 100 kΩ or greater

11. Contrary to [10], touch [-] of the tester to DIP-IPM DCL2 terminal, and [+] to [P] of DIP-IPM (soldered part) to measure the resistance.

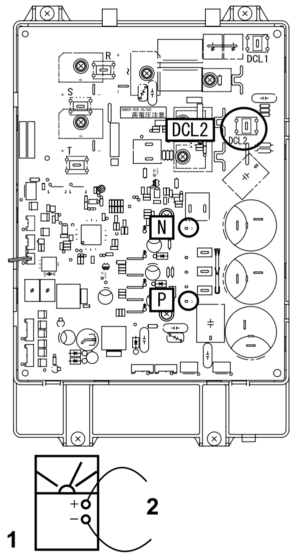
Normal if all three terminals have 1 kΩ or greater.

12. Touch [+] of the tester to DIP-IPM DCL2 terminal, and [-] to [N] of DIP-IPM (soldered part) to measure the resistance. Normal if all three terminals have 100 kΩ or greater.

13. Contrary to [12], touch [-] of the tester to DIP-IPM DCL2 terminal, and [+] to [N] of DIP-IPM (soldered part) to measure the resistance.

Normal if all three terminals have 10 kΩ or greater.

(Resistance gradually increases during measurement.)



1. Tester.
2. Contact with specified terminals to measure.

- **DIP-IPM**

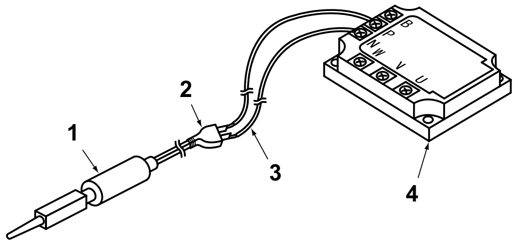
a. Turn OFF the main switches and wait for three minutes. Check to ensure that no high voltage exists. If LED201 is ON after start-up and LED201 is OFF after turning OFF power source, the voltage will decrease lower than DC50V.

b. Connect connecting wires to an electrical solder bit.

c. Connect the wires to terminals, P and N on IPM. => Discharging is started, resulting in hot solder bit. Pay attention not to short-circuit between terminal P and N.

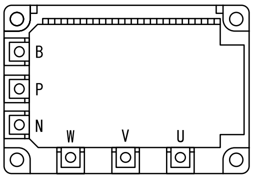
d. Wait for 2 or 3 minutes and measure the voltage once again. Check to ensure that no voltage is charged.

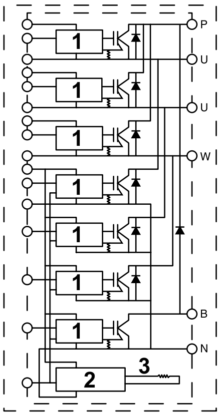
1. Solder bit.
2. Plug.
3. Connecting wires.
4. Transistor module (IPM).



1. Drive circuit.
2. Overheating protection circuit.
3. Sensor.

1. Checking Method of Transistor Module Outer Appearance and Internal Circuit of Transistor Module

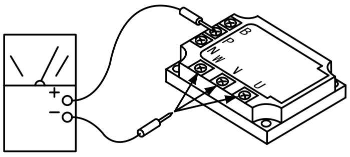




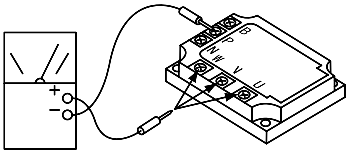
Procedure:

Remove all the terminals of the transistor module before check. If items (a) to (d) are performing and the results are satisfactory, the transistor module is normal. Measure it under 1kΩ range of a tester. Do NOT use a digital tester.

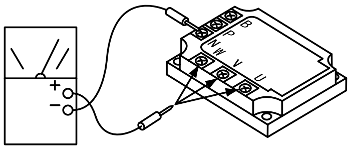
a. By touching the + side of the tester to the P terminal of transistor module and the - side of tester to U, V and W of transistor module, measure the resistance. If all the resistances are from 1 to 5kΩ, it is normal.



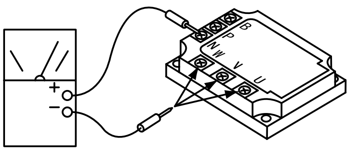
b. By touching the - side of the tester to the P terminal of transistor module and the + side of tester to U, V and W of transistor module, measure the resistance. If all the resistances are greater than 100kΩ, it is normal.



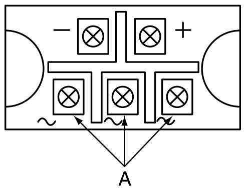
c. By touching the - side of the tester to the N terminal of transistor module and the + side of tester to U, V and W of transistor module, measure the resistance. If all the resistances are from 1 to 5kΩ, it is normal.

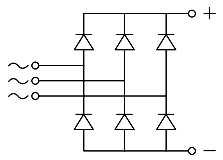


d. By touching the + side of the tester to the N terminal of transistor module and the - side of tester to U, V and W of transistor module, measure the resistance. If all the resistances are greater than 100kΩ, it is normal.



3. Checking method of diode module





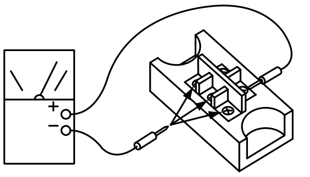
Outer appearance and internal circuit of diode module

If items (a) to (d) are performing and the results are satisfactory, the diode module is normal.

Measure it under 1kΩ range of a tester. Do NOT use a digital tester.

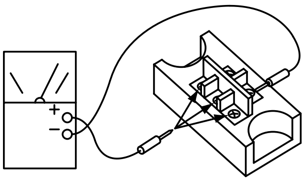
a. By touching the + side of the tester to the + terminal of diode module and the - side of tester to the ~ terminals (3 NOs.) of the diode module, measure the resistance.

If all the resistances are from 5 to 50kΩ, it is normal.



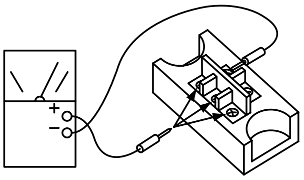
b. By touching the - side of the tester to the + terminal of diode module and the + side of tester to the ~ terminals (3 NOs.) of the diode module, measure the resistance.

If all the resistances are greater than 500kΩ, it is normal.



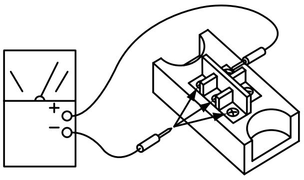
c. By touching the - side of the tester to the - terminal of diode module and the + side of tester to the ~ terminals (3 NOs.) of the diode module, measure the resistance.

If all the resistances are from 5 to 50kΩ, it is normal.



d. By touching the + side of the tester to the - terminal of diode module and the - side of tester to the ~ terminals (3 NOs.) of the diode module, measure the resistance.

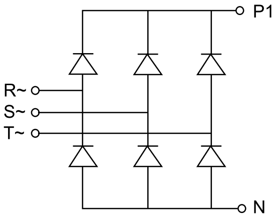
If all the resistances are greater than 500kΩ, it is normal.



- **Checking procedure for the ISPM**

Rectification parts of internal circuit of ISPM (Common)

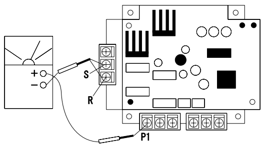
Remove all the terminals of the ISPM before check. If items (a) to (h) are performed and the results are satisfactory, ISPM is normal. Measure it under 1 kΩ range of a tester.



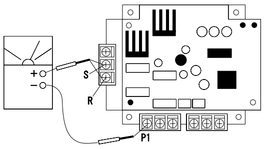
CAUTION

- ***Perform the high voltage discharge procedure as described***
- ***Do not use a digital tester.***

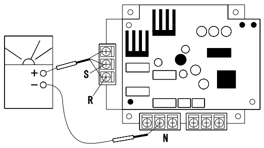
a. By touching the + side of the tester to the P1 terminal of ISPM and the - side of the tester to R and S of ISPM, measure the resistance. If all the resistances are more than 1 kΩ, it is normal.



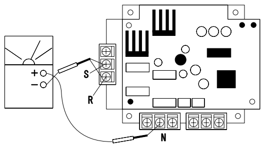
b. By touching the - side of the tester to the P1 terminal of ISPM and the + side of the tester to R and S of ISPM, measure the resistance. If all the resistances are more than 100 kΩ, it is normal.



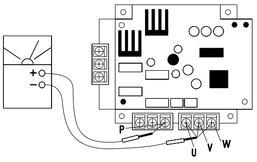
c. By touching the - side of the tester to the N terminal of ISPM and the + side of the tester to R and S of ISPM, measure the resistance. If all the resistances are more than 1 kΩ, it is normal.



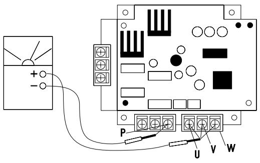
d. By touching the + side of the tester to the N terminal of ISPM and the - side of the tester to R and S of ISPM, measure the resistance. If all the resistances are more than 100 kΩ, it is normal.



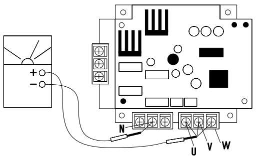
e. By touching the + side of the tester to the P terminal of ISPM and the - side of the tester to U, V and W of ISPM, measure the resistance. If all the resistances are more than 1 kΩ, it is normal.



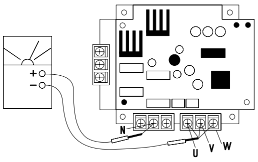
f. By touching the - side of the tester to the P terminal of ISPM and the + side of the tester to U, V and W of ISPM, measure the resistance. If all the resistances are more than 100 kΩ, it is normal.



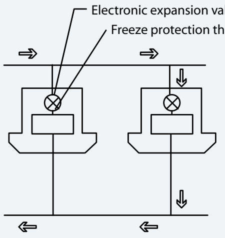
g. By touching the - side of the tester to the N terminal of ISPM and the + side of the tester to U, V and W of ISPM, measure the resistance. If all the resistances are more than 100 kΩ, it is normal.



h. By touching the + side of the tester to the N terminal of ISPM and the - side of the tester to U, V and W of ISPM, measure the resistance. If all the resistances are more than 1 kΩ, it is normal.



- **Checking procedure for the electronic expansion valve**

Valve position	Electronic expansion valve	Outdoor unit electronic expansion valve
Locked fully closed	Check the temperature of the piping in the heating process. Failure of the temperature to rise indicates a fault.	It is abnormal if the liquid pipe pressure does not increase during the cooling process.
Locked slightly open	The following conditions indicate a fault: - Where the freeze protection thermistor temperature is lower than the intake air temperature. - Where the unit being inspected stops and other units continue operating in cooling mode.  	It is abnormal if the liquid pipe pressure does not increase and the outlet temperature of the expansion valve decreases after the cooling process starts.
Locked fully open		It is abnormal under the following conditions: after the heating process for more than 30 minutes, the discharge gas temperature of the compressor is not 10°C higher than the condensing temperature and there is no other faults, such as an excessive charge of refrigerant and others.}

- **Fault diagnosis of DC fan motor**

About fan motor fault diagnosis.

When ISPM/DIP-IPM is faulty and Alarm 53 appears, the fan motor may also be damaged. To prevent ISPM/DIP-IPM damage which may result from operation combined with a faulty fan motor, check also if the fan motor is not damaged when ISPM/DIP-IPM is replaced.

⚠ **CAUTION**

- ***For the shake of safety, turn OFF the power before start working.***
- ***Working/checking with the power ON may disturb correct diagnosis and may result in failure.***

Models for ES:

DC motor(s) included in different models:

Model	Pieces
RAS-(2/2.5)HVRN2	1
RAS-3HVRNS2	1
RAS-(4-6)H(V)RNS2E	1
RAS-(8/10)HRNSE	1

Fault diagnosis procedure

1. Remove fan motor connectors from the control PCB ISPM or DIP-IPM and turn the fan motor shaft by hand.

Normal:	Fan motor shaft turns smoothly.
Faulty:	No continuous rotary torque movement felt when turning the motor by hand. This occurs because the internal magnet of the fan motor breaks the movement when the internal electronic circuit of the fan motor has a short-circuit fault

2. Measure the fan motor resistance using a tester.

Measurement procedure:	
1.	Remove the fan motor connector from the control PCB, ISPM or DIP-IPM.
2.	Connect the black test lead of the tester to the black wire pin of the fan motor connector
3.	Connect the red test lead to the wire connector pin to be checked
Results	
Normal:	Observed values will be close to the normal values in the table below
Faulty:	Observed values will be deviated from the normal values in the table below. Generally an open-circuit fault shows ∞, and a short-circuit fault shows several Ω-kΩ.) Internal electronic circuit fault of the fan motor including short-circuit and breakage can be checked

Model for ES	Motor model	Wire color for checking (normal value)			
		Red-Black	White-Black	Yellow-Black	Blue-Black
RAS-(2/2.5)HVRN2 RAS-3HVRNS2	FPD10U4OS-902 or DAJ12-55V71	13.5 ~ 14.4	1 MΩ or greater	225~226 kΩ	1 MΩ or greater
RAS-4H(V)RNS2E	SIC-68FV-D851-7	1 MΩ or greater	42 ~ 78 kΩ	166 ~ 312 kΩ	1 MΩ or greater
RAS-5/6H(V)RNS2E	SIC-81FV-D8138-1	1 MΩ or greater	42 ~ 78 kΩ	166 ~ 312 kΩ	1 MΩ or greater
RAS-(8/10)HRNSE	SIC-81FW-D81382	1 MΩ or greater	42 ~ 78 kΩ	168 ~ 312 kΩ	1 MΩ or greater

NOTE

- ***(*) Values are shown for referential purpose. While actual values may vary depending on the type of the tester; any tester can be used to determine any short-circuit or breakage based on ∞ or several Ω/several kΩ or 0Ω***

- **Other parts**

Part name	Unit models	Model code	Resistance (Ω)
Drain up motor	RCI-1.0-FSN3E RCIM-1.5-.5FSN2 RPI-2.0-6.0FSN3E	ADP-1403	139.00 at 21 ºC
	RCD.1.0~6.0FSN2	KJV-1004	347.00 at 20 ºC
Solenoid gas for gas bypass	RAS-(4-6)HVRNS2E RAS-(8/10)HRNSE	105-52-52 (50Hz)	1540.00 at 20 ºC
		105-52-51 (60Hz)	1250.00 at 20 ºC
Reversing valve		STF-01AJ502D1 (50Hz)	1435.00 at 20 ºC
		STF-01AI511A1 (60Hz)	1358.00 at 20 ºC
Expansion valve		UKV-U029E	46.00 at 20 ºC
Compressor motor	RAS-(2/2.5)HVRN2	EU1114D6	1.089 at 75 ºC
	RAS-3HVRNS2	EU1318D1	0.879 at 75 ºC
	RAS-(4/5)HVRNS2E	E306A4D-27A2	0.295 at 75 ºC
	RAS-6HVRNS2E	E406AHD-36A2	0.246 at 75 ºC
	RAS-(8/10)HRNSE	E655DHD-65D2	0.839 at 20 ºC

- **Checking procedure for the compressor**

CHECK LIST ON COMPRESSOR

Client:	**Model:**	**Date:**
Serie No.	**Production Date:**	**Checker:**

No.	Check item	Check method	Result	Remarks
1	Is THM9 correctly connected? THM9: Discharge Gas Thermistor	1. Is wire of thermistor correctly connected by viewing? 2. Check to ensure the 7-segment indication of Td when comp. is operating. Td: Temperature of THM9		
2	Is thermistor THM9 disconnected?	1. Check to ensure that thermistor on the top of comp. is correctly mounted by viewing? 2. Check to ensure that actually measured temp. is the same as the indication during check mode.		
3	Is current sensor faulty?	1. Check to ensure that indication A1 and A2 are 0 during compressor stopping. 2. Check to ensure that indication A1 and A2 are not 0 during compressor running.		
4	Is current sensing part on PCB2 faulty?			
5	Is the direction of current sensor CTU, CTV) reverse?	Check the direction => by viewing.		
6	Are power source wires, U and V inserted correctly into current sensor? .	Check to ensure that wires are correctly inserted		
7	Is exp. valve (MV1) correctly connected?	Check to ensure that MV1 to CN5A is correctly connected		
8	Is exp. valve coil (MV1) correctly connected?	Check to ensure that each coil is correctly mounted on the valve.		
9	Are the refrigeration cycle and electrical wiring system incorrectly connected?	Check to ensure that refrigerant is flowing into indoor units by operating one refrigerating cycle only from the outdoor unit.		
10	Is opening of exp. valve completely closed (locked)?	Check the following by the check mode of outdoor units. 1. Liquid Pipe Temp. (TL) < Air Intake Temp. (Ti) during Cooling Operation 2. Liquid Pipe Temp. (TL) > Air Intake Temp. (Ti) during Heating Operation		
11	Is opening of exp. valve fully opened locked)?	Check to ensure that liquid pipe temp. is lower than air intake temp. of stopping indoor unit when other indoor units are operating under cooling operation.		
12	Are the contacts for comp. magnetic switch CMC1 faulty?	Check the surface of each contact (L1, L2 and L3) by viewing.		
13	Is there any voltage abnormality among L1-L2, L2-L3 and L3-L1?	Check to ensure that voltage imbalance is smaller than 3%. Please note that power source voltage must be within 380V or 220V+10%.		
14	Is the comp. oil acidified during compressor motor burning?	Check to ensure that the oil color is not black.		

Additional Information for “CHECK LIST ON COMPRESSOR”

Check item	Additional information (mechanism of the compressor failure)
1 & 2	The liquid refrigerant return volume to the compressor is controlled by the discharge gas temperature Td when compressor is operating. If Td thermistor is disconnected, the liquid refrigerant return volume will become small by detecting the temperature even if the actual discharge gas temperature is high. Therefore, this abnormal overheating by detecting the temperature operation will result in insulation failure of the motor winding.
3 & 4	Overcurrent control (operating frequency control) is performed by detecting current by the PCB2. In this case, winding insulation failure will occur, since control is not available in spite of actually high current.
5 & 6	The current sensor checks phase and adjusts output electrical wave in addition to the above mentioned items. If fault occurs, the output electrical wave becomes unstable giving stress to the motor winding, resulting in winding insulation failure.
7 &8	During a cooling operation, SH is controlled by MV of each indoor units. During a heating operation, Td is controlled by MV1. If expansion valves are incorrectly connected, correct control is not available, resulting in compressor seizure depending on liquid refrigerant returning conditions or motor winding insulation failure depending on overheating conditions.
9	If the refrigeration cycle and electrical system are incorrectly connected, abnormally low suction pressure operation is maintained or abnormally high discharge pressure operation is maintained, resulting in giving stress to the compressor, since their correct control is not available.
10	ditto
11	The compressor may be locked due to the liquid return operation during the cooling operation.
12	In the case that the contacting resistance becomes big, voltage imbalance among each phase will cause abnormal overcurrent.
13	In this case, overcurrent will occur, efficiency will decrease or the motor winding will be excessively heated.
14	In the case, it will result in motor burning or compressor seizure.

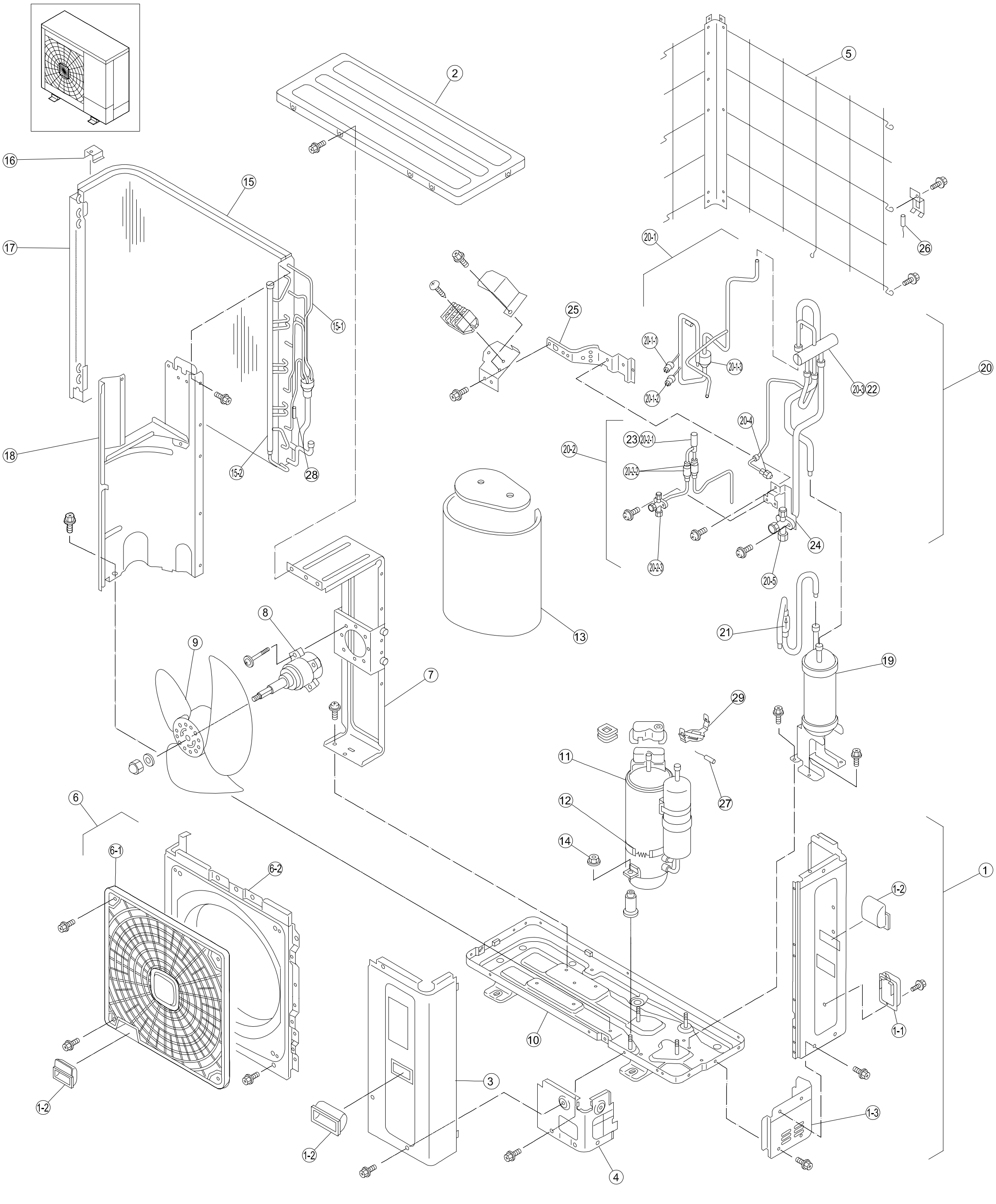
9. Spare Parts

Index

9.1 Spare parts for IVX Series

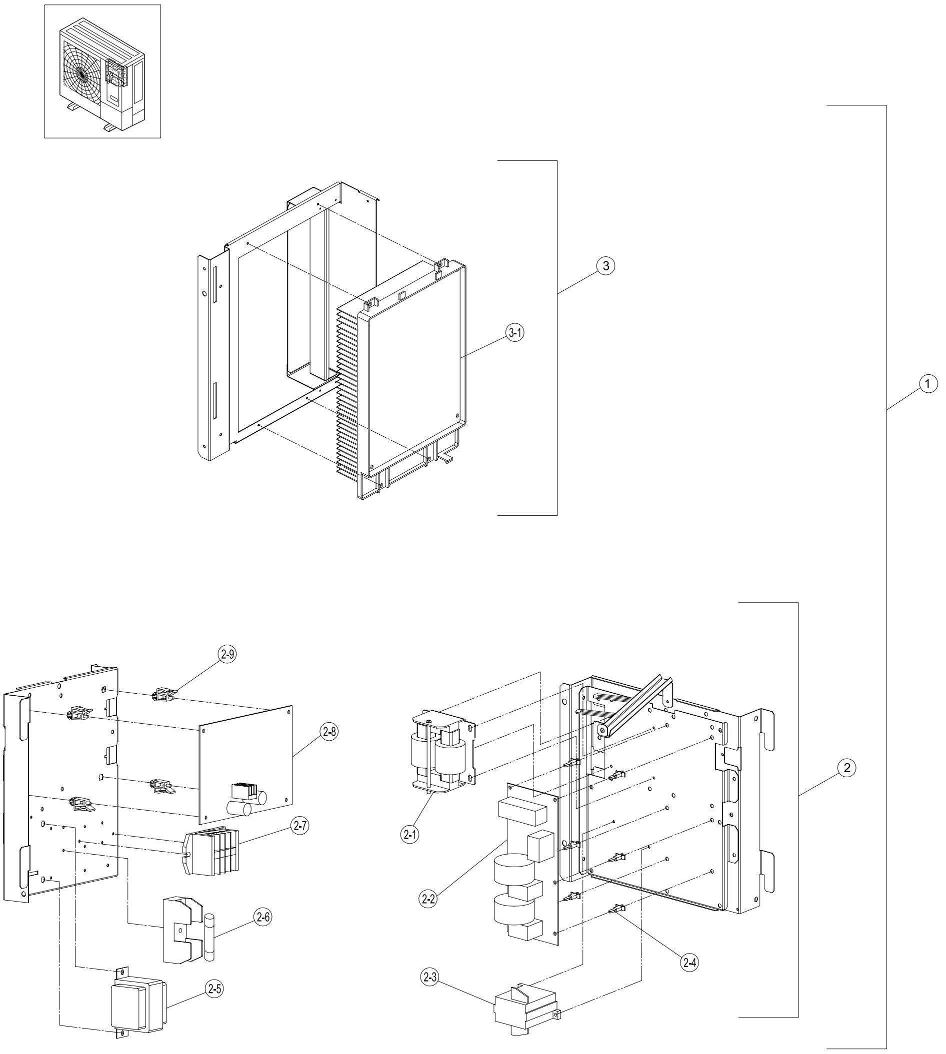
RAS-3HVRNM2E

- Cycle and structural parts



No.	Part name	Remarks
1	Rear Cover S Assy	Assembly
1-1	H-Cover	
1-2	Handle	
1-3	Piping Cover	Rear Piping Cover
2	Upper Cover Assy	Assembly
3	Service Cover S Assy	Assembly
4	S Cover B	Lower Service Cover
5	Protection Net S Assy	
6	Shroud S Unit	
6-1	Air Grille	Air Outlet
6-2	Shroud S	
7	Motor Clamp S Assy	
8	Fan Motor	DC74W, 8P
9	Propeller Fan	Ø544
10	B-Base Assy	
11	Compressor	2YC45DXD
12	C Heater	30W
13	Accoustical Cover	
14	Special Nut	
15	Condenser	Assembly (Heat exchanger+15-1+15-2)
15-1	Header L Assy	Assembly
15-2	Header G Assy	Assembly
16	Attaching Plate	Not included in 15
17	End Plate Assy	
18	Partition Plate	
19	Accumulator	
20	4-way valve assy	Assembly
20-1	D Pipe Assy	Assembly
20-1-1	Pressure Switch	PSC (Control)
20-1-2	Pressure Switch	PSH (High)
20-1-3	Silencer	
20-2	EVO Assy	Assembly
20-2-1	Expansion Valve	EVO
20-2-2	Strainer	
20-2-3	Stop Valve	
20-3	4-way valve	
20-4	Check Ja	
20-5	Stop Valve	
21	Strainer	
22	Coil	For 4-Way Valve
23	Coil for Exp. Valve	For Exp. Valve
24	Valve Stay	
25	V-Stay	
26	Thermistor	Outdoor Air
27	Thermistor	Compressor Top
28	Thermistor	Piping
29	TH-PLATE	

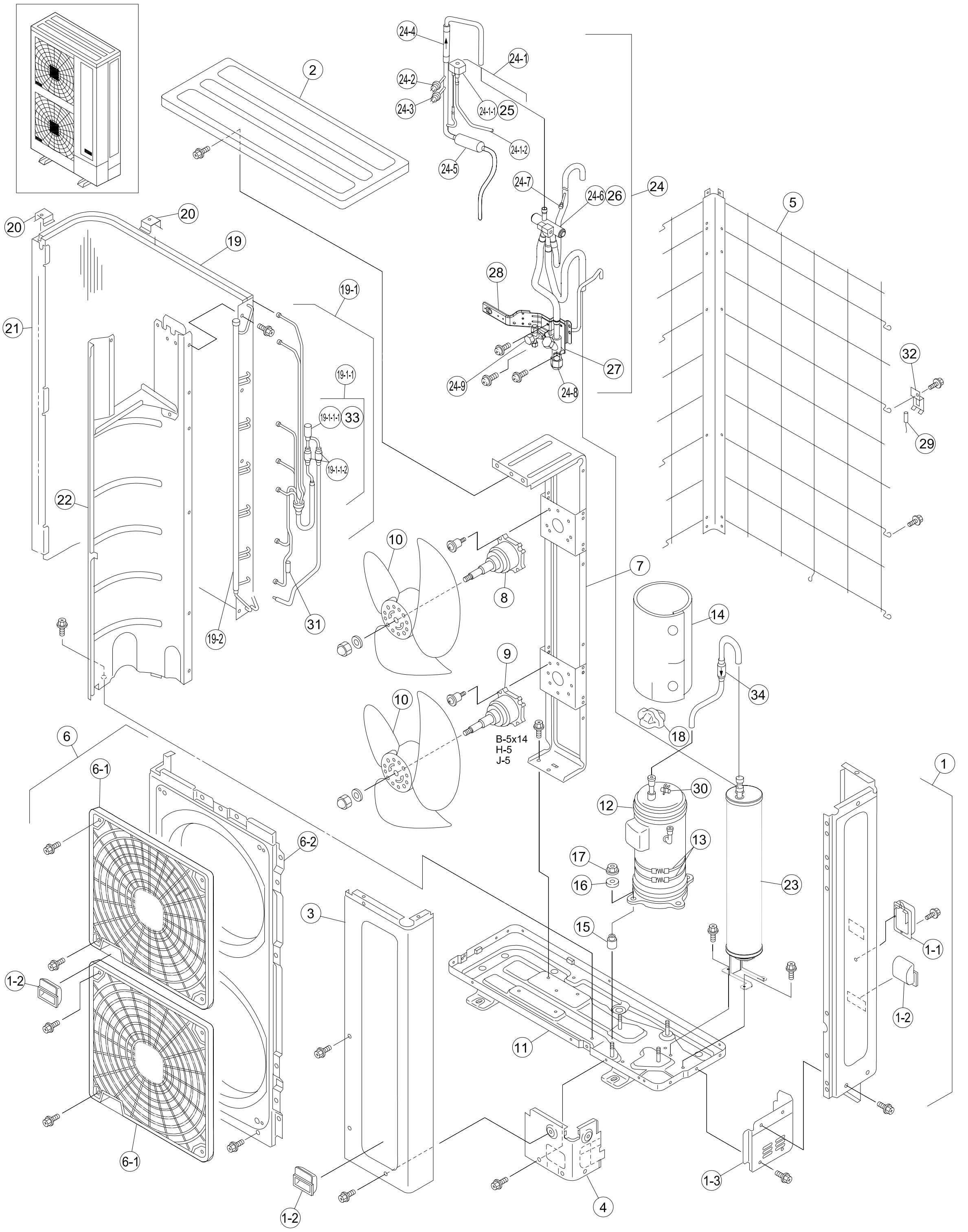
- Electrical parts



No.	Part name	Remarks
1	Electrical Wiring Diagram	Assembly(Steel Plates+Components+Harness)
2	P Plate Assy	Assembly (2-1~2-9)
2-1	Reactor	
2-2	Noise Filter	30A
2-3	Magnetic Contactor	
2-4	Spacer	For Noise Filter
2-5	Transformer	TF
2-6	Fuse	40A
2-7	Terminal Board	TB
2-8	Printed Circuit Board	PCB Main (PO052 Assy)
2-9	Holder	For PCB Main
3	Power Unit Assy	
3-1	Inverter Fin Assy	DIP-IPM (17A)

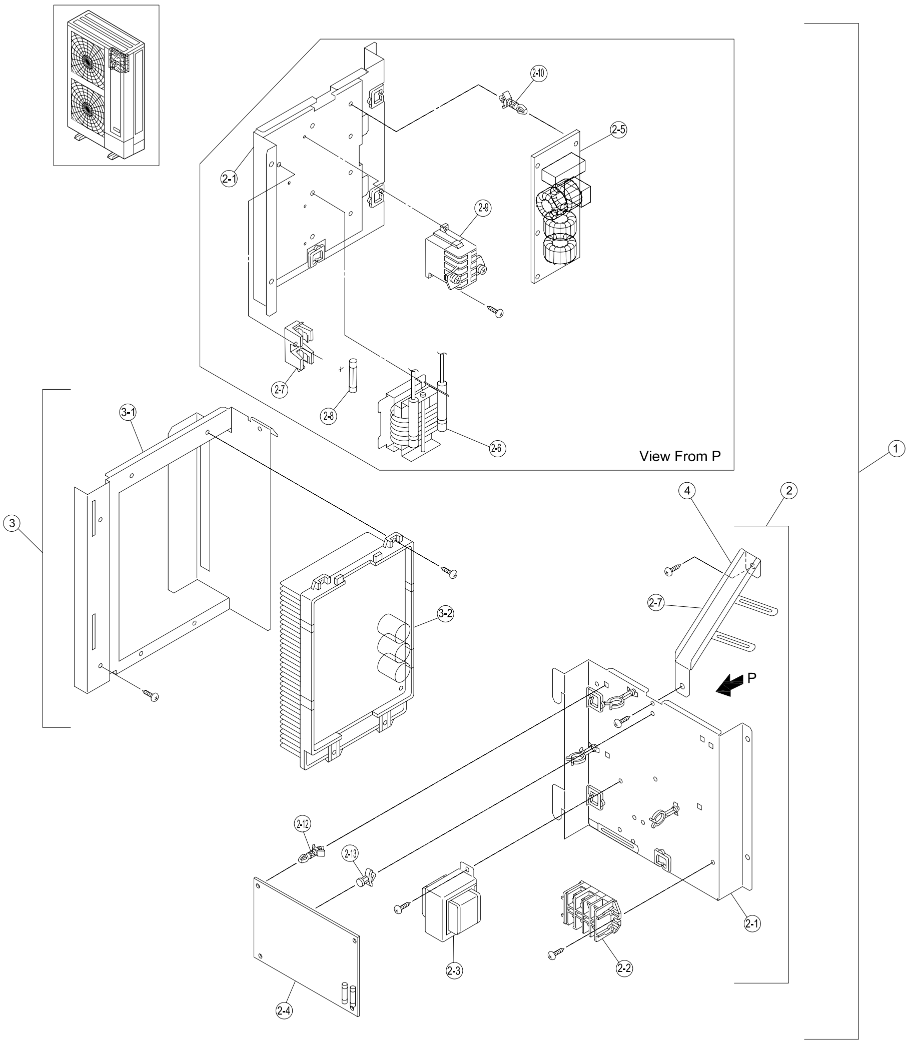
RAS-(4-6)HVRNM2E

- Cycle and structural parts



No.	Part name	Remarks
1	Rear Cover L Assy	Assembly
1-1	H-Cover	
1-2	Handle	
1-3	Piping Cover	Rear Piping Cover
2	Upper Cover Assy	Assembly
4	S Cover B	Lower Service Cover
5	Protection Net L Assy	
6	Shroud L Unit	
6-1	Air Grille	Air Grille
6-2	Shroud L	
7	Motor Clamp L Assy	
8	Fan Motor	5/6 HP MOF1: DC100W, 8P / 4 HP MOF1: DC74W, 8P
9	Fan Motor	5/6 HP MOF2: DC100W, 8P / 4 HP MOF2: DC74W, 8P
10	Propeller Fan	Ø544
11	B-Base Assy	
12	Compressor	E400HHD-36A2
13	Oil Heater	32W
14	Accoustical Cover	
15	Vibration Absorber 1	
16	Vibration Absorber 2	
17	Special Nut	
18	Rubber Cap	
19	Condenser	Assembly (Heat exchanger+ 19-1 + 19-2)
19	Condenser	Assembly (Heat exchanger+ 19-1 + 19-2)
19-1	Pipe L Assy	Assembly
19-1-1	EVO Assy	Assembly
19-1-1-1	Expansion Valve	EVO
19-1-1-2	Strainer	
19-2	Header G Assy	Assembly
20	Attaching Plate	Not included in 19
21	End Plate Assy	Not included in 19
22	Partition Plate	
23	Accumulator Assy	Assemby
24	4-way valve assy	Assembly
24-1	SVA Assy	Assembly
24-1-1	Solenoid Valve	SVA
24-2	Pressure Switch	PSC (Control)
24-3	Pressure Switch	PSH (High)
24-4	Check Valve	
24-5	Silencer	
24-6	4-way valve	RVR
24-7	Check Ja	
24-8	Stop Valve	For Gas Line (5/8)
24-9	Stop Valve	For Liquid Line (3/8)
25	Coil	For SVA
26	Coil	For RVR
27	Valve Stay	
28	V-Stay	
29	Thermistor	TA
30	Thermistor	TD
31	Thermistor	TE
32	TH-PLATE	
33	Coil	For MV
34	Strainer	
35	Attaching Plate	Not included in 19
36	Condenser Support	

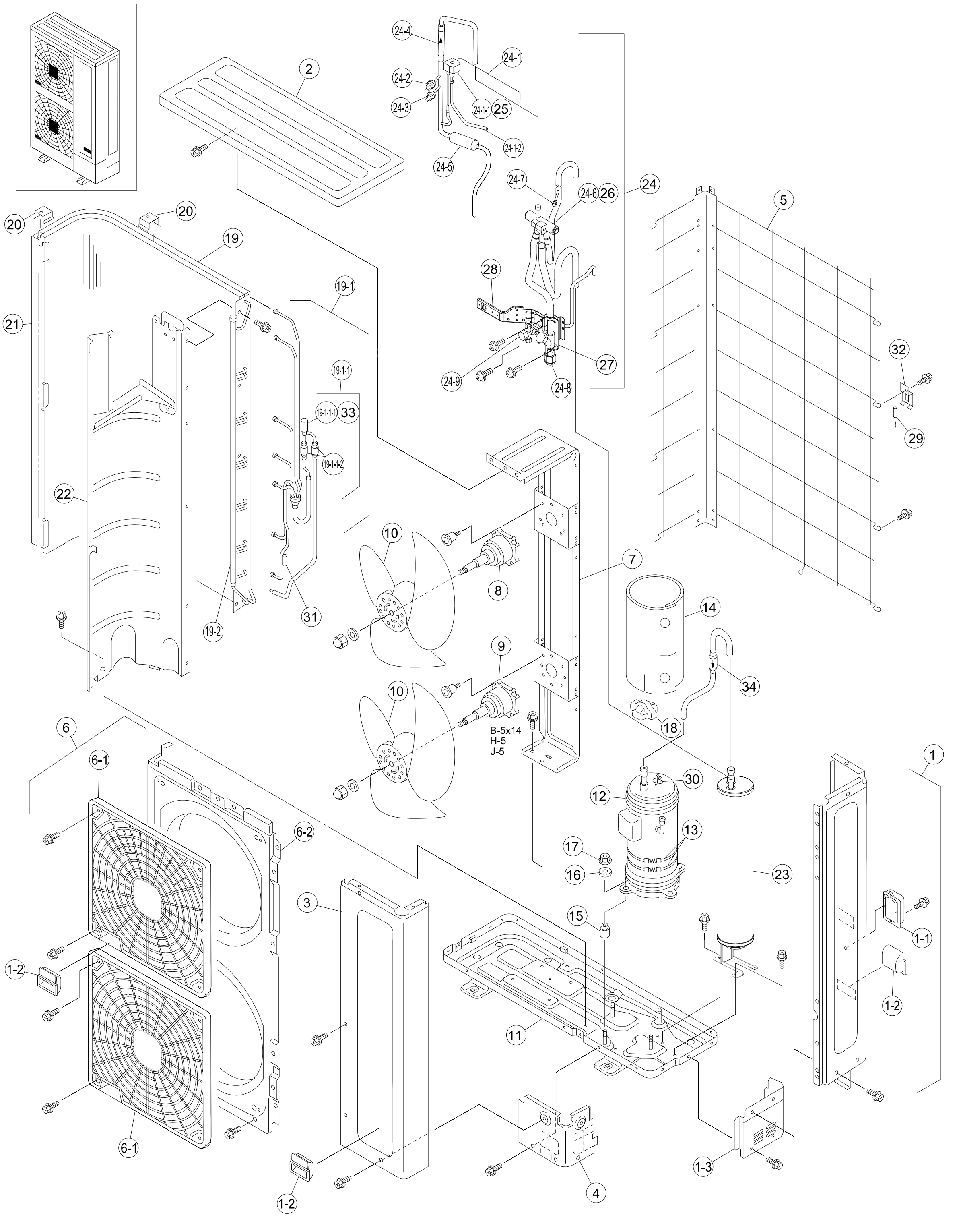
- Electrical parts



No.	Part name	Remarks
1	Electrical Wiring Diagram	Assembly (2+3+harness)
2	P-Plate Assy	Assembly (2-1~2-13)
2-1	P-Plate Unit	
2-2	Terminal Board	TB
2-3	Transformer	TF
2-4	Printed Circuit Board	PO081 Assy
2-5	Noise Filter	NF1
2-6	Reactor Unit	DCL
2-7	Fuse Holder	
2-8	Fuse	50A
2-9	Mag. Contactor	CMC1
2-10	Spacer	For Noise Filter
2-12	Spacer	For PCB1
2-13	Push Spacer	For PCB1
3	Power Unit Assy	Assembly (3-1~3-2)
3-1	Power Stay Assy	
3-2	Inverter Fin Assy	5/6 HP: DIP-IPM (25A) / 4 HP: DIP-IPM(17A)
4	Stay	

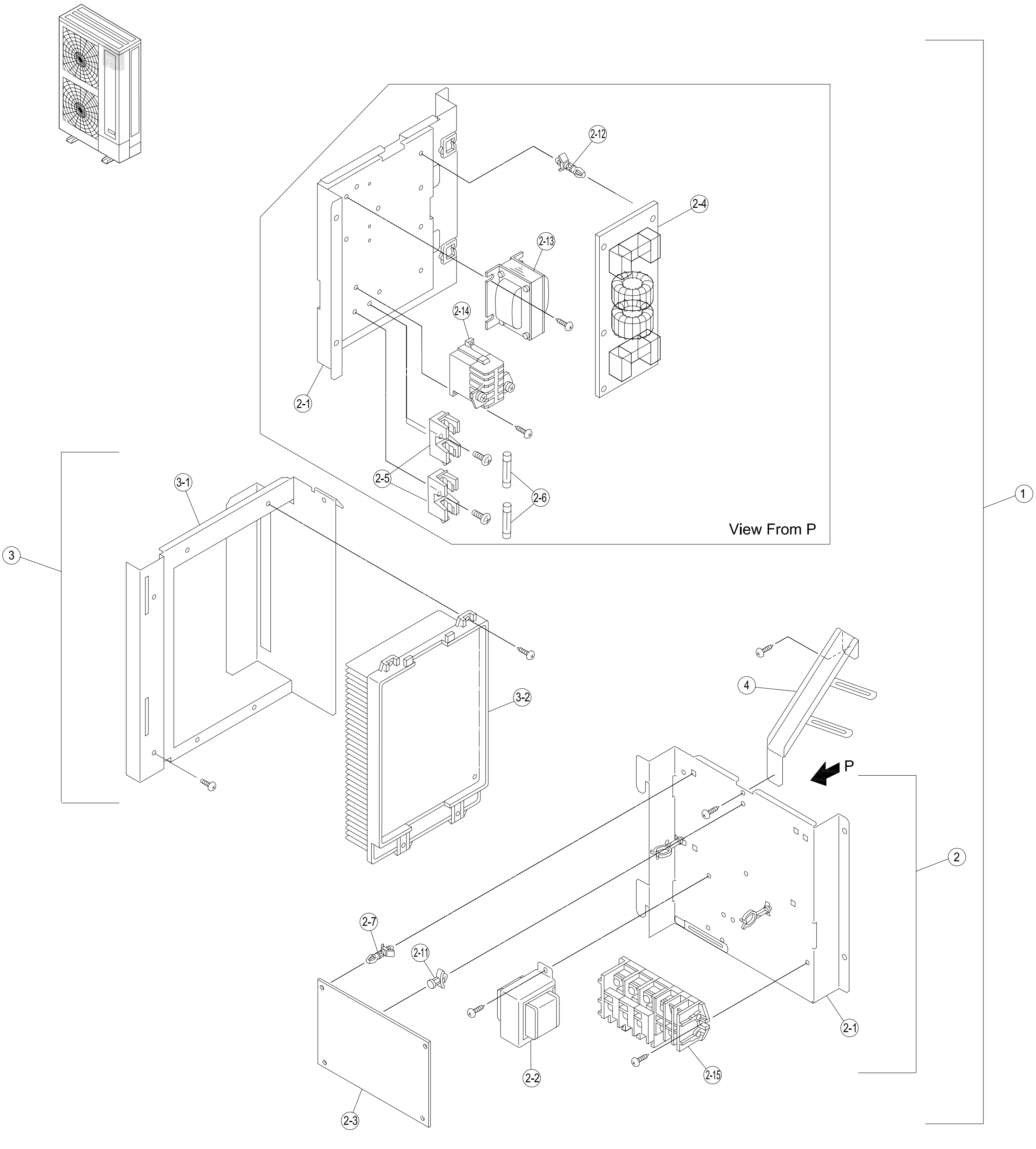
RAS-(4-6)HRNM2E

- Cycle and structural parts



No.	Part name	Remarks
1	Rear Cover L Assy	Assembly
1-1	H-Cover	
1-2	Handle	
1-3	Piping Cover	Rear Piping Cover
2	Upper Cover Assy	Assembly
3	Service Cover L Assy	Assembly
4	S Cover B	Lower Service Cover
5	Protection Net L Assy	
6	Shroud L Unit	
6-1	Air Grille	Air Grille
6-2	Shroud L	
7	Motor Clamp L Assy	
8	Fan Motor	5/6 HP: MOF1: DC100W, 8P / 4 HP: MOF1: DC74W, 8P
9	Fan Motor	5/6 HP MOF2: DC100W, 8P / 4 HP: MOF2: DC74W, 8P
10	Propeller Fan	Ø544
11	B-Base Assy	
12	Compressor	E400HHD-36D2
13	Oil Heater	32W
14	Accoustical Cover	
15	Vibration Absorber 1	
16	Vibration Absorber 2	
17	Special Nut	
18	Rubber Cap	
19	Condenser	Assembly (Heat exchanger+ 19-1 + 19-2)
19-1	Pipe L Assy	Assembly
19-1-1	EVO Assy	Assembly
19-1-1-1	Expansion Valve	EVO
19-1-1-2	Strainer	
19-2	Header G Assy	Assembly
20	Attaching Plate	Not included in 19
21	End Plate Assy	Not included in 19
22	Partition Plate	
23	Accumulator Assy	Assemby
24	4-way valve assy	Assembly
24-1	SVA Assy	Assembly
24-1-1	Solenoid Valve	SVA
24-2	Pressure Switch	PSC (Control)
24-3	Pressure Switch	PSH (High)
24-4	Check Valve	
24-5	Silencer	
24-6	4-way valve	RVR
24-6	4-way valve	RVR
24-7	Check Ja	
24-8	Stop Valve	For Gas Line (5/8)
24-9	Stop Valve	For Liquid Line (3/8)
25	Coil	For SVA
26	Coil	For RVR
27	Valve Stay	
28	V-Stay	
29	Thermistor	TA
30	Thermistor	TD
31	Thermistor	TE
32	TH-PLATE	
33	Coil	For MV
34	Strainer	
35	Attaching Plate	Not included in 19
36	Condenser Support	

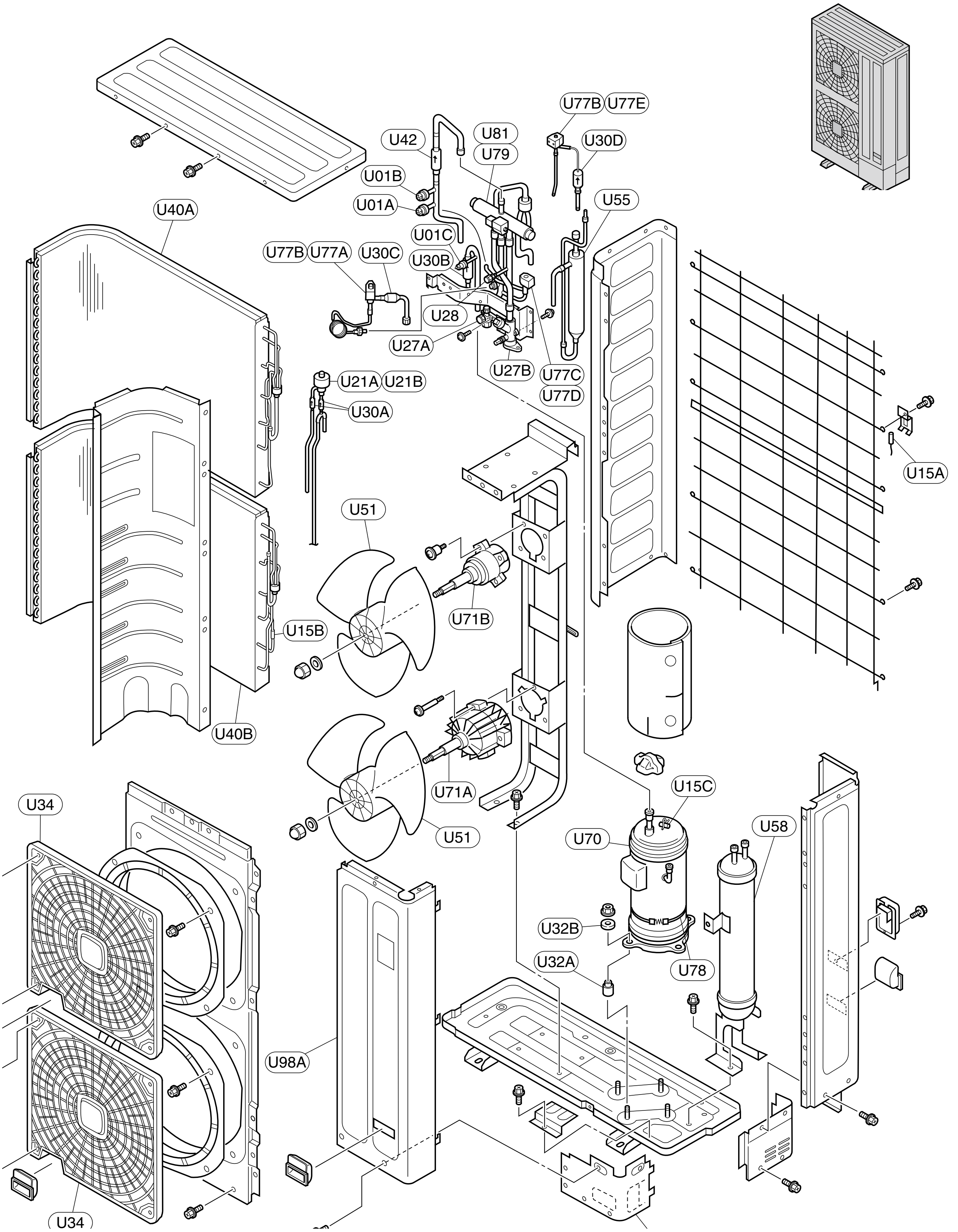
- Electrical parts



No.	Part name	Remarks
1	Electrical Wiring Diagram	Assembly (2+3+harness)
2	P-Plate Assy	Assembly (2-1~2-13)
2-1	P-Plate Unit	
2-2	Terminal Board	TB
2-3	Transformer	TF
2-4	Printed Circuit Board	PO081 Assy
2-5	Noise Filter	NF1
2-6	Reactor Unit	DCL
2-7	Fuse Holder	
2-8	Fuse	2 x 20A
2-9	Mag. Contactor	CMC1
2-10	Spacer	For Noise Filter
2-12	Spacer	For PCB1
2-13	Push Spacer	For PCB1
3	Power Unit Assy	Assembly (3-1~3-2)
3-1	Power Stay Assy	
3-2	Inverter Fin Assy	5/6 HP: DIP-IPM (25A) / 4 HP: DIP.1IPM (17A)
4	Stay	

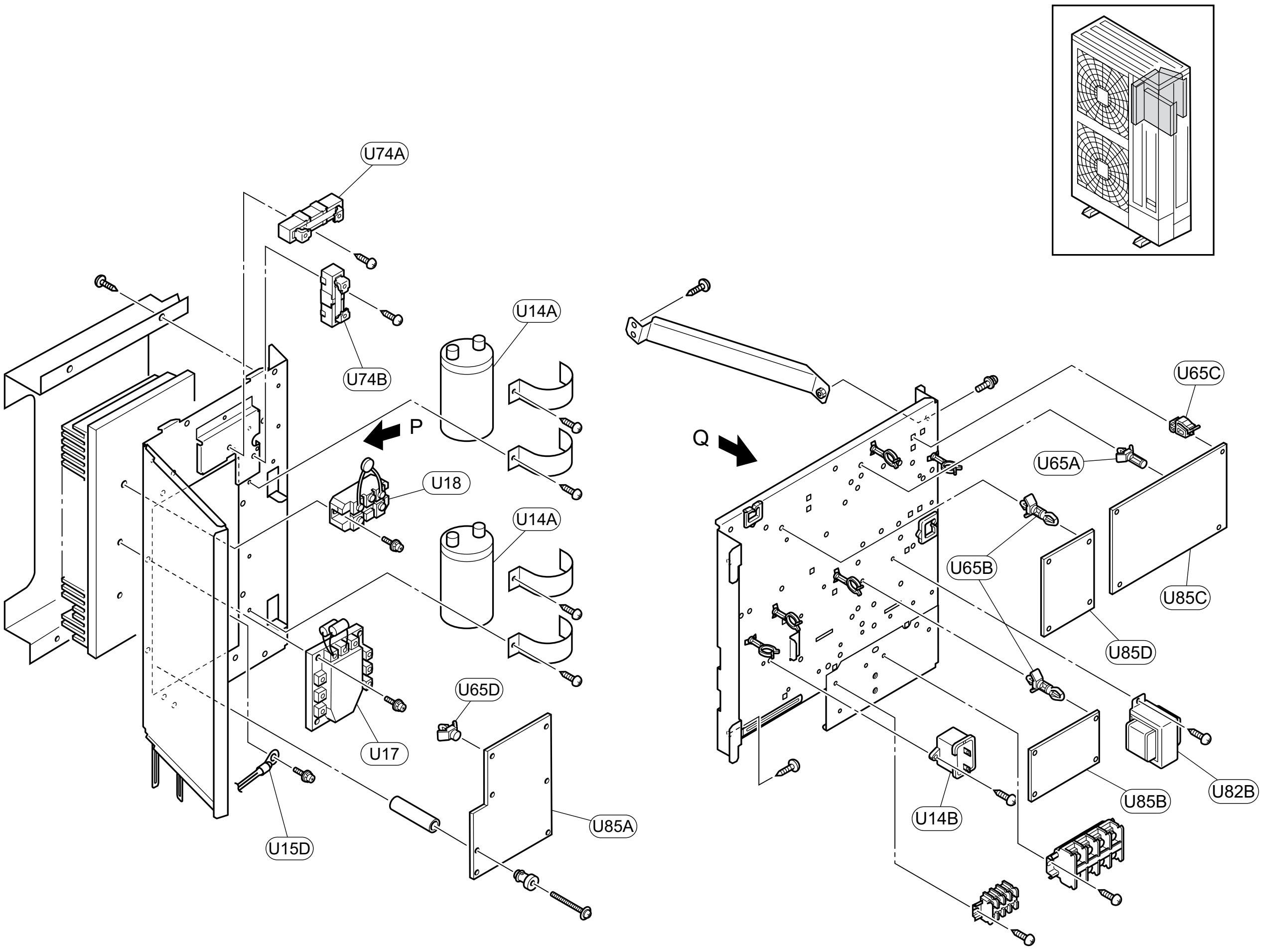
RAS-(8-12)HRNM

- Cycle and structural parts

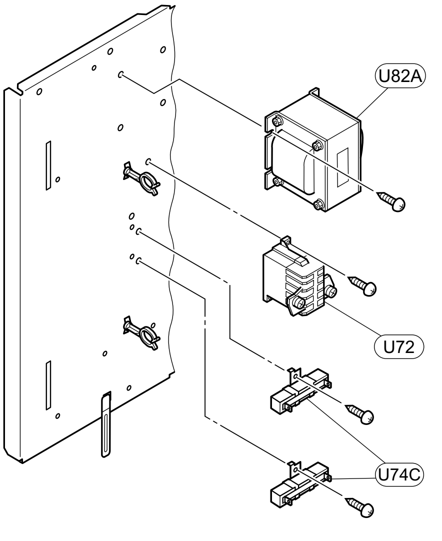


No.	Part name	Remarks
U01A	Pressure SW	High pressure
U01B	Pressure SW	For control
U01C	Pressure SW	Low pressure
U04	Fuse	40 A - 60 A
U14A	Capacitor	4700 µF
U14B	Capacitor	7 µF
U15A	Thermistor	—
U15B	Thermistor	—
U15C	Thermistor	—
U15D	Thermistor	—
U16A	Noise filter	—
U16B	Noise filter	—
U17	Transistor module	—
U18	Diode module	—
U21A	Exp. valve coil for	—
U21B	Exp. valve,	—
U27A	Stop valve	—
U27B	Stop valve	—
U28	Check joint	—
U30A	Strainer	—
U30B	Strainer	—
U30C	Strainer	—
U30D	Strainer	—
U32A	Vibration absorber	—
U32B	Vibration absorber	—
U34	Air grille	Air outlet
U40A	Condenser assembly	—
U40B	Condenser assembly	—
U42	Check valve	—
U51	Propeller fan	—
U55	Oil separator assy	—

- Electrical parts



View from P



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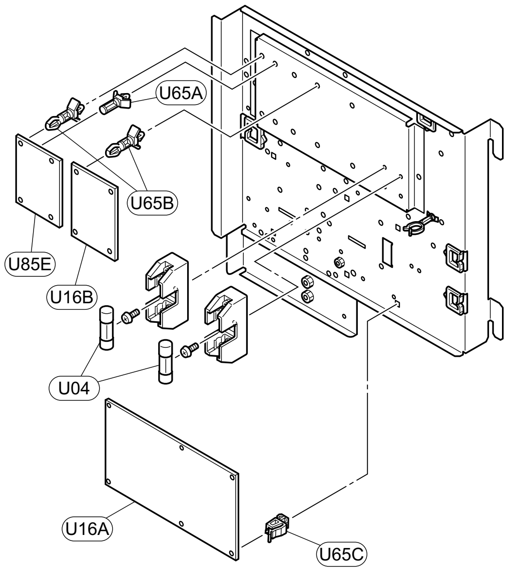
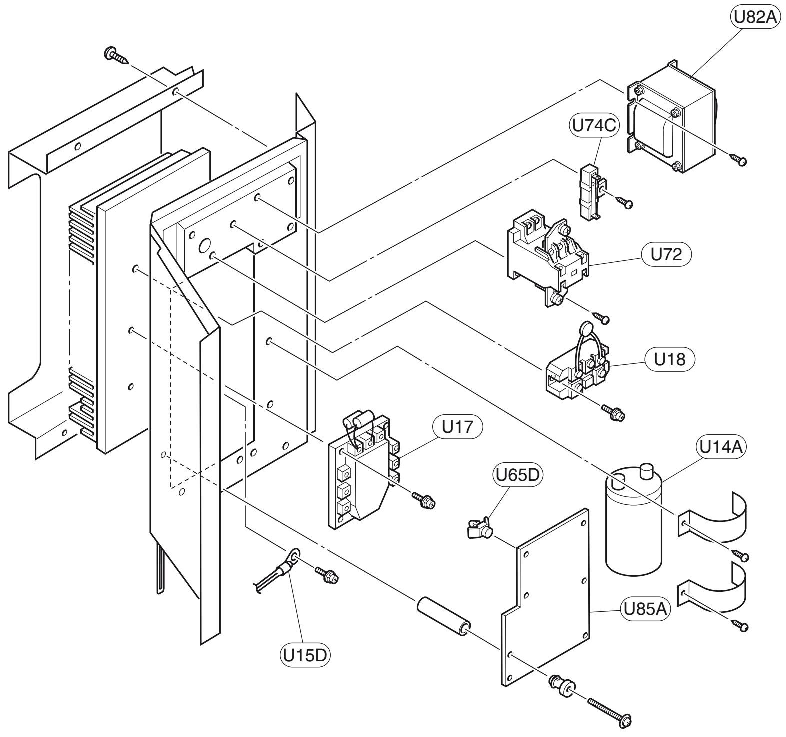
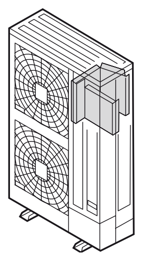
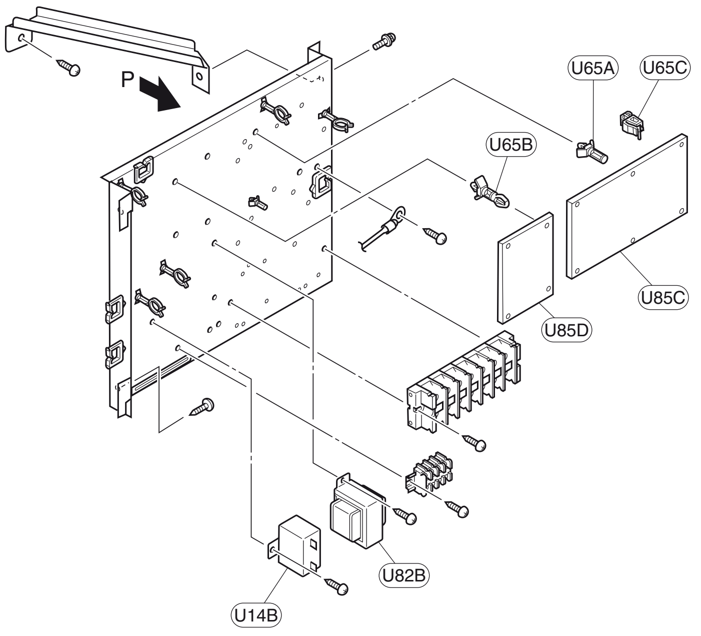


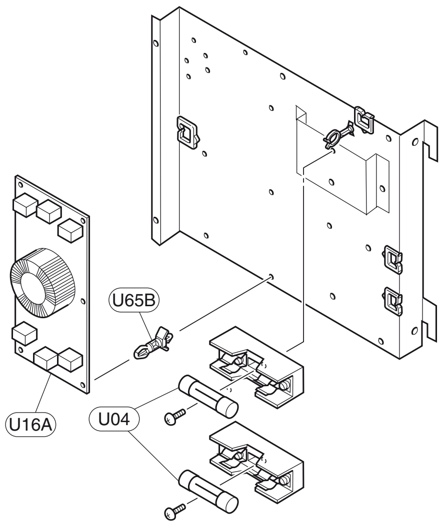
- Electrical parts (cont)







View from P



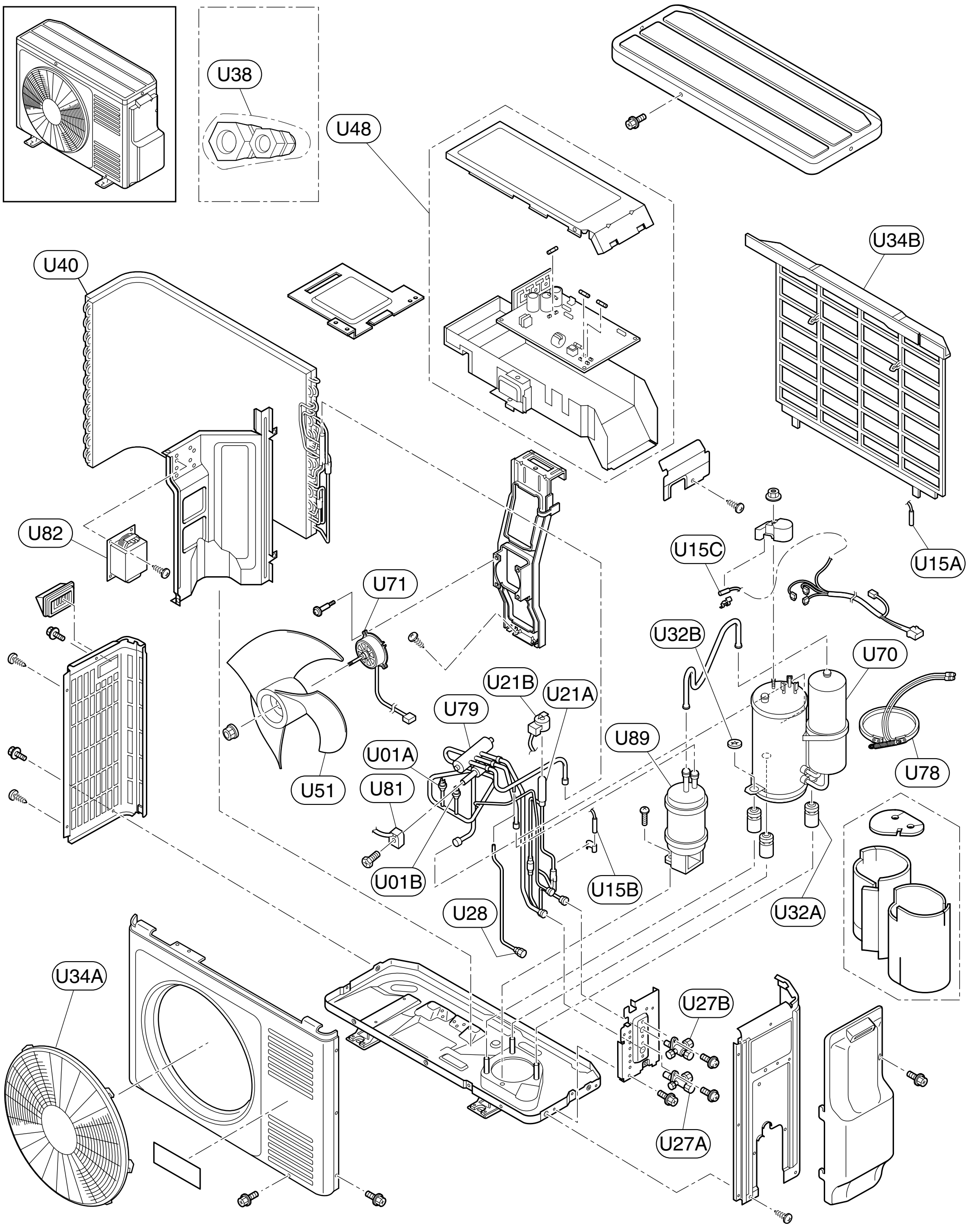
Drawing number: SPN200617
(RAS-8~12HRNM)

No.	Part name	Remarks
U58	L-tank assy	—
U65A	Plastic material	—
U65B	Plastic material	—
U65C	Plastic material	—
U65D	Plastic material	—
U70	Compressor	—
U71A	Motor	—
U71B	Motor	—
U72	Mag. contactor	—
U74A	Resistor	—
U74B	Resistor	—
U74C	Resistor	—
U77A	Solenoid valve	—
U77B	Solenoid valve	—
U77C	Solenoid valve	—
U77D	Solenoid valve	—
U77E	Solenoid valve	—
U78	Oil heater	—
U79	Four-way valve assy	—
U81	Coil for 4-way valve	—
U82A	Reactor	—
U82B	Transformer	—
U85A	Printed circuit board	For inverter P
U85B	Printed circuit board	Fan control
U85C	Printed circuit board	For control
U85D	Printed circuit board	Fan control
U85E	Printed circuit board	Phase detection
U98A	Cabinet panel	—
U98B	Cabinet panel	—

9.2 Spare parts for ES Series

RAS-(2/2.5)HVRN2

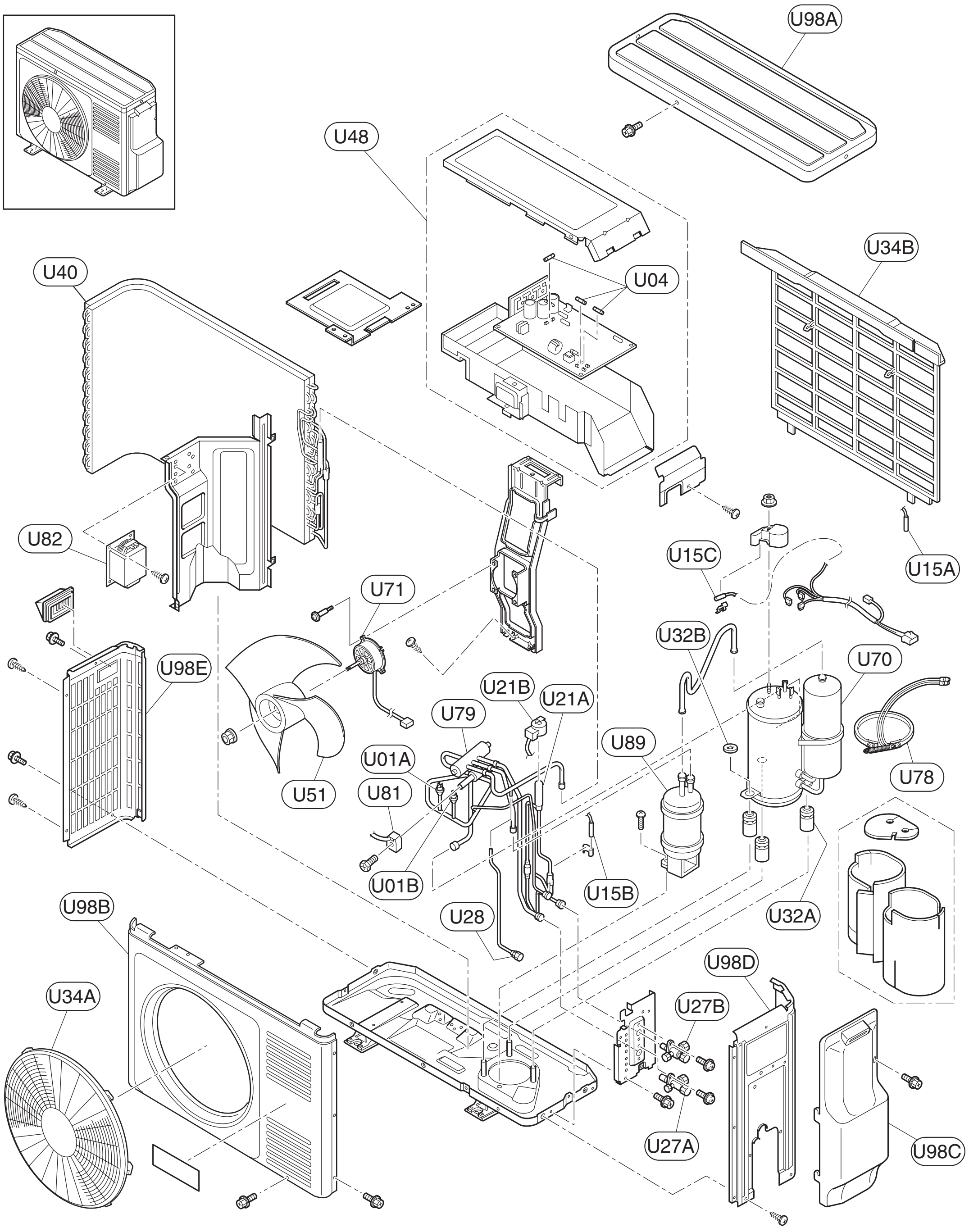
- Cycle, structural and electrical parts



No.	Part name	Remarks
U01A	Pressure SW	High pressure
U01B	Pressure SW	For control
U15A	Thermistor	TA (Ambient)
U15B	Thermistor	TE (Evaporation)
U15C	Thermistor	TD (Discharge)
U21A	Expansion valve	—
U21B	Coil for expansion valve	—
U27A	Stop valve	Gas line
U27B	Stop valve	Liquid line
U28	Check joint	—
U32A	Vibration absorber	—
U32B	Vibration absorber	—
U34A	Air grille	Outlet
U34B	Air grille	Inlet
U38	Piping set	—
U40	Condenser assembly	—
U48	Electrical box assembly	—
U51	Propeller fan	—
U70	Compressor	—
U71	Motor	—
U78	Oil heater	—
U79	Four-way valve assembly	—
U81	Coil for 4-way valve	—
U82	Transformer	—
U89	Accumulator	—

RAS-3HVRNS2

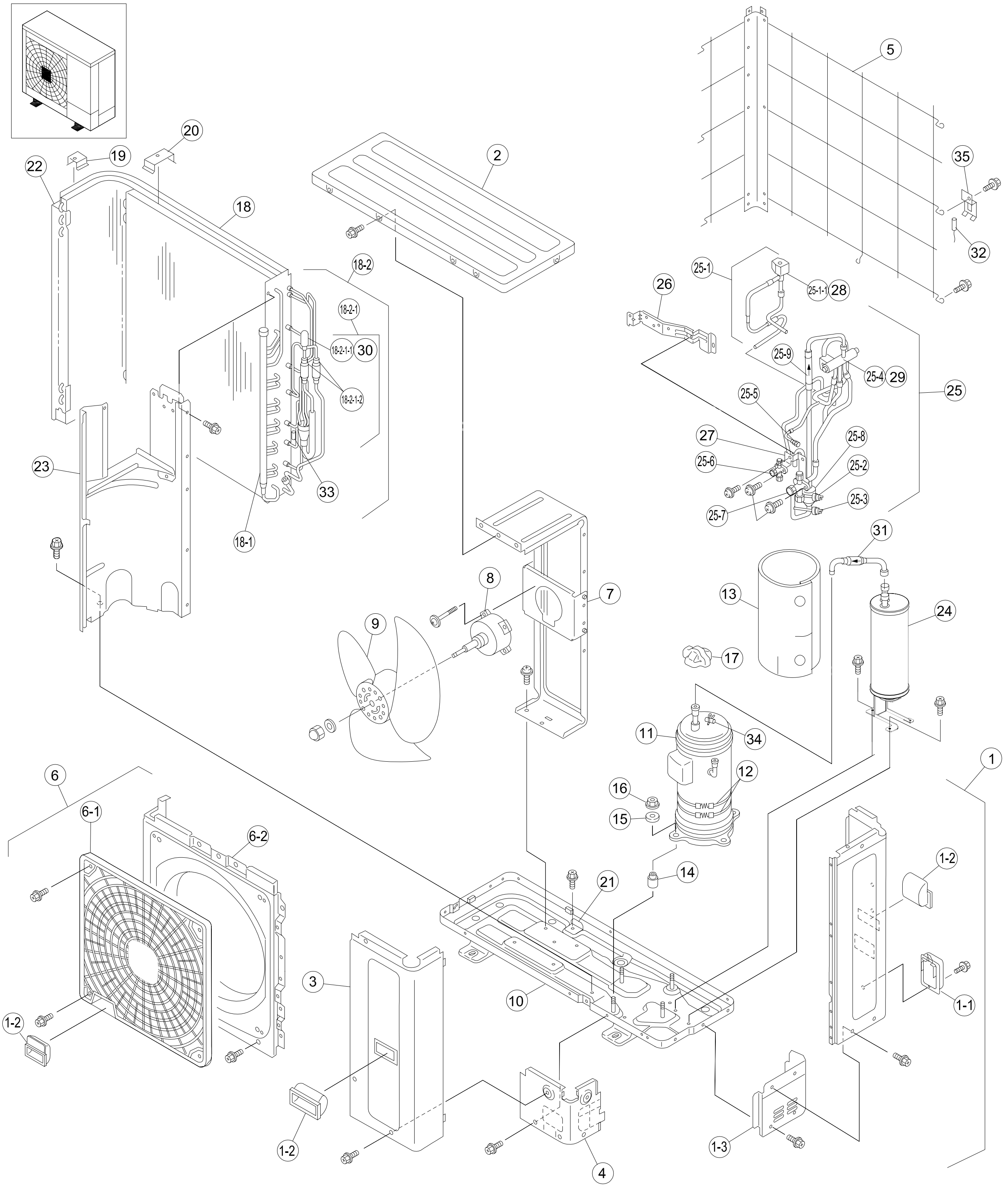
- Cycle, structural and electrical parts



No.	Part name	Remarks
U01A	Pressure SW	High pressure
U01B	Pressure SW	Control
U04	Fuse	3 A
U15A	Thermistor	TA (Ambient)
U15B	Thermistor	TE (Evaporation)
U15C	Thermistor	TD (Discharge)
U21A	Expansion valve	—
U21B	Coil for expansion valve	—
U27A	Stop valve	Gas
U27B	Stop valve	Liquid
U28	Check joint	—
U32A	Vibration absorber	—
U32B	Vibration absorber	—
U34A	Air grille	Outlet
U34B	Air grille	Inlet
U38	Piping set	—
U40	Condenser assembly	—
U48	Electrical box assembly	—
U51	Propeller fan	—
U70	Compressor	—
U71	Motor	—
U78	Oil heater	—
U79	Four-way valve assembly	—
U81	Coil for 4-way valve	—
U82	Transformer	—
U89	Accumulator	—
U98A	Cabinet panel	—
U98B	Cabinet panel	—
U98C	Cabinet panel	—
U98D	Cabinet panel	—

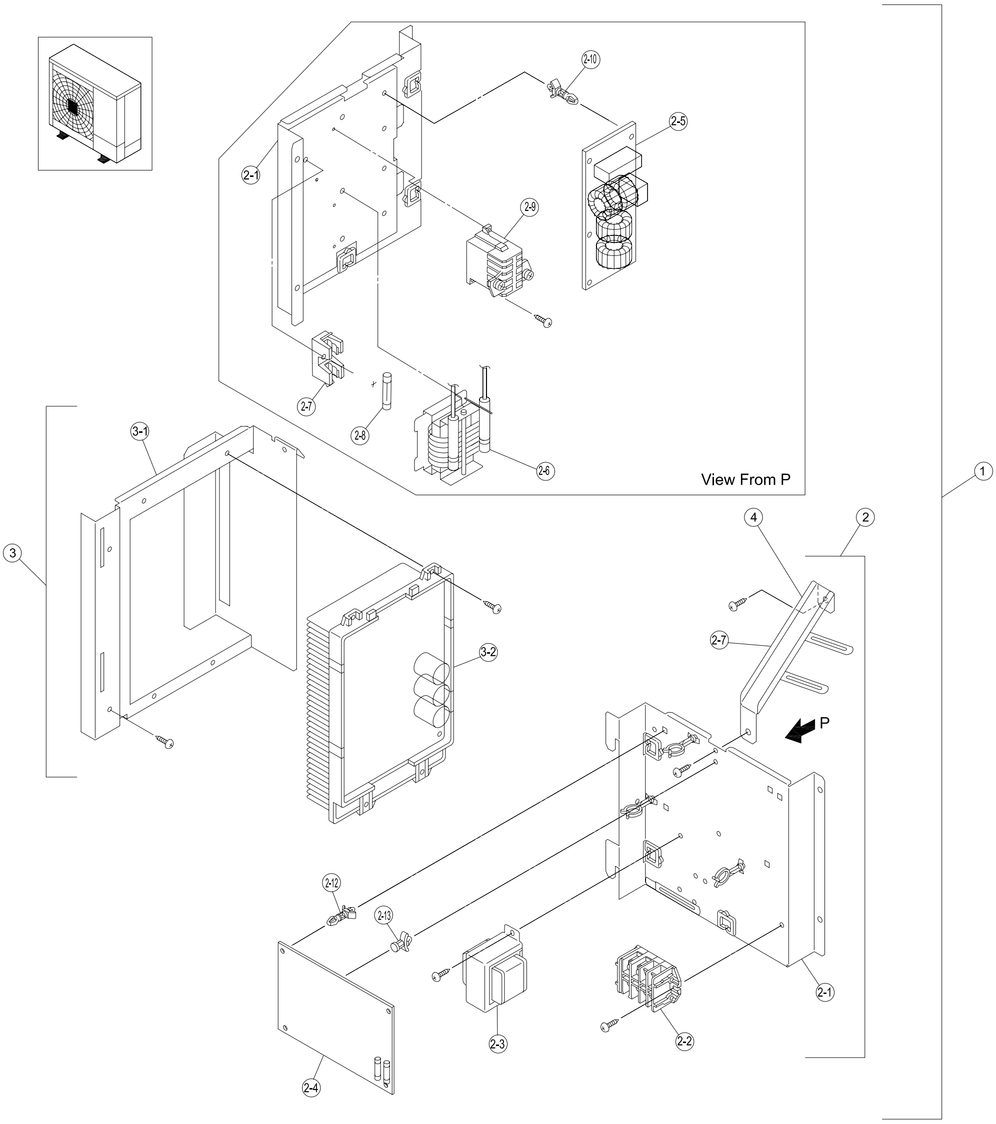
RAS-(4-6)HVRNS2E

- Cycle, structural



No.	Part name	Remarks
1	Rear Cover S Assy	Assembly
1-1	H-Cover	
1-2	Handle	
1-3	Piping Cover	Rear Piping Cover
2	Upper Cover Assy	Assembly
3	Service Cover Assy	Assembly
4	S Cover B	Lower Service Cover
5	Protection Net	
6	Shroud S Assy	
6-1	Shroud S	
6-2	Air Grille	Air Grille
7	Clamp Assy	
8	Fan Motor	DC 138W 8P
9	Propeller Fan	Ø544
10	B- Base Assy	
11	Compressor	E400HHD-36A2
12	Oil Heater	32W
13	Accoustical Cover	
14	Vibration Absorber	
15	Vibration Absorber	
16	Nut	
17	Rubber Cap	
18	Condenser	Assembly (Heat exchanger+18-1+18-2)
18-1	Header L Assy	Assembly
18-2	Header G Assy	Assembly
18-2	Header G Assy	Assembly
18-2-1	EVO Assy	Assembly
18-2-1-1	Expansion Valve	EVO
18-2-1-2	Strainer	
19	Attaching Plate	Not included in 18
20	Stay	Not included in 18
21	Condenser Support	
22	End Plate Assy	
23	Partition S Plate	
24	Accumulator	Assembly
25	4-Way Valve Assy	Assembly
25-1	SVA Assy	Assembly
25-1-1	Solenoid Valve	SVA
25-2	Pressure Switch	PSH (High)
25-3	Pressure Switch	PSC (Control)
25-4	Reversing Valve	RVR
25-5	Check JA	
25-6	Stop Valve	For Liquid Line (3/8)
25-7	Stop Valve	For Gas Line (5/8)
25-8	Silencer	
25-9	Check Valve	
26	Valve Stay	
27	Valve Stay	
28	Coil	For SVA
29	Coil	For RVR
30	Coil	For MV
31	Strainer	
32	Thermistor	TA
33	Thermistor	TE
34	Thermistor	TD
35	TH Plate	

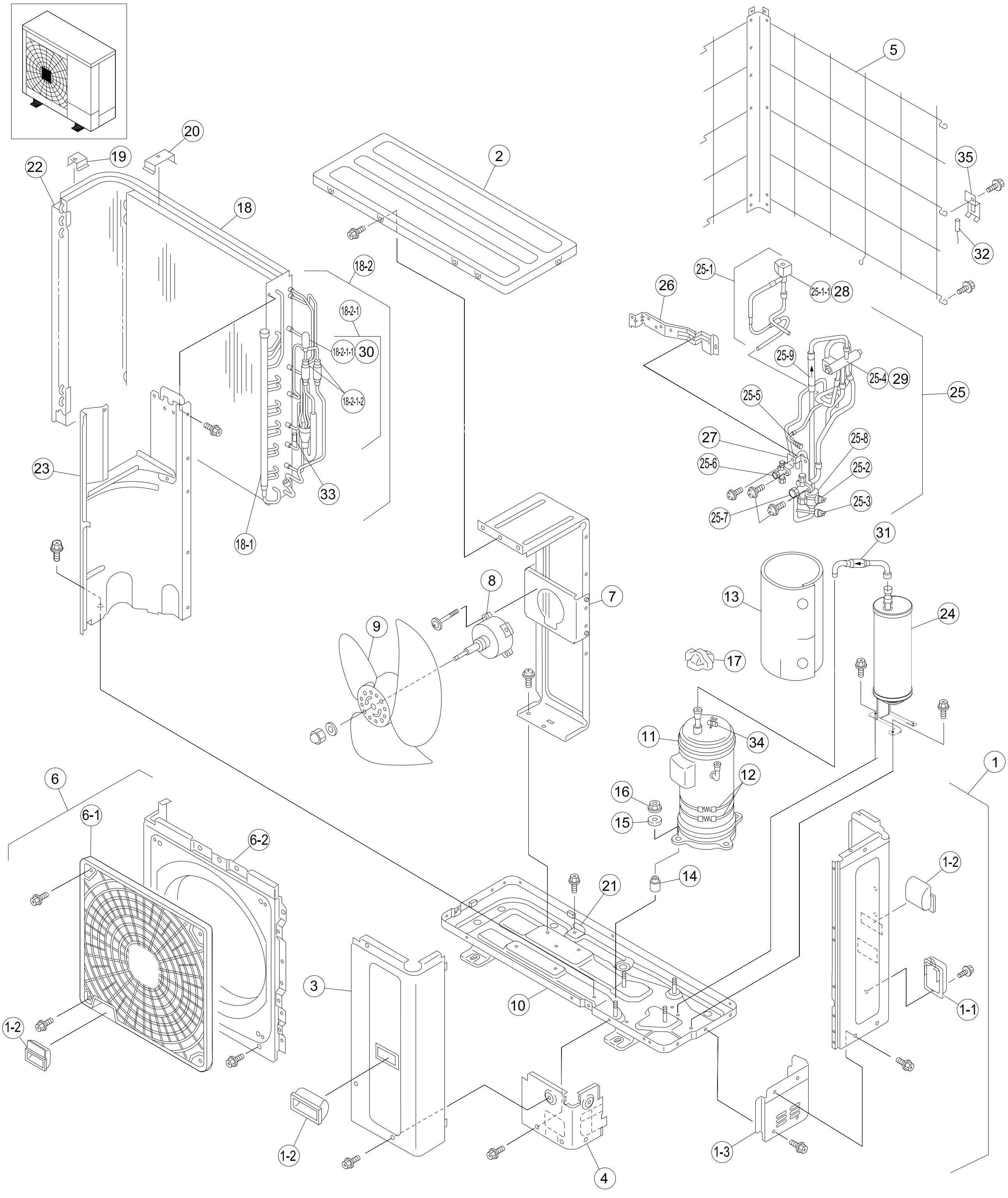
- Electrical parts



No.	Part name	Remarks
1	Electrical Wiring Diagram	Assembly (2+3+harness)
2	P-Plate Assy	Assembly (2-1~2-13)
2-1	P-Plate Unit	
2-2	Terminal Board	TB
2-3	Transformer	TF
2-4	Printed Circuit Board	PO081 Assy
2-5	Noise Filter	NF1
2-6	Reactor Unit	DCL
2-7	Fuse Holder	
2-8	Fuse	50A
2-9	Mag. Contactor	CMC1
2-10	Spacer	For Noise Filter
2-12	Spacer	For PCB1
2-13	Push Spacer	For PCB1
3	Power Unit Assy	Assembly (3-1~3-2)
3-1	Power Stay Assy	
3-2	Inverter Fin Assy	5/6 HP: DIP-IPM (25A) / 4 HP: DIP-IPM (17A)
4	Stay	

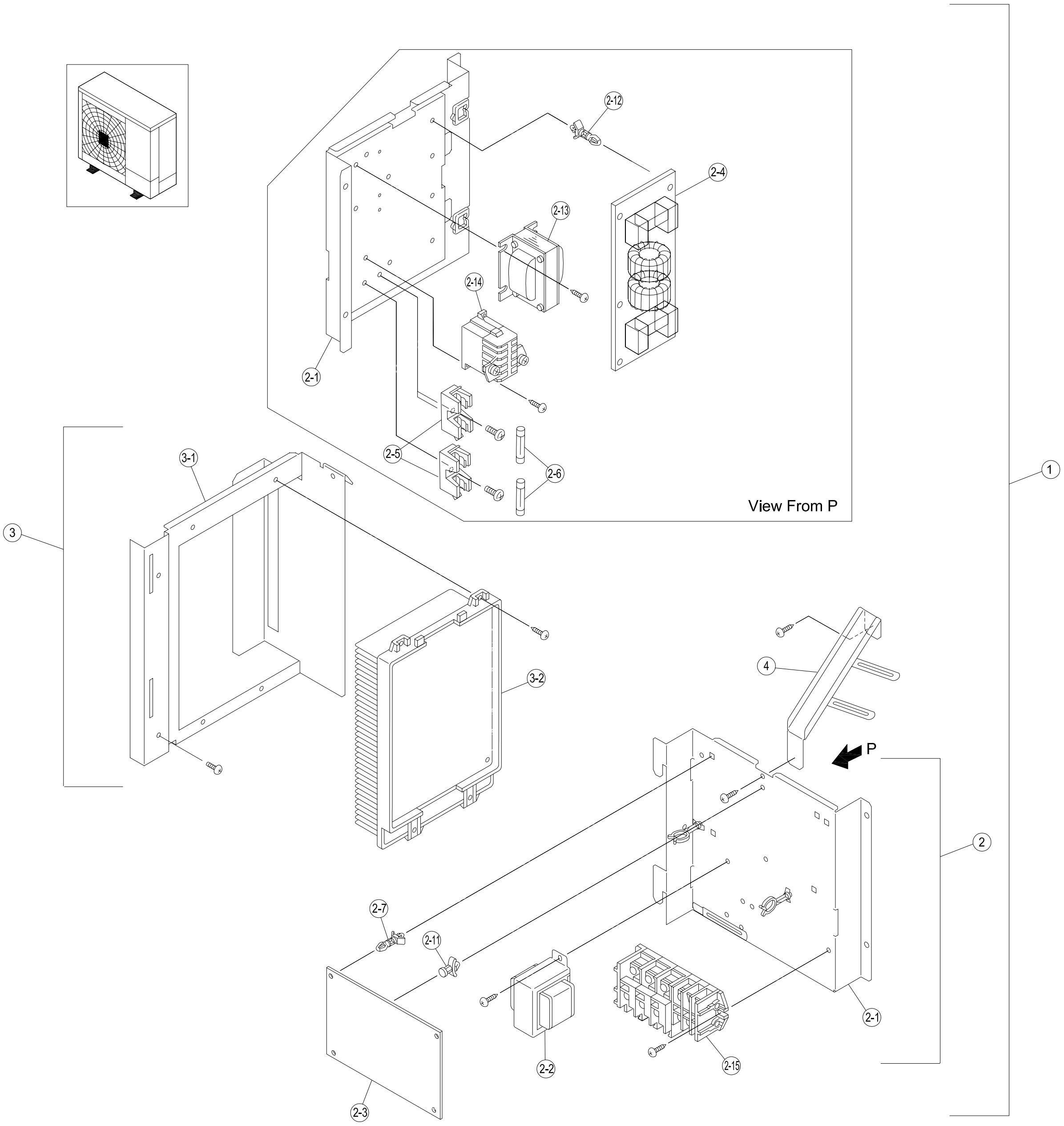
RAS-(4-6)HRNS2E

- Cycle, structural



No.	Part name	Remarks
1	Rear Cover S Assy	Assembly
1-1	H-Cover	
1-2	Handle	
1-3	Piping Cover	Rear Piping Cover
2	Upper Cover Assy	Assembly
3	Service Cover Assy	Assembly
4	S Cover B	Lower Service Cover
5	Protection Net	
6	Shroud S Assy	
6-1	Shroud S	
6-2	Air Grille	Air Grille
7	Clamp Assy	
8	Fan Motor	DC 138W 8P
9	Propeller Fan	Ø544
10	B- Base Assy	
11	Compressor	E400HHD-36D2
12	Oil Heater	32W
13	Accoustical Cover	
14	Vibration Absorber	
15	Vibration Absorber	
16	Nut	
17	Rubber Cap	
18	Condenser	Assembly (Heat exchanger+18-1+18-2)
18-1	Header L Assy	Assembly
18-2	Header G Assy	Assembly
18-2-1	EVO Assy	Assembly
18-2-1-1	Expansion Valve	EVO
18-2-1-2	Strainer	
19	Attaching Plate	Not included in 18
20	Stay	Not included in 18
21	Condenser Support	
22	End Plate Assy	
23	Partition S Plate	
24	Accumulator	Assembly
25	4-Way Valve Assy	Assembly
25-1	SVA Assy	Assembly
25-1-1	Solenoid Valve	SVA
25-2	Pressure Switch	PSH (High)
25-3	Pressure Switch	PSC (Control)
25-4	Reversing Valve	RVR
25-5	Check JA	
25-6	Stop Valve	For Liquid Line (3/8)
25-7	Stop Valve	For Gas Line (5/8)
25-8	Silencer	
25-9	Check Valve	
26	Valve Stay	
27	Valve Stay	
28	Coil	For SVA
29	Coil	For RVR
30	Coil	For MV
31	Strainer	
32	Thermistor	TA
33	Thermistor	TE
34	Thermistor	TD
35	TH Plate	

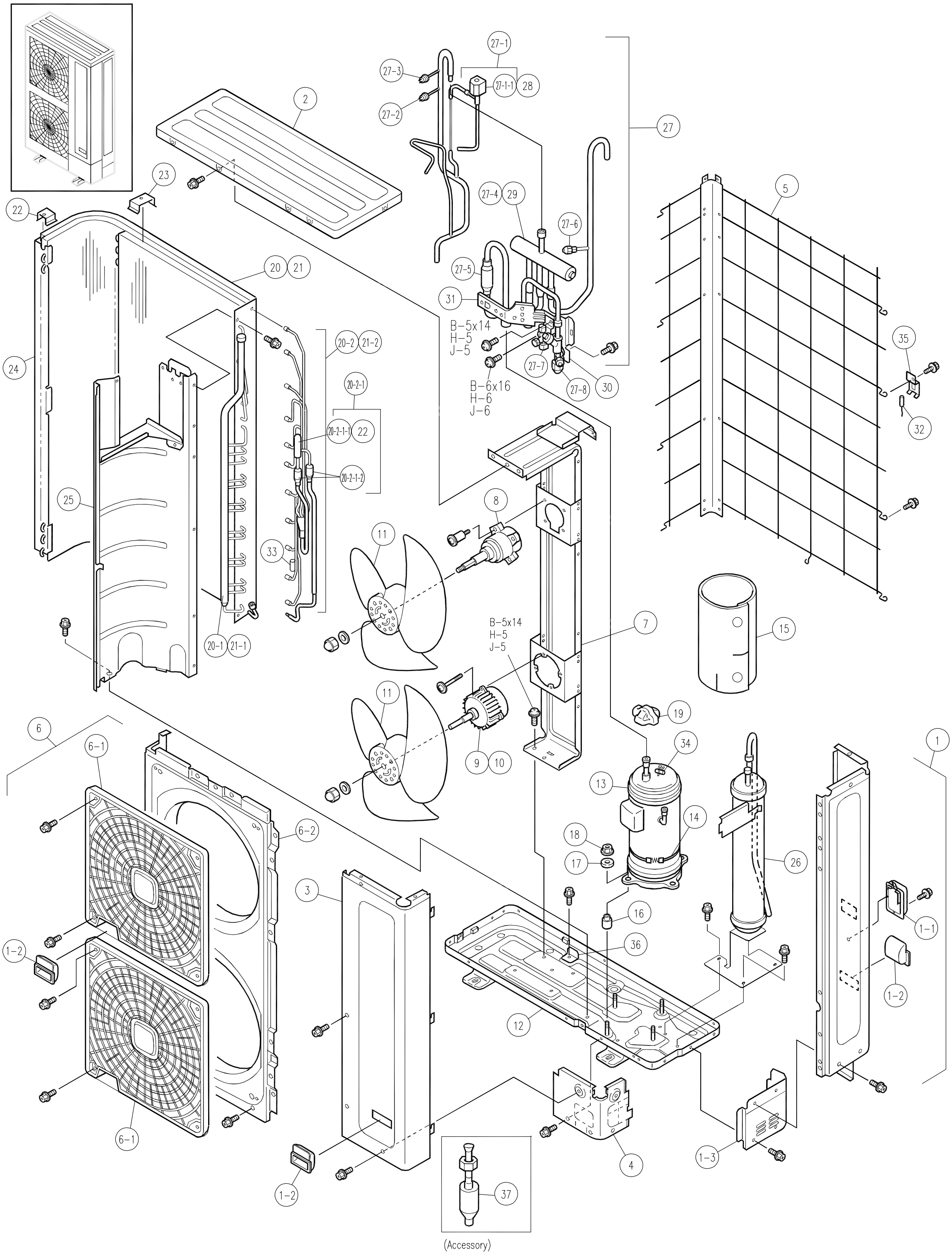
Electrical parts



No.	Part name	Remarks
1	Electrical Wiring Diagram	Assembly (2+3+harness)
2	P-Plate Assy	Assembly (2-1~2-13)
2-1	P-Plate Unit	
2-2	Terminal Board	TB
2-3	Transformer	TF
2-4	Printed Circuit Board	PO081 Assy
2-5	Noise Filter	NF1
2-6	Reactor Unit	DCL
2-7	Fuse Holder	
2-8	Fuse	2 x 20A
2-9	Mag. Contactor	CMC1
2-10	Spacer	For Noise Filter
2-12	Spacer	For PCB1
2-13	Push Spacer	For PCB1
3	Power Unit Assy	Assembly (3-1~3-2)
3-1	Power Stay Assy	
3-2	Inverter Fin Assy	5/6 HP: DIP-IPM (25A) / 4 HP DIP-IPM (17A)
4	Stay	

RAS-(8/10)HRNSE

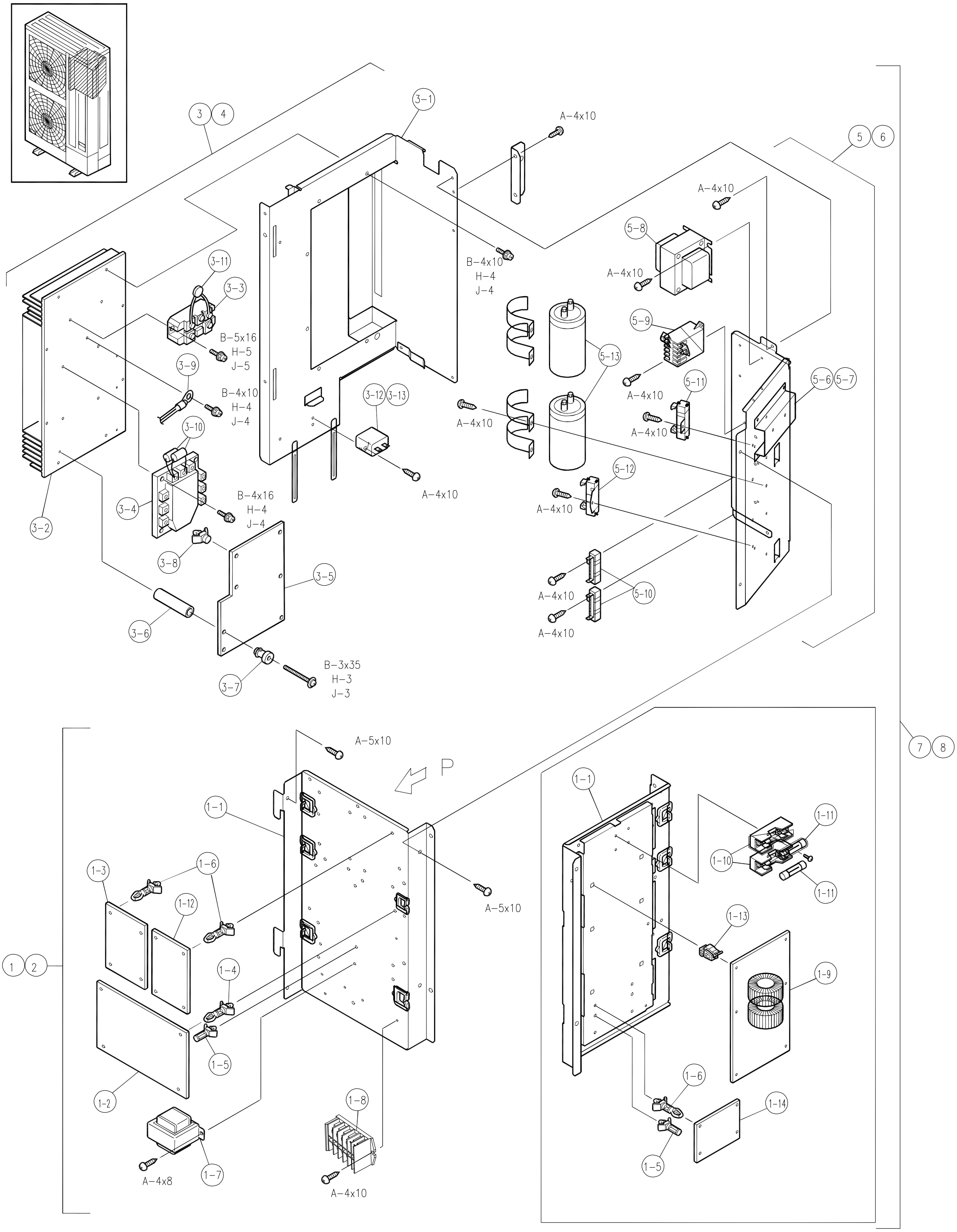
- Cycle and structural



No.	Part name	Remarks
1	Rear Cover Assy	Assembly
1-1	H-Cover	—
1-2	Handle	—
1-3	Piping Cover B	Rear Piping Cover
2	Upper Cover Assy	Assembly
3	Service Cover Assy	Assembly
4	S Cover B	Lower Service Cover
5	Protection Net	—
6	Shroud Assy	—
6-1	Air Grille	Air Outlet
6-2	Shroud	—
7	Clamp Assy	—
8	Fan Motor	DC Fan Motor, MOF 1/DC 138W,8P
9	Fan Motor (For RAS-8HRNSE)	AC Fan Motor,MOF 2/AC 120W,8P
10	Fan Motor (For RAS-10HRNSE)	AC Fan Motor, MOF2/AC 170W,8P
11	Propeller Fan	Ø544
12	Bottom Base Assy	—
13	Compressor	E655DHD-65D2
14	Oil Heater	Ø40W
15	Acoustical Cover	—
16	Vibration Absorber	—
17	Vibration Absorber	—
18	Special Nut	—
19	Rubber Cap	—
20	Condenser (For RAS-8HRNSE)	Assembly (Heat exchanger+20- 1+20-2)
20-1	Header G Assy	Assembly
20-2	Header L Assy	Assembly
20-2-1	EVO Assy	Assembly
20-2-1-1	Expansion Valve	EVO
20-2-1-2	Strainer	—
21	Condenser (For RAS-10HRNSE)	Assembly (Heat exchanger+21-1+21-2)
21-1	Header G Assy	Assembly
21-2	Header L Assy	Assembly
22	Coil	for EVO
22	Attaching Plate	Not included in 20/21
23	Attaching Plate	Not included in 21
24	End Plate Assy	Not included in 20/21
25	Partition Plate Assy	Assembly
26	LTank	—
27	Reversing Valve Assy	Assembly
27-1	SVA Assy	—
27-1-1	Solenoid Valve	SVA
27-2	Pressure Switch	PSH (High)
27-3	Pressure Switch	PSC (Control)
27-4	Reversing Valve	RVR
27-5	Strainer	—
27-6	Check Joint	—
27-7	Stop Valve 3/8	for Liquid Line
27-8	Stop Valve 3/4	for Gas Line
28	Coil	for SVA. Not included in 27-1
29	Coil	for RVR. Not included in 27

No.	Part name	Remarks
30	Valve Stay	—
31	Valve Stay	Not included in 27
32	Thermistor	TA (Air)
33	Thermistor	TE (Piping)
34	Thermistor	TD (Compressor)
35	Thermo Attaching Plate	—
36	Condenser Support	—
37	Accessory Pipe	—

- Electrical parts



No.	Part name	Remarks
2	Attaching P-Plate Assy	Assembly (1-1~1-14)
1-1	Attaching P-Plate	—
1-2	Printed Circuit Board	PCB Main (PO 052)
1-3	Printed Circuit Board	PCB for AC Fan Motor (PO 083)
1-4	Plastic Material	Spacer
1-5	Plastic Material	Spacer
1-6	Plastic Material	Spacer
1-7	Transformer	TF
1-8	Terminal Board	TB
1-9	Noise Filter	NF1
1-10	Fuse Holder	—
1-11	Fuse	40 A
1-12	Printed Circuit Board	PCB for DC Fan Motor (PO084)
1-13	Plastic Material	Holder for NF1
1-14	Reverse Phase Relay	
3	Power Plate Assy	Assembly (3-1~3-11+3-12)
4	Power Plate Assy	Assembly (3-1~3-11+3-13)
3-1	Power Plate	—
3-2	Radiation Fin	—
3-3	Diode Module	DM
3-4	Transistor Module	IPM
3-5	Printed Circuit Board	PCB for Inverter (PV041)
3-6	Plastic Material	Collar
3-7	Plastic Material	Bush
3-8	Plastic Material	Spacer
3-9	Thermistor	Fin Thermistor
3-10	Capacitor Assy	Harness PC301
3-11	Noise Suppressor	ZNR Assy
3-12	Capacitor (For RAS-8HRNSE)	440V AC, 6 μF
3-13	Capacitor (For RAS-10HRNSE)	440V AC, 7.5 μF
5	CB Plate Assy	Assembly (5-8~5-13+5-6)
6	CB Plate Assy	Assembly (5-8~5-13+5-7)
5-6	CB Plate Assy (For RAS-8HRNSE)	—
5-7	CB Plate (For RAS-10HRNSE)	—
5-8	Reactor	DCL
5-9	Mag Contactor	CMC1
5-10	Resistor	RS1, RS2
5-11	Resistor	R1
5-12	Resistor	R2
5-13	Capacitor	CB1,CB2 (400V AC,4700 μF)
7	Electrical Wiring Diagram (For RAS-8HRNSE)	Assembly (1+3+5+Harness)
8	Electrical Wiring Diagram (For RAS-10HRNSE)`	Assembly (2+4+6+Harness)

10. Servicing

Index

10.1 Introduction

DANGER

- ***Before performing any of the service operations described in this chapter turn all the main switches off and the place security lockers or convenient warning indicators in order to prevent them from turning on accidentally.***
- ***In case of blocked or stucked parts use appropiated tools and eventually lubricants to release them.***
- ***In case of sharped edged parts as covers use security gloves to avoid getting injured.***
- ***When performing brazing work besides security gloves it is must to wear convenient eye protection.***
- ***Check and be sure that the LED201 (Red) on the inverter PCB is OFF for all electrical maintenance.***
- ***Do NOT touch the electrical components when the LED201 (Red) on the inverter PCB is ON to avoid electrical shock.***

NOTE

- ***All compressors are connected by brazing. Check to ensure whether there are flammable things around or not when using a burner for pipe connections if not oil existing pipe inside may ignite.***
- ***Do not expose the refrigerant cycle to the atmosphere for a long period in order to avoid mixing the water and foreign particles into the refrigerant cycle. After removing compressor replace it quickly. If exposed for a long period seal the suction pipe and discharge pipe.***
- ***Remove the cap for the compressor just before replacing the compressor. Before mounting the compressor seal the suction pipe and discharge pipe with a tape to protect the compressor from foreign particles. Remove the tape at pipe connection.***

10.2 Servicing for IVX series

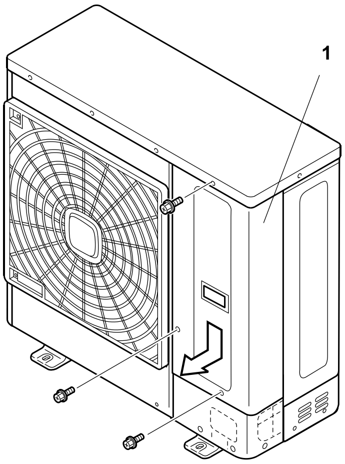
10.2.1 Outdoor unit RAS-3HVRNM2E

◆ Removing service cover

NOTE

- ***Remove the main parts according to the following procedures.***
  - ***To reassemble perform the procedures in reverse.***
  - ***To prevent contamination of the refrigerant with water or foreign particles do not expose open to atmosphere for long periods.***
  - ***If necessary seal pipe ends using caps or tape.***

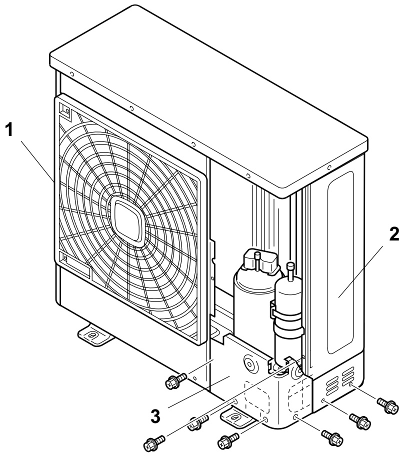
1 Remove the three (3) fixing screws.
2 Slide the service cover downward and remove it.
3 Pay attention of not falling off the service cover.



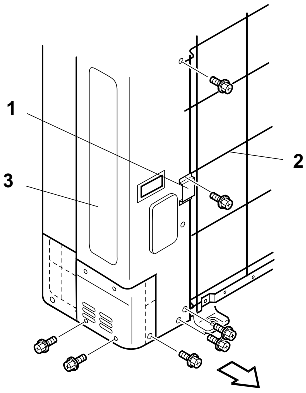
1. Service cover.

◆ Removing bottom service cover and rear cover

1 Remove five (5) screws which fix the bottom service cover. Pull and remove the bottom service cover.
2 Remove the upper cover following *Removing service cover, see on page 361*.
3 Remove seven (7) screws which fix the rear cover (eight (8) screws for two-fan models; the inlet grill is fixed with four (4)). Pull backward and remove the rear cover.



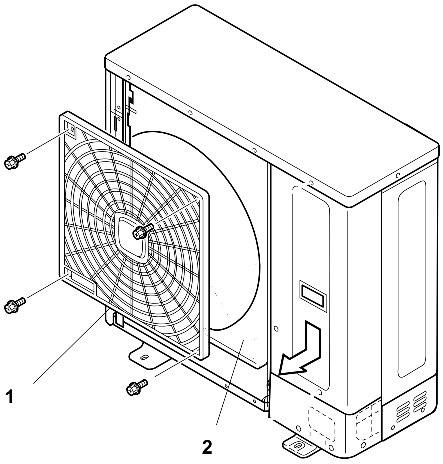
1. Outlet grille.
2. Rear cover.
3. Bottom service cover.



1. Outdoor air thermistor attachment.
2. Inlet grille.
3. Rear cover.

◆ Removing air outlet grille

1. Remove the four (4) fixing screws.
2. Lift the air outlet grille holding the lower parts.
3. Release the extruded hook of the air outlet grille from the shroud.

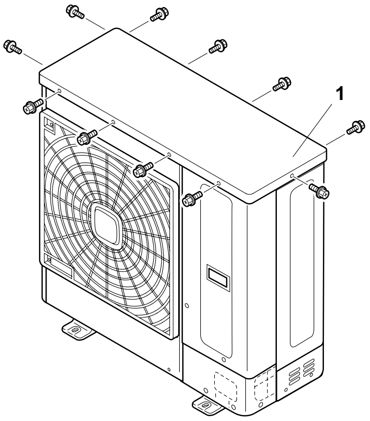


1. Air outlet grille.

2. Shroud.

◆ Removing upper cover

1. Remove the eleven (11) fixing screws.
2. Lift the upper cover upwards.



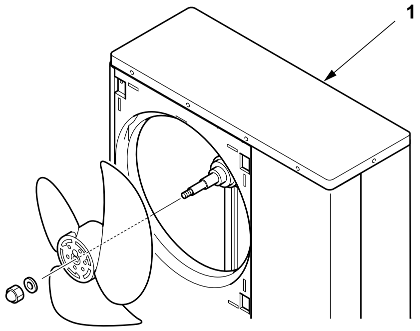
1. Upper cover.

◆ Removing outdoor fan motor

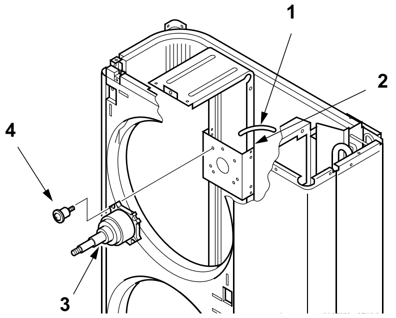
1. Remove the service cover according to the section *Removing service cover, see on page 361* in this chapter.
2. Remove the air outlet grille according to the section *Removing air outlet grille, see on page 362* in this chapter.
3. Remove the upper cover according to the section *Removing upper cover, see on page 362* in this chapter.
4. Disassemble the fan blade by removing the cap nuts and washers fixing the fan blade onto the motor shaft.
5. Remove the fan motor connector from the PCN202 at the electrical box.
   - Cut off the cable tie that fixes the lead wire of the fan motor.
   - Remove the four (4) screws that fix the motor to the motor clamp.

6 Fix the motor wire with the cable tie or the cord clamp. If not it may cause the disconnection of the fan motor's lead wire.

7 In order to avoid cutting edges mount the rubber bush at the partition plate when inserting the motor wire through it. If not it may cause the disconnection to the fan motor's lead wire.



1. Upper cover.



1. Fan motor lead wire.
2. Motor clamp.
3. Fan Motor.
4. Screw with spacer.

NOTE

- ***When assembling the motor ensure the cables section directly downwards. Fix the protection tube edge end downwards to ensure water from keeping inside it.***
- ***Fix the motor wires onto the motor clamp with a cable tie to prevent them from collisioning the fun blades.***
- ***Assembling the fan blade: Insert the skidding protection part of fan boss in accordance with the cutting part of the motor shaft and fix the screw after dismounting the screwed part of the shaft. (Tightening Torque of 20 Nm)***
- ***When connecting the motor wire check to ensure that the colors of the connectors on the PCN202 are matched with the wires.***
- ***Fix the air outlet grille firmly to the shroud.***

Fan components and technical features		
Power supply		230V/50Hz
Fan motor	DC fan motor	DPI IPM PCN202 (1 3) PCN202 (2 3 4)
Screw for motor fixing	DC Fan Motor	M4 Screw with spacer x 4

◆ Removing the compressor

1 Remove the service cover and the lower part of the service panel according to the sections *Removing service cover, see on page 361* and *Removing bottom service cover and rear cover, see on page 361*. In case that the outdoor unit is installed close to a wall closely separate first the outdoor unit from the wall.

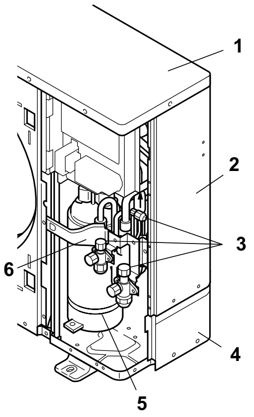
2 Collect the refrigerant from the liquid stop valve the gas stop valve and the check joint at the piping.

3 Open the sound insulation cover wrapped around the compressor and remove the terminal box cover at the compressor fixed by one (1) screw. Disconnect the compressor wires in the terminal box and remove the sound insulation cover.

NOTE

Check and take note of each terminal number and indications for its correct connection at the reassembling process. If wires are connected in incorrect order it will lead to a compressor failure.

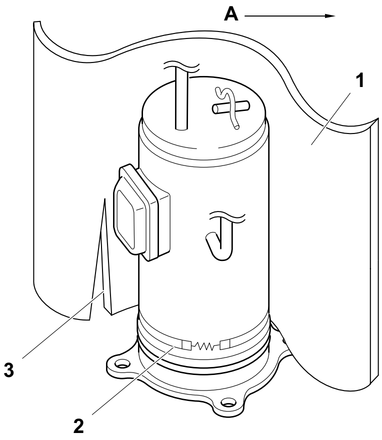
1. Upper cover.
2. Rear panel.
3. Check joint.
4. Rear pipe cover.
5. Crankcase heater.
6. Valve Stay.



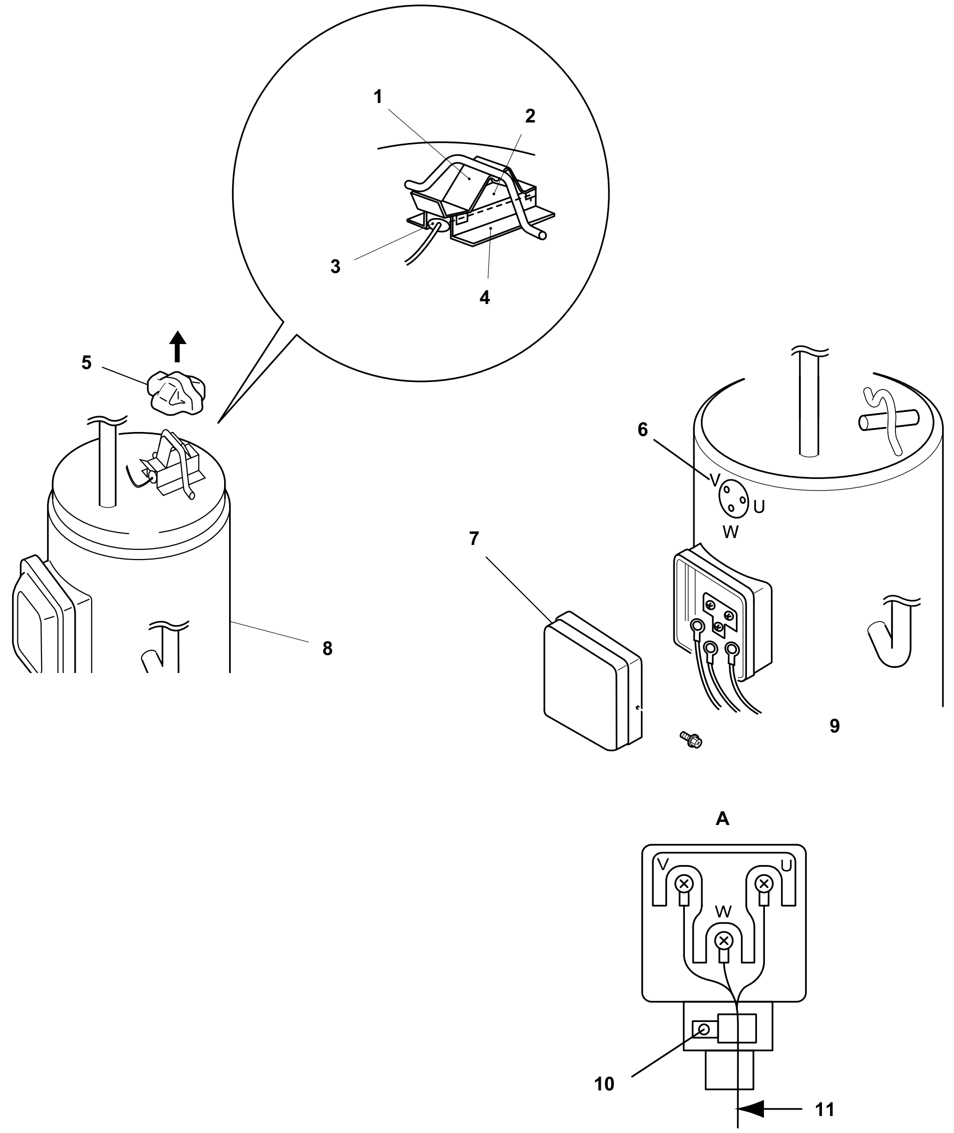
4 Remove the rubber cap and the thermistor on the top of the compressor.

1. Sound-proof cover.
2. Oil heater.
3. Cut part.

A. Direction to remove the cover.



5 Remove the crankcase heater. (Oil heater on the lower case).



1. Thermistor holder.
2. Holder.
3. Td Thermistor.
4. Thermistor fixing plate.
5. Rubber cap Th Thermistor.
6. Indication of terminal number.
7. Terminal box cover.
8. Compressor.
9. Compressor wires.
10. Fix it with screw.
11. Compressor wires (3 wires).

A. Details for compressor terminals.

NOTE

- ***Do not expose the refrigerant cycle to the atmosphere for a long period in order to avoid water and foreign particles entering into the refrigerant cycle. After removing the compressor replace it quickly. If it is exposed to the ambiance for a long period seal both suction and discharge pipes.***
- ***Remove the cap for the compressor just before replacing the compressor. Before assembling the compressor seal the suction pipe and discharge pipe with tape to protect the compressor interior from foreign particles. Remove the tape when connecting the pipes.***

DANGER

- ***All compressor pipes must be brazed to be connected to the refrigerant circuit. Ensure that all the surrounding is free of flammable objects and liquids when performing piping brazing work.***

6 Remove the suction pipe and the discharge pipe from the compressor. Isolate the wires and electrical components to protect them from the burner flame when brazing the connection pipes.

7 Remove the two (2) nuts fixing the compressor and remove the compressor from the unit by lifting it. Slightly incline it forward and lift.

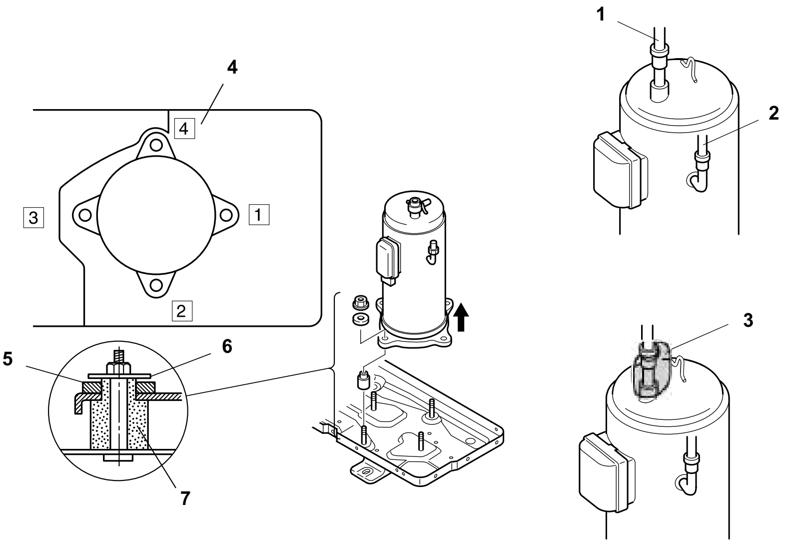
8 For brazing the compressor connection pipes first cool down the compressor piping side covering it with wet cloth. Then brazing material will not enter into the compressor. If the brazing material enters the compressor it will cause compressor failures.

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

  - Tighten the screws (U V and W) for compressor wires with 2.5 Nm.
  - Fix the lead wire firmly.

NOTE

- ***Fix the lead wire for the compressor firmly using a cable tie to avoid contacting the metal sheet sharp edges and the high temperature piping.***



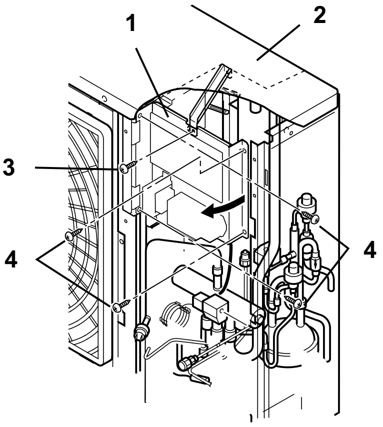
1. Suction pipe.
2. Discharge pipe.
3. Cover pipes with wet cloth.
4. See compressor position table below.
5. Vibration-Proof rubber 2.
6. Nut and washer.
7. Vibration-Proof rubber 1.

Fixation of the compressor to the bottom plate				
Compressor position	1	2	3	4
Vibration-proof rubber 1	x	x	x	x
Vibration-proof rubber 2	x	x	—	—
Nut	x	x	—	—

◆ Opening electrical box (P-mounting plate)

1 Remove the service cover according to the section *Removing service cover, see on page 361* in this chapter.
2 Remove the six (6) screws fixing the electrical box. Open the P-mounting plate by rotating it to the left.

1. P Plate.
2. Upper cover.
3. Screw.
4. Two (2) screws.



DANGER

- ***Check that the LED201 (red) located on the "W" surface PCB is OFF when opening the P-mounting plate.***
- ***Do not touch the electrical components when LED201 (Red) located on the "W" surface PCB is ON in order to avoid an electrical shock.***

◆ Removing reversing valve coil

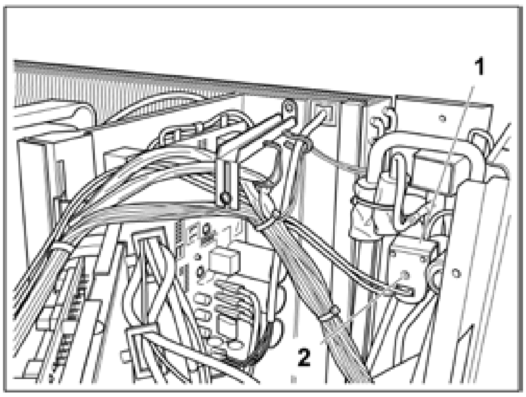
1 Remove the service cover according to the section *Removing service cover, see on page 361* in this chapter.
2 Open the P-mounting plate according to the section *Opening electrical box (P-mounting plate), see on page 367* in this chapter.

DANGER

- ***Check that the LED201 (red) located on the "W" surface PCB is OFF when opening the P-mounting plate.***
- ***Do not touch the electrical components when LED201 (Red) located on the "W" surface PCB is ON in order to avoid an electrical shock.***

3 Remove the connectors on the control PCB of the electrical box.
4 Remove the reversing valve coil by removing the screw fixing the coil.

1. Reversing valve coil.
2. Screw.



◆ Removing expansion valve coil

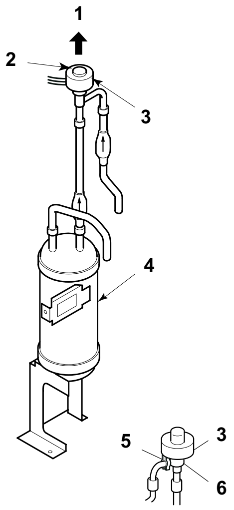
1. Remove the service cover according to the section *Removing service cover, see on page 361* in this chapter.
2. Open the P-mounting plate according to the section *Opening electrical box (P-mounting plate), see on page 367* in this chapter .

DANGER

- ***Check that the LED201 (red) located on the "W" surface PCB is OFF when opening the P-mounting plate.***
- ***Do not touch the electrical components when LED201 (Red) located on the "W" surface PCB is ON in order to avoid an electrical shock.***

3. Remove the CN5A connector on the control PCB of the electrical box.
4. Hold the expansion valve coil and slightly rotate then pull it up. Refer to the figure below to replace the electrical valve. The lock mechanism is equipped with the expansion valve coil. Check to ensure that the expansion valve coil is locked.

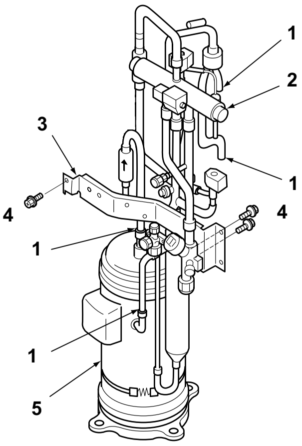
1. Pull out the electronic expansion valve coil upwards.
2. Release lock.
3. Electronic Expansion Valve Coil.
4. Liquid Tank.
5. Lock Part.
6. Electronic Expansion Valve.

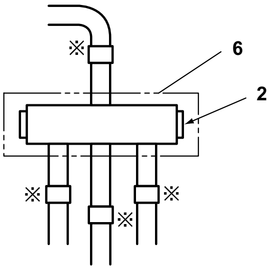


◆ Removing reversing valve

1. Remove the service cover and rear service panel according to the sections *Removing service cover, see on page 361* and *Removing bottom service cover and rear cover, see on page 361* in this chapter.
2. Collect the refrigerant from the check joint according to the section *Removing the compressor, see on page 363*
3. Remove the reversing valve coil according to the section *Removing reversing valve coil, see on page 367*.
4. Remove one (1) fixing screw for the valve-mounting plate.
5. Remove the stop valve at the gas side from the valve-mounting plate by removing the two (2) screws.
6. Remove the reversing valve assemblies from the 4 brazed parts where it is fixed. Remove the brazing of the reversing valve and the stop valve at the gas using a blowtorch. Cool down the piping side covering it with wet cloth in order to avoid brazing material entering the reversing valve. Protect the connecting wires and pipe insulation from the brazing frame.
7. Remove the reversing valves from its assemblies 4 brazed parts.
8. Perform the brazing with a blowtorch remove and reassemble the reversing valve by cooling the pipes first with wet cloth in order to avoid brazing material entering the reversing valve.
9. Reassemble the parts in the reverse order of removing procedures contained in this chapter. When SFV is removed fix it according to the sections *Remove solenoid valve, see on page 369* contained in this chapter.

1. Brazing.
2. Reversing valve.
3. Mounting plate.
4. Screw.
5. Compressor.
6. Cover by wet cloth.





◆ Removing expansion valve

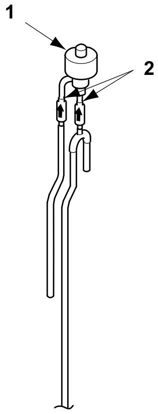
1 Remove the service cover and rear service panel according to the sections *Removing service cover, see on page 361* and *Removing bottom service cover and rear cover, see on page 361*.

2 Collect the refrigerant from the check joint according to the section *Removing the compressor, see on page 363*

3 Remove the coils according to the section *Removing reversing valve coil, see on page 367*.

4 Remove the brazing as shown in the figure.

- Electronic Expansion Valve (EV0): 2 brazing parts.
- Perform the brazing to remove and reassemble the electronic expansion valve by cooling with wet cloth.
- Protect the connecting wires and pipe insulation from brazing flame.



1. Expansion valve (EV0).
2. Brazing part.

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

◆ Remove solenoid valve

1 Remove the service cover and the rear service panel according to the sections *Removing service cover, see on page 361* and *Removing bottom service cover and rear cover, see on page 361* described in this chapter .

2 Collect the refrigerant from the check joint according to the section *Removing the compressor, see on page 363* in this chapter.

3 Remove the solenoid valve coil according to the section *Removing expansion valve coil, see on page 368* in this chapter.

4 Remove the brazing and flare nuts. Using a blowtorch and previously cooling the pipe side with wet cloth in order to avoid brazing material entering the reversing valve.

5 Perform the brazing to remove and reassemble the solenoid valve.

6 Protect the connecting wires and pipe insulation from the brazing flame.

7 Remove the flare nuts with two spanners to avoid twisting.

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

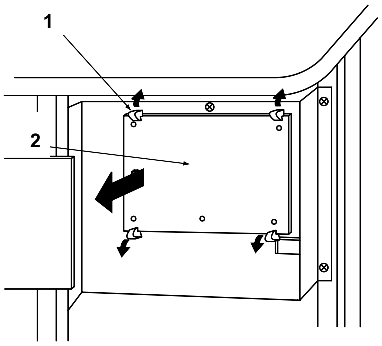
◆ Remove the electrical components

DANGER

- ***Do not touch the electrical components of the PCB directly.***
- ***When handling the PCB take care of components. Do not apply excessive force to them in order to avoid damaging the motherboard and failures.***

1 Remove the service cover according to section *Removing service cover, see on page 361* in this chapter.

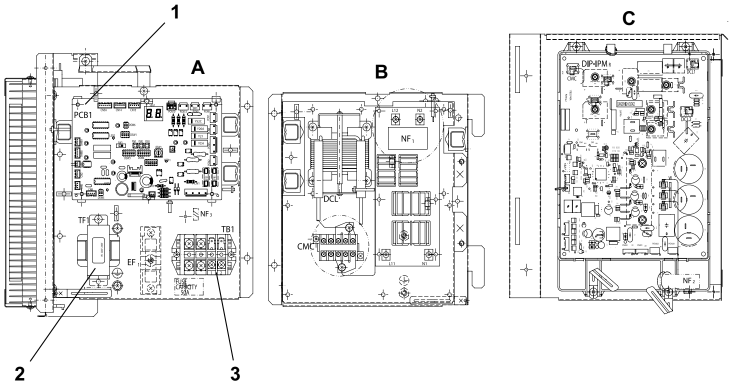
- Disconnect all the connectors in the PCB.
- Remove the PCB by sliding four (4) holders in the arrow direction.
- Remove the PCB for power distribution of the compressor and the motor.To remove the PCB slide the four (4) holders in the arrow direction.



1. Holder (4 pcs.).
2. PCB1 for control.

2 Removing the relay PCB

- Remove the service cover according to the section *Removing service cover, see on page 361* in this chapter.
- Disconnect all the wires connected to the relay PCB.

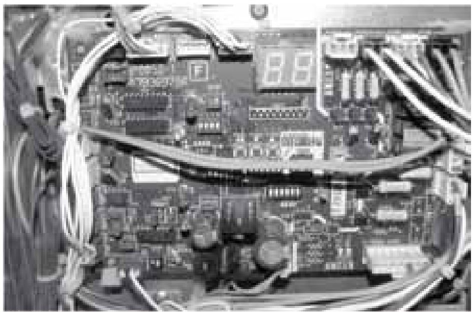


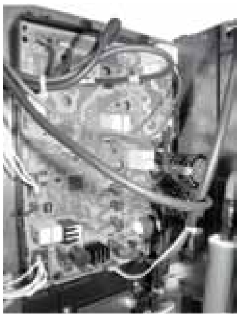
1. PCB1 for control.
2. Transformer.
3. Terminal board.

A. (U) Surface.

B. (V) Surface.

C. (W) Surface.





◆ Removing “W” electrical componets surface

1. Remove the service cover according to the section *Removing service cover, see on page 361* in this chapter.
2. Open the P-mounting plate by rotating 90 degrees to the left according to the section *Opening electrical box (P-mounting plate), see on page 367* in this chapter.
3. Use a screw driver to push and release the plastic holders retaining the “W” electrical components surface.

DANGER

- ***Check that the LED201 (red) located on the “W” surface PCB is OFF when opening the P-mounting plate.***
- ***Do not touch the electrical components when LED201 (Red) located on the “W” surface PCB is ON in order to avoid an electrical shock.***

NOTE

- ***Identify the terminal numbers with mark band. When reassembling the terminals have to be connected to the correct numbers . If incorrectly connected malfunctions or damages will occur.***
- ***Check to ensure that the electrical wires will not be caught between the assembled electrical components and the mounting plates when the “W” electrical components surface is reassembled.***

DANGER

- ***Identify the terminal numbers with mark band. When reassembling the terminals have to be connected to the correct numbers. If incorrectly connected malfunctions or damages will occur.***
- ***In case of replacing control PCB set all the dip switches as the same position before replacing. If not malfunction may occur. Refer to the manual attached with the service PCB.***
- ***Do not apply strong force to the electric components and PCBs to avoid damage.***

◆ Removing other electrical components

1. Remove the service cover according to the section *Removing service cover, see on page 361* in this chapter.
2. Open the P-mounting plate by rotating it to the left according to the section *Opening electrical box (P-mounting plate), see on page 367* in this chapter.
3. Check to ensure the LED201 (Red) of the inverter PCB is off when opening P-mounting plate.
4. Remove other electrical components according to the procedure below and the figures on Chapter 10.

DANGER

- ***Check that the LED201 (red) located on the “W” surface PCB is OFF when opening the P-mounting plate.***
- ***Do not touch the electrical components when LED201 (Red) located on the “W” surface PCB is ON in order to avoid an electrical shock.***

NOTE

- ***Disconnect all the wires connected with the smoothing capacitor (CB CB1 CB2 CA).***
- ***The wire has polar characters. Identify the wire mark band and the indication on the smoothing capacitor when wire connecting.***
- ***Remove the two (2) screws fixing the smoothing capacitor and remove the smoothing capacitor.***
- ***Disconnect all the wires connecting with the magnetic contactor (CMC1).***
- ***Remove the two (2) screws fixing the magnetic contactor and remove the magnetic contactor.***
- ***Remove the four (4) screws fixing the reactor and remove the reactor (DCL).***
- ***Disconnect all the wires connected with the noise filter (NF1).***
- ***Remove the noise filter by clamping the top of the holder (6 portions) with a pincher.***
- ***Identify the terminal numbers with mark band. When reassembling the terminals have to be connected to the correct numbers . If incorrectly connected malfunctions or damages will occur.***

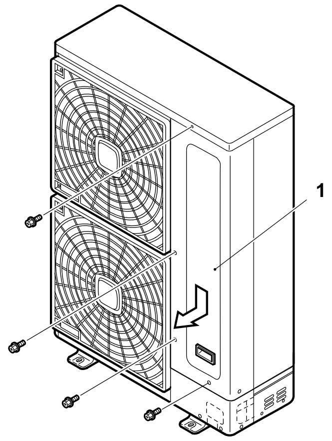
10.2.2 Outdoor units RAS-(4-6)H(V)RNM2E

◆ Removing service cover

NOTE

- ***Remove the main parts according to the following procedures.***
  - ***To reassemble perform the procedures in reverse.***
  - ***To prevent contamination of the refrigerant with water or foreign particles do not expose open to atmosphere for long periods.***
  - ***If necessary seal pipe ends using caps or tape.***

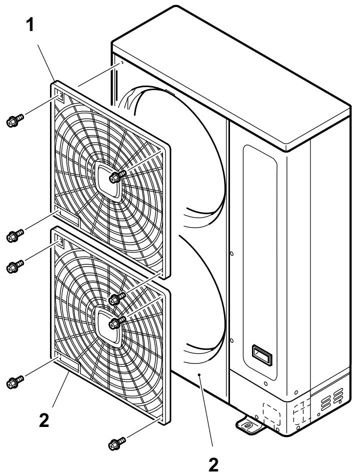
1 Remove the four (4) fixing screws.
2 Slide the service cover downward and remove it.
3 Pay attention of not falling off the service cover.



1. Service cover.

◆ Remove air outlet grille

1 Remove the eight (8) fixing screws.
2 Lift the air outlet grille holding the lower parts.
3 Release the extruded hook of the air outlet grille from the shroud.

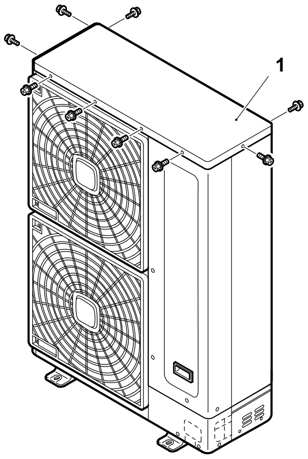


1. Air outlet grille.

2. Shroud.

◆ Removing upper cover

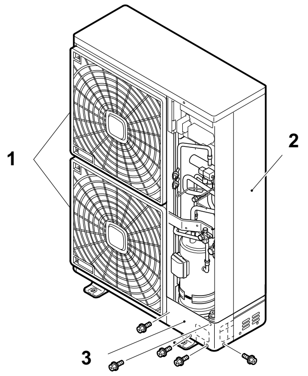
1 Remove all the screws fixing the upper cover both on the front and back of the machine.
2 Lift the upper cover upwards.



1. Upper cover.

◆ Removing the lower part of service panel and rear panel

1 Remove the five (5) fixing screws at the lower part of the service panel and remove the lower part of the service panel by pulling towards the front side. Remove the upper cover according to section *Removing upper cover, see on page 373* in this chapter.



1. Air outlet grille.

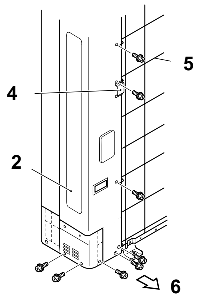
2. Rear cover.

3. Lower part of service cover.

4. Fixing portion for outdoor temperature thermistor.

5. Air inlet grille (rear side).

6. Pull.



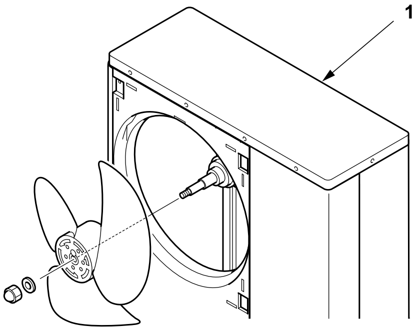
NOTE

- ***The length of fixing screws for the outdoor temperature thermistor is different than all other screws in the machine as an assembly poka-yoke.***

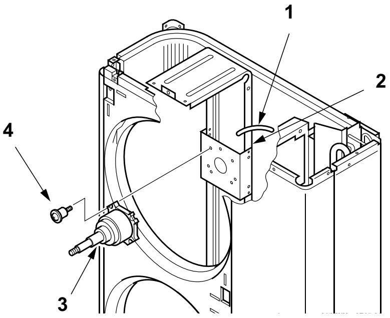
◆ Removing outdoor fan motor

1 Remove the service cover according to the section *Removing service cover, see on page 372* in this chapter.
2 Remove the air outlet grille according to the section *Remove air outlet grille, see on page 372* in this chapter.
3 Remove the upper cover according to the section *Removing upper cover, see on page 373* in this chapter.
4 Disassembly the fan blade by removing the cap nuts and washers fixing the fan blade onto the motor shaft.

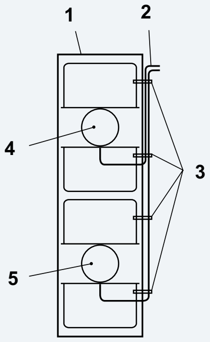
If the fan blade get stuck when trying to remove it use a puller to disassembly the fan.



1. Upper cover.

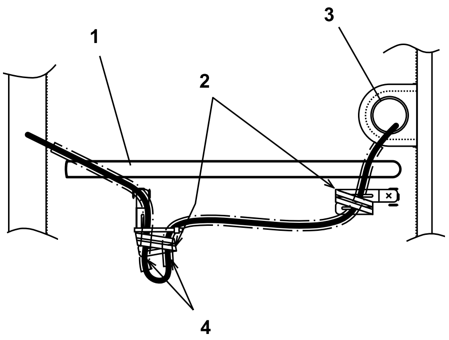


1. Fan motor lead wire.
2. Motor clamp.
3. Fan Motor.
4. Screw with spacer.

Fan components and technical features		
Power supply		230V/50Hz 400V/50Hz
Fan Motor Comp. Nº	DC Fan Motor UP	DIP IPM PCN202 (1 3) PCN202 (2 3 4)
	AC Fan Motor DOWN	DIP IPM PCN201 (1 3) PCN201 (2 3 4)
Screw for motor fixing	DC Fan Motor UP	4 x M4 screw (with spacer)
	AC Fan Motor DOWN	4x M4 screws (with spacer)
Motor clamp and wiring fixing position		 1 2 3 4 5 1. Motor clamp. 2. Fan motor lead wire. 3. Plastic tie. 4. DC Fan Motor UP. 5. DC Fan Motor DOWN.

5 Remove the fan motor connector from the PCN202 and PCN203 at the electrical box.

- Cut off the cable tie that fixes the lead wire of the fan motor.
- Remove the four (4) screws that fix the motor to the motor clamp.



1. Partition plate.
2. Cord holder or cable tie.
3. Rubber bush.
4. Install DC motor to this position facing down the trap.

6 Fix the motor wire with the cable tie or the cord clamp. If not it may cause the disconnection of the fan motor's lead wire.

7 In order to avoid cutting edges mount the rubber bush at the partition plate when inserting the motor wire through it. If not it may cause the disconnection to the fan motor's lead wire.

NOTE

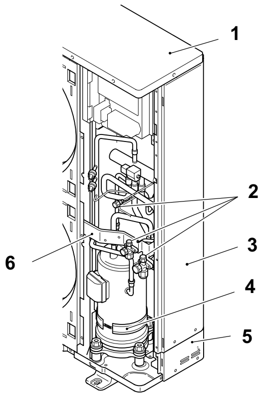
- ***When assembling the motor ensure the cables section directly downwards. Fix the protection tube edge end downwards to ensure water from keeping inside it.***
- ***Fix the motor wires onto the motor clamp with a cable tie to prevent them from collisioning the fun blades.***
- ***Assembling the fan blade: Insert the skidding protection part of fan boss in accordance with the cutting part of the motor shaft and fix the screw after dismounting the screwed part of the shaft. (Tightening Torque of 20 Nm)***
- ***When connecting the motor wire check to ensure that the colors of the connectors on the PCN201 and PCN202 are matched with the wires.***
- ***Fix the air outlet grille firmly to the shroud.***

◆ Removing the compressor

1 Remove the service cover and the lower part of the service panel according to the section *Removing service cover, see on page 372* and the section *Removing the lower part of service panel and rear panel, see on page 373*. In case that the outdoor unit is installed close to a wall closely separate first the outdoor unit from the wall.

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

3 Open the sound insulation cover wrapped around the compressor and remove the terminal box cover at the compressor fixed by one (1) screw. Disconnect the compressor wires in the terminal box and remove the sound insulation cover.



1. Upper Cover.
2. Check joint.
3. Rear panel.
4. Crankcase heater.
5. Rear pipe cover.
6. Valve stay

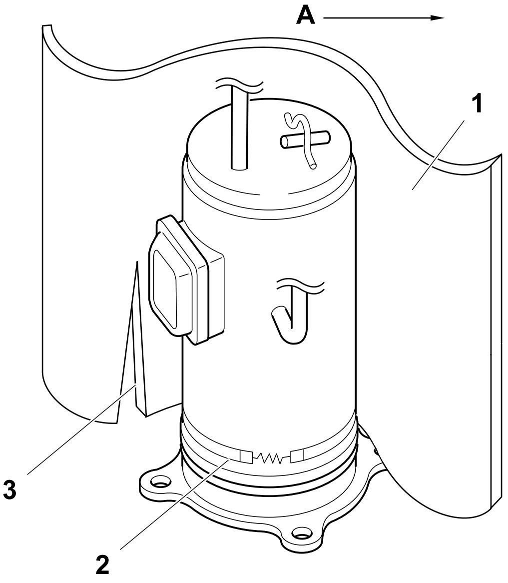
NOTE

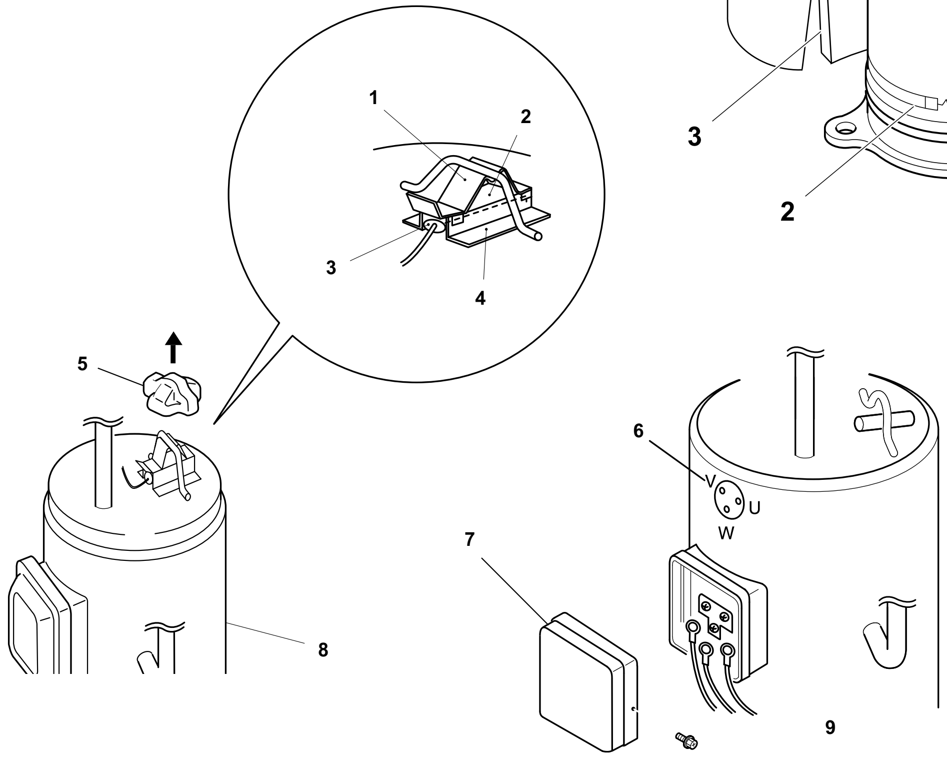
- ***Check and take note of each terminal number and indications for its correct connection at the reassembling process. If wires are connected in incorrect order it will lead to a compressor failure.***

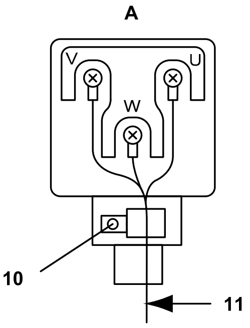
4 Remove the rubber cap and the thermistor on the top of the compressor.

5 Remove the crankcase heater. (Oil heater on the lower case).

1. Sound-proof cover.
2. Oil heater.
3. Cut part.
4. Direction to remove the cover.







1. Thermistor holder.
2. Holder.
3. Td Thermistor.
4. Thermistor fixing plate.
5. Rubber cap Th Thermistor.
6. Indication of terminal number.
7. Terminal box cover.
8. Compressor.
9. Compressor wires.
10. Fix it with screw.
11. Compressor wires (3 wires).

A. Details for compressor terminals.

NOTE

- ***Do not expose the refrigerant cycle to the atmosphere for a long period in order to avoid water and foreign particles entering into the refrigerant cycle. After removing the compressor replace it quickly. If it is exposed to the ambiance for a long period seal both suction and discharge pipes.***
- ***Remove the cap for the compressor just before replacing the compressor. Before assembling the compressor seal the suction pipe and discharge pipe with tape to protect the compressor interior from foreign particles. Remove the tape when connecting the pipes.***

DANGER

- ***All compressor pipes must be brazed to be connected to the refrigerant circuit. Ensure that all the surrounding is free of flammable objects and liquids when performing piping brazing work.***

6 Remove the suction pipe and the discharge pipe from the compressor. Isolate the wires and electrical components to protect them from the burner flame when brazing the connection pipes.

7 Remove the two (2) nuts fixing the compressor and remove the compressor from the unit by lifting it. Slightly incline it forward and lift.

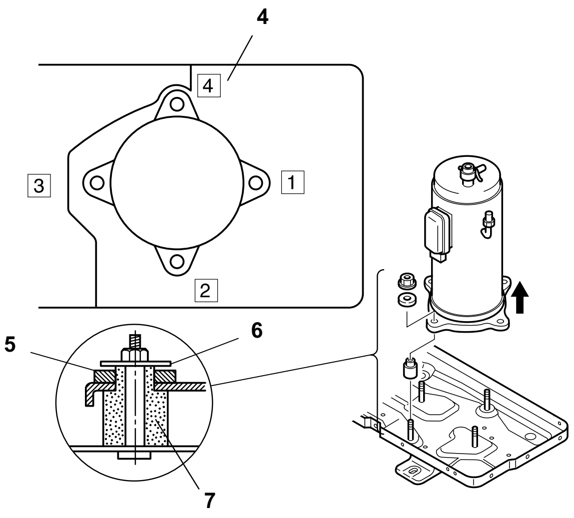
8 For brazing the compressor connection pipes first cool down the compressor piping side covering it with wet cloth. Then brazing material will not enter into the compressor. If the brazing material enters the compressor it will cause compressor failures.

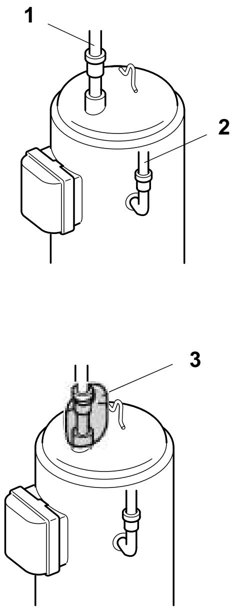
9 Reassemble the parts in the reverse order of the indicated removing procedures.

  - Tighten the screws (U V and W) for compressor wires with 2.5 Nm.
  - Fix the lead wire firmly.

NOTE

- ***Fix the lead wire for the compressor firmly using a cable tie to avoid contacting the metal sheet sharp edges and the high temperature piping.***





1. Suction pipe.
2. Discharge pipe.
3. Cover pipes with wet cloth.
4. See compressor position table below.
5. Vibration-Proof rubber 2.
6. Nut and washer.
7. Vibration-Proof rubber 1.

Fixation of the compressor to the bottom plate				
Compressor position	**1**	**2**	**3**	**4**
Vibration-proof rubber 1	x	x	x	x
Vibration-proof rubber 2	x	x	—	—
Nut	x	x	—	—

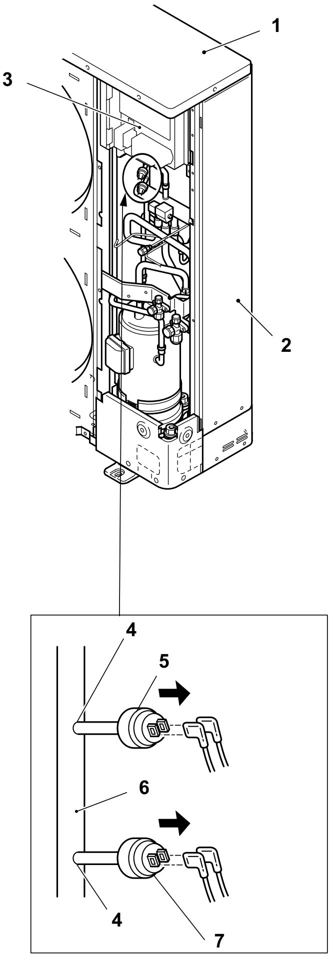
◆ Removing high pressure switch and control pressure switch

1 Remove the service cover according to the section *Removing service cover, see on page 372* in this chapter

2 Collect the refrigerant from the check joint according to the section *Removing the compressor, see on page 375* in this chapter.

3 Disconnect the fasten terminals from the pressure switches.

- Cut the high pressure switch and control pressure switch from the brazing neck using a burner.

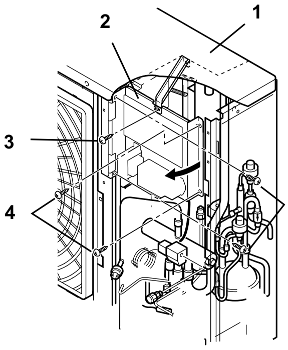


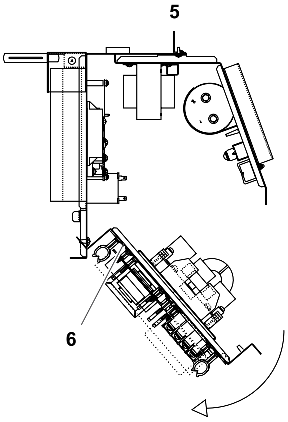
1. Upper cover.
2. Rear cover.
3. Electrical box.
4. Brazing part.
5. Pressure switch for control (PSC).
6. Discharge pipe.
7. High pressure switch (PSH).

◆ Opening electrical box (P-mounting plate)

1 Remove the service cover according to the section *Removing service cover, see on page 372* in this chapter.

- Remove the six (6) screws fixing the electrical box. Open the P-mounting plate by rotating it to the left.





1. Upper cover.
2. P Plate.
3. Screw.
4. Two (2) screws.
5. Electrical box (view from top).
6. P-Mounting plate.
7. Opening direction of P-Mounting Plate.

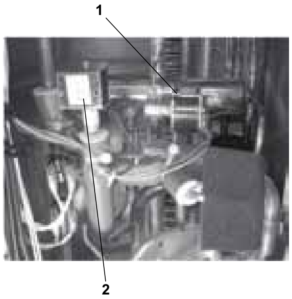
DANGER

- ***Check that the LED201 (red) located on the "W" surface PCB is OFF when opening the P-mounting plate.***
- ***Do not touch the electrical components when LED201 (Red) located on the "W" surface PCB is ON in order to avoid an electrical shock.***

◆ Removing the coils for reversing and solenoid valve (SVA1 SVA2 and SVF)

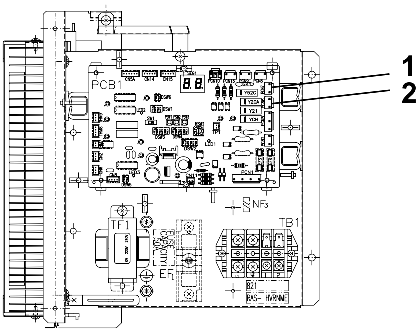
1 Remove the service cover according to the section *Removing service cover, see on page 372* in this chapter.
2 Open the P-mounting plate according to the section *Opening electrical box (P-mounting plate), see on page 379* in this chapter.

1. PCB.
2. Upper cover.
3. Rear cover.



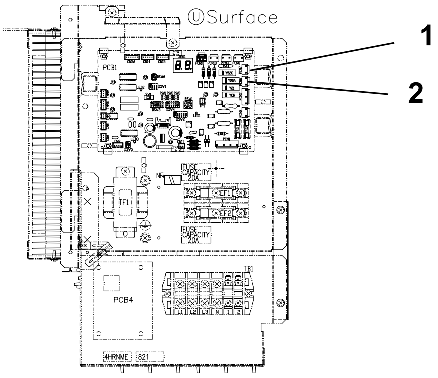
1. Reversing valve coil.
2. SVA.

RAS-(4-6)HVRNM2E



- 1. PCN7 (SVA) Solenoid valve.
- 2. PCN6 (RVR) Reversing valve coil.

RAS-(4-6)HRNM2E



- 1. PCN7 (SVA) Solenoid valve.
- 2. PCN6 (RVR) Reversing valve coil.

NOTE

- ***Do not touch the electrical components when the LED201 (Red) located on surface "W" PCB is ON in order to avoid electrical shock.***
- ***Remove the connectors on the control PCB of the electrical box.***
- ***Remove the reversing valve coil by removing the screw fixing the coil.***

◆ Removing expansion valve coil

1 Remove the service cover according to the section *Removing service cover, see on page 372* in this chapter.

2 Open the P-mounting plate according to the section *Opening electrical box (P-mounting plate), see on page 379* in this chapter .

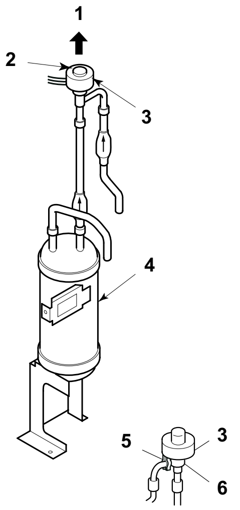
DANGER

- ***Check that the LED201 (red) located on the "W" surface PCB is OFF when opening the P-mounting plate.***
- ***Do not touch the electrical components when LED201 (Red) located on the "W" surface PCB is ON in order to avoid an electrical shock.***

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

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

1. Pull out the electronic expansion valve coil upwards.
2. Release lock.
3. Electronic Expansion Valve Coil.
4. Liquid Tank.
5. Lock Part.
6. Electronic Expansion Valve Coil.
7. Electronic Expansion Valve.



◆ Removing reversing valve

1 Remove the service cover and the rear service panel according to the sections *Removing service cover, see on page 372* and *Removing the lower part of service panel and rear panel, see on page 373* in this chapter.

2 Collect the refrigerant from the check joint according to the section *Removing the compressor, see on page 375*.

3 Remove the reversing valve coil according to the section *Removing the coils for reversing and solenoid valve (SVA1 SVA2 and SVF), see on page 380*.

4 Remove one (1) fixing screw for the valve-mounting plate.

5 Remove the stop valve at the gas side from the valve-mounting plate by removing the two (2) screws.

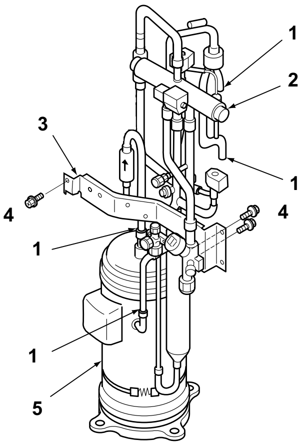
6 Remove the reversing valve assemblies from the 4 brazed parts where it is fixed. Remove the brazing of the reversing valve and the stop valve at the gas using a blowtorch. Cool down the piping side covering it with wet cloth in order to avoid brazing material entering the reversing valve. Protect the connecting wires and pipe insulation from the brazing frame.

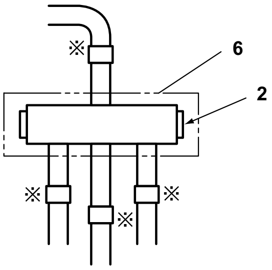
7 Remove the reversing valves from its assemblies 4 brazed parts.

8 Perform the brazing with a blowtorch remove and reassemble the reversing valve by cooling the pipes first with wet cloth in order to avoid brazing material entering the reversing valve.

9 Reassemble the parts in the reverse order of removing procedures contained in this chapter. When SFV is removed fix it according to the sections *Removing expansion valve, see on page 382* and the *Removing solenoid valve, see on page 382* contained in this chapter.

1. Brazing.
2. Reversing valve.
3. Mounting plate.
4. Screw.
5. Compressor.
6. Cover by wet cloth.





◆ Removing expansion valve

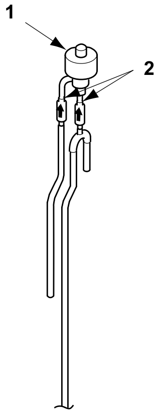
1 Remove the service cover and rear service panel according to the section *Removing service cover, see on page 372* and *Removing the lower part of service panel and rear panel, see on page 373*.

2 Collect the refrigerant from the check joint according to the section *Removing the compressor, see on page 375*.

3 Remove the coils according to the section *Removing the coils for reversing and solenoid valve (SVA1 SVA2 and SVF), see on page 380*.

4 Remove the brazing as shown in the figure.

- Electronic Expansion Valve (EV0): 2 brazing parts.
- Perform the brazing to remove and reassemble the electronic expansion valve by cooling with wet cloth.
- Protect the connecting wires and pipe insulation from brazing flame.



1. Expansion valve (EV0).
2. Brazing part.

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

◆ Removing solenoid valve

1 Remove the service cover and the rear service panel according to the sections *Removing service cover, see on page 372* and *Removing the lower part of service panel and rear panel, see on page 373* described in this chapter .

2 Collect the refrigerant from the check joint according to the section *Removing the compressor, see on page 375* in this chapter.

3 Remove the solenoid valve coil according to the section *Removing expansion valve, see on page 382* in this chapter.

4 Remove the brazing and flare nuts. Using a blowtorch and previously cooling the pipe side with wet cloth in order to avoid brazing material entering the reversing valve.

5 Perform the brazing to remove and reassemble the solenoid valve.

6 Protect the connecting wires and pipe insulation from the brazing flame.

7 Remove the flare nuts with two spanners to avoid twisting.

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

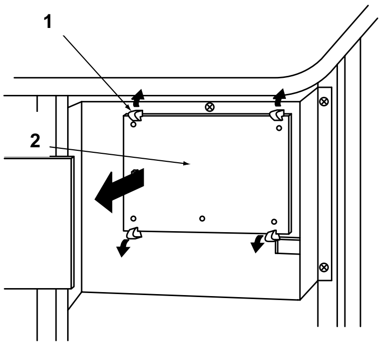
◆ Removing electrical components

DANGER

- ***Do not touch the electrical components of the PCB directly.***
- ***When handling the PCB take care of components. Do not apply excessive force to them in order to avoid damaging the motherboard and failures.***

1 Remove the service cover according to section *Removing service cover, see on page 372* in this chapter.

- Disconnect all the connectors in the PCB.
- Remove the PCB by sliding four (4) holders in the arrow direction.
- Remove the PCB for power distribution of the compressor and the motor.To remove the PCB slide the four (4) holders in the arrow direction.

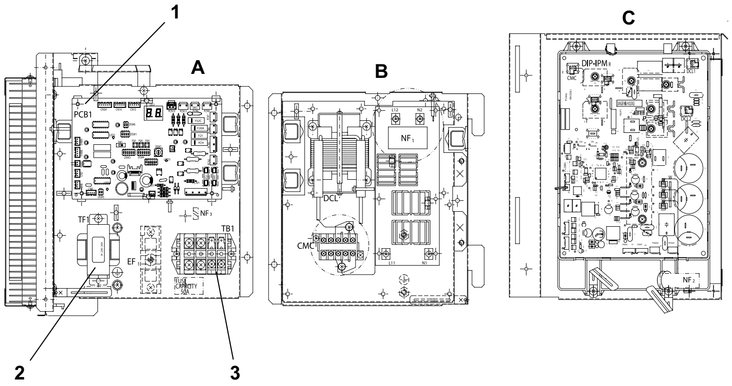


1. Holder (4 pcs.).
2. PCB1 for control.

2 Removing the relay PCB

- Remove the service cover according to the section *Removing service cover, see on page 372* in this chapter.
- Disconnect all the wires connected to the relay PCB.

RAS-(4-6)HVRNM2E

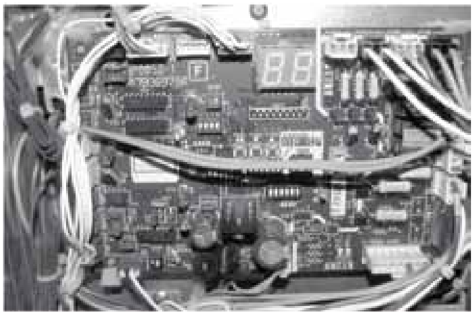


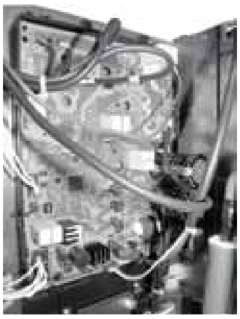
1. PCB1 for control.
2. Transformer.
3. Terminal board.

A. (U) Surface.

B. (V) Surface.

C. (W) Surface.





◆ Removing “W” electrical components surface

1. Remove the service cover according to the section *Removing service cover, see on page 372* in this chapter.
2. Open the P-mounting plate by rotating 90 degrees to the left according to the section *Opening electrical box (P-mounting plate), see on page 379* in this chapter.
3. Use a screw driver to push and release the plastic holders retaining the “W” electrical components surface.

DANGER

- ***Check that the LED201 (red) located on the “W” surface PCB is OFF when opening the P-mounting plate.***
- ***Do not touch the electrical components when LED201 (Red) located on the “W” surface PCB is ON in order to avoid an electrical shock.***

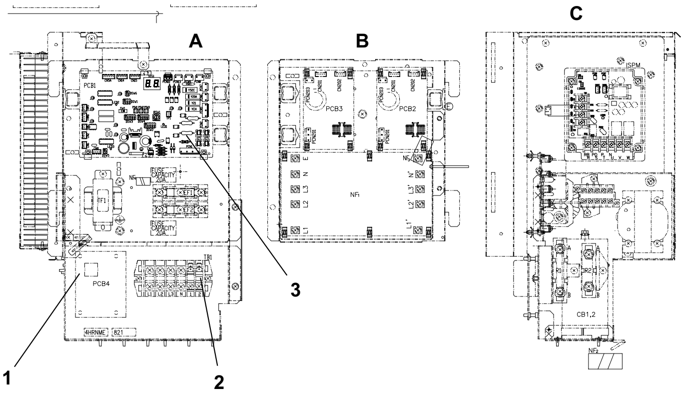
NOTE

- ***Identify the terminal numbers with mark band. When reassembling the terminals have to be connected to the correct numbers . If incorrectly connected malfunctions or damages will occur.***
- ***Check to ensure that the electrical wires will not be caught between the assembled electrical components and the mounting plates when the “W” electrical components surface is reassembled.***

DANGER

- ***Identify the terminal numbers with mark band. When reassembling the terminals have to be connected to the correct numbers . If incorrectly connected malfunctions or damages will occur.***
- ***In case of replacing control PCB set all the dip switches as the same position before replacing. If not malfunction may occur. Refer to the manual attached with the service PCB.***
- ***Do not apply strong force to the electric components and PCBs to avoid damage.***

RAS-(4-6)HRNM2E



1. Transformer.

2. Terminal board.

3. PCB1 for control.

A. (U) Surface.

B. (V) Surface.

C. (W) Surface.

◆ Removing other electrical components

1. Remove the service cover according to the section *Removing service cover, see on page 372* in this chapter.
2. Open the P-mounting plate by rotating it to the left according to the section *Opening electrical box (P-mounting plate), see on page 379* in this chapter.

3 Check to ensure the LED201 (Red) of the inverter PCB is off when opening P-mounting plate.
4 Remove other electrical components according to the procedure below and the figures on Chapter 10.

DANGER

- ***Check that the LED201 (red) located on the “W” surface PCB is OFF when opening the P-mounting plate.***
- ***Do not touch the electrical components when LED201 (Red) located on the “W” surface PCB is ON in order to avoid an electrical shock.***

NOTE

- ***Disconnect all the wires connected with the smoothing capacitor (CB CB1 CB2 CA).***
- ***The wire has polar characters. Identify the wire mark band and the indication on the smoothing capacitor when wire connecting.***
- ***Remove the two (2) screws fixing the smoothing capacitor and remove the smoothing capacitor.***
- ***Disconnect all the wires connecting with the magnetic contactor (CMC1).***
- ***Remove the two (2) screws fixing the magnetic contactor and remove the magnetic contactor.***
- ***Remove the four (4) screws fixing the reactor and remove the reactor (DCL).***
- ***Disconnect all the wires connected with the noise filter (NF1).***
- ***Remove the noise filter by clamping the top of the holder (6 portions) with a pincher.***
- ***Identify the terminal numbers with mark band. When reassembling the terminals have to be connected to the correct numbers . If incorrectly connected malfunctions or damages will occur.***

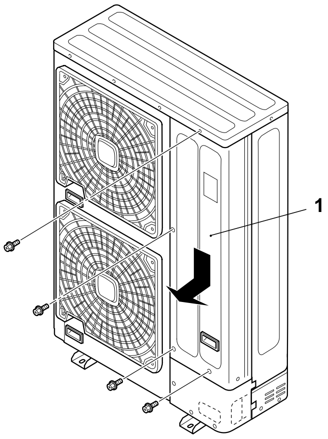
10.2.3 Oudoor units RAS-(8-12)HRNM

◆ Removing service cover

NOTE

- ***Remove the main parts according to the following procedures.***
  - ***To reassemble perform the procedures in reverse.***
  - ***To prevent contamination of the refrigerant with water or foreign particles do not expose open to atmosphere for long periods.***
  - ***If necessary seal pipe ends using caps or tape.***

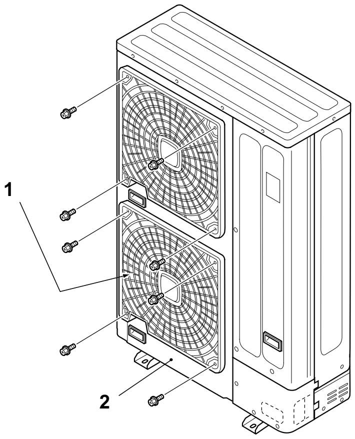
1 Remove the four (4) fixing screws.
2 Slide the service cover downward and remove it.
3 Pay attention of not falling off the service cover.



1. Service cover.

◆ Removing air outlet grille

1. Remove the eight (8) fixing screws.
2. Lift the air outlet grille holding the lower parts.
3. Release the extruded hook of the air outlet grille from the shroud.

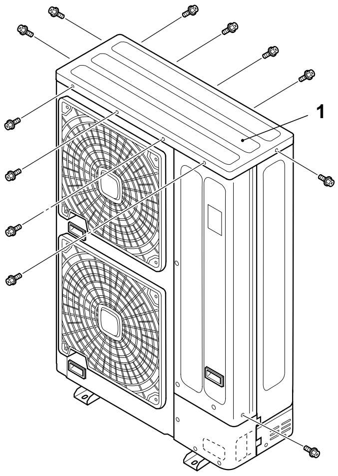


1. Air outlet grille.

2. Shroud.

◆ Removing upper cover

1. Remove the eleven (11) screws fixing the upper cover
2. Lift the upper cover upwards.

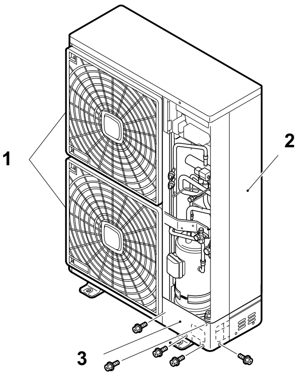


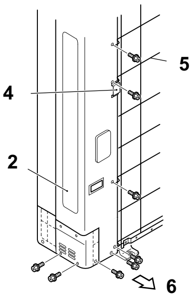
1. Upper cover.

◆ Removing the lower part of service panel and rear panel

1 Remove the five (5) fixing screws at the lower part of the service panel and remove the lower part of the service panel by pulling towards the front side. Remove the upper cover according to section *Removing upper cover, see on page 386* in this chapter.

2 Remove the six (6) fixing screws at the rear panel and remove.





1. Air outlet grille.
2. Rear cover.
3. Lower part of service cover.
4. Fixing portion for outdoor temperature thermistor.
5. Air inlet grille (rear side).
6. Pull.

NOTE

- ***The length of fixing screws for the outdoor temperature thermistor is different than all other screws in the machine as an assembly poka-yoke.***

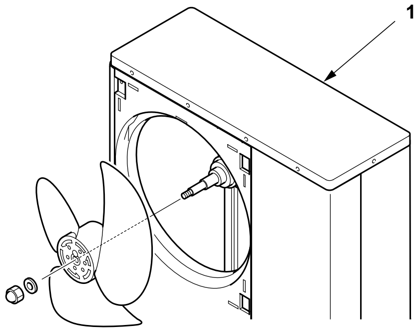
◆ Removing outdoor fan motor

1 Remove the service cover according to the section *Removing service cover, see on page 385* in this chapter.

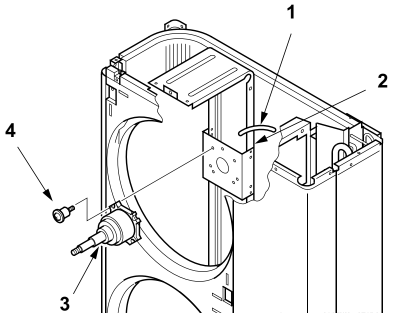
2 Remove the air outlet grille according to the section *Removing air outlet grille, see on page 386* in this chapter.

3 Remove the upper cover according to the section *Removing upper cover, see on page 386* in this chapter.

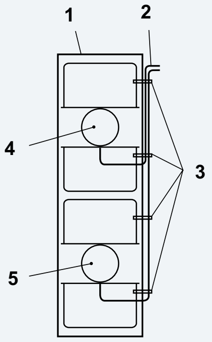
4 Disassembly the fan blade by removing the cap nuts and washers fixing the fan blade onto the motor shaft. If the fan blade get stuck when trying to remove it use a puller to disassembly the fan.



1. Upper cover.



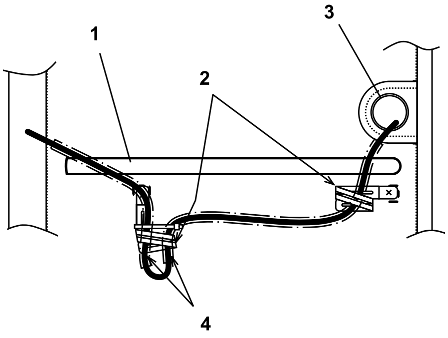
1. Fan motor lead wire.
2. Motor clamp.
3. Motor.
4. Screw with spacer.

Fan components and technical features		
Power supply		380-415V/50Hz
Fan Motor Comp. No.	DC Fan Motor	PCB5 PCN203 (1 3) CN201 (2 3 4)
	AC Fan Motor	PCB3 PCN404 (White)
Screw for motor fixing.	DC Fan Motor	4 x M6 screw (with spacer)
	AC Fan Motor	4x M8 screws
Motor clamp and wiring fixing position		 1. Motor clamp. 2. Fan motor lead wire. 3. Plastic tie. 4. DC Fan Motor. 5. AC Fan Motor.

5 Remove the fan motor connector from the PCB3 and PCB5 at the electrical box.

- Cut off the cable tie that fixes the lead wire of the fan motor.
- Remove the four (4) screws that fix the motor to the motor clamp.

1. Partition plate.
2. Cord holder or cable tie.
3. Rubber bush.
4. Install DC motor to this position facing down the trap.



6 Fix the motor wire with the cable tie or the cord clamp. If not it may cause the disconnection of the fan motor's lead wire.

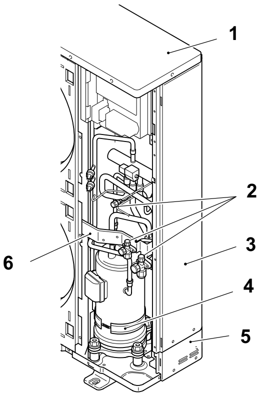
7 In order to avoid cutting edges mount the rubber bush at the partition plate when inserting the motor wire through it. If not it may cause the disconnection to the fan motor's lead wire.

NOTE

- ***When assembling the motor ensure the cables section directly downwards. Fix the protection tube edge end downwards to ensure water from keeping inside it.***
- ***Fix the motor wires onto the motor clamp with a cable tie to prevent them from collisioning the fun blades.***
- ***Assembling the fan blade: Insert the skidding protection part of fan boss in accordance with the cutting part of the motor shaft and fix the screw after dismounting the screwed part of the shaft. (Tightening Torque of 20 Nm)***
- ***When connecting the motor wire check to ensure that the colors of the connectors on the PCB3 and PCB5 are matched with the wires.***
- ***Fix the air outlet grille firmly to the shroud.***

◆ Removing the compressor

1. Remove the service cover and the lower part of the service panel according to the sections *Removing service cover, see on page 385* and the section *Removing the lower part of service panel and rear panel, see on page 387*. In case that the outdoor unit is installed close to a wall closely separated first the outdoor unit from the wall.
2. Collect the refrigerant from the liquid stop valve the gas stop valve and the check joint at the piping.
3. Open the sound insulation cover wrapped around the compressor and remove the terminal box cover at the compressor fixed by one (1) screw. Disconnect the compressor wires in the terminal box and remove the sound insulation cover.

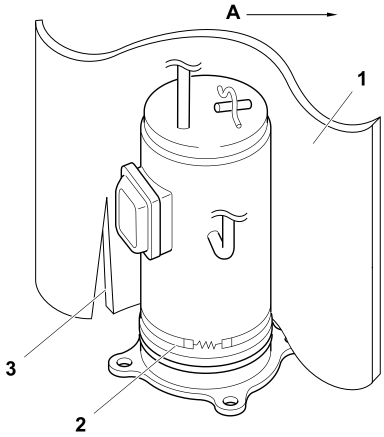


1. Upper Cover.
2. Check joint.
3. Rear panel.
4. Crankcase heater.
5. Rear pipe cover.
6. Valve stay

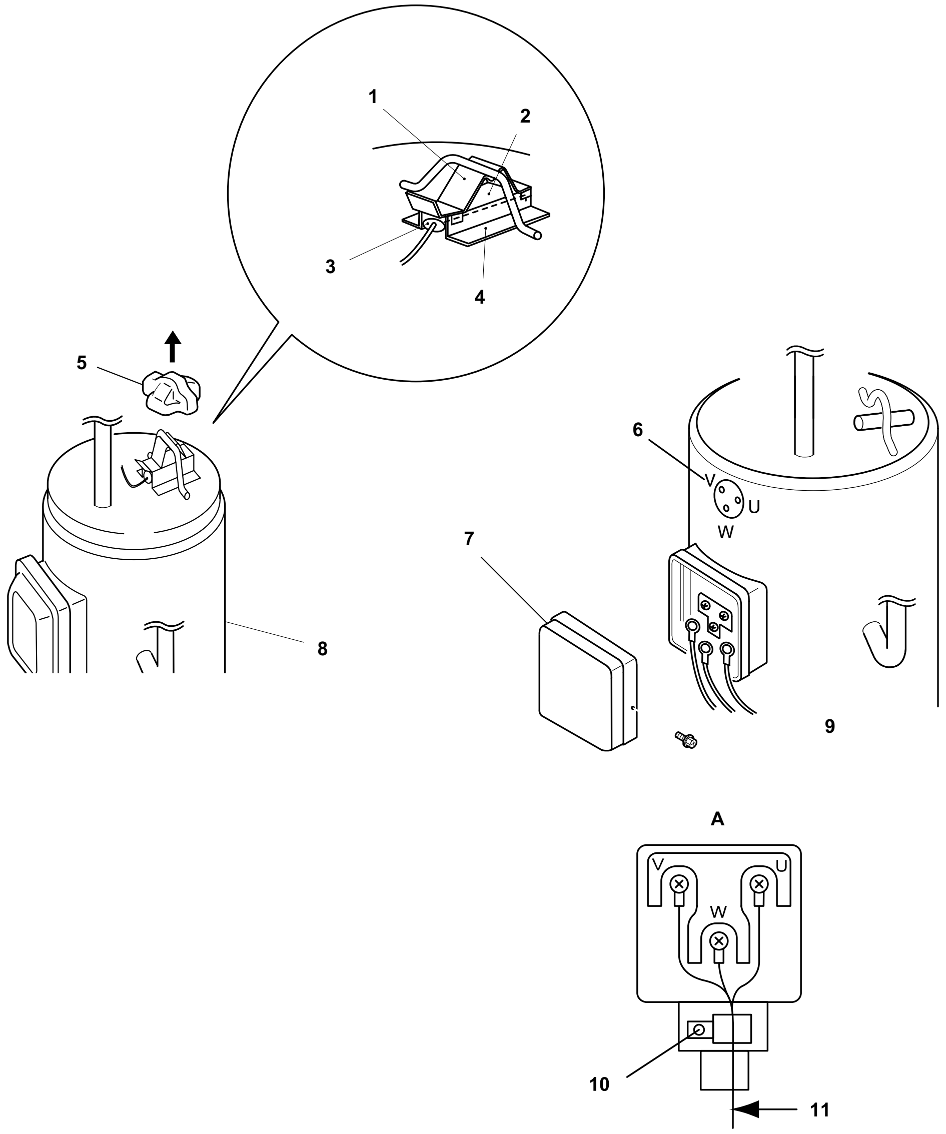
NOTE

- ***Check and take note of each terminal number and indications for its correct connection at the reassembling process. If wires are connected in incorrect order it will lead to a compressor failure.***

4. Remove the rubber cap and the thermistor on the top of the compressor.
5. Remove the crankcase heater. (Oil heater on the lower case).



1. Sound-proof cover.
2. Oil heater.
3. Cut part.
4. Direction to remove the cover.



1. Thermistor holder.
2. Holder.
3. Td Thermistor.
4. Thermistor fixing plate.
5. Rubber cap Th Thermistor.
6. Indication of terminal number.
7. Terminal box cover.
8. Compressor.
9. Compressor wires.
10. Fix it with screw.
11. Compressor wires (3 wires).

A. Details for compressor terminals.

NOTE

- ***Do not expose the refrigerant cycle to the atmosphere for a long period in order to avoid water and foreign particles entering into the refrigerant cycle. After removing the compressor replace it quickly. If it is exposed to the ambiance for a long period seal both suction and discharge pipes.***
- ***Remove the cap for the compressor just before replacing the compressor. Before assembling the compressor seal the suction pipe and discharge pipe with tape to protect the compressor interior from foreign particles. Remove the tape when connecting the pipes.***

DANGER

- ***All compressor pipes must be brazed to be connected to the refrigerant circuit. Ensure that all the surrounding is free of flammable objects and liquids when performing piping brazing work.***

6 Remove the suction pipe and the discharge pipe from the compressor. Isolate the wires and electrical components to protect them from the burner flame when brazing the connection pipes.

7 Remove the two (2) nuts fixing the compressor and remove the compressor from the unit by lifting it. Slightly incline it forward and lift.

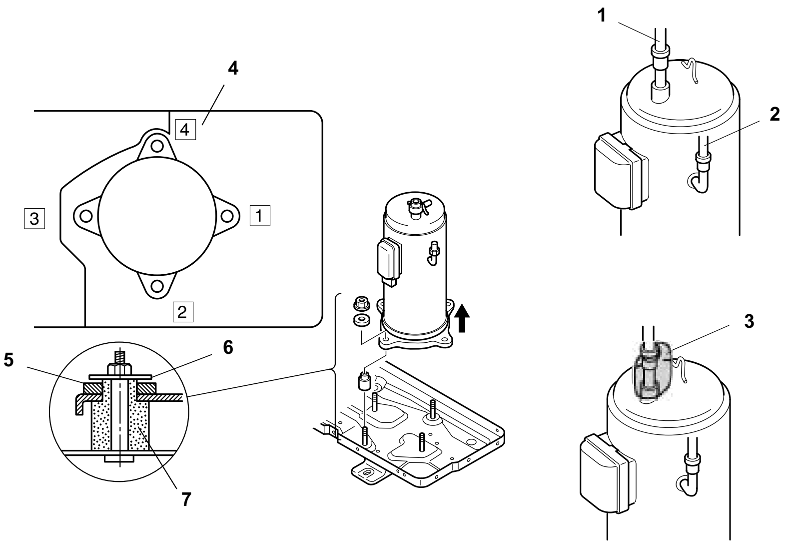
8 For brazing the compressor connection pipes first cool down the compressor piping side covering it with wet cloth. Then brazing material will not enter into the compressor. If the brazing material enters the compressor it will cause compressor failures.

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

- Tighten the screws (U V and W) for compressor wires with 2.5 Nm.
- Fix the lead wire firmly.

NOTE

- ***Fix the lead wire for the compressor firmly using a cable tie to avoid contacting the metal sheet sharp edges and the high temperature piping.***

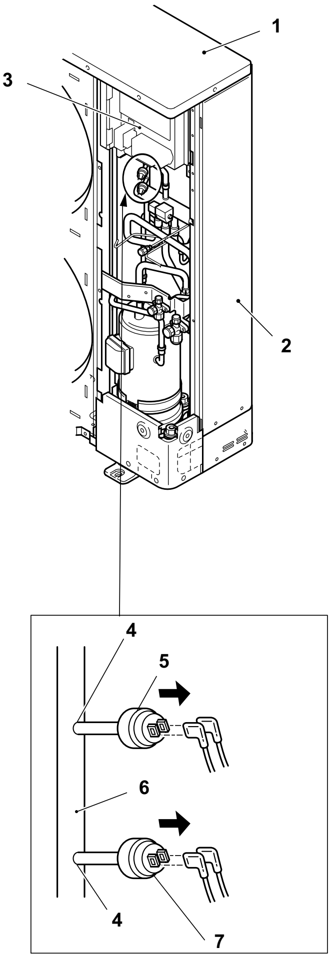


1. Suction pipe.
2. Discharge pipe.
3. Cover pipes with wet cloth.
4. See compressor position table below.
5. Vibration-Proof rubber 2.
6. Nut and washer.
7. Vibration-Proof rubber 1.

Fixation of the compressor to the bottom plate				
Compressor position	1	2	3	4
Vibration-proof rubber 1	x	x	x	x
Vibration-proof rubber 2	x	x	—	—
Nut	x	x	—	—

◆ Removing high pressure switch and control pressure switch

1. Remove the service cover according to the section *Removing service cover, see on page 385* in this chapter
2. Collect the refrigerant from the check joint according to the section *Removing the compressor, see on page 389* in this chapter.
3. Disconnect the fasten terminals from the pressure switches.
   - Cut the high pressure switch (63H1) and control pressure switch (63H2) from the brazing neck using a burner.

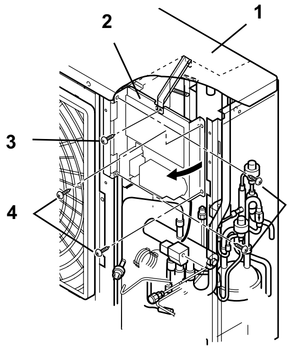


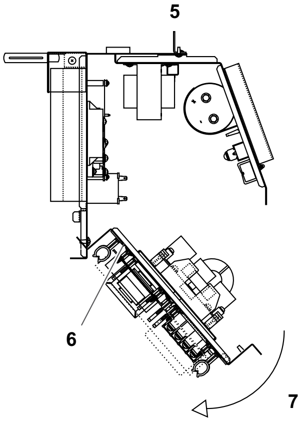
1. Upper cover box.
2. Rear cover.
3. Electrical box.
4. Brazing part.
5. Pressure switch for control (PSC).
6. Discharge pipe.
7. High pressure switch (PSH).

◆ Opening electrical box (P-mounting plate)

1 Remove the service cover according to the section *Removing service cover, see on page 385* in this chapter.

- Remove the six (6) screws fixing the electrical box. Open the P-mounting plate by rotating it 90 degrees to the left.





1. Upper cover.
2. P Plate.
3. Screw.
4. Two (2) screws.
5. Electrical box (view from top).
6. P-Mounting plate.
7. Opening direction of P-Mounting Plate.

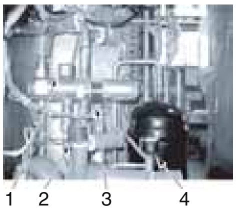
DANGER

- ***Check that the LED201 (red) located on the "W" surface PCB is OFF when opening the P-mounting plate.***
- ***Do not touch the electrical components when LED201 (Red) located on the "W" surface PCB is ON in order to avoid an electrical shock.***

◆ Removing the coils for the reversing and solenoid valves (SVA1 SVA2 and SVF)

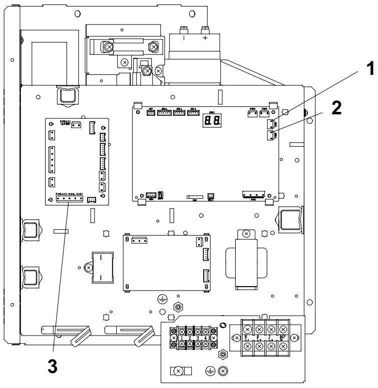
1 Remove the service cover according to the section *Removing service cover, see on page 385* in this chapter.
2 Open the P-mounting plate according to the section *Opening electrical box (P-mounting plate), see on page 393* in this chapter.

1. Electrical box.
2. Upper cover.
3. Rear cover.



1. SVA2.
2. SVF.
3. Reversing valve coil.
4. SVA1.

380-415V/50Hz



1: PCN7 (SVA2)

2: PCN6 (RVR)

3: PCN402 (SVA1 SVF)

NOTE

- ***Do not touch the electrical components when the LED201 (Red) located on surface “W” PCB is ON in order to avoid electrical shock.***
- ***Remove the connectors on the control PCB of the electrical box.***
- ***Remove the reversing valve coil by removing the screw fixing the coil.***

◆ Removing expansion valve coil

1 Remove the service cover according to the section *Removing service cover, see on page 385* in this chapter.
2 Open the P-mounting plate according to the section *Opening electrical box (P-mounting plate), see on page 393* in this chapter .

DANGER

- ***Check that the LED201 (red) located on the “W” surface PCB is OFF when opening the P-mounting plate.***
- ***Do not touch the electrical components when LED201 (Red) located on the “W” surface PCB is ON in order to avoid an electrical shock.***

3 Remove the CN5A connector on the control PCB of the electrical box.
4 Hold the expansion valve coil and slightly rotate then pull it up. Refer to the figure below to replace the electrical valve. The lock mechanism is equipped with the expansion valve coil. Check to ensure that the expansion valve coil is locked.

1. Pull out the electronic expansion valve coil upwards.

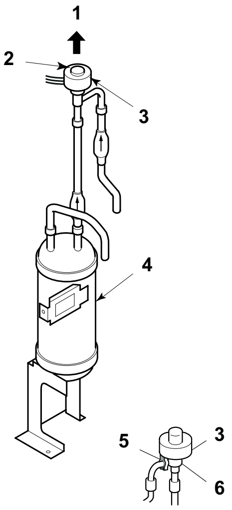
2. Release lock.

3. Electronic Expansion Valve Coil.

4. Liquid Tank.

5. Lock Part.

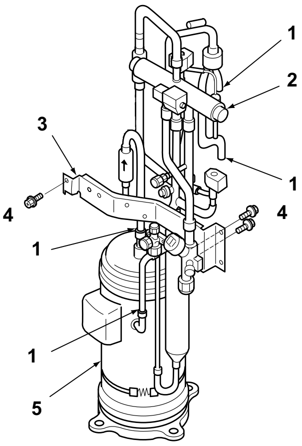
6. Electronic Expansion Valve.

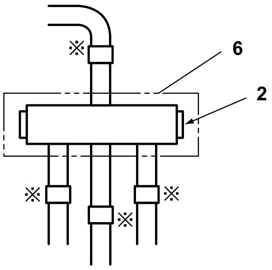


◆ Removing reversing valve

1. Remove the service cover and the rear service panel according to the section *Removing service cover, see on page 385* and *Removing the lower part of service panel and rear panel, see on page 387* in this chapter.
2. Collect the refrigerant from the check joint according to the section *Removing the compressor, see on page 389*.
3. Remove the reversing valve coil according to the section *Removing the coils for the reversing and solenoid valves (SVA1 SVA2 and SVF), see on page 393*.
4. Remove one (1) fixing screw for the valve-mounting plate.
5. Remove the stop valve at the gas side from the valve-mounting plate by removing the two (2) screws.
6. Remove the reversing valve assemblies from the 4 brazed parts where it is fixed. Remove the brazing of the reversing valve and the stop valve at the gas using a blowtorch. Cool down the piping side covering it with wet cloth in order to avoid brazing material entering the reversing valve. Protect the connecting wires and pipe insulation from the brazing frame.
7. Remove the reversing valves from its assemblies 4 brazed parts.
8. Perform the brazing with a blowtorch remove and reassemble the reversing valve by cooling the pipes first with wet cloth in order to avoid brazing material entering the reversing valve.
9. Reassemble the parts in the reverse order of removing procedures contained in this chapter. When SFV is removed fix it according to the section *Removing expansion valve, see on page 395* and the *Removing solenoid valve, see on page 396* contained in this chapter.

1. Brazing.
2. Reversing valve.
3. Mounting plate.
4. Screw.
5. Compressor.
6. Cover by wet cloth.

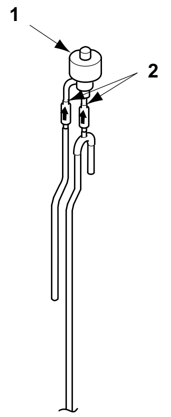




◆ Removing expansion valve

1. Remove the service cover and rear service panel according to the section *Removing service cover, see on page 385* and *Removing the lower part of service panel and rear panel, see on page 387*.
2. Collect the refrigerant from the check joint according to the section *Removing the compressor, see on page 389*.
3. Remove the coils according to the section *Removing the coils for the reversing and solenoid valves (SVA1 SVA2 and SVF), see on page 393*.
4. Remove the brazing as shown in the figure.

- Electronic Expansion Valve (EV0): 2 brazing parts.
- Perform the brazing to remove and reassemble the electronic expansion valve by cooling with wet cloth.
- Protect the connecting wires and pipe insulation from brazing flame.



1. Expansion valve (EV0).
2. Brazing part.

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

6 Removing solenoid valve

1 Remove the service cover and the rear service panel according to the sections *Removing service cover, see on page 385* and *Removing the lower part of service panel and rear panel, see on page 387* described in this chapter .

2 Collect the refrigerant from the check joint according to the section *Removing the compressor, see on page 389* in this chapter.

3 Remove the solenoid valve coil according to the section *Removing the coils for the reversing and solenoid valves (SVA1 SVA2 and SVF), see on page 393* in this chapter.

4 Remove the brazing and flare nuts as shown in the figure. Using a blowtorch and previously cooling the pipe side with wet cloth in order to avoid brazing material entering the reversing valve.

- Solenoid Valve (SVA1): 2 brazing parts
- Solenoid Valve (SVA2): 2 brazing parts
- Solenoid Valve (SVF): 2 brazing coils

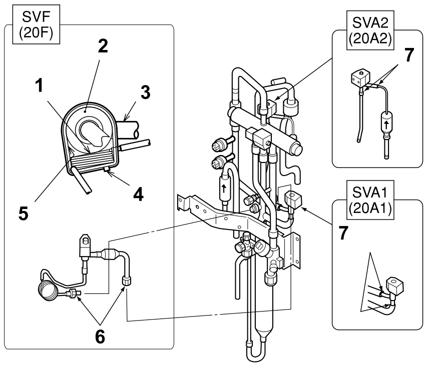
5 Perform the brazing to remove and reassemble the solenoid valve.

6 Protect the connecting wires and pipe insulation from the brazing flame.

7 Remove the flare nuts with two spanners to avoid twisting.

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

Fix the solenoid valve SVF as shown in the figure below.



1. Attach capillary tube with pipe insulation closely.
2. Pipe insulation.
3. S-Pipe.
4. Fix by cable tie.
5. Wind butil sheet around strainer and capillary tube.
6. Flare connection.
7. Brazing.

◆ Removing electrical components

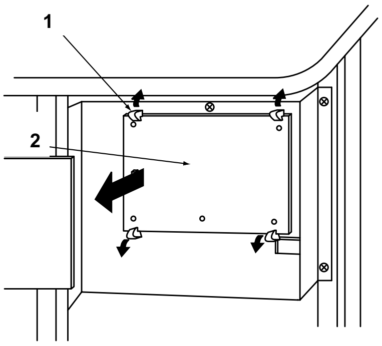
DANGER

- ***Check that the LED201 (red) located on the "W" surface PCB is OFF when opening the P-mounting plate.***
- ***Do not touch the electrical components when LED201 (red) located on "W" surface PCB is ON in order to avoid an electrical shock.***

1 Remove the service cover according to section *Removing service cover, see on page 385* in this chapter.

  - Disconnect all the connectors in the PCB.
  - Remove the PCB by sliding four (4) holders in the arrow direction.
  - Remove the PCB for power distribution of the compressor and the motor.

To remove the PCB slide the four (4) holders in the arrow direction.

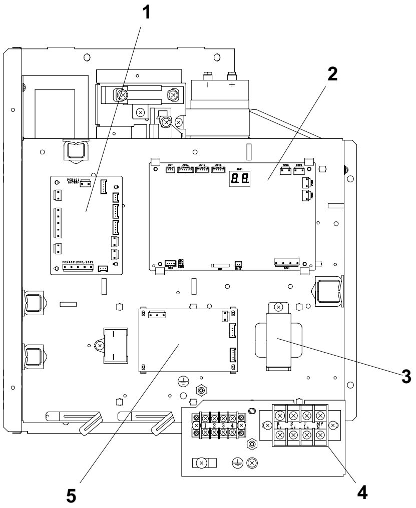


1. Holder (4 pcs.)
2. PCB1 for control

2 Removing the relay PCB

  - Remove the service cover according to the section *Removing service cover, see on page 372* in this chapter.
  - Disconnect all the wires connected to the relay PCB.

380-415V/50Hz 380V/60Hz



1. PCB3.
2. PCB1 for control.
3. Transformer.
4. Terminal board.
5. PCB5.

◆ Removing inverter components

1. Remove the service cover according to the section *Removing service cover, see on page 372* in this chapter.
2. Open the P-mounting plate by rotating 90 degrees to the left according to the section *Opening electrical box (P-mounting plate), see on page 393* in this chapter.

DANGER

- ***Check that the LED201 (red) located on the "W" surface PCB is OFF when opening the P-mounting plate.***
- ***Do not touch the electrical components when LED201 (Red) located on the "W" surface PCB is ON in order to avoid an electrical shock.***

DANGER

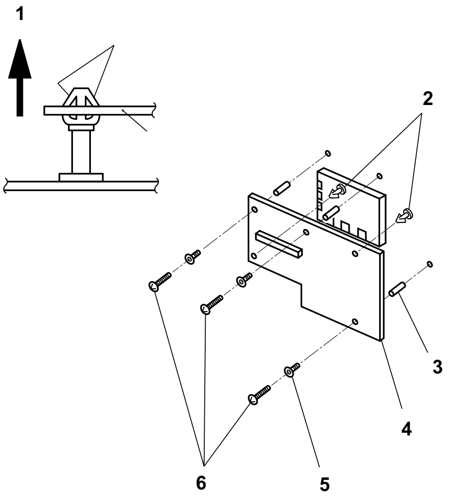
- ***Do not touch the electrical parts when LED201 (Red) on the PCB2 is lit to prevent from an electrical shock.***
- ***When replacing the transistor module (IPM) and diode module (DM) on heat radiation fin slightly apply the heat conducting silicon grease (Manufacture: Shin-Etsu Chemical Co. Ltd Product No.: G-746) over the fin contact surface.***
- ***Identify the terminal numbers with mark band. When reassembling the terminals have to be connected to the correct numbers . If incorrectly connected malfunctions or damages will occur.***
- ***Correctly insert two wires of U and V phases for the power cable of inverter compressor into the current sensor CTU and CTV on PCB2. Connect Phase U power cable with the current sensor CTU and CTV on PCB2. Connect the Phase U power cable with the current sensor Phase U (CTU) and Phase V power line with current sensor Phase V (CTV). If connected incorrectly malfunction or electrical component damage will occur.***
- ***When mounting PCB and the sheet metal part for PCB pay attention not to clamp the electrical wiring together.***
- ***Screws bushes and collars are used for fixing inverter PCB. Check to ensure that the bushes and collars are used for PCB remounting. If not used it may cause malfunction.***
- ***In case of replacing control PCB set all the dip switches as the same position before replacing. If not malfunction may occur. Refer to the manual attached with the service PCB.***
- ***Do not apply strong force to the electric components and PCBs to avoid damage.***

Removing the PCB2

Check to ensure that the LED201 (Red) of the PCB2 is OFF.

After removing the three (3) M3 fixing screws remove the bushes and the collars from the PCB2. When reassembling the components attach those bushes and collars.

1. Middle part of holder.
2. Holder.
3. Collar.
4. PCB3.
5. Bush.
6. Screw (M3).



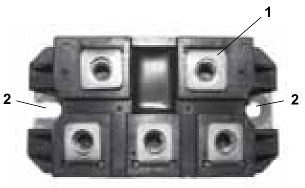
NOTE

- ***Identify the terminal numbers with mark band. When reassembling the terminals have to be connected to the correct numbers . If incorrectly connected malfunctions or damages will occur.***
- ***Check to ensure that the electrical wires will not be caught between the assembled electrical components and the mounting plates when the PCB2 is reassembled.***

◆ Removing diode module and transistor module

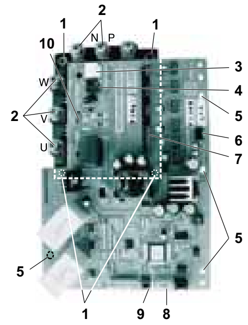
Check to ensure that the LED201 (Red) of the PCB2 is off.

Diode Module



1. 5 Screws (M5).
2. Fixing screw (M5).

PCB2 and transistor module



1. Screws for PCB2 (M3)
2. Screw (M5)
3. Fixing screws for transistor module (M4)
4. Led201
5. Screws for PCB (M3)
6. CN207

7.CN026

8. CN2

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

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

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

- Disconnect the wirings of connector CN2 CN206 and CN207.
- Disconnect the wirings from P N U V W on the transistor module.
- Remove the three (3) screws fixing the PCB2 and then remove the PCB2 from the transistor module.
- Remove the four (4) fixing screws on the transistor module.
- Remove the transistor module from the electrical box.

NOTE

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

◆ Removing other electrical components

1. Remove the service cover according to the section *Removing service cover, see on page 385* in this chapter.
2. Open the P-mounting plate by rotating it 90 degrees to the left according to the section *Opening electrical box (P-mounting plate), see on page 393* in this chapter.
3. Check to ensure the LED201 (Red) of the inverter PCB is off when opening P-mounting plate.
4. Remove other electrical components according to the procedure below and the figures on Chapter 10.

DANGER

- ***Check that the LED201 (red) located on the "W" surface PCB is OFF when opening the P-mounting plate.***
- ***Do not touch the electrical components when LED201 (Red) located on the "W" surface PCB is ON in order to avoid an electrical shock.***

NOTE

- ***Disconnect all the wires connected with the smoothing capacitor (CB CB1 CB2 CA).***
- ***The wire has polar characters. Identify the wire mark band and the indication on the smoothing capacitor when wire connecting.***
- ***Remove the two (2) screws fixing the smoothing capacitor and remove the smoothing capacitor.***
- ***Disconnect all the wires connecting with the magnetic contactor (CMC1).***
- ***Remove the two (2) screws fixing the magnetic contactor and remove the magnetic contactor.***
- ***Remove the four (4) screws fixing the reactor and remove the reactor (DCL).***
- ***Disconnect all the wires connected with the noise filter (NF1).***
- ***Remove the noise filter by clamping the top of the holder (6 portions) with a pincher.***
- ***Identify the terminal numbers with mark band. When reassembling the terminals have to be connected to the correct numbers . If incorrectly connected malfunctions or damages will occur.***

10.3 Servicing for ES Series

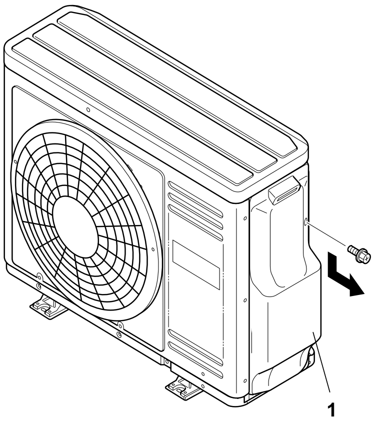
10.3.1 Outdoor Units RAS-(2/2.5)HVRN2 and RAS-3HVRNS2

◆ Removing pipe cover

Follow the procedure below to remove main parts and components. For mounting follow the reverse procedure of removal.

Do not expose the refrigerant cycle to the atmosphere for a long period to avoid moisture or dust entering into the cycle. Be sure to replace parts immediately after removing. Seal the refrigerant cycle when left unattached for a long period.

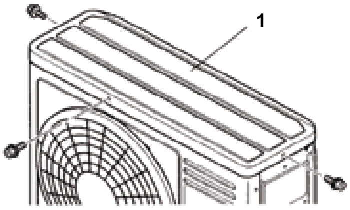
1 Remove pipe cover downward after removing one (1) screw.



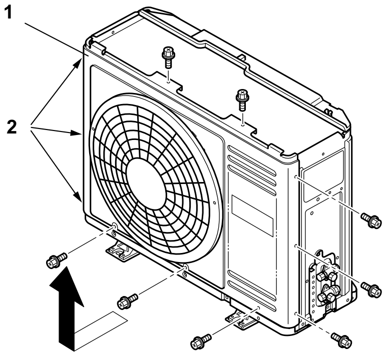
1. Pipe cover.

◆ Removing front cover

1 Remove the pipe cover following *Removing pipe cover, see on page 401*.
2 Remove three (3) fixing screws and remove the upper cover.
3 To remove the front cover remove eight (8) fixing screws and three (3) left nails.



1. Upper cover.



1. Front cover.

2. Nails.

◆ Removing outdoor fan

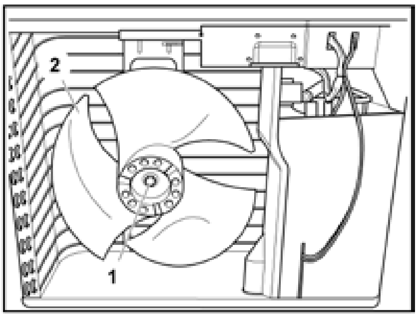
1 Remove the pipe cover following *Removing pipe cover, see on page 401*.
2 Remove three (3) fixing screws and remove the upper cover.
3 Remove the front cover following *Removing front cover, see on page 401*.
4 To remove the propeller fan remove the cap nut which fixes the propeller fan onto the motor shaft.

NOTE

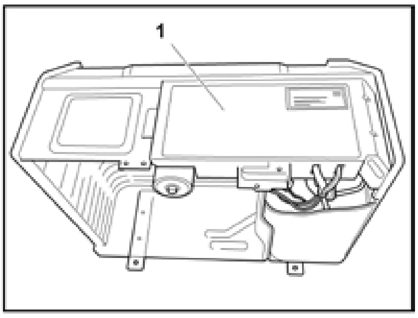
- ***Use a puller when the propeller fan and motor shaft are fixed too tightly.***
- ***The cap nut is left thread. For removal turn to the reverse direction to the propeller fan.***

5 Remove the electrical box cover.

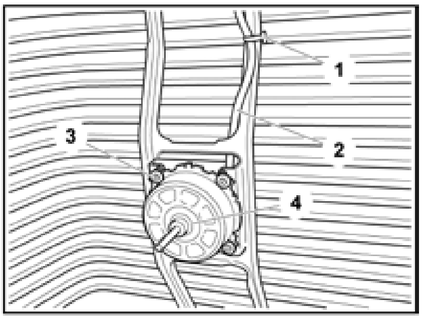
6 Remove the fan motor connector (CN24) inserted into the PCB in the electrical box.
Remove the fan motor lead wire fixed onto the motor clamp using a cord band.
Remove four (4) screws which fixes the motor.



1. Cap nut.
2. Propeller fan.



1. Electrical box cover.



1. Cord band.
2. Fan motor lead wire.
3. Four (4) screws.
4. Fan motor.

NOTE

- ***To mount the motor be sure to place the lead wire outlet downward.***
- ***Fix the motor lead wire onto the motor clamp using a cord band as before to avoid obstructing the propeller fan.***
- ***Mounting the propeller fan:***
  Insert the skidding protection part of the fan boss matching with the motor shaft notch; tighten the nut after the shaft screw fully comes out. (Tightening Torque 3.0 Nm).
- ***Connect the motor lead wire to the electrical box PCB. (To connect insert into the connector (CN24) on the PCB).***

◆ Removing the compressor

NOTE

Do not expose the refrigerant cycle to the atmosphere for a long period to avoid moisture or dust into the cycle. Be sure to replace the compressor immediately after removing. Seal to the suction and discharge pipes when the refrigerant cycle is left unattached for a prolonged time.

Remove the cap of new compressor right before the replacement. Before mounting the compressor seal the suction and discharge pipes with a tape to protect the compressor from dust. Remove the tape at pipe connection.

To connect wiring at reassembling ensure that the compressor terminal numbers and wiring mark band codes are matched. Incorrect wiring numbers may result in inverse rotation and damage the compressor.

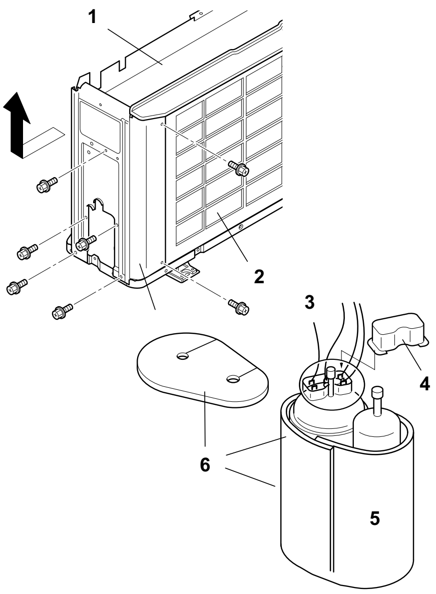
1 Remove the pipe cover following *Removing pipe cover, see on page 401*.
When the outdoor unit is installed close to a wall move the unit from the wall removing the refrigerant piping.

2 Collect the refrigerant from the check joint.

3 Remove the front cover following *Removing front cover, see on page 401*.

4 Remove seven (7) fixing screws and remove the side cover.

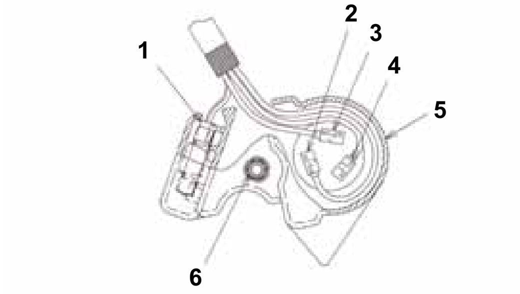
1. Electrical box.
2. Heat exchanger.
3. Compressor-top thermistor.
4. Compressor wiring.
5. Terminal cover.
6. Side cover Soundproof cover.



5 Open the soundproof cover wrapped around the compressor and remove the terminal box cover of the compressor body. Disconnect the compressor wires in the terminal box and remove the thermistor on top of the compressor.

- Check the wiring color and layout when disconnecting. Connecting wires in wrong order at reassembling may result in compressor damage.

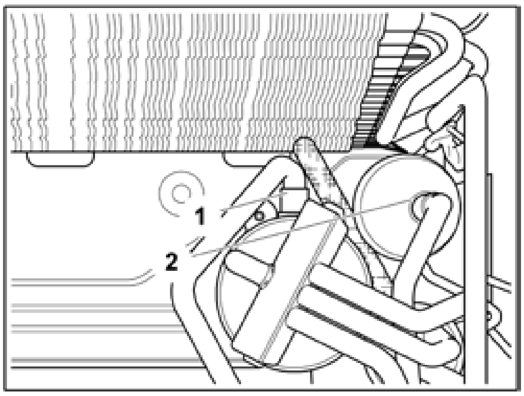
1. Compressor-Top Thermistor Mount onto Terminal Cover with Metal Fitting.
2. Yellow.
3. White.
4. Red.
5. Terminal cover.
6. M5 nut.



6 Remove the suction and discharge pipes from the compressor.

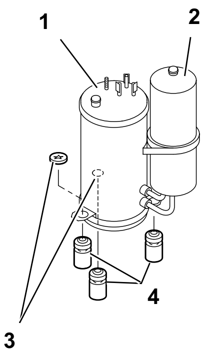
- Be sure to separate the blazing burner flame sufficiently from the wires and electrical components around the brazed part in order to avoid burning.

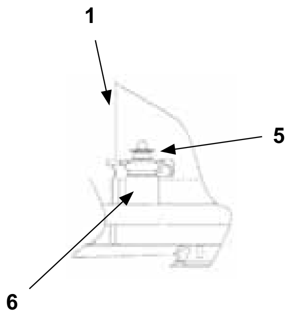
1. Blazing Discharge pipe.
2. Blazing Suction pipe.

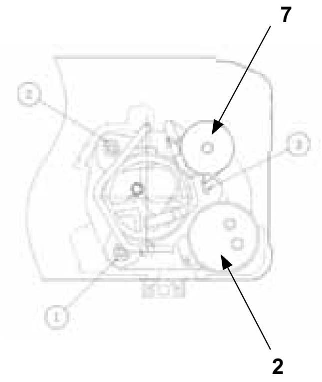


7 Remove push nuts A and B which fixes the compressor. Lift the compressor and remove from the unit body. (C in the figure does not have a push nut).

- **a.** Check if the Faston terminal has any abnormality when replacing the compressor. (Ensure the pull out force greater than 20 N)If the Faston terminal is identified faulty replace to a new one.
- **b.** Ensure the fixture of the lead wires.







1. Compressor.

2. Accumulator.

3. Push nut.

4. Vibration-proof rubber.

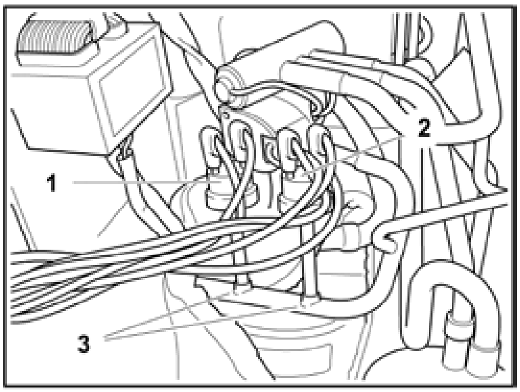
5. Two push nuts.

6. Three vibration-proof rubber.

7. Accumulator.

◆ Removing high pressure switch and pressure switch for control

1 Remove the pipe cover following *Removing pipe cover, see on page 401*.
2 Remove three (3) fixing screws and remove the upper cover.
3 Remove the front cover following *Removing front cover, see on page 401*.
4 Collect the refrigerant from the check joint.
5 Disconnect the Faston Terminals.
6 Remove the high pressure switch and the pressure switch for control from the brazed part of discharge piping.



1. High pressure switch.

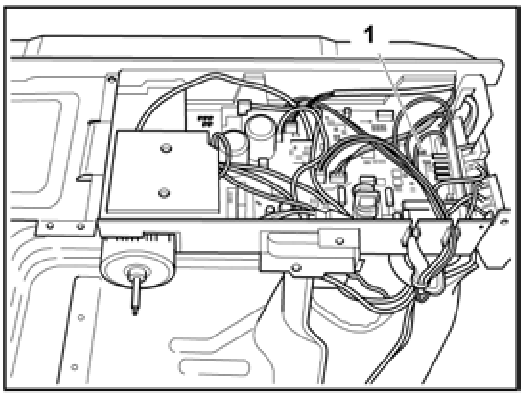
2. Pressure switch for control.

3. Brazing.

◆ Removing four-way valve coil

1 Remove the pipe cover following *Removing pipe cover, see on page 401*.
2 Remove three (3) fixing screws and remove the upper cover.
3 Remove the front cover following *Removing front cover, see on page 401*.
4 Remove the electrical box cover.
5 Disconnect the PCN6 connector on the control PCB of the electrical box.

1: PCN6 Connector (Green)

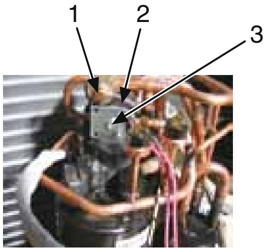


6 Remove one (1) fixing screw to remove the 4-way valve coil.

1. 4-way valve.

2. 4-way valve coil.

3. Screw.



NOTE

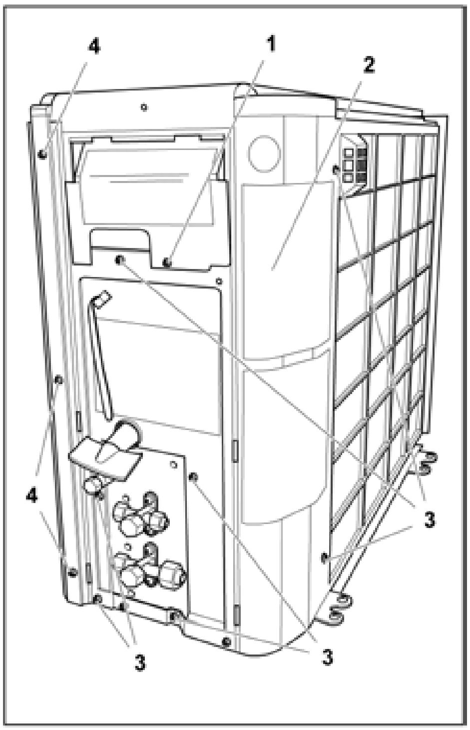
- ***DO NOT touch electrical components while the LED1 (Red) is ON to avoid electrical shock. Wait until the LED turns off.***

◆ Removing electronic expansion valve coil

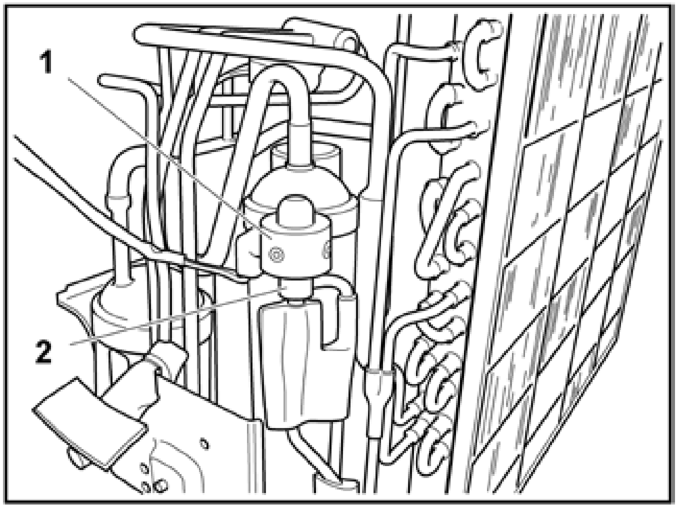
1 Remove the pipe cover following *Removing pipe cover, see on page 401*.
2 Remove three (3) fixing screws and remove the upper cover.
3 Remove the front cover following *Removing front cover, see on page 401*.
4 Remove the electrical box cover.
5 Remove seven (7) fixing screws and remove the side cover.

6 Remove the CN5A connector on the control PCB of the electrical box.

7 Hold and disconnect the coil of the expansion valve.The expansion valve coil is equipped with a lock mechanism.Ensure that the coil is locked when replacing.



1. One terminal cover screw.
2. Side cover.
3. Seven side cover screws.
4. Three front cover screws.



1. Expansion valve coil.
2. Expansion valve body.

NOTE

- ***DO NOT touch electrical components while the LED1 (Red) is ON to avoid electrical shock. Wait until the LED turns off.***

◆ Removing electrical components

Removing Electrical Box

1 Remove the pipe cover following *Removing pipe cover, see on page 401*.

2 Remove three (3) fixing screws and remove the upper cover.

3 Remove the electrical box cover.

4 Remove one (1) fixing screw and remove the terminal cover.

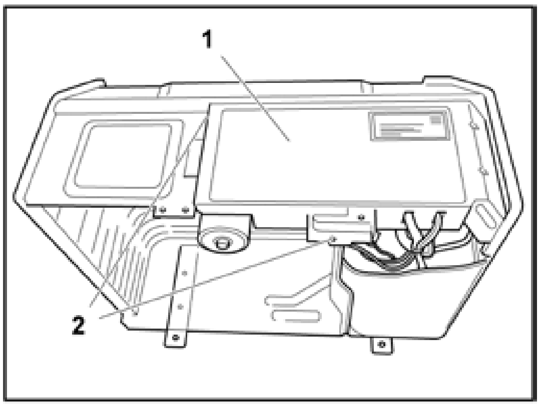
5 Disconnect all the wiring connected to the control PCB.

6 Remove two (2) screws which fix the electrical box.

7 Pull up and remove the electrical box.

1. Electrical box cover.

2. Two screws.



Removing Display PCB

1 Remove the pipe cover following *Removing pipe cover, see on page 401*.
2 Remove one (1) fixing screw and remove the terminal cover.
3 Disconnect all the wiring connected to the display PCB.
4 Hold the upper part of four (4) holders with long nose pliers and remove the display PCB.

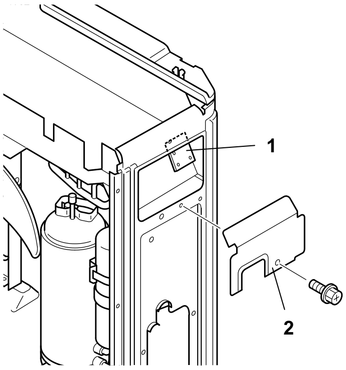
1. Display PCB (PWB2).

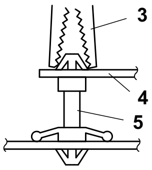
2. Terminal cover.

3. Long nose pliers.

4. Display PCB.

5. Holder.





NOTE

- ***DO NOT touch electrical components on the PCB. Pay attention not to bend or apply much force onto PCB in order to avoid PCB failure.***

NOTE

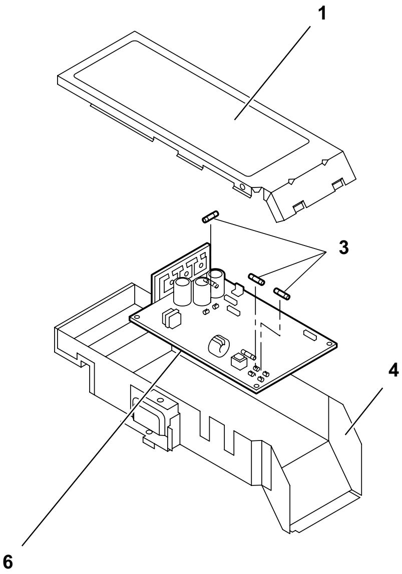
1 ***To connect wiring at reassembling ensure that the terminal numbers and wiring mark band codes are matched. Incorrect wiring may result in malfunction or damage of electrical components.***
2 ***Different dip switch setting shall be applied for each model when the electrical box is replaced; See chapter 8 "Troubleshooting".***
3 ***Pay attention not to clamp any wiring between plates or electrical components when closing electrical box cover or front cover at reassembling.***

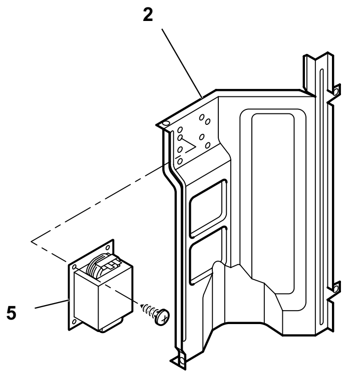
Removing other electrical components

1 Remove the pipe cover following *Removing pipe cover, see on page 401*.
2 Remove three (3) fixing screws and remove the upper cover.
3 Remove the electrical box cover.

4 Removing Electrical Components.
Remove the fixing screw and remove the reactor.

- To mount components be sure to match the wiring connection with the mark band codes.





1. Electrical box cover.
2. Partition plate.
3. Fuse.
4. Electrical box.
5. Reactor.
6. See the note.

NOTE

- ***The PCB cannot be removed from the electrical box. To replace PCB the entire electrical box must be replaced.***
- ***DO NOT touch electrical components while the LED1 (Red) is ON to avoid electrical shock. Wait until the LED turns off.***

10.3.2 Outdoor Units RAS-(4-6)H(V)RNS2E

◆ Removing service cover

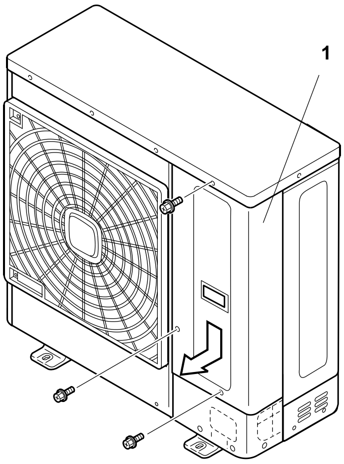
NOTE

Follow the procedure below to remove main parts and components. For mounting follow the reverse procedure of removal.

Do not expose the refrigerant cycle to the atmosphere for a long period to avoid moisture or dust entering into the cycle. Be sure to replace parts immediately after removing. Seal the refrigerant cycle when left unattached for a long period.

1 Pull downward and remove the service cover after removing three (3) upper and lower fixing screws.

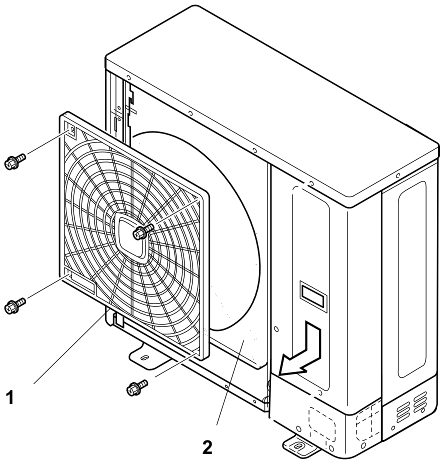
- Pay attention not to drop the service cover.



1. Service cover.

◆ Remove outlet grille

1 Remove four (4) screws which fix the outlet grille.

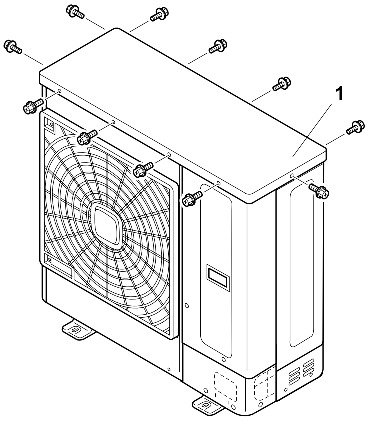


1. Air outlet grille.

2. Shroud.

◆ Removing upper cover

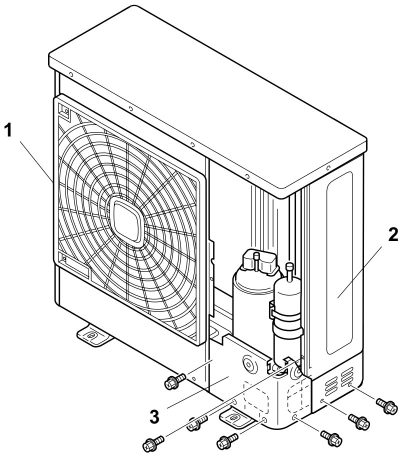
1 Remove the upper cover upward after removing nine (9) fixing screws.



1. Upper cover.

◆ Removing bottom service cover and rear cover

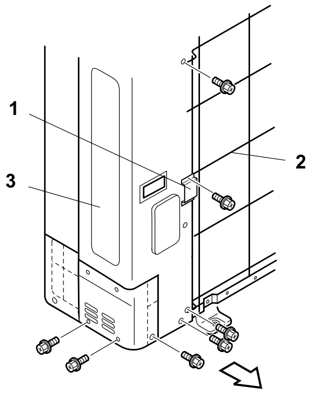
1. Remove five (5) screws which fix the bottom service cover. Pull and remove the bottom service cover.
2. Remove the upper cover following *Removing upper cover, see on page 409*.
3. Remove seven (7) screws which fix the rear cover (eight (8) screws for two-fan models; the inlet grill is fixed with four (4)). Pull backward and remove the rear cover.



1. Outlet grille.

2. Rear cover.

3. Bottom service cover.



1. Outdoor air thermistor attachment.

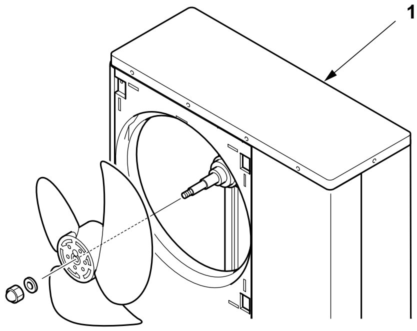
2. Inlet grille.

3. Rear cover.

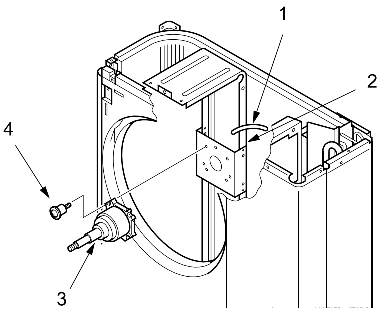
◆ Removing outdoor fan motor

1. Remove the service cover following *Removing service cover, see on page 408*.
2. Remove the outlet grille following *Remove outlet grille, see on page 409*.
3. Remove the upper cover following *Removing upper cover, see on page 409*.

4 To remove the propeller fan remove the cap nut and washer which fix the propeller fan onto the motor shaft. (Use a puller when the propeller fan and motor shaft are fixed too tightly).

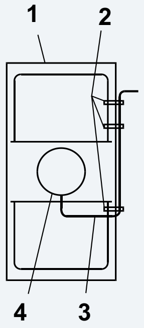


1. Upper cover.



1. Fan motor lead wire.
2. Motor clamp.
3. Motor.
4. Screw with spacer.

5 Remove the fan motor connector inserted into the electrical box DIP-IPM.
Cut the plastic tie with nippers which fixes the fan motor lead wire onto the motor clamp.
Remove four (4) screws which fix the motor.

Model	RAS-4H(V)RNS2E	RAS-5/6H(V)RNS2E
Connector pin location	DIP-IPM - CN202	
Motor fixing screws	4x M4 screws	4x M6 screws (with spacer)
		

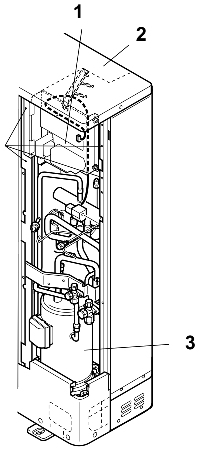
1. Motor clamp.
2. Plastic tie.
3. Wire.
4. Motor.

NOTE

1. ***To mount the motor be sure to place the lead wire outlet downward.***
   (Adjust the propeller fan and shroud not to contact with each other).
2. ***Fix the motor lead wire onto the motor clamp using a plastic tie as shown in the table on the previous page to avoid obstructing the propeller fan.***
3. ***Mounting propeller fan:***
   Insert the skidding protection part of the fan boss matching with the motor shaft notch; tighten the nut after the shaft screw fully comes out. (Tightening Torque 20 Nm)
4. ***Connect the motor lead wire to the electrical box DIP-IPM.***
   (Be sure to match colors of the PCB connectors and motor lead wire connectors).
5. ***Be sure to attach the outlet grill onto the shroud after replacing the fan motor.***

◆ Removing electrical box

1 Remove the service cover following *Removing service cover, see on page 408*.
2 Remove the upper cover following *Removing upper cover, see on page 409*.
3 Remove four (4) screws which fix the electrical box.
4 Pull up and remove the electrical box.



1. Electrical box.

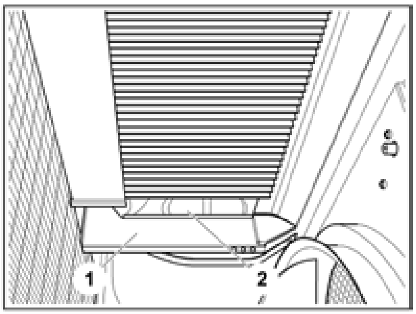
2. Upper cover.

3. Compressor.

NOTE

- ***Wiring must be removed to dismount the electrical box.***
  1. ***Remove the 4-way valve coil from the 4-way valve. : Removing four-way valve coil**, see on page 416.*
  2. ***Remove the expansion valve coil from the expansion valve. : Removing electronic expansion valve coil**, see on page 417.*
  3. ***Remove the solenoid valve coil from the solenoid valve. : Removing solenoid valve coil (20A)**, see on page 418.*
  4. ***Remove the Faston terminals of high pressure switch and the pressure switch for control from the switch body.***
  5. ***Remove connectors on the control PCB.***
     - ***THM7 (Outdoor Air).***
     - ***THM8 (Piping).***
     - ***THM9 (Compressor-top).***
     - ***PCN5 (Crankcase Heater).***
  6. ***Remove connectors on the DIP-IPM CN202***
  7. ***Remove the compressor power wire from the compressor.***
  8. ***To remount the electrical box attach the electrical box fitting with the partition plate.***
     (Insert the radiation fin into the U-notch on the partition plate and place the fin on the fan box side. Then attach the electrical box hooking onto the partition plate).

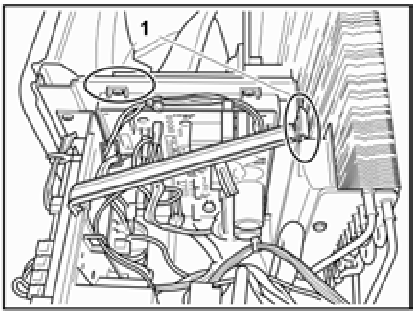
Correct installation



1. Partition Plate.

2. Place the electrical box onto the front fold of the partition plate (see correct installation).

Fan Box



1. Place to hook the part onto the partition plate.

◆ Removing the compressor

1. Remove the service cover upper cover bottom service cover and rear cover following *Removing service cover, see on page 408 Removing upper cover, see on page 409* and *Removing bottom service cover and rear cover, see on page 410*. When the outdoor unit is installed close to a wall remove the refrigerant piping and move the unit from the wall.
2. Remove the electrical box following *Removing electrical box, see on page 412*.
3. Collect the refrigerant from the check joint.
4. Remove the valve stay.

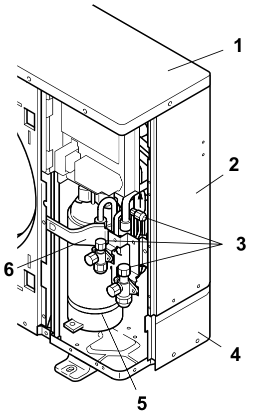
1. Upper cover.

2. Rear panel.

3. Check joint.

4. Rear pipe cover.

5. Crankcase heater.



5. Open the soundproof cover wrapped around the compressor and remove the terminal box cover of the compressor body. Disconnect the compressor wires in the terminal box and remove the thermistor on top of the compressor. Remove the soundproof cover.

- Check the terminal codes and mark bands when disconnecting the wires. Connecting wires in wrong order at reassembling may result in compressor damage.

6. Remove the rubber cap and the thermistor attached on top of the compressor.
7. Remove the crankcase heater.

NOTE

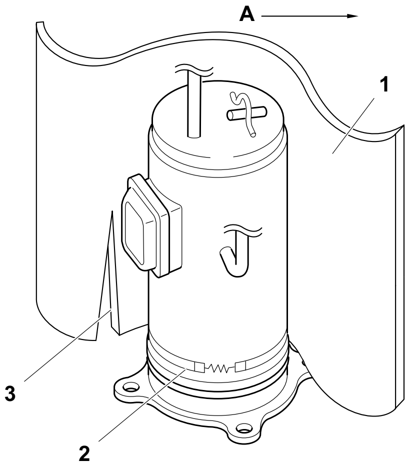
- ***Compressor piping must be connected by brazing. MAKE SURE that any flammable material is not around before heating with burner for the oil inside the piping may flame up.***
- ***Do not expose the refrigerant cycle to the atmosphere for a long period to avoid moisture or dust into the cycle. Be sure to replace the compressor immediately after removing. Seal the suction and discharge pipes when the refrigerant cycle is left unattached for a long period.***
- ***Remove the cap of new compressor right before the replacement. Before mounting the compressor seal the suction and discharge pipes with a tape to protect the compressor from dust. Remove the tape when blazing the pipe.***
- ***For piping at reassembling ensure that the compressor terminal numbers and wiring mark band codes are matched. Incorrect wiring numbers may result in inverse rotation and damage of the compressor.***

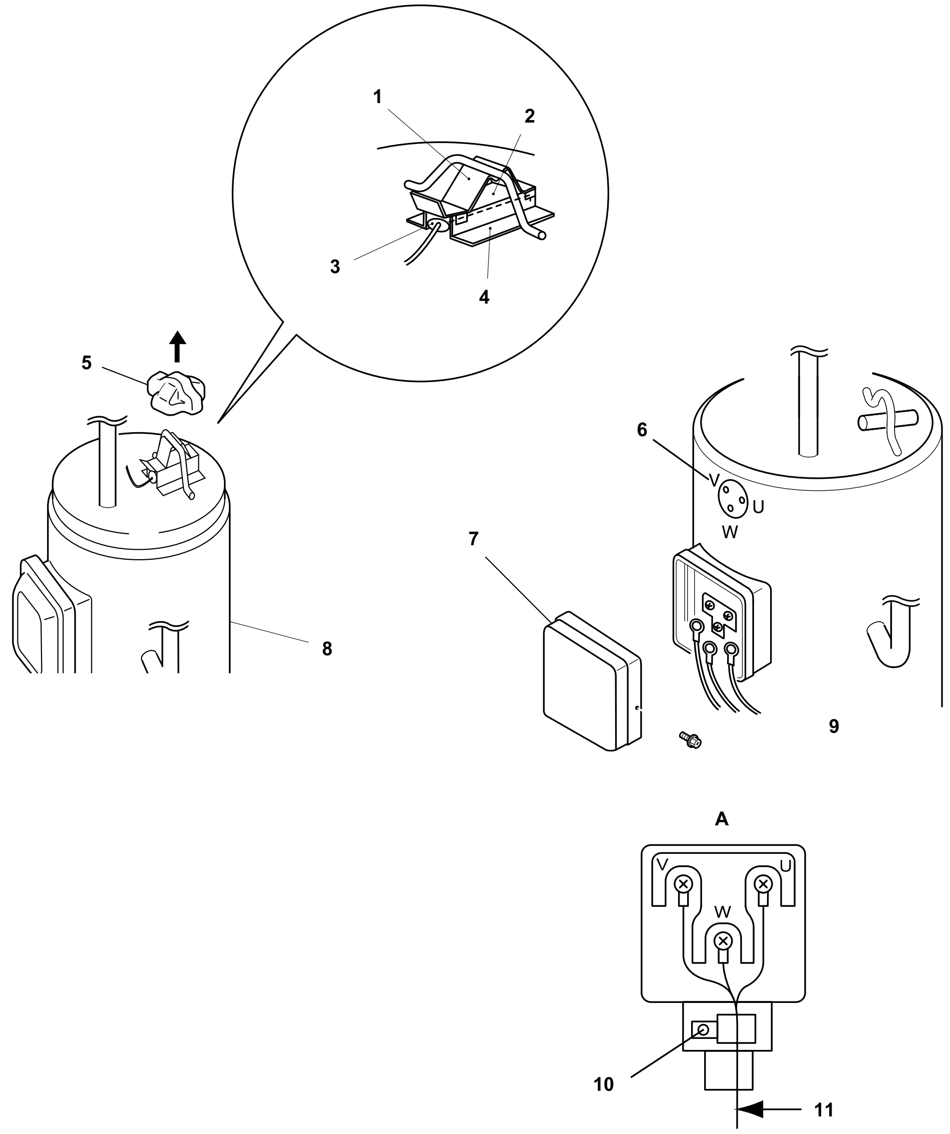
1. Soundproof cover.

2. Oil heater.

3. Cut part.

A. Direction to remove the cover.





1. Thermistor holder.

2. Holder.

3. Td Thermistor.

4. Thermistor fixing plate.

5. Rubber cap Th Thermistor.

6. Indication of terminal number.

7. Terminal box cover.

8. Compressor.

9. Compressor wires.

10. Fix it with screw.

11. Compressor wires (3 wires).

A. Details for compressor terminals.

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

- Be sure to separate the blazing burner flame sufficiently from the wires and electrical components around the brazed part in order to avoid burning.

9 Remove two (2) nuts which fix the compressor and remove the compressor. Lift the compressor and remove from the unit body.

NOTE

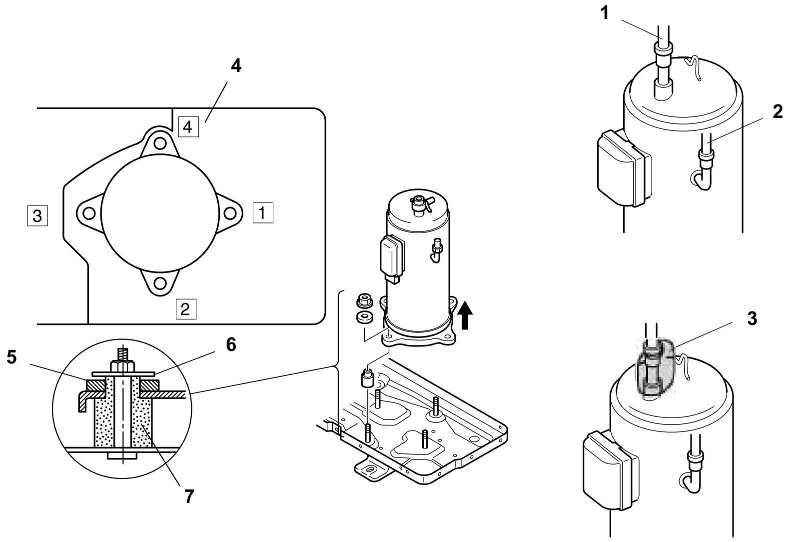
- ***To remove the compressor the liquid stop valve pipe should be moved (bent) to the right side hand. PAY CLOSE ATTENTION not to crush to break the pipe.***

10 When brazing the replaced compressor braze quickly cooling the pipes on the compressor side with wet cloth to avoid the filler metal entering into the compressor.

- PAY CLOSE ATTENTION not to let the filler metal enter into the compressor which may result in compressor damage.

a. Check if the Faston terminal has any abnormality. (Ensure the pull out force greater than 20 Nm) If the Faston terminal is identified faulty replace with a new one.

b. Ensure the fixture of the lead wires.



1. Suction pipe.
2. Discharge pipe.
3. Cover pipes with wet cloth.
4. See compressor position table below.
5. Vibration-Proof rubber 2.
6. Nut and washer.
7. Vibration-Proof rubber 1.

Fixation of the compressor to the bottom plate				
Compressor position	1	2	3	4
Vibration-proof rubber 1	x	x	x	x
Vibration-proof rubber 2	x	x	—	—
Nut	x	x	—	—

◆ Removing the high pressure switch and pressure switch for control

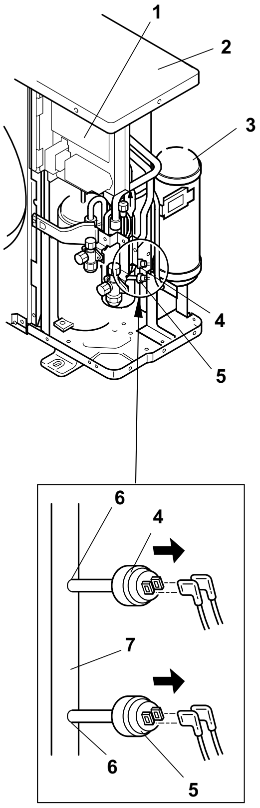
1 Remove the service cover bottom service cover and rear cover following *Removing service cover, see on page 408* and *Removing bottom service cover and rear cover, see on page 410*.

2 Collect the refrigerant from the check joint according to *Removing the compressor, see on page 413* in this chapter.

3 Remove the soundproof cover on the compressor.

4 Disconnect the Faston Terminals.
Remove the high pressure switch and the pressure switch for control from the brazed part of discharge piping.

1. Electrical box.
2. Upper cover.
3. Refrigerant amount controller.
4. Pressure switch for control.
5. High pressure switch.
6. Blazing.
7. Discharge pipe.



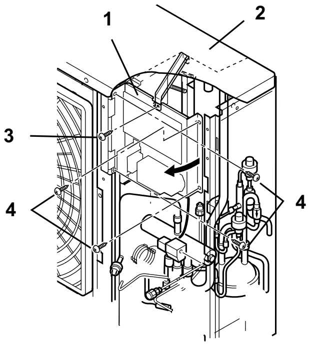
◆ Opening electrical box (P plate)

1 Remove the service cover following *Removing service cover, see on page 408* in this chapter.

2 Remove six (5) screws which fix the electrical box and open the P plate turning counter clockwise approximately 90°.

- Check that the LED201 (red) on the inverter PCB (PCB2) is OFF when opening P-mounting plate.

1. P Plate.
2. Upper cover.
3. Screw.
4. Two (2) screws.



DANGER

- ***DO NOT touch electrical components while the LED201 (Red) is ON to avoid electrical shock. Wait until the LED turns off.***

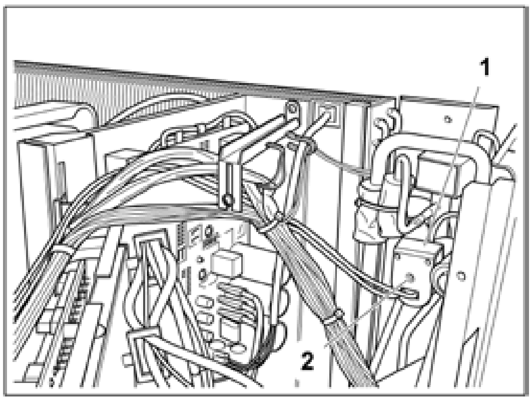
◆ Removing four-way valve coil

1 Remove the service cover following *Removing service cover, see on page 408*.

2 Open the P plate following *Opening electrical box (P plate), see on page 416***.**

3 Disconnect the PCN6 connector on the control PCB of the electrical box.

4 Remove one (1) fixing screw to remove the 4-way valve coil.



1. 4-way valve coil.
2. 4-way valve coil screw.

◆ Removing electronic expansion valve coil

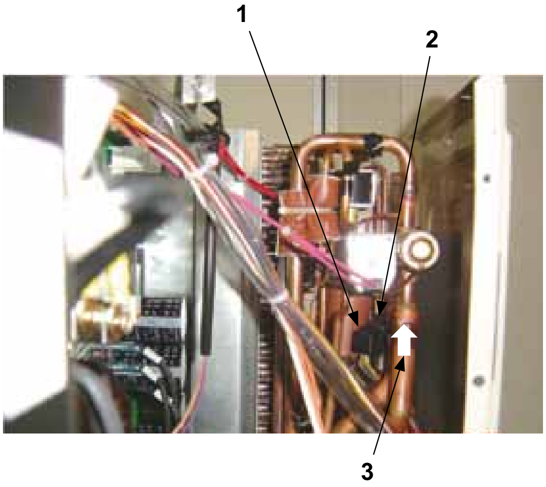
1 Remove the service cover following *Removing service cover, see on page 408*.

2 Open the P plate following *Opening electrical box (P plate), see on page 416*.

- Check that the LED201 (red) on DIP-IPM is OFF when the P plate is opened.

3 Disconnect the CN5A connector on the control PCB of the electrical box.

4 Hold the coil of the expansion valve and pull out upward.
The expansion valve coil is equipped with a lock mechanism. Ensure that the coil is locked when replacing.



1. Expansion valve coil.
2. Unlock.
3. Pull out upward.

DANGER

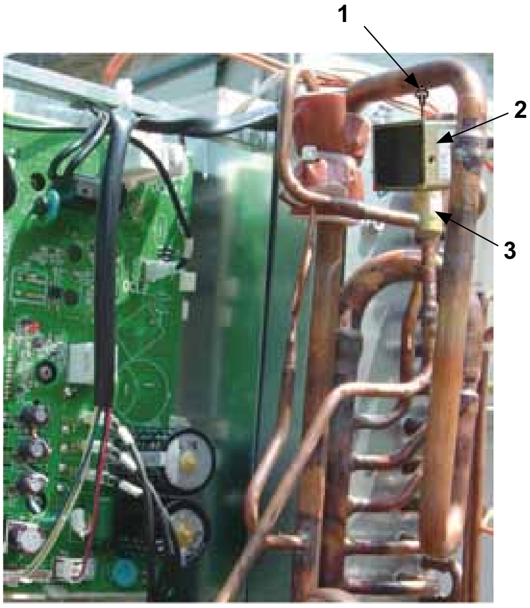
DO NOT touch electrical components while the LED1 (Red) is ON to avoid electrical shock. Wait until the LED turns off.

◆ Removing solenoid valve coil (20A)

1 Remove the service cover following *Removing service cover, see on page 372*.

2 Remove one (1) screw and remove the solenoid valve upward.

1. Solenoid valve coil screw.
2. Solenoid valve coil.
3. Solenoid valve.



◆ Removing electrical components

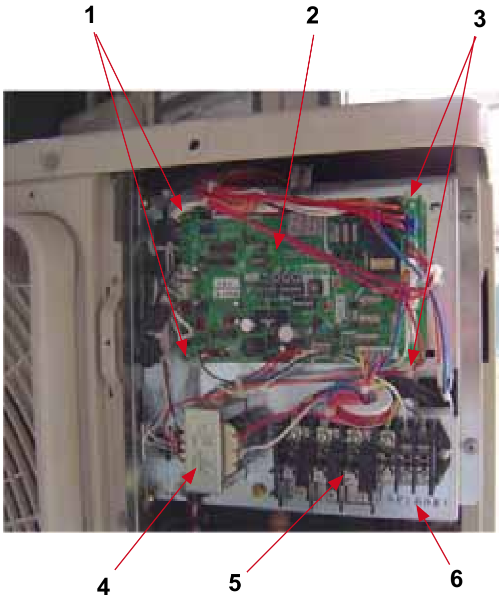
Removing control PCB

1 Remove the service cover following *Removing service cover, see on page 372*.

2 Remove all the wiring connected to the control PCB.

3 Move the four (4) holders to the direction marked with the arrow and remove the PCB.

1. Holder.
2. Control PCB.
3. Transformer.
4. Terminal board.
5. P Plate.



DANGER

DO NOT touch the electrical components on the PCB. Pay attention not to bend or apply much force onto PCB in order to avoid PCB failure.

Removing DIP-IPM

1 Remove the service cover following *Removing service cover, see on page 408*.

2 Open the P plate turning counter clockwise approximately 90° following *Opening electrical box (P plate), see on page 416*.

- Check that the LED201 (red) on DIP-IPM is OFF when the P plate is opened.

DANGER

- ***DO NOT touch electrical components while the LED1 (Red) is ON to avoid electrical shock. Wait until the LED turns off.***

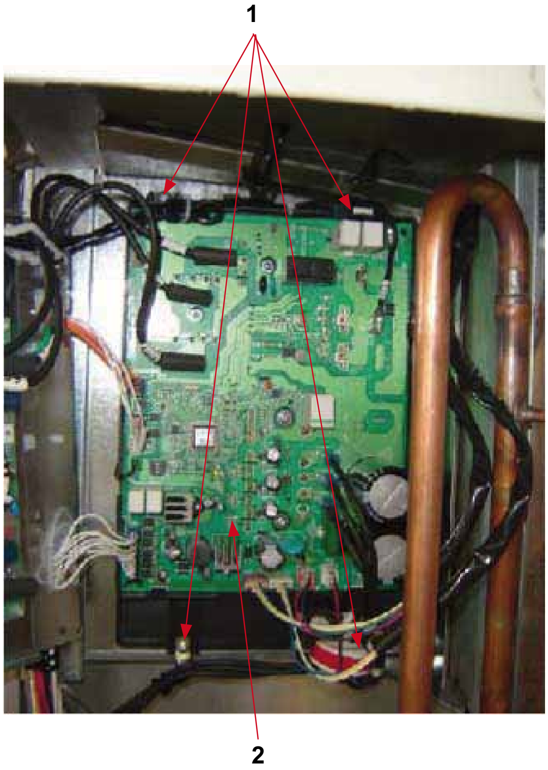
3 Remove all the wiring connected on the DIP-IPM.

4 Remove four (4) screws which fix the DIP-IPM.

5 Pull the DIP-IPM to the right viewed from the front of the product. (Remove along with the plastic case and the radiation fin).

1. Four (4) screws.

2. DIP-IPM.



Removing other electrical components

1 Remove the service cover following *Removing service cover, see on page 408*.

2 Open the P plate turning counter clockwise approximately 90° following *Opening electrical box (P plate).*

*, see on page 416*Check that the LED201 (red) on DIP-IPM is OFF when the P plate is opened.

DANGER

- ***DO NOT touch electrical components while the LED1 (Red) is ON to avoid electrical shock. Wait until the LED turns off***

3 Removing Each Electrical Component

- Remove the wiring connected to the electromagnetic contactor.
  (Use a Phillips screwdriver of size #3).
- Remove two (2) fixing screws and remove the electromagnetic contactor.
- Remove four (4) fixing screws and remove the reactor.
- Remove all the wiring connected to the noise filter.
- Hold the upper part of six (6) holders with long nose pliers and remove the noise filter.

To mount components be sure to match the wiring connection with the mark band codes.

View from P

10.3.3 Outdoor Units RAS-(8/10)HRNSE

◆ Removing service cover

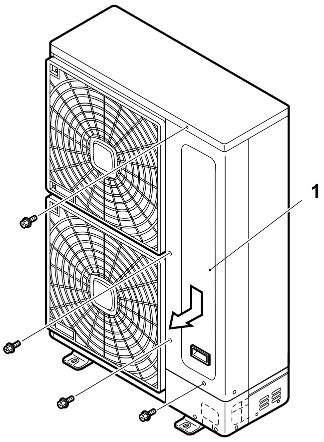
NOTE

Follow the procedure below to remove main parts and components. For mounting follow the reverse procedure of removal.

Do not expose the refrigerant cycle to the atmosphere for a long period to avoid moisture or dust entering into the cycle. Be sure to replace parts immediately after removing. Seal the refrigerant cycle when left unattached for a long period.

1 Remove the four (4) fixing screws slide the service cover downward and remove.

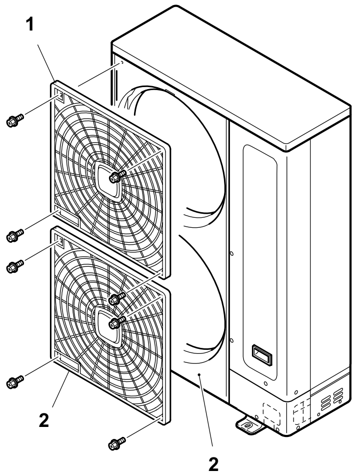
- Pay attention not to fall of the service cover.



1. Service cover.

◆ Removing air outlet grille

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

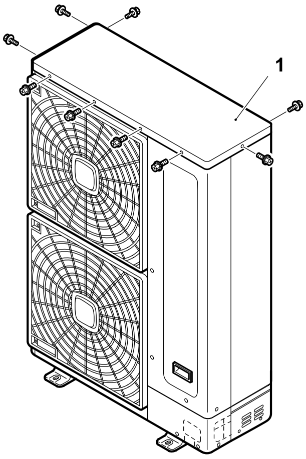


1. Air outlet grille.

2. Shroud.

◆ Removing upper cover

1 Remove nine (9) screws fixing the upper cover and remove the upper cover upward.



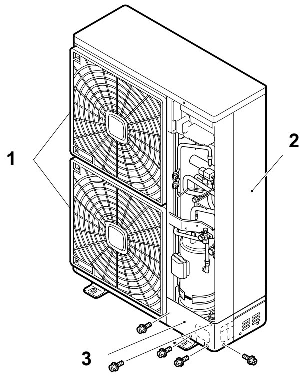
1. Upper cover.

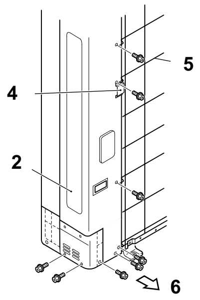
◆ Removing the bottom service cover and rear cover

1 Remove five (5) screws fixing the lower part of service cover and remove the lower part of service cover by pulling towards front side.

2 Remove the upper cover according to the item *Removing upper cover, see on page 421*.

3 Remove eight (8) screws fixing panel and remove the rear panel by pulling in the arrow direction.





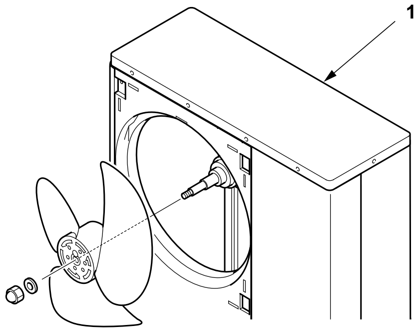
1. Air outlet grille.
2. Rear cover.
3. Lower part of service cover.
4. Fixing portion for outdoor temperature thermistor.
5. Air inlet grille (rear side).
6. Pull

NOTE

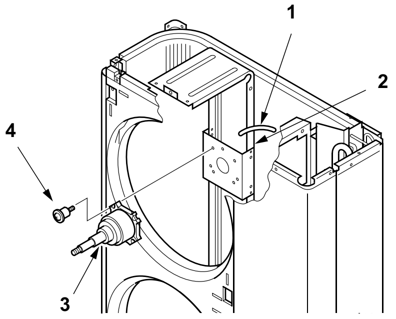
- ***DO NOT touch electrical components while the LED1 (Red) is ON to avoid electrical shock. Wait until the LED turns off.***

◆ Removing outdoor fan motor

1. Remove the service cover following Removing service cover, *see on page 420*.
2. Remove the outlet grille following Removing air outlet grille, *see on page 421*.
3. Remove the upper cover following Removing upper cover, *see on page 421*.
4. To remove the propeller fan remove the cap nut and washer which fix the propeller fan onto the motor shaft. (Use a puller when the propeller fan and motor shaft are fixed too tightly).

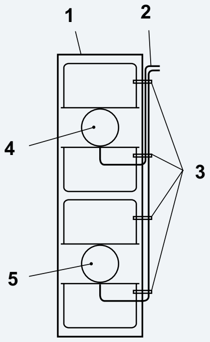


1. Upper cover.



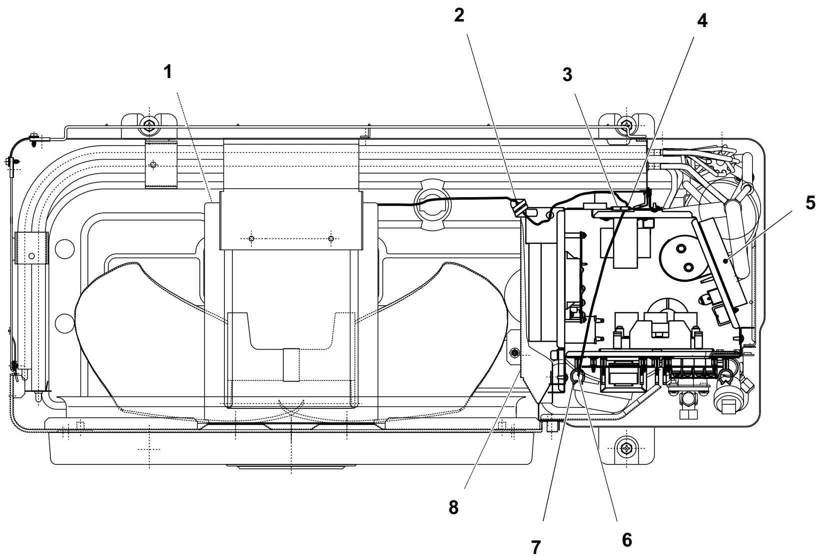
1. Fan motor lead wire.
2. Motor clamp.
3. Fan motor.
4. Screw with spacer.

5. Remove the fan motor connector from the PCB3 and PCB5 at the electrical box.
   Cut the plastic tie with nippers which fixes the fan motor lead wire onto the motor clamp.
   Remove four (4) screws which fix the motor.
6. Reassemble the parts in the reverse order of removing procedures.

Model		RAS-8/10HRNSE
Fan Motor Comp. Nº	DC Fan Motor	PCB5 PCN203 (White) CN201 (White)
	AC Fan Motor	PCB3 PCN404 (White)
Screw for motor fixing.	DC Fan Motor	4 x M6 screw (with spacer)
	AC Fan Motor	4x M6 screws
Motor clamp and wiring fixing position		 1. Motor clamp. 2. Fan motor lead wire. 3. Plastic tie. 4. DC Fan Motor. 5. AC Fan Motor.

NOTE

1. ***The motor lead wires must be through the route as shown in the figure. If not it may cause the disconnection to the fan motor lead wires.***
2. ***When mounting the motor ensure the cables point directly downward. Fix the protection tube edge downward to ensure the water may not keep in it.(Adjust the clearance between shroud and propeller fan so that they do not contact.)***
3. ***Fix the motor wires onto the motor clamp with a plastic tie to prevent them from obstructing the propeller fans.***
4. ***Mounting Propeller Fan.Insert the skidding protection part of fan boss in accordance with the cutting part of the motor shaft and fix the screw after exserting screw part of the shaft. (Tightening Torque of 20 Nm).***
5. ***When connecting the motor wire check to ensure that the colors of the connectors on the PCB3 and PCB5 are matched with wires.***



1. Motor clamp.

2. Fix the motor lead wires by the cord clamp.

3. Rubber Bush.

4. Pass the motor lead wires through the square hole of the electrical box.

5. Electrical Box.

6. Pass the motor lead wires through the harness lifter and connect them to the PCB3 (for MOF1) and PCB5 (for MOF2).

7. Harness Lifter.

8. Partition plate.

◆ Removing electrical box

1 Remove the service cover following *Removing service cover, see on page 420*.

2 Remove the upper cover following *Removing upper cover, see on page 421***.**

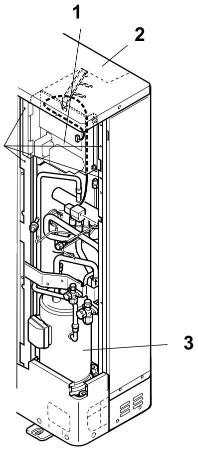
3 Remove four (4) screws which fix the electrical box.

4 Pull up and remove the electrical box.

1. Electrical box.

2. Upper cover.

3. Compressor.



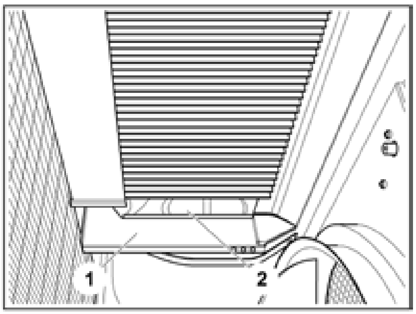
NOTE

- ***Wiring must be removed to dismount the electrical box.***
  1. ***Remove the 4-way valve coil from the 4-way valve. : Removing four-way valve coil**, see on page 431**.***
  2. ***Remove the expansion valve coil from the expansion valve. : Removing electronic expansion valve coil**, see on page 430**.***
  3. ***Remove the solenoid valve coil from the solenoid valve. : Removing Electronic expansion Valve and Sole-***

***noid Valve**, see on page 432.*

4. ***Remove the Faston terminals of high pressure switch and the pressure switch for control from the switch body.***
5. ***Remove connectors on the control PCB.***
   - ***THM7 (Outdoor Air)***
   - ***THM8 (Piping)***
   - ***THM9(Compressor-top)***
   - ***PCN5(Crankcase Heater)***
6. ***Remove connectors on the DIP-IPM CN202***
7. ***Remove the compressor power wire from the compressor.***
8. ***To remount the electrical box attach the electrical box fitting with the partition plate. (Insert the radiation fin into the U-notch on the partition plate and place the fin on the fan box side. Then attach the electrical box hooking onto the partition plate).***

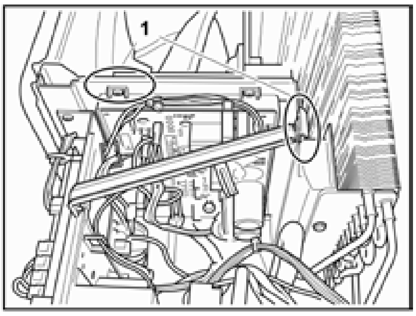
Correct installation



1. Partition Plate.

2. Place the electrical box onto the front fold of the partition plate (see correct installation).

Fan Box



1. Place to hook the part onto the partition plate.

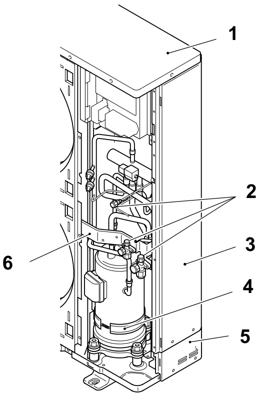
◆ Removing the compressor

1 Remove the service cover upper cover bottom service cover and rear cover following *Removing service cover, see on page 420 Removing upper cover, see on page 421* and *Removing the bottom service cover and rear cover, see on page 421*. When the outdoor unit is installed close to a wall remove the refrigerant piping and move the unit from the wall.

2 Remove the electrical box following *Removing electrical box, see on page 424*.

3 Collect the refrigerant from the check joint.

4 Remove the valve stay.



1. Upper Cover.

2. Check joint.

3. Rear panel.

4. Crankcase heater.

5. Rear pipe cover.

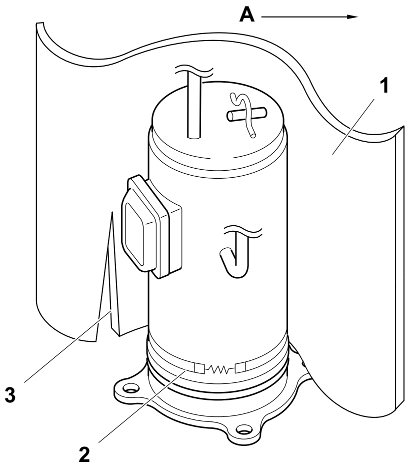
6. Valve stay

5 Open the soundproof cover wrapped around the compressor and remove the terminal box cover of the compressor body. Disconnect the compressor wires in the terminal box and remove the thermistor on top of the compressor. Remove the soundproof cover.

- Check the terminal codes and mark bands when disconnecting the wires. Connecting wires in wrong order at reassembling may result in compressor damage.

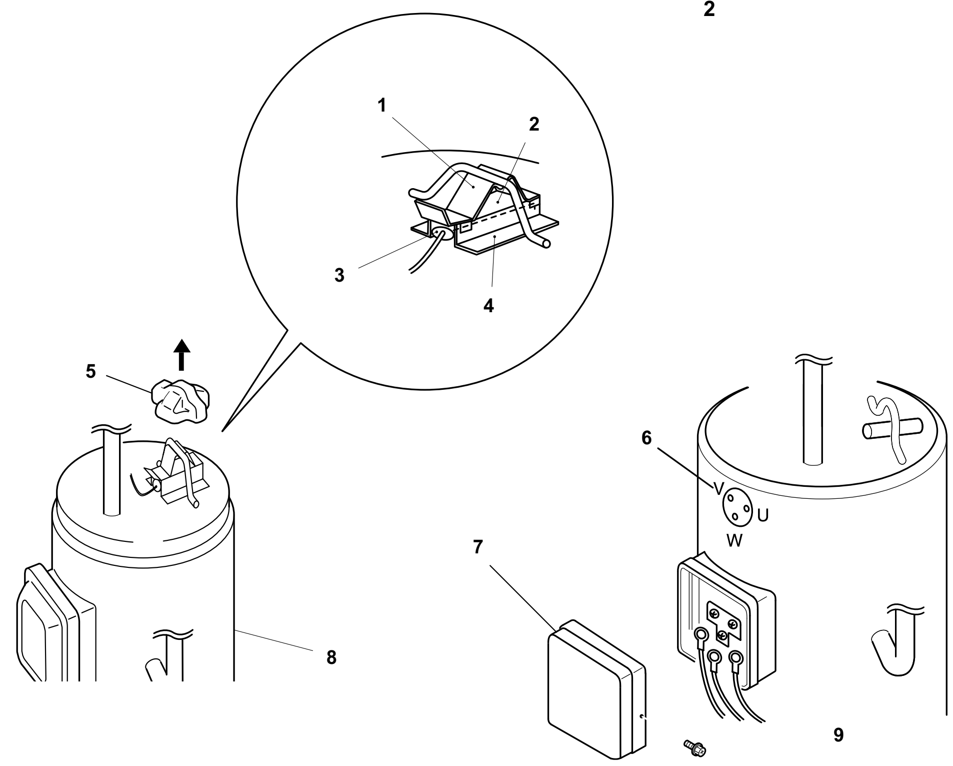
6 Remove the rubber cap and the thermistor attached on top of the compressor.

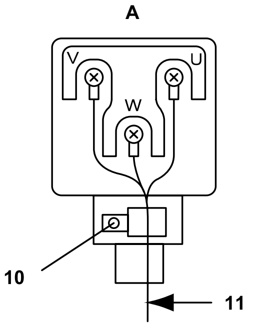
7 Remove the crankcase heater.



1. Sound-proof cover.
2. Oil heater.
3. Cut part.

A. Direction to remove the cover.





1. Thermistor holder
2. Holder
3. Td Thermistor
4. Thermistor fixing plate
5. Rubber cap Th Thermistor
6. Indication of terminal number
7. Terminal box cover
8. Compressor
9. Compressor wires
10. Fix it with screw
11. Compressor wires (3 wires)

A. Details for compressor terminals

NOTE

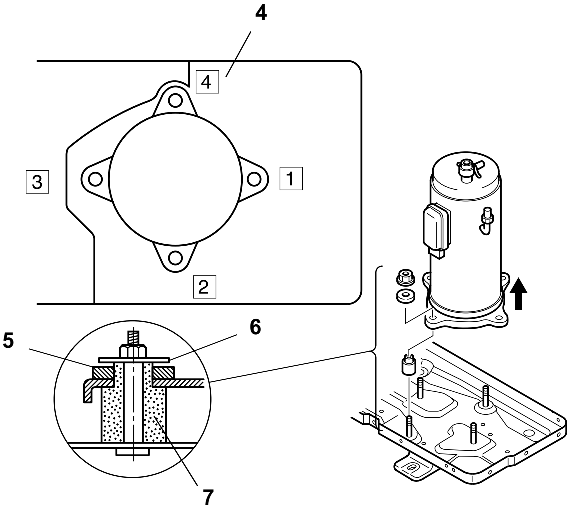
- ***Compressor piping must be connected by brazing. MAKE SURE that any flammable material is not around before heating with burner for the oil inside the piping may flame up.***
- ***Do not expose the refrigerant cycle to the atmosphere for a long period to avoid moisture or dust into the cycle. Be sure to replace the compressor immediately after removing. Seal the suction and discharge pipes when the refrigerant cycle is left unattached for a long period.***
- ***Remove the cap of new compressor right before the replacement. Before mounting the compressor seal the suction and discharge pipes with a tape to protect the compressor from dust. Remove the tape when blazing the pipe.***
- ***For piping at reassembling ensure that the compressor terminal numbers and wiring mark band codes are matched. Incorrect wiring numbers may result in inverse rotation and damage of the compressor.***

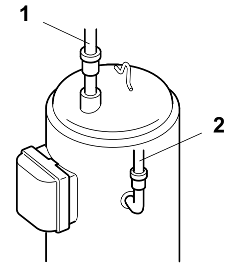
8 Remove the suction pipe and discharge pipe from the compressor.
  - Isolate the wires and electrical components to protect from the burner flame at brazing.

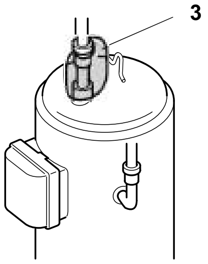
9 Remove two (2) nuts fixing the compressor and remove the compressor from the unit by lifting in the condition of slightly inclining forward.

10 When brazing the replaced compressor quickly perform the brazing while the compressor side piping is cooled with wet cloth in order to avoid the brazing material from entering the compressor. If the brazing material enters the compressor it will lead to compressor failure.

11 Reassemble the parts in the reverse order of removing procedures.
  - Tighten the screws (U V and W) for compressor wires with 2.5 Nm.
  - Fix the lead wire firmly.







1. Suction pipe.
2. Discharge pipe.
3. Cover pipes with wet cloth.
4. See compressor position table below.
5. Vibration-Proof rubber 2.
6. Nut and washer.
7. Vibration-Proof rubber 1.

NOTE

- ***Fix the lead wire for the compressor firmly not to contact with metal sheet edge and high temperature piping.***

Fixation of the compressor to the bottom plate				
Compressor position	**1**	**2**	**3**	**4**
Vibration-proof rubber 1	x	x	x	x
Vibration-proof rubber 2	x	x	—	—
Nut	x	x	—	—

◆ Removing High pressure switch and pressure switch for control

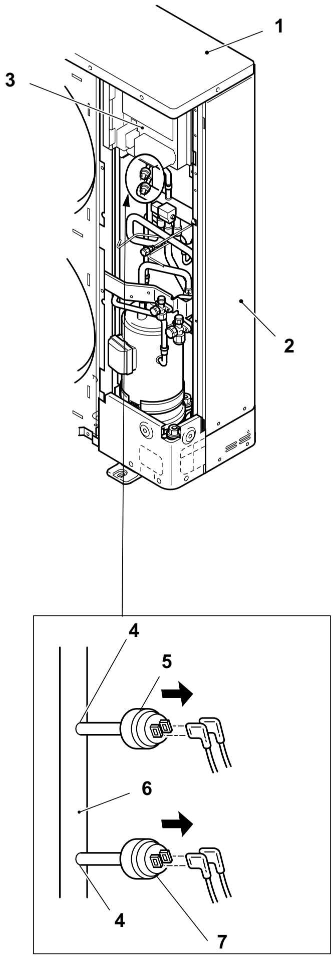
1 Remove the service cover according to the section *Removing service cover, see on page 420* .

2 Collect the refrigerant from the check joint according to the section *Removing the compressor, see on page 425*.

  a. Pull out the Faston terminals.

  b. Remove the high pressure switch (PSH) and pressure switch for control (PSC) from the brazing part of the discharge pipe.

1. Upper cover.
2. Rear cover.
3. Electrical box.
4. Brazing part.
5. Pressure switch for control (PSC).
6. Discharge pipe.
7. High pressure switch (PSH).



NOTE

- ***The capacitors (CB1 and CB2) are located on the pressure switch.***
- ***Pay attention not to touch the capacitors when removing work is performed. If not electrical shock may occur.***

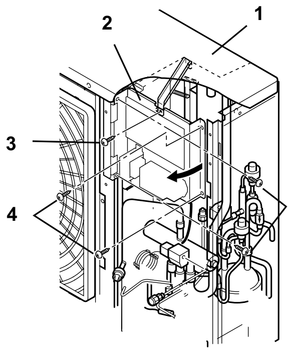
◆ Opening electrical box (P-Mounting Plate)

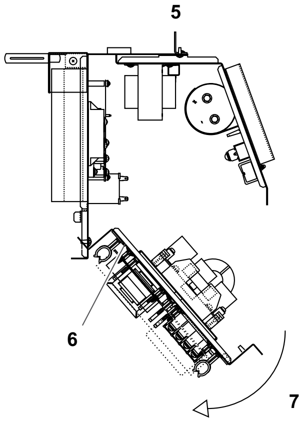
1 Remove the service cover following *Removing service cover, see on page 420*.

2 Remove six (6) screws which fix the electrical box and open the P plate turning counter clockwise approximately 90°.

- Check that the LED201 (red) on the inverter PCB (PCB2) is OFF when opening P-mounting plate.

1. Upper cover.
2. P Plate.
3. Screw.
4. Two (2) screws.
5. Electrical box (view from top).
6. P-Mounting plate.
7. Opening direction of P-Mounting Plate.





DANGER

- ***DO NOT touch electrical components while the LED201 (Red) is ON to avoid electrical shock. Wait until the LED turns off.***

◆ Removing reversing valve coil

1 Remove the service cover according to the item *Removing service cover, see on page 420*.

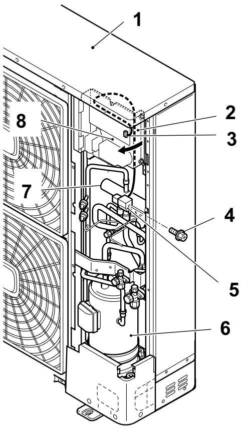
2 Check to ensure the LED201 (Red) of the inverter PCB (PCB2) is OFF.

NOTE

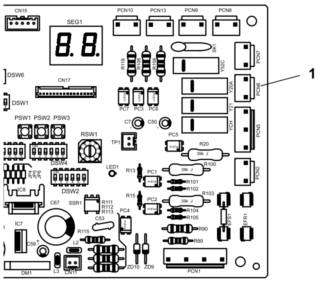
- ***DO NOT touch electrical components while the LED201 (Red) is ON to avoid electrical shock. Wait until the LED turns off.***

3 Remove the connector (PCN6) on the control PCB (PCB1) of the electrical box.

4 Remove the reversing valve coil by removing one (1) screw fixing the coil.



1. Upper cover.
2. Power Plate.
3. PCN6.
4. Fixing screw for reversing valve coil.
5. Reversing valve coil.
6. Compressor.
7. Reversing valve.
8. Electrical Box.



1. PCN6.

◆ Removing electronic expansion valve coil

1 Remove the service cover following *Removing service cover, see on page 420*.

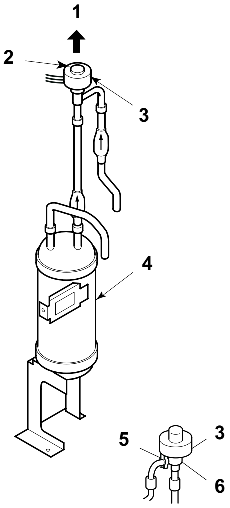
2 Open the P plate following *Opening electrical box (P-Mounting Plate), see on page 429*.

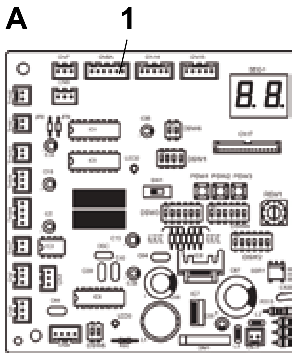
- Check that the LED201 (red) on DIP-IPM is OFF when the P plate is opened.

3 Disconnect the CN5A connector on the control PCB of the electrical box.

4 Hold the coil of the expansion valve and pull out upward.
The expansion valve coil is equipped with a lock mechanism. Ensure that the coil is locked when replacing.

1. Pull out the electronic expansion valve coil upwards.
2. Release lock.
3. Electronic Expansion Valve Coil.
4. Liquid Tank.
5. Lock Part.
6. Electronic Expansion Valve.





1. CN5A.

A. PCB1.

NOTE

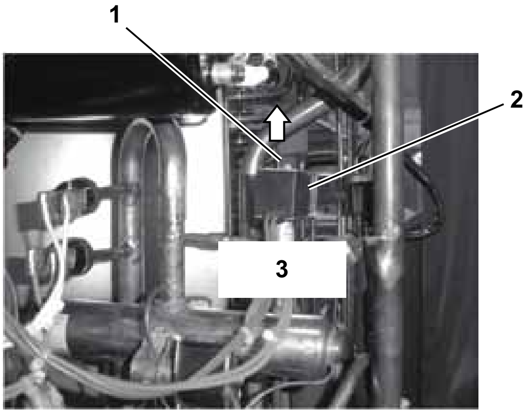
- ***DO NOT touch electrical components while LED1 (Red) is ON to avoid electrical shock. Wait until the LED turns off.***

◆ Removing solenoid valve coil (20A)

1 Remove the service cover following *Removing service cover, see on page 420*.

2 Open the P-mounting plate. Check to ensure the LED201 (Red) of the inverter PCB (PCB2) is OFF.

3 Pull the solenoid valve coil upwards by removing one (1) screw fixing the coil.



1. Fixing Screw for Solenoid Valve Coil.

2. Solenoid Valve (SVA).

3. Pull it upwards.

◆ Removing four-way valve coil

1 Remove the service cover and rear service cover according following the *Removing service cover, see on page 420* and the *Removing the bottom service cover and rear cover, see on page 421*.

2 Collect the refrigerant from the check joint following the *Removing the compressor, see on page 425*.

3 Remove the reversing valve coil following the *Removing reversing valve coil, see on page 429*.

4 Remove one (1) fixing screw and a band (RAS-8HRNSE only) for reversing valve assemblies.

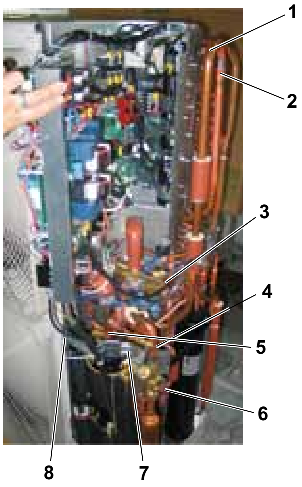
5 Remove the valve stay.

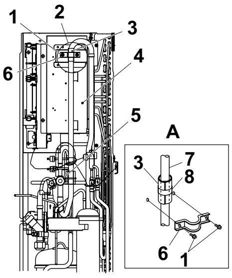
6 Remove the reversing valve assemblies from the designated positions. (4 brazing parts)
  - Remove the brazing of the reversing valve and the stop valve at gas side by cooling with wet cloth.
  - Protect the connecting wires and pipe insulation from brazing frame.

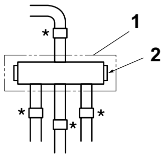
7 Remove the reversing valve from the assemblies.
  - Perform the brazing to remove and reassemble the reversing valve by cooling with wet cloth.

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

Details for Removing Band







1. Band (RAS-8HRNSE Only)
2. Removing brazing part (Outdoor heat exchange).
3. Reversing Valve.
4. Removing Brazing part (Gas stop valve).
5. Removing Brazing part (Compressor suction pipe).
6. Removing Brazing part (Compressor discharge pipe).
7. Valve stay.
8. Screw.

1. Screw.
2. P.
3. Silicon Plate.
4. Electrical box.
5. Reversing Valve.
6. Band.
7. Pipe.
8. F-Tape.

1. Cover by wet cloth.
2. Reversing valve.

◆ Removing Electronic expansion Valve and Solenoid Valve

1 Remove the service cover and rear cover following the *Removing service cover, see on page 420* and the *Removing the bottom service cover and rear cover, see on page 421*.

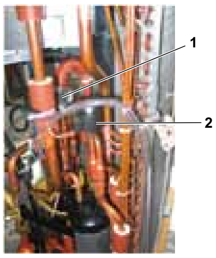
2 Collect the refrigerant from the check joint following the *Removing the compressor, see on page 425*.

3 Remove the coil following the *Removing reversing valve coil, see on page 429*.

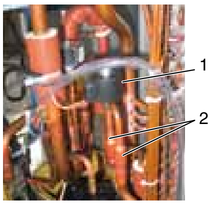
4 Remove the brazing as show in the figure below.

- Electronic Expansion Valve (MV1): 2 brazing parts.
- Solenoid Valve (SVA): 2 brazing parts.
- Perform the brazing to remove and reassemble the electronic expansion valve by cooling with wet cloth.
- Protect the connecting wires and pipe insulation from brazing flame.

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



1. Solenoid Valve.
2. Expansion Valve.



1. Expansion valve (MV1)
2. Removing brazing part

1. Solenoid valve (SVA)
2. Removing brazing part

◆ Removing electrical components

Removing control PCB (PCB1) and Relay (PCB3 PCB5)

1. Remove the service cover following *Removing service cover, see on page 420*.
2. Remove all the wiring connected to the control PCB.
3. Move the four (4) holders to the direction marked with the arrow and remove the PCB.

Removing Relay PCB (PCB3 PCB5)

1. Remove the service cover following the *Removing service cover, see on page 420*.
2. Disconnect all the wires connected with the relay PCB (PCB3 PCB5).
3. Clamp the middle part of the spacers (4 portions for each relay PCB) with long-nose pliers and remove PCB3 and PCB5 by pulling them out toward front side.

NOTE

- ***DO NOT touch the electrical components on the PCB. Pay attention not to bend or apply much force onto PCB in order to avoid PCB failure.***

1: Spacer

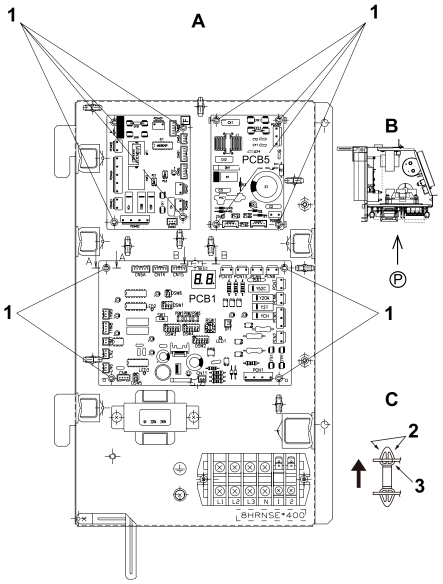
2: Middle Part of Spacer

3: PCB (1 3 5)

A: Enlarged View of P

B: Electrical Box (View from Top)

C: Spacer for PCB (1 3 5)



Removing Inverter Components and Capacitor for AC Fan Motor

1. Remove the service cover following the *Removing service cover, see on page 420*.
2. Open the P-mounting plate by rotating 90 degrees to the left following the *Opening electrical box (P-Mounting Plate), see on page 429*.
   - Check that the LED201 (red) on DIP-IPM is OFF when the P plate is opened.

DANGER

- ***DO NOT touch electrical components while the LED1 (Red) is ON to avoid electrical shock. Wait until the LED turns off.***

3. Remove inverter components and capacitor for AC fan motor (CA) according to the procedure below and the following figures.

Removing Inverter PCB (PCB2)

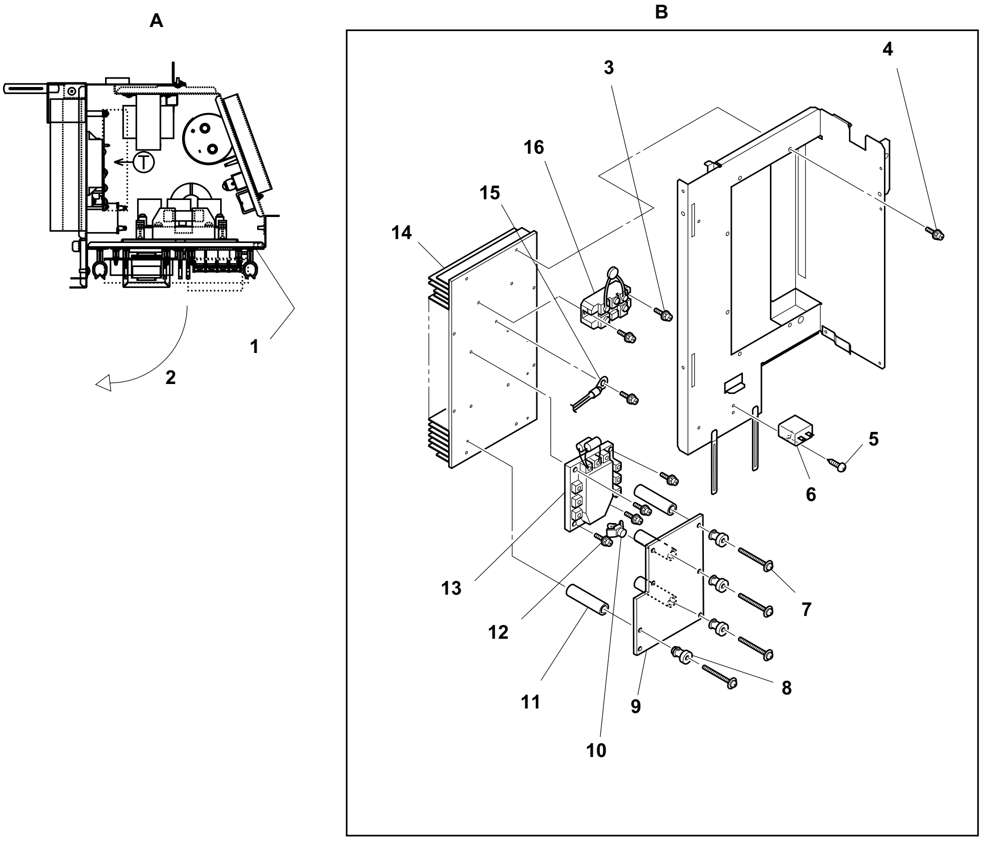
1. Disconnect the wirings of connector on the PCB2 as follows.
   - CN2
   - CN206
   - PCN301

- C

2 Disconnect the wirings of U V and W on the transistor module (IPM).

3 Remove the four (4) M3 screws for the PCB2 and then remove the PCB2 from the transistor module.

4 Remove the bushes and the collars from the PCB2. When remounting attach those bushes and collars.



No.	Part	Quantity
1	P-Mounting Plate	—
2	Opening Direction of P-Mounting Plate	—
3	M5 Screw for Diode Module	2
4	M4 Screw for Radiation Fin	8
5	M4 Screw for CA	1
6	CA	—
7	M3 Screw for PCB2	4
8	Bush for PCB2	4
9	PCB2	—
10	Spacer for PCB2M4	1
11	Collar for PCB2 Transistor	4
12	Screw for IPM	4
13	Module (IPM)	—
14	Radiation Fins	—
15	Fin Thermistor	—
16	Diode Module	—

A: Electrical box (View from Top).

B: Details for view from Top.

Removing Diode Module (DM)

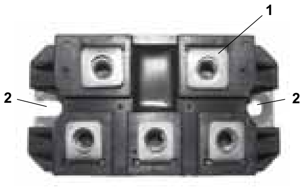
Disconnect all the wirings connected to the diode module as shown below.

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

Check to ensure that the LED201 (Red) of the PCB2 is off.

1: 5 Screws (M5)

2: Fixing screw (M5)



Removing Transistor Module (IPM)

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

1 Remove PCB2 from IPM according to the procedure of “Removing Inverter PCB (PCB2)”.
2 Disconnect the wirings of P N U V W on the transistor module.
3 Remove four (4) M4 fixing screws on the transistor module.
4 Remove the transistor module from the electrical box.
5 Reassemble the parts in the reverse order of removing order.

1. Screws for PCB2 (M3)

2. Screw (M5)

3. Fixing screws for transistor module (M4)

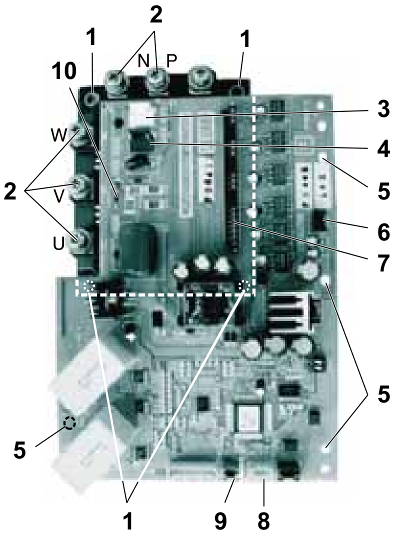
4. Led201

5. Screws for PCB (M3)

6. CN207

7..CN026

8. CN2



Removing Capacitor for AC Fan Motor (CA)

1 Disconnect the wirings of capacitor for AC fan motor (CA).
2 Remove one (1) screw for fixing the capacitor and remove the capacitor

◆ Removing other electrical components

1 Remove the service cover following the *Removing service cover, see on page 420*.
2 Open the P-mounting plate by rotating 90 degrees to the left as show in the *Opening electrical box (P-Mounting Plate), see on page 429*.
Check to ensure the LED201 (Red) of the inverter PCB (PCB2) is OFF when opening P-mounting plate.

NOTE

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

3 Remove other electrical components according to the procedure below and the figures are on the next page.

Removing Capacitors (CB1 CB2)

Disconnect all the wirings connected to the capacitors (CB1 CB2).

1 The wire has the polar characters. Identify the wire mark band and the indication on the capacitor when wire connecting.
2 Remove two (2) screws and two (2) saddles fixing the capacitor and remove each capacitor.

Removing Magnetic Contactor (CMC1)

1 Disconnect all the wirings connected to the magnetic contactor (CMC1).
2 Remove two (2) screws fixing the magnetic contactor and remove the magnetic contactor.

Removing Reactor (DCL)

1 Remove four (4) screws fixing the reactor and remove the reactor (DCL).

Removing Resistors (RS1 RS2 R1 R2)

1 Remove one (1) screw fixing the resistor and remove each resistor.

Removing Reverse Phase Relay PCB (PCB4).

1 Remove the four (4) spacers and remove the PCB4.

Removing Noise Filter (NF1)

1 Remove the noise filter by unhooking the top of the holder (6 portions).

Removing Fuse Holders for EF1 and EF2

1 Remove two (2) screws fixing the fuse holders and remove the fuse holders.

NOTE

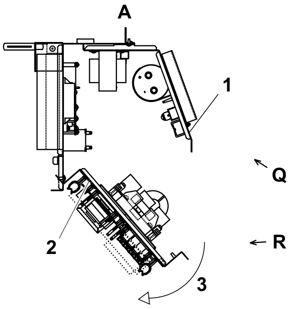
- ***Identify terminal Nos. with the mark band Nos. when reassembling to avoid incorrect wiring.***

1: CB-Mounting Plate

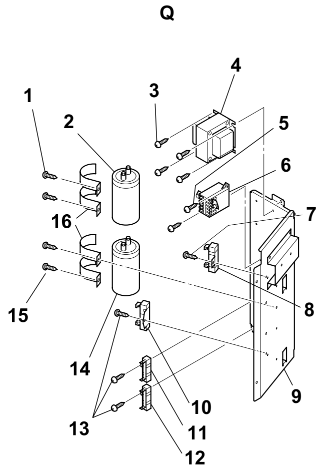
2: P-Mounting Plate

3: Opening Direction of P-Mounting Plate

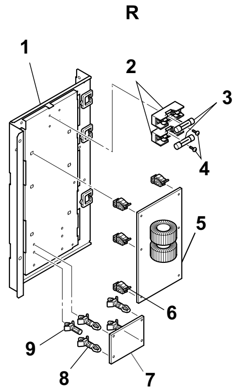
A: Electrical Box (View from Top)



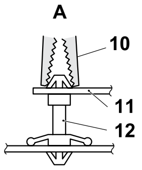
No.	Part	Quantity
1	M4 Screw for CB1	2
2	CB1	—
3	M4 Screw for DLC	4
4	DCL	—
5	M4 Screw for CMC1	2
6	CMC1	—
7	M4 Screw for Resistor	—
8	R1	—
9	CB-Mounting Plate	—
10	R2	—
11	RS1	—
12	RS2	—
13	M4 Screw for Resistor	—
14	CB2	—
15	M4 Screw for CB2	2
16	Saddle	—



No.	Part	Quantity
1	P-Mounting Plate	—
2	Fuse Holder	—
3	EF1 EF2	—
4	M4 Screw for Fuse Holder	—
5	NF1	—
6	Holder for NF1	6
7	PCB4	—
8	Spacer for PCB4	4
9	Spacer for PCB4	2
10	Long-nose Pliers	—
11	PCB4	—
12	Spacer	—



A:



NOTE

- ***The removing method for spacer of PCB4 is as follows.***

11. Electrical checks of main parts

Index

11.1 Inverter

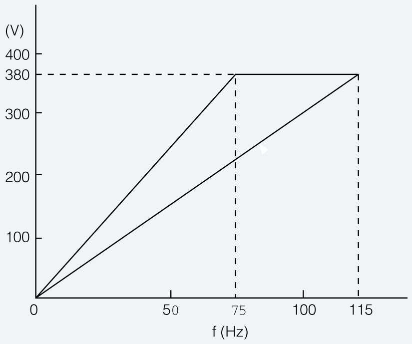
11.1.1 Inverter for IVX Series

◆ Specifications of inverter

<table>
<tr><th>Applicable model</th><th>RAS-(4-12)HRNM(2)(E)</th><th>RAS-(3-6)HVRNM(2)E</th></tr>
<tr><td>Applicable power source</td><td>3 Phase 400V 50 Hz RAS-(4-6)HRNM2E
3 Phase 380-415V 50 Hz RAS-(8-12)HRNM</td><td>1 Phase. 230V 50 Hz</td></tr>
<tr><td>Input current</td><td>RAS-(4-12)HRNM(2)(E) 6-25A</td><td>RAS-(3-6)HVRNM(2)E 15-30A</td></tr>
<tr><td>Control Method</td><td>Vector control</td><td>Vector control</td></tr>
<tr><td>Range output frequency</td><td>20-115HZ</td><td>20-115HZ</td></tr>
<tr><td>Accuracy of frequency</td><td>0.01</td><td>0.01</td></tr>
<tr><td>Controlled frequency</td><td>0.01Hz at applicable frequency range</td><td>0.01Hz at applicable frequency range</td></tr>
<tr><td>Output / characteristics</td><td>

Conditions:

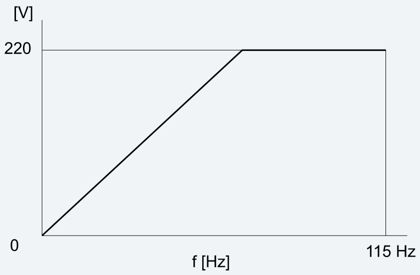
1. Power source voltage AC380/415V
2. Non-loading (free output)
3. Ammeter type volt-meter (X1.1)



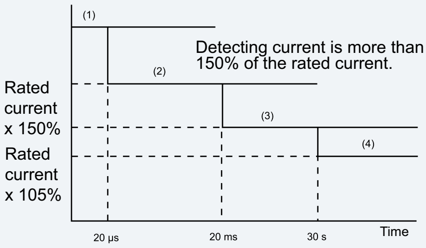
</td><td>

Conditions:

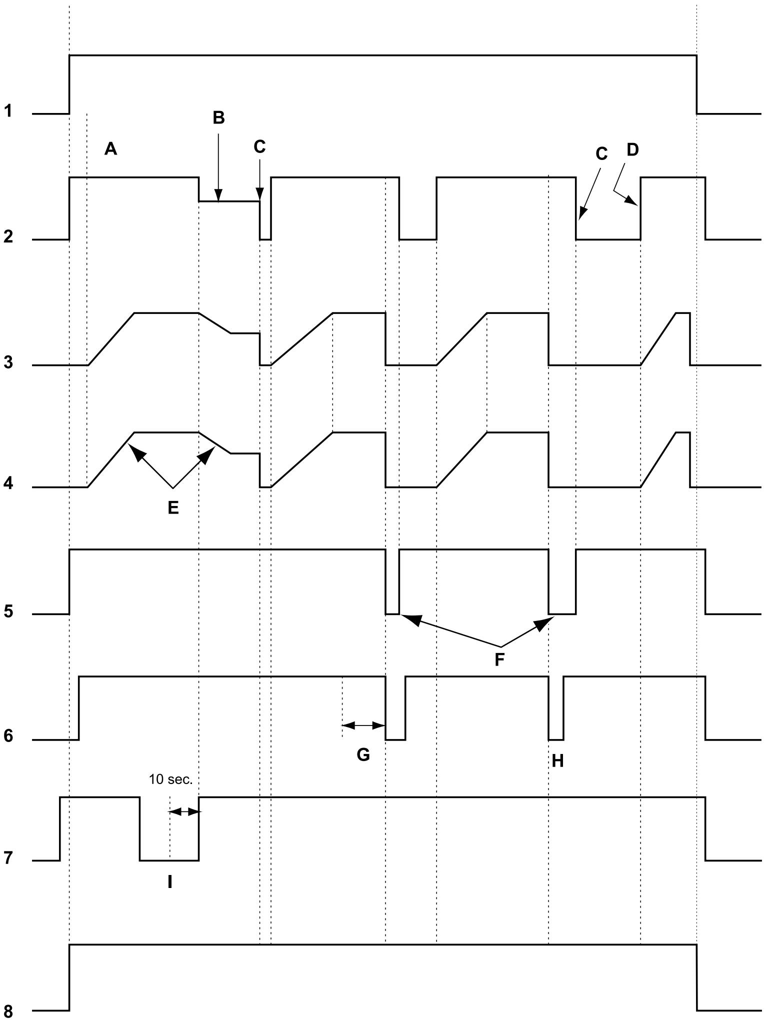
1. Power source voltage AC220/240V
2. Non-loading (free output)
3. Ammeter type volt-meter (X1.1)



</td></tr>
<tr><td>Soft start stop</td><td>0.125–3.00 Hz/s</td><td>—</td></tr>
</table>

Protection function		
Applicable model	**RAS-(4-12)HRNM(2)(E)**	**RAS-(3-6)HVRNM(2)E**
Excessive high or low voltage for inverter	Excessive low voltage at a voltage is lower than 350 V DC Excessive high voltage at a voltage is higher than 750 V DC	Excessive low voltage at a voltage is lower than 194 V DC Excessive high voltage at a voltage is higher than 420 V DC
Abnormality of current sensor (0A detection)	Stoppage at a current of compressor smaller than 1.5A. When the frequency is 15 to 18Hz after starting. Cause of abnormality: Failure of current sensor Failure of IPM/DIP-IPM/ ISPM Failure of compressor / fan motor Disconnected wiring	—
Overcurrent protection for inverter	 **1** Short-circuit trip of arm *) **2** Instantaneous overcurrent trip *) **3** Instantaneous overcurrent trip **4** Electronic thermal trip *) Internal protection IPM Condition is maintained longer than 30 seconds or accumulated longer than 3 minutes during 10 minutes sampling time.	
Protection of transistor module	IPM has four protection function for self-protection. **1** Some of the output terminals between “U” and “V” “V” and “W” “W” and “U” has a short-circuit. **2** Running current reaches the maximum rated current. **3** Abnormal temperature is measured by internal thermistor. **4** Control voltage decreases abnormally.	
Overload control	Overload control as a current greater than (rated current X105%). Overload control release at a current smaller than (rated current X 88%).	
Fin temperature increase	The unit is stopped when the fin temperature is higher than 100ºC	
Earth detection	The unit is stopped when the compressor is earthing.	

◆ Inverter time chart



1. Main circuit power source.
2. Frequency instruction.
3. Output voltage.
4. Soft start-stop (frequency).
5. Failure signal.
6. Activation of protection device.
7. Overload signal.
8. Charged indication.

A. Frequency HIGH.
B. Frequency LOW.
C. All bit 1.
D. Operation.
E. The changing speed depends on the outer setting.
F. Output.
G. Transmit error 30 sec.
H. Protection activation.
I. Activation recovery.

◆ Protective function

1 Excessive high or low voltage for inverter

a. Level of detection

- When the voltage of direct current is greater than (A) V abnormalities are detected.
- When the voltage of direct current is smaller than (B) V abnormalities are detected.

Power supply	400V 50Hz / 380-415V 50Hz	230V 50Hz
(A)	750	440
(B)	350	194

b. Function
When abnormalities are detected the inverter compressor is stopped and transmit the signal code of stoppage cause to PCB1.

c. Cancellation of protection function.
Transmission for signal code of stoppage cause is cancelled when a stopping order is given or main power source is cut off.

2 Abnormality of current sensor

a. Level of detection
When current of the inverter compressor decreases lower than 0.5A during the inverter compressor frequency between 15Hz and 18Hz an abnormality is detected.

b. Function
When abnormalities are detected the inverter compressor is stopped and transmit the signal code of stoppage cause to PCB1.

c. Cancellation of Protection Function
Transmission for signal code of stoppage cause is cancelled when a stopping order is issued or main power source is cut off.

3 Overcurrent protection for inverter

a. Level of detection
When the current detected by current sensor reaches 150 of the rated current overcurrent is detected. (Instantaneous overcurrent).When the current detected by current sensor exceeds 105 of the rated current continuously for 30 seconds or for 3.5 minutes in total during a 10 minutes period overcurrent is detected. (Electric thermal relay).

b. Function
When abnormalities are detected the inverter compressor is stopped and transmit the signal code of stoppage cause to PCB1.

c. Cancellation of protection function
Transmission for signal code of stoppage cause is cancelled by stopping order is issued or main power source is cut off.

4 Protection of IPM/DIP-IPM/ISPM

a. Level of detection
When some of the output terminals between “U” and “V” “V” and “W” “W” and “U” of IPM/dip IPM/ISPM are short-circuited an abnormality is detected.When the running current of IPM/DIP-IPM/ISPM reaches (maximum rated current x 105%) an abnormality is detected.When an internal temperature is measured by internal thermistor of IPM an abnormality is detected.When the control voltage of IPM/DIP-IPM/ISPM decreases an abnormality is detected.

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

c. Cancellation of protection function
Transmission for signal code of stoppage cause is cancelled when a stopping order is issued or main power source is cut off.

5 Fin temperature increase

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

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

c. Cancellation of protection function
Transmission for signal code of stoppage cause is cancelled when a stopping order is issued or main power source is cut off

6 Earth detection

a. Level of detection
When the starting current of the compressor reaches 80 of the overcurrent protection value an abnormality is detected.

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

c. Cancellation of protection function
Transmission for signal code of stoppage cause is cancelled when a stopping order is issued or main power source is cut off.

◆ Overload control

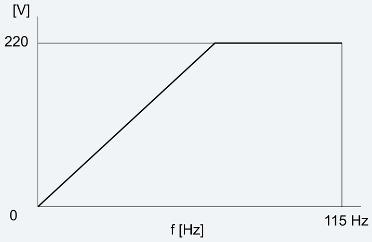
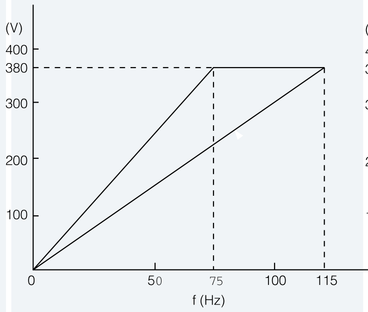
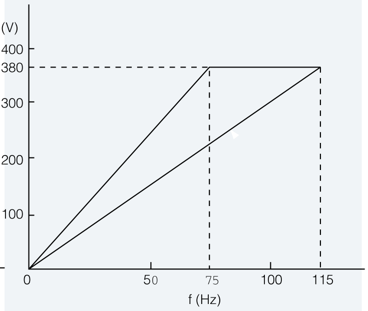
1 Level of detection
When the output current exceeds 105 of the maximum output current an abnormality is detected.

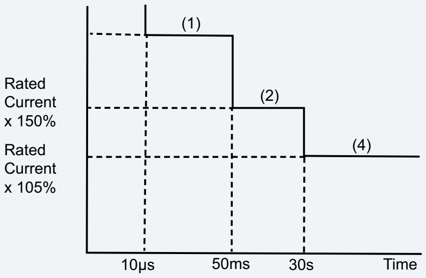
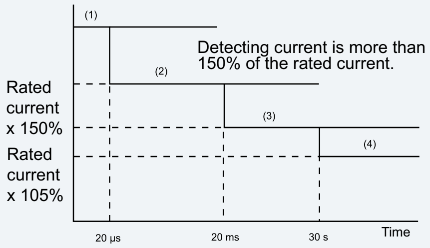
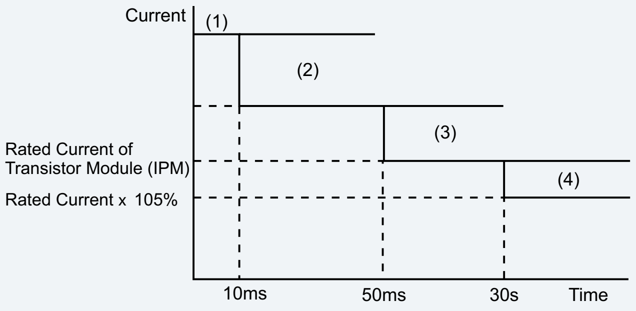
2 Function
An overload signal is issued when output current exceeds 105 of the maximum output current and the frequency decreases.
For 10 seconds after the output current decreases lower than 88 of the rated current the operation is performed with the compressor frequency limited to the upper level frequency when the output current decreases lower than 88 of the rated one.
However if the frequency order is smaller than the maximum value the operation is performed according to the order.

3 Cancellation of protection function
After the operation described in the above item b. is performed for 10 seconds this control is cancelled.

11.1.2 Inverter for ES Series

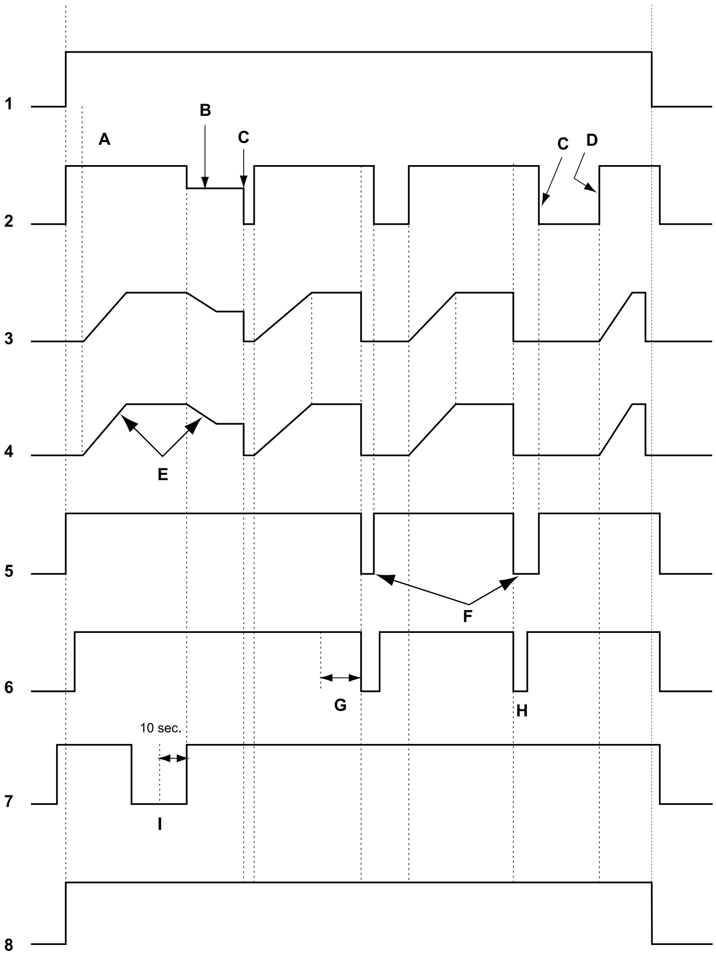
◆ Specifications of inverter

Applicable model	RAS-(2-3)HVRN(S)2	RAS-(4-6)HVRNS2E	RAS-(4-6)HRNS2E	RAS-(8/10)HRNSE
Applicable power source	1 Phase. 220-240V 50 Hz	1 Phase. 230V 50 Hz	3 Phase 400V 50 Hz	3 Phase 400V 50 Hz
Output current	10.5A	17A (4 HP) 25A(5/6HP)	6-25A	25A
Control Method	Vector control			
Range output frequency	31-115Hz	20-115Hz	20-115HZ	20-115Hz
Accuracy of frequency	0.01Hz at applicable frequency range			
Controlled frequency	0.01Hz at applicable frequency range			
Output / characteristics	Conditions **1** Power source voltage AC220/240V or AC 230V **2** Non-loading (free output) **3** Ammeter type volt-meter (X1.1)  		Conditions: **1** Power source voltage AC380/415V **2** Non-loading (free output) **3** Ammeter type volt-meter (X1.1)  	Conditions **1** Power source voltage AC400V **2** Non-loading (free output) **3** Ammeter type volt-meter (X1.1) 
Soft start stop	0.1 0.5 1 3 Hz/s (4 steps)	0.125 0.5 1 2 Hz/s (4 steps)	0.125–3.00 Hz/s	0.125 0.5 Hz/s (4 steps)

Protection function			
Applicable model	**RAS-(2-3)HVRN(S)2**	**RAS-(4-6)HVRNS2E**	**RAS-(8/10)HRNSE** **RAS-(4-6)HRNS2E**
Excessive high or low voltage for inverter	Excessive low voltage at a voltage is lower than 194 V DC Excessive high voltage at a voltage is higher than 400 V DC (2/2.5/3HP) or 423 V DC (4/5/6HP)		Excessive low voltage at a voltage is lower than 350 V DC Excessive high voltage at a voltage is higher than 750 V DC
Protection function Abnormality of current sensor (0A detection)	Stoppage at a current of compressor smaller than 1.5A. When the frequency is 15 to 18Hz after starting (except 2 /2.5/3 HP: 6 to 10 Hz) Cause of abnormality: Failure of current sensor. Failure of IPM (2/2.5/3/8/10 HP) or DIP-IPM (4/5/6 HP). Failure of compressor/fan motor. Disconnected wiring.		
Overcurrent protection for inverter	RAS-(2/2.5)HVRN2/RAS-3HVRNS2  RAS-(4-6)HVRNS2E  RAS-(8-10)HRNSE / RAS-(4-6)HRNS2E 		
	1 Short-circuit trip of arm *) **2** Instantaneous overcurrent trip *) **3** Instantaneous overcurrent trip **4** Electronic thermal trip Condition is maintained longer than 30 seconds or accumulated longer than 3 minutes during 10 minutes sampling time.		

Protection function			
Applicable model	**RAS-(2-3)HVRN(S)2**	**RAS-(4-6)HVRNS2E**	**RAS-(8/10)HRNSE** **RAS-(4-6)HRNS2E**
Protection of IPM	IPM has four protection function for self-protection. **1** Some of the output terminals between “U” and “V” “V” and “W” “W” and “U” has a short-circuit. **2** Running current reaches the maximum rated current. **3** Abnormal temperature is measured by internal thermistor. **4** Control voltage decreases abnormally.		
Overload control	Overload control as a current greater than (rated current X105%). Overload control release at a current smaller than (rated current X 88%).		
Fin temperature increase	The unit is stopped when the fin temperature is higher than 80 ºC (1 Phase) 100 °C (3 Phase).		
Earth detection	The unit is stopped when the compressor is earthing.		

◆ Inverter time chart



1. Main circuit power source.
2. Frequency instruction.
3. Output voltage.
4. Soft start-stop (frequency).
5. Failure signal.
6. Activation of protection device.
7. Overload signal.
8. Charged indication.

A. Frequency HIGH.

B. Frequency LOW.

C. All bit 1.

D. Operation.

E. The changing speed depends on the outer setting.

F. Output.

G. Transmit error 30 sec.

H. Protection activation.

I. Activation recovery.

◆ Protective function

1 Excessive high or low voltage for inverter

a. Level of detection

- When the voltage of direct current is greater than (A) V abnormalities are detected.
- When the voltage of direct current is smaller than (B) V abnormalities are detected.

Power supply	230V 50Hz	400V 50Hz
(A)	440	750
(B)	194	350

b. Function

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

c. Cancellation of protection function

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

2 Abnormality of current sensor

a. Level of detection

When current of the inverter compressor decreases lower than 0.5A during the inverter compressor frequency between 15Hz and 18Hz an abnormality is detected.

b. Function

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

c. Cancellation of Protection Function

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

3 Overcurrent protection for inverter

a. Level of detection

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

When the current detected by current sensor exceeds 105 of the rated current continuously for 30 seconds or for 3.5 minutes in total during a 10 minutes period overcurrent is detected. (Electric thermal relay) .

b. Function

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

c. Cancellation of protection function

Transmission for signal code of stoppage cause is cancelled by stopping order is issued or main power source is cut off.

4 Protection of IPM/DIP-IPM/ISPM

a. Level of detection

When some of the output terminals between “U” and “V” “V” and “W” “W” and “U” of IPM/DIP IPM/ISPM are short-circuited an abnormality is detected.

When the running current of IPM/DIP-IPM/ISPM reaches (maximum rated current x 105%) an abnormality is detected.

When an internal temperature is measured by internal thermistor of IPM an abnormality is detected.

When the control voltage of IPM/DIP-IPM/ISPM decreases an abnormality is detected.

b. Function

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

c. Cancellation of protection function

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

5 Fin temperature increase

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

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

c. Cancellation of protection function
Transmission for signal code of stoppage cause is cancelled when a stopping order is issued or main power source is cut off.

6 Earth detection

a. Level of detection
When the starting current of the compressor reaches 80 of the overcurrent protection value an abnormality is detected.

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

c. Cancellation of protection function
Transmission for signal code of stoppage cause is cancelled when a stopping order is issued or main power source is cut off.

◆ Overload control

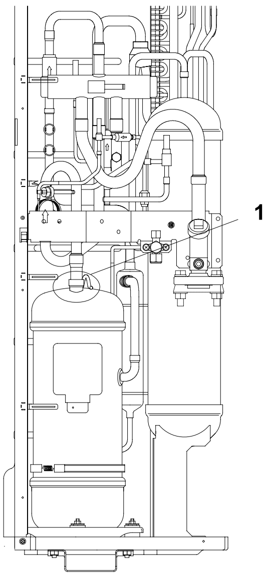
1 Level of detection
When the output current exceeds 105 of the maximum output current an abnormality is detected.

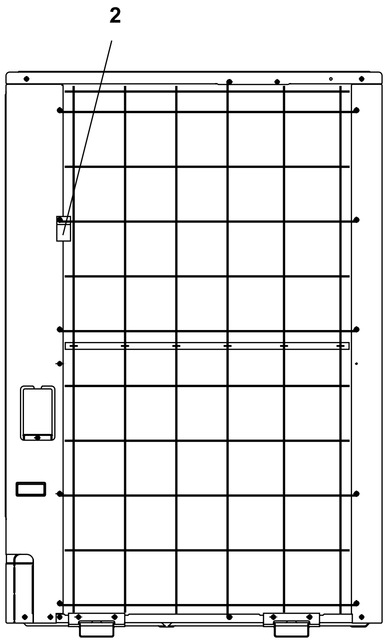
2 Function
An overload signal is issued when output current exceeds 105 of the maximum output current and the frequency decreases.
For 10 seconds after the output current decreases lower than 88 of the rated current the operation is performed with the compressor frequency limited to the upper level frequency when the output current decreases lower than 88 of the rated one.
However if the frequency order is smaller than the maximum value the operation is performed according to the order.

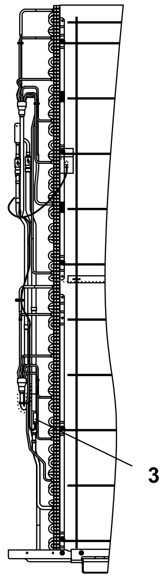
3 Cancellation of protection function
After the operation described in the above item b. is performed for 10 seconds this control is cancelled.

11.2 Thermistor

Thermistors for the outdoor unit







1. Thermistor for discharge gas temperature (THM9).
2. Thermistor for outdoor ambient temperature (THM7).
3. Thermistor for evaporating temperature (THM8).

Thermistor for upper part temperature of compressor

(For prevention of discharge gas overheating)

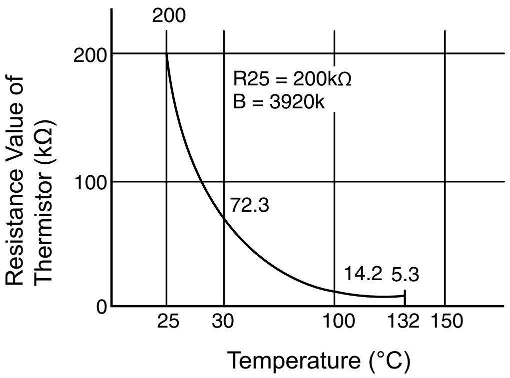
1 A thermistor for the upper part temperature of the compressor is installed to prevent discharge gas from overheating.
If discharge gas temperature increases excessively lubricating oil deterioration occurs and lubricating properties deteriorate resulting in short compressor life.

2 If discharge gas temperature increases excessively compressor temperature increases. At the worst compressor motor winding will be burnt out.

3 When the upper part temperature of compressor increases during heating operation the unit is controlled according to the following method.

- An electronic expansion valve of outdoor units is (are) opened to return the liquid refrigerant to the compressor through the accumulator decreasing compressor temperature.
- If the compressor upper part temperature increases exceeding 132 ºC even if an electronic expansion valve opens the compressor is stopped in order to protect the compressor.In cooling operation the above function is also available.

4 If compressor upper part temperature increases excessively the protection control is activated and the compressor is stopped according to the following method.



Resistance Characteristics of Thermistor for discharge Gas Overheating Protection

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

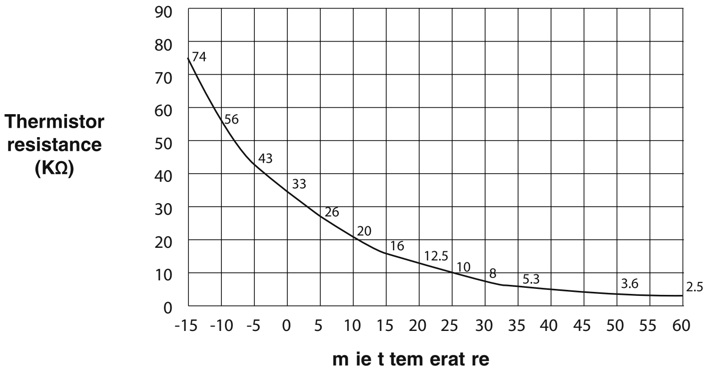
Thermistor for outdoor ambient temperature

The thermistor resistance characteristics are shown in the figure.

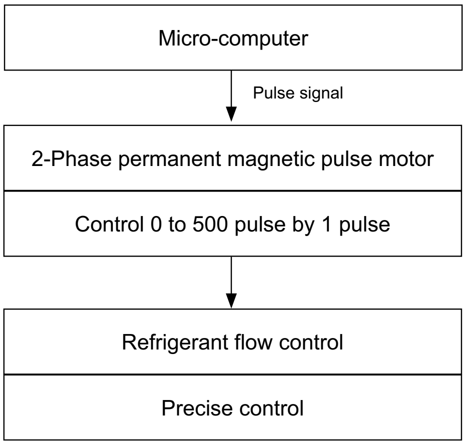
Thermistor for evaporating temperature of outdoor unit in heating operation (for defrosting)

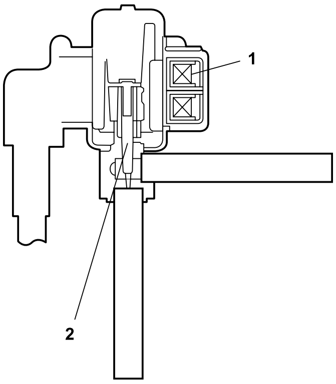
The characteristics for the thermistor is the same with the value of outdoor ambient temperature thermistor as shown in the figure.

Thermistor characteristics

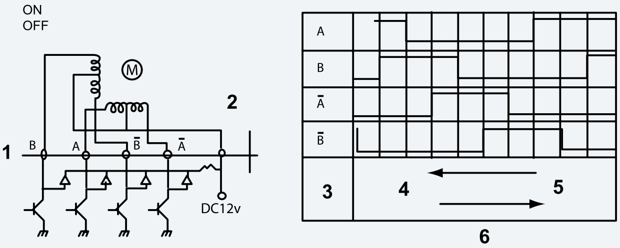


11.3 Electronic expansion valve





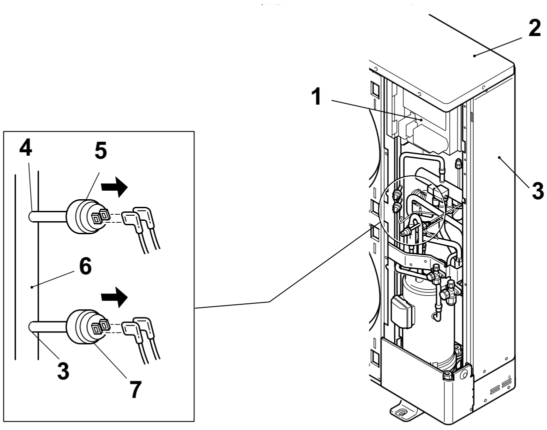
1. Pulse motor.
2. Needle.

Items	Specifications
Applicable to the models	For the main cycle of: For IVX RAS-(4-12)H(V)RNM(2)(E) and ES RAS-(4-10)H(V)RNS(2)E
Type	UKV(10.0 USRT) series/UKV (5.0USRT) series for MVB
Refrigerant	R410A
Working temperature range	-30 °C 65 °C (operation time of the coil: less than 50%)
Mounting direction	Drive shaft in vertical direction within an angle of 45 °C as maximum
Flow direction	Reversible
Drive method	4-Phase canned motor method
Rated voltage	DC12V±1.8 V
Drive condition	83PPS (pulse width at ON: 36 mm sec OFF: 60 mm sec) 1.2 phase excitation
Coil resistance (each phase)	46Ω ± 10 (at 20 °C)
Wiring diagram drive circuit and activation mode	 1. Drive circuit. 2. Wiring diagram. 3. Valve. 4 . Close. 5 . Open. 6 . Activation.

11.4 High pressure protection device

If the discharge pressure is excessively high the compressor and the component parts of the refrigeration cycle can be damaged. Therefore in case that the discharge pressure is higher than 4.15 MPa (R410A) the protection control is activated and the compressor is stopped.

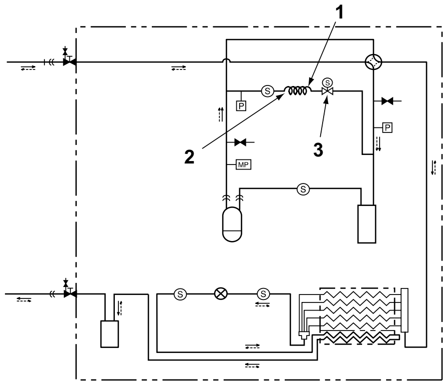
1. Electrical box.
2. Upper cover.
3. Rear cover.
4. Brazing.
5. Pressure switch for control (PSC).
6. Discharge pipe.
7. High pressure switch (PSH).



1 For controlling the high pressure not to increase excessively during heating operation the gas by-pass circuit and the air volume of the outdoor fan is controlled automatically.

2 The gas by-pass circuit which is composed of the solenoid valve and the capillary tube for flow adjustment control the high pressure not to increase excessively by leading the high pressure gas to the low pressure side.

1. Gas by-pass circuit.
2. Capillary tube.
3. Solenoid valve.



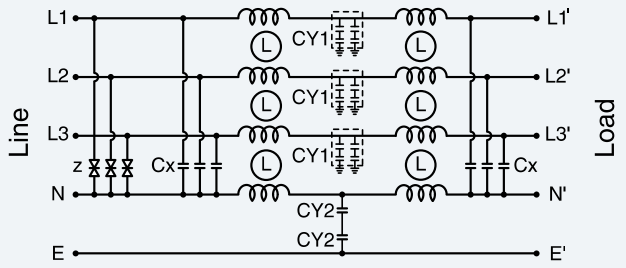
11.5 Noise filter (NF)

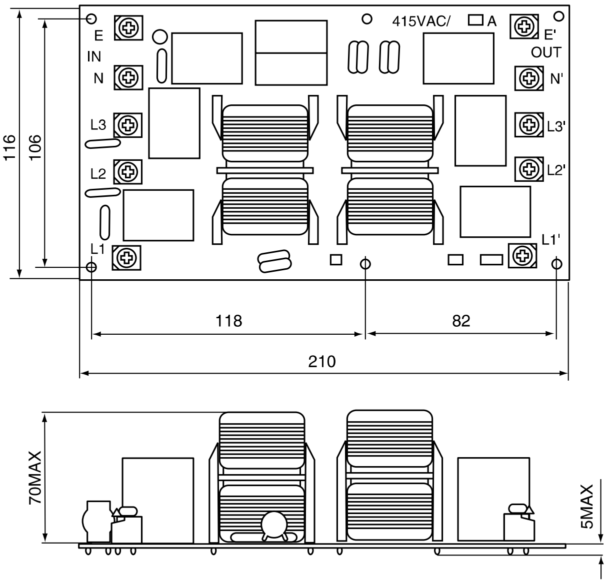
11.5.1 Noise filter for 3N~

The noise filter decreases the leakage of noise made by the inverter to the power supply side. Terminals indicated with “LOAD” are connected to the inverter side and terminals indicated with “LINE” to the power supply side.

RAS-(4-6)HRNM2E (400V/50Hz) / RAS-(4-6)HRNS2E (400V/50Hz) /

RAS-(8-12)HRNM (380-415V/50Hz) / RAS-(8/10)HRNSE (400V/50Hz)

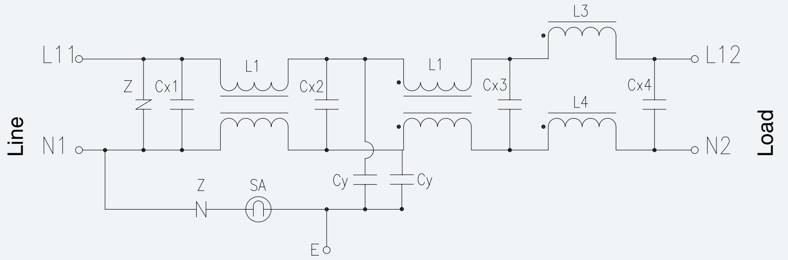
Items	Specifications
Model	4LFB-16830-2FA
Rated current	AC415V 27 A
Permissible temperature range	-25 ºC to 85 ºC
Circuit diagram	

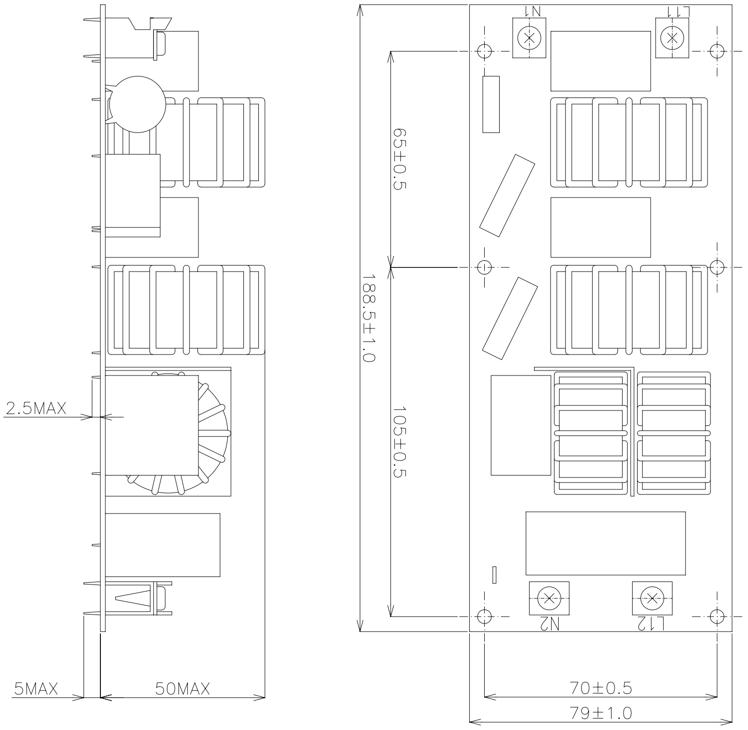


11.5.2 Noise filter for 1~

The noise filter decreases the leakage of noise made by the inverter to the power supply side. Terminals indicated with “LOAD” are connected to the inverter side and terminals indicated with “LINE” to the power supply side.

RAS-(4-6)HVRNM2E (230V/50Hz) / RAS-(4-6)HVRNS2E (230V/50Hz)

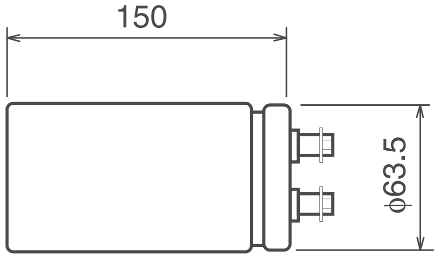
Items	Specifications
Model	LFB-14930-3M
Rated current	AC230V 30 A
Permissible temperature range.	-25 ºC to 85 ºC
Circuit diagram	

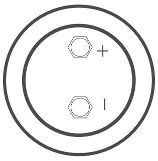


11.6 Capacitor (CB1 CB2)

This part is used for changing the alternative current to the direct current for the inverter. Connect two capacitor in line and used.

Items	Specifications
Models	LNX2G472MSEAHE
Capacity of static electricity	4700 µF
Rated voltage	400 VDC
Permissible temperature range	-25 ºC to 95 ºC





11.7 Reactor (DCL)

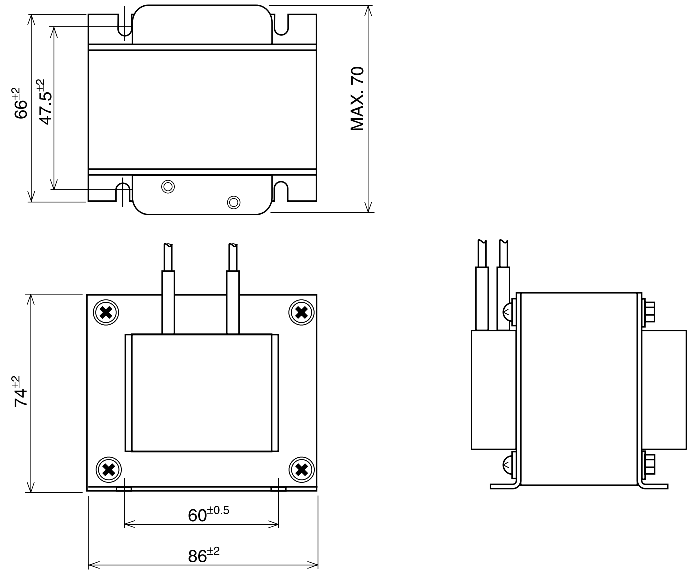
11.7.1 Reactor (DCL) for 3N~

This part is used for changing the alternative current to the direct current for the inverter.

RAS-(4-6)HRNM2E (400V/50Hz) / RAS-(4-6)HRNS2E (400V/50Hz) /

RAS-(8-12)HRNM (380-415V/50Hz) / RAS-(8/10)HRNSE (400V/50Hz)

Items	Specifications
Character	1.0 mH+10 (at 1 kHz)
Rated current	30 A
Direct resistance	22.8 mΩ+20 (at 20 °C)
Permissible temperature range	-20 ºC to 60 ºC

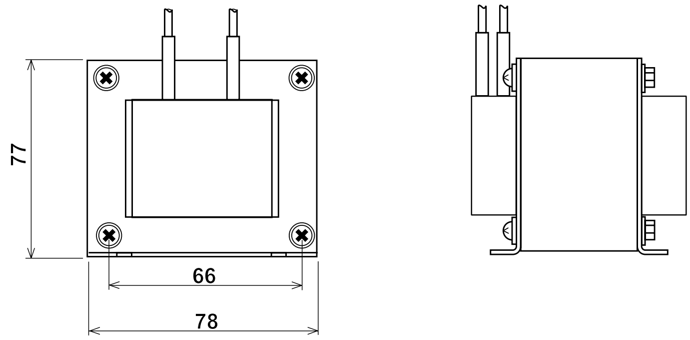


11.7.2 Reactor (DCL) for 1~

This part is used for changing the alternative current to the direct current for the inverter.

RAS-(4-6)HVRNM2E (230V/50Hz) / RAS-(4-6)HVRNS2E (230V/50Hz)

Items	Specifications
Character	0.59 mH±15 (at 1 kHz)
Rated current	30 A
DC Resistance	26 mΩ (at 20 °C)
Permissible temperature range	-20ºC to 60ºC



11.8 Scroll compressor

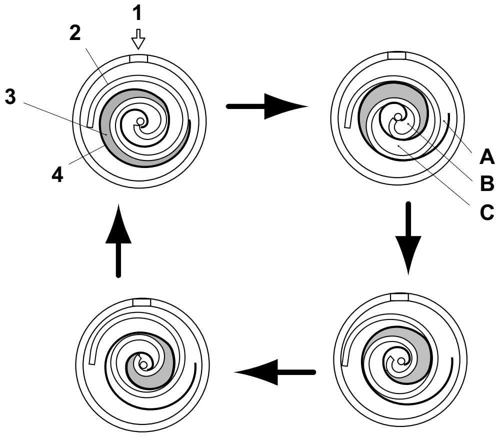
11.8.1 Reliable mechanism for low vibrating and low sound

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

11.8.2 Principle of compression

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

1. Gas.
2. Rotating scroll.
3. Compression space.
4. Fixed scroll
A. Suction procedure.
B. Discharge process.
C. Compression process.



12. Maintenace notes

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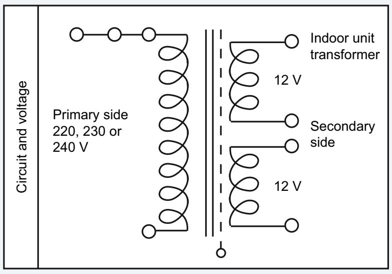
12.1 Checking the power source and the wiring connection

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?	Disconnect the secondary side of the transformer and check the voltage by means of a tester. 
3	Is the wiring loosened or inco-rrectly connected?	Check the wiring connection on the PCB. • Thermistor connectors • Connector of the remote control cable • Connector of the transformer Each connector in a high-voltage circuitCheck the connectors according to the **electrical wiring** diagram.

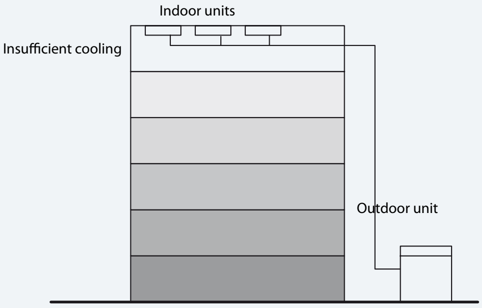
12.2 Burnt-out compressor due to an insufficient refrigerant charge

Question and answer for the field work

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

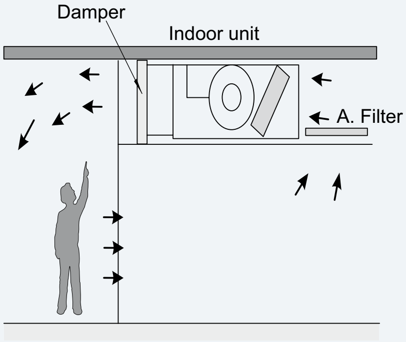
12.3 Insufficient cooling performance when a long piping is applied

Question and answer for the field work

Example 2: Insufficient cooling performance when a long piping is applied	
Phenomenon	Sufficient cooling was not available for an indoor unit that was located at the farthest position.
Cause	If the location of an outdoor unit is 20 meters lower than the location of the indoor units resetting of the DIP switch DSW3 is required. However no setting was performed. Therefore the largest discharge pressure was not increased. This resulted in an insufficient cooling performance for the indoor unit. 
Countermeasure	The setting of the DSW2 was changed.
Remarks	Pay special attention to the size of liquid pipe. Refer to “piping work in TC” for details.

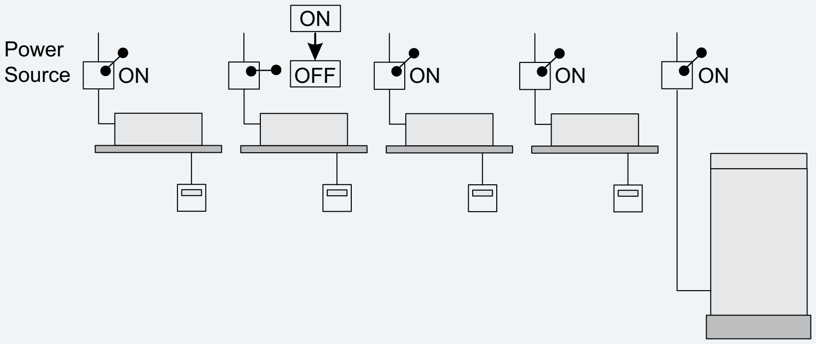
12.4 Abnormally high operation sound (in the ceiling type indoor unit).

Question and answer for the field work

Example 3: Abnormally high operation sound (in-the-ceiling type indoor unit)	
Phenomenon	The operation sound at the “HIGH” speed was abnormally high.
Cause	The indoor units were installed without the ducts. Since there scarcely was any external static pressure an abnormally big air volume was supplied. This resulted in a higher air speed through the heat exchanger. 
Countermeasure	In order to reduce the airflow rate a plate that is used as a damper at the discharge gas side was added.
Remarks	Note that the running current is increased when no external pressure is given to the indoor unit. This results in an over-heating.

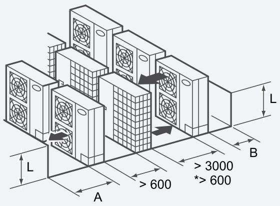
12.5 Alarm code “31”

Question and answer for the field work

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

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

Question and answer for the field work

<table>
<tr><th colspan="3">Example 5: Not cooling well due to insufficient installation space for outdoor unit</th></tr>
<tr><td>Phenomenon</td><td colspan="2">Cooling operation was well performed through the intermediate season. However the cooling operation was not well available when the outdoor temperature was higher than 35 °C.</td></tr>
<tr><td>Cause</td><td colspan="2">As the outdoor units were installed without a sufficient installation space the hot discharge air from other outdoor units was circulated.
In this case though the outdoor temperature was 35 °C the actual suction air temperature was nearly 50 °C and protection system from excessively high suction pressure was activated the frequency of the compressor was decreased and the cooling capacity was also decreased accordingly.
As the outdoor units in-line were installed back to back with a distance of 600 mm between each outdoor unit’s back the hot discharged air from other outdoor units was circulated.</td></tr>
<tr><td>Countermeasure</td><td colspan="2">Ensure that sufficient space should be secured for multi-row and multiple-installation.</td></tr>
<tr><td></td><td>
</td><td>Keep a distance of more than 15 mm between other units and do not put obstacles on the right and left sides. Dimension B is as shown below.
<table>
<tr><th>L</th><th>A</th><th>B</th></tr>
<tr><td>0 < L < 1/2H</td><td>600 or more</td><td>300 or more</td></tr>
<tr><td>1/2H < L < H</td><td>1400 or more</td><td>350 or more</td></tr>
</table></td></tr>
</table>

NOTE

- ***If L is larger than H mount the units on a base so that H is greater or equal to L.***
- ***In this situation ensure that the base is closed and does not allow the airflow to short circuit.***
- ***When the mark * dimension is secured be sure to mount the airflow guide.***

12.7 Caution with the refrigerant leakage

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

12.7.1 Maximum permissible concentration of the HCFC gas

The refrigerant R410A which is charged in the UTOPIA IVX/ES system is an incombustible non-toxic gas. However if the leakage occurs and the gas fills a room the gas may cause suffocation.

The maximum permissible concentration of the HCFC gas and the R410A in the air is 0.44 kg/m^3 according to the refrigeration and air conditioning system standard (KHK S 0010) by the KHK (high-pressure gas protection association) of Japan. Therefore you must take some effective measures in order to lower the R410A concentration in the air below 0.44 kg/m^3 if there is a leakage.

12.7.2 Calculation of the refrigerant concentration

1 Calculate the total quantity of refrigerant R (kg) that is charged in the system that connects all the indoor units of the rooms that need air conditioning systems.

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

3 Calculate the refrigerant concentration C (kg/m^3) of the room according to the following equation:

C = R/V	R: Total quantity of charged refrigerant (kg) V: Room volume (m^3) C: Refrigerant concentration (≤0.44* kg/m^3 for the R410A)
* Use this value only for reference because this value is not fixed yet.	

12.7.3 Countermeasure for the refrigerant leakage according to the KHK standard

According to the KHK standards you should arrange the facility as follows so that the refrigerant concentration will be bellow 0.3 kg/m^3.

1 Provide a shutterless opening that will allow the fresh air to circulate into the room.

2 Provide a doorless opening with a size of 0.15 or more to the floor area.

3 Provide a ventilator which must be linked with a gas leak detector with a ventilating capacity of 0.5 m^3/min or more per Japanese refrigeration ton (=compressor displacement 8.5 m^3/h of the air conditioning system which uses the refrigerant).

- **IVX**

O.U. model	Ton
RAS-8HRNM	2.49
RAS-10HRNM	3.32
RAS-12HRNM	4.15

- **ES**

O.U. model	Ton
RAS-(2-2.5)HVRN2)	0.88
RAS-3HVRNS2	1.14
RAS-4HVRNS2E	1.67
RAS-(5-6)HVRNS2E	2.27
RAS-8HRNSE	2.49
RAS-10HRNSE	3.32

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

12.8 Maintenance work

For the indoor unit and the outdoor unit

1 Fan and fan motor

- Lubrication: All the fan motors are pre-lubricated and sealed at the factory. Therefore no lubrication maintenance is required.
- Sound and vibration: Check for abnormal sounds and vibrations.
- Rotation: Check the clockwise rotation and the rotating speed.
- Insulation: Check the electrical insulation resistance.

2 Heat exchanger

- Clog: Inspect the heat exchanger at regular intervals and remove any accumulated dirt and any accumulated dust from the heat exchanger. You should also remove from the outdoor units other obstacles such as the growing grass and the pieces of paper which might restrict the airflow.

3 Piping connection

- Leakage: Check for the refrigerant leakage at the piping connection.

4 Cabinet

- Stain and lubrication: Check for any stain and any lubrication. Remove the stain and the lubrication.
- Fixing screw: Check for any loosened screw or any lost screw. Fix the loosened screws and the lost screws. Insulation material: Check for any peeled thermal insulator on the cabinet. Repair the thermal insulator.

5 Electrical equipment

- Activation: Check for an abnormal activation of the magnetic contactor the auxiliary relay the PCB and others.
- Line condition: Pay attention to the working voltage the working amperage and the working phase balance. Check for any faulty contact that is caused by the loosened terminal connections the oxidized contacts the foreign matter and other items. Check the electrical insulation resistance.

6 Control device and protection device

- Setting: Do not readjust the setting in the field unless the setting is maintained at a point that is different from the point listed in the section

For the outdoor unit

1 Compressor

- Sound and vibration: Check for abnormal sounds and vibrations.
- Activation: Check that the voltage drop of the power supply line is within 15 at the start and within 2 during the operation.

2 Reverse valve

- Activation: Check for any abnormal activation sound.

3 Strainer

- Clog: Check that there is no temperature difference between both ends.

4 Ground wire

- Ground line: Check for the continuity to earth.

5 Oil heater

- Activation: You should activate the oil heater at least twelve hours before the start-up by turning ON the main switch.

12.9 Service and maintenance record

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

No.	Check item	Action	Judgement	
37	Instructions to the client about the cleaning method.	—	Done	Not yet
38	Instructions to the client about the operation.	—	Done	Not yet

12.10 Service and maintenance record using the 7-segment display

Customer's name:________________________________ **Date:**____________________

Outdoor unit model (serial No.)		**RAS- (Serial No.)**				**RAS- (Serial No.)**			
1. Operation mode									
2. Test run start time									
3. Data collect start time									
4. Read out data from 7-segment in outdoor unit									
4.1 Protection control code									
4.2 Total capacity of I.U connected	CP								
4.3 Input/output state of outdoor micro-computer	SC	52C	FAN1	FAN2	20A	52C	FAN1	FAN2	20A
		20F	21	CH	PSH	20F	21	CH	PSH
4.4 Alarm code for abnormal stoppage of compressor	AC								
4.5 Inverter order frequency to compressor	H1								
4.6 Indoor order frequency to compressor	H2								
4.7 Air flow ratio	Fo								
4.8 O.U. expansion valve opening	Eo								
4.9 Temp. at the top of compressor	Td								
4.10 Evaporating temp. at heating	TE								
4.11 Ambient air temp.	To								
4.12 Cause of stoppage at inverter	iT								
4.13 Inverter secondary current	A2								
4.14 O.U. address	nA								
5. Indoor unit (unit No. 1)									
5.1 I.U. expansion valve opening	EA								
5.2 Liquid pipe temp. of I.U. (Freeze protection)	LA								
5.3 I.U. intake air temp.	iA								
5.4 I.U. discharge air temp.	oA								
5.5 Cause of I.U. stoppage	dA								
6. Indoor unit (unit No. 2)									
6.1 I.U. expansion valve opening	EA								
6.2 Liquid pipe temp of I.U. (Freeze protection)	LA								
6.3 I.U. intake air temp.	iA								
6.4 I.U. discharge air temp.	oA								
6.5 Cause of I.U. stoppage	dA								
7. Indoor unit (unit No. 3)									
7.1 I.U. expansion valve opening	EA								
7.2 Liquid pipe temp. of I.U. (Freeze protection)	LA								
7.3 I.U. intake air temp.	iA								
7.4 I.U. discharge air temp.	oA								
7.5 Cause of I.U. stoppage	dA								
8. Indoor unit (unit No. 4)									
8.1 I.U. expansion valve opening	EA								
8.2 Liquid pipe temp. of I.U. (Freeze protection)	LA								

Customer's name:______________________________			Date:___________________
Outdoor unit model (serial No.)		RAS- (Serial No.)	RAS- (Serial No.)
8.3 I.U. intake air temp.	iA		
8.4 I.U. discharge air temp.	oA		
8.5 Cause of I.U. stoppage	dA		

NOTE

- ***O.U.: Outdoor Unit.***
- ***I.U.: Indoor unit.***
- ***FAN1 FAN2: Constant speed fan.***
- ***52C: CMC.***
- ***PSH: High pressure switch.***
- ***20A: Solenoid valve (SVA).***
- ***20F: Solenoid valve (SFV).***
- ***21: Reversing valve (RVR).***
- ***CH: Oil heater.***
- ****: Multiply 1/8 by the code on the 7-segment.***

12.11 Service and maintenance record by remote control switch

Data sheet for checking by remote control switch

Time			:	:	:	:	:
I.U. modelo							
I.U. serial No.							
I.U. No. / alarm code							
	Check mode 1	Check mode 2	1·2	1·2	1·2	1·2	1·2
B Temp. indication							
Set temp.	b1	--					
Inlet air temp.	b2	91					
Discharge air temp.	b3	92					
Liquid pipe temp.	b4	93					
Remote thermistor temp.	b5	--					
Outdoor air temp.	b6	94					
Gas pipe temp.	b7	95					
Evaporating temp. at heating	b8	96					
Control information	b9	97					
Comp. top temp.	bA	98					
Thermo temp. of remote control switch	bb	--					
C Micro-computer state indication							
I.U. micro-computer	C1	--					
O.U. micro-computer	C2	--					
D Stopping cause state indication							
Stopping cause state indication	d1	--					
E Alarm occurrence							
Times of abnormality	E1	--					
Times of power failure	E2	--					
Times of abnormal transmitting	E3	--					
Times of inverter tripping	E4	--					
F Automatic louver state							
Louver sensor state	F1	--					
H Pressure frequency state indication							
Discharge pressure	H1	99					
Suction pressure	H2	9A					
Control information	H3	9b					
Operating frequency	H4	9C					
J I.U. capacity Indication							
I.U. capacity (1/8HP)	J1	--					
O.U. code	J2	--					
Refrigerant cycle number	J3	--					
Refrigerant cycle number	J4	--					
L Opening of ex. valve							
I.U. ex. valve	L1	9d					

O.U. ex. valve 1	L2	9E					
O.U. ex. valve 2	L3	--					
O.U. ex. valve B	L4	--					
P Running current indication (reference)							
Comp. current	P1	9F					

12.12 Pump-down method for replacing the compressor

No.	Procedure	Remarks
1	Turn off the main switch of the outdoor unit.	
2	Remove the covers the thermistor the crankcase heater the power wirings and other items according to the chapter 10.	Make sure that the terminal part of the detached power supply wires is not exposed by the winding insulation tape and other items.
3	Attach the manifold to the check joint of the high pressure side and the low-pressure side of the outdoor unit.	—
4	Turn on the main switch of the outdoor unit.	—
5	Set the exclusion of the compressor by setting the DSW so that a broken compressor will not work. You can set the exclusion of the compressor by setting the DSW1-4 in ON position.	—
6	The compressor replacing mode is performed: • The DSW1-4 on the outdoor unit PCB→ON (The cooling is run).	• This operation is performed for up to a maximum of ten minutes. • If the inverter compressor is excluded the operation starts after three minutes.
7	The operation finishes when one of the following conditions occurs: **1** Ten minutes have passed and STP is displayed in seven segments. **2** “08” is displayed in seven segments. **3** When Ps< 0.1 MPa is continued for one minute in ten minutes STP is displayed in seven seconds and the operation finishes.	• The operation may finished when any of the conditions 1) to 3) occurs.
8	Close the liquid stop valve completely.	To avoid the spillage of all the refrigerant if the check valve is broken.
9	Check for a leakage of the check valve on the discharge gas side: • DSW4-4 (enforced stoppage of the compressor) → ON so that the compressor will not run although the running command is sent from the remote control switch. • Check that variation of Ps on the outdoor unit PCB is 17 seconds. Make sure that the Ps increase is within 0.03 Mpa in two minutes after the Ps increase at the stoppage (during approximately five minutes). Also make sure that Pd > Ps.	• When you stop the compressor for replacing: • You can check the leakage of the check valve by means of the Ps variation because the SVA opens so that the discharge gas side of the inverter compressor can connect to the low-pressure side. • 0.03 MPa/2 minutes is within the permissible limits for the check valve on the discharge gas side. • The leakage of the check valve may cause an incorrect brazing due to the gas pressure at the brazing of the discharge piping. • If the compressor-replacing mode is performed again set the DSW4-4 to OFF and keep the DSW4-4 at the OFF side during ten minutes. Then start according to the procedure No. 6.
10	Collect the refrigerant by means of the refrigerant collection: • Perform either A or B depending on the process 10. - The leak rate at the process 10 is within the specification →Collect the refrigerant only at the low-pressure side. - The leak rate at the process 10 is greater than the specification → Collect all the refrigerant of the outdoor unit side by means of the machine.	• The discharge of the refrigerant in the atmosphere is strictly forbidden. Make sure that the refrigerant is collected by the collector. • Keep a note of the quantity of the collected refrigerant.
11	After collecting the refrigerant remove the change hose (collector side) of the low-pressure side so that the low-pressure side of the refrigerant cycle will be the atmosphere pressure.	• Make sure that there is no pressure increase of the low-pressure sides after collecting the refrigerant. • Make sure that the refrigerant cycle is the atmosphere pressure. Otherwise problems such as the blowing of gas and the suction of the cutting material) may occur when you are removing the compressors.
12	Turn OFF the main switch of the outdoor unit.	—
13	Perform the replacement of the compressor and the change of the refrigerant oil according to the section “replacing the compressor”.	Make sure that you follow the instructions.
14	Perform the vacuum from the check joint of the low-pressure side.	If you collect the refrigerant only on the low-pressure side (A in 11). You cannot perform the vacuum of the refrigerant from the check joint of the high-pressure side.
15	Open the liquid stop valve and the gas stop valve completely when you finish the vacuum.	—
16	Make sure that the power is turned OFF and attach the following items: the power supply wire the thermistor the crankcase heater the 63H wiring the panel and the nut).	—
17	Set the DSW back to the original setting. Make sure that all the wirings to the compressor are connected correctly.	—
18	Recharge the refrigerant that is collected in the process by the stop valve of the liquid side during the cooling at the TEST RUN mode.	If the replacement of the compressor takes more than two hours an additional change of the refrigerant is necessary. Additional change = (replacing time – 2 hours) x 0.5 kg.

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