HITACHI

CENTRIFUGAL VRF SERIES
RASC-HNPE

Service Manual

RASC-4HNPE
RASC-5HNPE
RASC-6HNPE
RASC-8HNPE
RASC-10HNPE

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1. General information

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1.1 General information

1.1.1 General notes

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

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

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

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

NOTE

This air conditioner has been designed for standard air conditioning for human beings. For use in other applications, please contact your HITACHI dealer or service contractor.

CAUTION

This unit is designed for commercial and light industrial application. If installed in house hold appliance, it could cause electromagnetic interference.

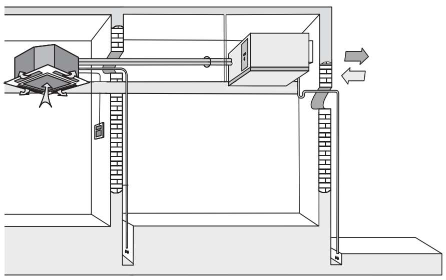
1.1.2 Introduction

RASC units are suitable for business premises and houses where the use of a conventional outdoor unit is either prohibited or impossible.

This air conditioner is designed to offer cooling, heating, dry and fan operation. The operation mode will be controlled by the remote control switch.

These units allow the installation with up to 5 different indoor units for RASC-(4-6)HNPE or 6 indoor units for RASC-(8/10)HNPE.

Additionally, to reduce as much as possible the energy consumption and improve the energy efficiency, RASC units include the “individual operation” mode, performing an individual control over the connected indoor units to create a zone-based control.



1.1.3 Environment-friendly units

This range of HITACHI RASC 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.

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 pose a risk to the safety of those in the surrounding area or to the unit itself are clearly indicated in this manual.

A series of special symbols is 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.***
- ***Not taking these instructions into account could lead to serious, very serious or even fatal injuries to you and others.***

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

CAUTION

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

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

NOTE

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

1.3 Product guide

1.3.1 Classification of RASC unit models

Unit type (RASC unit - Built in horizontal)
Position-separating hyphen (fixed)
Compressor power (HP): 4, 5, 6, 8, 10.
H = Heat pump
N = R410A refrigerant
P = Premium series
E = Made in Europe

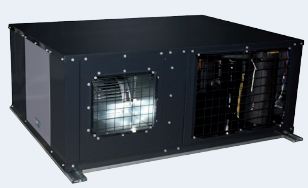
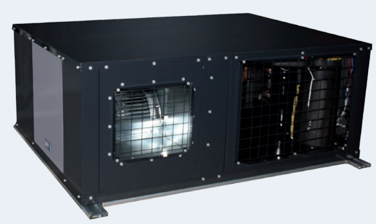
RASC	–	XX	H	N	P	E

1.3.2 Classification of indoor unit models

Unit type (indoor unit): RCI, RCIM, RCD, RPC, RPI, RPIM, RPK, RPF, RPFI
Position-separating hyphen (fixed)
Capacity (HP): 1.5, 2.0, 2.5, 3.0, 4.0, 5.0, 6.0, 8.0, 10.0.
FS = SYSTEM FREE
N = R410A refrigerant
H = Hotel (RPK-1.5HP only)
2/3/4 = series
E = Made in Europe
M = Made in Malaysia
– = Made in Japan
i= Version up (RCI only)
k = Version up RCI for P-AP160NA(1/E) panel only
(-DU) = Drain Up (RPIM only)
(-f) = Non-flammable insulation (RPI-(8.0-20.0)FSN3E-f only

XXX	–	X.X	FS	N	(H)	X	(X)	(i)	(-xx)

1.3.3 Product guide: RASC units

RASC			
			
Unit	Code	Unit	Code
RASC-4HNPE	7E343107		
RASC-5HNPE	7E343108		
RASC-6HNPE	7E343109		
		RASC-8HNPE	7E343110
		RASC-10HNPE	7E343111

NOTE

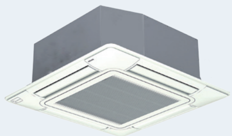
- *Check the exact classification for each unit (model, type, power and series) in “1.3.1 Classification of RASC unit models”.*
- *All references of the “Built-in-horizontal” units contained into this document, have been abbreviated as “RASC” unit.*
- *HITACHI has a range of remote control systems that can be used with the UTOPIA RASC units. Please, refer to the Controls Technical Catalogue.*

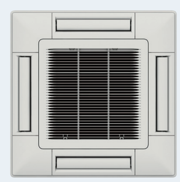
1.3.4 Product guide: Indoor units

NOTE

- *The indoor unit models and codes are the last updated at time of publication; other previous models and coming developments could be available for combination with RASC series.*
- *Check the exact classification for each unit (model, type, power and series) in* *"1.3.2 Classification of indoor unit models"**.*

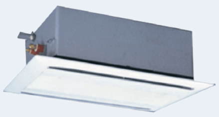
1

RCI						RCIM	
							
4-way cassette				4-way cassette (high efficiency)		4-way cassette (compact)	
Unit	Code	Unit	Code	Unit	Code	Unit	Code
						RCIM-0.8FSN4	60278216
RCI-1.0FSN3Ei	7E403014	RCI-1.0FSN3Ek	7E404001	RCI-1.0FSN3	60278119	RCIM-1.0FSN4	60278217
RCI-1.5FSN3Ei	7E403015	RCI-1.5FSN3Ek	7E404002	RCI-1.5FSN3	60278120	RCIM-1.5FSN4	60278218
RCI-2.0FSN3Ei	7E403016	RCI-2.0FSN3Ek	7E404003	RCI-2.0FSN3	60278121	RCIM-2.0FSN4	60278219
RCI-2.5FSN3Ei	7E403017	RCI-2.5FSN3Ek	7E404004	RCI-2.5FSN3	60278122	RCIM-2.5FSN4	60278220
RCI-3.0FSN3Ei	7E403018	RCI-3.0FSN3Ek	7E404005	RCI-3.0FSN3	60278123		
RCI-4.0FSN3Ei	7E403020	RCI-4.0FSN3Ek	7E404007	RCI-4.0FSN3	60278124		
RCI-5.0FSN3Ei	7E403021	RCI-5.0FSN3Ek	7E404008	RCI-5.0FSN3	60278125		
RCI-6.0FSN3Ei	7E403022	RCI-6.0FSN3Ek	7E404009	RCI-6.0FSN3	60278126		

Panels					
RCI				RCIM	
					
P-N23NA	70531000	P-AP160NA1	60297215	P-AP56NAM (Without motion sensor)	60297297
		P-AP160NAE (With motion sensor)	60297217		

NOTE

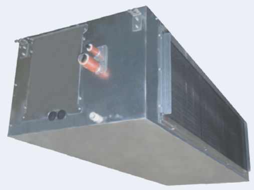
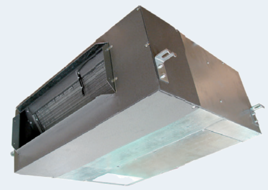
The RCI and RCIM models must be used in combination with the panels indicated above.

RCD				RPC			
							
2-way cassette				Ceiling type		Ceiling type (high efficiency)	
Unit	Code			Unit	Code	Unit	Code
RCD-1.0FSN2	60278029						
RCD-1.5FSN2	60278030					RPC-1.5FSN3	60278164
RCD-2.0FSN2	60278031					RPC-2.0FSN3	60278165
RCD-2.5FSN2	60278032					RPC-2.5FSN3	60278166
RCD-3.0FSN2	60278033			RPC-3.0FSN3E	7E443005	RPC-3.0FSN3	60278167
		RCD-4.0FSN2	60278034	RPC-4.0FSN3E	7E443007	RPC-4.0FSN3	60278168
		RCD-5.0FSN2	60278035	RPC-5.0FSN3E	7E443008	RPC-5.0FSN3	60278169
				RPC-6.0FSN3E	7E443009	RPC-6.0FSN3	60278170

Panels			
RCD			
			
P-N23DNA	60297211	P-N46DNA	60297212

NOTE

The RCD models must be used in combination with the panels indicated above.

RPI						RPIM	
							
Indoor ducted unit							
Unit	Code	Unit	Code	Unit	Code	Unit	Code
RPI-0.8FSN4E	7E424013					RPIM-0.8FSN4E	7E430013
						RPIM-0.8FSN4E-DU	7E431013
RPI-1.0FSN4E	7E424014					RPIM-1.0FSN4E	7E430014
						RPIM-1.0FSN4E-DU	7E431014
RPI-1.5FSN4E	7E424015					RPIM-1.5FSN4E	7E430015
						RPIM-1.5FSN4E-DU	7E431015
		RPI-2.0FSN4E	7E424016				
		RPI-2.5FSN4E	7E424017				
		RPI-3.0FSN4E	7E424018				
		RPI-4.0FSN4E	7E424020				
		RPI-5.0FSN4E	7E424021				
		RPI-6.0FSN4E	7E424022				
				RPI-8.0FSN3E	7E424010		
				RPI-8.0FSN3E-f	7E424410		
				RPI-10.0FSN3E	7E424011		
				RPI-10.0FSN3E-f	7E424411		

RPK		RPF		RPFI	
					
Wall type		Floor type		Floor concealed type	
Unit	Code	Unit	Code	Unit	Code
RPK-0.8FSN3M	60278146				
RPK-0.8FSNH3M	60278154				
RPK-1.0FSN3M	60278147	RPF-1.0FSN2E	7E450001	RPFI-1.0FSN2E	7E460001
RPK-1.0FSNH3M	60278155				
RPK-1.5FSN3M	60278148	RPF-1.5FSN2E	7E450002	RPFI-1.5FSN2E	7E460002
RPK-1.5FSNH3M	60278156				
RPK-2.0FSN3M	60278149	RPF-2.0FSN2E	7E450003	RPFI-2.0FSN2E	7E460003
RPK-2.5FSN3M	60278150	RPF-2.5FSN2E	7E450004	RPFI-2.5FSN2E	7E460004
RPK-3.0FSN3M	60278151				
RPK-4.0FSN3M	60278152				
EV-1.5N (*)	60921791				

NOTE

(*): For RPK-1.5FSNH3M model only.

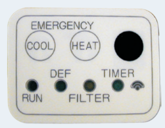
1.3.5 List of accessories

◆ Remote control systems

Individual remote controls

Name	Description	Code	Figure
PC-ARF	Remote control with timer	70510001	
PC-ART	Remote control with timer	70510000	
PC-ARH	Simplified remote control	60291486	
PC-LH3A	Wireless remote control	60291056	
PC-LH3B		60291770	

Receiver kit for combination with wireless remote control switch

Name	Description	Code	Figure
PC-ALH	Receiver kit (For RCI-FSN3Ei -on the panel) (Compatible with PC-LH3A)	60291464	
PC-ALHN		60291627	
PC-ALHD	Receiver kit (For RCD-FSN2 -on the panel) (Compatible with PC-LH3A)	60291467	
PC-ALH3	Receiver kit (For RCI-FSN3 and RCI-FSN3Ek -on the panel-) (Compatible with PC-LH3B)	60291767	
PC-ALHP1	Receiver kit (For RPC-FSN3 -on the panel-) (Compatible with PC-LH3B)	60291823	
PC-ALHC1	Receiver kit (For RCIM-FSN4 -on the panel-) (Compatible with PC-LH3B)	60292003	
PC-ALHZ	Receiver kit (For RCI-FSN3Ei, RCIM-FSN3E, RCD-FSN2, RPC-FSN2, RPI-FSN(3/4)(P)E, RPIM-FSN4E(-DU), RPK-FSN(H)2M, RPF(I)-FSN2E -on the wall-) (Compatible with PC-LH3A)	60291473	
PC-ALHZF	Receiver kit (For RCI-FSN3, RCI-FSN3Ek, RPK-FSN(H)3M and RPC-FSN3 -on the wall-) (Compatible with PC-LH3B)	60291789	

Centralised remote controls

Name	Description	Code	Figure
PSC-A64GT	Touch screen central station	60291730	
PSC-A32MN	Touch screen central station mini	60291966	
PSC-A64S	Centralised remote control	60291479	
PSC-A16RS	Centralised ON/OFF control	60291484	

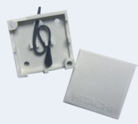
Building air conditioning controls

Name	Description	Code	Figure
CSNET WEB (PSC-A160WEB1)	Centralised control system which runs CSNET WEB software to control the indoor units	7E512000	
CSNET Manager LT	Centralised control with a touch interface of 12 inches which runs CSNET MANAGER software to control the indoor units.	7E512201	
CSNET Manager XT	Centralised control with a touch interface of 17 inches which runs CSNET MANAGER software to control the indoor units.	7E512202	
HC-A64NET	H-LINK gateway used by CSNET MANAGER Screens to communicate with indoor units (Max. 64 indoor units)	7E512200	

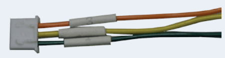
Gateways for building management systems (BMS)

Name	Description	Code	Figure
HC-A8MB	Integration with installation with intelligent control (Building Management System) Gateway Interface to MODBUS systems (Max. 8 indoor units).	7E513204	
HC-A64MB	Integration with installation with intelligent control (Building Management System) Gateway Interface to MODBUS systems (Max. 64 indoor units).	7E513205	
HC-A16KNX	Integration with installations with intelligent control (BMS). Gateway Interface to KNX systems.	7E513300	
KNX001	Integration with installations with intelligent control (BMS) through CSNET WEB. Gateway Interface to KNX systems.	7E512100	
HARC-BX E (A)	Integration with installation with intelligent control (Building Management System) Gateway Interface to LONWORKS systems. (H-LINK I communication) (Max. 64 units with 8 parameters)	60290874	
HARC-BX E (B)	Integration with installation with intelligent control (Building Management System) Gateway Interface to LONWORKS systems. (H-LINK I communication) (Max. 32 units with 16 parameters)	60290875	

Control support devices

Name	Description	Code	Figure
PSC-A1T	Programmable timer	60291482	
PSC-6RAD	H-LINK RAC Adapter	60063017	
PC-A1IO	Integration of external equipment into H-LINK	7E519000	
PSC-5HR	H-LINK Relay	60291105	
PC-AMTB	Connection board for multitenant buildings	7E519200	
THM-R2AE	Remote temperature sensor (THM4)	7E299907	

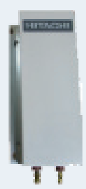
Control accessories

Name	Description	Code	Figure
Wall support	Wall mounted support (for both CSNET MANAGER LT/XT)	7E512300	
Stand support	Stand mounted support (for both CSNET MANAGER LT/XT)	7E512301	
PCC-1A	Optional function connector	70590901	
PRC-10E1	2P-Extension cord (10 metres)	7E790211	
PRC-15E1	2P-Extension cord (15 metres)	7E790212	
PRC-20E1	2P-Extension cord (20 metres)	7E790213	
PRC-30E1	2P-Extension cord (30 metres)	7E790214	
Net Config. Kit	Net configuration kit for HC-A(8/64)MB and HC-A64NET	7E512306	

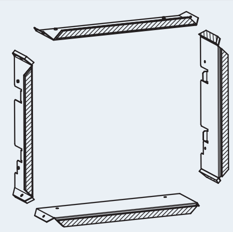
NOTE

In addition to all the aforementioned HITACHI controls, there are some non-HITACHI devices for combination with HITACHI Air Conditioning systems. Please refer to the Technical Catalogue of Controllers for Package for more information.

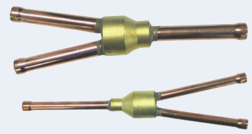
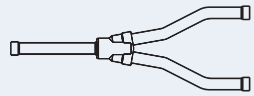
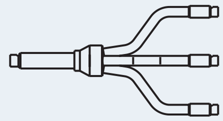
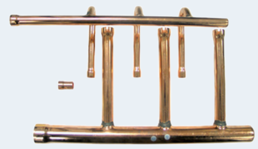
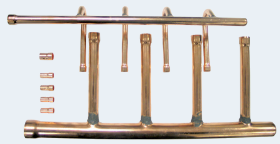
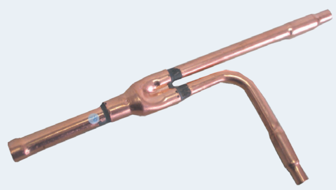
◆ Complementary systems (DX-Interface)

DX-Interface		
 Control box  Expansion valve box	Unit	Code
	EXV-2.0E1	7E610900
	EXV-2.5E1	7E610901
	EXV-3.0E1	7E610902
	EXV-4.0E1	7E610903
	EXV-5.0E1	7E610904
	EXV-6.0E1	7E610905
	EXV-8.0E1	7E610906
	EXV-10.0E1	7E610907

◆ Fan duct accessory

Name	Description	Code	Figure
FD-RASC46	Fan duct accessory for the optional air outlet position (For RASC-(4-6)HP)	7E590904	
FD-RASC810	Fan duct accessory for the optional air outlet position (For RASC-(8/10)HP)	7E590905	

Multikits

Name	Description	Code	Figure
TE-03N1	Branch pipe UTOPIA (pipe kit)	70527012	
TE-04N1		70527013	
TE-56N1		70527014	
TE-08N		70800003	
TE-10N		70800004	
TW-52AN		60291816	
TW-102AN		60291817	
TG-53AN		60291818	
TG-103AN		60291819	
TRE-46N1	Distributor UTOPIA	70527015	
TRE-812N1		70527016	
QE-812N1	Distributor UTOPIA	70527017	
E-102SN3	Branch pipe (multikit)	70524101	
E-162SN3		70524102	

2. Unit installation

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2.1 Initial check

CAUTION

- *Install the RASC unit in a restricted area not accessible by the general public.*
- *Do not install the unit outdoors (Water proof class: IPX0).Only indoor installation is allowed, and air for both suction and discharge must come from outside the building.*
- *Ensure that the installation area has a proper ventilation so that ambient temperature around the unit does never exceed 46ºC.*
- *Install the RASC unit with sufficient clearance around it for operation and maintenance.*
- *Do not install the RASC unit where is a high level of oil mist, salty air or sulphurous atmosphere.*
- *Install the RASC unit as far as practical (being at least 3 meters) from electromagnetic wave radiator (such as medical equipment).*
- *Install the RASC unit where good ventilation is available, for working in an enclosed space may 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.*
- *For cleaning, use noninflammable and nontoxic cleaning liquid. Use of inflammable agent may cause explosion or fire.*
- *Pay attention not to clamp cables when attaching the service cover to avoid electric shock or fire.*
- *Keep clearance between the units of more than 50mm, and avoid obstacles that may hamper air intake, when installing more than one units together.*
- *Install the RASC unit in the shade or not exposed to direct sunshine or direct radiation from high temperature heat source.*
- *Do not install the RASC unit in a space where a seasonal wind directly blows to the RASC unit.*
- *Check to ensure that the foundation is flat, level and sufficiently strong.*
- *Aluminium fins have very sharp edges. Pay attention to the fins to avoid injury.*
- *Keep clearance between the wall (without vent holes) and air inlet/outlet part more than 3 metres in order to avoid short circuit.*
- *Do not put any material on the products.*
- *Do not put any strange material (sticks, etc...) into the air inlet and outlet. These units have high speed rotating fans and it is dangerous that any object touches them.*
- *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.*
- *Children should be supervised to ensure that they do not play with the appliance.*

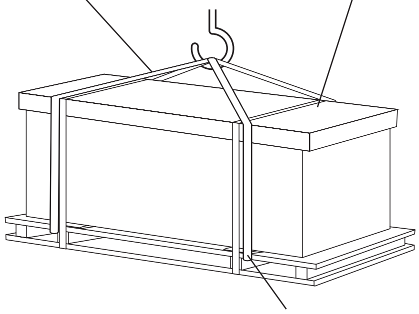
2.2 Transportation

DANGER

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

2.2.1 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 in the figure.



CAUTION

- *Apply two lifting wires on to the RASC unit, when lifting it by crane.*
- *For safety reasons ensure that the RASC unit is lifted smoothly and does not lean.*
- *Do not attach lifting equipment to the plastic band or the corrugated paper frame, because the ropes will slip or break the materials.*
- *Ensure that the exterior of the unit is adequately protected with cloth or paper.*
- *Transport the products as close to the installation location as practical before unpacking.*

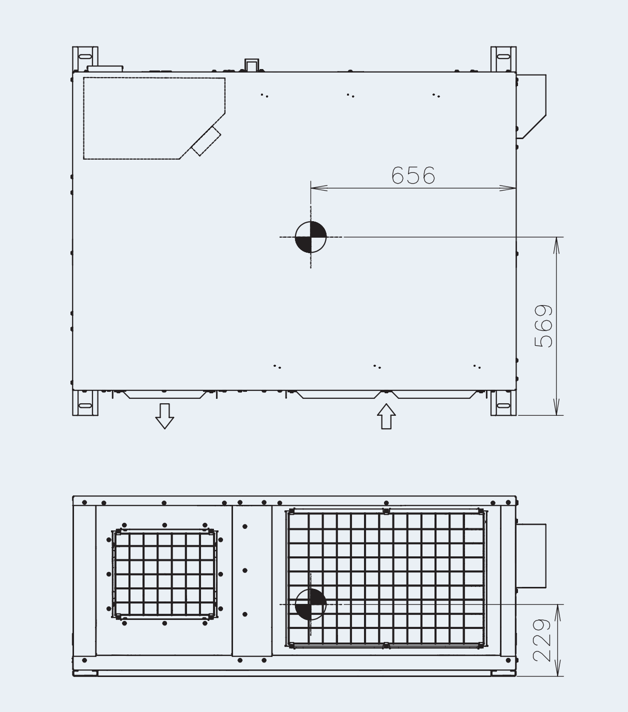
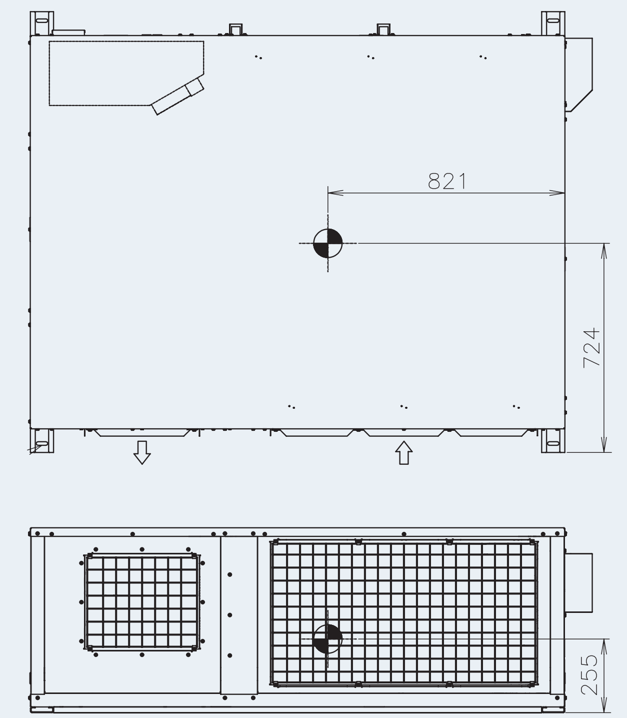
2.2.2 Handling unit (centre of gravity)

When the unit is lifted, pay attention to the following points:

1 Do not remove the wooden base until its final position.

2 To prevent the unit from overturning, pay attention to the centre of gravity as shown in the following figure:

(mm)

RASC-(4-6)HNPE	RASC-(8/10)HNPE
	

3 Due to the high weight of these units, use the appropriate machinery for these works.

Model	Gross weight (kg)
RASC-4HNPE	218
RASC-5HNPE	218
RASC-6HNPE	218
RASC-8HNPE	333
RASC-10HNPE	336

2.3 Factory-supplied components

Unpack the unit and check that:

- The package contains all the components (see next table).
- All components are in perfect condition.

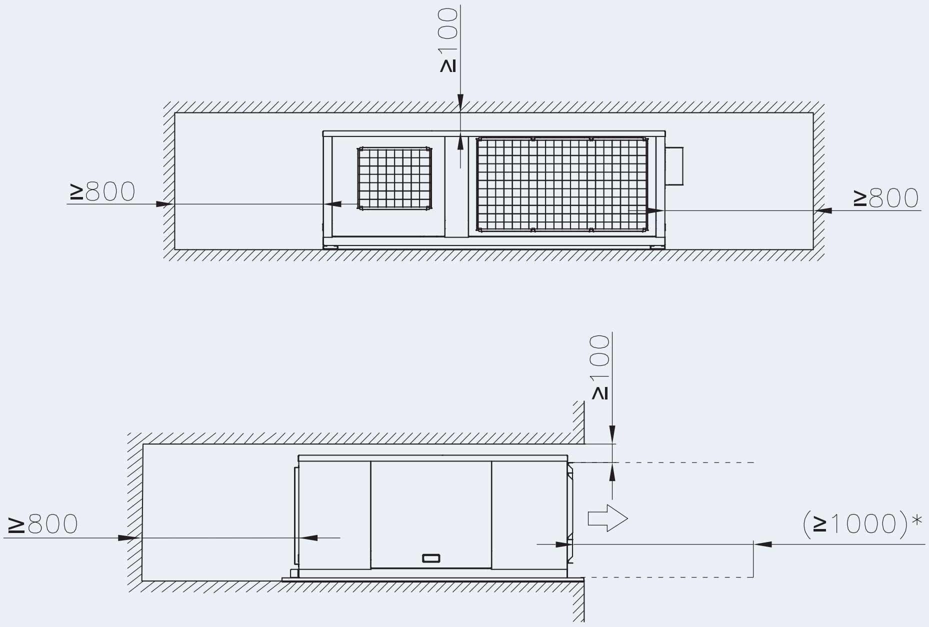
Otherwise, contact the manufacturer.

Name	Quantity	Comments
Declaration of conformity	1	-
Transparent label	1	For attaching in the refrigerant label.
Installation and operation manual	1	Installation and operation unit instructions.
Product fiche	1	(Only for RASC-4HNPE)
Energy label	1	(Only for RASC-4HNPE)
Gas pipe accessory	1	For brazing to the field supplied gas line, and connecting to the gas valve. (Only for RASC-(8/10)HNPE)

2.4 Installation space

Units in mm.

RASC-(4-10)HNPE



NOTE

(*): Recommended servicing space for fan unit in those cases where it is not possible to access from the unit's side. In these cases, a "removable servicing duct" or a "removable grille" (in case of installing the unit next to a wall) shall be installed to allow replacement of the fan unit whenever necessary (which should be made from the unit's front side).

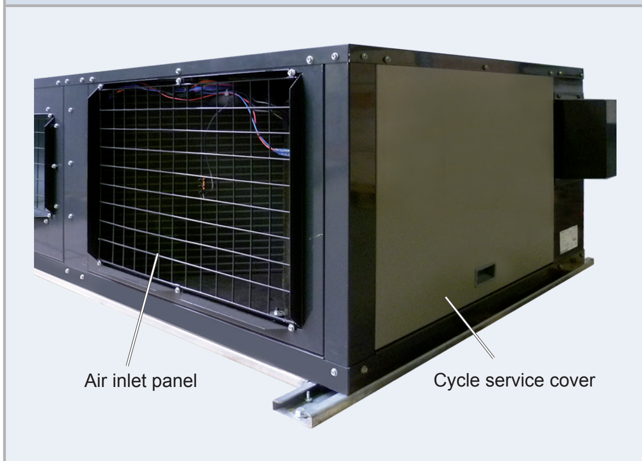
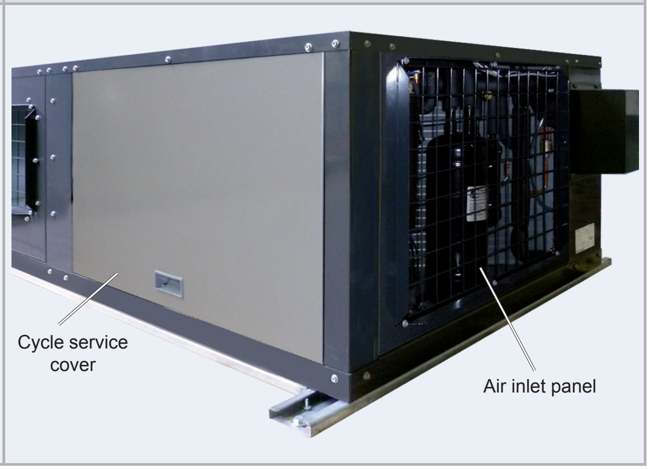
2.5 Interchangeability of air inlet and outlet panels

RASC units can be used in different air inlet/outlet configurations, just by switching the air inlet panel with the cycle service cover or the air outlet panel with the fan service cover.

With respect to the air outlet panel, the change of position entails the rotation of the fan motor as well.

◆ Air inlet modification

The air inlet panel position can be changed if were necessary. There are two different configurations depending on the air inlet panel position:

Air inlet panel (factory-supplied position)	Air inlet panel (optional position)
	

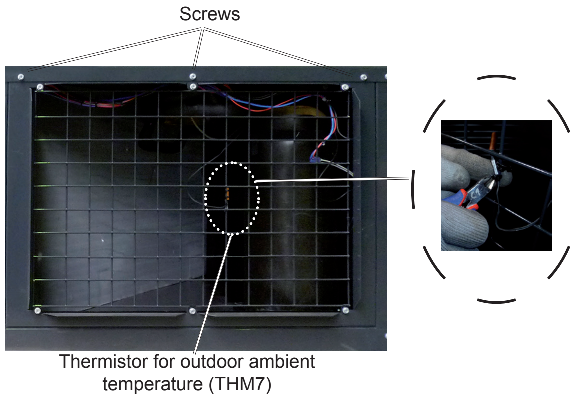
Procedure to change the air inlet panel from factory-supplied position to the optional position

When the air inlet panel position has to be changed, the following instructions must be performed:

1 Remove the air inlet panel:

a. Remove the 3 fixing screws.

b. Remove the thermistor for outdoor ambient temperature from the air inlet panel grill cutting the cable ties.



c. Slide the air inlet panel upward. Then, pull backwards and remove it using the grill.

2 Remove the cycle service cover:

- **a.** Remove the 3 fixing screws.
- **b.** Slide the service cover upward. Then, pull backwards and remove it using the handle.

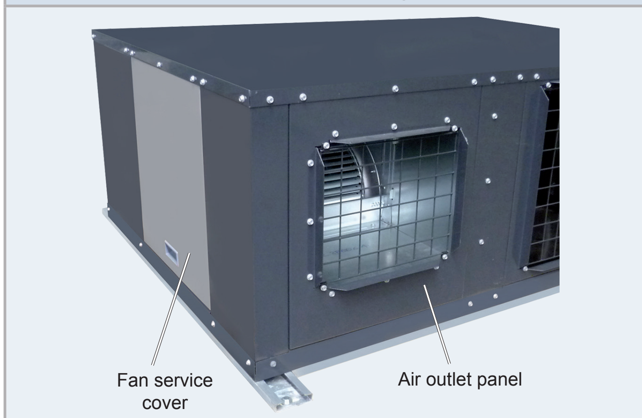
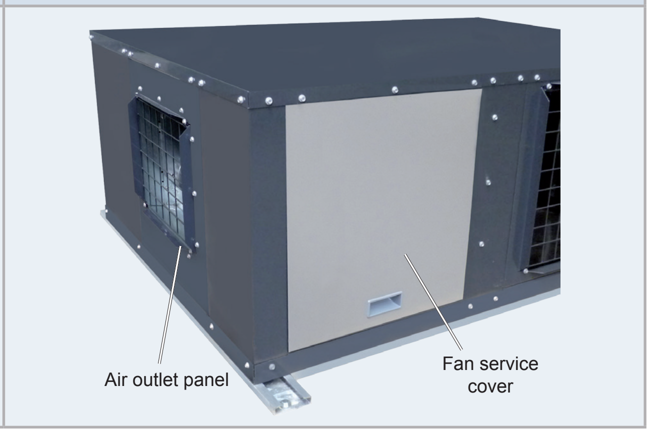
3 Finally, exchange both covers and tighten them with their respective screws.

NOTE

Remember fixing again the thermistor for outdoor ambient temperature (by using cable ties) to the air inlet panel grill, keeping the original position.

◆ Air outlet modification

The air outlet panel position can be changed if were necessary. There are two different configurations depending on the air outlet panel position:

<table>
<tr><th>Air outlet panel and fan unit (factory-supplied position)</th><th>Air outlet panel and fan unit (optional position)</th></tr>
<tr><td>
</td><td>
</td></tr>
</table>

Procedure to change the fan unit from factory-supplied position to the optional position

When the air outlet panel position has to be changed, ***the fan unit position must be modified*** by following this procedure:

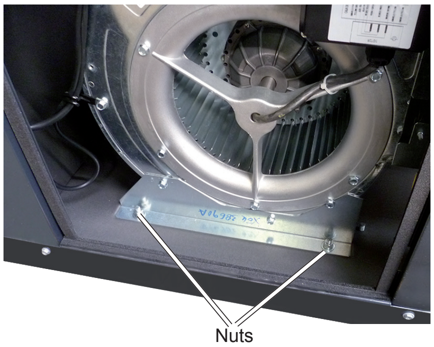
1 In order to access to the unit's internal parts, remove the following covers and panels depending on access restrictions:

- **a.** If upper cover can be removed, remove it as described on chapter *"9. Servicing"* in section *"9.3.6 Removing upper cover"* and access to the unit's internal parts from the upper side.
- **b.** If upper cover cannot be removed, remove the following parts:
  - Remove the fan service cover as described on chapter *"9. Servicing"* in *"9.3.2 Removing fan service cover"*.
  - Remove the back service cover as described on chapter *"9. Servicing"* in *"9.3.4 Removing back service cover"*.

2 Remove the air outlet panel as described on chapter *"9. Servicing"* in *"9.3.8 Removing air outlet panel".*

3 Unscrew the 4 fixing nuts of the fan unit feet:

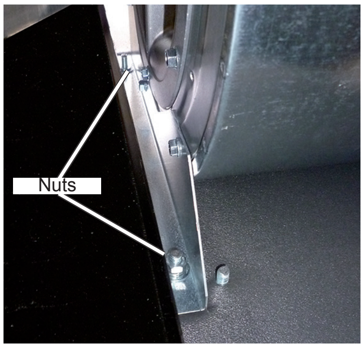
- From the fan service cover, unscrew the 2 nuts of one of the fan unit side feet.



- From the back service cover, unscrew the 2 nuts of the other fan unit side foot.

  NOTE

  There is little space to remove the fixing screws in this side. Use box spanner or universal joint in order to facilitate the work.

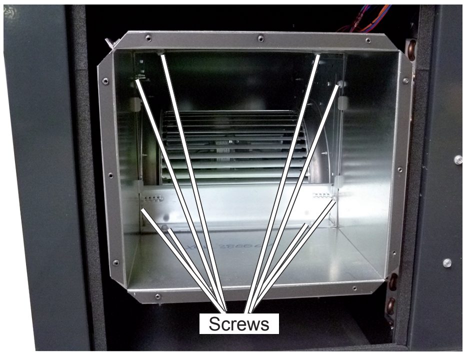


NOTE

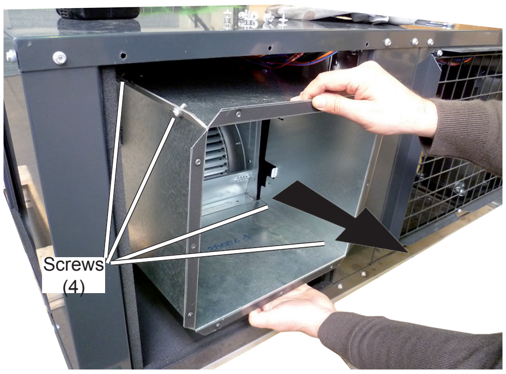
Keep the two 2 washers (1 flat washer + 1 spring washer) of each screw to use it when reassembling.

4 Remove the fan duct assembly by following these steps:

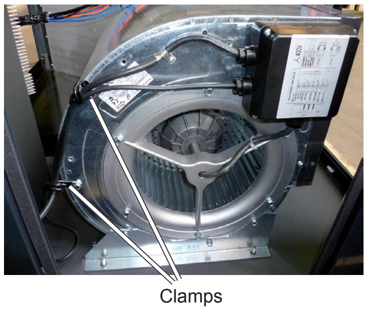
a. Remove the 8 screws of the fan duct assembly. Save these screws, as they will be needed for the assembly of the fan duct accessory.

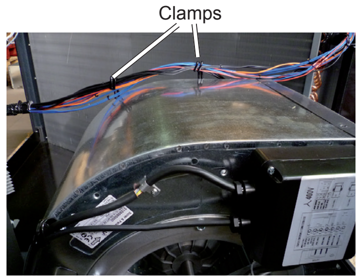


b. From the air outlet panel, take the fan duct assembly out by pulling it. There are 4 screws that will be needed for the assembly of the fan duct accessory.



5 Remove the wiring from the clamps before turning the fan to the optional position.

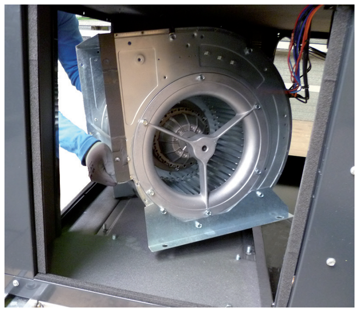


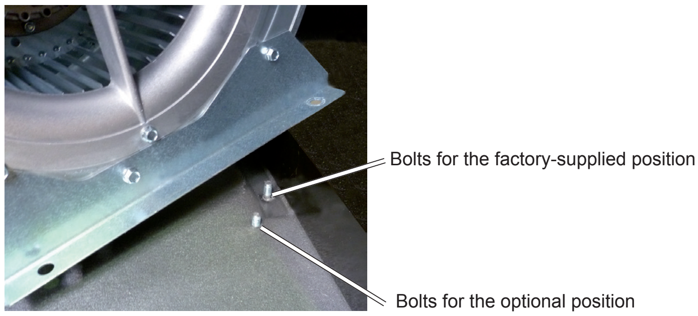


6 Lift the fan unit up slightly, turn it to the optional position, place both fan unit feet into their corresponding bolts for this optional position and fix the 4 screws to the fan unit feet.

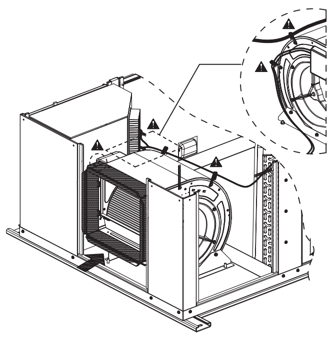
⚠ **CAUTION**

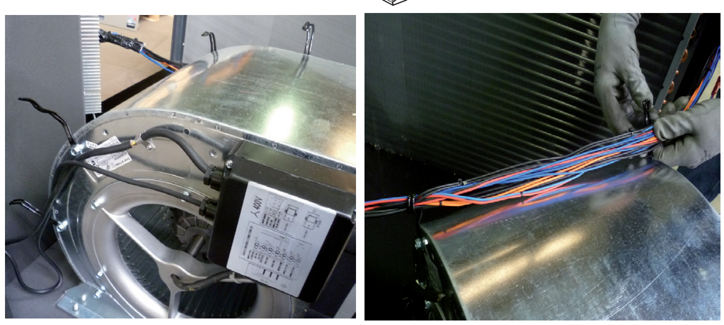
When lifting the fan unit up, at least two people are required (one from each side).





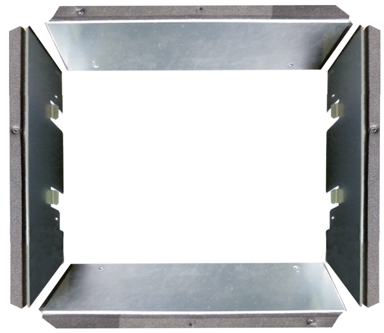
7 Place the wiring to the new position and fix them using the clamps, as shown in the picture.





8 Once the fan is placed to the optional position, proceed to the assembly of the fan duct accessory (provided separately).

- HITACHI accessory code:
  - 7E590904 (for 4-6 HP)
  - 7E590905 (for 8/10 HP)



9 The fan duct accessory consists of 4 plates: 2 long plates (for horizontal position) and 2 short plates (for vertical position).
They must be assembled as follows:

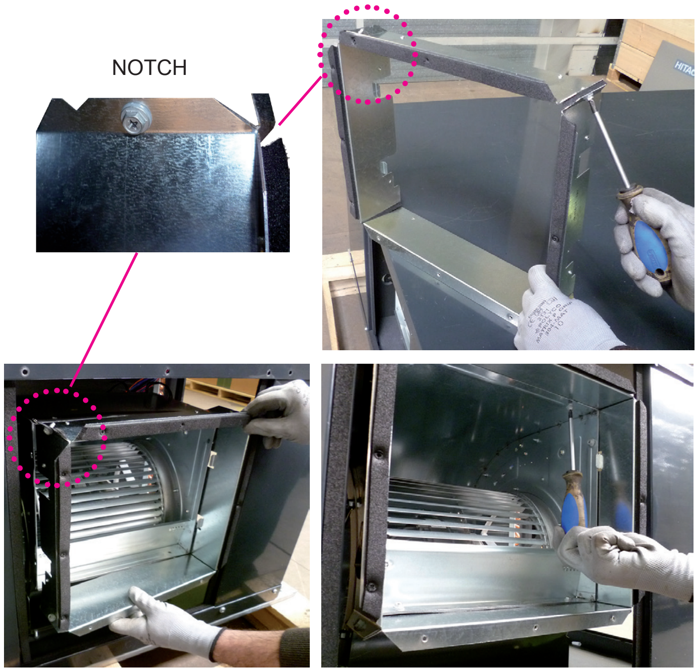
i. There is 1 long and 1 short plate with a notch. Ensure that they match for a correct assembly.

ii. Once those plates match, proceed to tighten the 4 screws (1 for each edge). The screws must have been kept from the disassembly of the fan duct assembly.

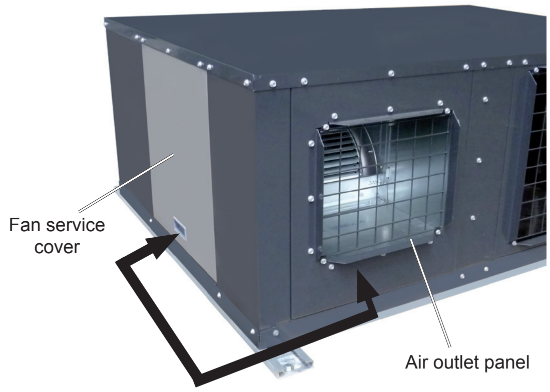
iii. After the accessory is mounted, proceed to place it to the fan unit. The notch must be at the top-left side of the fan unit. 8 screws are required to fix the duct accessory, which must have also been kept from the disassembly of the fan duct assembly.

NOTE

Carefully read the instructions provided with the fan duct accessory for a proper assembly.

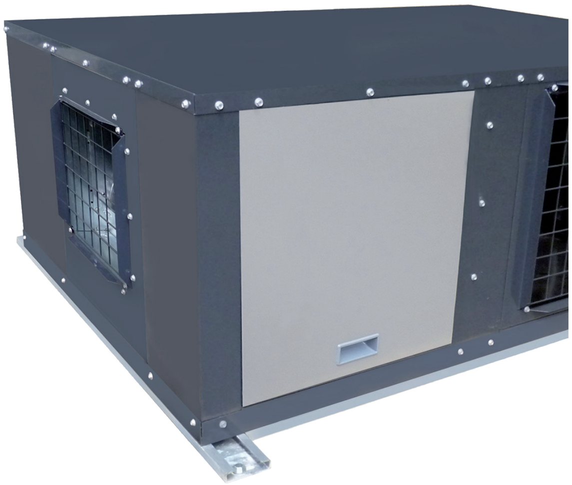


10 Exchange the position of the air outlet panel and fan service cover.



11 Finally, install all the covers again screwing them.

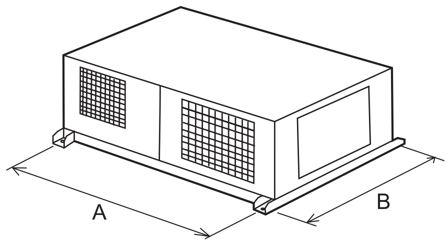




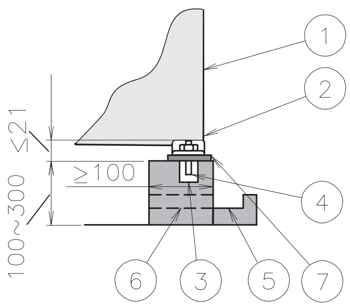
2.6 Installation place provision

◆ Floor mounted

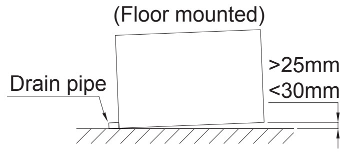
1. Foundation could be on flat and is recommended be 100-300mm higher than floor level.
2. Install a drainage around foundation for smooth drain.
3. When installing the unit fix it by anchor bolts of M10.
4. Use vibration-proof rubber (approx. 60 degree) between the unit and foundation.
5. Drain water sometimes turns to ice. Therefore, avoid draining in an area that people often use because it is slippery.
6. Check to ensure that water-proofing measure shall be taken to the foundation.
7. Install the unit making sure that the drain outlet part is lower (>25mm / <30mm) than the opposite side in order to avoid incorrect drain discharge.



Mark	Anchor bolt pitch	
Model	(4-6)HP	(8/10)HP
A(mm)	1335	1770
B(mm)	1113	1463

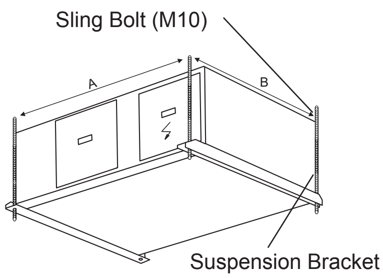


Nº	Description
①	Unit
②	Cut this portion of bolt If not, it's difficult to remove Service Cover
③	Mortar Hole (Ø100xDepth 150)
④	Anchor Bolt M10
⑤	Drainage (Wide 100xDepth 150)
⑥	Drainage
⑦	Vibration-proof rubber

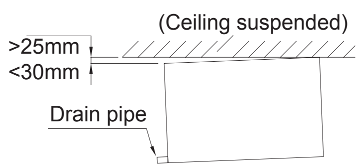


◆ Ceiling suspended

1. Suspend the unit as the drawing indicates.
2. Ensure that ceiling can resist the unit weight which is indicated into the specification label.
3. Install the unit so that the drain outlet parts is slightly lower than the other side (>25mm / <30mm), in order to avoid incorrect drain discharge.



Mark	Sling bolt pitch	
Model	(4-6)HP	(8/10)HP
A(mm)	1335	1770
B(mm)	1113	1463



⚠ **CAUTION**

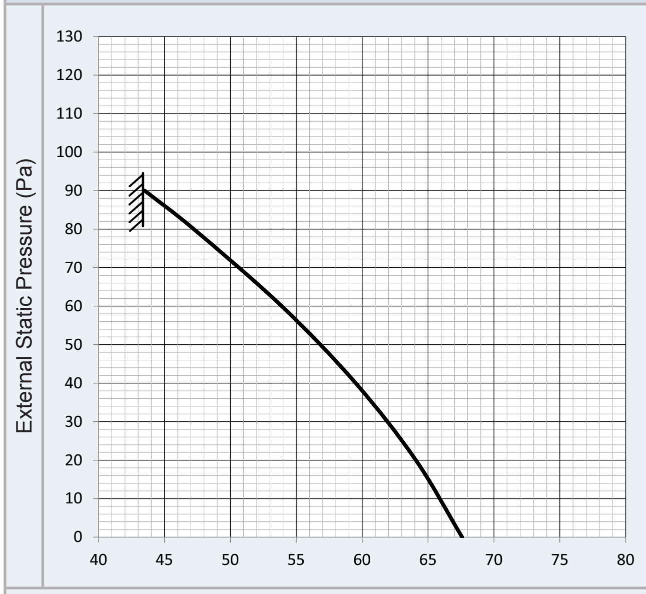
- *If the unit is suspended in the ceiling, place for installation is sufficiently strong. If not, reinforce the place with beams, etc., (more than 150 kg for one sling bolt) otherwise, the unit may fall down or the unit wind resonance may produce abnormal noise.*
- *Do not install the unit using vibration-proof springs or mounting springs.*

2.7 Fan performance curves

RASC unit can be installed with suction and/or discharge air ducts. Refer to the fan performance curves in order to ensure that the air volume is within the working range.

In case of using suction and/or discharge air ducts, check the fan performance curve and decide which ducts are suitable according to the external static pressure (Pa) / air flow volume (m^3/min.).

RASC-4HNPE

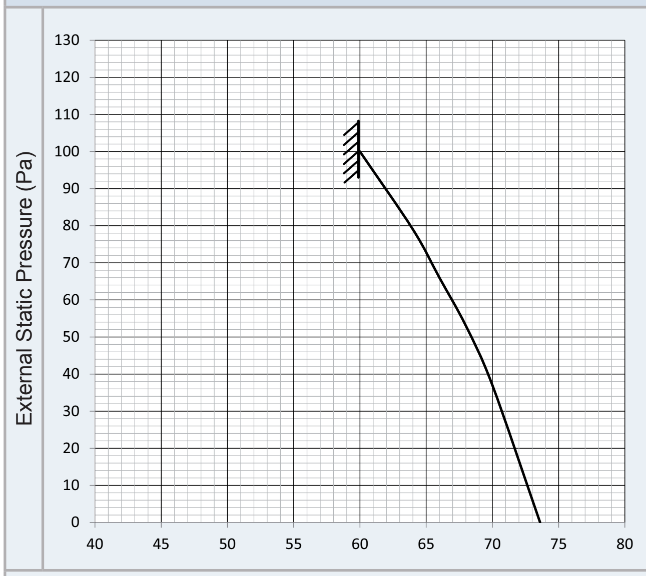


Air flow (m^3/min)

RASC-5HNPE

Air flow (m^3/min)

RASC-6HNPE

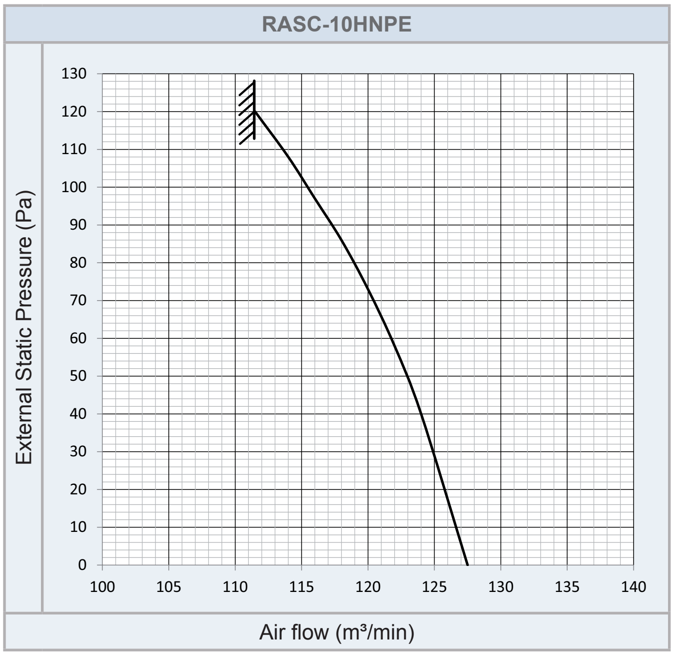


Air flow (m^3/min)

RASC-8HNPE

Air flow (m^3/min)

2



NOTE

- *When designing a duct, check to ensure that the Air volume is within working range as indicated in the fan performance curves.*
- *If the Air volume is set outside working range, water carry-over (drop in the ceiling or into the room), noise increase, damage to fan motor (high temperature) or insufficient Cooling/Heating capacity phenomena can occur.*

◆ Setting of the fan performance curves

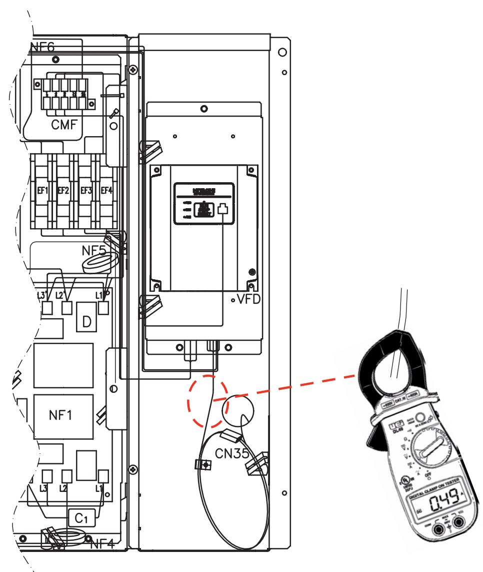
In some installations, it may be necessary to adjust the fan operation settings of RASC-(6/8/10)NPE units in order to achieve an optimal performance of the fan unit. The correct static pressure setting (Low / Medium / High) has to be selected using the PSW and 7-segment display on the RASC PCB, according to the pressure values below:

- RASC-(4/5)HP: No setting is required.
- RASC-(6/8)HP: Select the “Medium pressure setting (F2 : 1)” for external static pressures higher than 50 Pa.
- RASC-10HP: Select the most suitable static pressure setting, depending on the installation conditions:
  - “Medium pressure setting (F2 : 1)”: For external static pressures between 50 and 80 Pa.
  - “High pressure setting (F2 :2)”: For external static pressures higher than 80 Pa.

Default value: “Low pressure setting (F2 :0)”

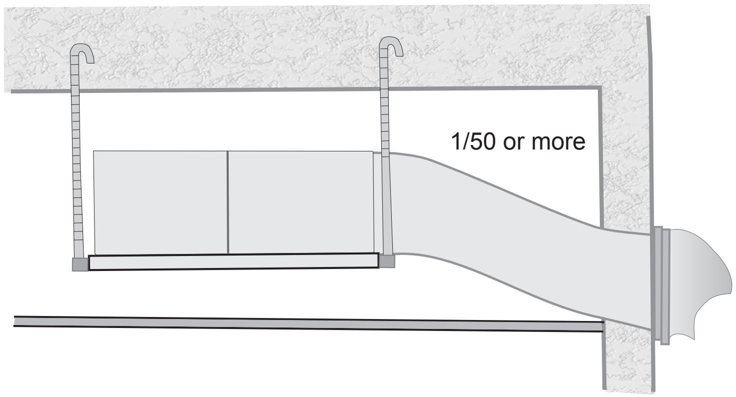
In order to do so, measure the fan motor current and set the static pressure setting according to the following table: For the measurement of the fan motor current, please refer to the following drawing:

Model	Fan motor current (A)	
	Medium pressure setting (F2: 0 → 1)	High pressure setting (F2: 0 → 2)
RASC-6HP	< 1.40 A	-
RASC-8HP	< 3.10 A	-
RASC-10HP	2.65 ~ 3.10 A	< 2.65



2.8 Duct connection

Install the duct with down slope to prevent entry of rain water. Also, provide insulation for duct and connection in order to prevent dew formation.



3. Piping work and refrigerant charge

Index

3.1 Piping work connection considerations

3.1.1 Copper pipes and sizes

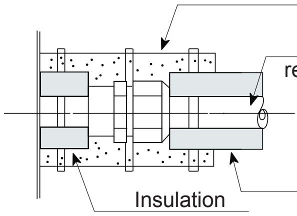
1 Prepare locally-supplied copper pipes.

2 Select the correct pipe size and material. Use the table below to select the required piping.

Nominal Diameter		Thickness (mm)	Copper Type
(mm)	(in)		
Ø6.35	1/4	0.80	Roll
Ø9.52	3/8	0.80	Roll
Ø12.7	1/2	0.80	Pipe/Roll
Ø15.88	5/8	1.00	Roll
Ø19.05	3/4	1.00	Pipe/Roll
Ø22.23	7/8	1.00	Pipe/Roll
Ø25.4	1	1.00	Pipe
Ø28.58	11/8	1.25	Coil

3 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.

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



NOTE

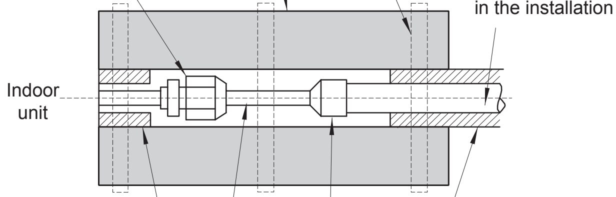
If copper pipe is used for piping bigger than Ø19.05 flaring work can not be performed. If necessary, use a joint adapter.

CAUTION

- *Do not use saws, grindstone or other tools which might create copper dust.*
- *When cutting pipes, secure the part to be soldered as shown in the Service Manual.*
- *Strictly follow national or local regulations regarding occupational health and safety.*
- *Wear appropriate means of protection during cutting or brazing operations and installation (gloves, eye protection, etc).*

3.1.2 Pipe connection

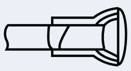
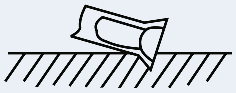
Fix the connecting pipe as shown in the figure below. Use the insulation attached to the indoor unit.



NOTE

A system with no moisture or oil contamination will give maximum performance and life-cycle as compared with 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.

- Cap the end of the pipe when the pipe is to be inserted through a hole.
- Do not place pipes directly on the ground without a cap or vinyl tape covering the end.

Correct	Wrong
	

- If piping installation cannot be completed until the following day or longer, solder the ends of the piping to close them and load with oxygen-free nitrogen using an access device such as a Schrader valve to avoid moisture and contamination by extraneous particles.
- Do not use insulation material containing NH3 as it can damage the copper piping material and may be a source of future leakage.

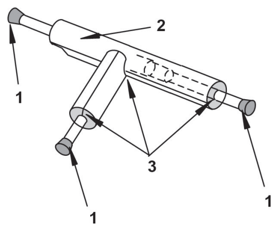
3.1.3 Insulation

Attach insulation package with the Multikit to each branch using vinyl tape. Also attach insulation to field-supplied piping to prevent capacity decrease due to ambient air conditions and dewing on pipe surface caused by low pressure.

NOTE

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

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



CAUTION

- *Perform insulation work when the surface temperature reaches the room temperature. Otherwise it is possible that the insulation will melt.*
- *If the ends of the piping system are open after accomplishing piping work securely attach caps or vinyl bags to the ends of the piping avoiding the invasion of moisture and dust.*

3.1.4 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.

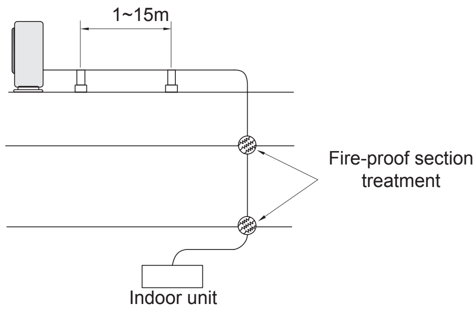
In order to avoid oxidation, pay much careful attention to basic piping work control to avoid infiltration of moisture or dust during the refrigerant piping work.

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 expansion valve (Water choking) + Generation of hydration and oxidation of oil ↓ Clogged strainer, etc., insulation failure and compressor failure	• Pipe protection 1 Pinching 2 Taping • Flushing • Vacuum drying - One gram of water turns into gas (approx. 1000 lrs) at 1 Torr - Therefore, it takes long time to vacuum-pump by a small vacuum pump
2 Clean No dust inside of pipes	• Infiltration of dust or other through the pipe ends • Oxidation film during brazing without blowing nitrogen • Insufficient flushing by nitrogen after brazing	Clogging of expansion valve, capillary tube and filter Oxidation of oil Compressor failure ↓ Insufficient cooling or heating compressor failure	• Pipe protection 1 Mounting caps 2 Taping 3 Pinching • Flushing
3 No leakage No leakage shall exist	• Brazing failure • Failed flaring work and insufficient torque of squeezing flare • Insufficient torque of squeezing flanges	Refrigerant shortage Performance decrease Oxidation of oil ☛ Overheating of compressor ↓ Insufficient cooling or heating Compressor failure	• Careful basic brazing work • Basic flaring work • Basic flange connecting work • Air tight test • Holding of vacuum

3.1.5 Suspension of refrigerant piping

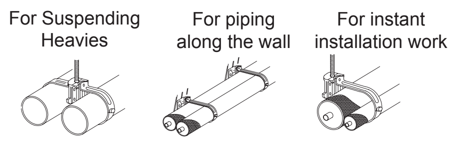
Suspend the refrigerant piping at certain points and prevent the refrigerant piping from touching the weak part of the building such as wall, ceiling, etc…

(If touched, abnormal sound may occur due to the vibration of the piping. Pay special attention in case of short piping length).



Do not fix the refrigerant piping directly with the metal fittings (The refrigerant piping may expand and contract).

Some examples for suspension method are shown below.

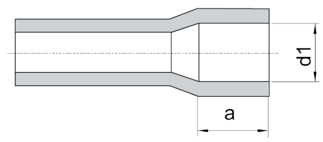


3.1.6 Brazing work

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.

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.

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

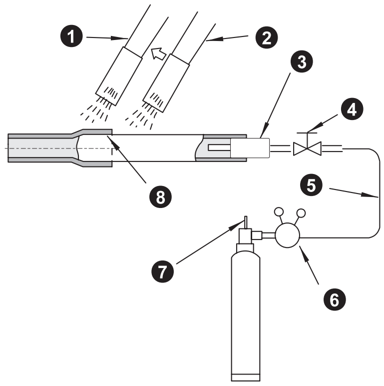


Copper pipe size		Ød1		Gap	a
Ø6.35	+0.08	Ø6.5	+0.1	0.33	6
	-0.08		0	0.07	
Ø9.52	+0.08	Ø9.7	+0.1	0.35	8
	-0.08		0	0.09	
Ø12.7	+0.08	Ø12.9	+0.1	0.38	8
	-0.08		0	0.19	
Ø15.88	+0.09	Ø16.1	+0.1	0.41	8
	-0.09		0	0.13	
Ø19.05	+0.09	Ø19.3	+0.1	0.44	10
	-0.09		0	0.16	

Copper pipe size		Ød1		Gap	a
Ø22.22	+0.09	Ø22.42	+0.1	0.39	10
	-0.09		0	0.11	
Ø25.4	+0.12	Ø25.6	+0.1	0.42	12
	-0.12		0	0.08	
Ø28.58	+0.12	Ø28.78	+0.1	0.42	12
	-0.12		0	0.08	
Ø31.75	+0.12	Ø32.0	+0.1	0.47	12
	-0.12		0	0.13	
Ø38.1	+0.12	Ø38.3	+0.1	0.52	14
	-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

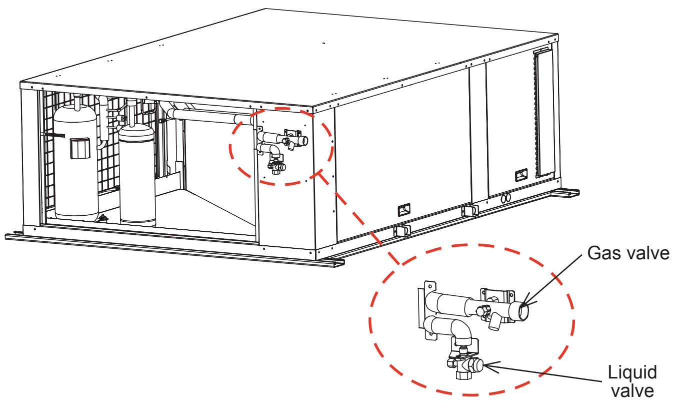


CAUTION

- *Use nitrogen gas for blowing during pipe brazing. If oxygen, acetylene or fluorocarbon gas is used, it will cause an explosion or poisonous gas.*
- *A lot of oxidation film will occur inside of tubes if no nitrogen gas blowing is performed during brazing work. This film will be flecked off after operation and will circulate in the cycle, resulting in clogged expansion valves, etc. This will cause bad influence to 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 a excessively high pressure is applied to a pipe, it will cause an explosion.*

3.2 Piping connection for RASC unit

The stop valves are located on the right side of unit cover. Before connecting refrigerant piping, the stop valve protection cover shall be removed.



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

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

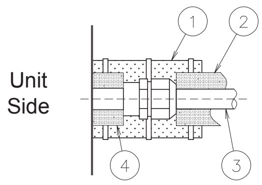
3 Check to ensure that the stop valves are completely closed before connecting pipes.

4 Connect the field supplied refrigerant pipes to the indoor unit and RASC 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 (1/4”)	20
Ø 9.52 mm (3/8”)	40
Ø 12.70 mm (1/2”)	60
Ø 15.88 mm (5/8”)	80
Ø 19.05 mm (3/4”)	100

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



Nº	Description
①	Insulation Material
②	Insulation Material
③	Field Supplied
④	Insulation Material

6 Operation of stop valve should be performed according to the indications below:

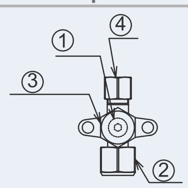
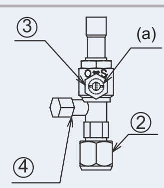
RASC unit stop valve

1 Remove the stop valve cap before performing the air tight test after connecting the flare nut. Tighten the spindle valve in clockwise according to the following table “Tightening Torque of Stop Valves”.

2 Tighten the flare nut according the specified torque. If the tightening torque is excessive, it may cause refrigerant leakage from the spindle part.

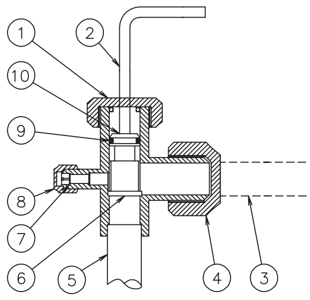
3 Perform the air tight test after the tightening work. It is more effective to perform this work after fix the flare nuts for the piping connection to the stop valves.

4 Use the charging hose for the check joint connection. When removing the charging hose from the check joint, a sound may be heard by a small quantity of refrigerant leak. However it is not abnormality. Do not apply excessive force to the end of opening the spindle. (Tightening Torque: < 5.0 N·m).

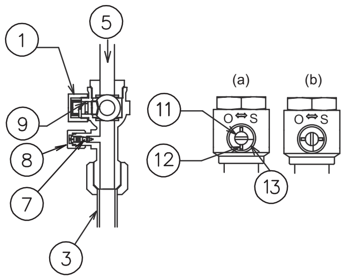
RASC unit stop valve		
	Spindle type	Ball type
	Liquid	Gas
		
①	Spindle valve	
②	Flare nut	
③	Cap	
④	Check joint for service port	

Tightening Torque (N.m)				
	①	②	③	④
Liquid valve	7-9	40 10HP: 60	33-42	14-18
Gas valve	-	80 8/10HP: 100	20-25	

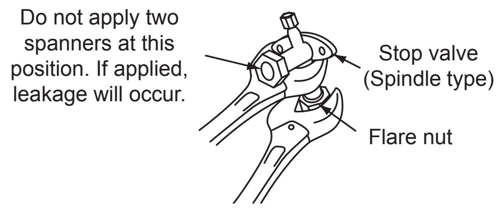
Spindle type

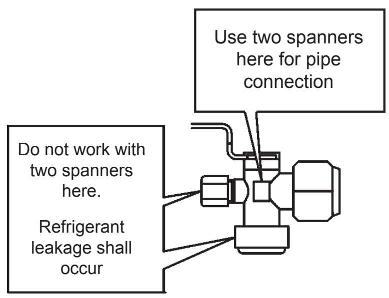


Ball type

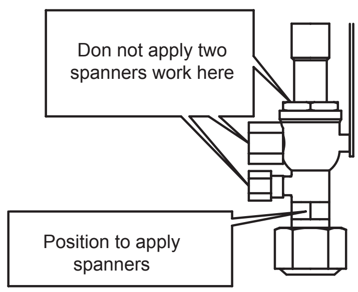


Nº	Description	Remarks
①	Cap	
②	Allen wrench	Hex 4 mm
③	Refrigerant piping	Field supplied
④	Flare nut	
⑤	Refrigerant pressure	To RASC unit
⑥	Seat Surface	Fully closed position
⑦	Check joint	Only the charging those can be connected
⑧	Charge port cap	
⑨	O-Ring	Rubber
⑩	Spindle valve	Open – Counterclockwise
		Close – Clockwise
⑪	Shaft	
⑫	Pin	
⑬	Stopper	
(a)	Closed	This valve is opened or closed with rotating 90 degrees at the ball valve part. Rotate the shaft until the pin touches the stopper. Do not apply the extra force. Use a slotted screwdriver to control the shaft. Do not leave the ball valve partly open
(b)	Opened	





Spindle type



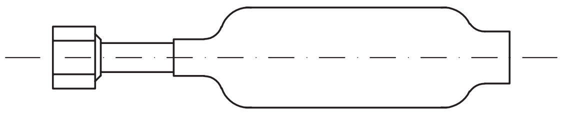
Ball type

⚠ CAUTION

- *At the test run, fully open the spindle and ball stop valve.*
- *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.*
- *An excess or a shortage of refrigerant is the main cause of trouble to the units. Charge the correct refrigerant quantity according to the description of label at the inside of service cover.*
- *Check for refrigerant leakage in detail. If a large refrigerant leakage occurs, it will cause difficulty with breathing or harmful gases would occur if a fire was being used in the room.*

◆ Gas pipe accessory (Only for RASC-(8/10)HNPE)

The gas pipe accessory (factory-supplied silencer) shall be brazed to the field supplied gas line, and connected to the gas valve as indicated in the drawing:



Brazing work

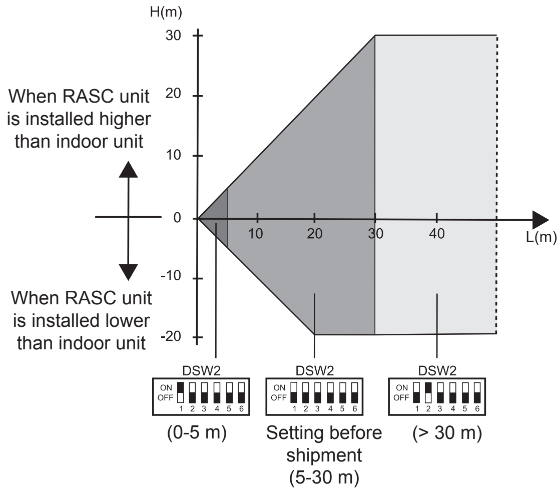
CAUTION

- *Use nitrogen gas for blowing during pipe brazing. If oxygen, acetylene or fluorocarbon gas is used, it will cause an explosion or poisonous gas.*
- *A lot of oxidation film will occur inside of tubes if no nitrogen gas blowing is performed during brazing work. This film will be flecked off after operation and will circulate in the cycle, resulting in clogged expansion valves, etc. This will cause bad influence to 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 a excessively high pressure is applied to a pipe, it will cause an explosion.*

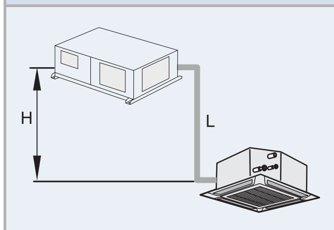
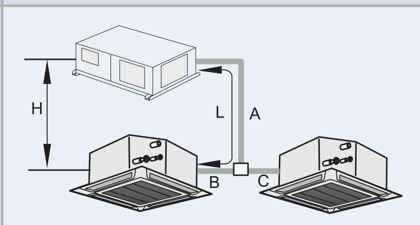
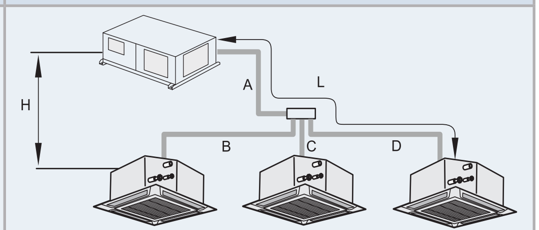
3.3 Refrigerant piping range

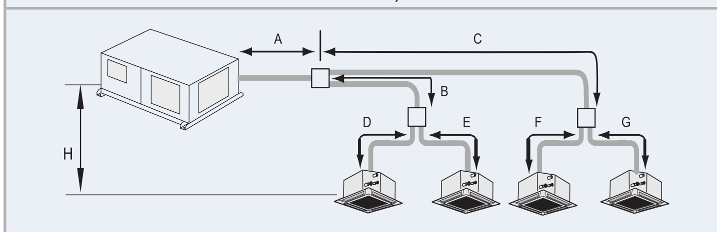
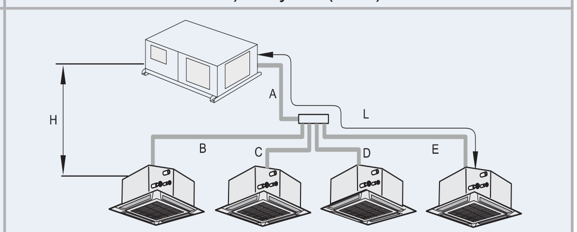
3.3.1 Refrigerant piping length

The refrigerant piping between the indoor unit and the RASC unit should be designed using the following instructions. Keep the design point within the area of the chart, which shows the applicable height difference according to piping length.



3.3.2 Piping system (Header branch installation)

1 indoor unit system	2 indoor units system	3 indoor units system
		
-	L= A + the longest of B & C	L=A + the longest of B, C & D

4 indoor units system	
Case a)	Case b) Only for (8/10)HP
	
L= A + the longest of (B + the longest of D & E) & (C + the longest of F & G)	L= A + the longest of B, C, D & E

NOTE

- *L and H are the length and height indicated in the above chart. For 1, 2 or 3 indoor unit systems, the length is the distance between the RASC unit and the farthest indoor unit.*
- *The liquid piping and the gas piping must be of the same length and run along the same route.*
- *Multi-kits for multiple connections (optional accessory as system parts) must be used to install the branch pipe to the indoor unit. Install them at the same horizontal level.*
- *Install the branch piping as close as possible to the indoor units.*

◆ Maximum refrigerant piping length (Header branch installation)

(m)

<table>
<tr><th colspan="3">Item</th><th>4HP</th><th>5HP</th><th>6HP</th><th>8HP</th><th>10HP</th></tr>
<tr><td rowspan="2">Maximum piping length between the RASC unit and the farthest indoor unit</td><td colspan="2">Actual piping length (L)</td><td colspan="3">75</td><td colspan="2">100</td></tr>
<tr><td colspan="2">Equivalent piping length (EL)</td><td colspan="3">95</td><td colspan="2">125</td></tr>
<tr><td rowspan="4">Maximum total piping length</td><td colspan="2">2 indoor units (A + B + C)</td><td colspan="3">85</td><td>100</td><td>115</td></tr>
<tr><td colspan="2">3 indoor units (A + B + C + D)</td><td colspan="3">95</td><td>100</td><td>130</td></tr>
<tr><td rowspan="2">4 indoor units</td><td>Case a) (A + B + C + D + E + F + G)</td><td colspan="3">95</td><td>100</td><td>145</td></tr>
<tr><td>Case b) (A + B + C + D + E)</td><td colspan="3">-</td><td>100</td><td>145</td></tr>
<tr><td rowspan="4">Maximum piping length between multikit and indoor unit</td><td colspan="2">2 indoor units (B, C)</td><td colspan="3">10</td><td colspan="2">15</td></tr>
<tr><td colspan="2">3 indoor units (B, C, D)</td><td colspan="3">10</td><td colspan="2">15</td></tr>
<tr><td rowspan="2">4 indoor units</td><td>Case a) B + D, B + E, C + F, C + G</td><td colspan="3">10</td><td colspan="2">15</td></tr>
<tr><td>Case b) B, C, D, E</td><td colspan="3">-</td><td colspan="2">15</td></tr>
<tr><td rowspan="2">Maximum height difference between RASC unit and indoor unit (H)</td><td colspan="2">RASC unit higher than indoor unit</td><td colspan="5">30</td></tr>
<tr><td colspan="2">Indoor unit higher than RASC unit</td><td colspan="5">20</td></tr>
<tr><td colspan="3">Maximum height difference between indoor units</td><td colspan="5">10</td></tr>
<tr><td colspan="3">Maximum height difference between multikits and between multikit and indoor unit</td><td colspan="5">3</td></tr>
</table>

NOTE

- *It is recommended that the refrigerant piping length from the RASC unit to the first branch (A) is greater than the piping length from the first branch to the farthest indoor unit.*
- *All branch piping should be balanced, and the difference between these sections cannot be greater than indicated in the tables below:*

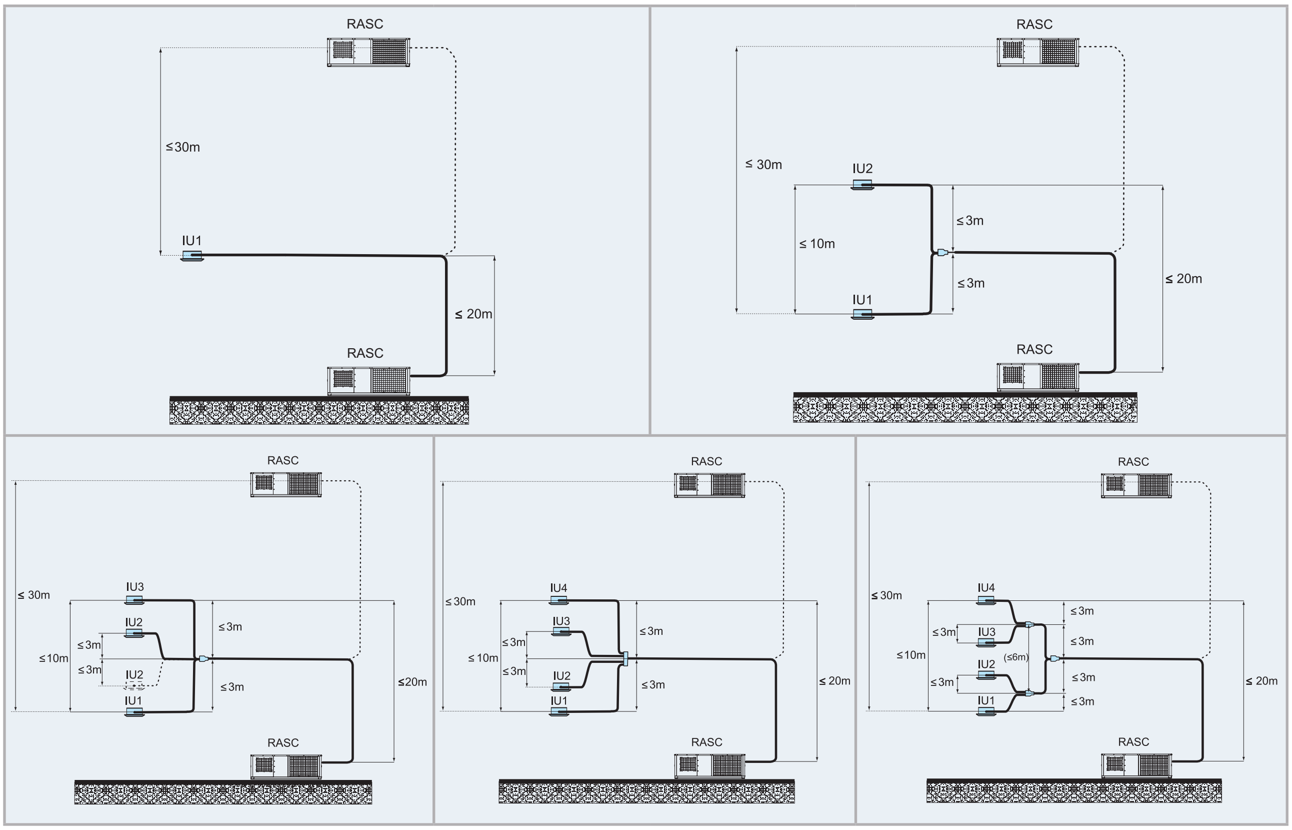
(m)

<table>
<tr><th colspan="3"></th><th>(4/10)HP</th></tr>
<tr><td colspan="2">2 indoor units</td><td>(B-C)</td><td rowspan="6">8</td></tr>
<tr><td colspan="2">3 indoor units</td><td>(B-C, B-D, C-D)</td></tr>
<tr><td rowspan="4">4 indoor units</td><td rowspan="3">Case a)</td><td>(B+(D or E)) - (C+(F or G))</td></tr>
<tr><td>(D-E)</td></tr>
<tr><td>(F-G)</td></tr>
<tr><td>Case b) Only for (8/10)HP</td><td>(B-C, B-D, B-E, C-D, C-E, D-E)</td></tr>
</table>

3

◆ Maximum height difference (clarification)

It is recommended to install all indoor units at the same height. Nevertheless, when the height difference between the indoor units due to building construction is necessary, this should be less than the value indicated in the figure:



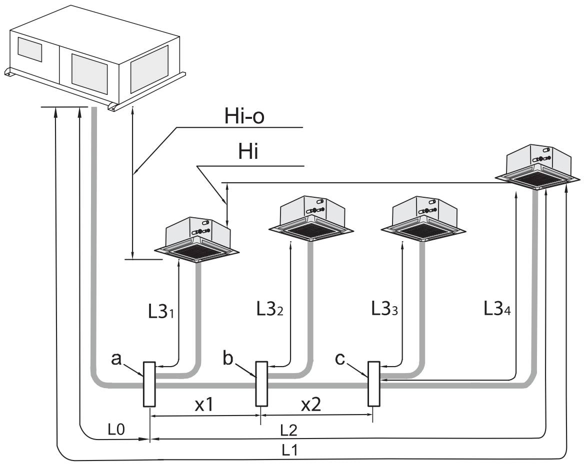
NOTE

All pictures are shown as an example.

3.3.3 Piping system (Line branch installation)

RASC unit	4 HP	5 HP	6 HP	8 HP	10 HP
Allowed quantity of indoor units	2 - 5 (*)			2 - 6 (*)	

(*): In case of more than 4 indoor units, please respect the restrictions shown in section Combinability of the Technical Catalogue.



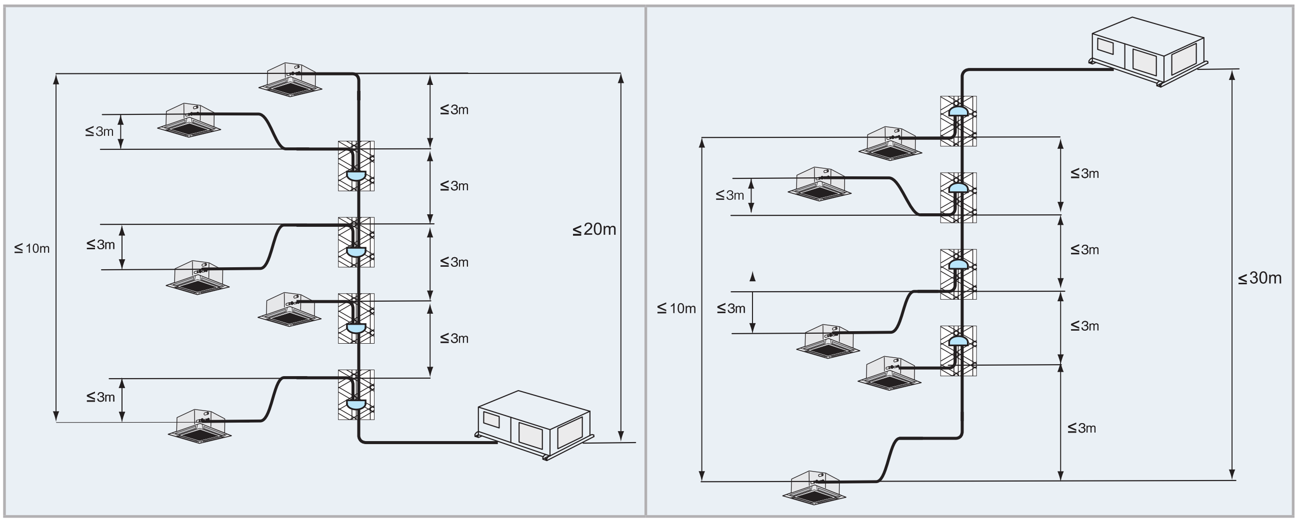
◆ Maximum refrigerant piping length (Line branch installation)

(m)

Item		4HP	5HP	6HP	8HP	10HP
Maximum piping length between the RASC unit and the farthest indoor unit	Actual piping length (L1)	75			100	
	Equivalent piping length (EL)	95			125	
Maximum total piping length ($L1 + L3_1 + L3_2 + ... + L3_{n-1}$)		95			100	145
Maximum piping length from the 1st multikit to the furthest indoor unit (L2)		30			40	
Maximum piping length between multikit and indoor unit ($L3_1$, $L3_2$, $L3_3$, ..., $L3_n$)		10			15	
Maximum height difference between RASC unit and indoor unit (Hi-o)	RASC unit higher than indoor unit	30				
	Indoor unit higher than RASC unit	20				
Maximum height difference between indoor units (Hi)		10				
Maximum height difference between multikits and between multikit and indoor unit		3				

◆ Maximum height difference (clarification)

It is recommended to install all indoor units at the same height. Nevertheless, when the height difference between the indoor units due to building construction is necessary, this should be less than the value indicated in the figure:



NOTE

All pictures are shown as an example.

3.3.4 Combinations of piping size and piping length

	Refrigerant piping length between RASC unit and the farthest indoor unit (m)														
Liquid	**Ø6.35**		**Ø9.52**					**Ø12.70**					**Ø15.88**		
Gas	**Ø15.88**	**Ø19.05**	**Ø12.70**	**Ø15.88**	**Ø19.05**	**Ø22.20**	**Ø25.40**	**Ø15.88**	**Ø19.05**	**Ø22.20**	**Ø25.40**	**Ø28.58**	**Ø22.20**	**Ø25.40**	**Ø28.58**
(4-6) HP	5 (2)	5 (2)	40 (1)	75	5 (4)	-	-	30 (3)	30 (3) (4)	-	-	-	-	-	-
8 HP	-	-	-	-	50 (1) (4) (6)	50 (1) (6)	70 (5) (6)	-	50 (1) (3) (4)	50 (1) (3)	100	-	50 (1) (3)	50 (3)	-
10 HP	-	-	-	-	-	-	-	-	-	50 (1)	100	50	50 (1) (3)	50 (3)	50 (3)

(1). Reducing gas pipe size will reduce cooling capacity due to larger pressure loss in gas piping and narrow operation range.

(2). Reducing liquid pipe size will narrow operation range due to the indoor unit relation with expansion valve capacity. In these cases, set the DSW2-1 to ON position.

(3). Increasing liquid pipe size will require additional refrigerant charge.

(4). When using Ø19.05 gas pipe (soft-annealed), please switch ON DSW2-4# in the RASC Unit PCB.

(5). In case that pipe length exceeds 70m in 8HP, please use a Ø12.7 pipe as a liquid pipe.

(6). In case of exceeding the recommended number of connected indoor (more than 4 units), please use a Ø12.7 pipe as liquid pipe.

	Standard

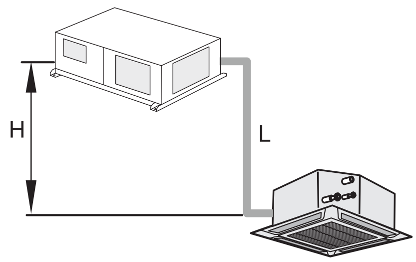
3.3.5 Refrigerant piping size and multikit/distributor selection

Select the piping connection sizes according to the following procedures:

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

◆ Header branch installation

1 indoor unit system



(mm)

RASC unit	Pipe size (L)	
	Gas	Liquid
(4-6) HP	Ø15.88	Ø9.52
8 HP (*)	Ø25.4	Ø9.52
10 HP (**)	Ø25.4	Ø12.7

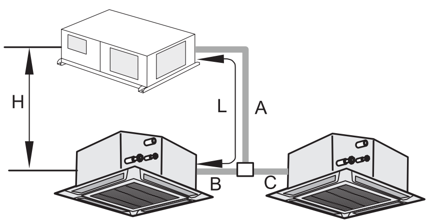
(*) Indoor unit RPI-8.0HP supplied with one adapter:

- Gas pipe adapter: Ø19.05 to Ø25.4

(**) Indoor unit RPI-10.0HP supplied with two adapters:

- Gas pipe adapter: Ø22.2 to Ø25.4
- Liquid pipe adapter: Ø9.52 to Ø12.7

2 indoor units system



(mm)

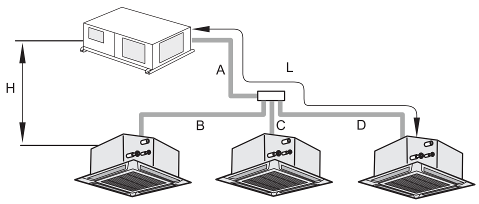
RASC unit	Pipe size (A)		Multi-kit (**)	
	Gas	Liquid	TE option	TW option
4 HP	Ø15.88	Ø9.52	TE-04N1	TW-52AN
(5/6) HP	Ø15.88	Ø9.52	TE-56N1	TW-52AN
8 HP	Ø25.4	Ø9.52 (*)	TE-08N (***)	TW-102AN (***)
10 HP	Ø25.4	Ø12.7	TE-10N	TW-102AN

- (*): In case that pipe length exceeds 70m in 8 HP, please use a Ø12.7 pipe as a liquid pipe, with its respective multi-kit.
- (**): In case of combinations with 8.0HP or 10.0HP indoor units, install a line branch system with multi-kit E-162SN3.
- (***): In combinations with indoor units of 2.0HP or less, use the multi-kits E-162SN3.
- The dimensions for TE and TW multi-kits are different. Refer to the Indoor units' Technical Catalogue in order to check the dimensions.

(mm)

Indoor unit capacity after branch	Pipe size (B, C)	
	Gas	Liquid
(0.8-1.5) HP	Ø12.7	Ø6.35
(1.8/2.0) HP	Ø15.88	Ø6.35
(2.3-6.0) HP	Ø15.88	Ø9.52
8.0 HP	Ø19.05	Ø9.52
10.0 HP	Ø22.20	Ø9.52

3 indoor units system



(mm)

RASC unit	Pipe Size (A)		Multi-kit (**)	
	Gas	Liquid	TRE option	TG option
(4-6) HP	Ø15.88	Ø9.52	TRE-46N1	TG-53AN
8 HP	Ø25.4	Ø9.52 (*)	TRE-812N1	TG-103AN
10 HP	Ø25.4	Ø12.7	TRE-812N1 (**)	TG-103AN (**)

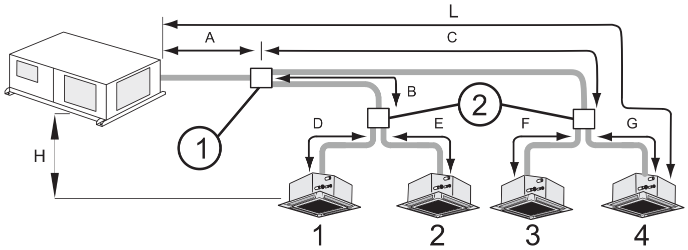
- (*): In case that pipe length (A+B or A+C or A+D) exceeds 70m in 8 HP, please use a Ø12.7 pipe as a liquid pipe.
- (**): In case of combinations with 8.0HP or 10.0HP indoor units, install a line branch system with multi-kits E-162SN3 and E-102SN3.
- The dimensions for TRE and TG multi-kits are different. Refer to the Indoor units' Technical Catalogue in order to check the dimensions.

(mm)

Indoor unit capacity after branch	Pipe size (B, C)	
	Gas	Liquid
(0.8-1.5) HP	Ø12.7	Ø6.35
(1.8/2.0) HP	Ø15.88	Ø6.35
(2.3-6.0) HP	Ø15.88	Ø9.52
8.0 HP	Ø19.05	Ø9.52
10.0 HP	Ø22.20	Ø9.52

4 indoor units system

- **Case a)**



NOTE

If the capacity ratio between IU group 1+2 and 3+4 is higher than 60/40%, install a line branch system or contact with your Hitachi dealer.

(mm)

RASC unit	Pipe Size (A)		Multi-kit ①	
	Gas	Liquid	TE option	TW option
4 HP	Ø15.88	Ø9.52	TE-04N1	TW-52AN
(5/6) HP	Ø15.88	Ø9.52	TE-56N1	TW-52AN
8 HP	Ø25.4	Ø9.52 (*)	TE-08N	TW-102AN
10 HP	Ø25.4	Ø12.7	TE-10N	TW-102AN

(*): In case that pipe length (A+B+(C or D) or A+C+(F or G)) exceeds 70m in 8 HP, please use a Ø12.7 pipe as a liquid pipe.

The dimensions for TRE and TW multi-kits are different. Refer to the Indoor units' Technical Catalogue in order to check the dimensions.

(mm)

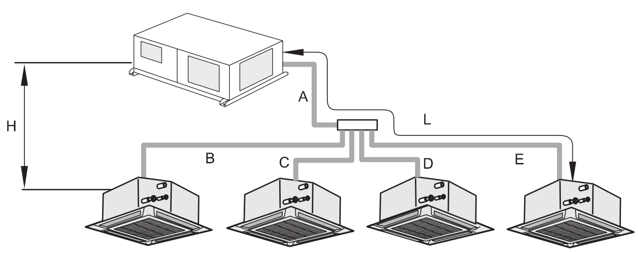
Total indoor unit capacity after first branch (1+2) or (3+4)	Pipe Size (B,C)		Multi-kit ②	
	Gas	Liquid	TE option	TW option
(0.8-1.5) HP	Ø12.7	Ø6.35	TE-03N1	TW-22AN
(1.8/2.0) HP	Ø15.88	Ø6.35	TE-03N1	TW-52AN
≥ 2.3 HP	Ø15.88	Ø9.52	<4HP: TE-03N1 =4HP: TE-04N1 ≥5HP: TE-56N1	TW-52AN

(mm)

Indoor unit capacity	Pipe Size (D,E,F,G)	
	Gas	Liquid
(0.8-1.5) HP	Ø12.7	Ø6.35
(1.8/2.0) HP	Ø15.88	Ø6.35
≥ 2.3HP	Ø9.52	Ø6.35

Connections including 8.0HP or 10.0HP indoor units are not possible.

- **Case b)**



(mm)

RASC unit	Pipe Size (A)		Multi-kit
	Gas	Liquid	
8 HP	Ø25.4	Ø9.52 (*)	QE-812N1
10 HP	Ø25.4	Ø12.7	

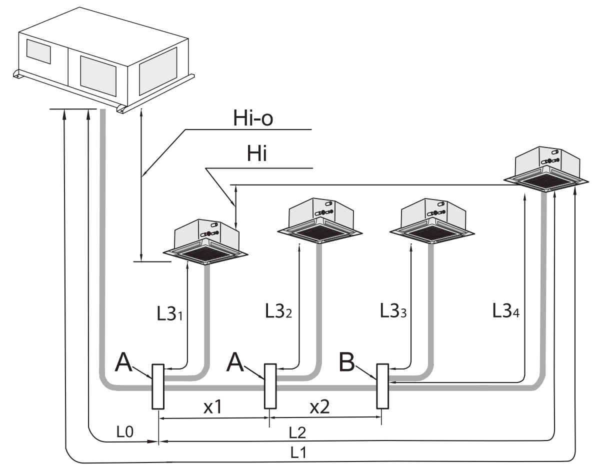
(*): In case that pipe length (A+B or A+C or A+D or A+E) exceeds 70m in 8 HP, please use a Ø12.7 pipe as a liquid pipe.

(mm)

Indoor unit capacity	Pipe Size (B,C,D,E)	
	Gas	Liquid
(0.8-1.5) HP	Ø12.7	Ø6.35
(1.8/2.0) HP	Ø15.88	Ø6.35
≥ 2.3HP	Ø15.88	Ø9.52

Connections including 8.0HP or 10.0HP indoor units are not possible.

◆ Line branch installation



(mm)

RASC unit	Pipe Size (L0,x1,x2)		Multi-kit model A	Multi-kit model B
	Gas	Liquid		
(4-6) HP	Ø15.88	Ø9.52	E-102SN3	E-102SN3
8 HP	Ø25.4	Ø9.52 (*)	E-162SN3	E-102SN3
10 HP	Ø25.4	Ø12.7	E-162SN3	E-102SN3

(*): In case that pipe length between RASC unit and the farthest indoor unit exceeds 70m in 8 HP, please use a Ø12.7 pipe as a liquid pipe.

(mm)

Indoor unit capacity	Pipe Size (L3)	
	Gas	Liquid
(0.8-1.5) HP	Ø12.7	Ø6.35
(1.8/2.0) HP	Ø15.88	Ø6.35
(2.3-6.0) HP	Ø15.88	Ø9.52
8.0 HP	Ø19.05	Ø9.52
10.0 HP (*)	Ø22.20	Ø9.52

NOTE

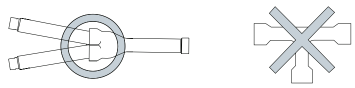
(*): In combinations with 10.0HP indoor units, only one of the two connections of the E-102SN3 multi-kit admits the Ø22.20 mm diameter corresponding to the gas pipe of the 10.0HP indoor unit. Please take this restriction into account in case that the installation requires the connection of gas piping of 10.0HP indoor units.

3.3.6 Considerations when installing distributors

1 Install the Distributor supplied by HITACHI on request.

A tee can not be installed instead of a branch pipe.

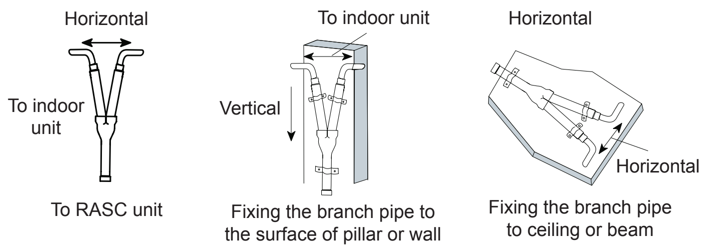
Sample: Twin System



2 Installing the distributor

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

Sample: Twin System

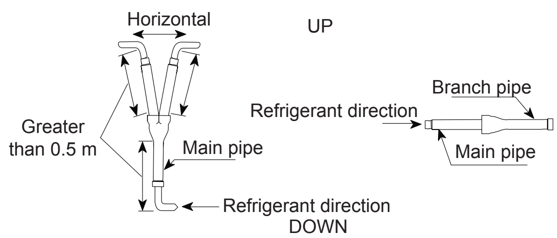


NOTE

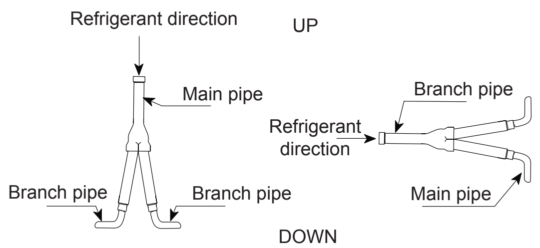
Fix the piping from outside of insulation or inserting absorber between the pipe and a fixing metal.

3 Correct position of twin distributor (available also for quad installation).

- This is the correct position.



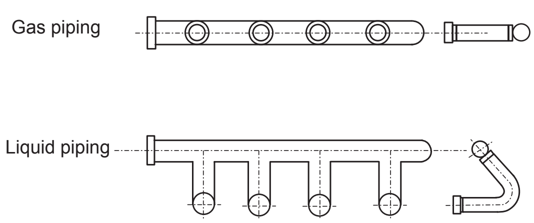
This is wrong position.



4 Correct position of Triple/Quad distributor.

- Install the header horizontally

Sample: Quad Branch pipe



3.4 Refrigerant charge

3.4.1 Refrigerant charge amount

Although refrigerant has been charged into this unit, the adequate refrigerant charge depends on the piping length.

- The adequate refrigerant quantity should be determined according to the following procedure.
- Record the adequate refrigerant quantity in order to facilitate maintenance and servicing activities.

CAUTION

- *When charging or removing refrigerant, measure the amount precisely. Overcharging or undercharging of refrigerant may cause compressor problems.*
- *In case of actual piping length less than 5 m, consult your distributor.*

◆ Refrigerant charge before shipment (W_0 (kg))

W_0 is the RASC unit refrigerant charge before shipment explained before, and it's shown in the following table:

Model	Refrigerant charge before shipment (W_0 (kg))	Additional refrigerant charge (P (g/m))	Maximum additional charge (kg)
RASC-4HNPE	4.1	60	3.9
RASC-5HNPE	4.2	60	3.9
RASC-6HNPE	4.2	60	3.9
RASC-8HNPE	5.7	(1)	6.3
RASC-10HNPE	6.2	(1)	8.1

(1): Needs to be calculated.

◆ Calculation method for the additional refrigerant charge

Calculate the additional refrigerant charge amount according to the following steps:

Step 1: Additional refrigerant charge calculation for liquid piping (W_1 (kg))

RASC units have been charged with refrigerant for 30 m of actual piping length. In systems with longer actual piping length, an additional refrigerant charged is required.

For RASC-(4-6)HNPE units

Use the following formula:

$$W_1 = (L-30) \times P$$

L: Total piping length (m)

P: Additional refrigerant charge (kg/m) (Refer to the *"Refrigerant charge before shipment (W0 (kg))"* section)

For RASC-(8/10)HNPE units

The additional refrigerant charge for **RASC-(8/10)HNPE** units must be calculated by multiplying the total piping length of each diameter per its calculation factor according to the following table. The result is the additional refrigerant charge for liquid piping $\mathbf{W_1}$.

Pipe size (mm)	Additional refrigerant charge factor (kg/m)
Ø15.88	x 0.19
Ø12.7	x 0.12
Ø9.52	x 0.065
Ø6.35	x 0.065 (*)

(*): For RASC-(8/10)HNPE units ,add 0.030 kg/m (instead of 0.065 kg/m) when there are 5 or more indoor units connected to the RASC unit.

Step 2: Additional refrigerant charge calculation for indoor unit (W_2 (kg))

When the RASC unit is combined with indoor units RPI-(8/10)HP, an additional refrigerant charge is required (W_2) = 1 kg/unit. For indoor units lower than 8 HP, an additional refrigerant charge is not needed.

Indoor unit capacity	Additional refrigerant charge (W_2 (kg))
≥ 8 HP	1
< 8 HP	0

Step 3: Calculation of total additional refrigerant charge (W (kg))

For RASC-(4-6)HNPE units

Put weight W_1 and W_2 calculated in step 1 and step 2 into the following formula:

$$W = W_1 + W_2$$

System example (W) =		+		=		kg

For RASC-(8/10)HNPE units

In case of RASC-(8/10)HNPE units, the following formula must be used:

$$W = W_1 + W_2 - C$$

System example (W) =		+		–		=		kg

C: Compensation value (kg) (Refer to the following table)

Model	Compensation value (C (kg))
RASC-8HNPE	1.6
RASC-10HNPE	2.0

CAUTION

Do not exceed the allowed maximum additional charge.

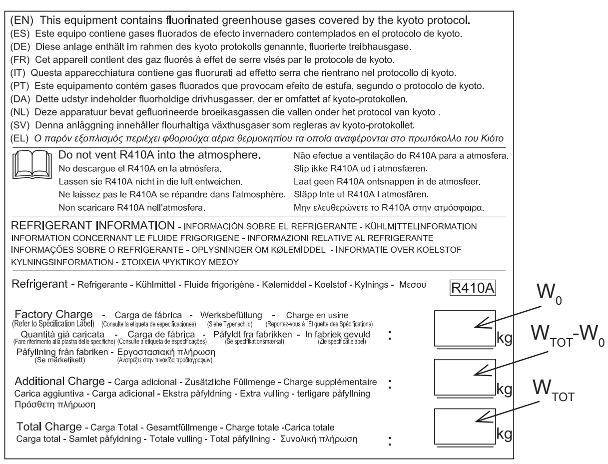
Step 4: Total refrigerant charge of the system (W_{TOT} (kg))

The total refrigerant charge of this system is calculated by the following formula:

$$W_{TOT} = W + W_0$$

System example (W_{TOT}) =		+		=		kg

Finally, record the refrigerant charge quantity in the F-Gas label in order to facilitate maintenance and servicing activities.


(EN) This equipment contains fluorinated greenhouse gases covered by the kyoto protocol.
(ES) Este equipo contiene gases fluorados de efecto invernadero contemplados en el protocolo de kyoto.
(DE) Diese anlage enthält im rahmen des kyoto protokolls genannte, fluorierte treibhausgase.
(FR) Cet appareil contient des gaz fluorés à effet de serre visés par le protocole de kyoto.
(IT) Questa apparecchiatura contiene gas fluorurati ad effetto serra che rientrano nel protocollo di kyoto.
(PT) Este equipamento contém gases fluorados que provocam efeito de estufa, segundo o protocolo de kyoto.
(DA) Dette udstyr indeholder fluorholdige drivhusgasser, der er omfattet af kyoto-protokollen.
(NL) Deze apparatuur bevat gefluorineerde broeikasgassen die vallen onder het protocol van kyoto .
(SV) Denna anläggning innehåller flourhaltiga växthusgaser som regleras av kyoto-protokollet.
(EL) *Ο παρόν εξοπλισμός περιέχει φθοριούχα αέρια θερμοκηπίου τα οποία αναφέρονται στο πρωτόκολλο του Κιότο*

Do not vent R410A into the atmosphere.
No descargue el R410A en la atmósfera.
Lassen sie R410A nicht in die luft entweichen.
Ne laissez pas le R410A se répandre dans l'atmosphère.
Non scaricare R410A nell'atmosfera.
Não efectue a ventilação do R410A para a atmosfera.
Slip ikke R410A ud i atmosfæren.
Laat geen R410A ontsnappen in de atmosfeer.
Släpp inte ut R410A i atmosfären.
Μην ελευθερώνετε το R410A στην ατμόσφαιρα.

REFRIGERANT INFORMATION - INFORMACIÓN SOBRE EL REFRIGERANTE - KÜHLMITTELINFORMATION INFORMATION CONCERNANT LE FLUIDE FRIGORIGENE - INFORMAZIONI RELATIVE AL REFRIGERANTE INFORMAÇÕES SOBRE O REFRIGERANTE - OPLYSNINGER OM KØLEMIDDEL - INFORMATIE OVER KOELSTOF KYLNINGSINFORMATION - ΣΤΟΙΧΕΙΑ ΨΥΚΤΙΚΟΥ ΜΕΣΟΥ

Refrigerant - Refrigerante - Kühlmittel - Fluide frigorigène - Kølemiddel - Koelstof - Kylnings - Μεσου R410A

Factory Charge (Refer to Specification Label) - Carga de fábrica (Consulte la etiqueta de especificaciones) - Werksbefüllung (Siehe Typenschild) - Charge en usine (Reportez-vous à l'Étiquette des Spécifications) - Quantità già caricata (Fare riferimento alla piastra delle specifiche) - Carga de fábrica (Consulte a etiqueta de especificações) - Påfyldt fra fabrikken (Se specifikationsmærkat) - In fabriek gevuld (Zie specificatielabel) - Påfyllning från fabriken (Se märketikett) - Εργοστασιακή πλήρωση (Ανατρέξτε στην πινακίδα προδιαγραφών) : kg

Additional Charge - Carga adicional - Zusätzliche Füllmenge - Charge supplémentaire - Carica aggiuntiva - Carga adicional - Ekstra påfyldning - Extra vulling - terligare påfyllning - Πρόσθετη πλήρωση : kg

Total Charge - Carga Total - Gesamtfüllmenge - Charge totale -Carica totale - Carga total - Samlet påfyldning - Totale vulling - Total påfyllning - Συνολική πλήρωση : kg

3.4.2 Refrigerant charge procedure

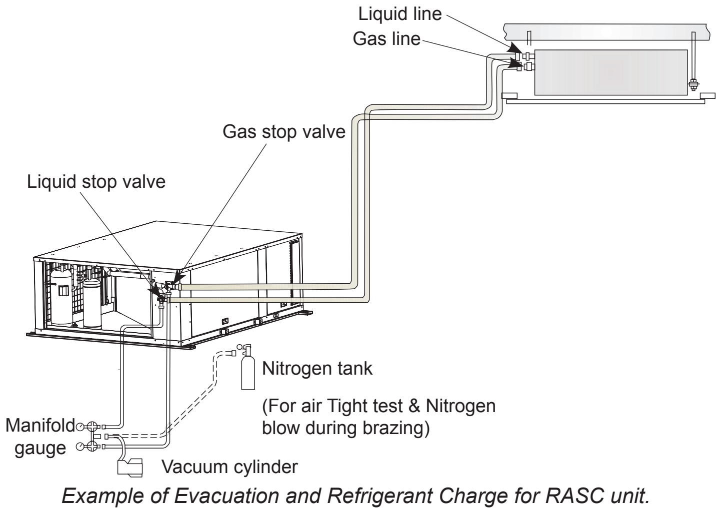
CAUTION

- *Use refrigerant R410A in the refrigerant cycle. Do not charge oxygen, acetylene or other flammable and poisonous gases into the refrigerant cycle when performing a leakage test or an air-tight test.*
- *These types of gases are extremely dangerous and can cause an explosion. It is recommended that compressed air, nitrogen or refrigerant be used for these types of tests.*
- *Check to ensure that no pressure exists inside the stop valve before removing the flange.*

◆ Vacuum procedure and refrigerant charge

Evacuation and refrigerant charging procedure should be performed according to the following instructions.

- The stop valve has been closed before shipment. However, make sure that the stop valves are completely closed.
- 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 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 ±0.5kg 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.
- Remove the “close” plate from the stop valve and hook the attached “open” plate at the stop valve.



Example of Evacuation and Refrigerant Charge for RASC unit.

NOTE

- *Charge the refrigerant correctly. Overcharge and insufficient charge of the refrigerant may cause the compressor failure.*
- *Insulate the unions and flare-nuts at the piping connection part completely.*
- *Insulate the liquid pipe for prevention of the capacity decrease according to the ambient air conditions and the dewing on the pipe surface by the low pressure.*
- *Check to ensure that there is no gas leakage. When large amount of the refrigerant leaks, the troubles as follows may occur:*
  - *Oxygen deficiency*
  - *Harmful gas generation due to chemical reaction with fire.*
- *Use thick gloves to protect your hands from liquid refrigerant injuries when handling refrigerant.*

CAUTION

Check for refrigerant leakage thoroughly. In case that a large amount of refrigerant is leaked, it may cause difficulty to breathe or the emission of harmful gases if fire is lit up in the room. An excess or a shortage of refrigerant is the main cause of trouble with the units.

3.4.3 Caution of the pressure by check joint

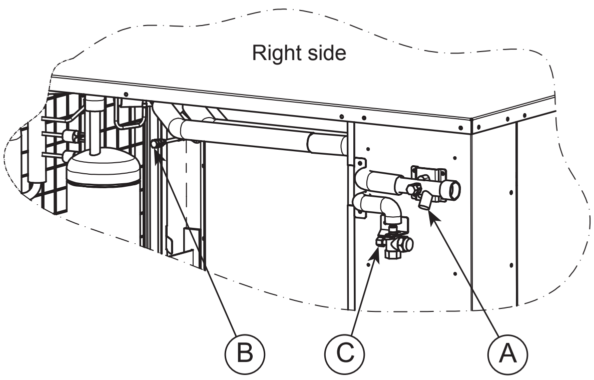
When the pressure is measured, use the check joint of gas stop valve (A), and use the check joint of liquid piping (B) in the figure below.

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.



3.4.4 Pump down refrigerant

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

1. Attach the manifold gauge to the gas and the liquid stop valves.
2. Turn ON the RASC unit power source.
3. Set the DSW1-1 pin of the RASC unit PCB at the “ON” side for pump down operation (test run cooling). Close the liquid stop valve to retain all the refrigerant inside the RASC unit.
4. When the pressure at lower pressure side (gas stop valve) indicates -0.01 MPa (-100 mmHg), perform the following procedures immediately.
    a. Close the gas stop valve.
    b. Set the RASC unit DSW1-1 pin at the “OFF” side (To stop the unit operation).
5. Turn OFF the RASC unit power source.

CAUTION

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

3.5 Caution in case of refrigerant leakage

The installers and those responsible for drafting the specifications are obliged to comply with local safety codes and regulations in the case of refrigerant leakage.

3.5.1 Maximum permitted concentration of HFCs

The refrigerant R410A, charged in the RASC series system, is an incombustible and non-toxic gas. However, if leakage occurs and gas fills a room, it may cause suffocation.

The maximum permissible concentration of HFC gas, R410A in air is 0.44 kg/m³, according to EN378-1.

Therefore, some effective measure must be taken to lower the R410A concentration in air below 0.44 kg/ m³, in case of leakage.

3.5.2 Calculation of refrigerant concentration

1 Calculate the total quantity of refrigerant R (kg) charged in the system by connecting all the indoor units in the rooms to be air-conditioned.

2 Calculate the room volume V (m³) of each room.

3 Calculate the refrigerant concentration C (kg/m³) of the room according to the following equation:

C= R / V	R: Total quantity of refrigerant charged (kg) V: Room volume (m³) C: Refrigerant concentration (=0.44* kg/m³ for R410A)

3.5.3 Countermeasure for refrigerant leakage

The facility must have the following features in case of a refrigerant leakage occurs:

1 Provide a shutterless opening which will allow fresh air to circulate into the room.

2 Provide a doorless opening of 0.15% or more size to the floor area.

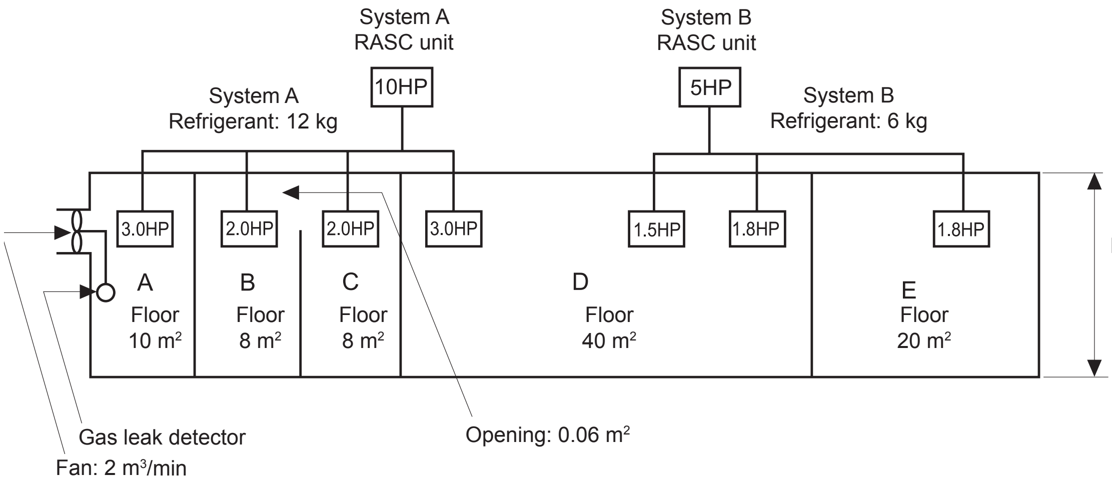
3 There must be a ventilator fan connected to a gas leak detector, with a ventilator capacity of 0.4 m³/min or higher per Japanese refrigeration ton (= compressor displacement volume / 5.7m³/h) of the air conditioning system using the refrigerant.

Model	Tonnes
RASC-(4-6)HNPE	2.27
RASC-8HNPE	3.16
RASC-10HNPE	4.11

4 Pay a special attention to the place, such as a basement, etc., where refrigerant can stay, since refrigerant is heavier than air.

(See the example of the following page)

- General example of application



Room	R (kg)	V (m^3)	C (kg/m^3)	Countermeasure
A	12	25	0.48	2 m^3/min fan linked with gas leak detector
B	12	20	0.60	0.06 m^2 aprox. opening
C	12	20	0.60	0.06 m^2 aprox. opening
B + C	12	40	0.30	-
D	18	100	0.18	-
E	6	50	0.12	-

3.6 Compatibility with the piping of current installations where R22 or R407C is used

This chapter describes the works in piping for compatibility with the piping of current installations where R22 or R407C is used. (Contact your Hitachi dealer for specific support on your installation).

The new RASC-HNPE series is compatible with those installations that have been operating with R22 or R407C. This allows installing the RASC units, which operate with R410A, without having to change piping installation.

3.6.1 Installation procedure for existing pipes

NOTE

- *For systems with several indoor units, branch pipes shall be changed to Hitachi-specified model for RASC-HNPE series (R410A).*
- *Existing RASC and indoor units for R22 or R407C can not be used.*

1 Recover refrigerant (R22 or R407C):

   a. Compressor of the existing unit is working
   Pump down. Perform refrigerant recovery operation of existing air conditioner without stopping during 30 minutes in cooling mode.
   b. Compressor of the existing unit is not working
   Recover refrigerant with a refrigerant recovery device.

2 Remove existing air conditioning system (RASC and indoor unit).

3 For the existing pipes, proceed with one of the following operations:

   a. Clean the existing piping.
   b. Install renewal kit (optional accessory).

4 Install the new unit of the RASC series.

5 Vacuum process.

6 Refrigerant charge (R410A)
Follow the normal process described in order to determine whether additional refrigerant charge is necessary.

CAUTION

Recovering R22 and R407C is mandatory to remove an existing air conditioner and piping. Do not vent into the atmosphere.

◆ Conditions to use existing pipes with cleaning process

After the piping cleaning process, follow the normal installation process as if they corresponded to a new installation, considering all the restrictions and limitations. Special atention is required with regard to the piping thickness for R410A.

◆ Conditions to use existing pipes without cleaning process

A Renewal Kit (sold separately) can be used even in cases where there is a history of compressor failure, allowing diversion to existing piping without cleaning. Thus, the burden of installation works at renewal can be reduced.

Existing pipes can be used without cleaning if the following conditions are satisfied:

1 The renewal kit shall be installed. (mandatory)

2 Maximum piping length shall be 50 m (If the pipe is longer than 50m, existing pipes can be used if cleaning is performed).

3 The capacity of the new unit must be equivalent to the one previously installed.

4 Existing pipes shall be free of corrosion, cracks, scratches or deformations.

5 Dirt inside the pipes shall not be noticeable.

6 The specifications of piping, flare nuts, gaskets, etc. shall be compliant.

7 Flare shall be reprocessed.

8 Piping airtightness and vacuuming shall be ensured in the same way as with new piping.

3.6.2 When the existing air conditioner is a product of another manufacturer

Existing pipes made by other manufacturer can also be used if the following conditions are satisfied:

1. For systems with several indoor units, branch pipes shall be changed to the model specified by Hitachi.
2. Pipes shall be cleaned.

3.6.3 Permissible range for existing air-conditioning pipes

◆ **Pipe length in the case of "without cleaning process"**

Liquid (mm)	Ø6.35		Ø9.52					Ø12.70					Ø15.88		
Thickness (mm)	0.8		0.8					0.8					1.0		
Gas (mm)	Ø15.88	Ø19.05	Ø12.70	Ø15.88	Ø19.05	Ø22.20	Ø25.40	Ø15.88	Ø19.05	Ø22.20	Ø25.40	Ø28.58	Ø22.20	Ø25.40	Ø28.58
Thickness (mm)	1.0	1.0	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Material soft-annealed	x	x	x	x	x			x	x						
Material drawn		x			x	x	x		x	x	x	x	x	x	x
Performance capacity															(m)
(4-6) HP	5 (2)	5 (2)	40 (1)	50	50 (4)	-	-	30 (3)	30 (3) (4)	-	-	-	-	-	-
8 HP	-	-	-	-	50 (1) (4)	50 (1)	50	-	50 (1) (3) (4)	50 (1) (3)	50 (3)	-	50 (1) (3)	50 (3)	-
10 HP	-	-	-	-	-	-	-	-	-	50 (1)	50	50	50 (1) (3)	50 (3)	50 (3)

(1). Reducing gas pipe size will reduce cooling capacity due to larger pressure loss in gas piping and narrow operation range.

(2). Reducing liquid pipe size will narrow operation range due to the indoor unit relation with expansion valve capacity. In these cases, set the DSW2-1 to ON position.

(3). Increasing liquid pipe size will require additional refrigerant charge.

(4). When using Ø19.05 gas pipe (soft-annealed), please switch ON DSW2-4# in the RASC Unit PCB.

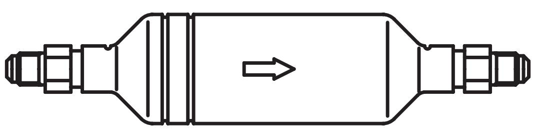
	Standard

⚠ **CAUTION**

In case that its thickness is less than the R410A piping specifications, set DSW2, pin 4 ON. With this setting the control system adjusts the pressure in order to avoid damage to the existing pipe for R22.

3.6.4 Selection of the renewal kit model

Hitachi offers a renewal kit as an accessory.



◆ **Recommended renewal kit**

RASC unit	Renewal kit
	External attachment to RASC unit [Short pipe (local) + Kit + existing piping]
RASC-(4-6)HNPE	TRF-NP160S
RASC-8HNPE	(*)
RASC-10HNPE	(*)

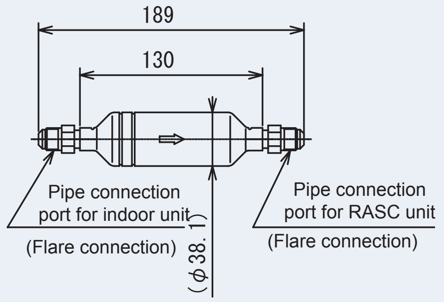
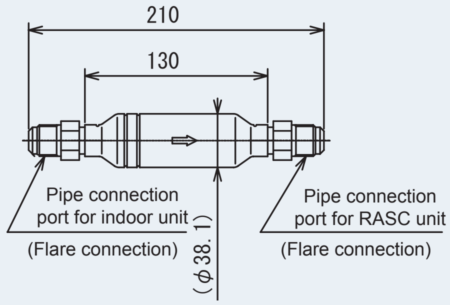
NOTE

(*): The availability of the renewal kit for RASC-(8/10)HNPE is to be confirmed.

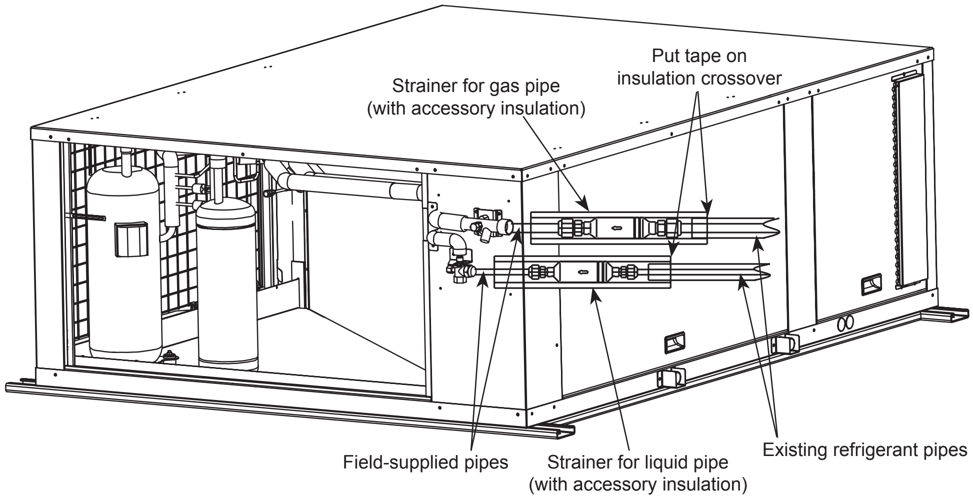
⚠ **CAUTION**

In case that its thickness is less than the R410A piping specifications, set DSW2, pin 4 ON. With this setting the control system adjusts the pressure in order to avoid damage to the existing pipe for R22.

◆ Details of renewal kit

Pipe \ Model	TRF-NP160S
For liquid pipe	
For gas pipe	

◆ Renewal kit installation (Example)

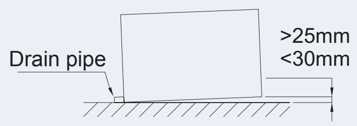
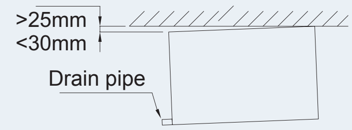


3.7 Drainage and drain pipe installation

◆ Provision regarding installation place

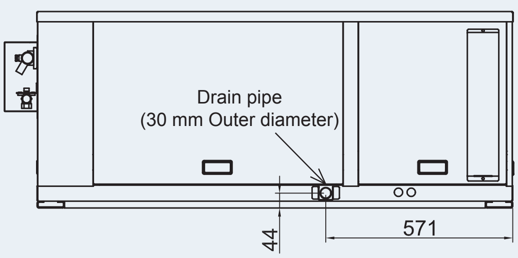
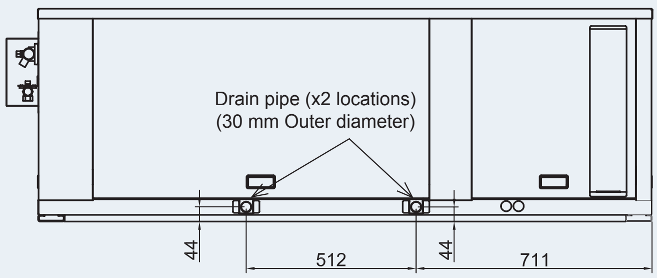
Drain water sometimes turns to ice. Therefore, avoid draining in a transited area, since it may become slippery.

Install the unit making sure that the drain outlet part is lower (>25mm / <30mm) than the opposite side in order to avoid incorrect drain discharge.

Floor mounted	Ceiling suspended
	

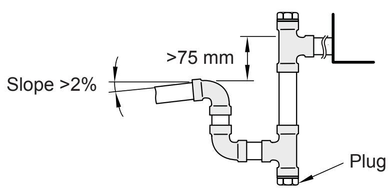
◆ Drain pipe location

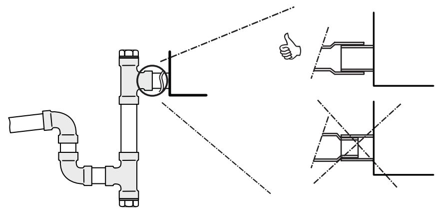
Drain pipe location is indicated in the figures below:

RASC-(4-6)HNPE	RASC-(8/10)HNPE
	

◆ Drain pipe connection

- **It is mandatory to connect a siphon** as shown in the figure below. Pay special attention when connecting it to the unit (proper installation work is needed in order to guarantee matching of connection pipes).





- Fasten the siphon to the drain hose with an adhesive and a field-supplied clamp.
- Prepare a draining pipe with an internal diameter higher than 30 mm for the draining line which shall be bent with a down slope > 2 %.
- Check to ensure that the water drains smoothly by pouring some water into the drain pan.
- Check to ensure that the water does not remain in the drain pan.
- Check the drain connections periodically (once a year), to avoid occurrence of water leakage.

⚠ CAUTION

- *If the unit is installed in a cold area, the drain water may freeze. Install an electric heater (field-supplied) at the drain connection.*
- *Do not install the unit using vibration-proof springs or mounting springs.*

4. Electrical and control settings

Index

4.1 General check

1. Ensure that the field-supplied electrical components (mains power switches, circuit breakers, wires, connectors and wire terminals) have been properly selected according to the electrical data indicated. Make sure that they comply with national and regional electrical codes.
2. Following the Council Directive 2004/108/EC(89/336/EEC), relating to electromagnetic compatibility, next table indicates: Maximum permissible system impedance Z_{max} at the interface point of the user's supply, in accordance with EN61000-3-11.

MODEL	Z_{max} (Ω)
RASC-4HNPE	-
RASC-5HNPE	-
RASC-6HNPE	-
RASC-8HNPE	-
RASC-10HNPE	-

3. Harmonics situation of each model regarding IEC 61000-3-2 and IEC 61000-3-12 is as follows:

MODELS SITUATION REGARDING IEC 61000-3-2 AND IEC 61000-3-12 Ssc "xx"	MODELS	Ssc "xx" (kVA)
Equipment complying with IEC 61000-3-12 (professional use)	RASC-4HNPE RASC-5HNPE RASC-6HNPE	-
This equipment complies with IEC 61000-3-12 provided that the short-circuit power Ssc is greater than or equal to xx (see Ssc column) at the interface point between the user's supply and the public system. It is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the equipment is connected only to a supply with a short-circuit power Ssc greater than or equal to xx (see Ssc column)	RASC-8HNPE RASC-10HNPE	3138

4. Check to ensure that the power supply voltage is within +/-10% of the rated voltage.
5. Check to ensure that power supply has an impedance low enough to warranty not reduce the starting voltage more than 85% of the rated voltage.
6. Check to ensure that the ground wire is connected.
7. Connect a fuse of specified capacity.

CAUTION

- *Check to ensure that screws for terminal block are tightly tightened.*
- *Check to ensure that the indoor unit fan and the RASC fan have stopped before electrical wiring work or periodical check is performed.*
- *Protect the wires, drain pipe, electrical parts, from rats or other small animals. If not protected, rats may damage unprotected parts, and at the worst, a fire will occur.*
- *Wrap the accessory packing around the wires, and plug the wiring connection hole with the seal material to protect the product from any condensed water and insects.*
- *Tightly secure the wires with the cord clamp inside the indoor unit.*
- *Lead the wires through the knockout hole in the side cover when using conduit.*
- *Secure the cable of the remote control switch with the cord clamp inside the electrical box.*
- *Electrical wiring must comply with national and local codes. Contact your local authority in regards to standards, rules, regulations, etc.*
- *Check that the ground wire is securely connected.*
- *Connect a fuse of specified capacity.*

DANGER

- *Do not connect of adjust any wiring or connections unless the main power switch is OFF.*
- *Check that the earth wire is securely connected, tagged and locked in accordance with national and local codes.*

NOTE

Check and test to ensure that if there is more than one source of power supply, that all are turned OFF.

4.2 System wiring diagram

Connect the units (RASC and indoor unit) according to the following electric diagram:

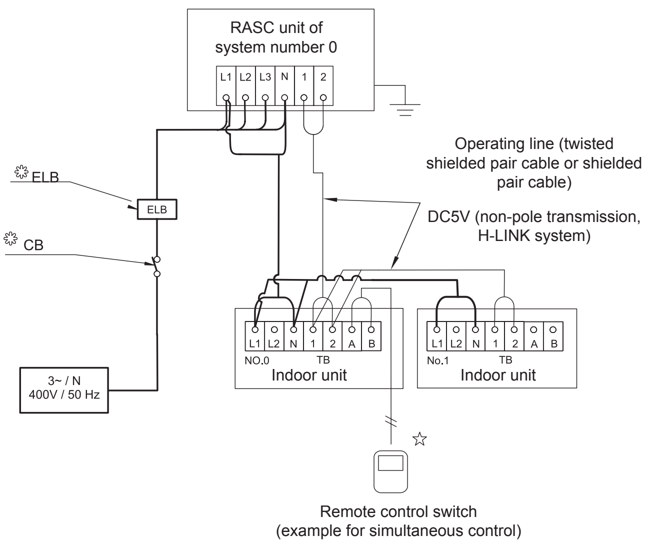
- Connect the operation wiring to the units in the same refrigerant cycle (The refrigerant piping and the control wiring should be connected to the same indoor units). If the refrigerant piping and the control wiring are connected to the units in the different refrigerant cycle, it may cause a abnormal operation.
- Use twist pair wire (more than 0.75 mm²) for operation wiring between RASC unit and indoor unit, and operation wiring between indoor units (H-Link connection). It can be also used shielded pair wiring. Shield shall be connected to earth only in one cable side.
- Use shielded wires for intermediate wiring to protect the units from noise obstacle at length of less than 300 m and size complied with local code.
- Do not use more than 3 cores for operation wiring (H-Link). Core sizes must be selected according to the national regulations.
- Open a hole near the connection hole of power source wiring when multiple RASC units are connected from one power source line.
- The recommended breaker sizes are shown in Table of electrical data and recommended Wiring, Breaker Size/1 RASC unit.
- In the case that a conduit tube for field-wiring is not used, fix rubber bushes with adhesive on the panel.

4

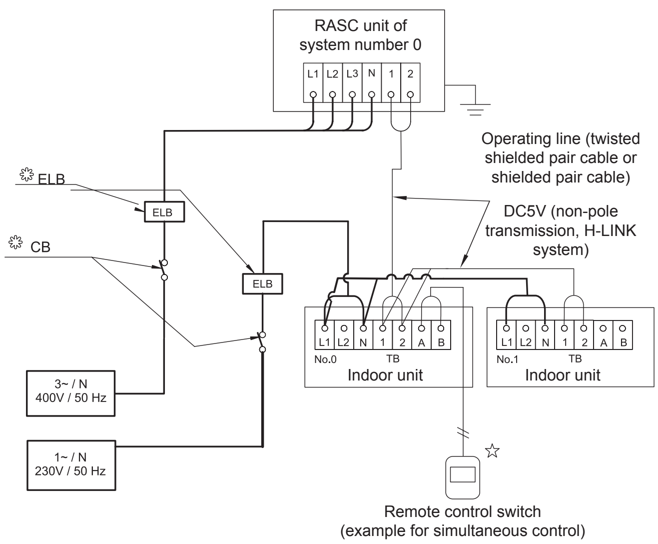
CAUTION

- *All the field wiring and electrical components must comply with local codes.*
- *Pay attention to the connection of the operating line. Incorrect connection may cause the failure of PCB.*

Power source from the RASC unit to the indoor unit



Independent power source of RASC unit and indoor unit (example)



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

4.3 Electrical connection of the RASC unit

CAUTION

Check to ensure that the field supplied electrical components (mains power switches, circuit breakers, wires, connectors and wire terminals) have been properly selected according to the electrical data indicated on this chapter and they comply with national and local codes. If it is necessary, contact with your local authority in regards to standards, rules, regulations, etc.

4.3.1 Wiring size

Recommended minimum sizes for field provided wires:

Model	Power supply	Max. current (A)	Power supply cable size	Transmitting cable size
			EN60 335-1	EN60 335-1
RASC-4HNPE	3N~ 400V 50Hz	14.1	4 x 4.0mm² + GND	2 x 0.75mm²
RASC-5HNPE		14.1	4 x 4.0mm² + GND	
RASC-6HNPE		16.0	4 x 4.0mm² + GND	
RASC-8HNPE		24.7	4 x 6.0mm² + GND	
RASC-10HNPE		24.7	4 x 6.0mm² + GND	

NOTE

Use wires which are not lighter than the polychloroprene sheathed flexible cord (code designation 60245 IEC 57).

4.3.2 Minimum requirements of the protection devices

CAUTION

- *Ensure specifically that there is an Earth Leakage Breaker (ELB) installed for the units (RASC and indoor unit).*
- *If the installation is already equipped with an Earth Leakage Breaker (ELB), ensure that its rated current is large enough to hold the current of the units (RASC and indoor).*

NOTE

- *Electric fuses can be used instead of magnetic Circuit Breakers (CB). In that case, select fuses with similar rated values as the CB.*
- *The Earth Leakage Breaker (ELB) mentioned on this manual is also commonly known as Residual Current Device (RCD) or Residual Current Circuit Breaker (RCCB).*
- *The Circuit Breakers (CB) are also known as Thermal-Magnetic Circuit Breakers or just Magnetic Circuit Breakers (MCB).*

◆ **Main switch protection**

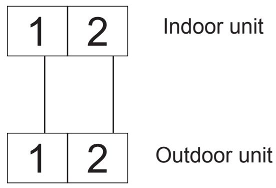
Select the main switches in according to the next table:

Model	Power source	Max. current (A)	CB (A)	ELB (no. poles/A/mA)
RASC-4HNPE	3N~ 400V 50Hz	14.1	20	4/40/30
RASC-5HNPE		14.1	20	
RASC-6HNPE		16.0	20	
RASC-8HNPE		24.7	30	
RASC-10HNPE		24.7	30	

ELB: Earth leakage breaker; CB: Circuit breaker

4.4 Transmission wiring between RASC and indoor unit

- The transmission is wired to terminals 1-2.
- The H-LINK II wiring system requires only two transmission cables that connect the indoor unit and the RASC unit.



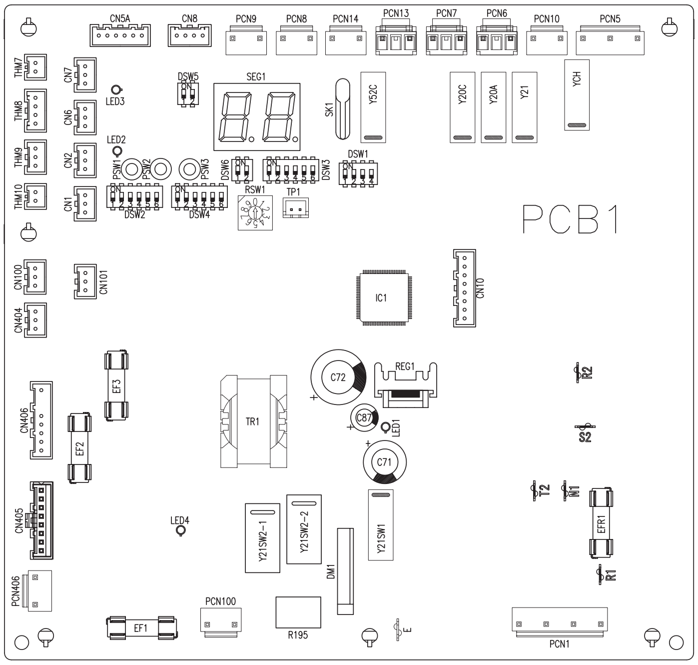
- Use twist pair wires (0.75 mm²) for operation wiring between RASC unit and indoor unit.
- The wiring must consist of 2-core wires (Do not use wire with more than 3 cores).
- Use shielded wires for intermediate wiring to protect the units from noise interference, with a length of less than 300m and a size in compliance with local codes.
- In the event that a conduit tube for field-wiring is not used, fix rubber bushes to the panel with adhesive.

CAUTION

Ensure that the transmission wiring is not wrongly connected to any live part that could be damaged the PCB.

4.5 Printed circuit board

4.5.1 RASC-(4-6)HNPE



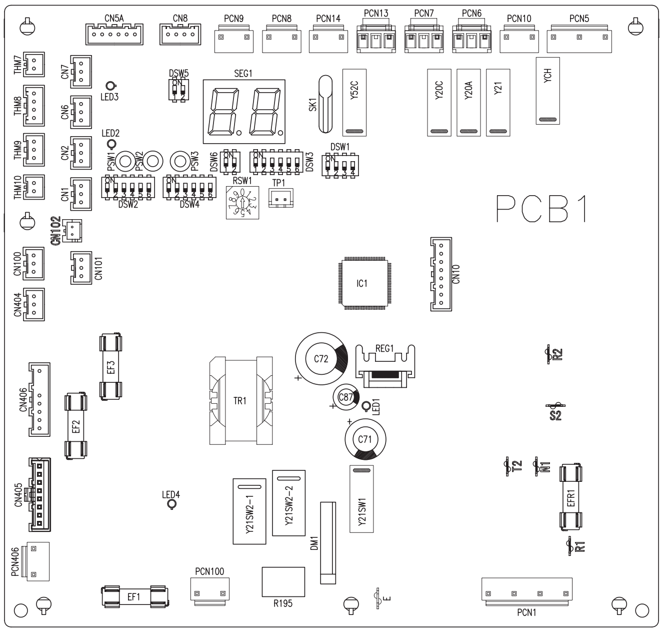
Connector indication	
R1,N1,R2, S2,T2	Power supply and reverse phase detection (3N~ only)
PCN5	Crankcase heater of compressor (oil)
PCN7	Solenoid valve
PCN8	High pressure switch protection, variable frequency driver alarm, internal thermostat protection of the motor and float switch.
PCN9	Magnetic contactor for compressor and magnetic contactor for fan
PCN10	Low pressure switch protection
PCN14	Solenoid valve
PCN100	4-way solenoid valve
PCN406	Power connection between PCB1 and DIP-IPM
THM7	Outdoor air temperature thermistor
THM8	Pipe evaporation temperature thermistor
THM9	Compressor discharge temperature thermistor
CN1	Input function
CN2	Demand input
CN5A	Micro electronic expansion valve
CN6	Transmission between PCB1 and DIP-IPM
CN7	External output
CN8	Transmission from RASC to indoor unit
CN10	Communication line between PCB1 and PCB3
CN100	Discharge pressure (Pd)
CN404	Line connection between PCB1 and DIP-IPM
EF1,2,3 EFR1	Power protection

Switch indication	
DSW1	Test run
DSW2	Auxiliary function setting
DSW3	Capacity code
DSW4/RSW1	Refrigerant cycle number
DSW5	End terminal resistance
DSW6	Simultaneous / individual operation
PSW1	Forced defrosting
PSW2	Checking mode (▽)
PSW3	Checking mode (△)

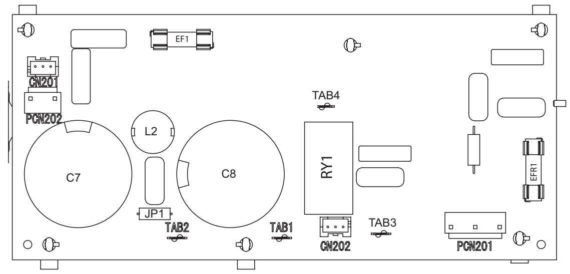
LED indication		
LED1	Red	Power source for the PCB
LED2	Green	This LED indicates the transmission status between the indoor unit and the RCS
LED3	Yellow	This LED indicates the transmission status between the indoor unit and the RASC unit
LED4	Red	Power source at 280V for the PCB

4.5.2 RASC-(8-10)HNPE

PCB1



PCB2



PCB1 Connector indication	
Connector	**Name**
R1,N1,R2, S2,T2	Power supply and reverse phase detection
PCN5	Crankcase heater of compressor (oil)
PCN7	Solenoid valve
PCN8	High pressure switch protection, variable frequency driver alarm, internal thermostat protection of the motor and float switch.
PCN9	Magnetic contactor for compressor and magnetic contactor for fan
PCN10	Low pressure switch protection
PCN14	Solenoid valve
PCN100	4-way solenoid valve
PCN406	Power connection between PCB1 and PCB3
THM7	Outdoor air temperature thermistor
THM8	Pipe evaporation temperature thermistor
THM9	Compressor discharge temperature thermistor
CN1	Input function
CN2	Demand input
CN5A	Micro electronic expansion valve
CN6	Transmission between PCB1 and DIP-IPM
CN7	External output
CN8	Transmission from RASC to indoor unit
CN10	Communication line between PCB1 and PCB3
CN100	Discharge pressure (Pd)
CN102	Line connection between PCB1 and PCB3
CN404	Line connection between PCB1 and PCB3
EF1,2,3 EFR1	Power protection

PCB1 Switch indication	
Connector	**Name**
DSW1	Test run
DSW2	Auxiliary function setting
DSW3	Capacity code
DSW4/RSW1	Refrigerant cycle number
DSW5	End terminal resistance
DSW6	Simultaneous / individual operation
PSW1	Forced defrosting
PSW2	Checking mode (▽)
PSW3	Checking mode (△)

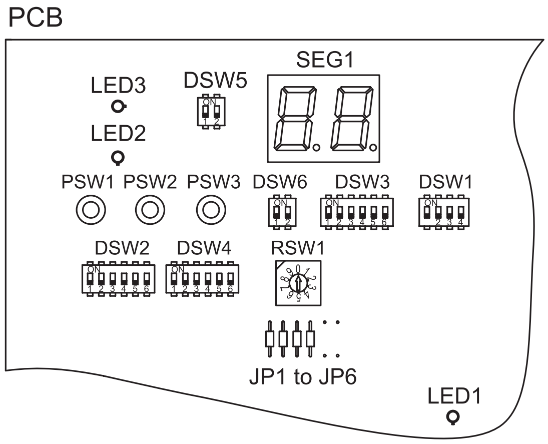
PCB1 LED indication		
LED	**Colour**	**Name**
LED1	Red	Power source for the PCB
LED2	Green	This LED indicates the transmission status between the indoor unit and the RCS
LED3	Yellow	This LED indicates the transmission status between the indoor unit and the RASC unit
LED4	Red	Power source at 280V for the PCB

PCB2 Connector indication	
Connector	**Name**
PCN201	Power supply
PCN202	Power connection between PCB3 and PCB1
CN201	Line connection between PCB3 and PCB1
CN202	Line connection between PCB3 and PCB1
EFR1	Power protection

4.6 Setting and function of DIP and RSW switches for RASC units

4.6.1 Location of DIP switches and RSW switches

(PCB layout)



4.6.2 Functions of dip switches and rotary switches

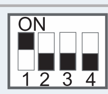
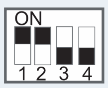
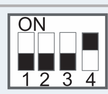
NOTE

- *The mark “■” indicates the dip switches positions.*
- *No mark “■” indicates pin position is not affected.*
- *The figures show the settings before shipment or after selection.*

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.

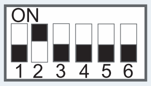
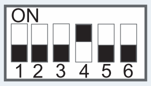
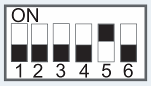
DSW1: Test run

Setting before shipment		-
Test Run for cooling		Continuous operation during 2 hours is performed without thermo OFF. The 3 minutes guard for compressor protection is not effective during the test run operation.
Test Run for heating		
Enforced compressor OFF		Compressor operation is OFF during the operation.

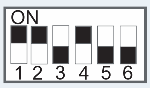
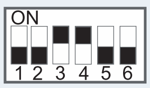
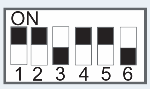
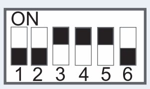
NOTE

- *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-minutes guard for compressor protection will be effective.*
- *Test run will start within 20 seconds after setting DSW1 pin 1 to ON position*

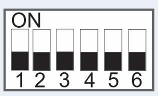
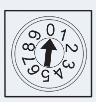
DSW2: Pipe length setting (Setting is required) / Optional function setting

Setting before shipment (5-30m)		-
Piping length (0~5 m)		Initial expansion valve opening is changed according to the piping.
Piping length (More than 30 m)		Initial expansion valve opening is changed according to the piping.
Piping pressure setting		Control to support existing pipes or when using Ø19.05 gas pipe (soft-annealed).
Function selection setting		Function selection is set by PSW.
External input/ output selection		External input/output selection is set by PSW.

DSW3: Capacity setting (No setting is required)

RASC-4HNPE		Setting before shipment.
RASC-5HNPE		
RASC-6HNPE		
RASC-8HNPE		
RASC-10HNPE		

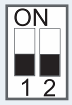
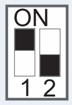
DSW4 and RSW1: Setting number of refrigerant cycles (Setting is required)

Setting for the tenth digit		Setting before shipment.
Setting for the last digit		

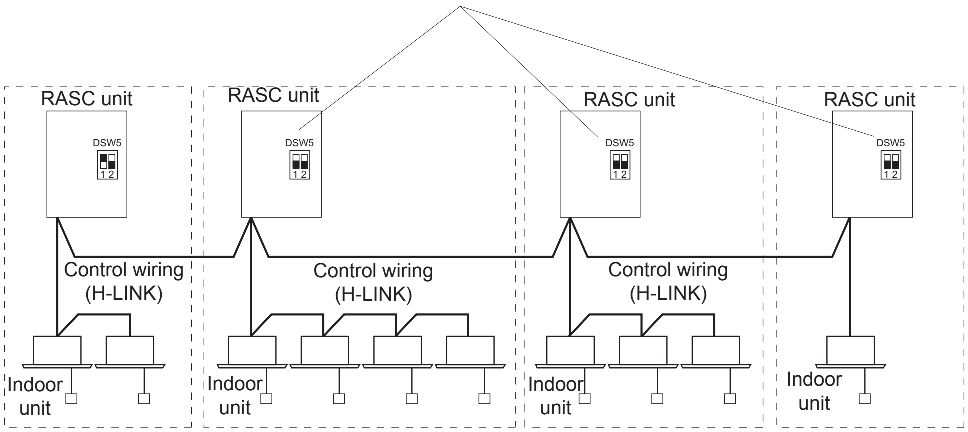
DSW5: Setting of end-terminal resistance

It is not necessary to set when the number of RASC units in the same H-LINK line is one. In case of more than one RASC unit in the same H-LINK line, set as follows:

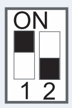
- First RASC unit: keep DSW5-1 in “ON”.
- Rest of RASC units: set DSW5-1 to “OFF”.

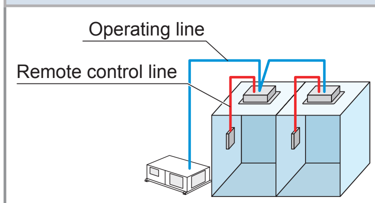
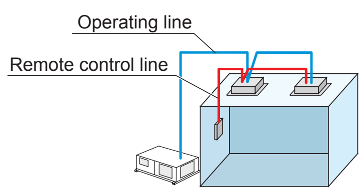
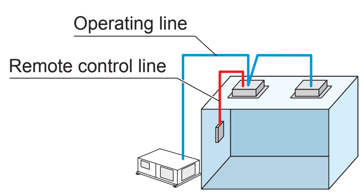
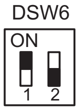
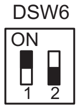
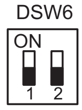
Setting before shipment	
Cancellation (Setting of end terminal resistance)	

Turn OFF DSW5 number 1 pin for cancel
of end terminal resistance setting



DSW6: Setting of indoor unit control operation

Individual control operation (Setting before shipment)	
Simultaneous control operation	

Individual control		Simultaneous control
		
Individual control Running ON/OFF individually Thermo-ON/OFF individually	Individual control Running ON/OFF simultaneously Thermo-ON/OFF individually	Simultaneous control Running ON/OFF simultaneously Thermo-ON/OFF simultaneously
DSW6 	DSW6 	DSW6 

4.6.3 Jumper lead setting (JP1~6)

Setting before shipment:

System	JP1	JP2	JP3	JP4	JP5	JP6
Three-phase (3N~)	1	1	0	1	0	0

NOTE

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

The function selection using the jumper lead setting is shown in the tables below:

Setting	Function	Details
JP1	Not used	-
JP2	Not used	-
JP3	400V power source voltage	When JP3 is set to “open”, current protection parameters are set for a 400 V power source voltage.
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	Self diagnosis	For function test of the RASC unit control PCB. Factory default setting is open. When power ON in short condition it enters self diagnosis.
JP6	Phase detection release	Phase detection abnormality not detected. When short, doesn’t affect phase detection.

4.6.4 LED’s indication

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 RASC unit
LED3	Green	Power source for the PCB

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4.7 H-LINK II system

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 RASC unit for a total of 64 refrigerant cycles.
- Connection wiring for all indoor and RASC units in series.

4.7.1 Application

The H-LINK II system can be applied to the following models:

Indoor unit	RASC unit
System Free	
RCI	RASC-(4-10)HNPE
RCIM	
RCD	
RPI	
RPIM	
RPK	
RPF	
RPFI	
RPC	

CAUTION

The H-LINK II system cannot be applied to the models with the old cycle, nor to units with an old transmission.

4.7.2 Features

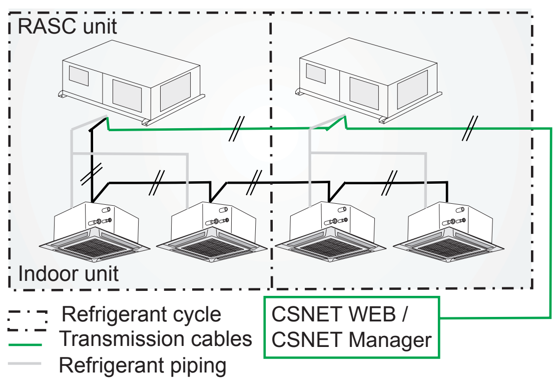
- The total wiring length is considerably reduced compared to traditional connections.
- Only one connection is required for the wiring between the indoor and RASC units.
- The wiring connection of the complementary central control devices is easy.

NOTE

CSNET WEB or CSNET Manager are centralised control systems which allow the installation to be controlled remotely. They can be connected at any point of the local corporate network, or even via the Internet.

4.7.3 Specifications

- Transmission cable: 2-wire.
- Polarity of transmission cable: non-polar wire.
- Maximum number of units that can be connected: 64 RASC units and 160 indoor units per H-LINK II system.
- Maximum wiring length: total 1000 m (including CSNET WEB or CSNET Manager).
- It is possible to increase the maximum wiring length up to 5000 m by using up to four PSC-5HR units.
- Recommended cable: shielded twisted pair cable, over 0.75 mm^2 (Equivalent to KPEV-S).
- Voltage: 5 V DC.



CAUTION

For the H-LINK II system must use twisted shielded pair cable or shielded pair cable.

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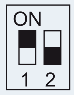
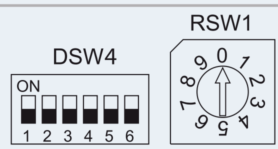
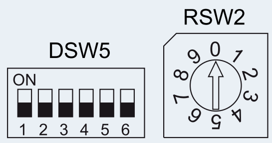
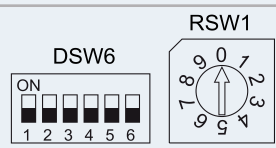
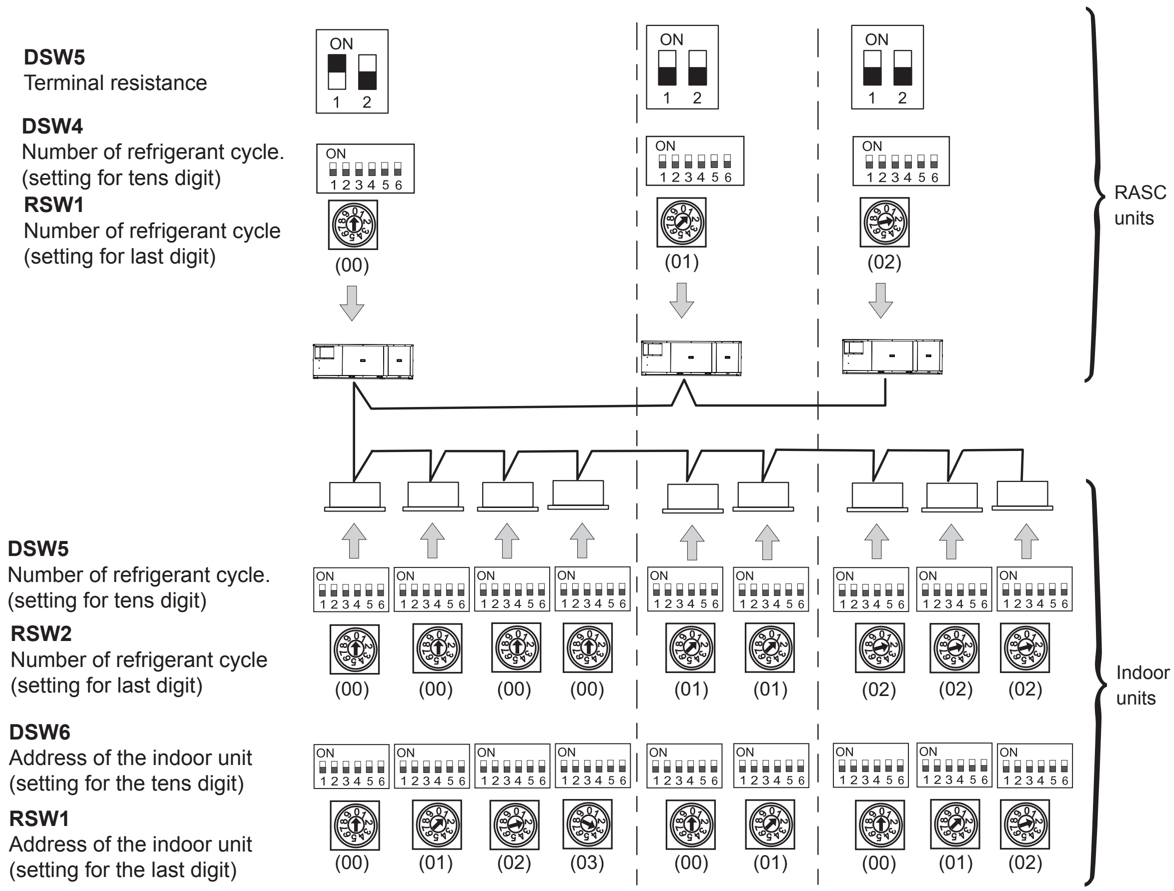
4.7.4 DIP Switch setting for multiple H-LINK system

The DIP switches of all the RASC and indoor units have to be set as follows:

Unit	Name of DIP switch	Mark	Setting before the Shipment	Function
RASC unit	Terminal resistance	DSW5		It is not necessary to set when the number of RASC units in the same H-LINK line is one. In case of more than one RASC unit in the same H-LINK line, set as follows: • First RASC unit: keep DSW5-1 in "ON". • Rest of RASC units: set DSW5-1 to "OFF".
	Refrigerant cycle	DSW4 RSW1		For setting the refrigerant cycle address of the RASC unit. Set the DSW4 and RSW1 to overlap the setting of other RASC units in the same H-LINK system.
Indoor unit	Refrigerant cycle	DSW5 RSW2		For setting the refrigerant cycle address of the indoor unit. Set the DSW5 and RSW2 corresponding to the address of RASC unit in the same refrigerant cycle.
	Address of the indoor unit	DSW6 RSW1		Setting indoor unit address. Set the DSW6 and RSW1 not to overlap the setting of other indoor units in the same refrigerant cycle. (If no set, the automatic address function is performed.)

- Example of the setting of the DIP switches.



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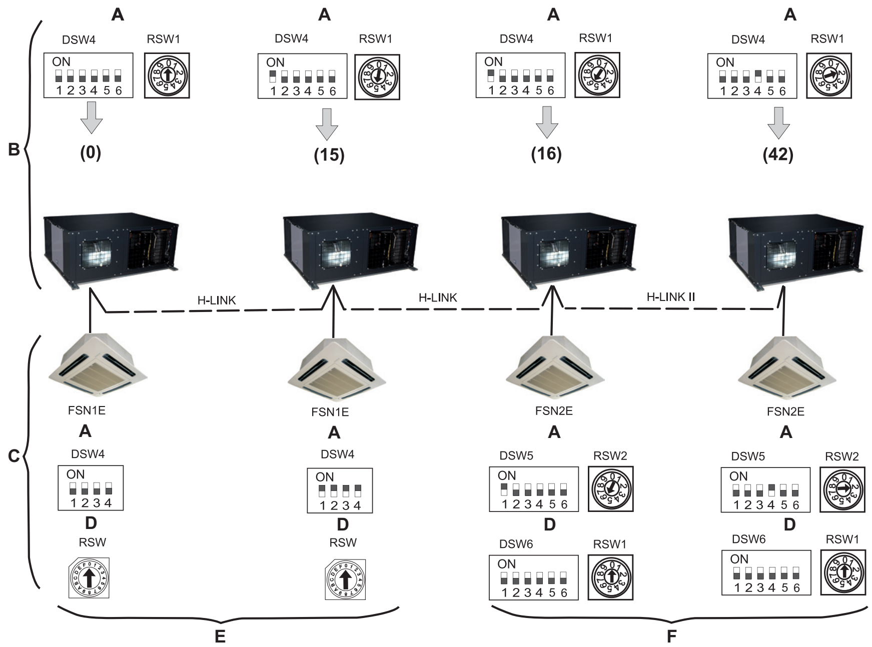
4.7.5 Examples of the system of connection between H-LINK and H-LINK II units

In the case of mixed systems with H-LINK and H-LINK II, set the H-LINK units in the first 16 position of the system, as in the following example where 42 systems are connected, 16 with indoor FSN1E units and 26 with indoor FSN(H)(2/3/4)(E)(M)(i)(-DU) units.



A. Refrigerant cycle.

B. RASC unit.

C. Indoor unit.

D. Indoor unit address.

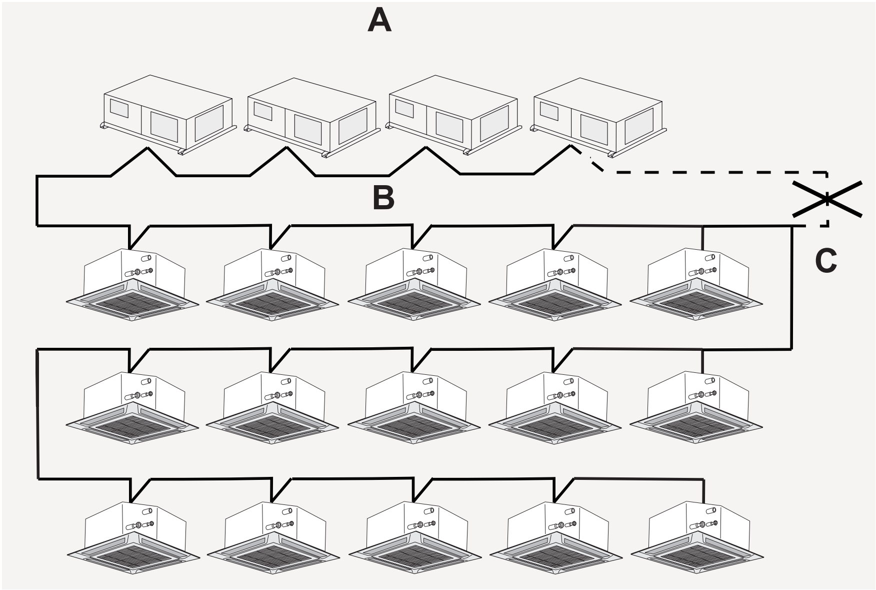
E. Either the current remote control switch (H-LINK) or the new one (H-LINK II) can be used.

F. Only the new remote control switch (H-LINK II) can be used.

4.7.6 Examples of H-LINK II system

1 Using the H-LINK II system for air conditioning systems without a central control device (Neither centralised remote controls nor Building air conditioning controls)

- Line connection with all units.

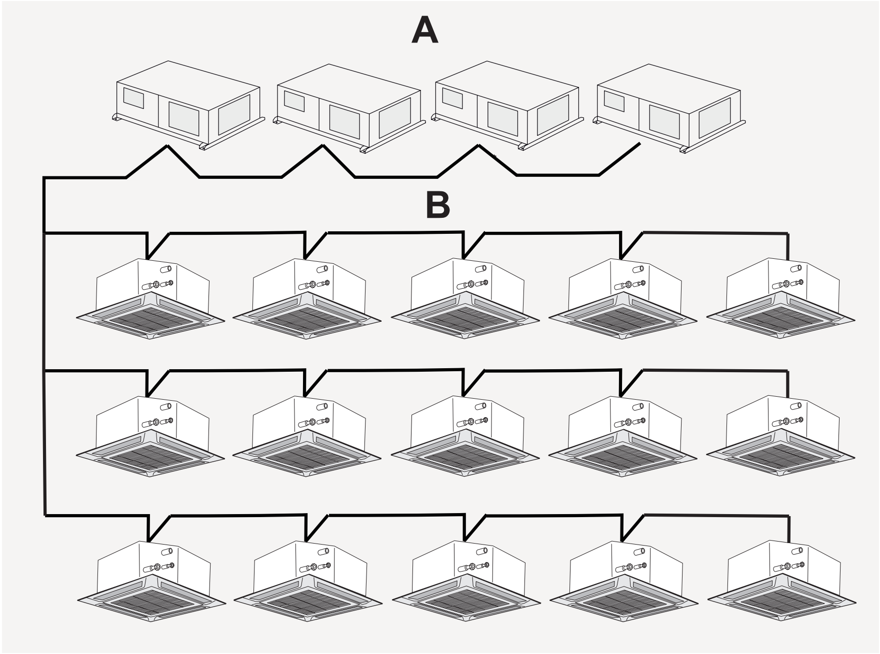


A. RASC units.

B. Indoor units.

C. Do not install wiring in a loop.

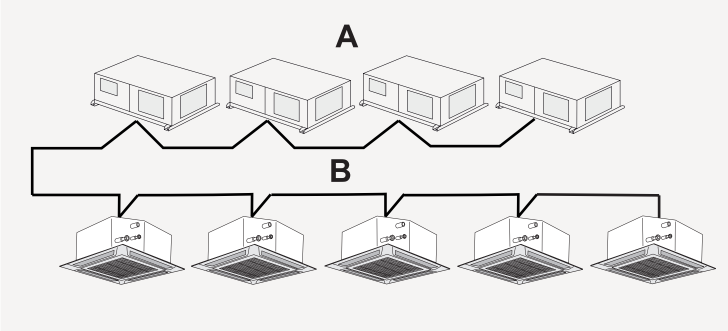
- Line connection for each floor.



A. RASC units.

B. Indoor units.

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



A. RASC units.

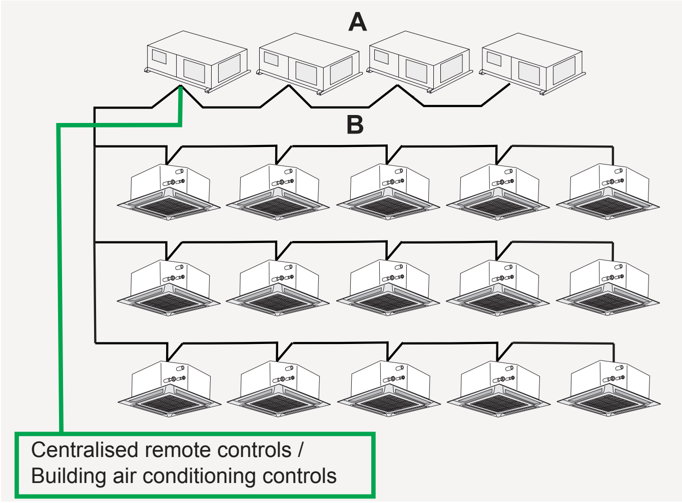
B. Indoor units.

CAUTION

- *Do not install the wiring in a loop.*
- *If the H-LINK II system is not used when carrying out the electrical wiring as shown above, it must be used once the wiring of the instrument is completed. The DIP switches must therefore be set as specified in the DIP switches on the PCB.*

2 Using the H-LINK II system for air conditioning systems with a central control device (Either centralised remote controls or Building air conditioning controls).

- If the central control device is used when carrying out electrical wiring, it can be connected at any point of the H-LINK II wiring.



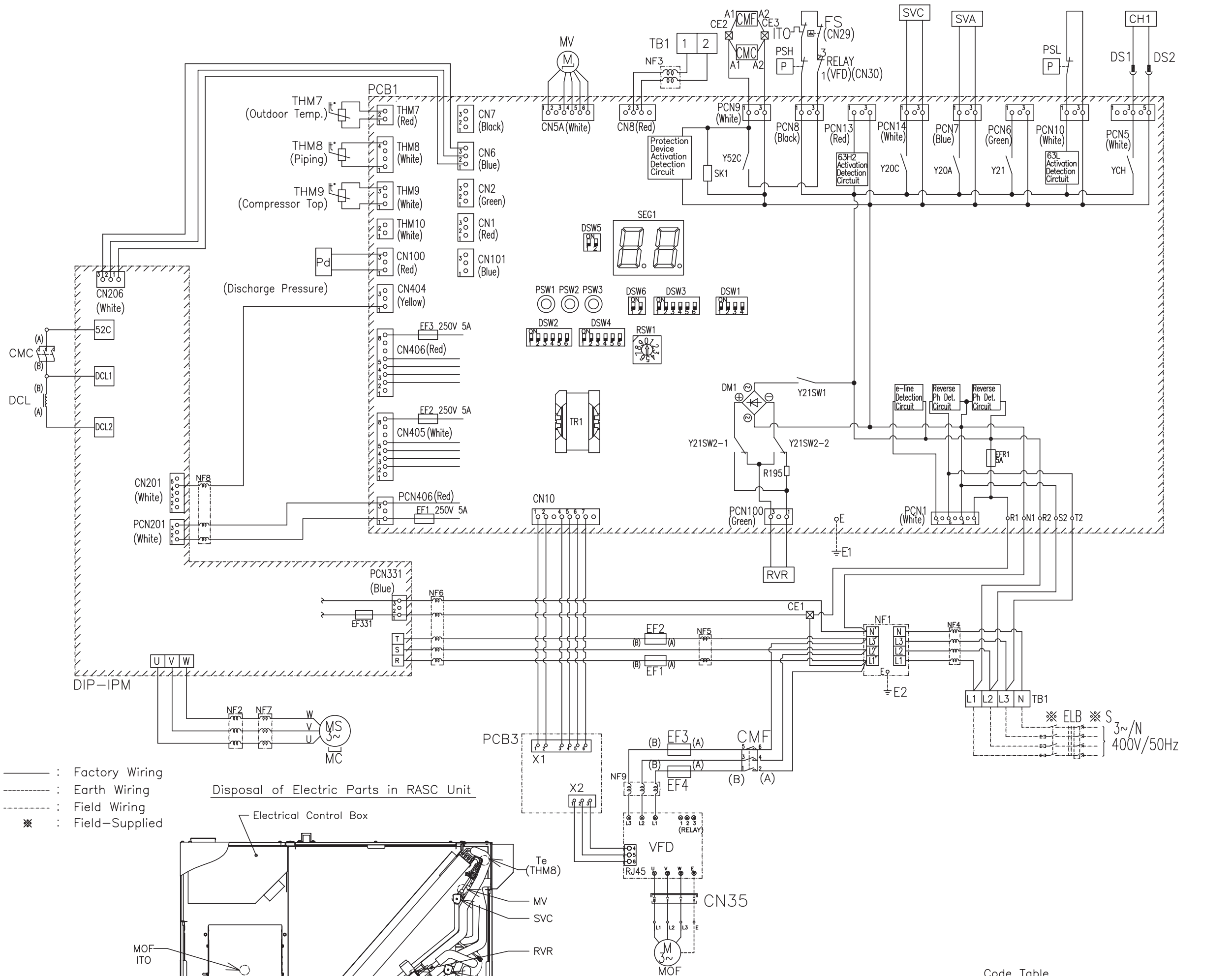
A. RASC units.

B. Indoor units.

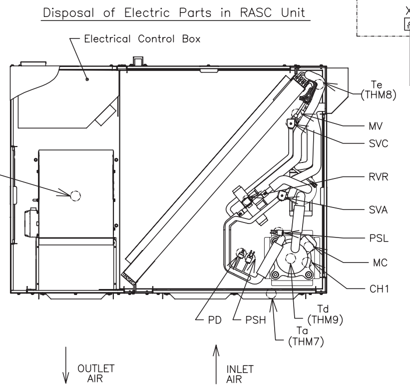
- If the central control device is not used when electrical wiring is carried out, you must connect the H-LINK II wiring to all the systems. The easiest method is usually to connect the RASC units.

4.8 Electrical wiring diagrams

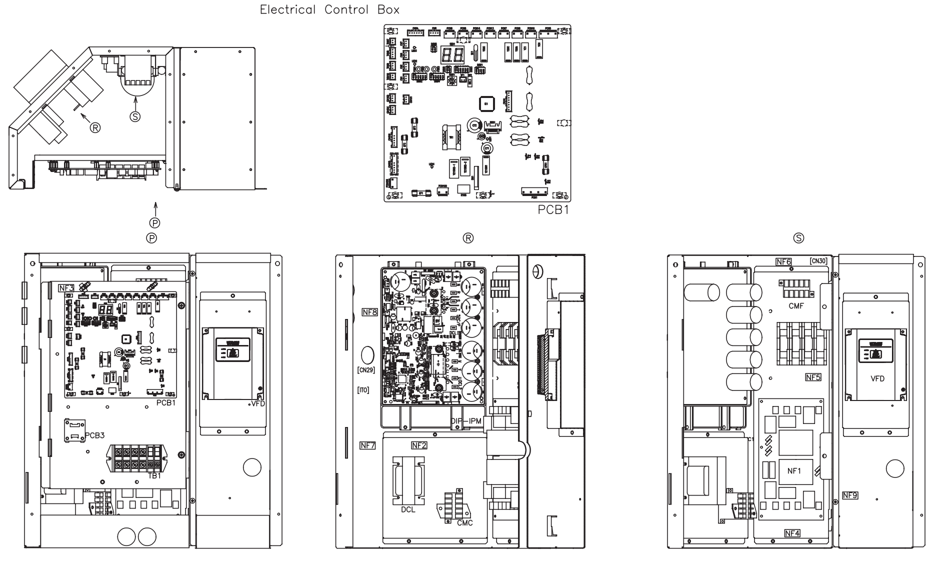
4.8.1 RASC-(4-6)HNPE (3N~ 400V 50Hz)



Disposal of Electric Parts in RASC Unit



Electrical Control Box



Code Table

Code	Name of Parts	Remarks
MC	Motor (for Compressor)	
MOF	Motor (for Fan)	
EF1~4	Power Fuse	
EF1~3	Fuse	on PCB1
CMC	Magnetic Contactor (for Compressor)	
CMF	Magnetic Contactor (for Fan)	
SVA,C	Solenoid Valve	
RVR	Magnetic 4 Way Valve	
MV	Electrical Expansion Valve	
TB1	Terminal Board	
E1,2	Earth	
FS	Float Switch	
TR1	Transformer	on PCB1
YCH	Auxiliary Relay (Oil Heater)	DC Coil
Y20A,Y20C	Auxiliary Relay (Solenoid Valve)	DC Coil
Y21	Auxiliary Relay (Solenoid 4-Way Valve)	DC Coil
Y52C	Auxiliary Relay (Compressor)	DC Coil
THM7	Thermistor (for Outdoor Air)	
THM8	Thermistor (for Piping)	
THM9	Thermistor (for Comp. Top)	
Pd	Pressure Sensor (Discharge Side)	
PSH	High Pressure Switch(for Protection)	
PSL	Low Pressure Switch (Control)	
DCL	Reactor	
IPM	Inverter Module	
PCB1	Control PCB	
PCB3	Power Source PCB	
NF1~9	Noise Filter	
EFR1	Fuse	on PCB1
PSW1	Switch(Forced Defrosting)	on PCB1
PSW2	Switch(Checking)	on PCB1
PSW3	Switch(Checking)	on PCB1
DSW1	Switch(Test Run)	on PCB1
DSW2	Switch(Auxiliary Option Setting)	on PCB1
DSW3	Switch(Outdoor Capacity Setting)	on PCB1
DSW4	Switch(Refrigerant Cycle Setting)	on PCB1
DSW5	Switch	on PCB1
DSW6	Switch	on PCB1
CH	Crankcase Heater	
DS1,DS2	Plug-in Connector	
VDF	Variable frequency driver	
CE	Connector	
CNx	Connector	
PCNx	Connector	on PCB

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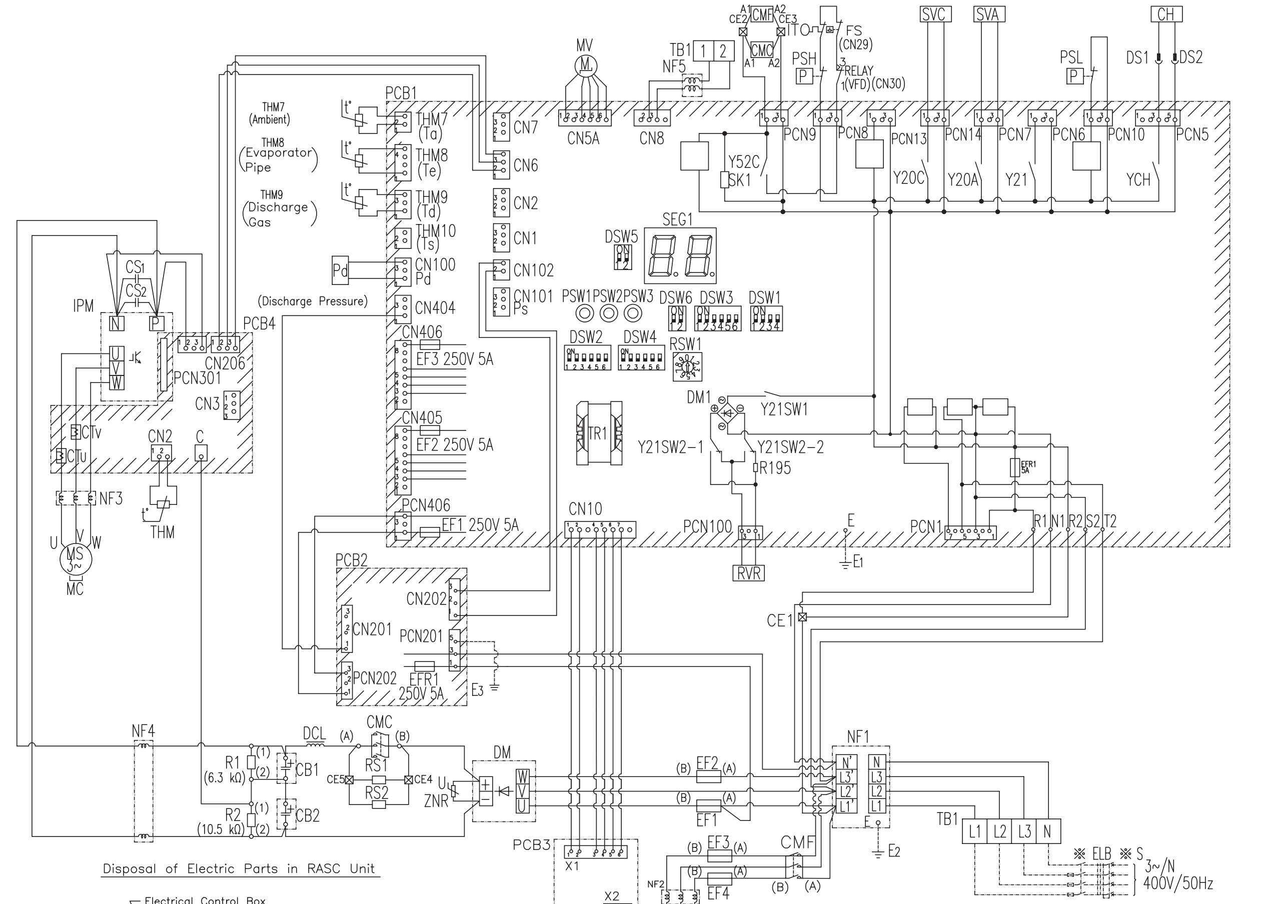
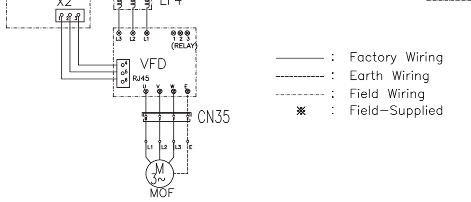
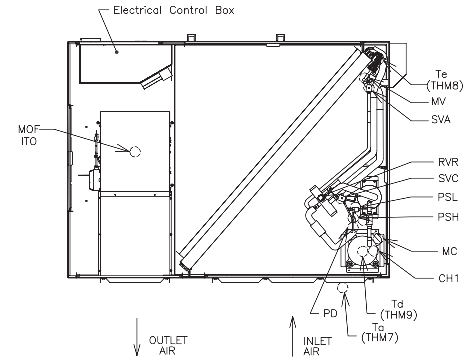
4.8.2 RASC-(8/10)HNPE (3N~ 400V 50Hz)

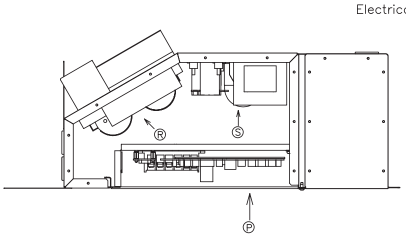


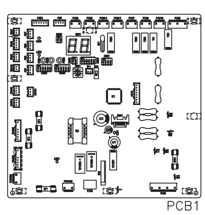
Disposal of Electric Parts in RASC Unit

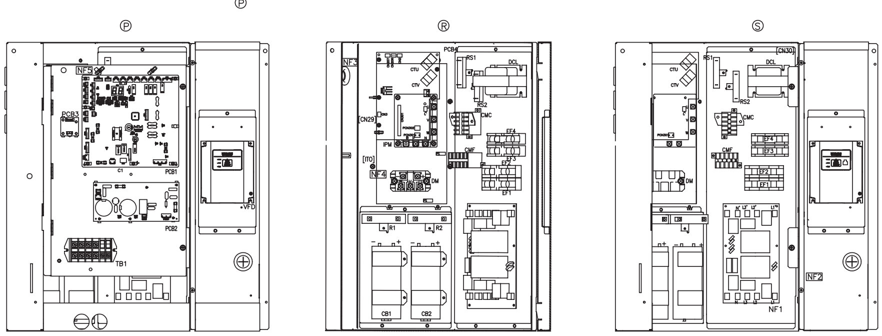




Electrical Control Box







Code Table

Code	Name of Parts	Remarks
MC	Motor (for Compressor)	
MOF	Motor (for Fan)	
EF1~4	Power Fuse	
EF1~3	Fuse	on PCB1
CMC	Magnetic Contactor (for Compressor)	
CMF	Magnetic Contactor (for Fan)	
SVA,C	Solenoid Valve	
RVR	Magnetic 4 Way Valve	
MV	Electrical Expansion Valve	
TB1	Terminal Board	
E1,2	Earth	
FS	Float Switch	
TR1	Transformer	on PCB1
Y_{CH}	Auxiliary Relay (Oil Heater)	DC Coil
Y_{20A},Y_{20C}	Auxiliary Relay (Solenoid Valve)	DC Coil
Y_{21}	Auxiliary Relay (Solenoid 4-Way Valve)	DC Coil
Y_{52C}	Auxiliary Relay (Compressor)	DC Coil
THM7	Thermistor (for Outdoor Air)	
THM8	Thermistor (for Piping)	
THM9	Thermistor (for Comp. Top)	
THM	Fin Thermistor	
Pd	Pressure Sensor (Discharge Side)	
PSH	High Pressure Switch(for Protection)	
PSL	Low Pressure Switch (Control)	
DCL	Reactor	
IPM	Inverter Module	
PCB1	Control PCB	
PCB2	Inverter PCB	
PCB3	Power Source PCB	
NF1~5	Noise Filter	
EFR1	Fuse	on PCB1
PSW1	Switch(Forced Defrosting)	on PCB1
PSW2	Switch(Checking)	on PCB1
PSW3	Switch(Checking)	on PCB1
DSW1	Switch(Test Run)	on PCB1
DSW2	Switch(Auxiliary Option Setting)	on PCB1
DSW3	Switch(Outdoor Capacity Setting)	on PCB1
DSW4	Switch(Refrigerant Cycle Setting)	on PCB1
DSW5	Switch	on PCB1
DSW6	Switch	on PCB1
CH	Crankcase Heater	
DS1,DS2	Plug–in Connector	
VDF	Variable frequency driver	
$CE_{1\sim5}$	Connector	
DM	Diode Module	
CB1,2	Capacitor	
CS1,2	Capacitor	
R1,2	Resistor	
RS1,2	Resistor	
ZNR	Surge Absorber	
CNx	Connector	
PCNx	Connector	on PCB

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5. Control system

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5.1 Device control system

Control subject	Purpose		
	Cooling operation	Heating operation	Defrost operation
Control frequency of inverter compressor	The frequency control is determined with the next parameters: • Ratio (IU capacity/RASC capacity) for individual operation. • Temperature difference between indoor unit air inlet temperature and room setting temperature.	The frequency control is determined with the next parameters: • Ratio (IU capacity/RASC capacity) for individual operation. • Temperature difference between indoor unit air inlet temperature and room setting temperature.	Fixed frequency (stop compressor during 30 sec. After defrosting condition was completed).
Opening degree expansion valve of RASC	Fully open	• Control range of expansion valve opening degree is determined to optimise temperature on the top of compressor. • When number of IU has decreased, the expansion valve opening degree is determined with IU capacity ratio of before/after decrease or with control range for individual operation.	Fully open
Opening degree expansion valve of indoor unit	• Control range of expansion valve opening degree is determined to optimise IU gas pipe temperature (Tg) - I.U. liquid pipe temperature (Tl) difference. • The expansion valve opening degree is controlled according to the number of connected IU for individual operation.	• Specified opening degree at normal control starting. Afterward, controlled to optimise IU liquid pipe temperature (Tl). • The expansion valve opening degree is controlled according to the number of connected IU for individual operation.	Specified opening degrees controlled by temperature on the top of compressor. (Td).
RASC fan	• Fan step is operated for RASC liquid pipe temperature (Te) stabilization control. - Increased number of I.U.: Step-up. - Decreased number of I.U.: Step-down.	• Fan step is controlled according to RASC liquid pipe temperature and temperature on the top of compressor. - Increased number of I.U.: Step-up. - Decreased number of I.U.: Step-down (limited the lowest by outdoor temperature)	Fan stop.
4-Way valve (RVR)	OFF	ON	OFF
Solenoid valve (SVA) (Equalised pressure valve)	• Turn ON at starting. Pd increase protection control.	• Turn ON at starting. Pd increase protection control.	Turn ON at starting
Solenoid valve (SVC) (Hot gas discharge bypass)	—	Turn ON depending on I.U. discharge / suction temperature, outdoor temperature, outdoor liquid temperature, etc.	—
High/Low pressure balance	Turn ON SVA during stop.	Turn ON SVA during stop.	—

I.U.: Indoor unit
Tc / Te: Condensing temperature / Evaporating temperature
Td: Discharge temperature
Tl: Liquid temperature
Tg: Gas temperature
Pd: Discharge pressure
Cap: Capacity
Temp.: Temperature

5.2 Safety protection and control

◆ Compressor and fan motor protections

The following devices and their combinations protect the compressor and fan motor.

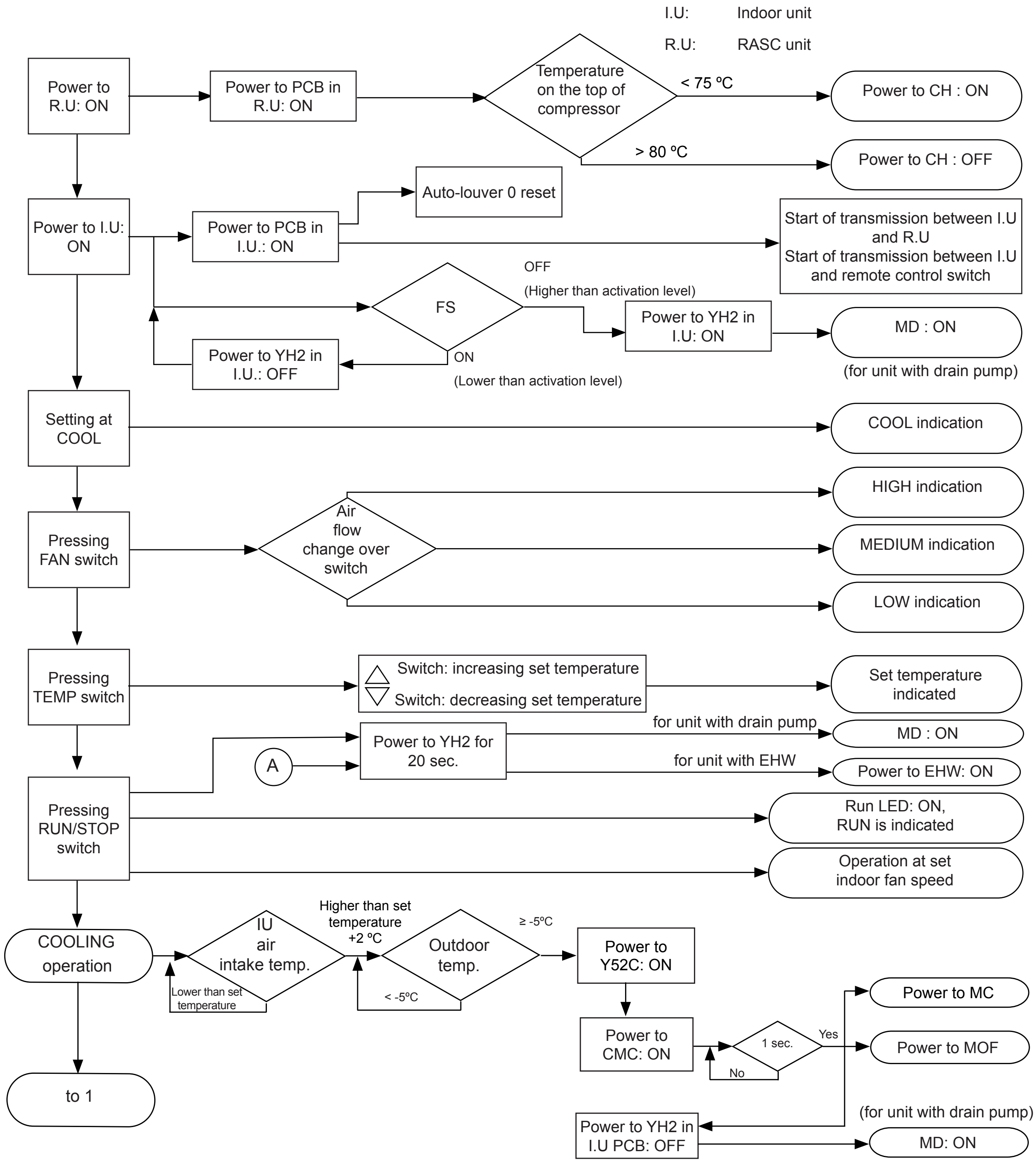
High-pressure switch	This switch cuts out the operation of the compressor when the discharge pressure exceeds the setting.
Oil heater	This band heater protects against the oil carry-over during the cold starting, as the band heater is energized while the compressor is stopped.
Fan motor protection	Internal 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.

◆ RASC safety and control device setting

Model			RASC(4-6)HNPE	RASC-(8/10)HNPE
High pressure switch for compressor	Type		Automatic Reset, Non-Adjustable (each one for each compressor)	
	Cut-Out	MPa	$4.15^{-0.05}_{-0.15}$	$4.15^{-0.05}_{-0.15}$
	Cut-In	MPa	$3.20^{+0.15}_{-0.15}$	$3.20^{+0.15}_{-0.15}$
Fuse	3N~ 400V 50Hz	A	20 x 2	40 x 2
Crankcase heater	Output	W	52.0	40.8
CCP Timer		-	Non-Adjustable	
Setting Time		min.	3	3
Fan Motor Fuse		A	10 x 2	10 x 2
Internal Thermostat for fan motor	Cut-Out	ºC	165 ± 10	165 ± 10
	Cut-In	ºC	130 ± 15	130 ± 15
Fuse capacity on PCB		A	5.0	5.0

5.3 Standard operation sequence

5.3.1 Cooling operation



IU: Indoor unit

RU: RASC unit

NOTE

YH2 in IU's PCB
Y52C in RASC PCB1

Continues in the next page.

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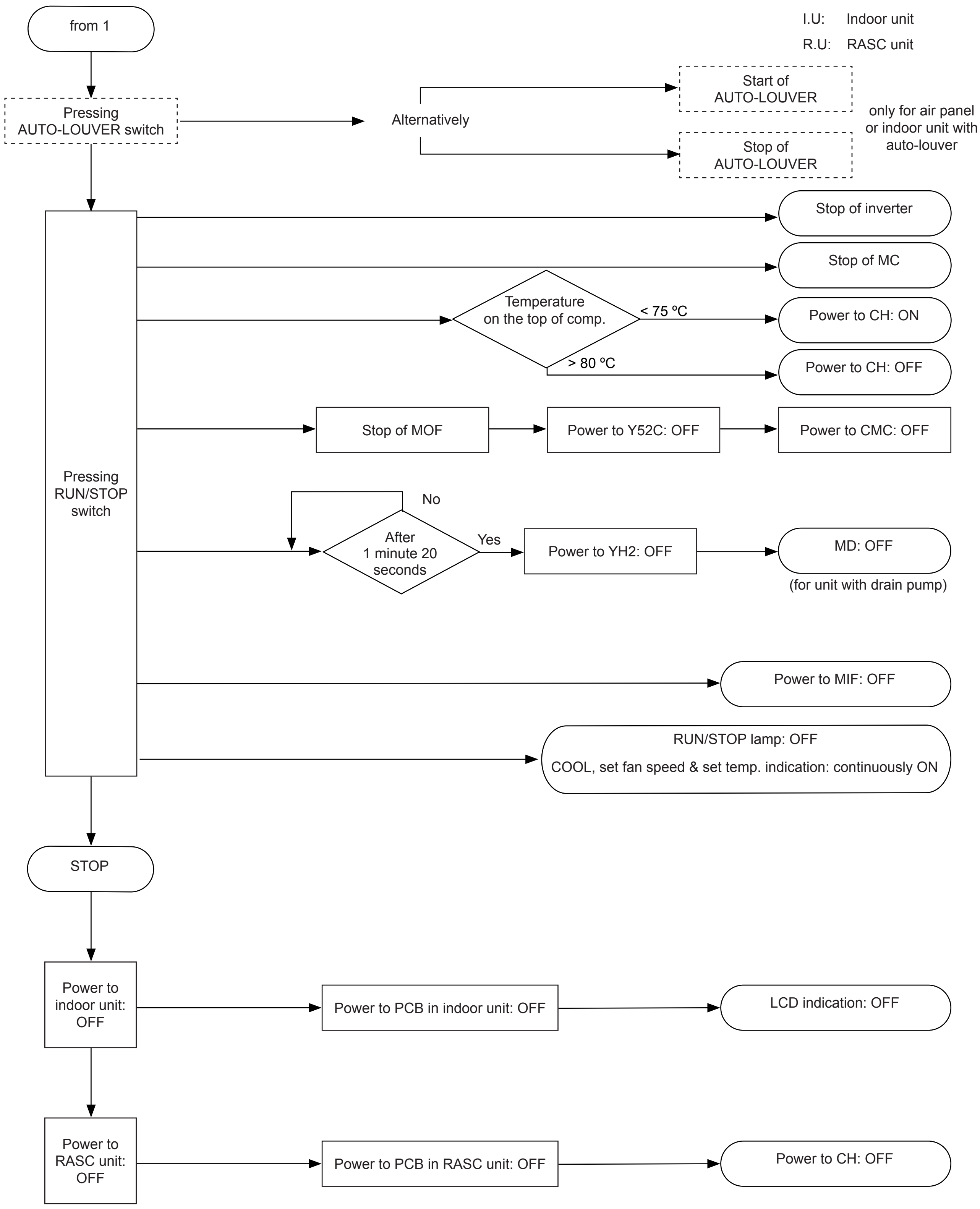
I.U: Indoor unit
R.U: RASC unit
from 1
Pressing AUTO-LOUVER switch
Alternatively
Start of AUTO-LOUVER
Stop of AUTO-LOUVER
only for air panel or indoor unit with auto-louver
Pressing RUN/STOP switch
Stop of inverter
Stop of MC
Temperature on the top of comp.
< 75 ºC
Power to CH: ON
> 80 ºC
Power to CH: OFF
Stop of MOF
Power to Y52C: OFF
Power to CMC: OFF
No
After 1 minute 20 seconds
Yes
Power to YH2: OFF
MD: OFF
(for unit with drain pump)
Power to MIF: OFF
RUN/STOP lamp: OFF
COOL, set fan speed & set temp. indication: continuously ON
STOP
Power to indoor unit: OFF
Power to PCB in indoor unit: OFF
LCD indication: OFF
Power to RASC unit: OFF
Power to PCB in RASC unit: OFF
Power to CH: OFF

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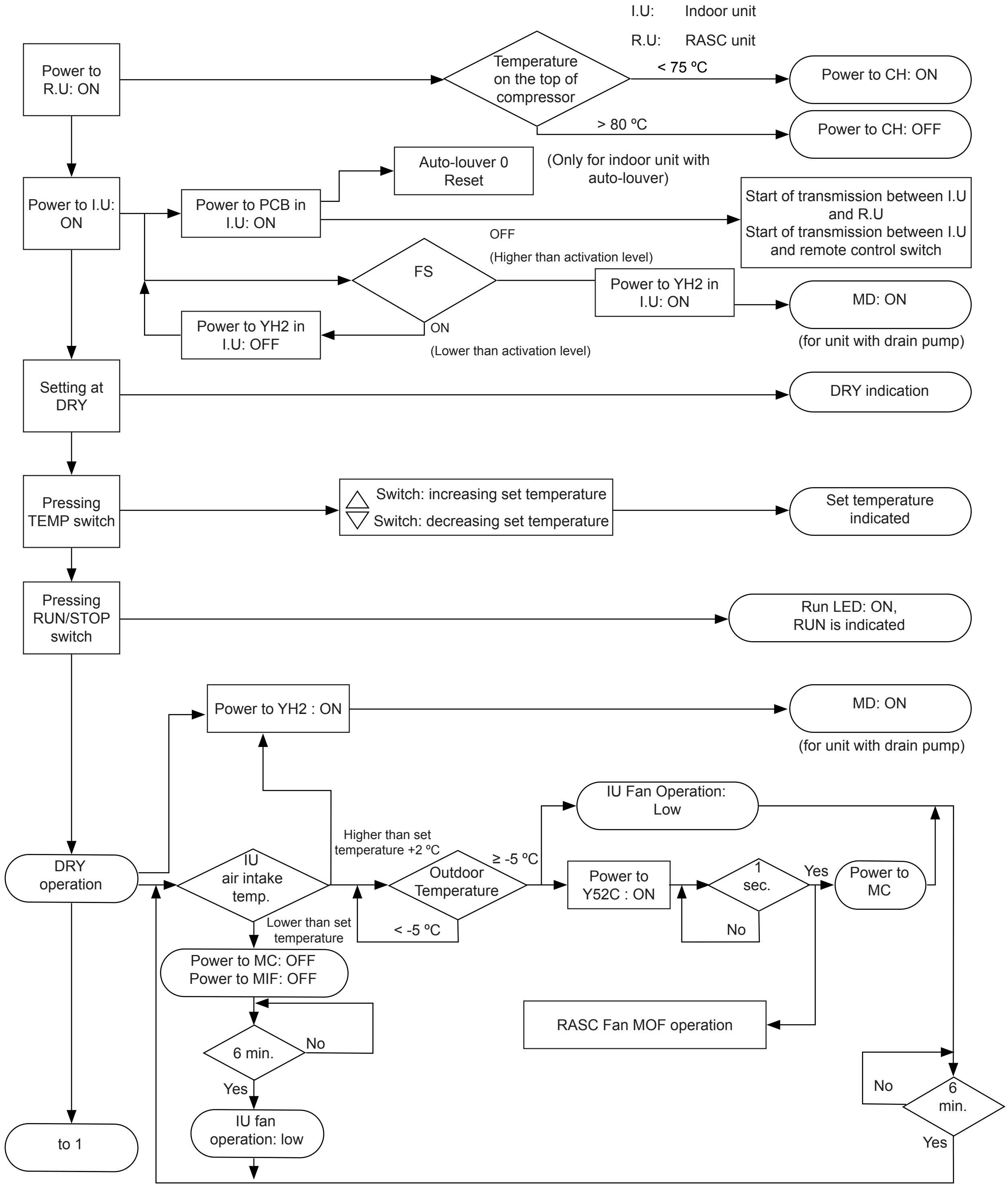
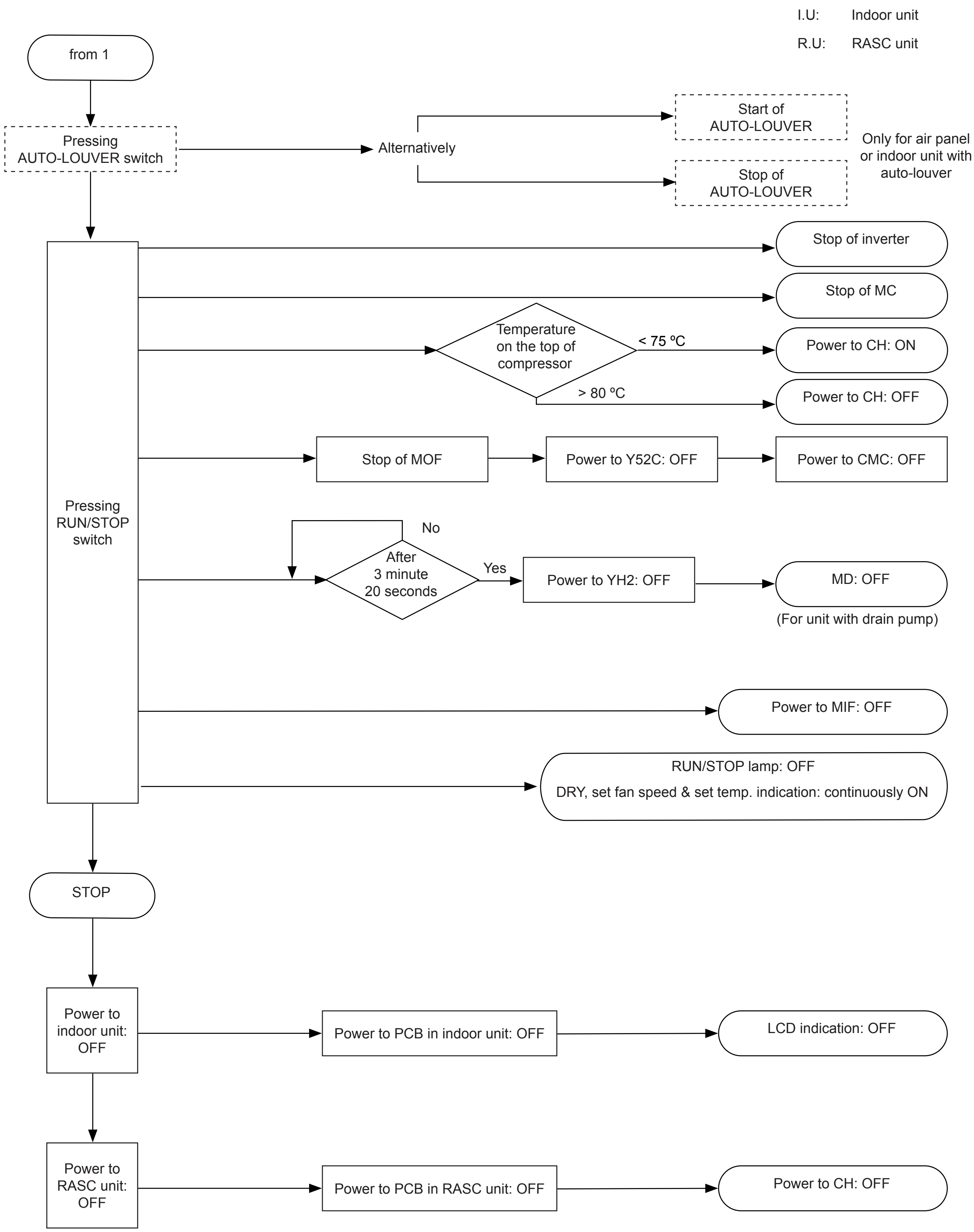
5.3.2 Dry operation




I.U: Indoor unit
R.U: RASC 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
Temperature on the top of compressor
< 75 ºC
Power to CH: ON
> 80 ºC
Power to CH: OFF
Stop of MOF
Power to Y52C: OFF
Power to CMC: OFF
No
After 3 minute 20 seconds
Yes
Power to YH2: OFF
MD: OFF
(For unit with drain pump)
Power to MIF: OFF
RUN/STOP lamp: OFF
DRY, set fan speed & set temp. indication: continuously ON
STOP
Power to indoor unit: OFF
Power to PCB in indoor unit: OFF
LCD indication: OFF
Power to RASC unit: OFF
Power to PCB in RASC unit: OFF
Power to CH: OFF

5

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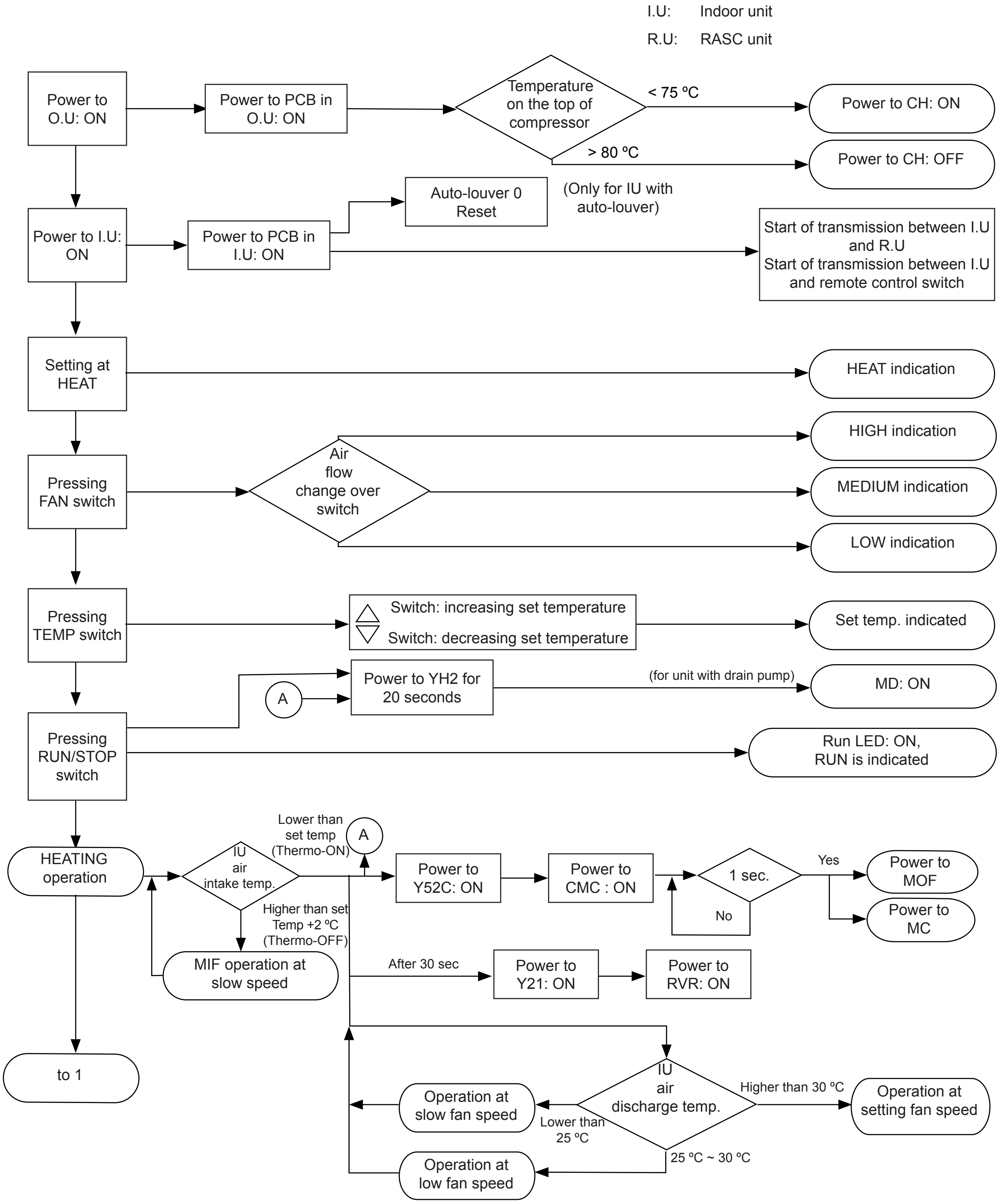
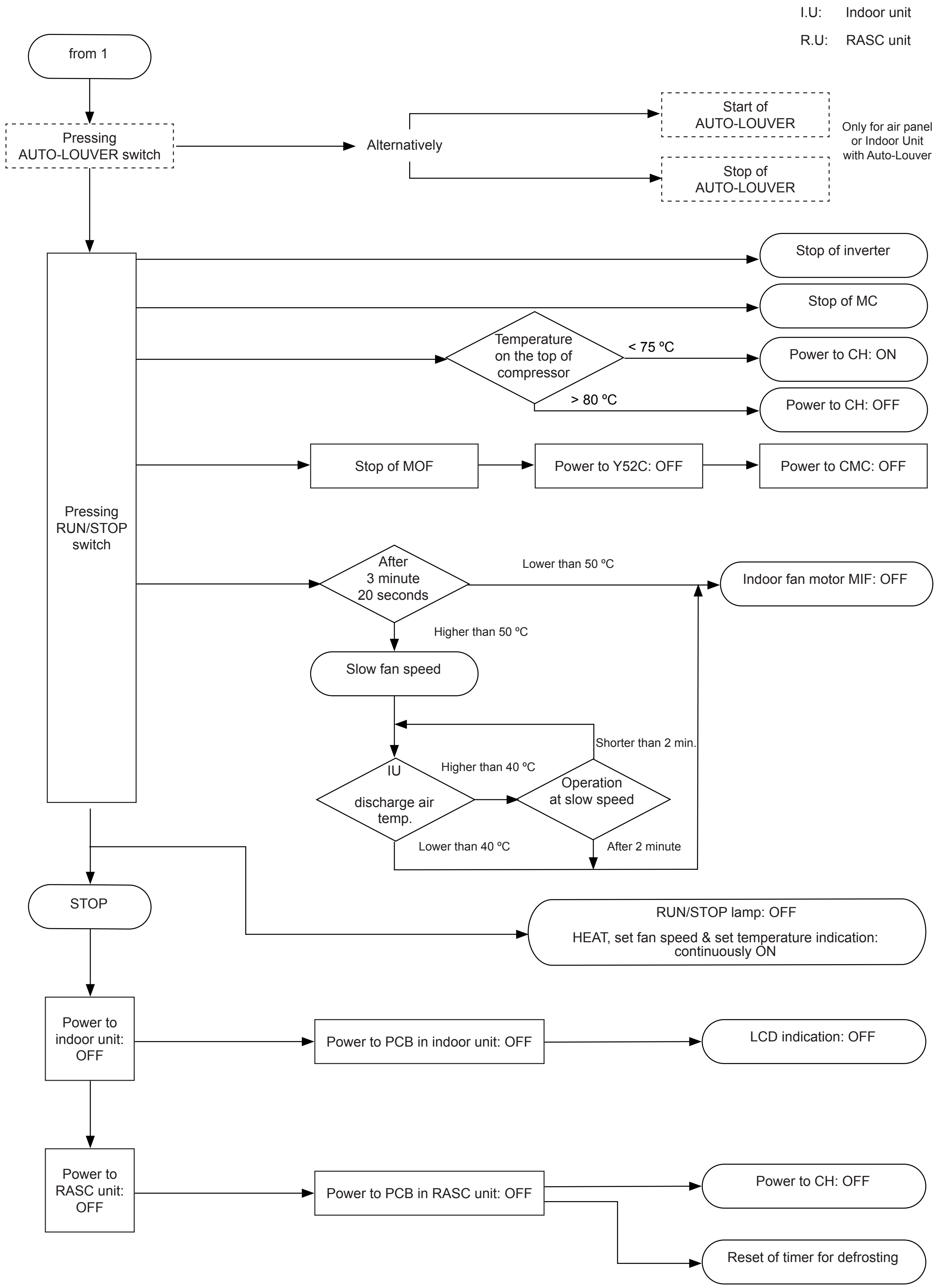
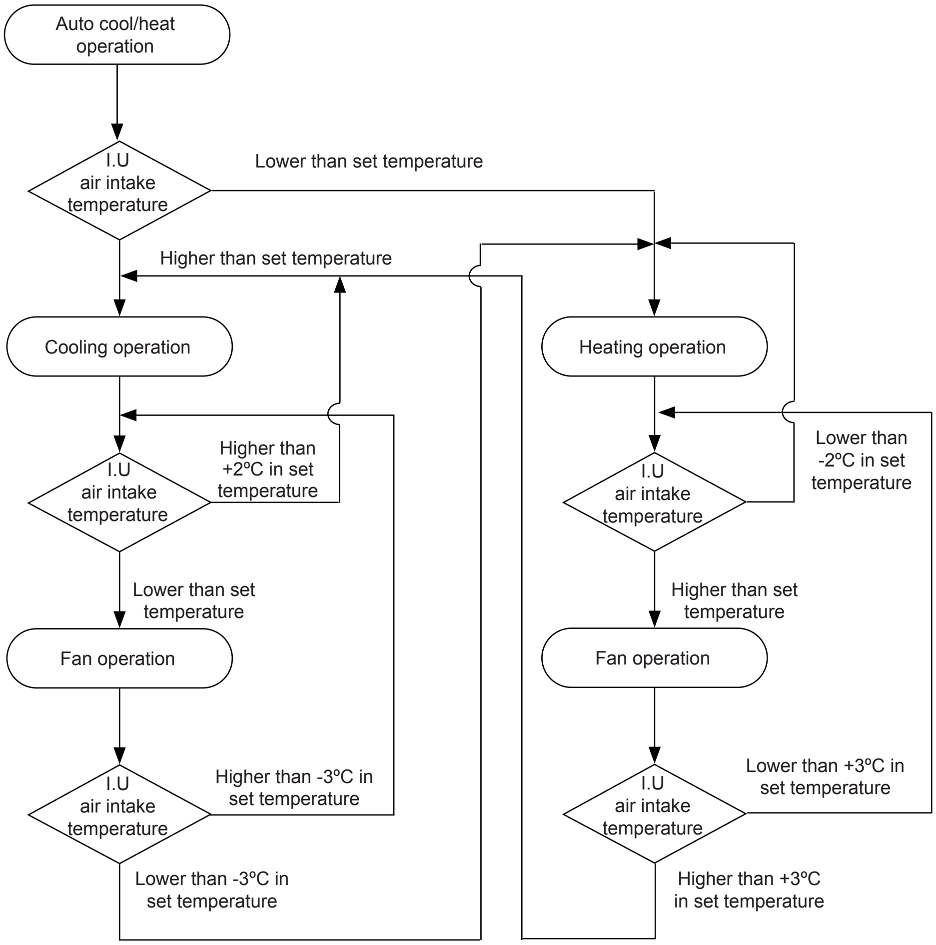
5.3.3 Heating operation




I.U: Indoor unit
R.U: RASC 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
Temperature on the top of compressor
< 75 ºC
Power to CH: ON
> 80 ºC
Power to CH: OFF
Stop of MOF
Power to Y52C: OFF
Power to CMC: OFF
After 3 minute 20 seconds
Lower than 50 ºC
Indoor fan motor MIF: OFF
Higher than 50 ºC
Slow fan speed
Shorter than 2 min.
IU discharge air temp.
Higher than 40 ºC
Operation at slow speed
Lower than 40 ºC
After 2 minute
STOP
RUN/STOP lamp: OFF
HEAT, set fan speed & set temperature indication: continuously ON
Power to indoor unit: OFF
Power to PCB in indoor unit: OFF
LCD indication: OFF
Power to RASC unit: OFF
Power to PCB in RASC unit: OFF
Power to CH: OFF
Reset of timer for defrosting

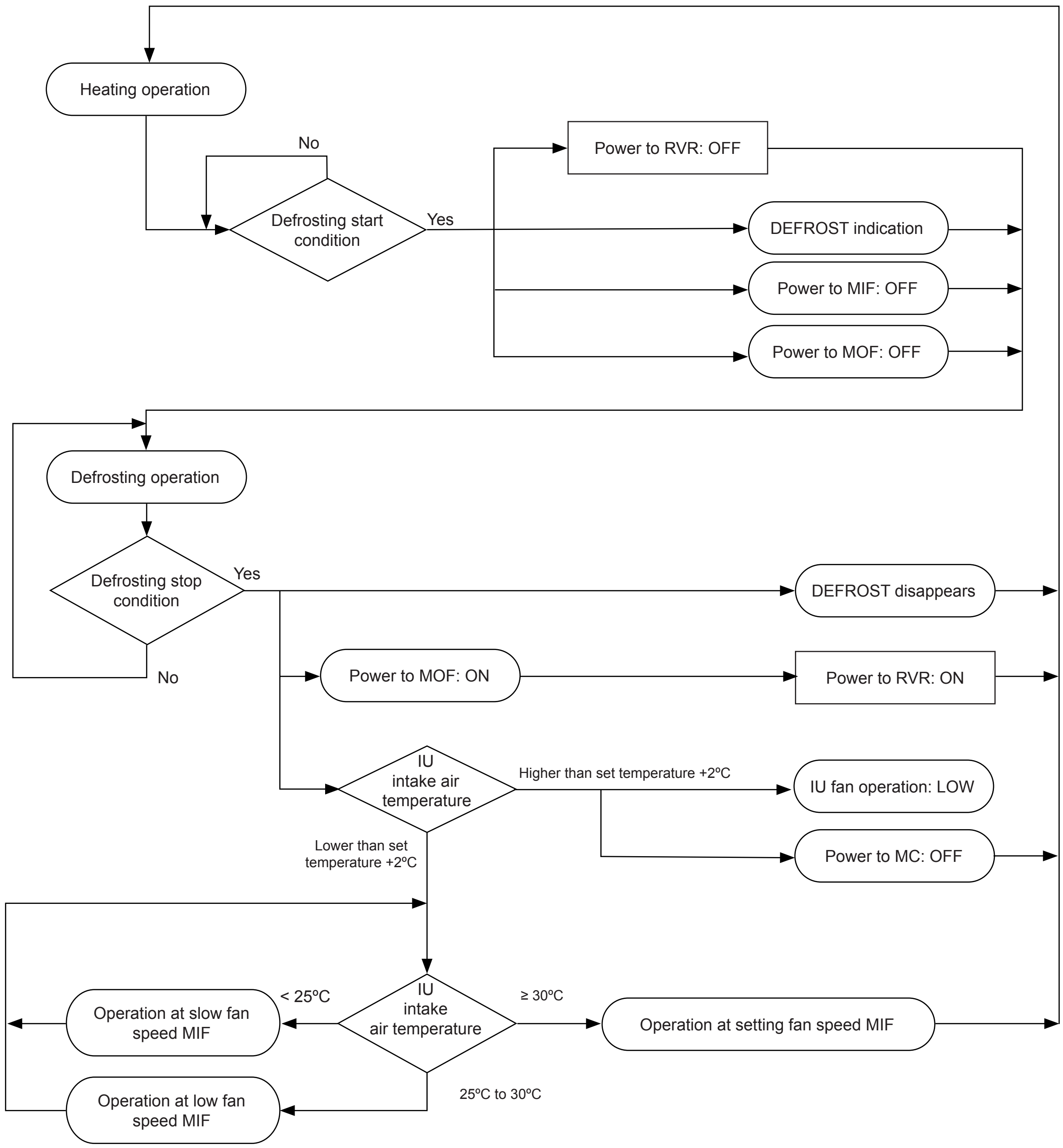
5

5.3.4 Automatic cooling and heating operation



I.U: Indoor unit

5.3.5 Defrost operation control



◆ Defrosting operation

The following defrosting operations, “Standard Defrost”, “Forced Defrost” and “Manual Defrost” are available.

1. Standard Defrost: This operation is started according to the outdoor temperature, the outdoor evaporating temperature and operating time.
2. Forced Defrost: This operation starts when the indoor unit is operated Thermo-ON/OFF repeatedly and the standard defrost is not used.
3. Manual Defrost: This operation starts when the push switch “PSW1” on the RASC PCB is pressed and hold for more than 3 seconds during the maintenance work. (It is not performed when the defrosting operation is started, the high pressure and the outdoor evaporating temperature is high.)

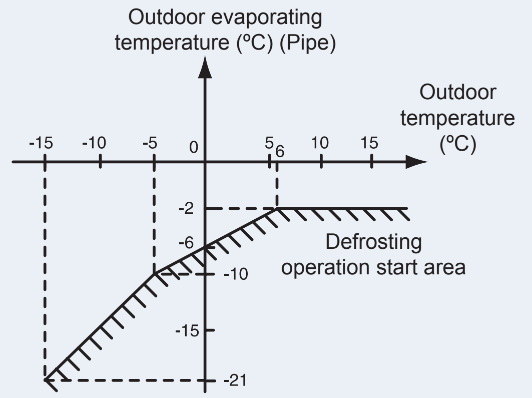
NOTE

Do not repeat manual defrost operation frequently.

◆ Condition for Starting Defrost

1 Standard defrost

a. Temperature condition

Model	RASC-(4-10)HNPE
Temperature condition under defrosting operation	

b. Condition for operating time of defrost operation start

The defrosting operation is started when the temperature condition is met “(a) Temperature Condition” after the heating operation is performed for 40 to 120 minutes. The heating operation time is determined by estimating the amount of frosting on the heat exchanger.

2 Forced Defrost

Condition for Starting

The forced defrosting operation is started when all the following conditions are met.

a. 120 minutes are passed after the reversing valve is “ON”.

b. The outdoor temperature is lower than 10ºC.

c. The accumulated heating operation time is more than 60 minutes.
(The accumulated time is reset when the operation is stopped or the defrosting operation is performed.)

d. The compressor is operated continuously for more than 1 and half minutes.

e. The outdoor evaporating temperature is lower than 5ºC right before starting the operation.

f. The pressure switch for control is “OFF”.

◆ Condition for completing defrost operation

The defrosting operation is stopped when any of following conditions are met.

1 The outdoor evaporating temperature becomes more than 25ºC for 2 minutes from starting the defrosting operation.

2 The outdoor evaporating temperature becomes more than 15ºC (the outdoor temperature < 10ºC) after passing 2 minutes from starting the defrosting operation.

3 The outdoor evaporating temperature becomes more than 5ºC (the outdoor temperature > 10ºC) after passing 2 minutes from starting the defrosting operation.

4 The pressure switch for control is “ON”.

5 More than 9 minutes are passed after starting the defrosting operation.

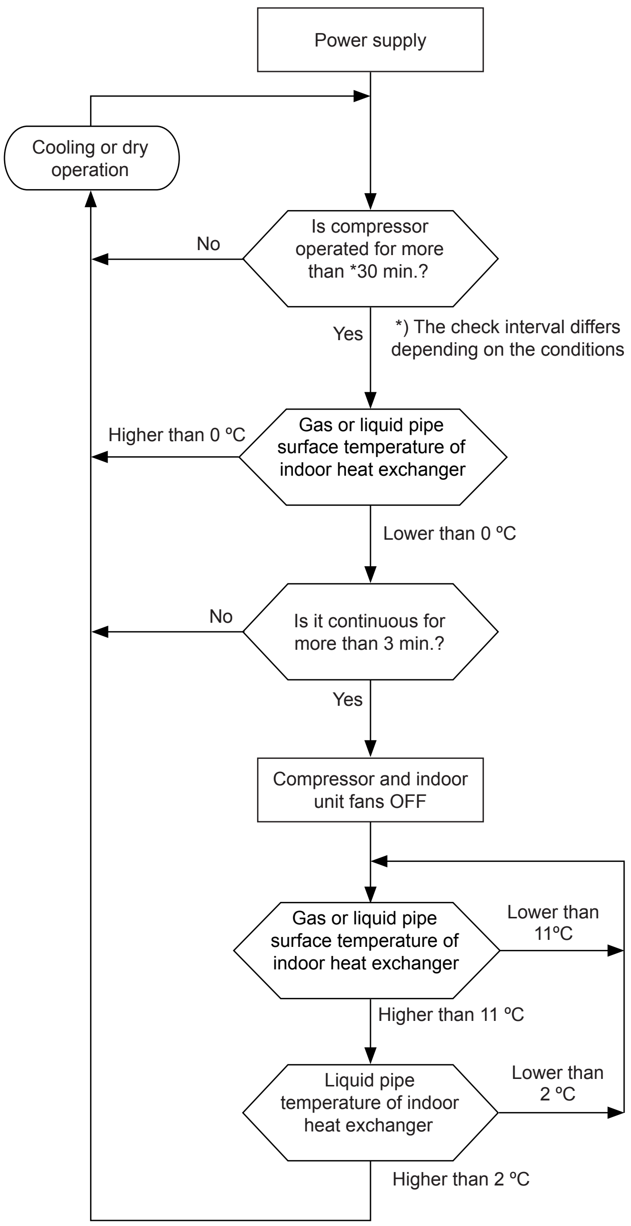
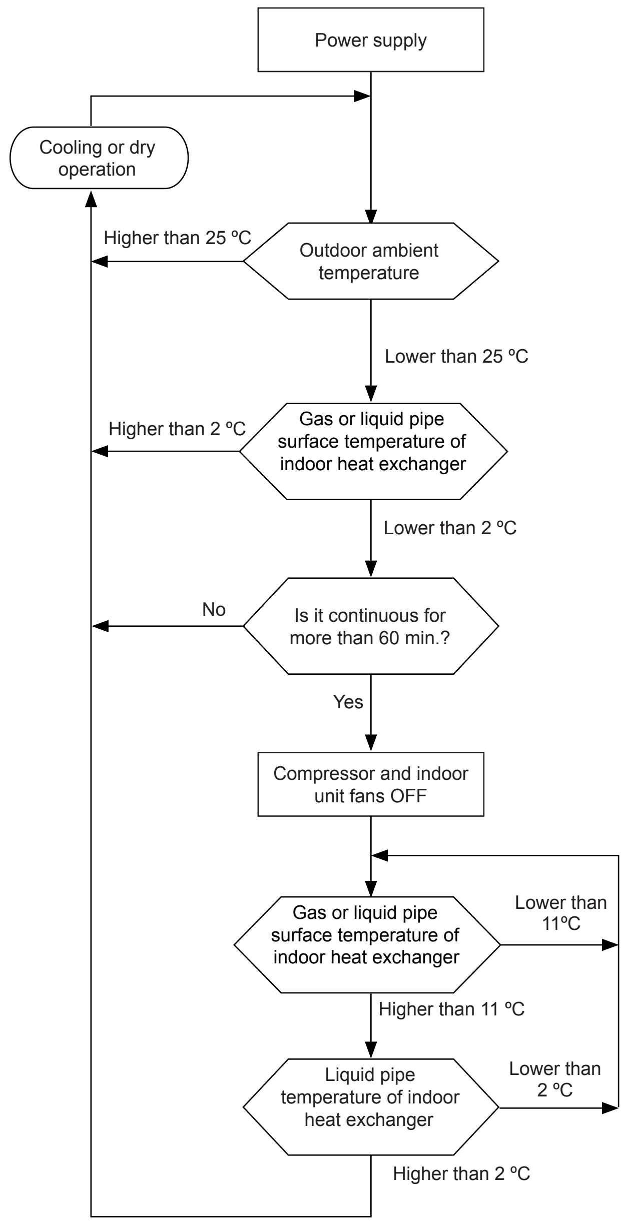
NOTE

- *The defrosting operation is not started immediately even if the above conditions are met. (The defrosting condition may be met temporally depending on the refrigerant cycle variability.)*
- *The defrosting operation is started when the conditions are met continuously for period of time.*

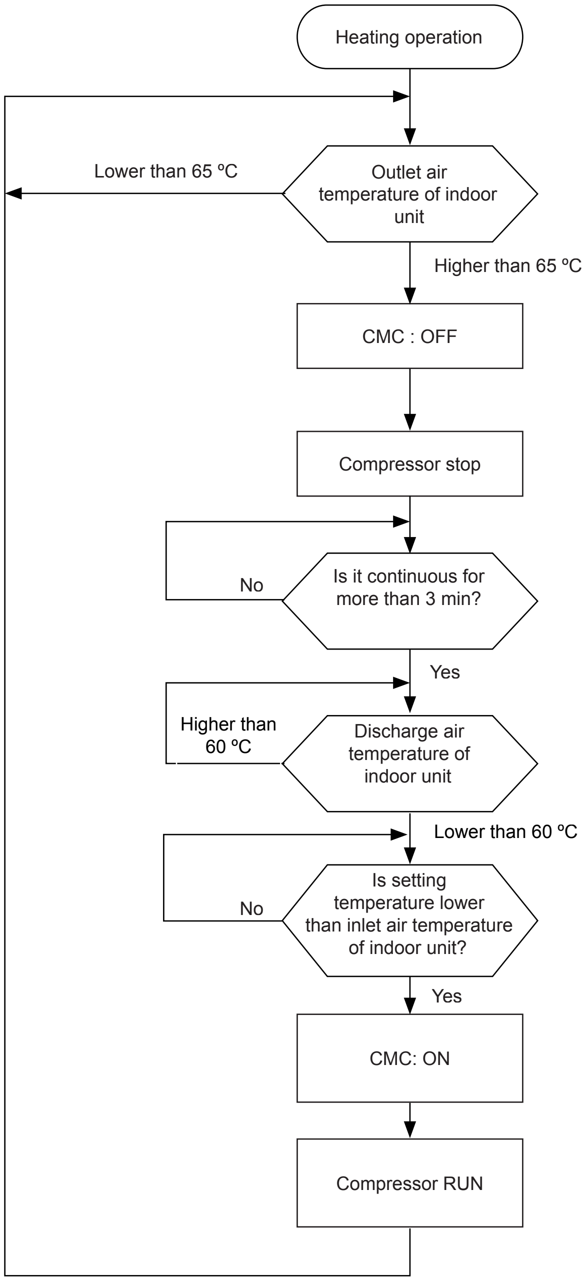
5.4 Standard control functions

5.4.1 Freezing protection during cooling process or dry operation

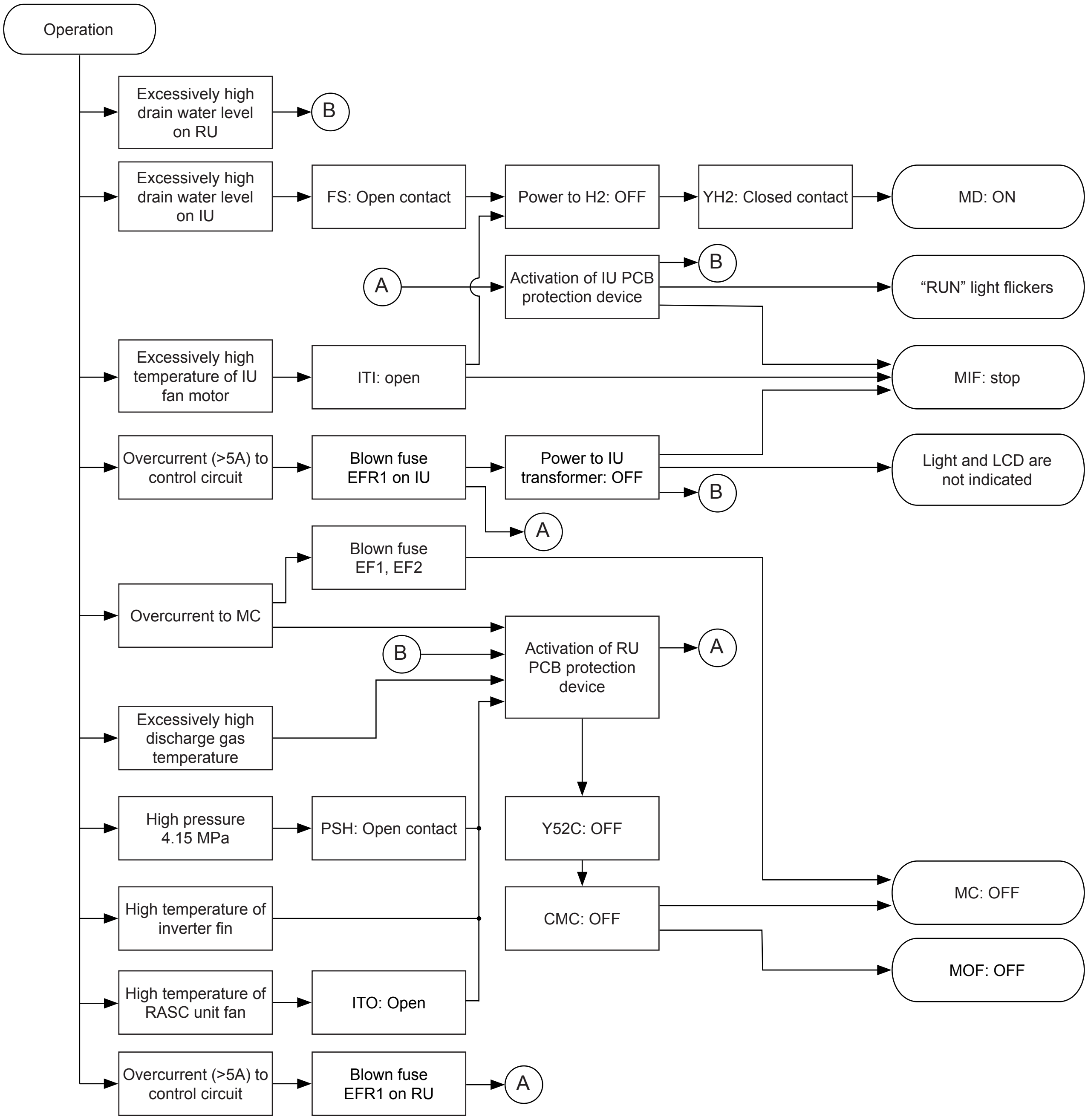
Anti-freeze control depends on 2 conditions:

CONDITION 1:	CONDITION 2:
	

5.4.2 Prevention control for excessively high discharge gas temperature



5.4.3 Activation for protection device control

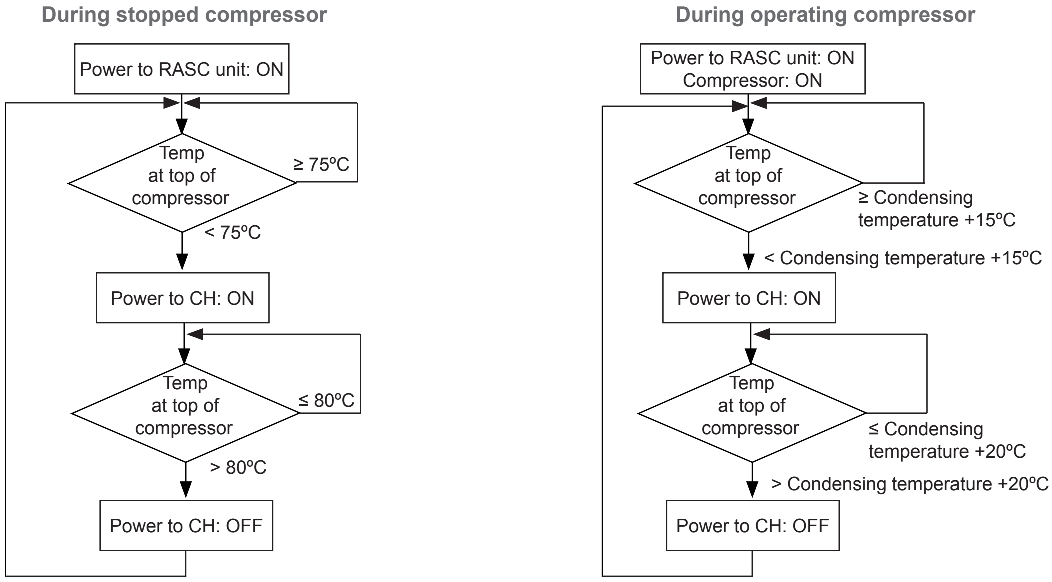


IU: Indoor unit

RU: RASC unit

5

5.4.4 Preheating control of compressor



5.4.5 Prevention control for high pressure increase during cooling operation

This function is performed to prevent the abnormal condition (Alarm Code: 02) when the air flow volume is abnormally decreased. When the following conditions are met, the forced Thermo-OFF operation is performed.

1 Y52C is turned “ON” during the cooling operation.

2 High Pressure ≥ 3.8 MPa.

The cause of stoppage is “13” during Thermo-OFF.

6. Optional functions

Index

6.1 Optional external input and output signals

6.1.1 Input and output signals through 7-segment display on the RASC unit PCB

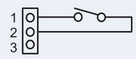
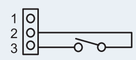
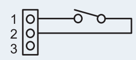
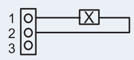
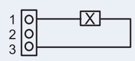
The system has several input and output signals, which can be selected using the following connectors of the RASC PCB:

- Input connectors CN1 and CN2, which have two and one ports respectively to configure three optional input signals.
- Output connector CN7, which has two ports to configure two optional output signals.

The selection of these input and output signals represents the selection of some optional functions programmed in the PCB of the RASC unit through the 7-segment display.

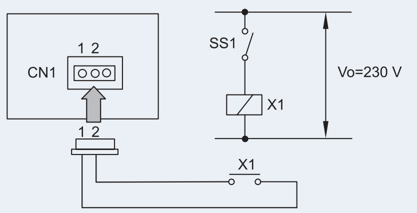
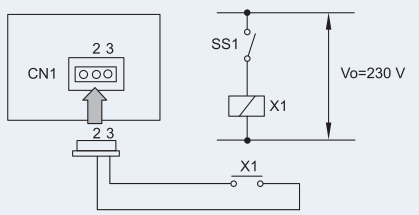
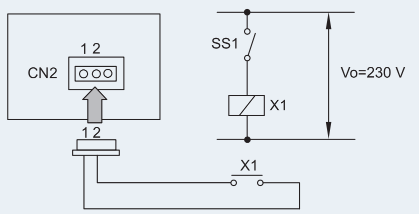
◆ Available ports

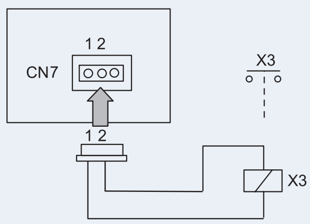
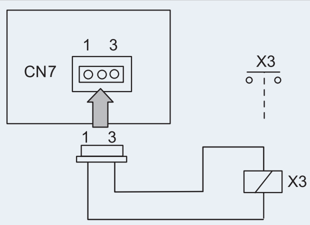
The system has the following input and output ports.

Content		Setting of the port in the PCB of the RASC 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 (X1)		OMRON mini power relay model: MY1F or equivalent	Voltage between relay terminals 12 Vdc - 75 mA
Auxiliary relay (X3)		OMRON mini power relay model: LY2F or equivalent	Voltage between relay terminals 12 Vdc
(SS1), (SS2), (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 mm²	
Wire (power)	Voltage: 230V	2.0 mm²	

NOTE

- *The connection of the input signal is only an example.*
- *Keep the CN1 and CN2 wires as short as possible.*
- *Do not run transmission wiring along 230 V / 400 V CA power supply cables. Leave a distance of more than 30 cm between them. (Intersection are occasionally allowed).*
- *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.*

◆ Available optional signals

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

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

NOTE

Do not set same function to multiple input/output ports. If set, the setting of the higher input/output number is cleared to 00.

Input signals (CN1 and CN2)

Indication	Input signal	Application
0	No setting application	No setting.
1	Fixing the heating mode	This signal allows to pre-fix the heating operation mode independently of what the indoor unit requests. If the indoor units request the opposite mode than the RASC unit, the compressor does not start.
2	Fixing the cooling mode	This signal allows to pre-fix the cooling operation mode independently of what the indoor unit requests. If the indoor units request the opposite mode than the RASC unit, the compressor does not start. This function is intended for those applications such as computer rooms, where the cooling mode is fixed throughout the year.
3	Demand thermo OFF	This signal allows to stop the compressor as well as to put the indoor unit in Thermo-OFF condition. When the compressor is stopped, this function allows the operation of the indoor unit fans to prevent from air stratification.
4	No setting application	No setting.
5	Forced stoppage	This signal allows to control the stoppage of the compressor and the fans of the indoor as well as RASC units. This function can be useful when used with the alarm signals of the fire prevention systems.
6	Current control demand (60%)	These signals allow to regulate the input current around the selected percentage (60%, 70%, 80% or 100%) of the maximum compressor current. This function provides energy-saving by limiting the installation power consumption.
7	Current control demand (70%)	
8	Current control demand (80%)	
9	Current control demand (100%)	
10	No setting application	No setting.

Output signals (CN7)

Indication	Output signal	Application
0	No setting application	No setting.
1	Operation signal	This signal allows to notify that the unit is operating. It enables to start up additional systems such as humidifiers, fans and other additional air-conditioning systems.
2	Alarm signal	This signal allows to notify that protection devices have been activated and to transfer it to additional systems.
3	Compressor ON signal	This signal allows to notify that the compressor is activated. This function can be applied for situations such as checking signals during remote-control operation and for the interlock of the RASC unit.
4	Defrost operation signal	This signal allows to notify that the unit is under defrosting operation.

◆ Setting of the optional signals

The optional signals of the RASC unit are available for being selected using the PSW switches and 7-segment on the RASC unit PCB.

NOTE

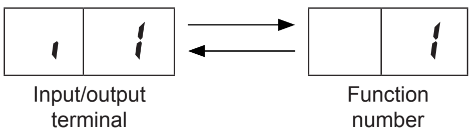
Before setting the optional signals, the following conditions must be complied:

- *RASC unit must be stopped.*
- *Check mode must not be selected.*
- *External optional signal must not be connected.*

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

1 Set pin 4 of DSW1 to ON.

2 Set pin 6 of DSW2 to ON. Because of these settings, the input/output signals selection mode becomes available and the following indication appears on the 7-segment display.



This example indicates that function number 1 “Fixing the heating mode” is set at input 1.

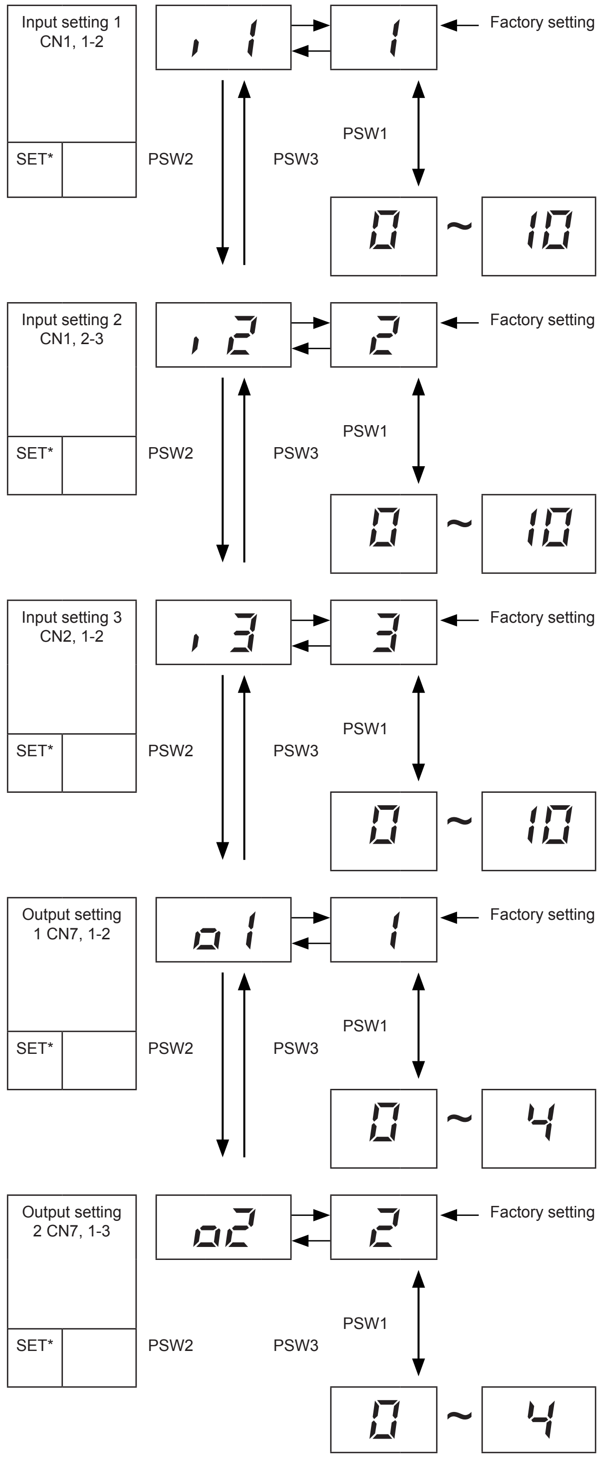
3 By pressing the push switches PSW2 and PSW3, the input/output terminal name can be changed. (See the flowchart shown in the side).

4 By pressing the push switch PSW1, the function number can be changed. (See the flowchart shown in the side).

5 After selecting the function number, return pin 6 of DSW2 to OFF position.

6 Set pin 4 of DSW1 to OFF.

The selected contents are memorised in the RASC unit printed circuit board and the function selection mode is stopped. The memorised data is maintained even power source lines are disconnected. The connecting details of each function are described, and the required parts are also indicated in the sections *"Description of optional input signals"* and *"Description of optional output signals"* on this chapter.



NOTE

(*) SET: Blank space is for recording the selected setting.*

◆ Description of optional input signals

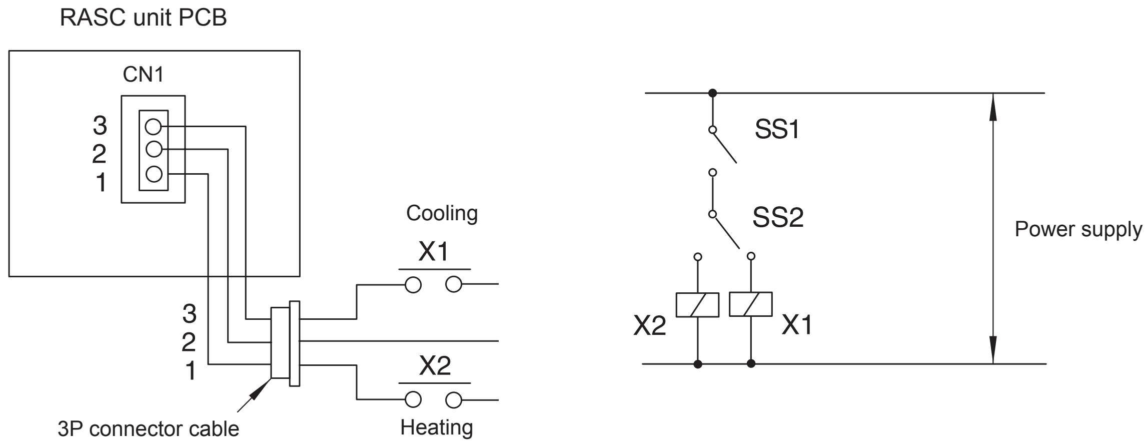
Fixing operation mode (heating / cooling) (1 / 2)

This input function is fixed in terminal CN1 of the PCB of the RASC unit, to use it as a cooling or 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” is 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 for fixing the operation mode.



SS1: Fixing operation mode switch

SS2: Changeover switch

X1: Heating

X2: Cooling

Demand thermo OFF (3)

This signal allows to stop the compressor as well as to put the indoor unit in Thermo-OFF condition. When the compressor is stopped, this function allows the operation of the indoor unit fans to prevent air stratification. Stoppage code “d1=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 section *"Available ports".*

Forced stoppage (5)

This signal allows to control the stoppage of the compressor and the fans of the indoor as well as RASC units. This function can be useful when used with the alarm signals of the fire prevention systems. Stoppage code “d1=10” is displayed on a remote-controlled when this option is turned on. If the switch of this function is disconnected it becomes available again.

Connect the cabling and use the materials as shown in section *"Available ports".*

NOTE

The minimum set interval for demand or forced stoppage should be 30 minutes in consideration with the compressor’s start/stop frequency and energy-saving.

Current control demand (6 / 7 / 8 / 9)

These signals allow to regulate the input current around the selected percentage (60%, 70%, 80% or 100%) of the maximum compressor current. This function provides energy-saving by limiting the installation power consumption.

If the running current of the RASC unit exceeds the maximum limit, the unit changes to the thermo-OFF condition. Stoppage cause code “d1=10” is displayed on the remote control. When the input terminal is opened during the demand current control, the control of the input terminal is reset.

Connect the cabling and use the materials as shown in section *"Available ports".*

◆ Description of optional output signals

Operation signal (1)

This signal allows to notify that the unit is operating. It enables to start up additional systems such as humidifiers, fans and other additional air-conditioning systems.

Connect the cabling and use the materials as shown in section *"Available ports"*.

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

Alarm signal (2)

This signal allows to notify that protection devices have been activated and to transfer it to additional systems.

Connect the cabling and use the materials as shown in section *"Available ports"*.

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

Compressor ON signal (3)

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.

This signal allows to notify that the compressor is activated. This function can be applied for situations such as checking signals during remote-control operation and for locking the compressor when the fans are locked.

Connect the cabling and use the materials as shown in section *"Available ports".*

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

Defrost operation signal (4)

This signal allows to notify that the unit is under defrosting operation.

Connect the cabling and use the materials as shown in section *"Available ports".*

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

6.1.2 Input and output signals through remote control switch

In addition to the external signals that can be selected through the 7-segment display on the RASC unit PCB, the remote control switches provide extra input/output signals.

An example of the available external input and output signals through the HITACHI individual remote controls (PC-ARF/PC-ART) is shown below:

Input and output number display and connectors

Input number display	Port	Factory setting	
Input/Output indication		Setting item	Indication
Input 1	CN3 1-2	Remote ON/OFF 1 (Level)	03
Input 2	CN3 2-3	Prohibiting Remote Control after Manual Stoppage	06
Output 1	CN7 1-2	Operation	01
Output 2	CN7 1-3	Alarm	02
Output 3	CN8 1-2	Thermo-ON for Heating	06

Input and output settings and display codes

Indication	Input	Output
00	Not set	Not set
01	Room Thermostat (for Cooling)	Operation
02	Room Thermostat (for Heating)	Alarm
03	Remote ON/OFF 1 (Level)	Cooling
04	Remote ON/OFF 2 (Operation)	Thermo-ON for Cooling
05	Remote ON/OFF 2 (Stoppage)	Heating
06	Forbidding Remote Control after Manual Stoppage	Thermo-ON for Heating
07	Remote Cooling / Heating Change	Total Heat Exchanger
08	Elevating Grille Input (not available for PC-ART)	Elevating Grille Output

NOTE

- *After at least 3 minutes from the power ON, change the optional setting.*
- *The elevating grille input can be set to “Input 2” only. It cannot be set to “Input 1”.*
- *The elevating grille output can be set to “Output 1” or “Output 2” only. It cannot be set to “Output 3”.*
- *Do not set the elevating grille for the total heat exchanger.*
- *Record the setting conditions for each input and output in the “Setting” column of the table.*

6.2 Optional functions

HITACHI units provide a large number of optional functions to adapt the system to the requirements of the customer. Each function is selected from different sources:

- Optional functions through 7-segment display on the RASC unit PCB.
- Optional functions through remote controllers.

6.2.1 Optional functions through 7-segment display on the RASC unit PCB

◆ Setting of the optional signals

The optional functions of the RASC unit are available for being selected using the PSW switches and 7-segment on the RASC unit PCB.

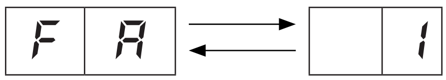
NOTE

Before setting the optional functions, must be complied the following conditions:

- *RASC unit must be stopped.*
- *Check mode must not be selected.*
- *External optional signal must not be connected.*

1 Set pin 4 of DSW1 to ON.

2 Set pin 5 of DSW2 to ON. Because of these settings, the optional function selection mode becomes available and the following indication appears on the 7-segment display.



Fixing of demand function Available

This example indicates that optional function “Control of the indoor unit fan during Thermo-OFF in heating mode” is available.

3 By pressing the push switches PSW2 and PSW3, the optional function can be changed. (See the flowchart shown in the next page).

4 By pressing the push switch PSW1, the availability of this optional function can be selected. (See the flowchart shown in the next page).

5 After selecting the function number, return pin 5 of DSW2 to OFF position.

6 Set pin 4 of DSW1 to OFF.

The selected contents are memorised in the RASC unit printed circuit board and the function selection mode is stopped. The memorised data is maintained even power source lines are disconnected. The details of each function are described in the section *"Description of the optional functions"* on this chapter.

NOTE

(*) SET: Blank space is for recording the selected setting.*

Function	SET*	SEG2	SEG1 (Not Available)	SEG1 (Available)
Control of the indoor unit fan during Thermo-OFF in heating mode		FA	0	1
Night mode (Low noise)		ni	0	1
Cancellation of outdoor ambient temperature limit		GS	0	1~3
Change of defrost condition		Jo	0	1
"Slow" fan speed during defrost operation		bJ	0	1
Not available		Hr	0	1
Capacity adjustment for long piping		nU	0	1
Target value of compressor frequency control in cooling operation		Hc	0	1
Target value of compressor frequency control in heating operation		Hh	0	1
Not prepared		SC	0	1

Function	SET*	SEG2	SEG1 (Not Available)	SEG1 (Available)
Opening of the indoor expansion valve during heating operation stoppage		Si	0	1~2
Opening of the indoor expansion valve during heating thermo-OFF		So	0	1~2
Initial opening of the indoor expansion valve at starting in heating operation		ci	0	1~2
Low noise setting		db	0	1
Fixing of current control demand function		dE	0	1
Wave function setting		UE	0	1
Cold draft protection		Fb	0	1~2
Cancellation of hot gas bypass control		Ei	0	1
Forced stoppage after defrost operation		dS	0	1
Defrost control in current control demand mode		F1	0~1	1
Setting of the fan performance curves		F2	0~2	
Compressor heater control mode (for 4 to 6 HP)		F3	0~1	
Not available		F4~F6	0	

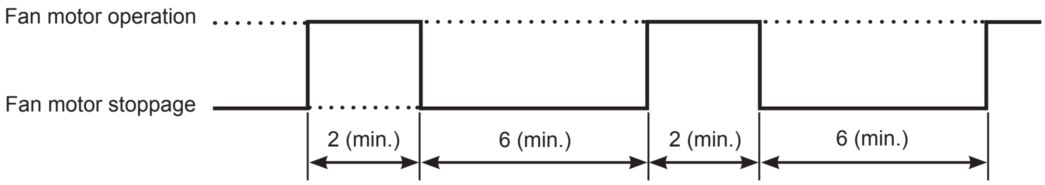
PSW2 ↓ / PSW3 ↑ (SEG2); PSW1 ↕ (SEG1)

◆ Description of the optional functions

Control of the indoor unit fan during Thermo-OFF in heating mode (FA)

The fan of the indoor units stops when the unit is in defrost operation. This function forces a start-and-stop cycle of the indoor unit fan to prevent air stratification.

The start-and stop cycle operates as follows:



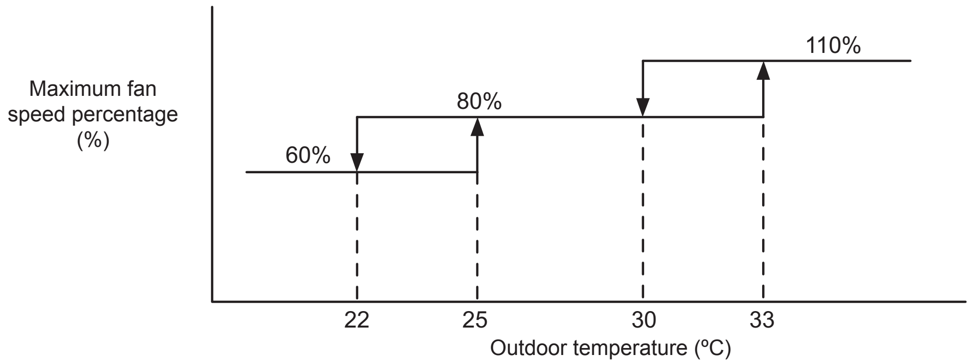
NOTE

When the indoor fans are stopped due to unit control, they remain stopped even if this function is enabled.

Night mode (Low noise) (ni)

This function reduces the outdoor fan speed and the maximum compressor frequency value in cooling operation according to the outdoor air temperature in order to reduce sound in low load conditions.

- Outdoor fan operation during this function:



NOTE

This function is only available in cooling operation for outdoor temperatures below 30ºC.

- Compressor operation during this function: The maximum limit of compressor frequency is lowered to approximately 50-60% of the maximum standard value.

Cancellation of outdoor ambient temperature limit (c5)

This function allows the operation of the units under unfavourable outdoor ambient temperature conditions compared to normal conditions (higher outdoor air temperatures in heating operation and lower outdoor air temperatures in cooling operation).

This function can be applied for heating operation, cooling operation or for both.

Setting condition	Operation mode for cancellation
0	Not available (default setting)
1	Heating
2	Cooling
3	Heating / Cooling

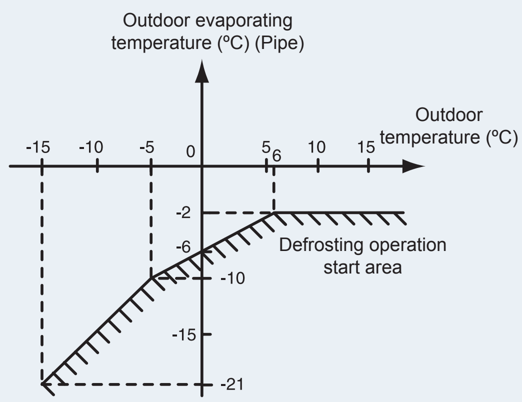
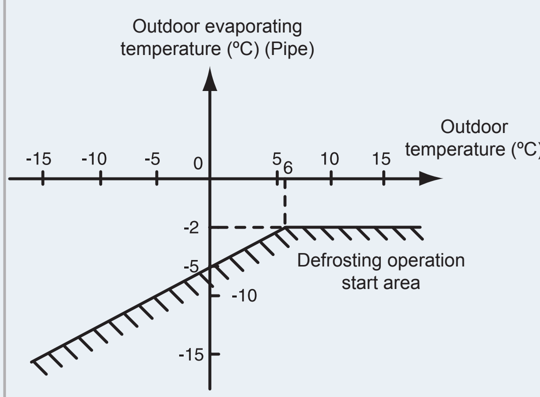
CAUTION

Do not activate this function frequently, since the unit could be damaged.

Change of defrost condition (do)

This function allows to shift the temperature conditions in order to cause an earlier defrosting.

It is useful in installations placed in very cold regions, where frost generates continuously; enabling an earlier defrosting operation results in a lower amount of accumulated frost, therefore keeping higher heating capacity values.

Setting condition	Function selection setting (do :0) (By default)	Function selection setting (do : 1)
Temperature conditions under defrosting operation		

"Slow" fan speed during defrost operation (bd)

The fan of the indoor units stops at low discharge pressures during and after defrost operation. This function allows to set the fan speed of the indoor unit fan to "Slow".

It helps to prevent air stratification and to avoid cold draft after defrosting.

Setting condition	Indoor fan operation
0	Indoor fan stop during defrost operation
1	Indoor fan "Slow" during defrost operation

NOTE

For indoor units without "Slow" fan speed setting, the fan speed is adjusted to "Low".

Capacity adjustment for long piping (nU)

This function modifies the parameters for compressor frequency calculation to achieve a faster compressor response. It is convenient for installations with long refrigerant piping length.

Target value of compressor frequency control in cooling operation (Control function (Hc))

This function allows to modify the compressor frequency range in cooling mode.

NOTE

For more information about this function, please contact with your HITACHI dealer.

Target value of compressor frequency control in heating operation (Control function (Hh))

This function allows to modify the compressor frequency range in heating mode.

NOTE

- *This function has no effect on RASC-(5/6/8)HNPE.*
- *For more information about this function, please contact with your HITACHI dealer.*

Opening of the indoor expansion valve during heating operation stoppage (Control function (Si))

This function allows to modify the opening of the indoor unit expansion valves during heating operation stoppage to opening values higher than the standard opening value in heating operation stoppage.

NOTE

For more information about this function, please contact with your HITACHI dealer.

Opening of the indoor expansion valve during heating thermo-OFF (Control function (So))

This function allows to modify the opening of the indoor unit expansion valves during heating thermo-OFF operation to opening values higher than the standard opening value in heating thermo-OFF operation.

NOTE

For more information about this function, please contact with your HITACHI dealer.

Initial opening of the indoor expansion valve at starting in heating operation (Control function (ci))

This function allows to modify the opening of the indoor unit expansion valves when the unit is starting in heating operation.

It is practical as a support of the optional function "Slow fan speed during defrost operation (bU)".

NOTE

For more information about this function, please contact with your HITACHI dealer.

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Low noise setting (Control function (db))

This function allows to set the maximum compressor frequency and the maximum outdoor fan speed to a value slightly lower than the standard maximum value. Unlike optional function “Night mode (n i)”, this setting can be enabled regardless of outdoor air temperature.

It is conceived for installations where sound level needs to be reduced.

- Outdoor fan operation during this function: The fan speed is lowered to approximately 90% of the maximum value.
- Compressor operation during this function: The compressor frequency is reduced to 80% of the maximum value.

NOTE

- *Cooling and heating capacities decrease while this function is activated.*
- *When optional functions "Compressor frequency control target value for cooling/heating operation (Hc / Hh)" are enabled, this function has no effect.*

Fixing of current control demand function (dE)

This function allows to regulate the input current around the percentage of the maximum compressor current which has been selected through external input signals on the 7-segment display (60%, 70%, 80% or 100%), without the need to short-circuit the input terminals (CN1 or CN2).

The following table shows the current control demand setting according to the input signal which has been selected:

Input signal function number	Running current control demand
00 ~ 05, 10	100%
06	60%
07	70%
08	80%
09	100%

This function can be activated when current control demand function is selected at one of the input terminal indications i1, i2 and i3. In case that multiple current control demand functions are set at the input terminal indications i1, i2 and i3, the lower settings have preference over the higher settings:

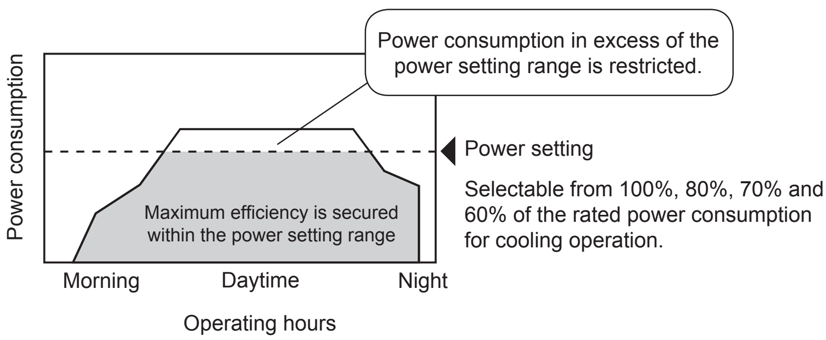
60% > 70% > 80% > 100% (Control function number)

NOTE

If no external input signals are set, the input current control is set at 100%.

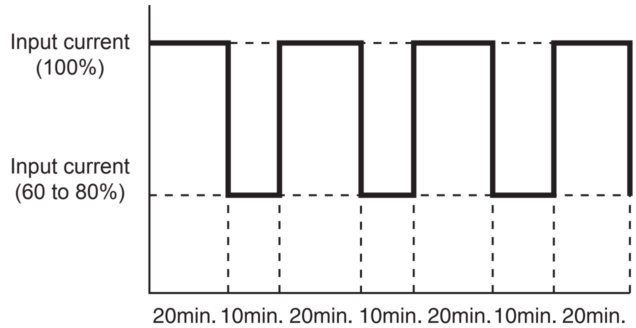
- Demand control:

  Energy saving has been largely improved by adopting the self-demand function, which drastically decreases power consumption.



Wave function setting (UE)

This function activates a continuous wave cycle for the control of input current (20 minutes at 100% of maximum compressor current, and 10 minutes at the percentage which has been selected through external input signals on the 7-segment display (60%, 70%, 80% or 100%)) (CN1 or CN2).



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

NOTE

- *If no external input signals are set, the input current control is set at 100%.*
- *The minimum limit of running current control is according to the set value of the demand function.*

Cold draft protection (Fb)

This function allows to reduce the compressor frequency when the discharge air temperature in the indoor unit falls below 12ºC in cooling operation. This is done in order to avoid the direct discharge of cold air.

Depending on the setting of “Cold draft protection” function, the SVA (Solenoid valve for high pressure bypass) is turned ON.

Setting condition	Temperature (ºC)	Condition
0	-	Not available (default setting).
1	< 12	Cold draft is prevented thanks to the compressor frequency control and turning ON SVA (solenoid valve for high pressure bypass circuit).
2	< 12	Cold draft is prevented thanks to the compressor frequency control.

Cancellation of hot gas bypass control (E1)

When this function is selected, the activation of hot gas bypass circuit between compressor discharge and heat exchanger inlet is not performed. The hot gas bypass circuit is intended to reduce the amount of frost at the heat exchanger.

Enabling this function, the number of defrost cycles is reduced while slightly reducing the heating capacity.

Forced stoppage after defrost operation (dS)

This function allows to stop the indoor unit fans after defrost operation is finished. The indoor unit fan operation is started again once 3-minute ON guard for indoor units has finished. Then, the heating operation is restarted.

It is helpful to avoid the direct discharge of cold air after defrost operation.

Defrost control in current control demand mode (F 1)

This function allows to reduce the accumulated heating operation time and to force an earlier defrosting operation.

It is practical as a support of optional function "Fixing of current control demand function (dE)".

Setting of the fan performance curves (F2)

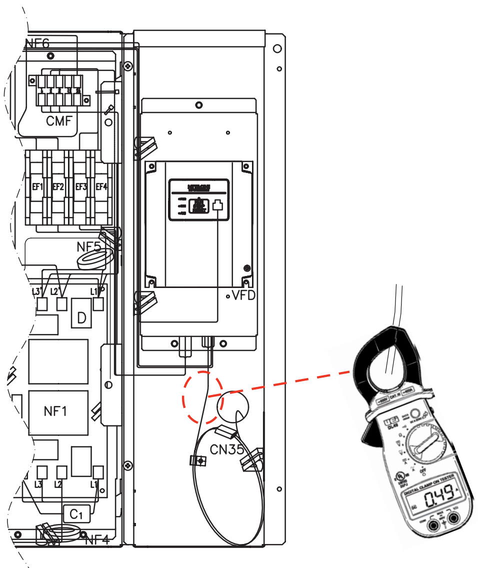
This function allows to adjust the fan operation settings of RASC-(6/8/10)NPE units in order to achieve an optimal performance of the fan unit. The correct static pressure setting (Low / Medium / High) has to be selected according to the pressure values below:

- RASC-(4/5)HP: No setting is required.
- RASC-(6/8)HP: Select the “Medium pressure setting (F2 : 1)” for external static pressures higher than 50 Pa.
- RASC-10HP: Select the most suitable static pressure setting, depending on the installation conditions:
  - “Medium pressure setting (F2 : 1)”: For external static pressures between 50 and 80 Pa.
  - “High pressure setting (F2 :2)”: For external static pressures higher than 80 Pa.

Default value: “Low pressure setting (F2 :0)”

In order to do so, measure the fan motor current and set the static pressure setting according to the following table: For the measurement of the fan motor current, please refer to the following drawing:

Model	Fan motor current (A)	
	Medium pressure setting (F2: 0 → 1)	High pressure setting (F2: 0 → 2)
RASC-6HP	< 1.40 A	-
RASC-8HP	< 3.10 A	-
RASC-10HP	2.65 ~ 3.10 A	< 2.65



Compressor heater control mode (F3) (Only for RASC-(4-6)HNPE)

When the system is in stand-by mode, the crankcase heater is ON to ensure an optimum temperature of the compressor's oil when the unit is required to start operation. This causes an additional heater input while the system is not expected to start.

This function switches the crankcase heater OFF in stand-by mode; therefore saving energy while the unit is not running.

⚠ **CAUTION**

When starting up the system again, it remains in thermo-OFF mode until compressor oil is at an optimal temperature to start operation. It is not recommended to use this control mode when immediate system starting is expected. The preparation time for the starting does never exceed 4 hours.

6.2.2 Optional functions through remote control switch

In addition to the possible optional functions through the 7-segment display of the RASC unit's PCB and through DIP switch setting, there are available a large quantity of optional functions for each remote control switch connected to the system.

An example of the available optional functions through the HITACHI individual remote controls (PC-ARF/PC-ART) is shown below:

NOTE

For the detailed information about optional functions through remote controls, please refer to the Technical catalogue of Packaged controllers.

Element	Optional function	Individual setting	Settings	Setting conditions	Description
b1	Removal of heating temperature compensation	O	00	Standard setting. It increase the temperature +4ºC	This function is used when the temperature setting displayed on the remote control switch and the inlet air temperature of the indoor unit must be the same.
			01	Removal	
			02 (*1)	It increase the temperature +2ºC	
b2	Circulator function at heating Thermo-OFF	O	00	Not activated function	This function means that the fan unit remains running at the same speed during Thermo-OFF condition to prevent the air in the room from stratifying.
			01	Activated function	
b3	Forced compressor operation for at least 3 minutes	O	00	Not activated function	This function is used to protect the compressor, preventing it from being started or stopped for periods of less than three minutes.
			01	Activated function	
b4	Pre-determined filter cleaning period change	O	00	Standard (1200 h factory setting) (*2)	This function is used to modify the period until the next display of filter cleaning sign.
			01	100 hours	
			02	1200 hours	
			03	2500 hours	
			04	No indication	
b5	Fixing of operation mode	X	00	Not activated function	Once the unit operating mode has been selected, this function prevents it from being modified from the remote control.
			01	Activated function	
b6	Fixing of setting temperature	X	00	Not activated function	Once the unit temperature has been selected, this function prevents it from being modified from the remote control.
			01	Activated function	
b7	Fixing of cooling operation	X	00	Not activated function	This function is available to use cooling mode only and to prevent heating mode from being enabled.
			01	Activated function	
b8	Automatic COOL/ HEAT operation	X	00	Not activated function	This function allows the automatic change from the cooling to the heating mode for the units with the same refrigerant cycle.
			01	Activated function	
b9	Fixing of indoor unit fan speed	X	00	Not activated function	Once the indoor unit fan speed has been selected, this function prevents it from being modified from the remote control.
			01	Activated function	
bA	Not available	X	"- -" permanent	Not available	–

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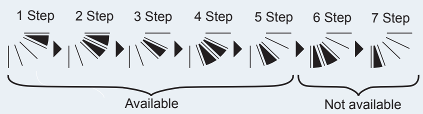
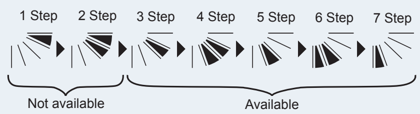
Element	Optional function	Individual setting	Settings	Setting conditions	Description
bb	Cooling temperature compensation	X	00	Standard setting. No compensation	This function is used to obtain longer cooling periods. When this function is enabled, Thermo-ON/OFF is controlled under lower temperature conditions than the setting temperature by the remote control switch.
			01	It decrease the temperature -1ºC	
			02	It decrease the temperature -2ºC	
bC	Not available	–	00	Not available	–
			01	(Used as 00 conditions)	
bd	Not available	–	00	Not available	–
			01	(Used as 00 conditions)	
bE	Not available	–	00	Not available	–
			01	(Used as 00 conditions)	
C1	Not available	–	00	Not available	–
			01	(Used as 00 conditions)	
C2	Not available	–	"- -" permanent	Not available	–
C3	Not available in the European market	O	00	Not available	–
			01	(Used as 00 conditions)	
C4	Drain pump in heating mode	O	00	Not activated function	This function is used to activate the drain pump in heating mode.
			01	Activated function	
C5	Static pressure selection (RPI)	O	00	Standard static pressure (factory set)	This function is used to change the static pressure of the RPI units from the remote control.
			01	High static pressure	
			02	Low static pressure	
	Increasing fan speed		00	Not available	This function is used to change the indoor units fan speed installed in high ceilings.
			01	Hi Speed 1 (*3)	
			02	Hi Speed 2 (*3)	
C6	High speed at heating Thermo-OFF	O	00	Not activated function	This function is used to increase the fan speed when the thermostat reaches the set temperature in heating using function C5.
			01	Activated function	
C7	Cancellation of the forced compressor operation for at least 3 minutes	O	00	Not activated function	This function is used to cancel the function b3 (Forced compressor operation for at least 3 minutes).
			01	Activated function	
C8	Thermistor of remote control switch	O	00	Not available	This function determines the thermistor to control the air temperature. **NOTE** *If THM-R2AE accessory is installed, these setting have different meaning.*
			01	Air temperature control using the remote control thermistor	
			02	Air temperature control using the average value of the air inlet thermistor and the remote control thermistor	
C9	Not available	–	"- -" permanent	Not available	–
CA	Not available	–	"- -" permanent	Not available	–

Element	Optional function	Individual setting	Settings	Setting conditions	Description
Cb	Selection of forced stoppage logic	X	00	A contact: Closed contact for forced stoppage	This function determines the logic operation for the forced stoppage contacts.
			01	B contact: Open contact for forced stoppage	
CC	Not available	X	00	Not available	–
			01	(Used as 00 conditions)	
Cd	Not available	O	00	Not available	–
			01	(Used as 00 conditions)	
CE	Not available	O	00	Not available	–
			01	(Used as 00 conditions)	
CF	Change of louvre swing angle	O	00	Standard (7 steps)	This function adjusts the angle of the air outlet louvre. 
			01	Draft prevention (5 steps)	
			02	High ceilings (5 steps)	
d1	Power supply ON/OFF 1	O	00	Not activated function	This function stores the unit settings in the event of a power cut. The unit is restarted when the power is re-established.
			01	Activated function	
d2	Not available	X	"- -" permanent	Not available	–
d3	Power supply ON/OFF 2	O	00	Not activated function	This function is used to restart the unit automatically after a power failure lasting more than 2 seconds. (3-minute compressor OFF guard applies).
			01	Activated function	
d4	Prevention of discharge air temperature drop in cooling operation	O	00	Not activated function	This function changes the cooling operating conditions to avoid cold drafts.
			01	Activated function	
d5	Prevention of discharge air temperature drop in heating operation	O	00	Not activated function	This function prevents a drop in the air temperature by decreasing the fan speed, regardless fan speed setting on the remote control.
			01	Activated function	
d6	Room temperature control for energy saving	O	00	Not activated function	This function saves energy when the outdoor air temperature thermistor detects from the outdoor temperature that the air-conditioning load is low
			01	Activated function	
d7	Fall distance of elevating panel (Indoor units with the elevating grille function only) (Not available in the European Market)	O	00~07	Not available (Used as 00 conditions)	-

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Element	Optional function	Individual setting	Settings	Setting conditions	Description
E1 (*4)	KPI: ventilation mode	O	00	Automatic ventilation	This function is used to set the unit ventilation mode with energy / heat recovery.
			01	Ventilation with total heat exchanger	
			02	Ventilation with bypass (no total heat exchange)	
	Econofresh: All fresh mode		00	Not available	This function allows to open the damper totally to activate the all fresh mode.
			01/02	Outdoor cooling mode (all-fresh)	
E2 (*4)	KPI: Increasing air supply volume	O	00	Not activated function	This function is used to increase the air supply pressure in the room.
			01	Activated function	
	Econofresh: Enthalpy sensor		00	Not activated function	This function selects the enthalpy sensor input.
			01	Activated function	
E3 (*4)	Not available	O	00	Not available	–
			01	(Used as 00 conditions)	
E4 (*4)	KPI: Pre-cooling / pre-heating period	O	00	Standard	This function delays the unit start-up with energy / heat recovery.
			01	30 minutes	
			02	60 minutes	
	Econofresh: gas sensor		00	Standard	This function selects the gas sensor input.
			01/02	CO_2 sensor	
E5	Not available	O	00	Not available	–
			01	(Used as 00 conditions)	
E6	Indoor fan operation time after cooling operation stoppage	O	00	Not activated function	This function prevents the condensation accumulation in the unit by keeping the fan running after it is switched off, as well as to prevent mildew or abnormal odours.
			01	60 minutes	
			02	120 minutes	
E7	Not available	O	00	Not available	–
			01	(Used as 00 conditions)	
E8	Fan operation control at heating Thermo-OFF	O	00	Not activated function	This function reduces the indoor unit fan speed during heating thermo-OFF to prevent cold drafts.
			01	Activated function	
E9	Not available	O	00	Not available	–
			01	(Used as 00 conditions)	
EA	Not available	O	00	Not available	–
			01	(Used as 00 conditions)	
Eb	Fan operation control at cooling Thermo-OFF	O	00	Not activated function	This function decreases the indoor unit fan speed during cooling thermo-OFF to reduce the spreading of odours and humidity.
			01	Low	
			02	Slow	
EC	Forced Thermo-ON stoppage at cooling operation	O	00	Not activated function	This function is used to stop the operation by forced thermo-ON operation when cooling is complete.
			01	Available	
Ed	Not available	O	00	Not available	–
			01	(Used as 00 conditions)	
EE	Automatic fan speed control	O	00	Not activated function	This function limits the unit operation by automatically controlling the fan speed when the room temperature is close to the set temperature.
			01	Activated function	

Element	Optional function	Individual setting	Settings	Setting conditions	Description
F0	Not available	-	-	Not used	–
F1	Automatic OFF timer setting	X	00	Not activated function	This function is used to set the automatic timer to switch off when the unit has been started by remote control. Do not set the functions "0C"-"0F" when two remote control switches are used in the same remote control group. (Settings 0C, 0D, 0E and 0F are not available for PC-ART).
			01	1 hour	
			02	2 hours	
			03-24	(03-24) hours	
			0A	30 minutes	
			0B	90 minutes	
			0C	40 minutes	
			0D	45 minutes	
			0E	50 minutes	
			0F	55 minutes	
F2 (*5)	Remote control Master-Slave setting	X	00	Master	This function is used when two remote controls are installed in a system. One of them has to be set as “Master” and the other one as “Slave”.
			01	Slave	
F3 (*6)	Automatic reset of setting temperature	X	00	Not activated function	When this function is activated, once a defined time (F4) has passed after the last change in the setting temperature by using the remote control switch, the setting temperature returns to the selected cooling (F5) or heating (F6) temperature values. This function provides energy-saving.
			01	Activated function	
F4	Automatic reset time	X	00	30 minutes (factory setting)	This function is used to set the automatic reset time with the temperature setting.
			01	15 minutes	
			02	60 minutes	
			03	90 minutes	
F5	Automatic reset temperature for cooling	X	19-24	(19-24) ºC	This function is used to set the automatic temperature reset in FAN/COOL/DRY modes.
			25	25 °C (factory setting)	
			26-30	(26-30) ºC	
F6	Automatic reset temperature for heating	X	17-20	(17-20) ºC	This function is used to set the automatic temperature reset in HEAT mode.
			21	21 ºC (factory setting)	
			22-30	(22-30) ºC	
F7 (*7)	Operation stoppage prevention by remote control switch operational error	X	00	Not activated function	This function is used to prevent the careless operational stoppage caused by remote control switch operational error.
			01	Activated function	
F8	Lock function for operation mode selection	X	00	Not activated function	This function is used to prevent changes to the operating mode.
			01	Activated function (factory setting)	
F9	Lock function for temperature setting	X	00	Not activated function	This function is used to prevent changes to the temperature setting.
			01	Activated function (factory setting)	
FA	Lock function for fan speed selection	X	00	Not activated function	This function is used to prevent changes to the fan speed.
			01	Activated function (factory setting)	

Element	Optional function	Individual setting	Settings	Setting conditions	Description
Fb	Lock function for swing louvre operation	X	00	Not activated function	This function is used to prevent changes to automatic louvre operations.
			01	Activated function (factory setting)	
FC	Lower limit of setting temperature for cooling operation	X	00	Standard	This function is used to limit the lowest setting temperature for FAN/COOL/DRY modes.
			01	Lower limit +1 ºC	
			02	Lower limit +2 ºC	
			03-08	Lower limit +(03-08) ºC	
			09	Lower limit +9 ºC	
			10	Lower limit +10 ºC	
Fd	Upper limit of setting temperature for heating operation	X	00	Standard	This function is used to limit the highest setting temperature for HEAT mode. (Settings 11 and 12 are not available for PC-ART).
			01	Lower limit -1 ºC	
			02	Lower limit -2 ºC	
			03-10	Lower limit -(3~10) ºC	
			11	Lower limit -11 ºC	
			12	Lower limit -12 ºC	
FE	Not available	–	00	Not available	–
			01	(Used as 00 conditions)	
			02		
FF	PC-ART: Lock function for timer	X	00	Not activated function	This function is used to lock timer activation.
			01	Activated function (factory setting)	
	PC-ARF: Not available	–	00	Not available	–
			01	(Used as 00 conditions)	
H1	PC-ART: Maintenance alarms	O	00	Display	This function is used to display or hide maintenance alarms.
			01	Hide	
	PC-ARF: Not available	–	00	Not available	–
			01	(Used as 00 conditions)	
H2	PC-ART: Automatic control indication	O	00	Display	This function is used to display or hide the automatic control indication.
			01	Hide	
	PC-ARF: Indication of hot start	X	00	Display	This function is used to display or hide the Hot start “HOT-ST” control indication.
			01	Hide	
H3	PC-ART: Operating mode change restriction	O	00	Operating mode change disabled (factory setting)	This function is used to configure restrictions to the operation mode. –
			01	Operating mode set by the central control + FAN mode	
			02	Unlimited operating mode	
	PC-ARF: Not available	–	00	Not available	–
			01	(Used as 00 conditions)	

Element	Optional function	Individual setting	Settings	Setting conditions	Description
H4	PC-ART: Operating modes for the ventilation unit with energy / heat recovery	O	00	Air conditioning only	This function allows to select the operation mode for KPI units. (Only available for KPI units)
			01	Ventilation only	
			02	Air conditioning + ventilation	
	PC-ARF: Not available	–	00	Not available	–
			01	(Used as 00 conditions)	
H5	PC-ART: Central control available after forced stoppage	O	00	Not available	This function allows the central control after the forced stoppage of the unit.
			01	Available	
	PC-ARF: Not available	–	–	Not available (Used as 00 conditions)	–
J1 (*8)	Temperature indication	X	00	Not available	This function is used to display the sensor temperature on the remote control switch. This temperature depends on the setting value of optional function (C8) and on the use of remote sensor (THM4) (Displayed on PC-ARF only)
			01	Available	
J2	Not available	–	–	Not used	(Displayed on PC-ARF only)
J3	Run indicator colour	X	00	Green	This function allows to select the colour of run indicator between green and red. (Displayed on PC-ARF only)
			01	Red	
J4	Not available	–	00	Not available	(Displayed on PC-ARF only)
			01	(Used as 00 conditions)	
			02		
J5	Not available	X	00	Not available	(Displayed on PC-ARF only)
			01	(Used as 00 conditions)	
J6	Error sound	X	00	Once	(Displayed on PC-ARF only)
			01	Sequence	
J7	Not available	–	00	Not available	(Displayed on PC-ARF only)
			01	(Used as 00 conditions)	
J8 (*9)	Eco-operation	X	00	Not activated function	When this function is activated, the setting temperature returns to the selected cooling (F5) or heating (F6) temperature values by restarting the operation using the RUN/ STOP button on the remote control switch. This function provides energy-saving. (Displayed on PC-ARF only)
			01	Activated function	
J9	Not available	–	00	Not available	(Displayed on PC-ARF only)
			01	(Used as 00 conditions)	
JA	Not available	–	00	Not available	(Displayed on PC-ARF only)
			01	(Used as 00 conditions)	
Jb	Not available	–	00	Not available	(Displayed on PC-ARF only)
			01	(Used as 00 conditions)	
K1	Not available	X	–	Not used	(Displayed on PC-ARF only)
K2	Not available	X	–	Not used	(Displayed on PC-ARF only)
K3	Not available	X	–	Not used	(Displayed on PC-ARF only)
K4	Not available	–	00~03	Not used	(Displayed on PC-ARF only)

Element	Optional function	Individual setting	Settings	Setting conditions	Description
K5 (*10)	Human sensor detection level	–	00	Standard	This function allows to modify the conditions for the detection of human activity. (Displayed on PC-ARF only)
			01	High sensitive	
			02	Low sensitive	

O: Allows for individual setting.

X: The setting is made for all RASC units.

–: Not used.

*(*1): Setting "02" is not available on all indoor units.*

*(*2): In case of RPK indoor units, the factory setting 00 is 200 hours.*

*(*3): On RPI units: 00 Increases speed 1 (standard), 01 Increases speed 2 (high static pressure), 02 Standard speed (low static pressure).*

*(*4): E1 to E4: Setting for the total heat exchanger KPI and Econofresh.*

*(*5): If function F2 is set up 01 (Sub) is displayed "--".*

*(*6): In case that the set temperature is changed and kept within the set time at "F4", the temperature is automatically changed to "F5" and "F6". In case that the set temperature is out of range at "F5" and "F6", it is applied within upper and lower limit for the set temperature.*

*(*7): Operation is stopped by pressing the run/stop switch for 3 seconds.*

*(*8): The sensor value at "C8" will be indicated. When the thermistor for remote control switch is used, the average value of the thermistor for remote control switch and the thermistor for indoor inlet will be indicated.*

*(*9): When the unit is restarted by the remote control switch, the temperature automatically changes to the setting temperature of "F5" or "F6".*

*(*10): This function is for air panel with motion sensor. If the air panel don't have available the motion sensor, setting condition is displayed as "--".*

NOTE

- *Make the changes to the optional settings at least three minutes after start-up.*
- *On modifying the "CF" (air outlet louvre angle change) setting, restore the power supply or allow the automatic louvre to make a full cycle in automatic mode to apply the optional setting.*
- *The optional function settings are different depending on the indoor or RASC units. Check that the unit has or not the optional setting.*
- *The above optional functions with "X" mark at the individual setting can change the condition only when "All Rooms" is set.*

7. Commissioning

Index

7.1 Checking procedure before the test run

When the installation is finished, perform the test run according to the following procedures. 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.

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 apply voltage on the terminals for transmission 1 and 2. (*)***
- ***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 90ºC.***
  - ***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.***

◆ 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 RASC units are correct. Especially, pay attention to the setting of the lift between the indoor units and the RASC units. Refer to the chapter *“4. Electrical and control settings”* 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 RASC units are connected as shown in chapter *“4. Electrical and control settings”*.

7 Make sure that each wire terminal (L1, L2, L3 and N, or L1 and N for single phase) 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 1,000 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 AC380-415V. “R” to “R” and “T” to “T” of each terminal board for AC220V) and the terminals for the intermediate wires between the indoor unit and the RASC unit (Operating Line: terminals of each terminal board for DC12V) coincide correctly. Otherwise, some components could be damaged.*
- *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 21.5ºC and above,
    - Indoor WB 16ºC and above,
    - Outdoor DB 0ºC and above
  - Heating operation:
    - Indoor DB 27ºC and below.

(*) About insulation resistance

The insulation might be reduced during a test run or after being left with the main power OFF for a long time, due to refrigerant accumulation in the compressor. Check the following when the insulation resistance lowers to 1 MΩ or below, or in case that the ground-fault circuit interrupter activates:

1 Remove compressor cables and measure the insulation resistance of the compressor alone. If the resistance is over 1 MΩ, other insulation failure of electric live part may exist.

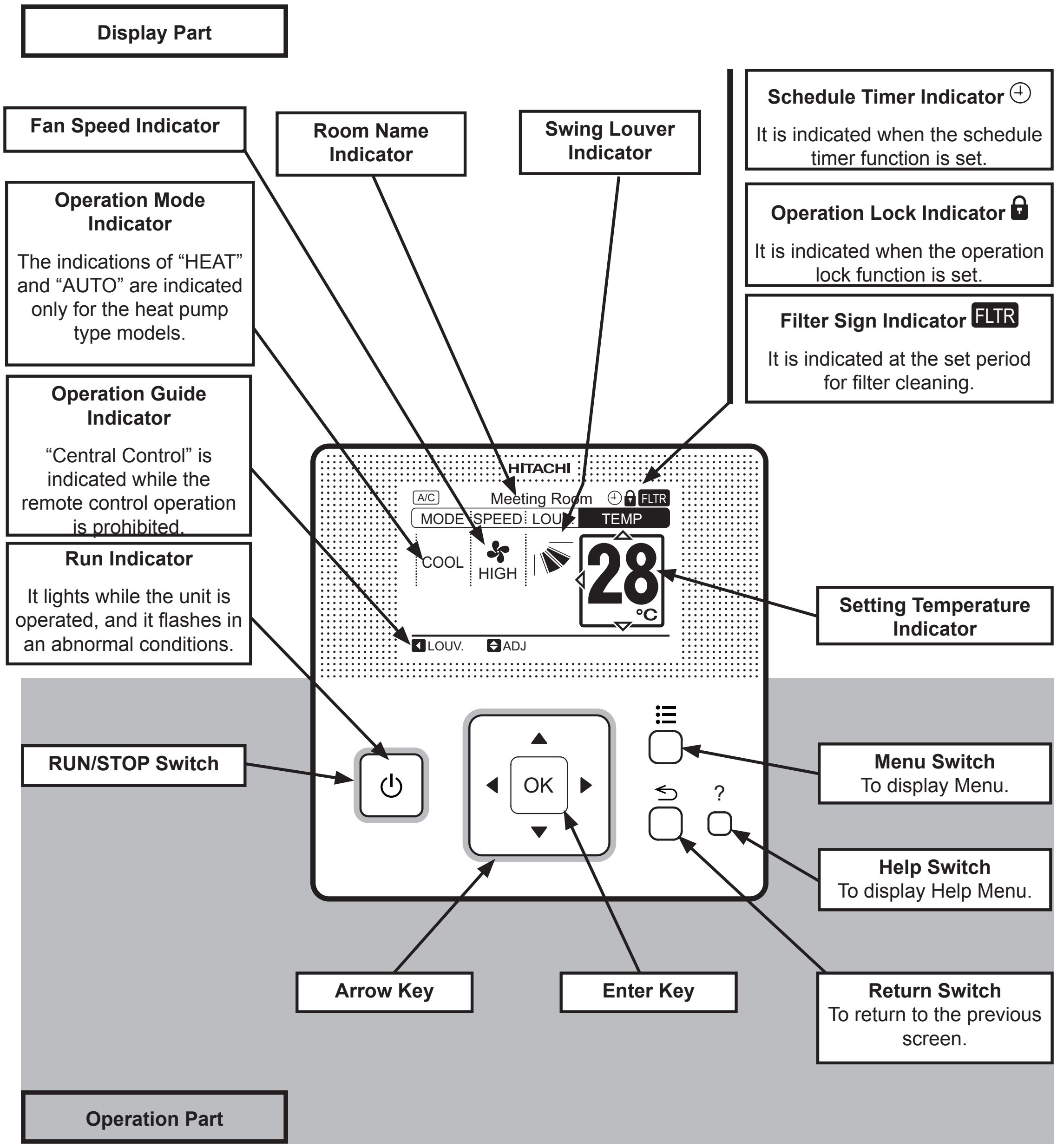
2 If the resistance is under 1 MΩ, remove compressor cables from the inverter PCB and turn the power ON and energize the oil heater. Measure the resistance after more than three hours of electric current application. If the insulation resistance recovers, the compressor does not have problems. In case that the resistance does not recover, compressor failure may exist. (More time may be required to apply the current depending on the conditions of air, pipe length or the refrigerant).

NOTE

To reconnect the removed compressor cables, re-caulk the terminal using a tool like long nose pliers in order that the Faston terminal does not remain loose.

In case of Earth Leakage Breaker (ELB) activation, please confirm the rated capacity of ELB as well. Earth leakage breaker (ELB) shall be inverter compatible, and select a high-sensitive and high-speed model for sensed current rating under 30 mA (activation time within 0.1 sec).

7.2 Test run procedure using the remote control switch (PC-ARF)



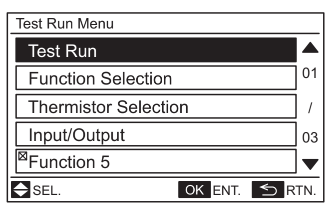
1 Turn ON the power supply for all the indoor units.

2 For the models with the auto-address function, wait for 3 minutes approximately. The addressing is automatically performed. (There is a case that 5 minutes is required according to the setting condition.) After that, select using language from "Menu". Refer to the operation manual for details.

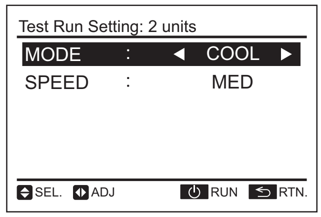
3 Press and hold "☰" (menu) and "↩" (return) simultaneously for at least 3 seconds.

a. The test run menu will be displayed.

Test run screen

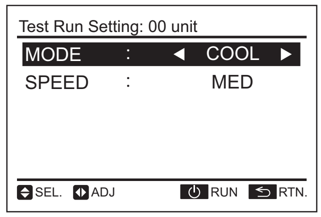


b. Select “Test Run” and press “OK”. The test run settings will be displayed.

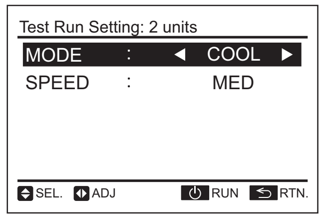


NOTE

When “00” is indicated, the auto-address function may be performing. Cancel “Test Run” mode and set it again.



4 The total number of the indoor units connected is indicated on the LCD (liquid crystal display). The case of the twin combination (one (1) set with two (2) indoor units) is indicated “2 units”, and the triple combination (one (1) set with three (3) indoor units) is indicated “3 units”.



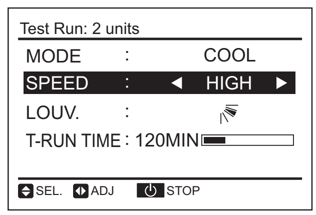
c. If the indicated number is not equal to the actual connected number of indoor unit, the auto-address function is not performed correctly due to incorrect wiring, the electric noise or etc. Turn OFF the power supply and correct the wiring after checking the following points; (Do not repeat turning ON and OFF within 10 seconds.)

- Power supply for indoor unit is not turned ON or incorrect wiring.
- Incorrect connectionn of connecting cable between indoor u nits or incorrect connection of controller cable.
- Incorrect setting of rotary switch and dip switch (the setting is overlapped) on the indoor units PCB.

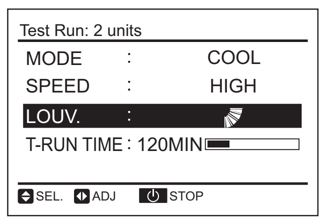
d. Press “⏻” (run/stop) to start the test run.

e. Press “△ ▽ ◁ ▷” and set each item.

5 Press “⏻” (run/stop). Start the test run when indicatin the air flow volume “HIGH” (default setting) and light the operation lamp. At this time, 2-hour OFF timmer will be set automatically..

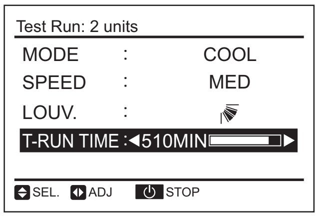


6 Press “△” or “▽”, select “LOUV.” and select “” (auto swing) by pressing “◁” or “▷”. The auto swing operation will be started. Check the operating sound at the louvers. If abnormal sound is not generated, press “◁” or “▷” again to stop the auto swing operation.

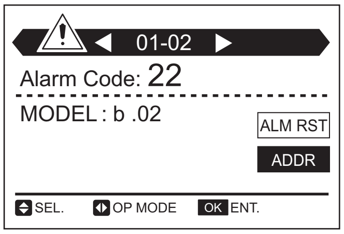


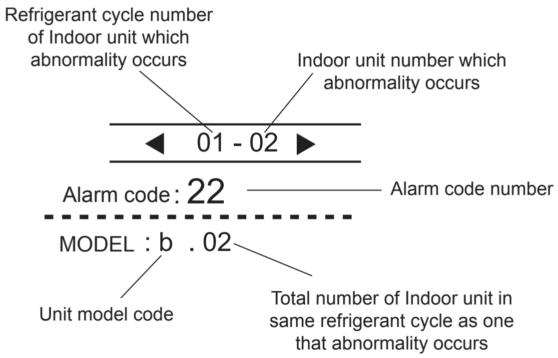
7 The temperature detections by the thermistors are invalid though the protection devices are valid during the test run.

8 To finish the test run, press “⏻” (run/stop) again or pass over the set test run time. When changing the test run time, press “△” or “▽” to select “T-RUN TIME”. Then, set the test run time (30 to 600 minutes) by pressing “◁” or “▷”



- The RUN indicator on the remote control switch flashes when some abnormalities such as protection devices activated occur during the test run as well as the RUN indicator (orange) on the indoor unit flashes (0.5 second ON/ 0.5 second OFF). Additionally, the alarm code, the unit model code and connected number of indoor units will be displayed on the LCD as shown in the figure below. If the RUN indicator on PC-ARF flashes (2 seconds ON/ 2 seconds OFF), it may be a failure in the transmission between the indoor unit and the remote control switch (loosening of connector, disconnecting wiring or breaking wire, etc.). In this case, check the item *“10.2.2 Alarm codes”* and perform for troubleshooting. Consult to authorized service engineers if abnormality can not be recovered.





7.3 Test run procedure using the remote control switch (PC-ART)

❶ Turn ON the power source of the indoor units and the RASC units

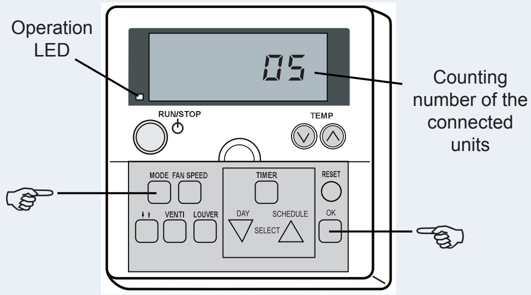
❷ Set the TEST RUN mode by means of the remote control switch.

Press the MODE switch and the OK switch simultaneously for more than three 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 ❹.

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 ❸.



❸

RCS 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.	**1** The connection between the remote control and the unit is correct. **2** Connecting points of the remote control cable. **3** The contact of the connectors of the remote control cable. **4** The screw fastening of each terminal board.
The counting number of the connected units is incorrect	• The power source of RASC unit is not turned ON. • 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).	**5** Setting of the DIP switches on the printed circuit board. **6** Wire connection order of the bridge cable. **7** Connecting points of the bridge cable. **8** The contact of the connectors of the bridge cable.

Back to ❶ after the checking

❹ Select the TEST RUN mode by pressing the MODE switch (COOL OR HEAT).

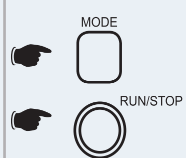
❺ Press the RUN/STOP switch.

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).

NOTE

- *TEST RUN operation ignores the temperature limitation and ambient temperature during heating operation to have a continuous operation, but the protections are alive. Therefore, the protection may activate when the heating TEST RUN operation is performed in high ambient temperature.*
- *TEST RUN operation time can be modified / increased depressing the time switch in the Remote control.*

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 ❻.



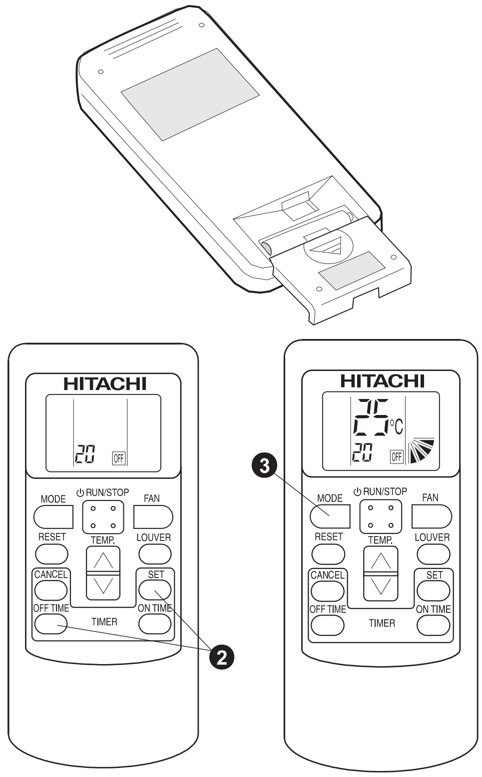
7

	RCS indication	Unit condition	Fault	Inspection points after the power source is OFF
❻	The operation LED flickers. (1 time / 1 sec.) and the unit number and the alarm code “03” flicker.	The unit does not start	The power source of RASC unit in not turned ON. The connect wires of the operating line are incorrect or loosened.	**1** The connection order of each terminal board. The fuse on the PCB may have blown out due to an incorrect wiring. **NOTE** Recovering method of FUSE for operating circuit. There is a fuse (FUSE4 on Indoor Unit PCB1, EF1 on RASC unit PCB1) to protect operating circuit on the PCB, when the power lines are connected to operating lines. If fuse is melted, operating circuit can be recovered once by setting the dip switch on the PCB as shown in ❼. **2** The screw fastening of each terminal board. **3** The connection order of the power supply wire between the indoor units and the RASC units.
	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 item ❸ 1, 2, and 3
	The flickering indicator is different from the one above	The unit does not start. The unit starts once and then the unit stops.	The connection of the thermistor or other connectors is incorrect. There is tripping of the protector.	Check the alarm code table in the service manual. (Service personnel should do the checking).
	The operation lamp Flickers. (1 Time/1s) Unit No. 00LU, Alarm Code dd and Unit Code E00LU flicker	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).
	Back to ❶ after the checking			
❼	Instructions for the recovery when the fuse of the transmission circuit is blown out: **1** Correct the wiring to the terminal board. **2** Set pin 2 of DSW7 on the indoor units PCB to ON (DSW7 not available in RPC-FSN3 indoor unit models)			

7.4 Test run procedure using the wireless remote control switch (PC-LH3A)

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 switch. 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.

- **a.** Set the batteries for the remote control switch.
- **b.** Turn ON the power source of the indoor units and the RASC units.
- **c.** The yellow ‘ ‘ LED on the receiver of 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 operation 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 commands, 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.

7

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.

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

6 Stop the test run (normal)

- **a.** The test run stops automatically after two hours.
- **b.** 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.

- **a.** 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.
- **b.** 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.

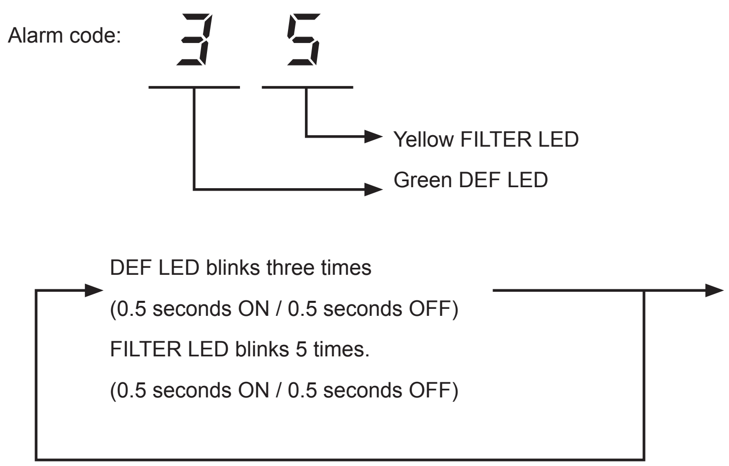
NOTE

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

c. 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 section *"10.2.2 Alarm codes"* on chapter *"10. Troubleshooting"*.
- 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.).

Example:



The red RUN LED (1 second ON / 1 second OFF) means that there is an abnormal transmission between the indoor units and the RASC unit.

7.5 Test run procedure from the RASC unit

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

◆ **Setting of dip switch (before shipment)**

DSW1		
ON 1 2 3 4	1	Test run
	2	Cooling (OFF) / Heating (ON)
	3	Intermediate season
	4	Manual compressor stop

DANGER

- ***Do not touch any other electrical parts when operating switches on the PCB.***
- ***Do not attach or detach service cover when the power source for the RASC unit is ON and the RASC unit is operated.***

NOTE

Turn all DIP switches of DSW1 OFF when the test run operation is completed.

	Dip switch setting	Operation	Remarks
Test run	**1** Setting operation mode (a) Cooling: Set DSW1-1 ON ON 1 2 3 4 (b) Heating SET DSW1-1 and 2 ON ON 1 2 3 4 (c) Cooling intermediate season: Set DSW1-1 and 3 ON ON 1 2 3 4 (d) Heating intermediate season: Set DSW1-1, 2 and 3 ON ON 1 2 3 4	• The indoor unit automatically starts to operate when the test run of the RASC unit is set. • You can perform the ON/OFF operation from the remote control switch or the DSW1-1 of the RASC unit. • Continuous operation during 2 hours is performed without the Thermo-OFF condition. **NOTE** • *TEST RUN operation time can be increased depressing the time switch in the Remote Control.* • *If is setting DSW1-3 ON, cooling/heating intermediate season mode is activated.*	• Make sure that the indoor units start to operate in accord with the test run of the RASC unit. • If you start the test run from the RASC 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 RASC 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.
Manual OFF of compressor	**2** Forced stoppage of compressor: Set DSW1-4 ON ON 1 2 3 4	• 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.

7

7.6 Check list on test run

MODEL:	
SERIAL NUMBER:	
COMPRESSOR MFG NUMBER:	
NAME AND ADDRESS OF CUSTOMER:	
DATE:	

1 Is the rotation direction of the indoor coil fan correct? __________
2 Is the rotation 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	Number 1	DB ____ ºC WB ____ ºC	Number 2	DB ____ ºC WB ____ ºC	Number 3	DB ____ ºC WB ____ ºC	Number 4	DB ____ ºC WB ____ ºC
Outlet		DB ____ ºC WB ____ ºC		DB ____ ºC WB ____ ºC		DB ____ ºC WB ____ ºC		DB ____ ºC WB ____ ºC
Inlet	Number 5	DB ____ ºC WB ____ ºC	Number 6	DB ____ ºC WB ____ ºC	Number 7	DB ____ ºC WB ____ ºC	Number 8	DB ____ ºC WB ____ ºC
Outlet		DB ____ ºC WB ____ ºC		DB ____ ºC WB ____ ºC		DB ____ ºC WB ____ ºC		DB ____ ºC WB ____ ºC

6 Check the outdoor ambient temperature:

Inlet	DB ____ ºC WB ____ ºC
Outlet	DB____ ºC WB ____ ºC

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

Discharge gas temperature	Td = _____ ºC
Liquid pipe temperature	Te = _____ ºC

8 Check the pressure:

Discharge pressure	Pd = _____kg/cm²G
Suction pressure	Ps = _____kg/cm²G

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? __________

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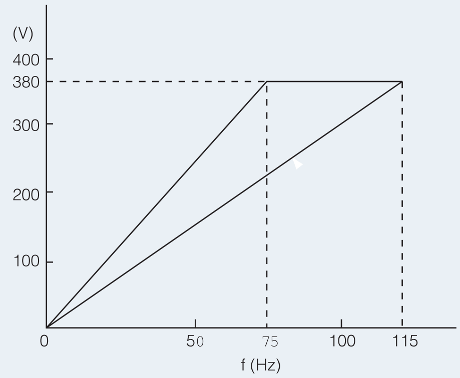
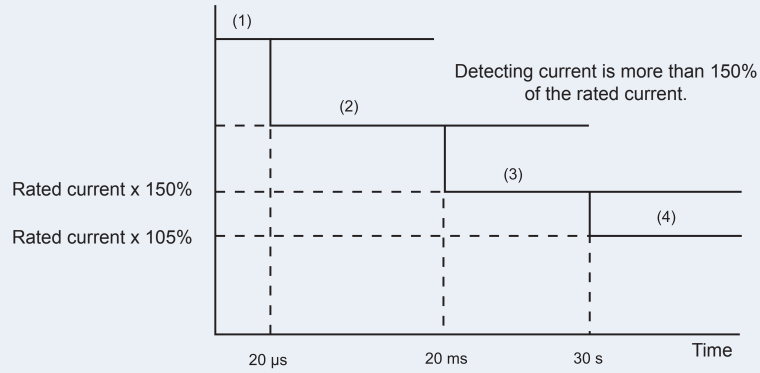
8. Electrical checks of the main parts

Index

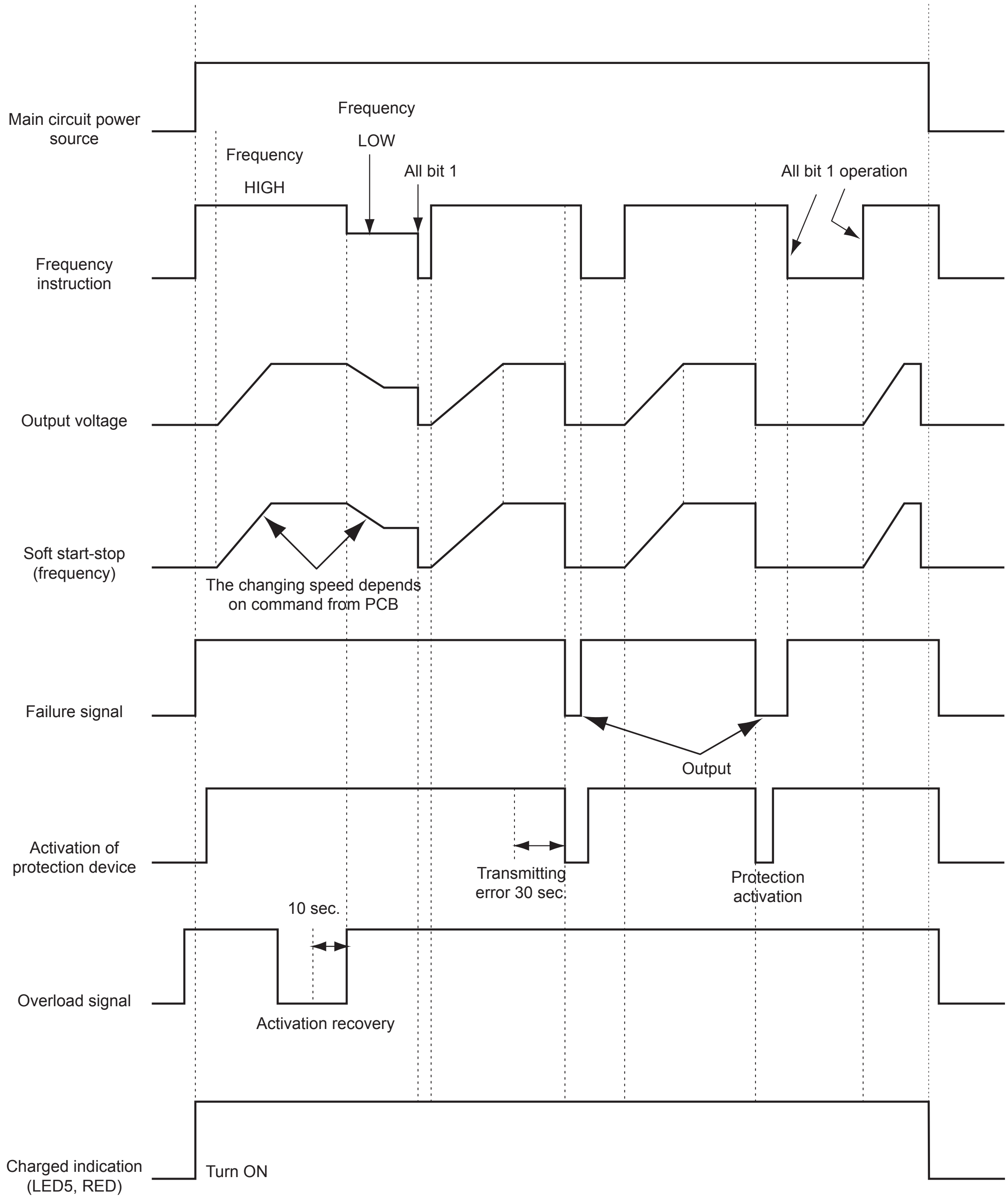
8.1 Inverter

8.1.1 Specifications of inverter

<table>
<tr><th>Applicable model</th><th>RASC-(4-6)HNPE</th><th>RASC-(8/10)HNPE</th></tr>
<tr><td>Applicable power source</td><td colspan="2">3N~ 400V 50 Hz</td></tr>
<tr><td>Output current</td><td>11.0 A</td><td>17.5 A (8HP), 20.0 A (10HP)</td></tr>
<tr><td>Control method</td><td colspan="2">Vector control</td></tr>
<tr><td>Range output frequency</td><td colspan="2">20~115 Hz</td></tr>
<tr><td>Accuracy of frequency</td><td colspan="2">0,01 Hz at applicable frequency range</td></tr>
<tr><td>Output / characteristics</td><td colspan="2">Conditions:
1 Power source voltage AC380/415V
2 Non-loading (free output)
3 Ammeter type volt-meter (X1.1)

</td></tr>
<tr><td>Soft start-stop</td><td colspan="2">0.125~3.00 Hz/s (5 steps)</td></tr>
<tr><td colspan="3">Protection function</td></tr>
<tr><td>Excessive high or low voltage for inverter</td><td colspan="2">Excessive low voltage at a voltage is lower than 350V DC
Excessive high voltage at a voltage is higher than 750V DC</td></tr>
<tr><td>Abnormality of current sensor (0A detection)</td><td colspan="2">Stoppage at a current of compressor smaller than 1.5A.
When the frequency is 15 to 18 Hz after starting.
Cause of abnormality:
- Failure of current sensor
- Failure of IPM/DIP-IPM/ ISPM
- Failure of compressor / fan motor
- Disconnected wiring</td></tr>
</table>

Protection function		
Applicable model	**RASC-(4-6)HNPE**	**RASC-(8/10)HNPE**
Overcurrent protection for inverter		
	1 Short-circuit trip of arm (*) **2** Instantaneous overcurrent trip (*) **3** Instantaneous overcurrent trip: it is detected when current valve is over rated current x 150%. **4** Electronic thermal trip: it is detected when current valve rated current x 105% for over 30 seconds or for over 3 minutes in total within 10 minutes. **NOTE** *(*): Internal protection IPM.* Condition is maintained longer than 30 seconds or accumulated longer than 3 minutes during 10 minutes sampling time.	
Protection of IPM	IPM has four protection functions for self-protection: **1** Short circuit in any of the “U”, “V” or “W” terminals. **2** Running current reaches the maximum rated current. **3** Abnormal temperature is measured by internal thermistor (for 8/10HP). **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 90ºC (for 4-6HP) or 100°C (for 8/10HP).	
Earth detection	The unit is stopped when the compressor is earthing.	

8.1.2 Inverter time chart



8.1.3 Protective function

1 Excessive high or low voltage for inverter

a. Level of detection

- When the voltage of direct current is greater than (A) V, abnormalities are detected.
- When the voltage of direct current is smaller than (B) V, abnormalities are detected.

Power supply	3N~ 400V 50Hz
(A)	750
(B)	350

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

c. Cancellation of protection function. Transmission for signal code of stoppage cause is cancelled when a stopping order is given or main power source is cut off.

2 Abnormality of current sensor

a. Level of detection. When current of the inverter compressor decreases lower than 1.5 A 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 transmits 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 transmits 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

a. Level of detection.

- When some of the output terminals between “U” and “V”, “V” and “W”, “W” and “U” of IPM/dip IPM are short-circuited, an abnormality is detected.
- When the running current of IPM/DIP-IPM 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 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 90ºC (for 4-6HP) or 100°C (for 8/10HP), 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.

8.1.4 Overload control

1 **Level of detection**. When the output current exceeds 105% of the maximum output current, an abnormality is detected.

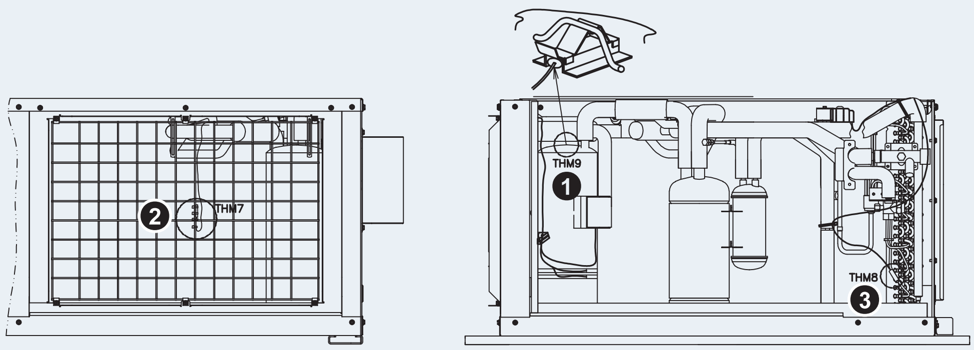
2 **Function**. An overload signal is issued when output current exceeds 105% of the maximum output current, and the frequency decreases. For 10 seconds after the output current decreases lower than 88% of the rated current, the operation is performed with the compressor frequency limited to the upper 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 2 is performed for 10 seconds, this control is cancelled.

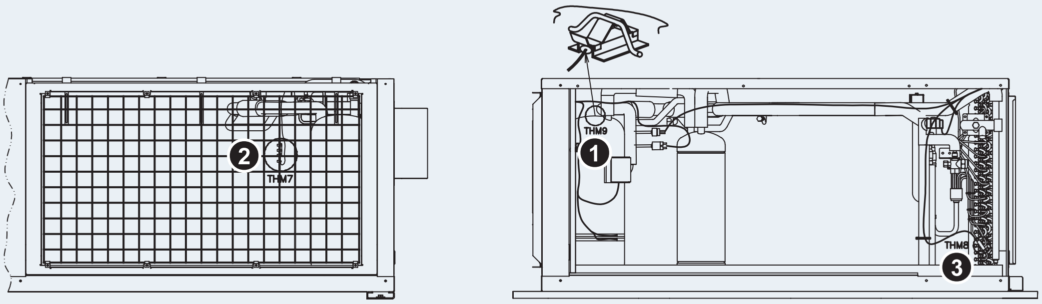
8.2 Thermistor

8.2.1 Summary of thermistors for RASC unit

RASC-(4-6)HNPE



RASC-(8/10)HNPE

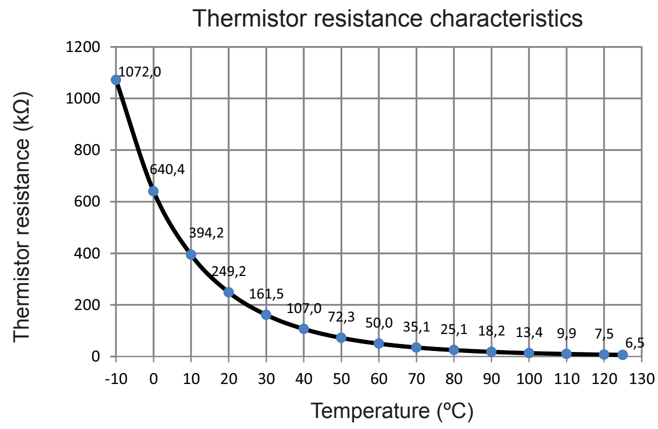


Number	Identification
1	Thermistor for discharge gas temperature (THM9)
2	Thermistor for outdoor ambient temperature (THM7)
3	Thermistor for evaporating temperature (THM8)

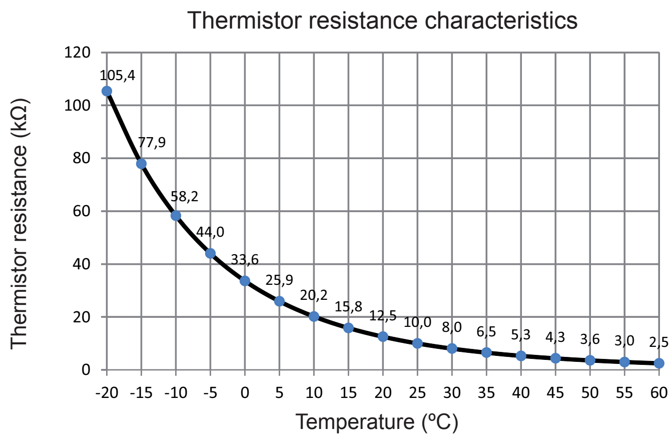
8

8.2.2 Diagrams of thermistors for RASC unit

◆ **Thermistor for discharge gas temperature of compressor (THM9)**



◆ **Thermistor for outdoor ambient temperature (THM7) and for evaporating temperature (THM8)**



8.3 Electronic expansion valve

Micro-computer

↓ Pulse signal

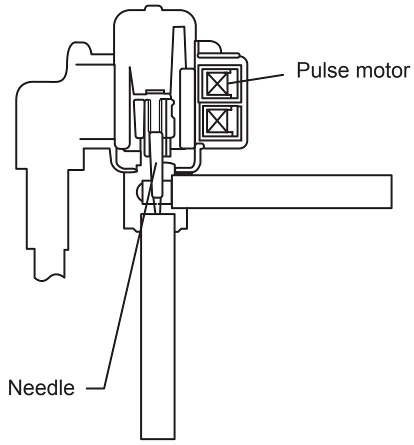
2-Phase permanent magnetic pulse motor

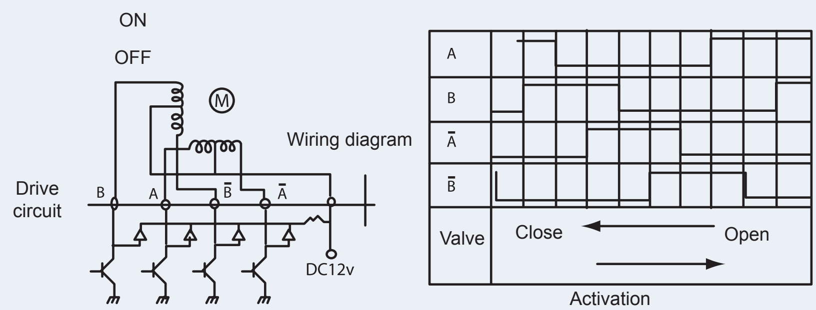
Control 0 to 500 pulse by 1 pulse

↓

Refrigerant flow control

Precise control

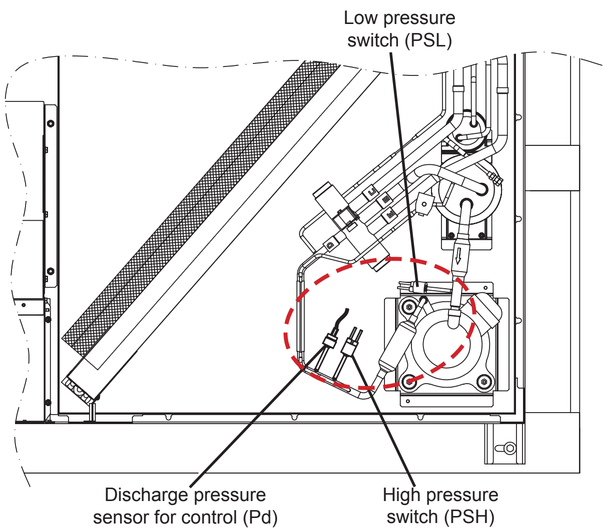


Items	Specifications
Type	UKV series
Refrigerant	R410A
Working temperature range	-30°C ~ 70°C (operation time of the coil: less than 50%)
Mounting direction	Drive shaft in vertical direction within an angle of 45° as maximum
Flow direction	Reversible
Drive method	Permanent magnet type (20 poles). Stepping motor direct drive type
Rated voltage	DC12V ±10%
Drive condition	80 ±5 pps (for 4-6HP) and 63 ±5 pps (for 8/10HP) 1-2 phase excitation
Coil resistance (each phase)	46 ±3Ω (at 20°C)
Wiring diagram, drive circuit and activation mode	

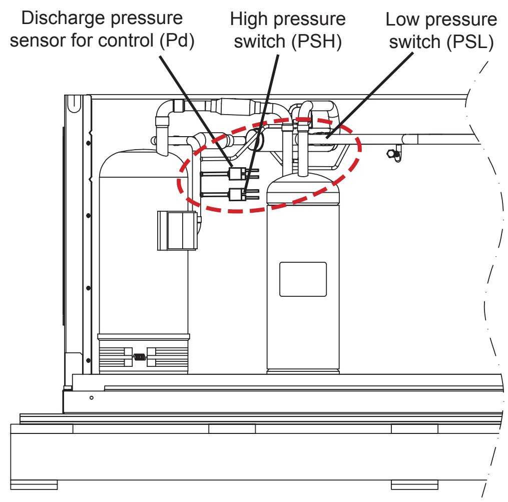
8.4 Pressure protection devices

8.4.1 Location of the pressure protection devices

RASC-(4-6)HNPE



RASC-(8/10)HNPE



8.4.2 Description of the pressure protection devices

◆ High pressure switch (PSH)

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.

◆ Discharge pressure sensor for control (Pd)

This pressure sensor allows the performance control of several components: fan motor performance, protection against high pressure, compressor frequency control, opening of the valves, etc.

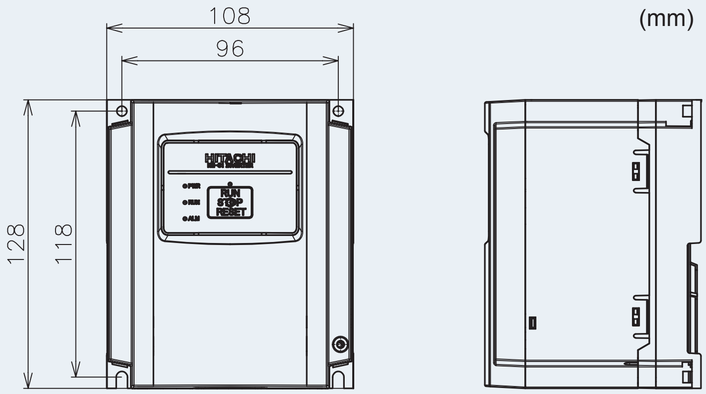
◆ Low pressure switch (PSL)

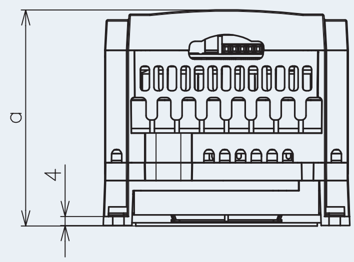
For internal control.

8.5 Variable frequency driver (VFD)

Items	RASC-(4-6)HNPE	RASC-(8/10)HNPE
Applicable power supply	3~ 400V 50Hz	
Rated input current (at 40 ºC)	3.3 A	7.0 A
Rated output current (at 40 ºC)	2.5 A	5.5 A
Enclosure	IP20	
Range of output frequency	0.1 ~ 400 Hz	

(mm)



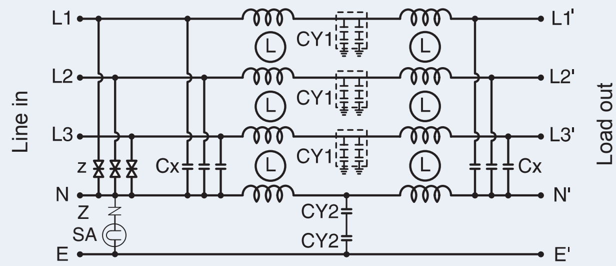
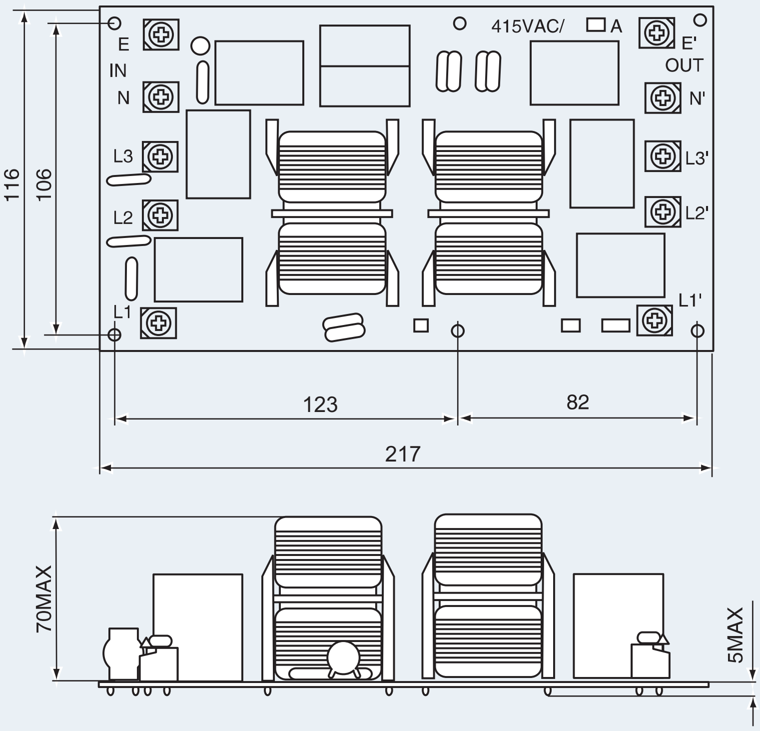


Model	a (mm)
RASC-(4-6)HNPE	96
RASC-(8/10)HNPE	125

8

8.6 Noise filters (NF)

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.

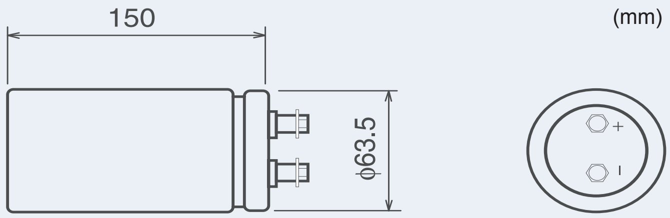
Items	Specifications
Model	4LFB-22930-2FB
Rated current	3N~ 400V, 27 A
Permissible temperature range	-25 ºC to 65 ºC
Circuit diagram	
Dimensions	(mm) 

8.7 Capacitor (CB1, CB2) (Only for RASC-(8/10)HNPE)

This part is used for changing the alternative current to the direct current for the inverter.

◆ CB1 and CB2 (3N~ 400V 50Hz)

Items	Specifications
Models	LNX2W472MSEEHE
Capacity of static electricity	4700 μF
Rated voltage	400 VDC
Permissible temperature range	-25ºC to 85ºC



8

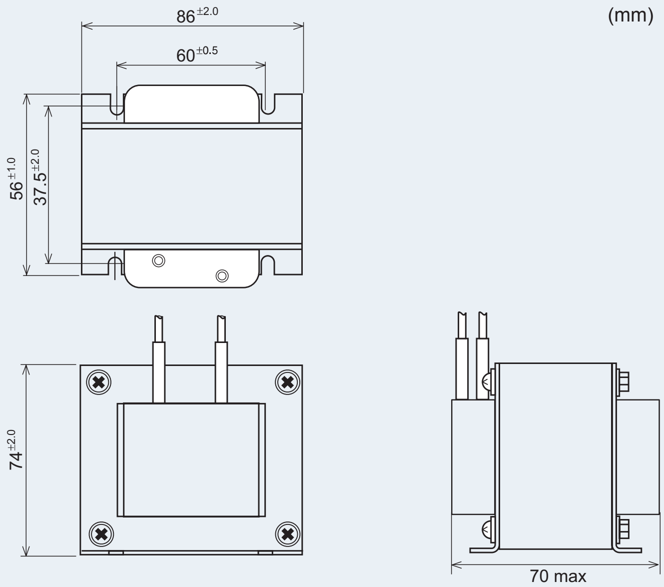
8.8 Reactor (DCL)

DCL reactor suppresses harmonics generated on inverter input side. Also it is useful for power factor improvement.

8.8.1 Reactor for RASC-(4-6)HNPE

Items	Specifications
Characteristics	0.5 mH±10% (at 1kHz)
Rated current	30 A
Direct resistance	15.0 mΩ±20% (at 20ºC)
Permissible temperature range	-20ºC to 60ºC

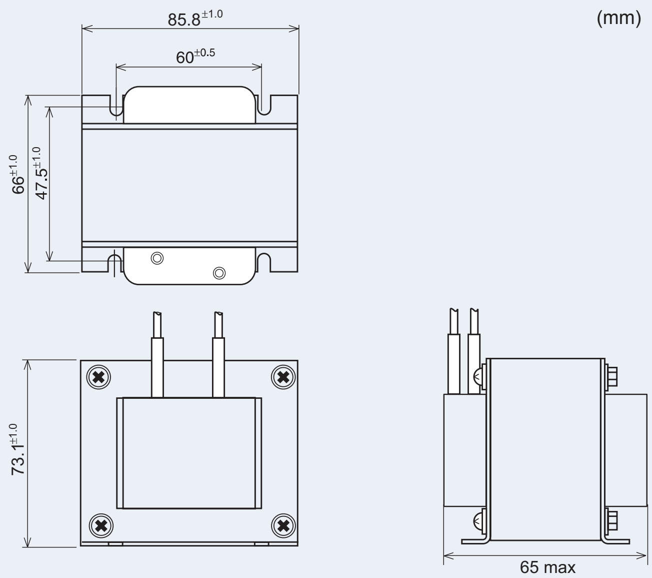
(mm)



8.8.2 Reactor for RASC-(8/10)HNPE

Items	Specifications
Characteristics	1.0 mH±10% (at 1 kHz)
Rated current	30 A
Direct resistance	27.4 mΩ±20% (at 20ºC)
Permissible temperature range	-20ºC to 60ºC

(mm)



8.9 Scroll compressor

8.9.1 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.

8.9.2 Principle of compression

1 The gas is inhaled from the inlet port at the outer frame of the fixed scroll.

↓

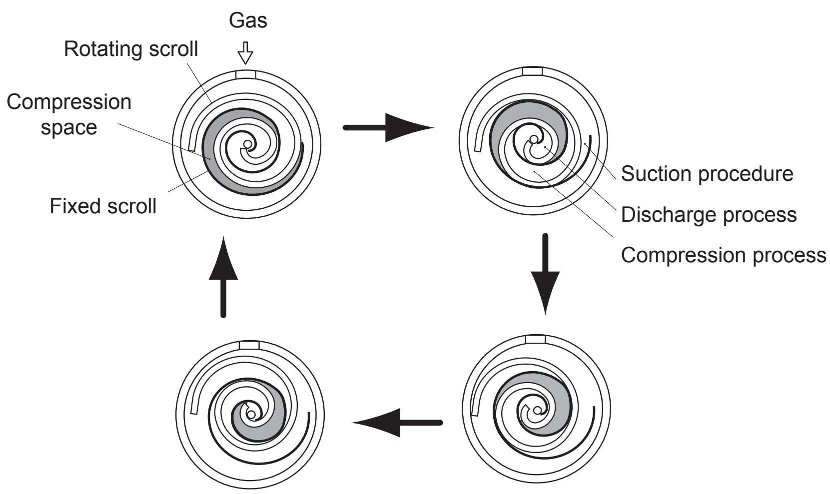
2 The gas inside of the compression space is compressed toward the centre of the scroll.

↓

3 The compression space is minimum at the centre of the scroll, and the gas compressed at the maximum is discharged from the outlet port of at the centre of the scroll.

↓

4 The above procedures (suction compression discharge) is repeated continuously.



9. Servicing

Index

9.1 General notes

Before starting to remove any component, take into account the following notes:

DANGER

- ***Before performing any of the service operations described in this chapter, turn all the main switches off and place security lockers or convenient warning indicators in order to prevent them from turning on accidentally.***
- ***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.***

CAUTION

- *In case of sharped edged parts, as covers, use security gloves to avoid getting injured.*
- *In case of blocked or stuck parts, use appropriated tools and eventually lubricants to release them.*
- *When performing brazing work, besides security gloves it is a must to wear convenient eye protection.*

NOTE

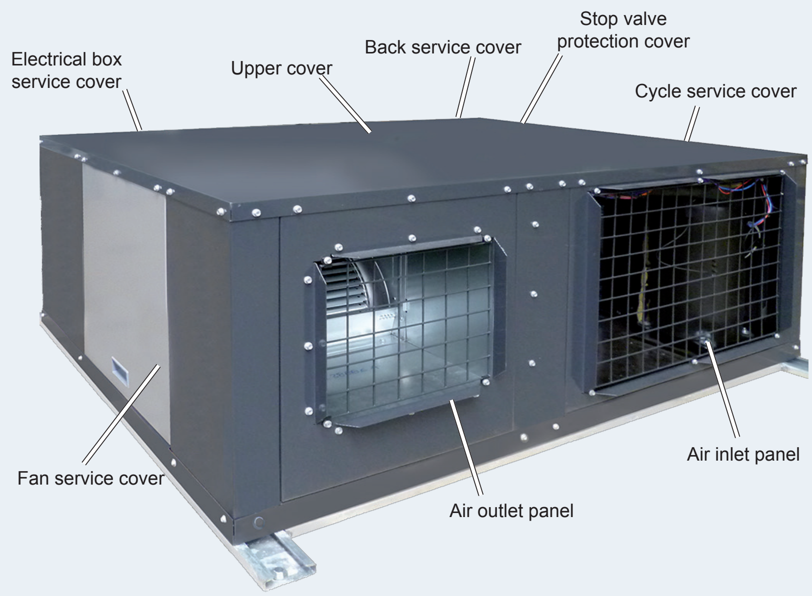
The images and pictures shown in this chapter, except when the contrary is indicated, correspond to the RASC-(4-6)HP units. Processes described are equally valid to (8/10)HP models.

NOTE

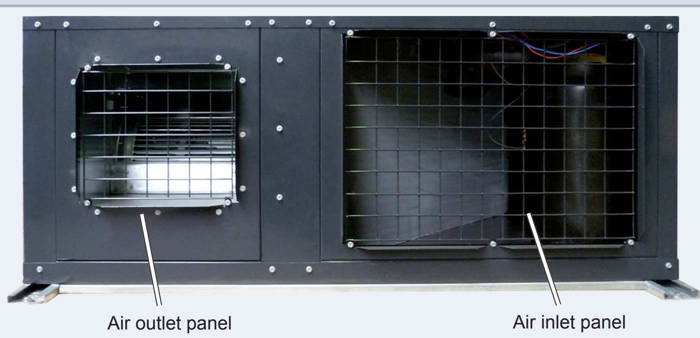
- *All compressors are connected by brazing. Check to ensure whether there are flammable things around or not when using a burner for pipe connections, if not, oil existing pipe inside may ignite.*
- *Do not expose the refrigerant cycle to the atmosphere for a long period in order to avoid mixing the 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. Seal pipe ends using caps or tape.*
- *To reassemble perform the procedures in reverse way.*
- *To prevent contamination of the refrigerant with water or foreign particles, do not expose open to atmosphere for long periods.*

9.2 Cabinet description

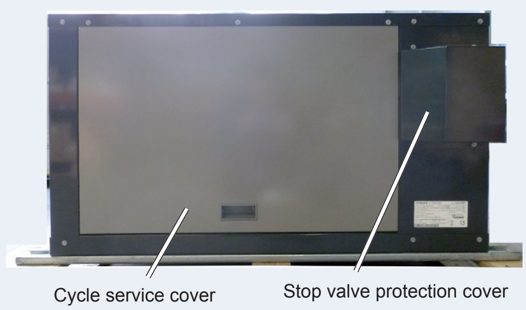
General view



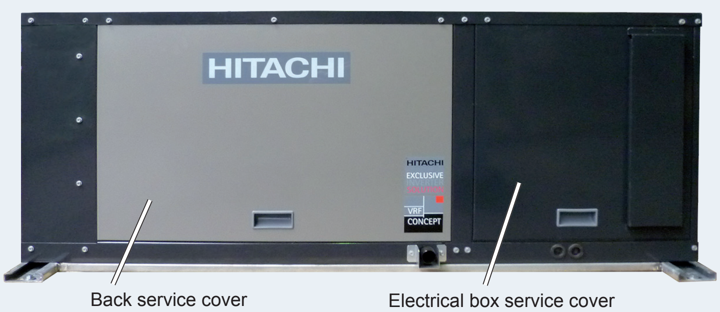
Front side view



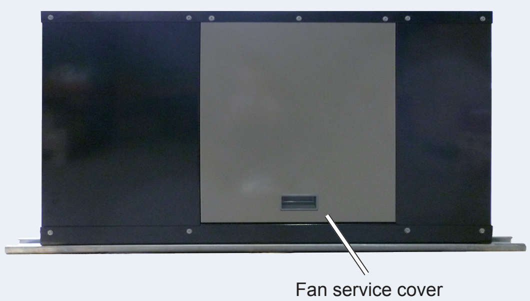
Right side view



Back side view



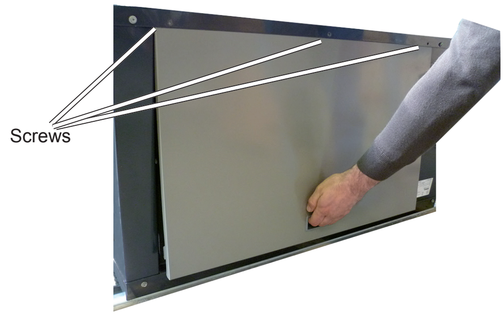
Left side view



9.3 Removing components

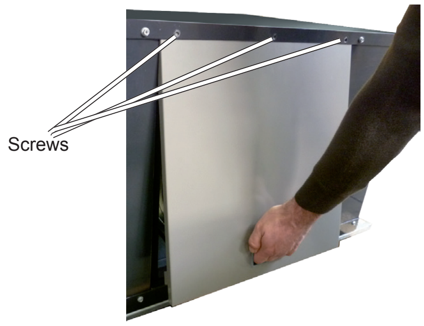
9.3.1 Removing cycle service cover

1. Unscrew the 3 fixing screws.
2. Slide the service cover upward. Then, pull backwards and remove it using the handle.



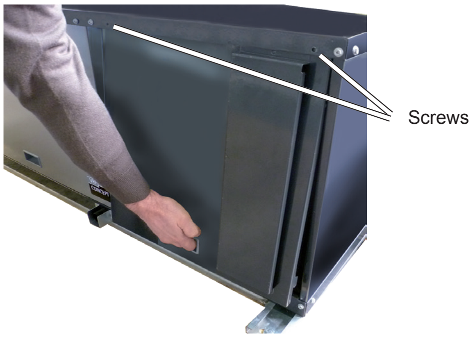
9.3.2 Removing fan service cover

1. Unscrew the 3 fixing screws.
2. Slide the service cover upward. Then, pull backwards and remove it using the handle.



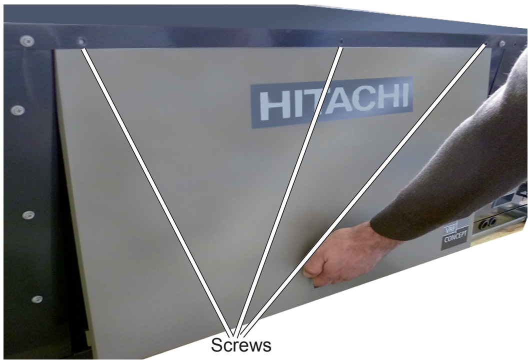
9.3.3 Removing electrical box service cover

1. Unscrew the 2 fixing screws.
2. Slide the service cover upward. Then, pull backwards and remove it using the handle.



9.3.4 Removing back service cover

1. Unscrew the 3 fixing screws.
2. Slide the service cover upward. Then, pull backwards and remove it using the handle.



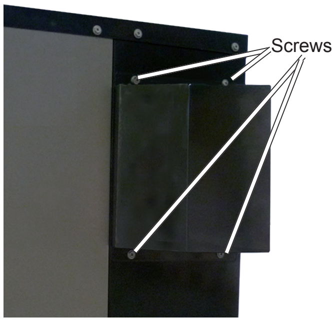
9.3.5 Removing stop valve protection cover

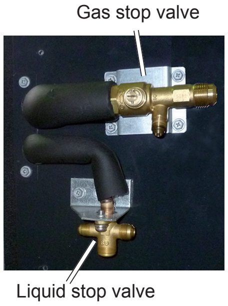
Stop valves are located at the right side of RASC units, next to the cycle service cover.

RASC units are factory-supplied with the stop valve protection cover. Before connecting refrigerant piping, the stop valve protection cover shall be removed:

1 Unscrew the 4 fixing screws.

2 Remove the protection cover.





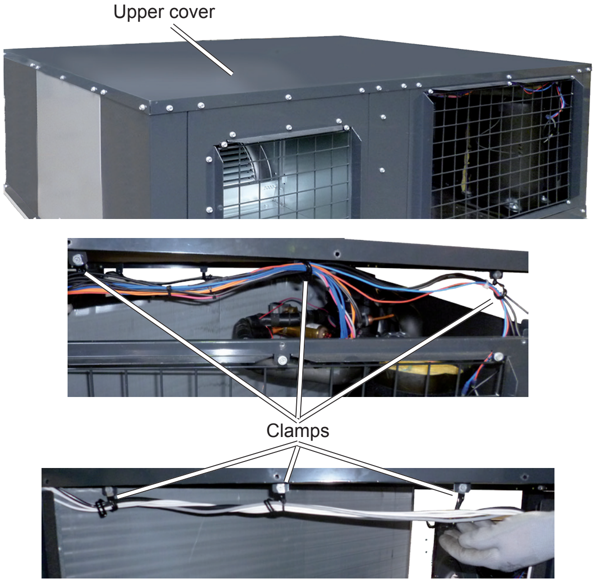
9.3.6 Removing upper cover

1 Unscrew the 35 fixing screws.

2 Lift the upper cover upward. Then, remove it and leave it away to a side carefully.

CAUTION

- *Wires are attached to the upper cover by 3 clamps at the front side and 3 clamps at the back side. Remember to release them before lifting the upper cover.*
- *When lifting up the upper cover, at least two people are required (one from each side).*

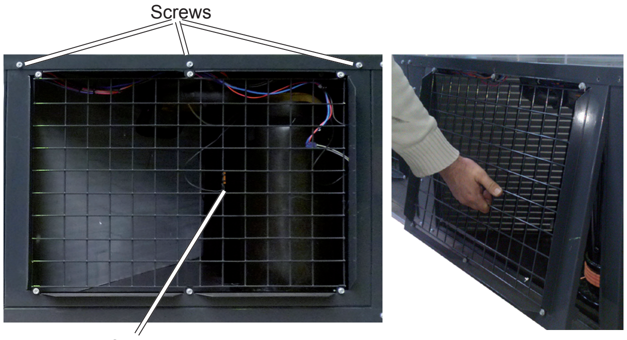


9.3.7 Removing air inlet panel

1 Unscrew the 3 fixing screws.

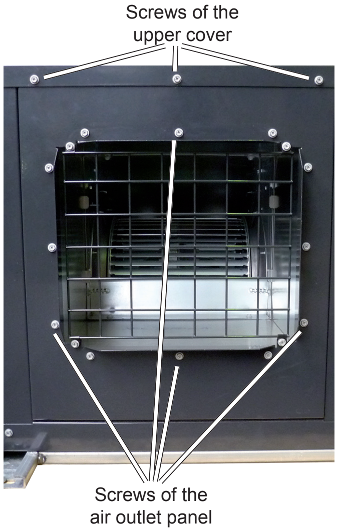
2 Remove the thermistor for outdoor ambient temperature from the air inlet panel grill cutting the cable ties.

3 Slide the air inlet panel upward. Then, pull backwards and remove it.



9.3.8 Removing air outlet panel

1. Unscrew the 3 fixing screws which attach the air outlet panel with the upper cover.
2. Unscrew the 12 screws, 3 for each side of the air outlet panel.



3. Slide the air outlet panel upward. Then, pull backwards and remove it.

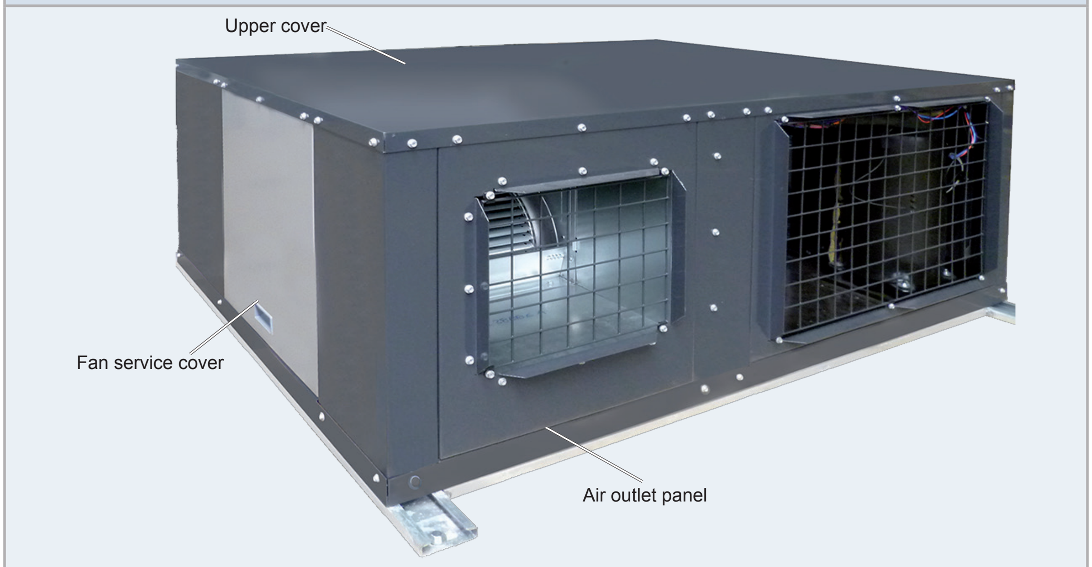
9.3.9 Removing fan motor

The procedure to remove the fan motor is different depending to the fan unit position (factory-supplied position or optional position).

◆ Factory-supplied position

If fan unit position is factory-supplied position, follow these steps:

Air outlet panel and fan unit (factory-supplied position)



1 In order to access to the unit's internal parts, remove the following covers and panels depending on access restrictions:

   a. If upper cover can be removed, remove it as described in section *"9.3.6 Removing upper cover"* and access to the unit's internal parts from the upper side.

   b. If upper cover cannot be removed but air outlet panel can be removed, remove it as described in section *"9.3.8 Removing air outlet panel"*

   c. If upper cover and air outlet panel cannot be removed, remove the following parts:

   - Remove the fan service cover as described in section *"9.3.2 Removing fan service cover"*.
   - Remove the back service cover as described in section *"9.3.4 Removing back service cover"*

DANGER

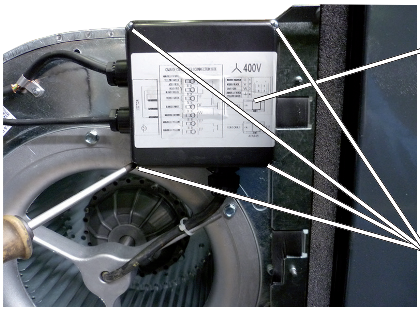
- ***Disconnect the RASC unit from the power supply before touching any of the parts. Do not touch the electrical box before disconnecting it in order to avoid an electrical shock.***
- ***Electrical hazard. Risk of electrical shock. Do not touch the electrical components when the LED1 (Red) located on the PCB1 is ON in order to avoid electrical shock.***

2 Disconnect the electric connection of the fan motor:

- From the fan service cover, open the fan motor connection box. 4 screws shall be loosened to remove the cover.
- From the fan motor connection box, disconnect all the wiring corresponding to the connections of the fan motor terminal.
- Unscrew and pull cable gland to release the wiring harness.

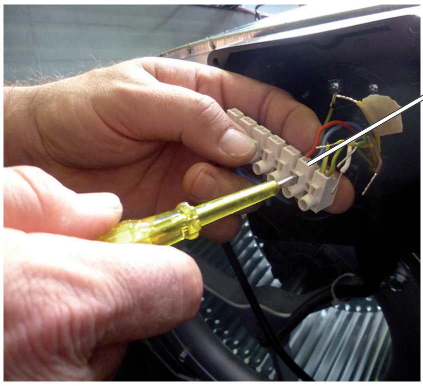
NOTE

Remember how the cables are connected, in order to avoid possible connection problems.

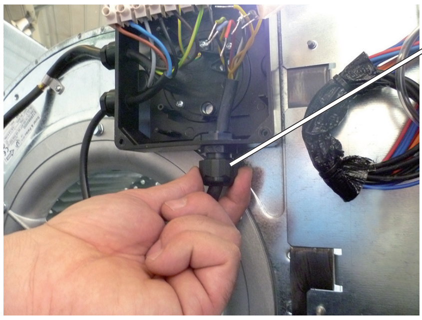


Fan motor connection box

Screws



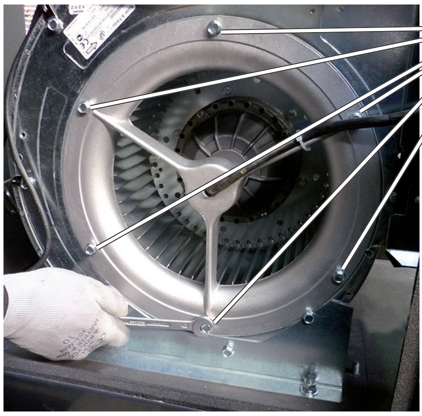
Fan motor terminal strip



Screwed cable gland

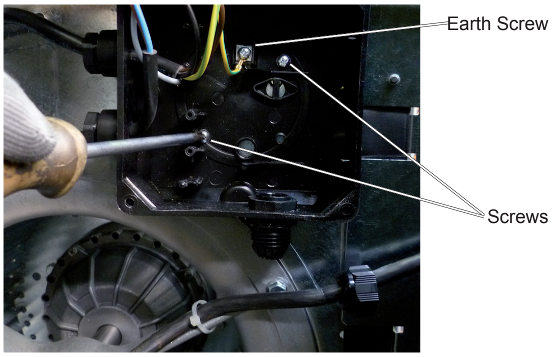
3 Unscrew the fan motor support.

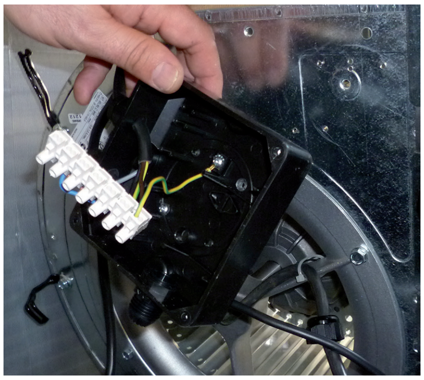
- From the fan service cover, unscrew the 6 screws which fixes the fan motor support.



Screws

- *In RASC-<(4-6) HP units, it may happens some obstruction due the electric box. Then, proceed to remove the electric box from the fan unit as shown in the pictures.*





- Gently but firmly, pull the motor support backwards.

⚠ CAUTION

Mind to take care from the runner, blades have cutting edges.

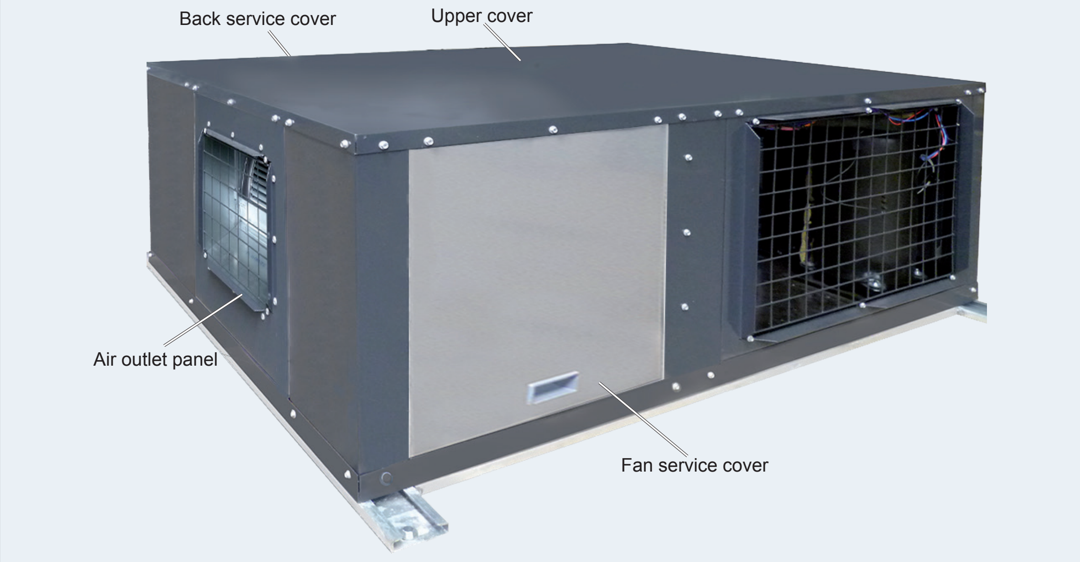
9

◆ Optional position

If there is enough space for this operation from the front side of the unit, follow the instructions described in section from fan service cover.

If there is not enough space for this operation from the front side of the unit, follow the instructions described in section from back service cover.

Air outlet panel and fan unit (optional position)



1 In order to access to the unit's internal parts, remove the following covers and panels depending on access restrictions:

a. If upper cover can be removed, remove it as described in section *"9.3.6 Removing upper cover"* and access to the unit's internal parts from the upper side.

b. If upper cover cannot be removed but air outlet panel can be removed, remove it as described in section *"9.3.8 Removing air outlet panel"*.

NOTE

If RASC unit is ducted, the fan duct of the installation must be removed in order to be able to unscrew the fan unit accessory from the air outlet panel.

c. If upper cover and air outlet panel cannot be removed, remove the following parts:

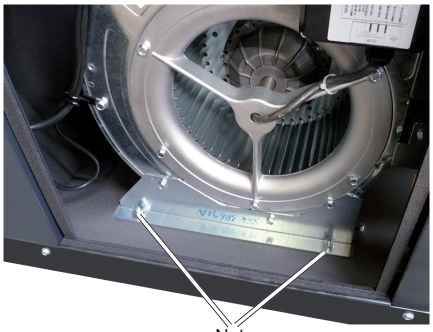
- Remove the fan service cover as described in section *"9.3.2 Removing fan service cover"*.
- Remove the back service cover as described in section *"9.3.4 Removing back service cover"*.

DANGER

- ***Disconnect the RASC unit from the power supply before touching any of the parts. Do not touch the electrical box before disconnecting it in order to avoid an electrical shock.***
- ***Electrical hazard. Risk of electrical shock. Do not touch the electrical components when the LED1 (Red) located on the PCB1 is ON in order to avoid electrical shock.***

2 Unscrew the 4 fixing nuts of the fan unit feet:

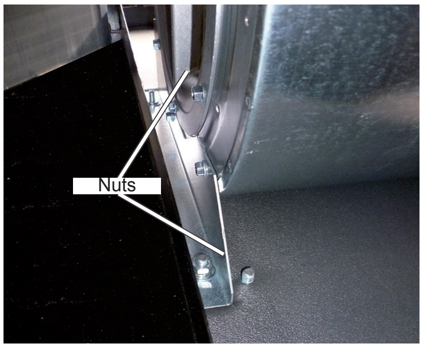
- From the fan service cover, unscrew the 2 nuts of one of the fan unit side feet.



- From the back service cover, unscrew the 2 nuts of the other fan unit side foot.

NOTE

There is little space to remove the fixing screws in this side. Use box spanner or universal joint in order to facilitate the work.

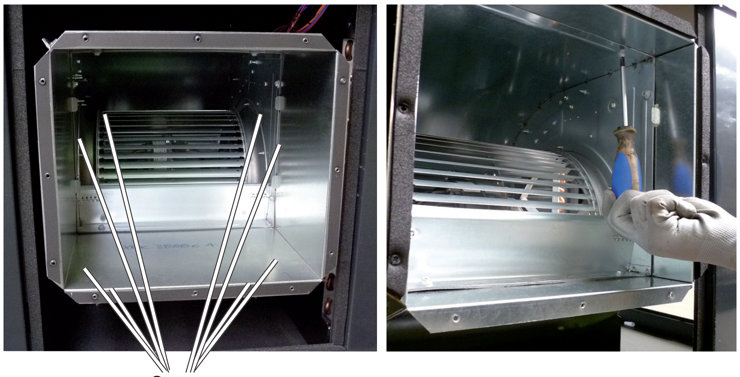


NOTE

Keep the two 2 washers (1 flat washer + 1 spring washer) of each screw to use it when reassembling.

3 Remove the fan duct accessory by following these steps:

a. From the air outlet panel, remove the 8 screws of the fan duct accessory.

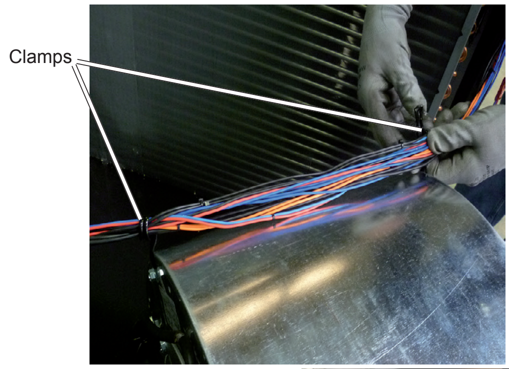


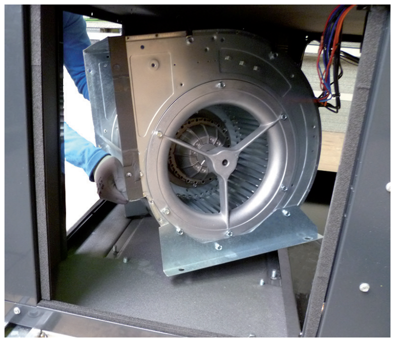
b. Take the fan duct accessory out by pulling it.

4 Remove the wiring from the clamps.

9

5 Lift the fan unit up slightly, turn it until the electrical box is accessible from the back service cover.



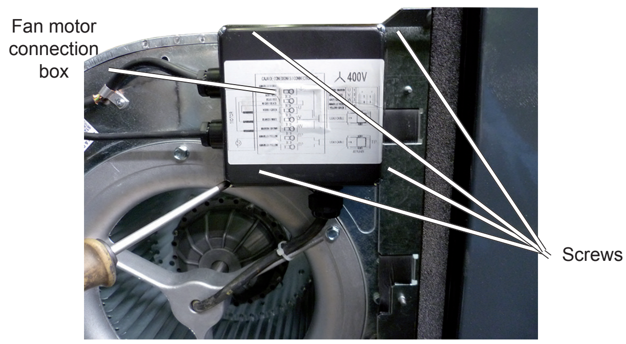


⚠ CAUTION

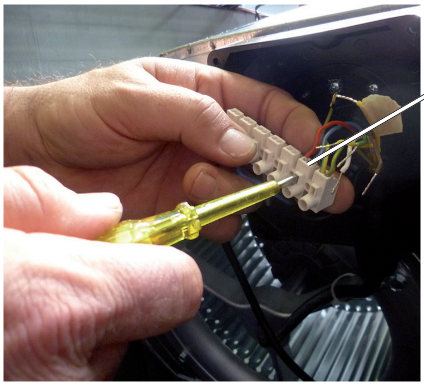
When lifting the fan unit up, at least two people are required (one from each side).

6 From de back service cover, disconnect the electric connection of the fan motor:

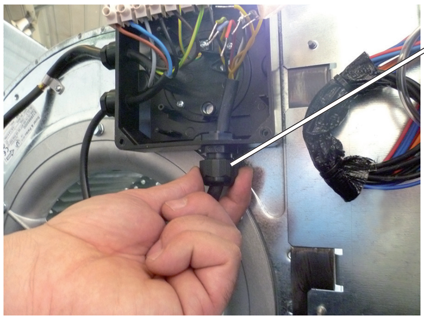
- Open the fan motor connection box. 4 screws shall be loosened to remove the cover.



- Disconnect all the wiring corresponding to the connections of the fan motor terminal.



- Unscrew and pull the screwed cable gland to release the wiring harness.



NOTE

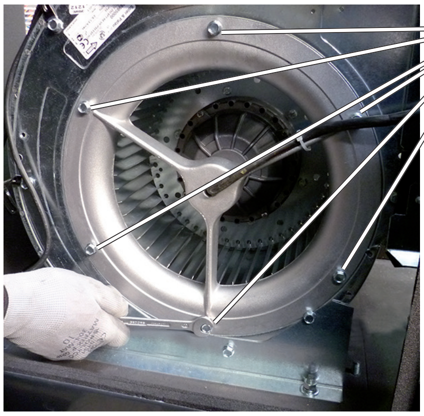
Remember how the cables are connected, in order to avoid possible connection problems.

DANGER

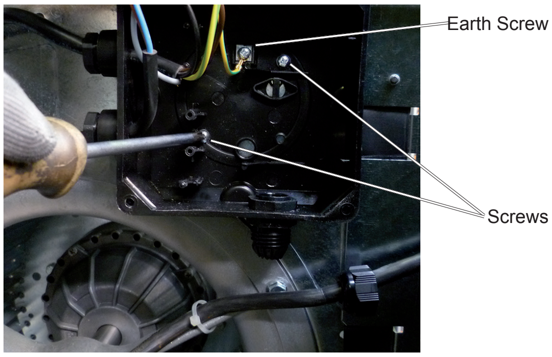
- ***Disconnect the RASC unit from the power supply before touching any of the parts. Do not touch the electrical box before disconnecting it in order to avoid an electrical shock.***
- ***Electrical hazard. Risk of electrical shock. Do not touch the electrical components when the LED1 (Red) located on the PCB1 is ON in order to avoid electrical shock.***

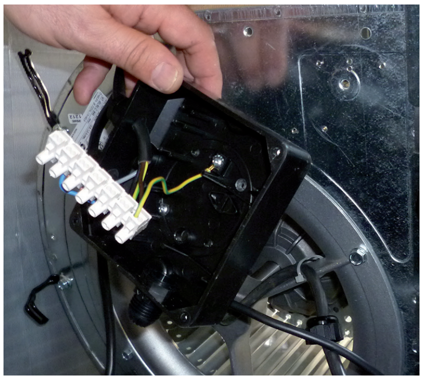
7 Remove the fan motor support following the next steps:

- From back service cover position, unscrew the 6 screws which fixes the fan motor support.



- In RASC-(4-6) HP units, it may happens some obstruction due the electric box. Then, proceed to remove the electric box from the fan unit as shown in the pictures.





- Gently but firmly, pull the motor support backwards.

NOTE

Mind to take care from the runner, blades have cutting edges.

9.3.10 Replacement of the compressor

1 In order to access to the unit's internal parts, remove the following covers depending on access restrictions:

   a. Remove the cycle service cover as described in section *"9.3.1 Removing cycle service cover"*.

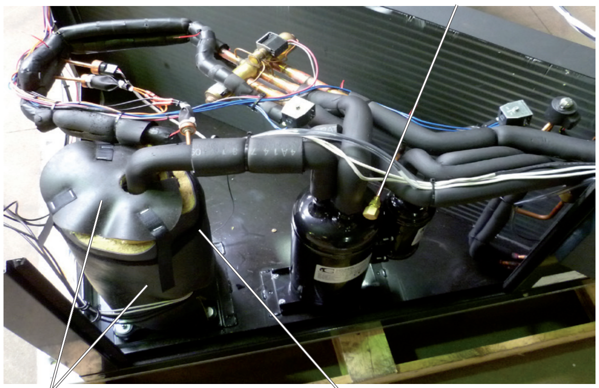
   b. If upper cover can be removed, remove it as described in section *"9.3.6 Removing upper cover"*.

2 Collect the refrigerant as explained in section *"3.4.4 Pump down refrigerant"*.

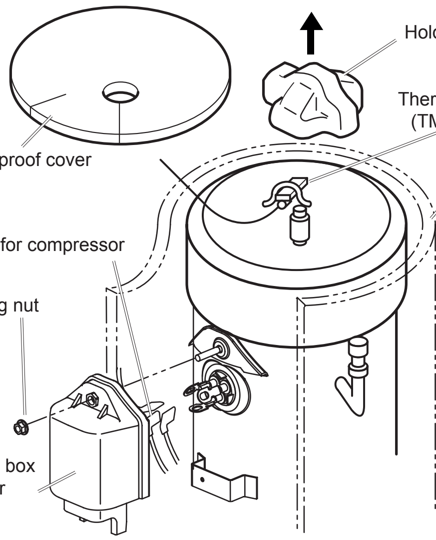
3 Open the sound-proof cover wrapped around the compressor and remove the terminal box cover from the compressor fixed by 1 screw. Disconnect the compressor wires in the terminal box.

NOTE

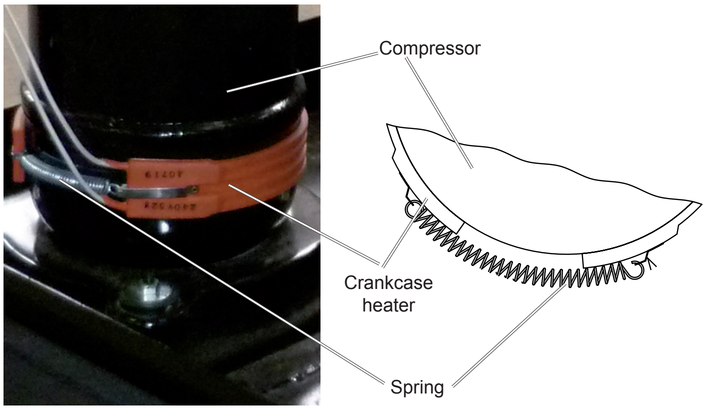
- *Make sure that the Faston terminals for the compressor are normal. Any lack of grip should lead to a change of the old terminals for new ones. It is recommended to clamp the fasten terminals to improve the contact.*
- *Check and take note of each terminal number and indications for its correct connection at the reassembling process. If wires are connected in incorrect order, it will lead to a compressor failure.*



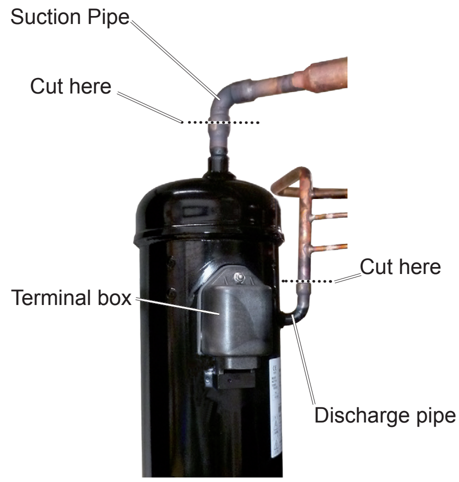
4 Remove the sound-proof cover at the top of the compressor and remove the rubber cap (holder) and the thermistor (THM9) at the top of the compressor.



5 Remove the crankcase heater by releasing the spring.



6 Remove the suction pipe and discharge pipe from compressor.



NOTE

- *Compressor piping are 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.*

NOTE

Be sure to separate the blazing burner flame sufficiently from the wires and electrical components around the brazed part in order to avoid burning.

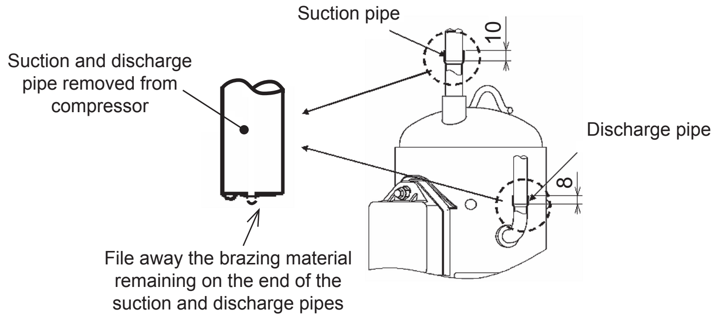
When replacing the compressor, the brazed material used for connecting the compressor and refrigerant pipes can drop into the pipes and get sucked into the compressor, causing a compressor failure. To avoid this, take the following points into account when replacing the compressor:

a. File away brazing material remaining on the end of the refrigerant pipes.

CAUTION

Be careful to avoid filed brazing material entering into the pipes.

b. Insert the pipes fully in to prevent brazing material from entering them.



c. Refer to the table for the recommended amount of brazing material. If using more brazing material than the recommended amount, it may drop into the pipes.

CAUTION

When brazing the pipes, prevent oxidized scale formation by nitrogen substitution.

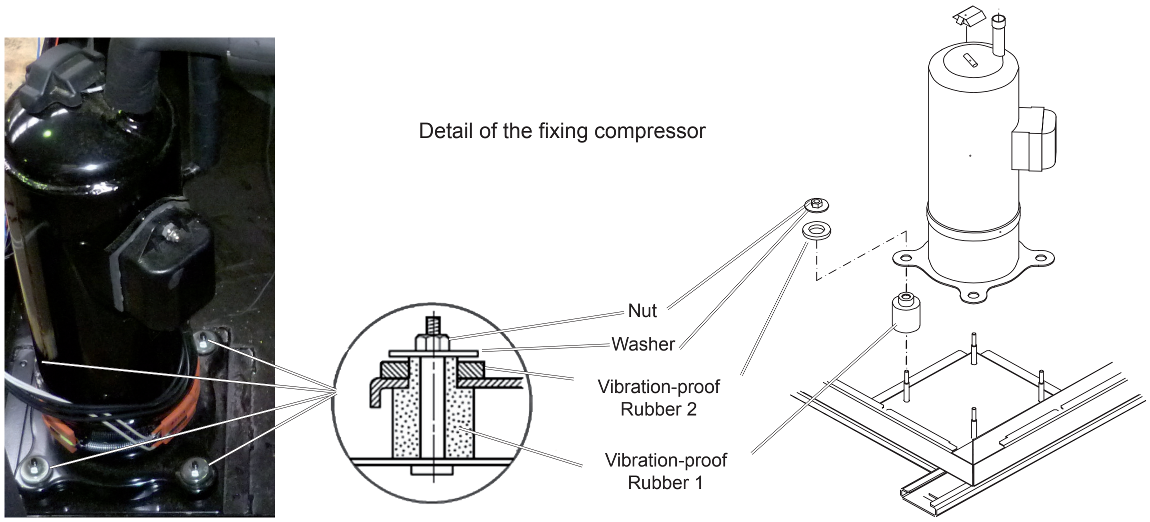
Thickness of brazing material	Piping diameter (refrigerant cycle side) (mm)						
	Ø6.35	Ø9.52	Ø12.7	Ø15.88	Ø19.05	Ø22.2	Ø28.2
Ø1.6mm	25	30	35	75	100	110	225
Ø2.0mm	15	15	20	45	55	70	135
Ø2.4mm	10	10	15	30	35	45	90

7 Remove the 4 nuts fixing the compressor and remove the compressor. When doing this, pay special attention not to touch or deform the surrounding pipes.

NOTE

If the upper cover had not been removed, lift it to facilitate the removal of the compressor.

To lift the upper cover, proceed as described in section “9.3.6 Removing upper cover”



8 Isolate the wires and electrical components to protect them from the burner flame when brazing the connection pipes.

9 Replace the compressor in the reverse procedure

a. Check if the Faton terminal has any abnormality. (Ensure the pull out force greater than 20 Nm). If the Faston terminal is identified faulty, replace it with a new one.

b. Ensure the fixture of the lead wires.

c. Surely fix the terminal box by tightening the closing nut (tightening torque: 3.0 Nm).

d. Attach the top of sound-proof cover to cover surely the compressor.

e. Wrap the sound-proof cover to cover the terminal box and the discharge pipe.

f. Attach the crankcase heater without torsion and gap to the compressor as shown in the figure.

CAUTION

Risk of fire. Smokes and other damages may occur. 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.

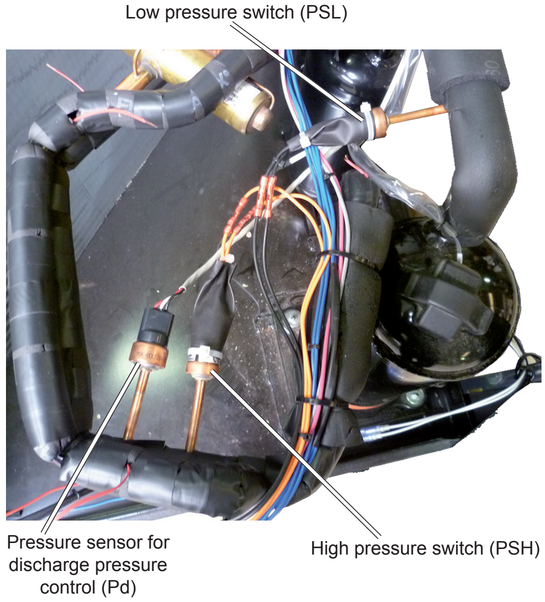
9.3.11 Replacement of the pressure protection devices

1 In order to access to the unit's internal parts, remove the following covers and panels depending on access restrictions:

a. If upper cover can be removed, remove it as described in section *"9.3.6 Removing upper cover"* and access to the unit's internal parts from the upper side.

b. If upper cover can be removed, remove the cycle service cover as described in section *"9.3.1 Removing cycle service cover"*.

2 Collect the refrigerant as explained in section *"3.4.4 Pump down refrigerant"*.

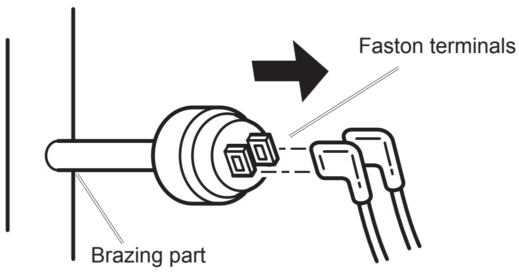


3 To remove the pressure protection devices, proceed as follows

High pressure switch (PSH) and Low pressure switch (PSL)

a. Disconnect the Faston terminals from the high pressure switch.

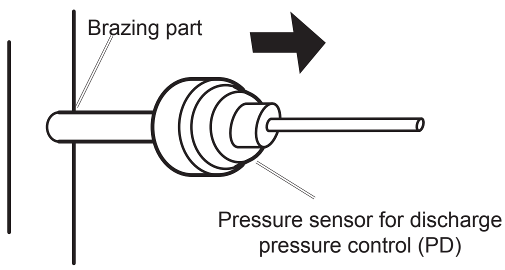
b. Using a burner, cut the high pressure switch from the brazing neck of discharge pipe (for PSH) and suction pipe (for PSL).



Pressure sensor for discharge pressure control (Pd)

a. Cut de pressure sensor from the brazing neck of discharge pipe

b. Disconnect the pressure sensor connector from CN100 of RASC PCB1, and then, remove the pressure sensor.



4 When reassembling, perform the procedure in the reverse order of removing.

NOTE

Fix the wires by plastic bands to the original position.

9.3.12 Replacement of the reversing valve coil

1 In order to access to the unit's internal parts, remove the following covers and panels depending on access restrictions:

a. If upper cover can be removed, remove it as described in section *"9.3.6 Removing upper cover"* and access to the unit's internal parts from the upper side.

b. If upper cover cannot be removed, remove the cycle service cover as described in section *"9.3.1 Removing cycle service cover"*.

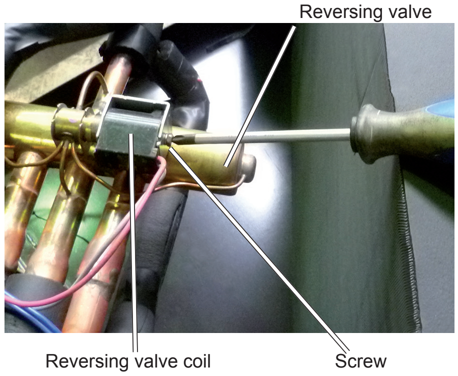
2 Disconnect the PCN100 connector on the RASC PCB1.

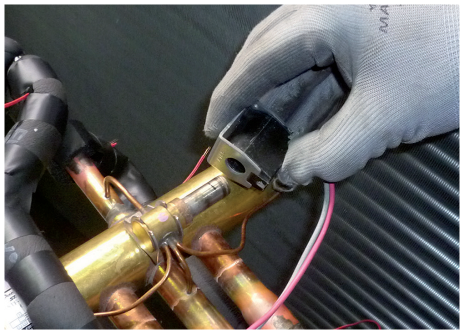
3 Remove the reversing valve coil by removing the screw fixing the coil.

4 When reassembling, perform the procedure in the reverse order of removing.

NOTE

Fix the wires by plastic bands to the original position.





9

9.3.13 Replacement of the expansion valve coil

1 In order to access to the unit's internal parts, remove the following covers and panels depending on access restrictions:

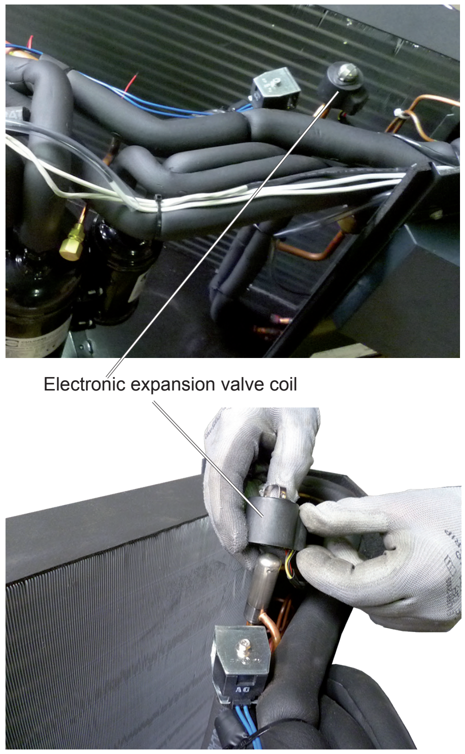
   a. If upper cover can be removed, remove it as described in section *"9.3.6 Removing upper cover"* and access to the unit's internal parts from the upper side.

   b. If upper cover cannot be removed, remove the cycle service cover as described in section *"9.3.1 Removing cycle service cover"*.

2 Disconnect the CN5A connector on the RASC PCB1.

3 Hold the coil of the expansion valve and pull out upward. It is easier to remove the expansion valve coil if it is rotated while pulling it upward.

4 When reassembling after replacing the expansion valve coil, perform the procedure in the reverse way of removing. The expansion valve coil is equipped with a lock mechanism. After attaching the expansion valve coil, rotate it until the sound of locking is heard.



NOTE

Fix the wires by plastic bands to the original position.

9.3.14 Replacement of the solenoid valve coil (SVA and SVC)

1 In order to access to the unit's internal parts, remove the following covers and panels depending on access restrictions:

   a. If upper cover can be removed, remove it as described in section *"9.3.6 Removing upper cover"* and access to the unit's internal parts from the upper side.

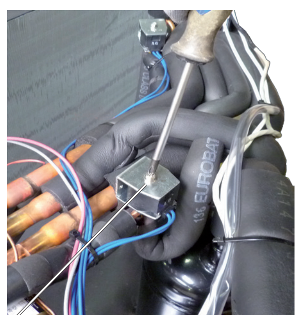
   b. If upper cover cannot be removed, remove the cycle service cover as described in section *"9.3.1 Removing cycle service cover"*.

2 Unplug the connector PCN7 (for SVA) and PCN14 (for SVC) on the RASC PCB1.

3 Unscrew the fixing screw, and remove the solenoid valve coils (SVA and SVC) by pulling upward.

Removing Solenoid Coil (SVC)

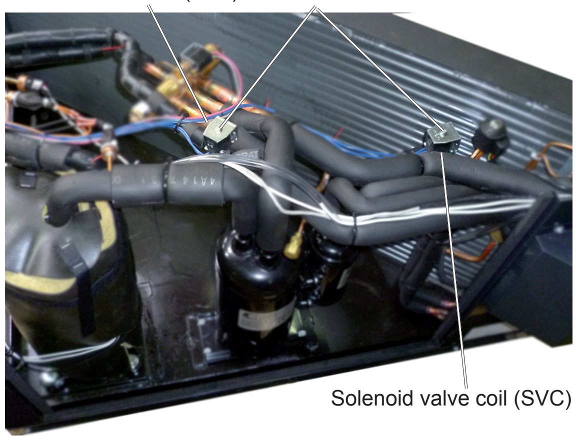
Removing Solenoid Coil (SVA)



4 When reassembling after replacing the solenoid valve coil, perform the procedure in the reverse order of removing.

NOTE

Fix the wires by plastic bands to the original position.



9.3.15 Replacement of the reversing valve

1 In order to access to the unit's internal parts, remove the following covers and panels depending on access restrictions:

   a. If upper cover can be removed, remove it as described in section *"9.3.6 Removing upper cover"* and access to the unit's internal parts from the upper side.

   b. If upper cover cannot be removed, remove the cycle service cover as described in section *"9.3.1 Removing cycle service cover"*.

2 Collect the refrigerant as explained in section *"3.4.4 Pump down refrigerant"*.

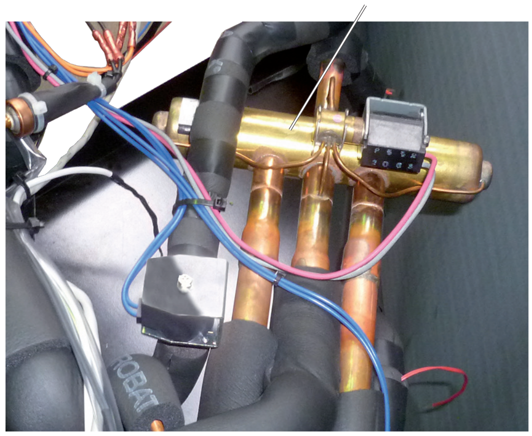
3 Remove the reversing valve coil according to the section *"9.3.12 Replacement of the reversing valve coil"*

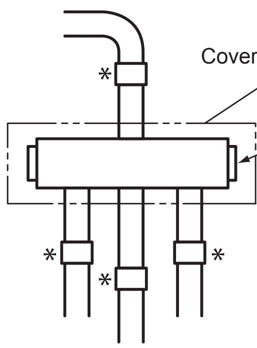
4 Remove the reversing valve assemblies from the 4 brazed parts (*) where it is fixed. Remove the brazing of the reversing valve using a blowtorch. Cool down the piping side covering it with wet cloth, in order to avoid brazing material entering the reversing valve. Protect the connecting wires and pipe insulation from the brazing flame.

5 Remove the reversing valves from its assemblies (4 brazed parts).

   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.

6 When reassembling after replacing the reversing valve, perform the procedure in the reverse way of removing.





NOTE

Fix the wires by plastic bands to the original position.

9.3.16 Replacement of the expansion valve and solenoid valves (SVA, SVC)

1 In order to access to the unit's internal parts, remove the following covers and panels depending on access restrictions:

   a. If upper cover can be removed, remove it as described in section *"9.3.6 Removing upper cover"* and access to the unit's internal parts from the upper side.

   b. If upper cover cannot be removed, remove the cycle service cover as described in section *"9.3.1 Removing cycle service cover"*.

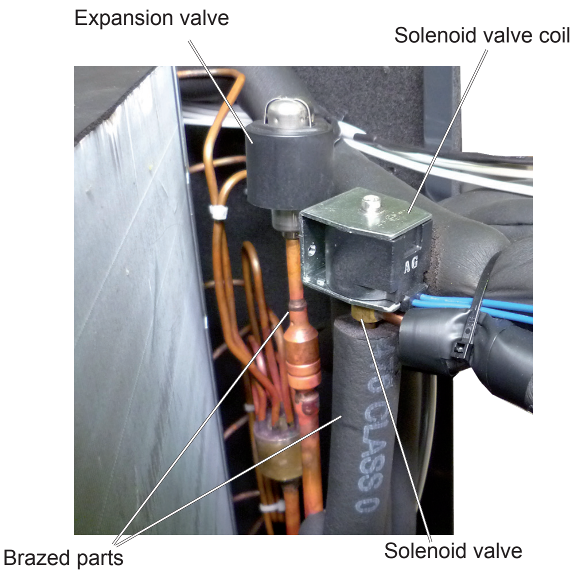
2 Collect the refrigerant as explained in section *"3.4.4 Pump down refrigerant"*.

3 Remove the coils according to the sections *"9.3.13 Replacement of the expansion valve coil"* and *"9.3.14 Replacement of the solenoid valve coil (SVA and SVC)"* in this chapter.

4 Remove the brazing parts using a blowtorch and previously cooling the pipe side with wet cloth in order to avoid brazing material entering the reversing valve.

5 Protect the connecting wires and pipe insulation from the brazing flame.

6 When reassembling after replacing the expansion valve or the solenoid valves, perform the procedure in the reverse order of removing.



NOTE

Fix the wires by plastic bands to the original position.

9.3.17 Removal of the electrical components (for 4-6 HP)

DANGER

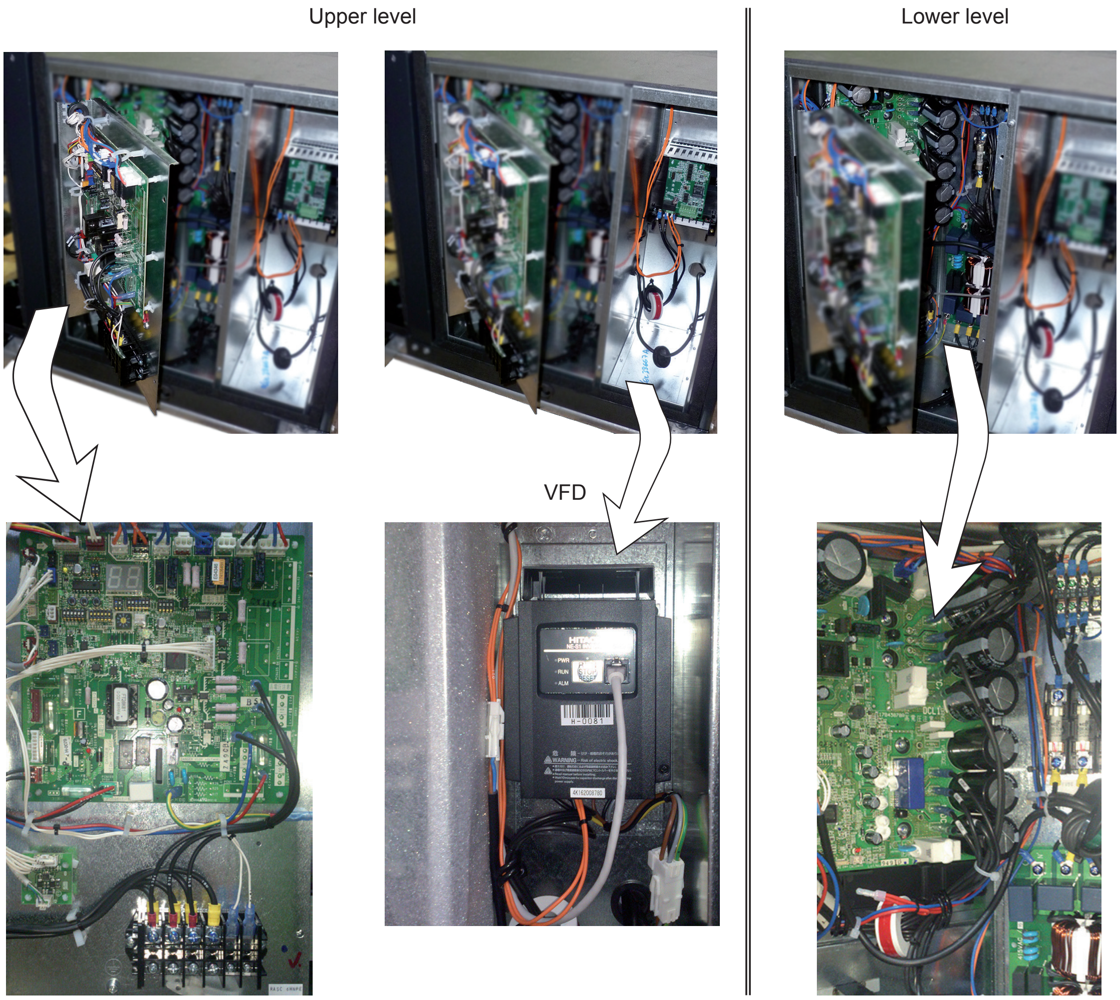
Electrical hazard. Risk of death.

- ***Do not touch the electrical components when LED1 (Red) of PCB1 or LED201 (Red) of DIP-IPM are ON in order to avoid an electrical shock.***
- ***Do not touch the electrical components of the PCB box directly.***

NOTE

When handling the PCB's, take care of components. Do not apply excessive force to them, in order to avoid damaging the motherboard and failures.

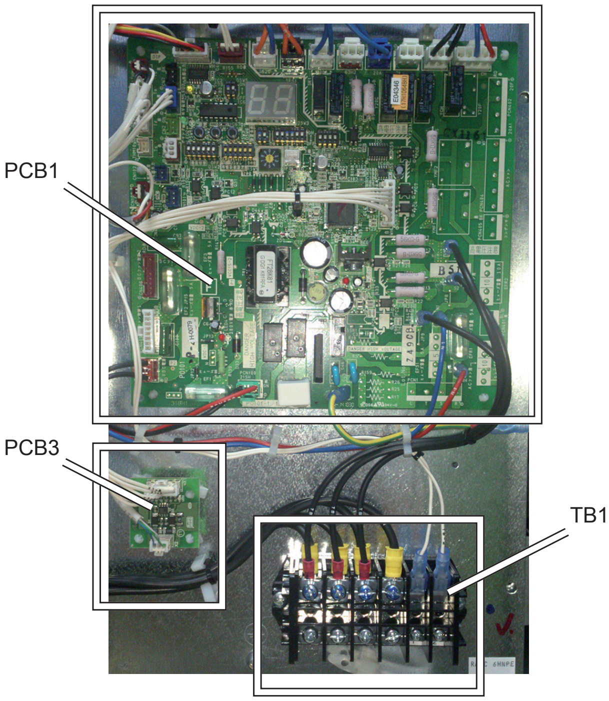
The electrical components of the electrical box are distributed in two levels: upper level and lower level.



1. To access to the upper level, remove the electrical box cover as described in section *"9.3.3 Removing electrical box service cover".*
2. To access to the lower level, remove the 2 screws that fix the upper level plate, gently pull the upper level and the lower level becomes accessible.

◆ Upper level

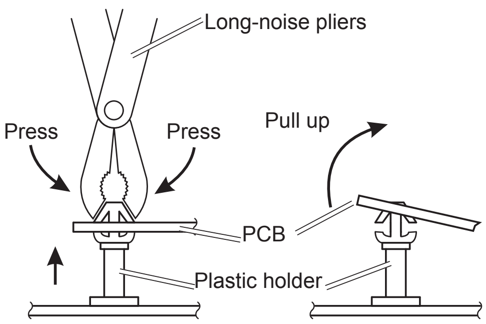
Upper level is accessible by only removing the electrical box service cover as described in section *“9.3.3 Removing electrical box service cover”*.



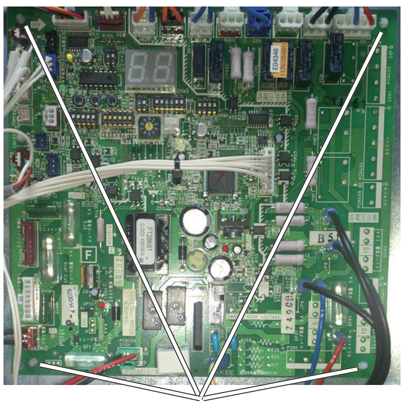
Mark	Part name
PCB1,3	Printed circuit boards 1,3
TB1	Terminal board

Removal of PCB’s (PCB1, PCB3)

1. Disconnect all the connectors in the PCB.
2. Remove the PCB by pressing the expanded part of the 4 plastic holders, using long-nose pliers, as shown in the picture below.
3. Pull the PCB out from the PCB plate.

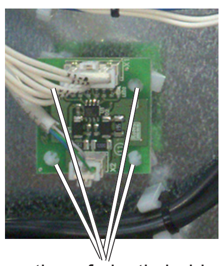


(PCB1)



Location of plastic holders

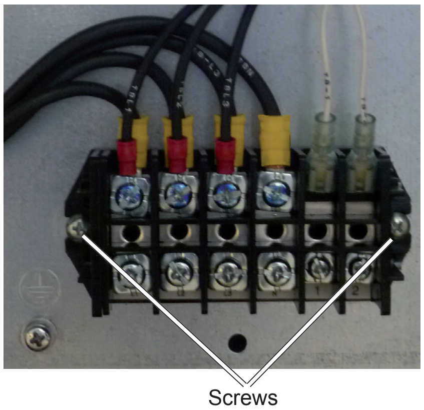
(PCB3)



Location of plastic holders

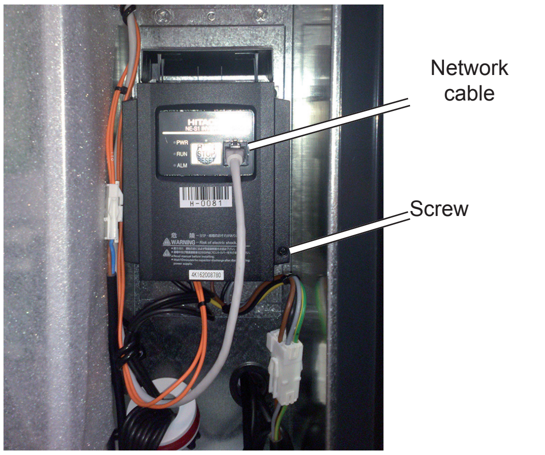
Removal of the terminal board (TB1)

1 Disconnect the power supply cables and the transmitting cables.
2 Unscrew the 2 screws and remove the terminal board.

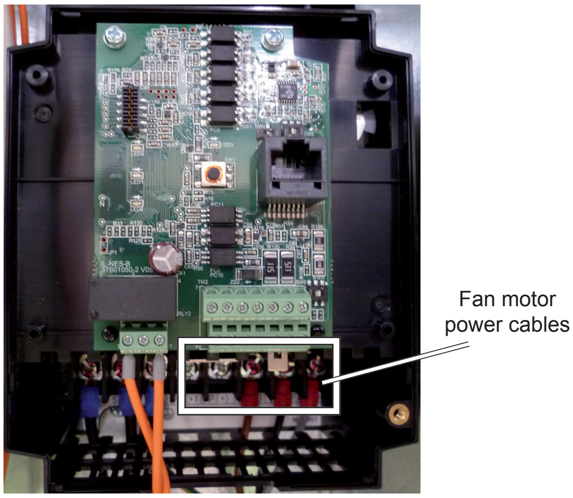


Removal of the variable frequency driver (VFD)

1 The control cables are located underneath the VFD cover. To remove the VFD cover, remove previously the network cable, and then, loosen the screw at the right side of the VFD. Gently pull the cover backwards.

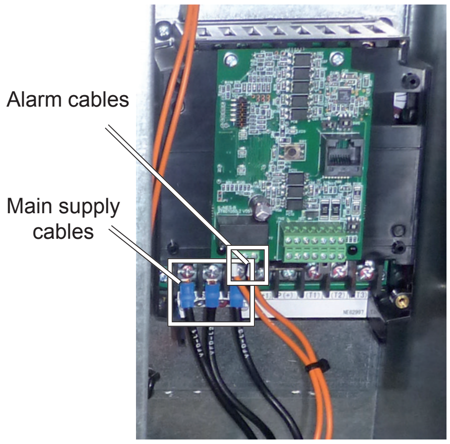


2 Disconnect the fan motor power cables (T1, T2, T3) and the fan motor earth cable from the variable frequency driver.

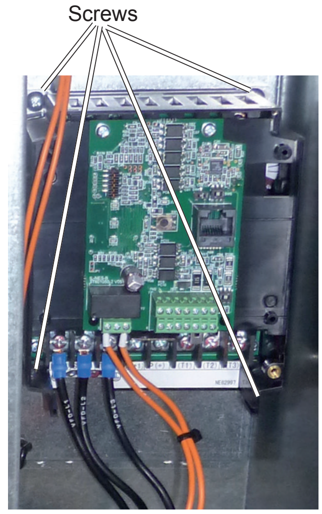


3 Disconnect the rest of the connected cables.

- Main supply cables (L1, L2 and L3).
- Alarm cables.



4 Remove the VFD by unscrewing the 4 screws which fix the VFD to the plate.



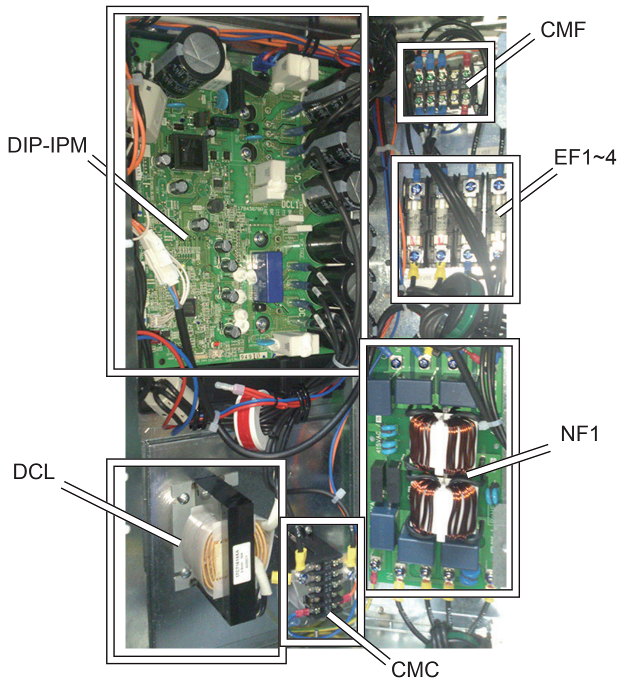
◆ Lower level

DANGER

Electrical hazard. Risk of death.

- ***Do not touch the electrical components when LED1 (Red) of PCB1 or LED201 (Red) of DIP-IPM are ON in order to avoid an electrical shock.***
- ***Do not touch the electrical components of the PCB box directly.***

The lower level is accessible by removing the 2 screws which fix the upper plate of the electrical box and turn it towards the front side as it has been explained at the beginning of section *"9.3.17 Removal of the electrical components (for 4-6 HP)"*.



Mark	Part name
DIP-IPM	Inverter PCB
NF1	Noise filter
DCL	Reactor
CMC	Magnetic contactor for compressor
CMF	Magnetic contactor for fan
EF1~4	Power fuses

9

Removal of the inverter PCB (DIP-IPM)

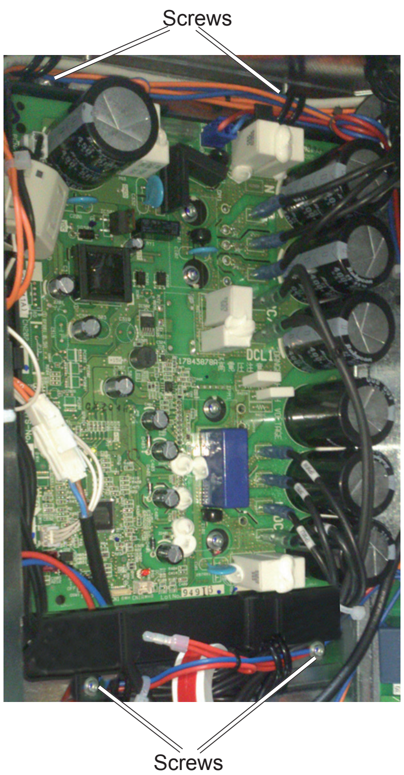
DANGER

Electrical hazard. Risk of death.

- ***Do not touch the electrical components when the LED201 (Red) of DIP-IPM is ON in order to avoid an electrical shock.***
- ***Do not touch the electrical components of the PCB box directly.***

1 Disconnect all the connectors in the DIP-IPM.

2 Remove the DIP-IPM by removing the 4 screws located at the top and bottom of the plastic plate that holds the DIP-IPM.

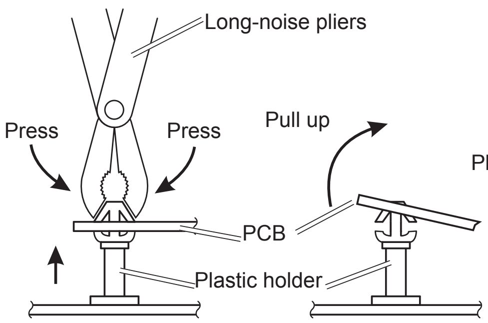


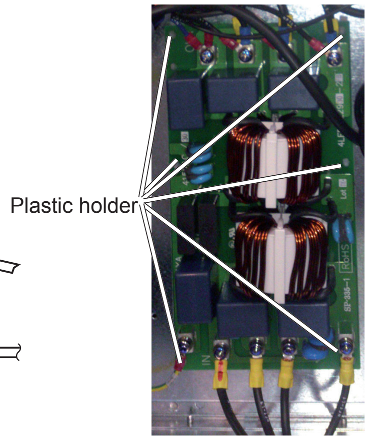
Removal of the noise filter (NF1)

1 Disconnect all the wires connected to the noise filter (NF1).

2 Remove the noise filter by pressing the expanded part of the 4 plastic holders, using long-nose pliers, as shown in the picture below.

3 Pull the noise filter plate out of the plastic holders.

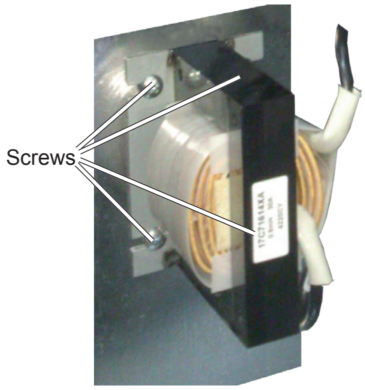




Removal of the reactor (DCL)

1 Disconnect the wires connected with the DCL.

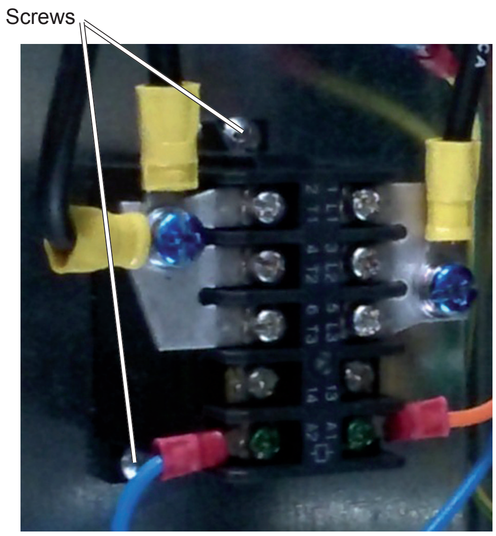
2 Remove the 4 screws fixing the DCL and remove it.



Removal of the magnetic contactor for compressor (CMC)

1 Disconnect the wires connected to the CMC.

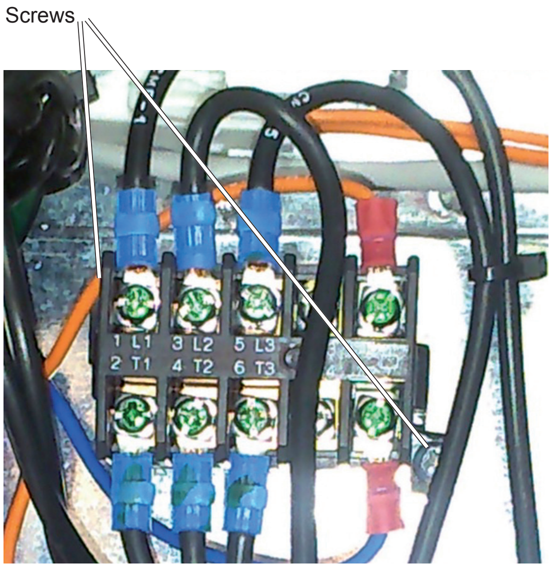
2 Remove the 2 screws fixing the CMC and remove it.



Removal of the magnetic contactor for fan (CMF)

1 Disconnect the wires connected to the CMF.

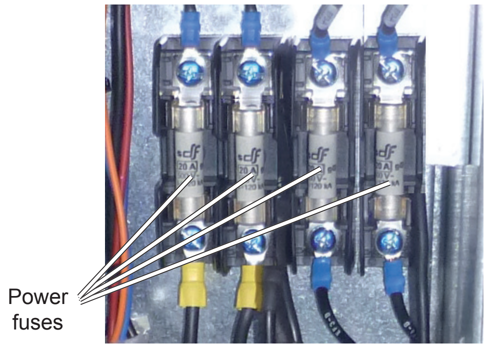
2 Remove the 2 screws fixing the CMF and remove it.



9

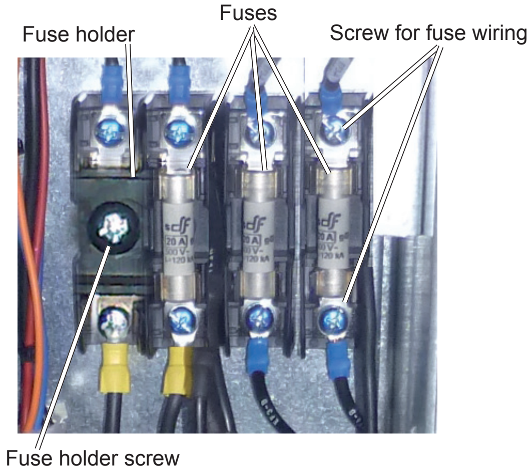
Removal of the power fuses (EF1~4)

Replace the fuses pulling up them from the fuse holder.



Removal of the fuse holder

Remove the fuse holder removing the screw. There is 1 screw for each fuse holder. Additionally, remove the screws that fix the wiring to the fuse holder.



9.3.18 Removal of the electrical components (for 8/10 HP)

DANGER

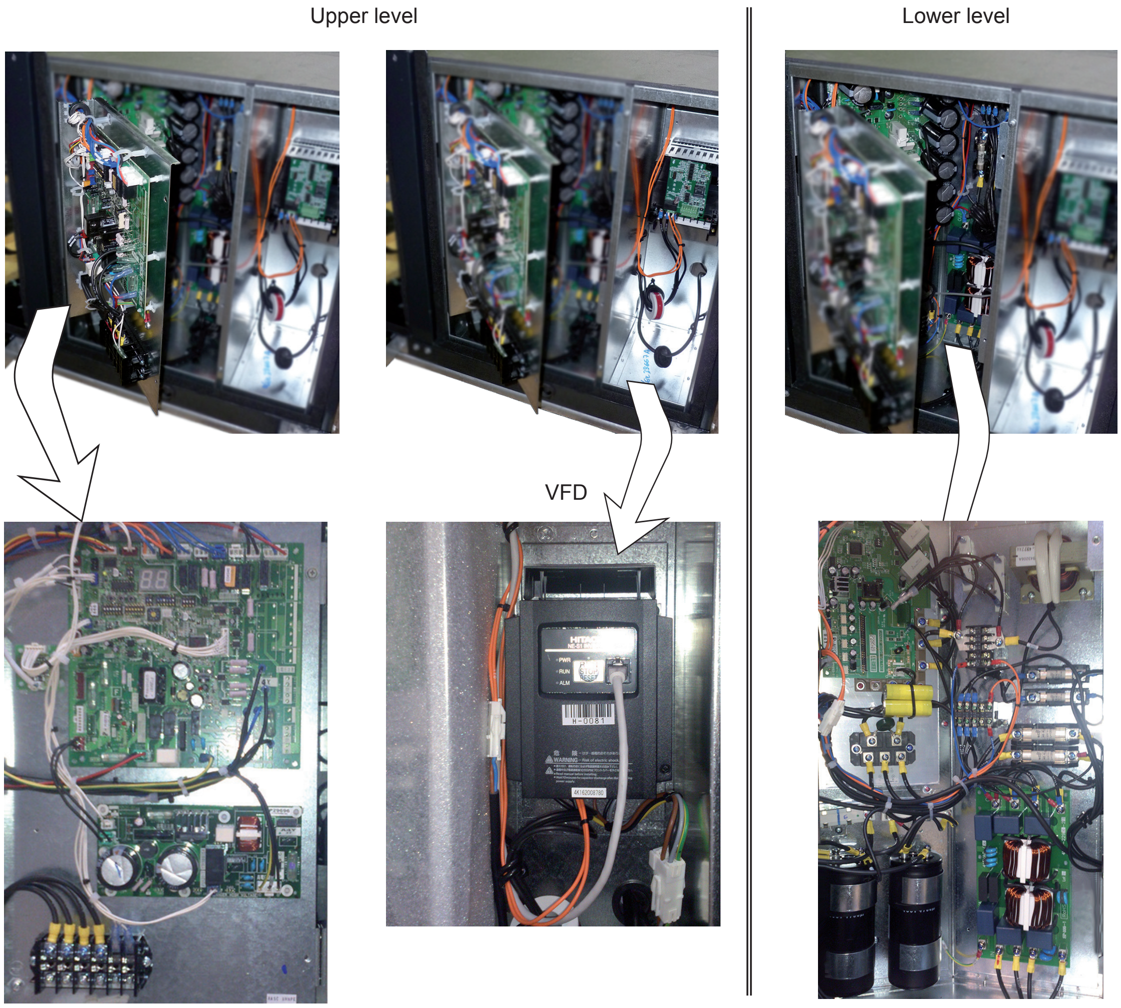
Electrical hazard. Risk of death.

- ***Do not touch the electrical components when LED1 (Red) of PCB1 or LED201 (Red) of PCB4 are ON in order to avoid an electrical shock.***
- ***Do not touch the electrical components of the PCB box directly.***

NOTE

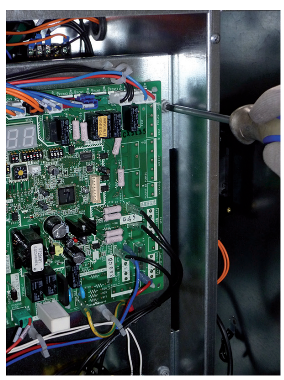
When handling the PCB's, take care of components. Do not apply excessive force to them, in order to avoid damaging the motherboard and failures.

The electrical components of the electrical box are distributed in two levels: upper level and lower level.



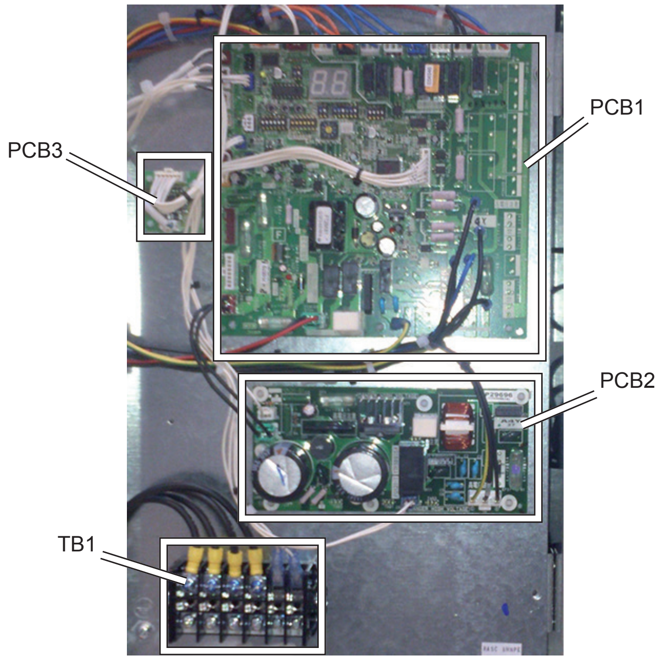
1 To access to the upper level, remove the electrical box cover as described in section *"9.3.3 Removing electrical box service cover".*

2 To access to the lower level, remove the 2 screws that fix the upper level plate, gently pull the upper level and the lower level becomes accessible.



◆ Upper level

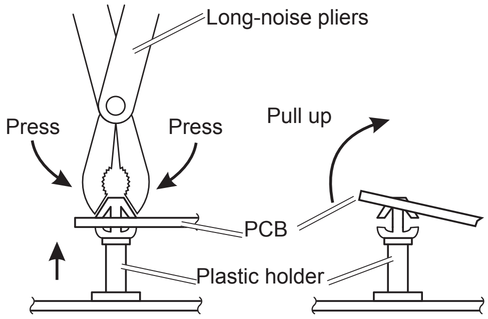
Upper level is accessible by only removing the electrical box service cover as described in section *"9.3.3 Removing electrical box service cover"*.



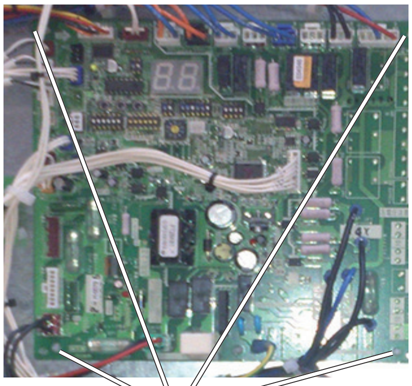
Mark	Part name
PCB1,2,3	Printed circuit boards 1, 2 and 3
TB1	Terminal board

Removal of PCB's (PCB1, PCB2 and PCB3)

1 Disconnect all the connectors in the PCB.
2 Remove the PCB by pressing the expanded part of the 4 plastic holders, using long-nose pliers, as shown in the picture below.
3 Pull the PCB out from the PCB plate.

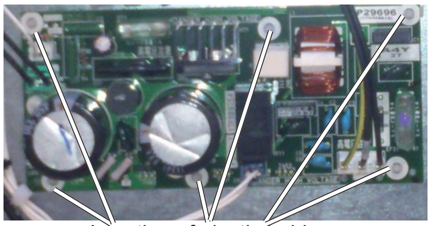


(PCB1)



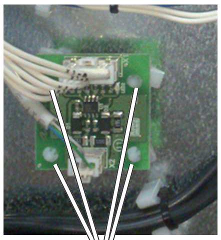
Location of plastic holders

(PCB2)



Location of plastic holders

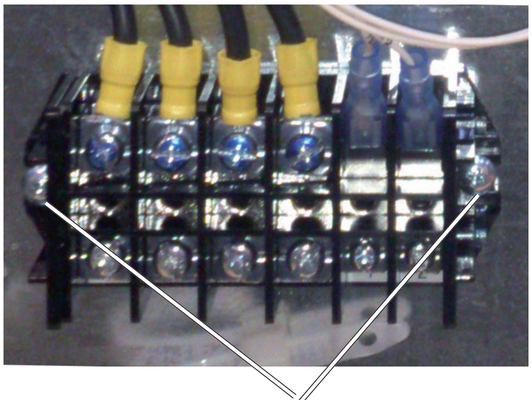
(PCB3)



Location of plastic holders

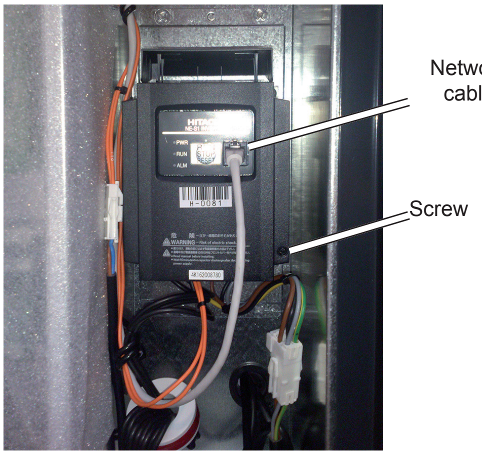
Removal of the terminal board (TB1)

1 Disconnect the power supply cables and the transmitting cables.
2 Unscrew the 2 screws and remove the terminal board.

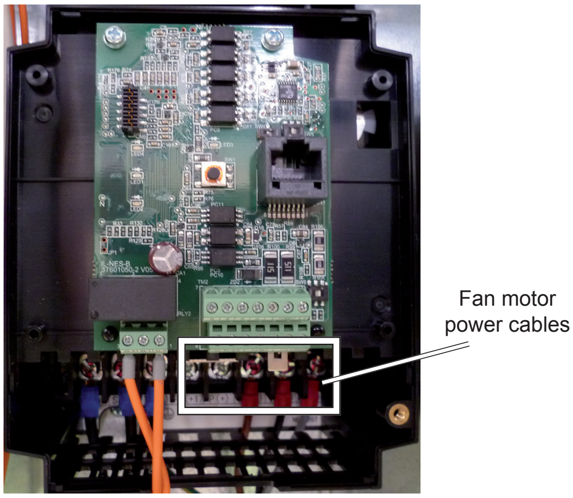


Removal of the variable frequency driver (VFD)

1 The control cables are located underneath the VFD cover. To remove the VFD cover, remove previously the network cable, and then, loosen the screw at the right side of the VFD. Gently pull the cover backwards.

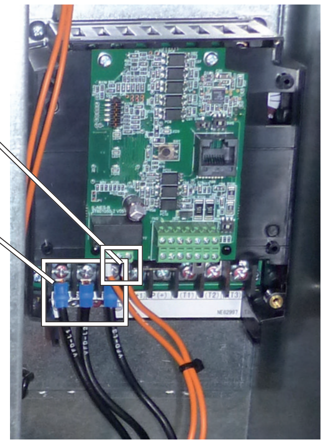


2 Disconnect the fan motor power cables (T1, T2, T3) and the fan motor earth cable from the variable frequency driver.

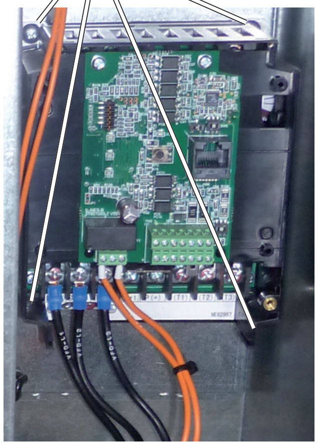


3 Disconnect the rest of the connected cables.

- Main supply cables (L1, L2 and L3).
- Alarm cables.



4 Remove the VFD by unscrewing the 4 screws which fix the VFD to the plate.



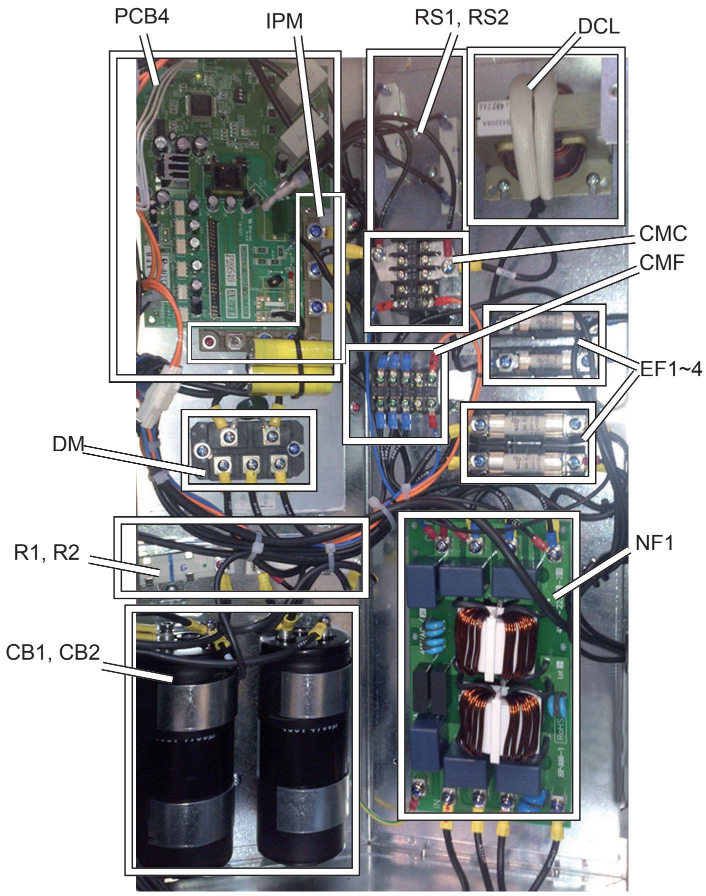
◆ Lower level

DANGER

Electrical hazard. Risk of death.

- ***Do not touch the electrical components when LED1 (Red) of PCB1 or LED201 (Red) of DIP-IPM are ON in order to avoid an electrical shock.***
- ***Do not touch the electrical components of the PCB box directly.***

The lower level is accessible by removing the 2 screws which fix the upper plate of the electrical box and turn it towards the front side as it has been explained at the beginning of section *"9.3.18 Removal of the electrical components (for 8/10 HP)".*



Mark	Part name
PCB4-IPM	Inverter power module
DM	Diode Module
NF1	Noise filter
DCL	Reactor
CMC	Magnetic contactor for compressor
CMF	Magnetic contactor for fan
CB1, CB2	Capacitors
R1, R2	Resistors
RS1, RS2	Resistors
EF1~4	Power fuses

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Removal of the Inverter PCB(PCB4) and the inverter power module (IPM)

DANGER

Electrical hazard. Risk of death.

- ***Do not touch the electrical components when the LED201 (Red) of DIP-IPM is ON in order to avoid an electrical shock.***
- ***Do not touch the electrical components of the PCB box directly.***

Disconnect all the wirings connected to the transistor module as shown in the figure.

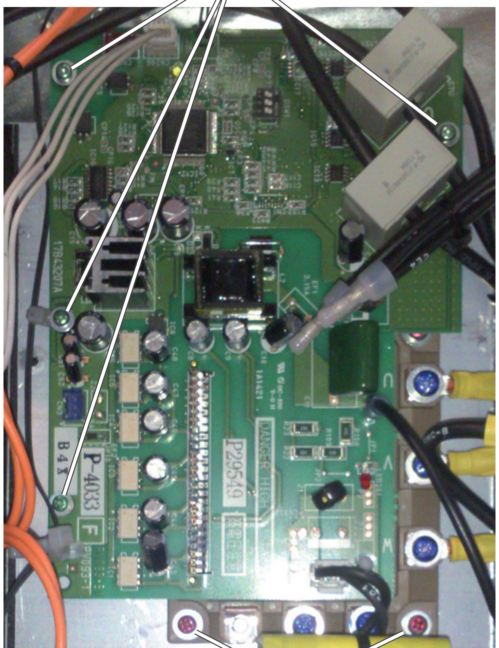
1. Disconnect all the wirings from PCB4.
2. Disconnect the wirings from P, N, U, V, W on the IPM.
3. Remove the 4 screws fixing the PCB4 and then remove the PCB4 from the transistor module.
4. Remove the 4 fixing screws on the IPM.
5. Remove the transistor module from the electrical box.

NOTE

- *The correct position of the marks on the PCB4 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 electrical wires will not be caught between the mounting electrical components and the mounting plates when the PCB4 is remounted.*
- *Apply silicon grease evenly on the whole rear side of the transistor module when mounting. Silicon grease is available as a field-supplied accessory.*

(PCB4 and transistor module (IPM)

Screws



Screws

Removal of the diode module (DM)

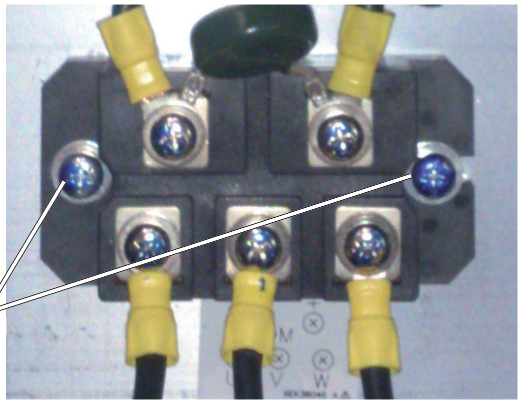
Disconnect all the wirings connected to the diode module as shown in the picture:

1. Disconnect all the wirings of the terminals +, -, U, V, W on the diode module (DM).
2. Remove the 2 screws fixing the diode module.
3. Remove the diode module from the electrical box.

NOTE

- *Identify the terminal Nos. with the mark band Nos. when reassembling. If incorrectly connected, malfunction or damage will occur.*
- *Apply silicon grease evenly on the whole rear side of the diode module when mounting. Silicon grease is available as a field-supplied accessory.*

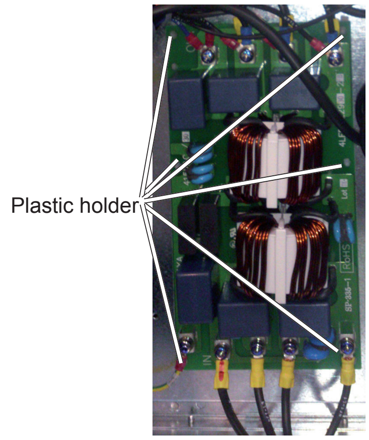
- +



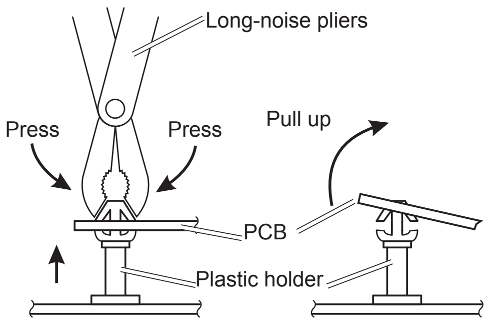
Screws

U V W

Removal of the noise filter (NF1)

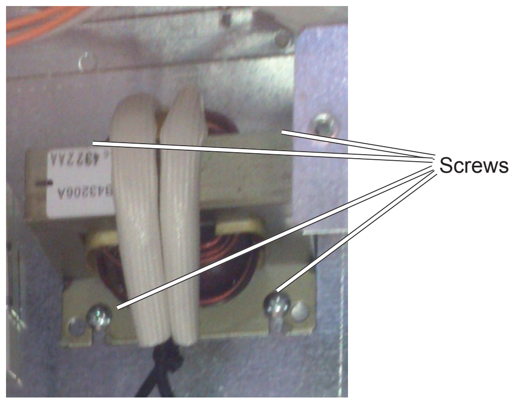


1. Disconnect all the wires connected to the noise filter (NF1).
2. Remove the noise filter by pressing the expanded part of the 4 plastic holders, using long-nose pliers, as shown in the picture below.
3. Pull the noise filter plate out of the plastic holders.



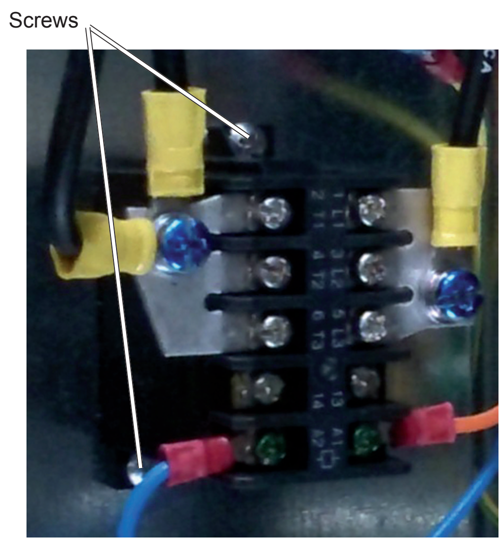
Removal of the reactor (DCL)

1. Disconnect the wires connected with the DCL.
2. Remove the 4 screws fixing the DCL and remove it.



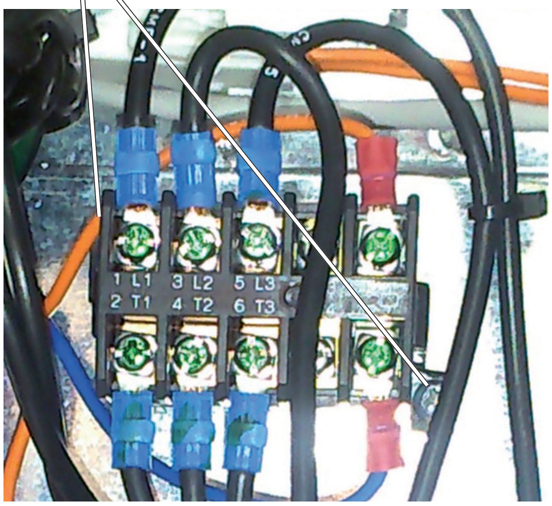
Removal of the magnetic contactor for compressor (CMC)

1. Disconnect the wires connected to the CMC.
2. Remove the 2 screws fixing the CMC and remove it.



Removal of the magnetic contactor for fan (CMF)

1. Disconnect the wires connected to the CMF.
2. Remove the 2 screws fixing the CMF and remove it.



Removal of the capacitors (CB1, CB2)

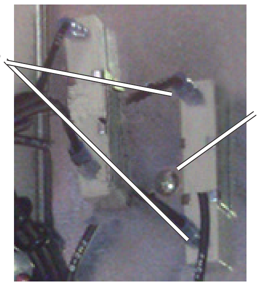
1. Disconnect all the wires connected to the capacitors (CB1, CB2). The wires have polar characters. Identify the wire mark and the indication on the capacitor when reconnecting the wiring.
2. Remove the 4 screws that fix the capacitor and remove it.

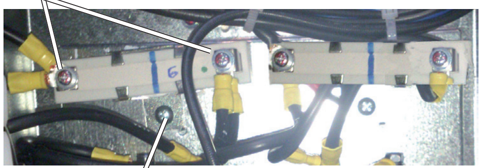
Removal of the resistors (R1, R2 and RS1, RS2)

1. Disconnect the wires connected to the resistors.
2. Remove the 1 fixing screw in order to remove the resistor.

NOTE

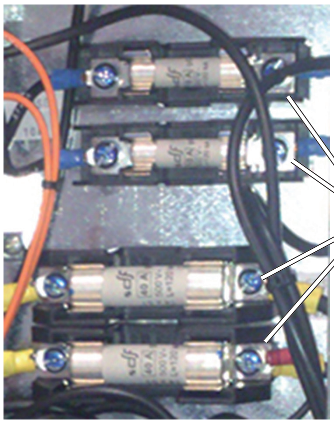
Although the wirings and the fixing screw are marked only in one resistor, all the resistors are connected and fixed in the same way.





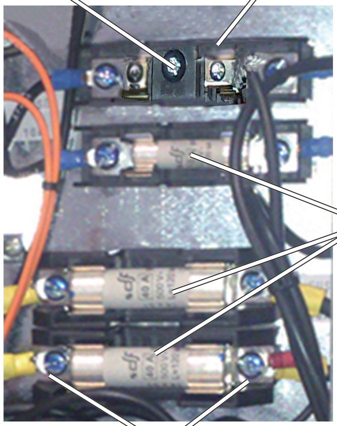
Removal of the power fuses (EF1~4)

Replace the fuses pulling them up from the fuse holder.



Removal of the fuse holder

Remove the fuse holder removing the screw. There is 1 screw for each fuse holder. Additionally, remove the screws that fix the wiring to the fuse holder.



10. Troubleshooting

Index

10.1 Initial troubleshooting

10.1.1 Checking using the 7-segment display

◆ Simple checking procedure using the 7-segment display

1. Turn on all the indoor units which are connected to the RASC unit.
2. Turn on the RASC unit
3. Auto-addressing starts. (RASC unit printed circuit board PCB 1). During the auto-addressing, you can check the following items using the 7-segment display of the RASC unit.
   - **a.** Disconnection of the power supply to the indoor unit.
   - **b.** Reverse connection of the operating line between the RASC unit and indoor units. In this case, “03” appears after 30 seconds.
   - **c.** Duplication of the indoor unit number. See alarm code 35.

Normal case

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

Abnormal case

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

Cause	Indication	Remarks
The indoor units are not supplied with power.	03	Continues to flash after 30 seconds.
Disconnection of the operating line between the RASC units and the indoor units.	03	Continues to flash after 30 seconds.
Duplicated settings of the indoor unit number on the rotary switch RSW (Refer to the section *“10.2.3 Troubleshooting by alarm code”* for the description of the alarm code "35").	35	

10.1.2 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 using 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
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 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 using 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 using the self-check mode *2)	Replace PCB if it failed
Incorrect wiring connection		Take action according to the procedure that is displayed in "TEST RUN"	

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

*2): Refer to section *“Self-checking procedure of PCB by means of the remote control switch”*.

10.1.3 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 using 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 using the self-check mode *2)	Replace PCB if it failed

NOTE

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

**2): Refer to section “Self-checking procedure of PCB by means of the remote control switch”.*

10.1.4 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 RASC fan or the compressor does not operate)	Failure of the indoor unit fan motor	Disconnected coil	Measure the coil resistance using the tester	Replace the indoor unit fan motor
		Burnt-out coil	Measure the insulation resistance	
	Failure of the RASC unit fan motor	Disconnected coil	Measure the coil resistance using the tester	Replace the RASC unit fan motor
		Burnt-out coil	Measure the insulation resistance	
	Failure of the magnetic switch for the RASC unit fan motor	Insufficient contacting	Measure the voltage between the contacting parts	Replace PCB for the RASC unit
	Failure of the compressor motor		Measure the resistance between two wires	Replace the compressor
	Failure of the compressor		Check for an abnormal sound from the compressor	
	Failure of the magnetic switch for compressor	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 using the self-check mode *2)	Replace PCB if it failed

<table>
<tr><th>Phenomenon</th><th colspan="2">Cause</th><th>Check item</th><th>Action
(Turn OFF the main switch)</th></tr>
<tr><td rowspan="6">The compressor does not stop or start even if the setting temperature on the LCD changes to *3)</td><td rowspan="2">Failure of air inlet thermistor</td><td>Failure of thermistor</td><td rowspan="3">Check it by self-checking *1)</td><td rowspan="3">Replace or correctly connect the wires if abnormal operation exists</td></tr>
<tr><td>Disconnection of thermistor</td></tr>
<tr><td colspan="2">Abnormal operation of the remote control switch cord</td></tr>
<tr><td colspan="2">Failure of the indoor unit PCB</td><td>Check PCB using the self-check mode *2)</td><td>Replace PCB if it failed</td></tr>
<tr><td colspan="2">Incorrect optional setting</td><td>Check the setting condition of “remote control thermostat” using the optional setting.
Setting and control:
“00”: Control using the indoor thermistor for the suction air.
“01”: Control using the thermostat of the remote control switch.
“02”: Control using the average value of the indoor thermistor for the suction air and the thermostat of the remote control switch.</td><td>If the thermostat of the remote control switch is not used, set at “00”</td></tr>
<tr><td colspan="2">Incorrect input/output setting</td><td>Check setting condition of “i1” and “i2” by input/output setting.
* Setting and control:
“01”: Room thermostat (cooling)
“02”: Room thermostat (heating)</td><td>In case that room thermostat is not used, set for input signal actually used. If no signal is used, set at “00”</td></tr>
<tr><td colspan="5">NOTE
*1): Refer to section “Self-checking procedure of the remote control switch”.
*2): Refer to section “Self-checking procedure of PCB by means of the remote control switch”.
*3): Even if the remote control switches are normal, the compressor does not operate under the following conditions:
1 Indoor temperature is lower than 21°C or outdoor temperature is lower than -5°C during the cooling process (DB).
2 Indoor temperature is higher than 27°C (DB) or outdoor temperature is higher than 15°C (WB) during the heating process.
3 When a cooling (or heating) process signal is given to the RASC 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 RASC unit.</td></tr>
<tr><td>Air flow volume “HH2” is not indicated on the remote control switch.
(Depending on indoor unit model)</td><td colspan="2">Incorrect remote control switch model</td><td>Check that remote control switch or transition wiring for remote control switch is directly connected to indoor unit(s) with “HH2” Air flow volume function</td><td>Connect remote control switch or transition wiring for remote control switch to indoor unit(s) with “HH2” air flow volume function if necessary</td></tr>
</table>

<table>
<tr><th>Phenomenon</th><th colspan="2">Cause</th><th>Check item</th><th>Action
(Turn OFF the main switch)</th></tr>
<tr><td rowspan="4">Indoor fan speed does not change</td><td rowspan="2">Failure of the discharge air temperature thermistor</td><td>Failure of the thermistor</td><td rowspan="2">Check the thermistor using the self-check mode *1)</td><td rowspan="2">Replace or correctly connect the wiring when it is abnormal</td></tr>
<tr><td>Disconnected wire of the thermistor</td></tr>
<tr><td colspan="2">Failure of the remote control switch</td><td rowspan="2">Check it using the self-check mode *2)</td><td>Replace if it failed</td></tr>
<tr><td colspan="2">Failure of PCB for the indoor unit</td><td>Replace if PCB fails</td></tr>
<tr><td rowspan="9">No defrost operation mode is available during the heating process or the defrost operation continues</td><td rowspan="2">Failure of thermistor for RASC evaporating temperature during heating</td><td>Failure of thermistor</td><td colspan="2" rowspan="2">Replace or correctly connect when it is abnormal</td></tr>
<tr><td>Disconnected wire of thermistor</td></tr>
<tr><td rowspan="2">Failure of 4-way valve</td><td>Disconnected 4-way valve coil</td><td>Measure the resistance of coil</td><td rowspan="2">Replace the 4-way valve</td></tr>
<tr><td>Incorrect activation of 4-way valve</td><td>Enforced power supply</td></tr>
<tr><td colspan="2">Disconnected control wires between indoor unit and RASC unit</td><td>Check the connectors</td><td>Correctly connect the wiring</td></tr>
<tr><td rowspan="2">Failure of the RASC units of PCB</td><td>Disconnected wiring to PCB</td><td>Check the connectors</td><td>Correctly connect the wiring</td></tr>
<tr><td>Failure of PCB</td><td>Check PCB using the self-check mode *2)</td><td>Replace PCB when the check mode is not available</td></tr>
<tr><td rowspan="2">Failure of the indoor unit of PCB</td><td>Disconnected wiring to PCB</td><td>Check the connectors</td><td>Correctly connect the wiring</td></tr>
<tr><td>Failure of PCB</td><td rowspan="2">Check PCB using the self-check mode *2)</td><td rowspan="2">Replace if PCB fails</td></tr>
<tr><td>The LED and the LCD on the remote control switch remain ON</td><td colspan="2">Failure of PCB in the indoor unit or the remote control switch</td></tr>
</table>

NOTE

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

*2): Refer to section *"Self-checking procedure of PCB by means of 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 RASC unit	Check whether or not the temperature difference exists before/after the check valve	Replace the check valve for the RASC 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 temperature 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 RASC unit heat exchanger	Clogging of the RASC unit heat exchanger?	Remove the clogging
			Obstacles at the inlet or the outlet of the RASC unit heat exchanger	Remove the obstacles
			Is the service area for the RASC unit sufficient?	Secure the service area
			Correct fan speed?	Replace the fan motor
		Excessively high air temperature to the RASC unit heat exchanger	Short-circuited air to the RASC unit?	Remove the cause of the short-circuited air
			Any other heat load near the RASC unit?	Remove the heat source
		Excessively charged refrigerant	Expansion valve opening	Correctly charge the refrigerant
		Non-condensate gas in cycle	Check each temperature 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 temperature 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 temperature 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 temperature 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

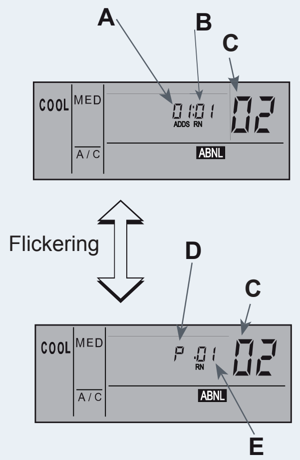
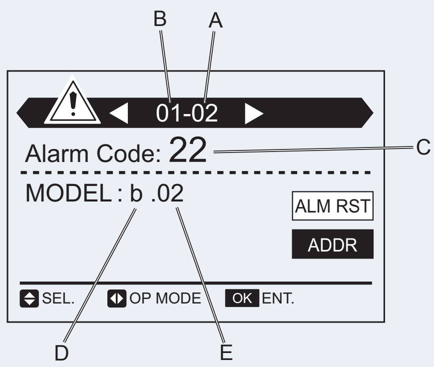
Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Insufficient heating process	Indoor heat load is greater than the heating capacity		Calculate the heat load	Replace the unit with a bigger unit
	Excessively low suction pressure	Gas leakage or insufficient refrigerant charge	Measure superheat	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 IU/ RASC unit strainer	Check the temperature difference between the inlet and the outlet of strainer	Replace the strainer for the RASC unit or the indoor unit
		Clogging of suction piping	Check the temperature difference of each part	Remove the clogging
		Insufficient air flow through the RASC unit heat exchanger	Is the RASC unit heat exchanger clogged?	Remove the clogging
			Are there any obstacles at the inlet or the outlet of RASC unit?	Remove the obstacles
			Is the service area for the RASC unit sufficient?	Secure a sufficient service area
			Check the speed of the RASC unit fan	Replace the fan motor
		Excessively low air temperature through the RASC unit heat exchanger	Check for any short-circuited air to the RASC 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

<table>
<tr><th>Phenomenon</th><th colspan="2">Cause</th><th>Check item</th><th>Action
(Turn OFF the main switch)</th></tr>
<tr><td rowspan="11">Insufficient heating process</td><td rowspan="7">Excessively high discharge pressure</td><td rowspan="3">Insufficient air flow to the indoor unit heat exchanger</td><td>Check the filter for a clogging</td><td>Remove the clogging</td></tr>
<tr><td>Check for any obstacles at the inlet or the outlet of the indoor unit</td><td>Remove the obstacles</td></tr>
<tr><td>Check the indoor fan speed</td><td>Replace the fan motor</td></tr>
<tr><td>Excessively high air temperature to the indoor unit heat exchanger</td><td>Check whether or not the short-circuited air exists</td><td>Remove the cause of the short-circuited air</td></tr>
<tr><td>Excessively charged refrigerant</td><td>Check the refrigerant quantity *1)</td><td>Correctly charge the refrigerant</td></tr>
<tr><td>Non-condensate gas in refrigerant cycle</td><td>Check the refrigerant quantity *1)</td><td>Recharge the refrigerant after the vacuum pumping</td></tr>
<tr><td>Clogging of the discharge pressure piping</td><td>Check for clogging</td><td>Remove the clogging</td></tr>
<tr><td colspan="2">Malfunction or internal leakage of the 4-way valve</td><td>Check the temperature difference at the inlet and the outlet of the 4-way valve</td><td>Replace the 4-way valve</td></tr>
<tr><td colspan="2">Malfunction of the check valve of the RASC unit</td><td>Check the temperature difference at the inlet and the outlet of the check valve</td><td>Replace the check valve</td></tr>
<tr><td>Excessively high suction pressure</td><td>Malfunction or internal leakage of 4-way valve</td><td>Check the temperature difference at the inlet and the outlet of the 4-way valve</td><td>Replace the 4-way valve</td></tr>
<tr><td colspan="2">Discharge temperature of the indoor unit is unstable</td><td>Check the expansion valve of the indoor unit in the same system</td><td>Replace the failed expansion valve of the indoor unit</td></tr>
<tr><td colspan="5">NOTE
*1): Refer to section “3.4.1 Refrigerant charge amount” in this document.</td></tr>
<tr><td rowspan="9">Cooling or heating process with an abnormal sound</td><td colspan="2">Foreign particles inside of the fan casing</td><td>Visually inspect it</td><td>Remove the foreign particles</td></tr>
<tr><td colspan="2">Indoor unit fan runner is hitting the casing</td><td>Visually inspect it</td><td>Adjust the position of the fan runner</td></tr>
<tr><td colspan="2">RASC unit fan runner is hitting the casing</td><td>Visually inspect it</td><td>Adjust the position of the fan runner</td></tr>
<tr><td rowspan="4">Abnormal sound from the compressor</td><td>Faulty Installation</td><td>Check that each part is tightly fixed</td><td>Tightly fix each part</td></tr>
<tr><td>Liquid refrigerant compression</td><td>Adjust the suction gas temp. and pressure</td><td>Ensure superheat</td></tr>
<tr><td>Wear or breakage of the internal compressor parts</td><td>Abnormal sound from the inside of the compressor</td><td>Replace the compressor</td></tr>
<tr><td>No heating by the oil heater</td><td>Check the resistance (oil heater, fuse)</td><td>Replace the oil heater or the fuse</td></tr>
<tr><td colspan="2">Humming sound from the magnetic conductor</td><td>Check the surface of the contacts</td><td>Replace the magnetic switch</td></tr>
<tr><td colspan="2">Abnormal vibration of the cabinets</td><td>Check each fixing screw</td><td>Tightly fix each screw</td></tr>
</table>

Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
RASC fan does not operate when the compressor operates	Obstacle at the RASC 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	Add the refrigerant
	Disconnected wiring for the indoor fan	Check the wiring	Connect the wiring correctly

10.2 Troubleshooting procedure

10.2.1 On-screen displays during abnormal operation

PC-ART	PC-ARF
	

Abnormal operation can be produced due to the following reasons:

◆ Malfunction

The RUN (red) indicator flashes.

The ALARM indicator appears on the liquid crystal display.

The screen also displays the following items:

- A: indoor unit address.
- B: Refrigerant cycle number.
- C: Alarm code.
- D: Model code.

Model code	
Indication	**Model**
H	Heat pump
P	Inverter
F	Multi (SET-FREE)
C	Cooling only
E	Other
b	IVX, individual operation

- E: If there are various indoor units connected, the above mentioned information is shown for each one of them.

◆ 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.

10.2.2 Alarm codes

- 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 7 segments of the RASC unit PCB and Remote control Screen (if installed).

Code number	Category	Type of abnormality	Main cause
1	Indoor unit	Activation of protection device (float switch)	Failure of fan motor, drain discharge, PCB, relay, float switch activated (High Water Level in Drain Pan, Abnormality of Drain Pipe, Float Switch or Drain Pan).
2	Protection device	Activation of protection device	Activation of the float switch (FS). Activation of the internal thermostat protection of the motor (ITO). Activation of the high pressure switch (PSH). Variable frequency driver failure (VFD).
3	Transmission	Abnormal transmission between RASC and indoor units	Incorrect wiring. Loose terminals, Failure of PCB. Tripping of fuse. Power supply OFF.
4		Abnormal transmission between inverter PCB and RASC unit PCB	Transmission failure between inverter PCBs. (Loose Connector, Wire Breaking, Blowout of Fuse).
5	Power supply	Reception of abnormal operation code for detection of power source phase	Power source with abnormal wave pattern. Main power supply phase is reversely connected or one phase is not connected.
6	Voltage	Excessively low voltage or excessively high voltage for the inverter	Voltage drop in power supply. Incorrect wiring or insufficient capacity of power supply wiring.
7	Cycle	Decrease in discharge gas superheat	Excessive Refrigerant Charge, Failure of Thermistor, Incorrect Wiring, Incorrect Piping Connection, Expansion Valve Locking at Opened Position (Disconnected Connector) or faulty RASC fan motor.
8		Excessively high discharge gas temperature at the top of compressor	Insufficient refrigerant charge, refrigerant leakage. Expansion valve closed or clogged.
11	Indoor unit sensor	Air inlet thermistor	Failure of thermistor, sensor, connection. (Incorrect Wiring, Disconnected Wiring, Wire Breaking, Short Circuit).
12		Air outlet thermistor	
13		Freeze protection thermistor	
14		Gas piping thermistor	
15	Econofresh	Thermistor of fresh outdoor air	
16	Indoor unit sensor	Remote thermistor	
17		Thermistor of remote control switch	
19	Fan motor	Activation of the protection device for the indoor fan motor	Failure of fan motor.
20	RASC unit sensor	Thermistor for discharge gas temperature (THM9)	Incorrect wiring, disconnected wiring, broken cable, short circuit.
21		High pressure sensor	
22		Thermistor for outdoor ambient temperature (THM7)	
24		Thermistor for evaporating temperature (THM8)	
31	System	Incorrect capacity setting or combined capacity between RASC and indoor units	Incorrect Capacity Code Setting, Excessive or Insufficient Indoor Unit Total Capacity Code.
35		Incorrect indoor unit number setting	Duplication of indoor unit number. Number of indoor units over specifications.
36		Incorrect of Indoor Unit Combination.	"Indoor Unit is Designed for Other Refrigerant (R22 or R407C)".
38		Abnormality of picking up circuit for protection (RASC unit)	Failure of indoor unit PCB, incorrect wiring, connection to PCB in indoor unit.

Code number	Category	Type of abnormality	Main cause
45	Protection device	Activation of the safety device from excessively high discharge pressure	Overload (obstruction of HEX, short circuit) mixture of inert gas, excessive refrigerant or faulty RASC fan motor.
47		Activation of the safety device from excessively low suction pressure (protection from vacuum operation)	Shortage or leakage of refrigerant, piping clogging, expansion valve close-locked, RASC fan motor locked.
48		Activation of overcurrent protection	Overload, overcurrent. Failure of inverter PCB, heat exchanger clogged, locked compressor. EVI/EVO failure.
51	Inverter	Abnormal operation of the current sensor	Incorrect wiring of current sensor. Failure of control PCB or Inverter PCB.
53		Inverter fin temperature increase	Inverter module (IPM) and Inverter PCB abnormality. Failure of compressor, clogging of heat exchanger.
54		Abnormality of inverter fin temperature	Abnormal inverter fin thermistor or Heat exchanger clogged.
55		Abnormality of inverter PCB	Failure of inverter PCB.
EE	Compressor	Compressor protection	"Compressor failure. This alarm code appears when the following alarms 02, 07, 08, 45, 47 occur three times within 6 hours."
b0	Indoor unit model setting	Incorrect setting of unit model	No setting of unit capacity or incorrect setting of unit capacity.
b1	Number setting	Incorrect setting address or refrigerant cycle	Over 64 indoor units setting by number or indoor unit address.
b5		Incorrect setting of indoor unit number for H-LINK type	The number of indoor units connected to the H-LINK II of one system is 17 or higher.

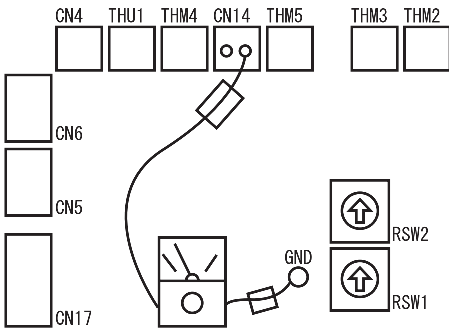
10.2.3 Troubleshooting by alarm code

Alarm code	01	Activation of the safety device (flow switch) in the indoor unit (except RPK series)

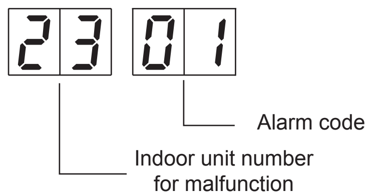
This alarm code is displayed when the contact between #1 and #2 of CN14 is not closed over 120 seconds during the cooling process, the heating process or the fan operation.

Is DC12V applied between #2 of CN14 and GND?

- No → Activation of float switch (FS) or incorrect wiring
- Yes → Faulty IU PCB

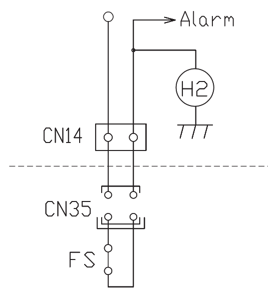


Indication of outdoor unit PCB



If all the above checks have been overcome, see the status of the following item:

- Check if float switch (FS) connected to the CN14 is open/activated by using a tester.



CN14: Safety devices line scheme

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 (except RPC)			Check PCB by means of the self-check mode *1)	Replace PCB if faulty
Faulty wiring (RPC only)			Check weather short-circuited connector is connected to CN-14)	Connect it correctly

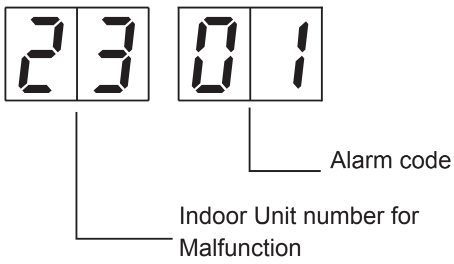
NOTE

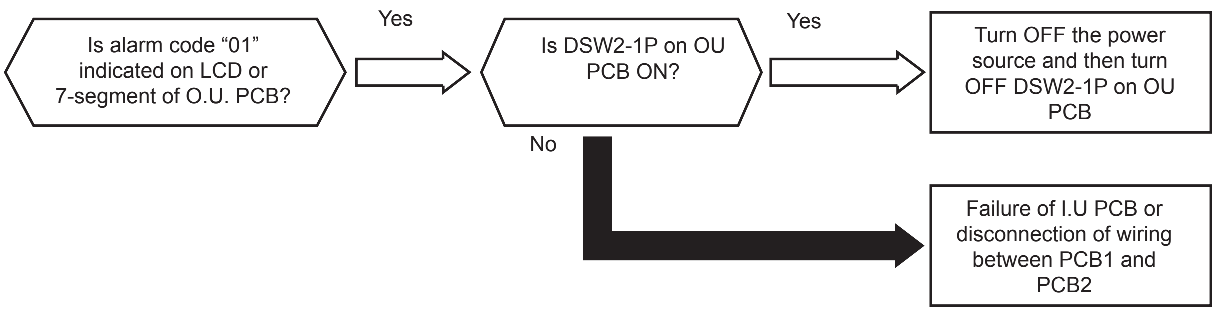
**1): Refer to section “Self-checking procedure of PCB by means of the remote control switch”.*

10

Alarm code	01	Activation of the safety device (flow switch) in the indoor unit (RPK only)

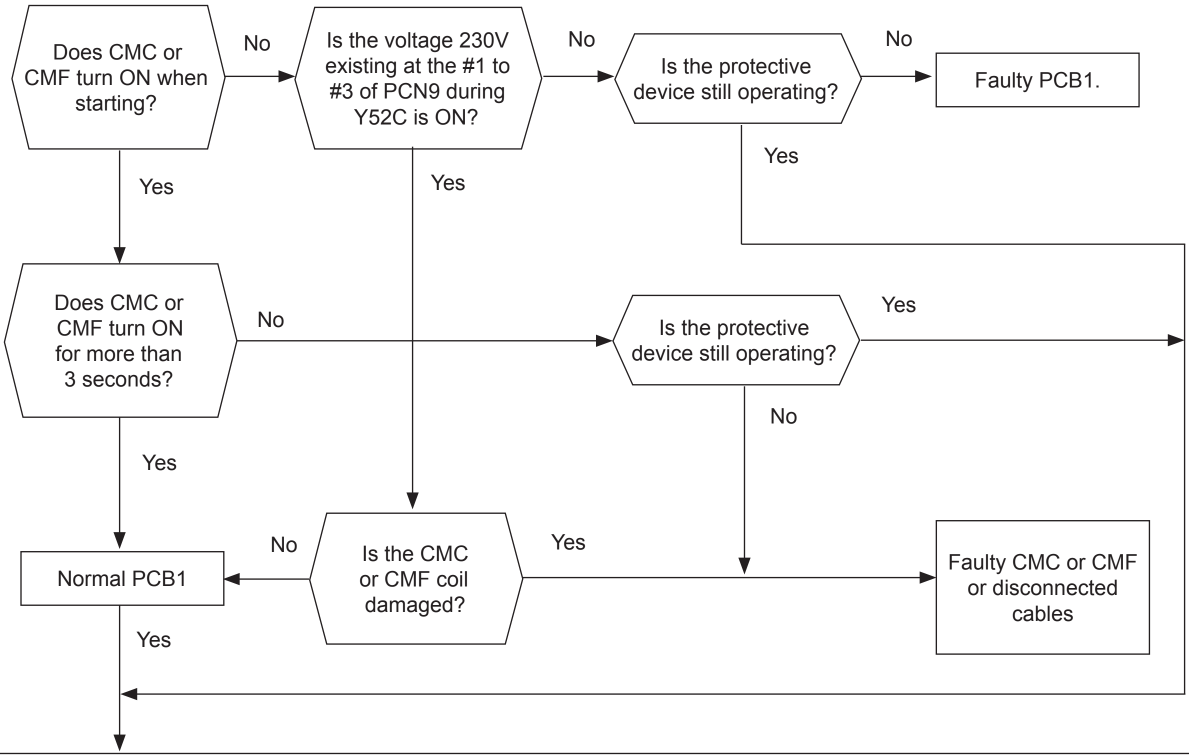
Indication of Outdoor Unit PCB





Alarm code	02	Activation of the safety device in the RASC unit

This alarm is indicated when one of safety devices is activated during compressor running.

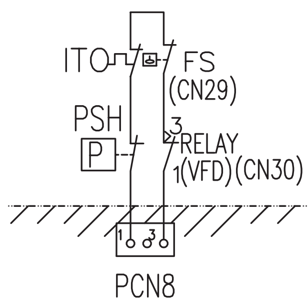


If all the above checks have been overcome, see the status of the following items in this order:

(Check if some of the following devices terminals connected to the PCN8 are open/activated by using a tester) ✸

1. Activation of the float switch (FS)
2. Activation of the internal thermostat protection of the motor (ITO)
3. Activation of the high pressure switch (PSH: 4.15 MPa)
4. Variable frequency driver failure (VFD)

✸ PCN8: Safety devices line scheme



NOTE

Please, refer to the table on the following page in order to know the specific details of each device.

10

<table>
<tr><th colspan="2">Phenomenon</th><th colspan="2">Cause</th><th>Check item</th><th>Action
(Turn OFF the main switch)</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Activation of the float switch
(FS)</td><td>High level of condensed water in the drain pan</td><td>Clogging of the drainage</td><td>Check the drain piping</td><td>Remove the clogged foreign particles</td></tr>
<tr><td colspan="2">Faulty float switch</td><td>Check the continuity when the drain level is low</td><td>Replace the float switch if faulty</td></tr>
<tr><td colspan="2" rowspan="2">Insufficient contact or incorrect connection</td><td>Measure the resistance using the tester</td><td>Correct looseness and replace the connector</td></tr>
<tr><td>Check the connections</td><td>Repair the connection</td></tr>
<tr><td rowspan="7">2</td><td rowspan="7">Activation of the internal thermostat protection of the motor
(ITO)</td><td colspan="2">Locked motor</td><td>Check the correct rotation of the fan</td><td>Remove a possible obstacle of the fan</td></tr>
<tr><td colspan="2" rowspan="3">Insufficient contact or incorrect connection</td><td>Check the continuity after the fan motor temperature decreases to room temp</td><td>Replace the fan motor if there is no continuity</td></tr>
<tr><td>Measure the resistance by means of the tester</td><td>Correct looseness. Replace the connectors</td></tr>
<tr><td>Check the connections</td><td>Repair the connections</td></tr>
<tr><td colspan="2">Coil damage</td><td>Measure the coil resistance and the insulation resistance</td><td>Replace the motor if faulty</td></tr>
<tr><td colspan="2" rowspan="2">Incorrect connection of the fan motor or variable frequency driver (VFD)</td><td>Check the connection of the fan motor power cables with the connector for fan motor power supply (CN35) and with the fan motor terminal box.</td><td>Connect it</td></tr>
<tr><td>Check if the fan motor power cables (U,V,W) and the fan motor earth cable are disconnected from the variable frequency driver.</td><td>Repair the connections</td></tr>
</table>

<table>
<tr><th colspan="2">Phenomenon</th><th colspan="2">Cause</th><th>Check item</th><th>Action
(Turn OFF the main switch)</th></tr>
<tr><td rowspan="13">3</td><td rowspan="13">Activation of the high-pressure switch due to the excessively high discharge pressure (PSH)</td><td rowspan="13">Insufficient air flow to the heat exchanger (RASC heat exchanger during the cooling process or indoor heat exchanger during the heating process)</td><td rowspan="2">Clogging of the heat exchanger</td><td>Check if the heat exchanger is clogged (by dust or any strange particle)</td><td>Remove the dust or strange particles</td></tr>
<tr><td>Check for any obstacles at the inlet or the outlet of the heat exchanger</td><td>Remove the obstacles</td></tr>
<tr><td>Accumulation of dust</td><td>Check the indoor unit air filter for dust</td><td>Remove the dust</td></tr>
<tr><td>Service space is not respected</td><td>Check the service space have been respected</td><td>Secure service area</td></tr>
<tr><td>Abnormally low indoor unit fan speed</td><td>Check the indoor fan speed during heating operation</td><td>Replace the fan motor if faulty</td></tr>
<tr><td rowspan="4">Abnormally low RASC fan speed during cooling mode</td><td>Check the communication line between PCB1 and PCB3 (CN10-X1) and between PCB3 and VFD (X2-RJ45).</td><td>Connect correctly the wiring if insufficient contact or replace it if damaged</td></tr>
<tr><td>Check the variable frequency driver (VFD)</td><td rowspan="2">Replace it if faulty</td></tr>
<tr><td>Check the fan motor</td></tr>
<tr><td>For RASC-(6/8/10)NPE units check the optional function “Setting of the fan performance curves (F2)”</td><td>Select the most appropriated setting. Refer to section “Setting of the fan performance curves (F2)” in chapter “6. Optional functions”</td></tr>
<tr><td rowspan="4">RASC fan does not run during cooling mode</td><td>Connect directly 400V into the fan motor terminals and check the fan operation</td><td>If not operation, replace the fan motor.</td></tr>
<tr><td>Check during operation that there are 400V between L1,L2,L3 and between U,V,W at the VFD</td><td rowspan="2">Connect correctly the wiring if insufficient contact or replace it if damaged</td></tr>
<tr><td>Check the communication line between PCB1 and PCB3 (CN10-X1) and between PCB3 and VFD (X2-RJ45).</td></tr>
<tr><td>Check the variable frequency driver during operation (VFD)</td><td>Replace the VFD in the following cases:
- If LED PWR on VFD is OFF
- If LED RUN on VFD is OFF
- If LED ALM on VFD is ON</td></tr>
</table>

Phenomenon		Cause		Check item	Action (Turn OFF the main switch)
③	Activation of the high-pressure switch due to the excessively high discharge pressure (PSH)	Excessively high temperature air to the indoor unit during heating mode		Calculate the heat load	Reduce the heat load or use a bigger unit if possible
				Check for hot air near the ceiling (heating)	Provide good circulation
				Check for short-circuited air (heating)	Remove the short-circuited air
				Check if there is any heat source near the unit	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 using the tester	Fix the looseness. Replace the connector
			Incorrect connection	Check the connections	Repair the connections
		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
				Disconnected of the connector or coil not well assembled	Fix the looseness or reconnect the connector
				Fully closed and locked	Replace the expansion valve
		Faulty gas bypass solenoid valve		Check for clogging	Replace the gas bypass solenoid valve
		Overcharged refrigerant		Check the cycle operation temperature	Charge the refrigerant correctly
		Mixture of the non-condensate gas in the refrigerant cycle		Check the air temperature and the pressure	Recharge the refrigerant after the vacuum pumping
		Clogging of the discharge piping		Check for clogging	Remove the clogging
		Liquid or gas line stop valve does not operate correctly		Check the stop valves	Fully open the stop valves
		Clogging of the check valve		Check for clogging	Replace the check valve
	Faulty magnetic contactor switch	No power is supplied to the coil		Check connections	Set the connections properly.
		No power at the magnetic contactor		Measure the resistance using a tester	Replace the magnetic switch if it is broken
④	Variable frequency driver failure (VFD) (LED ALM on VFD: ON (*))	Over temperature of the VFD device		Check the temperature in the installation area	Ensure that the installation area has a proper ventilation so that ambient temperature around the unit does never exceed 46ºC
		Faulty variable frequency driver		-	Replace the variable frequency driver

NOTE

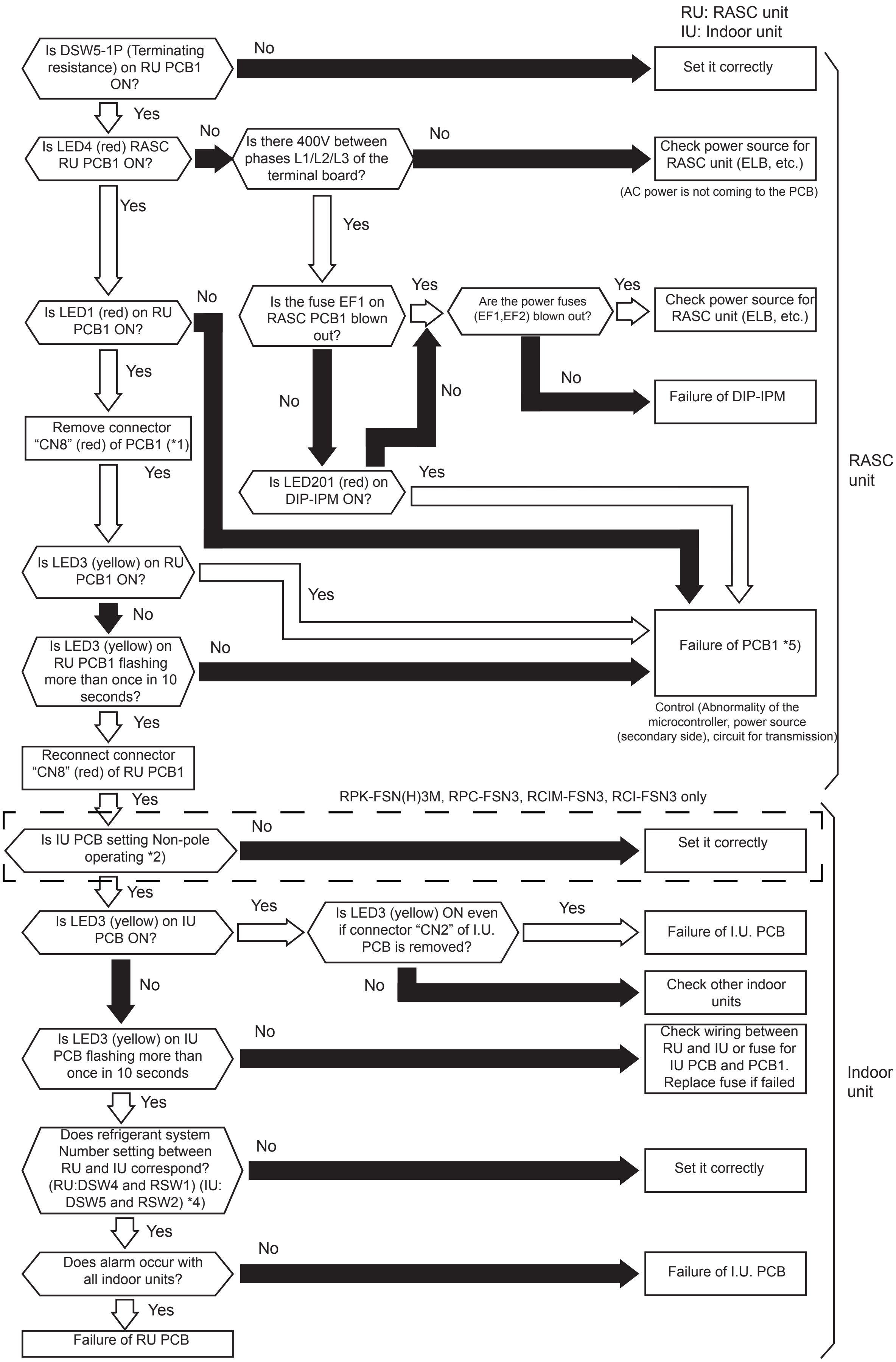
(*): Once the VFD contactor is open, the LED ALM on VFD is turned OFF after few seconds. Therefore, pay attention when revising the VFD, since the LED ALM may be OFF even though the alarm 02 has been caused due to VFD failure.

Alarm code	03	Abnormal transmission between the indoor units and the RASC unit

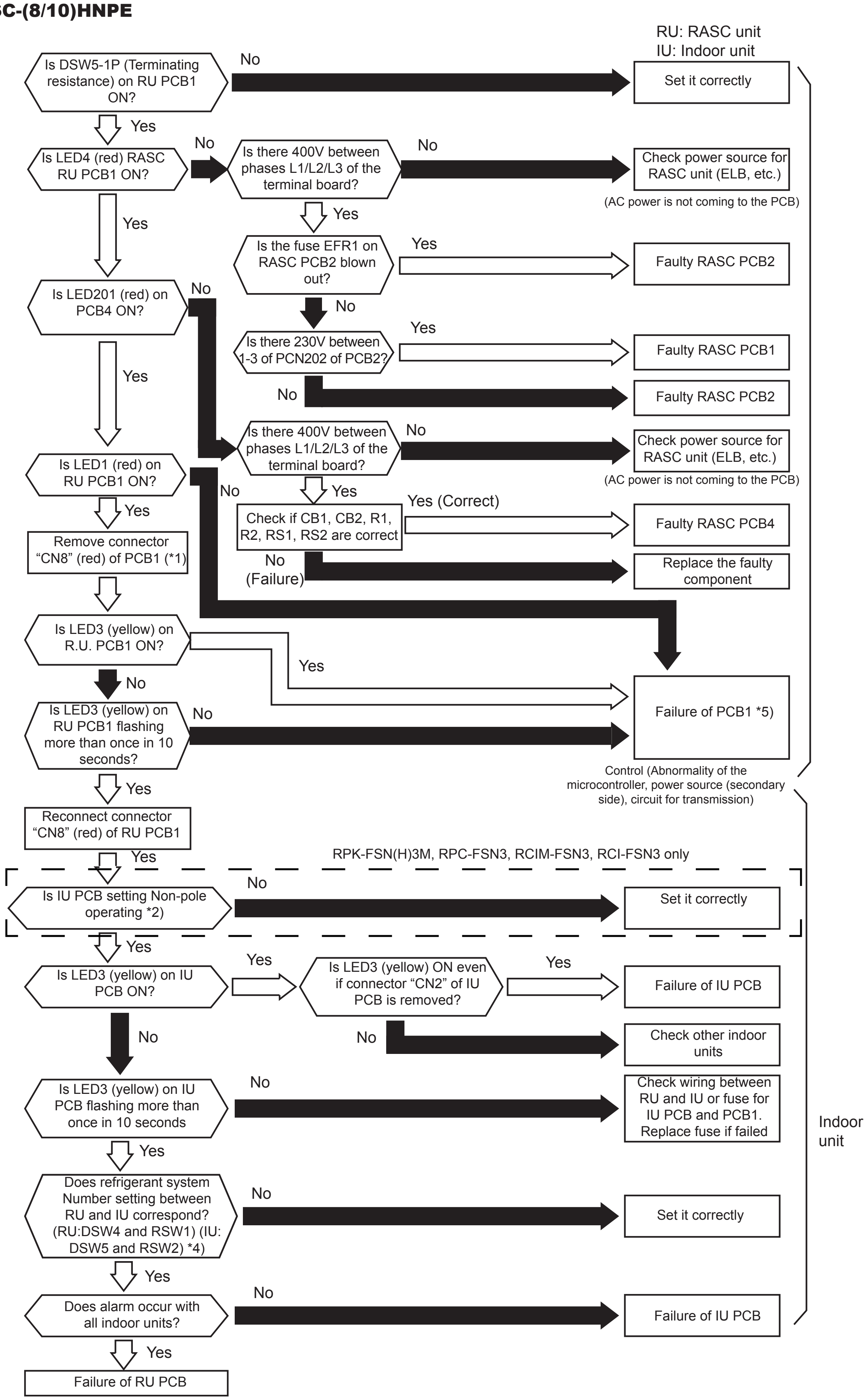
- This alarm is displayed when abnormal operation is maintained for three minutes after normal transmission has been confirmed between the indoor units and the RASC unit. Also, when abnormal operation continues for 30 seconds after the micro-computer is automatically reset.
- The alarm is displayed when the abnormal transmission is maintained for 30 seconds from the starting of the RASC unit.
- Investigate the cause of the overcurrent and take the necessary action when the fuses are blown out or the circuit breaker for the RASC unit is activated.
- This alarm code may be indicated when the inverter PCB and the RASC unit cannot secure the power source (No indication on the 7-segment of RASC unit PCB). In this case, make sure to check the inverter PCB and the continuity of the fuse on the circuit.

(Refer to the next page)

RASC-(4-6)HNPE


RU: RASC unit
IU: Indoor unit
Is DSW5-1P (Terminating resistance) on RU PCB1 ON?
No
Set it correctly
Yes
Is LED4 (red) RASC RU PCB1 ON?
No
Is there 400V between phases L1/L2/L3 of the terminal board?
No
Check power source for RASC unit (ELB, etc.)
(AC power is not coming to the PCB)
Yes
Yes
Is LED1 (red) on RU PCB1 ON?
No
Is the fuse EF1 on RASC PCB1 blown out?
Yes
Are the power fuses (EF1,EF2) blown out?
Yes
Check power source for RASC unit (ELB, etc.)
No
Failure of DIP-IPM
No
No
Yes
Remove connector "CN8" (red) of PCB1 (*1)
Yes
Is LED201 (red) on DIP-IPM ON?
Yes
RASC unit
Is LED3 (yellow) on RU PCB1 ON?
Yes
No
Is LED3 (yellow) on RU PCB1 flashing more than once in 10 seconds?
No
Failure of PCB1 *5)
Control (Abnormality of the microcontroller, power source (secondary side), circuit for transmission)
Yes
Reconnect connector "CN8" (red) of RU PCB1
Yes
RPK-FSN(H)3M, RPC-FSN3, RCIM-FSN3, RCI-FSN3 only
Is IU PCB setting Non-pole operating *2)
No
Set it correctly
Yes
Is LED3 (yellow) on IU PCB ON?
Yes
Is LED3 (yellow) ON even if connector "CN2" of I.U. PCB is removed?
Yes
Failure of I.U. PCB
No
No
Check other indoor units
Is LED3 (yellow) on IU PCB flashing more than once in 10 seconds
No
Check wiring between RU and IU or fuse for IU PCB and PCB1. Replace fuse if failed
Indoor unit
Yes
Does refrigerant system Number setting between RU and IU correspond? (RU:DSW4 and RSW1) (IU: DSW5 and RSW2) *4)
No
Set it correctly
Yes
Does alarm occur with all indoor units?
No
Failure of I.U. PCB
Yes
Failure of RU PCB

RASC-(8/10)HNPE



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Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Power failure or no power supply		Measure the voltage using the tester	Supply power
Melted fuse for power source or activation of the RASC unit breaker	Short circuit between wires	Check for breakage of insulation	Remove cause of short circuit. Replace fuse and/or indoor/ RASC unit PCB if faulty
	Short circuited wire to ground	Measure the insulation resistance	Remove cause of short circuit to ground. Replace fuse and/or indoor/ RASC PCB if faulty
	Faulty compressor motor	Measure the resistance between the wires and the insulation resistance	Replace compressor and fuse (RASC unit). Replace inverter PCB and/or PCB1 if faulty (RASC unit).
Melted fuse for DC power supply (RASC unit) EF1, EF2 and EF3 on PCB1 EF331 on inverter PCB	Short circuit between wires	Check for breakage of insulation	Remove cause of short circuit and replace fuse.
	Faulty solenoid coil for magnetic switch (CMC) for compressor motor	Measure insulation resistance	Remove cause of short circuit and replace fuse
	Incorrect power supply circuit of RASC unit PCB1	Check RASC unit PCB1 output. *3)	Replace fuse
Melted fuse RS1, RS2	Faulty CB	Measurement of insulation resistance	Replace IPM or CB
	Faulty IPM	Measurement of resistance between lines and insulation resistance	Replace IPM or PCB2 and IPM
Incorrect power supply circuit of RASC unit PCB1		Measure RASC unit PCB1 output. *3)	Replace RASC unit PCB1
Disconnected wires insufficient contacting or incorrect connection	Between RASC unit and indoor unit	Check the continuity of the wires. Check for looseness of the connection screws. Check the terminal numbers	Replacing wires repairing and tightening the screws and the correct wiring
	Power source wiring for the RASC unit		
Faulty PCB (RASC unit, indoor unit)	Disconnected wires to indoor/ RASC unit PCB	Check the connections	Correctly connect the wires
	Faulty indoor/RASC unit PCB		Replace it 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 terminal numbers	Correctly connect wires

NOTE

- **1) In the case that the end terminal resistance (DSW5-1) is set to OFF for H-LINK connection, set the end terminal resistance to ON when CN8 is disconnected. Set the end terminal resistance to OFF when CN8 is reconnected.*
- **2) Transmission Setting (SW1)*

Item	Setting Position
SW1	 3線 伝送切替 2線

- **3)*

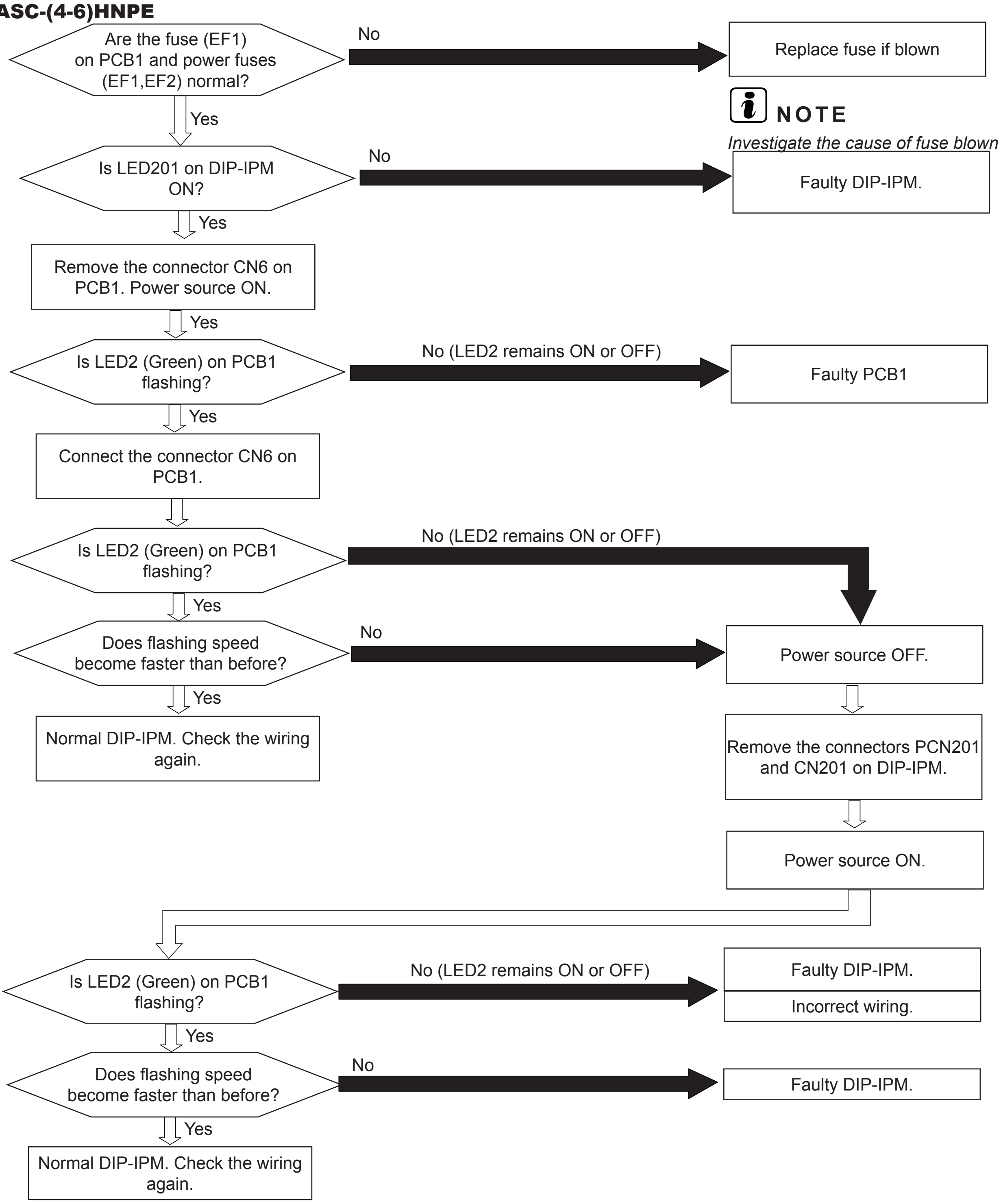
PCB1 output voltage	Voltage
Vcc 12 – GND2	12 VDC
Vcc 05 – GND1	5 VDC
Vcc 12 – GND1	12 VDC
Vcc 15 – GND1	15 VDC
Vcc 24 – GND1	24 VDC
Vcc 12T– GND1	12 VDC

- **4) The rotary switch (RSW2) is not available depending on the indoor unit model.*
- **6) Refer to section "Self-checking procedure of PCB by means of the remote control switch".*

Alarm code	04	Abnormal transmission between Inverter PCB and RASC PCB1

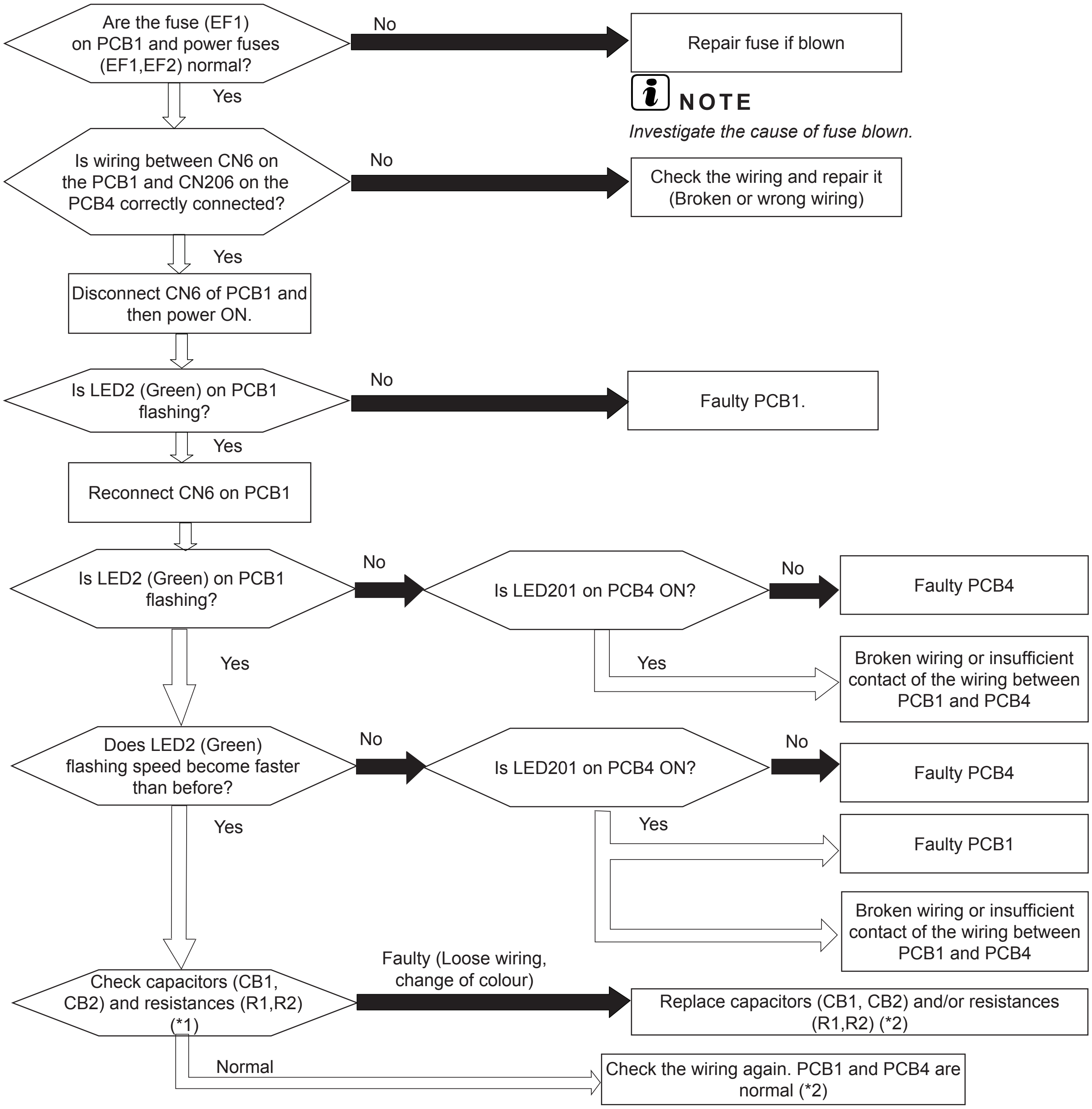
This alarm is displayed when the abnormal operation is maintained for 30 seconds after the normal transmission between the control PCB and the inverter PCB on RASC unit. Also, the abnormal operation is maintained for 30 seconds after the micro-computer is automatically reset. The alarm is displayed when the abnormal transmission is maintained for 30 seconds from the starting of the RASC unit.

RASC-(4-6)HNPE



PCB1: Control PCB in outdoor unit
DIP-IPM: Inverter PCB in outdoor unit

RASC-(8/10)HNPE



PCB1: Control PCB in outdoor unit

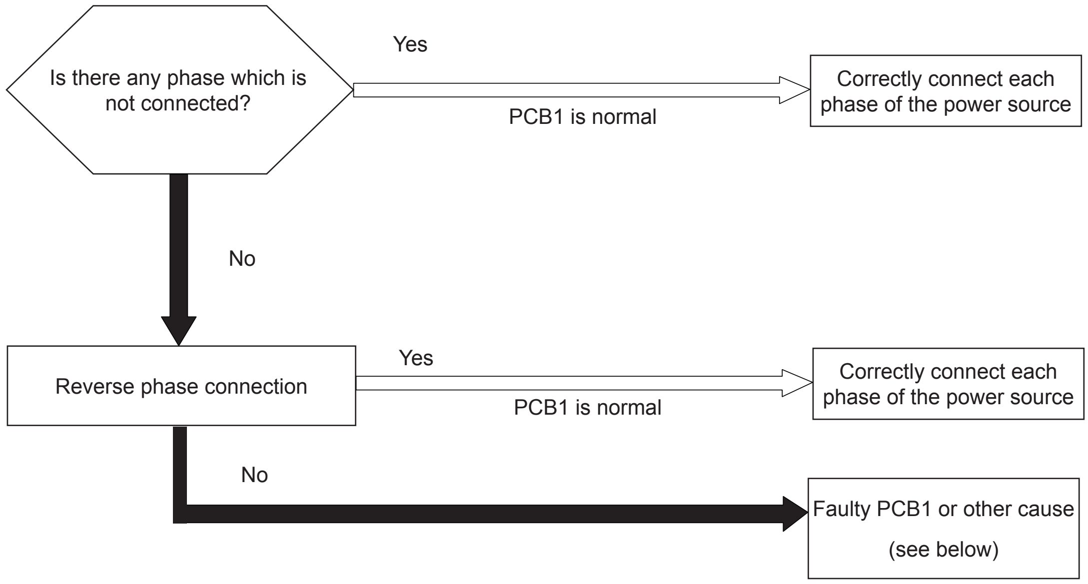
PCB4: Inverter PCB in outdoor unit

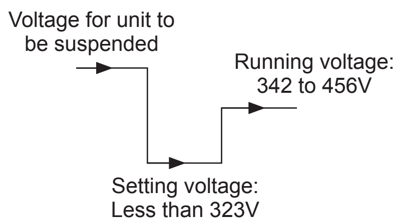
NOTE

- **1): For checking the capacitors, please refer to the sections "Checking capacitors CB1 and CB2" and "Checking R1 and R2".*
- **2): Regarding replacing or checking method for the inverter PCB and its components, refer to the paragraph "RASC-(8/10)HNPE" in section "10.4.2 Checking procedure for the inverter PCB".*

Alarm code	05	Code abnormal operation of picking up phase signal

This alarm is displayed when the main power source phase is reversely connected or one phase is not connected.



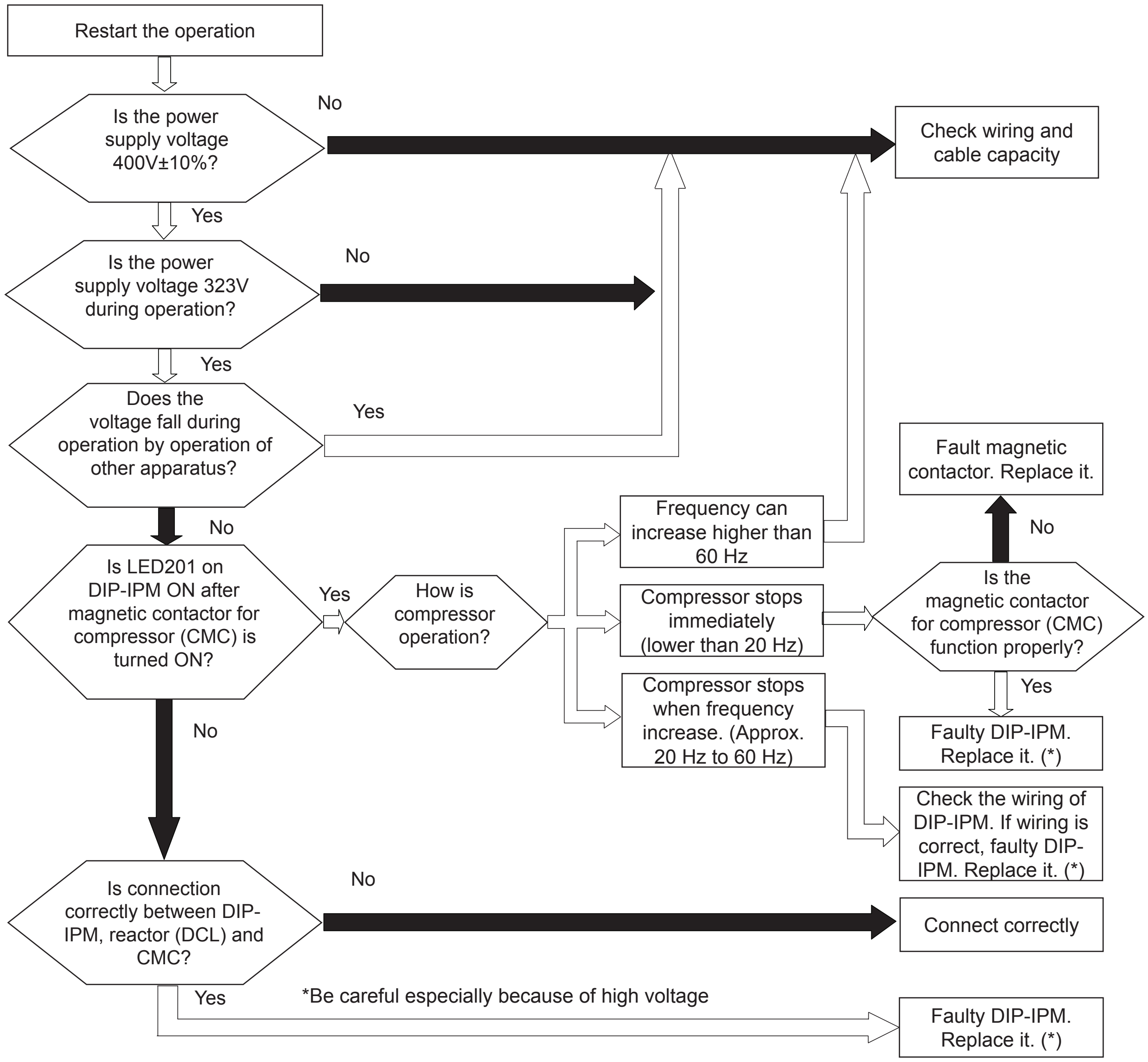


Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Activation of reverse phase sensor in the RASC unit	Reverse or single phase	Check it according to the electrical wiring	Replacing wires, repair, tightening screws or correct wiring
	Faulty RASC unit PCB	-	Replace PCB if faulty

Alarm code	06	Excessively low voltage or excessively high voltage for the inverter PCB

This alarm code is displayed when the voltage of DIP-IPM is insufficient or excessive and the alarm has three occurrences in 30 minutes. If the number of occurrences is smaller than two, the retry operation is performed.

RASC-(4-6)HNPE



DIP-IPM: Inverter PCB of RASC unit.

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NOTE

(*): Regarding replacing or checking method for the DIP-IPM, refer to the paragraph "RASC-(4-6)HNPE" in section "10.4.2 Checking procedure for the inverter PCB".

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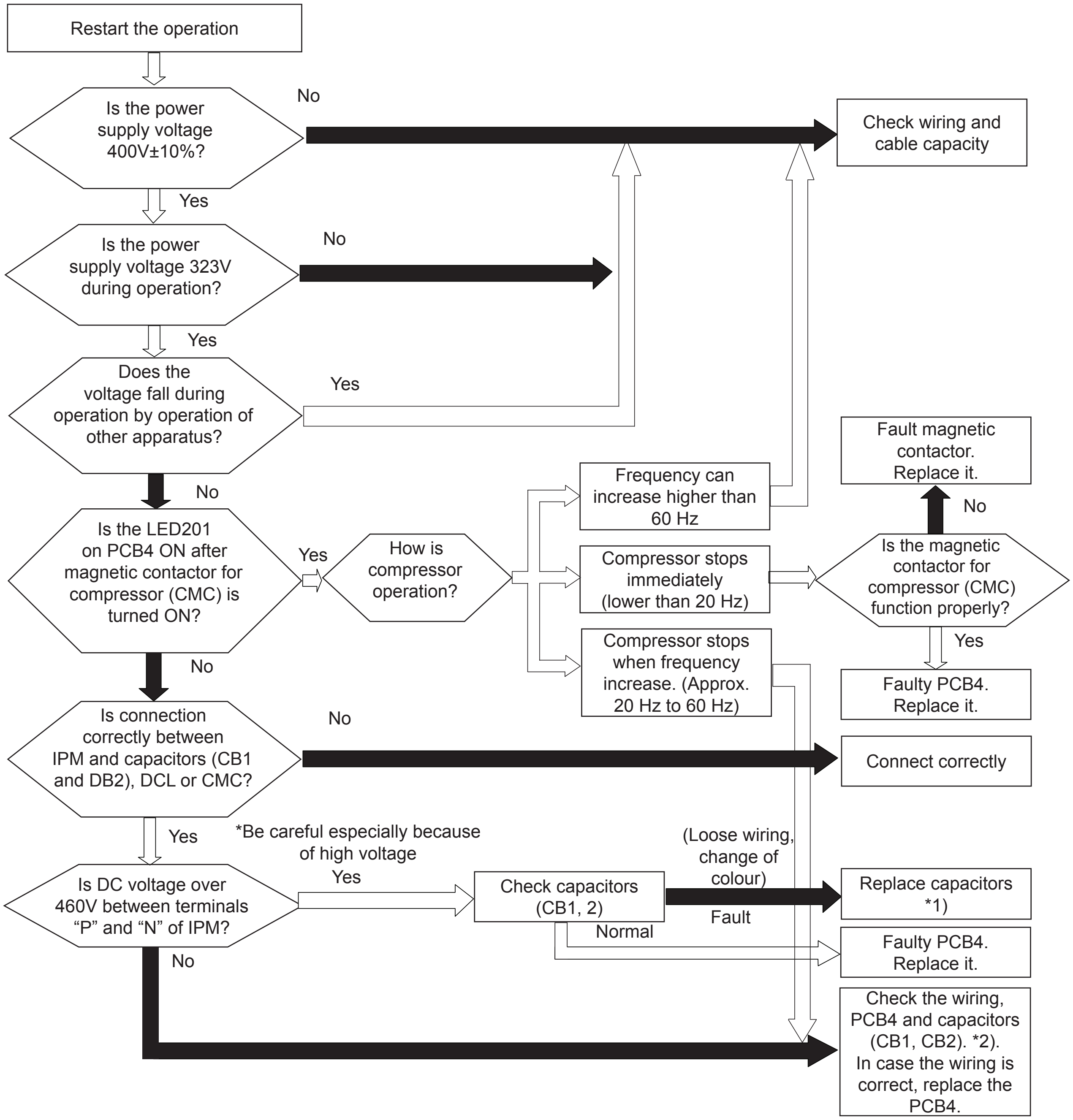
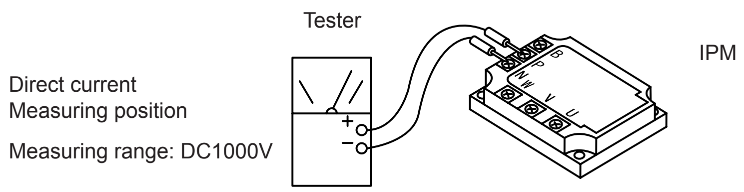
RASC-(8/10)HNPE





PCB1: Control PCB of RASC unit

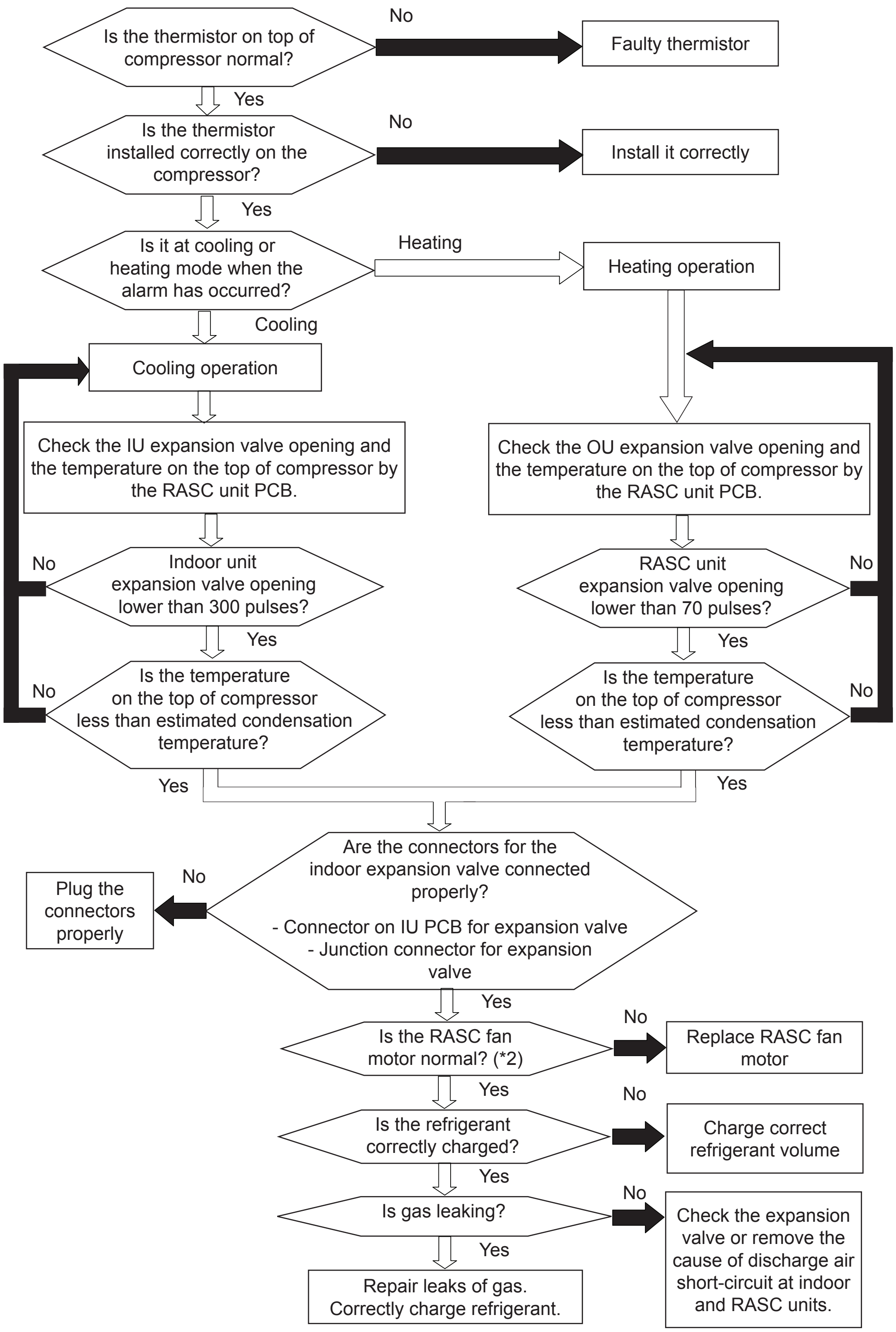
PCB4: Inverter PCB of RASC unit

NOTE

- *1): If capacitor has high voltage, perform the high voltage discharge work. Refer to the paragraph *“RASC-(8/10)HNPE”* in section *“10.4.2 Checking procedure for the inverter PCB”.*
- *2): Regarding replacing or checking method for the inverter PCB, refer to the paragraph *“RASC-(8/10)HNPE”* in section *“10.4.2 Checking procedure for the inverter PCB”.*

Alarm code	07	Decrease of discharge gas superheat

- When the temperature at the top of compressor remains lower than the condensing temperature during 30 continuous minutes, the compressor stops and performs a retry operation 3 minutes later. If this occurs 2 more times within 120 minutes, an alarm code is shown.
- This alarm code is indicated in situations such as damaged compressor due to lock shaft, when the detection of synchronism loss is not possible.



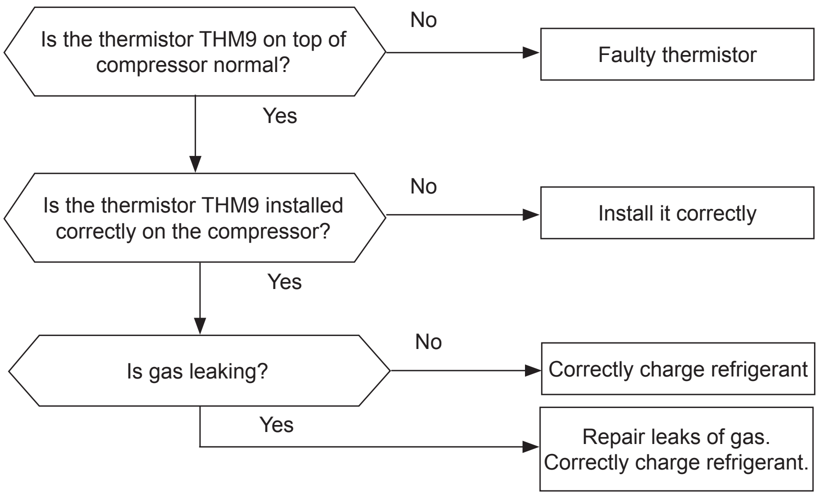
Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Decrease of discharge gas superheat	Refrigerant cycle is different from the electrical system		Check refrigerant cycle and the electrical system	Repair wiring
	Overcharged refrigerant		Measure pressure	Correctly charge refrigerant
	Faulty 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 expansion 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.
	Faulty RASC fan motor		Measure coil resistance and insulating resistance (*2)	Replace RASC fan motor if faulty.

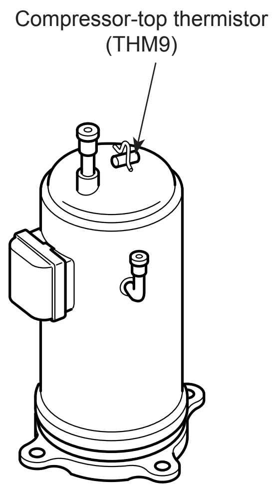
NOTE

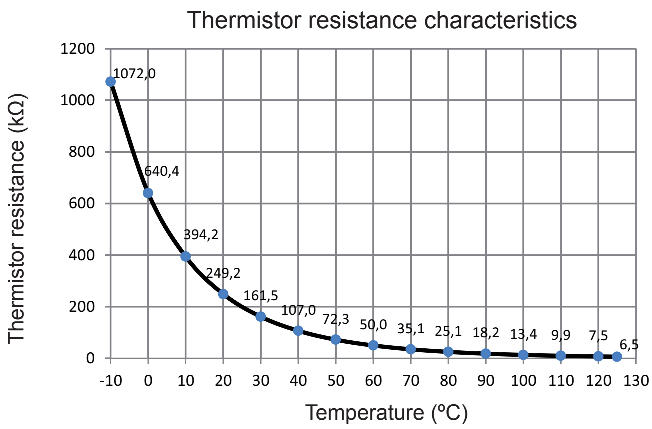
- *(*1) Refer to section “10.4.4 Checking procedure for the electronic expansion valve for indoor and RASC units”.*
- *(*2): When the alarm code “07” is indicated, the RASC fan motor may be damaged. Ensure that fan motor is checked according to the section “10.4.3 Fault diagnosis of fan motor”.*

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

- The alarm appears during cooling operation when the compressor-top thermistor temperature remains at Tdc1 or above for 10 minutes, or at Tdc2 or above for 5 seconds.
- The alarm appears during heating operation when the compressor-top thermistor temperature remains at Tdh1 or above for 10 minutes, or at Tdh2 or above for 5 seconds.







◆ Limits of temperature

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.

When the upper part temperature of compressor increases during operation, the solenoid valve SVA of the unit is opened to return the refrigerant to the compressor (through the accumulator for RASC unit).

If discharge gas temperature increases excessively, compressor temperature increases. At the worst, compressor motor winding can be burnt out. In this case, the protection control is activated and the compressor is stopped if the temperature values are higher than the following values:

RASC unit capacity	Cooling operation		Heating operation	
	Tdc1	Tdc2	Tdh1	Tdh2
RASC-(4-6)HNPE	115	125	115	125
RASC-(8/10)HNPE	127	135	120	135

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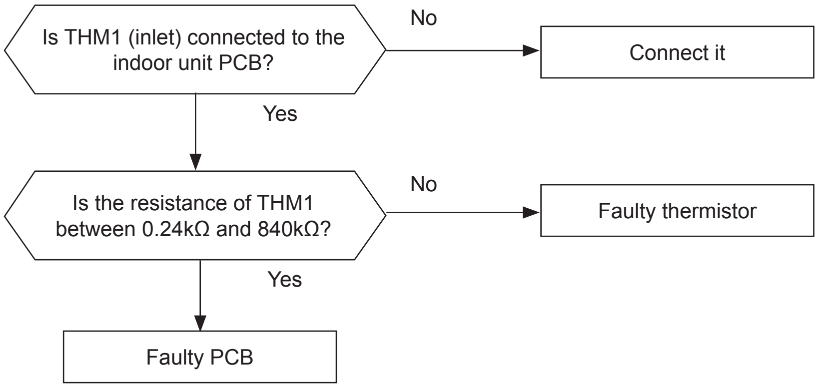
Alarm code	11	Abnormal operation of thermistor for the indoor unit air inlet temperature (air inlet thermistor)

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.



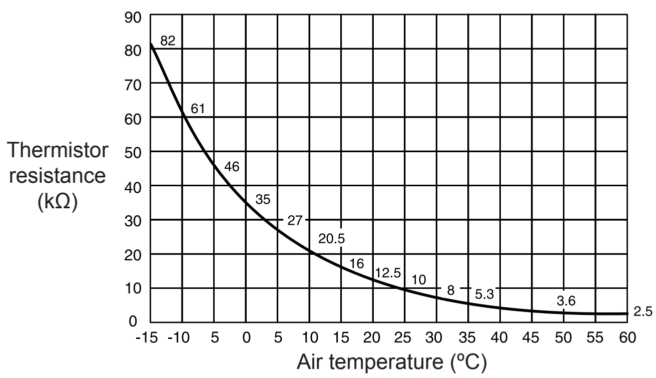
Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty air inlet thermistor	Fault	Check the resistance	Replace the thermistor if faulty
	Incorrect connection	Check the connection	Repair the wiring and the connections
Faulty PCB		Replace PCB and check the operation	Replace PCB if faulty

NOTE

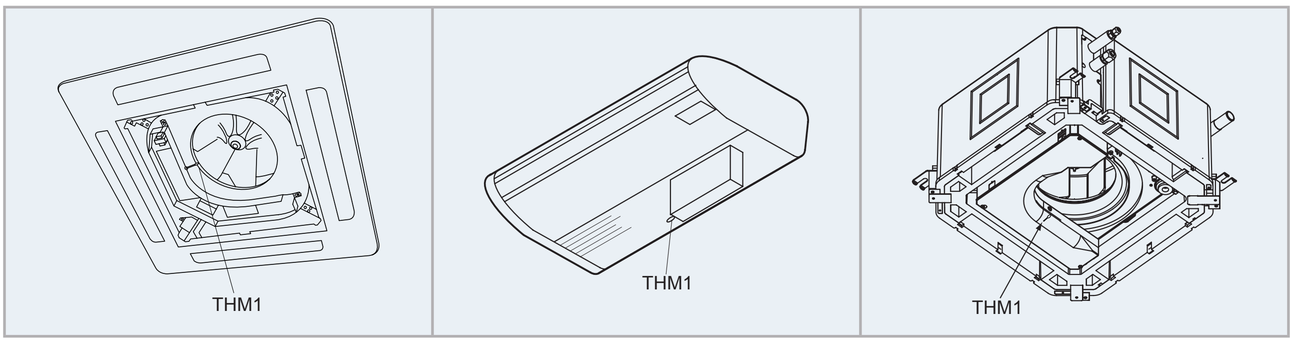
This data is applicable to the following thermistors:

- *Indoor unit discharge air temperature.*
- *Indoor unit liquid refrigerant temperature.*
- *Indoor unit air inlet temperature.*
- *Outdoor temperature.*
- *RASC unit evaporating temperature.*
- *Indoor unit gas piping.*

Thermistor characteristics



◆ **Examples of position of the indoor unit air inlet thermistor (THM1)**



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

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.

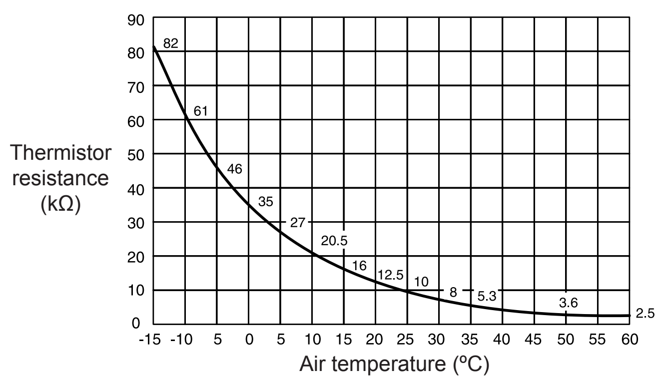
Is THM2 (outlet air) connected to the indoor unit PCB?
- No → Connect it
- Yes ↓

Is the resistance of THM2 between 0.24kΩ and 840kΩ?
- No → Faulty thermistor
- Yes ↓

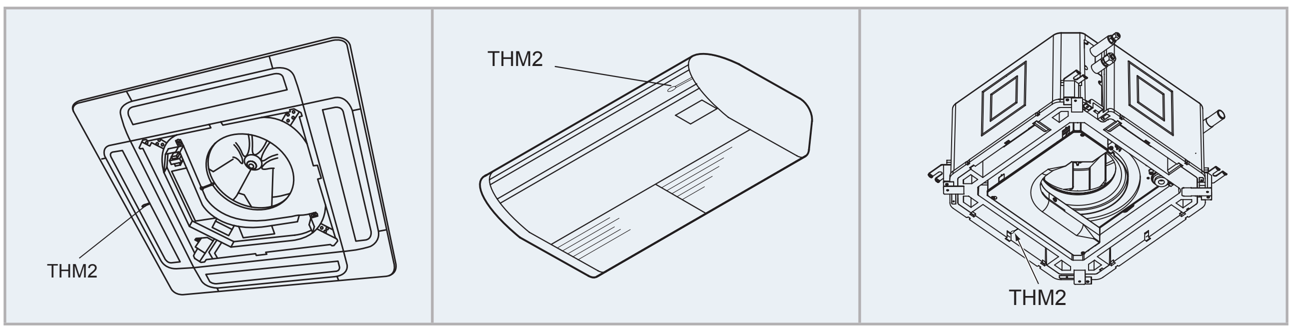
Faulty PCB

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

Thermistor characteristics

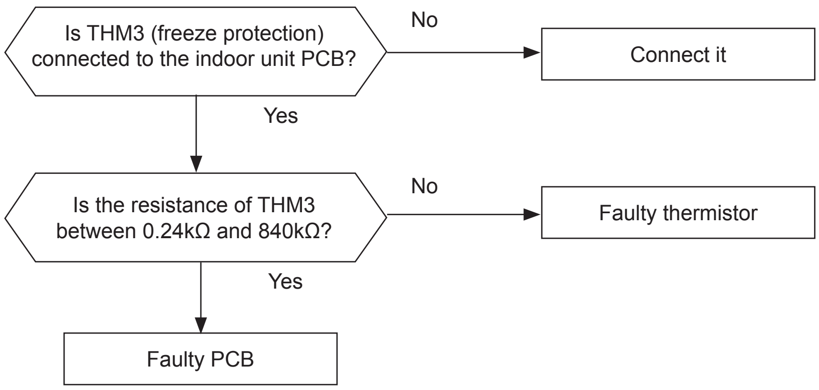


◆ **Examples of position of the indoor unit air outlet thermistor (THM2)**



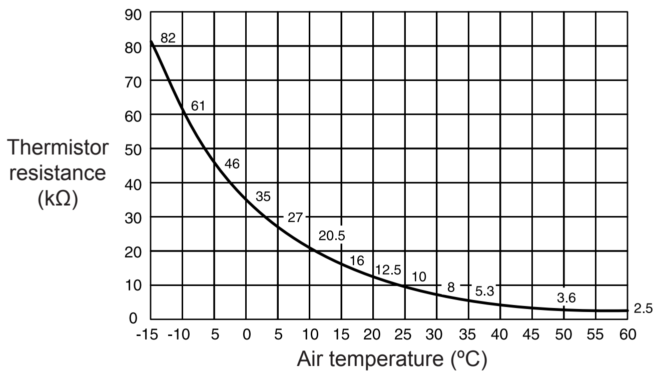
Alarm code	13	Abnormal operation of the thermistor for the indoor unit heat exchanger liquid pipe temperature (freeze protection thermistor)

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.

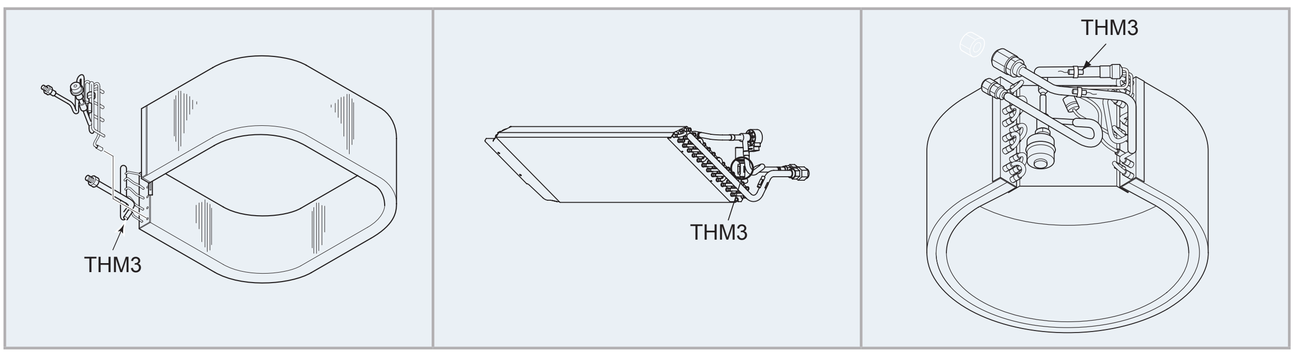


Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty freeze protection thermistor	Fault	Check the resistance	Replace the thermistor if faulty
	Incorrect connection	Check the connection	Repair the wiring and connections
Faulty PCB		Replace PCB and check the operation	Replace PCB if faulty

Thermistor characteristics

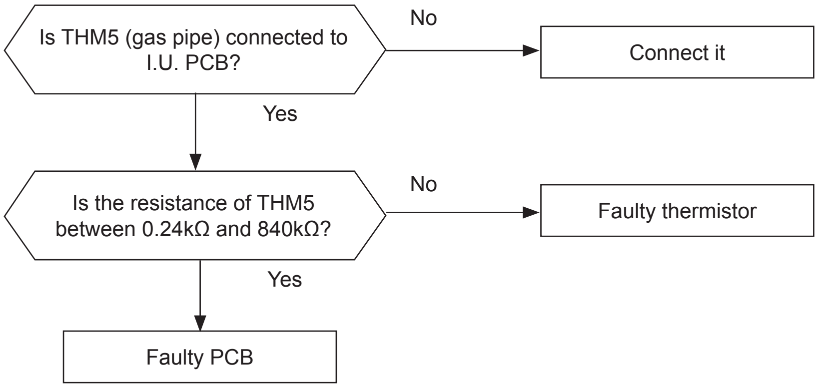


◆ **Examples of position of the indoor unit freeze protection thermistor (THM3)**



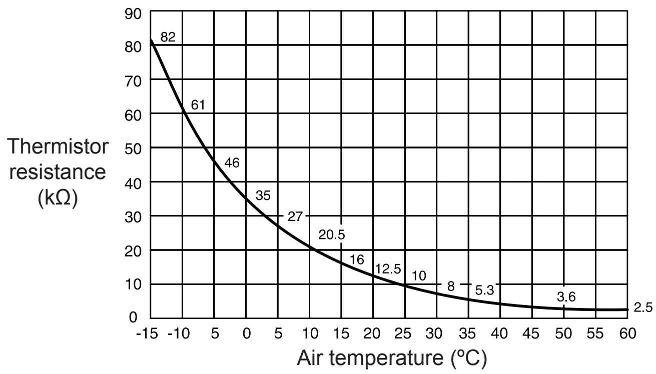
Alarm code	14	Abnormal operation of the thermistor for the indoor unit heat exchanger gas pipe temperature (gas piping thermistor)

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.

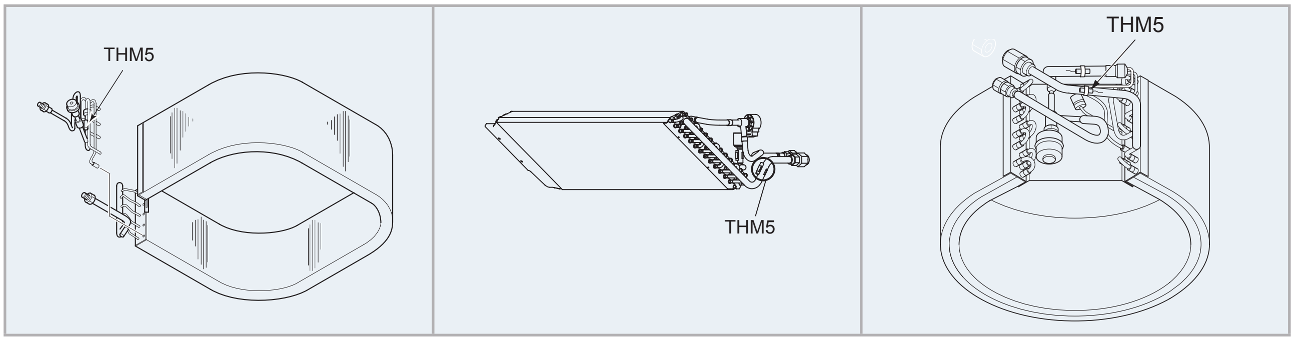


Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty gas piping thermistor	Fault	Check the resistance	Replace the thermistor if faulty
	Incorrect connection	Check the connection	Repair the wiring and connections
Faulty PCB		Replace PCB and check the operation	Replace PCB if faulty

Thermistor characteristics



◆ **Examples of position of the indoor unit heat exchanger gas pipe thermistor (THM5)**



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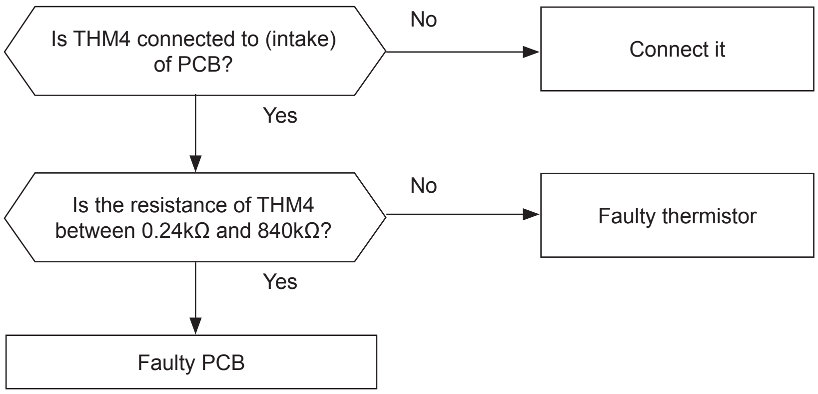
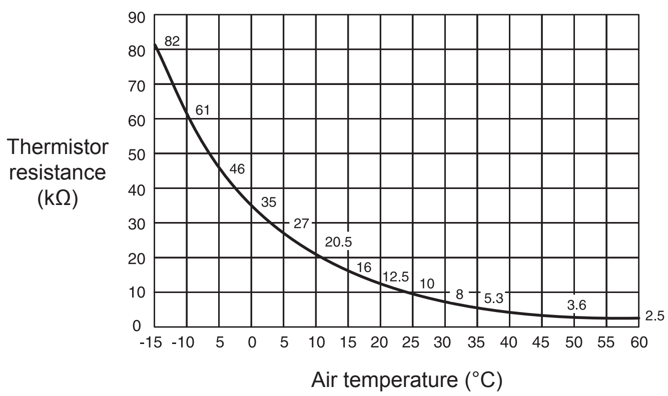
Alarm code	15	Abnormal operation of thermistor for fresh outdoor air (Econofresh)

- 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 RASC 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.



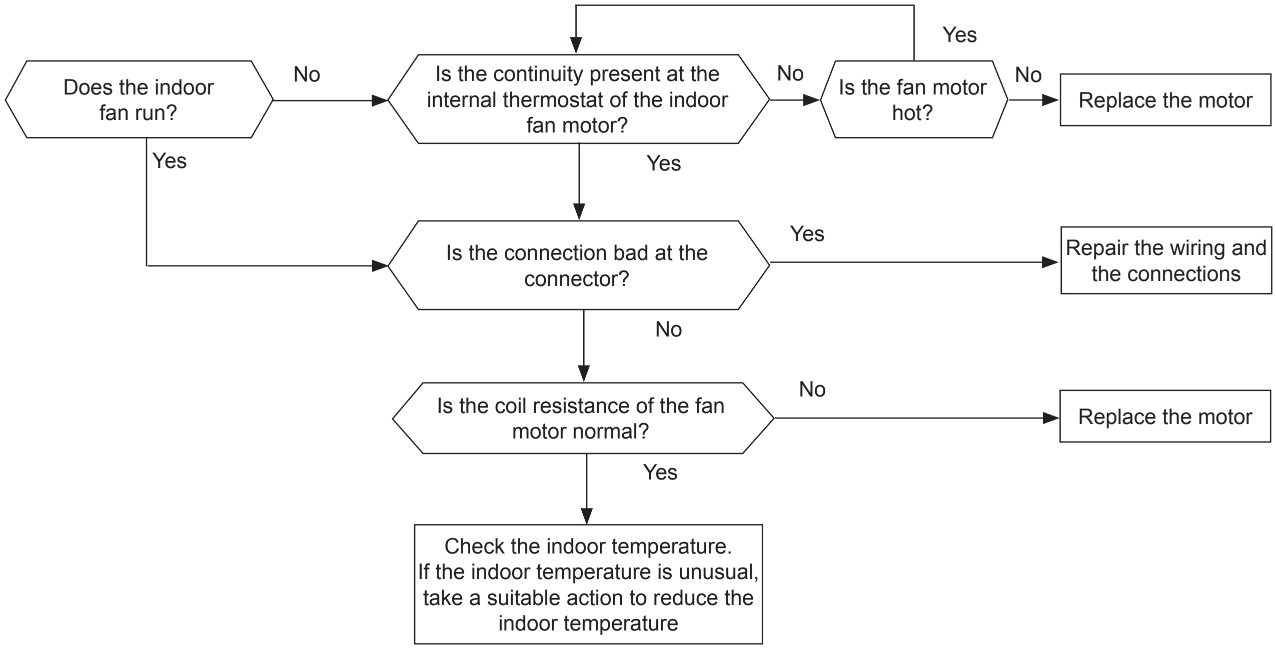
Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty fresh outdoor air (Econofresh) thermistor	Fault	Check the resistance	Replace the thermistor if faulty
	Incorrect connection	Check the connection	Repair the wiring and the connections
Faulty PCB		Replace PCB and check the operation	Replace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



Thermistor characteristics

Alarm code	19	Activation of the protection device for the indoor fan motor (except RCI-FSN3, RCIM-FSN3, RPC-FSN3 and RPK)

This alarm code is displayed when the temperature of the internal thermostat for the indoor fan motor is higher than 135 ºC.



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

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Alarm code	19	Activation of the protection device for the indoor fan motor (RCI-FSN3, RCIM-FSN3, RPC-FSN3)

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.

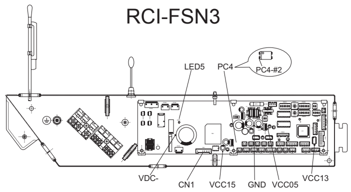
CAUTION

- *Perform the following check after setting the air flow volume to "HIGH".*
- *A high voltage is applied to electrical parts. Perform the check carefully to prevent an electric shock.*

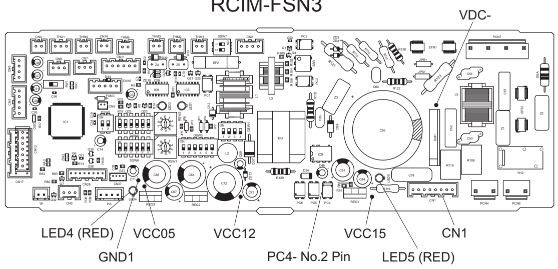
NOTE

Turn OFF the power source securely before connector checking. If not, it may cause DC fan motor failure. (Built-in PCB for DC fan motor may be damaged.)

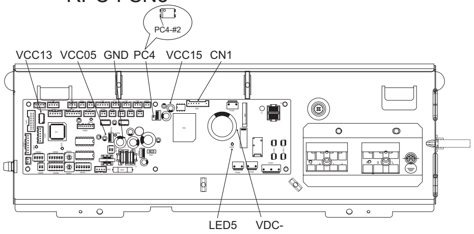
RCI-FSN3



RCIM-FSN3



RPC-FSN3



Occurrence of Alarm code "19"

→ Check connectors PCN7 and CN1 on IU PCB1

→ Check that 230 V is applied between L1 and N of TB1

→ Yes → Is LED4 on IU PCB1 OFF? (*1)
- Yes → Faulty IU PCB1 → Replace IU PCB1
- No ↓

(*1)
The electrical source for IU PCB1 is not supplied when LED4 is turned OFF

Is LED5 on IU PCB1 OFF? (*2)
- Yes → Faulty IU PCB1 → Replace IU PCB1
- No ↓

(*2)
Abnormal voltage is supplied for fan motor.
(Normal voltage: DC280V)

Is DC power output of IU PCB1 normal? (*3)
- No → Faulty IU PCB1 → Replace IU PCB1
- Yes ↓

(*3)
Measure the voltage between VCC15 and VDC (15V±10%) by tester.

Is DC power output of IU PCB1 normal? (*4)
- No → Faulty IU PCB1 → Replace IU PCB1
- Yes ↓

(*4)
Measure following check points voltages by tester.
Between VCC05 and GND: 5V±4%
Between VCC13 and GND: 13.1V±10%

(*5)
Perform the operation with disconnecting CN1 on IU PCB1. It is normal if more than 1V generates between number 3 pin of CN1 and VDC- (check point) for approx 10 seconds after starting the operation.

NOTE

- *Even if the operation is stopped, 0.3 to 0.4V may generate.*
- *Since the control specified in "*" is performed after the 10th second from the start of operation, it may not be possible to obtain a steady voltage after the 10th second.*

Is fan motor speed control command to fan motor correctly? (*5)
- No → Faulty IU PCB1 → Replace IU PCB1
- Yes → Does fan motor run?
  - No → Faulty fan motor → (*5) → Replace fan motor
  - Yes ↓

(*6)
Perform the operation with connecting CN1 on PCB1. It is normal if several voltages generate between number 2 pin of PC4 and VDC- (check point).

NOTE

Even if the operation is stopped, approx 0.2V may generate.

Is speed pulse signal to IU PCB1 correctly? (*6)?
- Yes → Faulty IU PCB1 → (*6) → Replace IU PCB1
- No → Faulty fan motor → Replace fan motor

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

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.

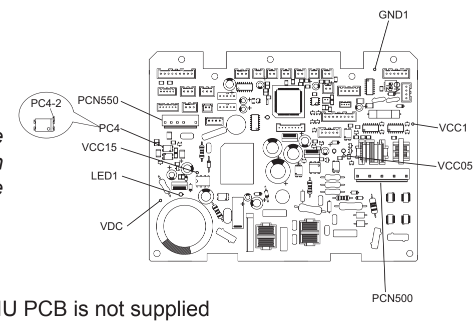
- (*)Set air flow volume "Hi" before starting this check.

CAUTION

- *Perform the following check after setting the air flow volume to "HIGH".*
- *A high voltage is applied to electrical parts. Perform the check carefully to prevent an electric shock.*

NOTE

Turn OFF the power source securely before connector checking. If not, it may cause DC fan motor failure. (Built-in PCB for DC fan motor may be damaged.)



Occurrence of Alarm code "19"

↓

Check connectors PCN500 and PCN550 on IU PCB

↓

Check that 230V is applied between L1 and N of TB1

Yes ↓

Is LED4 on IU PCB OFF? (*1) — Yes → Faulty IU PCB → Replace IU PCB

(*1)
The electrical source for IU PCB is not supplied when LED4 is turned OFF

No ↓

Is LED1 on IU PCB OFF? (*2) — Yes → Faulty IU PCB → Replace IU PCB

(*2)
Abnormal voltage is supplied for fan motor.
(Normal voltage: DC280V)

No ↓

Is DC power output of IU PCB normal? (*3) — No → Faulty IU PCB → Replace IU PCB

(*3)
Measure the voltage between VCC15 and VDC (15V±10%) by tester.

Yes ↓

Is DC power output of IU PCB normal? (*4) — No → Faulty IU PCB → Replace IU PCB

(*4)
Measure following check points voltages by tester.
Between VCC05 and GND: 5V±4%
Between VCC13 and GND: 13.1V±10%

Yes ↓

Is fan motor speed control command to fan motor correctly? (*5)

(*5)
Perform the operation with PCN550 on IU PCB disconnected. It functions normally if if more than 1V generates between number 4 pin of PCN550 and VDC- (check point) for approx 10 seconds after starting the operation.

NOTE

- *Even if the operation is stopped, 0.3 to 0.4V may generate.*
- *Since the control specified in "*" is performed after the 10th second from the start of operation, it may not be possible to obtain a steady voltage after the 10th second.*

No ↓ Faulty IU PCB → Replace IU PCB

Yes ↓

Does fan motor run? — No → Faulty fan motor → (*5) → Replace fan motor

Yes ↓

(*6)
Perform the operation with PCN550 on PCB connected. It functions normally if several voltages are generated between number 2 pin of PC4 and VDC- (chek point).

NOTE

Even if the operation is stopped, approx 0.2V may generate.

Is speed pulse signal to IU PCB sent correctly? (*6) — Yes → Faulty IU PCB → (*6) → Replace IU PCB

No ↓

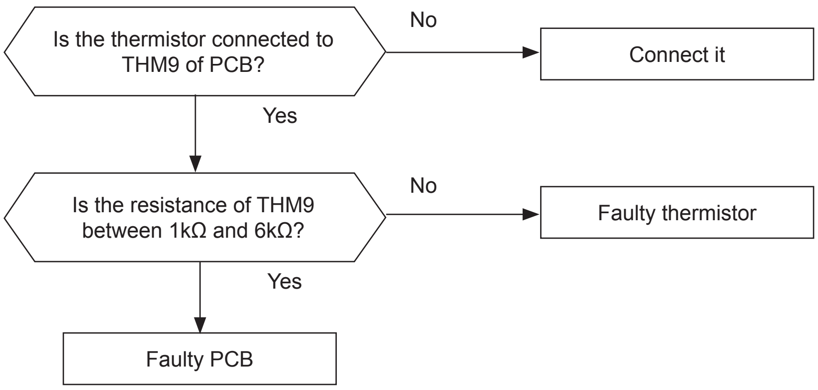
Faulty fan motor → Replace fan motor

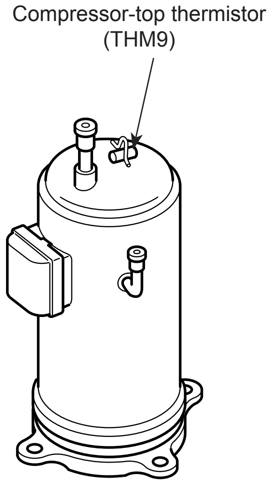
10

HITACHI

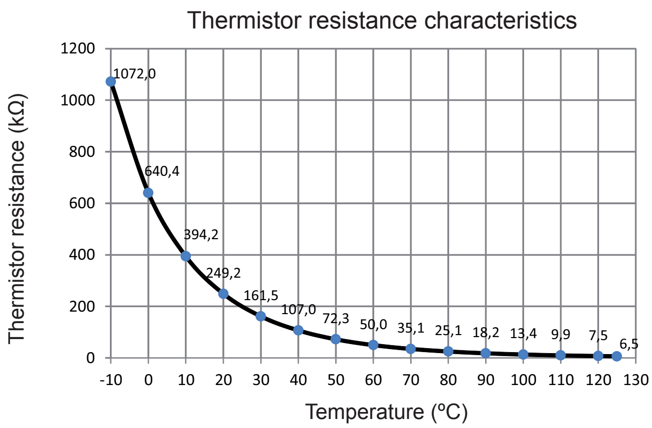
Alarm code	20	Abnormality of thermistor for discharge gas temperature (THM9) (Compressor thermistor)

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.





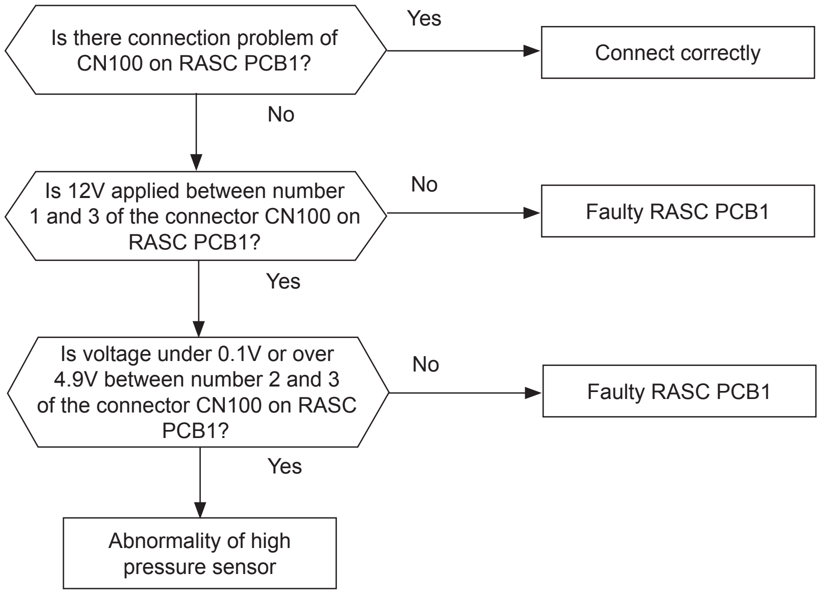
Phenomenon	Cause	Check item	Action (Turn OFF Main Switch)
Faulty top of compressor thermistor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to PCB1	Repair wiring and connections
Faulty PCB1		Replace PCB1 and check operation	Replace PCB1 if faulty



The resistance value have fudge factor (+10%).

Alarm code	21	Abnormality of high pressure sensor

This alarm code is indicated when the pressure sensor output voltage decreases (less than 0.1V) or increases (more than 4.9V) during the operation.



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
Indication of pressure value is excessively high or low	Malfunction of pressure sensor due to clogging wiring	-	Replace pressure sensor

10

Alarm code	22	Abnormal operation of the thermistor for the outdoor temperature (THM7) (RASC unit ambient thermistor)

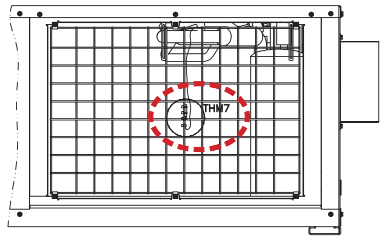
This alarm code is displayed when the thermistor is short-circuited (less than 0.2 kΩ) or cut (greater than 500 kΩ) during the operation.

Is the thermistor (THM7: red) connected to PCB1?
- No → Connect it
- Yes ↓

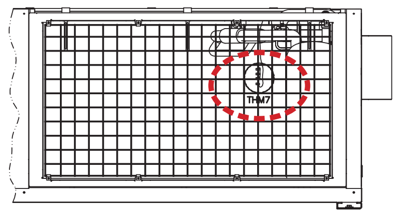
Is the resistance of THM7 between 0.24kΩ and 500kΩ?
- No → Faulty thermistor
- Yes ↓

Faulty PCB1

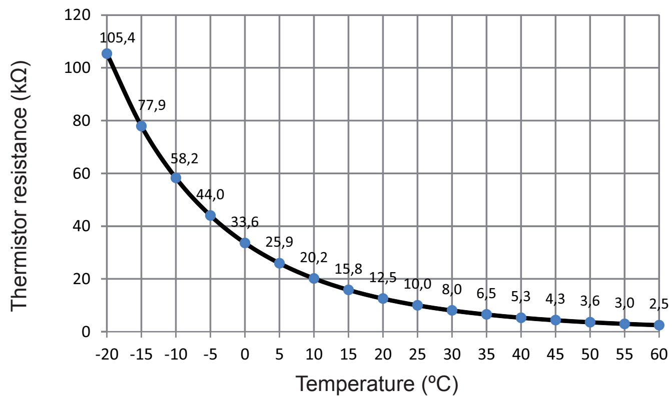
RASC-(4-6)HNPE



RASC-(8/10)HNPE



Thermistor resistance characteristics

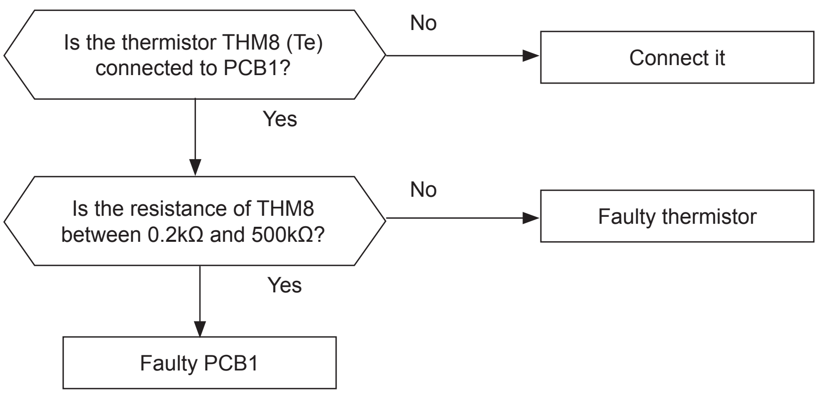


Phenomenon	Cause	Check item	Action (Turn OFF Main Switch)
Faulty thermistor for the RASC unit ambient	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to PCB	Repair wiring and connections
Faulty PCB1		Replace PCB1 and check operation	Replace PCB if faulty

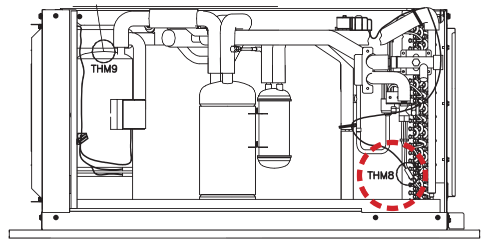
Alarm code	24	Abnormal operation of the thermistor for the evaporating temperature during the heating process (THM8) (RASC unit)

If you find an abnormal operation of the thermistor, check all the thermistors as shown below.

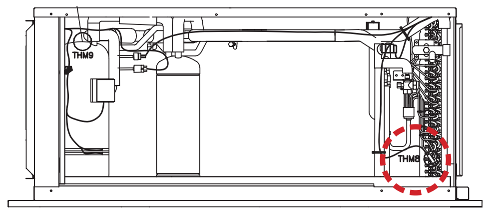
- The evaporating thermistor during the heating process is attached to the heat exchanger as shown in the figure below. If this the thermistor is faulty, such as short-circuit (less than 0,2kΩ) or cut (more than 500kΩ) during operation, this alarm is displayed. The position is indicated below.



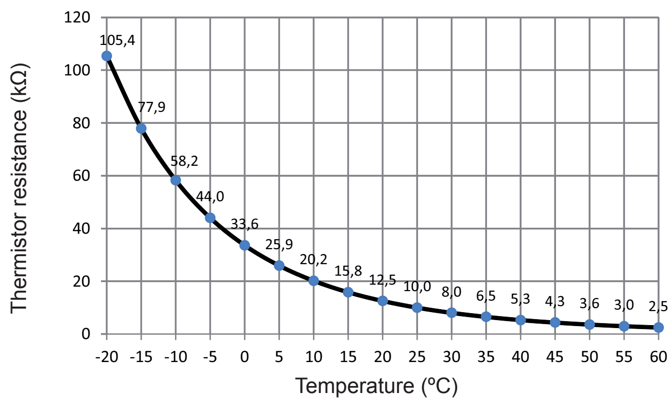
RASC-(4-6)HNPE



RASC-(8/10)HNPE



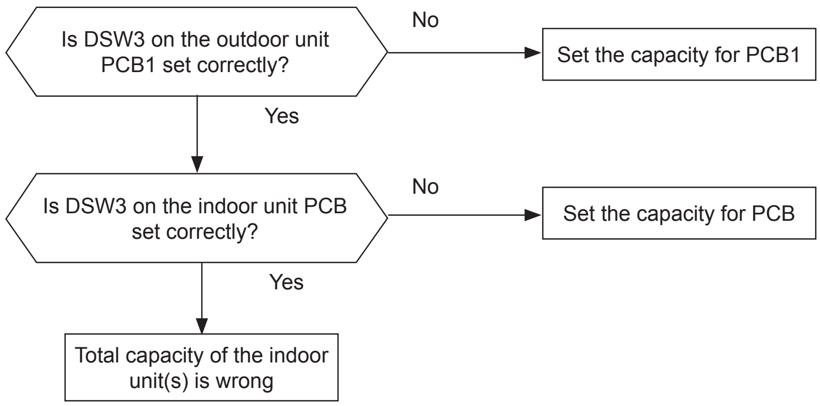
Thermistor resistance characteristics



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

Alarm code	31	Incorrect capacity setting or combined capacity between indoor units and RASC unit

- This alarm code is indicated when the undefined setting is set to DSW3 on the RASC unit PCB.
- This alarm code is indicated when the total indoor unit capacity is outside the range allowed of the combined RASC unit capacity.
- RASC unit capacity setting is not correct.



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 RASC unit		Check capacity setting on RASC unit PCB.	Correctly set dip switch, DSW3.
Total Indoor Unit Capacity Connected to the RASC unit is Beyond Permissible Range		Check RASC unit model by calculating total indoor units capacity.	Ensure that total indoor unit capacity is within 75~120%

NOTE

- *In case of H-LINK system, this alarm code is indicated when DSW4, RSW1 (for refrigerant system setting) on the RASC 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

This alarm code appears under any of the following conditions:

- Wrong indoor unit address (DSW6 + RSW1)
- Duplicated RASC unit refrigerant system setting or wrong refrigerant system DSW settings (DSW4 + RSW1).
- When the indoor and RASC 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).
- Error in the number of connected indoor units not compatible with H-LINK II. (In this case, the alarm code “b5” is flashing on the RASC unit PCB1).
  - Number of connected indoor units compatible with H-LINK II in the same refrigerant group exceeds 16 units.
  - In systems with indoor units compatible and not compatible with H-LINK II if there is no empty space in addresses 0~15 because these numbers have already been fixed for indoor units compatible with H-LINK II.

NOTE

The alarm code may appear when H-LINK system is employed for indoor-RASC unit transmission, if there is any incorrect setting in DSW4/RSW1 on the RASC 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 RASC unit PCB and DSW5/RSW2 on the indoor unit PCB before reactivating the power.

(Some indoor unit models do not have RSW2.)

Alarm code	36	Incorrect indoor unit combination

This alarm code is indicated when the indoor unit connected to the RASC unit is for other refrigerants (R22 or R407C).

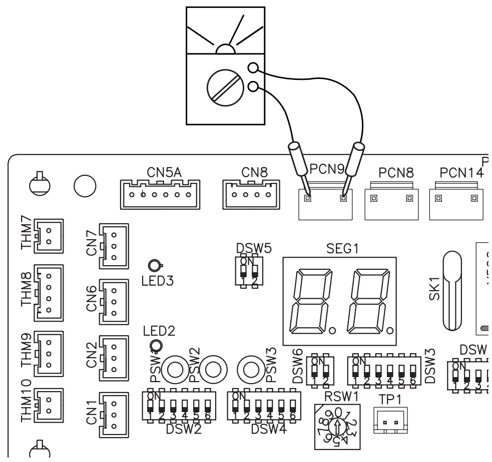
Alarm code	38	Abnormality of protective circuit for protection (RASC unit)

The alarm code appears if 1~ 230V is supplied to the connector on the RASC unit PCB1 while Y52C (Compressor relay open) is OFF or CMC (Magnetic contactor for compressor) or CMF (Magnetic contactor for fan motor) are open.

Is 1~ 230V applied between PCN9 number 1 and 3 during stoppage?

Yes → Faulty RASC PCB1

No: RASC PCB1 is normal → Check wiring connection except RASC PCB1



	Connector number for check
Connector	PCN9
Pin number	1 and 3

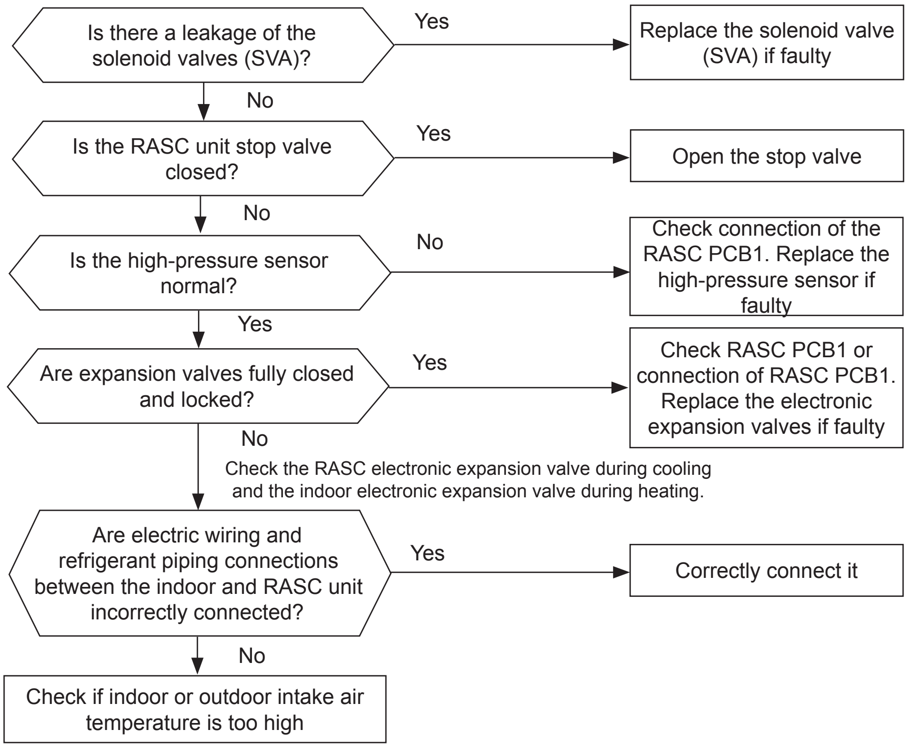
Phenomenon	Cause	Check item	Action (Turn OFF Main Switch)
Faulty DIP-IPM		Check DIP-IPM by self-checking	Replace DIP-IPM

NOTE

- *This alarm may appear if one of the protection devices of RASC unit is improperly connected or damaged (open-circuit fault) when the operation is started.*
- *Besides this, check also Alarm Code: 02 Activation of RASC Unit Protection Device.*

Alarm code	45	Activation of high pressure increase protection device

When the compressor operates with the discharge pressure (Pd) higher than 3.8 MPa for 1 minute, the retry operation is performed 3 minutes after compressor is stopped. Thereafter, this alarm code is indicated when above abnormality is detected twice in 30 minutes.



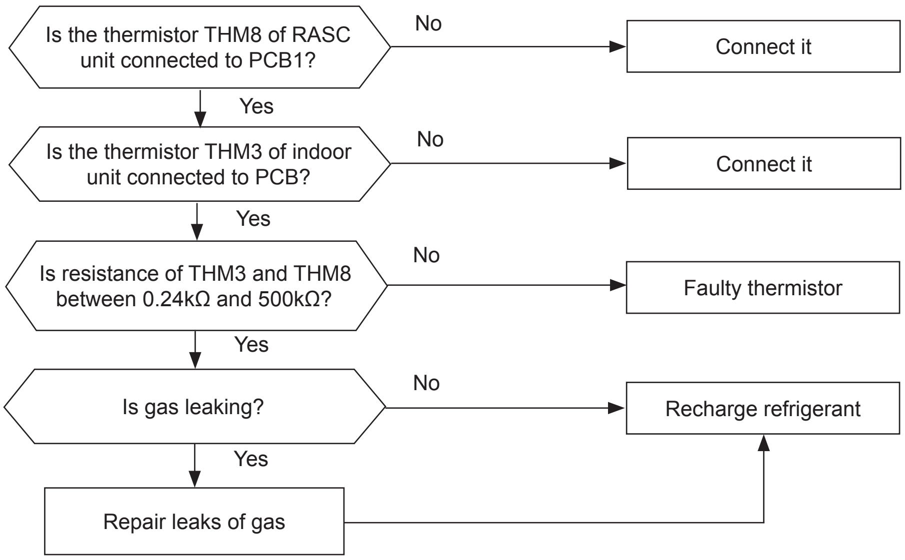
Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Excessively high discharge pressure	Leakage of solenoid valve (SVA)	Check the outlet temperature of solenoid valve (SVA)	Check connection. Replace solenoid valve (SVA) if faulty
	Closed stop valve	Check stop valve	Open stop valve
	Abnormal high pressure sensor	Check connecting condition and output voltage “CN100” (on RASC PCB1) for high pressure sensor	Replace high pressure sensor if faulty
	Excessively high temperature of inlet air for RASC unit or indoor unit	Check thermistor for indoor unit and RASC unit inlet air temperature	Replace the inlet air thermistor if faulty
	Incorrect connection between indoor unit and RASC unit	Check electrical system and refrigerant cycle system	Correctly connect
	Locked expansion valve with fully closed	Check condition of connector “CN100” on RASC PCB1	Repair connector for RASC PCB1 or expansion valve. Replace if faulty
	Faulty RASC fan motor	Measure coil resistance and insulating resistance (*)	Replace RASC fan motor if faulty.

NOTE

(*): When the alarm code “45” is indicated, the RASC fan motor may be damaged. Ensure that fan motor is checked according to the section “10.4.3 Fault diagnosis of fan motor”.

Alarm code	47	Activation to protect system from excessively low suction pressure (Protection from vacuum operation)

In the case that the evaporating temperature (Cooling: liquid refrigerant piping temperature of indoor unit; Heating: evaporating temperature of RASC unit) is lower than -37 ºC (250~350 kΩ) and the thermistor temperature on top of compressor is higher than 90 ºC for 3 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.

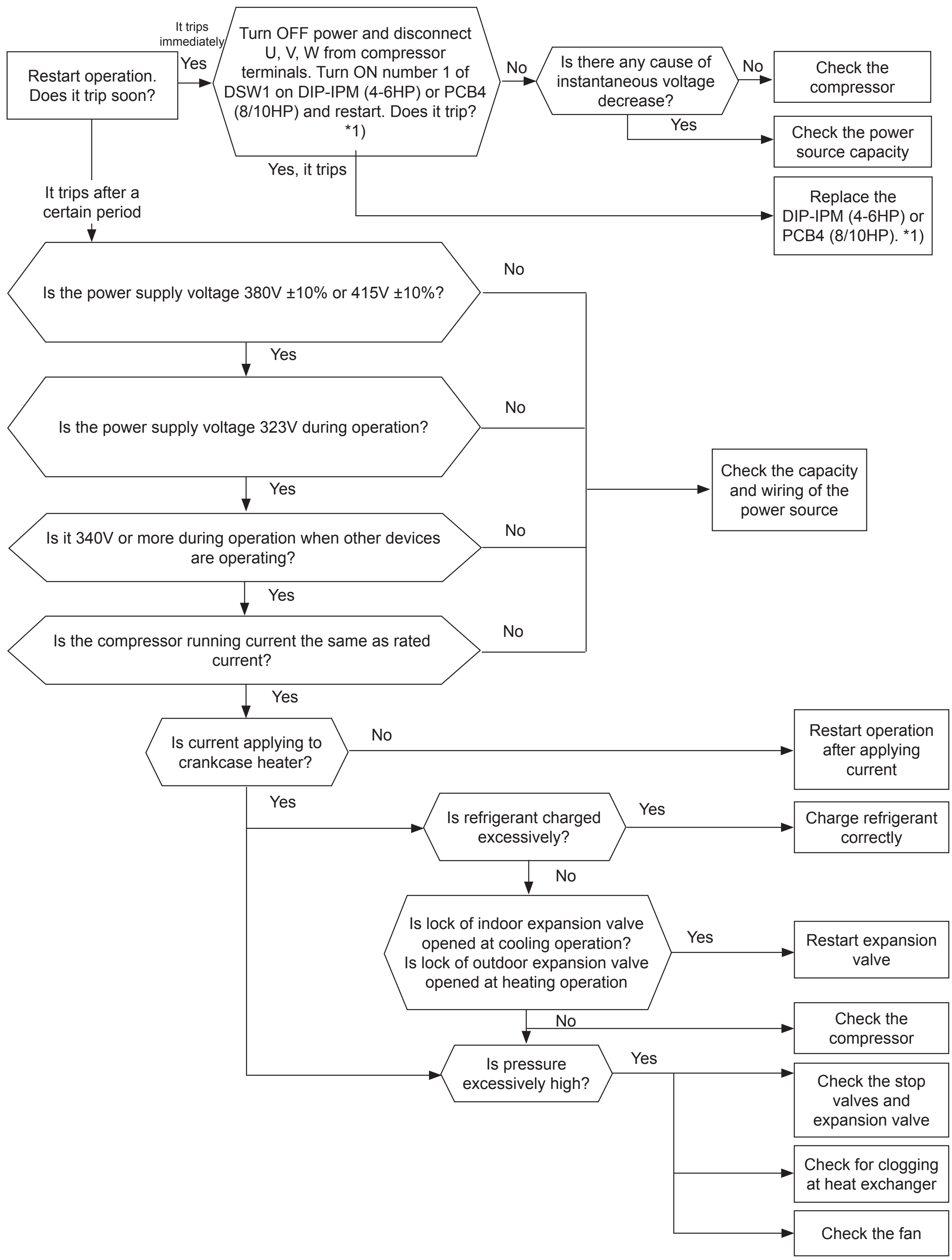


Phenomenon	Cause	Check item	Action (Turn OFF Main Switch)
– Faulty indoor unit liquid refrigerant temperature thermistor – Faulty RASC unit evaporating temperature thermistor	Fault	Check resistance.	Replace thermistor if faulty.
	Incorrect connection	Check wiring to PCB.	Repair wiring and connections.
Faulty PCB (RASC unit, Indoor unit)		Replace PCB and check the 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 temperature and pressure.	Charge refrigerant after vacuum pumping.
		Check gas leakage part.	Correctly charge refrigerant after repairing gas leakage.
Faulty RASC fan at heating operation	Faulty RASC fan motor	Measure coil resistance and insulating resistance (*)	Replace RASC fan motor if faulty.

NOTE

(*): When the alarm code "47" is indicated, the RASC fan motor may be damaged. Ensure that fan motor is checked according to the section "10.4.3 Fault diagnosis of fan motor".

Alarm code	48	Overcurrent protection activation

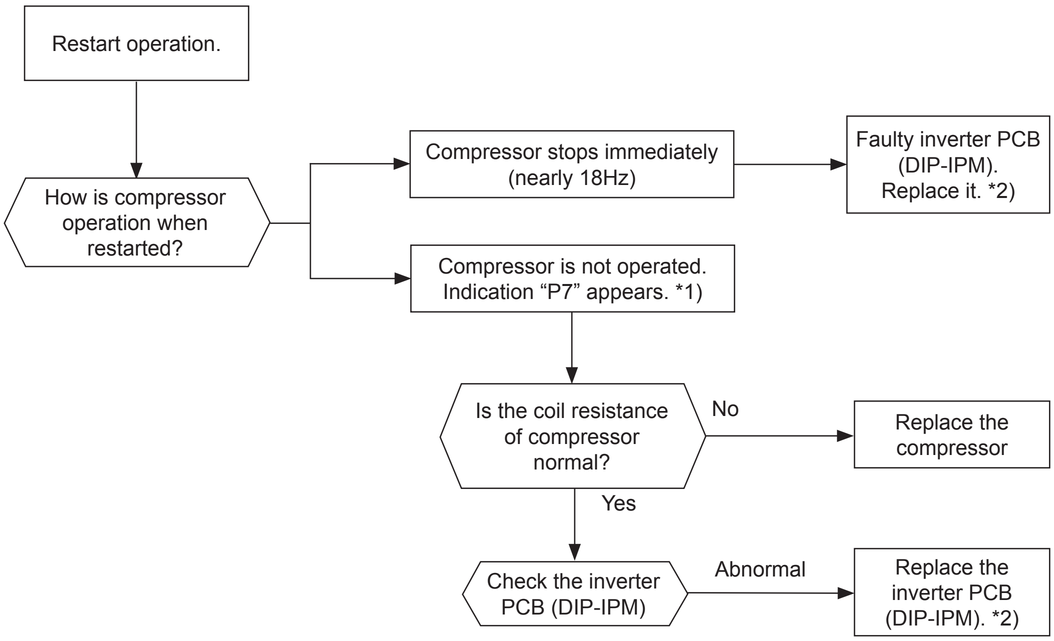


NOTE

**1): Perform the high voltage discharge work by referring to sections "RASC-(4-6)HNPE" and "RASC-(8/10)HNPE".*

Alarm code	51	Abnormal operation of the current sensor (RASC-(4-6)HNPE)

- 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 1.5 A).
  - Before the compressor is operated (at the end of position control), the current wave value is less than 5.0 A.

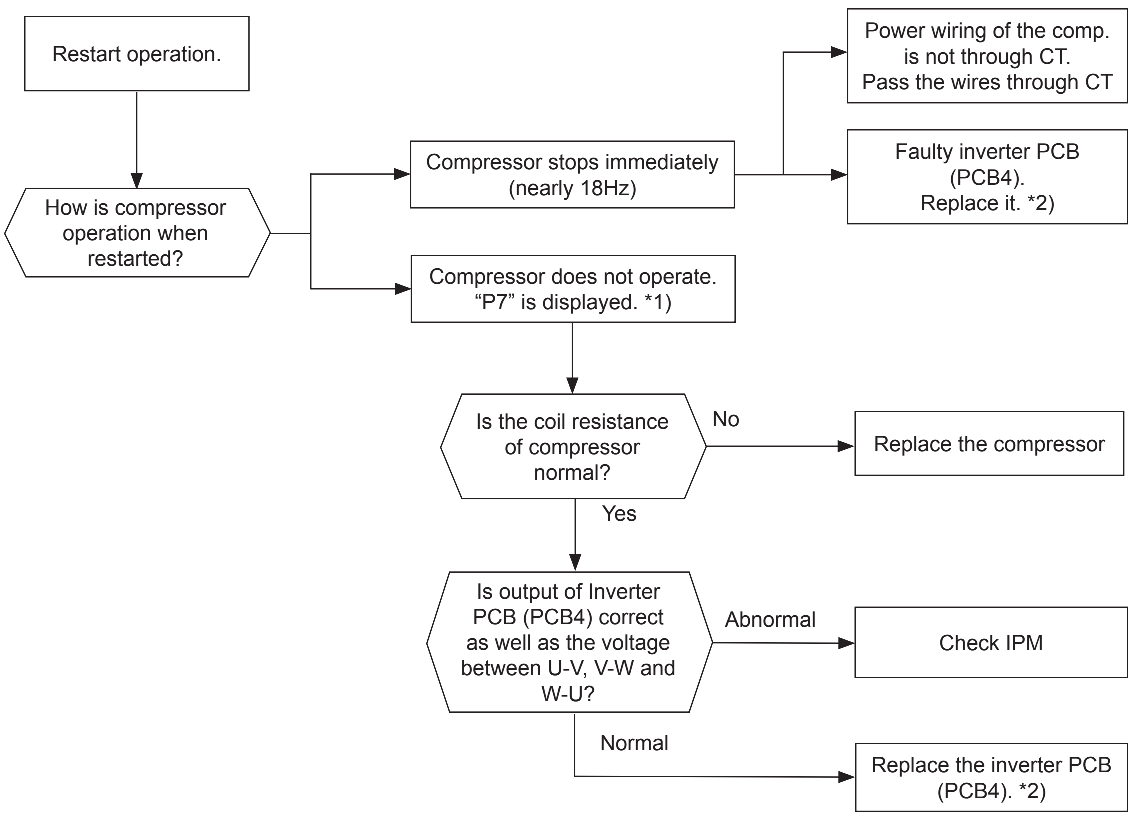


NOTE

- **1) P7 is shown at 7-segment on the RASC unit PCB.*
- **2) Perform the high voltage discharge work by referring to the item “RASC-(4-6)HNPE”, in section “10.4.2 Checking procedure for the inverter PCB” before checking and replacing the inverter parts.*

Alarm code	51	Abnormal operation of the current sensor (RASC-(8/10)HNPE)

- 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 1.5 A)
  - Before the compressor is operated (at the end of position control), the current wave value is less than 5.0 A.



NOTE

- **1) P7 is shown at 7-segment on the RASC unit PCB.*
- **2) Perform the high voltage discharge work by referring to the item “RASC-(8/10)HNPE”, in section “10.4.2 Checking procedure for the inverter PCB” before checking and replacing the inverter parts.*

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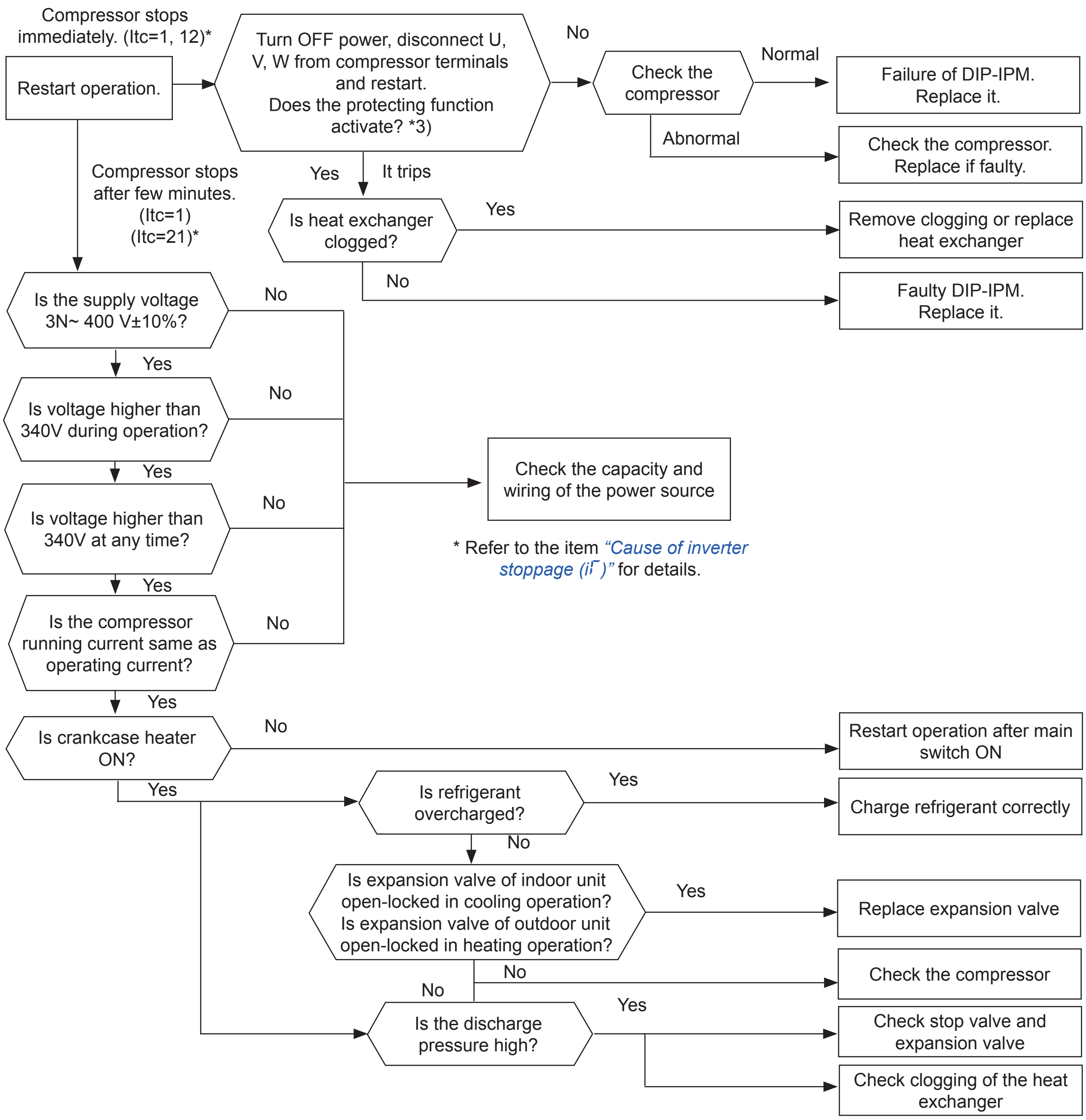
Alarm code	53	Protection activation of inverter module (RASC-(4-6)HNPE)

The inverter PCB (DIP-IPM) has a function of abnormality detection. This alarm is indicated when the inverter module detects the abnormality 7 times in 30 minutes including 7. Retry operation is performed up to the occurrence of 6 times.

Conditions:

- The abnormal current such as short circuited, grounded or the overcurrent occurs at the inverter module.
- The temperature at inverter module increases abnormally.
- The control voltage decreases.
- The angle difference between the shaft in compressor and the shaft in the control program exceeds +60deg.



NOTE

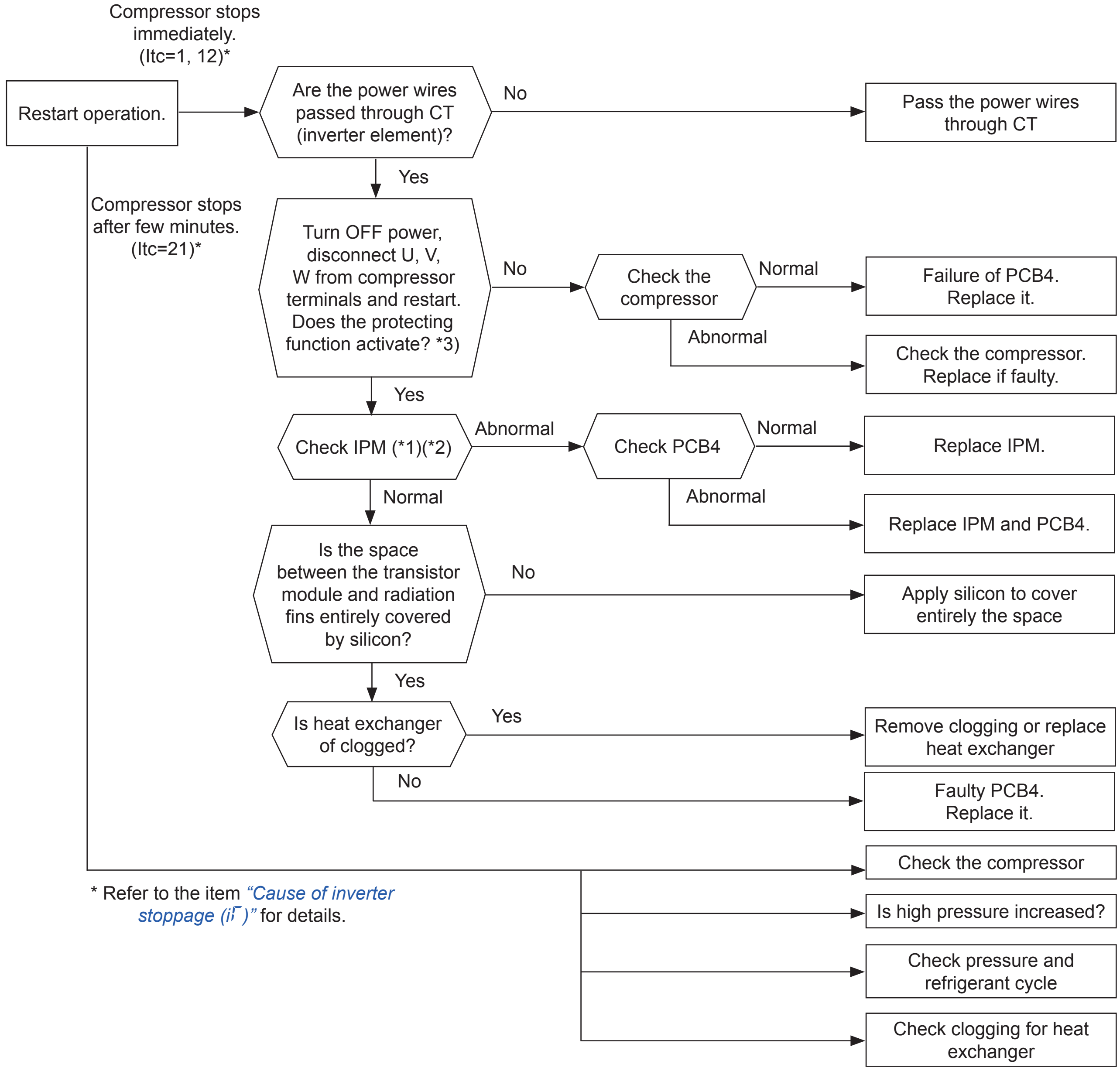
- *1): Perform the high voltage discharge work by referring to the paragraph *"RASC-(4-6)HNPE"* in section *"10.4.2 Checking procedure for the inverter PCB".*
- *2): Regarding replacing or checking method for the inverter PCB, refer to the paragraph "RASC-(4-6)HNPE" in section "10.4.2 Checking procedure for the inverter PCB".*
- *3): Turn ON the number 1 switch of the dip switch DSW1 on DIP-IPM when restarting with disconnecting the terminals of the compressor. After troubleshooting, turn OFF the number 1 switch of the dip switch DSW1 on DIP-IPM.*

Alarm code	53	Protection activation of transistor module (IPM) (RASC-(8/10)HNPE)

IPM has a function of abnormality detection. This alarm is indicated when the transistor module detects the abnormality 7 times in 30 minutes including 7. Retry operation is performed up to the occurrence of 6 times.

Conditions:

- The abnormal current such as short circuited, grounded or the overcurrent occurs at the transistor module.
- The temperature at inverter module increases abnormally.
- The control voltage decreases.
- The angle difference between the shaft in compressor and the shaft in the control program exceeds +60deg.



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NOTE

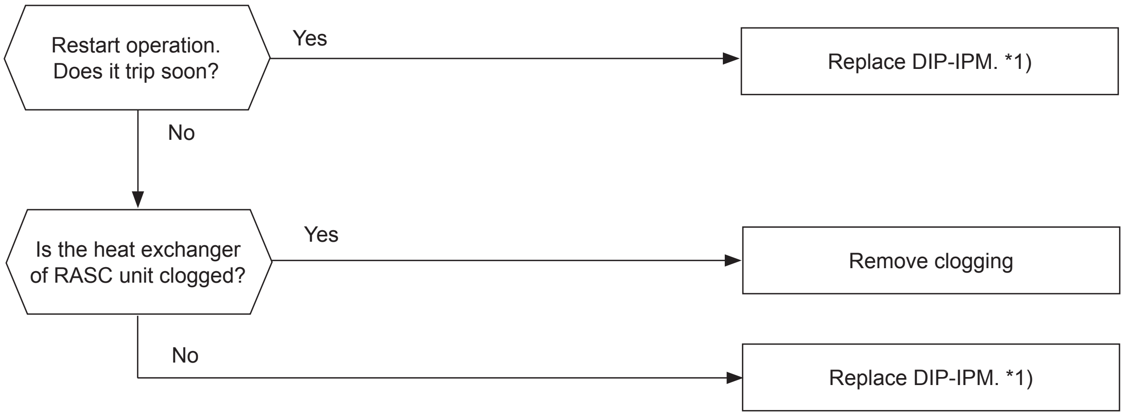
- *1): Perform the high voltage discharge work by referring to the paragraph "RASC-(8/10)HNPE" in section "10.4.2 Checking procedure for the inverter PCB".
- *2): Regarding replacing or checking method for the inverter PCB, refer to the paragraph "RASC-(8/10)HNPE" in section "10.4.2 Checking procedure for the inverter PCB".
- *3) Turn ON the number 1 switch of the dip switch DSW1 on PCB4 (inverter) when restarting with disconnecting the terminals of the compressor. After troubleshooting, turn OFF the number 1 switch of the dip switch DSW1 on PCB4.

Alarm code	54	Abnormality of inverter fin temperature (RASC-(4-6)HNPE)

This alarm code is indicated after the operation is stopped when the following condition occurs three times within 30 minutes. The retry operation is performed twice.

Conditions:

- When the temperature inside the transistor module of the inverter PCB exceeds 90 °C.



NOTE

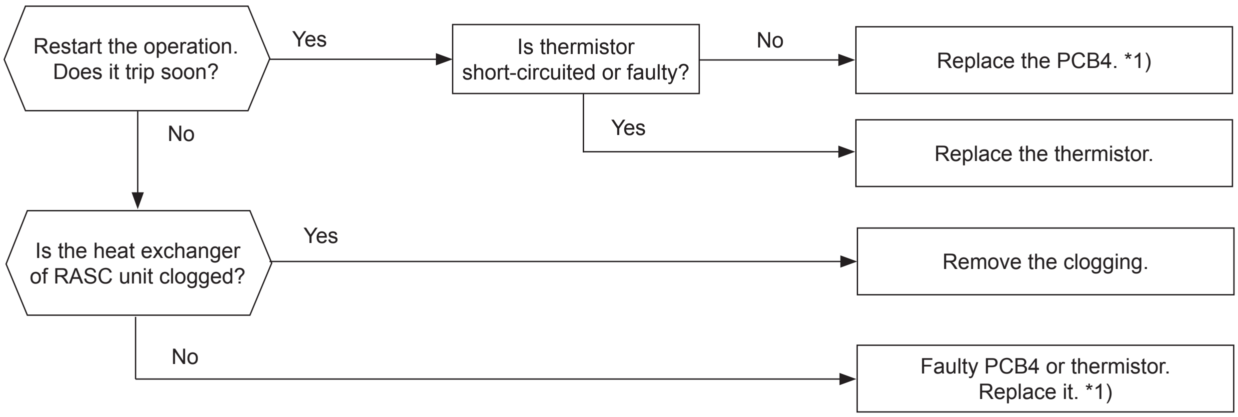
**1): Perform the high voltage discharge work by referring to the paragraph "RASC-(4-6)HNPE" in section "10.4.2 Checking procedure for the inverter PCB", before checking and replacing the inverter components.*

Alarm code	54	Abnormality of inverter fin temperature (RASC-(8/10)HNPE)

This alarm code is indicated after the operation is stopped when the following condition occurs three times within 30 minutes. The retry operation is performed twice.

Conditions:

- When the temperature of the thermistor for inverter fin exceeds 100 °C.



NOTE

**1): Perform the high voltage discharge work by referring to the paragraph "RASC-(8/10)HNPE" in section "10.4.2 Checking procedure for the inverter PCB", before checking and replacing the inverter components.*

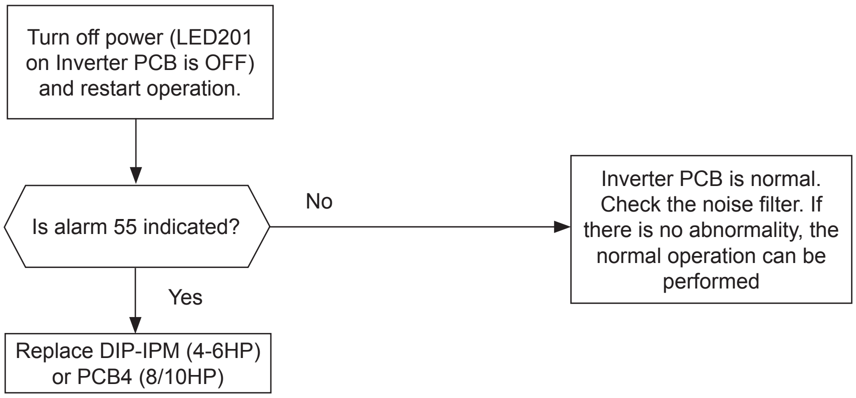
10

Alarm code	55	Abnormality of Inverter PCB

- Actual frequency from Inverter PCB is less than 10 Hz (after inverter frequency output form PCB1 to Inverter PCB).
- This alarm is displayed when it occurs 3 times in 30 minutes. Retry operation is performed up to the occurrence of 2 times.

Condition of activation:

This alarm is indicated when Inverter PCB is in abnormal condition.



Inverter PCB: DIP-IPM (For 4-6HP) and PCB4 (For 8/10HP).

NOTE

When the excessive surge current is applied to the unit due to lighting or other causes, this alarm code or the cause code of inverter stoppage (Itc=11) is indicated on the 7-segment display on RASC unit PCB1 and the unit can not operate. In this case, check to ensure the surge absorber (SA) on the noise filter (NF1). The surge absorber may be damaged if the inner surface of the surge absorber is changed to black. If the surge absorber is damaged, replace the noise filter. If the surge absorber does not have abnormality, turn OFF the power source once and wait until turning OFF LED201 (red) on inverter PCB for approx. 5 min. Then, turn ON again.

Alarm code	EE	Compressor protection

This alarm code is displayed when one of the following alarms occurs three times within six hours. If the RASC 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 RASC unit
07	Decrease in discharge gas superheat
08	Increase in discharge gas temperature
45	Activation of high pressure increase protection device
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, pay careful attention before starting, because there is a possibility of causing serious damages to the compressors.**

Alarm code	b0	Incorrect setting of unit model code

This alarm code is indicated in the following condition. Check the unit model code setting (DSW4) of indoor unit PCB after turning OFF the power source.

Condition	Action
The unit model code setting (DSW4) is not set (all pins are “OFF”), or is set for the incorrect indoor unit type.	Set DSW4 correctly.

Alarm code	b1	Incorrect setting of unit and refrigerant cycle number

This alarm code is indicated in the following condition. Check the settings of the dip switch (DSW) and the rotary switch (RSW) after turning OFF the power source.

Conditions	Action
The unit unit number setting (DSW6 and RSW1) or the refrigerant cycle unit number setting (DSW5 and RSW2) is set as “64” or more, or more than 2 pins of DSW5 or DSW6 are set.	**1** Unit number setting / refrigerant cycle number setting starting from “1” (recommended). - Set the unit number and the refrigerant cycle number from “1” to “63”. (Setting number for the 64th unit shall be “0”.) **2** Unit number setting / refrigerant cycle number setting starting from “0”. - Set the unit number and the refrigerant cycle number from “0” to “63.” (Setting number for the 64th unit shall be “63”.)
The unit unit number setting and the refrigerant cycle unit number setting are set between “16” and “63,” and the indoor unit does not support H-LINK ll.	Set the unit number and the refrigerant cycle unit number between “0” and “15”.

Alarm code	b5	Incorrect setting of indoor unit number for H-LINK type

*): The alarm code indicated on the remote control switch is “35”.

Condition	Action
The number of the connected indoor units that does not support H-LINK II is 17 and after.	The number of the connected indoor units must be 16 and before.

10.3 Troubleshooting in check mode

10.3.1 Troubleshooting using the remote controller PC-ART

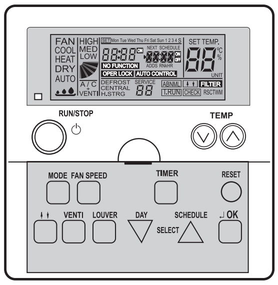
Use the “OK” switch of the remote control in the following cases:

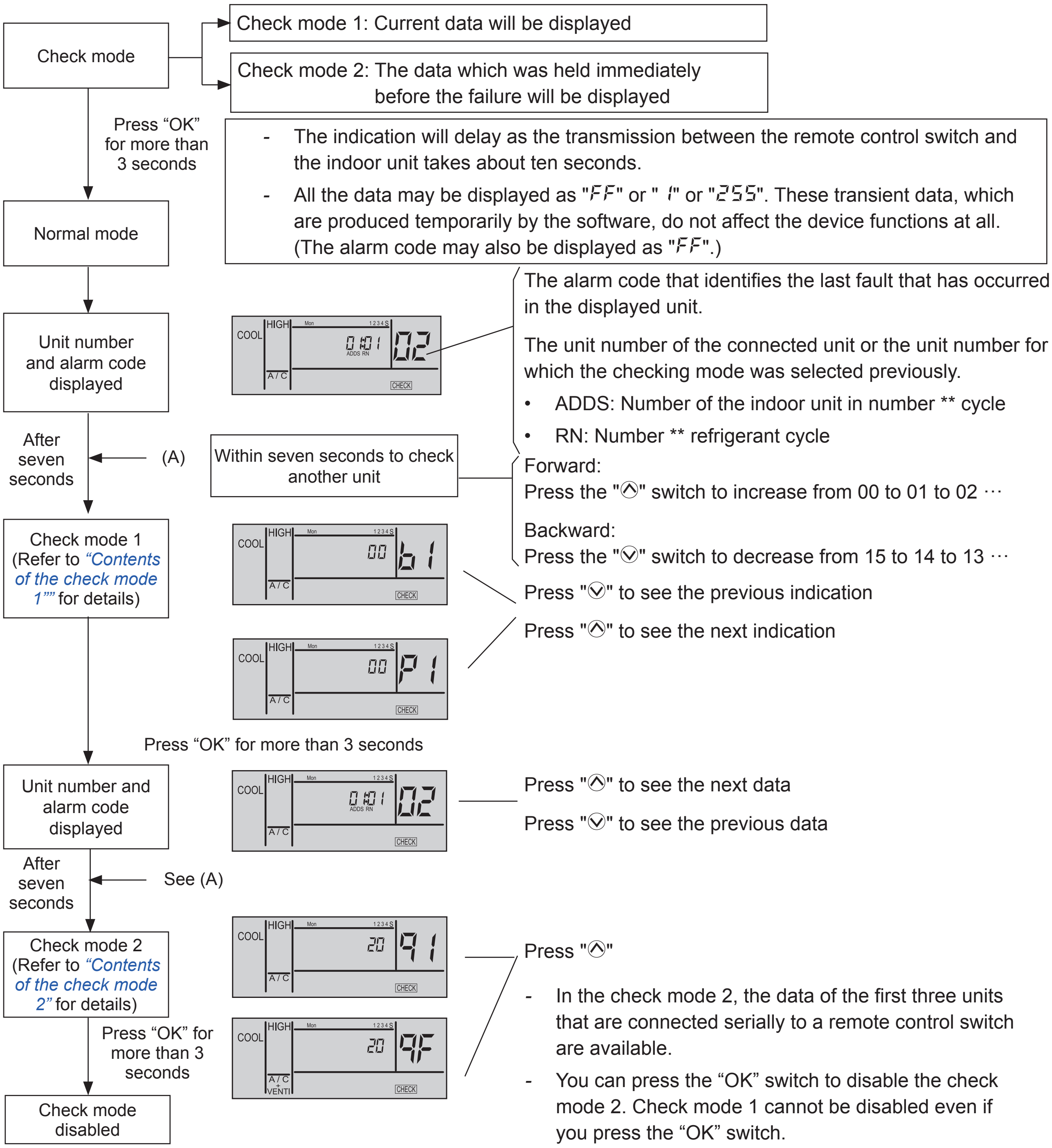
1 When the RUN LED is flickering.

2 To trace back the cause of the malfunction after restarting from the stoppage while the RUN LED is flickering.

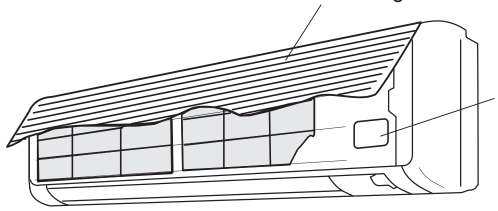
3 To check during the normal operation or during the stoppage.

4 To monitor the inlet air temperature and the discharge air temperature.





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

Normal ...... Temperature displayed

Abnormal
- -- (Thermistor is open-circuited or PCB is defective)
- or 129 (Temperature for top of compressor)
- FF (Thermistor is short-circuited or PCB is defective)
- or 255
- or 127 (Temperature for top of compressor)

Refer to section *"Self-checking procedure of PCB by means of the remote control switch"*

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

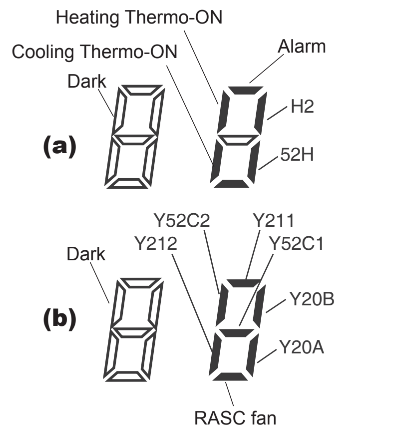
This is indicated only when a remote sensor is connected.
The indicator "--" is normally displayed.
RPK series cannot connect a remote sensor.
Therefore, the indicator is "--".

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

If the temperature is higher than 126 ºC, "126" is displayed on the remote controller screen.

Indication of micro-computer input/output

12	Micro-computer input/output in indoor unit	C1 4	(a)
13	Micro-computer input/output in RASC unit	C2 -	(b)



(Symbols with the letter Y are relays on the PCB)

Indication of unit stoppage cause

14	Cause of stoppage	d1 01

00	Operation OFF, Power OFF
01	Thermo-OFF, float switch activation (NOTE 1)
02	Alarm (NOTE 2)
03	Freeze protection, overheating protection
05	Instantaneous power failure at RASC unit (NOTE 3)
06	Instantaneous power failure at indoor unit (NOTE 4)
07	Stoppage of cooling operation due to low outdoor air temperature Stoppage of heating operation due to high outdoor air temperature
10	Demand
13	Retry due to high pressure increase prevention
15	Vacuum/discharge gas temperature increase retry
16	Retry due to discharge gas superheat decrease
17	Retry stop due to inverter trip (Instantaneous over-current, electronic thermal activation, current sensor abnormality)
18	Retry stop due to inverter trip (Voltage decrease, over-voltage, transmission error, micro-controller reset, etc.)
19	Deviation of expansion valve opening
21	Forced Thermo-OFF
22	Outdoor hot start control
26	Retry due to high pressure decrease
28	Cooling air discharge temperature decrease
33	Forced Thermo-OFF
34	Forced Thermo-OFF
35	Retry due to abnormal operating mode (Reversing valve switching failure)

NOTE 1

Explanation of term:

Thermo-ON: A condition that an indoor unit is requesting compressor to operate.

Thermo-OFF: A condition that an indoor unit is not requesting compressor to operate.

NOTE 2

Even if stoppage is caused by “Alarm”, “02” is not always indicated.

NOTE 3

If transmission between the inverter printed circuit board and the control printed circuit board is not performed during 30 seconds, the RASC unit is stopped.

In this case, stoppage is d1-05 cause and the alarm code “04” may be indicated.

NOTE 4

If transmission between the indoor unit and the RASC unit is not performed during 3 minutes, indoor units are stopped.

In this case, stoppage is d1-06 cause and the alarm code “03” may be indicated.

Abnormal operation occurrence counter

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

Countable up to 99.

Over 99 times, "99" is always displayed.

NOTE

- *If a transmission error continues for three minutes, one is added to the occurrence counter.*
- *The memorised data can be cancelled by the method which is explained in section "Self-checking procedure of PCB by means of the remote control switch"*

Indication of automatic louvre condition

19	Louvre sensor	F1 00

00: Normal

FF: Abnormal

Compressor pressure/frequency indication

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

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

Operation frequency: This is an indication for frequency of inverter

Indoor unit capacity indication

24	Indoor unit capacity	J1 08

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

Capacity code of indoor unit

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

25	RASC unit code	J2 Fn
26	Refrigerant cycle number (Indoor unit shipment DSW5+RSW2)	J3 01
27	Refrigerant cycle number (Indoor unit shipment DSW5+RSW2)	J4 00

"n" indicates the total number of Indoor Units:

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

J3: 01 ~ 64 (Decimal code)

J4: 00 ~ 3F (Hexadecimal code)

Expansion opening indication

28	Indoor unit expansion valve opening (%)	L1 20
29	RASC unit expansion valve MV opening (%)	L2 99
30	Same as line 29.	L3 99
31	Control information	L4 00

Estimated electric current indication

32	Compressor running current (A)	P1 25

The running current of the primary side of the inverter is displayed.

☛ Returns to **temperature indication**

10

◆ Contents of the check mode 2

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

If you press the part "⮝" of the TEMP switch, the next display appears. If you press the part "⮟" of the TEMP switch, the previous display appears.

Temperature indication

Indication of the category code
Indication of the temperature, etc

1	Indoor unit air inlet temperature at thermistor (°C)	91 23	Corresponds to check mode 1 "b2"
2	Indoor unit discharge air temperature at thermistor (°C)	92 50	Corresponds to check mode 1 "b3"
3	Indoor unit heat exchanger liquid pipe temperature (freeze protection) (°C)	93 25	Corresponds to check mode 1 "b4"
4	RASC unit ambient temperature (°C)	94 12	Corresponds to check mode 1 "b6"
5	Indoor unit heat exchanger gas pipe temperature (°C)	95 25	Corresponds to check mode 1 "b7"
6	RASC unit evaporating temperature during heating (°C)	96 03	Corresponds to check mode 1 "b8"
7	Control information	97 --	Corresponds to check mode 1 "b9"
8	Discharge gas temperature at the top of compressor chamber (°C)	98 45	Corresponds to check mode 1 "bA"

Compressor pressure/frequency indication

9	Discharge pressure (high) (x 0.1 MPa)	99 18	Corresponds to check mode 1 "H 1"
10	Suction pressure (low) (x 0.01 MPa)	9A 04	Corresponds to check mode 1 "H2"
11	Control information	96 44	Corresponds to check mode 1 "H3"
12	Operation frequency (Hz)	9C 44	Corresponds to check mode 1 "H4"

Expansion opening indication

13	Indoor unit expansion valve opening (%)	9d 20	Corresponds to check mode 1 "L 1"
14	RASC unit expansion valve MV opening (%)	9E 99	Corresponds to check mode 1 "L2"

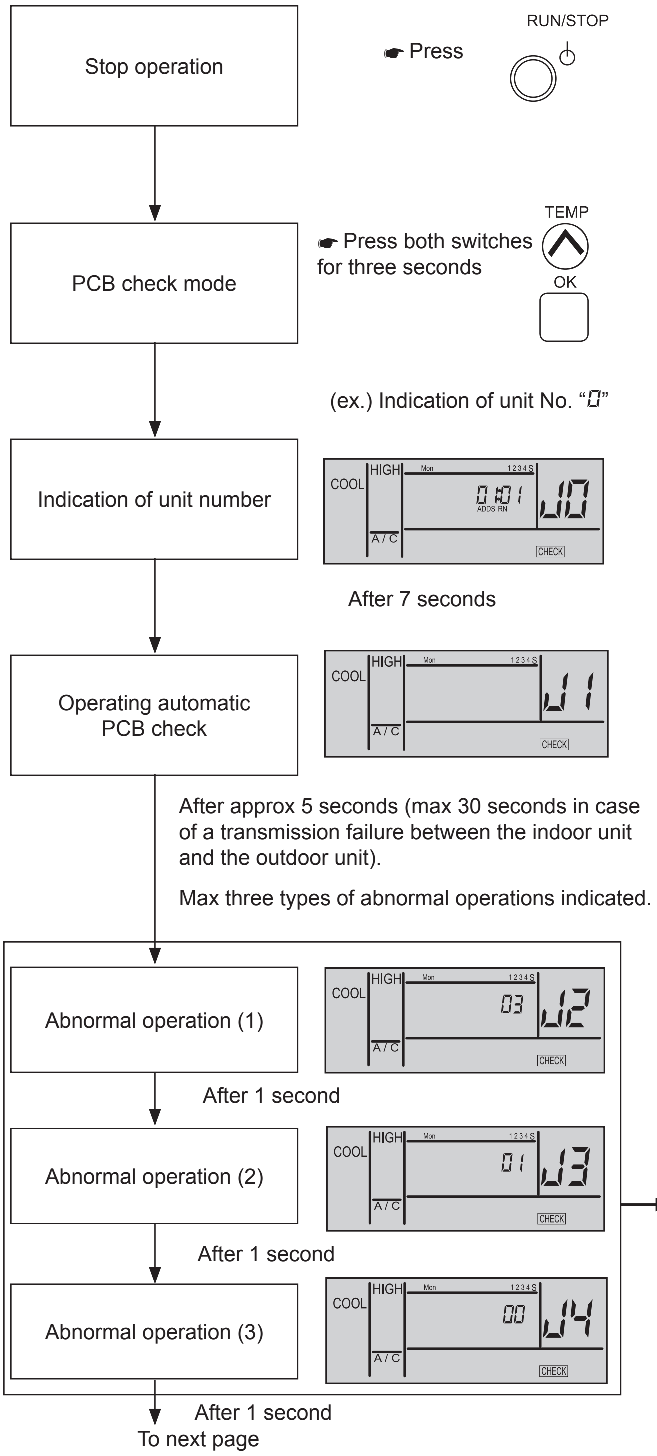
Estimated electric current indication

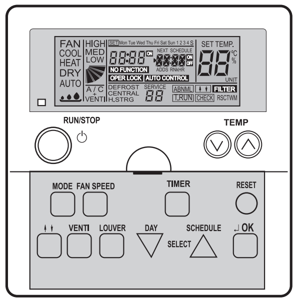
15	Compressor running current (A)	9F 20	Corresponds to check mode 1 "P 1"

☛ Returns to **temperature indication**

◆ 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 the RASC unit:





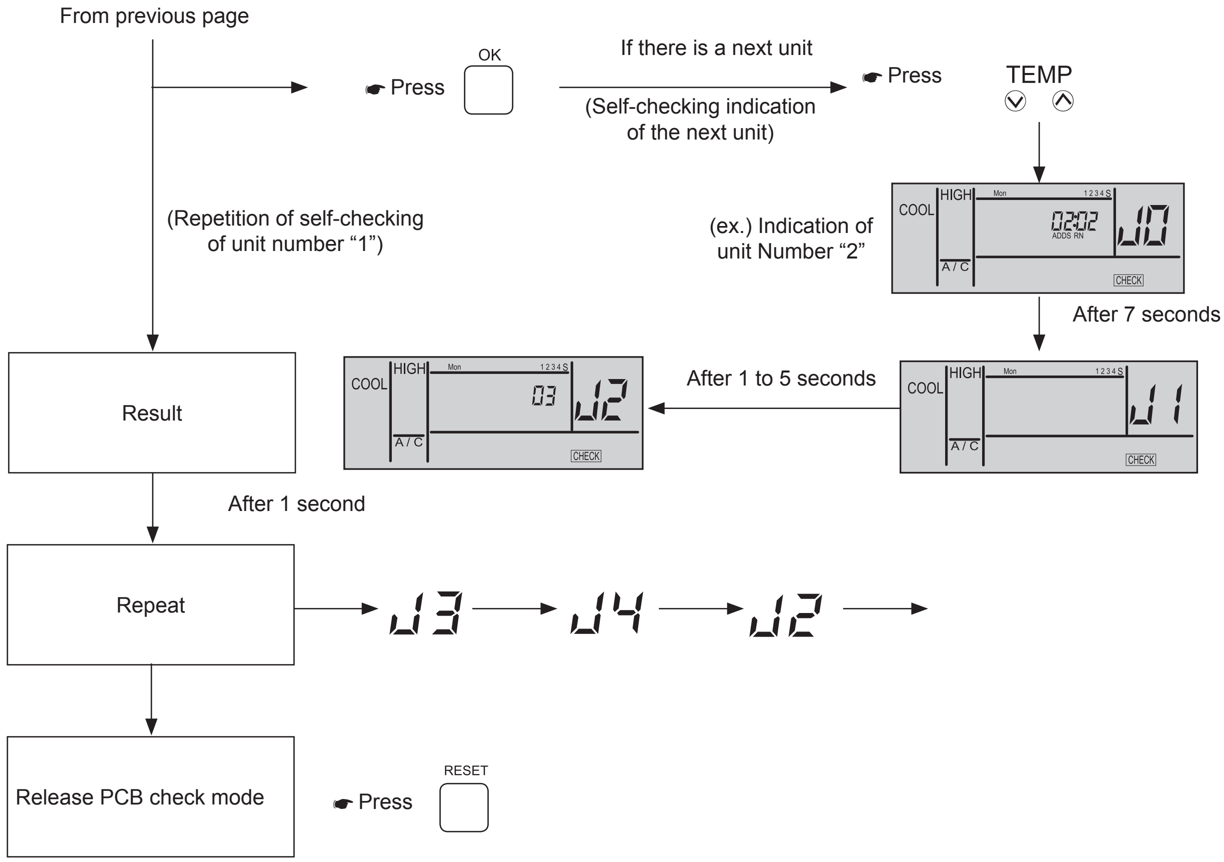
Indication	Contents	
00	Normal	
Abnormality (open-circuit, short-circuit, etc.) in circuit for:		
01	Air inlet temperature thermistor	Indoor unit PCB
02	Discharge air temperature thermistor	Indoor unit PCB
03	Liquid pipe temperature thermistor	Indoor unit PCB
04	Remote thermistor abnormality	Indoor unit PCB
05	Gas pipe temperature thermistor	Indoor unit PCB
06	Remote sensor	Indoor unit PCB
08	Transmission of central station	Indoor unit PCB
0A	EEPROM	Indoor unit PCB
0b	Zero cross input failure	Indoor unit PCB
EE	Transmission of indoor units during this checking operation	Indoor unit PCB
07	Transmission of RASC unit	RASC unit PCB
F4	Internal thermostat fan input failure	RASC unit PCB
F5	PSW input failure	RASC unit PCB
F6	PSH protection signal detection circuit	RASC unit PCB
F7	Phase detection	RASC unit PCB
F8	Transmission of inverter	RASC unit PCB
FA	High-pressure sensor	RASC unit PCB
Fb	Compressor discharge gas temperature thermistor	RASC unit PCB
FC	Low-pressure sensor	RASC unit PCB
Fd	Heat exchanger evaporation temperature thermistor	RASC unit PCB
FF	Ambient air temperature thermistor	RASC unit PCB

10

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 previous checking, perform the following procedure:

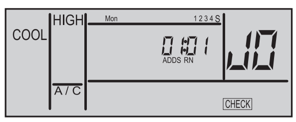
1. Turn OFF the power supply.
2. Set Dip Switch (SW1) of the receiver part at "wired" side.
3. Connect the PC-ART to the terminal board.
4. Turn ON the power supply.

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.*



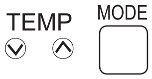
- *In this troubleshooting procedure, checking of the following parts of the PCB is not available.*
  - *PCB in indoor unit: relay circuit, DIP switch, option circuit, fan circuit, protection circuit.*
  - *PCB in RASC unit: relay circuit, DIP switch, option circuit.*
- *If this troubleshooting is performed in the system using 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.*

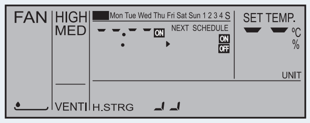
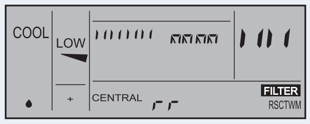
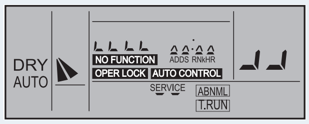
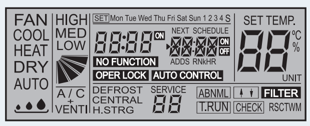
◆ Self-checking procedure of the remote control switch

Cases where the OK switch is used:

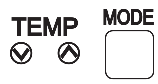
1 If the remote control switch displays a malfunction.

2 For the regular maintenance check.

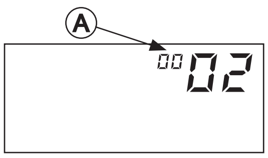
1	Turn ON the power source
2	Simultaneously press the following three switches. (During the operation, you can press the switches.) 
3	The LCD changes as shown in the right figure.
4	After the LCD changes as shown in the right figure, the RUN indicator flickers twice. 

Nº	LCD indication	Indicating period
1		1 second
2		1 second
3		1 second
4		1 second
5		3 seconds

Only for the cancellation of EEPROM, press the following three switches simultaneously during the changes of the LCD.



To 11

5	The LCD changes as shown below. Press all the switches (13 switches) one by one. Every time you press the switch, the number of the indication of the part (A) in the figure below increases one. 

NOTE

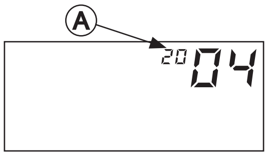
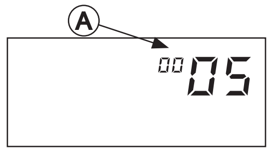
- *Unless all the switches are pressed, the checking does not proceed to the next item.*
- *You can press the switches in any order.*
- *Pressing two or more switches simultaneously is invalid and not counted.*

6	The LCD changes as shown below. The remote control switch automatically starts to check the transmission circuit. 

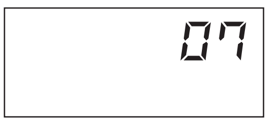
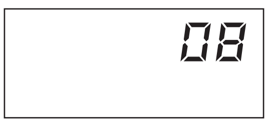
NOTE

In case that the transmission circuit is abnormal, the LCD remains as shown in the left figure and the checking does not proceed to the next item.

10

Step	Description	Remarks
7	The LCD changes as shown below. The detected temperature of the remote control thermostat is displayed at the (A) part in the figure below. 	If the indicators "--" or "FF" are displayed at the "A" part, the remote control thermostat is abnormal.
8	The LCD changes as shown below. 	If you press the RESET switch or you leave 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 displayed at the (A) part, which is shown in the figure below. When the number "99" is displayed, EEPROM is abnormal. 
9	The LCD changes as shown below.  After several seconds have passed, the remote control switch is automatically activated again.	If the number which is displayed at the (A) part is "99", the checking does not proceed to the next item.
10	When the remote control switch is activated again, the RUN indicator is ON and the operation is started. Therefore, press the RUN/STOP switch and stop the operation.	**NOTE** • *In case that the operation is not automatically started when the remote control switch is activated again, the detection circuit for the momentary stoppage may be abnormal. However, the detection circuit will not interfere with the normal operation.* • *There is a case where the operation is automatically stopped after the automatic operation when the remote control switch is activated again.*

Cancellation of EEPROM (from step 3)

Step	Description
11	The LCD changes as shown below and the remote control switch automatically cancels the EEPROM. 
12	The LCD changes as shown below  After several seconds have passed, the remote control switch is automatically activated again. In this case, the operation is not started automatically.

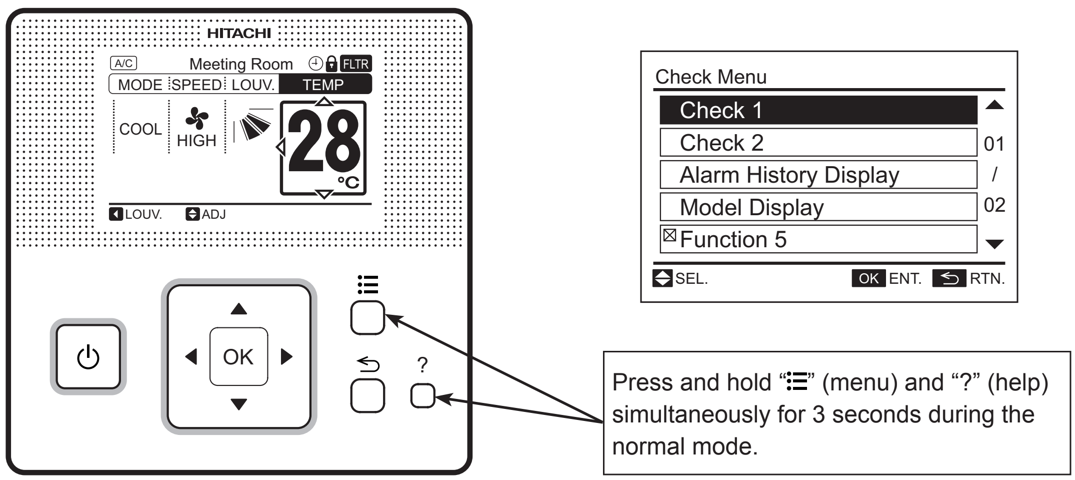
10.3.2 Troubleshooting using the remote controller PC-ARF

Each “Check Menu” item and its function is explained in the following table.

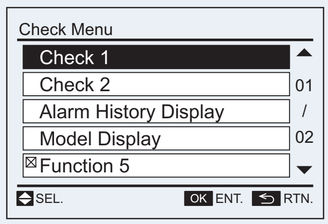
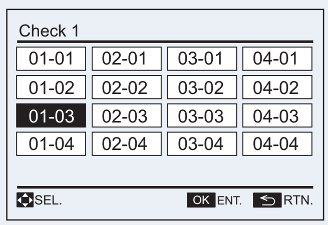
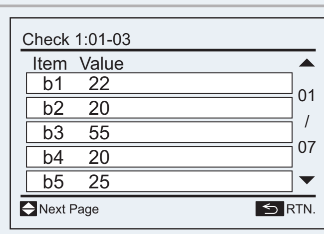
Check Menu item	Function
Check 1	Sensor condition of air conditioner will be monitored and indicated.
Check 2	Sensor data of air conditioner prior to alarm occurrence will be indicated.
Alarm History Display	Previous alarm record (date, time, alarm code) will be indicated.
Model Display	Model name and manufacturing number will be indicated.
IU/OU PCB Check	The result of PCB check will be indicated.
Self Checking	Checking of remote control switch will be carried out.

Normal mode display

Check menu display



◆ **Contents of the check mode 1 and 2**

(1) Press and hold “☰” (menu) and “?” (help) simultaneously for 3 seconds during the normal mode. The check menu is displayed. (2) Select “Check 1” (or “Check 2”) from the check menu and press “OK”.	
(3) Select the set indoor unit by pressing “△ ▽ ◁ ▷” and press “OK”. (This screen is NOT displayed when the number of indoor units connected with the remote control switch is 1 (one). In this case, (4) will be displayed.)	
(4) Press “△“ or “▽“ to change the screen.	

Items of Check mode 1

Nº	Item	Data Name
1	b1	Set Temperature
2	b2	Inlet Air Temperature
3	b3	Discharge Air Temperature
4	b4	Liquid Pipe Temperature
5	b5	Remote Thermistor Temperature
6	b6	Outdoor Air Temperature
7	b7	Gas Pipe Temperature
8	b8	Evaporating Temperature at Heating
9	b9	Condensing Temperature at Cooling
10	bA	Compressor Top Temperature
11	bb	Thermo Temperature of Remote Control Switch
12	bC	Not Prepared
13	C1	IU Micro-Computer
14	C2	OU Micro-Computer
15	d1	Stopping Cause State Indication
16	E1	Times of Abnormality
17	E2	Times of Power Failure

Nº	Item	Data Name
18	E3	Times of Abnormal Transmitting
19	E4	Times of Inverter Tripping
20	F1	Louvre Sensor State
21	H1	Discharge Pressure
22	H2	Suction Pressure
23	H3	Control Information
24	H4	Operating Frequency
25	J1	Indoor unit capacity
26	J2	RASC unit code
27	J3	Refrigerant Cycle Number (1)
28	J4	Refrigerant Cycle Number (2)
29	L1	IU Expansion Valve
30	L2	RASC unit expansion valve 1
31	L3	RASC unit expansion valve 2
32	L4	RASC unit expansion valve B
33	P1	Compressor Current
34	q1	Motion Sensor Reaction Rate (0 ~ 100%)

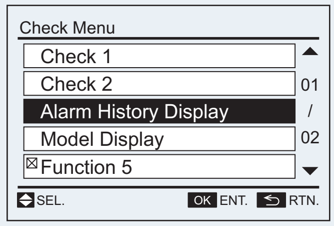
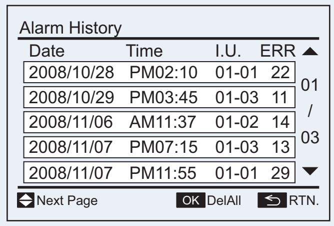
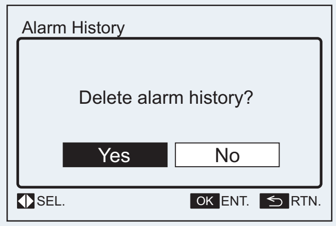
Items of Check mode 2

Nº	Item	Data Name
1	q1	Inlet Air Temperature
2	q2	Discharge Air Temperature
3	q3	Liquid Pipe Temperature
4	q4	Outdoor Air Temperature
5	q5	Gas Pipe Temperature
6	q6	Evaporating Temperature at Heating
7	q7	Condensing Temperature at Cooling
8	q8	Compressor Top Temperature

Nº	Item	Data Name
9	q9	Discharge Pressure
10	qA	Suction Pressure
11	qb	Control Information
12	qC	Operating Frequency
13	qd	Indoor unit expansion valve
14	qE	RASC unit expansion valve 1
15	qF	Compressor Current

◆ Alarm history display

The alarm history display can be set from the check menu.

(1) Press and hold “☰” (menu) and “?” (help) simultaneously for 3 seconds during the normal mode. The check menu is displayed.	
(2) Select “Alarm History Display” from the check menu and press “OK”.	
(3) The alarm history display is switched by pressing “△ or ▽”.	
(4) To delete the alarm history, press “OK.” The confirmation screen will be displayed. Select “Yes” and press “OK.” The alarm history will be deleted and the screen will return to (3) If “No” is pressed, the screen will return to (3).	

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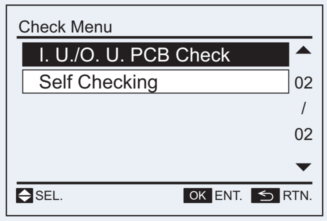
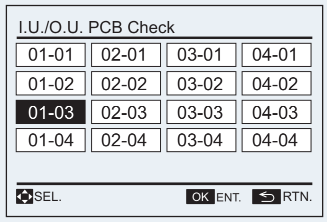
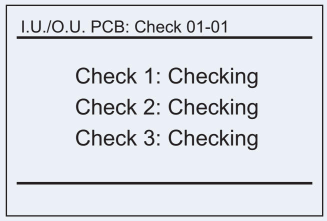
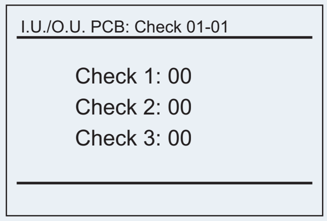
HITACHI

◆ Checking procedure of PCB by means of the remote control switch

(1) Press and hold "☰" (menu) and "?" (help) simultaneously for 3 seconds during the normal mode. The check menu is displayed.	
(2) Select "I.U./O.U. PCB Check" from the check menu and press "OK".	
(3) Select the set indoor unit by pressing "△ ▽ ◁ ▷" and press "OK". (This screen is NOT displayed when the number of indoor units connected with the remote control switch is 1 (one). In this case, (4) will be displayed.)	
(4) The indoor unit PCB and the RASC unit PCB checks are started. * If "☰" (menu) is pressed during the check, the check is cancelled and the screen will return to (2). * If "⮌" (return) is pressed during the check, the check is cancelled and the screen will return to (3).	
(5) After completing the check, the result of PCB check will be indicated. Press "⮌" (return) and return to (3).	

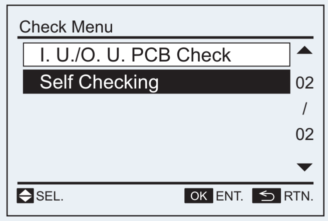
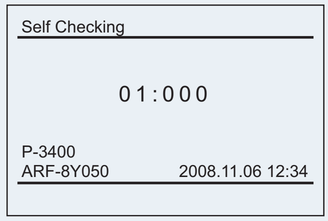
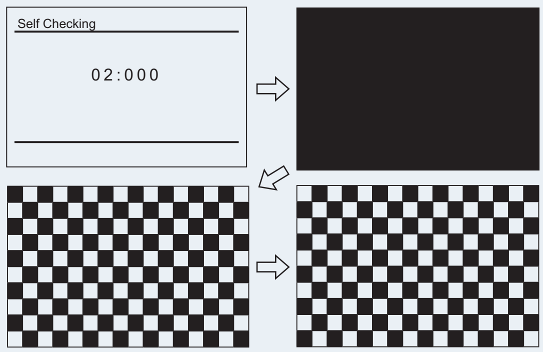
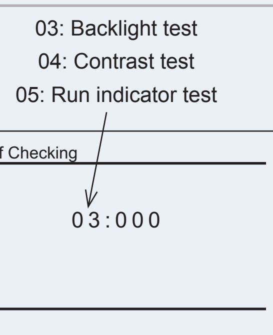
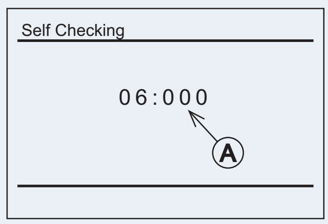
Result of check table

Indoor Unit PCB	
00	Normal
01	Abnormality of Inlet Air Temperature Thermistor
02	Abnormality of Outlet Air Temperature Thermistor
03	Abnormality of Liquid Pipe Temperature Thermistor
04	Abnormality of Remote Thermistor
05	Abnormality of Gas Pipe Temperature Thermistor
01	Abnormality of Transmission of Central Station
08	Abnormality of EEPROM
0A	Zero Cross Input Failure
0b	Abnormality of Transmission of I.U. during Check

RASC Unit PCB	
00	Normal
07	Abnormality of Transmission of RASC Unit
F4	ITO Input Failure
F5	PSH Input Failure
F6	Abnormality of Protection Signal Detection Circuit
F7	Abnormality of Phase Detection
F8	Abnormality of Transmission of Inverter
FA	Abnormality of High Pressure Sensor
Fb	Abnormality of Compressor Discharge Gas Temperature Thermistor
FC	Abnormality of Low Pressure Sensor
Fd	Abnormality of Evaporating Temperature Thermistor at Heating
FF	Abnormality of Ambient Air Temperature Thermistor

◆ Self-checking procedure of the remote control switch

The self checking performs to check the remote control switch and to clear EEPROM (storage cell inside of the remote control switch).

(1) Press and hold “☰” (menu) and “?” (help) simultaneously for 3 seconds during the normal mode (when unit is not operated). The check menu is displayed.	
(2) Select “Self Checking” from the check menu and press “OK”.	
(3) Select the process for “Self Checking”. * To start self check, press “?” (help). * To clear EEPROM, press “▽” and “?” (help) simultaneously. → See EEPROM clear process (15).	
(4) LCD Test Press “OK” and the screen will be switched as shown in the figure.	
(5) Backlight Test LCD brightness changes gradually by pressing “OK”.	
(6) Contrast Test Contrast of the LCD gradually changes by pressing “OK”.	
(7) Run Indicator Test Press “OK” and the run indicator will flash in red and green twice for each.	
(8) Switch Input Test Press the 9 switches one by one. The number indicated with “A” will be counted up as switch being pressed. * The order of pressing switch is at random. Do not press more than 1 (one) button, for it will not be counted.	

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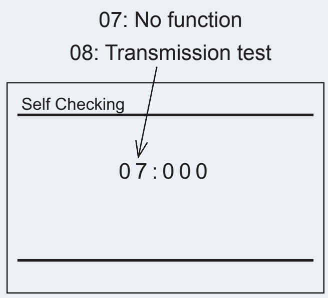
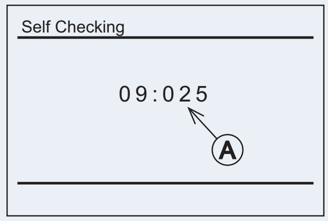
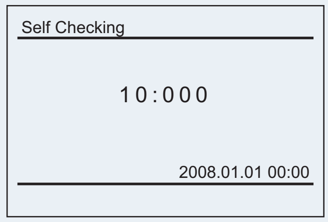
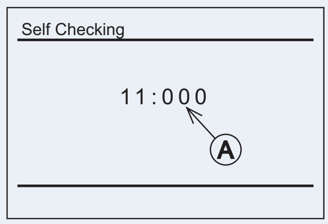
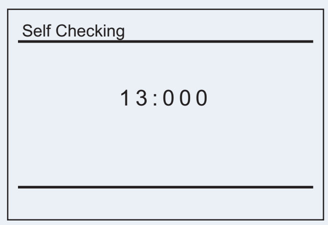
(9) No Function This function is not used. Press “OK” to proceed. (10) Transmission Circuit Test The remote control switch automatically starts to check the transmission circuit.	
(11)Remote Control Switch Thermistor Test The temperature detected by remote control switch thermistor is displayed at “A” in the right figure.	
(12) Date/Time Test The date and time is switched from “2012.03.04 12:34” to “2008. 01. 01 00:00”.	
(13) EEPROM Test < EEPROM Clearing Cancel > Press “?“ (help). < EEPROM Clear > Press “OK” or wait 15 seconds. EEPROM data will be cleared. During the process, the numbers will be indicated on where “A” is located. If A indicates “999”, EEPROM is in a faulty condition. *In case “A” indicates “999”, the process does not proceed to next step.	
(14) After the several seconds pass, the self checking is completed and the remote control switch automatically restarts.	

EEPROM process

(15) Clear EEPROM The remote control switch will automatically start EEPROM clearing process.	
(16) After the several seconds pass, the self checking is completed and the remote control switch automatically restarts.	

10.3.3 Troubleshooting using the 7 segment display

◆ Simple checking by 7-segment display

1	Turn ON indoor unit connected to the RASC unit
2	Turn ON the RASC unit
3	Auto-addressing starts

RASC unit, circuit board, PCB1

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

1 Disconnection of power supply to the indoor unit.

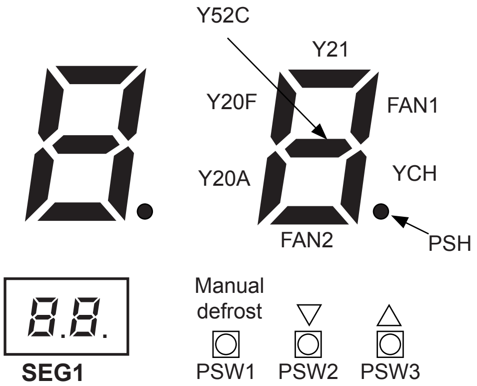
2 Reverse connection of the operating line between the RASC and indoor units.

3 Duplication of indoor unit number.

◆ Checking method by 7-segment display

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

(*1): Contents of RASC micro-controller output status



- 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.

Check mode items

NOTE

For figures consisting of more than 2 digits, the upper 2 digits and lower 2 digits of the figures are indicated alternatively every 0.5 sec In the 7-segments display, as shown below (the lower 2 digits are shown together with a dot at the lower right corner).

Example: 1253

10

Item	Item		Indication data		
	Check number	Indic.	Indic.	Contents	
Input/output state of RASC micro-computer	01	SC	5	Indicates only for the segments corresponding to the equipment in the figure. (See figure above (*1))	
Total capacity of operating indoor unit	02	oP	11	00~199 In case that capacity is higher than 100, the last two digits flash.	
Control software Number	03	SP	11	Control Software Number in use is indicated. Alternately upper 2 digits and lower 2 digits are indicated every 0.5 sec.	
Inverter software Number	04	iP	11	Control Software Number in use is indicated. Alternately upper 2 digits and lower 2 digits are indicated every 0.5 sec.	
Inverter order frequency to compressor	05	H1	74	0~115 (Hz) In case that frequency is higher than 100Hz, the last two digits flicker.	
Air flow ratio	06	Fo	80	00~15	
RASC unit expansion valve opening	07	Eo	30	00~100 (%) In case that expansion valve opening is 100%, "00" flashes	
Discharge pressure (high)	08	Pd	30	0.1 to 4.9 MPa	
Temperature at the top of compressor	09	Td	02	01~142 (ºC) In case that temperature is higher than 100ºC, the last two digits flash	
Evaporating temperature at heating	10	TE	-12	-19~80ºC	
Ambient air temperature	11	To	-3	-19~80ºC	
Inverter fin temperature	12	TF	20	-10~100 (ºC) In case that temperature is 100 ºC, "00" flashes.	
Inverter primary current	13	A1	12	00~199 (A) In case that current is higher than 100ºC, the last two digits flash	
Inverter secondary current	14	A2	20	00~199 (A) In case that current is higher than 100ºC, the last two digits flash	
Indoor unit address	15	nA	00	00~63	These items indicate the respective data for the different connected indoor units. The right character of the indication represents the indoor unit setting number. • 1st indoor unit: A • 2nd indoor unit: b • 3rd indoor unit: c • 4th indoor unit: d • 5th indoor unit: F • 6th indoor unit: G
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) In case that temperature is higher than 100ºC, the last two digits flash.	
Indoor unit intake air temperature	18	iA	28	-19~127 (ºC) In case that temperature is higher than 100ºC, the last two digits flash.	
Indoor unit discharge air temperature	19	oA	20	-19~127 (ºC) In case that temperature is higher than 100ºC, the last two digits flash.	
Cause of indoor unit stoppage	20	dA	05	(See table at the next pages)	
Total accumulated operation time of compressor	21	UJ	00	0 to 9999 (x 10 hours) Alternately upper 2 digits and lower 2 digits are indicated every 0.5 sec.	
Accumulated operation time of the compressor (can be reset to zero, example, when compressor is replaced)	22	cU	00	0 to 9999 (x 10 hours) Alternately upper 2 digits and lower 2 digits are indicated every 0.5 sec.	
Alarm code for abnormal stoppage of compressor	23	AC	08	Alarm code on compressor	
Cause of stoppage at inverter	24	iT	1	(See table at the next pages)	
Abnormal data record	25	n1	00	One of the abnormal data record from latest (n1) to oldest (n9) is indicated. Alarm code or cause code is indicated.	
Total capacity of indoor unit connected	26	CP	22	00~199 In case that capacity is higher than 100, the last two digits flash.	
Number of connected indoor units	27	AA	2	00~64	
Refrigerant address	28	GA	0	00~63	

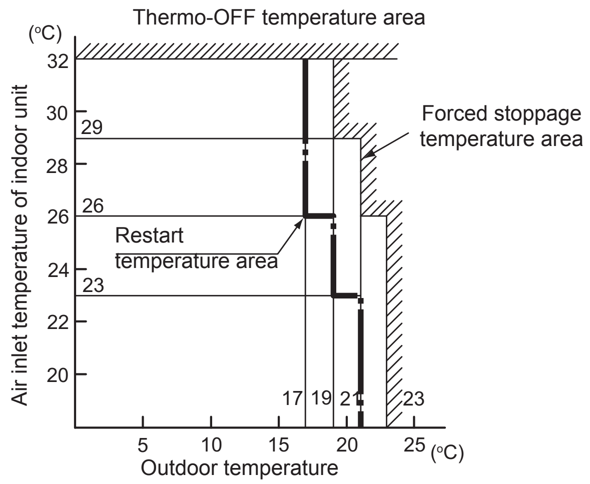
◆ Cause of indoor unit stoppage (dA)

Indication	Contents
00	Operation OFF, Power OFF
01	Thermo-OFF, float switch activation (NOTE 1)
02	Alarm (NOTE 2)
03	Freeze protection, overheating protection
05	Instantaneous power failure at RASC unit (NOTE 3)
06	Instantaneous power failure at indoor unit (NOTE 4)
07	Stoppage of cooling operation due to low outdoor air temperature Stoppage of heating operation due to high outdoor air temperature
10	Demand
11	Retry due to compression ratio decrease
13	Retry due to high pressure increase prevention
15	Vacuum/discharge gas temperature increase retry
16	Retry due to discharge gas superheat decrease
17	Retry stop due to inverter trip (Instantaneous over-current, electronic thermal activation, current sensor abnormality)
18	Retry stop due to inverter trip (Voltage decrease, over-voltage, transmission error, micro-controller reset, etc.)
19	Deviation of expansion valve opening
21	Forced Thermo-OFF
22	Outdoor hot start control
26	Retry due to high pressure decrease
28	Cooling air discharge temperature decrease
33	Forced Thermo-OFF
34	Forced Thermo-OFF
35	Retry due to abnormal operating mode (Reversing valve switching failure)

NOTE

- *10 Demand thermo OFF:*

  Temperature Area in Heating Operation



- *The cause code for indoor unit stoppage is not always "02" (Alarm) during stoppage by the abnormality. If the unit is under Thermo-OFF by other cause of stoppage before "02" (Alarm) occurs, the previous cause code for indoor unit stoppage remains.*
- *When the transmitting between the inverter PCB and the RASC unit PCB1 is disconnected for 30 seconds, the RASC micro-computer will be reset. Accordingly when the alarm code "04" (Abnormal Transmitting between Inverter PCB and RASC Unit PCB1) occurs, the cause code for indoor unit stoppage may be indicated "05".*
- *When the transmitting between the indoor unit and the RASC unit is disconnected for 3 minutes, the indoor micro-computer will be reset. Accordingly when the alarm code "03" (Abnormal Transmitting between Indoor Unit and RASC Unit) occurs, the cause code for indoor unit stoppage may be indicated "06".*
- *For combinations with several indoor units, if the cause code for indoor unit stoppage "21" is indicated, check the cause of stoppage for other indoor units.*

10

Cancellation of Forced Thermo OFF (Cause code: 21)

Turn ON the power source and wait for more than 30 seconds. Then press PSW1 for more than 3 seconds.

Forced thermo-OFF (indoor unit error code 21) 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.

◆ Cause of inverter stoppage (iT)

Code	Cause	Cause of stoppage for corresponding unit	Remark	
			Indication during retry	Alarm Code
1	Fault signal error of inverter module (DIP-IPM/IPM Error) (Overcurrent, Undercurrent, Temperature increase, etc.)	17	P7	53
2	Instantaneous overcurrent	17	P7	48
3	Abnormal inverter fin temperature	17	P7	54
4	Electronic thermal activation (Inverter overcurrent)	17	P7	48
5	Voltage decrease (Undervoltage)	18	P8	06
6	Overvoltage	18	P8	06
7	Abnormal inverter transmission	18	-	04
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	-	-
16	Inverter non-operation	18	P8	55
17	Communication abnormality	18	P8	55
18	Protection device activation (PSH)	-	-	02
19	Protection detection device abnormality	-	-	38
20	Early Return Protection Device	18	-	-
21	Synchronism loss detection	17	P7	53
22	PCB setting abnormality	-	-	31

◆ Table of capacity codes of indoor unit

Code	Equivalent horsepower
06	0.8
08	1.0
10	1.3
11	1.5
13	1.8

Code	Equivalent horsepower
14	2.0
16	2.3
18	2.5
22	3.0
32	4.0

Code	Equivalent horsepower
40	5.0
48	6.0
64	8.0
80	10.0

◆ 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

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

Priority	Protection control	Code
1	Pressure ratio control	P1
2	High-pressure increase protection	P2
3	Inverter current protection	P3
4	Inverter fin temperature increase prevention	P4
5	Discharge gas temperature increase protection	P5
6	Demand current control (running current limit control)	PA
7	High-pressure decrease protection	P9

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.

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◆ Activating condition of protection control code

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

Code	Protection control	Activating condition	Remarks
P1	Pressure ratio control	Compression ratio ε ≥ 7.5 => frequency decrease Compression ratio ε ≤ 1.6 => frequency increase	ε = (Pd+0.1)/(Ps+0.1)
P2	High-pressure increase protection	High pressure switch for control is activated => Frequency Decrease	-
P3	Inverter current protection	If Inverter PCB secondary current > (*1)A => Frequency decrease	-
P4	Inverter fin temperature increase prevention	If inverter fin temperature is: RASC-(4-6)HNPE ≥ 70 ºC RASC-(8/10)HNPE ≥ 80 ºC => Frequency decrease	-
P5	Discharge gas temperature increase protection	Temperature at the top of compressor is high => frequency decrease (Maximum temperature is different depending on the frequency) Temperature at the top of compressor > 112 ºC => Indicate P5	-
P9	High-pressure decrease protection	Discharge pressure of compressor decrease under 1.0 MPa => Frequency increase	Cooling operation and lowest step fan or heating operation
PA	Demand current control (running current limit control)	Compressor run current ≥ demand setting value => frequency decrease	Demand setting value: upper limit of total running current is set to 100%, 80%, 70%, 60% at normal operation using input on PCB1

Ps: Suction pressure of compressor (MPa)

Pd: Discharge pressure of compressor (MPa)

(1)*

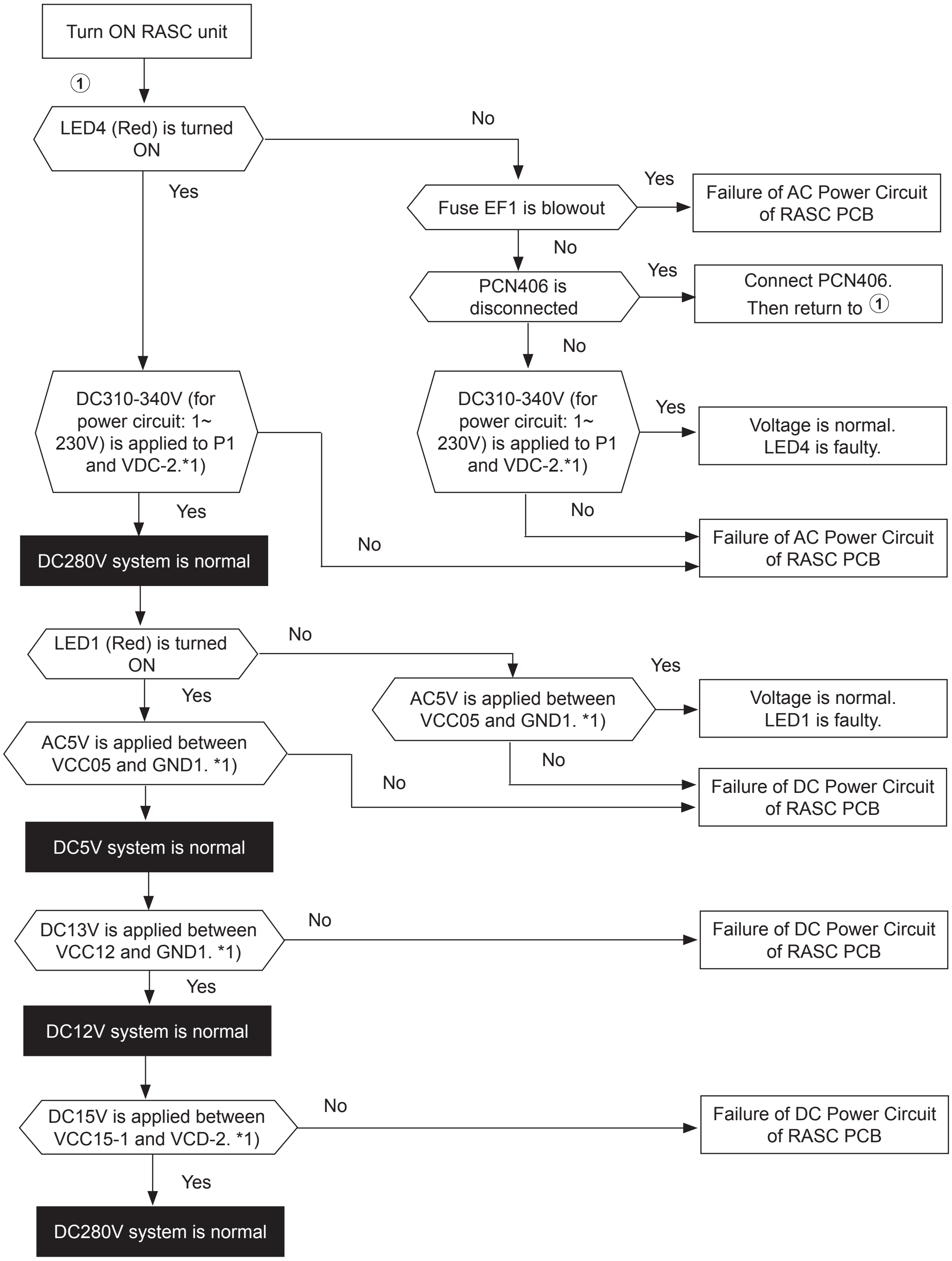
Connection	3N~ 400V 50Hz				
HP	4	5	6	8	10
Current (A)	11.0	11.0	11.0	17.5	20.0

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.*

10.4 Checking procedure for main parts

10.4.1 Checking procedure for the control PCB (PCB1)



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NOTE

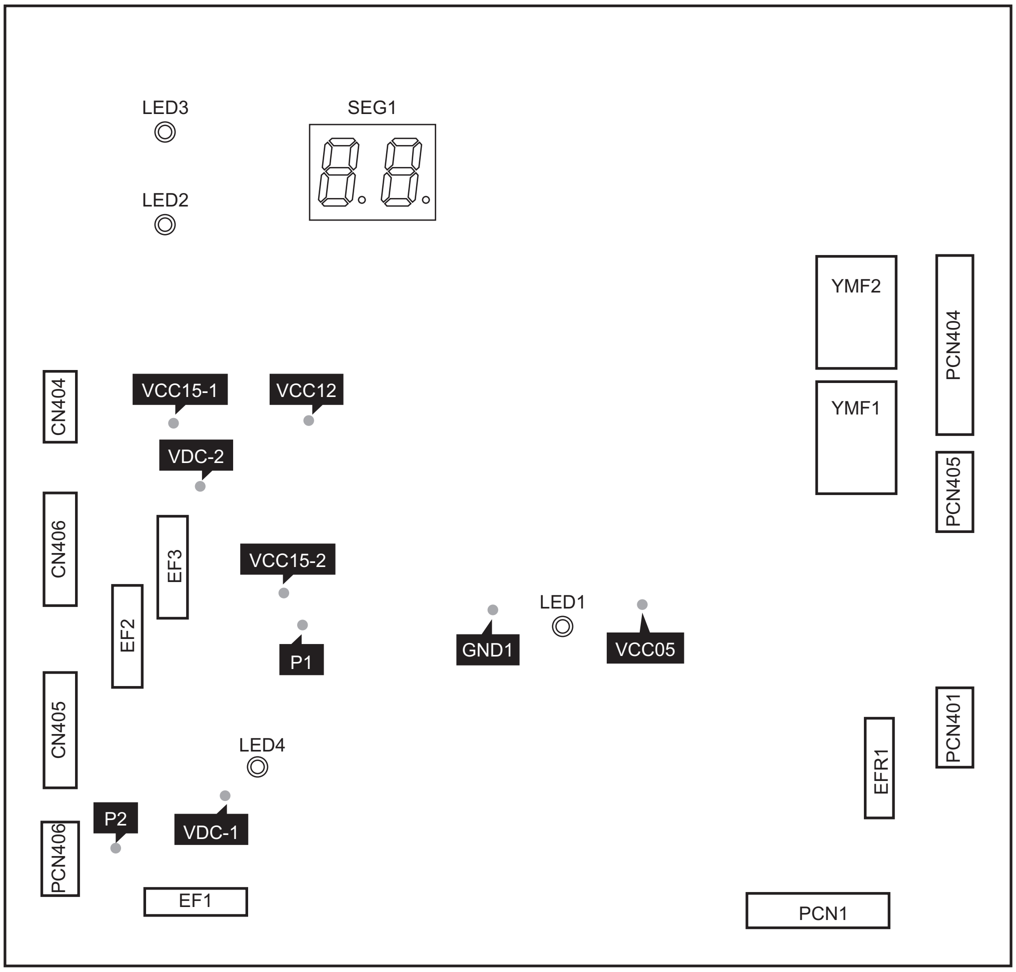
**1) The table in the next page shows the check points and the normal range of voltage in the case that the voltage on the RASC unit PCB is measured with a circuit tester. The setting of the circuit tester shall be set within the DC voltage measurement range when the following voltages are measured.*

Check point		Normal Range (V)
(+) Side of tester	(-) Side of tester	
P1	VDC-2	Approx. 311VDC
VCC15-1		13.5VDC ~ 16.5VDC
VCC05	GND1	4.5VDC ~ 5.5VDC
VCC12		11.9VDC ~14.3VDC

CAUTION

- *Do not apply the test lead to unspecified check points when measuring the voltage with a circuit tester. Otherwise, it may cause a failure of the RASC unit PCB and the circuit tester.*
- *When measuring the voltage with a circuit tester, the setting of the circuit tester shall be set within the DC voltage measurement range. If the setting is not correct, it may cause a failure of the RASC unit PCB and circuit tester.*

Position of the check points in the RASC Unit Printed Circuit Board (PCB1)



10.4.2 Checking procedure for the inverter PCB

◆ RASC-(4-6)HNPE

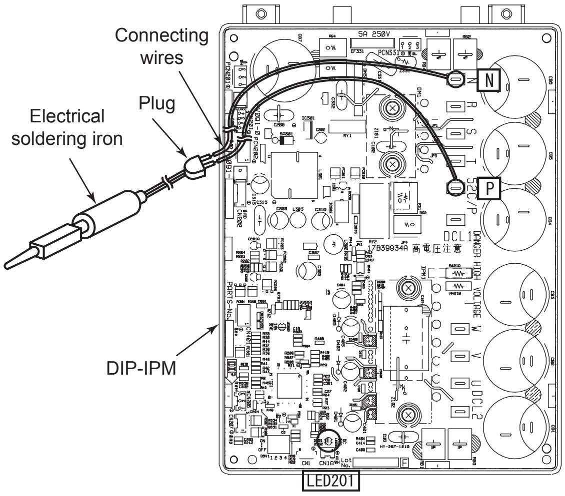
High voltage discharge work for replacing parts

High voltage discharge is an imperative work for replacing parts.

⚠ CAUTION

Electrical hazard. Risk of electrical shock. Perform this high voltage discharge work to avoid an electric shock.

1. Turn OFF the main switches and wait for three minutes. Make sure 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.
2. Connect connecting wires to an electrical soldering iron.
3. 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(-)
4. Wait for 2 or 3 minutes and measure the voltage once again. Check to ensure that no voltage is charged.



Inverter module checking procedure

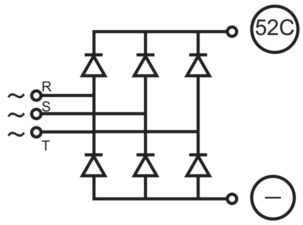
Rectifier circuit of inverter PCB

Remove all the terminals of the inverter PCB before checking.

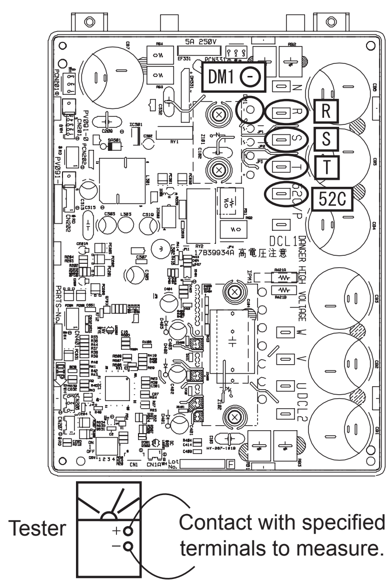
Non-faulty if [1] – [8] are checked and satisfied.

Measure with 1 kΩ range of a tester.

Internal circuit of rectified part of DIP-IPM



1. Touch [+] of the tester to DIP-IPM 52C terminal, and [-] to DIP-IPM R, S, T 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, T 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, T 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, T terminals to measure the resistance. Normal if all three terminals have 100 kΩ or greater.



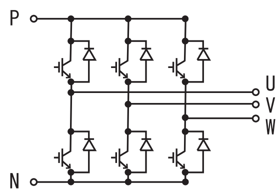
10

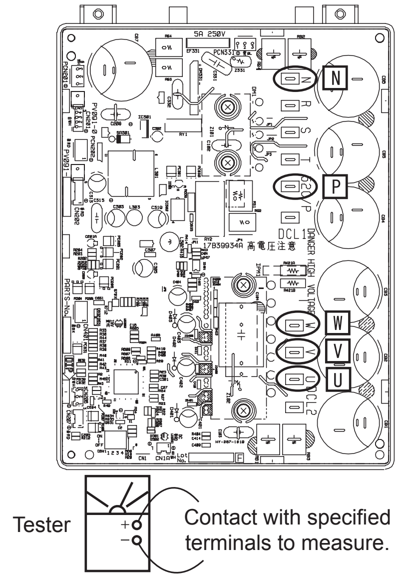
5 Touch [+] of the tester to [P] of DIP-IPM (soldered part), and [-] to DIP-IPM U, V, W terminals to measure the resistance. Normal if all three terminals have 1 kΩ or greater.

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 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.

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.)



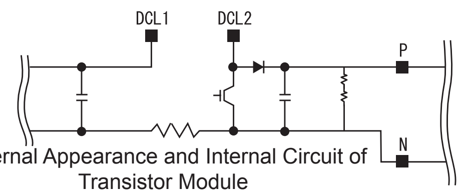


ACT circuit of inverter PCB

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



External Appearance and Internal Circuit of Transistor Module

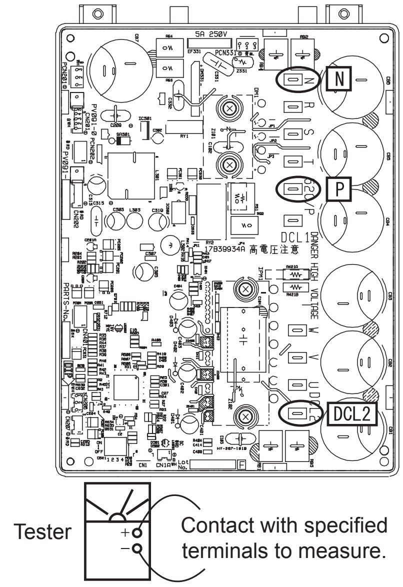
9 Check items [1] – [8].

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.

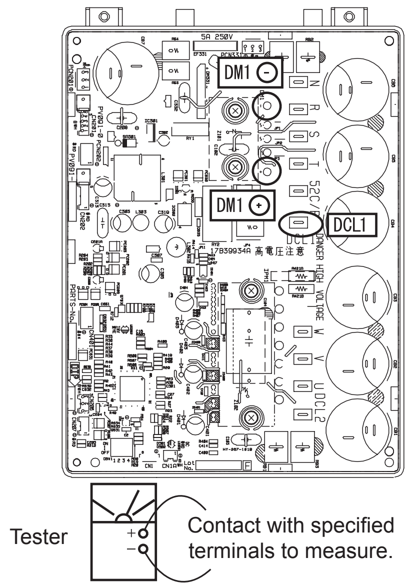
13 Contrary to [12], touch [-] of the tester to DIP-IPM DCL2 terminal, and [+] to [N] of DIP-IPM (soldered part) to measure the resistance. Normal if all three terminals have 10 kΩ or greater. (Resistance gradually increases during measurement).



Checking method of resistance for inrush current prevention (Built-in thermal fuse)

(Measure the resistance under 1 kΩ range of a circuit tester.)

By placing the ⊕ side of tester to the ⊕ side of DM1 (soldering portion) on DIP-IPM and the ⊖ side of tester to DCL1 DIP-IPM, measure the resistance. If the resistance is around 500Ω, it is normal. If the resistance is 0Ω or infinity Ω, it is abnormal.

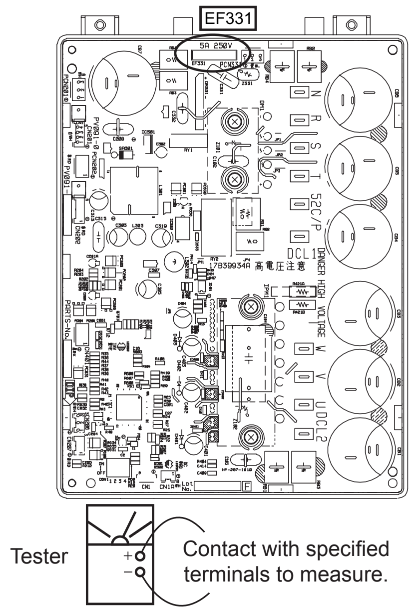


Checking method of fuse for DIP-IPM protection (EF331)

(Measure the resistance under 1 kΩ range of a circuit tester.)

By placing the ⊕ and ⊖ side of tester to EF331 on DIP-IPM, measure the resistance.

If the resistance is 0Ω, it is normal.



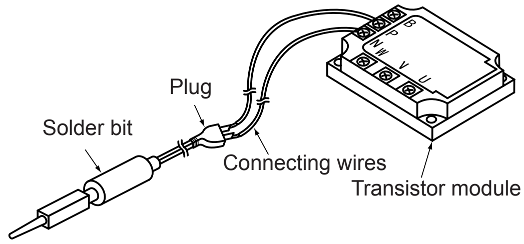
◆ RASC-(8/10)HNPE

High voltage discharge work for replacing parts

⚠ CAUTION

Electrical hazard. Risk of electrical shock. Perform this high voltage discharge work to avoid an electric shock.

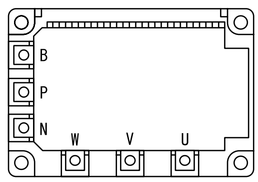
1. Turn OFF the main switches and wait for three minutes. Check to ensure that no high voltage exists. If LED2 is ON after start-up and LED2 is OFF after turning OFF power source, the voltage will decrease lower than DC50V.
2. Connect connecting wires to an electrical solder bit.
3. Connect the wires 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.
4. Wait for 2 or 3 minutes and measure the voltage once again. Check to ensure that no voltage is charged.

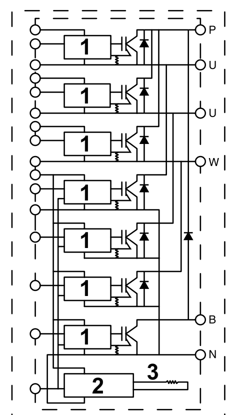


Transistor module checking procedure

Outer Appearance and Internal Circuit of Transistor Module

1. Drive circuit.
2. Overheating protection circuit.
3. Sensor.



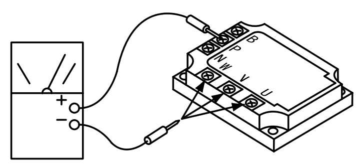


Procedure:

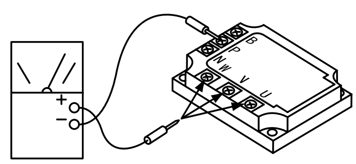
Remove all the terminals of the transistor module before check. If items [1] – [4] are performed and the results are satisfactory, the transistor module is normal.

Measure it under 1kΩ range of a tester.

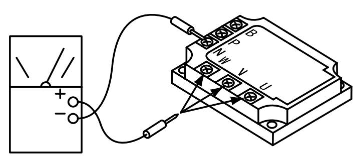
1. By touching the + side of the tester to the P terminal of transistor module and the - side of tester to U, V and W of transistor module, measure the resistance. If all the resistances are from 1 to 5kΩ, it is normal.



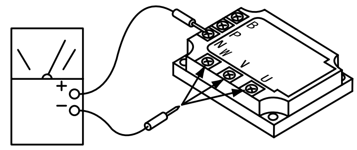
2. By touching the - side of the tester to the P terminal of transistor module and the + side of tester to U, V and W of transistor module, measure the resistance. If all the resistances are greater than 100kΩ, it is normal.



3. 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.

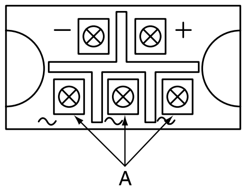


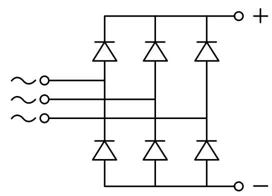
4 By touching the + side of the tester to the N terminal of transistor module and the - side of tester to U, V and W of transistor module, measure the resistance. If all the resistances are greater than 100kΩ, it is normal.



Diode module checking procedure

Outer appearance and internal circuit of diode module:

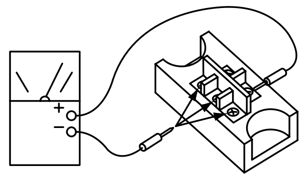




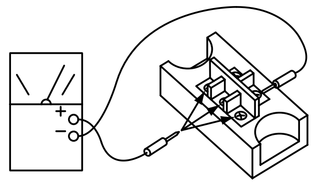
If items [1] – [4] are performed and the results are satisfactory, the diode module is normal.

Measure it under 1kΩ range of a tester.

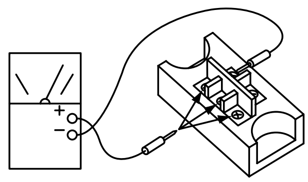
1 By touching the + side of the tester to the + terminal of diode module and the - side of tester to the ~ terminals (A) of the diode module, measure the resistance. If all the resistances are from 5 to 50kΩ, it is normal.



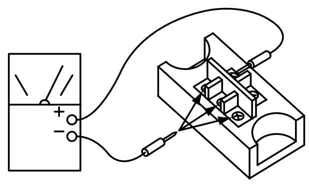
2 By touching the - side of the tester to the + terminal of diode module and the + side of tester to the ~ terminals (A) of the diode module, measure the resistance. If all the resistances are greater than 500kΩ, it is normal.



3 By touching the - side of the tester to the - terminal of diode module and the + side of tester to the ~ terminals (A) of the diode module, measure the resistance. If all the resistances are from 5 to 50kΩ, it is normal.



4 By touching the + side of the tester to the - terminal of diode module and the - side of tester to the ~ terminals (A) of the diode module, measure the resistance. If all the resistances are greater than 500kΩ, it is normal.



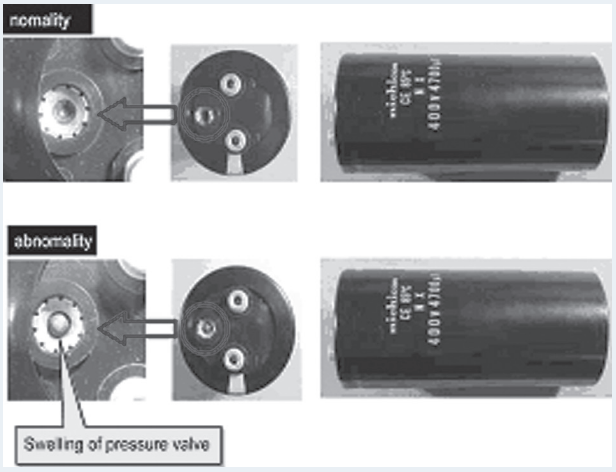
Checking capacitors CB1 and CB2

DANGER

Electrical hazard. Risk of serious injuries or death.

- ***Before installing the electrical wiring or before performing a periodical check, turn OFF the main switch of the unit. For safety reasons, be sure that the fan is stopped.***
- ***Prevent from touching the capacitors' terminals. High voltage should be present before discharging them.***
- ***Turn off the unit and wait for the LED 201 to be off before touching the components.***

If it's possible, check the capacitance of each capacitor : 4700μF ± 20% (between 3760μF to 5640μF).

A visual check of the pressure valve of capacitors must be done to ensure it's integrity	

NOTE

It is not recommended to check tension.

PN = Power source x √2, PC=CN is nearly equal to PN/2.

Checking R1 and R2

1 If the value is different:

- Capacitor could be damaged by overload.
- 04/06 alarm could be displayed if low supply voltage is present.

2 R1 = 6.3 kΩ & R2 = 10.5 kΩ. If these values are different, the capacitors are not properly charged.

Checking RS1 and RS2 between (A) and (B) = 250 Ω (white resistances)

In case that Mg. SW 52C (CMC) is not ON, the compressor current will travel through these resistances, and they will be broken. Mg. SW 52C (CMC) should be checked. Check the resistance between the primary and secondary terminal where the contact point is melted for Mg. SW 52C. If there is continuity, the contact is melted and 52C is broken.

NOTE

- *Noise filter does not affect inverter PCB directly, so is not necessary to check it when inverter PCB fails.*
- *Both digital or analog testers are valid to check the values.*

10.4.3 Fault diagnosis of fan motor

Some alarms may have been caused due to faulty fan motor. Therefore, check the fan motor as explained below:

CAUTION

- *Turn OFF main power before start working.*
- *Working and checking with the power ON may disturb correct diagnosis and may result in failure.*

Procedure in case of error diagnosis

1 Disconnect the fan motor connectors from the CN35 connector and remove the propeller fan. Then, 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.

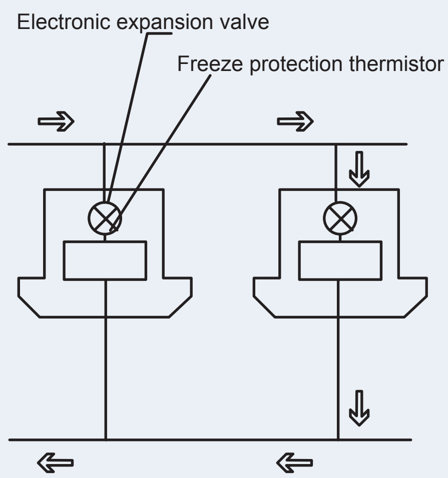
2 Measure the fan motor resistance:

Measurement procedure	
1	Ensure that the fan motor connector CN35 has been correctly disconnected as explained above.
2	Connect the tester between each pair of wires of the fan motor and measure if the coil resistance values are close to the normal values in the table below.
Results	
Normal	Observed values are close to the normal values in the table below.
Faulty	Observed values are 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	Coil resistance		
		U-V (Brown-Black)	V-W (Black-Grey)	W-U (Grey-Brown)
RASC-(4-6)HNPE	CBM-10/10 350	32 Ω	32 Ω	32 Ω
RASC-(8/10)HNPE	CBM-12/12 550	15 Ω	15 Ω	15 Ω

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 or 0 Ω or ∞.

10.4.4 Checking procedure for the electronic expansion valve for indoor and RASC units

<table>
<tr><th></th><th>Indoor unit electronic expansion valve</th><th>RASC unit electronic expansion valve</th></tr>
<tr><td>Locked with fully closed</td><td>Check the liquid pipe temperature during the heating process. It is abnormal if the temperature does not increase.</td><td>It is abnormal if the liquid pipe pressure does not increase during the pump down process.</td></tr>
<tr><td>Locked with slightly open</td><td rowspan="2">It is abnormal under the following condition:
The temperature of the freeze protection thermistor becomes lower than the suction air temperature when the unit which is under checking stops and the other units are under the pump down process.

</td><td>It is abnormal if the liquid pipe pressure does not increase and the outlet temperature of the expansion valve decreases after the pump down process starts.</td></tr>
<tr><td>Locked with fully open</td><td>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.</td></tr>
</table>

10.4.5 Checking procedure for other parts

Resistance (Ω)

Part name	Model code	Resistance (Ω)	Unit models
Solenoid Valve Coil	SR10D	1250 (at 20ºC)	RASC-(4-10)HNPE
Reversing Valve Coil (4-way solenoid valve)	VHV-01AP552B1	1473 (at 20ºC)	RASC-(4-10)HNPE
Compressor	E402HHD-36D2	1.839 (at 75ºC)	RASC-(4-6)HNPE
	DA50PHD-D1SE2	0.396 (at 75ºC)	RASC-8HNPE
	DA65PHD-D1SE2	0.320 (at 75ºC)	RASC-10HNPE
Magnetic contactor	FC-0/SP	1150 (at 20ºC)	RASC-(4-10)HNPE

◆ Checking procedure for the reversing valve

Troubleshooting

Is the connector PCN100 *1) on PCB1 connected correctly?
- No → Connect it correctly.
- Yes ↓

Is the resistance of the reversing valve coil *2) correct?
- No → Reversing valve is faulty (disconnection, etc.). Replace it with a new one.
- Yes ↓

Is there output voltage *3) generated from the connector PCN100 *1) on PCB1?
- No → PCB1 is faulty (Faulty reversing valve circuit, etc.). Replace it with a new one.
- Yes ↓

Reversing valve is faulty (valve locking, etc.). Replace it with a new one.

NOTE

**1) PCB1 connector PCN100, pin 1 - 3*

**2) See in the table “Resistance (Ω)”*

**3) See in the table”Output voltage” according to coil type operation mode.*

Output voltage

	Reversing valve ON	Reversing valve OFF
Test lead (+side)	pin 1	pin 3
Test lead (-side)	pin 3	pin 1
Range of voltage	325 VDC	163 VDC

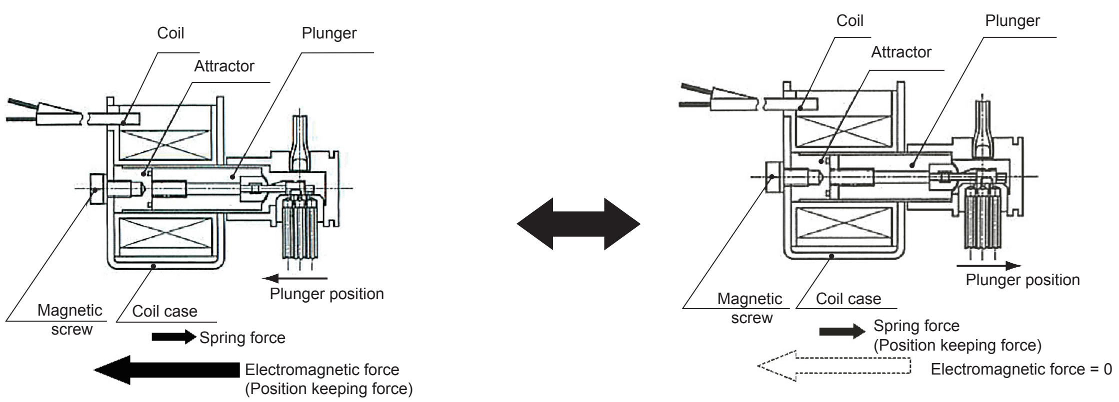
NOTE

The values may differ depending on testers. Appropriate output voltage is 70~339VDC

Actions of 4-way solenoid valve

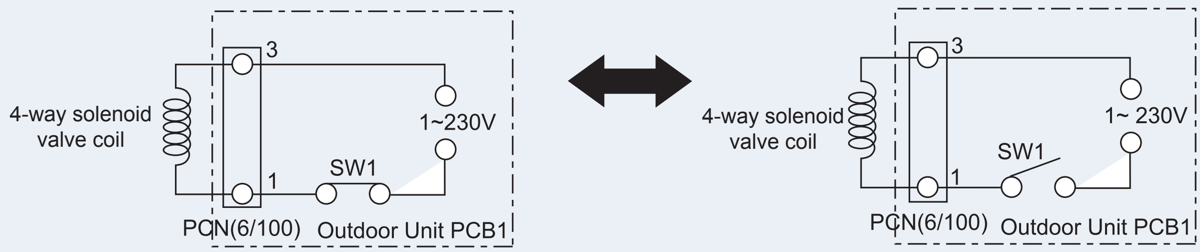
Monostable solenoid operation type

Operation Mode: Heating Reversing Valve Coil: ON	Operation Mode: Cooling Reversing Valve Coil: OFF
Electric Current Applied Current is applied to the reversing valve coil and so attraction is generated. The plunger position is kept by the electromagnetic force.	No Electric Current Applied No current is applied to the reversing valve coil and so no attraction is generated. The plunger position is kept by spring force.

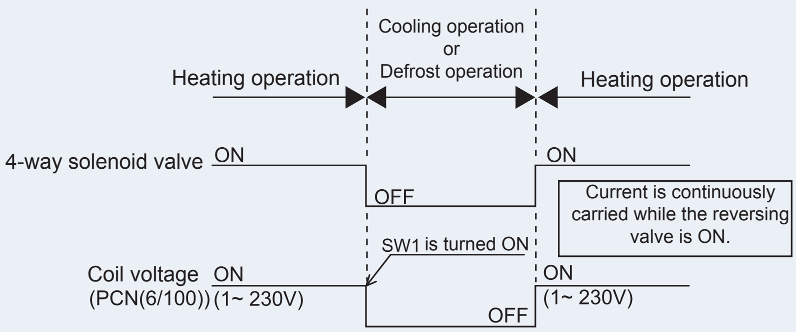


10

Electrical circuit

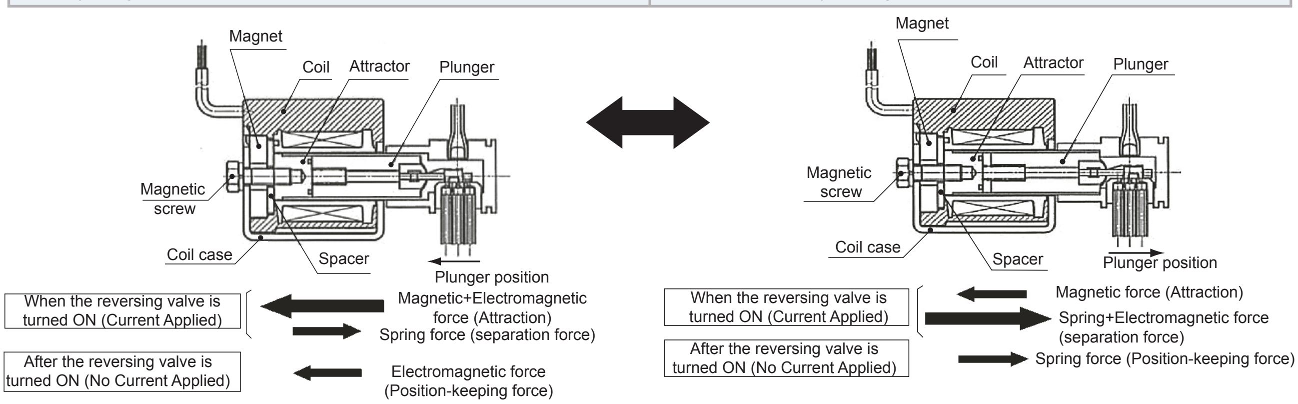


Time Chart

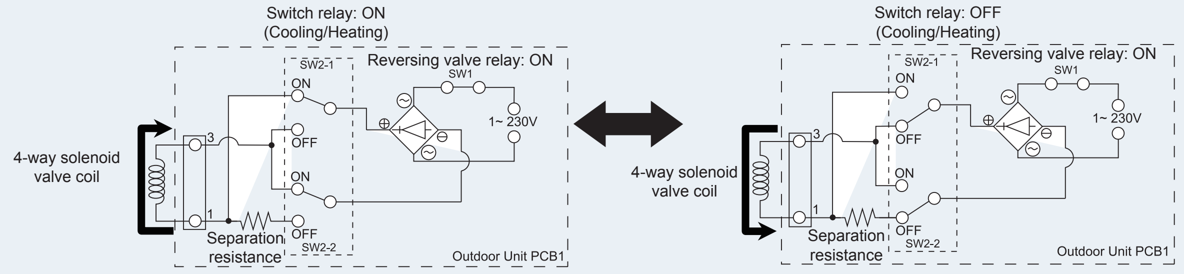


Bistable solenoid operation type (pulse-activated)

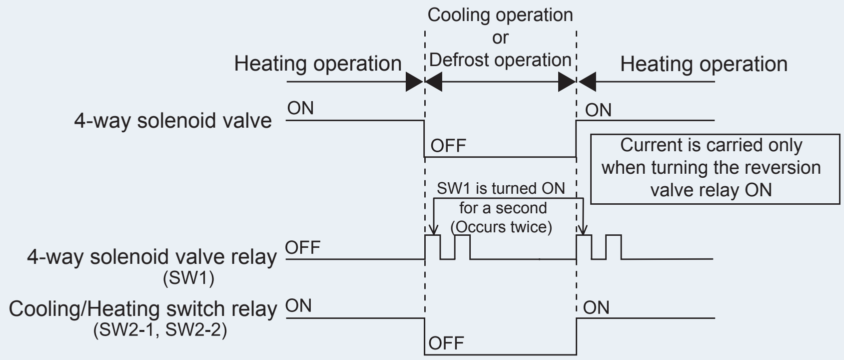
Operation Mode: Cooling → Heating Reversing Valve: OFF → ON	Operation Mode: Cooling → Heating Reversing Valve: OFF → ON
When current is applied to the reversing valve coil, an electromagnetic force headed in the same direction as the magnetic force is generated, and the valve is turned ON by their attraction. After the valve is turned ON, the plunger position is kept by magnetic force with no current applied.	When current is applied to the reversing valve coil, an electromagnetic force headed in the direction opposite to the magnetic force is generated, and the valve is turned OFF by their separation force. After the valve is turned OFF, the plunger position is kept by spring force.



Electrical circuit	
When the reversing valve relay is turned ON, current is applied to the coil. After the reversing valve relay is turned OFF, no current is applied.	When the reversing valve relay is turned ON, current is applied to the coil. After the reversing valve relay is turned OFF, no current is applied.



Time Chart



10

◆ Checking procedure for the compressor

CHECK LIST ON COMPRESSOR

Client:	**Model:**	**Date:**
Serie number:	**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 temperature 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 inverter PCB 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 expansion valve (MV1) correctly connected?	Check to ensure that MV1 to CN5A is correctly connected		
8	Is expansion 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 RASC unit.		
10	Is opening of expansion valve completely closed (locked)?	Check the following by the check mode of RASC units. 1. Liquid pipe temperature (TL) < Air Intake temperature (Ti) during cooling operation 2. Liquid pipe temperature (TL) > Air Intake temperature (Ti) during heating operation		
11	Is opening of expansion valve fully opened locked)?	Check to ensure that liquid pipe temperature is lower than air intake temperature 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+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.

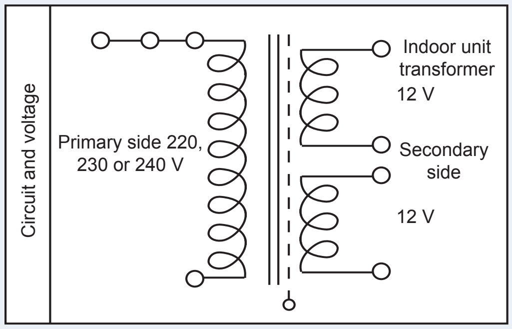
11. Maintenance notes

Index

11.1 General notes

11.1.1 Checking the power source and the wiring connection

Check the following items in the case of abnormal operation:

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

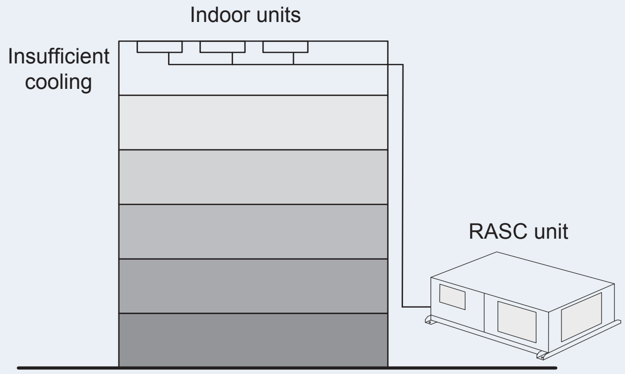
11.1.2 Burnt-out compressor due to an insufficient refrigerant charge

Question and answer for the field work:

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

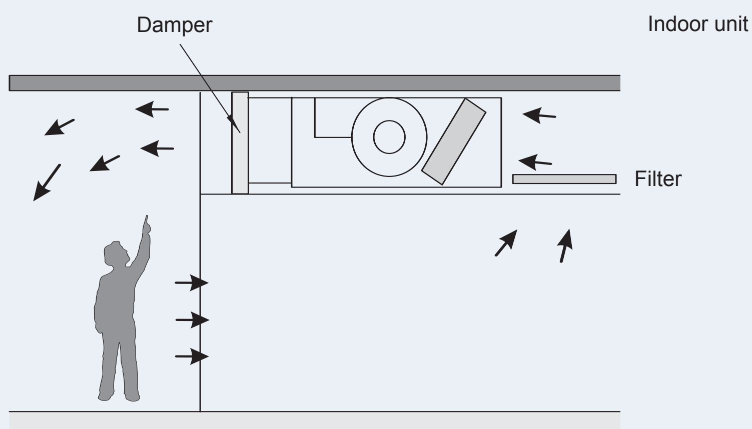
11.1.3 Insufficient cooling performance when a long piping is applied

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 a RASC unit is 20 meters lower than the location of the indoor units, resetting of the DIP switch DSW2 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 *"3.3 Refrigerant piping range"* for details.

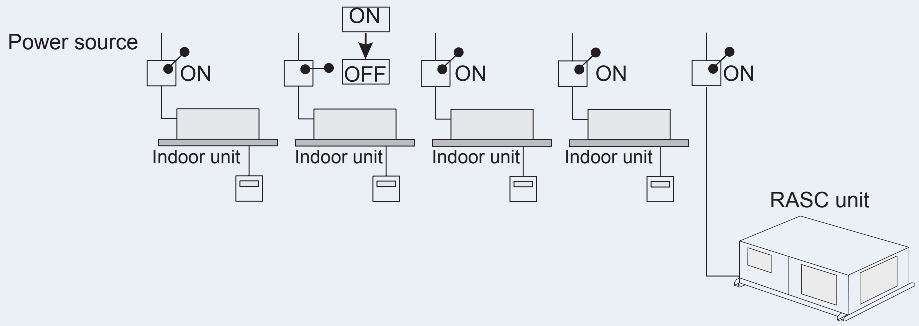
11.1.4 Abnormally high operation sound (in-the-ceiling type indoor unit)

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 overheating.

11.1.5 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 RASC unit was the following. 
	The system was used in a tenant building. One of tenants’ costumers turned off the main switch for the indoor unit while other indoor units were running. This resulted in a different setting of total indoor unit capacity in the same refrigerant cycle, causing abnormal working conditions. When the capacity of the system dropped under the minimum value, alarm 31 was activated putting the system in Thermo-OFF.
Countermeasure	To set the main switch of the indoor units to be always ON, or to install the Hitachi Multitenant building connection board PC-AMTB.

11.1.6 Not cooling well due to insufficient installation space for the RASC unit

Question and answer for the field work:

Example 5: Not cooling well due to insufficient installation space for RASC unit or inlet/outlet air bypass	
Phenomenon	Cooling operation was well performed through the intermediate season. However, the cooling operation was not well available when the outdoor temperature was higher than 35ºC.
Cause	Hot discharge air re-circulation. In this case, though the outdoor temperature was 35ºC, the actual suction air temperature was nearly 50ºC 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.
Countermeasure	Ensure that inlet and outlet is not bypassed (use grilles in opposite directions if necessary). Ensure that inlet and outlet air in opened spaces (never near walls).

11.2 Maintenance work

CAUTION

- *All inspections and checks of the RASC unit have to be carried out by a licensed technician and never by the user itself.*
- *Before any inspection and checking procedure, the unit main power supply has to be switched OFF.*
- *Wait minimum 10 minutes or more from all power supply have been turned OFF.*
- *Take care with the crankcase heater. It could operate even when compressor is OFF.*
- *Take care with the electrical box components. Some of them could remain hot after switch OFF the unit.*

NOTE

All these maintenance operations must be done with appropriate materials and following this manual.

◆ For the indoor unit and RASC unit

1 Fan and fan motor

- Lubrication: All the fan motors are prelubricated and sealed at the factory. Therefore, no lubrication maintenance is required.
- Sound and vibration: Check for abnormal sounds and vibrations.
- Rotation: Check the clockwise rotation and the rotating speed.
- Wiring: Check that the wiring is at optimum conditions and correctly tightened with its corresponding clamps.

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 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 between the RASC and the indoor unit.

4 Cabinet

- Stain: Check for any stain and remove it cleaning if it is the case.
- 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 section *“5.2 Safety protection and control”* on chapter *“5. Control system”*.

◆ For RASC 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 (Crankcase heater)

- Activation: You should activate the oil heater at least twelve hours before the start-up by turning ON the main switch.

11.3 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. Compressor 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 RASC heat exchanger	ditto	Good	Not good
15	Check for a leakage in the indoor heat exchanger	ditto	Good	Not good
16	Check for a leakage in the 4-way valve	ditto	Good	Not good
17	Check for a leakage in the check valve	ditto	Good	Not good
18	Check for a leakage in the accumulator	ditto	Good	Not good
19	Check for a leakage in the strainer	ditto	Good	Not good
20	Check for a leakage in the electronic expansion valve	ditto	Good	Not good
21	Check for a leakage in the piping	ditto	Good	Not good
22	Check the direction of the fans	By viewing the airflow volume	Good	Not good
23	Voltage among each phase	Higher than AC220V	Good	Not good
24	Vibration and sound	Check the fan, the compressor, the piping, and others.	Good	Not good
25	Activation of each operation mode	Check the activation of the COOL switch, the HEAT switch, the STOP switch and the TEMP switch.	Good	Not good
26	High-pressure cut-out switch	Check the actual activation value.	Good	Not good
27	Check the activation of the drain-up mechanism.	Check the activation during the cooling process.	Good	Not good
28	Air inlet temperature of the indoor unit DB/WB	-	(°C)DB	(°C)WB
29	Air outlet temperature of the indoor unit DB/WB	-	(°C)DB	(°C)WB
30	Air inlet temperature of the RASC unit DB/WB	-	(°C)DB	(°C)WB
31	Air outlet temperature of the RASC unit DB/WB	-	(°C)DB	(°C)WB
32	High-pressure switch	-	kg/cm²G	
33	Low-pressure switch	-	kg/cm²G	
34	Operating voltage	-	V	
35	Operating current	-	A	
36	Instructions to the client for cleaning the air filter	-	Done	Not yet
37	Instructions to the client about the cleaning method	-	Done	Not yet
38	Instructions to the client about the operation	-	Done	Not yet

11.4 Service and maintenance record using the 7-segment display

Data sheet for checking by 7-segment display

Customer's name:		Date:	

RASC unit model (serial number)			RASC- (Serial number)				RASC- (Serial number)			
(1)	Operation mode									
(2)	Test run start time									
(3)	Data collect start time									
(4)	Read out data from 7-segment in RASC unit									
	Protection control code									
	Total capacity of I.U connected	CP								
	Input/output state of RASC micro-computer	SC	52C	FAN1	FAN2	20A	52C	FAN1	FAN2	20A
			20F	21	CH	PSH	20F	21	CH	PSH
	Alarm code for abnormal stoppage of compressor	AC								
	Inverter order frequency to compressor	H1								
	Indoor order frequency to compressor	H2								
	Air flow ratio	Fo								
	RASC unit expansion valve opening	Eo								
	Temperature at the top of compressor	Td								
	Evaporating temperature at heating	TE								
	Ambient air temperature	To								
	Cause of stoppage at inverter	iT								
	Inverter secondary current	A2								
	Indoor unit address (Unit number 1)	nA								
	Indoor unit expansion valve opening	EA								
	Liquid pipe temperature of indoor unit (Freeze protection)	LA								
	Indoor unit intake air temperature	iA								
	Indoor unit discharge air temperature	oA								
	Cause of indoor unit stoppage	dA								
	Indoor unit address (Unit number 2)	nb								
	Indoor unit expansion valve opening	Eb								
	Liquid pipe temperature of indoor unit (Freeze protection)	Lb								
	Indoor unit intake air temperature	ib								
	Indoor unit discharge air temperature	ob								
	Cause of indoor unit stoppage	db								
	Indoor unit address (Unit number 3)	nc								
	Indoor unit expansion valve opening	Ec								
	Liquid pipe temperature of indoor unit (Freeze protection)	Lc								
	Indoor unit intake air temperature	ic								
	Indoor unit discharge air temperature	oc								
	Cause of indoor unit stoppage	dc								
	Indoor unit address (Unit number 4)	nd								
	Indoor unit expansion valve opening	Ed								
	Liquid pipe temperature of indoor unit (Freeze protection)	Ld								
	Indoor unit intake air temperature	id								
	Indoor unit discharge air temperature	od								

RASC unit model (serial number)				RASC- (Serial number)	RASC- (Serial number)
		Cause of indoor unit stoppage	dd		
	Indoor unit address (Unit number 5)		nF		
		Indoor unit expansion valve opening	EF		
		Liquid pipe temperature of indoor unit (Freeze protection)	LF		
		Indoor unit intake air temperature	iF		
		Indoor unit discharge air temperature	oF		
		Cause of indoor unit stoppage	dF		
	Indoor unit address (Unit number 6)		nG		
		Indoor unit expansion valve opening	EG		
		Liquid pipe temperature of indoor unit (Freeze protection)	LG		
		Indoor unit intake air temperature	iG		
		Indoor unit discharge air temperature	oG		
		Cause of indoor unit stoppage	dG		

FAN1, FAN2: Fan unit

52C: CMC

PSH: High pressure switch

20A: Solenoid valve (SVA)

20F: Solenoid valve (SVF)

21: Reversing valve (RVR)

CH: Crankcase heater

*: Multiply 1/8 by the code on the 7-segment.

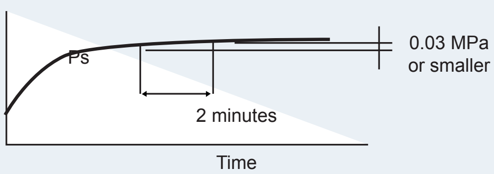
11.5 Service and maintenance record by remote control switch

Data sheet for checking by remote control switch

Time				:	:	:	:	:
Indoor unit model								
Indoor unit serial number								
Indoor unit number / alarm code								
		Check mode 1	Check mode 2	1 · 2	1 · 2	1 · 2	1 · 2	1 · 2
B	Temperature indication							
	Set temperature	b1	- -					
	Inlet air temperature	b2	91					
	Discharge air temperature	b3	92					
	Liquid pipe temperature	b4	93					
	Remote thermistor temperature	b5	- -					
	Outdoor air temperature	b6	94					
	Gas pipe temperature	b7	95					
	Evaporating temperature at heating	b8	96					
	Control information	b9	97					
	Compressor top temperature	bA	98					
	Thermo temperature of remote control switch	bb	- -					
C	Micro-computer state indication							
	Indoor unit micro-computer	C1	- -					
	RASC unit 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 louvre state							
	Louvre 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	Indoor unit capacity Indication							
	Indoor unit capacity (1/8HP)	J1	- -					
	RASC unit code	J2	- -					
	Refrigerant cycle number	J3	- -					
	Refrigerant cycle number	J4	- -					
L	Opening of expansion valve							
	Indoor unit expansion valve	L1	9d					
	RASC unit expansion valve 1	L2	9E					
	RASC unit expansion valve 2	L3	- -					
	RASC unit expansion valve B	L4	- -					
P	Running current indication (reference)							
	Compressor current	P1	9F					

11

11.6 Pump-down method for replacing the compressor

No.	Procedure	Remarks
1	Turn off the main switch of the RASC unit.	-
2	Remove the covers, the thermistor, the crankcase heater, the power wirings, and other items according to the chapter *"9. Servicing"*.	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 RASC unit.	-
4	Turn on the main switch of the RASC 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 RASC 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< 0.1MPa is continued for one minute, in ten minutes STP is displayed in seven segments 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 RASC 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 number 6.
10	Collect the refrigerant by means of the refrigerant collection: - Perform either A or B, depending on the process 10. **a.** The leak rate at the process 10 is within the specification → Collect the refrigerant only at the low-pressure side. **b.** The leak rate at the process 10 is greater than the specification → Collect all the refrigerant of the RASC 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.

No.	Procedure	Remarks
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 RASC unit.	-
13	Perform the replacement of the compressor and the change of the refrigerant oil according to the section *"9.3.10 Replacement of 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 0.5kg.

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