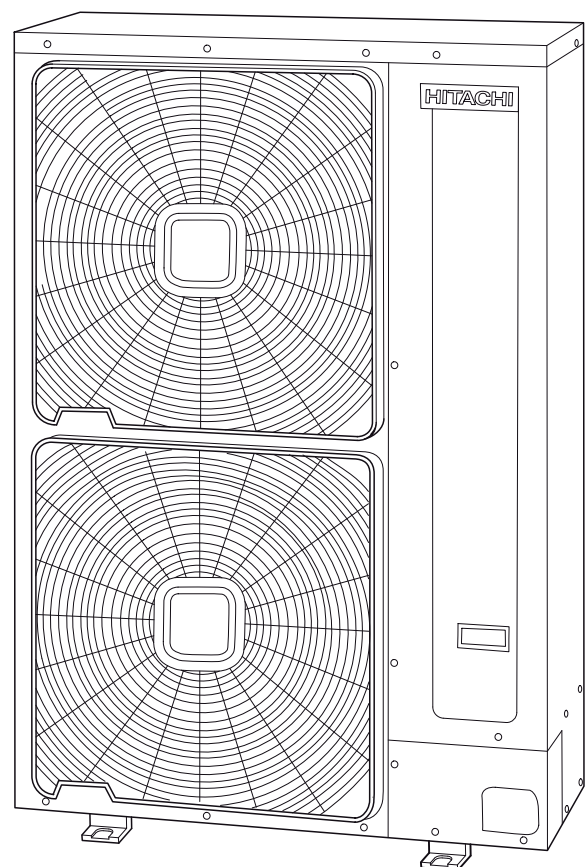


SET FREE MINI SERIES

Service Manual

RAS-(4-6)FSVN3E
RAS-(4-6)FSNY3E



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1.1 General information

1.1.1 General notes

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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

Hitachi presents the inverter-driven home central air-conditioning SET FREE mini series product, which is characterized by energy-saving, high efficiency, comfort, environmental protection, stability and reliability. In order to meet the requirement of increasing the control intelligence of equipment and of comfort, the intelligent control, energy-saving operation and comfortableness are more important. Especially the business building, building office, villa, apartment and residential area etc, need an intelligent and comfortable environment through all year. The better air conditioning solution can be provided for these buildings by inverter- driven and scroll compressor that the structure can be improved.

1.1.3 Environment-friendly units

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



1.2 Applied symbols

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

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

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

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



DANGER

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

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



CAUTION

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

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



NOTE

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

1.3 Product guide

1.3.1 Classification of outdoor unit models

Unit type (Outdoor unit):

			Position-separating hyphen (fixed)							
				Compressor power (HP): 4, 5, 6						
					FS = SET-FREE system					
						V = Single phase unit (1~ 230V 50Hz)				
							N = R410A refrigerant			
								Y = Three phase unit (3N~ 400V 50Hz)		
									Series	
										E = Made in Europe
RAS	-	X	FS	(V)	N	(Y)	3	E		

1.3.2 Classification of indoor unit models

Unit type (indoor unit): RCI, RCIM, RCD, RPC, RPI, RPIM, RPK, RPF, RPI

Position-separating hyphen (fixed)									
Capacity (HP): 0.6, 0.8, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0, 6.0									
FS = SYSTEM FREE									
N = R410A refrigerant									
H = Hotel (RPK-(0.6-1.5) only)									
2/3/4 = series									
E = Made in Europe									
M = Made in Malaysia									
- = Made in Japan									
i = Version up (RCI for P-N23NA panel only)									
k = Version up RCI for P-AP160NA(1/E) panel only									
(-DU) = Drain Up (RPIM only)									
XXX	-	X.X	FS	N	(H)	X	(X)	(x)	(-DU)

1.3.3 Product guide: Outdoor units

Outdoor units			
 			
1~		3N~	
FSVN3E		FSNY3E	
			
Unit	Code	Unit	Code
RAS-4FSVN3E	7E321007	RAS-4FSNY3E	7E321107
RAS-5FSVN3E	7E321008	RAS-5FSNY3E	7E321108
RAS-6FSVN3E	7E321009	RAS-6FSNY3E	7E321109

 NOTE

Check the exact classification for each unit (model, type, power and series) in Classification of outdoor unit models.

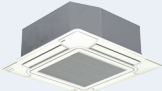
1.3.4 Product line-up: indoor units



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 this outdoor unit series.
- Check the exact classification for each unit (model, type, power and series) in “1.3.2 Classification of indoor unit models”.

◆ RCI and RCIM indoor units

RCI						RCIM	
							
							
4-way cassette						4-way cassette (compact)	
Unit	Code	Unit	Code	Unit	Code	Unit	Code
						RCIM-0.8FSN3	60278172
RCI-1.0FSN3Ei	7E403014	RCI-1.0FSN3Ek	7E404001	RCI-1.0FSN3	60278119	RCIM-1.0FSN3	60278173
RCI-1.5FSN3Ei	7E403015	RCI-1.5FSN3Ek	7E404002	RCI-1.5FSN3	60278120	RCIM-1.5FSN3	60278174
RCI-2.0FSN3Ei	7E403016	RCI-2.0FSN3Ek	7E404003	RCI-2.0FSN3	60278121	RCIM-2.0FSN3	60278175
RCI-2.5FSN3Ei	7E403017	RCI-2.5FSN3Ek	7E404004	RCI-2.5FSN3	60278122		
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-N23WAM	60197160
		P-AP160NAE (With motion sensor)	60297217		

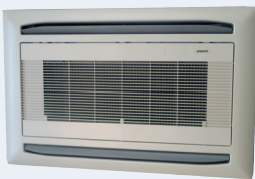


NOTE

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

◆ RCD and RPC indoor units

RCD				RPC			
							
2-way cassette				Ceiling type			
Unit	Code	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 and RPIM indoor units**

RPI			
			
			
Indoor ducted unit			
Unit	Code	Unit	Code
RPI-0.8FSN4E	7E424013		
RPI-1.0FSN4E	7E424014		
RPI-1.5FSN4E	7E424015		
		RPI-2.0FSN4E	7E424016
		RPI-2.5FSN4E	7E424017
		RPI-3.0FSN4E	7E424018
		RPI-4.0FSN4E	7E424020
		RPI-5.0FSN4E	7E424021
		RPI-6.0FSN4E	7E424022

RPIM	
	
	
Indoor ducted unit (mini)	
Unit	Code
RPIM-0.8FSN4E	7E430013
RPIM-0.8FSN4E -DU	7E431013
RPIM-1.0FSN4E	7E430014
RPIM-1.0FSN4E -DU	7E431014
RPIM-1.5FSN4E	7E430015
RPIM-1.5FSN4E -DU	7E431015

◆ **RPK, RPF and RPI indoor units**

RPK				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				
RPK-1.0FSNH3M	60278155	RPF-1.0FSN2E	7E450001	RPFI-1.0FSN2E	7E460001
RPK-1.5FSN3M	60278148				
RPK-1.5FSNH3M	60278156	RPF-1.5FSN2E	7E450002	RPFI-1.5FSN2E	7E460002
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				

Expansion valve kit ⁽¹⁾	
EV-1.5N1 ⁽¹⁾	60921791



NOTE

⁽¹⁾ For RPK-(0.6-1.5)FSNH3M models only.

1.3.5 Product line-up: KPI energy / heat recovery unit

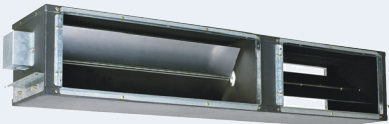
KPI					
					
Energy recovery		Heat recovery		Active (Energy Recovery+DX section)	
Unit	Code	Unit	Code	Unit	Code
KPI-252E3E	70602000				
KPI-502E3E	70602001	KPI-502H3E	70602101	KPI-502X3E	70602201
KPI-802E3E	70602002	KPI-802H3E	70602102	KPI-802X3E	70602202
KPI-1002E3E	70602003	KPI-1002H3E	70602103	KPI-1002X3E	70602203
KPI-1502E3E	70602004	KPI-1502H3E	70602104		
KPI-2002E3E	70602005	KPI-2002H3E	70602105		

1.3.6 Product line-up: 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

1.3.7 Product line-up: Econofresh

◆ Econofresh kit

Econofresh	
	
Unit	Code
EF-456NE	7E560000



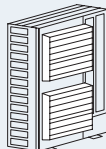
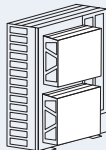
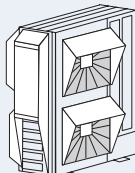
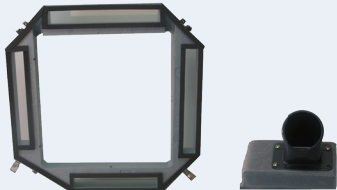
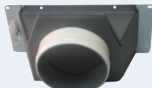
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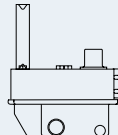
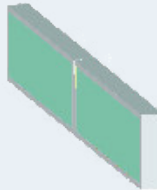
The EF-456NE unit can only be installed in combination with the following units (Sales from April 2014):

- RPI-4.0FSN4E (7E724020)
- RPI-5.0FSN4E (7E724021)
- RPI-6.0FSN4E (7E724022)

1.3.8 List of accessories

HITACHI offers a range of different accessories and remote control systems that can be used with the SET FREE outdoor units and system free indoor units.

Name	Unit Ref.	Description	Code	Figure
DBS-26	RAS-FS(V)N(Y)3E	Drain discharge connection	60299192	
AG-335A	RAS-FS(V)N(Y)3E	Air flow guide	60291431	
WSP-335A	RAS-FS(V)N(Y)3E	Wind guard	60291432	
ASG-NP335F	RAS-FS(V)N(Y)3E	Snow protection hood; air outlet (Zinc plate)	60291433	
ASG-NP335FS2	RAS-FS(V)N(Y)3E	Snow protection hood; air outlet (Stainless plate)	60291519	
ASG-NP280BS2	RAS-FS(V)N(Y)3E	Snow protection hood; air inlet of rear side (Stainless plate)	60291524	
ASG-NP280LS2	RAS-FS(V)N(Y)3E	Snow protection hood; air inlet of left side (Stainless plate)	60291525	
OACI-160K2	RCI-FSN3	Outdoor air inlet kit	60291761	
OACI-232	RCI-FSN3Ei		60199797	
OACI-232E	RCI-FSN3Ek		7E590902	
PD-75A	RCI-FSN3	Outdoor air inlet kit (single inlet)	60291763	
PD-75	RCI-FSN3E(i/k) RCIM-FSN3		60199798	
TKCI-160K	RCI-FSN3	Outdoor air inlet T-shaped duct connection kit	60291762	
TKCI-232	RCI-FSN3E(i/k)		60199801	
PDF-71C1	RCI-FSN3	Duct connecting flange for outdoor air outlet	-	
PDF-160C1			-	
PDF-23C3	RCI-FSN3E(i/k)		60199795	
PDF-46C3			60199796	
PI-160LS1	RCI-FSN3	3-way outlet parts	60291756	
PI-23LS5	RCI-FSN3E(i/k)		60199799	

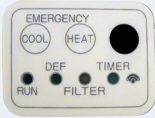
Name	Unit Ref.	Description	Code	Figure
B-160H2	RCI-FSN3	Adapter for deodorising filter	60291759	
B-23H4	RCI-FSN3Ei		60199790	
B-23H4E	RCI-FSN3Ek		7E590900	
F-160L-K	RCI-FSN3(Ek)	Anti-bacteria filter	60291760	
F-23L4-K	RCI-FSN3Ei		60199791	
F-71L-D1	RCI-FSN3	Deodorising filter	60291757	
F-160L-D1			60291758	
F-23L4-D	RCI-FSN3E(i/k)		60199793	
F-46L4-D	60199794			
F-56LPC1	RPC-FSN3	Long life filter	-	
F-90LPC1			-	
F-160LPC1			-	
DUPC-63K1	RPC-FSN3	Drain-up Mechanism	60291935	
DUPC-71K1			60291936	
DUPC-160K1			60291937	
E-102SN3	SET FREE	Line Branch	70524101	
E-162SN3			70524102	
E-242SN3			70524104	
E-302SN3			70524105	
E-52XN3			70525100	
E-102XN3			70525101	
E-162XN3			70525102	
E-202XN3			70525103	
E-242XN3			70525104	
E-322XN3			70525106	
MH-84AN	SET FREE	Header Branch	70522007	
MH-108AN			70522008	
MH-108XN			70523108	
SLT-30-200-L600	KPI	Noise damper	70550200	
SLT-30-250-L600			70550201	
SLT-30-300-L600			70550202	
SLT-30-355-L600			70550203	
HEF-252	KPI	High efficiency filter	70552201	
HEF-502			70552202	
HEF-802			70552203	
HEF-1002			70552204	
HEF-1502			70552205	
HEF-2002			70552206	
HEF-EF456	ECONOFRESH	High efficiency filter	7E561000	

◆ 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-ALHC	Receiver kit (For RCIM-FSN3 -on the panel-) (Compatible with PC-LH3A)	60291476	
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-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	

(*): All the data regarding PSC-A32MN are preliminary data, and therefore, they are subject to changes.

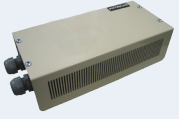
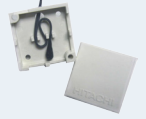
Building air conditioning controls

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	

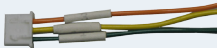
Gateways for building management systems (BMS)

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.	7E5121000	
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	To be informed later.
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	

(*): All the data regarding Wall support are preliminary data, and therefore, they are subject to changes.

2. Unit installation

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2

2.1 Initial check



CAUTION

- *Install the outdoor unit with sufficient clearance around it for operation and maintenance as shown in the next pages.*
- *Install the outdoor unit where good ventilation is available.*
- *Do not install the outdoor unit where exists a high level of oil mist, salty air or sulphurous atmosphere.*
- *Install the outdoor unit as far as practical (being at least 3 meters) from electromagnetic wave radiator, such as medical equipment.*
- *Keep clearance between units of more than 50 mm, and avoid obstacles that could hamper air intake, when installing more than one unit together.*
- *Install the outdoor unit in the shade or not exposed to direct sunshine or direct radiation from high temperature heat source.*
- *Do not install the outdoor unit in a place where a seasonal wind directly blows into the outdoor fan.*
- *For cleaning, use nonflammable and nontoxic cleaning liquid. Use of inflammable agent may cause explosion or fire.*
- *Work with sufficient ventilation, for working in an enclosed space could cause oxygen deficiency. Toxic gas may be produced when cleaning agent is heated to high temperature by, e.g., being exposed to fire.*
- *Cleaning liquid shall be collected after cleaning.*
- *Pay attention not to clamp cables when attaching the service cover to avoid electric shock or fire.*
- *Check the foundation to be flat, levelled and strongly enough.*
- *Install the unit in a restricted area not accessible by the general public.*
- *Aluminium fins have very sharp edges. Pay attention to the fins in order to avoid injury.*
- *Do not install the indoor units in a flammable environment to avoid a fire or an explosion.*
- *Do not install the indoor units, outdoor unit, within approximately 3 meters from strong electromagnetic wave radiators, such as medical equipment.*
- *Do not install the indoor units in a machinery shop or kitchen, where vapour from oil or mist flows to the indoor units. In the worst case, the oil damages the plastic parts of the indoor unit.*
- *This appliance must be used only by adult and capable people having received the technical information or instructions to handle properly and safely this appliance.*
- *Turn OFF all power switches before maintenance is performed.*
- *Do not start the cleaning procedures before 5 minutes of the stop of the unit.*

2.2 Transportation

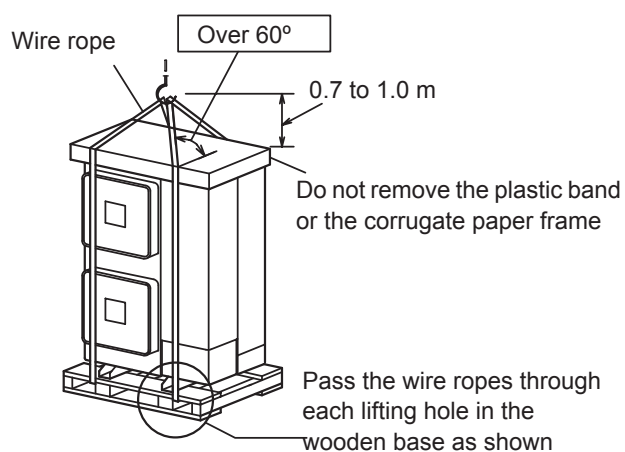


DANGER

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

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.



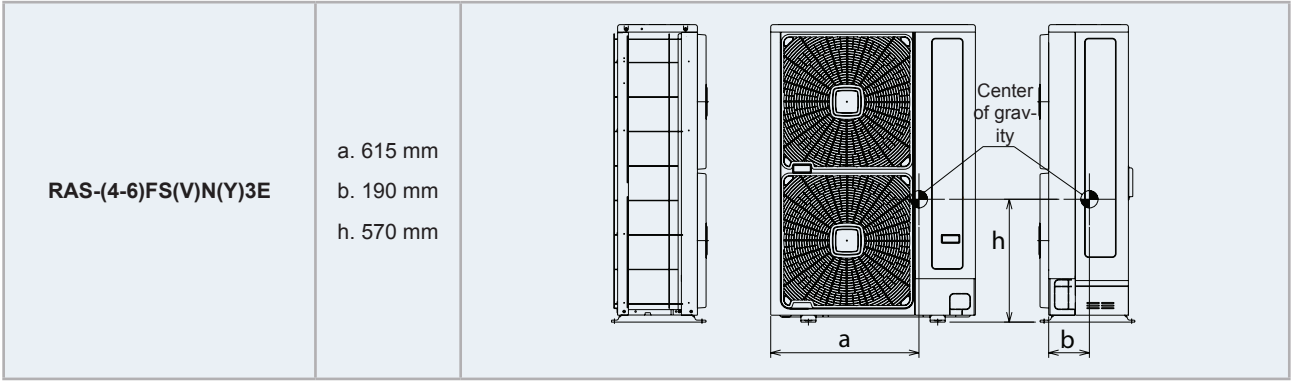
CAUTION

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

2.2.2 Handling unit (center of gravity)

When the unit is lifted manually (using the handles), pay attention to the following points:

- 1 Do not remove the wooden base from the unit.
- 2 To prevent the unit from overturning, pay attention to the center of gravity as shown in the below figure:

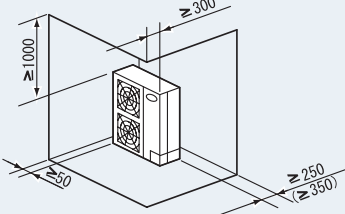
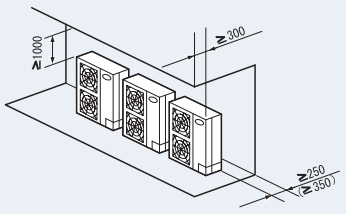
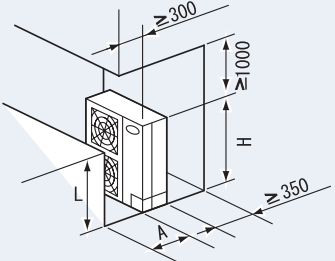
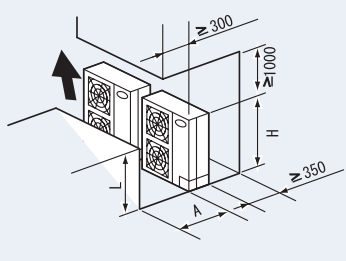


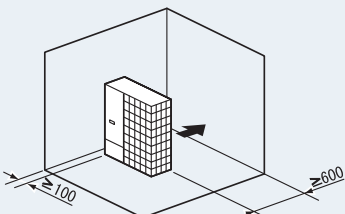
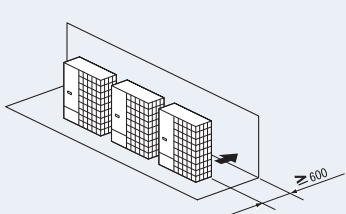
- 3 Two or more personnel should be used to move the unit.

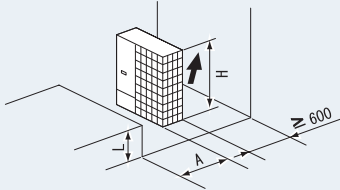
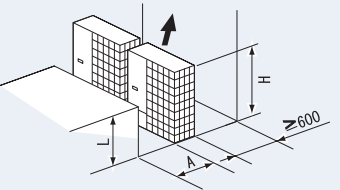
Net weight (kg)	
RAS-(4-6)FSVN3E	RAS-(4-6)FSNY3E
100	102

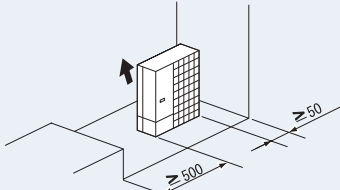
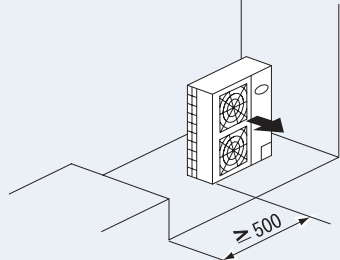
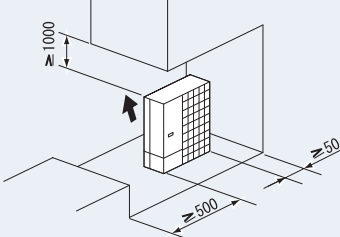
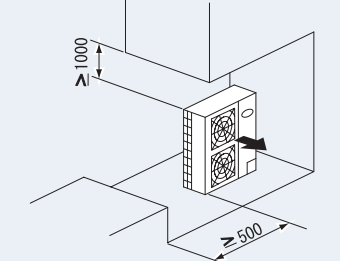
2.3 Installation space

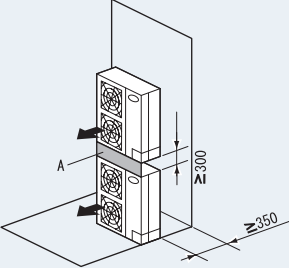
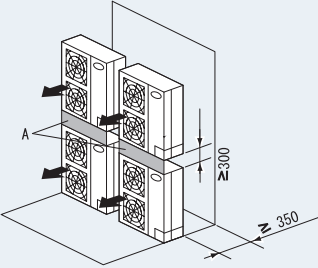
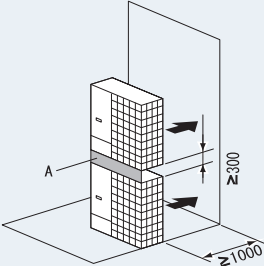
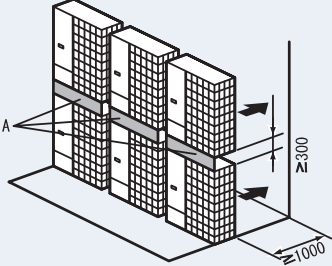
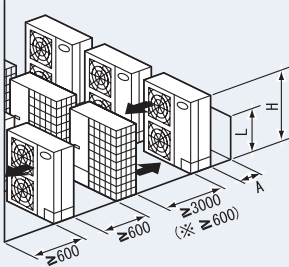
Blocked in Inlet Side	
Upper Side Open	
Single Installation	Multiple Installation (Two units or more)
100 mm or more of the side space is acceptable on the service cover side. Dimensions in () shows numbers especially for IVX 4-10 HP. 150 or more (200 or more) of the back space is acceptable when the right and left sides are open.	Allow 100 mm of space between units. Leave open both right and left sides. Dimensions in () shows numbers especially for IVX 4-10 HP.
Be sure to use the fan direction guide. Leave open both right and left sides.	Be sure to use the fan direction guide. Allow 100 mm of space between units. Leave open both right and left sides. When subject to direct sunlight on the back wall ensure the length marked with X be 500 or greater.

Blocked in Inlet Side							
Upper Side Blocked							
Single Installation	Multiple Installation (Two units or more)						
							
100 mm or more of the side space is acceptable on the service cover side. Dimensions in () shows numbers especially for IVX 4-10 HP.	Allow 100 mm of space between units. Leave open both right and left sides. Dimensions in () shows numbers especially for IVX 4-10 HP.						
							
Be sure to use the fan direction guide. Leave open both right and left sides.	Be sure to use the fan direction guide. Allow 100 mm of space between units. Leave open both right and left sides. Serial installation allowed up to two units.						
The length A is as shown in the following table:							
<table><tr><th>L</th><th>A</th></tr><tr><td>$0 < L \leq 1/2H$</td><td>600 or greater</td></tr><tr><td>$1/2H < L \leq H$</td><td>1200 or greater</td></tr></table>		L	A	$0 < L \leq 1/2H$	600 or greater	$1/2H < L \leq H$	1200 or greater
L	A						
$0 < L \leq 1/2H$	600 or greater						
$1/2H < L \leq H$	1200 or greater						
Be sure to use the fan direction guide. Allow 100 mm of space between units. Leave open both right and left sides. Serial installation allowed up to two units.							

Outlet Side Blocked	
Upper Side Open	
Single Installation	Multiple Installation (Two units or more)
	
	Allow 100 mm of space between units. Both right and left sides shall be open.

Outlet Side Blocked													
													
Be sure to use the fan direction guide. Leave open both right and left sides.	Be sure to use the fan direction guide. Allow 100 mm of space between units. Serial installation allowed up to two units. Leave open both right and left sides.												
The length A is as shown in the following table: <table><tr><th>L</th><th>A</th></tr><tr><td>$0 < L \leq 1/2H$</td><td>≤ 200</td></tr><tr><td>$1/2H < L \leq H$</td><td>≤ 300</td></tr></table>	L	A	$0 < L \leq 1/2H$	≤ 200	$1/2H < L \leq H$	≤ 300	The length A is as shown in the following table: <table><tr><th>L</th><th>A</th></tr><tr><td>$0 < L \leq 1/2H$</td><td>≤ 250</td></tr><tr><td>$1/2H < L \leq H$</td><td>≤ 350</td></tr></table>	L	A	$0 < L \leq 1/2H$	≤ 250	$1/2H < L \leq H$	≤ 350
L	A												
$0 < L \leq 1/2H$	≤ 200												
$1/2H < L \leq H$	≤ 300												
L	A												
$0 < L \leq 1/2H$	≤ 250												
$1/2H < L \leq H$	≤ 350												
When $L > H$ use a base for outdoor unit to make $L \leq H$. Close the base not to allow the outlet air bypassed.	When $L > H$ use a base for outdoor unit to make $L \leq H$. Close the base not to allow the outlet air bypassed.												

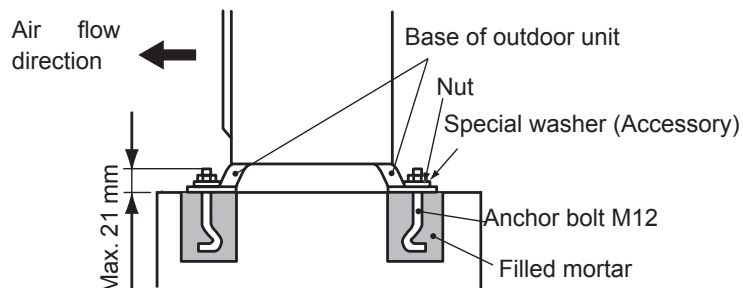
Lateral Side Blocked	
Upper Side Open	
Single Installation	
	
Upper Side Blocked	
	

Stack installation (allowed up to 2 Units)							
Upper Side Open							
Single Installation	Multiple Installation						
							
Close the part A not to allow the outlet air bypassed. Install to avoid the drain water from upper unit falling on the lower unit.	Allow 100 mm of space between units. Serial sideways installation allowed up to two units. Leave open both right and left sides. Close the part A not to allow the outlet air bypassed. Install to avoid the drain water from upper unit falling on the lower unit.						
Upper Side Blocked							
Single Installation	Multiple Installation						
							
Be sure to use the fan direction guide. Close the part A not to allow the outlet air bypassed. Install to avoid the drain water from upper unit falling on the lower unit.	Be sure to use the fan direction guide. Allow 100 mm of space between units. Serial side way installation allowed. but leave open both right and left sides. Close the part A not to allow the outlet air bypassed. Install to avoid the drain water from upper unit falling on the lower unit.						
Multiple Installation in Multiple Rows							
Serial Installation in Multiple Rows (E.g. Rooftop)							
	Allow approx. 100 mm of space from the side unit. Leave open both right and left sides. The length A is as shown in the following table: <table><tr><th>L</th><th>A</th></tr><tr><td>$0 < L \leq 1/2H$</td><td>≤ 200</td></tr><tr><td>$1/2H < L \leq H$</td><td>≤ 300</td></tr></table>	L	A	$0 < L \leq 1/2H$	≤ 200	$1/2H < L \leq H$	≤ 300
L	A						
$0 < L \leq 1/2H$	≤ 200						
$1/2H < L \leq H$	≤ 300						
 NOTE When $L > H$ use a base for outdoor unit to make $L = H$. Close the base not to allow the outlet air bypassed. Be sure to use the fan direction guide in order to ensure the length marked with ✕.							

2.4 Installation place provision

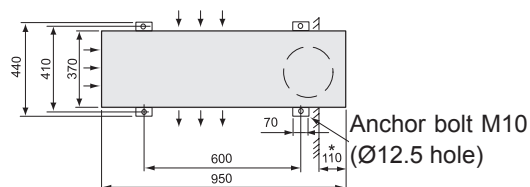
◆ Concrete foundation

- 1 When installing the outdoor unit, fix the unit by anchor bolts.



Fix the outdoor unit to the anchor bolts by special washer.

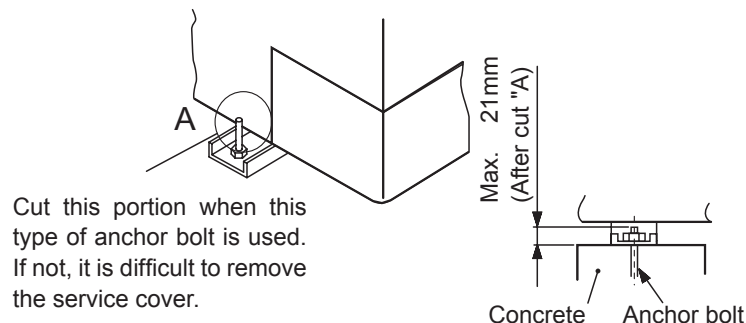
Please, refer to the following figure regarding the location of fixing holes:



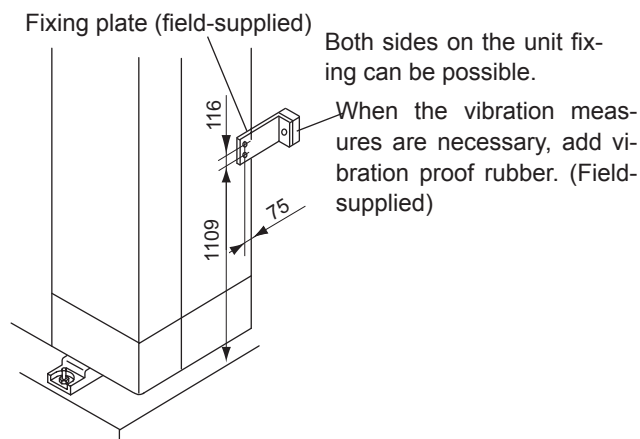
NOTE

*: Space for downward piping.

Example of fixing outdoor unit by anchor bolts.



- 2 Fix the outdoor unit firmly so that declining, making noise, and falling down by strong wind or earthquake is avoided.



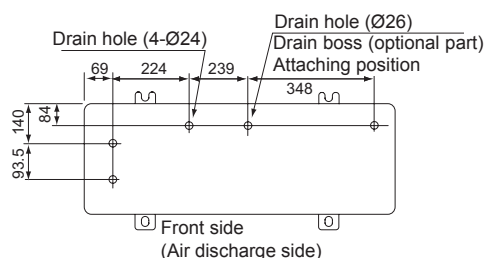
3 During the heating or defrosting operations, drain water is discharged from the unit.

When installing the unit, the location with good drainage should be selected, or establish the drainage.

It is recommended not to install the unit at high place such as on a roof or a veranda, because the water may drip from the unit.

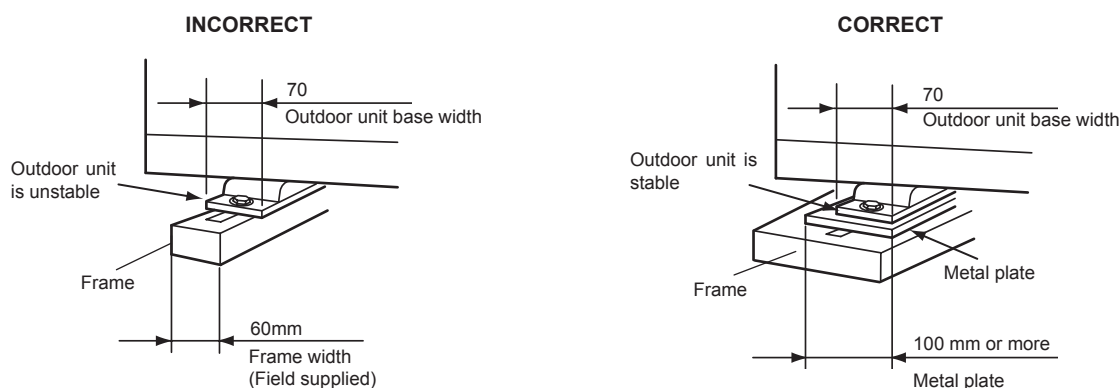
If the unit installation at high place is not avoidable, the drain water should be treated surely by installing additional drain pan. (Especially in winter, the drain water may be frozen and cause of injury by slipping.)

4 In case of the drain piping is necessary for the outdoor unit, use the drain-kit (DBS-26: Optional part).



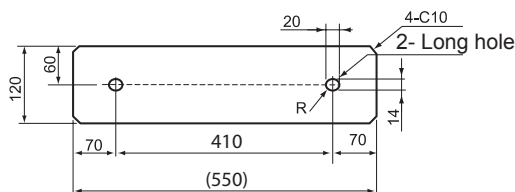
5 The whole base of the outdoor unit should be installed on a foundation or frame. When using vibration-proof material, it should also be positioned in the same place.

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



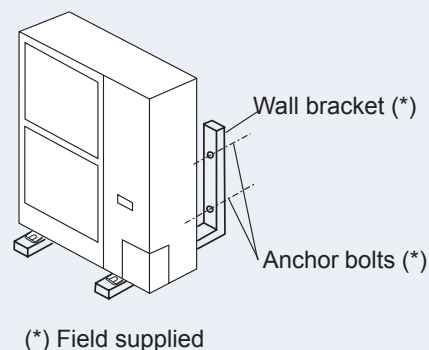
Recommended metal plate size (Field supplied)

- Material: Hot-rolled mild steel plate (SPHC)
- Plate thickness: 4.5 T



◆ **Suspended unit**

- 1 Suspend the unit as the drawing indicates.
- 2 Ensure that wall can resist the Outdoor unit weight indicated in specification label plate.
- 3 It is recommended to select each foot support to bear the full weight of the unit (in order to consider stress fatigue applied when unit is working too).



CAUTION

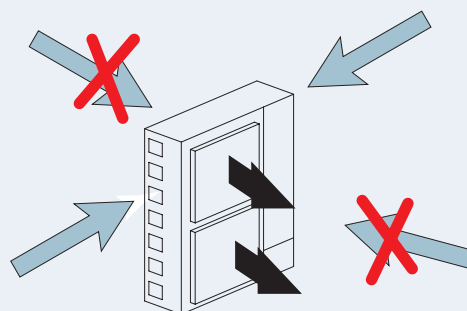
Pay attention to the following for installation:

- Installation shall ensure that outdoor unit will not incline, vibrate, make noise or fall down by a blast of wind or in an earthquake. Calculate quake-resistance strength to ensure that installation is strong enough against falling. Fix the unit with wires (field supplied) when installing in a location without walls or windbreak and likely exposed to a blast of wind.
- To use a vibration-proof mat, fix four places to the front and back.

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

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

- 1 Choose a location where the outlet or inlet side of the product will not be exposed to strong wind.
- 2 When the outlet is exposed to strong wind: Direct strong wind may cause lack of air flow and adversely affect to the operation.



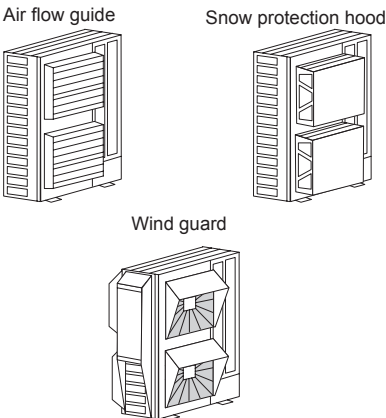
CAUTION

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

2.5 Optional parts and installation

◆ Air flow guide, wind guard and snow protection hood

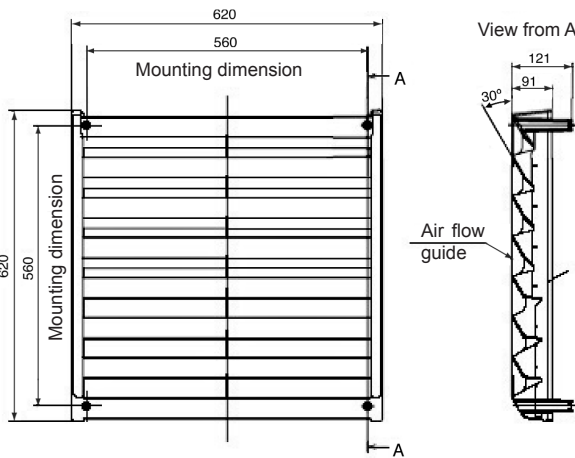
Optional parts			Model
Air flow guide			AG-335A x 2
Wind guard			WSP-335A x 2
Snow protection hood	Zinc plate	Air outlet	ASG-NP335F x 2
		Air inlet of rear side	ASG-NP280B
		Air inlet of side face	ASG-NP280L
	Stainless plate (NSSC 180)	Air outlet	ASG-NP335FS2 x 2
		Air inlet of rear side	ASG-NP280BS2
		Air inlet of side face	ASG-NP280LS2



Air flow guide

- Specifications

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

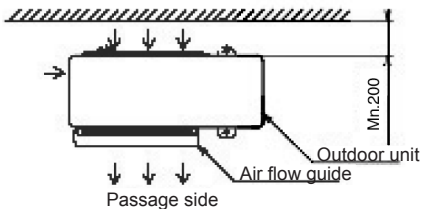
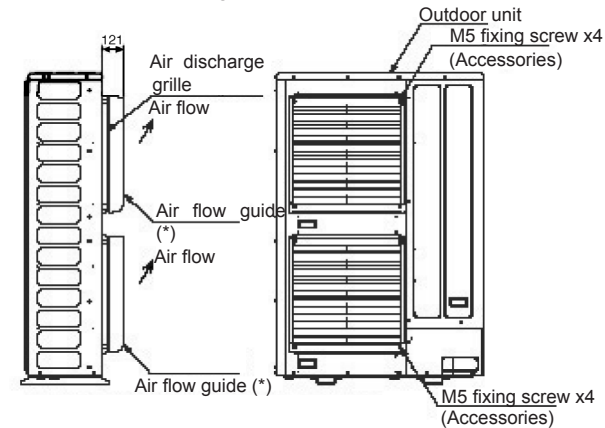


- Attaching example of air flow guide
 - Attach the air flow guide to the air discharge grille with four (4) screws (supplied).
 - The fixing holes are located at 4 positions on the grille. (Screw tightening torque 2.4~3.1N.m)
 - Do not remove the air discharge grille for air flow guide installation.

CAUTION

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

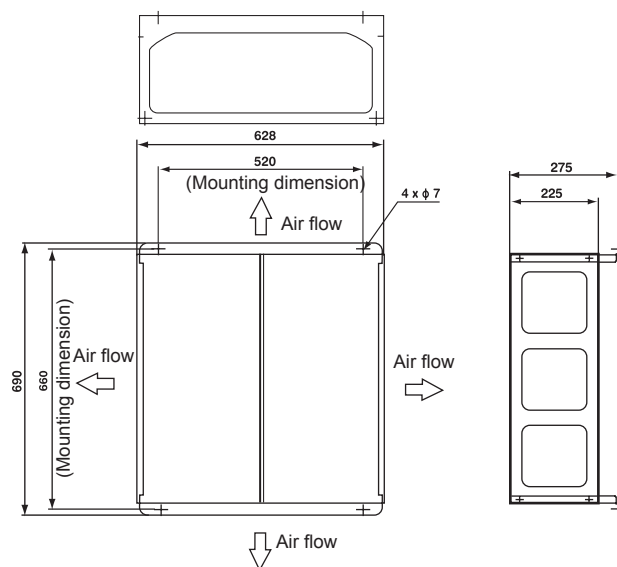
- Two air flow guides installation
 - ◆ In case of right and left sides air discharge, enough space for air discharge is required.
 - ◆ The downward air discharge is also available. In such case, install the base under the unit to secure enough space for air discharge.
 - ◆ In case of serial units installation,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



Wind guard

- Specifications

Model	WSP-335A
Quantity	2 per unit
Material	Galvanized sheet metal + baked painting
Color	Gray (1.oY8.5/0.5)
Weight	5.5 kg
Accessories	Fixing screw x 4 [M5 (SUS) x 12] Installation manual
Installation restriction	"Guard net", "Air flow guide" or "Snow protection hood" is not available to install with Wind guard



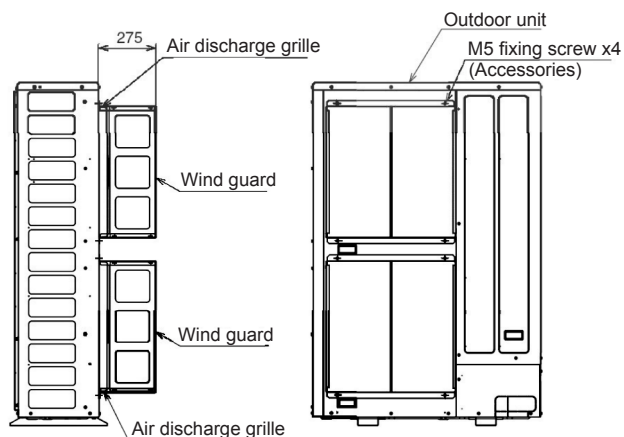
- Attaching example of wind guard
 - ♦ Attach the wind guard to the air discharge grille with four (4) screws (supplied).
 - ♦ The fixing holes are located at 4 positions on the grille (Screw tightening torque 2.4~3.1N.m).
 - ♦ Do not remove the air discharge grille for wind guard installation.



CAUTION

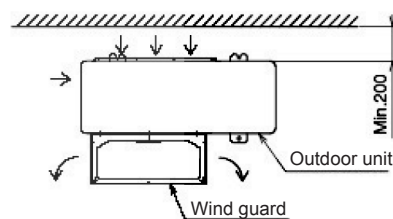
If the wind guard is installed without discharge grille, it may cause injury due to rotating fan.

- Two windguard covers installation



- Service space

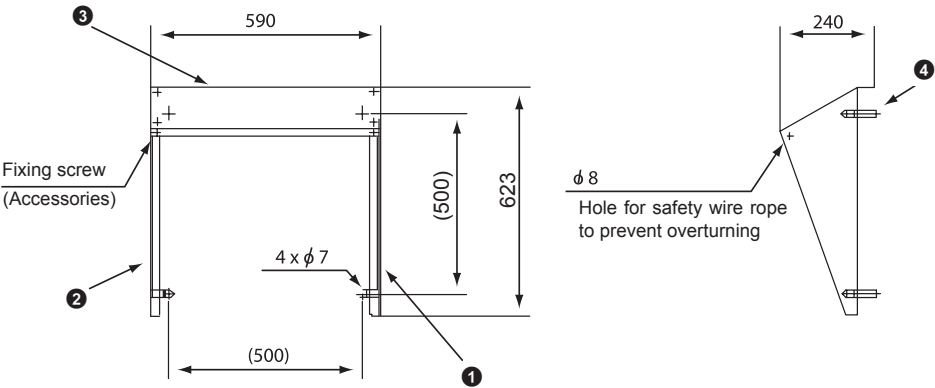
- ♦ Both sides of the outdoor unit should be open.
- ♦ No obstacles should be placed in the air discharge side.



Snow protection hood

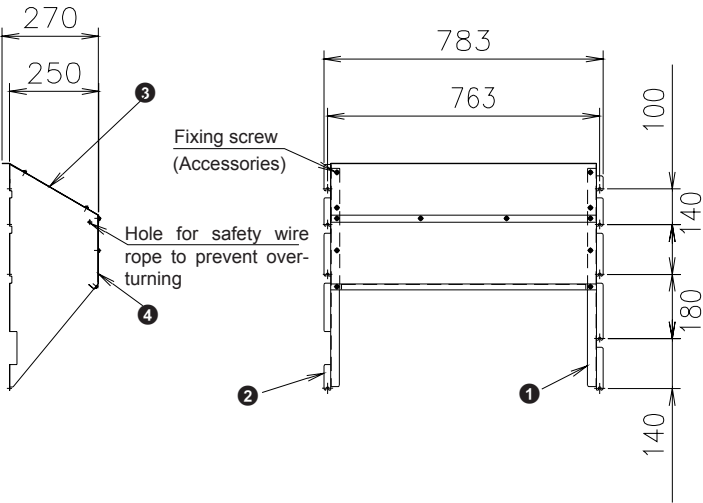
- Air discharge hood

No.	Part name	Qty.
❶	Right side plate	1
❷	Left side plate	1
❸	Front panel	1
❹	Stay	4



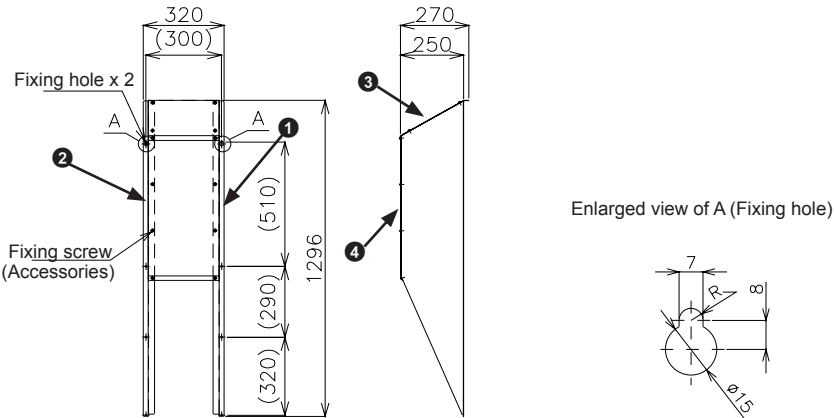
- Rear suction hood

No.	Part name	Qty.
❶	Right side plate	1
❷	Left side plate	1
❸	Upper front panel (Upside)	1
❹	Upper front panel (Downside)	1

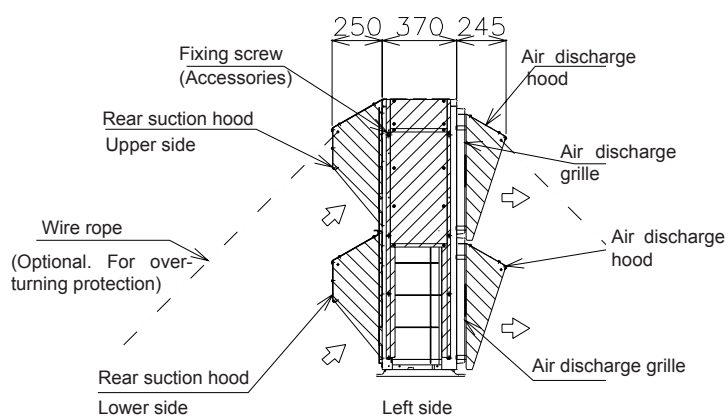
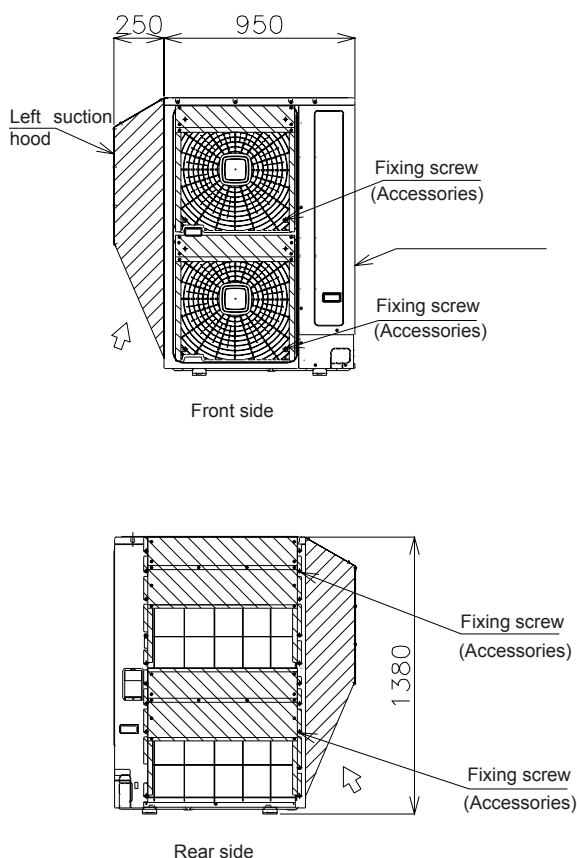


- Left suction hood

No.	Part name	Qty.
❶	Right side plate	1
❷	Left side plate	1
❸	Front panel (Upside)	1
❹	Front panel (Downside)	1



- Attaching example of snow protection hood



- Specifications of snow protection hood

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

3. Piping work and refrigerant charge

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3.1 General notes

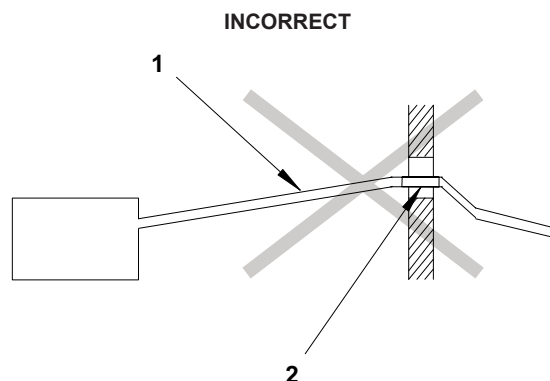
Connect all pipes as close as possible to the unit, so that disconnection can be easily performed when required.



CAUTION

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

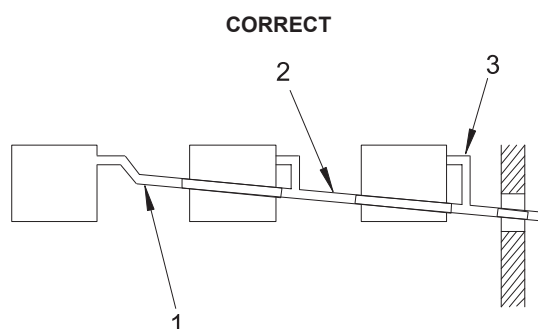
- 1 Common drain piping.
- 2 Up slope.



Do not connect the drain pipe with the sanitary piping, the sewage piping or any other drainage piping.

When the common drain piping is connected with other indoor units, the connected position of each indoor unit must be higher than the position of the common drain piping. The pipe section of the common drain pipe must be wide enough according to the unit size and the unit number.

- 1 Common drain piping.
- 2 Pitch of 4% (1/25) to 1% (1/100).
- 3 Drain piping connection.



The drain pipe will require insulation if it is installed in a location where the ambient humidity may condensate on the drain pipe outer surface. This condensation could drop and cause damage. The insulation for the drain pipe must be selected in order to ensure that the vapour is sealed and in order to prevent the condensation forming.

The drain trap should be installed next to the indoor unit, designed according to good practice and must be checked with charged water in order to test the correct flow. Do not tie or clamp the drain pipe and the refrigerant pipe together.



NOTE

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

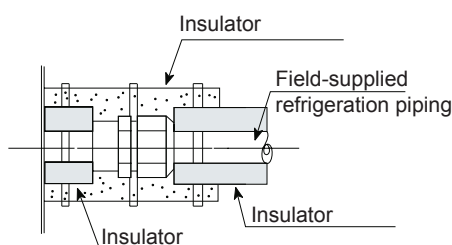
3.2 Piping work connection considerations

3.2.1 Piping materials

- 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)		
6.35	1/4	0.80	Roll
9.52	3/8	0.80	Roll
12.7	1/2	0.80	Pipe/Roll
15.88	5/8	1.00	Roll
19.05	3/4	1.00	Pipe/Roll
22.2	7/8	1.00	Pipe/Roll
25.4	1	1.00	Pipe

- 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.

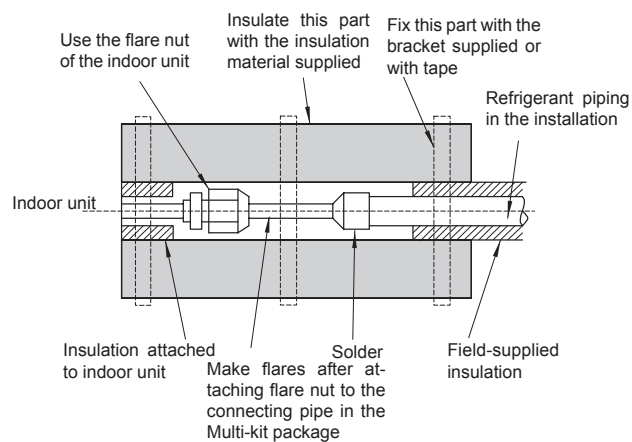


CAUTION

Do not use saws, grindstones or other tools which might create copper dust.

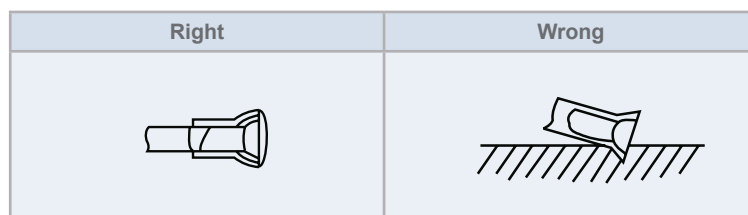
3.2.2 Pipe connection

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.
- 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.



- 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.

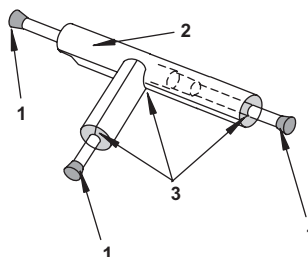
3.2.3 Insulation

Attach insulation package with the Multi-kit 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.

3.2.4 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.

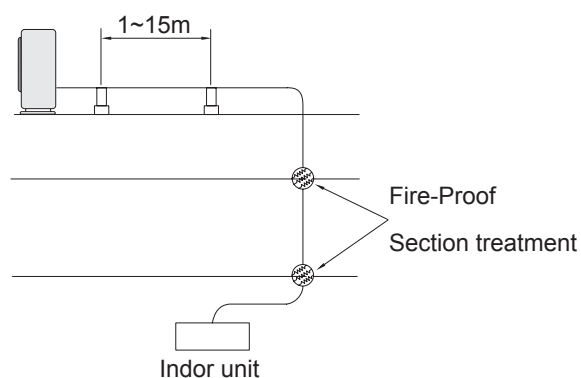
In order to avoid oxidation, pay much careful attention to basic piping work control to avoid infiltration of moisture or dust during the refrigerant piping work.

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

3.2.5 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...

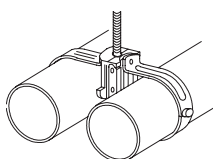
(If touched, abnormal sound may occur due to the vibration of the piping. Pay special attention in case of short piping length).



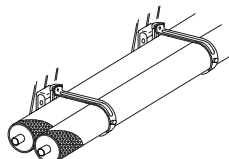
Do not fix the refrigerant piping directly with the metal fittings (The refrigerant piping may expand and contract).

Some examples for suspension method are shown below.

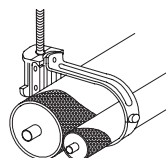
For suspending heavies



For piping along the wall



For instant installation work

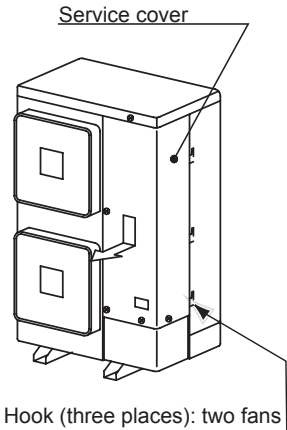


3.3 Unit piping connection

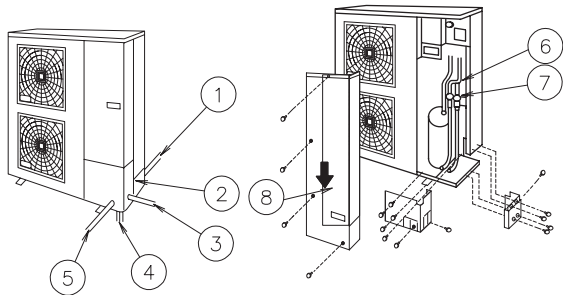
- 1 Notes to open/close the service cover:
- Remove the screws following the instructions to the above figure.
 - Slowly press down the cover.

i NOTE

Hold the cover with a hand to remove screws as the cover may fall down.

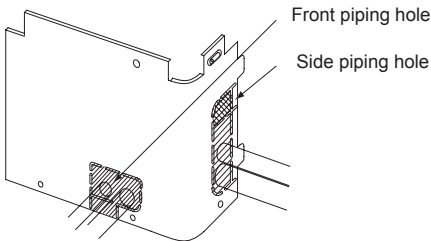


- 2 Confirm that the valve is closed.
- 3 Prepare a field-supplied bend pipe for liquid line. Connect it to the liquid valve by flare nut through the square hole of bottom base.
- 4 For Gas Piping Connection. Prepare a field-supplied bend pipe for gas line. Braze it and the factory-supplied pipe flange at the outside of the unit.
- 5 The pipes can be connected from 4 directions. Make holes in the piping cover or cabinet for taking out pipes. Take the piping cover away from the unit, and make holes by cutting along the guideline at the rear of the cover or punching with a driver. Remove the burr with a cutter, and place a insulation (field supplied) to protect cables and pipes.



N°	Description
①	Rear side piping work
②	Pipe Cover
③	Right side piping work
④	Bottom side piping work (Knock out hole)
⑤	Front side piping work
⑥	Piping work
⑦	Stop valve
⑧	Removing direction for service cover

◆ For the front and side piping

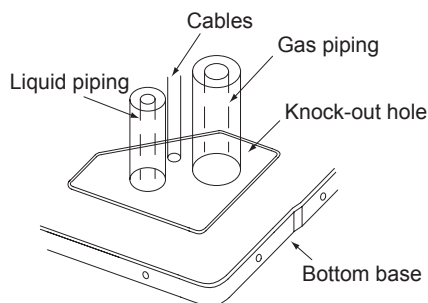


To use racking or conduit tubes, check the size and remove  part following the slit.

i NOTE

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

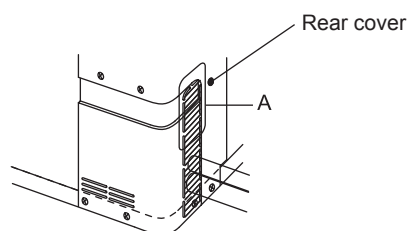
◆ For the downward piping



NOTE

Cables shall not contact directly to the pipes.

◆ For the rear side piping



NOTE

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

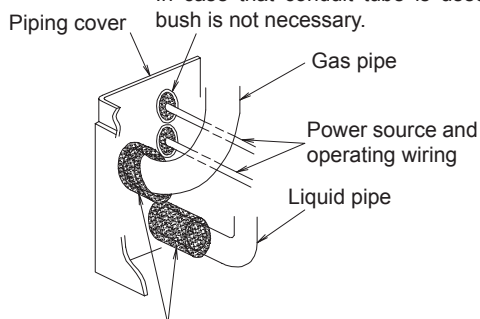
- 6 Mount the piping cover in order to avoid water entering into the unit. Seal the holes where pipes and wires are inserted, by using a insulator and rubber bushes as shown below.

Rubber Bush (Accessory)

Add cross cutting to the center of the rubber bushing.

Attach rubber bushing to the hole of wiring.

In case that conduit tube is used, rubber bush is not necessary.



Insulation (Accessory).

Attach insulation to the pipe as shown in the figure and space shall not exist at the piping hole.

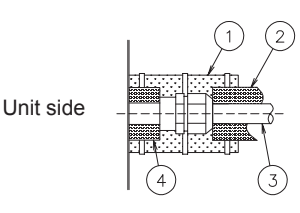
Cut the insulation as shown in the figure when attaching work is difficult.

- 7 If the field-supplied piping is connected with stop valves directly, it is recommended use a tube bender.
- 8 Check to ensure that the stop valves are closed completely before connecting pipes.
- 9 Connect the field supplied refrigerant pipes to the indoor unit and outdoor unit. Apply the oil thinly at the seat flare nut and pipe before tightening.

The required tightening torque is as follows:

Pipe Size	Tightening Torque (Nm)
Ø 6.35 mm	20
Ø 9.52 mm	40
Ø 12.70 mm	60
Ø 15.88 mm	80

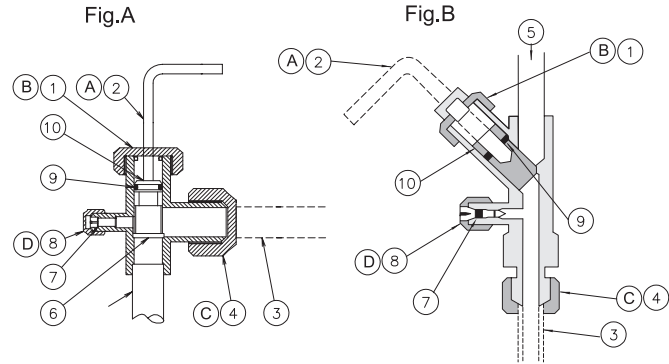
10 After connecting the refrigerant piping, seal the open space between knockout hole and refrigerant pipes by using insulation material.



N°	Description
①	Insulation material
②	Insulation material
③	Field supplied
④	Insulation material

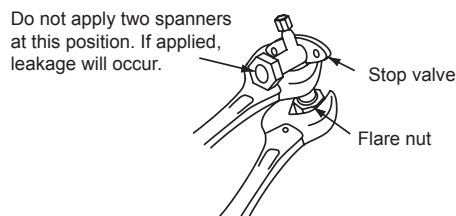
11 Operation of stop valve should be performed according to the figure below.

Close before shipment



N°	Description	Remarks
①	Cap	
②	Allen wrench	Fig.A: Hex 4 mm / Fig.B: Hex. 8 mm
③	Refrigerant piping	Field supplied
④	Flare nut	
⑤	Refrigerant pressure	To outdoor unit
⑥	Seat surface	Fully closed position
⑦	Check joint	Only the charging those can be connected
⑧	Cap	
⑨	O-Ring	Rubber
⑩	Spindle valve	Open – Counterclockwise Close – Clockwise

Tightening Torque (Nm)					
Valve type	Model	A	B	C	D
Fig.A Liquid valve	(4~6)HP	7-9	37	40	16
Fig.B Gas valve	(4~6)HP	9-11	30	60	9

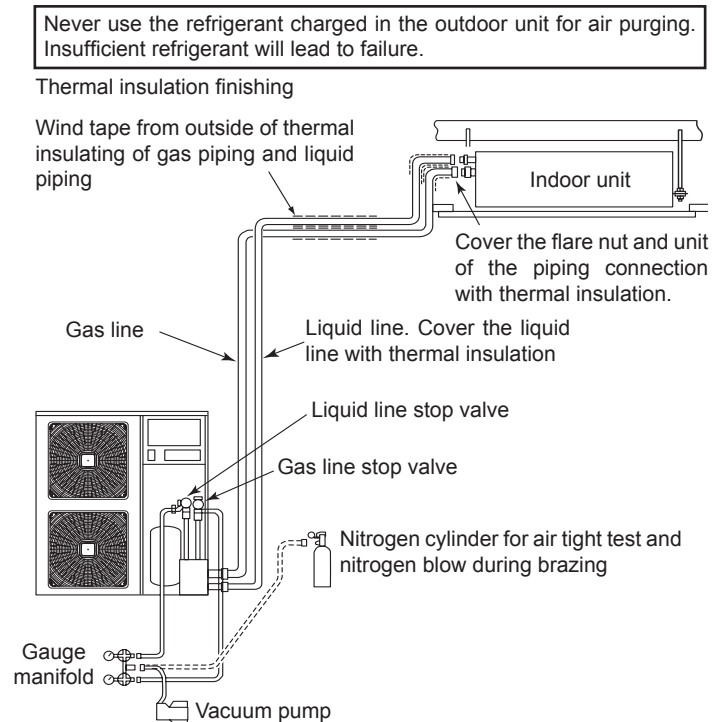
◆ Outdoor unit stop valve**CAUTION**

- *At the test run, fully open the spindle.*
- *If not fully opened, the devices will be damaged.*
- *Do not attempt to turn service valve rod beyond its stop.*
- *Do not loosen the stop ring. If the stop ring is loosened, it is dangerous since the spindle will hop out.*
- *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.*

◆ Evacuation and refrigerant charge

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

Example of Evacuation and Refrigerant Charge.



Check to ensure that there is no gas leakage. When large amount of the refrigerant leaks, the troubles as follows may occurs.

1. Oxygen deficiency
2. Generation of harmful gas due to chemical reaction with fire.

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.

◆ 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.

◆ Refrigerant charge



CAUTION

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

◆ 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.

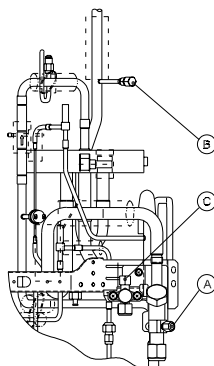
At that time, connect the pressure gauge according to the following table because of high pressure side and low pressure side changes by operation mode.

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



NOTE

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



◆ Pump down refrigerant

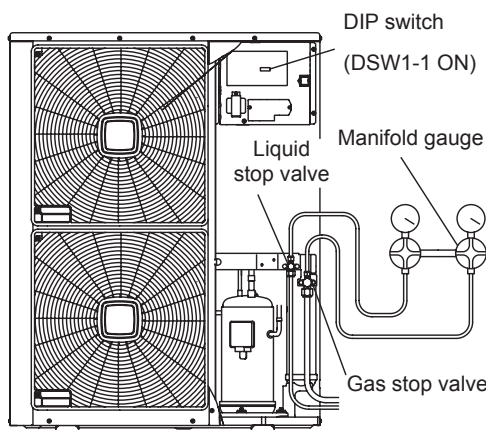
When the refrigerant should be collected into the outdoor unit due to indoor/outdoor unit relocation, collect the refrigerant as follows:

- 1 Attach the manifold gauge to the gas stop valve and the liquid stop valve
- 2 Turn ON the power source
- 3 Set the DSW1-1 pin of the outdoor unit PCB at the "ON" side for cooling operation. Close the liquid stop valve and collect the refrigerant.
- 4 When the pressure at lower pressure side (gas stop valve) indicates -0.01 MPa (-75 mmHg), perform the following procedures immediately.
 - Close the gas stop valve.
 - Set the DSW1-1 pin at the "OFF" side (To stop the unit operation).
- 5 Turn OFF the power source.



CAUTION

Measure the low pressure by the pressure gauge and keep it not to decrease than -0.01 MPa. If the pressure is lower than -0.01 MPa, the compressor may be faulty.



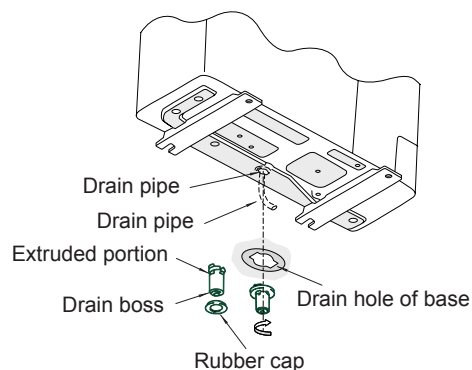
◆ Drain discharging boss

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

Model	Applicable model
DBS-26	RAS-(4-6)FS(V)N(Y)3E

Connecting procedure

- 1 Insert the rubber cap into the drain boss up to the extruded portions.
- 2 Insert the boss into the unit base and turn approximately 40 degree counterclockwise.
- 3 Size of the drain boss is 26 mm (O.D.).
- 4 A drain pipe should be field-supplied.



NOTE

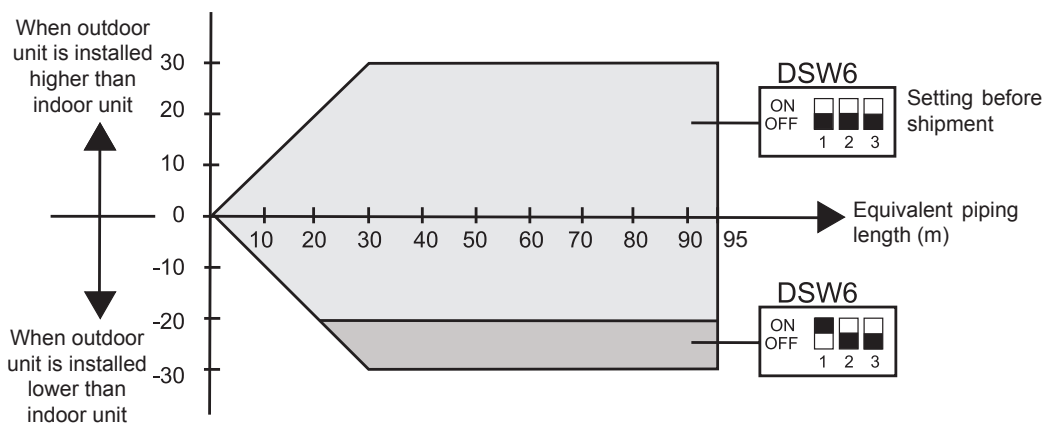
Do not use this drain boss set in a cold area, because the drain water may freeze. This drain boss is not sufficient to collect all the drain water. If collecting drain water is completely required, provide a drain-pan that is bigger than the unit base and install it under the unit with drainage.

3.4 Refrigerant piping size

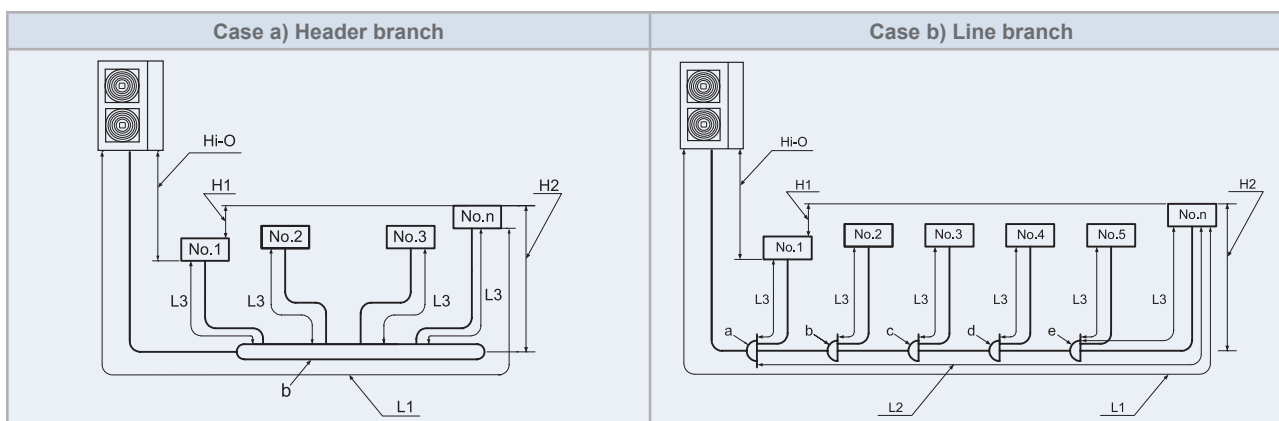
3.4.1 Refrigerant piping length

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

Keep the design point within the area of the chart, which is showing the applicable height difference according to piping length.



◆ Piping system



NOTE

- 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 Multi-kits at the same horizontal level.

Maximum refrigerant piping length

(m)		4HP	(5/6)HP	(*)
Item				
Maximum length from the outdoor unit to the furthest indoor unit (L1)	Actual length	≤ 75		
	Equivalent length	≤ 95		
Maximum length from the 1st Multi-kit to the furthest indoor unit (L2)		≤ 40		
Maximum length between Multi-kit and indoor unit (L3)	Case a) Header branch	≤ 15		
	Case b) Line branch	≤ 10		
Maximum height difference between outdoor and indoor unit (Hi-O)	If the outdoor unit is higher than the indoor unit	≤ 30		
	If the outdoor unit is lower than the indoor unit	≤ 30		
Maximum height difference between each indoor unit (H1)		≤ 15		
Maximum height difference between Multi-kit and indoor unit (H2)		≤ 5		
Total piping length (L1+L31+L32+...+L3n-1)		≤ 125	≤ 135	
Choice of each Multi-kit	Case a) Header branch	MH-84AN (4 branches) MH-108AN (8 branches)		
	Case b) Line branch	E-102SN3		


NOTE

(*): Some of these conditions could be different depending on the number of indoor units combinable. Please, refer to the following table for the specific considerations of combinability.

Specific considerations of combinability

Outdoor unit	Combinability						
	Minimum nominal combination capacity (HP)	Nominal combination capacity (HP)	Maximum nominal combination capacity (HP)	Minimum combination quantity of indoor units	Minimum single operation capacity (HP)	Maximum combination quantity of indoor units (The sum of the installed RPK and all other indoor units)	RPK restrictions Maximum number of combinable RPK indoor units (This number of units is the sum of the installed RPK-FSN3M and RPK-FSNH3M with its expansion valve kit EV-1.5N1)
RAS-4FS(V)N(Y)3E	2.0	4.0	5.2	1	0.6 (*)	8	6
RAS-5FS(V)N(Y)3E	2.5	5.0	6.5	1	0.6 (*)	10	7
RAS-6FS(V)N(Y)3E	3.0	6.0	7.8	1	0.6 (*)	12	7


NOTE

(*): Indoor unit of 0.8HP set as 0.6HP by specific DSW setting only for combinations with Set Free Mini Series 3.

• **Considerations by maximum quantity of combined indoor units (**)**

All the following points should be taken in consideration when the quantity of indoor units is over the value shown in the following table:

Outdoor unit	Quantity of combined indoor units
RAS-4FS(V)N(Y)3E	> 6
RAS-5FS(V)N(Y)3E	> 8
RAS-6FS(V)N(Y)3E	> 9

- a. The total piping length should be reduced as follows:

Outdoor unit	(m)						
	Quantity of combined indoor units						
	≤ 6	7	8	9	10	11	12
RAS-4FS(V)N(Y)3E	125	113	101	-	-	-	-
RAS-5FS(V)N(Y)3E	135	135	135	123	111	-	-
RAS-6FS(V)N(Y)3E	135	135	135	135	123	111	99

- b. In these cases HITACHI recommends using header branch as distribution system than line branch.
- c. For **Line branch** reduce the maximum length between Multi-kit and indoor unit (L3) as follows:

$$\text{Maximum length between Multi-kit and indoor unit (L3)} \leq 10 \rightarrow \leq 5 \quad (m)$$

- d. The following considerations must be taken into account:
- Divide the installation into many branches as possible and equilibrate the length and the ratio of total indoor unit connected capacity of each part.
 - Reduce as much as possible the following lengths:
 - Height difference between outdoor and indoor unit (Hi-O)
 - Height difference between each indoor unit (H1)
 - The installation position of big capacity indoor unit should be as far away as possible from the first branch.



NOTE

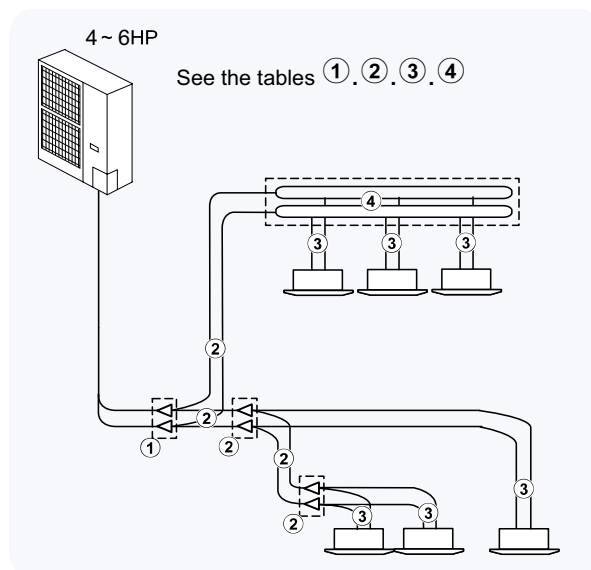
In case of installations not following the above considerations, please contact with your Hitachi dealer for advice.



CAUTION

In case of exceeding the quantity of indoor units shown before, and in some extreme conditions in terms of piping length and temperature, when all indoor units are in simultaneous operation, performance can decrease and discharge temperature of some indoor units can be lower than comfort temperature.

3.4.2 Refrigerant piping size



◆ **Table ①: Outdoor unit to first multi-kit**

Outdoor unit	Pipe size (Ø mm)		Multi-kit
	Gas	Liquid	
RAS-(4-6)FS(V)N(Y)3E	15.88	9.52	E-102SN3

◆ **Table ②: First multi-kit to last branch**

Total indoor units capacity	Pipe size (Ø mm)		Multi-kit
	Gas	Liquid	
<2.3HP	12.7	6.35	E-102SN3
2.3<HP<7.0	15.88	9.52	E-102SN3

◆ **Table ③: Multi-kit to indoor unit**

Indoor unit capacity (HP)	Pipe size (Ø mm)	
	Gas	Liquid
0.8 to 1.5	12.70	6.35 (*)
2.0	15.88	6.35 (*)
2.5 to 6.0	15.88	9.52



NOTE

- (*): The pipe size must be the same size of the piping connection hole of the I.U.
- The pipe shown in the above table is applicable for both: the line branch and the header branch.

◆ **Table ④: Header branch**

Applicable model	Pipe size (Ø mm)		Multi-kit model	
	Gas	Liquid	2~4 Branches	2~8 Branches
RAS-(4-6)FS(V)N(Y)3E	15.88	9.52	MH-84AN	MH-108AN

3.5 Distribution method

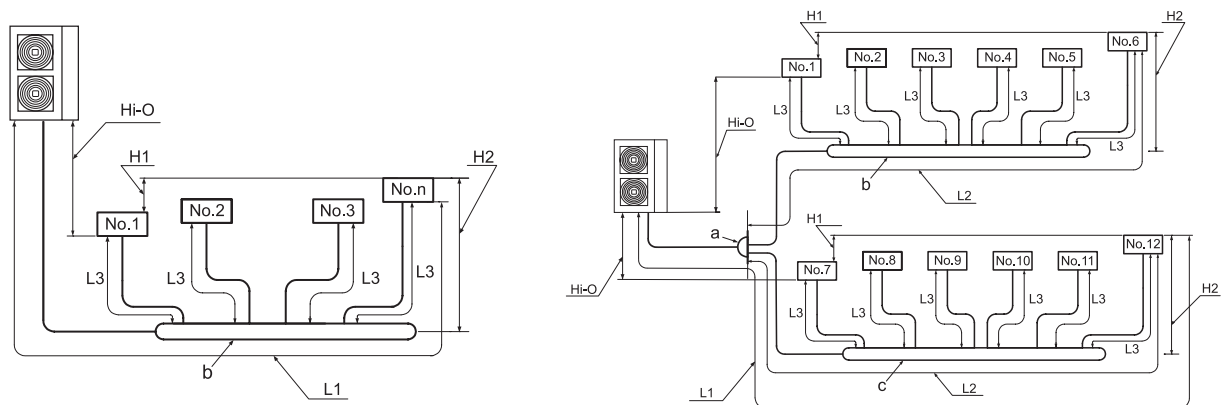


NOTE

For the following installation types, when the installation is divided into two or more parts, equilibrate the length and the ratio of total indoor unit connected capacity of each part.

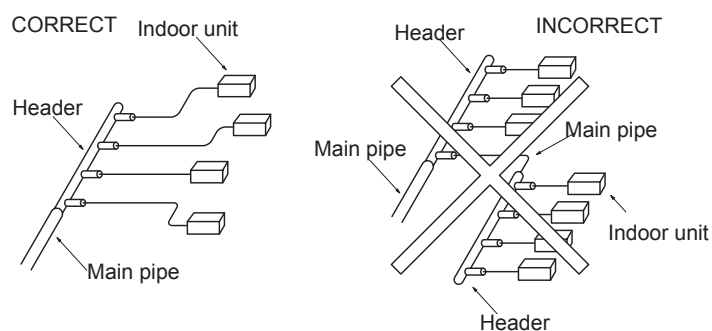
3.5.1 Header branch piping system

◆ Installation types



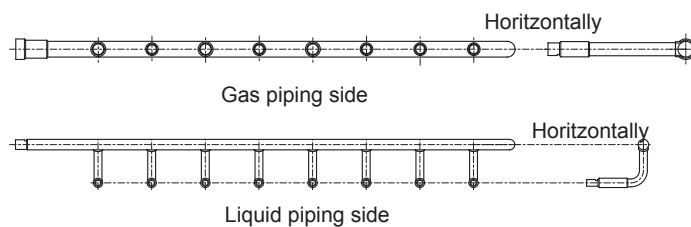
◆ Considerations

Do not connect two header branches consecutively.



Installation position

Perform to install horizontally always (Example.: In case of model MH-108AN)

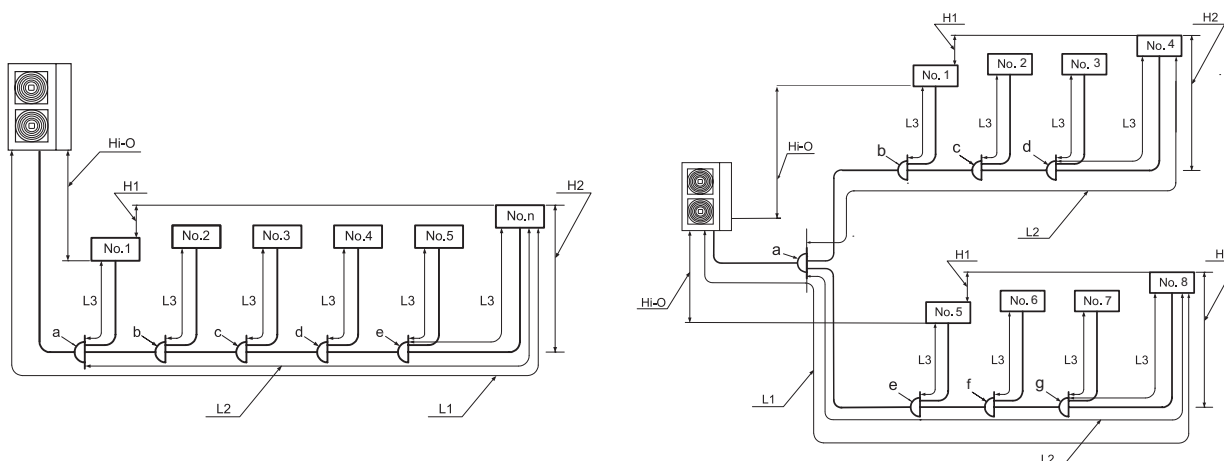


CAUTION

Seal the end of branch pipes which are not connected, by brazing factory supplied closing pipes.

3.5.2 Line branch piping system

◆ Installation types



NOTE

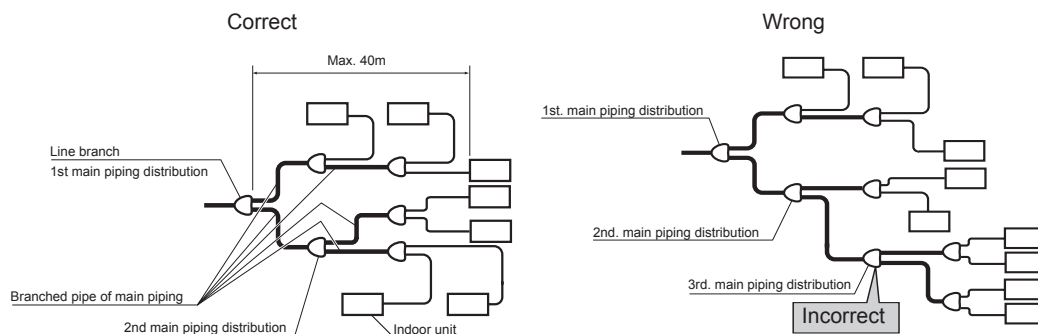
Distribution system not recommended for installations with more indoor units than:

- 6 units for RAS-4FS(V)N(Y)3E
- 8 units for RAS-5FS(V)N(Y)3E
- 9 units for RAS-6FS(V)N(Y)3E

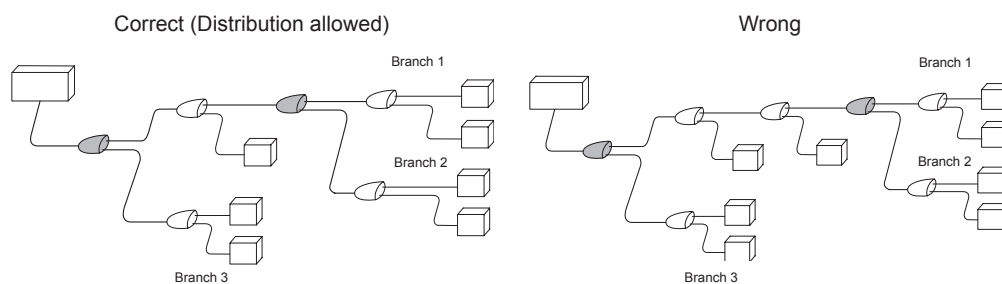
◆ Considerations

With line distribution method, it is possible to make the first or the second main pipe distribution within the third branch. And do not make the main pipe distribution, at or after the fourth branch.

Branch method



Branch method in 3rd multi-kit



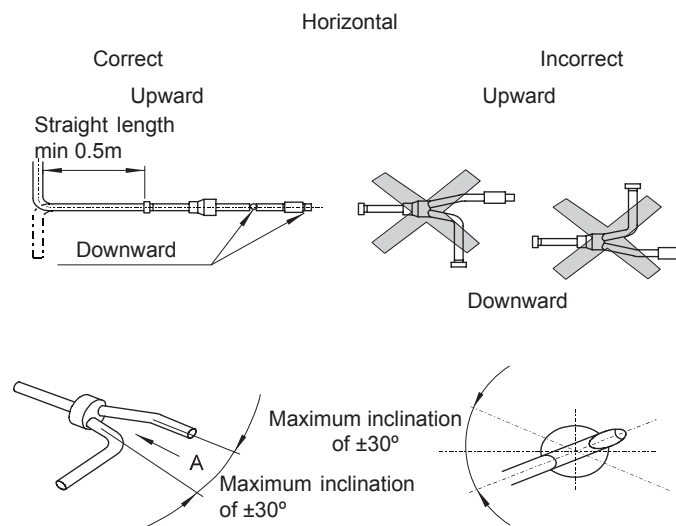
(Main pipe distribution: Distribution from one multi-kit to two multi-kits)

Installation position

• Horizontal installation

Locate the branch pipes on the same horizontal plane. (Inclination within 30°)

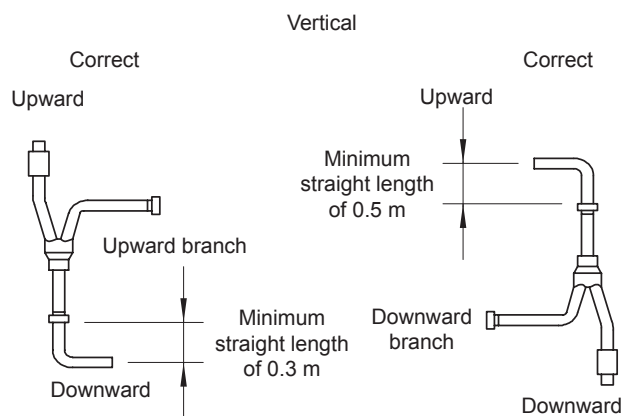
Make the straight length a minimum of 0.5m after the vertical bend.



• Vertical installation

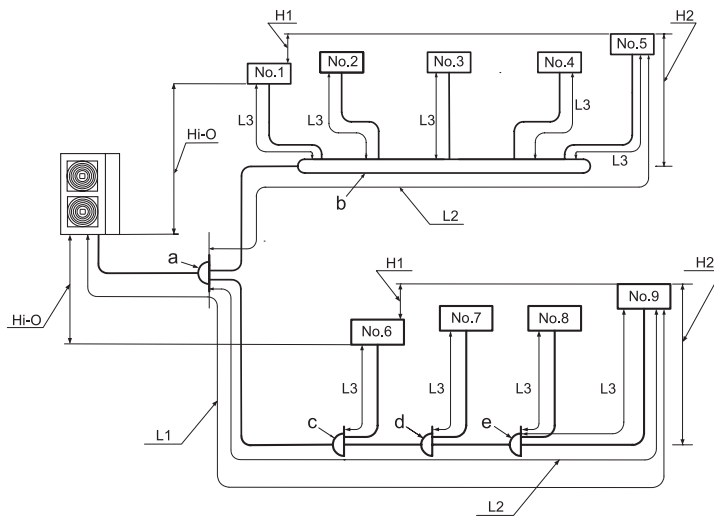
Straight length of the pipe connection on the outdoor unit side is made as follows:

- The collective pipe connection part is installed upward, the straight length must be min. 0.5m.
- The collective pipe connection part is installed downward, the straight length must be min. 0.3m.



3.5.3 Combination branch piping system

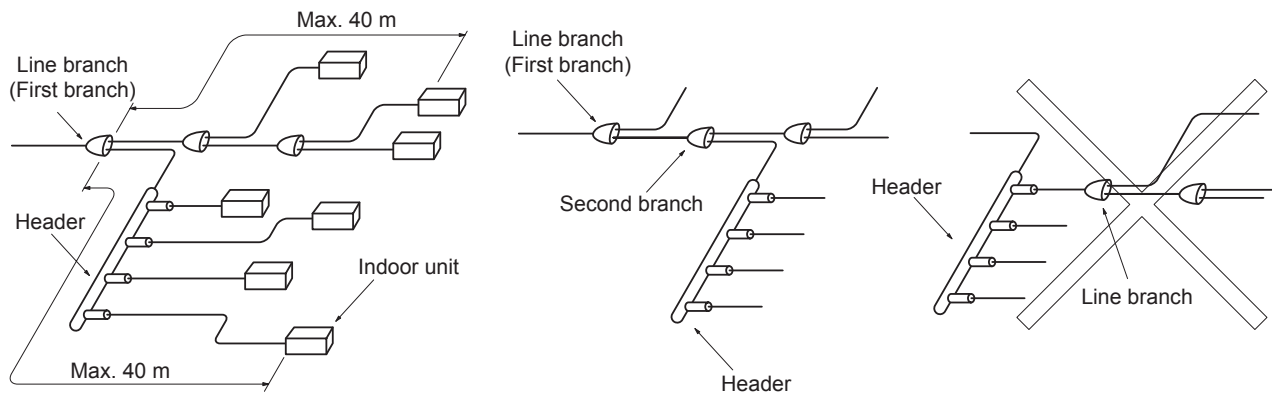
◆ Installation type



◆ Considerations

It is possible to connect the header to the second branch, when the first branch is also the line branch.

Do not connect a line branch to a header branch.



3.6 Refrigerant charge amount

Although refrigerant has been charged into this unit, additional refrigerant charge is required according to piping length.

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

3.6.1 Refrigerant charge before shipment (W_0 (kg))

W_0 is the outdoor unit refrigerant charge before shipment (Factory charge), and it's shown in the following table:

Model	Refrigerant charge before shipment (W_0 (kg))
RAS-4FS(V)N(Y)3E	3.6
RAS-5FS(V)N(Y)3E	
RAS-6FS(V)N(Y)3E	



CAUTION

- When charging refrigerant, measure the amount precisely.
- Overcharging or undercharging of refrigerant may cause compressor problems.

3.6.2 Additional refrigerant charge calculation method

Calculate the additional refrigerant charge amount (Additional charge) according to the following steps:

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

The additional refrigerant charge 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.

Pipe size (mm)	Additional refrigerant charge factor (kg/m)
Ø9.52	x 0.05
Ø6.35	x 0.02

◆ Step 2: Charging work

Charge refrigerant (R410A) into the system according to the instructions in the Service Manual.

◆ Step 3: Total refrigerant charge of the system (W_{TOT} (kg))

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

$W_{TOT} = W + W_0$				
System example (W_{TOT}) =	+	=		kg

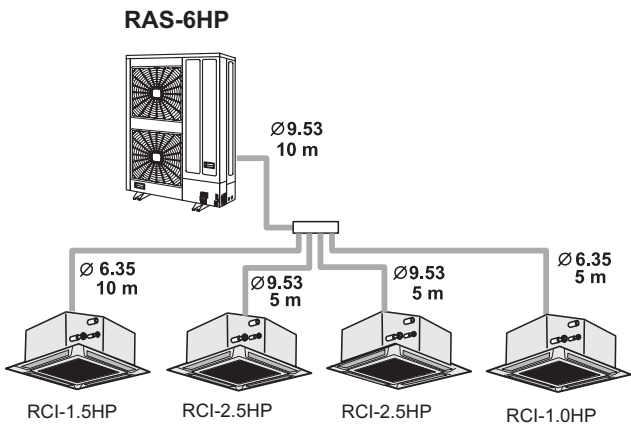
W_0 is the outdoor unit refrigerant charge before shipment explained before, and it's shown in its specific table.

Finally, record the refrigerant charge quantity in the F-Gas label 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) Questo apparecchio contiene gas fluorati 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 gefluoreerde broeikasgassen die vallen onder het protocol van Kyoto. (SV) Denna anläggning innehåller fluorhaltiga växthusgaser som regleras av Kyoto-protokollet. (EL) Ο παρών εξοπλισμός περιέχει φθοριωμένα αέρια θερμοκηπίου τα οποία αναφέρονται στο πρωτόκολλο του Κιότο.	
Do not vent R410A into the atmosphere. No descharge 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. Slap R410A uot atmosfēru. Laat geen R410A ontsappen in de atmosfeer. Släpp inte ut R410A i atmosfären. Μην αναρροπείτε το R410A στην ατμόσφαιρα.	
REFRIGERANT INFORMATION - INFORMACIÓN SOBRE EL REFRIGERANTE - KÜHLMITTELINFORMATION INFORMATION CONCERNANT LE FLUIDE FRIGORIGÈNE - INFORMAZIONI RELATIVE AL REFRIGERANTE INFORMAÇÕES SOBRE O REFRIGERANTE - OPLYSNINGER OM KØLEMIDDEL - INFORMATIE OVER KOELSTOF KYTLINGSINFORMATION - ITOKESIA-PIIKTIKOT MIEŠOY	
Refrigerant - Refrigerante - Kühlmittel - Fluide frigorigène - Kältemittel - Kooldstof - Kylfrings - Maczou R410A	
Factory Charge - Carga de fábrica - Werksabfüllung - Charge en usine (Fábrica de fábrica) (Carga de fábrica) (Fabrikabfüllung) (Charge en usine) Quantity of refrigerant charged at the factory - Cantidad de refrigerante cargada en la fábrica - In der Fabrik geladene Füllmenge - In de fabriek geladene vulling - In fabriek geladene vullingshoeft - In fabriek geladene vullingshoeft	kg
Additional Charge - Carga adicional - Zusätzliche Füllmenge - Charge supplémentaire Carga adicional - Carga adicional - Extra påfyllning - Extra vulling - terfigare påfyllning Προστίθοντις πρόσθετη	kg
Total Charge - Carga Total - Gesamtfüllmenge - Charge totale - Carga total Carga total - Samlet påfyllning - Totale vulling - Total påfylling - Zwaakke vullingshoeft	kg

3.6.3 Additional refrigerant charge calculation example

Example of quadruple system for RAS-6FS(V)N(Y)3E



3

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

Calculate the additional refrigerant charge for the liquid piping as indicated below. Check the example and fill in the following table.

Pipe size (mm)	Total Piping length (m)	Additional refrigerant charge (kg/m)	Subtotal (kg)
Ø9.52	10 + 5 + 5	x 0.05	1.0
Ø6.35	10 + 5	x 0.02	0.3
TOTAL			$W_1 = 1.3$

◆ Step 2: Total refrigerant charge of the system (W_{TOT} (kg))

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

$$W_{TOT} = W_0 + W_1$$

Refrigerant charge before shipment (W_0) = 3.6 kg (Refer to its specific table)

$$W_{TOT} = 3.6 + 1.3 = 4.9 \text{ kg}$$

4 . Electrical wiring

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4

4.1 General check

- 1 Ensure that the field-supplied electrical components (main 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)
RAS-4FSVN3E/4FSNY3E	0.29/ -
RAS-5FSVN3E/5FSNY3E	0.29/ -
RAS-6FSVN3E/6FSNY3E	0.29/ -

- 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 61000-3-2 (professional use)	RAS-(4~6FSNY3E)	-
Equipment complying with IEC 61000-3-12	RAS-(4~6FSVN3E)	-

- 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 capacity of power supply is enough. If not, the compressor will be not able to operate because of abnormal voltage drop at starting.
- 7 Check to ensure that the ground wire is connected.
- 8 Connect a fuse of specified capacity.



CAUTION

- Check to ensure that screws for terminal block are tightly tightened.
- Check to ensure that the indoor fan and the outdoor 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.
- Avoid the wiring from touching the refrigerant pipes, plate edges and electrical parts inside the unit.
- If not do, the wires will be damaged and at 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 or 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.



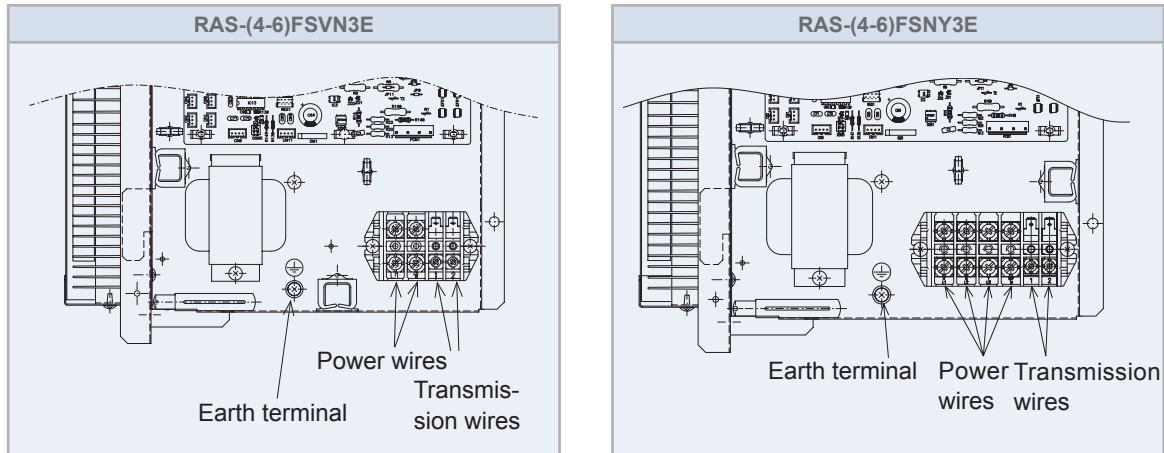
NOTE

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

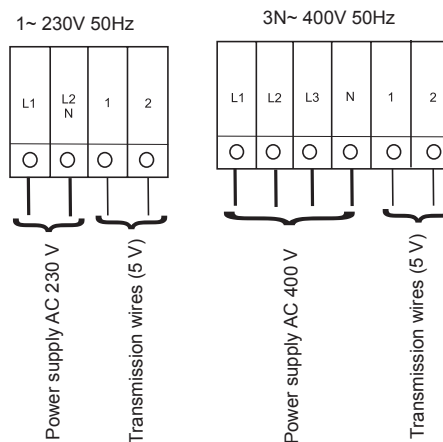
4.2 Electrical wiring connection

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

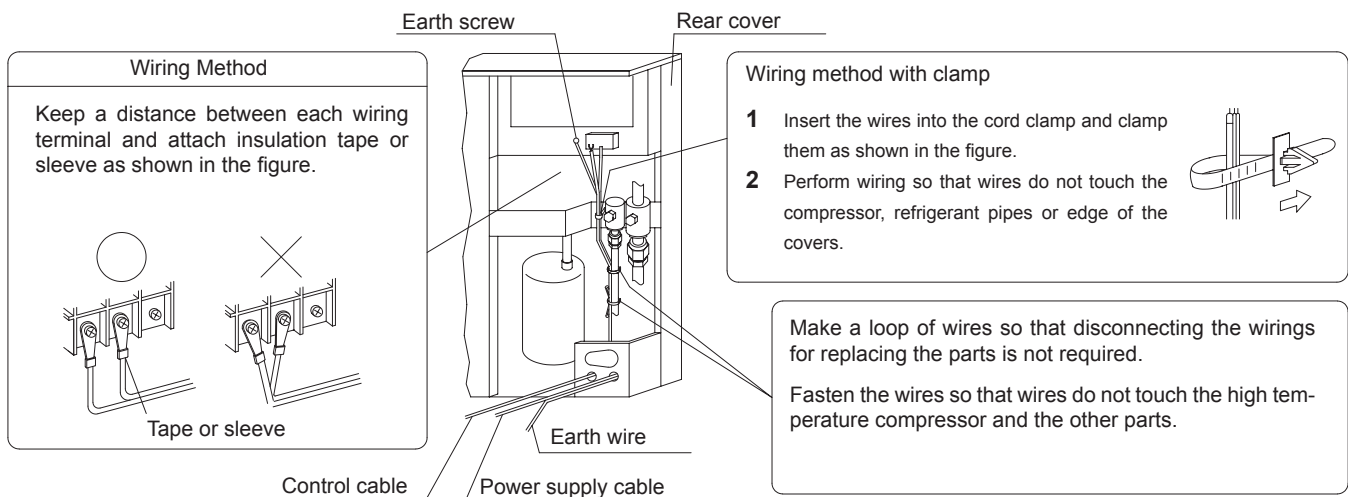
- 1 Using the appropriate cable, connect the power circuit to the appropriate terminals as shown on the wiring label and the illustration below. Connect the power supply cables L1 and N (for 230V 50Hz) or L1, L2, L3 and N (for 400V 50Hz) to the terminal board, and the earth conductor to the earth screw in the electrical box base plate.



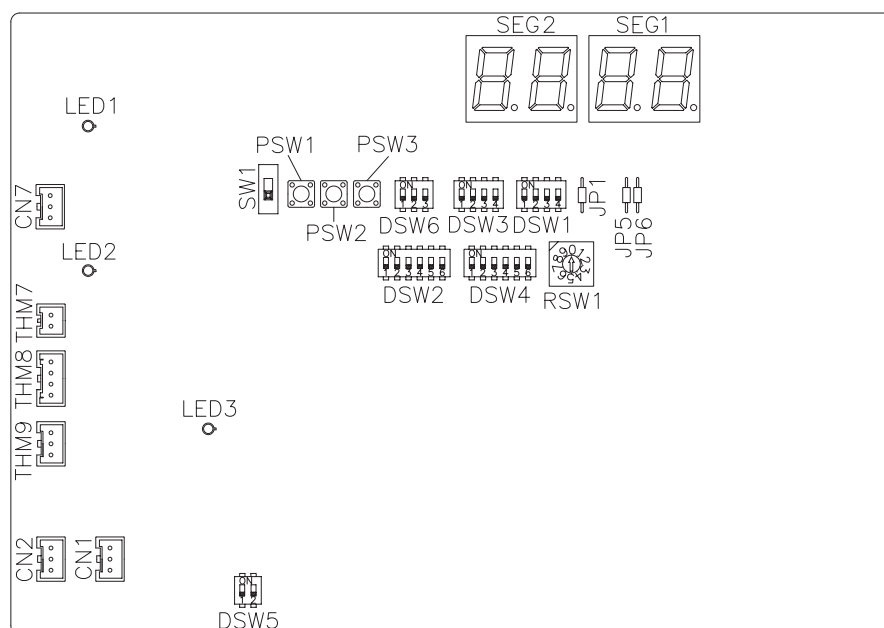
- 2 Connect the transmission wires between the outdoor unit and the indoor unit to the terminals 1 and 2 on the terminal board.



- 3 Fix the cable with the clamp supplied in the Electrical Box to ensure strain relief.
- 4 When routing out cable, make sure that it does not obstruct mounting of the outdoor service cover.



4.3 Printed circuit board (PCB)



Switch indication	
DSW1	Test run
DSW2	Optional function setting
DSW3	Capacity setting
DSW4 & RSW1	Refrigerant cycle number setting
DSW5	Transmission setting of end terminal resistance
DSW6	Other settings
PSW1	Manual defrost operation switch The defrost operation is manually available under the forced defrost area.
PSW2	Available optional function
PSW3	Settings can be selected by means of the 7-segment display.
SW1	Transmission switching
Jumper indication	
JP1	Fix cooling mode
JP5	Alternative defrosting
JP6	High pressure control based on R407C piping
LED indication	
LED1 (Red)	Transmission status between the indoor unit and the RCS.
LED2 (Yellow)	Transmission status between the indoor unit and the outdoor unit.
LED3 (Green)	Power source for the PCB.
Connector indication	
CN1	Optional input signal setting
CN2	
CN7	Optional output signal setting
Thermistor indication	
THM7	Outdoor air temperature thermistor
THM8	Evaporating pipe temperature thermistor
THM9	Compressor discharge gas temperature thermistor
7-segment indication	
SEG1	7-segment display
SEG2	

4.4 Setting of DIP switches, rotary switches and jumpers

4.4.1 Function of the DIP switches and rotary switches

◆ DSW1: For Test Run

Setting before shipment

ON

1 2 3 4

i NOTE

With the DSW1, the unit starts or stops after 10 to 20 seconds of the switch being activated.

◆ DSW2: Optional function setting

Setting before shipment
(RAS-(4-6)FS(V)N(Y)3E)

ON

1 2 3 4 5 6

Pin N°	Setting Item
1	OFF (Fixed)
2	OFF (Fixed)
3	OFF (Fixed)
4	OFF (Fixed)
5	Function selection setting (Selection is set by PSW)
6	External input/output selection (Selection is set by PSW)

◆ DSW3: Capacity setting

No setting is required	RAS-4FSVN3E	RAS-5FSVN3E	RAS-6FSVN3E
	ON 1 2 3 4	ON 1 2 3 4	ON 1 2 3 4
	RAS-4FSNY3E	RAS-5FSNY3E	RAS-6FSNY3E
	ON 1 2 3 4	ON 1 2 3 4	ON 1 2 3 4

◆ Refrigerant cycle number setting

DSW4

Setting position
(Setting for the ten digit).

ON

1 2 3 4 5 6

RSW1

Setting position.
(Setting for the last digit).

0 1 2 3 4 5 6 7 8 9

↑

◆ **DSW5: Transmission setting of end terminal resistance**

Setting before shipment	
-------------------------	---

◆ **DSW6: Other settings**

Setting before shipment	
Indoor units are higher than outdoor units (h > 20m)	
Fine-tuning of heating capacity	

4.4.2 Jumpers

◆ **JP1~6: Jumper cable**

No setting is required	JP1 cut: Fixing Cooling Mode JP5 cut: Alternative Defrosting JP6 cut: High-Pressure Control Based on R407C Piping
------------------------	---

4.5 Common wiring

4.5.1 Electrical wiring between outdoor and indoor unit

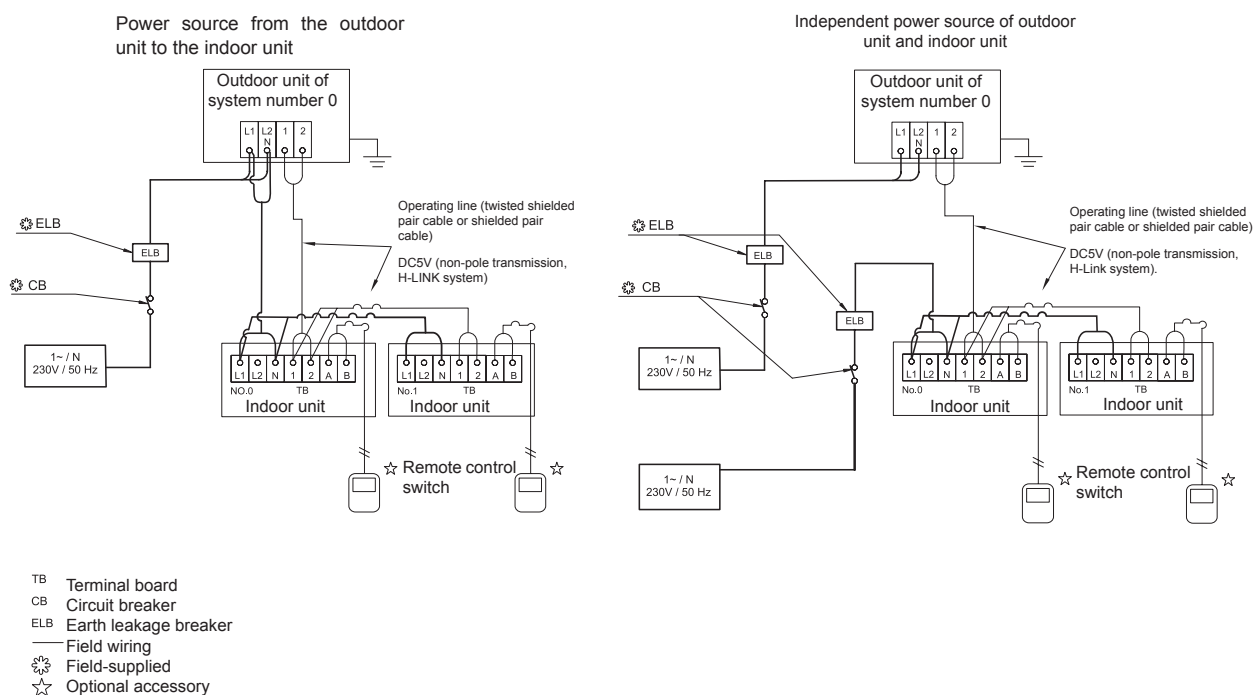
Connect the electrical wires between the indoor unit and the outdoor unit as show in the figure.

- The refrigerant piping and the control wiring are connected to the units in the same refrigerant cycle.
- Use twist pair wire (more than 0.75 mm²) for operation wiring between the outdoor unit and indoor unit, and operation wiring between indoor unit and indoor unit.
- Use a 2-core wire for the operating line (do not use wire with more than 3 cores).
- Use shielded wires for intermediate wiring to protect the units from noise interference at lengths of less than 300 m. The size must comply with local code.
- Open a hole near the connection hole of power source wiring when multiple outdoor units are connected from a single power source line.
- The recommended circuit-breaker sizes are shown in the table of electrical data and recommended wiring and breaker sizes / 1 O.U.
- In the case that a conduit tube for field-wiring is not used, fix rubber bushes with adhesive on the panel.
- All field wiring and equipment must comply with local and international codes.
- H-LINK twist pair shielded cable must be grounded in the outdoor unit side.



NOTE

Take care with the connection of the operating line. Incorrect connection may cause a failure of the PCB.



4.5.2 Wiring size

◆ Connection wiring

Recommended minimum sizes for field provided wires:

Model	Power supply	Maximum current (A)	Power supply cable size EN60 335-1	Transmitting cable size EN60 335-1
All indoor units	1~ 230V 50Hz	5.0	0.75 mm ²	0.75 mm ²
RAS-4FSVN3E		26.0	6.0 mm ²	
RAS-5FSVN3E		26.0	6.0 mm ²	
RAS-6FSVN3E		26.0	6.0 mm ²	
RAS-4FSNY3E	3N~ 400V 50Hz	13.0	4.0 mm ²	
RAS-5FSNY3E		13.0	4.0 mm ²	
RAS-6FSNY3E		13.0	4.0 mm ²	



NOTE

- Follow local codes and regulation when selecting field wires, circuit breakers and earth leakage breakers.
- Use the wires which are not lighter than the ordinary polychloroprene sheathers flexible cord (code designation H05RN-F).

◆ Main switch protection

Select the main switches according to the following table:

Model	Power supply	Maximum current (A)	CB (A)	ELB (No. of poles/A/mA)
All indoor units	1~ 230V 50Hz	5.0	6	2/40/30
RAS-4FSVN3E		26.0	32	
RAS-5FSVN3E		26.0	32	
RAS-6FSVN3E		26.0	32	
RAS-4FSNY3E	3N~ 400V 50Hz	13.0	20	4/40/30
RAS-5FSNY3E		13.0	20	
RAS-6FSNY3E		13.0	20	



NOTE

- CB: Circuit breaker.
- ELB: Earth leakage breaker.

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

4.6.1 Application

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

Indoor Unit	Outdoor Unit
System Free	RAS-(4-6)FS(V)N(Y)3E
RCI	
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.

4.6.2 Features

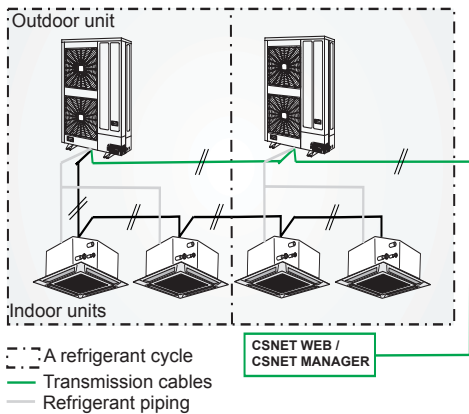
- The total wiring length is considerably reduced compared to traditional connections.
- Only one connection is required for the wiring between the indoor and outdoor units.
- The wiring connection of the complementary central control devices is easy.

 NOTE

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

4.6.3 Specifications

- Transmission cable: 2-wire.
- Polarity of transmission cable: non-polar wire.
- The maximum number of units that can be connected is 64 outdoor units and 160 indoor units (including Utopia and/or SET FREE models) per HLINK 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 mm² (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.

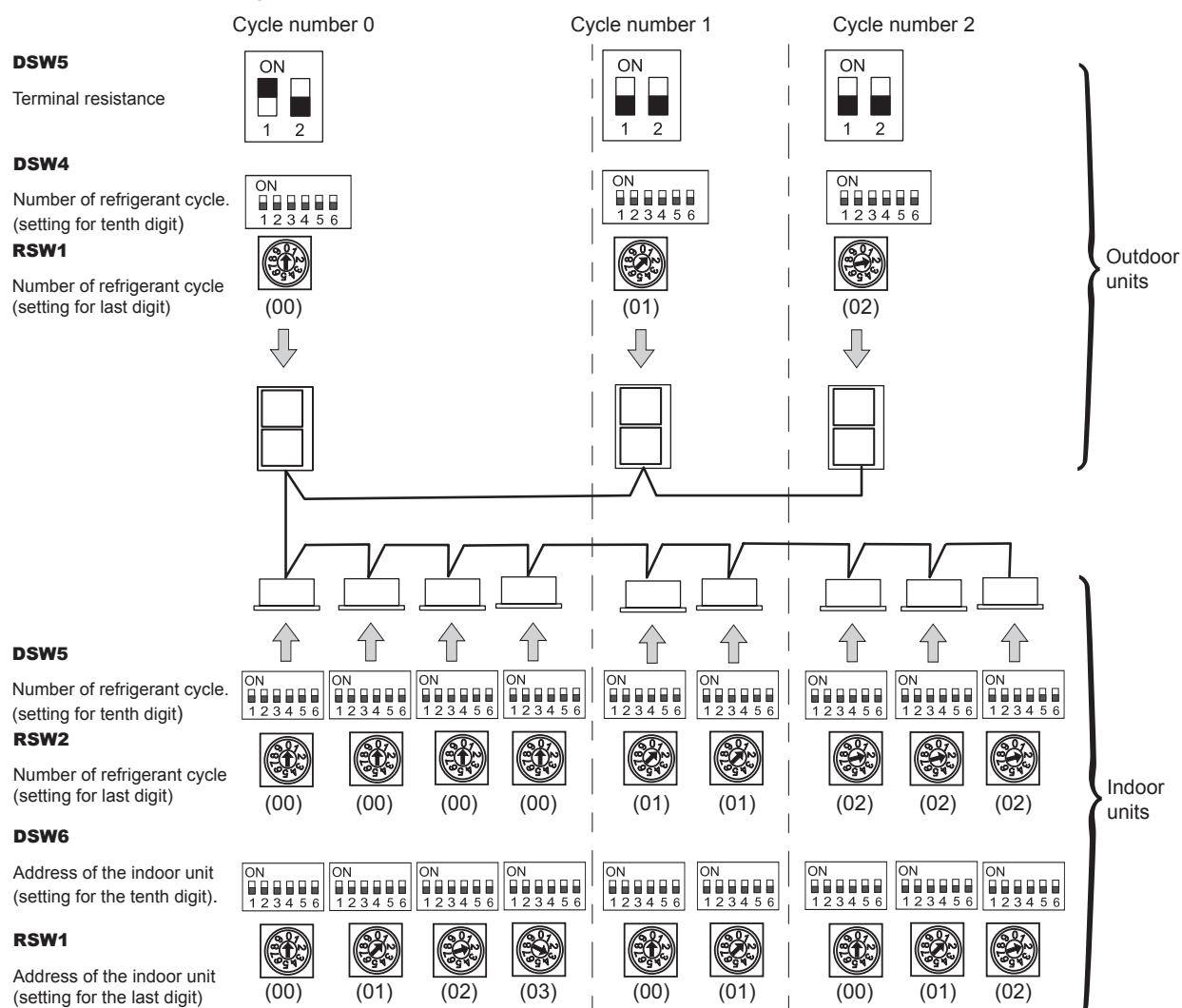


4.6.4 DIP switch setting for multiple H-LINK system

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

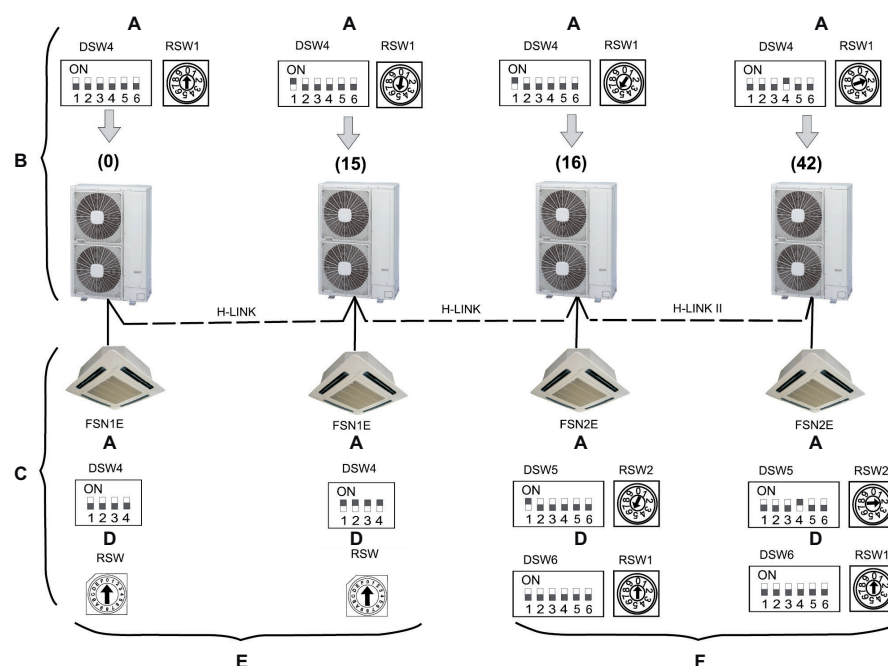
Unit	Name of DIP switch	Mark	Setting before the shipment	Function
Outdoor unit	Terminal resistance	DSW5		DSW5-1 is "ON" position before shipment. - It is not necessary to set when H-LINK is connected with only one outdoor unit. - When H-LINK is connected with more than one outdoor unit, set as follows: - First outdoor unit: Keep DSW5-1 in "ON". - Other outdoor units: Set DSW5-1 to "OFF".
	Refrigerant cycle	DSW4 RSW1		For setting the refrigerant cycle address of the outdoor unit. Set the DSW4 and RSW1 to overlap the setting of other outdoor 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 outdoor 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.



4.6.5 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(2/3/4)E units.



A: Refrigerant cycle.

B: Outdoor 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.



NOTE

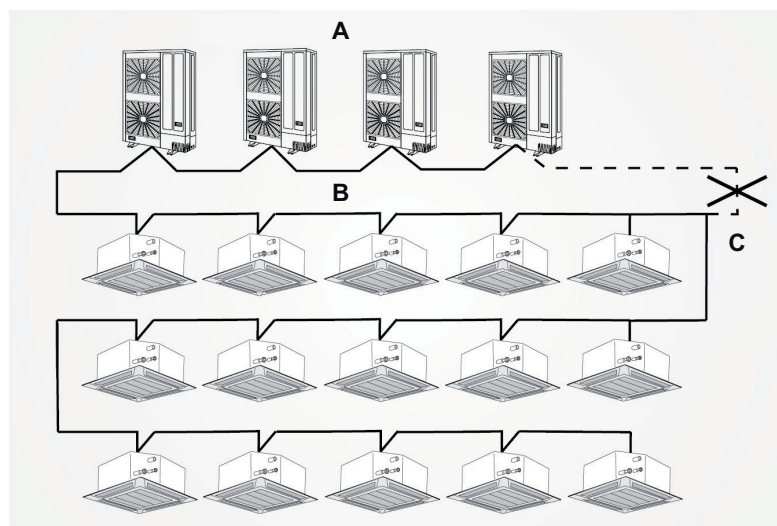
- The maximum number of indoor units than an H-LINK II can control is 160.
- If you use PSC-5S and the CSNET WEB 2.0 (systems only compatible with H-LINK) bear in mind that it will only recognize 16 indoor and 16 outdoor units.

4.6.6 Examples of H-LINK II system

Two cases:

1. Using H-LINK II system for air conditioning systems without a central control device (Neither centralised remote controls or Building air conditioning controls)

- Line connection with all units (including Utopia and/or Set Free).

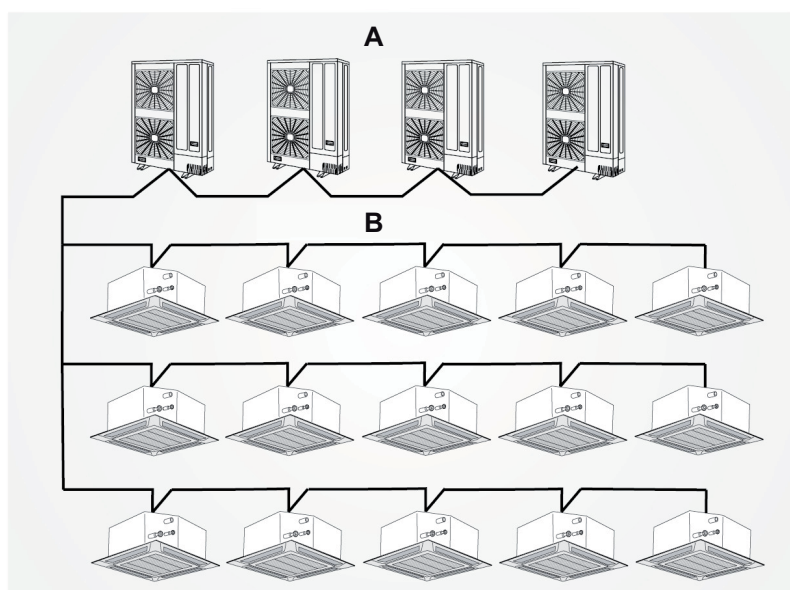


A: Outdoor units.

B: Indoor units.

C: Do not install wiring in a loop.

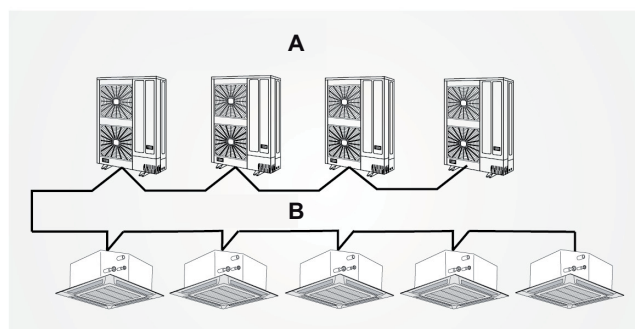
- Line connection for each floor.



A: Outdoor units.

B: Indoor units.

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



A: Outdoor units.

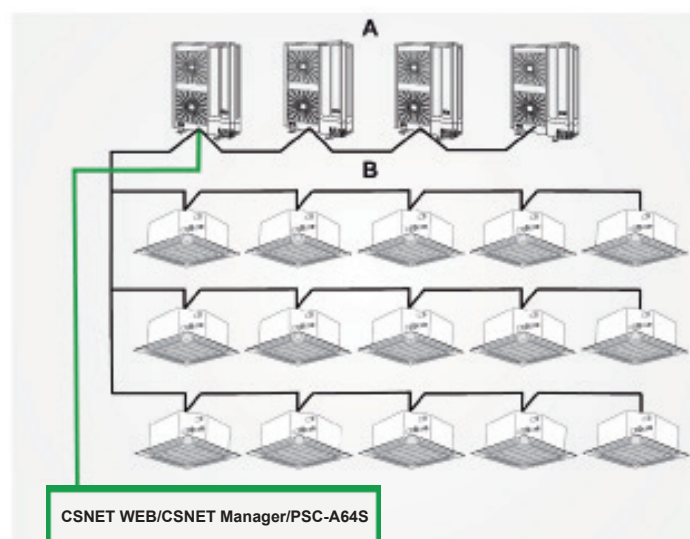
B: Indoor units.

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: Outdoor units.

B: Indoor units.

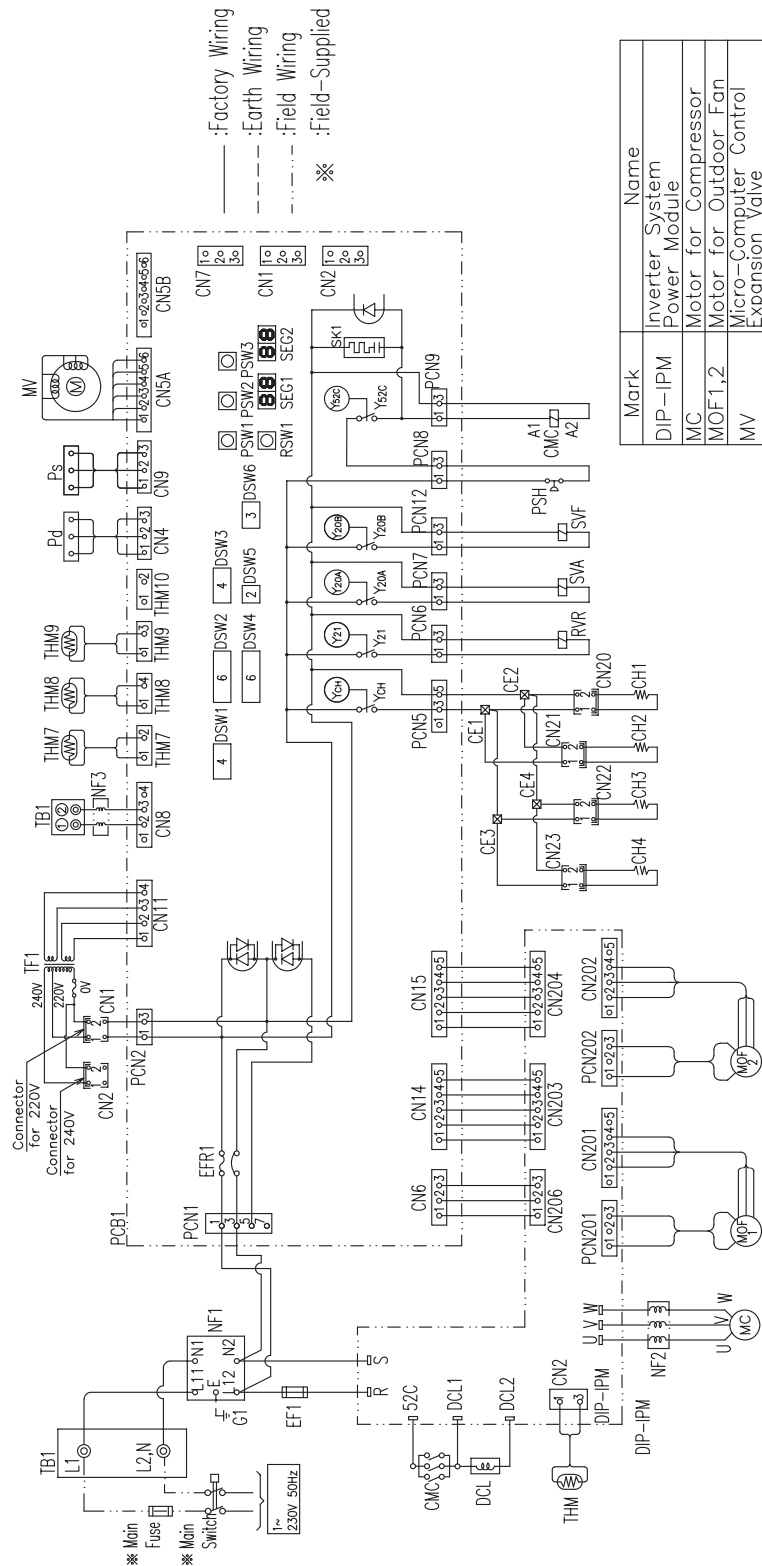
- If the central control device is not used when electrical wiring is carried out, you must connect the H-LINK II wiring to all the systems. The easiest method is usually to connect the outdoor units.

NOTE

For CSNET WEB 2.0 the limitations are those corresponding to H-LINK.

4.7 Electrical wiring diagram

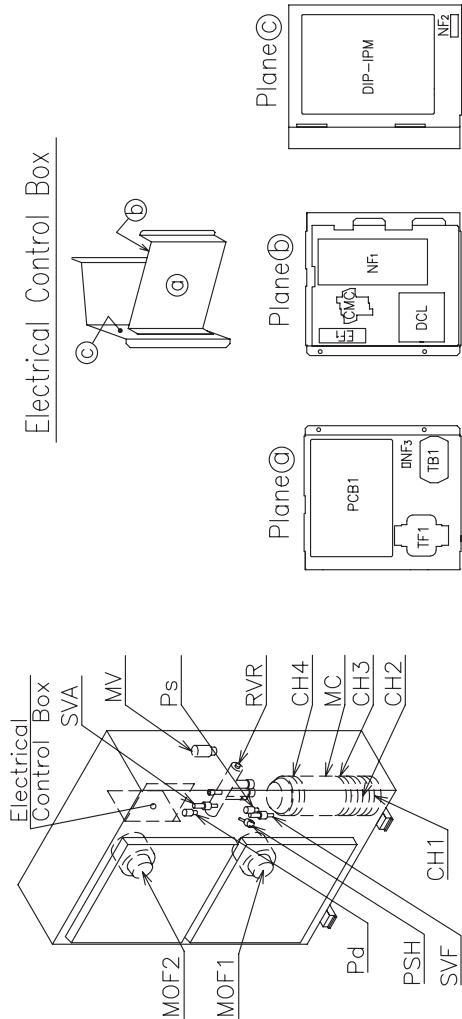
4.7.1 RAS-(4-6)FSVN3E



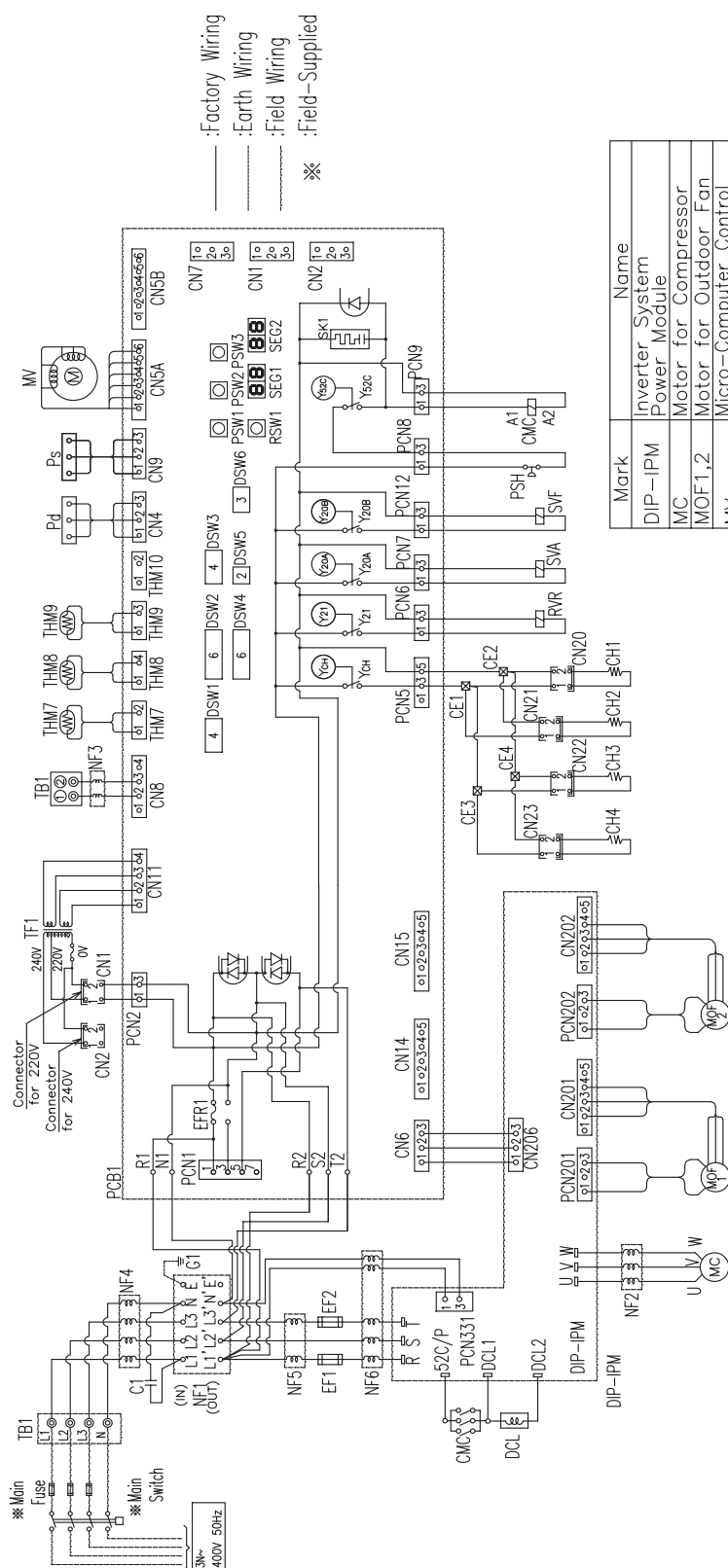
— :Factory Wiring
- - - :Earth Wiring
- · - · - :Field Wiring
※ :Field-Supplied

Mark	Name
DIP-IPM	Inverter System Power Module
MC	Motor for Compressor
MOF1,2	Motor for Outdoor Fan
MV	Micro-Computer Control Expansion Valve
NF1~6	Noise Filter
PCB	Printed Circuit Board
PSH	High Pressure Switch for Protection
Pd,Ps	Sensor for Refrigerant Pressure
PSW1~3	Push Switch on PCB1
RVR	Reversing Valve Relay
SVA,SVF	Solenoid Valve
TB1	Terminal Board
TF1	Transformer
THM	Thermistor for Fin Temperature
THM7~9	Thermistor
ZNR	Surge Absorber
C1	Capacitor
CH	Crankcase Heater
CMC	Contactor for Compressor Motor
DCL	Reactor
DSW1~6	Dip Switch on PCB1
EF1,2	Fuse

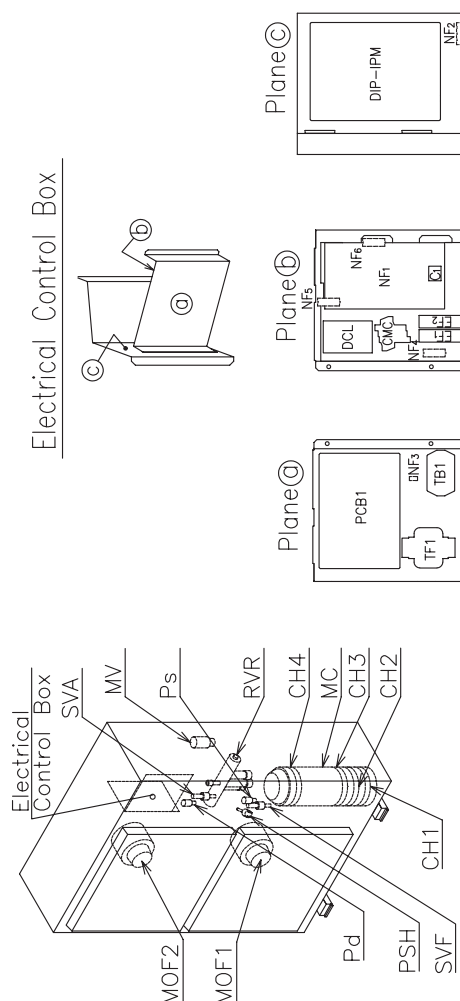
Electrical Control Box



4.7.2 RAS-(4-6)FSNY3E



Mark	Name
DIP-IPM	Inverter System Power Module
MC	Motor for Compressor
MOF1,2	Motor for Outdoor Fan
WV	Micro-Computer Control Expansion Valve
NF1~6	Noise Filter
PCB	Printed Circuit Board
OSH	High Pressure Switch for Protection
Pa,Pp	Sensor for Refrigerant Pressure
SW1~3	Push Switch on PCB1
RVR	Reversing Valve Relay
SVA,SVF	Solenoid Valve
TB1	Terminal Board
TF1	Transformer
THM	Thermistor for Fin Temperature
THM7~9	Thermistor
ZNR	Surge Absorber
C1	Capacitor
CH	Crankcase Heater
CMC	Contact for Compressor Motor
OC	Reactor
PSW1~6	Dip Switch on PCB1
FE1,2	Fuse



5. Control system

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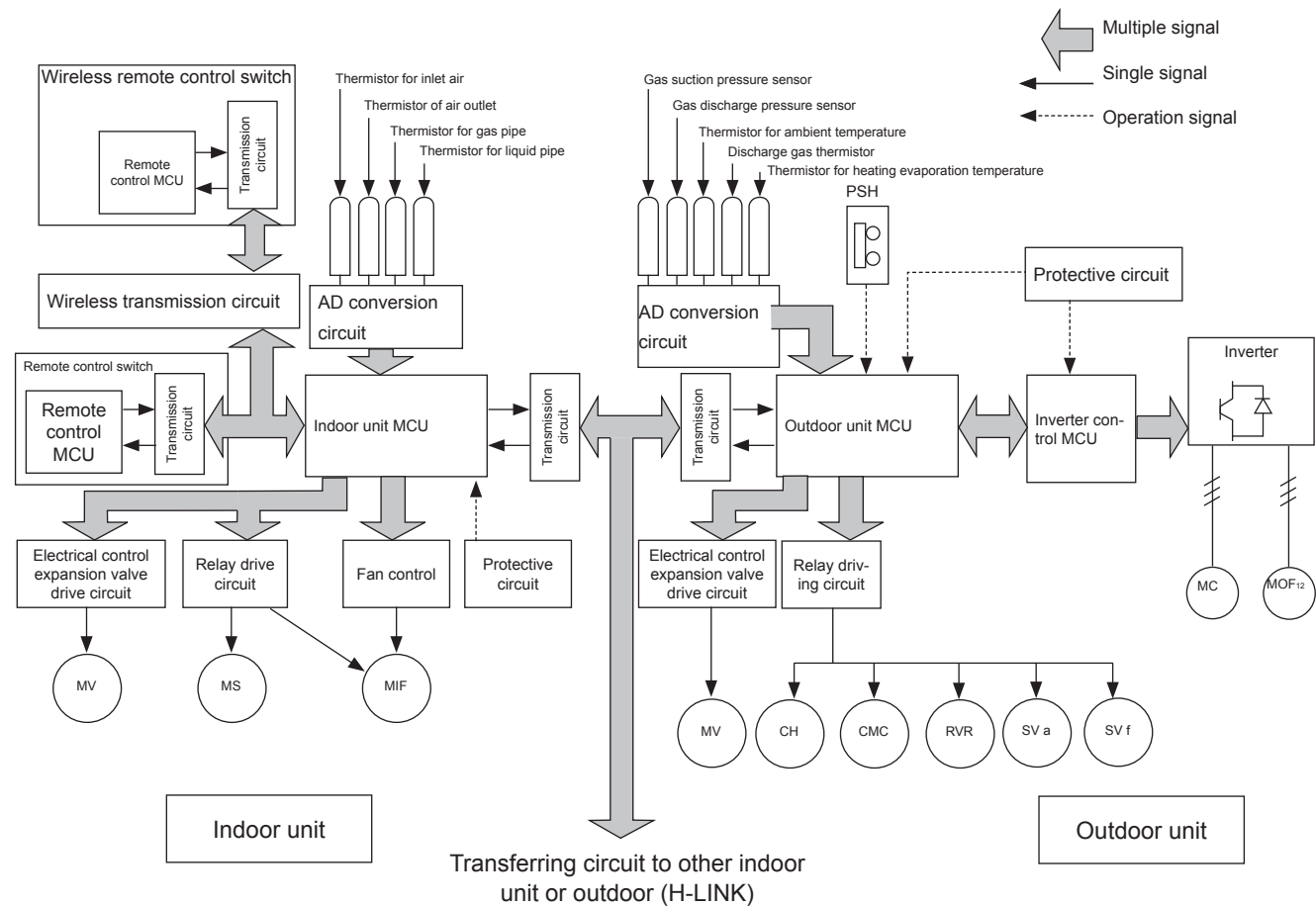


5.1 Device control system

5.1.1 Refrigerant cycle control

Control item	Measures	
	Cooling operation	Heating operation
Revolution of outdoor fan	Control discharge pressure: Pd	The pressure can be controlled based on the outdoor air temperature
Opening degree of electronic expansion valve of outdoor unit	Full open	Control the temperature of discharge gas superheat: Td SH
Opening degree of electronic expansion valve of indoor unit	1. Control the balance between the indoor units. 2. Control the temperature difference between gas-liquid pipe of indoor heat exchanger. 3. Control the temperature of discharge gas superheat: Td SH	1. Control the temperature difference between the indoor inlet and outlet air. 2. Balance the temperature difference between the gas-liquid pipes of each indoor unit.
Inverter frequency of compressor	1. Refrigerant cycles of indoor unit should be fully operated. 2. Pd control.	1. Refrigerant cycles of indoor unit should be fully operated. 2. Pd control.

The figure below shows the outline of the control system:



Symbol	Name
MC	Motor of compressor
MIF	Fan motor of indoor unit
MOF ₁₂	Fan motor of outdoor unit
MS	Motor of auto-louver
MV	Electronic expansion valve
CMC	Electromagnetic contactor

Symbol	Name
RVR	Four-way valve
SV _{a, f}	Solenoid valve
PSH	Pressure switch
CH	Crankcase heater

5.2 Protection and safety 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.

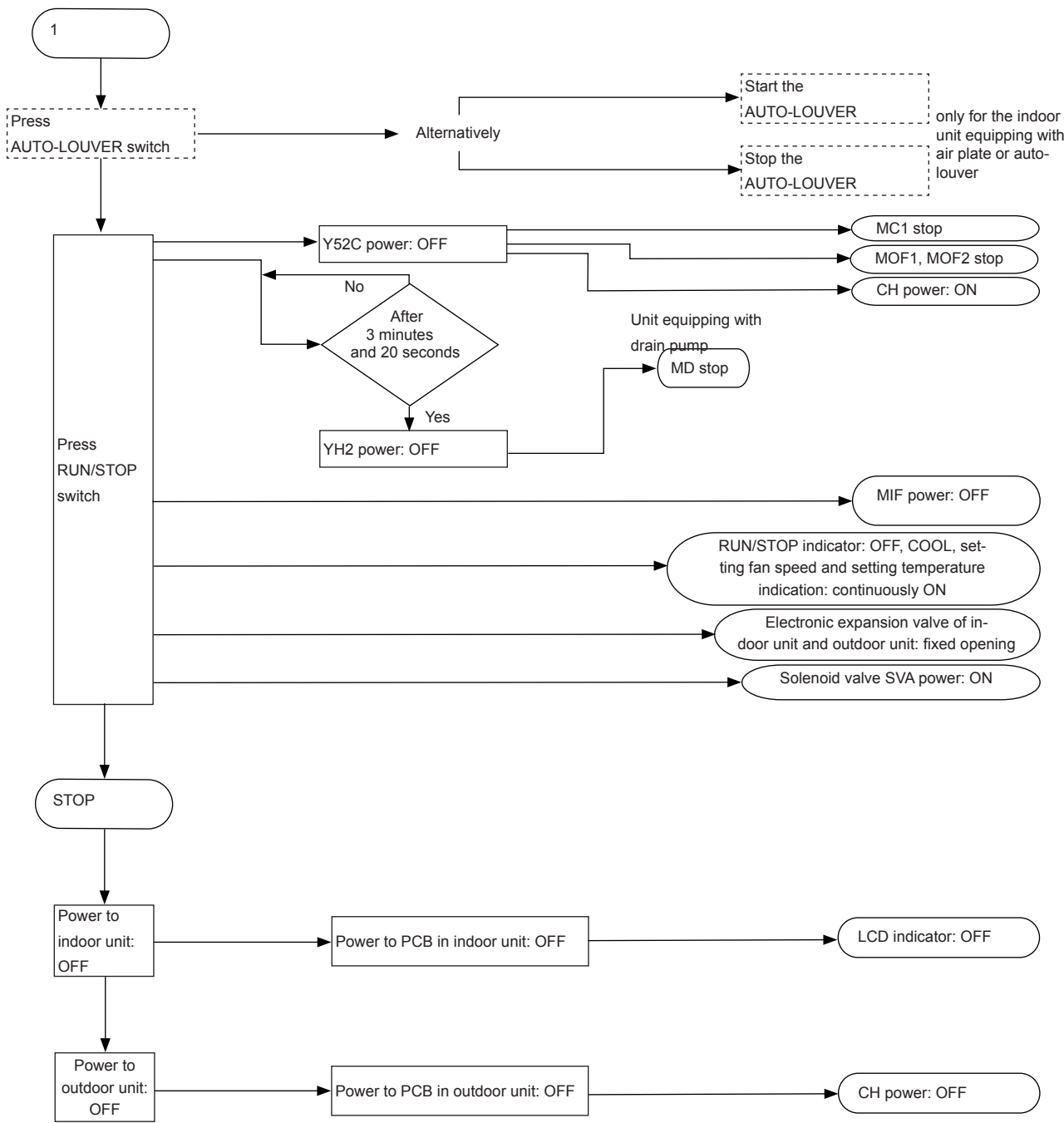
Safety and control device

Model			RAS-4FSVN3E RAS-5FSVN3E RAS-6FSVN3E			RAS-4FSNY3E RAS-5FSNY3E RAS-6FSNY3E		
For Compressor			Automatic Reset, Non-Adjustable (each one for each compressor)					
Pressure Switch								
High	Cut-Out	MPa	4.15	-0.05 -0.15	4.15	-0.05 -0.15		
	Cut-In	MPa	3.20±0.15			3.20±0.15		
For Control								
Pressure Switch								
	Cut-In	MPa	3.6	+0 -0.15	3.6	+0 -0.15		
	Cut-Out	MPa	2.85±0.1			2.85±0.1		
Fuse								
1~ 230V 50Hz		A	50			-		
3N~ 400V 50Hz		A	-			20 x 2		
CCP Timer		min.	Non-Adjustable					
	Setting Time		3			3		
For Condenser Fan Motor			Automatic Reset, Non-Adjustable (each one for each motor)					
Internal Protect Device								
For Control Circuit								
Fuse Capacity on PCB		A	5			5		

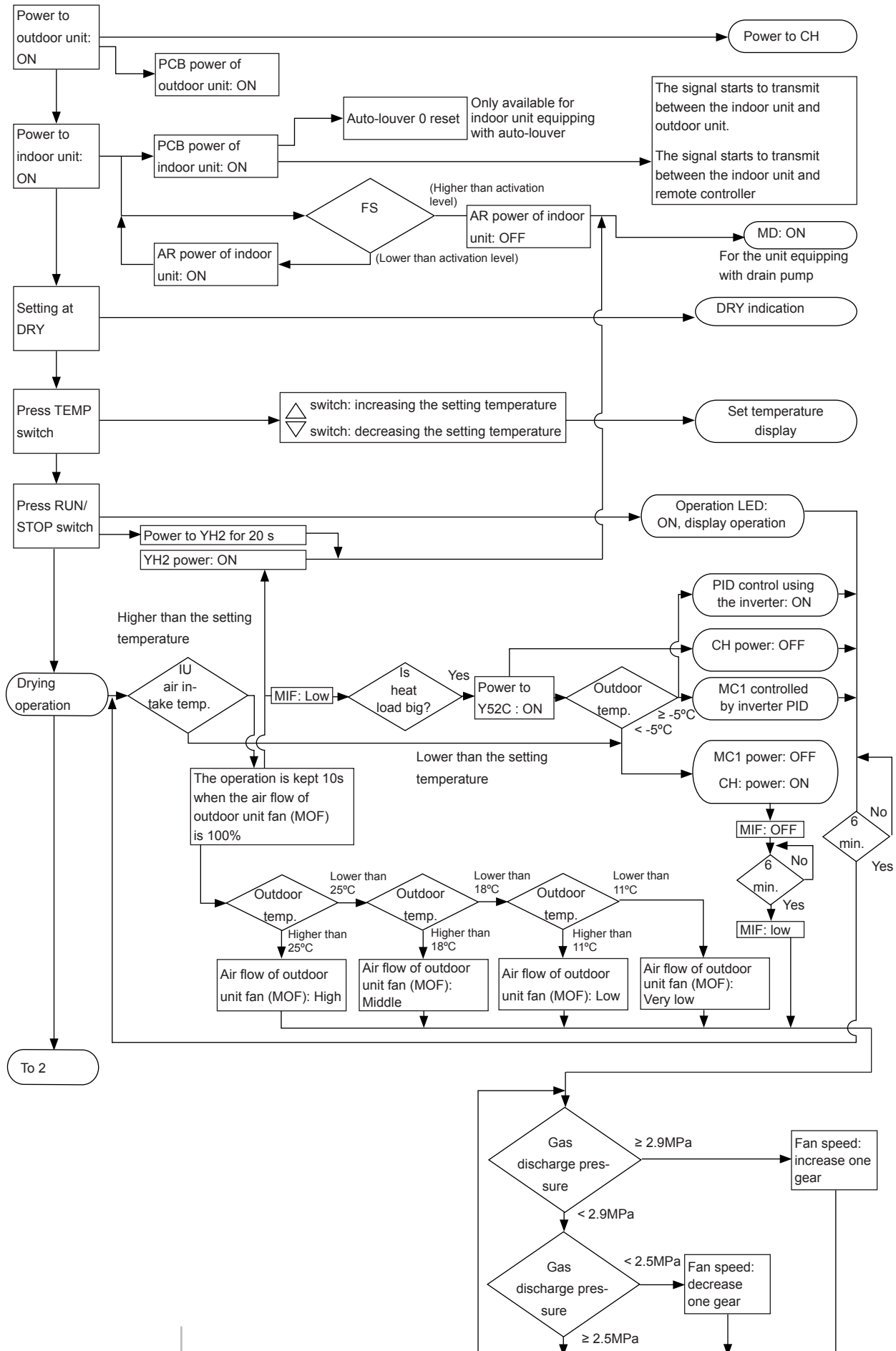
5

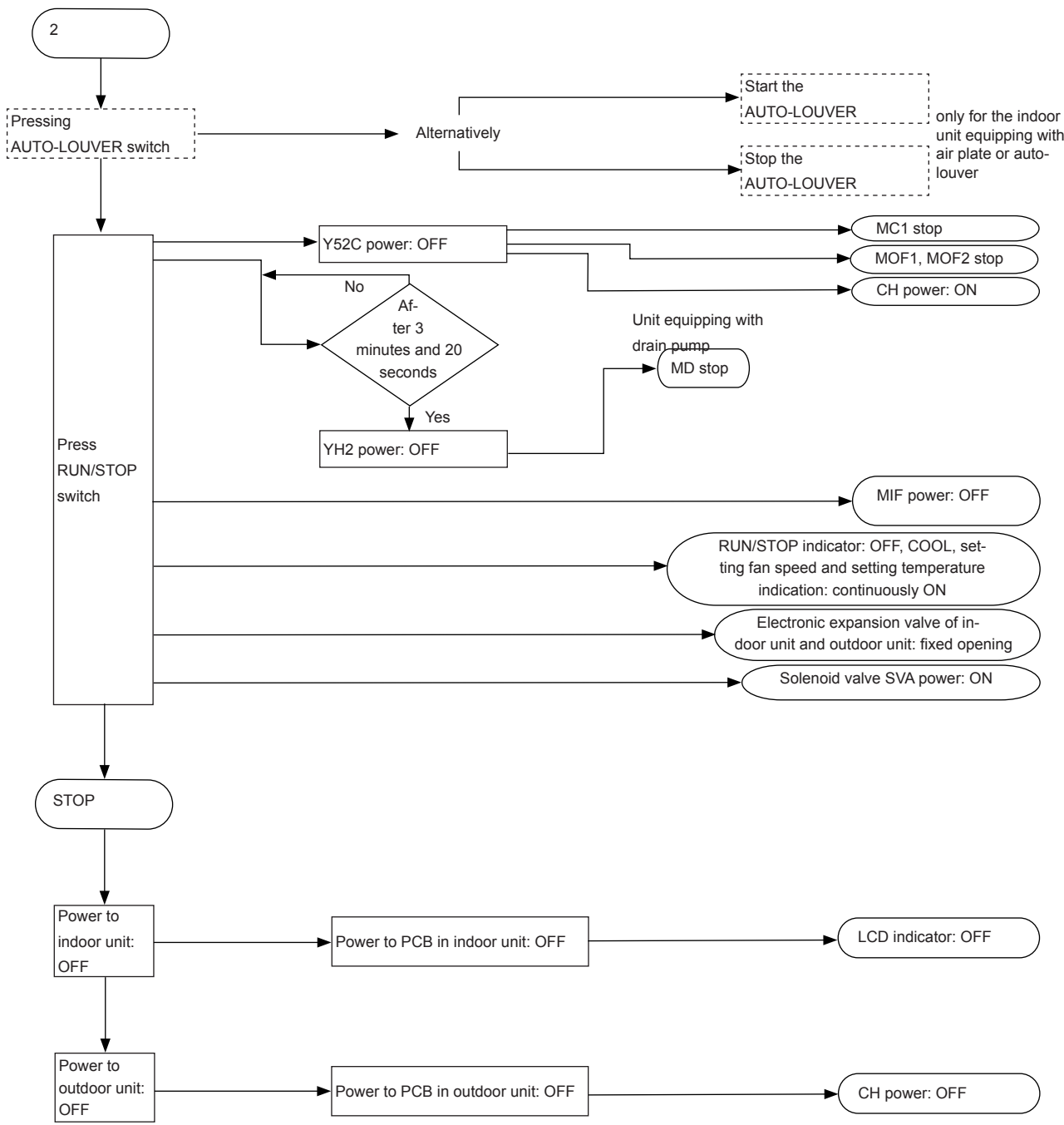
5.3.1 Cooling operation



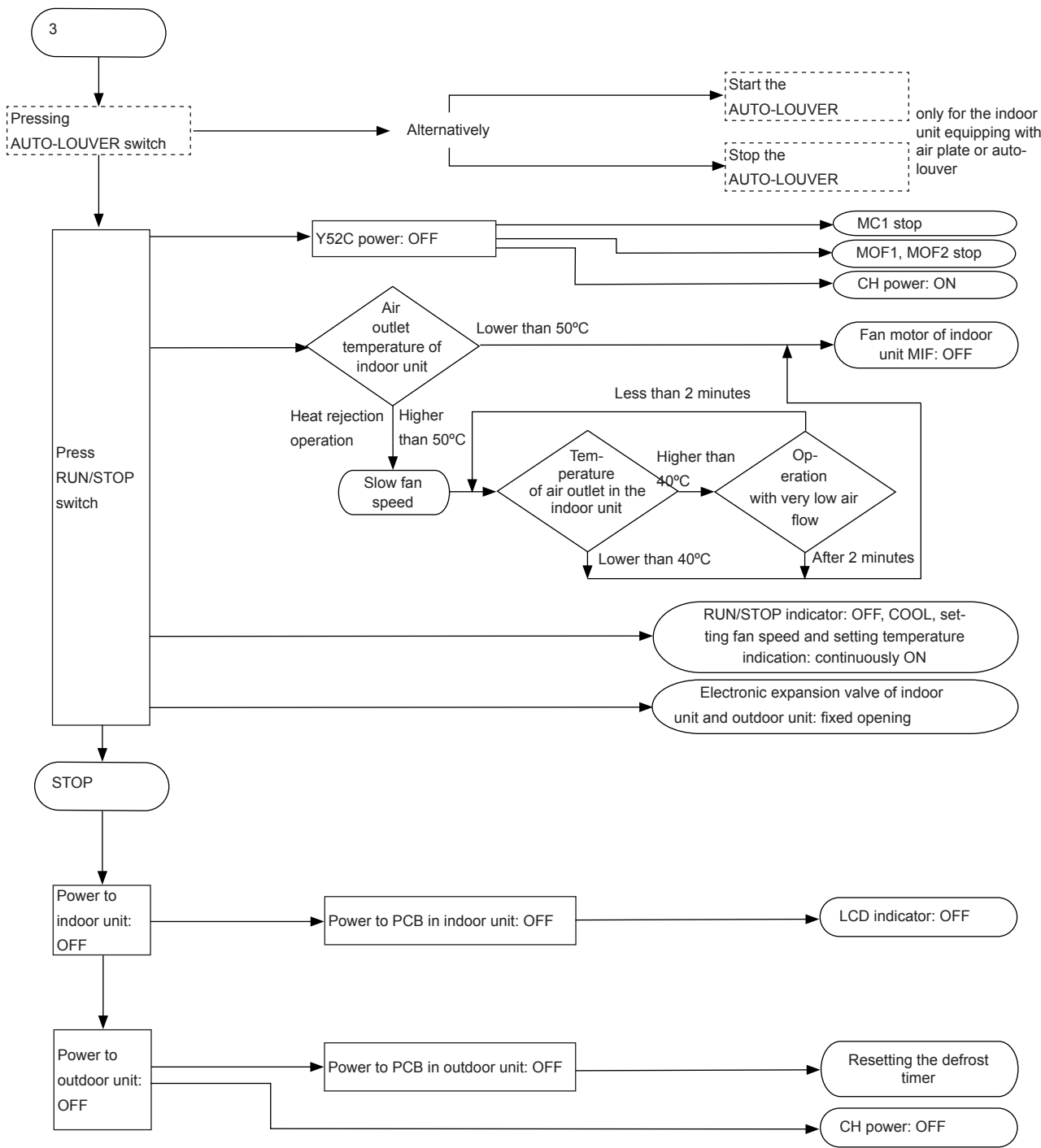


5.3.2 Drying operation



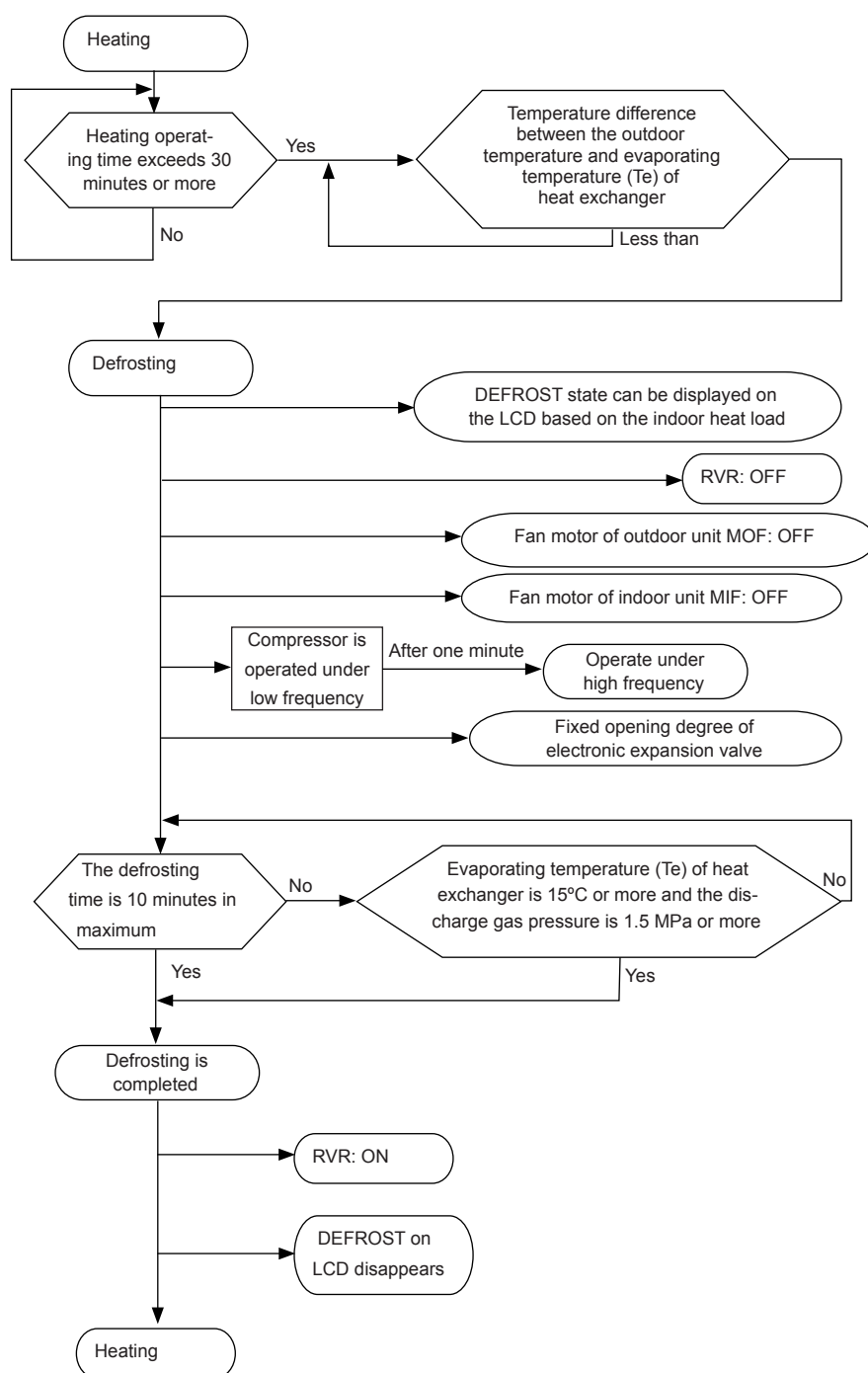






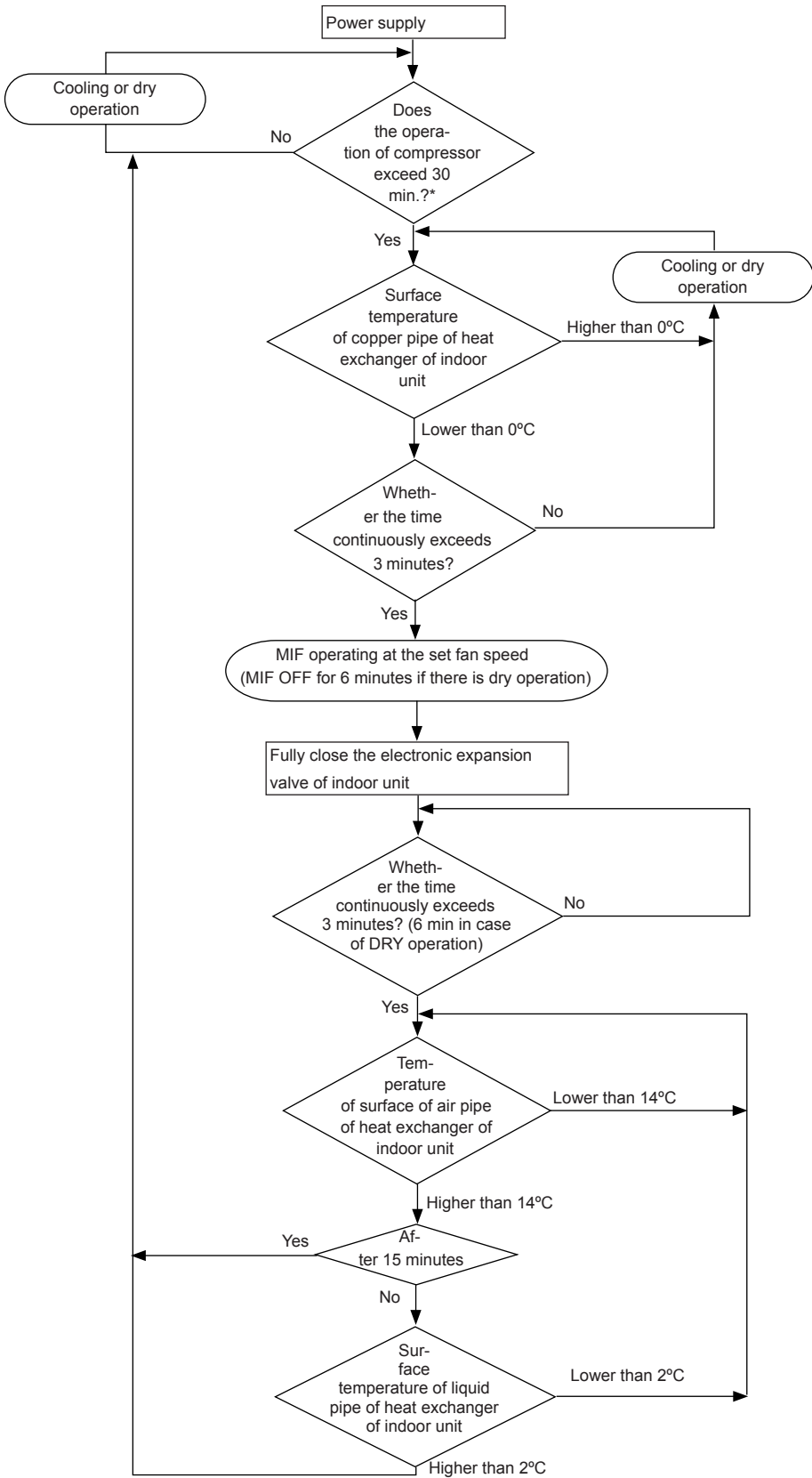
---: Unequipped, optional component

5.3.4 Defrosting operation



5.4 Standard control functions

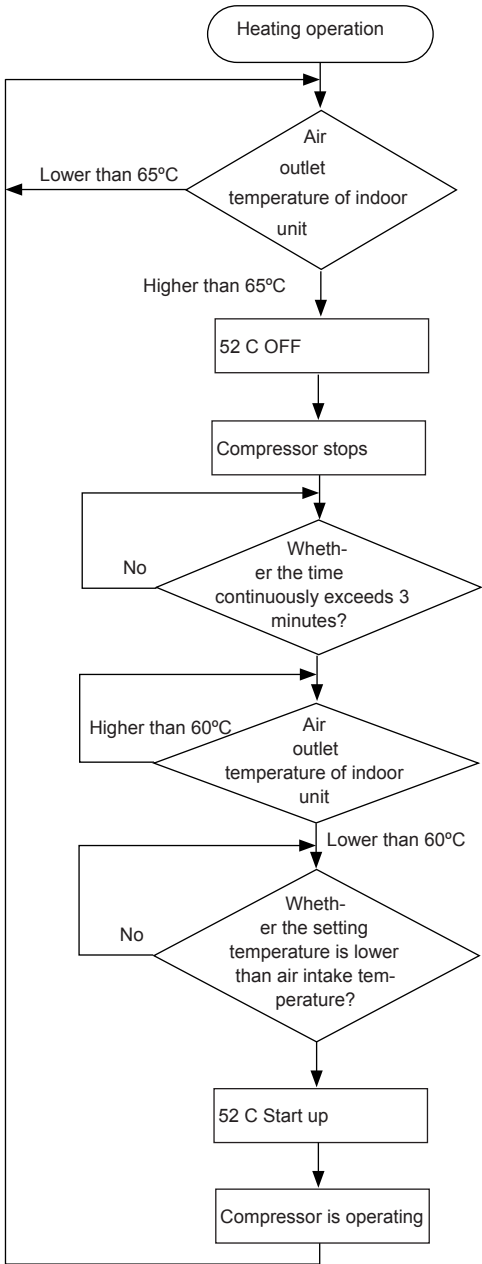
5.4.1 Freezing protection control during cooling or dry operation



NOTE

*: The operation time of compressor should be confirmed based on the operation condition.

5.4.2 Overheating protection of the outlet temperature



6 . Optional functions

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6.1 Optional input and output signals (By 7-segment display)

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

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

The selection of these input and output signals represent the selection of some optional functions programmed in the PCB of the outdoor unit.

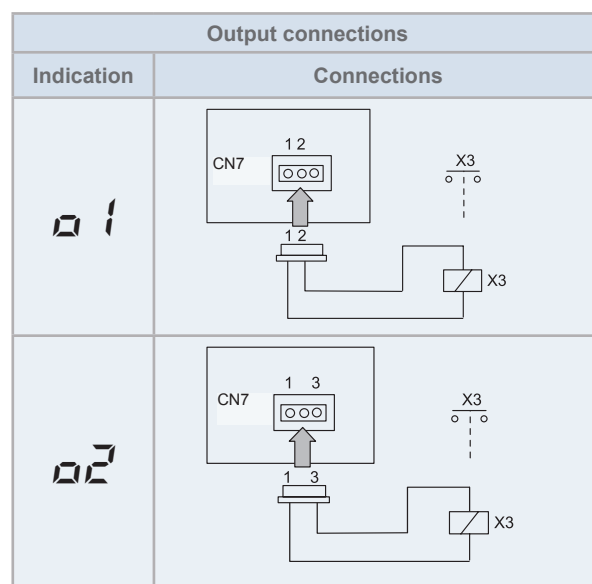
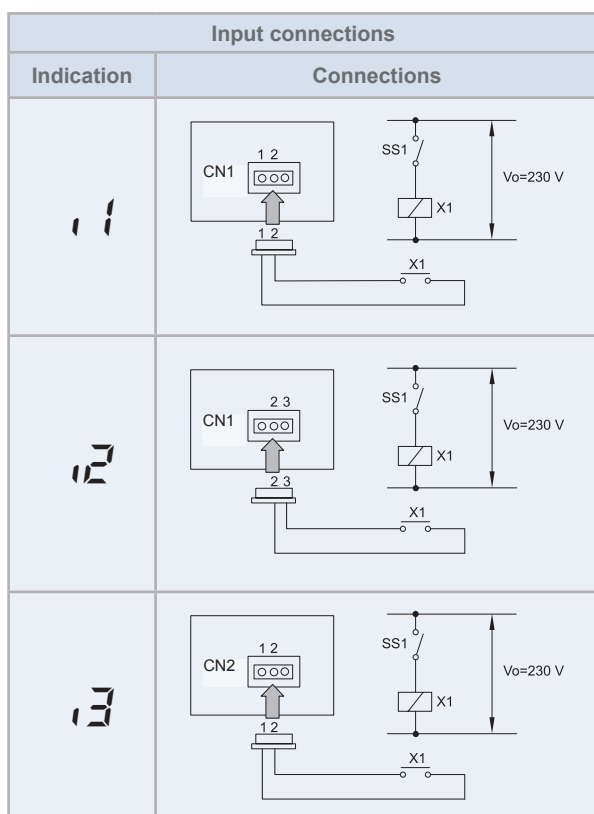
6.1.1 Available ports

The system has the following input and output ports:

Content		Setting of the port in the PCB of the indoor unit	Remarks	Outlet
Inputs	11	1-2 of CN1		Contact
	12	2-3 of CN1		Contact
	13	1-2 of CN2		Contact
Outputs	01	1-2 of CN7		DC 12V
	02	1-3 of CN7		DC 12V

◆ Connection

The system has the following connections:



◆ Specification of the components for a correct installation

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


NOTE

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

6.1.2 Available optional signals

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

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

◆ Input signals

Ind.	Input signal	Application	Port
1	Fixed heating mode	This signal allows to pre-fix the operation mode, in this case the heating mode, independently of what the indoor unit requests. If the indoor units request the opposite mode than the outdoor unit, the compressor will not start. This is very useful to set up a unique operation mode.	CN1 and CN2
2	Fixed cooling mode	This signal allows to pre-fix the operation mode, in this case the cooling mode, independently of what the indoor unit requests. If the indoor units request the opposite mode than the outdoor unit, the compressor will not start. This is very useful for computer rooms where the cooling mode is fixed throughout the year.	CN1 and CN2
3	Demand thermo OFF	This signal allows to stop the compressor if it reaches a certain power as well as to put the indoor unit in Thermo-OFF. This is very useful for installations with high power consumption.	CN1 and CN2
4	Snow sensor	This signal allows plugging in the fans even if the compressor is turned off. This is very useful for cold regions where it snows, which could cause the machine to break due to weight or ice.	CN1 and CN2
5	Forced stoppage	This signal allows to control the stoppage of the compressor and the fans of the indoor as well as outdoor units. This is very useful when used with the alarm signals of the fire prevention systems.	CN1 and CN2
6	Current control demand (60%)	This signal allows to regulate current consumption and establishing an average consumption of 60% of the rate point. This is very useful for installations that run 24 hours a day.	CN1 and CN2
7	Current control demand (70%)	This signal allows to regulate current consumption and establishing an average consumption of 70% of the rate point. This is very useful for installations that run 24 hours a day.	CN1 and CN2
8	Current control demand (80%)	This signal allows to regulate current consumption and establishing an average consumption of 80% of the rate point. This is very useful for installations that run 24 hours a day.	CN1 and CN2
9	Current control demand (100%)	This signal allows to regulate current consumption and establishing an average consumption of 100% of the rate point. This is very useful for installations that run 24 hours a day.	CN1 and CN2

◆ Output signals

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



NOTE

Do not set same function to multiple input port. If set, the higher input terminal number will be cancelled.

6.1.3 Setting of the optional signals

The optional signals of the outdoor unit are set up from the PCB of the outdoor unit and can be selected by pushing switches PSW1, PSW2 and PSW3.



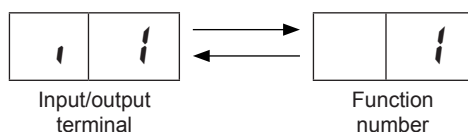
NOTE

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

- Outdoor 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:

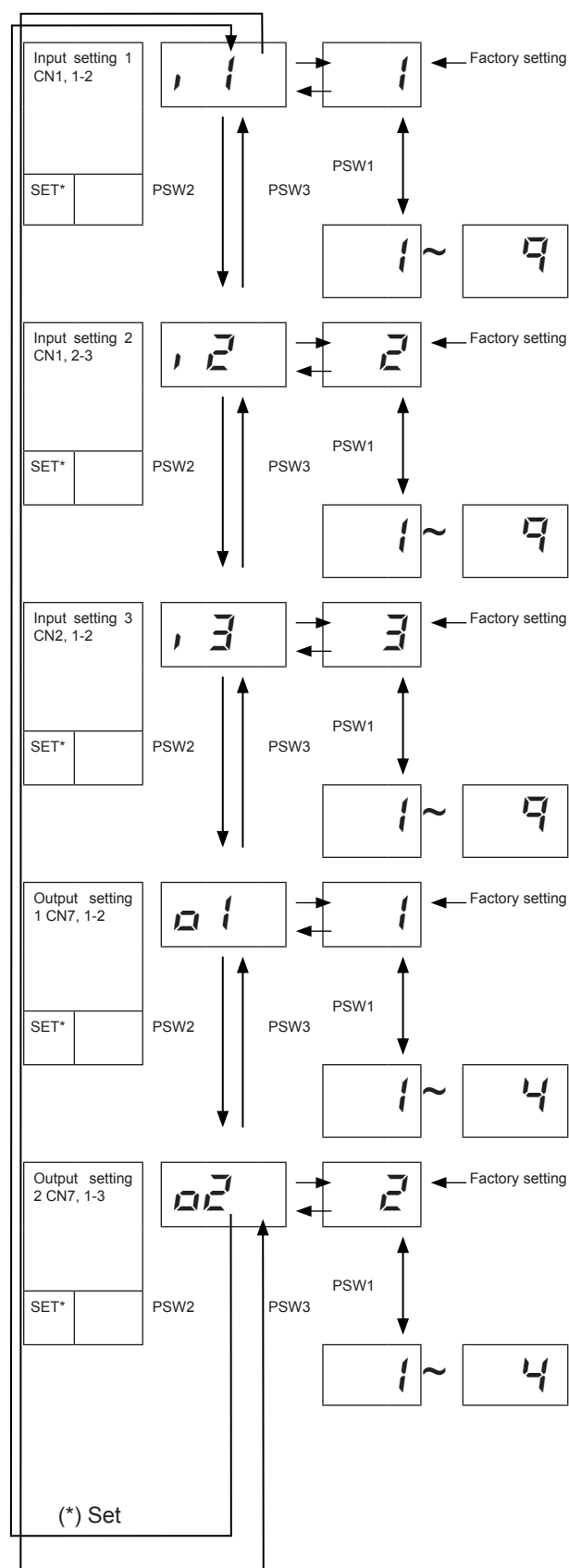
- 1 Set pin 6 of DSW2 to ON. Because of these settings, the input/output signals selection mode becomes available and the following indication appears on the 7-segment display.



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

- 2 By pressing the push switches PSW2 and PSW3, it can be changed the input/output terminal name. (See the flowchart show in the side).
- 3 By pressing the push switch PSW1, it can be changed the function number. (See the flowchart show in the side)
- 4 After selecting the function number, return pin 6 of DSW2 to OFF position.

The selected contents are memorized in the outdoor unit printed circuit board and the function selection mode is stopped. The memorized data is maintained even power source lines are disconnected. The connecting details of each function are described, and the required parts are also indicated in the section [Description of the optional signals](#) on this chapter.



6.1.4 Description of optional signals

◆ Input signals

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

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

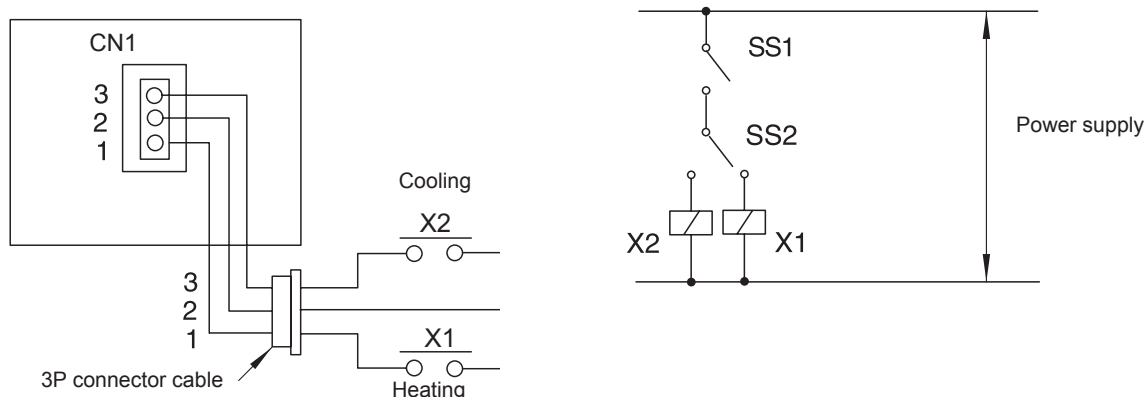
Short circuit between the terminals 1 and 2 of CN1: set heating mode.

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

After having pre-fixed the established mode, the remote control can only be used to adjust the temperatures. Stoppage code "d1" "20" will be displayed if an attempt is made to change the operation mode of any of the indoor units with the remote control.

Example of wiring diagram of fixing the operation mode.

Outdoor unit PCB:



SS1: Fixing operation mode switch

SS2: Changeover switch

X1: Heating

X2: Cooling

Demand thermo OFF (3)

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

Connect the cabling and use the materials as shown in section [Available ports](#).

Snow sensor (4)

This is an input function that turns on when the sensor detects snow on the fans. At that time the fans turn on at full speed although the compressor is stopped. Connect the cabling and use the materials as shown in section [Available ports](#).

Forced stoppage (5)

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

Connect the cabling and use the materials as shown in section [Available ports](#).

Current control demand (60/70/80/100%) (E/F/G/H)

This is an input function that turns on when it detects that the frequency of the compressor reaches 60%, 70%, 80% or 100%. The frequency of the compressor is determined when the maximum current reaches the established limit.

Connect the cabling and use the materials as shown in section [Available ports](#).

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

◆ Output signals
Operation signal (F 1)

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

Connect the cabling and use the materials as shown in section [Available ports](#).

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

Alarm signal (F 2)

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

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 (F 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.

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 (F 4)

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

Connect the cabling and use the materials as shown in section [Available ports](#).

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

6.2 Optional functions (By 7-segment display)

The outdoor unit has several optional functions which can be selected through the 7-segment display of the outdoor unit PCB.

6.2.1 Setting of the optional functions

The optional functions of the outdoor unit are set up from the PCB of the outdoor unit and can be selected by pushing switches PSW1, PSW2 and PSW3.



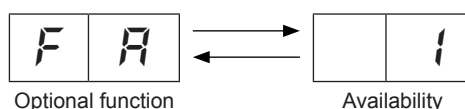
NOTE

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

- *Outdoor 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 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.



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

- 2 By pressing the push switches PSW2 and PSW3, it can be changed the optional function. (See the flowchart show in the next page).
- 3 By pressing the push switch PSW1, it can be selected the availability of this optional function. (See the flowchart show in the next page).
- 4 After selecting the function number, return pin 5 of DSW2 to OFF position.

The selected contents are memorized in the outdoor unit printed circuit board and the function selection mode is stopped. The memorized data is maintained even power source lines are disconnected. The details of each function are described in the section [Description of the optional functions](#) on this chapter.

Optional functions (By 7-segment display)

Control of the indoor unit fan during Thermo-OFF in heating mode	1↓ SEG2 FA PSW2↑ PSW3↓	3↑ SEG1 0 PSW1↑ PSW3↓ 1	Not Available	Not prepared	2↓ SEG2 SH PSW2↑ PSW3↓	4↑ SEG1 0 PSW1↑ PSW3↓ 1	Not Available
SET*			Available	SET*			Available
Night mode (Low noise)	PSW2↑ PSW3↓ ni	PSW1↑ PSW3↓ 0 1	Not Available	Long piping setting	PSW2↑ PSW3↓ nh	PSW1↑ PSW3↓ 0 1	Not Available
SET*			Available	SET*			Available
Cancellation of outdoor ambient temperature limit of heating	PSW2↑ PSW3↓ GH	PSW1↑ PSW3↓ 0 1	Not Available	Low noise setting	PSW2↑ PSW3↓ db	PSW1↑ PSW3↓ 0 1	Not Available
SET*			Available	SET*			Available
Cancellation of outdoor ambient temperature limit of cooling	PSW2↑ PSW3↓ GC	PSW1↑ PSW3↓ 0 1	Not Available	Fixing on demand function	PSW2↑ PSW3↓ de	PSW1↑ PSW3↓ 0 1	Not Available
SET*			Available	SET*			Available
Change of defrost condition	PSW2↑ PSW3↓ Ja	PSW1↑ PSW3↓ 0 1	Not Available	Wave function setting	PSW2↑ PSW3↓ UE	PSW1↑ PSW3↓ 0 1	Not Available
SET*			Available	SET*			Available
Slo defrost setting	PSW2↑ PSW3↓ bu	PSW1↑ PSW3↓ 0 1	Not Available	Cold draft protection 1	PSW2↑ PSW3↓ Fb	PSW1↑ PSW3↓ 0 1	Not Available
SET*			Available	SET*			Available
Cancellation of outdoor hot start limit	PSW2↑ PSW3↓ Hf	PSW1↑ PSW3↓ 0 1	Not Available	Cold draft protection 2	PSW2↑ PSW3↓ Fc	PSW1↑ PSW3↓ 0 1	Not Available
SET*			Available	SET*			Available
Priority cooling capacity mode	PSW2↑ PSW3↓ cu	PSW1↑ PSW3↓ 0 1	Not Available	Not prepared	PSW2↑ PSW3↓ E,	PSW1↑ PSW3↓ 0 1	Not Available
SET*			Available	SET*			Available
Priority heating capacity mode	PSW2↑ PSW3↓ hu	PSW1↑ PSW3↓ 0 1	Not Available	Not prepared	PSW2↑ PSW3↓ Co	PSW1↑ PSW3↓ 0 1	Not Available
SET*			Available	SET*			Available
Not prepared	PSW2↑ PSW3↓ SC	PSW1↑ PSW3↓ 0 1	Not Available	Not prepared	PSW2↑ PSW3↓ F1~F5	PSW1↑ PSW3↓ 0 1	Not Available
SET*			Available	SET*			Not Available
	2↓	4↑			1↓ 3↑		

6.2.2 Description of the optional functions

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

Press PSW1 and select the setting condition “1” at the circulator function at heating thermo-OFF “F_R”.

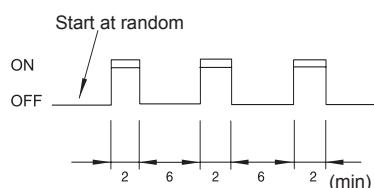
In case that the fan speed is changed to “LOW” at heating Thermo-OFF, there is a case that the room air temperature is too high at heating Thermo-OFF.

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

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

- Operation

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



NOTE

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

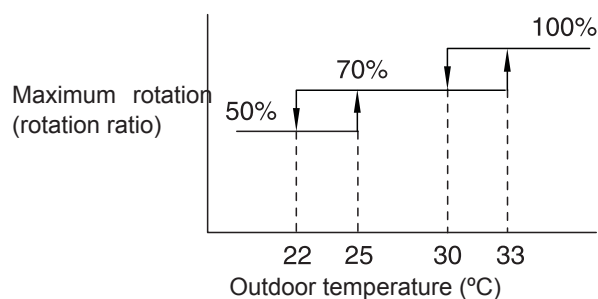
Night mode (Low noise) (n₁)

Press PSW1 and select the setting condition “1” at the night shift (low noise) “n₁”. Then, this function can be set.

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

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

- Outdoor Fan



NOTE

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

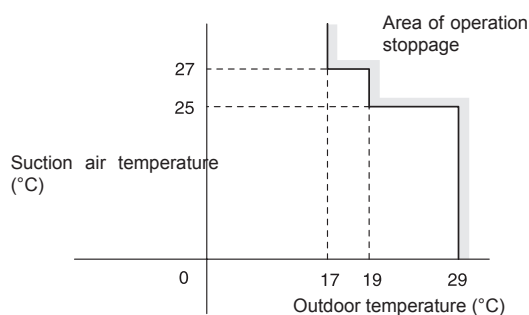
Cancellation of outdoor ambient temperature limit of heating (EH)

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

The heating operation is continued under a high outdoor temperature.

- Operation in heating mode

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



NOTE

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

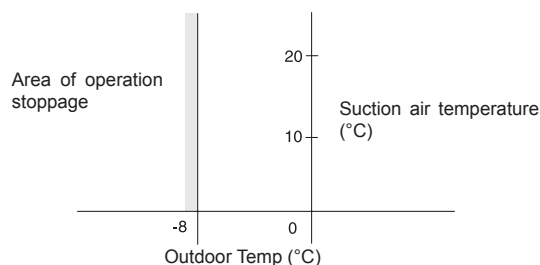
Cancellation of outdoor ambient temperature limit of cooling (EL)

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

The cooling operation is continued under a low temperature.

- Operation in cooling mode

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



NOTE

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

Change of defrost condition (ㄱㄷ)

Press "PSW1" and select the setting condition "1" at the change of defrost condition "ㄱㄷ".

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

Slo defrost setting (ㄴㄷ)

Press "PSW1" and select the setting condition "1" at the slow defrost setting "ㄴㄷ".

Indoor fan operation is stopped during the defrost operation. However, this function can be operated the indoor fan at low/superlow (depending to the case) speed during the defrosting operation.

Cancellation of outdoor hot start limit (ㄴㄹ)

Press "PSW3" and select the setting condition "1" at the cancellation of hot start setting "ㄴㄹ", so the hot start protection control can be cancelled.

Long piping setting (ㄴㄹ)

Press "PSW1" and select the setting condition "1" at the long piping setting "ㄴㄹ".

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

Low noise setting (ㄴㄹ)

Press "PSW1" and select the setting condition "1", so the low noise setting "ㄴㄹ" can be set.

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

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

- Outdoor temperature is over 40 °C.
- Total combination horsepower is over 100%.

Fixing on demand function (dE)

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

However, it is not necessary to short-circuit the demand input terminals on the outdoor unit PCB. (Refer to section [Description of optional signals](#) in the input [Current control demand \(60/70/80/100%\) \(6/7/8/9\)](#))

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

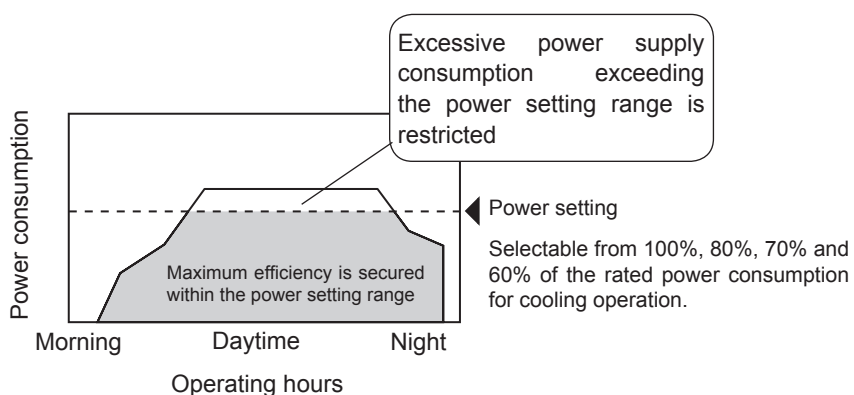
Control function number *	Demand running current control
1 to 5	100%
6	60%
7	70%
8	80%
9	100%

* This function can be activated when demand function is selected at one of the input terminal indications 1, 2 and 3.

In case that multiple demand functions are set at the input terminal indications, the lower setting demand have preference over the higher setting:

Priority 1	Priority 2	Priority 3	Priority 4
60 % (Control function number 6)	70 % (Control function number 7)	80 % (Control function number 8)	100 (Control function number 9)

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

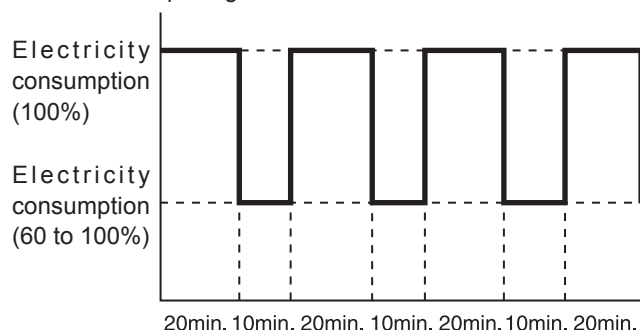


Wave function setting (WE)

Press "PSW1" and select the setting condition "1", so that the wave function setting "WE".

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

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



* Wave function can be activated when demand function is selected at one of the input terminal indications 1, 2 and 3.

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

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

Cold draft protection 1 (Fb)

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

Cold draft protection 2 (Fc)

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

6.3 Optional functions (By remote control switch)

Additionally to the possible optional functions by the 7-segment display of the outdoor unit's PCB, 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 by one of the HITACHI remote control switches (PC-ART) is shown below:



NOTE

- Please, refer to the Controller's Technical Catalogue for the specific information about the optional functions of PC-ART and for the rest of HITACHI's remote controls.
- The optional functions shown in the following table for PC-ART are the last updated at time of publication. In order to know the current optional functions, refer to the Controller's Technical Catalogue.

Items	Optional function	Individual setting	Setting condition	Contents
b1	Removal of heating temperature compensation	○	00	Standard (Set temperature +4°C)
			01	Removal (Set temperature)
			02	Set temperature +2°C (*1)
b2	Circulator function at heating Thermo-OFF	○	00	Not available
			01	Available
b3	3 minutes OFF guard compressor	○	00	Not available
			01	Available
b4	Period for filter sign	○	00	Standard
			01	100 hours
			02	1,200 hours
			03	2,500 hours
			04	No indication
b5	Fixing of operation mode	×	00	Not available
			01	Available
b6	Fixing of setting temperature	×	00	Not available
			01	Available
b7	Fixing cooling operation	×	00	Not available
			01	Available
b8	Automatic COOL/HEAT operation	×	00	Not available
			01	Available
b9	Fixing fan speed	×	00	Not available
			01	Available
bA	Not prepared	×	"- -" Fixed	Not used
bb	Cooling temperature compensation	○	00	Standard (No compensation)
			01	Set temperature -1°C
			02	Set temperature -2°C
bC	Not prepared	-	00	Not used
			01	(Use as 00 conditions)
bd	Not prepared	-	00	Not used
			01	(Use as 00 conditions)
bE	Not prepared	-	00	Not used
			01	(Use as 00 conditions)
C1	Not prepared	-	00	Not used
			01	(Use as 00 conditions)

Items	Optional function	Individual setting	Setting condition	Contents	
C2	Not prepared	-	“- -” Fixed	Not used	
C3	Not prepared	○	00	Not used	
			01	(Use as 00 conditions)	
C4	Drain pump in heating mode	○	00	Not available	
			01	Available	
C5	Static pressure selection (RPI)	○	00	Average static pressure (factory set)	
			01	High static pressure	
			02	Low static pressure	
	Increased fan speed (RCI, RCIM, RCD)		00	Normal	
			01	Speed increase 1	
			02	Speed increase 2	
C6	Increasing fan speed	○	00	Not available	
			01	Available	
C7	Canceling 3 minutes compressor guard	○	00	Available	
			01	Available	
C8	Thermistor of remote control switch	○	00	Control by indoor suction thermistor	
			01	Control by thermistor of remote control switch	
			02	Control by average value of indoor suction thermistor and thermistor of remote control switch	
C9	Not prepared	-	“- -” Fixed	Not used	
CA	Not prepared	-	“- -” Fixed	Not used	
Cb	Selection of forced stoppage logic	×	00	Forced stoppage input: A contact	
			01	Forced stoppage input: B contact	
CC	Not prepared	×	00	Not used	
			01	(Use as 00 conditions)	
Cd	Not prepared	○	00	Not used	
			01	(Use as 00 conditions)	
CE	Not prepared	-	00	Not used	
			01	(Use as 00 conditions)	
CF	Change of louver swing angle	○	00	Standard (7 steps)	
			01	Draft prevention (5 steps)	
			02	High ceiling (5 steps) (*2)	
d1	Power supply ON/OFF 1	○	00	Not available	
			01	Available	
d2	Not prepared	-	“- -” Fixed	Not used	
d3	Power Supply ON/OFF 2	○	00	Not available	
			01	Available	
d4	Prevention for cooling discharge air temperature decrease	○	00	Not available	
			01	Available	
d5	Prevention for heating discharge air temperature decrease	○	00	Not available	
			01	Available	
d6	Room temperature control for energy saving	○	00	Not available	
			01	Available	
d7	Not prepared	○	00~07	Not used (Use as 00 conditions)	

Items	Optional function	Individual setting	Setting condition	Contents	
E1	KPI: Ventilation mode	○	00	Automatic ventilation	
			01	Ventilation with total heat exchanger	
			02	Ventilation with bypass (No total heat exchange)	
	Econofresh: all fresh mode		00	Not available	
			01/02	All fresh mode	
E2	KPI: Increasing air supply volume	○	00	Not available	
	Econofresh: Enthalpy sensor		01	Available	
			00	Not available	
			01	Available	
E3	Not prepared	○	00	Not used	
			01	(Use as 00 conditions)	
E4	KPI: Pre-cooling / Pre-Heating period	○	00	Standard	
			01	30 minutes	
			02	60 minutes	
	Econofresh: gas sensor		00	Standard	
			01/02	CO ² sensor	
E5	Not Prepared	○	00	Not used	
			01	(Use as 00 conditions)	
E6	Indoor fan operation time after cooling operation stoppage	○	00	Not available	
			01	60 min.	
			02	120 min.	
E7	Not prepared	-	00	Not used	
			01	(Use as 00 conditions)	
E8	Fan operation control at heating Thermo-OFF	○	00	Not available	
			01	Available	
E9	Not prepared	-	00	Not used	
			01	(Use as 00 conditions)	
EA	Not prepared	○	00	Not used	
			01	(Use as 00 conditions)	
Eb	Fan operation control at cooling Thermo-OFF	○	00	Not available	
			01	LOW	
			02	SLOW	
EC	Forced Thermo-ON stoppage at cooling	○	00	Not available	
			01	Available	
Ed	Not prepared	○	00	Not used	
			01	(Use as 00 conditions)	
EE	Automatic fan speed control	○	00	Not available	
			01	Available	
F1	Automatic timer OFF setting	×	00	Function not valid	
			01	1 h	
			02	2 h	
			03	3 h	
			04-24	(04-24) h	
			0A	0.5 h	
			0B	1.5 h	

Items	Optional function	Individual setting	Setting condition	Contents
F2	Main and secondary remote control setting	×	00	Master
			01	Slave
F3	Automatic temperature setting release	×	00	Not available
			01	Available
F4	Automatic release time	×	00	30 minutes (Factory setting)
			01	15 minutes
			02	60 minutes
			03	90 minutes
F5	Automatic cooling temperature release	×	19	19 °C
			20	20 °C
			21-24	(21-24) °C
			25	25 °C (Factory setting)
			26-28	(26-28) °C
			29	29 °C
			30	30 °C
F6	Automatic heating temperature release	×	19	19 °C
			20	20 °C
			21-24	(21-24) °C
			25	25 °C (Factory setting)
			26-28	(26-28) °C
			29	29 °C
			30	30 °C
F7	Prevention of operation stoppage due to remote control operating error	×	00	Not available
			01	Available
F8	Lock function for operation mode selection	×	00	Not available
			01	Available (Factory-setting)
F9	Lock function for temperature setting	×	00	Not available
			01	Available (Factory-setting)
FA	Lock function for fan speed selection	×	00	Not available
			01	Available (Factory-setting)
Fb	Lock function for swing louver operation	×	00	Not available
			01	Available (Factory-setting)
FC	Cooling lower limit for setting temperature (*3)	×	00	Standard
			01	Lower limit +1°C
			02	Lower limit +2°C
			...	...
			09	Lower limit +9°C
			10	Lower limit +10°C
Fd	Heating upper limit for setting temperature (*4)	×	00	Standard
			01	Upper limit -1°C
			02	Upper limit -2°C
			...	...
			09	Upper limit -9°C
			10	Upper limit -10°C

Items	Optional function	Individual setting	Setting condition	Contents
FE	Not prepared	-	00	Not used
			01	(Use as 00 condition)
			02	
FF	Lock function for timer	×	00	Not available
			01	Available (Factory-setting)
H1	Maintenance alarm	○	00	Show
			01	Hide
H2	No automatic control indication	○	00	Show
			01	Hide
H3	Operation mode change restriction (*4)	○	00	Operation mode change off (hide operation mode) (factory setting)
			01	Operation mode set by the central control unit + "FAN" mode
			02	Unlimited operation
H4	Ventilation changeover (total heat exchanger only)	○	00	Air conditioning only
			01	Ventilation only
			02	Air conditioning + Ventilation
H5	Central control available after forced stoppage	○	00	OFF
			01	ON

○: Allow individual setting.

×: Setting is used for all the outdoor units

-: Not used

**NOTE**

*1: The "02" setting may not be available according to the type of indoor unit.

*2: 00: Standard (7-step operation), 01: Draft Prevention (lower 2 steps cutoff), 02: High ceiling (upper 2 steps cut off)

*3: Applicable to fan, cooling and dry operation modes.

*4: Applicable to heating operation mode.

- After at least 3 minutes from the power ON, not change the optional setting.
- When changing "CF" setting (change of louver swing range), restore the power supply or allow the louver to make one complete swing fully in the auto swing mode to apply the optional setting.
- The optional settings are different according to the indoor and outdoor unit models. Check to ensure that the unit has the optional setting or not.
- Record the setting conditions for each optional setting in the "Setting" column of the table.

7. Test run

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7.1 Checking procedure before the test run

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

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

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

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

You should perform the test run according to the next chapters.



CAUTION

- *General warning. Injuries of several kinds.*
- *Do not operate the system until all the check points have been cleared.*
- *Make sure that the stop valves of the outdoor unit are fully open. Then, start the system.*
- *Make sure that the switch on the main power source has been ON for more than twelve hours in order to warm the compressor oil by means of the oil heater.*
- *Do not push the button of the magnetic switch(es).*
- *Make sure that the stop valve of the gas line and the stop valve of the liquid line are fully open.*
- *Electrical hazard. Can cause serious injuries or death. Measure the resistance between the ground and the terminal of the electrical components. Make sure that the electrical resistance is more than 1 MΩ. Otherwise, do not operate the system until you find the electrical leakage and you repair the electrical leakage. Do not impress the voltage on the terminals for transmission 1 and 2.*
- *Burning surface. Heat wounds. 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 higher than 90°C.*
- *Electrical discharge. Can cause serious injuries. Do not touch any electrical components for more than three minutes after turning OFF the main switch.*

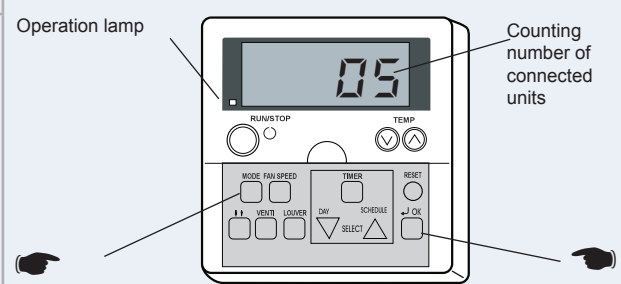
◆ Checking procedure

- 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 outdoor units are correct. Especially, pay attention to the setting of the lift between the indoor units and the outdoor units. Refer to [Electrical wiring](#) for details.
- 5 Make sure that the switch on the main power source has been ON for more than twelve hours in order to warm the compressor oil by means of the oil heater.
- 6 Check whether or not the electrical wiring of the indoor units and the outdoor units are connected as shown in chapter [Electrical wiring](#).
- 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 catalog 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 outdoor unit (Operating Line: terminals of each terminal board for DC12V) coincide correctly. Otherwise, you may damage some components.
- Check to ensure that the crankcase heater is turned ON for more than 4 hours. The operation is not available within 4 hours after turning ON the power supply.
- Check to ensure that the main source has been ON for more than 12 hours to warm the compressor oil by the oil heater.
- Check to ensure the operating temperature:
Cooling operation:
Indoor DB 21.5°C and above,
Indoor WB 16°C and above,
Outdoor DB 0°C and above.
Heating operation:
Indoor DB 27°C and below.
- The compressor is NOT available within 4 hours after turning ON the power supply.
- (Stoppage code: d1-22) If the compressor should be within 4 hours, turn ON the power and wait for more than 30 seconds. Press PSW1 and PSW3 on the outdoor PCB simultaneously for more than 3 seconds. The forced thermo-OFF function (d1-22) is canceled and the compressor operation is available.

7.2 Test run procedure using the remote control switch (Example with PC-ART)

①	Turn ON the power source of the indoor and outdoor units		
②	Set the TEST RUN mode by remote control switch. Depress the "MODE" and the "↵ OK" switches simultaneously for more than 3 seconds. If "TEST RUN" and the counting number of the connected units to the remote control switch (for example "05") are indicated on the remote control switch, the connection of remote control cable is correct. →Go to ④ If no indication appear or the number of the units indicated is smaller than the actual number of the units, some abnormalities exist. →Go to ③		
	Remote control switch indication	Wrong portions	Inspection points after power source OFF
	No indication	The power source of outdoor unit is not turned ON.	Connecting points of remote control cable terminal board of remote control switch and indoor unit.
		The connection of the remote control cable is incorrect.	
		The connecting wires of power supply line are incorrect or loosened.	Contact of terminals of remote control cable
			Connection order of each terminal board
			Screw fastening of each terminal boards.
③			
	Counting number of connected units is incorrect	The power source of outdoor unit is not turned ON.	Dip switch setting on printed circuit board
		The operating line wiring between indoor unit and outdoor unit is not connected.	
		The connection of control cables between each indoor units are incorrect. (When one remote control switch controls multiple units)	Connecting on the PCB
			This is the same as item ③ 1, 2, and 3.



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.

If the unit do not start or the operation lamp on the remote control switch is flickered, some abnormalities exist. →Go to ⑥

Remote control switch indication	Unit condition	Wrong portions	Inspection points after power source OFF
6 The operation lamp flickers. (1 time/1 sec.) And the unit number and alarm code "03" flicker	The unit does not start.	The power source of Outdoor Unit in not turned ON. The connecting wires of operating line are incorrect or loosened.	Connecting order of each terminal board. Screw fastening of each terminal boards.  NOTE <i>Recovering method of FUSE for operating circuit. There is a fuse (FUSE4 on Indoor Unit PCB1, EF1 on Outdoor 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 7</i>
			The operation lamp flickers. (1 time/2 sec.) The unit does not start.
			Remote control cable is broken. Contact of connectors is not good. The connection of remote control cable is incorrect
			Indication of flicker except above The unit does not start, or start once and then stops
The operation lamp flickers. (1 Time/1s) Unit number <i>00</i> , alarm code <i>dd</i> and unit code <i>EDD</i> flicker	The unit does not start.	The connection of thermistor or other connectors are incorrect. Tripping of protector exists, or else. The connection of the remote control cable between Indoor Units is incorrect.	Check by the abnormality mode table in the Technical Catalogue (Do it by service people). Check by the abnormality mode table in the Technical Catalog (Do it by service people).
Back to 1 after checking			
7 Instructions for the recovery when the fuse of the transmission circuit is blown out: Correct the wiring to the terminal board. Set the 1st pin of DSW7 on the indoor unit PCB to ON. Set the DSW7 on the indoor unit PCB to ON. (Only RPK-1.0/1.5)		Except RPK 1.0/1.5 	Only RPK-1.0/1.5 

7

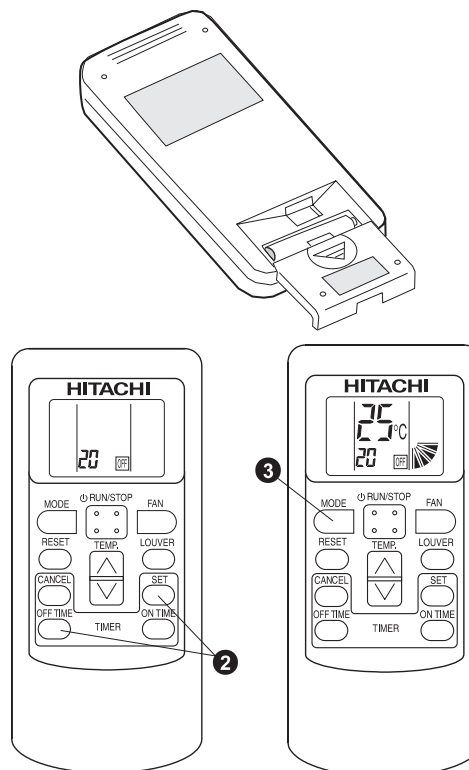
7.3 Test run procedure using the wireless remote control switch (Example with PC-LH3A)



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 outdoor 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.



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

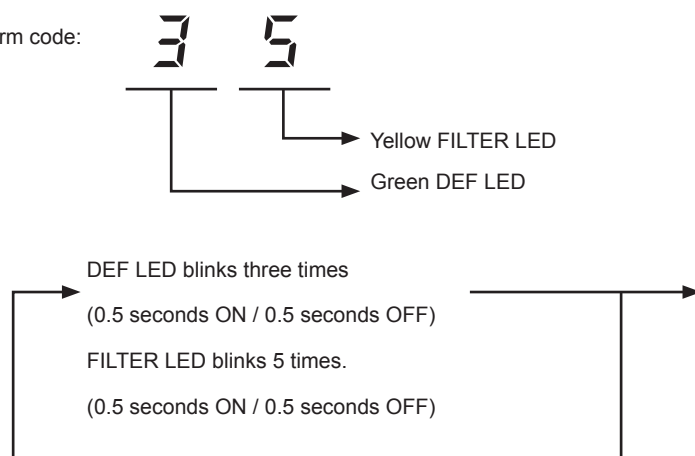
During the emergency operation, the yellow LED blinks (0.5 seconds ON / 0.5 seconds OFF).

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 [Alarm codes](#) on chapter [Troubleshooting](#).
- The alarm code displays the number of blinks of the green DEF LED and the yellow FILTER LED as shown below:
- 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:

Alarm code:



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

7.4 Test run procedure from outdoor unit

The procedure of test run from outdoor unit side is indicated below. Setting of this DIP switch is available with the power source ON.

Setting of DIP switch (before shipment)

DSW1	
Switch for setting of service operation and function	
	1 Test run
	2 COOL/HEAT
	3 Setting (ON: heat operation)
	4 OFF (Fixed)
	5 Manual compressor stop



CAUTION

- 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 outdoor unit is ON and the outdoor unit is operated.
- Turn all DIP switches of DSW1 OFF when the test run operation is completed.

Operation	Dip Switch Setting	Operation	Remarks
Test Run	① Setting of Operation Mode: Cooling: Set DSW1-2 OFF.  Heating: Set DSW1-2 ON.  ② Starting Test Run: Set DSW1-1 ON and the operation is started after a few ~20 seconds. When heating operation, leave DSW1-2 at ON ↓ 	① The indoor unit automatically start to operate when the test run of the outdoor unit is set. ② The ON/OFF operation can be performed from the remote control switch or DSW1-1 of the outdoor unit. ③ Continuous operation during 2 hours is performed without Thermo-OFF. i NOTE TEST RUN operation time can be increased depressing the time switch in the Remote Control.	Take care that the indoor units start operation in accord with the test run operation of the outdoor unit. The test run is started from the outdoor unit and stopped from the remote control switch, the test run function of the remote control switch is cancelled. However, the test run function of the outdoor unit is not cancelled In case that the plural indoor units are connected with one remote control switch, all the units start test run operation at the same time, therefore, turn the power source OFF for the indoor units not to operate test run. In this case, the "TEST RUN" indication of the remote control switch may flicker, and this is not abnormal. The setting of DSW1 is not required for the test run from the remote control switch.
Manual OFF of compressor	① Setting: Compressor Manual OFF: Set DSW1-4 ON.  Compressor ON: Set DSW1-4 OFF. 	① When DSW1-4 is ON during compressor operation, the compressor stops to operate immediately and the indoor unit is under the condition of Thermo-OFF. ② When DSW1-4 is OFF, the compressor starts to operate after the cancellation of 3-minutes guard.	Do not repeat compressor ON/OFF frequently.
Manual Defrost	① Manual defrost operation starts Press PSW1 for more than 3 seconds during heating operation, the defrost operation is started after 2 minutes. This function is not available within 5 minutes after starting heating operation ② Manual defrost operation finishes Defrost operation is automatically ended and the heating operation is started.	① Defrost operation is available regardless of frosting condition and total time of heating operation. ② Defrost operation is not performed when the temperature of outdoor heat exchanger is higher than 10°C, high pressure is higher than 3.3 MPa (33kgf/cm²G) or Thermo-OFF.	Do not repeat defrost operation frequently.

7.5 Check list

◆ Check list on test run

MODEL:

SERIAL No.

COMPRESSOR MFG. N°

CUSTOMER'S NAME AND ADDRESS:

DATE:

- 1 Is the rotating direction of the indoor coil fan correct?
- 2 Is the rotating direction of the outdoor unit coil fan correct?
- 3 Is there any abnormal compressor sound?
- 4 Has the unit been operating for at least twenty (20) minutes?
- 5 Check the room temperature:

Inlet: No.1	DB	/WB	°C,	No.2	DB	/WB	°C,	No.3	DB	/WB	°C,	No.4	DB	/WB	°C,
Outlet:	DB	/WB	°C,		DB	/WB	°C,		DB	/WB	°C,		DB	/WB	°C,
Inlet: No.5	DB	/WB	°C,	No.6	DB	/WB	°C,	No.7	DB	/WB	°C,	No.8	DB	/WB	°C,
Outlet:	DB	/WB	°C,		DB	/WB	°C,		DB	/WB	°C,		DB	/WB	°C,

- 6 Check the outdoor temperature:

Inlet: DB °C, WB °C

Outlet: DB °C, WB °C

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

Discharge gas temperature: $T_d =$ °CLiquid pipe temperature: $T_e =$ °C

- 8 Check the pressure:

Discharge pressure: $P_d =$ kg/cm²GSuction pressure: $P_s =$ kg/cm²G

- 9 Check the voltage:

Rated voltage _____ V

Operating voltage: $L1-L2$ _____ V, $L1-L3$ _____ V, $L2-L3$ _____ V

Starting voltage: _____ V

V

Phase imbalance: 1- _____ =

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?

7

8. Electrical checks of the main parts

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8.1 Inverter protective functions

1 Excessive high or low voltage for inverter

a. Level of detection

- ♦ When the voltage of direct current is equal or greater than 376V filtered by 600msec, abnormalities are detected.
- ♦ When the voltage of direct current is equal or smaller than 194V filtered by 600msec, abnormalities are detected.

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

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

2 Abnormality of current sensor

a. Level of detection. When current of the inverter compressor decreases lower than 1.5A during the inverter compressor frequency between 15Hz and 18Hz or when Phase U current is 5A peak or lower at the completion of positioning, an abnormality is detected.

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

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

3 Overcurrent protection for inverter

a. Level of detection. When the current detected by current sensor reaches 150% of the rated current, overcurrent is detected. (Instantaneous overcurrent). When the current detected by current sensor exceeds 105% of the rated current continuously for 30 seconds or for 3 minutes in total during a 10 minutes period, overcurrent is detected. (Electric thermal relay)

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

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

4 Protection of IPM/DIP-IPM/ISPM

a. Level of detection. When some of the output terminals between "U" and "V", "V" and "W", "W" and "U" of IPM/dip IPM/ISPM are short-circuited, an abnormality is detected. When the running current of IPM/DIP-IPM/ISPM reaches (maximum rated current x 105%), an abnormality is detected. When an internal temperature is measured by internal thermistor of IPM, an abnormality is detected. When the control voltage of IPM/DIP-IPM/ISPM decreases, an abnormality is detected.

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

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

5 Fin temperature increase

a. Level of detection. When the temperature of internal thermistor exceeds more than 100 °C, 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.

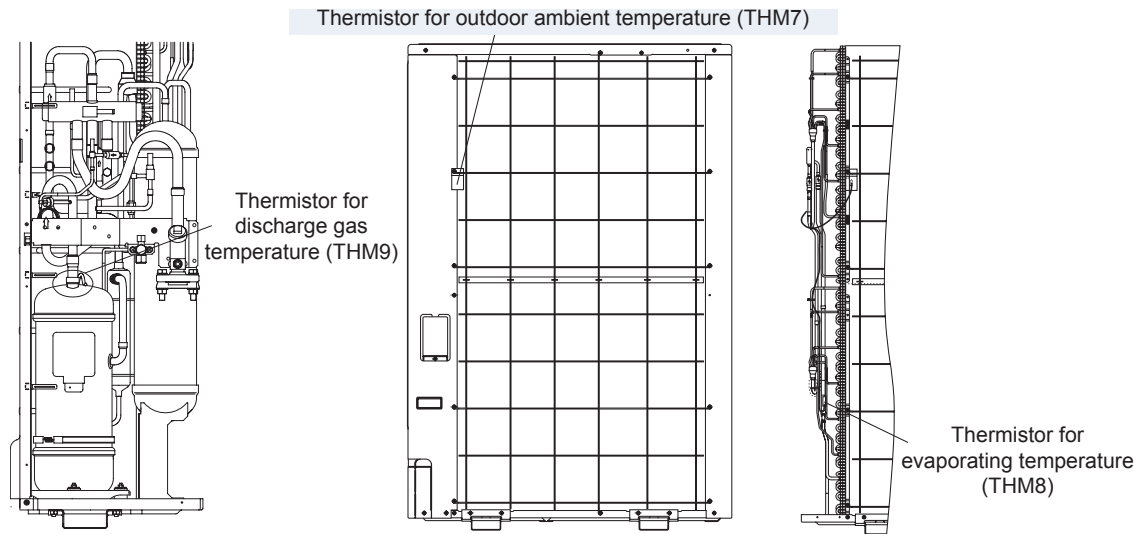
6 Earth detection

a. Level of detection. When the starting current of the compressor reaches 80% of the overcurrent protection value and when an IPM's error signal is received during earth detection, 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.

8.2 Thermistor

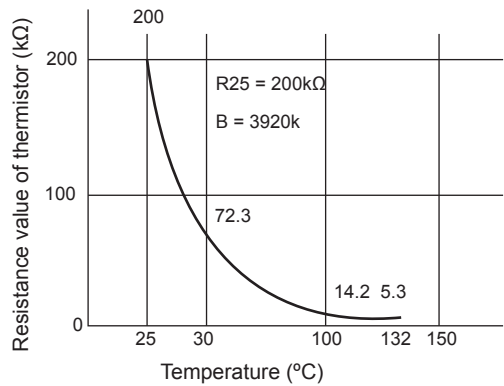


◆ Thermistor for upper part temperature of compressor

(For prevention of discharge gas overheating)

- d. 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.
- e. If discharge gas temperature increases excessively, compressor temperature increases. At the worst, compressor motor winding will be burnt out.
- f. When the upper part temperature of compressor increases during heating operation, the unit is controlled according to the following method
 - An electronic expansion valve of outdoor units is (are) opened to return the liquid refrigerant to the compressor through the accumulator, decreasing compressor temperature.
 - If the compressor upper part temperature increases exceeding 132°C even if an electronic expansion valve opens, the compressor is stopped, in order to protect the compressor.
 - In cooling operation, the above function is also available.

Resistance characteristics of thermistor for discharge gas overheating protection

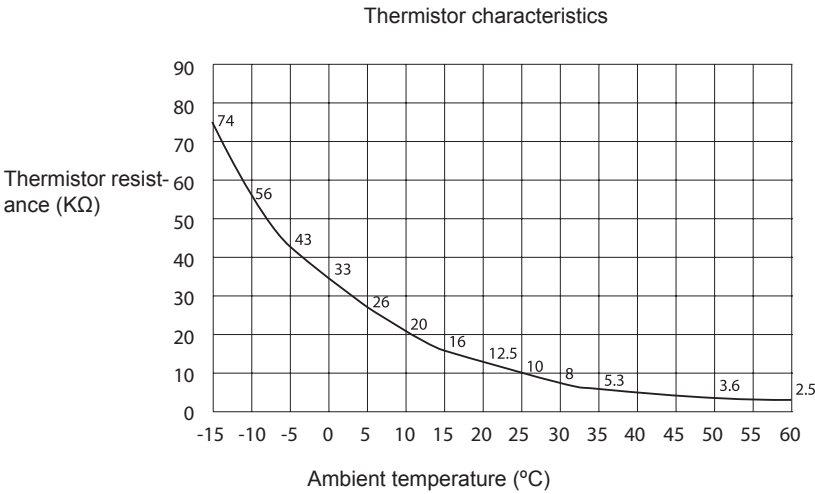


- g. If compressor upper part temperature increases excessively, the protection control is activated and the compressor is stopped according to the following method.

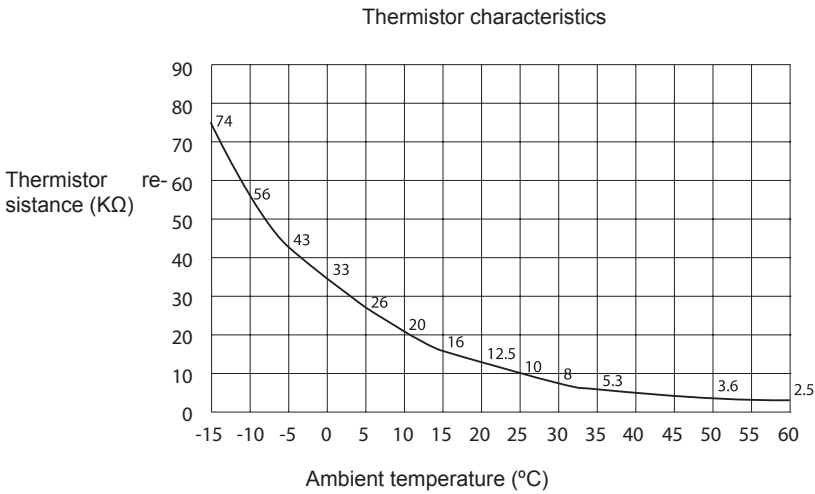
Operation	Upper part temperature of compressor	Defecting period
Cooling	Over 132°C	10 minutes (continuously)
	Over 140°C	5 seconds (continuously)
Heating	Over 132°C	10 minutes (continuously)
	Over 140°C	5 seconds (continuously)
Defrosting	Over 132°C	5 seconds (continuously)

◆ Thermistor for outdoor ambient temperature

The thermistor resistance characteristics are shown in the next figure.

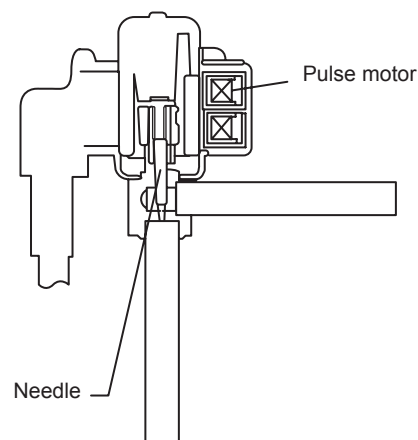


◆ Thermistor for evaporating temperature of outdoor unit in heating operation (for defrosting)



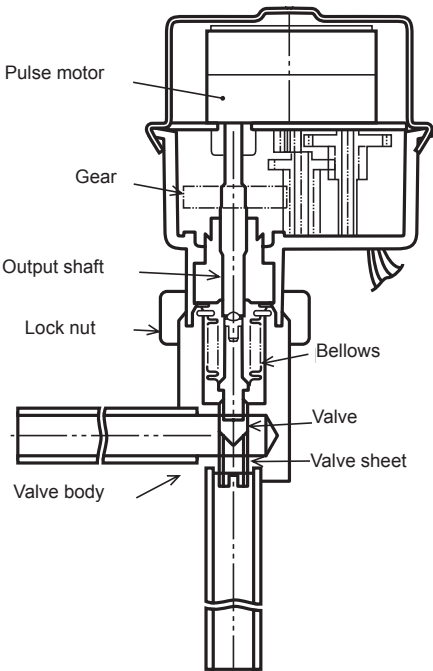
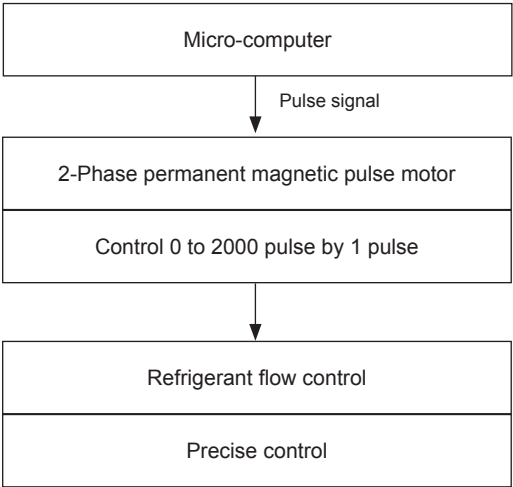
```
graph TD; A[Micro-computer] -- "Pulse signal" --> B[2-Phase permanent magnetic pulse motor]; B -- "Control 0 to 500 pulse by 1 pulse" --> C[Refrigerant flow control]; C --> D[Precise control];
```

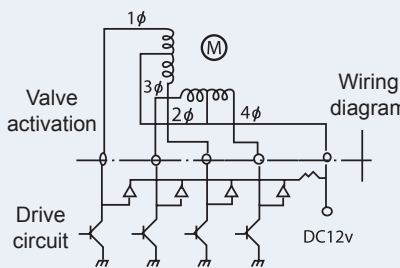
The flowchart illustrates the control system for a 2-phase permanent magnetic pulse motor. It begins with a 'Micro-computer' which sends a 'Pulse signal' to the '2-Phase permanent magnetic pulse motor'. This motor then provides 'Control 0 to 500 pulse by 1 pulse' to the 'Refrigerant flow control' block. Finally, the 'Refrigerant flow control' block leads to 'Precise control'.



Items	Specifications															
Applicable to the models	For the main cycle of RAS-(4-6)FS(V)N(Y)3E															
Type	UKV(10.0 USRT) series/UKV (5.0USRT) series for MVB															
Refrigerant	R410A															
Working temperature range	-30℃ ~ 65℃ (operation time of the coil: less than 50%)															
Mounting direction	Drive shaft in vertical direction within an angle of 45° as maximum															
Flow direction	Reversible															
Drive method	4-Phase canned motor method															
Rated voltage	DC12V±1.8V															
Drive condition	83PPS (pulse width at ON: 36mm sec, OFF: 60mm sec) 1,2 phase excitation															
Coil resistance (each phase)	46Ω ± 10% (at 20℃)															
Wiring diagram, drive circuit and activation mode	ON OFF Drive circuit Wiring diagram <table border="1"><thead><tr><th></th><th>A</th><th>B</th><th>$\bar{A}$</th><th>$\bar{B}$</th></tr></thead><tbody><tr><td>Valve</td><td colspan="4">Close ←</td></tr><tr><td></td><td colspan="4">→ Open</td></tr></tbody></table> Activation		A	B	$\bar{A}$	$\bar{B}$	Valve	Close ←					→ Open			
	A	B	$\bar{A}$	$\bar{B}$												
Valve	Close ←															
	→ Open															

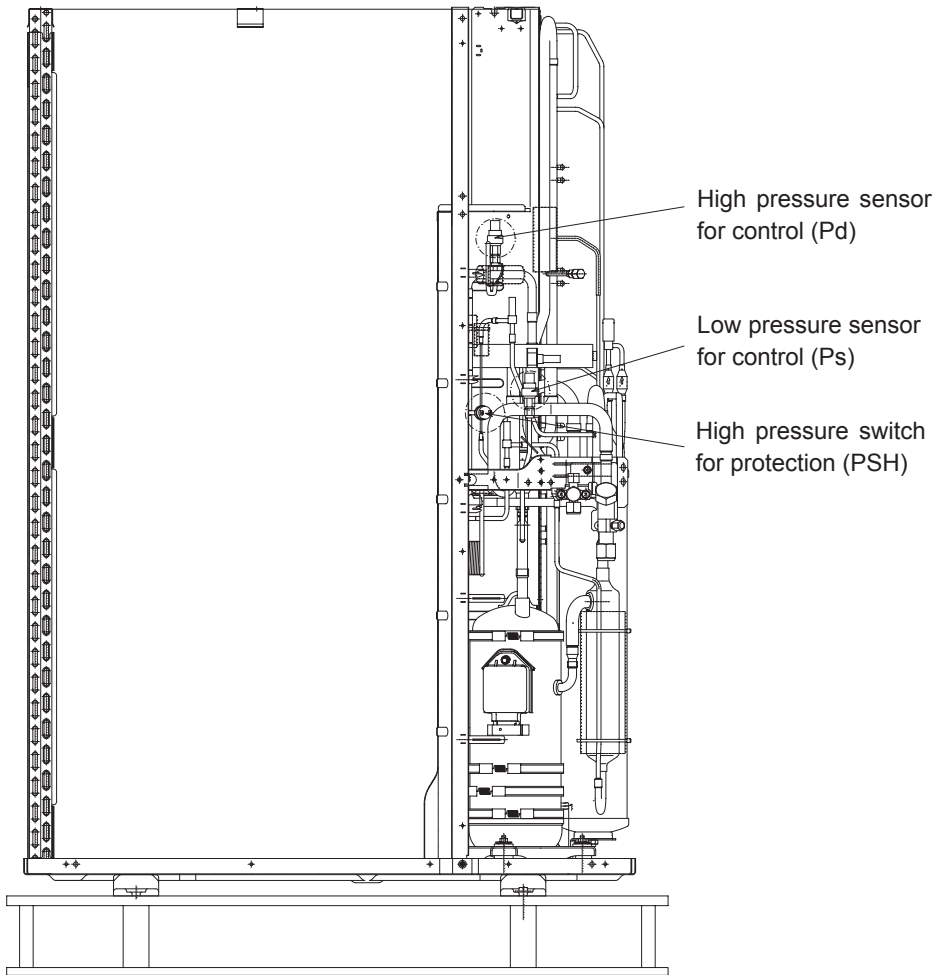
8.3.2 Electronic expansion valve for the indoor unit



Items	Specifications																														
Type	EDM type																														
Refrigerant	R410A																														
Working temperature range	-30℃ ~ 70℃ (with coils which are not electrified)																														
Mounting direction	Drive shaft in vertical direction, motor upside and 90° in four direction																														
Flow direction	Reversible																														
Drive method	4-phase pulse motor																														
Voltage rate	DC12V±1.2V																														
Drive condition	100Ω ± 250PPS (pulse width over 3mm) 2 phase excitation																														
Coil resistance (each phase)	150Ω ± 10% (at 20℃)																														
Wiring diagram, drive circuit and activation mode	 <table border="1"><thead><tr><th>Procedure Phase</th><th>1</th><th>2</th><th>3</th><th>4</th><th>1</th></tr></thead><tbody><tr><td>1φ</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2φ</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>3φ</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>4φ</td><td></td><td></td><td></td><td></td><td></td></tr></tbody></table> Close ← → Open Activation mode	Procedure Phase	1	2	3	4	1	1φ						2φ						3φ						4φ					
Procedure Phase	1	2	3	4	1																										
1φ																															
2φ																															
3φ																															
4φ																															

8.4 Pressure control and protection

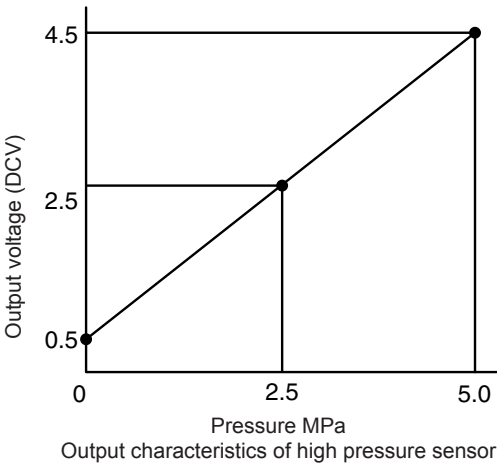
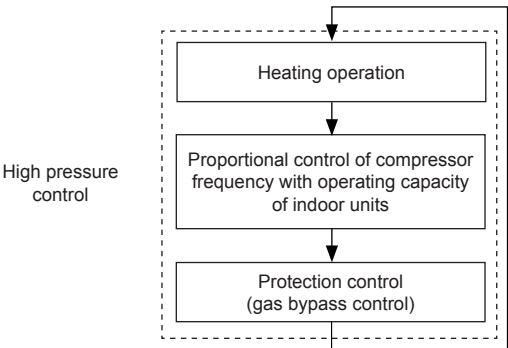
8.4.1 Pressure control and protection location



8.4.2 Pressure sensor for control

◆ High pressure sensor for control (Pd)

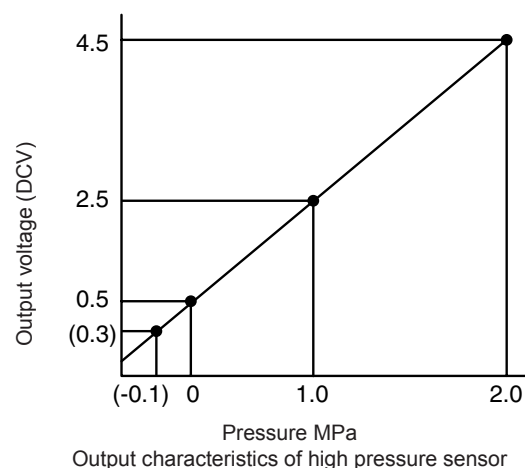
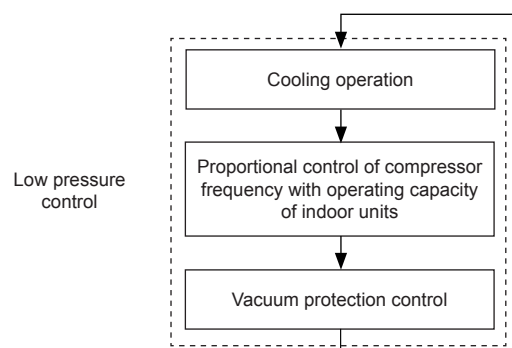
The high pressure is detected during the heating mode by means of a high pressure sensor and the compressor frequencies are controlled by the proportional control method with operating capacity of the indoor units (or PID control for the compressor frequency); therefore the high pressure is controlled within an appropriate range. The output of the high pressure sensor during the heating operation activates the protection control the gas bypass.



◆ Low pressure sensor for control (Ps)

The suction pressure is detected during the cooling operation by means of a low pressure sensor and the compressor frequencies are controlled by the proportional control method with operating capacity of the indoor units (or PID control for the compressor frequency); therefore, the suction pressure is controlled within an appropriate range.

If the suction pressure is excessively low, the cooling may not be sufficient and the parts of the refrigerant cycle may be damaged. For this reason, if the output of the low pressure sensor indicates vacuum and a constant value for twelve or more minutes, the compressor stops in order to protect itself.



8.4.3 High pressure switch for protection (PSH)

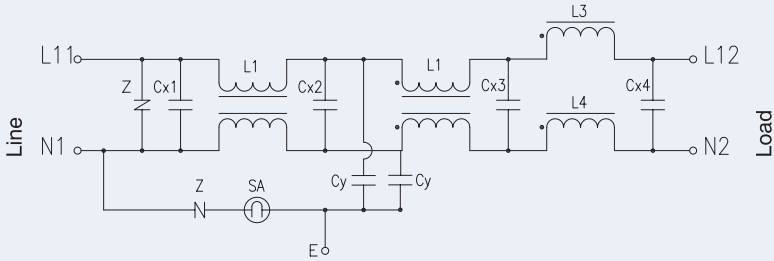
If the discharge pressure is excessively high, the compressor and the refrigerant cycle components may be damaged. However, if the discharge pressure is higher than 4.15 MPa (R410A), the protection control is activated and the compressor will stop.

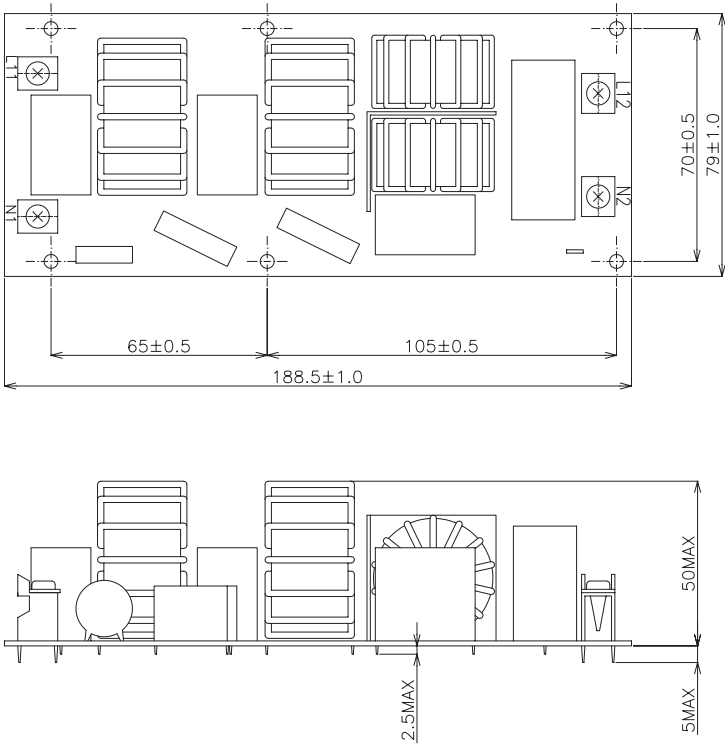
8.5 Noise filter (NF)

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.

8.5.1 Noise filter for 1~

RAS-(4-6)FSVN3E

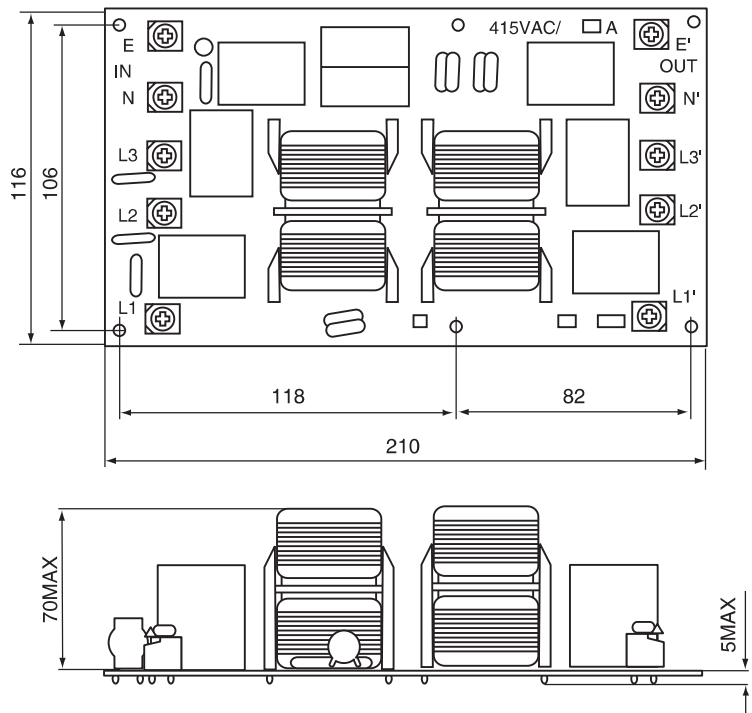
Items	Specifications
Model	LFB-14930-3M
Rated current	AC230V 30 A
Permissible temperature range.	-25 °C to 85 °C
Circuit diagram	



8.5.2 Noise filter for 3N~

RAS-(4-6)FSNY3E

Items	Specifications
Model	4LFB-16830-2FA
Rated current	AC415V 27A
Permissible temperature range	-25°C to 85°C
Circuit diagram HRNM(E)	



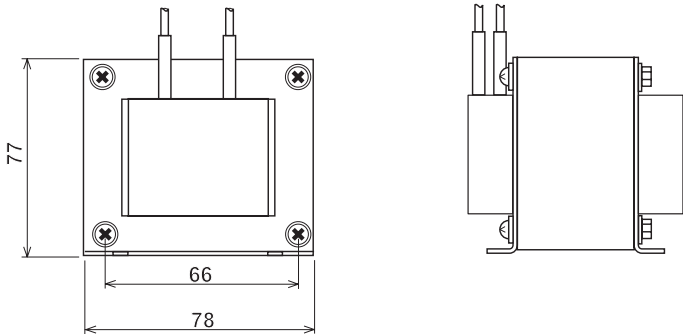
8.6 Reactor (DCL)

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

8.6.1 Reactor for 1~

RAS-(4-6)FSVN3E

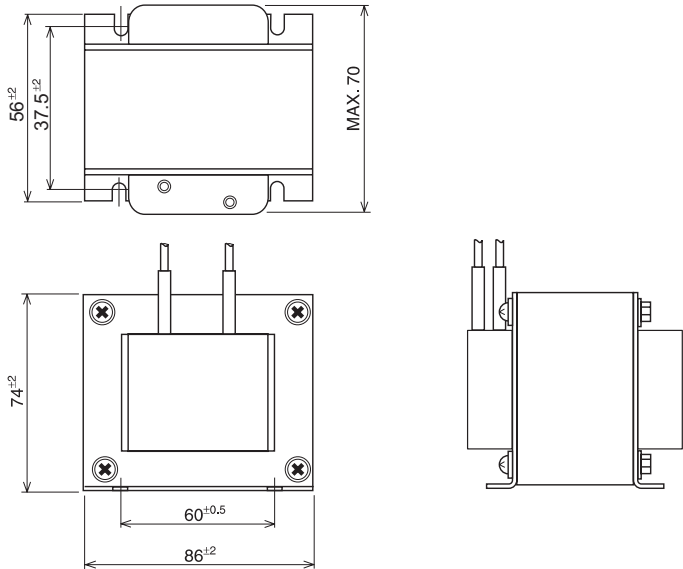
Items	Specifications
Inductance	0.59mH±15% (at 1 kHz)
Rated current	30 A
DC Resistance	26 mΩ (at 20 °C)
Permissible temperature range	-20°C to 60°C



8.6.2 Reactor for 3N~

RAS-(4-6)FSNY3E

Items	Specifications
Inductance	0.5mH±10% (at 1 kHz)
Rated current	30 A
Direct resistance	15mΩ±20% (at 20 °C)
Permissible temperature range	-20 °C to 60 °C

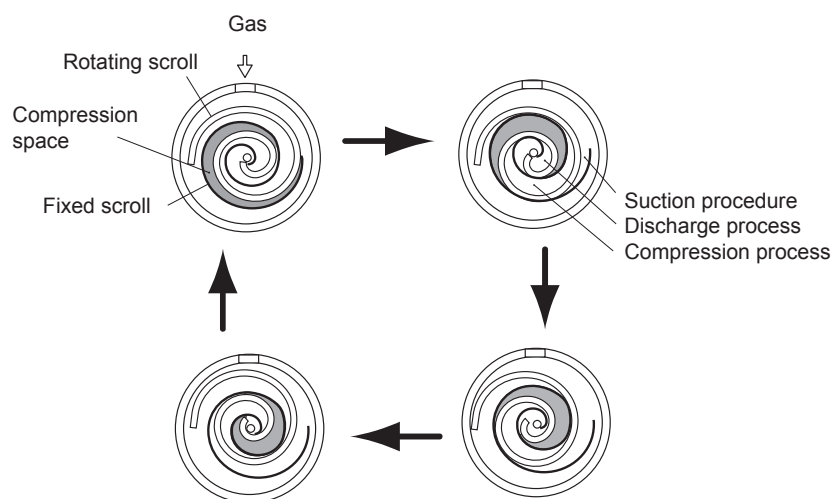
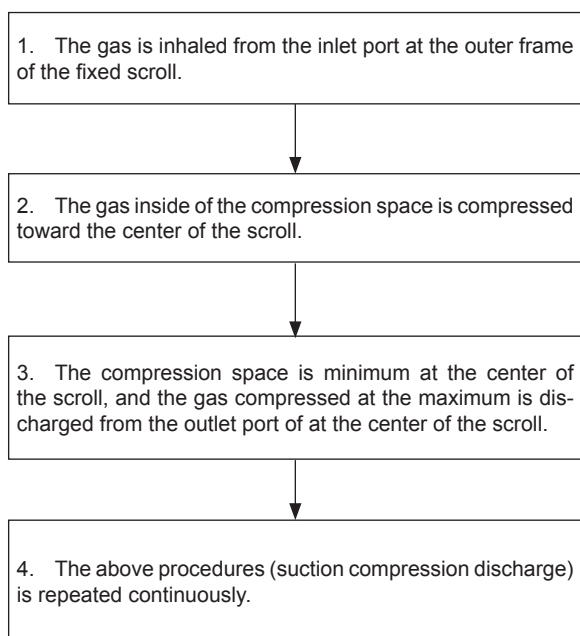


8.7 Scroll compressor

◆ 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.

◆ Principle of compression



9. Servicing

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9.3 Removing upper cover..... 127

9.4 Removing the lower part of service panel and rear panel 127

9.5 Removing outdoor fan motor 128



9.1 Removing service cover

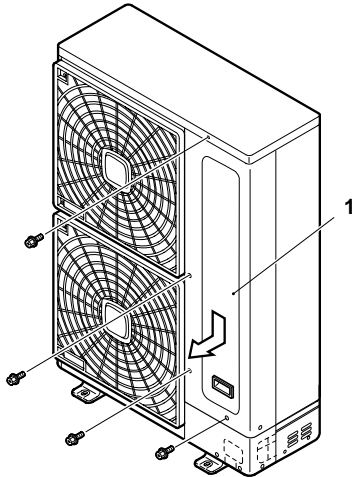
Remove the main parts according to the following procedures.



NOTE

- To reassemble perform the procedures in reverse.
- To prevent contamination of the refrigerant with water or foreign particles, do not expose open to atmosphere for long periods.
- If necessary, seal pipe ends using caps or tape.

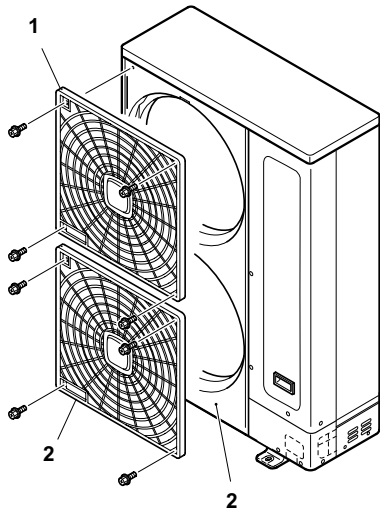
Remove the four (4) fixing screws.
Slide the service cover downward and remove it.
Pay attention of not falling off the service cover.



No.	Part
1	Service cover

9.2 Removing air outlet grille

Remove the eight (8) fixing screws.
Lift the air outlet grille holding the lower parts.
Release the extruded hook of the air outlet grille from the shroud.



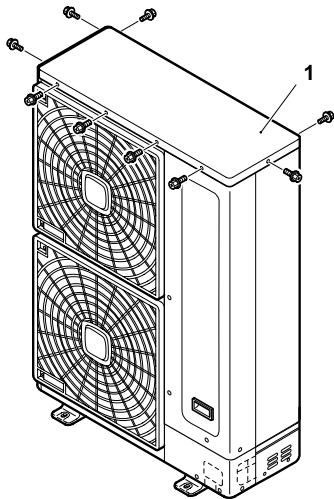
No.	Part
1	Air outlet grille
2	Shroud

9.3 Removing upper cover

Remove all the screws fixing the upper cover, both on the front and back of the machine.

Lift the upper cover upwards.

No.	Part
1	Upper cover



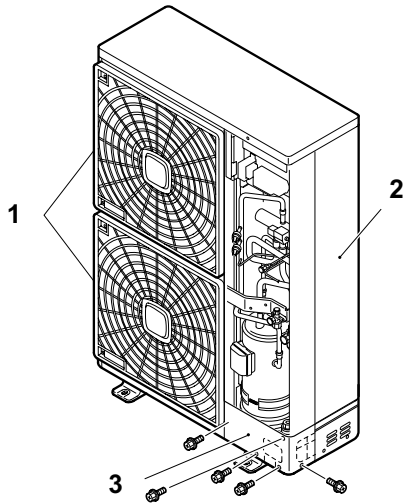
9.4 Removing the lower part of service panel and rear panel

Remove the five (5) fixing screws at the lower part of the service panel and remove the lower part of the service panel by pulling towards the front side. Remove the upper cover according to section “Removing upper cover” in this chapter.

 NOTE

The length of fixing screws for the outdoor temperature thermistor is different than all other screws in the machine, as an assembly poka-yoke.

No.	Part
1	Rear panel
2	Screws
3	The lower part of service panel



9.5 Removing outdoor fan motor

Remove the service cover according to the section *Removing service cover* in this chapter.

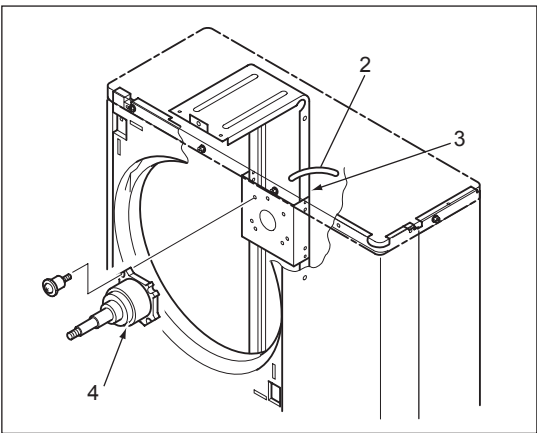
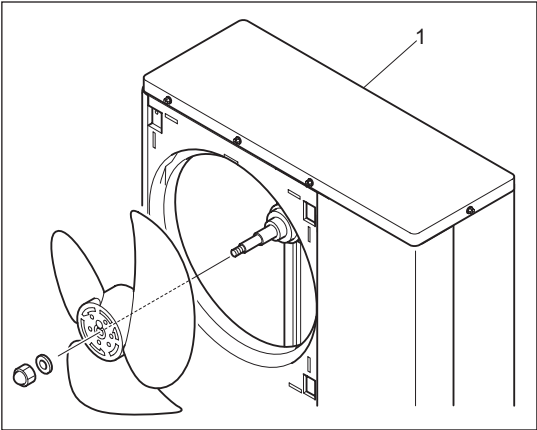
Remove the air outlet grille according to the section *Removing air outlet grille* in this chapter.

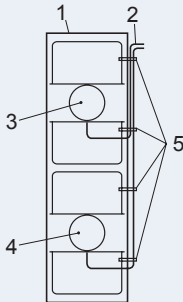
Remove the upper cover according to the section *Removing upper cover* in this chapter.

Disassembly the fan blade by removing the cap nuts and washers fixing the fan blade onto the motor shaft.

If the fan blade get stuck when trying to remove it, use a puller to disassembly the fan.

No.	Part
1	Upper cover
2	Fan motor lead wire
3	Motor clamp
4	Fan motor



Fan components and technical features															
Power supply		1~ 230V 50Hz 3N~ 400V 50Hz													
Fan motor	DC fan motor UP	DIP IPM PCN202 CN202													
	DC fan motor DOWN	DIP IPM PCN201 CN201													
Screw for motor fixing	DC Fan Motor UP	M4 Screw with spacer x 4													
	DC Fan Motor DOWN	M4 Screw with spacer x 4													
Motor clamp and wiring fixing position		<table><tr><th>No.</th><th>Part</th></tr><tr><td>1</td><td>Motor clamp</td></tr><tr><td>2</td><td>Fan motor lead wire</td></tr><tr><td>3</td><td>DC fan motor UP</td></tr><tr><td>4</td><td>DC fan motor DOWN</td></tr><tr><td>5</td><td>Cable tie</td></tr></table>	No.	Part	1	Motor clamp	2	Fan motor lead wire	3	DC fan motor UP	4	DC fan motor DOWN	5	Cable tie	
No.	Part														
1	Motor clamp														
2	Fan motor lead wire														
3	DC fan motor UP														
4	DC fan motor DOWN														
5	Cable tie														

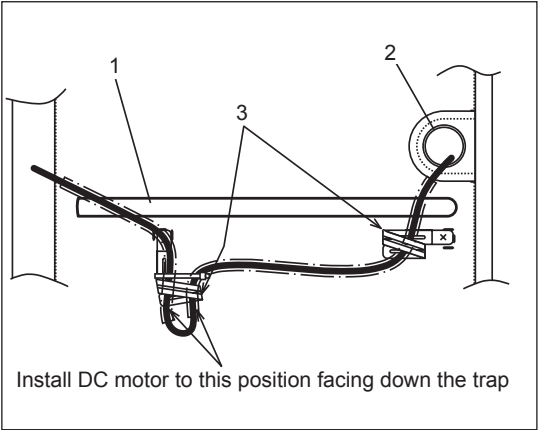
Remove the fan motor connector from the PCN202 and PCN203 at the electrical box.

- Cut off the cable tie that fixes the lead wire of the fan motor.
- Remove the four (4) screws that fix the motor to the motor clamp.

Fix the motor wire with the cable tie or the cord clamp. If not, it may cause the disconnection of the fan motor's lead wire.

In order to avoid cutting edges, mount the rubber bush at the partition plate when inserting the motor wire through it. If not, it may cause the disconnection to the fan motor's lead wire.

No.	Part
1	Partition plate
2	Rubber bush
3	Cord holder or cable tie



NOTE

- When assembling the motor, ensure the cables section directly downwards. Fix the protection tube edge end downwards to ensure water from keeping inside it.
- Fix the motor wires onto the motor clamp with a cable tie to prevent them from colliding the fan blades.
- Assembling the fan blade: Insert the skidding protection part of fan boss in accordance with the cutting part of the motor shaft, and fix the screw after dismounting the screwed part of the shaft. (Tightening Torque of 20 N.m)
- When connecting the motor wire, check to ensure that the colours of the connectors on the PCN201 and PCN202 are matched with the wires.
- Fix the air outlet grille firmly to the shroud.

10. Troubleshooting

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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 outdoor unit.
- 2 Turn on the outdoor unit
- 3 Auto-addressing starts. (outdoor unit printed circuit board PCB 1). During the auto-addressing, you can check the following items using the 7-segment display of the outdoor unit.
 - a. Disconnection of the power supply to the indoor unit.
 - b. Duplication of the indoor unit number.

Normal case

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

Abnormal case

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

Cause	Indication	Remarks
a. The indoor units are not supplied with power.	03	Continues to flash after 30 seconds.
b. Disconnection of the operating line between the outdoor units and the indoor units.	03	Continues to flash after 30 seconds.
c. Duplicated settings of the indoor unit number on the rotary switch RSW (Refer to the section Troubleshooting by alarm code for the description of the alarm code "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	Solve the cause of the short circuit and replace the fuse
	Short circuit of the wires to earth	Measure the insulation resistance	Solve 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	Solve the cause of the short circuit and replace the fuse
	Short circuit of the control circuit to earth	Measure the insulation resistance	Solve 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 using 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

*1): Refer to section [Self-checking procedure of the remote control switch](#).

*2): Refer to section [Self-checking procedure of PCB using 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 outdoor 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 outdoor unit fan motor	Disconnected coil	Measure the coil resistance using the tester	Replace the outdoor unit fan motor
		Burnt-out coil	Measure the insulation resistance	
	Failure of the magnetic switch for the outdoor unit fan motor	Insufficient contacting	Measure the voltage between the contacting parts	Replace PCB for the outdoor unit
	Failure of the 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
The compressor does not stop or start even if the setting temperature on the LCD changes to *3)	Failure of air inlet thermistor	Failure of thermistor	Check it by self-checking *1)	Replace or correctly connect the wires if abnormal operation exists
		Disconnection of thermistor		
	Abnormal operation of the remote control switch cord			
	Failure of the indoor unit PCB		Check PCB using the self-check mode *2)	Replace PCB if it failed

Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
The comp. does not stop or start even if the setting temperature on LCD changes to *3)	Incorrect optional setting	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.	If the thermostat of the remote control switch is not used, set at "00"
	Incorrect input/output setting	Check setting condition of "i1" and "i2" by input/output setting. * Setting and control: "01": Room thermostat (cooling) "02": Room thermostat (heating)	In case that room thermostat is not used, set for input signal actually used. If no signal is used, set at "00"



NOTE

*1): Refer to section [Self-checking procedure of the remote control switch](#).

*2): Refer to section [Self-checking procedure of PCB using 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 outdoor unit and a different mode as heating (or cooling) process signal is given to the indoor units.
4. When an emergency stop signal is given to outdoor unit.

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Indoor fan speed does not change	Failure of the discharge air temperature thermistor	Failure of the thermistor	Check the thermistor using the self-check mode *1)	Replace or correctly connect the wiring when it is abnormal
		Disconnected wire of the thermistor		
	Failure of the remote control switch		Check it using the self-check mode *2)	Replace if it failed
	Failure of PCB for the indoor unit			Replace if PCB fails
No defrost operation mode is available during the heating process or the defrost operation continues	Failure of thermistor for outdoor evaporating temperature during heating	Failure of thermistor	Replace or correctly connect when it is abnormal	
		Disconnected wire of thermistor		
	Failure of 4-way valve	Disconnected 4-way valve coil	Measure the resistance of coil	Replace the 4-way valve
		Incorrect activation of 4-way valve	Enforced power supply	
	Disconnected control wires between indoor unit and outdoor unit		Check the connectors	Correctly connect the wiring
	Failure of the outdoor units of PCB	Disconnected wiring to PCB	Check the connectors	Correctly connect the wiring
		Failure of PCB	Check PCB using the self-check mode *2)	Replace PCB when the check mode is not available
	Failure of the indoor unit of PCB	Disconnected wiring to PCB	Check the connectors	Correctly connect the wiring
		Failure of PCB	Check PCB using the self-check mode *2)	Replace if PCB fails
	The LED and the LCD on the remote control switch remain ON			



NOTE

*1): Refer to section [Self-checking procedure of the remote control switch](#).

*2): Refer to section [Self-checking procedure of PCB using the remote control switch](#).

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

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



NOTE

*1): Refer to section [Refrigerant charge amount](#) in this document.

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

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.
- E: If there are various indoor units connected, the above mentioned information is shown for each one of them.

Write down the indications and contact your HITACHI service supplier.

- Power supply failure.

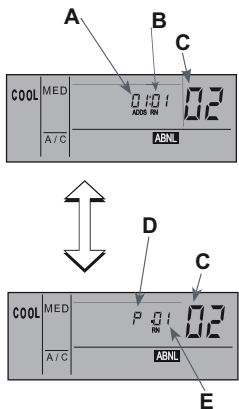
All displays disappear.

If the unit stops due to a power shortage, it will not start again, even though the power comes back on. Carry out the start-up operations again.

If the power failure lasts less than 2 seconds, the unit will start again automatically.

- Electrical noise

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



NOTE

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

Model code	
Indication	Model
H	Heat pump
P	Inverter
F	Multi (SET-FREE)
C	Cooling only
E	Other
b	IVX, individual operation
L	KPI

10.2.2 Alarm codes

The RUN LED flickers and "ALARM" is displayed on the remote control switch.

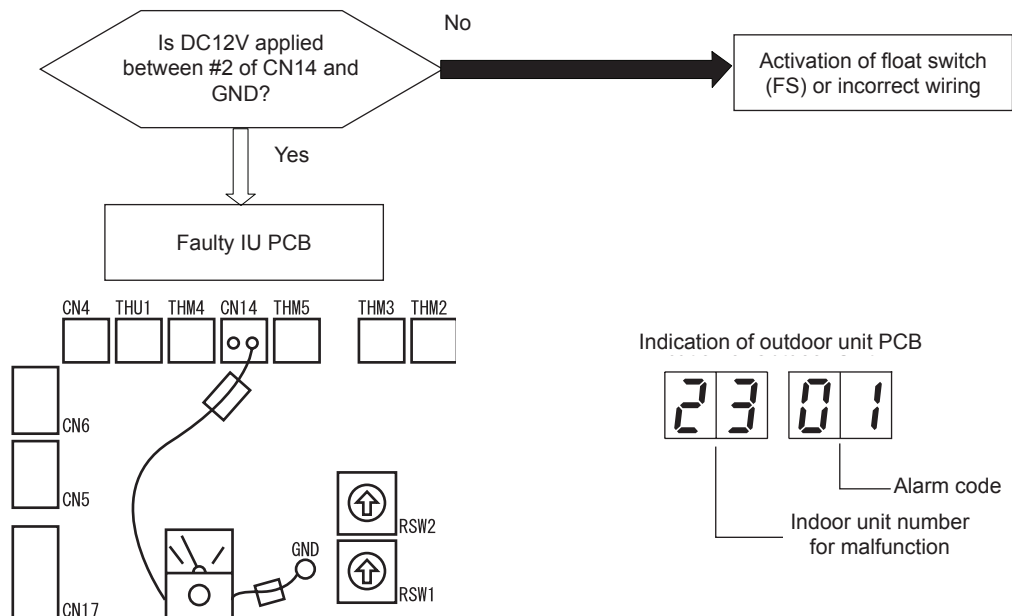
Code number	Category	Abnormality	Cause
01	Indoor unit	Activation of the safety device	Failure of fan motor, drain discharge, PCB, relay, float switch activated
02	Outdoor unit	Activation of the safety device	Activation of PSH, locked motor, abnormal operation in the power supply phase
03	Transmission	Abnormal transmission between outdoor and indoor units	Incorrect wiring, failure of PCB, tripping of fuse, power supply OFF
04		Abnormal transmission between inverter PCB (DIP-IPM) and outdoor unit PCB (PCB1)	Abnormal transmission between PCB
05	Power supply	Abnormal operation of picking up phase signal	Main power supply phase is reversely connected or one phase is not connected.
06	Voltage	Excessively low voltage or excessively high voltage for the inverter	Incorrect wiring or insufficient capacity of power supply wiring
07	Cycle	Excessively low discharge gas superheat temperature	Discharge gas superheat less than 10 degrees is maintained for 30 minutes.
08		Excessively high discharge gas temperature at the top of compressor	Temperature of top compressor: Td Td > 132°C over 10 minutes, or Td > 140°C over 5 minutes
11	Sensor on indoor unit	Air inlet thermistor	Failure of thermistor, sensor, connection.
12		Air outlet thermistor	
13		Freeze protection thermistor	
14		Gas piping thermistor	
15	Econofresh	Abnormal operation of thermistor for fresh outdoor air	
16	Sensor on indoor unit	Remote thermistor	Failure of thermistor
17		Thermistor of RCS	Failure of thermistor
19		Activation of the protection device for the indoor fan motor	Failure of fan motor
21	Sensor on outdoor unit	High pressure sensor	Incorrect wiring, disconnected wiring, broken cable, short circuit.
22		Thermistor for outdoor ambient temperature (THM7)	Failure of thermistor, sensor, connection.
23		Thermistor for discharge gas temperature (THM9)	Incorrect wiring, disconnected wiring, broken cable, short circuit.
24		Thermistor for evaporating temperature (THM8)	Failure of thermistor, sensor, connection.
29		Low pressure sensor	Incorrect wiring, disconnected wiring, broken cable, short circuit.
31	System	Incorrect capacity setting or combined capacity between outdoor and indoor units	Incorrect setting of the capacity code.
35		Incorrect indoor unit number setting	Duplication of indoor unit number , number of indoor units over specifications.
36		Incorrect indoor unit combination	R22 indoor unit
38		Abnormality of picking up circuit for protection (Outdoor unit)	Failure of indoor unit PCB, incorrect wiring, connection to PCB in indoor unit.

Code number	Category	Abnormality	Cause
43	Pressure	Activation of the safety device from compression ratio decrease	Abnormal compress (Compressor, Inverter damage)
44		Activation of the safety device from excessively high suction pressure	Overload during cooling, high temperature with heating, locked expansion valve
45		Activation of the safety device from excessively high discharge pressure	Overload (obstruction of heat exchanger, short circuit) mixture of inert gas
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, fan motor locked.
48	Inverter	Activation of overcurrent protection activation for inverter	Failure of DIP-IPM, heat exchanger clogged, locked compressor, EVI/EVO failure or overcharge.
51		Abnormality of current sensor for inverter	Failure of control PCB, inverter module.
53		Protection activation of inverter module	Inverter module abnormality. Failure of compressor, clogging of heat exchanger.
54		Inverter fin temperature increase	Abnormal inverter fin thermistor, clogging of heat exchanger, abnormal outdoor fan.
55		Inverter module abnormality	Failure of inverter module.
57	Outdoor fan	Fan motor abnormality	Disconnected wire of incorrect wiring between control PCB and inverter PCB. Incorrect wiring or fan motor abnormality.
b1	Indoor unit number setting	Incorrect setting of the unit and the refrigerant cycle number.	Over 64 indoor units setting by number or indoor unit address.
b5		Incorrect indoor unit connection number setting	There are more than 17 units not corresponding to H-Link II connected to one system
EE	Compressor	Compressor protection	Failure of compressor.

10.2.3 Troubleshooting by alarm code

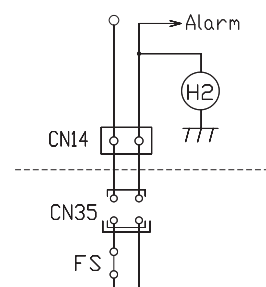
Alarm code	01	Activation of the safety device (flow switch) in the indoor unit (except RPK series)
------------	-----------	--

- 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.



If all the above checks have been overcome, see the status of the following item:

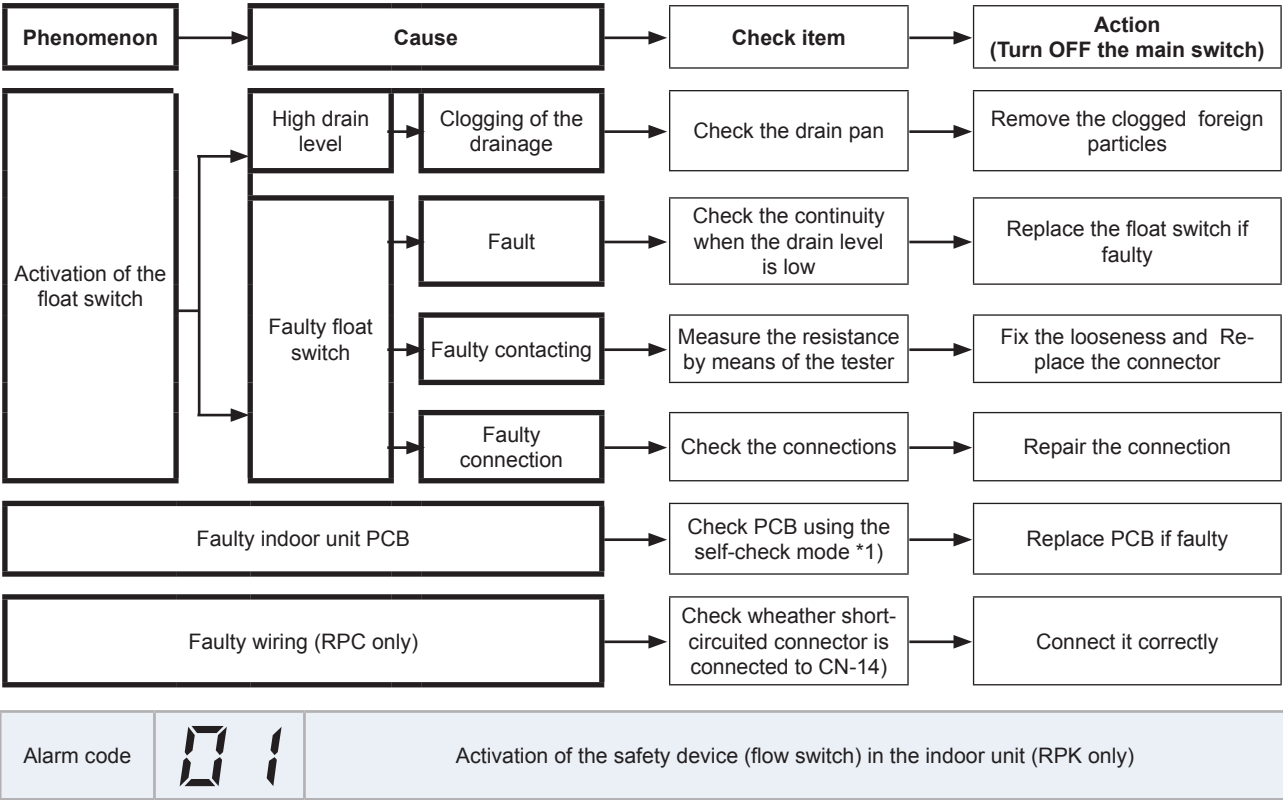
- Check if float switch (FS) connected to the CN14 is open/activated by using a tester.



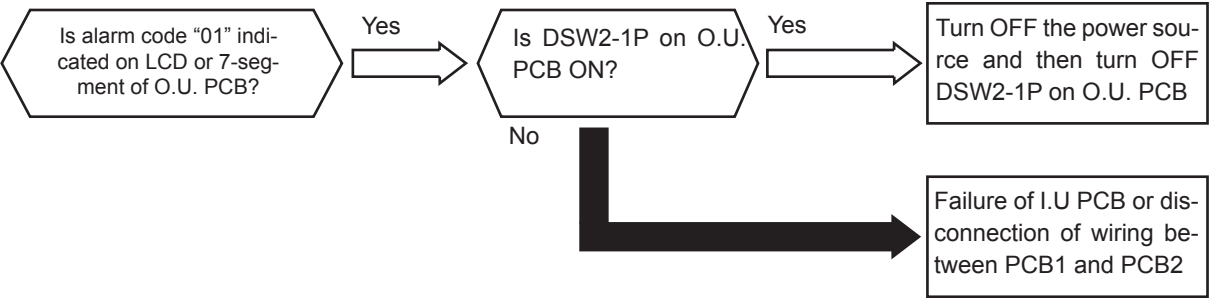
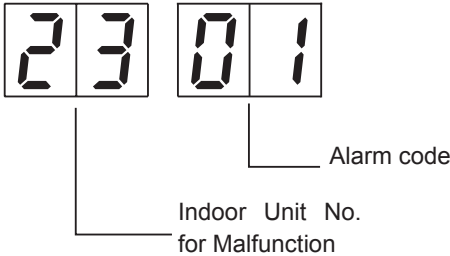
CN14: Safety devices line scheme

i NOTE

*1): Refer to section "Self-checking procedure of PCB by means of the Remote Control Switch" in this chapter.



Indication of Outdoor Unit PCB



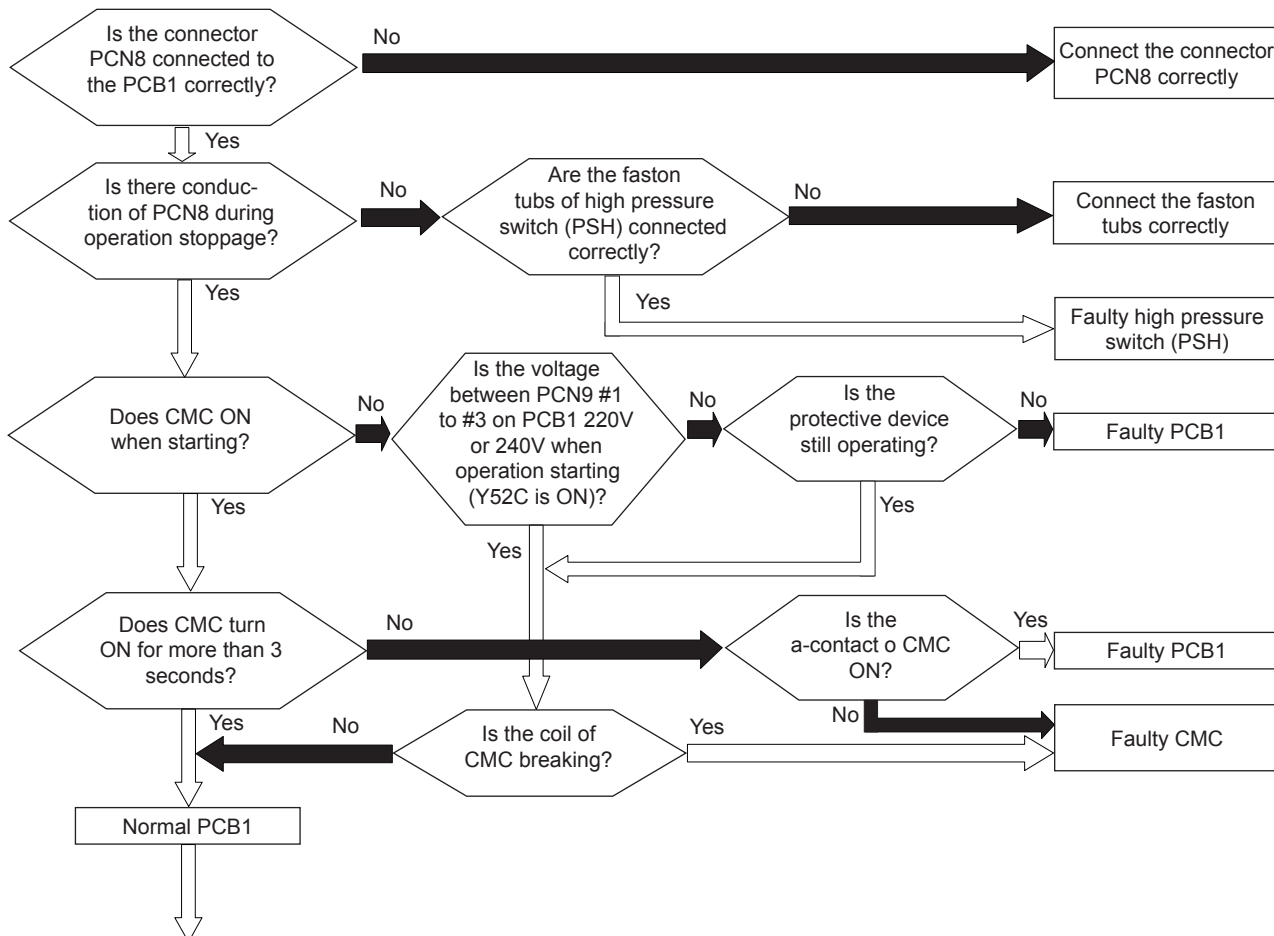
Alarm code

02

Activation of the safety device in the outdoor unit

- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
- This alarm is indicated when one of safety devices is activated during compressor running.

PCB1: Control PCB in outdoor unit



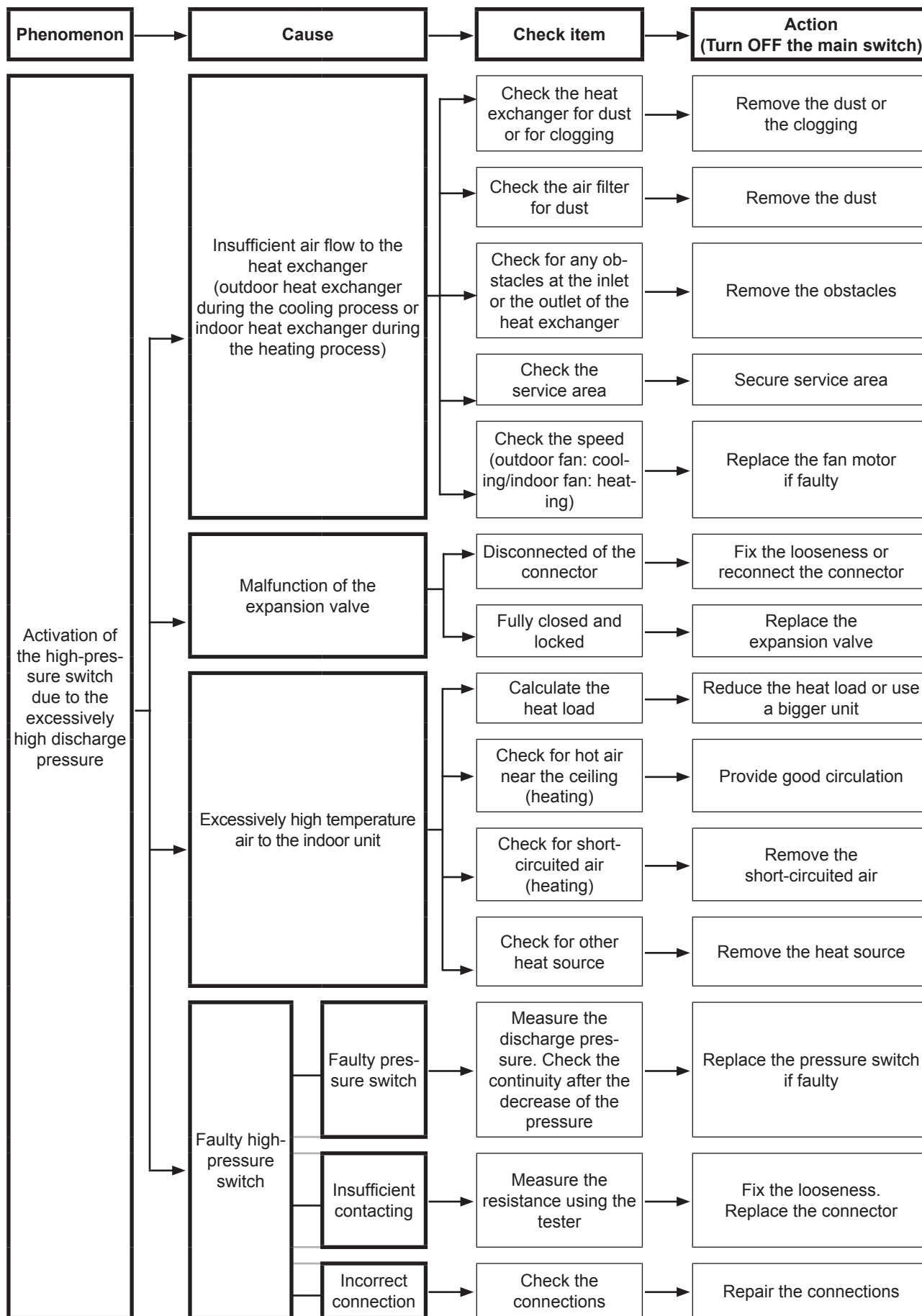
Check activation of the following safety devices and the power source wiring.

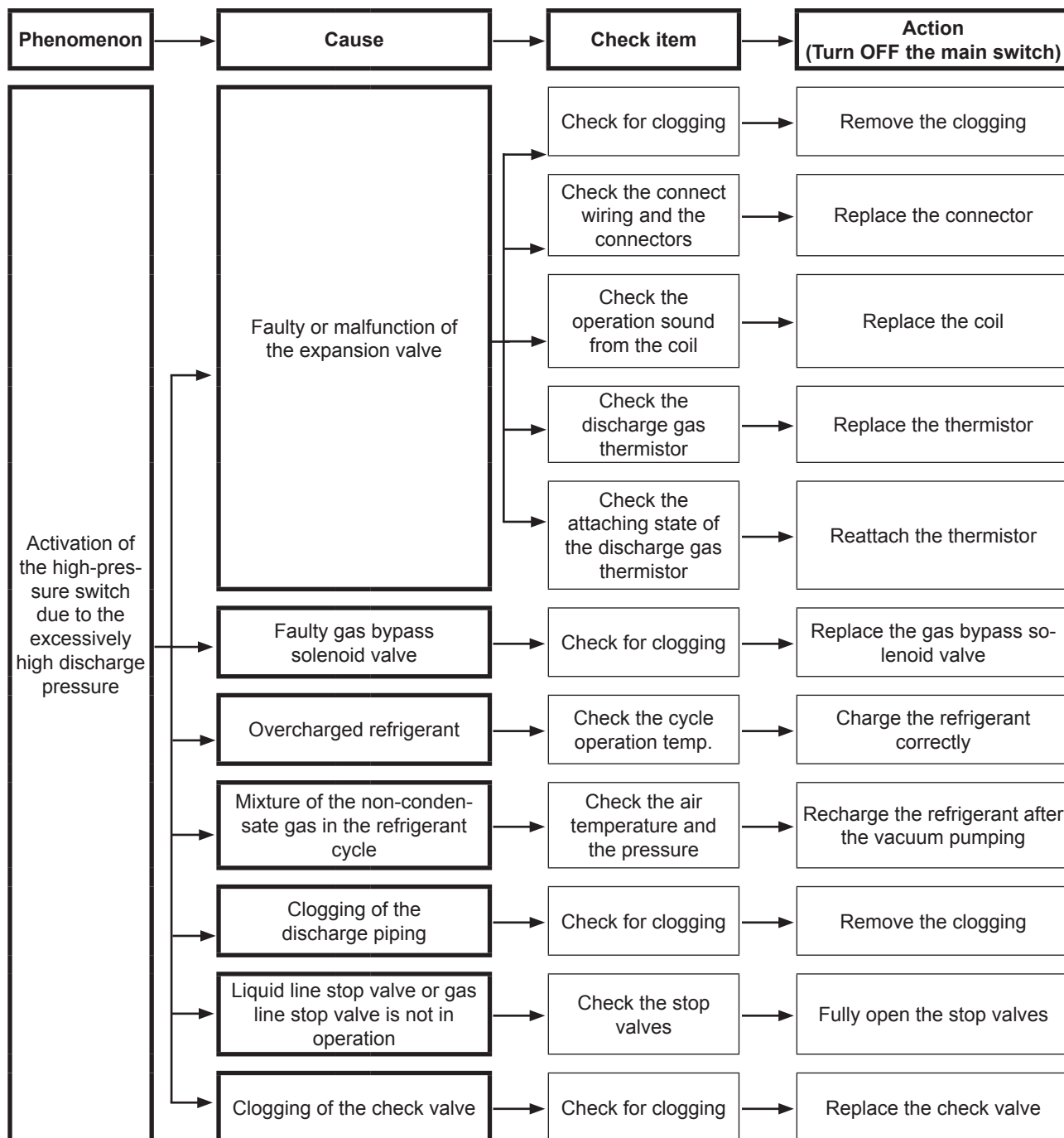
Remove the cause after checking.

(1) High pressure switch (PSH: 4.15MPa)

(2) Is the power source line reverse phase or open phase?

If the wiring is incorrect, perform the wiring correctly again.

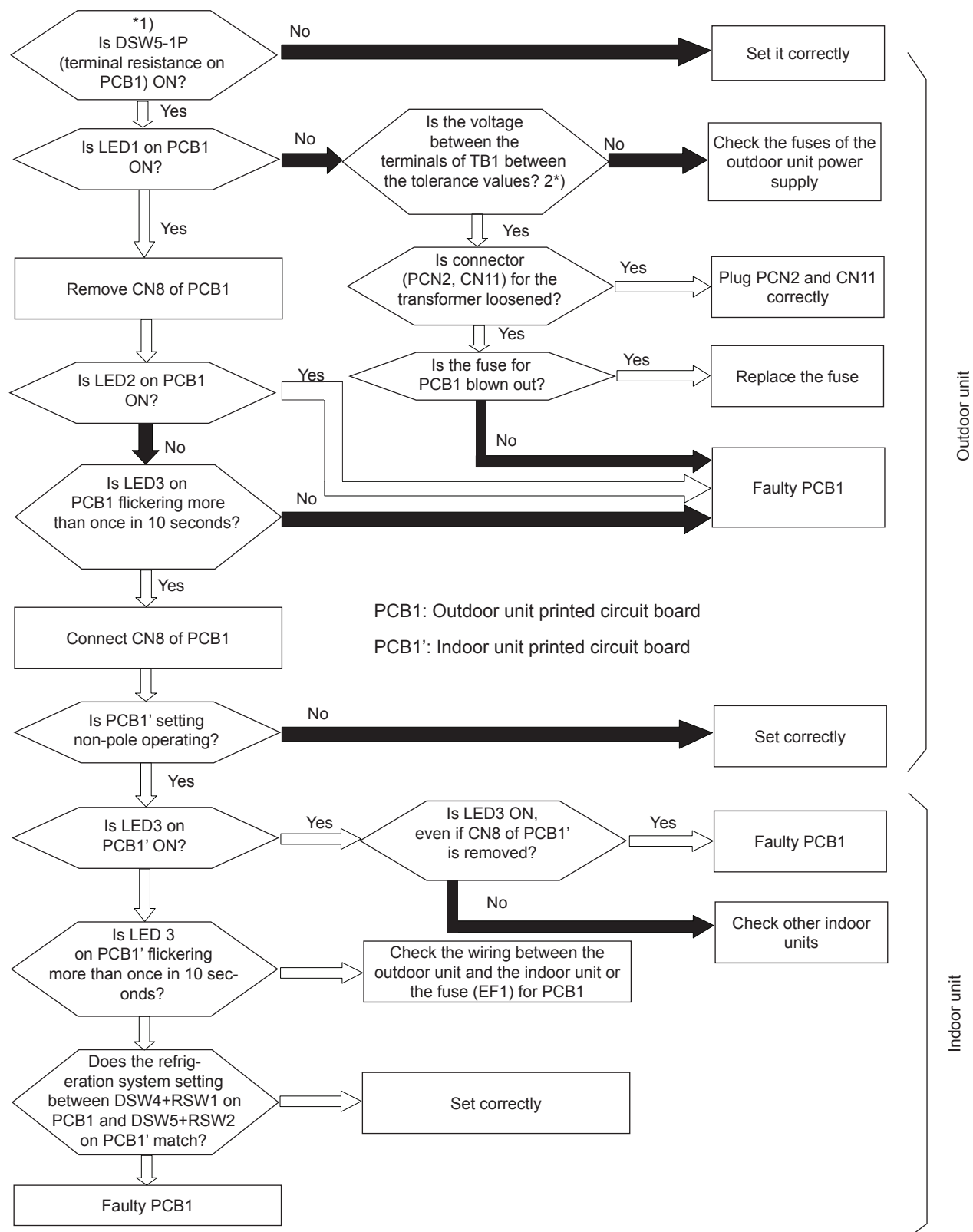




Alarm code	03	Abnormal transmission between outdoor and indoor units
------------	----	--

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

(Refer to the next page)

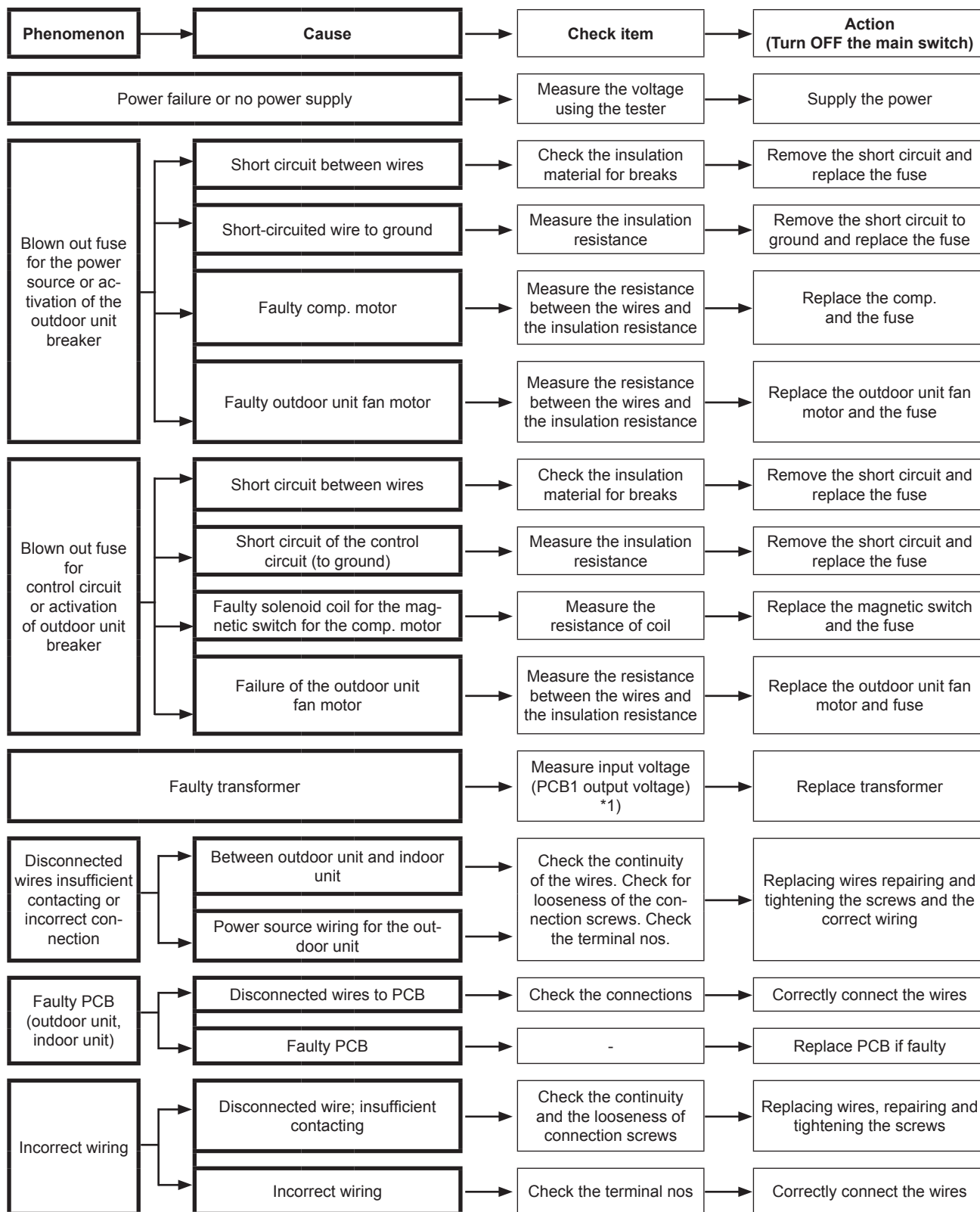


*1) In case that terminal resistance (DSW5-1P) is OFF when H-Link II connection is performed.

- Set the terminal resistance to ON when CN8 is removed.
- Set the terminal resistance to OFF when CN8 is reconnected.

*2) Check item

Power supply	Faston terminal
1~ 230V 50Hz 3N~ 400V 50Hz	Between terminals of TB1



*1)

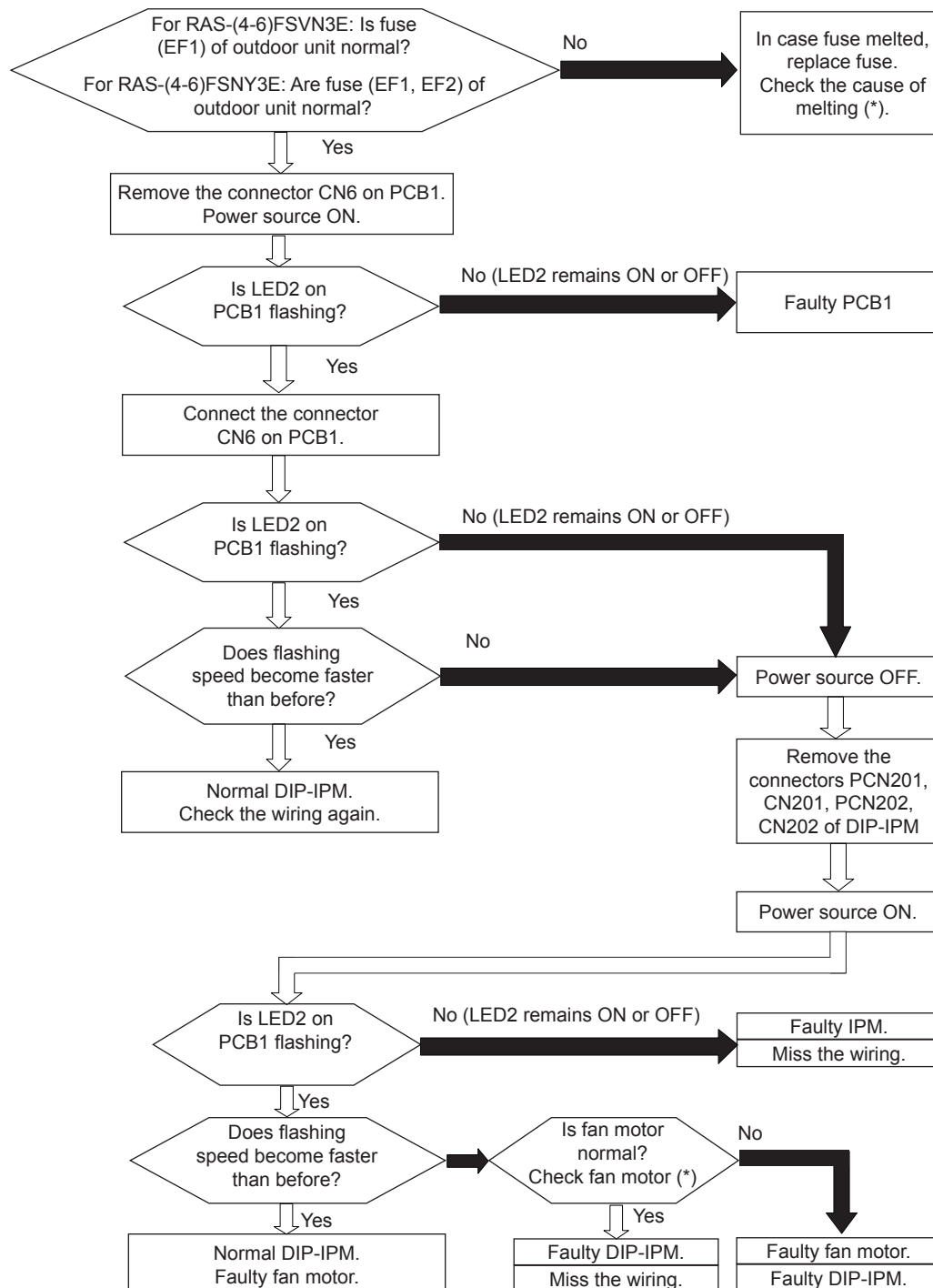
PCB1 output voltage	Voltage
Vcc 12 - GND2	12VDC
Vcc 05 - GND1	5 VDC
Vcc 15 - GND1	15 VDC
Vcc 24 - GND1	24 VDC
Vcc 12T - GND1	12 VDC

Alarm code

04

Abnormal transmission between inverter PCB (DIP-IPM) and outdoor unit PCB (PCB1)

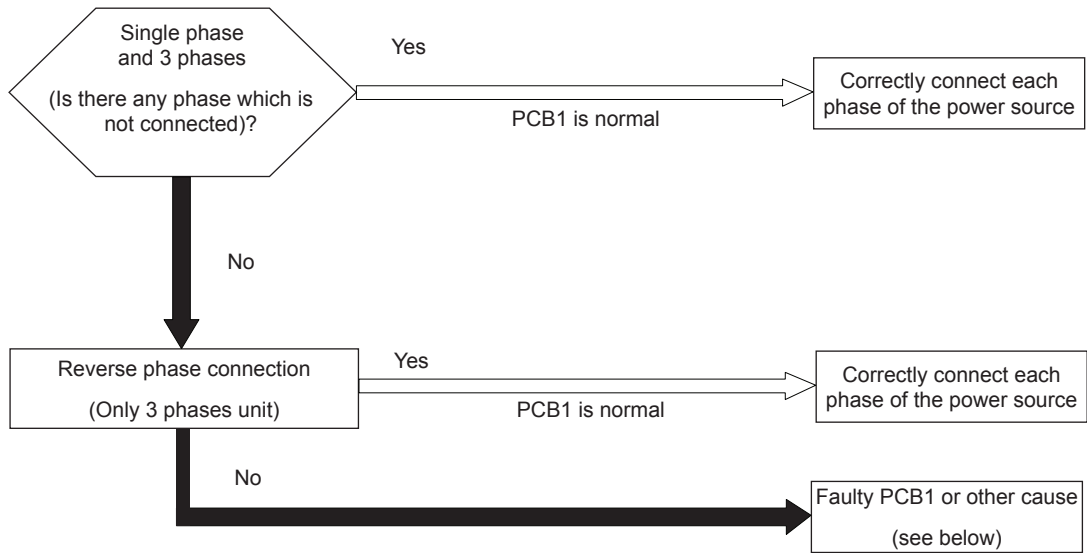
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
- This alarm is displayed when the abnormal operation is maintained for 30 seconds after the normal transmission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



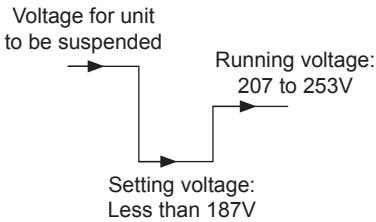
(*) Check to ensure fan motor troubleshooting. If not, faulty fan motor may damage the normal DIP-IPM.

Alarm code	05	Abnormal operation of picking up phase signal
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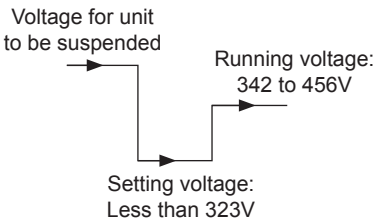
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
- This alarm is displayed when the main power source phase is reversely connected or one phase is not connected.



RAS-(4-6)FSVN3E



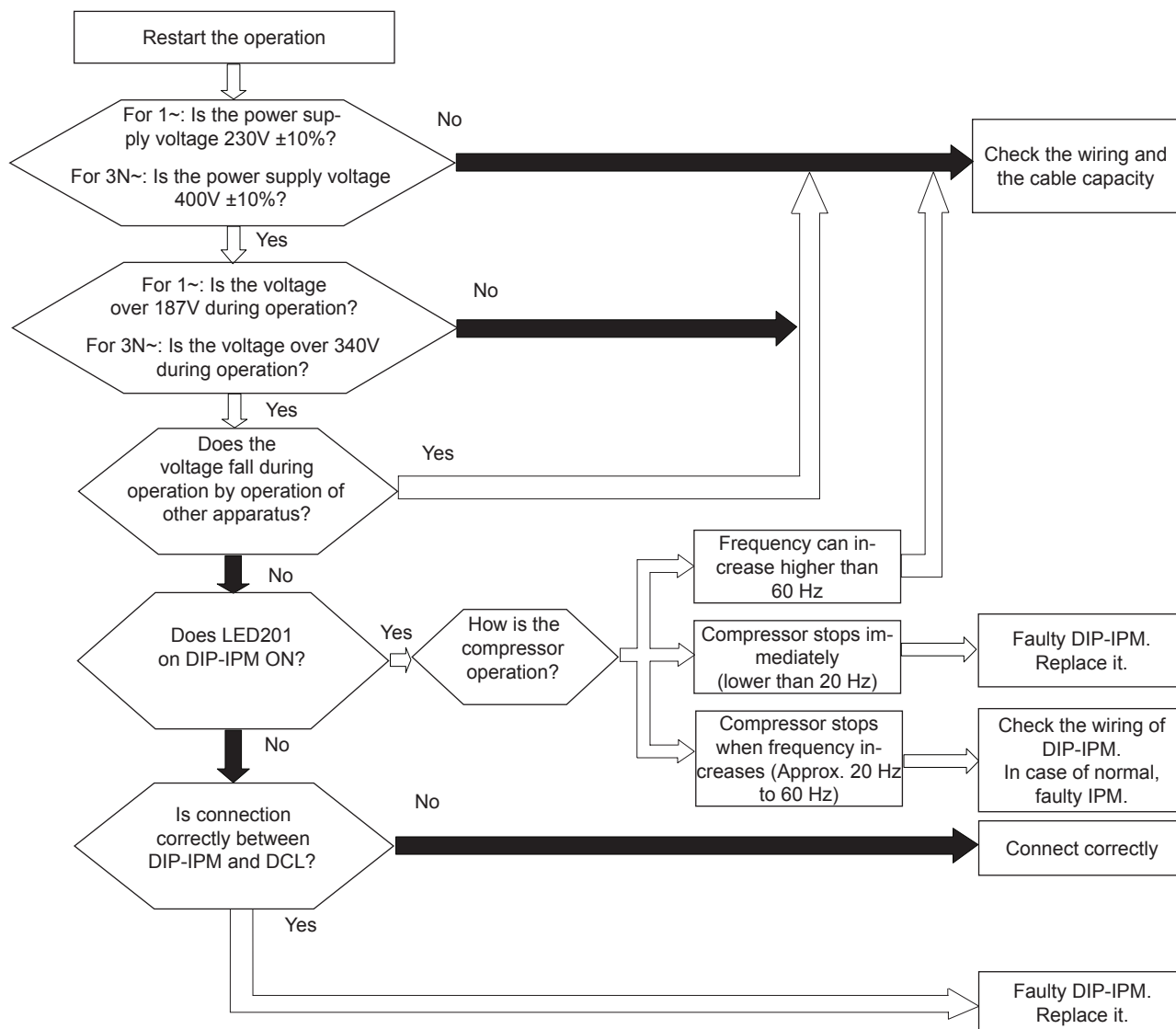
RAS-(4-6)FSNY3E



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

Alarm code	06	Excessively low voltage or excessively high voltage for the inverter
------------	-----------	--

- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
- This alarm code is indicated when voltage of DIP-IPM is insufficient or excessive and its occurrence is three times in 30 minutes. In the case that the occurrence is smaller than 2 times, retry is performed.



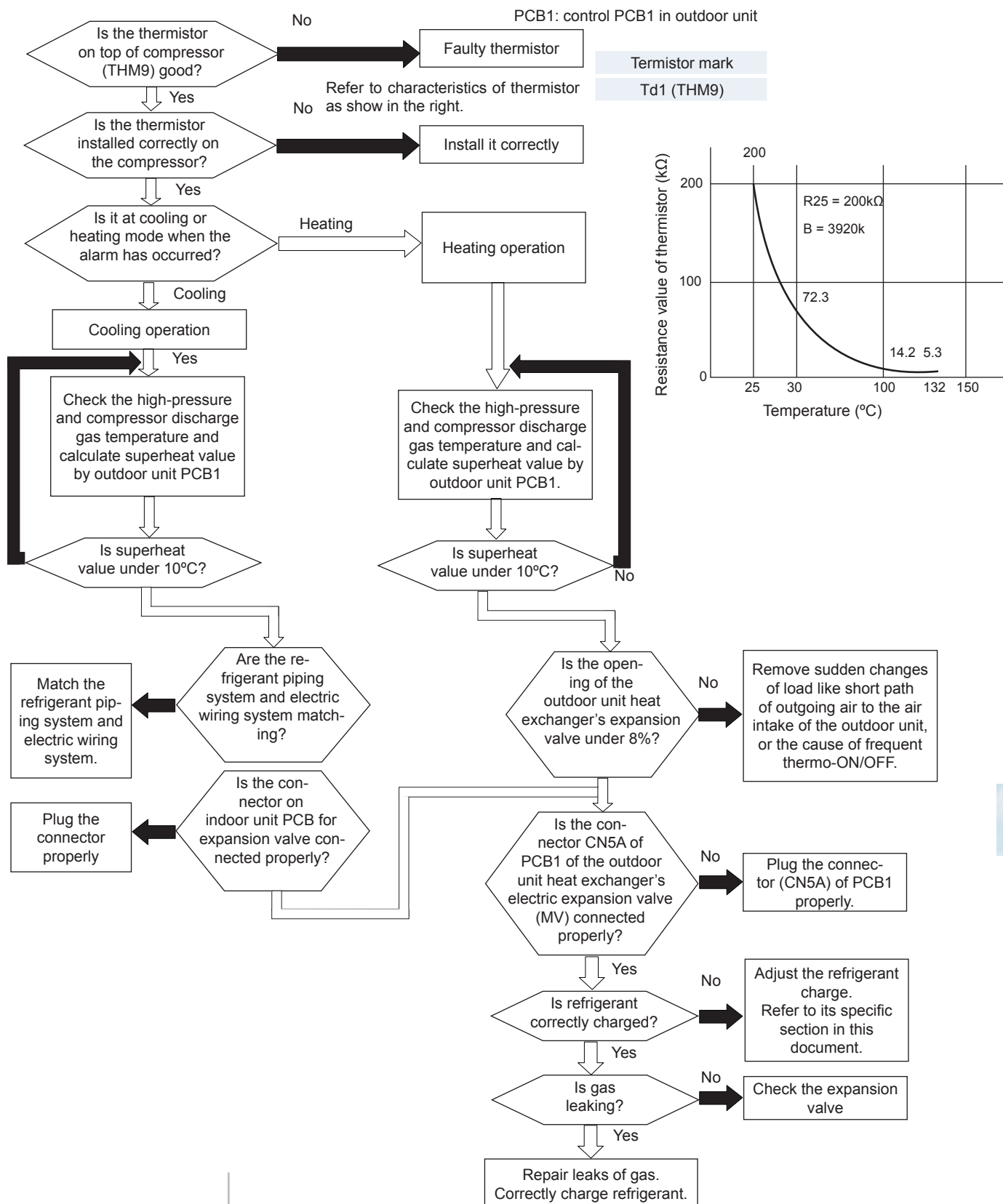
Alarm code

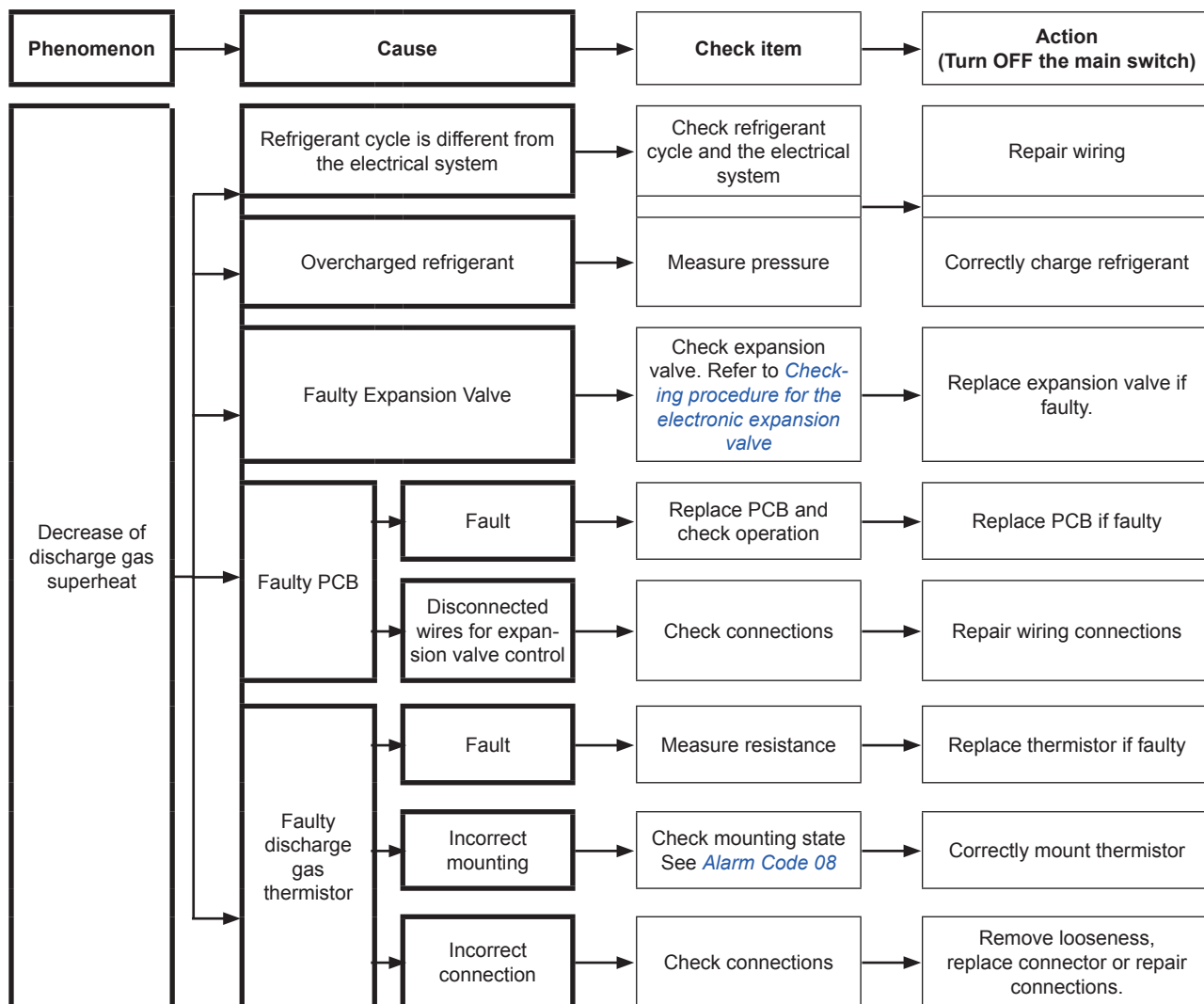
07

Excessively low discharge gas superheat temperature

- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.

In the case that the discharge gas superheat less than 10 deg. at the top of the compressor is maintained for 30 minutes, retry operation is performed. However, when the alarm occurs twice within two hours, this alarm code is indicated.

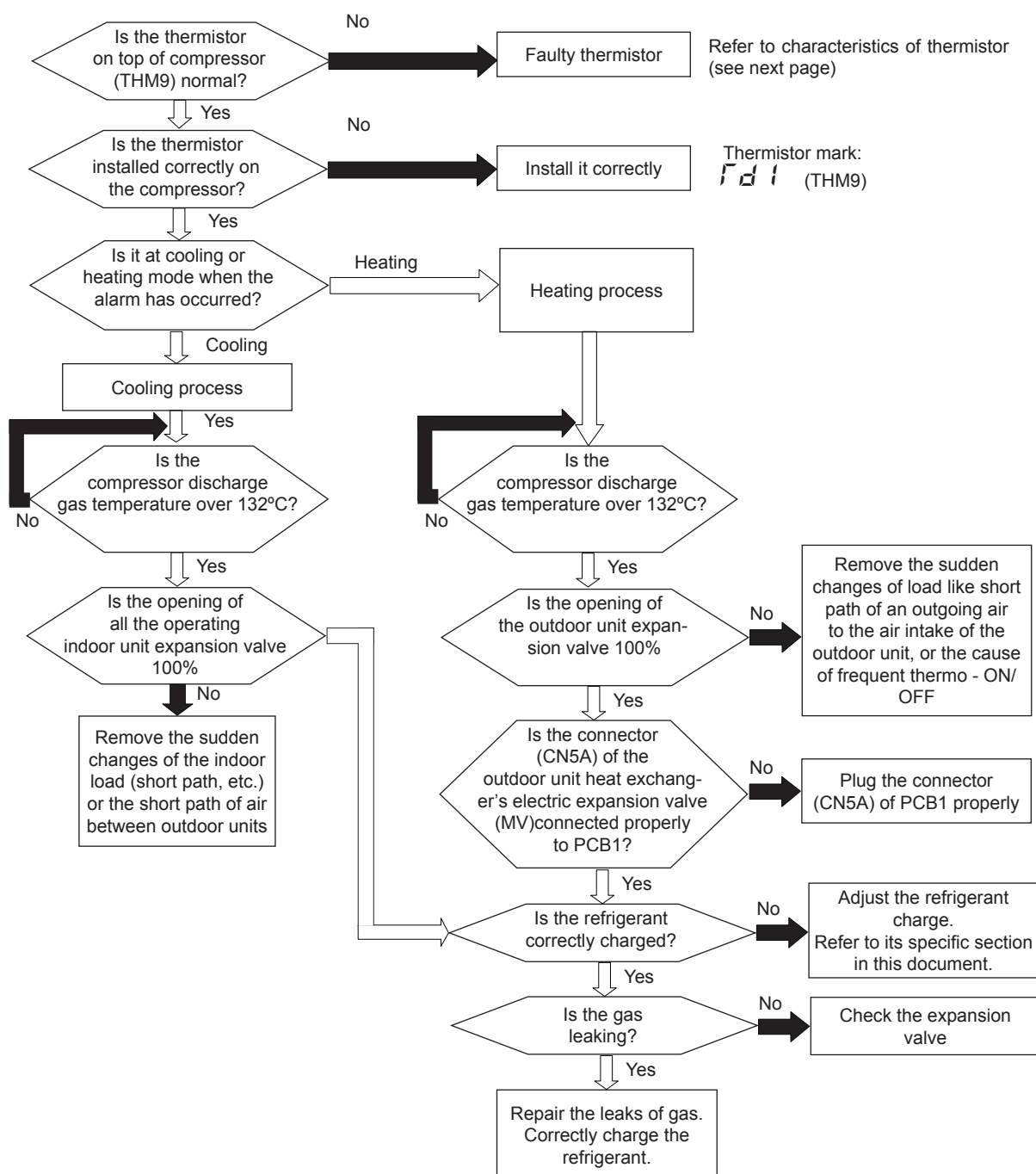




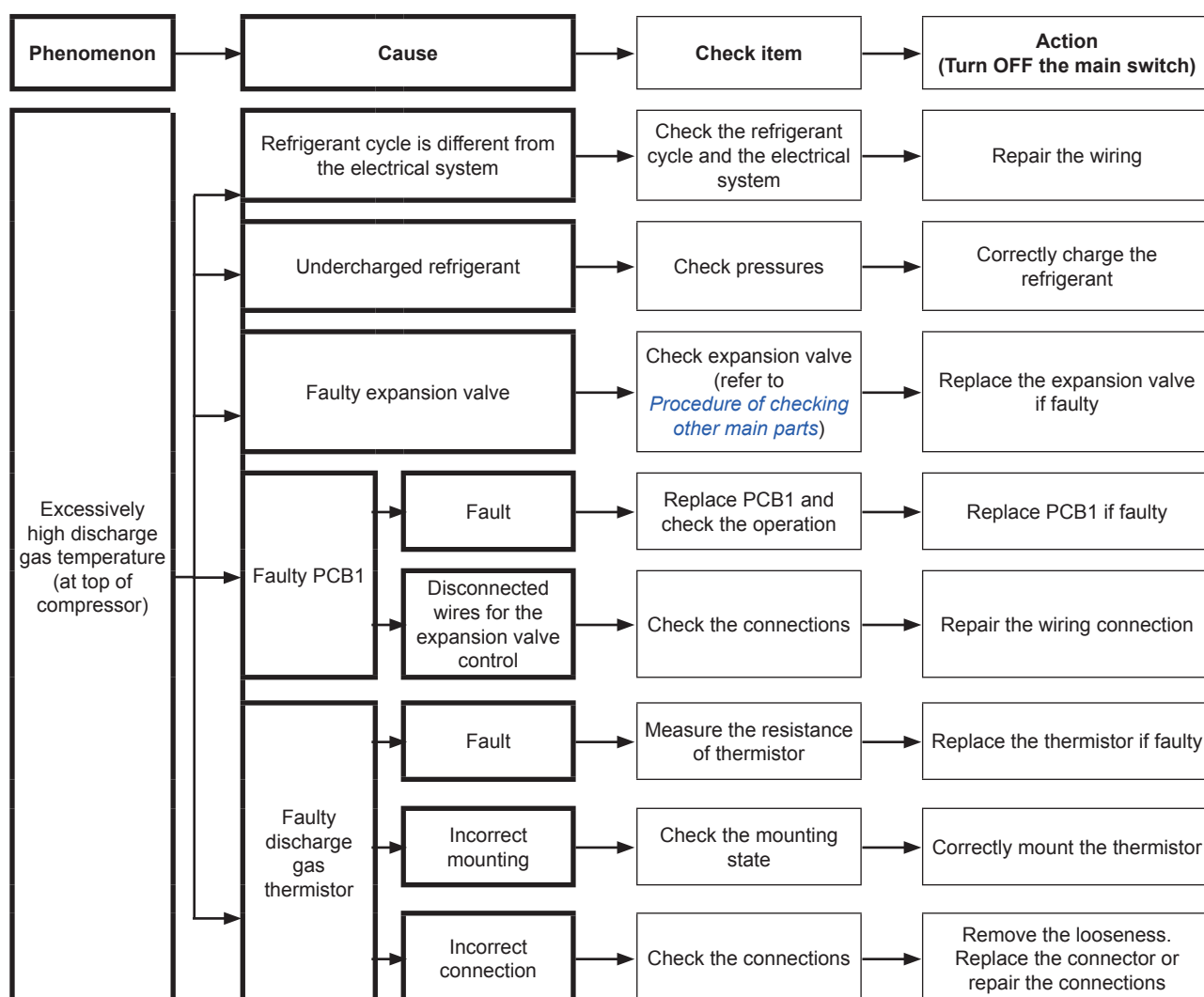
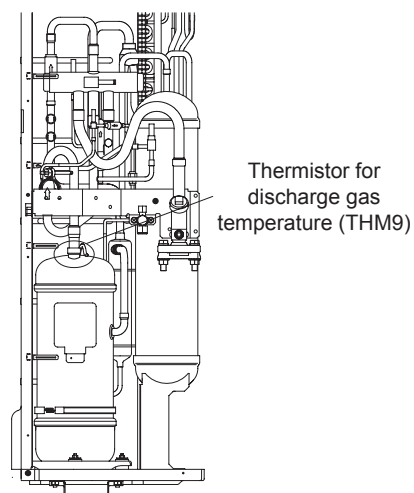
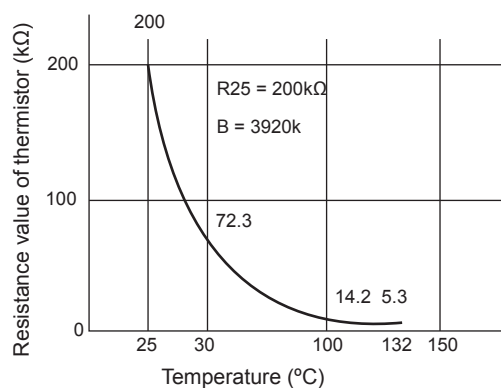
Alarm code	08	Excessively high discharge gas temperature at the top of the compressor chamber
------------	-----------	---

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

PCB1: outdoor unit printed circuit board

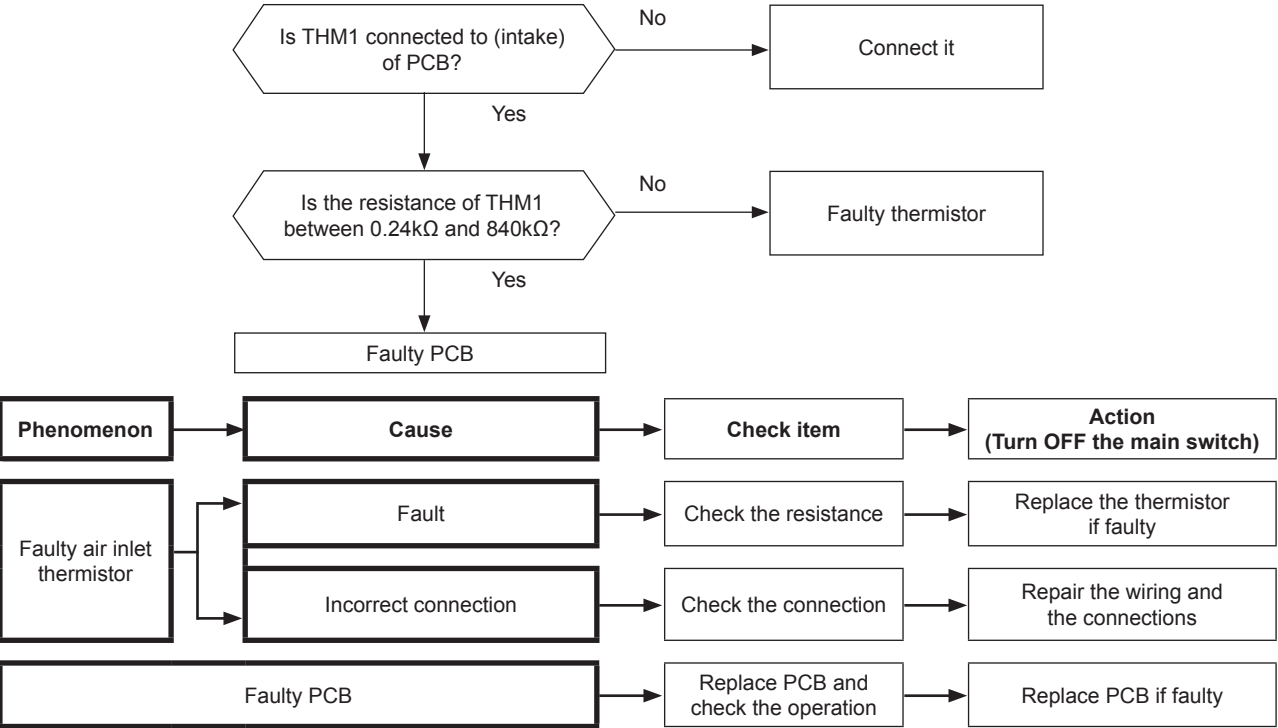


Characteristics of thermistor



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

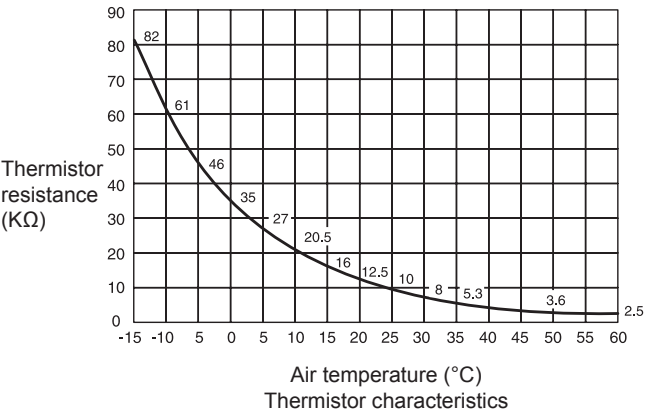
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
- This alarm code is displayed when the thermistor is short-circuited (less than 0.24 kΩ) or cut (greater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



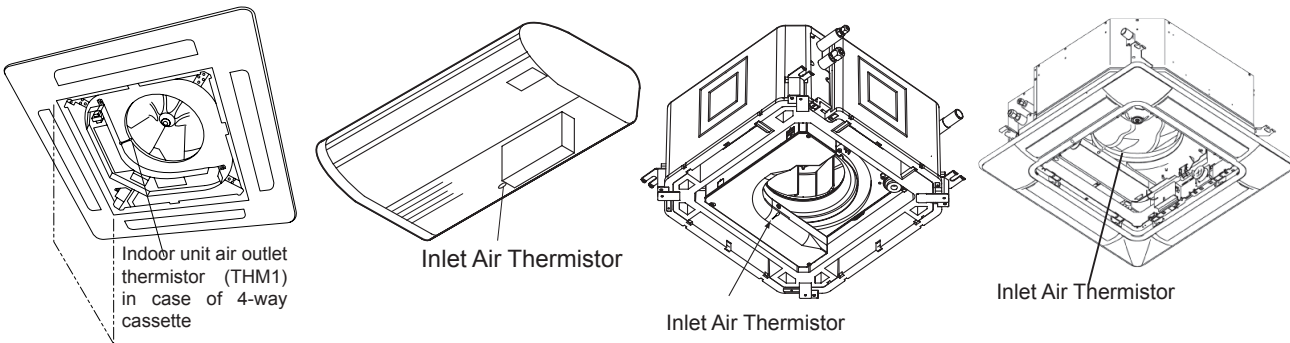
i NOTE

This data is applicable to the following thermistors:

- Indoor unit discharge air temperature.
- Indoor unit liquid refrigerant temperature.
- Indoor unit air inlet temperature.
- Outdoor temperature (Outdoor unit inlet air temperature).
- Outdoor unit evaporating temperature.
- Indoor unit gas piping.

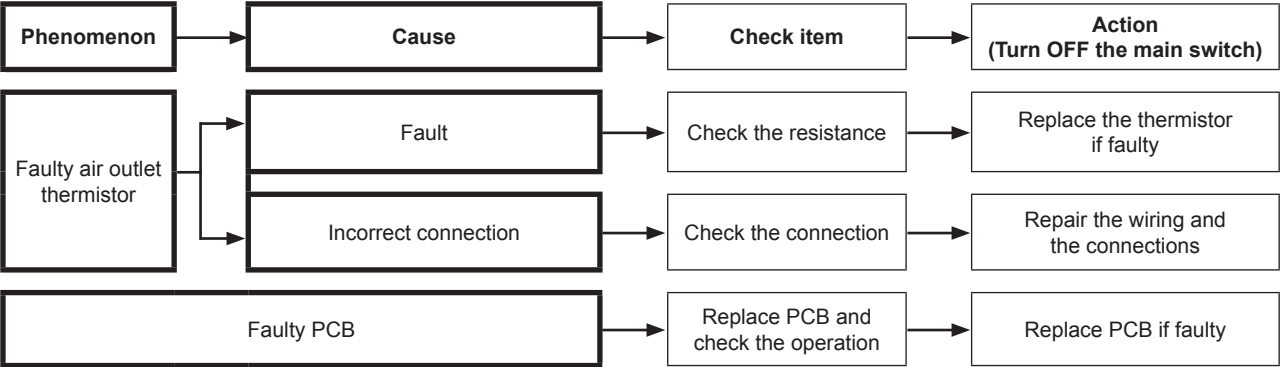
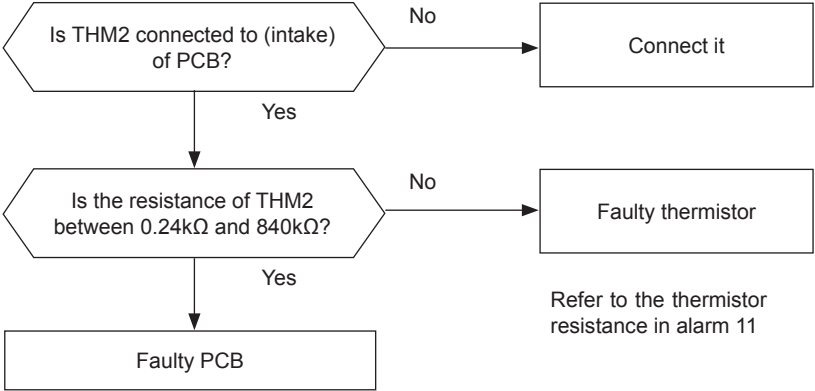


◆ Examples

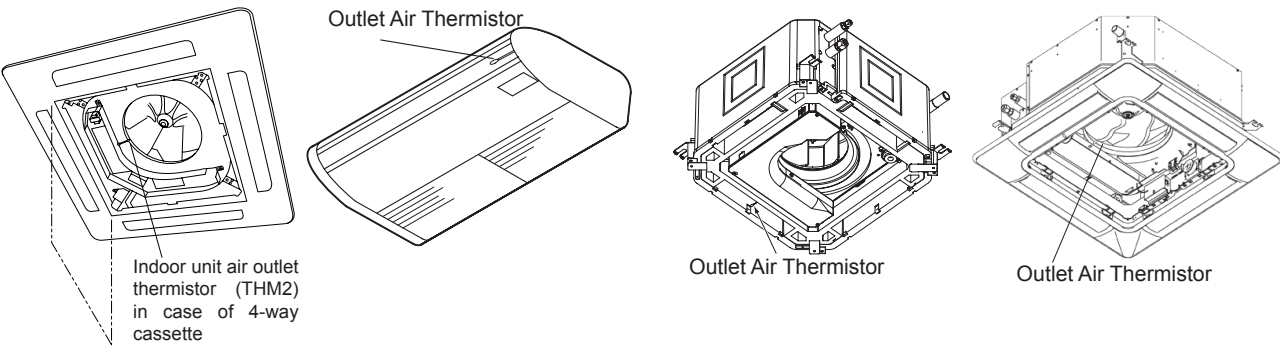


Alarm code	12	Abnormal operation of the thermistor for the indoor discharge air temperature (air outlet thermistor)
------------	-----------	---

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

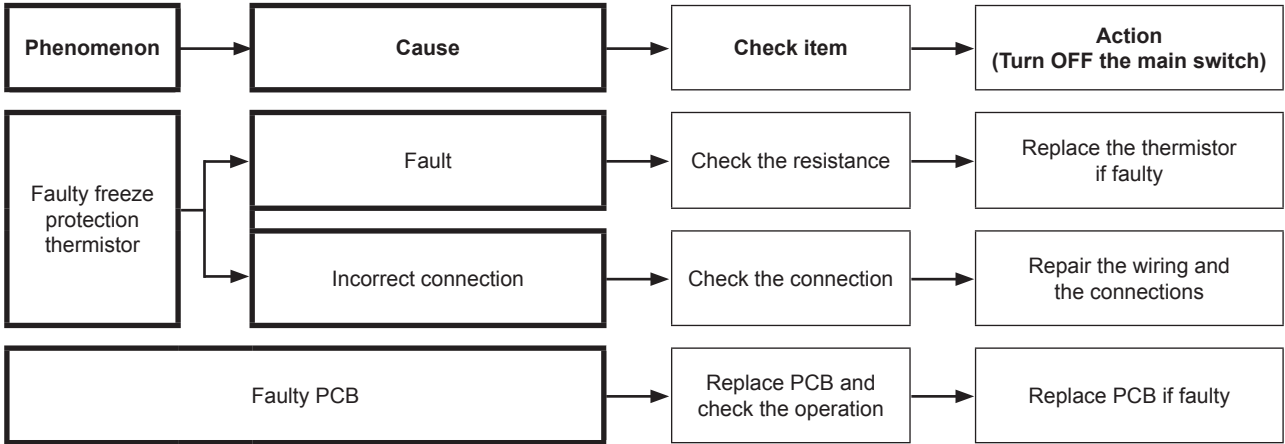
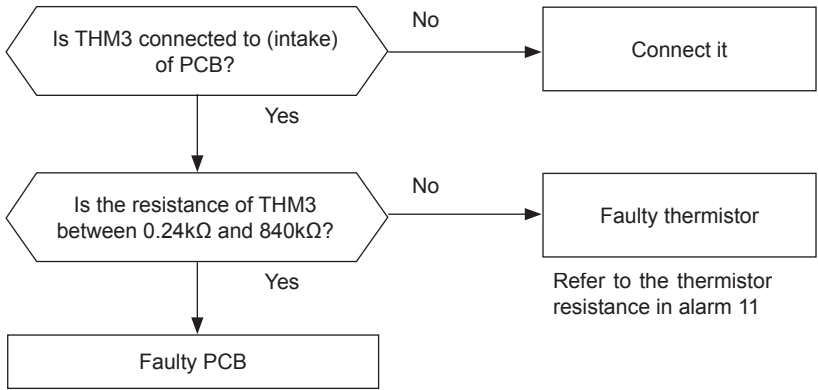


◆ Examples

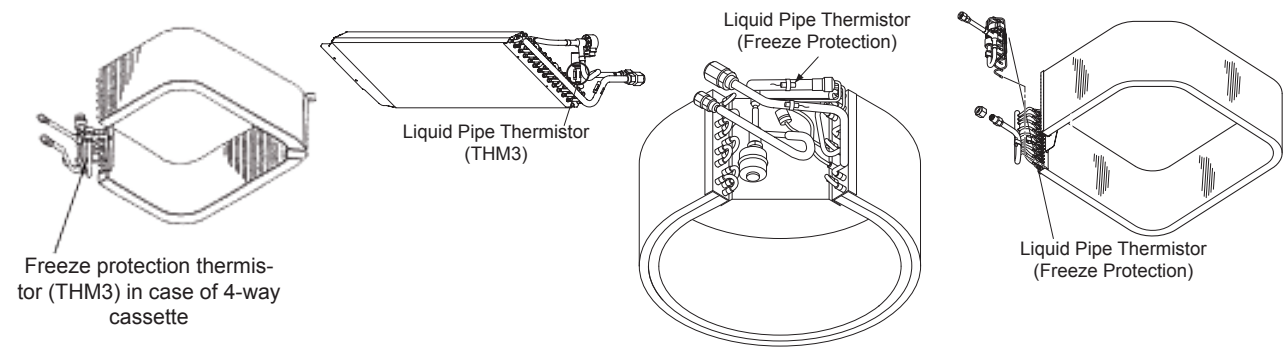


Alarm code	13	Abnormal operation of the thermistor for the indoor unit heat exchanger liquid pipe temperature (freeze protection thermistor)
------------	-----------	--

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

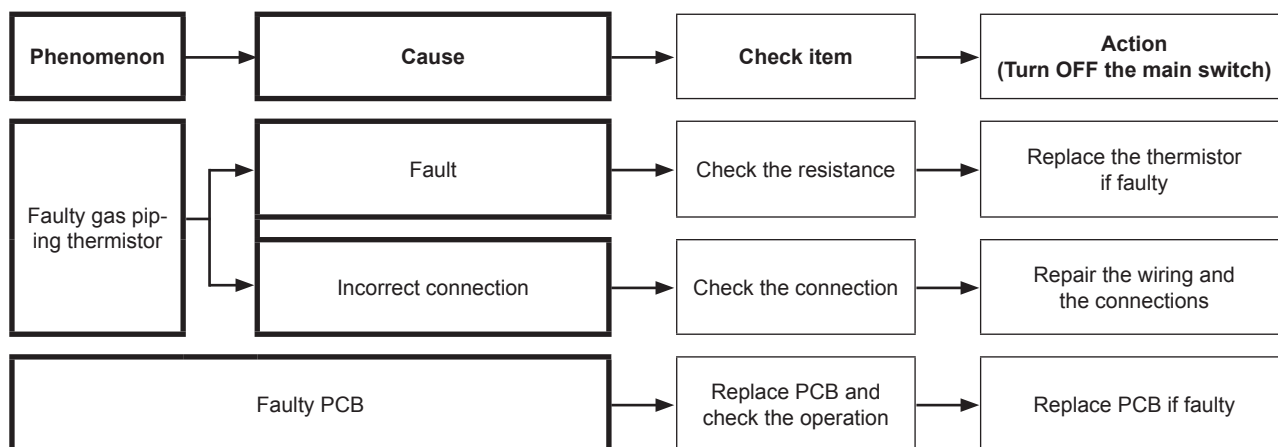
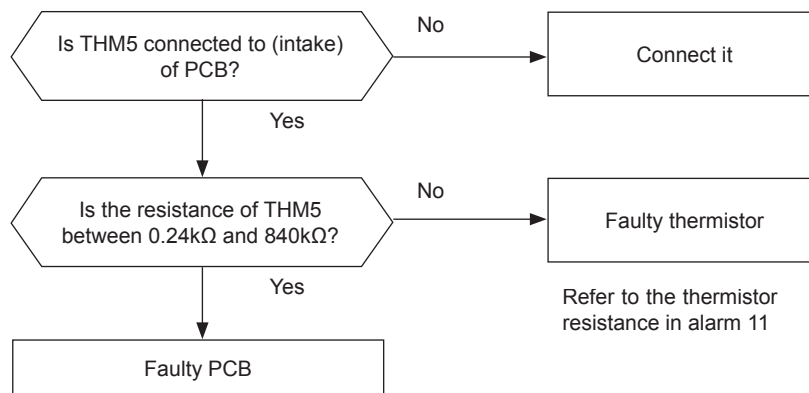


◆ Examples

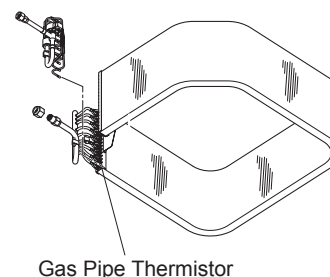
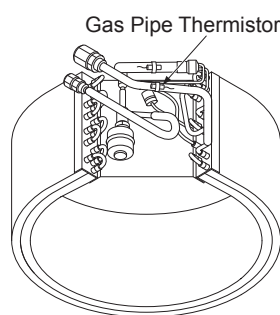
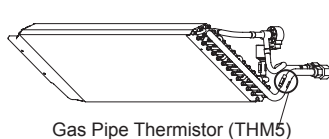
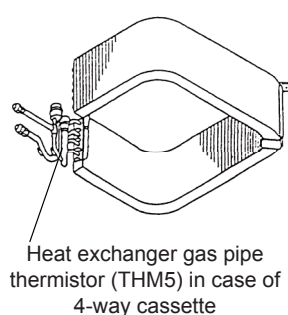


Alarm code	14	Abnormal operation of the thermistor for the indoor unit heat exchanger gas pipe temperature (gas piping thermistor)
------------	-----------	--

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

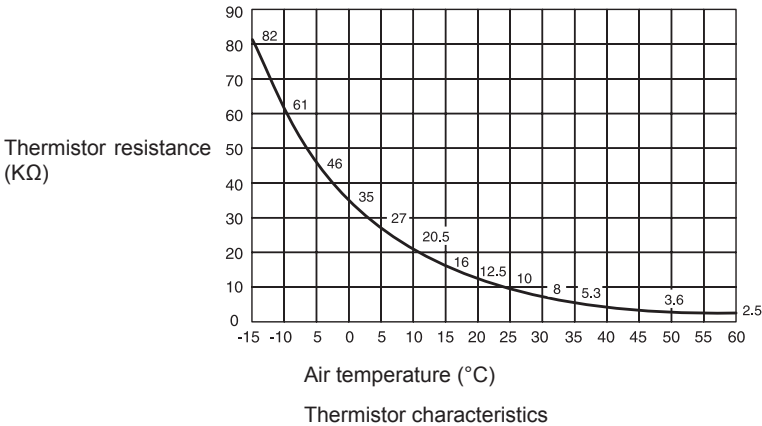
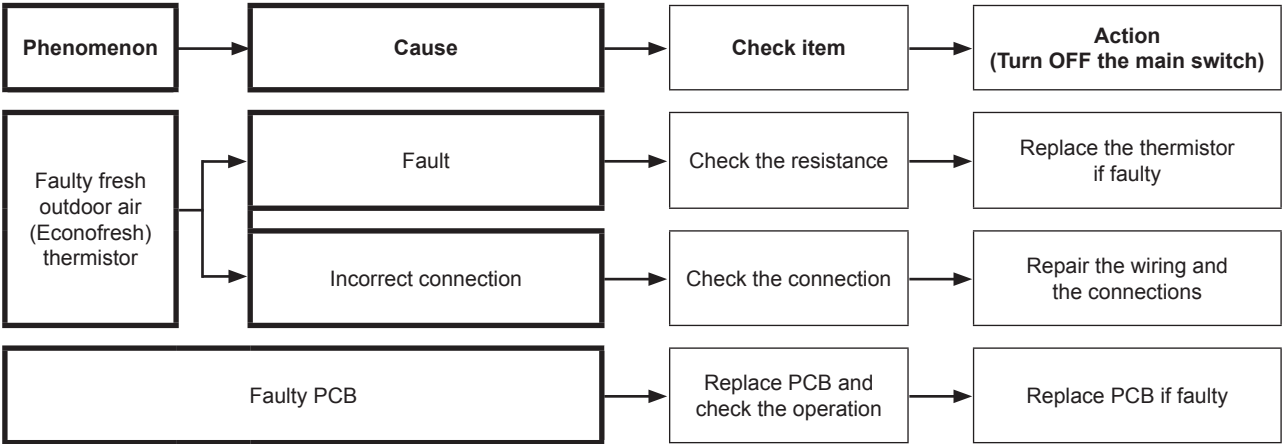
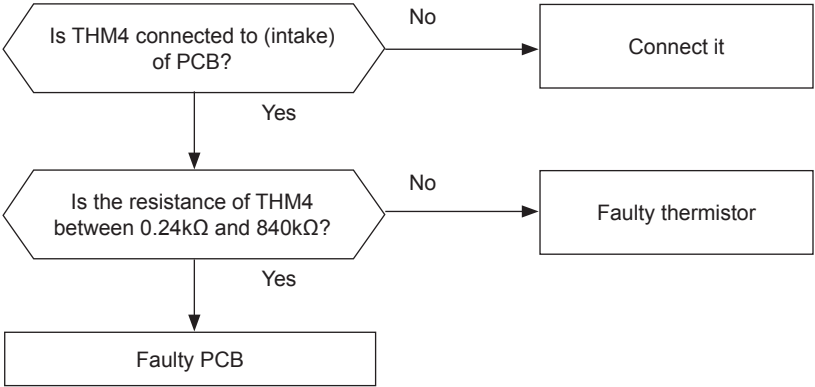


◆ Examples



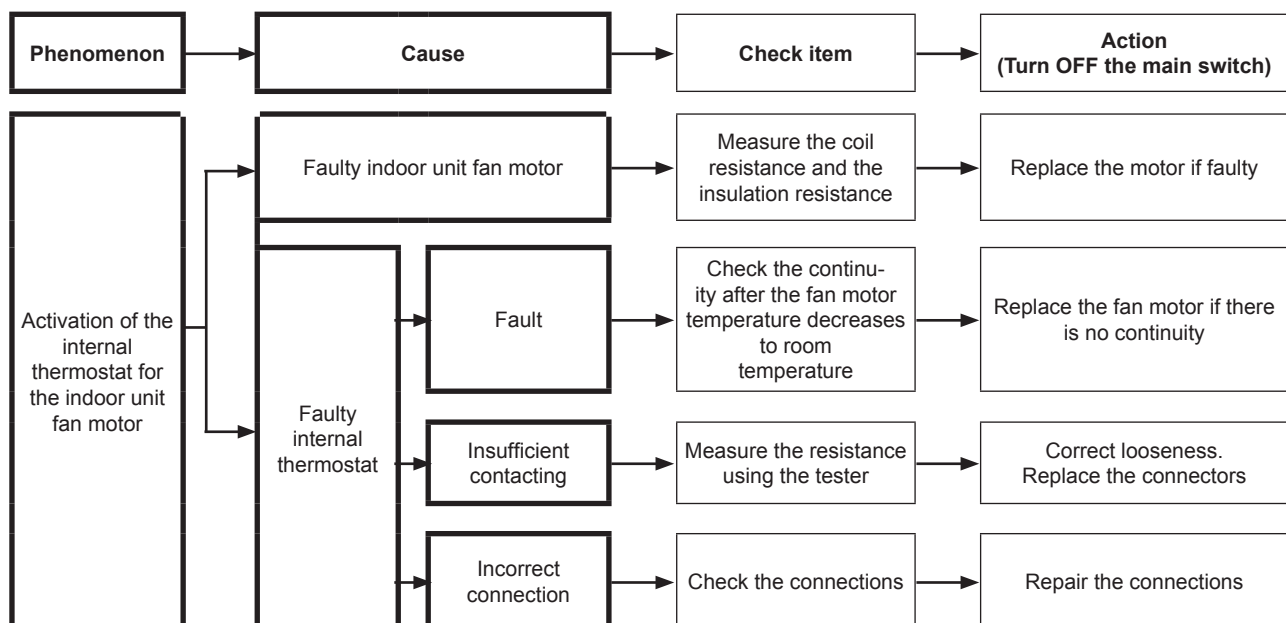
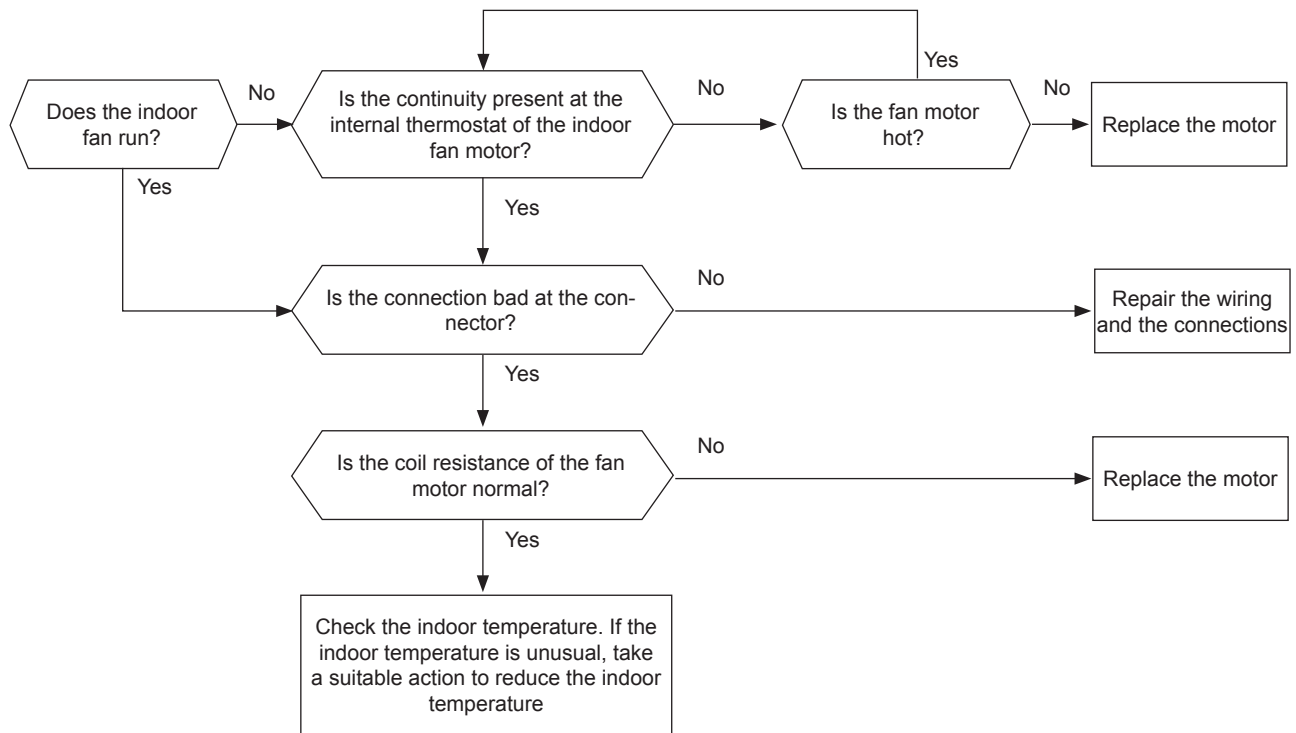
Alarm code	15	Abnormal operation of thermistor for fresh outdoor air (Econofresh)
------------	----	---

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



Alarm code	19	Activation of the protection device for the indoor fan motor (except RCI-FSN3, RCIM-FSN3, RPC-FSN3 and RPK-FS(H)3M)
------------	-----------	--

- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
- This alarm code is displayed when the temperature of the internal thermostat for the indoor fan motor is higher than 130°C.



Alarm code

19

Activation of the protection device for the indoor fan motor (RCI-FSN3, RCIM-FSN3, RPC-FSN3)

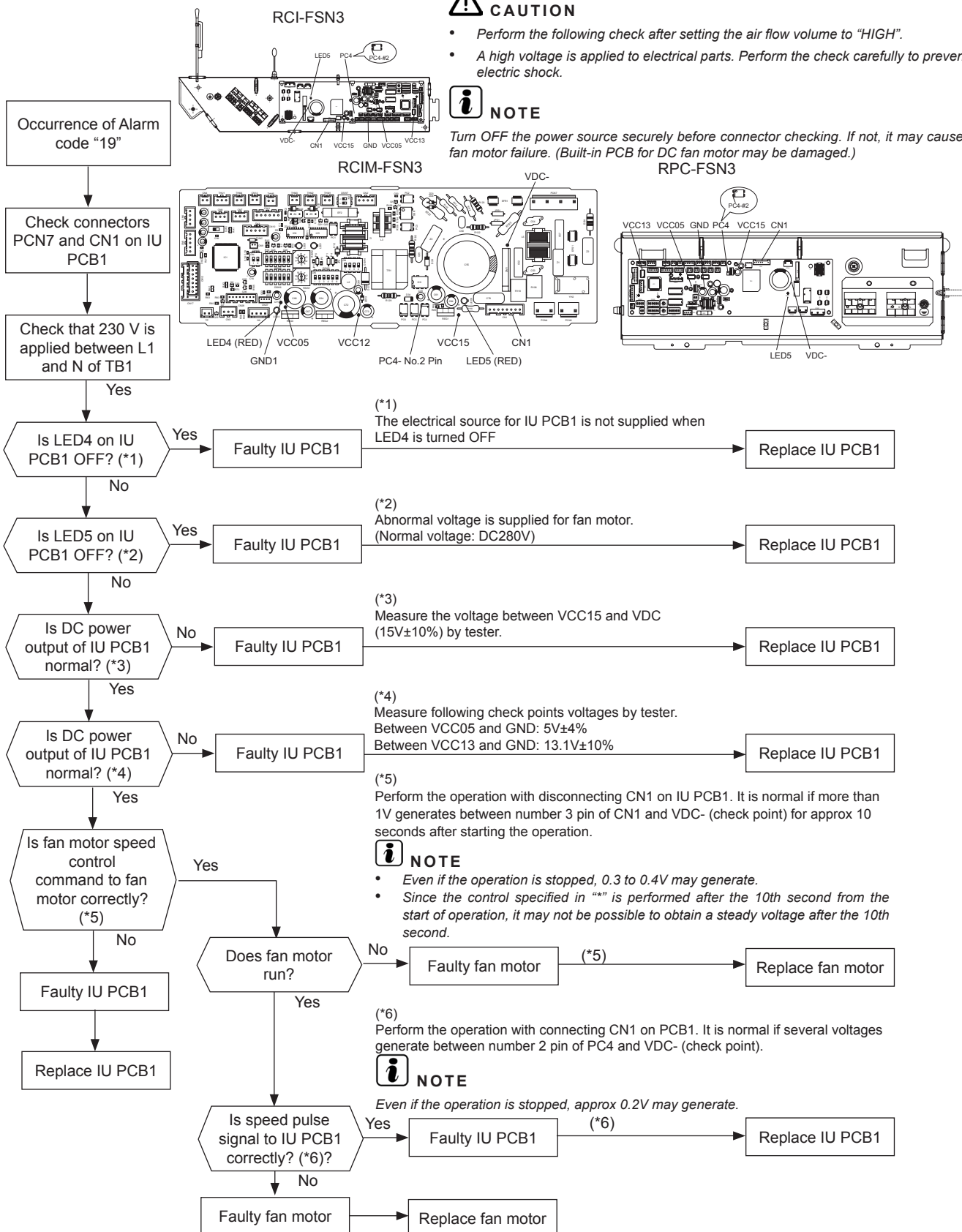
- This alarm code is displayed when the following conditions occurs three times in 30 minutes. Indoor fan rotates less than 70 rpm for 5 seconds during operation.
- (*)When the cause is checked by means of this flow chart, confirm that fan speed setting is Hi.

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.

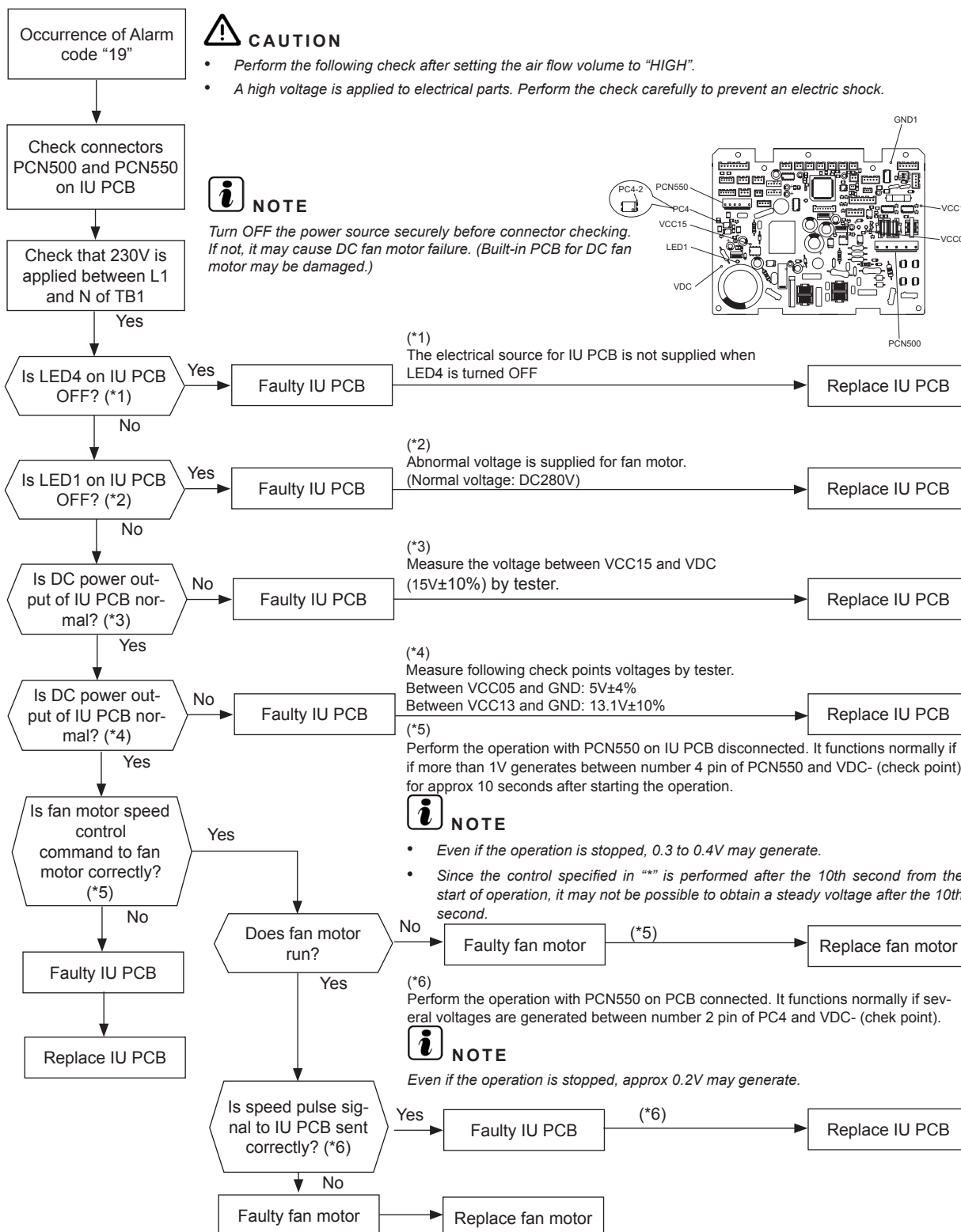
NOTE

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.)



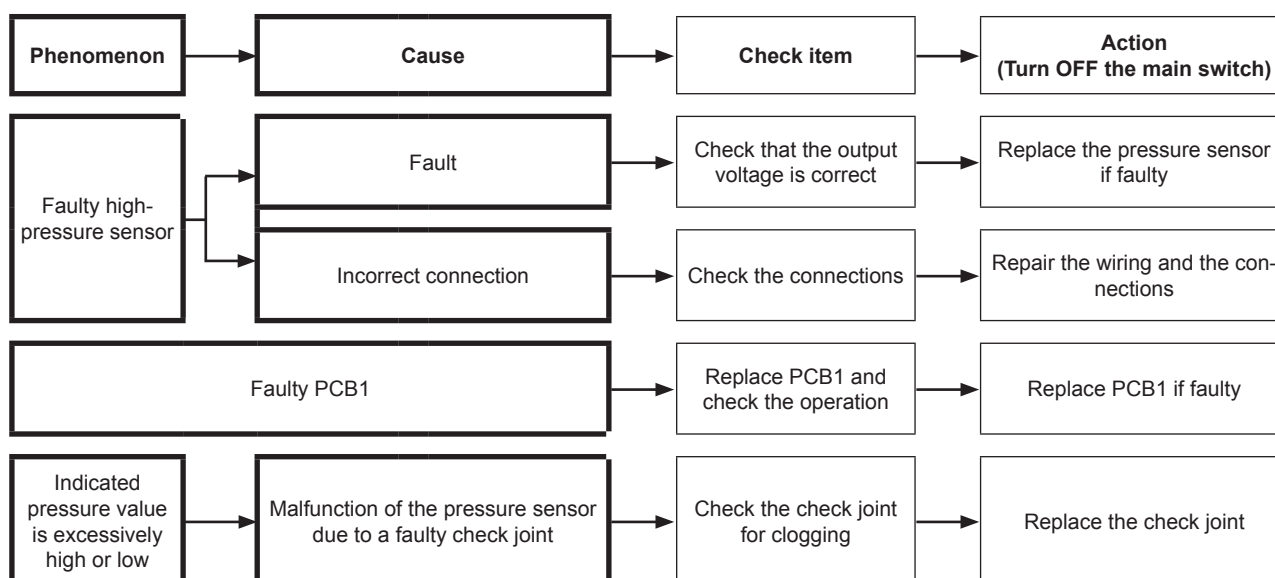
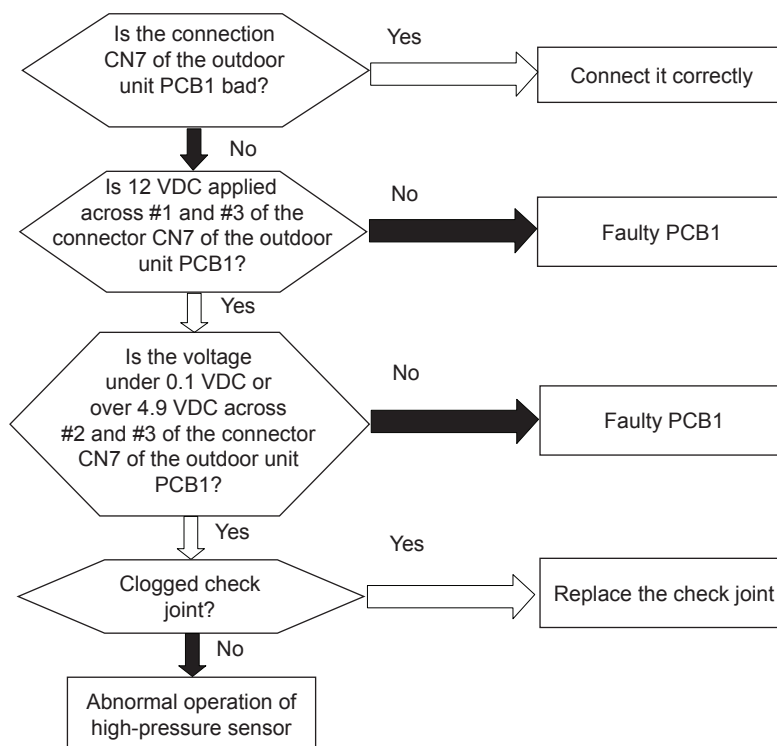
Alarm code	19	Activation of the protection device for the indoor fan motor (RPK)
------------	-----------	--

- 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.



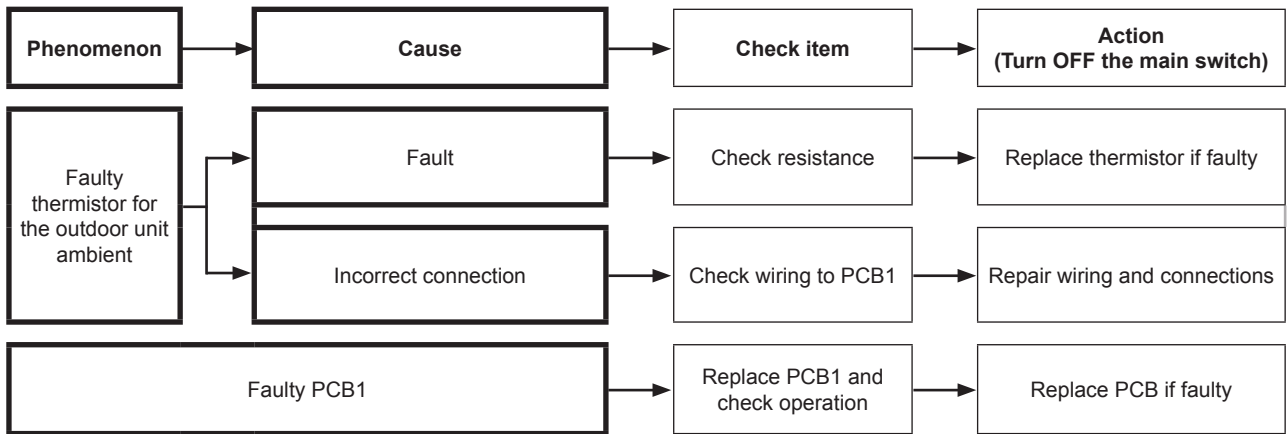
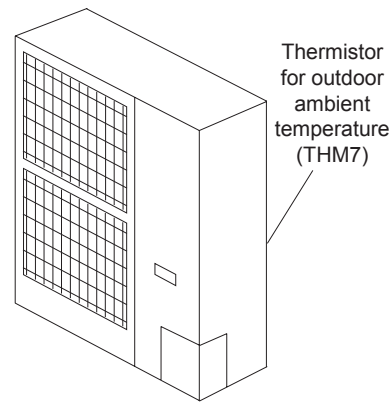
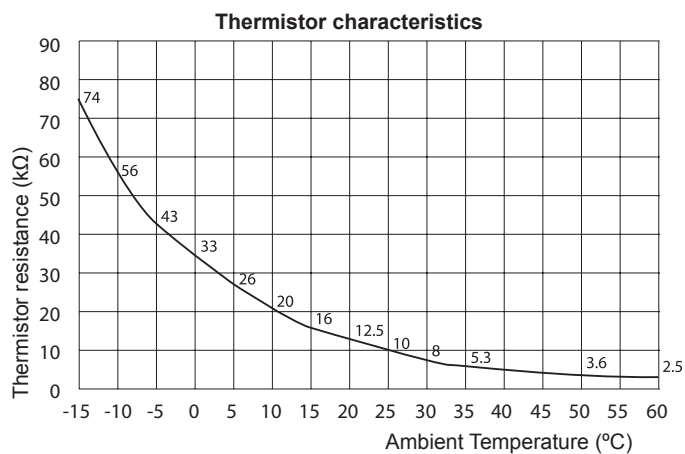
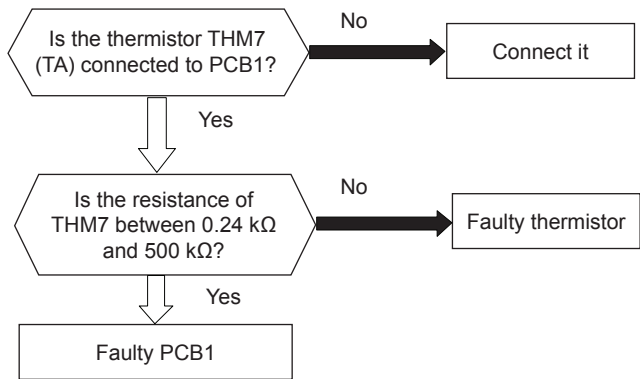
Alarm code	21	Abnormal operation of the high-pressure sensor for the outdoor unit
------------	-----------	---

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



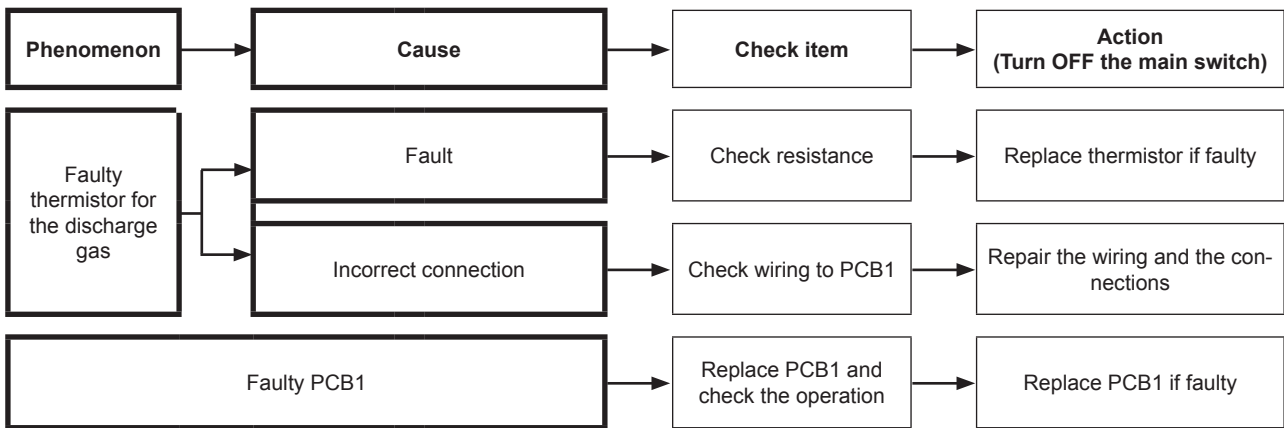
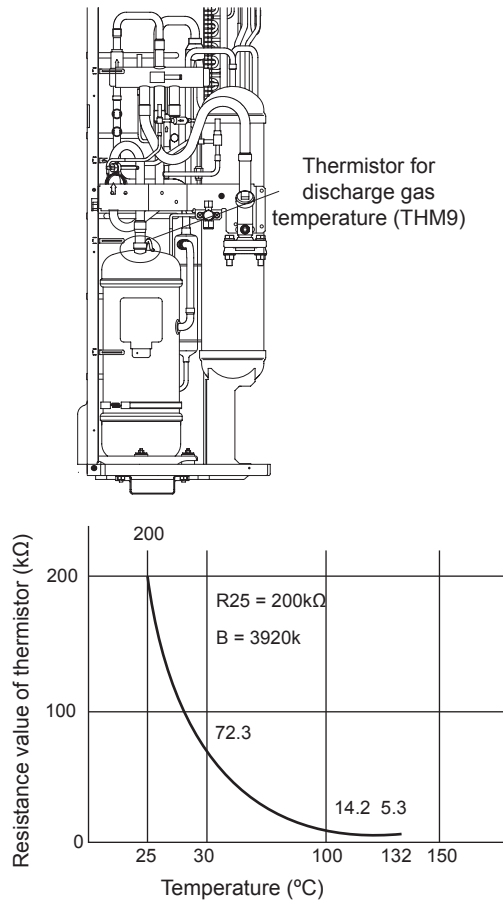
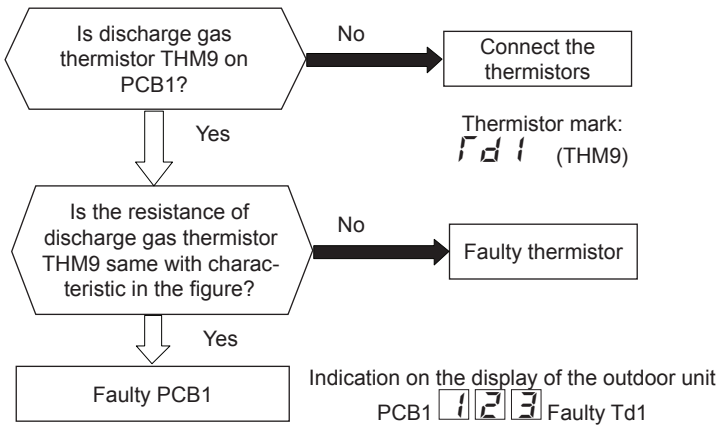
Alarm code	22	Abnormal operation of the thermistor for outdoor ambient temperature (THM7)
------------	-----------	---

- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
- This alarm code is displayed when the thermistor is short-circuited (less than 0.2 kΩ) or cut (greater than 500 kΩ) during the operation. However, this alarm occurs during the test run mode only. In the case that the thermistor is abnormal during the operation, the operation continues based on the assumption that the outdoor temperature is 35 °C (cooling) / 6 °C (heating).



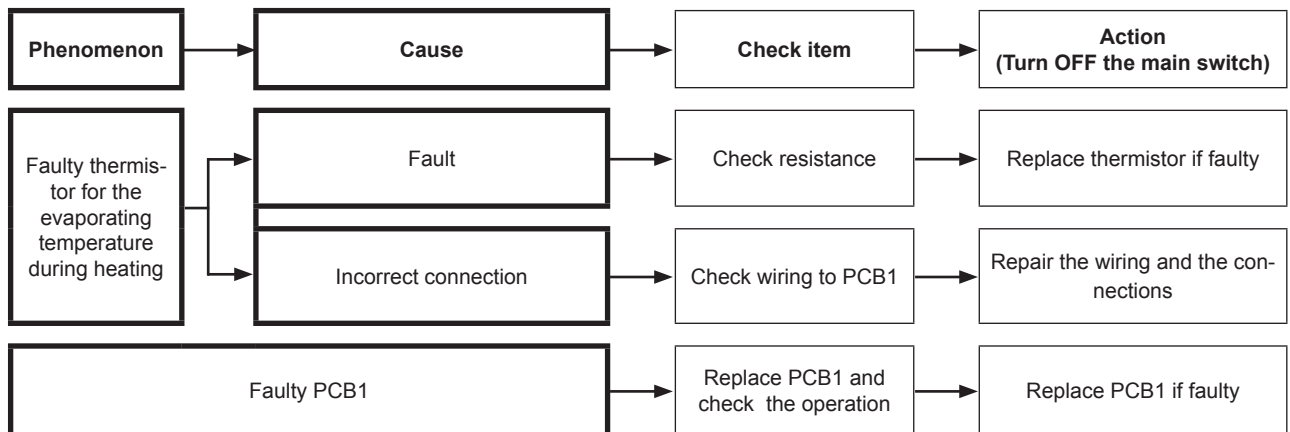
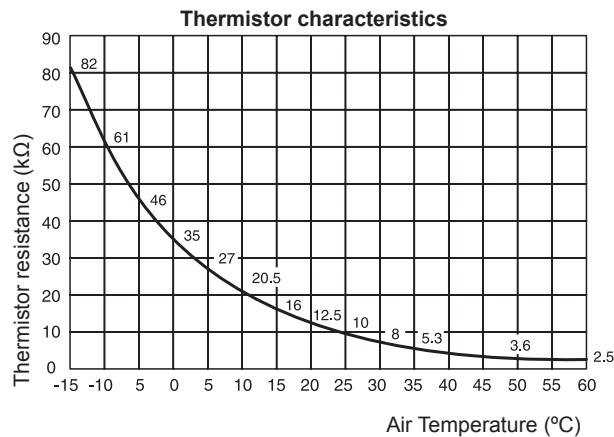
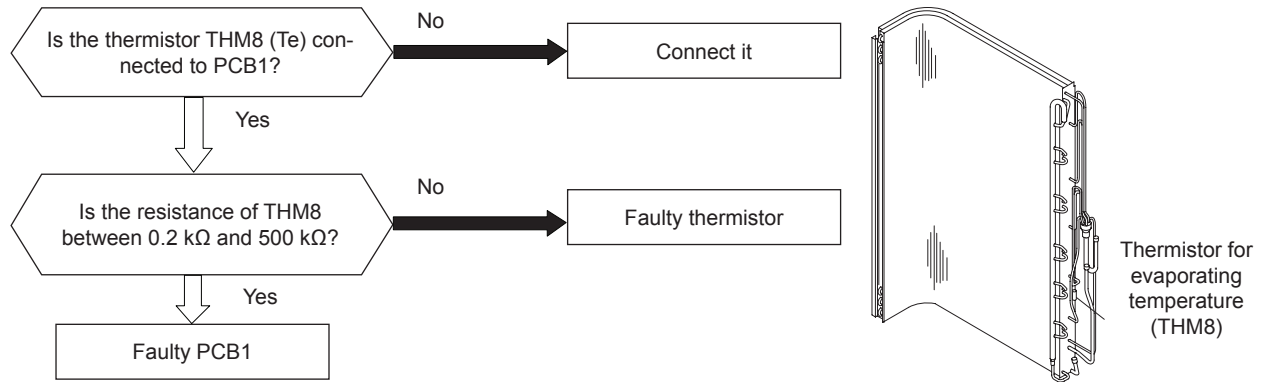
Alarm code	23	Abnormal operation of the thermistor for discharge gas temperature (THM9)
------------	----	---

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



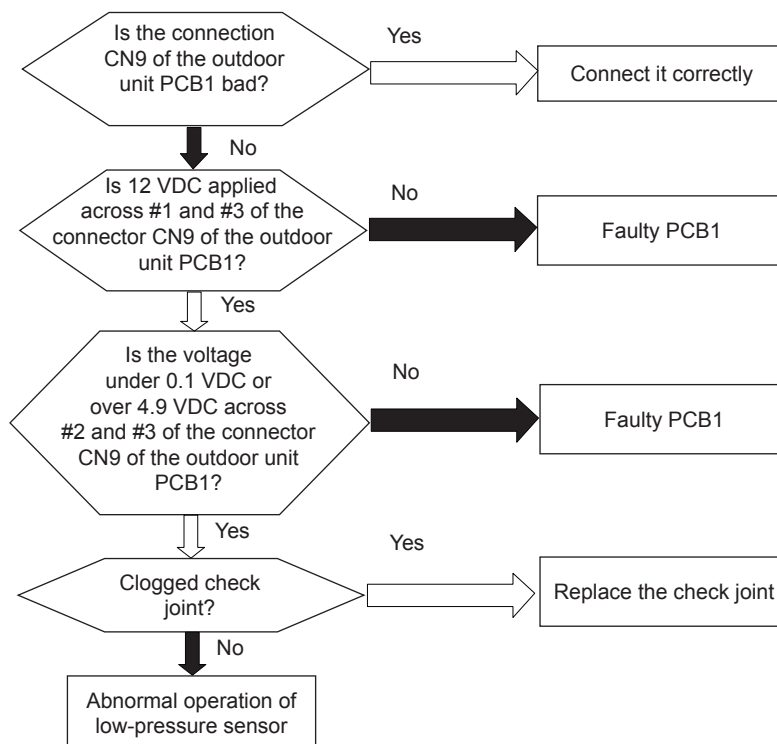
Alarm code	24	Abnormal operation of the thermistor for evaporating temperature (THM8)
------------	----	---

- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB. If 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 thermistor is faulty, such as short-circuit (less than 0,2kΩ) or cut (more than 500kΩ) during eight minutes continuously, this alarm is displayed. The position is indicated below.



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

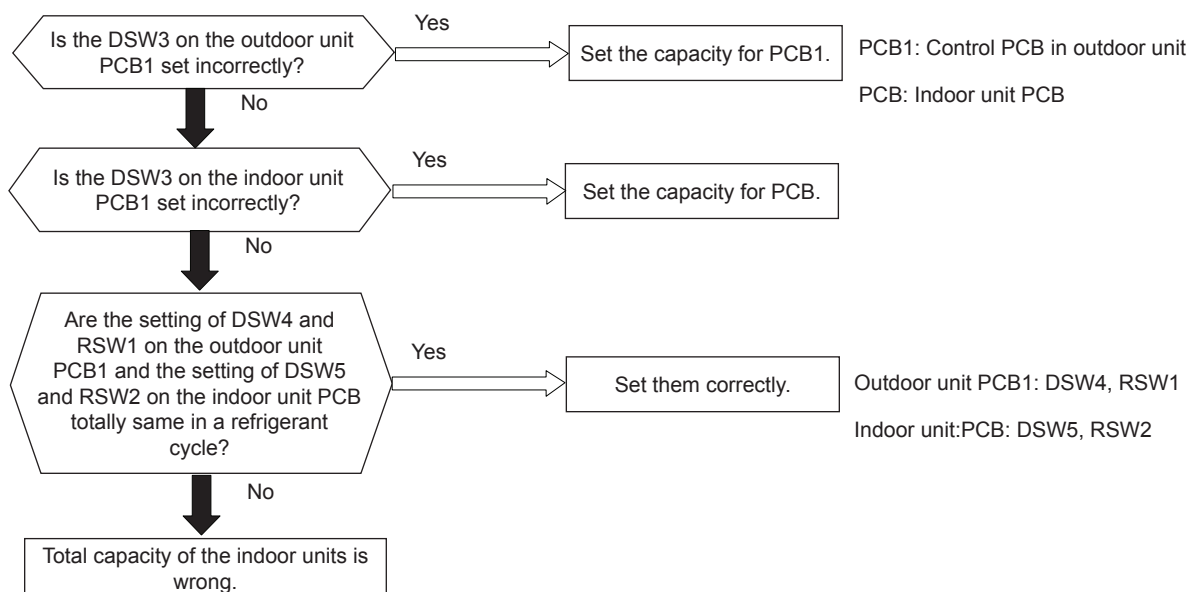
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
- This alarm code is displayed when the low-pressure sensor voltage decreases lower than 0.1V or increases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



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

Alarm code	31	Incorrect capacity setting or combined capacity between outdoor and indoor units
------------	-----------	--

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



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

Refrigerant cycle number setting

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

Example: in case of setting refrigerant cycle number 25	
Turn ON number 2 pin	Set dial number 5
DSW and RSW setting before shipment is 0.	
Maximum in setting refrigerant cycle number is 63.	

Alarm code	35	Incorrect indoor unit number setting
------------	----	--------------------------------------

- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
 - This alarm code is indicated 3 minutes after power is supplied to the outdoor unit when the indoor unit no. connected to the outdoor unit is duplicated by setting of RSW.



NOTE

- In case of H-LINK system, this alarm code is indicated when the refrigerant system setting on the outdoor unit PCB and the indoor unit PCB are incorrectly set.
- In this case, set correctly referring to the section [Setting of DIP switches and RSW switches](#) after turning OFF main switch.

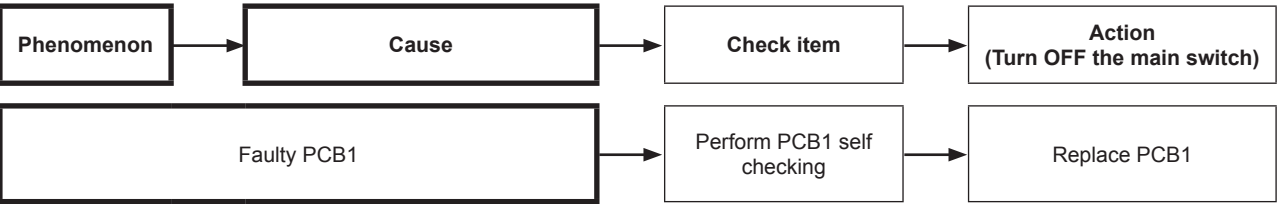
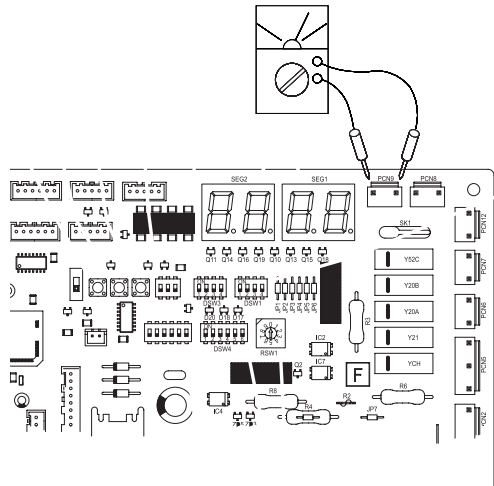
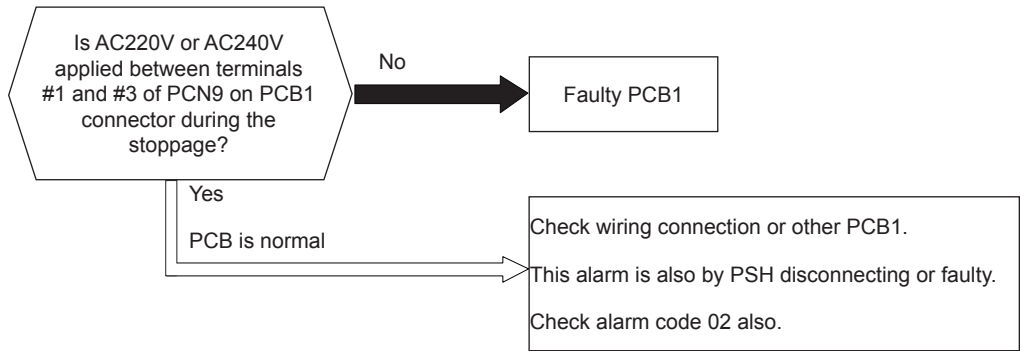
Alarm code	36	Incorrect indoor unit combination
------------	-----------	-----------------------------------

- “RUN” light flashes and “ALARM” is indicated on the remote control switch.
- The unit number, alarm code and the unit code is alternately indicated on the set temperature section, and the alarm code is indicated on the display of the outdoor unit PCB1.
 - This alarm is indicated when the indoor unit connected to outdoor unit is designed for refrigerant R22 type.

PCB1: Control PCB in outdoor unit

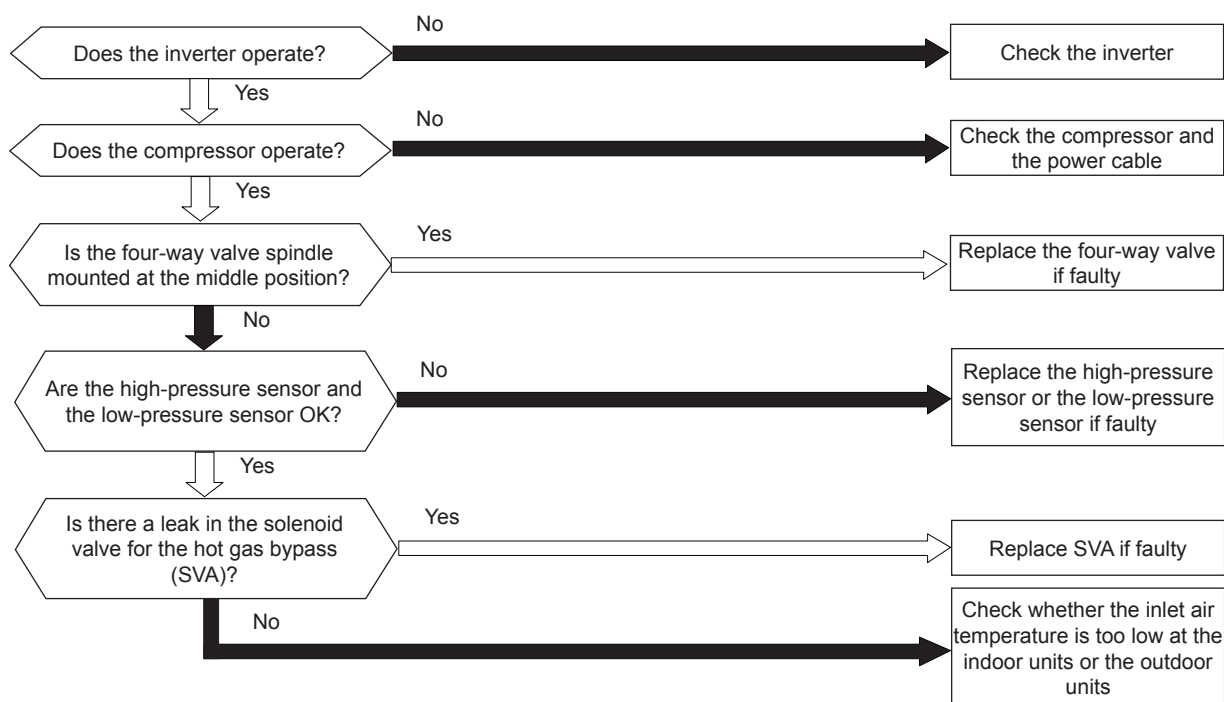
Alarm code	38	Abnormality of picking up circuit for protection (Outdoor unit)
------------	----	---

- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
 - This alarm code is indicated when AC 220V or 240V is detected in PCN9 - #1 and #3 during inverter compressor stoppage.



Alarm code	43	Activation of the safety device from compression ratio decrease
------------	-----------	---

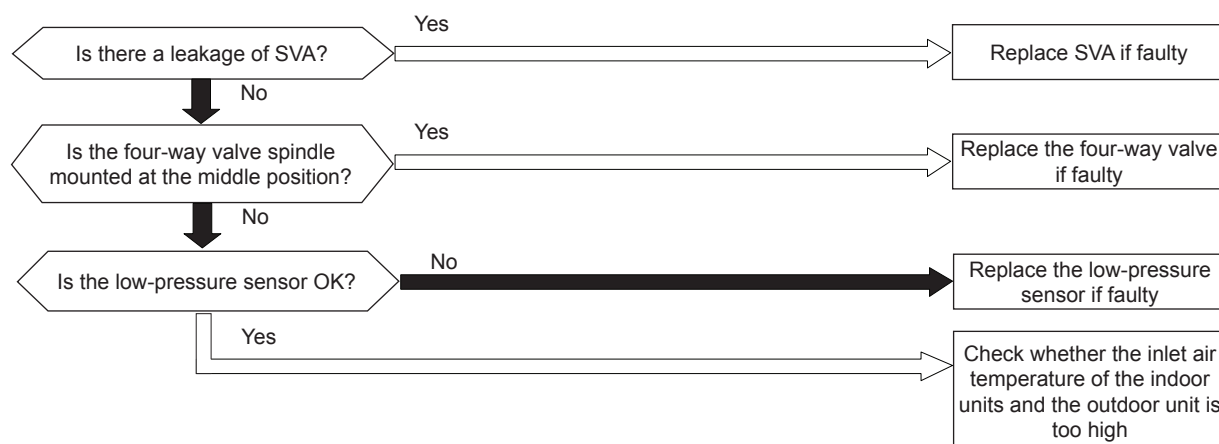
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
 - This alarm code is displayed when a compression ratio, $\epsilon = \{(Pd + 0.1) / (Ps + 0.06)\}$ is calculated from a discharge pressure (Pd MPa) and a suction pressure (Ps MPa), and the condition which is lower than $\epsilon = 1.5$ occurs three or more than three times in one hour



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

Alarm code	44	Activation of the safety device from excessively high suction pressure
------------	-----------	--

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



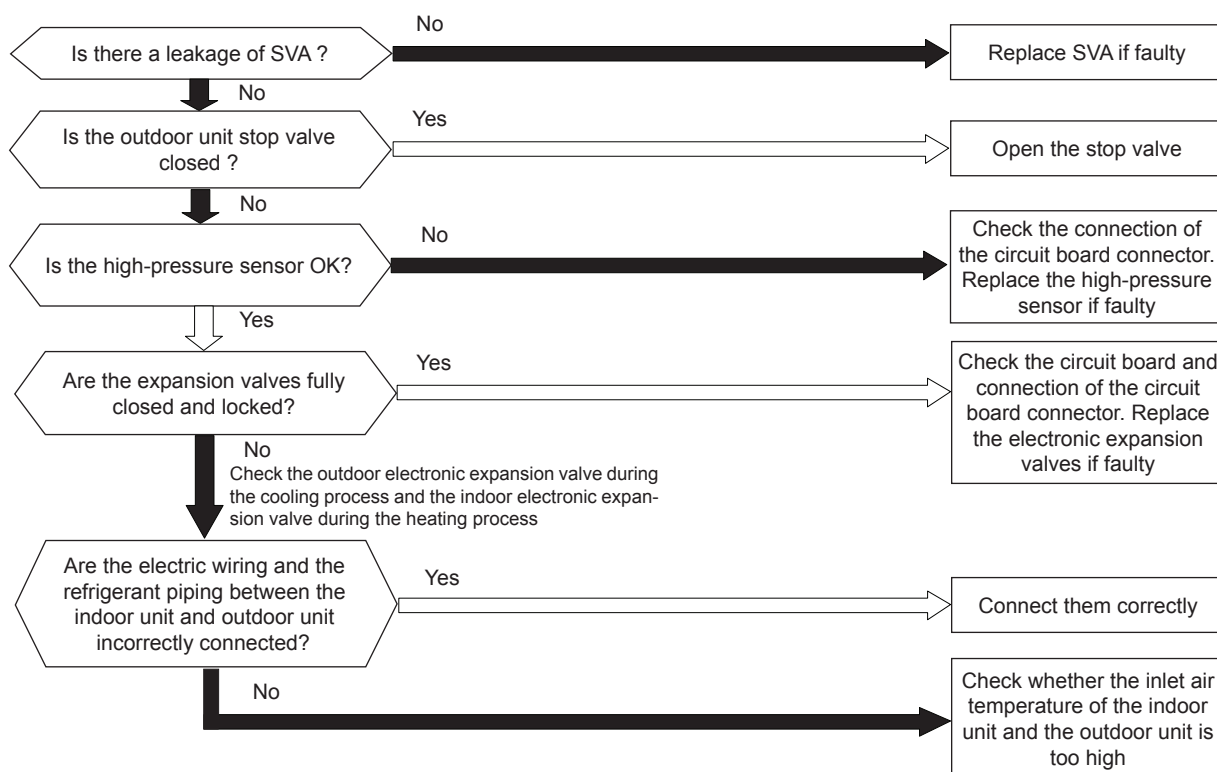
Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Excessively high suction pressure	Leakage of solenoid valve (SVA)	Check the outlet pipe temperature of SVA	Check the connect wires. Replace SVA if faulty
	Valve stoppage at the medium position of the 4-way valve	Measure the suction gas temperature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

Alarm code	45	Activation of the safety device from excessively high discharge pressure
------------	-----------	--

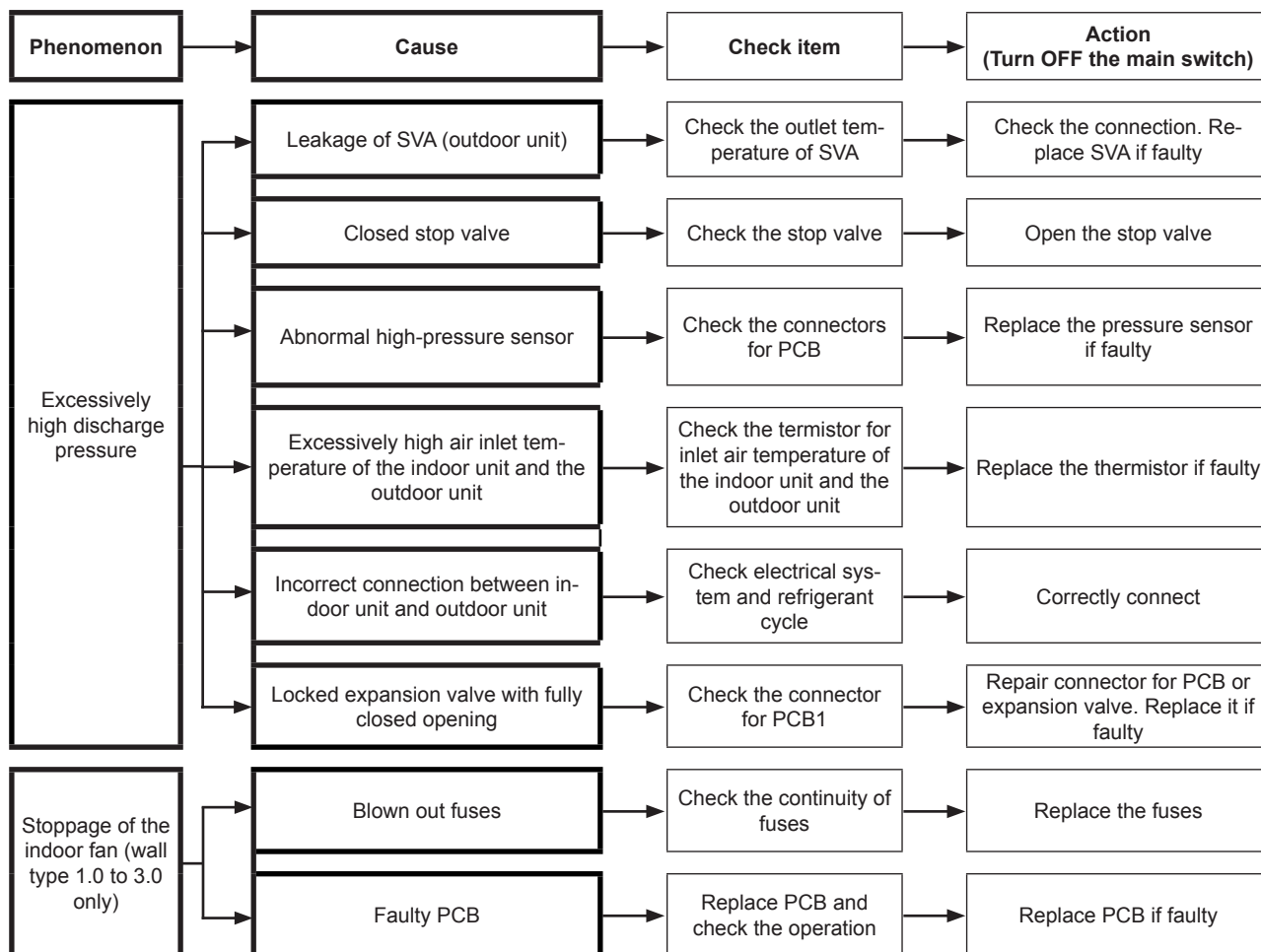
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
- In case that compressor is operated under the condition that is higher than 3.8MPa of discharge pressure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

PCB1: Control PCB in outdoor unit

PCB: Indoor unit PCB

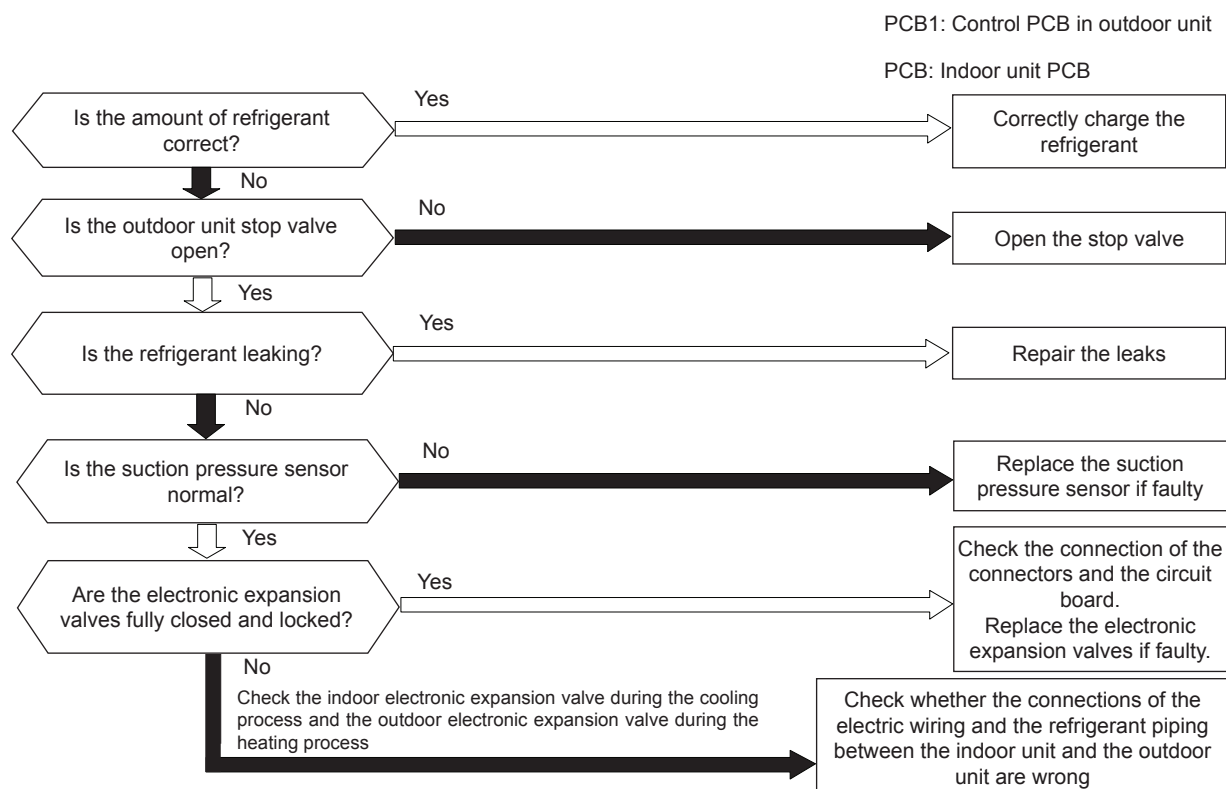
**NOTE**

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



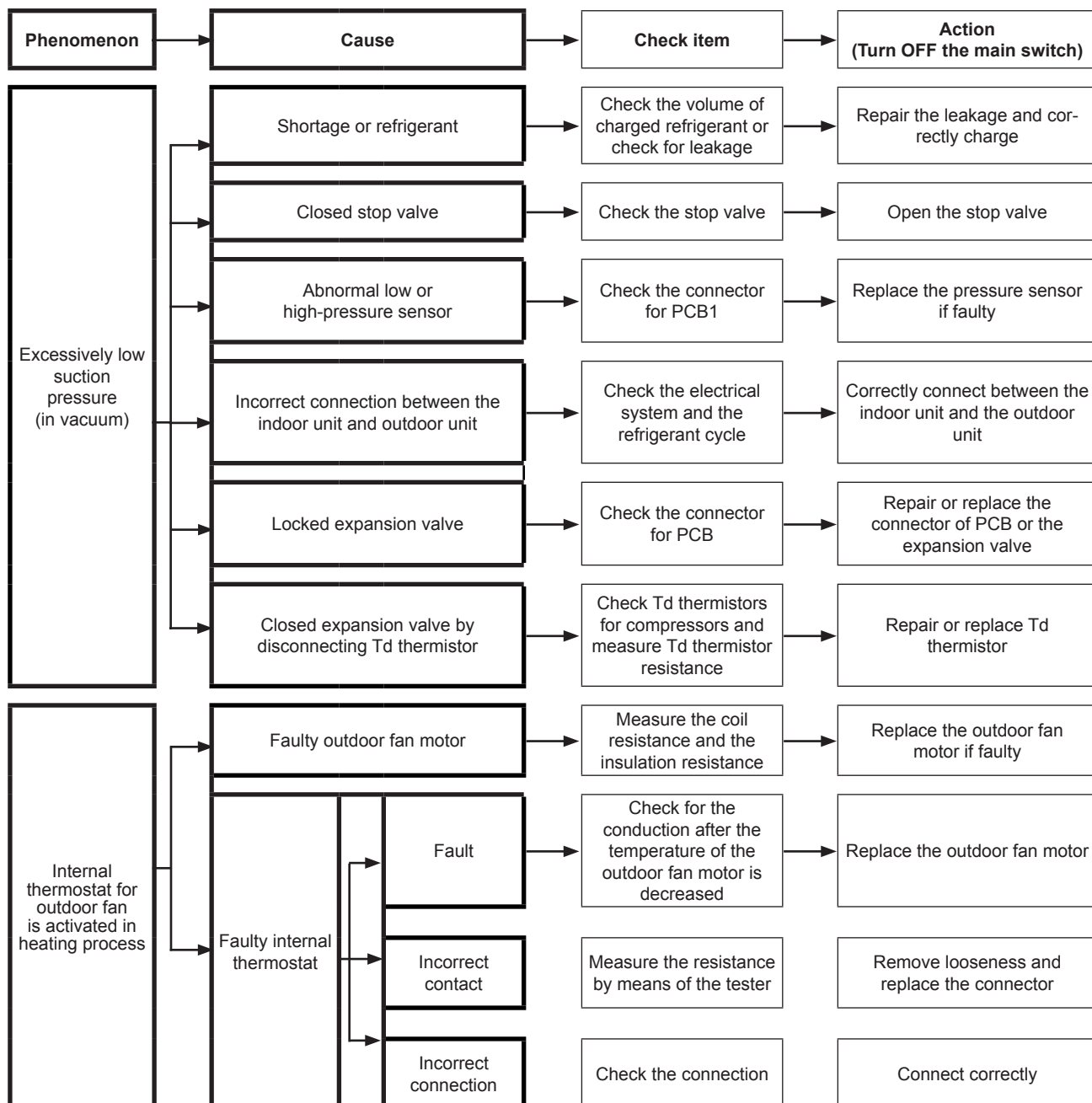
Alarm code	47	Activation for protecting the system from excessively low suction pressure (protection from the vacuum operation)
------------	-----------	--

- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
- This alarm code is displayed when a suction pressure is lower than 0.09 MPa for over 12 minutes and the alarm occurs two or more times within 30 minutes after the first abnormality is detected.

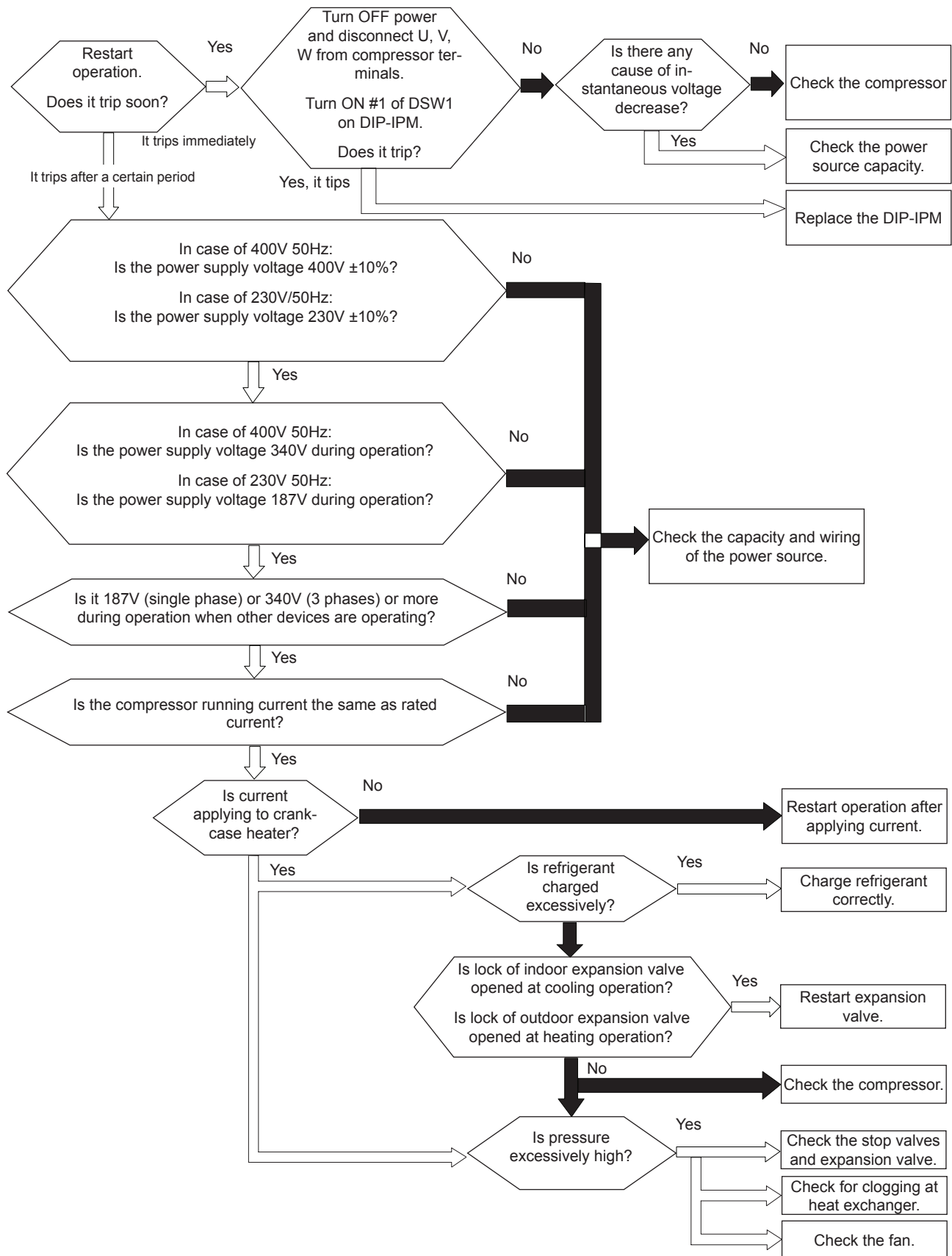


NOTE

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



Alarm code	48	Activation of overcurrent protection activation for inverter
------------	-----------	--

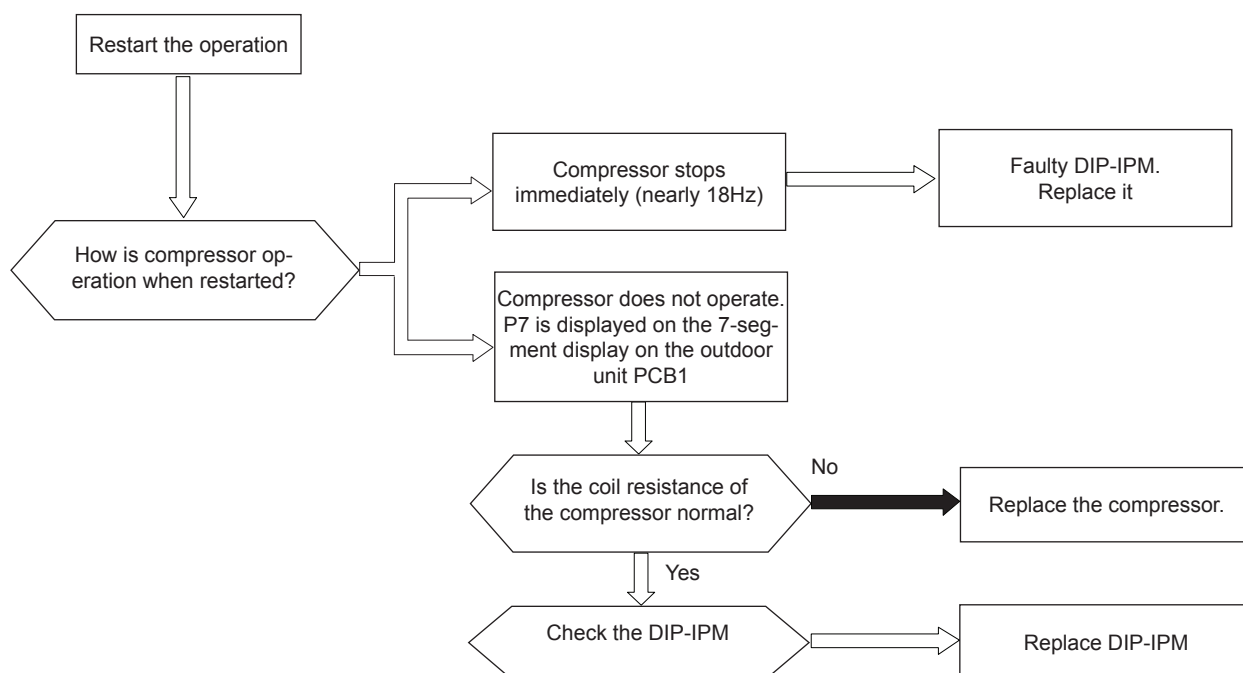


Alarm code	51	Abnormality of current sensor for inverter
------------	-----------	--

- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
 - In case that the abnormality of alarm code 51 occurs six times within 30 seconds, the alarm code of abnormality occurred for the sixth time is indicated. Retry operation is performed up to second time of abnormality occurrence.

Condition of activation:

- When the frequency of compressor is maintained at 15 to 18Hz after compressor is started, the absolute value of running current is less than 1.5A (including 1.5A).
- Before starting compressor (after positioning), the current wave passing through the phase for positioning in less than 5A.



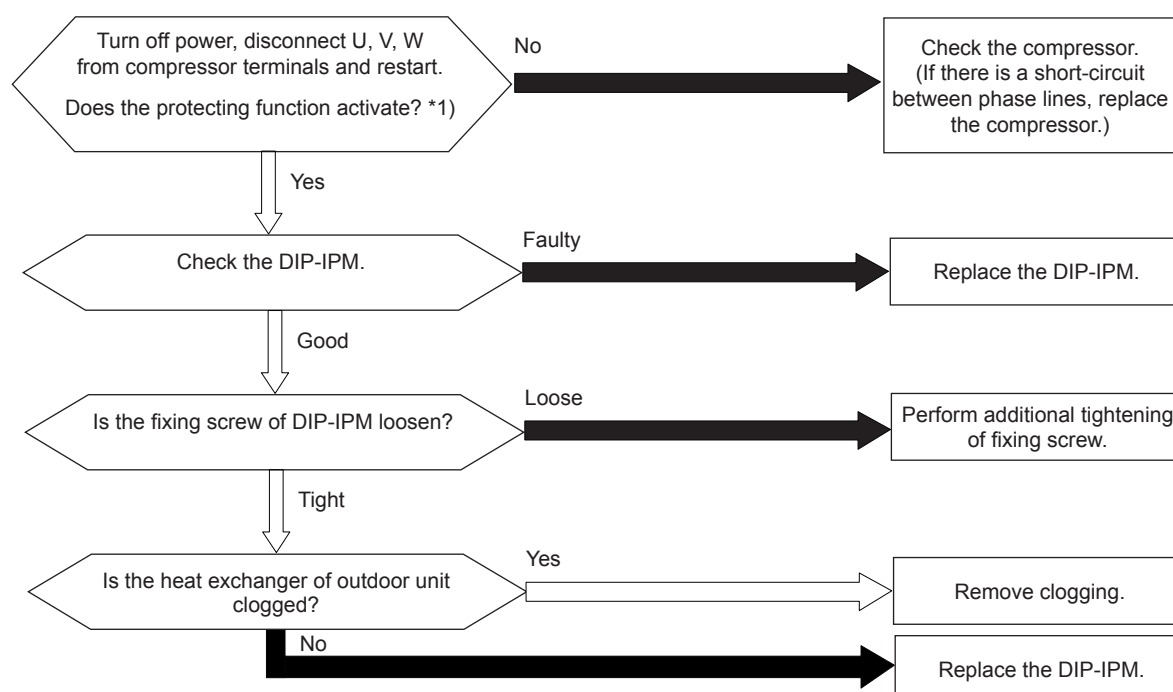
Alarm code	53	Protection activation of inverter module
------------	-----------	--

- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.

* Inverter Module have detecting function of abnormality.

This alarm is indicated when the below condition occurs the abnormality 7 times in 30 minutes including 7. Retry operation is performed up to the occurrence of 6 times.

Conditions: Abnormal current to the inverter module such as short circuited or grounded or
 Abnormal current of the inverter module or
 Control voltage decrease



*1) Turn ON the No.1 switch of DSW1 on DIP-IPM when restarting with disconnecting the terminals of the compressor. After troubleshooting, turn OFF the No.1 switch of DSW1 on DIP-IPM.

In case alarm code 53 is indicated, the outdoor fan motor may be damaged.

Check the outdoor fan motor.

Alarm code	54	Inverter fin temperature increase
------------	-----------	-----------------------------------

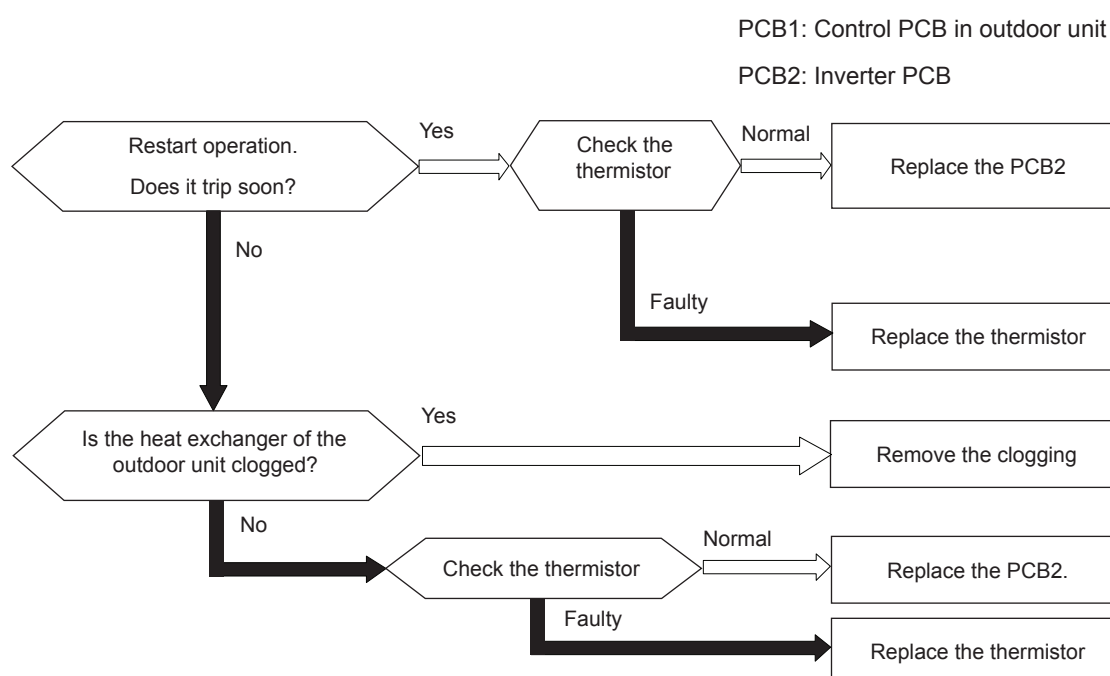
- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.

* In case that the abnormality of inverter fin temperature occurs three times within 30 minutes, this alarm is indicated at the third time.

(Retry operation is performed up to second time of abnormality occurrence.)

Conditions of activation:

This alarm is indicated when the temperature of the inverter fin thermistor for inverter module is higher than 100°C.



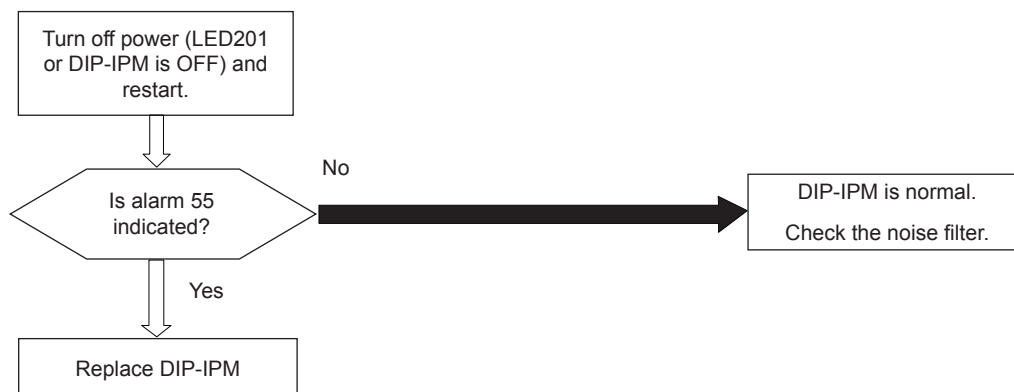
Alarm code	55	Inverter module abnormality
------------	-----------	-----------------------------

- "RUN" light flashes and "ALARM" is indicated on the remote control switch.
- The unit number, alarm code and the unit code is alternately indicated on the set temperature section, and the unit number and alarm code are indicated on the display of the outdoor unit PCB.

* This alarm is indicated when the below condition is activated 3 times including 3 in 30 minutes. Retry operation is performed up to the occurrence of 2 times.

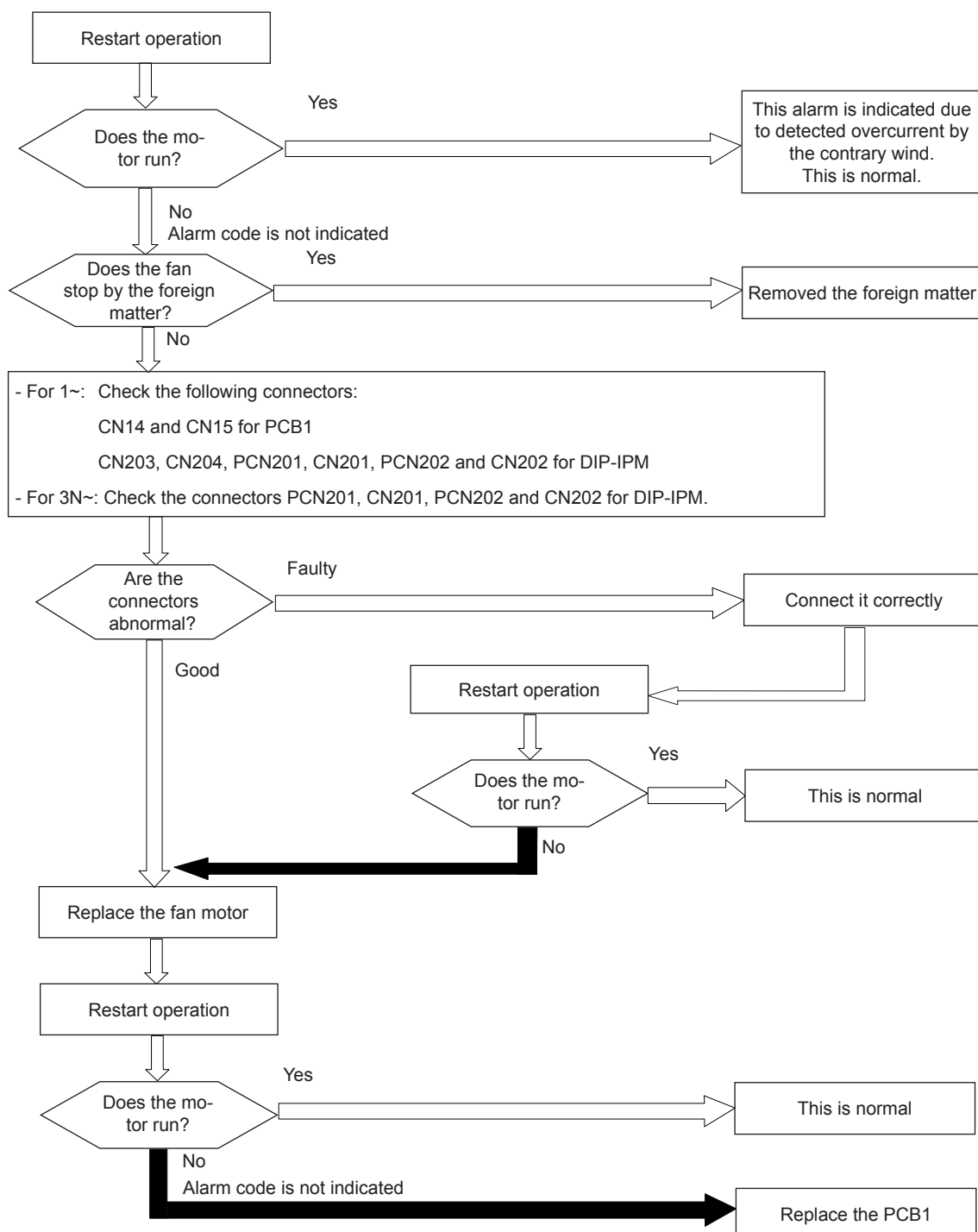
Condition of activation:

When the PCB1 does not receive the frequency signal from inverter module, this alarm is indicated.



Alarm code	57	Fan motor abnormality
------------	-----------	-----------------------

- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
- For 1~: This alarm is indicated when the revolution pulse output from the fan motor is 10rpm or less and the reverse revolution signal is detected. The fan motor is stopped once, and restarted after 10 seconds. It occurs more than 10 times in 5 minutes, this alarm is indicated. The abnormality occurs when the fan motor is stopped.
- For 3N~: When the difference between the maximum and minimum unfiltered Vdc voltage, detected in 20 msec cycle, is 55V or higher five times in succession.



Alarm code	b1	Incorrect setting of the unit and the refrigerant cycle number.
------------	-----------	---

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit number and alarm code are displayed on the outdoor unit's PCB1 display.

This alarm is indicated under the following conditions. Turn OFF the power supply and check the settings of the DSW and RSW.

Conditions	Action
Unit number (DSW6 and RSW1) or refrigerant cycle number (DSW5 and RSW2) are set above "64". Or, more than two contacts are set in DSW5 and DSW6.	Set the unit number and refrigerant cycle number below "63".
Unit number and refrigerant cycle number are set from "16" to "63" and the indoor unit does not correspond to H-LINK II.	Set the unit number and refrigerant cycle number from "0" to "15".

Alarm code	b5	Incorrect indoor unit connection number setting
------------	-----------	---

- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1. ("35" is indicated in the display of the remote control switch)
 - This alarm is indicated under the following conditions. Turn OFF the power supply and check the setting of DSW and RSW.

Conditions: There are more than 17 indoor units not corresponding to H-LINK II connected to one system.

Countermeasure: The number of indoor units not corresponding to H-LINK II system must be 16 or less.

Alarm code	EE	Compressor protection
------------	-----------	-----------------------

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

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



NOTE

You can check these alarms by means of the check mode 1. Follow the action that is indicated in each alarm chart.



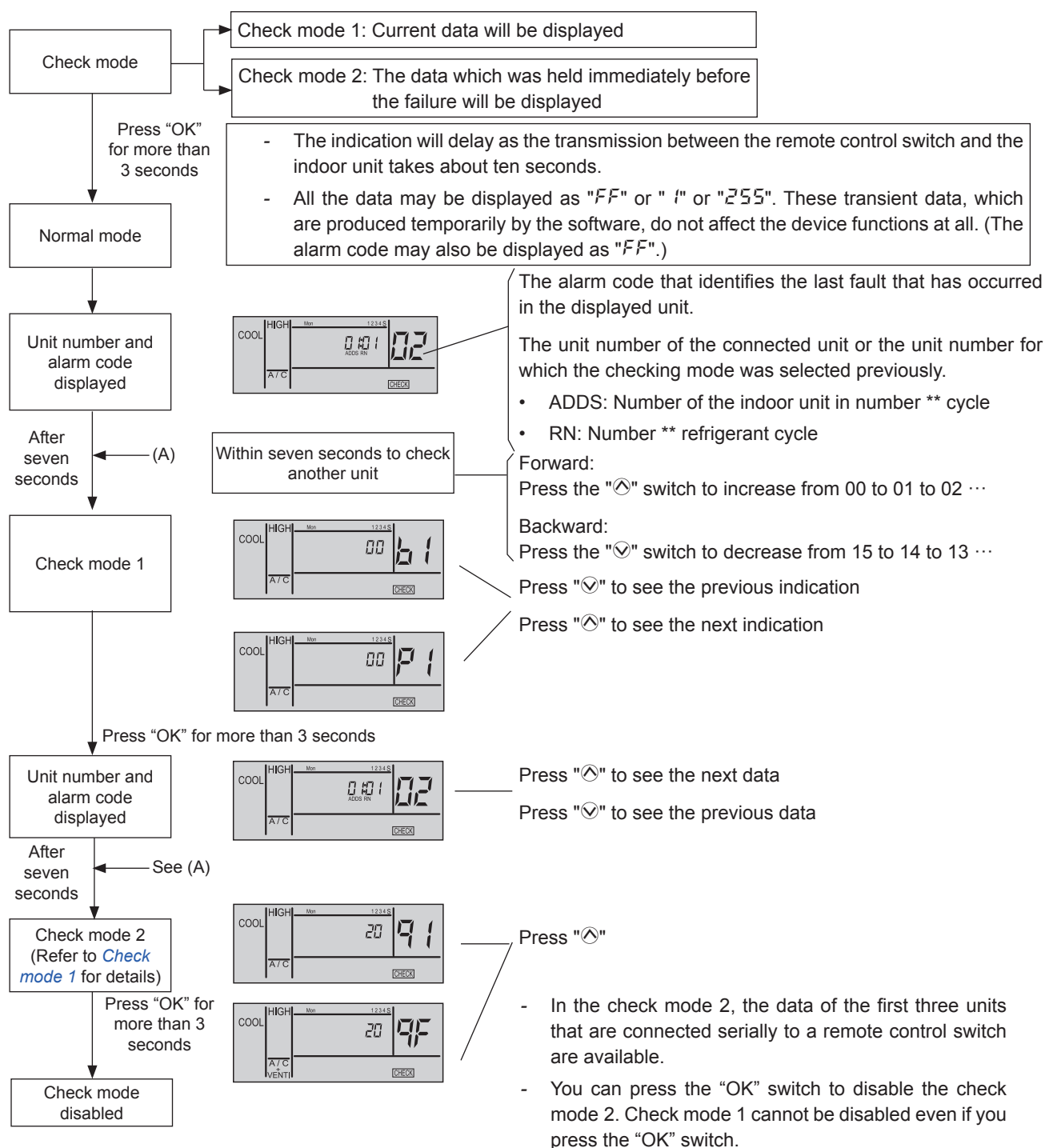
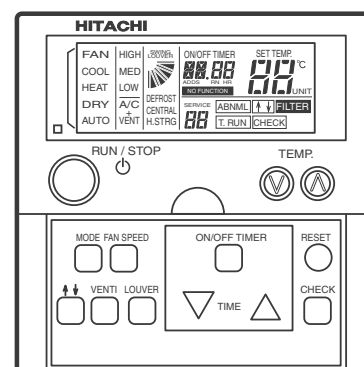
CAUTION

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.

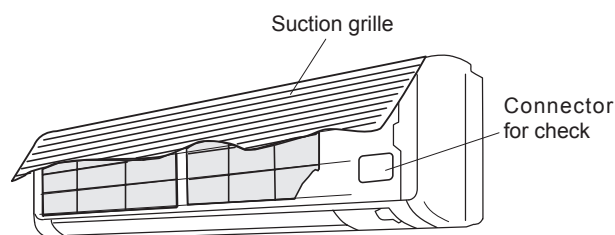
10.2.4 Troubleshooting in check mode

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

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



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-P2HTE.



i 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-P2HTE. The indication is not the data before the alarm occurs.

◆ **Contents of the check mode 1**

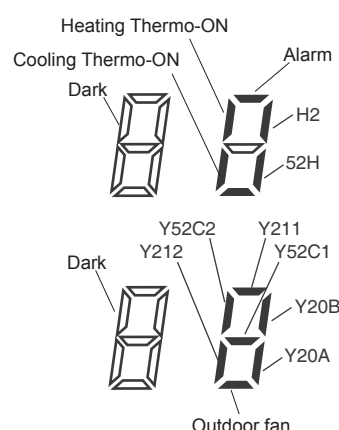
The next indication is shown if you press the part “△” of the TEMP switch. If you press the part “▽” of the TEMP switch, the previous indication is shown.

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	Normal	... Temperature displayed
3	Indoor unit discharge air temperature at thermistor (°C)	b3	55	Abnormal	-- (Thermistor is open-circuited or PCB is defective)
4	Indoor unit heat exchanger liquid pipe temperature (°C)	b4	20		or 129 (Temperature for top of compressor)
5	Temperature at remote sensor (°C)	b5	25		FF (Thermistor is short-circuited or PCB is defective)
6	Outdoor unit ambient temperature (°C)	b6	10		or 255
7	Indoor unit heat exchanger gas pipe temperature (°C)	b7	25		or 127 (Temperature for top of compressor)
8	Outdoor unit evaporating temperature during heating (°C)	b8	02		Refer to section Self-checking procedure of PCB using the remote control switch
9	Control information	b9	--	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. (Ex.) During the operation of several compressors, the average temperature of two compressors is indicated. If the temperature is higher than 126 °C, “126”	
10	Discharge gas temperature at the top of the compressor chamber (°C)	bA	41		
11	Thermo temperature of the remote control switch	bB	23		

Indication of micro-computer input/output

12	Micro-computer input/output in indoor unit	014
13	Micro-computer input/output in outdoor unit	02-



Indication of unit stoppage cause

14	Cause of stoppage	d101
----	-------------------	------

00	Operation OFF, power OFF
01	Thermo - OFF (NOTE 1), activating float switch
02	Alarm (NOTE 2)
03	Freeze protection, overheating protection
05	Instantaneous power failure at outdoor unit, reset (NOTE 3)
06	Instantaneous power failure at indoor unit, reset (NOTE 4)
07	Outdoor temperature at cooling lower than -5°C, outdoor air temperature and indoor suction temperature at heating (Overload condition), outdoor temperature at heating lower than -20°C.
10	Demand, emergency stoppage (DSW 1-4 ON or forced stop)
11	Retry due to compression ratio decrease
12	Retry due to low pressure increase
13	Retry due to high pressure increase
15	Retry due to abnormal high temperature of discharge gas, excessive low suction pressure
16	Retry due to decrease of discharge gas superheat
17	Retry due to inverter tripping (Instantaneous overcurrent, electronic thermal activation, current sensor abnormality)
18	Retry due to inverter tripping (Inverter under voltage, over voltage, transmission error, microcomputer reset, etc.)
19	Expansion valve opening change protection
21	Thermo OFF due to oil return control
22	Outdoor unit hot start control



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 outdoor 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 outdoor 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	E101
16	Instantaneous power failure occurrence counter in indoor unit	E200
17	Transmission error occurrence counter between remote control switch and indoor unit	E300
18	Abnormal operation occurrence counter on inverter	E400

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 memorized data can be cancelled by the method which is explained in section [Self-checking procedure of PCB using the remote control switch](#).

Indication of automatic louver condition

19	Louver sensor	F100
----	---------------	------

00 : Normal

FF : Abnormal

Compressor pressure/frequency indication

20	Discharge pressure (high) (x 0.1 MPa)	H118
21	Suction pressure (low) (x 0.01 MPa)	H204
22	Control information	H344
23	Operation frequency (Hz)	H444

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

This is an indication for frequency of inverter

Indoor unit capacity indication

24	Indoor unit capacity	J108
25	Outdoor unit code	J2Fn
26	Refrigerant cycle number (Indoor unit shipment DSW5+RSW2)	J301
27	Refrigerant cycle number (Indoor unit shipment DSW5+RSW2)	J400

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

"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 (%)	L120
29	Outdoor unit expansion valve MV1 opening (%)	L299
30	Outdoor unit expansion valve MV2 opening (%)	L399
31	Control information	L400

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

Estimated electric current indication

32	Compressor running current (A)	P125
----	--------------------------------	------

The total current is displayed when several compressors are running.

In case of the inverter compressor, the running current of the primary side of the inverter is displayed.

➡ Returns to **temperature indication**

◆ Contents of the check mode 2

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

If you press the part "⊙" of the TEMP switch, the next display appears. If you press the part "⊖" of the TEMP switch, the previous display appears.

Temperature indication

		/		Indication of the category code
		/		Indication of the temperature, etc
1	Indoor unit air inlet temperature at thermistor (°C)	9123		Corresponds to check mode 1 "b2"
2	Indoor unit discharge air temperature at thermistor (°C)	9250		Corresponds to check mode 1 "b3"
3	Indoor unit heat exchanger liquid pipe temperature (freeze protection) (°C)	9325		Corresponds to check mode 1 "b4"
4	Outdoor temperature (°C)	9412		Corresponds to check mode 1 "b5"
5	Indoor unit heat exchanger gas pipe temperature (°C)	9525		Corresponds to check mode 1 "b7"
6	Evaporating temperature at heating (°C)	9603		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)	9845		Corresponds to check mode 1 "bA"

Compressor pressure/frequency indication

9	Discharge pressure (high) (x 0.1 MPa)	9918		Corresponds to check mode 1 "H1"
10	Suction pressure (low) (x 0.01 MPa)	9A04		Corresponds to check mode 1 "H2"
11	Control information	9B44		Corresponds to check mode 1 "H3"
12	Operating frequency (Hz)	9C44		Corresponds to check mode 1 "H4"

Expansion opening indication

13	Indoor unit expansion valve opening (%)	9d20		Corresponds to check mode 1 "L1"
14	Outdoor unit expansion valve mv1 opening (%)	9E99		Corresponds to check mode 1 "L2"

Estimated electric current indication

15	Compressor running current (A)	9F20		Corresponds to check mode 1 "P1"
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☛ Returns to temperature indication

10.2.5 Troubleshooting by means of the 7-segment display

Simple checking by 7-segment display

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

- 1 Disconnection of power supply to the indoor unit.
- 2 Reverse connection of the operating line between the outdoor and indoor units.
- 3 Duplication of indoor unit number.

- Outdoor unit, circuit board, PCB1

- 1 Turn ON all indoor units connected to the outdoor unit
- 2 Turn ON the outdoor unit
- 3 Auto-addressing starts

Checking method by 7-segment display

Operating conditions and each part of refrigeration cycle can be checked by 7-segment and push switches (PSW) on the PCB in the outdoor unit.



CAUTION

During checking data, do not touch the electric parts except for the indicated switches. Pay attention not to contact the tools with electrical parts. If contacted, electrical parts will be damaged.

- To start checking, press PSW2 switch for more than three seconds.
- To proceed checking, press the PSW2 switch.

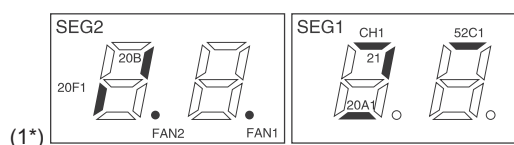
If PSW2 is pressed one time, item indication is shown.

When PSW2 is pressed for a second time, data indication is shown.

Then, press PSW2 and go to the following item indication. The checking procedure will be repeated over and over again.

- To back to the previous item, press the PSW3 switch.
- To cancel or finish this checking, press the PSW2 switch for more than 3 seconds

Checking item	Item indication		Data indication	
	Check No.	Indication	Indication	Contents
Output state of outdoor unit micro-computer	01	SC	--	(1*) Refer to the display position of the table
Indoor units capacity	02	oP	24	Display the capacity of indoor unit
Running frequency of inverter compressor	03	H I	100	Unit is Hz
Number of running compressor	04	CC	1	
Air flow rate	05	Fo	5	Display the gear (0~16) of outdoor unit, larger number denotes the larger air flow
Outdoor unit expansion valve opening	06	oE 1	50	Display by %; the larger number denotes the larger opening.
Discharge pressure (high)	08	Pd	1.8	Unit is MPa
Suction pressure (low)	09	PS	0.5	Unit is MPa
Discharge gas temperature on the top of compressor	10	rd 1	85	Unit is °C
Evaporating temperature at heating	11	FE 1	30	Unit is °C
Ambient temperature	12	ro	35	Unit is °C
Current of inverter compressor	14	R 1	20	Unit is A. Display the current of one time of inverter (input)
Indoor unit expansion valve opening (from 0 to 63)	15	EO	20	Display by %; the larger number denotes the larger opening. Only display the connecting indoor unit
Indoor unit heat exchanger liquid pipe temperature (freeze protection) (from 0 to 63)	16	FLD	20	Unit is °C. Only display the connecting indoor unit.
Indoor unit heat exchanger gas pipe temperature. (from 0 to 63)	17	FGD	5	Unit is °C. Only display the connecting indoor unit.
Indoor unit air inlet temperature. (from 0 to 63)	18	ro	25	Unit is °C. Only display the connecting indoor unit.
Indoor unit discharge air temperature. (from 0 to 63)	19	roD	18	Unit is °C. Only display the connecting indoor unit.
Indoor unit capacity setting. (from 0 to 63)	20	CRD	6	Display the capacities of all indoor units
Indoor unit cause of stoppage. (from 0 to 63)	21	d 10	0 1	(2*): Display the cause of stoppage of indoor unit. Please, refer to the cause code in the table
Pressure ratio fall protection degeneration control	22	c 1 1	1	0: Degeneration control does not act 1: Degeneration control is acting
High pressure rise protection degeneration control	23	c 1 3	1	0: Degeneration control does not act 1: Degeneration control is acting
Inverter fin temperature increase protection degeneration control	24	c 1 4	1	0: Degeneration control does not act 1: Degeneration control is acting
Discharge gas temperature increase protection degeneration control	25	c 1 5	1	0: Degeneration control does not act 1: Degeneration control is acting
Discharge gas temperature decrease protection degeneration control	26	c 1 6	1	0: Degeneration control does not act 1: Degeneration control is acting
Current protection degeneration control	27	c 1 7	1	0: Degeneration control does not act 1: Degeneration control is acting
Control information	28	uu 1	50	
The latest alarm code cause of stoppage at outdoor unit	30	AC	02	Display the latest alarm code of stoppage of outdoor unit
Cause code of stoppage at inverter	31	IFC	1	Display the cause of stopping inverter. The cause codes refer to right table
Total capacity setting of indoor unit	33	CP	52	Denotes the capacity of connecting indoor unit, displayed by 3.5 times
Total quantity of combined indoor unit	34	RR	4	
Address of refrigerant system	35	GR	2	0-63



(2*) Table of stoppage cause codes of indoor unit

Indication	Contents
00	Operation OFF, Power OFF
01	Thermo-OFF
02	Alarm
03	Antifreeze protection, overheat protection
05	Instantaneous power failure at outdoor unit
06	Instantaneous power failure at indoor unit
07	Stoppage of cooling operation due to low outdoor air temperature Stoppage of heating operation due to high outdoor air temperature
10	Demand thermo OFF
11	Retry for too low pressure ratio
12	Retry for Ps increase prevention
13	Retry for Pd increase prevention
15	Vacuum Discharge gas temperature increase retry
16	Retry due to discharge gas superheat decrease
17	IPM error retry, instantaneous over current of inverter retry, electronic thermal activation of inverter retry, abnormal current sensor of inverter retry
18	Retry due to inverter voltage decrease Retry due to inverter overvoltage
19	Expansion valve opening deviance prevention
20	Different operation mode between indoor and outdoor units (Only for individual twin / triple / quad types)
21	Forced Thermo-OFF (Only for simultaneous twin / triple / quad types)
22	Forced Thermo-OFF (During compressor pre-heating)
26	Retry for too low Pd

Release the
CHECK

If you want to release CHECK, please press the PSW2 for continuously above 3s.

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
14	2.0
16	2.3
18	2.5
22	3.0
32	4.0



NOTE

- *Even there is alarm stoppage, the stoppage code may not be "02". Because before the alarm, the stoppage cause code can be left due to the shut down of thermostat.*
- *For the machine equipped with inverter, if the transmission between the inverter and base board of outdoor unit is cut off for 30s, the outdoor chip will be reset. Therefore, when the 04 alarm is given, the stoppage cause code may be 05.*
- *If the transmission between the indoor unit and outdoor unit is cut off 3 minutes, the indoor chip is reset. Therefore, the stoppage cause code may be 06 when 03 alarm is given.*
- *When display the "21", please confirm the stoppage cause of other unit.*

Cancellation of Forced Thermo OFF

Turn ON the power source and wait for more than 30 seconds. Then press PSW1 and PSW3 simultaneously for more than 3 seconds.

Forced Thermo-OFF (Indoor unit error code 22) will be cancelled.

However, this function may damage the compressor, use only on inevitable occasion.

In case of using the remote control switch (PC-ART), the cancellation is also available with it.

When "Operation Lock" indication flashes on the remote control LCD, press FAN SPEED and LOUVER switches simultaneously for more than 3 seconds.

"Operation Lock" indication is disappeared and operation is available.

Cause of inverter stoppage

Code	Cause	Cause of stoppage for corresponding unit	Remark	
			Indication during retry	Alarm code
1	IPM fault signal error (Over current, decrease voltage, short circuit protection)	17	P 17	53
2	Instantaneous over current	17	P 17	48
3	Abnormal inverter fin thermistor	17	P 17	54
4	Electronic thermal activation	17	P 17	48
5	Inverter voltage decrease	18	P 18	06
6	Over voltage	18	P 18	06
7	Abnormal inverter transmission	18	-	04
8	Abnormal current detection	17	P 17	51
9	Instantaneous power failure detection	18	-	-
11	Reset of micro-computer for inverter	18	-	-
12	Earth fault detection from compressor (Only starting)	17	P 17	53
13	Abnormal power source phase (Open phase)	18	-	-
16	Inverter non-operation	18	P 18	55
17	Abnormal communication	18	P 18	55
18	Protection device activation	-	-	02
19	Abnormal protective detection device	-	-	38
20	Early 63H recovery	18	-	-

10.2.6 Troubleshooting by means of the flashing alarm LEDs for RPK-FSN(2/3)M

The red LED located on the panel indicates the following alarms:

Code	Cause	Indication
Alarm 02	Unit protection	This alarm is activated when the blinks sequence is two times ON / two seconds OFF
Alarm 03	Transmission error	This alarm is activated when the blinks sequence is three times ON / two seconds OFF
Alarm 04	Inverter outdoor unit error	This alarm is activated when the blinks sequence is four times ON / two seconds OFF

For the rest of the alarms, the blink sequence is one second ON / one second OFF.

10.2.7 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).
 - Higher priority is given to protection control related to frequency control than the other.

Priority	Protection control	Code
1	Pressure ratio control	<i>P01</i>
2	High-pressure rise protection	<i>P02</i>
3	Current protection	<i>P03</i>
4	Inverter fin temperature rise protection	<i>P04</i>
5	Discharge gas temperature rise protection	<i>P05</i>
6	Low-pressure decrease protection	<i>P06</i>
7	Low-pressure increase protection	<i>P0d</i>
8	Demand current control (running current limit control)	<i>P0A</i>
9	High pressure decrease protection	<i>P09</i>
10	Discharge gas superheat temperature decrease protection	<i>P0C</i>

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

Code	Protection control
<i>P01</i>	Pressure ratio control (*)
<i>P02</i>	High pressure rise protection (*)
<i>P03</i>	Inverter current protection control (*)
<i>P04</i>	Inverter fin temperature rise protection (*)
<i>P05</i>	Discharge gas temperature increase protection (*)
<i>P06</i>	Low pressure decrease protection
<i>P09</i>	High pressure decrease protection
<i>P0A</i>	Demand current control (60% to 100%)
<i>P0C</i>	Discharge gas superheat temperature decrease protection (*)

Code	Protection control
<i>P0d</i>	Low pressure increase protection
<i>P11</i>	Pressure ratio decrease retry
<i>P12</i>	Low pressure increase retry
<i>P13</i>	High pressure increase retry
<i>P15</i>	Suction pressure decrease and discharge temperature increase retry control
<i>P16</i>	Discharge gas SUPERHEAT decrease retry
<i>P17</i>	Inverter trip retry
<i>P18</i>	Insufficient voltage/excessive voltage retry

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

The retry indication continues for 30 minutes unless a protection control is displayed.

The retry indication disappears if the stop signal comes from all the rooms.



NOTE

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

Activating condition of the protection control code

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

Code	Protection control	Activating condition	Remarks
P01	Pressure ratio control	Compression ratio $\geq 9 \Rightarrow$ frequency decrease $(Pd+0.1)/(Ps+0.6) \leq 2.2 \Rightarrow$ frequency decrease	Ps: Suction pressure of compressor (Mpa) Pd: Discharge pressure of compressor (Mpa)
P02	High-pressure increase protection	$Pd \geq 3.6$ Mpa (36kgf/cm ² G) $\Rightarrow$ frequency decrease	
P03	Inverter current protection	If current is over larger when frequency changes two times $\Rightarrow$ frequency decrease	
P04	Inverter fin temperature increase protection	Inverter fin temperature ≥ 89 °C $\Rightarrow$ frequency decrease	
P05	Discharge gas temperature increase protection	Temperature at the top of compressor is high $\Rightarrow$ frequency decrease (Maximum temperature is different depending on the frequency)	
P06	Low-pressure decrease protection	Low-pressure is excessively low $\Rightarrow$ Frequency decrease (Minimum pressure is different depending on the ambient temperature)	
P09	High-pressure decrease protection	Discharge pressure of compressor decrease $\Rightarrow$ Frequency increase	
P0A	Demand current control (running current limit control)	Compressor run current $\geq$ demand setting value $\Rightarrow$ frequency decrease	Demand setting value: upper limit of total running current is set to 80%, 70%, 60% at normal operation using input on PCB1
P0C	Discharge gas superheat temperature decrease protection		
P0d	Low-pressure increase protection	Low pressure ≥ 1.3 MPa $\Rightarrow$ frequency increase	
P11	Pressure ratio decrease retry	Compression ratio $(Pd+0.1)/(Ps+0.6) \leq 1.5$	When it activates three times in 30 minutes, the alarm code "43" is displayed.
P12	Low-pressure increase retry	$Ps > 1.5$ MPa	When it activates three times in 30 minutes, the alarm code "44" is displayed.
P13	High-pressure increase retry	$Pd > 3.8$ MPa	When it activates three times in 30 minutes, the alarm code "45" is displayed.
P15	Vacuum/discharge gas temperature increase retry	In Case of $Ps < 0.09$ MPa for over 12 minutes, or discharge gas temperature ≥ 132 °C for over ten minutes or discharge gas temperature ≥ 140 °C for over five seconds	When it activates three times in one hour, the alarm codes "47" (Ps) or "08" (Discharge gas) are displayed
P16	Discharge gas SUPERHEAT decrease retry	Discharge gas SUPERHEAT less than ten (10) degrees is maintained for 30 minutes	When it activates three times in two hours, the alarm code "07" is displayed
P17	Inverter trip retry	Automatic stoppage of transistor module, activation of electronic thermal or abnormal current sensor	When activating three times in 30 minutes, "48", "51" and "53" alarm is indicated
P18	Insufficient voltage/ excessive voltage retry	Insufficient/excessive voltage at the inverter circuit or CB connector part	When it activates three times in 30 minutes, the alarm code "06" is displayed

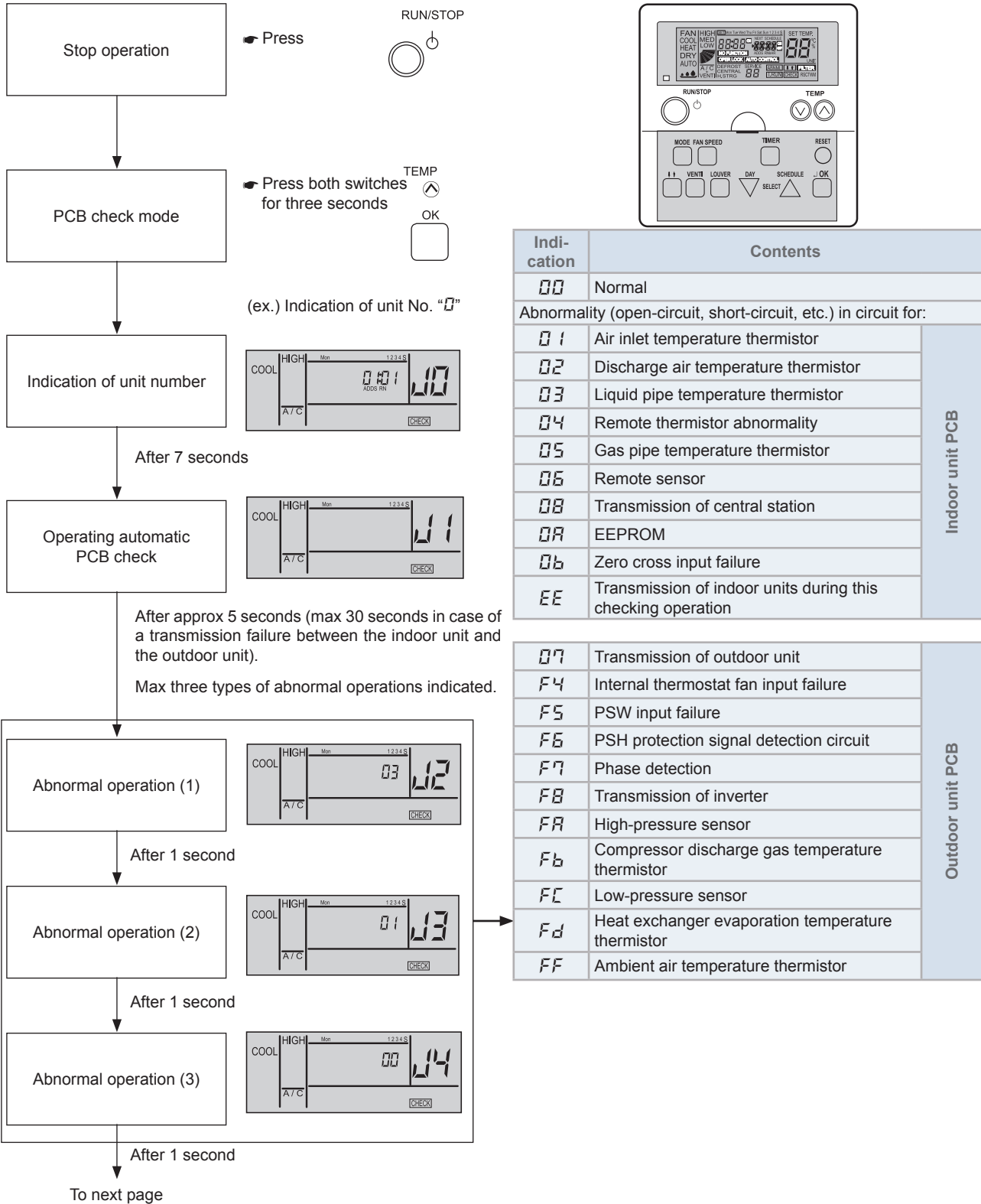
Ps: Suction pressure of compressor

Pd: Discharge pressure of compressor

10.3 Procedure for checking each main part

10.3.1 Self-checking procedure of PCB using the remote control switch

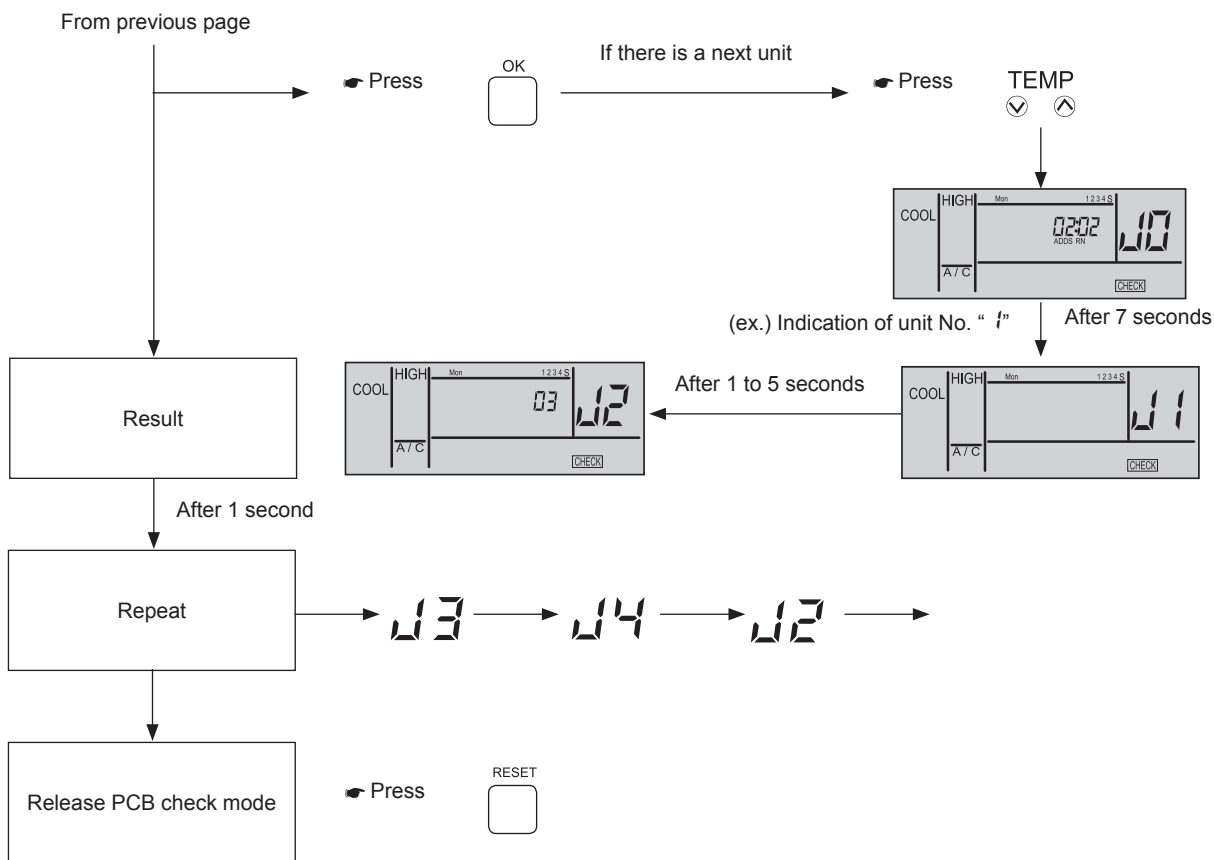
Use the following troubleshooting procedure for testing the PCB in the indoor unit and the outdoor unit:



If you are using a wireless remote control switch with the built-in receiver part of the wall-type indoor unit and you need to perform the above checking, perform the following procedure:

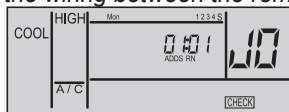
- 1 Turn OFF the power supply.
- 2 Disconnect the connector (CN25) on PWB(M).
- 3 Connect the PC-ART.
- 4 Turn ON the power supply.

After finishing the checking, turn OFF the power supply again and reconnect the connectors according to the previous situation before the checking.



i NOTE

- If this indication continues and the alarm code “ 1” is not displayed, this means that each one of indoor unit is not connected to the remote control switch. Check the wiring between the remote control switch and the indoor unit.



- *In this troubleshooting procedure, checking of the following parts of the PCB is not available.*
PCB in indoor unit: relay circuit, DIP switch, option circuit, fan circuit, protection circuit.
PCB in outdoor unit: relay circuit, DIP switch, option circuit.
- *If this troubleshooting is performed in the system 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.*

10.3.2 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.)

TEMP

MODE

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.

01

No.	LCD indication	Indicating period (sec.)
1		1
2		1
3		1
4		1
5		3

Only for the cancellation of EEPROM, press the following three switches simultaneously during the changes of the LCD.

TEMP

MODE

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.

A

02

6

The LCD changes as shown below. The remote control switch automatically starts to check the transmission circuit

03

i

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.

i

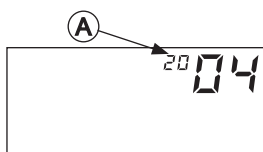
NOTE

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.

The LCD changes as shown below.

The detected temperature of the remote control thermostat is displayed at the (A) part in the figure below.

7



If the indicators "--" or "FF" are displayed at the "A" part, the remote control thermostat is abnormal.

The LCD changes as shown below.

8

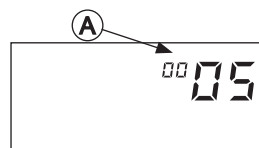


If you press the RESET switch or you leave the switches for 15 seconds, the data of EEPROM (storage cell inside of the remote control switch) is cleared.

→ 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.

The LCD changes as shown below.

9



← If the number which is displayed at the (A) part is "99", the checking does not proceed to the next item.

After several seconds have passed, the remote control switch is automatically activated again.

When the remote control switch is activated again, the RUN indicator is ON and the operation is started.

10

Therefore, press the RUN/STOP switch and stop the operation.

Cancellation of EEPROM
(from step 3)

The LCD changes as shown below and the remote control switch automatically cancels the EEPROM.

11



The LCD changes as shown below

12



After several seconds have passed, the remote control switch is automatically activated again. In this case, the operation is not started automatically.

→ **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.

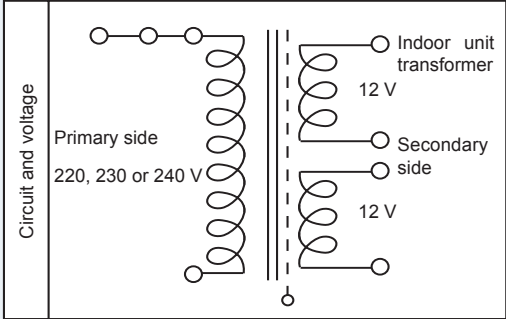
11. Maintenance notes

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11.1 Checking the power source and the wiring connection

Check the following items in the case of abnormal operation:

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

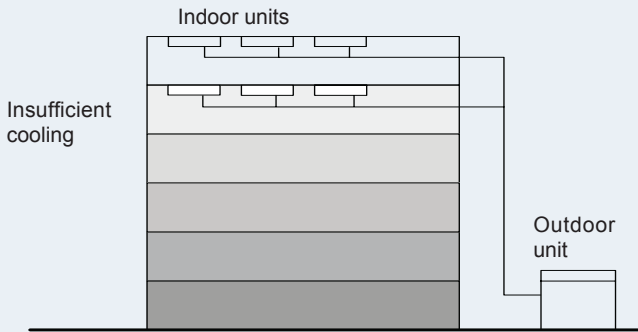
11.2 Burnt-out compressor due to an insufficient refrigerant charge

Question and answer for the field work

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

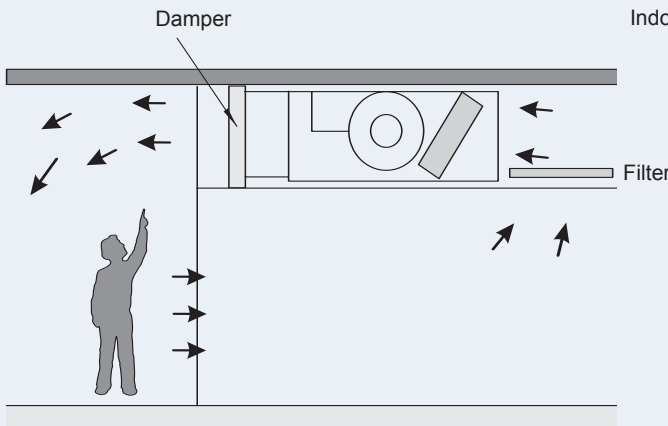
11.3 Insufficient cooling performance when a long piping is applied

Question and answer for the field work

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

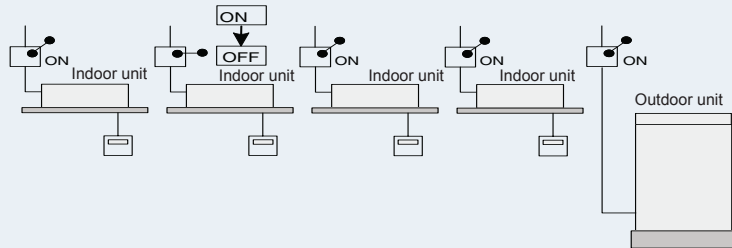
11.4 Abnormally high operation sound (in-the-ceiling type indoor unit)

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.

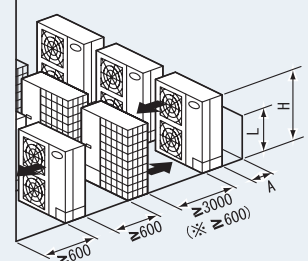
11.5 Alarm code "31"

Question and answer for the field work

Example 4: Alarm code "31"	
Phenomenon	Alarm code "31" sometimes occurred and the system stopped.
Cause	The combination of the indoor units and the outdoor unit was the following.  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.

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

Question and answer for the field work

Example 5: Not cooling well due to insufficient installation space for outdoor unit							
Phenomenon	Cooling operation was well performed through the intermediate season. However the cooling operation was not well available when the outdoor temperature was higher than 35 °C.						
Cause	As the outdoor units were installed without a sufficient installation space the hot discharge air from other outdoor units was circulated. In this case though the outdoor temperature was 35 °C the actual suction air temperature was nearly 50 °C and protection system from excessively high suction pressure was activated the frequency of the compressor was decreased and the cooling capacity was also decreased accordingly. As the outdoor units in-line were installed back to back with a distance of 600 mm between each outdoor unit's back the hot discharged air from other outdoor units was circulated.						
Countermeasure	Ensure that sufficient space should be secured for multi-row and multiple-installation.  Allow approx. 100 mm of space from the side unit. Leave open both right and left sides. The length A is as shown in the following table: <table border="1"> <thead> <tr> <th>L</th><th>A</th></tr> </thead> <tbody> <tr> <td>$0 < L \leq 1/2H$</td><td>≤ 200</td></tr> <tr> <td>$1/2H < L \leq H$</td><td>≤ 300</td></tr> </tbody> </table>	L	A	$0 < L \leq 1/2H$	≤ 200	$1/2H < L \leq H$	≤ 300
L	A						
$0 < L \leq 1/2H$	≤ 200						
$1/2H < L \leq H$	≤ 300						



NOTE

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

11.7 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.

11.7.1 Maximum permitted concentration of hydrofluorocarbon (HFC)

The refrigerant R410A, charged in the UTOPIA 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.

11.7.2 Calculation of refrigerant concentration

The volume of the room and the refrigerant charge amount in each room must follow the next equation:

- 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 (m ³).
C: Refrigerant concentration (≤ 0.44 kg/m ³ for R410A).

11.7.3 Countermeasure for refrigerant leakage

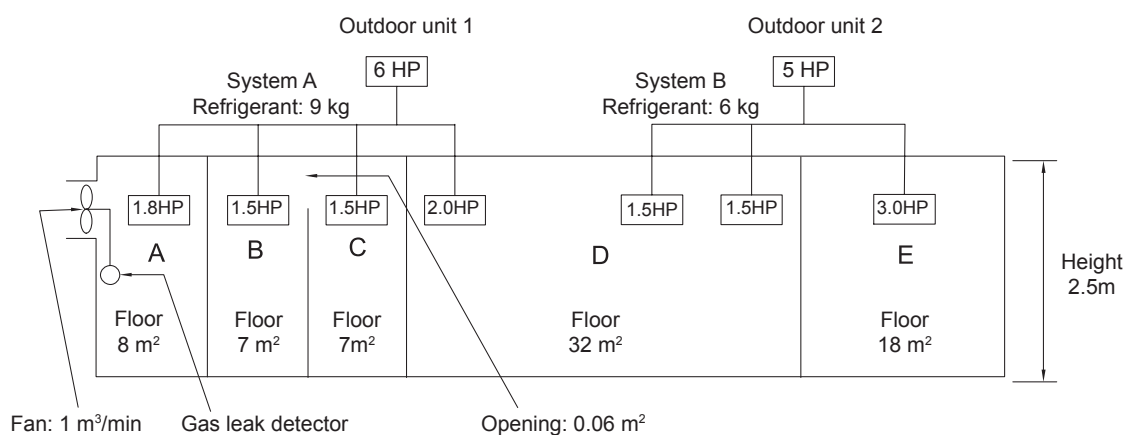
The facility must have the following features in case of a refrigerant leakage occurs:

- 1 Provide a shutterless opening which will allow fresh air to circulate into the room.
- 2 Provide a door-less 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 / 5.7 m³/h) of the air conditioning system using the refrigerant.

Model	Tonnes
RAS-4FS(V)N(Y)3E	1.84
RAS-5FS(V)N(Y)3E	2.07
RAS-6FS(V)N(Y)3E	2.30

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

◆ Example of application



Room	R (kg)	V (m³)	C (kg/m³)	Countermeasure
A	9	20	0.45	1 m³/min fan linked with gas leak detector
B	9	17.5	0.51	0.06 m² aprox. opening
C	9	17.5	0.51	0.06 m² aprox. opening
B+C	9	35	0.26	-
D	16	80	0.20	-
E	7	45	0.16	-

11.8 Maintenance work

For the indoor unit and the outdoor unit

1 Fan and fan motor

- Lubrication: All the fan motors are pre-lubricated and sealed at the factory. Therefore, no lubrication maintenance is required.
- Sound and vibration: Check for abnormal sounds and vibrations.
- Rotation: Check the clockwise rotation and the rotating speed.
- Insulation: Check the electrical insulation resistance.

2 Heat exchanger

- Clog: Inspect the heat exchanger at regular intervals and remove any accumulated dirt and any accumulated dust from the heat exchanger. You should also remove from the outdoor units other obstacles, such as the growing grass and the pieces of paper, which might restrict the airflow.

3 Piping connection

- Leakage: Check for the refrigerant leakage at the piping connection.

4 Cabinet

- Stain and Lubrication: Check for any stain and any lubrication. Remove the stain and the lubrication.
- Fixing Screw: Check for any loosened screw or any lost screw. Fix the loosened screws and the lost screws.
- Insulation Material: Check for any peeled thermal insulator on the cabinet. Repair the thermal insulator.

5 Electrical equipment

- Activation: Check for an abnormal activation of the magnetic contactor, the auxiliary relay, the PCB and others.
- Line condition: Pay attention to the working voltage, the working amperage and the working phase balance. Check for any faulty contact that is caused by the loosened terminal connections, the oxidized contacts, the foreign matter, and other items. Check the electrical insulation resistance.

6 Control device and protection device

- Setting: Do not readjust the setting in the field unless the setting is maintained at a point that is different from the point that is listed in the section [Safety and control device setting](#) of TC.

For the indoor unit

1 Air filter

- Cleaning: Check for any accumulated dirt and any accumulated dust. Remove the dirt and the dust.

2 Drain pan, drain-up mechanism and drain pipe

- Drain line: Check and clean the condensate drain pipe at least twice a year.
- Drain-up mechanism: Check the activation of the drain-up mechanism.

3 Float switch

- Activation: Check the activation of the float switch.

For the outdoor unit**1 Compressor**

- Sound and vibration: Check for abnormal sounds and vibrations.
- Activation: Check that the voltage drop of the power supply line is within 15% at the start and within 2% during the operation.

2 Reverse valve

- Activation: Check for any abnormal activation sound.

3 Strainer

- Clog: Check that there is no temperature difference between both ends.

4 Ground wire

- Ground line: Check for the continuity to earth.

5 Oil heater

- Activation: You should activate the oil heater at least twelve hours before the start-up by turning ON the main switch.

11.9 Service and maintenance record

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

11.10 Service and maintenance record using the 7-segment display

Customer's name: _____					Date: _____					
Outdoor unit model (serial number)			RAS- (Serial number)				RAS- (Serial number)			
1	Operation mode									
2	Test run start time									
3	Data collect start time									
4	Read out data from 7-segment in outdoor unit									
4.1	Protection control code									
4.2	Total capacity of IU connected	CP								
4.3	Input/output state of outdoor micro-computer	SC	52C	FAN1	FAN2	20A	52C	FAN1	FAN2	20A
			20F	21	CH	PSH	20F	21	CH	PSH
4.4	Alarm code for abnormal stoppage of compressor	AC								
4.5	Inverter order frequency to compressor	H1								
4.6	Indoor order frequency to compressor	H2								
4.7	Air flow ratio	Fo								
4.8	OU expansion valve opening	Eo								
4.9	Temperature at the top of compressor	Td								
4.10	Evaporating temp. at heating	TE								
4.11	Ambient air temperature	To								
4.12	Cause of stoppage at inverter	iT								
4.13	Inverter secondary current	A2								
4.14	OU address	nA								
5	Indoor unit (unit number 1)									
5.1	IU expansion valve opening	EA								
5.2	Liquid pipe temperature of IU (Freeze protection)	LA								
5.3	IU intake air temperature	iA								
5.4	IU discharge air temperature	oA								
5.5	Cause of IU stoppage	dA								
6	Indoor unit (unit number 2)									
6.1	IU expansion valve opening	EA								
6.2	Liquid pipe temperature of IU (Freeze protection)	LA								
6.3	IU intake air temperature	iA								
6.4	IU discharge air temperature	oA								
6.5	Cause of IU stoppage	dA								
7	Indoor unit (unit number 3)									
7.1	IU expansion valve opening	EA								
7.2	Liquid pipe temperature of IU (Freeze protection)	LA								
7.3	IU intake air temperature	iA								
7.4	IU discharge air temperature	oA								
7.5	Cause of IU stoppage	dA								

Service and maintenance record using the 7-segment display

Customer's name: _____			Date: _____
Outdoor unit model (serial number)		RAS- (Serial number)	RAS- (Serial number)
8	Indoor unit (unit number 4)		
8.1	IU expansion valve opening	EA	
8.2	Liquid pipe temperature of IU (Freeze protection)	LA	
8.3	IU intake air temperature	iA	
8.4	IU discharge air temperature	oA	
8.5	Cause of IU stoppage	dA	

**NOTE**

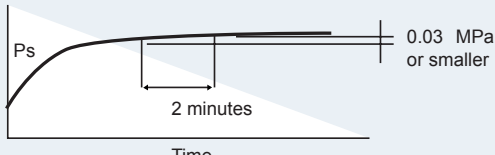
- O.U.: Outdoor Unit.
- I.U.: Indoor unit.
- FAN1 FAN2: Constant speed fan.
- 52C: CMC.
- PSH: High pressure switch.
- 20A: Solenoid valve (SVA).
- 20F: Solenoid valve (SFV).
- 21: Reversing valve (RVR).
- CH: Oil heater.
- *: Multiply 1/8 by the code on the 7-segment.

11.11 Service and maintenance record by remote control switch

Data sheet for checking by remote control switch

Time	:	:	:	:	:	:
IU model						
IU serial number						
IU number / alarm code						
	Check mode 1	Check mode 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						
IU micro-computer	C1	--				
OU micro-computer	C2	--				
D Stopping cause state indication						
Stopping cause state indication	d1	--				
E Alarm occurrence						
Times of abnormality	E1	--				
Times of power failure	E2	--				
Times of abnormal transmitting	E3	--				
Times of inverter tripping	E4	--				
F Automatic louver state						
Louver sensor state	F1	--				
H Pressure and frequency state indication						
Discharge pressure	H1	99				
Suction pressure	H2	9A				
Control information	H3	9b				
Operating frequency	H4	9C				
J I.U. capacity Indication						
IU capacity (1/8HP)	J1	--				
OU code	J2	--				
Refrigerant cycle number	J3	--				
Refrigerant cycle number	J4	--				
L Opening of expansion valve						
IU expansion valve	L1	9d				
OU expansion valve 1	L2	9E				
OU expansion valve 2	L3	--				
OU expansion valve B	L4	--				
P Running current indication (reference)						
Compressor current	P1	9F				

11.12 Pump-down method for replacing the compressor

No.	Procedure	Remarks
1	Turn off the main switch of the outdoor unit.	-
2	Remove the covers, the thermistor, the crankcase heater, the power wirings, and other items according to the chapter 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 outdoor unit.	-
4	Turn on the main switch of the outdoor unit.	-
5	Set the exclusion of the compressor by setting the DSW so that a broken compressor will not work. You can set the exclusion of the compressor by setting the DSW1-4 in ON position.	-
6	The compressor replacing mode is performed: - The DSW1-4 on the outdoor unit PCB → ON (The cooling is run).	- This operation is performed for up to a maximum of ten minutes. - If the inverter compressor is excluded, the operation starts after three minutes.
7	The operation finishes when one of the following conditions occurs: 1 Ten minutes have passed and STP is displayed in seven segments. 2 "08" is displayed in seven segments. 3 When $P_s < 0.1\text{MPa}$ 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 P_s on the outdoor unit PCB is 17 seconds. Make sure that the P_s increase is within 0.03 Mpa in two minutes after the P_s increase at the stoppage (during approximately five minutes). Also make sure that $P_d > P_s$. 	- When you stop the compressor for replacing: - You can check the leakage of the check valve by means of the P_s variation because the SVA opens so that the discharge gas side of the inverter compressor can connect to the low-pressure side. - 0.03 Mpa / 2 minutes is within the permissible limits for the check valve on the discharge gas side. - The leakage of the check valve may cause an incorrect brazing, due to the gas pressure at the brazing of the discharge piping. - If the compressor-replacing mode is performed again, set the DSW4-4 to OFF and keep the DSW4-4 at the OFF side during ten minutes. Then, start according to the procedure No. 6.

No.	Procedure	Remarks
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 outdoor unit side by means of the machine.	- The discharge of the refrigerant in the atmosphere is strictly forbidden. Make sure that the refrigerant is collected by the collector. - Keep a note of the quantity of the collected refrigerant.
11	After collecting the refrigerant, remove the change hose (collector side) of the low-pressure side, so that the low-pressure side of the refrigerant cycle will be the atmosphere pressure.	- Make sure that there is no pressure increase of the low-pressure sides after collecting the refrigerant. - Make sure that the refrigerant cycle is the atmosphere pressure. Otherwise, problems such as the blowing of gas and the suction of the cutting material) may occur when you are removing the compressors.
12	Turn OFF the main switch of the outdoor unit.	-
13	Perform the replacement of the compressor and the change of the refrigerant oil according to the section Replacing the compressor .	Make sure that you follow the instructions.
14	Perform the vacuum from the check joint of the low-pressure side.	If you collect the refrigerant only on the low-pressure side (A in 11). You cannot perform the vacuum of the refrigerant from the check joint of the high-pressure side.
15	Open the liquid stop valve and the gas stop valve completely when you finish the vacuum.	-
16	Make sure that the power is turned OFF and attach the following items: the power supply wire, the thermistor, the crankcase heater, the 63H wiring, the panel and the nut).	-
17	Set the DSW back to the original setting. Make sure that all the wirings to the compressor are connected correctly.	-
18	Recharge the refrigerant that is collected in the process by the stop valve of the liquid side during the cooling at the TEST RUN mode.	If the replacement of the compressor takes more than two hours, an additional change of the refrigerant is necessary. Additional change = (replacing time – 2 hours) x 0.5kg.

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