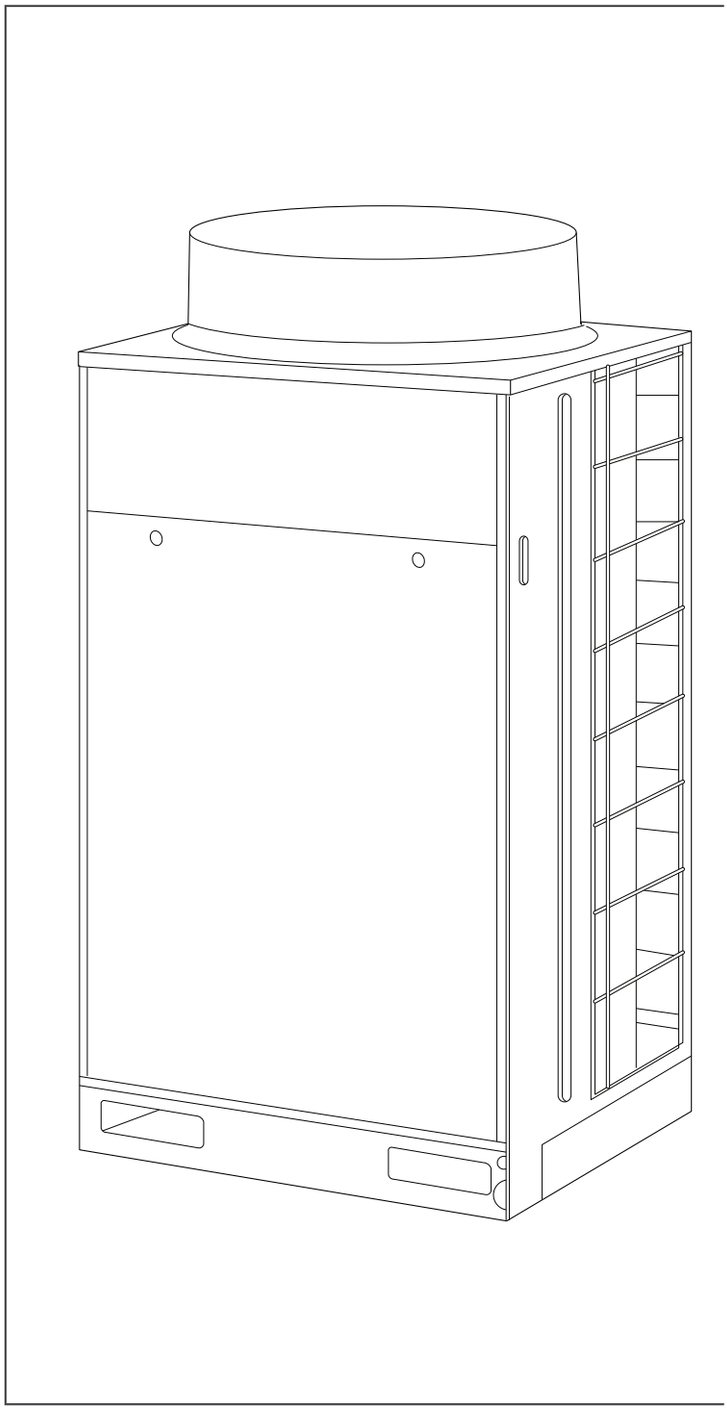
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SET FREE SERIES
FSXN1E
FSXNH(E)



Service Manual

RAS-(8-54)FSXN1E(-P)
RAS-(5-36)FSXNH(E)(-P)

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1. General information

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1.1 General information

1.1.1 General notes

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

1.1.2 Introduction

HITACHI presents the FSXNH(E) and FSXN1E series, which belongs to the SET FREE series characterised by its modular design. The application of a single unit, called a base unit (from 5 to 12 HP for FSXNH(E) series, and from 8 to 16 HP for FSXN1E) or the combination of two or up to three of these base units of different powers covers the rest of the range of capacities (from 12 to 36 HP for FSXNH(E)(-P) series, and from 18 to 54 HP for FSXN1E(-P)) for air conditioning in office buildings and small industry.

The modular concept of the FSXNH(E) and FSXN1E series offers refrigeration, heating or both simultaneously, to create personalised environments for every necessity.

1.1.3 Environment-friendly units

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



1.2 Safety

1.2.1 Symbols used

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

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

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

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

DANGER

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

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

CAUTION

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

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

NOTE

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

1.3 Product guide

1.3.1 Classification of outdoor unit models and CH modules

◆ Outdoor units FSXN1E series

Unit type (outdoor unit): RAS							
	Position-separating hyphen (fixed)						
		Capacity (HP): (8-54)					
			FSX: SET FREE series				
				N: R410A refrigerant			
					1: Series		
						E= Made in Europe	
							-P: Special type
XXX	–	XX	FSX	N	1	E	(-P)

◆ Outdoor units FSXNH(E) series

Unit type (outdoor unit): RAS							
	Position-separating hyphen (fixed)						
		Capacity (HP): (5-36)					
			FSX: SET FREE series				
				N: R410A refrigerant			
					H: High efficiency type		
						- = Made in Japan E = Made in Europe	
							-P: Special type
XXX	–	XX	FSX	N	H	(X)	(-P)

◆ CH units

Type of unit: CH (Cooling/Heating Changeover unit)					
	Position-separating hyphen (fixed)				
		Maximum capacity of connectable indoor units (HP) 6.0: 6.0 HP 10.0: 6.1 to 10.0 HP			
			N: R410A refrigerant		
				Generation: 1 or 2	
XX	–	XX	N	(X)	

1.3.2 Classification of indoor unit models

Unit type (indoor unit): RCI, RCIM, RCD, RPC, RPI, RPIM, RPK, RPF, RPFI											
	Position-separating hyphen (fixed)										
		Capacity (HP): 0.6, 0.8, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0, 6.0, 8.0, 10.0, 16.0, 20.0									
			FS = SYSTEM FREE								
				N = R410A refrigerant							
					H = Hotel (RPK-(0.6-1.5) only)						
						2/3/4 = series					
							P= Pair				
								E = Made in Europe M = Made in Malaysia – = Made in Japan			
									i = Version up (RCI only) k = Version up RCI for P-AP160NA(1/E) panel only		
										(-DU) = Drain Up (RPIM only)	
XXX	–	X.X	FS	N	(H)	X	(P)	(X)	(x)	(-DU)	

1.3.3 Product guide: Outdoor units

◆ Outdoor units FSXN1E series

Outdoor Units ❄ ☀			
3N~ 400V 50Hz			
RAS-FSXN1E			
			
Unit	Code	Unit	Code
RAS-8FSXN1E	7E331110	RAS-14FSXN1E	7E331130
RAS-10FSXN1E	7E331111	RAS-16FSXN1E	7E331131
RAS-12FSXN1E	7E331112		

NOTE

To obtain the different working range powers, please refer to chapter "Combination of outdoor units FSXN1E series".

◆ Outdoor units FSXNH(E) series

Outdoor Units ❄ ☀			
3N~ 400V 50Hz			
RAS-FSXNH(E)			
			
Unit	Code	Unit	Code
RAS-5FSXNH(E)	60288573 (7E332008)	RAS-8FSXNH(E)	60288575 (7E332010)
RAS-6FSXNH(E)	60288574 (7E332009)	RAS-10FSXNH(E)	60288576 (7E332011)
		RAS-12FSXNH(E)	60288577 (7E332012)

NOTE

To obtain the different working range powers, please refer to chapter "Combination of outdoor units FSXNH(E) series".

◆ Combination of outdoor units FSXN1E series

The power range of the RAS-(8-54)FSXN1E(-P) outdoor units is obtained by applying one unit (RAS-(8-16)FSXN1E) or by the combination of two, three or four outdoor units, depending on the instructions in the following tables.

Base units

HP	8	10	12	14	16
Model	RAS-8FSXN1E	RAS-10FSXN1E	RAS-12FSXN1E	RAS-14FSXN1E	RAS-16FSXN1E
Code	7E331110	7E331111	7E331112	7E331130	7E331131

Combination of base units

HP	16-P	18	20	22	24	26
Model	RAS-16FSXN1E-P	RAS-18FSXN1E	RAS-20FSXN1E	RAS-22FSXN1E	RAS-24FSXN1E	RAS-26FSXN1E
Combination	RAS-8FSXN1E	RAS-8FSXN1E	RAS-8FSXN1E	RAS-8FSXN1E	RAS-10FSXN1E	RAS-12FSXN1E
	RAS-10FSXN1E	RAS-10FSXN1E	RAS-12FSXN1E	RAS-14FSXN1E	RAS-14FSXN1E	RAS-14FSXN1E

HP	28	30	32	32-P	34	36
Model	RAS-28FSXN1E	RAS-30FSXN1E	RAS-32FSXN1E	RAS-32FSXN1E-P	RAS-34FSXN1E	RAS-36FSXN1E
Combination	RAS-14FSXN1E	RAS-14FSXN1E	RAS-16FSXN1E	RAS-10FSXN1E	RAS-10FSXN1E	RAS-12FSXN1E
	RAS-14FSXN1E	RAS-16FSXN1E	RAS-16FSXN1E	RAS-12FSXN1E	RAS-12FSXN1E	RAS-12FSXN1E
	-	-	-	RAS-12FSXN1E	RAS-12FSXN1E	RAS-12FSXN1E

HP	38	40	42	44	46	48
Model	RAS-38FSXN1E	RAS-40FSXN1E	RAS-42FSXN1E	RAS-44FSXN1E	RAS-46FSXN1E	RAS-48FSXN1E
Combination	RAS-12FSXN1E	RAS-12FSXN1E	RAS-12FSXN1E	RAS-12FSXN1E	RAS-14FSXN1E	RAS-16FSXN1E
	RAS-12FSXN1E	RAS-12FSXN1E	RAS-14FSXN1E	RAS-16FSXN1E	RAS-16FSXN1E	RAS-16FSXN1E
	RAS-14FSXN1E	RAS-16FSXN1E	RAS-16FSXN1E	RAS-16FSXN1E	RAS-16FSXN1E	RAS-16FSXN1E

HP	50	52	54
Model	RAS-50FSXN1E	RAS-52FSXN1E	RAS-54FSXN1E
Combination	RAS-10FSXN1E	RAS-12FSXN1E	RAS-12FSXN1E
	RAS-12FSXN1E	RAS-12FSXN1E	RAS-12FSXN1E
	RAS-14FSXN1E	RAS-14FSXN1E	RAS-14FSXN1E
	RAS-14FSXN1E	RAS-14FSXN1E	RAS-16FSXN1E

◆ Combination of outdoor units FSXNH(E) series

The power range of the RAS-(5-36)FSXNH(E)(-P) outdoor units is obtained by applying one unit (RAS-(5-12)FSXNH(E)) or by the combination of two or three outdoor units, depending on the instructions in the following tables.

Base units

HP	5	6	8	10	12
Model	RAS-5FSXNH(E)	RAS-6FSXNH(E)	RAS-8FSXNH(E)	RAS-10FSXNH(E)	RAS-12FSXNH(E)
Code	60288573 (7E332008)	60288574 (7E332009)	60288575 (7E332010)	60288576 (7E332011)	60288577 (7E332012)

Combination of base units

HP	12-P	14	16	18	20
Model	RAS-12FSXNH(E)-P	RAS-14FSXNH(E)	RAS-16FSXNH(E)	RAS-18FSXNH(E)	RAS-20FSXNH(E)
Combination	RAS-6FSXNH(E)	RAS-6FSXNH(E)	RAS-8FSXNH(E)	RAS-8FSXNH(E)	RAS-8FSXNH(E)
	RAS-8FSXNH(E)	RAS-8FSXNH(E)	RAS-8FSXNH(E)	RAS-10FSXNH(E)	RAS-12FSXNH(E)

HP	22	24	24-P	26	28
Model	RAS-22FSXNH(E)	RAS-24FSXNH(E)	RAS-24FSXNH(E)-P	RAS-26FSXNH(E)	RAS-28FSXNH(E)
Combination	RAS-10FSXNH(E)	RAS-12FSXNH(E)	RAS-8FSXNH(E)	RAS-8FSXNH(E)	RAS-8FSXNH(E)
	RAS-12FSXNH(E)	RAS-12FSXNH(E)	RAS-8FSXNH(E)	RAS-8FSXNH(E)	RAS-8FSXNH(E)
	-	-	RAS-10FSXNH(E)	RAS-10FSXNH(E)	RAS-12FSXNH(E)

HP	30	32	34	36
Model	RAS-30FSXNH(E)	RAS-32FSXNH(E)	RAS-34FSXNH(E)	RAS-36FSXNH(E)
Combination	RAS-8FSXNH(E)	RAS-8FSXNH(E)	RAS-10FSXNH(E)	RAS-12FSXNH(E)
	RAS-10FSXNH(E)	RAS-12FSXNH(E)	RAS-12FSXNH(E)	RAS-12FSXNH(E)
	RAS-12FSXNH(E)	RAS-12FSXNH(E)	RAS-12FSXNH(E)	RAS-12FSXNH(E)

◆ Special models RAS-(16/32)FSXN1E-P and RAS-(12/24)FSXNH(E)-P

The special models RAS-(16/32)FSXN1E-P and RAS-(12/24)FSXNH(E)-P are aimed for installations where high performance is required.

Specific data for these units, like capacities and efficiency, is shown in the *"3. General data"* chapter in the Technical Catalogue, and the selection data, like nominal capacity tables and the capacity tables according to the total power of combined indoor units, is available in chapter *"4. Capacities and selection data"* in the Technical Catalogue.

The contents regarding component data and sound curves, as well as the instructions for installation, piping, commissioning, maintenance and other works are common for each pair of models shown below.

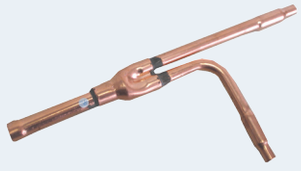
RAS-16FSXN1E-P → RAS-18FSXN1E
RAS-32FSXN1E-P → RAS-34FSXN1E

RAS-12FSXNH(E)-P → RAS-14FSXNH(E)
RAS-24FSXNH(E)-P → RAS-26FSXNH(E)

Therefore there are no specific instructions shown for these special models.

1.3.4 Accessory code list

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

Name	Description	Code	Figure
MC-20AN1	Branch pipe (OU pipe connection kit)	70526209	
MC-21AN1			
MC-30AN1		70526211	
MC-40AN1			
MC-20XN1		70526309	
MC-21XN1			
MC-30XN1		70526311	
MC-40XN1			
CH-6.0N2	CH Unit	60291930	
CH-10.0N2		60291931	
DBS-TP10A	Drain Boss	60291683	
E-102SN3	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	Header branch	70522007	
MH-108AN		70522008	
MH-108XN		70523108	

1.3.5 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**

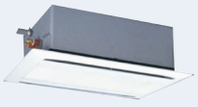
RCI						RCIM	
❄☀							
							
4-way cassette						4-way cassette (compact)	
Unit	Code	Unit	Code	Unit	Code	Unit	Code
						RCIM-0.6FSN3 (*)	60278171
						RCIM-0.8FSN3	60278172
RCI-1.0FSN3Ei	7E403014	RCI-1.0FSN3Ek	7E404001	RCI-1.0FSN3	60278119	RCIM-1.0FSN3	60278173
RCI-1.5FSN3Ei	7E403015	RCI-1.5FSN3Ek	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.*
- *(*): 0.6 HP Indoor Units can only be used in combination with Set Free FSXN1E and FSXNH(E) series.*

◆ RCD and RPC indoor units

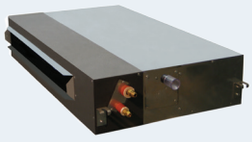
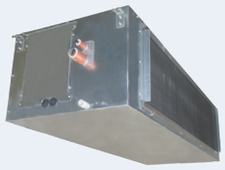
RCD				RPC			
							
2-way cassette				Ceiling type			
Unit	Code	Unit	Code	Unit	Code	Unit	Code
RCD-1.0FSN2	60278029						
RCD-1.5FSN2	60278030					RPC-1.5FSN3	60278164
RCD-2.0FSN2	60278031			RPC-2.0FSN3E	7E443003	RPC-2.0FSN3	60278165
RCD-2.5FSN2	60278032			RPC-2.5FSN3E	7E443004	RPC-2.5FSN3	60278166
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	Unit	Code	Unit	Code
RPI-0.6FSN4E (*)	7E424037						
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				
				RPI-8.0FSN3E	7E424010		
				RPI-10.0FSN3E	7E424011		
						RPI-16.0FSN3PE	7E425038 (**)
						RPI-20.0FSN3PE	7E425039 (**)

RPIM	
	
Indoor ducted unit (mini)	
Unit	Code
RPIM-0.6FSN4E (*)	7E430037
RPIM-0.6FSN4E-DU (*)	7E431037
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

NOTE

- *(*): 0.6 HP Indoor Units can only be used in combination with Set Free FSXN1E and FSXNH(E) series.*
- *(**): RPI-FSN3PE can only be used in combination with Set Free FSXN, FSXN1E and FSXNH(E) series.*

◆ RPK, RPF and RPFI indoor units

RPK		RPF		RPFI	
		❄☀			
					
Wall type		Floor type		Floor concealed type	
Unit	Code	Unit	Code	Unit	Code
RPK-0.6FSN3M (*)	60278145				
RPK-0.6FSNH3M (*)	60278153				
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

- *(*) 0.6 HP Indoor Units can only be used in combination with Set Free FSXN1E and FSXNH(E) series*
- *[1] For RPK-(0.6-1.5)FSNH3M models only.*

1.3.6 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		

1.3.7 Product line-up: DX-Interface

DX-Interface			
	Control 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
	Expansion valve box	EXV-10.0E1	7E610907

1.3.8 Product line-up: Econofresh

◆ Econofresh kit

Econofresh	
	
Unit	Code
EF-456NE	7E560000

NOTE

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)*

2. Unit installation

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2.1 Outdoor unit

2.1.1 Preliminary conditions for positioning of outdoor unit

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

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

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

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

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

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

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

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

CAUTION

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

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

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

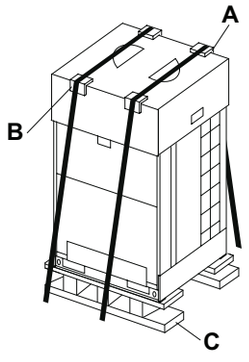
CAUTION

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

2.1.2 Transport, lifting and handling of the units

◆ Transport of outdoor unit

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



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

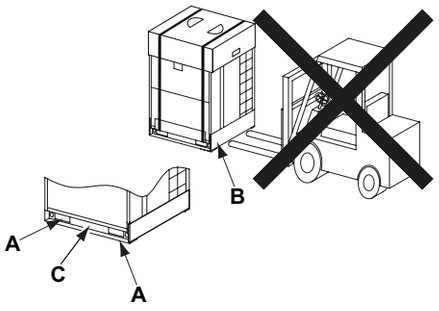
CAUTION

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

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

◆ Handling

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



CAUTION

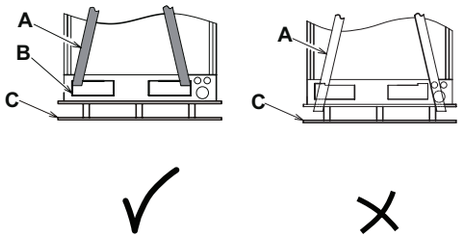
- *National and local legislation must be observed with respect to driving and the handling of loads with fork-lift trucks.*
- *The only places in which the forks of the fork-lift truck can be inserted are through the openings -A- of the unit base.*
- *Do not apply excessive force to these openings, with either the forks or other tools. This could damage the base of the unit.*
- *Do not move the unit by pushing it on side -B- of the base with the forks of the fork-lift truck or by applying force on zone -C-.*
- *Do not use wheelbarrows to move the unit.*

◆ Lifting method

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

The unit should only be lifted from the base.

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



DANGER

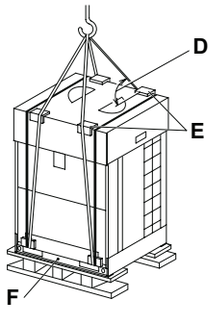
- ***Always use textile slings in good condition, without cuts or wear, and with the correct capacity for lifting the outdoor unit.***
- ***Do not fit the slings on the wooden base -C- of the unit. The wooden base is only designed to protect the base of the unit during transportation; it will not withstand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

Slightly tighten the two hoisting slings.

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

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

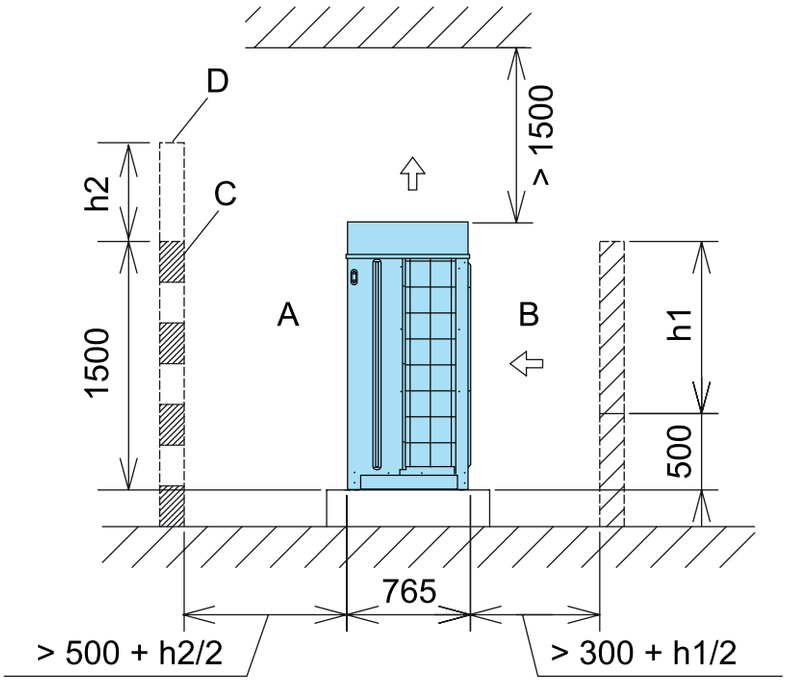
Do not apply force to zone -F-.



DANGER

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

2.1.3 Installation space RAS-(5-12)FSXNH(E)



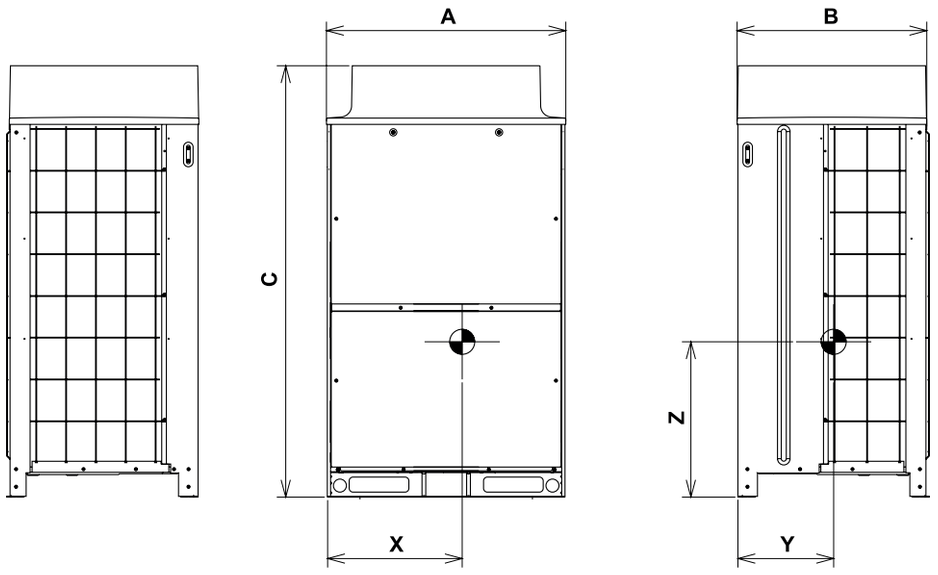
NOTE

Side view. All measurements are in mm.

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

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

2.1.4 Center of gravity

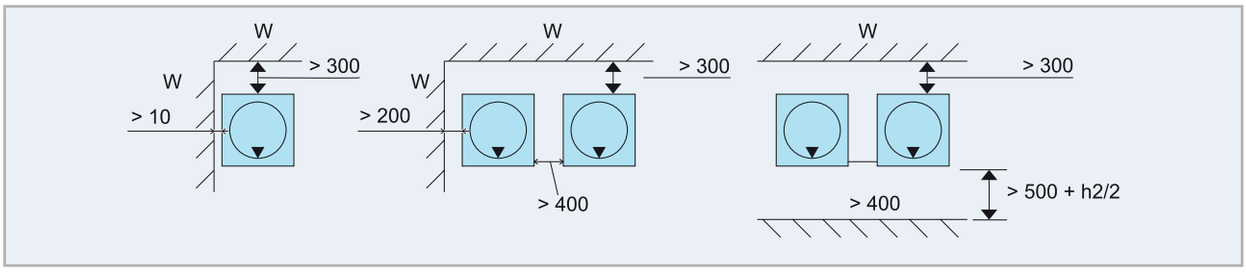


Model	Net weight (kg)	Center of gravity (mm)			Outer dimensions (mm)		
		X	Y	Z	A	B	C
RAS-8FSXN1E	215	465	335	645	950	765	1720
RAS-10FSXN1E	230	465	350	650	950	765	1720
RAS-12FSXN1E							
RAS-14FSXN1E	310	600	320	615	1210	765	1720
RAS-16FSXN1E							
RAS-5FSXNH(E)	215	465	335	645	950	765	1720
RAS-6FSXNH(E)							
RAS-8FSXNH(E)	260	580	350	660	1210	765	1720
RAS-10FSXNH(E)							
RAS-12FSXNH(E)							

2.1.5 Installation

◆ Installation with walls in two directions

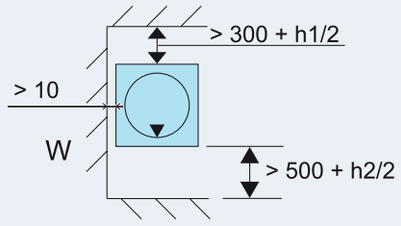
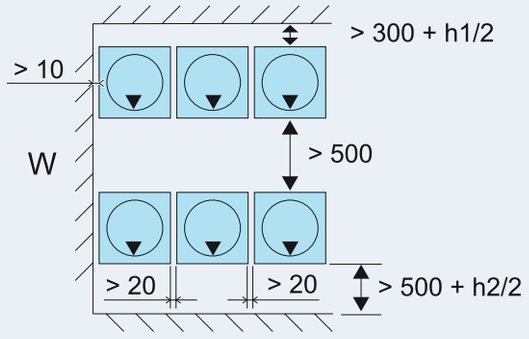
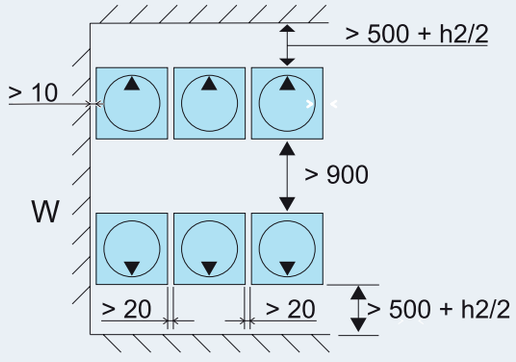
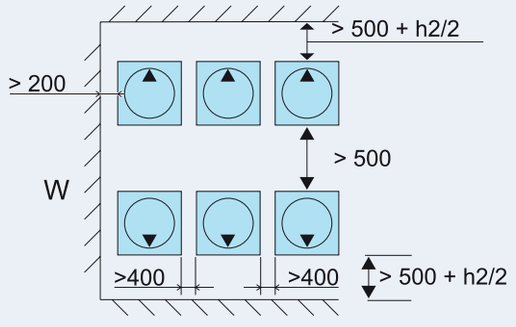
If the units installed are adjacent to high buildings, without walls in two directions, a space of 300 mm is required at the rear side of the unit.



NOTE

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

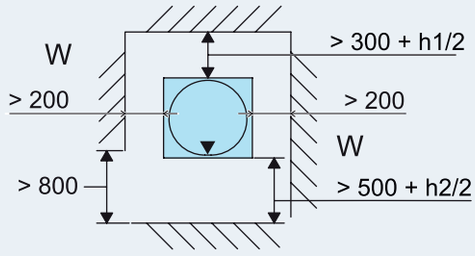
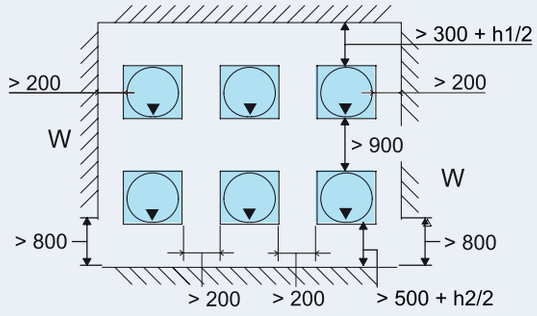
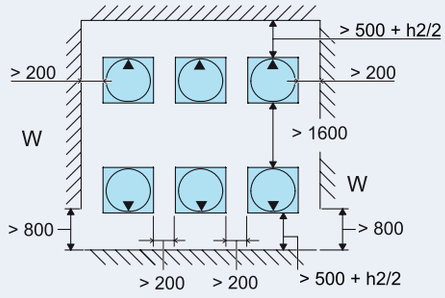
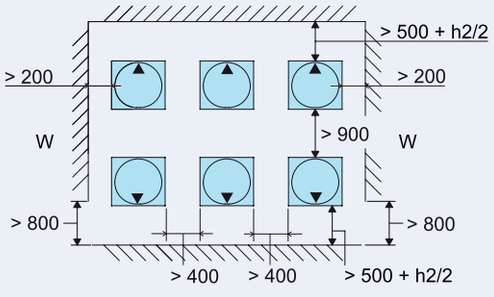
◆ Installation with walls in three directions

Single Installation	Installation in the same direction
	
Rear to rear installation 1	**Rear to rear installation 2**
	

NOTE

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

◆ Installation with walls in four directions

Single installation	Installation in the same direction
	
Rear to rear installation 1	**Rear to rear installation 2**
	

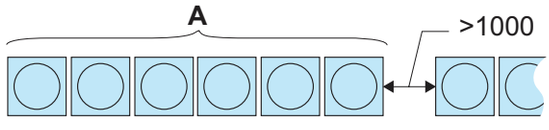
NOTE

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

◆ Considerations

NOTE

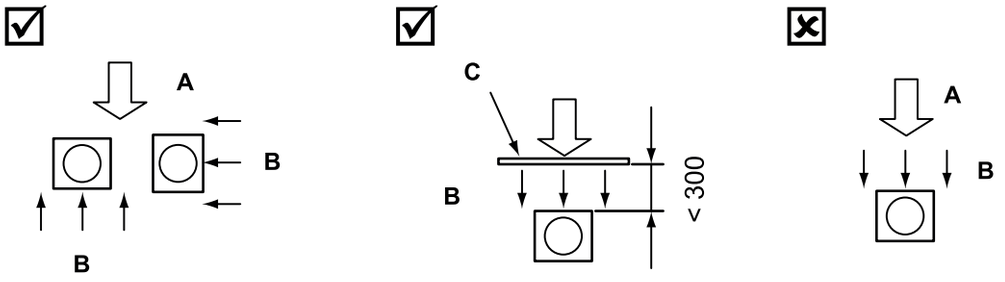
- *All measurements are in mm.*
- *The dimensions considered in the following figures include the space necessary for typical installation and maintenance work for operation in refrigeration mode at an outdoor temperature of 35 °C.*
  If the outdoor temperature is higher and if there is the possibility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



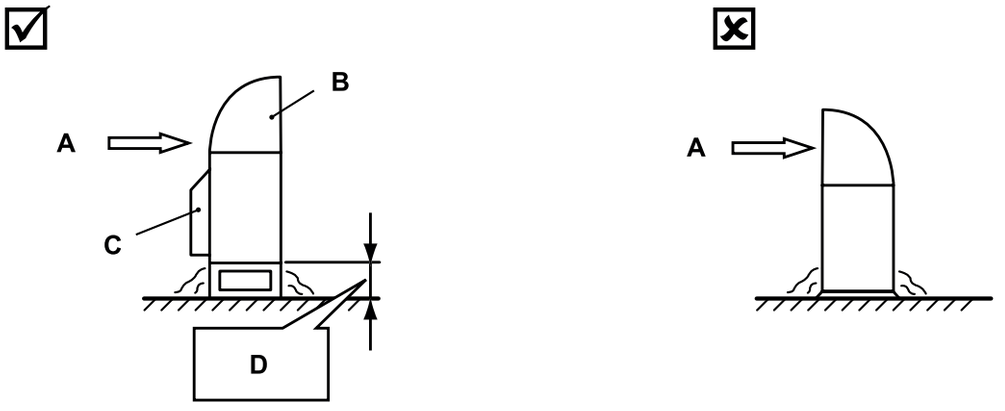
- *If the unit is surrounded by walls on all four sides, keep one of the walls partially open.*
- *Keep the upper side open to prevent mutual interference of inlet and outlet air for each outdoor unit.*

◆ Installation precautions

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



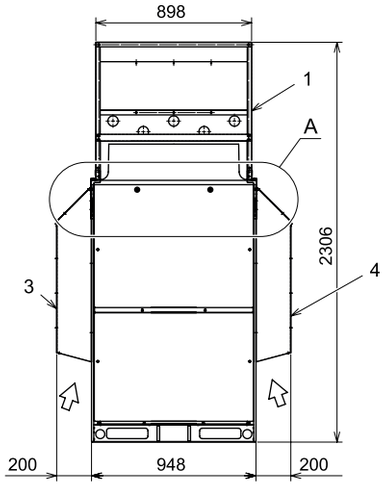
- At locations where snow is frequent, place hoods, field supplied, on the air inlet and outlet areas (B and C) preventing the wind (A) from directly affecting the air outlet. Also, a higher base foundation should be installed in order to prevent the accumulation of snow (D). Install the unit at a sunny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

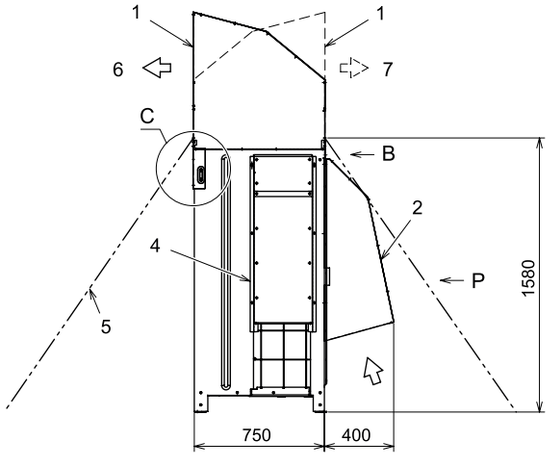


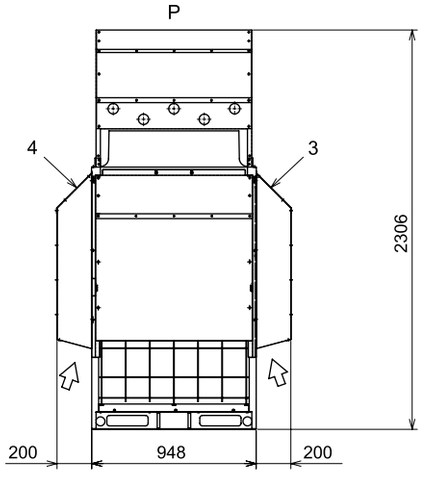
2.1.6 Hood dimensions (field supplied)

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

RAS-(8-12)FSXN1E and RAS-(5/6)FSXNH(E)

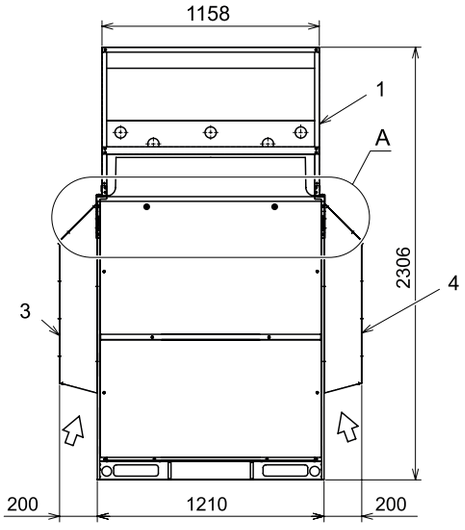


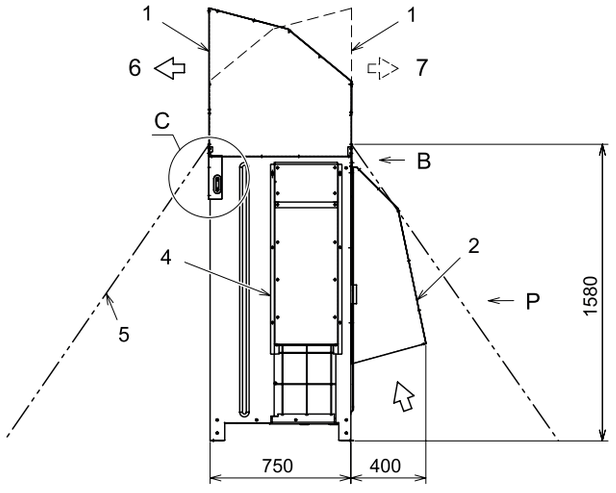


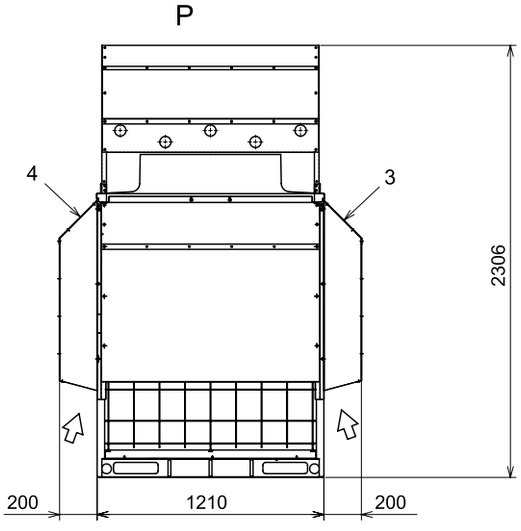


No.	Name
1	Air discharge hood
2	Rear suction hood
3	Left suction hood
4	Right suction hood
5	Safety cable (to prevent overturning)
6	Air flow direction (front side)
7	Air flow direction (rear side)

RAS-(14/16)FSXN1E and RAS-(8-12)FSXNH(E)

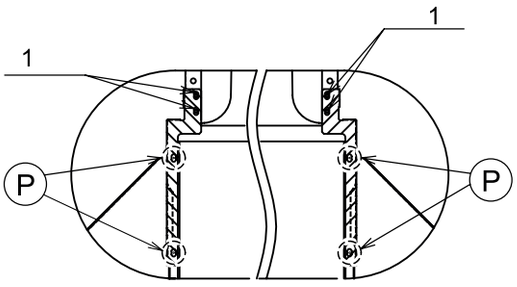






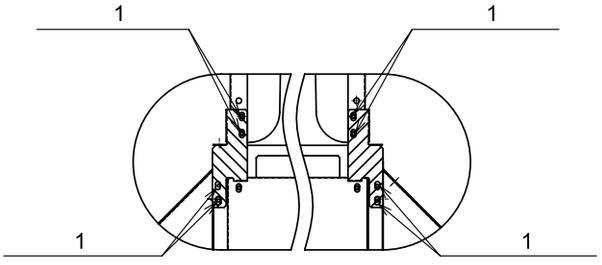
No.	Name
1	Air discharge hood
2	Rear suction hood
3	Left suction hood
4	Right suction hood
5	Safety cable (to prevent overturning)
6	Air flow direction (front side)
7	Air flow direction (rear side)

- Enlarge view of A



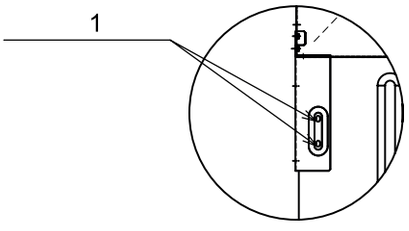
1	Fixing screw
P	Punch mark (4 places). Drill a pilot hole into the punch mark and mount the fixing plate

- Enlarge view of B



1	Fixing screw

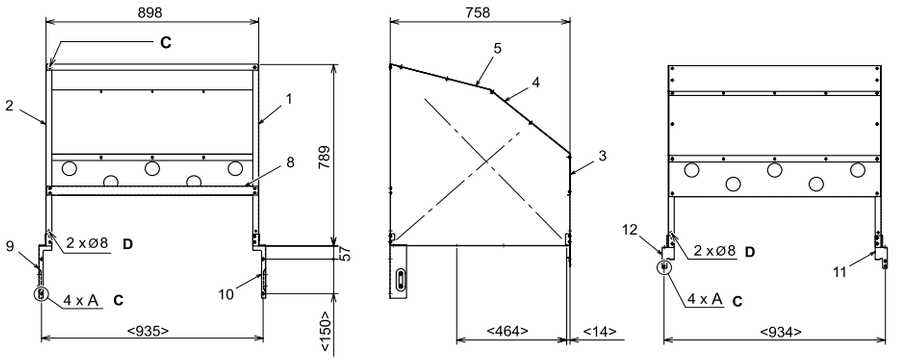
- Enlarge view of C



1	Fixing screw

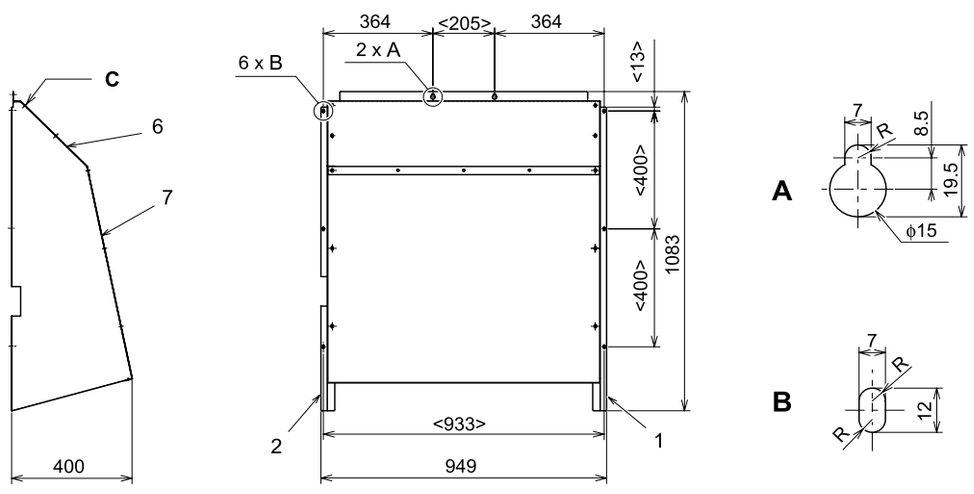
◆ Air discharge and rear suction hood for RAS-(8-12)FSXN1E and RAS-(5/6)FSXNH(E)

- Air discharge hood



C	Fixing screw (accessory)
D	Hole for fixing screw to prevent overturning
< >	Dimension of installation

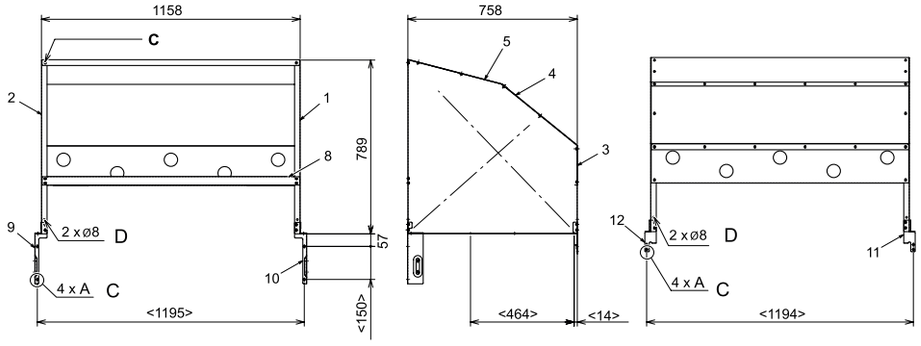
- Rear suction hood

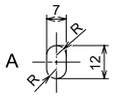


No.	Name	Quantity	
		Air discharge hood	Suction rear hood
1	Right plate	1	1
2	Left plate	1	1
3	Front panel (1)	1	-
4	Front panel (2)	1	-
5	Front panel (3)	1	-
6	Front panel (upper)	-	1
7	Front panel (lower)	-	1
8	Side plate	1	-
9	Left fixing plate for front	1	-
10	Right fixing plate for front	1	-
11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

◆ Air discharge hood and rear suction hood for RAS-(14/16)FSXN1E and RAS-(8-12)FSXNH(E)

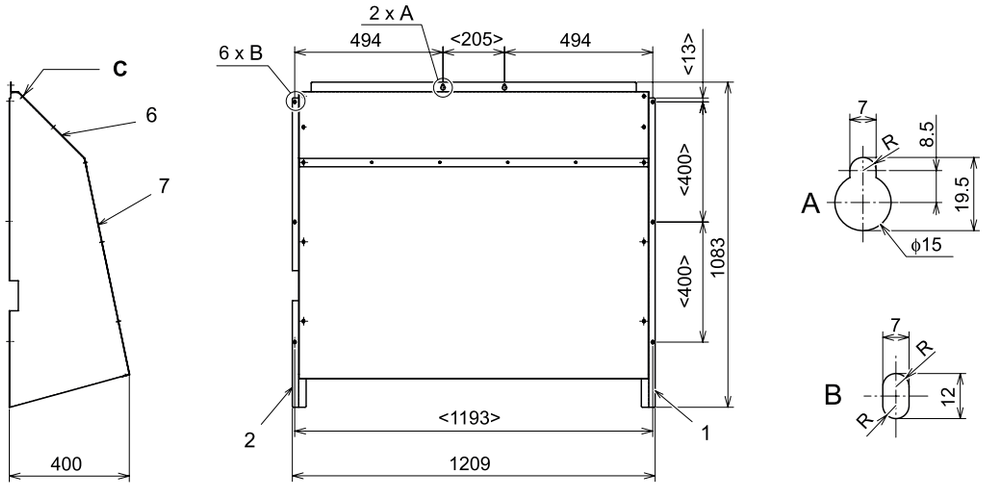
- Air discharge hood





C	Fixing screw (accessory)
D	Hole for fixing screw to prevent overturning
< >	Dimension of installation

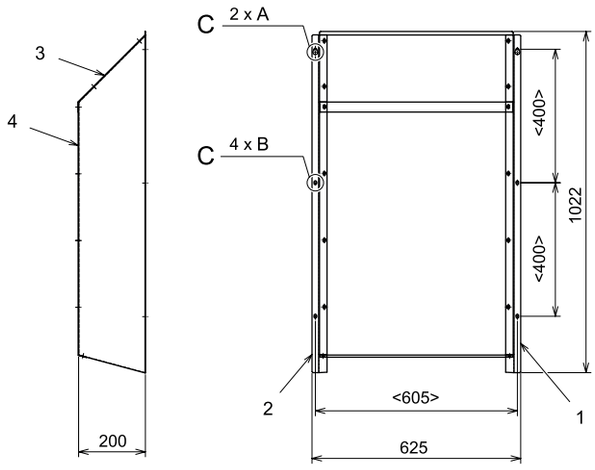
- Rear suction hood



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

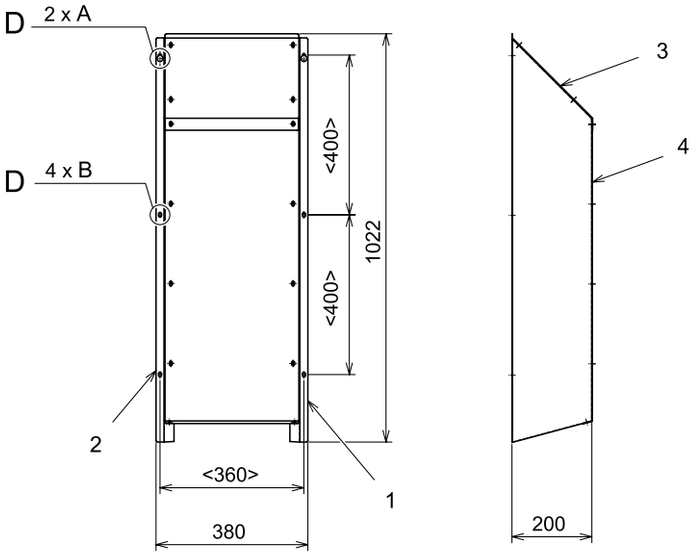
◆ Left and right suction hood for RAS-(8-16)FSXN1E and RAS-(5-12)FSXNH(E)

- Left suction hood



C	Fixing screw (accessory)
D	Hole for fixing screw to prevent overturning
< >	Dimension of installation

- Right suction hood

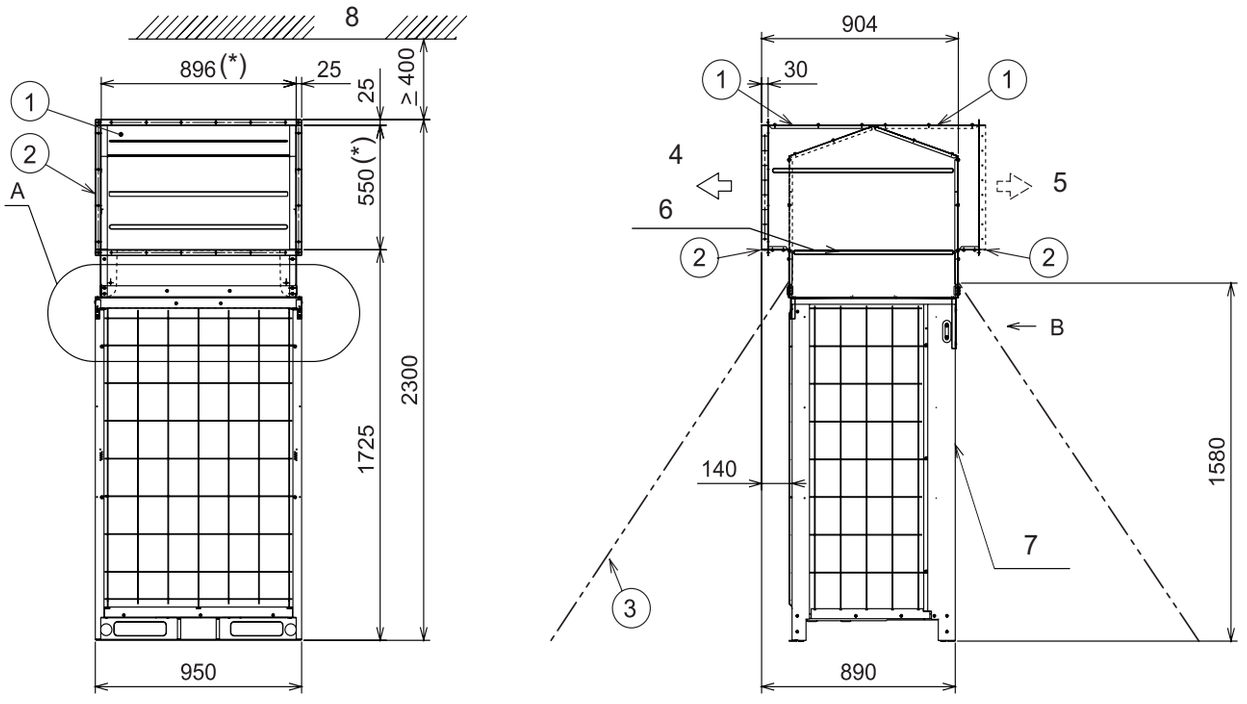


No.	Name	Quantity	
		Left suction hood	Right suction hood
1	Right plate	1	1
2	Left plate	1	1
3	Front panel (1)	1	1
4	Front panel (2)	1	1

2.1.7 Air outlet duct kit (field supplied)

- The following figures show the recommended dimensions of the air outlet duct for the outdoor unit.
- Use 1 mm thick steel plates for the hoods and 1.6 mm for the flanged and stay parts.
- Paint the hoods in accordance with Munsell code 1.0Y 8.5/0.5 beige color.
- Use self-tapping screws M5 for fixing the hoods.
- Reinforce the duct with supports if necessary.
- All measurements are in mm.

RAS-(8-12)FSXN1E and RAS-(5/6)FSXNH(E)

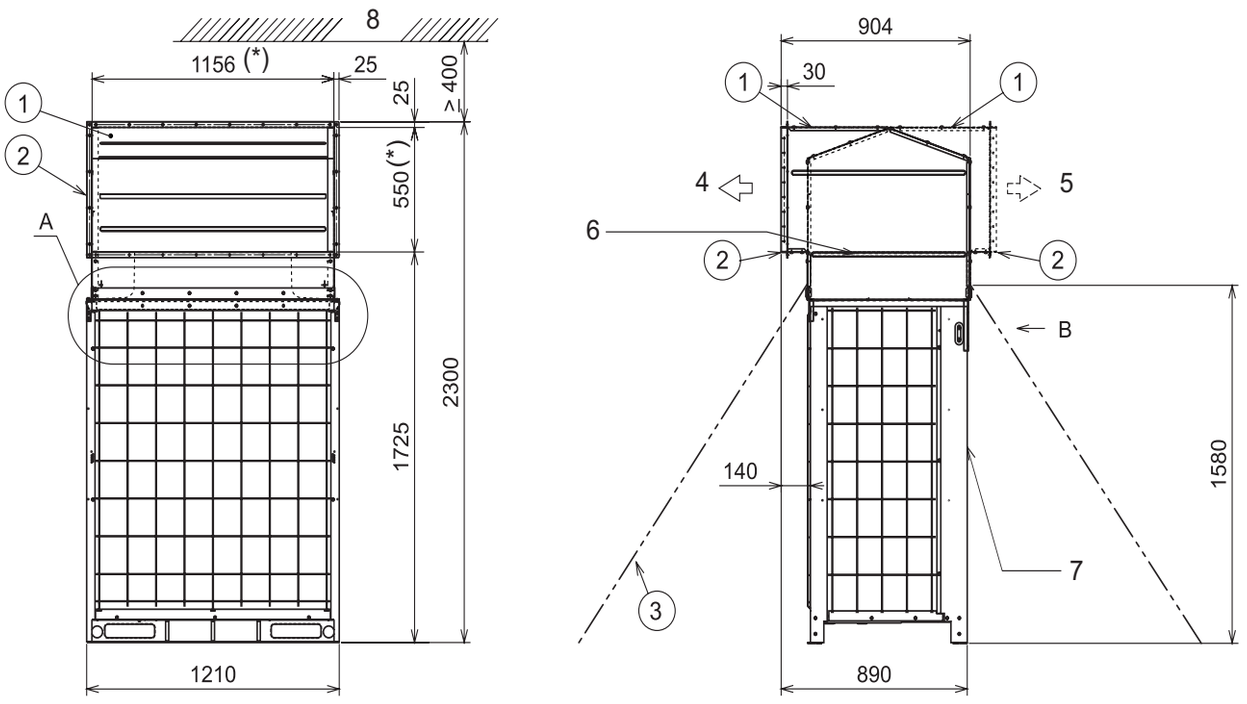


NOTE

**: Inside dimension.*

No.	Name
1	Air outlet duct
2	Duct flange
3	Safety cable (to prevent overturning)
4	Air flow direction (rear side)
5	Air flow direction (front side))
6	Air outlet of outdoor unit
7	Outdoor unit
8	Ceiling)

RAS-(14/16)FSXN1E and RAS-(8-12)FSXNH(E)

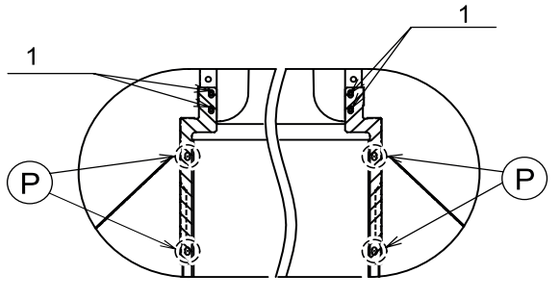


NOTE

**: Inside dimension*

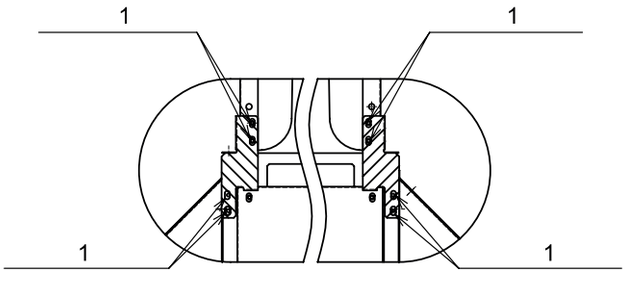
No.	Name
1	Air outlet duct
2	Duct flange
3	Safety cable (to prevent overturning)
4	Air flow direction (rear side)
5	Air flow direction (front side))
6	Air outlet of outdoor unit
7	Outdoor unit
8	Ceiling)

- Enlarge view of A



1	Fixing screw
P	Punch mark (4 places). Drill a pilot hole into the punch mark and mount the fixing plate

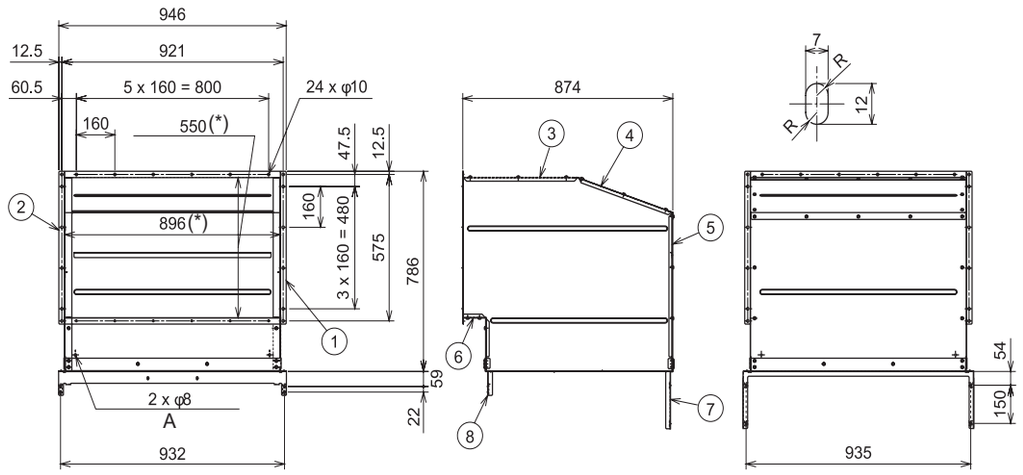
- Enlarge view of B



1	Fixing screw

◆ Air outlet duct and duct flange for RAS-(8-12)FSXN1E and RAS-(5/6)FSXNH(E)

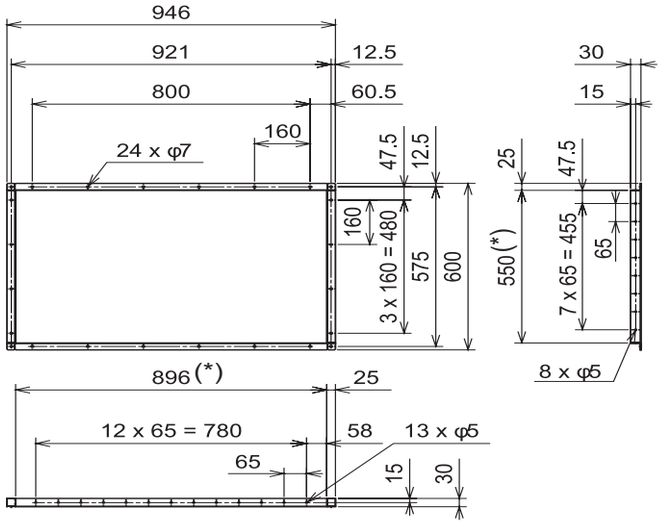
- Air outlet duct



*	Inside dimension
A	Hole for fixing screw to prevent overturning

No.	Name
1	Right plate
2	Left plate
3	Front panel (1)
4	Front panel (2)
5	Front panel (3)
6	Front panel
7	Fixing plate for Front side
8	Fixing plate for Rear side

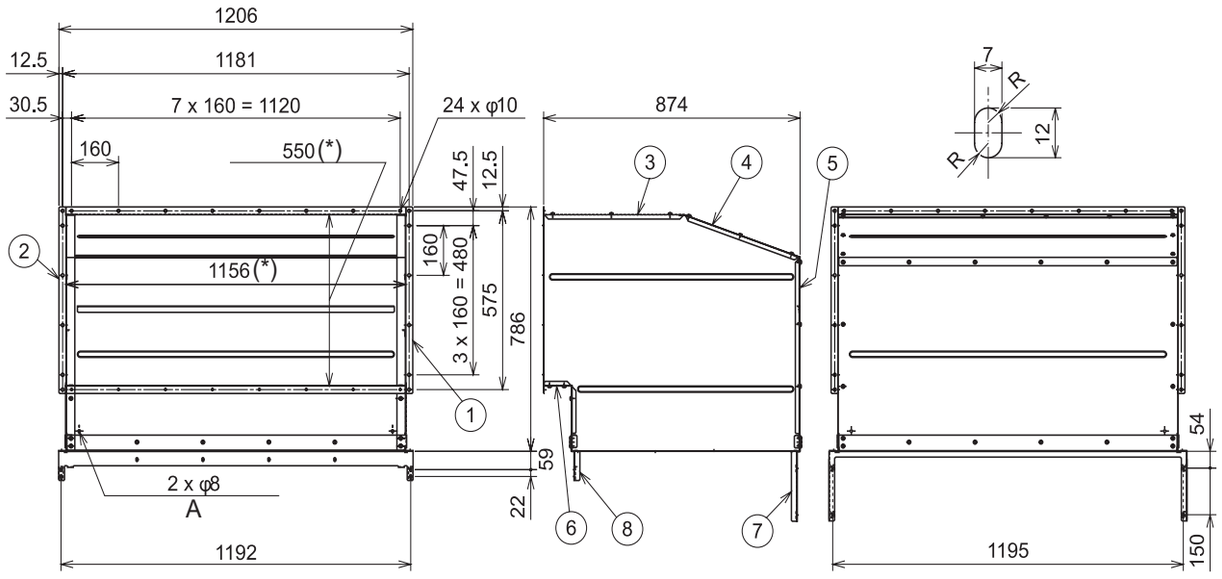
- Duct flange



*	Inside dimension
A	Hole for fixing screw to prevent overturning

◆ Air outlet duct and duct flange for RAS-(14/16)FSXN1E and RAS-(8-12)FSXNH(E)

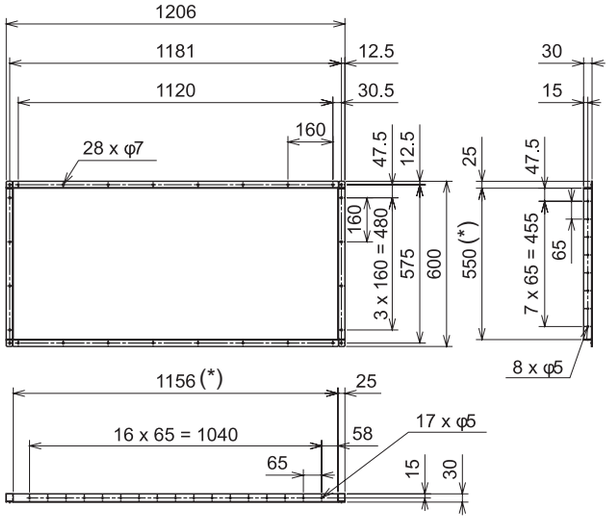
- Air outlet duct



No.	Name
1	Right plate
2	Left plate
3	Front panel (1)
4	Front panel (2)
5	Front panel (3)
6	Front panel
7	Fixing plate for Front side
8	Fixing plate for Rear side

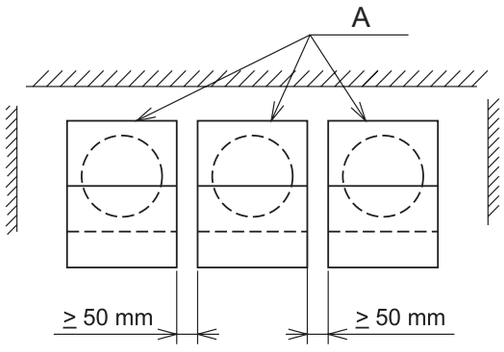
*	Inside dimension
A	Hole for fixing screw to prevent overturning

- Duct flange



*	Inside dimension

2.1.8 Service space for contiguos of multiple units



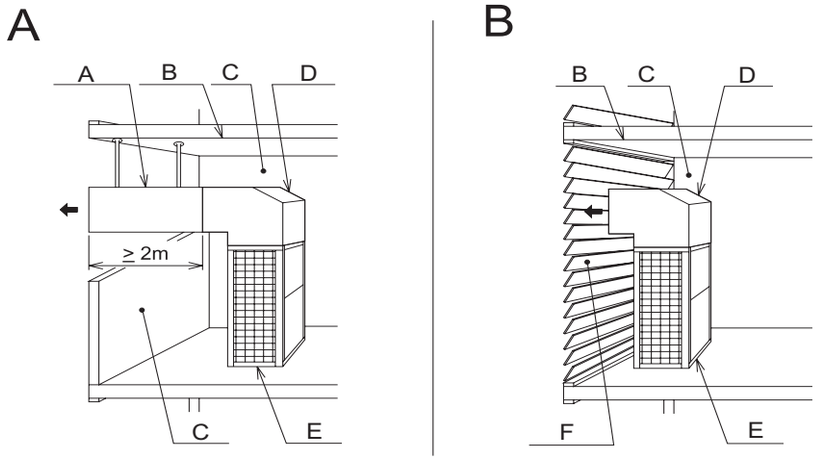
NOTE

Refer to Installation of the outdoor units for details

◆ Example of air outlet duct installation

Case A: the fan outdoor unit is installed beyond reach of user's hands or sticks.
Removing existing air outlet net, installation of air duct kit and field supplied duct (≥ 2 m).

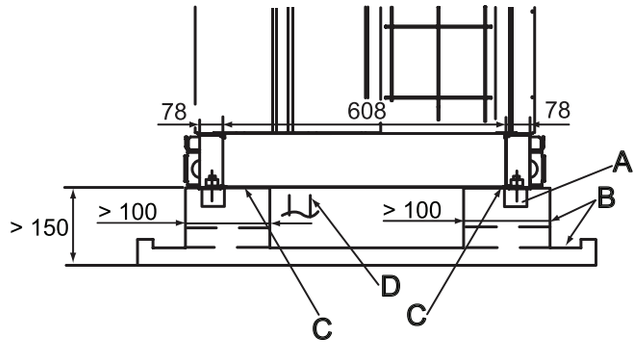
Case B: the fan outdoor unit is installed within reach of user's hands or sticks.
Using existing air outlet net, installation of air outlet duct kit.



No.	Name
A	Duct (field supplied)
B	Ceiling
C	Wall
D	Air outlet duct kit
E	Outdoor unit
F	Louver

2.1.9 Foundation and anchorage of outdoor unit

◆ Foundations



A	Mortar housing ø100 x 150 (square x depth)
B	Drainage 100 x 20 (width x depth)
C	Anti-vibration insulation material
D	Refrigerant pipes

NOTE

All measurements are in mm.

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

The foundations require perimeter drainage to help drain condensation.

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

DANGER

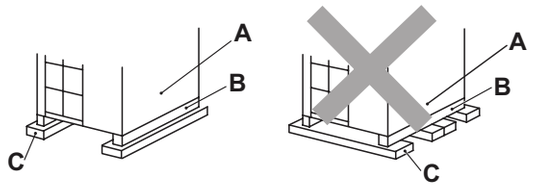
Drainage must not take place in areas frequented by pedestrians. In low temperatures, the drainage water could freeze and lead to falls.

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

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

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

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



A	Front part of the unit
B	Base of unit
C	Foundations

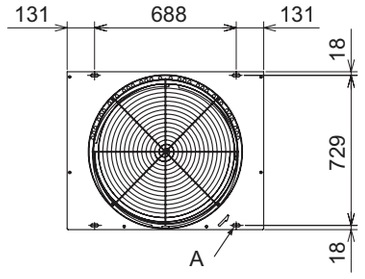
◆ Position of anchorage bolts

NOTE

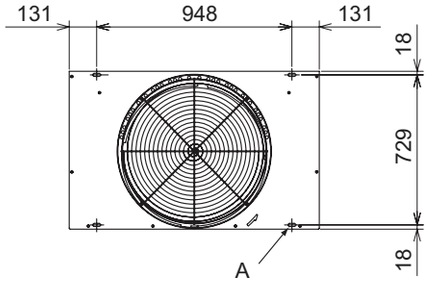
All measurements are in mm.

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

1

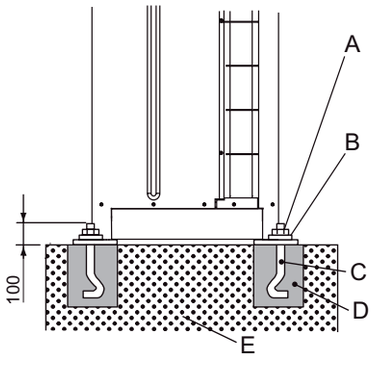


2



A	Openings for the anchorage bolts (4x) 38 x 15
B	Outdoor unit SET FREE RAS-(8-12)FSXN1E and RAS-(5/6)FSXNH(E)
C	Outdoor unit SET FREE RAS-(14/16)FSXN1E and RAS-(8-12)FSXNH(E)

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



A	Nut
B	Washer
C	M12 anchorage bolt
D	Mortar fill
E	Concrete

2.2 CH units

2.2.1 Transportation and handling CH units

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

DANGER

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

CAUTION

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

◆ **Combination CH unit and indoor unit**

The CH unit can be installed for the SET FREE FSXNH(E) system, between the outdoor unit and indoor unit. The combination of the CH unit and indoor unit is as follows:

Model	Indoor unit quantity	Total indor capacity (HP)
CH-6.0N2	1 to 7	Less than 6.0
CH-10.0N2	1 to 8	6.0 ~ 10.0

NOTE

- *The excess of the total capacity may cause insufficient performance and abnormal sound. Be sure to connect within the allowable total capacity.*
- *In case that the indoor unit total capacity is 10.0 HP for CH-10.0N2, the performance may decrease approximately 5% in cooling and 10% in heating.*

2.2.2 CH unit installation

DANGER

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

CAUTION

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

◆ Factory supplied accesories

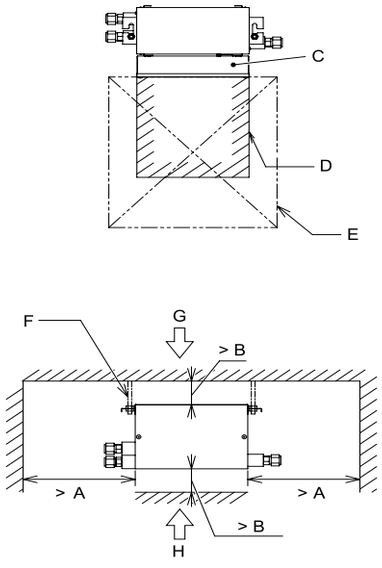
Check to ensure that the following accesories are packed with the CH unit.

			Model							
			CH-6.0N2			Qty.	CH-10.0N2			Qty.
Accessory	Reducer		ID15.88		ID19.05	1	ID15.88		ID19.05	1
	Accessory Pipe(for flare nut)		ID12.7		ID15.88	2	-	-	-	-
			-	-	-	-	ID22.2		ID19.05	2
			-	-	-	-	ID19.05		ID19.05	2
	Insulation material	ID16	-		-	2	-	-	-	-
		ID38	-		-	3	-	-	-	-
		ID20	-	-	-	-	-		-	1
		ID22	-	-	-	-	-		-	2
		ID43	-	-	-	-	-		-	3
	Clamp		-		-	6	-		-	6

ID: Inner diameter.

◆ Initial check

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



Model	A	B
CH-6.0N2	300	70
CH-10.0N2	400	70

Electrical box

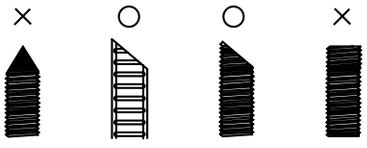
D	Service space (300 x 300)
E	Service access door (450 x 540)
F	2- suspension bolt. M10 or W3/8 (field supplied)
G	Upper side.
H	Bottom side.

NOTE

All measurements are in mm.

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

◆ Suspension bolts



NOTE

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

Step 1

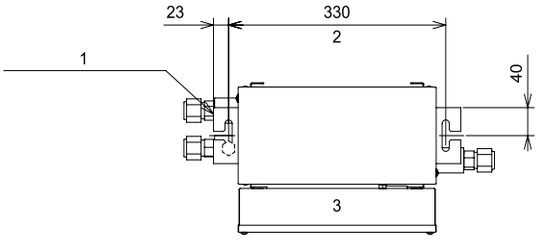
Select a final location and installation direction of the CH unit paying careful attention to the space for the pipping, wiring and maintenance.

Mount suspension bolts after selecting the final location of the CH unit.

Mount the suspension bolts in the slotted hole on the electrical box side.

Contact the qualified constructor or carpenter for the ceiling treatment.

Units: mm

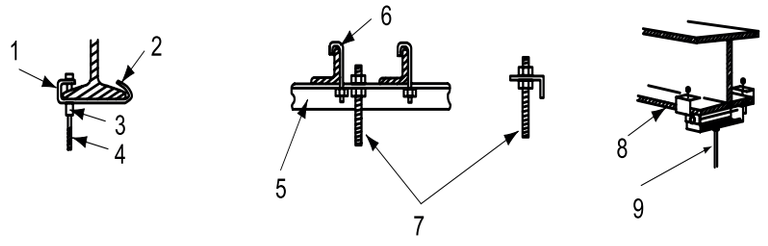


1	Suspension bracket 2–11 x 34 slotted hole
2	(for suspension bolt)
3	Electrical box

Step 2

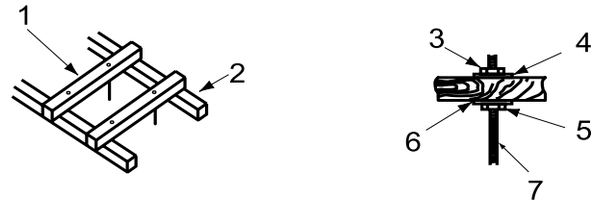
Mount suspension bolts, as shown in next figures.

- For steel beam



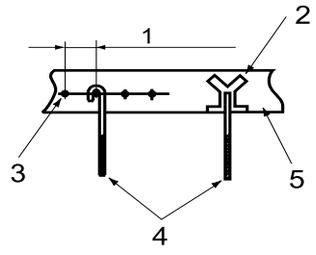
1	C-shaped clamp
2	Antiskid clamp (bend it)
3	Nut
4	Suspension bolt
5	Support angle
6	Suspension bolt
7	Suspension bolt (W3/8 or M10)
8	I beam
9	Suspension bolt (W3/8 or M10)

- For wooden beam suspension



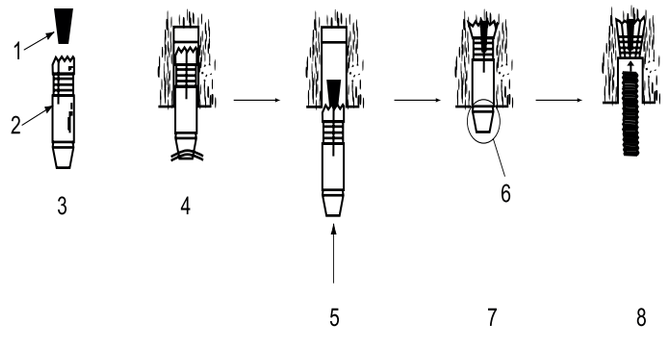
1	Wooden bar (60 to 90 mm square)
2	Wooden beam
3	Nut
4	Square washer
5	Nut
6	Square washer
7	Suspension bolt (W3/8 or M10)

- For reinforcing steel



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

- For concrete slab
  - Hole-in-anchor



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

- Resin capsule

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



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

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

Required time is as shown in the following table:

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

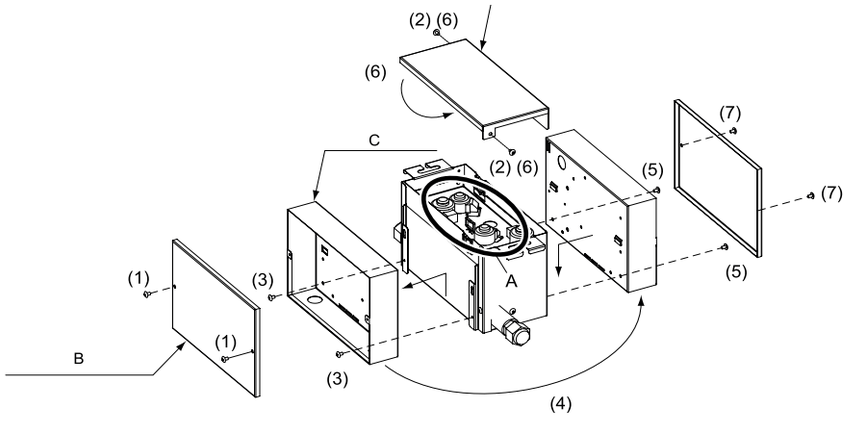
◆ Installation

Changing the location of electrical box

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

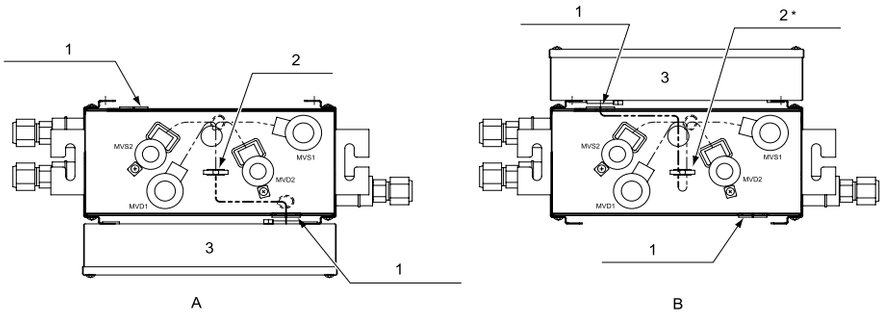
In case of changing the location of electrical box, follow the procedure below.

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



A	See below the enlarged view
B	Service cover for electrical box
C	Electrical box
D	Service cover for electronic expansion valve

- Enlarged view of A



1	Edge saddle
2	Wire clip
3	Electrical box
A	Before change
B	After change

2

NOTE

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

Marking of the position of the suspension bolts and wiring connections

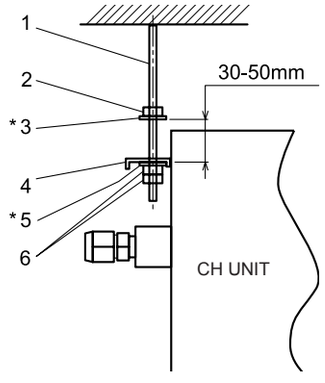
1 Mark the positions of the suspension bolts, refrigerant piping connections and wiring connection.
2 Installation dimensions are shown in *"Initial check"*.

Mounting the CH unit

1 How to put nuts.

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

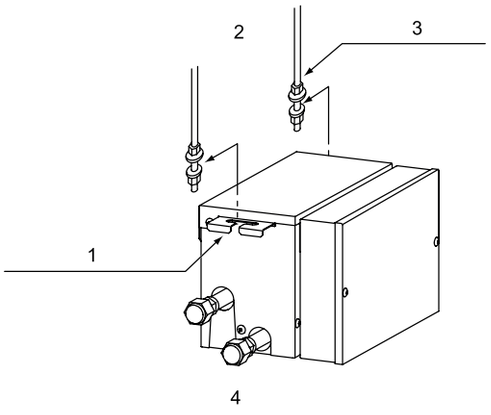
* Mounting washers are required in order to fix the suspension bracket to the suspension bolt.



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

2 Hanging the CH unit.

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



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

3. Piping work and refrigerant charge

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3.1 Outdoor unit

3.1.1 Refrigerant pipe selection

The RAS-(5-36)FSXNH(E)(-P) outdoor units can work as a heat pump system, by means of a two-pipe system (gas pipe and liquid pipe), or they can work as a heat recovery system by means of a three-pipe system (high and low pressure gas pipe and liquid pipe), requiring in addition the CH units supplied as accessories.

The variety of capacities that can be obtained by combining a small number of outdoor units (a maximum of three), called base units, greatly helps the specific design of installations.

◆ Pipe size selection

Select the pipe size in line with the following instructions:

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

CAUTION

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

◆ Multi-kit or distributor selection

NOTE

- *Pipe connection sizes on outdoor units, indoor units and the multi-kit or distributor vary depending on the system. Consult the Technical Manual for the SET FREE Series FSXN1E and FSXNH(E).*
- *The sizes of the indoor and outdoor units are different. Adjust the flare adapter (accessory) to the indoor pipe connection.*

3.1.2 Copper pipes, sizes, connection and insulation

◆ Copper pipes and sizes

CAUTION

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

Prepare the copper pipes provided by the supplier.

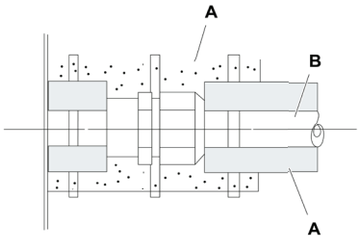
Select the pipe with the appropriate diameter and thickness. Use the table below to select the most appropriate pipe:

Nominal diameter		Thickness mm	Supply	Nominal diameter		Thickness mm	Supply
mm	Inches			mm	Inches		
ø6.35	1/4	0.80	Coil	ø25.4	1	1.00	Straight lengths
ø9.52	3/8	0.80	Coil	ø28.6	1-1/8	1.00	Straight lengths
ø12.7	1/2	0.80	Coil	ø31.75	1-1/4	1.10	Straight lengths
ø15.88	5/8	1.00	Coil	ø38.1	1-1/2	1.35	Straight lengths
ø19.05	3/4	1.00	Straight lengths	ø41.3	1-5/8	1.45	Straight lengths
ø22.2	7/8	1.00	Straight lengths	ø44.45	1-3/4	1.55	Straight lengths

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

CAUTION

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



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

◆ Pipe connection

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

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

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



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

NOTE

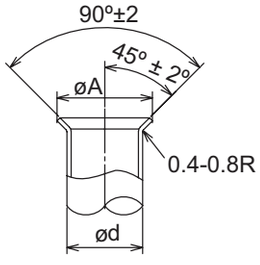
- *Where polyethylene foam insulation is used, a 10 mm thick layer should be used for the liquid pipe and between 15 and 20 mm for the gas pipe.*
- *Install the insulation after the pipe surface temperature has dropped to the same temperature as that of the room, otherwise the insulation may melt.*

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

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

Dimensions of flared pipe

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



Diameters (mm)	$A^{+0}_{-0.4}$ (mm)
ø6.35	9.1
ø9.52	13.2
ø12.7	16.6
ø15.88	19.7
ø19.05	– (1)

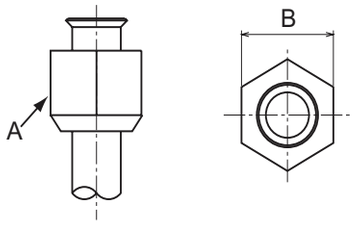
(1) Not possible to perform the widening using pipe. In this case, use a connection with flare fitting.

Selection of the connection with flare fitting

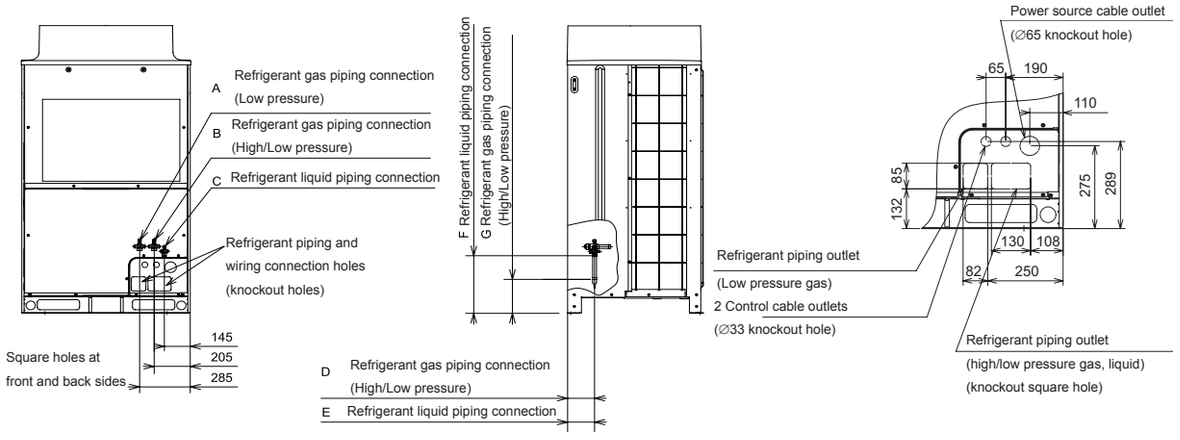
It is not possible to perform the widening operation, if copper is used in pipes. In this case, use a connection with flare fitting.

Minimum thickness of the connection (mm)	
Diameters (mm)	R410A
ø6.35	0.5
ø9.52	0.6
ø12.7	0.7
ø15.88	0.8
ø19.05	0.8
ø22.2	0.9
ø25.4	0.95
ø28.6	1.0
ø31.75	1.1
ø38.1	1.35
ø43.3	1.45
ø44.5	1.55

Distance between sides -B- of the nut -A-	
Diameters (mm)	-B- (mm)
ø6.35	17
ø9.52	22
ø12.7	26
ø15.88	29
ø19.05	36



◆ Connection of pipes from the installation to the outdoor unit



Outdoor unit	D	E	F	G
RAS-(5/6)FSXNH(E)	150	150	340	205
RAS-(8-12)FSXNH(E)	170	170		

◆ Connection position of outdoor unit pipes

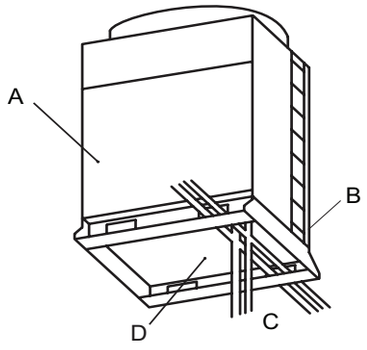
Fit and secure refrigerant pipes correctly to prevent vibrations and strain on the stop valves.

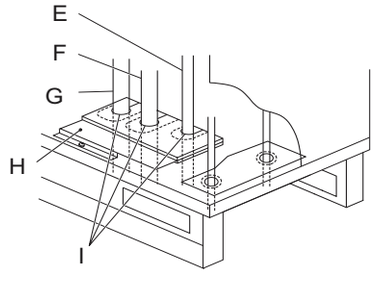
The pipes may be fitted in three directions (front, rear or inferior) from the base of the unit.

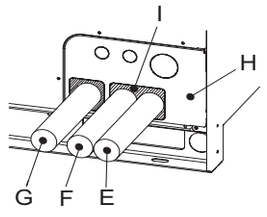
Remove the cover of the gas and liquid pipes -H- and Wconnect using the accessories factory-supplied with the unit: *"Accessories factory-supplied with FSXN1E units"* and *"Accessories factory-supplied with FSXNH(E) units"*.

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

A	Front
B	Rear
C	Lower side
D	Base
E	Liquid pipe
F	Gas pipe (high pressure)
G	Gas pipe (low pressure) (only for heat recovery systems, with CH units)
H	Cover of refrigerant gas and liquid pipes
I	Cover insulation







◆ Accessories factory-supplied with FSXN1E units

Accessory		Application					
		8HP	10HP	12HP	14HP	16HP	Remarks
Accessory for pipes: connection for refrigerant pipe (high pressure)		ø22.2→ø15.88	ø22.2→ø19.05	–	ø25.4→ø22.2	ø25.4→ø22.2	Only for heat recovery system
Accessory for pipes: connection for refrigerant pipe (high/low pressure)		ø22.2→ø19.05	–	ø22.2→ø25.4	–	ø25.4→ø28.58	Low for heat recovery system High for heat pump system
Accessory for pipes: connection for refrigerant liquid pipe		–	–	ø9.52→ø12.7	–	–	
Power wiring clamp		(x1)					
Bushing for power source cable outlet (bottom base, feet)		(x2)					ø58
Bushing for power source cable outlet (pipping cover)		(x2)					ø32
Bushing for communication wire outlet (bottom base, feet)		(x1)					ø70
Bushing for communication wire outlet (pipping cover)		(x2)					ø38
Screw (1 for fixing cord clamp, 2 for spare)		(x3)					
Unit combination model label		(x1)					
Core (ø40)		(x1)					

NOTE

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

◆ Accessories factory-supplied with FSXNH(E) units

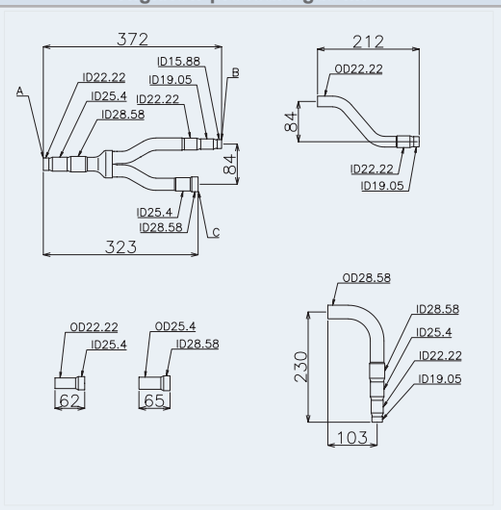
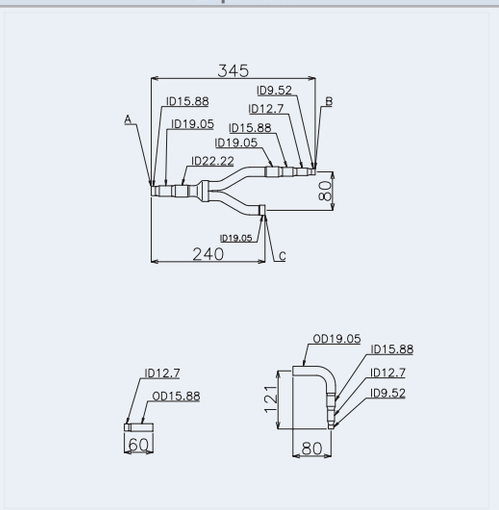
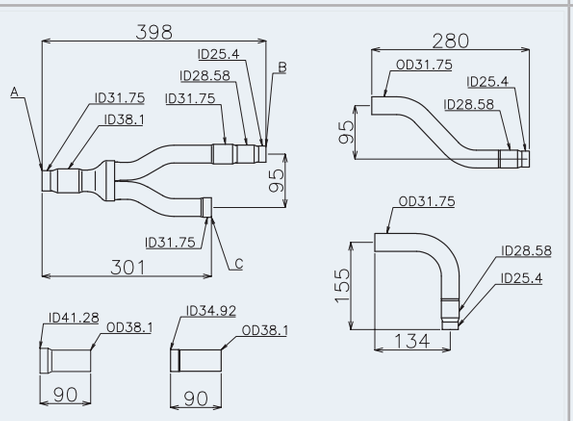
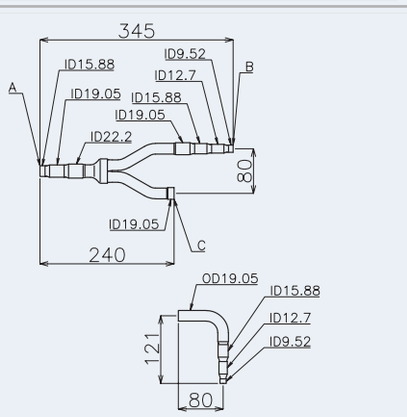
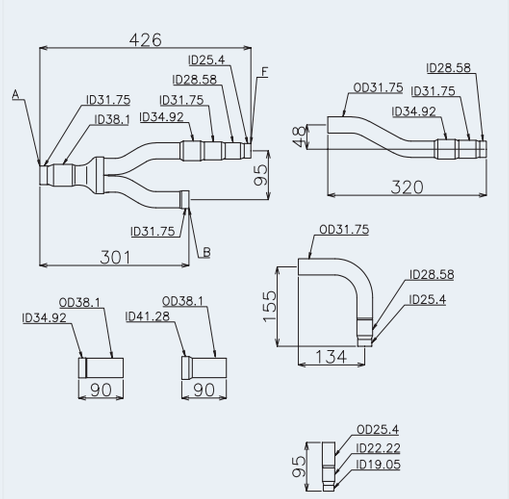
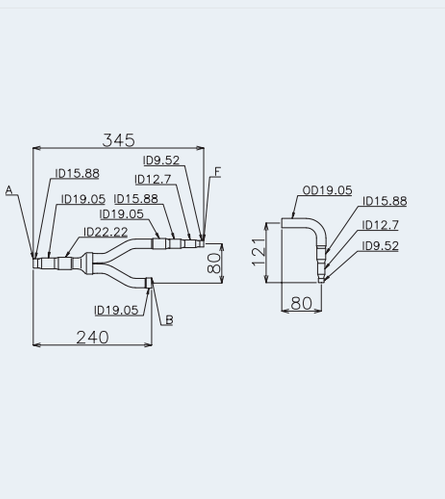
Accessory		Application					
		RAS-5FSXNH(E)	RAS-6FSXNH(E)	RAS-8FSXNH(E)	RAS-10FSXNH(E)	RAS-12FSXNH(E)	Remarks
Accessory for pipes: connection for refrigerant pipe (high pressure)		ø22.2→ø12.7	ø22.2→ø15.88	ø22.2→ø15.88	ø22.2→ø19.05	–	Only for heat recovery system
Accessory for pipes: connection for refrigerant pipe (high/low pressure)		ø22.2→ø15.88	ø22.2→ø19.05	ø22.2→ø19.05	–	ø22.5→ø25.4	Low for heat recovery system High for heat pump system
Accessory for pipes: connection for refrigerant liquid pipe		–	–	–	–	ø9.52→ø12.7	ø12.7→ø15.88
Power wiring clamp		(x1)					
Bushing for power source cable outlet (bottom base, feet)		(x2)					ø58
Bushing for power source cable outlet (pipping cover)		(x1)					ø32
Bushing for communication wire outlet (bottom base, feet)		(x2)					ø70
Bushing for communication wire outlet (pipping cover)		(x2)					ø38
Screw (1 for fixing cord clamp, 2 for spare)		(x3)					
Unit combination model label		–	(x1)				
Core (Ø40)		(x1)					

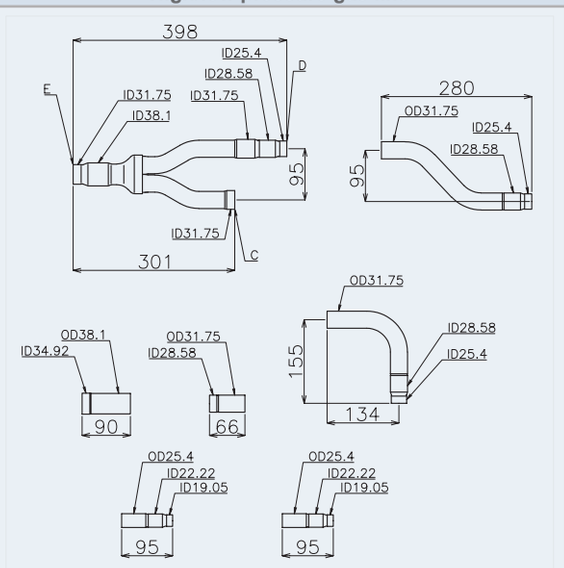
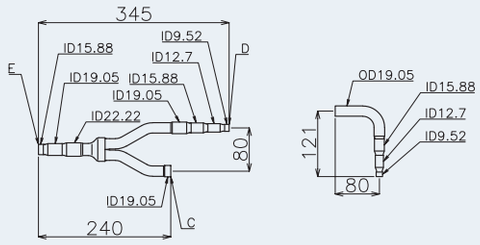
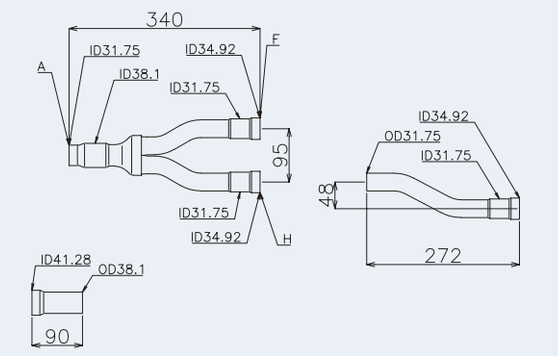
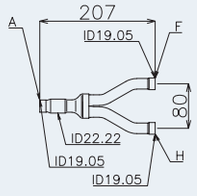
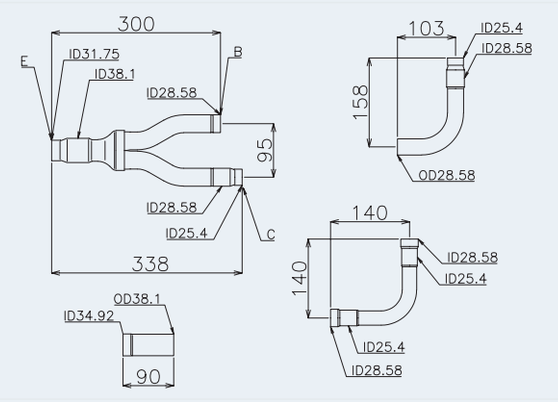
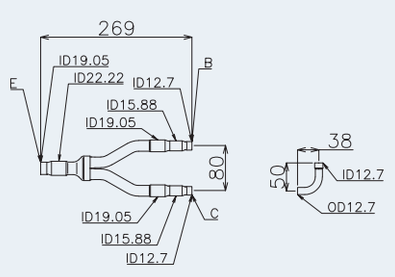
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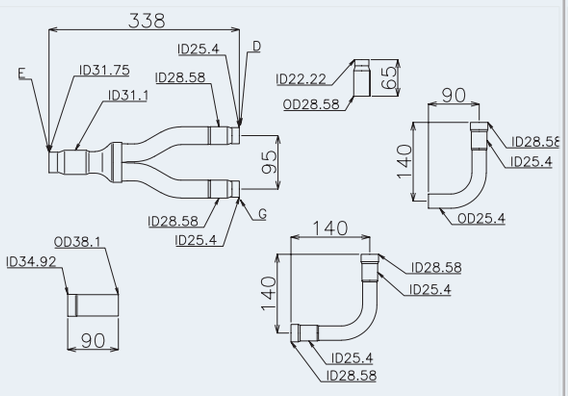
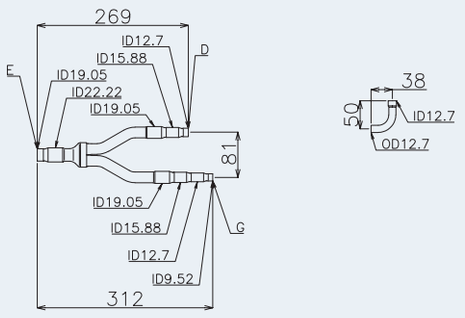
Please contact your HITACHI distributor if any of the accessories has not been supplied with the unit.

3.1.3 Pipe connection kit (optional parts)

◆ SET FREE FSXN1E series (2 pipes)

Model	High/low pressure gas line	Liquid line
MC-20AN1		
MC-21AN1		
MC-30AN1 KIT 1		

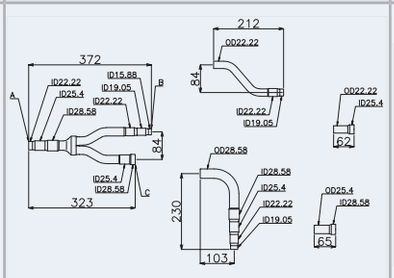
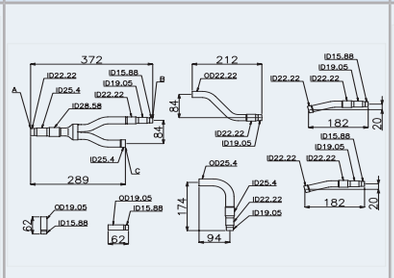
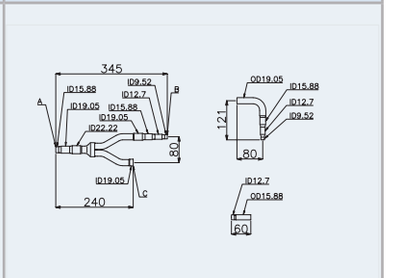
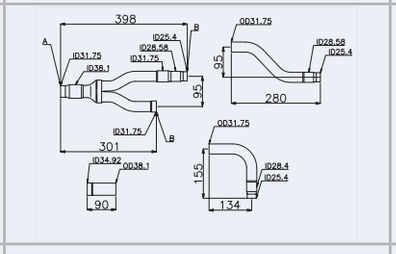
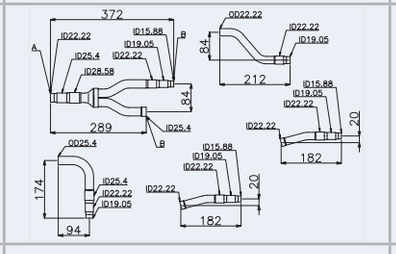
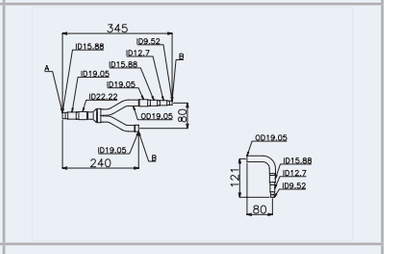
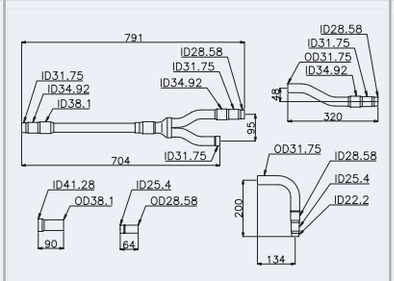
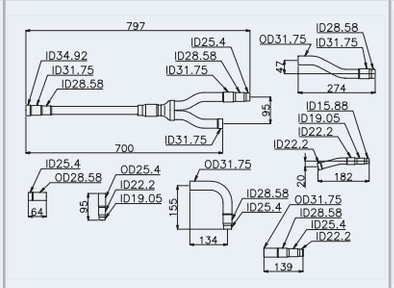
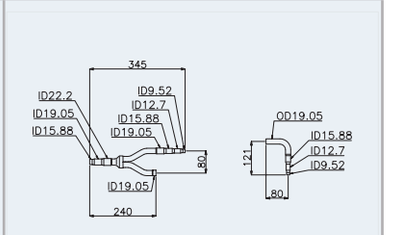
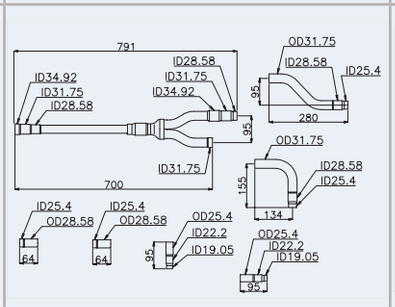
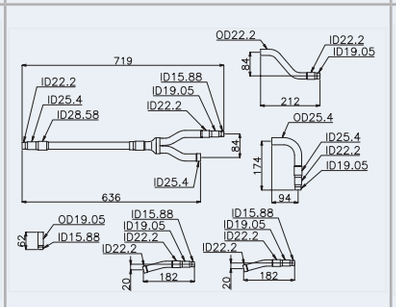
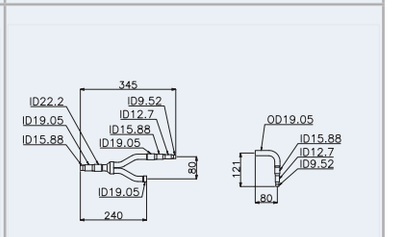
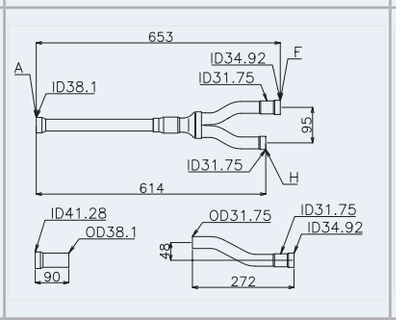
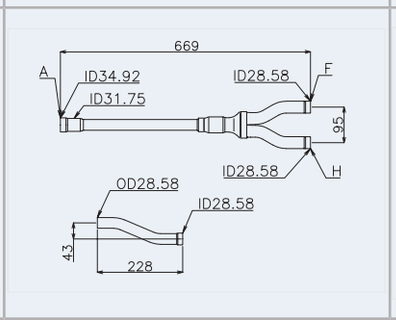
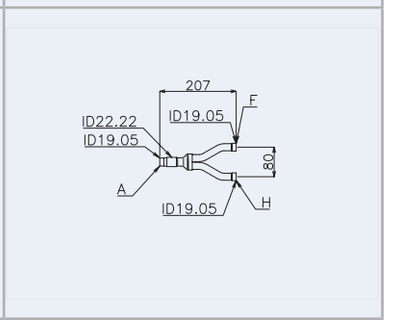
Model	High/low pressure gas line	Liquid line
MC-30AN1 KIT 2		
MC-40AN1 KIT 1		
MC-40AN1 KIT 2		

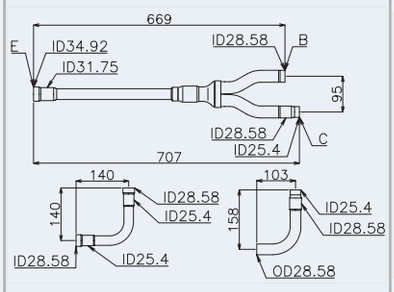
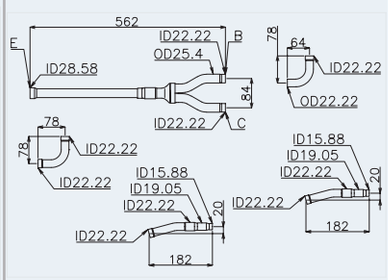
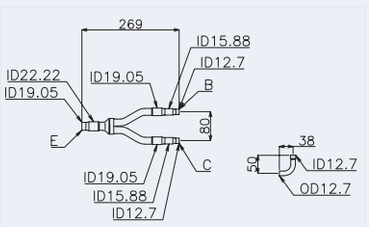
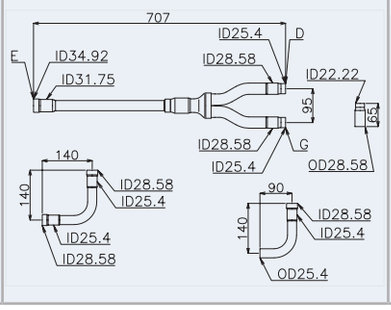
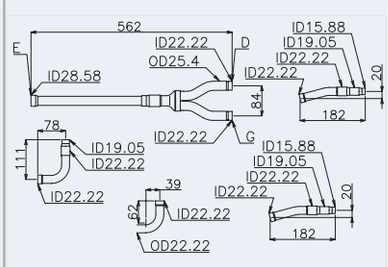
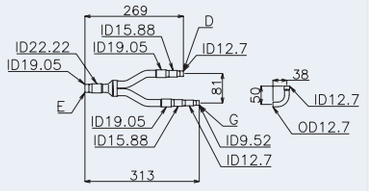
Model	High/low pressure gas line	Liquid line
MC-40AN1 KIT 3		

Unit: mm, ID: Inner diameter, OD: Outer diameter

A	To indoor unit	E	To piping connection kit 1
B	To outdoor unit A	F	To piping connection kit 2
C	To outdoor unit B	G	To outdoor unit D
D	To outdoor unit C	H	To piping connection kit 3

◆ SET FREE FSXN1E series (3 pipes)

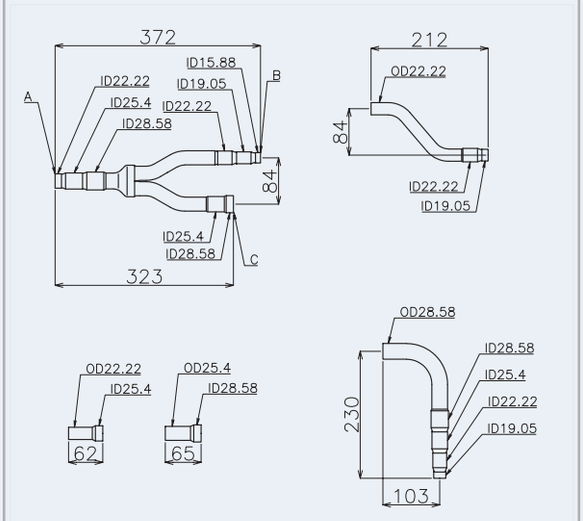
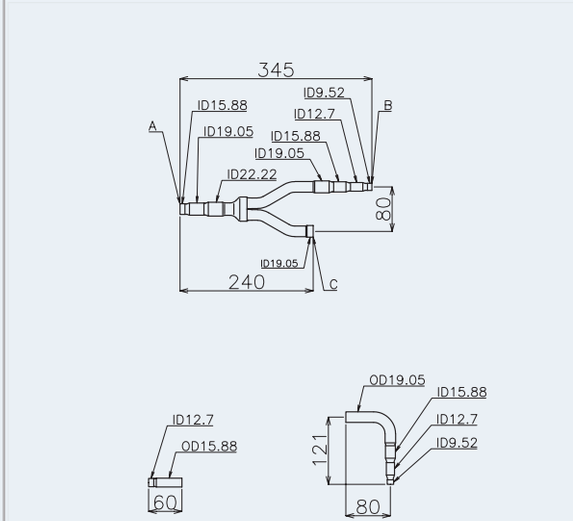
Model	Low pressure gas line	High/low pressure gas line	Liquid line
MC-20XN1			
MC-21XN1			
MC-30XN1 KIT 1			
MC-30XN1 KIT 2			
MC-40XN1 KIT 1			

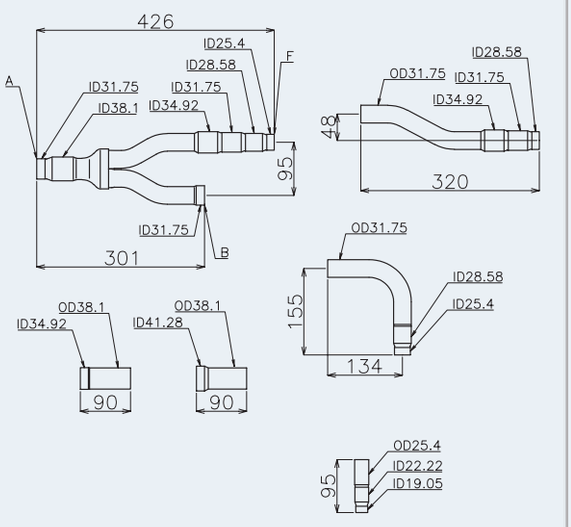
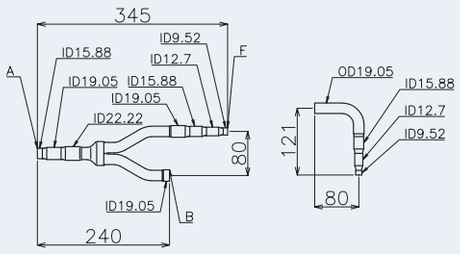
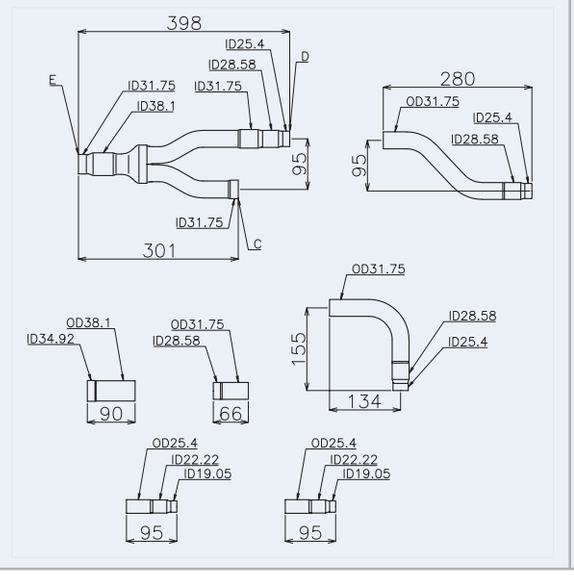
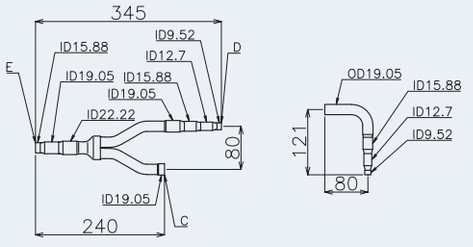
Model	Low pressure gas line	High/low pressure gas line	Liquid line
MC-40XN1 KIT 2			
MC-40XN1 KIT 3			

Unit: mm, ID: Inner diameter, OD: Outer diameter

A	To indoor unit	E	To piping connection kit 1
B	To outdoor unit A	F	To piping connection kit 2
C	To outdoor unit B	G	To outdoor unit D
D	To outdoor unit C	H	To piping connection kit 3

◆ SET FREE FSXNH(E) (2 pipes)

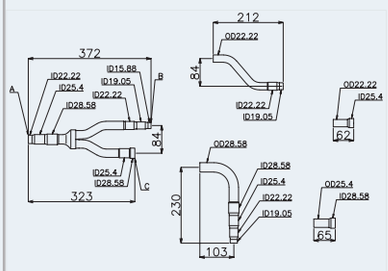
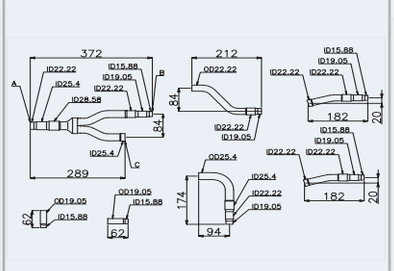
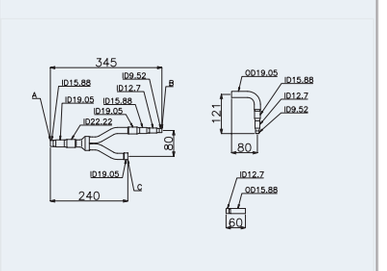
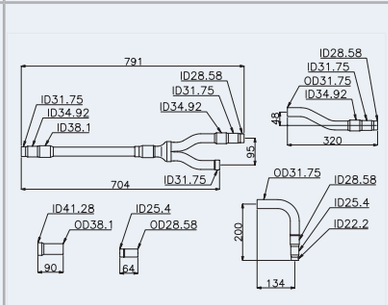
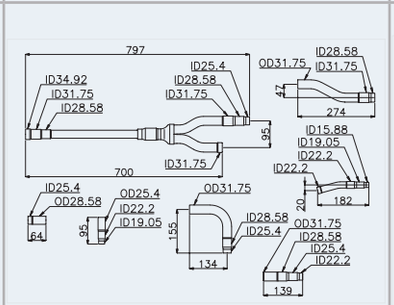
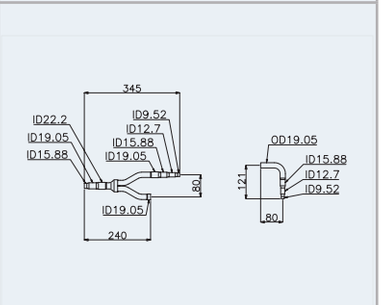
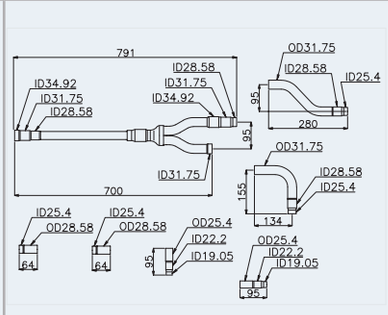
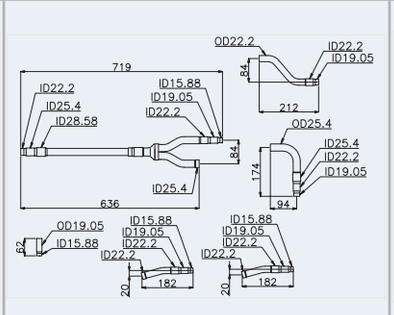
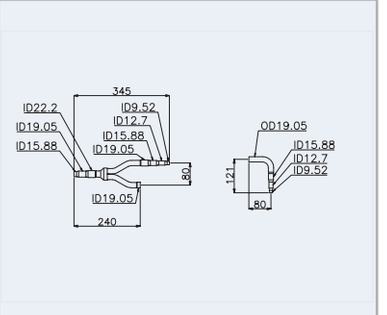
Model	High/low pressure gas line	Liquid line
MC-20AN1		

Model	High/low pressure gas line	Liquid line
MC-30AN1 KIT 1		
MC-30AN1 KIT 2		

Unit: mm, ID: Inner diameter, OD: Outer diameter

A	To indoor unit	E	To piping connection kit 1
B	To outdoor unit A	F	To piping connection kit 2
C	To outdoor unit B	G	To outdoor unit D
D	To outdoor unit C	H	To piping connection kit 3

◆ SET FREE FSXNH(E) (2 pipes)

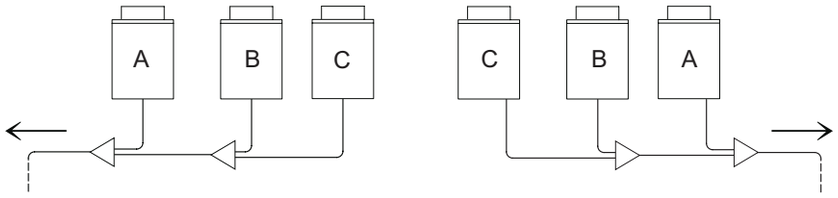
Model	Low pressure gas line	High/low pressure gas line	Liquid line
MC-20XN1			
MC-30XN1 KIT 1			
MC-30XN1 KIT 2			

Unit: mm, ID: Inner diameter, OD: Outer diameter

A	To indoor unit	E	To piping connection kit 1
B	To outdoor unit A	F	To piping connection kit 2
C	To outdoor unit B	G	To outdoor unit D
D	To outdoor unit C	H	To piping connection kit 3

3.1.4 Precautions for the installation of the outdoor unit.

Order of installation of the units

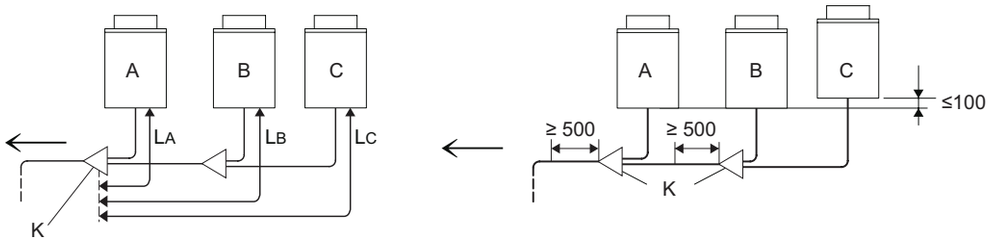


The outdoor units must be installed in decreasing order of capacity:

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

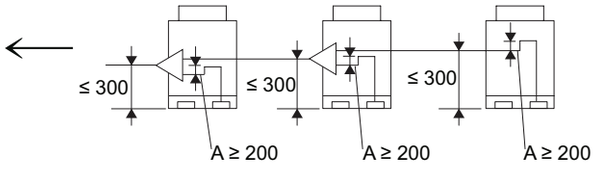
Unit -A-, with the highest capacity, must be closest the indoor units.

Refrigerant pipe installation between outdoor units

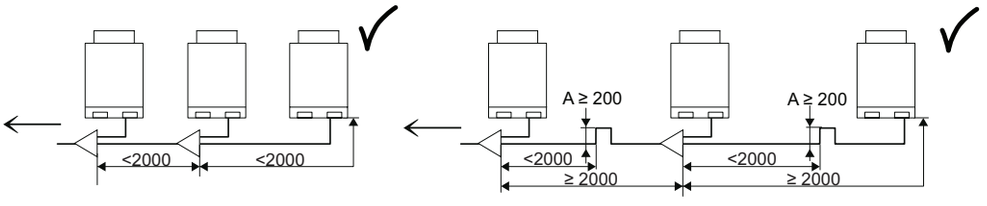


The length between the connection kit -K- (on the side of the outdoor unit) and the outside unit, must be $L_A \leq L_B \leq L_C \leq 10$ m.

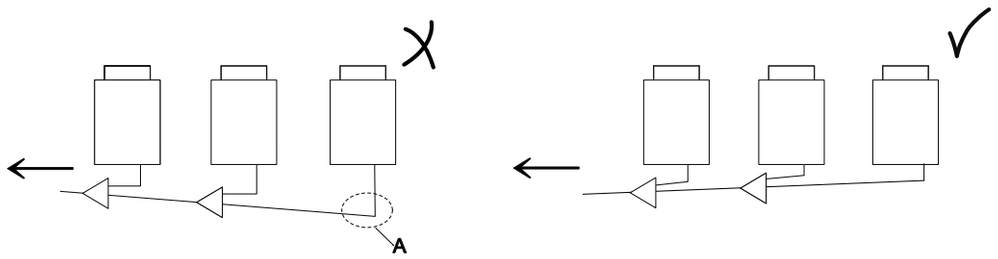
Place the connection kit at a lower level with respect to the connection of the refrigerant pipes of the outdoor unit.



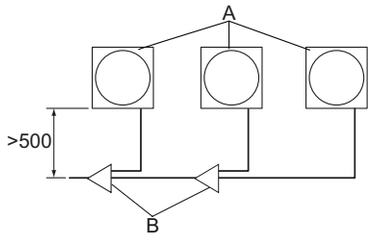
If the connection kit is placed above the refrigerant pipe connection of the outdoor unit, keep a maximum of 300 mm between the connection kit and the base of the outdoor unit. In addition, an oil recovery unit -A- (minimum 200 mm) should be fitted between the connection kit and the outdoor unit.



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



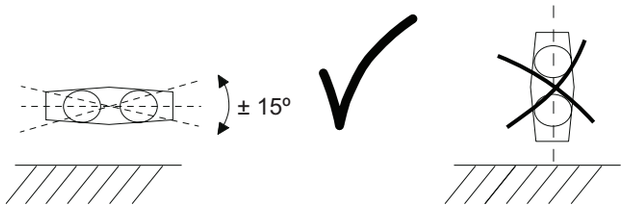
Place the refrigerant pipes of the outdoor units horizontally, or slightly tilted towards the side of the indoor units to prevent the build-up of refrigerant oil at the lowest point -A-.



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

NOTE

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



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

3.1.5 General instructions on the installation of refrigerant pipes

The copper pipe used for the installation must be specific for refrigeration systems: *"Copper pipes and sizes"*.

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

The units must be located and the gas pipes laid, particularly when the outdoor unit is at a different height to the indoor unit, in line with the instructions given in chapter *"3.1.4 Precautions for the installation of the outdoor unit."*.

System performance depends on the distance between the outdoor and indoor unit. This aspect must be taken into account for the installation of the refrigerant pipe. The outdoor units are factory-charged with sufficient refrigerant for a standard installation of certain characteristics. Where the system installation requirements involve an increase in the distance between the outdoor and indoor unit, refrigerant must be added to the installation in line with the instructions given in Chapter *"3.1.8 Refrigerant charge"*.

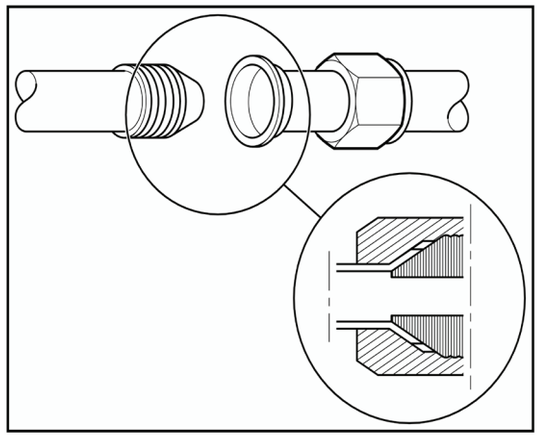
◆ Flared connection mounting

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

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

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

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



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

⚠ CAUTION

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

◆ Refrigerant pipe insulation

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

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

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

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

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

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

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

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

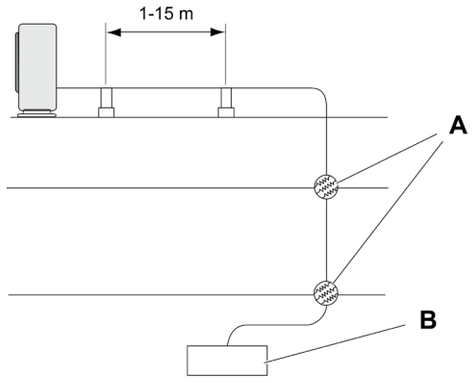
◆ **Refrigerant pipe suspension**

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

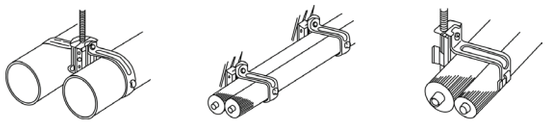
Prevent the refrigerant pipes from touching weak parts of the building, such as walls (non-structural), partition walls, ceilings, etc. Otherwise, operating noise may be caused by pipe vibrations (pay special attention in the case of short pipes).

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

B: indoor unit.

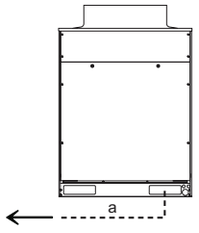


Use suitable suspension systems for refrigeration pipes or clamps to suspend the pipes, as shown in the diagram.



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

◆ **Pipe sizes for RAS-(8-16)FSXN1E and RAS-(5-12)FSXNH(E) (Base unit)**



All measurements are in mm.

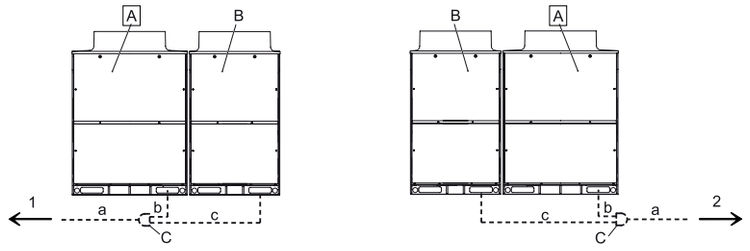
Model			RAS-8FSXN1E	RAS-10FSXN1E	RAS-12FSXN1E	RAS-14FSXN1E	RAS-16FSXN1E
Piping size (Ø mm)	a	High/Low pressure gas	19.05 (19.05 - 22.2)	22.2 (22.2 - 25.4)	25.4 (25.4 - 28.58)	25.4 (25.4 - 28.58)	28.58 (28.58 - 31.75)
		Liquid	9.52 (9.52 - 12.7)	9.52 (9.52 - 12.7)	12.7 (12.7 - 15.88)	12.7 (12.7 - 15.88)	12.7 (12.7 - 15.88)

Model			RAS-5FSXNH(E)	RAS-6FSXNH(E)	RAS-8FSXNH(E)	RAS-10FSXNH(E)	RAS-12FSXNH(E)
Piping size (Ø mm)	a	High/Low pressure gas	15.88 (15.88 - 19.05)	19.05 (19.05 - 22.2)	19.05 (19.05 - 22.2)	22.2 (22.2 - 25.4)	25.4 (25.4 - 28.58)
		Liquid	9.52 (9.52 - 12.7)	9.52 (9.52 - 12.7)	9.52 (9.52 - 12.7)	9.52 (9.52 - 12.7)	12.7 (12.7 - 15.88)

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

Main pipe	Alternative pipe and reducer	Main pipe	Alternative pipe and reducer
Ø9.52	(Ø9.52-Ø12.7)	Ø22.2	(Ø22.2-Ø25.4)
Ø12.7	(Ø12.7-Ø15.88)	Ø25.4	(Ø25.4-Ø28.6)
Ø15.88	(Ø15.88-Ø19.05)	Ø28.58	(Ø28.58-Ø31.75)
Ø19.05	(Ø19.05-Ø22.2)		

◆ Pipe sizes for RAS-(18-32)FSXN1E and RAS-(14-24)FSXNH(E) (Combination of 2 units)



A	Main outdoor unit
B	Secondary outdoor unit
C	Connection kit
1	Indoor units on left side
2	Indoor units on right side

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

All measurements are in mm.

Combination of base units

Model			RAS-18FSXN1E	RAS-20FSXN1E	RAS-22FSXN1E	RAS-24FSXN1E
Combination unit	Outdoor unit A		RAS-10FSXN1E	RAS-12FSXN1E	RAS-14FSXN1E	RAS-14FSXN1E
	Outdoor unit B		RAS-8FSXN1E	RAS-8FSXN1E	RAS-8FSXN1E	RAS-10FSXN1E
Piping connection kit			MC-20AN1			
Piping size (Ø mm)	a	High/Low Pressure gas	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)
		Liquid	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)
	b	High/Low pressure gas	22.2 (22.2-25.4)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)
		Liquid	9.52 (9.52-12.7)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	c	High/Low pressure gas	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	22.2 (22.2-25.4)
		Liquid	9.52 (9.52-12.7)	9.52 (9.52-12.7)	9.52 (9.52-12.7)	9.52 (9.52-12.7)

Model			RAS-26FSXN1E	RAS-28FSXN1E	RAS-30FSXN1E	RAS-32FSXN1E
Combination unit	Outdoor unit A		RAS-14FSXN1E	RAS-14FSXN1E	RAS-16FSXN1E	RAS-16FSXN1E
	Outdoor unit B		RAS-12FSXN1E	RAS-14FSXN1E	RAS-14FSXN1E	RAS-16FSXN1E
Piping connection kit			MC-21AN1			
Piping size (Ø mm)	a	High/Low Pressure gas	31.75 (31.75-34.9)	31.75 (31.75-34.9)	31.75 (31.75-34.9)	31.75 (31.75-34.9)
		Liquid	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)
	b	High/Low pressure gas	25.4 (25.4-28.58)	25.4 (25.4-28.58)	28.58 (28.58-31.75)	28.58 (28.58-31.75)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	c	High/Low pressure gas	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	28.58 (28.58-31.75)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)

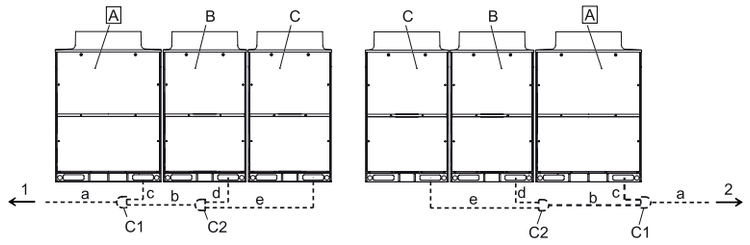
Model			RAS-26FSXN1E	RAS-28FSXN1E	RAS-30FSXN1E	RAS-32FSXN1E
Combination unit	Outdoor unit A		RAS-14FSXN1E	RAS-14FSXN1E	RAS-16FSXN1E	RAS-16FSXN1E
	Outdoor unit B		RAS-12FSXN1E	RAS-14FSXN1E	RAS-14FSXN1E	RAS-16FSXN1E
Piping connection kit			MC-21AN1			
Piping size (Ø mm)	a	High/Low Pressure gas	31.75 (31.75-34.9)	31.75 (31.75-34.9)	31.75 (31.75-34.9)	31.75 (31.75-34.9)
		Liquid	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)
	b	High/Low pressure gas	25.4 (25.4-28.58)	25.4 (25.4-28.58)	28.58 (28.58-31.75)	28.58 (28.58-31.75)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	c	High/Low pressure gas	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	28.58 (28.58-31.75)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)

Model			RAS-14FSXNH(E)	RAS-16FSXNH(E)	RAS-18FSXNH(E)	RAS-20FSXNH(E)	RAS-22FSXNH(E)	RAS-24FSXNH(E)
Combination unit	Outdoor unit A		RAS-8FSXNH(E)	RAS-8FSXNH(E)	RAS-10FSXNH(E)	RAS-12FSXNH(E)	RAS-12FSXNH(E)	RAS-12FSXNH(E)
	Outdoor unit B		RAS-6FSXNH(E)	RAS-8FSXNH(E)	RAS-8FSXNH(E)	RAS-8FSXNH(E)	RAS-10FSXNH(E)	RAS-12FSXNH(E)
Piping connection kit			MC-20AN1					
Piping size (Ø mm)	a	High/Low Pressure gas	25.4 (25.4-28.58)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)
	b	High/Low pressure gas	19.05 (19.05-22.2)	19.05 (19.05-22.2)	22.2 (22.2-25.4)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)
		Liquid	9.52 (9.52-12.7)	9.52 (9.52-12.7)	9.52 (9.52-12.7)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	c	High/Low pressure gas	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	22.2 (22.2-25.4)	25.4 (25.4-28.58)
		Liquid	9.52 (9.52-12.7)	9.52 (9.52-12.7)	9.52 (9.52-12.7)	9.52 (9.52-12.7)	9.52 (9.52-12.7)	12.7 (12.7-15.88)

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

Main pipe	Alternative pipe and reducer	Main pipe	Alternative pipe and reducer
ø9.52	(ø9.52-ø12.7)	ø25.4	(ø25.4-ø28.6)
ø12.7	(ø12.7-ø15.88)	ø28.6	(ø28.6-ø31.75)
ø15.88	(ø15.88-ø19.05)	ø31.75	(ø31.75-ø34.9)
ø19.05	(ø19.05-ø22.2)	ø38.1	(ø38.1-ø41.3)
ø22.2	(ø22.2-ø25.4)		

◆ Pipe sizes for RAS-(34-48)FSXN1E and RAS-(26-36)FSXNH(E) (Combination of 3 units)



A	Main outdoor unit
B	Secondary outdoor unit
C	Secondary outdoor unit
C1	Connection kit 1
C2	Connection kit 2
1	Indoor units on left side
2	Indoor units on right side

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

All measurements are in mm.

Combination of base units

Model			RAS-34FSXN1E	RAS-36FSXN1E	RAS-38FSXN1E	RAS-40FSXN1E
Combination unit	Outdoor unit A		RAS-12FSXN1E	RAS-12FSXN1E	RAS-14FSXN1E	RAS-16FSXN1E
	Outdoor unit B		RAS-12FSXN1E	RAS-12FSXN1E	RAS-12FSXN1E	RAS-12FSXN1E
	Outdoor unit C		RAS-10FSXN1E	RAS-12FSXN1E	RAS-12FSXN1E	RAS-12FSXN1E
Piping connection kit			MC-30AN1			
Piping size (Ø mm)	a	High/Low pressure gas	31.75 (31.75-34.9)	38.1 (38.1-41.3)	38.1 (38.1-41.3)	38.1 (38.1-41.3)
		Liquid	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)
	b	High/Low pressure gas	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)
		Liquid	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)
	c	High/Low pressure gas	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	28.58 (28.58-31.75)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	d	High/Low pressure gas	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	e	High/Low pressure gas	22.2 (22.2-25.4)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)
		Liquid	9.52 (9.52-12.7)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)

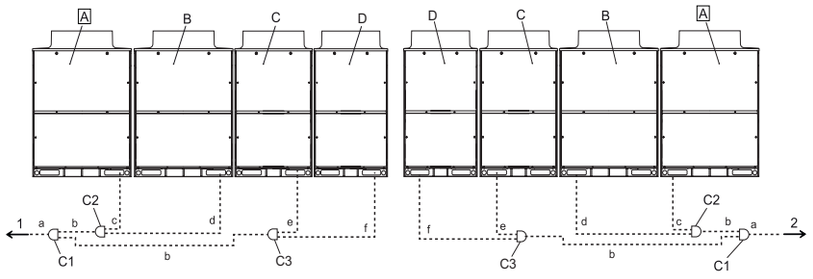
Model			RAS-42FSXN1E	RAS-44FSXN1E	RAS-46FSXN1E	RAS-48FSXN1E
Combination unit	Outdoor unit A		RAS-16FSXN1E	RAS-16FSXN1E	RAS-16FSXN1E	RAS-16FSXN1E
	Outdoor unit B		RAS-14FSXN1E	RAS-16FSXN1E	RAS-16FSXN1E	RAS-16FSXN1E
	Outdoor unit C		RAS-12FSXN1E	RAS-12FSXN1E	RAS-14FSXN1E	RAS-16FSXN1E
Piping connection kit			MC-30AN1			
Piping size (Ø mm)	a	High/Low pressure gas	38.1 (38.1-41.3)	38.1 (38.1-41.3)	38.1 (38.1-41.3)	38.1 (38.1-41.3)
		Liquid	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)
	b	High/Low pressure gas	31.75 (31.75-34.9)	31.75 (31.75-34.9)	31.75 (31.75-34.9)	31.75 (31.75-34.9)
		Liquid	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)
	c	High/Low pressure gas	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	d	High/Low pressure gas	25.4 (25.4-28.58)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	e	High/Low pressure gas	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	28.58 (28.58-31.75)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)

Model			RAS-26FSXNH(E)	RAS-28FSXNH(E)	RAS-30FSXNH(E)	RAS-32FSXNH(E)	RAS-34FSXNH(E)	RAS-36FSXNH(E)
Combination unit	Outdoor unit A		RAS-10FSXNH(E)	RAS-12FSXNH(E)	RAS-12FSXNH(E)	RAS-12FSXNH(E)	RAS-12FSXNH(E)	RAS-12FSXNH(E)
	Outdoor unit B		RAS-8FSXNH(E)	RAS-8FSXNH(E)	RAS-10FSXNH(E)	RAS-12FSXNH(E)	RAS-12FSXNH(E)	RAS-12FSXNH(E)
	Outdoor unit C		RAS-8FSXNH(E)	RAS-8FSXNH(E)	RAS-8FSXNH(E)	RAS-8FSXNH(E)	RAS-10FSXNH(E)	RAS-12FSXNH(E)
Piping connection kit			MC-30AN1					
Piping size (Ø mm)	a	High/Low pressure gas	31.75 (31.75-34.9)	31.75 (31.75-34.9)	31.75 (31.75-34.9)	31.75 (31.75-34.9)	31.75 (31.75-34.9)	38.1 (38.1-41.3)
		Liquid	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)
	b	High/Low pressure gas	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)
		Liquid	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)
	c	High/Low pressure gas	22.2 (22.2-25.4)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)
		Liquid	9.52 (9.52-12.7)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	d	High/Low pressure gas	19.05 (19.05-22.2)	19.05 (19.05-22.2)	22.2 (22.2-25.4)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)
		Liquid	9.52 (9.52-12.7)	9.52 (9.52-12.7)	9.52 (9.52-12.7)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	e	High/Low pressure gas	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	22.2 (22.2-25.4)	25.4 (25.4-28.58)
		Liquid	9.52 (9.52-12.7)	9.52 (9.52-12.7)	9.52 (9.52-12.7)	9.52 (9.52-12.7)	9.52 (9.52-12.7)	12.7 (12.7-15.88)

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

Main pipe	Alternative pipe and reducer	Main pipe	Alternative pipe and reducer
Ø9.52	(Ø9.52-Ø12.7)	Ø25.4	(Ø25.4-Ø28.6)
Ø12.7	(Ø12.7-Ø15.88)	Ø28.6	(Ø28.6-Ø31.75)
Ø15.88	(Ø15.88-Ø19.05)	Ø31.75	(Ø31.75-Ø34.9)
Ø19.05	(Ø19.05-Ø22.2)	Ø38.1	(Ø38.1-Ø41.3)
Ø22.2	(Ø22.2-Ø25.4)		

◆ Pipe sizes for RAS-(50-54)FSXN1E (Combination of 4 units)



A	Main outdoor unit
B	Secondary outdoor unit
C	Secondary outdoor unit
D	Secondary outdoor unit
C1	Connection kit 1
C2	Connection kit 2
C3	Connection kit 3
1	Indoor units on left side
2	Indoor units on right side

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

All measurements are in mm.

Combination of base units

Model			RAS-50FSXN1E	RAS-52FSXN1E	RAS-54FSXN1E
Combination unit	Outdoor unit A		RAS-14FSXN1E	RAS-14FSXN1E	RAS-16FSXN1E
	Outdoor unit B		RAS-14FSXN1E	RAS-14FSXN1E	RAS-14FSXN1E
	Outdoor unit C		RAS-12FSXN1E	RAS-12FSXN1E	RAS-12FSXN1E
	Outdoor unit D		RAS-10FSXN1E	RAS-12FSXN1E	RAS-12FSXN1E
Piping connection kit			MC-40AN1		
Piping size (Ø mm)	a	High/Low pressure gas	38.1 (38.1-41.3)	38.1 (38.1-41.3)	38.1 (38.1-41.3)
		Liquid	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)
	b	High/Low pressure gas	31.75 (31.75-34.9)	31.75 (31.75-34.9)	31.75 (31.75-34.9)
		Liquid	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)
	c	High/Low pressure gas	25.4 (25.4-28.58)	25.4 (25.4-28.58)	28.58 (28.58-31.75)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	d	High/Low pressure gas	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	e	High/Low pressure gas	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	f	High/Low pressure gas	22.2 (22.2-25.4)	25.4 (25.4-28.58)	25.4 (25.4-28.58)
		Liquid	9.52 (9.52-12.7)	12.7 (12.7-15.88)	12.7 (12.7-15.88)

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

Main pipe	Alternative pipe and reducer	Main pipe	Alternative pipe and reducer
Ø9.52	(Ø9.52-Ø12.7)	Ø25.4	(Ø25.4-Ø28.6)
Ø12.7	(Ø12.7-Ø15.88)	Ø28.6	(Ø28.6-Ø31.75)
Ø15.88	(Ø15.88-Ø19.05)	Ø31.75	(Ø31.75-Ø34.9)
Ø19.05	(Ø19.05-Ø22.2)	Ø38.1	(Ø38.1-Ø41.3)
Ø22.2	(Ø22.2-Ø25.4)		

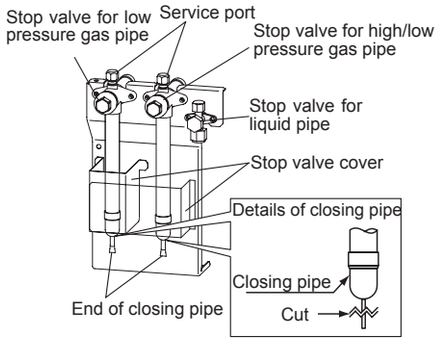
◆ Stop valve

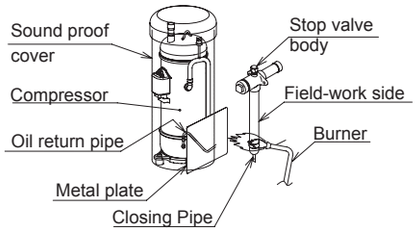
Follow the restrictions for refrigerant piping (permissible length, height difference) according to the item *"Piping connection"*. If not, the outdoor unit may be damaged or fail.

The stop valves shall be closed completely (factory setting) when the refrigerant piping connection is performed. Do not open the stop valves until all the refrigerant piping connections, air-tight test and vacuuming have been completed.

Gas valve

1. Make sure that all the spindles are closed completely.
2. Connect the charging hose to the service port and release the gas inside the piping from the high/low and low pressure gas pipes.
3. Cut the end of the closing pipes and check that no gas exists inside the high/low and low pressure gas pipes.
4. Remove the stop valve cover.
5. Remove the closing pipe from the brazing portion with a burner. Pay attention to the flame from the burner not to burn the stop valve body.





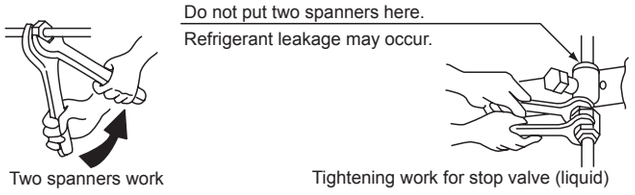
CAUTION

- *Ensure that there is no gas inside the pipe when removing the closing pipe. Otherwise, the pipe may be blown out and it may lead to injury.*
- *Protect the return oil pipe and vibration proof of the compressor with a metal plate when using a burner.*

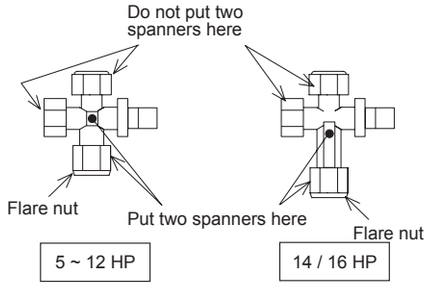
Liquid valve

Tighten the flare nut for liquid stop valve according to the following torque. If an excessive force is applied to the flare nut, the refrigerant leakage may occur from the spindle part.

(Put two spanners as shown in the right figure when the piping is removed and attached. If not, the refrigerant leakage may occur.)



HP	Tightening Torque (N-m)
(5-12)	33 - 42
(14/16)	50 - 62



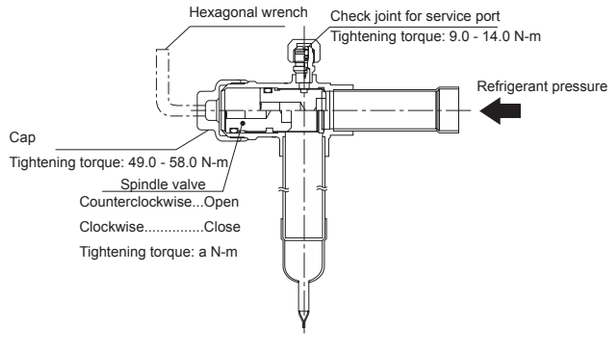
CAUTION

- *Do not apply an excessive force to the spindle valve after fully opening the spindle. The back seat construction is not provided.*
- *At the test run, fully open the spindle. If it is not fully opened, the devices will be damaged.*

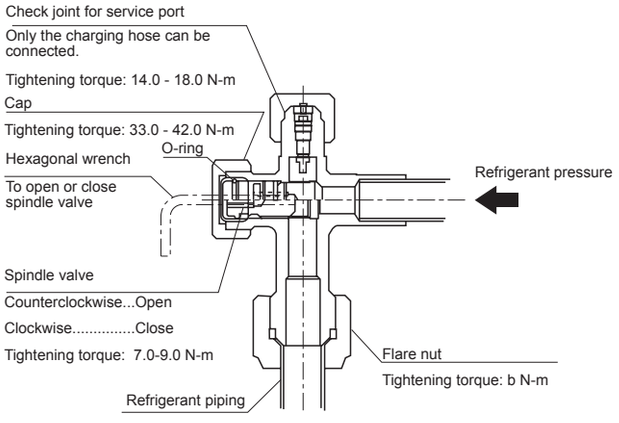
◆ Details of the gas and liquid stop valves

The details of stop valves is as follows:

Gas valve



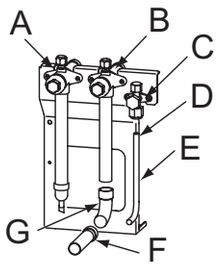
Liquid valve



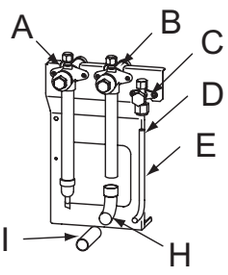
Model	Tightening Torque (Nm)	
	a	b
RAS-(8-12)FSXN1E RAS-(5-12)FSXNH(E)	18.0 - 22.0	33.0 - 42.0
RAS-(14/16)FSXN1E	25.0 - 31.0	50.0 - 62.0

◆ Refrigerant pipe connection

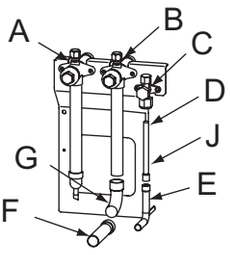
RAS-(8/16)FSXN1E
RAS-(5-8)FSXNH(E)



RAS-(10/14)FSXN1E
RAS-10FSXNH(E)



RAS-12FSXN1E
RAS-12FSXNH(E)



A	Stop valve (Low pressure gas)
B	Stop valve (High/low pressure gas)
C	Stop valve (Liquid)
D	Flaring
E	Liquid pipe (field-supplied)
F	Accessory pipe (B)
G	90° Elbow B (field-supplied)
H	90° Elbow A (field-supplied)
I	High/low pressure gas pipe (field-supplied)
J	Accessory pipe (C)

3

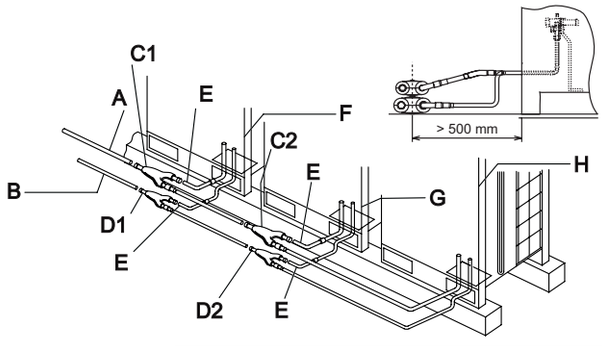
◆ Pipe connection kit (optional)

Series	Operation	Application in outdoor units		Model	Notes
		Outdoor unit	No. of outdoor units		
FSXN1E	Heat pump system	RAS-(18-24)FSXN1E	2	MC-20AN1	For two pipes: Gas: 1 part. Liquid: 1 part.
		RAS-(26-32)FSXN1E	2	MC-21AN1	
		RAS-(34-48)FSXN1E	3	MC-30AN1	
		RAS-(50-54)FSXN1E	4	MC-40AN1	
FSXNH(E)	Heat pump system	RAS-(14-24)FSXNH(E)	2	MC-20AN1	
		RAS-(26-36)FSXNH(E)	3	MC-30AN1	

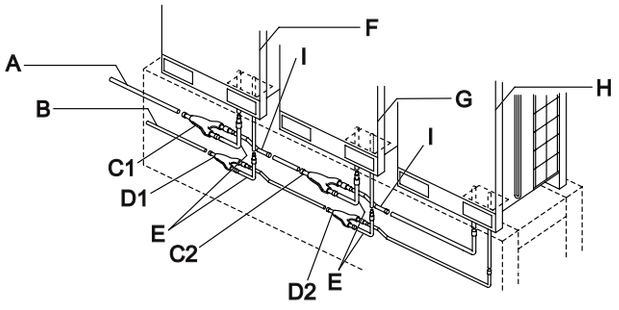
◆ Example of installation (2 pipes)

- For 3 units combination

Front side piping connection



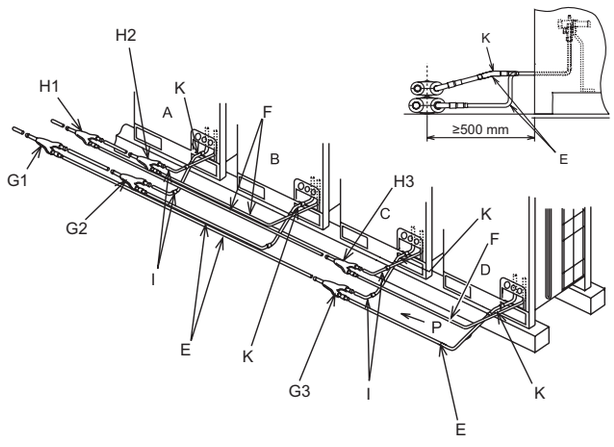
Downward piping connection



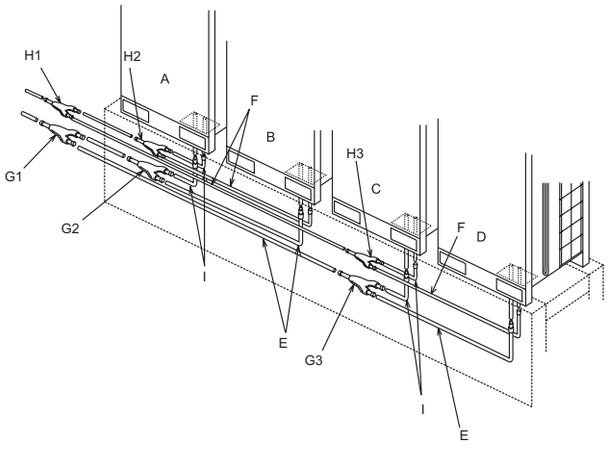
A	Gas pipe (field-supplied)	E	Accessory for connection of pipes (L-shaped)
B	Liquid pipe (field-supplied)	F	Outdoor unit 1
C1	Gas connection kit 1	G	Outdoor unit 2
C2	Gas connection kit 2	H	Outdoor unit 3
D1	Liquid connection kit 1	I	Accessory for connection of pipes (Z-shaped)
D2	Liquid connection kit 2		

- For 4 units combination

Front side piping connection

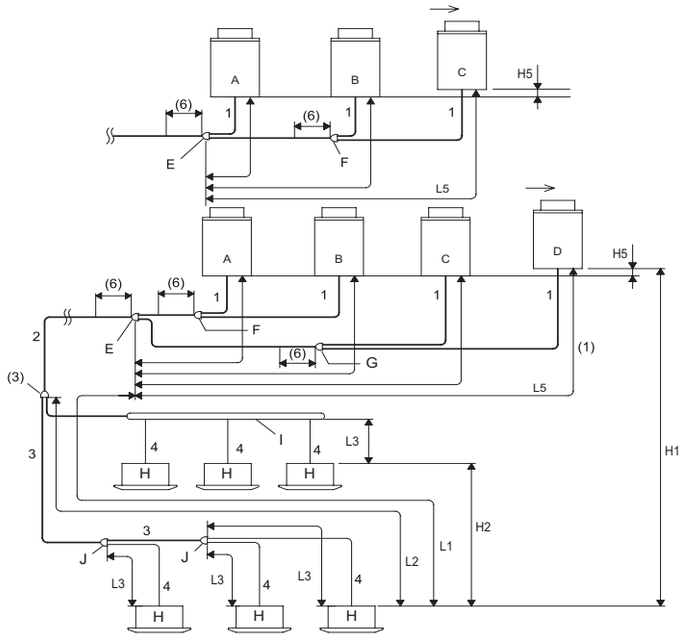


Downward piping connection



A	Outdoor unit A	**G3**	Piping connection kit 3 (high/low pressure gas)
B	Outdoor unit B	**H1**	Piping connection kit 1 (liquid)
C	Outdoor unit C	**H2**	Piping connection kit 2 (liquid)
D	Outdoor unit D	**H3**	Piping connection kit 3 (liquid)
E	High/Low pressure gas piping (field-supplied)	**I**	Accessory pipe (L-shaped)
F	Liquid piping (field-supplied)	**J**	Accessory pipe (Z-shaped)
G1	Piping connection kit 1 (high/low pressure gas)	**K**	Accessory pipe
G2	Piping connection kit 2 (high/low pressure gas)		

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



A	Main outdoor unit
B	Secondary outdoor units
C	
D	
E	Connection kit 1
F	Connection kit 2
G	Connection kit 3
H	Indoor units
I	Header branch
J	Multi-kit after first branch

Size of pipes

1. Pipe diameter for the outdoor unit.

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

HP outdoor unit	Equivalent pipe length < 100 m		HP outdoor unit	Equivalent pipe length < 100 m	
	Gas	Liquid		Gas	Liquid
5	ø15.88	ø9.52	16	ø28.6	ø12.7
(6/8)	ø19.05	ø9.52	(18-24)	ø28.6	ø15.88
10	ø22.2	ø9.52	(26-34)	ø31.75	ø19.05
(12/14)	ø25.4	ø12.7	(36-54)	ø38.1	ø19.05

3. Pipe diameter after first branch[3].

Total HP indoor unit	Gas	Liquid	Total HP indoor unit	Gas	Liquid
< 6	ø15.88	ø9.52	(16-17.99)	ø28.6	ø12.7
(6-8.99)	ø19.05	ø9.52	(18-25.99)	ø28.6	ø15.88
(9-11.99)	ø22.2	ø9.52	(26-35.99)	ø31.75	ø19.05
(12-15.99)	ø25.4	ø12.7	≥36	ø38.1	ø19.05

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

Indoor unit HP	Gas	Liquid	Indoor unit HP	Gas	Liquid
(0.8-1.5)	Ø12.7	Ø6.35[5]	10.0	Ø22.2	Ø9.52
2.0	Ø15.88	Ø6.35[5]	16.0	Ø28.58	Ø12.7
(2.5-6.0)	Ø15.88	Ø9.52	20.0	Ø28.58	Ø15.88
8.0	Ø19.05	Ø9.52			

Pipe working conditions

Part		Make	Permitted pipe length [7]	
			≤ Recommended number of connected indoor units	> Recommended number of connected indoor units
Total pipe length		Current total liquid pipe length	≤ 1000 m[8]	≤ 300 m
Maximum pipe length	Current length	L1	≤ 165 m	≤ 165 m
	Equivalent length		≤ 190 m	≤ 190 m
Maximum pipe length between the multikit of the first branch and each indoor unit		L2	≤ 90 m	≤ 40 m
Maximum pipe length between each multikit and each indoor unit		L3	≤ 40 m	≤ 30 m
Pipe length between connection kit 1 and each outdoor unit		La, Lb, Lc, Ld	≤ 10 m	≤ 10 m
Difference in height between outdoor and indoor units	Highest outdoor unit	H1	≤ 50 m [9]	≤ 50 m [9]
	Lowest outdoor unit		≤ 40 m	≤ 40 m
Difference in height between indoor units		H2	≤ 30 m	≤ 30 m
Difference in height between outdoor units		H5	≤ 0.1 m	≤ 0.1 m

NOTE

- [1] *The connection kit is taken into account from the side of the indoor unit (as connection kit 1).*
- [2] *When the maximum equivalent refrigerant pipe length (L1) from the outdoor unit/connection kit 1 to the indoor unit is greater than 100 m, the diameter of the gas/liquid pipe from the outdoor unit/connection kit 1 to the first branch must be increased using the reducer (field-supplied).*
- [3] *Where the refrigerant pipe length is greater than 100 m, the pipe diameter does not have to be increased after the first branch. Where the size of the multikit is greater than that of the first branch, adjust the size of the multikit to the first branch. Where the diameter of the pipe selected after the first branch is greater than the diameter of the pipe after it,*

use the same diameter as the inlet pipe.

- (4) *The pipe diameter -4- must be the same as that of the indoor unit connection.*
- (5) *Where the liquid pipe length is greater than 15 m, use 9.53 mm diameter pipe and a reducer (field-supplied).*
- (6) *Keep a direct distance of 500 mm or greater after the connection kit.*
- (7) *The installation conditions for the refrigerant pipes are different depending on the number of indoor units connected.*
- (8) *The total pipe length permitted must be less than 1000 m due to the maximum additional refrigerant charge limitation.*
- (9) *Longer piping up to 90 m is available only for base units of FSXNH(E) / FSXN1E series. (Dip switch setting required). In the case of base units of FSXN1E series: only for the maximum number of connectable indoor units: (RAS-8FSXN1E ≤ 14), (RAS-10FSXN1E ≤ 18), (RAS-12FSXN1E ≤ 21), (RAS-14FSXN1E ≤ 26), (RAS-16FSXN1E ≤ 29).*

NOTE

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

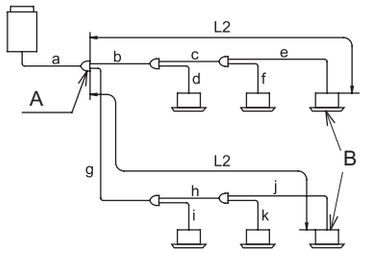
◆ Pipe branching restrictions (Installation with Main Piping Branch)

Unlimited number of Main Piping Branches as long as the following restrictions are respected.

In the case that the piping length L2 from the Multi-Kit at the first branch to the farthest indoor unit is over 40m, follow the instructions below when performing the field-supplied piping work.

Example

Piping length from the multikit at the first branch to the terminal Indoor Units is within 40-90 m



A	Main branch
B	Terminal indoor unit

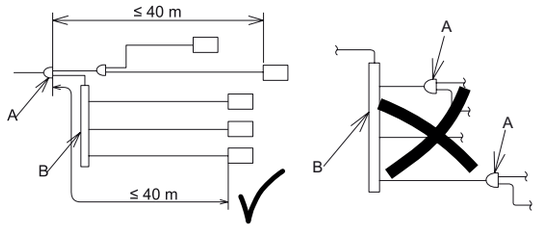
1 In the case that the piping length L2 is over 40m, thet size of gas and liquid lines “b and c” or “g and h” should be increased by one size with reducers (field-supplied).
   - If (a) is smaller than (b, c) after increasing the size, increase the size of (a) to the same size as (b, c).
2 The difference between the piping length from the first branch to the farthest indoor unit and the piping length from the first branch to the closest indoor unit must be within 40m.
   - (g+h+j)-(b+d) ≤ 40m

NOTE

- *Main Piping Branch: Both of the pipes branched from Multi-kit are connected to a further Multi-kit.*

◆ Heat pump system (with header branches)

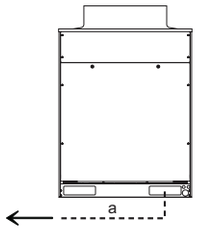
Header branch can be used with line branch at the 3 pipes portion and 2 pipes portion. Header branch can also be used after the second branch. Do not connect a line branch to a header branch. When using header branch, make sure that the piping length L2 from the Multi-Kit at the first branch to the farthest indoor unit is within 40m.



A	Line branch
B	Distributor (header branch)

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

◆ Pipe sizes for RAS-(8-16)FSXN1E and RAS-(5-12)FSXNH(E) (Base unit)



All measurements are in mm.

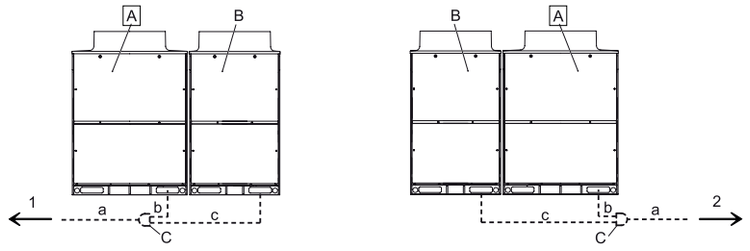
Model		RAS-8FSXN1E	RAS-10FSXN1E	RAS-12FSXN1E	RAS-14FSXN1E	RAS-16FSXN1E
a	Gas (low pressure)	19.05 (19.05 - 22.2)	22.2 (22.2 - 25.4)	25.4 (25.4 - 28.58)	25.4 (25.4 - 28.58)	28.58 (28.58 - 31.75)
	Gas (high/low pressure)	15.88 (15.88 - 19.05)	19.05 (19.05 - 22.2)	22.2 (22.2 - 25.4)	22.2 (22.2 - 25.4)	22.2 (22.2 - 25.4)
	Liquid	9.52 (9.52 - 12.7)	9.52 (9.52 - 12.7)	12.7 (12.7 - 15.88)	12.7 (12.7 - 15.88)	12.7 (12.7 - 15.88)

Model		RAS-5FSXNH(E)	RAS-6FSXNH(E)	RAS-8FSXNH(E)	RAS-10FSXNH(E)	RAS-12FSXNH(E)
a	Gas (low pressure)	15.88 (15.88 - 19.05)	19.05 (19.05 - 22.2)	19.05 (19.05 - 22.2)	22.2 (22.2 - 25.4)	25.4 (25.4 - 28.58)
	Gas (high/low pressure)	12.7 (12.7 - 15.88)	15.88 (15.88 - 19.05)	15.88 (15.88 - 19.05)	19.05 (19.05 - 22.2)	22.2 (22.2 - 25.4)
	Liquid	9.52 (9.52 - 12.7)	9.52 (9.52 - 12.7)	9.52 (9.52 - 12.7)	9.52 (9.52 - 12.7)	12.7 (12.7 - 15.88)

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

Main pipe	Alternative pipe and reducer	Main pipe	Alternative pipe and reducer
ø9.52	(ø9.52-ø12.7)	ø22.2	(ø22.2-ø25.4)
ø12.7	(ø12.7-ø15.88)	ø25.4	(ø25.4-ø28.6)
ø15.88	(ø15.88-ø19.05)	ø28.6	(ø28.6-ø31.75)
ø19.05	(ø19.05-ø22.2)		

◆ Pipe sizes for RAS-(18-32)FSXN1E and RAS-(14-24)FSXNH(E) (Combination of 2 units)



A	Main outdoor unit
B	Secondary outdoor unit
C	Connection kit
1	Indoor units on left side
2	Indoor units on right side

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

All measurements are in mm.

Combination of base units

Model			RAS-18FSXN1E	RAS-20FSXN1E	RAS-22FSXN1E	RAS-24FSXN1E
Unit A			RAS-10FSXN1E	RAS-12FSXN1E	RAS-14FSXN1E	RAS-14FSXN1E
Unit B			RAS-8FSXN1E	RAS-8FSXN1E	RAS-8FSXN1E	RAS-10FSXN1E
Connection kit			MC-20XN1			
Piping sizes (Ømm)	a	Gas (low pressure)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)
		Gas (high/low pressure)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	25.4 (25.4-28.58)	25.4 (25.4-28.58)
		Liquid	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)
	b	Gas (low pressure)	22.2 (22.2-25.4)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)
		Gas (high/low pressure)	19.05 (19.05-22.2)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)
		Liquid	9.52 (9.52-12.7)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	c	Gas (low pressure)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	22.2 (22.2-25.4)
		Gas (high/low pressure)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	19.05 (19.05-22.2)
		Liquid	9.52 (9.52-12.7)	9.52 (9.52-12.7)	9.52 (9.52-12.7)	9.52 (9.52-12.7)

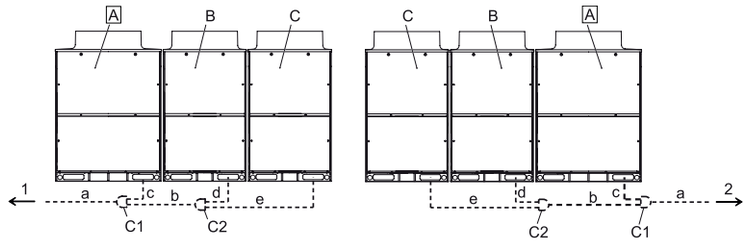
Model			RAS-26FSXN1E	RAS-28FSXN1E	RAS-30FSXN1E	RAS-32FSXN1E
Unit A			RAS-14FSXN1E	RAS-14FSXN1E	RAS-16FSXN1E	RAS-16FSXN1E
Unit B			RAS-12FSXN1E	RAS-14FSXN1E	RAS-14FSXN1E	RAS-16FSXN1E
Connection kit			MC-21XN1			
Piping sizes (Ømm)	a	Gas (low pressure)	31.75 (31.75-34.9)	31.75 (31.75-34.9)	31.75 (31.75-34.9)	31.75 (31.75-34.9)
		Gas (high/low pressure)	25.4 (25.4-28.58)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)
		Liquid	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)
	b	Gas (low pressure)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	28.58 (28.58-31.75)	28.58 (28.58-31.75)
		Gas (high/low pressure)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	c	Gas (low pressure)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	28.58 (28.58-31.75)
		Gas (high/low pressure)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)

Model			RAS-14 FSXNH(E)	RAS-16 FSXNH(E)	RAS-18 FSXNH(E)	RAS-20 FSXNH(E)	RAS-22 FSXNH(E)	RAS-24 FSXNH(E)
Unit A			RAS-8 FSXNH(E)	RAS-8 FSXNH(E)	RAS-10 FSXNH(E)	RAS-12 FSXNH(E)	RAS-12 FSXNH(E)	RAS-12 FSXNH(E)
Unit B			RAS-6 FSXNH(E)	RAS-8 FSXNH(E)	RAS-8 FSXNH(E)	RAS-8 FSXNH(E)	RAS-10 FSXNH(E)	RAS-12 FSXNH(E)
Connection kit			MC-20XN1					
Piping sizes (Ømm)	a	Gas (low pressure)	25.4 (25.4-28.58)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)
		Gas (high/low pressure)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	25.4 (25.4-28.58)	25.4 (25.4-28.58)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)
	b	Gas (low pressure)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	22.2 (22.2-25.4)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)
		Gas (high/low pressure)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	19.05 (19.05-22.2)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)
		Liquid	9.52 (9.52-12.7)	9.52 (9.52-12.7)	9.52 (9.52-12.7)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	c	Gas (low pressure)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	22.2 (22.2-25.4)	25.4 (25.4-28.58)
		Gas (high/low pressure)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	19.05 (19.05-22.2)	22.2 (22.2-25.4)
		Liquid	9.52 (9.52-12.7)	9.52 (9.52-12.7)	9.52 (9.52-12.7)	9.52 (9.52-12.7)	9.52 (9.52-12.7)	12.7 (12.7-15.88)

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

Main pipe	Alternative pipe and reducer	Main pipe	Alternative pipe and reducer
ø9.52	(ø9.52-ø12.7)	ø22.2	(ø22.2-ø25.4)
ø12.7	(ø12.7-ø15.88)	ø25.4	(ø25.4-ø28.6)
ø15.88	(ø15.88-ø19.05)	ø28.6	(ø28.6-ø31.75)
ø19.05	(ø19.05-ø22.2)	ø31.75	(ø31.75-ø34.9)

◆ Pipe sizes for RAS-(34-48)FSXN1E and RAS-(26-36)FSXNH(E) (Combination of 3 units)



A	Main outdoor unit
B	Secondary outdoor unit
C	Secondary outdoor unit
C1	Connection kit 1
C2	Connection kit 2
1	Indoor units on left side
2	Indoor units on right side

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

All measurements are in mm.

Combination of base units

Model			RAS-34FSXN1E	RAS-36FSXN1E	RAS-38FSXN1E	RAS-40FSXN1E
Unit A			RAS-12FSXN1E	RAS-12FSXN1E	RAS-14FSXN1E	RAS-16FSXN1E
Unit B			RAS-12FSXN1E	RAS-12FSXN1E	RAS-12FSXN1E	RAS-12FSXN1E
Unit C			RAS-10FSXN1E	RAS-12FSXN1E	RAS-12FSXN1E	RAS-12FSXN1E
Connection kit			MC-30XN1			
Piping sizes (Ø mm)	a	Gas (low pressure)	31.75 (31.75-34.9)	38.1 (38.1-41.3)	38.1 (38.1-41.3)	38.1 (38.1-41.3)
		Gas (high/low pressure)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	31.75 (31.75-34.9)	31.75 (31.75-34.9)
		Liquid	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)
	b	Gas (low pressure)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)
		Gas (high/low pressure)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)
		Liquid	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)
	c	Gas (low pressure)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	28.58 (28.58-31.75)
		Gas (high/low pressure)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	d	Gas (low pressure)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)
		Gas (high/low pressure)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	e	Gas (low pressure)	22.2 (22.2-25.4)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)
		Gas (high/low pressure)	19.05 (19.05-22.2)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)
		Liquid	9.52 (9.52-12.7)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)

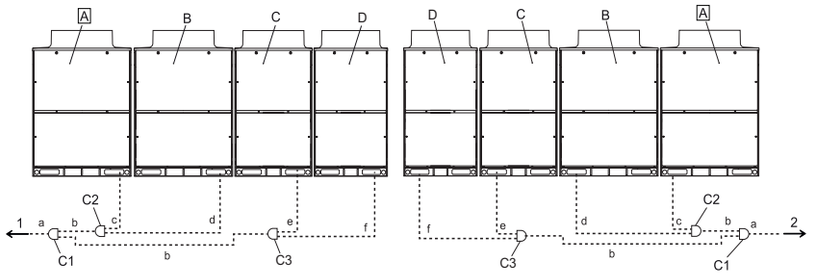
Model			RAS-42FSXN1E	RAS-44FSXN1E	RAS-46FSXN1E	RAS-48FSXN1E
Unit A			RAS-16FSXN1E	RAS-16FSXN1E	RAS-16FSXN1E	RAS-16FSXN1E
Unit B			RAS-14FSXN1E	RAS-16FSXN1E	RAS-16FSXN1E	RAS-16FSXN1E
Unit C			RAS-12FSXN1E	RAS-12FSXN1E	RAS-14FSXN1E	RAS-16FSXN1E
Connection kit			MC-30XN1			
Piping sizes (Ø mm)	a	Gas (low pressure)	38.1 (38.1-41.3)	38.1 (38.1-41.3)	38.1 (38.1-41.3)	38.1 (38.1-41.3)
		Gas (high/low pressure)	31.75 (31.75-34.9)	31.75 (31.75-34.9)	31.75 (31.75-34.9)	31.75 (31.75-34.9)
		Liquid	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)
	b	Gas (low pressure)	31.75 (31.75-34.9)	31.75 (31.75-34.9)	31.75 (31.75-34.9)	31.75 (31.75-34.9)
		Gas (high/low pressure)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)
		Liquid	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)
	c	Gas (low pressure)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)
		Gas (high/low pressure)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	d	Gas (low pressure)	25.4 (25.4-28.58)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)
		Gas (high/low pressure)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	e	Gas (low pressure)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	28.58 (28.58-31.75)
		Gas (high/low pressure)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)

Model			RAS-26 FSXNH(E)	RAS-28 FSXNH(E)	RAS-30 FSXNH(E)	RAS-32 FSXNH(E)	RAS-34 FSXNH(E)	RAS-36 FSXNH(E)
Unit A			RAS-10 FSXNH(E)	RAS-12 FSXNH(E)	RAS-12 FSXNH(E)	RAS-12 FSXNH(E)	RAS-12 FSXNH(E)	RAS-12 FSXNH(E)
Unit B			RAS-8 FSXNH(E)	RAS-8 FSXNH(E)	RAS-10 FSXNH(E)	RAS-12 FSXNH(E)	RAS-12 FSXNH(E)	RAS-12 FSXNH(E)
Unit C			RAS-8 FSXNH(E)	RAS-8 FSXNH(E)	RAS-8 FSXNH(E)	RAS-8 FSXNH(E)	RAS-10 FSXNH(E)	RAS-12 FSXNH(E)
Connection kit			MC-30XN1					
Piping sizes (Ø mm)	a	Gas (low pressure)	31.75 (31.75-34.9)	31.75 (31.75-34.9)	31.75 (31.75-34.9)	31.75 (31.75-34.9)	31.75 (31.75-34.9)	38.1 (38.1-41.3)
		Gas (high/low pressure)	25.4 (25.4-28.58)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)
		Liquid	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)
	b	Gas (low pressure)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)
		Gas (high/low pressure)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	25.4 (25.4-28.58)	25.4 (25.4-28.58)
		Liquid	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)
	c	Gas (low pressure)	22.2 (22.2-25.4)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)
		Gas (high/low pressure)	19.05 (19.05-22.2)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)
		Liquid	9.52 (9.52-12.7)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	d	Gas (low pressure)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	22.2 (22.2-25.4)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)
		Gas (high/low pressure)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	19.05 (19.05-22.2)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)
		Liquid	9.52 (9.52-12.7)	9.52 (9.52-12.7)	9.52 (9.52-12.7)	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	e	Gas (low pressure)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)	22.2 (22.2-25.4)	25.4 (25.4-28.58)
		Gas (high/low pressure)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	15.88 (15.88-19.05)	19.05 (19.05-22.2)	22.2 (22.2-25.4)
		Liquid	9.52 (9.52-12.7)	9.52 (9.52-12.7)	9.52 (9.52-12.7)	9.52 (9.52-12.7)	9.52 (9.52-12.7)	12.7 (12.7-15.88)

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

Main pipe	Alternative pipe and reducer	Main pipe	Alternative pipe and reducer
Ø9.52	(Ø9.52-Ø12.7)	Ø25.4	(Ø25.4-Ø28.6)
Ø12.7	(Ø12.7-Ø15.88)	Ø28.6	(Ø28.6-Ø31.75)
Ø15.88	(Ø15.88-Ø19.05)	Ø31.75	(Ø31.75-Ø34.9)
Ø19.05	(Ø19.05-Ø22.2)	Ø38.1	(Ø38.1-Ø41.3)
Ø22.2	(Ø22.2-Ø25.4)		

◆ Pipe sizes for RAS-(50-54)FSXN1E (Combination of 4 units)



A	Main outdoor unit
B	Secondary outdoor unit
C	Secondary outdoor unit
D	Secondary outdoor unit
C1	Connection kit 1
C2	Connection kit 2
C3	Connection kit 3
1	Indoor units on left side
2	Indoor units on right side

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

All measurements are in mm.

◆ Combination of base units

Model			RAS-50FSXN1E	RAS-52FSXN1E	RAS-54FSXN1E
Unit A			RAS-14FSXN1E	RAS-14FSXN1E	RAS-16FSXN1E
Unit B			RAS-14FSXN1E	RAS-14FSXN1E	RAS-14FSXN1E
Unit C			RAS-12FSXN1E	RAS-12FSXN1E	RAS-12FSXN1E
Unit D			RAS-10FSXN1E	RAS-12FSXN1E	RAS-12FSXN1E
Connection kit			MC-40XN1		
Piping sizes (Ø mm)	a	Gas (low pressure)	38.1 (38.1-41.3)	38.1 (38.1-41.3)	38.1 (38.1-41.3)
		Gas (high/low pressure)	31.75 (31.75-34.9)	31.75 (31.75-34.9)	31.75 (31.75-34.9)
		Liquid	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)
	b	Gas (low pressure)	31.75 (31.75-34.9)	31.75 (31.75-34.9)	31.75 (31.75-34.9)
		Gas (high/low pressure)	28.58 (28.58-31.75)	28.58 (28.58-31.75)	28.58 (28.58-31.75)
		Liquid	19.05 (19.05-22.2)	19.05 (19.05-22.2)	19.05 (19.05-22.2)
	c	Gas (low pressure)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	28.58 (28.58-31.75)
		Gas (high/low pressure)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	d	Gas (low pressure)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)
		Gas (high/low pressure)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	e	Gas (low pressure)	25.4 (25.4-28.58)	25.4 (25.4-28.58)	25.4 (25.4-28.58)
		Gas (high/low pressure)	22.2 (22.2-25.4)	22.2 (22.2-25.4)	22.2 (22.2-25.4)
		Liquid	12.7 (12.7-15.88)	12.7 (12.7-15.88)	12.7 (12.7-15.88)
	f	Gas (low pressure)	22.2 (22.2-25.4)	25.4 (25.4-28.58)	25.4 (25.4-28.58)
		Gas (high/low pressure)	19.05 (19.05-22.2)	22.2 (22.2-25.4)	22.2 (22.2-25.4)
		Liquid	9.52 (9.52 - 12.7)	12.7 (12.7-15.88)	12.7 (12.7-15.88)

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

Main pipe	Alternative pipe and reducer	Main pipe	Alternative pipe and reducer
Ø9.52	(Ø9.52-Ø12.7)	Ø25.4	(Ø25.4-Ø28.6)
Ø12.7	(Ø12.7-Ø15.88)	Ø28.6	(Ø28.6-Ø31.75)
Ø15.88	(Ø15.88-Ø19.05)	Ø31.75	(Ø31.75-Ø34.9)
Ø19.05	(Ø19.05-Ø22.2)	Ø38.1	(Ø38.1-Ø41.3)
Ø22.2	(Ø22.2-Ø25.4)		

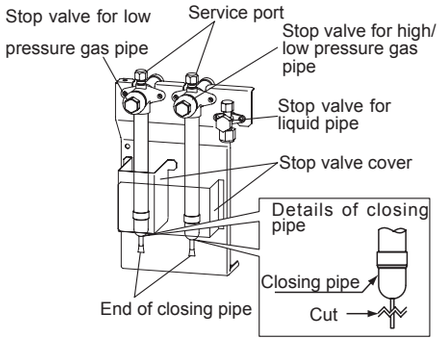
◆ Stop valve

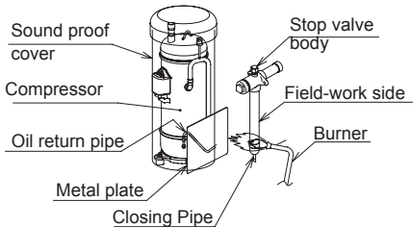
Follow the restrictions for refrigerant piping (permissible length, height difference) according to the item *"Piping connection"*. If not, the outdoor unit may be damaged or fail.

The stop valves shall be closed completely (factory setting) when the refrigerant piping connection is performed. Do not open the stop valves until all the refrigerant piping connections, air-tight test and vacuuming have been completed.

Gas valve

1. Make sure that all the spindles are closed completely.
2. Connect the charging hose to the service port and release the gas inside the piping from the high/low and low pressure gas pipes.
3. Cut the end of the closing pipes and check that no gas exists inside the high/low and low pressure gas pipes.
4. Remove the stop valve cover.
5. Remove the closing pipe from the brazing portion with a burner. Pay attention to the flame from the burner not to burn the stop valve body.





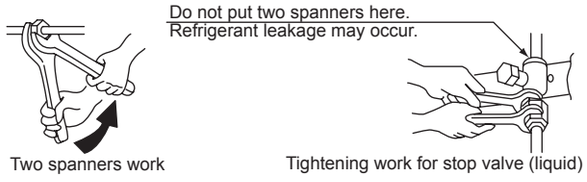
⚠ CAUTION

- *Ensure that there is no gas inside the pipe when removing the closing pipe. Otherwise, the pipe may be blown out and it may lead to injury.*
- *Protect the return oil pipe and vibration proof of the compressor with a metal plate when using a burner*

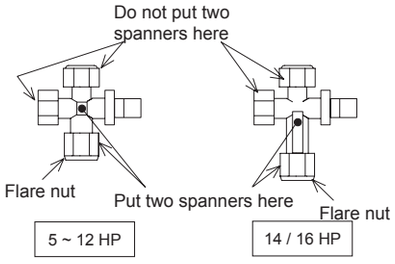
◆ Liquid valve

Tighten the flare nut for liquid stop valve according to the following torque. If an excessive force is applied to the flare nut, the refrigerant leakage may occur from the spindle part.

(Put two spanners as shown in the right figure when the piping is removed and attached. If not, the refrigerant leakage may occur.)



HP	Tightening Torque (N-m)
(5-12)	33 - 42
(14/16)	50 - 62



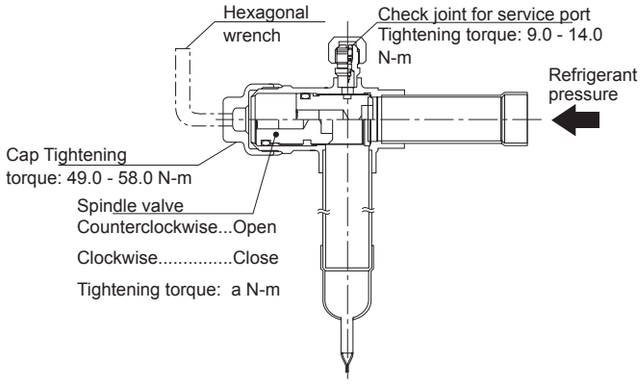
⚠ CAUTION

- *Do not apply an excessive force to the spindle valve after fully opening the spindle. The back seat construction is not provided.*
- *At the test run, fully open the spindle. If it is not fully opened, the devices will be damaged.*

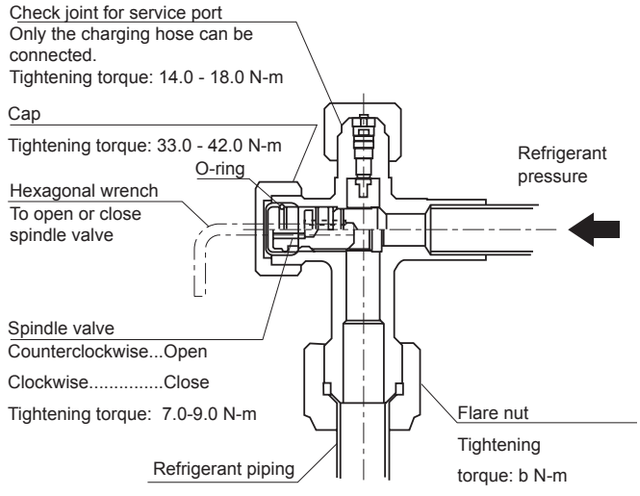
3

The details of stop valves is as follows:

Gas valve



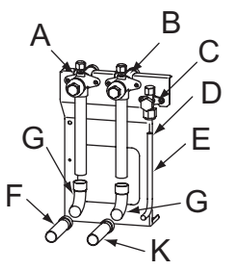
Liquid valve



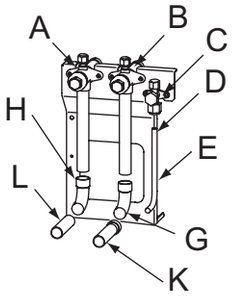
Model	Tightening Torque (Nm)	
	a	b
RAS-(8-12)FSXN1E RAS-(5-12)FSXNH(E)	18.0 - 22.0	33.0 - 42.0
RAS-(14/16)FSXN1E	25.0 - 31.0	50.0 - 62.0

◆ Refrigerant pipe connection

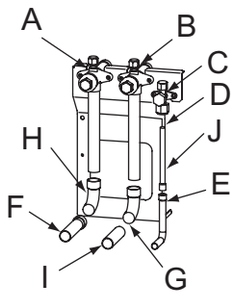
RAS-8FSXN1E
RAS-(5-8)FSXNH(E)



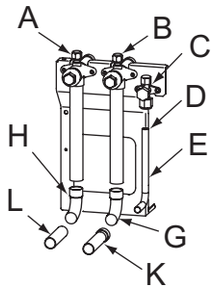
RAS-10FSXN1E
RAS-10FSXNH(E)



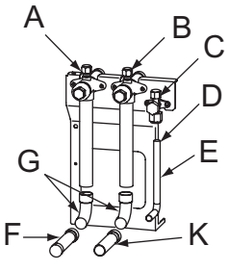
RAS-12FSXN1E



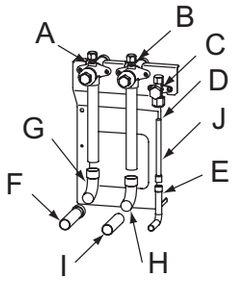
RAS-14FSXN1E



RAS-16FSXN1E



RAS-12FSXNH(E)



A	Stop valve (Low pressure gas).
B	Stop valve (High/low pressure gas)
C	Stop valve (Liquid)
D	Flaring
E	Liquid pipe (field-supplied)
F	Accessory pipe (B)
G	90º Elbow B (field-supplied)
H	90º Elbow A (field-supplied)
I	High/low pressure gas pipe (field-supplied)
J	Accessory pipe (C)
K	Accessory pipe (A)
L	Low pressure gas pipe (Field supplied)

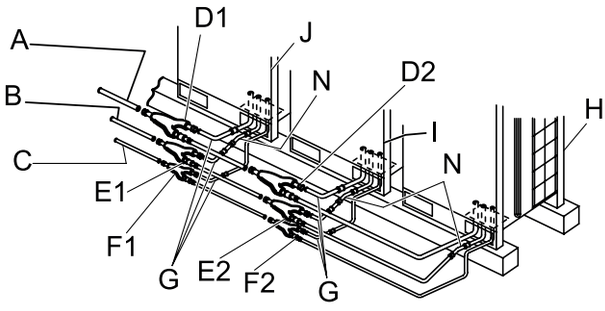
◆ Pipe connection kit (optional)

Series	Operation	Application in outdoor units		Model	Notes
		Outdoor unit	No. of outdoor units		
FSXN1E	Heat recovery system	RAS-(18-24)FSXN1E	2	MC-20XN1	For three pipes: Gas, high pressure: 1 part. Gas, low pressure: 1 part. Liquid: 1 part.
		RAS-(26-32)FSXN1E	2	MC-21XN1	
		RAS-(34-48)FSXN1E	3	MC-30XN1	
		RAS-(50-54)FSXN1E	4	MC-40XN1	
FSXNH(E)	Heat recovery system	RAS-(14-24)FSXNH(E)	2	MC-20XN1	
		RAS-(26-36)FSXNH(E)	3	MC-30XN1	

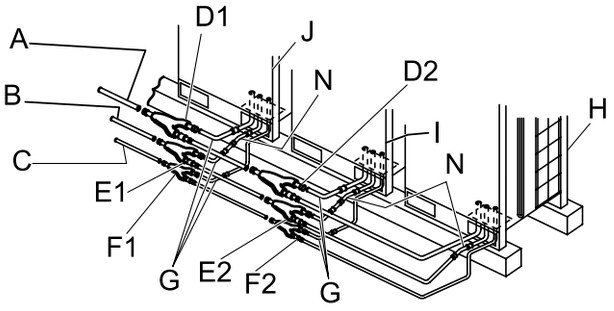
◆ Example of installation (3 pipes)

- For 3 units combination

Front side piping connection



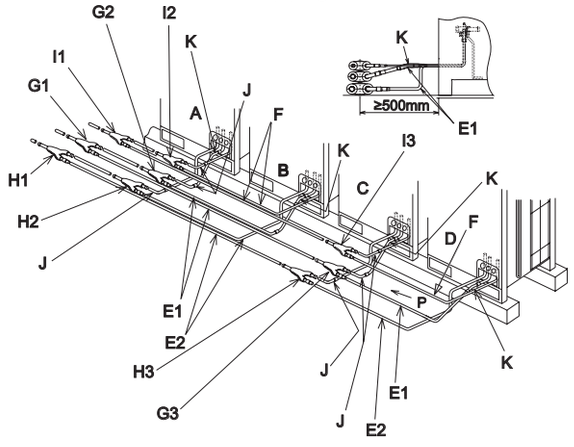
Downward piping connection



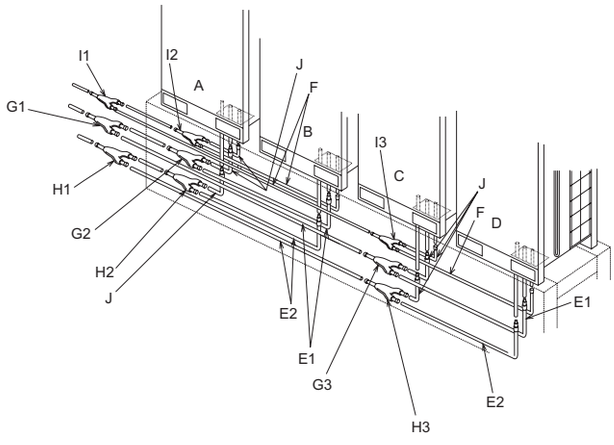
A	Gas pipe, low pressure (field-supplied)	F2	Liquid connection kit 2
B	Gas pipe, high pressure (field-supplied)	G	Accessory for connection of pipes (L-shaped)
C	Liquid pipe (field-supplied)	H	Outdoor unit 3
D1	Gas connection kit, low pressure 1	I	Outdoor unit 2
D2	Gas connection kit, low pressure 2	J	Outdoor unit 1
E1	Gas connection kit, high pressure 1	K	Accessory for connection of pipes (Z-shaped)
E2	Gas connection kit, high pressure 2	N	Accessory for connection of pipes
F1	Liquid connection kit 1		

- For 4 units combination

Front side piping connection

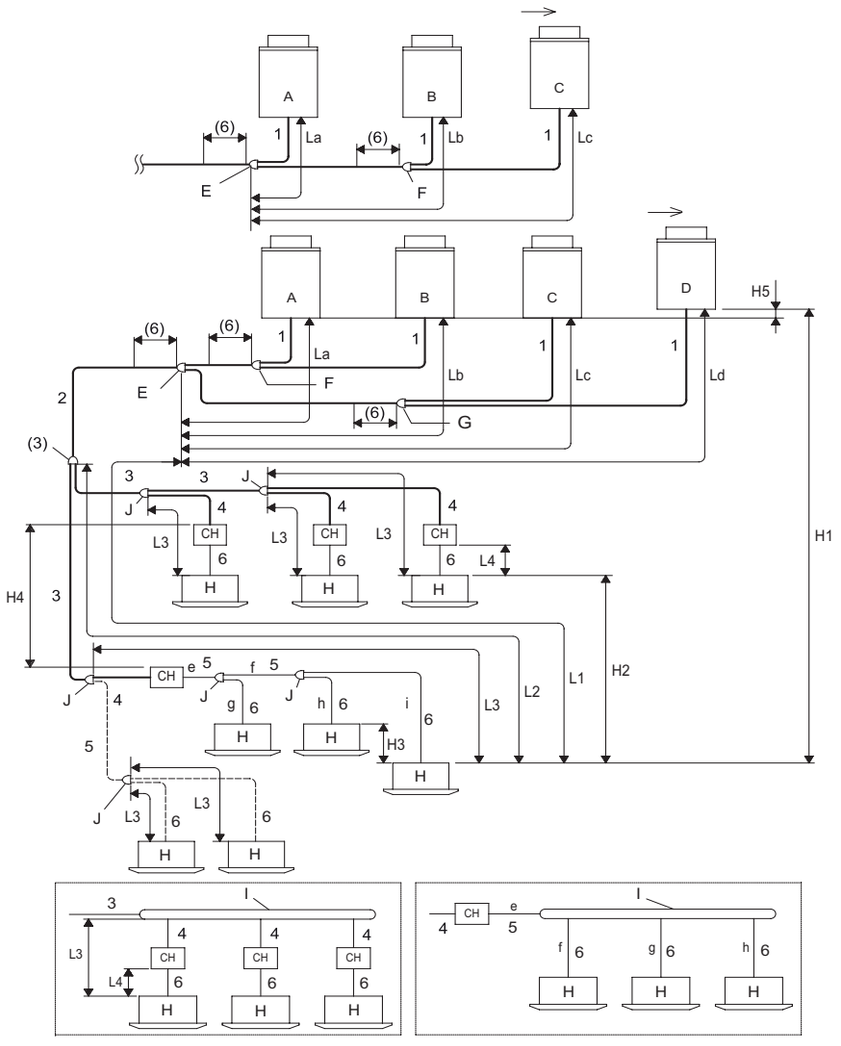


Downward piping connection



A	Outdoor unit A	G3	Piping connection kit 3 (high/low pressure gas)
B	Outdoor unit B	H1	Piping connection kit 1 (low pressure gas)
C	Outdoor unit C	H2	Piping connection kit 2 (low pressure gas)
D	Outdoor unit D	H3	Piping connection kit 3 (low pressure gas)
E1	High/low pressure gas piping (field-supplied)	I1	Piping connection kit 1 (liquid)
E2	Low pressure gas piping (field-supplied)	I2	Piping connection kit 2 (liquid)
F	Liquid piping (field-supplied)	I3	Piping connection kit 3 (liquid)
G1	Piping connection kit 1 (high/low pressure gas)	J	Accessory pipe (L-shaped)
G2	Piping connection kit 2 (high/low pressure gas)	K	Accessory pipe

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



A	Main outdoor unit
B	Secondary outdoor units
C	
D	
E	Connection kit 1
F	Connection kit 2
G	Connection kit 3
H	Indoor units
I	Header branch
J	Multi-kit after first branch

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

Size of pipes

1. Pipe diameter for the outdoor unit.

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

Outdoor unit (HP)	Gas, low pressure	Gas, high/low pressure	Liquid	Outdoor unit (HP)	Gas, low pressure	Gas, high/low pressure	Liquid
5	ø15.88	ø12.7	ø9.52	(22/24)	ø28.58	ø25.4	ø15.88
(6/8)	ø19.05	ø15.88	ø9.52	26	ø31.75	ø25.4	ø19.05
10	ø22.2	ø19.05	ø9.52	(28-34)	ø31.75	ø28.58	ø19.05
(12/14)	ø25.4	ø22.2	ø12.7	36	ø38.1	ø28.58	ø19.05
16	ø28.58	ø22.2	ø12.7	38-54	ø38.1	ø31.75	ø19.05
(18/20)	ø28.58	ø22.2	ø15.88				

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

Total HP indoor unit	Gas, low pressure	Gas, high/low pressure	Liquid	Total HP indoor unit	Gas, low pressure	Gas, high/low pressure	Liquid
< 6	ø15.88	ø12.7	ø9.52	(18-21.99)	ø28.58	ø22.2	ø15.88
(6-8.99)	ø19.05	ø15.88	ø9.52	(22-25.99)	ø28.58	ø25.4	ø15.88
(9-11.99)	ø22.2	ø19.05	ø9.52	(26-35.99)	ø31.75	ø28.58	ø19.05
(12-15.99)	ø25.4	ø22.2	ø12.7	≥36	ø38.1	ø31.75	ø19.05
(16-17.99)	ø28.58	ø22.2	ø12.7				

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

CH unit	Maximum combination of indoor units[8]	Capacity of indoor units	Gas, low pressure	Gas, high pressure	Liquid
CH-6.0N2	7	(0.8-4.0)	ø15.88	ø12.7	ø9.52
		(4.1-6.0)	ø19.05	ø15.88	ø9.52
CH-10.0N2	8	(6.1-8.0)	ø19.05	ø15.88	ø9.52
		(8.1-10.0)	ø22.2	ø19.05	ø9.52

5. Pipe diameter for 2 pipes and multikit.

Total HP indoor unit	Gas	Liquid	Total HP indoor unit	Gas	Liquid
< 6	ø15.88	ø9.52	(12-15.99)	ø25.4	ø12.7
(6-8.99)	ø19.05	ø9.52	(16-17.99)	ø28.58	ø12.7
(9-11.99)	ø22.2	ø9.52	(18-25.99)	ø28.58	ø15.88

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

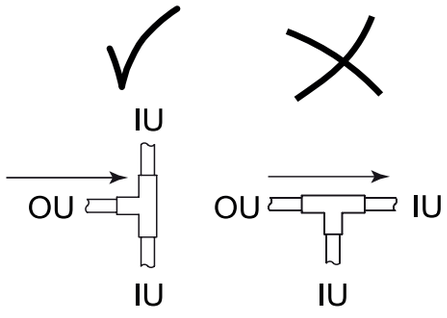
Indoor unit HP	Gas	Liquid	Indoor unit HP	Gas	Liquid
(0.8-1.5)	Ø12.7	Ø6.35[5]	8.0	Ø19.05	Ø9.52
2.0	Ø15.88	Ø6.35[5]	10.0	Ø22.2	Ø9.52
(2.5-6.0)	Ø15.88	Ø9.52			

Pipe working conditions

Part		Make	Permitted pipe length (13)	
			≤ Recommended number of connected indoor units	≥ Recommended number of connected indoor units
Total pipe length		Current total liquid pipe length	≤ 1000 m(14)	≤ 300 m
Maximum pipe length	Current length	L1	≤ 165 m	≤ 165 m
	Equivalent length		≤ 190 m	≤ 190 m
Maximum pipe length between the multikit of the first branch and each indoor unit		L2	≤ 90 m	≤ 40 m
Maximum pipe length between each multikit and each indoor unit		L3	≤ 40 m	≤ 30 m
Total pipe length between the CH unit and each indoor unit		*L4 *a+b+c+d+e	CH-6.0N2: ≤ 30 m	CH-6.0N2: ≤ 30 m
			CH-10.0N2: ≤ 10 m	CH-10.0N2: ≤ 10 m
Pipe length between connection kit 1 and each outdoor unit		L5	≤ 10 m	≤ 10 m
Difference in height between outdoor and indoor units	Highest outdoor unit	H1	≤ 50 m	≤ 50 m
	Lowest outdoor unit		≤ 40 m	≤ 40 m
Difference in height between indoor units		H2	≤ 15 m	≤ 15 m
Difference in height between indoor units using the same CH unit		H3	≤ 4 m	≤ 4 m
Difference in height between CH units		H4	≤ 15 m	≤ 15 m
Difference in height between outdoor units		H5	≤ 0.1 m	≤ 0.1 m

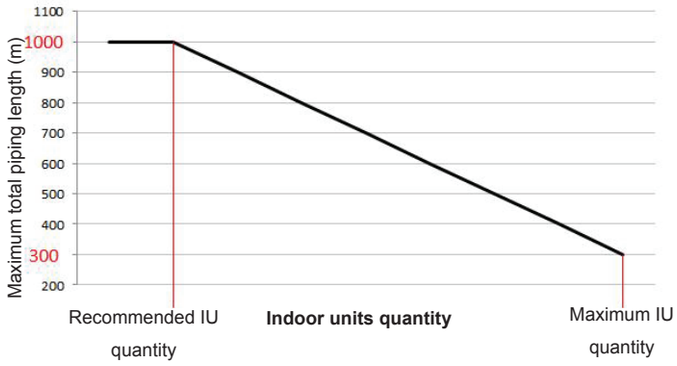
NOTE

- (1) *The connection kit is taken into account from the side of the indoor unit (as connection kit 1).*
- (2) *When the maximum equivalent refrigerant pipe length (L1) from the outdoor unit/connection kit 1 to the indoor unit is greater than 100 m, the diameter of the liquid pipe from the outdoor unit/connection kit 1 to the first branch must be increased using the reducer (field-supplied).*
- (3) *Where the refrigerant pipe length is greater than 100 m, the pipe diameter does not have to be increased after the first branch. Where the size of the multikit is greater than that of the first branch, adjust the size of the multikit to the first branch. Where the diameter of the pipe selected after the first branch is greater than the diameter of the pipe after it, use the same diameter as the inlet pipe.*
- (4) *The pipe diameter -6- must be the same as that of the indoor unit connection.*
- (5) *Where the liquid pipe length is greater than 15 m, use 9.53 mm diameter pipe and a reducer (field-supplied).*
- (6) *Keep a direct distance of 500 mm or greater after the connection kit.*
- (7) *In the case of branches, where the pipe length between the three-pipe branch -F- and the furthest indoor unit exceeds 5 m, use a T-branch pipe for the three-branch liquid pipe (corresponding to the same diameter, as per JIS B8607).*
- (8) *Where the number of connectable indoor units is greater than four, the high/low-pressure gas, gas and liquid pipes, -4-, -5- and -6-, must be increased by one measurement, respectively.*
- (9) *The liquid pipe does not have to be connected to the CH unit. See Table 6 for the pipe diameter between the multikit and the indoor unit.*
- (10) *Where the combination of indoor unit capacities is 10 HP for the CH-10.0N2 unit, performance will drop by approximately 5% in refrigeration and 10% in heating.*
- (11) *The excess total capacity may lead to insufficient performance and abnormal operating noise. Check that the installation is within the total capacity values.*
- (12) *For operations in refrigeration mode only, connect the indoor units using gas and liquid pipes (without the CH unit). The total capacity in refrigeration mode only must be less than 50% the total capacity of the indoor units.*



- (13) *The installation conditions for the refrigerant pipes are different depending on the number of indoor units connected.*

- *(14) The total pipe length permitted must be less than 1000 m due to the maximum additional refrigerant charge limitation. In case "Recommended IU quantity" is exceeded, next graph restriction applies to total piping length:*



Make sure to calculate a lineal proportion when working out intermediate cases. In case the total pipe length is longer than 300m, capacity may drop progressively as a result of heat loss through the pipes.

- *(15) Where the branch is after the CH unit and the capacity of the connected indoor unit is (0.8-1.5) HP, use a 15.88 mm diameter for the gas pipe.*

NOTE

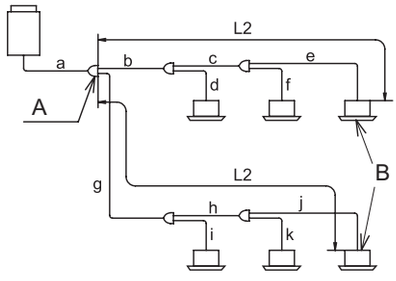
1. *Check that the gas pipe and the liquid pipe are equivalent in terms of length and installation system.*
2. *Use the multikit system for branching of the indoor units and the CH unit.*
3. *Install the indoor unit, the multikit and the CH unit according to the instructions given in this manual.*
4.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

◆ Pipe branching restrictions (Installation with Main Piping Branch)

In the case that the piping length L2 from the Multi-Kit at the first branch to the farthest indoor unit is over 40m, follow the instructions below when performing the field-supplied piping work.

Example

Piping length from the multikit at the first branch to the terminal Indoor Units is within 40-90 m.



A	Main branch
B	Terminal indoor unit

1. The difference between the piping length from the first branch to the farthest indoor unit and the piping length from the first branch to the closest indoor unit must be within 40m.
   - (g+h+j)-(b+d) < 40m

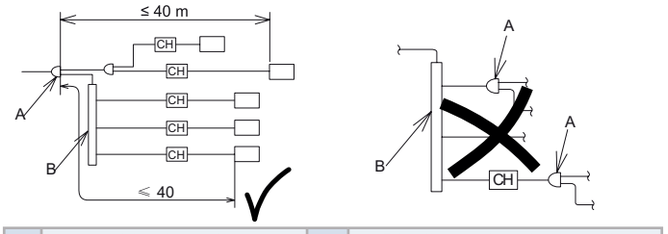
NOTE

- *Do not size up the piping for heat recovery system. Otherwise, it may cause failure.*
- *For Heat Recovery System, there is no restriction if installed without a main piping branch.*
- *Main Piping Branch: Both of the pipes branched from Multi-kit are connected to a further Multi-kit.*

◆ Heat recovery syetm (with header branches)

Unlimited number of Main Piping Branches as long as the following restrictions are respected.

Header branch can be used with line branch at the 3 pipes portion and 2 pipes portion. Header branch can also be used after the second branch. Do not connect a line branch to a header branch. When using header branch, make sure that the piping length L2 from the Multi-Kit at the first branch to the farthest indoor unit is within 40m.



A	Line branch	B	Distributor (header branch)

3.1.8 Refrigerant charge

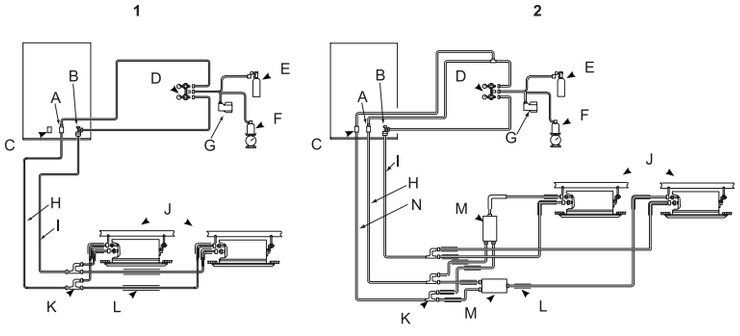
◆ Installation airtight test

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

- Heat pump system: *"Details of the gas and liquid stop valves"*.
- Heat recovery system: *"Details of the gas and liquid stop valves"*.

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

Check the suspension of the refrigerant pipes as described in chapter *"Refrigerant pipe suspension"*.



1	Heat pump system	G	Vacuum pump
2	Heat recovery system	H	Refrigerant gas pipe, high pressure
A	Stop valve, high pressure (gas)	I	Refrigerant liquid pipe
B	Stop valve (liquid)	J	Indoor units
C	Stop valve, low pressure (gas)	K	Multikit
D	Measurement indicators	L	Insulation
E	Nitrogen gas bottle	M	CH unit
F	Refrigerant bottle and balance	N	Refrigerant gas pipe, low pressure

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

NOTE

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

DANGER

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

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

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

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

◆ Installation vacuum

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

NOTE

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

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

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

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

NOTE

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

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

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

- Heat pump system: *"Details of the gas and liquid stop valves"*.
- Heat recovery system: *"Details of the gas and liquid stop valves"*.

◆ Quantity of refrigerant charged in the W0 outdoor unit

Outdoor unit	Quantity of refrigerant charged in the W0 outdoor unit (kg)	Outdoor unit	Quantity of refrigerant charged in the W0 outdoor unit (kg)
RAS-8FSXN1E	5.4	RAS-14FSX1E	8.5
RAS-10FSXN1E	6.4	RAS-16FSX1E	9.3
RAS-12FSXN1E	7.3		

Outdoor unit	Quantity of refrigerant charged in the W0 outdoor unit (kg)	Outdoor unit	Quantity of refrigerant charged in the W0 outdoor unit (kg)
RAS-5FSXNH(E)	5.6	RAS-10FSXNH(E)	7.7
RAS-6FSXNH(E)	5.6	RAS-12FSXNH(E)	8.3
RAS-8FSXNH(E)	7.7		

NOTE

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

◆ Maximum additional refrigerant charge

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

Outdoor unit HP	5-10	12	14/16	18-24	26-54
Maximum additional refrigerant charge (kg)	28.0	36.0	40.0	51.0	63.0

◆ Method of calculation of the total additional refrigerant charge

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

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

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

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

Nominal diameter		Total length (m)	Quantity of refrigerant per metre of pipe	Additional refrigerant charge (kg)
mm	Inches			
ø22.2	7/8	___ m	x 0.36	
ø19.05	3/4	___ m	x 0.26	
ø15.88	5/8	___ m	x 0.17	
ø12.7	1/2	___ m	x 0.11	
ø9.52	3/8	___ m	x 0.056	
ø6.35	1/4	___ m	x 0.024	
Total additional refrigerant charge =				_____ kg

W2: additional refrigerant charge per indoor unit

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

System		Heat pump			Heat recovery
Model		RCI-2.0FSN3	RCI-2.5FSN3	RCI-(3.0-6.0)FSN3	RCI-(2.0-6.0)FSN3
Connectable number	1	0.0	0.0	0.5	0.0
	2	0.5	0.5	1.0	0.0
	3	0.5	1.0	1.5	0.0
	4 or more	1.0	1.5	2.0	0.0

NOTE

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

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

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

Ratio of indoor units	Additional refrigerant charge (kg)
≤ 100%	0 kg
>100%	0.5 kg

W: total additional refrigerant charge

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

NOTE

Check that the total additional refrigerant charge is not greater than the values given in: "Maximum additional refrigerant charge".

◆ Refrigerant charge

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

- Heat pump system: *"Details of the gas and liquid stop valves"*.
- Heat recovery system: *"Details of the gas and liquid stop valves"*.

Charge the total additional refrigerant as calculated in chapter: *"Method of calculation of the total additional refrigerant charge"*.

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

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

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

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

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

CAUTION

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

Fill in the F-Gas Label.

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

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

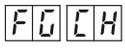
Connect the power supply to the indoor and outdoor units in the same refrigeration cycle for the function to automatically estimate the amount of refrigerant charged in the unit.

NOTE

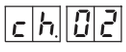
- *This function is applicable when the outdoor temperature range is between 0 and 43 °C DB (DB: dry bulb) and the indoor temperature is between 10 and 32 °C DB (DB: dry bulb).*
- *For RAS-(14-36)FSXNH(E) units, the indications, verifications and consultations of the seven-segment display should be done on the main unit.*
- *The electricity supply to the outdoor unit must remain connected twelve hours prior to the test to heat up the compressor oil.*

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

The seven-segment display on the unit will indicate:

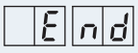
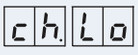
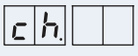


Check the seven-segment display and press PSW1. The outdoor unit fan and the compressor will start up. The display will indicate:



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

Check the result obtained with the following table:

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

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

NOTE

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

CAUTION

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

3.1.9 Precautions in the event of refrigerant leaks

DANGER

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

◆ **Maximum permitted concentration of hydrofluorcarbon (HFC)**

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

DANGER

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

The maximum permitted concentration of HFC R410A gas in the air is 0.44 kg/m^3, in accordance with standard EN378-1.

Therefore, efficient measures should be adopted to ensure the concentration of R410A gas in the air is kept below 0.44 kg/m^3 in the event of a leak.

◆ Calculation of the refrigerant concentration

1 Calculate the total quantity of refrigerant *R* (kg) charged in the system; to do so, connect all the indoor units of the rooms in which you wish to have air conditioning.
2 Calculate the volume *V* (m^3) of each room.
3 Calculate the refrigerant concentration *C* (kg/m^3) of the room in accordance with the following formula:

$$R / V = C$$

R: Total quantity of refrigerant charged (kg).

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

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

◆ Countermeasures in the event of refrigerant leaks

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

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

DANGER

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

3.1.10 Drainage pipes

◆ Condensation drainage system

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

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

DANGER

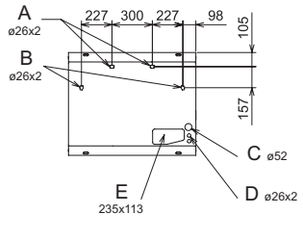
- ***Drainage must not take place in areas frequented by pedestrians. In low temperatures, the drainage water could freeze and lead to falls. If it is necessary to install the outdoor unit in an area frequented by pedestrians, an additional drainage tray should be fitted.***
- ***Do not fit drainage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

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

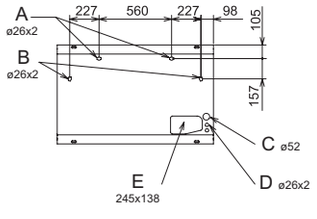
NOTE

All measurements are in mm.

SET FREE RAS-(8-12)FSXN1E and RAS-(5/6) FSXNH(E)



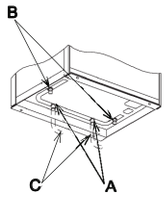
SET FREE RAS-(14-16)FSXN1E and RAS-(8-12) FSXNH(E)

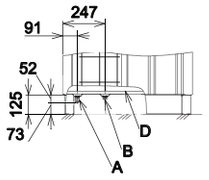


A	Drainage hole. Drain boss position (option). For the optional drainage kit DBS-TP10A
B	Drainage hole. Drain cap position (option) For optional drainage plug
C	Opening for power wiring feed through ø52
D	Opening for communication wiring feed through ø26
E	Opening for feed through of refrigerant pipes 235 x 113

◆ Installation position of the optional drainage kit DBS-TP10A

Installation position (example: RAS-6FSXNH(E), lower and side views).





A	Drain pipe	C	Drain pipes (field-supplied)
B	Optional drain plug	D	Base of unit

Drain kit components

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

3.2 CH unit

3.2.1 Considerations

DANGER

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

3.2.2 Piping materials

1 Prepare locally-supplied copper pipes.
2 Select clean copper pipes. Make sure there is no dust and moisture inside. Before connecting pipes, blow the inside of the pipes with nitrogen or dry air, to remove any dust or foreign materials.
3 Select the piping size with the correct thickness and correct material which can have sufficient pressure strength.

CAUTION

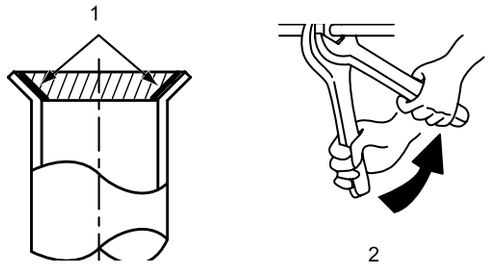
- *Cover the end of the pipe if the pipe has to be inserted through a hole.*
- *Do not put pipes on the ground directly without a cap or vinyl tape at the end of the pipe.*
- *Remove all the flammable materials around the units. If not, it will cause a fire.*

3.2.3 Cautions for piping connection work

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

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

1 Apply refrigerant oil.
2 Two spanners work.



NOTE

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

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

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

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

Required tightening torque

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

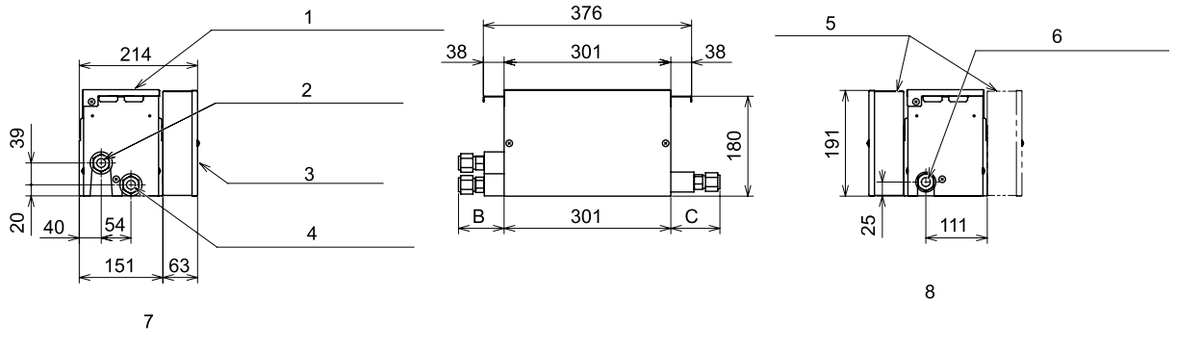
CAUTION

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

3.2.4 Refrigerant piping work

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

◆ **Position of piping connection**



7 8

Unit: mm.

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

Model	Dimension		
	A	B	C
CH-6.0N2	ø15.88	82	89
CH-10.0N2	ø19.05	89	96

◆ **Selecting piping size**

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

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

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

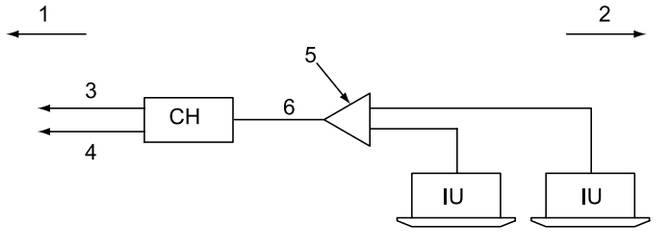
Table 1 Connected indoor unit capacity and piping size.

Model	Connected indoor Unit capacity (HP)	Low pressure gas pipe (mm)	High pressure gas pipe (mm)	Gas pipe (mm)
CH-6.0N2	0.8 ~ 1.5	ø15.88	ø12.7	ø12.7 *
	1.6 ~ 4.0	ø15.88	ø12.7	ø15.88
	4.1 ~ 6.0	ø19.05	ø15.88	ø15.88
CH-10.0N2	6.1 ~ 8.0	ø19.05	ø15.88	ø19.05
	8.1 ~ 10.0	ø22.2	ø19.05	ø22.2

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

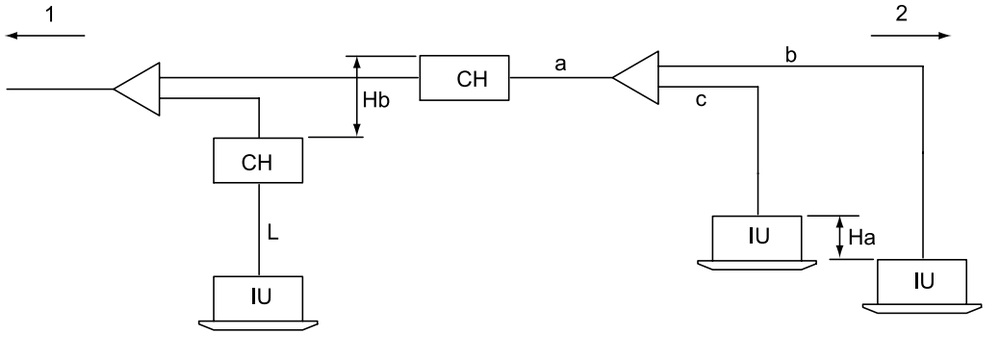
Table 2 Piping conection size for CH unit.

Model	Low pressure gas pipe (mm)	High pressure gas pipe (mm)	Gas pipe (mm)
CH-6.0N2	ø15.88	ø15.88	ø15.88
CH-10.0N2	ø19.05	ø19.05	ø19.05



1	Upstream	5	Multi-kit
2	Downstream	6	Gas pipe
3	Low pressure gas pipe	IU	Indoor unit
4	High pressure gas pipe	CH	CH Unit

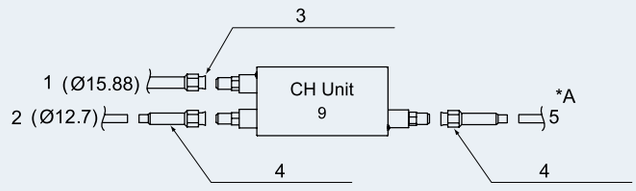
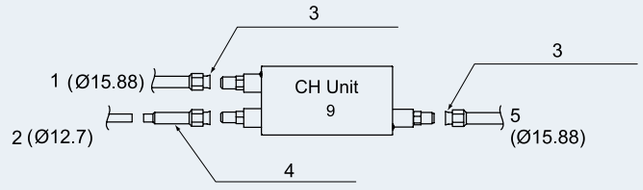
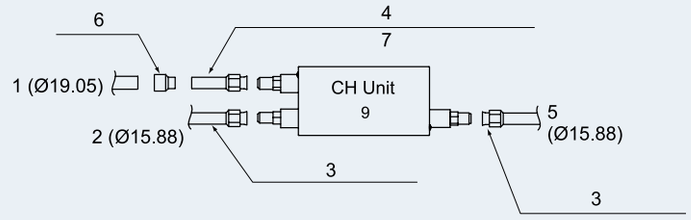
Condition of piping work.



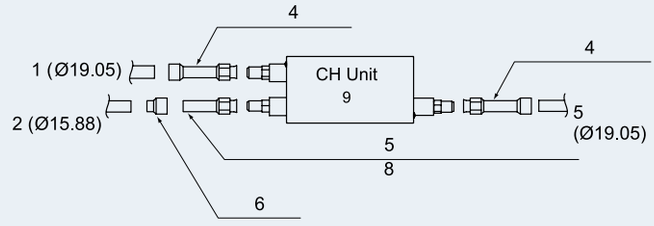
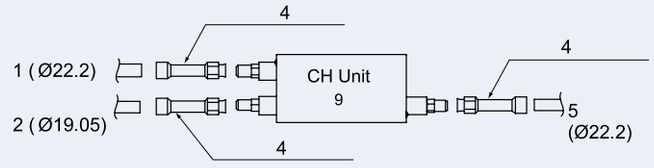
1	Upstream	IU	Indoor unit
2	Downstream	CH	CH Unit

Item		Allowable piping length	
Total piping length between CH unit and indoor unit	L; a+b+c	CH-6.0N2	within 30 m
		CH-10.0N2	within 10 m
Height difference between indoor units connected to the same CH unit	Ha	within 4 m	
Height difference between CH units	Hb	within 15 m	

◆ Piping connection

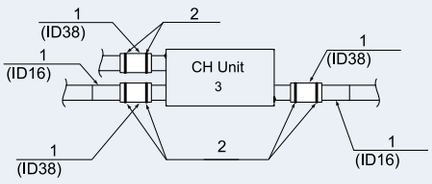
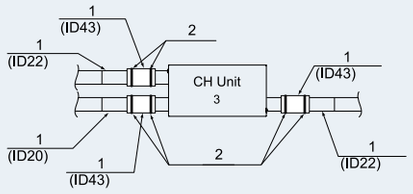
Connected indoor unit capacity (HP)	CH-6.0N2
0.8 to 1.5	
1.6 to 4.0	
4.1 to 6.0	

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

Connected indoor unit capacity (HP)	CH-10.0N2
6.1 to 8.0	
8.0 to 10.0	

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

◆ Piping insulation

CH-6.0N2	
CH-10.0N2	

1	Insulation	3	(Upper surface)
2	Clamp.	ID	Inner diameter

3

NOTE

- *In case that the humidity inside the ceiling is high, apply additional insulation to the flare nut connection.*
- *Refer to the chapter "Initial check".*

4. Electrical wiring

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4.1 Outdoor unit

4.1.1 General information

CAUTION

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

DANGER

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

4.1.2 General verifications

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

a. The electricity supply to the unit should be via an exclusive power control switch and protective circuit breaker, certified and installed in accordance with local or national safety regulations.

b. The electricity supply for the outdoor and indoor units should be separate. Connect the voltage supply wiring for each group of indoor units to the same outdoor unit (maximum capacity for each group of indoor units: 26 HP).

c. For heat recovery systems, the CH unit and the indoor unit of the same refrigerant cycle can be supplied from the same mains power switch.

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

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

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

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

NOTE

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

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

5 Check that the earth cable is correctly connected.

DANGER

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

4.1.3 Connection of the power supply circuits

◆ Cable sizes

Outdoor units:

Model	Power supply	Maximum running current (A)	④ Power source cable size EN60 335-1 (1) *1 (mm²)	⑥⑦ Transmitting cable size EN60 335-1 (1) *1 (mm²)	⑤ Earth wire size (mm²)
RAS-8FSXN1E	3N~ 400V/50Hz	15.0	4.0	0.75	4.0
RAS-10FSXN1E		20.0	6.0	0.75	6.0
RAS-12FSXN1E		26.5	6.0	0.75	6.0
RAS-14FSXN1E		29.2	10.0	0.75	10.0
RAS-16FSXN1E		33.0	10.0	0.75	10.0
RAS-5FSXNH(E)	3N~ 400V/50Hz	13.0	4.0	0.75	4.0
RAS-6FSXNH(E)		13.0	4.0	0.75	4.0
RAS-8FSXNH(E)		15.0	4.0	0.75	4.0
RAS-10FSXNH(E)		18.7	6.0	0.75	6.0
RAS-12FSXNH(E)		20.0	6.0	0.75	6.0

* Refer to the NOTES for selection of the power source cable size.

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

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

NOTE

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

◆ Main breaker switch

Model	Power supply	Maximum running current (A)	Power supply line (□ mm)	① ELB Nominal current (A)	① ELB Nominal sensitive current (mA)	③ Main switch Nominal current (A)	② CB (A)
RAS-8FSXN1E	3N~ 400V/50Hz	15.0	MLFC 2.0SQ	40	30	20	20
RAS-10FSXN1E		20.0	MLFC 3.5SQ	40	30	30	30
RAS-12FSXN1E		26.5	MLFC 5.5SQ	40	30	40	40
RAS-14FSXN1E		29.2	MLFC 5.5SQ	63	30	40	40
RAS-16FSXN1E		33.0	MLFC 8.0SQ	63	30	50	50
RAS-5FSXNH(E)	3N~ 400V/50Hz	13.0	MLFC 2.0SQ	40	30	20	20
RAS-6FSXNH(E)		13.0	MLFC 2.0SQ	40	30	20	20
RAS-8FSXNH(E)		15.0	MLFC 2.0SQ	40	30	20	20
RAS-10FSXNH(E)		18.7	MLFC 3.5SQ	40	30	30	30
RAS-12FSXNH(E)		20.0	MLFC 3.5SQ	40	30	30	30

ELB: Earthleakage Breaker (field-supplied), CB: circuit breaker (field-supplied), MLFC: Flame Retardant Polyflex Wire
Install main switch and ELB for each system separately. Select the high response type of ELB that acts within 0.1 second.

◆ Voltage supply

Service voltage

Between 90 and 110% of the rated voltage.

Start-up voltage

Between 85 and 115% of the rated voltage.

Voltage imbalance

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

Electromagnetic compatibility

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

Model	Z_{max} (Ω)
RAS-(8-10)FSXN1E	–
RAS-12FSXN1E	0.26
RAS-(14/16)FSXN1E	0.12
RAS-(5-12)FSXNH(E)	–

Harmonics

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

<table>
<tr><th>Situation of the models in relation to IEC 61000- 3-2 and IEC 61000-3-12 Ssc "xx"</th><th colspan="2">Model</th></tr>
<tr><td rowspan="3">Unit compliant with IEC 61000-3-2 (professional use).</td><td colspan="2">RAS-8FSXN1E</td></tr>
<tr><td colspan="2">RAS-10FSXN1E</td></tr>
<tr><td colspan="2">RAS-(5-10)FSXNH(E)</td></tr>
<tr><td>Unit compliant with IEC 61000-3-12.</td><td colspan="2">–</td></tr>
<tr><td rowspan="3">This unit is in accordance with Standard IEC 61000-3-12 with the condition that the short circuit current Ssc is greater than or equal to xx (see Ssc column) at the connection point between the power supply of the user and the public grid. It is the responsibility of the installer or the user of the unit to ensure, if necessary consulting the distribution grid operator, that the unit is connected only to a power supply where the short circuit power is greater than or equal to xx (see Ssc column).</td><td>Model</td><td>Ssc “xx” (kVA)</td></tr>
<tr><td>RAS-14FSXN1E</td><td>5089</td></tr>
<tr><td>RAS-16FSXN1E</td><td>2493</td></tr>
<tr><td rowspan="2">The authorities responsible for the electrical power supply can apply restrictions relating to harmonics.</td><td colspan="2">RAS-12FSXN1E</td></tr>
<tr><td colspan="2">RAS-12FSXNH(E)</td></tr>
</table>

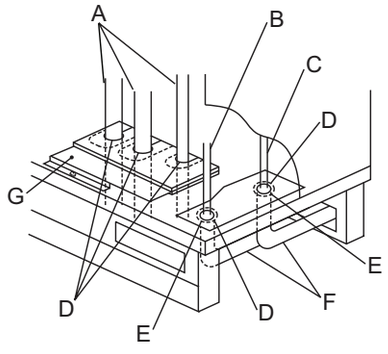
◆ Connection of outdoor units

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

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

NOTE

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



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

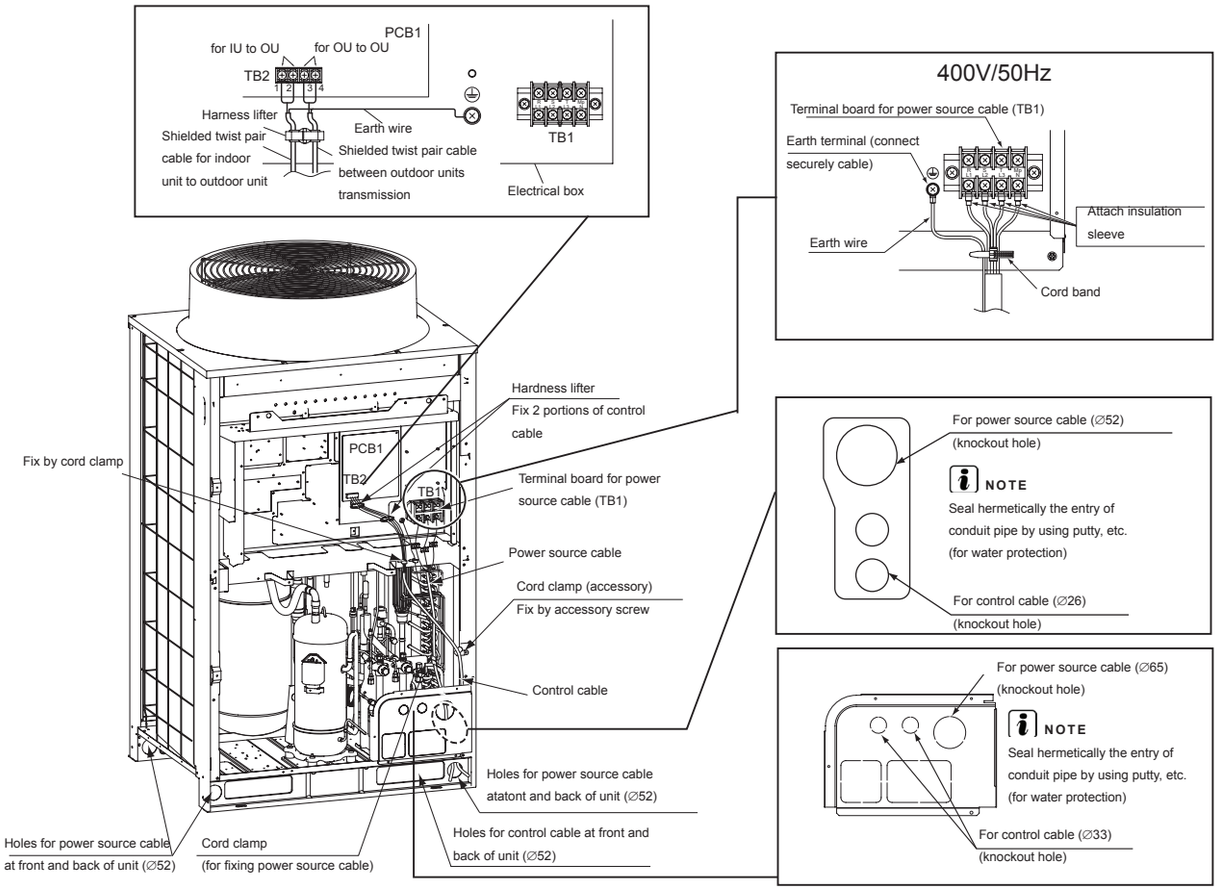
Do not allow the cables to touch the refrigerant pipes, sharp metal edges or electric parts from inside the unit.

NOTE

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

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

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



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

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

- From the indoor units to the outdoor unit: terminals 1 and 2.

From the outdoor unit to the next outdoor unit in the same refrigerant cycle: terminals 3 and 4.

NOTE

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

Tighten the connection terminals as shown in the following table:

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

◆ Connection of indoor units

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

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

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

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

NOTE

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

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

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

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

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

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

CAUTION

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

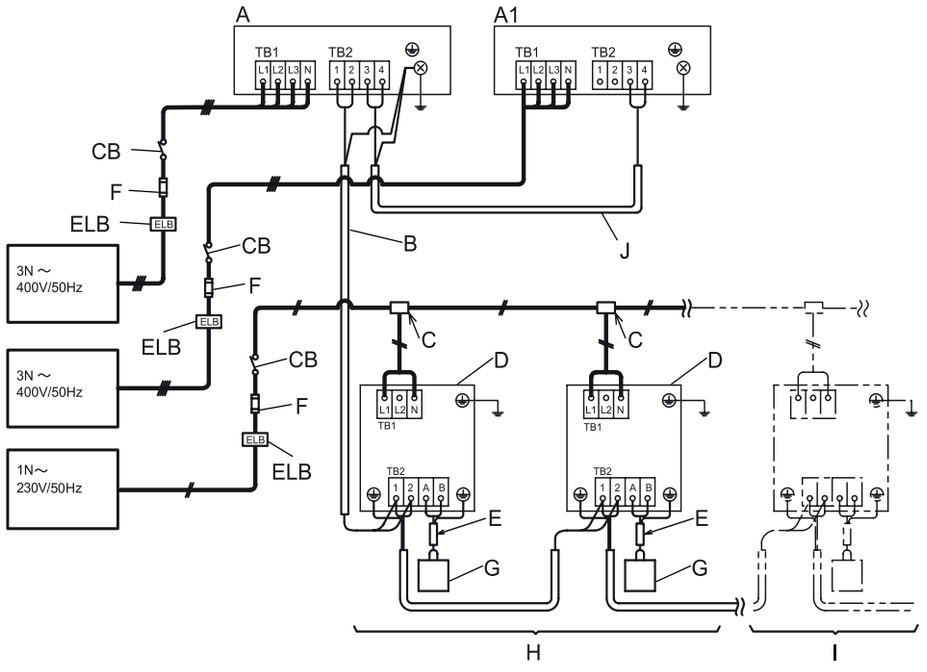
For heat recovery systems, connect the communication cable on the indoor unit (used exclusively for refrigeration) to TB2 terminals 1 and 2 on the CH unit.

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

NOTE

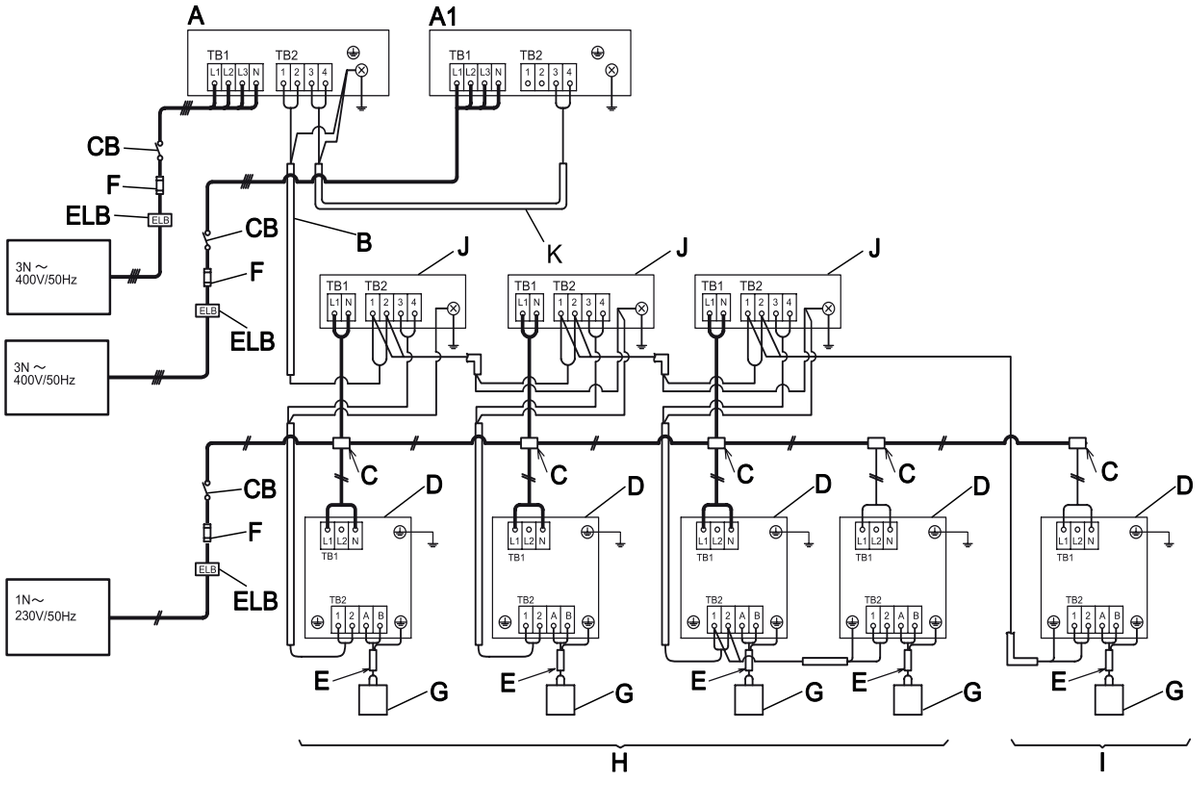
- *Set the DSW switches on the main and secondary units for the combination of (14-36) HP outdoor units.*
- *An alarm is triggered if the communication cables between the outdoor units are connected to terminals 1 and 2 for H-LINK II.*
- *Where an alarm is indicated on the display of the main outdoor unit, follow the instructions given to make the necessary checks.*
- *Make the function settings from the main outdoor unit.*
- *Maximum number of refrigeration groups with one remote control: 64.*
- *Maximum number of indoor units connected: 160.*

Connection diagram: heat pump system



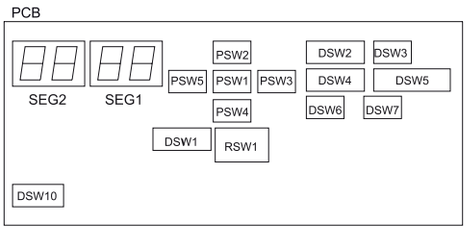
A	Main outdoor unit
A1	Secondary outdoor unit
B	Operation wiring (shielded twisted pair cable or shielded pair cable) 5 Vdc non-polar H-LINK (field-supplied)
C	Distribution box (field-supplied)
D	Indoor units
E	Remote control wire (shielded twisted pair cable or shielded pair cable) (field-supplied)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

Connection diagram: heat recovery system



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

4.1.4 Setting of the DSW switches on PCB1



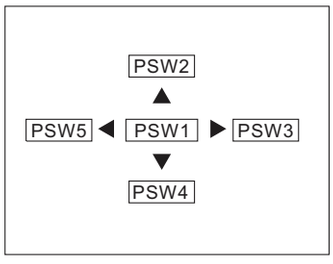
Location of the DSW switches on PCB1.

CAUTION

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

NOTE

- *Tirn OFF all power source before the setting.*
- *Only the DIP DSW4, pin 1, 2 and 3, and push switches can be set while the voltage supply is connected.*
- *The symbol "■" indicates the position of the DIP switches. The figures show the position of the DIP switch once the position setting has been completed.*
- *With the DSW4 switch, the unit starts or stops after 10 to 20 seconds of the switch being activated.*
- *Record the number of the outdoor unit to tell it apart from others during service and maintenance operations in this area:* ☐



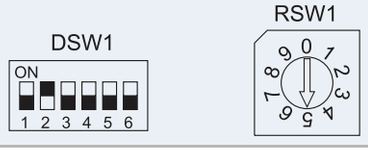
PSW: Pushswitch on PCB1

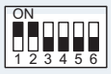
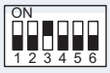
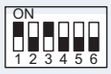
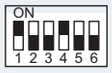
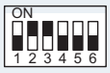
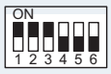
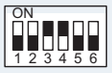
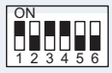
PSW1: Enter.

PSW2, 3, 4 and 5: for checking.

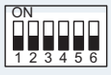
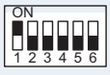
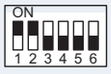
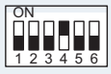
PSW5: for manual defrost.

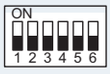
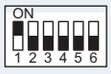
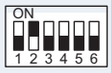
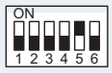
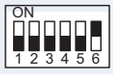
DSW1, RSW1: refrigerant cycle number setting	
• Setting required. • Setting before RSW1 supply: 0. • Setting before DSW1 supply: 0 (digit of tens). • Set each main outdoor unit number on each refrigerant cycle (Sub-units setting are not required). • Outdoor and indoor units belonging to the same refrigerant cycle: set the same cycle number in the outdoor and indoor units (indoor units: DSW5 and RSW2).	

DSW1, RSW1: setting example for refrigerant cycle number 25	
• Maximum refrigerant cycle number setting: 63 (from 00 to 63).	

DSW2: capacity setting					
Setting not required.					
RAS-FSXN1E			RAS-FSXNH(E)		
8HP	10HP	12HP	5HP	6HP	8HP
					
14HP	16HP		10HP	12HP	
					

DSW3	
Setting not required.	

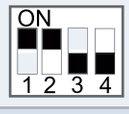
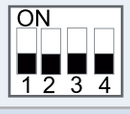
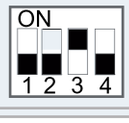
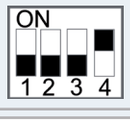
DSW4: test run and service settings			
Setting required			
Setting before shipment	Cooling test run	Heating test run	Forced compressor stoppage
			

DSW5: emergency operation /test run and service setting					
Setting not required.					
Setting before shipment	Inverter compressor disabled	Constant speed compressor disabled	Monitoring of refrigerant quantity	High static pressure mode (*)	Longer pipe up to 90 m (**)
					

NOTE

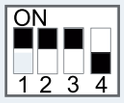
High static pressure mode setting:

- *(*) In the case of combination of the outdoor units (RAS-18FSXN1E to RAS-54FSXN1E and RAS-14FSXNH(E) to RAS-36FSXNH(E)), set this function for all the outdoor units (the sound value may increase by 3dB from nominal value).*
- *(**)Available only for base units RAS-(5-12)FSNXH(E) and RAS-(8-16)FSXN1E (when height difference >70m ≤ 90m)*

DSW6: setting outdoor unit number		
Setting required		
Base unit before shipment	Combination of base unit (*)	
	Unit A (No. 0)	Unit B (No. 1)
		
	Unit C (No. 2)	Unit D (No. 3)
		

NOTE

- *The combination of outdoor units must be set.*
- *(*) For FSXN1E: Unit A - B - C - D. For FSXNH(E): Unit A - B - C.*

DSW7: supply voltage setting	
Setting not required.	

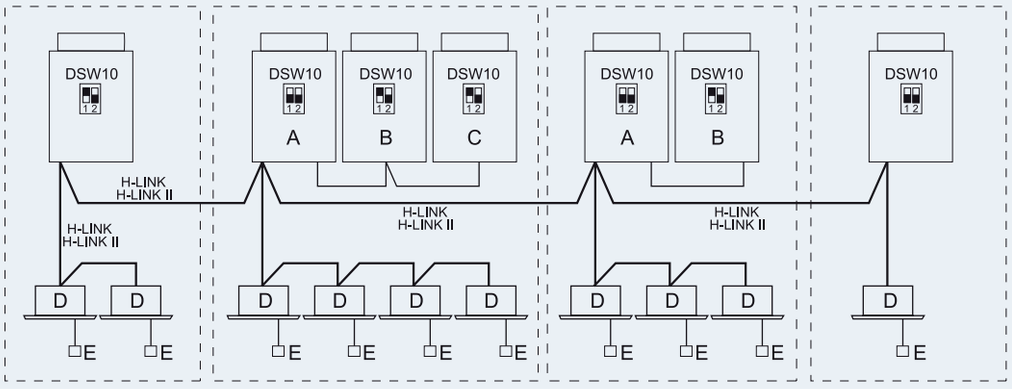
DSW10: communication setting	
Setting required.	
Setting before supply	**Cancellation of final resistance**
	

NOTE

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



DSW10: switch setting example

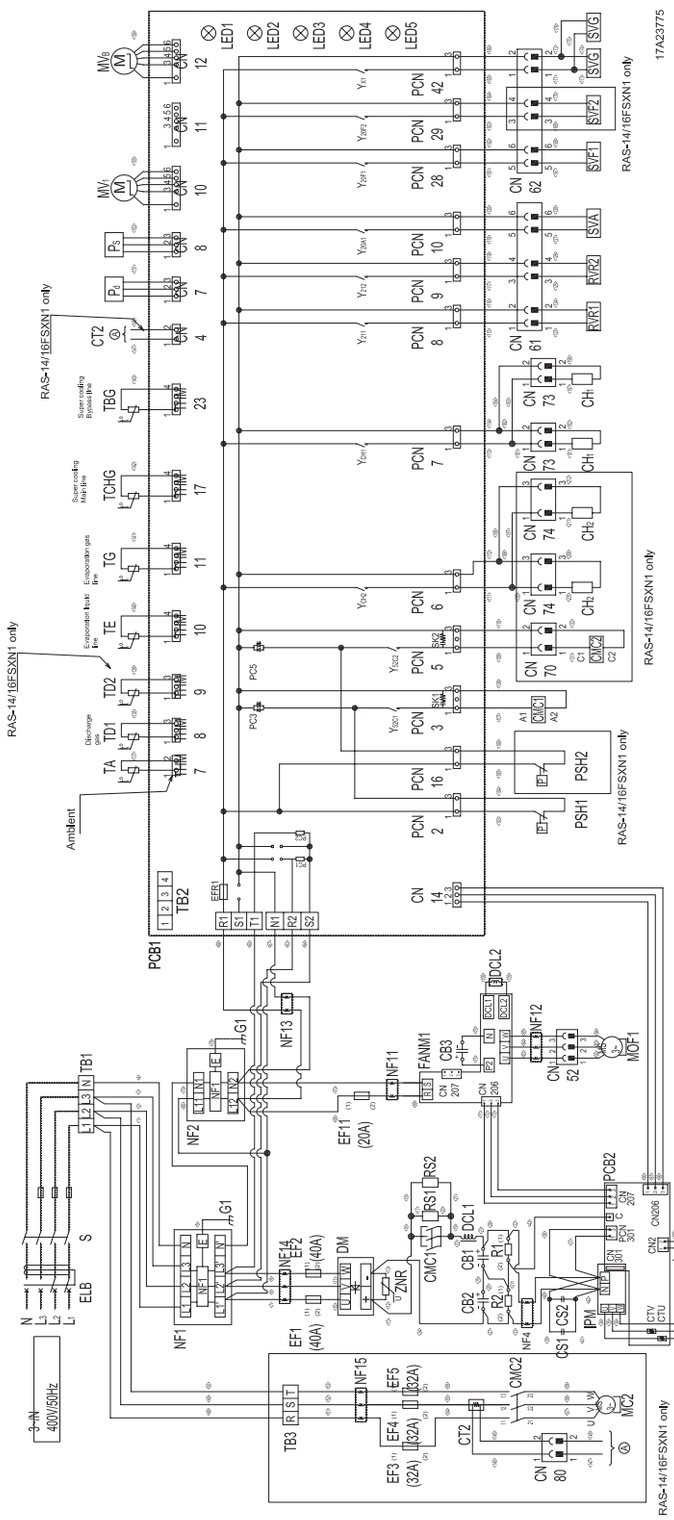


A	Main unit	**D**	Indoor units
B	Secondary unit	**E**	Remote control
C	Secondary unit		

NOTE

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

4.1.5 Electrical wiring diagram RAS-(8-16)FSXN1E



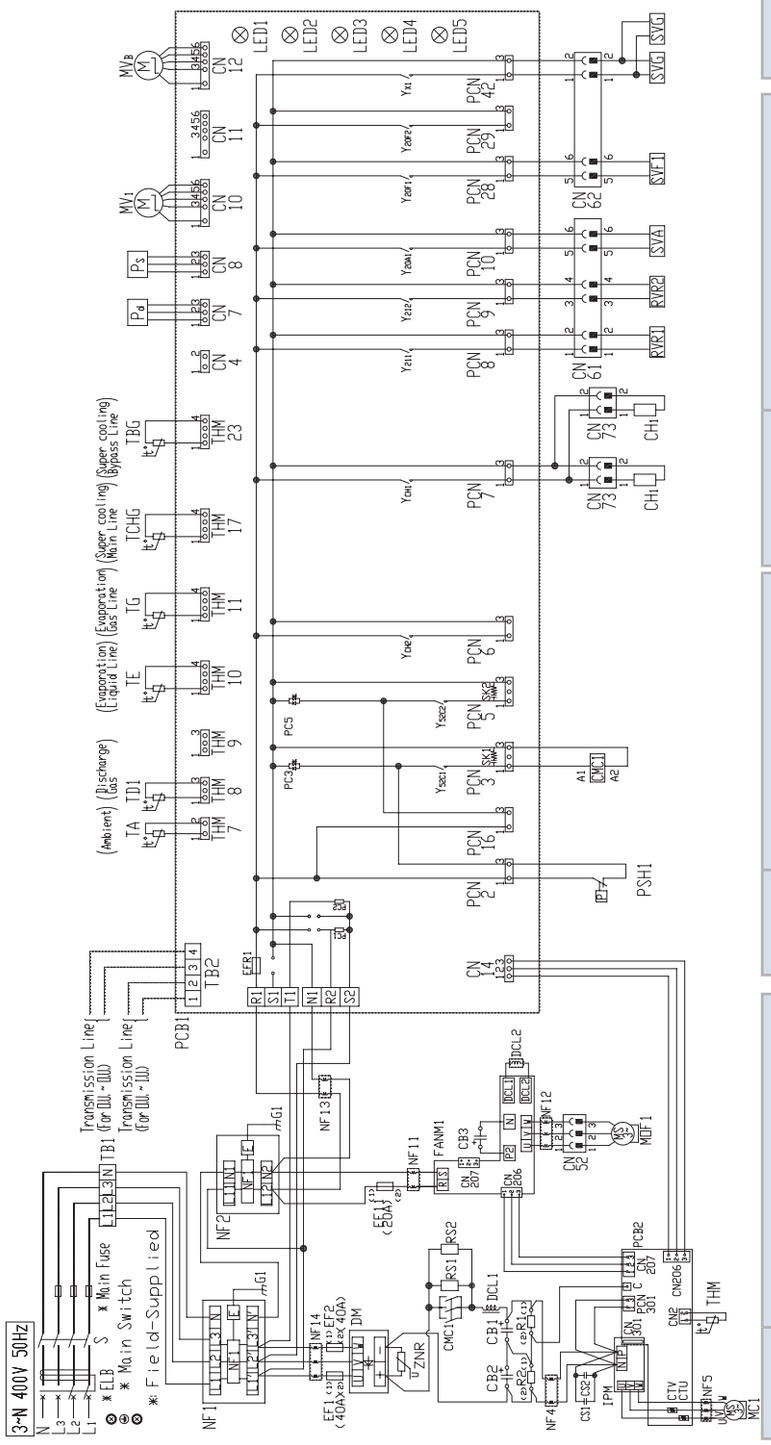
Mark	Name
MC1	Motor for compressor (Inverter)
MFC1	Motor for outdoor fan
CMC1	Contactor for compressor
Y	Auxiliary relay on PCB1
CH_1	Crankcase heater
RVR1,2	Reversing valve relay
SVA,G,F1	Solenoid valve
$MV_{1,B}$	Micro-computer control expansion valve
Pd,s	Sensor for refrigerant pressure
THM7~23	Thermistor

Mark	Name
THM	Thermistor fin temperature
PSH1	Pressure switch for protection
PCB1,2	Printed circuit board
DM	Diode module
IPM	Transistor module
FANM1	Fan module
CTU,V	Current transformer
EF1~7	Fuse
EFR1	Fuse on PCB1
DCL1,2	Reactor
CB1~3	Capacitor

Mark	Name
NF1,2	Noise filter
NF4,5,11~14	Noise filter (ring core)
CS1,2	Capacitor
ZNR	Surge absorber
R1,2	Resistor
RS1,2	Resistor for starting
TB1	Terminal board for power supply
TB2	Terminal board for transmission
TB4	Terminal board for AS 4755
CN	Connector
PCN	Connector

Mark	Name
DSW1~10	Dip Switch on PCB1
PSW1~5	Push switch on PCB1
LED1~5	Light emitting diode on PCB1
SEG1,2	7-segment on PCB1
EFR1	Fuse on PCB1
DCL1,2	Reactor
CB1~3	Capacitor

4.1.6 Electrical wiring diagram RAS-(5-12)FSXNH(E)



Mark	Name
MC1	Motor for compressor (Inverter)
MFC1	Motor for outdoor fan
CMC1	Contactor for compressor
Y	Auxiliary relay on PCB1
CH_1	Crankcase heater
RVR1,2	Reversing valve relay
SVA,G,F1	Solenoid valve
$MV_{1,B}$	Micro-computer control expansion valve
Pd,s	Sensor for refrigerant pressure
THM7~23	Thermistor

Mark	Name
THM	Thermistor fin temperature
PSH1	Pressure switch for protection
PCB1,2	Printed circuit board
DM	Diode module
IPM	Transistor module
FANM1	Fan module
CTU,V	Current transformer
EF1~7	Fuse
EFR1	Fuse on PCB1
DCL1,2	Reactor
CB1~3	Capacitor

Mark	Name
NF1,2	Noise filter
NF4,5,11~14	Noise filter (ring core)
CS1,2	Capacitor
ZNR	Surge absorber
R1,2	Resistor
RS1,2	Resistor for starting
TB1	Terminal board for power supply
TB2	Terminal board for transmission
TB4	Terminal board for AS 4755
CN	Connector
PCN	Connector

Mark	Name
DSW1~10	Dip Switch on PCB1
PSW1~5	Push switch on PCB1
LED1~5	Light emitting diode on PCB1
SEG1,2	7-segment on PCB1
EFR1	Fuse on PCB1
DCL1,2	Reactor
CB1~3	Capacitor

4.2 CH unit

4.2.1 General information

DANGER

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

CAUTION

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

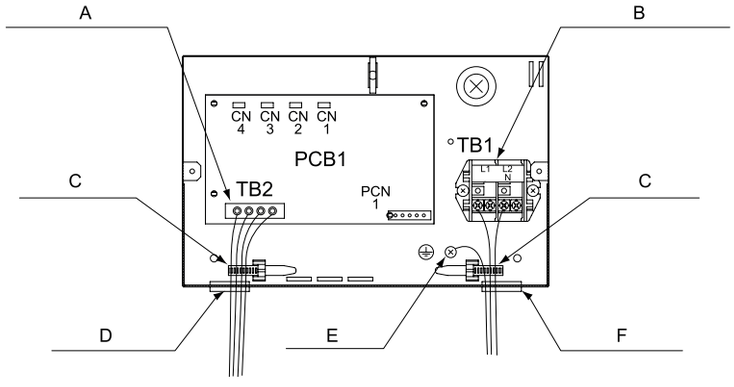
4.2.2 General verifications

1 Make sure that the field-selected electrical components (main power switches, circuit breakers, wires, conduit connectors and wire terminals) have been properly selected according to the electrical data indicated in Technical Catalogue. Make sure that the components comply with National Electrical code (NEC).
2 Check to ensure that the power supply voltage is within ±10% of rated voltage.
3 Check the power source capacity is too low, the system cannot be started due to the voltage drop.
4 Check to ensure that the ground wire is connected.

4.2.3 Electrical wiring connection CH units

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

1 Turn OFF the main power switch and take off the electrical box cover of CH unit.
2 Connect the power supply and earth wires to the terminals in the electrical box.
3 Connect the wires of the operating line to the terminals in the electrical box.
4 Tightly clamp the wires using the cord clamp inside the electrical box.
5 Fix the electrical box cover after wiring work.



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

◆ Field minimun wire sizes

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

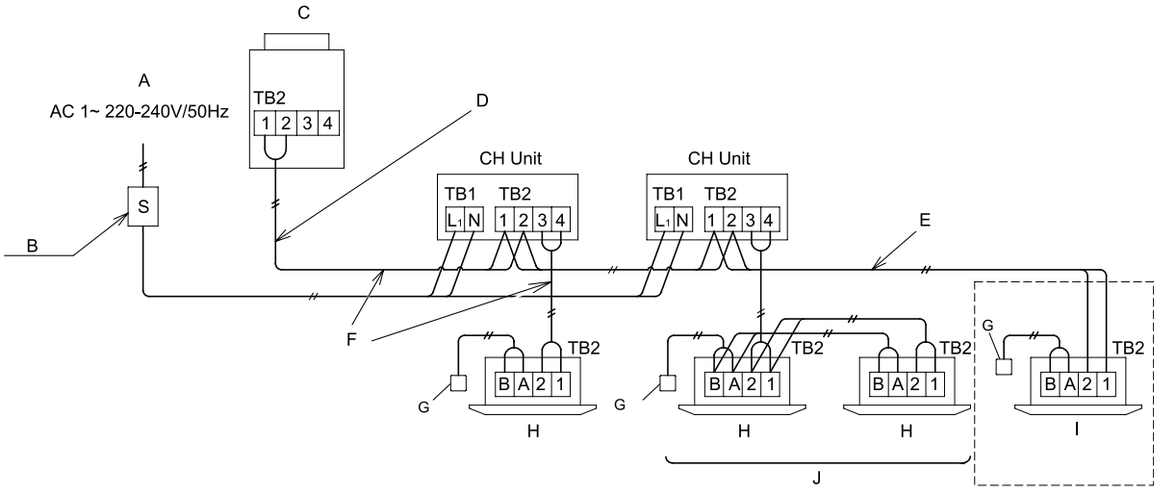
Model	Supply voltage	Maximum current (A)	Power source cable size	Transmitting cable size	Earth wire size (mm²)
			EN60 335-1 (mm²)(1)	EN60 335-1 (mm²)(1)	
CH-6.0N2	1~ 230V 50Hz	1	0.75	0.75	2.5
CH-10.0N2					

NOTE

- *Follow local codes and regulations when selecting field wires.*
- *The wire sizes marked with [1] in the above table are selected at the maximum current of the unit according to the European Standard, EN60 335-1. Use the wires which are not lighter than the ordinary tough rubber sheathed flexible cord (code designation H05RN-F) or ordinary polychloroprene sheathed flexible cord (code designation H05RN-F).*
- *Use a shielded cable for the transmitting circuit and connect it to ground.*

◆ Example of electrical wiring

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



A	Outdoor unit power supply	F	Operating line (non-pole, DC5 V)
B	Earth leakage breaker (ELB) and main switch (S)	G	Remote control switch
C	Outdoor unit	H	Indoor unit
D	Connect the operating line for the outdoor unit to the terminal “1” and “2” of TB2 on the CH unit	I	Indoor Unit (exclusive use of cooling operation)
E	Connect the operating line for the indoor unit (exclusive use of cooling operation) to the terminal “1” and “2” of TB2 on the CH unit	J	In case that the multiple indoor units are connected to the same CH unit, the operation mode (cooling/heating) for the indoor units will be the same

NOTE

- *Do not apply excessive voltage to the operating line (DC5V (non-pole)) between outdoor unit and CH unit, between CH unit and indoor unit, between CH units.*
- *Use 2-Core cable for the operating line. (Do not use 3-Core cable or over.)*
- *Connect the operating line for the outdoor unit to the terminal “1” and “2” of TB2 on the CH unit.*

- *Connect the operating line for the indoor unit exclusively for cooling operation to the terminal "1" and "2" of TB2 on the CH unit.*
- *For the CH unit in the same refrigerant cycle, electrical power source can be supplied by one switch.*
- *Do not connect the power supply line (220V~240V) to the terminal board for operating line.*
- *Connect the earth wire for the outdoor/indoor units and CH unit. The ground wiring work under the condition of 100 W (max.) ground resistance should be performed by the qualified electrician.*

◆ Setting of DIP switches

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

DSW1	DSW101	SW301
		

CAUTION

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

NOTE

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

5. Control system

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5.1 Control system

5.1.1 Cycle control

Control device	Cooling		Heating Heat recovery		Defrost
	Purpose	Contents	Purpose	Contents	Contents
Compressor Inverter frequency	Total operation capacity of the indoor unit	Capacity control is carried out to reach the evaporation temperature objective value	Total operation capacity of the indoor unit	PI control is carried out to reach the Pd objective value.	All the compressors operating
Electronic expansion valve for the outdoor unit heat exchanger.	Capacity control	Completely open (the opening of the electronic expansion valve is dependent on the refrigerant cycle conditions)	Condenser COND Capacity control	Condenser COND Completely open (the opening of the electronic expansion valve is dependent on the refrigerant cycle conditions)	Completely open
			Evaporator EVAP outdoor unit heat exchanger SH	Evaporator EVAP PI control is carried out to reach the superheat objective value in the outdoor unit heat exchanger.	
Electronic expansion valve for the supercooling heat exchanger.	TsSH control	Control TsSH of the compressor to reach the objective value	TsSH control	Control TsSH of the compressor to reach the objective value	TsSH control
Electronic expansion valve for the indoor unit heat exchanger	Indoor unit heat exchanger SH	PI control is carried out to reach objective value in the indoor unit heat exchanger SH	**Cooling setting** Indoor unit heat exchanger SH	**Cooling setting** PI control is carried out to reach the objective value in the indoor unit heat exchanger SH	Indoor unit heat exchanger SH
			Heating setting Indoor unit heat exchanger SC	**Heating setting** Control SC of the indoor unit liquid thermistor to reach objective value	
Outdoor unit fan	Pd control	PI control is carried out to reach the Pd objective value	Condenser COND Pd control	Condenser COND PI control is carried out to reach the Pd objective value	Stoppage
			Evaporator EVAP Fixing by ambient temperature and operating capacity	Evaporator EVAP Fan rotation is controlled by the ambient temperature and the indoor unit operating capacity	
Gas bypass valve (SVA)	1. Increase in Pd protection 2. Decrease in Ps protection	1. Pd > 3.6 MPa: ON 2. Ps < 0.2 MPa: ON	1. Increase in Pd protection 2. Decrease in Ps protection	1. Pd > 3.5 MPa: ON 2. Ps < 0.1 MPa: ON	Closed
High and low pressure shut-off valve (SVG)	Shut-off of high and low pressure in the cycle during stoppage	Compressor operating: ON Compressor stopped: OFF	Shut-off of high and low pressure in the cycle during stoppage	Compressor operating: ON Compressor stopped: OFF	Open
Oil return valve (SVF)	Prevention of oil decrease in compressor	Depending on ambient temperature and operating conditions	Prevention of oil decrease in compressor	Depending on ambient temperature and operating conditions	

Pd	Discharge pressure	SC	Supercooling
Ps	Suction pressure	TsSH	Superheat of discharge gas temperature
SH	Superheat		

5.1.2 Compressor operation control

◆ Compressor rotation control

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

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

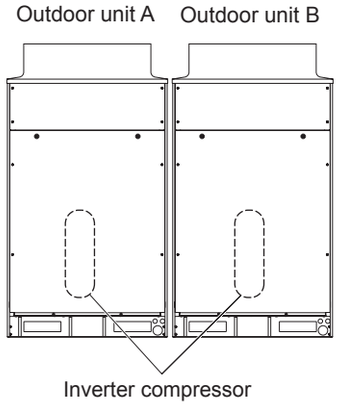
In case of switch-OFF or Thermo-OFF after 120 minutes of operation, the inverter compressor with the shortest operation time will be preferably turned on.

NOTE

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

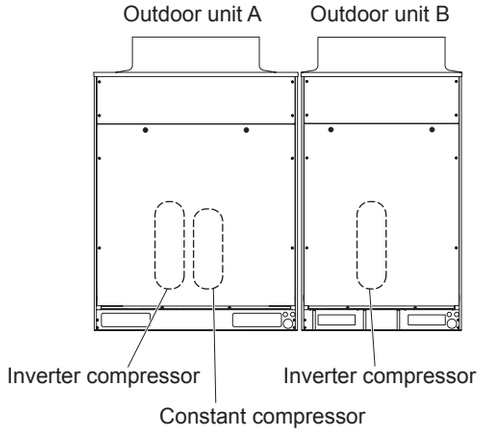
The operating sequence of the compressor rotation is described below.

RAS-(18/20)FSXN1E and RAS-(14-24)FSXNH(E)



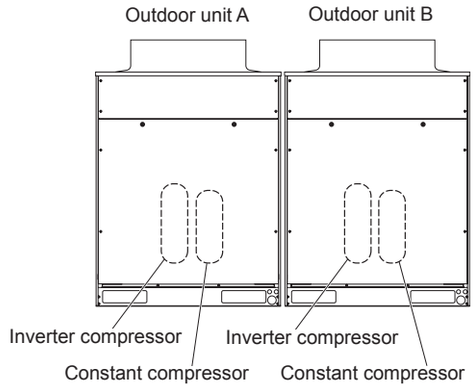
	Outdoor unit A	Outdoor unit B
	Inverter compressor	
Last time	1	2
Currently	2	1
Next time	1	2

RAS-(22-26)FSXN1E



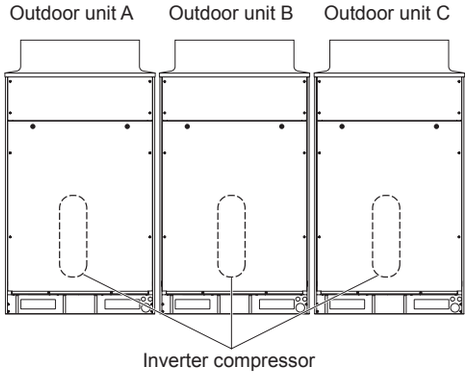
	Outdoor unit A		Outdoor unit B
	Inverter compressor	Constant compressor	Inverter compressor
Last time	1	3	2
Currently	2	3	1
Next time	1	3	2

RAS-(28-32)FSXN1E



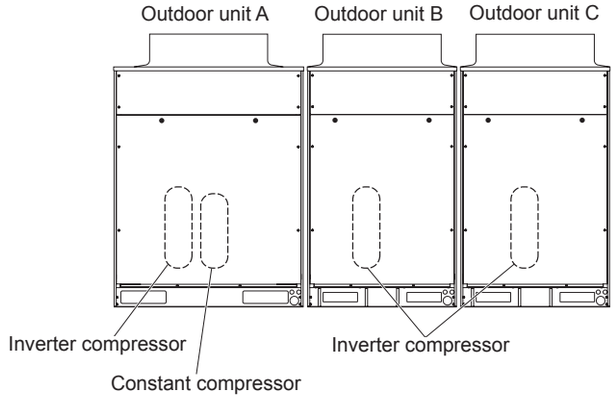
	Outdoor unit A		Outdoor unit B	
	Inverter compressor	Constant compressor	Inverter compressor	Constant compressor
Last time	1	3	2	4
Currently	2	4	1	3
Next time	1	3	2	4

RAS-(34/36)FSXN1E and RAS-(26-36)FSXNH(E)



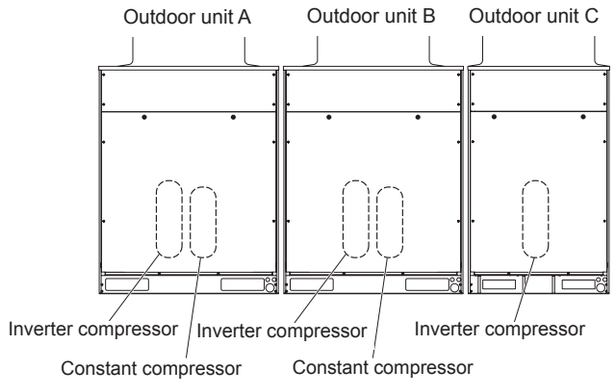
	Outdoor unit A	Outdoor unit B	Outdoor unit C
	Inverter compressor	Inverter compressor	Inverter compressor
Last time	1	2	3
Currently	2	3	1
Next time	3	1	2

RAS-(38/40)FSXN1E



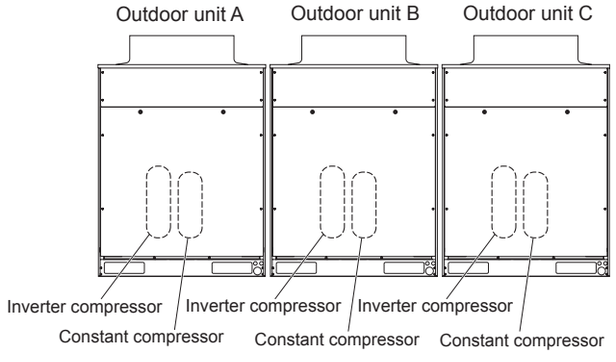
	Outdoor unit A		Outdoor unit B	Outdoor unit C
	Inverter compressor	Constant compressor	Inverter compressor	Inverter compressor
Last time	1	4	2	3
Currently	2	4	3	1
Next time	3	4	1	2

RAS-(42/44)FSXN1E



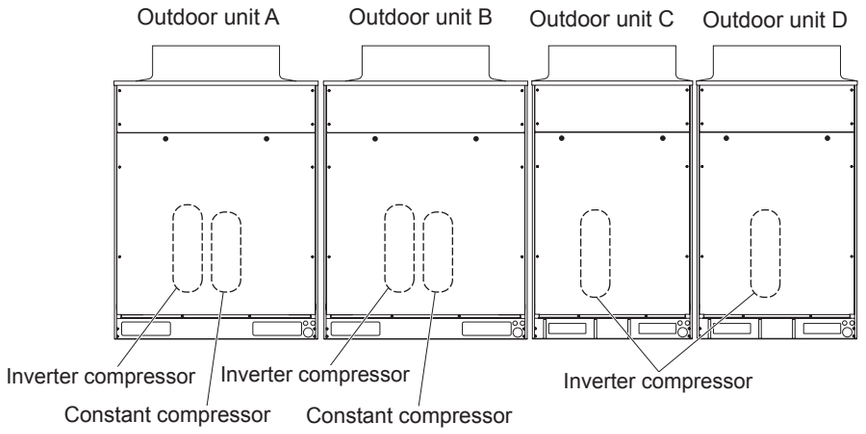
	Outdoor unit A		Outdoor unit B		Outdoor unit C
	Inverter compressor	Constant compressor	Inverter compressor	Constant compressor	Inverter compressor
Last time	1	4	2	5	3
Currently	2	4	3	5	1
Next time	3	5	1	4	2

RAS-(46/48)FSXN1E



	Outdoor unit A		Outdoor unit B		Outdoor unit C	
	Inverter compressor	Constant compressor	Inverter compressor	Constant compressor	Inverter compressor	Constant compressor
Last time	1	4	2	5	3	6
Currently	2	5	3	6	1	4
Next time	3	5	1	4	2	5

RAS-(50-54)FSXN1E



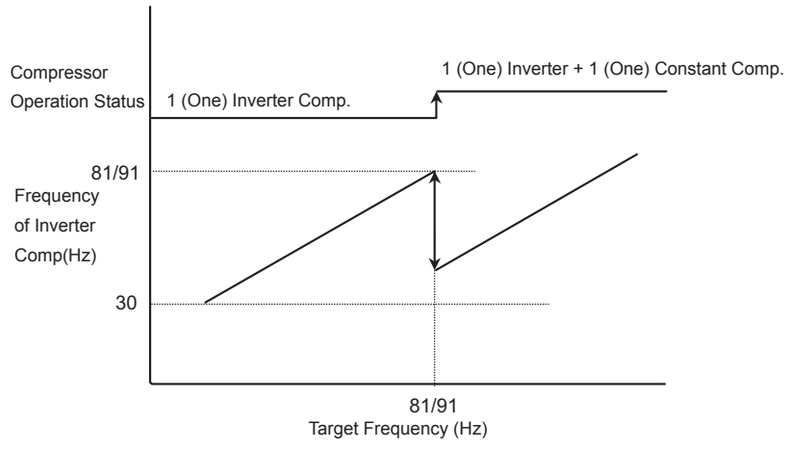
	Outdoor unit A		Outdoor unit B		Outdoor unit C	Outdoor unit D
	Inverter compressor	Constant compressor	Inverter compressor	Constant compressor	Inverter compressor	Inverter compressor
Before last time	1	5	2	6	3	4
Last time	2	5	3	6	4	1
Currently	3	5	4	6	1	2
Next time	4	6	1	5	2	3

◆ Compressor frequency control

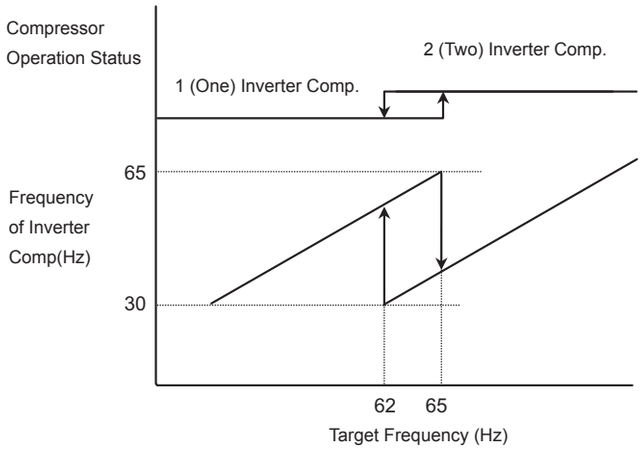
Operational control is carried out to optimise the compressor output frequency or to carry out the turning on and stopping while in constant operation in accordance with the target frequency (the target frequency is determined by the calculation of the PID control and the heating and cooling load).

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

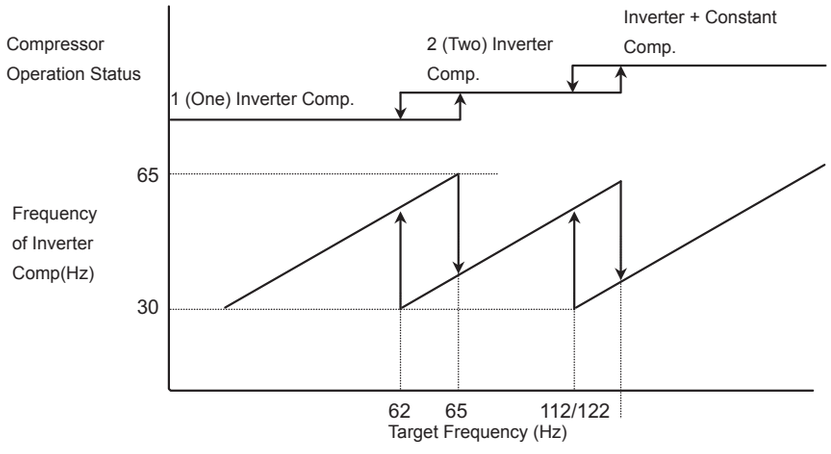
RAS-(14/16)FSXN1E



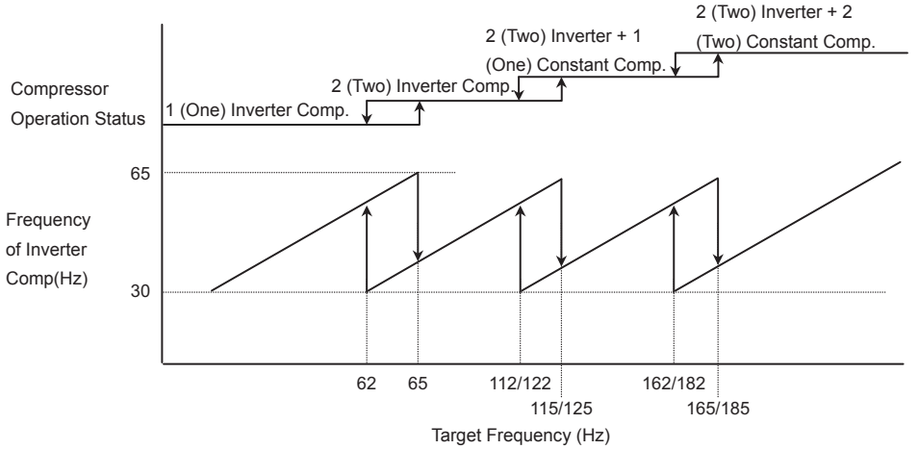
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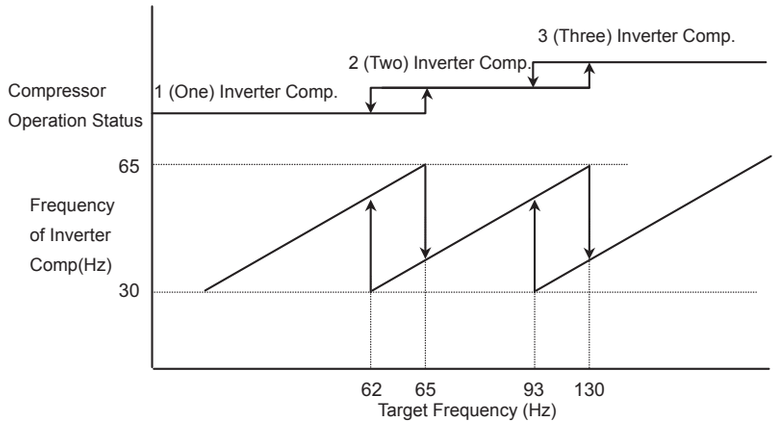
RAS-(22-26)FSXN1E



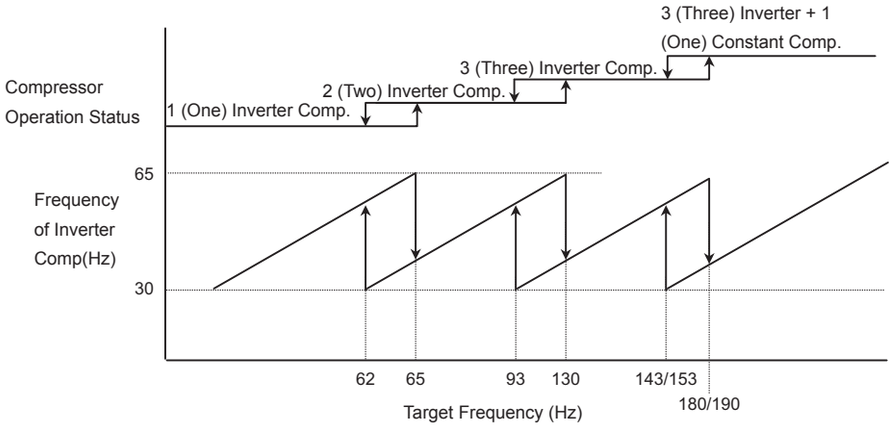
RAS-(28-32)FSXN1E



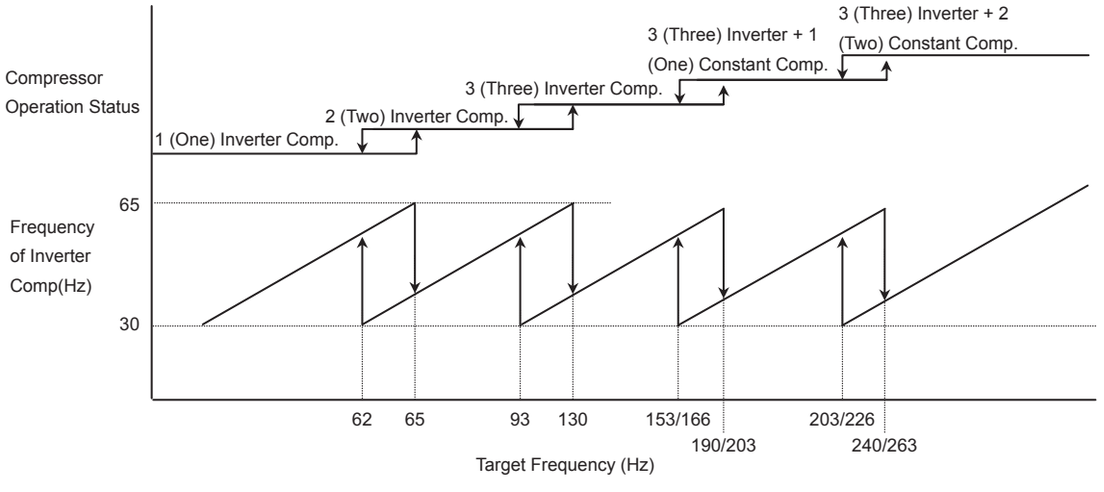
RAS-(34/36)FSXN1E



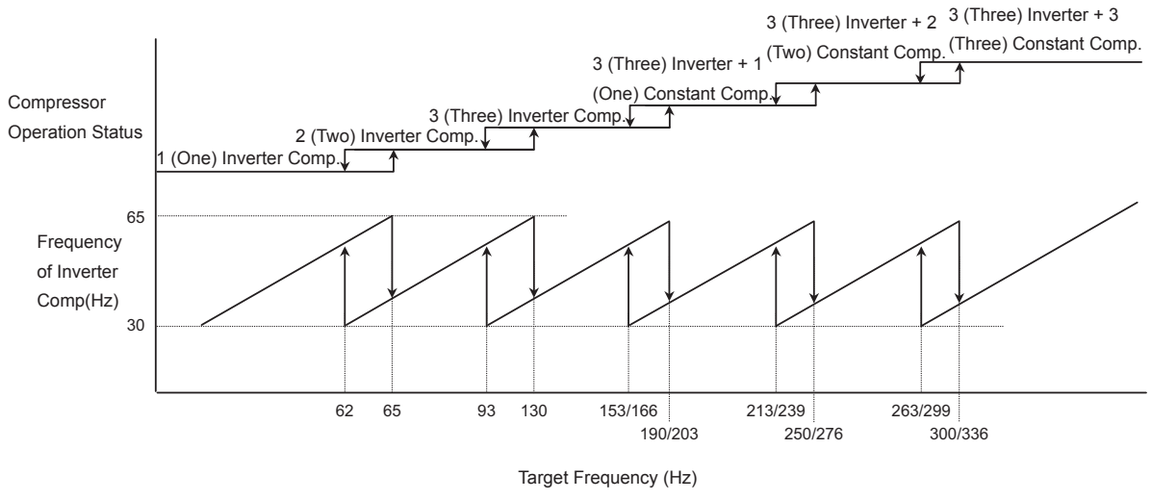
RAS-(38/40)FSXN1E



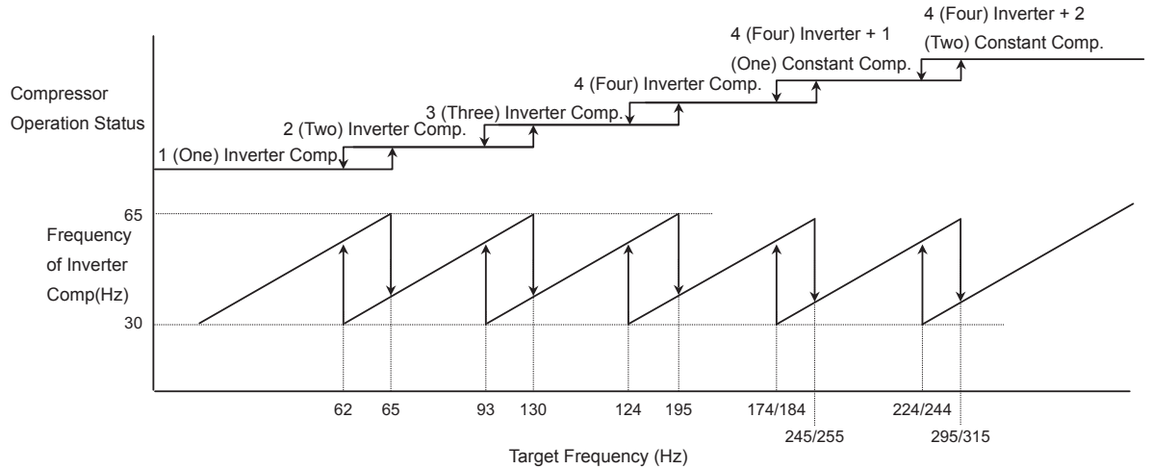
RAS-(42/44)FSXN1E



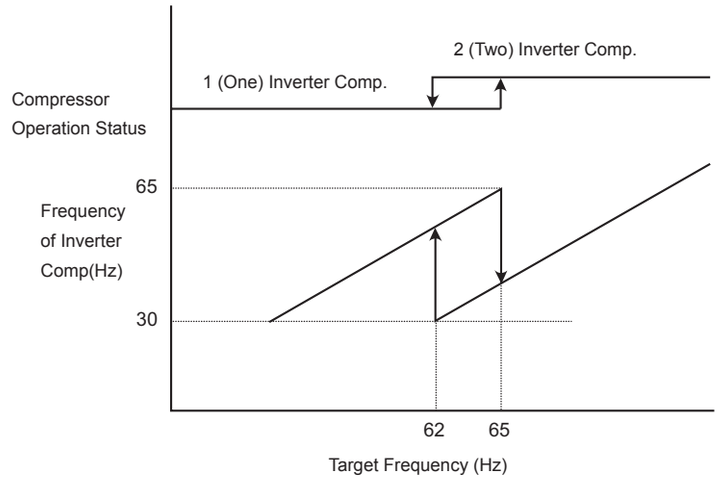
RAS-(46/48)FSXN1E



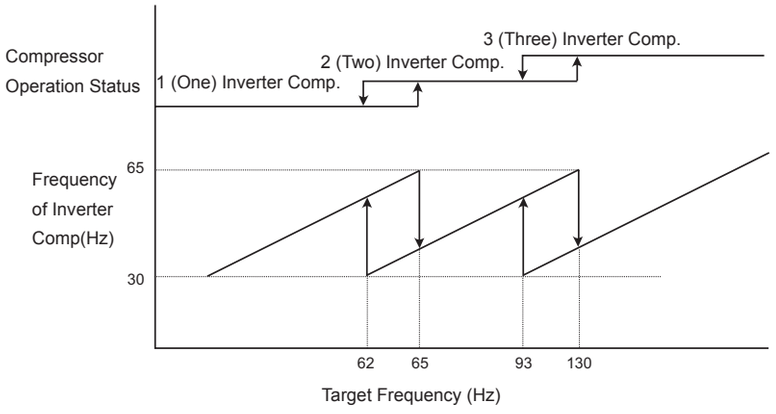
RAS-(50-54)FSXN1E



RAS-(14-24)FSXNH(E)



RAS-(26-36)FSXNH(E)



◆ Heat exchanger mode control

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

NOTE

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

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

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

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

The number of outdoor unit: 1

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

The number of outdoor unit: 2

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

The number of outdoor unit: 3

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

5

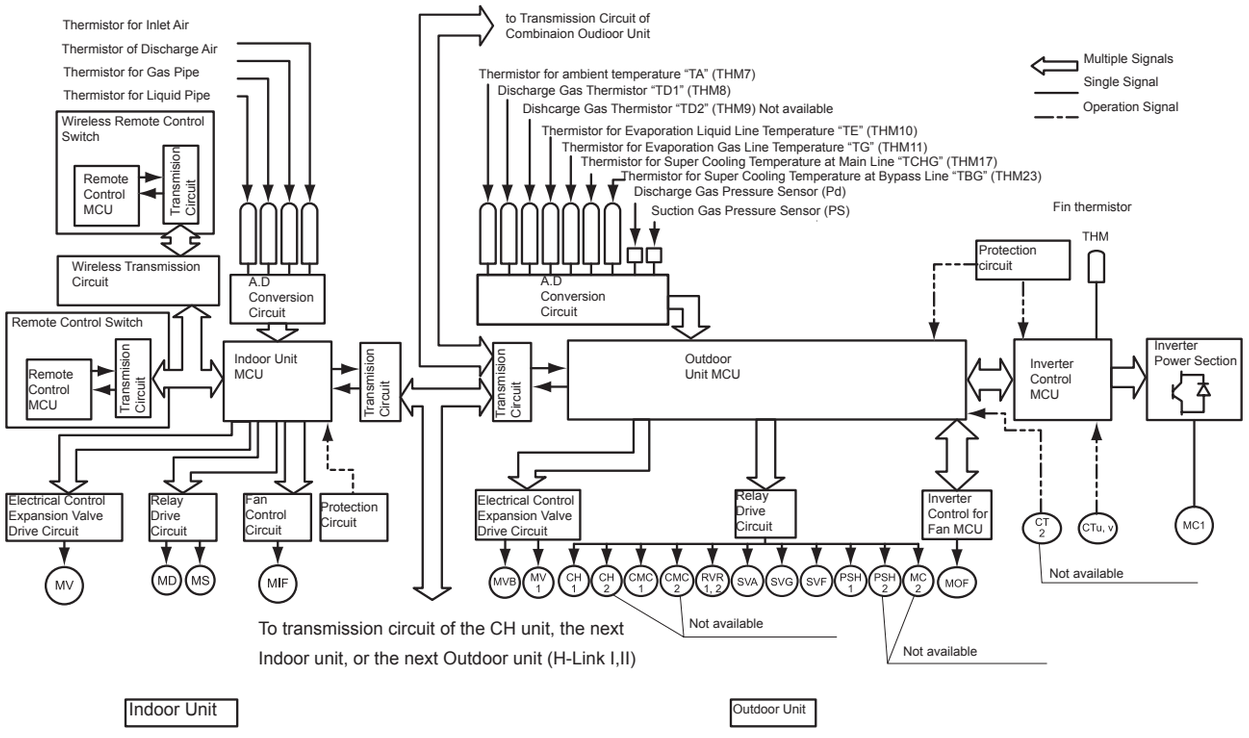
The number of outdoor unit: 4

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

Pd	Discharge pressure	SH	Superheat
Ps	Suction pressure	TsSH	Superheat of discharge gas temperature

5.1.3 Outline of the control system

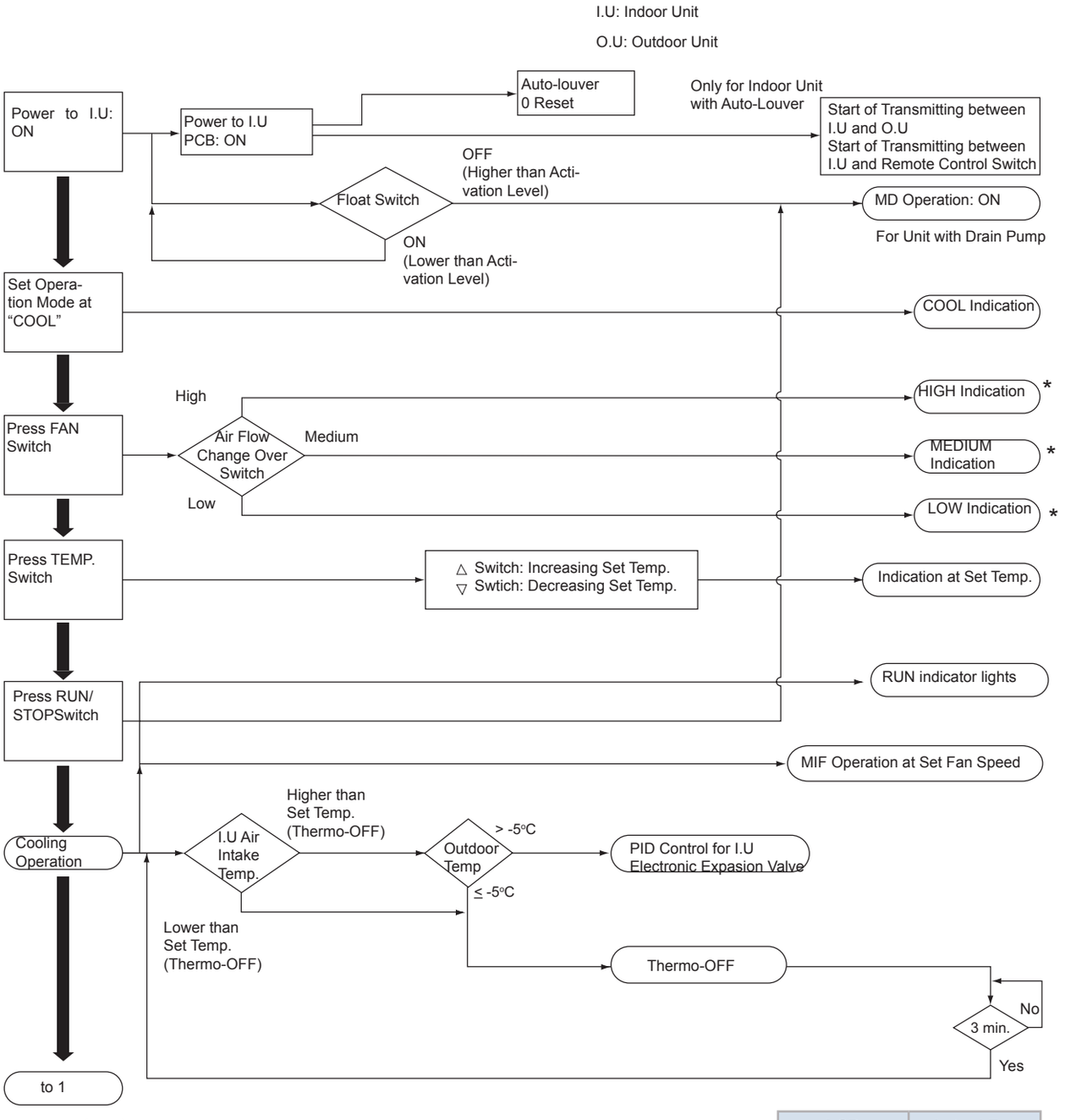
The figure below shows the outline of the control system.



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

5.2 Standard operation sequence

5.2.1 Cooling operation

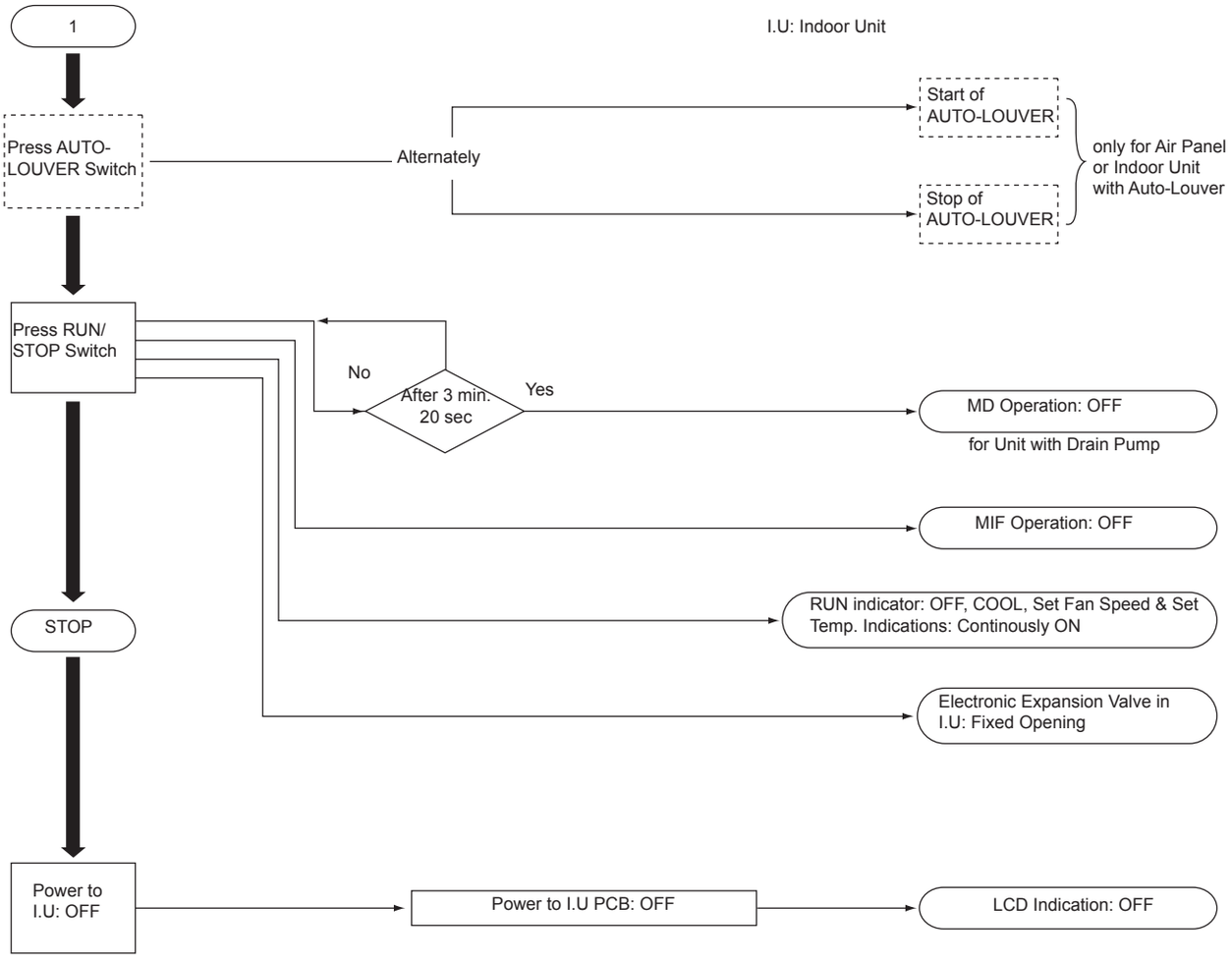


NOTE

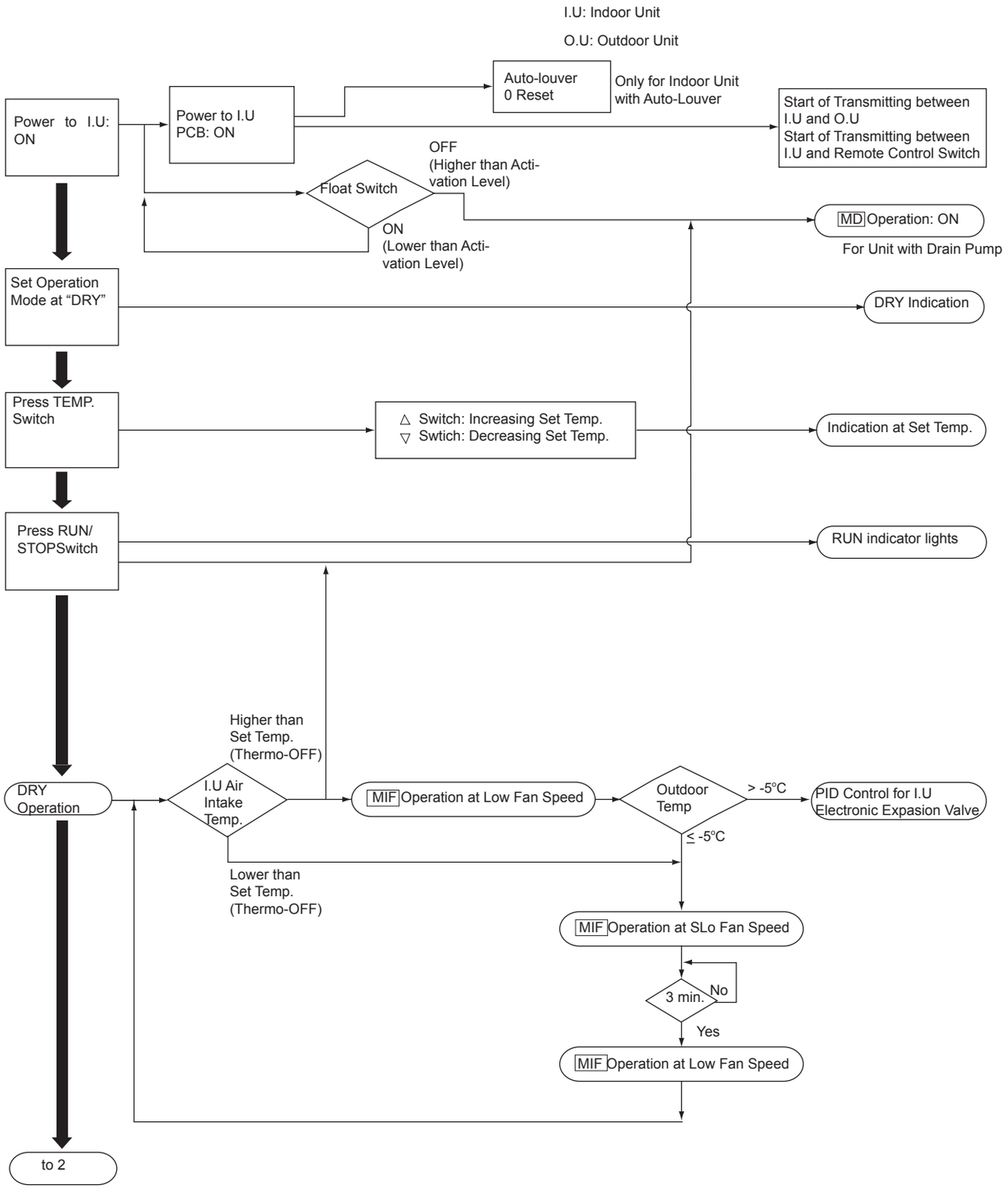
(*) For RPI-8FSN and 10FSN, the fan speed is "HIGH" and "LOW" only. By pressing the FAN SPEED SWITCH of Remote Control Switch, the indication of LCD is changed as Hi → Me → Lo *, but the actual fan speed is as shown in the table right.*

LCD Indication	Actual Fan Speed
HIGH	HIGH
MED	MED
LOW	LOW

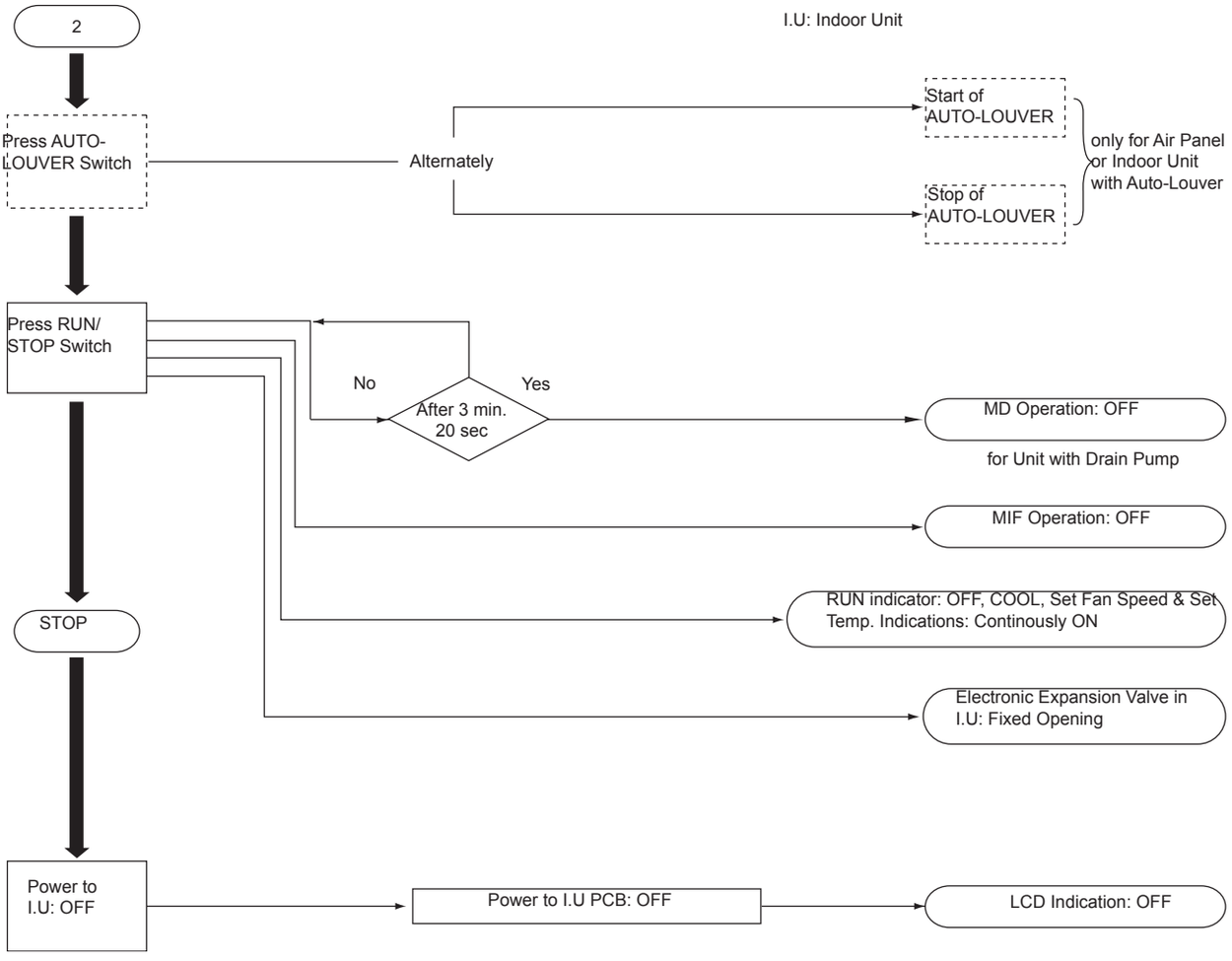
5.2.2 Cooling operation (continued)



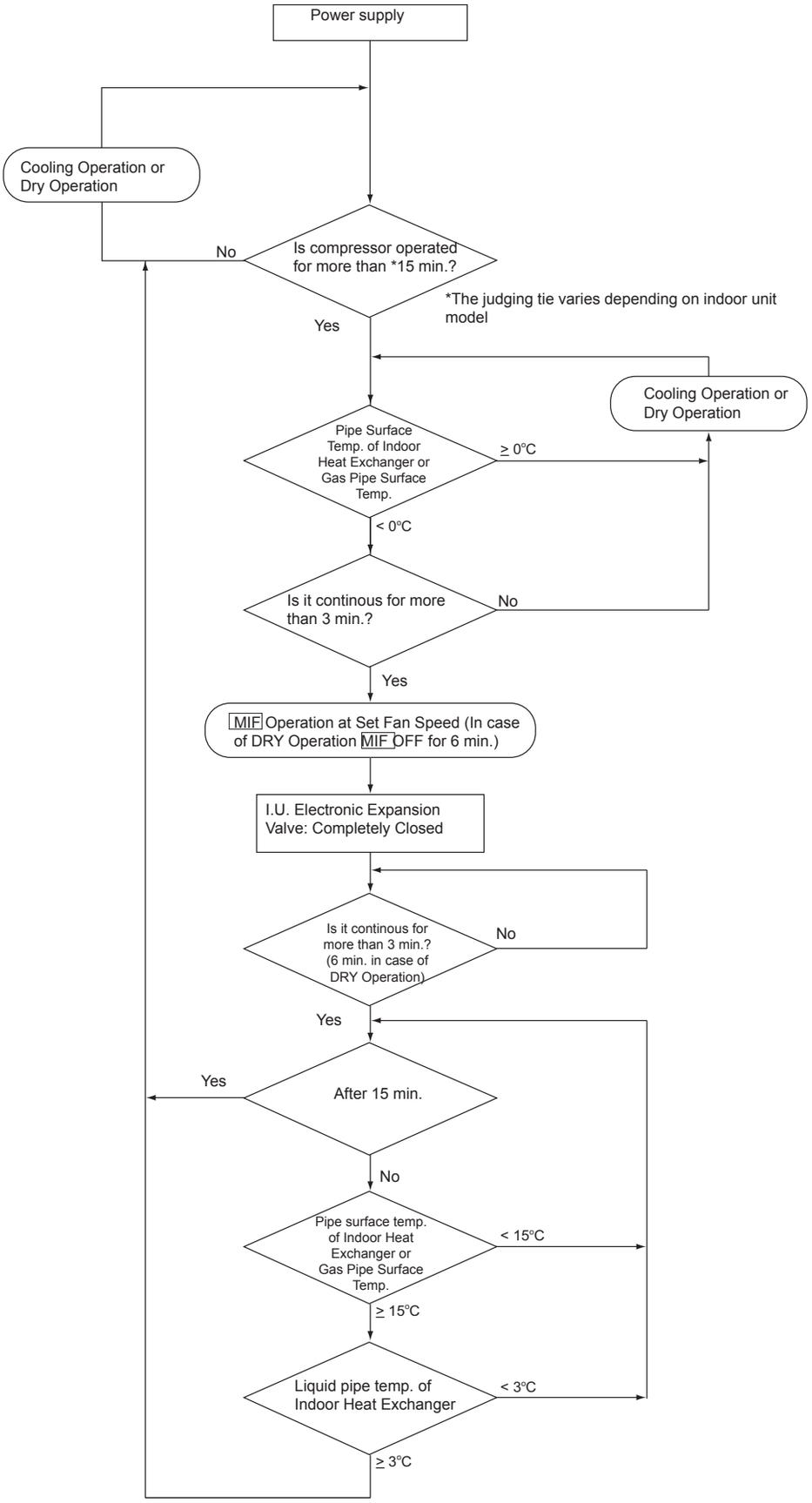
5.2.3 Dry operation



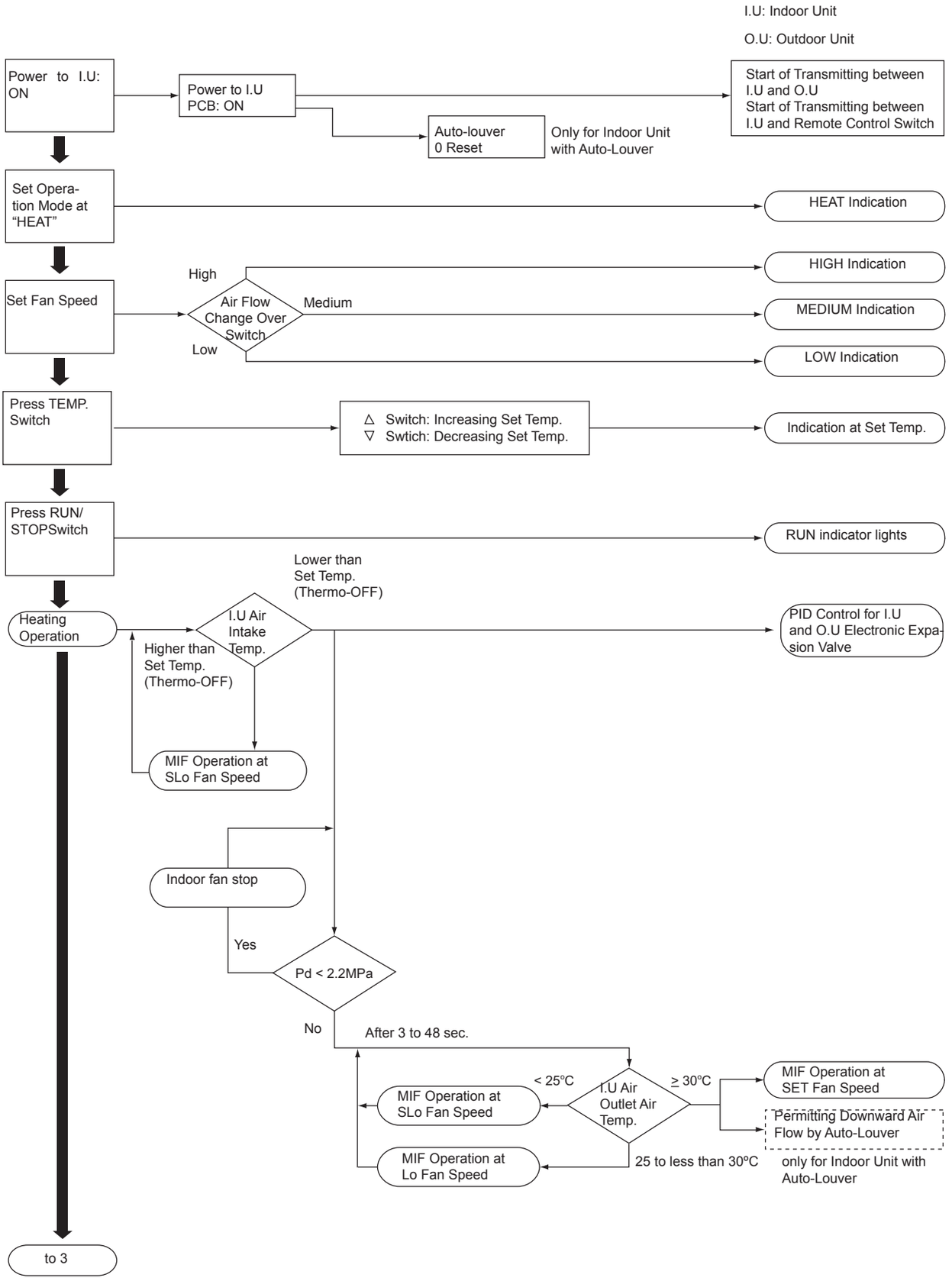
5.2.4 Dry operation (continued)



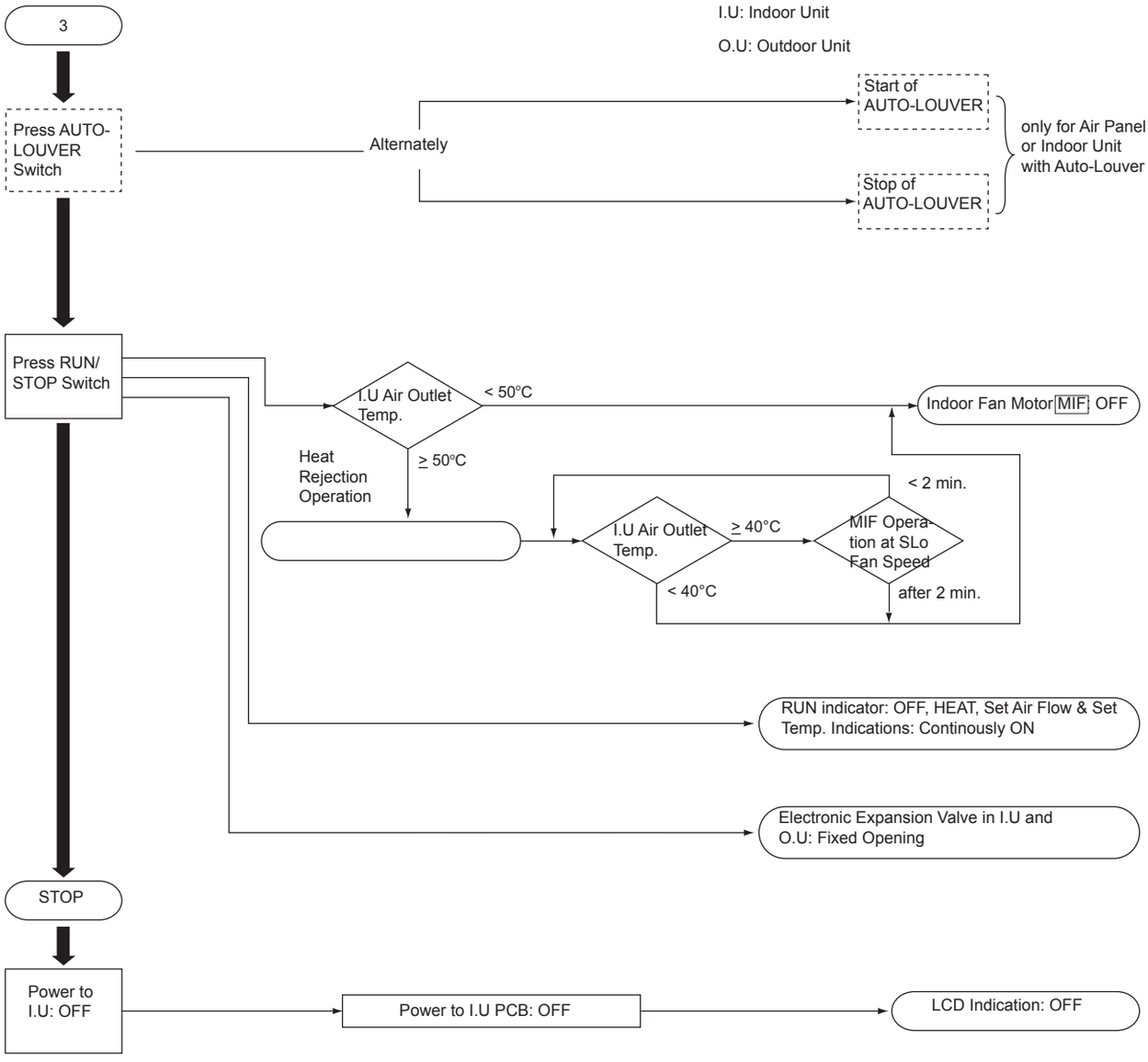
5.2.5 Antifreeze protection control during the cooling or dry operation



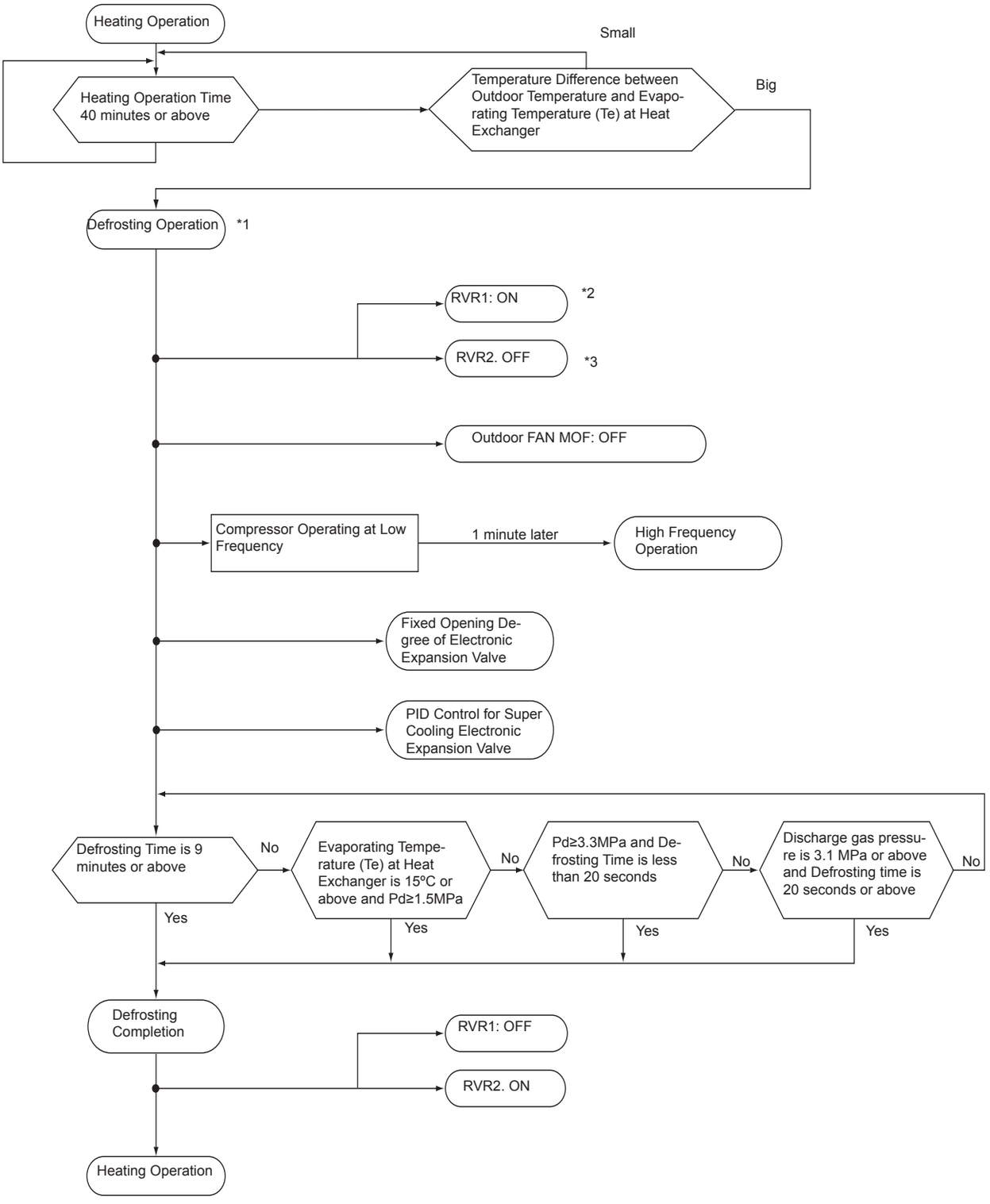
5.2.6 Heating operation



5.2.7 Heating operation (continued)



5.2.8 Defrost operation

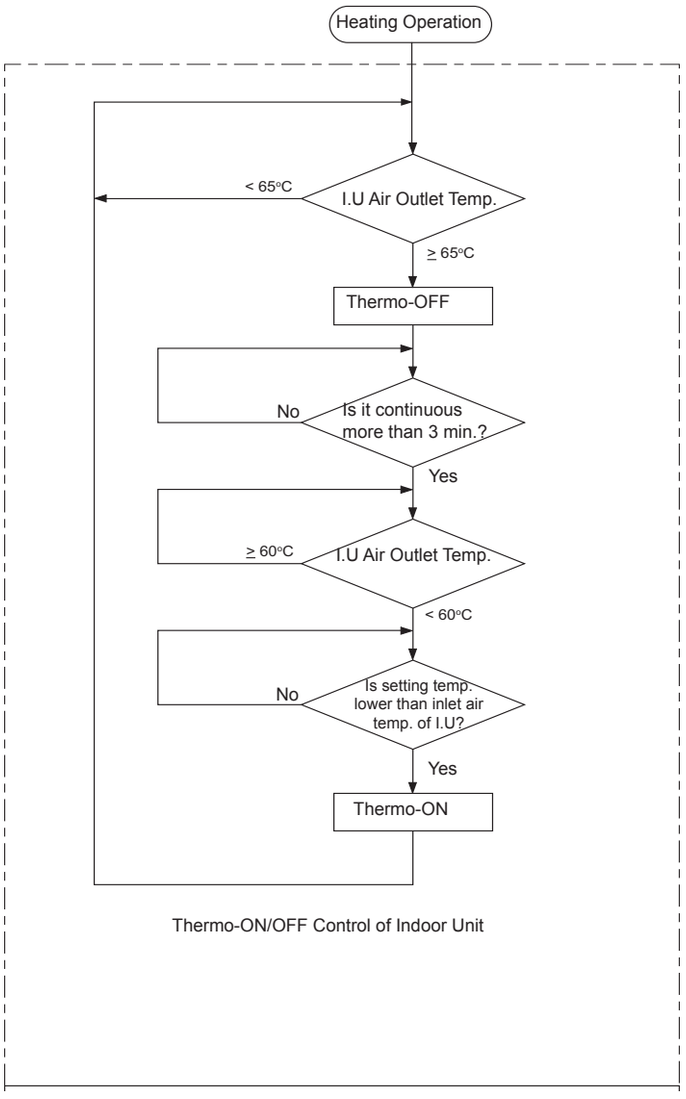


(1) The defrost signal is transmitted to the indoor unit during the defrost operation. After the signal is received, the remote control liquid crystal display indicates DEFROST and the indoor unit fan stops.

(2) For heat recovery systems with 18 HP or more, the RVR1 reversing valve will not operate.

(3) For heat recovery systems with 18 HP or more, switching power ON/OFF of the RVR2 reversing valve will be carried out in each outdoor unit.

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



Thermo-ON/OFF Control of Indoor Unit

5.2.10 Protection control

◆ Pressure ratio increase protection control

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

NOTE

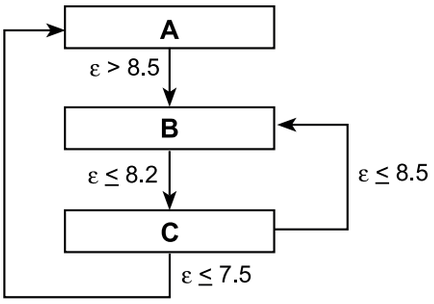
1 *In the case of base unit combinations, the control of the figure is carried out for connecting each outdoor unit.*

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

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

Pd: High pressure sensor detected value.

Ps: Low pressure sensor detected value.



A	Normal operation
B	Forced decrease in frequency (1.0 Hz/s)
C	Not allowing frequency increases (only frequency decreases are allowed)

◆ High pressure protection control

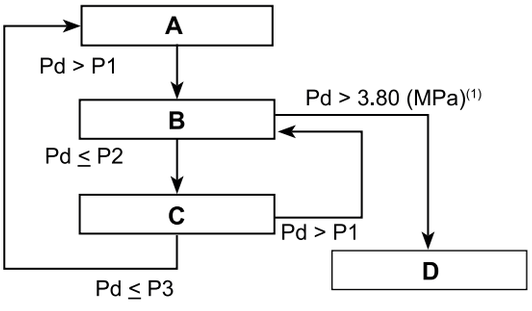
The high pressure protection control is carried out to prevent the protection device from being activated due to an increase in high pressure during an anomaly and protect the compressor from excessive high pressure increases.

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

NOTE

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

Pd: high pressure sensor detected value.



A	Normal operation
B	Forced decrease in frequency (1.5 Hz/s)
C	Not allowing frequency increases (only frequency decreases are allowed)
D	Abnormal stoppage (cause of stoppage d1-13)
(1)	For 2 seconds

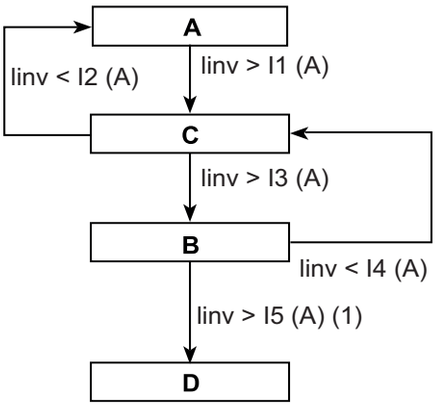
◆ Inverter current protection control

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

NOTE

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

Iinv: Inverter secondary current detected value.



A	Normal operation
B	Forced decrease in frequency (3.0 Hz/s)
C	Not allowing frequency increases (only frequency decreases are allowed)
D	Abnormal stoppage (cause of stoppage d1-17)
(1)	For 30 seconds

Model	I1	I2	I3	I4	I5
RAS-8FSXN1E RAS(5/6)FSXNH(E)	17.5	17	18.5	18	23.5
RAS-(10-16)FSXN1E RAS(8-12)FSXNH(E)	19.5	19	20.5	20	23.5

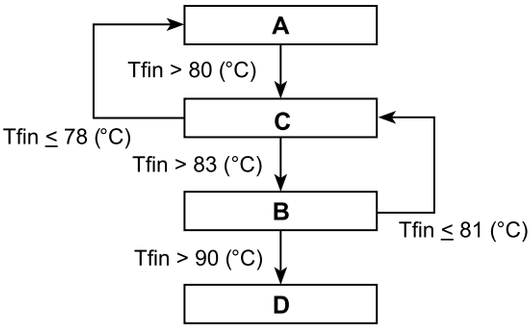
◆ Inverter fin temperature increase protection control

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

NOTE

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

Tfin: inverter fin temperature sensor detected value.



A	Normal operation
B	Forced decrease in frequency (0.25 Hz/s)
C	Not allowing frequency increases (only frequency decreases are allowed)
D	Abnormal stoppage (cause of stoppage d1-17)

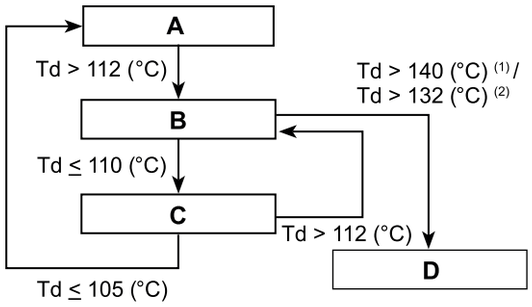
◆ Discharge temperature increase protection control

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

NOTE

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

Td: discharge gas temperature sensor detected value.



A	Normal operation
B	Forced decrease in frequency (1.0 Hz/s)
C	Not allowing frequency increases (only frequency decreases are allowed)
D	Abnormal stoppage (cause of stoppage d1-15)
(1)	For 5 seconds
(2)	For 10 minutes

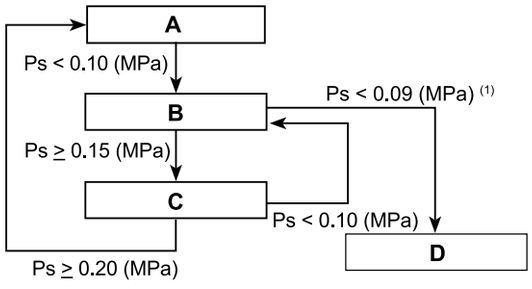
◆ Suction pressure protection control

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

NOTE

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

Ps: suction pressure sensor detected value.



A	Normal operation
B	Forced decrease in frequency (0.25 Hz/s)
C	Not allowing frequency increases (only frequency decreases are allowed)
D	Abnormal stoppage (cause of stoppage d1-15)
(1)	For 12 minutes

◆ Degeneration control

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

Protection control ratio:

(1) Pressure ratio decrease protection control.

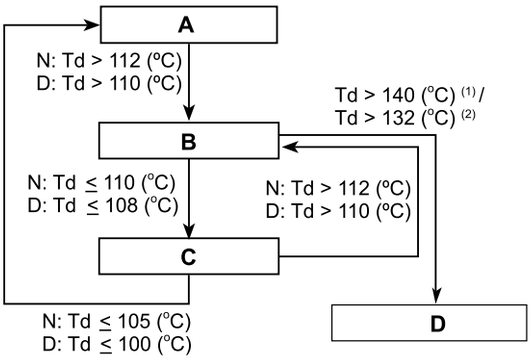
(2) Discharge pressure increase protection control.

(3) Inverter overcurrent protection control.

(4) Inverter fin temperature increase protection control.

(5) Discharge temperature increase protection control.

Example of discharge temperature increase protection control:



A	Normal operation
B	Forced decrease in frequency (1.0 Hz/s)
C	Not allowing frequency increases (only frequency decreases are allowed)
D	Abnormal stoppage (cause of stoppage d1-15)
(1)	For 5 seconds
(2)	For 10 minutes
N	Normal
D	Degeneration

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

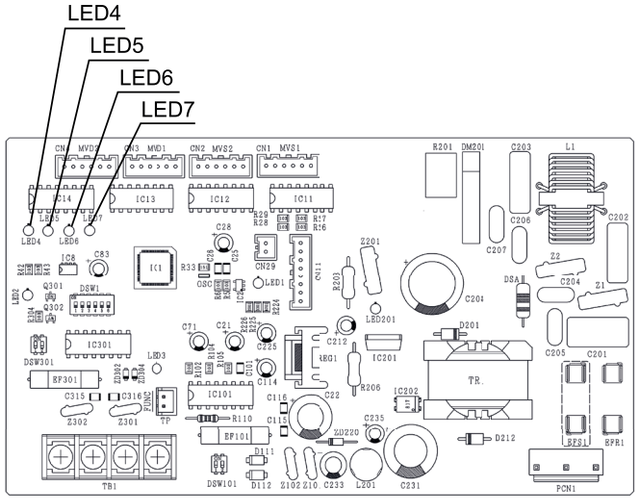
The following table shows the expansion valve opening of CH unit at the steady condition.

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

(1) Checking Method of CH Unit Performance.

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

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



LED		Expansion valve	
Number	Condition	Signal	Opening (Pulse)
LED4	ON	MVD2	420
	OFF		0
LED5	ON	MVD1	600
	OFF		0
LED6	ON	MVS2	420
	OFF		0
LED7	ON	MVS1	600
	OFF		0

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

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

CH unit expansion valve	Indoor Unit Operation Mode (Remote Control Setting)		
	Cooling *	Heating	FAN
MVS1	600	0	600
MVS2	420	0	420
MVD1	0	600	0
MVD2	0	420	0

*: Dry setting is included as cooling operation.

(b) When Outdoor Unit Compressor is Operated.

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

Outdoor unit Operation condition	CH unit Expansion valve	Indoor Unit Operation Mode (Remote Control Setting)				
		Cooling *	Heating	Cooling Thermo-OFF *	Heating Thermo-OFF	FAN
Cooling mode	MVS1	600	-	600	600	600
	MVS2	420	-	420	420	420
	MVD1	600	-	600	0	600
	MVD2	420	-	420	0	420
Heating mode	MVS1	-	0	600	600	600
	MVS2	-	0	420	420	420
	MVD1	-	600	0	0	0
	MVD2	-	420	0	0	0
Heat recovery mode	MVS1	600	0	600	600	600
	MVS2	420	0	420	420	420
	MVD1	0	600	0	0	0
	MVD2	0	420	0	0	0

*: Dry setting is included as cooling operation.

NOTE

The numerical value to indicate fully open state differs according to the model of value; 600 for valves MVS1 and MVD1, and 420 for valves MVS2 and MVD2.

5.3 Control and safety devices

5.3.1 Outdoor unit

Compressor protection

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

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

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

Model			RAS-(8-12)FSXN1E	RAS-(14/16)FSXN1E
Compressor				
Pressure switches			Automatic restart (one per compressor)	Automatic restart (one per compressor)
High pressure	Disconnection	MPa	$4.15^{-0.05}_{-0.15}$	$4.15^{-0.05}_{-0.15}$
	Connection	MPa	$3.20^{\pm 0.15}$	$3.20^{\pm 0.15}$
Fuse capacity (3N~ 400V 50Hz)		A	40x2	40x2 + 32x3
Oil heater				
Power		W	40.8x2	40.8x4
CCP timer			Not adjustable	Not adjustable
Time setting		min.	3	3
Direct current module for fan				
Fuse capacity (3N~ 400V 50Hz)		A	20x1	20x1

Model			RAS-(5-12)FSXNH(E)
Compressor			
Pressure switches			Automatic restart (one per compressor)
High pressure	Disconnection	MPa	$4.15^{-0.05}_{-0.15}$
	Connection	MPa	$3.20^{\pm 0.15}$
Fuse capacity (3N~ 400V 50Hz)		A	40x2
Oil heater			
Power		W	40.8x2
CCP timer			Not adjustable
Time setting		min.	3
Direct current module for fan			
Fuse capacity (3N~ 400V 50Hz)		A	20x1

5.3.2 CH unit

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

6. Optional functions

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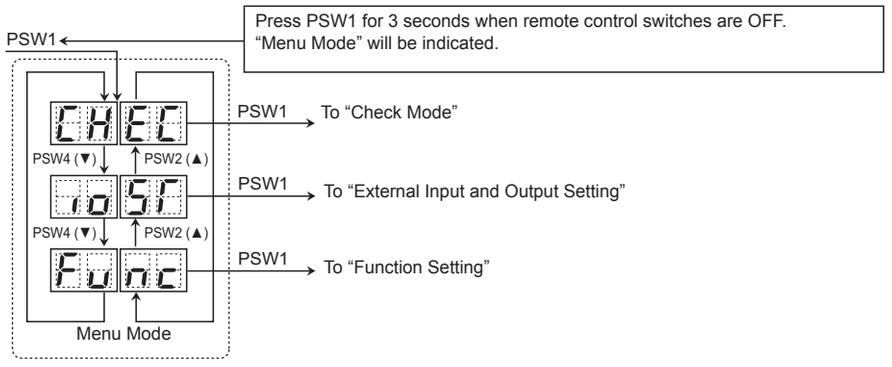
6.1 Menu mode accessing (by 7-segment display)

Setting PSW of the outdoor unit PCB is required for setting *"6.2 Optional external input and output setting (by 7-segment display)"* (*).

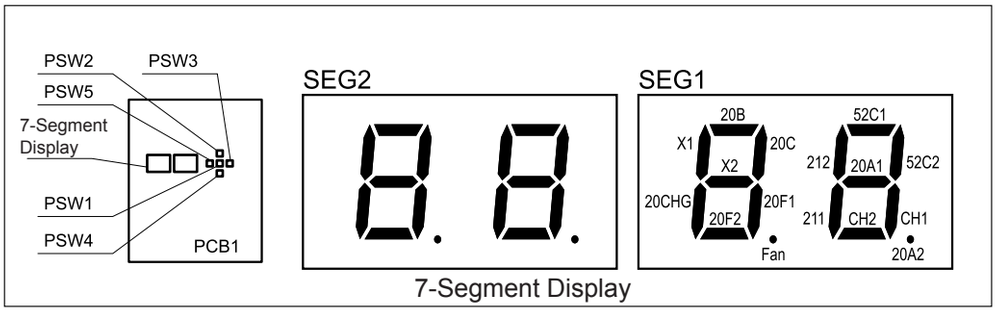
NOTE

(*) In case of 14 to 36 HP, set from the PSW in outdoor unit A (setting from the PSW in outdoor unit B and C is not valid).

1. Press PSW1 for 3 seconds when remote control switches are OFF. The "Menu mode" will be indicated.
2. After carrying out the configuration, press PSW1 for 3 seconds when the "Menu mode" is indicated. The display will return to normal indication.



Arrangement of push switches on PCB1



NOTE

In the menu mode, the following can be selected:

1. *Check mode*

   It indicate the alarm code history for outdoor unit and indoor unit. It is mainly used at service.

2. *External input and output setting*

   It is used to set the functions by external input and output signals. When the setting is performed by external input and output setting, set DSW4-#4 of the outdoor unit PCB at ON.

3. *Function setting*

   It is used to set the change of operation target, night-shift, etc. Set DSW4-#4 of the outdoor unit PCB at ON.

6.2 Optional external input and output setting (by 7-segment display)

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

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

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

Control function number	Configuration of output functions
1	Operating signal
2	Alarm signal
3	Compressor ON signal
4	Defrost signal
0	Without setting

The following functions are set before shipment:

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

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

NOTE

The same input/output function cannot be set to different input/output terminals. If set, a setting of larger function number is became invalid.

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

Example:

1

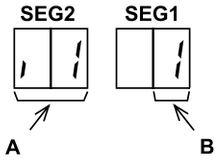
	Item	SEG2	SEG1	SET
1	Input Setting 1 CN17 [1-2 pin]	i1	1	
2	Input Setting 2 CN17 [2-3 pin]	i2	2	
3	Input Setting 3 CN18 [1-2 pin]	i3	3	
4	Output Setting 1 CN16 [1-2 pin]	o1	1	
5	Output Setting 2 CN16 [1-3 pin]	o2	2	

(Setting before shipment)

6.2.1 Setting of the optional signal

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

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

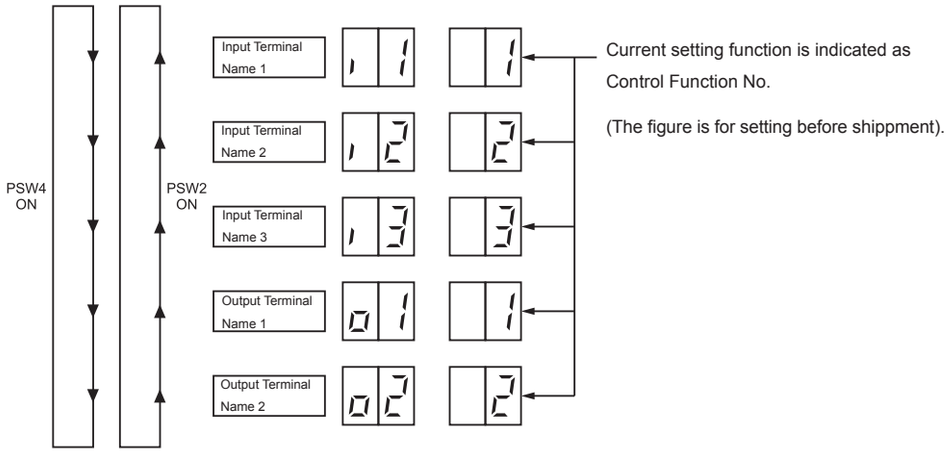


A	Input/output terminal name
B	Control function number

NOTE

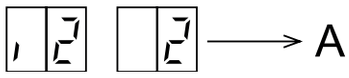
(*) This display shows the control function No. 1 (fixed heating operation mode) is set at input 1.

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



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

A
By pressing PSW3, the number increases by 1.
By pressing PSW5, the number decreases by 1.
(Control Function No.14 → Press PSW3 → return to 0)



4 After the function number is selected, press PSW1 for 3 seconds. The display will return to its normal indication. The selected contents will be memorised in the outdoor unit's printed circuit board and the “External Input and Output Setting” is completed. The memorised data is maintained even though the power supply is disconnected. The electrical wiring diagram for each control function are described and the necessary parts are listed in *“6.2.2 External input function setting”* and *“6.2.3 External output function setting”*.

6.2.2 External input function setting

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

Specifications for the main component requirements:

Components		Specifications	Remarks
Auxiliary relay (X1, X2)		Mini power relay, MY1F (or MY2F) made by OMRON	230 V
Changeover switch (SS2, SS3)		Manual switch	230 V
3-pin connector cable		PCC-1A (connected to a JST, XARP-3 connector)	5 cables with connectors in a single assembly
Cable (Inside the unit)	Low voltage	0.3 mm^2	less than 24 V
	230 V	0.5 to 0.75 mm^2	—
Cable (Outside the unit)	Low voltage	0.5 to 0.75 mm^2	less than 24 V
	230 V	2 mm^2	—

NOTE

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

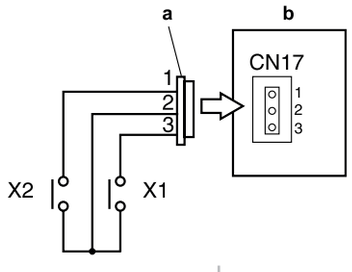
◆ Fixing of the heating mode (Control function number 1) Fixing of the cooling mode (Control function number 2)

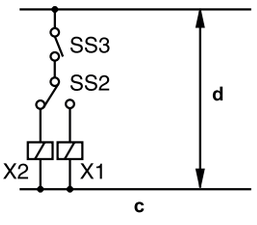
When the input terminals for setting the operation mode of the outdoor unit PCB1 are short-circuited, the operation mode can be fixed for cooling or heating mode.

- Short-circuit between terminals 1 and 2 (input 1) of the CN17 to fix heating operation mode.
- Short-circuit between terminals 2 and 3 (input 2) of the CN17 to fix cooling operation mode.

During the setting of heating (or cooling) mode, cooling (or heating) mode will not be available. The indoor units in cooling or dry operation (or heating operation) will be switched to Thermo-OFF condition during the setting of the operation, and stoppage code number “20” is given.

-Setting example:





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

◆ Demand stoppage (Control function number 3)

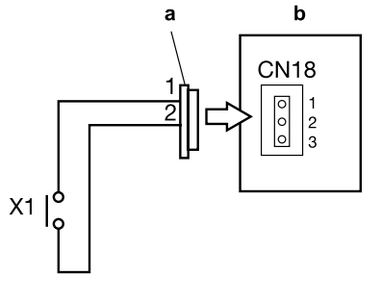
When the input terminals for the outdoor unit PCB1 demand stoppage are short-circuited, the compressor or compressors will be stopped. In this case, the indoor units will be under Thermo-OFF condition. In cooling mode: air flow setting, heating mode: Lo setting.

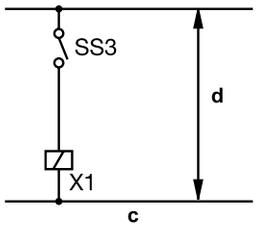
- Short-circuit terminals 1 and 2 (input 3) of CN18 to set the stoppage demand.

The stoppage code is number 10. By disconnecting the demand switch contact, restarting is available.

NOTE

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



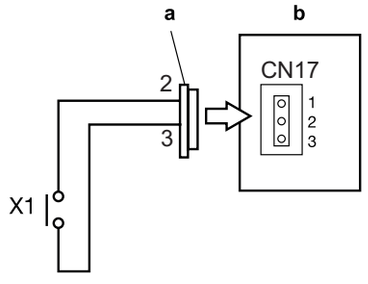


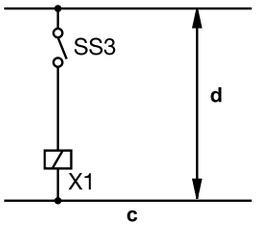
a	3-pin connector
b	Outdoor unit PCB1
c	Control circuit
d	Power source
X1	Auxiliary relay
SS3	Demand stoppage switch

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

This is an auxiliary function to protect the outdoor unit from snow. When the input terminals for Outdoor Fan Motor Start/Stop on the outdoor unit PCB are short-circuited during the compressor stoppage, all the outdoor fan motors start operating. If the compressor restarts operating, the outdoor fan motors will be restored to normal operation. If the input terminals of Outdoor Fan Motor Start/Stop are opened during the outdoor fan motor operation following the short circuit of these terminals, the outdoor fan motor will stop.

This function is only available when the compressor is stopped. Therefore, if the input signal is mistakenly sent during a normal cooling or heating operation, this function will not be available.



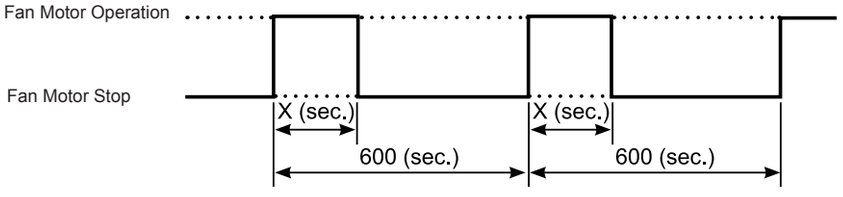


a	3-pin connector
b	Outdoor unit PCB1
c	Control circuit
d	Power source
X1	Auxiliary relay
SS3	Snow sensor switch

The wiring diagram above is an example when setting the outdoor fan motor start/stop by external signal (Control Function No.4) at Input 2 (between 2 and 3 pins of CN17).

Furthermore, the intermittent operation of the outdoor fan motor is available by combining with function setting (setting item “F1”). The intermittent operation of the outdoor fan motor is valid when the input terminals of the outdoor fan motor start/stop are short-circuited.

The action during the intermittent operation of the outdoor fan motor(s) is indicated as follows.



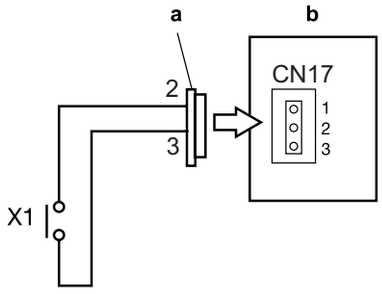
Contents of Function Setting Item "F1"

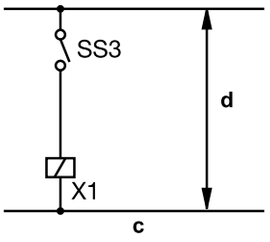
	Contents of function setting item "F1"				
	0	1	2	3	4
Outdoor Fan Motor Operation Time X (sec.)	(Continuous Operation)	30	60	120	300

◆ Forced stoppage (Control function number 5)

When the outdoor unit PBC1 input terminals for the forced stoppage are short-circuited during running the compressor and the indoor unit fans are stopped. However, the remote control screen remains in the same number 10 stoppage code. In this case, if the input terminals are open, the operation is resumed.

- Short-circuit terminals 2 and 3 (input 2) of CN17 to set the forced stoppage.





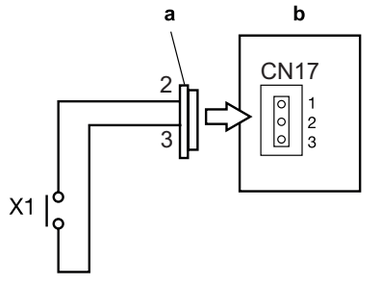
a	3-pin connector
b	Outdoor unit PCB1
c	Control circuit
d	Power source
X1	Auxiliary relay
SS3	Forced stoppage switch

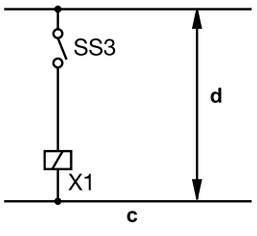
◆ Demand current control of 40, 60, 70, 80 and 100% (Control function number 6 to 10)

When the demand current control input terminals for the outdoor unit PCB1 are short-circuited, the compressor frequency is controlled by the maximum current limit of the outdoor unit, which is set at 100%, 80%, 70%, 60% and 40%. The maximum running current of the outdoor unit will be selected as described in procedure *"6.2 Optional external input and output setting (by 7-segment display)"*.

- Short-circuit terminals 2 and 3 (input 2) of CN17 to configure the current demand.

If the running current of the outdoor unit increases above the limit, the indoor unit is put in Thermo-OFF condition. Stoppage code number 10 is shown. When the input terminal is opened during the demand current control, control is re-established.





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

NOTE

At facility design:

1. *The demand current control (%) is value criterion. The value used for this control is calculated from the current, and therefore is different from the value indicated by a wattmeter. If it is required that the maximum power consumption is managed precisely, a field-supplied demand controller should be used.*
2. *The actual value may temporarily be higher than the indicated value (by 40 ~100%) depending on the operating control conditions such as protection control.*

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

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

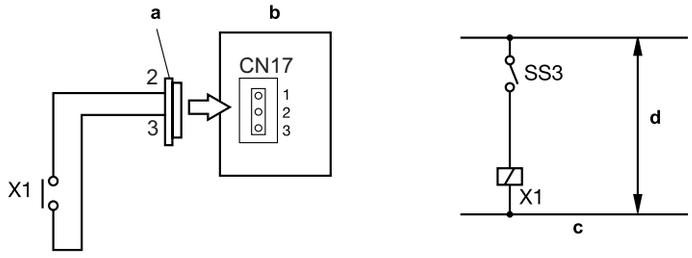
The sound operation can be adjusted by selecting the control function number.

Control function number	Operating sound (targeted value)	Outdoor unit capacity (specification ratio)
No setting	Catalogue value	100%
11 (Low noise level setting 1)	55 dB*	80%
12 (Low noise level setting 2)	50 dB	60%
13 (Low noise level setting 3)	45 dB	40%

- * For RAS-(5/6)FSXNH(E), target value is 52 dB
- In case of combination unit (RAS-12FSXNH(E)-P and RAS-(14-36)FSXNH(E)) sound will be higher than the values showed in the table.
- Short-circuit terminals 2 and 3 (input 2) of CN17 to set the low noise setting.

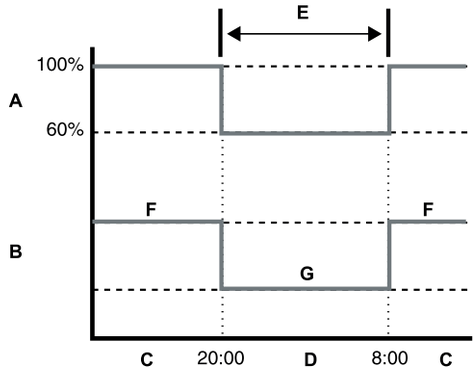
NOTE

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



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

Example: Low noise setting 2 during night time only:



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

6.2.3 External output function setting

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

Specification for the main component requirements:

Components		Specifications	Remarks
Auxiliary relay (*)		High power relay, LY2F DC12V made by OMRON	—
3-pin connector cable		PCC-1A (connected to a JST, XARP-3 connector)	5 cables with connectors in a single assembly
Cable (Inside the unit)	Low voltage	0.3 mm^2	less than 24 V
	230 V	0.5 to 0.75 mm^2	—
Cable (Outside the unit)	Low voltage	0.5 to 0.75 mm^2	less than 24 V
	230 V	2 mm^2	—

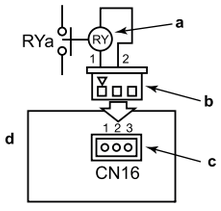
NOTE

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

◆ Operation signal (Control function number 1)

This function is used to receive the operation signal.

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

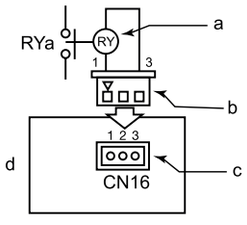


a	Auxiliary relay
b	3-pin connector
c	Connector CN16
d	Outdoor unit PCB1

◆ Alarm signal (Control function number 2)

This function is used to receive the alarm signal.

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

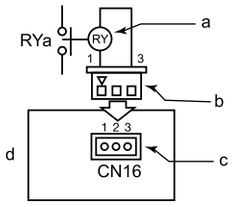


a	Auxiliary relay
b	3-pin connector
c	Connector CN16
d	Outdoor unit PCB1

◆ Compressor ON signal (Control function number 3)

This function is used to receive the compressor operation signal.

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

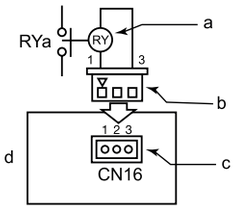


a	Auxiliary relay
b	3-pin connector
c	Connector CN16
d	Outdoor unit PCB1

◆ Defrosting signal (Control function number 4)

This function is used to receive the defrosting signal.

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



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

6.3 Optional functions (by 7–segment display)

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

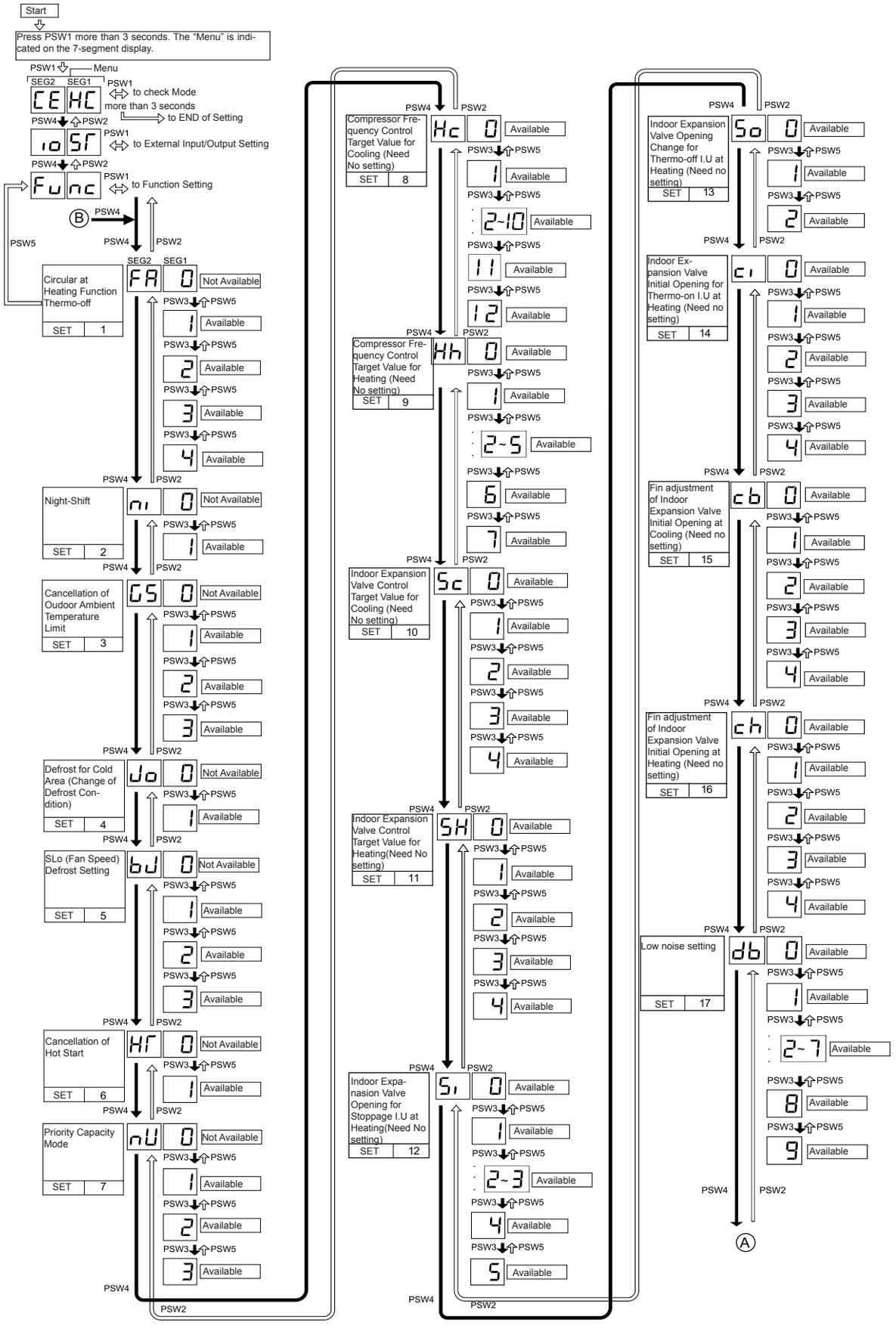
2 Press PSW1 for more than 3 seconds.
”Menu” will be displayed on the 7-segment display. The menu indicates the changes by pressing PSW2 or PSW4 Selection of the function setting mode is indicated by the “Func” mode on the 7-segment display.

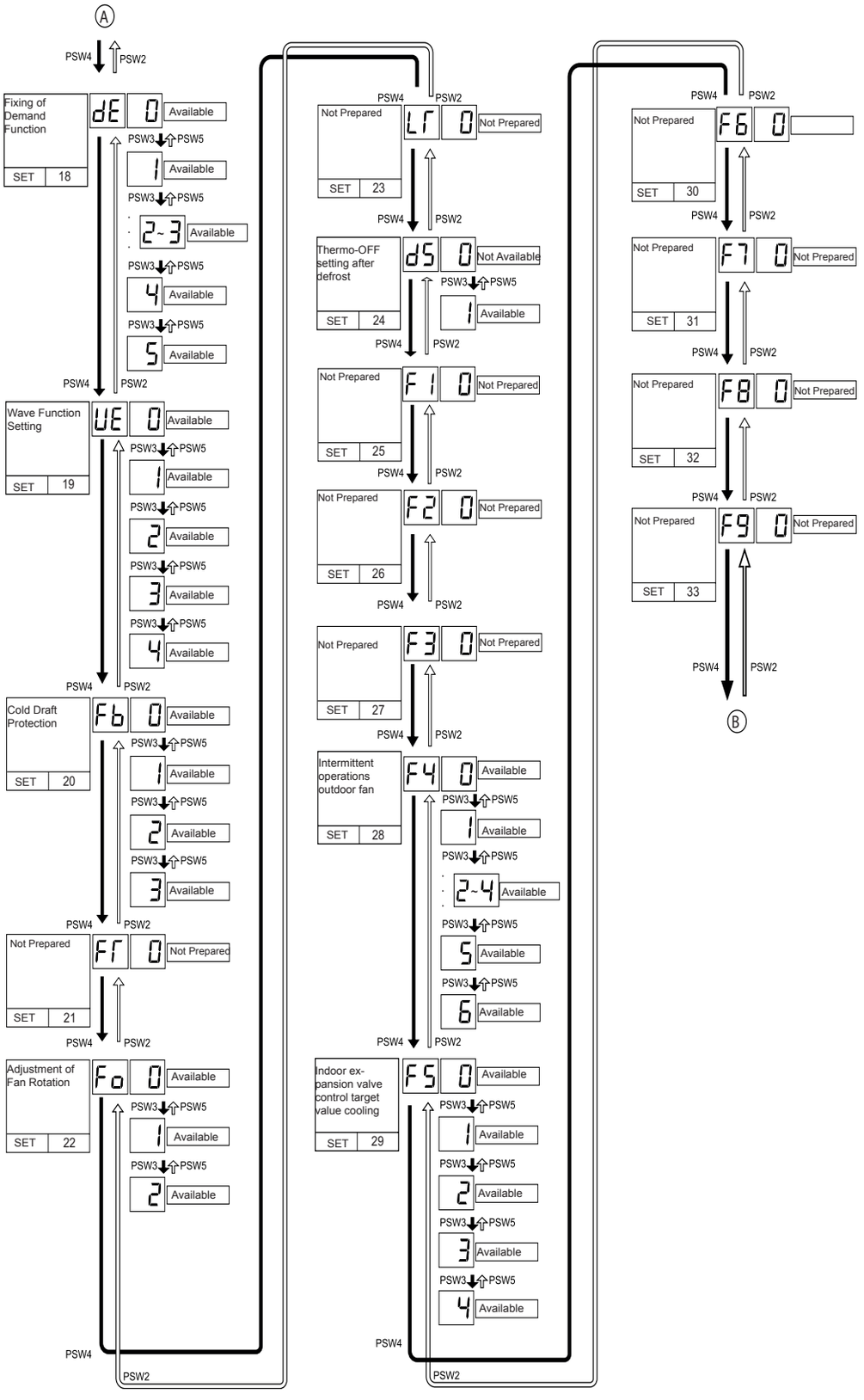
3 End of setting:
- Press PSW1 for more than 3 seconds. The display indication change to normal indication.
- Turn OFF DSW4-#4.

NOTE

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

6.3.1 Function Setting from the outdoor unit PCB




A
PSW4
PSW2
Fixing of Demand Function
SET 18
dE 0 Available
PSW3 PSW5
1 Available
2~3 Available
4 Available
5 Available
Wave Function Setting
SET 19
UE 0 Available
1 Available
2 Available
3 Available
4 Available
Cold Draft Protection
SET 20
Fb 0 Available
1 Available
2 Available
3 Available
Not Prepared
SET 21
Fr 0 Not Prepared
Adjustment of Fan Rotation
SET 22
Fo 0 Available
1 Available
2 Available
Not Prepared
SET 23
LR 0 Not Prepared
Thermo-OFF setting after defrost
SET 24
dS 0 Not Available
1 Available
Not Prepared
SET 25
F1 0 Not Prepared
Not Prepared
SET 26
F2 0 Not Prepared
Not Prepared
SET 27
F3 0 Not Prepared
Intermittent operations outdoor fan
SET 28
F4 0 Available
1 Available
2~4 Available
5 Available
6 Available
Indoor ex-pansion valve control target value cooling
SET 29
F5 0 Available
1 Available
2 Available
3 Available
4 Available
Not Prepared
SET 30
F6 0
Not Prepared
SET 31
F7 0 Not Prepared
Not Prepared
SET 32
F8 0 Not Prepared
Not Prepared
SET 33
F9 0 Not Prepared
B

Function setting

No.	Setting item	7-segment display		Contents
		SEG2	SEG1	
1	Indoor unit fan control during the Thermo-OFF in heating mode	FA	00	No setting
			01	Indoor fan forced ON and OFF (2 minutes ON / 6 minutes OFF)
			02	Indoor fan forced ON and OFF (2 minutes ON / 13 minutes OFF)
			03	Indoor fan forced ON and OFF (2 minutes ON / 28 minutes OFF)
			04	Indoor fan STOP
2	Night-shift (low noise)	ni	00	No setting
			01	Setting of night-shift
3	Cancellation of the outdoor ambient temperature limit.	GS	00	No setting
			01	For heating
			02	For cooling
			03	For cooling/heating
4	Defrost for cold area (change in the defrost condition)	Jo	00	No setting
			01	Defrost operation condition 2
5	SLo (fan speed) Defrost setting	bJ	00	Stopping the Indoor unit fan when the heating operation is turned on during the defrost operation
			01	Indoor unit SLo fan operation during the defrost operation
			02	Indoor unit SLo fan operation when the heating operation is activated
			03	Fan operation when the heating operation is activated/Operation of the indoor unit SLo fan during defrost operation
6	Cancellation of the hot start	H□	00	Hot start available
			01	Cancellation of the hot start
7	Priority capacity mode	nU	00	No setting
			01	Change in the maximum frequency limit value
			02	Change in the current limit value
			03	Change in the maximum frequency limit value and the current limit value
8	Target value of the compressor frequency for cooling	Hc	00	Initial setting (Targeted value of the Ps evaporating temperature 8 °C)
			01	Targeted value (2 °C)
			02	Targeted value (3 °C)
			03	Targeted value (4 °C)
			04	Targeted value (5 °C)
			05	Targeted value (6 °C)
			06	Targeted value (7 °C)
			07	Targeted value (9 °C)
			08	Targeted value (10 °C)
			09	Targeted value (11 °C)
			10	Targeted value (12 °C)
			11	Targeted value (13 °C)
			12	Targeted value (14 °C)
9	Target value of the compressor frequency for heating	Hh	00	Initial setting (Targeted value of the Ps 2.65 MPa)
			01	Targeted value (2.50 MPa)
			02	Targeted value (2.55 MPa)
			03	Targeted value (2.60 MPa)
			04	Targeted value (2.62 MPa)
			05	Targeted value (2.68 MPa)
			06	Targeted value (2.70 MPa)
			07	Targeted value (2.75 MPa)

No.	Setting item	7-segment display		Contents
		SEG2	SEG1	
10	Target value of the Indoor unit expansion valve control for cooling	SC	00	Initial setting (Targeted value of the SH +5 °C)
			01	SH targeted value 7
			02	SH targeted value 6
			03	SH targeted value 4
			04	SH targeted value 3
11	Target value of the Indoor unit expansion valve control for heating	SH	00	Initial setting (Target value of the SC +5 °C)
			01	SC targeted value 11
			02	SC targeted value 8
			03	SC targeted value 2
			04	SC targeted value -1
12	Indoor expansion valve opening change for stoppage indoor unit in heating mode	Si	00	Initial setting (stoppage unit expansion valve opening) 0.8~2.0 HP: 100~200 pulses, 2.3 or over: 200~300 pulses
			01	Opening of the expansion valve: 150~325 pulses
			02	Opening of the expansion valve (0.8-2.0) HP: 175 pulses, 2.3 HP or greater: 300 pulses
			03	Opening of the expansion valve (0.8-2.0) HP: 100 pulses, 2.3 HP or greater: 150 pulses
			04	Opening of the expansion valve (0.8-2.0) HP: 90 pulses, 2.3 HP or greater: 100 pulses
			05	Opening of the expansion valve (0.8-2.0) HP: 40 pulses, 2.3 HP or greater: 40 pulses
13	Indoor expansion valve opening change for Thermo-OFF indoor unit in heating mode	So	00	Thermo-OFF unit expansion valve opening (150~325 pulses)
			01	Opening of the expansion valve (0.8-2.0) HP: 175 pulses, 2.3 HP or greater: 300 pulses
			02	Opening of the expansion valve (0.8-2.0) HP: 100 pulses, 2.3 HP or greater: 150 pulses
14	Indoor expansion valve initial opening of Thermo-ON indoor unit in heating mode	ci	00	Initial setting (300~650 pulses)
			01	2000 pulses
			02	1400 pulses
			03	1000 pulses
			04	600 pulses
15	Fine adjustment of indoor expansion valve initial opening in cooling mode (initial opening)	cb	00	Initial setting
			01	Initial opening in cooling operation -2%
			02	Initial opening in cooling operation +1%
			03	Initial opening in cooling operation +3%
			04	Initial opening in cooling operation +5%
16	Fine adjustment of indoor expansion valve initial opening in heating mode (initial opening)	ch	00	Initial setting
			01	Initial opening in heating operation -2%
			02	Initial opening in heating operation +1%
			03	Initial opening in heating operation +3%
			04	Initial opening in heating operation +5%

No.	Setting item	7-segment display		Contents
		SEG2	SEG1	
17	Low noise setting (in the case of low noise setting, the working range in cooling/heating will be restricted)	db	00	Initial setting
			01	Maximum fan rotation limit 20 steps
			02	Maximum fan rotation limit 18 steps
			03	Maximum fan rotation limit 16 steps
			04	Frequency limit 1
			05	Frequency limit 2
			06	Frequency limit 3
			07	operating sound value, catalogue value -2 dB (A)
			08	operating sound value, catalogue value -5 dB (A)
			09	operating sound value, catalogue value -8 dB (A)
18	Demand function setting	dE	00	Without demand control
			01	Demand control 40%
			02	Demand control 60%
			03	Demand control 70%
			04	Demand control 80%
			05	Demand control 100%
19	Wave function setting	UE	00	Without wave function
			01	Minimum limit 40%
			02	Minimum limit 60%
			03	Minimum limit 70%
			04	Minimum limit 80%
20	Cold draft protection	Fb	00	Initial setting
			01	Outlet temperature ≥ 10 °C
			02	Outlet temperature ≥ 12 °C
			03	Outlet temperature ≥ 14 °C
21	Not prepared	F□	00	–
22	Fan rotation adjustment (to prevent humming noises in multiple installation)	Fo	00	Initial setting
			01	Change of fan rotation -15 rpm
			02	Change of fan rotation -30 rpm
23	Not prepared	L□	00	–
24	Thermo-OFF setting for outdoor unit after defrosting operation	d5	00	No setting
			01	Thermo-OFF stoppage setting for outdoor unit after defrosting operation
25	Not prepared	F1	00	–
26	Not prepared	F2	00	–
27	Not prepared	F3	00	–
28	Intermittent operations of outdoor fan motor	F4	00	No intermittent operation
			01	Set outdoor temperature ≤ 3 ºC
			02	Set outdoor temperature ≤ 0 ºC
			03	Set outdoor temperature ≤ 1 ºC
			04	Set outdoor temperature ≤ 2 ºC
			05	Set outdoor temperature ≤ 4 ºC
			06	Set outdoor temperature ≤ 5 ºC
29	Indoor expansion valve control target value for cooling (only for RCI-FSN3 series)	f5	00	Initial tager value (SH target value 5 ºC)
			01	SH target value 4 ºC
			02	SH target value 3 ºC
			03	SH target value 2 ºC
			04	SH target value 1 ºC

No.	Setting item	7-segment display		Contents
		SEG2	SEG1	
30	Not prepared	F6	00	–
31	Not prepared	f7	00	–
32	Not prepared	f8	00	–
33	Not prepared	f9	00	–

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

Example:

1

Item		SEG2	SEG1	SET
1	Indoor unit fan control during the Thermo-OFF in heating mode	FA	0	
2	Night-Shift (low noise)	n1	0	
3	Cancellation of outdoor ambient temperature limit	GS	0	
4	Defrost for cold area (change in the defrost condition)	do	0	
5	SLo (Fan Speed) Defrost setting	bU	0	
6	Cancellation of hot start	HF	0	
7	Priority capacity mode	nU	0	
8	Target value of the compressor frequency for cooling	Hc	0	
9	Target value of the compressor frequency for heating	HH	0	
10	Target value of the Indoor unit expansion valve control for cooling	SC	0	
11	Target value of the Indoor unit expansion valve control for heating	SH	0	
12	Indoor expansion valve opening change for stoppage indoor unit in heating mode	S1	0	
13	Indoor expansion valve opening change for Thermo-OFF indoor unit in heating mode	So	0	
14	Indoor expansion valve initial opening of Thermo-ON indoor unit in heating mode	c1	0	
15	Fine adjustment of indoor expansion valve initial opening in cooling mode (initial opening)	cb	0	
16	Fine adjustment of indoor expansion valve initial opening in heating mode (initial opening)	ch	0	
17	Low noise setting (in the case of low noise setting, the working range in cooling/heating will be restricted)	db	0	
18	Demand function setting	dE	0	
19	Wave Function Setting	UE	0	
20	Cold draft protection	Fb	0	
21	Not Prepared	FF	0	
22	Fan rotation adjustment (to prevent humming noises in multiple installation)	Fo	0	

Item		SEG2	SEG1	SET
23	Not Prepared	LF	0	
24	Thermo-OFF setting for outdoor unit after defrosting operation	dS	0	
25	Not Prepared	F1	0	
26	Not Prepared	F2	0	
27	Not Prepared	f3	0	
28	Intermittent operations of outdoor fan motor	f4	0	
29	Indoor expansion valve control target value for cooling (only for RCI-FSN3 series)	f5	0	
30	Not Prepared	f6	0	
31	Not Prepared	f7	0	
32	Not Prepared	f8	0	
33	Not Prepared	f9	0	

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

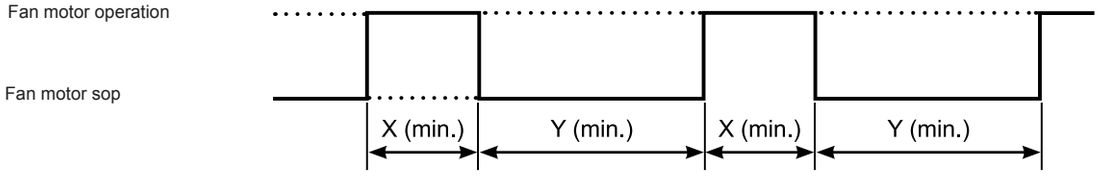
1 Press PSW3 and select the setting of the condition “0” to “4” of the indoor unit fan control during the Thermo-OFF in heating mode “FA”.

Normally, the fan speed is changed to “LOW” at heating Thermo-OFF. (There is a case that the room temperature is too high at the heating Thermo-OFF.) However, the indoor fan motor is operated at “LOW” and stopped repeatedly by setting this function.

NOTE

When the compressor is stopped, the indoor fan motor operates at “LOW” speed continuously.

The action when the indoor fan motor operates at the circulator function indicated as follows.



Contents of Function Setting Item "FA"

	Contents of function setting item “FA”				
	0	1	2	3	4
Indoor Fan Motor “LOW” Operation Time X (min.)	(Continuous Operation)	2	2	2	0
Indoor Fan Motor Stop Time Y (min.)	0	6	13	28	Stopped

NOTE

In case using the function setting No.2 to 4, install the remote sensor (THM-R2A: Optional). Because the time period of stopping the indoor fan becomes longer, the detected value of the suction air thermistor for indoor unit becomes high, and it may take time to Thermo-ON.

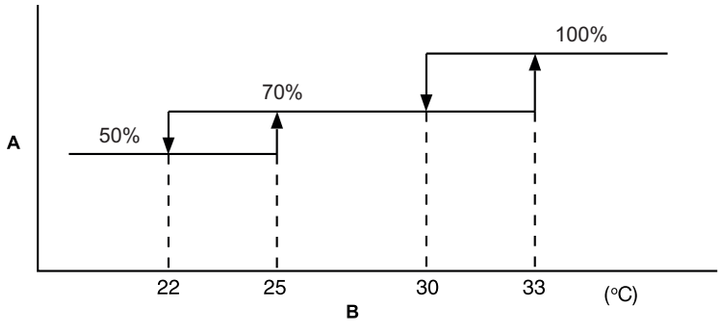
6.3.3 Night-shift (low noise)

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

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

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

1 Outdoor fan (example):



A	Maximum rotation (Rotation ratio)
B	Outdoor temperature

NOTE

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

2 Frequency range (cooling operation)

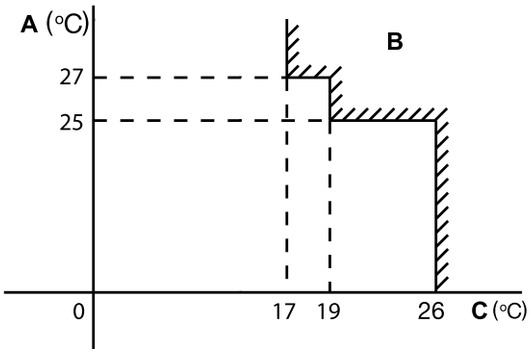
When Night Shift is not Set ni=0				When Night Shift is Set ni=1			
Outdoor unit capacity (HP)	Minimum frequency (Hz)	Maximum frequency (Hz)	Conditions	Outdoor unit capacity (HP)	Minimum frequency (Hz)	Maximum frequency (Hz)	Conditions
5	15	45	Except the conditions on the right	5	15	40	-
6		50		6		40	
8		75		8		60	
10		90		10		60	
12		90		12		60	

6.3.4 Cancellation of the outdoor ambient temperature limit

- Press PSW3 and select the setting condition “0” to “3” at the cancellation of outdoor ambient temperature limit of 05. Then this function can be set.
- The heating operation is continued under a high outdoor temperature or the cooling operation is continued under a low temperature.
- The limitation of the outdoor unit temperature area for heating mode is shown in the picture.

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

Heating operation



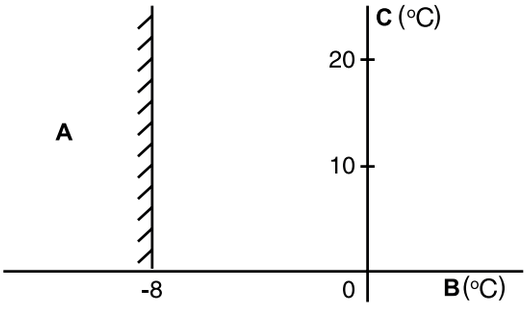
A	Indoor suction air temperature (°C)
B	Operation stoppage area
C	Outdoor temperature (°C)

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

NOTE

- *When the outdoor ambient temperature limit for heating operation is cancelled, the operation may stop due to increasing high pressure since the protection control is not cancelled.*

Cooling operation



A	Stoppage function area
B	Indoor suction air temperature (°C)
C	Outdoor temperature (°C)

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

NOTE

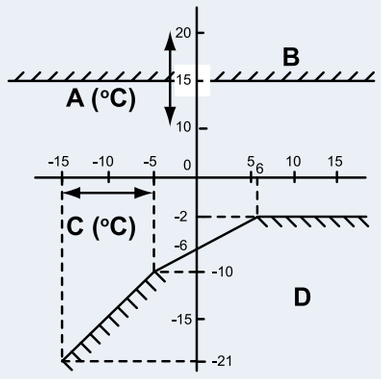
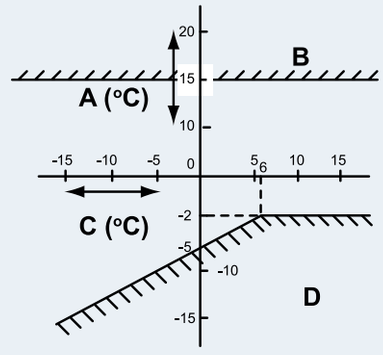
- *When the outdoor ambient temperature limit for cooling operation is cancelled, the operation may stop due to decreasing low pressure since the protection control is not cancelled.*

NOTE

- *If this function is set and the outdoor unit operates in the operation stoppage area shown in the above figure for a long time, the outdoor unit may be damaged since protection control is canceled.*

6.3.5 Defrost for cold area (change of defrost condition)

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

Setting condition	Standard specifications	Cold area specifications
	When change of defrost condition is not set	When change of defrost condition is set
Temperature conditions under defrosting operation		
	A: Outdoor evaporation temperature (pipe) (ºC) B: Defrost operation in the stop area. C: Outdoor temperature (ºC) D: Defrost operation in the start area.	

6.3.6 SLo defrost setting

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

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

Setting condition	Indoor fan operation
0	Default setting
1	Indoor fan SLo during defrost operation
2	Indoor fan SLo when heating operation starts
3	Indoor fan SLo when heating operation starts Indoor fan SLo during defrost operation

6.3.7 Priority capacity mode setting

Press PSW3 and select the setting condition “0” to “3” at the capacity-focused mode setting “nU”. By setting this function, the target frequency and current limit of the compressor are set higher.

NOTE

Do not use the setting condition “2” and “3” unless the power source line is of sufficient ampacity, because the target frequency and current limit of the compressor during the operation are set higher.

Setting condition	Compressor frequency and current operation
0	Default setting
1	Compressor frequency limit control
2	Current limit control
3	Compressor frequency limit and current limit control

6.3.8 Low noise setting

Press PSW3 and select the setting condition “0” to “9” at the low noise setting “db” to reduce the compressor frequency and the outdoor fan motor rotation frequency.

NOTE

- *By setting this function, the compressor frequency and the outdoor fan motor rotation frequency are forcibly reduced and so the outdoor unit capacity decreases and the unit operation range is limited.*
- *The operating noise values for a single unit are shown below. These are targeted values and so the actual values can temporarily be higher depending on operation conditions. The operating noise values for combination units are higher than the values below.*

Setting condition	Compressor frequency limit	Outdoor fan motor step limit	Operating noise (targeted value)	Outdoor unit capacity (to specification)
0	Not changed	Not changed	Catalog value	100%
1	Not changed	20 steps	-	-
2	Not changed	18 steps	-	-
3	Not changed	16 steps	-	-
4	80%	Not changed	-	-
5	60%	Not changed	-	-
6	40%	Not changed	-	-
7	80%	20 steps	Setting 1: 55 dB(A) *	80%
8	60%	18 steps	Setting 2: 50 dB(A)	60%
9	40%	16 steps	Setting 3: 45 dB(A)	40%

NOTE

** For RAS-(5/6)FSXNH(E), target value is 52 dB.*

6.3.9 Demand function setting

Press PSW3 and select the settings for conditions “0” to “5” to set the demand function “dE”.

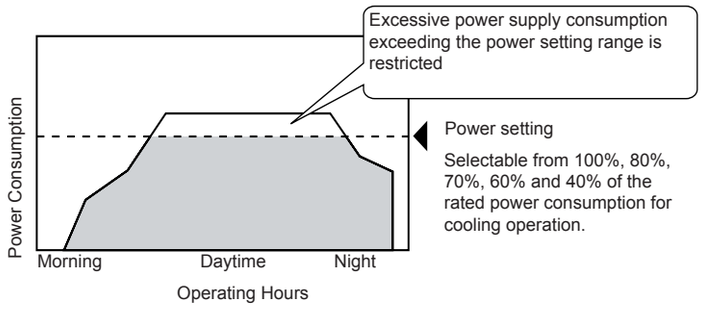
NOTE

In the case that the demand current control by external input is set and the external input signal is available,this function is not available even when the demand current control by external input signal is performed.

Setting condition	Demand running current control
0	Not available (default setting)
1	40%
2	60%
3	70%
4	80%
5	100%

Demand control

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



NOTE

- *The demand current control (%) is value criterion. The value used for this control is calculated from the current, and therefore is different from the value indicated by a wattmeter. If it is required that the maximum power consumption is managed precisely, a field-supplied demand controller should be used.*
- *The actual value may temporarily be higher than the indicated value shown above depending on the operating control conditions such as protection control.*

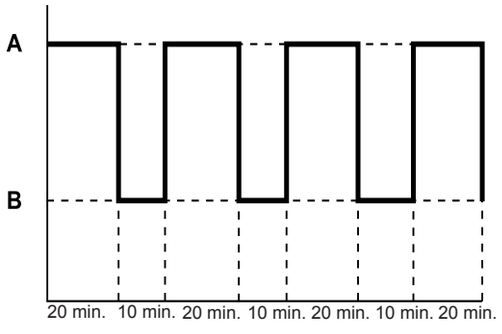
6.3.10 Wave function setting

Press PSW3 and select the settings condition “0” to “4” to set wave function setting “UE” .

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

NOTE

In the case that the demand current control by external input is set and the external input signal is available,this function is not available even when the demand current control by external input signal is performed.



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

Setting condition	Current setting
0	Not available (default setting)
1	40%
2	60%
3	70%
4	80%

NOTE

The current limit value is targeted value. The actual current value may temporarily be higher than the value shown in the table above depending on the operating control condition.

6.3.11 Cold draft protection

Press PSW3 and select the setting condition “0” to “3” to set the cold draft protection “Fb” .

When the indoor unit discharge air temperature drops falls down at cooling operation, the outdoor unit fan stops and the compressor frequency decreases to prevent a drop in discharge air temperature. If the outlet temperature decreases and the temperature is less than Thermo-OFF condition even after the compressor frequency decreases, the indoor unit becomes Thermo-OFF condition. (When Thermo-OFF is activated under this condition, the operation will be restarted after 3 minutes).

Setting condition	Outlet temperature	
	Target value	at Thermo-OFF
0	-	-
1	10 ºC	7 ºC
2	12 ºC	9 ºC
3	14 ºC	11 ºC

6.3.12 Adjustment of fan rotation

Press PSW3 and select the setting condition “0” or “2” to set the fan rotation setting “Fo” .

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

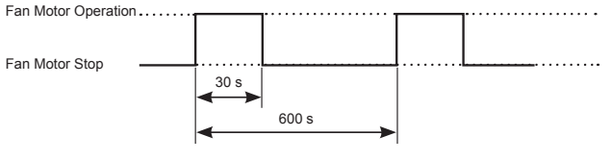
Setting condition	Adjustment of fan rotation
0	Not available (default setting)
1	-15 rpm
2	-13 rpm

6.3.13 Outdoor fan motor intermitted operation setting

Press PSW3 and select the setting condition “0” to “6” to set the outdoor fan intermitted operation setting “F4” (auxiliary function) to protect the outdoor fan motor from snow.

When the outdoor temperature reaches the setting temperature, all the outdoor fan motors start intermitted operation. When the outdoor temperature is at least 5 ºC higher than the setting temperature, the outdoor fan motors stop operating.

If the compressor restarts operating, the outdoor fan motors will be restored to normal operation.



Setting condition	Adjustment of fan intermitted operation
0	No intermitted operation
1	Set outdoor temperature ≤ 3 ºC
2	Set outdoor temperature ≤ 0 ºC
3	Set outdoor temperature ≤ 1 ºC
4	Set outdoor temperature ≤ 2 ºC
5	Set outdoor temperature ≤ 4 ºC
6	Set outdoor temperature ≤ 5 ºC

NOTE

- *This is an auxiliary function to protect the unit from snow. In snowy regions, make sure to protect the unit with a snow-prevention roof, fence or snow-prevention hood (Field-Supplied), etc.. Otherwise, abnormal vibrations due to imbalanced propeller fan will be caused .*
- *If the fan motor or fan controller fail during the outdoor fan motor start/stop operation, stop all the outdoor fan motor to suspend the operation. Check the alarm code and deal properly with the failure next time the compressor is operated.*

DANGER

With this setting, the outdoor fan can operate even while the outdoor unit (compressor) stops.

Display a notice to that effect on a readily visible part of the unit body, in order to avoid injuries caused by an unintended outdoor fan operation.

7. Test run

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7.1 Preliminary checks

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

DANGER

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

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

CAUTION

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

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

NOTE

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

7.2 Test run

7.2.1 Before the test run

CAUTION

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

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

Check items		Contents
1	Damage	is the unit or its internal parts damaged?
2	Fan motor	Is the fan runner installed in the centre of the casing? Is the fan motor installed outside the casing? (The fan motor must not make contact with the casing.)
3	Screws	Have the screws loosened due to vibration during transport? Check that the screws are firmly fastened during the installation, especially the screws for the electrical wiring.
4	Refrigerant leak	Check that no refrigerant leaks are present. The pipe torque part (flare part) may be loosened due to vibration during transport.
5	Setting the DSW	Check that the DSW setting is the same as before shipment. RSW, DSW and LED functions, see *"11.7 RSW, DSWs and LEDs functions"*.
6	Insulation *	Measure the resistance between electrical components terminal and ground using a multimeter. It is normal for the resistance to be 1 MΩ and greater. If it is 1 MΩ or less, do not start-up the unit due to insulation failures in the electrical parts. Do not apply power to the operating line terminal board (The control PCB may be damaged) .
7	Stop valve completely open	Before the test run, check that the outdoor unit stop valve is completely open.
8	Power phases	Operation is not available with an incorrect power phase or absence of a phase. • Alarm "05" will be displayed on the remote control LCD screen. • Alarm "05" will be displayed on the outdoor unit 7 segment display. Check the power phase in accordance with the caution label located near the terminal board of the outdoor unit or on the back side of the service cover.
9	Turn ON crankcase heater **	Once items 1 to 8 have been completed, turn ON power supply to the outdoor unit. The electricity is provided to the crankcase heater to heat the compressor. The compressor may be damaged if not pre-heated. Therefore, the compressor must be activated after the power supply is turned ON for at least 12 hours.
10	Indoor and outdoor temperature	**To be used with cooling and heating operation** Is the indoor temperature 27 °C DB or lower during the heating operation? (The heating operation may not be operated due to the activation of the operating overload prevention with an ambient temperature of 19 °C or over). In order to carry out the operational test, set the test mode via the remote control.

NOTE

**** Insulation resistance***

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

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

Before connecting the circuit breaker, check the rated capacity.

***** Stoppage of the compressor operation***

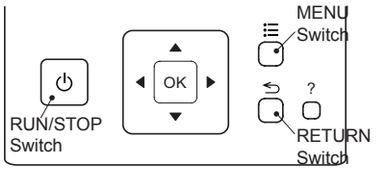
The compressor may not be available for a maximum time period of 4 hours if the power supply is not previously turned ON. At this time, stoppage code (d1-22) is displayed on the LCD screen of the remote control and the forced Thermo-OFF function is started.

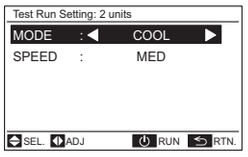
If compressor operation is required, turn ON the power supply to the outdoor unit, wait 30 seconds and press PSW5 on PCB1 of the outdoor unit for at least 3 seconds. The forced Thermo-OFF function (d1-22) will be cancelled and the operation of the compressor will be available.

7.2.2 Test run using the PC-ART remote control switch (example)

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

- Depress the “MENU” and the “RETURN” switches simultaneously for more than 3 seconds.
- Select “Test Run” by pressing “▲▼ ” and press “OK”. The test run screen will be displayed.





NOTE

For other remote control switches such as PC-LH3A, PC-ARH, refer to “Installation Manual” of each remote control switch

Normal

If “TEST RUN” and the total number of the units connected to the remote control switch (for example “2 units”) are indicated on the remote control switch, the connection of remote control cable is correct.

- The total number of indoor units connected is indicated on the LCD (Liquid crystal display).
- If the indicated number is not equal to the actual number of connected indoor units, the auto-address function is not performed correctly due to incorrect wiring, the electric noise, etc.Turn OFF the power supply, and correct the wiring after checking the following points (Do not repeat turning ON and OFF within 10 seconds.)

  a. The power supply for the indoor unit is NOT turned ON or the incorrect wiring.

  b. Loose connection between indoor units or remote control switch

  c. Incorrect setting of indoor unit address (the indoor unit address is overlapped.)

Proceed to step 4.

NOTE

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

Abnormal

- If no indication or “00” appears or the number of the units indicated is less than the actual number of the units, there is an abnormality.

3 Checking procedure for abnormalities

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

Back to step 1 after checking.

4 Depress “RUN/STOP” switch.

Normal

The test run operation will be started. The operation mode, the air flow volume, the air flow direction and the test run time can be set on the test run screen. Select the item by pressing “▲▼◄►”. The test run will be finished by pressing “RETURN” switch during the stoppage or “RUN/STOP” switch during the operation.

Abnormal

If the units do not start or the operation lamp on the remote control switch flashes, there is an abnormality.

5 Checking procedure for abnormalities

Remote control switch indication	Unit condition	Fault	Inspection points after the power source OFF
The operation lamp flashes. (1 time/1 sec.) and the Unit No. and Alarm Code “03” flash.	The unit does not start.	The power source is not turned ON.	-
		The connecting wires of operating line are incorrect or loosened.	1. Connecting Order of each Terminal Board. The fuse on the PCB may be blown out due to miswiring. (Can be recovered only once by the DSW on the PCB). (*) 2. Screw fastening of each terminal board. 3. Connecting order of power line between indoor units and outdoor unit.
The operation lamp flashes. (1 time/2 sec.)	The unit does not start.	The connection of remote control cable is incorrect.	
Other alarm codes or indications than those above (Refer to the alarm code table.)	The unit does not start, or starts once and then stops.	The connection of the thermistors or other connectors are incorrect. Tripping of protector exists, or else.	Check the unit by the alarm code table in the service manual (by authorized service persons only).
The operation lamp flashes. (1 time/1 sec.) And the Unit No. 00. Alarm Code dd and Unit Code E.00 flash.	The unit does not start.	The connecting wires of operating line are incorrect or loosened.	Check the unit by the alarm code table in the service manual (by authorized service persons only).

(*) Procedures for recovery when transmitting circuit fuse is blown out:

a. Correct the wiring for the terminal board.

b. Setting positions of the model code are shown below.

Indoor unit PCB	Outdoor unit PCB
DSW7	DSW10
	

Back to step 1 after checking.

7.2.3 Test run from the outdoor unit

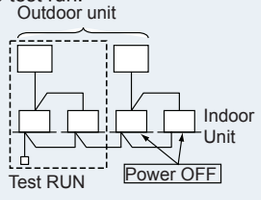
The procedure of test run from the outdoor unit is indicated below. The setting of this DIP switch is available with power source ON.

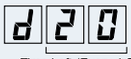
Setting of DIP switch (before shipment):

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

DANGER

- *Do not touch any other electrical component part when operating switches on the the PCB.*
- *Do not attach or detach service cover when the power source for the outdoor unit is supplied and the outdoor unit is operated.*
- *Turn all the dip switches of DSW4 OFF when the test run operation is completed.*

	Setting the DSW	Operation	Remarks
Test run	1. Setting the operation mode.  Cooling: Set DSW4-2 OFF  Heating:. Set DSW4-2 ON 2. Start of the test run. Set DSW4-1 ON and the operation starts after approximately 20 seconds.  NOTE *In the heating mode, leave DSW4-2 in the ON position.*	1. The indoor unit automatically starts operating when the test run of the outdoor unit is set. 2. The ON/OFF can be performed from the remote control or DSW4-1 on the outdoor unit. 3. The operation continues for 2 hours without Thermo-OFF.	Note that the indoor units operate in conjunction with the test run operation of the outdoor unit. If 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 of the outdoor unit is not cancelled. Check that DSW4-1 of the outdoor unit PCB is turned OFF. In the case that several indoor units are connected with one remote control, perform the test run operation individually for each refrigerant system one by one. Then, make sure to turn the power source OFF for the indoor units in other refrigerant systems not to operate test run.  The setting of DSW4 is not required for the test run from the remote control switch.
Manual OFF of the compressor	1. Setting. Compressor manual OFF set DSW4-4 to the ON position. 2. Reset. Compressor ON: set DSW4-4 in the OFF position. 	1. When DSW4-4 is ON during the compressor operation, the compressor stops operating immediatly and the indoor unit is under the condition of Thermo-OFF. 2. When DSW4-4 is OFF, the compressor starts to operating after the cancellation of 3-minutes guard.	Do not repeat the compressor ON/OFF with frequency.

	Setting the DSW	Operation	Remarks
Manual defrost	1. Manual defrost operation. Press PSW5 for more than 3 seconds during the heating operation, and the defrosting operation is started after 2 minutes. This function is not available within 5 minutes after starting heating operation. 2. Manual defrost operation completion. Defrosting operation automatically ends and the heating operation restarts.	1. Defrost operation is available regardless of the frost condition and total time of the heating operation. 2. Defrost operation is not performed when the temperature of outdoor unit heat exchanger is higher than 10 °C, high pressure is higher than 3.3 MPa or the unit is Thermo-OFF .	Do not repeat defrosting operation frequently. When manual defrosting operation is accepted by PSW5, the time left before starting defrosting operation is indicated on the 7-segment indicator on the PCB.  Time Left (Every 4 Seconds)

When the test run operation is completed, turn all the switches of DSW4 OFF.

1 If the remote control switch is set to a different mode, the test run function will not start. In this case, perform the following actions before the test run.

- Remote Control Switch: STOP
- Central Station: STOP and Remote Control Switch is available mode.
- COOL/HEAT Changeover Switch: Connector (CN17) of outdoor unit PCB is opened.
- During the test run mode, do not control the remote control switch, the central station and cool/heat changeover switch. Otherwise, the operation mode will be changed or the test run will be ended. If necessary, control them after the test run is completed.

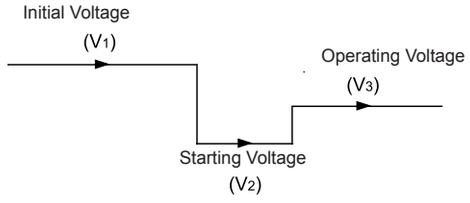
2 If an alarm code is indicated during the test run, reset the system by turning the main power supply off then back on. The system should then operate.

7.2.4 Checking at test run

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

2 Power supply voltage. Check the power supply. If the power supply is abnormal, contact the electric power company. Usually, voltage drop will occur when starting the operation as shown in the figure (V_2).

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



◆ **Normal power supply voltage range**

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

3 Normal operating pressure. Normal operating suction pressure is 0.2 at 1.1 MPa and the normal operating discharge pressure is 1.0 at 3.5 MPa when the refrigerant charge quantity is correct. Check the operating pressure in the test run mode.

4 High pressure switch

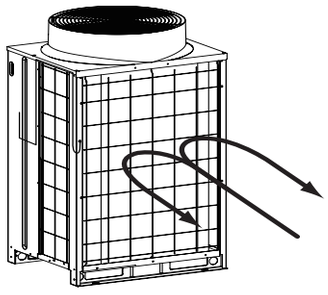
Check the operating pressure of the high pressure switch in the following table.

Refrigerant	Operating pressure
R410A	4.15 MPa

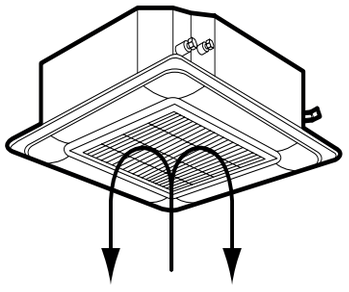
5 High pressure increase retry (protection control)

a. The high pressure will increase when the following procedure is performed.

Cover the air inlet of the outdoor unit during the cooling operation



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



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

NOTE

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

7.2.5 Refrigerant cycle checklist

CHECKLIST ON TEST OPERATION		
CUSTOMER: _____	INSTALLER: _____ _____	DATE: _____
OUTDOOR UNIT MODEL: _____	OUTDOOR UNIT SERIAL NO.: _____	INSPECTOR: _____

Indoor unit model							
Indoor unit serial number							

Piping length: _____ m	Additional refrigerant charge: _____ kg

1 General

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

2 Refrigerant cycle

a. Operation (cooling/heating)

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

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

No.	Check item	Result
1	Check the operating data after it has been operating for 20 minutes.	
2	Check Pd and Td. IsTd-SH between 15 and 45 ºC?	
3	Is Ps between 0.15 and 1.3 MPa?	
4	Is Pd between 1.0 and 3.6 MPa? (If the outdoor temperature is high, Pd becomes high).	

NOTE

Underlined ____ indicates a checking item.

3 Check item after the data sample

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

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

7

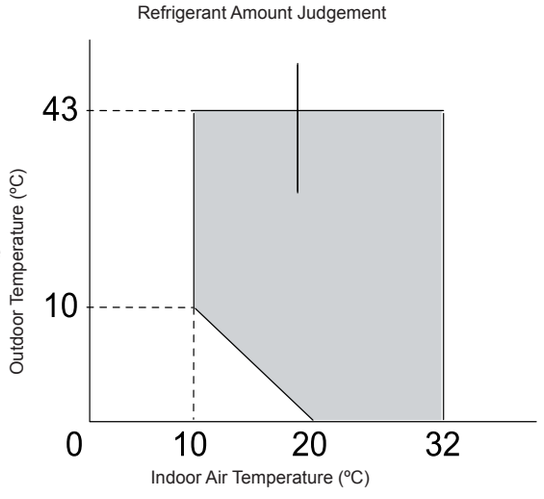
b. Heating operation (this is applicable when the outdoor temperature is higher than 0 °C).

No.	Check item	Standard	Causes	Result
1	Are oE1 and oE2 (opening of the outdoor unit expansion valves) abnormally low or high when TdSH is between 15 and 45 degrees?	—	• Low: excessive refrigerant. • High: insufficient refrigerant.	
2	Is Pd between “1.6” and “3.6”? (Pd is high when the indoor temperature is high).	1.6 - 3.6	• Low: solenoid valve SVA leak . • High: excessive pressure loss in the gas pipe.	
3	Is Ps between "0.15" and "1.3"?	0.15 - 1.3	• Low: outdoor unit short-circuit. • low/high: outdoor unit fan motor failure, fan module failure or outdoor unit ambient temperature thermistor failure.	
4	Is the difference in temperature between indoor units* more than 10 °C when iE (indoor unit expansion valve) is "100? * The difference in temperature between indoor units means the following: b3 (discharge air temperature) -b2 (air inlet temperature) indicated on the remote control by the check mode. However, this is only applicable when b2 (Air inlet temperature) -b1 (setting temperature) is higher than 3 °C.	10 ºC and over	• Failure such as PCB, wiring, indoor unit expansion valve and coil • Excessive pressure loss in the pipe. • Thermistor failure for air discharge	

7.2.6 Automatic judgement system for refrigerant amount

◆ Before refrigerant amount judgment

1 Check the indoor and outdoor temperature in the picture.
2 Calculate the amount of refrigerant for the length of the pipe and add it.

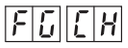


◆ Procedure of refrigerant amount check operation

1 Check all the switches of indoor units are turned OFF.

2 Turn DSW5-4 (PCB of main outdoor unit) ON as shown in the figure. Then, 7-segment display will be indicated as shown below.

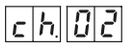
7-segment display



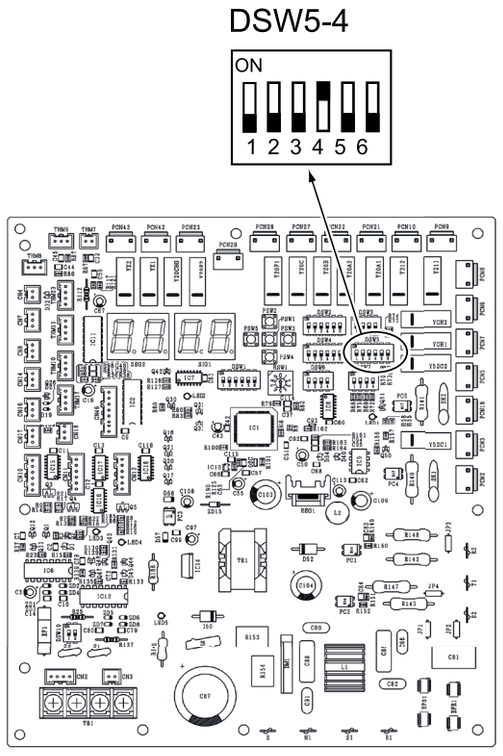
The refrigerant amount judgement is carried out automatically during cooling operation. (This function is NOT available during heating operation.) Before starting, check the indoor and outdoor air temperature.

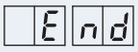
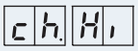
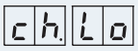
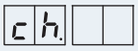
3 Check the 7-segment display and press PSW1. The outdoor fan and compressor will be activated and the 7-segment display will be indicated as shown below.

7-segment display



The judgement takes 30 to 40 minutes. Refer to the table below for the result indications. When the judgement result is excessive refrigerant, insufficient refrigerant or abnormal termination, find out the cause of the abnormality and perform the refrigerant amount check operation again.



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

4 Place DSW5-4 (on PCB1) OFF when the refrigerant amount is sufficient. Wait a maximum of three minutes after placing contact 4 of DSW5 (on PCB1) to the OFF position so that the outdoor unit is ready for operation.

NOTE

During the check, the indication on the 7-segment display may be changed to the protection control code by the activation of the protection control, although this is normal.

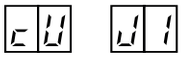
7.2.7 Reset for accumulated operation time of compressor 1-2 (cUJ1-cUJ2)

There are accumulated operation time of compressor after maintenance and after starting operation. The following procedure shows how to reset the accumulated operation time of compressor after maintenance. Perform it for each outdoor unit.

◆ **Procedure**

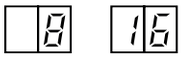
Press PSW1 and PSW3 for 5 seconds while the accumulated operation time of compressor data is displayed. The accumulated operation time of compressor is reset.

◆ **Example of compressor 1**



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

PSW2 ↑↓ PSW3

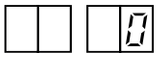


Press PSW1 and PSW3 for 5 seconds while the accumulated operation time is displayed

⇩

The indication will be chaged to "0".

(The accumulated operation time of compressor 1 i es "0")



NOTE

In the case of the combinated units, reset the accumulated operation time is required for each outdoor units.

7.2.8 Test run check list

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

1 Does the indoor unit fan rotation in the correct direction? _____
2 Does the outdoor unit fan rotation in the correct direction? _____
3 Can you hear strange noises in the compressor?
4 Has the unit been operating for at least twenty (20) minutes? _____
5 Check the temperature of the room:

Inlet:	No. 1	DB____ °C WB____ °C	No. 2	DB____ °C WB____ °C	No. 3	DB____ °C WB____ °C	No. 4	DB____ °C WB____ °C
Outlet:		DB____ °C WB____ °C		DB____ °C WB____ °C		DB____ °C WB____ °C		DB____ °C WB____ °C
Inlet:	No. 5	DB____ °C WB____ °C	No. 6	DB____ °C WB____ °C	No. 7	DB____ °C WB____ °C	No. 8	DB____ °C WB____ °C
Outlet:		DB____ °C WB____ °C		DB____ °C WB____ °C		DB____ °C WB____ °C		DB____ °C WB____ °C

6 Check the outdoor ambient temperature:

Inlet	DB _____°C	WB _____°C
Outlet	DB _____°C	WB _____°C

7 Check the temperature of the refrigerant:

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

8 Check the pressure:

Discharge pressure	Pd = _____ MPa
Suction pressure	Ps = _____ MPa

9 Check the voltage:

Rated voltage	_____ V	—	—
Operating voltage	L1–L2 _____ V	L1–L3 _____ V	L2–L3 _____ V
Starting voltage	_____ V	—	—
Phase imbalance	1-(V/Vm) = _____	—	—

10 Check the compressor input running current:

Input	_____ kW
Running current	_____ A

11 Is the refrigerant charge OK? _____
12 Do the operating control devices work correctly? _____
13 Do the safety devices work correctly? _____
14 Has the unit been checked for refrigerant leaks? _____
15 Is the unit clean inside and outside? _____
16 Are all the panels of the unit fastened securely? _____
17 Are the panels of the cabinet fastened so that they do not make any noise? _____
18 Is the filter clean? _____
19 Is the heat exchanger clean? _____
20 Are the stop valves open? _____
21 Does the water flow freely through the drain hose? _____

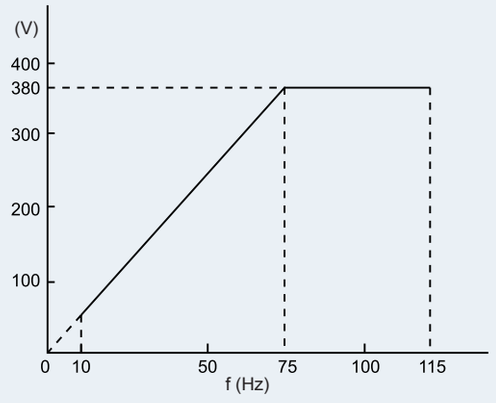
8. Electrical checks of the main parts

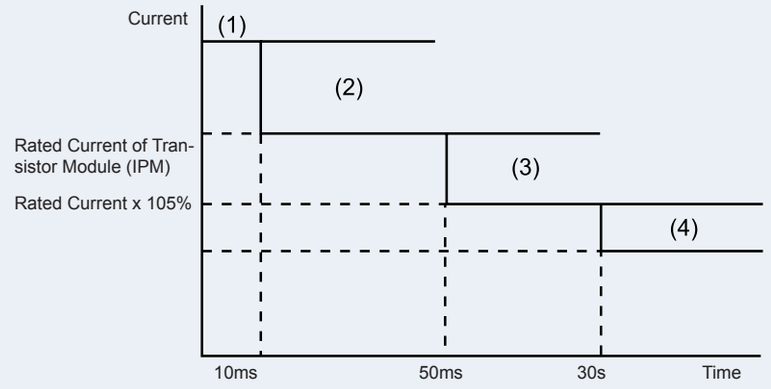
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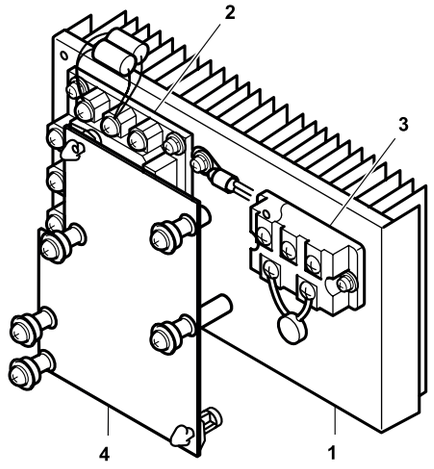
8.1 Inverter

8.1.1 Inverter specifications

Applicable models	RAS-(8-16)FSXN1E
	RAS-(5-12)FSXNH(E)
Applicable power source	3 phase, 400 V ± 10%, 50 Hz
Maximum output voltage	380 - 415 V
Maximum output current	23.5 A
Control method	Vector control PWM (Pulse width modulator)
Output frequency range	20 to 100 Hz
Frequency accuracy	0.01 Hz
Output / characteristics	Conditions: 1. Power source voltage 400 V AC. 2. Without a load (Free output).  **NOTE** *The characteristics are fluctuated due to the current minimize control.*
Soft start and stop	0.125 Hz/s, 0.25 Hz/s, 0.5 Hz/s, 1 Hz/s, 3 Hz/s (5 steps)
Protection function: Excessively high or low inverter voltage	Excessively low voltage in case the DC voltage is lower than 388 V. Excessively high voltage in case the DC voltage is higher than 752 V.
Malfunction in the current sensor	Compressor current stoppage lower than 1.5 A Cause of the malfunction: • Sensor current failure. • Transistor module failure. • Compressor failure. • Disconnected wiring.

Protection function: Overcurrent protection for Inverter	 1. Short-circuit trip of arm (*). 2. Instantaneous overcurrent trip (*). 3. Instantaneous Overcurrent Trip. When detecting current is more than rated current of transistor module, overcurrent is detected. 4. Electronic Thermal Trip. When the current detected by current sensor exceeds 105% of the rated current continuously for 30 seconds or for 3 minutes in total during a 10 minutes period, overcurrent is detected. (*) Internal Protection Transistor Module (IPM).
Protection of Transistor module (IPM)	The transistor module (IPM) has four protection functions to auto-protect itself: 1. Some of the output terminals between “U” and “V”, “V” and “W” , “W” and “U” has short-circuit. 2. Running current reaches the maximum rated current. 3. The abnormal temperature is measured by internal thermistor. 4. Abnormal decrease in control voltage.
Overload control	The overload control with a current that is greater than the rated current X 105%. The overload control release at a current that is smaller than the rated current X 88%.
Fin temperature increase	The unit stops when the IPM temperature is higher than 90 °C.
Earth detection	The unit stops when the compressor is earthing.

8.1.2 Inverter power Unit structure



1	Radiated fin
2	Transistor module
3	Diode module
4	Inverter PCB

8.1.3 Protection function

1 Excessively high or low Inverter voltage

a. Level of detection at 400 V / 50 Hz:

- Excessively low voltage in case the DC voltage is lower than 388 V.
- Excessively high voltage in case the DC voltage is higher than 752 V.

b. Function:

- When a malfunction has been detected, the Inverter compressor stops and transmits the stop cause signal to PCB1.

c. Cancellation of the protection function:

- The stop cause signal transmission is cancelled when remote control switch is off or main power source is cut off.

2 Malfunction in the current sensor

a. Level of detection:

- A malfunction is detected when the operating frequency is 15–18 Hz and the inverter compressor current decreases below 1.5 A.
- The wave height value of running current for the phase positioning is less than 5 A before the compressor is started (at completing the phase positioning).

b. Function:

- When a malfunction has been detected, the Inverter compressor stops and transmits the stop cause signal to PCB1.

c. Cancellation of the protection function:

- The stop cause signal transmission is cancelled when remote control switch is off or main power source is cut off.

3 Inverter overcurrent protection

a. Level of detection:

- Overcurrent is detected when the current sensor detects that the compressor current is higher than the transistor module's (IPM) rated current. (Instantaneous Overcurrent).
- When the current detected by current sensor exceeds 105 % of the rated current continuosly for 30 seconds or for 3 minutes in total during a 10 minutes period, overcurrent is detected. (Electric Thermal Relay).

b. Function:

- When a malfunction has been detected, the Inverter compressor stops and transmits the stop cause signal to PCB1.

c. Cancellation of the protection function:

- The stop cause signal transmission is cancelled when remote control switch is off or main power source is cut off.

4 Transistor module (IPM) protection

a. Level of detection:

- An anomaly is detected when some of the output terminals between “U” and “V”, “V” and “W”, “W” and “U” of the transistor module (IPM) are short-circuited.
- A malfunction is detected when the transistor module (IPM) running current reaches the rated current limit.
- A malfunction is detected when the transistor module (IPM) thermistor measures an abnormal increase in temperature.
- A malfunction is detected when the transistor module (IPM) control voltage detects an abnormal decrease.

b. Function:

- When a malfunction has been detected, the Inverter compressor stops and transmits the stop cause signal to PCB1.

c. Cancellation of the protection function:

- The stop cause signal transmission is cancelled when remote control switch is off or main power source is cut off.

5 Fin temperature increase

a. Level of detection:

- An anomaly is detected when the thermistor's internal temperature increases above 90 °C.

b. Function:

- When a malfunction has been detected, the Inverter compressor stops and transmits the stop cause signal to PCB1.

c. Cancellation of the protection function:

- The stop cause signal transmission is cancelled when remote control switch is off or main power source is cut off.

6 Earth detection

a. Level of detection:

- A malfunction is detected when the terminal U, V, W a compressor earth are short-circuited before the compressor is turned on.
- A malfunction is detected when the transistor module (IPM) output terminals (U, V, W) are short-circuited.

b. Function:

- When a malfunction has been detected, the Inverter compressor stops and transmits the stop cause signal to PCB1.

c. Cancellation of the protection function:

- The stop cause signal transmission is cancelled when remote control switch is off or main power source is cut off.

8.1.4 Overload protection control

1 Level of detection:

- A malfunction is detected when the output current increases above 105% of the maximum output current.

2 Function:

- When the output current increases above 105% of the maximum output current, and the frequency decrease, an overload signal is transmitted sent to PCB1. For 10 seconds after the decrease lower than 88% in output current, the compressor maximum frequency is limited to the specified value. However, if the frequency command is smaller than the maximum value, the operation is carried out as per the command.

3 Cancellation of the protection function:

- After the described operation, is performed for 10 seconds, this control is cancelled.

8.2 Scroll compressor

8.2.1 Reliable mechanism for low vibration and low sound

1 The direction of rotation is definite.
2 The pressure inside the chamber is high pressure and its surface temperature is between 60 °C and 110 °C.

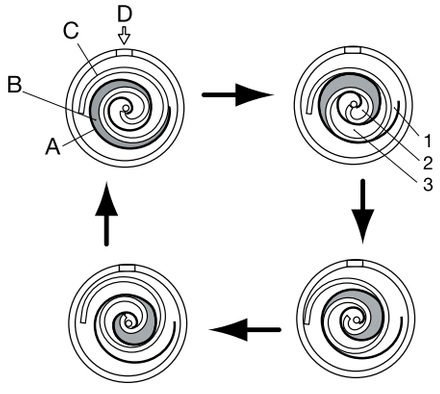
8.2.2 Compression principles

(1) The gas is sucked from the inlet port at the outer frame of the fixed scroll.

(2) The gas inside of the compression space is compressed toward the center of the scroll.

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

(4) The above procedures (Suction-Compression-Discharge) is repeated continously.

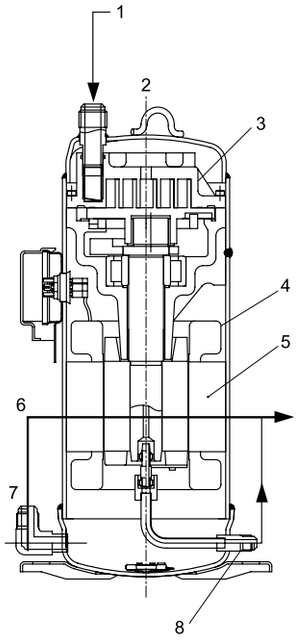


A	Fixed scroll
B	Compression space
C	Rotating scroll
D	Gas
1	Suction process
2	Discharge process
3	Compression process

8.2.3 Structure

The compressor has a structure for supplying oil from the outdoor oil separator.

Inside the oil separator, the pressure is high and the surface temperature of the oil separator is between 60 °C and 110 °C just like the compressor.



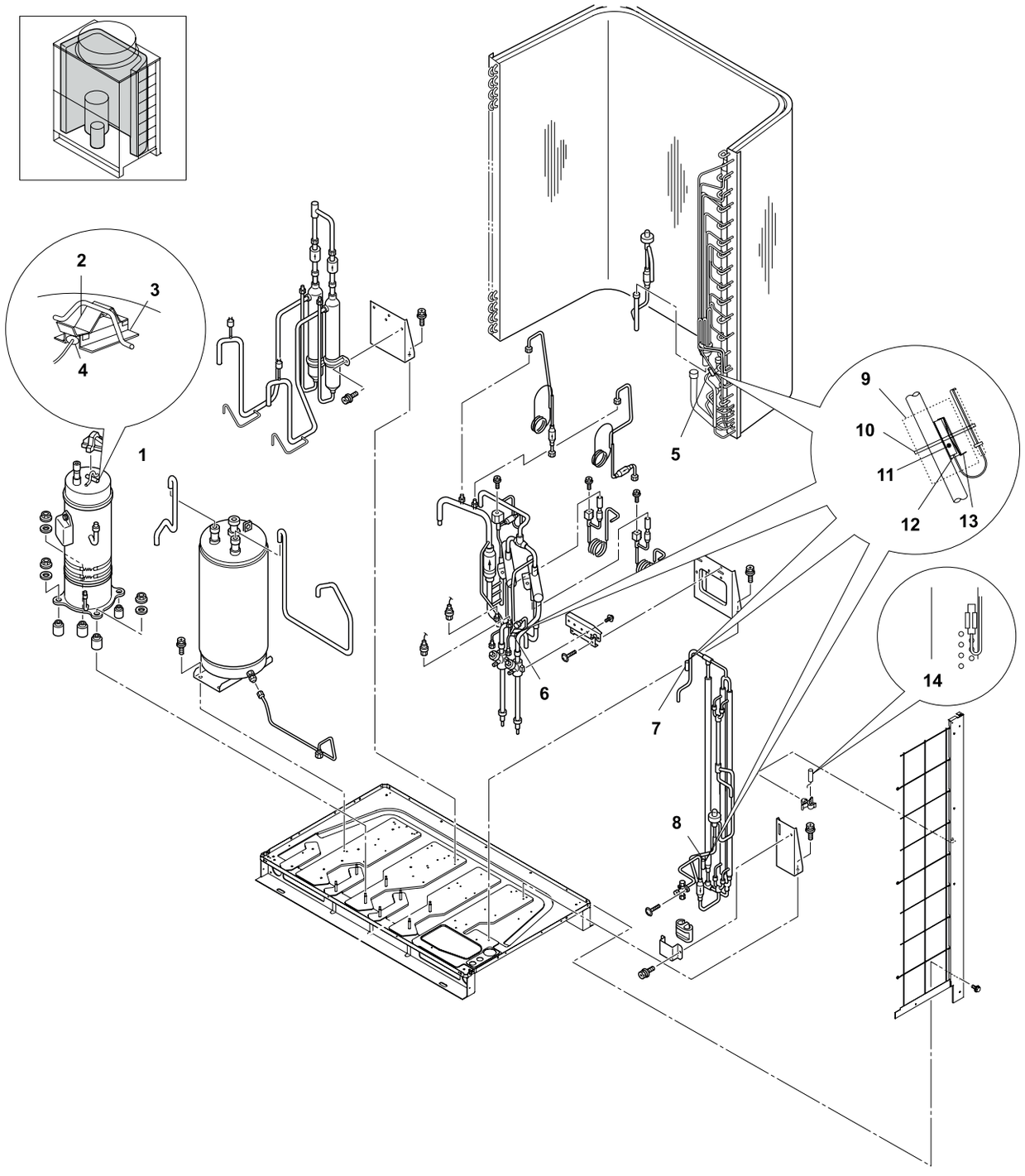
1	Suction pipe
2	Suction
3	Fixed scroll
4	Frame
5	Motor
6	Discharge pipe
7	Discharge
8	Oil pipe

◆ **Compressor type**

Model	Inverter Compressor		Constant speed compressor	Total quantity
	DA50PHD	DA65PHD	E655DH	
RAS-8FSXN1E RAS-(5/6)FSXNH(E)	1	-	-	1
RAS-(10/12)FSXN1E RAS-(8-12)FSXNH(E)	-	1	-	1
RAS-(14/16)FSXN1E	-	1	1	2

8.3 Thermistors

8.3.1 Thermistor positions for RAS-12FSXNH(E) (example)



1	Inverter compressor	8	Tchg thermistor (Super-cooling main line)
2	Thermistor holder	9	Butyl sheet
3	Thermistor fixing plate	10	Plastic band
4	Td thermistor (Td1) for the discharge gas temperature	11	Thermistor (Te, Tg, Tbg, Tchg)
5	Te thermistor (Liquid evaporation line)	12	Thermistor holder
6	Tg thermistor (gas evaporation line)	13	Thermo clip
7	Tbg thermistor (Super-cooling bypass line)	14	Ta thermistor

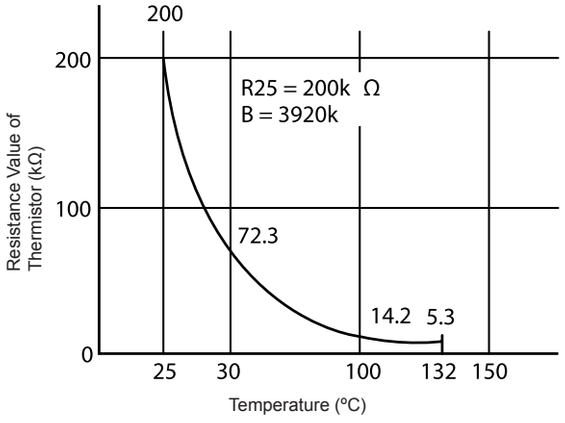
8.3.2 Thermistor for the temperature of the upper part of the compressor

1 The thermistor for the temperature of the upper part of the compressor is installed for the purpose of preventing discharge gas due to overheating. If the discharge gas temperature increases excessively, the lubricating oil deteriorates and loses its properties and consequently, the compressor's life is shortened.
2 If the discharge gas temperature increases excessively, the compressor temperature increases. Consequently, the compressor motor will burn out.
3 When the temperature of the upper part of the compressor increases during heating operation, the unit is controlled according to the following method.

   a. The expansion valve of the outdoor unit opens to return the liquid refrigerant to the compressor through the accumulator, decreasing the compressor's temperature.

   b. If the temperature of the upper part of the compressor increases over 132 °C, even if the expansion valve opens, the compressor stops in order to protect itself. This procedure is also available in the cooling operation.

4 If the temperature of the upper part of the compressor increases excessively, protection control will be activated and the compressor will stop according to the following method:

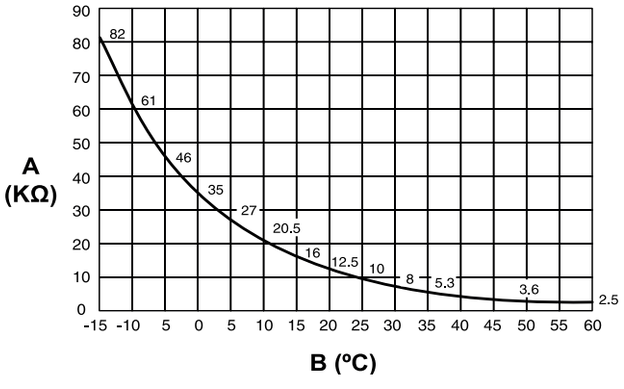


Resistance Characteristics of Thermistor for discharge Gas Overheating Protection

Operation	Temperature of the upper part of the compressor	Stopping period
Cooling	Over 132 °C	10 minutes (continuous)
	Over 140 °C	5 seconds (continuous)
Heating	Over 132 °C	10 minutes (continuous)
	Over 140 °C	5 seconds (continuous)
Defrosting	Over 132 °C	5 seconds (continuous)

8.3.3 Thermistor for the outdoor ambient temperature

Thermistor resistance characteristics are shown in the figure.



A	Thermistor resistance
B	Ambient temperature

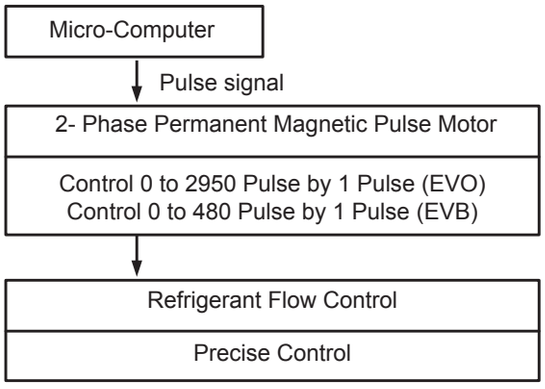
8.3.4 Thermistor for the evaporating temperature of the outdoor unit in the heating operation (For defrosting)

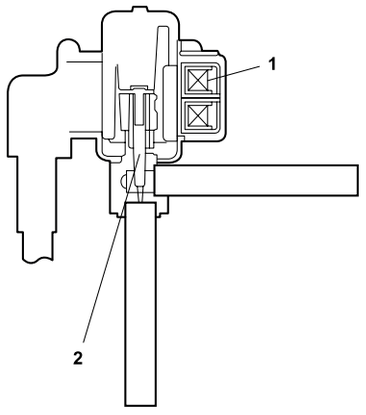
The thermistor resistance characteristics are the same as in the outdoor ambient temperature thermistor.

8.3.5 Thermistor for super cooling bypass and main line temperature of outdoor unit

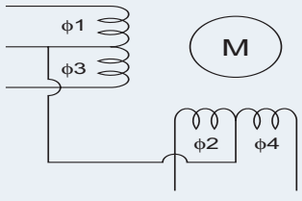
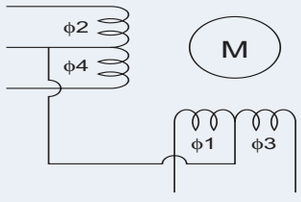
The thermistor resistance characteristics are the same as in the outdoor ambient temperature thermistor.

8.4 Electronic expansion valve





1	Pulse motor
2	Needle

Items	Specifications	
Applicable models	For Main cycle (EVO)	For Super Cooling Bypass line (EVB)
Type	PAM series	UKV series
Refrigerant	R410A	
Working temperature range	-30 °C to 70 °C	
Direction of the installation	Drive shaft in vertical direction at a 90° angle as maximum	Drive shaft in vertical direction at a 45° angle as maximum
Direction of the flow	Reversible	
Rated voltage	DC 12 V ± 1.2 V	
Drive condition	100 - 200 PPS 2-2 phase excitation	80 ± 5 PPS 1-2 phase excitation
Coil resistance (for each phase)	100 Ω	46 Ω ± 3 Ω (at 20 °C)
Wiring diagram, drive circuit and activation mode		

Phase	1	2	3	4
1	ON	OFF	OFF	ON
2	ON	ON	OFF	OFF
3	OFF	ON	ON	OFF
4	OFF	OFF	ON	ON

OPEN: 4 - 3 - 2 - 1 - 4

CLOSE: 1 - 2 - 3 - 4 - 1

Phase	1	2	3	4	5	6	7	8
1	ON	ON	OFF	OFF	OFF	OFF	OFF	ON
2	OFF	OFF	OFF	OFF	OFF	ON	ON	ON
3	OFF	OFF	OFF	ON	ON	ON	OFF	OFF
4	OFF	ON	ON	ON	OFF	OFF	OFF	OFF

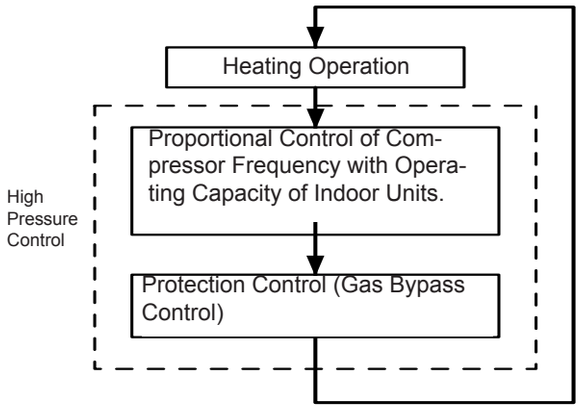
OPEN: 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8

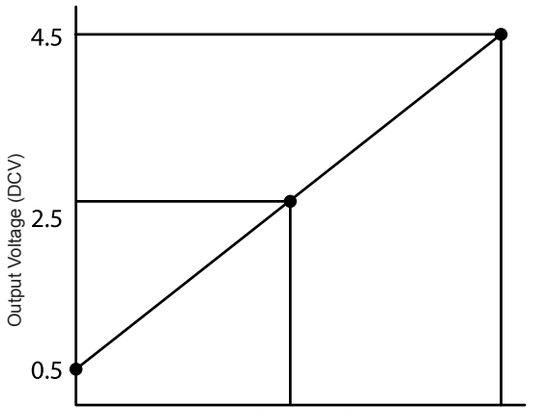
CLOSE: 8 - 7 - 6 - 5 - 4 - 3 - 2 - 1

8.5 Pressure sensor

8.5.1 High pressure control

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



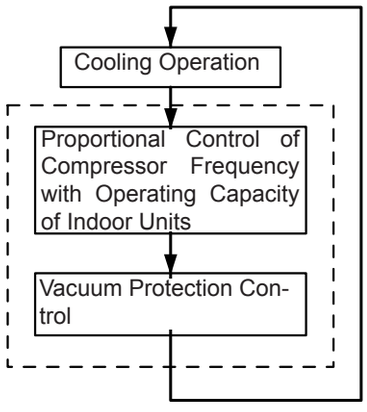


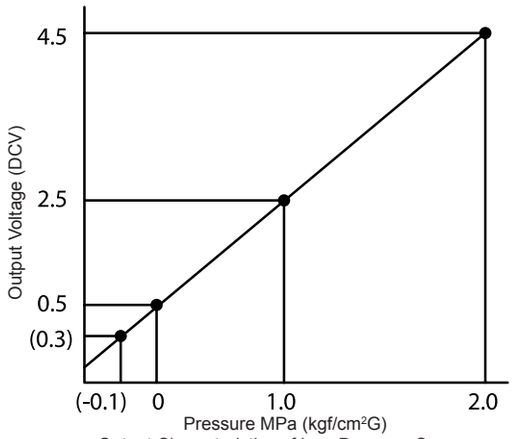
Output Characteristics of High Pressure Sensor

8.5.2 Low pressure control

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

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

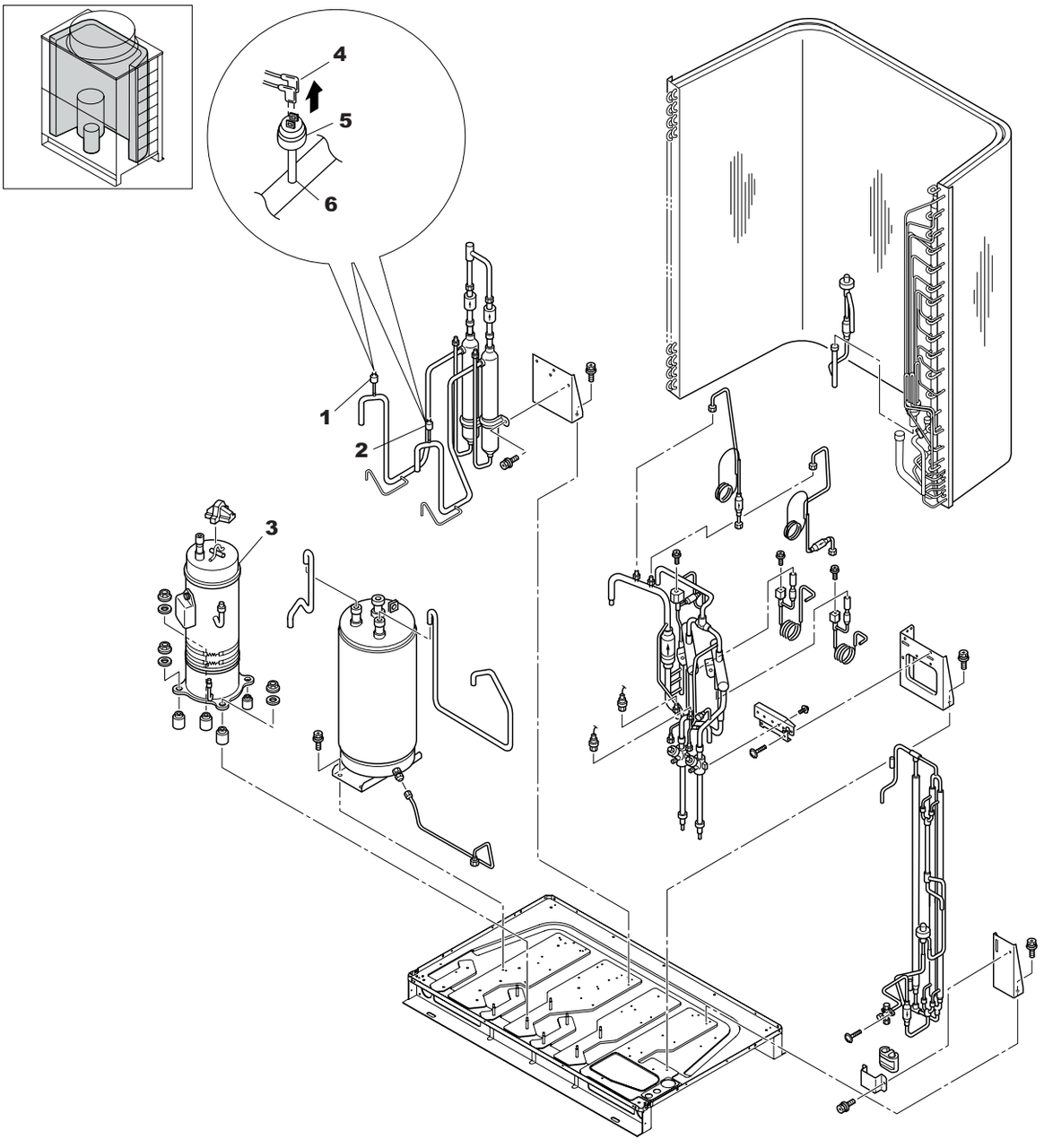




Output Characteristics of Low Pressure Sensor

8.6 High pressure protection device

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

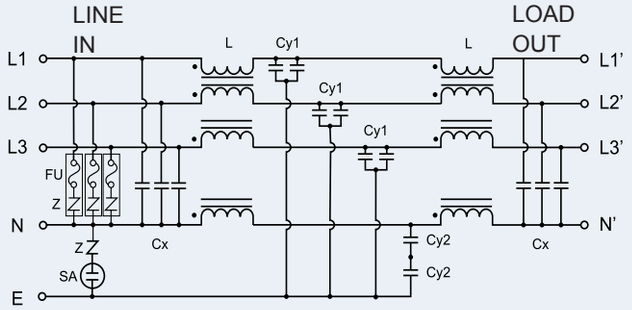


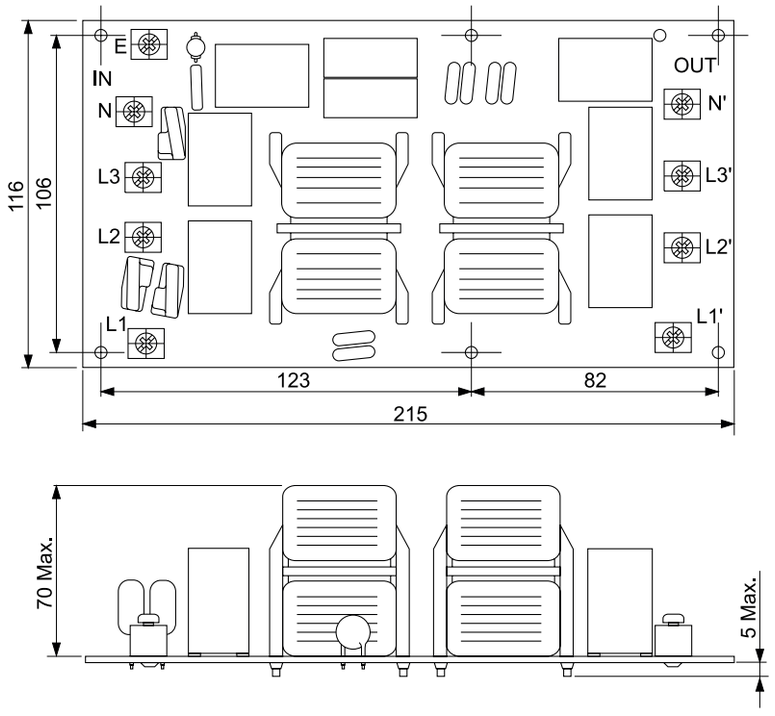
1	PSH1
2	PSH2
3	Inverter compressor
4	Faston terminal
5	High pressure switch
6	Welding

8.7 Noise filter (NF1, NF2)

The noise filter decreases the noise caused by the inverter to the power supply line. The terminals that indicate "LOAD" are connected to the inverter and terminals that indicate "LINE" are connected to the power supply line.

◆ **NF1**

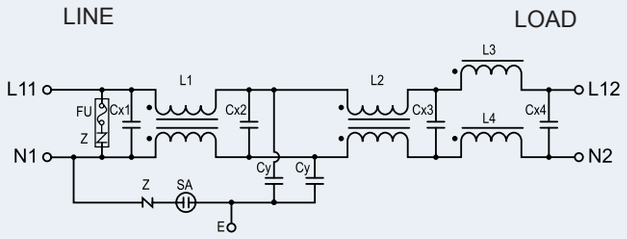
Items	Specifications
Model	4LFB-22930-2F
Rated Current	AC 400 V 27 A
Permissible temperature range	From -25 °C to 65 °C
Circuit diagram	

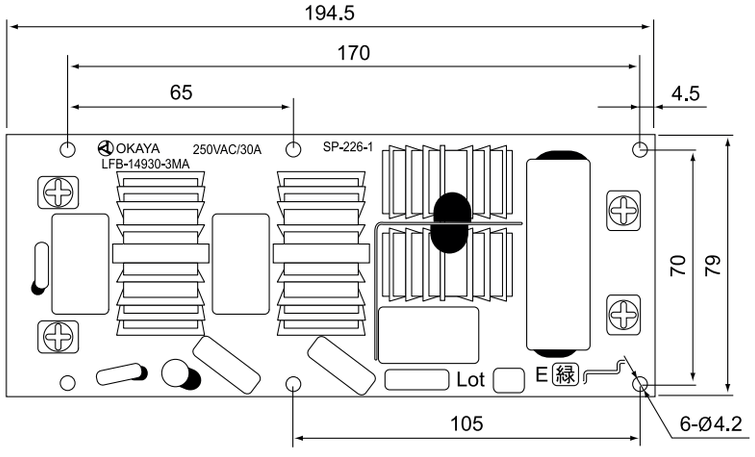


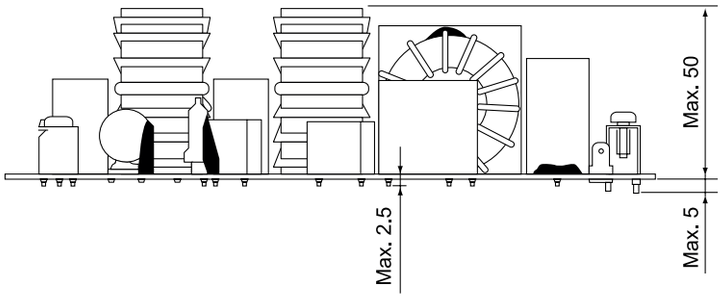
NOTE

All measurements are in mm.

◆ NF2

Items	Specifications
Model	LTB-14930-3MA
Rated Current	AC 230 V 30 A
Permissible temperature range	From -25 °C to 60 °C
Circuit diagram	





NOTE

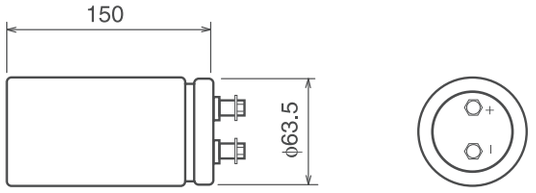
All measurements are in mm.

8.8 Capacitors (CB1 and CB2 / CB3)

◆ CB1 and CB2

This part is used to change the alternating current to direct current for the inverter.

Item	Specifications
Model	LNX2W472MSEEHE
Static electricity capacity	4700 µF
Rated voltage	450 V
Allowed temperature range	-25 °C to 85 °C



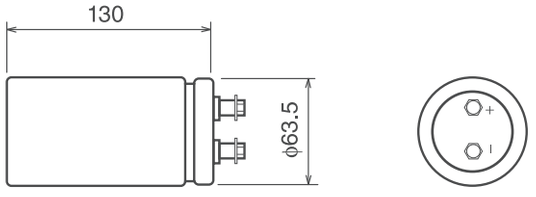
(mm)

Two capacitors in line are used.

◆ CB3

This part is used to change the alternating current to direct current for fan controller.

Item	Specifications
Model	LNT2W272MSEAHE
Static electricity capacity	2700 µF
Rated voltage	450 V
Allowed temperature range	-25 °C to 105 °C



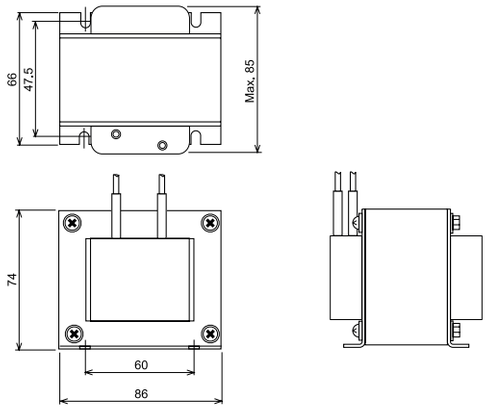
(mm)

8.9 Reactor (DCL1 and DCL2)

This part is used to change the alternating current to direct current for the inverter.

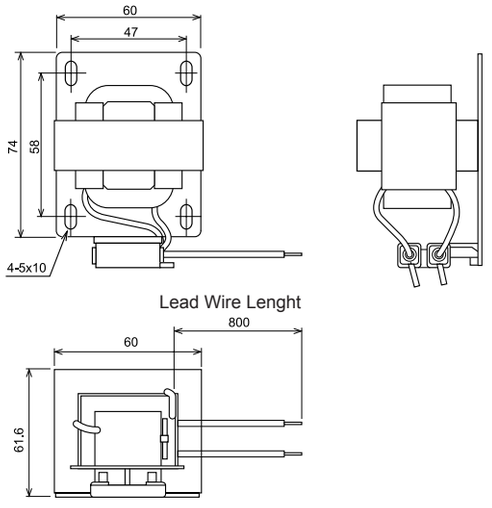
◆ DCL1

Item	Specifications
Condition	1.0 mH ± 10% (at 1 Khz)
Rated current	30 A
Direct current resistance	22.8 mΩ ± 20% (at 20 °C)
Allowed temperature range	Maximum 60 °C



◆ DCL2

Item	Specifications
Condition	3.0 mH
Rated current	10 A
Direct current resistance	0.13 Ω ± 10% (at 25 °C)
Allowed temperature range	-10 °C to 180 °C



NOTE

All measurements are in mm.

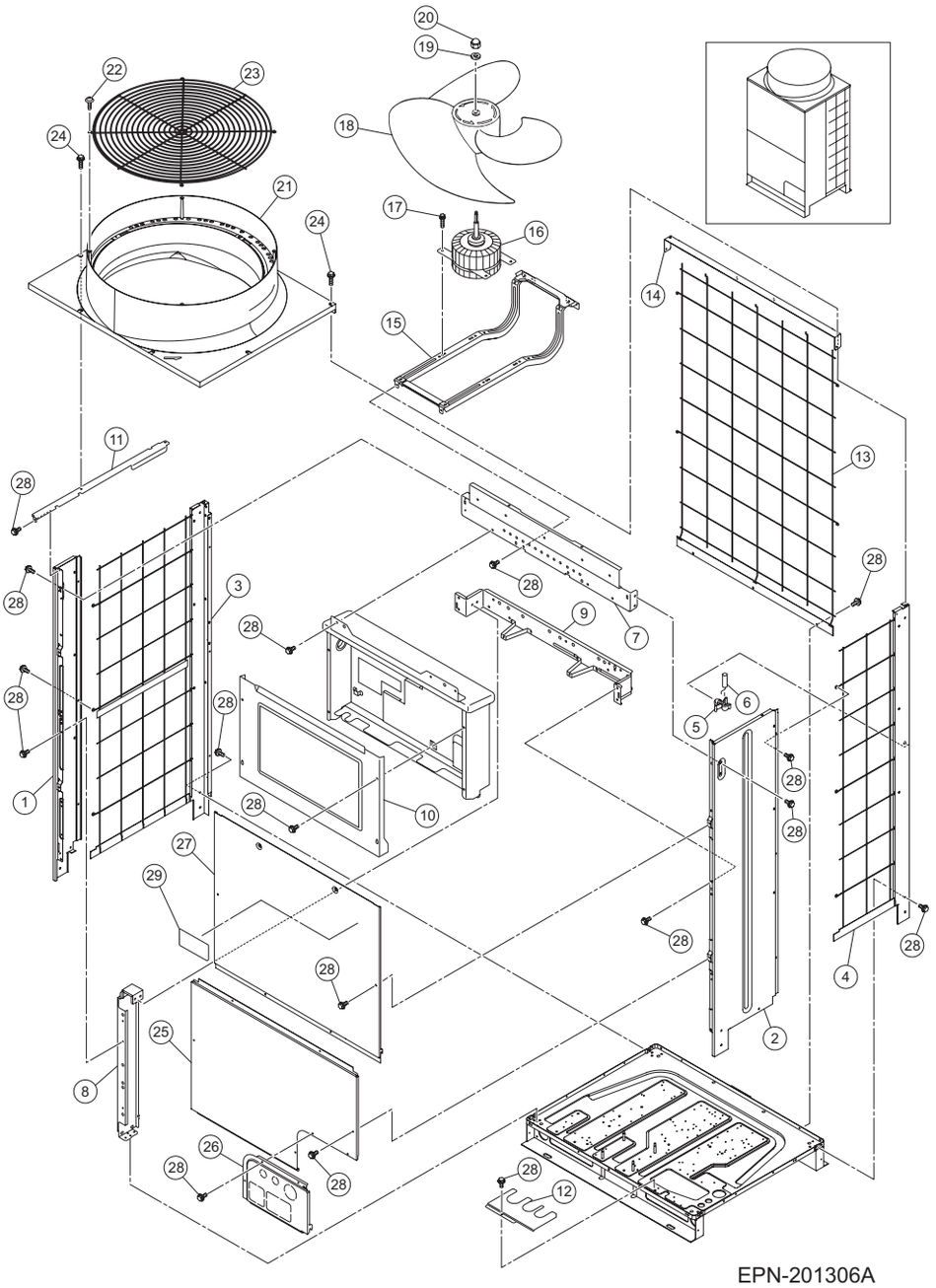
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9.1 Cabinet and fan components for outdoor units

9.1.1 Cabinet and fan components for RAS-(8-12)FSXN1E and RAS-(5/6)FSXNH(E)



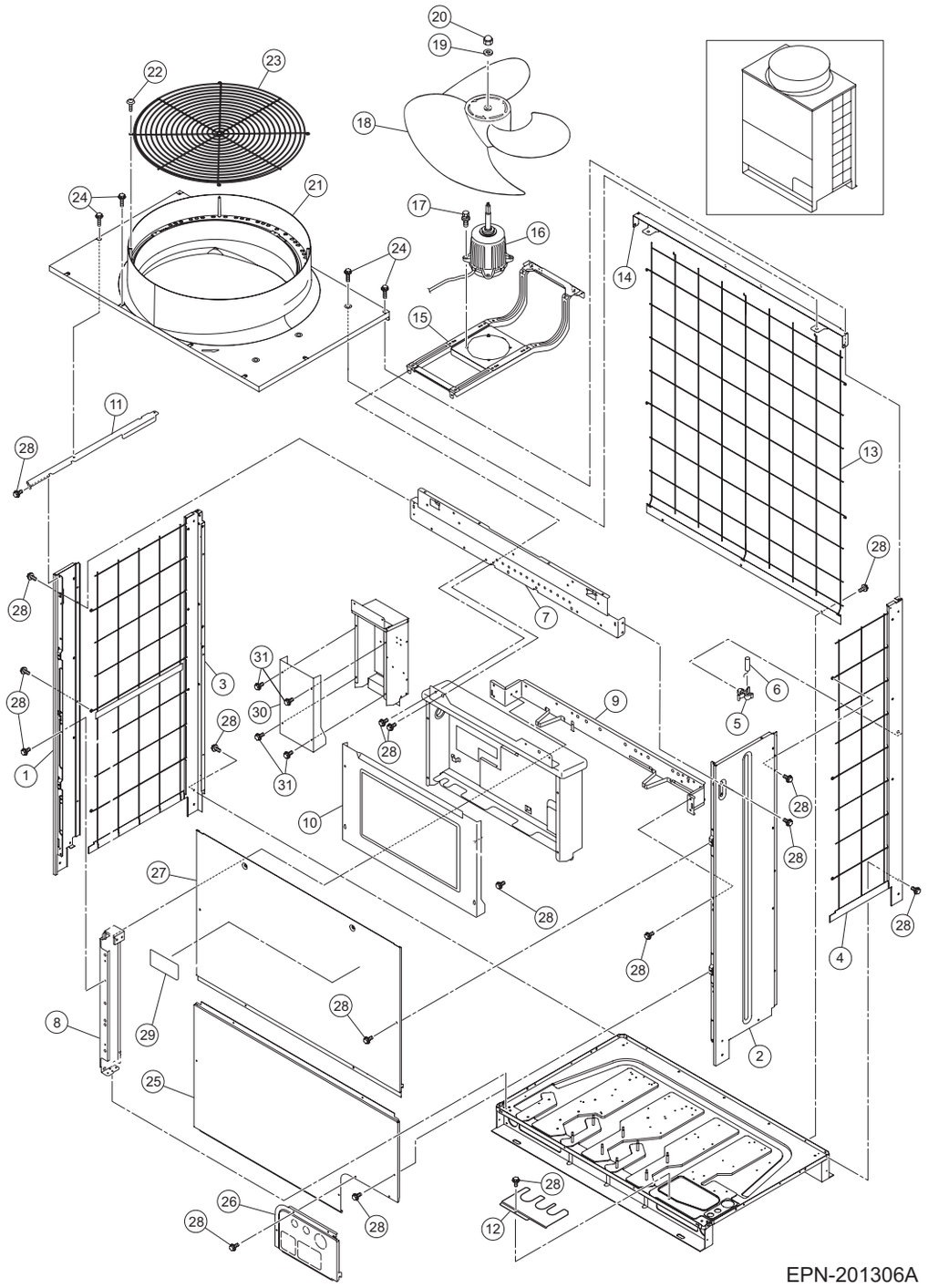
A	Truss Head Tapping Screw		F	Stud Bolt	
B	Round Head Screw		G	Nut	
C	Flat Head Screw		H	Washer	
D	Pan Head Tapping Screw		J	Spring Lock Washer	
E	Hexagon Head Bolt		K	Toothed Lock Washer	

NOTE

The unicromated coating is applied to iron and steel material for the unspecified materials of the bolt and screw

Part No.	Description	Remarks
1	Side cover L	—
2	Side cover R	—
3	Side cover 2 L	—
4	Side cover 2 R	—
5	TH holder	For Ta thermistor
6	Thermistor	THM7: Ambient (Ta)
7	Front stay M	—
8	Support stay assy	—
9	D fix S assy	—
10	Electrical box cover	—
11	Upper Stay	—
12	Piping cover	—
13	Protection net	—
14	Upper rear stay	—
15	Clamp unit	—
16	Fan motor	MOF1
17	Screw	SUS, M6 for the fan motor
18	Propeller fan	ø644
19	Washer	SUS
20	Closing nut	SUS, M10
21	Upper cover	—
22	Screw	SUS, M4
23	Air grille	—
24	Screw	SUS, M5
25	Front cover M2	—
26	Pipe cover 2	—
27	Service cover	—
28	Screw	SUS, M5
29	HITACHI label	—

9.1.2 Cabinet and fan components for RAS-(14/16)FSXN1E



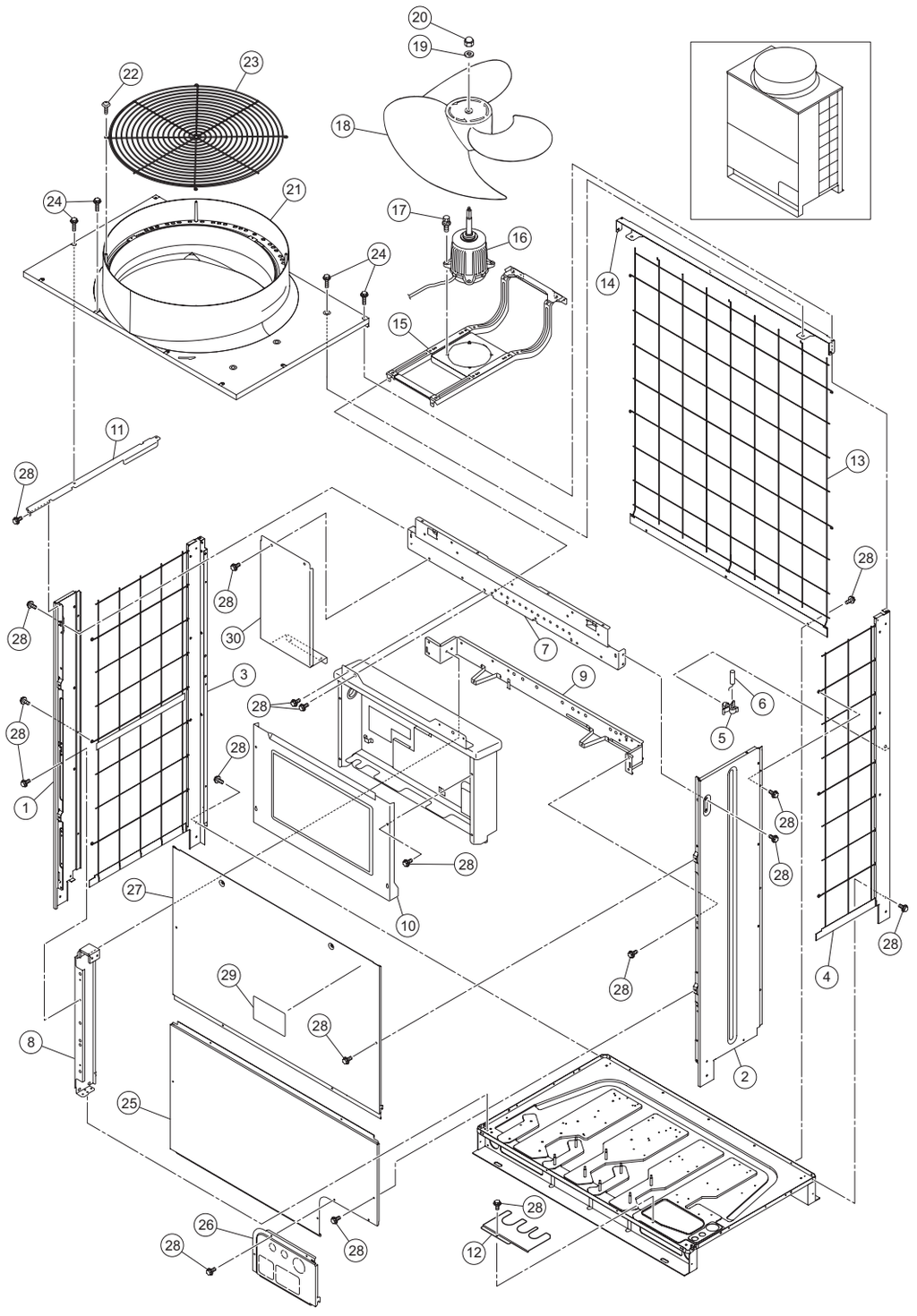
A	Truss Head Tapping Screw		F	Stud Bolt	
B	Round Head Screw		G	Nut	
C	Flat Head Screw		H	Washer	
D	Pan Head Tapping Screw		J	Spring Lock Washer	
E	Hexagon Head Bolt		K	Toothed Lock Washer	

NOTE

The unicromated coating is applied to iron and steel material for the unspecified materials of the bolt and screw

Part No.	Description	Remarks
1	Side cover L	—
2	Side cover R	—
3	Side cover 2 L	—
4	Side cover 2 R	—
5	TH holder	For Ta thermistor
6	Thermistor	THM7: Ambient (Ta)
7	Front stay	—
8	Support assy stay	—
9	D fix L assy	—
10	Electrical box cover	—
11	Upper Stay L	—
12	Piping cover	—
13	Protection net	—
14	Rear stay assy	—
15	Clamp unit	—
16	Fan motor	MOF1
17	Screw	SUS, M6 for the fan motor
18	Propeller fan	ø644
19	Washer	SUS
20	Closing nut	SUS, M10
21	Upper cover	—
22	Screw	SUS, M4
23	Air grille	—
24	Screw	SUS, M5
25	Front cover L2	—
26	Service cover L	—
27	Cabinet panel	—
28	Screw	SUS, M5
29	HITACHI label	—
30	Sub electrical box cover	—
31	Screw	For Sub E-Box cover

9.1.3 Cabinet and fan components for RAS-(8-12)FSXNH(E)



A	Truss Head Tapping Screw		F	Stud Bolt	
B	Round Head Screw		G	Nut	
C	Flat Head Screw		H	Washer	
D	Pan Head Tapping Screw		J	Spring Lock Washer	
E	Hexagon Head Bolt		K	Toothed Lock Washer	

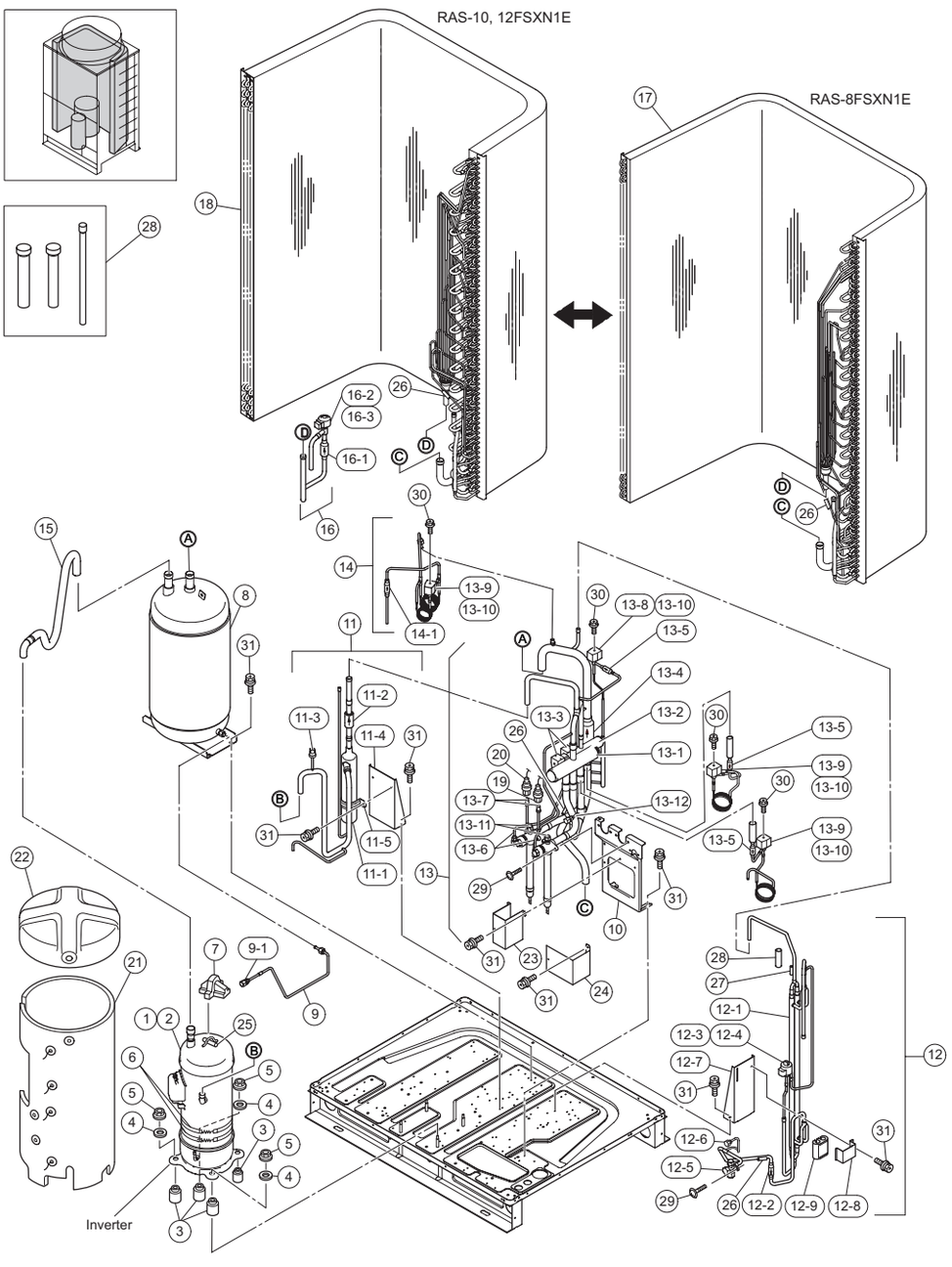
NOTE

The unicromated coating is applied to iron and steel material for the unspecified materials of the bolt and screw

Part No.	Description	Remarks
1	Side Cover R	
2	Side Cover L	
3	Side Cover L2 Assy	
4	Side Cover R2 Assy	
5	Th Holder	for Ta Thermistor
6	Thermistor	THM7: for Ambient (Ta)
7	Front Stay	
8	Support Stay Assy	
9	D Fix L Assy	
10	E-Box Cover	
11	Upper Stay	
12	Piping Cover	
13	Protection Net	
14	Stay	
15	Clamp Unit	
16	Fan Motor	MOF1
17	Screw	SUS, M6, for Fan Motor
18	Propeller Fan	Ø644
19	Washer	SUS
20	Closing Nut	SUS, M10
21	Upper Cover	
22	Screw	SUS, M4
23	Outlet Protector	
24	Screw	SUS, M5
25	Front Cover L2	
26	Pipe Cover 2	
27	Service Cover L	
28	Screw	SUS, M5
29	Hitachi Label	
30	Fan Cover	

9.2 Refrigerant cycle components for outdoor units

9.2.1 Refrigerant cycle components for RAS-(8-12)FSXN1E



A	Truss Head Tapping Screw		F	Stud Bolt	
B	Round Head Screw		G	Nut	
C	Flat Head Screw		H	Washer	
D	Pan Head Tapping Screw		J	Spring Lock Washer	
E	Hexagon Head Bolt		K	Toothed Lock Washer	

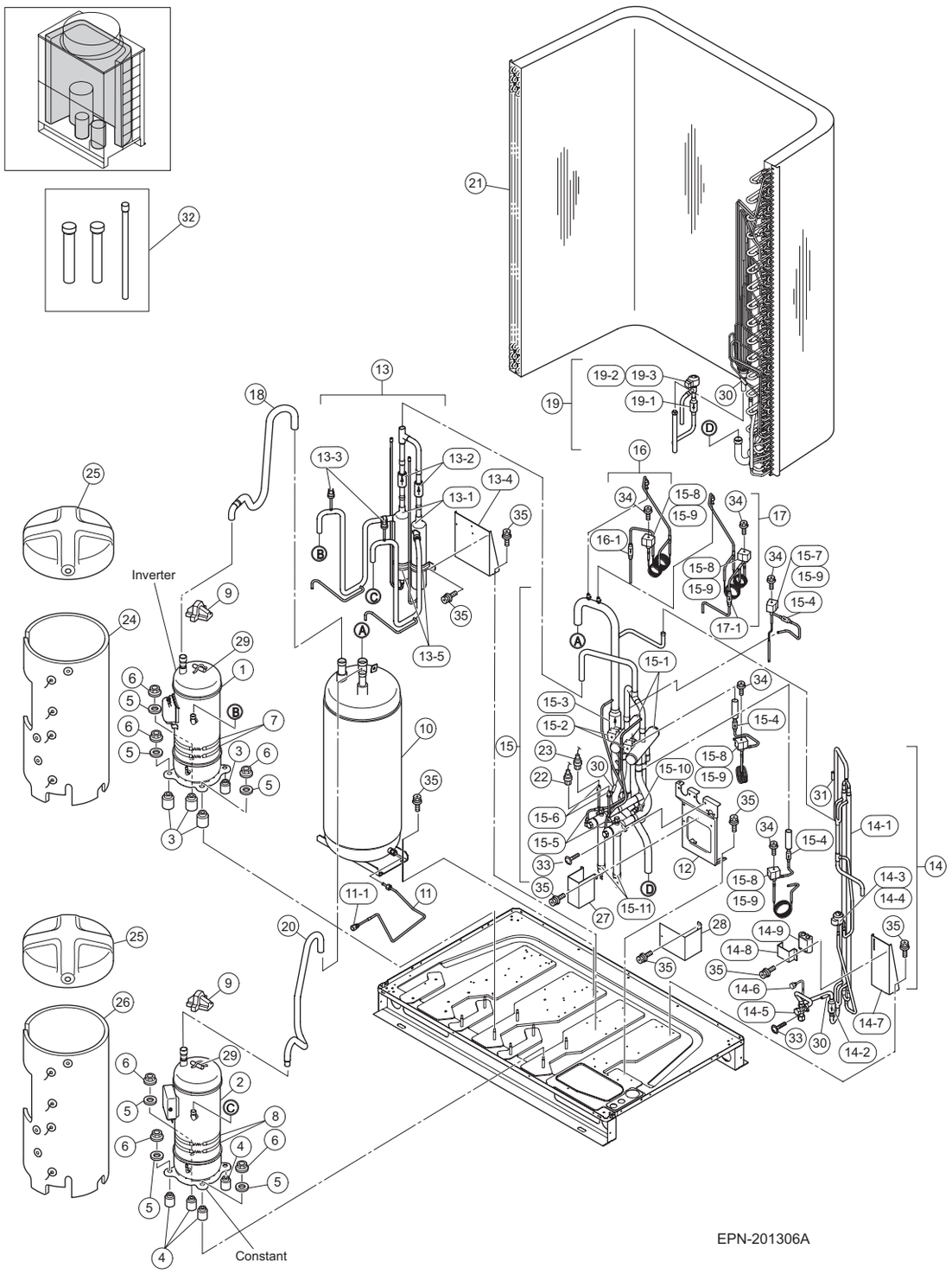
NOTE

The unicromated coating is applied to iron and steel material for the unspecified materials of the bolt and screw

Part No.	Description	Remarks
1	Compressor (Inverter)	MC1: DA50PHD-D1YE2
2	Compressor (Inverter)	MC1: DA65PHD-D1YE2
3	Vibration Proof Rubber 1	
4	Vibration Proof Rubber 2	
5	Nut	
6	Oil Heater	CH1: 40.8W, Belt Heater
7	Rubber Cap	
8	Accumulator	
9	Oil Pipe Assy	
9-1	Check Joint	
10	Valve Stay	
11	D Pipe Unit	
11-1	Oil Separator	
11-2	Check Valve	
11-3	High Pressure Switch	PSH1: Saginomiya, ACB-1UB42
11-4	Stay for Oil Serparator	
11-5	Saddle	
12	L Pipe Assy	
12-1	Double Tube	
12-2	Strainer	
12-3	Expansion Valve	MVB: Saginomiya, UKV-25D26
12-4	Coil for Expansion Valve	MVB: Saginomiya, UKV-A035
12-5	Stop Valve (Liquid)	3/8
12-6	Check Joint	
12-7	Plate Stay	
12-8	Plate Stopper	
12-9	Rubber Sheet	
13	4-Way Valve Assy	
13-1	4-Way Valve	RVR1: Saginomiya, STF-H0712
13-2	4-Way Valve	RVR2: Saginomiya, STF-H0404
13-3	Coil for 4-Way Valve	RVR1, 2: Saginomiya, STF-H01AI1870A1
13-4	Strainer	
13-5	Strainer	
13-6	Check Joint	
13-7	PGC Joint	
13-8	Solenoid Valve	SVA: Nichiden Kougyou, SR10PA
13-9	Solenoid Valve	SVF, SVG: Nichiden Kougyou, SR10D
13-10	Coil for Solenoid Valve	SVA, SVF, SVG: Nichiden Kougyou, SR10PA
13-11	Stop Valve (Gas)	7/8
13-12	Check Joint	
14	Oil Return Pipe Assy	
14-1	Strainer	
15	Pipe S1 Assy	
16	Expansion Valve Assy	
16-1	Strainer	
16-2	Expansion Valve	MV1: Saginomiya, PAM-BBOYGHS-1
16-3	Coil for Expansion Valve	MV1: Saginomiya, PAM-MD12HS-7
17	Condenser Assy	
18	Condenser Assy	

Part No.	Description	Remarks
19	Pressure Sensor (High)	PD: Saginomiya, NSK-BD050F-102
20	Presure Sensor (Low)	PS: Saginomiya, NSK-BD020F-102
21	Sound Proof Cover	
22	Top Sound Proof Cover	
23	Cover Stay 1	
24	Cover Stay 2	
25	Thermistor	THM8: for Compressor (Td1)
26	Thermistor	THM17, 11, 10: for Piping (Te, Tg, Tchg)
27	Thermistor	THM23: for Piping (TBg)
28	Accessory Pipe	
29	Screw	SUS, M6
30	Screw	for Coil
31	Screw	SUS, M5

9.2.2 Refrigerant cycle components for RAS-(14/16)FSXN1E



A	Truss Head Tapping Screw		F	Stud Bolt	
B	Round Head Screw		G	Nut	
C	Flat Head Screw		H	Washer	
D	Pan Head Tapping Screw		J	Spring Lock Washer	
E	Hexagon Head Bolt		K	Toothed Lock Washer	

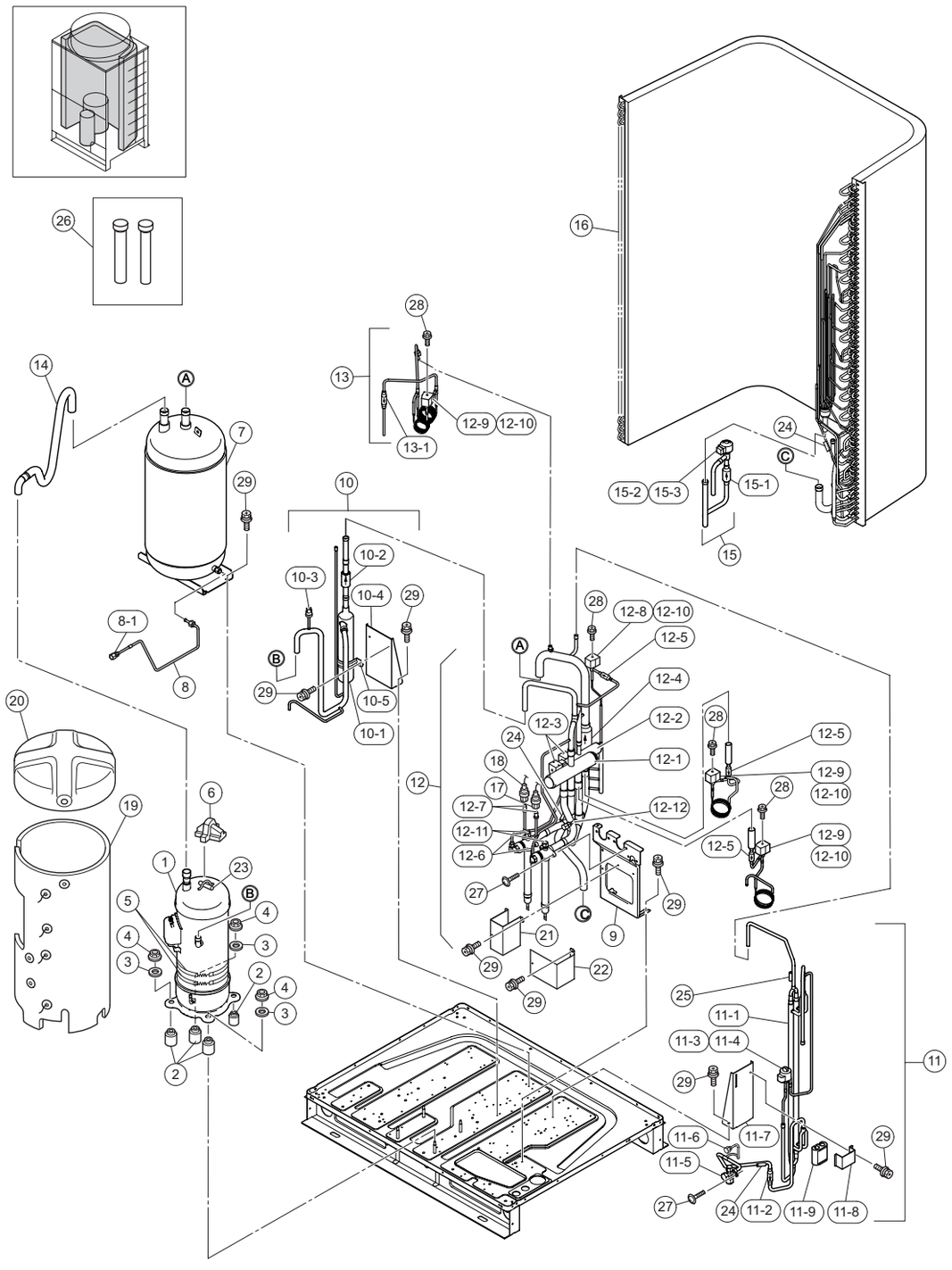
NOTE

The unicromated coating is applied to iron and steel material for the unspecified materials of the bolt and screw

Part No.	Description	Remarks
1	Compressor (Inverter)	MC1: DA65PHD-D1YE2
2	Compressor (Constant)	MC2: E655DH-65D2Y
3	Vibration Proof Rubber	
4	Vibration Proof Rubber	
5	Vibration Proof Rubber	
6	Nut	
7	Oil Heater	CH1: 40.8W, Belt Heater
8	Oil Heater	CH2: 40.8W, Belt Heater
9	Rubber Cap	
10	Accumulator	
11	Oil Pipe Assy	
11-1	Check Joint	
12	Valve Stay	
13	D Pipe Assy	
13-1	Oil Separator	
13-2	Check Valve	
13-3	High Pressure Switch	PSH1: Saginomiya, ACB-1UB42
13-4	Stay for Oil Separator	
13-5	Saddle	
14	L Pipe Assy	
14-1	Double Tube Assy	
14-2	Strainer	
14-3	Expansion Valve	MVB: Saginomiya, UKV-25D26
14-4	Coil for Expansion Valve	MVB: Saginomiya, UKV-A035
14-5	Stop Valve (Liquid)	1/2
14-6	Check Joint	
14-7	Plate Stay	
14-8	Plate Support	
14-9	Rubber Sheet	
15	4-Way Valve Assy	
15-1	4-Way Valve	RVR1, 2: Saginomiya, STF-H0712
15-2	Coil for 4-Way Valve	RVR1, 2: Saginomiya, STF-H01AI1870A1
15-3	Strainer	
15-4	Strainer	
15-5	Check Joint	
15-6	PGC Joint	
15-7	Solenoid Valve	SVA: Nichiden Kougyou, SR10PA
15-8	Solenoid Valve	SVF, SVG: Nichiden Kougyou, SR10D
15-9	Coil for Solenoid Valve	SVA, SVF, SVG: Nichiden Kougyou, SR10
15-10	Check Joint	
15-11	Stop Valve (Gas)	1/1
16	Oil Return Pipe Assy 1	for Inverter Compressor
16-1	Strainer	
17	Oil Return Pipe Assy 2	for Constant Compressor
17-1	Strainer	
18	Pipe S1 Assy	
19	Expansion Valve Assy	
19-1	Strainer	
19-2	Expansion Valve	MV1: Saginomiya, PAM-BBOYGHS-1

Part No.	Description	Remarks
19-3	Coil for Expansion Valve	MV1: Saginomiya, PAM-MD12HS-7
20	S Pipe 2	
21	Condenser Assy	
22	Pressure Sensor (High)	PD: Saginomiya, NSK-BD050F-102
23	Pressure Sensor (Low)	PS: Saginomiya, NSK-BD020F-102
24	Sound Proof Cover	
25	Top Sound Proof Cover	
26	Sound Proof Cover	
27	Cover Stay 1	
28	Cover Stay 2	
29	Thermistor	THM8: for Compressor (Td1)
30	Thermistor	THM17, 11, 10: for Piping (Te, Tg, Tchg)
31	Thermistor	THM23: for Piping (TBg)
32	Accessory Pipe Unit	
33	Screw	SUS, M6
34	Screw	for Coil
35	Screw	SUS, M5

9.2.3 Refrigerant cycle components for RAS-(5/6)FSXNH(E)



A	Truss Head Tapping Screw		F	Stud Bolt	
B	Round Head Screw		G	Nut	
C	Flat Head Screw		H	Washer	
D	Pan Head Tapping Screw		J	Spring Lock Washer	
E	Hexagon Head Bolt		K	Toothed Lock Washer	

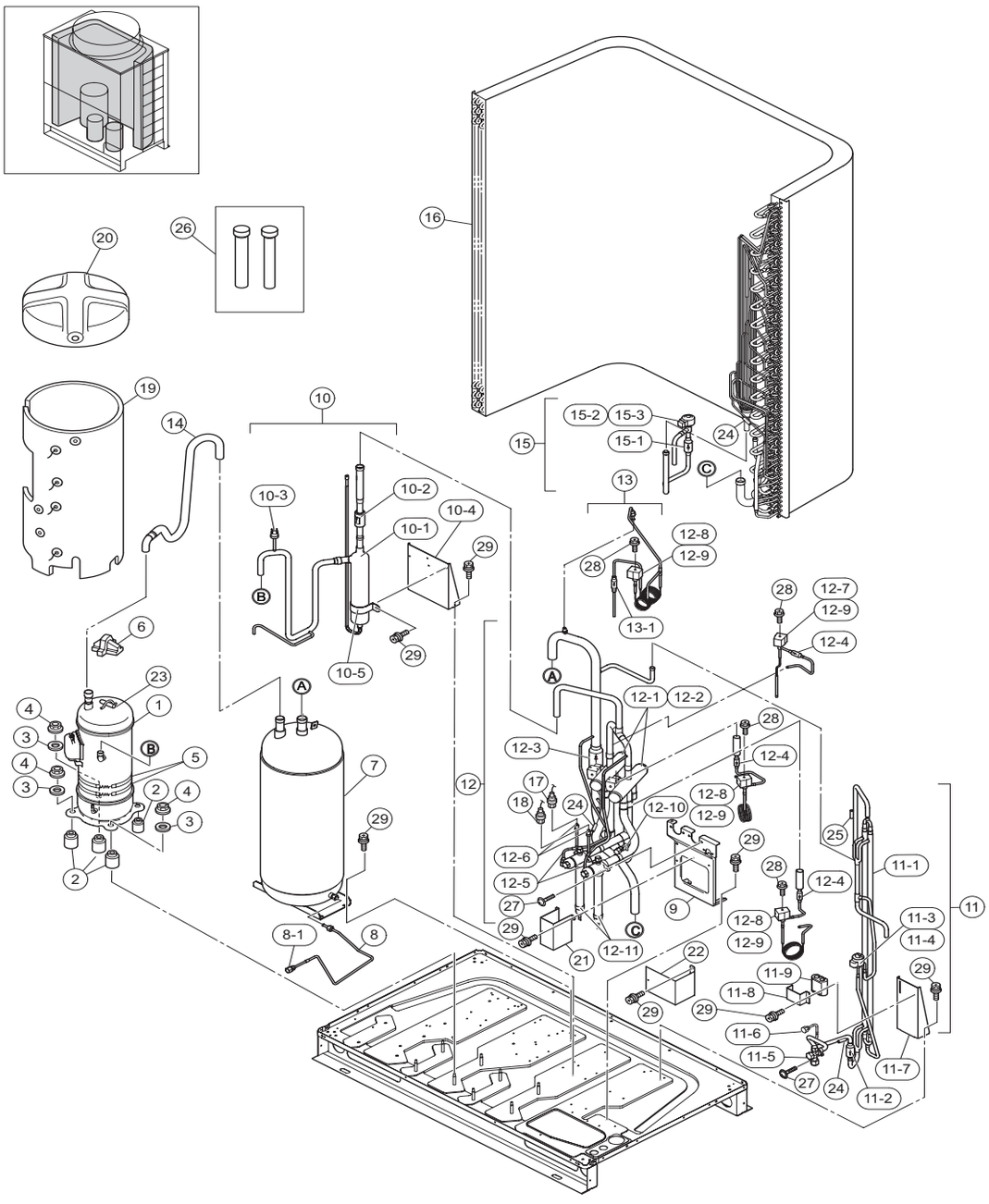
NOTE

The unicromated coating is applied to iron and steel material for the unspecified materials of the bolt and screw

Part No.	Description	Remarks
1	Compressor	MC1: DA50PHD-D1YE2
2	Vibration Proof Rubber	
3	Vibration Proof Rubber	
4	Special Nut	
5	Oil Heater	CH1: 40.8W, Belt Heater
6	Rubber Cap	
7	Accumulator	
8	Oil Pipe Assy	
8-1	Check Joint	
9	Valve Stay	
10	D Pipe Unit	
10-1	Oil Separator	
10-2	Check Valve	
10-3	Pressure Sw	PSH1: Saginomiya, ACB-1UB42
10-4	Stay For Oil Separator	
10-5	Saddle	
11	L Pipe Assy	
11-1	Double Tube	
11-2	Strainer	
11-3	Exp. Valve	MVB: Saginomiya, UKV-25D26
11-4	Coil For Exp. Valve	MVB: Saginomiya, UKV-A035
11-5	S Valve 3/8	3/8
11-6	Check Ja	
11-7	Plate Stay	
11-8	Plate Stopper	
11-9	Rubber Sheet	
12	4-Way Valve Assy	
12-1	4-Way Valve	RVR1: Saginomiya, STF-H0712
12-2	4-Way Valve	RVR2: Saginomiya, STF-H0404
12-3	Coil for 4-Way Valve	RVR1, 2: Saginomiya, STF-H01AI1870A1
12-4	Strainer	
12-5	Strainer	
12-6	Check Ja	
12-7	PGC Joint	
12-8	Body 20	SVA: Nichiden Kougyou, SR10PA
12-9	Solenoid Valve	SVF, SVG: Nichiden Kougyou, SR10D
12-10	Coil For Solenoid Valve	SVA, SVF, SVG: Nichiden Kougyou, SR10PA
12-11	Stop Valve(Gas)	7/8
12-12	Check Joint	
13	Piping Assy	for Return Oil
13-1	Strainer	
14	Pipe S1 Assy	
15	Expansion Valve Assy	
15-1	Strainer	
15-2	Expansion Valve	MV1: Saginomiya, PAM-BBOYGHS-1
15-3	Coil	MV1: Saginomiya, PAM-MD12HS-7
16	Condenser Assy	
17	Pressure Sensor	PD: Saginomiya, NSK-BD050F-102
18	Pressure Sensor	PS: Saginomiya, NSK-BD020F-102

Part No.	Description	Remarks
19	Sound proof Cover	
20	Top Sound Proof Cover	
21	Valve Cover 1	
22	Valve Cover 2	
23	Thermistor	THM8: for Compressor (Td1)
24	Thermistor	THM17, 11, 10: for Piping (Te, Tg, Tchg)
25	Thermistor	THM23: for Piping (TBg)
26	Accessory Pipe	
26	Accessory Pipe	
27	Screw	SUS, M6
28	Screw	for Coil
29	Screw	SUS, M5

9.2.4 Refrigerant cycle components for RAS-(8-12)FSXNH(E)



A	Truss Head Tapping Screw		F	Stud Bolt	
B	Round Head Screw		G	Nut	
C	Flat Head Screw		H	Washer	
D	Pan Head Tapping Screw		J	Spring Lock Washer	
E	Hexagon Head Bolt		K	Toothed Lock Washer	

NOTE

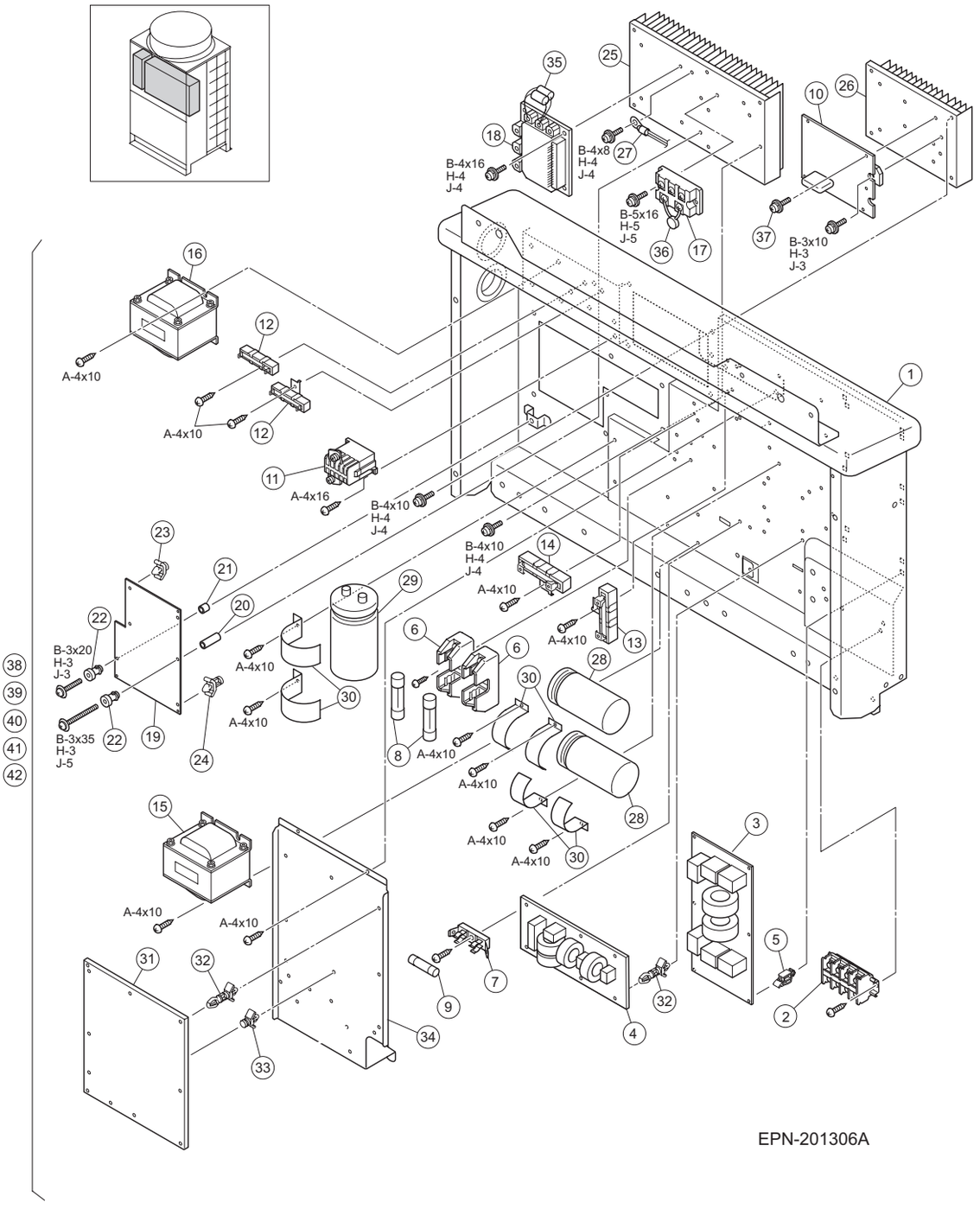
The unicromated coating is applied to iron and steel material for the unspecified materials of the bolt and screw

Part No.	Description	Remarks
1	Compressor	MC1: DA65PHD-D1YE2
2	Vibration Proof Rubber	
3	Vibration Proof Rubber	
4	Special Nut	
5	Oil Heater	CH1: 40.8W, Belt Heater
6	Rubber Cap	
7	Accumulator	
8	Oil Pipe Assy	
8-1	Check Joint	
9	Valve Stay	
10	D Pipe Unit	
10-1	Oil Separator	
10-2	Check Valve	
10-3	Pressure Sw	PSH1: Saginomiya, ACB-1UB42
10-4	Stay For Oil Separator	
10-5	Saddle	
11	L Pipe Assy	
11-1	Double Tube Assy	
11-2	Strainer	
11-3	Exp. Valve	MVB: Saginomiya, UKV-25D26
11-4	Coil For Exp. Valve	MVB: Saginomiya, UKV-A035
11-5	S Valve 3/8	3/8
11-6	Check Ja	
11-7	Plate Stay	
11-8	Plate Stopper	
11-9	Rubber Sheet	
12	4-Way Valve Assy	
12-1	4-Way Valve	RVR1, 2: Saginomiya, STF-H0712
12-2	Coil for 4-Way Valve	RVR1, 2: Saginomiya, STF-H01AI1870A1
12-3	Strainer	
12-4	Strainer	
12-5	Check Ja	
12-6	PGC Joint	
12-7	Body 20	SVA: Nichiden Kougyou, SR10PA
12-8	Solenoid Valve	SVF, SVG: Nichiden Kougyou, SR10D
12-9	Coil For Solenoid Valve	SVA, SVF, SVG: Nichiden Kougyou, SR10PA
12-10	Check Joint	
12-11	Stop Valve(Gas)	7/8
13	Piping Assy	for Return Oil
13-1	Strainer	
14	Pipe S1 Assy	
15	Expansion Valve Assy	
15-1	Strainer	
15-2	Expansion Valve	MV1: Saginomiya, PAM-BBOYGHS-1
15-3	Coil	MV1: Saginomiya, PAM-MD12HS-7
16	Condenser Assy	
17	Pressure Sensor	PD: Saginomiya, NSK-BD050F-102
18	Pressure Sensor	PS: Saginomiya, NSK-BD020F-102
19	Sound Proof Cover	

Part No.	Description	Remarks
20	Top Sound Proof Cover	
21	Valve Cover 1	
22	Valve Cover 2	
23	Thermistor	THM8: for Compressor (Td1)
24	Thermistor	THM17, 11, 10: for Piping (Te, Tg, Tchg)
25	Thermistor	THM23: for Piping (TBg)
26	Accessory Pipe	
26	Accessory Pipe	
26	Accessory Pipe	
27	Screw	SUS, M6
28	Screw	for Coil

9.3 Electrical parts for outdoor units

9.3.1 Electrical box components for RAS-(8-16)FSXN1E



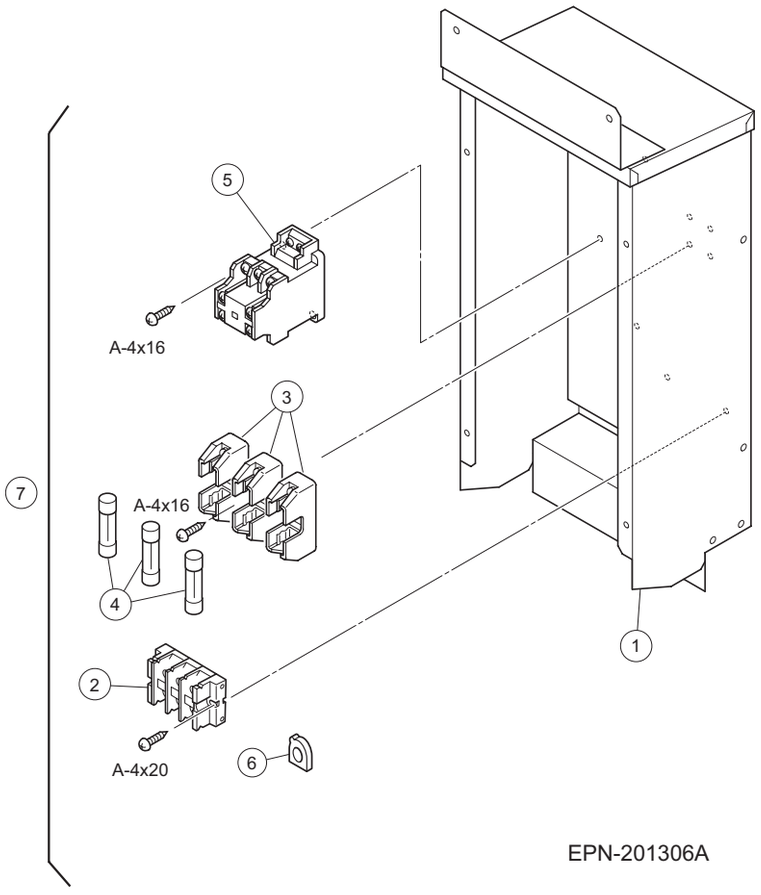
A	Truss Head Tapping Screw		F	Stud Bolt	
B	Round Head Screw		G	Nut	
C	Flat Head Screw		H	Washer	
D	Pan Head Tapping Screw		J	Spring Lock Washer	
E	Hexagon Head Bolt		K	Toothed Lock Washer	

NOTE

The unicromated coating is applied to iron and steel material for the unspecified materials of the bolt and screw

Part No.	Description	Remarks
1	Electrical Box Plate	Steel Plate Only
2	Terminal Board	TB1: 600V, 50A
2	Terminal Board	TB1: 600V, 80A
3	Noise Filter	NF1: 4LFB-22930-2F
4	Noise Filter	NF2: LFB-14930-3MA
5	Holder	
6	Fuse Holder	EF1, 2 (for Inv. Comp.)
7	Fuse Holder	EF11 (for Fan)
8	Fuse	EF1, 2: 40A, Cartridge Fuse (for Inv. Comp.)
9	Fuse	EF11: 20A, Cartridge Fuse (for Fan)
10	Fan Controller	FANM: PV092
11	Magnet Switch	CMC1: Fuji Electric, FC-0/SP
12	Resistor	RS1, 2: 20SHT500JA187
13	Resistor	R1: 40SH, 6.3kΩ
14	Resistor	R2: 40SH, 10.5kΩ
15	Reactor	DCL2: 3.0mH, 10A (for Fan)
16	Reactor	DCL1: 1.0mH, 30A (for INV.)
17	Diode Module	DM: PT50SN16
18	Transistor Module	IPM: 6MBP50RA120-55
19	PCB for Inverter	PCB2: PV093
20	Collar	
21	Collar	
22	Bush	
23	Spacer	
24	Spacer	
25	Radiation Fin 1	
26	Radiation Fin 2	
27	Thermistor	THM: for Inverter Fin
28	Capacitor	CB1, 2: 450V, 4700ϑF (for INV.)
29	Capacitor	CB3: 450V, 2700ϑF (for Fan)
30	Saddle	
31	Printed Circuit Board	PCB1: PO113
32	Spacer	
33	Spacer	
34	PCB Plate	
35	Capacitor	CS1, CS2
36	Noise Supressor	ZNR
37	Screw	
38	Electrical Box	Components+Harness+Plates
39	Electrical Box	Components+Harness+Plates
40	Electrical Box	Components+Harness+Plates
41	Electrical Box	Components+Harness+Plates
42	Electrical Box	Components+Harness+Plates

9.3.2 Sub electrical box components for RAS-(14/16)FSXN1E



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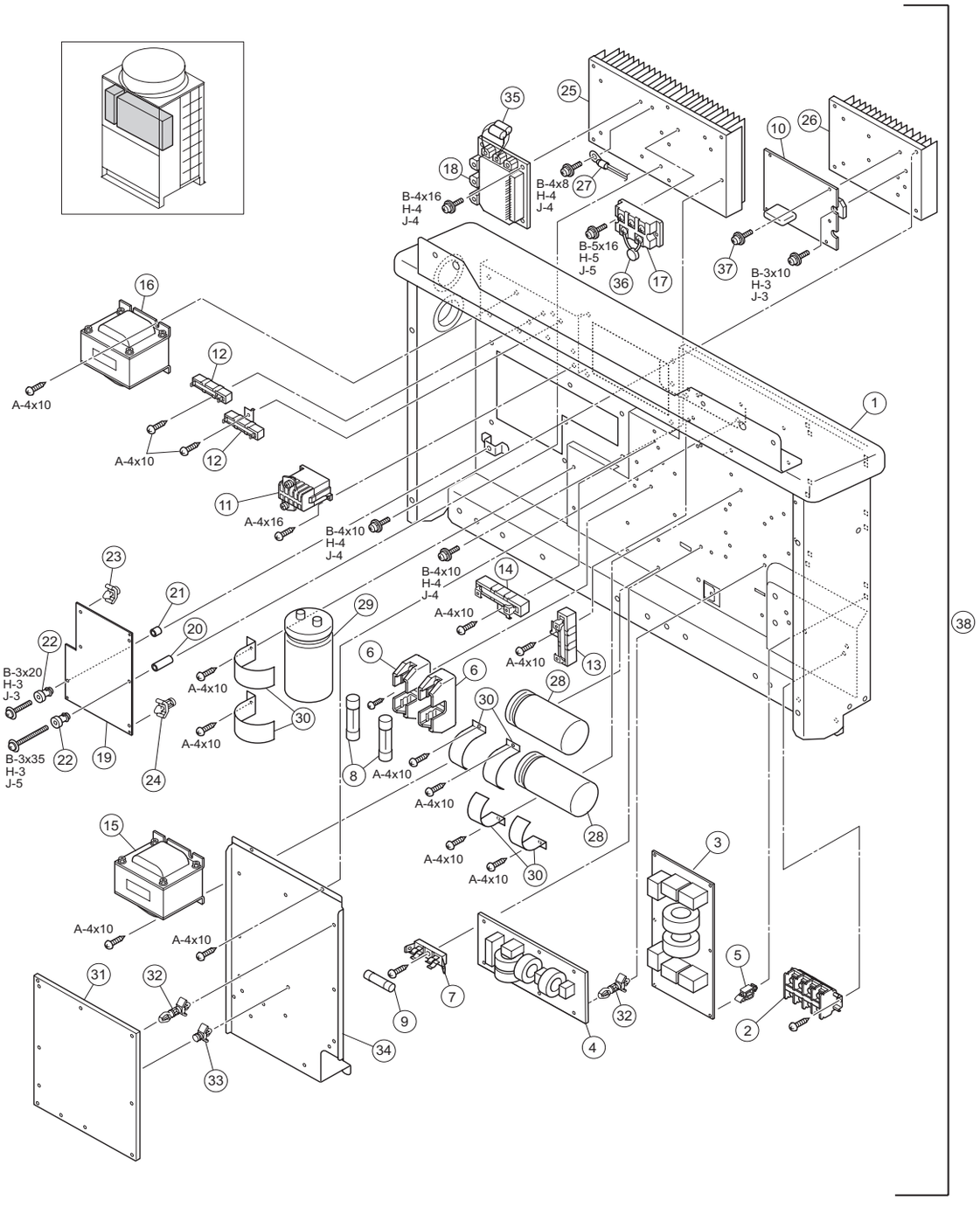
A	Truss Head Tapping Screw		F	Stud Bolt	
B	Round Head Screw		G	Nut	
C	Flat Head Screw		H	Washer	
D	Pan Head Tapping Screw		J	Spring Lock Washer	
E	Hexagon Head Bolt		K	Toothed Lock Washer	

NOTE

The unicromated coating is applied to iron and steel material for the unspecified materials of the bolt and screw

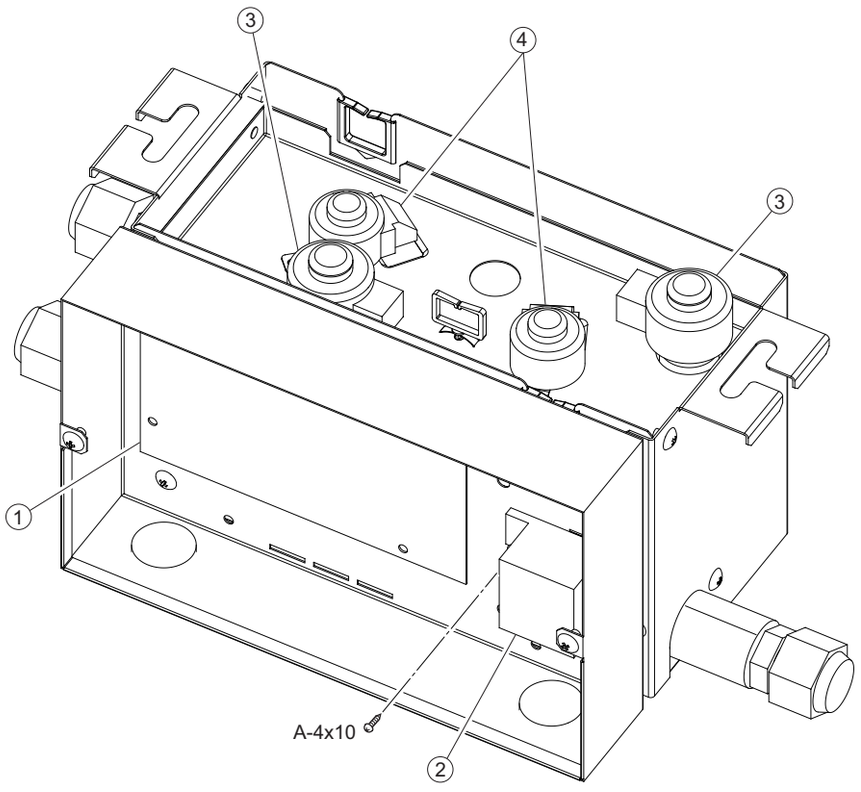
Part No.	Description	Remarks
1	E-Box Unit	Steel Plate Only
2	Terminal Board	
3	Fuse Holder	EF3, 4, 5
4	Fuse	EF3, 4, 5: 32A, Cartridge Fuse(for Constant Comp.)
5	Magnet Switch	CMC2: Fuji Electric, FC-2S
6	Current Sensor	CT2
7	Sub Electrical Box	Components+Harness+Plates

9.3.3 Electrical box components for RAS-(5-12)FSXNH(E)



Part No.	Description	Remarks
1	Electrical Box Plate	Steel Plate Only
2	Terminal Board	TB1: 600V, 50A
3	Noise Filter	NF1: 4LFB-22930-2F
4	Noise Filter	NF2: LFB-14930-3MA
5	Holder	
6	Fuse Holder	EF1, 2 (for Inv. Comp.)
7	Fuse Holder	EF11 (for Fan)
8	Fuse	EF1, 2: 40A, Cartridge Fuse (for Inv. Comp.)
9	Fuse	EF11: 20A, Cartridge Fuse (for Fan)
10	Fan Controller	FANM: PV092
11	Magnet Switch	CMC1: Fuji Electric, FC-0/SP
12	Resistor	RS1, 2: 20SHT500JA187
13	Resistor	R1: 40SH, 6.3kW
14	Resistor	R2: 40SH, 10.5kW
15	Reactor	DCL2: 3.0mH, 10A (for Fan)
16	Reactor	DCL1: 1.0mH, 30A (for INV.)
17	Diode Module	DM: PT50SN16
18	Transistor Module	IPM: 6MBP50RA120-55
19	PCB for Inverter	PCB2: PV093
20	Collar	
21	Collar	
22	Bush	
23	Spacer	
24	Spacer	
25	Radiation Fin 1	
26	Radiation Fin 2	
27	Thermistor	THM: for Inverter Fin
28	Capacitor	CB1, 2: 450V, 4700μF (for INV.)
29	Capacitor	CB3: 450V, 2700μF (for Fan)
30	Saddle	
31	Printed Circuit Board	PCB1: PO113
32	Spacer	
33	Spacer	
34	PCB Plate	
35	Capacitor	CS1, CS2
36	Noise Supressor	ZNR
37	Screw	
38	Electrical Box	Components+Harness+Plates
38	Electrical Box	Components+Harness+Plates
38	Electrical Box	Components+Harness+Plates
38	Electrical Box	Components+Harness+Plates
38	Electrical Box	Components+Harness+Plates

9.4 Refrigerant cycle and electrical parts for CH units



Part No.	Description	Remarks
1	Printed circuit board	PCB1
2	Terminal board	TB1: 600 V, 30 A
3	Expansion valve coil	MVD1, S1: Fuji Kouki, HAM-MD12HS-2
4	Expansion valve coil	MVD2, S2: Fuji Kouki, CAM-MD12HS-9

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10.1 Removing the front service cover

DANGER

Turn OFF all the power source switches.

NOTE

For servicing use the following tool:

- Phillips screwdriver.

1 Remove the service cover. Remove the 6 screws from the service cover. Hold the service cover at the bottom and extract it forwards. Remove the cover from the hooks on the right and left sides (refer to Fig. 1).

2 Remove the front cover

a. Remove the front cover with piping cover. Remove the screws from the front cover.

- RAS-(8-12)FSXN1E and RAS(5/6)FSXNH(E): 4 screws
- RAS-(14/16)FSXN1E and RAS(8-12)FSXNH(E): 5 screws

Hold the upper side of the front cover and lift it upwards. Remove the cover from the hooks on the right and left sides. Then, draw the front cover frontward. (refer to Fig. 2).

b. Remove the front cover only. Remove the screws from the front cover.

- RAS(5/6)FSXNH(E): 4 screws
- RAS(8-12)FSXNH(E): 5 screws

Then remove the screws fixing the piping cover. (Do not remove the screws circled in the Fig. 3). Hold the front cover at the upper and lift it upwards. Remove the front cover from the plug-in part (the intersection part into the piping cover) on the left. Then, draw the front cover frontward (refer to Fig. 3).

NOTE

- *When fitting and removing the front cover take care not to get injured with the edges of the cover.*
- *When securing the front cover, insert the hooks firmly in the lower part of the square holes of the side cover, as shown in the figure.*
- *Do not insert the lower end of the front cover into inside of the bottom base.*

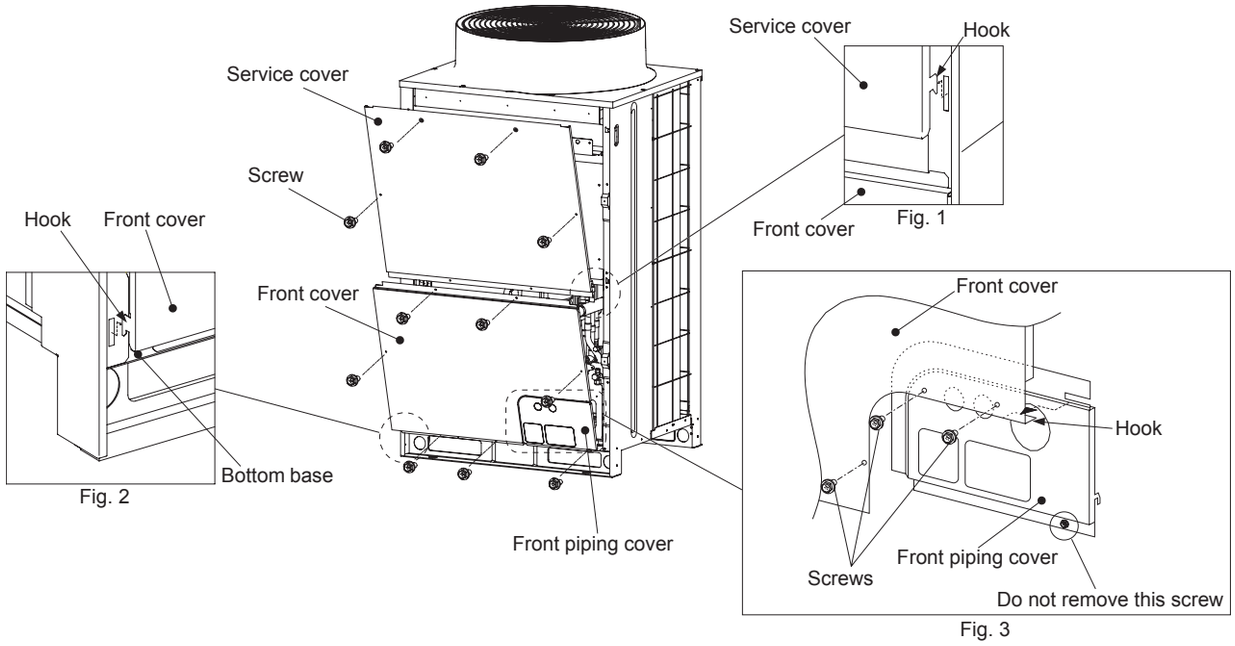


Fig. 2

Fig. 1

Fig. 3

10.2 Attaching the front service cover

DANGER

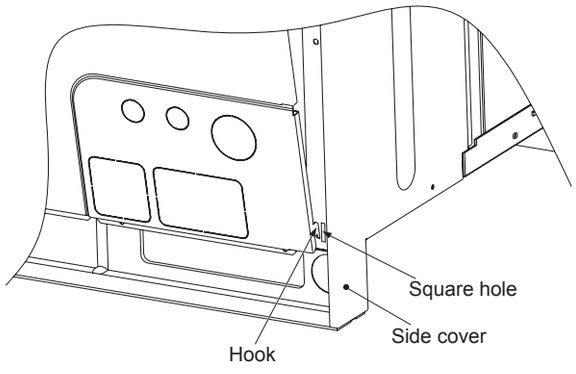
Turn OFF all the power source switches.

NOTE

For servicing use the following tool:

- Phillips screwdriver.

1 Attaching the front service cover. Insert the hooks of the front cover into the square holes of the side cover. DO not insert the lower end of the front cover into the inside of the bottom base. Fix the front cover with the screws.



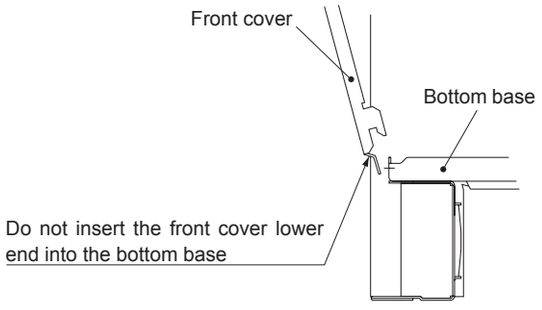


Fig. 1

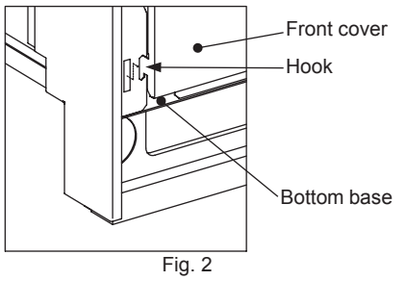


Fig. 2

2 Attaching the service cover. Service cover shall be attached after attaching the front cover. Insert the hooks of the service cover into the square holes of the side cover. Fix the front cover with the screws.

10.3 Removing the upper cover

DANGER

Turn OFF all the power source switches.

NOTE

For servicing use the following tool:

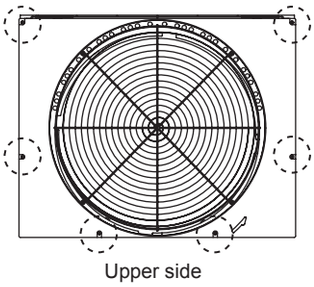
- Phillips screwdriver.

1 Remove the screws that attach the upper cover.

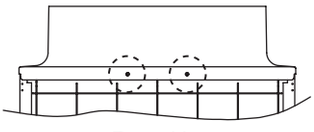
- RAS-(5/6)FSXNH(E): 8 screws.
- RAS-(8-12)FSXNH(E): 14 screws.

2 Lift the upper cover upward. Take care with the propeller fan when removing the upper cover.

RAS-(8-12)FSXN1E
RAS-(5/6)FSXNH(E)

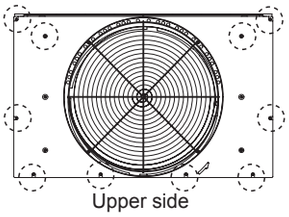


Upper side

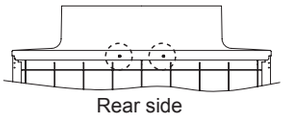


Rear side

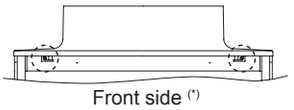
RAS-(14/16)FSXN1E
RAS-(8-12)FSXNH(E)



Upper side



Rear side



Front side (*)

NOTE

(*) When removing the two screw on the front side, remove the service cover according to Removing the front service cover.

10.4 Removing the protection net

DANGER

Turn OFF all the power source switches.

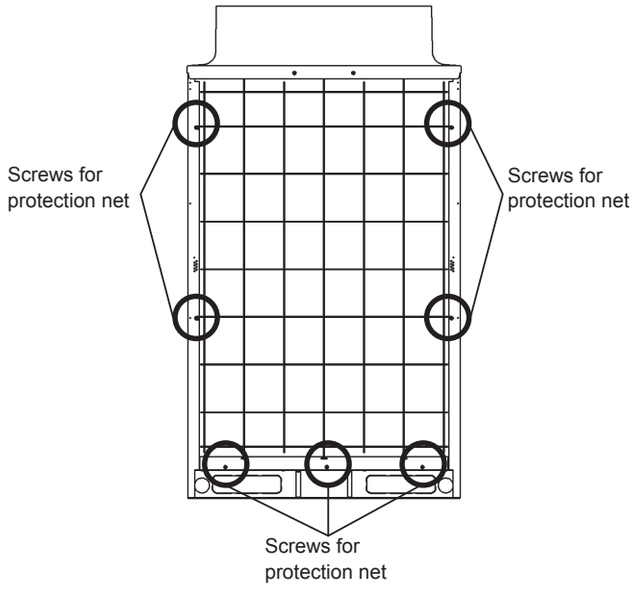
NOTE

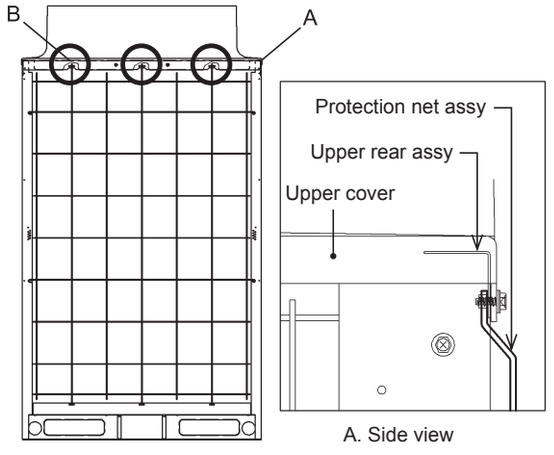
For servicing use the following tool:

- Phillips screwdriver.

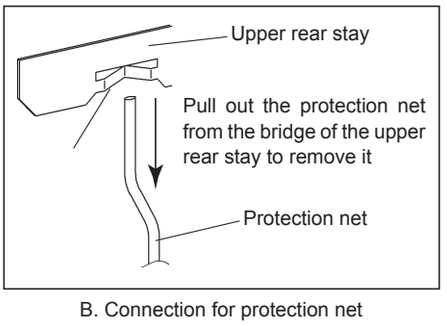
1 Remove the 7 screws that fix the protection net.

2 Pull out the protection net from the bridge of the upper rear stay to remove it.





A. Side view



B. Connection for protection net

10.5 Removing the electrical box cover

DANGER

Turn OFF all the power source switches.

NOTE

For servicing use the following tool:

- Phillips screwdriver.

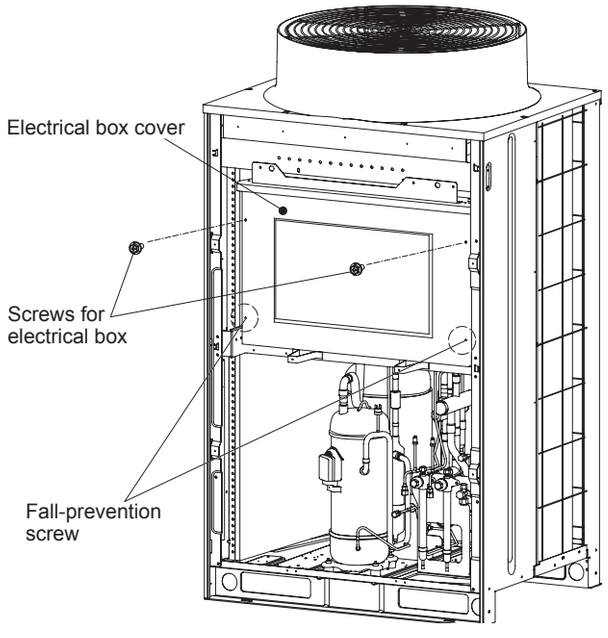
10.5.1 Removing the electrical box cover

1 Remove the front service cover as described in the procedure *"10.1 Removing the front service cover"*.
2 Remove the 2 screws of the electrical box cover and loosen the other 2 fall-prevention screws.
3 Lift the electrical box cover and remove it frontward from the fall-prevention screws.

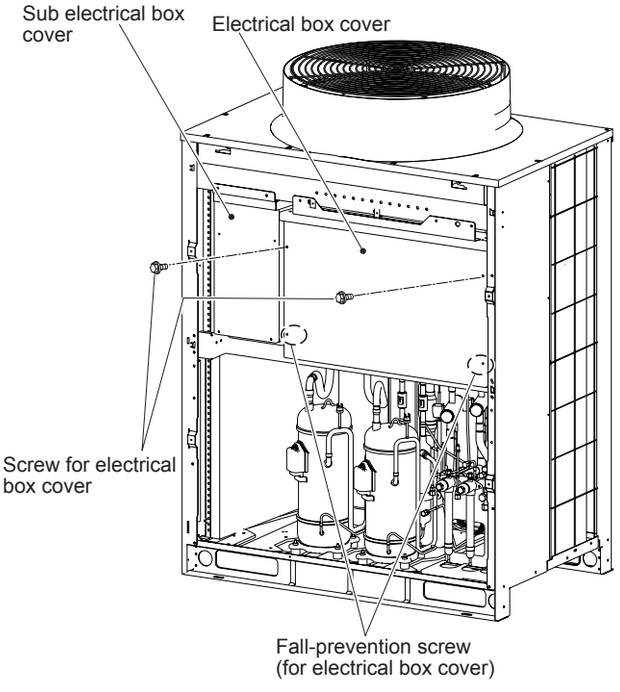
NOTE

- *Before removing the screws that fix the electrical box cover, make sure that the fall-prevention screws are fixed to the cover in order to prevent the electrical box cover from dropping off.*
- *Take care not get injured with the edges of the front cover when removing the electrical box cover.*

RAS-(8-12)FSXN1E
RAS-(5/6)FSXNH(E)



RAS-(14/16)FSXN1E
RAS-(8-12)FSXNH(E)



10.5.2 Removing the sub electrical box cover

◆ For RAS-(14/16)FSXN1E

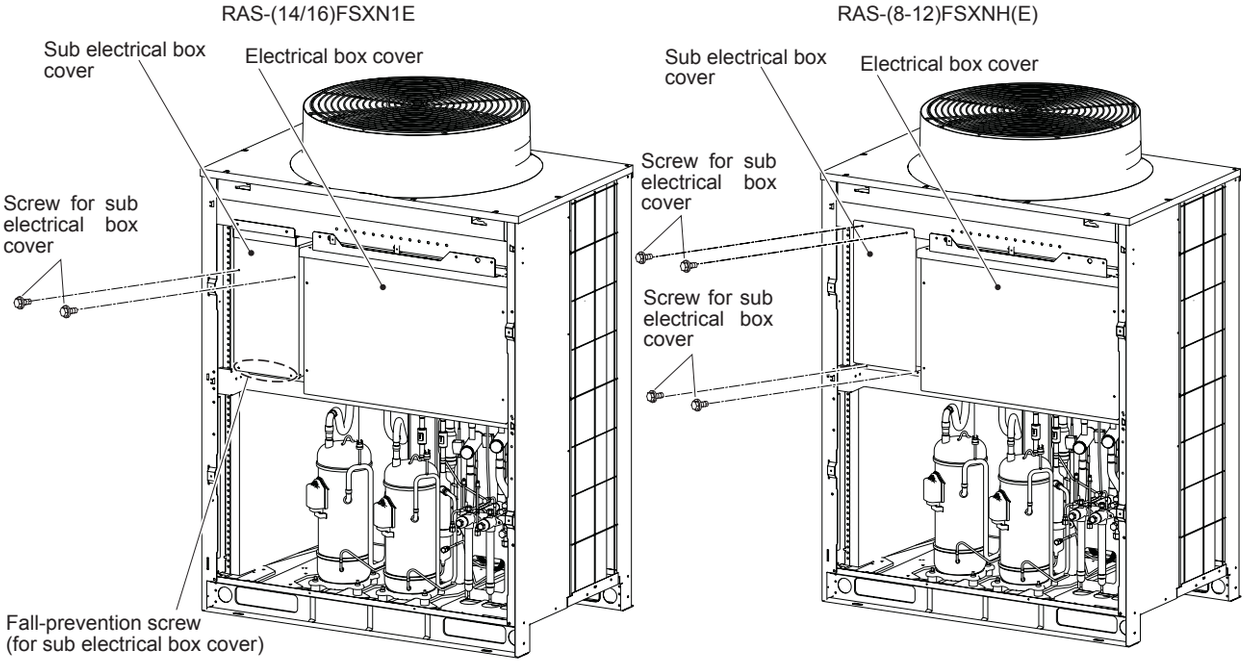
1 Remove the front service cover as described in the procedure *Removing the front service cover*.
2 Remove the two screws of the sub electrical box cover and loosen the 2 fall-prevention screws.
3 Lift the sub electrical box cover and remove it frontward from the screws.

◆ For RAS-(8-12)FSXNH(E)

1 Remove the front service cover as described in the procedure *Removing the front service cover*.
2 Remove the two screws of the sub electrical box cover and loosen the 2 fall-prevention screws.
3 Lift the sub electrical box cover and remove it frontward from the screws.

NOTE

- *Before removing the screws that fix the sub electrical box cover, make sure that the fall-prevention screws are fixed to the cover in order to prevent the electrical box cover from dropping off.*
- *Take care not to get injured with the edges of the front cover when removing the sub electrical box cover.*



10.6 Removing the electrical box

DANGER

Turn OFF all the power source switches.

NOTE

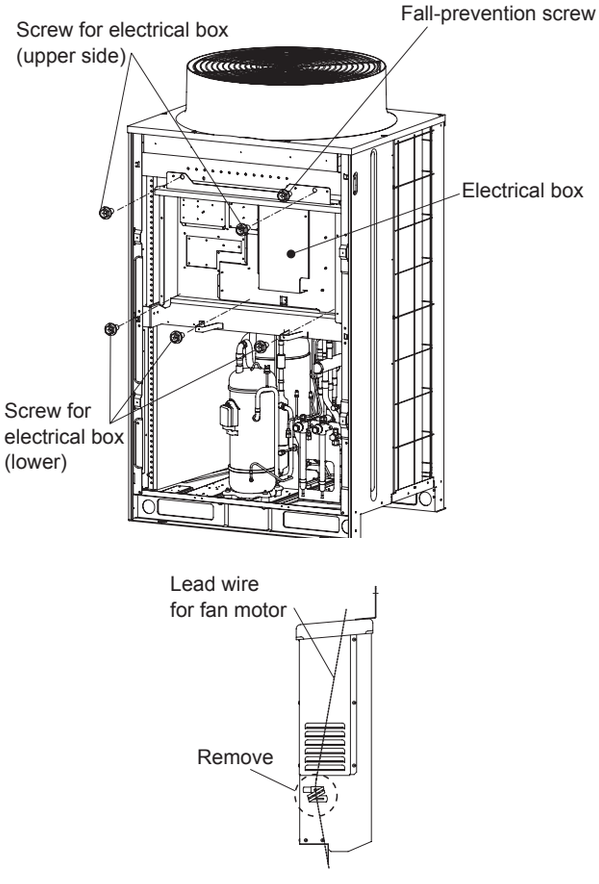
For servicing use the following tool:

- Phillips screwdriver.

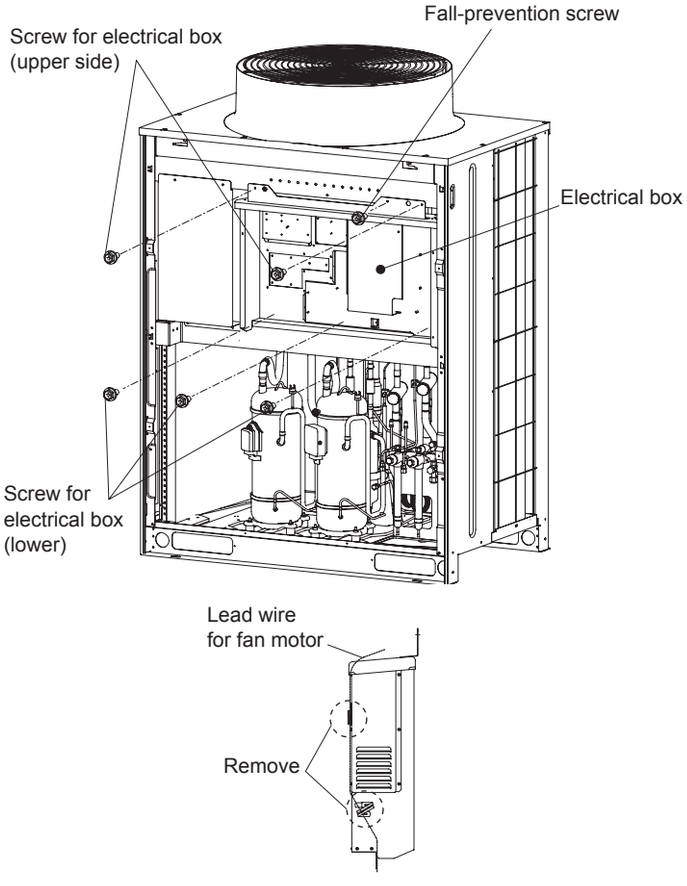
10.6.1 Removing the electrical box

1. Remove the front service cover as described in the procedure *Removing the front service cover*.
2. Remove the electrical box cover as described in the procedure *Removing the electrical box cover*.
3. Remove the screws that fix the wiring of the power supply, the wiring of the compressor, the operation line and the earth wire.
4. Disconnect the connector for the fan motor, the solenoid valve, the crankcase heater and the high pressure switch.
5. Disconnect the connector for the thermistor, the electronic expansion valve and the pressure sensor of the PCB1.
6. Unfix the lead wire fixed on the left side of the electrical box with a cord clamp.
7. Remove the 3 lower screws of the electrical box.
8. Fit the electrical box cover.
9. Remove the 2 upper screws of the electrical box and loosen the fall-prevention screw.
10. Lift the electrical box and remove it frontward from the fall-prevention screw.

RAS-(8-12)FSXN1E
RAS-(5/6)FSXNH(E)

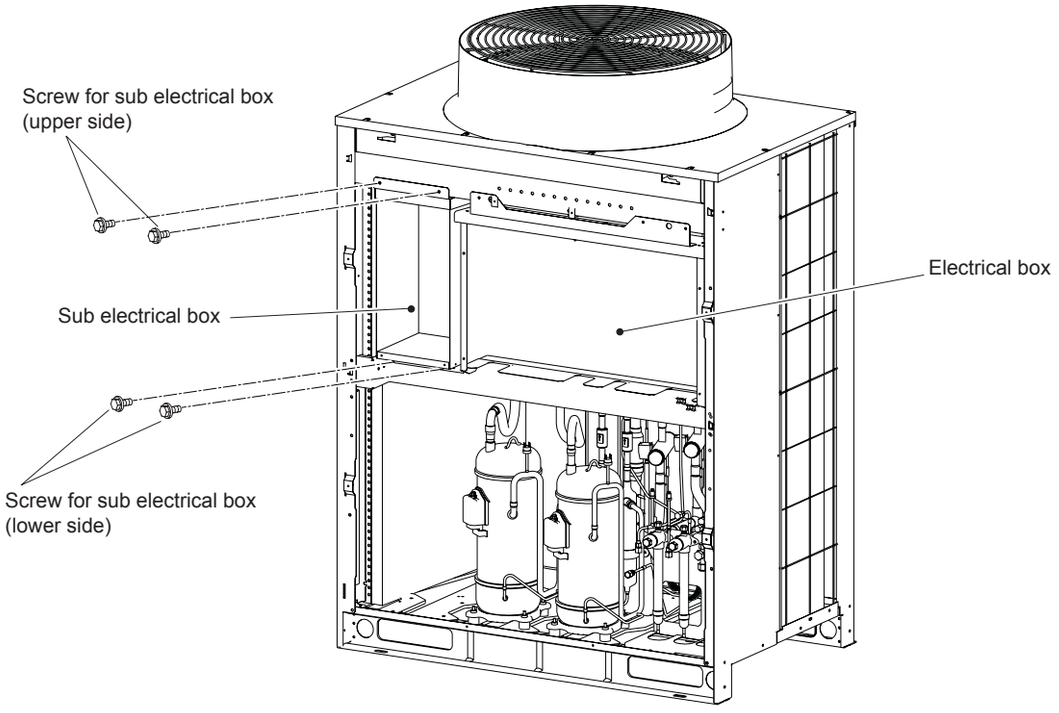


RAS-(14/16)FSXN1E
RAS-(8-12)FSXNH(E)



10.6.2 Removing the sub electrical box for RAS-(14/16)FSXN1E only

1 Remove the front service cover as described in the procedure *"10.1 Removing the front service cover"*.
2 Remove the sub electrical box cover as described in the procedure *"10.5.2 Removing the sub electrical box cover"*.
3 Remove the 2 screws fixing lower side of the sub electrical box.
4 Remove the 2 screws fixing upper side of the sub electrical box.
5 Remove the sub electrical box.



10.7 Removing the electrical box stay

DANGER

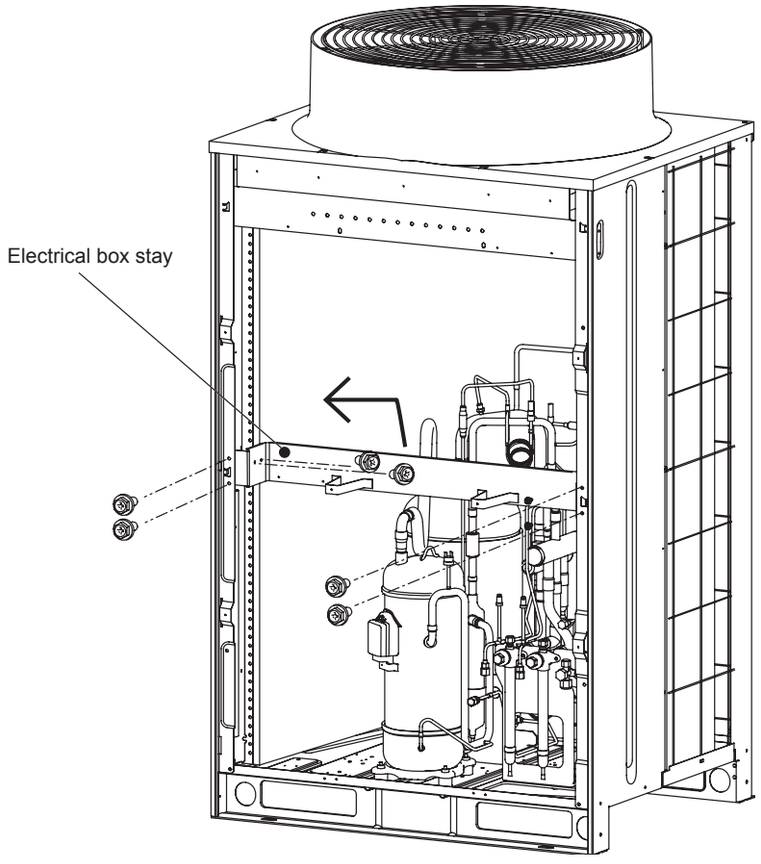
Turn OFF all the power source switches.

NOTE

For servicing use the following tool:

- Phillips screwdriver.

1 Remove the electrical box and sub electrical box as described in the procedure *"10.6.1 Removing the electrical box"*.
2 Remove the 6 screws fixing the electrical box stay.
3 Lift the electrical box stay upward. Remove the right and left hooks that fix the electrical box stay in the direction of the arrow.



10.8 Removing the air grille

DANGER

Turn OFF all the power source switches.

NOTE

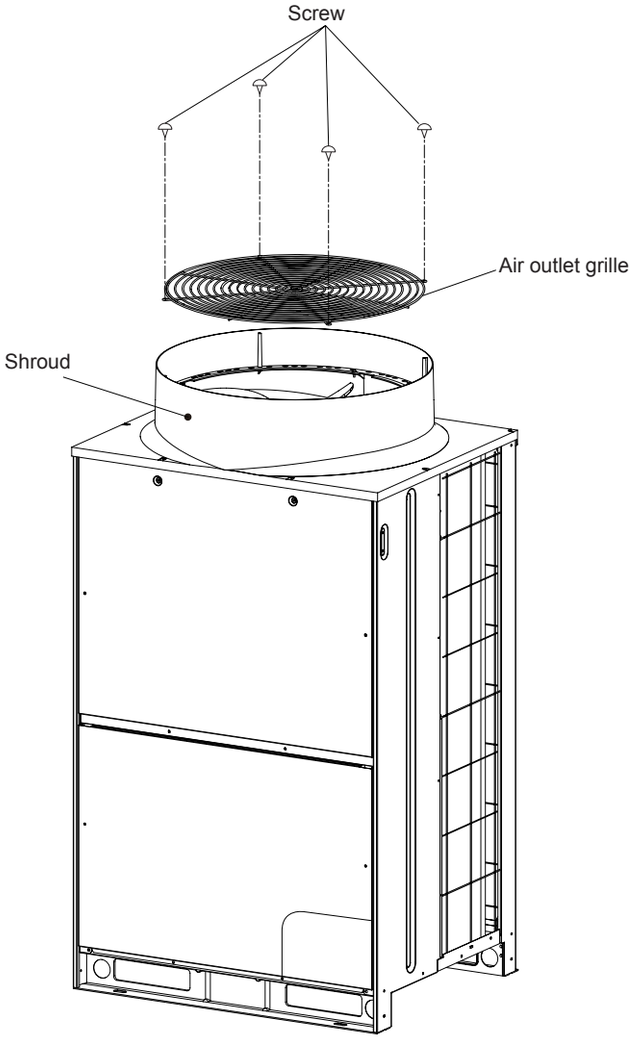
For servicing use the following tool:

- Phillips screw driver.

1 Remove the 4 fixing screws of the air grille.
2 Remove the air grille.

NOTE

Do not apply an excessive force to the shroud (plastic part) to avoid breaking or deforming it.



10.9 Removing the outdoor fan

DANGER

Turn OFF all the power source switches.

NOTE

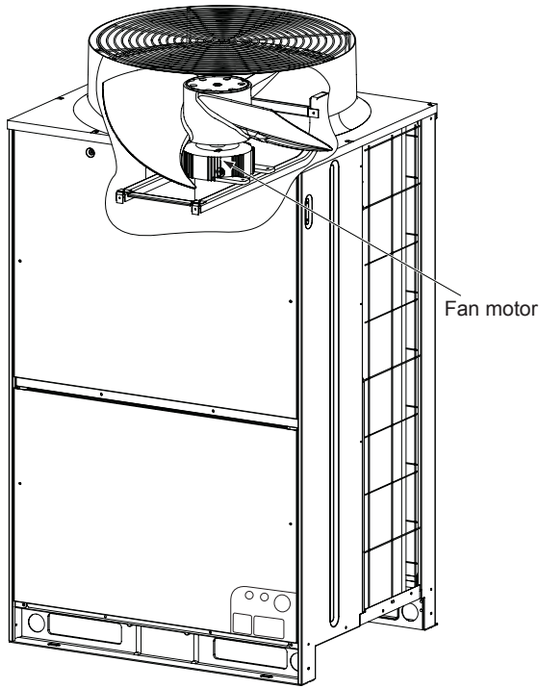
For servicing use the following tools:

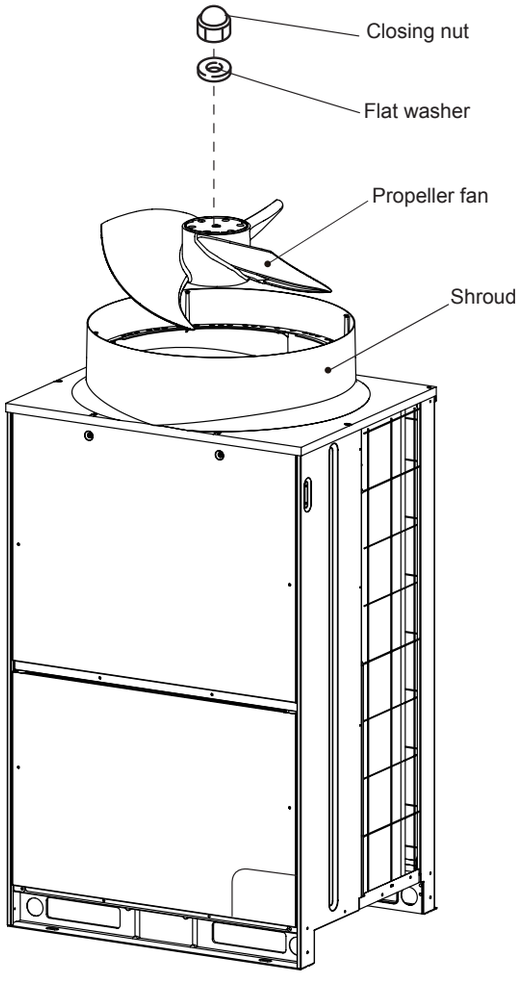
- Adjustable wrench.
- Puller.
- Spanner.
- Nipper.
- Phillips screwdriver.
- Box wrench.

1 Remove the air grille as described in the procedure *Removing the air grille*.
2 Remove the closing nut and the flat washer fixing the propeller fan to the motor shaft using a box wrench.
3 Remove the propeller fan from the motor shaft (lift the propeller fun up). When attaching the propeller fan to the motor shaft, make the D-cut at the boss portion connected to the D-cut of the fan motor shaft.

NOTE

Do not apply an excessive force to the shroud (plastic part) to avoid breaking or deforming it.





4 Remove the wire. Remove the service cover and the electrical box acording to *"10.1 Removing the front service cover"* and *"10.5 Removing the electrical box cover".* Disconnect the wire connector for the fan motor in the electrical box. Unfix the lead wire connecting the electrical box and the fan motor. Remove 4 bolts fixing the fan motor and remove it.

- RAS-(5/6)FSXNH(E): M6
- RAS-(8-12)FSXNH(E): M5

5 Set up the wire in reverse procedure.

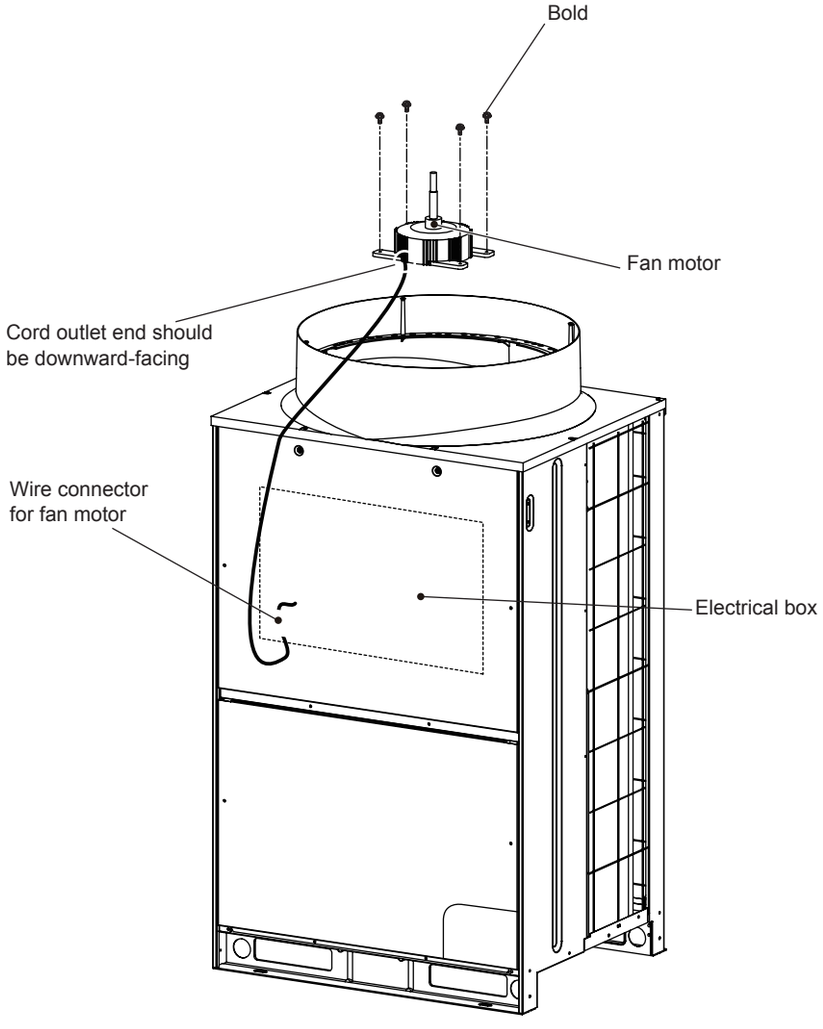
NOTE

- *The cord outlet end should be downward-facin when mounting the fan motor (make a wire trap).*
- *Fix the motor wire to the motor clamp using a plastic tie to avoid contact with the propeller fan.*
- *When mounting the propeller fan on the motor shaft, make the D-cut at the boss portion (Θ mark part) connected to the D-cut of the fan motor shaft. Firmly fix the propeller fan with 30 Nm torque after the head of the fan shaft comes up.*

Tightening torque for the propeller fan
30 Nm

- *Connect the motor wire in the electrical box connector.*

6 After mounting the fan motor, check from above that gap between the propeller fan and the upper cover is even. Alsco check that there is no noise caused by contact between the propeller fan and the upper cover during the propeller fan operation.



10.10 Removing the compressor

DANGER

Turn OFF all the power source switches.

NOTE

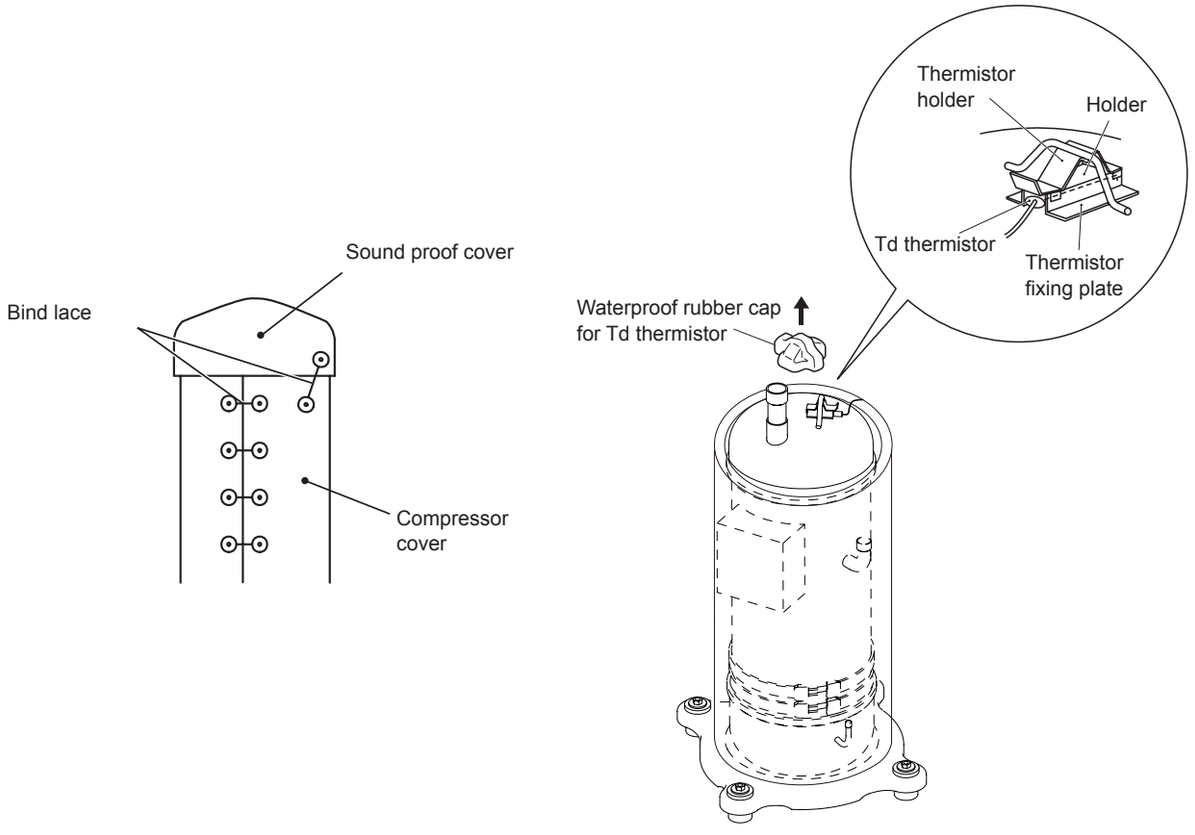
For servicing use the following tools:

- Long-nose pliers.	- Burner (welder)	- Box wrench.
- Phillips screwdriver.	- Oil pan.	- Measure cap.
- Spanner.	- Pipe cutter.	- Wet cloth.
- Pincher.	- Adjustable wrench.	- Pliers

1 Remove the front service cover as described in the procedure *Removing the front service cover*. In case that the outdoor unit is installed closely to the wall, remove the refrigerant piping and move the outdoor unit away from the wall.
2 Release the bind lace for the sound proof cover of the compressor and remove the sound proof cover.
3 Remove the Td thermistor on the top of the compressor.

NOTE

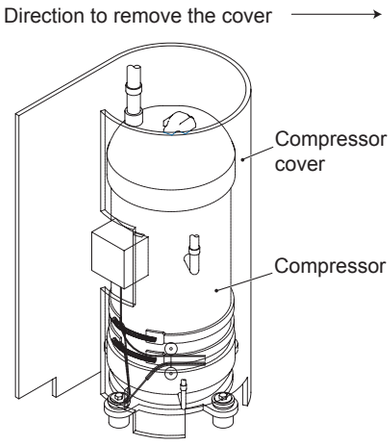
- *The thermistor holder, the thermistor fixing plate and the waterproof rubber cap and the compressor cover will be used again for the reassembly. Keep them in a box and such during the replacement, in order not to lose them.*
- *When removing the compressor, the electrical box located above the compressor may disturb removing the compressor cover. In that case, remove the electrical box stay before starting the work. If not, the inner aluminium sheet may be damaged when removing the cover.*



4 Release the bind lace for the compressor cover to remove.

NOTE

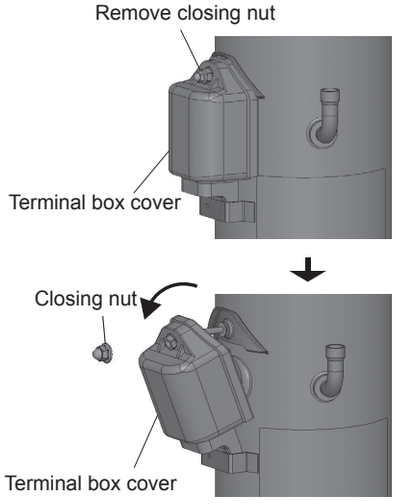
- *When removing the compressor cover, take special care not to deform the piping around the cover. The brazing parts may be damaged due to pipe deformation.*
- *When removing the compressor cover, take special care not to be injured with the sheet metal edges or the heat exchanger fins.*
- *The aluminium sheet is conductive. If the aluminium sheet is damaged it may lead to failure due to an electric wiring contact. To avoid such a failure, check the compressor cover condition before fixing the cover.*

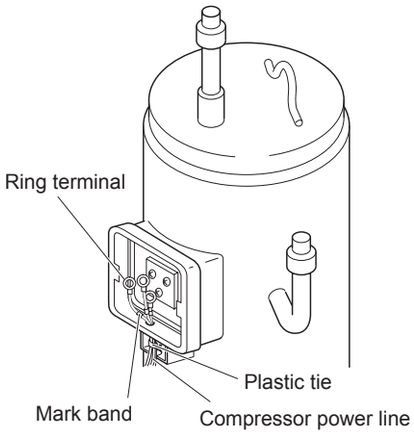


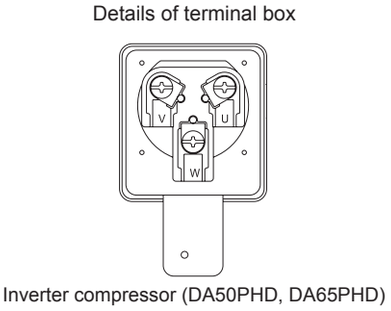
5 Remove the terminal box cover for the compressor and disconnect the wiring to the compressor terminals. Then, check the terminals Nos. and the mark band Nos.. Match the terminal Nos. with the mark band Nos. when rewiring the compressor. If they are incorrectly connected, the compressor may be damaged due to reverse rotation.

NOTE

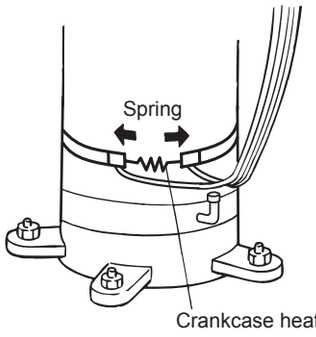
- *When replacing the compressor, check for the ring terminal condition. If there is something wrong with any of the ring terminals, replace it with a new one.*
- *Fix the lead wire firmly with plastic ties.*
- *Retighten the compressor screws after the replacement.*







6 Release the spring for the crankcase heater to remove it.



7 Disconnect the discharge and suction pipes and the oil discharge pipe from the compressor. Check the air pressure in the piping is equal to the atmospheric pressure. Then, cut the pipes at the closer position to the compressor from each brazing part. After cutting the pipes, remove the pipes from the brazing parts of the compressor.

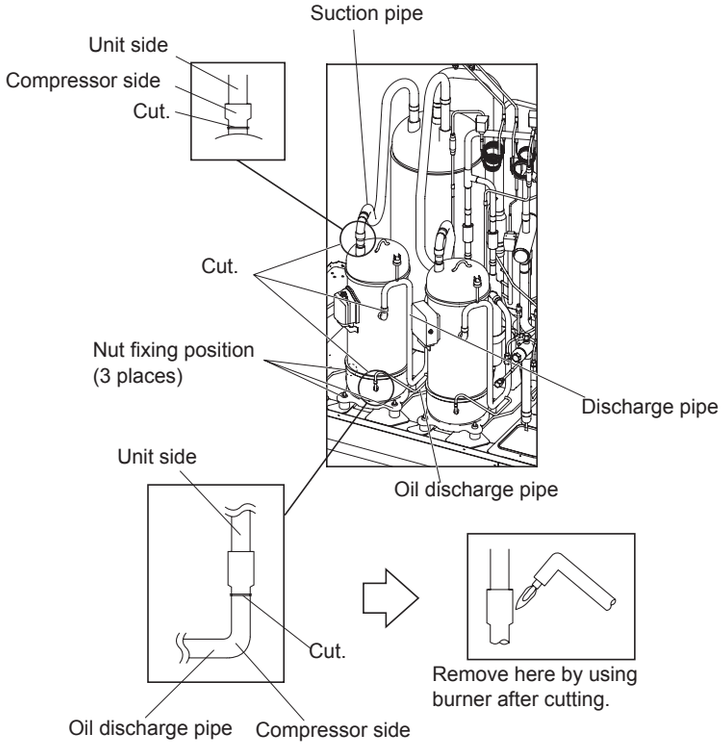
NOTE

- *All the pipes are connected by brazing. When applying the burner to the pipe connections, the oil adhered inside the pipes may burn. So clear flammable materials around the compressor before the work.*
- *Burner work under applying gas pressure is very dangerous. Make sure to cut the pipes first before burner work.*

8 Disconnect the oil discharge pipe from the compressor. Before disconnecting it, pinch and cut the pipe at the closer position to the compressor from the brazing part so that the refrigerant oil remaining inside the compressor will not spill out from the oil discharge pipe.

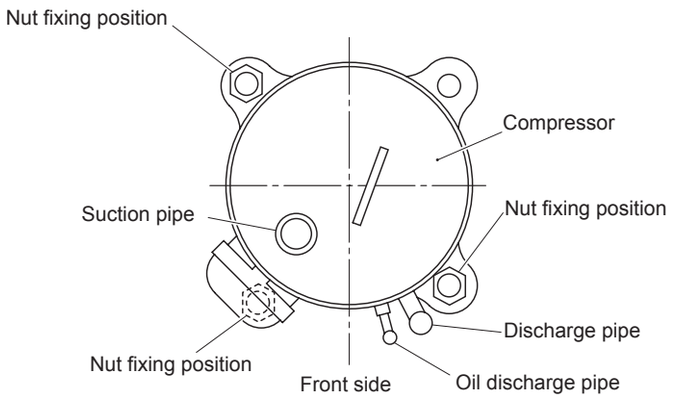
NOTE

- *If the oil discharge pipe is disconnected without performing the above procedure (for example, applying burner directly to the brazing part), the refrigerant oil may pill out from the oil discharge pipe and catch fire. Make sure to follow the procedure for safety.*
- *When disconnecting the oil discharge pipe, use an oil pan and such in case the remaining refrigerant oil spills.*
- *Do not throw out the oil collected with the oil pan and such. The oil quantity must be measured afterward.*



9 Remove 3 nuts fixing the compressor and remove the compressor.

View from top of compressor



NOTE

- *When removing the compressor, take special care not to contact with the surrounding pipes. If contacted, the pipes may be deformed.*
- *Take special care not to be injured with the sheet metal edges while working.*
- *When removing the compressor fixed with the oil discharge pipe, seal the pipe end with tapes so that the refrigerant oil remaining inside the compressor will not spill out from the oil discharge pipe.*
- *To prevent water and foreign particles from entering the refrigerant cycle, mount the new compressor immediately after removing the old one.*
- *When removing the compressor, remove the electrical box located above the compressor to make the work easier. 10 mm box wrench is required to remove the nuts fixing the compressor.*

10 Withdraw the remaining refrigerant oil in the compressor from the discharge pipe, and measure the oil quantity.

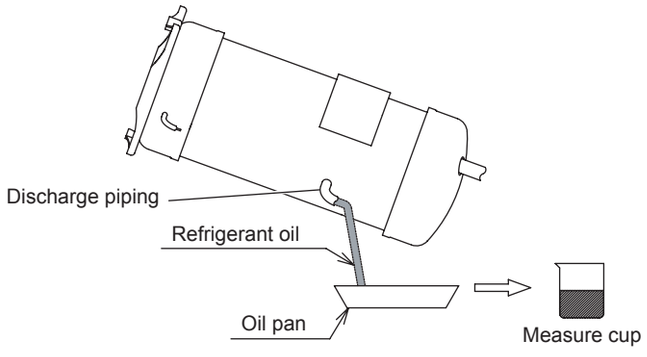
NOTE

- *Additional refrigerant oil charge is required if: remaining refrigerant oil quantity in the old compressor > pre-charged refrigerant oil in the new compressor.*
- *No additional refrigerant oil charge is required if: remaining refrigerant oil quantity in the old compressor < pre-charged refrigerant oil in the new compressor.*
- *The recharged quantity of the refrigerant oil to the cycle is calculated as follows: (Remaining quantity in the old compressor + Collected quantity in the item 2.10 (8) + 200 cc*) - (Initial charged quantity in the compressor for each model)*

Compressor	Initial charged refrigerant oil
For inverter (DA50PHD)	1100cc
For inverter (DA65PHD)	1100cc
For constant speed (E655DH)	500cc

*200cc: This value is not considered to be removed from the chamber.

- *If the refrigerant oil is contaminated, replace all of it with new refrigerant oil.*



11 Mount the new compressor. When attaching the nut at the front side, take care not to deform the oil discharge pipe. Perform brazing according to the following order:

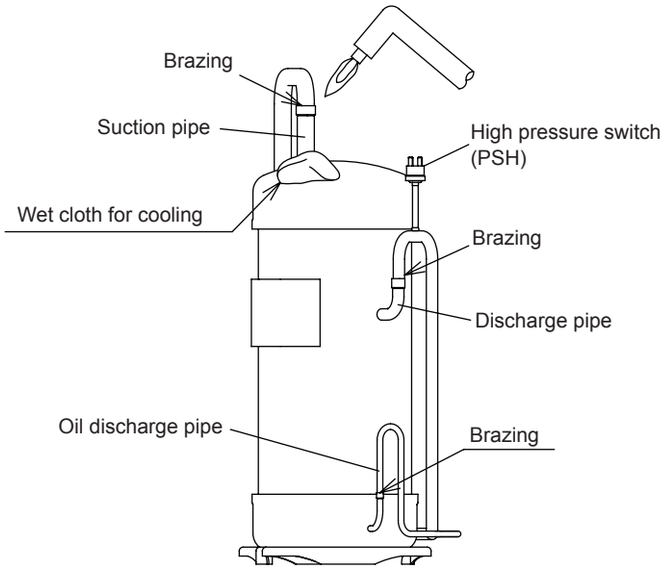
a. Oil Discharge Pipe

b. Discharge Pipe

c. Suction Pipe

NOTE

- *When mounting the new compressor on the base, take special care not to contact the piping. If contacted, piping may be deformed.*
- *The new compressor should be mounted with the cap, and remove the cap just before starting the brazing work.*
- *Connect the charging hose with the check joint at the low pressure side to release pressure.*
- *When brazing the suction pipe, make sure that the connecting part is firmly inserted into the compressor and that the piping root is cooled, in order to prevent the brazing material from entering the compressor.*



12 Wind the crankcase heater around the compressor.
13 Attach the compressor cover to the compressor.
14 Reconnect all wires.

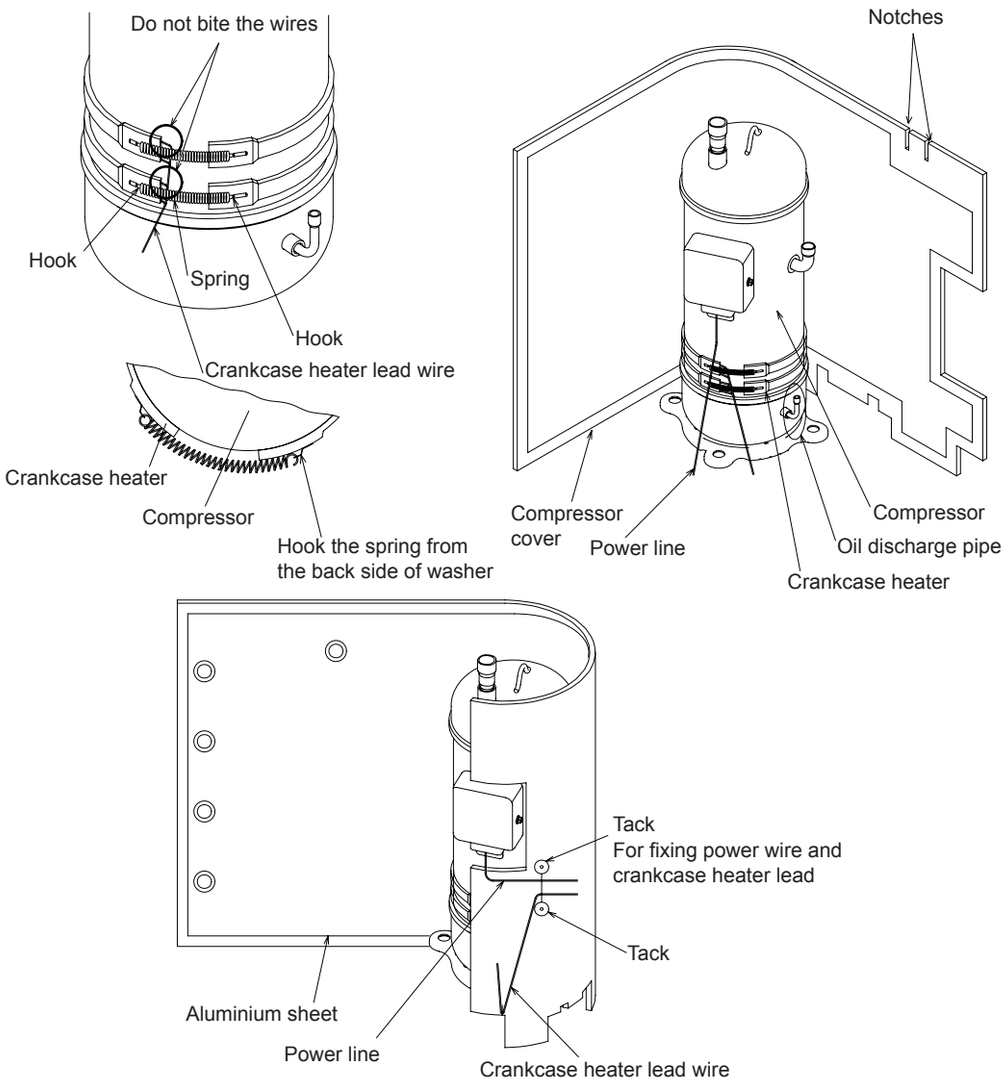
a. The crankcase heater lead wire and the power line shall be fixed inside the compressor cover with tacks, without contacting the piping.

b. Draw the lead wire for high pressure switch (PSH) and attach the Td thermistor. Pull out the wire from the dent part at the top of the compressor cover.

NOTE

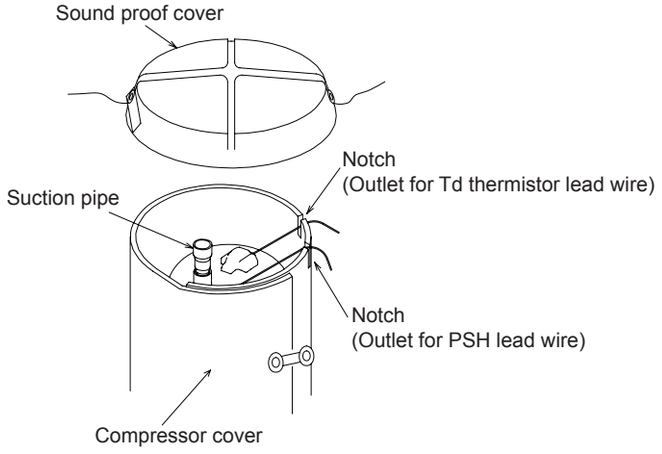
- *If the power line or the crankcase heater lead line contacts the high temperature part such as the oil discharge pipe or compressor chamber, the wire may be cut or catch fire. Protect the wire from overheating and protect the edge with the compressor cover.*
- *Check that the high pressure switch (PSH) does not contact the compressor cover aluminium sheet.*
- *Attach the crankcase heater firmly to the compressor and fix it with springs as shown in the figure.*
- *If there is clearance between the crankcase heater and the compressor due to wire overlapping, excessive heat will be generated there. Then crankcase heater may break down due to overheating. When mounting the reassembled crankcase heater, this point should be taken into account.*
- *If the crankcase heater lead wire catches on the springs, the lead wire may be cut due to vibration. When reassembling the crankcase heater, attention should be paid to the lead wire.*

Example



c. *Fix the cover firmly with two tacks to prevent water from entering from the clearance between the compressor cover and the sound proof cover.*

Example

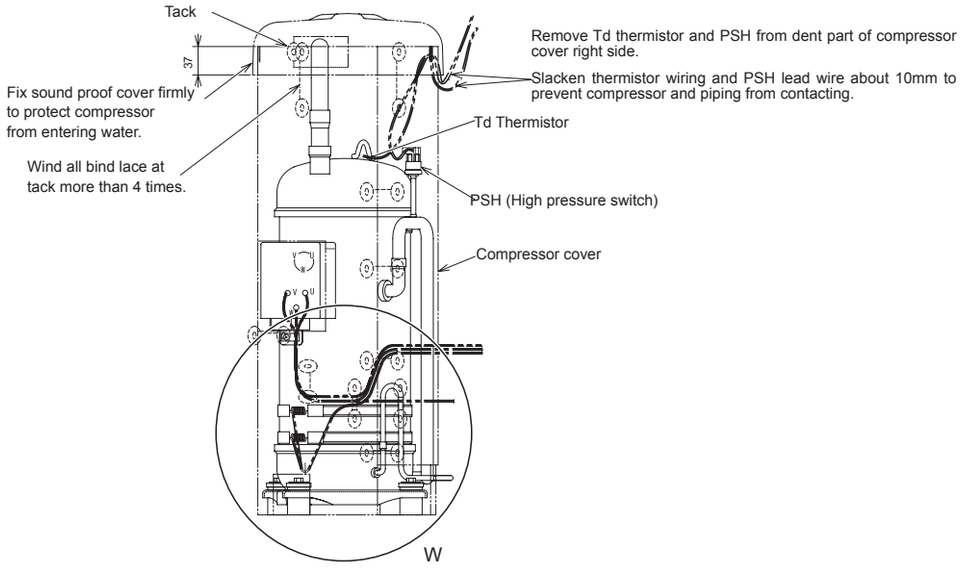


10

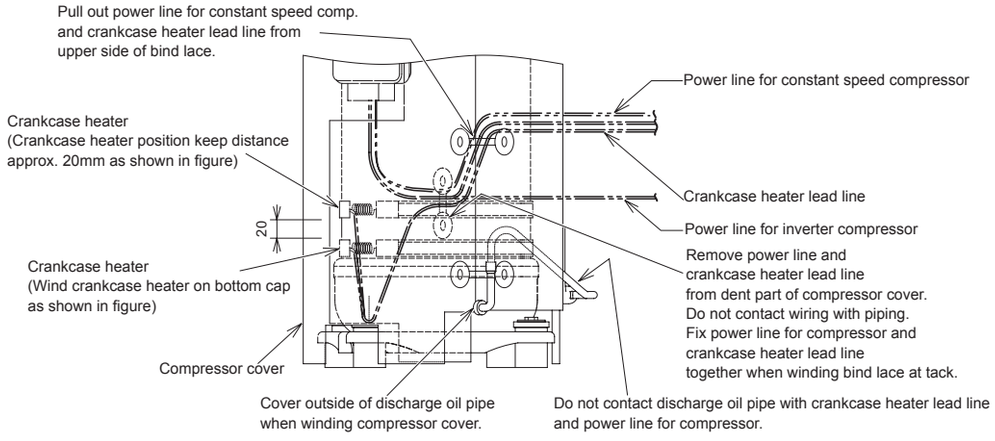
15 Perform the final check for wiring conditions referring to the figure below.

NOTE

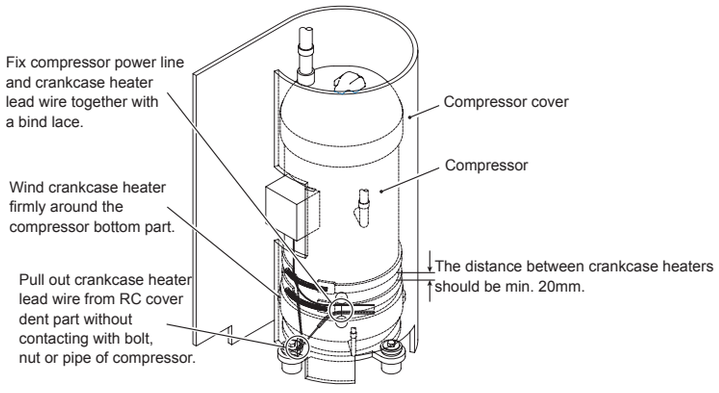
Check that all wires do not contact the compressor, piping and plate edges. If any of the wires contacts with them, wire breakage or fire may occur.



Details view from W



Details of compressor crankcase heater harness wiring



10.11 Replacing the refrigerant oil

DANGER

Turn OFF all the power source switches.

NOTE

For servicing use the following tool:

- Adjustable wrench or spanner.

10.11.1 No clogging in return oil circuit

1 Remove the front service cover as described in the procedure *"10.1 Removing the front service cover"*.
2 Close the following stop valves.

   a. Heat pump system: close the high/low pressure gas stop valve and the liquid stop valve.

   b. Heat recovery system: close the high/low pressure gas stop valve, the low pressure gas stop valve and the liquid stop valve.

3 Collect the outdoor unit refrigerant from the low pressure check joint and the high pressure check joint. Make sure that the pressure will not increase at this time.

NOTE

If the pressure increases, collect all the refrigerant in the refrigerant circuit.

4 Connect the charge hose (for R410A) to the pressure check joint to collect the refrigerant oil.
5 Charge with nitrogen (0.15MPa) from the low pressure check joint and collect the refrigerant oil in the accumulator by applying pressure for approximately 20 minutes.

NOTE

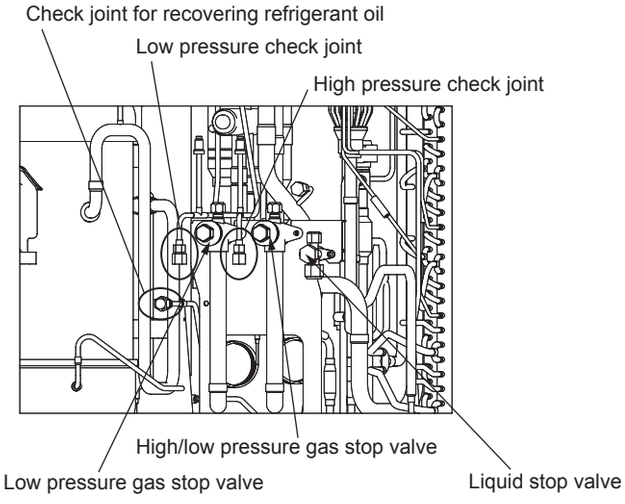
Make sure that the pressure of the high pressure check joint is not abnormal when the nitrogen is charged.

6 Stop charging with nitrogen after the refrigerant oil is completely collected. Perform vacuuming from the low pressure check joint and add the same quantity as the collected refrigerant oil.

NOTE

When the collected refrigearnt oil is 3 L. or less, clogging may exist in the return oil circuit. In this case, replace the return oil circuit as described in the procedure "10.11.2 Clogging in return oil circuit and replacing return oil circuit"

7 When the procedure is finished, perform the vacumming again from the low pressure check joint and recharge the refrigerant. After recharging, open the stop valves.



NOTE

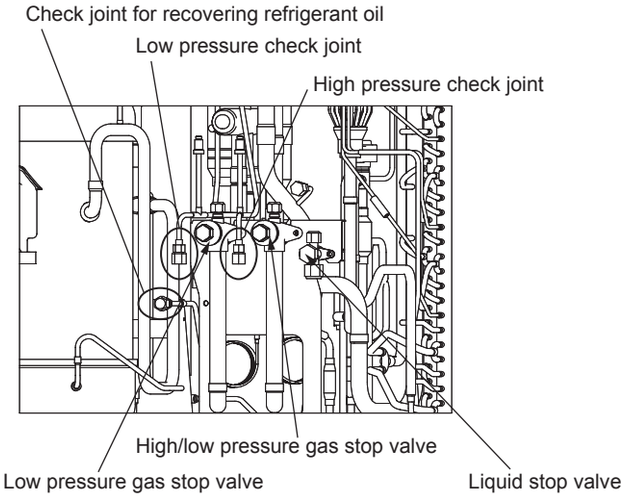
- *Use a clean charge hose.*
- *Charge the refrigerant oil in a short period of time (approximately 20 minutes). Use a container with a small opening so the refrigerant oil does not absorbe the moisture in the atmosphere.*

10.11.2 Clogging in return oil circuit and replacing return oil circuit

NOTE

In the case of replacing the return oil circuit only, the procedures 8 and 9 are not required.

1 Remove the front service cover as described in the procedure *"10.1 Removing the front service cover"*.
2 Remove the electrical box and electrical box stay as described in the procedures *"10.6 Removing the electrical box"* and *"10.7 Removing the electrical box stay"*.
3 Close the following stop valves.
   a. Heat pump system: close the high/low pressure gas stop valve and the liquid stop valve.
   b. Heat recovery system: close the high/low pressure gas stop valve, the low pressure gas stop valve and the liquid stop valve.
4 Collect the outdoor unit refrigerant from the low pressure check joint and the high pressure check joint. Make sure that the pressure will not increase at this time.



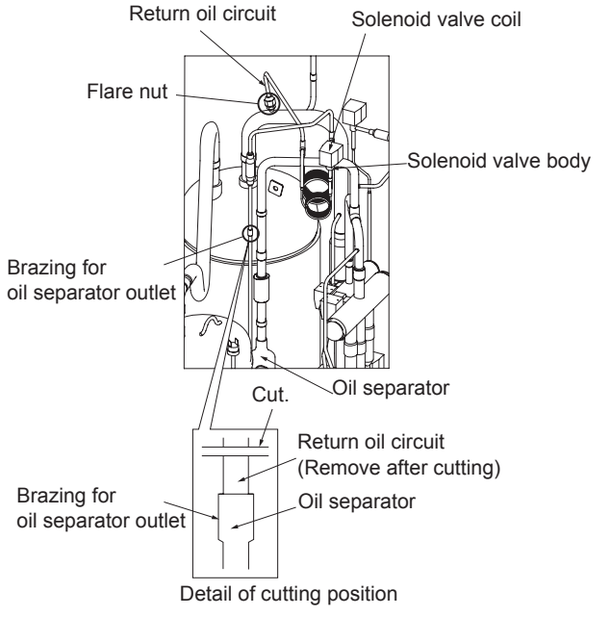
NOTE

If the pressure increases, collect all the refrigerant in the refrigerant circuit.

5 Remove solenoid valve coil connected to solenoid valve of the return oil circuit as described in the procedure *"10.12.2 Removing the solenoid valve coil (SVA, SVG, SVF)"*.
6 Remove the flare nut that connects with the return oil circuit and other pipings at the upper part of the reurn oil circuit.
7 Cut return oil circuit off from oil separator outlet port at the point indicated in the figure. Remove return oil circuit from the unit. Then, remove brazing part of the oil separator outlet port.

NOTE

- *When cutting return oil circuit off, cut the closer part to return oil circuit to prevent the refrigerant oil remaining in return oil circuit from spilling out.*
- *When cutting return oil circuit off, do not use a tool spewing swarf such as a saw.*
- *After cutting return oil circuit off, remove the cut-off piping from brazing part of the oil separator outlet port.*
- *When removing flare nut at the upper part of the return oil circuit and brazing part of the oil separator outlet port, refrigerant oil may come out. Prepare the oil pan and such before the work to receive the refrigerant oil.*



8 Connect a charging hose to brazing part of oil separator outlet port. Then, charge nitrogen (0.15MPa) from the upper union of return oil circuit, and collect refrigerant oil in oil separator, applying pressure.

NOTE

In the case that the unit has 2 return oil circuits and 2 oil separators (Example: RAS-14FSXN1E and RAS-16FSXN1E), collect the refrigerant oil from one oil separator and then from the other.

9 Stop charging nitrogen after the refrigerant oil has completely been collected and mount the flare nut removed in the procedure 6 above. Perform vacuuming from low pressure check joint and add the same quantity of oil as the collected refrigerant oil from check joint for collecting refrigerant oil.

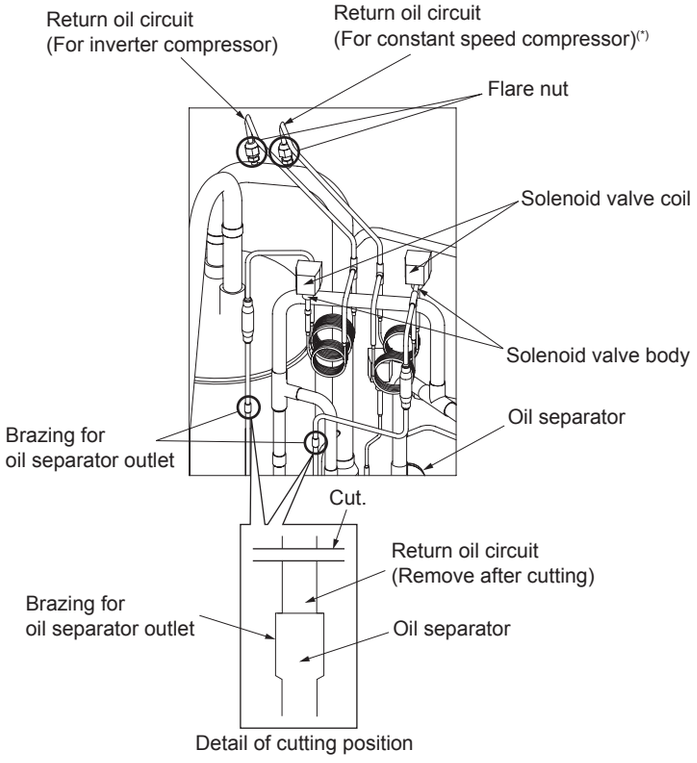
10 Connect the return oil pipe for replacement oil. After connecting the pipe, perform the nitrogen pressurization from low pressure check joint. During the work, check that the oil does not spill out from the flare nut connection and brazing part.

11 When the procedures have been completed, perform vacuuming again from low pressure check joint and recharge the refrigerant. After recharging, open the stop valves.

NOTE

- *Use a clean charging hose.*
- *Charge the refrigerant oil in a short time (within approx. 20 minutes). Use a container with a small opening so that the refrigerant oil will not absorb the moisture in the atmosphere.*

In case of RAS-(14/16)FSXN1E and RAS-(8-12)FSXNH(E)



NOTE

(*) Only for RAS-(14/16)FSXN1E.

10.12 Removing the coils

DANGER

Turn OFF all the power source switches.

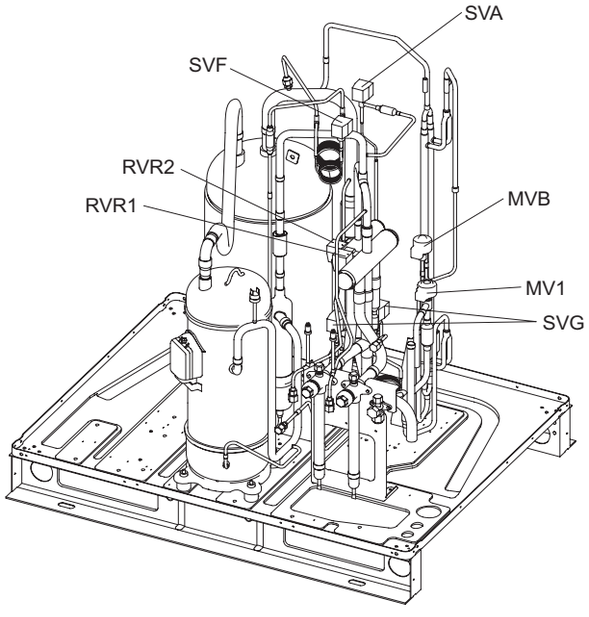
NOTE

For servicing use the following tools:

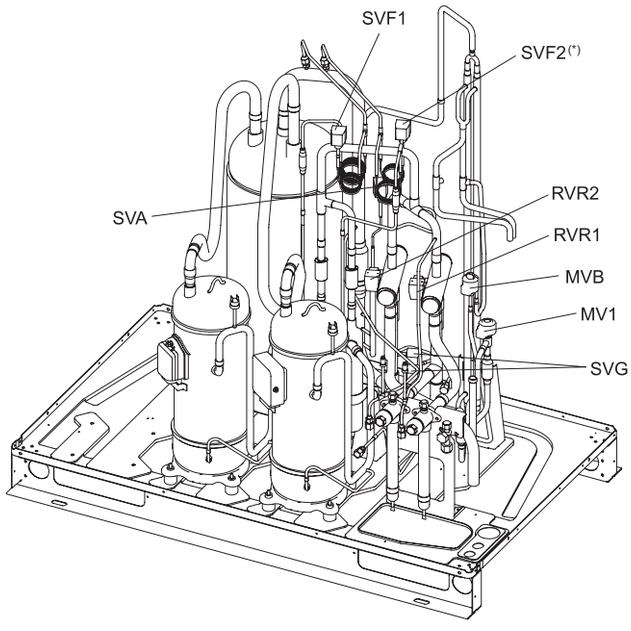
- Pliers.
- Phillips screwdriver.
- Charging hose.
- Burner.
- Wet cloth.
- Adjustable wrench or spanner.
- Pipe cutter.
- Pincher.

The following figures indicate the position of the coils:

RAS-(8-12)FSXN1E and RAS-(5/6)FSXNH(E)



RAS-(14/16)FSXN1E and RAS-(8-12)FSXNH(E)



SVF	Solenoid valve coil
SVF1	
SVF2	
SVA	
SVG	
RVR1	Reversing valve coil
RVR2	
MV1	Expansion valve coil
MVB	

NOTE

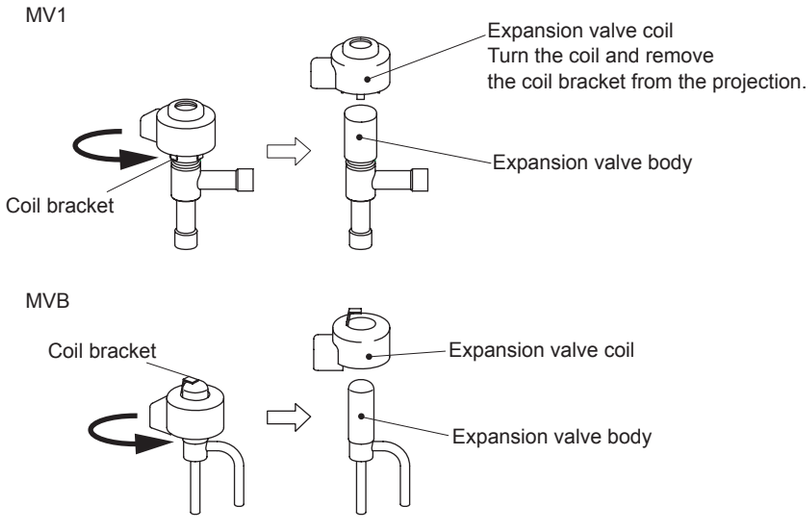
(*) Only for RAS-(14/16)FSXN1E.

10.12.1 Removing the expansion valve coil (MV1, MVB)

1 Remove the front service cover as described in the procedure *"10.1 Removing the front service cover"*.
2 Rotate the expansion valve coil in anticlockwise direction as indicated in the figure below. Remove the expansion valve coil bracket from the expansion valve slot. Then, pull the coil upward. Pay attention to the thermistor wiring when removing the expansion valve coils.

NOTE

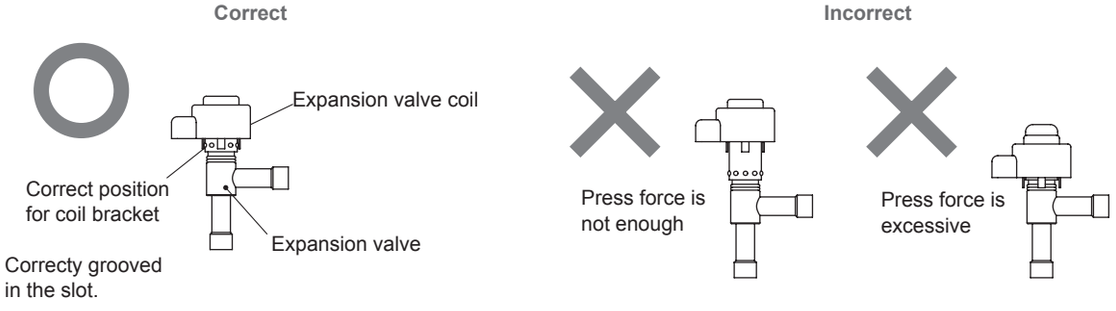
Make sure to remove the coil bracket from the coil slot before pulling the coil out. If not, your hand may be hit against the piping as a reaction. Follow the above procedure carefully to avoid any injuries.



3 When replacing the expansion valve coils, press the coil into the expansion valve slot turning the coil. If an excessive force is applied to the coil, the coil bracket may be deformed. As a result, the coil cannot be fixed at the correct position shown in the figure. Any slots on the expansion valve inner surface will do.

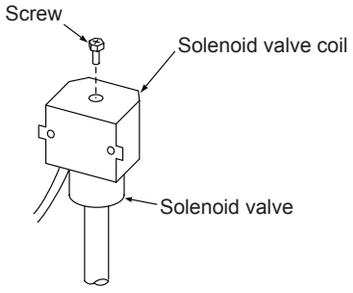
NOTE

Do not apply an excessive force to the coil when pressing it into the slot. Otherwise, it may cause damage to the piping.



10.12.2 Removing the solenoid valve coil (SVA, SVG, SVF)

1 Remove the front service cover as described in the procedure *"10.1 Removing the front service cover"*.
2 Remove the screw from the solenoid valve coil with a Philips screwdriver. If the screw is difficult to remove, use an adjustable wrench or spanner.
3 Remove the solenoid valve coil.



10.12.3 Removing the solenoid valve (SVA and SVG)

1 Remove the front service cover as described in the procedure *"10.1 Removing the front service cover"*.
2 Close the following stop valves.
   a. Heat pump system: close the high/low pressure gas stop valve and the liquid stop valve.
   b. Heat recovery system: close the high/low pressure gas stop valve, the low pressure gas stop valve and the liquid stop valve.
3 Collect the outdoor unit refrigerant from the low pressure check joint and the high pressure check joint. Make sure that the pressure will not increase at this time.

NOTE

If the pressure increases, collect all the refrigerant in the refrigerant circuit.

4 Remove the solenoid valve coil as described in the procedure *"10.12.2 Removing the solenoid valve coil (SVA, SVG, SVF)"*.
5 Remove the brazing at the position shown in the figure below.

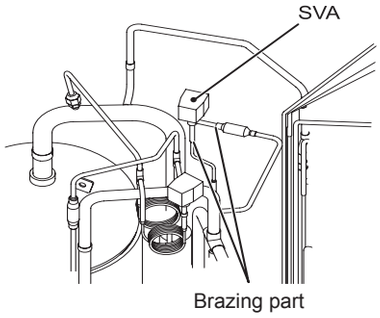
NOTE

- *During brazing work, cover the solenoid valves with wet cloth for cooling.*
- *Take special care not to burn the connecting wiring and the piping insulation during brazing work.*

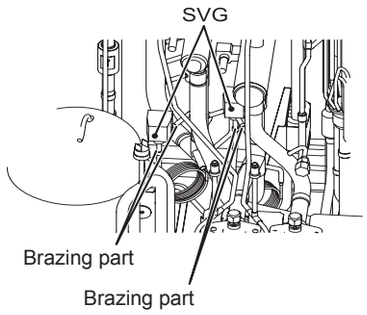
6 Set the solenoid valves in the reverse procedure.

RAS-(8-12)FSXN1E and RAS-(5/6)FSXNH(E)

Removing SVA

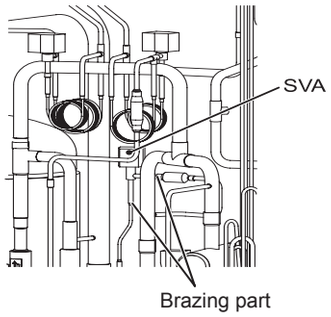


Removing SVG

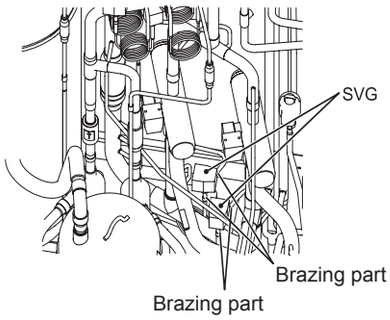


RAS-(14/16)FSXN1E and RAS-(8-12)FSXNH(E)

Removing SVA

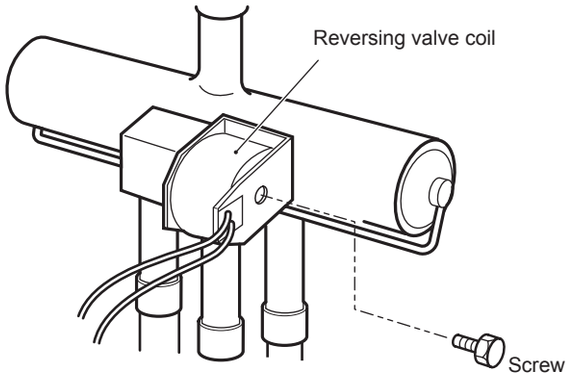


Removing SVG



10.12.4 Removing the reversing valve coil (RVR1, RVR2)

1 Remove the screw from the reversing valve coil with a Philips screwdriver. If the screw is difficult to remove, use an adjustable wrench or spanner.
2 Remove the reversing valve coils.



Front view

10.12.5 Removing the reversing valve

1 Remove the front service cover as described in the procedure *"10.1 Removing the front service cover"*.
2 Remove the electrical and sub electrical box, wirings and electrical box stay as described in the procedures *"10.6 Removing the electrical box"* and *"10.7 Removing the electrical box stay"*.
3 Before starting with the task, collect the refrigerant from the refrigerant circuit into a cylinder.
4 The position of the reversing valve is shown in the figure.
5 Remove the reversing valve coils as described in the procedure *"10.12 Removing the coils"*.
6 Remove the brazing portion shown in the figures below with the reversing valves and the stop valves covered with wet cloth for cooling.

NOTE

- *Make sure to remove the brazing portion at the indicated positions in the figures. If not, leakage may occur when reassembling the valves.*
- *In the case of Heat Pump System, connect the charging hose to the check joint for low pressure gas stop valve before removing the brazing.*

7 Remove the reversing valve assembly. Remove the brazing as shown in the figures with the reversing valves covered with wet cloth for cooling. Remove the brazing in the following order:

a. Brazing at the right and left branch pipes of the three pipes coming from the reversing valve.

b. Brazing at the middle branch pipe of the three pipes coming from the reversing valve.

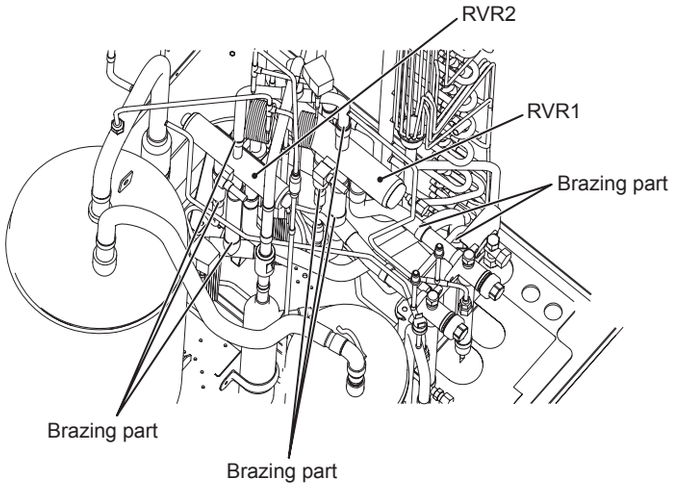
8 Set the reversing valves in the reverse procedure.

NOTE

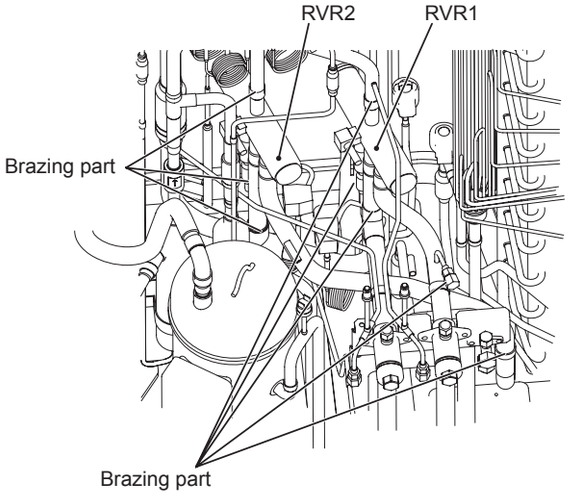
During brazing work, cover the reversing valves and the stop valves with wet cloth for cooling.

Reversing valve position

RAS-(8-12)FSXN1E and RAS-(5/6)FSXNH(E)



RAS-(14/16)FSXN1E and RAS-(8-12)FSXNH(E)



10.13 Removing the stop valve

DANGER

Turn OFF all the power source switches.

NOTE

For servicing use the following tools:

- Pliers.
- Phillips screwdriver.
- Burner.
- Wet cloth.

1 Remove the front service cover as described in the procedure *"10.1 Removing the front service cover"*.
2 Collect all the refrigerant in the refrigerant cycle.
3 When removing high/low pressure gas stop valve and low pressure gas stop valve, cover the stop valves with wet cloth for cooling and then remove the brazing. When removing liquid stop valve, remove the brazing of the pipe for the stop valve as shown in the figure.

NOTE

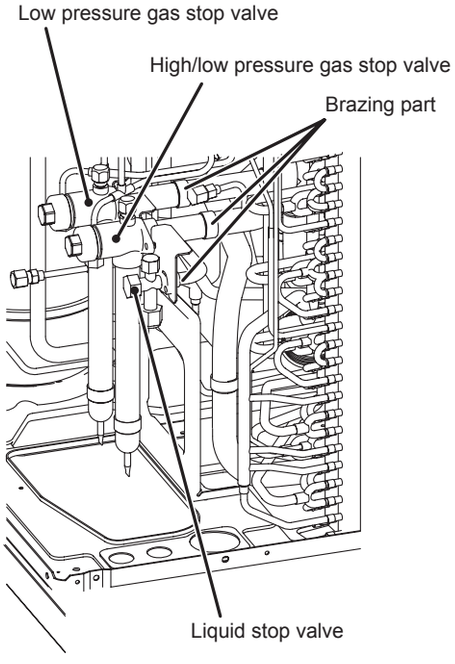
- *In the case of the heat pump system, connect the charging hose to the low pressure gas stop valve.*
- *When removing the brazing for high pressure stop valve and low pressure stop valve, the compressor cover should be removed or protected with a metal plate*

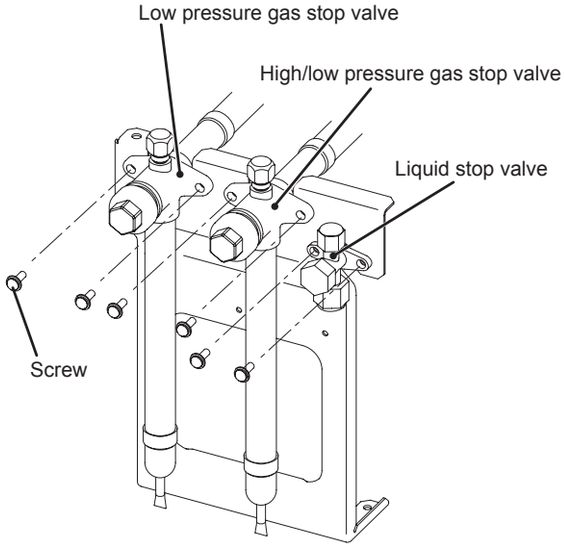
4 After removing the brazing for the stop valves, remove the screws fixing the plates as shown in the figure and pull out the stop valves and the plates.
5 Set the stop valves in the reverse procedure.

NOTE

When brazing the stop valves or removing the brazing, cover the stop valves with wet cloth for cooling. The allowable temperature limit of the internal stop valve is 120ºC

Stop valve position





10.14 Removing the high pressure switch, high pressure sensor, low pressure sensor and thermistors

DANGER

Turn OFF all the power source switches.

NOTE

For servicing use the following tools:

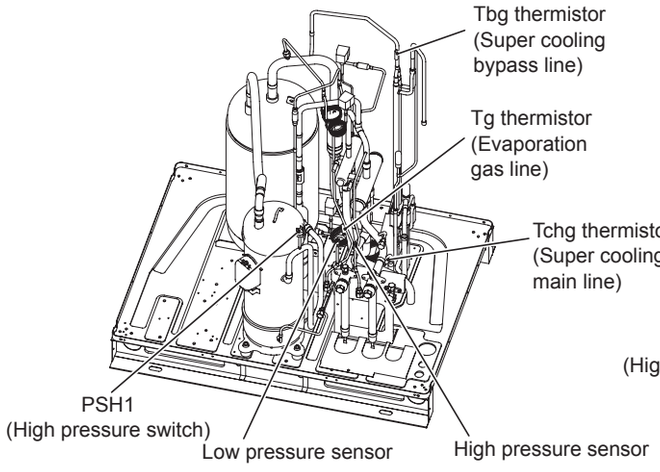
- Pliers.
- Phillips screw driver.
- Adjustable wrench or spanner.
- Burner.

1 Remove the front service cover as described in the procedure *"10.1 Removing the front service cover"*.

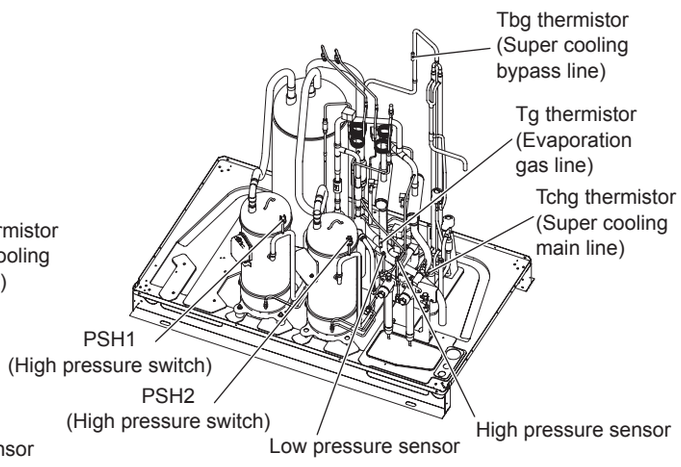
2 The high pressure switch (PSH1 and PSCH2), the high pressure sensor, the low pressure sensor and the thermistors (Tg, Tchg, Tbg and Te) are fixed in the position shown in the figure.

High pressure switch, high/low pressure sensor position

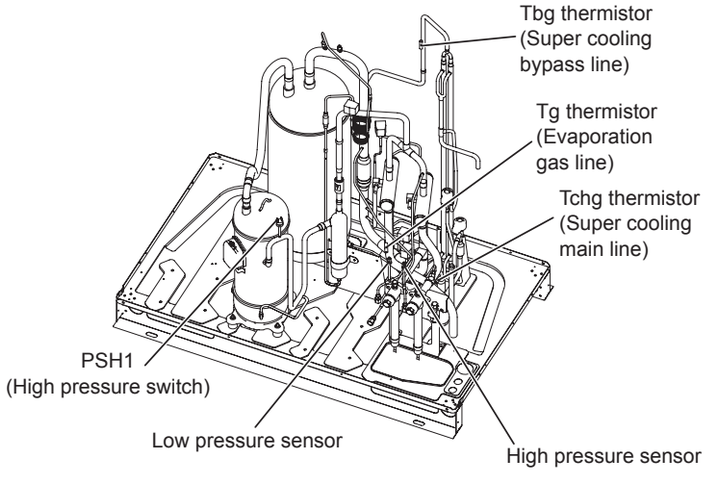
RAS-(8-12)FSXN1E and RAS-(5/6)FSXNH(E)



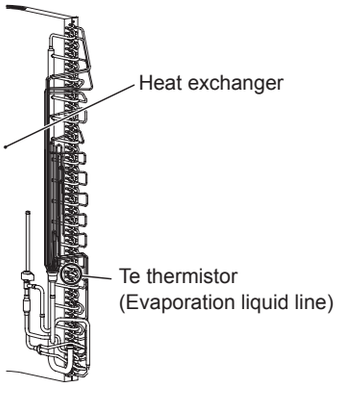
RAS-(14/16)FSXN1E



RAS-(8-12)FSXNH(E)



All models

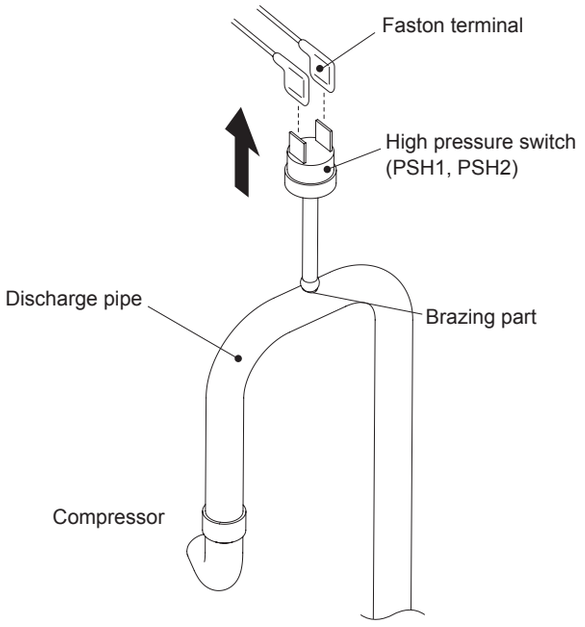


10.14.1 Removing the high pressure switch (PSH1, PSH2)

1 Collect the refrigerant.
2 Disconnect the faston terminals.
3 Remove high pressure switch from the brazing part of the discharge pipe using a burner.

NOTE

- *To prevent water and foreign particles from entering the refrigerant cycle, mount the new high pressure switch immediately after removing the old one. If it is impossible by necessity, seal the hole with tapes.*
- *Check that the compressor cover inner side (aluminium sheet) does not contact the terminals of the high pressure switch.*
- *Make sure to fix the insulating sleeve of the faston terminals as shown in the figure. If the terminals of the high pressure switch are exposed and contact with the compressor cover, the electrical components may be damaged.*



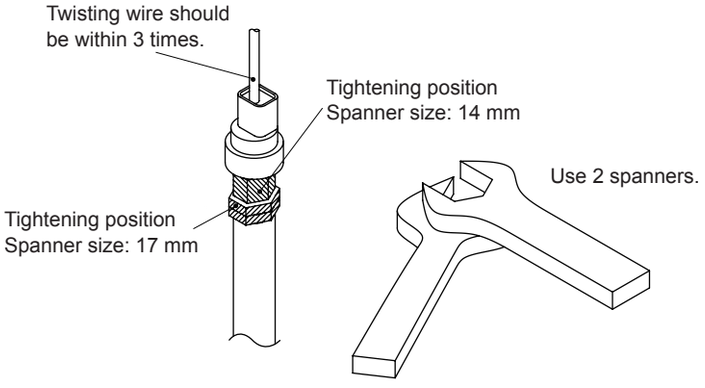
10.14.2 Removing the high pressure sensor (Pd) and low pressure sensor (Ps)

1 Remove the connector for the pressure sensor wiring from the PCB1.

NOTE

First, remove the connector. If not, the wiring may be damaged.

2 Remove the refrigerant piping for the high pressure sensor or low pressure sensor with 2 spanners.



NOTE

Tightening torque differs depending on the model of the pressure sensor to be used. Make sure to check the order No. and the recommended tightening torque for the model when connecting the refrigerant piping.

Model	Order No.		Tightening torque
	High pressure side	Low pressure side	
NSK Type	P26013	P26014	15 Nm
AAG Type	P29264	P29265	10 Nm

10.15 Removing the liquid pipe thermistor

DANGER

Turn OFF all the power source switches.

NOTE

For servicing use the following tools:

- Wet cloth.
- Burner.
- Pliers.
- Phillips screwdriver.
- Nippers.

1 Remove the front service cover as described in the procedure *"10.1 Removing the front service cover"*.
2 Remove the electrical box cover as described in the procedures *"10.5 Removing the electrical box cover"*.
3 Remove the cork tape. Then, remove the thermistor for the liquid pipe by pulling out the thermo clip from the pipe.

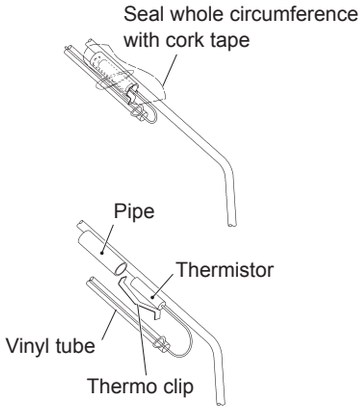
NOTE

When removing the thermistor of the liquid pipe, take care not to cause damage to your hands or the thermistor with the valve stay fixing the stop valve.

4 Reassemble the thermistor for liquid pipe in the reverse procedure.

NOTE

When reassembling the thermistor, fix the thermistor with the vinyl pipe end downward to prevent water from entering the pipe.



10.16 Removing the ambient temperature thermistor

DANGER

Turn OFF all the power source switches.

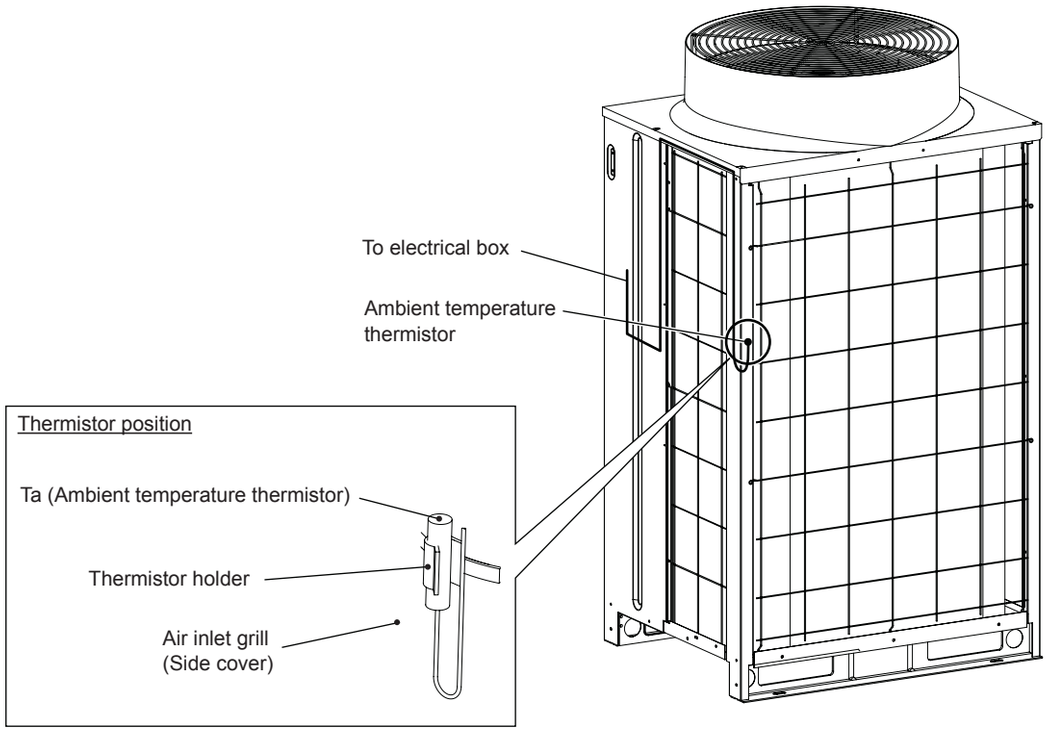
NOTE

For servicing use the following tools:

- Phillips screwdriver.
- Nippers.

1 Remove the front service cover as described in the procedure *"10.1 Removing the front service cover"*.
2 Remove the electrical box cover as described in the procedures *"10.5 Removing the electrical box cover".*
3 Remove the upper cover as described in the procedure *"10.3 Removing the upper cover"*.
4 Thermistor wiring is fixed at the heat changer, pipings and such. Remove the fixing clamps for the wiring.
5 Reassemble the thermistor for ambient temperature in the reverse procedure.

Thermistor position for ambient temperature (Example of RAS-12FSXN1E)



10.17 Removing other electrical components

DANGER

- ***Turn OFF all the power source switches.***
- ***Do not touch any electrical component if the LED201 (Red) of the PCB2 is ON. Otherwise, an electric shock will occur.***

NOTE

For servicing use the following tools:

- Phillips screwdriver.
- Pincher.
- Long-nose pliers.
- Pliers.

NOTE

1 *When replacing the components of the radiation fin such as transistor module (IPM), diode module (DM) and fan controller (FANM), apply conductive silicon grease (Service Parts No.: P22760) in a thin layer over the contact surface with the fin.*
2 *When reassembling the electrical components, match the terminal Nos. with the mark band Nos. . If they are incorrectly connected, malfunction may occur or the electrical components may be damaged.*
3 *The U and V-Phase of the power source cables for the inverter compressor (MC1) must pass through the current sensor (CTU and CTV) of the inverter PCB completely. Connect U-Phase of the power source cable with U-Phase side (CTU), and V-Phase with V-Phase side (CTV) of the current sensor. If not, it may cause equipment malfunction or failure.*
4 *When fixing PCBs or sheet metals for outdoor unit PCB, protect the electric wiring from catching on the sheet metals or the electrical components.*
5 *Make sure to use screws, bushes and collars when fixing inverter PCBs. If not, it may cause equipment malfunction.*
6 *When replacing the outdoor unit PCB, set the dip switches in the same way as before the outdoor unit PCB replacement. Incorrect setting will cause malfunction. Refer to the instruction manual attached to servicing outdoor unit PCB.*
7 *Do not apply an excessive force to the electrical components on PCBs or PCBs themselves. It may lead to PCBs failure.*
8 *When replacing the fan controller, set the dip switches in the same way as before the fan controller replacement. Incorrect setting will cause malfunction.*

10.17.1 Removing the PCB1 and electrical components for the electrical box

◆ Removing the PCB1

1 Remove all the connectors for wiring connected to the outdoor unit PCB1.
2 Hold the convex part of the holder fixing the outdoor unit PCB1 (Part A in the figure, 11 portions) with a long-nose pliers and pull it out to remove.

◆ Opening of the PCB1 fixing plate

1 Remove all the wirings connected with the electrical components.
2 When checking or replacing the electrical components, remove 2 screws at Part B in the figure and open the outdoor unit PCB1 fixing plate.
3 When removing the fixing plate for outdoor unit PCB1, all the connectors connected with the outdoor unit PCB1 should be removed.

◆ Removing the electrical components

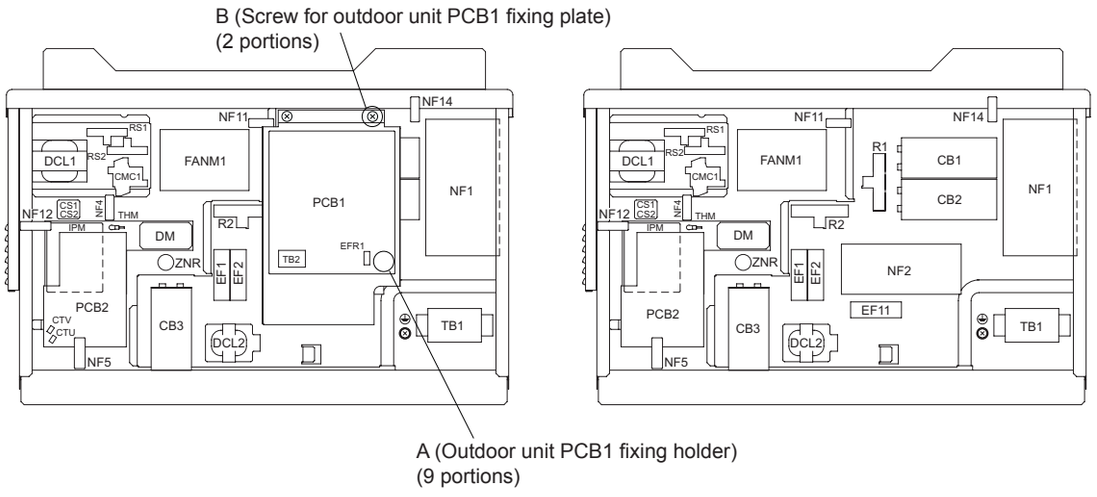
1 Disconnect all the wirings connected with the electrical components.
2 Remove the screws fixing the electrical components.

NOTE

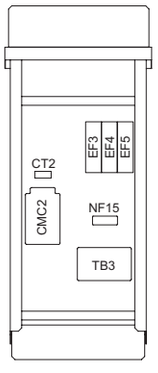
- *The open angle for the outdoor unit PCB1s fixing plate should be within 120 degrees. The fixing plate will not open more than 120 degrees due to the insufficient electrical wiring length.*
- *Do not touch the electrical components on the outdoor unit PCB1s. Do not bend the outdoor unit PCB1 by applying an excessive force to it. Otherwise, it will cause outdoor unit PCB1 failure.*
- *When reassembling the electrical components, match the terminal Nos. with the mark band Nos. . If they are incorrectly connected, malfunction may occur or the electrical components may be damaged.*
- *When closing the outdoor unit PCB fixing plate for reassembly, protect the cables from catching on the plate edges or electrical components.*
- *The capacitor is charged with electricity even when the power source is turned off. Do not touch the terminals, to avoid an electrical shock. (*)*

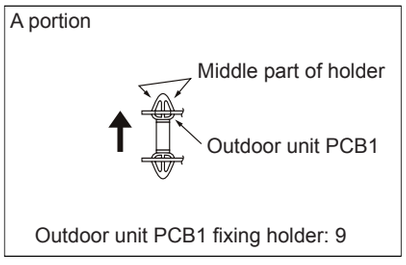
Front side (for main)

The interior of the electrical box (for main)



Front side (For sub electrical box)
RAS-(14/16)FSXN1E only





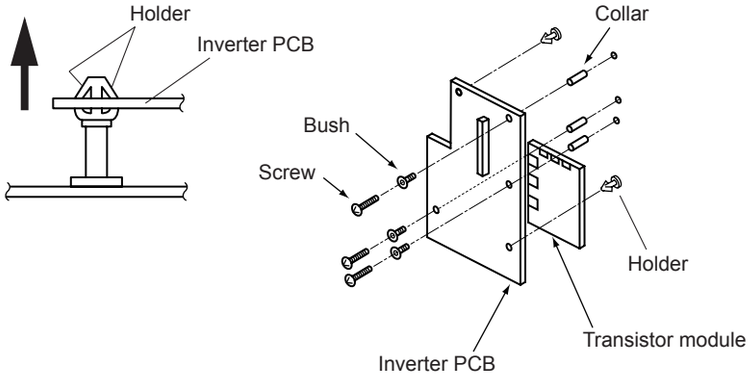
Item	Part Name	Item	Part Name
PCB1	Outdoor unit PCB1	PCB2	Inverter PCB
IPM	Transistor module	FANM1	Fan controller
DM	Diode module	DCL1, 2	Reactor
NF1~14	Noise filter	R1, 2	Resistor
RS1, 2	Resistor for starting	CS1, 2	Capacitor (*)
CB1, 2, 3	Capacitor (*)	CMC1, 2	Magnetic contactor for compressor motor
TB1, 2, 3	Terminal board	EFR1	Fuse on PCB1
EF1, 2, 3, 4, 5, 11	Fuse	ZNR	Surge Absorver
CT2, CTU, CTV	Current sensor		

10.17.2 Removing the inverter PCB

1 Disconnect all the wirings connected to the CN2, CN206, PCN301.
2 Disconnect the wirings for the transistor module (U, V, W) . Then, disconnect the wirings for U and V from the current sensor.
3 After removing 3 M3 screws, remove the bushes and collars from the inverter PCB. When reassembling the inverter PCB, the bushes and collars should be fixed correctly.

NOTE

- *Do not touch any electrical components while LED201 (red) of inverter PCB is ON. Otherwise, it may lead to an electrical shock.*
- *When reassembling the electrical components, match the terminal Nos. with the mark band Nos. . If they are incorrectly connected, malfunction may occur or the electrical components may be damaged.*
- *When closing the outdoor unit PCB fixing plate for reassembly, protect the cables from catching on the plate edges or electrical components.*



10.17.3 Removing the diode module and transistor module

1 Disconnect the wirings connected to the terminals (1)~(5) on the diode module and to the terminals P, N, U, V and W on the transistor module.

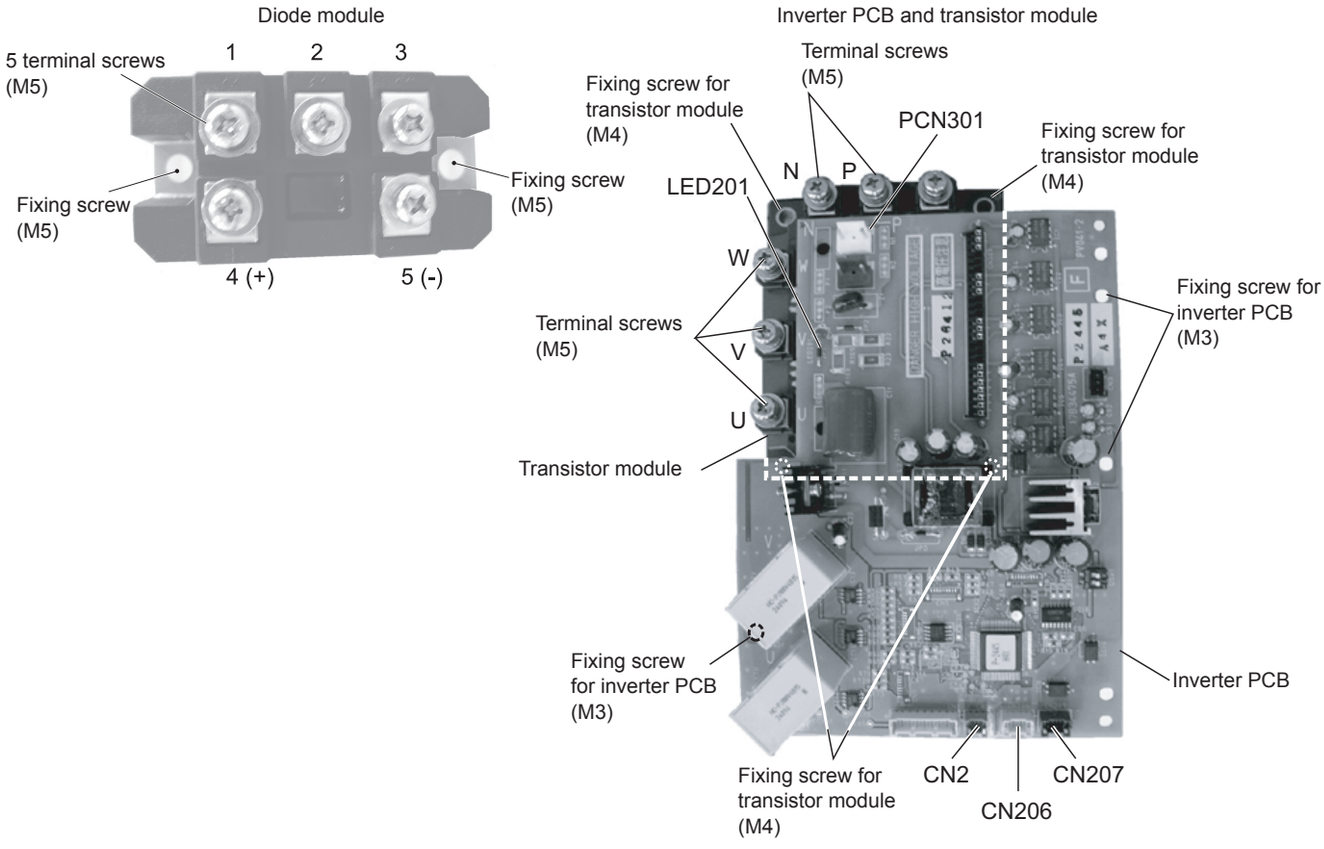
NOTE

Do not touch any electrical components while LED201 (red) of inverter PCB is ON. Otherwise, it may lead to an electrical shock.

2 Remove 6 screws fixing the diode module and transistor module. Then, remove the diode module and transistor module.

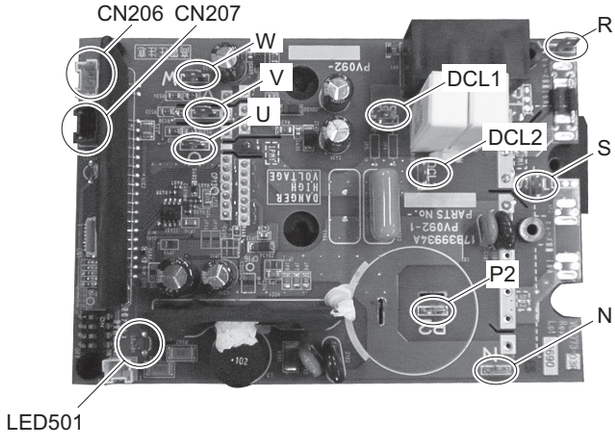
NOTE

- *As for the inverter PCB and the transistor module, the figure below indicates the correct mounting* position, with the letters on the inverter PCB sideways.
- When reassembling the electrical components, match the terminal Nos. with the mark band Nos. . If they are incorrectly connected, malfunction may occur or the electrical components may be damaged.
- When closing the outdoor unit PCB fixing plate for reassembly, protect the cables from catching on the plate edges or electrical components.
- When mounting the diode module and transistor module, apply silicon grease evenly over the whole back side of the diode module and the transistor module. Use Silicon grease provided as accessory (Service Parts No.: P22760).



10.17.4 Removing the fan controller

1 Remove the front service cover as described in the procedure *Removing the front service cover*.
2 Check to ensure that the LED501 (red) of PCB2 is OFF.
3 Disconnect all the fan controller wiring CN206, CN207, R, S, U, V, W, P2, N, DCL1 and DCL2.
4 Remove the 9 screws fixing the fan controller.
5 Remove the fan controller.



NOTE

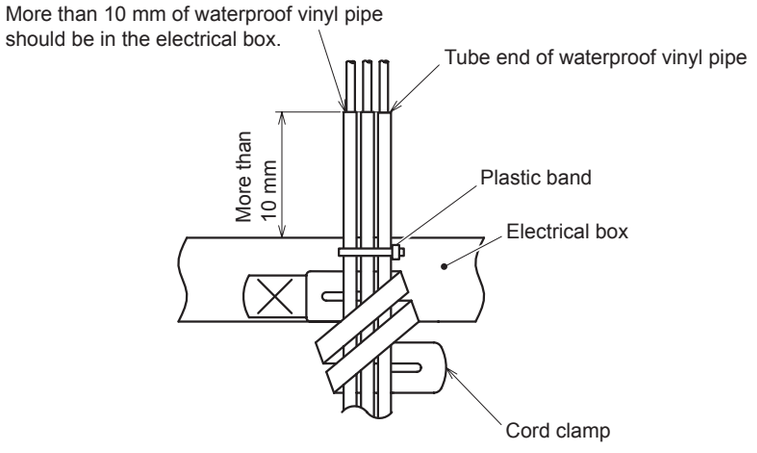
- *Do not apply great force when removing the fan controller, or the soldering will be fallen apart and a malfunction of the fan controller may occur.*
- *Identify the terminal Nos. with the mark band Nos. when reassembling. If incorrectly connected, malfunction or damage will occur.*
- *Check to ensure that the electrical wires will not be caught between the mounting electrical components and the mounting plates when the inverter PCB is remounted.*
- *Apply silicon grease evenly on the whole rear side of the fan controller when mounting. Use Silicon grease provided as accessory (service parts No.: P22760).*

6 Mount the electrical box in the reverse procedure.

NOTE

- *Check to ensure that the tube end of waterproof vinyl pipe and the connectors are in the electrical box. Fix them firmly with a cord clamp when wiring up as shown in the figure below.*
- *Fix the wiring connecting each electrical part and the electrical box with a plastic band to avoid direct contact with the compressor, piping and plate edges.*
- *Fix the wiring neatly with a cord clump and make sure that the wiring will not be held down by the electrical box cover. Otherwise, the wiring may be damaged while the cover is closed.*
- *Fix the fan motor wiring with a cord clamp as shown in the figure.*
- *When reassembling the electrical component, match the terminal Nos. with the mark band Nos. . If they are incorrectly connected, malfunction may occur or the electrical components may be damaged.*
- *The setting of dip switches differs according to the model. When replacing the outdoor unit PCB, refer to "Field Work Installation."*

Details of fixing the vinyl pipe edge



10.18 Removing components for CH unit

DANGER

Turn OFF all the power source switches.

NOTE

For servicing use the following tools:

- Phillips screwdriver.

- Long-nose pliers.

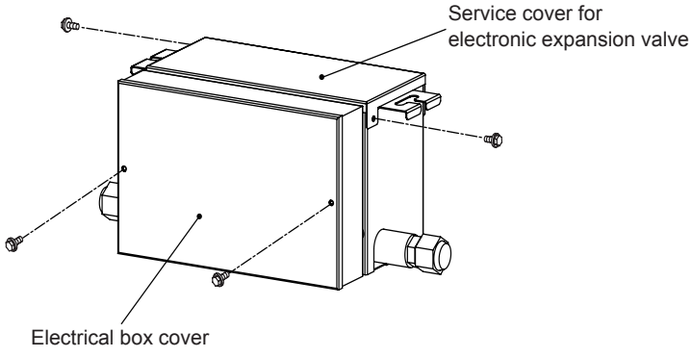
- Nippers.

10.18.1 Removing the front service cover for electrical box and electronic expansion valve

1 Remove the 2 screws fixing the electrical box cover and the electronic expansion valve cover.

NOTE

When attaching / removing the front service cover, take special attention to be not injured with the plate edges.



10.18.2 Removing the electrical components

◆ **Removing PCB**

1 Remove all connectors and transmission wirings connected to the PCB.

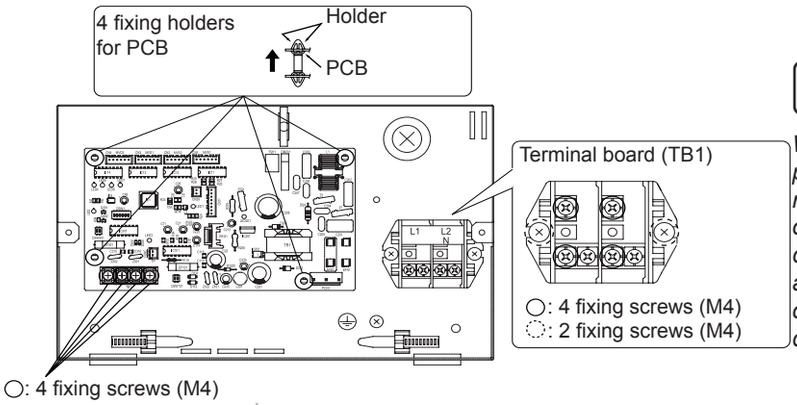
2 Remove the transmission wirings connected to the PCB. Do not touch the electrical components on the PCB during the work. Otherwise, the PCB may be damaged.

3 Hold the convex part of the 4 holders fixing the PCB with a long-nose pliers and pull it out to remove.

◆ **Removing electrical component (terminal board for power source)**

1 Remove all the wirings connected to the electrical components.

2 Remove the screws fixing the electrical components.



NOTE

When reassembling the electrical components, match the terminal Nos. with the mark band Nos. and also match the colors of the connectors on the PCB with the colors of the connector for wiring. If they are incorrectly connected, malfunction may occur or the electrical components may be damaged.

10.18.3 Removing electronic expansion valve coil

1 Remove the front service cover as described in the procedure *Removing the front service cover*.

2 Removing the expansion electronic expansion valve (MVD1, MVS1).

a. Turn the electronic expansion valve coil in a counterclockwise direction as shown in the figure below. Remove the electronic expansion valve coil bracket from the electronic expansion valve slot. Then, pull the coil upward and remove it

b. When replacing the electronic expansion valve coil, turn the coil bracket and press the coil into the electronic expansion valve slot.

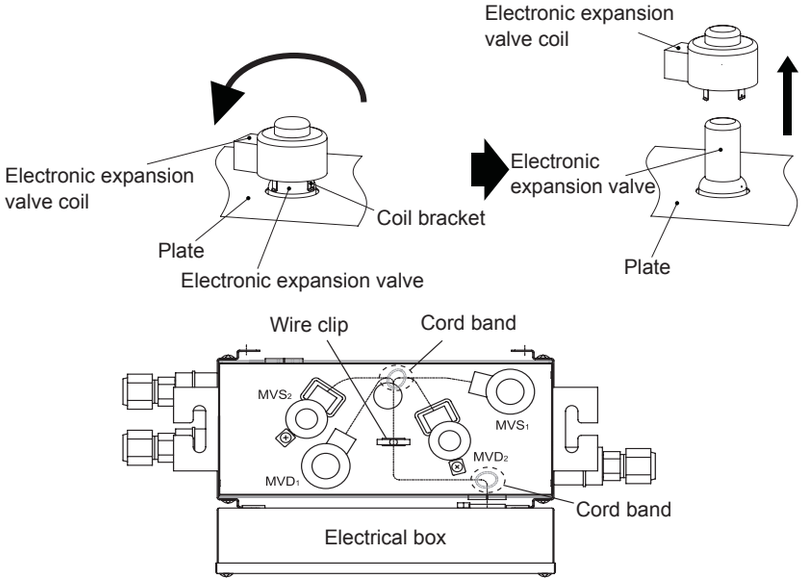
3 Removing the electronic expansion valve (MVD2, MVS2).

a. Remove 2 screws (M4) fixing the electronic expansion valve coil at the circled part in the figure.

b. Then, pull the coil upward and remove it.

NOTE

When replacing the electronic expansion valve, bind up the wirings with a cord clamp at the 2 parts indicated in the figure. Make sure to bind up extra wirings and fix them with a wire clip. If not, water may enter the electrical box.



11. Troubleshooting

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11.1 Initial troubleshooting

11.1.1 Checking the electrical wires and the power source

No.	Item to check	Check method
1	Is the power source breaker or the fuse blown out?	Check the voltage (secondary side) of the breaker and using a tester, check the conductivity of the fuse.
2	Is the transformer's secondary voltage correct?	Remove the transformer's secondary connection and check the voltage using a tester.
3	Is the electrical wiring properly secured and are the connections correctly fixed?	Check the connection of the wiring to the PCB and ensure that the following connections are not loose or removed: • 1. Thermistor connector (each of them). • 2. Remote control cable connector. • 3. Transformer connector. • 4. Each connector of the main power supply circuit.

11.1.2 Checking by 7-segment display

1 *Turn on All Indoor Units

2 Turn on the Outdoor Unit

3 Auto-addressing Starts

* All the Indoor Unis Connected to the Outdoor Unit

During auto-addressing, the following items can be checked using the outdoor unit's on-board 7-segment LED display.
(1)Disconnection of power supply to the indoor unit.
(2)Reverse connection of the operating line between the outdoor and indoor units.
In this case, "03" appears after 30 seconds.
(3)Duplication of indoor unit number. See Alarm Code 35.

Outdoor Unit Printed Circuit Board PCB

Normal Case

(1) The outdoor unit's on-board 7-segment LED display is not indicated.

Abnormal Case

(2) The outdoor unit's on-board 7-segment LED display indicates the followings if there is something wrong.

(A) Alarm code will be displayed on the 7-segment when alarm is received from indoor unit in normal mode.

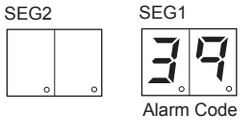
As for the following alarm codes, however, alarm code will be displayed on the 7- segment when alarm is detected by outdoor unit itself.

Alarm Code "03" (Abnormal Transmission between Indoor Unit and Outdoor Unit)

Alarm Code "35" (Incorrect Indoor and Outdoor Unit No.Setting)

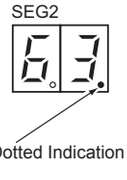
(B) Alarm code of smaller indoor unit adresss No. will be displayed when alarm is received from multiple indoor units.

(C) The following 7-segment is displayed and flashed every 0.5 seconds.



Alarm Code

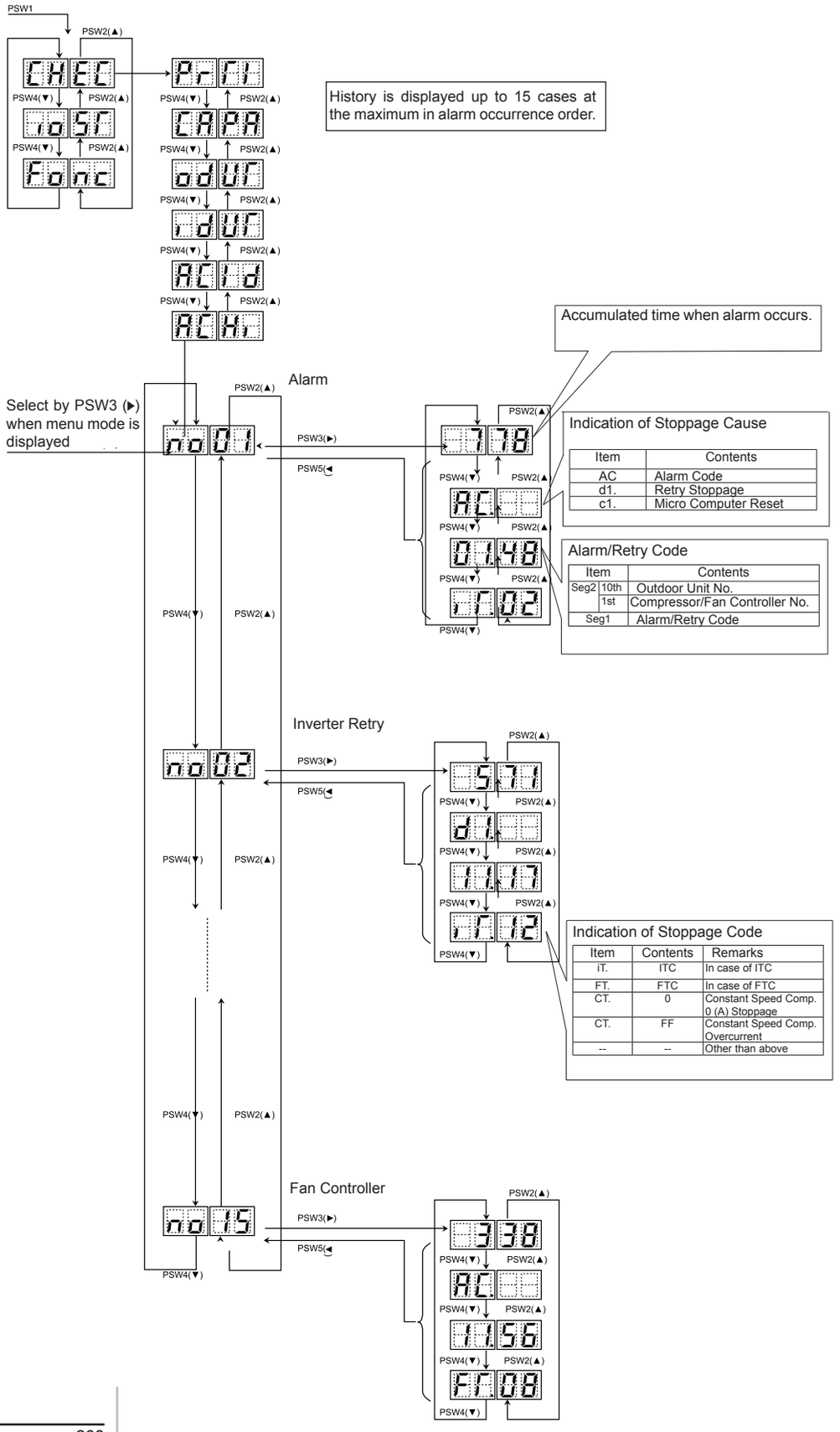
(D) SEG1 and SEG2 are as follows.

7-Segment Display	Dotted Indication	Remarks
In Case of Unit No. 63, Alarm Code "01" SEG2: Indoor Unit No. (0-63) SEG1: Alarm Code  Indoor Unit No. Alarm Code	 	In the case that 2 refrigerant cycle groups exist, one refrigerant cycle group is shown without dotted indication. The other refrigerant cycle group is shown with dotted indication.

11.1.3 Checking of the alarm code history

Alarm code history is indicated in the following order while the check mode is displayed. “no01 (latest)⟷history data ~ “no15” (oldest)⟷history data

Refer to the figure below as an example.



◆ Alarm code history record

Cause of stoppage (alarm code or stoppage code)	Contents	Alarm code history indication					
		Time	Alarm[1]	Alarm code			Alarm code or stoppage code
				Outdoor unit no.	Compressor no.	Fan no.	
02	Activation of the protection device	Accumulated time	AC.	O	O		--
03	Abnormality transmitting between the indoor and outdoor units	Accumulated time	AC.				--
04	Abnormality transmitting between the inverter PCB and the outdoor unit PCB	Accumulated time	AC.	O	O		--
04.	Abnormality transmitting between the fan controller and the outdoor unit PCB	Accumulated time	AC.	O		O	--
05	Abnormal power phase	Accumulated time	AC.	O			--
06	Abnormal Inverter voltage	Accumulated time	AC.	O	O		iTC
d1-18		Accumulated time	d1.	O	O		iTC
06.	Abnormal fan controller voltage	Accumulated time	AC.	O		O	FTC
07	Decrease in discharge gas super-heat	Accumulated time	AC.	O	O		--
d1-16		Accumulated time	d1.	O	O		--
08	Temperature increase of the discharge gas at the upper part of the compressor	Accumulated time	AC.	O	O		--
d1-15		Accumulated time	d1.	O	O		--
0A	Abnormality transmitting between the outdoor units	Accumulated time	AC.				--
0b	Incorrect outdoor unit adress setting	Accumulated time	AC.				--
0c	Incorrect setting of the main outdoor unit	Accumulated time	AC.				--
21	Abnormality high pressure sensor	Accumulated time	AC.	O			--
22	Abnormality of thermistor for outdoor air temperature	Accumulated time	AC.	O			--
23	Abnormality of discharge gas temperature thermistor at the upper part of the compressor	Accumulated time	AC.	O	O		--
24	Abnormality of the liquid pipe thermistor of the outdoor unit's heat exchanger (Te/Tchg)	Accumulated time	AC.	O	Thermistor signal: Te: E Tchg: C		--
25	Abnormality of the gas pipe thermistor of the outdoor unit's heat exchanger (Te/TbG)	Accumulated time	AC.	O	Thermistor signal TG: G TbG: b		--
29	Abnormality of low pressure sensor	Accumulated time	AC.	O			--
31	Incorrect capacity setting on outdoor and indoor unit	Accumulated time	AC.				--
	Abnormal transmitting between outdoor units	Accumulated time	AC.				--
35	Incorrect indoor unit number setting	Accumulated time	AC.				--

Cause of stoppage (alarm code or stoppage code)	Contents	Alarm code history indication					
		Time	Alarm[1]	Alarm code			Alarm code or stoppage code
				Outdoor unit no.	Compressor no.	Fan no.	
36	Incorrect indoor unit combination	Accumulated time	AC.				--
38	Abnormality of the collection circuit for outdoor unit protection	Accumulated time	AC.	O			--
39	Abnormality of running current in constant speed compressor	Accumulated time	AC.	O			CT value detected
d1-14		Accumulated time	d1.	O			
3A	Abnormal outdoor unit capacity	Accumulated time	AC.				--
3b	Incorrect setting of voltage or combination of outdoor unit models	Accumulated time	AC.				--
3d	Abnormality transmitting between the main unit and the secondary unit(s)	Accumulated time	AC.				--
43	Abnormality of low compression ratio	Accumulated time		O			--
d1-11		Accumulated time	d1.	O			--
44	Abnormality of low pressure increase	Accumulated time	AC.	O			--
d1-12		Accumulated time	d1.	O			--
45	Abnormality of high pressure increase	Accumulated time	AC.	O			--
d1-13		Accumulated time	d1.	O			--
47	Activation of the low pressure decrease protection device (Vacuum operation protection)	Accumulated time	AC.	O			--
d1-15		Accumulated time	d1.	O			--
48	Activation of the Inverter overcurrent protection device	Accumulated time	AC.	O	O		iTC
d1-17		Accumulated time	d1.	O	O		iTC
51	Abnormal Inverter current sensor	Accumulated time	AC.	O	O		iTC
d1-17		Accumulated time	d1.	O	O		iTC
53	Inverter signal detection error	Accumulated time	AC.	O	O		iTC
d1-17		Accumulated time	d1.	O	O		iTC
54	Abnormal Inverter fin temperature	Accumulated time	AC.	O	O		iTC
d1-17		Accumulated time	d1.	O	O		iTC
55	Inverter failure	Accumulated time	AC.	O	O		iTC
d1-17		Accumulated time	d1.	O	O		iTC
56	Abnormal fan motor location detection	Accumulated time	AC.	O		O	FTC
57	Activation of the fan controller protection device	Accumulated time	AC.	O		O	FTC
58	Abnormal of fan controller	Accumulated time	AC.	O		O	FTC

Cause of stoppage (alarm code or stoppage code)	Contents	Alarm code history indication					
		Time	Alarm[1]	Alarm code			Alarm code or stoppage code
				Outdoor unit no.	Compressor no.	Fan no.	
b5	Incorrect setting of indoor unit connection number	Accumulated time	AC.				--
EE	Compressor protection alarm	Accumulated time	AC.				--
A1	Abnormal of active filter	Accumulated time	AC.	O			--
d1-05	Instant power failure	Accumulated time	di.				--
d1-18	Inverter malfunction and others	Accumulated time	di.				iTC
d1-26	Abnormality of high pressure decrease	Accumulated time	di.				--
d1-32	Retry stoppage due to automatic adress setting of the indoor unit	Accumulated time	di.				--
Control information	Restarting of the microcomputer due to an Inverter malfunction	Accumulated time	Ci.				1
	Restarting of the microcomputer due to a fan controller transmission malfunction	Accumulated time	Ci.				2
	Restarting of the microcomputer due to an indoor unit transmission malfunction	Accumulated time	Ci.				3
	Restarting of the microcomputer due to a transmission malfunction between the indoor unit and the outdoor unit	Accumulated time	Ci.				4
	Restarting of the microcomputer due to a status control malfunction	Accumulated time	Ci.				6

[1] Alarm details:

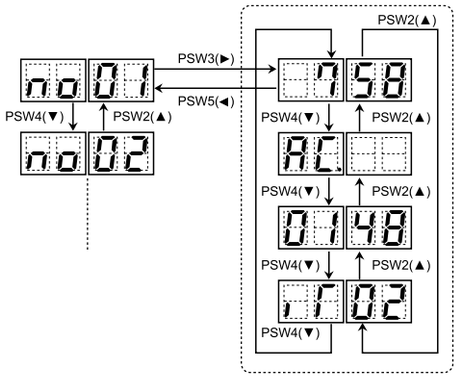
- AC.: alarm.
- d1.: retry.
- Ci.: control information.

iTC: Inverter stoppage code.

FTC: Fan controller stoppage code.

◆ Deletion of the alarm code history

Press PSW1 and PSW3 for five seconds to delete the alarm code history while it is shown on the display (the entire history can be deleted).



In order to delete all the history, press PSW1 and PSW3 (►) for 5 seconds while history is displayed.

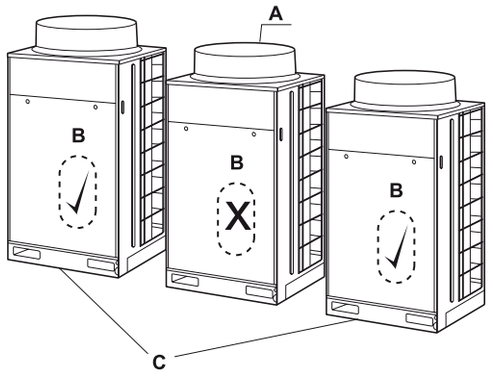
11.1.4 Emergency operation

◆ Emergency mode operation from the remote control (only for RAS-(18-54)FSXN1E and RAS-(14-36)FSXNH(E))

If the compressor fails, the emergency mode operation is available from the remote control.

Even if the compressor fails, the operation of the air conditioner is continuously available until the troubleshooting and problem resolution procedure is carried out.

A	Outdoor unit failed
B	Compressor
C	Even though one unit has failed, the other units can operate continuously



NOTE

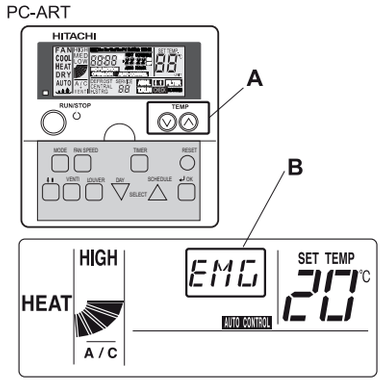
For FSXNH(E) only: In order for the emergency operation to be used, two or more outdoor units are required in the same refrigerant cycle.

The emergency operation can be activated when the following alarm codes are displayed on the remote control screen:

Alarm code	Compressor type	Description of the failure
06	Failure of the inverter compressor	Abnormal inverter voltage
23		Abnormal discharge gas thermistor
48		Activation of the inverter overcurrent protection device
51		Abnormal inverter current sensor
53		Inverter error signal detection
54		Abnormal inverter radiator temperature
23	Failure of the constant speed compressor	Abnormal discharge gas thermistor
39		Abnormal running current at constant speed compressor

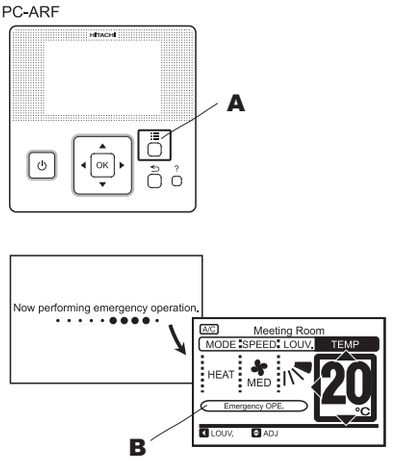
Procedure (remote control PC-ART example)

Simultaneously pressing the pushbuttons “TEMP” ▲ and ▼ -A- for 3 seconds will start the emergency operation mode. The message EMG -B- is displayed on the remote control screen.



Procedure (remote control PC-ARF example)

Pressing the button “MENU” -A- for 3 seconds will start the emergency operation mode. The message “Now performing emergency operation” -B- is displayed on the remote control screen.



Operating condition

The emergency operation is not applicable to the outdoor unit whose compressor has failed.

NOTE

- *The emergency operation is only available when all the indoor units and the connected remote controllers are H-LINKII.*
- *The emergency operation is only available when the alarm codes shown in the previous table are displayed.*
- *The emergency operation is not available in case of failure of the inverter PCB or the fan controller.*
- *The emergency operation is not a normal operating mode but a temporary operating mode until technical service maintenance personnel arrive. If the alarm is indicated again during the emergency operation, the alarm cannot be cancelled.*
- *Do not run the emergency operation for more than eight hours. Otherwise, it may damage the unit.*
- *Power off the system in order to release the emergency operation.*

◆ Emergency mode operation from the outdoor unit PCB (only for RAS-(18-54)FSXN1E and RAS-(16-36)FSXNH(E))

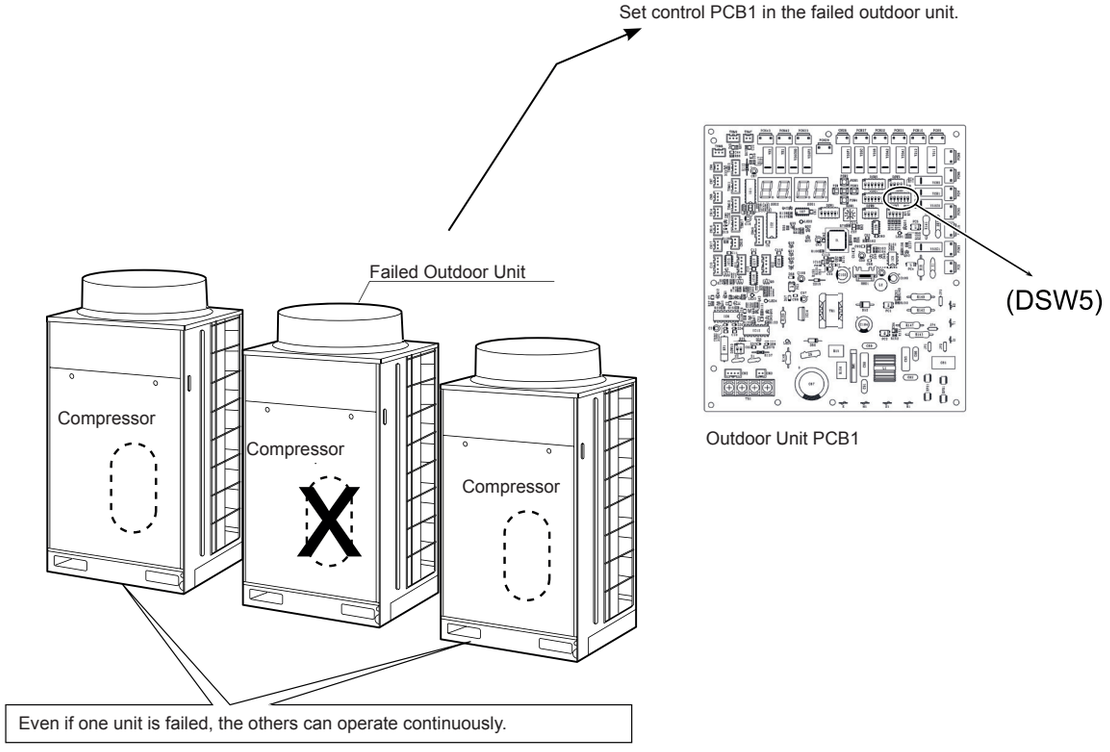
NOTE

- *Measure the insulation resistance of the Inverter compressor. Do not activate the emergency operation when the insulation resistance is 0 Ω. Another compressor may suffer damage due to the possibility that refrigerant oil may be oxidized.*
- *The total operating capacity of the indoor units should be 10 HP or greater. It may be necessary to force the indoor unit operation through the remote controller., Less than 10 HP: forced stoppage.*
- *In emergency operation, the compressor frequency can not normally be controlled. Consequently, alarm codes “07”, “43”, “44”, “45” or “47” can be displayed on the LCD.*
- *The emergency operation cannot provide sufficient cooling and heating capacity.*
- *The emergency operation is a temporary mode of operation used when the Inverter compressor is damaged. Therefore, replace it with a new one as soon as possible.*
- *Turn DSW5-1 OFF on PCB1 of the outdoor unit after replacing the compressor. If this setting is not carried out, the Inverter compressor will be damaged.*

Alarm code	Compressor type	Description of the failure
04	Failure of the Inverter compressor	Abnormal Inverter voltage
06		Abnormal discharge gas thermistor
23		Activation of the Inverter overcurrent protection device
48		Abnormal Inverter current sensor
51		Inverter error signal detection
52		Abnormal Inverter radiator temperature
53		Inverter error signal detection
54		Abnormal inverter fin temperature
23	Failure of the constant speed compressor	Abnormal discharge gas thermistor
39		Abnormal running current at constant speed compressor

Procedure

1. Turn OFF the main switches to all the indoor and outdoor units.
2. Check the inverter PCB; if it is damaged, disconnect terminals (U, V, W) from the diode module (isolate the disconnected terminals).
3. Turn ON DSW5-1 and DSW5-2 on PCB1 of the outdoor unit to stop the compressor operation. If they are set, all the set compressors in the failed outdoor unit will not operate. For heat pump system, fully close the stop valves (for gas/liquid) of the failed outdoor unit.
4. Turn ON the power supply.
5. Start operation using the remote control switch.



DSW5	Compressor
1	Inverter compressor
2	Constant speed compressor 1

Operation condition

The compressor is forced to stop for compressor protection under the following condition: total capacity of Thermo ON I.U. < 50% of O.U. capacity and total capacity of thermo ON I.U. < 10HP. (A lack of thermo ON indoor unit may lead to a constant speed compressor failure because the compressor is operated and stopped repeatedly.)

◆ Emergency mode operation from the outdoor unit PCB (only for RAS-(14/16)FSXN1E)

NOTE

- *Measure the insulation resistance of the Inverter compressor. Do not activate the emergency operation when the insulation resistance is 0 Ω. The other compressors may suffer damage due to the possibility that refrigerant oil may be oxidized.*
- *In emergency operation, the compressor frequency can not normally be controlled. Consequently, alarm codes "07", "43", "44", "45" or "47" can be displayed on the LCD.*
- *The emergency operation cannot provide sufficient cooling and heating capacity.*
- *The emergency operation is a temporary mode of operation used when the inverter compressor is damaged. Therefore, replace it with a new one as soon as possible.*
- *Turn OFF DSW5-1 and DSW5-2 On PCB1 of the outdoor unit after replacing the compressor. If this setting is not carried out, the inverter compressor will be damaged.*

Inverter compressor failure

Alarm code	Description of the failure
04	Abnormal transmission between inverter PCB and outdoor unit PCB1
06	Abnormal inverter voltage
23	Abnormal discharge gas thermistor
48	Activation of the inverter overcurrent protection device
51	Abnormal inverter current sensor
52	Abnormal inverter overcurrent
53	Inverter error signal detection
54	Abnormal inverter fin temperature

- Procedure

1 Turn OFF the main switches to all the indoor and outdoor units.
2 Check the inverter PCB; if it is damaged, disconnect terminals (U, V, W) from the diode module (isolate the disconnected terminals).
3 Turn DSW5-1 ON on PCB1 of the outdoor unit to stop the compressor operation. Not all the compressors in the failed outdoor unit will stop the operation. If two compressors are stopped simultaneously, the stoppage cause is supposed to be d1-30.
4 Turn ON the power supply.
5 Start operation using the remote control switch.

Constant speed compressor failure

Alarm code	Description of the failure
23	Abnormal discharge gas thermistor
39	Abnormal running current at constant speed compressor

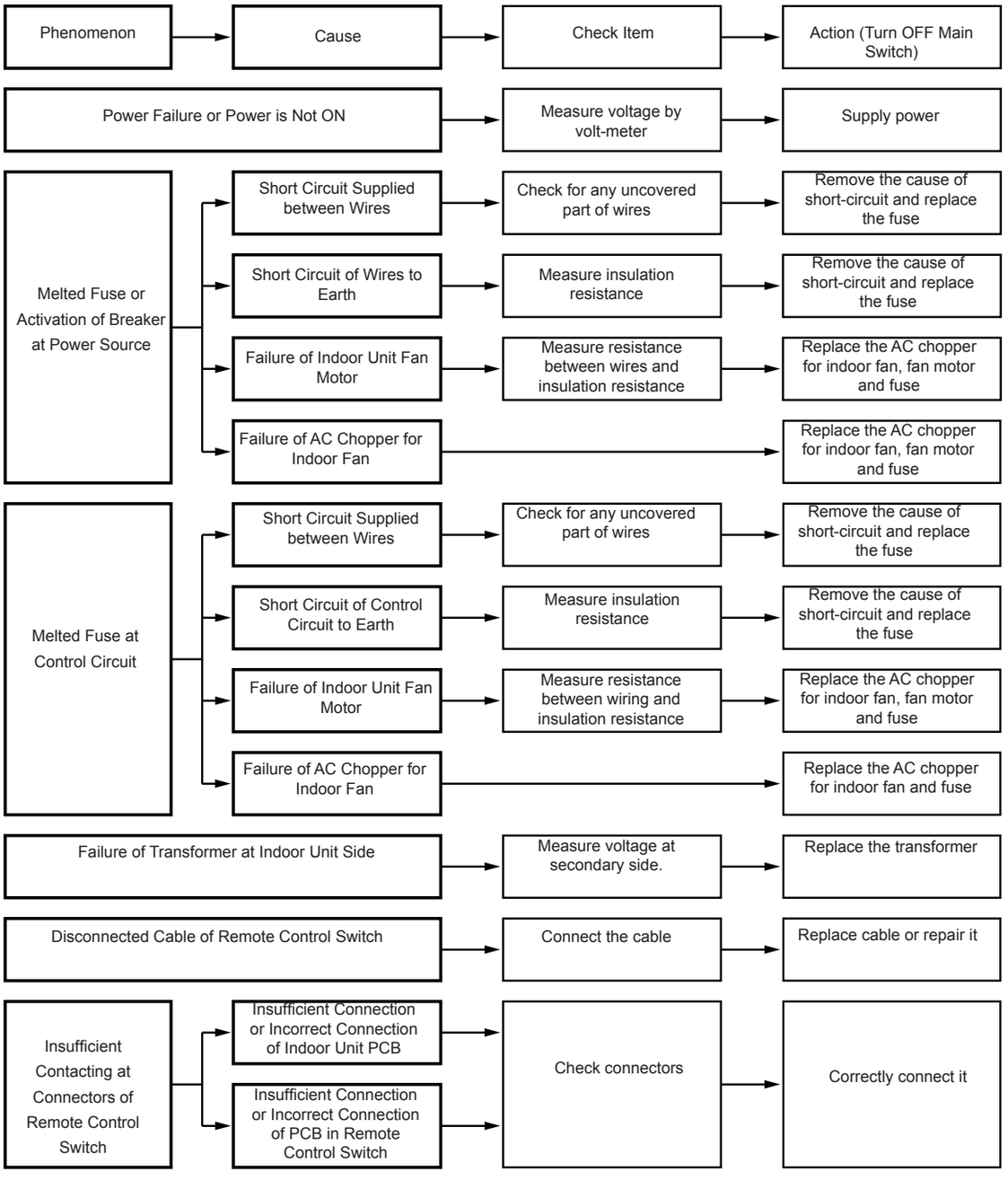
- Procedure

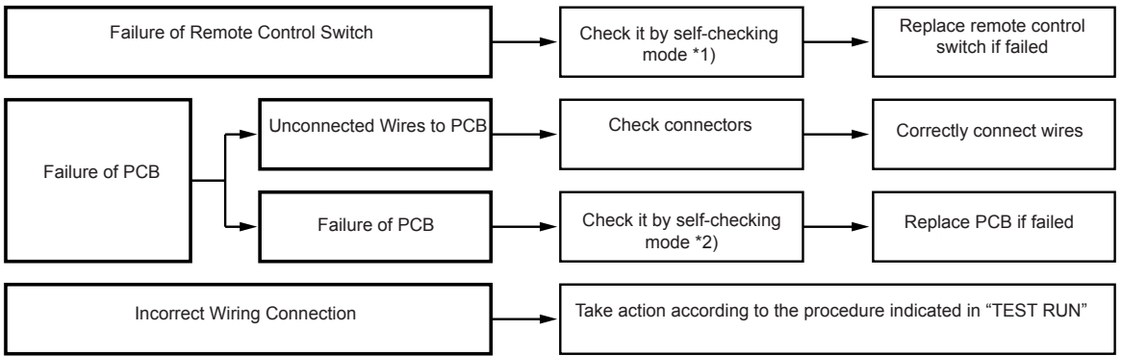
1 Turn OFF the main switches to all the indoor and outdoor units.
2 Turn DSW5-2 ON on PCB1 of the outdoor unit for the failure constant speed compressor. Not all the compressors in the failed outdoor unit will stop the operation. If two compressors are stopped simultaneously, the stoppage cause is supposed to be d1-30.
3 Turn ON the power supply.
4 Start operation using the remote control switch.

- Operation condition
  - Td thermistor: Td thermistor on the failure constant speed compressor is ignored by setting DSW5. If the thermistor is short-circuited, this operation is available.
  - Operating indoor unit capacity: the normal operation is available.

11.1.5 Failure of the power supply to the indoor units and the remote control switch

- The lights and the LCD are not indicated.
- Inoperative. If the fuses are blown or the circuit breaker is activated, investigate the cause of the excessive current and take the necessary measures.



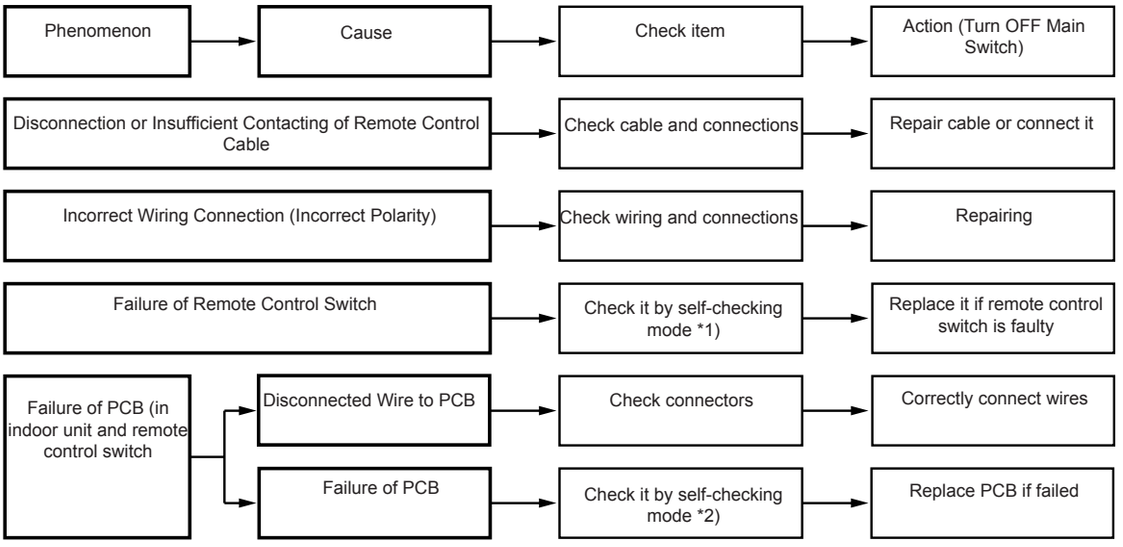


*1): Refer to the Installation and Operation Manual of the remote control switch.

*2): Refer to the Installation and Operation Manual of the remote control switch.

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

- The RUN indicator on the remote control: Flashes every two seconds.

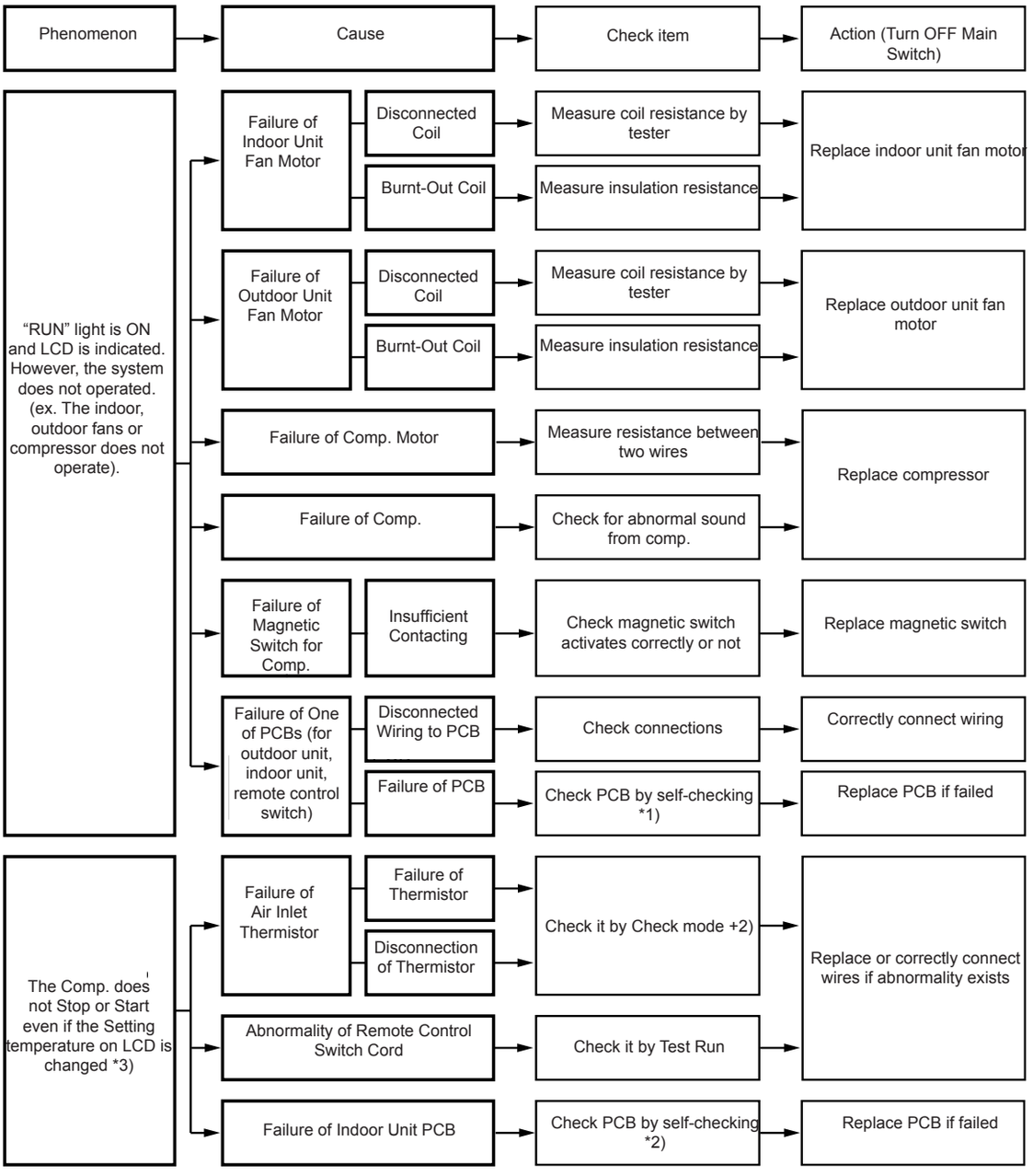


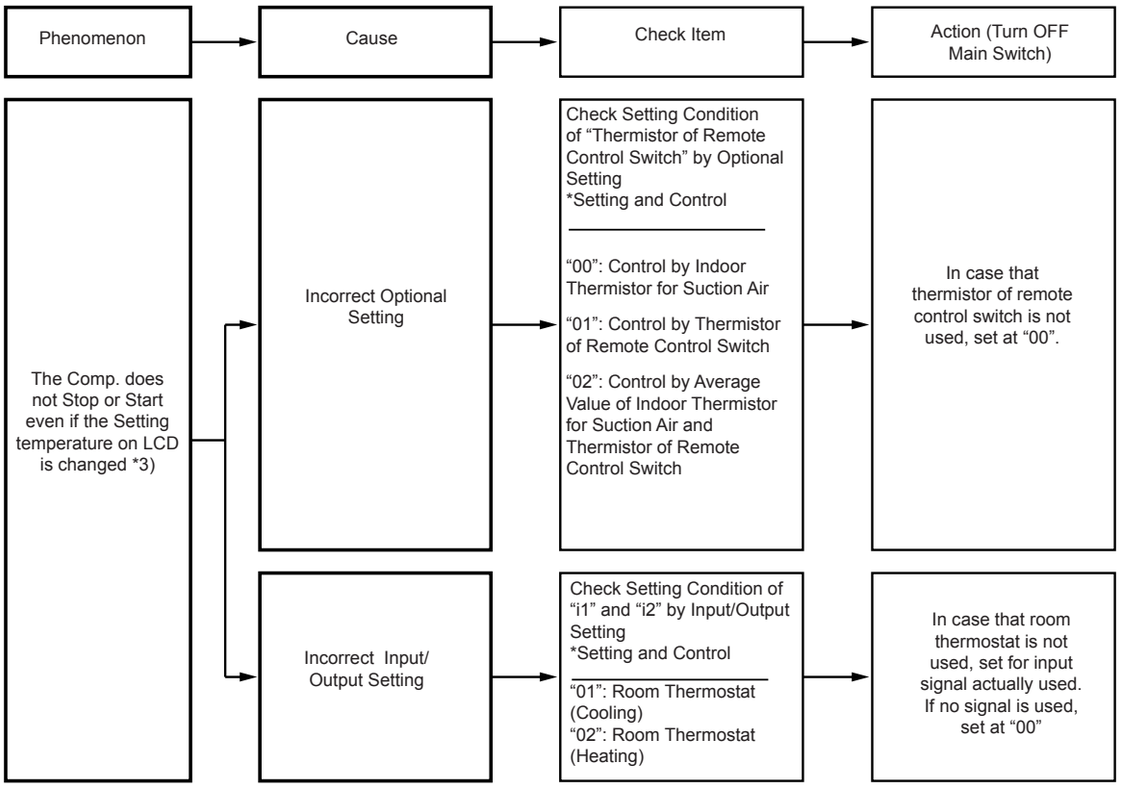
*1): Refer to the Installation and Operation Manual of the remote control switch.

*2): Refer to the Installation and Operation Manual of the remote control switch.

11.1.7 Abnormal operation of the devices

In the case no anomalies are detected (alarm codes) in the remote control switch, and normal operation is not available, carry out the required actions in accordance with the procedures described below.



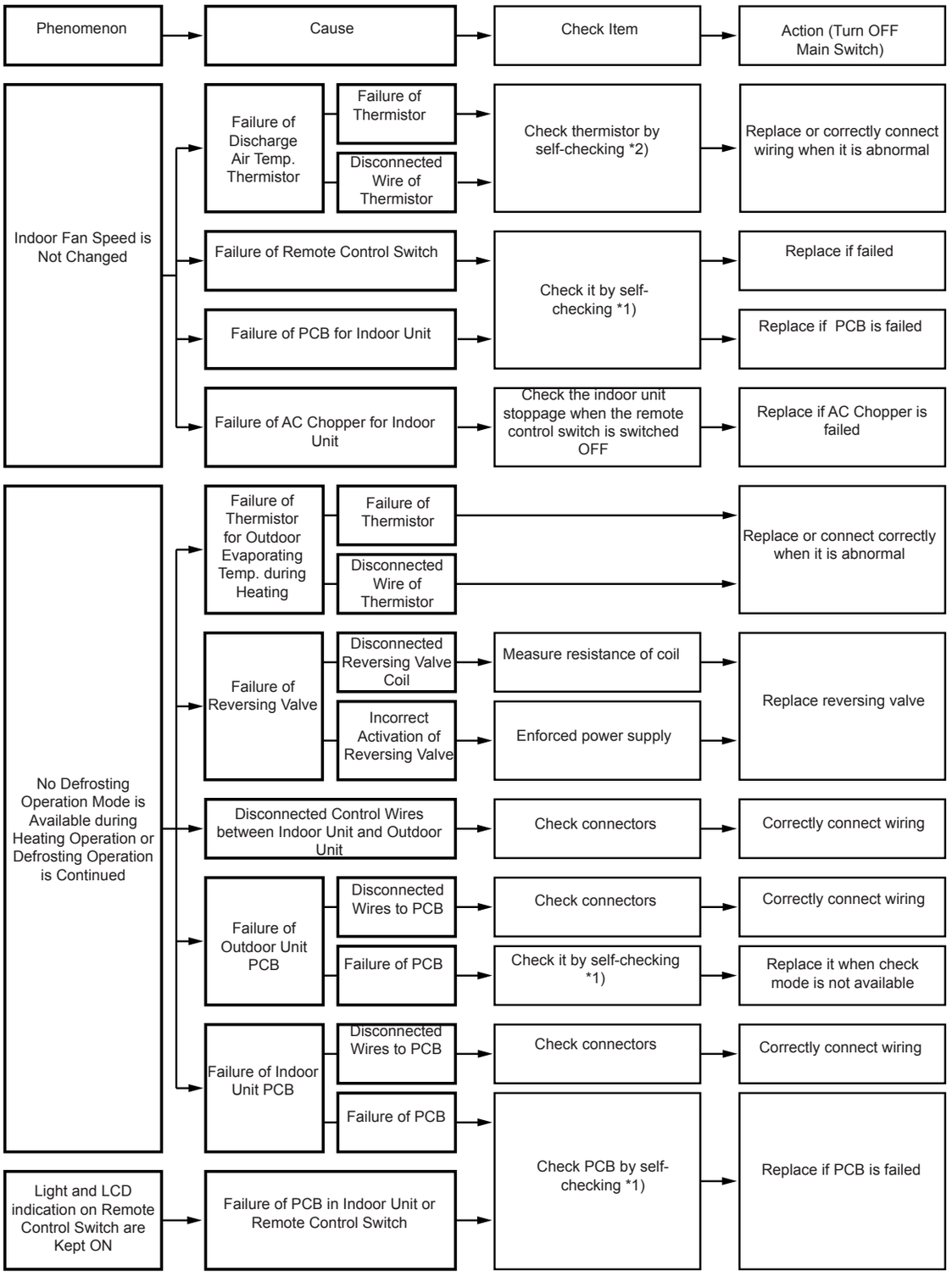


*1): Refer tothe Installation and Operation Manual of the remote control switch.

*2): Refer tothe Installation and Operation Manual of the remote control switch.

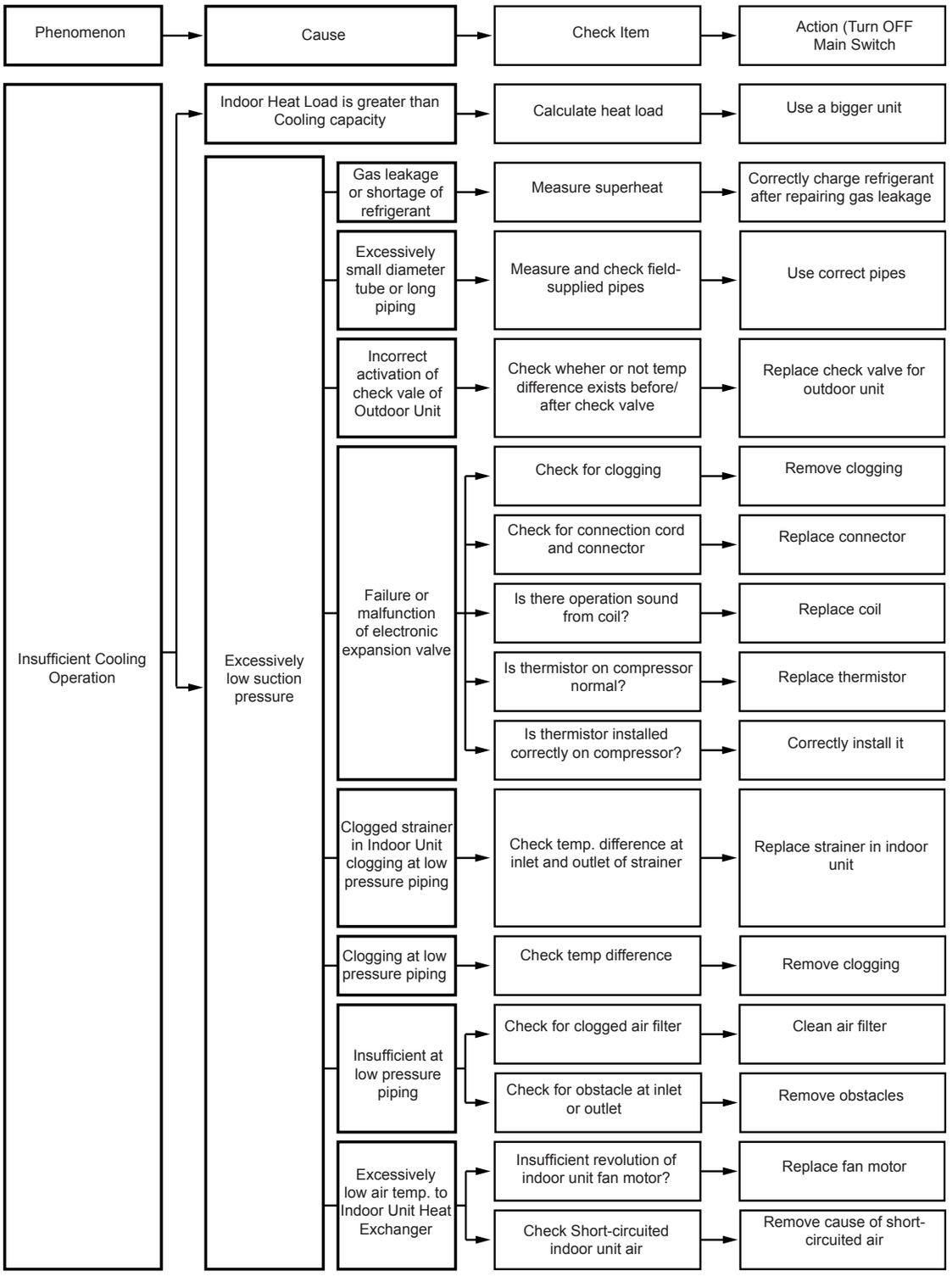
*3): Even if the controllers are correct, the compressor does not operate under the following conditions:

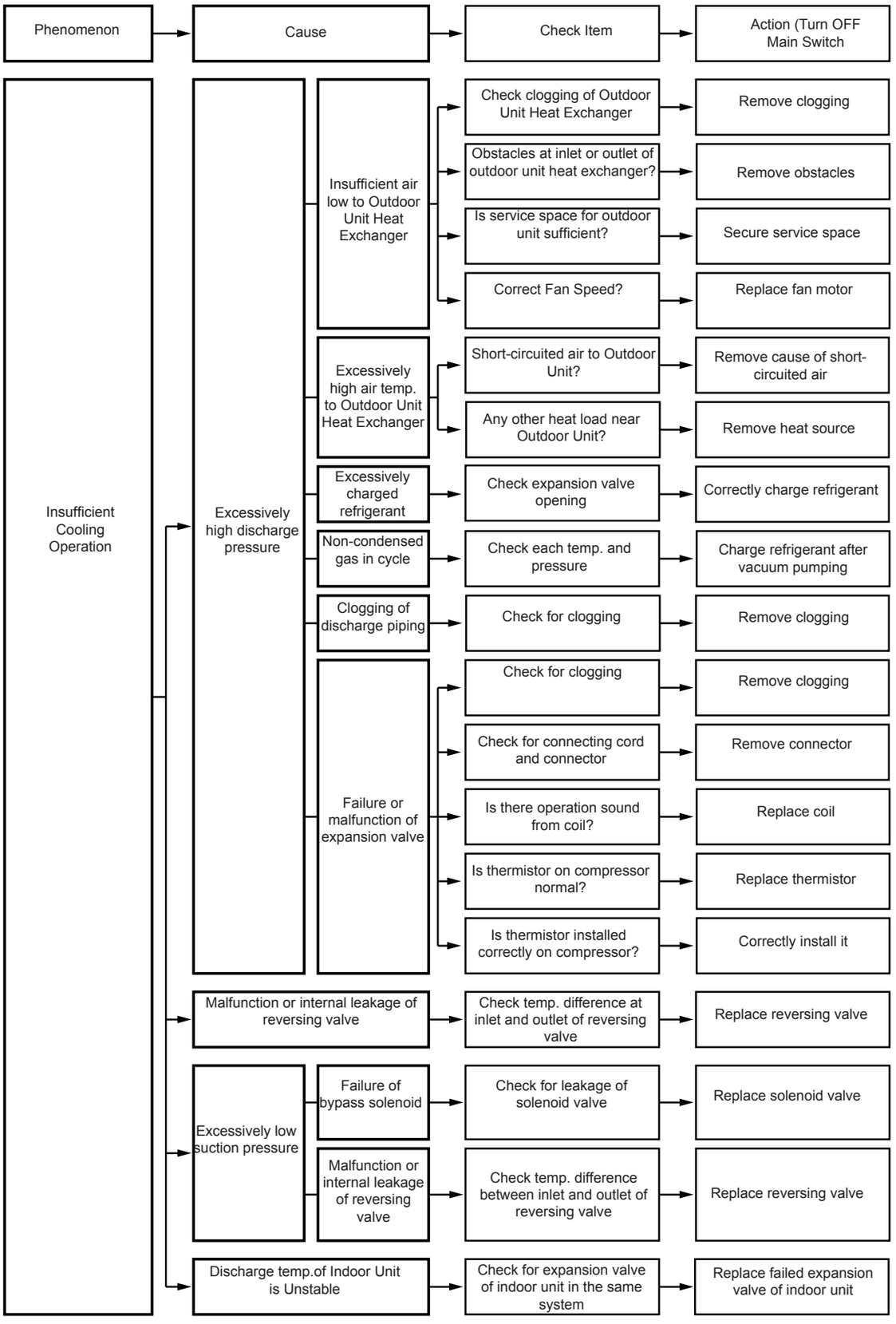
- Indoor air temperature is lower than -21 °C or the outdoor air temperature lower than -5 °C during the cooling operation.
- Indoor air temperature is higher than 30 °C or outdoor air temperature higher than 23 °C during the heating operation.
- When the cooling (or heating) operation signal is sent to the outdoor unit and a different mode as heating (or cooling) operation signal is sent to the indoor units.
- When the demand or emergency stop signal is sent to the outdoor unit.

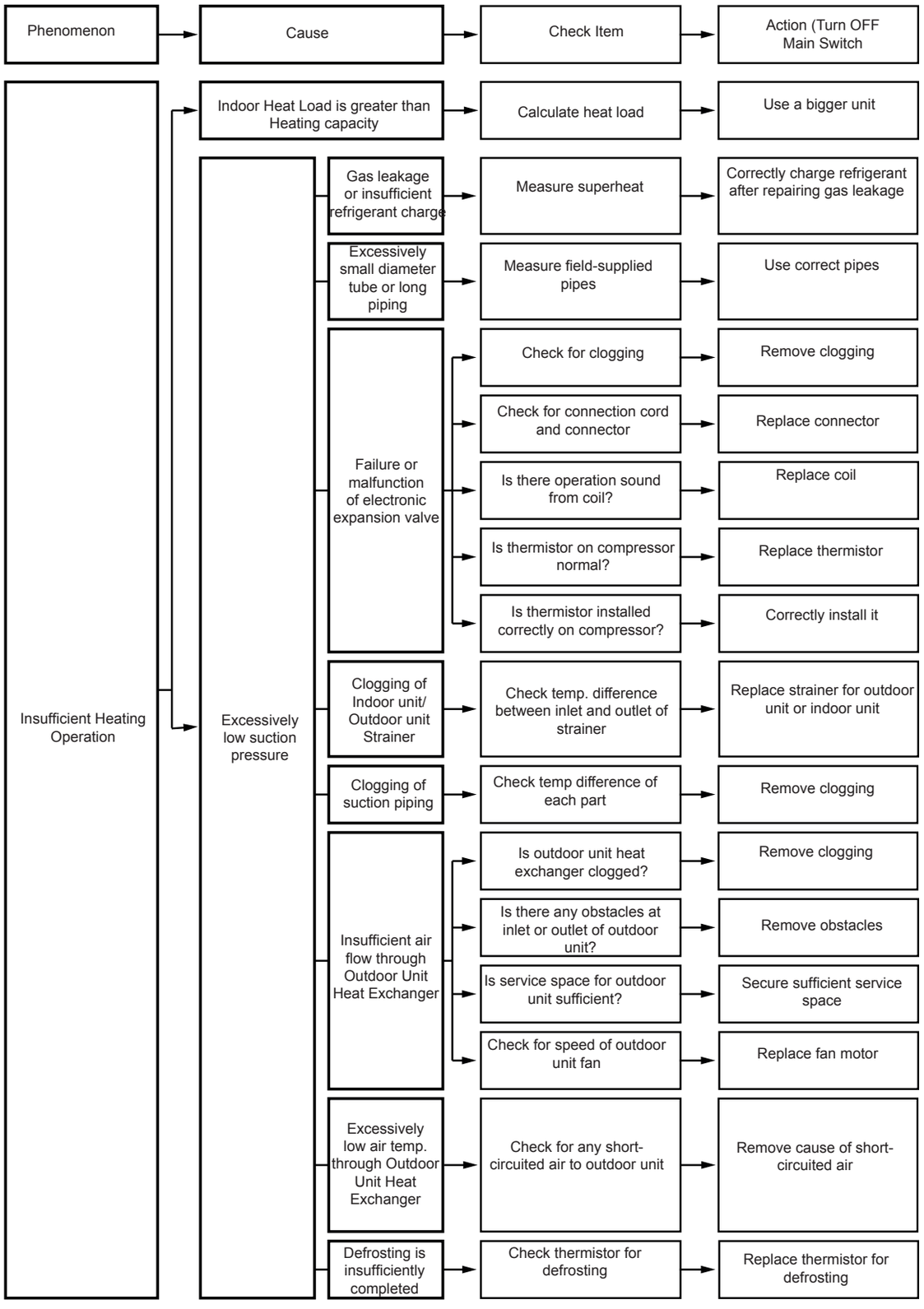


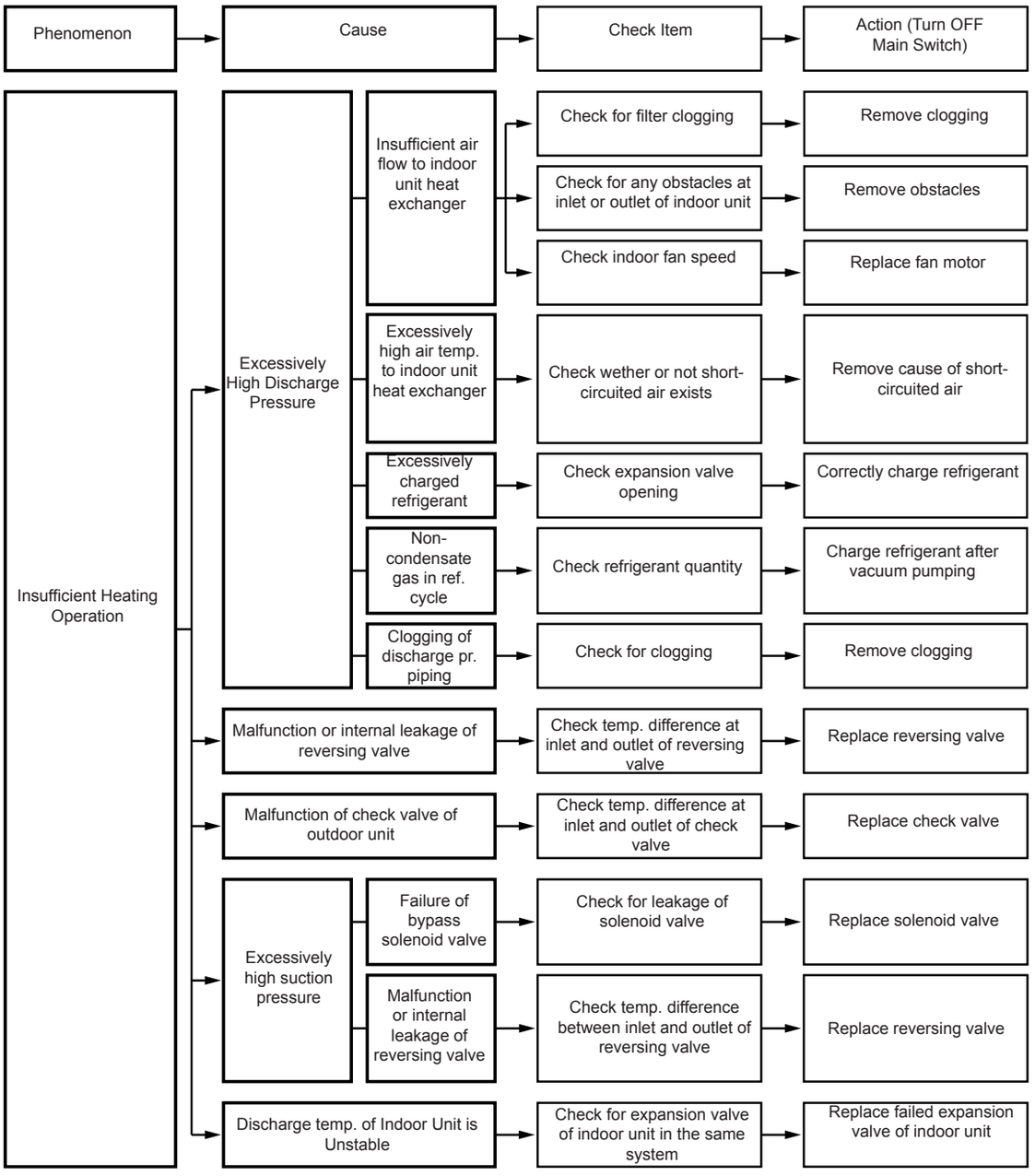
*1): Refer tothe Installation and Operation Manual of the remote control switch.

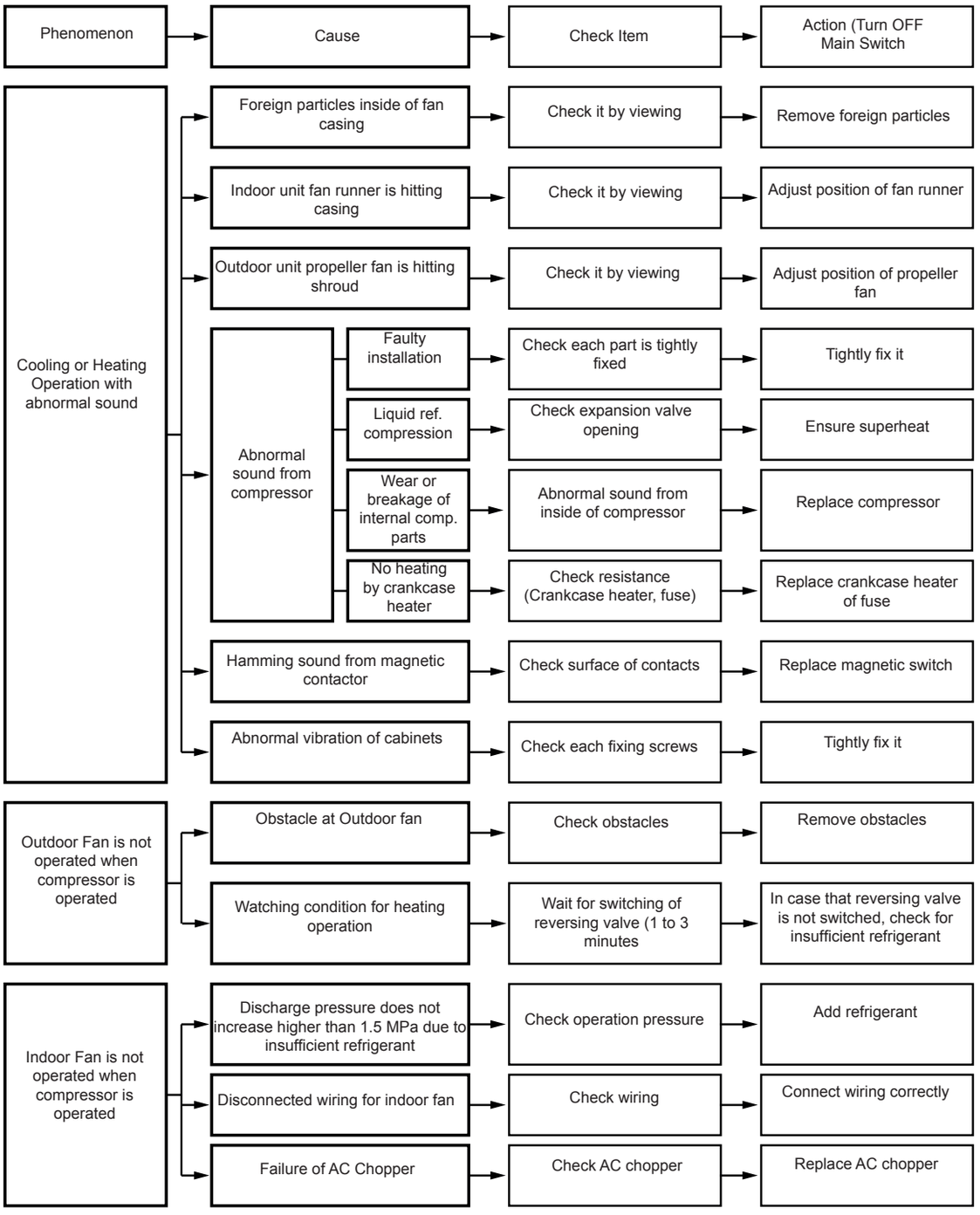
*2): Refer the Installation and Operation Manual of the remote control switch.


Phenomenon
Cause
Check Item
Action (Turn OFF Main Switch
Insufficient Cooling Operation
Indoor Heat Load is greater than Cooling capacity
Calculate heat load
Use a bigger unit
Excessively low suction pressure
Gas leakage or shortage of refrigerant
Measure superheat
Correctly charge refrigerant after repairing gas leakage
Excessively small diameter tube or long piping
Measure and check field-supplied pipes
Use correct pipes
Incorrect activation of check vale of Outdoor Unit
Check wheher or not temp difference exists before/ after check valve
Replace check valve for outdoor unit
Failure or malfunction of electronic expansion valve
Check for clogging
Remove clogging
Check for connection cord and connector
Replace connector
Is there operation sound from coil?
Replace coil
Is thermistor on compressor normal?
Replace thermistor
Is thermistor installed correctly on compressor?
Correctly install it
Clogged strainer in Indoor Unit clogging at low pressure piping
Check temp. difference at inlet and outlet of strainer
Replace strainer in indoor unit
Clogging at low pressure piping
Check temp difference
Remove clogging
Insufficient at low pressure piping
Check for clogged air filter
Clean air filter
Check for obstacle at inlet or outlet
Remove obstacles
Excessively low air temp. to Indoor Unit Heat Exchanger
Insufficient revolution of indoor unit fan motor?
Replace fan motor
Check Short-circuited indoor unit air
Remove cause of short-circuited air


Phenomenon
Cause
Check Item
Action (Turn OFF Main Switch
Insufficient Cooling Operation
Excessively high discharge pressure
Insufficient air low to Outdoor Unit Heat Exchanger
Check clogging of Outdoor Unit Heat Exchanger
Remove clogging
Obstacles at inlet or outlet of outdoor unit heat exchanger?
Remove obstacles
Is service space for outdoor unit sufficient?
Secure service space
Correct Fan Speed?
Replace fan motor
Excessively high air temp. to Outdoor Unit Heat Exchanger
Short-circuited air to Outdoor Unit?
Remove cause of short-circuited air
Any other heat load near Outdoor Unit?
Remove heat source
Excessively charged refrigerant
Check expansion valve opening
Correctly charge refrigerant
Non-condensed gas in cycle
Check each temp. and pressure
Charge refrigerant after vacuum pumping
Clogging of discharge piping
Check for clogging
Remove clogging
Failure or malfunction of expansion valve
Check for clogging
Remove clogging
Check for connecting cord and connector
Remove connector
Is there operation sound from coil?
Replace coil
Is thermistor on compressor normal?
Replace thermistor
Is thermistor installed correctly on compressor?
Correctly install it
Malfunction or internal leakage of reversing valve
Check temp. difference at inlet and outlet of reversing valve
Replace reversing valve
Excessively low suction pressure
Failure of bypass solenoid
Check for leakage of solenoid valve
Replace solenoid valve
Malfunction or internal leakage of reversing valve
Check temp. difference between inlet and outlet of reversing valve
Replace reversing valve
Discharge temp.of Indoor Unit is Unstable
Check for expansion valve of indoor unit in the same system
Replace failed expansion valve of indoor unit


Phenomenon
Cause
Check Item
Action (Turn OFF Main Switch
Insufficient Heating Operation
Indoor Heat Load is greater than Heating capacity
Calculate heat load
Use a bigger unit
Excessively low suction pressure
Gas leakage or insufficient refrigerant charge
Measure superheat
Correctly charge refrigerant after repairing gas leakage
Excessively small diameter tube or long piping
Measure field-supplied pipes
Use correct pipes
Failure or malfunction of electronic expansion valve
Check for clogging
Remove clogging
Check for connection cord and connector
Replace connector
Is there operation sound from coil?
Replace coil
Is thermistor on compressor normal?
Replace thermistor
Is thermistor installed correctly on compressor?
Correctly install it
Clogging of Indoor unit/ Outdoor unit Strainer
Check temp. difference between inlet and outlet of strainer
Replace strainer for outdoor unit or indoor unit
Clogging of suction piping
Check temp difference of each part
Remove clogging
Insufficient air flow through Outdoor Unit Heat Exchanger
Is outdoor unit heat exchanger clogged?
Remove clogging
Is there any obstacles at inlet or outlet of outdoor unit?
Remove obstacles
Is service space for outdoor unit sufficient?
Secure sufficient service space
Check for speed of outdoor unit fan
Replace fan motor
Excessively low air temp. through Outdoor Unit Heat Exchanger
Check for any short-circuited air to outdoor unit
Remove cause of short-circuited air
Defrosting is insufficiently completed
Check thermistor for defrosting
Replace thermistor for defrosting


Phenomenon
Cause
Check Item
Action (Turn OFF Main Switch)
Insufficient Heating Operation
Excessively High Discharge Pressure
Insufficient air flow to indoor unit heat exchanger
Check for filter clogging
Remove clogging
Check for any obstacles at inlet or outlet of indoor unit
Remove obstacles
Check indoor fan speed
Replace fan motor
Excessively high air temp. to indoor unit heat exchanger
Check wether or not short-circuited air exists
Remove cause of short-circuited air
Excessively charged refrigerant
Check expansion valve opening
Correctly charge refrigerant
Non-condensate gas in ref. cycle
Check refrigerant quantity
Charge refrigerant after vacuum pumping
Clogging of discharge pr. piping
Check for clogging
Remove clogging
Malfunction or internal leakage of reversing valve
Check temp. difference at inlet and outlet of reversing valve
Replace reversing valve
Malfunction of check valve of outdoor unit
Check temp. difference at inlet and outlet of check valve
Replace check valve
Excessively high suction pressure
Failure of bypass solenoid valve
Check for leakage of solenoid valve
Replace solenoid valve
Malfunction or internal leakage of reversing valve
Check temp. difference between inlet and outlet of reversing valve
Replace reversing valve
Discharge temp. of Indoor Unit is Unstable
Check for expansion valve of indoor unit in the same system
Replace failed expansion valve of indoor unit


Phenomenon
Cause
Check Item
Action (Turn OFF Main Switch
Cooling or Heating Operation with abnormal sound
Foreign particles inside of fan casing
Check it by viewing
Remove foreign particles
Indoor unit fan runner is hitting casing
Check it by viewing
Adjust position of fan runner
Outdoor unit propeller fan is hitting shroud
Check it by viewing
Adjust position of propeller fan
Abnormal sound from compressor
Faulty installation
Check each part is tightly fixed
Tightly fix it
Liquid ref. compression
Check expansion valve opening
Ensure superheat
Wear or breakage of internal comp. parts
Abnormal sound from inside of compressor
Replace compressor
No heating by crankcase heater
Check resistance (Crankcase heater, fuse)
Replace crankcase heater of fuse
Hamming sound from magnetic contactor
Check surface of contacts
Replace magnetic switch
Abnormal vibration of cabinets
Check each fixing screws
Tightly fix it
Outdoor Fan is not operated when compressor is operated
Obstacle at Outdoor fan
Check obstacles
Remove obstacles
Watching condition for heating operation
Wait for switching of reversing valve (1 to 3 minutes
In case that reversing valve is not switched, check for insufficient refrigerant
Indoor Fan is not operated when compressor is operated
Discharge pressure does not increase higher than 1.5 MPa due to insufficient refrigerant
Check operation pressure
Add refrigerant
Disconnected wiring for indoor fan
Check wiring
Connect wiring correctly
Failure of AC Chopper
Check AC chopper
Replace AC chopper

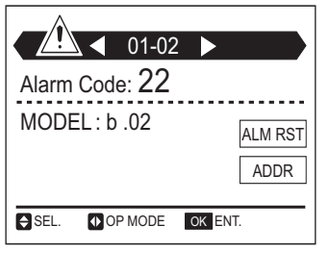
11.2 Procedure for troubleshooting

If RUN lamp flashes for 2 seconds, there is a failure in transmission between the indoor unit and the remote control switch. Possible causes are:

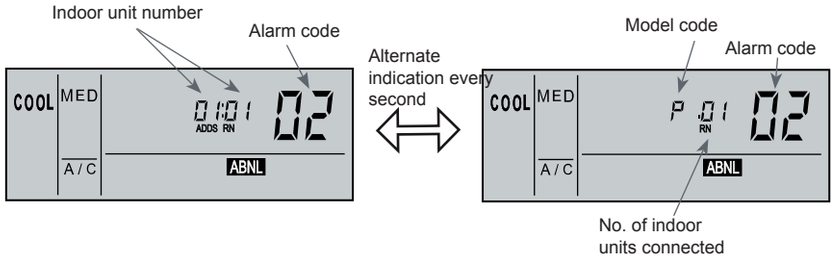
- The remote cable is broken.
- Contact failure in remote control cable.
- IC or microcomputer defective.
- In all cases, contact your service provider.

If RUN lamp flashes 5 times (5 seconds) with unit number and alarm code displayed, note the alarm code (see table Alarm codes) and contact your service provider.

PC-ARF



PC-ART

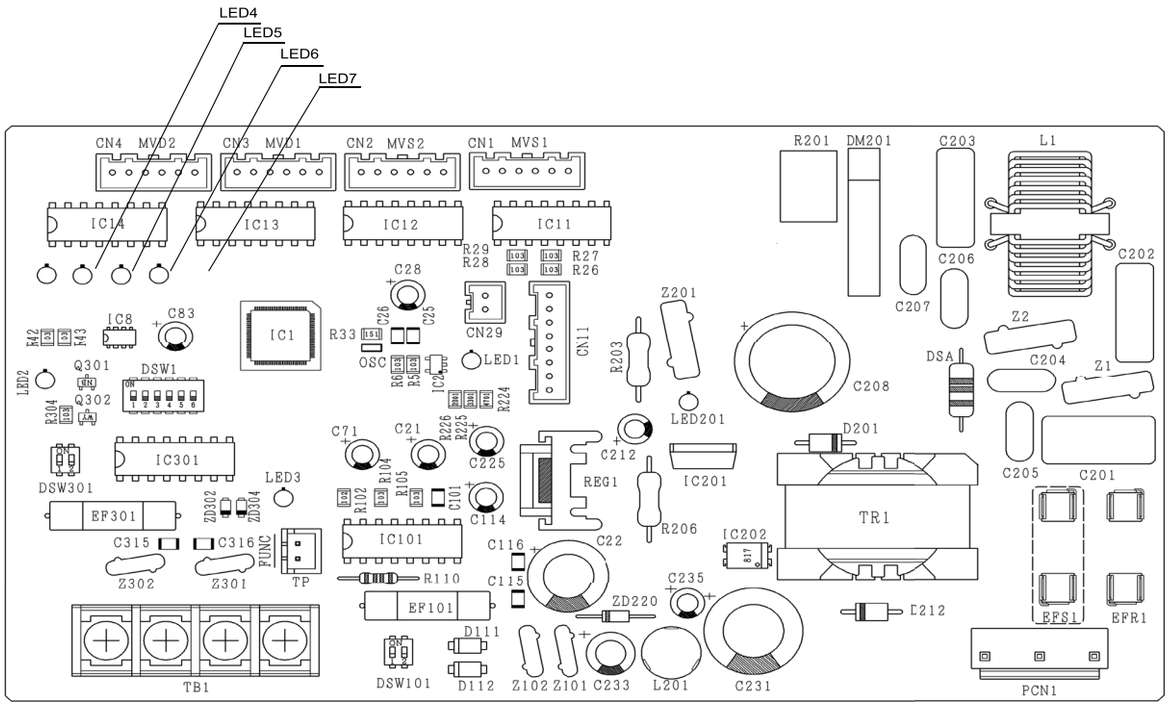


11.2.1 Alarm codes

Code	Category	Content of abnormality	Possible cause
01	Indoor unit	Protection device activation (float switch)	Float switch activation (high water level in drain hose or abnormality in drain pipe, float switch or drain pan).
02	Outdoor unit	Protection device activation (disconnection due to high pressure)	PSH activation (pipe clogging, excess refrigerant, mixture of inert gas).
03	Transmission	Abnormality between indoor and outdoor	Incorrect wiring, loose terminals, disconnect cable, blown fuse, outdoor unit switched off.
04		Abnormality between inverter PCB and outdoor PCB	Inverter PCB - Outdoor PCB transmission fault (loose connector, broken cable, blown fuse).
04.		Abnormality between fan controller and outdoor PCB	Fan controller - Outdoor PCB transmission fault (loose connector, broken cable, blown fuse).
05	Power phase	Abnormality in the power phases	Incorrect power supply, inverted phase connection, open phase.
06	Voltage	Abnormal inverter voltage	Outdoor voltage drop, insufficient power.
06.		Abnormal fan controller voltage	Outdoor voltage drop, insufficient power.
07	Cycle	Drop in discharge gas superheat	Excessive refrigerant charge, thermistor fault, incorrect wiring, incorrect pipe connection, expansion valve locked in open position (connector disconnected).
08		Increase in discharge gas temperature	Insufficient refrigerant charge, pipe clogging, thermistor fault, incorrect wiring, incorrect pipe connection, expansion valve locked in closed position (connector disconnected).
0A	Transmission	Abnormality between outdoor and indoor	Incorrect wiring, broken cable, loose terminals.
0b	Outdoor unit	Incorrect outdoor unit address setting	Duplicate address setting of outdoor units (secondary units) in the same refrigerant cycle system.
0C		Main unit of the outdoor unit incorrectly set	Two (or more) outdoor units defined as the “main unit” in the same refrigerant cycle system.
11	Indoor unit sensor	Air inlet thermistor	Incorrect wiring, disconnected wiring, broken cable, short circuit.
12		Air outlet thermistor	
13		Frost protection thermistor	
14		Gas pipe thermistor	
19	Fan motor	Indoor fan protection device activation	Fan motor overheating, locking.

Code	Category	Content of abnormality	Possible cause
21	Outdoor unit sensor	High pressure sensor	Incorrect wiring, disconnected wiring, broken cable, short circuit.
22		Outdoor air thermistor	
23		Discharge gas thermistor at top of compressor	
24		Heat exchanger liquid pipe thermistor	
25		Heat exchanger gas pipe thermistor	
29		Low pressure sensor	
31	System	Incorrect capacity setting on outdoor and indoor units	Combination capacity incorrectly set. Excessive or insufficient total indoor unit capacity.
		Abnormal transmitting between outdoor units	
35		Indoor unit no. incorrectly set	Indoor unit no. duplicated in same reference group.
36		Incorrect of indoor unit combination	Indoor unit designed for R22.
38		Abnormality in the collection circuit for outdoor unit protection	Protection detection device fault (incorrect wiring of outdoor PCB).
39	Compressor	Abnormal running current at constant speed compressor	Overcurrent, blowout fuse, current sensor failure, instantaneous power failure, voltage drop, abnormal power supply.
3A	Outdoor unit	Abnormal outdoor unit capacity.	Outdoor unit capacity >54 HP.
3b		Voltage or combination of outdoor unit models incorrectly set	Voltage or combination of secondary and main units incorrectly set.
3d		Abnormal transmission between the main unit and the secondary unit(s)	Incorrect wiring, disconnected wiring, broken cable, PCB fault.
43	Protection device	Low-pressure decrease protection device activation	Defective compression (compressor or inverter fault, loose power supply connection).
44		Low-pressure increase protection device activation	Overload during cooling, high temperature with heating, locked expansion valve (loose connector).
45		High pressure increase protection device activation	Overload (clogging, short pitch), pipe clogging, excess refrigerant, mixture of inert gas.
47		Low-pressure decrease protection device activation (vacuum protection)	Insufficient refrigerant, refrigerant pipes, clogging, expansion valve locked in open position (loose connector).
48		Inverter overcurrent protection device activation	Overload, compressor fault.
51	Sensor	Abnormal inverter current sensor	Current sensor fault.
53	Inverter	Inverter error signal detection	Controller IC error signal detection (overcurrent, low-voltage and short-circuit protection).
54		Abnormal inverter fin temperature	Abnormal inverter fin thermistor, heat exchanger clogging, fan motor fault.
55		Inverter fault	Inverter PCB fault.
57	Fan controller	Fan controller protection activation	Controller IC error signal detection (overcurrent, low-voltage and short-circuit protection), instant overcurrent.
5A		Abnormal fan controller fin temperature	Fin thermistor fault, heat exchanger clogging, fan motor fault.
5b		Overcurrent protection activation	Fan motor fault.
5C		Abnormal fan controller sensor	Current sensor fault (instant overcurrent, increased fin temperature, low voltage, earthing fault, step-out).
EE	Compressor	Compressor protection alarm (cannot be reset from the remote controller)	This alarm code is displayed when the following alarms are triggered three times within six hours: 02, 07, 08, 39, 43 to 45, 47.
b1	Outdoor unit number setting	Unit number or address number of the outdoor unit incorrectly set	A number greater than 64 has been set for the refrigerant cycle or address.
b5	Indoor unit number setting	Connection number of the indoor unit incorrectly set	There are more than 17 units not corresponding to H-LINK II connected to one system.
C1	CH unit	Incorrect indoor unit connection	There are 2 or more CH units connected between the outdoor and indoor units.
C2		Connection number of the indoor unit incorrectly set	There are 9 or more indoor units connected to the CH unit
C3		Incorrect indoor unit connection	Indoor units from different refrigerant cycles have been connected to the CH unit.

The alarm code is indicated by LED on the CH unit PCB:



LED				Alarm Code	Content of abnormality
4	5	6	7		
O	O	X	X	03	Abnormal transmission between CH and outdoor unit
X	X	O	O	03	Abnormal transmission between CH and indoor unit
O	O	O	O	C1	There are 2 or more CH units connected between the outdoor and indoor units.
O	O	O	X	C2	There are 9 or more indoor units connected to the CH unit
X	O	O	X	C3	Indoor units from different refrigerant cycles have been connected to the CH unit.

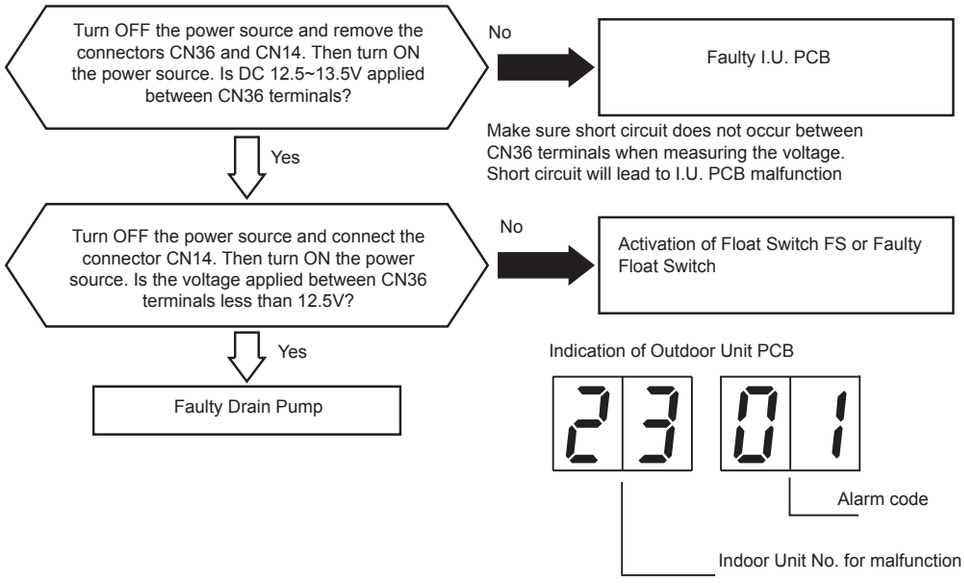
O: Flashing (turn ON; 0.5 sec / turn OFF; 0.5 sec).
X: Turn OFF.

11.3 Troubleshooting by alarm code

Alarm code	01	Activation of the Indoor unit protection device.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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 when the contact between No. and No. 2 of CN14 is opened more than 120 seconds during the cooling, dry, fan or heating operation.

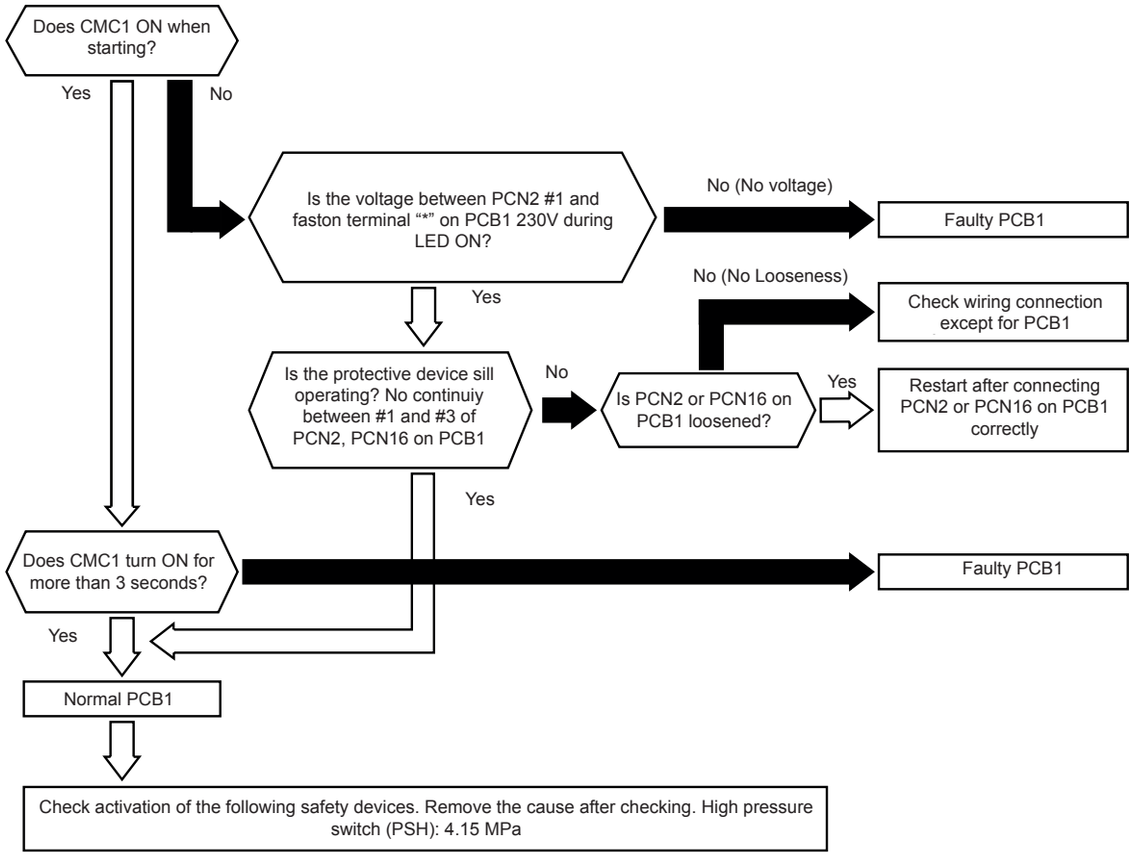


Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
Activation of float switch	High drain level	Clogging of drainage up-solpe drain piping	Check drain pan Check drainage by pouring water	Remove foreign particles clogging the drainage
Faulty float switch	Failure		Check conduction when drain level is low	Replace float switch if faulty
	Poor Contact		Measure resistance by tester	Replace looseness and replace connector
	Faulty Contact		Check connections	Repair connection
Faulty drain pump	Failure		Measure voltage between CN36 terminals by tester	Repair drain pump if faulty
	Poor Contact		Measure resistance by tester	Repair looseness and replace conector
	Faulty Contact		Check connections	Repair connection
Faulty indoor unit PCB			Check PCB by self-checking *1)	Replace it if faulty

Alarm code	02	Activation of the outdoor unit protection device.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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.

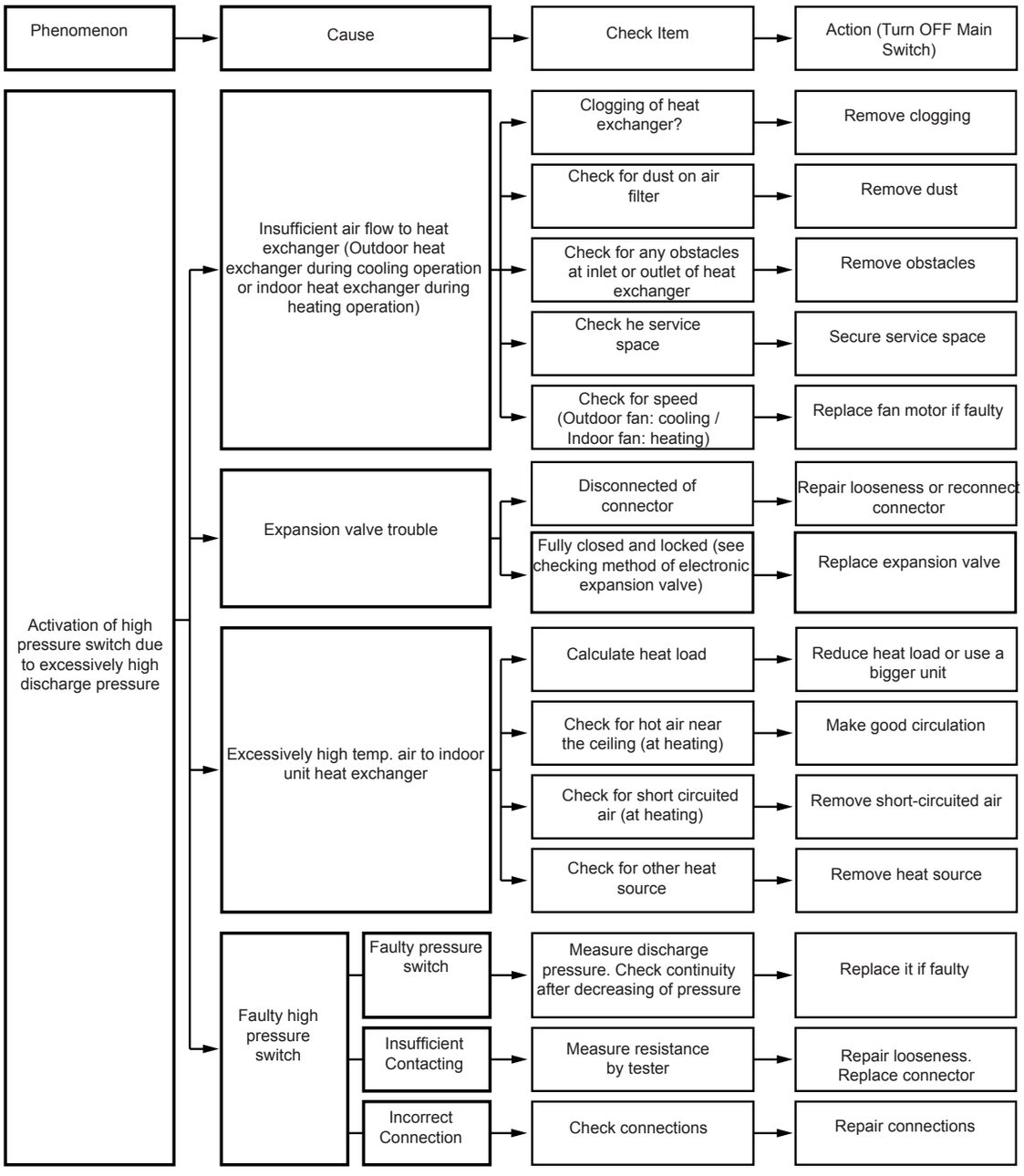
This alarm is indicated when one of the safety devices is activated during the compressor running.

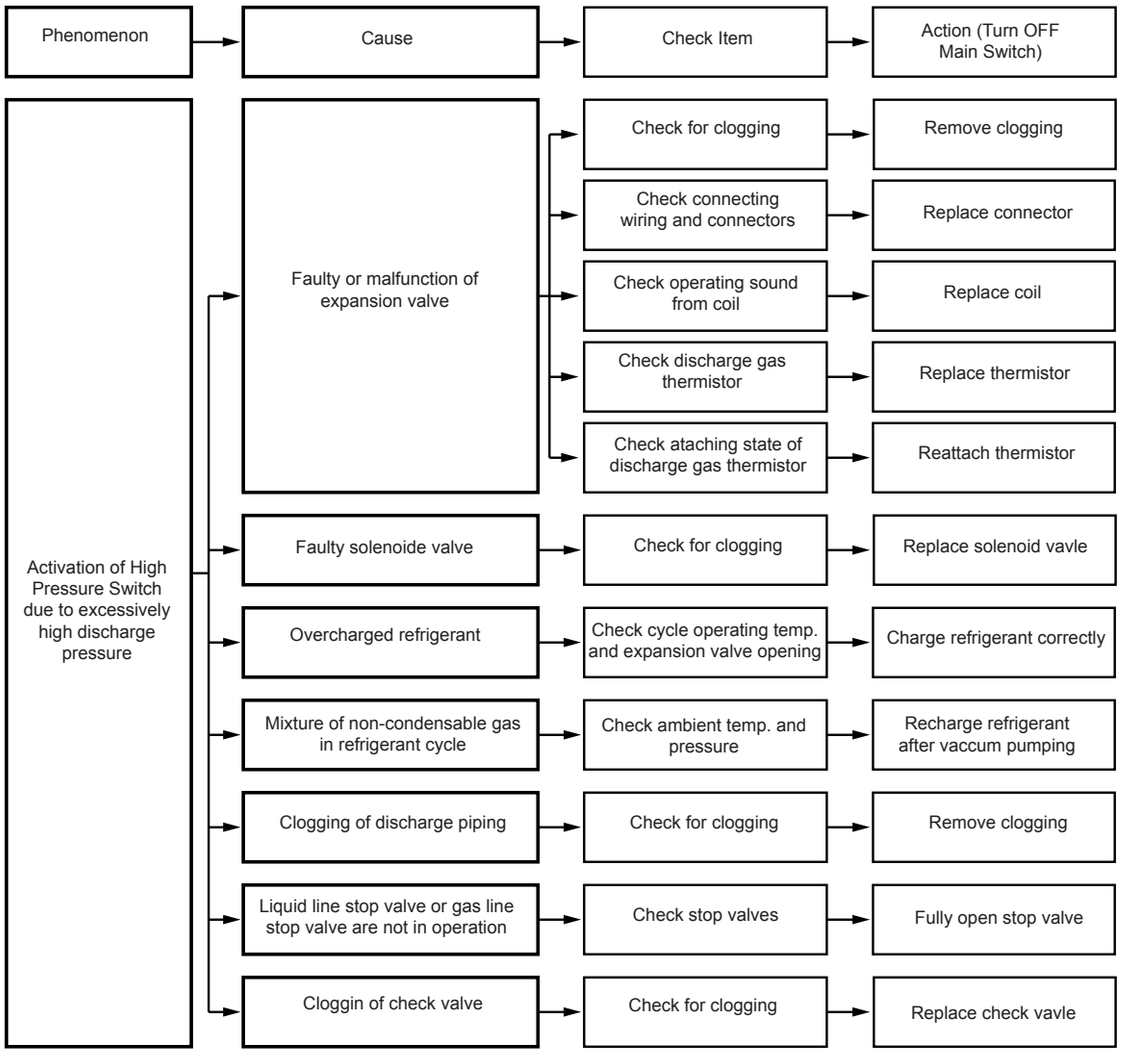


Check the following elements:

Connector for CMC1	Faston terminal *		Connector for the protection device
PCN3	400V 50Hz	N1	PCN2 or PCN16

Model	High pressure switch (connector no.)	
	PSH1 (PCN2)	PSH2 (PCN16)
RAS-(8-12)FSXN1E RAS-(5-12)FSXNH(E)	O	-
RAS-(14/16)FSXN1E	O	O


Phenomenon
Cause
Check Item
Action (Turn OFF Main Switch)
Activation of high pressure switch due to excessively high discharge pressure
Insufficient air flow to heat exchanger (Outdoor heat exchanger during cooling operation or indoor heat exchanger during heating operation)
Clogging of heat exchanger?
Remove clogging
Check for dust on air filter
Remove dust
Check for any obstacles at inlet or outlet of heat exchanger
Remove obstacles
Check he service space
Secure service space
Check for speed (Outdoor fan: cooling / Indoor fan: heating)
Replace fan motor if faulty
Expansion valve trouble
Disconnected of connector
Repair looseness or reconnect connector
Fully closed and locked (see checking method of electronic expansion valve)
Replace expansion valve
Excessively high temp. air to indoor unit heat exchanger
Calculate heat load
Reduce heat load or use a bigger unit
Check for hot air near the ceiling (at heating)
Make good circulation
Check for short circuited air (at heating)
Remove short-circuited air
Check for other heat source
Remove heat source
Faulty high pressure switch
Faulty pressure switch
Measure discharge pressure. Check continuity after decreasing of pressure
Replace it if faulty
Insufficient Contacting
Measure resistance by tester
Repair looseness. Replace connector
Incorrect Connection
Check connections
Repair connections


Phenomenon
Cause
Check Item
Action (Turn OFF Main Switch)
Activation of High Pressure Switch due to excessively high discharge pressure
Faulty or malfunction of expansion valve
Check for clogging
Remove clogging
Check connecting wiring and connectors
Replace connector
Check operating sound from coil
Replace coil
Check discharge gas thermistor
Replace thermistor
Check atacching state of discharge gas thermistor
Reattach thermistor
Faulty solenoide valve
Check for clogging
Replace solenoid vavle
Overcharged refrigerant
Check cycle operating temp. and expansion valve opening
Charge refrigerant correctly
Mixture of non-condensable gas in refrigerant cycle
Check ambient temp. and pressure
Recharge refrigerant after vaccum pumping
Clogging of discharge piping
Check for clogging
Remove clogging
Liquid line stop valve or gas line stop valve are not in operation
Check stop valves
Fully open stop valve
Cloggin of check valve
Check for clogging
Replace check vavle

Alarm code	03	Abnormal transmission between the indoor and outdoor units.

- 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.

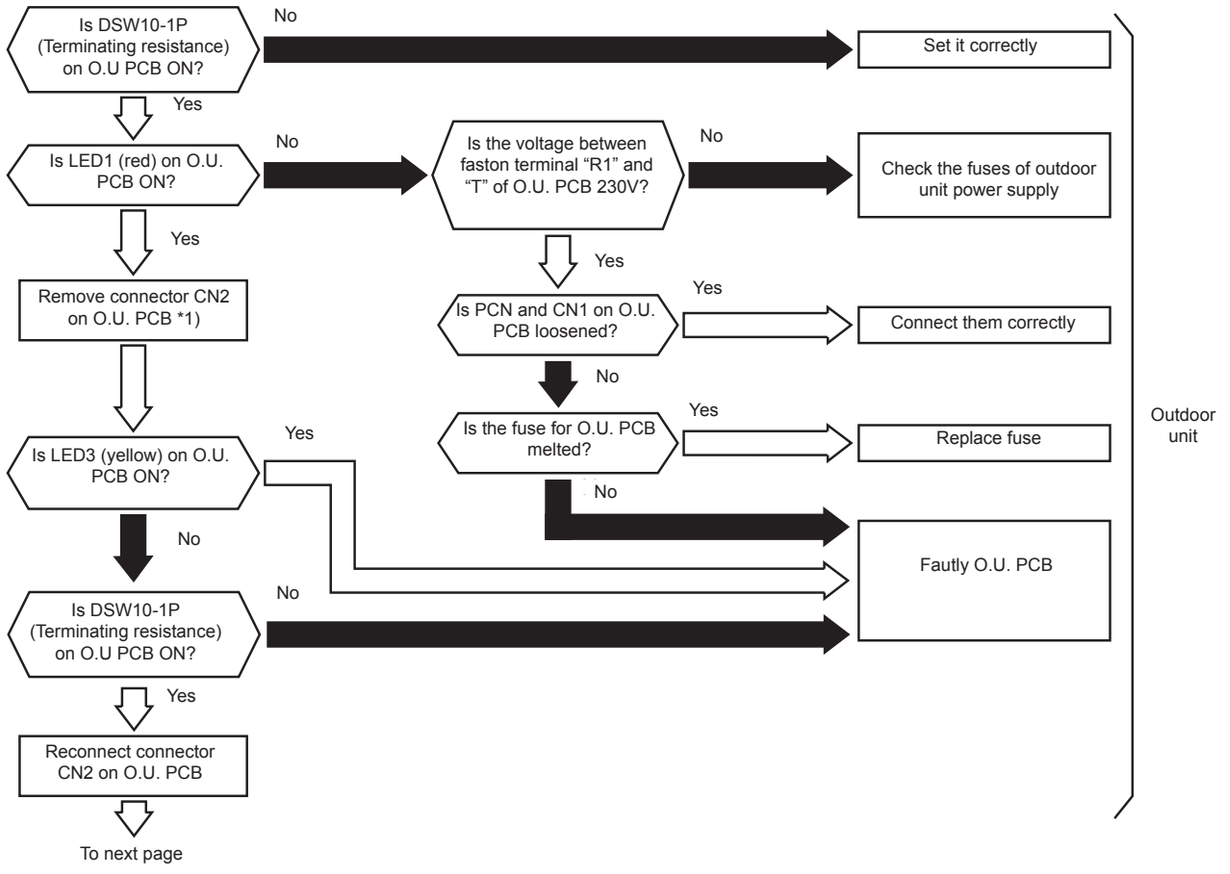
This alarm is indicated when an anomaly is maintained for 3 minutes after the normal transmission between indoor, CH units and outdoor units, and also if the anomaly is maintained for 30 seconds after the microcomputer is automatically reset.The alarm is indicated when the abnormal transmission is maintained for 30 seconds from the start up of the outdoor unit. Investigate the cause of the excessive current consumption and take the necessary measures when fuses are blown or the circuit breakers for the outdoor unit are activated.

NOTE

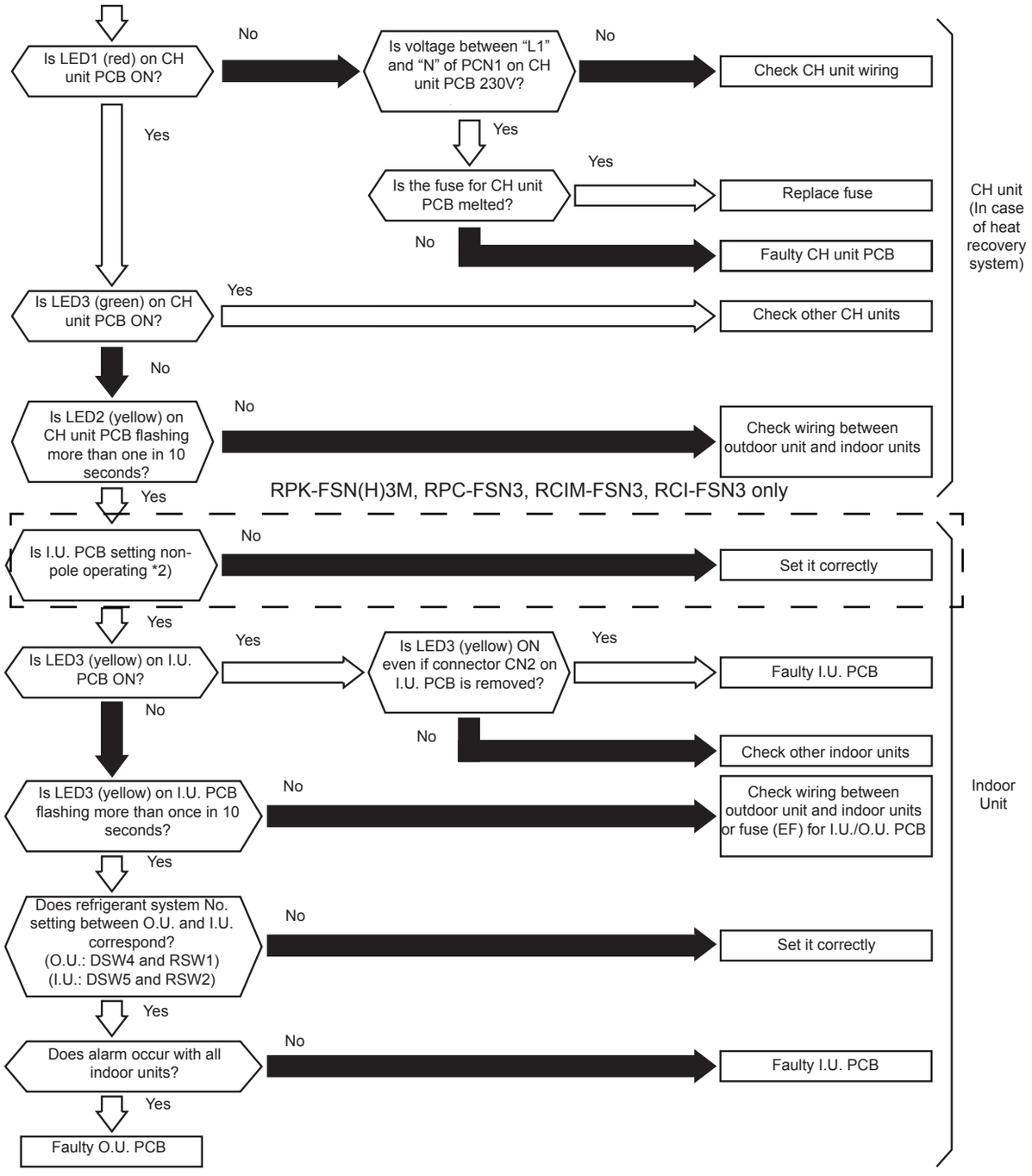
- *CH units heat recovery system only (3 pipes).*
- **1) In the case that terminating resistance (DSW10-1) is in the OFF when the H-LINK connection is performed set terminating resistance to ON when CN2 is disconnected. Set terminating resistance to OFF when CN2 is reconnected.*
- **2) Transmission setting (SW1):*

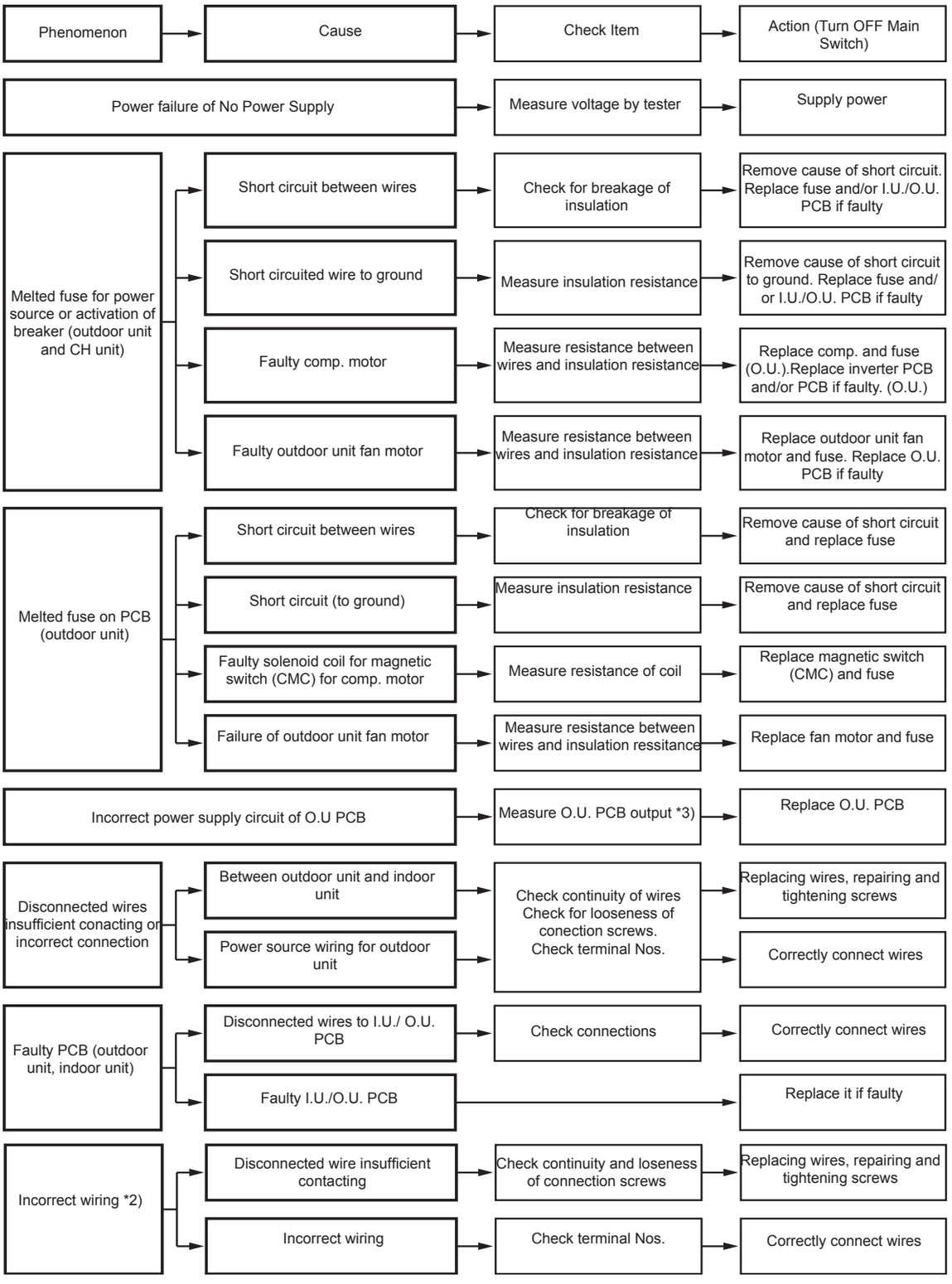
Item	Setting position
SW1	

- **3): 12VDC between VCC12 and GND2, 5VDC between VCC05 and GND1, 12VDC between VCC12 and GND1, 15VDC between VCC15 and GND1, 24VDC between VCC24 and GND1, 12VDC between VCC12T and GND1.*



Power supply	Faston terminal (T)
400V 50Hz	N1

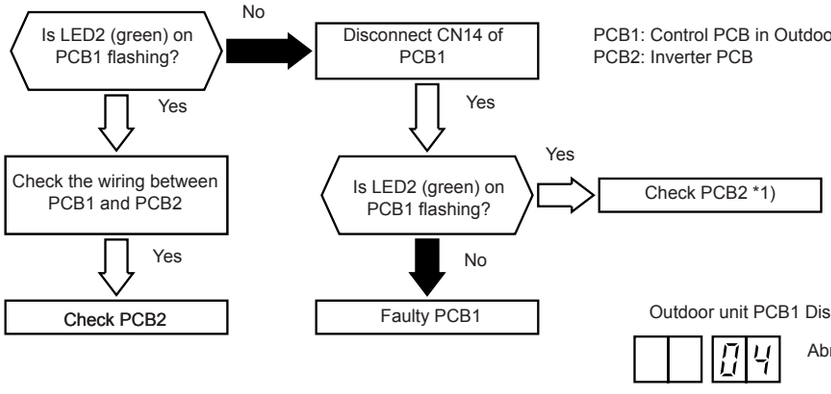

Is LED1 (red) on CH unit PCB ON?
No
Is voltage between "L1" and "N" of PCN1 on CH unit PCB 230V?
No
Check CH unit wiring
Yes
Yes
Is the fuse for CH unit PCB melted?
Yes
Replace fuse
No
Faulty CH unit PCB
CH unit (In case of heat recovery system)
Is LED3 (green) on CH unit PCB ON?
Yes
Check other CH units
No
Is LED2 (yellow) on CH unit PCB flashing more than one in 10 seconds?
No
Check wiring between outdoor unit and indoor units
Yes
RPK-FSN(H)3M, RPC-FSN3, RCIM-FSN3, RCI-FSN3 only
Is I.U. PCB setting non-pole operating *2)
No
Set it correctly
Yes
Is LED3 (yellow) on I.U. PCB ON?
Yes
Is LED3 (yellow) ON even if connector CN2 on I.U. PCB is removed?
Yes
Faulty I.U. PCB
No
No
Check other indoor units
Is LED3 (yellow) on I.U. PCB flashing more than once in 10 seconds?
No
Check wiring between outdoor unit and indoor units or fuse (EF) for I.U./O.U. PCB
Yes
Does refrigerant system No. setting between O.U. and I.U. correspond?
(O.U.: DSW4 and RSW1)
(I.U.: DSW5 and RSW2)
No
Set it correctly
Yes
Does alarm occur with all indoor units?
No
Faulty I.U. PCB
Yes
Faulty O.U. PCB
Indoor Unit


Phenomenon
Cause
Check Item
Action (Turn OFF Main Switch)
Power failure of No Power Supply
Measure voltage by tester
Supply power
Melted fuse for power source or activation of breaker (outdoor unit and CH unit)
Short circuit between wires
Check for breakage of insulation
Remove cause of short circuit. Replace fuse and/or I.U./O.U. PCB if faulty
Short circuited wire to ground
Measure insulation resistance
Remove cause of short circuit to ground. Replace fuse and/ or I.U./O.U. PCB if faulty
Faulty comp. motor
Measure resistance between wires and insulation resistance
Replace comp. and fuse (O.U.).Replace inverter PCB and/or PCB if faulty. (O.U.)
Faulty outdoor unit fan motor
Measure resistance between wires and insulation resistance
Replace outdoor unit fan motor and fuse. Replace O.U. PCB if faulty
Melted fuse on PCB (outdoor unit)
Short circuit between wires
Check for breakage of insulation
Remove cause of short circuit and replace fuse
Short circuit (to ground)
Measure insulation resistance
Remove cause of short circuit and replace fuse
Faulty solenoid coil for magnetic switch (CMC) for comp. motor
Measure resistance of coil
Replace magnetic switch (CMC) and fuse
Failure of outdoor unit fan motor
Measure resistance between wires and insulation ressitance
Replace fan motor and fuse
Incorrect power supply circuit of O.U PCB
Measure O.U. PCB output *3)
Replace O.U. PCB
Disconnected wires insufficient conacting or incorrect connection
Between outdoor unit and indoor unit
Power source wiring for outdoor unit
Check continuity of wires
Check for looseness of conection screws.
Check terminal Nos.
Replacing wires, repairing and tightening screws
Correctly connect wires
Faulty PCB (outdoor unit, indoor unit)
Disconnected wires to I.U./ O.U. PCB
Check connections
Correctly connect wires
Faulty I.U./O.U. PCB
Replace it if faulty
Incorrect wiring *2)
Disconnected wire insufficient contacting
Check continuity and loseness of connection screws
Replacing wires, repairing and tightening screws
Incorrect wiring
Check terminal Nos.
Correctly connect wires

Alarm code	04	Abnormal transmission between the inverter PCB and the outdoor unit PCB.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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 when an anomaly is maintained for 30 seconds after the normal transmission between PCB1 and PCB2 of the outdoor unit, and also if the anomaly is maintained for 30 seconds after the microcomputer is automatically reset. The alarm is indicated when abnormal transmission is maintained for 30 seconds after the outdoor unit is turned on.



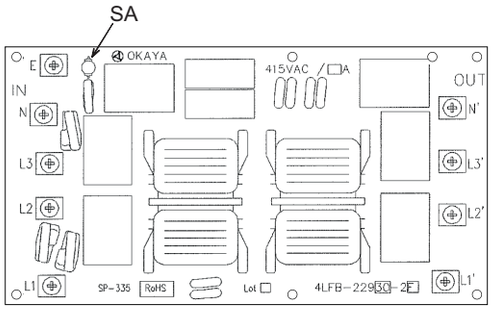
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Disconnected wires insufficient conacting or incorrect connection	Between PCB1 and PCB1	Check continuity of wires Check for looseness of conection screws. Check terminal connection No..	Replacing wires, repairing, tightening screws and incorrect wiring
	Power source wiring for outdoor unit		
Faulty PCB (PCB1 and PCB2)	Disconneced wires to PCB	Check connections	Repair wiring connections
	Faulty PCB		Replace PCB if faulty
Faulty electrical components (Power fuse, resistance)	Melted power fuse	Check conductivity of power fuse, power transistor, and diode module	Replace power fuse, power transistor, and diode module
	Disconnected incoming current limit resistance	Check resistance of incoming current limit resistance	Replace incoming current limit resistance
Incorrect wiring	Disconnected wire insufficient contacting	Check continuity and loseness of connection screws	Replacing wires, repairing and tightening screws
	Incorrect wiring	Check connection Nos.	Correctly connect wires

*1): When the unit is applied the excessive surge current due to lightning or other causes, alarm code "04" or Inverter stoppage code (IT) "11" is indicated and the unit cannot be operated. In this case, check to ensure the surge absorver (SA) in the noise filter (NF1, NF2). The surge absorver may be damaged if the inner surface of the SA is black. If so, replace surge absorver.

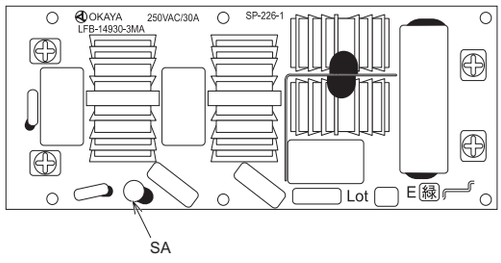
If the inside of the surge absorver is normal, turn OFF the power supply and wait for LED201 (red) of PCB2 OFF (approximately 5 minutes) and turn ON power supply again.

Position of surge absorver.

NF1



NF2

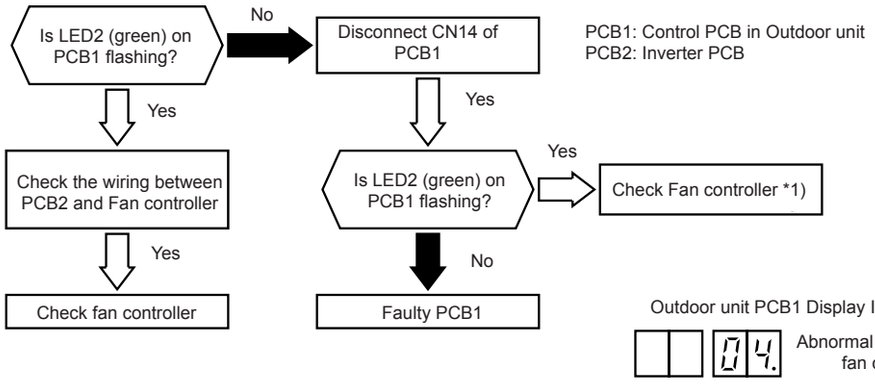


SA: Surge absorver.

Alarm code	04.	Abnormal transmission between the fan controller and the outdoor unit PCB.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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 when an anomaly is maintained for 30 seconds after the normal transmission between PCB1 of the outdoor unit and the fan controller, and also if the anomaly is maintained for 30 seconds after the microcomputer is automatically reset. The alarm is indicated when abnormal transmission is maintained for 30 seconds after the outdoor unit is turned on.



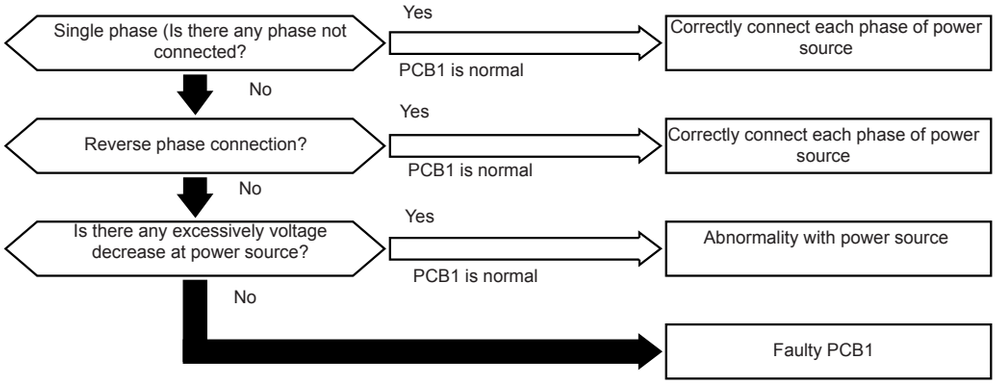
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Disconnected wires nsufficient conacting o incorrect connection	Between PCB1 and PCB1 and Fan controller	Check continuity of wires Check for looseness of conection screws. Check terminal connection No..	Replacing wires, repairing, tightening screws and incorrect wiring
	Power source wiring for outdoor unit		
Faulty PCB (PCB1 and PCB2 fan controller)	Disconneced wires to PCB	Check connections	Repair wiring connections
	Faulty PCB		Replace PCB if faulty
	Melted fuse (Fan controller)	Check conductivity of fuse	Replace fan controller *1)
Faulty electrical components (Power fuse, resistance)	Melted power fuse	Check conductivity of power fuse, power transistor, and diode module	Replace power fuse, power transistor, and diode module
	Disconnected incoming current limit resistance	Check resistance of incoming current limit resistance	Replace incoming current limit resistance
Incorrect wiring	Disconnected wire insufficient contacting	Check continuity and loseness of connection screws	Replacing wires, repairing and tightening screws
	Incorrect wiring	Check connection Nos.	Correctly connect wires

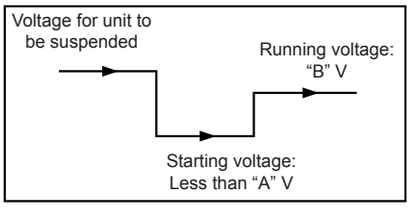
*1): The fan controller may be damaged if the fan controller fuse is blown. In that case, replace the fan controller.

Alarm code	05	Abnormal power source phase.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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.

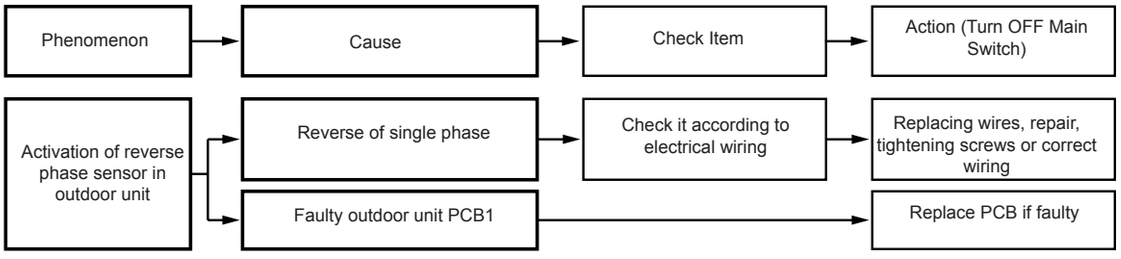
This alarm is indicated when the main power source phase is reversely connected or one phase is not connected.





Check item

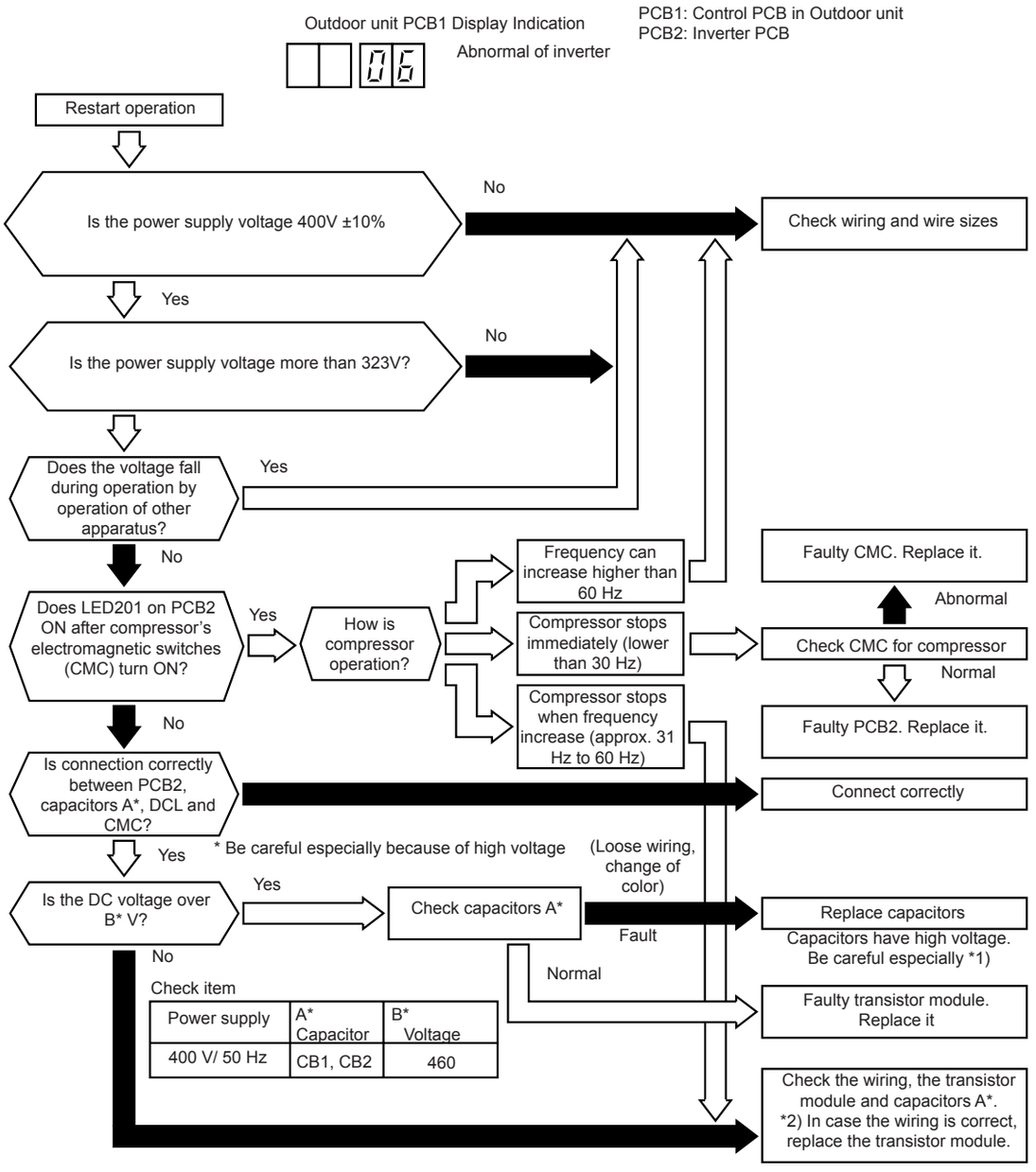
Power supply	"A"	"B"
400 V/ 50 Hz	323	342 to 123



Alarm code	06	Abnormal Inverter voltage.

- 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 when the voltage between terminal "P" and "N" of the transistor module (IPM) is insufficient and occurs 3 times within a 30 minute period. If it occurs less than 2 times, a retry is carried out.



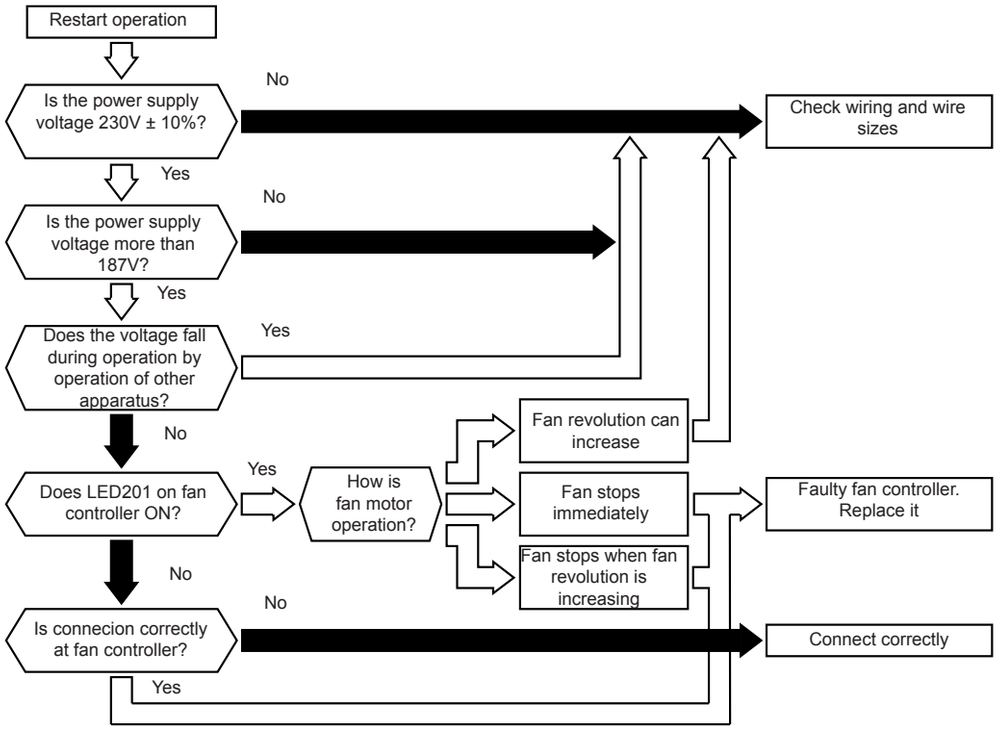
*1): If the capacitor has high voltage, carry out the high voltage discharge in accordance with procedures described in chapter *"11.8 Checking procedures for each main part"*.

*2): The transistor module checking procedure is indicated in chapter *"11.8 Checking procedures for each main part"*.

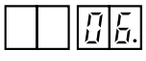
Alarm code	05.	Abnormal fan controller voltage.

- 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 when voltage between terminal "R" and "S" of fan controller is insufficient and its occurence is 3 times in 30 minutes. In the case that the occurrence is smaller than 2 times, retry is performed.



Outdoor unit PCB1 Display indication



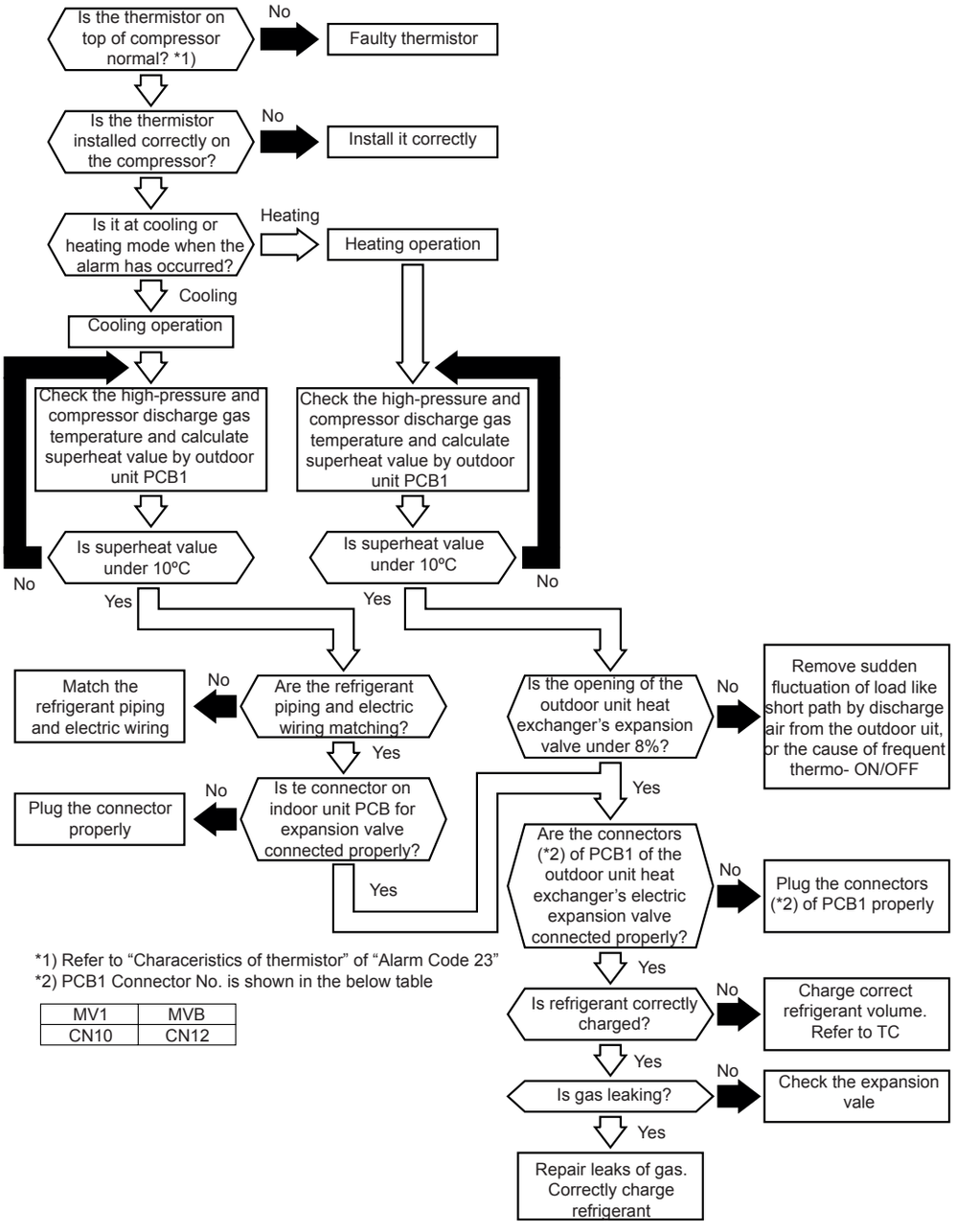
Abnormal of Fan controller

- If fan controller has high voltage, perform the high voltage discharge work according to *"11.8 Checking procedures for each main part"*.
- Check the wiring connection according to the checking procedure of fan controller indicated in the *"11.8 Checking procedures for each main part"*.

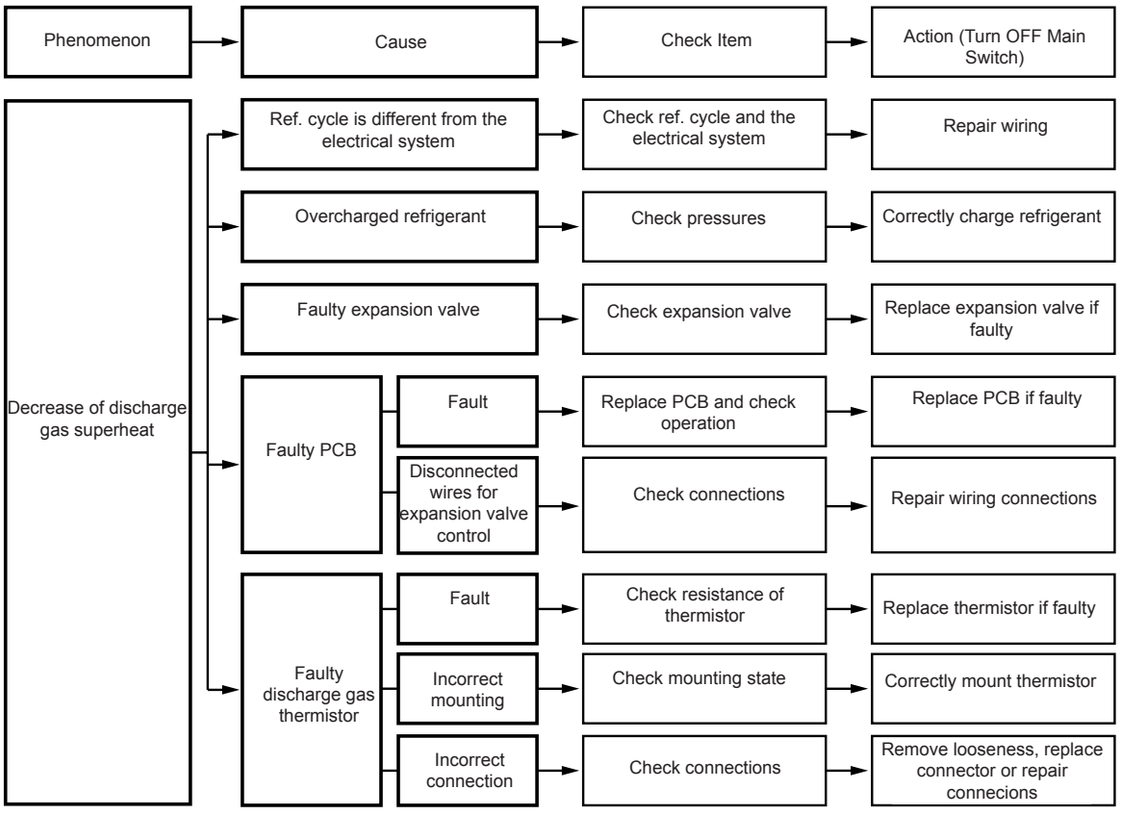
Alarm code	07	Decrease in discharge gas superheat.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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.

In the case that the discharge gas superheat is less than 10 degrees on the upper part of the compressor is maintained for 30 minutes, a retry operation is carried out. However, when the alarm occurs twice in 2 hours, the alarm code is indicated.



Model	Thermistor	
	Td1 (THM8)	Td2 (THM9)
RAS-(8-12)FSXN1E RAS-(5-12)FSXNH(E)	O	-
RAS-(14/16)FSXN1E	O	O

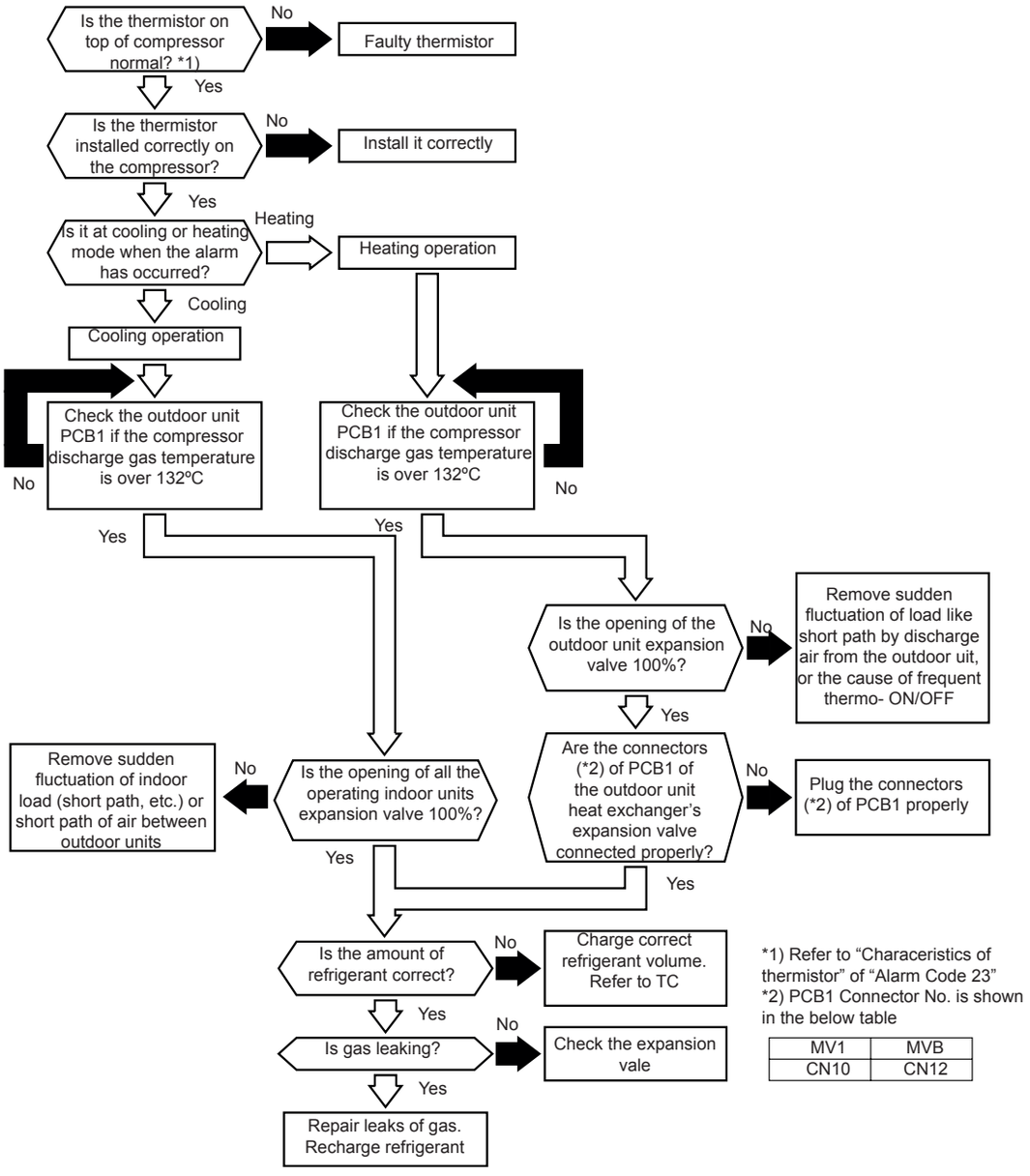

Phenomenon
Cause
Check Item
Action (Turn OFF Main Switch)
Decrease of discharge gas superheat
Ref. cycle is different from the electrical system
Check ref. cycle and the electrical system
Repair wiring
Overcharged refrigerant
Check pressures
Correctly charge refrigerant
Faulty expansion valve
Check expansion valve
Replace expansion valve if faulty
Faulty PCB
Fault
Replace PCB and check operation
Replace PCB if faulty
Disconnected wires for expansion valve control
Check connections
Repair wiring connections
Faulty discharge gas thermistor
Fault
Check resistance of thermistor
Replace thermistor if faulty
Incorrect mounting
Check mounting state
Correctly mount thermistor
Incorrect connection
Check connections
Remove looseness, replace connector or repair connecions

Alarm code	08	Increase in discharge gas temperature at the upper part of the compressor.

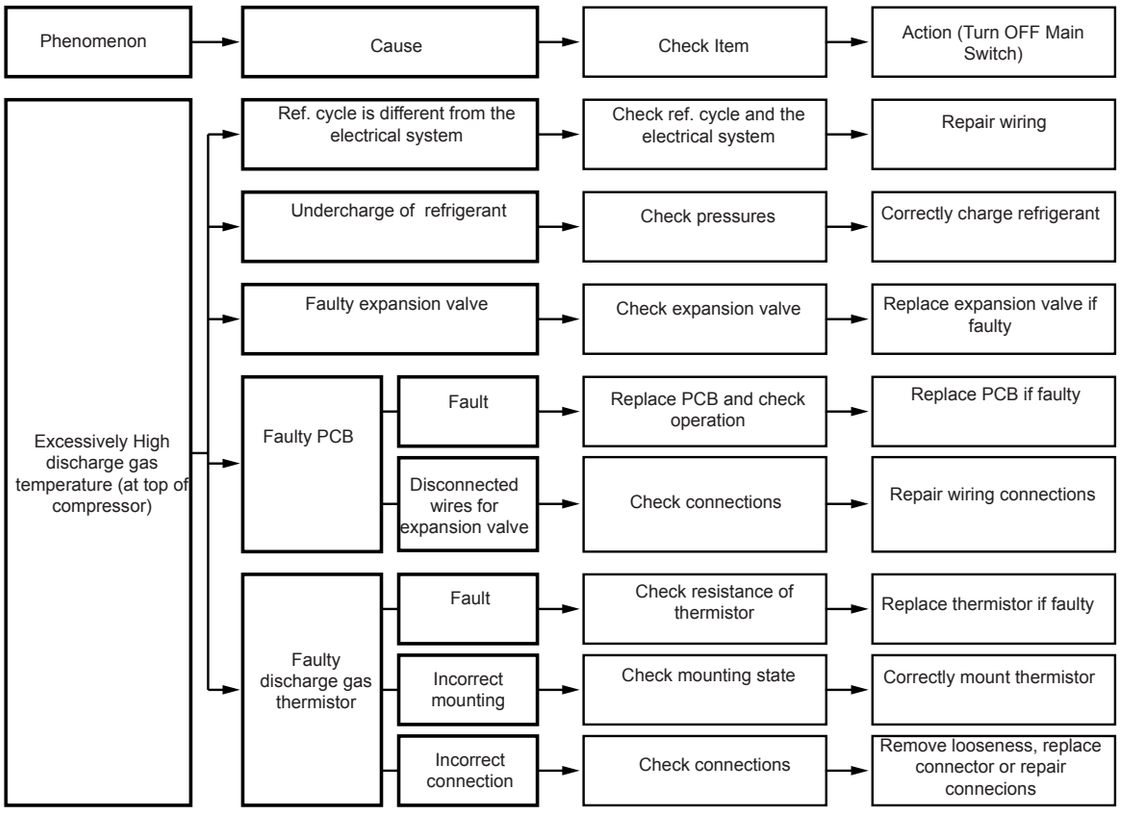
- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit number and alarm code are displayed on the outdoor unit's PCB1 display.

This alarm is displayed when the following conditions occurs three times in one hour:

- The temperature of the thermistor on the upper part of the compressor is maintained higher than 132 °C for 10 minutes.
- The temperature of the thermistor on the upper part of the compressor is maintained higher than 140 °C for 5 seconds.

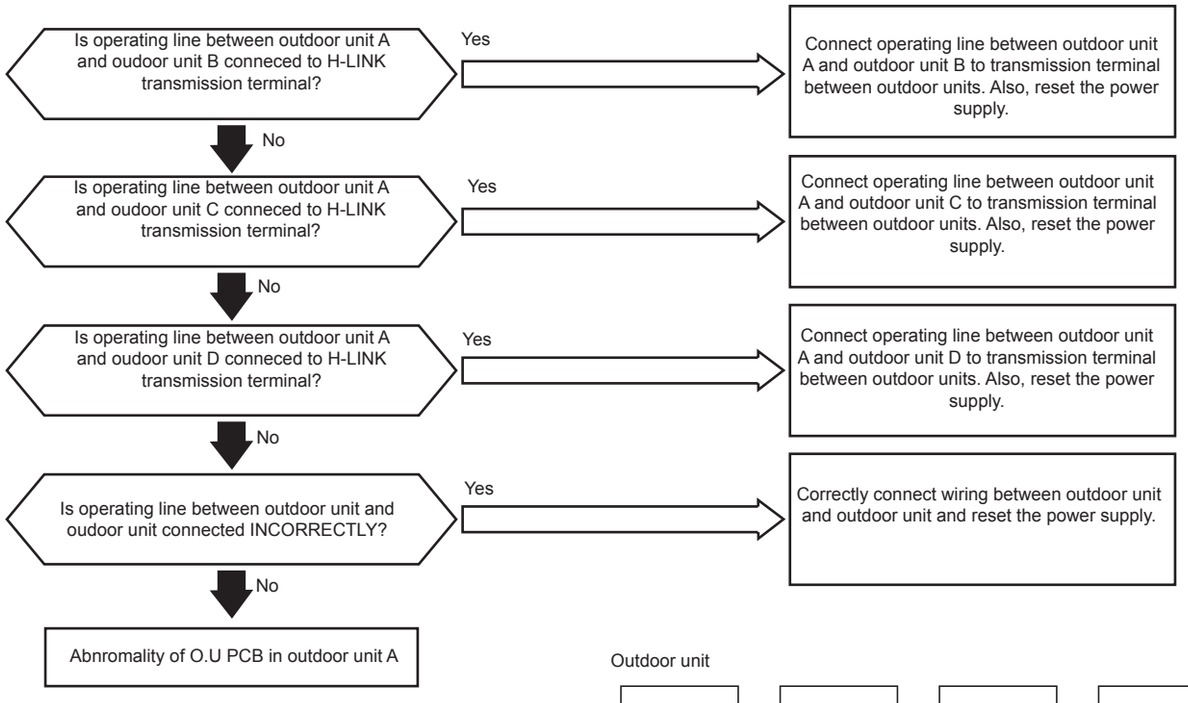


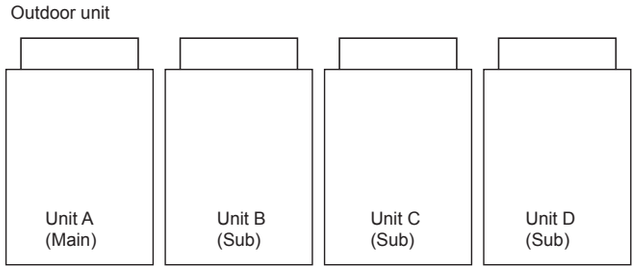
Model	Thermistor	
	Td1 (THM8)	Td2 (THM9)
RAS-(8-12)FSXN1E and RAS-(5-12) FSXNH(E)	O	-
RAS-(14/16)FSXN1E	O	O


Phenomenon
Cause
Check Item
Action (Turn OFF Main Switch)
Excessively High discharge gas temperature (at top of compressor)
Ref. cycle is different from the electrical system
Check ref. cycle and the electrical system
Repair wiring
Undercharge of refrigerant
Check pressures
Correctly charge refrigerant
Faulty expansion valve
Check expansion valve
Replace expansion valve if faulty
Faulty PCB
Fault
Replace PCB and check operation
Replace PCB if faulty
Disconnected wires for expansion valve
Check connections
Repair wiring connections
Faulty discharge gas thermistor
Fault
Check resistance of thermistor
Replace thermistor if faulty
Incorrect mounting
Check mounting state
Correctly mount thermistor
Incorrect connection
Check connections
Remove looseness, replace connector or repair connecions

Alarm code	0A	Abnormal transmission between outdoor units.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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.

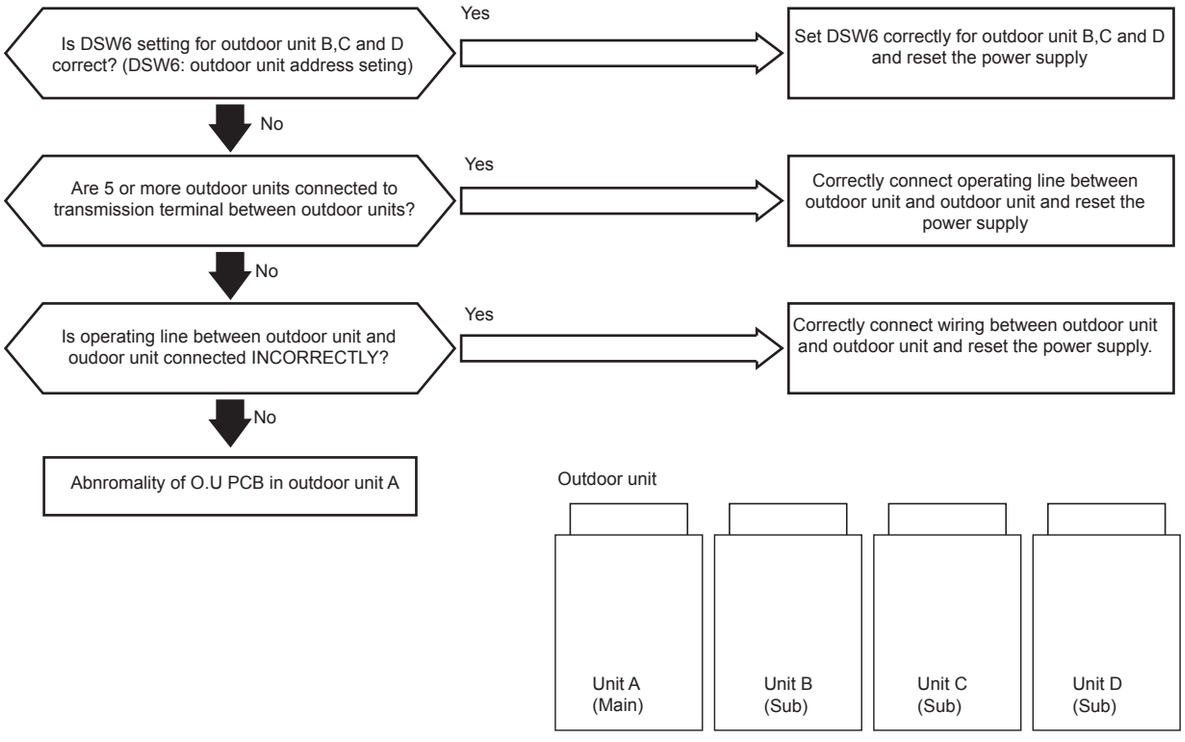




(Sub): Secondary unit(s).

Alarm code		Incorrect outdoor unit adress setting.

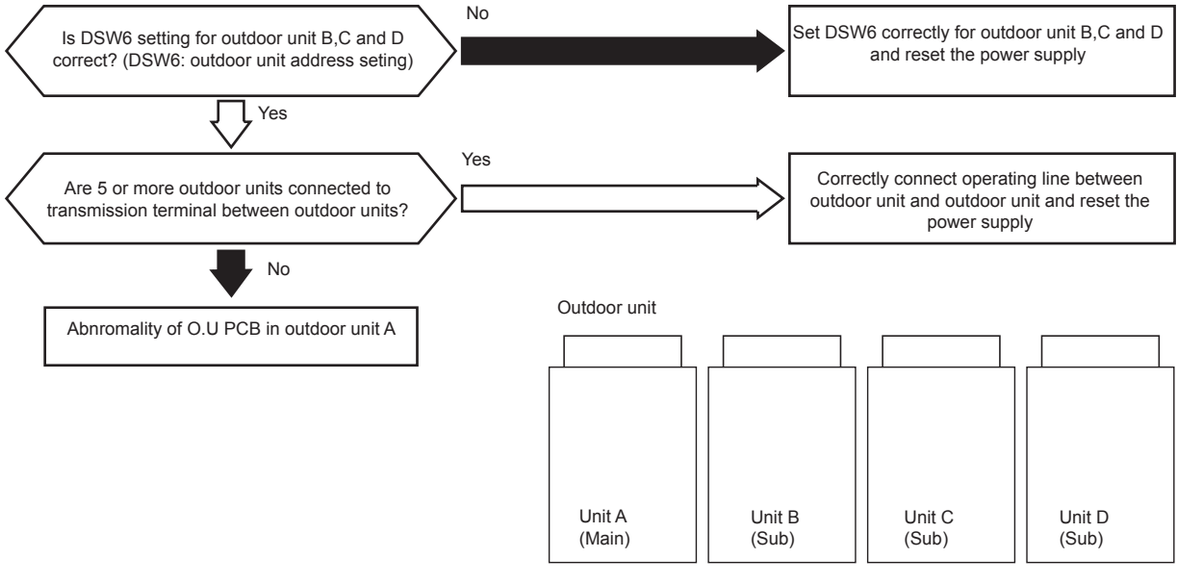
- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit number and alarm code are displayed on the outdoor unit's PCB1 display.



(Sub): Secondary unit(s).

Alarm code	0C	Incorrect outdoor main unit setting.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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.

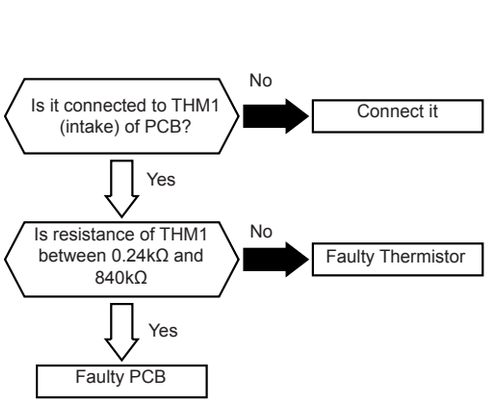


(Sub): Secondary unit(s).

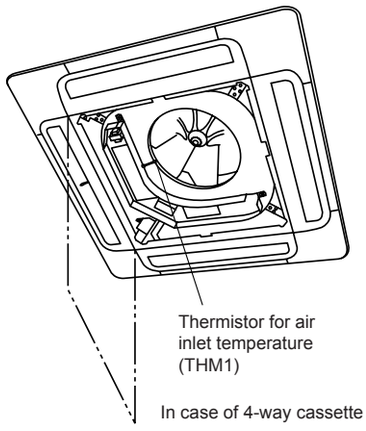
Alarm code	11	Abnormal operation of thermistor for indoor unit inlet air temperature (air inlet thermistor).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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.

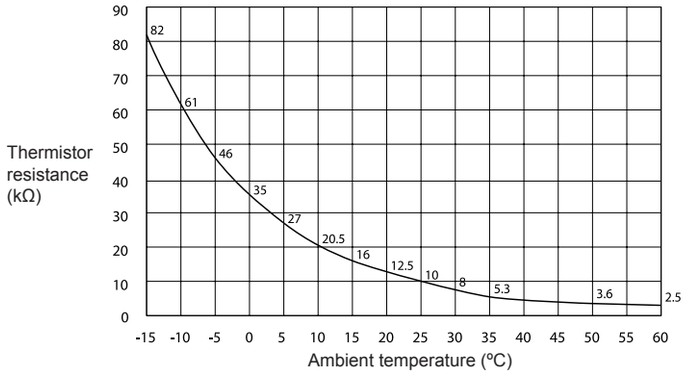
This alarm is indicated when the thermistor is short-circuited (less than 0.24 kΩ) or cut (greater than 840 kΩ) during the cooling or heating operation. The system automatically restarts when the fault is eliminated.



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

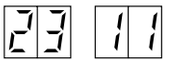


Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty intake air thermistor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check connection	Connect wiring correctly
Faulty PCB		Replace PCB and check operatiion	Replace PCB if faulty



Thermistor Characteristics

Outdoor unit PCB1 Display indication
(Alarm Code 11~19)



(Alarm Code 11~19)

Indoor unit No.
for Failure

NOTE

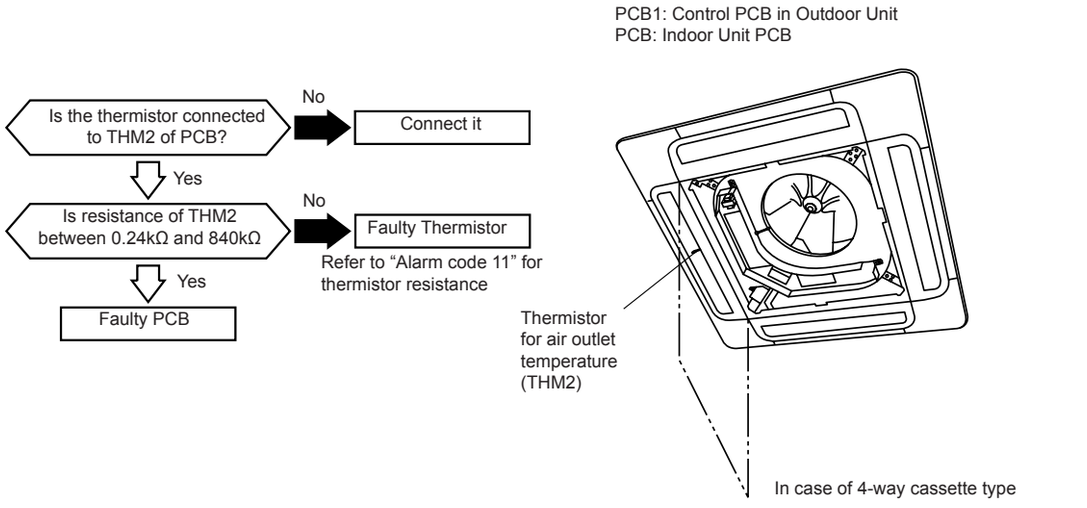
This data is applicable to the following thermistors:

1 *Inlet air thermistor (THM1).*
2 *Liquid pipe thermistor (freese protection) (THM3).*
3 *Gas pipe thermistor (THM5).*
4 *Outlet air thermistor (THM2).*

Alarm code	12	Abnormal operation of thermistor for indoor unit discharge air temperature (air outlet thermistor).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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 when the thermistor is short-circuited (less than 0.24 kΩ) or cut (greater than 840 kΩ) during the cooling or heating operation. The system automatically restarts when the fault is eliminated.

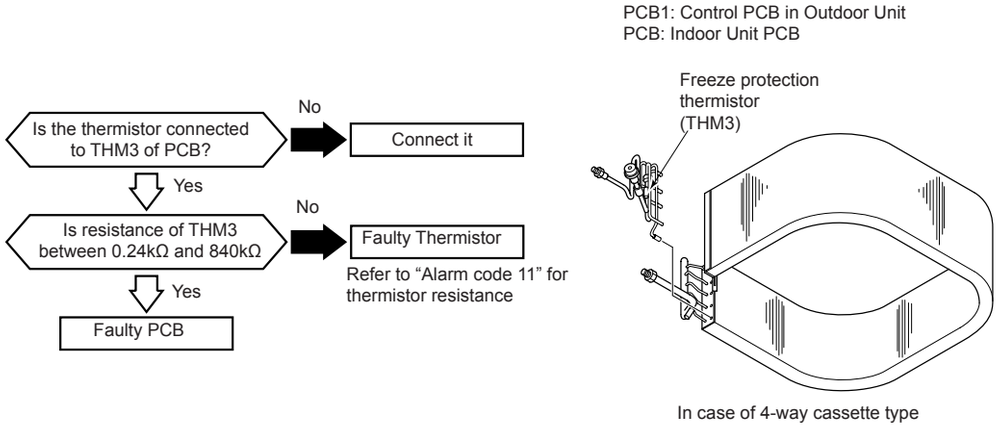


Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty air outlet thermistor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to PCB	Connect wiring correctly
Faulty PCB		Replace PCB and check operatiion	Replace PCB if faulty

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

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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 when the thermistor is short-circuited (less than 0.24 kΩ) or cut (greater than 840 kΩ) during the cooling or heating operation. The system automatically restarts when the fault is eliminated.

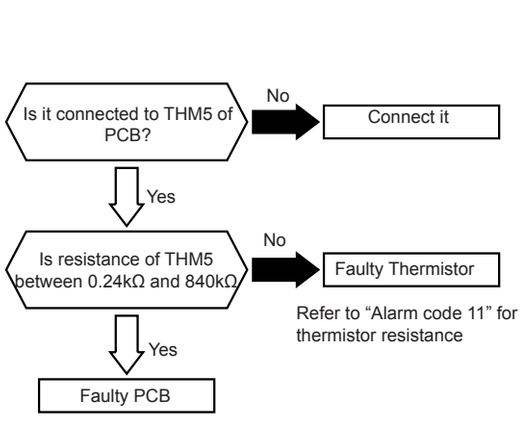


Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty freeze protection thermistor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to PCB	Connect wiring correctly
Faulty PCB		Replace PCB and check operatiion	Replace PCB if faulty

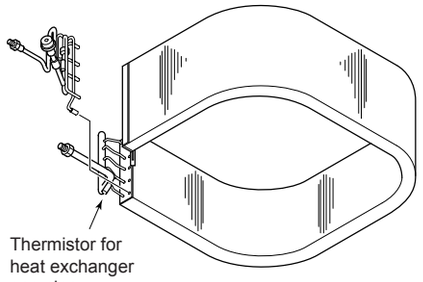
Alarm code	14	Abnormal operation of thermistor for indoor unit heat exchanger gas refrigerant pipe temperature (gas pipe thermistor).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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 when the thermistor is short-circuited (less than 0.24 kΩ) or cut (greater than 840 kΩ) during the cooling or heating*1) operation. The system automatically restarts when the fault is eliminated.



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



In case of 4-way cassette type

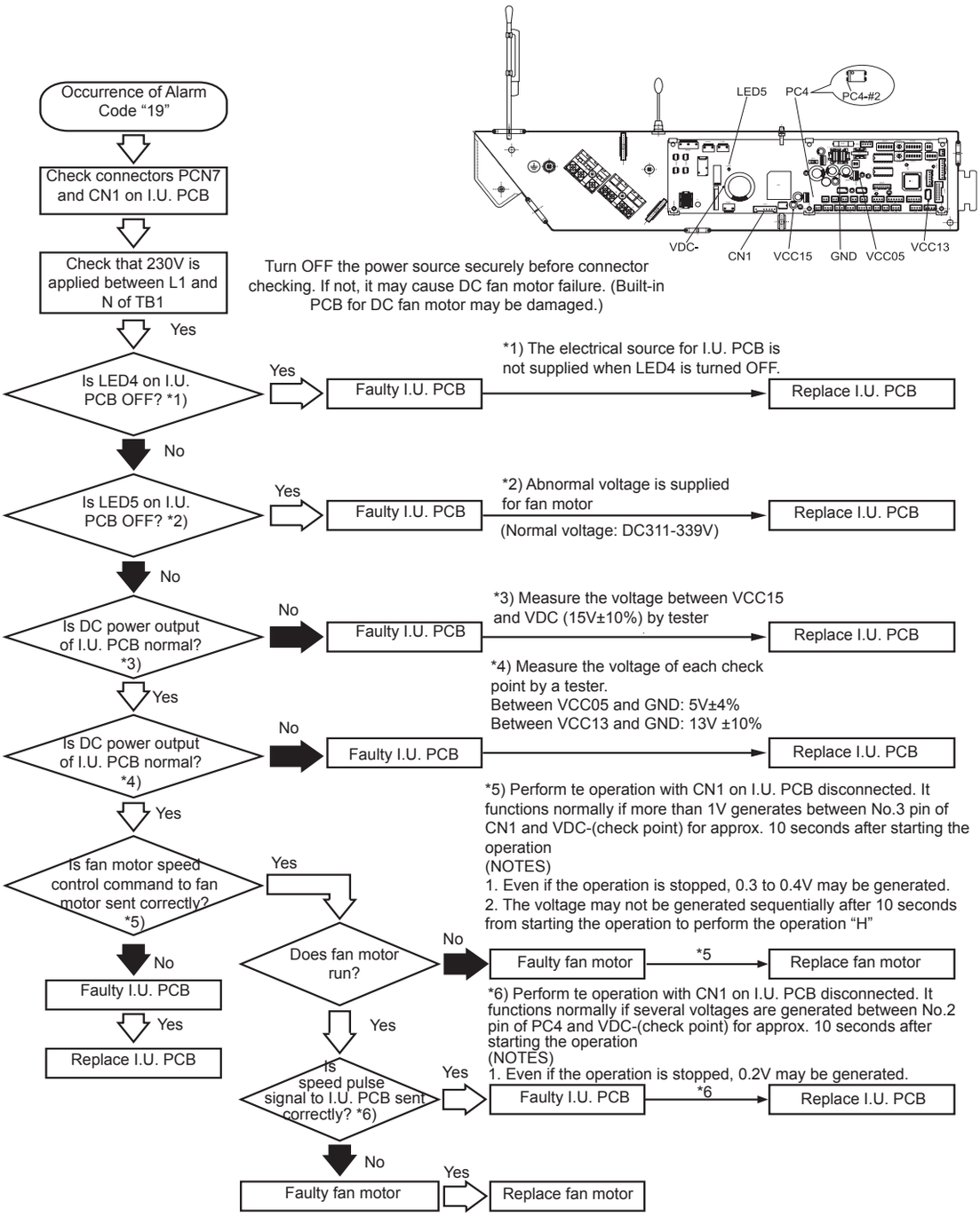
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty gas pipe thermistor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to PCB	Connect wiring correctly
Faulty PCB		Replace PCB and check operatiion	Replace PCB if faulty

*1): The heating operation is available only during the test run.

Alarm code	19	Activation of the protection device for the indoor unit fan motor (Indoor unit with DC motor).

- 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 when the following condition occur 3 times in 30 minutes: the indoor unit fan motor rotates less than 70 rpm for 5 seconds while it is operating.



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.*

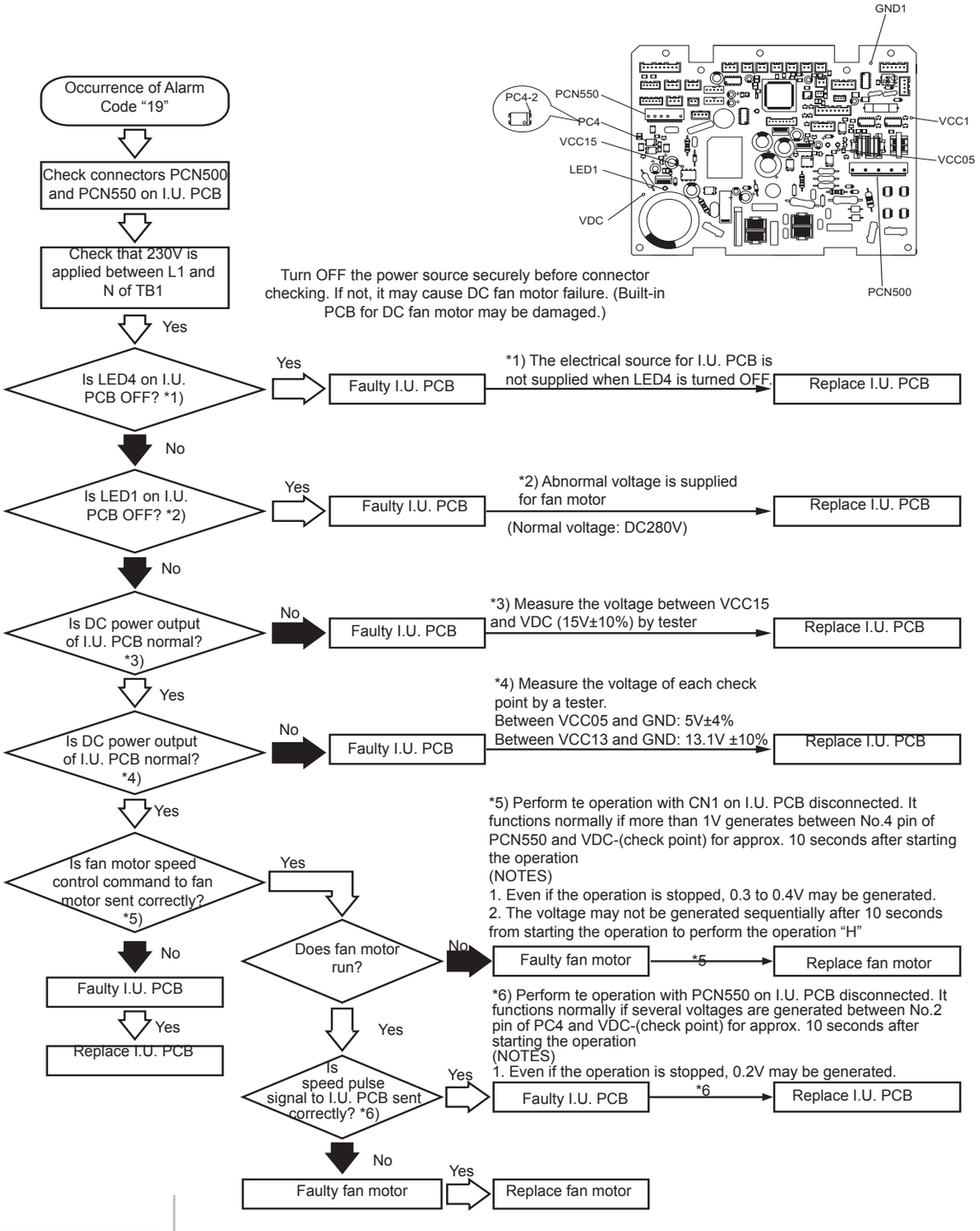
Alarm code	19	Activation of the protection device for the indoor unit fan motor (RPK models).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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 when the following condition occur 3 times in 30 minutes: the indoor unit fan motor rotates less than 70 rpm for five seconds while it is operating.

⚠ CAUTION

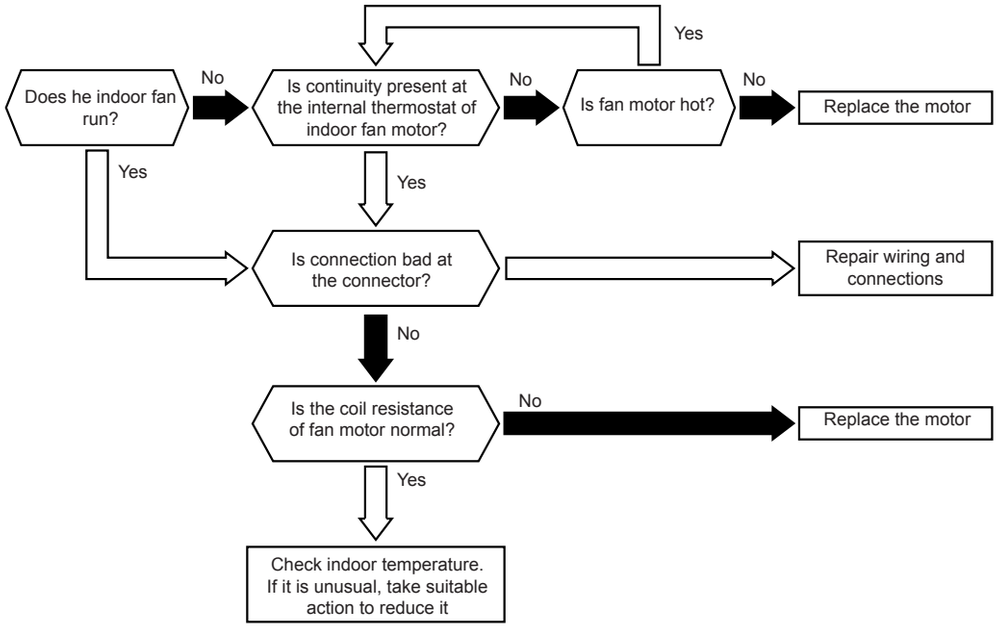
- *Perform the following check after setting the air flow volume to "HIGH".*
- *A high voltage is applied to electrical parts. Perform the check carefully to prevent an electric shock.*



Alarm code	19	Activation of the protection device for the indoor unit fan motor (Indoor unit with AC motor).

- 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 code is indicated when over approximately 1 A is applied to the indoor unit fan motor.

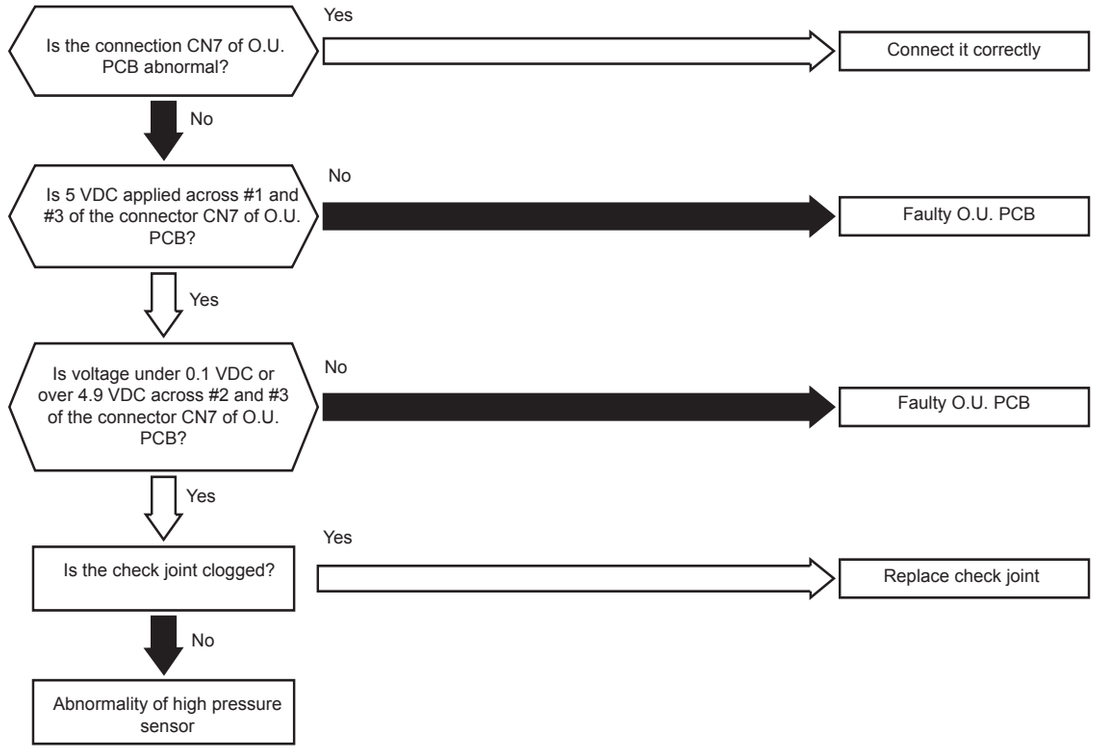


Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
Activation of internal thermostat for indoor unit fan motor	Faulty indoor unit fan motor		Measure coil resistance and insulation resistance	Replace motor if faulty
	Faulty internal thermostat	Fault	Check continuity after fan motor temperature decreases to room temp.	Replace fan motor if o continuity
		Insufficient contacting	Measure resistance by tester	Correct looseness. Replace connectors
		Incorrect connection	Check connections	Repair connections

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

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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 when the pressure sensor voltage decreases lower than 0.1V or increases higher than 4.9V during the operation.

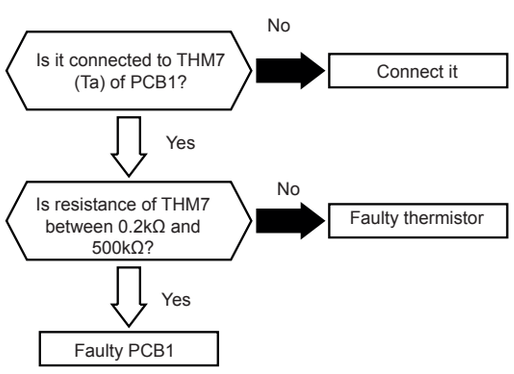


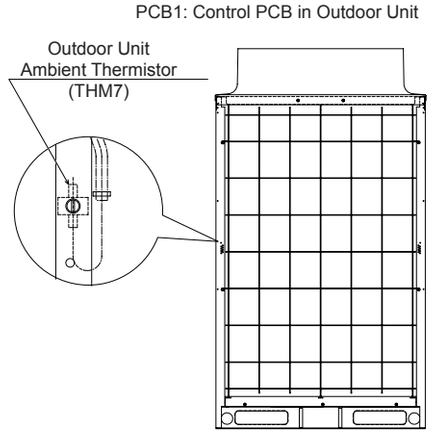
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty high pressure sensor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check connections	Repair wiring and connections
Faulty PCB1		Replace PCB1 and check operatiion	Replace PCB1 if faulty
Indicated pressure value is excessively high or low	Malfunction of pressure sensor due to faulty check joint	Check for clogging of check joint	Replace check joint

Alarm code	22	Abnormal operation of the thermistor for outdoor air temperature (outdoor unit ambient thermistor).

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

This alarm is indicated when the thermistor is short-circuited (less than 0.2 kΩ) or cut (greater than 500 kΩ) during the operation.



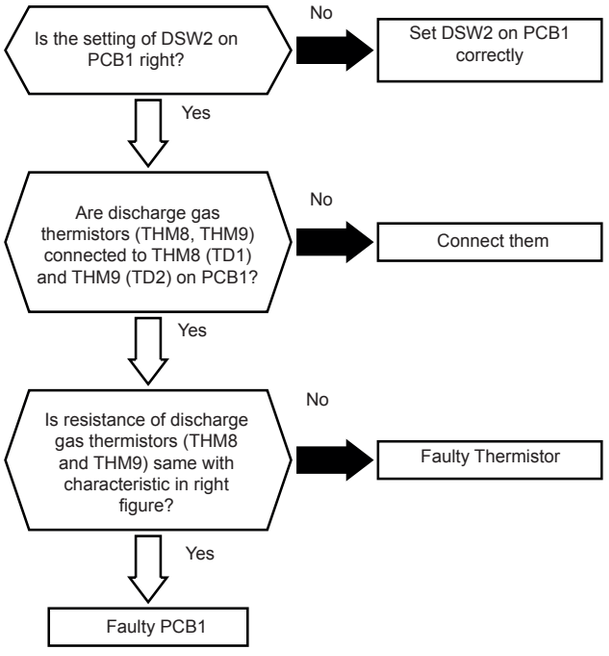


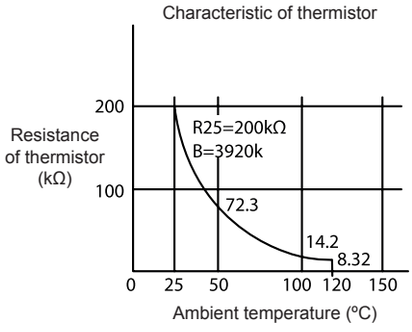
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty outdoor unit ambient thermistor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to PCB1	Repair wiring and connections
Faulty PCB1		Replace PCB1 and check operatiion	Replace PCB1 if faulty

Alarm code	23	Abnormal operation of thermistor for discharge gas temperature at the upper part of the compressor.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on remote control LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7-segment of outdoor unit PCB. (For the combination of outdoor units, the alarm code is displayed on PCB of main outdoor unit). Additionally for the outdoor unit number and compressor number with abnormal thermistor, check the alarm code history.

This alarm is indicated when the thermistor is short-circuited (less than 0.9 kΩ) or cut (greater than 5946 kΩ) during the operation.



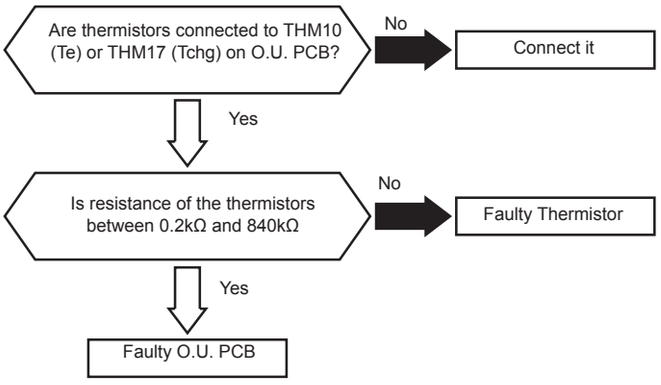


Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty discharge gas thermistor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to PCB1	Repair wiring and connections
Faulty PCB1		Replace PCB1 and check operatiion	Replace PCB1 if faulty
Incorrect setting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

Alarm code	24	Abnormal operation of the thermistor for the outdoor unit heat exchanger liquid pipe (Te/Tchg).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on remote control LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7-segment of outdoor unit PCB. (For the combination of outdoor units, the alarm code is displayed on PCB of main outdoor unit). Additionally for the outdoor unit number and compressor number with abnormal thermistor, check the alarm code history.

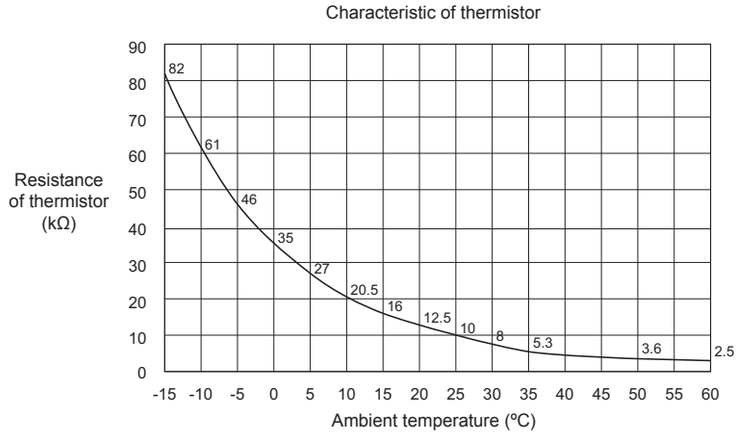
This alarm is indicated when the thermistor is short-circuited (less than 0.2 kΩ) or cut (greater than 840 kΩ) for 8 minutes during operation.

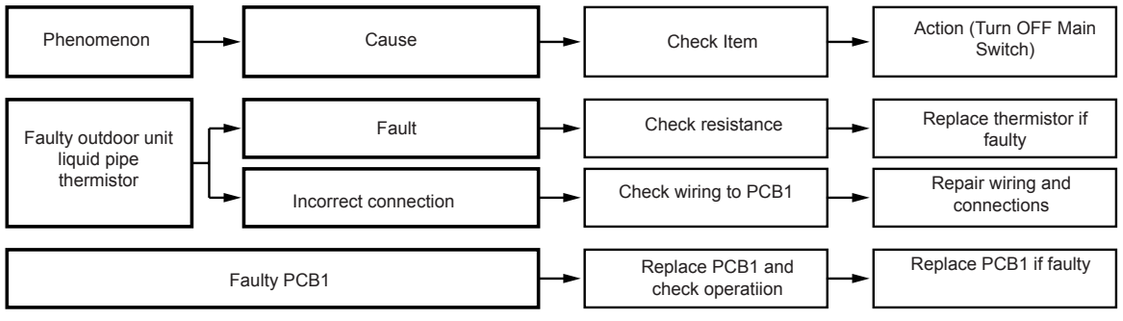


Te: Thermistor for outdoor liquid pipe

Tchg: Thermistor for super cooling main line

PCB1: Control PCB in outdoor unit





NOTE

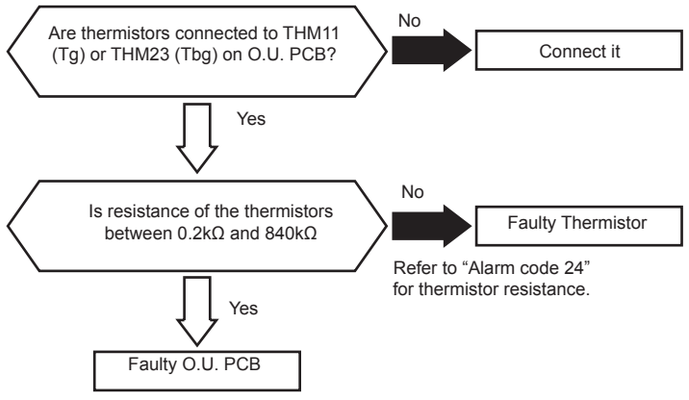
This data is applicable to the following thermistors:

1 *Ambient temperature thermistor (THM7).*
2 *Evaporation liquid line thermistor (THM10).*
3 *Evaporation gas line thermistor (THM11).*
4 *Super cooling main line thermistor (THM17).*
5 *Super cooling bypass line thermistor (THM23).*

Alarm code	25	Abnormal operation of the thermistor for the outdoor unit heat exchanger gas pipe (Tg/Tbg).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on remote control LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7-segment of outdoor unit PCB. (For the combination of outdoor units, the alarm code is displayed on PCB of main outdoor unit.) Additionally for the outdoor unit number and compressor number with abnormal thermistor, check the alarm code history.

This alarm is indicated when the thermistor is short-circuited (less than 0.2 kΩ) or cut (greater than 840 kΩ) for 8 minutes during operation.



Tg: Thermistor for outdoor liquid pipe

Tbg: Thermistor for super cooling main line

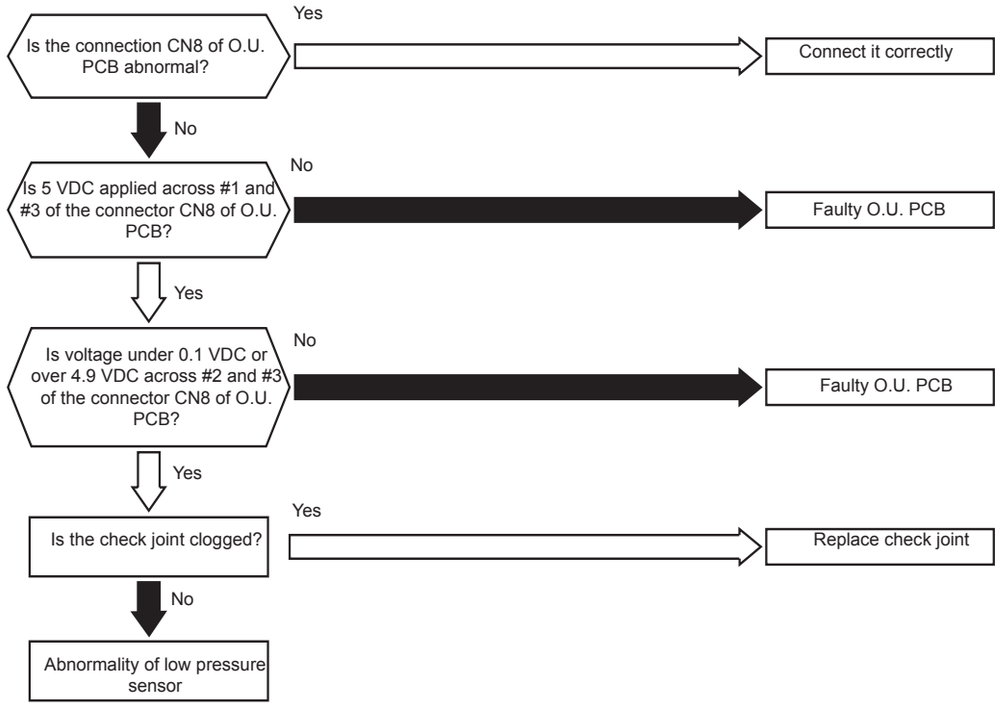
O.U. PCB: outdoor unit PCB

Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty outdoor unit gas pipe thermistor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to PCB1	Repair wiring and connections
Faulty PCB1		Replace PCB1 and check operatiion	Replace PCB1 if faulty

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

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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 when the pressure sensor voltage decreases lower than 0.1V or increases higher than 4.9V during operation.



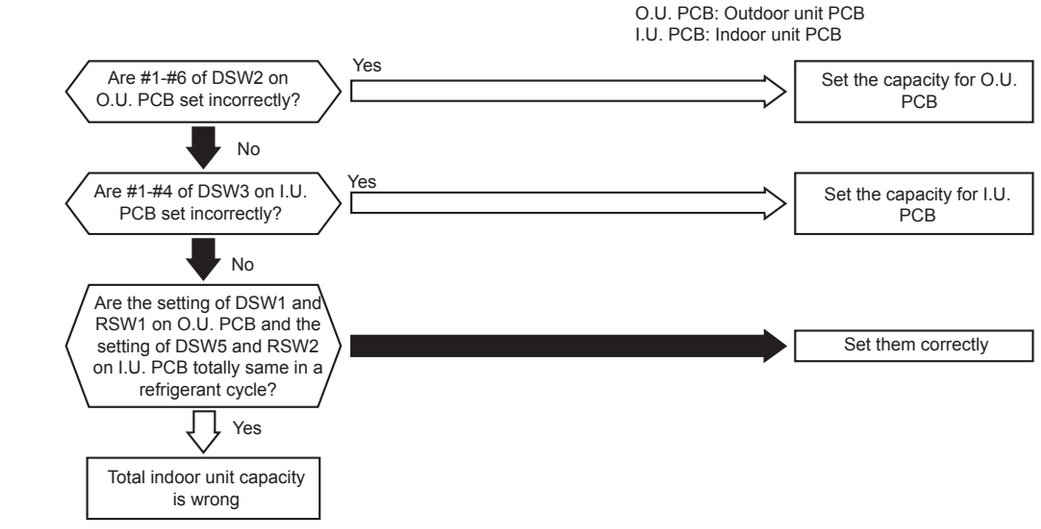
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty low pressure sensor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check connections	Repair wiring and connections
Faulty PCB1		Replace PCB1 and check operatiion	Replace PCB1 if faulty
Indicated pressure value is excessively high or low	Malfunction of pressure sensor due to faulty check joint	Check for clogging of check joint	Replace check joint

Alarm code	31	Incorrect capacity setting of the outdoor and indoor unit.

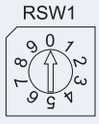
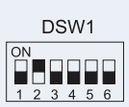
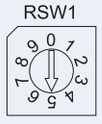
- The RUN indicator and the ALARM indication is displayed on the remote control switch flashes.
- The unit number, the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit number and alarm code are displayed on the outdoor unit's PCB1 display.

This alarm is indicated when the capacity setting DIP switch, DSW2 on PCB1 of the outdoor unit is not set (all the contacts from No.1 to No.6 are in the OFF position) or it is incorrectly set.

This alarm is indicated when the total capacity of the indoor unit is less than 50% or greater than 130% of the combined capacity of the outdoor unit.



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
	Incorrect capacity setting of indoor unit	Check combination of indoor units and capacity setting on PCB	Correctly set dip switch, DSW3
	Incorrect capacity setting of outdoor unit	Check capacity setting on outdoor unit PCB1	Correctly set dip switch, DSW2
	Total indoor unit capacity connected to the outdoor unit is beyond permissible range	Check outdoor unit model by calculating total indoor units capacity	Ensure that total indoor unit capacity is from 50% to 130%
	Refrigerant cycle setting of outdoor unit and indoor unit is different	Check refrigeration cycle setting on outdoor unit PCB1 and indoor unit PCB	Set them correctly

	Setting of the refrigerant cycle number		Setting example of the refrigerant cycle number 25
	DSW1 	RSW1 	 
Outdoor unit	DSW1, (10 digits)	RSW1, (1 digit)	
Indoor unit (H-LINK II)	DSW5	RSW2	

Setting before shipment RSW1 and DSW1 is 0.

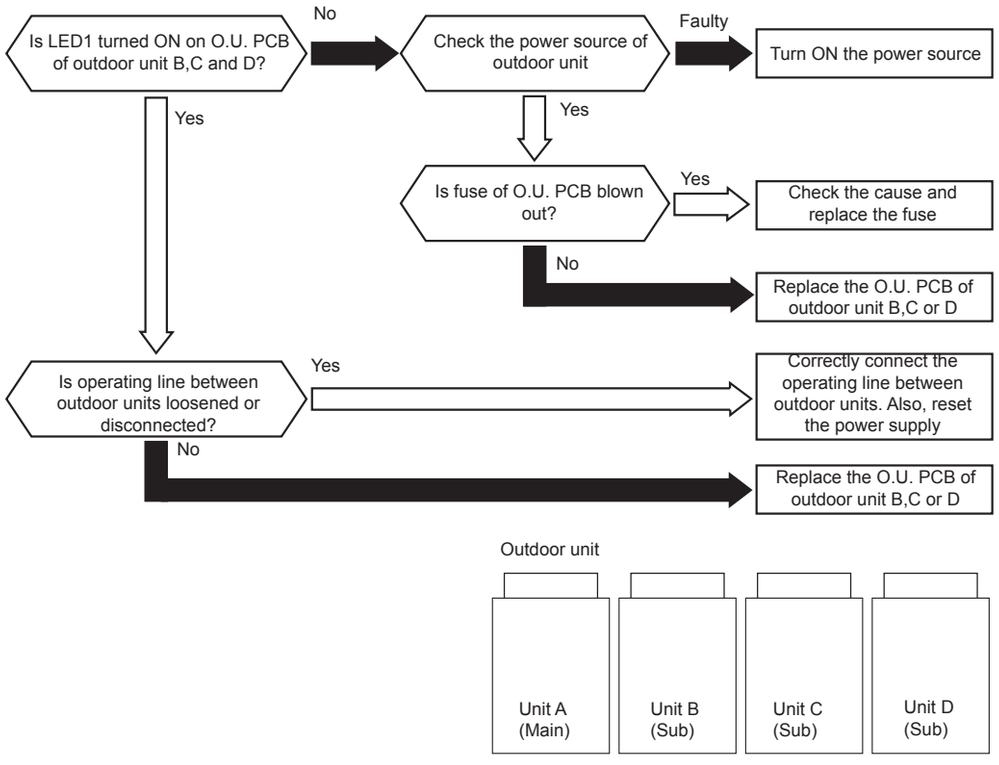
Maximum refrigerant cycle number setting: 63.

Alarm code	31	Abnormal transmission between outdoor units.

- The RUN indicator on the remote control switch flashes and the ALARM indication is displayed.
- The unit 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 when the following conditions occur after maintaining a normal transmission between the outdoor and indoor unit.

- The anomaly is maintained for 30 seconds.
- The anomaly is maintained for 30 seconds after the microcomputer automatically reset.



(Sub): Secondary unit(s).

Alarm code	35	Incorrect indoor unit number setting.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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 5 minutes after power is supplied to the outdoor unit when the indoor unit number connected to the outdoor unit is duplicated by the DSW6 and RSW1 setting.

NOTE

- *In the case of H-LINK systems, this alarm code is indicated when DSW1 and RSW1 of PCB1 of the outdoor unit and DSW5 and RSW2 of the PCB of the indoor unit are incorrectly set. In this case, set them properly after turning OFF the main power switch and turn ON again the main power switch.*
- *When the setting of the refrigerant cycle number of the outdoor unit (H-LINK II) and one of the outdoor unit (H-LINK) is duplicated, alarm code "35" can be ON and OFF repeatedly.*

Alarm code	36	Incorrect indoor unit combination.

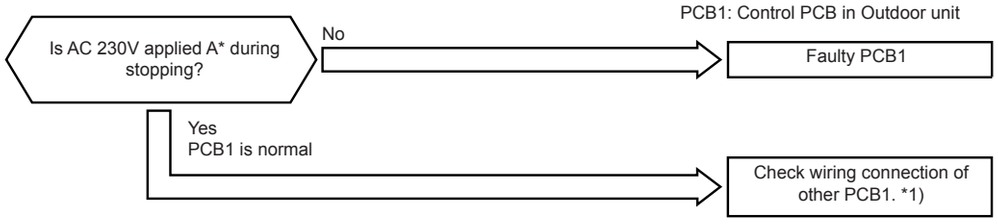
- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit number and alarm code are displayed on the outdoor unit's PCB1 display.

This alarm is indicated when the indoor unit connected to the outdoor unit is designed for other refrigerants (R22 or R407C).

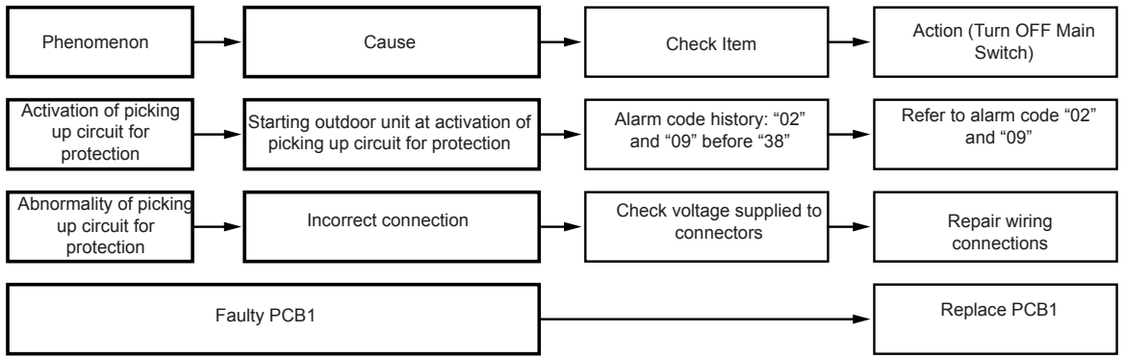
Alarm code	38	Abnormality of picking up circuit for protection in the outdoor unit.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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 when 230V is not detected in A* during inverter compressor stoppage.



Power supply	A*
400V / 50 Hz	Between terminal #3 of PCN2, PCN16 and faston terminal “N1” on PCB1



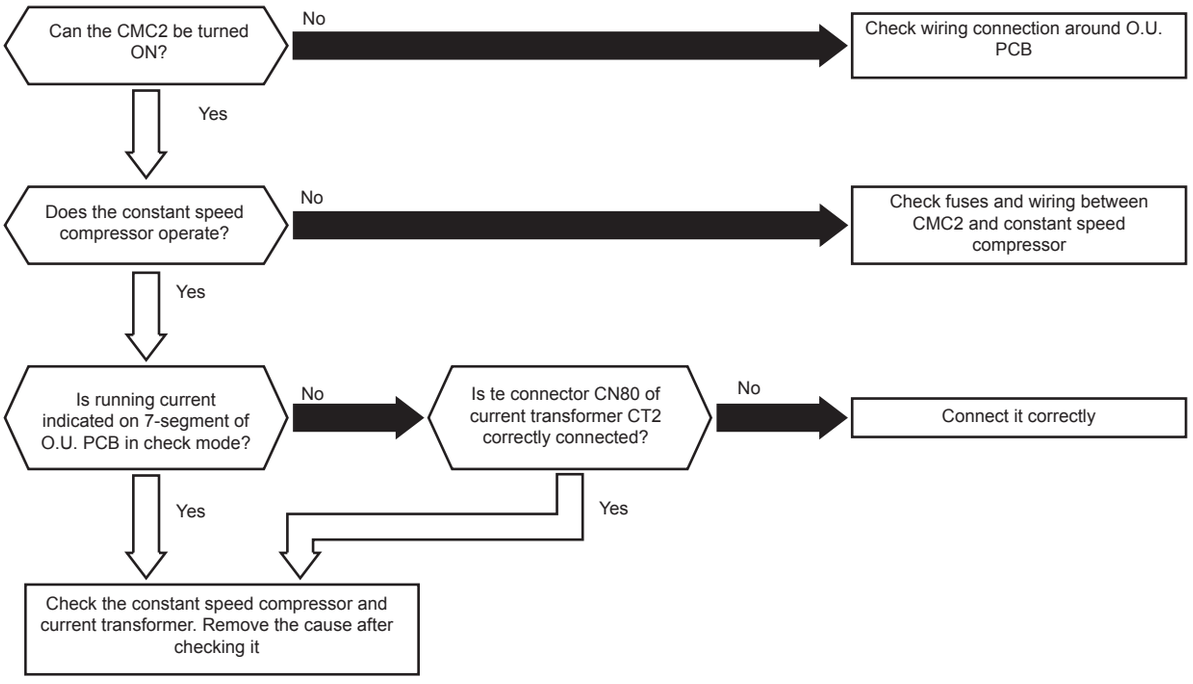
*1): This alarm code may be indicated when the high pressure switch (PSH) is connected incorrectly or fails (open fault). The item for alarm code 02 should be checked as well.

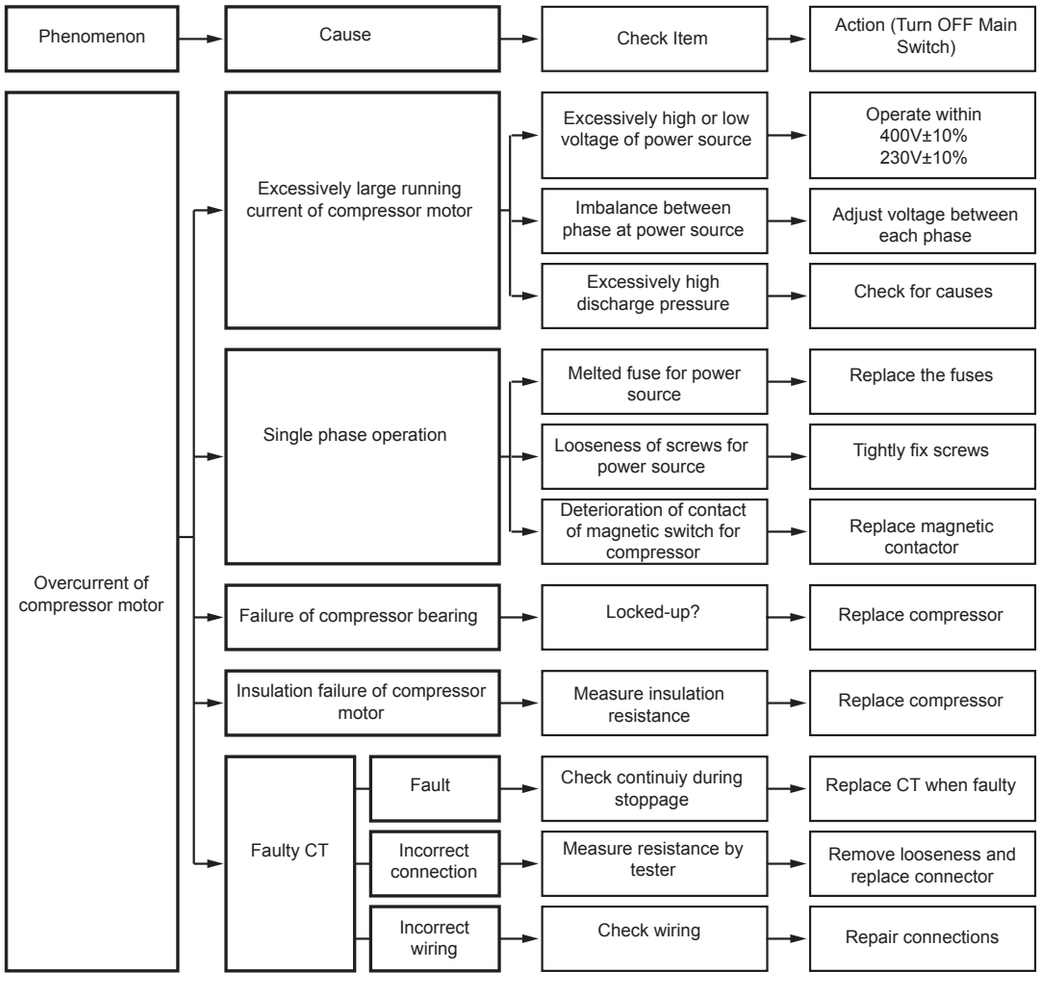
*2): Especially, check the wiring connection for PCN2 and PCN16 on O.U. PCB.

Alarm code	39	Abnormality of running current at constant speed compressor.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7-segment of outdoor unit PCB. (For the combination of outdoor units, the alarm code is displayed on PCB of outdoor unit A.) Additionally for the outdoor unit number and compressor number with abnormal thermistor, check the alarm code history.

This alarm is indicated when the running current of the constant speed compressor is 0A or exceeds the overcurrent limit during the operation, all the compressors stop and then retry the operation after 3 minutes. This alarm code is indicated when this occurs twice more within the next 30 minutes

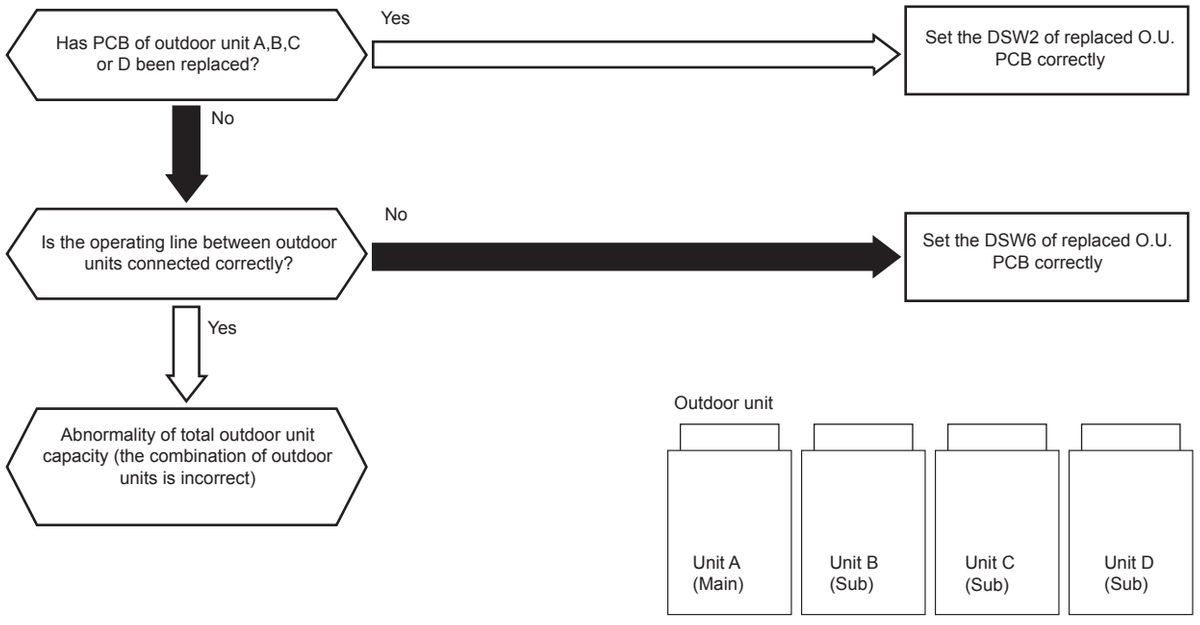



Phenomenon
Cause
Check Item
Action (Turn OFF Main Switch)
Overcurrent of compressor motor
Excessively large running current of compressor motor
Excessively high or low voltage of power source
Operate within 400V±10% 230V±10%
Imbalance between phase at power source
Adjust voltage between each phase
Excessively high discharge pressure
Check for causes
Single phase operation
Melted fuse for power source
Replace the fuses
Looseness of screws for power source
Tightly fix screws
Deterioration of contact of magnetic switch for compressor
Replace magnetic contactor
Failure of compressor bearing
Locked-up?
Replace compressor
Insulation failure of compressor motor
Measure insulation resistance
Replace compressor
Faulty CT
Fault
Check continuiy during stoppage
Replace CT when faulty
Incorrect connection
Measure resistance by tester
Remove looseness and replace connector
Incorrect wiring
Check wiring
Repair connections

Alarm code	3A	Abnormal outdoor unit capacity.

- 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 when the total capacity of the outdoor unit connected to the transmission terminal of the O.U. - O.U. exceeds 54 HP for standard outdoor unit and 36 HP for high efficiency outdoor unit.



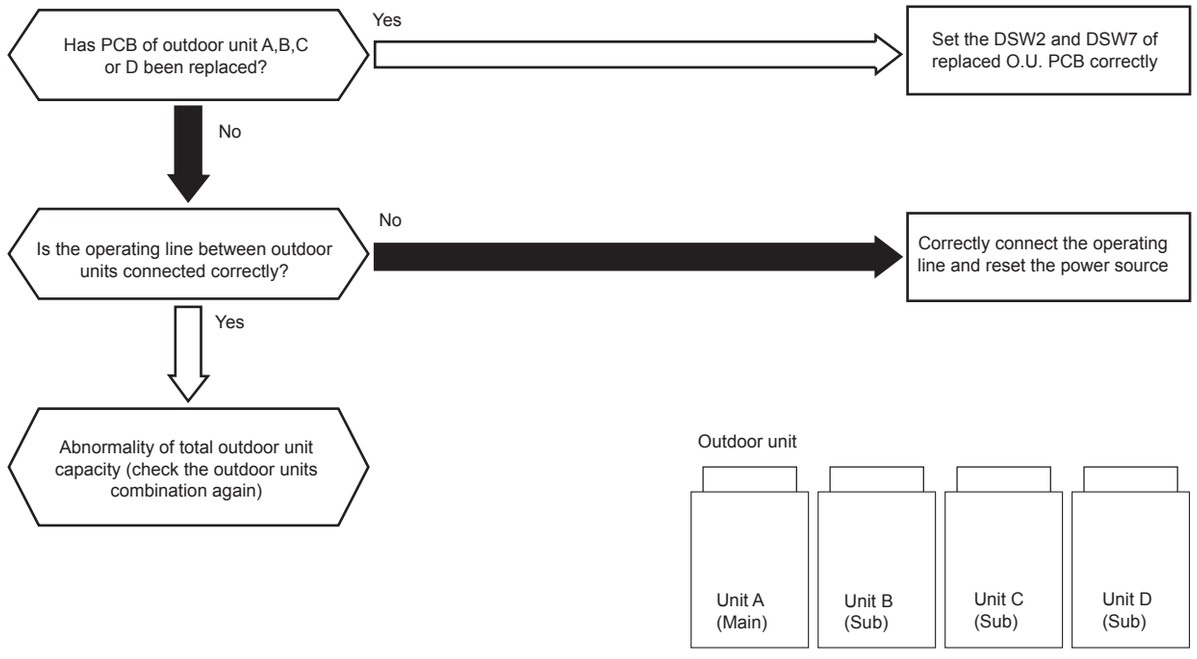
NOTE

- *(Sub): Secondary unit(s).*
- *O.U. PCB: PCB1 (outdoor unit PCB).*
- *Inverter PCB: PCB2.*

Alarm code	3b	Incorrect setting of outdoor unit model combination or voltage.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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 when the model setting of the outdoor unit connected to the transmission terminal of the O.U. - O.U. is incorrect.



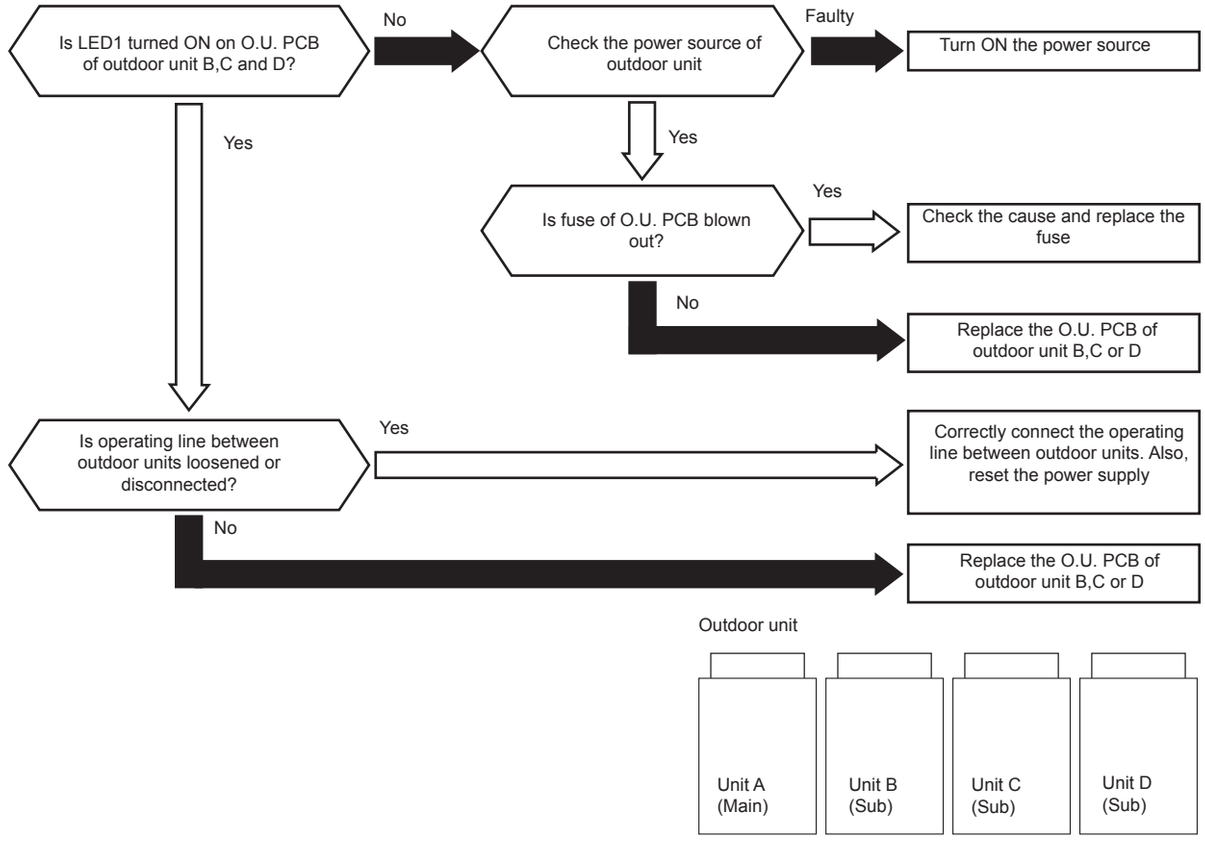
NOTE

- *(Sub): Secondary unit(s).*
- *O.U. PCB: PCB1 (outdoor unit PCB).*
- *Inverter PCB: PCB2.*

Alarm code	3d	Abnormal transmission between the main unit and the secondary unit(s).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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 when the transmission to outdoor unit B, C or D is not maintained for 30 seconds (alarm code "31" will be indicated when the transmission to all the outdoor units connected to transmission terminal of the O.U. - O.U. is not maintained).



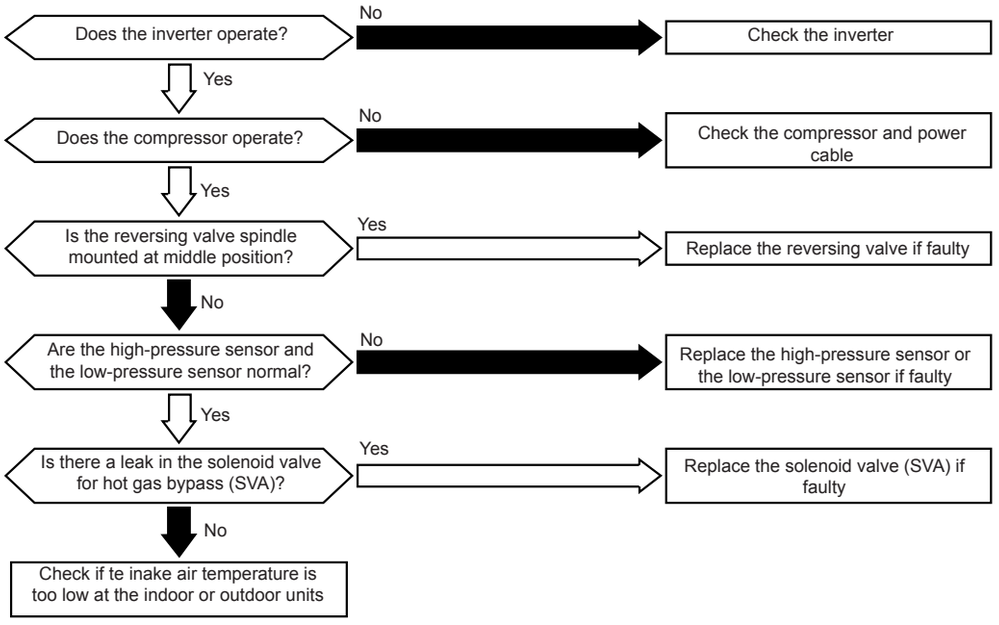
NOTE

- *(Sub): Secondary unit(s).*
- *O.U. PCB: PCB1 (outdoor unit PCB).*
- *Inverter PCB: PCB2.*

Alarm code	43	Activation of the low compression ratio protection device.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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 when the compression ratio, Ɛ = ((Pd + 0.1) / (Ps + 0.06)) (calculated from the discharge pressure (Pd MPa) and the suction pressure (Ps MPa) is less than Ɛ < 1.8 and occurs 3 times in 1 hour.

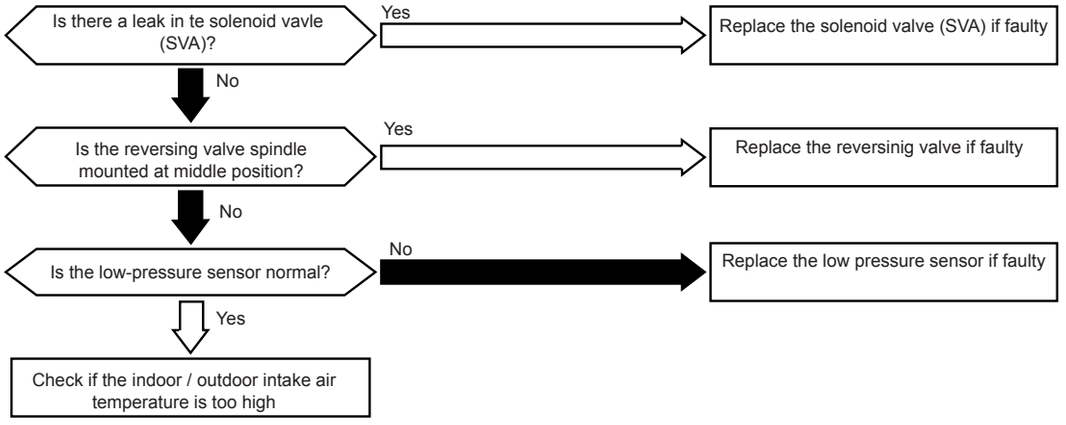


Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively low compression ratio	Inverter is not functioning	Check inverter	Repair faulty part
	Compressor is not operating	Check compressor	Replace comp. if faulty
	Valve stoppage at middle position of reversing valve	Measure suction pipe temp.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

Alarm code	44	Activation of the low pressure increase protection device.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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 when the following condition occurs 3 times in 30 minutes: the suction pressure (Ps) continues to be higher than 1.4MPa for more than a minute, all the compressors stop and then retry the operation after 3 minutes.

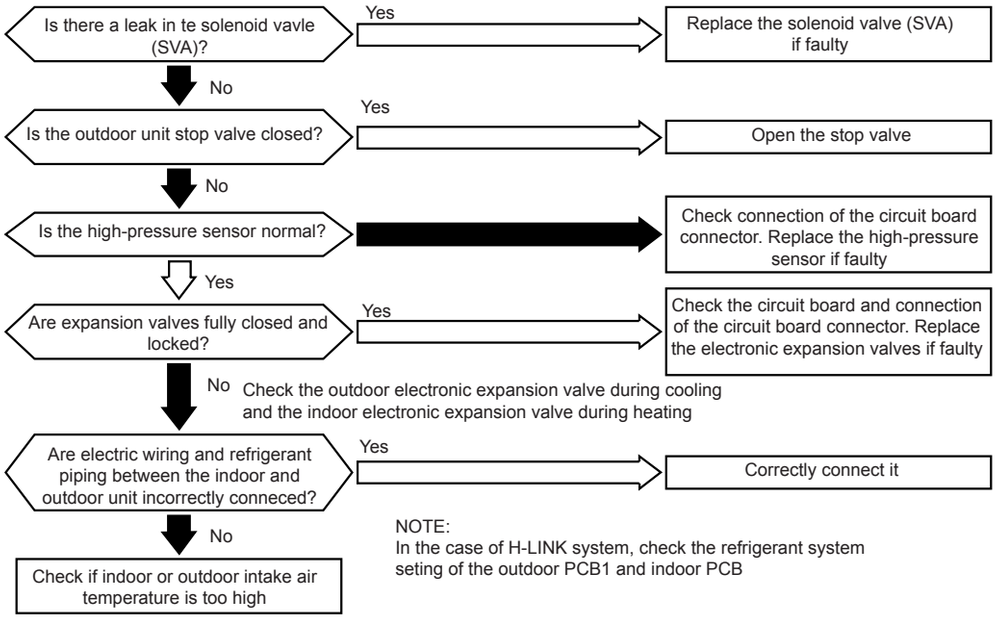


Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively low sutcion pressure	Leakage of solenoid valve (SVA)	Check outlet pipe temp. of solenoid valve (SVA)	Check connecting wires. Replace SVA if faulty
	Valve stoppage at middle position of reversing valve	Measure suction gas pipe temp. of reversing valve	Replace reversing valve if faulty
	Abnormal suction pressure sensor	Check connector for PCB1, and power source	Replace sensor if faulty
	Excessively high indoor unit and outdoor unit suction air temperature	Check indoor unit and outdoor unit suction air temp. thermistor	Replace thermistor if faulty

Alarm code	45	Activation of the high pressure increase protection device.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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 when the following condition occurs 3 times in 30 minutes: the discharge pressure (Pd) continues to be higher than 3.8MPa for more than a minute, all the compressors stop and then retry the operation after 3 minutes.

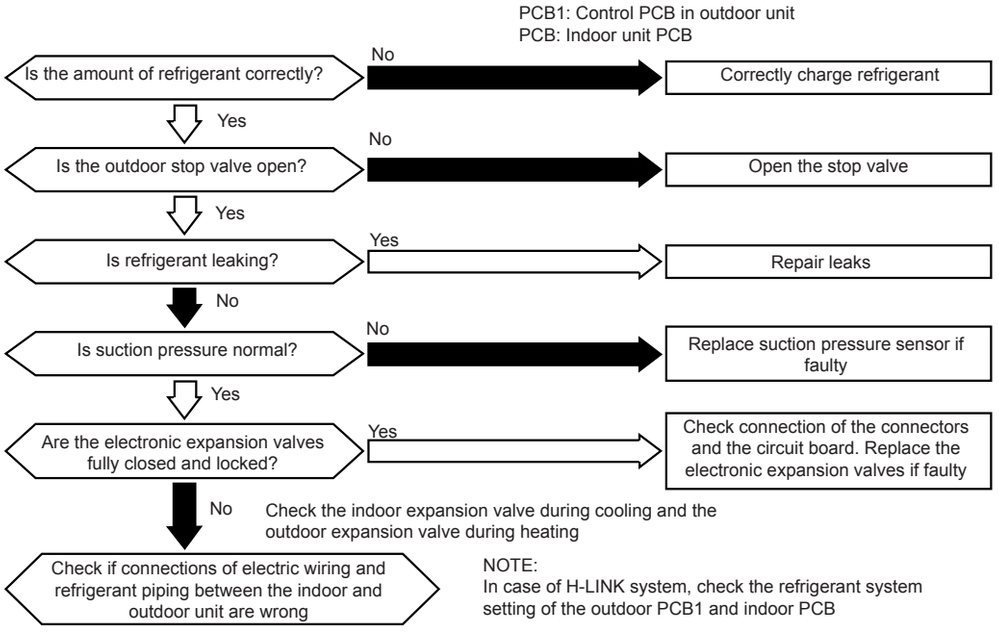


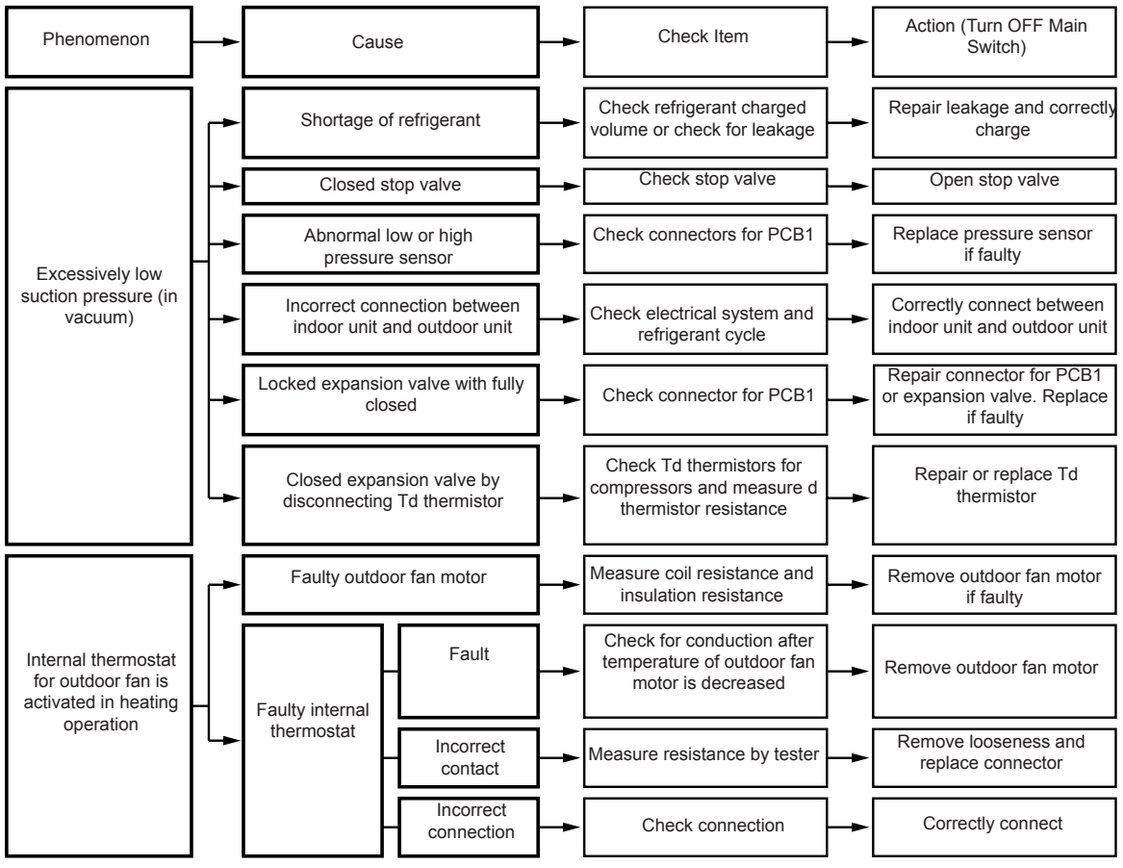
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively high discharge pressure	Leakage of solenoid valve (SVA)	Check outlet pipe temp. of solenoid valve (SVA)	Check connecting wires. Replace SVA if faulty
	Closed stop valve	Check stop valve	Open stop valve
	Abnormal high pressure sensor	Check connectors for PCB1	Replace pressure sensor if faulty
	Excessively high indoor unit and outdoor unit inlet air temperature	Check indoor unit and outdoor unit inlet air temp. thermistor	Replace thermistor if faulty
	Incorrect connection between indoor unit and outdoor unit	Check electrical system and refrigerant cycle	Correctly connect
	Locked expansion valve with fully closed	Check connectors for PCB	Repair connector for PCB or expansion valve. Replace if faulty
Stoppage of indoor fan (wall type 1.0 to 3.0 HP only)	Melted fuses	Check continuity of fuses	Replace fuses
	Faulty I.U. PCB	Replace I.U PCB and check operation	Replace I.U PCB if faulty

Alarm code	47	Activation of the low pressure decrease protection device (Vacuum operation protection).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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 when the following condition occurs 2 or more times in 1 hour: the suction pressure (Ps) is lower than 0.09 MPa for more than 12 minutes.




Phenomenon
Cause
Check Item
Action (Turn OFF Main Switch)
Excessively low suction pressure (in vacuum)
Shortage of refrigerant
Check refrigerant charged volume or check for leakage
Repair leakage and correctly charge
Closed stop valve
Check stop valve
Open stop valve
Abnormal low or high pressure sensor
Check connectors for PCB1
Replace pressure sensor if faulty
Incorrect connection between indoor unit and outdoor unit
Check electrical system and refrigerant cycle
Correctly connect between indoor unit and outdoor unit
Locked expansion valve with fully closed
Check connector for PCB1
Repair connector for PCB1 or expansion valve. Replace if faulty
Closed expansion valve by disconnecting Td thermistor
Check Td thermistors for compressors and measure d thermistor resistance
Repair or replace Td thermistor
Internal thermostat for outdoor fan is activated in heating operation
Faulty outdoor fan motor
Measure coil resistance and insulation resistance
Remove outdoor fan motor if faulty
Faulty internal thermostat
Fault
Check for conduction after temperature of outdoor fan motor is decreased
Remove outdoor fan motor
Incorrect contact
Measure resistance by tester
Remove looseness and replace connector
Incorrect connection
Check connection
Correctly connect

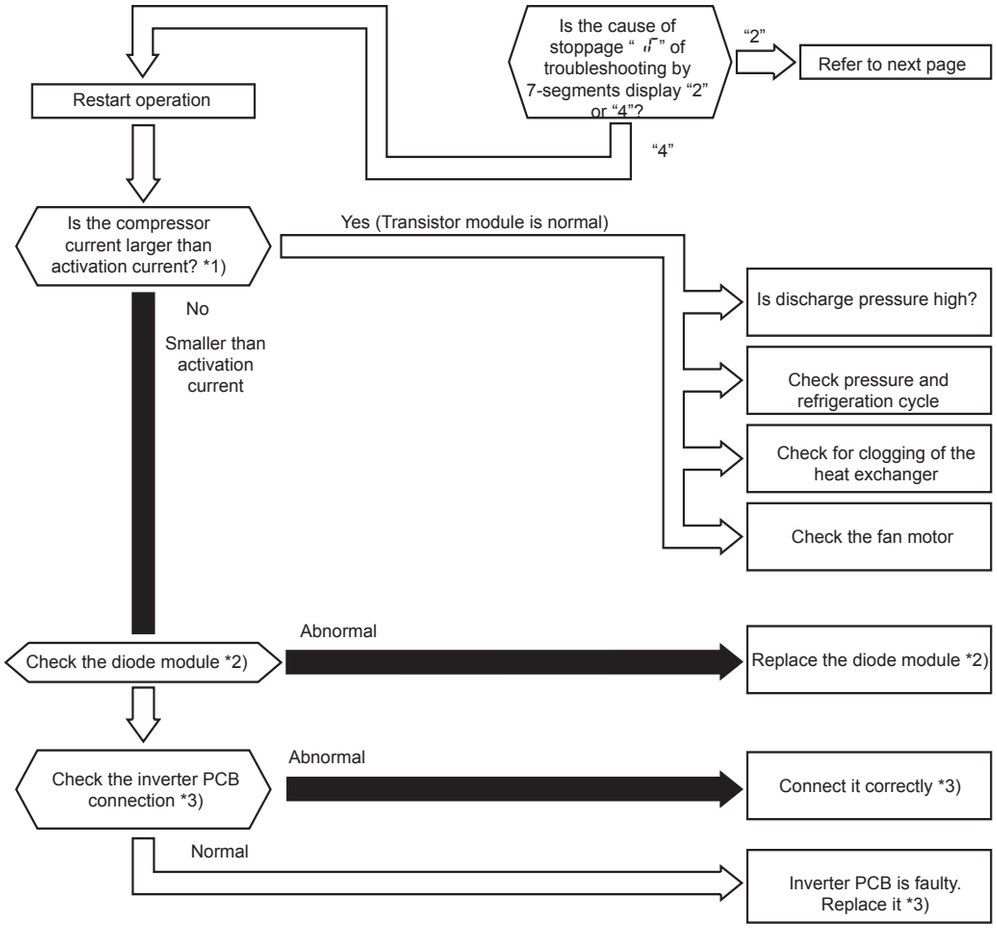
Alarm code	48	Activation of Inverter overcurrent protection device (1).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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 when the inverter electronic thermal protection is activated 6 times in 30 minutes (retry operation is carried out up to 5 times).

Activation conditions:

- Inverter current with 105% of the rated current runs continuously for 30 seconds.
- Inverter current runs intermittently and the accumulated time is reaches up to 3 minutes in a 10 minute period.



*1): Regarding the activation current value setting, refer to *"8.1.1 Inverter specifications"*

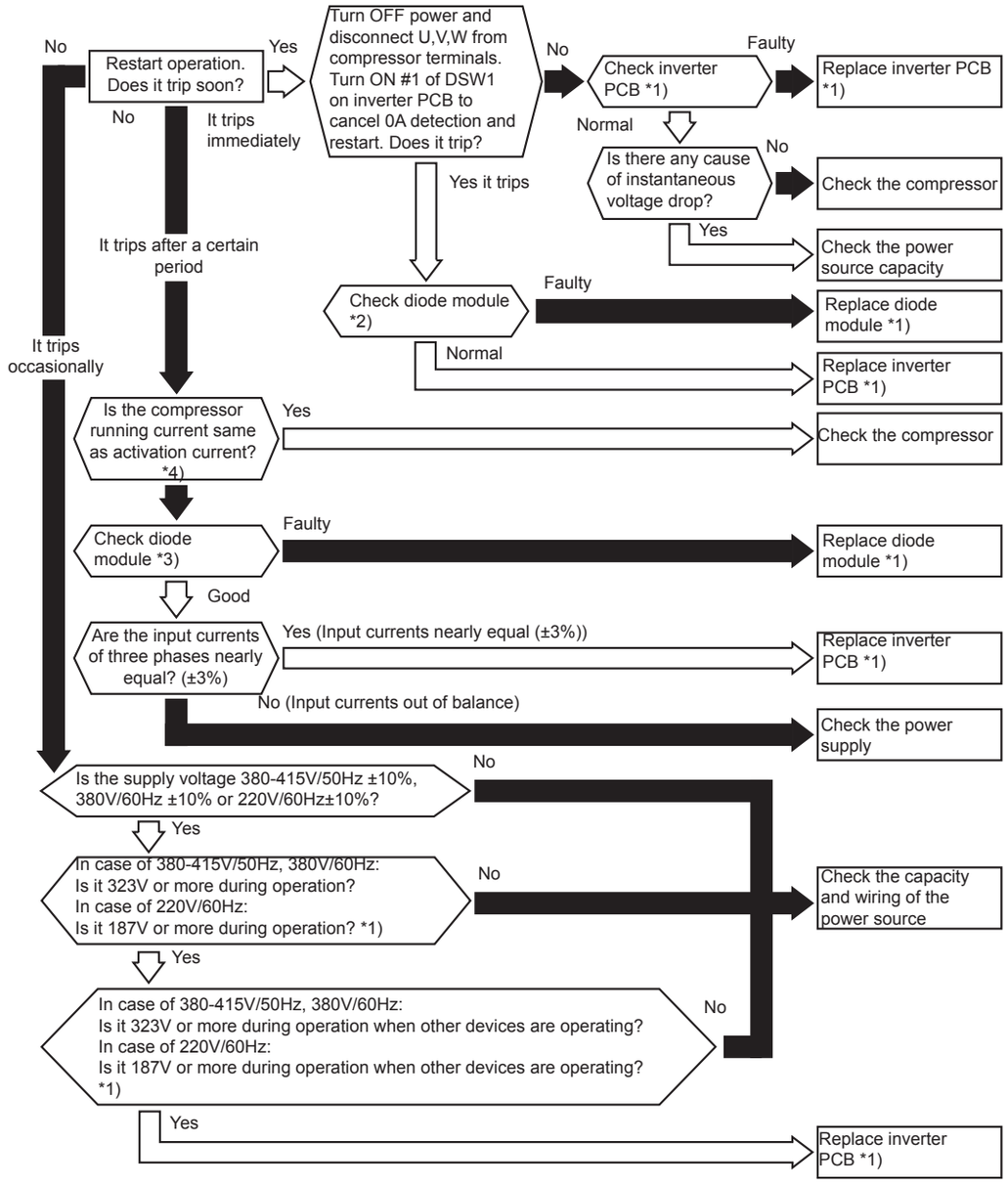
*2): Regarding the checking or replacement of the diode module, refer to *"11.8 Checking procedures for each main part"*.

*3): Regarding the checking method or replacement of the Inverter parts, refer to *"11.8 Checking procedures for each main part"*.

Alarm code	48	Activation of Inverter overcurrent protection device (2).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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 when instantaneous overcurrent occurs 6 times in 30 minutes (retry operation is carried out up to 5 times). Activation condition: Inverter current with 150% of the rated current.



*1): Carry out the electrical discharge when inverter parts are checked or replaced, refer to *"11.8 Checking procedures for each main part"*.

*2): Refer to *"11.8 Checking procedures for each main part"* for details of checking procedures of transistor module.

*3): Refer to *"11.8 Checking procedures for each main part"* for details of checking procedures of transistor module.

*4): Regarding the setting value of activation current, refer to *"8.1.1 Inverter specifications"*.

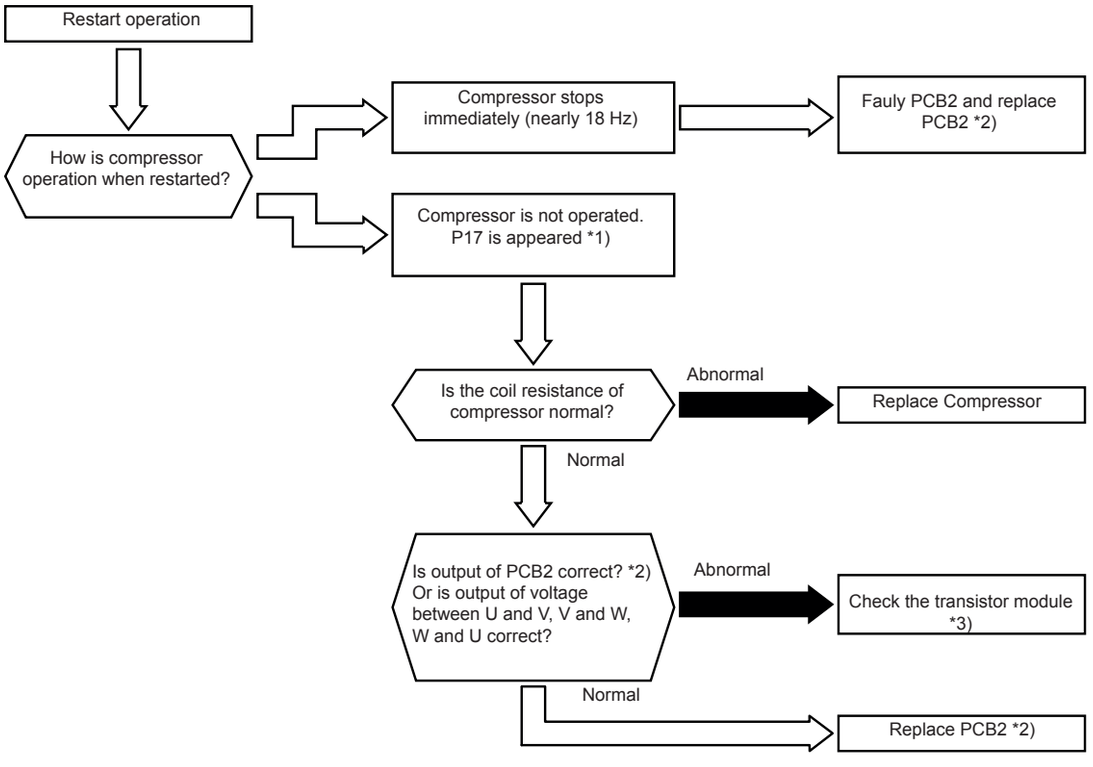
Alarm code	51	Abnormal Inverter current sensor.

- 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 when an abnormality of current transformer (0A detecting) occurs 3 times within 30 minutes (retry operation is carried up for the first two times).

Activation condition:

- When the compressor frequency is maintained between 15 and 18 Hz after the compressor is started, one of the absolute running current values detected by the current transformer in each phase U+, U-, V+ and V- is equal or less than 1.5 A.
- The wave height value of running current for the phase positioning is less than 5A before the compressor is started (at completing the phase positioning).



*1): P17 is displayed on the 7-segment display of the outdoor unit PCB1.

*2): Carry out the high voltage discharge before Inverter parts are checked or replaced, refer to *"11.8 Checking procedures for each main part"*.

*3): Refer to *"11.8 Checking procedures for each main part"* for details of checking procedures of transistor module.

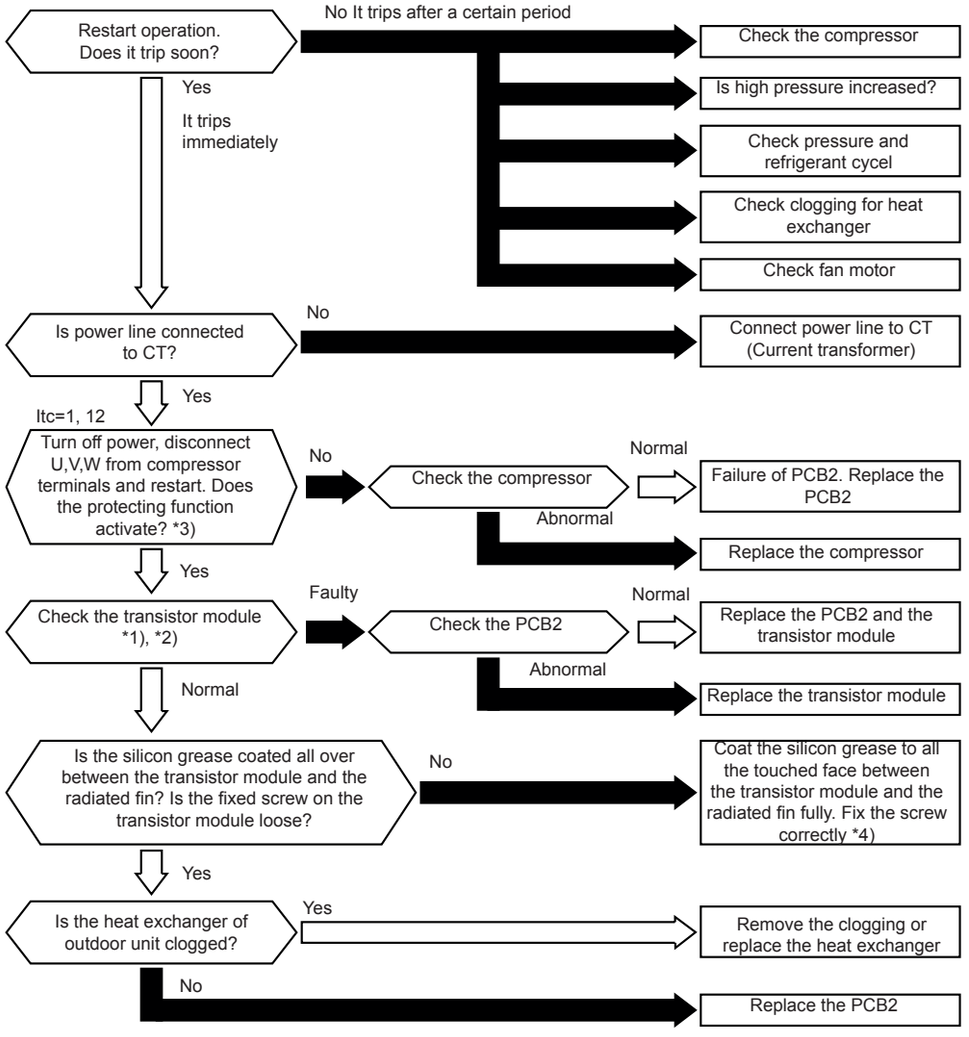
Alarm code	53	Inverter error signal detection.

- 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 when the IMP (transistor module) detects an abnormal function 7 times in 30 minutes (retry operation is carried out up to sixth times).

Activation conditions:

- Abnormal current to the transistor module, such as a short-circuit or earth leakage.
- Abnormal temperature in the transistor module.
- Decrease in control voltage.



*1): Carry out the electrical discharge when Inverter parts are checked or replaced, refer to *"11.8 Checking procedures for each main part"*.

*2): Regarding the method for checking the transistor module, refer to: *"11.8 Checking procedures for each main part"*

*3): Set DSW1-1 ON on PCB2 when restarting with the compressor terminals disconnected. After troubleshooting, set DSW1-1 OFF on PCB2.

*4): Use silicone grease supplied as an accessory (Service part No. P22760).

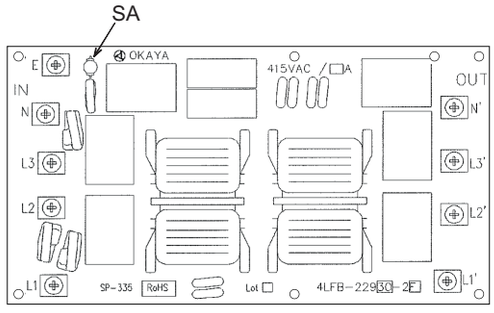
NOTE

When an excessive surge current is applied to the unit due to lightning or other causes, this alarm code "53" or Inverter stoppage code (IT) "11" is indicated and the unit cannot be operated. In this case, check to ensure the surge absorver (SA) in the noise filter (NF1, NF2). The surge absorver may be damaged if the inner surface in the SA is black. In that case, replace surge absorver.

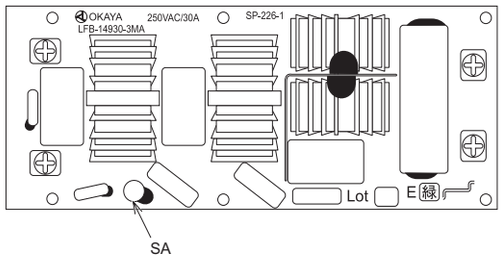
If the inside of the surge absorver is normal, turn OFF the power supply and wait for LED201 (red) of PCB2 OFF (approximately 5 minutes) and turn ON power supply again.

Positioning of the surge absorver:

NF1



NF2

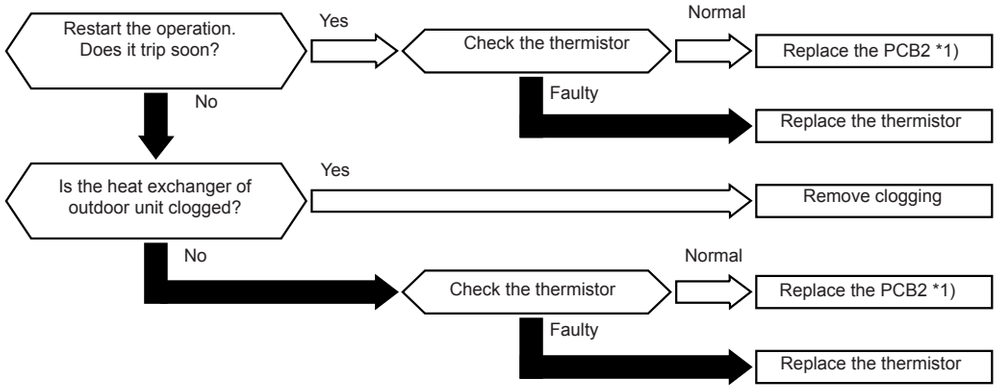


SA: Surge absorver.

Alarm code	54	Abnormal Inverter fin temperature.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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 when an abnormality of inverter fin temperature occurs 3 times in 30 minutes (retry operation is carried out up to the second time the anomaly occurs). Activation condition: the radiation fin temperature exceeds 90 °C.



*1): Carry out the electrical discharge when Inverter parts are checked or replaced, refer to *"11.8 Checking procedures for each main part"*.

Alarm code	55	Inverter failure.

- 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.

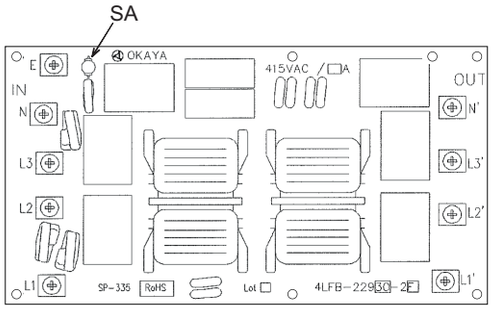
This alarm is indicated when the following phenomenon occurs 3 times in 30 minutes (retry operation is carried up to the second time the anomaly occurs): the actual frequency from PCB2 is less than 10 Hz (after the Inverter frequency output from PCB1). Activation condition: this alarm is indicated when PCB2 is not performed normally.



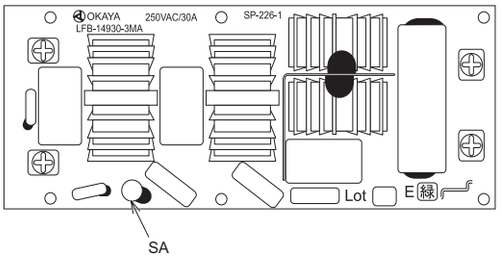
*1): When an excessive surge current is applied to the unit due to lightning or other causes, alarm code "55" or Inverter stoppage code (IT) "11" is indicated and the unit cannot be operated. In this case, check to ensure the surge absorver (SA) in the noise filter (NF1, NF2). The surge absorver may be damaged if the inner surface of the SA is black. If so, replace the surge absorver. If the inside of the surge absorver is normal, turn OFF the power supply and wait for LED201 (red) of PCB2 OFF (approximately 5 minutes) and turn ON power supply again.

Positioning of surge absorver:

NF1



NF2

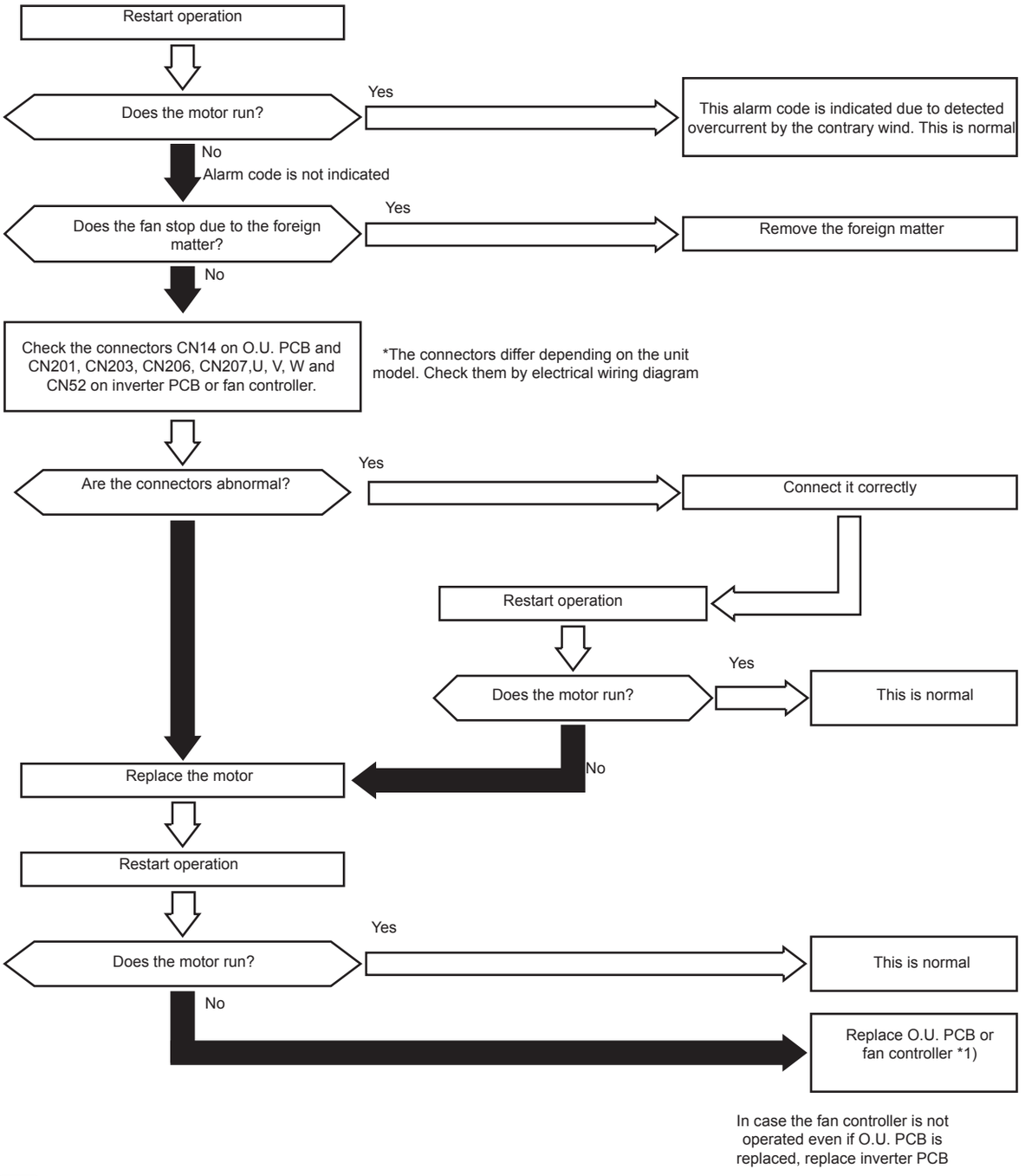


SA: Surge absorver.

Alarm code	56	Abnormal position detection for fan motor

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7-segment of outdoor unit PCB.

The fan motor stops when the revolution pulse output from the fan motor is 10rpm or less. The retry operation is performed after 10 seconds. This alarm code is indicated when the abnormality occurs ten times in 30 minutes. The abnormality occurs when the fan motor stops by slugging.



NOTE

- *O.U. PCB: PCB1 (outdoor unit PCB).*
- *Inverter PCB: PCB2.*

Alarm code	57	Activation of fan controller protection.

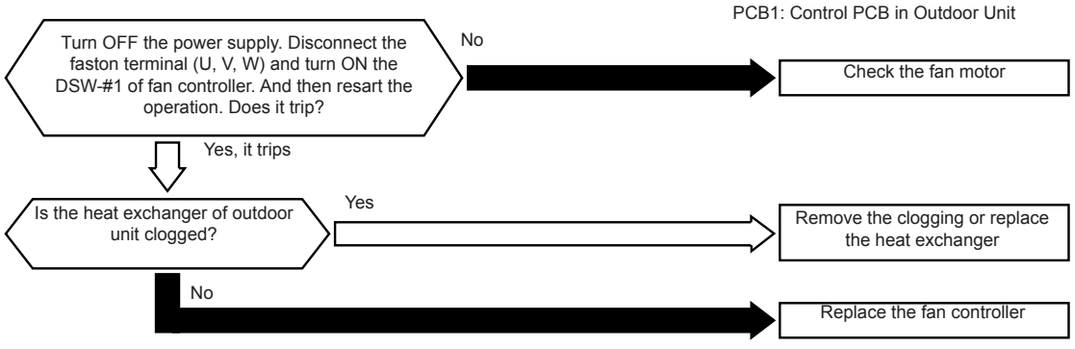
- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit number and alarm code are displayed on the outdoor unit's PCB1 display.

This alarm is indicated when the IMP (transistor module) detects an abnormality function 10 times in 30 minutes (retry operation is performed instead carried out up to the ninth time).

Activation conditions:

- Abnormal current to the transistor module, such as a short-circuit or earth leakage, or overcurrent occurs at the transistor module.
- Decrease in control voltage.

PCB1: Control PCB in Outdoor Unit



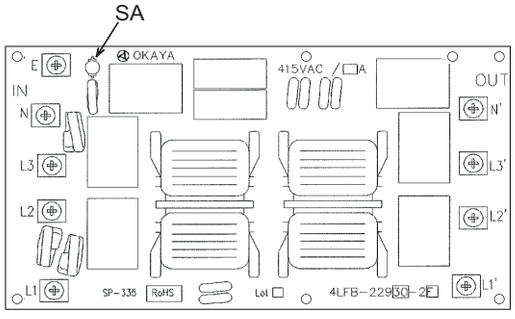
NOTE

When the unit is applied the excessive current due to lightning or other causes, alarm code "57" or Inverter stoppage code (IT) "11" is indicated and the unit cannot be operated. In this case, check to ensure the surge absorver (SA) in the noise filter (NF1, NF2). The surge absorver may be damaged if the inner surface of the SA is black. If so, replace the surge absorver.

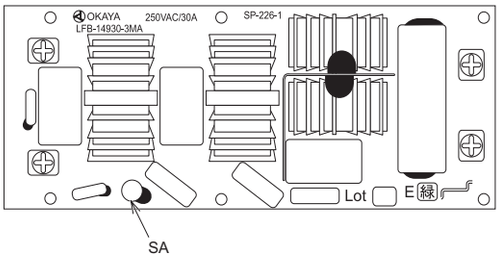
If the inside of the surge absorver is normal, turn OFF the power supply and wait for LED201 (red) of PCB2 OFF (approximately 5 minutes) and turn ON power supply again.

Position of surge absorver:

NF1



NF2

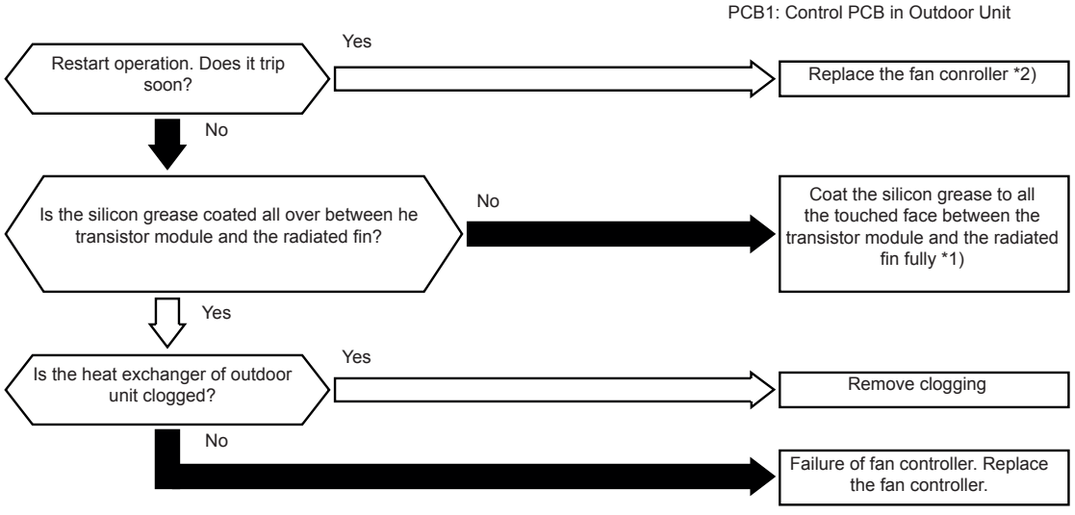


SA: Surge absorver.

Alarm code	5A	Abnormal fan controller fin temperature.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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 when the fan controller fin temperature anomaly occurs 10 times in 30 minutes (retry operation is carried out up to 9 times). Activation condition: this alarm is indicated when the thermistor temperature inside the transistor module increases over 100 °C.



*1): Use silicone grease supplied as an accessory (Service part No. P22760).

*2): For the maintenance and replacement of fan controller, perform the high voltage discharge work according to *"11.8 Checking procedures for each main part"*.

Alarm code	5b	Activation of fan controller overcurrent protection device (1).

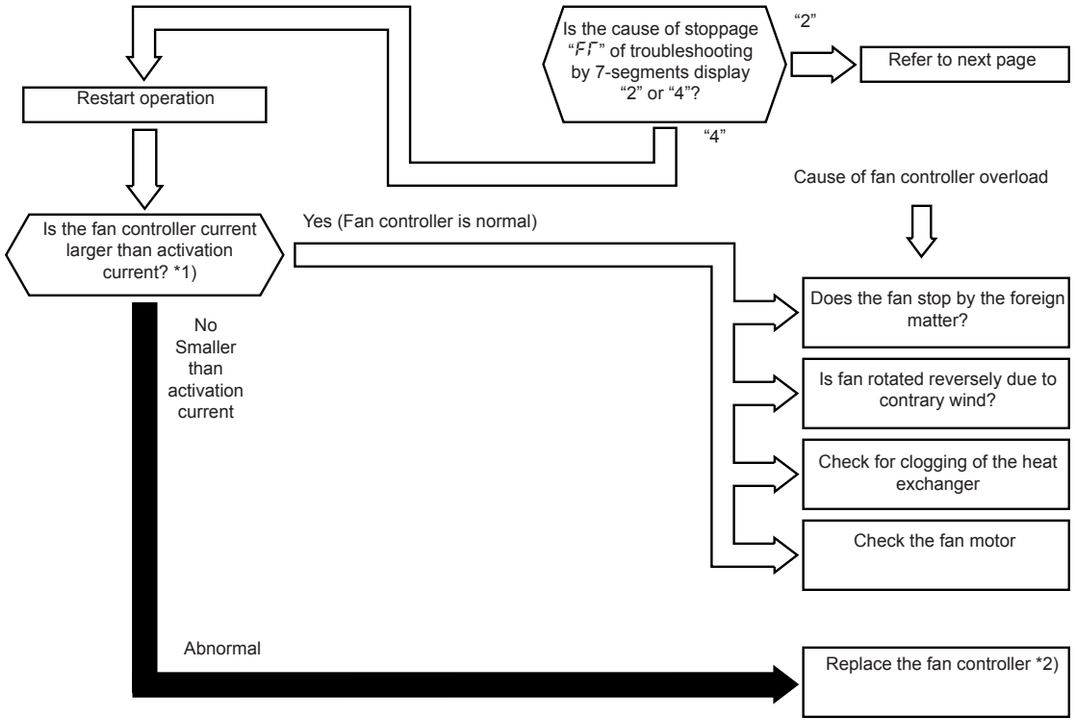
- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit number and alarm code are displayed on the outdoor unit's PCB1 display.

This alarm is indicated when the electronic thermal protection for the fan controller is activated 10 times in 30 minutes (retry operation is carried out up to 9 times).

Activation condition:

- Electrical current with 105% of the rated current runs continuously for 30 seconds.
- Electrical current runs intermittently and the accumulated time reaches to 3 minutes in a 10 minute period.

PCB1: Control PCB in Outdoor Unit



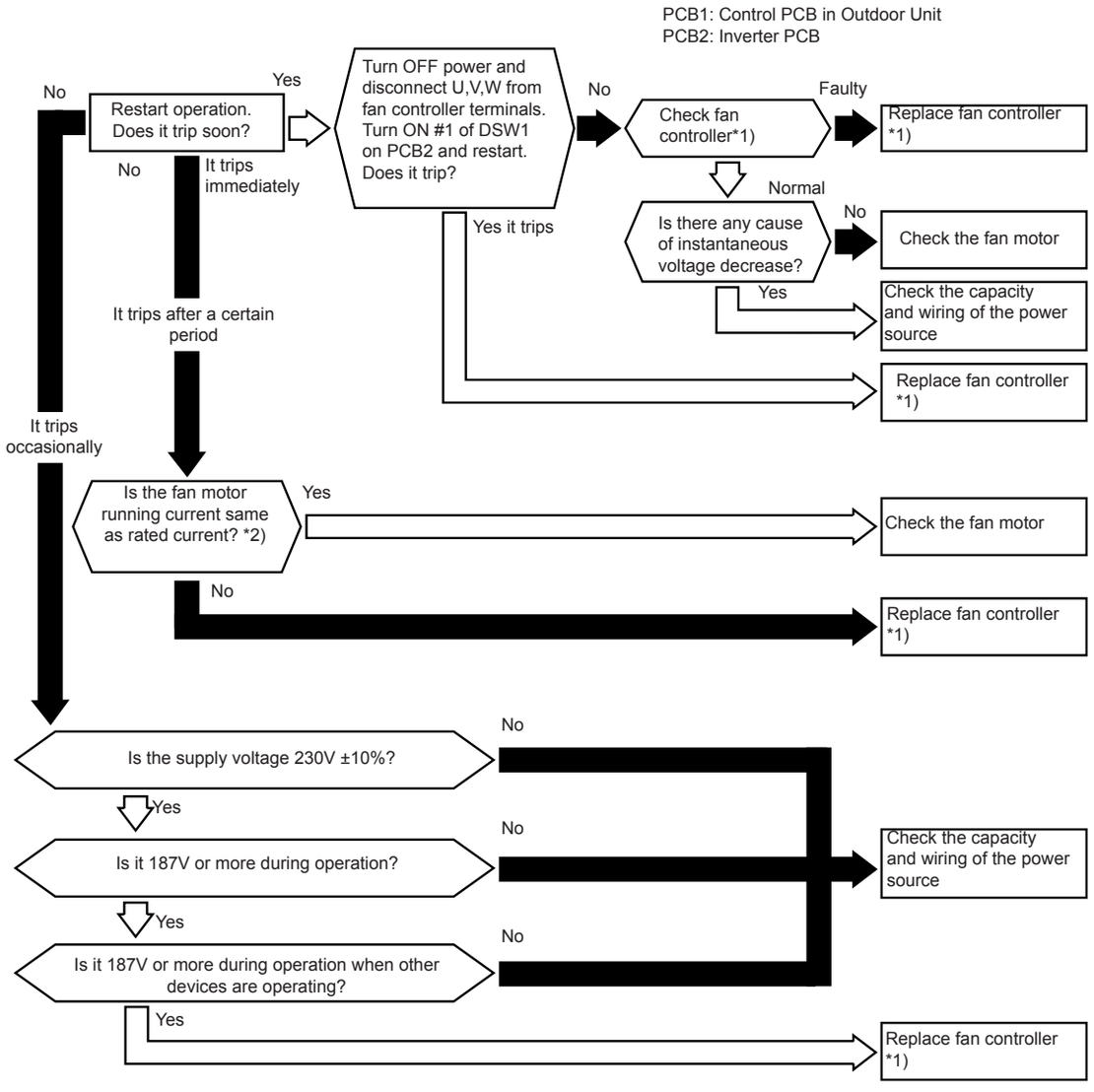
*1): Regarding the activation current value setting, refer to *"8.1.1 Inverter specifications"*.

*2): Carry out the electrical discharge when fan controller is checked or replaced, refer to: *"11.8 Checking procedures for each main part"*.

Alarm code	5b	Activation of fan controller overcurrent protection device (2).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit 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 when the instantaneous overcurrent occurs 10 times in 30 minutes (retry operation is carried out up to 9 times). Activation condition: the running current exceeds the rated current of transistor module.



*1): Carry out the electrical discharge when fan controller is checked or replaced, refer to: *"11.8 Checking procedures for each main part"*.

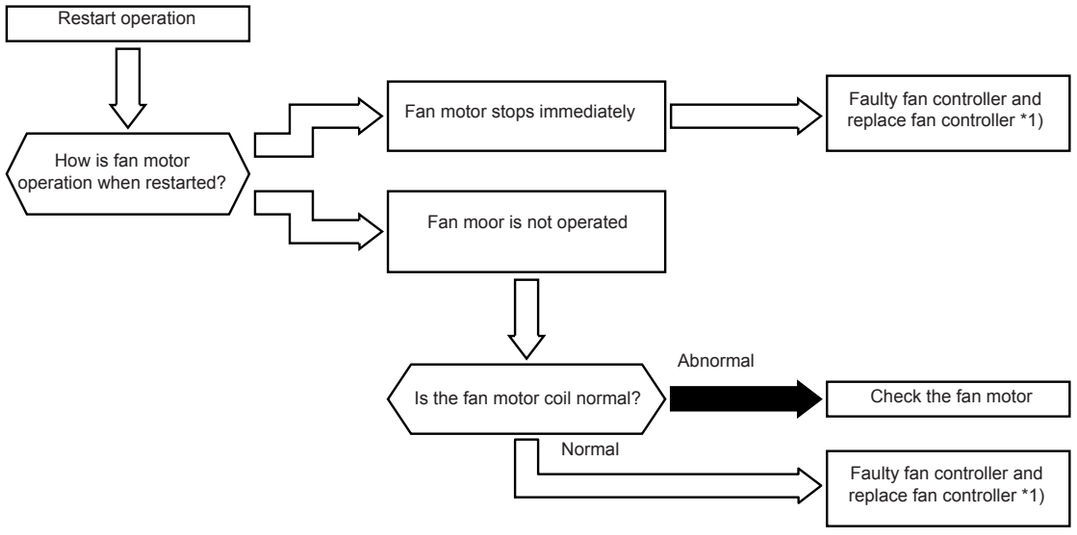
*2): Regarding the activation current value setting, refer to *"8.1.1 Inverter specifications"*

.

Alarm code	5C	Abnormal fan controller sensor.

This alarm is indicated when the following conditions occur:

- After starting the fan motor operation, the fan controller current does not exceed over 1.5 A.
- Before starting the fan motor operation, the fan controller peak current is less than 4 A.



*1): Carry out the electrical discharge when fan controller is checked or replaced, refer to: *"11.8 Checking procedures for each main part"*.

Alarm code	EE	Compressor protection.

This alarm code appears when one of the following alarms occur 3 times in 6 hours, which may result in serious damage to the compressor, if the outdoor unit operates continuously without eliminating the cause.

Alarm code	Content of anomaly
02	Activation of protection device (high pressure cut)
07	Decrease in discharge gas superheat
08	Increase in discharge gas temperature at the upper part of the compressor
39	Abnormal operation of running current in constant speed compressor
43	Activation of the low compression ratio protection device
44	Activation of the low pressure increase protection device
45	Activation of the high pressure increase protection device
47	Activation of the low pressure decrease protection device (Vacuum operation protection)

These alarms can be checked using check mode 1. Follow the actions indicated in each alarm chart.

NOTE

These alarms can only be eliminated by turning OFF the system's main power switch. However, special care must be taken before starting, since there is a possibility that the compressor may be seriously damaged.

Alarm code		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.

Unit No. setting	Conditions	Action
1 ~ 64 (recommended)	Unit number (DSW6 and RSW1) or refrigerant cycle number (DSW5 and RSW2) are set above "64". Or, more than 2 pins are set in DSW5 and DSW6.	Set the unit number and refrigerant cycle number below "64".
0 ~ 63	Unit number (DSW6 and RSW1) or refrigerant cycle number (DSW5 and RSW2) are set above "63". Or, more than 2 pins 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		Incorrect setting of indoor unit connection 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.

  ("35" is displayed on the remote control switch screen).

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

Conditions:	The number of the connected indoor units not supporting H-LINK II are 17 or more.
Countermeasures:	The number of the connected indoor units must be 16 or less.

PCB1: Control PCB for the outdoor unit.

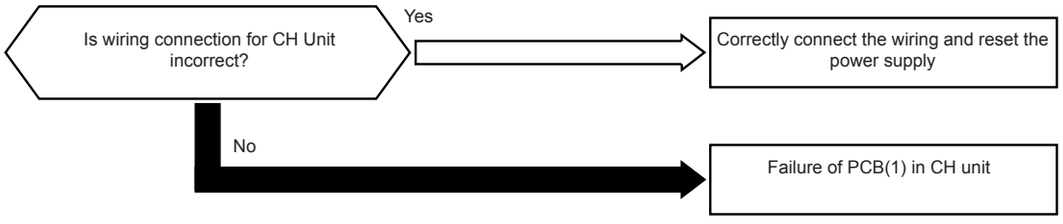
Alarm code	C 1	Incorrect indoor unit connection (CH unit).

- 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.

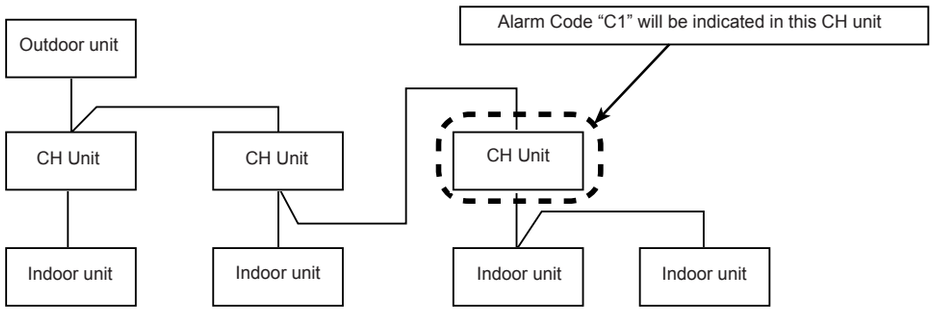
◆ Heat recovery system

This alarm is indicated when 2 or more CH units are connected between the outdoor unit and the indoor unit.

PCB1: Control PCB in Outdoor Unit
PCB(1): CH Unit PCB



- Alarm code "C1" will be indicated when the units are connected as follows.



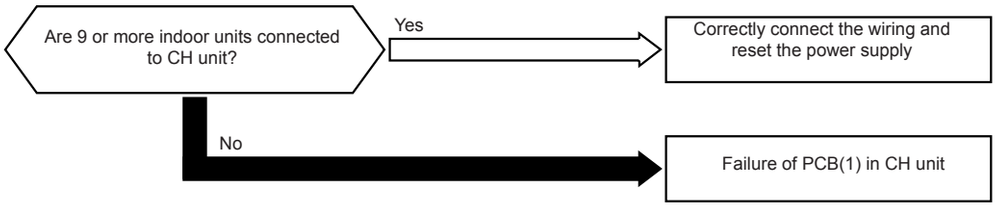
Alarm code	C2	Incorrect setting of the indoor unit connection number (CH unit).

- The unit number, alarm code ("35") and the unit code are alternately indicated in the temperature setting section of the indoor unit connected to the CH unit.
- LED (LED4, 5, 6) in PCB(1) of the CH unit flashes.

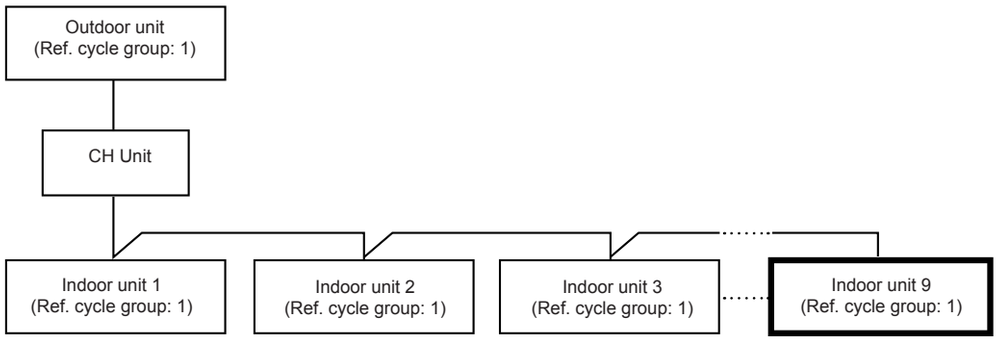
◆ Heat recovery system

This alarm is indicated when 9 or more indoor units are connected to the CH unit.

PCB1: Control PCB in Outdoor Unit
PCB(1): CH Unit PCB



- Alarm code "C2" will be indicated when the units are connected as follows.



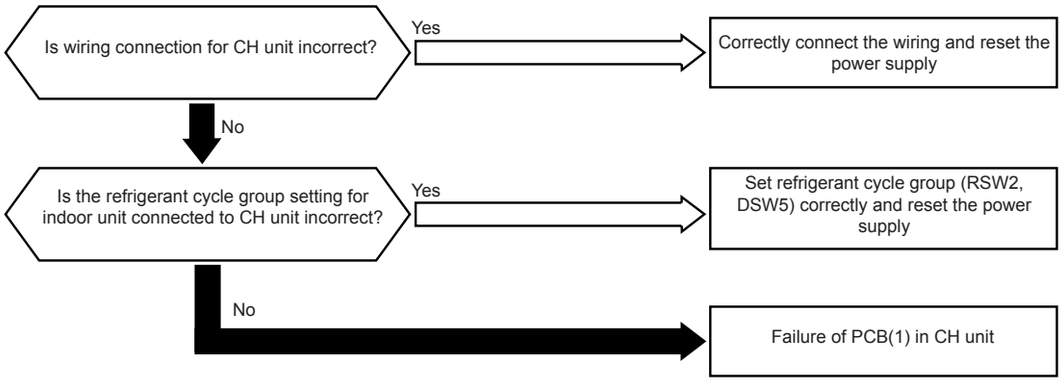
Alarm code	C3	Incorrect indoor unit connection (CH unit).

- The unit number, alarm code ("35") and the unit code are alternately indicated in the temperature setting section of the indoor unit connected to the CH unit.
- LED (LED5, 6) in PCB(1) of the CH unit flashes.

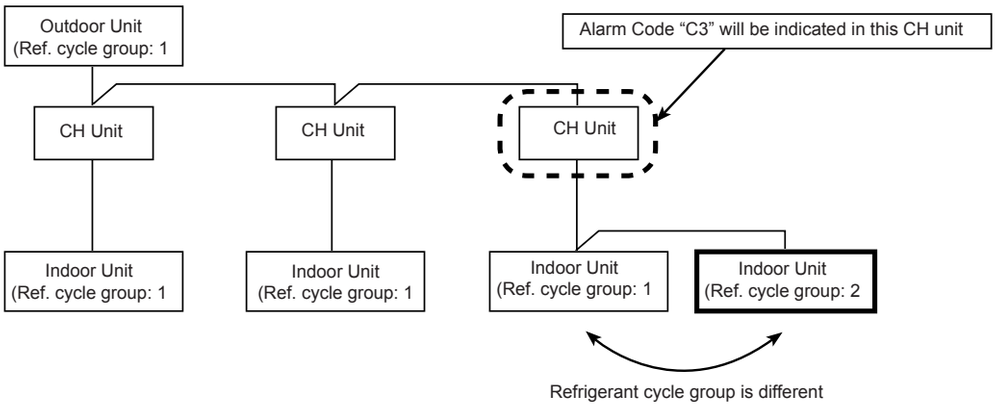
◆ Heat recovery system

This alarm is indicated when an indoor unit with a different refrigerant cycle group is connected to the CH unit.

PCB1: Control PCB in Outdoor Unit
PCB(1): CH Unit PCB



- Alarm code "C3" will be indicated when the units are connected as follows.

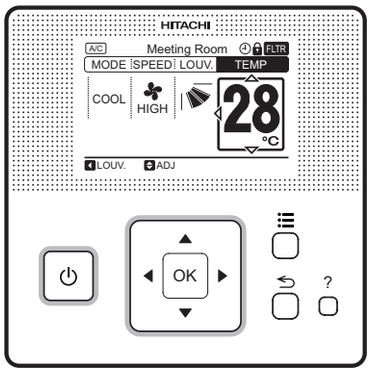


11.4 Troubleshooting in the check mode by using the remote control switch (PC-ARF example)

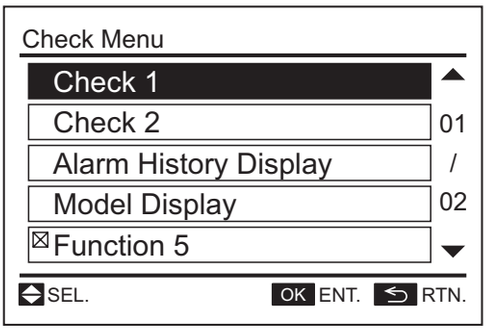
Each “Check menu” item and it’s function are explained in the following table:

Check menu item	Function
Check 1	Sensor condition of air conditioner will be monitored and indicated
Check 2	Sensor data of air conditioner prior to alarm accurrence will be indicated
Alarm history display	Previous alarm record (date, time, alarm code) will be indicated
Model display	Model name and manufacturing number will be indicated
I.U. / O.U. PCB Check	The result of PCB check will be indicated
Self checking	Checking of remote control switch will be carried out

Normal mode display

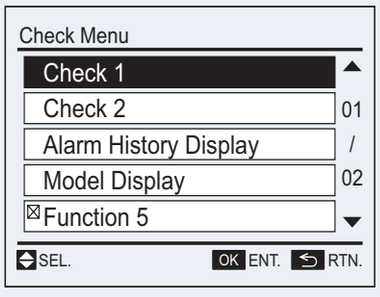
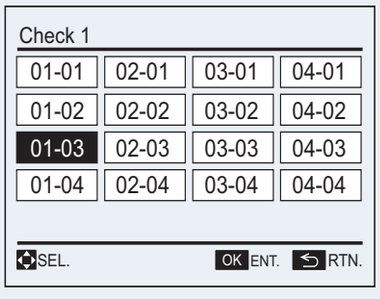


Check menu display

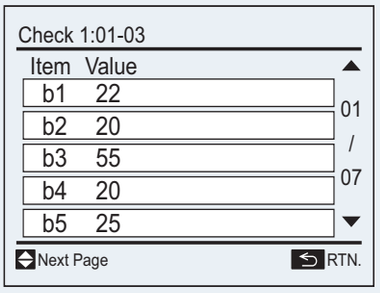


Press and hold “☰” (menu) and “?” (help) simultaneously for 3 seconds during the normal mode.

11.4.1 Check 1 and check 2

(1) Press and hold “☰” (menu) and “?” (help) simultaneously for 3 seconds during the normal mode. The check menu is displayed.	
(2) Select “Check 1” (or “Check 2”) form the check menu and press “OK”.	
(3) Select the set indoor unit by pressing “△ ▽ ◁ ▷” and press “OK”. (This screen is NOT displayed when the number of indoor unit connected with the remote control switch is 1 (one). In this case, (4) will be displayed.)	

(4) Press "△" or "▽" to change the screen.



Items of Check mode 1:

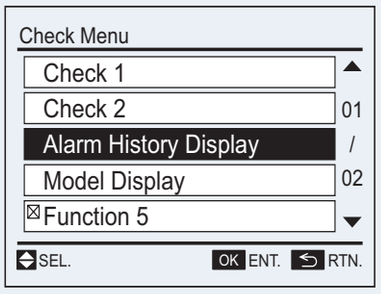
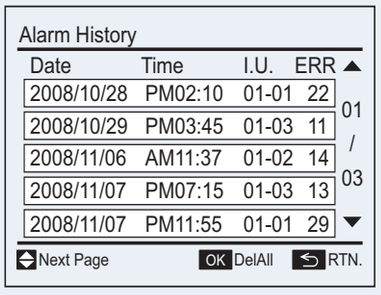
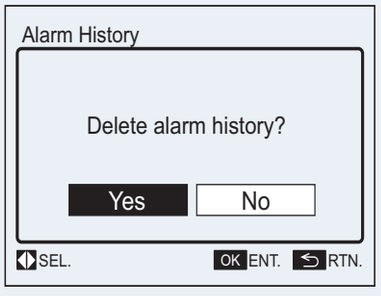
No.	Item	Data name	No.	Item	Data name
1	b1	Set Temp.	18	E3	Times of Abnormal Transmitting
2	b2	Inlet Air Temp.	19	E4	Times of Inverter Tripping
3	b3	Discharge Air Temp.	20	F1	Louver Sensor State
4	b4	Liquid Pipe Temp.	21	H1	Discharge Pressure
5	b5	Remote Thermistor Temp.	22	H2	Suction Pressure
6	b6	Outdoor Air Temp.	23	H3	Control Information
7	b7	Gas Pipe Temp.	24	H4	Operating Frequency
8	b8	Evaporating Temp. at Heating	25	J1	I.U. Capacity
9	b9	Condensing Temp. at Cooling	26	J2	O.U. Code
10	bA	Comp. Top Temp.	27	J3	Refrigerant Cycle Number (1)
11	bb	Thermo Temp. of Remote Control Switch	28	J4	Refrigerant Cycle Number (2)
12	bC	Not Prepared	29	L1	I.U. Expansion Valve
13	C1	I.U. Micro-Computer	30	L2	O.U. Expansion Valve 1
14	C2	O.U. Micro-Computer	31	L3	O.U. Expansion Valve 2
15	d1	Stopping Cause State Indication	32	L4	O.U. Expansion Valve B
16	E1	Times of Abnormality	33	P1	Comp. Current
17	E2	Times of Power Failure	34	q1	Motion Sensor Reaction Rate (0 ~ 100%)

Items of Check mode 2:

No.	Item	Data name	No.	Item	Data name
1	q1	Inlet Air Temp.	9	q9	Discharge Pressure
2	q2	Discharge Air Temp.	10	qA	Suction Pressure
3	q3	Liquid Pipe Temp.	11	qb	Control Information
4	q4	Outdoor Air Temp.	12	qC	Operating Frequency
5	q5	Gas Pipe Temp.	13	qd	I.U. Expansion Valve
6	q6	Evaporating Temp. at Heating	14	qE	O.U. Expansion Valve 1
7	q7	Condensing Temp. at Cooling	15	qF	Comp. Current
8	q8	Comp. Top Temp.			

11.4.2 Alarm history display

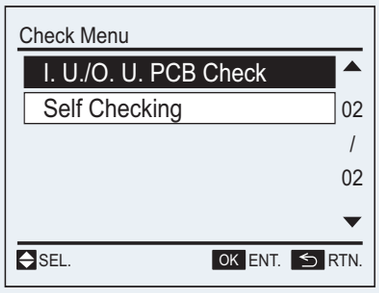
The alarm history display is available to be set from the check menu.

(1) Press and hold "☰" (menu) and "?" (help) simultaneously for 3 seconds during the normal mode. The check menu is displayed.	
(2) Select "Alarm History Menu" form the check menu and press "OK".	
(3) The alarm history display is switched by pressing "△" or "▽".	
(4) To delete the alarm history, press "OK". The confirmation screen will be displayed. Select "YES" and press "OK". The alarm history is deleted and the screen will return to (3). If "NO" is pressed, the screen will return to (3).	

11.4.3 I.U. / O.U. PCB Check

(1) Press and hold "☰" (menu) and "?" (help) simultaneously for 3 seconds during the normal mode.

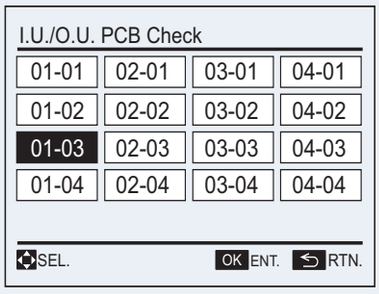
The check menu is displayed.



(2) Select "I.U./O.U. PCB Check" form the check menu and press "OK".

(3) Select the set indoor unit by pressing "△ ▽ ◁ ▷" and press "OK".

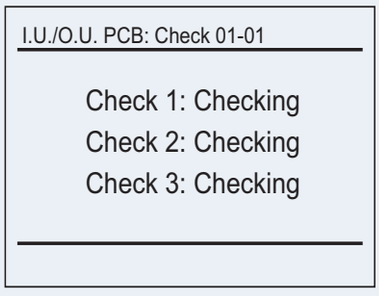
(This screen is NOT displayed when the number of indoor unit connected with the remote control switch is 1 (one). In this case, (4) will be displayed.)



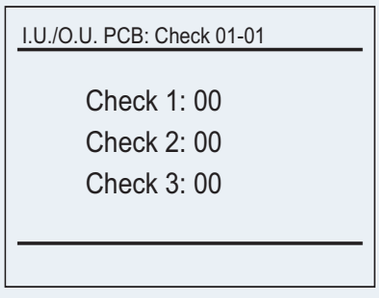
(4) The indoor unit PCB and the outdoor unit PCB check are started.

* If "☰" (menu) is pressed during the check, the check is canceled and the screen will return to (2).

* If return is pressed during the check, the check is canceled and the screen will return to (3).



(5) After completing the check, the result of PCB check will be indicated. Press return abd return to (3).



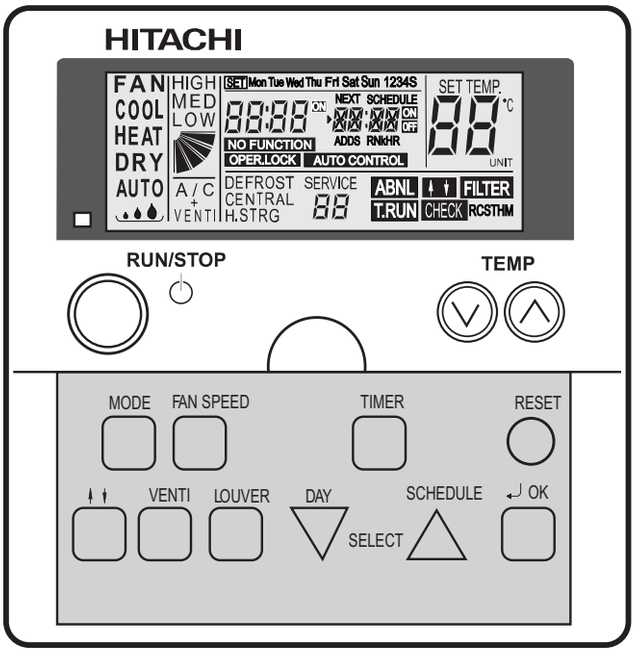
Result of check table:

Indoor Unit PCB		Outdoor Unit PCB	
00	Normal	00	Normal
01	Abnormality of Inlet Air Temp. Thermistor	07	Abnormality of Transmission of Outdoor Unit
02	Abnormality of Outlet Air Temp. Thermistor	F4	ITO Input Failure
03	Abnormality of Liquid Pipe Temp. Thermistor	F5	PSH Input Failure
04	Abnormality of Remote Thermistor	F6	Abnormality of Protection Signal Detection Circuit
05	Abnormality of Gas Pipe Temp. Thermistor	F7	Abnormality of Phase Detection
08	Abnormality of Transmission of Central Station	F8	Abnormality of Transmission of Inverter
0A	Abnormality of EEPROM	FA	Abnormality of High Pressure Sensor
0b	Zero Cross Input Failure	Fb	Abnormality of Comp. Discharge Gas Temp. Thermistor
EE	Abnormality of Transmission of I.U. during Check	FC	Abnormality of Low Pressure Sensor
		Fd	Abnormality of Evaporating Temp. Thermistor at Heating
		FF	Abnormality of Ambient Air Temp. Thermistor

11.5 Troubleshooting in the check mode by using the remote control switch (PC-ART example)

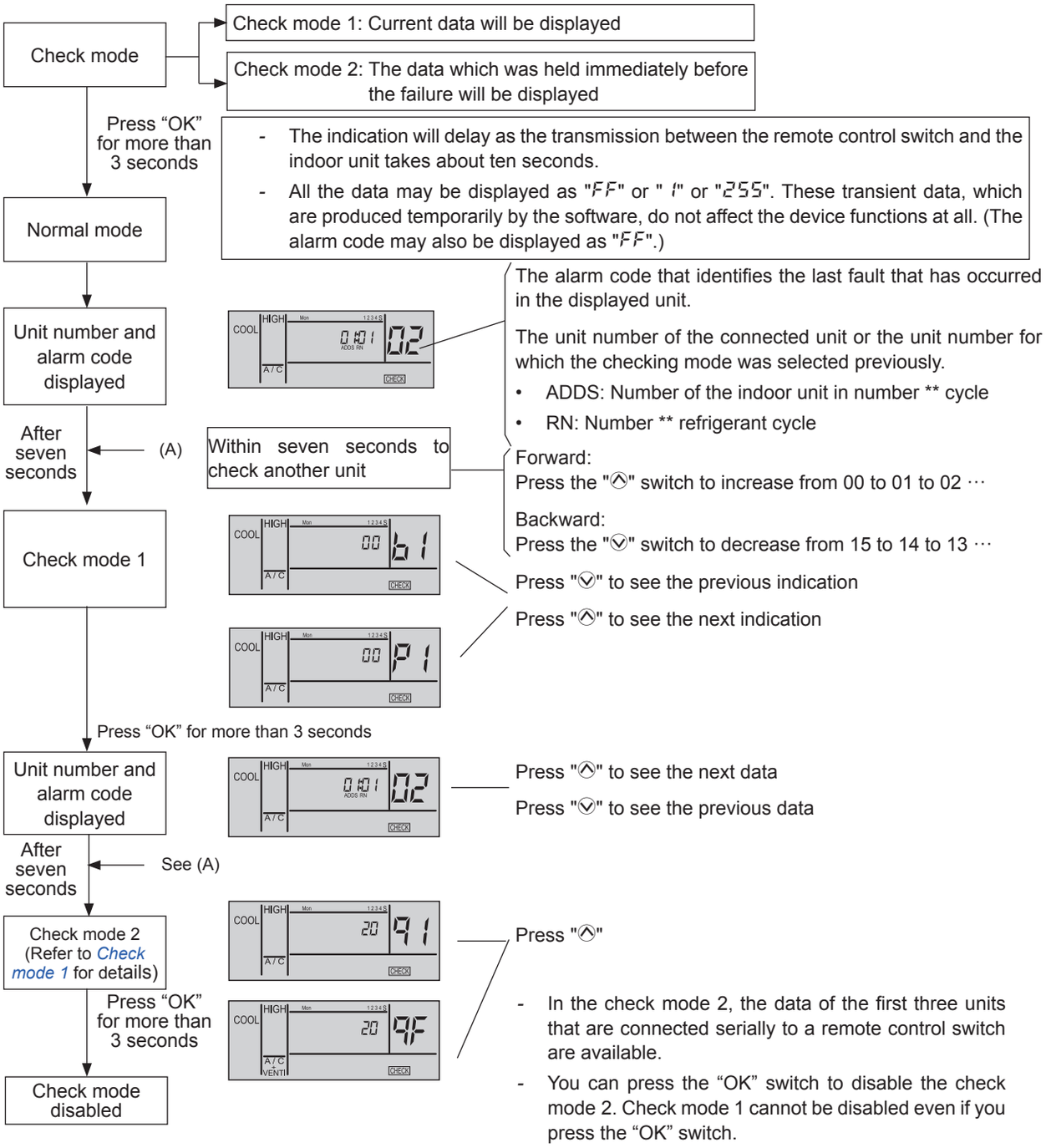
Each “Check menu” item and it’s function are explained in the following table:

Check menu item	Function
Check 1	Sensor condition of air conditioner will be monitored and indicated
Check 2	Sensor data of air conditioner prior to alarm accurrence will be indicated
I.U. / O.U. PCB Check	The result of PCB check will be indicated
Self checking	Checking of remote control switch will be carried out



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.

11.5.1 Check 1 and check 2



Items of Check mode 1:

No.	Item	Data name	No.	Item	Data name
1	b1	Set Temp.	17	E3	Times of Abnormal Transmitting
2	b2	Inlet Air Temp.	18	E4	Times of Inverter Tripping
3	b3	Discharge Air Temp.	19	F1	Louver Sensor State
4	b4	Liquid Pipe Temp.	20	H1	Discharge Pressure
5	b5	Remote Thermistor Temp.	21	H2	Suction Pressure
6	b6	Outdoor Air Temp.	22	H3	Control Information
7	b7	Gas Pipe Temp.	23	H4	Operating Frequency
8	b8	Evaporating Temp. at Heating	24	J1	I.U. Capacity
9	b9	Control information	25	J2	O.U. Code
10	bA	Comp. Top Temp.	26	J3	Refrigerant Cycle Number (1)
11	bb	Thermo Temp. of Remote Control Switch	27	J4	Refrigerant Cycle Number (2)
12	C1	I.U. Micro-Computer	28	L1	I.U. Expansion Valve
13	C2	O.U. Micro-Computer	29	L2	O.U. Expansion Valve 1
14	d1	Stopping Cause State Indication	30	L3	O.U. Expansion Valve 2
15	E1	Times of Abnormality	31	L4	O.U. Expansion Valve B
16	E2	Times of Power Failure	32	P1	Comp. Current

Items of Check mode 2:

No.	Item	Data name	No.	Item	Data name
1	q1	Inlet Air Temp.	9	q9	Discharge Pressure
2	q2	Discharge Air Temp.	10	qA	Suction Pressure
3	q3	Liquid Pipe Temp.	11	qb	Control Information
4	q4	Outdoor Air Temp.	12	qC	Operating Frequency
5	q5	Gas Pipe Temp.	13	qd	I.U. Expansion Valve
6	q6	Evaporating Temp. at Heating	14	qE	O.U. Expansion Valve 1
7	q7	Condensing Temp. at Cooling	15	qF	Comp. Current
8	q8	Comp. Top Temp.			

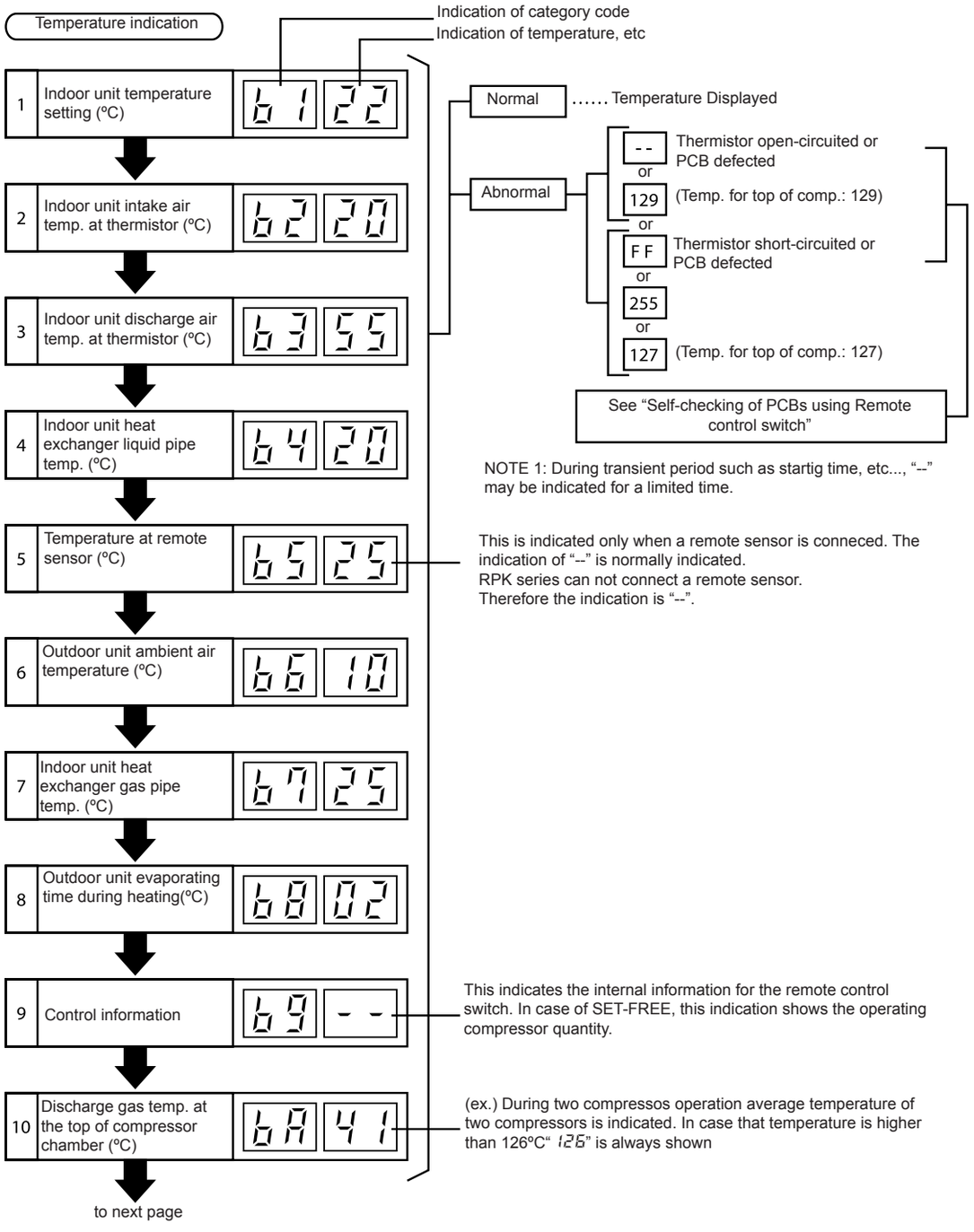
Even though the wireless remote control is used for the wall type indoor unit with integrated receiver, the alarm code can be checked by connecting the PC-ART to the unit connector and pressing the operation switch.

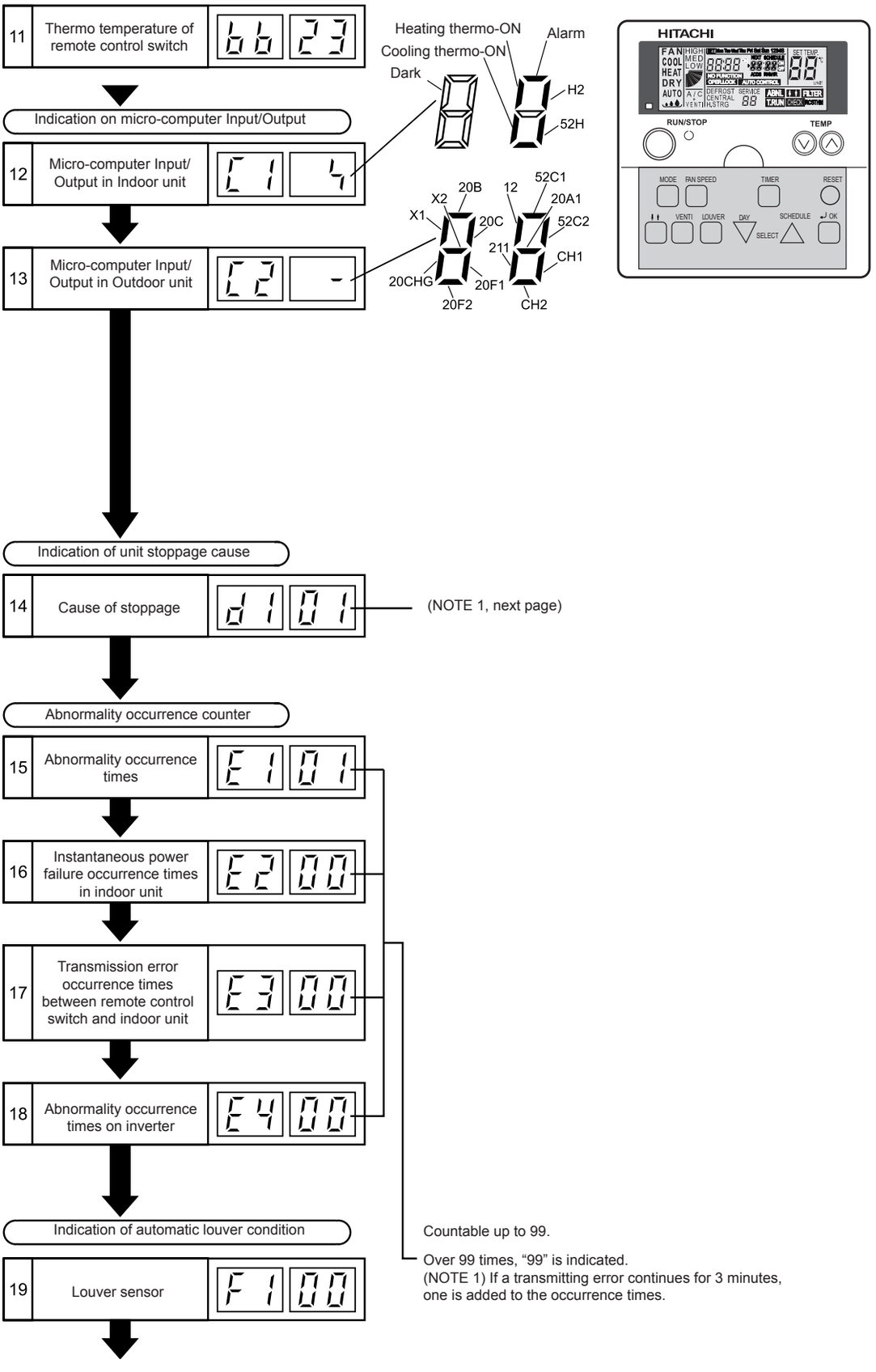
NOTE

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

Contents of Check mode 1

The following indication is displayed when the "▲" pushbutton is pressed, which is located below the TEMP indication on the remote control. If the "▼" pushbutton is pressed, the prior indication is displayed.



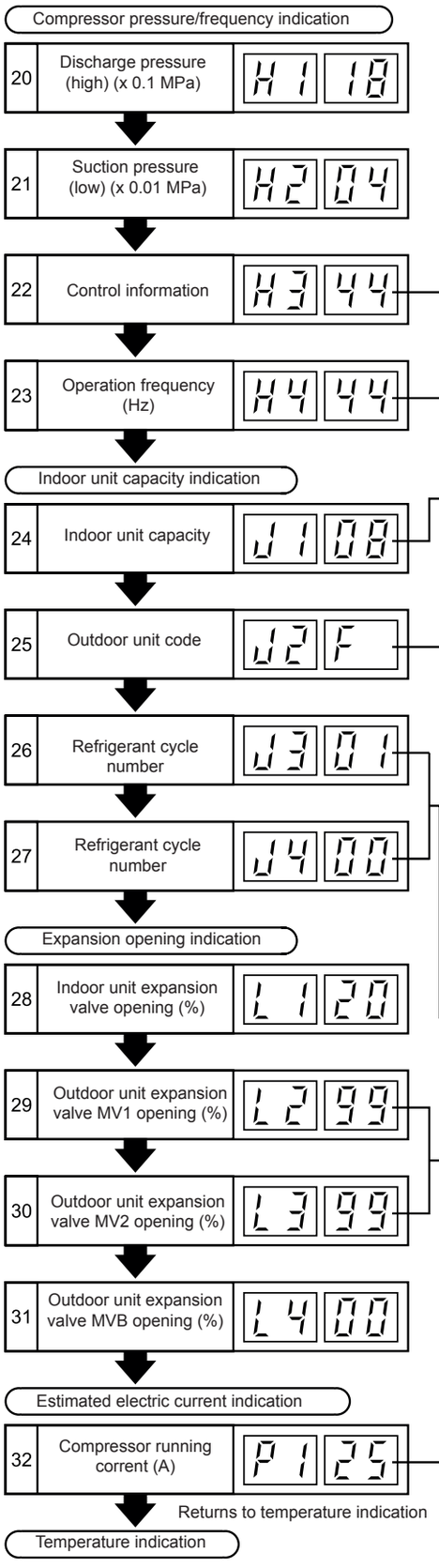

11
Thermo temperature of remote control switch
b b 2 3
Indication on micro-computer Input/Output
12
Micro-computer Input/ Output in Indoor unit
C 1
4
13
Micro-computer Input/ Output in Outdoor unit
C 2
-
Heating thermo-ON
Alarm
Cooling thermo-ON
Dark
H2
52H
X2
20B
12
52C1
20A1
X1
20C
52C2
211
CH1
20CHG
20F1
20F2
CH2
HITACHI
RUN/STOP
TEMP
MODE
FAN SPEED
TIMER
RESET
VENTI
LOUVER
DAY
SCHEDULE
OK
SELECT
Indication of unit stoppage cause
14
Cause of stoppage
d 1 0 1
(NOTE 1, next page)
Abnormality occurrence counter
15
Abnormality occurrence times
E 1 0 1
16
Instantaneous power failure occurrence times in indoor unit
E 2 0 0
17
Transmission error occurrence times between remote control switch and indoor unit
E 3 0 0
18
Abnormality occurrence times on inverter
E 4 0 0
Indication of automatic louver condition
19
Louver sensor
F 1 0 0
Countable up to 99.
Over 99 times, “99” is indicated.
(NOTE 1) If a transmitting error continues for 3 minutes, one is added to the occurrence times.

NOTE

Cause of stoppage

Cause of stoppage	
00	Operation OFF, Power supply OFF
01	Thermo-OFF (NOTE 2), float switch activation
02	Alarm (NOTE 3)
03	Freezing protection, overheat protection
05	Instantaneous power supply failure in the outdoor unit, reset (NOTE 4)
06	Instantaneous power supply failure in the indoor unit, restart (NOTE 5)
07	Stoppage of the cooling operation due to low outdoor air temperature, stoppage of the heating operation due to high outdoor air temperature
09	Reversing valve changeover stoppage
10	Demand enforced stoppage
11	Retry due to a decrease of pressure ratio
12	Retry due to an increase of low pressure
13	Retry due to an increase of high pressure
14	Retry due to abnormal current in the constant speed compressor
15	Retry due to abnormal high discharge gas temperature, suction pressure excessively low
16	Retry due to a decrease of discharge gas superheat
17	Retry due to Inverter abnormality
18	Retry due to a decrease in voltage, another retry due to the Inverter
19	Expansion valve opening change protection
21	Thermo-OFF due to oil return control
22	Hot start of the outdoor unit
26	Retry due to a decrease of high pressure
28	Cold draft control
30	Thermo-OFF due to compressor forced stop
32	Retry due to a excessive outdoor unit number

- *Explanation of the term: Thermo-ON: condition by which an indoor unit is requesting the compressor to operate. Thermo-OFF: condition by which an indoor unit is not requesting the compressor operate.*
- *Even if stoppage is caused by "Alarm", "02" is not always displayed.*
- *If the transmission between the Inverter printed circuit board and the control printed circuit board is not carried out for 30 seconds, the outdoor unit stops. In this case, the cause of the stoppage is d1-05 and the alarm code "04" may be indicated.*
- *If the transmission between the indoor unit and the outdoor unit is not carried out for 3 minutes, the indoor units stop. In this case, the cause of stoppage is d1-06 and the alarm code "03" may be displayed.*



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

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

Capacity Code of Indoor Unit

Indication code	Equivalent capacity (HP)
05	0.6
06	0.8
08	1.0
10	1.3
13	1.5
14	1.8
16	2.0
18	2.3
20	2.5
22	2.8
26	3.0
32	4.0
40	5.0
64	8.0
80	10.0

"n" indicates total number of indoor units

n = 1~9, A, b, C, d, E, F, U
(10) (11) (12) (13) (14) (15) (16)

J3: 01 to 16
(01: when shipment (DSW5), decimal indication)
J4: 00 to 0F
(00: when shipment (DSW5), indication with 16 numbers)

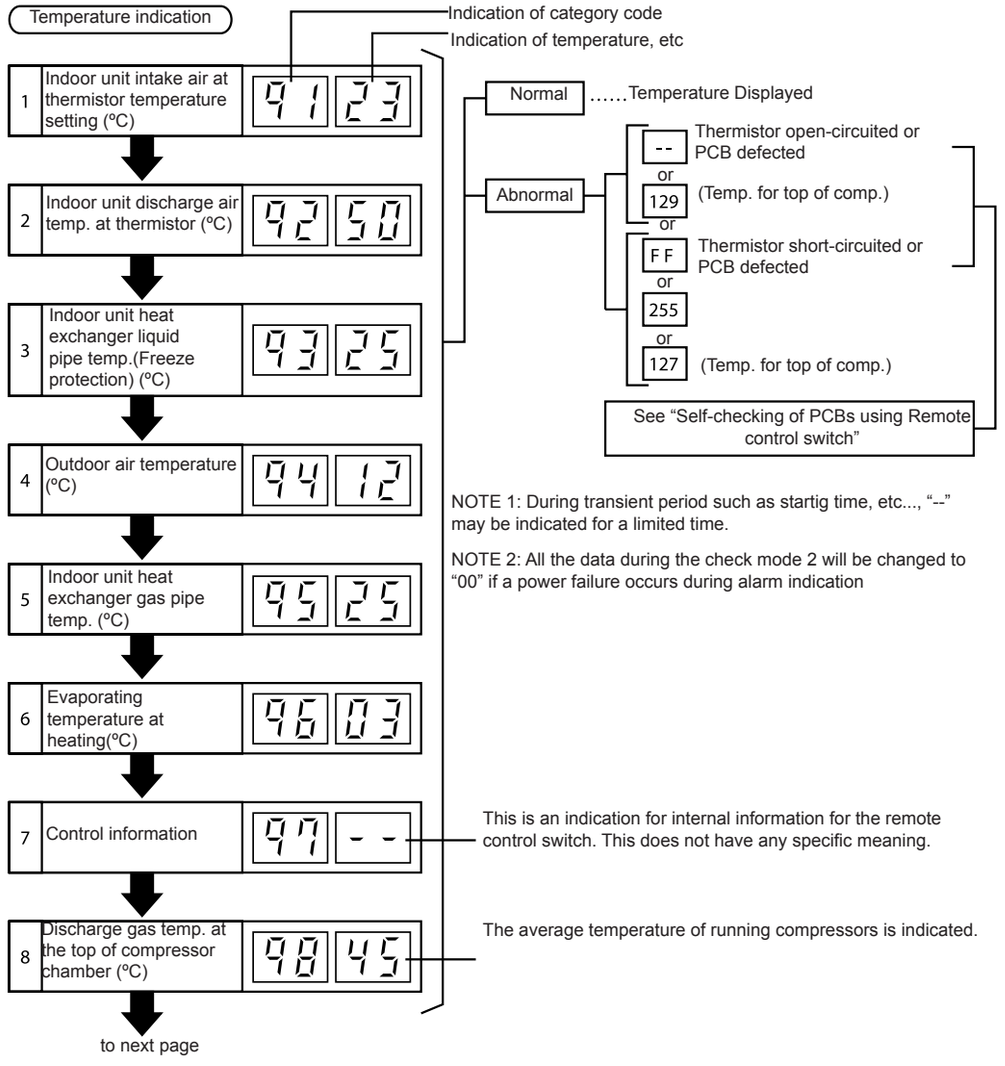
In case of models without expansion valve (MV2), the same figure is indicated

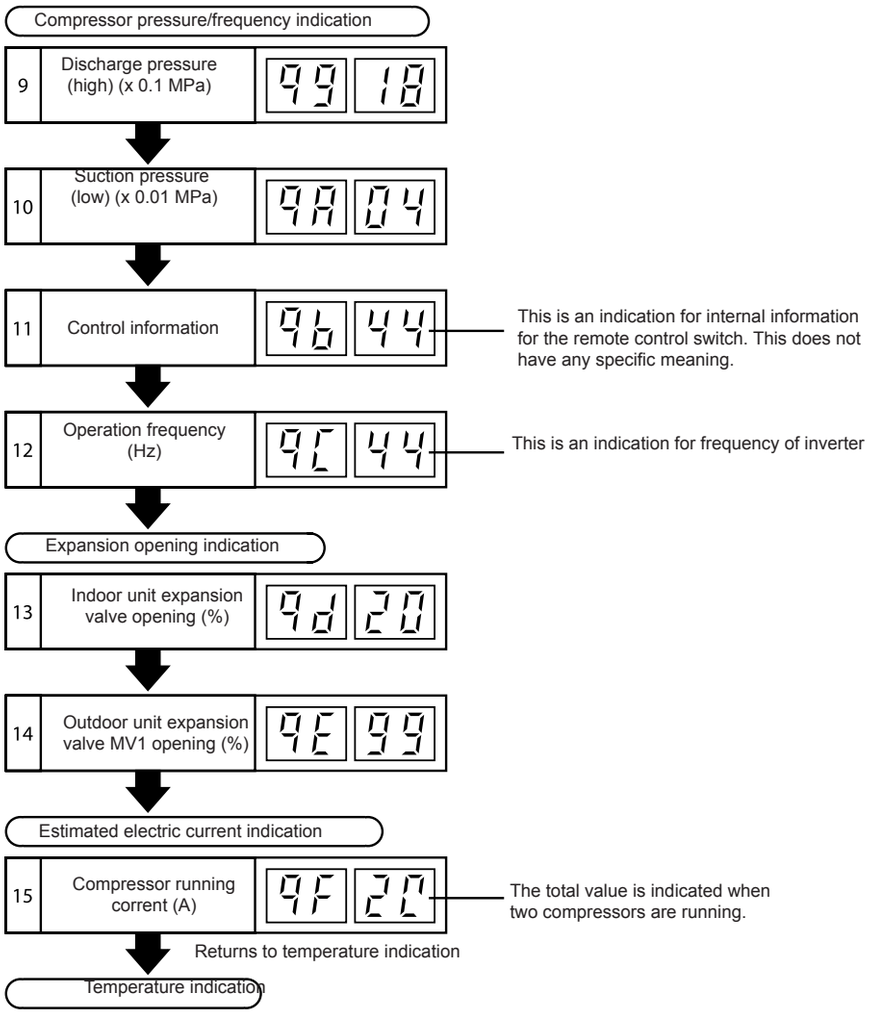
The total current is indicaed when several compressors are running. In case of inverter compressor, the running current of primary side of inverter is indicated

Contents of Check mode 2

The latest data for the three first indoor units that are connected in series are indicated when there are more than three indoor units connected to one remote control switch.

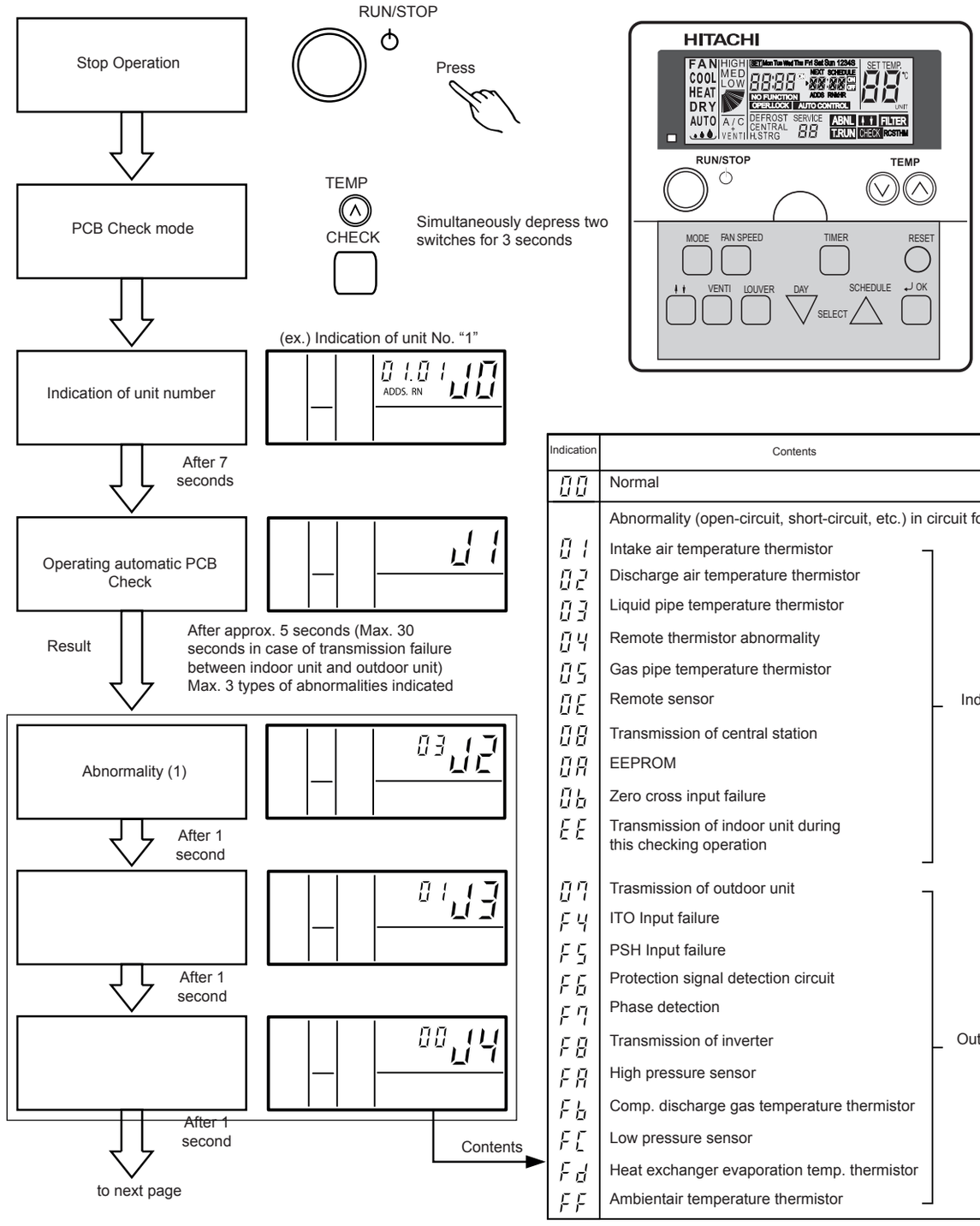
Pressing the "▲" pushbutton located under the TEMP indication on the remote control will display the following indication. If the "▼" pushbutton is pressed, the prior indication is displayed.




Compressor pressure/frequency indication
9
Discharge pressure (high) (x 0.1 MPa)
99 18
10
Suction pressure (low) (x 0.01 MPa)
9A 04
11
Control information
9b 44
This is an indication for internal information for the remote control switch. This does not have any specific meaning.
12
Operation frequency (Hz)
9C 44
This is an indication for frequency of inverter
Expansion opening indication
13
Indoor unit expansion valve opening (%)
9d 20
14
Outdoor unit expansion valve MV1 opening (%)
9E 99
Estimated electric current indication
15
Compressor running corrent (A)
9F 2C
The total value is indicated when two compressors are running.
Returns to temperature indication
Temperature indication

11.5.2 I.U. / O.U. PCB check (PC-ART example)

The following troubleshooting procedure is used for carrying out function test of the indoor and outdoor unit PCBs.

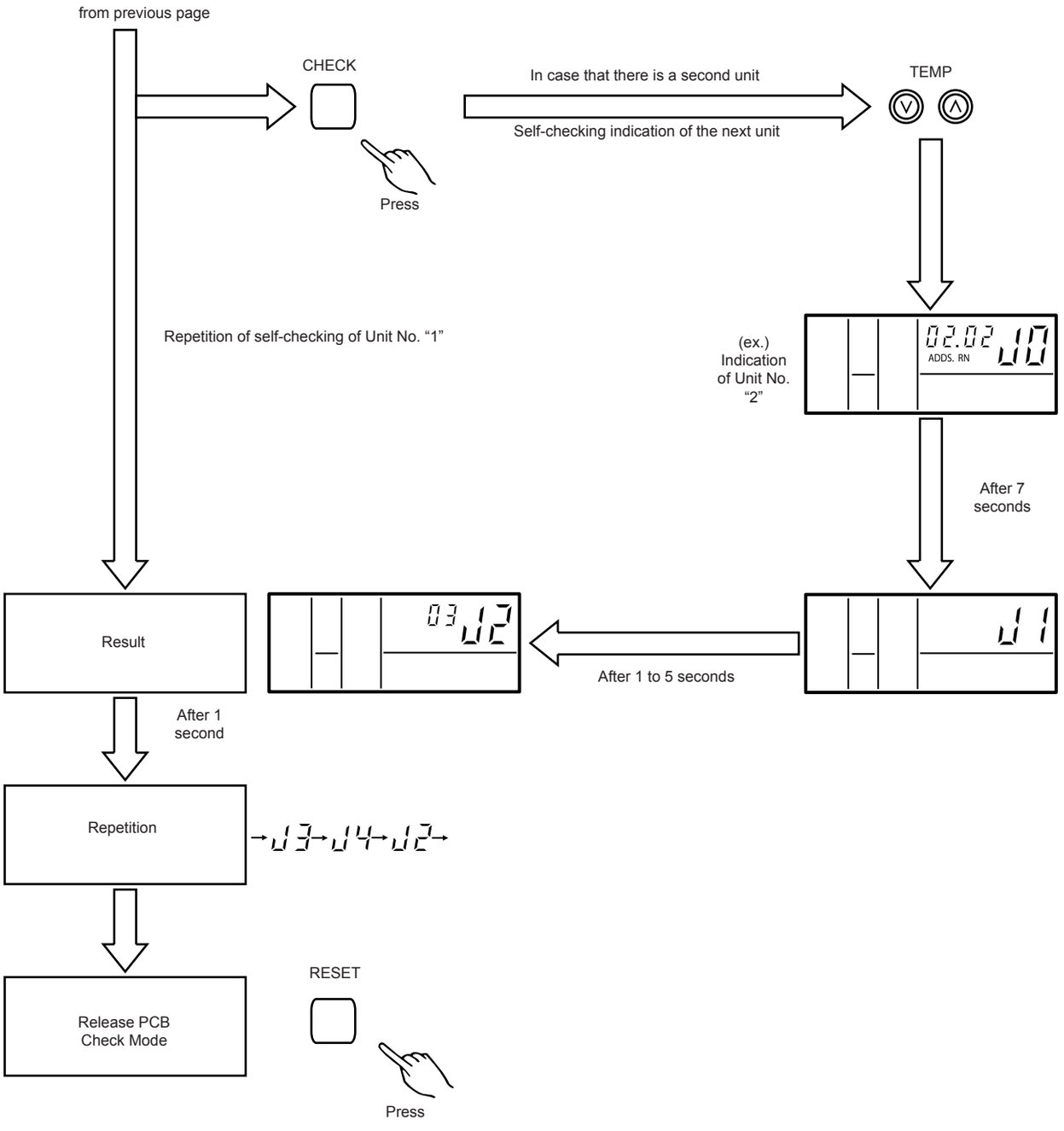


NOTE

In order to carry out the prior check, in the case the wireless remote control is used, carry out the following procedures:

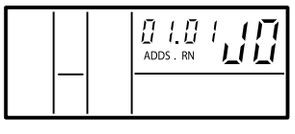
1. *Turn OFF the power supply.*
2. *Place contact no.1 of the wireless receiver's SW3 to the ON position.*
3. *Connect the PC-ART remote control to the terminal board.*
4. *Turn ON the power supply.*

Once the check has been carried out, turn OFF the electrical power supply and return the connectors to the way they were before the check.



NOTE

1 *If this indication is continuous and "J1" is not displayed, this indicates that each one of the indoor units is not connected to the remote control. Check the wiring between the remote control and the indoor unit.*



2 *During this troubleshooting procedure, the check of the following PCB parts is not available: Indoor unit PCB: relay circuit, DSW switches, option circuit, fan circuit, protection circuit.Outdoor unit PCB: relay circuit, DSW switches, option circuit.*

3 *In the case this troubleshooting procedure is carried out in the system using the central station, the indication on the central station may change during this procedure. However, this is not abnormal.*

11.6 Troubleshooting by using the 7-segment display

NOTE

Only the authorized person can carry out checks using this method.

The operating conditions and each part of the refrigerant cycle can be checked with the 7-segment display and push switches on the PCB1 in the outdoor unit.

11.6.1 Before carrying out checks

(a) Turn ON the main power supply switch. Wait more than 20 seconds before starting the checks.

(b) Check items:

- Connection information.
- Information of the outdoor unit.
- Information of the indoor unit.
- Information of the cause of the alarm code.
- Alarm code historical information.

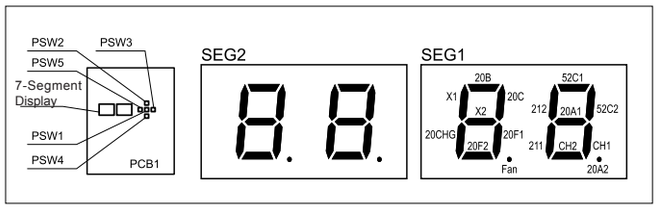
(c) Check the location of the 7-segment display and the pushswitches.

DANGER

The PCB and the electrical components are powered by AC 230 V. Never touch the electrical parts and the cables when carrying out the checks.

11.6.2 Location of the pushswitches and the 7-segment display

The pushswitches and the 7-segment display are located on PCB1.



11.6.3 Protection control code on the 7-segment display

- A protection control code is displayed on the 7-segment display during the operation when the protection control has been activated.
- A protection control code is displayed while the function is operating, and it is cancelled when it is released.
- When several protection controls are activated, the code number with the highest priority is displayed (see below for the order of priority).

(a) Higher priority will be given to the protection control related with the frequency control.

<1> Pressure ratio control
<2> High pressure increase protection
<3> Current protection
<4> Inverter fin temperature increase protection
<5> Discharge gas temperature increase protection
<6> Low pressure decrease protection
<7> Demand current control (running current limit control)
<8> Low pressure increase protection
<9> High pressure decrease protection

(b) Regarding the retry control, the lastest retry code will be indicated unless the protection control related with the frequency control is indicated.

Code			Protection control	Code during the degeneration control		
P	0	1	Pressure ratio protection control	P	c	1
P	0	2	High pressure increase protection	P	c	2
P	0	3	Inverter current protection	P	c	3
P	0	4	Inverter fin temperature increase protection	P	c	4
P	0	5	Discharge gas temperature increase protection at the upper part of the compressor	P	c	5
P	0	6	Low pressure decrease protection			
P	0	9	High pressure decrease protection			
P	0	A	Demand current protection control			
P	0	d	Low pressure increase protection			

Code			Retry control	Code during the degeneration control
P	1	1	Pressure ratio decrease retry	Without
P	1	2	Low pressure increase retry	
P	1	3	High pressure increase retry	
P	1	4	Constant speed compressor overcurrent retry	
P	1	5	Discharge gas temperature increase retry / Low pressure decrease retry	
P	1	6	Discharge gas super-heat decrease retry	
P	1	7	Inverter anomaly retry	
P	1	8	Abnormal Inverter voltage retry / Inverter failure retry	
P	2	6	High pressure decrease retry	

NOTE

(1) The retry indication is prolonged for 30 minutes unless a protection control is indicated.

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

(3) The protection control code indicated on the 7 segment display changes to an alarm code when the abnormal operation occurs. Also, the same alarm code is indicated on the remote control.

(4) In the case that the degeneration control is activated, indications Pc1 to Pc5 are displayed instead of P01 to P05.

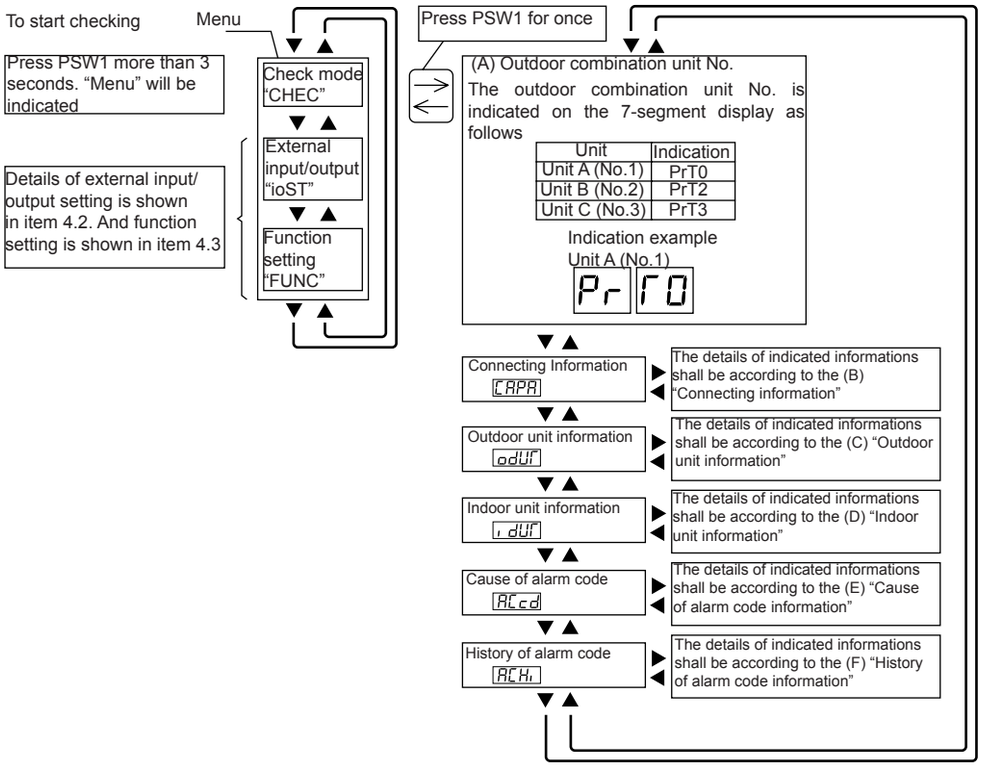
11.6.4 Activation condition of the protection retry control code

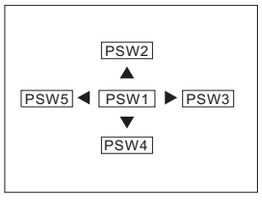
The protection control or the retry control is carried out to prevent abnormal operation. The activation conditions are listed in the following table.

Code	Protection control	Activation conditions		Notes
P01	Pressure ratio protection control	Compression ratio Ɛ ≥ 8.5 or compression ratio Ɛ ≤ 2.0		-
P02	High pressure increase protection	Discharge pressure Pd ≥ 3.45 (in cooling mode) Pd ≥ 3.35 (in heating mode and in heat recovery mode)		-
P03	Inverter current protection	Inverter output current ≥ (a) A		-
		Inv. Comp.	(a)	
		DA50PHD	17.5	
		DA65PHD	19.5	
P04	Inverter fin temperature increase protection	Inverter fin temperature ≥ 80 °C		-
P05	Discharge gas temperature increase protection	Temperature of the upper part of the compressor Td ≥ 112 °C		-
P06	Low pressure decrease protection	Suction pressure Ps ≤ 0.1 MPa		-
P09	High pressure decrease protection	Discharge pressure Pd ≤ 1.0 MPa		-
P0A	Demand current protection control	Compressor running current ≥ Demand current setting value		Demand current setting value: the Upper limit of the total running current is set to 100%, 80%, 70%, 60% and 40% in normal operation.
P0d	Low pressure increase protection	Suction pressure ≥ 1.3 MPa		-

Code	Retry control	Activation conditions		Notes
P11	Pressure ratio decrease retry	Pressure ratio Ɛ < 1.8		When activating three times in thirty minutes, alarm code "43" is indicated.
P12	Low pressure increase retry	Ps > 1.4 MPa		When activating three times in thirty minutes, alarm code "44" is indicated.
P13	High pressure increase retry	Pd ≥ 3.8 MPa		When activating three times in thirty minutes, alarm code "45" is indicated.
P14	Constant speed compressor overcurrent retry	* ico < 2.5 A over 50 ms * ico ≥ icomax over 50 ms ico: running current of the constant speed compressor icomax: maximum current of the constant speed compressor		When activating three times in thirty minutes, alarm code "39" is indicated.
		Constant speed compressor	icomax	
			400 V	
		E655	15.5 A	
P15	Discharge gas temperature increase retry	Discharge gas temperature ≥ 132 °C for more than 10 minutes, or Discharge gas temperature ≥ 140 °C for more than 5 seconds		When activating three times in sixty minutes, alarm code "08" is indicated.
	Low pressure decrease retry	Ps < 0.09 MPa more than 12 minutes		When activating three times in sixty minutes, alarm code "47" is indicated.
P16	Discharge gas super-heating decrease retry	Discharge gas superheat ≤ Tc + 10 °C more than 30 minutes Tc: Saturation temperature		When activating three times in one hundred and twenty minutes, alarm code "07" is indicated.
P17	Inverter anomaly retry	Instantaneous overcurrent		When activating six times in thirty minutes, alarm code "48" is indicated.
		Abnormal current sensor		When activating three times in thirty minutes, alarm code "51" is indicated.
		IPM error		When activating seven times in thirty minutes, alarm code "53" is indicated.
		Fin temperature ≥ 100 °C		When activating three times in thirty minutes, alarm code "54" is indicated.
P18	Inverter voltage anomaly retry	Insufficient voltage in the Inverter circuit		When activating three times in thirty minutes, alarm code "06" is indicated.
		Excessive voltage in the Inverter circuit		When activating three times in thirty minutes, alarm code "06" is indicated.
	Inverter failure retry	The actual Inverter frequency is 0 Hz more than 3 seconds after the Inverter frequency is outputted		When activating three times in thirty minutes, alarm code "55" is indicated.
P26	High pressure decrease retry	Pd < Ta / 130 + 0.1 MPa more than 4 minutes, or Pd < 1.0 MPa more than 60 minutes Ta: Ambient temperature		No alarm.
Ps: Compressor suction pressure; Pd: compressor discharge pressure.				

11.6.5 Check method by checking mode





PSW push switch on PCB1

PSW1: enter.

PSW2, 3, 4 and 5: for checking.

- To cancel the check method.

  Press PSW1 for more than three seconds while the "menu mode" is displayed.

  The indication on the LCD screen will be turned OFF and condition will return to normal.

NOTE

Ensure the check mode is cancelled after the checks have been carried out.

◆ Connection information

This information is indicated on unit A (main unit) only.

Press PSW4 (▼) to move forward or PSW2 (▲) to move back.

Select the outdoor unit No. for indication.

Press PSW3 (►) for detailed information on the selected unit No.:

Unit	Indication
Unit A (No. 1)	od00
Unit B (No. 2)	od02
Unit C (No. 3)	od03

Press PSW4 (▼) to move forward or PSW2 (▲) go back.

This information will be alternatively indicated as "Item" → "Details".

Press PSW5 (◄) to return to the outdoor unit No. selection.

Item		7-segment display		Details
		SEG2	SEG1	
1	Total capacity of the connected outdoor units	o	CP	Total capacity of the combination of outdoor units Refer to the "Capacity table for the outdoor units".
2	Constitution quantities of the outdoor units	o	AA	Constitution quantities of outdoor unit combination
3	Total capacity of the connected indoor units	i	CP	Total capacity of the connected indoor units
4	Number of connected indoor units	i	AA	Number of connected indoor units
5	Refrigerant group		GA	Refrigerant group number (0 to 64)
6	Total capacity of the operating indoor units		oP	Total capacity of the operating indoor units. Refer to the "Capacity table for the indoor units".
7	Total compressor frequency		Hz	Units: Hz
8	Accumulated operating time		UJ	Units: hour (indication x 10 hours)

◆ Information for the outdoor unit

Select the outdoor unit combination number for indication.

When changing the selection, press PSW4 (▼) to move forward or PSW2 (▲) to move back.

Select the outdoor unit combination number by pressing PSW4 or PSW2.

Unit	Indication
Unit A (No. 1)	od00
Unit B (No. 2)	od02
Unit C (No. 3)	od03

Press PSW3 (►) for detailed information.

Press PSW4 (▼) to move forward or PSW2 (▲) to go back.

This information will be indicated alternating as “Item” → “Details”.

Press PSW5 (◄) to return to the outdoor unit combination number selection.

Indication details:

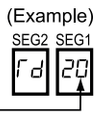
Item		7-segment display		Details
		SEG2	SEG1	
1	Capacity of the outdoor unit	CA	0	Unit capacity indication. Refer to the "Capacity table for the outdoor units".
2	Output status of the outdoor unit microcomputer	SC	0	Output status of the outdoor unit microcomputer. Refer to section "location of pushswitches and the 7-segment display".
3	Running frequency of the Inverter compressor MC1	H1	0	Running frequency of Inverter compressor indication (Hz)
4	Total number of compressors running	CC	0	Indication of the total number of compressors running
5	Air flow rate	Fo	0	Air flow rate indication (0 to 25 steps)
6	Opening of the expansion valve MV1 of outdoor unit	E1	0	Opening indication of the expansion valve MV1 for outdoor unit (Unit: %)
7	Opening of the expansion valve MVB of the outdoor unit for bypass	Eb	0	Opening indication of the expansion valve MVB for the bypass indication (Unit: %)
8	Discharge pressure (High)	Pd	0	Unit: MPa Thermistor open circuit indication: 5.62 Thermistor short-circuit indication: -0.62

Item		7-segment display		Details
		SEG2	SEG1	
9	Suction pressure (Low)	PS	0	Unit: MPa Thermistor open circuit indication: 2.25 Thermistor short-circuit indication: -0.25
10	Ambient air temperature (Ta)	Ta	0	Unit: °C Thermistor open circuit indication: - 127 Thermistor short-circuit indication: 127
11	Discharge gas temperature at the upper part of the compressor MC1 (TD1)	Td	10	Units °C Thermistor open circuit indication: 0 Thermistor short-circuit indication: 255
12	Discharge gas temperature at the upper part of the compressor MC2 (TD2)	Td	20	Unit: °C Thermistor open circuit indication: 0 Thermistor short-circuit indication: 255 Only 14 HP to 18 HP
13	Evaporating temperature TE in heating	TE	0	Unit: °C Thermistor open circuit indication: - 127 Thermistor short-circuit indication: 127
14	Gas temperature in the outdoor unit heat exchanger	TG	0	Unit: °C Thermistor open circuit indication: - 127 Thermistor short-circuit indication: 127
15	Super-cooling temperature	TC	H0	Unit: °C Thermistor open circuit indication: - 127 Thermistor short-circuit indication: 127
16	Super-cooling temperature in the by-pass	Tb	C0	Unit: °C Thermistor open circuit indication: - 127 Thermistor short-circuit indication: 127
17	Inverter fin temperature	TF	,0	Unit: °C
18	Fan controller fin temperature	TF	F0	Units °C
19	Compressor MC1 current *1)	A1	0	Unit: A
21	Fan motor MFO1 current *1)	AF	0	Unit: A
22	Compressor MC1 accumulated operating time	UJ	10	Unit: hour (indication x 10 hours)
24	Compressor MC1 accumulated operating time	cU	10	Unit: hour (Indication x 10 hours) The accumulated operating time can be reset. *2)
26	Cause of the Inverter stoppage	,F	10	Refer to the "Inverter stoppage cause table". *3)
27	Cause for fan controller stoppage	FF	10	Refer to the "Cause for fan controller stoppage" *4)

*1) The indicated current is a reduced value. Use a clamp meter for the current precise value.

*2) To reset the accumulated operating time, press "PSW1 and PSW3" for five seconds while the accumulated data is displayed.

NOTE: The outdoor unit No. is indicated on the one digit of “SEG1”



*3) Cause of the Inverter stoppage: display digits indication

	: compressor No. : outdoor unit No.

*4) Cause for fan controller stoppage display digits indication

	: fan controller No. : outdoor unit No.

Capacity table for the outdoor units.

Indication	Capacity (kW)	Horsepower (HP)
40	140	5.0
48	160	6.0
64	224	8.0
80	280	10.0
96	335	12.0
112	400	14.0
128	450	16.0

NOTE

In the case of unit combinations, the outdoor unit capacity indication is the total capacity of the constitution units.
Example:
In the case of unit RAS-24FSXNH(E):
RAS-24FSXNH(E) = RAS-12FSXNH(E) x 2
96 x 2 = 192
Indication "192" will be displayed.

◆ Indoor unit information

This information is indicated on unit A (main unit) only.

Select the indoor unit number for information indication.

Press PSW4 (▼) to move forward or PSW2 (▲) to move back.

Select the indoor unit number for indication.

Press PSW3 (►) for more detailed information on the unit number selected.

Unit no.	Indication
No. 0	
No. 1	
↓	↓
No. 63	

Press PSW4 (▼) to move forward or PSW2 (▲) go back.

This information will be alternatively indicated as “Item” → “Details”.

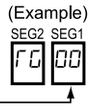
Press PSW5 (◄) to return to the indoor unit No. selection.

Indication details:

Item		7-segment display		Details
		SEG2	SEG1	
1	Capacity of the indoor unit	CA	00	Unit capacity indication. Refer to the "Capacity table for the indoor units".
2	Opening of the expansion valve	,E	00	Unit: %
3	Heat exchanger liquid pipe temperature	rL	00	Unit: °C
4	Heat exchanger gas pipe temperature	rG	00	Unit: °C
5	Air inlet temperature	r,	00	Unit: °C
6	Air outlet temperature	ro	00	Unit: °C
7	Unit stoppage cause code	d1	00	Indoor unit stoppage cause code indication. Refer to the "Indoor unit stoppage cause table".

NOTE: The indoor unit No. is indicated on “SEG1”

(Example)



Capacity table for the indoor units.

Indication	Capacity (kW)	Horsepower (HP)	Indication	Capacity (kW)	Horsepower (HP)	Indication	Capacity (kW)	Horsepower (HP)
5	17	0.6	16	56	2.3	48	160	6.0
6	22	0.8	18	63	2.5	64	224	8.0
8	28	1.0	20	71	2.8	80	280	10.0
10	36	1.3	22	80	3.0	128	450	16.0
11	40	1.5	26	90	3.3	160	560	20.0
13	45	1.8	32	112	4.0			
14	50	2.0	40	140	5.0			

◆ Cause for alarm code information

This information is indicated in unit A (main unit) only.

Press PSW4 (▼) to move forward or PSW2 (▲) to go back.

This information will be indicated alternating as “Item” → “Details”.

Indication details:

Item		7-segment display		Details
		SEG2	SEG1	
1	Alarm cause code		AC	Outdoor unit lastest stoppage alarm code indication. Refer to the "Alarm codes table".
2	Degeneracy control for pressure ratio decrease protection	c	11	0: degeneracy control is not activated. 1: degeneracy control is activated.
3	Degeneracy control for high pressure increase protection	c	13	0: degeneracy control is not activated. 1: degeneracy control is activated.
4	Degeneracy control for Inverter fin temperature increase protection	c	14	0: degeneracy control is not activated. 1: degeneracy control is activated.
5	Degeneracy control for discharge gas temperature increase protection	c	15	0: degeneracy control is not activated. 1: degeneracy control is activated.
6	Degeneracy control for Td SH decrease protection	c	16	0: degeneracy control is not activated. 1: degeneracy control is activated.
7	Degeneracy control for overcurrent protection	c	17	0: degeneracy control is not activated. 1: degeneracy control is activated.

◆ Alarm code history information

This information is indicated in unit A (main unit) only.

If a history of anomalies exists, a maximum of fifteen cases in chronological order are indicated.

Press PSW4 (▼) to move forward or PSW2 (▲) to go back.

No. of data	7-segment display	
	SEG2	SEG1
No. 1 (lastest data)	no	01
↓	↓	↓
No. 15 (oldest data)	no	15

Select the data No. for information indication by pressing PSW4 or PSW2.

Press PSW3 (►) for detailed information.

Press PSW4 (▼) to move forward or PSW2 (▲) to go back.

Press PSW5 (◄) to return to the unit No. combination selection.

Indication details:

Item		7-segment display		Details
		SEG2	SEG1	
1	Unit accumulated operating time	07	08	Outdoor unit accumulated operating time when the stoppage is carried out Unit: hour (indication x 10 hours)
2	Cause for stoppage	AL		Alarm stoppage
		d.		Retry stoppage
		C.		Control information
3	Alarm / Stoppage cause code	01	48	Alarm and stoppage cause code. The outdoor unit No. is indicated in 10 digit of SEG2. The compressor and fan controller No. are indicated in one digit of SEG2. The alarm and stoppage cause code are indicated in SEG1.
4	Abnormal data indication	iF	12	The Inverter stoppage cause code is indicated when the IT code exists in SEG2.
		FF	12	The fan controller stoppage cause code is indicated when the FT code exists in SEG2.
		CF	0	Stoppage cause of the constant speed compressor abnormal current is 0 A stoppage.
		CF	FF	Overcurrent stoppage of the constant speed compressor.
		--	--	With the exception of the above.

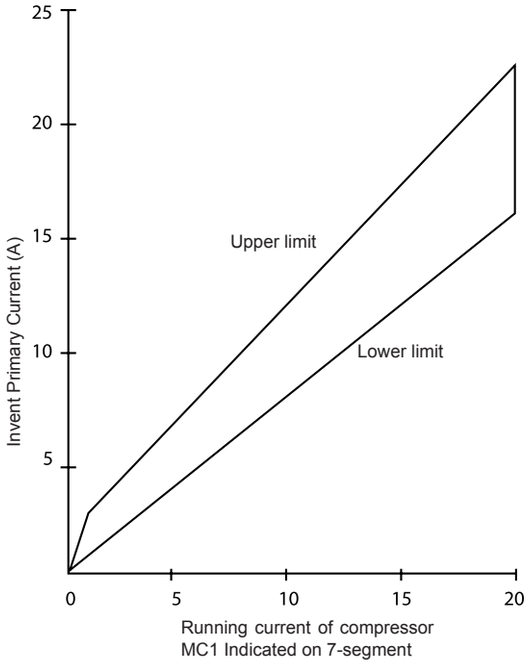
11.6.6 Running current of compressor

- Inverter primary current.

The Inverter primary current is estimated from the running current of compressor MC1 indicated on the 7-segment display as shown in the picture.

- Indicated running current for compressor MC2.

The running current for compressor MC2 is detected by current sensor (CT2).



Cause of Inverter stoppage (check the item dF)

Code	Cause
1	IPM error (Overcurrent, voltage decrease, short-circuit)
2	Instantaneous overcurrent
3	Abnormal Inverter fin temperature
4	Inverter overcurrent
5	Inverter voltage decrease
6	Inverter voltage increase
7	Abnormal Inverter transmission
8	Abnormal current sensor
9	Instantaneous power failure Anomaly in the power source phases
11	Microcomputer reset
12	Earth fault detection
13	Abnormal power source phase
16	Inverter failure
21	Abnormal start-up

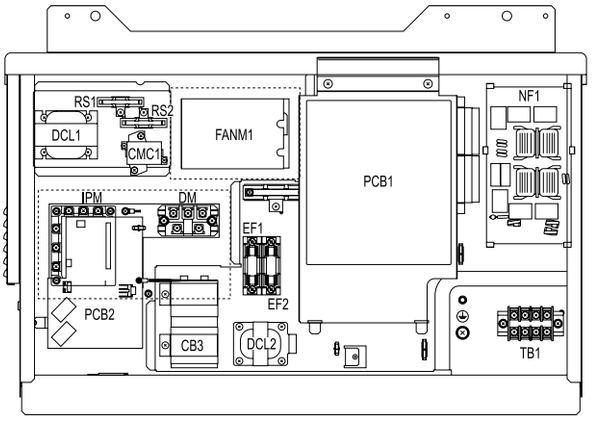
Cause for fan controller stoppage (Check the item FF)

Code	Cause
1	Driver IC error
2	Instantaneous overcurrent
3	Abnormal Inverter fin temperature
4	Inverter overcurrent
5	Decrease in fan controller voltage
6	Increase in fan controller voltage
7	Abnormal fan controller transmission
8	Abnormal current sensor
9	Instantaneous power failure
11	Microcomputer reset
12	Earth fault detection
15	Reverse rotation
16	Fan controller retry
17	Abnormal control
21	Abnormal start-up

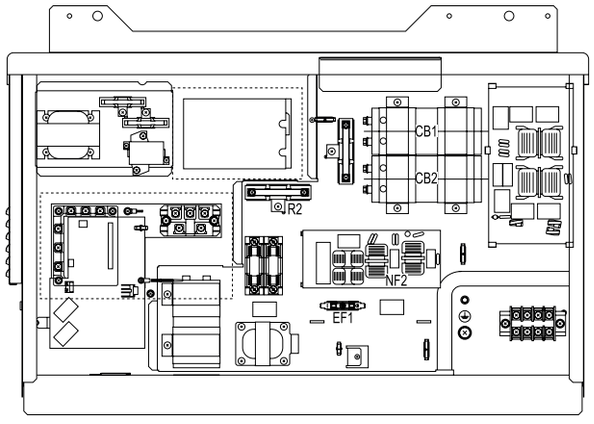
11.7 RSW, DSWs and LEDs functions

Location inside the electrical box for RAS-(8-16)FSXN1E and RAS-(5-12)FSXNH(E)

1



2



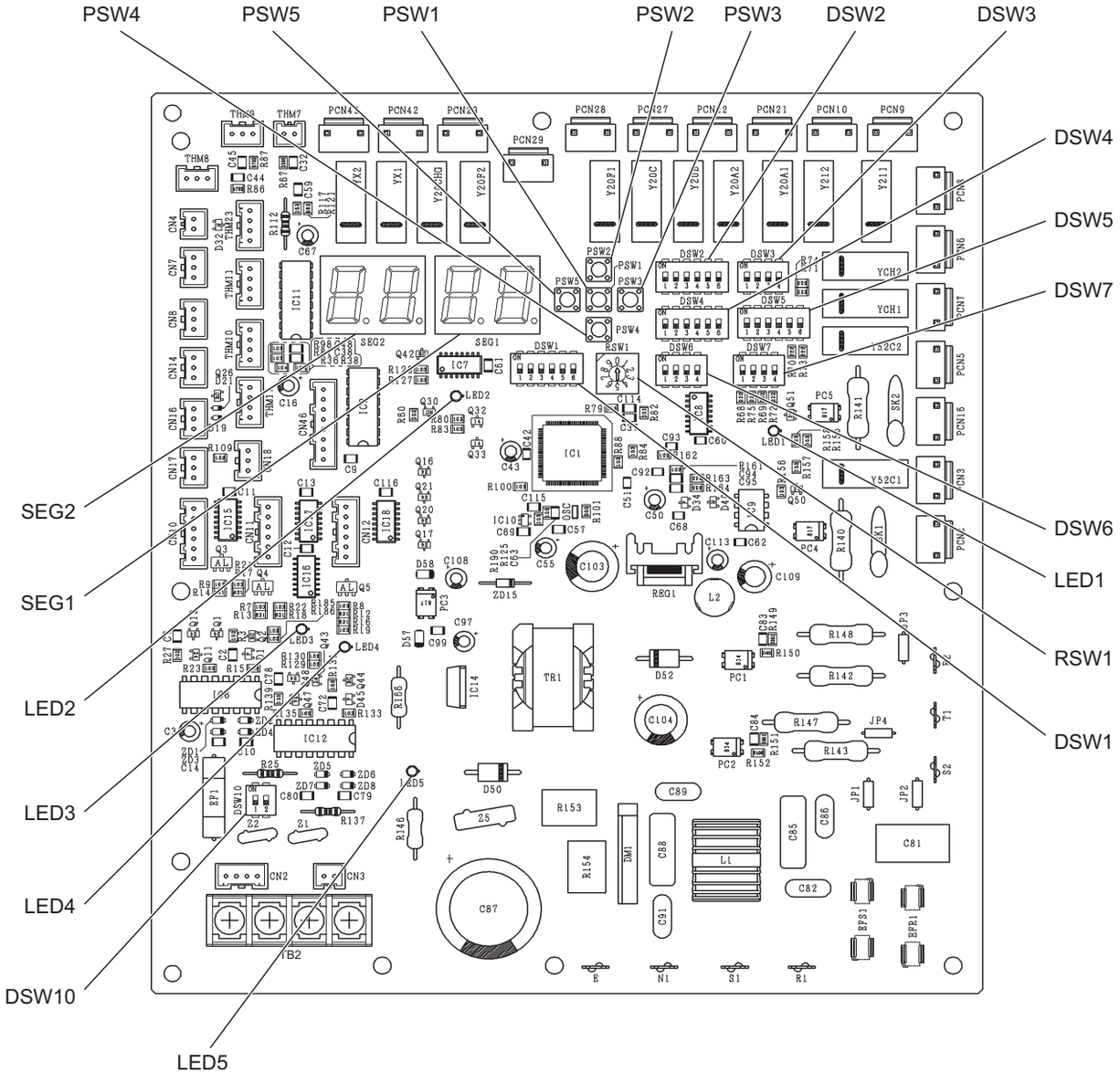
1: Front side (main).

2: Interior of the electrical control box (main).

Purpose

Symbol	PCB	Purpose
PCB1	For control	1. Transmission between the indoor and outdoor units. 2. Processing for sensor input. 3. Processing for dip switch input. 4. Operation control for parts 1 to 3. Compressor operating control, control of the bypass valve, fan control and overcurrent control. 5. 7-segment display indication. 6. Processing of the safety device input. 7. Processing of the relay output. 8. Detection of reverse phase for power source.
PCB2	For Inverter	1. Inverter power part is driven by instruction of PCB1 and compressor is driven. 2. Overcurrent control. 3. Inverter protection control.
FANM	For fan	1. DC motor speed control. 2. Overcurrent control.

a. Printed circuit board for control: PCB1



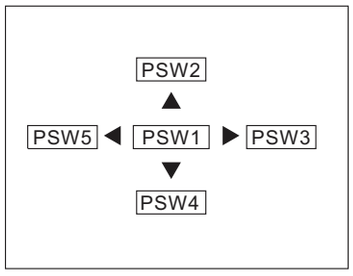
◆ Setting of the outdoor unit DIP switches

CAUTION

Before modifying the DIP switch settings, the power supply must be disconnected. Otherwise, the new setting will not be valid.

NOTE

- *While the power remains on, the switches are disabled and the settings carried out are not valid. However, switch DSW4, contacts 1, 2 and 4 and the pushbuttons can be used with the power supply turned on.*
- *Mark "■" indicates the position of the DIP switches. The figures show the position of the DIP switch once the position setting has been completed.*



PSW pushswitch on PCB1

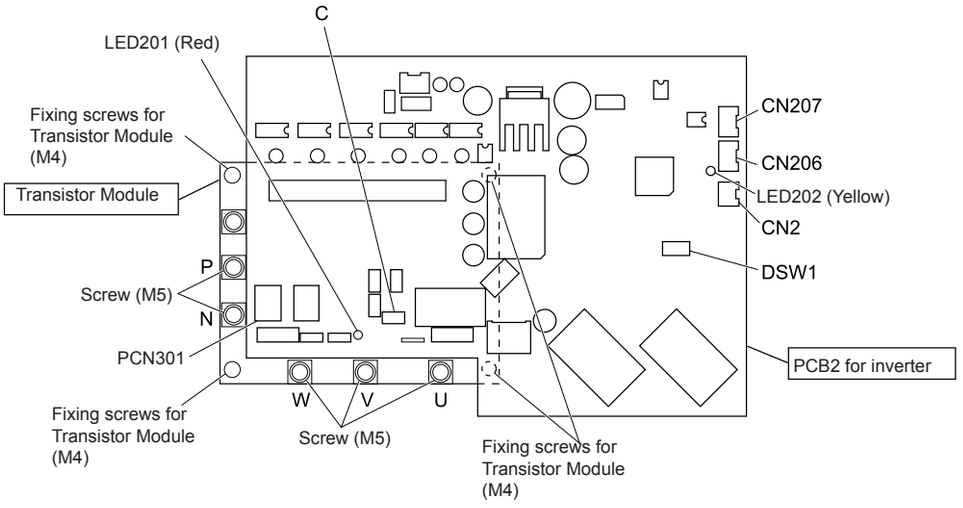
PSW1: enter.

PSW2, 3, 4 and 5: for checking.

Part name		Contents of functions
RSW & DSWs	DSW1, RSW1	Refrigerant cycle number setting.
	DSW2	Capacity setting.
	DSW3	Setting not required.
	DSW4	Operational test and service settings.
	DSW5	Emergency operation / operational test and service setting.
	DSW6	Setting outdoor unit number.
	DSW7	Supply voltage setting.
	DSW10	Communication setting.

Part name		Contents of functions
LEDs	LED1 (Red)	PCB1 power indication (Low voltage). Normal condition: activated. Abnormal condition: not activated.
	LED2 (Green)	LED2 indicates the transmission status between PCB1 and PCB2. Normal condition: flashing. Abnormal condition: activated or not activated.
	LED3 (Yellow)	LED3 indicates the transmission status between the indoor and outdoor units. Normal condition: flashing. Abnormal condition: activated or not activated.
	LED4 (orange)	LED4 indicates the transmission status between outdoor units. Normal condition: flashing. Abnormal condition: activated or not activated.
	LED5 (Red)	PCB1 power indication (High voltage). Normal condition: activated. Abnormal condition: not activated.
SEGs	SEG1, SEG2	Indicate the following: "Alarm", "Safety protection device has been activated' or "Checking items".

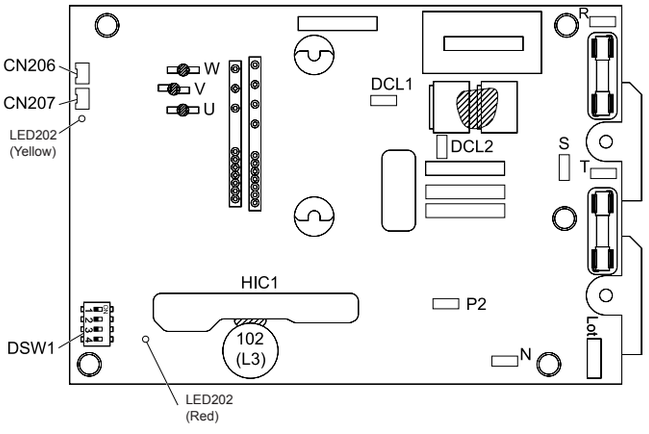
b. Inverter printed circuit board: PCB2 (and transistor module)



Part name	Contents of functions
LED201 (Red)	PCB2 power indication. Normal condition: activated. Abnormal condition: not activated.
LED202 (Yellow)	Microcomputer status indication. Normal condition: activated. Abnormal condition: not activated.

DSW1	
Setting not required to be carried out.When contact number 1 is set to the ON position, the electrical current detection is cancelled.Contact number 1 must be set to the OFF position after the electrical work is carried out.	

c. Fan controller

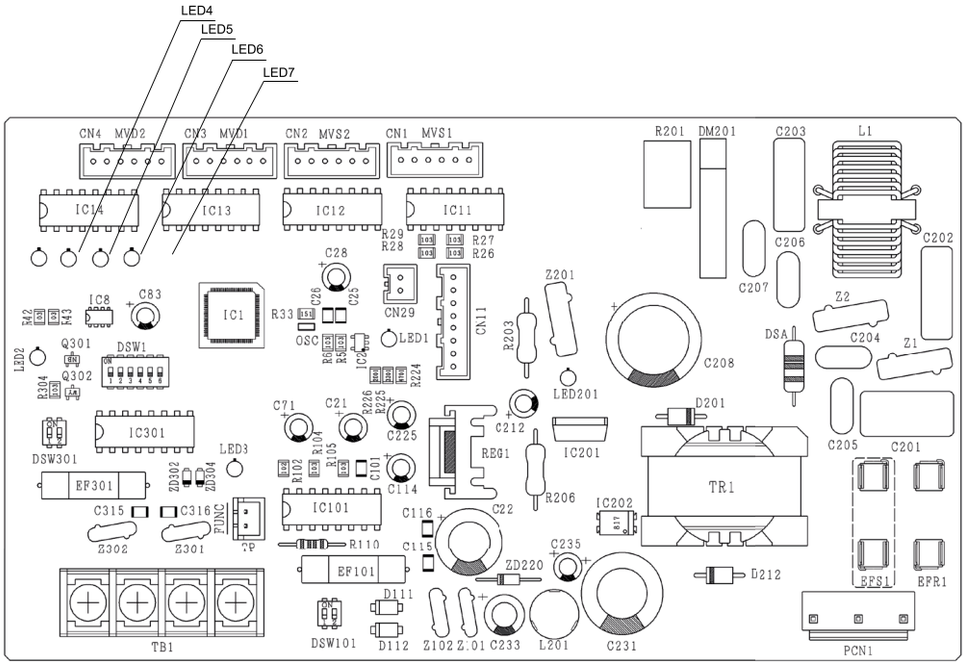


Part name	Contents of functions
LED501 (Red)	Fan controller power indication. Normal condition: activated. Abnormal condition: not activated.
LED202 (Yellow)	Microcomputer status indication. Normal condition: activated. Abnormal condition: not activated.

DSW1	
Setting not required to be carried out.	

d. Printed circuit board (PCB) of CH unit

By the LED on the PCB in the CH unit, the condition of the expansion valve and alarm information can be checked.



1) The table below indicates the LED condition for each expansion valve when performing normal operation.

Part name	Expansion valve	Contents of functions
LED4 (Green)	MVD2	Fully opened (480 pulse): Turn ON Fully closed (0 pulse): Turn OFF
LED5 (Green)	MVD1	Fully opened (600 pulse): Turn ON Fully closed (0 pulse): Turn OFF
LED6 (Green)	MVS2	Fully opened (480 pulse): Turn ON Fully closed (0 pulse): Turn OFF
LED7 (Green)	MVS1	Fully opened (600 pulse): Turn ON Fully closed (0 pulse): Turn OFF

2) When alarming, the alarm code is indicated by LED.

LED				Alarm code	Contents
4	5	6	7		
O	O	X	X	03	Abnormal transmission between CH unit and outdoor unit.
X	X	O	O	03	Abnormal transmission between CH unit and indoor unit.
O	O	O	O	C1	2 or more CH units are connected between outdoor unit and indoor unit.
O	O	O	X	C2	9 or more indoor units connected to CH unit.
X	O	O	X	C3	The indoor units of different refrigerant cycle is connected to CH unit.

O: Flashing (Turn ON; 0.5 sec. / Turn OFF; 0.5 sec.)

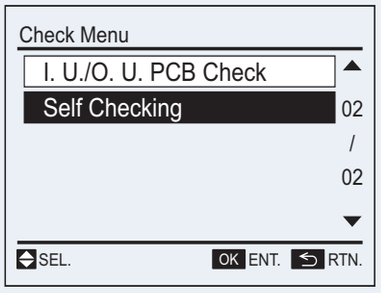
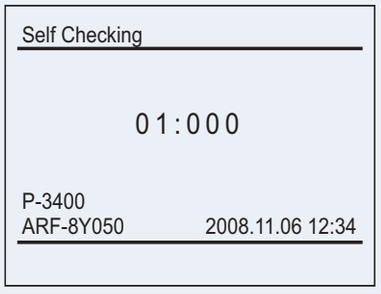
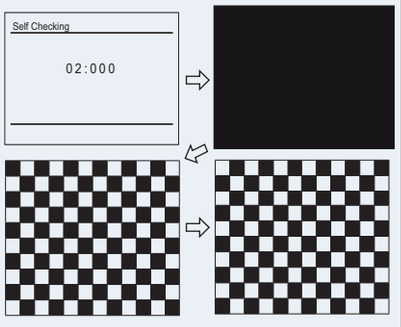
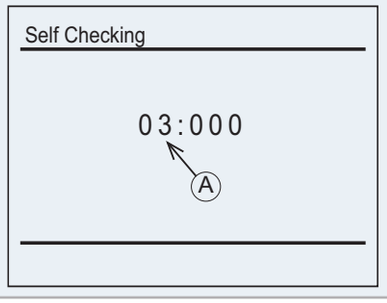
X: Turn OFF.

11.8 Checking procedures for each main part

11.8.1 Self-checking of PCB using the remote control (PC-ARF example)

◆ Self checking

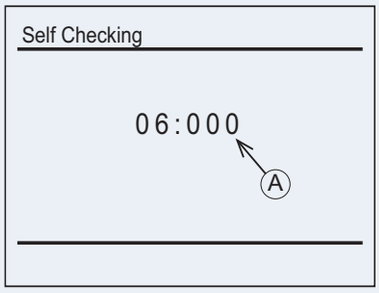
The self checking performs to check the remote control switch and to clear EEPROM (storage cell inside of the remote control switch).

(1) Press and hold "☰" (menu) and "?" (help) simultaneously for 3 seconds during the normal mode (when the unit is not operated). The check menu is displayed.	
(2) Select "Self Checking" form the check menu and press "OK".	
(3) Select the process for "Self Checking". * To start self check, press "?" (help). * To clear EEPROM, press "▽" and "?" (help) simultaneously. (see EEPROM clear process (15)).	
(4) LCD test. Press "OK" and the screen will be switched as shown in the picture.	
(5) Blackligh test. LCD brightness is changed gradually by pressing "OK".	A: 03: Blackligh test 04: Contrast test 05: Run indicator test 
(6) Contrast . Contrast of the LCD gradually changes by pressing "OK".	
(7) Run indicator test. Press "OK" and the run indicator will flash in red and green twice for each.	

(8) Switch input test.

Press the 9 switches one by one. The number indicated with “A” will count up as switch being pressed.

* The order of pressing switch is at random. Do not press more than 1 (one) button for it will not be counted.



(9) No function.

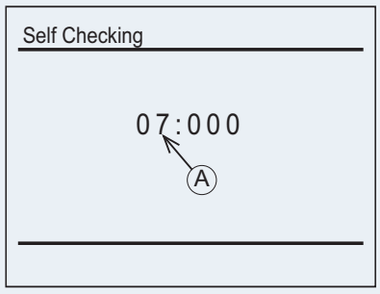
This function is not used. Press “OK” to proceed.

A: 07: No function

08: Transmission test

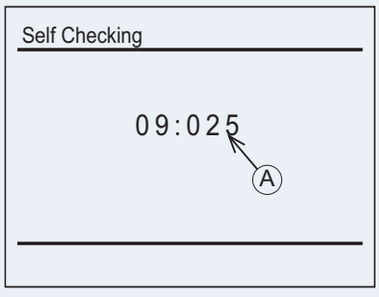
(10) Transmission circuit test.

The remote control switch automatically starts to check the transmission circuit.



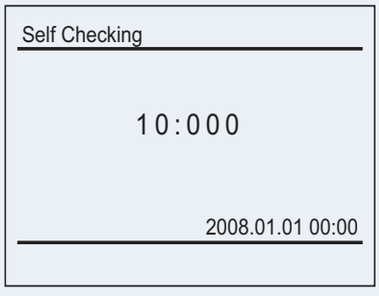
(11) Remote control switch thermistor test.

The detected temperature by remote control switch thermistor is displayed at “A” in the right picture.



(12) Date/Time test.

The date and time is switched from “2012.03.04 12:34” to “2008.01.01 00:00”.



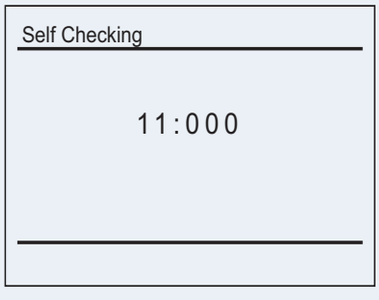
(13) EEPROM test.

<EEPROM Clearing Cancel> Press “?” (help).

<EEPROM Clear> Press “OK” or wait 15 seconds. EEPROM data will be cleared. During the process, the numbers will be indicated on where is located with “A”.

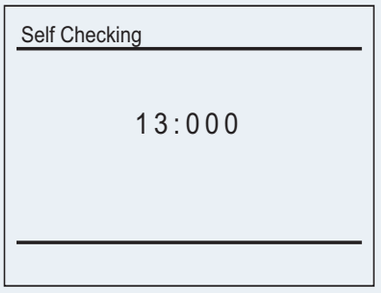
If “A” has value of “999”, EEPROM is in faulty condition.

* In case “A” has “999”, the process does not proceed to next step.



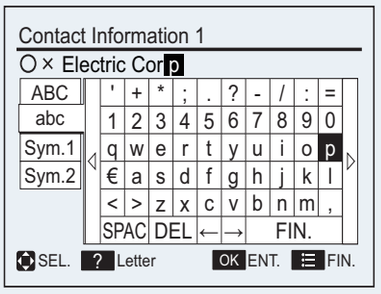
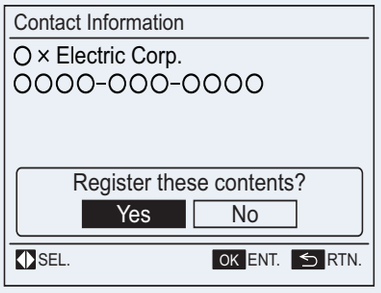
(14) After the several seconds are passed, the self checking is completed and the remote control switch is automatically restarted.

EEPROM process:

(15) Clear EEPROM. The remote control switch will automatically restart EEPROM clearing process.	
(16) After the several seconds are passed, the self checking is completed and the remote control switch is automatically restarted.	

◆ Contact information registration.

Contact information can be registered from "Contact Information".

(1) Press and hold "☰" (menu) and return simultaneously for at least 3 seconds during the normal mode (when unit is not operated). The test run menu will be displayed.	
(2) Select "Contact Information" from the test run menu and press "OK". The contact information 1 will be displayed.	
(3) Press "?" (help) to change font type.	
(4) Press "△ ▽ ◁ ▷" to select letter.	
(5) Press "OK" to confirm the letter. (Max.: 28 letters)	
(6) Select "FIN." and press "OK" (or simply press "☰" (menu)), (7) will be displayed.	
(7) Repeat (3) ~ (5) to register contact information 2. Select "FIN." and press "OK", the confirmation screen will be displayed. (Also, press "☰" (menu) and the confirmation screen will be displayed).	
(8) Select "Yes" and press "OK". The test run menu will be displayed after the setting is confirmed. If "No" is pressed, the screen will return to (3).	



11.8.2 Self-checking of the remote control switch (PC-ART example)

1 Turn ON the power source

2 Simultaneously depress the following 3 switches. During operation, they can be depressed

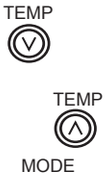


3 The LCD indication changes as shown in the right figure

4 After LCD indication changes as shown in the right figure, the RUN indicator flashes twice

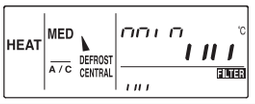
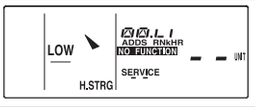
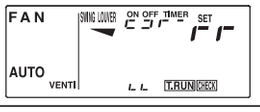
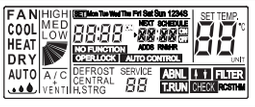


Only for cancellation of EEPROM, depress the following 3 switches simultaneously during changing LCD indication

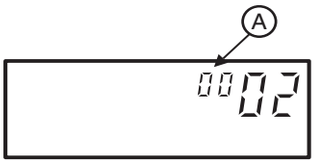


To 11

Changing of LCD indication

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

5 The LCD indication changes as shown below. Depress all the switches (13 switches) one by one. Every time the switch is depressed, the number of the indication of (A) part in the figure below increases one by one.



NOTES:

1. Any order of depressing switches is available.
2. Depressing 2 or more switches simultaneously is invalid and not counted.

Unless all the switches are depressed, the checking do not proceed to the next item.

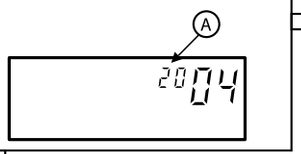
6 The LCD indication changes as shown below. The remote control switch automatically starts to check the transmission circuit.



In case that the transmission circuit is abnormal, the LCD indication remains as the left figure and the checking do not proceed o the next item

To the next page

7 The LCD indication changes as shown below. The detected temperature of remote control thermostat is indicated at the part (A) in the figure below

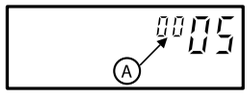


If the number "--" or "FF" is indicated at the (A) part, the remote control thermostat is abnormal

8 The LCD indication changes as shown below



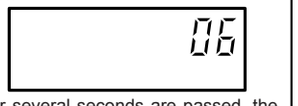
In case of depressing the RESET switch or leaving the switches for 15 seconds, the data of EEPROM (storage cell inside of the remote control switch) is cleared. At this time, the number is indicated at the (A) part shown in the figure below. When the number "99" is indicated, EEPROM is abnormal.



The number indicated at the (A) part is "99", the checking do not proceed to the next item.

In case that EEPROM is not canceled, depress the CHECK switch

9 The LCD indication changes as shown below



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

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

RUN/ STOP P



NOTES:

1. In case that the operation is not automatically started when the remote control switch is activated again, the detection circuit for momentary stoppage may be abnormal. However, it would not interfere the normal operation.
2. There is a case that the operation is automatically stopped after the automatic operation when the remote control switch is activated again.

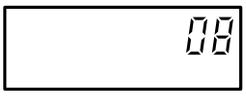
Cancellation of EEPROM

3

11 The LCD indication changes as shown below and the EEPROM is automatically canceled by the remote control switch



12 The LCD indication changes as shown below



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

11.8.3 Checking procedures for each main part

◆ High voltage discharge work for replacing parts

CAUTION

Carry out this high voltage discharge work to prevent electric shock.

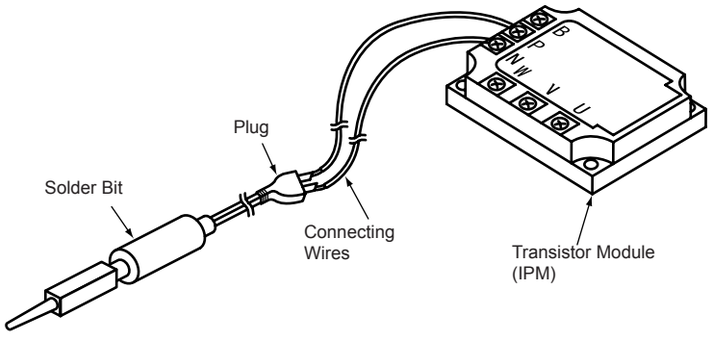
Procedure

(a) Turn OFF the main switches and wait three minutes. Check to make sure high voltage is not present. If LED201 is ON after the start-up and OFF after the power supply is turned OFF, the voltage will decrease lower than DC 50V.

(b) Connect connecting wires to an electrical solder bit.

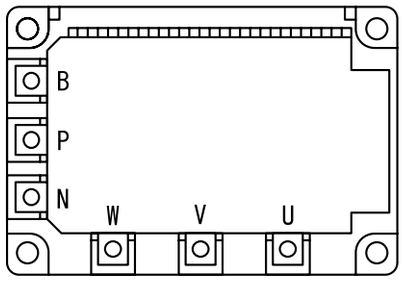
(c) Connect the cables to terminals, P and N of the IPM. => The discharge is started, which will heat up solder bit. Be careful not to short-circuit between terminals P and N.

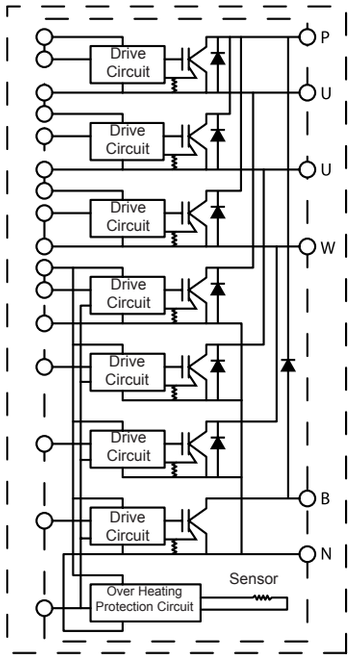
(d) Wait 2 or 3 minutes and measure the voltage once again. Make sure no voltage is present.



◆ Method for checking the transistor module (IPM).

External appearance and internal circuit of transistor module.

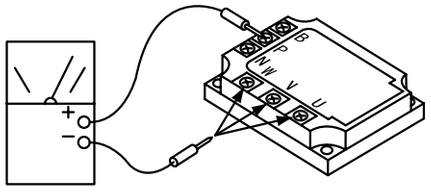




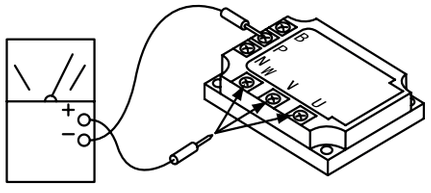
Procedure:

Remove all the terminals from the transistor module before the check. If steps (a) and (d) are carried out and the results are satisfactory, the transistor module is normal. Measure with the multimeter set under 1 kΩ range. Do not use a digital multimeter.

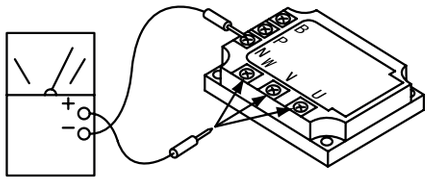
(a) Resistance is measured when the + side of the multimeter touches terminal P of the transistor module and the - side of the multimeter touches terminals U, V and W of the transistor module. It is normal for all the resistances to be between 1 and 5 kΩ.



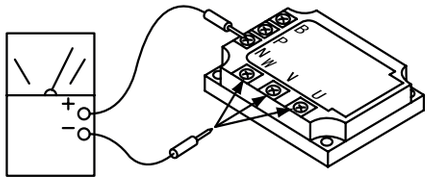
(b) Resistance is measured when the - side of the multimeter touches terminal P of the transistor module and the + side of the multimeter touches terminals U, V and W of the transistor module. It is normal for all the resistances to be greater than 100 kΩ.



(c) Resistance is measured when the - side of the multimeter touches terminal N of the transistor module and the + side of the multimeter touches terminals U, V and W of the transistor module. It is normal for all the resistances to be between 1 and 5 kΩ.

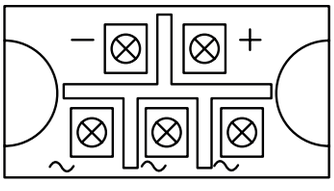


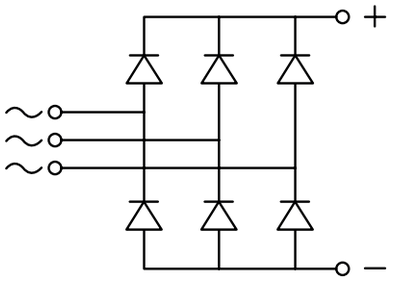
(d) Resistance is measured when the + side of the multimeter touches terminal N of the transistor module and the - side of the multimeter touches terminals U, V and W of the transistor module. It is normal for all the resistances to be greater than 100 kΩ.



◆ Method for checking the diodes module (DM).

External appearance and internal circuit of diode module.

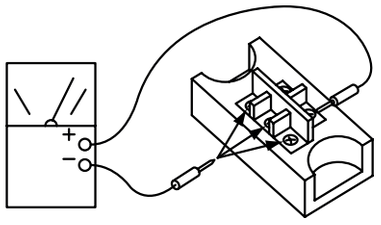




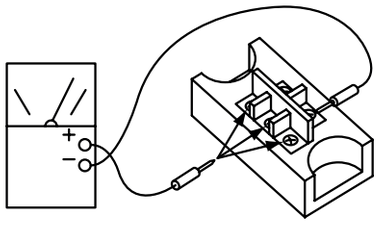
Procedure:

If steps (a) to (d) are carried out and the results are satisfactory, the diode module is normal. Measure with the multimeter set under 1 kΩ range. Do not use a digital multimeter.

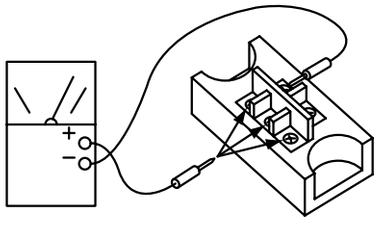
(a) Resistance is measured when the + side of the multimeter touches the + terminal of the diode module and the - side of the multimeter touches the ~ terminals (3 Nos.) of the diode module. It is normal for all the resistances to be between 5 and 50 kΩ.



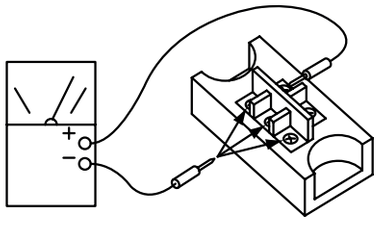
(b) Resistance is measured when the - side of the multimeter touches the + side of the diode module and the + side of the multimeter touches the ~ terminals (3 Nos.) of the diode module. It is normal for all the resistances to be greater than 500 kΩ.



(c) Resistance is measured when the - side of the multimeter touches the - side of the diode module and the + side of the multimeter touches the ~ terminals (3 Nos.) of the diode module. It is normal for all the resistances to be between 5 and 50 kΩ.



(d) Resistance is measured when the + side of the multimeter touches the - side of the diode module and the - side of the multimeter touches the ~ terminals (3 Nos.) of the diode module. It is normal for all the resistances to be greater than 500 kΩ.



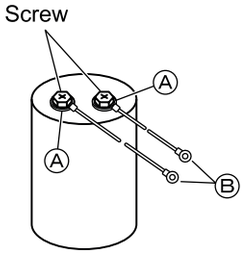
◆ Method for checking the capacitor

(a) Check that the screws are tightly fastened.

(b) Check that the capacitor is not blackened or bulging out.

When checking the capacitor, disconnect the -B- terminals.

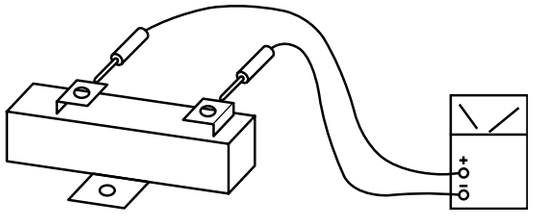
Do not disconnect the -A- terminals.



Capacitance	400 V
For Inverter	4700 µF
For the fan controller	2700 µF

◆ Method for checking the resistor

Measure both ends of the resistor as shown in the figure. It is normal for the resistance to be ∞ Ω.



Resistance		400 V
For Inverter	RS1	0.5 kΩ
	RS2	0.5 kΩ
	R1	6.3 kΩ
	R2	10.5 kΩ

◆ Method for checking the fan controller

(a) Turn OFF the power source switches before performing this work.

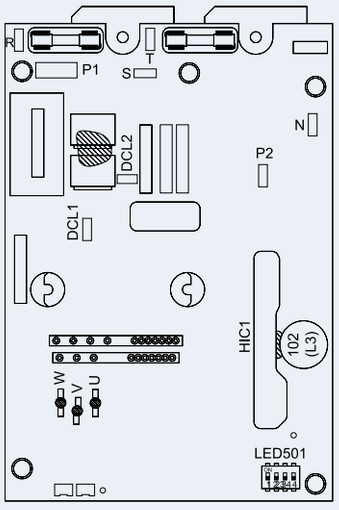
Also ensure that LED501 (red) on the fan controller is turned OFF.

If LED501 is ON, electrical shock may occur.

(b) Disconnect all the cables connected to the fan controller.

Measure the resistance between terminals using a multimeter. Do not use a digital multimeter.

When measuring, check the multimeter probe colour and the terminals to be measured as shown in the table below.

Fan controller	Multimeter probes Red (+) - Black (-)	Resistance range
	P1 - R P1 - S P1 - T R - N S - N T - N P1 - U P1 - V P1 - W U - N V - N W - N	1 kΩ and over
	R - P1 S - P1 T - P1 N - R N - S N - T U - P1 V - P1 W - P1 N - U N - V N - W	The resistance will gradually increase after it is between 1700 kΩ to 1900 kΩ (*)

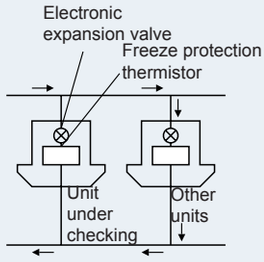
(*) Stay on for at least 30 seconds when measuring the following terminals.

◆ Initial DSW setting

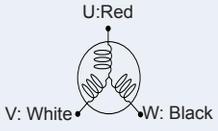
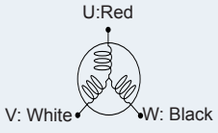
DSW1			
1	2	3	4
OFF	OFF	OFF	OFF

Regarding the DSW setting, do not change the original setting. If the settings are modified, transmission anomalies and fan controller failure may occur.

◆ Method for checking the electronic expansion valve

	Indoor unit electronic expansion valve	Outdoor unit electronic expansion valve
Locked with fully closed	Check the temperature of the liquid pipe during the heating operation. If the temperature does not increase, this is abnormal.	It is not abnormal if the pressure of the liquid pipe does not increase during the cooling operation.
Locked with slightly open	It is abnormal under the following conditions: The temperature of the freeze protection thermistor is lower than the temperature of the suction air when the unit under checking is stopped and other units are operating in cooling.	It is abnormal if the pressure of the liquid pipe does not increase and the expansion valve outlet temperature decreases after the cooling operation is started.
Locked with fully open		It is abnormal under the following conditions: After heating operation in the heating mode for longer than 30 minutes, the compressor discharge gas temperature is not 10°C higher than the condensing temperature and there are no other problems such as excessive refrigerant charge, etc.

◆ Checking the electrical coil parts

Part name	Model	Electrical wiring diagram	Wiring No.	Resistance (Ω)
DC fan motor for outdoor unit RAS-(8-12)FSXN1E RAS-(5/6)FSXNH(E)	DMLBA8PHT 750 W		White-black Black-red Red-white	2.58 ± 0.3 at 20°C
DC fan motor for outdoor unit RAS-(14/16)FSXN1E RAS-(8-12)FSXNH(E)	ECW8802AH 1200 W		White-black Black-red Red-white	0.794 ± 5% at 20°C

Part names	Model	Resistance (Ω)
Solenoid valve for gas bypass	SR10PA	1.250 at 20°C
Reversing valve	Coil: STF-H01AI1870A1 + Body: STF-H0404 (RAS-(8-12)FSXN1E and RAS-(5/6)FSXNH(E)) STF-H0712 (RAS-(8-16)FSXN1E and RAS-(5-12)FSXNH(E))	-
Compressor motor (for Inverter compressor)	DA50PHD	0.396 at 75°C
	DA65PHD	0.320 at 75°C

◆ Compressor checks

COMPRESSOR CHECKLIST		
CUSTOMER: _____	MODEL: _____	DATE: _____
Serial No.: _____	Production date: _____	Inspector: _____

No.	Checking item	Check method	Result	Notes
1	Are THM8 and THM9 properly connected? THM8 and THM9: discharge gas thermistors	(1) Are the thermistor wires properly connected? (2) Check to ensure that the Td1 indication on the 7-segment display is greater than the Td2 indication when compressor No. 1 is operating. Td1: THM8 temperature Td2: THM9 temperature		
2	Are thermistors THM8 and THM9 disconnected?	(1) Check to ensure that the thermistor on the upper part of the compressor is properly installed. (2) Check to ensure that the currently measured temperature is very different than the (Td1, Td2) indication during the check mode.		
3	Are the current sensor connectors properly connected?	(1) Check to ensure that the A1 and A2 indication on the 7 segment display is 0 during the compressor stoppage. (2) Check to ensure that the A1 and A2 indication is not 0 during the compressor operation (however, A2 is 0 during the stoppage of compressor No. 2.).		
4	Is the current sensor defective?			
5	Is the current sensor part of PCB2 defective?			
6	Is the direction of the current sensor (CTU, CTV) reversed?	Visually check the direction.		
7	Are power supply cables U and V correctly inserted in the current sensor?	Check to ensure that the cables are properly inserted.		
8	Are expansion valves (MV1 and MVB) properly connected?	Check to ensure that MV1 to CN10 and MVB to CN12 connections are correct.		
9	Are expansion valve (MV1 and MVB) coils properly installed?	Check to ensure that each coil is properly installed in the valve.		
10	Are the refrigeration cycle and the electrical wiring system improperly connected?	Check to ensure that refrigerant flows in the indoor units by operating one refrigeration cycle from the outdoor unit.		
11	Is the expansion valve completely closed (locked)?	Check the following by the outdoor unit check mode. (1) Liquid pipe temperature (TL) < Inlet air temperature (Ti) during the cooling operation. (2) Liquid pipe temperature (TL) > Inlet air temperature (Ti) during the heating operation.		
12	Is the expansion valve completely open (locked)?	Check to ensure that the liquid pipe temperature is lower than the inlet air temperature of the stopped indoor unit when other indoor units are operating in cooling mode.		
13	Are the magnetic switch (CMC1 and CMC2) contacts for compressor defectives?	Visually check the surface of each contact.		
14	Is there any voltage anomaly between L1-L2, L2-L3 and L3-L1?	Check to ensure the voltage imbalance is smaller than 3%. Take into account that the power supply voltage must be within 400 V ± 10%.		
15	Is the compressor oil acidified when the compressor motor has burned out?	Check to ensure that the oil colour is not black.		

Additional information regarding the COMPRESSOR CHECKLIST

Check item	Additional information (Mechanism of compressor failure)
1 and 2	The liquid refrigerant return volume to the compressor is controlled by the discharge gas temperature Td1 when only compressor No. 1 is operating. If Td1 and Td2 are reversely connected, the liquid refrigerant return volume will be small by detecting the temperatures even if the actual temperature of the discharge gas is high. Therefore, this abnormal overheating operation will cause the insulation failure on the motor winding.
3, 4 and 5	The overcurrent control (operating frequency control) is carried out by current detected by the current sensor. In this case, a winding insulation failure will occur, since control is not available in spite of the high current.
6 and 7	The current sensor checks the phase and adjusts the output of the electrical wave, as well as what has been described above. If a fault occurs, the electrical wave output becomes unstable adding overload to the motor windings and causing winding insulation failures.
8 and 9	During the cooling operation, Pd is controlled by the fan revolution of the indoor unit, and Td and SH are controlled by MV for each of the indoor units. During the heating operation, Td and SH are controlled by MV1. If the expansion valves are improperly connected, proper control is not available, resulting in compressor seizure depending on the liquid refrigerant return conditions or motor winding insulation failure depending on the overheating conditions.
10	If the refrigeration cycle and the electrical system are improperly connected, the suction pressure operation is maintained abnormally low or the discharge pressure operation is maintained abnormally high, resulting in an increase in compressor overload, since its proper control is not available.
11	The same
12	The compressor may be locked due to the liquid return operation during the cooling operation.
13	In the case that the contact resistance becomes big, the voltage imbalance between phases will cause an abnormal overcurrent.
14	In this case, an overcurrent will occur, the efficiency will be reduced or the motor winding will heat up excessively.
15	In this case, the motor will burn up or compressor seizure.

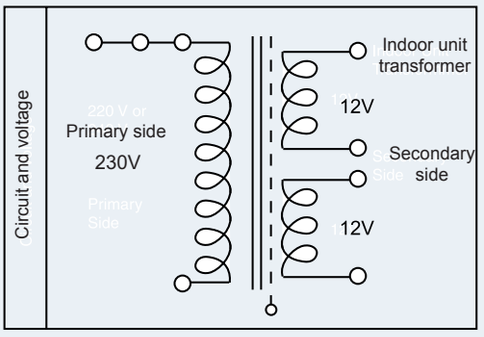
12. Maintenance notes

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12.1 Checking the power source and the wiring connection

Check the following items in the case of abnormal operation:

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

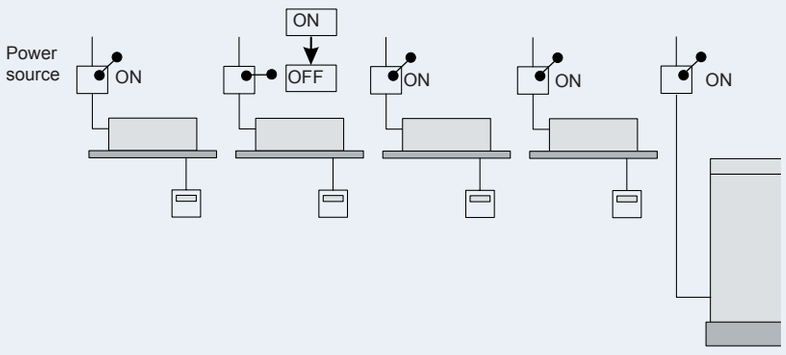
12.2 Burnt-out compressor due to an insufficient refrigerant charge

- Question and answer for the field work

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

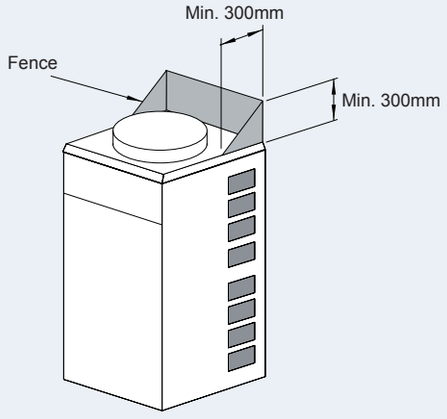
12.3 Alarm code "31"

- Question and answer for the field work

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

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

Question and answer for the field work

Example: Not cooling well due to insufficient installation space for outdoor unit	
Phenomenon	Cooling operation was well performed through the intermediate season. However, the cooling operation was not well available when the outdoor temperature was higher than 35 °C.
Cause	As the outdoor units were installed without a sufficient installation space, the hot discharge air from other outdoor units was circulated. In this case, though the outdoor temperature was 35 °C, the actual suction air temperature was nearly 50 °C and the protection system for excessively high suction pressure was activated, the frequency of the compressor was decreased and the cooling capacity was also decreased accordingly. As the outdoor units in-line were installed back to back with a distance of 600 mm between each outdoor unit’s back, the hot discharged air from other outdoor units was circulated. 
Countermeasure	To protect the unit from a short circuit, fences were mounted at the discharge air side as shown.

12.5 Precautions in the event of refrigerant leaks

CAUTION

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

12.5.1 Maximum permissible concentration of hydrofluorocarbon (HFC)

The R410A refrigerant gas, used in the equipment, is non-flammable and non-toxic.

DANGER

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

The maximum permissible concentration of HFC R410A gas in the air is 0.44 kg/m^3, according to standard EN 378-1. Consequently, effective measures must be adopted to maintain the concentration of R410A gas in the air below 0.44 kg/m^3 in case of leakage.

12.5.2 Calculation of the refrigerant concentration

1. Calculate the total quantity of refrigerant *R* (kg) charged in the system; to do so, connect all the indoor units of the rooms in which you need air conditioning systems.
2. Calculate the volume *V* (m^3) of each room.
3. Calculate the refrigerant concentration *C* (kg/m^3) of the room in accordance with the following formula:

$$R / V = C$$

R: total quantity of refrigerant charged (kg).

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

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

Particularly for the SET FREE series, whose outdoor units can be connected to multiple indoor units at a distance, the refrigerant charge is greater than for individual units.

DANGER

Check that the room where the indoor units will be installed can maintain the refrigerant concentration below the lower limit established in case of leakage. Otherwise, take the necessary action to correct this situation.

12.5.3 Countermeasures in the event of refrigerant leaks

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

1 Opening without shutter to permit the circulation of fresh air in the room.
2 Opening without door measuring 0.15%, or greater, of the floor surface.
3 A ventilator with a capacity of at least 0.4 m^3/min per refrigeration ton or greater, connected to a gas leak detector, should be installed.

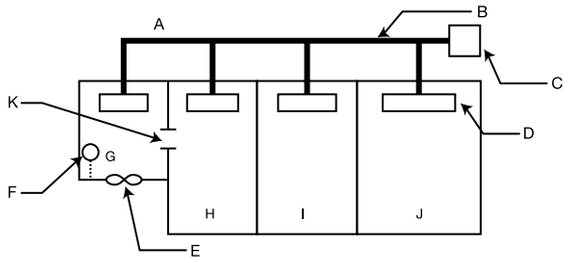
Model	Ton	Model	Ton
RAS-8FSXN1E	2.37	RAS-32FSXN1E	11.50
RAS-10FSXN1E	3.69	RAS-34FSXN1E	11.91
RAS-12FSXN1E	4.11	RAS-36FSXN1E	12.33
RAS-14FSXN1E	5.75	RAS-38FSXN1E	13.97
RAS-16FSXN1E	5.75	RAS-40FSXN1E	13.97
RAS-18FSXN1E	6.06	RAS-42FSXN1E	15.61
RAS-20FSXN1E	6.48	RAS-44FSXN1E	15.61
RAS-22FSXN1E	8.12	RAS-46FSXN1E	17.25
RAS-24FSXN1E	9.44	RAS-48FSXN1E	17.25
RAS-26FSXN1E	9.86	RAS-50FSXN1E	19.30
RAS-28FSXN1E	11.50	RAS-52FSXN1E	19.72
RAS-30FSXN1E	11.50	RAS-54FSXN1E	19.72

Model	Ton	Model	Ton
RAS-5FSXNH(E)	2.37	RAS-22FSXNH(E)	7.80
RAS-6FSXNH(E)	2.38	RAS-24FSXNH(E)	8.22
RAS-8FSXNH(E)	3.69	RAS-24FSXNH(E)-P	11.07
RAS-10FSXNH(E)	3.69	RAS-26FSXNH(E)	11.07
RAS-12FSXNH(E)	4.11	RAS-28FSXNH(E)	11.49
RAS-12FSXNH(E)-P	6.06	RAS-30FSXNH(E)	11.49
RAS-14FSXNH(E)	6.06	RAS-32FSXNH(E)	11.91
RAS-16FSXNH(E)	7.38	RAS-34FSXNH(E)	11.91
RAS-18FSXNH(E)	7.38	RAS-36FSXNH(E)	12.33
RAS-20FSXNH(E)	7.80		

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

Example:

A	Refrigerant charge: 60 kg	**G**	The smallest opening room
B	Refrigerant piping	**H**	Small room
C	Outdoor unit	**I**	Medium-sized room
D	Indoor unit	**J**	Large room
E	Mechanical ventilation equipment	**K**	Opening
F	Gas leak detector		



NOTE

1 *The gas leakage quantity for each room (large, medium-sized, small and the smallest) should be calculated as 60 kg.*
2 *The gas concentration of each room should not exceed the limit value, 0,44 kg/m^3.*

12.6 Maintenance work

For outdoor and indoor units

(A) Fan and fan motor.

- Lubrication. All the fan motors are lubricated and sealed in the factory. Consequently, lubrication is not necessary.
- Noise and vibrations. Check there are no strange noises or vibrations.
- Rotation. Check that fan rotates clockwise and that the speed is suitable.
- Insulation. Check the electric insulation resistance.

(B) Heat exchanger.

- Clogging. Check regularly that there is no accumulated dirt or dust. Regarding the outdoor unit, also check there are no obstacles for the air circulation such as pieces of paper, twigs, grass, etc. If necessary, remove them.

(C) Pipe connection.

- Leakage. Check there is no leakage in the connections of the refrigerant pipes.

(D) Cabinet.

- Stains and lubricant. Check there are no stains or lubricant.
- Tightening of screws. Check all screws are correctly tightened. If not, tighten them to the prescribed torque.
- Insulation. Check for imperfections in the thermal insulation of the unit cabinet and repair if necessary.

(E) Electrical equipment.

- Activation. Check the normal operation of the magnetic contactor, auxiliary relay, PCB, etc.
- State of the power supply line. Check the power supply, the current consumption (amperage) and the phase balance in particular. Check that there are no contact faults caused by loose terminals, rusty contacts, foreign objects or other causes. Check the electric insulation resistance.

(F) Control and protection devices.

- Setting. Do not readjust the setting in the field, except those indicated in section *"Only for outdoor units"*.

Only for outdoor units

(A) Compressor.

- Noise and vibrations. Check there are no strange noises or vibrations.
- Activation. Check that the voltage drop of the power supply line is within 16% at start-up and within 2% during operation.

(B) Reversing valve.

- Activation. Check there is no abnormal activation noise.

(C) Filter.

- Clogging. Check there are no differences in temperature between the two ends.

(D) Earthing connection wire.

- Earth line. Check the continuity to earth.

(E) Compressor crankcase heater.

- Activation. The crankcase heater should be activated at least 12 hours before start-up, by switching ON the main power source.

Only for indoor units

(A) Air filter.

- Cleanliness. Check regularly that there is no accumulated dirt or dust.

(B) Drain pan, drain-up mechanism and drain pipe.

- Drain line. Check and clean the drainage system at least twice a year.
- Drain-up mechanism. Check the activation of the drain-up mechanism.

(C) Float switch.

- Activation. Check the activation of the float switch.

12.7 Service and maintenance table through the 7-segment display

Customer's name: _____										Date: _____									
Outdoor unit model (Serial number: _____)		RAS- (Serial number: _____)								RAS- (Serial number: _____)									
1. Operation mode																			
2. Start time of test run																			
3. Start time of data collection																			
4. Reading the data on the 7-segment display in the outdoor unit																			
4.1 Protection control code																			
4.2 Operation capacity																			
4.2.1 Total connection capacity of the outdoor unit	oCP																		
4.2.2 Quantity of outdoor units connected	oAA																		
4.2.3 Total connection capacity of the indoor unit	iCP																		
4.2.4 Quantity of indoor units connected	iAA																		
4.2.5 Refrigeration system address	GA																		
4.2.6 Operation capacity of the indoor units	oP																		
4.2.7 Total frequency	Hz																		
4.2.8 Accumulated operation time of the unit	UJ																		
4.3 Information of the outdo-or unit																			
4.3.1 Capacity of the outdoor unit	CA																		
4.3.2 Outdoor unit microcom-puter output	SC	$52C_1$	$52C_2$	CH_1	CH_2	A_1	A_2	21_1	21_2	$52C_1$	$52C_2$	CH_1	CH_2	A_1	A_2	21_1	21_2		
		FAN	20B	20C	$20F_1$	$20F_2$	20CHG	X_1	X_2	FAN	20B	20C	$20F_1$	$20F_2$	20CHG	X_1	X_2		
4.3.3 Inverter frequency	H1																		
4.3.4 Quantity of compressors running	CC																		
4.3.5 Step of the outdoor unit fan	Fo																		
4.3.6 Outdoor unit expansion valve opening	E1																		
	Eb																		
4.3.7 Discharge pressure	Pd																		
4.3.8 Suction pressure	Ps																		
4.3.9 Outdoor temperature	To																		
4.3.10 Discharge gas temperature	Td1																		
	Td2																		
4.3.11 Heat exchanger liquid temperature	TE																		
4.3.12 Heat exchanger gas temperature	TG																		

Customer's name: _____			Date: _____
Outdoor unit model (Serial number: _____)		RAS- (Serial number: _____)	RAS- (Serial number: _____)
4.3.13 Automatic refrigerant charge temperature	TCH		
4.3.14 Gas bypass temperature	TbG		
4.3.15 Temperature in the Inverter fin	TFi		
4.3.16 Fan controller temperature	TFF		
4.3.17 Compressor running current	A1		
	A2		
4.3.18 Fan running current	AF		
4.3.19 Accumulated operation time of compressor	UJ1		
	UJ2		
4.3.20 Accumulated operation time of the compressor (available for timer reset)	cU1		
	cU2		
4.3.21 Cause code for stoppage of the Inverter	iT		
4.3.22 Cause code for stoppage of the fan controller	FT		
4.4 Information of the indoor unit			
Indoor unit capacity	CA		
Indoor unit expansion valve opening	iE		
Heat exchanger liquid temperature	TL		
Heat exchanger gas temperature	TG		
Inlet air temperature	Ti		
Outlet air temperature	To		
Cause code for stoppage of the indoor unit	d1		

Detailed information of the outdoor unit microcomputer output from the above table (4.3.2):

Mark	Description of mark	Parts mark in wiring diagram
$52C_1$	Contactor of relay (Y_{52C1}) on PCB1 for Inverter compressor	CMC1
$52C_2$	Contactor of relay (Y_{52C2}) on PCB1 for constant speed compressor	CMC2
CH_1	Contactor of relay (Y_{CH1}) on PCB1 for crankcase heater	CH1
CH_2	Contactor of relay (Y_{CH2}) on PCB1 for crankcase heater	CH2
$20A_1$	Contactor of relay (Y_{20A1}) on PCB1 for solenoid valve	SVA
$20A_2$	-	-
21_1	Contactor of relay (Y_{211}) on PCB1 for reversing valve	RVR1
21_2	Contactor of relay (Y_{212}) on PCB1 for reversing valve	RVR2
FAN	-	-
20B	-	-
20C	-	-
$20F_1$	-	-
$20F_2$	-	-
20CHG	-	-
X_1	Contactor of relay (Y_{X1}) on PCB1 for solenoid valve	SVG
X_2	-	-

12.8 Service and maintenance table through the remote control switch

Data sheet for the checks using the remote control switch:

Time			:	:	:	:	:
I.U. model							
I.U. serial number							
I.U. number / Alarm code							
	Check mode 1	Check mode 2	1 · 2	1 · 2	1 · 2	1 · 2	1 · 2

B Temperature indication							
Temperature setting	b1	--					
Inlet air temperature	b2	91					
Discharge air temperature	b3	92					
Liquid pipe temperature	b4	93					
Remote thermistor temperature	b5	--					
Outlet air temperature	b6	94					
Gas pipe temperature	b7	95					
Evaporating temperature in heating mode	b8	96					
Control information	b9	97					
Temperature of the upper part of the compressor	bA	98					
Thermo temp. of remote control switch	bb	--					

C Indication of the microcomputer state							
I.U. microcomputer	C1	--					
O.U. microcomputer	C2	--					

D Stoppage cause state indication							
Stoppage cause state indication	d1	--					

E Alarm fault							
Abnormal times	E1	--					
Power failure times	E2	--					
Abnormal transmission times	E3						
Inverter trip times	E4	--					

F Automatic louver state							
Louver sensor state	F1	--					

H Pressure and frequency state indication							
Discharge pressure	H1	99					
Suction pressure	H2	9A					
Control information	H3	9b					
Operating frequency	H4	9C					

J Indication of the I.U. capacity							
I.U. capacity (x 1/8 HP)	J1	--					
O.U. code	J2	--					
Refrigerant cycle number	J3	--					
Refrigerant cycle number	J4	--					

L Expansion valve opening							
I.U. expansion valve	L1	9d					
O.U. expansion valve 1	L2	9E					
O.U. expansion valve 2	L3	--					
O.U. expansion valve B	L4	--					

P Running current indication (reference)							
Compressor current	P1	9F					

NOTE

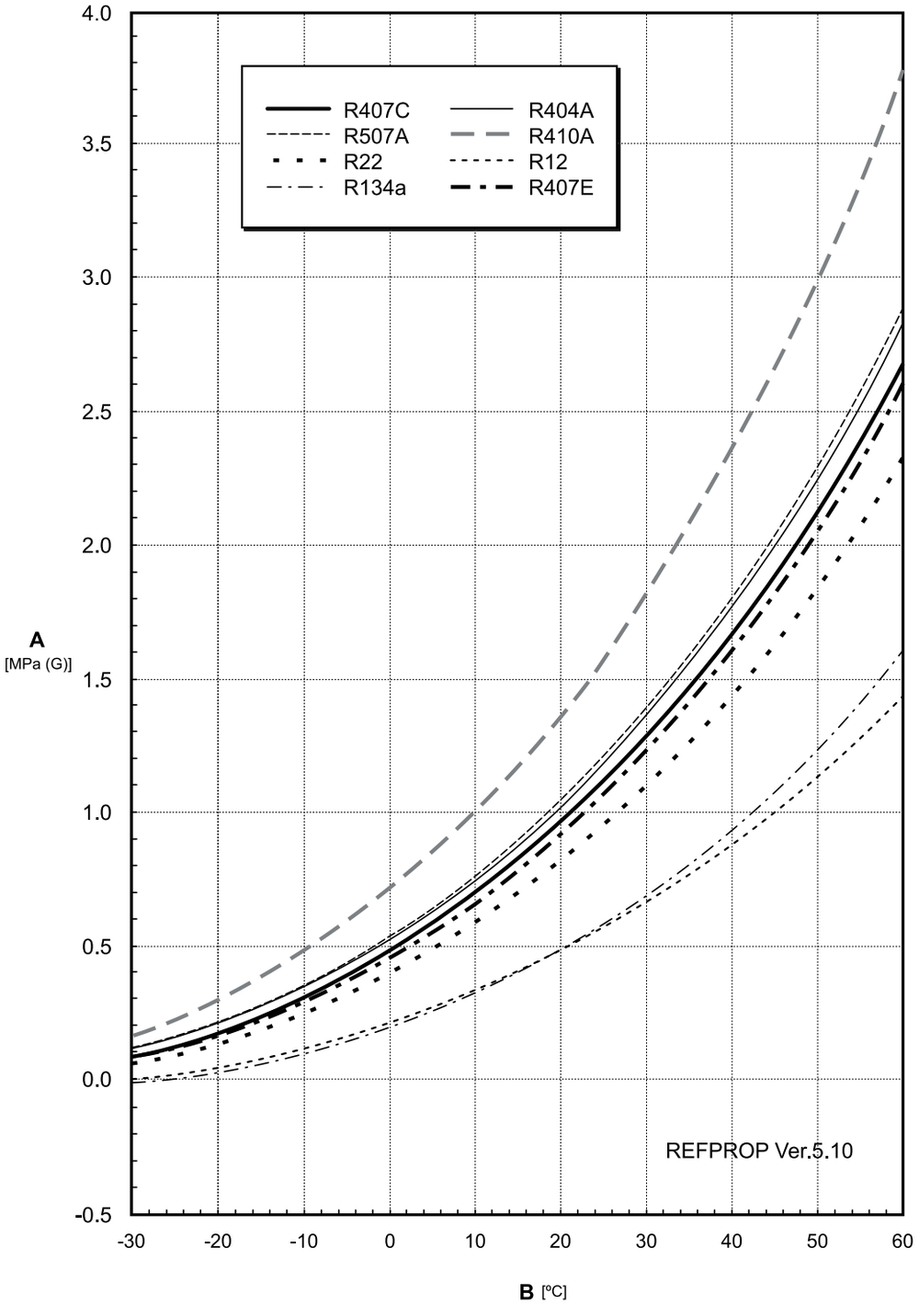
- *I.U.: Indoor unit*
- *O.U.: Outdoor unit*

Customer:_____	Result
Installation date:_____	
System number:_____	
Inspection date:_____	
Inspection technician:_____	

12.9 Service and maintenance table

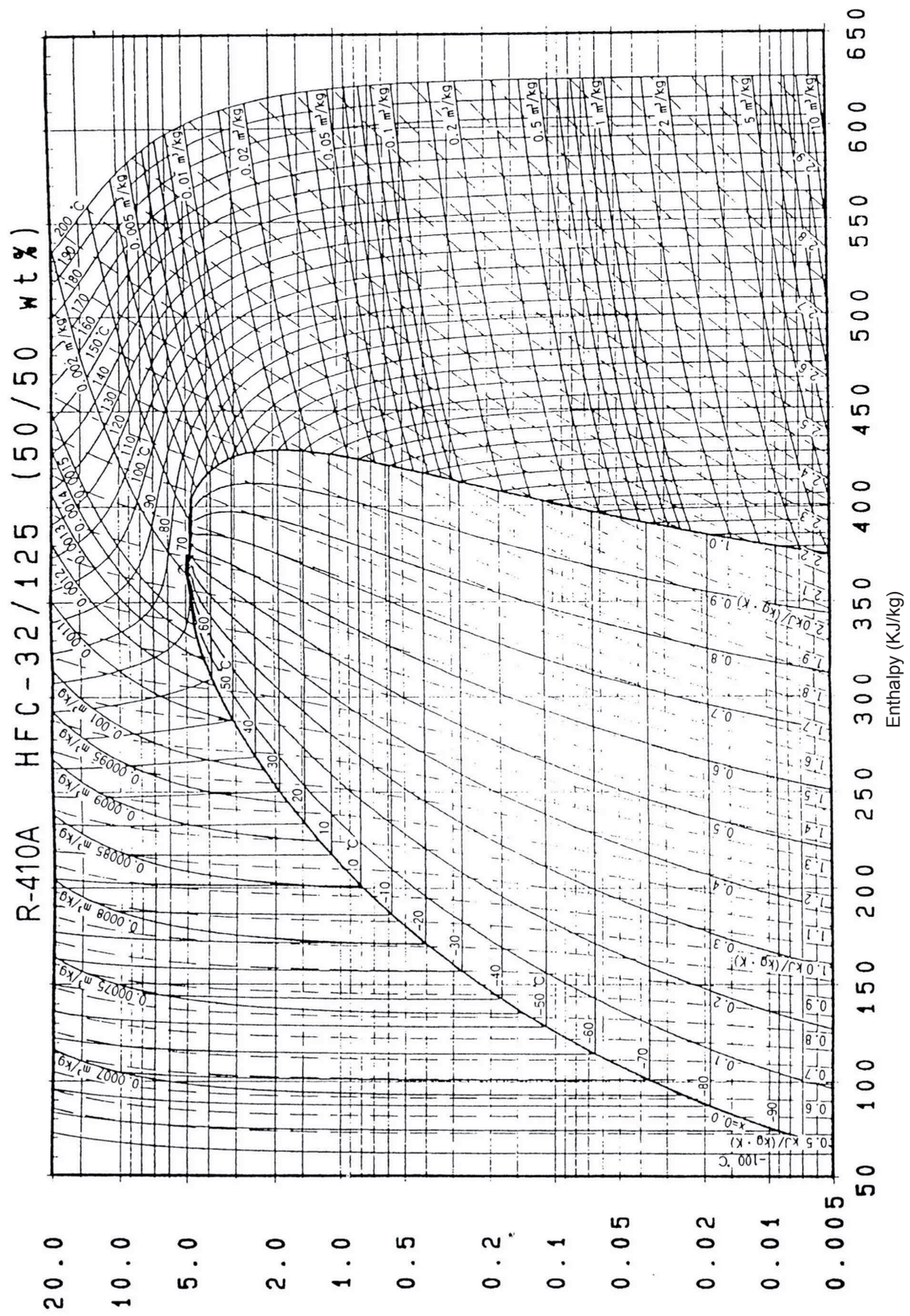
No.	Check item	Action	Judgement	
1	Is the service space sufficient?		Yes	No
2	Is there a short circuit in the discharge air?		Yes	No
3	Any heat influence?		Yes	No
4	Is the earth wire connected?		Yes	No
5	Refrigerant pipe		Correct	Incorrect
6	Fixing of units		Correct	Incorrect
7	Are the internal and external surfaces damaged?		Yes	No
8	Are the screws and bolts tightened?	Tighten if loose.	Tightened	Not tightened
9	Are the terminal screws tightened?	Tighten the screws on the terminals with a Philips screwdriver.	Tightened	Not tightened
10	Are the compressor terminals tightened?	Push all the terminals.	Push	Not push
11	Insulation resistance	Measure the insulation resistance with a multimeter. Fan and compressor: Motor: greater than 3 MΩ. Others: greater than 3 MΩ.	Correct	Incorrect
12	Are there drainage problems in the water flow?	Check the smoth flow with a little water.	Correct	Incorrect
13	Is there leakage in the compressor?	Check there is no leakage.	Correct	Incorrect
14	Is there leakage in the outdoor heat exchanger?	Check there is no leakage.	Correct	Incorrect
15	Is there leakage in the indoor heat exchanger?	Check there is no leakage.	Correct	Incorrect
16	Is there leakage in the 4-way valves?	Check there is no leakage.	Correct	Incorrect
17	Is there leakage in the check valve?	Check there is no leakage.	Correct	Incorrect
18	Is there leakage in the accumulator?	Check there is no leakage.	Correct	Incorrect
19	Is there leakage in the strainer?	Check there is no leakage.	Correct	Incorrect
20	Is there leakage in the expansion valve?	Check there is no leakage.	Correct	Incorrect
21	Is there leakage in the piping?	Check there is no leakage.	Correct	Incorrect
22	Check the direction of the fans	See the air flow volume.	Correct	Incorrect
23	Check the voltage of each phase	Greater than 220 V.	Correct	Incorrect
24	Vibrations and noise	Check the compressor, the piping, the fan, etc.	Correct	Incorrect
25	Activation of the operation modes	Activate the COOL switch, the HEAT switch, the STOP switch and the TEMP switch.	Correct	Incorrect
26	Cut-out of the high pressure switch	Check the current activation valve.	Correct	Incorrect
27	Activate the drain-up mechanism	Check it is activated during cooling mode.	Correct	Incorrect
28	Indoor inlet air temperature DB/WB	—	(°C) DB	(°C) WB
29	Indoor outlet air temperature DB/WB	—	(°C) DB	(°C) WB
30	Outdoor inlet air temperature DB/WB	—	(°C) DB	(°C) WB
31	Outdoor outlet air temperature DB/WB	—	(°C) DB	(°C) WB
32	High pressure switch	—	MPaG	
33	Low pressure switch	—	MPaG	
34	Operating voltage	—	V	
35	Operating current	—	A	
36	Instructions for the customer for cleaning the filters	—	Done	Not yet
37	Instructions for the customer for the cleaning procedure	—	Done	Not yet
38	Instructions for the customer for operation	—	Done	Not yet

12.10 Saturation curve for refrigerant



A	Saturation pressure (Liquid)
B	Saturation temperature (Liquid)

12.11 Mollier chart for R410A



- The refrigerant collection method when replacing the parts (compressor or cycle parts) of outdoor unit.

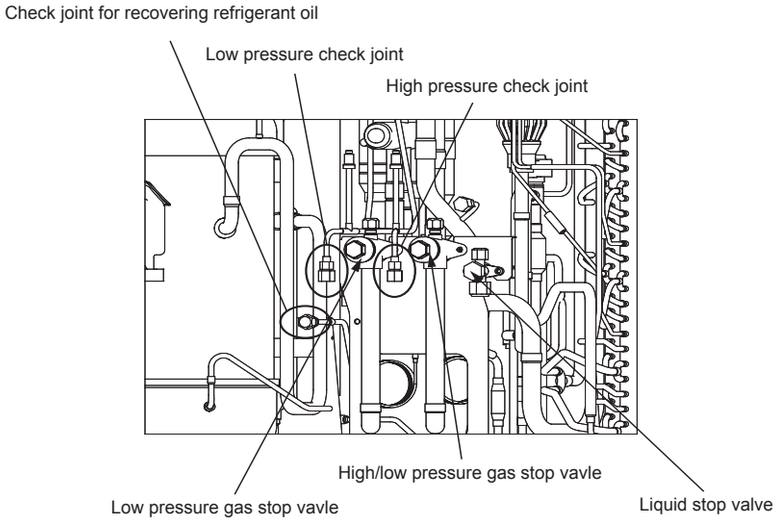
Process No.	Procedure	Remarks
1	Turn OFF the main switch of O.U.	-
2	Connect manifold to the check joint at low and high pressure side in O.U.	-
3	Turn ON the main switch of O.U.	-
4	**In case that compressor operates** Perform pre-refrigerant collection during cooling test run. • Turn ON the dip switch (DSW4#1) of O.U. PCB1 and start the test run. • The test run should be performed for approx. 20 min, (until Ps>0.3 MPa, Td>75 °C) • Check the suction pressure “Ps” on 7-seg. of O.U. PCB1. • Close the gas valve inmediately. Perform the forced stoppage by turning on the dip switch (DSW4#4) when Ps is ≤0.2 MPa. • Cancel cooling operation (by DSW4#1 is OFF). • Cancel the forced stoppage (by DSW4#4 is OFF).**In case that compressor does not operate** • Close all the gas stop valves (at low and high pressure sides).	After closing the gas stop valve, the decrease of Ps value is fast. To guarantee the reliability of the Comp., make sure that the decrease does not reach Ps<0.1 MPa when performing the forced stoppage.
5	Close the liquid stop valve completely.	-
6	Collect refrigerant by a refrigerant collector. Collect the refrigerant from the check joints at low and high pressure sides in O.U. All the refrigerant of O.U. side is collected by a refrigerant collector.	• The discharge of the refrigerant in the atmosphere is strictly forbidden. Make sure that the refrigerant is collected by a refrigerant collector. • Measure the quantity of the collected refrigerant and record it.
7	After collecting the refrigerant, remove the charge hose at the collector side, so that the inside of the refrigerant cycle will be the atmosphere pressure.	• Make sure that there is no pressure increase after collecting the refrigerant and then remove the charge hose. • Make sure that the refrigerant cycle is the atmosphere pressure. Otherwise, problems such as the blowing of gas and the suction of the cutting material will occur when removing the Comp.
8	Turn OFF the main switch of O.U.	-
9	Perform replacing Comp., return oil circuit or electrical parts.	Removing electrical box may be required. Measure the quantity of the refrigerant oil and record it.
10	Charge the refrigerant oil as the same quantity as the collected refrigerant oil. Perform the vacuuming from the check joint at a low and high pressure sides. Connect the charge hose to the charge port of return oil circuit and charge the refrigerant oil.	• When the refrigerant oil is collected from the accumulator or compressor, calculation for recharge amount is required. • Use a clean charge hose. • Use a container with a small opening so that the refrigerant oil does not absorb the moisture in the atmosphere and work in a short time (approx. within 20 minutes).
11	Disconnect the charge hose from the charger port of return oil circuit. Perform the vacuuming from the check joint at low and high pressure sides.	Refer to *“Installation vacuum”*.
12	Recharge the collected refrigerant (process No.6) from the check joint at high pressure side. For the remainded quantity: Fully open the liquid and gas stop valve and set DSW4#1 to ON side of O.U. PCB1. Then recharge it from the liquid stop valve check joint during cooling operation.	Refer to *“3.1.8 Refrigerant charge”*.
13	Check the liquid and gas stop valves are fully opened.	-

O.U.: Outdoor unit.

7-seg.: 7-segment.

Comp.: Compressor.

Location of check joints and stop valves



- The refrigerant collection method when replacing indoor unit.

Process No.	Procedure	Remarks
1	Turn OFF the main switch of O.U. and I.U.	-
2	Close all the gas stop valves (at low and high pressure side) of O.U. and the liquid and gas stop valve completely.	-
3	Collect the refrigerant by a refrigerant collector. Collect the refrigerant from the gas stop valves (at low and high pressure sides) of O.U. and the check joint of the liquid stop valve. Collect all the refrigerant in the I.U. side by refrigerant collector.	• The discharge of the refrigerant in the atmosphere is strictly forbidden. Make sure that the refrigerant is collected by a refrigerant collector. • Measure the quantity of the collected refrigerant and record it.
4	After collecting the refrigerant, remove the charge hose at the collector side, so that the inside of the refrigerant cycle will be the atmosphere pressure.	• ;ake sure that there is no pressure increase after collecting the refrigerant and then remove the charge hose. • Make sure that the refrigerant cycle is the atmosphere pressure. Otherwise, problems such as the blowing of gas and the suction of the cutting material may occur when removing the refrigerant cycle parts.
5	Perform replacing I.U.	-
6	Perform the vacuuming from the gas stop valves (at low and high pressure sides) of O.U. and the check joint of the liquid stop valve.	Refer to *"Installation vacuum"*.
7	Recharge the collected refrigerant (Process No.3) from the liquid stop valve.	Refer to *"3.1.8 Refrigerant charge"*.
8	Check the liquid and gas stop valves are fully opened.	-

O.U.: Outdoor unit.

I.U.: Indoor unit.

Comp.: Compressor.

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SMGB0076 rev.2 - 07/2014

Printed in Spain