SERVICE MANUAL

UTOPIA
R32 SERIES
R410A SERIES

MODELS

RAS-3HVRC2
RAS-(4-6)H(V)RC2E - RAS-(4-6)H(V)RP2E
RAS-(4-6)H(V)NC2E - RAS-(4-6)H(V)NP2E

Cooling & Heating

SMGB0136 rev.0 - 07/2021

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1. General Information

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1.1 General information

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1.1.1 Introduction

Hitachi UTOPIA Prime/ UTOPIA IVX Prime series is an outdoor unit series designed with the goal to cover the requirements of the split and multisplit systems, for installations where from one indoor unit (single system) to up to 4 indoor units, are connected to the same UTOPIA outdoor unit (depending on model).

UTOPIA series 2 consists in two different outdoor unit series: UTOPIA Prime and UTOPIA IVX Prime, which compliant with the Eco Design (ErP) and Energy Labelling (ELD) directives about seasonal energy performance:

- ErP 206/2012& ELD (626/2011) for models up to 12kW of Cooling capacity
- ErP 2016/2281 for models higher than 12kW of Cooling capacity

The Seasonal Energy Efficiency Ratio (SEER) in cooling and the Seasonal Coefficient of Performance (SCOP) in heating, show an approach values to the real energy consumption.

UTOPIA series incorporate the Hitachi inverter technology, which makes possible to adapt automatically and without the user operation the capacity of the unit, so the power input, to the real demand of the installation, increasing the system efficiency to unattainable levels with other technologies. All UTOPIA units are equipped with a heat pump, resulting in an air conditioning system valid for the whole year, in which the installation of additional and specific systems are not necessary.

UTOPIA series 2

Nominal capacity from 7 kW to 14 kW (cooling mode). Connectable indoor units up to 4 units (depending on model) and total combination power from 90% up to 115%, outdoor units from 4 to 6HP, or 90% up to 100% for 3HP outdoor units.

Indoor Units

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

1.2 Applied symbols

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

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

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, in addition to hazards or unsafe practices which could result in severe personal injuries or death.***
- ***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, in addition to hazards or unsafe practices which could result in minor personal injury or product or property damage*
- *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 Norms and Regulations

Following Regulation EU Nº 517/2014 on Certain Fluorinated Greenhouse gases, it is mandatory to fill in the label attached to the unit with the total amount of refrigerant charged on the installation.

Do not vent R32 into the atmosphere: R32 is fluorinated greenhouse gas covered by the Kyoto protocol global warming potential (GWP) R32 = 675.

Do not vent R410A into the atmosphere: R410A are fluorinated greenhouse gases covered by the Kyoto protocol global warming potential (GWP) R410A = 2088.

Tn of CO_2 equivalent of fluorinated greenhouse gases contained is calculated by indicated GWP * Total Charge (in kg) indicated in the product label and divided by 1000.

Appropriate refrigerant

The refrigerant used in each unit is identified on the specification label and manuals of the unit. Hitachi shall not be held liable for any failure, trouble, malfunction or accident caused by units illegally charged with refrigerants other than the specified one.

Consequences of charging non-specified refrigerant

IIt may cause mechanical failure, malfunction and other accidents.

It may cause operational failure of protection and safety devices of air conditioners.

It may also cause lubrication failure of the sliding part of the compressor due to deterioration of refrigerant oil.

In particular, hydrocarbon refrigerants (such as propane, R441A, R443A, GF-08, etc.) are not allowed, since these are combustible and may cause major accidents such as fire and explosion in case of improper handling.

Once a non-specified refrigerant has been charged, no further servicing (including draining of refrigerant) shall be performed, even in case of malfunction. Improper handling of refrigerant may be a cause of fire and explosion, and servicing in such cases may be considered an illegal act.

End clients and costumers shall be informed that servicing is not approved, and the installer who charged the nonspecified refrigerant shall be asked to fix the unit.

Hitachi will accept no responsibility for units that have been charged with non-specified refrigerant once.

1.4 Product guide

1.4.1 Classification of outdoor unit models

Unit type (Outdoor unit): RAS

Position-separating hyphen (fixed)

Capacity (HP): 3, 4, 5, 6

H = Heat pump

V = Single phase unit (1~ 230V 50Hz)
- = Three phase unit (3N~ 400V 50Hz)

R = R32 refrigerant
N = R410A refrigerant

C: Simultaneous operation mode
P: Individual operation mode

2 = series 2

E = Made in Europe
- = Made in Japan

RAS	–	X	H	(X)	X	X	2	(X)

1.4.2 Classification of indoor unit models

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

Position-separating hyphen (fixed)

Capacity (HP): 0.4, 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

R = R32 / R410A refrigerant
N = R410A refrigerant

H = Hotel (RPK-(0.4-1.5) only)

2/3/6 = series

P= Pair

E = Made in Europe
M = Made in Malaysia
– = Made in Japan or China

(-f) = Non-flammable insulation (RPI-(8.0-20.0)FSN3(P)E-f only)
(-EF) = Ducted indoor unit for econofresh assembly (RPI-(4.0-6.0)FSN6E-EF only)

XXX	–	X.X	FS	(X)	(H)	X	(P)	(X)	(X)

1.4.3 Product line-up: Outdoor units

◆ **UTOPIA Prime**

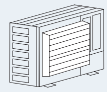
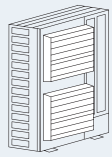
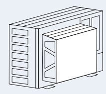
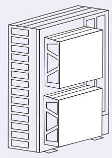
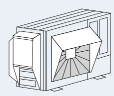
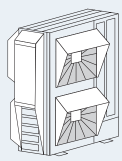
R32						R410A			
1~ 230V 50Hz				3N~ 400V 50Hz		1~ 230V 50Hz		3N~ 400V 50Hz	
									
Unit	Code	Unit	Code	Unit	Code	Unit	Code	Unit	Code
RAS-3HVRC2	60289185								
		RAS-4HVRC2E	7E303034	RAS-4HRC2E	7E303134	RAS-4HVNC2E	7E305055	RAS-4HNC2E	7E305155
		RAS-5HVRC2E	7E303035	RAS-5HRC2E	7E303135	RAS-5HVNC2E	7E305056	RAS-5HNC2E	7E305156
		RAS-6HVRC2E	7E303036	RAS-6HRC2E	7E303136	RAS-6HVNC2E	7E305057	RAS-6HNC2E	7E305157

◆ **UTOPIA IVX Prime**

R32				R410A			
1~ 230V 50Hz		3N~ 400V 50Hz		1~ 230V 50Hz		3N~ 400V 50Hz	
							
Unit	Code	Unit	Code	Unit	Code	Unit	Code
RAS-4HVRP2E	7E303234	RAS-4HRP2E	7E303334	RAS-4HVNP2E	7E305255	RAS-4HNP2E	7E305355
RAS-5HVRP2E	7E303235	RAS-5HRP2E	7E303335	RAS-5HVNP2E	7E305256	RAS-5HNP2E	7E305356
RAS-6HVRP2E	7E303236	RAS-6HRP2E	7E303336	RAS-6HVNP2E	7E305257	RAS-6HNP2E	7E305357

HITACHI

1.4.4 Outdoor unit accessory code list

Name	OU Reference	Description	Code	Figure
DBS-12L	RAS-3HVRC2	Drain discharge connection	60291491	
DBS-26	RAS-(4-6)H(V)(R/N)(C/P)2E	Drain discharge connection	60299192	
AG-264	RAS-3HVRC2	Air flow guide	60209100	
AG-335A	RAS-(4-6)H(V)(R/N)(C/P)2E	Air flow guide	60291431	
WSP-264	RAS-3HVRC2	Wind guard	60291831	
WSP-335A	RAS-(4-6)H(V)(R/N)(C/P)2E	Wind guard	60291432	
Snow protection hood				
Name	OU Reference	Description	Code	Figure
ZINC PLATE				 
ASG-SP10FTB (Half)	RAS-3HVRC2	Air outlet	60292336	
ASG-SP11FTB (Full)			60292339	
ASG-NP335F1 (Half)	RAS-(4-6)H(V)(R/N)(C/P)2E		60291771	
ASG-SP11FB (Full)			60291781	
ASG-SP10BTB	RAS-3HVRC2	Air inlet of rear side	60292337	
ASG-SP10BE	RAS-(4-6)H(V)(R/N)(C/P)2E		60291938	
ASG-SP10LTB	RAS-3HVRC2	Air inlet of left side	60292338	
ASG-SP10LE	RAS-(4-6)H(V)(R/N)(C/P)2E		60291939	
STAINLESS PLATE				
ASG-SP10FTBS (Half)	RAS-3HVRC2	Air outlet	60292352	
ASG-SP11FTBS (Full)			60292355	
ASG-NP335FS4 (Half)	RAS-(4-6)H(V)(R/N)(C/P)2E		60291940	
ASG-SP2 (Full)			60291947	
ASG-SP10BTBS (Half)	RAS-3HVRC2	Air inlet of rear side	60292353	
ASG-SP10BES2	RAS-(4-6)H(V)(R/N)(C/P)2E		60291943	
ASG-SP10LTBS (Half)	RAS-3HVRC2	Air inlet of left side	60292354	
ASG-SP10LES2	RAS-(4-6)H(V)(R/N)(C/P)2E		60291944	
Drain Heater				
DH-SP63A	RAS-3HVRC2	-	60292335	-

NOTE

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

1.4.5 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 the outdoor unit series.*
- *Check the exact classification for each unit (model, type, power and series) in* *"1.4.1 Classification of outdoor unit models".*

◆ RCI and RCIM indoor units

RCI (R32 / R410A)		RCIM (R32 / R410A)	
			
4-way cassette		4-way cassette (compact)	
Unit	Code	Unit	Code
		RCIM-0.4FSRE (*1)	7E414148
		RCIM-0.6FSRE (*2)	7E414137
		RCIM-0.8FSRE	7E414100
RCI-1.0FSR	70405301	RCIM-1.0FSRE	7E414101
RCI-1.5FSR	70405302	RCIM-1.5FSRE	7E414102
RCI-2.0FSR	70405303	RCIM-2.0FSRE	7E414103
RCI-2.5FSR	70405304	RCIM-2.5FSRE	7E414104
RCI-3.0FSR	70405305		
RCI-4.0FSR	70405307		
RCI-5.0FSR	70405308		
RCI-6.0FSR	70405309		
Panel		**Panel**	
P-N23NA2 (without Motion Sensor)	70532000	P-AP56NAM (without Motion Sensor)	70533000
P-AP160KA3 (Standard panel without Motion Sensor, black)	60279337	P-AP56NAMS (Motion Sensor embedded)	70533100
P-GP160NAP (Iconic panel, white)	60297331	P-AP56NAMR (Receiver kit embedded)	70533500
P-GP160KAP (Iconic panel, black)	60297334		
P-GP160NAPU (Iconic panel, with elevating grille)	60297339		

NOTE

- *The RCI and RCIM models must be used in combination with the indicated panels.*
- *(*1): Follow the detailed information about the combinability and restrictions for 0.4 HP Indoor Units, which can only be used in combination with current SET FREE Mini (RAS-(4-6)FS(V)NME, RAS-(8-12)FSXNME) and SET FREE (RAS-FSXNSE, RAS-FSXNPE).*
- *(*2): 0.6 HP Indoor Units can only be used in combination with SET FREE Mini (RAS-(4-6)FS(V)NME, RAS-(8-12)FSXNME) and SET FREE (RAS-FSXNSE, RAS-FSXNPE).*

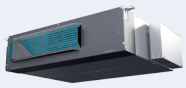
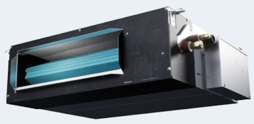
◆ RCD and RPC indoor units

RCD (R32 / R410A)				RPC (R32 / R410A)	
					
2-way cassette				Ceiling type	
Unit	Code	Unit	Code	Unit	Code
RCD-0.8FSR (*)	60279168				
RCD-1.0FSR (*)	60279169				
RCD-1.5FSR (*)	60279170			RPC-1.5FSR	60279267
RCD-2.0FSR (*)	60279171			RPC-2.0FSR	60279268
RCD-2.5FSR (*)	60279172			RPC-2.5FSR	60279269
RCD-3.0FSR (*)	60279173			RPC-3.0FSR	60279270
		RCD-4.0FSR (*)	60279174	RPC-4.0FSR	60279271
		RCD-5.0FSR (*)	60279175	RPC-5.0FSR	60279272
		RCD-6.0FSR (*)	60279176	RPC-6.0FSR	60279273
Panel		**Panel**			
P-AP90DNA	60297319	P-AP160DNA	60297320		

NOTE

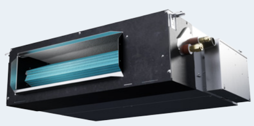
- *The RCD models must be used in combination with the indicated panels.*
- *(*): 1 indoor unit combinations with UTOPIA series not allowed.*

◆ RPI indoor units

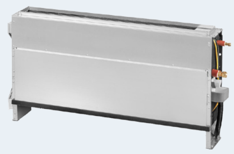
DUCTED INDOOR UNIT (R32 / R410A)					
					
RPIL-FSRE		RPI-FSRE		RPIH-FSRE	
Unit	Code				
RPIL-0.4FSRE(*1)	7E426048				
RPIL-0.6FSRE (*2)	7E426037				
RPIL-0.8FSRE	7E426013				
RPIL-1.0FSRE	7E426014				
RPIL-1.5FSRE	7E426002	RPI-1.5FSRE	7E426015		
		RPI-2.0FSRE	7E426016		
		RPI-2.5FSRE	7E426017		
		RPI-3.0FSRE	7E426018		
		RPI-4.0FSRE	7E426020	RPIH-4.0FSRE	7E426007
		RPI-5.0FSRE	7E426021	RPIH-5.0FSRE	7E426008
		RPI-6.0FSRE	7E426022	RPIH-6.0FSRE	7E426009

NOTE

- *(*1): Follow the detailed information about the combinability and restrictions for 0.4 HP Indoor Units, which can only be used in combination with current SET FREE RAS-FSXNSE, RAS-FSXNPE and SIDE FLOW RAS-FS(X)NME.*
- *(*2) 0.6 HP Indoor Units can only be used in combination with SET FREE RAS-FSXNSE and RAS-FSXNPE series and SIDE FLOW RAS-FS(X)NME.*

DUCTED INDOOR UNIT for ECONOFRESH ASSEMBLY (R410A)	
	
Unit	Code
RPI-4.0FSN6E-EF	7E426027
RPI-5.0FSN6E-EF	7E426028
RPI-6.0FSN6E-EF	7E426029

◆ RPK, RPF and RPFI indoor units

RPK (R32 / R410A)		RPF (R410A)		RPFI (R410A)	
					
Wall type		Floor type		Floor concealed type	
Unit	Code	Unit	Code	Unit	Code
RPK-0.4FSRM (*1)	60279204				
RPK-0.4FSRHM (*1)	60279221				
RPK-0.6FSRM (*2)	60279205				
RPK-0.6FSRHM (*2)	60279222				
RPK-0.8FSRM	60279206				
RPK-0.8FSRHM	60279223				
RPK-1.0FSRM	60279207				
RPK-1.0FSRHM	60279224	RPF-1.0FSN2E	7E450001	RPFI-1.0FSN2E	7E460001
RPK-1.5FSRM	60279208				
RPK-1.5FSRHM	60279225	RPF-1.5FSN2E	7E450002	RPFI-1.5FSN2E	7E460002
RPK-2.0FSRM	60279209	RPF-2.0FSN2E (*3)	7E450003	RPFI-2.0FSN2E (*3)	7E460003
RPK-2.5FSRM	60279210	RPF-2.5FSN2E (*3)	7E450004	RPFI-2.5FSN2E (*3)	7E460004
RPK-3.0FSRM	60279211				
RPK-4.0FSRM	60279212				
Expansion valve kit (*4)					
EV-1.5N1 (*4)	60921792				

NOTE

- *(*1): Follow the detailed information about the combinability and restrictions for 0.4 HP Indoor Units, which can only be used in combination with current SET FREE Mini (RAS-(4-6)FS(V)NME, RAS-(8-12)FSXNME) and SET FREE (RAS-FSXNSE, RAS-FSXNPE).*
- *(*2): 0.6 HP Indoor Units can only be used in combination with SET FREE Mini (RAS-(4-6)FS(V)NME, RAS-(8-12)FSXNME) and SET FREE (RAS-FSXNSE, RAS-FSXNPE).*
- *(*3) 1 indoor unit combinations with UTOPIA Prime / UTOPIA IVX Prime and UTOPIA IVX Standard / Premium series not allowed.*
- *(*4) For RPK-(0.4-1.5)FSRHM models only.*

1.4.6 Product line-up: KPI energy recovery unit

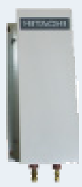
KPI

Energy recovery		Active (Energy Recovery+ R410A DX section)	
Unit	Code	Unit	Code
KPI-252E4E	70603000		
KPI-502E4E	70603001	KPI-502X4E	70603201
KPI-802E4E	70603002	KPI-802X4E	70603202
KPI-1002E4E	70603003	KPI-1002X4E	70603203
KPI-1502E4E	70603004		
KPI-2002E4E	70603005		

1.4.7 Product line-up: DX-Interface

DX-Interface (R410A)

Control box



Expansion valve box

Unit	Code
EXV-2.0E2	7E611000
EXV-2.5E2	7E611001
EXV-3.0E2	7E611002
EXV-4.0E2	7E611003
EXV-5.0E2	7E611004
EXV-6.0E2	7E611005
EXV-8.0E2	7E611006
EXV-10.0E2	7E611007

1.4.8 Product line-up: Econofresh

Econofresh (R410A)

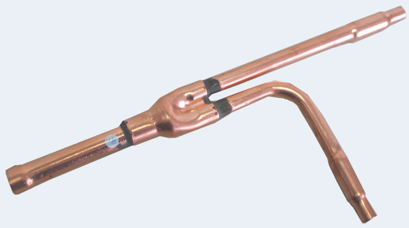
Unit	Code
EF-456N1E	7E560001

NOTE

The EF-456N1E unit can only be installed in combination with the following units:

- *RPI-4.0FSN6E-EF (7E426027)*
- *RPI-5.0FSN6E-EF (7E426028)*
- *RPI-6.0FSN6E-EF (7E426029)*

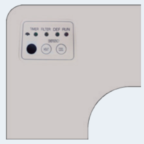
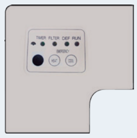
1.4.9 Multi-Kits

Name	Description	Code	Figure
E-102SN4	Branch Pipe	70524201	
E-162SN4		70524202	
MH-84AN1	Header Branch	70522009	

1.4.10 Individual remote controls

Name	Description	Code	Figure
PC-ARFP1E	Remote control with timer	70510003	
PC-ARH1E	Simplified remote control	70510004	
PC-AWR	Wireless remote control	60291969	

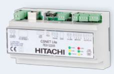
1.4.11 Receiver kit for combination with wireless remote control switch

Receiver kit name	Indoor unit application	Compatible wireless remote control	Code	Figure
on the panel				
PC-ALH3	RCI-FSR	PC-AWR	60291767	
PC-ALHC1	RCIM-FSRE	PC-AWR	70590906	
PC-ALHD1	RCD-FSR	PC-AWR	60292053	
PC-ALHP1	RPC-FSR	PC-AWR	60291823	
on the wall				
PC-ALHZ1	RPI(L/H)-FSRE(-EF) RPI-FSN(3/6)(P)E(-f) RPF(I)-FSN2E RCI-FSR RCIM-FSRE RCD-FSR RPK-FSR(H)M RPC-FSR	PC-AWR	60292245	

1.4.12 Centralised remote controls

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

1.4.13 Building air conditioning controls

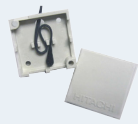
Name	Description	Code	Figure
CSNET Manager 2 T10	Centralised control with a touch interface of 10 inches which runs CSNET Manager 2 software to control the indoor units.	7E512203	
CSNET Manager 2 T15	Centralised control with a touch interface of 15 inches which runs CSNET Manager 2 software to control the indoor units.	7E512206	
CSNET Manager 2 SL	Centralised control interface screen-less which runs CSNET Manager 2 software to control the indoor units.	7E512204	
CSNET Lite	Centralised control which runs CSNET Lite software to control the indoor units in a small installations.	7E512205	
HC-A64NET	H-LINK gateway used by CSNET Manager Screens to communicate with indoor units (Max. 64 indoor units)	7E512200	
HC-IOTGW	airCloud PRO Gateway	60063203	

1.4.14 Gateways for building management systems (BMS)

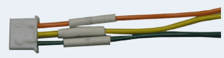
Name	Description	Code	Figure
HC-A16MB	Integration with installation with intelligent control (Building Management System) Gateway Interface to MODBUS systems (Max. 16 indoor units).	7E513210	
HC-A64MB	Integration with installation with intelligent control (Building Management System) Gateway Interface to MODBUS systems (Max. 64 indoor units).	7E513205	
KNX001	Integration with installations with intelligent control (BMS) through CSNET WEB. Gateway Interface to KNX systems.	7E5121000	
HI-AC-KNX-16	Integration with installations with intelligent control (BMS) through CSNET Manager 2 and CSNET Lite. Gateway Interface to KNX systems.	70513303	
HI-AC-KNX-64	Integration with installations with intelligent control (BMS) through CSNET Manager 2 and CSNET Lite. Gateway Interface to KNX systems.	70513304	
HARC-BX E (A)	Integration with installation with intelligent control (Building Management System) Gateway Interface to LONWORKS systems. (H-LINK I communication) (Max. 64 units with 8 parameters)	60290874	
HARC-BX E (B)	Integration with installation with intelligent control (Building Management System) Gateway Interface to LONWORKS systems. (H-LINK I communication) (Max. 32 units with 16 parameters)	60290875	
HI-AC-BAC-16	BACnet gateway connectable to HC-A16MB	70513100	
HI-AC-BAC-64	BACnet gateway connectable to HC-A64MB	70513101	

1.4.15 Control support devices

Name	Description	Code	Figure
PSC-A1T	Programmable timer	60291482	
PSC-6RAD	H-LINK RAC Adapter	60063017	
PC-A1IO	Integration of external equipment into H-LINK	7E519000	
PSC-5HR	H-LINK Relay	60291105	

Name	Description	Code	Figure
THM-R2AE	Remote temperature sensor (THM4)	7E299907	

1.4.16 Control accessories

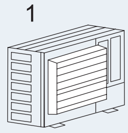
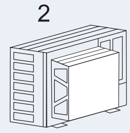
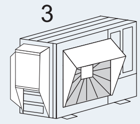
Name	Description	Code	Figure
Wall support 2	Wall mounted support (for both CSNET Manager 2 T10 / T15)	7E512302	
Stand support	Stand mounted support (for both CSNET Manager 2 T10 / T15)	7E512301	
Din rail	Standard din rail for CSNET Lite	7E512303	
PCC-1A	Optional function connector	70590901	
PRC-10E1	2P-Extension cord (10 metres)	7E790211	
PRC-15E1	2P-Extension cord (15 metres)	7E790212	
PRC-20E1	2P-Extension cord (20 metres)	7E790213	
PRC-30E1	2P-Extension cord (30 metres)	7E790214	
Net Configuration Kit	Net configuration kit for HC-A(8/64)MB and HC-A64NET	7E512306	

2. Optional parts and installation

Index

2.1 Optional parts and installation for RAS-3HVRC2

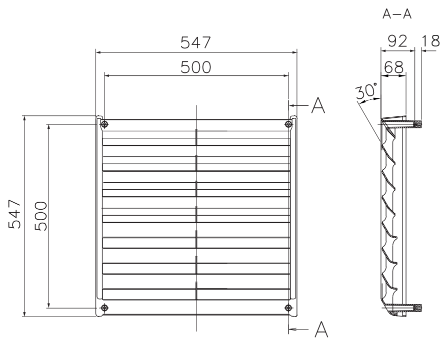
◆ Air flow guide wind guard and snow protection hood

Optional parts			Model	
Air flow guide			AG-264	1  2 
Wind guard			WSP-264	
Snow protection hood	Zinc Plate	Air outlet	ASG-SP10FTB (Half)	
			ASG-SP11FTB (Full)	
		Air inlet of rear side	ASG-SP10BTB	
		Air inlet of side face	ASG-SP10LTB	
	Stainless plate (NSSC180)	Air outlet	ASG-SP10FTBS (Half)	3 
			AASG-SP11FTBS (Full)	
		Air inlet of rear side	ASG-SP10BTBS	
		Air inlet of side face	ASG-SP10LTBS (Half)	**1** Air flow guide **2** Wind Guard **3** Snow protection hood
Drain Heater			DH-SP63A	

2.1.1 Air flow guide AG-264

◆ Specifications

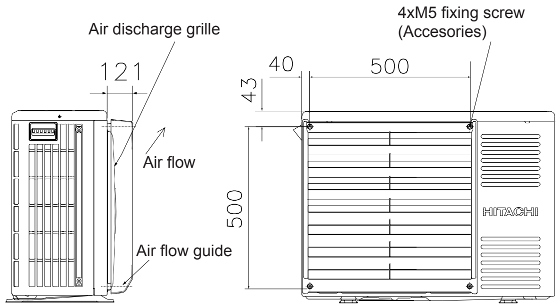
Air discharge direction		Upward (downward) left and right
Material		Weather proof polypropylene resin
Color		Gray (Mussel code:1.0Y8.5/0.5)
Weight		1.7 kg
Accessories	Fixing screw	4 x [M5 (SUS) x 12] + 4 x [M5 (SUS) x 30]
	Self-screw	Self-screw 2x [M4 x 13]
		Installation manual
Installation restriction		“Wind Guard” or “Snow protection hood” is not available to install with air flow guide. (“Guard net” is available to be installed together.)



◆ Air flow guide installation

One air flow installation

- Open the holes for the attachment of the airflow guide with a M4x13 self-tapping screw at the designated locations.
- Attach the air flow guide to the air discharge grille with the supplied M5x12 SUS screws for fixing the airflow guide.
- Do not remove the air discharge grille for air flow guide installation.

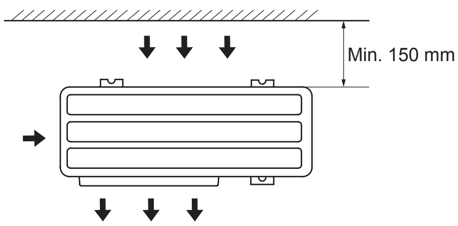


⚠ **CAUTION**

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

◆ Service space

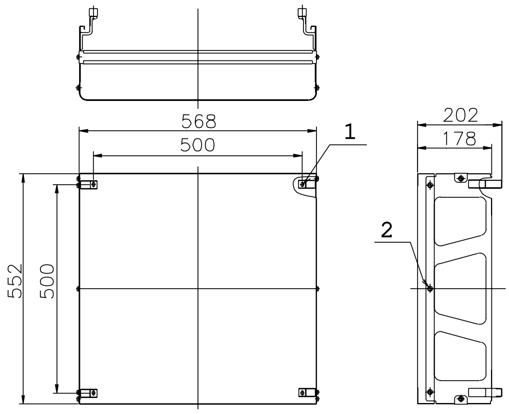
- In case of right and left sides air discharge enough space for air discharge is required.
- The downward air discharge is also available. In such case install the base under the unit to secure enough space for air discharge.
- In case of serial units installation air discharge should be upward.



2.1.2 Wind guard WSP-264

◆ **Specifications**

Material		Galvanized sheet metal + baked painting
Color		UTOPIA Beige (Mussel code: 2.5Y8/2)
Weight		4.0 kg
Accessories	Unit fixing screw	4 x [M5 (SUS) x 30]
	Wind guard fixing screw	10 x [M5 (SUS) x 12]
		Installation manual
Installation restriction		“Guard net” “Air flow guide” or “Snow protection hood” is not available to install with Wind guard
		1 4-6x10 Long Hole **2** 5 (Both Sides) - M5 Screw (attachement)



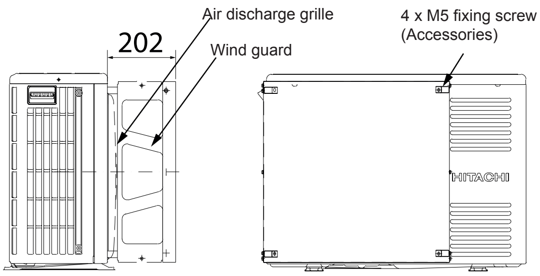
◆ **Installation**

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

⚠ **CAUTION**

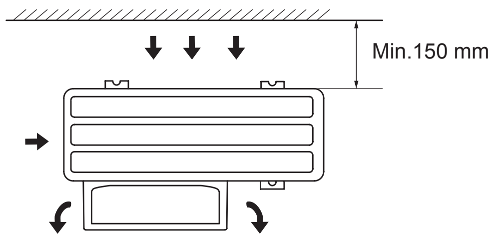
If the air guide is installed without discharge grille it may cause injury due to rotating fan.

◆ **One wind guard cover installation**



◆ **Service space (In case of upward air discharge)**

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

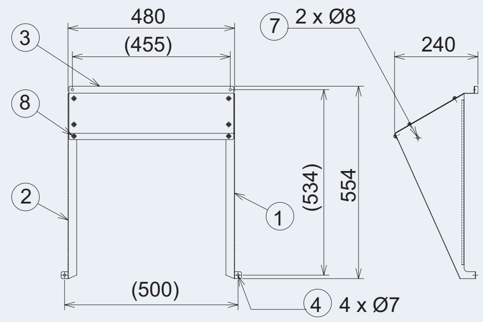


2.1.3 Snow protection hood

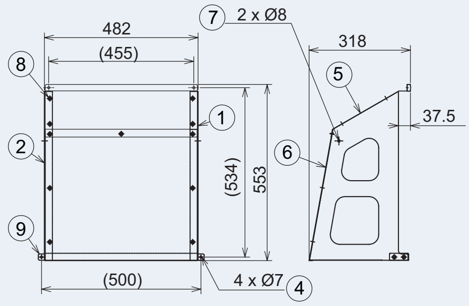
2.1.3.1 Air discharge hood

Product name		ASG-SP10FTB (Half) (1) ASG-SP11FTB (Full) (2)	ASG-SP10FTBS (Half) (1) ASG-SP11FTBS (Full) (2)
Material		Bonderized steel sheet	Stainless (NSSC 180)
Color		Gray (1.0Y8.5/0.5)	—
Weight		(1) 1.9 kg (2) 4.3 kg	(1) 1.9 kg
Assembling		Assembly on site	
Components			
	Hood	For air discharge part x1	
	Fixing screw	(1) 7 x [M5x12] (2) 16 x [M5x12]	6 x [M5x12] (2) 16 x [M5x12]
	Hood fixing screw (SUS)	5 x [M5x16]	8 x [M5x14]
	Self-screw	2 x [M4x13]	
Installation restriction		Installation with “Air flow guide” or “Wind guard” is not available.	
Safety wire rope		ASG-SW20A (for overturning prevention (optional parts))	

(1) Half type



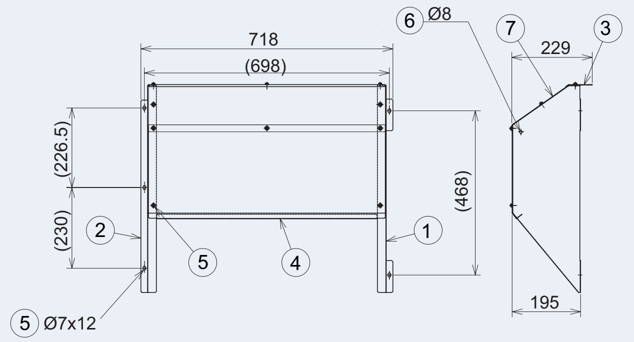
(2) Full type



Nº	Name of parts	Half type	Full type
		Quantity	Quantity
1	Right plate	1	1
2	Left plate	1	1
3	Front plate	1	-
4	Fixing support Hole	4	4
5	Front plate (Upside)	-	1
6	Front plate (Downside)	-	1
7	Hole (safety wire rope)	2	2
8	Assembling screw	6	15
9	Fixing plate	-	1

2.1.3.2 Rear suction hood

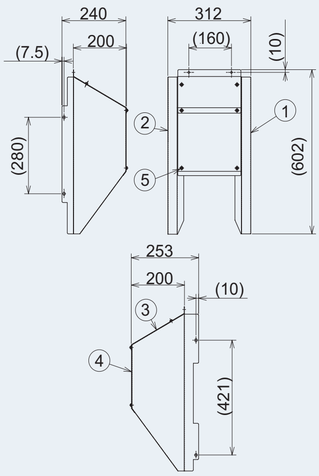
Product name	ASG-SP10BTB	ASG-SP10BTBS
Material	Bonderized steel sheet	Stainless (NSSC 180)
Color	Gray (1.0Y8.5/0.5)	—
Weight	3.9 kg	3.9 kg
Assembling	Assembly on site	
Components		
Hood	For rear side air intake x 1 (Upper side x 1 lower side x 1)	
Fixing screw	4 x [M5x12]	
Hood fixing screw (SUS)	10 x [M5x12]	12 x [M5x14]
Self-screw	2 x (M4x13)	
Installation restriction	Installation with “Guard net” is not available	
Safety wire rope	ASG-SW20A (for overturning prevention (optional parts))	



Nº	Name of parts	Quantity
1	Right side plate	1
2	Left side plate	1
3	Upper front panel (Upside)	1
4	Upper front panel (Downside)	1
5	Fixing screw (Accessories)	1
6	Hole for safety wire rope to prevent overturning	10
7	Surface plate (Middle)	1

2

2.1.3.3 Left suction hood

Product name		ASG-SP10LTB	ASG-SP10LTBS
Material		Bonderized steel sheet	Stainless (NSSC 180)
Color		Gray (1.0Y8.5/0.5)	—
Weight		2.5 kg	2.5 kg
Assembling		Assembly on site	
Components			
	Hood	For left side air intake x 1	
	Fixing screw	6 [M5x12]	
	Hood fixing screw (SUS)	6 x [M5x12]	8 x [M5x14]
	Self-screw	2 (M4x13)	
Installation restriction		Installation with “Guard net” is not available	
Safety wire rope		ASG-SW20A (for overturning prevention (optional parts))	
			

Nº	Name of parts
1	Right plate
2	Left plate
3	Upper front panel (Upside)
4	Upper front panel (Downside)
5	Fixing screw (accessory)
6	-

2.1.3.4 Assembly of snow protection hood

A. Rear side

B. Left side

C Front side

1 Fixing screw

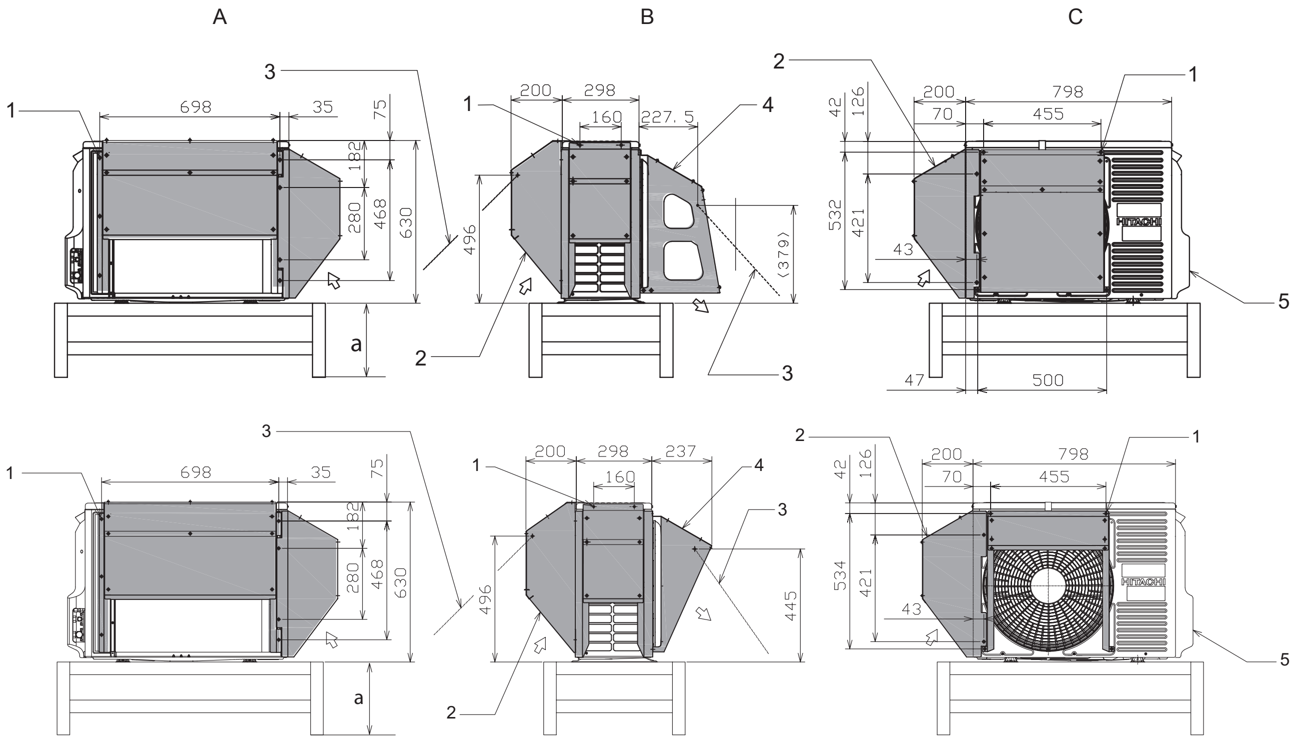
2 Air inlet hood

3 Wire rope (optional for over turning protection)

4 Air discharge hood

5 Outdoor unit

a > Maximum snowfall height

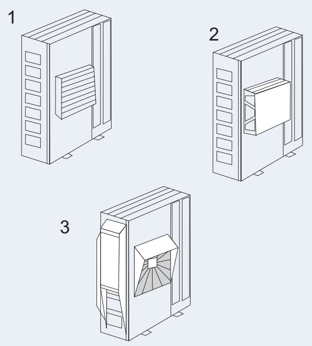


NOTE

The holes locations marked with a mark shall be made by using self screw (M4x13) and later shall be used SUS Screw for fixing protection hood.

2.2 Optional parts and installation RAS-(4-6)H(V)(R/N)(C/P)2E

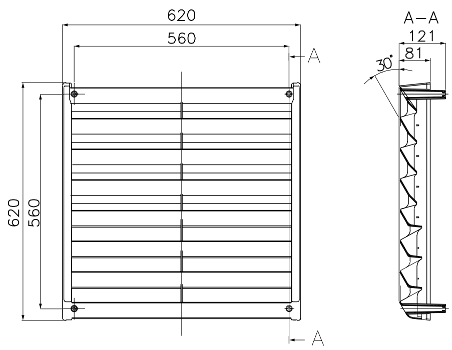
◆ **Air flow guide wind guard and snow protection hood**

Optional parts			Model	
Air flow guide			AG-335A	
Wind guard			WSP-335A	
Snow protection hood	Zinc plate	Air outlet	ASG-NP335F1 (Half)	
			ASG-SP11FB (Full)	
		Air inlet of rear side	ASG-SP10BE	
		Air inlet of side face	ASG-SP10LE	
	Stainless plate (SUS304)	Air outlet	ASG-NP335FS4 (Half)	
			ASG-SP11FBS2	
		Air inlet of rear side	ASG-SP10BES2	
		Air inlet of side face	ASG-SP10LES2	**1** Air flow guide **2** Wind Guard **3** Snow protection hood
Drain Heater			DH-SP280A	

2.2.1 Air flow guide AG-335A

◆ **Specifications**

Air discharge direction		Upward (downward) left and right
Material		Weather proof polypropylene resin
Color		Natural gray
Weight		1.9 kg
Accessories	**Fixing screw**	4 x [M5 (SUS) x 20]
		Installation manual
Installation restriction		“Wind guard” or “Snow protection hood” is not available to install with air flow guide.



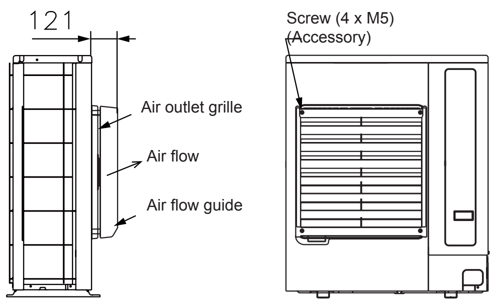
◆ **Installation**

1. To attach the air flow guide, remove the 4 fixing screws at corner of resin air outlet grille. Then, attach the air flow guide by 4 screws (accessory). (Tightening torque: 2.4 - 3.1Nm)
2. When the air flow guide is attached, do not remove the air outlet grille. (If it is removed, there is danger of touching fan rotating parts.)

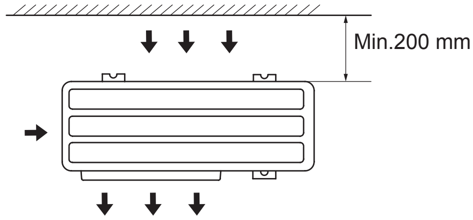
NOTE

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

◆ **One air flow installation**



◆ Service space (In case of upward air discharge)

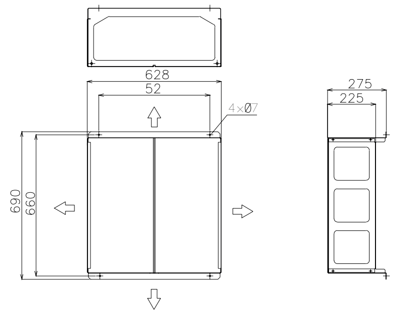


- In case of right and left sides air discharge enough space for air discharge is required.
- The downward air discharge is also available. In such case install the base under the unit to secure enough space for air discharge.
- In case of serial units installation air discharge should be upward.

2.2.2 Wind guard WSP-335A

◆ Specifications

Material		Galvanized sheet metal + baked painting
Color		Gray (1.0Y8.5/0.5)
Weight		8 kg
Accessories	Fixing screw	4 x [M5 (SUS) x 12]
		Installation manual
Installation restriction		"Guard net" "Air flow guide" or "Snow protection hood" is not available to install with Wind guard



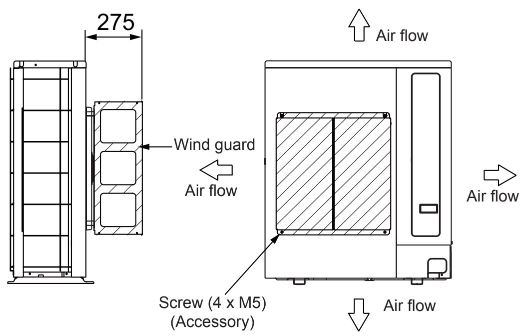
◆ Installation

1 Remove the 4 fixing screws at corner of resin air outlet grille to attach the air flow guide.
2 Attach the air flow guide by 4 screws (accessory). (Tightening Torque: 2.4 - 3.1Nm).
3 Do not remove the air discharge grille for air flow guide installation.

CAUTION

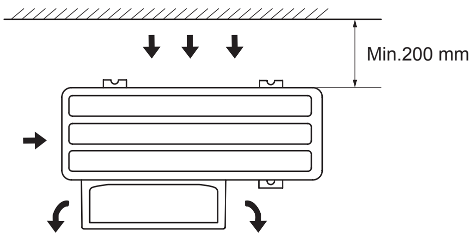
If the air guide is installed without discharge grille it may cause injury due to rotating fan.

◆ One wind guard cover installation



◆ Service space

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

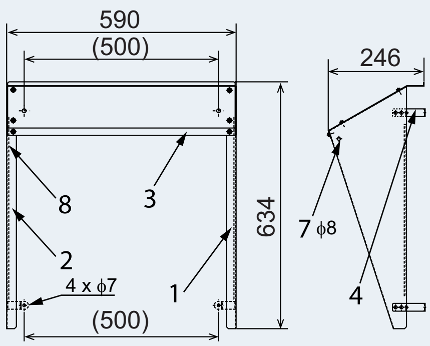


2.2.3 Snow protection hood

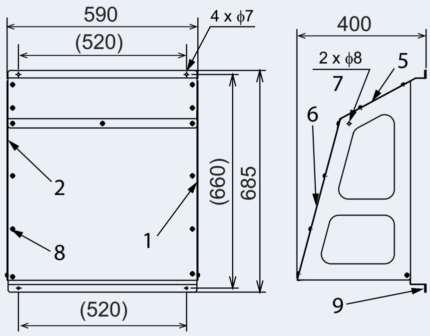
2.2.3.1 Air discharge hood

Product name	ASG-NP335F1 (Half) (1) ASG-SP11FB (Full) (2)	ASG-NP335FS4 (Half)(1) ASG-SP11FBS2 (Full) (2)
Material	Bonderized steel sheet	Stainless (NSSC 180)
Color	Gray (1.0Y8.5/0.5)	—
Weight	(1) 3 kg (2) 8 kg	(1) 3 kg (2) 8 kg
Assembling	Assembly on site	
Components		
Hood	For air discharge part x1	
Fixing screw	(1) (2) 6 x [M5x12]	
Hood fixing screw (SUS)	6 x [M5x12]	8 x [M5x14]
Self-screw	2 x [M4x13]	
Installation restriction	Installation with “Air flow guide” or “Wind guard” is not available.	
Safety wire rope	ASG-SW20A (for overturning prevention (optional parts))	

(1) Half type

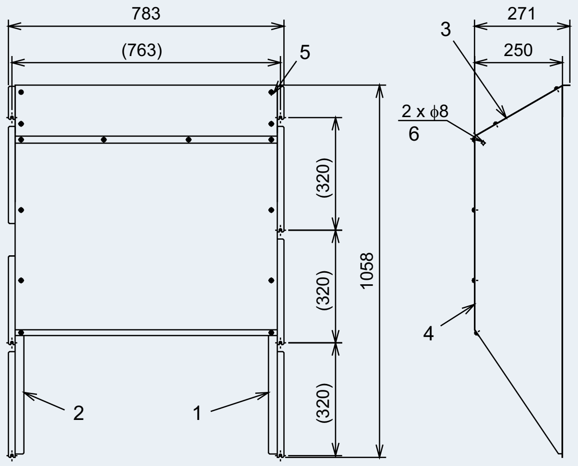


(2) Full type

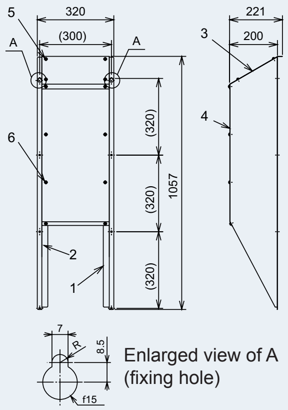


Nº	Name of parts	Half type	Full type
		Quantity	Quantity
1	Right plate	1	1
2	Left plate	1	1
3	Front plate	1	-
4	Fixing support Hole	4	-
5	Front plate (Upside)	-	1
6	Front plate (Downside)	-	1
7	Hole (safety wire rope)	1	1
8	Assembling screw	1	1
9	Fixing plate	-	1

2.2.3.2 Rear suction hood

Product name	ASG-SP10BE	ASG-SP10BES2
Material	Bonderized steel sheet	Stainless (NSSC 180)
Color	Gray (1.0Y8.5/0.5)	—
Weight	11 kg	11 kg
Assembling	Assembly on site	
Components		
Hood	For rear side air intake x 1 (Upper side x 1 lower side x 1)	
Fixing screw	9 x [M5x12]	
Hood fixing screw (SUS)	14 x [M5x12]	16 x [M5x14]
Self-screw	-	
Installation restriction	Installation with “Guard net” is not available	
Safety wire rope	ASG-SW20A (for overturning prevention (optional parts))	
		
Nº	Name of parts	Quantity
1	Right side plate	1
2	Left side plate	1
3	Upper front panel (Upside)	1
4	Upper front panel (Downside)	1
5	Fixing screw (Accessories)	1
6	Hole for safety wire rope to prevent overturning	10
7	Surface plate (Middle)	1

2.2.3.3 Left suction hood

Product name	ASG-SP10LE	ASG-SP10LES2
Material	Bonderized steel sheet	Stainless (NSSC 180)
Color	Gray (1.0Y8.5/0.5)	—
Weight	6.5 kg	6.5 kg
Assembling	Assembly on site	
Components		
Hood	For left side air intake x 1	
Fixing screw	10 x [M5x12]	
Hood fixing screw (SUS)	12 x [M5x12]	14 x [M5x14]
Self-screw	Installation manual	
Installation restriction	Installation with “Guard net” is not available	
Safety wire rope	ASG-SW20A (for overturning prevention (optional parts))	
		

Nº	Name of parts
1	Right plate
2	Left plate
3	Front plate (upper)
4	Front plate (lower)
5	Assembling screw (accesory)
6	Fixing screw (accesory)

2.2.3.4 Assembly of snow protection hood

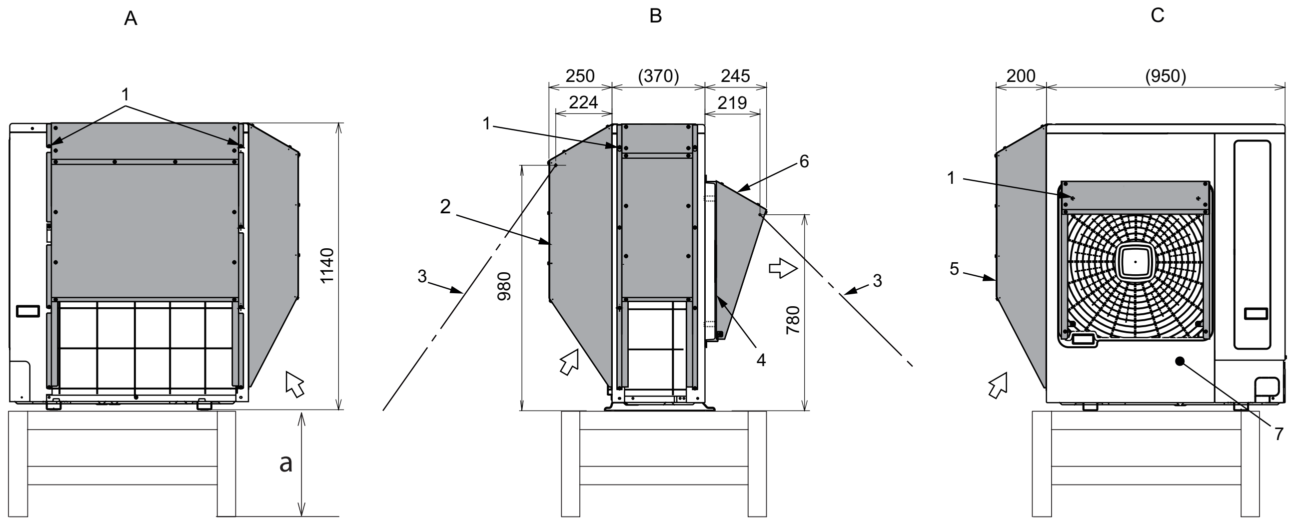
A. Rear side

B. Left side

C Front side

1 Fixing screw
2 Rear suction hood
3 Wire rope (optional for over turning protection)
4 Air discharge grille
5 Left suction hood
6 Air discharge hood
7 Outdoor unit

a > Maximum snowfall height



NOTE

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

3. Piping work and refrigerant charge

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Index

3.1 General notes before performing pipe work

3.1.1 Piping Materials

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

NOTE

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

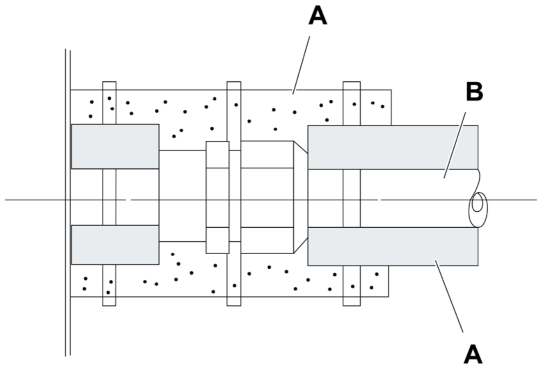
2 Select the piping size with the correct thickness and correct material able to withstand sufficient pressure.

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

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

A. Insulator material.

B. Field-supplied refrigeration pipe.



CAUTION

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

◆ **Piping Connection**

Fix the connecting pipe as shown in the following figure using the insulation attached to the Indoor Unit.

A. Use the flare nut of the indoor unit.

B. Insulate this part with the attached insulation.

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

D. Field-supplied refrigerant piping.

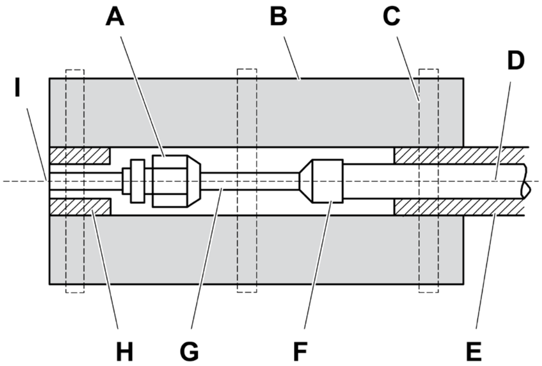
E. Field-supplied insulation.

F. Brazing.

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

H. Insulation attached to indoor unit.

I. Indoor unit.

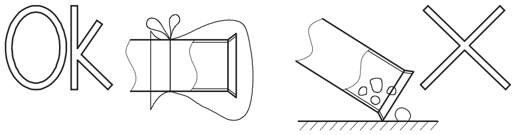


NOTE

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

CAUTION

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



- *If piping installation is not completed until next day or over a longer period of time, braze off the ends of the piping and charge with oxygen free nitrogen through a Schrader valve type access fitting to prevent moisture and particle contamination.*
- *Do not use insulation material that contains NH3, as it can damage copper pipe material and become a source of future leakage.*
- *Insulate the unions and flare-nuts at the piping connection part completely.*
- *Completely insulate both refrigerant gas and liquid piping between the indoor unit and the outdoor unit to avoid a decrease of performance; if not, dew will occur on the piping surface.*
- *Refrigerant circuit and Water circuit must be performed and inspected by a licensed technician and must comply with all relevant European and national regulations.*

3

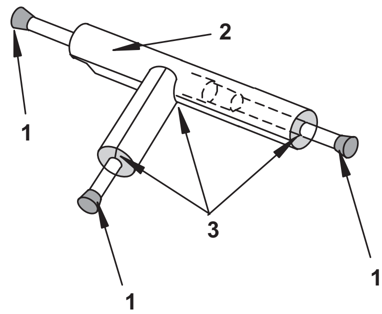
◆ Insulation

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

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

NOTE

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



CAUTION

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

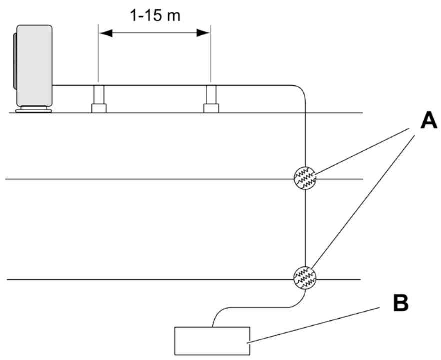
3.1.2 Three principles on refrigerant piping work

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

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

3.1.3 Suspension of refrigerant piping

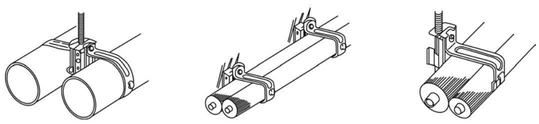
Suspend the refrigerant piping at certain points and prevent the refrigerant piping from touching weak parts of the building such as walls, ceiling, etc. (If touched, abnormal noises may occur due to the vibration of the piping. Pay special attention in case of short piping length).



A. Fire-proof section treatment.

B. Indoor unit.

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

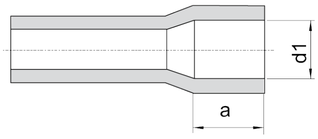


3.1.4 Brazing work

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

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

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

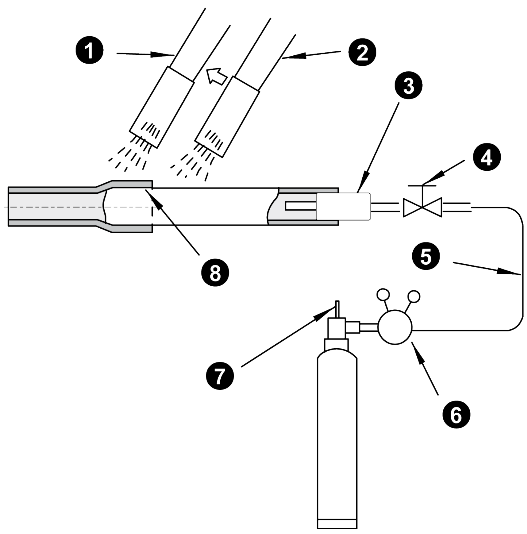


Copper pipe size		Ød1		Gap	a
Ø6.35	+0.08	Ø6.5	+0.1	0.33	6
	-0.08		0	0.07	
Ø9.52	+0.08	Ø9.7	+0.1	0.35	8
	-0.08		0	0.09	
Ø12.7	+0.08	Ø12.9	+0.1	0.38	8
	-0.08		0	0.19	
Ø15.88	+0.09	Ø16.1	+0.1	0.41	8
	-0.09		0	0.13	
Ø19.05	+0.09	Ø19.3	+0.1	0.44	10
	-0.09		0	0.16	

Copper pipe size		Ød1		Gap	a
Ø22.22	+0.09	Ø22.42	+0.1	0.39	10
	-0.09		0	0.11	
Ø25.4	+0.12	Ø25.6	+0.1	0.42	12
	-0.12		0	0.08	
Ø28.58	+0.12	Ø28.78	+0.1	0.42	12
	-0.12		0	0.08	
Ø31.75	+0.12	Ø32.0	+0.1	0.47	12
	-0.12		0	0.13	
Ø38.1	+0.12	Ø38.3	+0.1	0.52	14
	-0.12		0	0.18	

A basic brazing method is shown below.

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



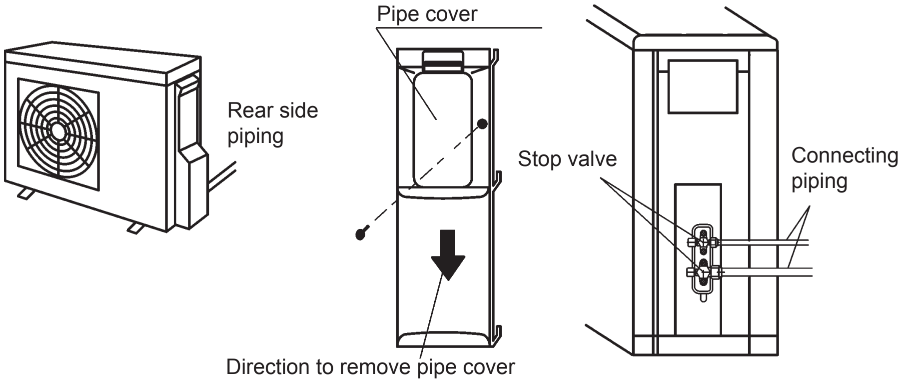
CAUTION

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

3.2 Piping connection for outdoor unit

3.2.1 RAS-3HVRC2

1 Take the piping cover away from the unit. Then fetch the pipes through the rear side and route piping according to the installation place as shown in the figure. Make holes by cutting along the guideline at the rear of the cover or punching with a driver. Remove the burr with a cutter, and place a insulation (field supplied) to protect cables and pipes.



2 Attach the pipe cover in order to prevent rainwater from entering inside the cabinet.

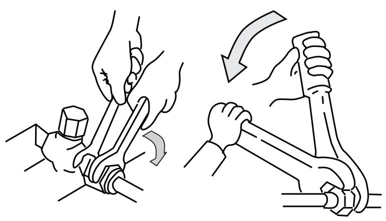
3 Use a pipe bender for pipe bending work when connecting pipes.

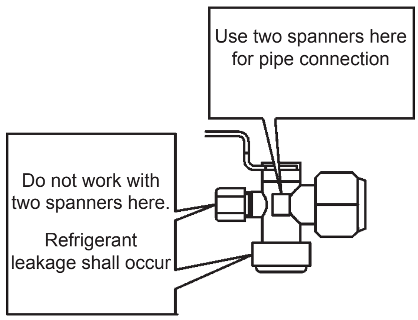
4 Check to ensure that the stop valves are completely closed before connecting pipes.

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

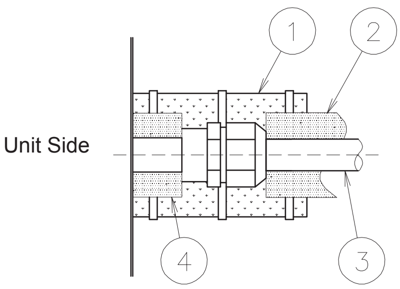
The required tightening torque is as follows:

Pipe Size	Tightening Torque (Nm)
Ø 6.35 mm (1/4)	20
Ø 9.52 mm (3/8)	40
Ø 12.70 mm (1/2)	60
Ø 15.88 mm (5/8)	80
Ø 19.05 mm (3/4)	100





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

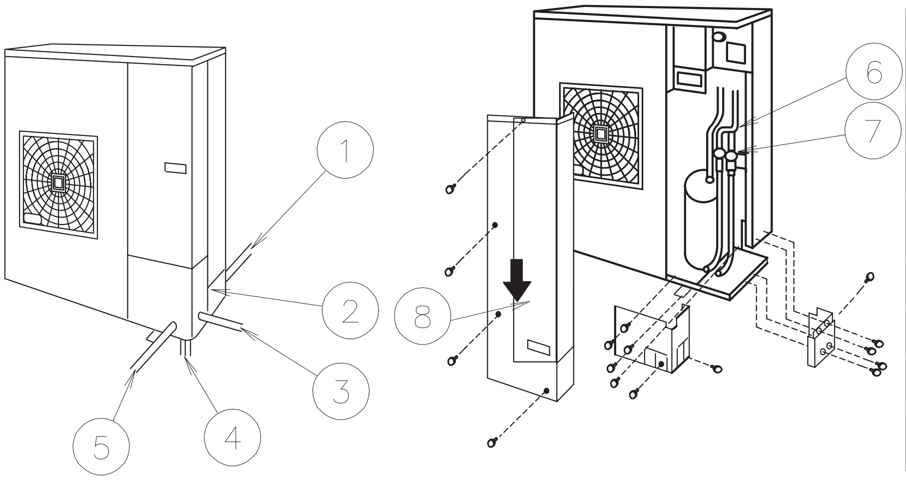


Nº	Description
①	Insulation Material
②	Insulation Material
③	Field Supplied
④	Insulation Material

7 Operation of stop valve should be performed according to the *"3.2.3 Outdoor unit stop valve"* explanation.

3.2.2 RAS-(4-6)H(V)(R/N)(C/P)2E

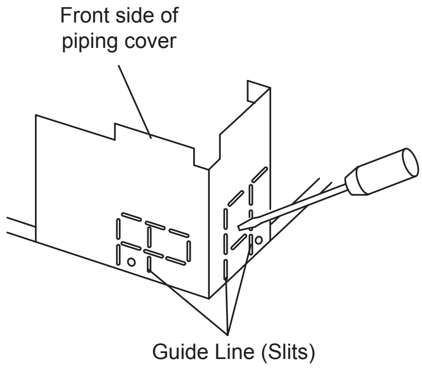
1 The pipes can be connected from 4 directions. Make holes in the piping cover or cabinet for taking out pipes.



Nº	Description
①	Rear side piping work
②	Pipe Cover
③	Right side piping work
④	Bottom side piping work (Knock out hole)
⑤	Front side piping work
⑥	Piping work
⑦	Stop Valve
⑧	Removing direction for service cover

2 Take the piping cover away from the unit and make holes by cutting along the guideline at the rear of the cover or punching with a driver.

3 Remove the burr with a cutter and place a insulation (field supplied) to protect cables and pipes.



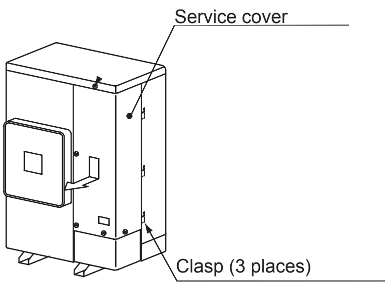
CAUTION

Notes to open/close the service cover:

- *Remove the screws following the instructions to the above figure.*
- *Slowly press down the cover.*

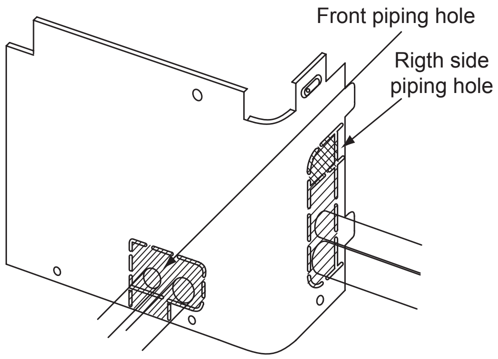
NOTE

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



◆ For the front and side piping

Select the correct knock-out size depending on whether it is for power wiring or transition wiring



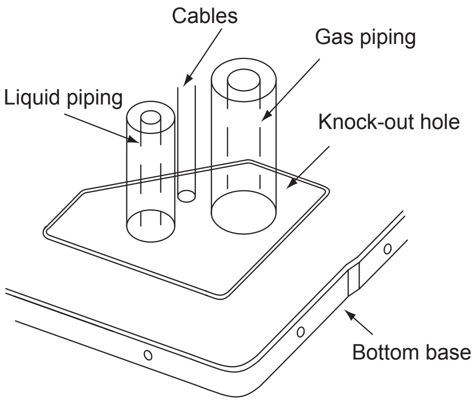
To use racking or conduit tubes, check the size and remove ▨ part following the slit.

NOTE

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

◆ For the downward piping

After removing the bottom of the piping cover, perform piping and wiring works.

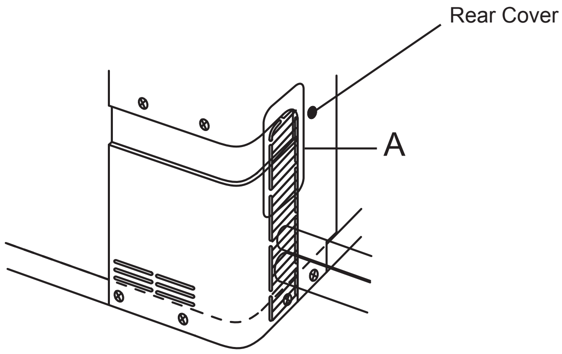


NOTE

Cables shall not contact directly to the pipes.

◆ For the rear side piping

After removing the rear-side piping cover, punch out the “A” holes along the guide line.



NOTE

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

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

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

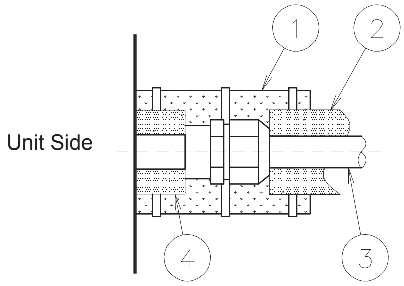
6 Check to ensure that the stop valves are completely closed before connecting pipes.

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

The required tightening torque is as follows:

Pipe Size	Tightening Torque (Nm)
Ø 6.35 mm (1/4)	20
Ø 9.52 mm (3/8)	40
Ø 12.70 mm (1/2)	60
Ø 15.88 mm (5/8)	80
Ø 19.05 mm (3/4)	100

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



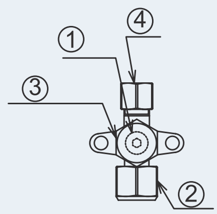
Nº	Description
1	Insulation Material
2	Insulation Material
3	Field Supplied
4	Insulation Material

9 Operation of stop valve should be performed according to the *"3.2.3 Outdoor unit stop valve"* explanation.

3.2.3 Outdoor unit stop valve

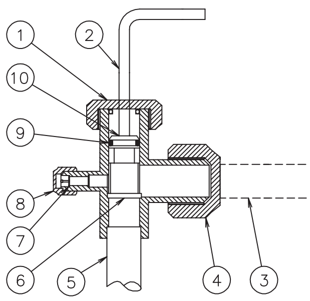
1. Remove the stop valve cap before performing the air tight test after connecting the flare nut. Tighten the spindle valve in clockwise according to the following table “Tightening Torque of Stop Valves.”
2. Tighten the flare nut according the specified torque. If the tightening torque is excessive, it may cause refrigerant leakage from the spindle part.
3. Perform the air tight test after the tightening work. It is more effective to perform this work after fix the flare nuts for the piping connection to the stop valves.
4. Use the charging hose for the check joint connection. When removing the charging hose from the check joint, a sound may be heard by a small quantity of refrigerant leak. However it is not abnormality. Do not apply excessive force to the end of opening the spindle. (Tightening Torque: < 5.0N-m)

Spindle Type

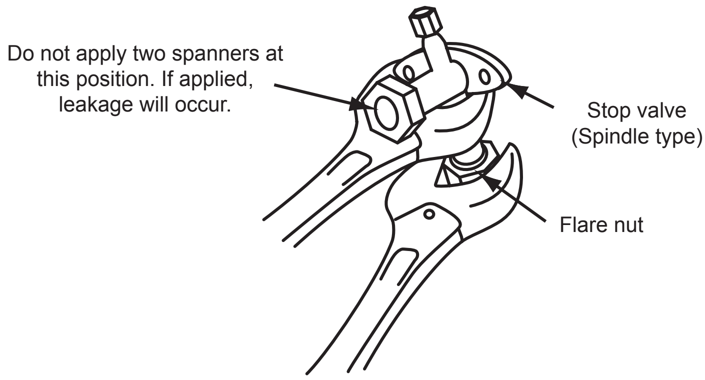


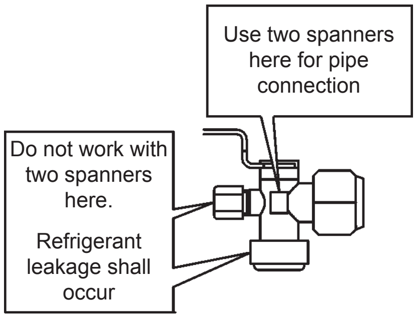
①	Spindle valve
②	Flare nut
③	Cap
④	Check joint for service port

Outdoor unit	Tightening Torque (Nm)							
	①		②		③		④	
	Gas valve	Liquid valve	Gas valve	Liquid valve	Gas valve	Liquid valve	Gas valve	Liquid valve
RAS-3HVRC2	9-11	7-9	68-82	33-42	33-42	33-42	14-18	14-18
RAS-(4-6)H(V)(R/N)(C/P)2E	9-11	7-9	68-82	33-42	50-62	33-42	14-18	14-18



Nº	Description	Remarks
①	Cap	Tighten the cap with 37 Nm torque
②	Allen wrench	Liquid valve: Hex 4mm Gas valve: Hex 5mm
③	Refrigerant piping	Field supplied
④	Flare nut	
⑤	Refrigerant pressure	To outdoor unit
⑥	Seat Surface	Fully closed position
⑦	Check joint	Only the charging those can be connected
⑧	Charge port cap	Tighten the cap with 16 Nm torque
⑨	O-Ring	Rubber
⑩	Spindle valve	Open – Counterclockwise Close – Clockwise





3

⚠ CAUTION

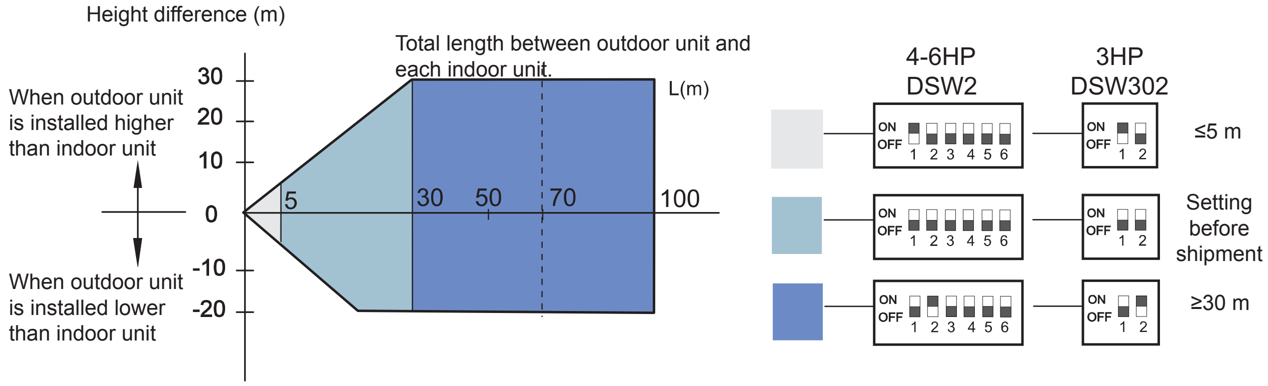
- *At the test run, fully open the spindle and ball stop valve.*
- *If not fully opened, the devices will be damaged.*
- *Do not attempt to turn service valve rod beyond its stop.*
- *Do not loosen the stop ring. If the stop ring is loosened, it is dangerous since the spindle will hop out.*
- *An excess or a shortage of refrigerant is the main cause of trouble to the units. Charge the correct refrigerant quantity according to the description of label at the inside of service cover.*
- *Check for refrigerant leakage in detail. If a large refrigerant leakage occurs, it will cause difficulty with breathing or harmful gases would occur if a fire was being used in the room.*

3.3 Refrigerant piping range

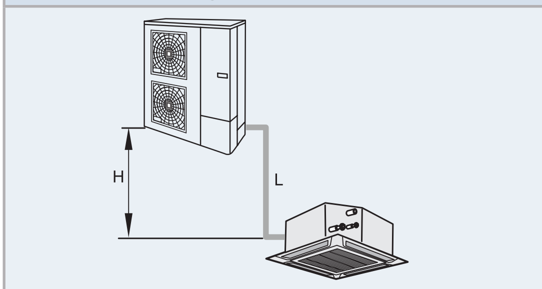
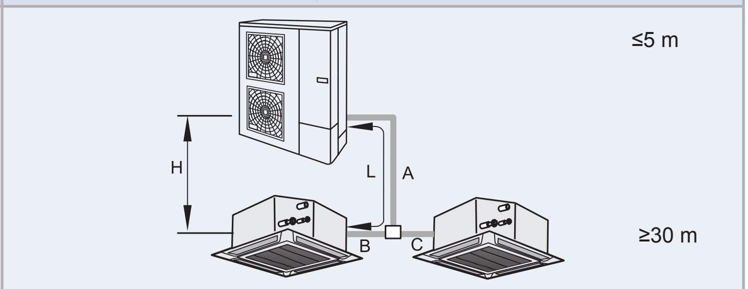
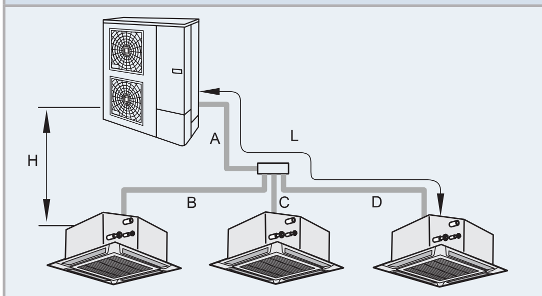
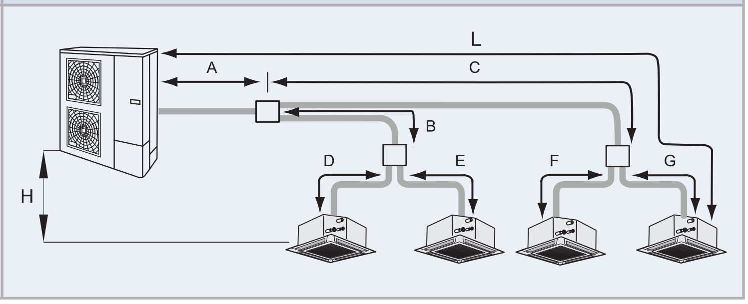
3.3.1 Refrigerant piping length

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

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



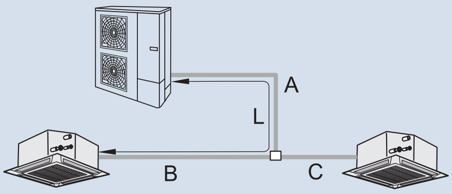
3.3.2 Piping system for header branch

1 indoor unit system (O.U. from 3 to 6 HP)	2 indoor units system (O.U. from 3 to 6 HP)
	
3 indoor units system (OU from 4 to 6 HP)	**4 indoor units system (OU from 4 to 6 HP)**
	

(*diagrams are shown as an example*)

3.3.3 Maximum lenght of refrigerant piping

(m)

Outdoor Unit		3 HP	4 HP	5 HP	6 HP
Maximum piping length between the outdoor unit and the farthest indoor unit	Actual length (L)	50	75		
	Equivalent length (EL)	70	95		
Total piping length	2 units (A+B+C)	50	85		
	3 units (A+B+C+D)	--	85		
	4 units (A+B+C+D+E+F+G)	--	85		
Maximum piping line after first branch	2 units (B, C)	15	15		
	2 and 3 units (B, C, D)	--	15		
	4 units (B+D, B+E, C+F, C+G)	--	15		
Maximum height difference, Outdoor / Indoor (H) (Outdoor Unit is higher / lower)		30 / 20			
Maximum height difference Indoor / Indoor		3			
Maximum height difference: branch pipe/indoor (2,3 and 4 indoor units system) branch pipe/branch pipe (4 indoor units system)		3			
Maximum length difference of the several branches:		< 8	< 10		
(B-C) (2 and 3 unit system) (B-D) (3 unit system) (C-D) (3 unit system) (C+G)-(C+F) (4 unit system) (B+E)-(B+D) (4 unit system) (C+G)-(B+E) (4 unit system) (C+G)-(B+D) (4 unit system) (C+F)-(B+E) (4 unit system) (C+F)-(B+D) (4 unit system)	*Example:* 				

NOTE

- *The liquid piping and the gas piping must be of the same piping length and run along the same route.*
- *Install the branch piping as much as possible near the indoor units.*
- *Install Multi-Kits at the same horizontal level.*

3.3.4 Combinations of piping size and piping length

Liquid	Ø6.35				Ø9.52					Ø12.70					Ø15.88		
Gas	Ø9.52	Ø12.70	Ø15.88	Ø19.05	Ø12.70	Ø15.88	Ø19.05	Ø22.20	Ø25.40	Ø15.88	Ø19.05	Ø22.20	Ø25.40	Ø28.58	Ø22.20	Ø25.40	Ø28.58
3 HP	-	30 (1) (2)	30 (2)	-	30 (1)	50	-	-	-	-	-	-	-	-	-	-	-
4 - 5 - 6 HP	-	-	5 (2)	5 (2)	40 (1)	75	50 (4)	-	-	30 (3)	30 (3) (4)	-	-	-	-	-	-

(1).Reducing gas pipe size will lower cooling capacity due to larger pressure loss in gas piping and narrow operation range.
(2).Reducing liquid pipe size will narrow operation range due to indoor unit relation with expansion valve capacity.
(3).Increasing liquid pipe size will require additional refrigerant charge.
(4).When using Ø19.05 gas pipe (soft-annealed), please switch ON DSW2-4# in the Outdoor Unit PCB.

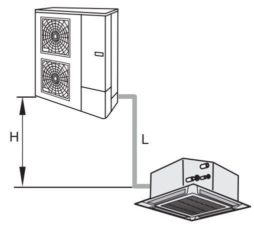
Default combination

3.3.5 Refrigerant piping size and multikit/distributor

Select the piping connection sizes according to the following procedures

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

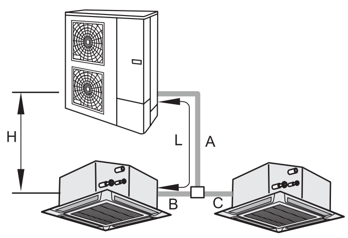
1 indoor unit system



(mm)

Outdoor Unit HP	Pipe Size (L)	
	Gas	Liquid
3 - 6	Ø15.88	Ø9.52

2 indoor units system



(mm)

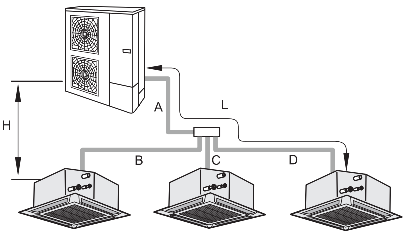
Outdoor Unit HP	Pipe Size (A)		Branch pipe
	Gas	Liquid	
3 - 6	Ø15.88	Ø9.52	E-102SN4

(mm)

Indoor unit capacity	Pipe Size (B, C)	
	Gas	Liquid
≤ 1.5 HP	Ø12.70	Ø6.35
1.8/2.0HP	Ø15.88	Ø6.35
≥ 2.3 HP	Ø15.88	Ø9.52

Connections including Indoor Units 8 and 10 HP are not possible

3 indoor units system



(mm)

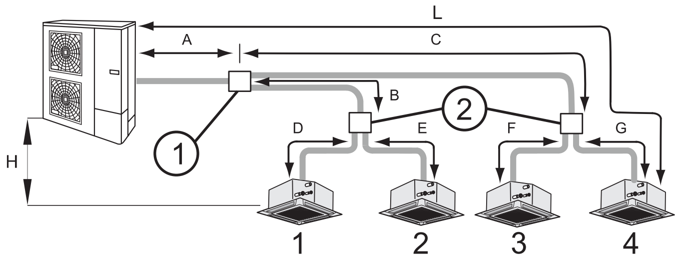
Outdoor Unit HP	Pipe Size (A)		Header Branch
	Gas	Liquid	
4 / 5 / 6	Ø15.88	Ø9.52	MH-84AN1

(mm)

Indoor unit capacity	Pipe Size (B, C, D)	
	Gas	Liquid
≤ 1.5 HP	Ø12.70	Ø6.35
1.8/2.0HP	Ø15.88	Ø6.35
≥ 2.3 HP	Ø15.88	Ø9.52

Connections including Indoor Units 8 and 10 HP are not possible

4 indoor units system



(mm)

Outdoor Unit HP	Pipe Size (A)		Branch pipe ①
	Gas	Liquid	
4 / 5 / 6	Ø15.88	Ø9.52	E-102SN4

(mm)

Total Indoor Unit capacity after branch pipe 1+2 or 3+4	Pipe Size (B, C)		Branch line ②
	Gas	Liquid	
≤ 1.5 HP	Ø12.70	Ø6.35	E-102SN4
from 1.8 to 2.0 HP	Ø15.88	Ø6.35	E-102SN4
≥ 2.3 HP	Ø15.88	Ø9.52	E-102SN4

Indoor Unit capacity	Pipe Size (D, E, F, G)	
	Gas	Liquid
≤ 1.5 HP	Ø12.70	Ø6.35
1.8/2.0HP	Ø15.88	Ø6.35
≥ 2.3 HP	Ø15.88	Ø9.52

NOTE

Recomended capacity ratio for 4 indoor units system:

Capacity indoor unit 1+2 / Capacity 1+2+3+4 < 60%

Capacity indoor unit 3+4 / Capacity 1+2+3+4 < 60%

If the capacity ratio of branch of indoor units 1 and 2 is bigger than 60% of total capacity of the system or capacity ratio of branch of indoor units 3 and 4 is bigger than 60 % of total capacity of the system, please contact with your Hitachi Dealer or Hitachi Customer Service Department.

3.3.6 System installation

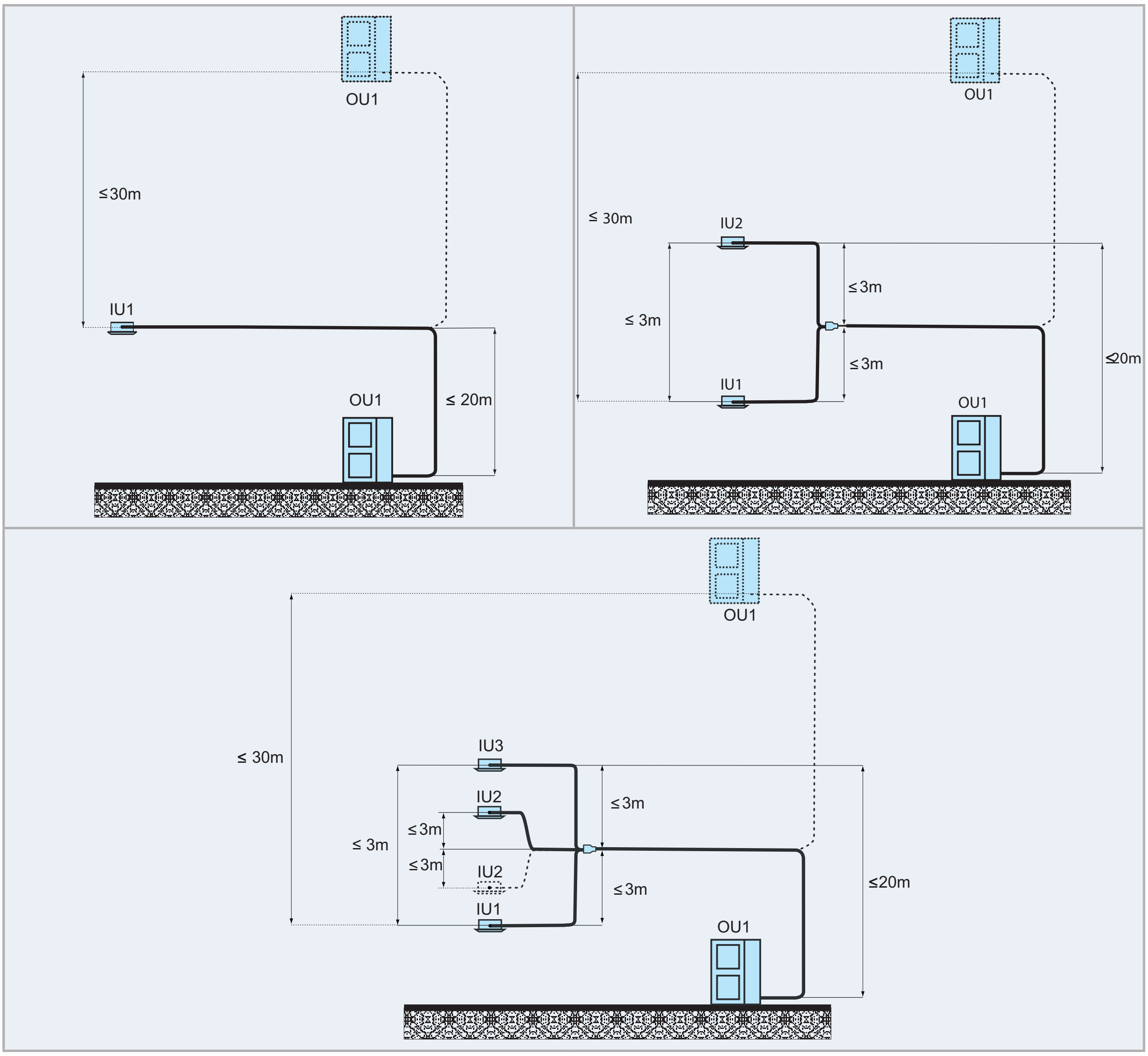
NOTE

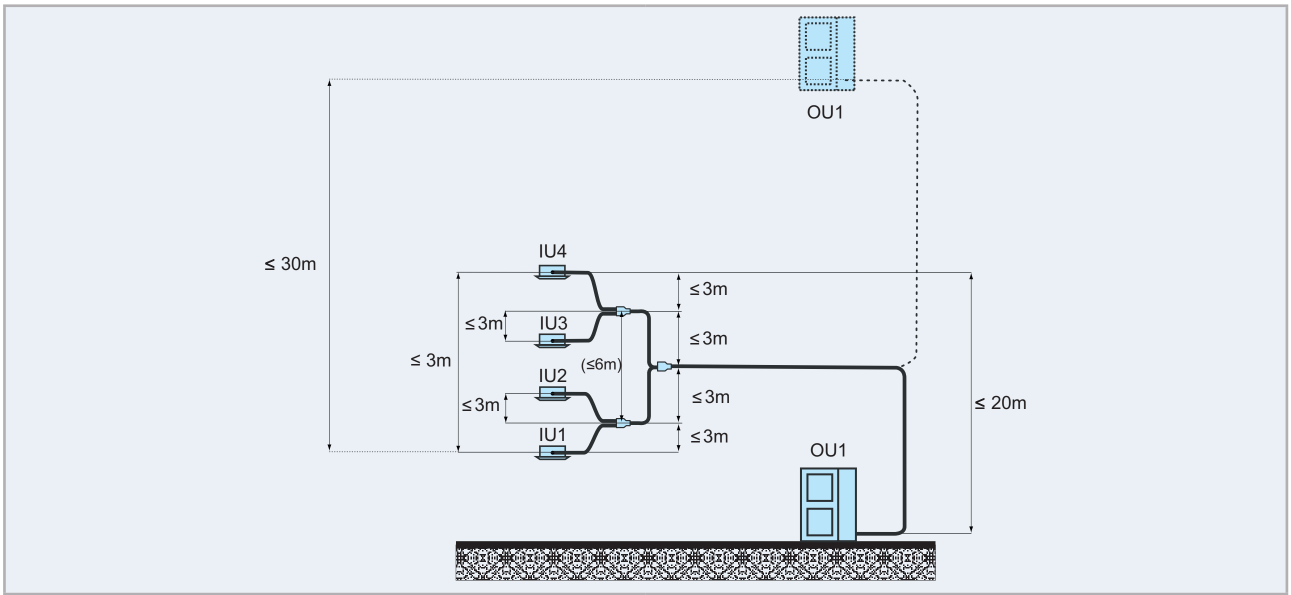
- *Pipe connection size on outdoor units, indoor units and the multikit or distributor vary according to the system.*
- *The sizes of the indoor and outdoor units could be different. Adjust the flare adapter (accessory) to the indoor pipe connection in these cases.*

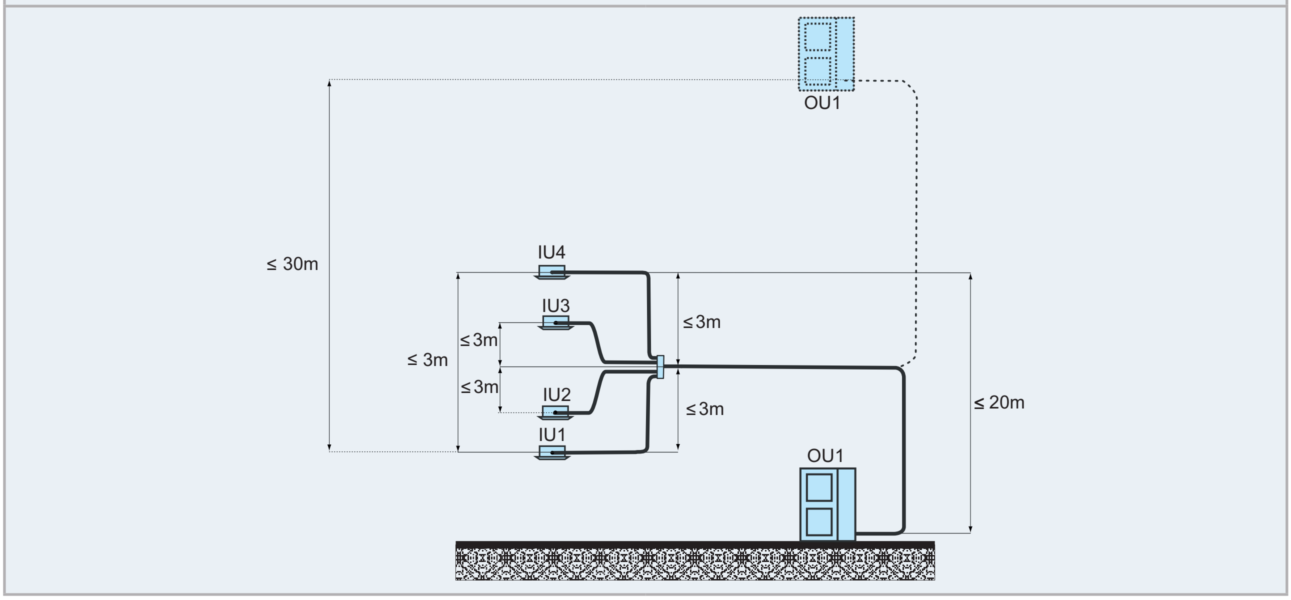
◆ Height difference between indoor units and distributor

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

Maximum height difference (clarification)







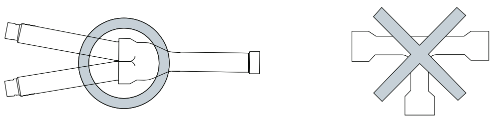
NOTE

All pictures are as example. Branch and headers are not showed as real sizes or real picture, for the installation of this components follow the technical documentation.

◆ Installing Distributor

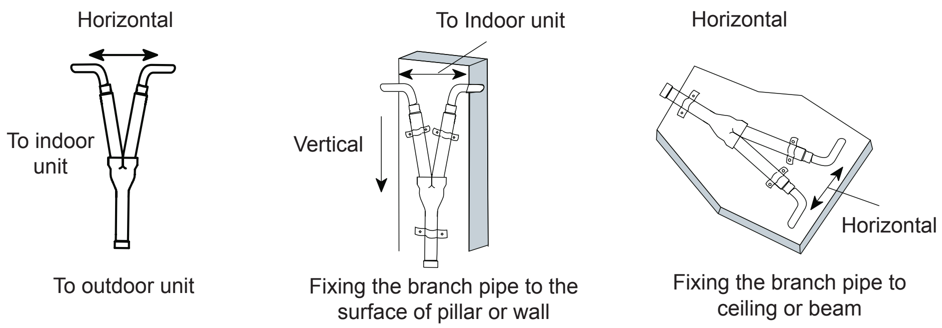
1 Install the distributor supplied by Hitachi on request.

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



2 Installing the distributor

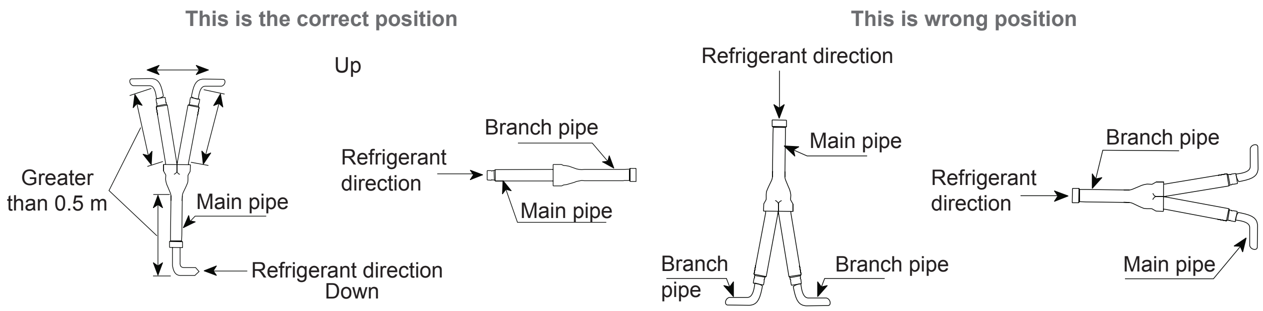
Fix the branch pipe horizontally to the pillar, wall or ceiling. Piping must not be fixed rigidly to the wall as thermal expansion and contraction can cause pipe fracture.



NOTE

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

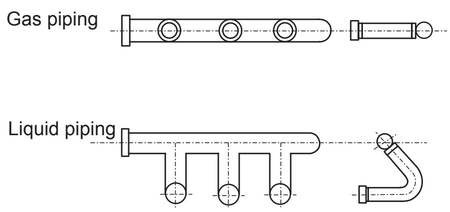
3 Correct position of distributor (available also for quad installation)



4 Correct position of Triple Branch Pipe (Standard series only).

- Install the header horizontally

Sample: Triple Branch pipe



3.4 Refrigerant charge

CAUTION

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

1 Connect the gauge manifold using charging hoses with a vacuum pump or a nitrogen cylinder to the check joints of the liquid line and the gas line stop valve.

2 Check for any gas leakage at the flare nut connection, by using nitrogen gas to increase the pressure at 4.15 MPa for outdoor units inside of the field-supplied piping.

3 Operate the vacuum pump for 1 to 2 hours until the pressure decreases lower than a pressure of 756 mmHg in vacuum.

3

NOTE

Charge the proper quantity of refrigerant according to the piping length (Calculate the quantity of the refrigerant charge).

4 For charging refrigerant, connect the gauge manifold using charging hoses with a refrigerant charging cylinder to the check joint of the liquid line stop valve.

5 Fully open the gas line stop valve, and slightly open the liquid line stop valve.

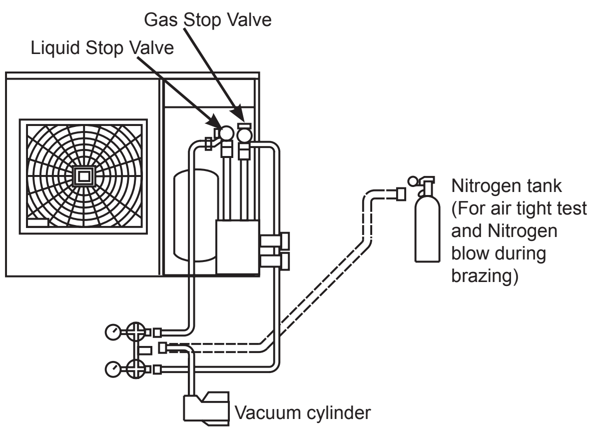
6 Charge refrigerant by opening the gauge manifold valve.

7 Charge the required refrigerant within the difference range of ±0.5 kg by operating the system in cooling.

8 Fully open the liquid line stop valve after completing refrigerant charge.

9 Continue cooling operation for more than 10 minutes to circulate the refrigerant.

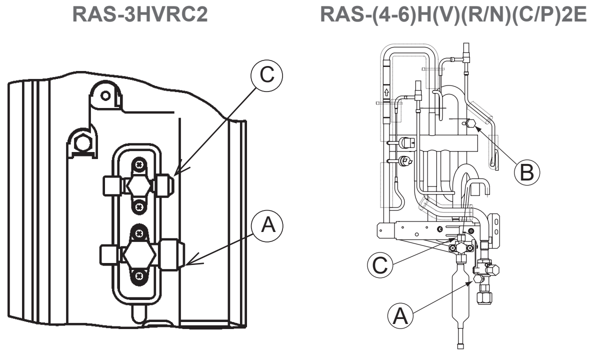
Monoblock system



3.4.1 Caution of the pressure by check joint

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

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



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

NOTE

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

3.4.2 Refrigerant charge quantity

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

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

CAUTION

- *When charging refrigerant, measure the amount precisely. Overloading or underloading of refrigerant may cause compressor problems. If the actual piping length is less than 5 m consult your dealer.*
- ***Appropriate refrigerant***

  The refrigerant used in each unit is identified on the specification label and manuals of the unit. Hitachi shall not be held liable for any failure, trouble, malfunction or accident caused by units illegally charged with refrigerants other than the specified one.
- ***Consequences of charging non-specified refrigerant***
- *It may cause mechanical failure, malfunction and other accidents. It may cause operational failure of protection and safety devices of air conditioners. It may also cause lubrication failure of the sliding part of the compressor due to deterioration of refrigerant oil.*
- *In particular, hydrocarbon refrigerants (such as propane, R441A, R443A, GF-08, etc.) are not allowed, since these are combustible and may cause major accidents such as fire and explosion in case of improper handling.*
- *Once a non-specified refrigerant has been charged, no further servicing (including draining of refrigerant) shall be performed, even in case of malfunction. Improper handling of refrigerant may be a cause of fire and explosion, and servicing in such cases may be considered an illegal act.*
- *End clients and costumers shall be informed that servicing is not approved, and the installer who charged the non-specified refrigerant shall be asked to fix the unit.*

3.4.3 Refrigerant charge before shipment (W_0 (kg))

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

UTOPIA series 2

Model	Refrigerant charge before shipment (W_0 (kg))	Additional refrigerant charge (P) (g/m)	Maximum additional charge (kg)
RAS-3HVRC2	1.7	30	0.9
RAS-4HVR(C/P)2E	3.0	45	2.9
RAS-5HVR(C/P)2E			
RAS-6HVR(C/P)2E			
RAS-4HR(C/P)2E			
RAS-5HR(C/P)2E			
RAS-6HR(C/P)2E			
RAS-4HVN(C/P)2E	3.2	60	3.9
RAS-5HVN(C/P)2E			
RAS-6HVN(C/P)2E			
RAS-4HN(C/P)2E			
RAS-5HN(C/P)2E			
RAS-6HN(C/P)2E			

3.4.4 Calculation method for the additional refrigerant charge

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

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

Outdoor units have been charged with refrigerant for 20 m of actual piping length: In systems with longer actual piping length, an additional refrigerant charge is required.

Use the following formula:

$$W_1 = (TL-20) \times P$$

TL: Total piping length (m)

P: Additional refrigerant charge (kg/m) (Refer to the *"3.4.3 Refrigerant charge before shipment (W_0 (kg))"* chapter)

⚠ **CAUTION**

Do not exceed the allowed maximum additional charge.

◆ **Step 2: Charging work**

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

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

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

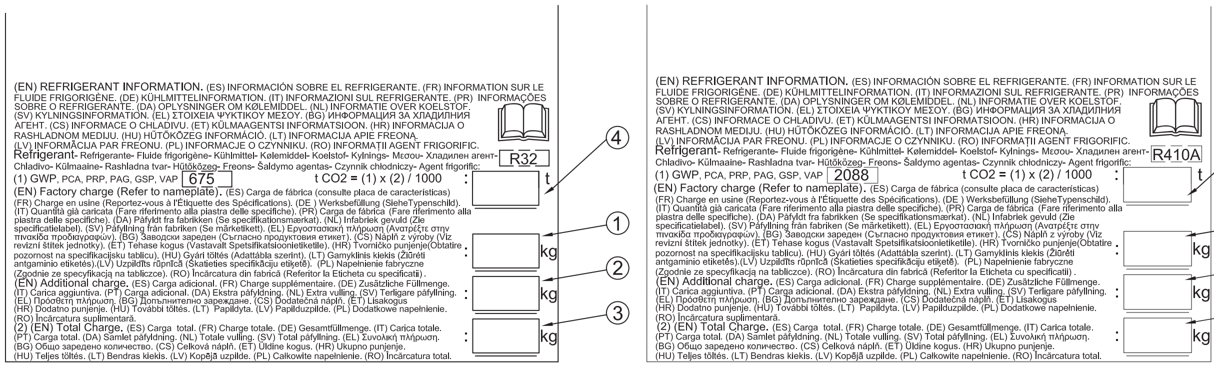
$$W_{TOT} = W_0 + W_1$$

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

HITACHI

◆ Step 4: Record the refrigerant charge

Fill the “F-Gas Label” with the refrigerant charge quantity in order to facilitate maintenance and servicing activities:



① Factory Charge

② Additional Charge

③ Total Charge

④ t CO_2

3

3.5 Caution in case of refrigerant leakage

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.***
- ***The following standards may be applicable, if local regulations are not available. International Organization for Standardization, ISO5149 or European Standard, EN378 for R410A refrigerant gas.***
- ***The following standards may be applicable, if local regulations are not available. International Organization for Standardization, ISO 817 and International Electrotechnical Commission, IEC 60335-2-40:2018 and European Standard, EN 378-1:2016 for R32 refrigerant gas.***

3.5.1 Maximum permitted concentration of hydrofluorocarbon (HFC)

R410A Refrigerant circuit

The R410A refrigerant gas, used in the equipment, is fireproof and non-toxic.

The maximum permissible concentration of HFC R410A gas in the air is 0.44 kg/m^3, according to Standard EN378-1. 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.

DANGER

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

NOTE

Before the indoor unit installation, confirm that the room can keep the lower gas concentration than the limit value in order to take the emergency countermeasures even if the gas leakage is ocurred.

R32 Refrigerant circuit

The unit installation and refrigerant piping should comply with the relevant local and national regulations for the designed refrigerant.

Due to R32 refrigerant and depending on final refrigerant charge amount, a minimum floor area for installation must be considered.

- If total refrigerant charge amount <1.84kg, there are no additional minimum floor area requirements.
- If total refrigerant charge amount ≥1.84kg, there are additional minimum floor area requirements to be checked.

NOTE

In case of not achieving the minimum floor area, contact with your dealer.

3.5.2 Calculation of refrigerant concentration

R410A Refrigerant circuit

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.

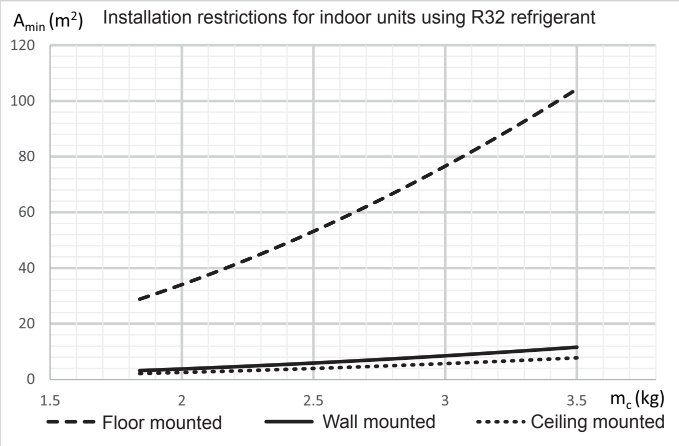
2 Calculate the volume *V* (m^3) of each room.

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

$C = R / V$
R: Total quantity of refrigerant charged (kg).
V: Room volume (m^3).
C: Refrigerant concentration (≤ 0.44 kg/m^3 for R410A gas).

R32 Refrigerant circuit

- The following chart and table shows the minimum floor area (A_{min}) required for the installation of an indoor unit from a refrigerant system containing a certain refrigerant charge (m_c) of R32 (A2L refrigerant), and supposing a total room height not lower than 2.2 m. (According to IEC 60335-2-40:2018 and EN 378-1:2016).
- For m_c<1.84 kg, IEC 60335-2-40:2018 and EN 378-1:2016 do not establish any minimum floor area restriction. In that case check local regulations to ensure that no hard restrictions may apply.



$$A_{min} = (m_c * / (2.5 * LFL^{\wedge(5/4)} * h_0)^{\wedge 2}$$

- A_{min}: Minimum installation area of an Indoor unit for a given refrigerant charge m_c (kg) and considering the installation height h_0 (m²)
- h_0: Installation height of the bottom side of the indoor unit + distance from the indoor unit bottom side to the lowest part for which a refrigerant leak may release to the indoor area
- m_c: total system refrigerant charge that could be released to the indoor area in case of undetected refrigerant leak.
- LFL: Lower Flammability Limit for R32, 0,307 kg/m³ as established by EN 378-1:2016 and ISO 817

Minimum floor area for equipment installed inside			
m_c(kg)	A_{min}(m²)	A_{min}(m²)	A_{min}(m²)
	Floor mounted	Wall mounted	Ceiling mounted
1.84	28.81	3.20	2.14
1.9	30.72	3.41	2.29
2.0	34.04	3.78	2.53
2.1	37.53	4.17	2.79
2.2	41.19	4.58	3.06
2.3	45.02	5.00	3.35
2.4	49.02	5.45	3.65
2.5	53.19	5.91	3.96
2.6	57.53	6.39	4.28
2.7	62.04	6.89	4.61
2.8	66.72	7.41	4.96
2.9	71.58	7.95	5.32
3.0	76.6	8.51	5.70
3.1	81.79	9.09	6.08
3.2	87.15	9.68	6.48
3.3	92.68	10.30	6.89
3.4	98.39	10.93	7.32
3.5	104.26	11.58	7.75
4.0	136.17	15.13	10.13
4.5	172.34	19.15	12.82
5.0	212.77	23.64	15.83
6.0	306.39	34.04	22.79
7.0	417.03	46.34	31.02
8.0	544.69	60.52	40.51
9.0	689.38	76.60	51.28
10.0	851.08	94.56	63.30

- Floor mounted: Refrigerant parts not sealed installed <0.6m height
- Wall mounted: Refrigerant parts not sealed installed >1.8m height
- Ceiling mounted: Refrigerant parts not sealed installed >2.2m height

3.5.3 Countermeasure for R410A refrigerant leakage

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 There must be a ventilator fan connected to a gas leak detector, with a ventilator capacity of 0.92 m³/min or greater.

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.

3.6 Drain piping

3.6.1 Drain discharging boss

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

Model	Applicable Model
DBS-12L	RAS-3HVRC2
DBS-26	RAS-(4-6)H(V)(R/N)(C/P)2E

◆ Connecting procedure

1 Insert the plastic cap into the drain boss up to the extruded portions.

2 Insert the boss into the unit base up to the extruded portions.

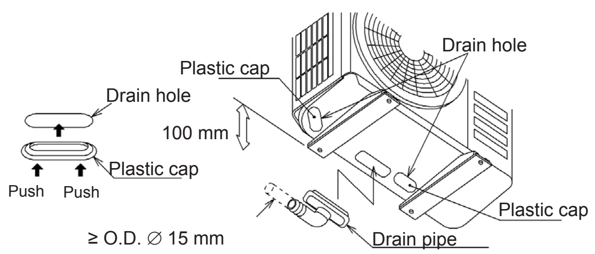
3 Size of the drain boss is:
   - For DBS-12L: 15 mm (O.D.)
   - For DBS-26: 32 mm (O.D.)

4 A drain pipe should be field-supplied.

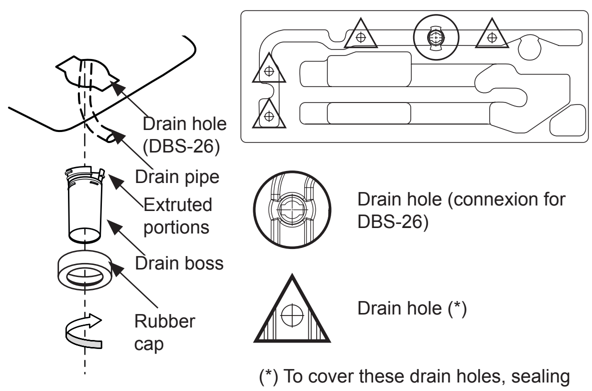
NOTE

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

DBS-12L - RAS-3HVRC2



DBS-26 - RAS-(4-6)H(V)(R/N)(C/P)2E



(*) To cover these drain holes, sealing pads are included in DBS-26 kit.

4. Electrical and control settings

Index

4.1 General notes

DANGER

- ***Do not connect of adjust any wiring or connections unless the main power switch is OFF.***
- ***Use an earth leakage breaker with medium sensitivity, and an activation speed of 0.1 sec 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.***
- ***Never connect the earth cable to the refrigerant pipes. Fire can may occur.***
- ***Do not connect the earth cable to the lighting arrest system. The electrical potential of earth would increase abnormally.***

CAUTION

- *Before any electrical wiring work or regular inspections, switch off the main power supply switches of the indoor and outdoor units. Wait three minutes before starting installation or maintenance work.*
- *Make sure that the indoor and outdoor are completely stopped before starting work on the electrical wiring or regular inspections.*
- *Protect cables, drain hose, electric parts, etc. from rodents and insects; otherwise these might damage unprotected components and, in the worst case, cause a fire.*
- *Wrap the accessory packing around the wires, and plug the wiring connection hole with the seal material to protect the product from any condensed water and insects.*
- *Do not allow cables to come into contact with the refrigerant pipes, metal edges, printed circuit boards (PCB) or the electric parts inside the unit; the cables may be damaged and, in the worst case, cause a fire.*
- *Tightly secure the wires with the cord clamp inside the indoor unit.*
- *Lead the wires through the knockout hole in the side cover when using conduit.*
- *Secure the cable of the remote control switch with the cord clamp inside the electrical box.*
- *Electrical wiring must comply with national and local codes. Contact your local authority in regards to standards, rules, regulations, etc.*

NOTE

- *Use twist pair wire (more than 0.75 mm²) for operation wiring between outdoor unit and indoor unit, and operation wiring between indoor unit and indoor unit.(Do not use wire with more than 3 cores).*
- *H-LINK twist pair shielded cable must be grounded in the outdoor unit side.*
- *Use shielded wires for intermediate wiring to protect the units from noise obstacle at length of less than 300 m and size complied with local code.*

4.1.1 General check

1. Ensure that the field-supplied electrical components (mains power switches, circuit breakers, wires, connectors and wire terminals) have been properly selected according to the electrical data indicated. Make sure that they comply with national and regional electrical codes.
2. Check to ensure that the power supply voltage is within +/-10% of the rated voltage.
3. Check to ensure that power supply has an impedance low enough to warranty not reduce the starting voltage more than 85% of the rated voltage.
4. Check to ensure that the ground wire is connected.
5. Ensure that fuse or circuit breaker are of specified capacity.

4.1.2 LED’s indication

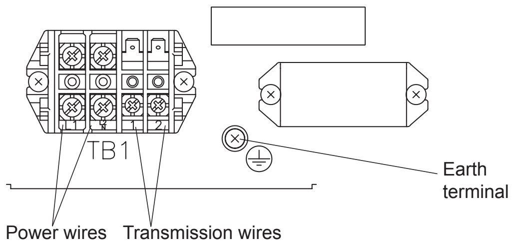
LED Indication		
LED1	Green	Power Indication
LED2	Red	Power Indication
LED3	Red	Heat pump operation (thermo ON/OFF)
LED4	Yellow	Alarm (flickering with 1 sec interval)
LED5	Green	Not used
LED6	Yellow	H-LINK transmission
LED7	Yellow	H-LINK RCS transmission

4.2 Electrical wiring connection for the outdoor unit

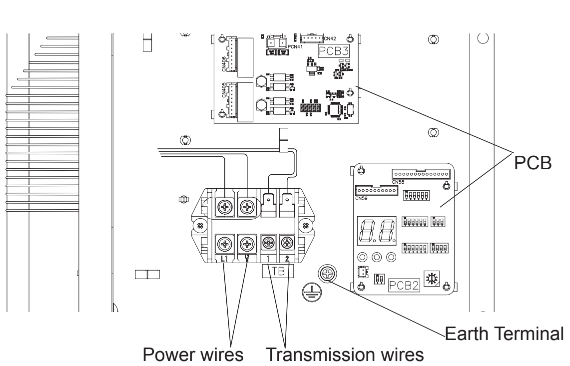
The correct electrical wiring connection for the outdoor unit is shown below.

1 Ensure the connection of the three-phase power supply source wires L1, L2, L3 and N (for 400V/50Hz) or L1 and N (for 230V/50Hz) to the terminal board. Connect the ground wire to the plate in the electrical box.

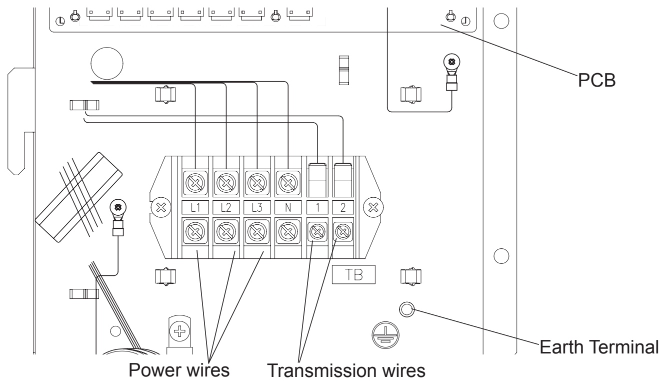
RAS-3HVRC2



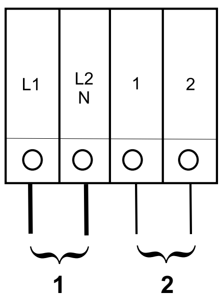
RAS-(4-6)HV(R/N)(C/P)2E



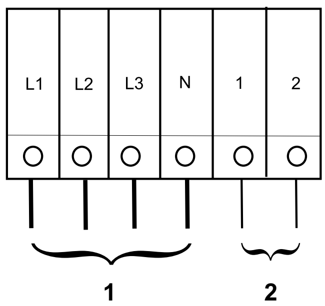
RAS-(4-6)H(R/N)(C/P)2E



2 Ensure the wires connection between the outdoor unit and the indoor unit to the terminals 1 and 2 on the terminal board.



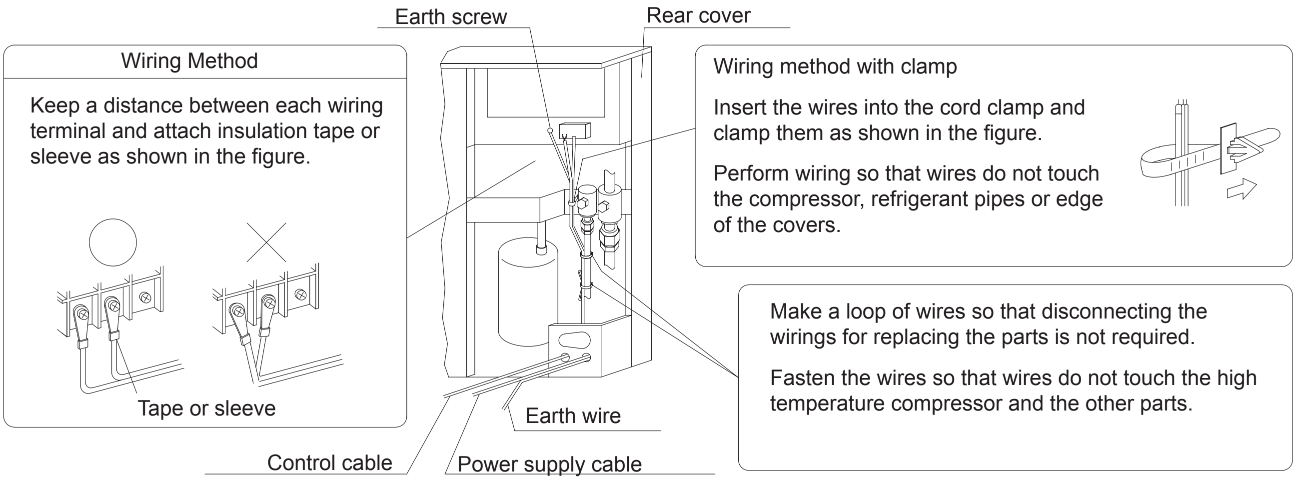
1. Power supply 1~ 230V.
2. Control cable (5V).

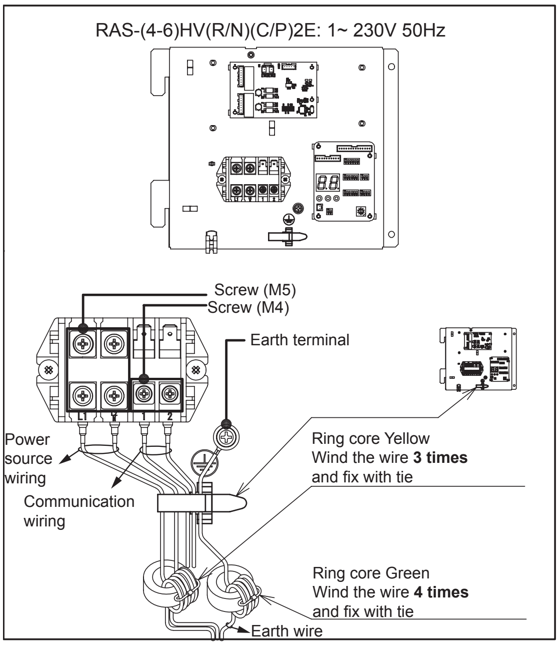


1. Power supply 3N~ 400V.
2. Control cable (5V).

3 Ensure the cables are fixed with the clamp supplied in the Electrical Box to ensure strain relief.

4 When routing out cable, make sure that it does not obstruct mounting of the outdoor service cover.

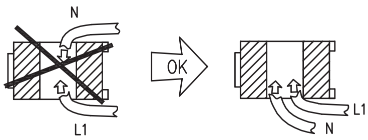




NOTE

Insert the power source cables L1 and N (for 1~ 230V 50Hz) into the yellow ring core, coiling them with 3 turns and fix the cables using the cable tie (accessory). As shown in next figure, do not insert the cables from different sides into the ring core.

Insert the ground cable into the green ring core, coiling them with 4 turns and fix the cables using the cable tie.



4.3 Electrical settings

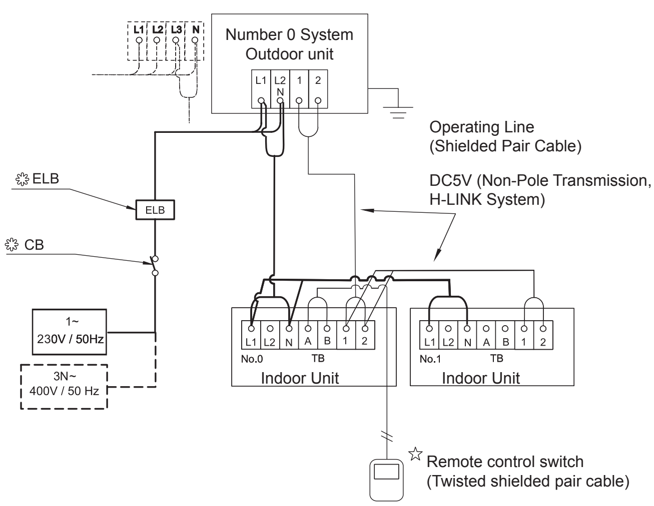
4.3.1 Outdoor and indoor unit electrical wiring

- Ensure proper connection of the electrical wires (indoor unit and the outdoor unit) as show in the figure.
- When installing the electrical wiring, follow local codes and regulations.
- The refrigerant piping and the control wiring are connected to the units in the same refrigerant cycle.
- Open a hole near the connection hole of power source wiring when multiple outdoor units are connected from a single power source line.
- The recommended breaker sizes are detailed in the Wire size section.
- In the case that a conduit tube for field-wiring is not used, fix rubber bushes with adhesive on the panel.
- All field wiring and equipment must comply with local and international codes.

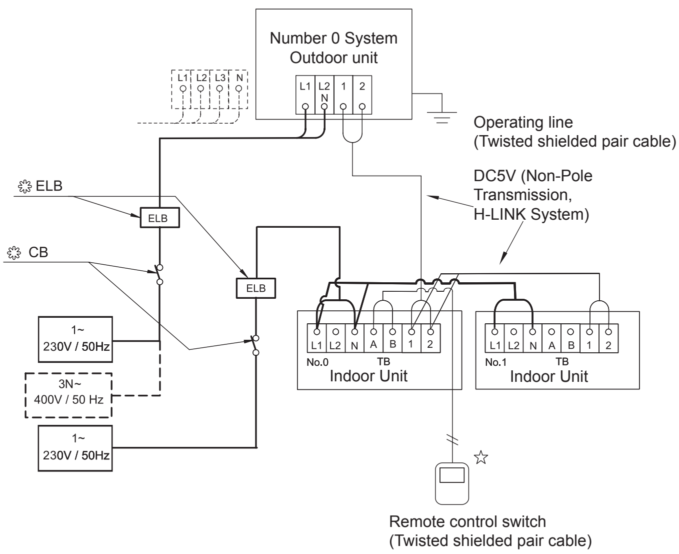
CAUTION

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

Power source from the outdoor unit to the indoor unit



Independent power source of outdoor unit and indoor unit



TB Terminal board
CB Circuit breaker
ELB Earthleakage breaker
—— Field wiring
Field supplied
☆ Optional accessory

4

4.3.2 Wire size

◆ Connection wiring

Recommended minimum sizes for field provided wires:

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

Model	Power supply	Power source cable size	Transmitting cable size
		EN60 335-1	EN60 335-1
All Indoor Units (except 8, 10, 16 and 20HP)	1~ 230V 50Hz or 1~ 220-240V 50Hz (depending on the model)	0.75 mm²	0.75 mm²
RAS-3HVRC2	1~ 230V 50Hz	4.0 mm²	
RAS-(4-6)HV(R/N)(C/P)2E		6.0 mm²	
RAS-(4-6)H(R/N)(C/P)2E	3N~ 400V 50Hz	4.0 mm²	

NOTE

- *Follow local codes and regulations when selecting field wires, Circuit breakers and Earth Leakage breakers.*
- *Use the wires which are not lighter than the ordinary polychloroprene sheathed flexible cord (code designation 60245 IEC 57).*

◆ Main switch protection

Select the main switches in according to the next table:

Model	Power supply	Max. current (A)	CB (A)	ELB (no.poles/A/mA)
All Indoor Units (except 8, 10, 16 and 20HP)	1~ 230V 50Hz or 1~220-240V 50Hz (depending on the model)	5.0	6	2/40/30

ELB: Earth switch; CB: Circuit breaker

Outdoor unit	MC (A)	CB (A)	ELB (no.poles/A/mA)
RAS-3HVRC2	15.8	20	2/40/30
RAS-4HV(R/N)(C/P)2E	22.5	25	
RAS-5HV(R/N)(C/P)2E	22.5	25	
RAS-6HV(R/N)(C/P)2E	22.5	25	
RAS-4H(R/N)(C/P)2E	15.0	20	4/40/30
RAS-5H(R/N)(C/P)2E	15.0	20	
RAS-6H(R/N)(C/P)2E	15.0	20	

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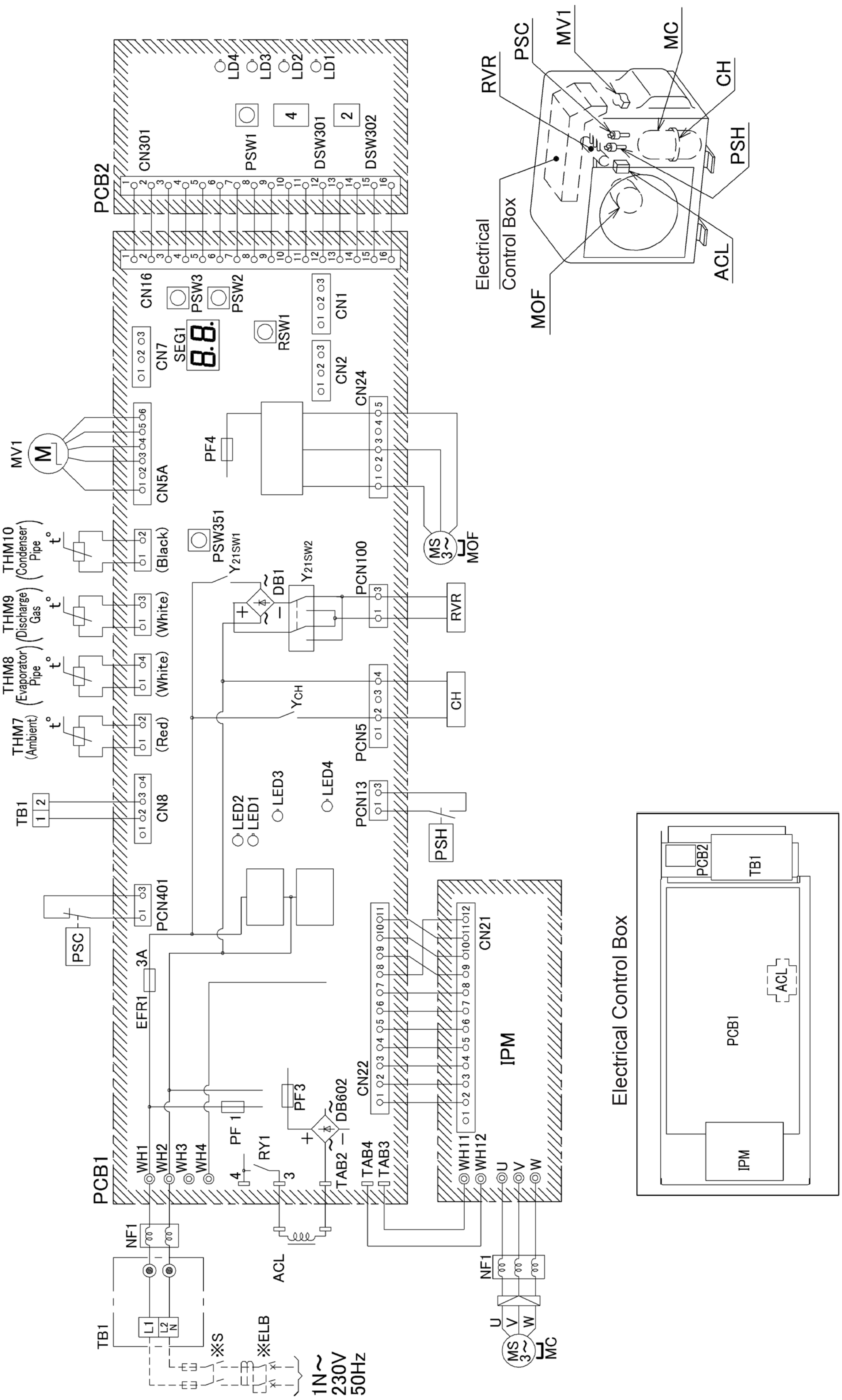
4.4 Electrical wiring diagrams

4.4.1 RAS-3HVRC2



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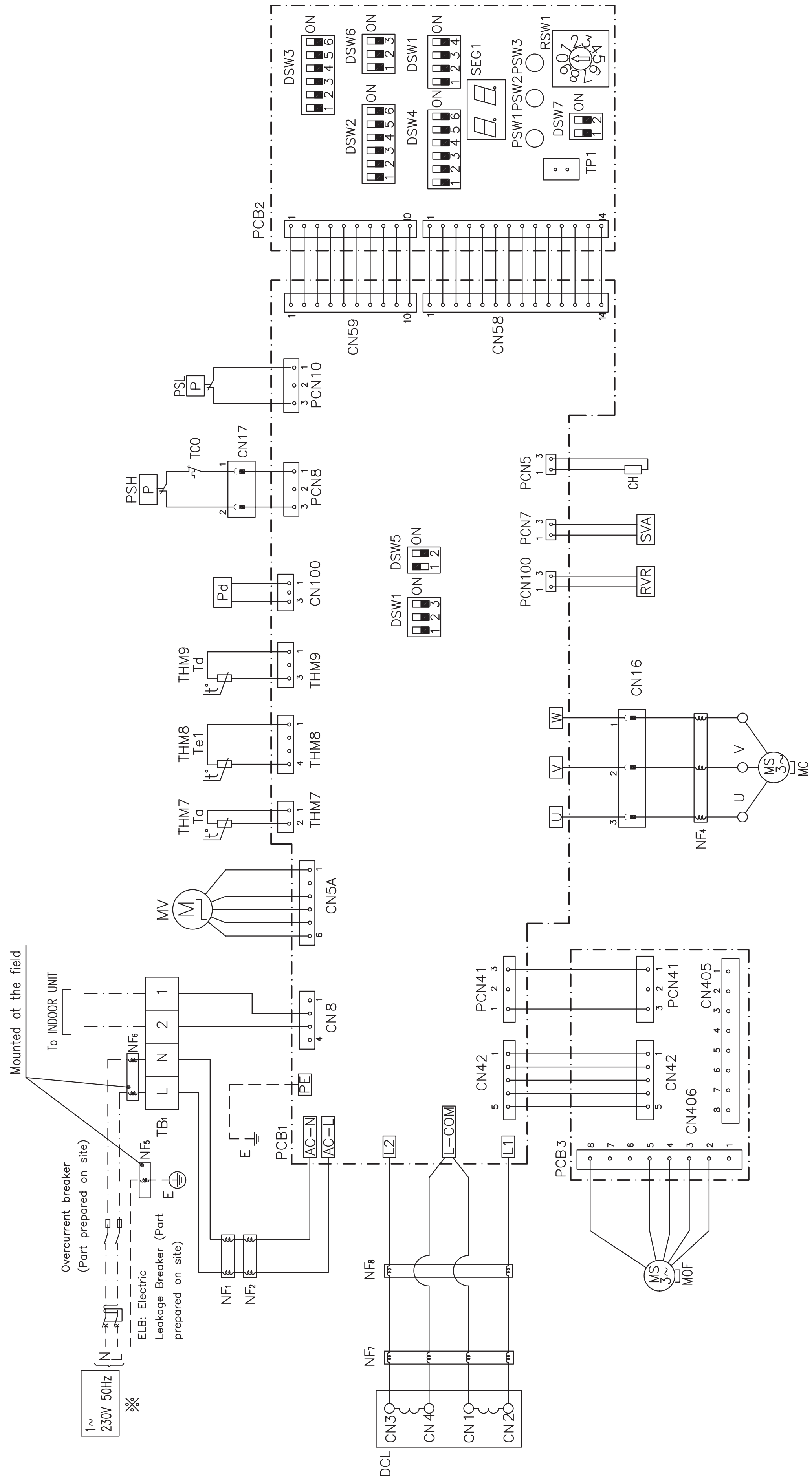
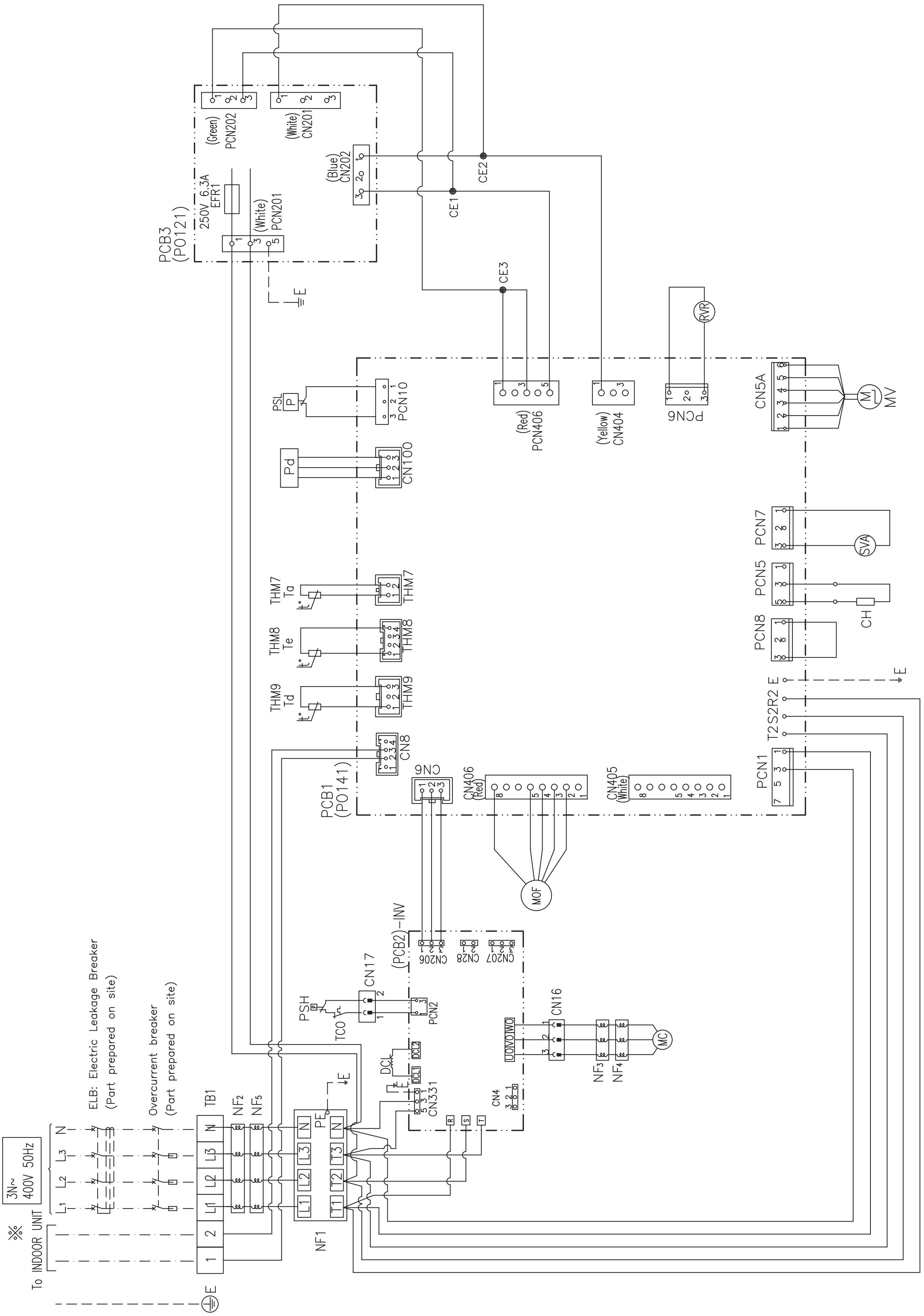
Mark	Name
MC	Motor for Compressor
MOF	Motor for Outdoor Fan
RVR	Reversing Valve Relay
EFR1, PF1,3	Fuse on PCB
MV1	Micro-Computer Control Expansion Valve
TB1	Terminal Board
PCB1,2	Printed Circuit Board
THM7~10	Thermistor
PSH	High Pressure Switch for Protection
PSC	Pressure Switch for Control
CH	Oil heater
ACL	Reactor
IPM	Inverter System Power Module
NF1	Noise Filter
PSW1~3,351 DSW1~7,301, 302 RSW1	Setting Switch on PCB
SEG1	Indication Lamp for 7-Segment
LED1~3 LED351,353 LD1~4	Indication Lamp

4.4.2 RAS-(4-6)HV(R/N)(C/P)2E (1~ 230V 50Hz)



MARK	NAME
CH	Crank-case Heater
$CN_{16\text{-}17}$	Aerial Connectors
DCL	Reactor
MC	Electric Motor (for the compressor)
MOF	Electric Motor (for the outdoor fan)
MV	Electronic expansion valve
$NF_{1\sim2,4\sim8}$	Noise Filter (Ring core)
PCB_1	PCB for control
PCB_2	PCB for Dip Switch
PCB_3	PCB for Fan
Pd	Pressure sensor (discharge side)
PSH	High pressure breaker Device
PSL	Low pressure switch (for control)
RVR	4-way valve coil
SVA	Solenoid Valve coil (for high-low pressure bypass)
TB_1	Terminal Board
TCO	Thermal Cut-Out
$THM_{7\sim9}$	Thermistor

4.4.3 RAS-(4-6)HV(R/N)(C/P)2E (3N~ 400V 50Hz)



XEKS2002

MARK	NAME
$CE_{1,2,3}$	Terminating connector
CH	Crank-case Heater
CN_{16-17}	Aerial Connectors
DCL	Reactor
MC	Electric Motor (for the compressor)
MOF	Electric Motor (for the outdoor fan)
MV	Electronic expansion valve
NF1	Noise Filter (Printed board)
$NF_{2\sim5}$	Noise Filter (Ring core)
PCB_1	PCB for control
PCB_2	PCB for Inverter
PCB_3	PCB for Fan
Pd	Pressure sensor (discharge side)
PSH	High pressure breaker Device
PSL	Low pressure switch (for control)
RVR	4-way valve coil
SVA	Solenoid Valve coil (for high-low pressure bypass)
TB_1	Terminal Board
TCO	Thermal Cut-Out
$THM_{7\sim9}$	Thermistor

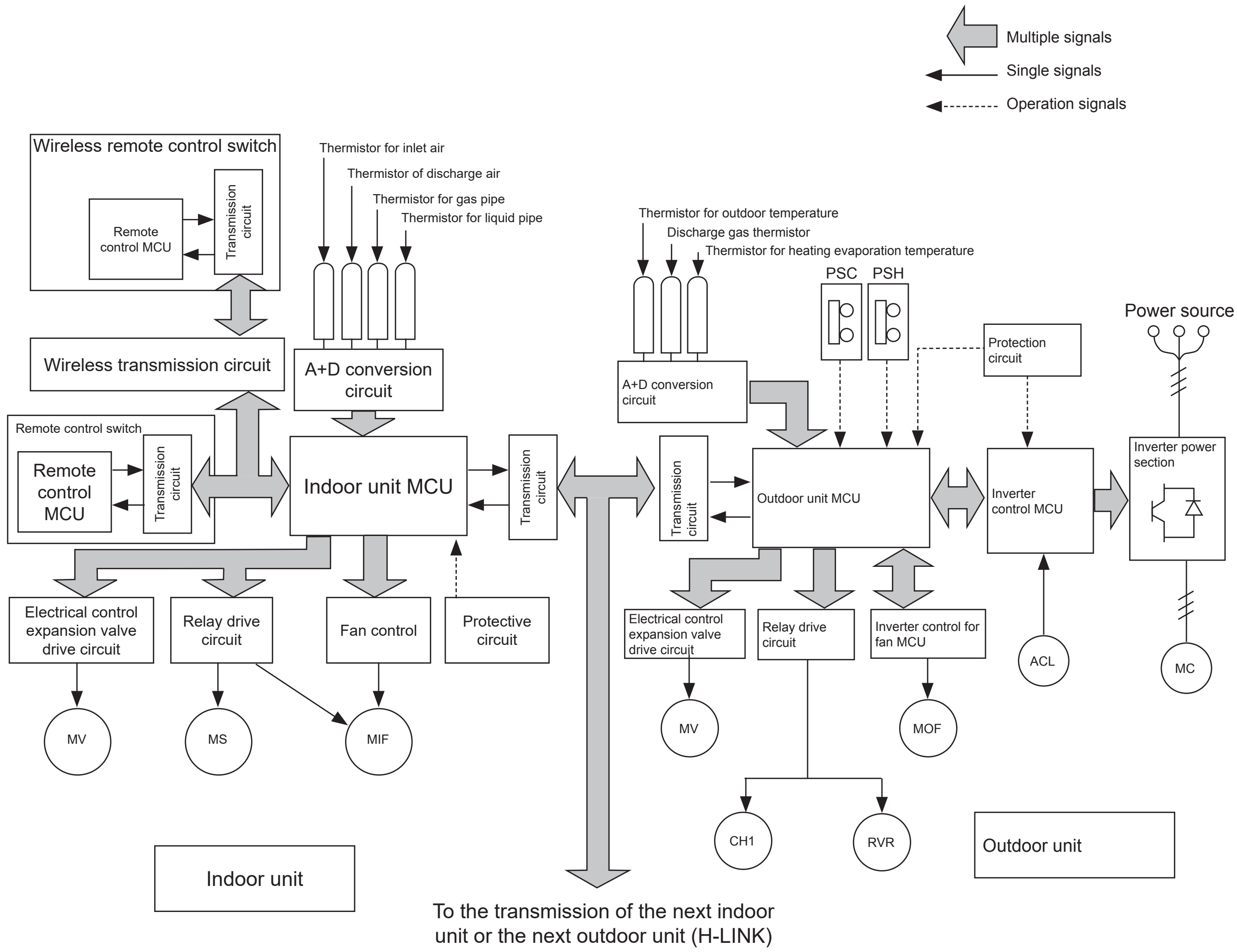
5. Control System

Index

5.1 Device control system

The figure below shows the outline of the control system.

5.1.1 RAS-3HVRC2



Symbol	Name	Symbol	Name
PSH	High pressure switch	ACL	Reactor
THe	Electrical heater thermostat protection	MC	Motor for compressor
Input 1~7	Optional inputs	MIF	Motor for indoor fan
Output 1~4	Optional outputs	MS	Motor for auto-louver
CH1	Crankcase heater	MV	Electronic expansion valve
MOF	Motor (for outdoor fan)	PSC	Pressure switch for control
RVR	4-way valve	PSH	High pressure switch

5.1.2 RAS-(4-6)H(V)(R/N)(C/P)2E

Control device	Cooling operation	
	Control Category	Purpose of Control
Compressor inverter frequency	Total indoor units Operating Capacity	To determine the compressor frequency depending on: - Difference between Indoor Inlet Air Temperature and Setting Temperature - Amount of Temperature Difference Change - Capacity Ratio between Operating Indoor Unit and Outdoor Unit
Electronic Expansion Valve for indoor unit Heat Exchanger	Indoor units Heat Exchanger SH	Quasi PI Control: - To determine the indoor units electronic expansion valve opening so as to keep (Temperature Difference between Indoor Gas Pipe and Indoor Liquid Pipe = Indoor Gas Pipe Temperature - Indoor Liquid Pipe Temperature.) at an optimum value. - To change the indoor units electronic expansion valve opening when the number of operating indoor units is changed.
Electronic expansion valve for the outdoor unit heat exchanger	Capacity control	EVO: 480pls (Fully Opened)
Outdoor unit fan	Pd control	To control the fan steps so that High Pressure is within a stable temperature range.
4-way valve control		OFF
Control of solenoid valve for High/Low pressure Gas Bypass Valve (SVA)	1. Increase in Pd protection 2. Decrease in Ps protection	At Start-up and when High Pressure Increase Protection activated: ON
High and low pressure control	Shut-off of high and low pressure in the cycle during stoppage	SVA: ON (during Operation Stop)
Comp. Preheating Control	Crankcase Heater Control	

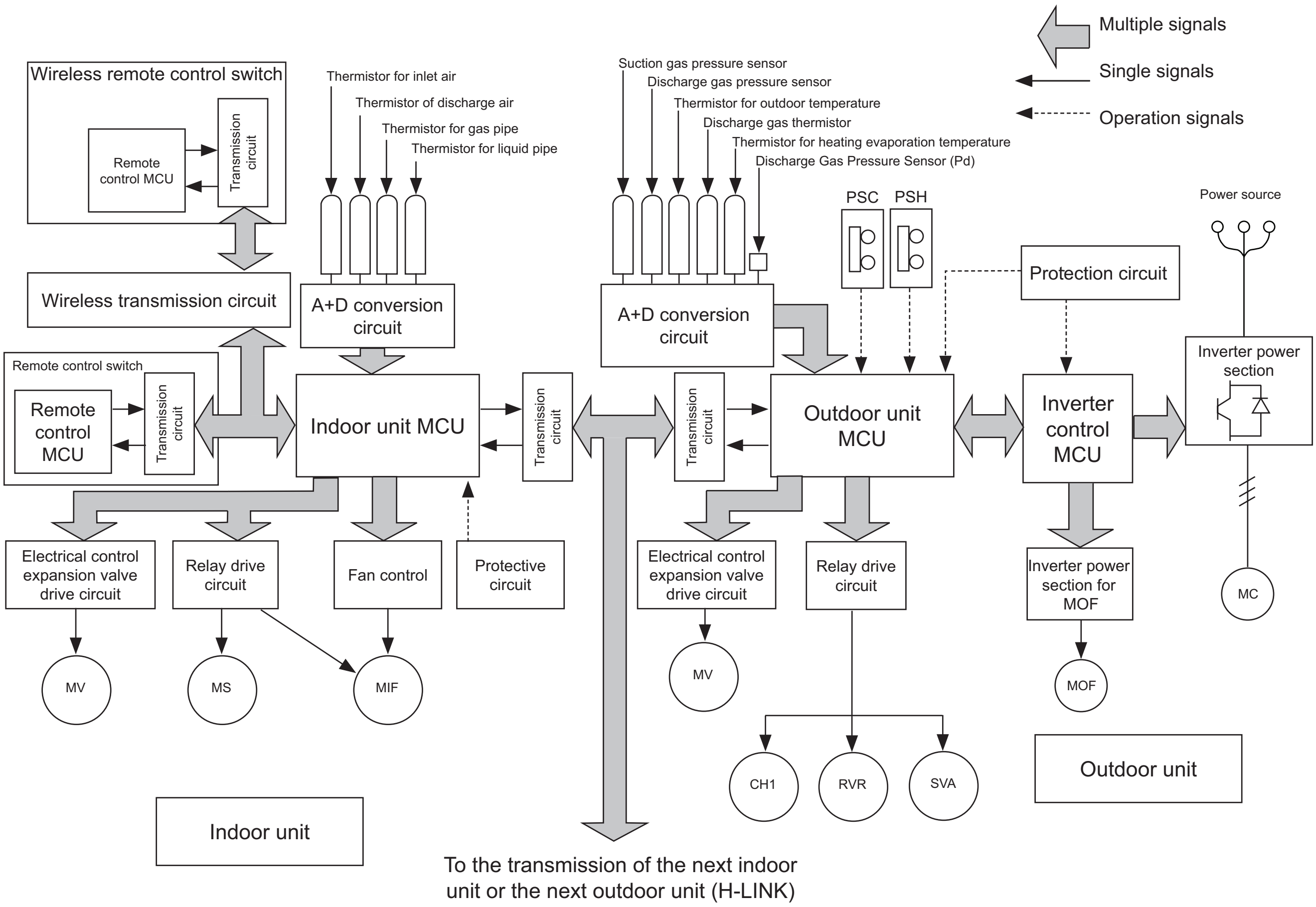
Control device	Heating operation	
	Control Category	Purpose of Control
Compressor inverter frequency	Total indoor units Operating Capacity	- PI Control: To determine the compressor frequency so as to keep High Pressure. - To determine the compressor frequency from difference between Indoor Inlet Air Temperature and Setting Temperature and Capacity Ratio between Operating Indoor Unit and Outdoor Unit when heating operation is started or the number of operating indoor units is changed.
Electronic Expansion Valve for indoor unit Heat Exchanger	Indoor units Heat Exchanger SC	- To determine the indoor units electronic expansion valve opening so that the indoor liquid pipe temperature is at an optimum level. - To change the indoor units electronic expansion valve opening when the number of operating indoor units is changed.
Electronic expansion valve for the outdoor unit heat exchanger	Outdoor unit Heat Exchanger SH	- Quasi PI Control: To determine the outdoor unit electronic expansion valve opening so as to keep the temperature at the top of the compressor at an optimum level. - When Operating Indoor Unit Number Changed: To determine the outdoor unit electronic expansion valve opening from the compressor frequency ratio before/after the change and Quasi PI Control.
Outdoor unit fan	Ps Control	The fan steps are dependent on Ta in the beginning. After that to control the fan steps so that Ps is within a stable pressure range.
4-way valve control		ON
Control of solenoid valve for High/Low pressure Gas Bypass Valve (SVA)	1. Increase in Pd protection 2. Decrease in Ps protection	At Start-up and when High Pressure Increase Protection activated: ON
Compressor Preheating Control	Crankcase Heater Control	

5

Control device	Defrosting (Dry operation is included in the cooling operation)
	Condition
Compressor inverter frequency	SVA: ON (during operation stop)
Electronic Expansion Valve for indoor unit Heat Exchanger	To determine the IU electronic expansion valve opening depending on the temperature at the top of the compressor (Td).
Electronic expansion valve for the outdoor unit heat exchanger	EVO: 480pls (Fully Opened)
Outdoor unit fan	To stop the outdoor fan.
4-way valve control	OFF
Control of solenoid valve for High/Low pressure Gas Bypass Valve (SVA)	At Start-up: ON
Comp. Preheating Control	Crankcase Heater Control

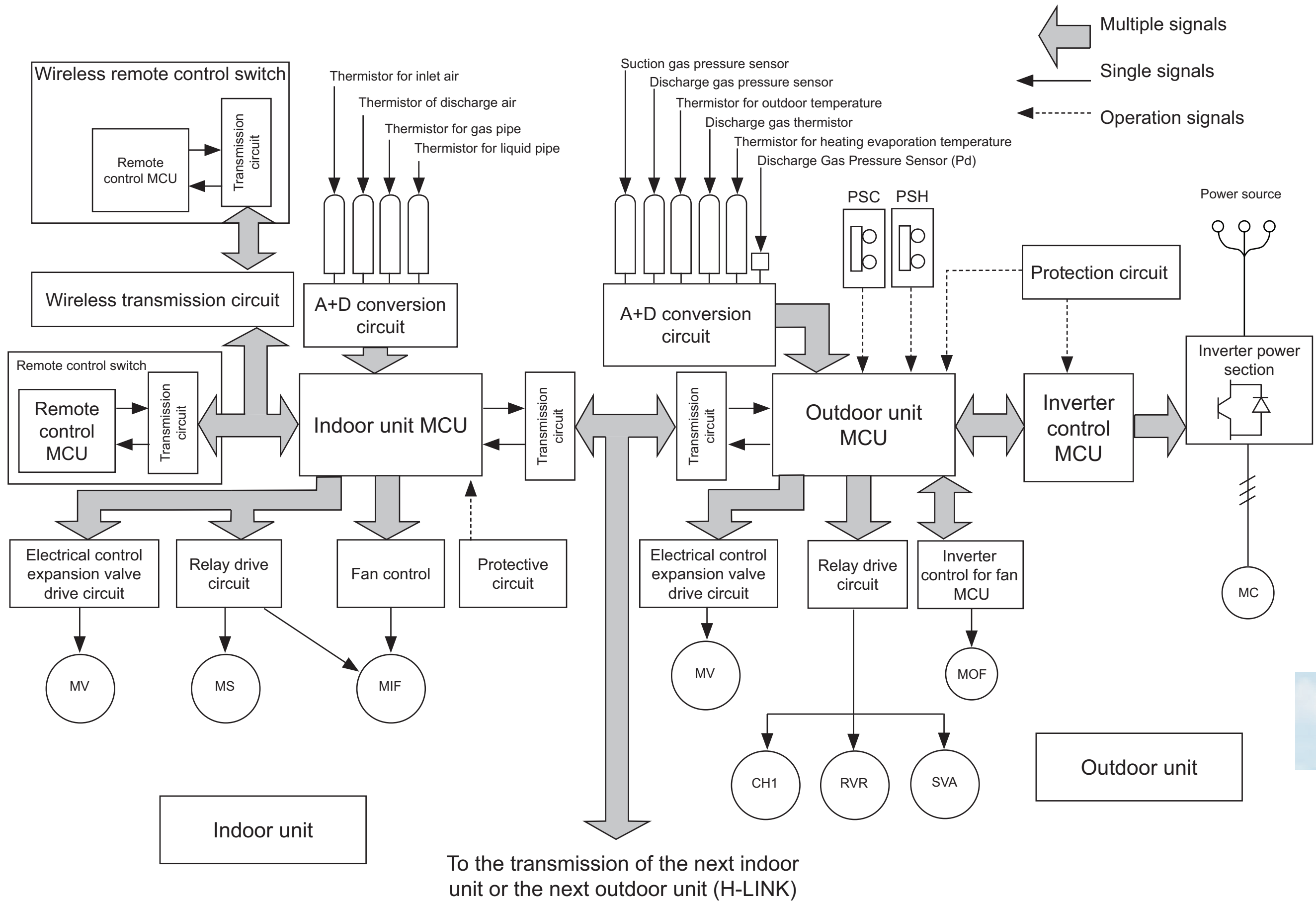
5.1.3 Outline of the control system

The figure below shows the outline of the control system for RAS-(4-6)HV(R/N)(C/P)2E



Symbol	Description	Symbol	Description
MC	Motor (for compressor)	CH	Crankcase heater
MIF	Motor (for indoor fan)	RVR	4-Way valve
MOF	Motor (for outdoor fan)	SVA	Solenoid valve
MS	Motor (for auto-louver)	PSC	Low Pressure switch for control
MV	Electronic expansion valve	PSH	High Pressure switch
CMC	Compressor magnetic contactor		

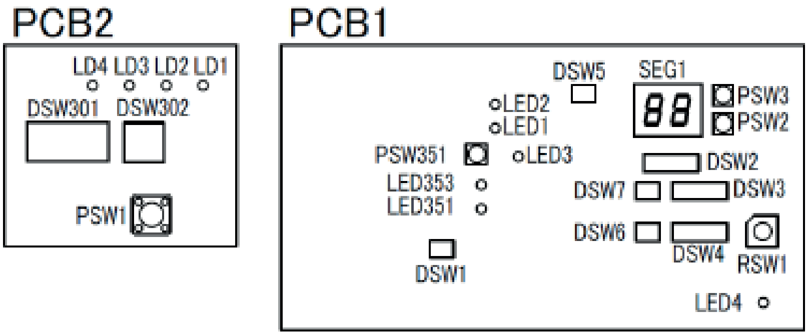
The figure below shows the outline of the control system for RAS-(4-6)H(R/N)(C/P)2E



Symbol	Description	Symbol	Description
MC	Motor (for compressor)	CH	Crankcase heater
MIF	Motor (for indoor fan)	RVR	4-Way valve
MOF	Motor (for outdoor fan)	SVA	Solenoid valve
MS	Motor (for auto-louver)	PSC	Low Pressure switch for control
MV	Electronic expansion valve	PSH	High Pressure switch
CMC	Compressor magnetic contactor		

5.2 Outdoor units Printed circuit board (PCB)

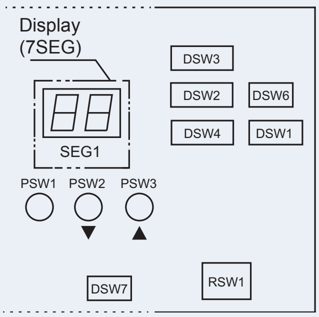
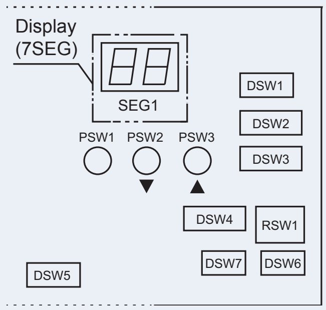
5.2.1 RAS-3HVRC2



Switch indication	
DSW1	No setting required
DSW2	Function selection
DSW3	Capacity
DSW4	Ref. cycle number
DSW5	End terminal resistance
DSW6	Optional function
DSW7	Optional function
DSW1	Optional function
DSW301	Test run mode
DSW302	Pipe lenght
RSW1	Ref. cycle number
PSW1	Manual defrost operation switch. The defrost option is manually available under the forced defrost area
PSW2	Available optional function. Setting can be selected using the 7-segment display
PSW3	

PCB1 LED indication		
LED1	Red	Power source for the PCB
LED2	Green	This LED indicates the inverter transmission status
LED3	Yellow	This LED indicates the transmission status between the indoor unit and the outdoor unit
LED4	Red	For checking 280V power source.
LD1	Red	For inspection
LD2	Red	For inspection
LD3	Red	For inspection
LD4	Red	For inspection
LED351	Red	For inspection
LED353	Red	For inspection

5.2.2 RAS-(4-6)H(V)(R/N)(P/C)2E

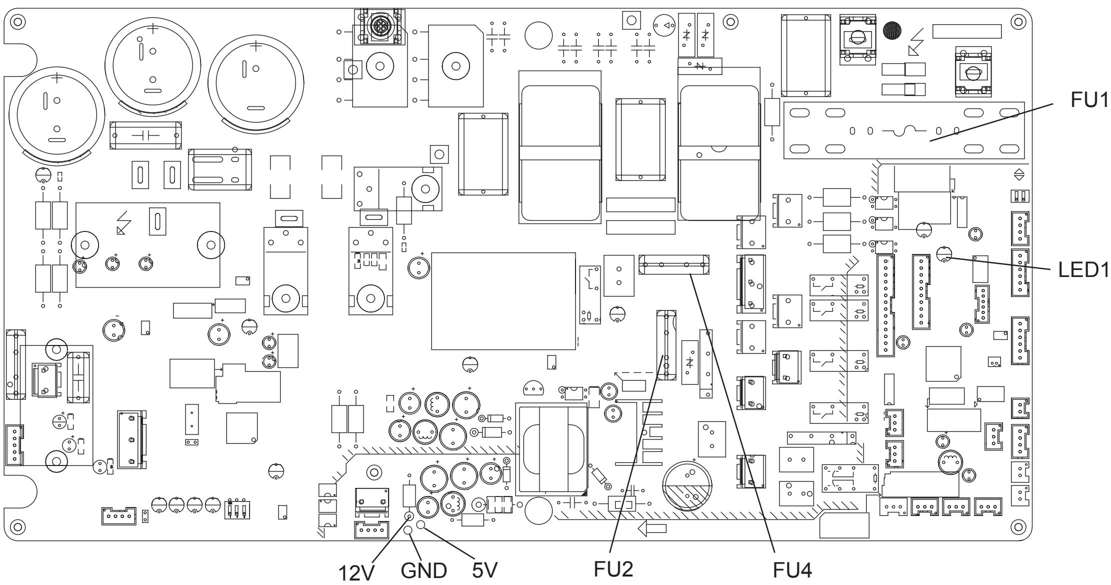
RAS-(4-6)HV(R/N)(C/P)2E (PCB2)	RAS-(4-6)H(R/N)(C/P)2E (PCB)
	
DSW1 and PSW can be operated while power source is ON. It may take up to 20 seconds for the change of operation state (RUN/STOP) to be effective after having set DSW1.	

CAUTION

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

5.2.2.1 RAS-(4-6)HV(R/N)(C/P)2E (PCB1)

Item	Part Name
LED	LED1, LED2, LED***
Connector	PCN***, CN***
Fuse	FU1, FU2
Check Point	5V, 12V, GND



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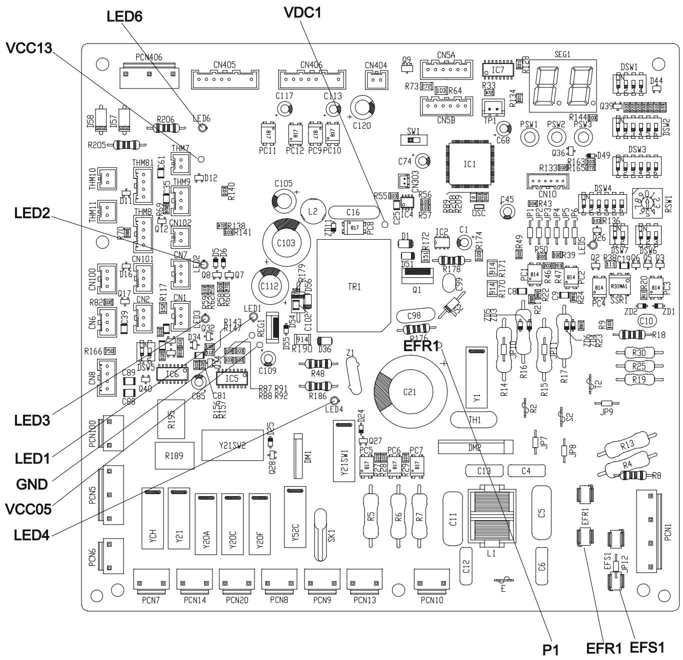
5.2.2.2 RAS-(4-6)H(R/N)(C/P)2E (PCB)

Item	Part Name
LED	LED1, LED2, LED3, LED4, LED6
Connector	PCN***, CN***
Fuse	EFR1, EFS1
Check Point	P1, GND, VCC05, VCC13, VDC-1



5.3 Protection control

5.3.1 Protection control code on 7-segment display

1 Protection control code is displayed on 7-segment when a protection control is activated.

2 Protection control code is displayed while function is working, and goes out when released.

3 When several protection control are activated, code number with higher priority will be indicated (see below for the priority order).

a. Higher priority is given to protection control related to frequency control than the other. Priority order:

- High-pressure increase protection
- Over current protection
- Cold draft protection

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

Priority	Protection control	Code
1	Pressure Ratio Control	P1
2	Pd Protection control	P2
3	Current Protection Control	P3
4	Control for prevention of the increase of Inverter fin temperature	P4
5	Td increase protection control	P5
6	Demand Control	PA
7	Pd decrease prevention control	P9
8	Inverter Trip Retry	P7
9	Insufficient Voltage/Open Phase Detection Retry	P8

NOTE

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

5.3.2 Activating condition of protection control code

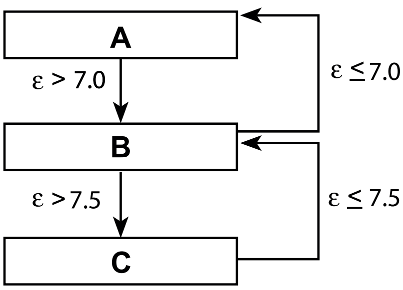
To monitor the conditions such as the temperature change and others, the control of the frequency and other controls are performed by the protection control in order to prevent the abnormal operations. The activating conditions of protection control are shown in the table below:

Code	Protection Control	Remark
P1	Pressure Ratio Protection Control	To control the compressor frequency for prevention of operation with high/low pressure ratio.
P2	High-Pressure Increase Protection Control	To control the compressor frequency for prevention of high pressure increase.
P3	Inverter Current Protection Control	To control the compressor frequency for prevention of inverter current increase in the outdoor unit during operation.
P4	Inverter Fin Temperature Increase Protection Control	To control the compressor frequency for prevention of inverter fin temperature increase. The inverter fin temperature is detected at the inverter PCB.
P5	Discharge Temperature Increase Protection Control	To control the compressor frequency for prevention of discharge gas temperature increase during operation.
P9	High Pressure Decrease Protection Control	To control the compressor frequency for prevention of high pressure decrease, which would interrupt smooth refrigerant distribution to indoor units with different height and oil supply to the compressor.
PA	Demand Current Control	To control the compressor frequency for fixing the inverter primary current around the set value (40~100% of rated current for cooling).
P7	Inverter Trip Retry	To stop the unit operation temporarily for protection of the compressor and inverter. The operation will be restarted or stopped depending on the retry.
P8	Insufficient Voltage/Open Phase Detection Retry	Insufficient Voltage/Open Phase frequency.

◆ **P01: Pressure ratio increase protection control**

a. Pressure Ratio Increase Protection Control.

It is performed in order to protect the compressor from an increase of pressure ratio.



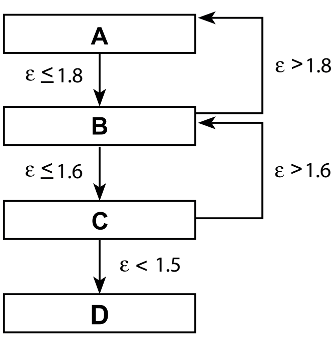
A	Normal operation
B	Not allowing frequency increases (only frequency decreases are allowed)
C	Frequency forced decrease (0.25Hz/sec)

NOTE

- *In order to carry out this control, the pressure ratio of each outdoor unit is calculated.*
  Pressure ratio ε = (Pd +0.1) / (Ps +0.1)
  Pd: High pressure sensor detected value (MPa).
  Ps: Low pressure sensor detected value (MPa).

b. Low Compression Ratio Protection Function

This function is activated to protect the compressor during occurrences of low compression ratio.



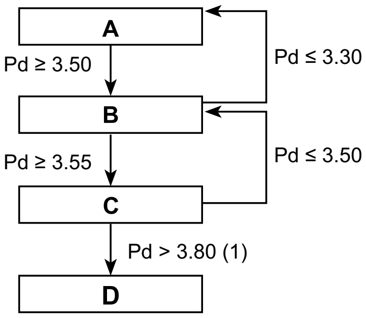
A	Normal operation
B	Not allowing frequency increases (only frequency decreases are allowed)
C	Forced increase in frequency (0.25 Hz/s)
D	Abnormal Stoppage (cause of stoppage d1-11)
(1)	for 1 minute

NOTE

ε: pressure ratio

◆ P02: 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.



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

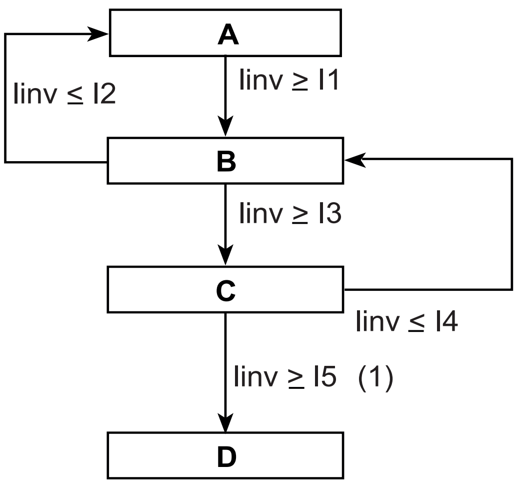
NOTE

- *Pd: high pressure sensor detected value.*
- *Units in MPa.*

◆ P03: 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.

a. Inverter Secondary Current Protection



A	Normal operation
B	Not allowing frequency increases (only frequency decreases are allowed)
C	Forced decrease in frequency (2.0 Hz/s)
D	Abnormal stoppage (cause of stoppage d1-17)
(1)	For 30 seconds

NOTE

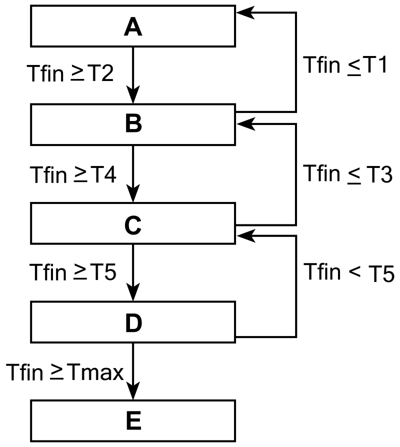
Iinv: Detected Value of Inverter Secondary Current Sensor (A)

Model	I1	I2	I3	I4	I5
RAS-3HVRC2	9	8	10.5	9.5	-
RAS-(4-6)HV(R/N)(C/P)2E	18.5	17.5	20.0	19	28
RAS-(4-6)H(R/N)(C/P)2E	19	18.5	20.0	19.5	28

Units in Amp.

◆ P04: 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.



A	Normal operation
B	Not allowing frequency increases (only frequency decreases are allowed)
C	Forced decrease in frequency (0.125 Hz/s)
D	Forced decrease in frequency (0.5 Hz/s)
E	Abnormal stoppage (cause of stoppage d1-17)

NOTE

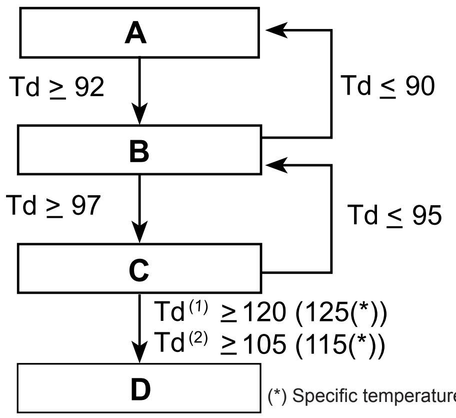
Tfin: inverter fin temperature sensor detected value.

Model	T1	T2	T3	T4	T5	Tmax
RAS-3HVRC2	89	91	94	95	98	100
RAS-(4-6)HV(R/N)(C/P)2E	75	81	83	84	87	92
RAS-(4-6)H(R/N)(C/P)2E	89	90	91	92	95	100

Units in ºC

◆ P05: 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.



(*) Specific temperature for RAS-3HVRC2

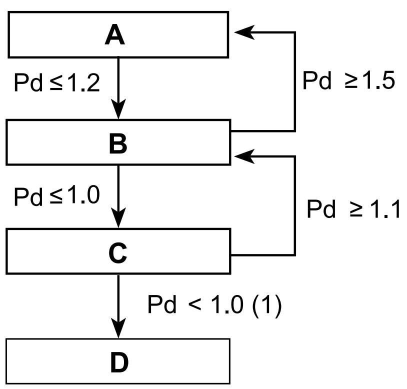
A	Normal operation
B	Not allowing frequency increases (only frequency decreases are allowed)
C	Forced decrease in frequency (0.125Hz/s for 3HP; 0.25 Hz/s for 4-6HP)
D	Abnormal stoppage (cause of stoppage d1-15)
(1)	For 5 seconds
(2)	For 10 minutes

NOTE

- *Td: discharge gas temperature sensor detected value.*
- *Units in ºC*

◆ P09: High pressure decrease protection control

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



A	Normal operation
B	Not allowing frequency decreases (only frequency increases are allowed)
C	Forced increase in frequency (0.125Hz/s for 3HP; 0.25 Hz/s for 4-6HP)
D	Abnormal stoppage (cause of stoppage d1-26)
(1)	For 1 hour

NOTE

Pd: Detected Value of High Pressure Sensor.

◆ P0A: Demand current control

The compressor operation frequency is controlled to set at the setting value of the outdoor unit inverter primary current (40% to 100% of rated current of cooling operation). This function is detailed in the “External Input and Output Setting”. Refer to the Service Manual for details.

Operating Conditions

The demand current control can be performed under the following conditions.

- **a.** The demand signal is input from the centralized operation controller.
- **b.** The demand signal is input at the external input terminals of the outdoor unit from external equipment such as a building management system or a utility with a smart meter.
- **c.** The demand function settings are set from the outdoor unit PCB.
- **d.** The wave function is set from the outdoor unit PCB.
- **e.** The demand signal is input from the indoor unit (wired controller).

If the operation current exceeds each setting function value, the compressor operation frequency is controlled.

◆ Priority of protection control

If two or more protection controls meet a condition, the protection controls perform according to the following.

Rank order	Indication	Protection control contents
1	P1	Pressure Ratio Control
2	P2	Pd Protection control
3	P3	Current Protection Control
4	P4	Control for prevention of the increase of Inverter fin temperature
5	P5	Td increase protection control
6	PA	Demand Control
7	P9	Pd decrease prevention control
8	P7	Inverter Trip Retry
9	P8	Insufficient Voltage/Open Phase Detection Retry

		② Lower Rank Order of Protection Control Function			
		Forced Decrease	Forced Increase	Prohibited Increase	Prohibited Decrease
① Higher Rank Order of Protection Control Function	Forced Decrease	①	①	①	①
	Forced Increase	①	①	①	①
	Prohibited Increase	②	①	② *1	①
	Prohibited Decrease	②	②	②	②

NOTE

**1 Discharge temperature increase protection control (P5) is higher than the following protection controls.*

1 Low Pressure Decrease Protection Control (P6).

2 Demand Current Control (PA).

◆ 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.

Related protection control

a. Pressure ratio decrease protection control (P1).

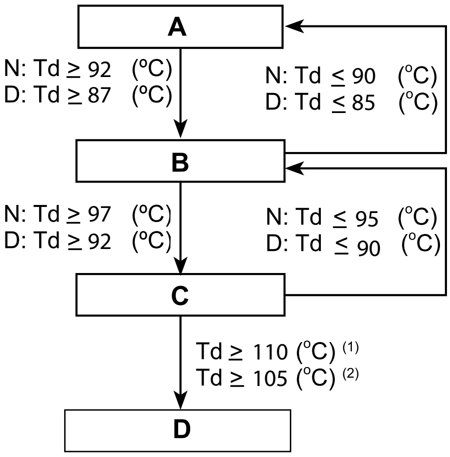
b. Discharge pressure increase protection control (P2).

c. Inverter overcurrent protection control (P3).

d. Inverter fin temperature increase protection control (P4).

e. Discharge temperature increase protection control (P5).

Example of discharge temperature increase protection control for RAS-(4-6)H(V)(R/N)(C/P)2E:



A	Normal operation
B	Not allowing frequency increases (only frequency decreases are allowed) Forced decrease in frequency (1.0 Hz/s)
C	Forced decrease in frequency (0.25 Hz/s)
D	Abnormal stoppage (cause of stoppage d1-15)
(1)	For 5 seconds
(2)	For 10 minutes
N	Normal
D	Degeneration
Td	Discharge gas temperature sensor detected value

5.4 Control and safety devices

1. Compressor protection: the compressor is protected by High 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.

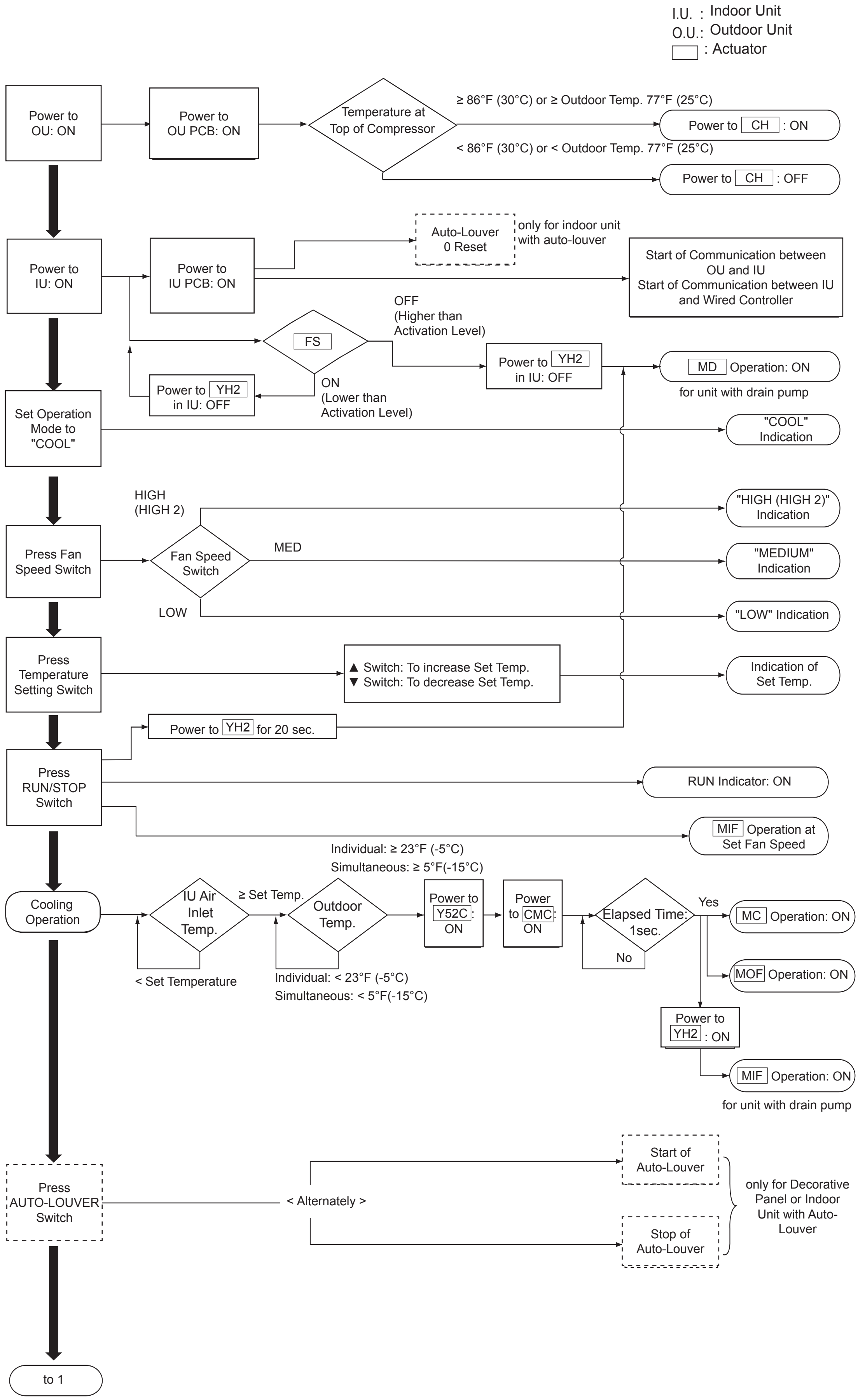
Model			RAS-3HVRC2
For Compressor			
Pressure switches			Automatic reset, non-adjustable (Each one for each compressor)
High	Cut-out	MPa	$4.15^{-0.05}_{-0.15}$
	Cut-in		3.20±0.15
Low	Cut-out	MPa	2.85±0.1
(For control)	Cut-in		3.6±0.15
Fuse capacity on PCB (PF1)	1~ 230V 50Hz	A	25
CCP timer		-	Non adjustable
Setting time		min	3
For fan module			
Fuse capacity			
On PCB (PF4) (for fan motor)		A	15
On PCB (EFR1) (for control circuit)		A	3

Model			RAS-(4-6)HV(R/N)(C/P)2E	RAS-(4-6)H(R/N)(C/P)2E
For Compressor				
Pressure switches			Automatic restart, non adjustable (each one for each compressor)	
High pressure	Cut-Out	MPa	$4.15^{-0.05}_{-0.15}$	$4.15^{-0.05}_{-0.15}$
	Cut-In	MPa	$3.20^{+0.15}_{-0.20}$	$3.20^{+0.15}_{-0.20}$
Fuse capacity				
	1~ 230V 50Hz	A	50	-
	3N~ 400V 50Hz	A	-	32
Oil heater capacity		W	24	24
CCP timer		-	Not adjustable	
	Time setting	min.	3	3
For fan module				
Fuse capacity (for both fans)				
	DC 310V	A	3.15	5
	3N~ 400V 50Hz	A	-	-

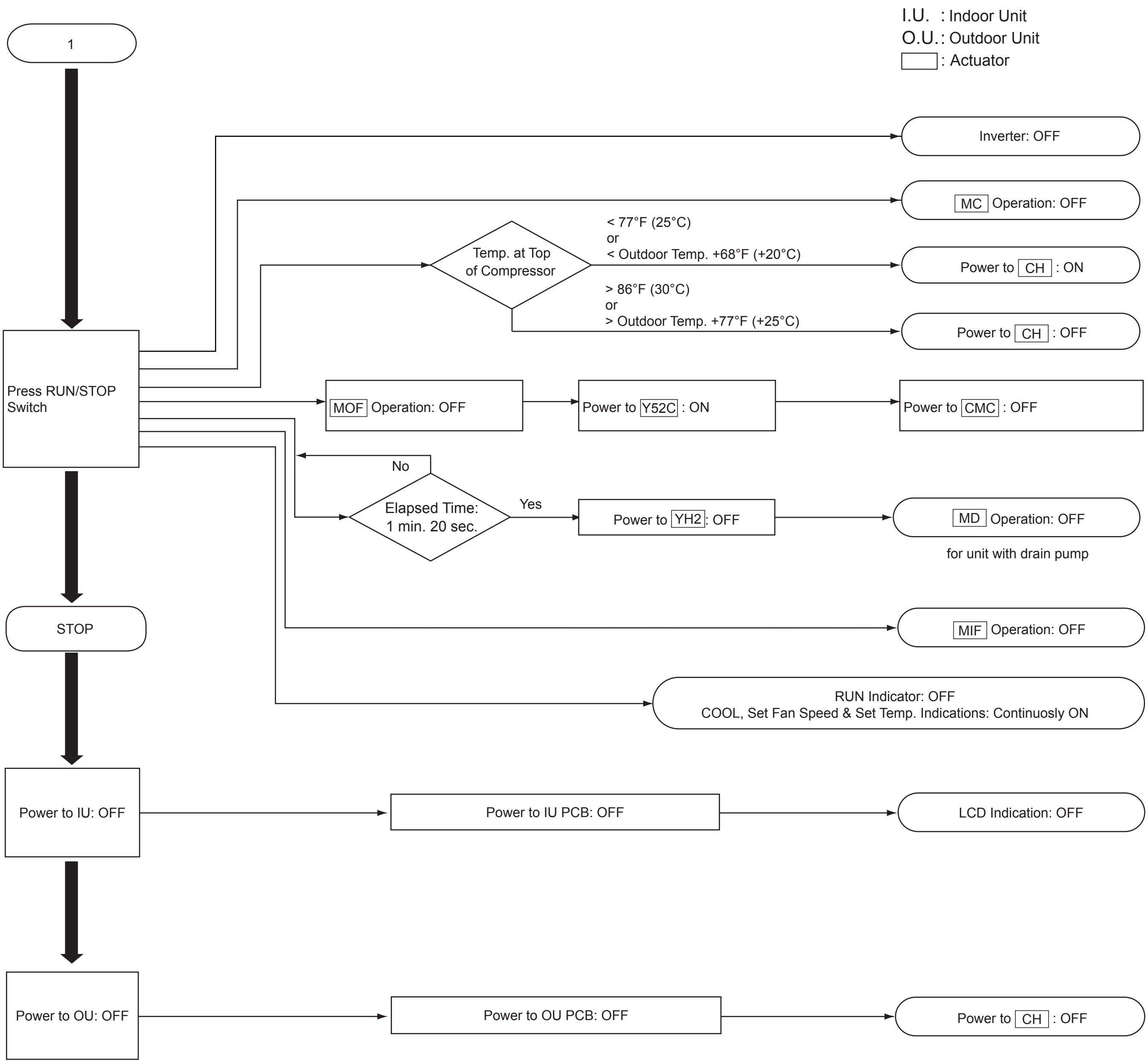
5

5.5 Standard operation sequence RAS-3HVRC2 and RAS-(4-6)H(V)(R/N)(C/P)2E

5.5.1 Cooling operation



Cooling operation (continued)



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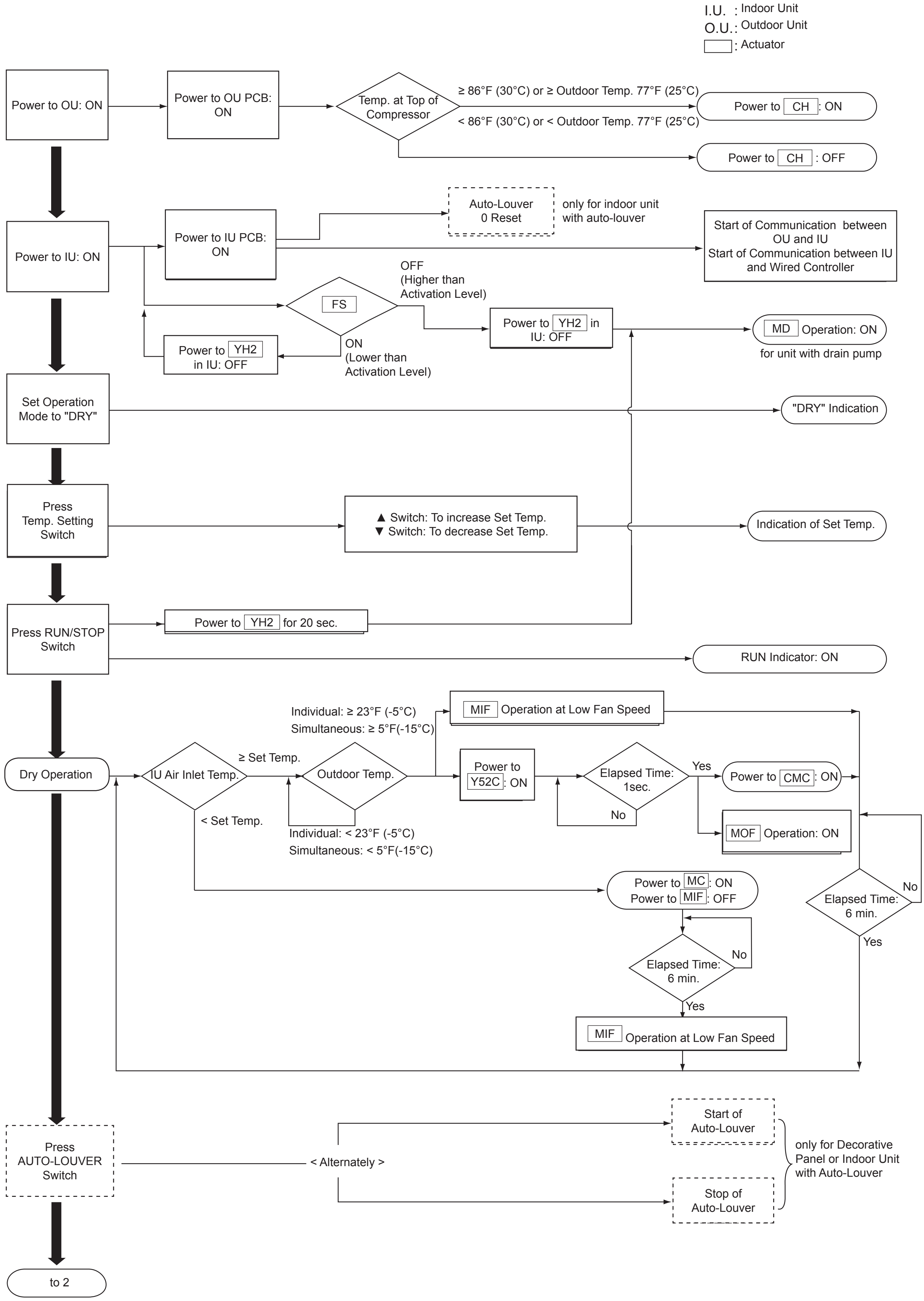
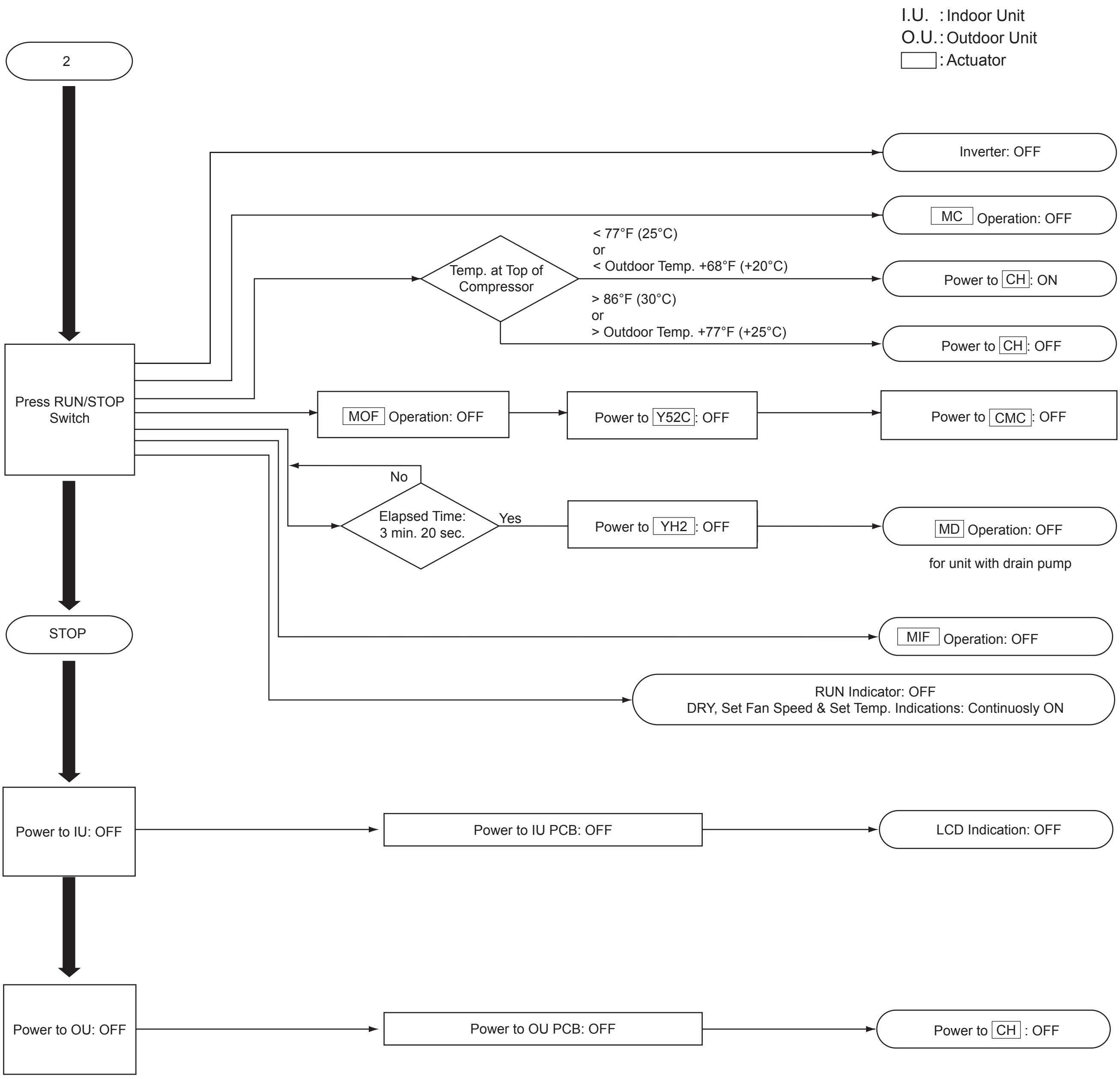
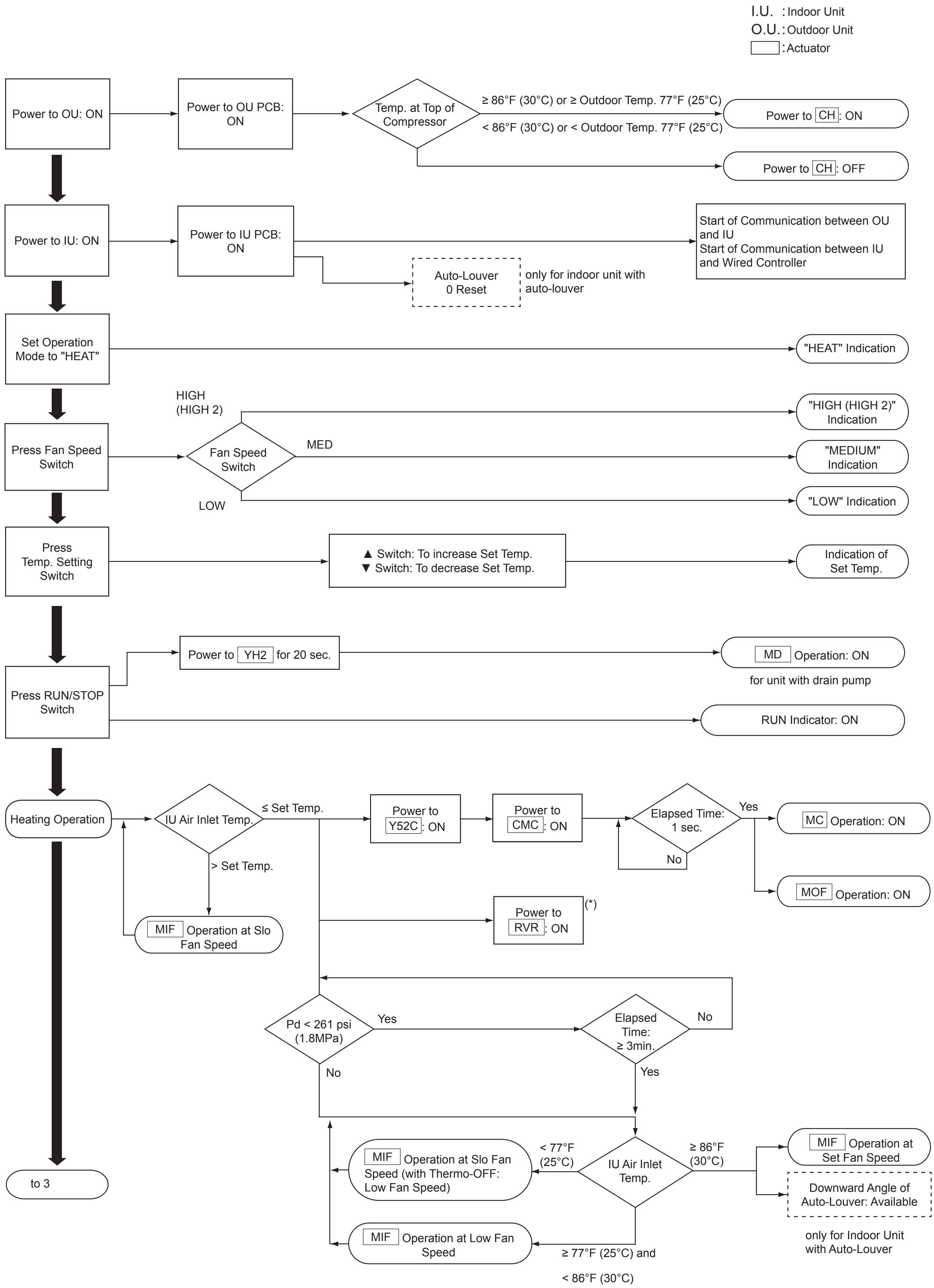
5.5.2 Dry operation



Dry operation (continued)

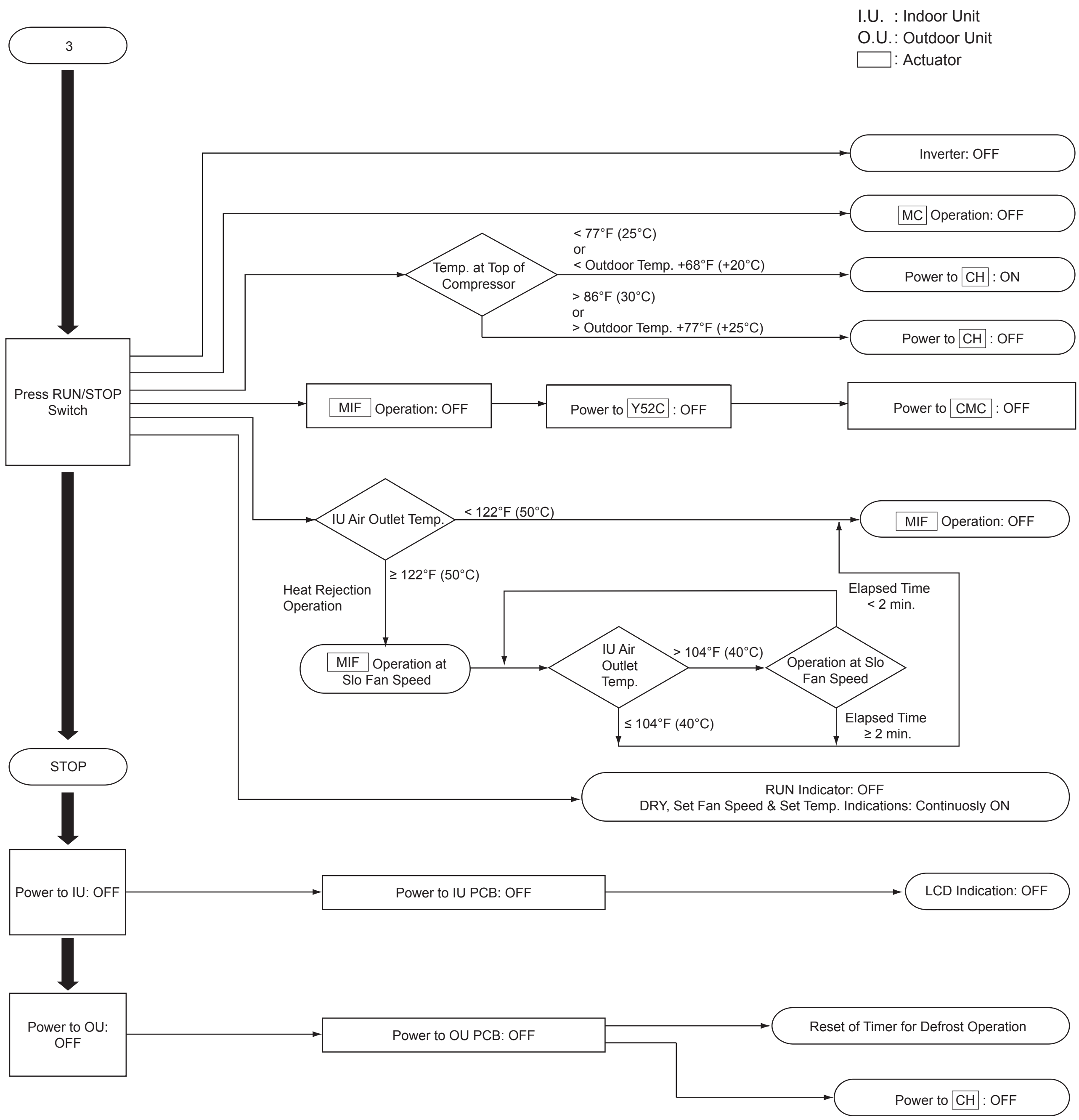


5.5.3 Heating operation



(*) Refer to Service Manual for the timing diagram of the reversing valve.

Heating operation (continued)



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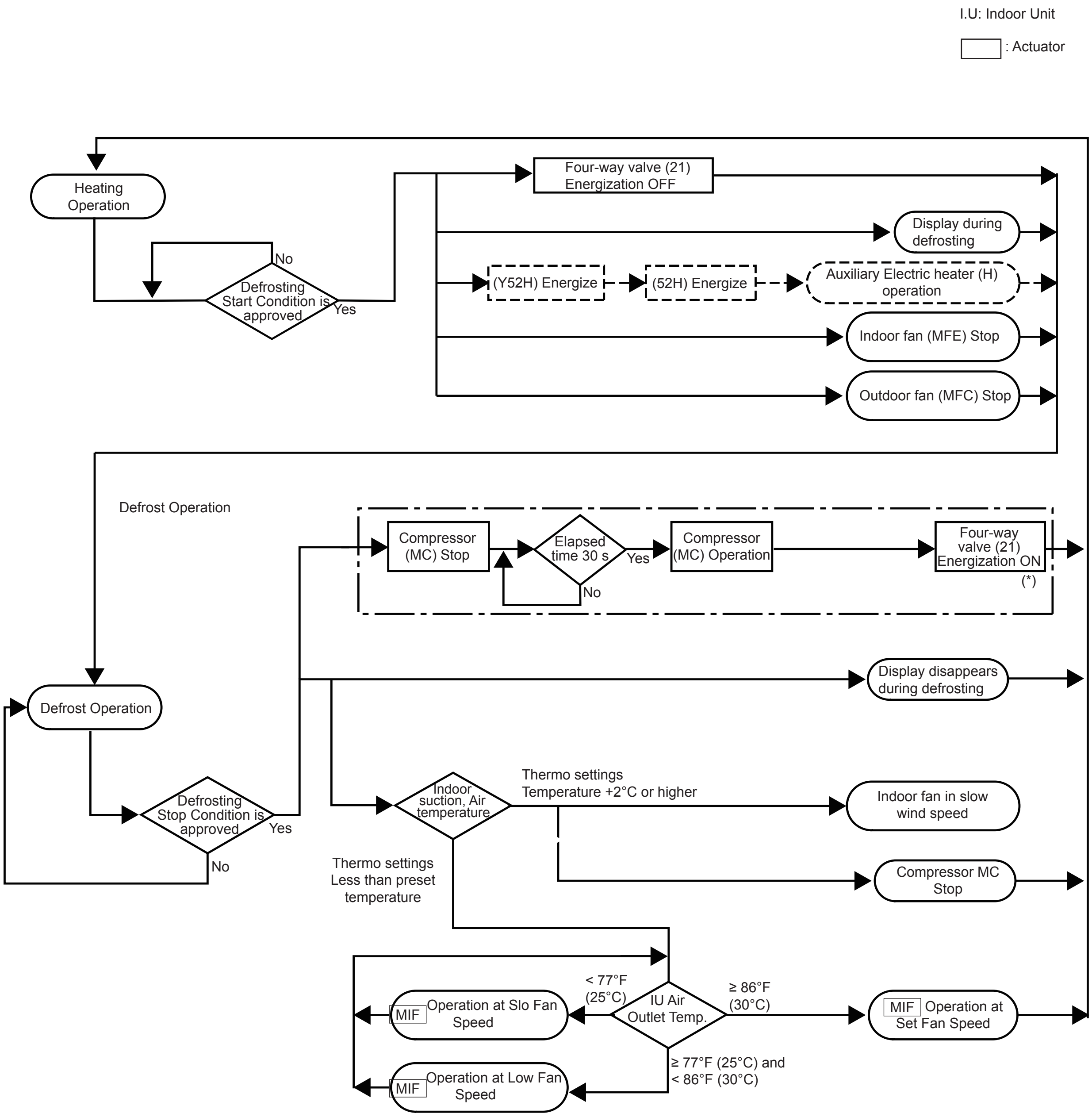
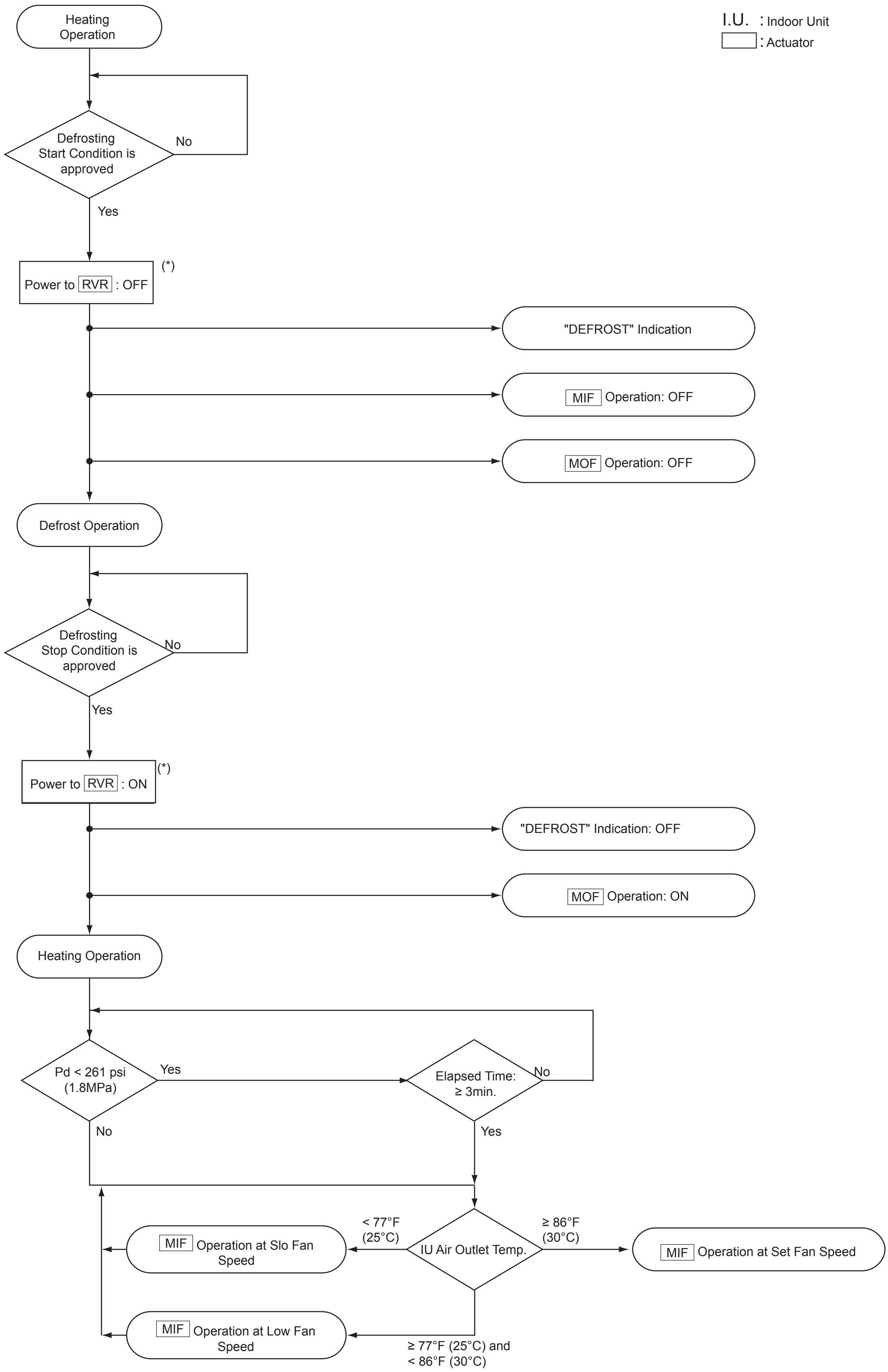
5.5.4 Defrost operation RAS-3HVRC2



(*) Refer to Service Manual for the timing diagram of the reversing valve.

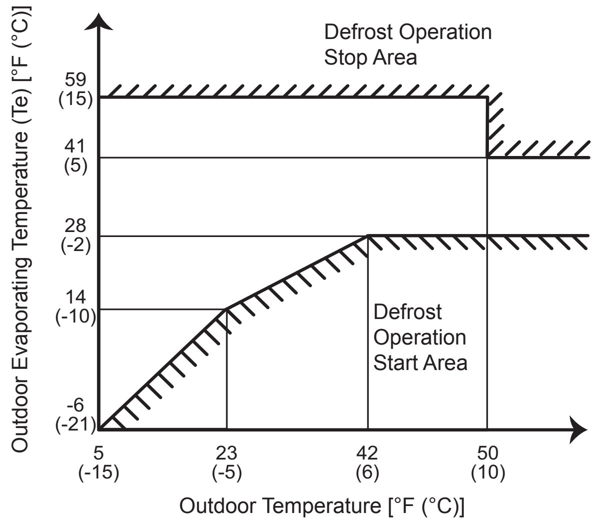
5.5.5 Defrost operation RAS-(4-6)H(V)(R/N)(C/P)2E



(*) Refer to Service Manual for the timing diagram of the reversing valve.

◆ Standard Defrost

1 Temperature Condition

Temperature Conditions under Defrost Operation	

2 Conditioning of Operating Time for Defrost Operation Start

The defrost operation starts when the temperature condition shown in “(a) Temperature Condition” is met after a heating operation of 40 to 120 minutes. The heating operation time is determined by estimating the amount of frost on the heat exchanger.

◆ Forced Defrost

The “Forced Defrost” starts when all the following conditions are met:

1 The reversing valve is “ON” for more than 120 minutes.
2 The outdoor temperature is 50°F (10°C) or lower.
3 The accumulated heating operation time is more than 60 minutes.
4 The accumulated time is reset when the operation is stopped or the defrost operation is performed.
5 The compressor is operated continuously for more than 90 seconds.
6 The outdoor evaporating temperature is lower than 41°F (5°C) right before the operation starts.
7 The pressure switch for control is “OFF”.

◆ Condition for Completing Defrost Operation

The defrost operation stops when any of the following conditions is met:

1 The outdoor evaporating temperature reaches 77°F (25°C) within 2 minutes after the defrost operation starts.
2 The outdoor evaporating temperature reaches 59°F (15°C) (the outdoor temperature < 50°F (10°C)) and high pressure reaches 218psi (1.5MPa) after a lapse of 2 minutes or more from the defrost operation start.
3 The outdoor evaporating temperature reaches 41°F (5°C) (the outdoor temperature ≥ 50°F (10°C)) after a lapse of 2 minutes or more from the defrost operation start.
4 The temperature at the top of the compressor reaches 270°F (132°C).
5 The temperature switch for control is “ON”.
6 The high pressure reaches 479psi (3.3MPa) within 20 seconds after the defrost operation starts.
7 The high pressure reaches 450psi (3.1MPa) after a lapse of 2 minutes or more from the defrost operation start.
8 More than 9 minutes have passed from the defrost operation start.

NOTE

- *The defrost operation does not start immediately even it the above conditions are met, because these conditions may be met temporarily depending on the refrigerant system variability.*
- *The defrost operations start when these conditions are met continuously for a certain period of time.*

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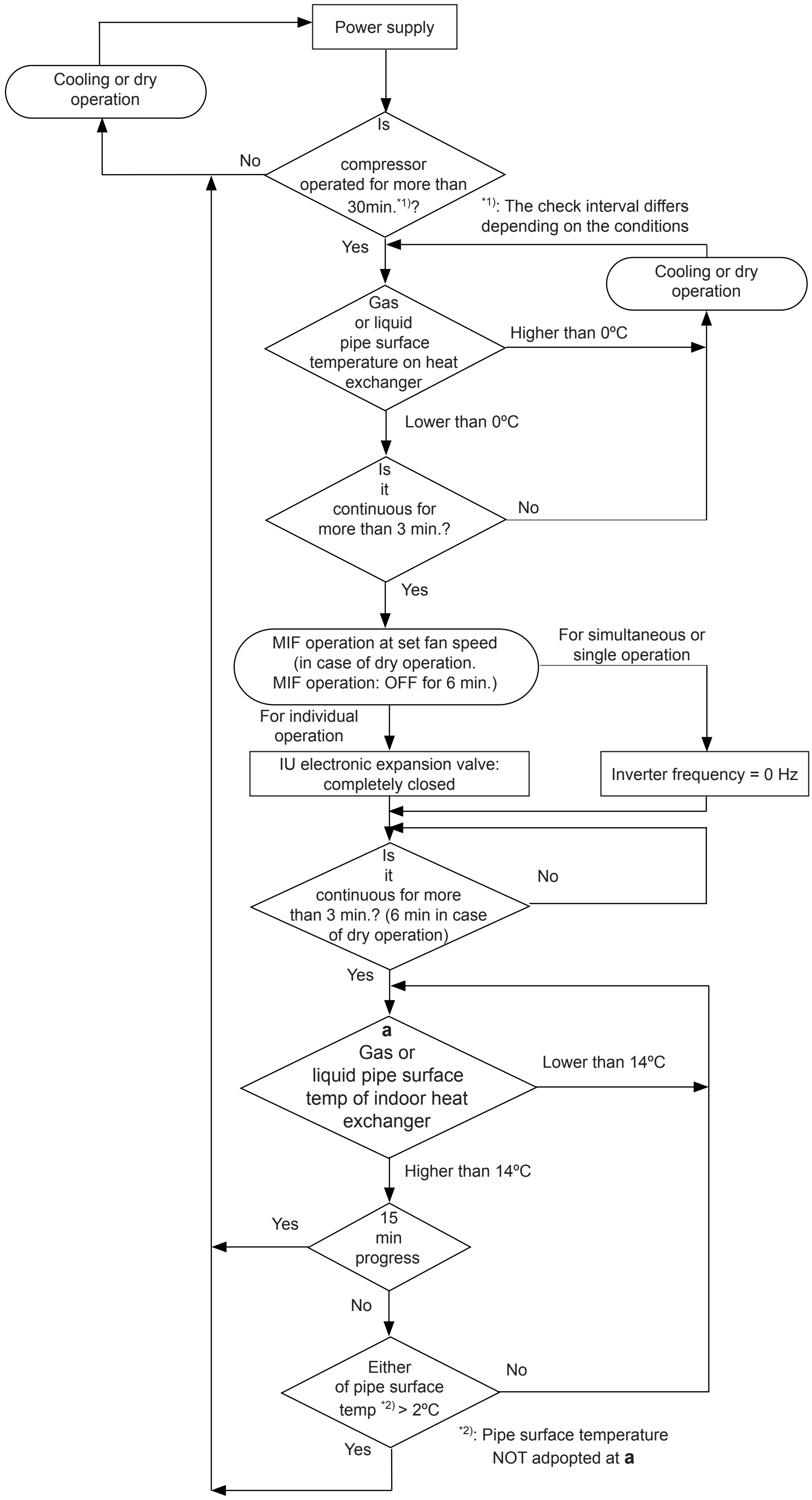
5.6 Standard control functions

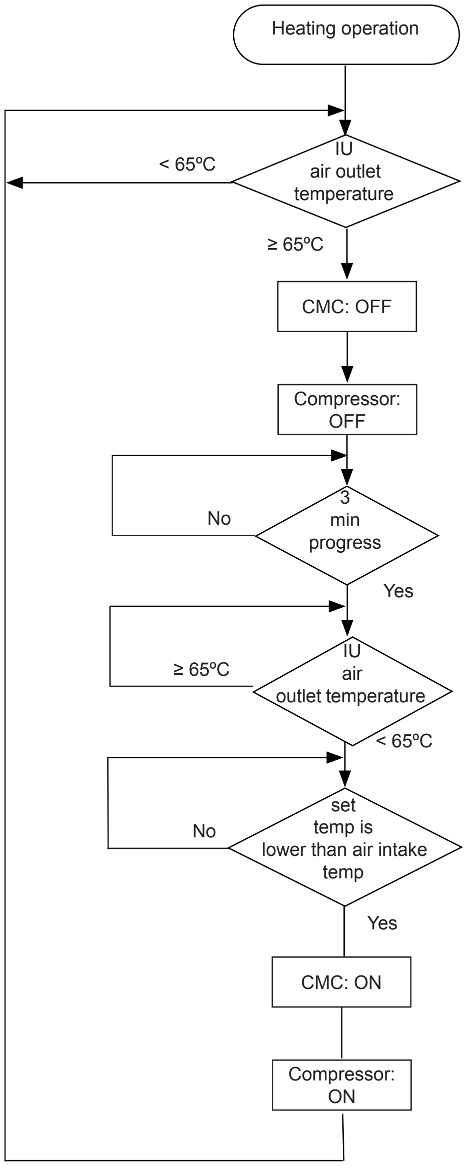
5.6.1 Freezing protection during cooling process or dry operation



IU: Indoor unit

5

5.6.2 Prevention control for excessively high discharge gas temperature



Thermo-ON/OFF control for indoor unit

IU: Indoor unit

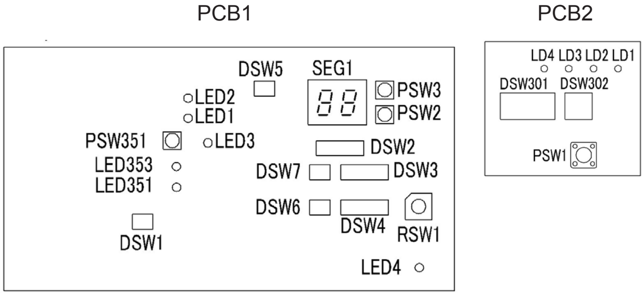
6. Optional functions

Index

6.1 RAS-3HVRC2

6.1.1 Menu mode accessing (by 7-segment display)

Make sure to perform external input/output and setting while the outdoor unit is stopped. It cannot be set while the outdoor is operating or check mode.



7-segment display, DSWs and PSWs location.

6.1.1.1 Check mode

It is used to check the condition of the outdoor and indoor units. It also displays the last 15 items in alarm code history. It is mainly used for servicing.

Start setting	Exit setting
Press PSW1 for 3 seconds	Press PSW1 for 3 seconds

6.1.1.2 External input and output setting

It is used to set the functions by external input and output signals.

Start setting	Exit setting
1º Turn ON DSW2 PIN6 2º Turn ON DSW301 PIN4	1º Turn OFF DSW301 PIN4 during indicated external Input/Output setting mode 2º Turn OFF DSW2 PIN6

6.1.1.3 Function setting

It is used to set the operation mode of the indoor units depending on the requirements of the system.

Start setting	Exit setting
1º Turn ON DSW2 PIN5 2º Turn ON DSW301 PIN4	1º Turn OFF DSW301 PIN4 during indicated external Input/Output setting mode 2º Turn OFF DSW2 PIN5

NOTE

- *After setting, confirm DSW2 and DSW1 setting is same as setting before shipment.*
- *Release “Menu Mode” after the setting is completed. Otherwise, the air conditioner may not operate appropriately.*

6.1.2 External input and output setting (by 7-segment display)

6.1.2.1 Available control functions

The outdoor unit PCB1 has three input terminals (CN1, CN2) that receive external signals and two output terminals (CN7) 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	Configuration of output functions
1	Fixing heating operation mode	Operating signal
2	Fixing cooling operation mode	Alarm signal
3	Demand stoppage	Compressor ON signal
4	Outdoor unit fan motor start/stop	Defrost signal
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	
0	Without setting	Without setting

The following functions are set before shipment:

Input terminal			
Name of the input terminal	Connector pin number	Setting function	Control function number
Input 1	CN1 (1-2)	Fixing heating operation mode	1
Input 2	CN1 (2-3)	Fixing cooling operation mode	2
Input 3	CN2 (1-2)	Demand stoppage	3

Output terminal			
Name of the output terminal	Connector pin number	Setting function	Control function number
Output 1	CN7 (1-2)	Operating signal	1
Output 2	CN7 (1-3)	Alarm signal	2

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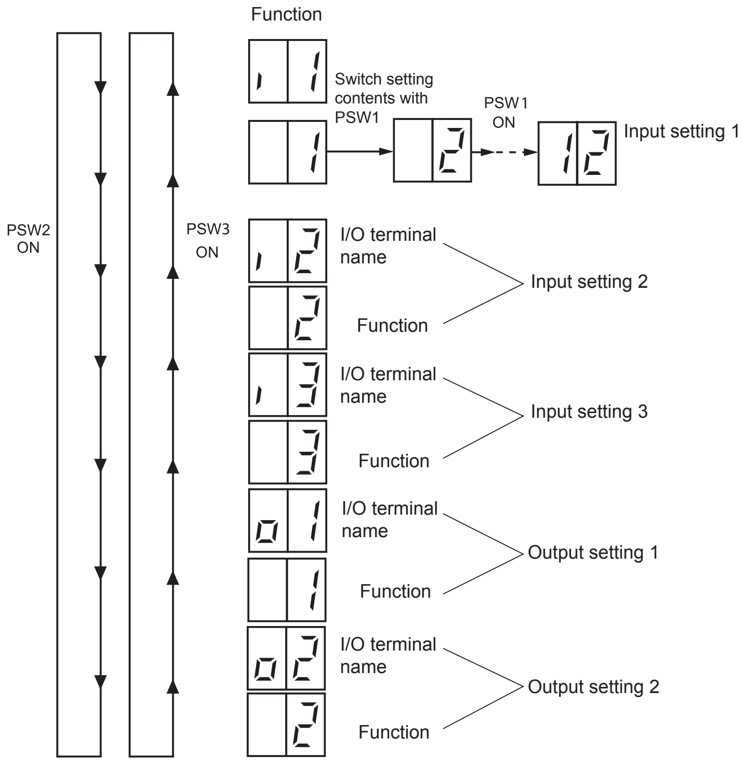
NOTE

The same input/output function cannot be assigned to different input/output terminals. In such case, the setting of the higher terminal number would become invalid.

6.1.2.2 Setting of external input and output

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

1 DSW301 PIN4 of the outdoor unit PCB must be set to "ON" before the modification in order to prevent activation of the compressor. (The setting must be carried out during the stoppage of the outdoor unit.)
2 Set DSW2 PIN6 ON for "External Input and Output Setting", it will be displayed on the 7-segment display.
3 Pressing PSW2 and PSW3 changes the input/output terminal name. After the each input/output name appear the function number, pressing PSW1 it can be changed.



4 After selecting the control function number, turn OFF DSW2 PIN6. The display will be back to the normal operation. Then turn OFF the DSW301 PIN4. The selected data is stored in the outdoor unit PCB1 and the "External Input and Output Setting" is completed. The stored data is maintained even when the power source is cut OFF. Refer to the next table for the details for the electrical wiring connection and the required parts.

Specifications of required main parts

Components		Specifications	Remarks
3-pin connector cable		PCC-1A (Accesory) (connected to a JST Connector, XARP-3)	5 cables with connectors in a single assembly
Cable (Inside the unit)	Low voltage	0.3 mm²	Less than 24 V

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.*

6.1.2.3 Optional external output signals

◆ **Output signals through 7-segment display**

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

- Output connector CN7, which has two ports to configure two optional output signals.

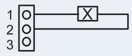
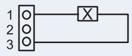
The selection of these input and output signals represents the selection of some optional functions programmed in the PCB through the 7-segment display.

NOTE

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

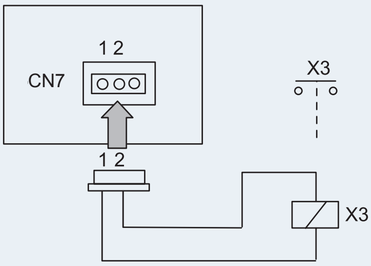
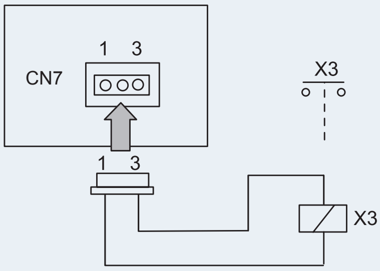
6.1.2.4 Available ports

The system has the following output ports.

Content		Setting of the port in the PCB of the indoor unit	Remarks	Outlet
Outputs	o1	1-2 of CN7		DC 12V
	o2	1-3 of CN7		DC 12V

◆ **Connection**

The system has the following connections:

Output connections	
Indication	**Connections**
o1	
o2	

◆ **Specification of the components for a correct installation**

Component		Manufacturer or specifications	Remarks
Auxiliary relay (X3)		OMRON mini power relay model: MY1F or equivalent	Voltage between relay terminals 12 Vdc - 75 mA
3P connector cable		Optional part PCC-1A (capable of connecting the JST XHP –3 connector)	Five wires with connectors as one set
Wire (control)	Voltage 12V DC	0.5 mm²	
Wire (power)	Voltage 230V	2.0 mm²	

NOTE

- *The connection of the output signal is only an example.*
- *Keep the CN7 wire as short as possible.*
- *Do not run the wires along 230 V/400 V CA power cables Separately install them at a distance of more than 30 cm. (The cables may intersect.)*
- *If you install the wires along a power supply wire, insert the wires in a metal conduit tube and ground one end of the tube.*
- *The maximum wiring length is 70 m. If you use this function, it is recommended that you use safety devices such as an electrical leakage breaker or a smoke detector.*

6.1.2.5 Available output signals

Ind.	Output signal	Application	Port
0	Nº setting application	Nº setting	-
01	Operation signal	This signal allows to pick up the machine’s operation signal.	CN7
02	Alarm signal	This signal picks up the machine’s alarm.	CN7
03	Compressor ON signal	This single allows to pick up the compressor’s operation signal.	CN7
04	Defrost operation signal	This signal allows to pick up the defrosting of the unit.	CN7

NOTE

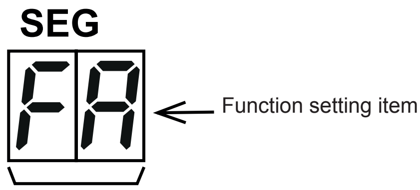
Do not set same function (01~04) to multiple ports.

6.1.3 Function setting (by 7–segment display)

6.1.3.1 Sequence of the function setting

1 Set DSW301 PIN4 of the outdoor unit to ON position before performing in order to prevent the compressor from being activated (outdoor unit stoppage). This setting must be carried out during stoppage of the outdoor unit.

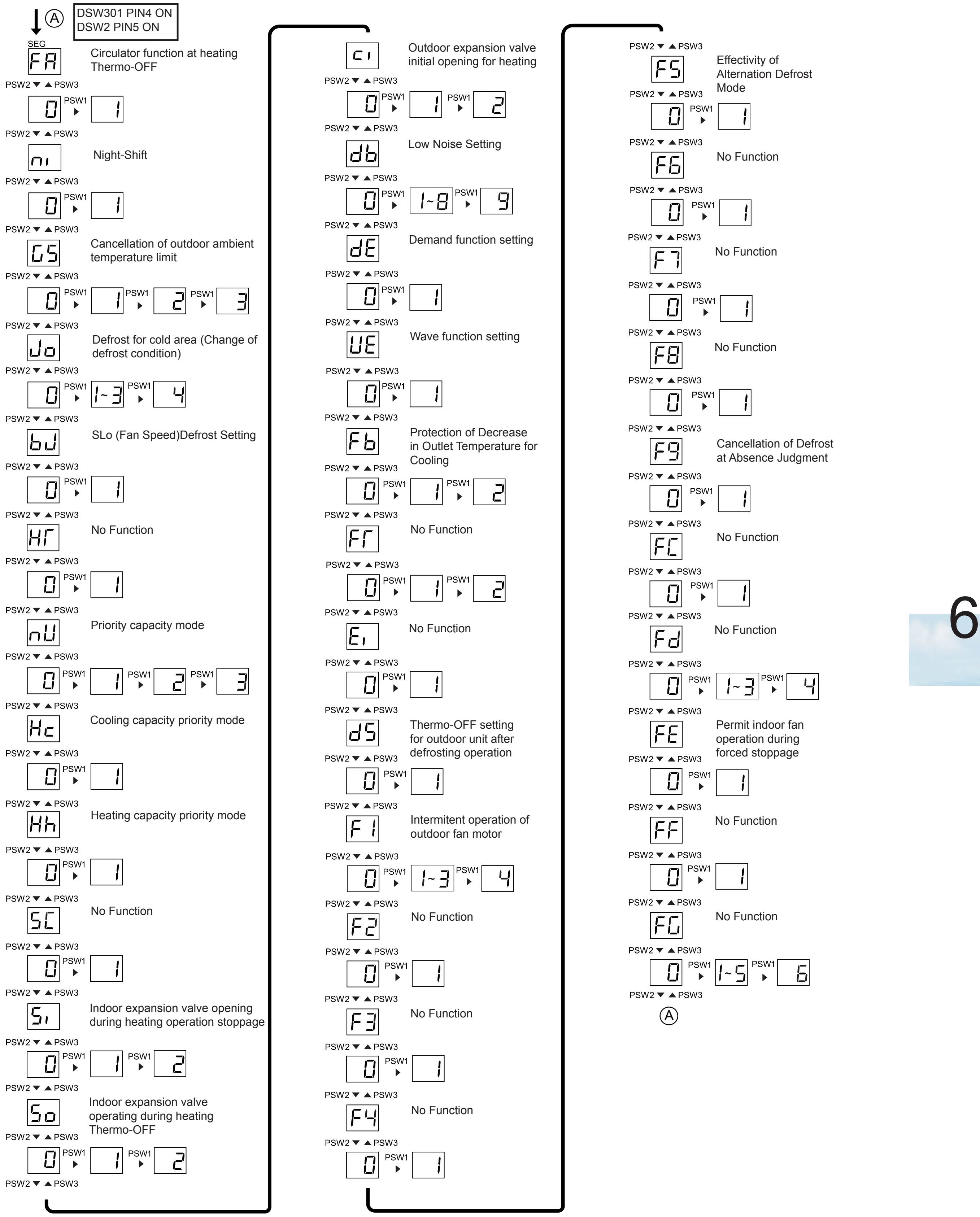
2 By selecting DSW2 PIN5 “Function setting”, the following appears on the 7-segment display.



NOTE

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

3 Pressing PSW2 and PSW3 changes the function setting item. After the each function setting item appear the function number, pressing PSW1 it can be changed.



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4 After selecting the function setting, turn OFF DSW2 PIN5. The display will be back to the normal operation. Then turn OFF DSW301 PIN4. The selected data is stored in the outdoor unit PCB and the “function setting” is completed. The stored data is maintained even when the power source is cut OFF.

6.1.3.2 Function setting

No.	Setting Item	7-Segment Display		Contents
1	Circulator function at heating Thermo-OFF	FA	00	Not available (default setting)
			01	Heating Thermo-OFF fan intermittent operation
2	Night-shift (low noise)	ni	00	Not available (default setting)
			01	Night-shift
3	Cancellation of outdoor ambient temperature limit	CS	00	Not available (default setting)
			01	For heating
			02	For cooling
			03	For cooling/heating
4	Defrost	do	00	Not available (default setting)
			01	Defrost for Cold Area (Change of Defrost Condition)
			02	Defrost for Warm Area (Change of Defrost Condition)
			03	Defrost for Extreme Cold Area 1 (Change of Defrost Condition)
			04	Defrost for Extreme Cold Area 2 (Change of Defrost Condition)
5	SLo (Fan Speed) defrost setting	bJ	00	Not available (default setting)
			01	Slo wind defrosting setting
6	No Function	Hr	00	Not available (default setting)
			01	No setting
7	Priority capacity mode	nU	00	Not available (default setting)
			01	Cooling capacity correction mode 1
			02	Cooling capacity correction mode 2
			03	Cooling capacity correction mode 3
8	Priority Cooling Capacity Mode	Hc	00	Not available (default setting)
			01	Priority Cooling Capacity Mode
9	Priority Heating Capacity Mode	Hh	00	Not available (default setting)
			01	Priority Heating Capacity Mode
10	No Function	SC	00	Not available (default setting)
			01	No setting
11	Indoor Expansion Valve Opening During Heating Operation Stoppage	Si	00	Not available (default setting)
			01	Heating Operation Stoppage 1
			02	Heating Operation Stoppage 2
12	Indoor Expansion Valve Operating during Heating Thermo-OFF	So	00	Not available (default setting)
			01	Heating Thermo-OFF 1
			02	Heating Thermo-OFF 2
13	Outdoor Expansion Valve Initial Opening for Heating	ci	00	Not available (default setting)
			01	Initial Opening for Heating 1
			02	Initial Opening for Heating 2
14	Low Noise Setting	db	00	Not available (default setting)
			01	Low noise setting 1
			02	Low noise setting 2
			03	Low noise setting 3
			04	Low noise setting 1
			05	Low noise setting 2
			06	Low noise setting 3
			07	Low noise setting 1
			08	Low noise setting 2
			09	Low noise setting 3
15	Demand Function Setting	dE	00	Not available (default setting)
			01	Demand Function always enabled
16	Wave Function Setting	UE	00	Not available (default setting)
			01	Wave Function enabled
17	Protection of Decrease in Outlet Temperature for Cooling	Fb	00	Not available (default setting)
			01	Outlet Temperature for Cooling 1
			02	Outlet Temperature for Cooling 2

No.	Setting Item	7-Segment Display		Contents
18	No Function	Fr	00	Not available (default setting)
			01	No setting
			02	No setting
19	No Function	Ei	00	Not available (default setting)
			01	No setting
20	Thermo-OFF Setting for Outdoor Unit after Defrosting Operation	d5	00	Not available (default setting)
			01	Forced stop upon return from defrosting
21	Intermitent operation of outdoor fan motor	F1	00	Not available (default setting)
			01	Outdoor Fan Star/Stop Operation 1
			02	Outdoor Fan Star/Stop Operation 2
			03	Outdoor Fan Star/Stop Operation 3
			04	Outdoor Fan Star/Stop Operation 4
22	No Function	F2	00	Not available (default setting)
			01	No setting
23	No Function	F3	00	Not available (default setting)
			01	No setting
24	No Function	F4	00	Not available (default setting)
			01	No setting
25	Effectivity of Alternation Defrost Mode	F5	00	Not available (default setting)
			01	Effectivity of Alternation Defrost Mode
26	No Function	F6	00	Not available (default setting)
			01	No setting
27	No Function	F7	00	Not available (default setting)
			01	No setting
28	No Function	F8	00	Not available (default setting)
			01	No setting
29	Cancellation of Defrost at Absence Judgment	F9	00	Not available (default setting)
			01	Cancellation of Defrost at Absence Judgment
30	No Function	FC	00	Not available (default setting)
			01	No setting
31	No Function	Fd	00	Not available (default setting)
			01	No setting
32	Permit Indoor Fan Operation during Forced Stoppage	FE	00	Not available (default setting)
			01	Change of forced stop state
33	No Function	FF	00	Not available (default setting)
			01	No setting
34	No Function	FG	00	Not available (default setting)
			01	No setting
			02	No setting
			03	No setting
			04	No setting
			05	No setting
			06	No setting

◆ Record settings

Fill out the selected function setting number in the space of the table as shown (SET).

Item		SEG2	SEG1	SET
1	Circulator function at heating Thermo-OFF	FA	0	
2	Night-shift (low noise)	ni	0	
3	Cancellation of outdoor ambient temperature limit	GS	0	
4	Defrost	do	0	
5	SLo (Fan Speed) defrost setting	bd	0	
6	No Function	Hr	0	
7	Priority capacity mode	nU	0	
8	Priority Cooling Capacity Mode	Hc	0	
9	Priority Heating Capacity Mode	Hh	0	
10	No Function	SC	0	
11	Indoor Expansion Valve Opening During Heating Operation Stoppage	Si	0	
12	Indoor Expansion Valve Operating during Heating Thermo-OFF	So	0	
13	Outdoor Expansion Valve Initial Opening for Heating	ci	0	
14	Low Noise Setting	db	0	
15	Demand Function Setting	dE	0	
16	Wave Function Setting	UE	0	
17	Protection of Decrease in Outlet Temperature for Cooling	Fb	0	
18	No Function	Fr	0	
19	No Function	Ei	0	
20	Thermo-OFF Setting for Outdoor Unit after Defrosting Operation	dS	0	
21	Intermitent operation of outdoor fan motor	F1	0	
22	No Function	F2	0	
23	No Function	F3	0	
24	No Function	F4	0	
25	Effectivity of Alternation Defrost Mode	F5	0	
26	No Function	F6	0	
27	No Function	F7	0	
28	No Function	F8	0	
29	Cancellation of Defrost at Absence Judgment	F9	0	
30	No Function	FC	0	
31	No Function	Fd	0	
32	Permit Indoor Fan Operation during Forced Stoppage	FE	0	
33	No Function	FF	0	
34	No Function	FG	0	

6.1.3.3 Circulator function at heating Thermo-OFF (FA)

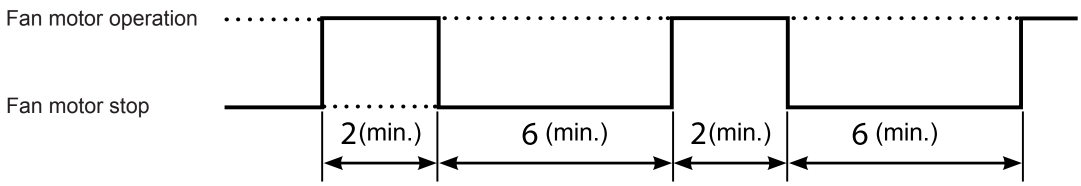
Press PSW1 and select the setting of the condition “0” to “1” of the indoor unit fan control during the Thermo-OFF in heating mode “FA”.

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.*
- *Thermo-ON: The indoor unit is running.*
- *Thermo-OFF: The indoor unit stays on, but doesn’t run.*

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

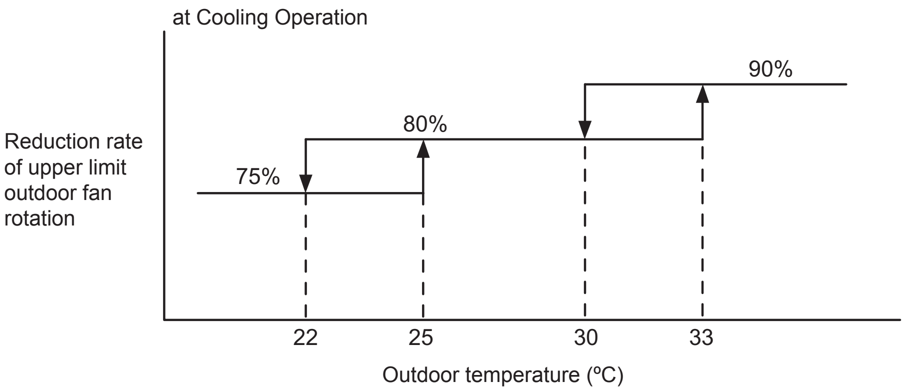


6.1.3.4 Night-shift (low noise)(ni)

Press PSW1 and select the setting for condition “0” or “1” of the night shift (low noise) “ni” consequently, the function can be set. “ni”=1 reduces the upper limit of the outdoor fan rotation and the compressor frequency as shown below in cooling operation.

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.

“ni” Setting Condition	Operation	Reduction Rate of Maximum	
		Outdoor Fan Rotation	Compressor Frequency
		Cooling (Including Dry Operation)	Cooling (Including Dry Operation)
0	No Effect (Default Setting)	Not Changed (=100%)	Not Changed (=100%)
1	Night Shift	Shown as below	60%



NOTE

- *Reduction rates are approximate, these may change slightly depending on the outdoor unit model.*
- *This function setting is not possible to set with Priority Capacity Mode (nU) and the Low Noise Setting (db) at the same time.*

6.1.3.5 Cancellation of the outdoor ambient temperature limit (C5)

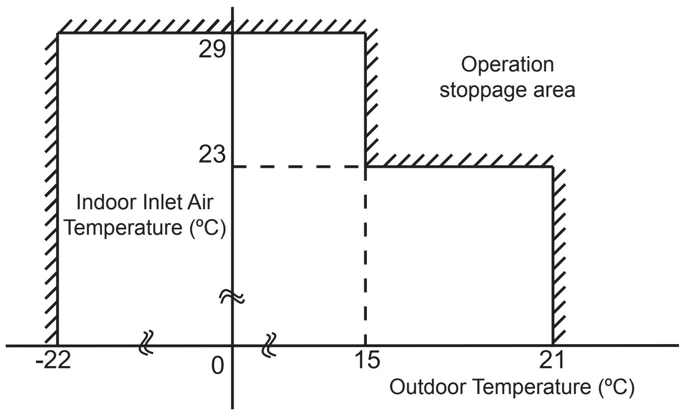
Press PSW1 and select the setting condition “0” to “3” at the cancellation of outdoor ambient temperature limit of C5. Then this function can be set.

The heating operation is continued under a high outdoor temperature or the cooling operation is continued under a low temperature.

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

◆ Heating operation

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

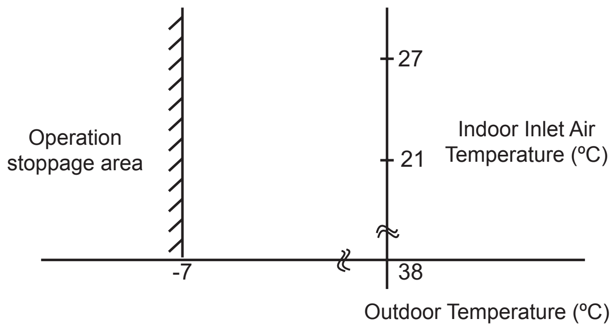


NOTE

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

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



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 cancelled and some alarm codes by abnormal operation may occur. If the alarm codes occur frequently, contact your distributor or contractor.

6.1.3.6 Change of defrost condition (do)

These optional function is available for being selected using the PSW switches and 7-segment on the PCB:

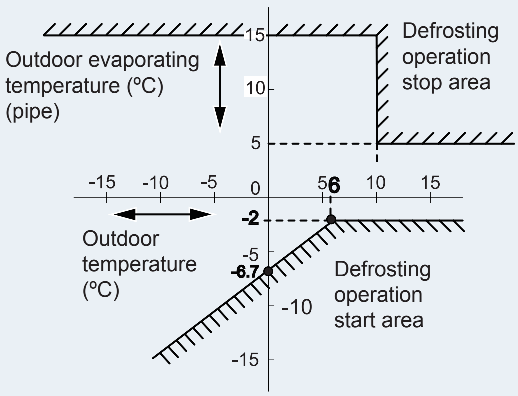
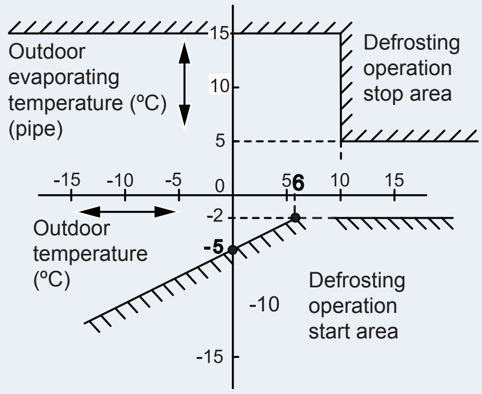
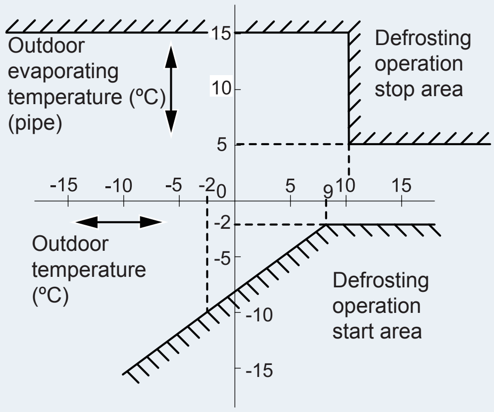
This function allows to shift the temperature conditions in order to cause an earlier defrosting.

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

Press “PSW1” and select the setting condition “1-4” at the change of defrost condition “do”.

Setting condition	Operation mode
0	Not available (default setting)
1	Defrost for Cold Area
2	Defrost for Warm Area
3	Defrost for Extreme Cold Area 1
4	Defrost for Extreme Cold Area 2

Example of setting:

<table>
<tr><th rowspan="2">Setting condition</th><th>Standard Specifications (factory default state)</th><th>Heating specification</th></tr>
<tr><th>Function selection setting do :0</th><th>Function selection setting do : 1</th></tr>
<tr><td rowspan="3">Temperature conditions under defrosting operation</td><td rowspan="3">
</td><td>
</td></tr>
<tr><th>Function selection setting do :2</th></tr>
<tr><td>
</td></tr>
</table>

6

6.1.3.7 SLo defrost setting (bu)

Press PSW1 and select the settings condition “0” to “1” 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		
	At Start of Compressor Operation in Heating Operation	During Defrost Operation	After Defrost Operation
0	STOP	STOP	STOP
1	STOP	SLo Speed	SLo Speed

NOTE

The indoor fan may operate at other speed depending on outlet air temperature of the indoor unit.

6.1.3.8 Priority capacity mode setting (nU)

Press PSW1 and select the setting condition “0” to “3” at the priority capacity mode setting “nU”. By setting this function, the target frequency, current limit of the compressor and the maximum indoor fan motor step are set higher.

NOTE

- *Do not use the setting condition “2” and “3” unless the power supply wiring is of sufficient ampacity, because the target frequency and current limit of the compressor during the operation are set higher.*
- *Level 1 < level 2 < level 3.*

Setting condition	Operation mode
0	Not available (default setting)
1	Correctly Cooling Capacity Mode 1
2	Correctly Cooling Capacity Mode 2
3	Correctly Cooling Capacity Mode 3

6.1.3.9 Priority Cooling Capacity mode (Hc)

By setting the priority cooling capacity mode “Hc” to “1” in the function selection, the upper frequency and target frequency of the compressor can be set higher than normal.

The upper frequency and the target frequency of the compressor can be set higher than usual. However, the upper frequency may not be higher in some models due to the relationship with the upper frequency.

6.1.3.10 Priority Heating Capacity mode (Hh)

By setting the heating capacity priority mode “Hh” to “1” in the function selection, the upper frequency and target frequency of the compressor can be higher than normal.

The upper frequency and target frequency of the compressor can be set higher than usual. However, some models may not have a higher upper frequency due to the relationship with the upper frequency.

6.1.3.11 Change the opening degree of the Expansion Valve (5 i)

By setting the heating stop unit opening degree change “5 i” to “1” or “2” in the function selection, the expansion valve opening degree of the Expansion Valve of the indoor unit can be changed.

Setting condition	Operation mode
0	Not available (default setting)
1	Indoor Expansion Valve Opening during Heating Operation Stoppage 1
2	Indoor Expansion Valve Opening during Heating Operation Stoppage 2

6.1.3.12 Change of heating Thermo-OFF opening degree of the Expansion Valve (5o)

The opening degree of the expansion valve of the heating Thermo-OFF unit can be changed by setting the heating Thermo-OFF opening degree “5o” to “1” or “2” in the function selection.

Setting condition	Operation mode
0	Not available (default setting)
1	Indoor Expansion Valve Operating during Heating Thermo-OFF 1
2	Indoor Expansion Valve Operating during Heating Thermo-OFF 2

6.1.3.13 Heating start opening degree change (c1)

By setting the heating start opening degree change “c1” to “1” or “2” in the function selection, the expansion valve opening degree for heating start can be changed.

Setting condition	Operation mode
0	Not available (default setting)
1	Outdoor Expansion Valve Initial Opening for Heating 1
2	Outdoor Expansion Valve Initial Opening for Heating 2

6.1.3.14 Low noise setting (db)

By setting the operation noise reduction setting “db” to “1” to “3” in the function selection setting, the operation noise reduction specification can be set. Unlike the night shift setting, the compressor frequency is set lower than normal for both cooling and heating regardless of the outdoor air temperature.

In this case, the cooling and heating capacity will be reduced to 80%, 70%, and 60%, respectively.

Press PSW1 and select the setting condition “0” to “9” at the low noise setting “db” to reduce the upper limit compressor frequency.

Setting condition	Compressor frequency limit	Operating noise (dB targeted value)
0	Not available (default setting)	Not available (default setting)
1	80%	Low Noise Setting 1
2	70%	Low Noise Setting 2
3	60%	Low Noise Setting 3
4	80%	Low Noise Setting 1
5	70%	Low Noise Setting 2
6	60%	Low Noise Setting 3
7	80%	Low Noise Setting 1
8	70%	Low Noise Setting 2
9	60%	Low Noise Setting 3

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.

6.1.3.15 Demand function setting (dE)

Demand current control is enabled even when no signal is input to the external input terminal of the outdoor PCB by setting “dE” to “1” for the demand function always enabled in the function selection setting.

Press PSW1 and select the settings for conditions “0” or “1” to set the demand function “dE”. This function is available by setting to “1” for the demand current control without inputting the signal to the external input terminal on the outdoor unit PCB1. The table below is shown for the limit of the operating current for this function.

NOTE

If the outdoor unit running current exceeds the maximum limit for twenty minutes, the indoor unit is put under Thermo-OFF condition. In this case, the stoppage code Number “10” is given.

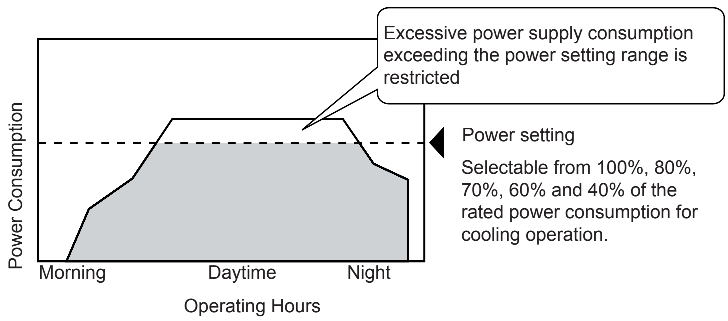
Setting condition	Operation mode
0	Not available (default setting)
1	Value according to external input demand function

Set by the external I/O setting Function number of external input 1 to 3 (*)	Demand current limit value
1~5, 11	100%
6	40%
7	60%
8	70%
9	80%
10	100%

(*) The setting is valid if it is set in one of the inputs 1 to 3. When multiple settings are made, priority is given in the order of 6 > 7 > 8 > 9 > 10.

Demand control

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



NOTE

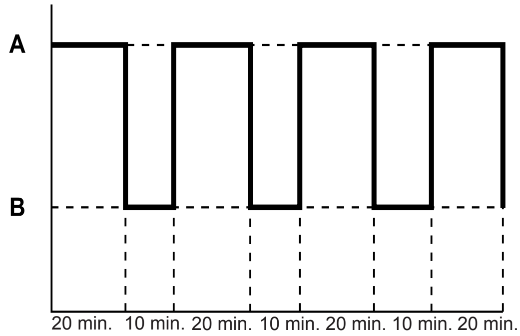
- *The demand current control (%) is value criterion. The value used for this control is calculated from the current, and therefore is different from the value indicated by a wattmeter. If it is required that the maximum power consumption is managed precisely, a field-supplied demand controller should 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.*

6.1.3.16 Wave function setting (UE)

Press PSW3 and select the settings condition “0” to “1” 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	Operation mode
0	Not available (default setting)
1	Value according to external input demand function

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.*
- *When the scheduled operation of “Demand Function Setting” is set from the centralized controller, refer to “Technical Catalog” and “Installation & Maintenance Manual” of the centralized controller.*

6.1.3.17 Cold draft protection (Fb)

Press PSW1 and select the setting condition “0” to “2” 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).

NOTE

- *Thermo-ON: The indoor unit is running.*
- *Thermo-OFF: The indoor unit stays on, but doesn’t run.*

Setting condition	Outlet temperature	
	Target value	At Thermo-OFF
0	-	-
1	10ºC	7ºC
2	12ºC	9ºC

6.1.3.18 Forced stop when defrosting is restored (dS)

The outdoor unit can be stopped after defrosting is completed by setting “dS” to “1” in “Forced stop when defrosting returns” in “Function selection”.

After stopping, the outdoor unit will start heating after the 3-minute on-guard period.

Setting condition	Operation mode
0	Not available (default setting)
1	Thermo-OFF Setting for Outdoor Unit After Defrosting Operation

6

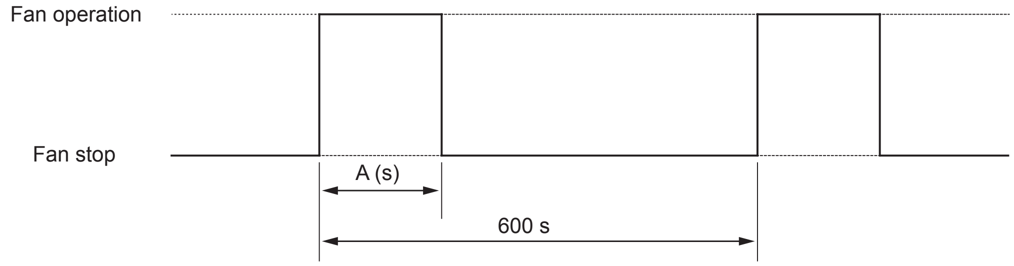
6.1.3.19 Intermittent operation of outdoor fan (F 1)

It can be used as a simple snow prevention measure (auxiliary function) for outdoor fans.

Intermittent operation of outdoor fan is enabled when external input function number “4” is set or when function selection setting “F 1” is set to “1” to “4”. When the outdoor unit is stopped (compressor is stopped), the fan of the outdoor unit starts intermittent operation when the outdoor air temperature becomes 10°C or lower, and stops when the outdoor air temperature becomes 16°C or higher.

If the outdoor unit is operated (compressor is operated) in this state, the fan of the outdoor unit will switch to normal operation.

The operation during intermittent operation of the outdoor blower is as shown below.



NOTE

Repeats intermittent operation with 600[s] as one cycle.

Setting condition	Operation mode	Outdoor fan operation time A(s)
0	Not available (default setting)	Continuous operation (600 s)
1	Outdoor Fan Start/Stop Operation 1	30
2	Outdoor Fan Start/Stop Operation 2	60
3	Outdoor Fan Start/Stop Operation 3	120
4	Outdoor Fan Start/Stop Operation 4	300

NOTE

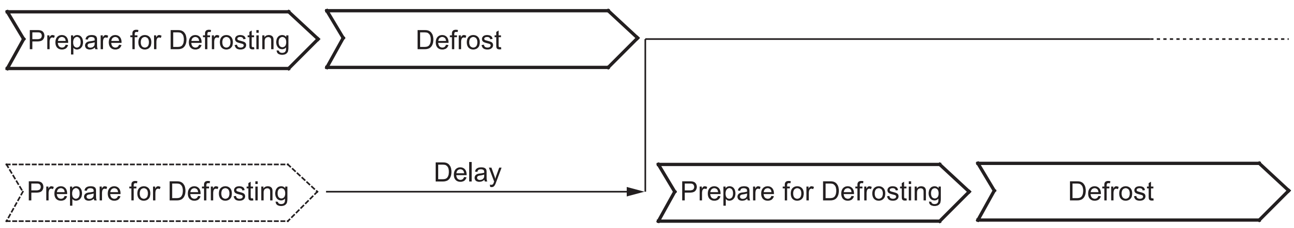
- *This function is an auxiliary function to prevent snow accumulation. In snowfall areas or areas where snow accumulates, the propeller fan may break due to snowfall. In snowfall areas or areas where snow accumulates, be sure to install a snow-proof roof, enclosure, snow-proof hood (optional part), etc. on the outdoor unit to prevent the propeller fan from cracking due to snowfall or abnormal vibration due to unbalanced propeller fan.*
- *If the fan motor malfunctions during operation with this function, the fan of the outdoor unit will be stopped and this function will be suspended. As for the alarm code, the relevant alarm will be reported the next time the outdoor unit is operated (when the compressor is operating). Please check the contents of the alarm code before taking any action.*
- *When using the unit, to prevent injury due to unexpected fan operation, indicate on a clearly visible part of the unit that the fan is set to operate while the outdoor unit is stopped (compressor is stopped).*

6.1.3.20 Alternate defrost mode (F5)

When “F5” is set to “1” for “Alternate defrost mode” in the function selection, defrosting is performed alternately when there are two or more outdoor units connected to H-LINK II.

Setting condition	Operation mode
0	Not available (default setting)
1	Effectivity of Alternation Defrost Mode

The other outdoor unit will not defrost until the other outdoor unit finishes defrosting.



NOTE

This mode performs defrosting alternately for each combination of outdoor unit A (refrigerant system is even) and outdoor unit B (refrigerant system is the refrigerant system of outdoor unit A + 1) connected by H-LINK II.

6.1.3.21 Cancellation of Defrost at Absence Judgement (F9)

When “F9” is set to “1” in the function selection, this function allows the unit to continue defrosting or heating operation without defrosting even if the motion sensor determines that no one is present in the area during defrosting preparation.

Setting condition	Operation mode
0	Not available (default setting)
1	Cancellation of Defrost at Absence Judgement

6.1.3.22 Change Forced stoppage status (FE)

By setting the forced stop status change “FE” to “1” in the function selection, the indoor fan can be operated while the compressor is forced off.

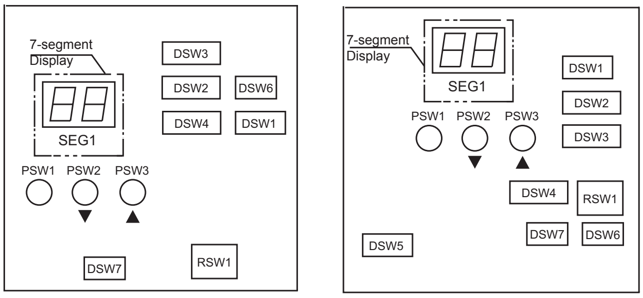
Setting condition	Operation mode
0	Not available (default setting)
1	Permit Indoor Fan Operating during Forced Stoppage

6.2 RAS-(4-6)H(V)(R/N)(C/P)2E

6.2.1 Menu mode accessing (by 7-segment display)

Make sure to perform external input/output and setting while the outdoor unit is stopped. It cannot be set while the outdoor is operating or check mode.

RAS-(4-6)HV(R/N)(C/P)2E (PCB2) | RAS-(4-6)H(R/N)(C/P)2E (PCB1)



7-segment display, DSWs and PSWs location.

NOTE

All the DSWs and PSWs mentioned in this chapter are located in this way:
- PCB2 for RAS-(4-6)HV(R/N)(C/P)2E
- PCB1 for RAS-(4-6)H(R/N)(C/P)2E

6.2.1.1 Check mode

It is used to check the condition of the outdoor and indoor units. It also displays the last 15 items in alarm code history. It is mainly used for servicing.

Start setting	Exit setting
Press PSW1 for 3 seconds	Press PSW1 for 3 seconds

6.2.1.2 External input and output setting

It is used to set the functions by external input and output signals.

Start setting	Exit setting
1º Turn ON DSW1 PIN4 2º Turn ON DSW2 PIN6	1º Turn OFF DSW2 PIN6 during indicated external Input/Output setting mode 2º Turn OFF DSW1 PIN4

6.2.1.3 Function setting

It is used to set the operation mode of the indoor units depending on the requirements of the system.

Start setting	Exit setting
1º Turn ON DSW1 PIN4, 2º Turn ON DSW2 PIN5	1º Turn OFF DSW2 PIN5 during indicated function setting mode 2º Turn OFF DSW1-PIN4

NOTE

- *After setting, confirm DSW2 and DSW1 setting is same as setting before shipment.*
- *Release “Menu Mode” after the setting is completed. Otherwise, the air conditioner may not operate appropriately.*

6.2.2 External input and output setting (by 7-segment display)

6.2.2.1 Available control functions

The outdoor unit PCB1 has three input terminals (CN1, CN2) that receive external signals and two output terminals (CN7) 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	Configuration of output functions
1	Fixing heating operation mode	Operating signal
2	Fixing cooling operation mode	Alarm signal
3	Demand stoppage	Compressor ON signal
4	Outdoor unit fan motor start/stop	Defrost signal
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	
0	Without setting	Without setting

The following functions are set before shipment:

Input terminal			
Name of the input terminal	Connector pin number	Setting function	Control function number
Input 1	CN1 (1-2)	Fixing heating operation mode	1
Input 2	CN1 (2-3)	Fixing cooling operation mode	2
Input 3	CN2 (1-2)	Demand stoppage	3

Output terminal			
Name of the output terminal	Connector pin number	Setting function	Control function number
Output 1	CN7 (1-2)	Operating signal	1
Output 2	CN7 (1-3)	Alarm signal	2

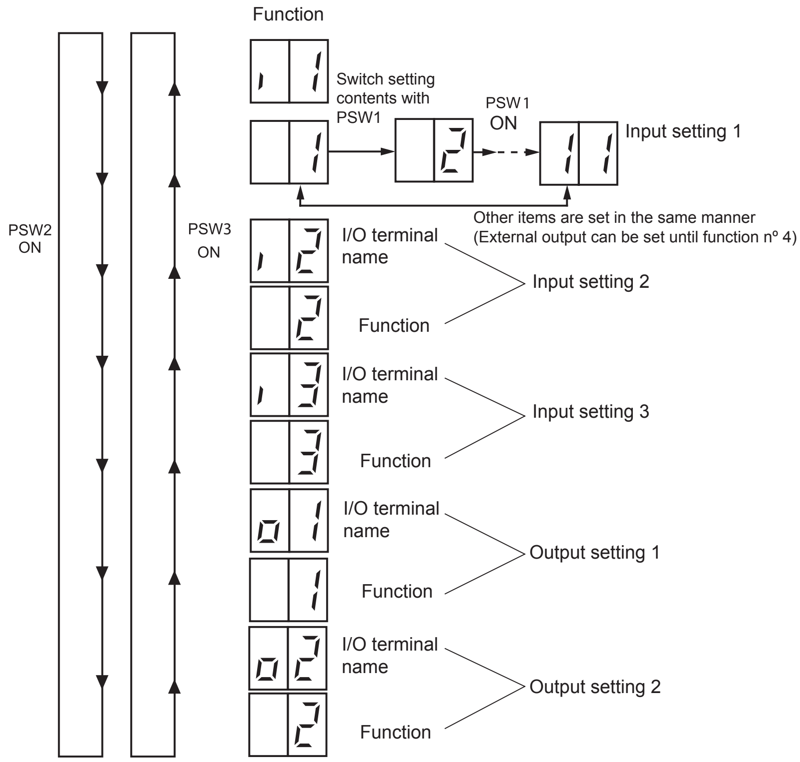
NOTE

The same input/output function cannot be assigned to different input/output terminals. In such case, the setting of the higher terminal number would become invalid.

6.2.2.2 Setting of external input and output

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

1. DSW1 PIN4 of the outdoor unit PCB must be set to “ON” before the modification in order to prevent activation of the compressor. (The setting must be carried out during the stoppage of the outdoor unit.)
2. Set DSW2 PIN6 ON for “External Input and Output Setting”, it will be displayed on the 7-segment display.
3. Pressing PSW2 and PSW3 changes the input/output terminal name. After the each input/output name appear the function number, pressing PSW1 it can be changed.



4. After selecting the control function number, turn OFF DSW2 PIN6. The display will be back to the normal operation. Then turn OFF the DSW1 PIN4. The selected data is stored in the outdoor unit PCB1 and the “External Input and Output Setting” is completed. The stored data is maintained even when the power source is cut OFF. Refer to the next table for the details for the electrical wiring connection and the required parts.

Specifications of required main parts

Components		Specifications	Remarks
3-pin connector cable		PCC-1A (Accesory) (connected to a JST Connector, XARP-3)	5 cables with connectors in a single assembly
Cable (Inside the unit)	Low voltage	0.3 mm²	Less than 24 V

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.*

6.2.2.3 External input function setting

The following signals can be received by the outdoor unit PCB1.

◆ Fixing heating operation mode (Control function nº 1) / Fixing cooling operation mode (Control function nº 2)

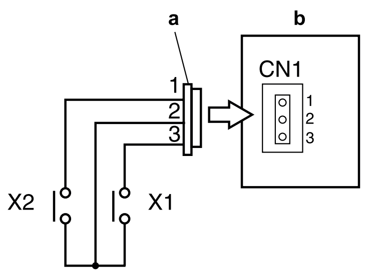
When the input terminals for setting the operation mode of the outdoor unit PCB1 are short-circuited, the operation mode can be fixed for cooling or heating mode.

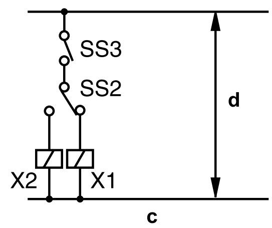
- Short-circuit between terminals 1 and 2 (input 1) of the CN1 to fix heating operation mode.
- Short-circuit between terminals 2 and 3 (input 2) of the CN1 to fix cooling operation mode.

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:

- Fixing Heating Operation at Input 1 (between 1 and 2 pins of CN1).
- Fixing Cooling Operation at Input 2 (between 3 and 2 pins of CN1).





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

◆ Demand stoppage (Control function nº 3) / Forced stoppage (Control function nº 5)

When the input terminals for demand stoppage or forced stoppage on the outdoor unit PCB1 are shortcircuited while running, the compressor(s) is stopped. The fan motor of indoor unit(s) is operated as shown below.

Demand Stoppage (Control Function Number 3)		Indoor fan
Forced Stoppage (Control Function Number 5)	Function Setting “FE”=0	Stop
	Function Setting “FE”=1	Cooling: Airflow Setting, Heating Lo Setting

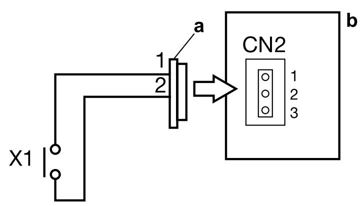
- Short-circuit terminals 1 and 2 (input 3) of CN2 to set the stoppage demand.
- Short-circuit terminals 1 and 2 (input 3) of CN2 to set the stoppage forced.
- The stoppage code is number 10. By disconnecting the demand switch contact, restarting is available.

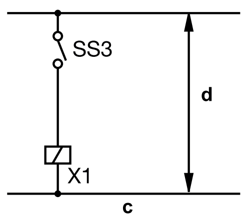
NOTE

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 15 minutes, the minimum to save energy.

Setting example

- Demand Stoppage at Input 3 (between 1 and 2 pins of CN2).
- Forced Stoppage at Input 3 (between 1 and 2 pins of CN2).





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 nº 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 PCB1 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 possible only during the compressor stoppage (during Switch-OFF or Thermo-OFF of the Switch-ON). Therefore, this function will not be possible even if the input signal is sent during the normal cooling or heating operation.

NOTE

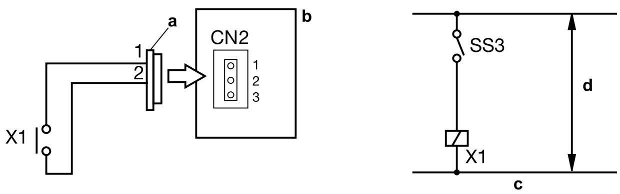
- *This is an auxiliary function to protect the unit from snow. In snowy regions, make sure to protect the unit with a snow-prevention roof, fence (Field-Supplied) or snow-prevention hood (optional), etc. Otherwise, abnormal vibrations due to imbalanced propeller fan will be caused.*
- *If the fan motor or fan controller fail during the outdoor fan motor start/stop operation, stop the outdoor fan motor to suspend the operation. Check the alarm code and deal properly with the failure next time the compressor is operated.*
- *When setting the snow sensor switch for Outdoor Fan Motor Start/Stop, make sure that the continuous operating time is 30 seconds or more. Also the outdoor fan motor start/stop intervals shall be at least 10 minutes. Otherwise, malfunction of the outdoor fan motors will be caused by frequent start/stop.*

CAUTION

Because of 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.

Setting example

Outdoor fan motor Start/Stop at Input 2 (between 2 and 3 pins of CN2)



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

◆ Demand current control of 40, 60, 70, 80 and 100% (Control function nº 6 to 10)

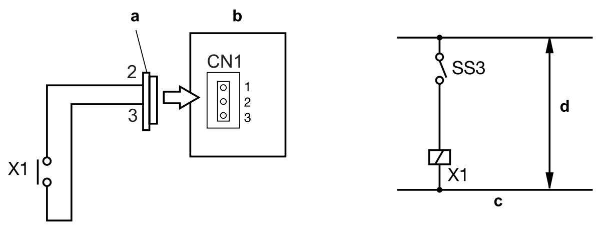
When the demand current control input terminals for the outdoor unit PCB1 are short-circuited, the compressor frequency is controlled by the maximum current limit of the outdoor unit, which is set at 100%, 80%, 70%, 60% and 40%. If the outdoor unit running current exceeds the maximum limit for twenty minutes, the indoor unit is put under Thermo-OFF condition. In this case, the stoppage code Number “10” is given. When the input terminal is opened during the demand current control, its control is released.

NOTE

- *Thermo-ON: The outdoor unit and some indoor units are running.*
- *Thermo-OFF: The outdoor unit and some indoor units stay on, but don’t run.*
- *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 (by 40% to 100%) depending on the operating control conditions such as protection control.*

Setting example

Demand current control at Input 2 (between 2 and 3 pins of CN1), control function number 6 to 10.



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

6.2.2.4 External output function setting

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

Specification for the main component requirements:

Components	Specifications
Auxiliary relay (*)	High power relay, LY2F DC12V

NOTE

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

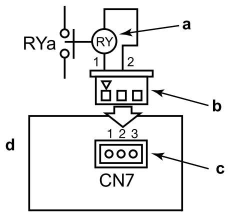
◆ Operation signal (Control function nº1)

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.

Setting example:

Operation Signal at Output 1 (between 1 and 2 pins of CN7).



a	Auxiliary relay
b	3-pin connector
c	Connector CN7
d	Outdoor unit PCB1

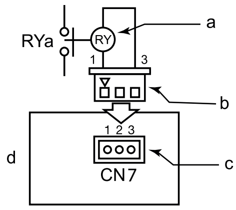
◆ Alarm signal (Control function nº2)

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.

Setting example:

Alarm Signal at Output 2 (between 1 and 3 pins of CN7).



a	Auxiliary relay
b	3-pin connector
c	Connector CN7
d	Outdoor unit PCB1

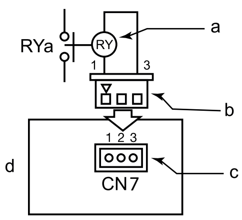
◆ Compressor ON signal (Control function nº3)

This function is used to receive the compressor operation signal.

The auxiliary contact relay (RYa) is closed during the compressor operation. Compressor ON signal at output 2 (between 1 and 3 pins of CN7).

Setting example:

Compressor ON Signal at Output 2 (between 1 and 3 pins of CN7).



a	Auxiliary relay
b	3-pin connector
c	Connector CN7
d	Outdoor unit PCB1

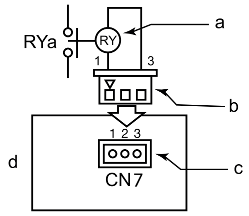
◆ Defrosting signal (Control function nº4)

This function is used to receive the defrosting signal.

The auxiliary contact relay (RYa) is closed during defrosting.

Setting example:

Defrosting Stoppage at Output 2 (between 1 and 3 pins of CN7).



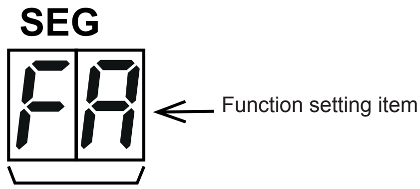
a	Auxiliary relay
b	3-pin connector
c	Connector CN7
d	Outdoor unit PCB1

6.2.3 Function setting (by 7–segment display)

6.2.3.1 Sequence of the function setting

1 Set DSW1 PIN4 of the outdoor unit to ON position before performing in order to prevent the compressor from being activated (outdoor unit stoppage). This setting must be carried out during stoppage of the outdoor unit.

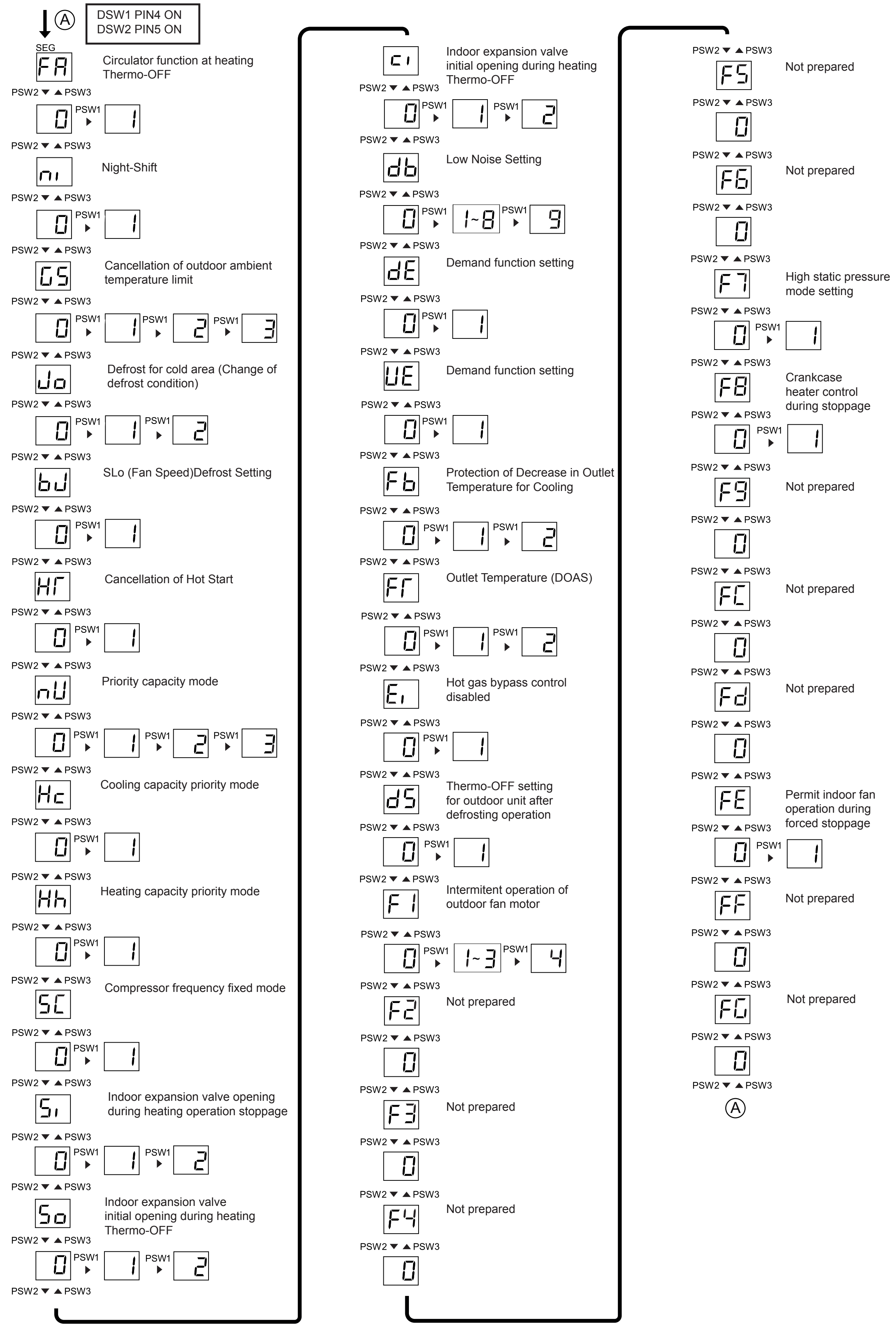
2 By selecting DSW2 PIN5 “Function setting”, the following appears on the 7-segment display.



NOTE

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

3 Pressing PSW2 and PSW3 changes the function setting item. After the each function setting item appear the function number, pressing PSW1 it can be changed.



4 After selecting the function setting, turn OFF DSW2 PIN5. The display will be back to the normal operation. Then turn OFF DSW1 PIN4. The selected data is stored in the outdoor unit PCB and the “function setting” is completed. The stored data is maintained even when the power source is cut OFF.

6

6.2.3.2 Function setting

No.	Setting Item	7-Segment Display		Contents
1	Circulator function at heating Thermo-OFF	FA	00	Initial setting
			01	Heating Thermo-OFF fan intermittent operation
2	Night-shift (low noise)	ni	00	Initial setting
			01	Night-shift
3	Cancellation of outdoor ambient temperature limit	CS	00	Initial setting
			01	For heating
			02	For cooling
			03	For cooling/heating
4	Defrost for cold area (Change of defrost condition)	Jo	00	Initial setting
			01	Switching of defrosting conditions (Cold region)
			02	Switching of defrosting conditions (Warm)
5	SLo (Fan Speed) defrost setting	bJ	00	Initial setting
			01	Slo wind defrosting setting
6	Cancellation outdoor unit of hot start	HT	00	Initial setting
			01	Release of outdoor hot start control
7	Priority capacity mode	nU	00	Initial setting
			01	Cooling capacity correction mode 1
			02	Cooling capacity correction mode 2
			03	Cooling capacity correction mode 3
8	Cooling capacity priority mode	Hc	00	Initial setting
			01	Cooling capacity priority mode
9	Heating capacity priority mode	Hh	00	Initial setting
			01	Heating capacity priority mode
10	Compressor frequency fixed mode	SC	00	Initial setting
			01	Fixed Frequency Mode
11	Indoor expansion valve opening during heating operation stoppage	Si	00	Initial setting
			01	Change of opening of stopped heating unit 1
			02	Change of opening of stopped heating unit 2
12	Indoor expansion valve initial opening during heating Thermo-OFF	So	00	Initial setting
			01	Change of opening of heating Thermo-OFF 1
			02	Change of opening of heating Thermo-OFF 2
13	Indoor expansion valve initial opening during heating Thermo-ON	ci	00	Initial setting
			01	Change of heating starting opening 1
			02	Change of heating starting opening 2
14	Low Noise Setting (In the case of low noise setting, cooling/heating operation range will be restricted.)	db	00	Initial setting
			01	Low noise setting 1
			02	Low noise setting 2
			03	Low noise setting 3
			04	Low noise setting 1
			05	Low noise setting 2
			06	Low noise setting 3
			07	Low noise setting 1
			08	Low noise setting 2
			09	Low noise setting 3
15	Demand function setting	dE	00	Initial setting
			01	Demand function always enabled
16	Wave function setting	UE	00	Initial setting
			01	Wave function enabled
17	Cold draft protection (Protection in decrease in Indoor temperature for cooling)	Fb	00	Initial setting
			01	Cooling discharge temperature decrease prevention 1
			02	Cooling discharge temperature decrease prevention 2
18	Outlet Temperature (DOAS)	FT	00	Initial setting
			01	Capacity restriction mode
			02	Discharge temperature restriction mode

No.	Setting Item	7-Segment Display		Contents
19	Hot gas bypass control disabled	E1	00	Initial setting
			01	Hot gas bypass control disabled
20	Thermo-OFF setting for outdoor unit after defrosting operation	d5	00	Initial setting
			01	Forced stop upon return from defrosting
21	Intermitent operation of outdoor fan motor	F1	00	Initial setting
			01	Intermittent fan operation (30[s] run / 570[s] stop)
			02	Intermittent fan operation (60[s] run / 540[s] stop)
			03	Intermittent fan operation (120[s] run / 480[s] stop)
			04	Intermittent fan operation (300[s] run / 300[s] stop)
22	Not prepared	F2	00	-
23	Not prepared	F3	00	-
24	Not prepared	F4	00	-
25	Not prepared	F5	00	-
26	Not prepared	F6	00	-
27	High static pressure mode setting	F7	00	No setting
			01	Static pressure setting
28	Crankcase heater control during stoppage	F8	00	No setting
			01	Enable the control to restrain heater standby power
29	Not prepared	F9	00	-
30	Not prepared	FC	00	-
31	Not prepared	Fd	00	-
32	Permit indoor fan operation during forced stoppage	FE	00	No setting
			01	Change of forced stop state
33	Not Prepared	FF	00	-
34	Not Prepared	FG	00	-

◆ Record settings

Fill out the selected function setting number in the space of the table as shown (SET).

	Item	SEG2	SEG1	SET
1	Circulator function at heating Thermo-OFF	FA	0	
2	Night-shift (low noise)	ni	0	
3	Cancellation of outdoor ambient temperature limit	GS	0	
4	Defrost for cold area (Change of defrost condition)	Jo	0	
5	SLo (Fan Speed)Defrost Setting	bJ	0	
6	Cancellation of Hot Start	Hr	0	
7	Priority capacity mode	nU	0	
8	Cooling capacity priority mode	Hc	0	
9	Heating capacity priority mode	Hh	0	
10	Compressor frequency fixed mode	SC	0	
11	Indoor expansion valve opening during heating operation stoppage	Si	0	
12	Indoor expansion valve initial opening during heating Thermo-OFF	So	0	
13	Indoor expansion valve initial opening during heating Thermo-ON	ci	0	
14	Low Noise Setting	db	0	
15	Demand function setting	dE	0	
16	Wave function setting	UE	0	
17	Protection of decrease in outlet temperature for cooling	Fb	0	
18	Outlet Temperature (DOAS)	Fr	0	
19	Hot gas bypass control disabled	Ei	0	
20	Thermo-OFF setting for outdoor unit after defrosting operation	dS	0	
21	Intermitent operation of outdoor fan motor	F1	0	
22	Not prepared	F2	0	
23	Not prepared	F3	0	
24	Not prepared	F4	0	
25	Not prepared	F5	0	
26	Not prepared	F6	0	
27	High static pressure mode setting	F7	0	
28	Crankcase heater control during stoppage	F8	0	
29	Not prepared	F9	0	
30	Not prepared	FC	0	
31	Not prepared	Fd	0	
32	Permit indoor fan operation during forced stoppage	FE	0	
33	Not prepared	FF	0	
34	Not prepared	FG	0	

6.2.3.3 Circulator function at heating Thermo-OFF (FA)

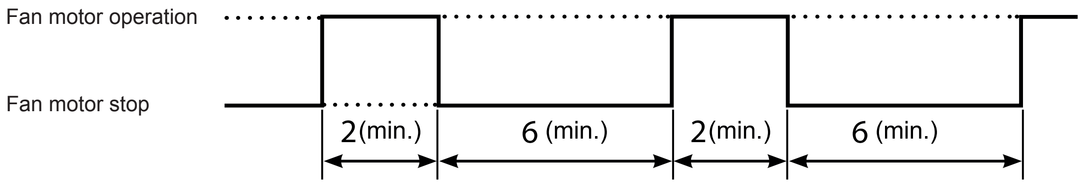
Press PSW1 and select the setting of the condition “0” to “1” of the indoor unit fan control during the Thermo-OFF in heating mode “FA”.

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.*
- *Thermo-ON: The indoor unit is running.*
- *Thermo-OFF: The indoor unit stays on, but doesn’t run.*

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



NOTE

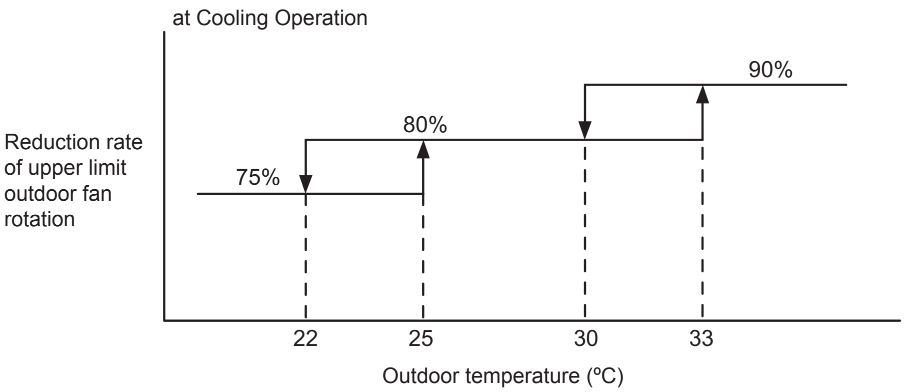
In case using the function setting Number 2 to 4, install the remote sensor (THM-R2A: Optional). Because the time period of stopping the indoor fan becomes longer, the detected value of the suction air thermistor for indoor unit becomes high, and it may take time to Thermo-ON.

6.2.3.4 Night-shift (low noise)(ni)

Press PSW1 and select the setting for condition “0” or “1” of the night shift (low noise) “ni” consequently, the function can be set. “ni”=1 reduces the upper limit of the outdoor fan rotation and the compressor frequency as shown below in cooling operation.

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.

“ni” Setting Condition	Operation	Reduction Rate of Maximum	
		Outdoor Fan Rotation	Compressor Frequency
		Cooling (Including Dry Operation)	Cooling (Including Dry Operation)
0	No Effect (Default Setting)	Not Changed (=100%)	Not Changed (=100%)
1	Night Shift	Shown as below	60%



NOTE

- *Reduction rates are approximate, these may change slightly depending on the outdoor unit model.*
- *This function setting is not possible to set with Priority Capacity Mode (nU) and the Low Noise Setting (db) at the same time.*

6

6.2.3.5 Cancellation of the outdoor ambient temperature limit (C5)

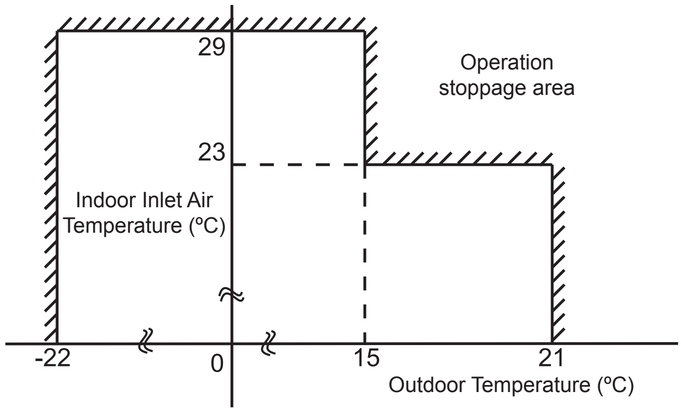
Press PSW1 and select the setting condition “0” to “3” at the cancellation of outdoor ambient temperature limit of C5. Then this function can be set.

The heating operation is continued under a high outdoor temperature or the cooling operation is continued under a low temperature.

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

◆ Heating operation

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

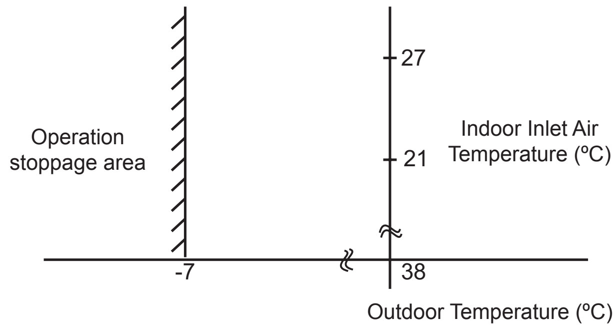


NOTE

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

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



NOTE

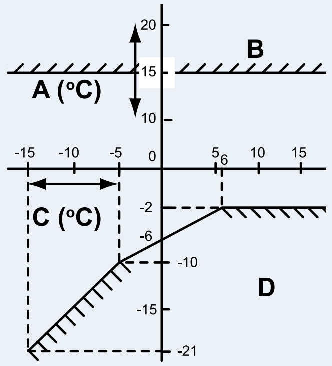
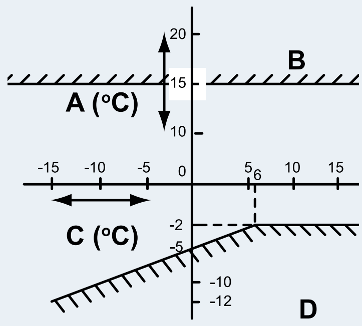
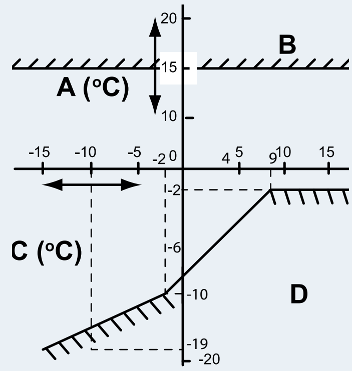
When the outdoor ambient temperature limit for cooling operation is cancelled, the operation may stop due to decreasing low pressure since the protection control is not cancelled.

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 cancelled and some alarm codes by abnormal operation may occur. If the alarm codes occur frequently, contact your distributor or contractor.

6.2.3.6 Defrost for cold area (Jo)

Press PSW1 and select the setting condition “0” to “2” at the defrost for the cold area “Jo” to change the temperature condition for starting defrost operation

Setting condition	Standard specifications	Cold area specifications	Warm area specifications
	When change of defrost condition is not set “Jo=0”	When change of defrost condition is set “Jo=1”	When change of defrost condition is set “Jo=2”
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.		

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6.2.3.7 SLo defrost setting (bJ)

Press PSW1 and select the settings condition “0” to “1” at the SLo defrost setting “bJ”.

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

Setting condition	Indoor fan operation		
	At Start of Compressor Operation in Heating Operation	During Defrost Operation	After Defrost Operation
0	STOP	STOP	STOP
1	STOP	SLo Speed	SLo Speed

NOTE

The indoor fan may operate at other speed depending on outlet air temperature of the indoor unit.

6.2.3.8 Priority capacity mode setting (nU)

Press PSW1 and select the setting condition “0” to “3” at the priority capacity mode setting “nU”. By setting this function, the target frequency, current limit of the compressor and the maximum indoor fan motor step are set higher.

NOTE

- *Do not use the setting condition “2” and “3” unless the power supply wiring is of sufficient ampacity, because the target frequency and current limit of the compressor during the operation are set higher.*
- *Level 1 < level 2 < level 3.*

Setting condition	Compressor frequency and current limit
0	Default setting
1	Compressor frequency limit is set higher to level 1
2	Compressor frequency limit is set higher to level 2
3	Compressor frequency limit is set higher to level 3

6.2.3.9 Low noise setting (db)

Press PSW1 and select the setting condition “0” to “9” at the low noise setting “db” to reduce the upper limit 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 (dB targeted value)			Outdoor unit capacity (to specification)
			RAS-4H(V)(R/N)(C/P)2E	RAS-5H(V)(R/N)(C/P)2E	RAS-6H(V)(R/N)(C/P)2E	
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: 68	Setting 1: 68	Setting 1: 69	80%
8	60%	18 steps	Setting 2: 67	Setting 2: 67	Setting 2: 68	60%
9	40%	16 steps	Setting 3: 66	Setting 3: 66	Setting 3: 67	40%

6.2.3.10 Demand function setting (dE)

Press PSW1 and select the settings for conditions “0” or “1” to set the demand function “dE”. This function is available by setting to “1” for the demand current control without inputting the signal to the external input terminal on the outdoor unit PCB1. The table below is shown for the limit of the operating current for this function.

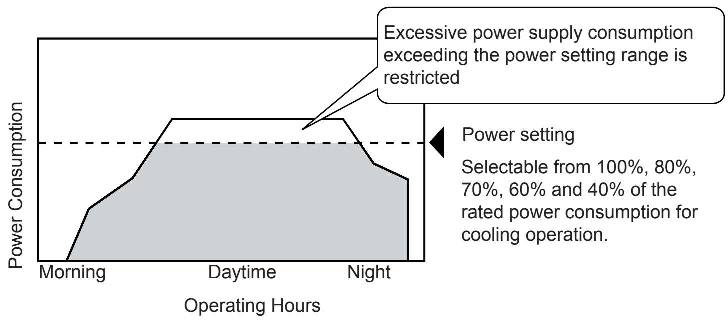
NOTE

If the outdoor unit running current exceeds the maximum limit for twenty minutes, the indoor unit is put under Thermo-OFF condition. In this case, the stoppage code Number “10” is given.

Setting condition	Demand running current control
0	Not available (default setting)
1	Value according to external input demand function

Demand control

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



NOTE

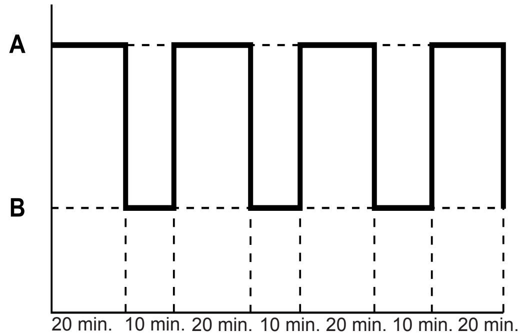
- *The demand current control (%) is value criterion. The value used for this control is calculated from the current, and therefore is different from the value indicated by a wattmeter. If it is required that the maximum power consumption is managed precisely, a field-supplied demand controller should 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.*

6.2.3.11 Wave function setting (UE)

Press PSW3 and select the settings condition “0” to “1” 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	Value according to external input demand function

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.*
- *When the scheduled operation of “Demand Function Setting” is set from the centralized controller, refer to “Technical Catalog” and “Installation & Maintenance Manual” of the centralized controller.*

6.2.3.12 Cold draft protection (Fb)

Press PSW1 and select the setting condition “0” to “2” 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).

NOTE

- *Thermo-ON: The indoor unit is running.*
- *Thermo-OFF: The indoor unit stays on, but doesn’t run.*

Setting condition	Outlet temperature	
	Target value	At Thermo-OFF
0	-	-
1	10ºC	7ºC
2	12ºC	9ºC

6.2.4 Power saving function from wired controller

6.2.4.1 Power Saving Guide

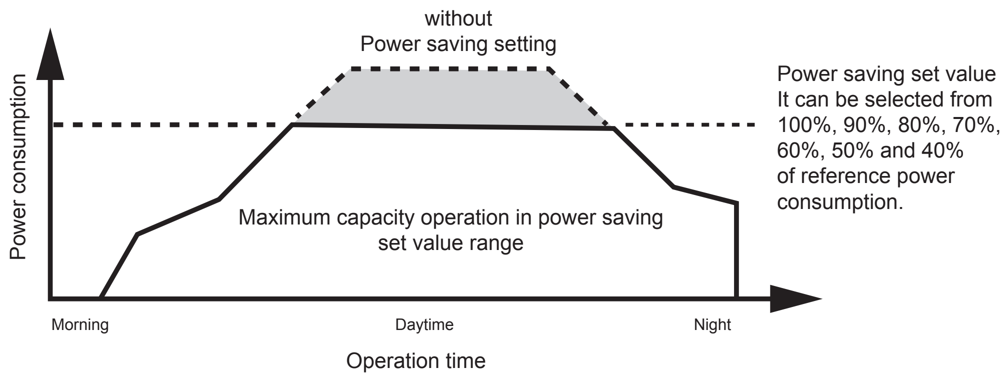
Press “ECO” button then the power saving guide will be displayed to support the setting. Easy access to the confirmation and setting screen from the current setting status screen.

6.2.4.2 Outdoor Unit Capacity Control

The demand function setting can be controlled from wired controller. Select from “Peak Cut Control” and “Moderate Control” according to the situation.

“Peak Cut Control” function

The peak cut control reduces the power consumption range when it exceeds the value of the power saving setting.

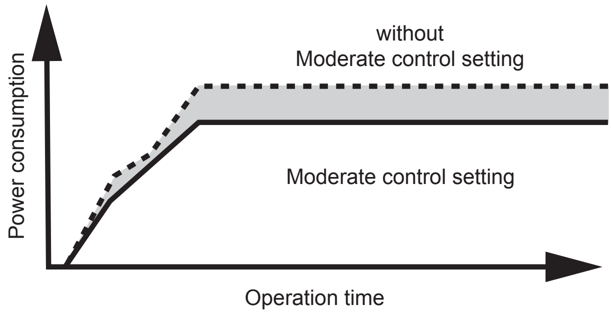


NOTE

- *The power set value (%) is just a criterion. The power set value for this function is different from the actual power value in precision. Use the demand controller (option) when it is necessary to manage the maximum power correctly.*
- *The cooling capacity will be decreased according to the power saving setting value for the reducing of compressor motor revolution.*
- *The actual electrical power consumption may be higher than the value displayed on the screen under certain operating condition such as protective control.*
- *This function is used to inhibit power consumption of the operating. Do not use it for minimize the capacity of current and the voltage for the power circuit, power source wiring, ELB, transformer, etc. It may cause actuation of interrupter and equipment fault.*

“Moderate Control” function

The moderate control adjusts the air conditioning capacity not to exceeds the value of the power saving setting.

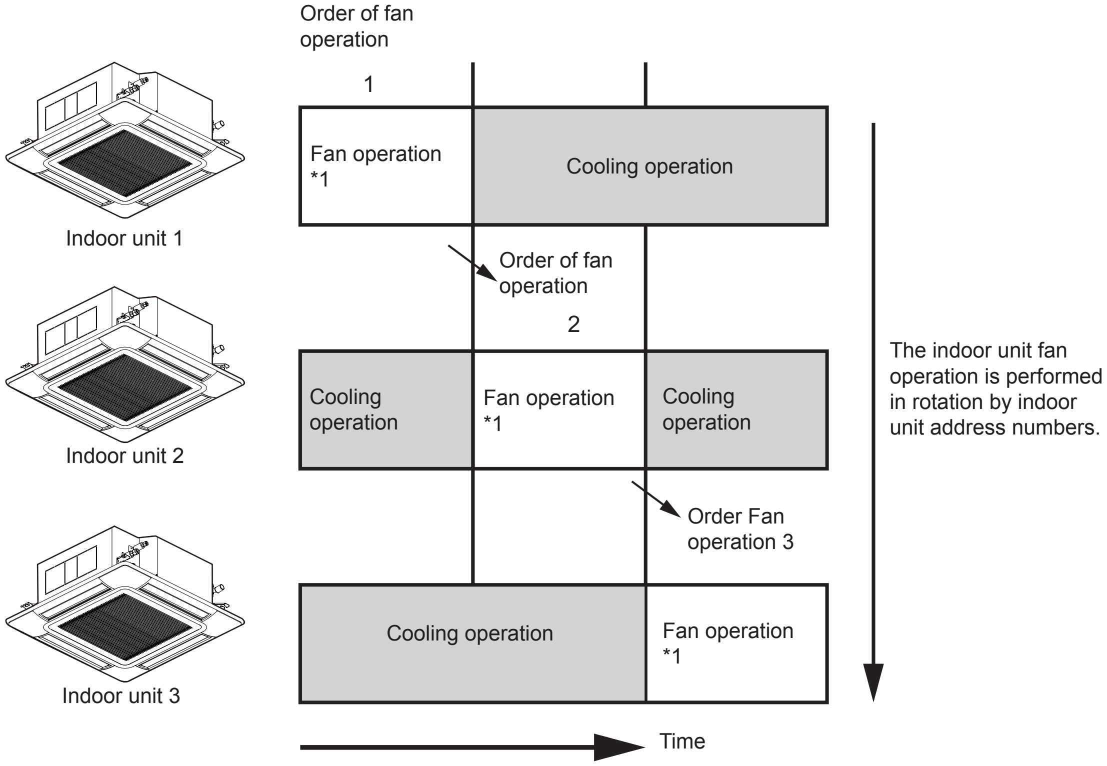


NOTE

- *The moderate control setting value can be set from 40% to 100% of regular capacity by every 10%.*
- *The setting value is just a criterion. It might be different according to the actual service condition and operating condition.*

6.2.4.3 Rotation control function

The rotation control switches multiple indoor unit operating mode to FAN mode (Thermo-OFF) in order one by one.

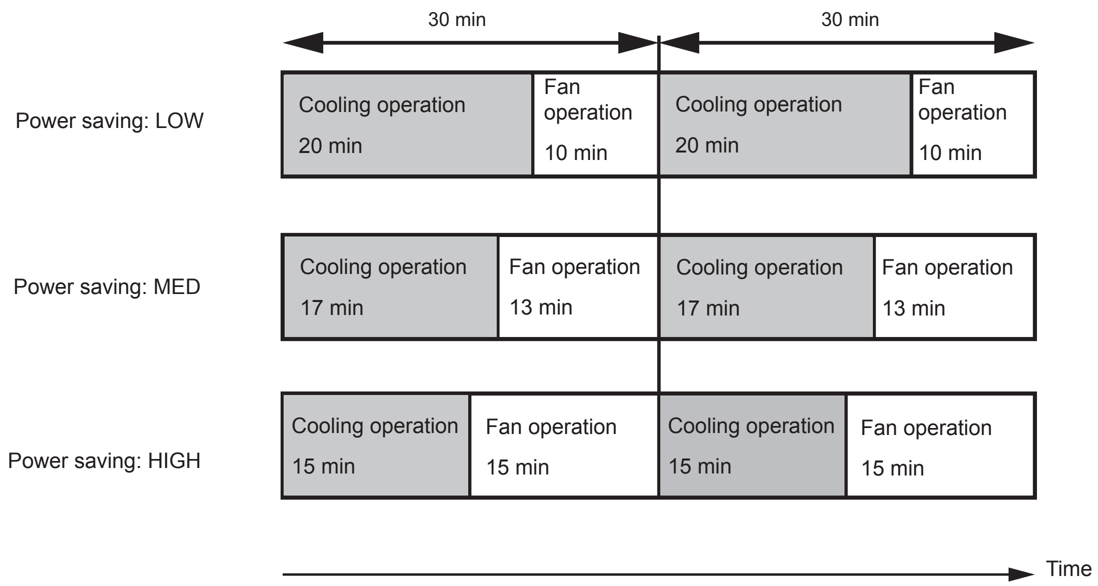


NOTE

- *(*1)The fan mode time can be selected in the interval of three minutes, five minutes and ten minutes.*
- *It is possible to change the rotation assigned number according to the minimum differential between the setting temperature and indoor temperature.*

6.2.4.4 Intermittent control function

The intermittent control repeats Cooling/Heating and Fan (Thermo-OFF) mode in fixed intervals.

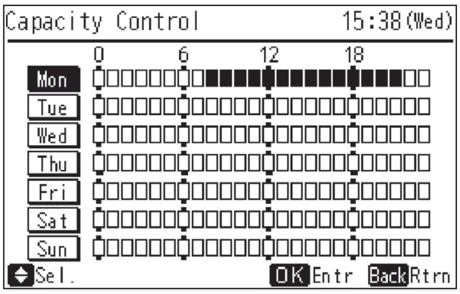


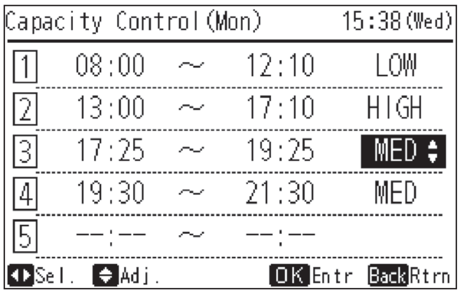
NOTE

The fan mode will be repeated in the interval of five minutes (LOW), ten minutes (MED) and fifteen minutes (HIGH) during heating operation. Power saving schedule function.

6.2.4.5 Power Saving Schedule Function

The power saving schedule function is utilized to set the power saving schedule on indoor unit capacity control and intermittent control up to five settings a day each day of the week.





The display of Noise Reduction Schedule is the same

6.2.4.6 Operation noise reduction schedule function

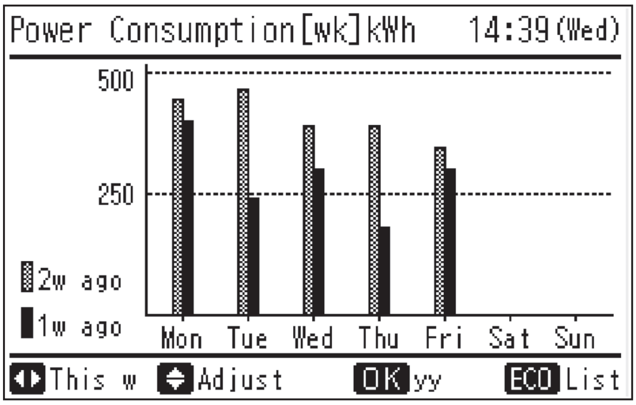
The operation noise reduction schedule function is utilized to set the operation noise reduction schedule up to five settings a day each day of the week.

NOTE

The operation noise reduction setting may decreases the cooling/heating capacity.

6.2.4.7 Power Consumption Display Function

This function displays the power consumption of the outdoor unit compressor. The value of each displayed in Graph/List format is one day, one week and one year. The display period of consumption comparison can be selected from one day before/Today to 1 year ago/This year.



NOTE

The power consumption for outdoor unit compressor will be displayed.

7. Commissioning

Index

7.1 Preliminary checks

The test run must be performed according to the instructions in this chapter.

DANGER

Do not use the system until all the checkpoints have been verified.

- 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 (on outdoor units, on indoor units) and of the unit number (DSW4 and RSW1 for R32 or DSW6 and RSW1 for R410A) of the indoor units is suitable for the system. Check whether the DSW 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 of 4-6HP: TB2; terminals 1, 2, 3, 4 / Outdoor unit of 3HP: TB1; terminals 1, 2 / Indoor unit: TB2; terminals 1, 2, A, B / CH-Box: TB2; terminals 1, 2, 3, 4).
- Check that all the cables, L1, L2, L3 and N (R, S and T) in case of 3 phases or L and N in case of 1 phase models 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.

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).*
- *For 3 phases models, check the connection of the power supply wiring terminals (terminals “L1 to L1 (R)”, “L2 to L2 (S)”, “L3 to L3 (T)” and “N to N”). Supply voltage 3N ~ 400V 50Hz. If it is different, some components could be damaged.*
- *For 1 phase models, check the connection of the power supply wirinf terminals (terminals “L1 to L1” and “N to N”). Supply voltage 3N ~ 230V 50Hz. If it is different, some components could be damaged.*

7.2 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.
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 “03” or “05” will be displayed on the remote control LCD screen.* • *Alarm “03” or “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 27 °C DB 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.

- *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.*
- *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***

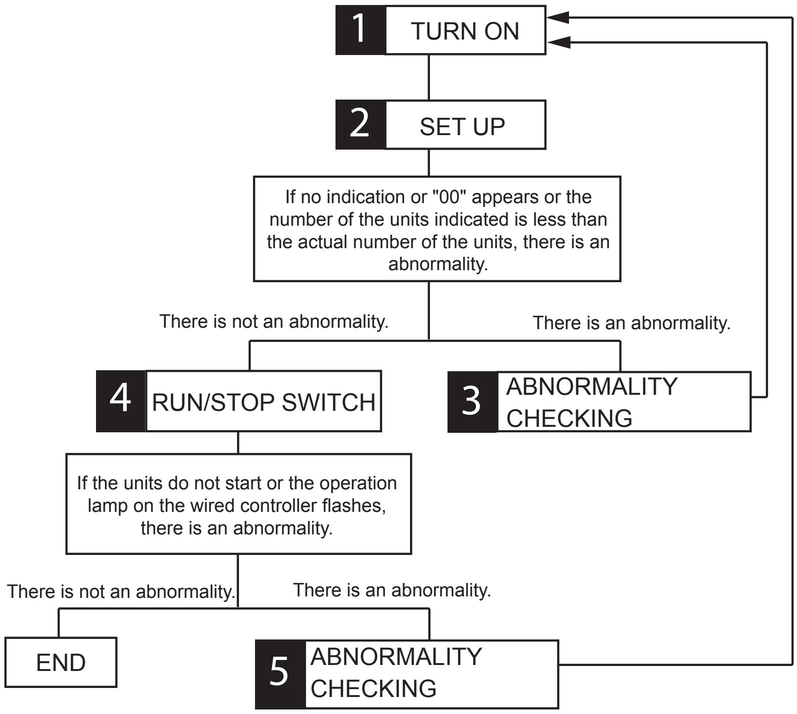
The compressor may not be available for a maximum time period of 4 hours if the power supply is not previously turned ON. At this time, stoppage code (d1-22) is displayed on the LCD screen of the remote control and the forced Thermo-OFF function is started.

If compressor operation is required:

1. *Turn ON the power supply to the outdoor unit*
2. *Wait 30 seconds and press of the outdoor unit for at least 3 seconds:*
   - *PSW1 on PCB1 for models from 4 to 6 HP 3N~ 400V 50Hz*
   - *PSW1 on PCB2 for models from 3 to 6 HP 1~ 230V 50Hz*

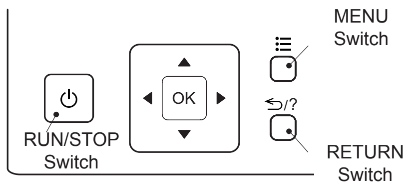
The forced Thermo-OFF function (d1-22) will be cancelled and the operation of the compressor will be available.

7.3 Test run using the PC-ARFP1E remote control switch (example)



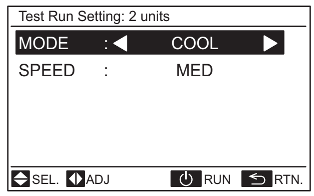
Step 1

Turn ON the power source of the indoor and outdoor units.



Step 2

Set the TEST RUN mode by the remote control switch.
Press and hold 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-AWR, PC-ARH1E, refer to “Installation Manual” of each remote control switch.

- Normal (there is not an abnormality):

  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.)
  - The operation mode and the air flow volume can be set on the Test Run screen. Select the item by pressing the directional key “▲▼◀▶”.

  Move to Step 4 to continue with the process.
- Abnormal (there is an abnormality):

  If there is an abnormality (no indication or “00” appears or the number of the units indicated is less than the actual number of the units), do the following checking procedure for abnormalities (Step 3).

  NOTE

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

Step 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

After checking procedure back to Step 1.

Step 4

Press and hold “RUN/STOP” switch.

- Normal (there is not an abnormality):

  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 default setting of the test run time is 2-hours OFF timer. The indoor temperature shall be 21°CDB / 15°CWB or higher and outdoor temperature shall be -5°CDB (-15°C in case of simulatenous operation) or higher for the cooling operation.
  The indoor temperature shall be 27°CDB or lower for the heating operation.
  The cooling operation is not performed if the outdoor temperature is below -5°CDB (-15°C in case of simulatenous operation).
  The temperature detections by the thermistors are invalid through the protection device are valid during test run.
  Remove the abnormality according to the table below and perform test run again.
  The test run will be finished by pressing “RETURN” switch during the stoppage or “RUN/STOP” switch during the operation.

- Abnormal (there is an abnormality):

  If the units do not start or the operation lamp on the remote control switch flashes, there is an abnormality.
  Do the following checking procedure for abnormalities (Step 5).

Step 5

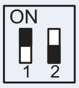
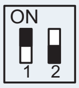
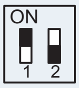
Checking procedure for abnormalities

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 RAS-3HVRC2	Outdoor unit PCB RAS-(4-6)H(V)(R/N)(C/P)2E
DSW7	DSW5	DSW5
		

After checking procedure back to Step 1.

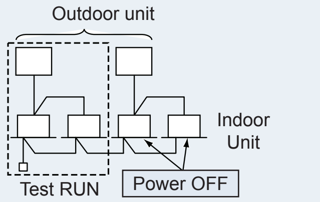
7.4 Test run from the outdoor unit

The procedure of test run from the outdoor unit is indicated below. The setting of this DSW is available with power source ON. Setting of DSW (before shipment):

RAS-3HVRC2- Outdoor unit PCB - DSW301			RAS-(4-6)HV(R/N)(C/P)2E - Outdoor unit PCB2 - DSW1 RAS-(4-6)H(R/N)(C/P)2E - Outdoor unit PCB1 - DSW1		
Switch for setting of service operation and function			Switch for setting of service operation and function		
	**Pin**	**Function**		**Pin**	**Function**
	1	Cooling		1	Test run
	2	Heating		2	COOL / HEAT setting (OFF: cooling mode) (ON: heating mode)
	3	OFF (fixed)		3	OFF (fixed)
	4	Manual compressor OFF		4	Manual compressor OFF

DANGER

- ***Do not touch any other electrical component part when operating switches on 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 OFF when the test run operation is completed.***

	Setting the DSW DSW301 for 3HP DSW1 for 4-6HP	Operation	Remarks
Test run	1. Setting the operation mode.  Cooling: Set DSW PIN2 OFF  Heating: Set DSW PIN2 ON 2. Start of the test run. Set DSW PIN1 ON and the operation starts after approximately 20 seconds.  **NOTE** *In the heating mode, leave DSW-PIN2 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 DSW PIN1 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 DSW PIN1 of the outdoor unit PCB1 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 DSW is not required for the test run from the remote control switch.
Manual OFF of the compressor	1. Setting. Compressor manual OFF set DSW PIN4 to the ON position.  2. Reset. Compressor ON: set DSW PIN4 in the OFF position. 	1. When DSW PIN4 is ON during the compressor operation, the compressor stops operating immediatly and the indoor unit is under the condition of Thermo-OFF. 2. When DSW PIN4 is OFF, the compressor starts to operating after the cancellation of 3-minutes guard.	Do not repeat the compressor ON/OFF with frequency.
Manual defrost	1. Manual defrost operation. Press PSW1 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 3.2 MPa or the unit is Thermo-OFF .	Do not repeat defrosting operation frequently. When manual defrosting operation is accepted by PSW5 or PSW1, the time left before starting defrosting operation is indicated on the 7-segment indicator on the PCB.

When the test run operation is completed, turn all pins in the DSW to 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.
   - Wired remote Control Switch: STOP
   - Central Station: STOP and Remote Control Switch is available mode.
   - COOL/HEAT Changeover Switch: Connector CN1 of outdoor unit PCB is opened.
   - During the test run mode, do not control the wired 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.

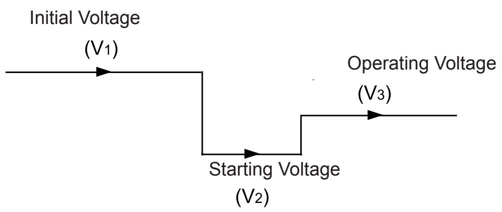
2 If an alarm code is indicated during the test run, reset the system by turning the main power supply off then back on. The system should then operate.

7

7.5 Checking at test run

1. Indoor and outdoor fan.
   Check that the indoor and outdoor fan rotate properly and 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 (V2).

   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.

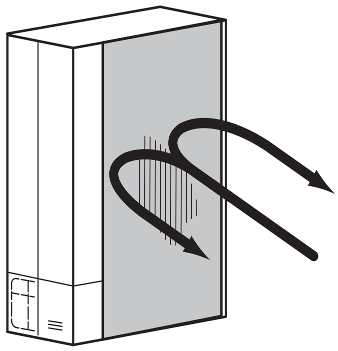
   Check the operating pressure of the high pressure switch in the following table.

Refrigerant	Operating pressure
R32	4.15 MPa
R410A	

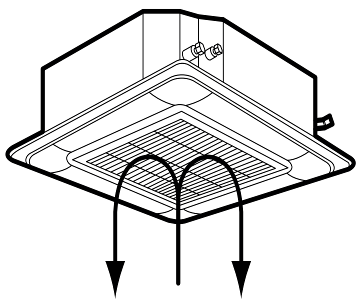
5. High pressure increase retry (protection control)

   a. The high pressure will increase when the following procedure is performed.

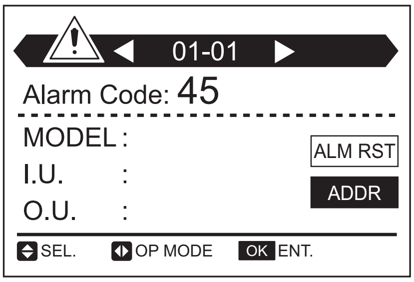
Cover the air inlet of the outdoor unit during the cooling operation



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



b. When the high pressure retry control is activated, alarm code "P13" will be indicated on the 7 segment display of the outdoor unit PCB1. 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 on the 7 segment display of the outdoor unit PCB1.



NOTE

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

7.6 Refrigerant cycle checklist

The refrigerant cycle data can be checked on 7-segment of outdoor unit PCB during the test run and the troubleshooting. However, it may take time for the checking because the operation cycle changes depending on the operating condition.

To check the quality of refrigerant cycle, the following check list shall be used at the test run, troubleshooting and emergency check.

1. The most important thing in the refrigerant cycle check is to check that each expansion valve opening and the operating frequency is within the specified range. Each item varies in the value depending on the operating frequency, indoor temperature and ambient temperature.
2. The service system tester, which automatically calculates Td and SH, facilitates the refrigerant cycle check. If possible, record the operating cycle data by the service system tester.

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	Are the power source wire and the transmission wire separated from the refrigerant pipes?	
2	Is the earth wire connected?	
3	Is there any short-circuit?	
4	For 3 phases models, is there any voltage abnormality between each phase? (R-S, S-T, T-R)	
5	For 1 phase models, is there any voltage abnormality between L and N?	

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. Is Td-SH between 15 and 55 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 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 fully closed • Short-circuit	
3	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 fully closed or partially open • Short-circuit	
4	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 fully open, partially open or completely closed	
5	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 fully open • Mismatched wiring and piping	
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 "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	
7	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	—	

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

No.	Check item	Standard	Causes	Result
1	Is TdSH “15 - 55 ºC”? TdSH = Td - Saturated vapor refrigerant temperature	15 - 55 ºC	• Low: excessive refrigerant. • High: insufficient refrigerant. • OU Expansion Valve; Locked and Slightly Open or Closed.	
2	Is Pd between “1.5” and “3.3”?	1.5 - 3.3	• 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.	

NOTE

- *The symbol with an underline _____ indicates checking item and the mark “ ” indicates checking data.*
- *For 3 HP models: Service Tools can be connected to TB1 in terminals 1 and 2.*
- *For 4-6 HP models: Service Tools can be connected to TB No.1 and TB No.2.*

7.7 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	1 Ph	L _____ V	—	—
	3 Ph	R–S _____ V	R–T _____ V	S–T _____ 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? __________

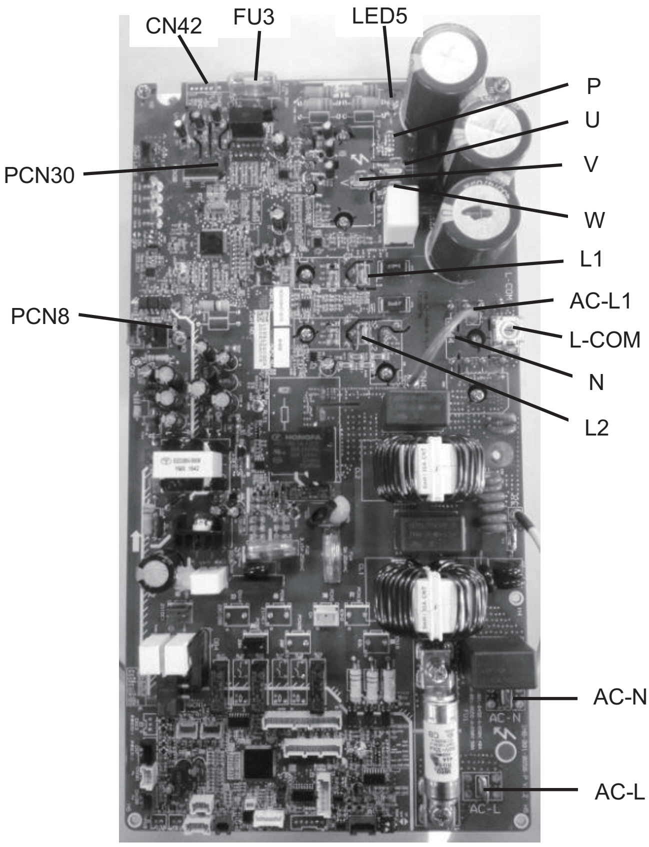
21 Does the water flow freely through the drain hose? __________

8. Electrical checks of main parts

Index

8.1 Inverter

8.1.1 RAS-(4-6)HV(R/N)(C/P)2E

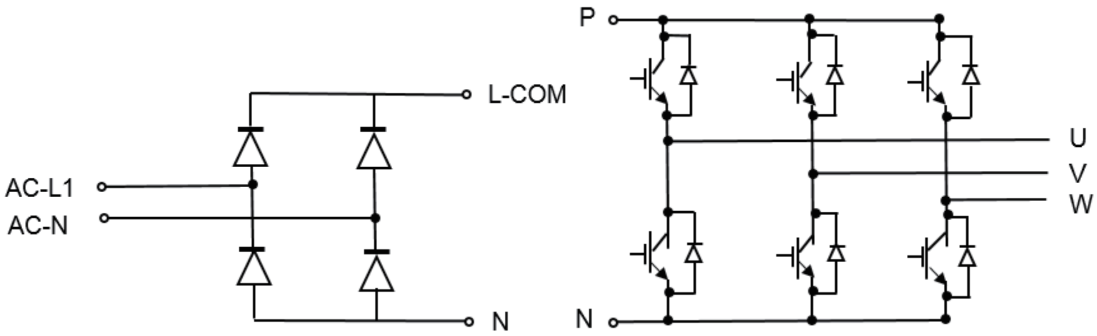


Applicable power source		1~ 230V 50Hz
Maximum output voltage		415V (Depends on power source voltage)
Maximum output current	**Compressor**	20A
	Fan controller	1.3A
Control method		Vector control PWM (Pulse width modulator)
Output frequency range	**Compressor**	11Hz to 130Hz
	Fan controller	0 to 21.7rps
Frequency accuracy		0.01 Hz

1 Check whether the high voltage still exists in the inverter PCB after power is disconnected. When the unit is operated, LED5 is turned ON. At the time of powering off the unit, LED5 is turned OFF. In this case, the residual voltage is less than DC50V.

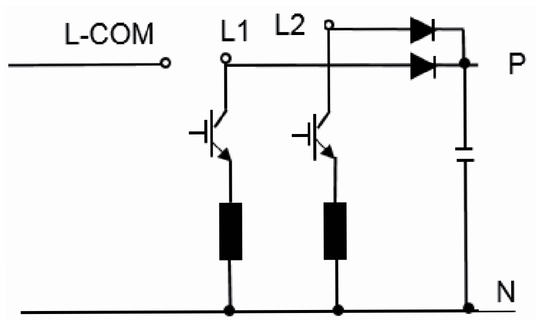
2 If LED5 is turned ON while powering off the unit, please wait for about five minutes, LED5 will turn OFF.

3 Remove all the terminals of the inverter module before check. If all the items (below table) are performed and all items are satisfied, the inverter module is non-defective.



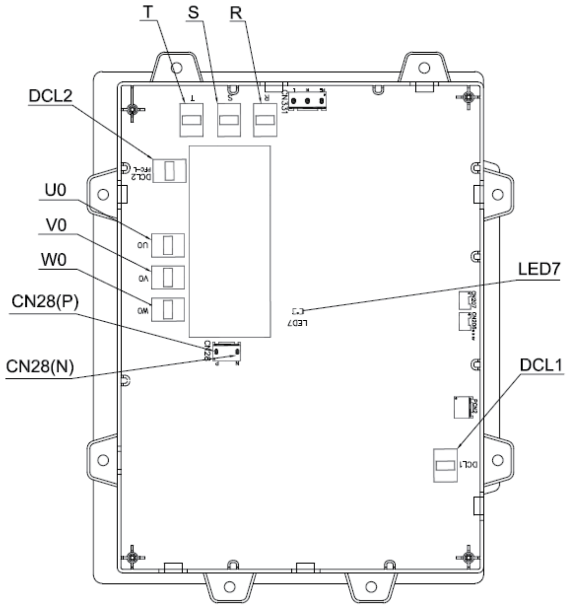
Test Point		Analog Tester Result	Digital Tester Result
(+) Side of Tester	(-) Side of Tester		
AC-L1/AC-N	L-COM	More than 1k Ohm	0.5V or smaller
AC-L1/AC-N	N	More than 100k Ohm	Overload
L-COM	AC-L1/AC-N	More than 100k Ohm	Overload
N	AC-L1/AC-N	More than 1k Ohm	0.5V or smaller
U / V / W	P	More than 1k Ohm	0.5V or smaller
U / V / W	N	More than 100k Ohm	Overload
P	U / V / W	More than 100k Ohm	Overload
N	U / V / W	More than 1k Ohm	0.5V or smaller

4 If all the items (below table) are performed and all items are satisfied, the inverter module is non-defective.



Test Point		Analog Tester Result	Digital Tester Result
(+) Side of Tester	(-) Side of Tester		
L1 / L2	P	More than 1k Ohm	0.5V or smaller
P	L1 / L2	More than 100k Ohm	Overload
L1 / L2	N	More than 5M Ohm	Overload
N	L1 / L2	More than 0.5M Ohm	Overload

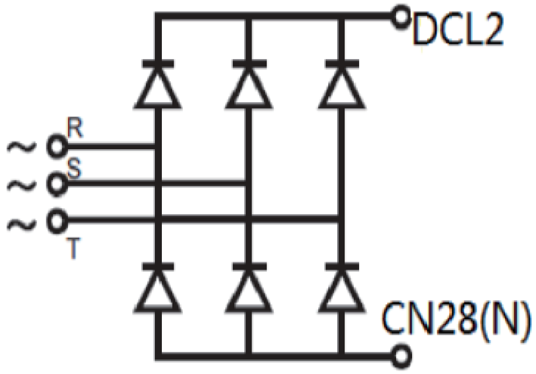
8.1.2 RAS-(4-6)H(R/N)(C/P)2E



Applicable power source	3N~ 400V 50Hz
Maximum output voltage	415V (Depends on power source voltage)
Maximum output current	20A
Control method	Vector control PWM (Pulse width modulator)
Output frequency range	11Hz to 130Hz
	0 to 21.7rps
Frequency accuracy	0.01 Hz

- Check whether the high voltage still exists in the inverter PCB after power is disconnected. When the unit is operated, LED7 is turned ON. At the time of powering off the unit, LED7 is turned OFF. In this case, the residual voltage is less than DC50V.
- If LED7 is turned ON while powering off the unit, please wait for about ten minutes, LED7 will turn OFF.

Remove all the terminals of the driver board before check. If all the items (below table) are performed and all items are satisfied, the driver board is non-defective.



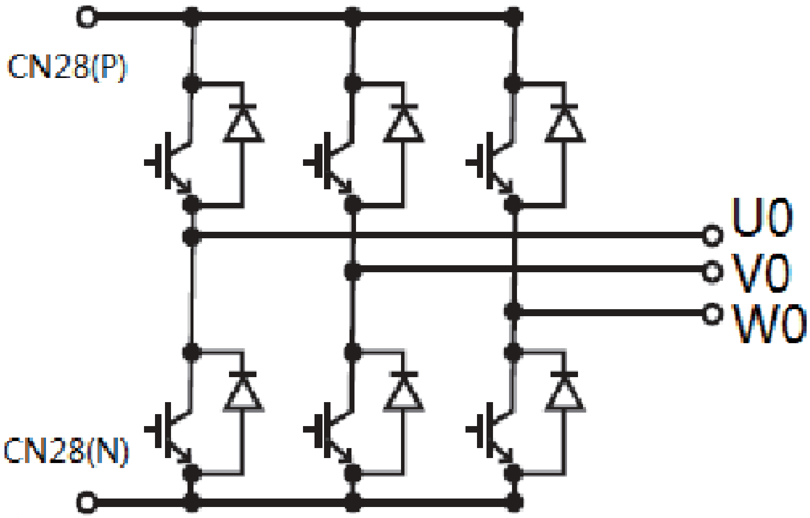
Check Point		Digital Tester Result
(+) Side of Tester	**(-) Side of Tester**	
DCL2	R/S/T	Overload
R/S/T	DCL2	0.5V or smaller
R/S/T	CN28(N)	Overload
CN28(N)	R/S/T	0.5V or smaller

◆ IPM Circuit of Driver Board (In case of using Digital Tester)

- The positive side (+) of tester: Red; The negative side (-) of tester: Black.
- Pre-charge circuit of the Inverter PCBA. If the positive side (+) of tester is connected to DCL1, and the negative side (-) of tester is connected to CN28(P).

1 If the resistance is about 1k Ohm, it is OK.

2 If the resistance is about 0 Ohm or infinity, it is damaged.



Test Point	Analog Tester Result	Digital Tester Result
(+)DCL2, (-)R	More than 100k Ohm	Overload
(-)DCL2, (+)R	More than 1k Ohm	0.5V or smaller
(-)CN28(N), (+)R	More than 100k Ohm	Overload
(+)CN28(N), (-)R	More than 1k Ohm	0.5V or smaller
(+)DCL2, (-)S	More than 100k Ohm	Overload
(-)DCL2, (+)S	More than 1k Ohm	0.5V or smaller
(-)CN28(N), (+)S	More than 100k Ohm	Overload
(+)CN28(N), (-)S	More than 1k Ohm	0.5V or smaller
(+)DCL2, (-)T	More than 100k Ohm	Overload
(-)DCL2, (+)T	More than 1k Ohm	0.5V or smaller
(-)CN28(N), (+)T	More than 100k Ohm	Overload
(+)CN28(N), (-)T	More than 1k Ohm	0.5V or smaller
(+)CN28(P), (-)U0	More than 100k Ohm	Overload
(-)CN28(P), (+)U0	More than 1k Ohm	0.5V or smaller
(-)CN28(N), (+)U0	More than 100k Ohm	Overload
(+)CN28(N), (-)U0	More than 1k Ohm	0.5V or smaller
(+)CN28(P), (-)V0	More than 100k Ohm	Overload
(-)CN28(P), (+)V0	More than 1k Ohm	0.5V or smaller
(-)CN28(N), (+)V0	More than 100k Ohm	Overload
(+)CN28(N), (-)V0	More than 1k Ohm	0.5V or smaller
(+)CN28(P), (-)W0	More than 100k Ohm	Overload
(-)CN28(P), (+)W0	More than 1k Ohm	0.5V or smaller
(-)CN28(N), (+)W0	More than 100k Ohm	Overload
(+)CN28(N), (-)W0	More than 1k Ohm	0.5V or smaller

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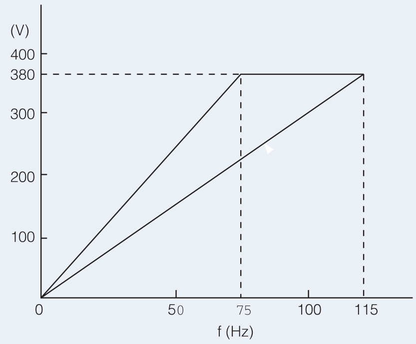
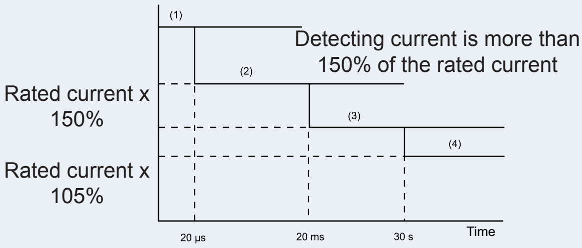
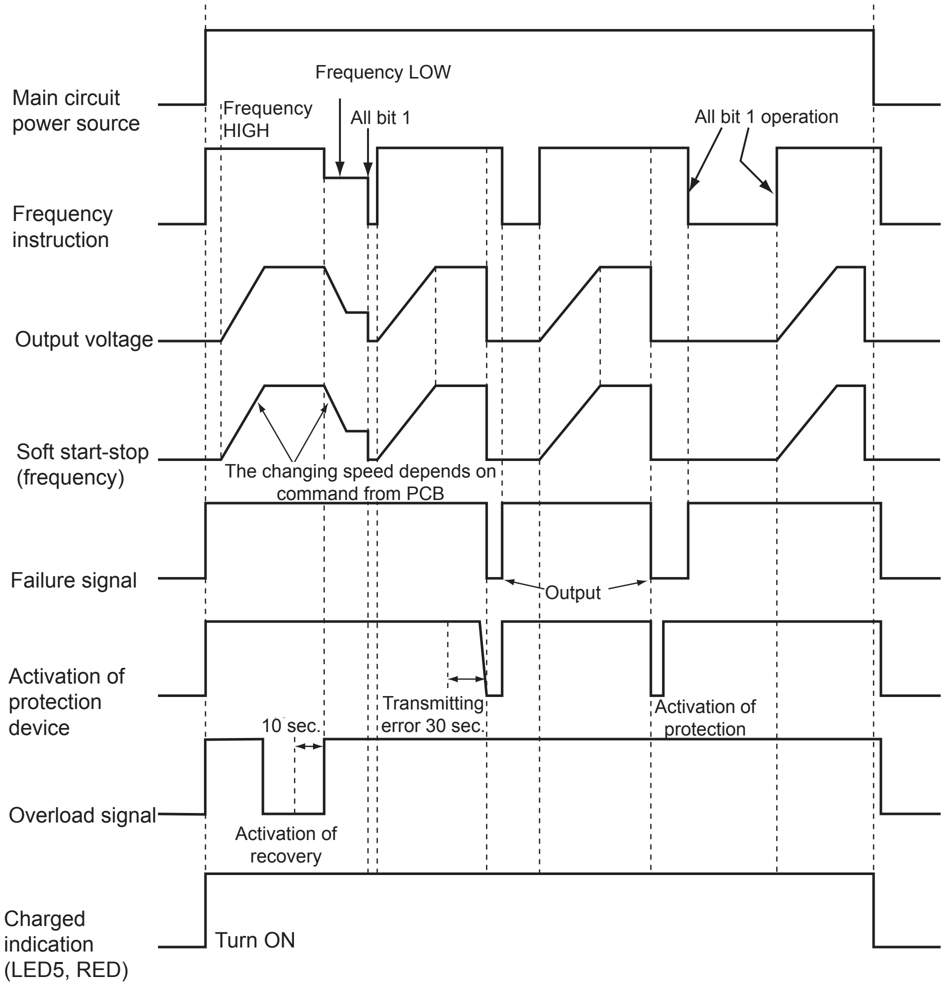
8.1.3 Specifications of inverter

<table>
<tr><th>Applicable model</th><th>RAS-3HVRC2</th><th>RAS-(4-6)HV(R/N)(C/P)2E</th><th>RAS-(4-6)H(R/N)(C/P)2E</th></tr>
<tr><td>Applicable power source</td><td colspan="2">1 Phase. 230V 50 Hz</td><td>3 Phase 400V 50 Hz</td></tr>
<tr><td>Output current</td><td>10.5A</td><td>20.0A</td><td>20.0A</td></tr>
<tr><td>Control Method</td><td colspan="3">Vector control</td></tr>
<tr><td>Range output frequency</td><td>11-125Hz</td><td>11-130Hz</td><td>11-130Hz</td></tr>
<tr><td>Accuracy of frequency</td><td colspan="3">0.01Hz at applicable frequency range</td></tr>
<tr><td>Output / characteristics</td><td colspan="2">Conditions:
Power source voltage AC220/240V
Non-loading (free output)
Ammeter type volt-meter (X1.1)
</td><td>Conditions:
Power source voltage AC380/415V
Non-loading (free output)
Ammeter type volt-meter (X1.1)
</td></tr>
<tr><td>Increasing/ Decreasing Hz</td><td colspan="2">0.125–2.00 Hz/s (5 steps)</td><td>0.125–3.00 Hz/s (5 steps)</td></tr>
</table>

<table>
<tr><td colspan="3">Protection function</td><td></td></tr>
<tr><td>Applicable model</td><td>RAS-3HVRC2</td><td>RAS-(4-6)HVNC1E</td><td>RAS-(4-6)HNC1E</td></tr>
<tr><td>Excessive high or low voltage for inverter</td><td colspan="2">Excessive low voltage at a voltage is lower than 194 V DC
Excessive high voltage at a voltage is higher than 400 V DC</td><td>Excessive low voltage at a voltage is lower than 350 V DC
Excessive high voltage at a voltage is higher than 750 V DC</td></tr>
<tr><td>Abnormality of current sensor (0A detection)</td><td colspan="2">1 When the compressor’s operating frequency reaches 15 to 18 Hz after the compressor starts, the effective value of running current at each phase is 1.5A or less.
2 The wave height value of running current for the phase positioning is 5A or less before the compressor starts (at the end of the phase positioning).
Cause of Abnormality: Failure of Current Sensor (on Inverter PCB),
Failure of IPM, Failure of Compressor, Disconnected Wiring</td><td>Stoppage at a current of compressor smaller than 1.5A.
When the frequency is 15 to 18Hz after starting. Cause of abnormality:
Failure of current sensor
Failure of IPM/DIP-IPM/ ISPM
Failure of compressor / fan motor
Disconnected wiring</td></tr>
<tr><td>Overcurrent protection for inverter</td><td colspan="3">

Short-circuit trip of arm *)
Instantaneous overcurrent trip *)
Instantaneous overcurrent trip: it is detected when current valve is over rated current x 150%.
Electronic thermal trip: it is detected when current valve rated current x 105% for over 30 seconds or for over 3 minutes in total within 10 minutes.
NOTE
*) Internal protection IPM
Condition is maintained longer than 30 seconds or accumulated longer than 3 minutes during 10 minutes sampling time.</td></tr>
<tr><td>Protection of transistor module</td><td colspan="3">IPM has four protection function for self-protection.
Short circuit in any of the “U”, “V” or “W” terminals
Running current reaches the maximum rated current.
Control voltage decreases abnormally.</td></tr>
<tr><td>Overload control</td><td colspan="3">Overload control as a current greater than rated current X105%.
Overload control release at a current smaller than rated current X 88%.</td></tr>
<tr><td>Fin temperature increase</td><td colspan="3">The unit is stopped when the fin temperature is higher than 80ºC (for 3HP), 90ºC (for 4 to 6HP).</td></tr>
<tr><td>Earth detection</td><td colspan="3">The unit is stopped when the compressor is earthing.</td></tr>
</table>

8.1.4 Inverter time chart



8.1.5 Protective function

1 Excessive high or low voltage for inverter

a. Level of detection

- When the voltage of direct current is greater than (A)
- When the voltage of direct current is smaller than (B)

Power supply	3N ~ 400V 50Hz	1 ~ 230V 50Hz
(A)	750 Volts	376 (400*) Volts
(B)	350 Volts	194 Volts

(*) For RAS-3HVRNC2

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

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

2 Abnormality of current sensor

a. Level of detection
When current of the inverter compressor decreases lower than 1.5A during the inverter compressor frequency between 15Hz and 18Hz an abnormality is detected.

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

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

3 Overcurrent protection for inverter

a. Level of detection

- When the current detected by current sensor reaches 150% of the rated current overcurrent is detected. (Instantaneous overcurrent).
- When the current detected by current sensor exceeds 105% of the rated current continuously for 30 seconds or for 3.5 minutes in total during a 10 minutes period overcurrent is detected. (Electric thermal relay).

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

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

4 Protection of IPM/DIP-IPM/ISPM

a. Level of detection

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

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

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

5 Fin temperature increase

a. Level of detection
When the temperature of internal thermistor exceeds more than 80ºC (for 3HP), 90ºC (for 4 to 6HP) an abnormality is detected.

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

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

6 Earth detection

a. Level of detection
When the starting current of the compressor reaches 80% of the overcurrent protection value an abnormality is detected.

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

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

8.1.6 Overload control

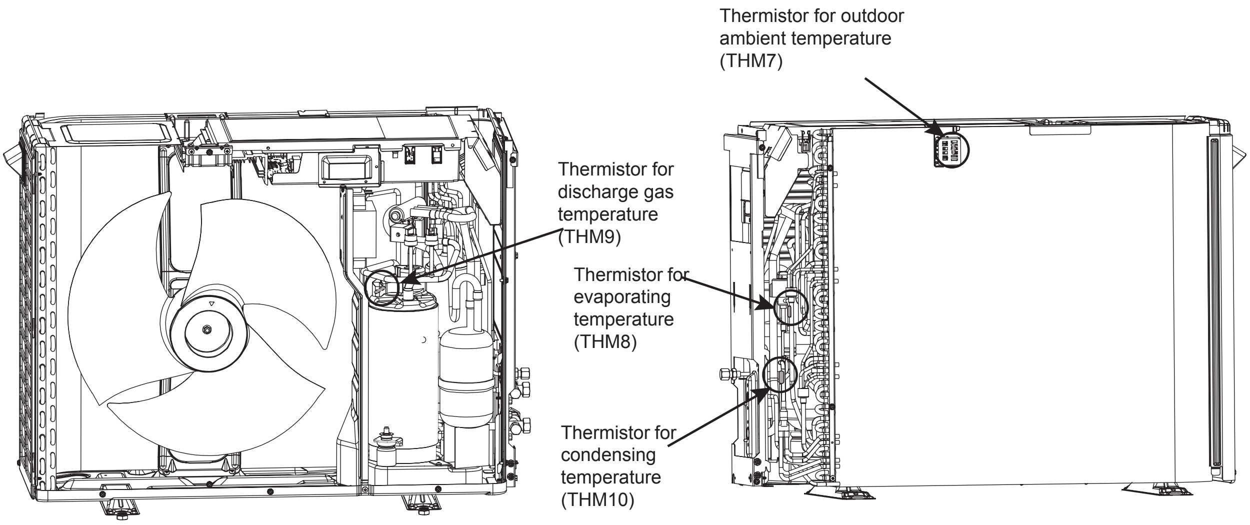
1 Level of detection
When the output current exceeds 105% of the maximum output current an abnormality is detected.

2 Function
An overload signal is issued when output current exceeds 105% of the maximum output current and the frequency decreases.
For 10 seconds after the output current decreases lower than 88% of the rated current the operation is performed with the compressor frequency limited to the upper level frequency when the output current decreases lower than 88% of the rated one.
However if the frequency order is smaller than the maximum value the operation is performed according to the order.

3 Cancellation of protection function
After the operation described in the above item 2. is performed for 10 seconds this control is cancelled.

8.2 Thermistor

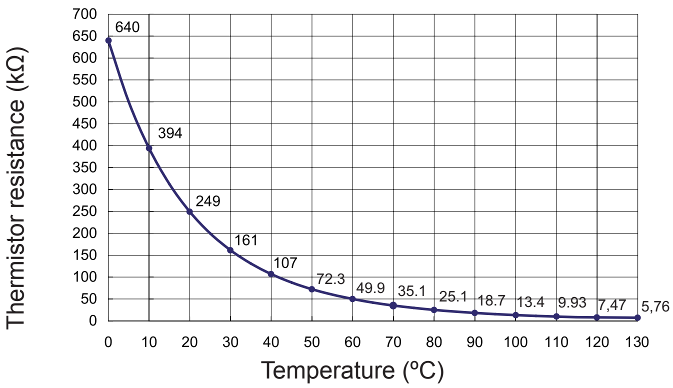
8.2.1 Thermistors for RAS-3HVRC2



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

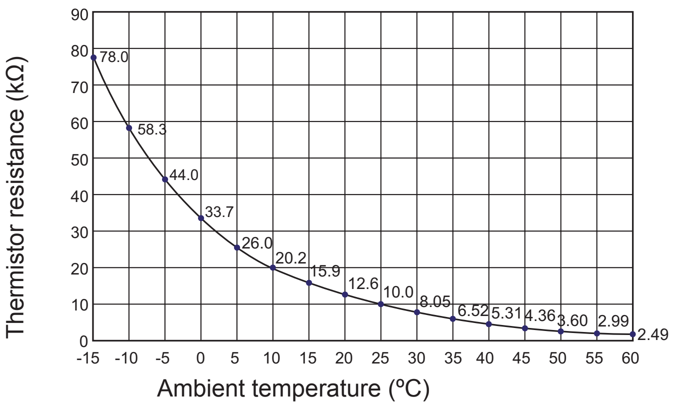
For prevention of discharge gas overheating

Thermistor resistance characteristics

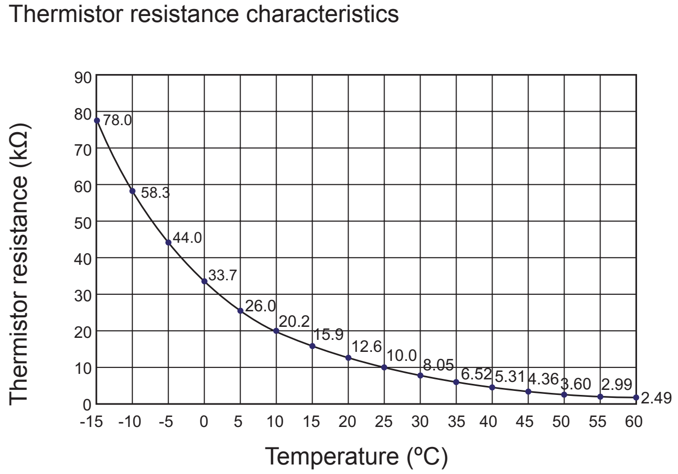


◆ **Thermistor for outdoor ambient temperature (THM7)**

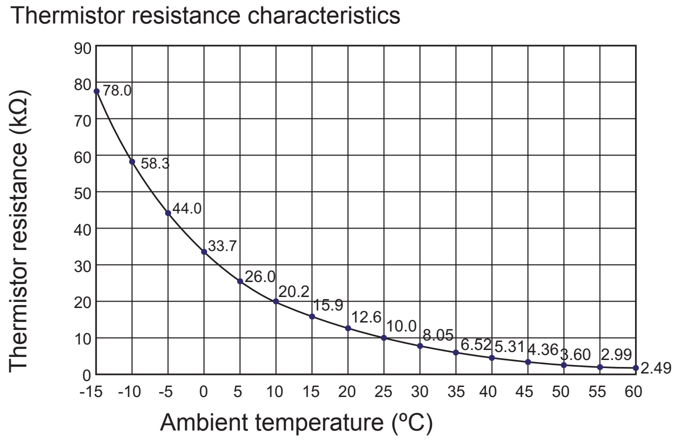
Thermistor resistance characteristics



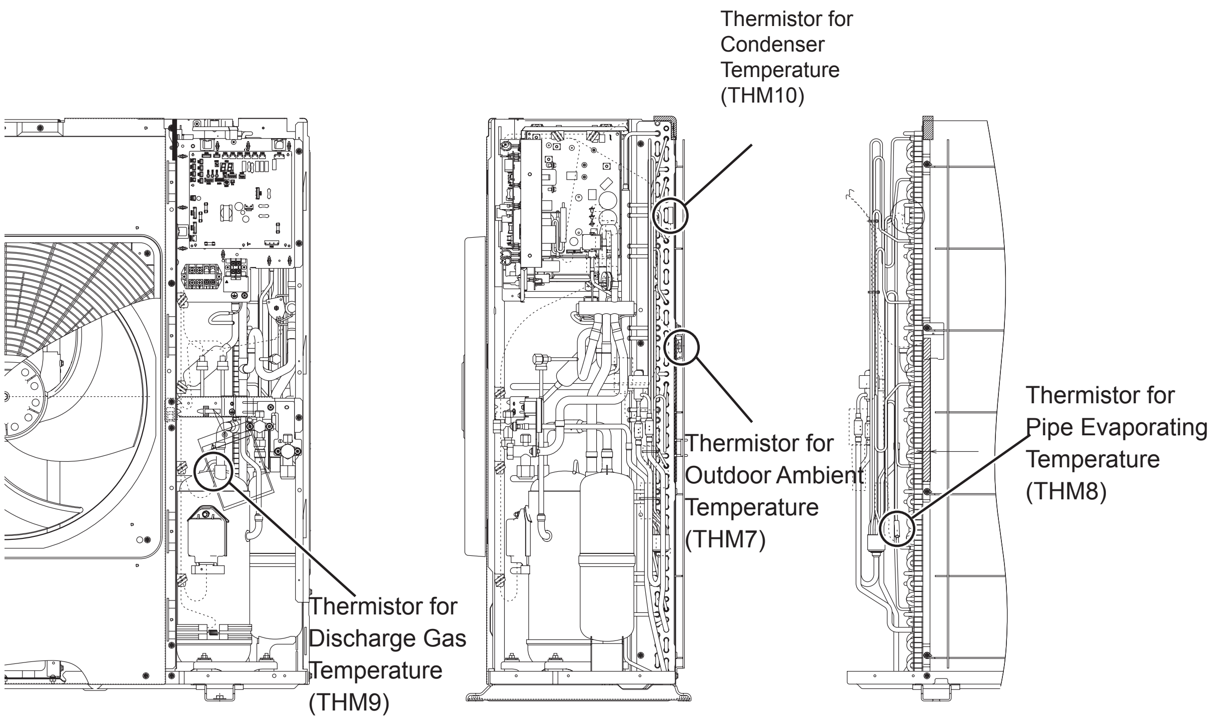
◆ Thermistor for evaporating temperature of outdoor unit in heating operation (for defrosting) (THM8)



◆ Thermistor for condensing temperature (THM10)



8.2.2 Thermistors for RAS-(4-6)H(V)(R/N)(C/P)2E



◆ Thermistor for discharge gas temperature (THM9)

1 A thermistor for the upper part temperature of the compressor is installed to prevent discharge gas from overheating.

- If discharge gas temperature increases excessively lubricating oil deterioration occurs and lubricating properties deteriorate resulting in short compressor life.

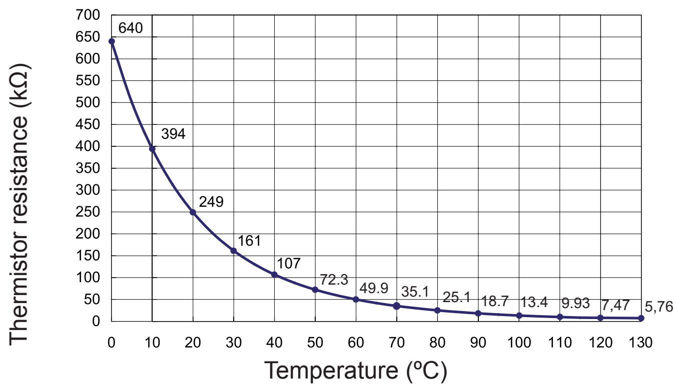
2 If discharge gas temperature increases excessively compressor temperature increases. At the worst compressor motor winding will be burnt out.

3 When the upper part temperature of compressor increases during heating operation the unit is controlled according to the following method.

- An electronic expansion valve of outdoor units is (are) opened to return the liquid refrigerant to the compressor through the accumulator decreasing compressor temperature.
- If the compressor upper part temperature increases exceeding 132 ºC even if an electronic expansion valve opens the compressor is stopped in order to protect the compressor.In cooling operation the above function is also available.

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

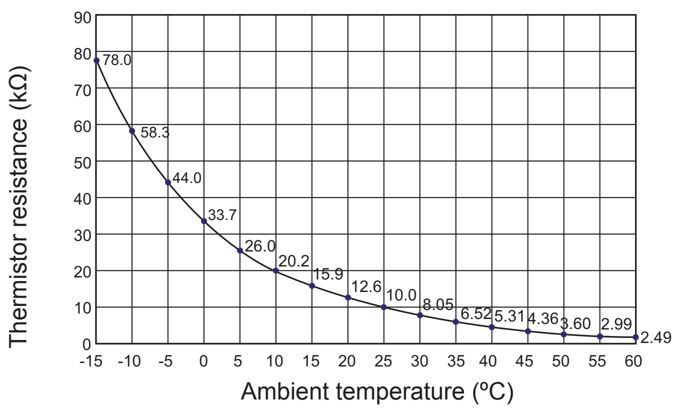
Thermistor resistance characteristics



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

◆ Thermistor for outdoor ambient temperature (THM7)

Thermistor resistance characteristics



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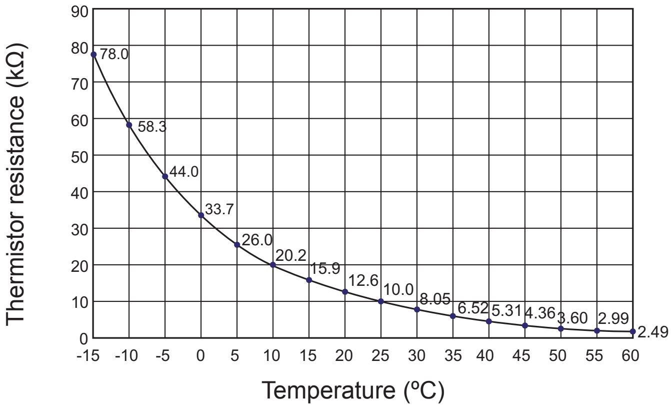
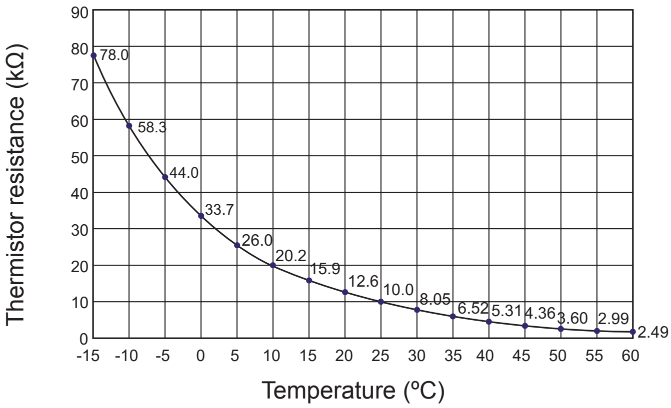
◆ **Thermistor for evaporating temperature of outdoor unit in heating operation (for defrosting) (THM8)**

Thermistor resistance characteristics



◆ **Thermistor for condensing temperature of RAS-(4-6)H(V)(R/N)(C/P)2E outdoor unit (THM10)**

Thermistor resistance characteristics



8.3 Electronic expansion valve

Micro-computer

↓ Pulse signal

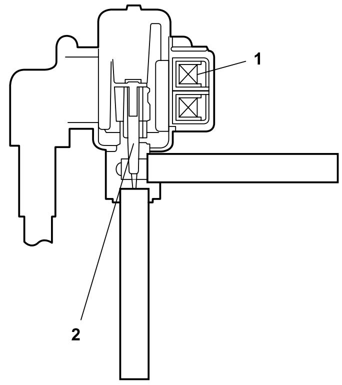
2-phase permanent magnetic pulse motor

Control 0 to 500 pulse by 1 pulse

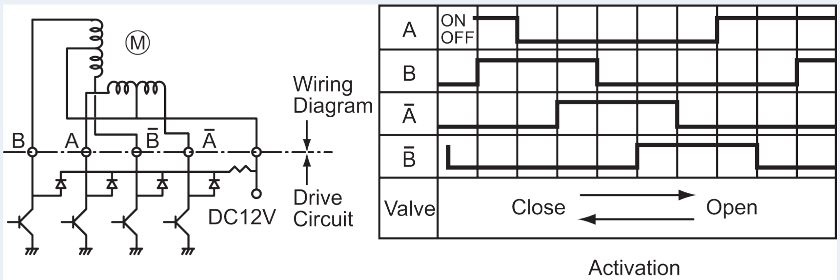
↓

Refrigerant flow control

Precise control



1. Pulse motor.
2. Needle.

Items	Specifications
Type	UKV series
Refrigerant	R32 / R410A
Working temperature range	-30 ºC 70 ºC (operation time of the coil: less than 50%)
Mounting direction	Drive shaft in vertical direction within an angle of 45 °C as maximum
Flow direction	Reversible
Drive method	4-Phase canned motor method
Rated voltage	DC12V±1.8 V
Drive condition	63PPS 1.2 phase excitation
Coil resistance (each phase)	46Ω ± 10 (at 20 ºC)
Wiring diagram drive circuit and activation mode	

8.4 High pressure protection device

8.4.1 RAS-3HVRC2

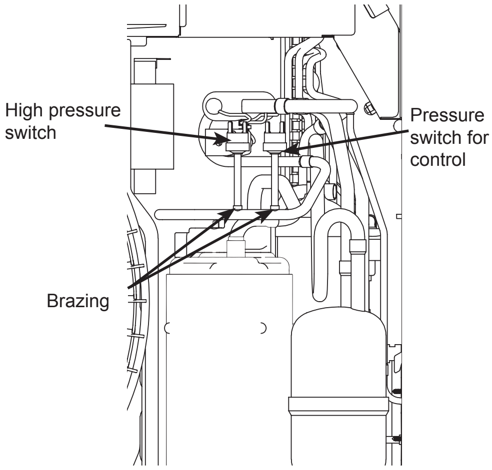
If the discharge pressure is excessively high the compressor and the component parts of the refrigeration cycle can be damaged. Therefore, in case that the discharge pressure is higher than 4.15 MPa the protection control is activated and the compressor is stopped.:

In case that the discharge pressure is higher than 3.6 MPa the protection control might be performed.

Depending on model (check refrigerant cycle):

1 For controlling the high pressure not to increase excessively during heating operation the gas by-pass circuit and the air volume of the outdoor fan is controlled automatically.

2 The gas by-pass circuit which is composed of the solenoid valve and the capillary tube for flow adjustment control the high pressure not to increase excessively by leading the high pressure gas to the low pressure side.



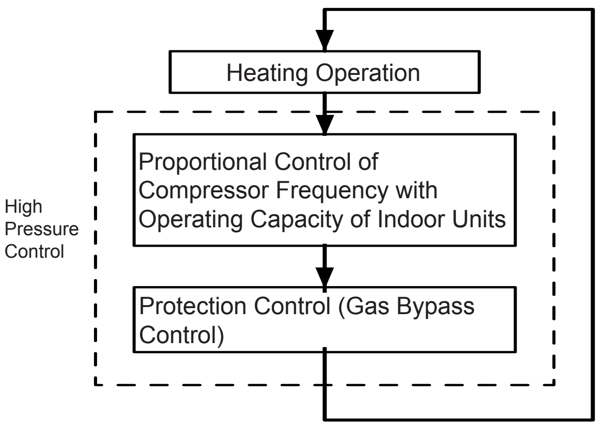
NOTE

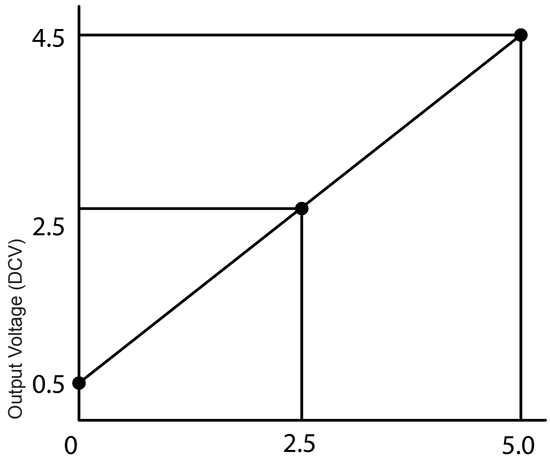
All figures only for illustration purpose. The actual product may differ.

8.4.2 RAS-(4-6)H(V)(R/N)(C/P)2E

◆ **High pressure control (Pressure sensor Pd)**

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



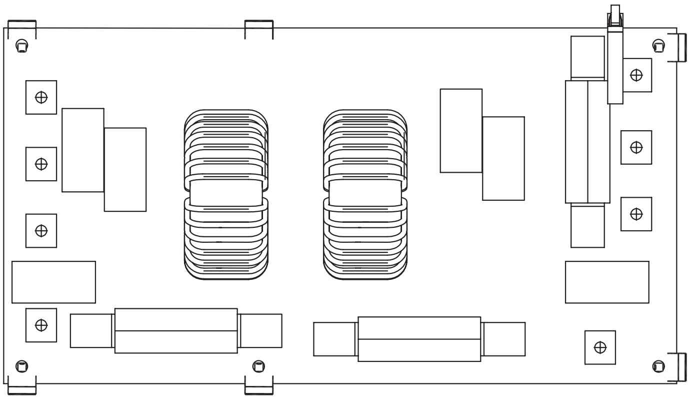


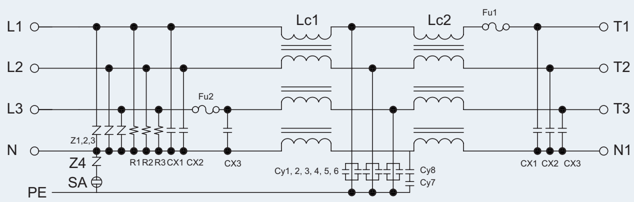
Pressure MPa (kgf/cm²G)
Output Characteristics of High Pressure Sensor

8.5 Noise filter (NF)

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.

RAS-(4-6)H(R/N)(C/P)2E



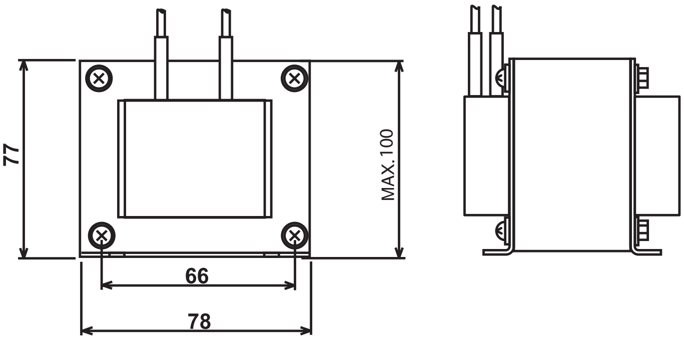
Items	Specifications
Model	NF167ES
Rated Current	AC 400 V
Rated Current	32A
Circuit diagram	

8.6 Reactor (DCL)

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

8.6.1 RAS-3HVRC2

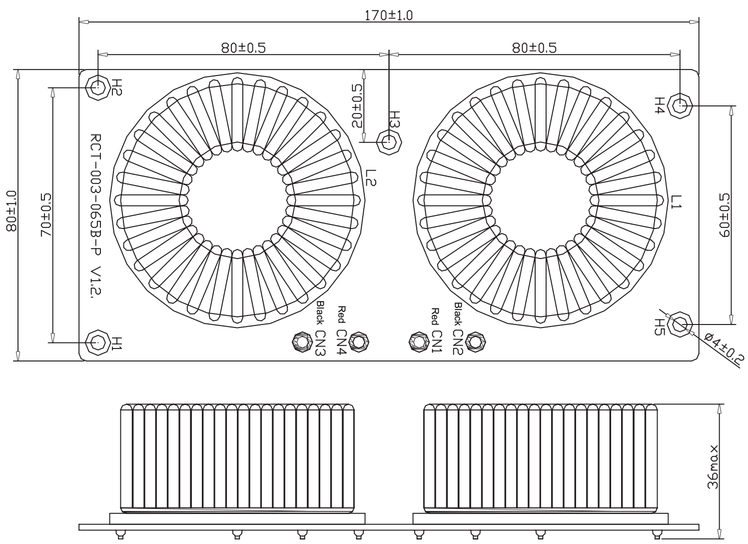
Items	Specifications
Character	12 mH±15 (at 1 kHz)
Rated current	15 A
DC Resistance	160 mΩ (max.)
Permissible temperature range	-25ºC to 60ºC



NOTE

All measurements are in mm.

8.6.2 RAS-(4-6)HV(R/N)(C/P)2E



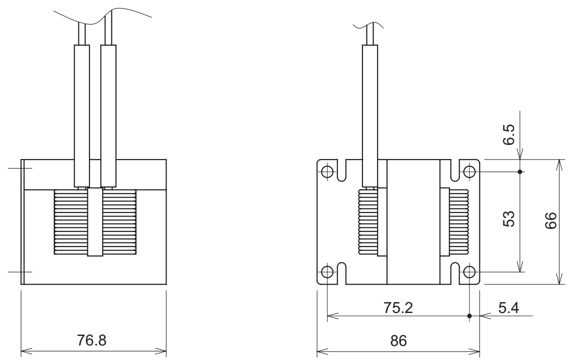
Item	Specifications
Condition	0.41 mH ± 10% (DC 16A)
Rated current	16 A
Direct current resistance	50.0 mΩ ± 20% (at 25°C)

NOTE

All measurements are in mm.

8.6.3 RAS-(4-6)H(R/N)(C/P)2E

Item	Specifications
Condition	1.0 mH ± 10% (at 1 Khz)
Rated current	35 A
Direct current resistance	27.0 mΩ ± 20% (at 20°C)



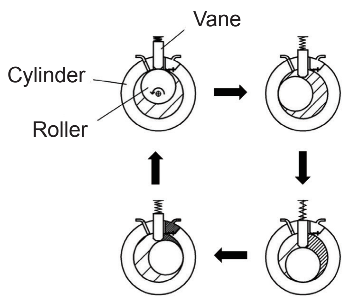
NOTE

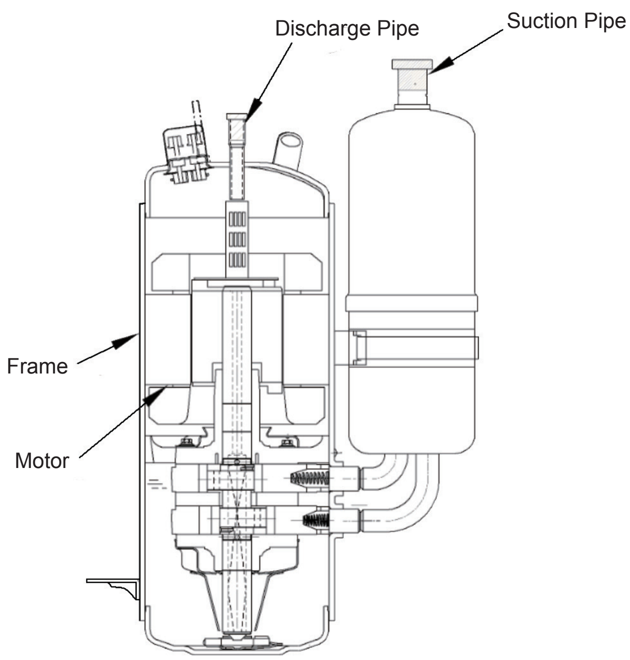
All measurements are in mm.

8.7 Rotary compressor

- Low vibration and low noise design
- (i) The twin rotor crankshaft is arranged in a symmetrical type, which counteracts the centrifugal force produced by the rotation, and the vibration is smaller.
- (ii) Unique low noise structure design, and high efficiency DC motor is adopted. The operation can be smooth and low noise at the full frequency.

◆ Compression principles





9. Servicing

Index

9.1 Safety Introduction

DANGER

DO NOT TOUCH THE ELECTRICAL COMPONENTS WHILE LEDS 1~4/351~353 on PCB1 or LD1~4 on PCB2 ARE ON, TO AVOID ELECTRICAL SHOCK.

WAIT UNTIL ALL LEDS TURN OFF.

DANGER

- ***Before performing any of the service operations described in this chapter turn all the main switches off and the place security lockers or convenient warning indicators in order to prevent them from turning on accidentally.***
- ***In case of blocked or stucked parts use appropiated tools and eventually lubricants to release them.***
- ***In case of sharped edged parts as covers use security gloves to avoid getting injured.***
- ***When performing brazing work besides security gloves it is must to wear convenient eye protection.***
- ***Check and be sure that all LEDS on the PCB are OFF for all electrical maintenance.***

NOTE

- *All compressors are connected by brazing. Check to ensure whether there are flammable things around or not when using a burner for pipe connections if not oil existing pipe inside may ignite.*
- *Do not expose the refrigerant cycle to the atmosphere for a long period in order to avoid mixing the water and foreign particles into the refrigerant cycle. After removing compressor replace it quickly. If exposed for a long period seal the suction pipe and discharge pipe.*
- *Remove the cap for the compressor just before replacing the compressor. Before mounting the compressor seal the suction pipe and discharge pipe with a tape to protect the compressor from foreign particles. Remove the tape at pipe connection.*
- *Caution for Replacement of Compressor.*

Remove the suction pipe and the discharge pipe from the compressor. Isolate the wires and electrical components to protect them from the burner flame when brazing the connection pipes.

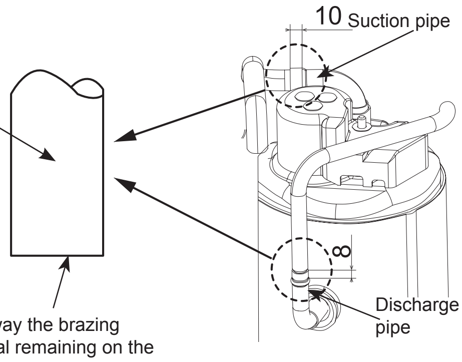
When replacing the compressor, the brazed material used for connecting the compressor and refrigerant pipes can drop into the pipes and get sucked into the compressor, causing a compressor failure. To avoid this, take the following points into account when replacing the compressor:

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

CAUTION

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

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



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

CAUTION

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

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

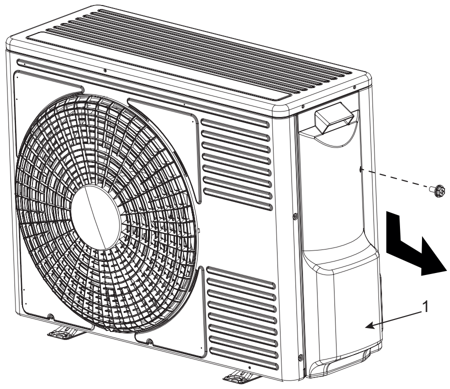
9.2 RAS-3HVRC2

9.2.1 Removing the pipe cover

Follow the procedure below to remove main parts and components. For mounting follow the reverse procedure of removal.

Do not expose the refrigerant cycle to the atmosphere for a long period to avoid moisture or dust entering into the cycle. Be sure to replace parts immediately after removing. Seal the refrigerant cycle when left unattached for a long period.

1 Remove pipe cover downward after removing 1 screw.



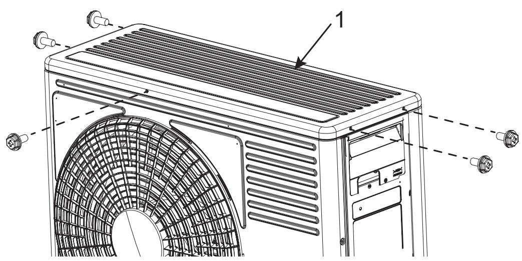
1 - Pipe cover

9.2.2 Removing the front cover

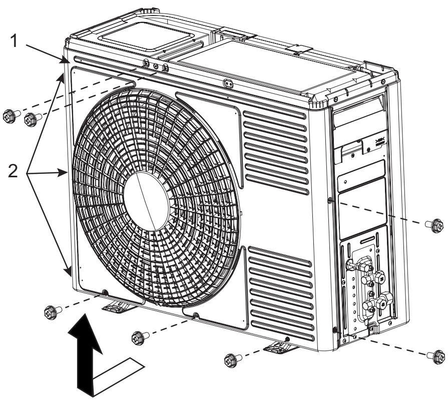
1 Remove the pipe cover following *"9.2.1 Removing the pipe cover".*

2 Remove 5 fixing screws and remove the upper cover.

3 To remove the front cover remove 7 fixing screws and 3 left nails.



1 - Upper cover



1 - Front cover
2 - Nails

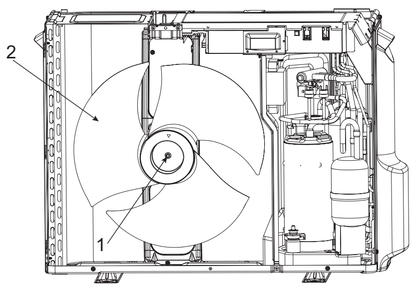
9.2.3 Removing the outdoor fan

1. Remove the pipe cover following *"9.2.1 Removing the pipe cover".*
2. Remove 3 fixing screws and remove the upper cover.
3. Remove the front cover following *"9.2.2 Removing the front cover".*
4. To remove the propeller fan remove the cap nut which fixes the propeller fan onto the motor shaft.

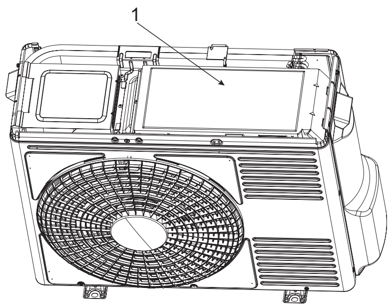
NOTE

- *Use a puller when the propeller fan and fan motor shaft are fixed too tightly.*
- *The cap nut is left thread. For removal turn to the reverse direction to the propeller fan.*

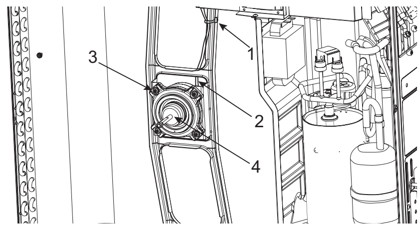
5. Remove the electrical box cover.
6. Remove the fan motor connector (CN24) inserted into the PCB in the electrical box:
   - Remove the fan motor lead wire fixed onto the motor clamp using a cord band.
   - Remove 4 screws which fix the motor.



1 - Cap nut
2 - Propeller fan



1 - Electrical box cover



1 - Cord band
2 - Fan motor lead wire
3 - Four screws
4 - Fan motor

NOTE

- *Be sure to place the lead wire outlet downward when assembling the motor.*
- *Fix the motor lead wire onto the motor clamp using a cord band as before to avoid obstructing the propeller fan.*
- *Assembling the propeller fan: Insert the skidding protection part of the fan boss matching with the motor shaft notch; tighten the nut after the shaft screw fully comes out. (Tightening Torque 3.0 Nm).*
- *Connect the motor lead wire to the electrical box PCB. (To connect insert into the connector (CN24) on the PCB).*

9.2.4 Removing the compressor

NOTE

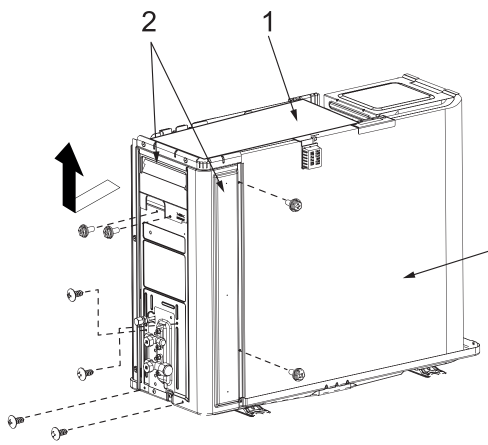
- *Do not expose the refrigerant cycle to the atmosphere for a long period to avoid moisture or dust into the cycle. Be sure to replace the compressor immediately after removing. Seal to the suction and discharge pipes when the refrigerant cycle is left unattached for a prolonged time.*
- *Remove the cap of new compressor right before the replacement. Before mounting the compressor seal the suction and discharge pipes with a tape to protect the compressor from dust. Remove the tape at pipe connection.*
- *To connect wiring at reassembling ensure that the compressor terminal numbers and wiring mark band codes are matched. Incorrect wiring numbers may result in inverse rotation and damage the compressor.*

1 Remove the pipe cover following *“9.2.1 Removing the pipe cover”*. When the outdoor unit is installed close to a wall move the unit from the wall removing the refrigerant piping.

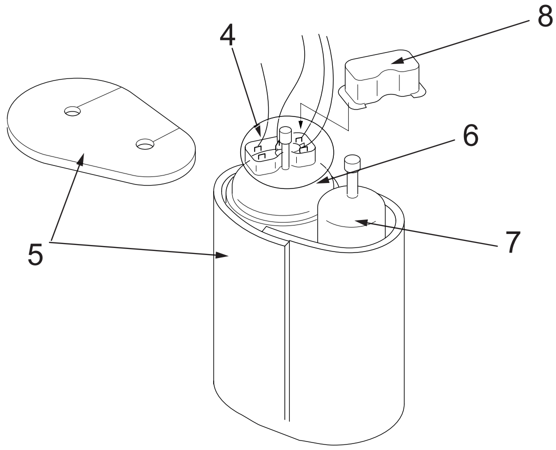
2 Collect the refrigerant from the check joint.

3 Remove the front cover following *““9.2.2 Removing the front cover”*.

4 Remove 8 fixing screws and remove the side cover.



1 - Electrical box cover
2 - Side cover
3 - Heat exchanger



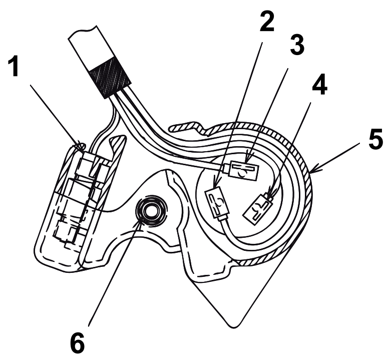
4 - Compressor-top thermistor and wiring
5 - Side and top soundproff cover
6 - Compressor
7 - Accumulator
8 - Terminal box cover

5 Open the soundproof cover wrapped around the compressor and remove the terminal box cover of the compressor body.

6 Disconnect the compressor wires in the terminal box and remove the thermistor on top of the compressor.

CAUTION

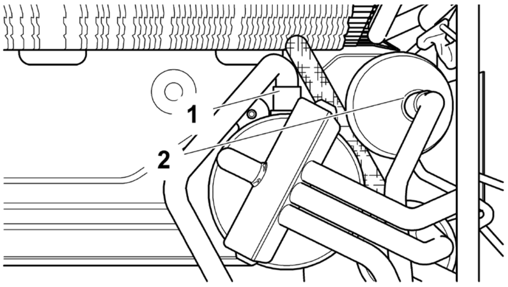
Check the wiring color and layout when disconnecting. Connecting wires in wrong order at reassembling may result in compressor damage.



1 - Compressor-top thermistor mount onto terminal cover with metal fitting.
2 - Yellow.
3 - White.
4 - Red.
5 - Terminal cover.
6 - M8 hexagonal nut.

7 Remove the suction and discharge pipes from the compressor.

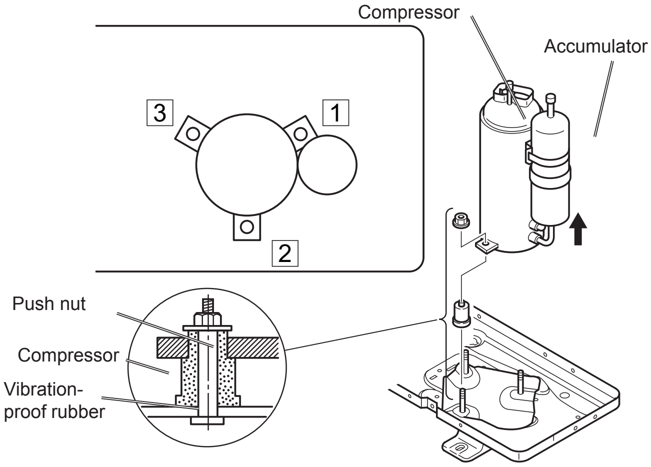
Be sure to separate the blazing burner flame sufficiently from the wires and electrical components around the brazed part in order to avoid burning.



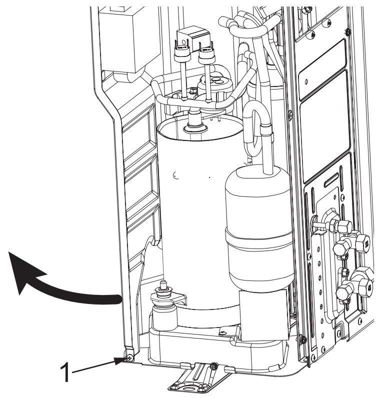
1- Blazing Discharge pipe.
2 - Blazing Suction pipe.

8 Remove push nuts 1 and 2 which fixes the compressor. Lift the compressor and remove from the unit body. (3 in the figure does not have a push nut).

9 Check if the Faston terminal has any abnormality when replacing the compressor. (Ensure the pull out force greater than 20 N). If the Faston terminal is identified faulty replace to a new one.



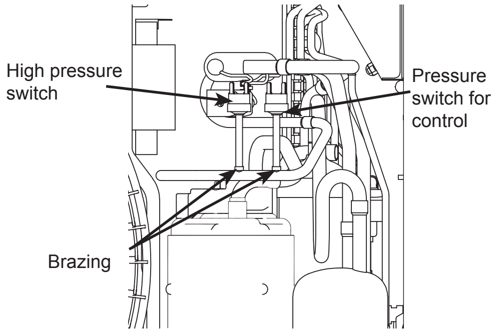
10 In case that is necessary more space to take out the compressor, remove the screw of the metal sheet.



1 - Metal sheet screw

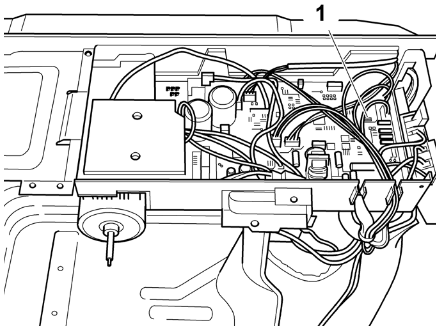
9.2.5 Removing the high pressure switch and pressure switch for control

1. Remove the pipe cover following *“9.2.1 Removing the pipe cover”.*
2. Remove 5 fixing screws and remove the upper cover.
3. Remove the front cover following *“9.2.2 Removing the front cover”.*
4. Collect the refrigerant from the check joint.
5. Disconnect the Faston Terminals.
6. Remove the high pressure switch and the pressure switch for control from the brazed part of discharge piping.



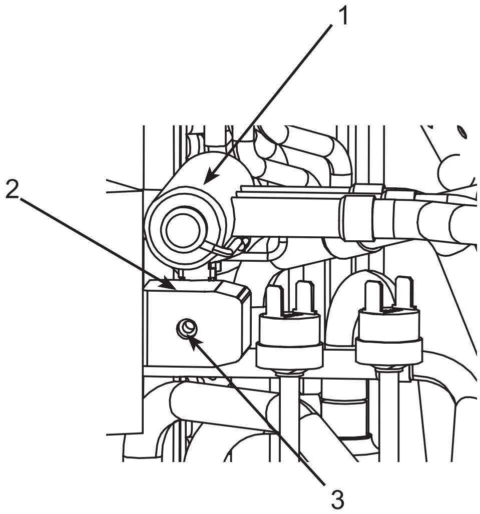
9.2.6 Removing the 4-way valve coil

1. Remove the pipe cover following *“9.2.1 Removing the pipe cover”.*
2. Remove 5 fixing screws and remove the upper cover.
3. Remove the front cover following *“9.2.2 Removing the front cover”.*
4. Disconnect the PCN6 connector on the control PCB of the electrical box.



1 - PCN6 Connector (Green)

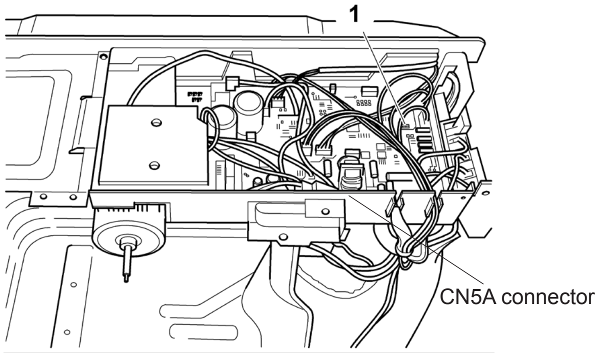
5. Remove 1 fixing screw to remove the 4-way valve coil.

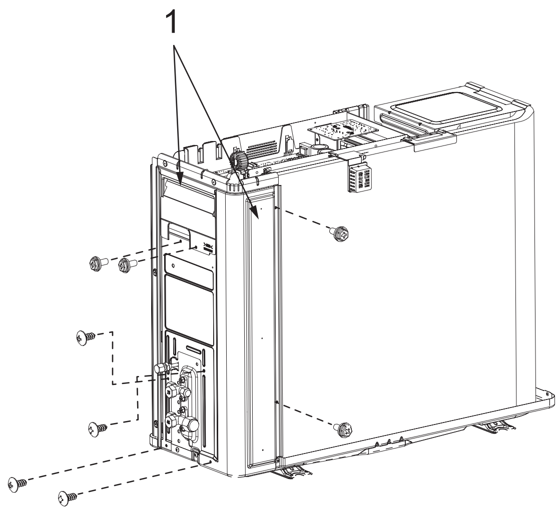


1 - 4-way valve.
2 - 4-way valve coil.
3 - Screw.

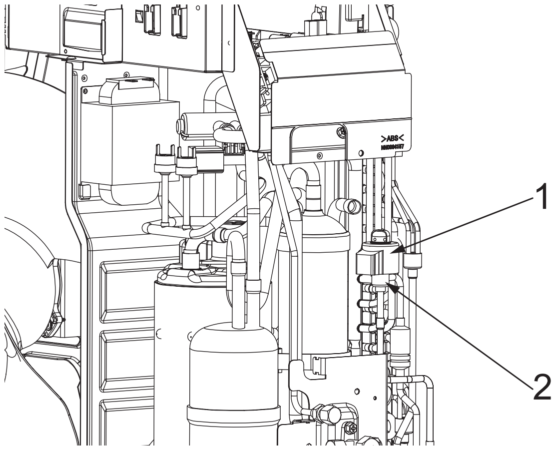
9.2.7 Removing the electronic expansion valve coil

1. Remove the pipe cover following *"9.2.1 Removing the pipe cover".*
2. Remove 5 fixing screws and remove the upper cover.
3. Remove the front cover following *"9.2.2 Removing the front cover".*
4. Remove the electrical box cover.
5. Remove 8 fixing screws and remove the side cover.
6. Remove the CN5A connector on the control PCB of the electrical box.
7. Hold and disconnect the coil of the expansion valve. The expansion valve coil is equipped with a lock mechanism. Ensure that the coil is locked when replacing.





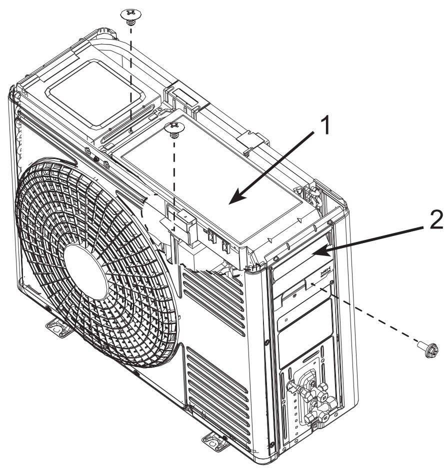
1 - Side cover



1 - Expansion valve coil
2 - Expansion valve body

9.2.8 Removing the electrical box

1. Remove the pipe cover following *"9.2.1 Removing the pipe cover".*
2. Remove 5 fixing screws and remove the upper cover.
3. Remove the electrical box cover.
4. Remove 1 fixing screw and remove the terminal cover.
5. Disconnect all the wiring connected to the control PCB.
6. Remove 2 screws which fix the electrical box.
7. Pull up and remove the electrical box.



1 - Electrical box cover
2 - Terminal cover

9.2.9 Removing Display PCB

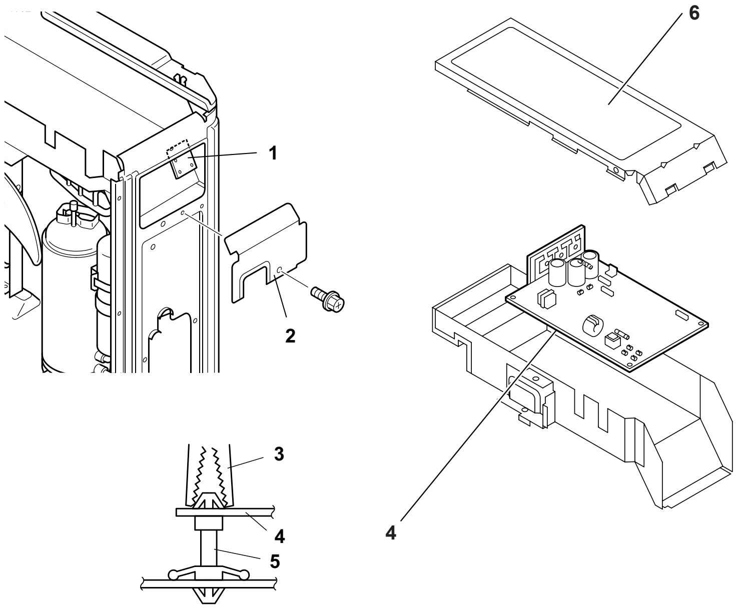
1 Remove the pipe cover following *"9.2.1 Removing the pipe cover".*

2 Remove 1 fixing screw and remove the terminal cover.

3 Disconnect all the wiring connected to the display PCB.

4 Hold the upper part of 4 holders with long nose pliers and remove the display PCB.

1 - Display PCB (PWB2).
2 - Terminal cover.
3 - Long nose pliers.
4 - Display PCB.
5 -Holder.
6 -Electrical box cover.



NOTE

- *DO NOT touch electrical components on the PCB. Pay attention not to bend or apply much force onto PCB in order to avoid PCB failure.*
- *To connect wiring at reassembling ensure that the terminal numbers and wiring mark band codes are matched. Incorrect wiring may result in malfunction or damage of electrical components.*
- *Different dip switch setting shall be applied for each model when the electrical box is replaced; See chapter "10. Troubleshooting".*
- *Pay attention not to clamp any wiring between plates or electrical components when closing electrical box cover or front cover at reassembling.*

9.2.10 Removing other electrical components

1 Remove the pipe cover following *"9.2.1 Removing the pipe cover".*

2 Remove 3 fixing screws and remove the upper cover.

3 Remove the electrical box cover.

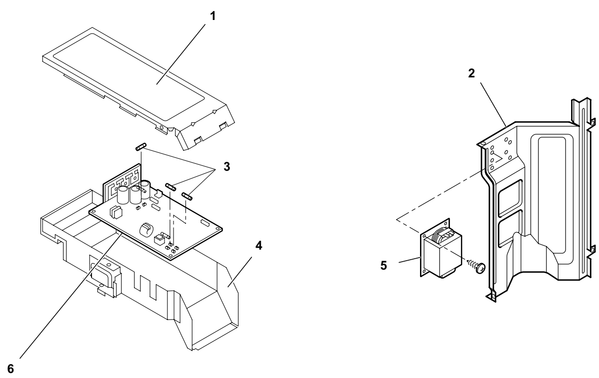
4 Removing Electrical Components.

Remove the 2 fixing screw and remove the reactor.

- To mount components be sure to match the wiring connection with the mark band codes.

9

1	Electrical box cover
2	Partition plate
3	Fuse
4	Electrical box
5	Reactor
6	PCB



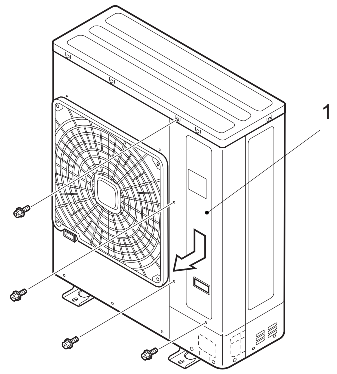
9.3 RAS-(4-6)H(V)(R/N)(C/P)2E

9.3.1 Removing service cover

NOTE

- *Follow the procedure below to remove main parts and components. For mounting follow the reverse procedure of removal.*
- *Do not expose the refrigerant cycle to the atmosphere for a long period to avoid moisture or dust entering into the cycle. Be sure to replace parts immediately after removing. Seal the refrigerant cycle when left unattached for a long period.*

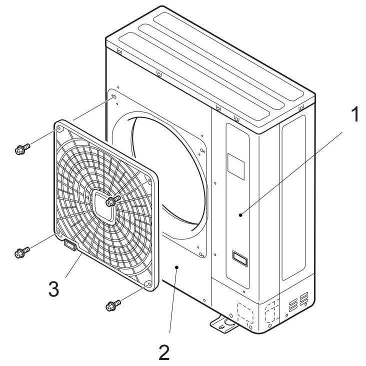
1 Pull downward and remove the service cover after removing 4 upper and lower fixing screws.
   - Pay attention not to drop the service cover.



1	Service cover

9.3.2 Remove outlet grille

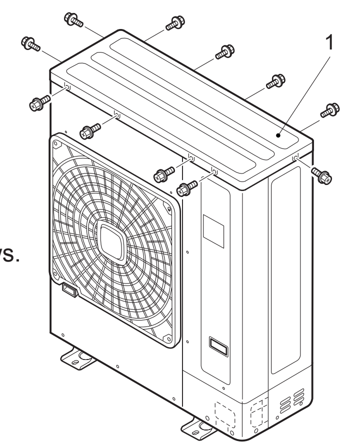
1 Remove 4 screws which fix the outlet grille.



1	Service cover
2	Air outlet grille
3	Shroud

9.3.3 Removing upper cover

1 Remove the upper cover upward after removing 11 fixing screws.



1	Upper cover

9.3.4 Removing bottom service cover and rear cover

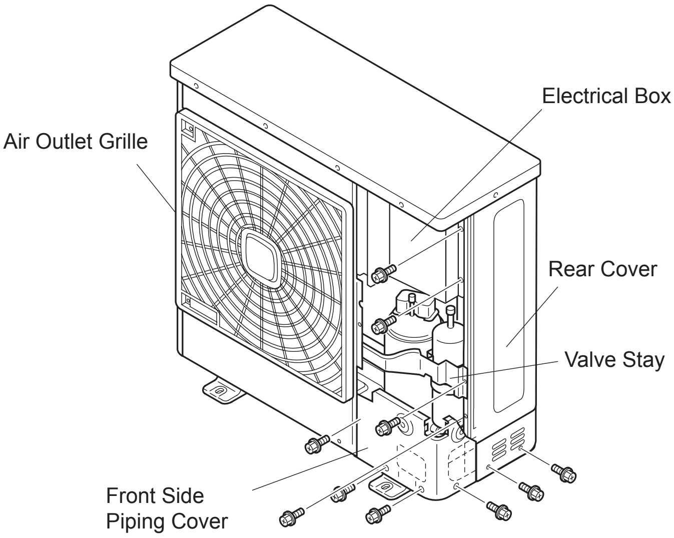
1 Remove 5 screws which fix the bottom service cover.

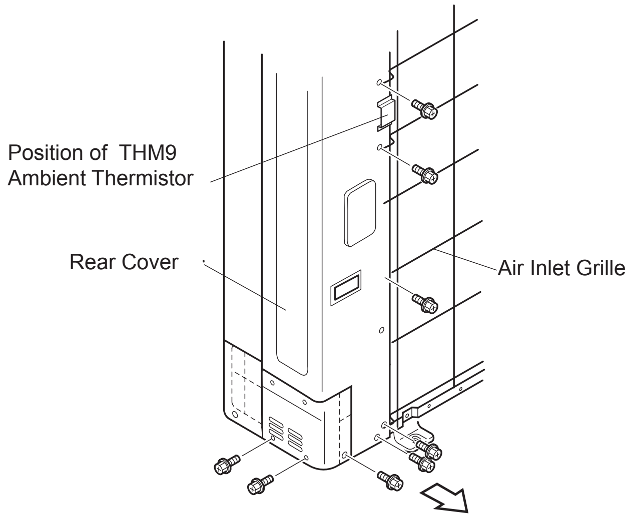
2 Pull and remove the bottom service cover.

3 Remove the upper cover following *"9.3.3 Removing upper cover"*.

4 Remove 8 screws which fix the rear cover.

5 Pull backward and remove the rear cover.





NOTE

Pay attention that the screw length for the ambient thermistor differs from other fixing screws.

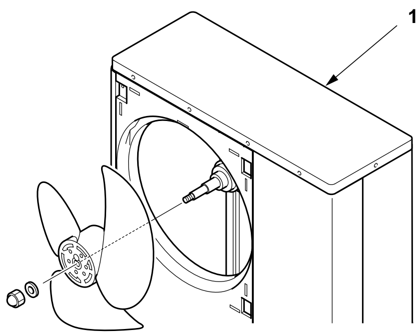
9.3.5 Removing outdoor fan motor

1 Remove the service cover following *"9.3.1 Removing service cover"*.

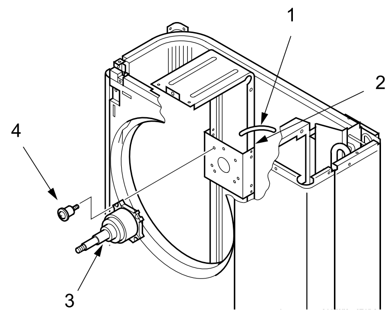
2 Remove the outlet grille following *"9.3.2 Remove outlet grille"*.

3 Remove the upper cover following *"9.3.3 Removing upper cover"*.

4 To remove the propeller fan remove the cap nut and washer which fix the propeller fan onto the motor shaft. (Use a puller when the propeller fan and motor shaft are fixed too tightly).



1	Upper cover

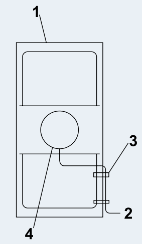


1	Fan motor lead wire
2	Motor clamp
3	Motor
4	Screw with spacer

5 Remove the fan motor connector from PCB in the electrical box (CN406 (Red)).

6 Cut the plastic tie with nippers which fixes the fan motor lead wire onto the motor clamp.

7 Remove 4 screws which fix the motor.

Model	RAS-(4-6)H(V)(R/N)(C/P)2E
Connector pin location	Inverter PCB - CN406
Motor fixing screws	4x M5 screws
1. Motor clamp 2. Fan motor lead wire 3. Plastic band 4. Fan motor	

NOTE

1. To mount the motor be sure to place the lead wire outlet downward. (Adjust the propeller fan and shroud not to contact with each other).

2. Fix the motor lead wire onto the motor clamp using a plastic tie as shown in the table on the previous page to avoid obstructing the propeller fan.

3. Mounting propeller fan: Insert the skidding protection part of the fan boss matching with the motor shaft notch; tighten the nut after the shaft screw fully comes out. (Tightening Torque 20 Nm)

4. Connect the motor lead wire to PCB1 of the electrical box. (Be sure to match colors of the PCB connectors and motor lead wire connectors).

5. Be sure to attach the outlet grille onto the shroud after replacing the fan motor.

9.3.6 Removing electrical box

NOTE

The images may differ in some details with respect to the final product.

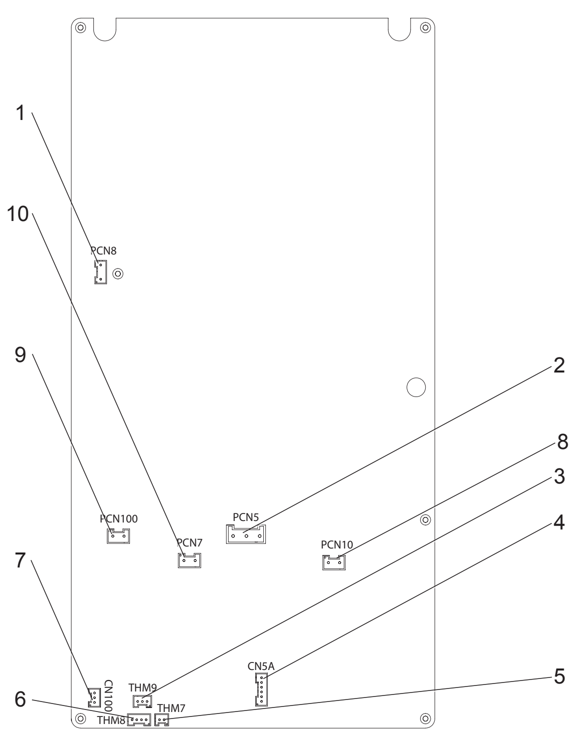
1 Disassembly the upper cover according to the item *"9.3.3 Removing upper cover".*

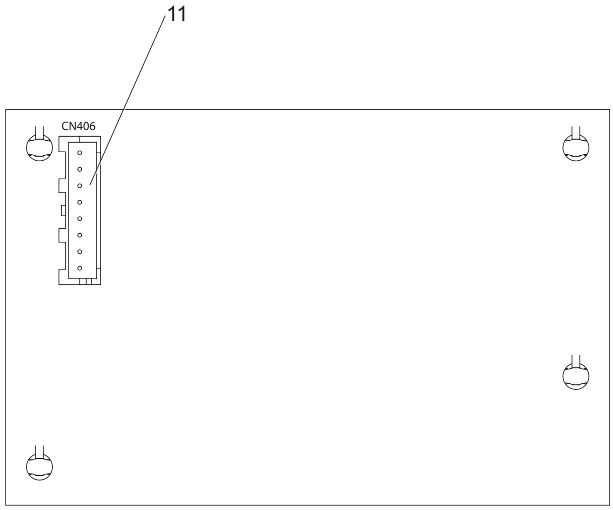
2 Disassembly the service cover according to the item *"9.3.1 Removing service cover".*

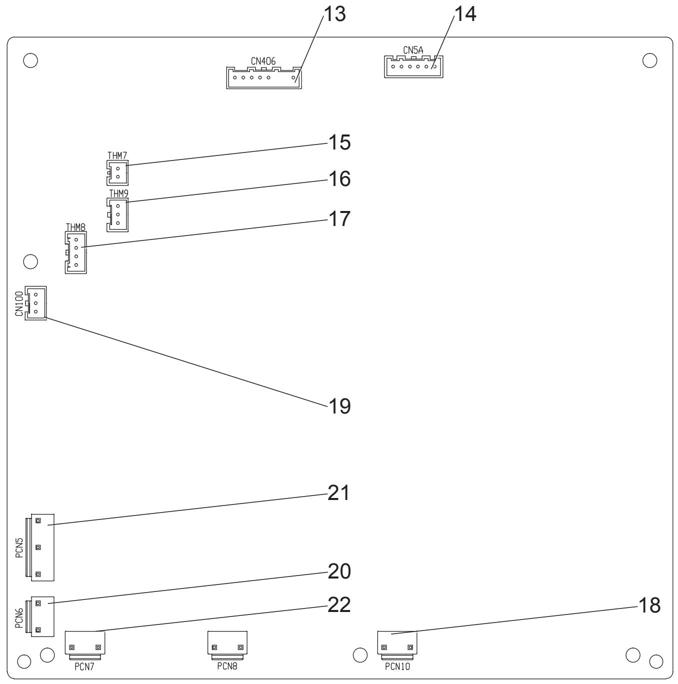
3 Remove the 6 fixing screws **-1-** of the electrical box.

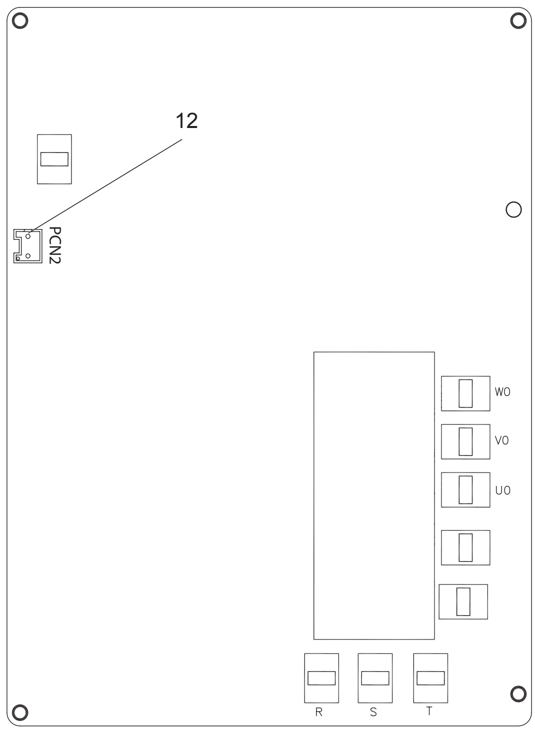
4 Disconnect the necessary connectors depending on the OU model.

Model	Code	Denomination	id.	Location
RAS-(4-6)HV(R/N)(C/P)2E -A-	CN406	Fan motor	11	PCB3
	PCN10	Low pressure switch (for control)	8	PCB1
	CN100	Pressure sensor	7	PCB1
	PCN7	Solenoid valve coil (SVA)	10	PCB1
	PCN100	4-way valve coil	9	PCB1
	THM7-9	Thermistors	3, 5, 6	PCB1
	PCN5	Crankcase heater	2	PCB1
	CN17	High pressure breaker Device	1	PCB1
	CN5A	Expansion valve	4	PCB1
	CN16	Compressor	-	Aerial
RAS-(4-6)H(R/N)(C/P)2E -B-	CN406	Fan motor	13	PCB1
	PCN6	4-way valve coil	20	PCB1
	CN5A	Expansion valve	14	PCB1
	PCN7	Solenoid valve coil (SVA)	22	PCB1
	CN100	Pressure sensor	19	PCB1
	CN17	High pressure breaker Device	12	PCB2
	PCN5	Crankcase heater	21	PCB1
	PCN10	Low pressure switch (for control)	18	PCB1
	THM7-9	Thermistors	15, 16, 17	PCB1
	CN16	Compressor	-	Aerial







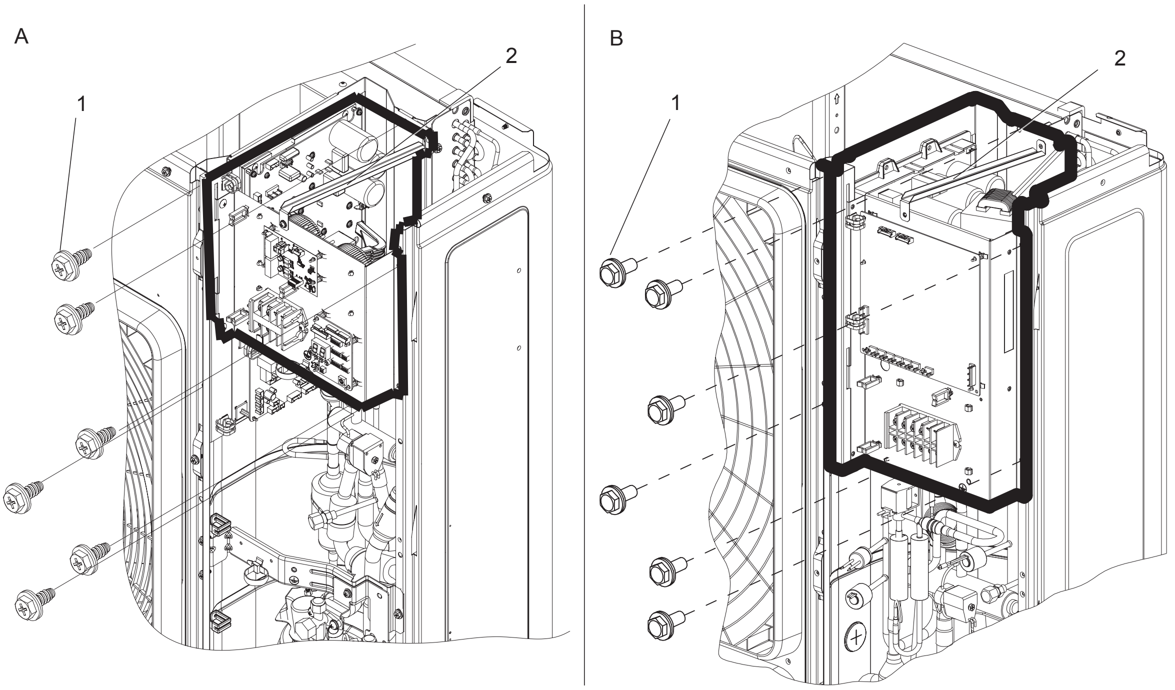


9

CAUTION

The electrical box is a heavy component, two personnel are recommended to handle it.

5 Pull up the electrical box **-A-** or **-B-** through the upper support **-2-** until it is free and can be removed from the front.



6 Disassembly the valve coils according to the items.

- *"9.3.9 Removing 4-way valve coil"*
- *"9.3.10 Removing electronic expansion valve coil"*
- *"9.3.11 Removing solenoid valve coil (SVA)"*

7 Disassembly the thermistors according to the items.

- *"THM9 - Thermistor for discharge gas temperature (Td)"*
- *"THM8 - Thermistor for evaporating temperature (Te)"*
- *"THM7 - Thermistor for outdoor ambient temperature (Ta)"*

8 Disassembly the pressure switch control wires and Faston connectors according to the item *"9.3.8 Removing the High pressure switch and Pressure switch for control"*.

9 Assembly the new electrical box.

NOTE

The spare electrical box is supplied with new thermistors, valve coils and pressure switch control wires with the Faston connectors.

a. Insert the radiation fin **-3-** into the U-notch on the partition plate **-2-** and place the fin on the fan box side.

b. Attach the electrical box fitting **-1-** with the partition plate.

c. Assembly the pressure switch control wires and Faston connectors according to the item *"9.3.8 Removing the High pressure switch and Pressure switch for control"*.

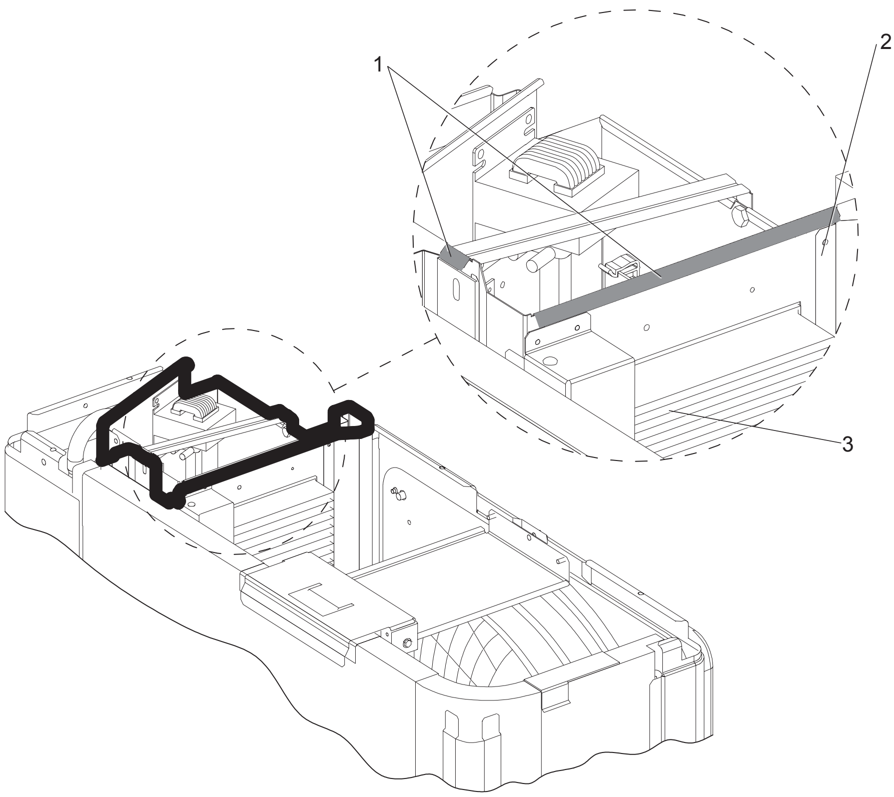
d. Assembly the thermistors according to the items.

- *"THM9 - Thermistor for discharge gas temperature (Td)"*
- *"THM8 - Thermistor for evaporating temperature (Te)"*
- *"THM7 - Thermistor for outdoor ambient temperature (Ta)"*

e. Assembly the valve coils according to the items.

- *"9.3.9 Removing 4-way valve coil"*
- *"9.3.10 Removing electronic expansion valve coil"*
- *"9.3.11 Removing solenoid valve coil (SVA)"*

10 Connect all the connectors listed in the table above depending on the OU model.



NOTE

The figure corresponds to a RAS-(4-6)H(R/N)(C/P)2E unit.

11 Mount the 6 fixing screws **-1-** of the electrical box.

12 Assembly the service cover according to the item *"9.3.1 Removing service cover"*.

13 Assembly the upper cover according to the item *"9.3.3 Removing upper cover"*.

9.3.7 Removing the compressor

1 Disassembly the service cover according to the item *"9.3.1 Removing service cover"*.

2 Disassembly the bottom service cover and rear cover according to the item *"9.3.4 Removing bottom service cover and rear cover"*.

3 Collect the refrigerant according to the item *"3.4 Refrigerant charge"*.

- If the outdoor unit is installed close to a wall remove the refrigerant piping and move the unit from the wall.

4 Open the soundproof cover **-3-** wrapped around the compressor and remove it.

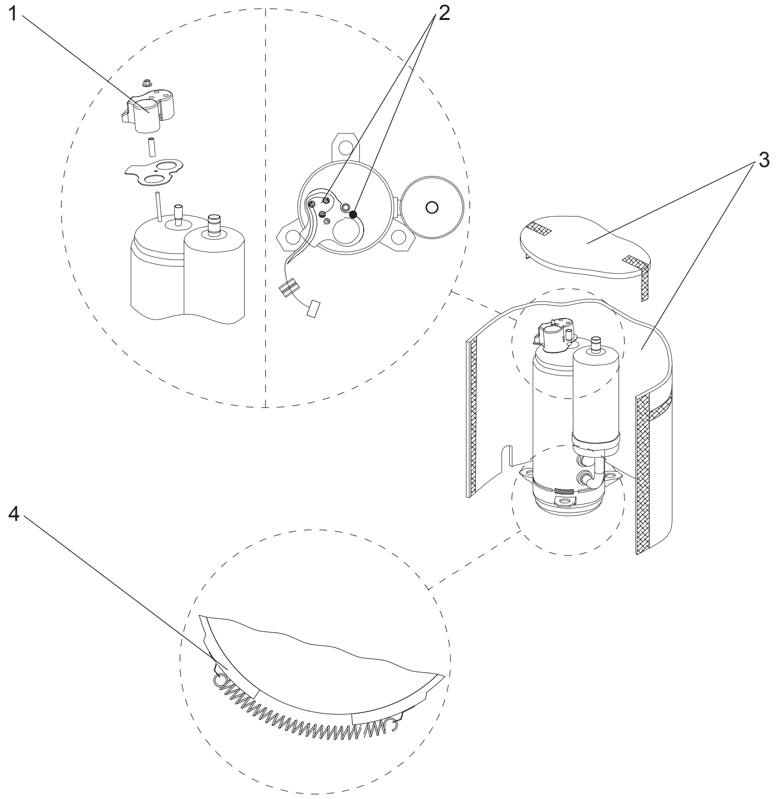
5 Remove the terminal box cover **-1-** on top of the compressor.

NOTE

Connecting wires in wrong order at reassembling may result in compressor damage.

6 Identify and disconnect the compressor wires and the thermostat **-2-** in the terminal box on top of the compressor.

7 Remove the crankcase heater **-4-**.



8 Protect the nearest thermistor **-5-** with a wet cloth.

9 Close the check joints **-2-** and **-6-**.

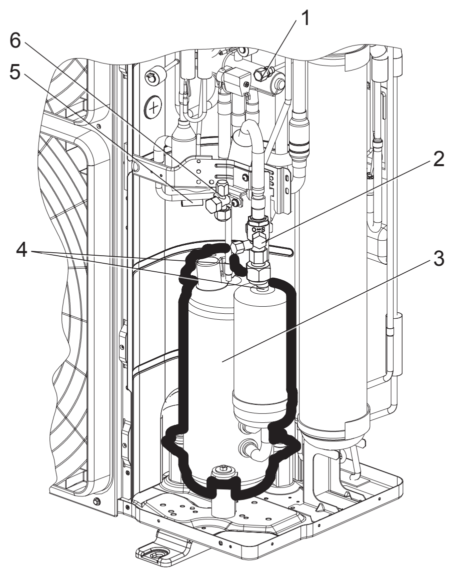
10 Charge the check joint **-1-** with nitrogen and refill the compressor piping.

NOTE

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

11 Heat the brazed connection **-4-** between the compressor and the pipes with a brazing unit until the brazing is undone.

12 Remove the suction pipe and discharge pipe from the compressor **-3-**.



13 Seal the suction and discharge pipes with a tape to protect the compressor from dust.

14 Remove the 2 nuts **-1-** which fix the compressor.

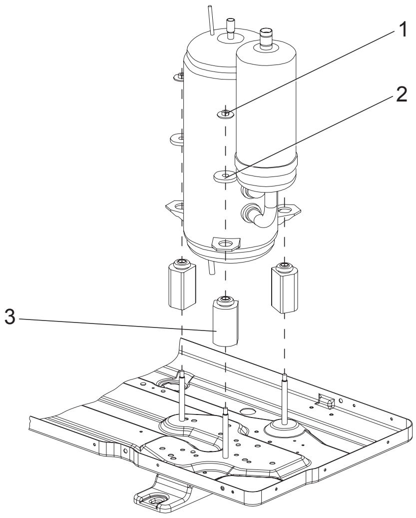
15 Remove the vibration-proof rubber **-2-** and the vibration-proof rubber **-3-**.

CAUTION

- *To remove the compressor the liquid stop valve pipe should be moved (bent) to the right side hand. PAY CLOSE ATTENTION not to crush to break the pipe.*
- *The compressor is a heavy component, two personnel are recommended to handle it.*

16 Remove the compressor by lifting it up with inclining forward.

17 Install the new vibration-proof rubber **-3-**.



CAUTION

- *Compressor piping must be connected by brazing. MAKE SURE that any flammable material is not around before heating with burner, the oil inside the piping may flame up.*
- *The replacement of the compressor should be done immediately after removing. Seal the suction and discharge pipes when the refrigerant cycle is left unattached for a long period.*
- *For piping at reassembling ensure that the compressor terminal numbers and wiring mark band codes are matched.*

18 Place the new compressor **-4-** in its place.

19 Protect the compressor side pipping **-2-** with a wet cloth **-3-**.

NOTE

A wet cloth will cool the compressor side piping in order to avoid the brazing material from entering the compressor.

20 Remove the tapes of new compressor right before the brazing and face the piping with the compressor.

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

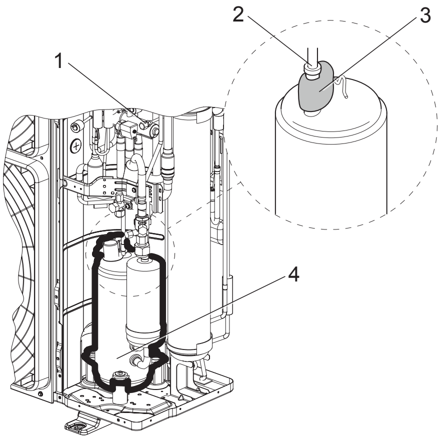
22 Charge the check joint **-1-** with nitrogen and refill the compressor piping.

NOTE

- *Be sure to separate the blazing burner flame sufficiently from the wires and electrical components around the brazed part in order to avoid burning.*
- *PAY CLOSE ATTENTION not to let the filler metal enter into the compressor which may result in compressor damage.*
- *Refer to the table for the recommended amount of brazing material. If using more brazing than the recommended amount, it may drop into the pipes.*

Thickness of brazing material	Piping diameter (refrigerant cycle side) (mm)						
	Ø6.35	Ø9.5	Ø12.7	Ø15.9	Ø19.1	Ø22.2	Ø28.2
Ø1.6mm	25	30	35	75	100	110	225
Ø2.0mm	15	15	20	45	55	70	135
Ø2.4mm	10	10	15	30	35	45	90

23 Braze the connection **-2-** between the compressor and the pipes with a brazing unit.



24 Install the vibration-proof rubber and thigten the 2 nuts for fixing the compressor.

- Tightening Torque: 6 Nm

CAUTION

Incorrect wiring numbers may result in inverse rotation and damage of the compressor.

25 Check if the Faston terminal and the thermostat have any abnormality and connect it in the terminal box making sure the assembly order.

- If the Faston terminal is identified faulty replace with a new one.

26 Ensure the pull out force greater than 20 Nm.

27 Ensure the fixture of the lead wires.

28 Assembly the terminal box and tighten the closing nut.

- Tightening Torque: 3.0 Nm

29 Assembly the crankcase heater without torsion and gap to the compressor.

30 Wrap the sound-proof cover around the compressor.

31 Assembly the top of sound-proof cover.

32 Charge new refrigerant according to the item *“3.4 Refrigerant charge”*.

33 Assembly the bottom service cover and rear cover according to the item *“9.3.4 Removing bottom service cover and rear cover”*.

34 Assembly the service cover according to the item *“9.3.1 Removing service cover”*.

9.3.8 Removing the High pressure switch and Pressure switch for control

1 Disassembly the service cover according to the item *“9.3.1 Removing service cover”*.

2 Disassembly the bottom service cover and rear cover according to the item *“9.3.4 Removing bottom service cover and rear cover”*.

3 Collect the refrigerant according to the item *“3.4 Refrigerant charge”*.

- If the outdoor unit is installed close to a wall remove the refrigerant piping and move the unit from the wall.

◆ **High Pressure Switch**

a. Disconnect the Faston terminals **-1-**.

b. Move all cables and remove the necessary components to leave the working area free.

c. Protect the 4-way **-5-** valve with a wet cloth.

d. Protect the check valve with a wet cloth.

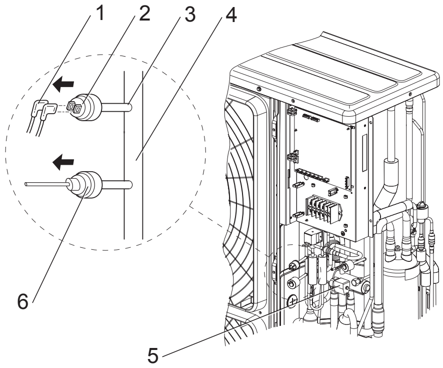
e. Protect the Pressure Sensor **-6-** for Discharge Pipe **-4-** with a wet cloth.

f. Heat the brazing joint **-3-** between the High Pressure Switch **-2-** and the Discharge Pipe **-4-** until the switch is released.

g. Remove the High Pressure Switch **-2-** and install the new one.

h. Protect the new High Pressure Switch **-2-** with a wet cloth.

i. Braze the connection **-3-** to the Discharge Pipe **-4-** until the switch is properly installed.



j. Allow the brazing to cool down for a few minutes.

k. Remove all used protections and wet cloths.

l. Move the cables until they are the same as they were originally.

m. Connect the Faston terminals to the switch.

9

◆ **Pressure sensor for Discharge Pipe**

a. Disconnect the Pressure Sensor CN100 conntector in PCB1 according to the item *“9.3.6 Removing electrical box”*.

b. Move all cables and remove the necessary components to leave the working area free.

c. Protect the 4-way **-3-** valve with a wet cloth.

d. Protect the check valve with a wet cloth.

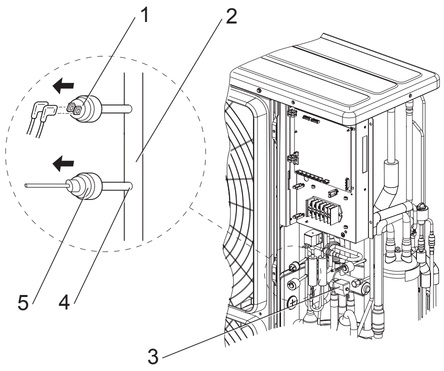
e. Protect the High Pressure Switch **-1-** with a wet cloth.

f. Heat the brazing joint between **-4-** the Pressure sensor **-5-** and the discharge pipe **-2-** until the sensor is released.

g. Remove the sensor **-5-** with his wire and install the new one.

h. Protect the new sensor with a wet cloth.

i. Braze the connection **-4-** to the Discharge Pipe **-2-** until the sensor is properly installed.



j. Allow the brazing to cool down for a few minutes.

k. Remove all used protections and wet cloths.

l. Move the cables until they are the same as they were originally.

m. Install the wire of the new sensor as it was originally and connect the PCB1 according to the item *"9.3.6 Removing electrical box"*.

◆ **Pressure switch for control on Suction Pipe**

a. Disconnect the Faston terminals **-1-**.

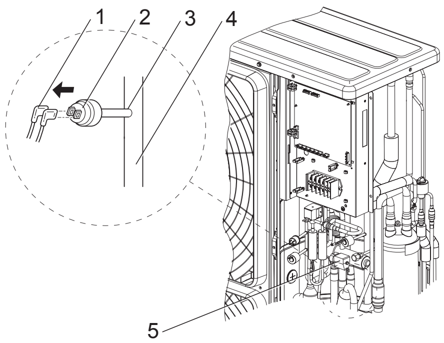
b. Move all cables and remove the necessary components to leave the working area free.

c. Protect the 4-way valve **-5-** with a wet cloth.

d. Protect the check valve with a wet cloth.

e. Heat the brazing joint **-3-** between the Pressure Switch for control **-2-** and the Suction Pipe **-4-** until the switch is released.

f. Remove the Pressure Switch for control **-2-** and install the new one.



g. Protect the new Pressure Switch for control **-2-** with a wet cloth.

h. Braze the connection **-3-** to the Suction Pipe **-4-** until the switch is properly installed.

i. Allow the brazing to cool down for a few minutes.

j. Remove all used protections and wet cloths.

k. Move the cables until they are the same as they were originally.

l. Connect the Faston terminals to the switch.

4 Charge new refrigerant according to the item *"3.4 Refrigerant charge"*.

5 Assembly the bottom service cover and rear cover according to the item *"9.3.4 Removing bottom service cover and rear cover"*.

6 Assembly the service cover according to the item *"9.3.1 Removing service cover"*.

9.3.9 Removing 4-way valve coil

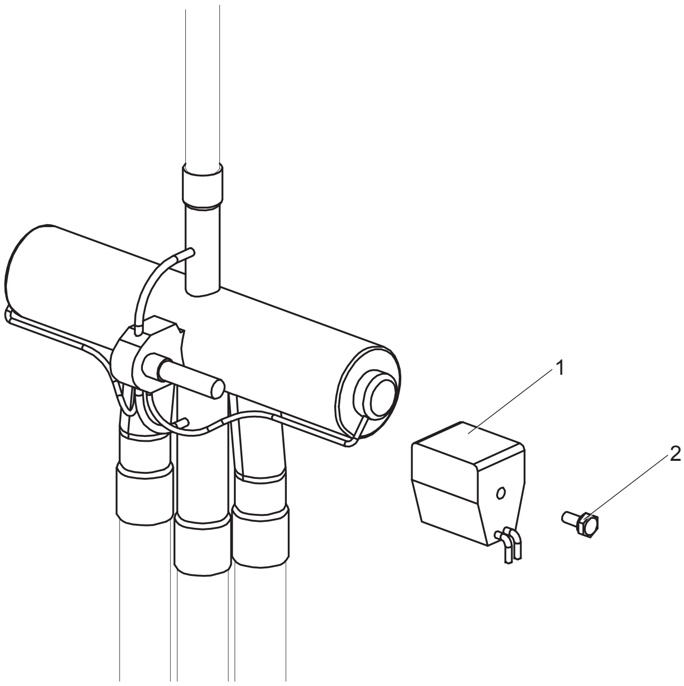
1 Remove the service cover, the bottom service cover, the rear cover and the upper cover following *"9.3.1 Removing service cover"*, *"9.3.4 Removing bottom service cover and rear cover"* and *"9.3.3 Removing upper cover"*.

2 Disconnect the connector on the control PCB of the electrical box.

- PCN100: RAS-(4-6)HV(R/N)(C/P)2E
- PCN6: RAS-(4-6)H(R/N)(C/P)2E

3 Remove 1 fixing screw **-2-** to remove the reversing valve coil **-1-**.

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



NOTE

Fix the wires by plastic bands to the original position.

9.3.10 Removing electronic expansion valve coil

1 Disassembly the service cover according to the item *"9.3.1 Removing service cover"*.

2 Disassembly the rear cover according to the item *"9.3.4 Removing bottom service cover and rear cover"*.

3 Disconnect the CN5A connector **-1-** on the control PCB1 of the electrical box.

4 Cut the necessary plastic ties to remove the expansion valve coil wire.

5 Hold the coil **-2-** of the expansion valve **-3-** and pull out upward.

NOTE

It is easier to disassembly the expansion valve coil if it is rotated while pulling it upward.

6 Disassembly the expansion valve coil **-2-** with his wire and install the new one.

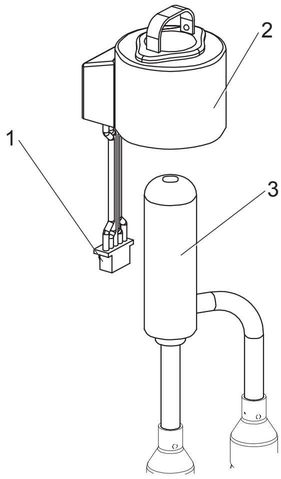
7 Assembly the new expansion valve coil **-2-** by inserting the expansion valve **-3-** inside.

NOTE

- *The expansion valve coil is equipped with a lock mechanism.*
- *Do not apply an excessive force to the coil when pressing it into the slot. Otherwise, it may cause damage to the piping or deform the coil bracket avoiding a properly fixation.*

8 Rotate the expansion valve coil **-2-** until the sound of locking is heard.

9 Connect the CN5A connector **-1-** on the control PCB1 of the electrical box.



10 Fix the expansion valve coil wire with plastic ties as it was originally.

11 Assembly the rear cover according to the item *"9.3.4 Removing bottom service cover and rear cover"*.

12 Assembly the service cover according to the item *"9.3.1 Removing service cover"*.

9.3.11 Removing solenoid valve coil (SVA)

1 Disassembly the service cover according to the item *"9.3.1 Removing service cover"*.

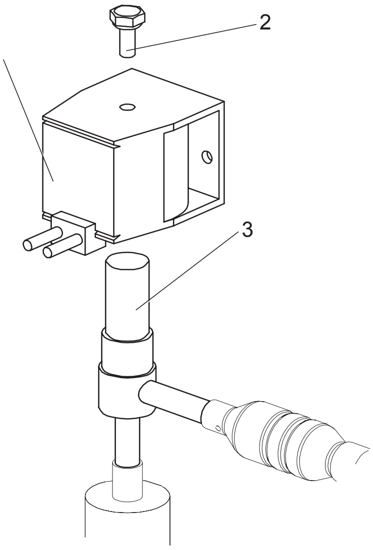
2 Disconnect the PCN7 connector on the control PCB1 of the electrical box.

3 Cut the necessary plastic ties to remove the solenoid valve coil wire.

4 Remove 1 fixing screw **-2-** to the valve **-3-** and disassembly the solenoid valve coil **-1-**.

5 Remove the solenoid valve coil **-1-** with his wire and install the new one.

6 Mount the fixing screw **-2-**.



7 Connect the PCN7 (SVA) connector on the control PCB1 of the electrical box.

8 Fix the valve coil wire with plastic ties as it was originally.

9 Assembly the service cover according to the item *"9.3.1 Removing service cover"*.

9.3.12 Removing 4-way valve

1 Disassembly the service cover according to the item *"9.3.1 Removing service cover"*.

2 Disassembly the rear cover according to the item *""9.3.4 Removing bottom service cover and rear cover"*.

3 Collect the refrigerant according to the item *""3.4 Refrigerant charge"*.

4 Disassembly the reversing valve coil **-3-** according to the item *"9.3.9 Removing 4-way valve coil"*.

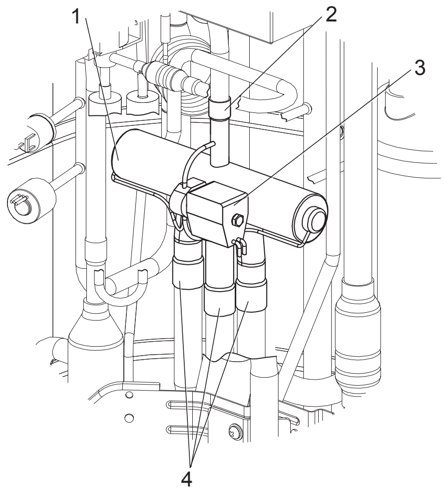
5 Disassembly the electrical box according to the item *"9.3.6 Removing electrical box".*

6 Move all cables and remove the necessary components to leave the working area free.

7 Protect all the elements located around the reversing valve and the brazing area with a wet cloth.

8 Charge the stop valve for liquid with nitrogen and refill the reverse valve piping.

9 Heat the brazed connection **-2-** and **-4-** between the reversing valve **-1-** and the piping with a brazing unit until the brazing is undone.



10 Remove the pipes from the reversing valve.

11 Seal the pipes with a tape to protect the reversing valve and the cycle assembly from dust.

12 Remove reversing valve **-1-** from the assemblies and install the new one.

13 Protect the new reversing valve **-1-** with a wet cloth.

14 Braze the connections **-2-** and **-4-** between the reversing valve **-1-** and the piping until the valve is properly installed.

15 Allow the brazing to cool down for a few minutes.

16 Remove all used protections and wet cloths.

17 Assembly the electrical box according to the item *“9.3.6 Removing electrical box”.*

18 Move the cables until they are the same as they were originally.

19 Assembly the reversing valve coil **-3-** according to the item *“9.3.9 Removing 4-way valve coil”.*

20 Charge new refrigerant according to the item *“3.4 Refrigerant charge”*.

21 Assembly the rear cover according to the item *“9.3.4 Removing bottom service cover and rear cover”*.

22 Assembly the service cover according to the item *“9.3.1 Removing service cover”*.

9.3.13 Removing Electronic expansion valve

1 Disassembly the service cover according to the item *“9.3.1 Removing service cover”*.

2 Disassembly the rear cover according to the item *“9.3.4 Removing bottom service cover and rear cover”*.

3 Disassembly the electrical box according to the item *“9.3.6 Removing electrical box”.*

4 Collect the refrigerant according to the item *“3.4 Refrigerant charge”*.

5 Disassembly the Electronic expansion valve coil **-1-** according to the item *“9.3.10 Removing electronic expansion valve coil”.*

6 Protect all the elements located around the expansion valve and the brazing area with a wet cloth.

7 Charge the stop valve for liquid with nitrogen and refill the expansion valve piping.

8 Heat the brazed connection **-3-** between the expansion valve **-2-** and the piping with a brazing unit until the brazing is undone.

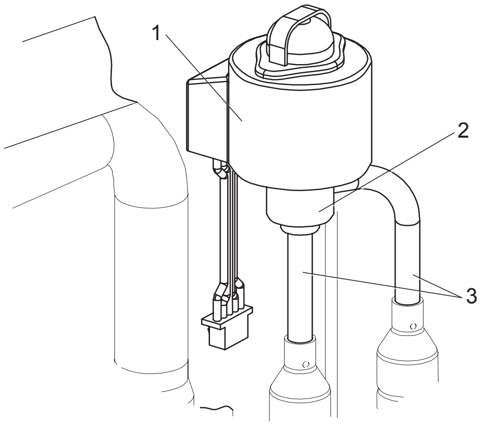
9 Remove the pipes from the expansion valve.

10 Seal the pipes with a tape to protect the reversing valve and the cycle assembly from dust.

11 Remove the electronic expansion valve **-2-** from the assemblies and install the new one.

12 Protect the new electronic expansion valve **-2-** with a wet cloth.

13 Braze the connections **-3-** between the expansion valve **-2-** and the piping until the valve is properly installed.



14 Allow the brazing to cool down for a few minutes.

15 Remove all used protections and wet cloths.

16 Assembly the Electronic expansion valve coil **-1-** according to the item *"9.3.10 Removing electronic expansion valve coil"*.

17 Charge new refrigerant according to the item *"3.4 Refrigerant charge"*.

18 Assembly the electrical box according to the item *"9.3.6 Removing electrical box".*

19 Assembly the rear cover according to the item *"9.3.4 Removing bottom service cover and rear cover"*.

20 Assembly the service cover according to the item *"9.3.1 Removing service cover"*.

9.3.14 Removing Solenoid valve

1 Remove the service cover according to the item *"9.3.1 Removing service cover"*.

2 Disassembly the electrical box according to the item *9.3.6 Removing electrical box".*

3 Collect the refrigerant according to the item *"3.4 Refrigerant charge"*.

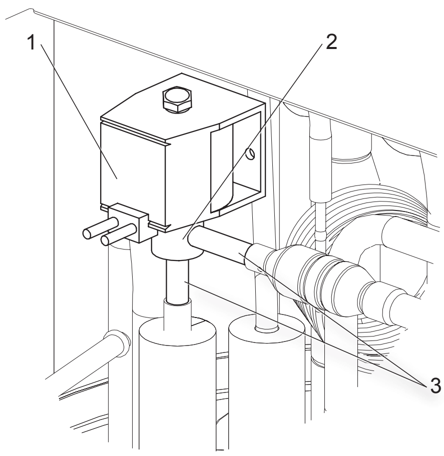
4 Remove the solenoid valve coil **-1-** according to the item *"9.3.11 Removing solenoid valve coil (SVA)"*.

5 Move all cables and remove the necessary components to leave the working area free.

6 Protect all the elements located around the solenoid valve and the brazing area with a wet cloth.

7 Charge the stop valve for liquid with nitrogen and refill the solenoid valve piping.

8 Heat the brazed connection **-3-** between the solenoid valve **-2-** and the piping with a brazing unit until the brazing is undone.



9 Remove the pipes from the solenoid valve.

10 Seal the pipes with a tape to protect the solenoid valve and the cycle assembly from dust.

11 Remove solenoid valve **-2-** from the assemblies and install the new one.

12 Protect the new solenoid valve **-2-** with a wet cloth.

13 Braze the connections **-3-** between the solenoid valve **-2-** and the piping until the valve is properly installed.

14 Allow the brazing to cool down for a few minutes.

15 Remove all used protections and wet cloths.

16 Move the cables until they are the same as they were originally.

17 Assembly the solenoid valve coil **-1-** according to the item *"9.3.11 Removing solenoid valve coil (SVA)"*.

18 Charge new refrigerant according to the item *"3.4 Refrigerant charge"*.

19 Assembly the electrical box according to the item *"9.3.6 Removing electrical box"*.

20 Assembly the service cover according to the item *"9.3.1 Removing service cover"*.

9.3.15 Disassembly / Assembly the Electrical components for RAS-(4-6)HV(R/N)(C/P)2E

DANGER

Check that all the LEDs on the inverter PCB (PCB2) are OFF. If necessary, wait a few minutes until all the LEDs are completely switched OFF.

CAUTION

- *When attaching the PCB, or when attaching the parts attached to the PCB, pay attention not to clamp any wiring between plates or electrical components.*
- *To connect wiring at reassembling, ensure that the terminal numbers and wiring mark band codes are matched. If connections are wrong, there is the possibility of wrong operation and to cause damage to electrical parts.*

◆ Opening / Closing Electrical box (P plate)

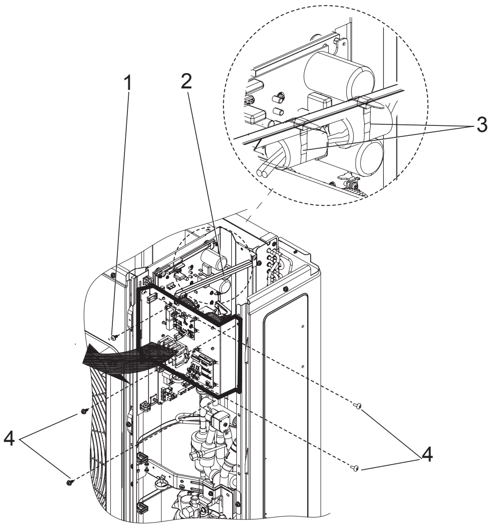
1 Disassembly the service cover according to the item *"9.3.1 Removing service cover"*.

2 Remove the fixing screw **-1-** of the electrical box upper support **-2-**.

3 Remove the 4 fixing screws **-4-** of the electrical box.

4 Disassembly the more convenient cover to access inside the electrical box and cut the plastic ties **-3-** that fixes the lead wire to the upper support.

- Upper cover according to the item *"9.3.3 Removing upper cover"*.
- Rear cover according to the item *"9.3.4 Removing bottom service cover and rear cover"*.



5 Open the P plate turning it clockwise approximately 90°.

6 Close the P plate turning it counter clockwise.

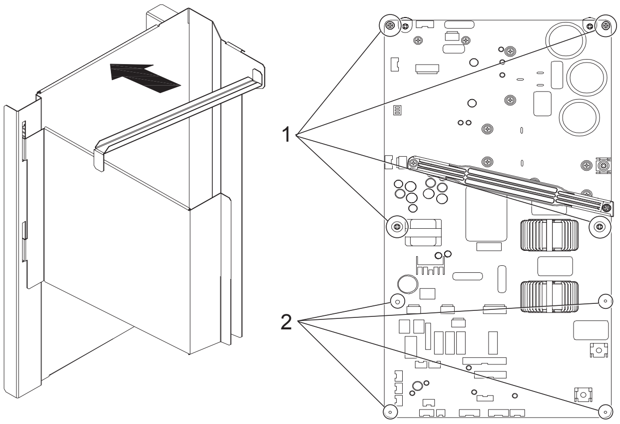
7 Fix the lead wire to the upper support with two plastic ties as it was originally.

8 Assembly the cover removed on Step 4.

9 Assembly the service cover according to the item *"9.3.1 Removing service cover"*.

◆ Disassembly / Assembly the Inverter module (PCB1)

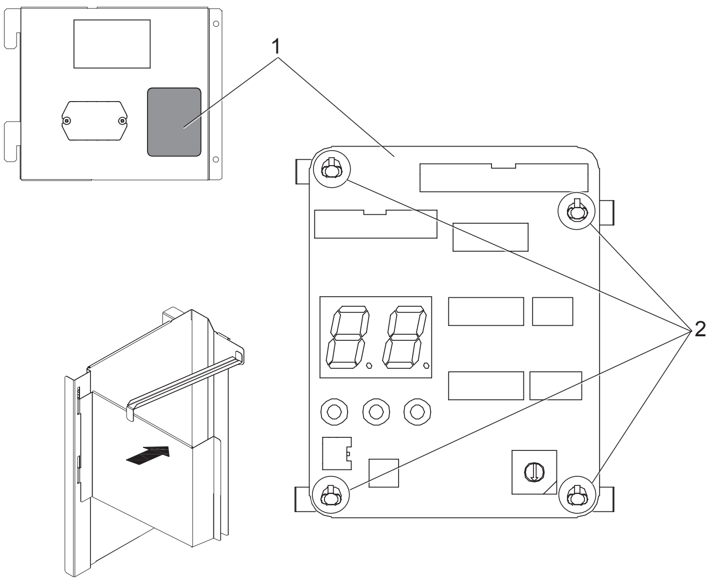
1 Disassembly the upper cover according to the item *"9.3.3 Removing upper cover".*
2 Open the electrical box according to the item *"Opening / Closing Electrical box (P plate)"*.
3 Disconnect all the wiring connected to the control PCB.
4 Remove the 4 fixing screws **-1-.**
5 Remove the 4 fixing holders **-2-** and disassembly the control PCB.
6 Assembly the new control PCB and fix it with 4 fixing holders **-2-**.
7 Assembly the 4 fixing screws **-1-**.



8 Connect all the wiring connected to the control PCB as it was originally.
9 Close the electrical box according to the item *"Opening / Closing Electrical box (P plate)"*.
10 Assembly the upper cover according to the item *"9.3.3 Removing upper cover".*

◆ Disassembly / Assembly the DSW module (PCB2)

1 Disassembly the service cover according to the item *"9.3.1 Removing service cover"*.
2 Disconnect all the wiring connected to the control PCB.
3 Remove the 4 fixing holders **-2-** and disassembly the control PCB2 **-1-**.
4 Assembly the new control PCB **-1-** and fix it with 4 holders **-2-**.



5 Connect all the wiring connected to the control PCB as it was originally.
6 Assembly the service cover according to the item *"9.3.1 Removing service cover"*.

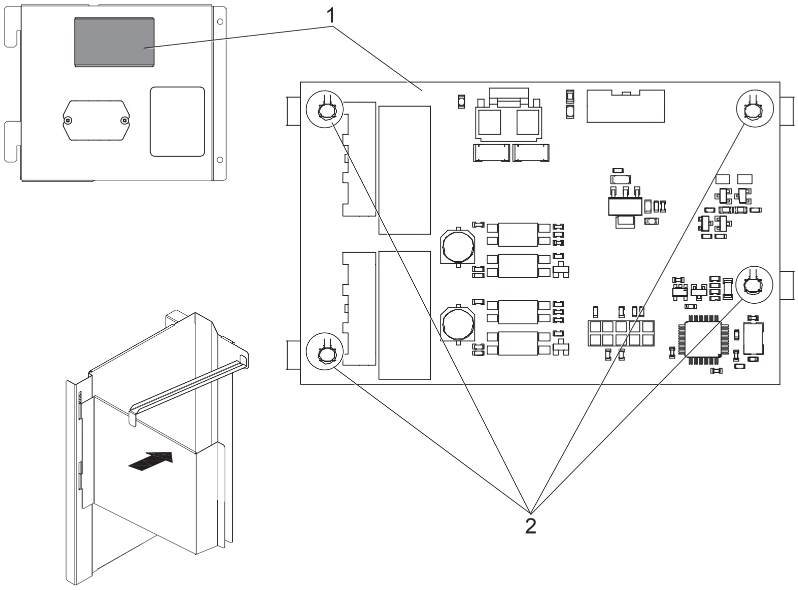
◆ Disassembly / Assembly the PCB3

1 Disassembly the service cover according to the item *“9.3.1 Removing service cover”*.

2 Disconnect all the wiring connected to the PCB.

3 Remove the 4 fixing holders **-2-** and disassembly the PCB **-1-**.

4 Assembly the new control PCB **-1-** and fix it with 4 holders **-2-**.



5 Connect all the wiring connected to the PCB as it was originally.

6 Assembly the service cover according to the item *“9.3.1 Removing service cover”*.

◆ Disassembly / Assembly the Terminal Board (TB)

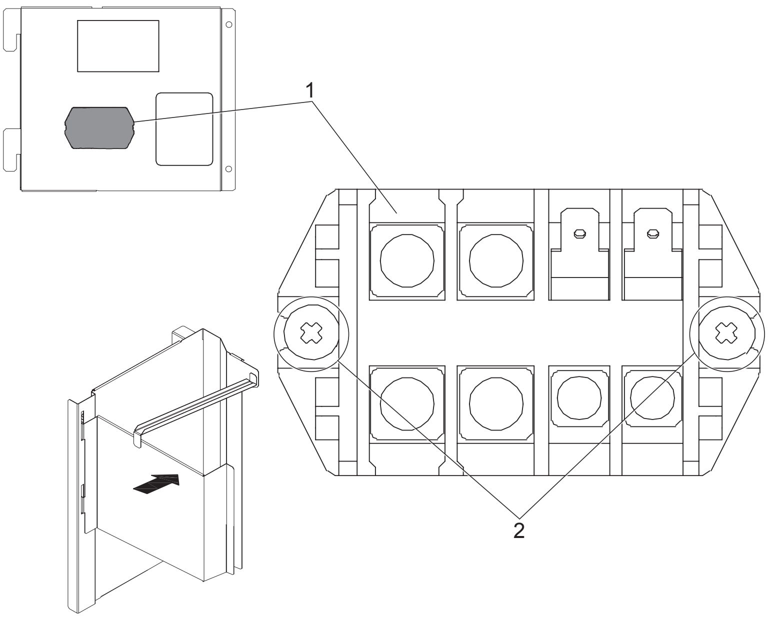
1 Disassembly the service cover according to the item *“9.3.1 Removing service cover”*.

2 Disconnect the wirings of terminal board.

- L
- N
- 2
- 1

3 Remove the 2 fixing screws **-2-** and disassembly the terminal board **-1-**.

4 Assembly the new terminal board **-1-** and fix it with 2 screws **-2-**.



⚠ CAUTION

To connect wiring at reassembling, ensure that the terminal numbers and wiring mark band codes are matched. If connections are wrong, there is the possibility of wrong operation and to cause damage to electrical parts.

5 Connect all the wiring connected to the control PCB as it was originally.

6 Assembly the service cover according to the item *“9.3.1 Removing service cover”*.

◆ Disassembly / Assembly DCL

1 Open the electrical box according to the item *"Opening / Closing Electrical box (P plate)"*.

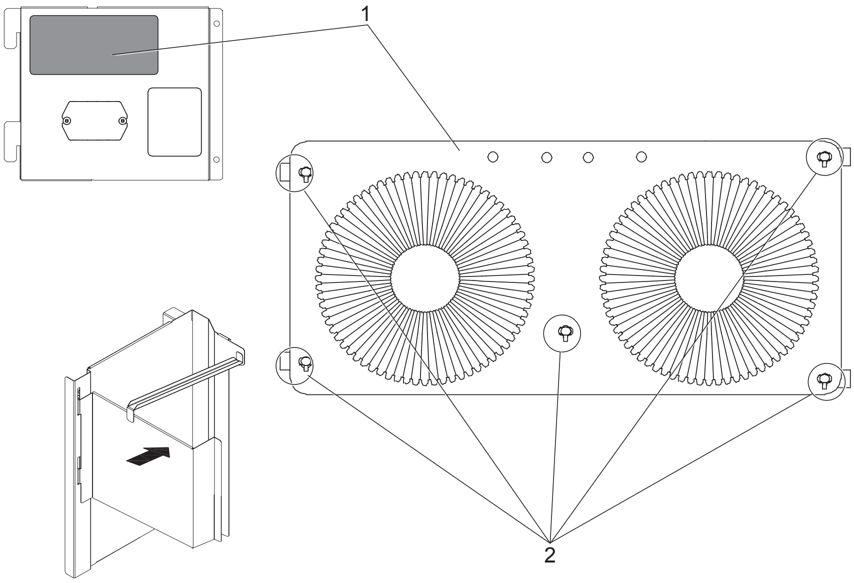
2 Disconnect the wirings and cut the plastic ties that fixes the lead wire from PCB1.

- L2
- L-COM
- L1

3 Remove the 5 fixing holders **-2-** and disassembly the DCL **-1-**.

4 Disassembly the DCL and the wiring.

5 Assembly the new DCL board **-1-** and fix it with 5 holders **-2-**.



⚠ **CAUTION**

To connect wiring at reassembling, ensure that the terminal numbers and wiring mark band codes are matched. If connections are wrong, there is the possibility of wrong operation and to cause damage to electrical parts.

6 Connect all the wiring connected to the control PCB and fix it as it was originally.

7 Close the electrical box according to the item *"Opening / Closing Electrical box (P plate)"*.

9.3.16 Disassembly / Assembly Electrical components for RAS-(4-6)H(R/N)(C/P)2E

DANGER

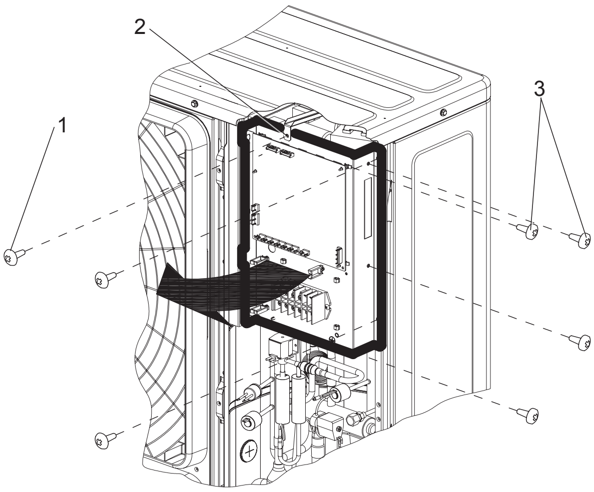
Check that all the LEDs on the inverter PCB (PCB2) are OFF. If necessary, wait a few minutes until all the LEDs are completely switched OFF.

CAUTION

- *When attaching the PCB, or when attaching the parts attached to the PCB, pay attention not to clamp any wiring between plates or electrical components.*
- *To connect wiring at reassembling, ensure that the terminal numbers and wiring mark band codes are matched. If connections are wrong, there is the possibility of wrong operation and to cause damage to electrical parts.*

◆ **Opening / Closing the Electrical box (P plate)**

1. Disassembly the service cover according to the item *"9.3.1 Removing service cover"*.
2. Remove the fixing screw **-1-** of the electrical box upper support **-2-**.
3. Remove the 6 fixing screws **-3-** of the electrical box.



4. Open the P plate turning it clockwise approximately 90°.
5. Close the P plate turning it counter clockwise.
6. Fix the lead wire to the upper support with two plastic ties as it was originally.
7. Assembly the service cover according to the item *"9.3.1 Removing service cover"*.

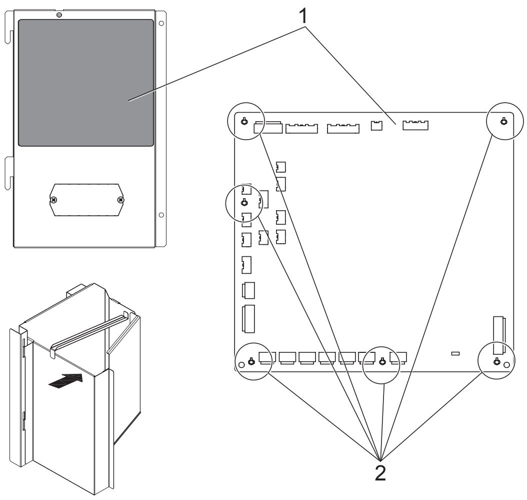
◆ Disassembly / Assembly the control PCB (PCB1)

1 Disassembly the service cover according to the item *“9.3.1 Removing service cover”*.

2 Disconnect all the wiring connected to the control PCB.

3 Remove the 6 fixing holders **-2-** and disassembly the control PCB **-1-**.

4 Assembly the new control PCB **-1-** and fix it with 6 holders **-2-**.



5 Connect all the wiring connected to the control PCB as it was originally.

6 Assembly the service cover according to the item *“9.3.1 Removing service cover”*.

◆ Disassembly / Assembly the Inverter module (PCB2)

1 Disassembly the upper cover according to the item *“9.3.3 Removing upper cover”.*

2 Open the electrical box according to the item *“Opening / Closing Electrical box (P plate)”*.

3 Disconnect all the wiring connected to the Inverter module.

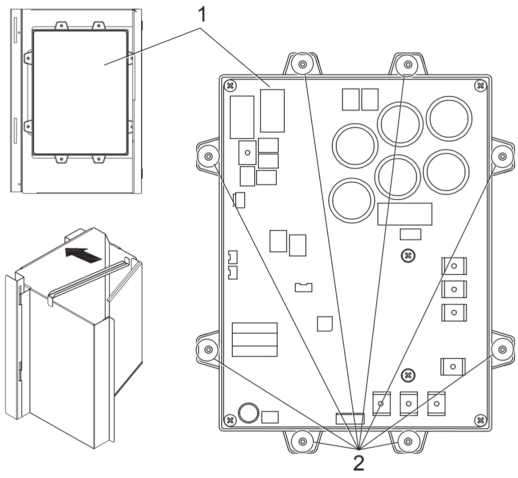
- DCL1 (Reactor)
- DCL2 (Reactor)
- CN331 (NF)
- CN16 Aerial connector (compressor)
- PCN2 (pressure switch control)
- CN206 (PCB communication)
- R, S, T (NF)

4 Remove the 8 fixing screws **-2-** and disassembly the control PCB **-1-**.

- Recommended the use of a flexible screwdriver or if necessary, remove the PCB3 according to the item *“Disassembly / Assembly the PCB3”* to improve the access to the right side screws.

5 Pull the Inverter and remove along with the plastic case and the radiation fin.

6 Assembly the new control PCB **-1-** and fix it with 8 screws **-2-**.



7 Connect all the wiring desconnected to the control PCB as it was originally.

8 Close the electrical box according to the item *"Opening / Closing Electrical box (P plate)"*.

9 Assembly the upper cover according to the item *"9.3.3 Removing upper cover".*

◆ Disassembly / Assembly the PCB3

1 Open the electrical box according to the item *"Opening / Closing Electrical box (P plate)"*.

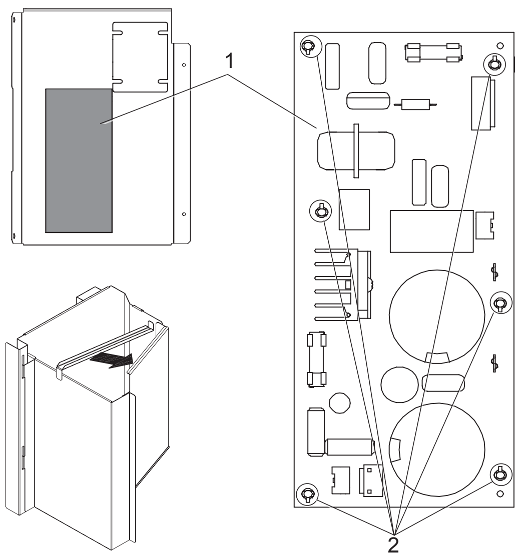
2 Disconnect all the wiring connected to the PCB.

- CN201
- CN202
- PCN201
- PCN202

3 Remove the 6 fixing holders **-2-** and disassembly the PCB3 **-1-**.

4 Disassembly the PCB3 **-1-** and the wiring.

5 Assembly the new control PCB **-1-** and fix it with 6 holders **-2-**.



6 Connect all the wiring connected to the control PCB as it was originally.

7 Close the electrical box according to the item *"Opening / Closing Electrical box (P plate)"*.

◆ Disassembly / Assembly the terminal board (TB)

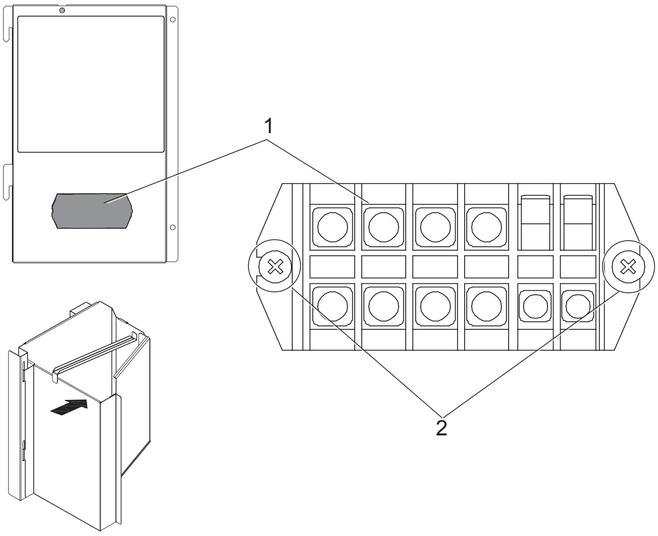
1 Disassembly the service cover according to the item *"9.3.1 Removing service cover"*.

2 Disconnect the wirings of terminal board **-1-**.

- 1
- 2
- L1
- L2
- L3
- N

3 Remove the 2 fixing screws **-2-** and disassembly the terminal board **-1-**.

4 Assembly the new terminal board **-1-** and fix it with 2 screws **-2-**.



⚠ **CAUTION**

To connect wiring at reassembling, ensure that the terminal numbers and wiring mark band codes are matched. If connections are wrong, there is the possibility of wrong operation and to cause damage to electrical parts.

5 Connect all the wiring connected to the control PCB as it was originally.

6 Assembly the service cover according to the item *"9.3.1 Removing service cover"*.

◆ Disassembly / Assembly the DCL

1 Open the electrical box according to the item *"Opening / Closing Electrical box (P plate)"*.

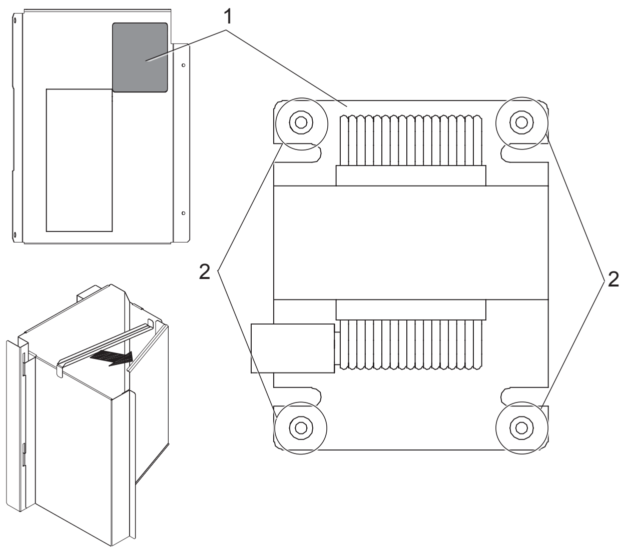
2 Disconnect the wirings and cut the plastic ties that fixes the lead wire from PCB2.

- DCL1
- DCL2

3 Remove the 5 fixing holders **-2-** and disassembly the DCL **-1-**.

4 Disassembly the DCL **-1-** and the wiring.

5 Assembly the new DCL board **-1-** and fix it with 5 holders **-2-**.



CAUTION

To connect wiring at reassembling, ensure that the terminal numbers and wiring mark band codes are matched. If connections are wrong, there is the possibility of wrong operation and to cause damage to electrical parts.

6 Connect all the wiring connected to the control PCB and fix it as it was originally.

7 Close the electrical box according to the item *"Opening / Closing Electrical box (P plate)"*.

◆ Disassembly / Assembly the Noise filter

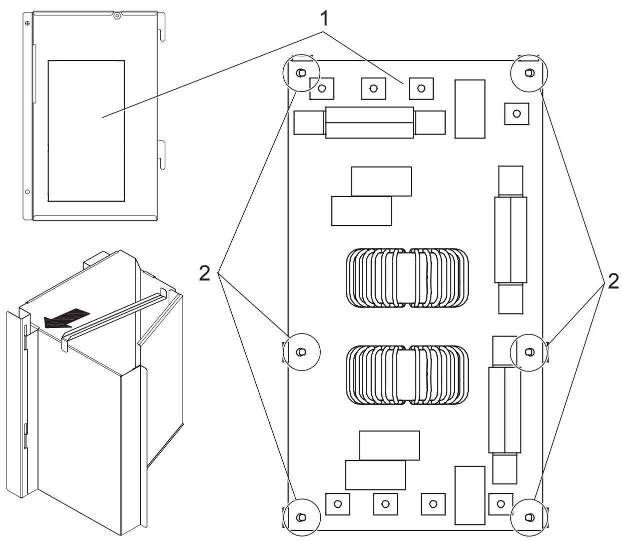
1 Open the electrical box according to the item *"Opening / Closing Electrical box (P plate)"*.

2 Disconnect the wirings of Noise filter:

- T1	- L1
- T2	- L2
- T3	- L3
- N	- N

4 Remove the 6 fixing holders **-2-** and disassembly the Noise filter **-1-**.

5 Assembly the new Noise filter **-1-** and fix it with 6 holders **-2-**.



NOTE

To connect wiring at reassembling, ensure that the terminal numbers and wiring mark band codes are matched. If connections are wrong, there is the possibility of wrong operation and to cause damage to electrical parts.

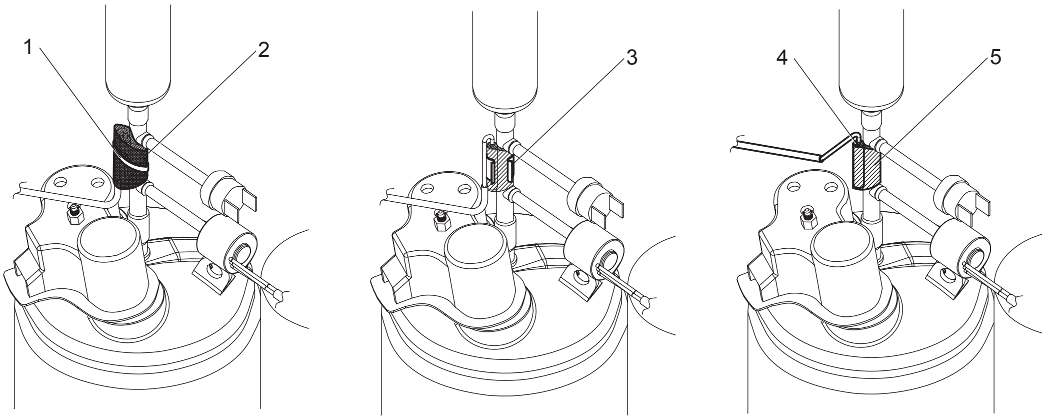
6 Connect all the wiring connected to the noise filter and fix it as it was originally.

7 Close the electrical box according to the item *"Opening / Closing Electrical box (P plate)"*.

9.3.17 Removing pipe thermistors

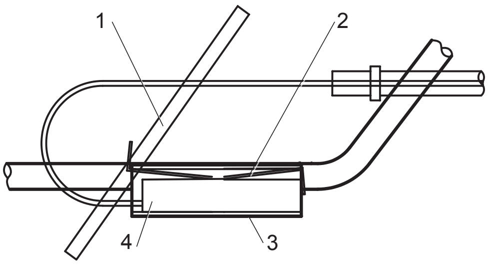
◆ **THM9 - Thermistor for discharge gas temperature (Td)**

1 Disassembly the service cover according to the item *"9.3.1 Removing service cover"*.
2 Cut the plastic tie **-1-**.
3 Remove the butyl sheet **-2-**.
4 Pull out the thermo spring **-3-** from the feeler pipe.
5 Remove the aluminium tape **-5-** and disassembly the thermistor **-4-**.
6 Pull the wire off along its routing, release the clamps fixing the wire and pass all the vinyl pipe until the electrical box.
7 Disconnect the thermistor **-4-** from the PCB1 connector.
8 Assembly the new thermistor **-4-** and stick it with the aluminium tape **-5-** in the pipe.
9 Assembly the thermo spring **-3-**.
10 Protect with the butyl sheet **-2-** and fix it with a plastic tie **-1-**.
11 Install the wire until it is the same as it was originally.
12 Connect the thermistor **-4-** to the PCB1 connector.
13 Assembly the service cover according to the item *"9.3.1 Removing service cover"*.



◆ **THM8 - Thermistor for evaporating temperature (Te)**

1 Disassembly the rear cover according to the item *"9.3.4 Removing bottom service cover and rear cover"*.
2 Disassembly the service cover according to the item *"9.3.1 Removing service cover"*.
3 Cut the plastic tie **-1-**.
4 Remove the butyl sheet.
5 Pull out the thermo clip **-2-** from the feeler pipe **-3-** and disassembly the thermistor **-4-**.
6 Pull the wire off along its routing, release the clamps fixing the wire and pass all the vinyl pipe until the electrical box.
7 Disconnect the thermistor **-4-** from the PCB1 connector.
8 Assembly the new thermistor **-4-** inside the feeler pipe **-3-** and fix it with the thermo clip **-2-**.
9 Protect with the butyl sheet and fix it with a plastic tie **-1-**.
10 Install the wire until it is the same as it was originally.
11 Connect the thermistor **-4-** to the PCB1 connector.
12 Assembly the service cover according to the item *"9.3.1 Removing service cover"*.
13 Assembly the rear cover according to the item *"9.3.4 Removing bottom service cover and rear cover"*.



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◆ THM7 - Thermistor for outdoor ambient temperature (Ta)

1 Remove the fixing screw **-1-** of the thermistor plate **-2-**.

2 Unclip the thermistor **-3-** from the plate **-4-** and remove the thermistor plate **-2-**.

3 Disassembly the rear cover according to the item *"9.3.4 Removing bottom service cover and rear cover"*.

4 Disassembly the service cover according to the item *"9.3.1 Removing service cover"*.

5 Pull the wire off along its routing, release the clamps fixing the wire and pass all the vinyl pipe until the electrical box.

6 Disconnect the thermistor **-3-** from the PCB1 connector.

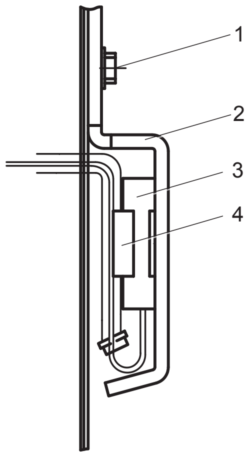
7 Install the wire until it is the same as it was originally.

8 Connect the thermistor **-3-** to the PCB1 connector.

9 Assembly the service cover according to the item *"9.3.1 Removing service cover"*.

10 Assembly the rear cover according to the item *""9.3.4 Removing bottom service cover and rear cover"*.

11 Clip the thermistor **-3-** to the plate **-4-** and assembly the thermistor plate **-2-** with the fixing screw **-1-**.



10. Troubleshooting

Index

10.1 Initial troubleshooting

10.1.1 RAS-3HVRC2

10.1.1.1 Simple checking procedure by means of the 7-segment display

1 Turn on the indoor unit connected to the outdoor unit.

2 Turn on the outdoor unit

3 Auto-addressing starts. (Outdoor unit printed circuit board PCB1).

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

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

Cause	Indication	Remarks
A. The indoor unit is not supplied with power.	03	Continues to flash after 30 seconds.
B. Disconnection of the operating line between the outdoor units and the indoor unit.	03	Continues to flash after 30 seconds.
C. Duplicated settings of the indoor unit number on the rotary switch RSW, ***see*** the description of the alarm code “35”).	—	—

10.1.1.2 Power supply failure to the indoor unit and the remote control switch (PC-ARFP1E)

- The LED and the Unit controller are not indicated.
- Not operated

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

Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Power failure or power is not ON		Measure the voltage by means of the voltmeter	Supply the power
Blown out fuse or activation of the breaker at the power source	Short circuit supplied between the wires	Check for any uncovered part of the wires	Remove the cause of the short circuit and replace the fuse
	Short circuit of the wires to earth	Measure the insulation resistance	Remove the cause of the short circuit and replace the fuse
Blown out fuse at the control circuit	Short circuit supplied between the wires	Check for any uncovered part of the wires	Remove the cause of the short circuit and replace the fuse
	Short circuit of the control circuit to earth	Measure the insulation resistance	Remove the cause of the short circuit and replace the fuse
Disconnected cable of the remote control switch		Connect the cable	Replace the cable or repair the cable
Insufficient contacting at the connectors of the remote control switch	Insufficient connection or incorrect connection of the indoor unit PCB	Check the connectors	Correctly connect the connector
	Insufficient connection or incorrect connection of the indoor unit PCB in the remote control switch		
Failure of the remote control switch		Check the remote control switch by means of the self-check mode	Replace the remote control switch if it failed
Failure of PCB	Unconnected wires to PCB	Check the connectors	Correctly connect the wires
	Failure of PCB	Check PCB by means of the self-check mode	Replace PCB if it failed
Incorrect wiring connection		Take action according to the procedure explained in *“7.3 Test run using the PC-ARFP1E remote control switch (example)”* chapter	

10.1.1.3 Abnormal operation of the devices

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
No defrost operation mode is available during the heating process or the defrost operation continues	Failure of thermistor for outdoor evaporating temperature during heating	Failure of thermistor	Replace or correctly connect when it is abnormal	
		Disconnected wire of thermistor		
	Failure of 4-way valve	Disconnected 4-way valve coil	Measure the resistance of coil	Replace the 4-way valve
		Incorrect activation of 4-way valve	Enforced power supply	
	Disconnected control wires between indoor unit and outdoor unit		Check the connectors	Correctly connect the wiring
	Failure of the PCB of the indoor unit	Disconnected wiring to PCB	Check the connectors	Correctly connect the wiring
		Failure of PCB	Check PCB by means of the self-check mode	Replace PCB when the check mode is not available
	Failure of the PCB of the indoor unit	Disconnected wiring to PCB	Check the connectors	Correctly connect the wiring
		Failure of the PCB	Check PCB by means of the self-check mode	Replace if PCB fails
Insufficient cooling process	Indoor cool load is higher than the cooling capacity		Calculate the cool load	Use a bigger unit
	Excessively low suction pressure	Gas leakage or shortage of refrigerant	Measure superheat	Correctly charge the refrigerant after repairing the gas leakage
		Excessively small diameter tube or long piping	Measure and check the field-supplied pipes	Use the correct pipes
		Incorrect activation of the check valve of the outdoor unit	Check whether or not the temperature difference before/ after the check valve	Replace the check valve of the outdoor unit
		Failure or malfunction of the expansion valve	Check for clogging	Remove the clogging
			Check the connection cord and the connector	Replace the connector
			Is there an operation sound from the coil?	Replace the coil
			Is the thermistor on the compressor normal?	Replace the thermistor
			Is the thermistor installed correctly on compressor?	Correctly install the thermistor
		Clogged strainer in the indoor unit; clogging at the low pressure piping	Check the temperature difference at the inlet and the outlet of the strainer	Replace the strainer in the indoor unit
		Clogging at the low pressure piping	Check the temperature difference	Remove the clogging

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

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Insufficient heating process	Indoor heat load is greater than the heating capacity		Calculate the heat load	Replace the unit with a bigger unit
	Excessively low suction pressure	Gas leakage or insufficient refrigerant charge	Measure superheat	Correctly charge the refrigerant after the gas leakage check and repairing
		Excessively small diameter or long piping	Measure the field supplied piping	Use the specified pipes
		Failure or malfunction of the expansion valve	Check for clogging	Remove the clogging
			Check the connection cord and the connector	Replace the connector
			Is there an operation sound from the coil?	Replace the coil
			Is the thermistor on the compressor normal?	Replace the thermistor
			Is the thermistor installed correctly on compressor?	Correctly install the thermistor
		Clogging of IU/OU strainer	Check the temperature difference between the inlet and the outlet of strainer	Replace the strainer for the outdoor unit or the indoor unit
		Clogging of suction piping	Check the temperature difference of each part	Remove the clogging
		Insufficient air flow through the outdoor unit heat exchanger	Is the outdoor unit heat exchanger clogged?	Remove the clogging
			Are there any obstacles at the inlet or the outlet of outdoor unit?	Remove the obstacles
			Is the service area for the outdoor unit sufficient?	Secure a sufficient service area
			Check the speed of the outdoor unit fan	Replace the fan motor
		Excessively low air temperature through the outdoor unit heat exchanger	Check for any short-circuited air to the outdoor unit	Remove the cause of the short-circuited air
		Defrosting is insufficiently completed	Check the thermistor for the defrost operation	Replace the thermistor for the defrost operation
	Excessively high discharge pressure	Excessively charged refrigerant	Check the refrigerant quantity	Correctly charge the refrigerant
		Non-condensate gas in refrigerant cycle	Check the refrigerant quantity	Recharge the refrigerant after the vacuum pumping
		Clogging of the discharge pressure piping	Check for clogging	Remove the clogging
	Malfunction or internal leakage of the 4-way valve		Check the temperature difference at the inlet and the outlet of the 4-way valve	Replace the 4-way valve
	Malfunction of the check valve of the outdoor unit		Check the temperature difference at the inlet and the outlet of the check valve	Replace the check valve
	Excessively high suction pressure	Malfunction or internal leakage of 4-way valve	Check the temperature difference at the inlet and the outlet of the 4-way valve	Replace the 4-way valve
	Discharge temperature of the indoor unit is unstable		Check the expansion valve of the indoor unit in the same system	Replace the failed expansion valve of the indoor unit

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

10.1.2 RAS-(4-6)H(V)(R/N)(C/P)2E

10.1.2.1 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 electrical wiring properly secured and are the connections correctly fixed?	Check that the following wiring connection on outdoor unit/indoor unit PCBs is not loosened. - *The connection for thermistors* - *The connection for the communication cable.* - *The communication cable connects to a terminal block at the outdoor unit / indoor unit not PCB.* - *Power supply wiring is connected to a terminal block, not PCB.* - *Each connection for power source line.* Check that the wiring connections on outdoor unit and indoor unit PCBs is not loosened or misconnected on the site according to “Electrical Wiring Diagram” of the technical catalogue.

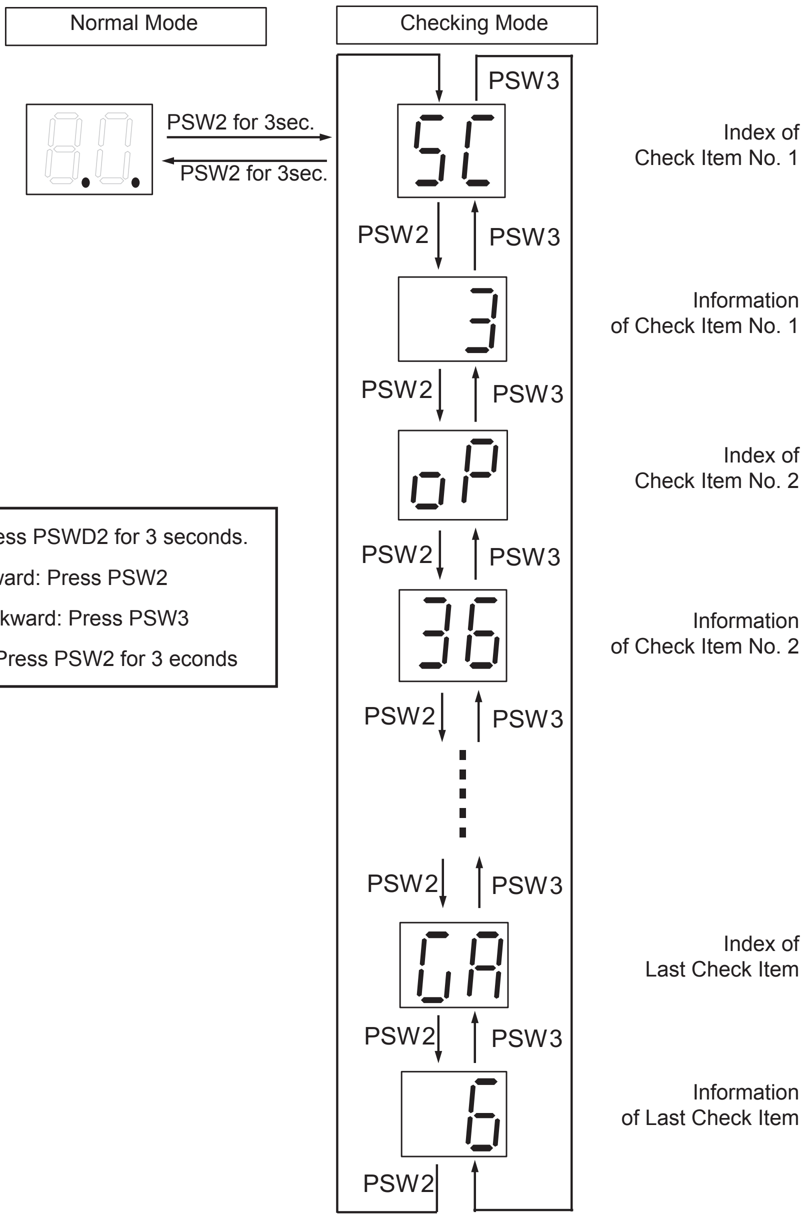
NOTE

If the fuse on an indoor unit PCB is blown, diagnose the cause of overcurrent and replace the fuse(s). In addition, check the power source of optional parts because the fuses may blow out by the power source failure. Turn off power for safety.

10.1.2.2 Checking by 7-segment display

- Turn ON the main power supply. Wait for more than 20 seconds to start checking.
- Checking Items
    - Expansion Valve Opening
    - Temperature Readings from Thermistors
    - Number of Indoor Units Connecting in the Same System
- Check the locations of 7-segment and push switches.
- AC220~240V is applied to the PCB and electrical parts. Never touch electrical parts and wires without appropriate personal protective equipment (PPE) when checking.

Check the operating conditions and each part of the refrigerant system temperature condition by 7-segment display (SEG1) and push switches (PSW).



(A) To start the checking mode: Press PSWD2 for 3 seconds.
(B) To move the checking item forward: Press PSW2
(C) To move the checking item backward: Press PSW3
(D) To cancel the checking mode: Press PSW2 for 3 econds

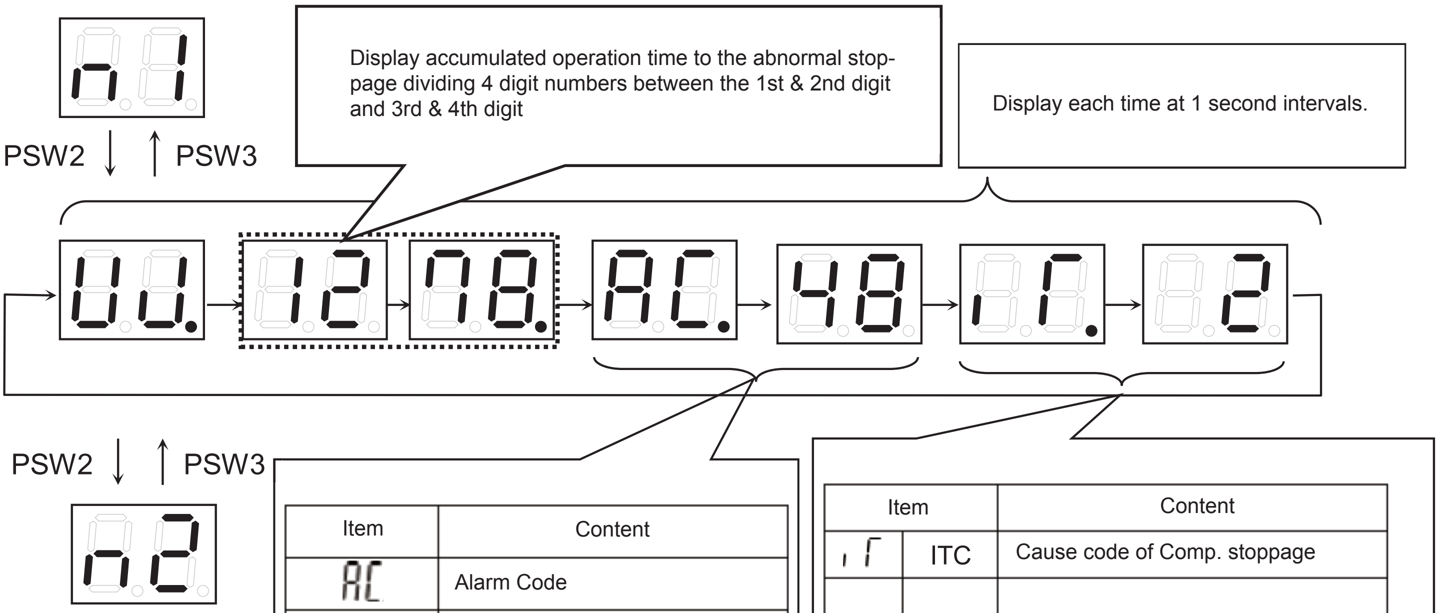
◆ Checking of the alarm code history

Abnormal Data Record

“Abnormal Data Record” (n1 ~ n9) in checking item can record recent abnormal stoppages. (The maximum number of recordable is n9, n1 is the latest one.) In case of abnormal stoppage in following table, accumulated operation time when abnormality happened, alarm code/cause code of ID stoppage, and cause code of inverter/fan stoppage are recorded:

For example:

Number of Abnormal Data	n1
Accumulated Operation Time	1278h
Alarm Code	48
Cause Code of Inverter Stoppage	2



Item	Content
AC	Alarm Code
d1	Cause code of I.D. stoppage

Item		Content
iT	ITC	Cause code of Comp. stoppage
-	-	The Others

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◆ Alarm code history record

Alarm Code or Cause Code of I.D. Stoppage	Contents	Cause Code of Inverter/Fan Stoppage	
		ITC	FTC
02	Activation of protection device (High Pressure Cut)	-	-
04	Abnormality communication between inverter PCB and outdoor unit PCB	-	-
05	Abnormality of power supply phase	-	-
06 d1-18	Activation of inverter voltage increase/decrease protection	5, 6	-
07 d1-16	Activation of discharge gas superheat decrease protection	-	-
08 d1-15	Activation of discharge gas temperature increase protection	-	-
20	Abnormality of thermistor for discharge gas temp. (Td)	-	-
21	Abnormality of pressure sensor (Pd)	-	-
22	Abnormality of thermistor for outdoor air temperature (Ta)	-	-
24	Abnormality of thermistor for outdoor unit heat exchanger liquid pipe (Te)	-	-
31	Incorrect capacity setting of indoor unit and outdoor unit	-	-
38	Abnormality of picking up circuit for protection in outdoor unit	-	-
45 d1-13	Activation of high pressure increase protection	-	-
47 d1-15	Activation of low pressure decrease protection	-	-
48 d1-17	Activation of overcurrent protection	2, 4	-
51 d1-17	Abnormality of current sensor for inverter	8	-
53 d1-17	Activation of inverter PCB protection device	1, 12, 21	-
54 d1-17	Activation of inverter fin temperature increase protection	3	-
55 d1-18	Inverter failure	9, 10, 11, 13, 14, 15, 16, 23	-
57	Abnormality of Outdoor Fan Motor	-	1, 12, 24
5b	Activation of overcurrent protection for outdoor fan	-	2
5C	Abnormality of outdoor fan controller sensor	-	8
EE	Compressor protection alarm	-	-
d1-05	Instantaneous power failure at the outdoor unit	-	-
d1-26	Retry due to high pressure decrease	-	-
A1	Abnormality of Active Filter	-	-
d1-35	4-Way valve switching failure	-	-

NOTE

All History will be erased by pressing PSW1 for 5 seconds when Abnormal Data Record is displayed.

10.1.2.3 Failure of the power supply to indoor units and the remote control switch

- The lights and the LCD are not indicated.
- Inoperative. If the fuses are blown or the circuit breaker is activated, investigate the cause of the excessive current and take the necessary measures.

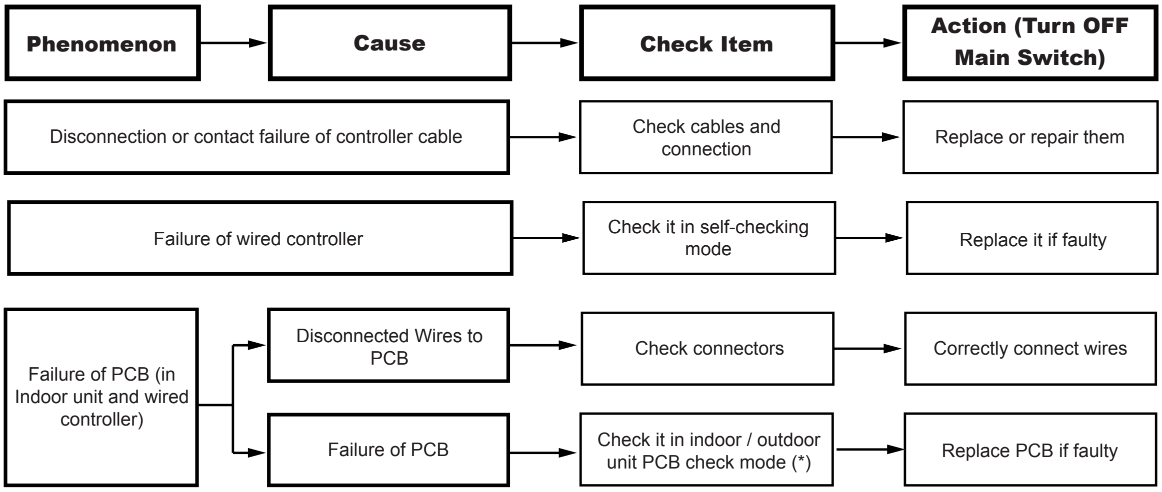
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Power failure or power is not ON		Measure voltage by volt-meter	Supply power
Melted Fuse or Activation of Breaker at Power Source	Short Circuit Supplied between Wires	Check for any uncovered part of wires	Remove the cause of short-circuit and replace the fuse
	Short Circuit of Wires to Earth	Measure insulation resistance	Remove the cause of short-circuit and replace the fuse
	Failure of Indoor Unit Fan Motor	Measure resistance between wires and insulation resistance	Replace fan motor if faulty
Melted fuse for Control Circuit	Short Circuit Supplied between Wires	Check for any uncovered part of wires	Remove the cause of short-circuit and replace the fuse
	Short Circuit of Wires to Earth	Measure insulation resistance	Remove the cause of short-circuit and replace the fuse
	Failure of Indoor Unit Fan Motor	Measure resistance between wires and insulation resistance	Replace fan motor if faulty
Disconnected Cable of Remote Control Switch		Connect the cable	Replace cable or repair it
Insufficient Contacting at Connectors of Remote Control Switch	Contact failure or incorrect connection of indoor unit PCB	Check connectors	Correctly connect it
	Contact failure or incorrect connection of PCB in Remote Control Switch		
Failure of remote control switch		Check it by self-checking mode	Replace it if remote control switch is faulty
Failure of each PCB	Disconnected wire to each PCB	Check connectors	Correctly connect wires
	Failure of each PCB	Check each PCB in indoor unit and outdoor unit PCB1 check mode (*)	Replace PCB if faulty
Incorrect wiring connection		Take action according to the procedure indicated in "TEST RUN CHECK"	

NOTE

- *(*): Refer to the item "10.4.2 RSW, DSWs and LEDs functions RAS-(4-6)HV(R/N)(C/P)2E" or "10.4.3 RSW, DSWs and LEDs functions RAS-(4-6)H(R/N)(C/P)2E" in these chapters.*

10.1.2.4 Abnormal transmission between remote control switch and indoor unit

- The RUN indicator on the remote control: Flashes every two seconds.



NOTE

- *(*): Refer to the item “10.4.2 RSW, DSWs and LEDs functions RAS-(4-6)HV(R/N)(C/P)2E” or “10.4.3 RSW, DSWs and LEDs functions RAS-(4-6)H(R/N)(C/P)2E” in these chapters.*

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10.1.2.5 Abnormal operation of the devices

In the case no anomalies are detected (alarm codes) in the remote control switch, and normal operation is not available, carry out the required actions in accordance with the procedures described below.

Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
"RUN" light is ON and LCD is indicated. However, the system does not operated. (ex. The indoor, outdoor fans or compressor does not operate).	Failure of Indoor Unit Fan Motor	Disconnected Coil	Measure coil resistance by tester	Replace indoor unit fan motor
		Burnt-Out Coil	Measure insulation resistance	
	Failure of Outdoor Unit Fan Motor	Disconnected Coil	Measure coil resistance by tester	Replace outdoor unit fan motor
		Burnt-Out Coil	Measure insulation resistance	
	Failure of Outdoor Unit PCB	Contact failure	Measure voltage between contacting parts	Replace outdoor unit PCB1
	Failure of Compressor Motor		Measure resistance between wires	Replace compressor
	Failure of Compressor		Check for abnormal sound from compressor	
	Failure of Magnetic Switch for Compressor	Insufficient Contacting	Check magnetic switch activates correctly or not	Replace magnetic switch
	Failure of One of PCBs (for outdoor unit, indoor unit, remote control switch)	Disconnected Wiring to PCB	Check connections	Correctly connect wiring
		Failure of PCB	Check PCB by self-checking	Replace PCB if failed
The Compressor does not stop or start even if the setting temperature on LCD is changed (**)	Failure of Air Inlet Thermistor	Failure of Thermistor	Check it by Check mode (*)	Replace or correctly connect wires if abnormality exists
		Disconnection of Thermistor		
	Abnormality of Remote Control Switch Cord		Check it by Test Run	
	Failure of Indoor Unit PCB		Check PCB by self-checking	Replace PCB if failed

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Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
The Compressor does not Stop or Start even if the Setting temperature on LCD is changed (**)	Incorrect optional setting	Check Setting Condition of "Thermistor of Remote Control Switch" by Optional Setting *Setting and Control "00": Control by Indoor Thermistor for Suction Air "01": Control by Thermistor of Remote Control Switch "02": Control by Average Value of Indoor Thermistor for Suction Air and Thermistor of Remote Control Switch	In case that thermistor of remote control switch is not used, set at "00".
	Incorrect Input/Output Setting	Check Setting Condition of "i1" and "i2" by Input/Output Setting *Setting and Control "01": Room Thermostat (Cooling) "02": Room Thermostat (Heating)	In case that room thermostat is not used, set for input signal actually used. If no signal is used, set at "00"
Air flow volume "HH2" is not indicated on the wired controller.	Incorrect wired controller model	Check that remote control switch or transition wiring is connected to indoor unit(s) with 4 internal air flow volumes.	Connect wired controller or transition wiring for wired controller to indoor unit(s) with 4 internal air flow volumes if necessary.

NOTE

- *(*): Refer to the item "10.4.2 RSW, DSWs and LEDs functions RAS-(4-6)HV(R/N)(C/P)2E" or "10.4.3 RSW, DSWs and LEDs functions RAS-(4-6)H(R/N)(C/P)2E" in these chapters.*
- *(**): 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 for individual operation mode, -15°C for simultaneous operation mode, during the cooling operation.*
  - *Indoor air temperature is higher than 27°C or outdoor air temperature higher than 18°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.*

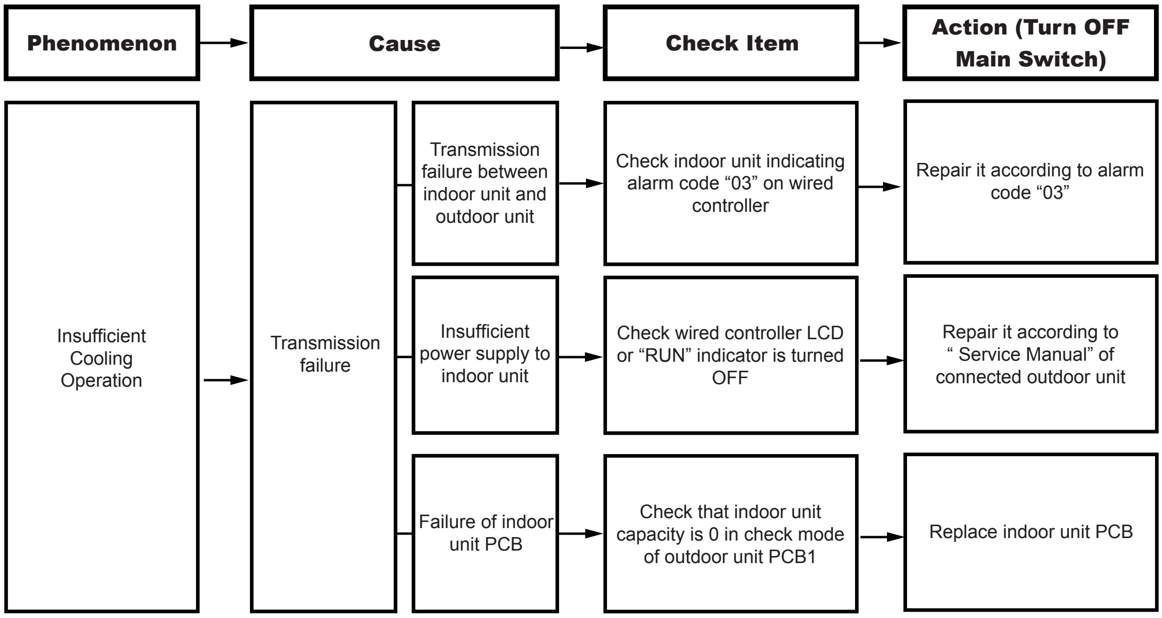
Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
Indoor Fan Speed is Not Changed	Failure of Discharge Air Temperature Thermistor	Failure of Thermistor	Check thermistor in check mode of remote control switch (*)	Replace or correctly connect wiring when it is abnormal
		Disconnected Wire of Thermistor	Check thermistor in check mode of remote control switch (*)	Replace or correctly connect wiring when it is abnormal
	Failure of Remote Control Switch		Check it by self-checking from remote control switch	Replace if failed
	Failure of PCB for Indoor Unit		Check it by self-checking from remote control switch (**)	Replace if failed
No Defrosting Operation Mode is Available during Heating Operation or Defrosting Operation is Continued	Failure of thermistor for outdoor evaporating temperature during heating or thermistor for outdoor temperature	Failure of Thermistor		Replace or connect correctly when it is abnormal
		Disconnected Wire of Thermistor		Replace or connect correctly when it is abnormal
	Failure of Reversing Valve	Disconnected Reversing Valve Coil	Measure resistance of coil	Replace reversing valve
		Incorrect Activation of Reversing Valve	Enforced power supply	Replace reversing valve
	Disconnected Control Wires between Indoor Unit and Outdoor Unit		Check connectors	Correctly connect wiring
	Failure of Outdoor Unit PCB	Disconnected Wires to PCB	Check connectors	Correctly connect wiring
		Failure of PCB		Replace it when check mode is not available
	Failure of Indoor Unit PCB	Disconnected Wires to PCB	Check connectors	Correctly connect wiring
		Failure of PCB	Check it in indoor / outdoor unit PCB check mode (**)	Replace if failed
"RUN" Indicator or LCD indication on Remote Control Switch are Kept ON	Failure of PCB in Indoor Unit or Remote Control Switch		Check PCB in indoor / outdoor unit PCB1 check mode (**), or check wired controller in self-checking mode	Replace if failed

NOTE

- *(*): Refer to the item "10.1.2.2 Checking by 7-segment display" in this chapter.*
- *(**): Refer to the item "10.4.2 RSW, DSWs and LEDs functions RAS-(4-6)HV(R/N)(C/P)2E" or "10.4.3 RSW, DSWs and LEDs functions RAS-(4-6)H(R/N)(C/P)2E" in this chapter.*

Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
Insufficient Cooling Operation	Indoor heat load is larger than cooling capacity		Calculate heat load	Use larger unit
	Excessively low suction pressure	Gas leakage or shortage of refrigerant	Measure superheat	Correctly charge refrigerant after repairing gas leakage
		Excessively small diameter tube or long piping	Measure and check field-supplied pipes	Use correct pipes
		Incorrect activation of check valve of Outdoor Unit	Check whether or not temperature 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 temperature 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 temperature 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
	Activation of motion sensor control		"Motion sensor is activated" is indicated on wired controller.	It is normal

Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
Insufficient Cooling Operation	Excessively high discharge pressure	Insufficient air flow to outdoor unit heat exchanger	Check clogging of Outdoor Unit Heat Exchanger	Remove clogging
			Obstacles at inlet or outlet of outdoor unit heat exchanger?	Remove obstacles
			Is service space for outdoor unit sufficient?	Secure service space
			Correct Fan Speed?	Replace fan motor
		Excessively high air temperature 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 temperature 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 temperature 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 temperature difference between inlet and outlet of reversing valve	Replace reversing valve
	Discharge temperature 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 Cooling Operation
Transmission failure
Transmission failure between indoor unit and outdoor unit
Check indoor unit indicating alarm code “03” on wired controller
Repair it according to alarm code “03”
Insufficient power supply to indoor unit
Check wired controller LCD or “RUN” indicator is turned OFF
Repair it according to “ Service Manual” of connected outdoor unit
Failure of indoor unit PCB
Check that indoor unit capacity is 0 in check mode of outdoor unit PCB1
Replace indoor unit PCB

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 temperature difference between inlet and outlet of strainer	Replace strainer for outdoor unit or indoor unit
		Clogging of suction piping	Check temperature 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 temperature through Outdoor Unit Heat Exchanger	Check for any short-circuited air to outdoor unit	Remove cause of short-circuited air
		Defrosting is insufficiently completed	Check thermistor for defrosting	Replace thermistor for defrosting

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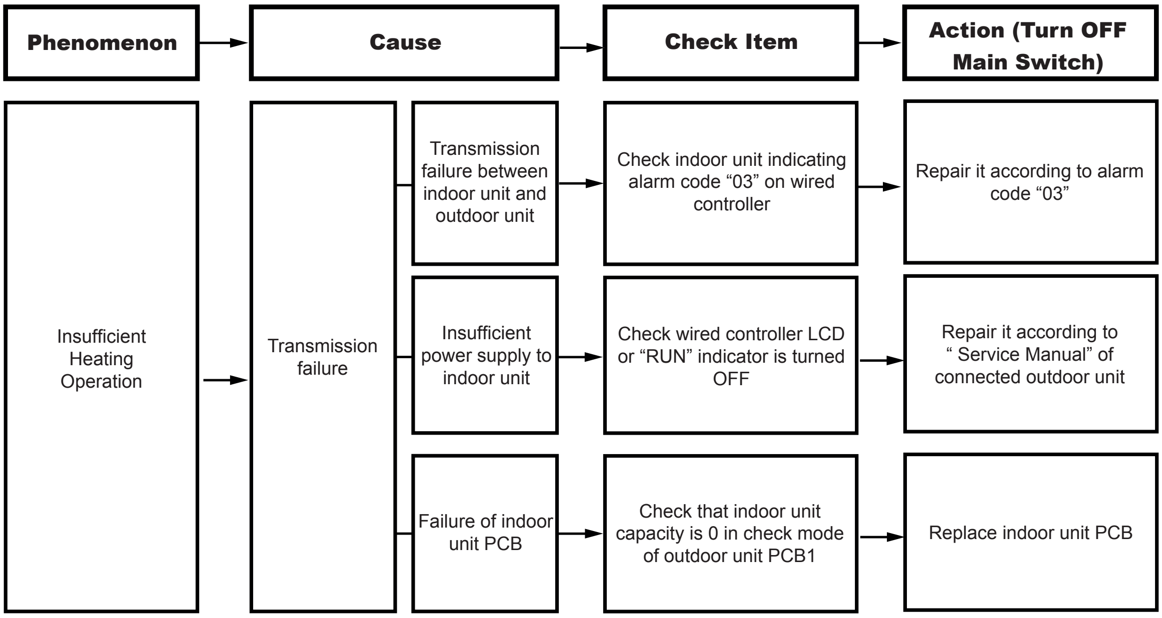
Phenomenon
Cause
Check Item
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Check indoor unit indicating alarm code “03” on wired controller
Repair it according to alarm code “03”
Insufficient power supply to indoor unit
Check wired controller LCD or “RUN” indicator is turned OFF
Repair it according to “ Service Manual” of connected outdoor unit
Failure of indoor unit PCB
Check that indoor unit capacity is 0 in check mode of outdoor unit PCB1
Replace indoor unit PCB

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Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
Insufficient Heating Operation	Excessively High Discharge Pressure	Insufficient air flow to indoor unit heat exchanger	Check for filter clogging	Remove clogging
			Check for any obstacles at inlet or outlet of indoor unit	Remove obstacles
			Check indoor fan speed	Replace fan motor
		Excessively high air temperature to indoor unit heat exchanger	Check short-circuited air to indoor units.	Remove cause of short-circuited air
		Excessively charged refrigerant	Check expansion valve opening	Correctly charge refrigerant
		Non-condensate gas in refrigerant cycle	Check each temperature and pressure	Recharge refrigerant after vacuum pumping
		Clogging of discharge piping	Check for clogging	Remove clogging
	Malfunction or internal leakage of reversing valve		Check temperature difference at inlet and outlet of reversing valve	Replace reversing valve
	Malfunction of check valve of outdoor unit		Check temperature 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 temperature difference between inlet and outlet of reversing valve	Replace reversing valve
	Discharge temperature of Indoor Unit is Unstable		Check for expansion valve of indoor unit in the same system	Replace failed expansion valve of indoor unit
	Activation of motion sensor control		"Motion sensor is activated" is indicated on wired controller	It is normal

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	Failure of installation	Check each part is tightly fixed	Tightly fix it
		Liquid refrigerant compression	Check expansion valve opening	Ensure superheat
		Wear or breakage of internal compressor parts	Abnormal sound from inside of compressor	Replace compressor
		Crankcase heater does not get warm	Check resistance (Crankcase heater, fuse)	Replace crankcase heater orr fuse
	Hamming sound from magnetic conductor		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
	Preparatory state 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 2.2 MPa due to insufficient refrigerant		Check operation pressure	Add refrigerant
	Disconnected wiring for indoor fan		Check wiring	Connect wiring correctly
	Failure of indoor unit PCB		Check indoor unit PCB	Replace indoor unit PCB

Phenomenon	Cause / Check Item	Action (Turn OFF Main Switch)
"Motion sensor is activated" is NOT indicated on wired controller LCD.	Check connection of connector	Connect it securely
Operation stops though someone is present	Check reaction rate (Check mode 1:q1) (reaction rate is always 0%: abnormal)	Replace motion sensor
	Check connection of connector	Connect it securely
Operation continues though no one in present	Check reaction rate (Check mode 1:q1) (reaction rate is always 100%: abnormal)	Replace motion sensor
	Check heat source (a moving object whose temperature is different from atmosphere)	Remove it
	Check connection of connector	Connect it securely

10.2 Troubleshooting procedure

10.2.1 RAS-3HVRC2

10.2.1.1 Alarm codes for the outdoor units

Alarm code	Retry stop code	Origin	Detail of Abnormality	Main Factors
02	–	Outdoor Unit	Activation of protection device (high pressure cut)	Activation of PSH, locked motor, abnormal operation in the power supply phase. Failure of fan motor, drain discharge, PCB, relay, float switch activated. (Pipe clogging, excessive refrigerant, innert gas mixing, fan motor locking at cooling operation)
03	–	Transmission	Transmission Alarm (Not outdoor unit detected)	Loose, disconnected, broken or short-circuited connector
04	–		Abnormal transmission between inverter PCB and RASC unit PCB	Transmission failure between inverter PCBs. (Loose Connector, Wire Breaking, Blowout of Fuse).
05	–	Power supply	Reception of abnormal operation code for detection of power source phase	Power source with abnormal wave pattern. Main power supply phase is reversely connected or one phase is not connected.
06	–	Voltage	Excessively low voltage or excessively high voltage for the inverter	Voltage drop in power supply. Incorrect wiring or insufficient capacity of power supply wiring.
07	–	Cycle	Decrease in discharge gas superheat	Excessive Refrigerant Charge, Failure of Thermistor, Incorrect Wiring, Incorrect Piping Connection, Expansion Valve Locking at Opened Position (Disconnected Connector).
08	–		Excessively high discharge gas temperature at the top of compressor	Insufficient refrigerant charge, refrigerant leakage. Expansion valve closed or clogged.
20	–	OU sensor	Thermistor for discharge gas temperature (THM9)	Incorrect wiring, disconnected wiring, broken cable, short circuit.
22	–		Thermistor for outdoor ambient temperature (THM7)	
24	–	OU sensor	Thermistor for evaporation or condensation temperature (THM8 / THM10)	Incorrect wiring, disconnected wiring, broken cable, short circuit.
31	–	System	Incorrect capacity setting or combined capacity between outdoor and indoor units	Incorrect Capacity Code Setting, Excessive or Insufficient Indoor Unit Total Capacity Code.
35	–		Incorrect indoor unit number setting	Duplication of indoor unit number, number of indoor units over specifications.
36	–		Incorrect indoor unit combination	
38	–		Abnormality at picking up circuit for protection (OU)	Failure of indoor unit PCB, incorrect wiring, connection to PCB in indoor unit.
47	–		Activation of the safety device from excessively low suction pressure (protection from vacuum operation)	Shortage or leakage of refrigerant, piping clogging, expansion valve close-locked, fan motor locked.
48	–		Activation of overcurrent protection	Overload, overcurrent. Failure of Inverter PCB, heat exchanger clogged, locked compressor. EVI/EVO failure.
51	–	Inverter	Abnormal operation of the current sensor	Incorrect wiring of current sensor. Failure of control PCB or Inverter PCB.
53	–		Inverter fin temperature increase	Inverter module (IPM, DIP-IPM) and Inverter PCB abnormality. Failure of compressor, clogging of heat exchanger.
54	–		Abnormality of inverter fin temperature	Heat Exchanger Clogging. Fan Motor Failure.
55	–		Abnormality of inverter module	Failure of DIP-IPM, IPM or Inverter PCB.
57	–	Outdoor	Fan motor protection	Abnormality of fan motor protection (DC fan motor)
5b	–	Outdoor fan	Activation of over current protection	Fan consumption abnormality
5c	–	Outdoor fan	Abnormality in current detection circuit	Abnormality in fan current detection circuit
EE	–	Compres-sor	Compressor protection	"Compressor failure. This alarm code appears when the following alarms: 02, 07, 08, 45, 47 occur three times within 6 hours."

◆ Cause of compressor stop

When the compressor stops due any of the factors below, Stop Reason Code (d1 Code) is sent to Indoor Unit.

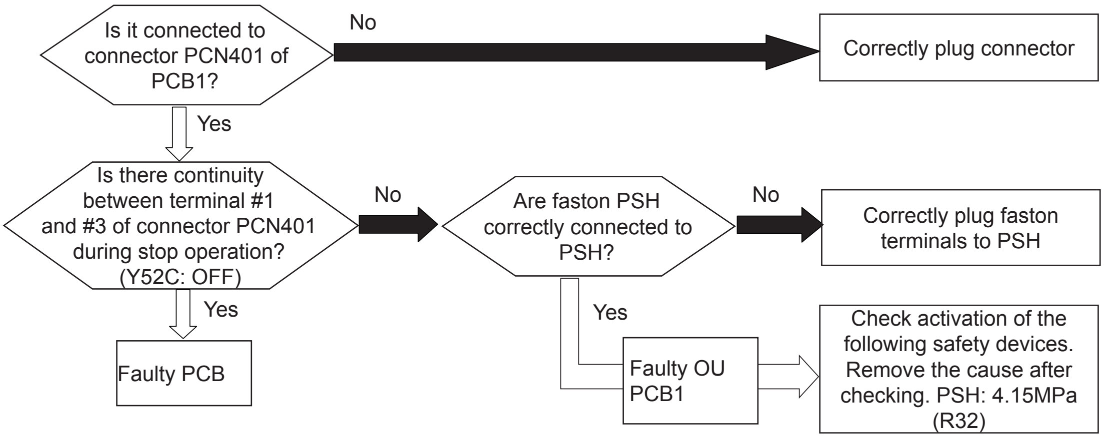
The Code will be overridden when another Code is sent before it.

Stop reason code	Stop factors	52C1 Process
00	Switch OFF	OFF
01	Thermo OFF	ON
02	Alarm	OFF
03	Freeze protection	ON
05	Momentary power failure detection in Outdoor unit and reset of the Outdoor PCB micro controller	OFF
07	Outdoor temperature at cooling lower than -5°C for individual operation (Outdoor temperature -15°C for simultaneous operation at annual cooling setting)	ON
	Outdoor air temperature and indoor suction temperature for heating (Overload condition)	ON
	Stop due to outdoor heating temperature lower than -20°C (Low temperature condition)	ON
10	Demand (external input)	ON
	Emergency stop (DSW1-4: ON or forced stop input)	OFF
13	Discharge pressure increase prevention for cooling and heating	ON
15	Gas shortage detection (detected by pipe temperature: gas shortage detection I)	OFF
	Gas shortage detection (detected by compressor-top temperature: gas shortage detection II)	OFF
	Compressor-top overheating (Td)	ON
16	Abnormal decrease of discharge gas superheat degree (TdSH)	ON
17	Inverter trip (Instantaneous overcurrent, Electronic thermal activation, Current sensor abnormality)	OFF
18	Inverter trip (Inverter undervoltage, Overvoltage, Transmission error, Microcomputer reset)	OFF
19	Prevention Control for expansion valve opening deviance	ON
21	Thermo OFF stop due to oil return control	ON
	Forced Thermo OFF of simultaneous twin or greater (when other units are Thermo OFF)	ON
22	Outdoor unit Heat Start Control	OFF
26	Retry stop due to high pressure decrease abnormality	ON
28	Cooling discharge temperature control	ON
35	Refrigerating cycle abnormality (Bad or wrong switch of 4-way valve)	OFF
36	Forced stop upon return from defrosting	ON
39	Stop due to indoor unit rotation control	ON
41	Stop due to pump down control	ON

10.2.1.2 Troubleshooting by alarm code

Alarm code	02	Activation of the safety device (high pressure switch) in the outdoor unit (Except Alarm codes 41 and 42)

- This alarm is indicated when one of the safety devices is activated during compressor running.

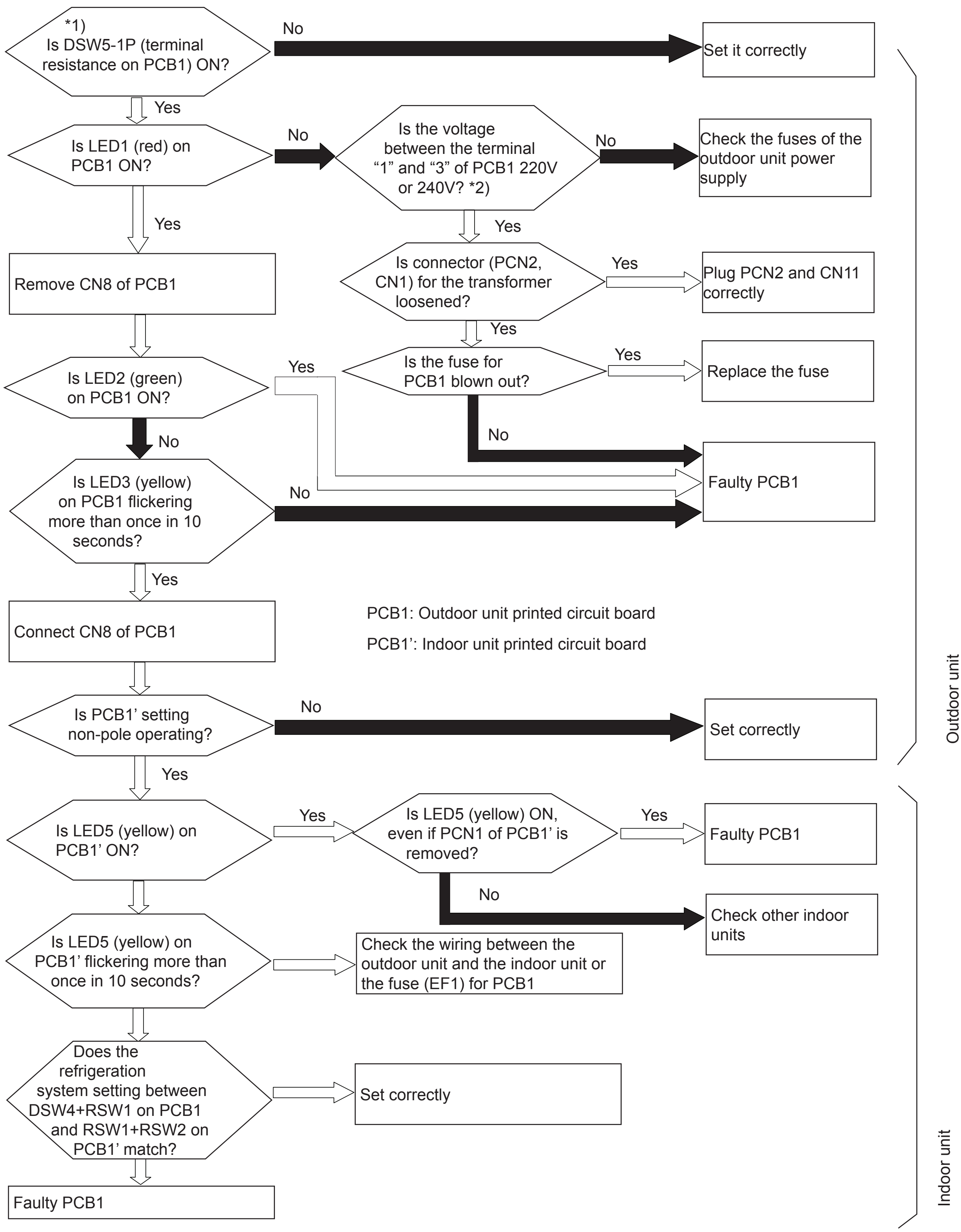


<table>
<tr><th>Phenomenon</th><th colspan="2">Cause</th><th>Check item</th><th>Action (Turn OFF the main switch)</th></tr>
<tr><td rowspan="18">Activation of the high-pressure switch due to the excessively high discharge pressure (PSH)</td><td colspan="2" rowspan="6">Outdoor Unit:
Insufficient Air Flow to the Heat Exchanger (Outdoor Heat Exchanger during the Cooling Process)
Indoor Unit:
Indoor Heat Exchanger (during the Heating Process)</td><td>Check the heat exchanger for dust or for clogging</td><td>Remove the dust or the clogging</td></tr>
<tr><td>Check the air filter for dust</td><td>Remove the dust</td></tr>
<tr><td>Check for any obstacles at the inlet or the outlet of the heat exchanger</td><td>Remove the obstacles</td></tr>
<tr><td>Check the service area</td><td>Secure service area</td></tr>
<tr><td>Check the speed (Outdoor Fan: Cooling)</td><td>Replace the fan motor if faulty</td></tr>
<tr><td>Check the speed of the water pump</td><td>Replace the water pump if faulty</td></tr>
<tr><td colspan="2" rowspan="5">Expansion valve malfunction or abnormality</td><td>Disconnected</td><td>Fix the looseness or reconnect the connector</td></tr>
<tr><td>Fully closed and locked</td><td>Replace the expansion valve</td></tr>
<tr><td>Check the operation sound of the coil</td><td>Replace the coil</td></tr>
<tr><td>Check the Discharge Gas thermistor</td><td>Replace the thermistor</td></tr>
<tr><td>Check the fastening of the thermistor</td><td>Re-fasten the thermistor</td></tr>
<tr><td rowspan="3">Faulty High-Pressure Switch</td><td>Faulty Pressure Switch</td><td>Measure the discharge pressure. Check the continuity after the decrease of the pressure</td><td>Replace the pressure switch if faulty</td></tr>
<tr><td>Insufficient Contacting</td><td>Measure the resistance by means of a tester</td><td>Fix the looseness. Replace the connector</td></tr>
<tr><td>Incorrect Connection</td><td>Check the connections</td><td>Repair the connections</td></tr>
<tr><td colspan="2">Overcharged refrigerant</td><td>Check the cycle operation temp.</td><td>Charge the refrigerant correctly</td></tr>
<tr><td colspan="2">Mixture of the non-condensate gas in the refrigerant cycle</td><td>Check the air temp. and the pressure</td><td>Recharge the refrigerant after the vacuum pumping</td></tr>
<tr><td colspan="2">Clogging of the discharge piping</td><td>Check for clogging</td><td>Remove the clogging</td></tr>
<tr><td colspan="2">Liquid line stop valve or gas line stop valve is not in operation</td><td>Check the stop valves</td><td>Fully Open the stop valves</td></tr>
<tr><td rowspan="2">Faulty magnetic contactor switch</td><td colspan="2">No power is supplied to the coil</td><td>Check connections</td><td>Set the connections properly.</td></tr>
<tr><td colspan="2">No power at the A contact</td><td>Measure the resistance using a tester</td><td>Replace the magnetic switch if it is broken</td></tr>
</table>

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

- This alarm is displayed when an abnormal operation is maintained for three minutes after the normal transmission between the indoor units and the outdoor unit. Also, an abnormal operation is maintained for 30 seconds after the micro-computer is automatically reset. The alarm is displayed when the abnormal transmission is maintained for 30 seconds from the starting of the outdoor unit.
- Investigate the cause of the overcurrent and take the necessary action when the fuses are blown out or the breaker for the outdoor unit is activated.
- This alarm code may be indicated when the inverter or the fan motor malfunction and the outdoor unit cannot secure the power source (No indication on the 7-segment of outdoor unit PCB). In this case, surely check the inverter, fan motor and the continuity of the fuse on the circuit.

(Refer to the next page)



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

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

*2) Check item

Power supply	Faston terminal
1~ 230V 50Hz	Between 1 and 3 of PCN1 on OU PCB

Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Power failure or power is not ON		Measure the voltage by means of the tester	Supply the power
Blown out fuse for the power source or activation of the outdoor unit breaker	Short-circuit between the wires	Check the insulation material for breaks	Remove the short-circuit and replace the fuse
	Short-circuited wire to ground	Measure the insulation resistance	Remove short-circuit to ground and replace the fuse
	Faulty compressor motor	Measure the resistance between the wires and the insulation resistance	Replace the compressor and the fuse
	Failure of outdoor unit fan motor	Measure resistance between wires and insulation resistance	Replace the outdoor unit fan motor and the fuse
Blown out fuse for control circuit or activation of outdoor unit breaker	Short-circuit between the wires	Check the insulation material for breaks	Remove the short-circuit and replace the fuse
	Short-circuit of the control circuit (to ground)	Measure the insulation resistance	Remove the short-circuit and replace the fuse
	Faulty solenoid coil for the magnetic switch for the compressor motor	Measure the resistance of coil	Replace the magnetic switch and the fuse
	Failure of outdoor unit fan motor	Measure the resistance between the wires and the insulation resistance	Replace the outdoor unit fan motor and fuse
PCB1 Power circuit failure		PCB1 Measure output voltage *1)	Replace PCB1
Disconnected wires insufficient contacting or incorrect connection	Between outdoor unit and indoor unit	Check the continuity of the wires Check for looseness of the connection screws Check the terminal numbers	Replacing wires repairing and tightening the power source wiring for the screws and the correct wiring
	Power source wiring for the screws and the correct wiring outdoor unit		
Faulty PCB (outdoor unit, indoor unit)	Disconnected wires to PCB	Check the connections	Correctly connect the wires
	Faulty PCB	—	Replace PCB if faulty
Incorrect wiring	Disconnected wire; insufficient contacting	Check the continuity and the looseness of connection screws	Replacing wires, repairing and tightening the screws
	Incorrect wiring	Check the terminal numbers	Correctly connect the wires

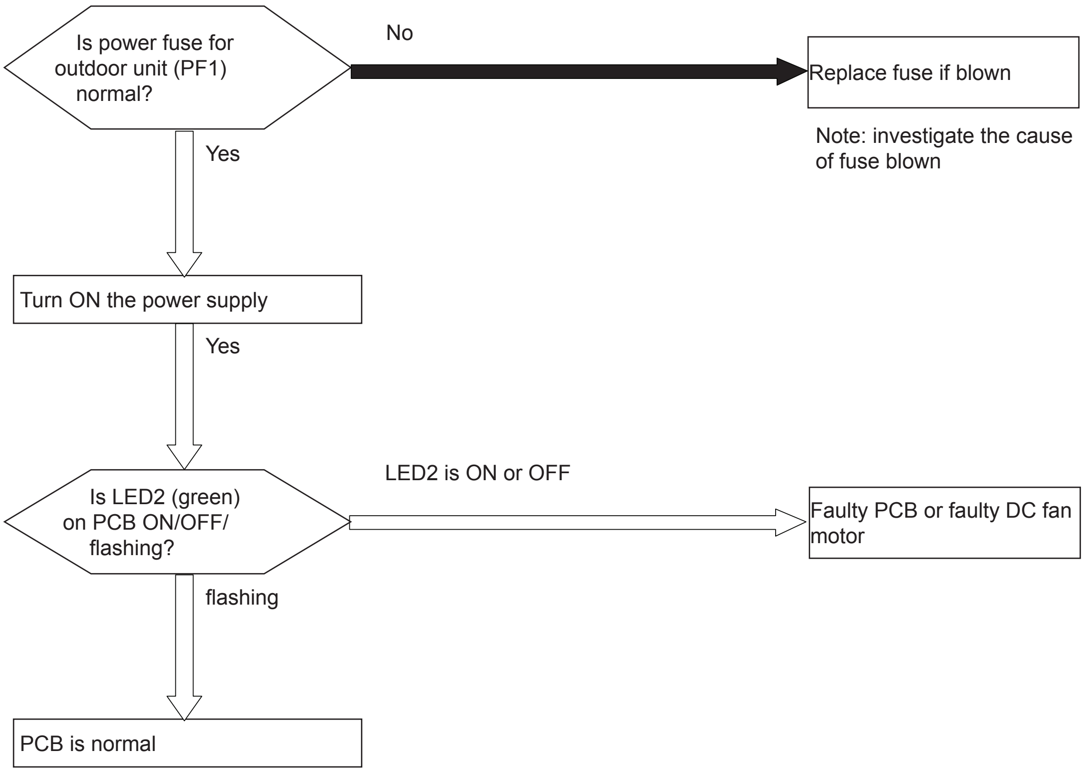
NOTE

- **1) In the case that the end terminal resistance (DSW5-1) is set to OFF for H-LINK connection, set the end terminal resistance to ON when CN8 is disconnected. Set the end terminal resistance to OFF when CN8 is reconnected.*
- **2) Transmission Setting (SW1)*
- **3)*

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

Alarm code	04	Abnormal transmission between control PCB and inverter PCB in outdoor unit

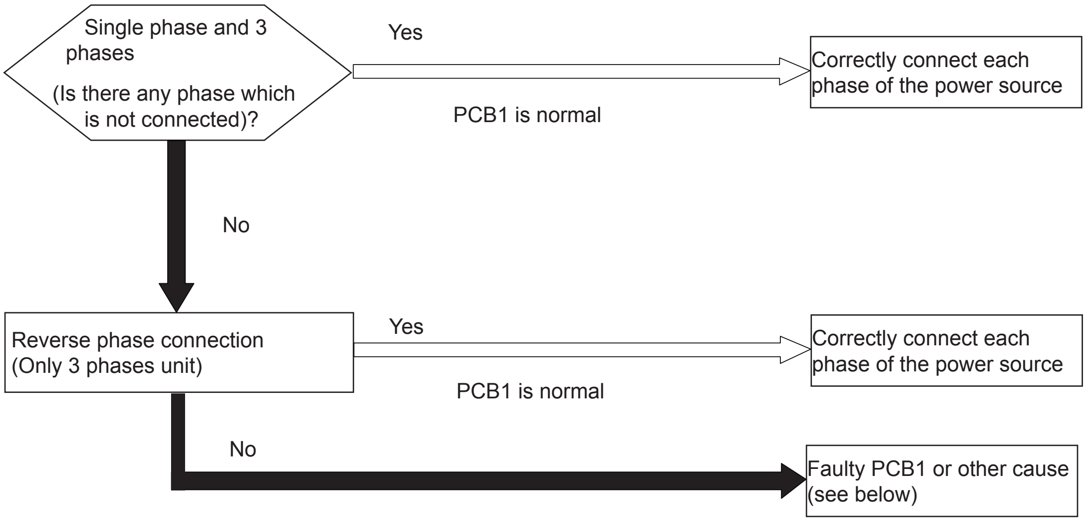
- This alarm is displayed when the abnormal operation is maintained for 30 seconds after the normal transmission between the outdoor unit PCB1 and inverter PCB2. Also, the abnormal operation is maintained for 30 seconds after the micro-computer is automatically reset. The alarm is displayed when the abnormal transmission is maintained for 30 seconds from the starting of the outdoor unit.

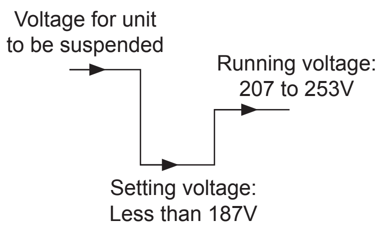


PCB1: Control PCB in outdoor unit

Alarm code	05	Code abnormal operation of picking up phase signal

- This alarm is displayed when the main power source phase is reversely connected or one phase is not connected.

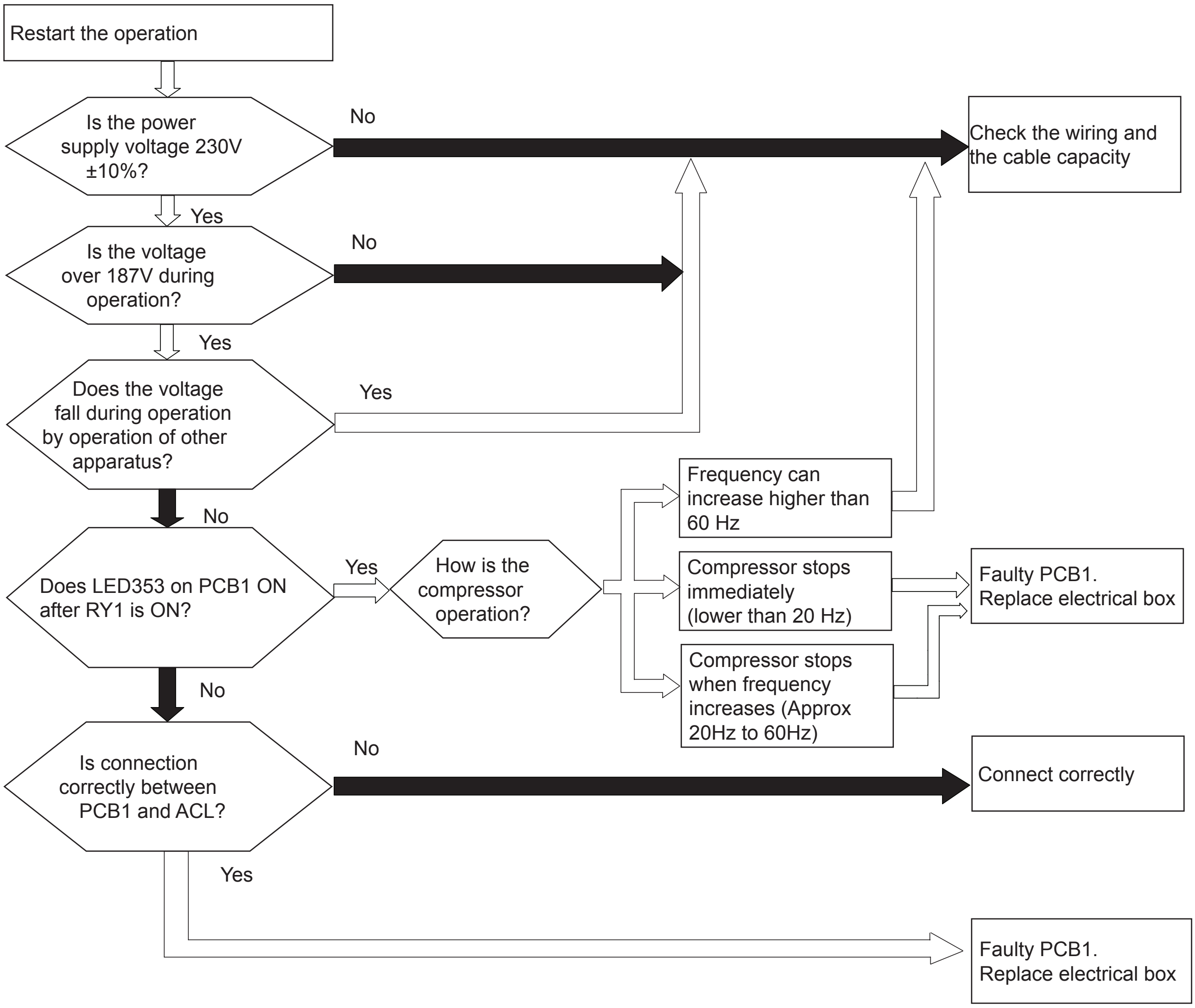




Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Activation of reverse phase sensor in the outdoor unit	Reverse or single phase	Check it according to the electrical wiring	Replacing wires, repair, tightening screws or correct wiring
	Faulty outdoor unit PCB	-	Replace PCB if faulty

Alarm code	06	Excessively low voltage or excessively high voltage for the inverter (RAS-3HVRC2)

- This alarm code is displayed when the voltage between terminal “P” and “N” of Inverter is insufficient and the alarm has three occurrences in 30 minutes. If the number of occurrences is smaller than two, the retry operation is performed. The alarm code “06.” Means fan controller Abnormal Operation.



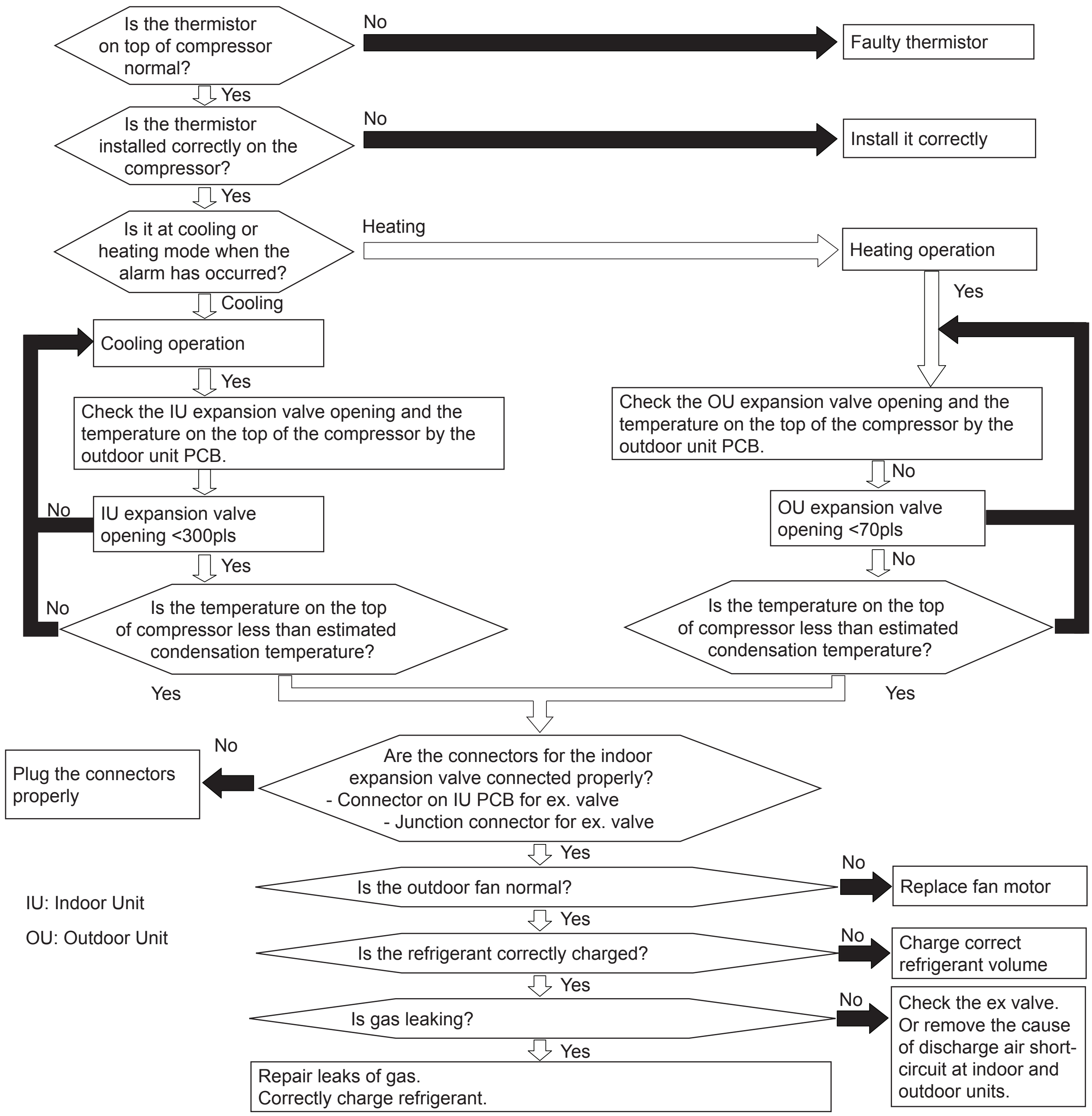
NOTE

Only replace electrical box when LED is OFF.

Alarm code	07	Decrease of Discharge Gas Superheat

This alarm code is indicated as follows:

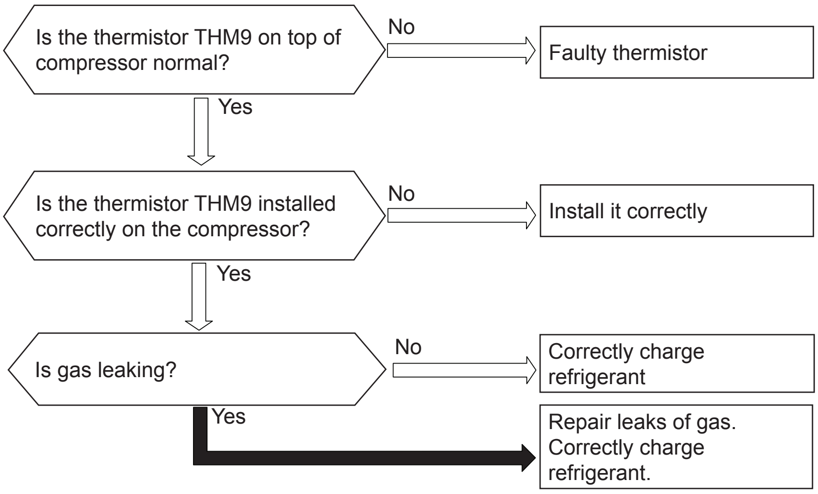
- The temperature on the top of the compressor is less than the target and also the IU expansion valve opening is under 300 pulses at cooling operation for 30 minutes.
- The temperature on the top of compressor is less than the target and also the OU expansion valve opening is under 70 pulses at heating operation for 30 minutes.
- The compressor is stopped and then the retry operation is performed after 30 minutes.

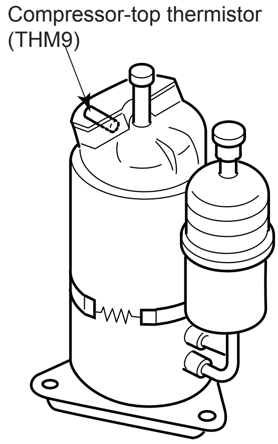


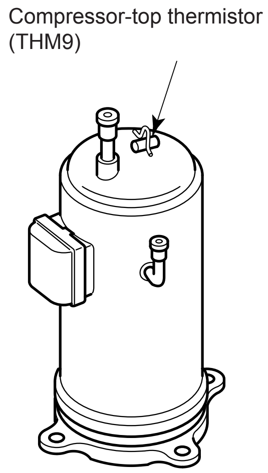
Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Decrease of discharge gas superheat	Refrigerant cycle is different from the electrical system		Check refrigerant cycle and the electrical system	Repair wiring
	Overcharged refrigerant		Measure pressure	Correctly charge refrigerant
	Faulty Expansion Valve		Check expansion valve. Refer to *“8.3 Electronic 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	Measure resistance	Replace thermistor if faulty
		Incorrect mounting	Check mounting state See Alarm Code 08 in section *“10.2.1.1 Alarm codes for the outdoor units”*	Correctly mount thermistor
		Incorrect connection	Check connections	Remove looseness, replace connector or repair connections.

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

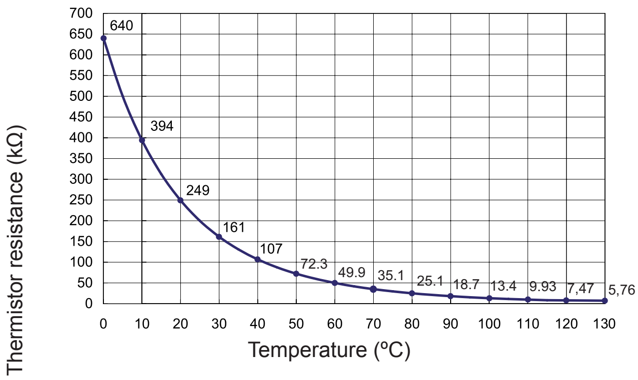
- The alarm appears during cooling operation when the compressor-top thermistor temperature remains at Tdc1 or above for 10 minutes, or at Tdc2 or above for 5 seconds.
- The alarm appears during heating operation when the compressor-top thermistor temperature remains at Tdh1 or above for 10 minutes, or at Tdh2 or above for 5 seconds.







Thermistor resistance characteristics



◆ Limits of temperature

Outdoor capacity	Tdc1	Tdc2	Tdh1	Tdh2
RAS-3HVRC2	115	125	115	125

Alarm code	20	Abnormality of thermistor for discharge gas temperature (compressor thermistor)

- This alarm code is indicated when the thermistor is short-circuited (less than 1 kΩ) or cut (higher than 640 kΩ) during the cooling or the heating process.
- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.

Is the thermistor connected to THM9 of PCB? — No → Connect it

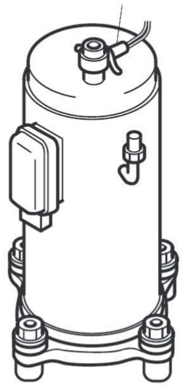
Yes ↓

Is the resistance of THM9 between 1kΩ and 6kΩ? — No → Faulty thermistor

Yes ↓

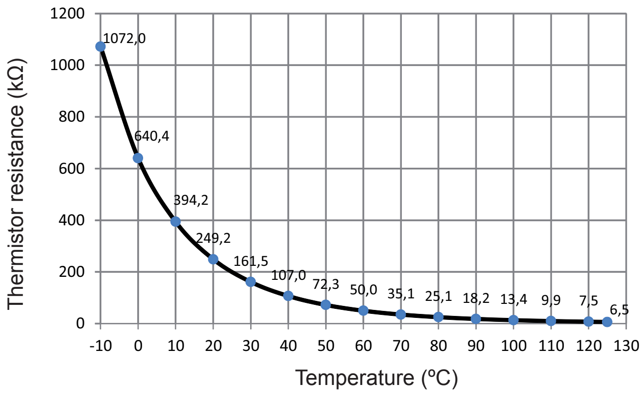
Faulty PCB

Thermistor on top of compressor



Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty top of compressor thermistor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to PCB1	Repair wiring and connections
Faulty PCB1		Replace PCB1 and check operation	Replace PCB1 if faulty

Thermistor resistance characteristics



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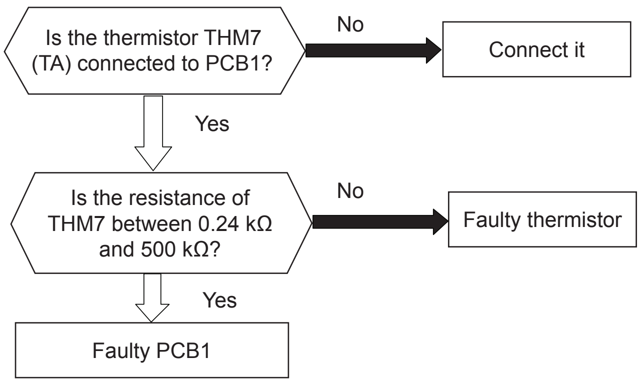
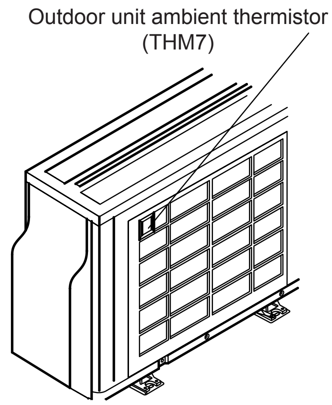
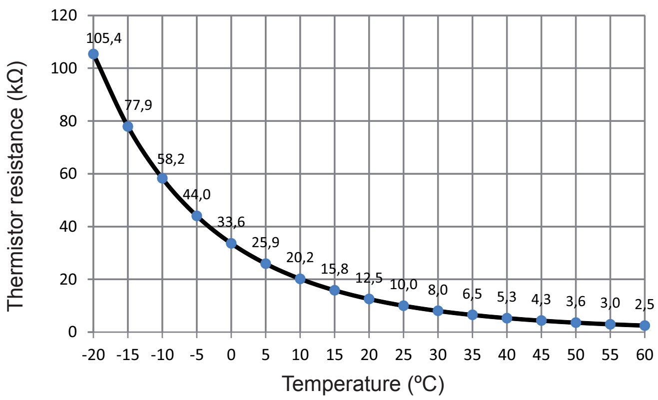
Alarm code	22	Abnormal operation of the thermistor for the outdoor temperature (outdoor unit ambient thermistor) (THM7)

- This alarm code is displayed when the thermistor is short-circuited (less than 0.2 kΩ) or cut (greater than 500 kΩ) during the operation.
- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.





Thermistor resistance characteristics

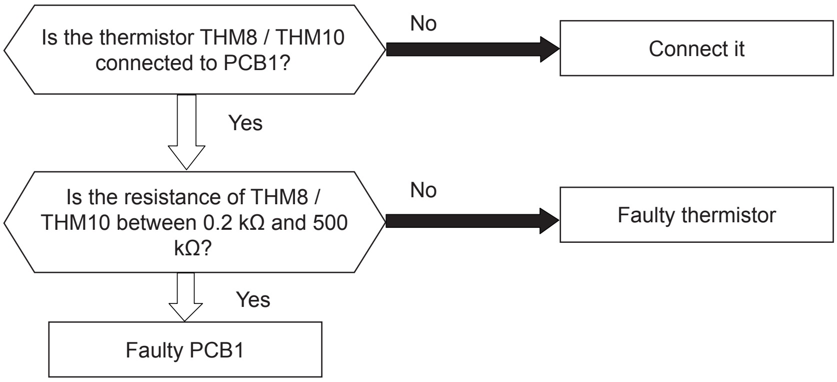


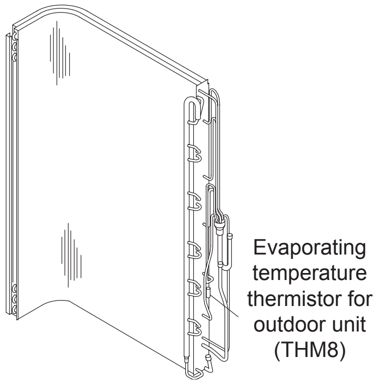
Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty thermistor for the outdoor unit ambient	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to PCB	Repair wiring and connections
Faulty PCB		Replace PCB and check operation	Replace PCB if faulty

Alarm code	24	Abnormal operation of the thermistor for the evaporating temperature during the heating process (outdoor unit) (THM8/THM10)

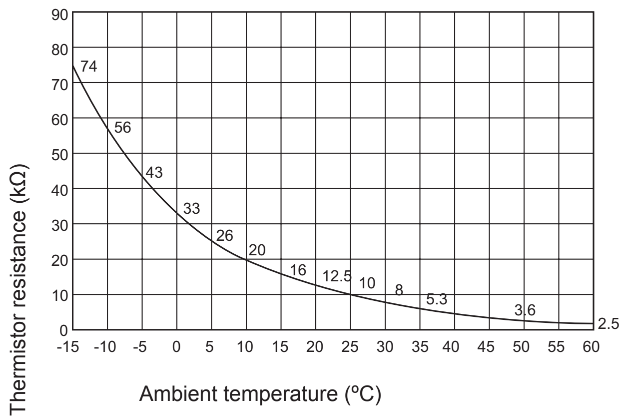
- The evaporating / condensing thermistor during the heating process is attached to the heat exchanger as shown in the figure below. If this thermistor is faulty, such as short-circuit (less than 0,2kΩ) or cut (more than 500kΩ) during eight minutes continuously, this alarm is displayed. The position is indicated below.

- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.

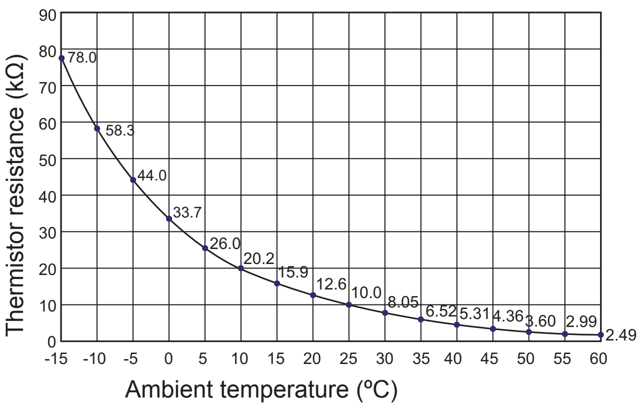




Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty thermistor for the evaporating / condensing temperature during heating	Fault	Check the resistance	Replace the thermistor if faulty
	Incorrect Connection	Check the wiring to PCB	Repair the wiring and the connections
Faulty PCB		Replace PCB and check the operation	Replace PCB if faulty



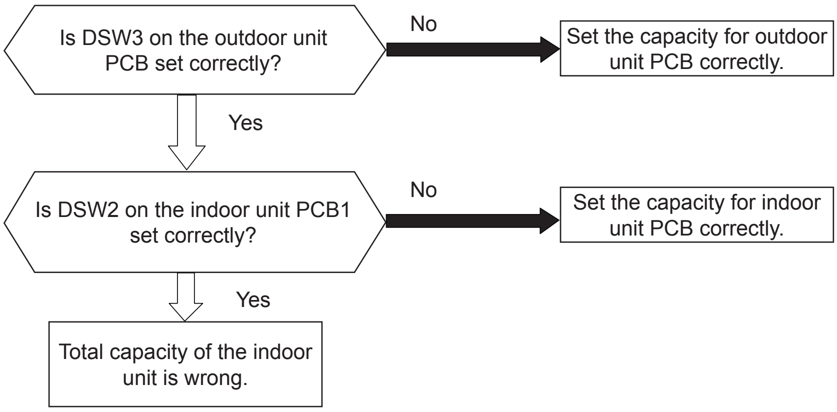
THM8 (Evaporating thermistor)



THM10 (Condensing thermistor)

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

- This alarm code is indicated when the undefined setting is set to DSW3 on the outdoor unit PCB or to DSW2 on indoor unit PCB1.
- This alarm code is indicated when the total indoor unit capacity is not equal to the combined outdoor unit capacity. Outdoor unit capacity setting is not correct.
- Outdoor unit capacity setting is not correct
- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.



Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Incorrect capacity setting of outdoor unit		Check capacity setting on outdoor unit PCB.	Correctly set the dip switch, DSW3.
Incorrect capacity setting of indoor unit		Check capacity setting on indoor unit PCB1.	Correctly set the dip switch, DSW2.

NOTE

- *In case of H-LINK system, this alarm code is indicated when DSW4, RSW1 (for refrigerant system setting) on the outdoor unit PCB and DSW5, RSW2 (for refrigerant system setting) on the indoor unit PCB are incorrectly set.*
- *In this case, set correctly DSW4, RSW1, DSW5 and RSW2 after turning OFF main switch.*

Alarm code	35	Incorrect capacity setting or combined capacity between indoor unit and outdoor unit

- The alarm code appears from 3 to 5 minutes after the outdoor unit power activation if any inconsistency according to capacity is detected between indoor unit and outdoor unit. This applies when indoor unit capacity has no coincidence with outdoor unit capacity
- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.

Alarm code	36	Indoor unit combination error

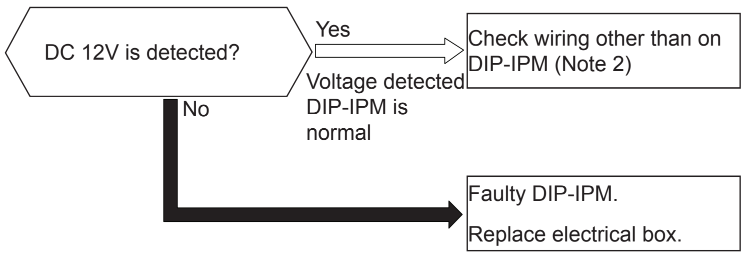
- This alarm code is indicated in case that there is at least 1 indoor unit of a model other than GP (supporting R32 refrigerant) among the connected indoor units
- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.

Alarm code	38	Abnormality of protective circuit for protection (outdoor unit)

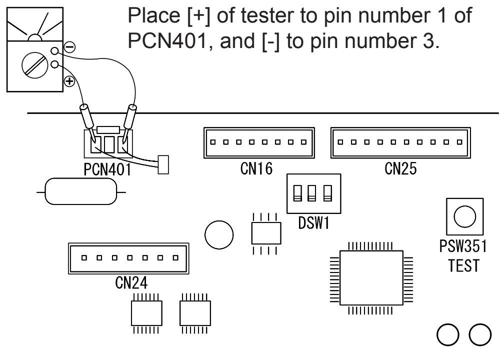
- The alarm code appears in case that any of the following is fulfilled
  - In case that there is no PSC (63H) input signal for 5 continued seconds and more than 2 seconds have passed after switch OFF.
  - In case that "Abnormality of the detection circuit for protection (itc=19)" is received from the inverter microcontroller.

Place the tester as shown in the diagram below to check the connector of PCN401. The connector shall remain inserted. DC12V will constantly be detected and disturb the diagnosis if the connector of PCN401 is pulled out.

- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.



Place [+] of tester to pin number 1 of PCN401, and [-] to pin number 3.



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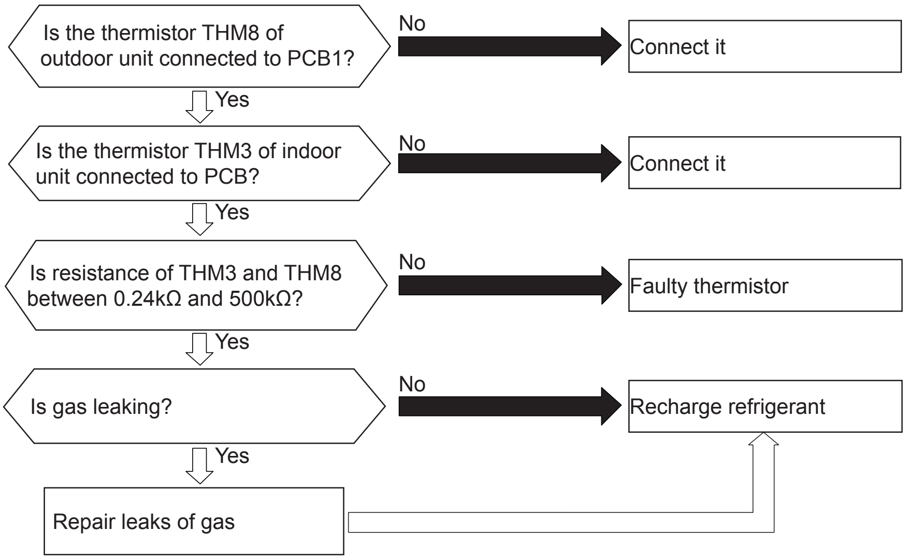
NOTE

- *This alarm may appear if the Faston terminal of the high pressure switch (63H1) is improperly connected or damaged (open-circuit fault) when the operation is started. Besides this, check also Alarm Code: 02 Activation of Outdoor Unit Protection Device.*
- *This alarm code may appear at the beginning of the operation if high pressure switch (PSH) is incorrectly connected or fail (open fault). See also alarm 02.*

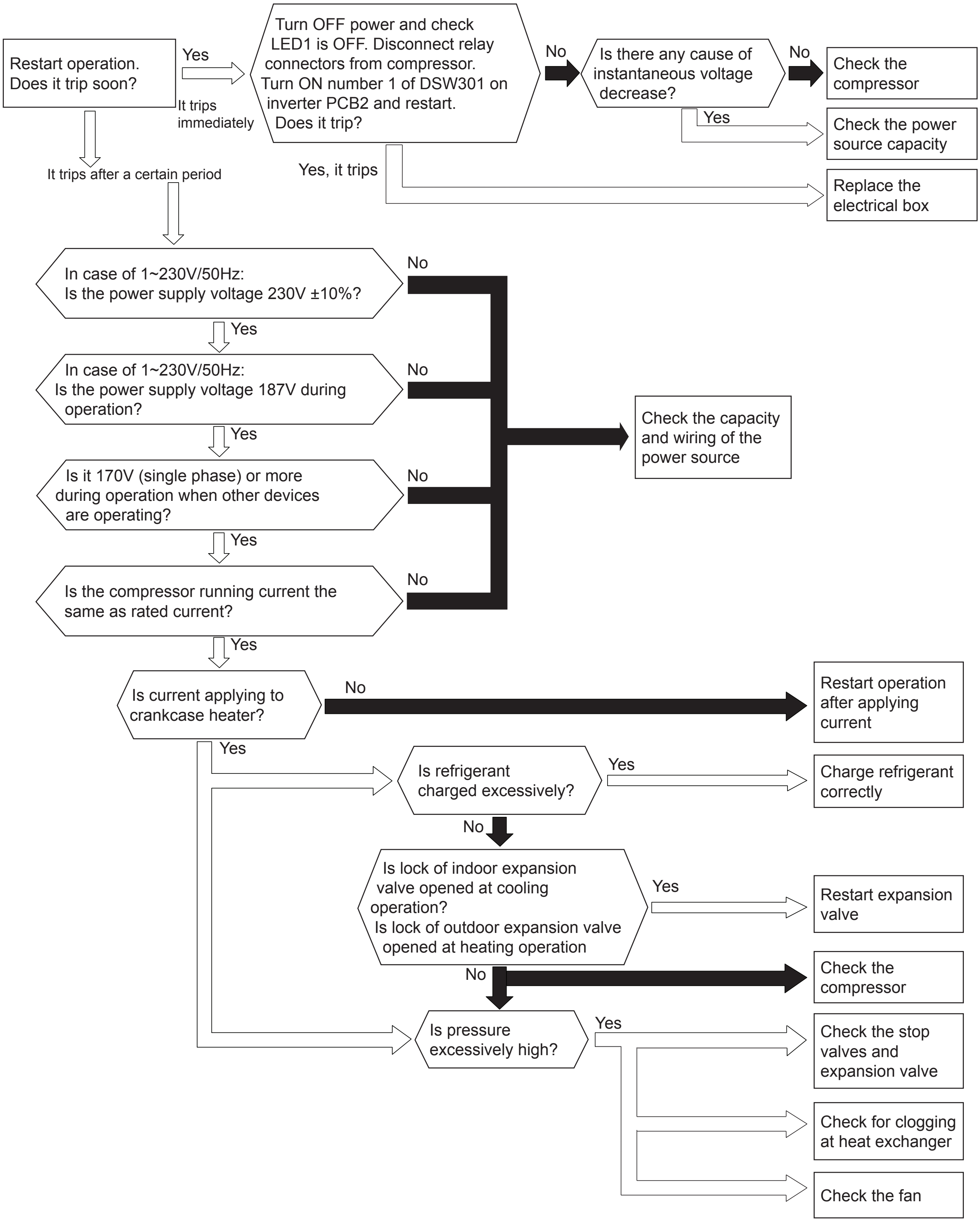
Alarm code	47	Activation to Protect System from Excessively Low Suction Pressure (Protection from Vacuum Operation)

- In the case that the evaporating temperature (Cooling: Liquid Refrigerant Piping Temperature of Indoor Unit, Heating: Evaporating Temperature of Outdoor Unit) is lower than -37 ºC (250~350 kΩ) and the thermistor on top of compressor is higher than 90 ºC for 10 minutes, retry operation is performed 3 minutes after compressor stoppage. However, when the state occurs more than 3 times including 3 in one hour, this alarm code is indicated.
- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.



Phenomenon	Cause	Check item	Action (Turn OFF Main Switch)
– Faulty indoor unit liquid refrigerant temperature thermistor – Faulty outdoor unit evaporating temperature thermistor	Fault	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to PCB.	Repair wiring and connections.
Faulty PCB (Outdoor Unit, Indoor Unit)		Replace PCB and check the operation.	Replace PCB if faulty.
Excessively low suction pressure (in vacuum)	Liquid line stop valve is not open before operation	Check stop valve.	Fully open stop valve.
	Faulty or malfunction of expansion Valve	Check for clogging.	Remove clogging.
		Check connecting wiring and connectors.	Replace connector.
		Check operating sound from coil.	Replace coil.
		Check discharge gas thermistor.	Replace thermistor.
		Check attaching state of discharge gas thermistor.	Reattach thermistor.
	Refrigerant Leakage	Check each temperature and pressure.	Charge refrigerant after vacuum pumping.
		Check gas leakage part.	Correctly charge refrigerant after repairing gas leakage.
Faulty outdoor fan at heating operation	Faulty outdoor fan motor	Measure coil resistance and insulating resistance.	Replace outdoor fan motor if faulty.

Alarm code	48	Overcurrent protection activation



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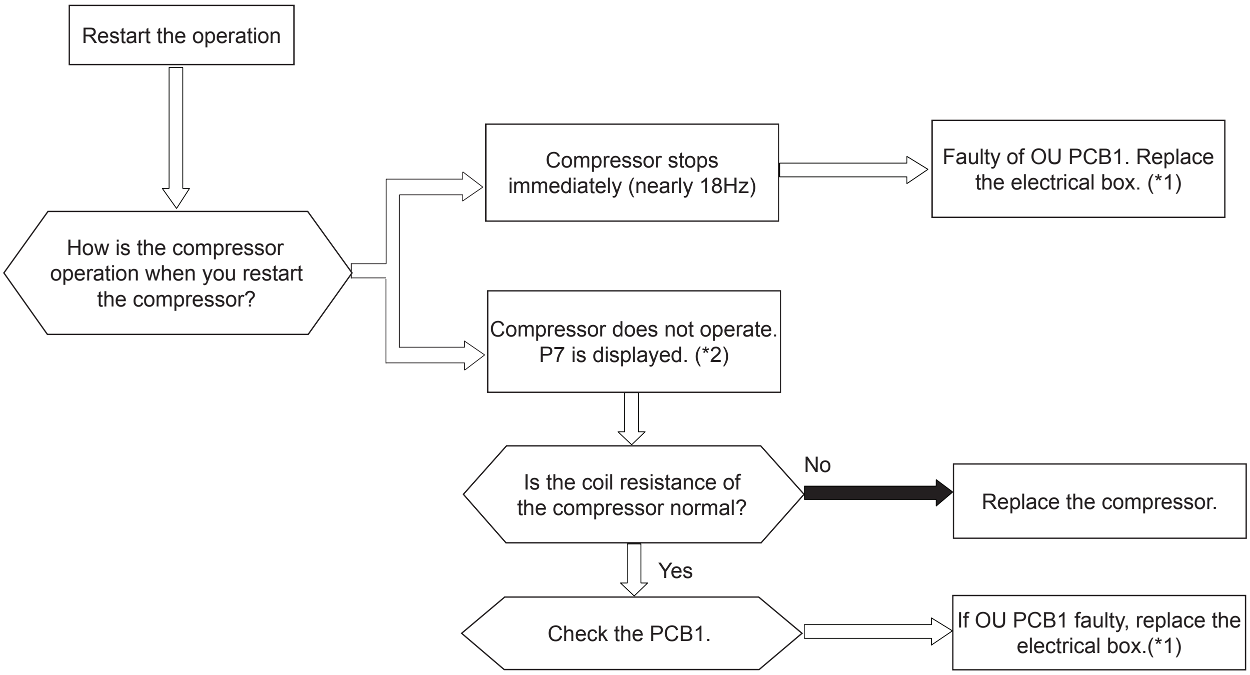
Alarm code	51	Abnormal operation of the current sensor.

- This alarm code is displayed when the current transformer is abnormal (0 A detection or 3 A alarm condition) and the alarm has more than three occurrences in 30 minutes.
- Condition of activation:
  - When the frequency of compressor is maintained at 6 to 10Hz (3HP) after compressor is started, one of the absolute value of running current at each phase is ≤ 1.5A.
  - Before the compressor is operated (at the end of control position) the current wave value is less than 3.0 A.
- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.

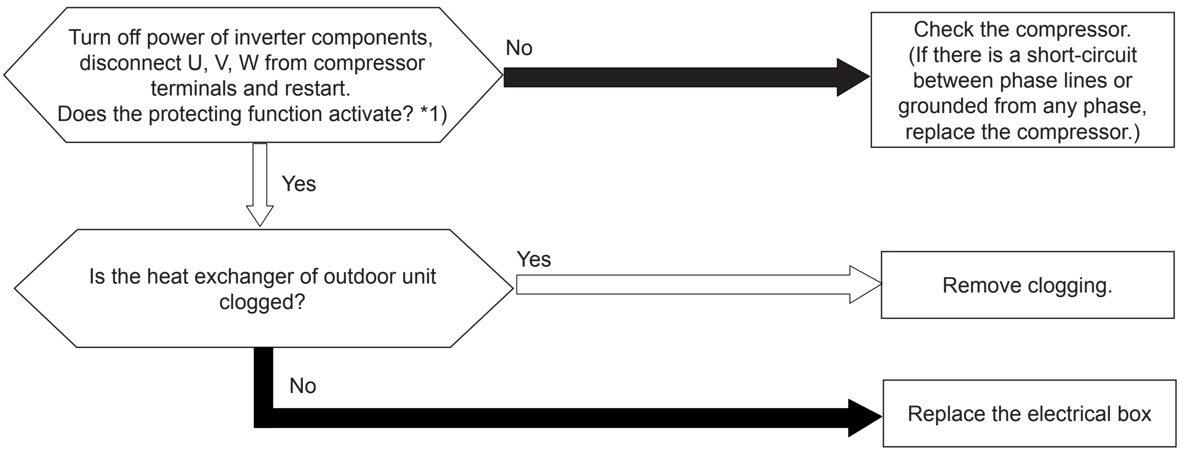


NOTE

- *(*1): Make sure LED1 is OFF.*
- *(*2): P7 is shown at 7-segment on the outdoor unit PCB1.*

Alarm code	53	Activation of transistor module

- ISPM has a detection function of the abnormal operation. This alarm is displayed when the ISPM module detects the abnormal operation 7 times or more than 7 times in 30 minutes. The retry operation is performed six times.
- Condition of activation:
  - The abnormal current to the ISPM, such as short-circuited, grounded, overcurrent or control voltage decrease.
- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.

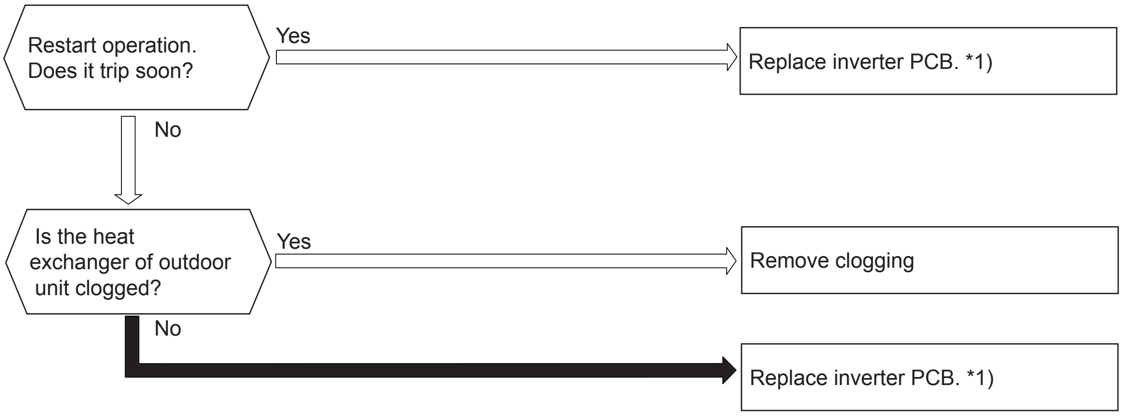


NOTE

- **1) Ensure that the LED1 of inverter PCB (PCB2) is OFF. Then, set the DSW1 pin #1 on inverter PCB (PCB2) to ON when you are restarting with the terminals of the compressor disconnected. After the troubleshooting, set the DSW1 pin #1 to OFF.*
- *When the alarm code "53" is indicated, the outdoor fan motor (DC motor) ensure that DC fan motor is checked according to the item "10.4 Checking procedure for main parts". Check other main parts in all cases. If there is a malfunction in DC fan motor, it may cause damage to the inverter PCB.*

Alarm code	54	Abnormality of the inverter fin temperature

- This alarm code is indicated after the operation is stopped when the following conditions occur three times within 30 minutes. The retry operation is performed twice.
- Conditions of activation:
  - When the temperature of the thermistor for inverter fin exceeds 80 °C.
- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.

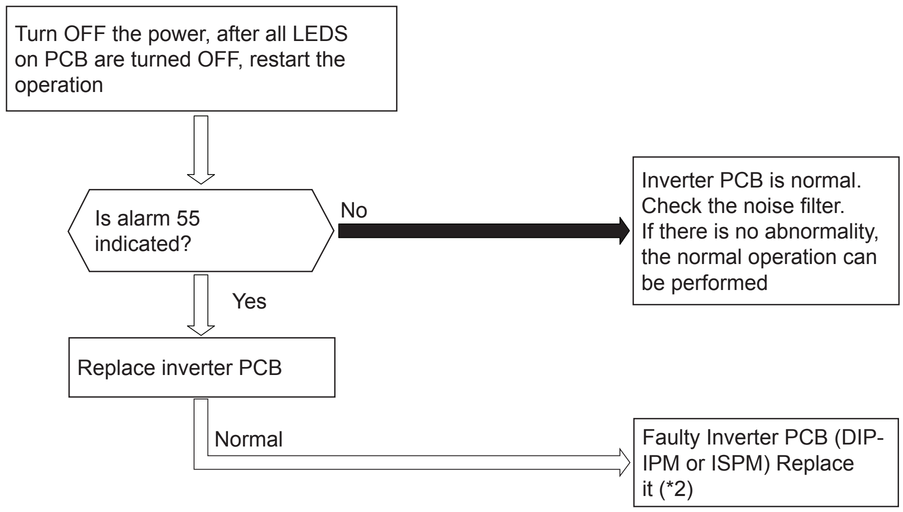


NOTE

1): Perform the high voltage discharge work by referring to the item "10.4.1.4 Checking procedure for other parts", before checking and replacing the inverter components.*

Alarm code	55	Abnormality of inverter module

- Actual frequency from Inverter PCB is less than 10 Hz (after inverter frequency output form PCB1 to Inverter PCB).
- This alarm is displayed when it occurs 3 times in 30 minutes. Retry operation is performed up to the occurrence of 2 times.
- Condition of Activation:
  - This alarm is indicated when Inverter PCB is not performed normally.
- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.

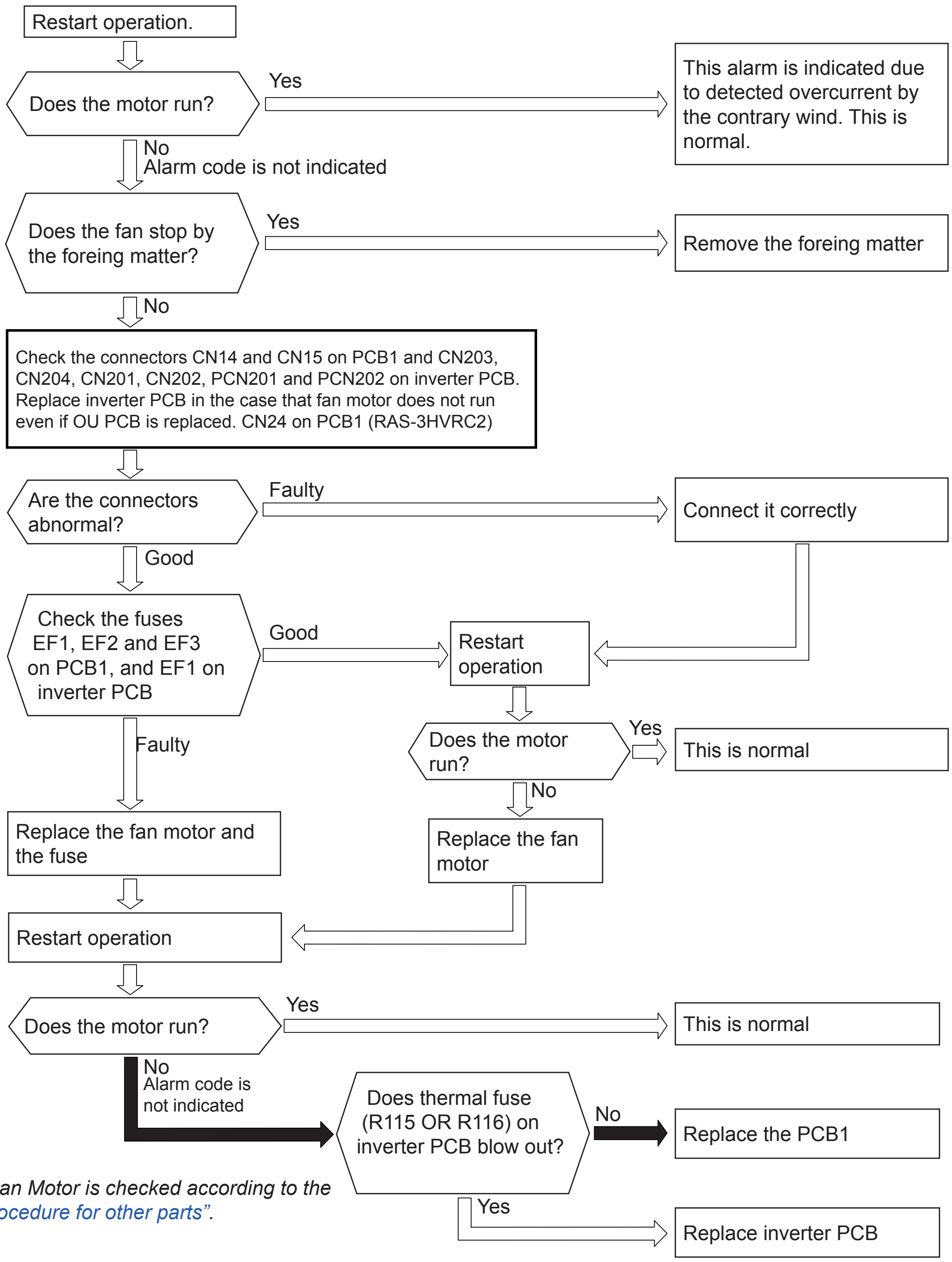


NOTE

When the excessive surge current is applied to the unit due to lighting or other causes, this alarm code or the cause code of inverter stoppage (Itc=11) will be indicated on the 7-segment display on OU PCB1 and the unit can not be operated. In this case, check to ensure the surge absorber (SA) on the PCB1. The surge absorber may be damaged if the inner surface of the surge absorber is changed to black. If the surge absorber is damaged, replace the noise filter. If the surge absorber does not have abnormality, turn OFF the power source once and wait until turning OFF all LEDS on inverter PCB for approx. 5 min. Then, turn ON again.

Alarm code	57	Abnormality of fan motor protection (DC fan motor)

- This alarm is indicated when the revolution pulse output from the fan motor is lower than 20min-1 during 30 seconds and it stops. Regarding stops, when less than 35 seconds have passed since fan start up, after the first abnormality is detected, if its occurs 4 times more within 5 minutes, it stops and alarm is displayed.



NOTE

Check to ensure that DC Fan Motor is checked according to the item "10.4.1.4 Checking procedure for other parts".

Alarm code	81	"Momentary power interruption" or "Low voltage detected"

- This alarm is displayed to indicate a momentary power interruption or a low voltage detected during compressor operation.

A brief power interruption (which may not cause the reset of the microcomputer), may cause, instead, the relay Y52C or the CMC (Contactor for Compressor Motor) to release. Abnormal conditions kept for more than 60 seconds is considered a "Critical power supply problem", since no power is detected but microprocessor is still operating. In this case, Alarm 81 is recorded.

- A power interruption shorter than 2 seconds is considered a "Momentary Power Interruption. In this case, a Control for recovery from "Momentary power interruption is performed.
- A power interruption longer than 3 seconds is considered a "Power failure" and the unit is stopped as a normal stop. In this case no alarm is displayed.
- This alarm forces all operations to stop and force all digital outputs to an OFF state.
- The alarm is released when anomaly conditions are not detected for more than 10 seconds (power restored).

Alarm code	EE	Compressor protection

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

Alarm code	Content of abnormality
02	Tripping of protection device in outdoor unit
07	Decrease in discharge gas superheat
08	Increase in discharge gas temperature
41	High pressure switch overload
42	Heating overload
47	Low pressure decrease protection activating

NOTE

These alarms can be checked using the check mode 1. The action indicated in each alarm chart must be followed. These alarms have to be cleared by turning OFF the main switch of the system. **Pay special attention before starting. There is a possibility of causing serious damages to the compressor.**

Alarm code	b0	Incorrect setting of unit model

- This alarm code is indicated in the following condition. Check the unit model code setting (DSW4) of IU PCB after turning OFF the power source.

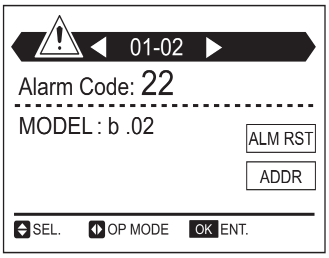
Condition	Action
The unit model code setting (DSW4) is not set (all pins are “OFF”), or is set for the incorrect indoor unit type.	Set DSW4 correctly according to the dip switch setting in “Installation and Operation Manual”.

10.2.2 RAS-(4-6)H(V)(R/N)(C/P)2E

10.2.2.1 Alarm codes of wired controller

- The RUN indicator (red) flashes on the remote control switch.
- The unit number, the alarm code and the unit model code and the number of connected indoor units are alternatively displayed on the LCD, and the indoor unit number and the alarm code are displayed on the 7-segment display of outdoor unit PCB1.
- 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.

PC-ARFP1E



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.

NOTE

Depends on models some alarms or causes are not applicable.

Code	Category	Content of Abnormality	Leading Cause
01	Indoor Unit	Activation of Protection Device (Float Switch)	Activation of Float Switch (High Water Level in Drain Pan, Abnormality of Drain Pipe, Float Switch, or Drain Pan)
02	Outdoor Unit	Activation of Protection Device (High Pressure Cut) or Clixon (compressor thermostat) activation (high temperature cut)	Activation of PSH (Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing). Activation of Compressor thermostat due to abnormality on discharge temperature.
03	Communication	Abnormal Communication between Indoor Units and Outdoor Units	Incorrect Wiring, Loose Terminals, Disconnected Communication Cable, Blowout of Fuse, Indoor Unit Power OFF
04		Abnormal Communication between Inverter PCB and Outdoor PCB	Inverter PCB -Outdoor PCB Communication Failure (Loose Connector, Wire Breaking, Blowout of Fuse)
05	Supply Phase	Abnormality of Power Supply Phases	Incorrect Power Supply or Open-Phase
06	Voltage	Abnormal Inverter Voltage	Outdoor Voltage Decrease, Insufficient Power Capacity
07	Cycle	Decrease in Discharge Gas Superheat	Excessive Refrigerant Charge, Failure of Thermistor, Incorrect Wiring, Incorrect Piping Connection, Expansion Valve Locking at Opened Position (Disconnect Connector)
08		Increase in Discharge Gas Temperature	Insufficient Refrigerant Charge, Pipe Clogging, Failure of Thermistor, Incorrect Wiring, Incorrect Piping Connection, Expansion Valve Locking at Closed Position (Disconnect Connector)
11	Sensor on Indoor Unit	Abnormality of Inlet Air Thermistor	Incorrect Wiring, Disconnecting Wiring, Breaking Wire, Short Circuit
12		Abnormality of Outlet Air Thermistor	
13		Abnormality of Freeze Protection Thermistor	
14		Abnormality of Gas Piping Thermistor	
15		Abnormality of Outdoor Air Thermistor (EconoFresh)	
16		Abnormality of Remote Sensor (DOAS)	
17		Abnormality of Thermistor Built-in Remote Controller (DOAS)	

Code	Category	Content of Abnormality	Leading Cause
18	Indoor Fan Motor	Abnormality of Indoor Fan System	Abnormality of Indoor Fan Motor (Step-Out), Indoor Fan Controller Failure
19		Activation of Protection Device for Indoor Fan	Fan Motor Overheat, Lockup
1A	Indoor Fan Controller	Abnormality of Fan Controller Fin Temperature	Abnormality of Fin Thermistor or Fan Controller, Heat Exchanger Clogging, Abnormality of Fan Motor
1b		Activation of Overcurrent Protection	Abnormality of Fan Motor
1C		Problem with Current Sensor	Abnormality of Fan Controller Current Sensor
1d		Activation Fan Controller Protection	Driver IC Error Signal Detection, Instantaneous Overcurrent
1E		Abnormality of Indoor Fan Controller Voltage	Indoor Voltage Decrease, Insufficient Capacity of Power Supply Wiring
20	Sensor on Outdoor Unit	Abnormality of compressor thermistor	
21		Abnormality of High Pressure Sensor	Incorrect Wiring, Disconnecting Wiring, Breaking Wire, Short Circuit
22		Abnormality of Outdoor Air Thermistor	
23		Abnormality of Discharge Gas Thermistor on Top of Compressor	
24		Abnormality of Heat Exchanger Liquid Pipe Thermistor	
25		Abnormality of Heat Exchanger Gas Pipe Thermistor	
29		Abnormality of Low Pressure Sensor	
30	System	Incorrect DSW Settings of Outdoor Unit for CH-Box	Connection of CH-Box to Heat Pump System, Disconnection of CH-Box to Heat Recover System. CH-Unit (Generation 1 mode) and CH-BOx (Generation 2 model) are used in the same system together.
31		Incorrect Capacity Setting of Outdoor Unit and Indoor Unit	Incorrect Capacity Setting of Outdoor Unit and Indoor Unit, Excessive or Insufficient Indoor Unit Total Capacity Code
35		Incorrect Setting of Indoor Unit No.	Duplication of Indoor Unit Number In same Refrigerant Cycle Number
36		Incorrect of Indoor Unit Combination	Alarm triggered in case Outdoor Unit es R32 and Indoor Unit is not designed for R32.
38		Abnormality of Picking up Circuit for Protection in Outdoor Unit	Failure of Protection Detecting Device (Incorrect Wiring of Outdoor PCB) Compressor thermoistat (clixon) is already activated when compressor is OFF
3E	Outdoor Unit	Abnormal Combination between Inverter PCB and Outdoor PCB	Incorrect Combination between Inverter PCB and Outdoor PCB
43	Protection Device	Activation of Pressure Ratio Decrease Protection	Defective Compression (Failure of Compressor or Inverter, Loose Power Supply Connection)
44		Activation of Low Pressure Increase Protection	Overload at Cooling, High Temperature at Heating, Expansion Valve Locking at Open Position (Loose Connector)
45		Activation of High Pressure Increase Protection	Overload Operation (Heat Exchanger Clogging, Short Circuit of Airflow), Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing
47		Activation of Low Pressure Decrease Protection	Insufficient Refrigerant, Piping Clogging, Expansion Valve Locking at Close Position (Loosen Connector)
48		Activation of Inverter Overcurrent Protection	Overload Operation, Compressor Failure
49	Outdoor Unit	Shortage of energy transfer at IDU and ODU side	Shortage of refrigerant due to gas leakage
50		Compressor continuously in operation under very low discharge pressure	Abnormality operation at a low ambient temperature
51	Sensor	Abnormal Inverter Current Sensor	Current Sensor Failure
53	Inverter	Inverter Error Signal Detection	Driver IC Error Signal Detection (Protection for Overcurrent, Voltage Decrease, Short Circuit), Instantaneous Overcurrent
54		Abnormality of Inverter Fin Temperature	Abnormal Inverter Fin Thermistor, Heat Exchanger Clogging, Fan Motor Failure
55		Inverter Failure	Inverter PCB Failure

Code	Category	Content of Abnormality	Leading Cause
57	Fan Controller	Activation of Fan Controller Protection	Driver IC Error Signal Detection (Protection for Overcurrent, Voltage Decrease, Short Circuit), Instantaneous Overcurrent
5A		Abnormality of Fan Controller Fin Temperature	Fin Thermistor Failure, Heat Exchanger Clogging, Fan Motor Failure
5b		Activation of Overcurrent Protection	Fan Motor Failure
5C		Abnormality of Fan Controller Sensor	Failure of Current Sensor (Instantaneous Overcurrent, Increase of Fin Temperature, Voltage Decrease, Grand Fault, Step-Out)
88	Outdoor unit	Alarm of abnormality of fan or compressor unit	The fan or compressor driver do not transfer and identification code
A1	External Input	Detection of External Abnormality	Input Signal by External Abnormality Detection Setting
b0	Indoor Unit	Incorrect Setting of Unit Model Code	Incorrect Setting of Indoor Unit Model
b1		Incorrect Setting of Unit and Refrigerant Cycle Number	64 or More Number is Set for Address or Refrigerant Cycle
b2		Abnormality of EEPROM	EEPROM failure, Incorrect Data of EEPROM
b3		Wrong combination of indoor unit and remote control switches	Wrong combination of indoor unit and remote control switches
b5		Incorrect Indoor Unit Number Setting	There are 17 or More Non-Corresponding to H-LINK II Units are Connected to One System.
b6		Abnormal Communication between Indoor PCB and Indoor Fan Controller	Communication Failure, Disconnected Communication Cable, Abnormal Connection
b7		Transmission abnormality between the indoor and the PCB for 2 fans	Transmission abnormality between the indoor and the PCBfor 2 fans
bF		Abnormality in the number of connectedsub-PCB	Abnormality in the number of connected sub-PCB
EE	Compressor	Compressor Protection Alarm (It can not be reset from Wired Controller)	This alarm code appears when the following alarms* occurs three times within 6 hours. *02, 07, 08, 39, 43 to 45, 47

10.2.2.2 Troubleshooting by alarm code

Alarm code	01	Activation of the Indoor unit protection device (float switch) in indoor unit

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

Example of 4-way Cassette Type

This alarm code is displayed when the contact between #1 and #2 of CN14 on the I.U. PCB is opened for 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-slope drain piping	Check drain pan Check drainage by pouring water	Remove foreign particles clogging the drainage
Failure float switch	Failure		Check conduction when drain level is low	Replace float switch if failure
	Contact failure		Measure resistance by tester	Replace looseness and replace connector
	Incorrect connection		Check connections	Repair connection
Failure drain pump	Failure		Measure voltage between the terminals for water pump.	Replace drain pump if faulty
	Contact failure		Measure resistance by tester	Replace and tighten connector
	Incorrect connection		Check connections	Repair connection
Failure indoor unit PCB			Check PCB by self-checking (*)	Replace it if failure

NOTE

(*) Refer to the chapter "10.4.2 RSW, DSWs and LEDs functions RAS-(4-6)HV(R/N)(C/P)2E" or "10.4.3 RSW, DSWs and LEDs functions RAS-(4-6)H(R/N)(C/P)2E".

10

Alarm code	02	Activation of Protection Device (High Pressure Switch) in Outdoor Unit or Compressor thermostat activation (High Temperature Cut)

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Activation of High Pressure Switch due to Excessively Increasing High Pressure	Excessively High Temp. Air to Indoor Unit Heat Exchanger	Calculate heat load	Reduce heat load or use a larger unit
		Check for hot air near ceiling (Heating)	Make circulation better
		Check for short circuited air (Heating)	Remove short-circuited air
		Check for other heat source	Remove heat source
	Failure of High Pressure Switch – Failure of Pressure Switch	Measure discharge pressure. Check continuity after decreasing of pressure.	Replace it if faulty
	Failure of High Pressure Switch – Contact Failure	Measure resistance with tester	Repair looseness Replace connector
	Failure of High Pressure Switch – Incorrect Connection	Check connection	Repair connection
	Overcharged Refrigerant	Check system operating temp	Charge correct amount of regrigerant
	Contamination of Non-condensable Gas into Refrigerant System	Check ambient temp.and pressure	Recharge refrigerant after vacuum pumping
	Clogging of Discharge Pipe	Check for clogging	Remove clogging
	Liquid line stop valve or gas line stop valve is not fully opened	Check stop valves	Fully open stop valves
	Insufficient Airflow to Heat Exchanger (Cooling: O.U. Heat Exchanger, Heating: I.U. Heat Exchanger)	Check for 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 service space is sufficient	Secure sufficient service space
		Check fan motor speed (Cooling: Outdoor Fan, Heating: Indoor Fan)	Replace fan motor if faulty
Activation of Compressor Thermostat due to High Compressor Temperature	Refrigerant leakage	Check refrigerant	Correct refrigerant charge

Alarm code	03	Abnormal Communication between Indoor Units and Outdoor Units

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

When fuses are blown, or the circuit breakers are activated, check the cause of overcurrent and take necessary action.

This alarm code is displayed when an abnormal condition continues for three minutes after normal communication between indoor units and outdoor units, and also the abnormal condition continues for 30 seconds even after the micro-computer is automatically reset. If communication failure occurs from the beginning, the alarm code is displayed after 30 seconds from start up.

Phenomenon	**Cause**	**Check Item**	**Action (Turn OFF Main Switch)**
Power Failure or No Power Supply		Measure voltage with tester	Supply power
Blown Fuse for Power Supply or Activation of Outdoor Unit Breaker	Short Circuit between Wires	Check for breakage of insulation	Remove cause of short circuit Replace fuse and/or Outdoor Unit and Indoor Unit PCB if faulty
	Ground Fault	Measure insulation resistance	Remove cause of short circuit to ground Replace fuse and/or Outdoor Unit and Indoor Unit PCB if faulty
	Failure of Comp. Motor	Measure resistance between wires and insulation resistance	Replace comp. and fuse of Outdoor Unit Replace inverter PCB and/or Outdoor Unit PCB if faulty
	Failure of Outdoor Unit Fan Motor	Measure resistance between wires and insulation resistance	Replace Outdoor Unit fan motor and fuse Replace Outdoor Unit PCB if faulty
Blown Fuse on Outdoor Unit PCB	Short Circuit between Wires	Check for breakage of insulation	Remove cause of short circuit and replace fuse
	Incorrect Power Supply Circuit of Outdoor Unit PCB	Check Outdoor Unit PCB output	Replace fuse
Incorrect Power Supply Circuit of Outdoor Unit PCB		Measure Outdoor Unit PCB output	Replace Outdoor Unit PCB
Disconnected Wires, Contact Failure or Incorrect Connection	Communication Cable Between Outdoor Unit and Indoor Unit	Check continuity of wires. Check for looseness of connection screws. Check terminal numbers.	Replace or repair wires, tighten screws or correct wires
	Power Supply Wiring for Outdoor Unit		
Failure of Outdoor Unit and Indoor Unit PCB	Disconnected Wires to Outdoor Unit and Indoor Unit PCB	Check connection	Correctly connect wires
	Failure of Outdoor Unit and Indoor Unit PCB		Replace if it faulty

10

Alarm code	04	Abnormal Communication between Inverter PCB and the Outdoor Unit PCB

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

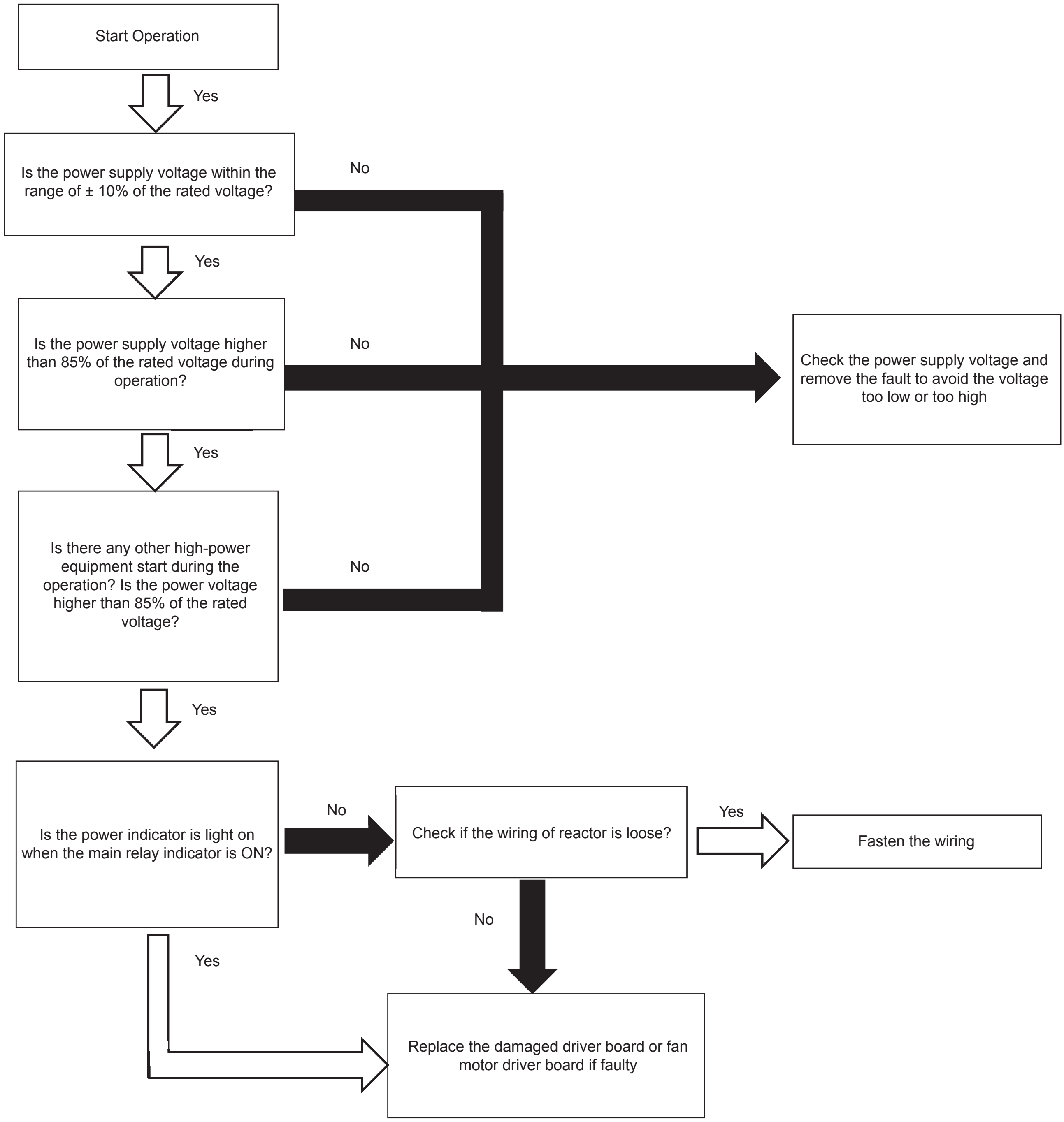
This alarm code is displayed after the operation is stopped when an abnormal communication occurs between the inverter PCB (Driver Board) and the outdoor unit PCB (Main Board).

Phenomenon	**Cause**	**Check Item**	**Action (Turn OFF Main Switch)**
Abnormal communication between inverter PCB and outdoor unit PCB	Incorrect setting of DSW1 DIP3 of outdoor unit board or driver board (4~6HP)	Is DSW1 DIP3 OFF?	Switch DIP3 of DSW1 to OFF and re-power ON
	The outdoor unit board or driver board (4~6HP) has been damaged	Re-power ON to check if the cause is eliminated	Replace the outdoor unit board or driver board (4~6HP) if faulty

Alarm code	06	Abnormal Inverter voltage (Insufficient inverter voltage or over voltage)

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

If either insufficient voltage or overvoltage is detected between the terminal R-S on the inverter PCB (Driver Board) three times in 30 minutes, the operation stops and this alarm code is displayed. If this occurs less than three times in 30 minutes, the operation is automatically retried.



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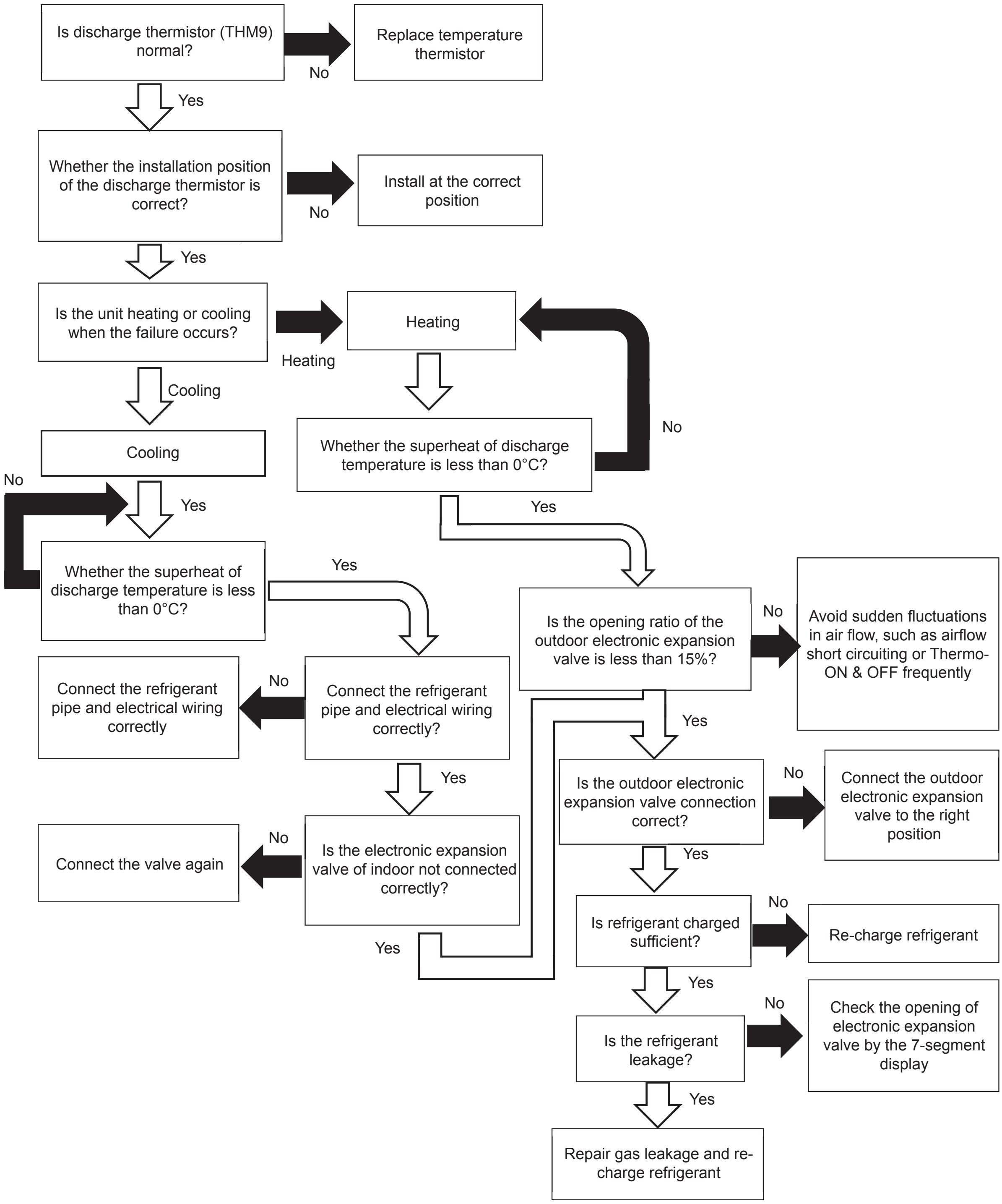
Alarm code	07	Decrease in Discharge Gas Superheat

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

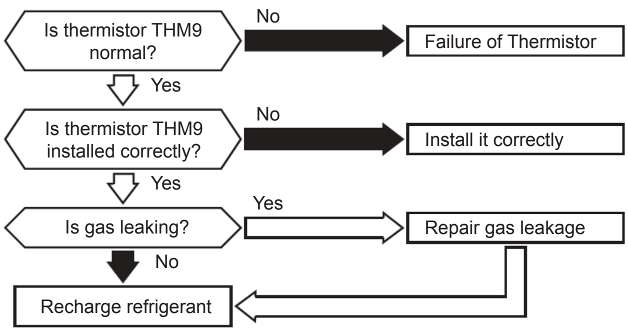
If either insufficient voltage or overvoltage is detected between the terminal R-S on the inverter PCB (Driver Board) three times in 30 minutes, the operation stops and this alarm code is displayed. If this occurs less than three times in 30 minutes, the operation is automatically retried.

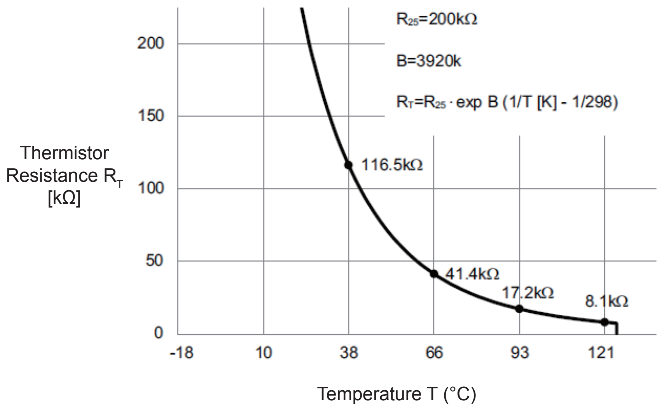


Alarm code	08	Excessively High Discharge Gas Temperature

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

This alarm code is displayed when the discharge temperature is too high during cooling/heating operation.



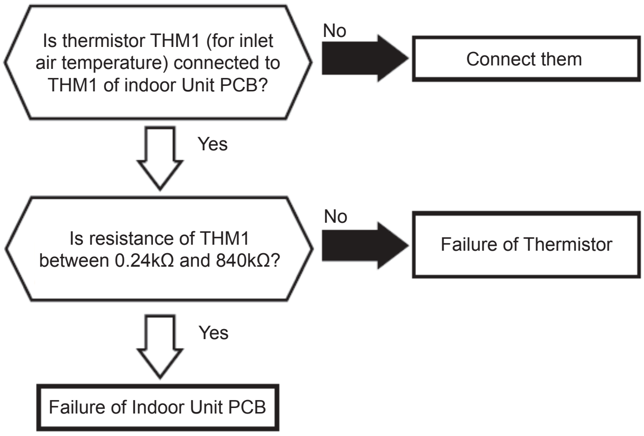


Thermistor Characteristics

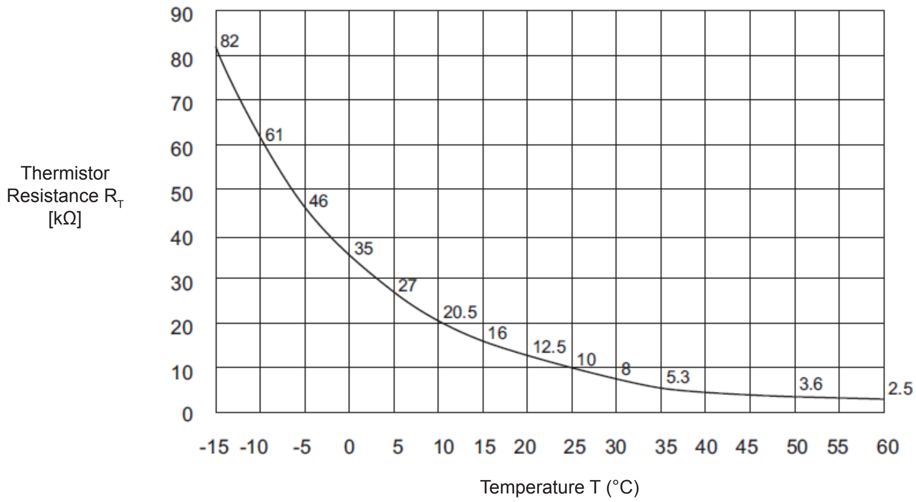
Alarm code	11	Abnormality of Thermistor for Indoor Unit Inlet Air Temperatures (Inlet Air Thermistor)

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

This alarm code is displayed when a short circuit (0.24kΩ or less) or disconnection (840kΩ or more) of the thermistor is detected during a heating or cooling operation. The operation automatically restarts when the malfunction is removed.



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Inlet Air Thermistor	Failure	Check resistance	Replace thermistor if faulty
	Incorrect Connection	Check connection	Correctly connect wires
Failure of Indoor Unit PCB		Replace Indoor Unit PCB and check operation	Replace Indoor Unit PCB if faulty

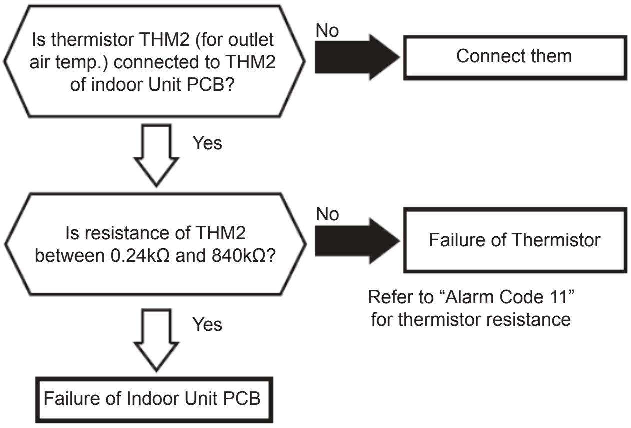


Thermistor Characteristics

Alarm code	12	Abnormality of Thermistor for Indoor Unit Outlet Air Temperatures (Outlet Air Thermistor)

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

This alarm code is displayed when a short circuit (0.24kΩ or less) or disconnection (840kΩ or more) of the thermistor is detected during a heating or cooling operation. The operation automatically restarts when the malfunction is removed.



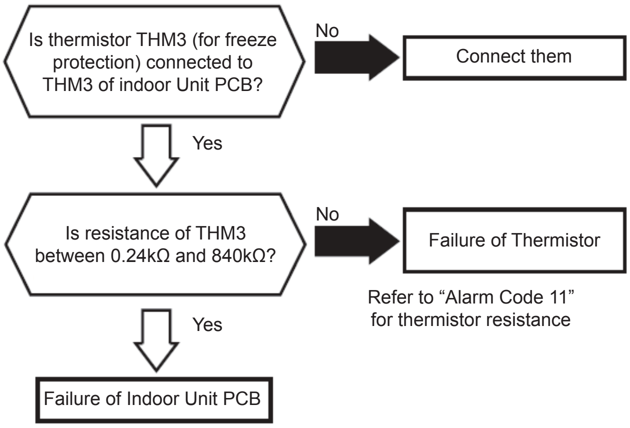
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Outlet Air Thermistor	Failure	Check resistance	Replace thermistor if faulty
	Incorrect Connection	Check wiring to Indoor Unit PCB	Correctly connect wires
Failure of Indoor Unit PCB		Replace Indoor Unit PCB and check operation	Replace Indoor Unit PCB if faulty

10

Alarm code	13	Abnormality of Thermistor for Liquid Refrigerant Pipe Temperature at Indoor Unit Heat Exchanger (Freeze Protection Thermistor)

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

This alarm code is displayed when a short circuit (0.24kΩ or less) or disconnection (840kΩ or more) of the thermistor is detected during a heating or cooling operation. The operation automatically restarts when the malfunction is removed.

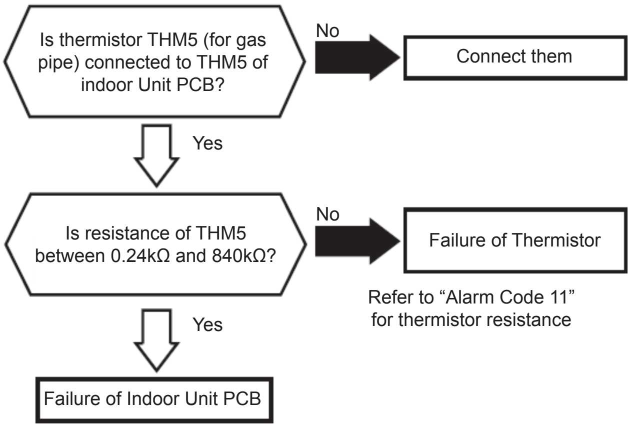


Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Freeze Protection Thermistor	Failure	Check resistance	Replace thermistor if faulty
	Incorrect Connection	Check wiring to Indoor Unit PCB	Correctly connect wires
Failure of Indoor Unit PCB		Replace Indoor Unit PCB and check operation	Replace Indoor Unit PCB if faulty

Alarm code	14	Abnormality of Thermistor for Gas Refrigerant Pipe Temperature at Indoor Unit Heat Exchanger (Gas Pipe Thermistor)

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

This alarm code is displayed when a short circuit (0.24kΩ or less) or disconnection (840kΩ or more) of the thermistor is detected during a heating or cooling operation. The operation automatically restarts when the malfunction is removed.

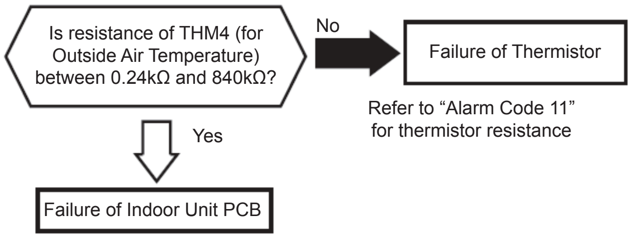


Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Thermistor for Indoor Unit Heat Exchanger Gas Pipe Temp.	Failure	Check resistance	Replace thermistor if faulty
	Incorrect Connection	Check wiring to Indoor Unit PCB	Correctly connect wires
Failure of Indoor Unit PCB		Replace Indoor Unit PCB and check operation	Replace Indoor Unit PCB if faulty

Alarm code	15	Abnormality of Thermistor for Outside Air Temperature (for Econofresh)

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

This alarm code is displayed when a short circuit (0.24kΩ or less) or disconnection (840kΩ or more) of the thermistor is detected during a heating or cooling operation. The operation automatically restarts when the malfunction is removed.



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Thermistor for Outside Air Temperature	Failure	Check resistance	Replace thermistor if faulty
	Incorrect Connection	Check wiring to Indoor Unit PCB	Correctly connect wires
Failure of Indoor Unit PCB		Replace Indoor Unit PCB and check operation	Replace Indoor Unit PCB if faulty

Alarm code	20	Abnormality of Discharge Gas Thermistor

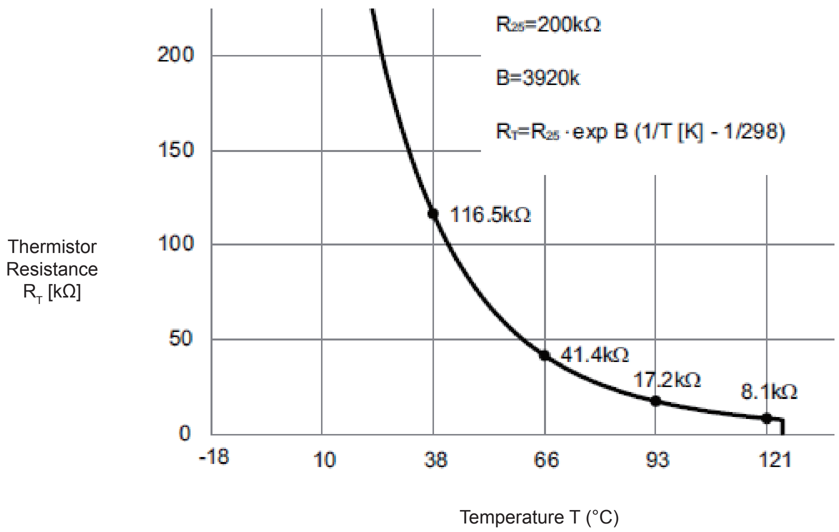
- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

This alarm code is displayed when a short circuit (0.9kΩ or less) or disconnection (5946kΩ or more) of the thermistor is detected during a heating or cooling operation.

Is thermistor connected to THM9 of Outdoor Unit PCB?
- No → Connect it
- Yes ↓

Is resistance of THM9 within range shown in "Thermistor Characteristics"?
- No → Failure of Thermistor
- Yes ↓

Failure of O.U. PCB



Thermistor Characteristics

Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Thermistor for Discharge Gas Temp. on Top of Compressor	Failure	Check resistance	Replace thermistor if faulty
	Incorrect Connection	Check wiring to Outdoor Unit PCB	Repair wiring and connection
Failure of Outdoor Unit PCB		Replace Outdoor Unit PCB and check operation	Replace Outdoor Unit PCB if faulty

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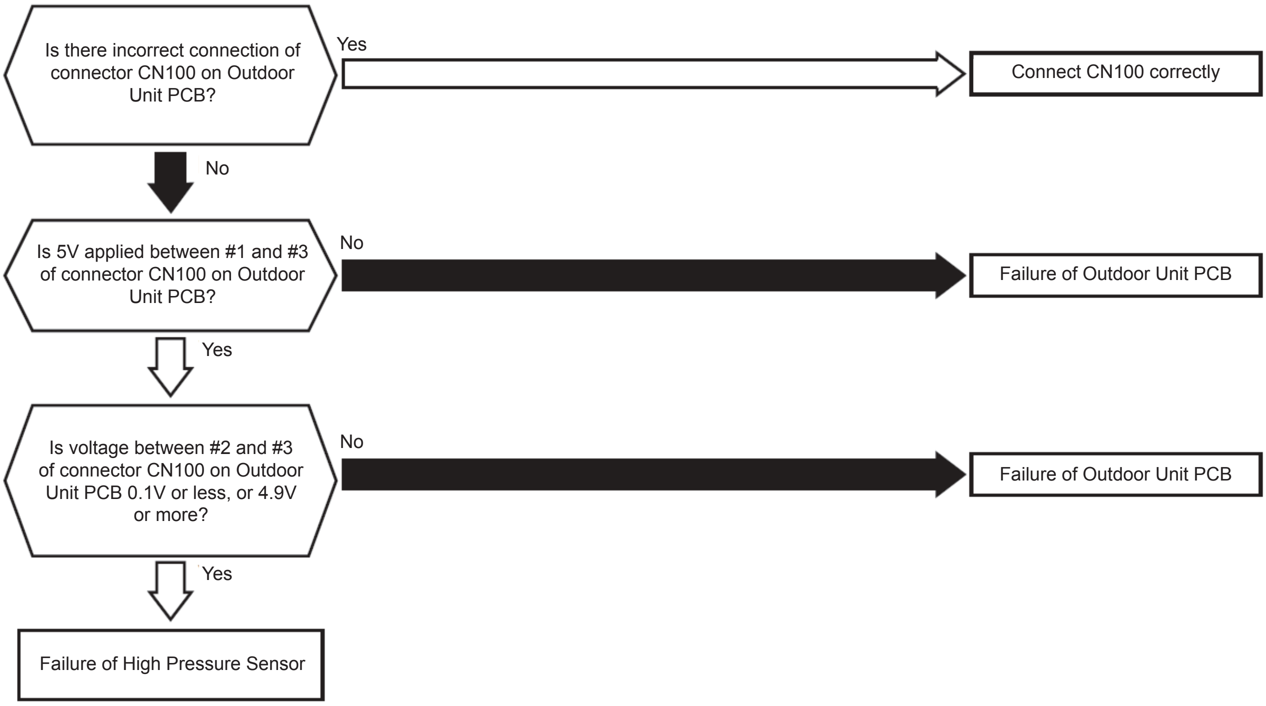
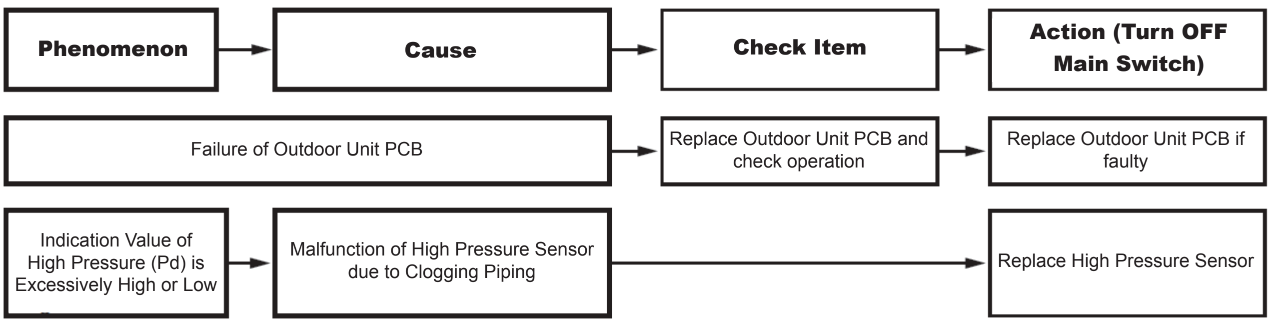
Alarm code	21	Abnormality of High Pressure Sensor

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

This alarm code is displayed when output voltage of the high pressure sensor decreases to 0.1V or less, or increases to 4.9V or more during operation.

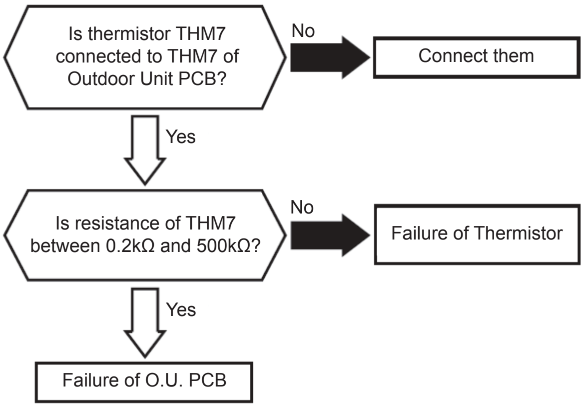




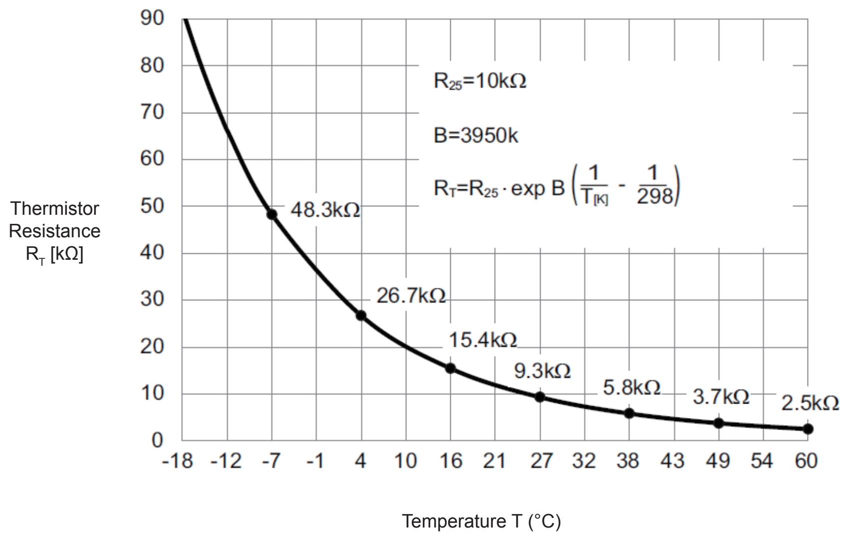
Alarm code	22	Abnormality of Outdoor Air Thermistor (Outdoor Unit Ambient Thermistor)

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

This alarm code is displayed when a short circuit (0.2kΩ or less) or disconnection (500kΩ or more) of the thermistor is detected during heating or cooling operation.



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Thermistor for Outdoor Air Temp.	Failure	Check resistance	Replace thermistor if faulty
	Incorrect Connection	Check wiring to Outdoor Unit PCB	Repair wiring and connection
Failure of Outdoor Unit PCB		Replace Outdoor Unit PCB and check operation	Replace Outdoor Unit PCB if faulty



Thermistor Characteristics

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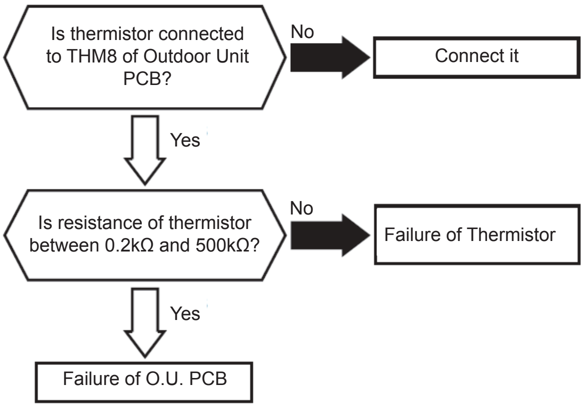
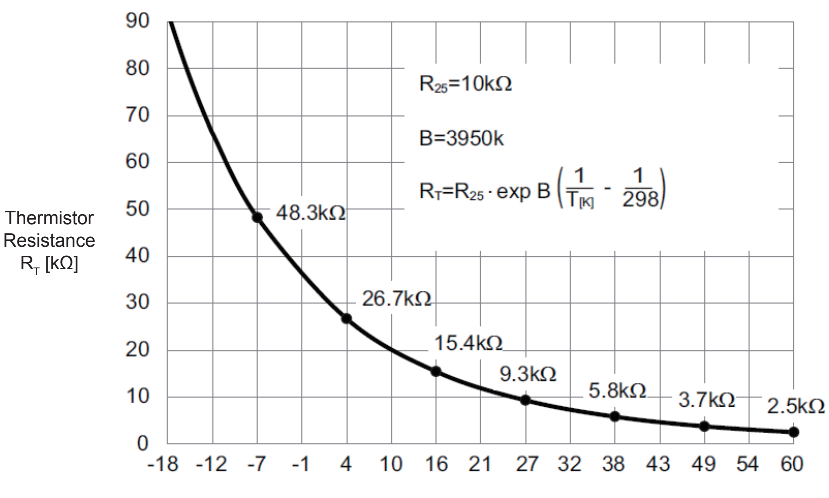
Alarm code	24	Abnormality of Thermistor for Evaporating Temperature during Heating Operation (Outdoor Unit Evaporating Thermistor)

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

This alarm code is displayed when a short circuit (0.2kΩ or less) or disconnection (500kΩ or more) of the thermistor is detected during heating or cooling operation.



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Thermistor for Evaporating Temperature during Heating	Failure	Check resistance	Replace thermistor if faulty
	Incorrect Connection	Check wiring to Outdoor Unit PCB	Repair wiring and connection
Failure of Outdoor Unit PCB		Replace Outdoor Unit PCB and check operation	Replace Outdoor Unit PCB if faulty

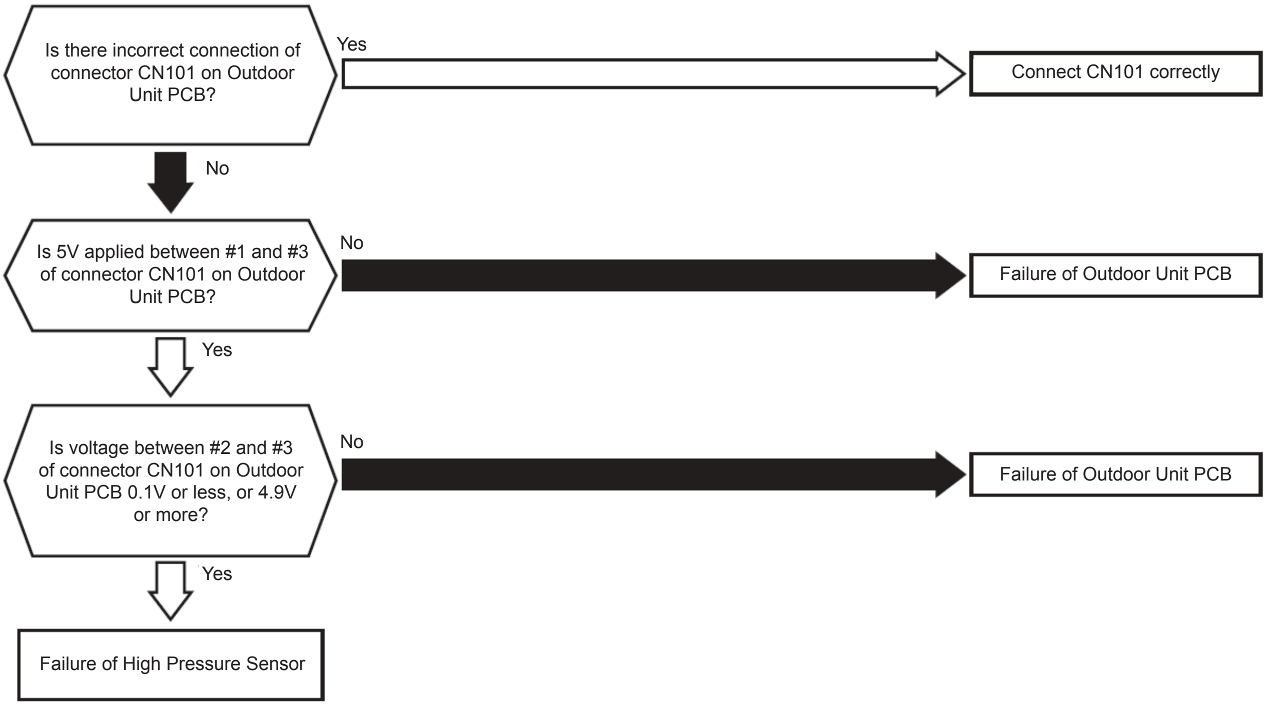


Thermistor Characteristics

Alarm code	24	Abnormality of Low Pressure Sensor

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

This alarm code is displayed when output voltage of the high pressure sensor decreases to 0.1V or less, or increases to 4.9V or more during operation.



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Outdoor Unit PCB		Replace Outdoor Unit PCB and check operation	Replace Outdoor Unit PCB if faulty
Indication Value of Low Pressure (Ps) is Excessively High or Low	Malfunction of Low Pressure Sensor due to Clogging Piping		Replace Low Pressure Sensor

Alarm code	31	Incorrect Capacity Setting of Outdoor Unit and Indoor Unit

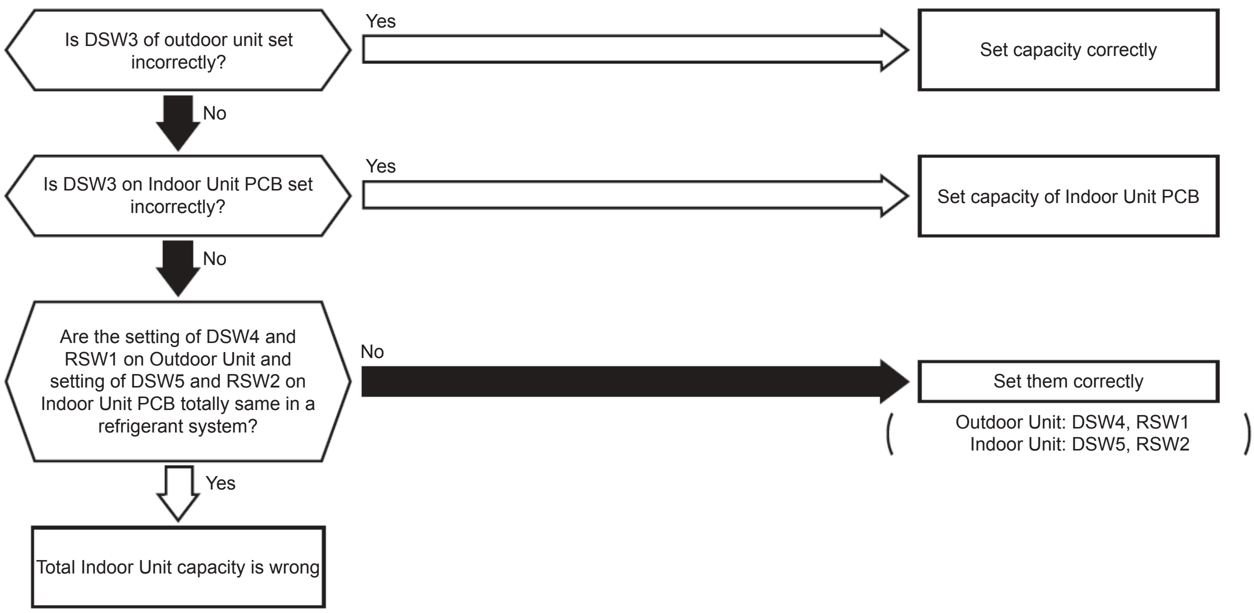
- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

This alarm code is displayed when an undefined setting is set to DSW3 (for capacity and power supply setting) on the service board or O.U.PCB (4~6HP).

This alarm code is displayed when the total indoor unit capacity is outside the range of connectable indoor unit capacity ratio.

Connectable Indoor Unit Capacity

Outdoor Unit Model	Connectable Indoor Unit Capacity Ratio	
	Minimum	Maximum
4HP ~ 6HP	45%	150%



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
	Incorrect Capacity Setting of Indoor Unit	Check combination of Indoor Units and capacity setting of Indoor Unit PCB	Correctly set DIP switch, DSW3
	Incorrect Capacity Setting of Outdoor Unit	Check capacity setting of Outdoor Unit	Correctly set DIP switch, DSW3
	Total Indoor Unit Capacity Connected to Outdoor Unit is Beyond Permissible Range	Check Outdoor Unit model by calculating total Indoor Units capacity	Ensure the total Indoor Unit capacity
	Refrigerant System Setting of Outdoor Unit and Indoor Unit is Different	Check refrigerant system setting of Outdoor Unit and Indoor Unit PCB	Set them correctly

Alarm code	35	Incorrect Setting of Indoor Unit Number

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

This alarm code is displayed in 3 to 5 minutes after power-on of outdoor unit, when the indoor unit No. set by DSW6 and RSW1 on I.U. PCB in the same refrigerant system No. duplicates.

This alarm code is displayed when the refrigerant system No. and the address setting value are 64 or more. (The alarm code “b1” is displayed on the wired controller.)

This alarm code is displayed when refrigerant system No. set by DSW4 and RSW1 on service board or outdoor unit PCB (4~6HP) in the same H-LINK ll system duplicates.

NOTE

In the case of H-LINK ll system, this alarm code may be displayed when DSW4 and RSW1 (for refrigerant system No. setting) on the outdoor unit and DSW5 and RSW2 (for refrigerant system No. setting) on the indoor unit PCB are not set correctly. In this case, turn OFF the power supply and set them correctly, and turn ON the power supply again. (The rotary switch RSW2 is not available depending on the indoor unit model.)

Alarm code	36	Incorrect of Indoor Unit Combination

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

This alarm code is indicated in case that there is at least 1 indoor unit of a model other than GP (supporting R32 refrigerant) among the connected indoor units.

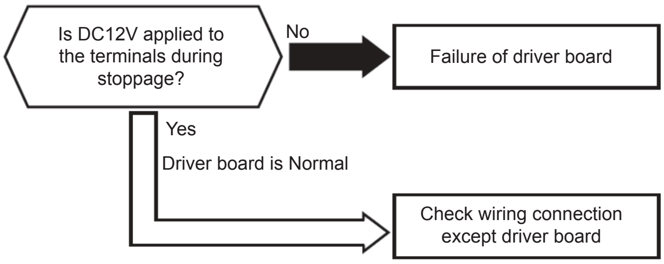
This alarm forces all operations to stop (Outdoor & Indoor Units).

The unit should be stopped to release the alarm.

Alarm code	38	Problem with Picking Up Circuit for Protection in Outdoor Unit

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

This alarm code is displayed when the outdoor unit PCB detects that the protection device (PSH) is activated.



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty Outdoor Unit PCB or driver board (4-6HP)		Check the boards in self-checking mode	Replace the malfunction board if faulty
Compressor thermostat is activated	Compressor top temperature is still high regardless compressor is OFF	Check the compressor top temperature	Wait until top compressor temperature decreases before switch unit On again. If problem persists there is refrigerant leakage.
	Compressor thermostat is disconnected	Check the compressor thermostat is correctly connected in series with PSH device	Solve connexion issue

NOTE

This alarm code may be displayed at starting the operation when the high pressure switch (PSH) is connected incorrectly or fails (open fault). The item for alarm code 02 should be checked as well.

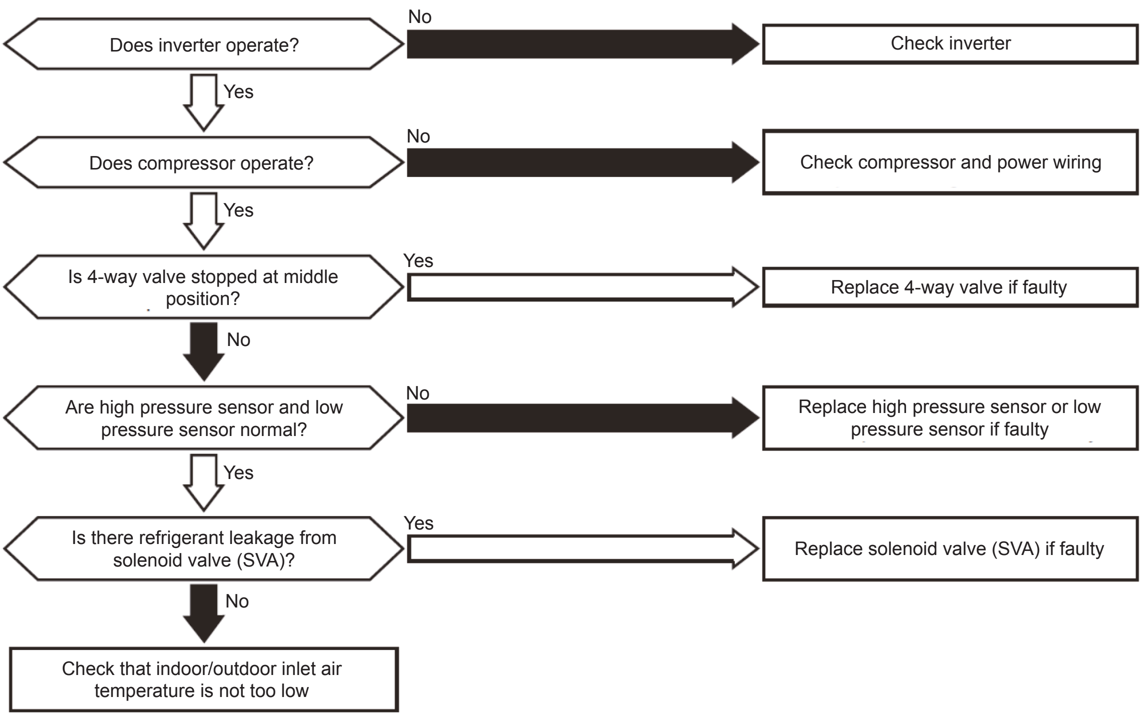
Alarm code	43	Activation of Pressure Ratio Decrease Protection

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

If the pressure ratio ε[*1)] is less than 1.5 for a minute, the compressor stops. It automatically restarts after three minutes. If this occurs again twice in the next 30 minutes, this alarm code is displayed.

[*1)] Pressure Ratio ε= (Pd[MPa] + 0.1)/(Ps[MPa] + 0.1)

Pd: high pressure (discharge pressure) Ps: low pressure (suction pressure)



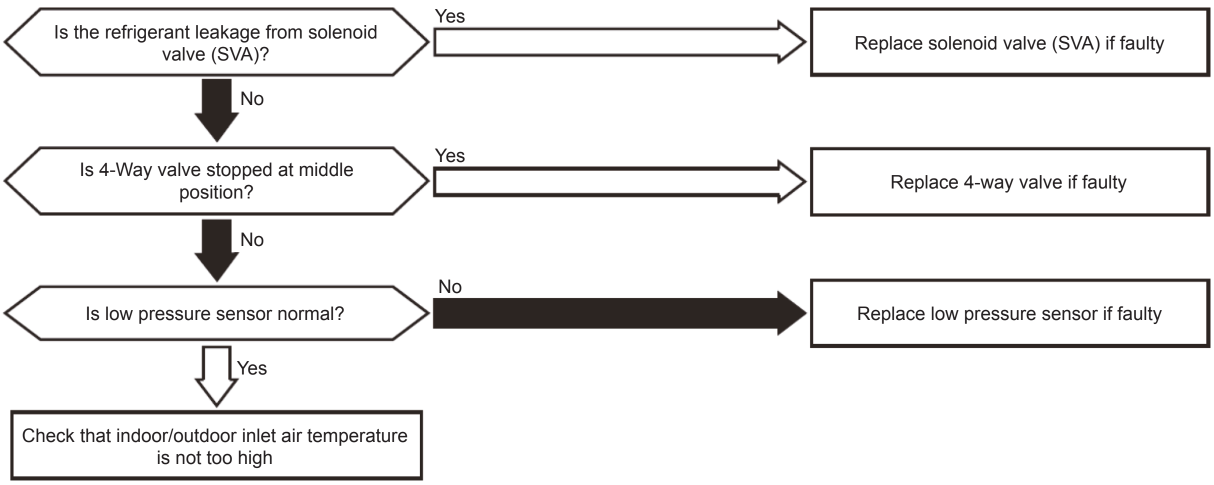
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively Low Pressure Ratio	Inverter is not operating	Check inverter	Repair faulty part
	Compressor is not operating	Check compressor	Replace compressor if faulty
	Valve Stoppage at Middle Position of 4-Way Valve	Measure suction pipe temperature of 4-way valve	Replace 4-way valve if faulty
	Abnormality of High or Low Pressure Sensor	Check connector for Outdoor Unit, power supply and pressure indication	Replace sensor if faulty
	Excessively Low Indoor Inlet 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 there is leakage

Alarm code	44	Activation of Low Pressure Increase Protection

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

If the pressure (Ps) of the compressor is more than 1.4 MPa for a minute, the compressor stops. The operation automatically restarts after three minutes. If this occurs again twice in the next 30 minutes, this alarm code is displayed.

O.U. PCB: Outdoor Unit PCB

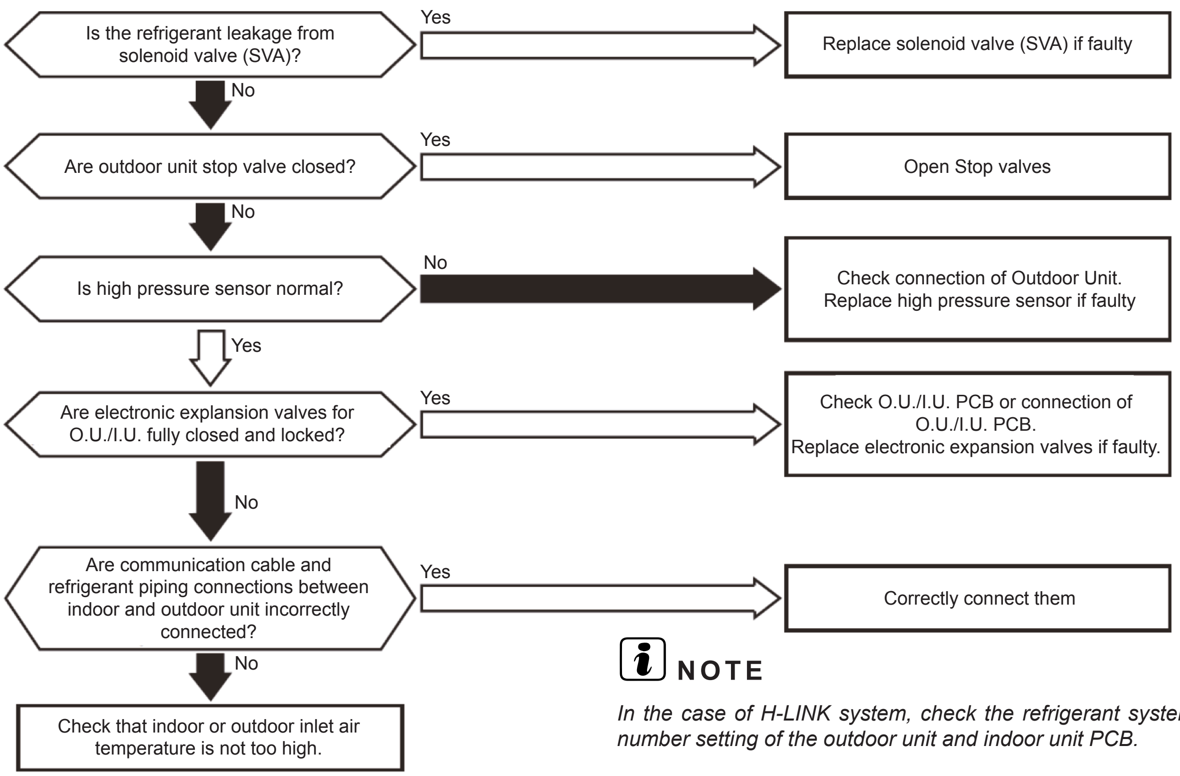


Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively Increasing Low Pressure	Leakage from Solenoid Valve (SVA)	Check outlet pipe temp. of solenoid valve (SVA)	Check connecting wires. Replace solenoid valve (SVA) if faulty.
	Valve Stoppage at Middle Position of 4-Way Valve	Measure suction gas pipe temp. of 4-way valve	Replace 4-Way valve if faulty
	Abnormal Suction Pressure Sensor	Check connectors of Outdoor Unit and power supply	Replace 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

Alarm code	45	Activation of High Pressure Increase Protection

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

If the high pressure (Pd) of the compressor is more than 3.8 MPa for a minute, the compressor stops. The operation automatically restarts after three minutes. If this occurs again twice in the next 30 minutes, this alarm code is displayed.



NOTE

In the case of H-LINK system, check the refrigerant system number setting of the outdoor unit and indoor unit PCB.

Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively Increasing High Pressure	Leakage from Solenoid Valve (SVA)	Check outlet temp. of solenoid valve (SVA)	Check connection. Replace solenoid valve (SVA) if faulty.
	Closed Stop Valve	Check stop valves	Open stop valves
	Abnormal High Pressure Sensor	Check connecting condition and output voltage of connector CN100 (on O.U.) for high pressure sensor	Replace high pressure sensor if faulty.
	Excessively High Temperature of Inlet Air for Outdoor Unit or Indoor Unit	Check thermistor for indoor unit and outdoor unit inlet air temp.	Replace inlet air thermistor if faulty.
	Incorrect Connection between Indoor Unit and Outdoor Unit	Check electrical system and refrigerant system	Correctly connect them
	Locked Expansion Valve (Fully Closed)	Check condition of connector CN100 on O.U.	Repair connector for O.U. or expansion valve. Replace it if faulty.

Alarm code	47	Activation of Low Pressure Decrease Protection

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

If the low pressure (Ps) of the compressor is less than 0.09 MPa for 12 minutes, the compressor stops. The operation automatically restarts after three minutes. If this occurs again twice in the next 60 minutes, this alarm code is displayed.

O.U: outdoor unit; I.U. PCB: indoor unit PCB

Is amount of refrigerant correct? — No → Correctly charge refrigerant
↓ Yes
Is outdoor stop valve open? — No → Open the stop valve
↓ Yes
Is refrigerant leaking? — Yes → Repair leaks
↓ No
Is low pressure sensor normal? — No → Replace low pressure sensor if faulty
↓ Yes
Are electronic expansion valves for O.U./I.U. fully closed and locked? — Yes → Check connection of connectors O.U./ I.U. PCB and electronic expansion valves. Replace them if faulty.
↓ No
Check communication cable and refrigerant piping between indoor and outdoor units are correctly connected

NOTE

Check the refrigerant system number setting of O.U. and I.U. PCB.

Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
Excessively Decreasing Low Pressure	Shortage of Refrigerant		Check charged refrigerant volume or check for leakage	Repair leakage and correctly charge refrigerant
	Closed Stop Valve		Check stop valve	Open stop valve
	Abnormal High Pressure Sensor		Check connector for O.U. PCB	Replace pressure sensor if faulty
	Incorrect Connection between Indoor Unit and Outdoor Unit		Check electrical system and refrigerant system	Correctly connect indoor unit and outdoor unit
	Locked Electronic Expansion Valve for O.U./I.U. (Fully Closed)		Check connector for O.U./ I.U. PCB	Repair connector for O.U./ I.U. PCB or expansion valve. Replace if faulty.
	Electronic Expansion Valve Closed by Disconnecting Td Thermistor		Electronic Expansion Valve Closed by Disconnecting Td Thermistor	Repair or replace Td Thermistor
Internal Thermostat for Outdoor Fan is Activated in Heating Operation	Faulty Outdoor Fan Motor		Measure coil resistance and insulation resistance	Replace outdoor fan motor
	Faulty internal Thermostat	Failure	Check for continuity after temperature of outdoor fan motor decreases	Replace outdoor fan motor
		Contact Failure	Measure resistance with a tester	Tighten or replace connector
		Incorrect Connection	Check connection	Connect it correctly

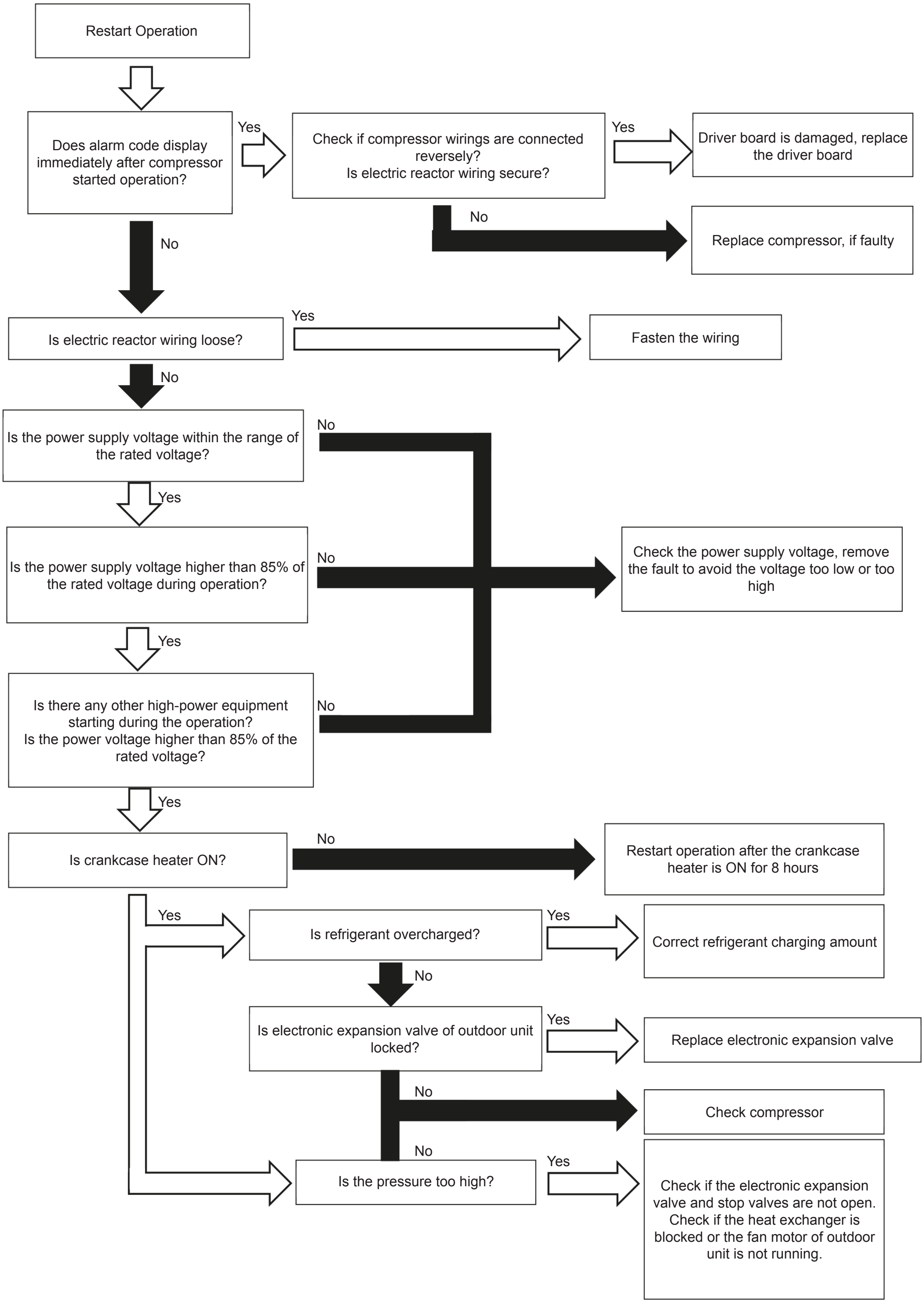
Alarm code	48	Activation of Inverter Overcurrent Protection

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

If instantaneous overcurrent or electronic thermal protection occurs on inverter as follows, the compressor stops. The operation automatically restarts after three minutes. If this occurs again five times in the next 30 minutes, this alarm code is displayed.

Condition of Activation:

1. Instantaneous overcurrent
Main causes: Compressor damage, output U, V, W are connected in reverse.
2. Electronic thermal
Main causes: Heavy compressor load, and so on.
3. PFC_A hardware overcurrent
Main causes: Short circuited PFC electric reactor L1, driver hardware is abnormal.
4. PFC_B hardware overcurrent
Main causes: Short circuited PFC electric reactor L2, driver hardware is abnormal.
5. AC input overcurrent
Main causes: AC input voltage under voltage, higher compressor load, and so on.
6. AC input overload
Main causes: AC input voltage overload, higher compressor load, and so on.


Restart Operation
Does alarm code display immediately after compressor started operation?
Yes
Check if compressor wirings are connected reversely?
Is electric reactor wiring secure?
Yes
Driver board is damaged, replace the driver board
No
Replace compressor, if faulty
No
Is electric reactor wiring loose?
Yes
Fasten the wiring
No
Is the power supply voltage within the range of the rated voltage?
No
Yes
Is the power supply voltage higher than 85% of the rated voltage during operation?
No
Check the power supply voltage, remove the fault to avoid the voltage too low or too high
Yes
Is there any other high-power equipment starting during the operation?
Is the power voltage higher than 85% of the rated voltage?
No
Yes
Is crankcase heater ON?
No
Restart operation after the crankcase heater is ON for 8 hours
Yes
Is refrigerant overcharged?
Yes
Correct refrigerant charging amount
No
Is electronic expansion valve of outdoor unit locked?
Yes
Replace electronic expansion valve
No
Check compressor
No
Is the pressure too high?
Yes
Check if the electronic expansion valve and stop valves are not open.
Check if the heat exchanger is blocked or the fan motor of outdoor unit is not running.

Alarm code	49	Shortage of energy transfer at IDU and ODU side

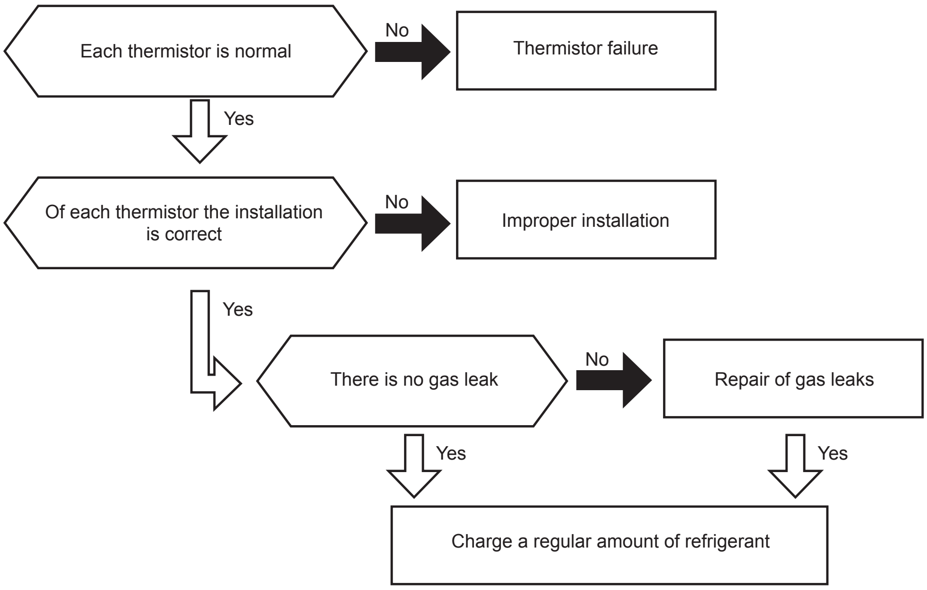
- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

If any of the following operating conditions occur during compressor operation, the compressor will stop and retry after 3 minutes.

If the alarm is detected 3 times within 1 hour, this alarm code is displayed.

1 In cooling operation, when “indoor suction temperature is equal to or less than indoor outlet temperature and outdoor piping temperature is equal to or less than outdoor air temperature” is maintained for 4 minutes.

2 In heating operation, when “indoor outlet temperature is below the indoor suction temperature and outdoor air temperature is below the outdoor piping temperature” is continued for 4 minutes.



Alarm code	50	Compressor continuously in operation under very low discharge pressure

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

High pressure decrease abnormality control in Cooling mode and Low Ta.

Stop code 25 is triggered when Pd is not able to increase above 0.6 MPa when working in cooling mode and ambient temperature is below 5ºC.

If abnormal detection occurs 2 more times within 30 minutes, this alarm code is displayed.

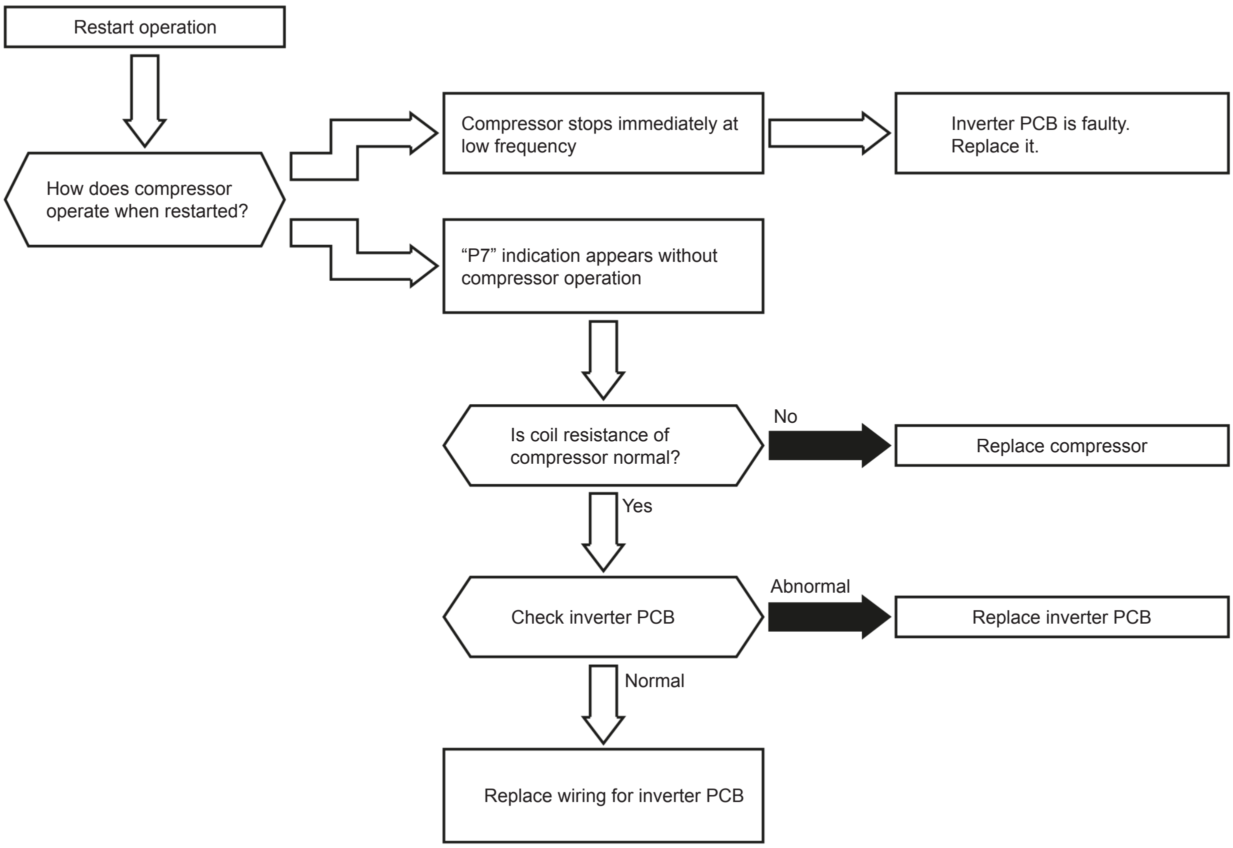
Alarm code	51	Abnormality of Current Sensor for Inverter

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

If abnormal current detection occurs, the compressor stops. The operation automatically restarts after three minutes. If this occurs again twice in the next 30 minutes, this alarm code is displayed.

Condition of Activation:

1. Picking up circuit for inverter current is not central value before the compressor starts operation.
2. Inverter secondary current es excessively low when the compressor starts operation.



Alarm code	53	Inverter Error Signal Detection

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

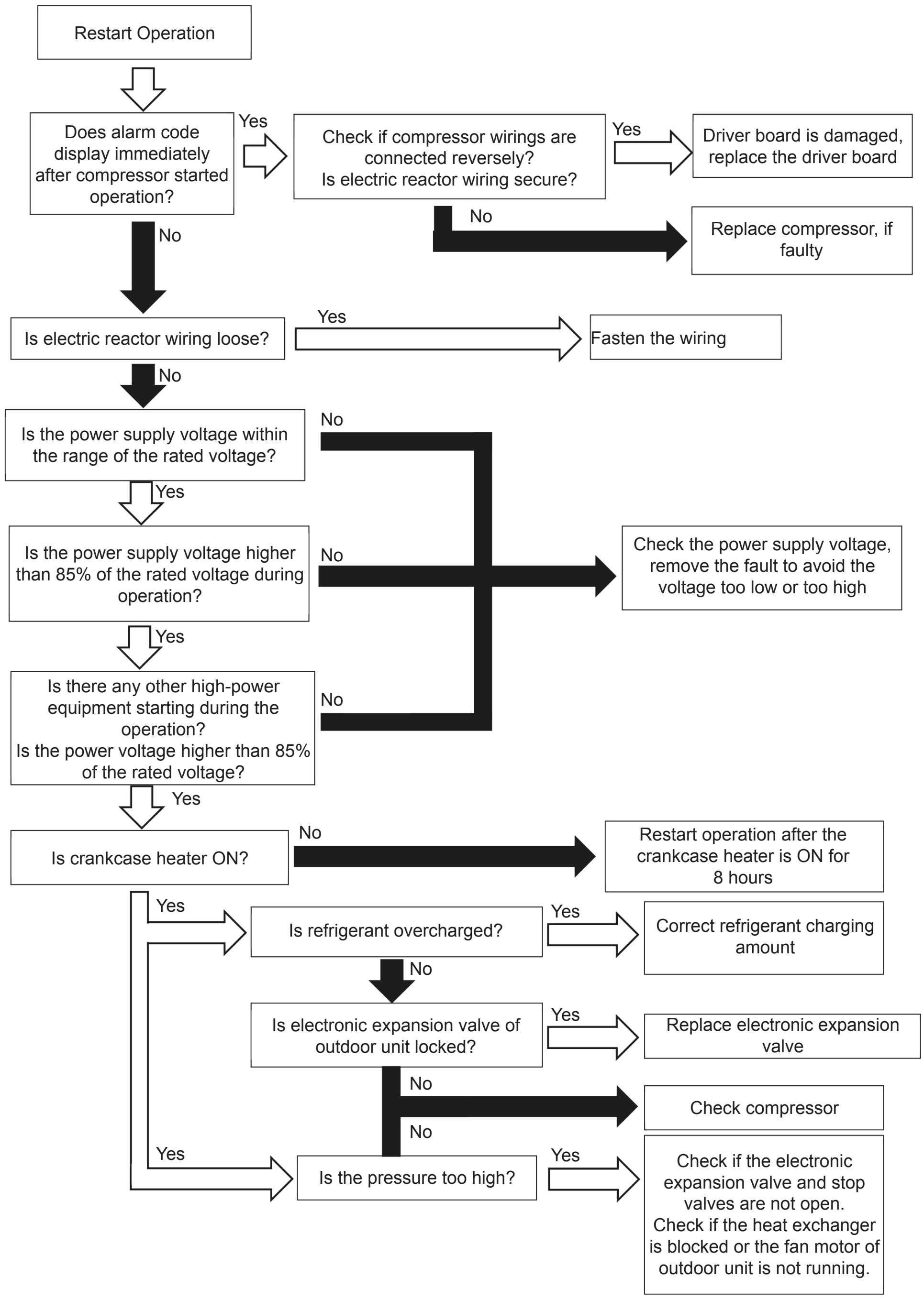
If IPM (transistor module) error, ground fault detection or step-out detection occurs, the compressor stops. The operation automatically restarts after three minutes. If this occurs again six times in the next 30 minutes, this alarm code is displayed.

Condition of Activation:

1 IPM (Fault) signal error
Main causes: Abnormal compressor current, abnormal IPM control voltage, short circuited IPM, and so on.

2 Speed abnormality
Main causes: Compressor phase loss, output U, V, W are open.

3 FOC output phase loss
Main causes: Compressor phase loss and so on.


Restart Operation
Does alarm code display immediately after compressor started operation?
Yes
Check if compressor wirings are connected reversely?
Is electric reactor wiring secure?
Yes
Driver board is damaged, replace the driver board
No
Replace compressor, if faulty
No
Is electric reactor wiring loose?
Yes
Fasten the wiring
No
Is the power supply voltage within the range of the rated voltage?
No
Yes
Is the power supply voltage higher than 85% of the rated voltage during operation?
No
Check the power supply voltage, remove the fault to avoid the voltage too low or too high
Yes
Is there any other high-power equipment starting during the operation?
Is the power voltage higher than 85% of the rated voltage?
No
Yes
Is crankcase heater ON?
No
Restart operation after the crankcase heater is ON for 8 hours
Yes
Is refrigerant overcharged?
Yes
Correct refrigerant charging amount
No
Is electronic expansion valve of outdoor unit locked?
Yes
Replace electronic expansion valve
No
Check compressor
No
Yes
Is the pressure too high?
Yes
Check if the electronic expansion valve and stop valves are not open.
Check if the heat exchanger is blocked or the fan motor of outdoor unit is not running.

Alarm code	54	Abnormality of Inverter Fin Temperature

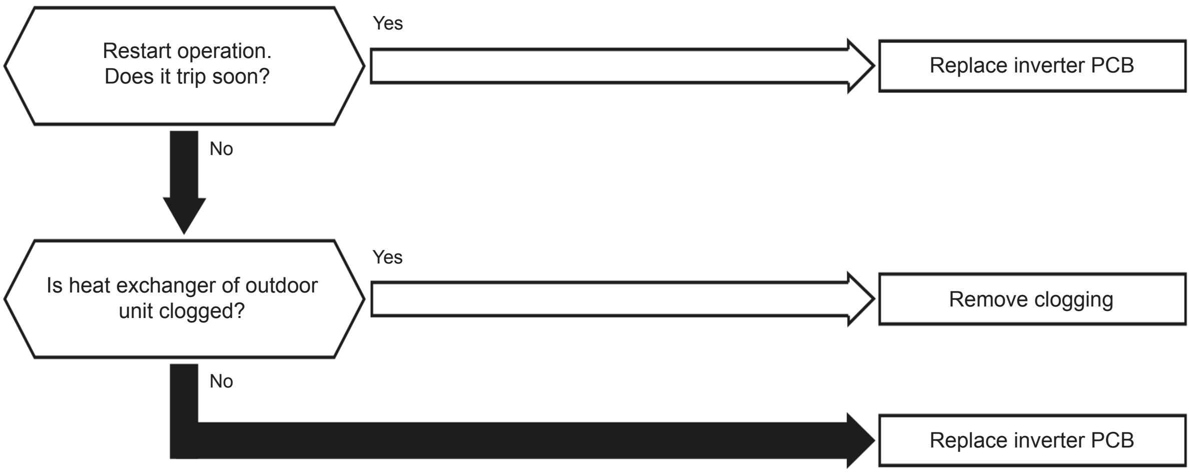
- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

When the following condition occurs three times in 30 minutes, the operation stops and this alarm code is displayed. If this occurs less than three times in 30 minutes, the operation automatically restarts.

Condition of Activation:

1 Fin temperature increases
Main causes: Increased temperature of the fins of the heat dissipation module

2 Thermistor failure
Main causes: Abnormality of driver temperature sampling circuit, and so on.



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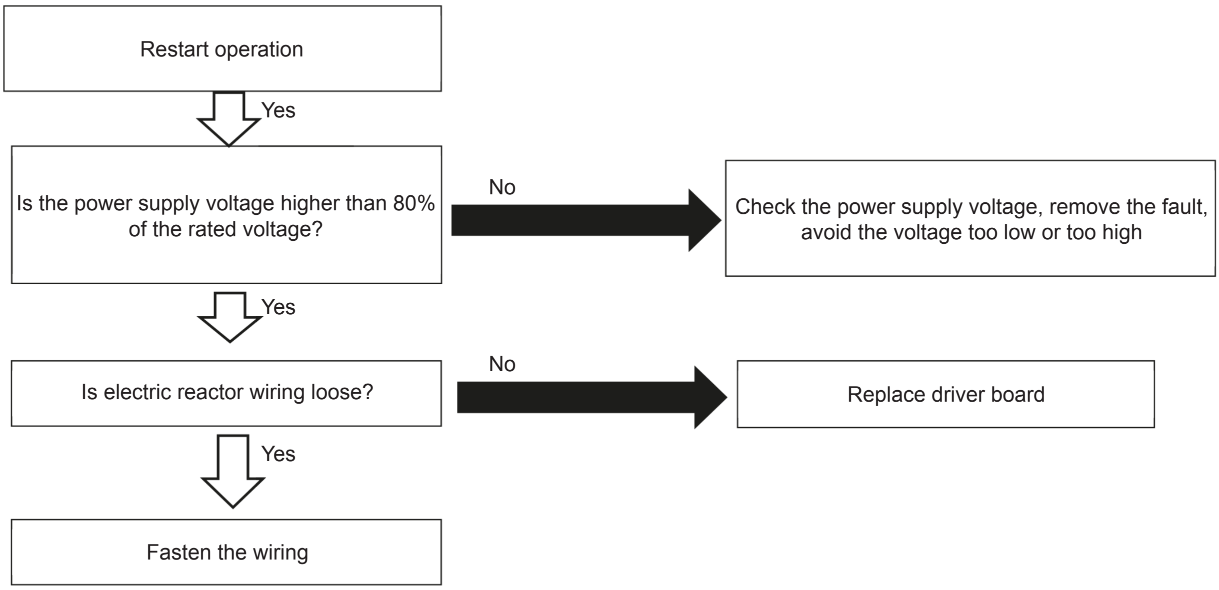
Alarm code	55	Inverter Failure

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

When the following condition occurs three times in 30 minutes, the operation stops and this alarm code is displayed. If this occurs less than three times in 30 minutes, the operation automatically restarts.

Condition of Activation:

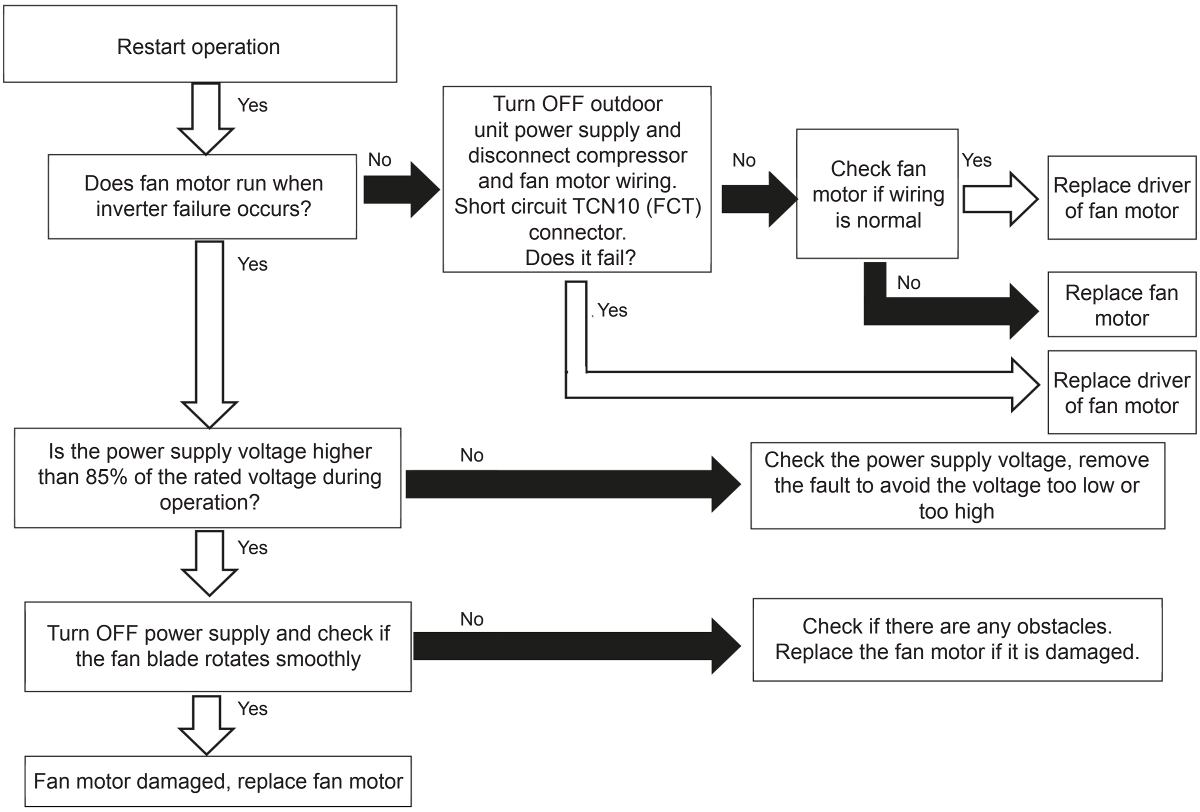
1. Pre-charge failure
   Main causes: AC input is under voltage, driver hardware abnormality, and so on.
2. MCU RAM abnormality
   Main causes: MCU RAM abnormality, driver MCU abnormality.
3. MCU Register abnormality
   Main causes: Driver MCU abnormality.
4. MCU clock abnormality
   Main causes: Driver MCU abnormality, driver crystal oscillator circuit abnormality.
5. MCU FLASH abnormality
   Main causes: Driver MCU abnormality.
6. Reference voltage abnormality
   Main causes: Driver MCU abnormality, driver reference voltage circuit abnormality.
7. Software protection module abnormality
   Main causes: Driver MCU abnormality.



Alarm code	57	Abnormality of Fan Motor

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

If the revolution of the fan motor is less than 10rpm in 10 seconds after the fan motor starts operation, the fan motor stops. The fan motor restarts operation automatically after 10 seconds (During this, the compressor continues to operate). If this occurs again nine times in the next five minutes, this alarm code is displayed. This alarm is caused by locking or electrical abnormality of the fan motor.



10.3 Troubleshooting in check mode

10.3.1 RAS-3HVRC2

10.3.1.1 Check mode display by Unit controller

10.3.1.2 Troubleshooting using the 7 segment display (Outdoor unit)

◆ **Simple checking by 7-segment display**

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

Outdoor unit, circuit board, PCB

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

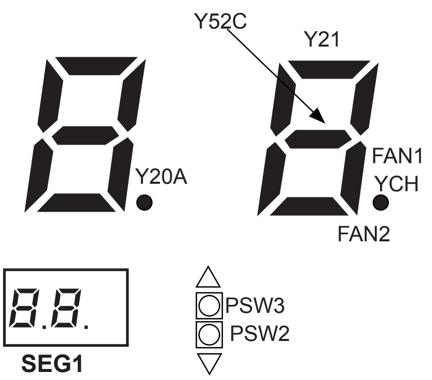
1 Disconnection of power supply to the indoor unit.

2 Reverse connection of the operating line between the outdoor and indoor units.

3 Duplication of indoor unit number.

◆ **Checking method by 7-segment display**

Operating conditions and each part of refrigeration cycle can be checked by 7-segment and push switches (PSW) on the PCB in the outdoor unit. During checking data, do not touch the electric parts except for the indicated switches because 220-240V is applied to them. Pay attention not to contact the tools with electrical parts. If contacted, electrical parts will be damaged.



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

◆ **Check mode items**

NOTE

For figures consisting of more than 2 digits, the upper 2 digits and lower 2 digits of the figures are indicated alternatively every 0.5 sec In the 7-segments display, as shown below (the lower 2 digits are shown together with a dot at the lower right corner)

Example: 1253

Item	Item		Indication data	
	Check number	Indic.	Indic.	Contents
Input/output state of outdoor micro-computer	01	SC	3	Indicates only for the segments corresponding to the equipment in the figure. (See figure above)
Capacity of operating indoor unit	02	oP	36	00~199 In case that capacity is higher than 100, the last two digits flash
Control software number	03	SP	12↔34.	Control Software No. in use is indicated. Alternately upper 2 digits and lower 2 digits are indicated every 0.5 sec.
Inverter software number	04	iP	12↔34.	Inverter Software No. in use is indicated. Alternately upper 2 digits and lower 2 digits are indicated every 0.5 sec.
Inverter order frequency to compressor	05	H1	74	0~115 (Hz) In case that frequency is higher than 100Hz, the last two digits flash.
Air flow step	06	Fo	15	00~15 step
Outdoor unit expansion valve opening	07	Eo	30	00~100 (%) In case that expansion valve opening is 100%, "00" flashes
Temperature at the top of compressor	10	Γd	94	00~142 (ºC) In case that temperature is higher than 100ºC, the last two digits flash
Evaporating temperature at heating	11	ΓE	34	-19~80ºC
Ambient air temperature	12	Γo	44	-19~80ºC
Condenser Pipe Temperature	13	ΓC	22	-19~80ºC
Control information	14	ΓF	20	Internal information of the PCB
Inverter Firstly Current	15	A1	12	00~199 (A) In case that current is higher than 100ºC, the last two digits flash
Inverter secondary current	16	A2	20	00~199 (A) In case that current is higher than 100ºC, the last two digits flash
Indoor unit address	17	nA	00	00~63
Indoor unit expansion valve opening	18	EA	20	00~100 (%) In case that opening is 100%. "00" flashes
Liquid pipe temperature of indoor unit (freeze protection)	19	LA	05	-19~127 (ºC) When Temp. is higher than 100, the last two digite flash.
Gas Pipe Temperature of Indoor Unit	20	uA	26	-19~127 (ºC) When Temp. is higher than 100, the last two digite flash.
Indoor unit inlet air temperature	21	iA	28	-19~127 (ºC) When Temp. is higher than 100, the last two digite flash.
Indoor unit outlet air temperature	22	oA	20	-19~127 (ºC) When Temp. is higher than 100, the last two digite flash.
Cause of indoor unit stoppage	23	dA	01	00~99 Indicated Cause of Stoppage Code
Total accumulated operation time of Compressor	24	UJ	00↔00	0 to 9999 (x 10 hours) Alternately upper 2 digits and lower 2 digits are indicated every 0.5 sec.
Accumulated operation time of compressor (can be reset to zero for instance when compressor is replaced)	25	cU	00↔00	0 to 9999 (x 10 hours) Alternately upper 2 digits and lower 2 digits are indicated every 0.5 sec.
Outdoor unit alarm code	26	AC	08	00~99 Indicated Alarm Code
Cause of stoppage at inverter	27	iΓ	1	00~99 Indicated Cause of Stoppage Code
Cause of FAN stoppage	28	FΓ	0	00~99 Indicated Cause of Stoppage Code
Abnormal data record	29	n1	00	One of the abnormal data record from latest (n1) to oldest (n9) is indicated. Alarm code or cause code is indicated.
Total capacity of indoor unit connected	30	CP	36	00~199 In case that capacity is higher than 100, the last two digits flash
Quantity of connected indoor units	31	AA	2	00~64
Refrigerant address	32	GA	0	00~63

◆ Cause of indoor unit stoppage (dA)

Indication	Contents
00	Operation OFF, Power OFF
01	Thermo-OFF
02	Alarm
03	Freeze protection overheating protection
05	Instantaneous power failure at outdoor unit
06	Instantaneous power failure at indoor unit
07	Stoppage of Cooling Operation due to Low Outdoor Air Temperature Stoppage of Heating Operation due to High Outdoor Air Temperature
10	Demand
11	Retry due to compression ratio decrease
12	Retry due to low pressure increase
13	Retry for Pd increase prevention
15	Vacuum/discharge gas temperature increase retry
16	Retry due to discharge gas SUPERHEAT decrease
17	IPM error retry, instantaneous over current of inverter retry, electronic thermal activation of inverter retry, abnormal current sensor of inverter retry
18	Retry due to inverter voltage decrease Retry due to Inverter Overvoltage Retry due to inverter transmission abnormality
19	Retry due to Expansion Valve Control
21	Forced Thermo-OFF
22	Outdoor hot start control
24	Thermo-OFF during energy saving operation mode
26	Retry due to high pressure decrease
28	Cooling air discharge temperature decrease
33	Forced Thermo-OFF (example: due to Air Filter Cleaning)
34	Forced Thermo-OFF (example: due to Motion Sensor
35	Retry due to abnormal operating mode (Reversing valve switching failure)
39	Forced Thermo-OFF due to Power Saving Control)

NOTE

- *The cause code for indoor unit stoppage is not always "02" (Alarm) during stoppage by the abnormality. If the unit is under Thermo-OFF by other cause of stoppage before "02" (Alarm) occurs, the previous cause code for indoor unit stoppage remains.*
- *When the transmitting between the inverter PCB and the outdoor unit PCB1 is disconnected for 30 seconds, the outdoor micro-computer will be reset. Accordingly when the alarm code "04" (Abnormal Transmitting between Inverter PCB and Outdoor Unit PCB1) occurs, the cause code for indoor unit stoppage may be indicated "05".*
- *When the transmitting between the indoor unit and the outdoor unit is disconnected for 3 minutes, the indoor micro-computer will be reset. Accordingly when the alarm code "03" (Abnormal Transmitting between Indoor Unit and Outdoor Unit) occurs, the cause code for indoor unit stoppage may be indicated "06".*

◆ Cause of inverter stoppage (iT)

Code	Cause	Cause of stoppage for corresponding unit	Remark	
			Indication during retry	Alarm Code
1	Automatic Stoppage of Transistor Module (DIP-IPM Error) (Overcurrent, Undercurrent, Temperature increase)	17	P7	53
2	Instantaneous Over Current	17	P7	48
3	Abnormal Inverter Fin Thermistor	17	P7	54
4	Electronic Thermal Activation (Inverter overcurrent)	17	P7	48
5	Inverter Voltage Decrease (Undervoltage)	18	P8	06
6	Over Voltage	18	P8	06
7	Abnormal Inverter Transmission	18	-	04
8	Abnormal Current Detection	17	P7	51
9	Instantaneous Power Failure Detection	18	-	-
11	Reset of Micro-Computer for Inverter	18	-	-
12	Earth Fault Detection from Compressor (Only Starting)	17	P7	53
13	Phase detection abnormality	18	P8	-
14	Inverter Non-Operation	18	-	55
15	Inverter Non-Operation	18	-	55
16	Inverter Non-Operation	18	P8	55
17	Communication Abnormality	18	P8	55
18	Protection Device Activation (PSH)	-	-	02
19	Protection Detection Device Abnormality	-	-	38
20	Early Return Protection Device	18	P7	53
21	Loss of synchronism	17	-	31

◆ Table of capacity codes of indoor unit

Code	Equivalent horsepower
06	0.8
08	1.0
10	1.3
11	1.5
13	1.8

Code	Equivalent horsepower
14	2.0
16	2.3
18	2.5
22	3.0
32	4.0

Code	Equivalent horsepower
40	5.0
48	6.0

◆ Protection control code on 7-segment display

1 Protection control code is displayed on 7-segment when a protection control is activated.

2 Protection control code is displayed while function is working, and goes out when released.

3 When several protection control are activated, code number with higher priority will be indicated (see below for the priority order).

a. Higher priority is given to protection control related to frequency control than the other. Priority order:

- High-pressure increase protection
- Over current protection
- Cold draft protection

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

RAS-3HVRC2

Priority	Protection control	Code
1	Low-Pressure Ratio Control at Cooling Operation	P0
2	High-pressure ratio control at heating operation	P1
3	High-pressure rise protection	P2
4	Current protection	P3
5	Inverter fin temperature rise prevention	P4
6	Discharge gas temperature rise protection	P5
7	Unbalance Power Source Detecting	P9
8	Demand current control	PA

NOTE

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

◆ Activating condition of protection control code

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

Code	Protection Control	Activating Condition	Remarks
P0	Low-Pressure Ratio Control at Cooling Operation	If Compression Ratio ε exceeds a threshold value => Frequency Increase	—
P1	High-Pressure Ratio Control at Heating Operation	If Compression Ratio ε is lower than a threshold value => Frequency Decrease	—
P2	High-Pressure Increase Protection	High Pressure Switch for Control is activated => Frequency Decrease	—
P3	Over Current Protection	Inverter Output Current > (*1)A => Frequency Decrease	—
P4	Inverter Temperature Increase Protection	Inverter Fin Temperature RAS-3HVRC2 ≥ 70 ºC => Frequency Decrease	—
P5	Discharge Gas Temperature Increase Protection	Temperature at the top of compressor is high => Frequency Decrease	—
P9	Unbalance Power Source Detecting	Inverter Output Current exceeds a threshold value => Frequency Decrease	—
PA	Current Demand Control	Inverter Output Current exceeds a threshold value => Frequency Decrease	In case of Demand Control Setting

(1)*

Connection	220-240V		
HP	2	2.5	3
Current (A)	10.5	10.5	10.5

10.3.2 RAS-(4-6)H(V)(R/N)(C/P)2E

10.3.2.1 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 (models RAS-(4-6)HV(R/N)(C/P)2E and PCB2 (models RAS-(4-6)H(R/N)(C/P)2E) in the outdoor unit.

10

◆ Before carrying out checks

1 Turn ON the main power supply switch. Wait more than 20 seconds before starting the checks.

2 Check items:
   - Information of the outdoor unit.
   - Information of the indoor unit and ombined indoor units number.
   - Expansion valve opening.
   - Temperature at each part, etc.
   - Information of the cause of the alarm code.
   - Alarm code historical information.

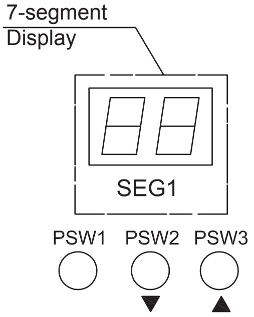
3 Check the location of the 7-segment display and the push switches.

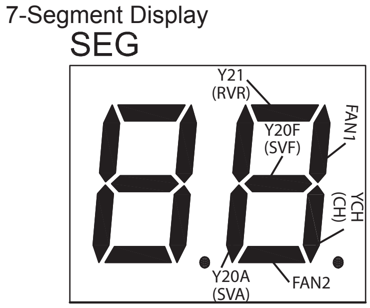
DANGER

AC220-240V is applied to the PCB and electrical parts. Never touch the electrical parts and the cables when carrying out the checks.

◆ Location of the pushswitches and the 7-segment display

The push-switches and the 7-segment display are located on PCB2 (RAS-(4-6)HV(R/N)(C/P)2E) and PCB1 (RAS-(4-6) H(R/N)(C/P)2E).





◆ 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).

1 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

2 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
P	1	Pressure ratio protection control
P	2	High pressure increase protection
P	3	Inverter current protection
P	4	Inverter fin temperature increase protection
P	5	Discharge gas temperature increase protection at the upper part of the compressor
P	6	Low pressure decrease protection
P	9	High pressure decrease protection
P	A	Demand current protection control
P	d	Low pressure increase protection

Code		Retry control
P	7	Inverter trip retry control
P	8	Inverter voltage drop. Overvoltage retry control

NOTE

- *The retry indication is prolonged for 30 minutes unless a protection control is indicated.*
- *The retry indication disappears if the stop signal comes from all rooms.*
- *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.*

◆ 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 ≥ 7.0 or compression ratio Ɛ ≤ 1.8	-
P02	High pressure increase protection	Discharge pressure Pd ≥ 3.5	-
P03	Inverter current protection	Inverter output current ≥ (a) A Inv. Compressor: (a) ATH356: 18.5	-
P04	Inverter fin temperature increase protection	Inverter fin temperature ≥ 81 °C for 1ph Inverter fin temperature ≥ 89 °C for 3ph	-
P05	Discharge gas temperature increase protection	Temperature of the upper part of the compressor Td ≥ 92 °C	-
P06	Low pressure decrease protection	Suction pressure Ps ≤ 0.1 MPa	-
P09	High pressure decrease protection	Discharge pressure Pd ≤ 1.2 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	-

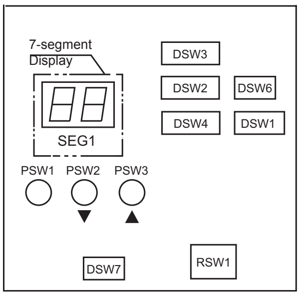
P11	Pressure ratio decrease retry	Pressure ratio Ɛ < 1.5	When activating three times in thirty minutes, alarm code "43" is indicated.
P12	Low pressure increase retry	Ps > 1.7 MPa	When activating three times in thirty minutes, alarm code "44" is indicated.
P13	High pressure increase retry	Pd ≥ 3.8 MPa	When activating three times in thirty minutes, alarm code "45" is indicated.
P15	Discharge gas temperature increase retry	Cooling Discharge gas temperature ≥ 112 °C for more than 10 minutes, or Discharge gas temperature ≥ 120 °C for more than 5 seconds Heating Discharge gas temperature ≥ 105 °C for more than 10 minutes, or Discharge gas temperature ≥ 120 °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.			

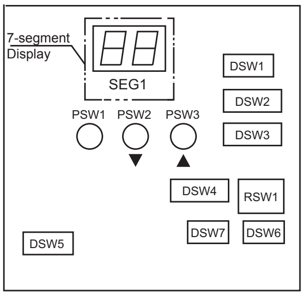
◆ Check method by checking mode

Operating conditions and each part of a system can be checked using the 7-segment display on the PCB1 in the outdoor unit.

RAS-(4-6)HV(R/N)(C/P)2E (PCB2)



RAS-(4-6)H(R/N)(C/P)2E (PCB1)



Start setting	Exit setting
Press PSW1 for 3 seconds	Press PSW1 for 3 seconds

NOTE

Ensure the check mode is cancelled after the checks have been carried out.

◆ Information for the outdoor unit

Press PSW2 (▼) for forward of PSW3 (▲) to backward. The information will be alternately indicated as “Item” ⟶ “Details”

	Item	7-Segment Display SEG	Details
1	Output State of Outdoor Micro-Computer	SC	Output State of Outdoor Micro-Computer Indication Refer to “Arrangement of Push Switches and 7-Segment Display
2	Total Capacity of Operated Indoor Unit	oP	Total Capacity of Operated Indoor Units. Refer to “Indoor Unit Capacity Table”
3	Number of Control Software	SP	Control Software Number in use is indicated
4	Number of Compressor Inverter Software	iP	Compressor Inverter Software Number In use Is Indicated
5	Running Frequency of Inverter Compressor MC1	H1	Running Frequency of Number1 Compressor Indication [Hz]
6	Outdoor Fan Step	Fo	Outdoor Fan Step Indication (0 to 27 [Step])
7	Speed of Outdoor Fan 1	FS.	0~1000 (rpm)
8	Outdoor Electronic Expansion Valve Opening	Eo	0~100 (%)
9	High (Discharge) Pressure (Pd)	Pd.	0.1~4.9 (MPa)
10	Discharge Gas Temperature on Top of Compressor MC1	Td	1~142 (°C)
11	Outdoor Heat Exchanger Liquid Temperature (Te1)	TE	-19~80 (°C)
12	Ambient Air Temperature (Ta)	To	-19~80 (°C)
13	Liquid Stop Valve Temperature (Tchg)	TC	-19~80 (°C)
14	Inverter Fin Temperature	TF	-19~127 (°C)
15	Inverter Primary Current	A1	0~199 (A)
16	Inverter Secondary Current	A2	0~199 (A)
17	Indoor Unit Address	nA	0~63 (Indoor Unit Number) *4
18	Indoor Electronic Expansion Valve Opening	EA	0-100 (%) *4
19	Liquid Pipe Temperature of Indoor Unit	LA	-19~127 (°C) *4
20	Gas Pipe Temperature of Indoor Unit	uA	-19~127 (°C) *4
21	Indoor Unit Inlet Air Temperature	iA	-19~127 (°C) *4
22	Indoor Unit Outlet Air Temperature	oA	-19~127 (°C) *4
23	Cause Code of Indoor Unit Stoppage	dA	0~99 *4
24	Accumulated Operation Time of Compressor MC1	UJ	[10 Hours]
25	Accumulated Operation Time of Compressor MC1 (Resetable)	cU	[10 Hours] Accumulated operation time can be reset *2
26	Outdoor Unit Alarm Code	AC	o~FF
27	Cause Code of Inverter Stoppage 1	iT	Cause of INV Compressor MC1 Stoppage Refer to “Cause Code of Inverter Stoppage”
28	Abnormal Data Record (Number1)	n1	Accumulated Operating Time. Alarm Code or Cause Cicle of Indoor Unit Stoppage, Cause Code of Inverter Fan Stoppage
29	....	...	
30	Abnormal Data Record (Number9)	n9	
31	Capacity of Outdoor Unit	oC	Capacity Code of Outdoor Unit. For example, 40 represent that 40/8[5]HP.
32	Total Capacity of Connected Indoor Units	CP	Total Capacity of Connected Indoor Units
33	Connected Indoor Unit Number	AA	Connected Indoor Unit Number
34	Refrigerant Cycle Number	GA	Refrigerant Cycle Number

◆ Capacity table for the outdoor units

Indication	Capacity (kW)	Horsepower (HP)
32	12.1	4.0
40	14.0	5.0
48	15.5	6.0

◆ Capacity table for the indoor units

Indication	Capacity (kW)	Horsepower (HP)
3	1.1	0.4
5	1.8	0.6
6	2.2	0.8
8	2.8	1.0
10	3.6	1.3
11	4.0	1.5
13	4.5	1.8
14	5.0	2.0

Indication	Capacity (kW)	Horsepower (HP)
16	5.6	2.3
18	6.3	2.5
20	7.1	2.8
22	8.0	3.0
26	9.0	3.3
32	11.2	4.0
40	14.0	5.0
48	16.0	6.0

◆ Cause of indoor unit stoppage

NOTE

Depends on models some causes are not applicable.

Code	Cause	Code	Cause
0	Operation OFF, Power OFF	16	Retry due to Decrease of Discharge Gas Superheat
1	Thermo-OFF	17	Retry due to inverter tripping
2	Alarm (Not always indicated)	18	Retry due to voltage decrease / Increase, other retry of inverter
3	Freeze Protection, Overheating Protection	19	Expansion Valve Opening Difference Protection
5	Instantaneous Power Failure at Outdoor Unit	21	Forced Thermo-OFF for Oil Return
6	Instantaneous Power Failure at Indoor Unit	22	Enforced Thermo-OFF for Hot Start Control at Crankcase Heater Preheating
7	Stoppage of Cooling Operation due to High/Low Outdoor Air Temperature Stoppage of Heating Operation due to High Outdoor Air Temperature	26	Retry due to High Pressure Decrease
		28	Stoppage due to Outlet Temperature Decrease in Cooling
10	Demand Enforced Stoppage	33-34	Stoppage of Thermo-OFF by Motion Sensor
11	Retry due to Pressure Ratio Decrease	35	Retry due to abnormal operating mode (4-way valve switching failure)
12	Retry due to Low Pressure Increase	36	Retry after Defrosting Operation
13	Retry due to High Pressure Increase	39	Stoppage of Thermo-OFF due to Power Saving Control
15	Retry due to Discharge Gas Temperature Increase, Retry due to Low Pressure Decrease	41	Stoppage of Thermo-OFF due to Outdoor unit Control

◆ Cause of inverter stoppage (check the item iT)

Code	Cause
1	Driver IC Error Signal Detection
2	Instantaneous Overcurrent
3	Inverter fin temperature increase
4	Electronic Thermal Protection (Inverter Overcurrent)
5	Inverter voltage decrease
6	Inverter voltage increase
7	Abnormal Inverter transmission
8	Abnormal current sensor
9	Instantaneous Power Failure Detection
11	Microcomputer reset
12	Earth fault detection
13	Open-Phase Detection
16	Inverter failure
17	Abnormal Control
18	Forced stoppage by high pressure detection
19	Abnormality of picking up circuit for protection
20	Early returns protective device

Code	Cause
21	Abnormal compressor motor (Step-out)
22	Abnormal combination of PCB
23	EPROM error
24	Abnormal compressor frequency
25	Beyond frequency scope
26	DC BUS Pre-charge malfunction
30	Phase default of compressor inverter output
32	Overcurrent of L1 reactor
33	Overcurrent of L2 reactor
34	Overcurrent of compressor inverter input
35	Overload of compressor inverter input
38	Error of IPM temperature sensor
40	Abnormal MCU RAM
41	Abnormal MCU register
42	Abnormal MCU timer
43	Abnormal MCU flash
44	Abnormal reference voltage
45	Abnormal software protection module

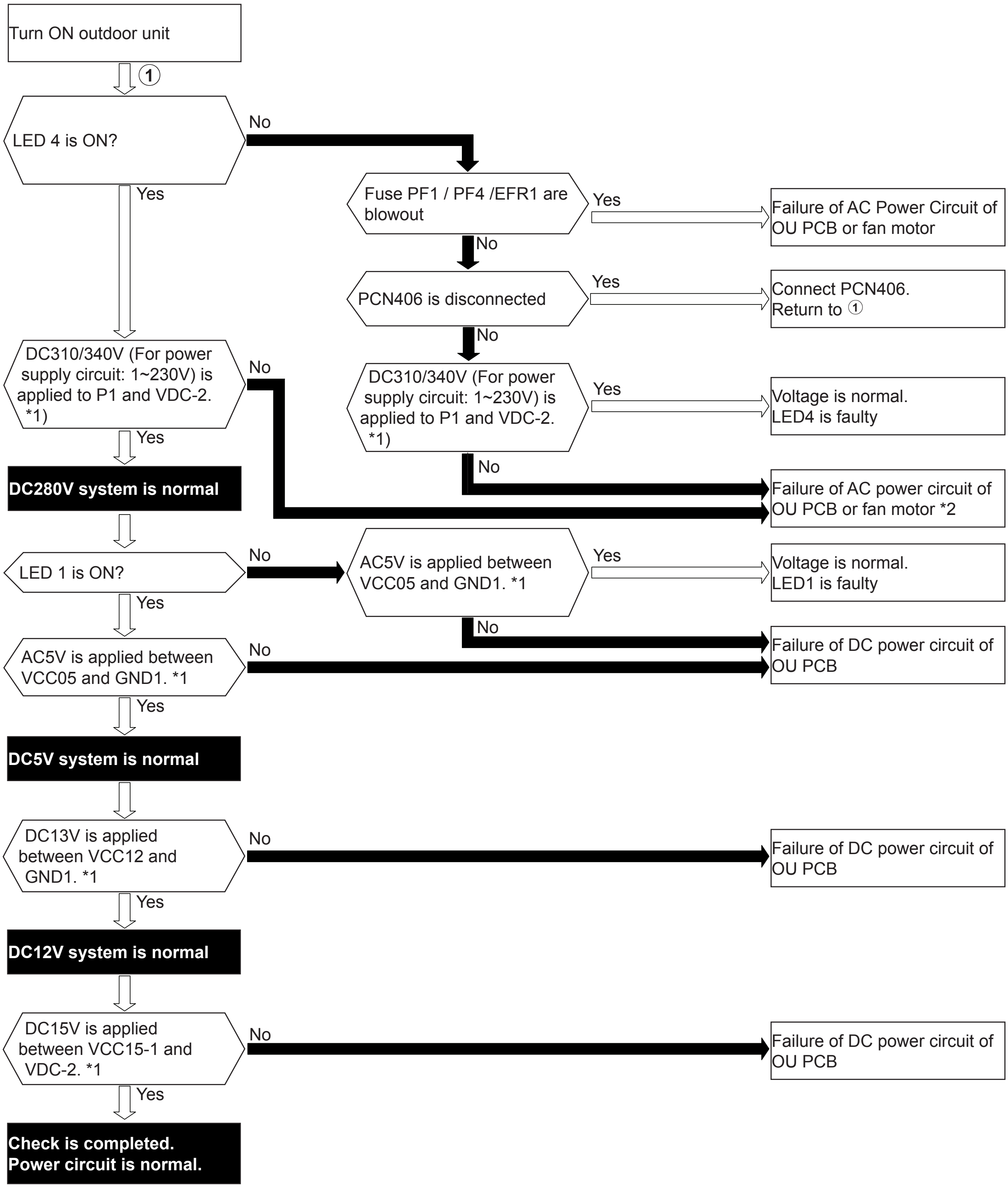
◆ Normal Operation Condition

Discharge pressure	3.6 Mpa or less
Suctions pressure	0.15 to 1.3MPa
Discharge temperature	110ºC or Less
Heat exchanger liquid piping temperature at heating mode	-12 to +15ºC

10.4 Checking procedure for main parts

10.4.1 RAS-3HVRC2

10.4.1.1 Checking procedure for the PCB



NOTE

- **1) The following table shows the check points and the normal range of voltage in the case that the voltage on the outdoor unit PCB is measured with a circuit tester. The setting of the circuit tester shall be set within the DC voltage measurement range when the following voltages are measured.*
- **2) If 230V / 400V is present in DIP-IPM terminals R-S / R-S-T, DIP-IPM may be faulty. Alarm 03 may be shown in this case.*

Check Point		Normal Range (V)
(+) Side of Tester	(-) Side of Tester	
P1	VDC-2	Approx. 311VDC
VCC15-1		13.5VDC ~ 16.5VDC
VCC05	GND1	4.5VDC ~ 5.5VDC
VCC12		11.9VDC ~14.3VDC

⚠ **CAUTION**

- *Do not apply the test lead to unspecified check points when measuring the voltage with a circuit tester. Otherwise, it may cause a failure of the outdoor unit PCB and the circuit tester.*
- *When measuring the voltage with a circuit tester, the setting of the circuit tester shall be set within the DC voltage measurement range. If the setting is not correct, it may cause a failure of the outdoor unit PCB and circuit tester*

10.4.1.2 Checking procedeure for the DC fan motor

When ISPM/DIP-IPM is faulty and Alarm 03, 04 or 53 appears, the fan motor may also be damaged. To prevent ISPM/DIP-IPM damage which may result from operation combined with a faulty fan motor, check also if the fan motor is not damaged when ISPM/DIP-IPM is replaced

⚠ **CAUTION**

- ***Turn OFF main power before start working.***
- ***Working and checking with the power ON may disturb correct diagnosis and may result in failure.***

Procedure in case of error diagnosis

1 Remove fan motor connectors for DC fan motor from the control PCB, ISPM or DIP-IPM and turn the fan motor shaft by hand.

Normal	Fan motor shaft turns smoothly
Normal	The fan motor shaft turns smoothly.
Faulty	No continuous rotary torque movement felt when turning the motor by hand. This occurs because the internal magnet of the fan motor breaks the movement when the internal electronic circuit of the fan motor has a short-circuit fault.

2 Measure the fan motor resistance:

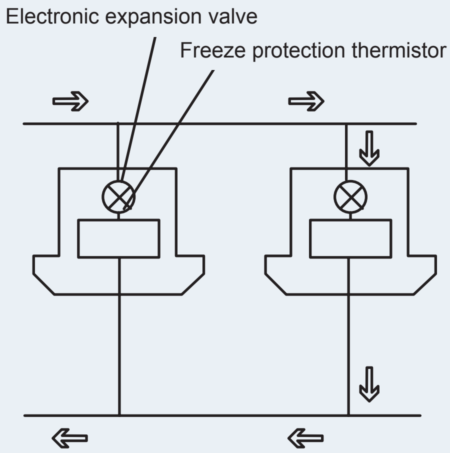
Measurement procedure	
Remove the fan motor connector from the control PCB, ISPM or DIP-IPM.	
Connect the black test lead of the tester to the black wire pin of the fan motor connector.	
Connect the red test lead to the wire connector pin to be checked.	
Results	
Normal	Observed values will be close to the normal values in the table below.
Faulty	Obbserved values will be deviated from the normal values in the table below. (Generally, an open-circuit fault shows ∞, and a short-circuit fault shows several Ω - kΩ).Internal electronic circuit fault of the fan motor including short-circuit and breakage can be checked.

Wire color for checking (Normal value)			
Red-black	White-black	Yellow-black	Blue-black
-	1MΩ or greater	-	1MΩ or greater

NOTE

Values are shown for referential purpose. While actual values may vary depending on the type of the tester, any tester can be used to determine any short-circuit or breakage based on ∞ or several Ω or 0 Ω or ∞.

10.4.1.3 Checking procedure for the electronic expansion valve for indoor and outdoor units

<table>
<tr><th></th><th>Indoor unit electronic expansion valve</th><th>Outdoor unit electronic expansion valve</th></tr>
<tr><td>Locked with fully closed</td><td>Check the liquid pipe temperature during the heating process. It is abnormal if the temperature does not increase.</td><td>It is abnormal if the liquid pipe pressure does not increase during the pump down process.</td></tr>
<tr><td>Locked with slightly open</td><td rowspan="2">It is abnormal under the following condition:
The temperature of the freeze protection thermistor becomes lower than the suction air temperature when the unit which is under chechink stops and the other units are under the pump down process.

</td><td>It is abnormal if the liquid pipe pressure does not increase and the outlet temperature of the expansion valve decreases after the pump down process starts.</td></tr>
<tr><td>Locked with fully open</td><td>It is abnormal under the following conditions: after the heating process for more than 30 minutes, the discharge gas temperature of the compressor is not 10°C higher than the condensing temperature and there is no other faults, such as an excessive charge of refrigerant and others.</td></tr>
</table>

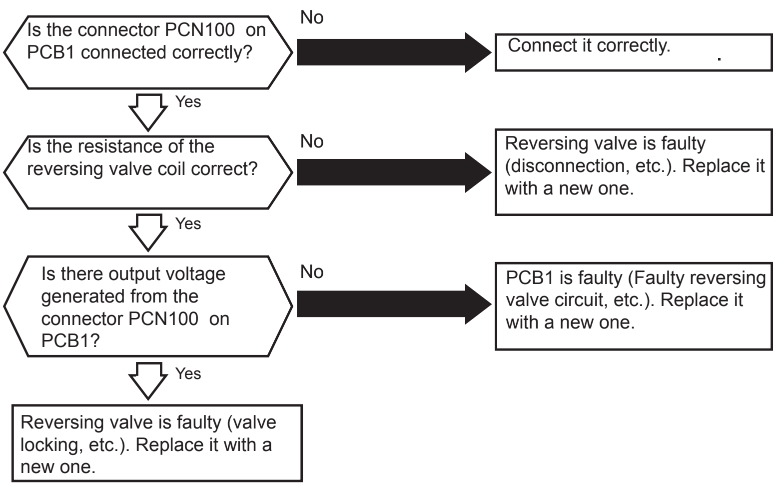
10.4.1.4 Checking procedure for other parts

Resistance (Ω)

Part name	Model code	Resistance (Ω)
Reversing Valve Coil (4-way solenoid valve)	VHV-01AP552B1	1473 (at 20ºC)
	STF-G01AG579A1	950 (at 75ºC)
	STF-H01AI1870A1	1800 (at 20ºC)
Compressor	EU1114D9	1.138 (at 75ºC)
	EU140XA2	1.138 (at 75ºC)
	EU180XA1	1.138 (at 75ºC)
	2YC45KXD	0.644 at 20 ºC
	EU260X(C1/D2)	0.490/1.650 (at 20 ºC)
	E402HHD-36(A/D)2	0.460/1.839 (at 75 ºC)
	HB36PHD-(A1/D1)S2	0.434/1.763 (at 75 ºC)
	DA50PHD-D1SE2	0.396 (at 75 ºC)
	DA65PHD-D1SE2	0.320 (at 75 ºC)
Magnet Contactor	FC-0/SP	1150 (at 20ºC)

◆ **Checking procedure for the reversing valve**

Troubleshooting



Output voltage

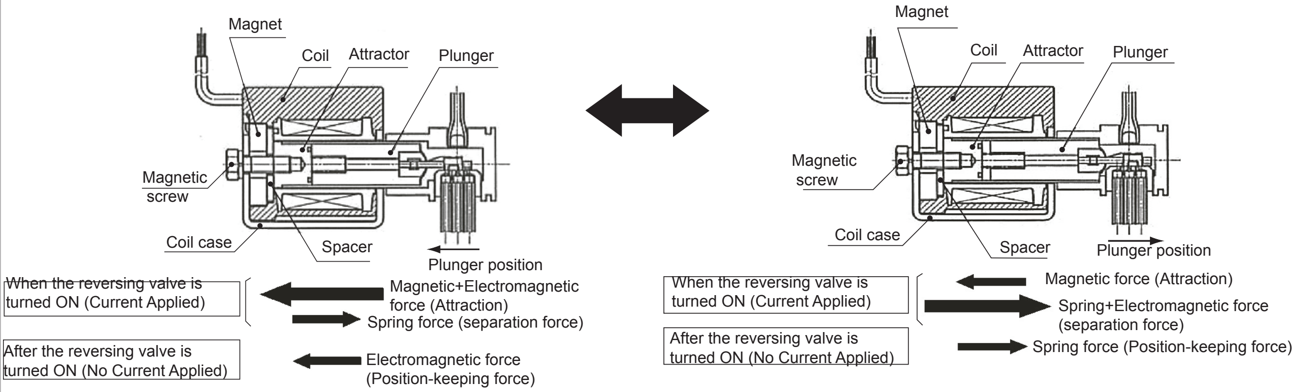
	Reversing valve ON	Reversing valve OFF
Test lead (+side)	pin 1	pin 3
Test lead (-side)	pin 3	pin 1
Range of voltaje	325 VDC	163 VDC

NOTE

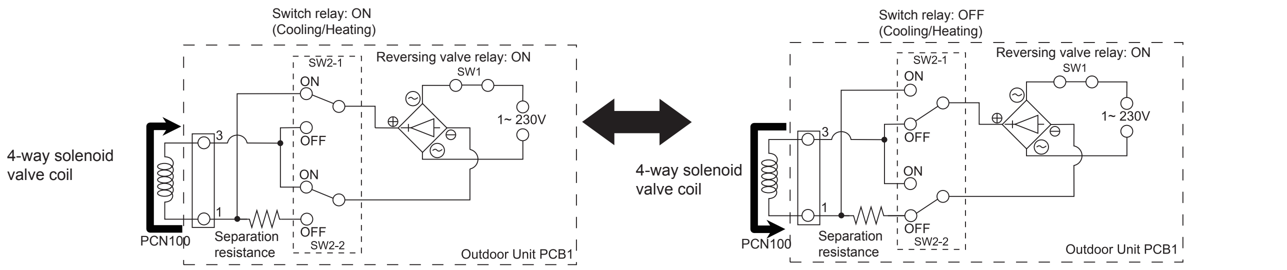
The values may differ depending on testers. Appropriate output voltage is 70~339VDC

Bistable solenoid operation type (pulse-activated)

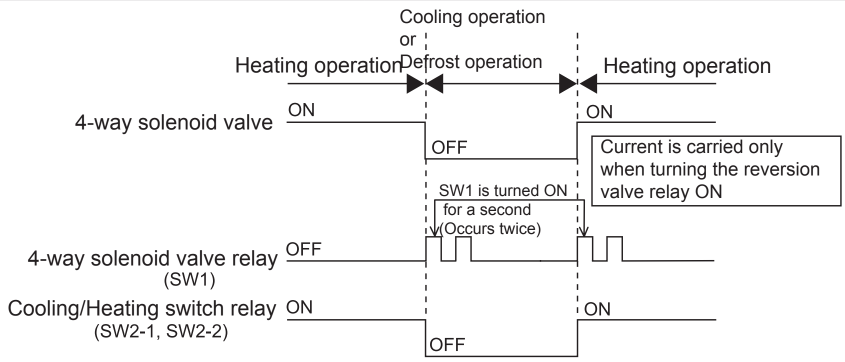
Operation Mode: Cooling → Heating Reversing Valve: OFF → ON	Operation Mode: Cooling → Heating Reversing Valve: OFF → ON
When current is applied to the reversing valve coil, an electromagnetic force headed in the same direction as the magnetic force is generated, and the valve is turned ON by their attraction. After the valve is turned ON, the plunger position is kept by magnetic force with no current applied.	When current is applied to the reversing valve coil, an electromagnetic force headed in the direction opposite to the magnetic force is generated, and the valve is turned OFF by their separation force. After the valve is turned OFF, the plunger position is kept by spring force.



Electrical circuit	
When the reversing valve relay is turned ON, current is applied to the coil. After the reversing valve relay is turned OFF, no current is applied.	When the reversing valve relay is turned ON, current is applied to the coil. After the reversing valve relay is turned OFF, no current is applied.



Time Chart



10.4.1.5 Checking procedure for the inverter PCB

◆ Fault diagnosis of DC fan motor

When Alarm 04 or 53 is indicated and some PCB is faulty, it may have been caused due to faulty fan motor. If PCB operates with a faulty fan motor, it can be damaged. Therefore, check the fan motor as explained below when replacing the faulty PCB.

⚠ **CAUTION**

- *Turn OFF main power before start working.*
- *Working and checking with the power ON may disturb correct diagnosis and may result in failure.*

Procedure in case of error diagnosis

1 Disconnect the fan motor connectors from its respective PCB and remove the propeller fan. Then, turn the fan motor shaft by hand.

Normal	Fan motor shaft turns smoothly
Faulty	No continuous rotary torque movement felt when turning the motor by hand. This occurs because the internal magnet of the fan motor breaks the movement when the internal electronic circuit of the fan motor has a short-circuit fault.

2 Measure the fan motor resistance:

Measurement procedure	
1	Ensure that the fan motor connectors have been correctly disconnected as explained above.
2	Connect the black test lead of the tester to the black wire pin of the fan motor connector.
3	Connect the red test lead to the wire connector pin to be checked.
Results	
Normal	Observed values will be close to the normal values in the table below.
Faulty	Observed values will be deviated from the normal values in the table below. (Generally, an open-circuit fault shows ∞, and a short-circuit fault shows several Ω - kΩ). Internal electronic circuit fault of the fan motor including short-circuit and breakage can be checked.

Motor model	Wire colour for checking (Normal value)			
	Red-black	White-black	Yellow-black	Blue-black
RRMB4415	13.5 - 14.4kΩ	1MΩ or greater	225-226kΩ	1MΩ or greater
SIC-68FV-D851-18	1MΩ or greater	26-50kΩ	168-312kΩ	1MΩ or greater
SIC-68FV-D851-17	1MΩ or greater	42-78kΩ	168-312kΩ	1MΩ or greater
SIC-81FV-D8138-1				

Values are shown for referential purpose. While actual values may vary depending on the type of the tester, any tester can be used to determine any short-circuit or breakage based on ∞ or several Ω or 0 Ω or ∞.

10.4.1.6 Checking procedure for the compressor

◆ Check list on compressor

Check list on compressor		
Client:_________________________	Model: ________________________	Date: ____________________
Serial Nº: _____________________	Production date: ________________	Checker: __________________

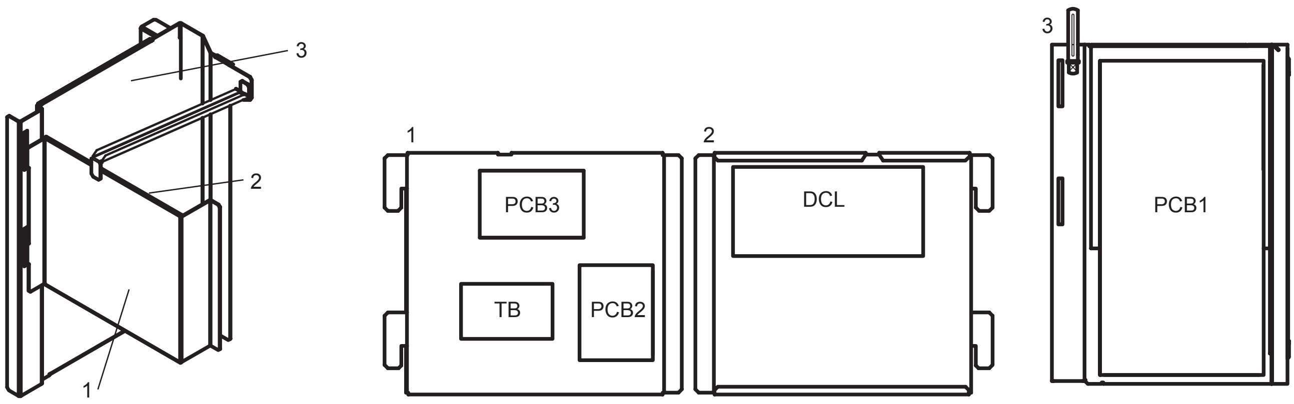
No.	Check item	Check method	Result	Remarks
1	Is THM9 correctly connected? THM9: discharge gas thermistor	1. Is wire of thermistor correctly connected by viewing? 2. Check to ensure the 7-segment indication of Td when compressor is operating. Td: temperature of THM9		
2	Is thermistor THM9 disconnected?	1. Check to ensure that thermistor on the top of compressor is correctly mounted by viewing? 2. Check to ensure that actually measured temperature is the same as the indication during check mode.		
3	Is current sensor faulty?	1. Check to ensure that indication A1 and A2 are 0 during compressor stopping. 2. Check to ensure that indication A1 and A2 are not 0 during compressor running.		
4	Is current sensing part on PCB2 faulty?			
5	Is the direction of current sensor (CTU, CTV) reverse?	Check the direction => by viewing.		
6	Are power source wires, U and V inserted correctly into current sensor?	Check to ensure that wires are correctly inserted		
7	Is expansion valve (MV1) correctly connected?	Check to ensure that MV1 to CN5A is correctly connected		
8	Is exp. valve coil (MV1) correctly connected?	Check to ensure that each coil is correctly mounted on the valve.		
9	Are the refrigeration cycle and electrical wiring system incorrectly connected?	Check to ensure that refrigerant is flowing into indoor units by operating one refrigerating cycle only from the outdoor unit.		
10	Is opening of expansion valve completely closed (locked)?	Check the following by the check mode of outdoor units. 1. Liquid pipe temperature (TL) < Control information B2 during cooling operation 2. Liquid pipe temperature (TL) > Control information B2 during heating operation		
12	Are the contacts for compressor magnetic switch CMC1 faulty?	Check the surface of each contact (L1, L2 and L3) by viewing.		
13	Is there any voltage abnormality among L1-L2, L2-L3 and L3-L1?	Check to ensure that voltage imbalance is smaller than 3%. Please note that power source voltage must be within 380V or 220V+10%.		
14	Is the compressor oil acidified during compressor motor burning?	Check to ensure that the oil color is not black.		

◆ Additional Information for “Check list on compressor”

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

10.4.2 RSW, DSWs and LEDs functions RAS-(4-6)HV(R/N)(C/P)2E

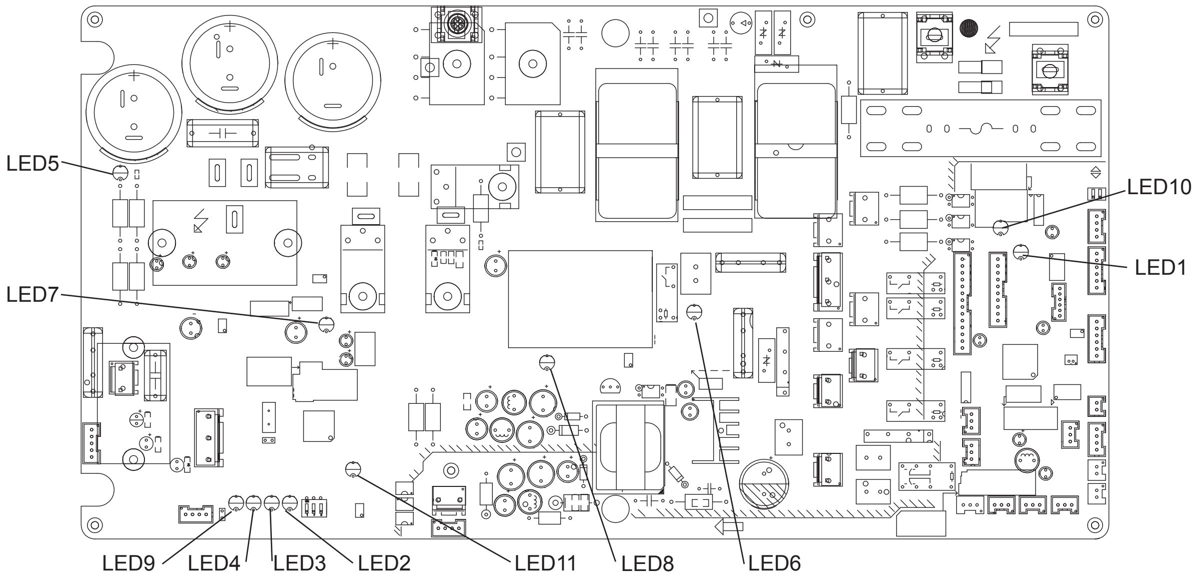
10.4.2.1 Location of print circuit boards (PCBs)



10.4.2.2 Purpose

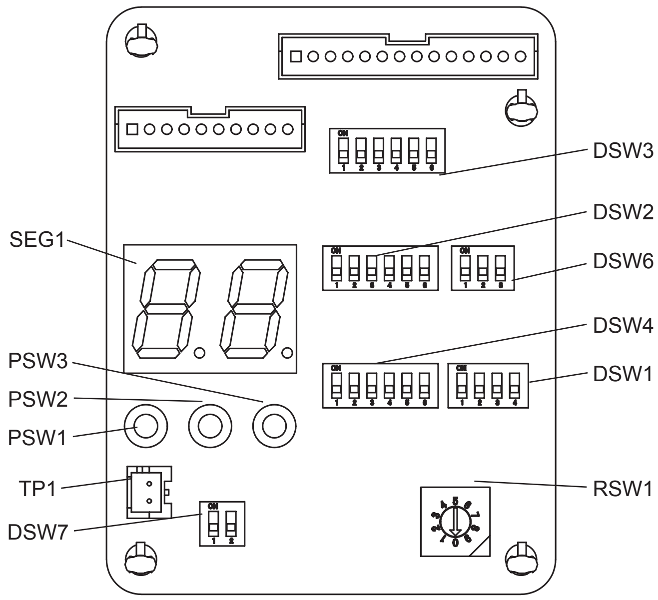
Symbol	PCB	Purpose
PCB1	Control and Inverter PCB	1. Transmission between the indoor and outdoor units. 2. Processing for sensor input. 3. Processing for dip switch input. 4. Operation control for parts 1 to 3. Compressor operating control, control of the bypass valve, fan control and overcurrent control. 5. Processing of the safety device input. 6. Processing of the relay output. 7. Detection of reverse phase for power source.
PCB2	DSW-PCB	1. 7-segment display indication. 2. Transmission dip switch input to PCB1.
PCB3	Fan PCB	Drive Fan1 Motor.
DCL	Reactor	Used for the Power Factor Correction.

Printed circuit board for control: PCB1



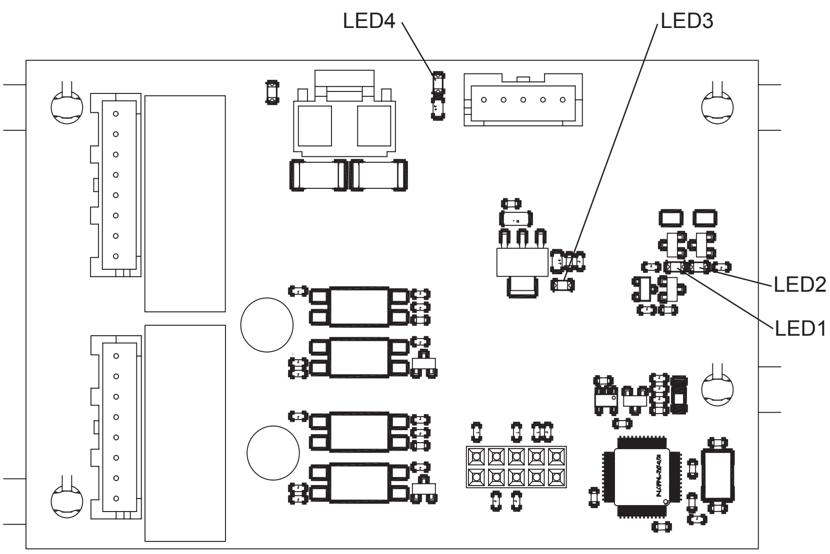
Part name	Contents of functions
LED1 (Red)	Power source indicator for main control of the PCB1 (5V). Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.
LED2 (Red)	It indicates: “Alarm”.
LED3 (Yellow)	It indicates: “Alarm”.
LED4 (Green)	It indicates: “Alarm”.
LED5 (Red)	Indicator for DC Bus Voltage Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.
LED6 (Red)	Power source indicator for Precharge Relay. Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.
LED7 (Green)	Power source indicator for inverter control of the PCB1 (3.3V). Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.
LED8 (Red)	Power source indicator for Main Relay. Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.
LED9 (Orange)	It indicates: “Alarm”.
LED10 (Yellow)	It indicates the communication state between the indoor unit and outdoor unit. Normal condition: Activated / Flash. Abnormal condition: Deactivated / OFF.
LED11 (Green)	It indicates the communication state between the main control and inverter control of PCB1. Normal condition: Activated / Flash. Abnormal condition: Deactivated / OFF.

Inverter printed circuit board for control: PCB2



No.	DIP Switch Code	Definition	No.	DIP Switch Code	Definition
1	DSW1	Test Run	7	PSW1	Manual Defrosting
2	DSW2	Function Setting	8	PSW2	Decrease (▼)
3	DSW3	Model Setting	9	PSW3	Increase (▲)
4	DSW4	System Address Setting: Double Digit	10	RDW1	System Address Setting: Single Digit
5	DSW6	Function Setting	11	SEG1	7-segment Display
6	DSW7	Function Setting	12	TP1	Test Port for Factory

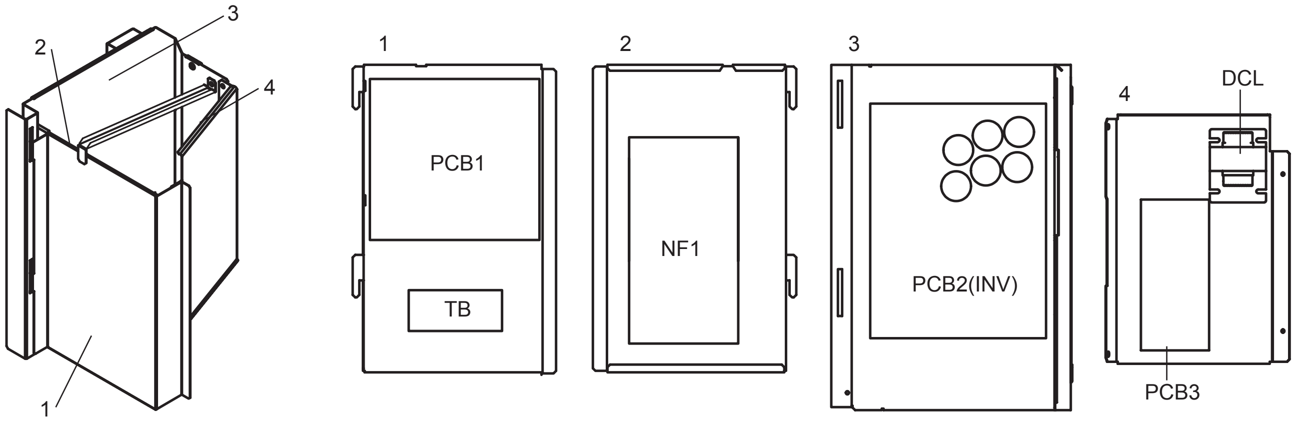
Printed Circuit Board for Fan Control: PCB3



Part name	Contents of functions
LED1 (Yellow)	Communication Indicator. Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.
LED2 (Red)	Communication Indicator. Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.
LED3 (Green)	Power source indicator for Fan PCB (3.3V). Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.
LED4 (Green)	Power source indicator for Fan (15V). Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.

10.4.3 RSW, DSWs and LEDs functions RAS-(4-6)H(R/N)(C/P)2E

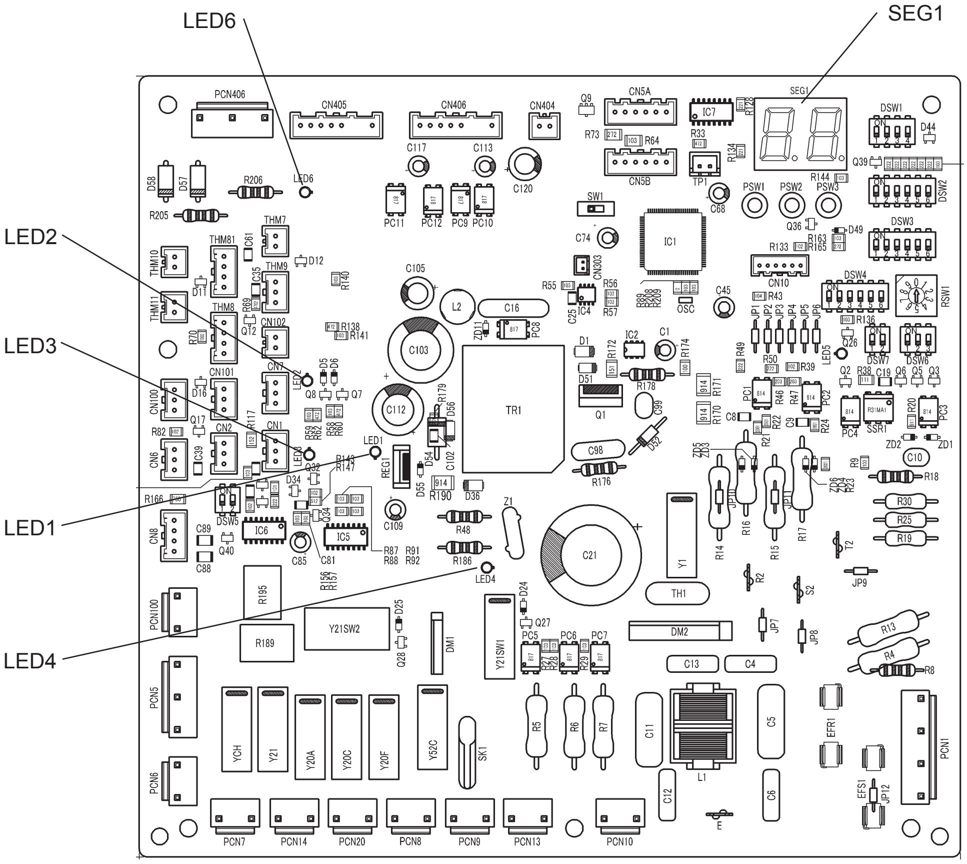
10.4.3.1 Location of print circuit boards (PCBs)



10.4.3.2 Purpose

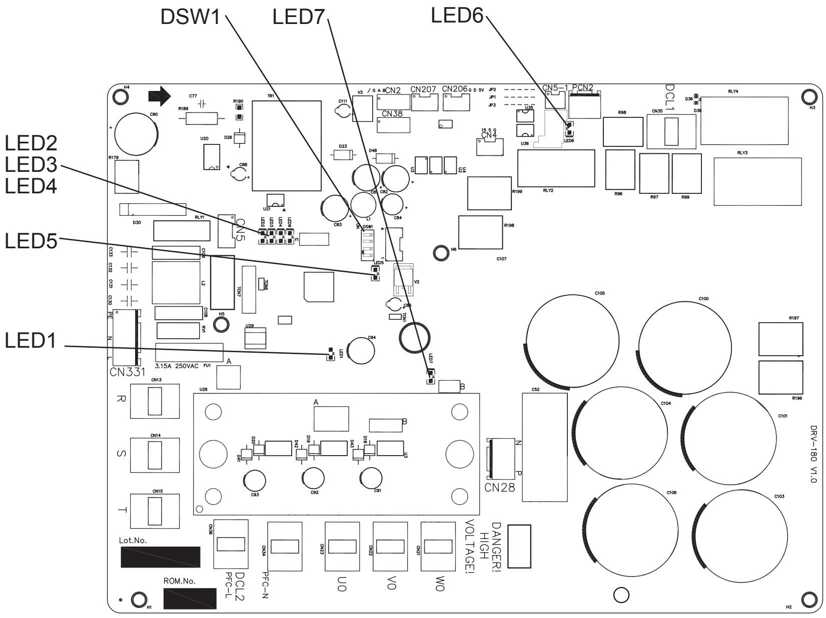
Symbol	PCB	Purpose
PCB1	Control and Inverter PCB	1. Transmission between the indoor and outdoor units. 2. Processing for sensor input. 3. Processing for dip switch input. 4. Operation control for parts 1 to 3. Compressor operating control, control of the bypass valve, fan control and overcurrent control. 5. Processing of the safety device input. 6. Processing of the relay output. 7. Detection of reverse phase for power source.
PCB2	DSW-PCB	1. 7-segment display indication. 2. Transmission dip switch input to PCB1.
PCB3	Fan PCB	Drive Fan1 Motor.

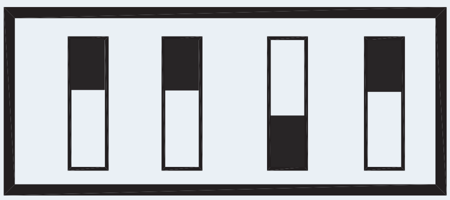
Printed circuit board for control: PCB1



Part name	Contents of functions
LED1 (Red)	Power source indicator for main board (Low Voltage). Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.
LED2 (Green)	It indicates the communication state between the Main Board and Driven Board. Normal condition: Flashing. Abnormal condition: Deactivated / OFF.
LED3 (Yellow)	It indicates the communication state between the indoor unit and outdoor unit. Normal condition: Flashing. Abnormal condition: Deactivated / OFF.
LED4 (Red)	Power source indicator for Outdoor Unit PCB (280VDC). Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.
LED6 (Red)	Power source indicator for Outdoor Unit PCB (from PCB2). Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.
SEG1	It indicates: “Alarm”, “Protective Safety Device has Tripped” or “Checking Items”.

Inverter printed circuit board for control: PCB2

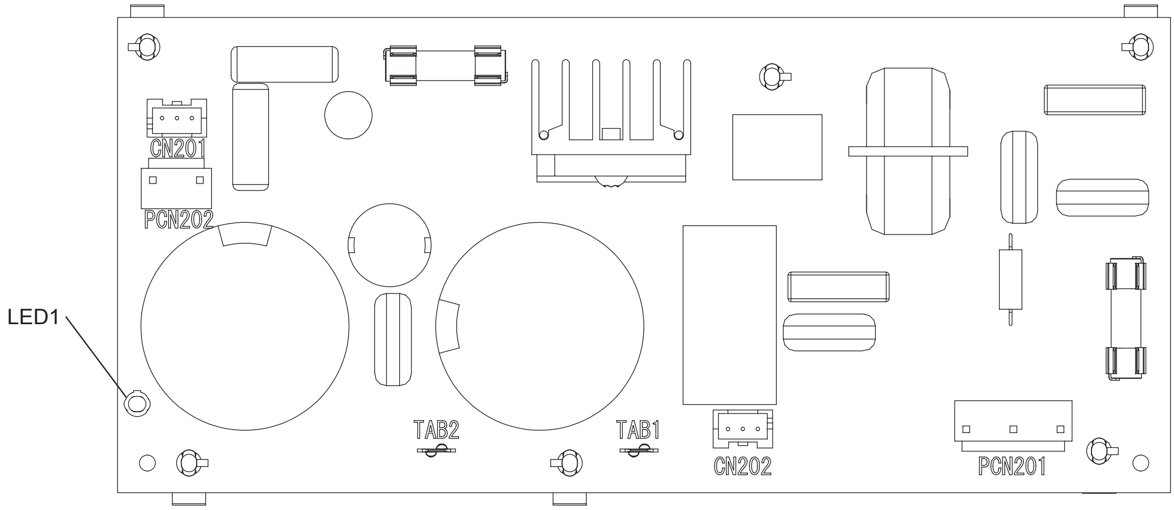


Part name	Contents of functions
LED1 (Green)	Communication Indicator. Normal condition: Flashing. Abnormal condition: ON / OFF.
LED7 (Red)	Power Source Indicator for Driver Board Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.
LED5 (Green)	Power Source Indicator for Control Part. Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.
LED6 (Red)	Power source indicator for Precharge Relay. Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.
LED4 (Green) LED3 (Yellow) LED2 (Red)	Compressor is Working ON OFF OFF
	Frequency Decrease for Overcurrent ON ON OFF
	Frequency Limit for Overcurrent ON ON ON
	Frequency Limit for Overheat ON Flash OFF
	Frequency Decrease for Overheat ON Flash Flash
	Compressor is Ready to Operate. (The Main Relay is Activated) Flash OFF OFF
DSW1	No Setting is Required ON OFF  1 2 3 4

NOTE

Flash represent that the LED is ON for 0.5 second and then it is OFF for 0.5 second repeatedly.

Printed Circuit Board for Fan Control: PCB3



Part name	Contents of functions
LED1 (Red)	PCB1 power indication Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.

HITACHI

11. Maintenance notes

Index

11.1 General notes

11.1.1 Checking the power source and the wiring connection

Check the following items in the case of abnormal operation:

No.	Check item	Procedure
1	Is the breaker of the fuse cut out?	Check the secondary voltage of the breaker and the fuse by means of a tester.
2	Is the wiring loosened or incorrectly connected?	Check the wiring connection on the PCB. • Thermistor connectors • Connector of the Unit controller cable • Each connector in a high-voltage circuit Check the connectors according to the **electrical wiring** diagram.

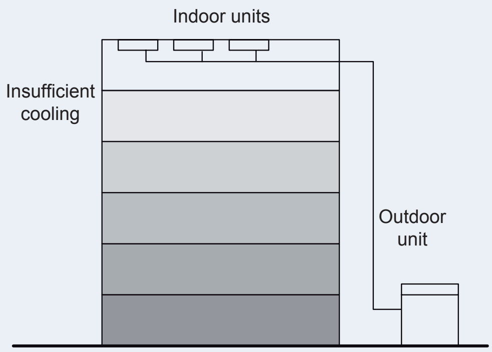
11.1.2 Burnt-out compressor due to an insufficient refrigerant charge

Question and answer for the field work

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

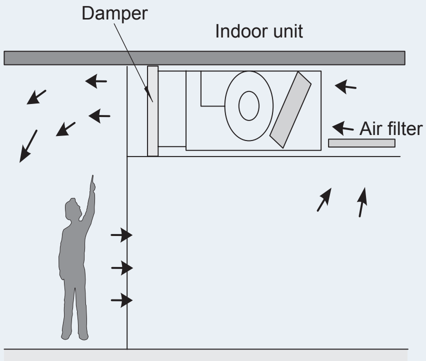
11.1.3 Insufficient cooling performance when a long piping is applied

Question and answer for the field work

Example 2: Insufficient cooling performance when a long piping is applied	
Phenomenon	Sufficient cooling was not available for an indoor unit that was located at the farthest position.
Cause	If the location of an outdoor unit is 20 meters lower than the location of the indoor units resetting of the DIP switch DSW2 is required. However no setting was performed. Therefore the largest discharge pressure was not increased. This resulted in an insufficient cooling performance for the indoor unit. 
Countermeasure	The setting of the DSW2 was changed.
Remarks	Pay special attention to the size of liquid pipe. Refer to *“3. Piping work and refrigerant charge”* chapter for details.

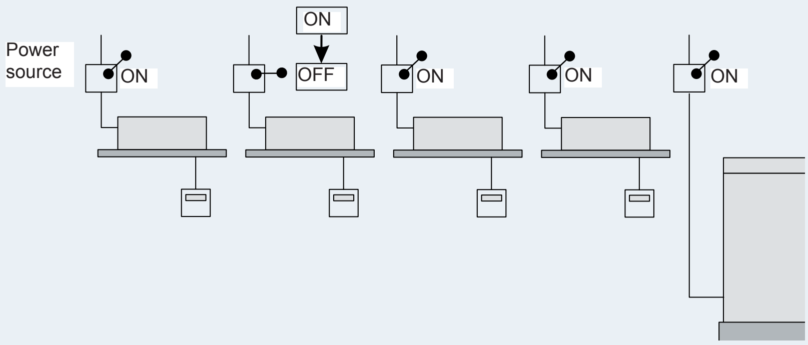
11.1.4 Abnormally high operation sound (in the ceiling type indoor unit)

Question and answer for the field work

Example 3: Abnormally high operation sound (in-the-ceiling type indoor unit)	
Phenomenon	The operation sound at the “HIGH” speed was abnormally high.
Cause	The indoor units were installed without the ducts. Since there was any external static pressure a big air volume was supplied. This resulted in a higher air speed through the heat exchanger. 
Countermeasure	In order to reduce the airflow set the indoor unit at “Low static pressure” setting.

11.1.5 Alarm code “31”

Question and answer for the field work

Example 4: Alarm code “31”	
Phenomenon	Alarm code “31” sometimes occurred and the system stopped.
Cause	The combination of the indoor units and the 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.

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

Question and answer for the field work

Example 5: Not cooling well due to insufficient installation space for outdoor unit	
Phenomenon	Cooling operation was well performed through the intermediate season. However the cooling operation was not well available when the outdoor temperature was higher than 35 °C.
Cause	As the outdoor units were installed without a sufficient installation space the hot discharge air from other outdoor units was circulated. In this case though the outdoor temperature was 35 °C the actual suction air temperature was nearly 50 °C and protection system from excessively high suction pressure was activated the frequency of the compressor was decreased and the cooling capacity was also decreased accordingly. As the outdoor units in-line were installed back to back with a certain distance between each outdoor unit’s back the hot discharged air from other outdoor units was circulated.
Countermeasure	Ensure that sufficient space should be secured for multi-row and multiple-installation.

11.2 Maintenance work

CAUTION

- *All inspections and checks of the outdoor unit and indoor unit have to be carried out by a licensed technician and never by the user itself.*
- *Before any inspection and check the unit main power supply has to be switched OFF.*
- *Wait minimum 10 minutes or more from all power supply have been turned OFF.*
- *Take care with the crankcase heater. It could operate even when compressor is OFF.*
- *Take care with the electrical box components. Some of them could remain hot after switch OFF the unit.*

NOTE

All these maintenance operations must be done with appropriate materials and following this manual.

Outdoor unit

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

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

3 Refrigerant piping connection
- Leakage: Check for the refrigerant leakage at the piping connection between the outdoor and the indoor unit.
- Pressure: Check the R32 refrigerant pressure using the check joints of the outdoor unit.

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

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

6 Control device and protection device
- Setting: Do not readjust the setting in the field unless the setting is maintained at a point that is different from the point listed in the Installation and operation manual.

7 R32 compressor
- Sound and vibration: Check for abnormal sounds and vibrations.
- Activation: Check that the voltage drop of the power supply line is within 15% at the start and within 2% during the operation.

8 Reversing valve
- Activation: Check for any abnormal activation sound.

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

10 Ground wire
- Ground line: Check for the continuity to earth.

11 Oil heater (Crankcase heater of the R32 compressor)
- Activation: You should activate the oil heater at least 12 hours before the start-up by turning ON the main switch.

11.3 Service and maintenance record

No.	Check item	Action	Judgement	
1	Is the service area sufficient?	—	Yes	No
2	Is there a short circuit of the discharged air?	—	Yes	No
3	Any heat influence?	—	Yes	No
4	Is the earth wire connected?	—	Yes	No
5	Refrigerant piping.	—	Good	Not Good
6	Fixing the units.	—	Good	Not Good
7	Are the internal and external surfaces damaged?	—	Yes	No
8	Are the screws and bolts tightened?	Tighten if loosened.	Tightened	Not Tightened
9	Are the terminal screws tightened?	Tighten all the terminal screws with a Phillips screwdriver.	Tightened	Not Tightened
10	Are the compressor terminals tightened?	Push all the terminals.	Pushed	Not Pushed
11	Insulation resistance.	Measure the insulation resistance with an insulation resistance meter. Compressor and fan. Motor: > 3MΩ (3HP) / 100MΩ (4-6HP). Others: > 3MΩ (3HP) / 1MΩ (4-6HP).	Good	Not Good
12	Does the drain water flow smoothly?	Check the smooth flow by pouring some water.	Good	Not Good
13	Check for a leakage in the compressor.	Check for any leakage.	Good	Not Good
14	Check for a leakage in the outdoor heat exchanger.	Check for any leakage.	Good	Not Good
15	Check for a leakage in the 4-way valve.	Check for any leakage.	Good	Not Good
16	Check for a leakage in the check valve.	Check for any leakage.	Good	No Good
17	Check for a leakage in the accumulator.	Check for any leakage.	Good	Not Good
18	Check for a leakage in the strainer.	Check for any leakage.	Good	Not Good
19	Check for a leakage in the electronic expansion valve.	Check for any leakage.	Good	Not Good
20	Check for a leakage in the piping.	Check for any leakage.	Good	Not Good
21	Check the direction of the fans.	By viewing the airflow volume.	Good	Not Good
22	Voltage among each phase.	Higher than AC220V.	Good	Not Good
23	Vibration and noise.	Check the fan the compressor the piping and others.	Good	Not Good
24	Activation of each operation mode.	Check the activation of the COOL switch the HEAT switch the STOP switch and the TEMP switch.	Good	Not Good
25	High-pressure cut-out switch.	Check the actual activation value.	Good	Not Good
26	Check the activation of the drain-up mechanism.	Check the activation during the cooling process.	Good	Not Good
27	Air inlet temperature of the outdoor unit DB/ WB.	—	(°C)DB	(°C)WB
28	Air outlet temperature of the outdoor unit DB/ WB.	—	(°C)DB	(°C)WB
29	High-pressure switch.	—	psi (G)	
30	Low-pressure switch.	—	psi (G)	
31	Operating voltage.	—	V	
32	Operating current.	—	A	
33	Instructions to the customer for cleaning the air filter.	—	Done	Not yet
34	Instructions to the customer about the cleaning method.	—	Done	Not yet
35	Instructions to the customer about the operation.	—	Done	Not yet

11.4 Service and maintenance record using the 7-segment display

◆ RAS-3HVRC2

Customer's name:				**Date:**	
Outdoor unit model (serial No.)		**RAS-**			
1. Operation mode					
2. Test run start time					
3. Data collect start time					
4. Read out data from 7-segment in outdoor unit					
4.1 Protection control code					
4.2 Total capacity of connected IU *	CP				
4.3 Input/output state of outdoor micro-computer	SC	Y52C	FAN1	Y21	YCH
		Y20A			
4.4 Alarm code for abnormal stoppage of compressor	AC				
4.5 Inverter order frequency to compressor	H 1				
4.6 Air flow ratio	Fo				
4.7 OU expansion valve opening	Eo				
4.8 Temperature at the top of compressor	Td				
4.9 Evaporating temperature at heating	TE				
4.10 Ambient air temperature	To				
4.11 Cause of stoppage at inverter	iT				
4.12 Inverter secondary current	A2				
4.13 IU address	nA				
4.14 IU expansion valve opening	EA				
4.15 Liquid pipe temperature of IU (Freeze protection)	LA				
4.16 Cause of IU stoppage	dA				

NOTE

- *OU: Outdoor Unit.*
- *IU: Indoor unit.*
- *FAN1: Constant speed fan.*
- *Y52C: Compressor operation.*
- *Y21: Reversing valve (RVR).*
- *YCH: Oil heater.*
- *Y20A: Gas Bypass Circuit for Startup*
- **: Multiply 1/8 by the code on the 7-segment.*

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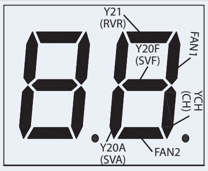
◆ **RAS-(4-6)(V)(R/N)(C/P)2E**

Customer's name: ____________								Date: ____________				
Outdoor unit model (Serial number: ____________)			RAS- (Serial number: ____________)					RAS- (Serial number: ____________)				
1. Operation mode												
2. Test Run Start Time												
3. Data Collect Start Time												
4. Read Out Data from 7-Segment in Outdoor Unit												
5. Protection Control Code												
Checking Mode		SC	Y20A (SVA)	Y21 (RVR)	Y52C (CMC)	Fan	YCH (CH)	Y20A (SVA)	Y21 (RVR)	Y52C (CMC)	Fan	YCH (CH)
Checking Mode	Input/Output State of Outdoor Micro-Computer											
Checking Mode	Total Capacity of Operating Indoor Unit	oP										
Checking Mode	Control Software No	SP										
Checking Mode	Inverter Software No.	iP										
Checking Mode	Inverter Order Frequency to Compressor	H1										
Checking Mode	Outdoor Fan Step	Fo										
Checking Mode	Outdoor Fan Speed	FS.										
Checking Mode	Outdoor Expansion Valve Opening	Eo										
Checking Mode	High Pressure (Discharge Pressure)	Pd.										
Checking Mode	Low Pressure (Suction Pressure)	PS.										
Checking Mode	Discharge Temperature	Td										
Checking Mode	Evaporating Temperature	TE										
Checking Mode	Ambient Air Temperature	To										
Checking Mode	Outdoor Condensing Temperature	TC										
Checking Mode	Inverter Fin Temperature	TF										
Checking Mode	Inverter Primary Current	A1										
Checking Mode	Inverter Secondary Current	A2										
Checking Mode – Checking for Indoor Unit	Indoor Unit Address	n-										
Checking Mode – Checking for Indoor Unit	Indoor Expansion Valve Opening	E-										
Checking Mode – Checking for Indoor Unit	Liquid Pipe Temperature of Indoor Unit	L-										
Checking Mode – Checking for Indoor Unit	Gas Pipe Temperature of Indoor Unit	u-										
Checking Mode – Checking for Indoor Unit	Indoor Unit Inlet Air Temperature	i-										
Checking Mode – Checking for Indoor Unit	Indoor Unit Outlet Air Temperature	o-										
Checking Mode – Checking for Indoor Unit	Cause Code of Indoor Unit Stoppage	d-										
Checking Mode	Accumulated operation time of the unit	UJ										
Checking Mode	Accumulated operation time of Compressor (After Reset)	cU										
Checking Mode	Outdoor Unit Alarm Code	AC										
Checking Mode	Cause Code of Inverter Stoppage	iT										
Checking Mode	Capacity of Indoor Unit(capacity DIP)	oC										
Checking Mode	Total connection capacity of the indoor unit*	CP										
Checking Mode	Quantity of indoor units connected	AA										
Checking Mode	Refrigeration system address	GA										

NOTE

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

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11.4.1 Information of Indoor unit

Indoor unit model			RAS- (Serial number: ____________)	RAS- (Serial number: ________________)
1. Test Run Start Time				
2. Data Collect Start Time				
	Indoor Unit Capacity	CA		
	Indoor Expansion Valve Opening	iE		
	Liquid Pipe Temperature of Indoor Unit	TL		
	Gas Pipe Temperature of Indoor Unit	TG		
	Indoor Unit Inlet Air Temperature	Ti		
	Indoor Unit Outlet Air Temperature	To		
	Cause Code of Indoor Unit Stoppage	d1		

11.4.2 Information of cause code of alarm

1. Test Run Start Time						
2. Data Collect Start Time						
	Alarm Cause Code	AC				
	Degeneracy Control for Pressure Ratio Decrease Protection	c11				
	Degeneracy Control for High Pressure Increase Protection	c13				
	Degeneracy Control for Inverter Fin Temperature Increase protection	c14				
	Degeneracy Control for Discharge Gas Temperature Increase protection	c15				
	Degeneracy Control for TdSH Decrease Protection	c16				
	Degeneracy Control for Overcurrent Protection	c17				

11.4.3 Information of cause code of alarm record

	Nº1	Nº2	Nº3	Nº4
1. Test Run Start Time				
2. Data Collect Start Time				
3. Alarm code/ cause code of stoppage				
4. Abnormal Data Indication				

11.5 Service and maintenance table through the remote control switch

11.5.1 RAS-3HVRC2

Data sheet for the checks using the remote control switch:

Time			:	:	:	:	:
IU model							
IU serial number							
IU number / Alarm code							
	Check mode 1	Check mode 2	1 · 2	1 · 2	1 · 2	1 · 2	1 · 2

B Temperature indication

Temperature setting	b1	--					
Inlet air temperature	b2	q1					
Discharge air temperature	b3	q2					
Liquid pipe temperature	b4	q3					
Remote thermistor temperature	b5	--					
Outlet air temperature	b6	q4					
Gas pipe temperature	b7	q5					
Evaporating temperature in heating mode	b8	q6					
Control information	b9	q7					
Temperature of the upper part of the compressor	bA	q8					
Thermo temperature of remote control switch	bb	--					
Not prepared	bC	--					

C Indication of the microcomputer state

IU microcomputer	C1	--					
OU microcomputer	C2	--					

D Stoppage cause state indication

Cause code of Indoor Unit Stoppage	d1	--					

E Alarm fault

Times of Abnormality	E1	--					
Times of Power Failure	E2	--					
Times of Abnormal Communication	E3	--					
Times of Inverter Tripping	E4	--					

F Automatic louver state

Louver sensor state	F1	--					

H Pressure and frequency state indication

Discharge pressure	H1	q9					
Suction pressure	H2	qA					
Control information	H3	qb					
Operating frequency	H4	qC					

J Indication of the IU capacity

IU capacity (x 1/8 HP)	J1	--					
OU code	J2	--					
Refrigerant cycle number	J3	--					
Refrigerant cycle number	J4	--					

L Expansion valve opening

IU expansion valve	L1	9d					
OU expansion valve 1	L2	9E					
OU expansion valve 2	L3	--					
OU expansion valve B	L4	--					

P Compressor condition indication (Reference)

Compressor current	P1	qF					
Accumulated Operation Time of Compressor	P2	--					

Customer:______________________________	Result
Installation date:______________________________	
System number:______________________________	
Inspection date:______________________________	
Inspection technician:______________________________	

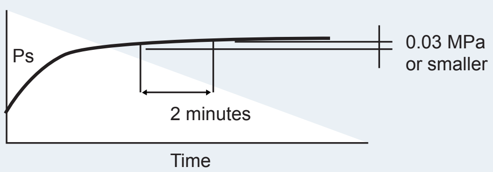
11.5.2 RAS-(4-6)(V)(R/N)(C/P)2E

Data sheet for checking by remote control switch

Time			:	:	:	:	:
IU model							
IU serial number							
IU number / alarm code							
	Check mode 1	Check mode 2	1·2	1·2	1·2	1·2	1·2
B Temperature indication							
Set temperature	b1	--					
Inlet air temperature	b2	q1					
Discharge air temperature	b3	q2					
Liquid pipe temperature	b4	q3					
Remote thermistor temperature	b5	--					
Outdoor air temperature	b6	q4					
Gas pipe temperature	b7	q5					
Evaporating temperature at heating	b8	q6					
Condensing temperature at cooling	b9	q7					
Compressor top temperature	bA	q8					
Thermo temperature of remote control switch	bb	--					
Not prepared	bC	--					
C Micro-computer state indication							
IU micro-computer	C1	--					
OU micro-computer	C2	--					
D Stopping cause state indication							
Stopping cause state indication	d1	--					
E Alarm occurrence							
Times of abnormality	E1	--					
Times of power failure	E2	--					
Times of abnormal transmitting	E3	--					
Times of inverter tripping	E4	--					
F Automatic louver state							
Louver sensor state	F1	--					
H Pressure frequency state indication							
Discharge pressure	H1	q9					
Suction pressure	H2	qA					
Control information	H3	qb					
Operating frequency	H4	qC					
J IU capacity Indication							
IU capacity (1/8HP)	J1	--					
OU code	J2	--					
Refrigerant cycle number	J3	--					
Refrigerant cycle number	J4	--					
L Opening of expansion valve							
IU expansion valve	L1	qd					
OU expansion valve 1	L2	qE					
OU expansion valve 2	L3	--					
OU expansion valve B	L4	--					
P Running current indication (reference)							
Compressor current	P1	qF					
Q Motion Sensor Indication							
Motion Sensor Reaction Rate	q1	--					

11.6 Refrigerant collection method

11.6.1 Refrigerant collection method when replacing the parts of outdoor unit

Process No.	Procedure	Remarks
1	Turn OFF the main switch of the outdoor unit.	-
2	Remove the covers, the thermistor, the crankcase heater, the power wirings, and other items.	Make sure that the terminal part of the detached power supply wires is not exposed by the winding insulation tape and other items.
3	Attach the manifold to the check joint of the high pressure side and the low pressure side of the outdoor unit.	-
4	Turn ON the main switch of the outdoor unit.	-
5	**In case that compressor operates** Perform pre-refrigerant collection during cooling test run. • Start the test run: - Turn ON the dip switch of outdoor unit: 3HP 1ph = PCB - DSW301 pin1 4-6HP 1ph = PCB2 - DSW1 pin1 → ON 4-6HP 3ph = PCB1 - DSW1 pin1 → ON • The test run should be performed for approx. 10 min, (until Ps>0.3 MPa, Td>75 °C) • Check the suction pressure “Ps” on 7-segments display of outdoor unit. • Close the gas valve inmediately. When Ps is ≤0.2 MPa perform the forced stoppage by turning on the dip switch: 3HP 1ph = PCB - DSW301 pin4 → ON 4-6HP 1ph = PCB2 - DSW1 pin4 → ON 4-6HP 3ph = PCB1 - DSW1 pin4 → ON • Cancel cooling operation: 3HP 1ph = PCB - DSW301 pin1 → OFF 4-6HP 1ph = PCB2 - DSW1 pin1 → OFF 4-6HP 3ph = PCB1 - DSW1 pin1 → OFF • Cancel the forced stoppage: 3HP 1ph = PCB - DSW301 pin4 → OFF 4-6HP 1ph = PCB2 - DSW1 pin4 → OFF 4-6HP 3ph = PCB1 - DSW1 pin4 → 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 compressor., make sure that the decrease does not reach Ps<0.1 MPa when performing the forced stoppage. The operation may finished when any of the conditions 1) to 3) occus: **1** Ten minutes have passed and STP is displayed in 7-segments. **2** “08” is displayed in 7-segments. **3** When Ps<0.1 MPa is continued for one minute in ten minutes STP is displayed in 7-segments and the operation finishes.
6	Close the liquid stop valve completely.	To avoid the spillage of all the refrigerant if the check valve is broken.
7	Check for a leakage of the check valve on the discharge gas side: • Enforced stoppage of the compressor → ON so that the compressor will not run although the running command is sent from the remote control switch. • Check that variation of Ps on the outdoor unit PCB is 17 seconds. Make sure that the Ps increase is within 0.03 MPa in two minutes after the Ps increase at the stoppage (during approximately five minutes). Also make sure that Pd > Ps.  	When you stop the compressor for replacing: • You can check the leakage of the check valve by means of the Ps variation because the SVA opens so that the discharge gas side of the inverter compressor can connect to the low pressure side. • 0.03 MPa/2 minutes is within the permissible limits for the check valve on the discharge gas side. • The leakage of the check valve may cause an incorrect brazing due to the gas pressure at the brazing of the discharge piping. • If the compressor-replacing mode is performed again set the DSW4-4 to OFF and keep the DSW4-4 at the OFF side during ten minutes. Then start according to the procedure No. 6.

Process No.	Procedure	Remarks
8	Collect the refrigerant by means of the refrigerant collection: Perform either A or B depending on the process 7. A. The leak rate at the process 7 is within the specification →Collect the refrigerant only at the low-pressure side. B. The leak rate at the process 9 is greater than the specification → Collect all the refrigerant of the outdoor unit side by means of the machine.	• The discharge of the refrigerant in the atmosphere is strictly forbidden. Make sure that the refrigerant is collected by a refrigerant collector. • Measure the quantity of the collected refrigerant and record it.
9	After collecting the refrigerant, remove the charge hose at the collector side of the low pressure side, so that the low pressure side of the refrigerant cycle will be the atmosphere pressure.	Make sure that there is no pressure increase of the low pressure sides after collecting the refrigerant.
10	Cancel the forced open valve mode.	Make sure that the refrigerant cycle is the atmosphere pressure. Otherwise, problems such as the blowing of gas and the suction of the cutting material may occur when you are removing the compressors.
11	Turn OFF the main switch of the outdoor unit.	-
12	Perform the replacement of the compressor and the change of the refrigerant oil according to the section “replacing the compressor”.	• Make sure that you follow the instructions. • Removing electrical box may be required. • Measure the quantity of the refrigerant oil and record it.
13	Perform the vacuum from the check joint of the low pressure side.	• If you collect the refrigerant only on the low pressure side (A in 8). You cannot perform the vacuum of the refrigerant from the check joint of the high pressure side.
14	Open the liquid stop valve and the gas stop valve completely when you finish the vacuum.	-
15	Make sure that the power is turned OFF and attach the following items: the power supply wire, the thermistor, the crankcase heater, the 63H wiring, the panel and the nut.	-
16	Charge new 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).
17	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.	-
18	Recharge the collected refrigerant (process No.8) 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 OU PCB1. Then recharge it from the liquid stop valve check joint during cooling operation.	If the replacement of the compressor takes more than two hours an additional charge of the refrigerant is necessary. Additional charge = (replacing time – 2 hours) x 0.5 kg.
19	Set the DSW back to the original setting. Make sure that all the wirings to the compressor are connected correctly.	-
20	Check the liquid and gas stop valves are fully opened.	-

11.6.2 Refrigerant collection method when replacing indoor unit

Process No.	Procedure	Remarks
1	Turn OFF the main switch of OU and I.U.	-
2	Close all the gas stop valves (at low and high pressure side) of OU and the liquid and gas stop valve completely.	-
3	Collect the refrigerant by a refrigerant collector. Activate forced open valve mode. Collect the refrigerant from the gas stop valves (at low and high pressure sides) of OU and the check joint of the liquid stop valve. Collect all the refrigerant in the IU 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. Cancel the forced open valve mode.	• 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 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 OU and the check joint of the liquid stop valve.	-
7	Recharge the collected refrigerant (Process No.3) from the liquid stop valve.	-
8	Check the liquid and gas stop valves are fully opened.	-

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08233 Vacarisses (Barcelona) Spain

SMGB0136 rev.0 - 07/2021

Printed in Spain