

SET FREE SERIES  
FSXNSE  
FSXNPE

## Service Manual

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RAS-(8-96)FSXNSE  
RAS-(5-72)FSXNPE





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Contents

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General information	1
Electrical wiring	2
Control system	3
Optional functions	4
Test run	5
Electrical checks of the main parts	6
Troubleshooting	7
Maintenance notes	8



## General Index

<b>1.</b>	<b>General information.....</b>	<b>1</b>
1.1	General information.....	2
1.1.1	General notes.....	2
1.1.2	Introduction.....	2
1.2	Safety.....	3
1.2.1	Applied symbols.....	3
1.2.2	Norms and Regulations.....	3
1.3	Product guide.....	4
1.3.1	Classification of outdoor unit.....	4
1.3.2	Classification of the CH-Box.....	4
1.3.3	Product line-up: outdoor units.....	5
1.3.4	Product line-up: CH-Box.....	6
1.3.5	Combination of outdoor units FSXN(S/P)E series (heat pump and heat recovery system).....	7
1.3.6	Accessory code list.....	10
1.3.7	Product line-up: indoor units.....	11
1.3.8	Product line-up: HYDRO FREE.....	16
1.3.9	Product line-up: KPI energy recovery unit.....	17
1.3.10	Product line-up: DX-Interface.....	17
1.3.11	Product line-up: Econofresh.....	17
<b>2.</b>	<b>Electrical wiring.....</b>	<b>19</b>
2.1	Outdoor unit.....	20
2.1.1	General information.....	20
2.1.2	Electrical wiring diagrams outdoor unit.....	21
2.2	CH-Box.....	25
2.2.1	General information.....	25
2.2.2	Electrical wiring diagrams CH-Box.....	26
<b>3.</b>	<b>Control system.....</b>	<b>33</b>
3.1	Control system.....	34
3.1.1	Cycle control.....	34
3.1.2	Compressor operation control.....	35
3.1.2.1	Compressor rotation control.....	35
3.1.2.2	Compressor frequency control.....	40
3.1.3	Heat exchanger mode control.....	43
3.1.4	Outline of the control system.....	45
3.2	Standard operation sequence.....	46
3.2.1	Cooling operation.....	46
3.2.2	Dry operation.....	48
3.2.3	Antifreeze protection control during the cooling or dry operation.....	50
3.2.4	Heating operation.....	51
3.2.5	Defrost operation.....	53
3.2.6	Excessive high discharge air temperature prevention control (depending on the indoor unit model).....	54
3.3	Protection control.....	55

3.3.1	Control of CH-Box .....	62
3.4	Control and safety devices .....	64
3.4.1	Compressor protection .....	64
3.4.1.1	Outdoor unit .....	64
3.4.1.2	CH-Box .....	64
<b>4.</b>	<b>Optional functions .....</b>	<b>65</b>
4.1	Menu mode accessing (by 7-segment display) .....	66
4.1.1	Check mode .....	66
4.1.2	External input and output setting .....	66
4.1.3	Function setting .....	66
4.2	External input and output setting (by 7-segment display) .....	67
4.2.1	Available control functions .....	67
4.2.2	Setting of external input and output .....	68
4.2.3	External input function setting .....	69
4.2.4	External output function setting .....	73
4.3	Function setting (by 7-segment display) .....	74
4.3.1	Sequence of the function setting .....	74
4.3.2	Function setting .....	78
4.3.4	Circulator function at heating Thermo-OFF (FA) .....	84
4.3.5	Night-shift (low noise)(ni) .....	84
4.3.6	Cancellation of the outdoor ambient temperature limit (GS) .....	85
4.3.7	Defrost for cold area (Jp) .....	86
4.3.8	SLo defrost setting (bJ) .....	87
4.3.9	Priority capacity mode setting (nU) .....	87
4.3.10	Low noise setting (db) .....	87
4.3.11	Demand function setting .....	88
4.3.12	Wave function setting (UE) .....	89
4.3.13	Cold draft protection (Fb) .....	89
4.3.14	Adjustment of fan rotation (Fo) .....	90
4.3.15	Outdoor fan motor intermitted operation setting (F4) .....	90
4.4	Power saving function from wired controller .....	91
4.4.1	Power Saving Guide .....	91
4.4.2	Outdoor Unit Capacity Control .....	91
4.4.3	Rotation control function .....	92
4.4.4	Intermittent control function .....	92
4.4.5	Power Saving Schedule Function .....	93
4.4.6	Operation noise reduction schedule function .....	93
4.4.7	Operation noise reduction schedule function .....	93
<b>5.</b>	<b>Test run .....</b>	<b>95</b>
5.1	Preliminary checks .....	96
5.2	Before the test run .....	97
5.3	Test run using the PC-ARFPE remote control switch (example) .....	98
5.4	Test run from the outdoor unit .....	100
5.5	Checking at test run .....	102

5.6	Reset for accumulated operation time of compressor 1-2 (cU1-cU2) .....	103
5.7	Setting of forced open valve mode .....	104
5.8	Refrigerant cycle checklist.....	106
5.9	Test run check list.....	109
<b>6.</b>	<b>Electrical checks of the main parts.....</b>	<b>111</b>
6.1	Outdoor unit PCB (PCB1) .....	113
6.1.1	Arrangement of connectors and check points .....	113
6.1.2	Checking procedures for outdoor unit PCB1.....	113
6.2	Inverter (INV1, INV2).....	114
6.2.1	Inverter specifications.....	114
6.2.2	High voltage discharge work for replacing parts .....	116
6.2.3	Checking method of inverter PCB (INV).....	116
6.2.4	Protection function.....	122
6.2.5	Overload protection control .....	123
6.3	Scroll compressor.....	124
6.3.1	Reliable mechanism for low vibration and low sound.....	124
6.3.2	Compression principles .....	124
6.3.3	Structure.....	125
6.3.4	Compressor type .....	125
6.3.5	Checking of compressor motor .....	125
6.3.6	Check list on compressor.....	126
6.3.7	Additional information for “check list on compressor” .....	126
6.4	Fan motor.....	127
6.5	Thermistors .....	128
6.5.1	Thermistor positions for RAS-(8-12)FSXNSE and RAS-(5/6)FSXNPE.....	128
6.5.2	Thermistor positions for RAS-14FSXNSE and RAS-(8-14)FSXNPE .....	129
6.5.3	Thermistor positions for RAS-(16/18)FSXNSE .....	130
6.5.4	Thermistor positions for RAS-(20-24)FSXNSE and RAS-(16/18)FSXNPE.....	131
6.5.5	Thermistor (Td) for discharge gas temperature.....	132
6.5.6	Thermistor for the outdoor ambient temperature.....	132
6.5.7	Thermistor for the evaporating temperature of the outdoor unit in the heating operation (For defrosting)..	132
6.5.8	Thermistor for super cooling bypass and main line temperature of outdoor unit .....	132
6.6	Electronic expansion valve (MV1, MV2, MVB).....	133
6.6.1	Specifications for MV1 and MV2 .....	133
6.6.2	Specifications for MVB .....	134
6.7	Pressure sensor (Pd) .....	135
6.7.1	High pressure control .....	135
6.7.2	Low pressure control .....	135
6.8	High pressure protection device (PSH).....	136
6.9	Electrical Coil Parts .....	137
6.10	Noise filter (NF1, NF2) .....	137
6.11	Reactor (DCL1 and DCL2).....	138

6.12	CH-Box PCB (PCB1).....	139
6.12.1	Check points PCB1 of single type CH-Box .....	139
6.12.2	Check points PCB1-4 of multi type CH-Box.....	139
6.12.3	Specifications for MVD1 and MVS1 .....	140
<b>7.</b>	<b>Troubleshooting.....</b>	<b>141</b>
7.1	Initial troubleshooting .....	142
7.1.1	Checking the electrical wires and the power source .....	142
7.1.2	Checking by 7-segment display .....	143
7.1.3	Checking of the alarm code history .....	144
7.1.4	Emergency mode operation from the remote control (only for RAS-(16-96)FSXNSE and RAS-(16-72)FSXNPE).....	148
7.1.5	Emergency mode operation from the outdoor unit PCB1 for compressor failure (only for RAS-(26-96)FSXNSE and RAS-(20-72)FSXNPE).....	149
7.1.6	Failure of the power supply to indoor units and the remote control switch.....	150
7.1.7	Abnormal transmission between remote control switch and indoor unit.....	151
7.1.8	Abnormal operation of the devices .....	152
7.2	Procedure for troubleshooting.....	163
7.2.1	Alarm codes of wired controller .....	163
7.2.2	Alarm code CH-Box:.....	166
7.3	Troubleshooting by alarm code .....	167
7.4	Troubleshooting in the check mode by using the remote control switch (PC-ARFPE example).....	228
7.4.1	Setting method .....	228
7.5	Troubleshooting by using the 7-segment display .....	236
7.5.1	Before carrying out checks.....	236
7.5.2	Location of the pushswitches and the 7-segment display.....	236
7.5.3	Protection control code on the 7-segment display .....	236
7.5.4	Activation condition of the protection retry control code .....	238
7.5.5	Check method by checking mode .....	240
7.6	RSW, DSWs and LEDs functions.....	247
7.6.1	Outdoor unit.....	247
7.6.1.1	Location of print circuit boards (PCBs).....	247
7.6.1.2	Purpose.....	247
7.6.2	CH-Box.....	250
<b>8.</b>	<b>Maintenance notes.....</b>	<b>253</b>
8.1	Checking the power source and the wiring connection .....	254
8.2	Burnt-out compressor due to an insufficient refrigerant charge .....	254
8.3	Alarm code "31" .....	255
8.4	Not cooling well due to insufficient installation space for the outdoor unit .....	255
8.5	Precautions in the event of refrigerant leaks .....	256
8.5.1	Maximum permissible concentration of hydrofluorocarbon (HFC) .....	256
8.5.2	Calculation of the refrigerant concentration.....	256



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8.5.3 Countermeasures in the event of refrigerant leaks .....	257
8.6 Maintenance work .....	257
8.7 Service and maintenance table through the 7-segment display .....	258
8.8 Service and maintenance table through the remote control switch.....	261
8.9 Service and maintenance table .....	263
8.10 Saturation curve for refrigerant.....	264
8.11 Mollier chart for R410A.....	265



# 1 . General information

## Index

1.1	General information.....	2
1.1.1	General notes.....	2
1.1.2	Introduction.....	2
1.2	Safety .....	3
1.2.1	Applied symbols .....	3
1.2.2	Norms and Regulations.....	3
1.3	Product guide .....	4
1.3.1	Classification of outdoor unit .....	4
1.3.2	Classification of the CH-Box.....	4
1.3.3	Product line-up: outdoor units .....	5
1.3.4	Product line-up: CH-Box.....	6
1.3.5	Combination of outdoor units FSXN(S/P)E series (heat pump and heat recovery system).....	7
1.3.6	Accessory code list.....	10
1.3.7	Product line-up: indoor units.....	11
1.3.8	Product line-up: HYDRO FREE .....	16
1.3.9	Product line-up: KPI energy recovery unit.....	17
1.3.10	Product line-up: DX-Interface .....	17
1.3.11	Product line-up: Econofresh .....	17

## 1.1 General information

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### 1.1.1 General notes

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

### 1.1.2 Introduction

HITACHI proudly presents the FSXNSE and FSXNPE models in the SET FREE series, characterised by its modular design. Space, structure and necessary functions, in line with evolution in building design, the requirements for air conditioning have also diversified.

Because the most suitable unit can be selected from a wide range of models for the standard type FSXNSE and the high efficiency type FSXNPE, you can create a custom air conditioning environment to satisfy your specific building conditions.

- Standard type: Nominal capacity from 22.4 kW to 268 kW (cooling mode) and from 25 kW to 305 kW (heating mode). Connectable indoor unit up to 64 depending on the model and total combination power from 50% up to 130%.
- High efficiency type: Nominal capacity from 14 kW to 201 kW (cooling mode) and from 16 kW to 225 kW (heating mode). Connectable indoor unit up to 64 depending on the model and total combination power from 50% up to 130% or 150%, depending on the model.

Standard and High efficiency type are available for heat pump system (2 pipes) and heat recovery system (3 pipes).

The FSXNSE range consists of 9 modules with different horsepower for each of the heat pump and heat recovery variants, while the FSXNPE range consists of 8 modules for each of the variants.

## 1.2 Safety

### 1.2.1 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 injuries and damage to the unit, the installation, the building or property.

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

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

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

#### DANGER

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

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

#### CAUTION

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

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

#### NOTE

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

### 1.2.2 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 R410A into the atmosphere: R410A are fluorinated greenhouse gases covered by the Kyoto protocol global warming potential (GWP) R410A: = 2088.

Tn of CO<sub>2</sub> 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**

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 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.

### 1.3 Product guide

#### 1.3.1 Classification of outdoor unit

Unit type (outdoor unit): RAS

			Position-separating hyphen (fixed)				
					System capacity (HP): High efficiency (5-72), Standard (8-96)		
				SET FREE System			
					X : Heat Pump system (2 pipes) and Heat Recovery system (3 pipes)		
					Refrigerant type N: R410A		
					P : High efficiency type		
					S : Standard type		
					E: Made in Europe		
<b>RAS</b>	<b>-</b>	<b>XX</b>	<b>FS</b>	<b>X</b>	<b>N</b>	<b>X</b>	<b>E</b>

#### 1.3.2 Classification of the CH-Box

##### ◆ CH-Box single

Unit Type

CH: Cooling/Heating Changeover Box

			Position-separating hyphen (fixed)			
					Refrigerant Type. AP: R410A	
					Maximum Connectable Indoor Unit Capacity (HP) 160: 6.0HP 280: 6.1HP - 10.0HP	
					Applicable System SSX: for Heat Recovery System (3 Pipes System)	
<b>CH</b>	<b>-</b>	<b>AP</b>	<b>XXX</b>	<b>SSX</b>		

##### ◆ CH-Box multi

Unit Type

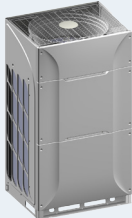


CH: Cooling/Heating Changeover Box

			Position-separating hyphen (fixed)			
					Refrigerant Type. AP: R410A	
					Maximum Connectable Indoor Unit Capacity (HP) 04: 4 branches; 08: 8 branches; 12: 12 branches; 16: 16 branches	
					M : multiple	
					Applicable System SSX: for Heat Recovery System (3 Pipes System)	
<b>CH</b>	<b>-</b>	<b>AP</b>	<b>XX</b>	<b>M</b>	<b>SSX</b>	

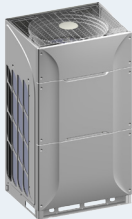


**1.3.3 Product line-up: outdoor units**

**◆ Outdoor units FSXN(S/P)E series (2 and 3 pipes system)**

**RAS-FSXNSE - Standard type**

OUTDOOR UNIT ❄️ 🔥					
					
Unit	Code	Unit	Code	Unit	Code
RAS-8FSXNSE	7E334210	RAS-14FSXNSE	7E334230	RAS-20FSXNSE	7E334239
RAS-10FSXNSE	7E334211	RAS-16FSXNSE	7E334231	RAS-22FSXNSE	7E334251
RAS-12FSXNSE	7E334212	RAS-18FSXNSE	7E334232	RAS-24FSXNSE	7E334240

**RAS-FSXNPE - High efficiency type**



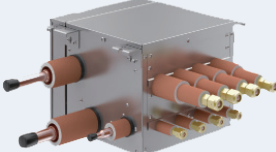
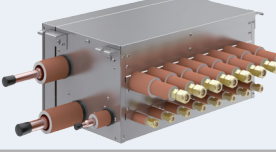
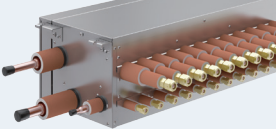

OUTDOOR UNIT ❄️ 🔥					
					
Unit	Code	Unit	Code	Unit	Code
RAS-5FSXNPE	7E334308	RAS-8FSXNPE	7E334310	RAS-16FSXNPE	7E334331
RAS-6FSXNPE	7E334309	RAS-10FSXNPE	7E334311	RAS-18FSXNPE	7E334332
		RAS-12FSXNPE	7E334312		
		RAS-14FSXNPE	7E334330		

** NOTE**

To obtain the different working range powers, please refer to chapter “1.3.5 Combination of outdoor units FSXN(S/P)E series (heat pump and heat recovery system)”.



**1.3.4 Product line-up: CH-Box**

CH-Box ❄️ 🔥				
Single		CH-AP160SSX	60292158	
		CH-AP280SSX	60292159	
Multiple	4 Branch	CH-AP04MSSX	60292160	
	8 Branch	CH-AP08MSSX	60292161	
	12 Branch	CH-AP12MSSX	60292162	
	16 Branch	CH-AP16MSSX	60292163	



### 1.3.5 Combination of outdoor units FSXN(S/P)E series (heat pump and heat recovery system)

#### ◆ RAS-FSXNSE - Standard type

The FSXNSE series of outdoor units comprises a capacity range from 8 to 96 HP. The models in the RAS-(8-24) FSXNSE range consist of a single-module base unit, while the models in the RAS-(26-96)FSXNSE range consist of the combination of two, three or four base units, according to the details provided in the following tables.

	Base unit	Build up the total capacity Heat Recovery system (3 pipes)	Build up the total capacity Heat Pump system (2 pipes)
Standard type	from 8 to 24 HP	from 8 to 54 HP	from 8 to 96 HP

#### Base units

HP	8	10	12	14	16
Model	RAS-8FSXNSE	RAS-10FSXNSE	RAS-12FSXNSE	RAS-14FSXNSE	RAS-16FSXNSE

HP	18	20	22	24
Model	RAS-18FSXNSE	RAS-20FSXNSE	RAS-22FSXNSE	RAS-24FSXNSE

#### Combination of base units

HP	26	28	30	32	34
Model	RAS-26FSXNSE	RAS-28FSXNSE	RAS-30FSXNSE	RAS-32FSXNSE	RAS-34FSXNSE
Combination	RAS-14FSXNSE	RAS-16FSXNSE	RAS-18FSXNSE	RAS-18FSXNSE	RAS-18FSXNSE
	RAS-12FSXNSE	RAS-12FSXNSE	RAS-12FSXNSE	RAS-14FSXNSE	RAS-16FSXNSE

HP	36	38	40	42	44
Model	RAS-36FSXNSE	RAS-38FSXNSE	RAS-40FSXNSE	RAS-42FSXNSE	RAS-44FSXNSE
Combination	RAS-18FSXNSE	RAS-24FSXNSE	RAS-22FSXNSE	RAS-24FSXNSE	RAS-22FSXNSE
	RAS-18FSXNSE	RAS-14FSXNSE	RAS-18FSXNSE	RAS-18FSXNSE	RAS-22FSXNSE

HP	46	48	50	52	54
Model	RAS-46FSXNSE	RAS-48FSXNSE	RAS-50FSXNSE	RAS-52FSXNSE	RAS-54FSXNSE
Combination	RAS-24FSXNSE	RAS-24FSXNSE	RAS-18FSXNSE	RAS-18FSXNSE	RAS-18FSXNSE
	RAS-22FSXNSE	RAS-24FSXNSE	RAS-18FSXNSE	RAS-18FSXNSE	RAS-18FSXNSE
	-	-	RAS-14FSXNSE	RAS-16FSXNSE	RAS-18FSXNSE

#### Combinations of base units only for Heat Pump system (\*)

HP	56	58	60	62	64
Model	RAS-56FSXNSE	RAS-58FSXNSE	RAS-60FSXNSE	RAS-62FSXNSE	RAS-64FSXNSE
Combination	RAS-24FSXNSE	RAS-22FSXNSE	RAS-24FSXNSE	RAS-24FSXNSE	RAS-24FSXNSE
	RAS-18FSXNSE	RAS-18FSXNSE	RAS-18FSXNSE	RAS-24FSXNSE	RAS-22FSXNSE
	RAS-14FSXNSE	RAS-18FSXNSE	RAS-18FSXNSE	RAS-14FSXNSE	RAS-18FSXNSE

HP	66	68	70	72	74
Model	RAS-66FSXNSE	RAS-68FSXNSE	RAS-60FSXNSE	RAS-62FSXNSE	RAS-64FSXNSE
Combination	RAS-24FSXNSE	RAS-24FSXNSE	RAS-24FSXNSE	RAS-24FSXNSE	RAS-24FSXNSE
	RAS-24FSXNSE	RAS-22FSXNSE	RAS-24FSXNSE	RAS-24FSXNSE	RAS-18FSXNSE
	RAS-18FSXNSE	RAS-22FSXNSE	RAS-22FSXNSE	RAS-24FSXNSE	RAS-18FSXNSE
	-	-	-	-	RAS-14FSXNSE

HP	76	78	80	82	84
Model	RAS-76FSXNSE	RAS-78FSXNSE	RAS-80FSXNSE	RAS-82FSXNSE	RAS-84FSXNSE
Combination	RAS-22FSXNSE	RAS-24FSXNSE	RAS-24FSXNSE	RAS-24FSXNSE	RAS-18FSXNSE
	RAS-18FSXNSE	RAS-18FSXNSE	RAS-24FSXNSE	RAS-24FSXNSE	RAS-18FSXNSE
	RAS-18FSXNSE	RAS-18FSXNSE	RAS-18FSXNSE	RAS-18FSXNSE	RAS-18FSXNSE
	RAS-18FSXNSE	RAS-18FSXNSE	RAS-14FSXNSE	RAS-16FSXNSE	RAS-18FSXNSE

HP	86	88	90	92	94
Model	RAS-86FSXNSE	RAS-88FSXNSE	RAS-90FSXNSE	RAS-92FSXNSE	RAS-94FSXNSE
Combination	RAS-24FSXNSE	RAS-24FSXNSE	RAS-24FSXNSE	RAS-24FSXNSE	RAS-24FSXNSE
	RAS-24FSXNSE	RAS-24FSXNSE	RAS-24FSXNSE	RAS-24FSXNSE	RAS-24FSXNSE
	RAS-24FSXNSE	RAS-24FSXNSE	RAS-24FSXNSE	RAS-22FSXNSE	RAS-24FSXNSE
	RAS-14FSXNSE	RAS-16FSXNSE	RAS-18FSXNSE	RAS-22FSXNSE	RAS-22FSXNSE

HP	96
Model	RAS-96FSXNSE
Combination	RAS-24FSXNSE
	RAS-24FSXNSE
	RAS-24FSXNSE
	RAS-24FSXNSE

### CAUTION

- Only the combinations in the table are allowed, not being possible to mix heat pump system (2 pipes) and heat recovery system (3 pipes) in the same combination. It is not possible to mix standard and high efficiency units either.
- (\*) DSW7 pin4 must be set OFF in all the modules of the combination.

### ◆ RAS-FSXNPE - High efficiency type

The FSXNPE series of outdoor units comprises a capacity range from 5 to 72 HP. The models in the RAS-(5-18) FSXNPE range consist of a single-module base unit, while the models in the RAS-(20-72)FSXNPE range consist of the combination of two, three or four base units, according to the details provided in the following tables.

	Base unit	Build up the total capacity Heat Recovery system (3 pipes)	Build up the total capacity Heat Pump system (2 pipes)
High efficiency type	from 5 to 18 HP	from 5 to 54 HP	from 5 to 72 HP

#### Base units

HP	5	6	8	10
Model	RAS-5FSXNPE	RAS-6FSXNPE	RAS-8FSXNPE	RAS-10FSXNPE

HP	12	14	16	18
Model	RAS-12FSXNPE	RAS-14FSXNPE	RAS-16FSXNPE	RAS-18FSXNPE

#### Combination of base units

HP	20	22	24	26	28
Model	RAS-20FSXNPE	RAS-22FSXNPE	RAS-24FSXNPE	RAS-26FSXNPE	RAS-28FSXNPE
Combination	RAS-10FSXNPE	RAS-12FSXNPE	RAS-12FSXNPE	RAS-16FSXNPE	RAS-16FSXNPE
	RAS-10FSXNPE	RAS-10FSXNPE	RAS-12FSXNPE	RAS-10FSXNPE	RAS-12FSXNPE

HP	30	32	34	36	38
Model	RAS-30FSXNPE	RAS-32FSXNPE	RAS-34FSXNPE	RAS-36FSXNPE	RAS-38FSXNPE
Combination	RAS-18FSXNPE	RAS-18FSXNPE	RAS-18FSXNPE	RAS-18FSXNPE	RAS-14FSXNPE
	RAS-12FSXNPE	RAS-14FSXNPE	RAS-16FSXNPE	RAS-18FSXNPE	RAS-12FSXNPE
	-	-	-	-	RAS-12FSXNPE

HP	40	42	44	46	48
Model	RAS-40FSXNPE	RAS-42FSXNPE	RAS-44FSXNPE	RAS-46FSXNPE	RAS-48FSXNPE
Combination	RAS-14FSXNPE	RAS-14FSXNPE	RAS-18FSXNPE	RAS-18FSXNPE	RAS-18FSXNPE
	RAS-14FSXNPE	RAS-14FSXNPE	RAS-14FSXNPE	RAS-14FSXNPE	RAS-18FSXNPE
	RAS-12FSXNPE	RAS-14FSXNPE	RAS-12FSXNPE	RAS-14FSXNPE	RAS-12FSXNPE

HP	50	52	54
Model	RAS-50FSXNPE	RAS-52FSXNPE	RAS-54FSXNPE
Combination	RAS-18FSXNPE	RAS-18FSXNPE	RAS-18FSXNPE
	RAS-18FSXNPE	RAS-18FSXNPE	RAS-18FSXNPE
	RAS-14FSXNPE	RAS-16FSXNPE	RAS-18FSXNPE

#### Combinations of base units only for Heat Pump system (\*)

HP	56	58	60	62	64
Model	RAS-56FSXNPE	RAS-58FSXNPE	RAS-60FSXNPE	RAS-62FSXNPE	RAS-64FSXNPE
Combination	RAS-18FSXNPE	RAS-18FSXNPE	RAS-16FSXNPE	RAS-16FSXNPE	RAS-16FSXNPE
	RAS-14FSXNPE	RAS-14FSXNPE	RAS-16FSXNPE	RAS-16FSXNPE	RAS-16FSXNPE
	RAS-12FSXNPE	RAS-14FSXNPE	RAS-14FSXNPE	RAS-16FSXNPE	RAS-16FSXNPE
	RAS-12FSXNPE	RAS-12FSXNPE	RAS-14FSXNPE	RAS-14FSXNPE	RAS-16FSXNPE


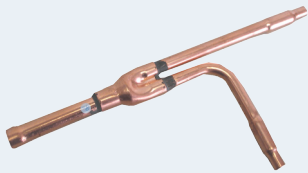

HP	66	68	70	72
Model	RAS-66FSXNPE	RAS-68FSXNPE	RAS-70FSXNPE	RAS-72FSXNPE
Combination	RAS-18FSXNPE	RAS-18FSXNPE	RAS-18FSXNPE	RAS-18FSXNPE
	RAS-16FSXNPE	RAS-18FSXNPE	RAS-18FSXNPE	RAS-18FSXNPE
	RAS-16FSXNPE	RAS-16FSXNPE	RAS-18FSXNPE	RAS-18FSXNPE
	RAS-16FSXNPE	RAS-16FSXNPE	RAS-16FSXNPE	RAS-18FSXNPE

### ⚠ CAUTION

- Only the combinations in the table are allowed, not being possible to mix heat pump system (2 pipes) and heat recovery system (3 pipes) in the same combination. It is not possible to mix standard and high efficiency units either.
- (\*) DSW7 pin4 must be set OFF in all the modules of the combination

### 1.3.6 Accessory code list

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




Name	Description	Code	Figure
MC-20AN1	Branch pipe (OU pipe connection kit)	70526209	
MC-21AN1		70526210	
MC-30AN1		70526211	
MC-NP31SA		60292293	
MC-NP40SA		60292294	
MC-20XN1		70526309	
MC-21XN1		70526310	
MC-30XN1		70526311	
DBS-TP10A	Drain Boss	60291683	
E-102SN4	Line Branch	70524201	
E-162SN4		70524202	
E-242SN3		70524104	
E-302SN3		70524105	
MW-NP2682A3		60292295	
E-52XN3		70525100	
E-102XN3		70525101	
E-162XN3		70525102	
E-202XN3		70525103	
E-242XN3		70525104	
E-322XN3		70525106	
MH-84AN1	Header branch	70522009	
MH-108AN		70522008	
MH-108XN		70523108	

**1.3.7 Product line-up: indoor units**

**i NOTE**

- The indoor unit models and codes are the last updated at time of publication; other previous models and coming developments could be available for combination with this outdoor unit series.
- Check the exact classification for each unit (model, type, power and series) in “1.3.1 Classification of outdoor unit”.

**◆ RCI and RCIM indoor units**


RCI		RCIM	
			
			
4-way cassette		4-way cassette (compact)	
Unit	Code	Unit	Code
		RCIM-0.4FSN4E (*1)	7E411148
		RCIM-0.6FSN4E (*2)	7E411137
		RCIM-0.8FSN4E (*3)	7E411100
RCI-1.0FSN4	70405001	RCIM-1.0FSN4E	7E411101
RCI-1.5FSN4	70405002	RCIM-1.5FSN4E	7E411102
RCI-2.0FSN4	70405003	RCIM-2.0FSN4E	7E411103
RCI-2.5FSN4	70405004	RCIM-2.5FSN4E	7E411104
RCI-3.0FSN4	70405005		
RCI-4.0FSN4	70405007		
RCI-5.0FSN4	70405008		
RCI-6.0FSN4	70405009		
Panel		Panel	
P-N23NA2 (without Motion Sensor)	70532000	P-AP56NAM (without Motion Sensor)	60297318

**i 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 SET FREE FSXNSE and FSXNPE series.
- (\*2): 0.6 HP Indoor Units can only be used in combination with SET FREE FSXNSE and FSXNPE series.
- (\*3): 0.8 HP Indoor Units set to a lower capacity (0.6 HP) can only be used in combination with SET FREE MINI series 3 (RAS-(4-6) FS(V)N(Y)3E)series.



◆ **RCD and RPC indoor units**


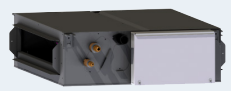



RCD				RPC			
							
							
2-way cassette				Ceiling type			
Unit	Code	Unit	Code	Unit	Code	Unit	Code
RCD-0.8FSN3	60278242						
RCD-1.0FSN3	60278243						
RCD-1.5FSN3	60278244					RPC-1.5FSN3	60278164
RCD-2.0FSN3	60278245					RPC-2.0FSN3	60278165
RCD-2.5FSN3	60278246					RPC-2.5FSN3	60278166
RCD-3.0FSN3	60278247			RPC-3.0FSN3E	7E443005	RPC-3.0FSN3	60278167
		RCD-4.0FSN3	60278248	RPC-4.0FSN3E	7E443007	RPC-4.0FSN3	60278168
		RCD-5.0FSN3	60278249	RPC-5.0FSN3E	7E443008	RPC-5.0FSN3	60278169
		RCD-6.0FSN3	60278250	RPC-6.0FSN3E	7E443009	RPC-6.0FSN3	60278170
Panel		Panel					
P-AP90DNA	60297319	P-AP160DNA	60297320				



**NOTE**

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

◆ RPI indoor units

RPI							
							
							
Indoor ducted unit							
Unit	Code	Unit	Code	Unit	Code	Unit	Code
RPI-0.4FSN5E(*1)	7E422048						
		RPI-0.6FSN5E (*2)	7E422037				
		RPI-0.8FSN5E (*3)	7E422013				
		RPI-1.0FSN5E	7E422014				
		RPI-1.5FSN5E	7E422015				
				RPI-2.0FSN5E	7E422016		
				RPI-2.5FSN5E	7E422017		
				RPI-3.0FSN5E	7E422018		
						RPI-4.0FSN5E	7E422020
						RPI-5.0FSN5E	7E422021
						RPI-6.0FSN5E	7E422022

RPI							
							
							
Indoor ducted unit							
Unit	Code	Unit	Code	Unit	Code	Unit	Code
RPI-8.0FSN3E	7E424010	RPI-8.0FSN3E-f	7E424410				
RPI-10.0FSN3E	7E424011	RPI-10.0FSN3E-f	7E424411				
				RPI-16.0FSN3PE (*4)	7E425038	RPI-16.0FSN3PE-f (*4)	7E425438
				RPI-20.0FSN3PE (*4)	7E425039	RPI-20.0FSN3PE-f (*4)	7E425439

**i** 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 SET FREE FSXNSE and FSXNPE series.
- (\*2) 0.6 HP Indoor Units can only be used in combination with SET FREE FSXNSE and FSXNPE series.
- (\*3): 0.8 HP Indoor Units set to a lower capacity (0.6 HP) can only be used in combination with SET FREE MINI series 3 (RAS-(4-6) FS(V)N(Y)3E)series.
- (\*4): RPI-FSN3PE(-f) can only be used in combination with SET FREE FSXNSE and FSXNPE series.



◆ **RPIM indoor units**



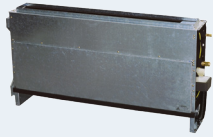
RPIM	
	
	
Indoor ducted unit (compact)	
Unit	Code
RPIM-0.6FSN4E (*1)	7E430037
RPIM-0.6FSN4E-DU (*1)	7E431037
RPIM-0.8FSN4E (*2)	7E430013
RPIM-0.8FSN4E -DU (*2)	7E431013
RPIM-1.0FSN4E	7E430014
RPIM-1.0FSN4E -DU	7E431014
RPIM-1.5FSN4E	7E430015
RPIM-1.5FSN4E -DU	7E431015

 **NOTE**

- (\*1) 0.6 HP Indoor Units can only be used in combination with SET FREE FSXNSE and FSXNPE series.
- (\*2): 0.8 HP Indoor Units set to a lower capacity (0.6 HP) can only be used in combination with SET FREE MINI series 3 (RAS-(4-6) FS(V)N(Y)3E)series.



## ◆ RPK, RPF and RPI indoor units

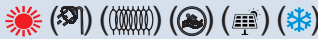
RPK		RPF		RPI	
					
Wall type		Floor type		Floor concealed type	
Unit	Code	Unit	Code	Unit	Code
RPK-0.4FSNH3M (*1)	60279062				
RPK-0.4FSN3M (*1)	60279061				
RPK-0.6FSN3M (*2)	60278145				
RPK-0.6FSNH3M (*2)	60278153				
RPK-0.8FSN3M (*3)	60278146				
RPK-0.8FSNH3M (*3)	60278154				
RPK-1.0FSN3M	60278147				
RPK-1.0FSNH3M	60278155	RPF-1.0FSN2E	7E450001	RPI-1.0FSN2E	7E460001
RPK-1.5FSN3M	60278148				
RPK-1.5FSNH3M	60278156	RPF-1.5FSN2E	7E450002	RPI-1.5FSN2E	7E460002
RPK-2.0FSN3M	60278149	RPF-2.0FSN2E	7E450003	RPI-2.0FSN2E	7E460003
RPK-2.5FSN3M	60278150	RPF-2.5FSN2E	7E450004	RPI-2.5FSN2E	7E460004
RPK-3.0FSN3M	60278151				
RPK-4.0FSN3M	60278152				
Expansion valve kit <sup>(1)</sup>					
EV-1.5N <sup>(1)</sup>	60921791				




**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 SET FREE FSXNSE and FSXNPE series.
- (\*2) 0.6 HP Indoor Units can only be used in combination with SET FREE FSXNSE and FSXNPE series.
- (\*3): 0.8 HP Indoor Units set to a lower capacity (0.6 HP) can only be used in combination with SET FREE MINI series 3 (RAS-(4-6) FS(V)N(Y)3E) series.
- <sup>(1)</sup> For RPK-(0.4-1.5)FSNH3M models only.

### 1.3.8 Product line-up: HYDRO FREE

#### ◆ Low temperature


					
1~ 230V 50Hz					
Unit	Code	Unit	Code	Unit	Code
RWLT-3.0VN1E	7E476018	-	-	-	-
		RWLT-5.0VN1E	7E476021	-	-
		-	-	RWLT-10.0VN1E	7E476024






#### NOTE

- For cooling operation, refer to the Cooling kit accessory for HYDRO FREE Low temperature unit.
- The PC-ARFWE controller required for the operation of the HYDRO FREE Low temperature is factory supplied in these models.

#### ◆ High temperature

	
1~ 230V 50Hz	
Unit	Code
RWHT-5.0VNF1E	7E484021









#### NOTE

The PC-ARFWE controller required for the operation of the HYDRO FREE High temperature is not factory supplied in these models, and must be ordered as an accessory separately.

#### Icons description

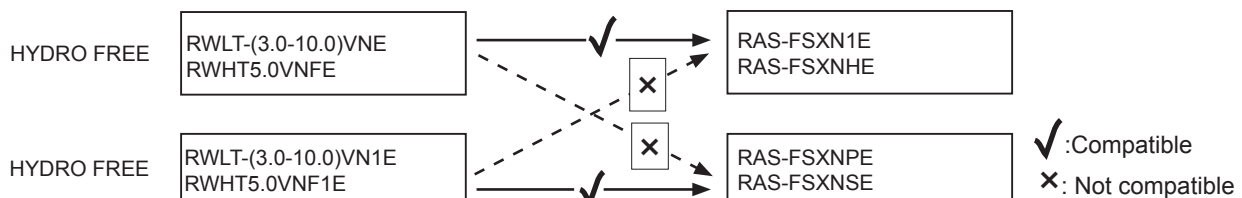
Icons between brackets mean possible extra operations to the factory-supplied operations (additional accessories, field-supplied accessories or systems can be needed)

- |   |  |
|---|--|
| <p> : Heating operation</p> <p> : Domestic hot water (DHW)</p> <p> : Additional heater (electrical heater accessory or boiler)</p> | <p> : Swimming pool application</p> <p> : Solar combination</p> <p> : Cooling operation</p> |
|---|--|


#### HYDRO FREE Interchangeability

RWLT-(3.0-10.0)VN1E and RWHT5.0VNF1E are compatible with RAS-FSXN(P/S)E only.



Likewise, RWLT-(3.0-10.0)VNE and RWHT5.0VNF1E are compatible with RAS-FSXN(1/H)E only.



**1.3.9 Product line-up: KPI energy recovery unit**

KPI			
			
Energy recovery		Active (Energy Recovery+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		

**1.3.10 Product line-up: DX-Interface**

DX-Interface		
 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

**1.3.11 Product line-up: Econofresh**

Econofresh	
	
Unit	Code
EF-456N1E	7E560001

** NOTE**

The EF-456N1E unit can only be installed in combination with the following units (Sales from October 2017):

- RPI-4.0FSN5E (7E422020)
- RPI-5.0FSN5E (7E422021)
- RPI-6.0FSN5E (7E422022)





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# 2. Electrical wiring

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## Index

2.1	Outdoor unit.....	20
2.1.1	General information.....	20
2.1.2	Electrical wiring diagrams outdoor unit.....	21
2.2	CH-Box.....	25
2.2.1	General information.....	25
2.2.2	Electrical wiring diagrams CH-Box.....	26



## 2.1 Outdoor unit

### 2.1.1 General information

#### CAUTION

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

#### DANGER

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

#### General verifications

- 1 Make sure the electric components supplied by the fitter (main power switches, circuit breakers, wires, connectors and connection terminals) have been selected correctly in line with the electrical data given.
  - a. The electricity supply to the unit should be via an exclusive power control switch and protective circuit breaker, certified and installed in accordance with local or national safety regulations.
  - b. The electricity supply for the outdoor and indoor units should be separate. Connect the voltage supply wiring for each group of indoor units to the same outdoor unit (maximum capacity for each group of indoor units: 26 HP).
  - c. For heat recovery systems, the CH-Box and the indoor unit of the same refrigerant cycle can be supplied from the same mains power switch.
- 2 Check that the supply voltage is between 90 and 110% of the rated voltage. Where the voltage capacity is too low, it will not be possible to start the system due to the drop in voltage.
- 3 Sometimes, the refrigeration/heating system is not able to operate correctly in the following cases:
  - When the system is supplied from the same supply line as other major consumers (heavy machinery, power inverter systems, cranes, welding machinery, etc).
  - When the supply cables of the major consumers and the refrigeration/heating system are very close together.

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

#### NOTE

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

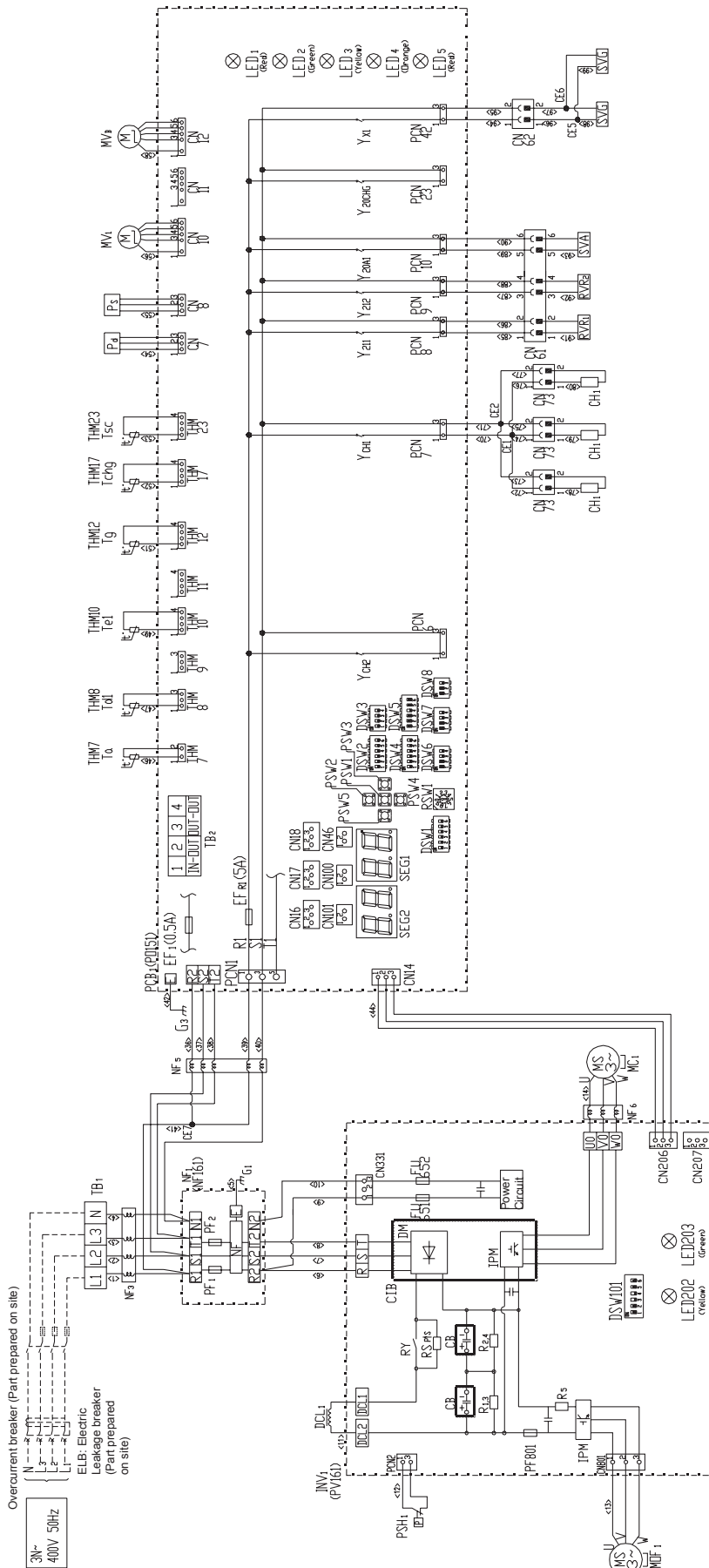
- 4 During the preliminary preparation work of the electricity supply line for the unit, the provisions in local and national legislation must never be violated.
- 5 Check that the earth cable is correctly connected.

#### DANGER

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

2.1.2 Electrical wiring diagrams outdoor unit

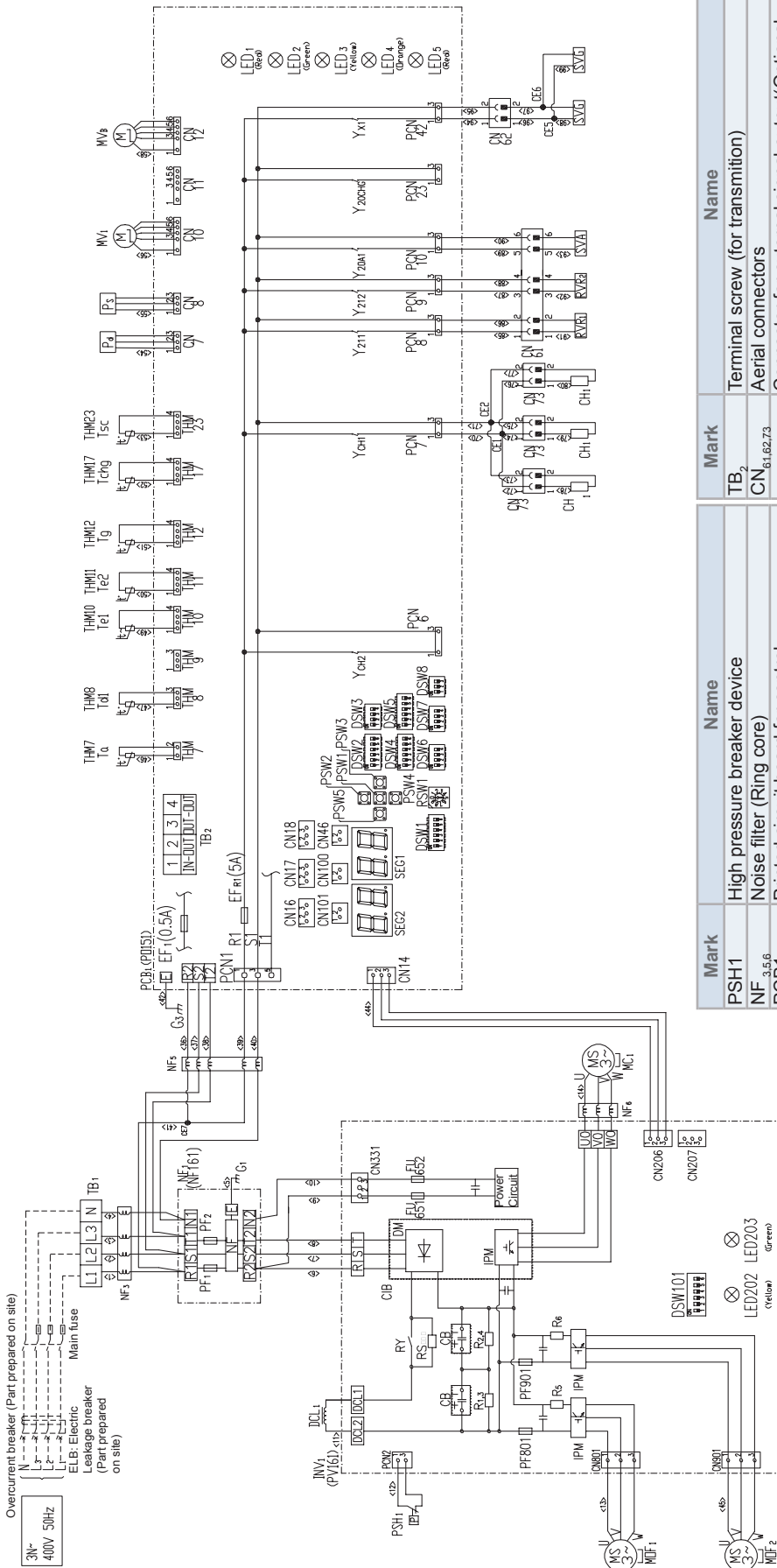
◆ RAS-(8-12)FSXNSE and RAS-(5/6)FSXNPE



Mark	Name	Mark	Name	Mark	Name	Mark	Name
MC1	Motor for compressor (Inverter)	DC1 <sub>1</sub>	Reactor	DC1 <sub>1</sub>	Reactor	DC1 <sub>1</sub>	Pressure sensor for refrigerant (suction side)
MOF1	Motor for outdoor fan	CB	Smoothing capacitor	CB	Smoothing capacitor	Ps	Pressure sensor for refrigerant (suction side)
CH <sub>1</sub>	Crank-case heater	RS <sub>P.S.</sub>	Resistor	RS <sub>P.S.</sub>	Resistor	THM <sub>7-23</sub>	Thermistor
RVR1	Solenoid 4-valve (for switching high/low pressure)	RY	Relay	RY	Relay	PSH <sub>1</sub>	High pressure breaker device
RVR2	Solenoid 4-valve (for switching cooling and heating)	TB <sub>1</sub>	Terminal board (for power)	TB <sub>1</sub>	Terminal board (for power)	NF <sub>3,5,6</sub>	Noise filter (Ring core)
SVA	Solenoid valve (for high-low pressure bypass)	TB <sub>2</sub>	Terminal board (for transmission)	TB <sub>2</sub>	Terminal board (for transmission)	PCB1	Printed circuit board for control
SVG	Solenoid valve (for high-low pressure breaker)	CN <sub>61,62,73</sub>	Aerial connectors	CN <sub>61,62,73</sub>	Aerial connectors	INV1	Printed circuit board for inverter
MV <sub>1,1B</sub>	Electronic control expansion valve	CN <sub>16</sub>	Connector for external signal output (Optional functions)	CN <sub>16</sub>	Connector for external signal output (Optional functions)	NF <sub>1</sub>	Noise filter (Printed board)
Pd	Pressure sensor for refrigerant (discharge side)	CN <sub>17,18</sub>	Connector for external signal input (Optional functions)	CN <sub>17,18</sub>	Connector for external signal input (Optional functions)	CE <sub>1,2,5,6,7</sub>	Fuse (for the operation circuit)
		CN <sub>5,401</sub>	Indication lamp (red) state of the power source	CN <sub>5,401</sub>	Indication lamp (red) state of the power source	EF <sub>R1</sub>	Fuse (for the control circuit)
		LED <sub>202</sub>	Indication lamp (yellow) H-LINK transmission	LED <sub>2,203</sub>	Indication lamp (green) INV transmission	FU <sub>051,052</sub>	Fuse (for the power circuit)
		LED <sub>203</sub>	Indication lamp (orange) outdoor-outdoor transmission	LED <sub>4</sub>	Indication lamp (orange) outdoor-outdoor transmission	PF <sub>1,2</sub>	Fuse (for the power circuit)
		E	Indication lamp (red) state of the power source	LED <sub>5,401</sub>	Indication lamp (red) state of the power source	CIB	Converter inverter break
		C <sub>1-3</sub>	Indication lamp (yellow) H-LINK transmission	CN <sub>100</sub>	For EEPROM access (Data logging)	IPM	Inverter module
			Field supply	CN <sub>101</sub>	H-LINK transmission (for service)		
			Field wiring				



**RAS-14FSXNPE and RAS-(8/14)FSXNPE**



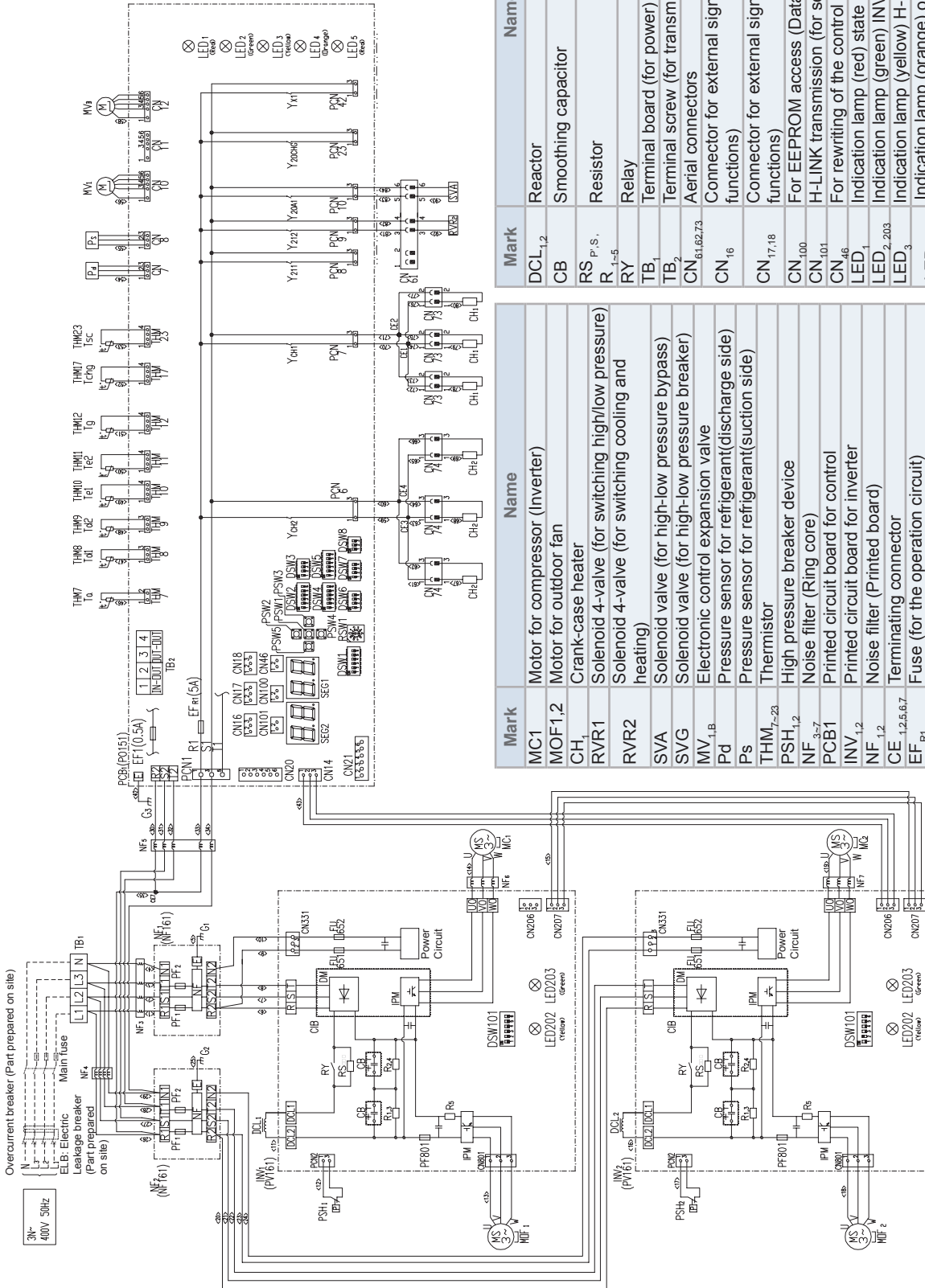
Mark	Name
PSH1	High pressure breaker device
NF <sub>3,5,6</sub>	Noise filter (Ring core)
PCB1	Printed circuit board for control
INV1	Printed circuit board for inverter
NF <sub>1</sub>	Noise filter (Printed board)
CE <sub>1,2,5,6,7</sub>	Terminating connector
EF <sub>R1</sub>	Fuse (for the operation circuit)
EF <sub>1</sub>	Fuse (for the control circuit)
FU <sub>651,652</sub>	Fuse (for the operation circuit)
PF <sub>1,2</sub>	Fuse (for the power circuit)
CIB	Converter inverter break
IPM	Inverter module
DCL <sub>1</sub>	Reactor
CB	Smoothing capacitor
RS <sub>R</sub>	Resistor
RY <sub>1-5</sub>	Relay
TB <sub>1</sub>	Terminal board (for power)

Mark	Name
TB <sub>7</sub>	Terminal screw (for transmission)
CN <sub>61,62,73</sub>	Aerial connectors
CN <sub>16</sub>	Connector for external signal output(Optional functions)
CN <sub>17,18</sub>	Connector for external signal input(Optional functions)
CN <sub>100</sub>	For EEPROM access (Data logging)
CN <sub>101</sub>	H-LINK transmission (for service)
CN <sub>46</sub>	For rewriting of the control software
LED <sub>1</sub>	Indication lamp (red) state of the power source
LED <sub>2,203</sub>	Indication lamp (green) INV transmission
LED <sub>3</sub>	Indication lamp (yellow) H-LINK transmission
LED <sub>4</sub>	Indication lamp (orange) outdoor-outdoor transmission
LED <sub>5,401</sub>	Indication lamp (red) state of the power source
LED <sub>202</sub>	Indication lamp(yellow)INV transmission
E	Field supply
G <sub>1-3</sub>	Field wiring

Mark	Name
MC1	Motor for compressor (Inverter)
MOF1,2	Motor for outdoor fan
CH <sub>1</sub>	Crank-case heater
RVR1	Solenoid 4-valve (for switching high/low pressure)
RVR2	Solenoid 4-valve (for switching cooling and heating)
SVA	Solenoid valve (for high-low pressure bypass)
SVG	Solenoid valve (for high-low pressure breaker)
MV <sub>1,B</sub>	Electronic control expansion valve
Pd	Pressure sensor for refrigerant(discharge side)
Ps	Pressure sensor for refrigerant(suction side)
THM <sub>7-23</sub>	Thermistor



◆ RAS-(16/18)FSXNSE

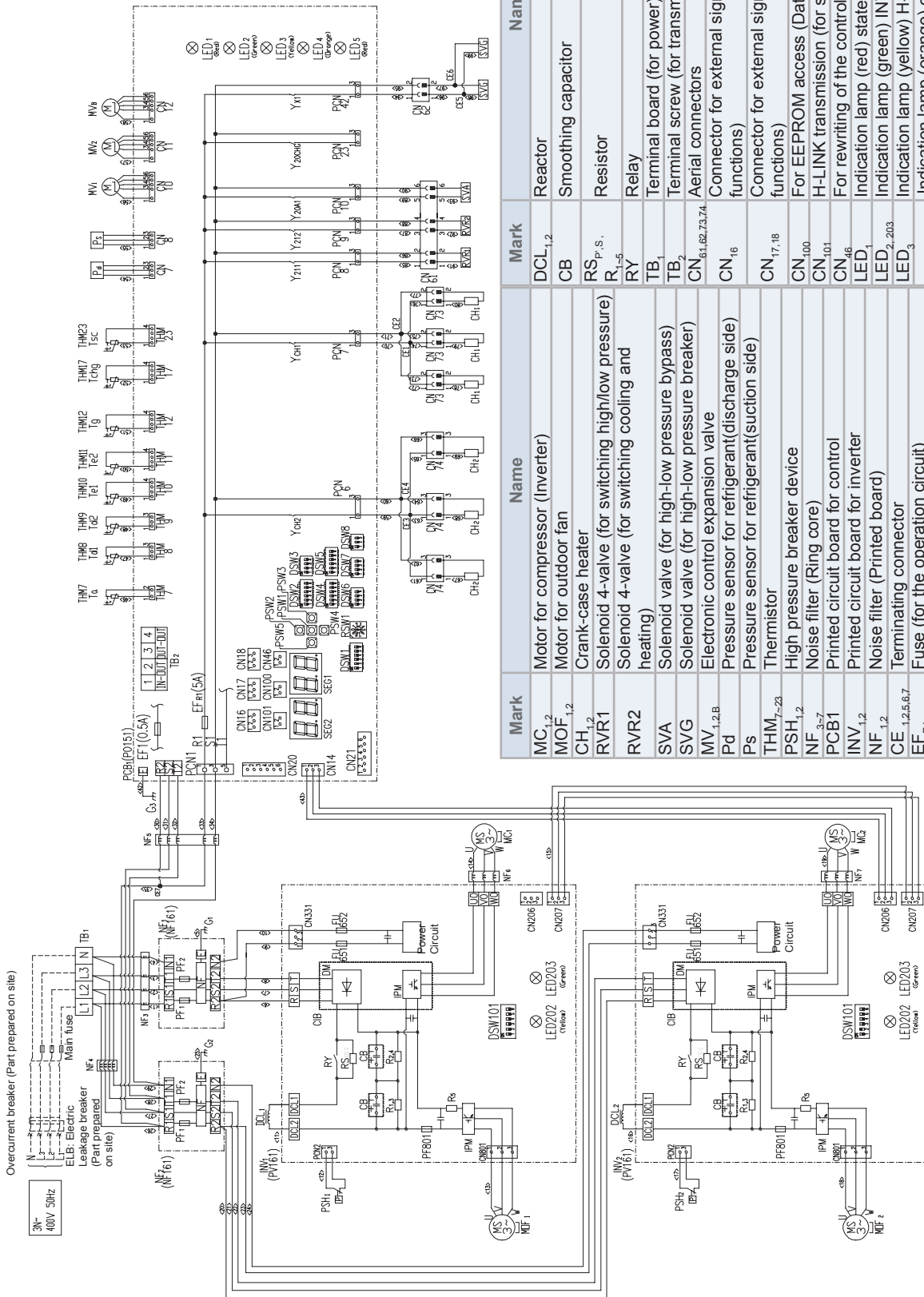


Mark	Name
DC1.2	Reactor
CB	Smoothing capacitor
RS <sub>P.S.</sub>	Resistor
RY <sub>1-5</sub>	Relay
TB <sub>1</sub>	Terminal board (for power)
TB <sub>2</sub>	Terminal screw (for transmission)
CN <sub>61,62,73</sub>	Aerial connectors
CN <sub>16</sub>	Connector for external signal output(Optional functions)
CN <sub>17,18</sub>	Connector for external signal input(Optional functions)
CN <sub>100</sub>	For EEPROM access (Data logging)
CN <sub>101</sub>	H-LINK transmission (for service)
CN <sub>46</sub>	For rewriting of the control software
LED <sub>1</sub>	Indication lamp (red) state of the power source
LED <sub>2,203</sub>	Indication lamp (green) INV transmission
LED <sub>3</sub>	Indication lamp (yellow) H-LINK transmission
LED <sub>4</sub>	Indication lamp (orange) outdoor-outdoor transmission
LED <sub>5,401</sub>	Indication lamp (red) state of the power source
LED <sub>202</sub>	Indication lamp (yellow)INV transmission
E	Field supply
G <sub>1-3</sub>	Field wiring

Mark	Name
MC1	Motor for compressor (Inverter)
MOF1.2	Motor for outdoor fan
CH1	Crank-case heater
RVR1	Solenoid 4-valve (for switching high/low pressure)
RVR2	Solenoid 4-valve (for switching cooling and heating)
SVA	Solenoid valve (for high-low pressure bypass)
SVG	Solenoid valve (for high-low pressure breaker)
MV <sub>1,B</sub>	Electronic control expansion valve
Pd	Pressure sensor for refrigerant(discharge side)
Ps	Pressure sensor for refrigerant(suction side)
THM <sub>7-23</sub>	Thermistor
PSH <sub>1,2</sub>	High pressure breaker device
NF <sub>3-7</sub>	Noise filter (Ring core)
PCB1	Printed circuit board for control
INV <sub>1,2</sub>	Printed circuit board for inverter
NF <sub>1,2</sub>	Noise filter (Printed board)
CE <sub>1,2,5,6,7</sub>	Terminating connector
EF <sub>R1</sub>	Fuse (for the operation circuit)
EF <sub>1</sub>	Fuse (for the control circuit)
FU <sub>651,652</sub>	Fuse (for the operation circuit)
PF <sub>1,2</sub>	Fuse (for the power circuit)
CIB	Converter inverter break
IPM	Inverter module



◆ RAS-(20-24)FSXNSE and RAS-(16/18)FSXNPE



Mark	Name	Name	Mark	Name
MC <sub>1,2</sub>	Motor for compressor (Inverter)	Motor for compressor (Inverter)	DC1 <sub>1,2</sub>	Reactor
MOF <sub>1,2</sub>	Motor for outdoor fan	Motor for outdoor fan	CB	Smoothing capacitor
CH <sub>1,2</sub>	Crank-case heater	Crank-case heater	RS <sub>P,S</sub>	Resistor
RVR1	Solenoid 4-valve (for switching high/low pressure)	Solenoid 4-valve (for switching high/low pressure)	R <sub>1-5</sub>	Relay
RVR2	Solenoid 4-valve (for switching cooling and heating)	Solenoid 4-valve (for switching cooling and heating)	TB <sub>1</sub>	Terminal board (for power)
SVA	Solenoid valve (for high-low pressure bypass)	Solenoid valve (for high-low pressure bypass)	TB <sub>2</sub>	Terminal screw (for transmission)
SVG	Solenoid valve (for high-low pressure breaker)	Solenoid valve (for high-low pressure breaker)	CN <sub>61,62,73,74</sub>	Aerial connectors
MV <sub>1,2,B</sub>	Electronic control expansion valve	Electronic control expansion valve	CN <sub>16</sub>	Connector for external signal output(Optional functions)
Pd	Pressure sensor for refrigerant(discharge side)	Pressure sensor for refrigerant(discharge side)	CN <sub>17,18</sub>	Connector for external signal input(Optional functions)
Ps	Pressure sensor for refrigerant(suction side)	Pressure sensor for refrigerant(suction side)	CN <sub>100</sub>	For EEPROM access (Data logging)
THM <sub>7-23</sub>	Thermistor	Thermistor	CN <sub>101</sub>	H-LINK transmission (for service)
PSH <sub>1,2</sub>	High pressure breaker device	High pressure breaker device	CN <sub>46</sub>	For rewriting of the control software
NF <sub>3-7</sub>	Noise filter (Ring core)	Noise filter (Ring core)	LED <sub>1</sub>	Indication lamp (red) state of the power source
PCB1	Printed circuit board for control	Printed circuit board for control	LED <sub>2,203</sub>	Indication lamp (green) INV transmission
INV <sub>1,2</sub>	Printed circuit board for inverter	Printed circuit board for inverter	LED <sub>3</sub>	Indication lamp (yellow) H-LINK transmission
NF <sub>1,2</sub>	Noise filter (Printed board)	Noise filter (Printed board)	LED <sub>4</sub>	Indication lamp (orange) outdoor-outdoor transmission
CE <sub>1,2,5,6,7</sub>	Terminating connector	Terminating connector	LED <sub>5,401</sub>	Indication lamp (red) state of the power source
EF <sub>R1</sub>	Fuse (for the operation circuit)	Fuse (for the operation circuit)	LED <sub>202</sub>	Indication lamp(yellow)INV transmission
EF <sub>1</sub>	Fuse (for the control circuit)	Fuse (for the control circuit)	E	Field supply
FU <sub>651,652</sub>	Fuse (for the operation circuit)	Fuse (for the operation circuit)	G <sub>1-3</sub>	Field wiring
PF <sub>1,2</sub>	Fuse (for the power circuit)	Fuse (for the power circuit)		
CIB	Converter inverter break	Converter inverter break		
IPM	Inverter module	Inverter module		

## 2.2 CH-Box

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### 2.2.1 General information

#### DANGER

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

#### CAUTION

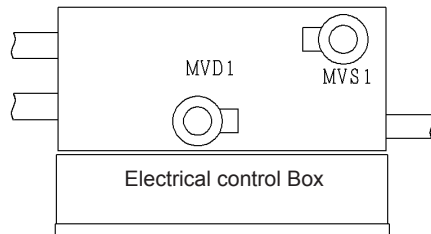
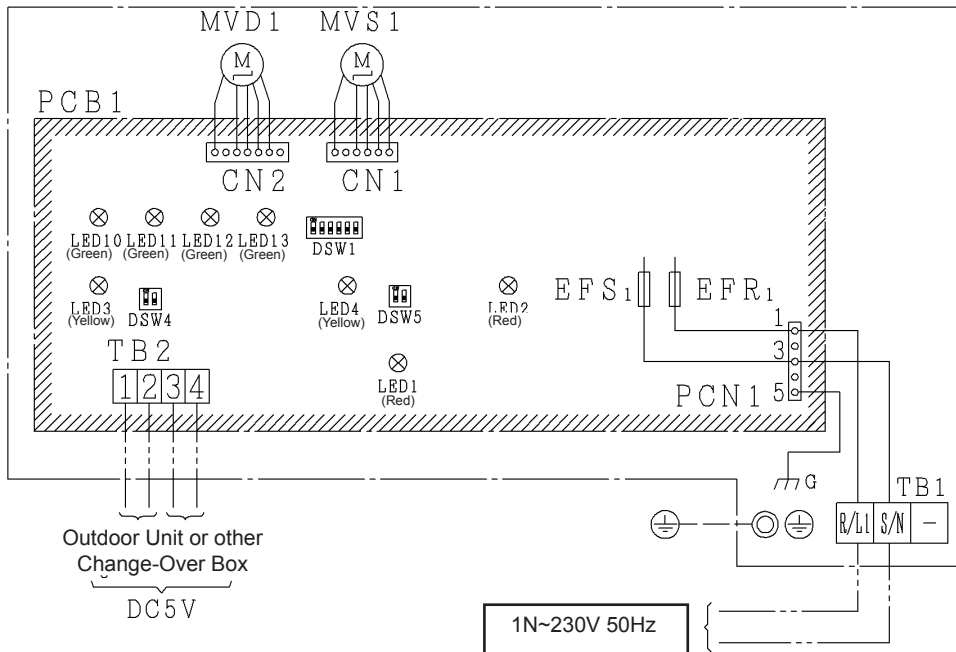
- Wrap the accessory packing around the wires, and plug the wiring connection hole with the seal material to protect the product from any condensate water or insects.
- Tightly secure the wires with the cord clamp inside the electrical box.
- Use twisted shielded pair cable or shield pair cable for transmission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

#### General verifications

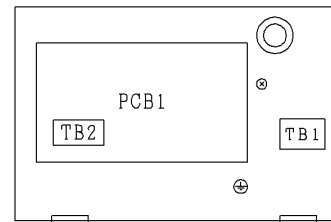
- 1 Make sure that the field-selected electrical components (main power switches, circuit breakers, wires, conduit connectors and wire terminals) have been properly selected according to the electrical data indicated in Technical Catalogue. Make sure that the components comply with National Electrical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

2.2.2 Electrical wiring diagrams CH-Box

CH-AP160SSX, CH-AP280SSX



Arrangement of Electronic Expansion Valves (View from above)

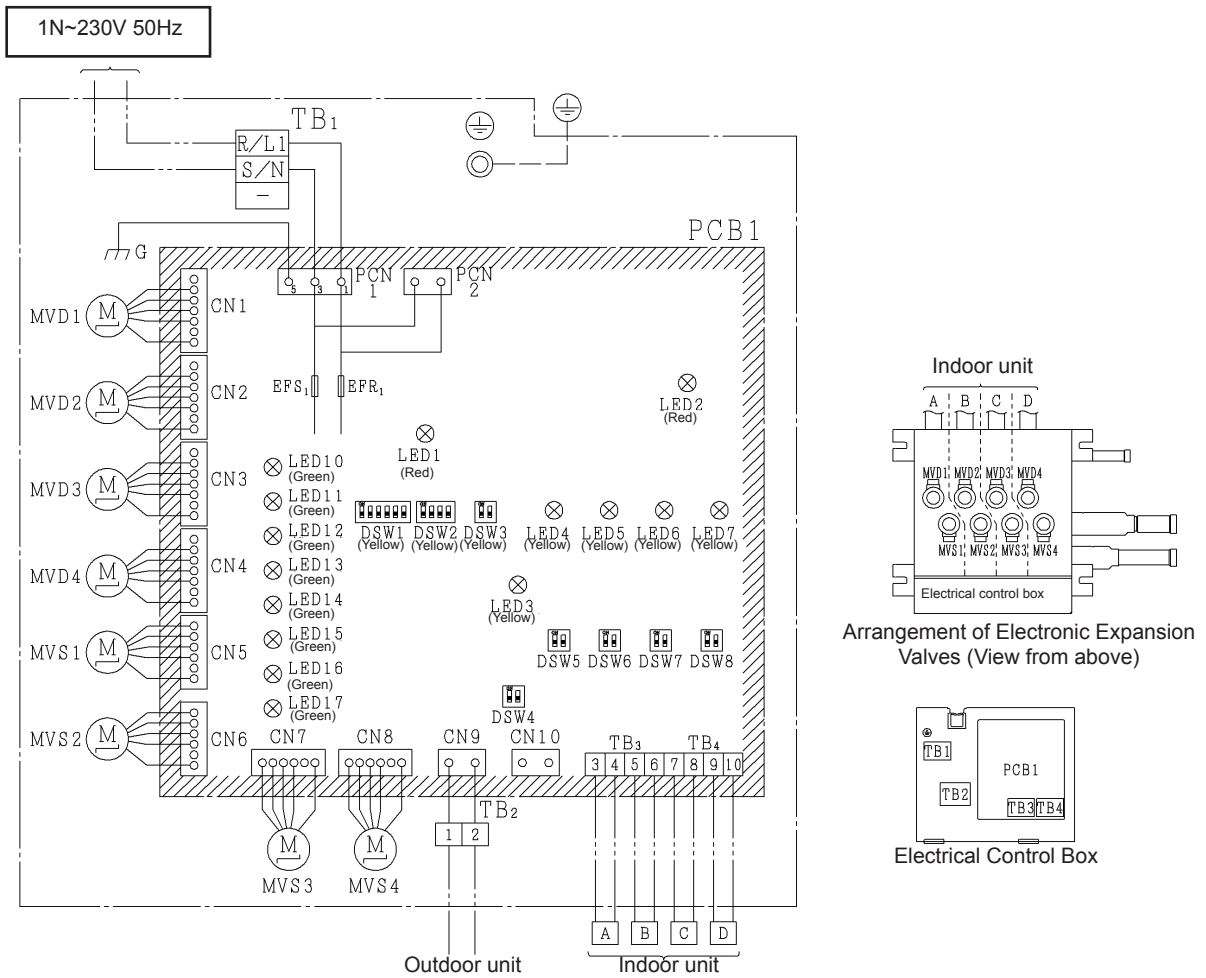


Electrical Control Box

Mark	Torque tighten the terminal	Screw Size
TB1	1.0~1.3 (Nm)	M4
TB2	0.7~1.1 (Nm)	M3.5

Mark	Name	Remark
PCB1	Printed circuit board	
TB1	Terminal Block	for Power Supply
TB2	Terminal Block	for Communication
MVD <sub>1</sub> ,MVS <sub>1</sub>	Electronic Expansion Valve	
EFR <sub>1</sub> ,EFS <sub>1</sub>	Fuse	
LED1	LED(Red)	Power status
LED2	LED(Red)	DC Power Status
LED3	LED(Yellow)	Communication (Outdoor Unit)
LED4	LED(Yellow)	Communication (Indoor Unit)
LED10~13	LED(Green)	
DSW1	DIP Switch	
DSW4	DIP Switch	Communication (Outdoor Unit)
DSW5	DIP Switch	Communication (Indoor Unit)

CH-AP04MSSX



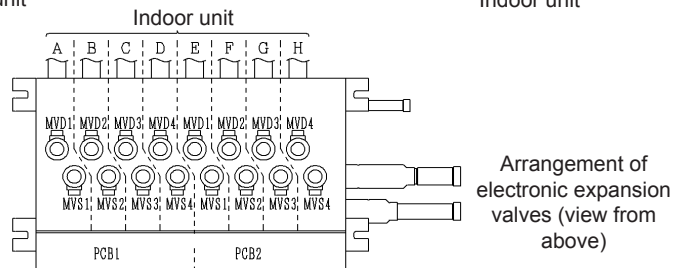
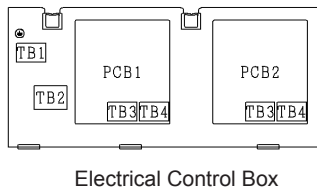
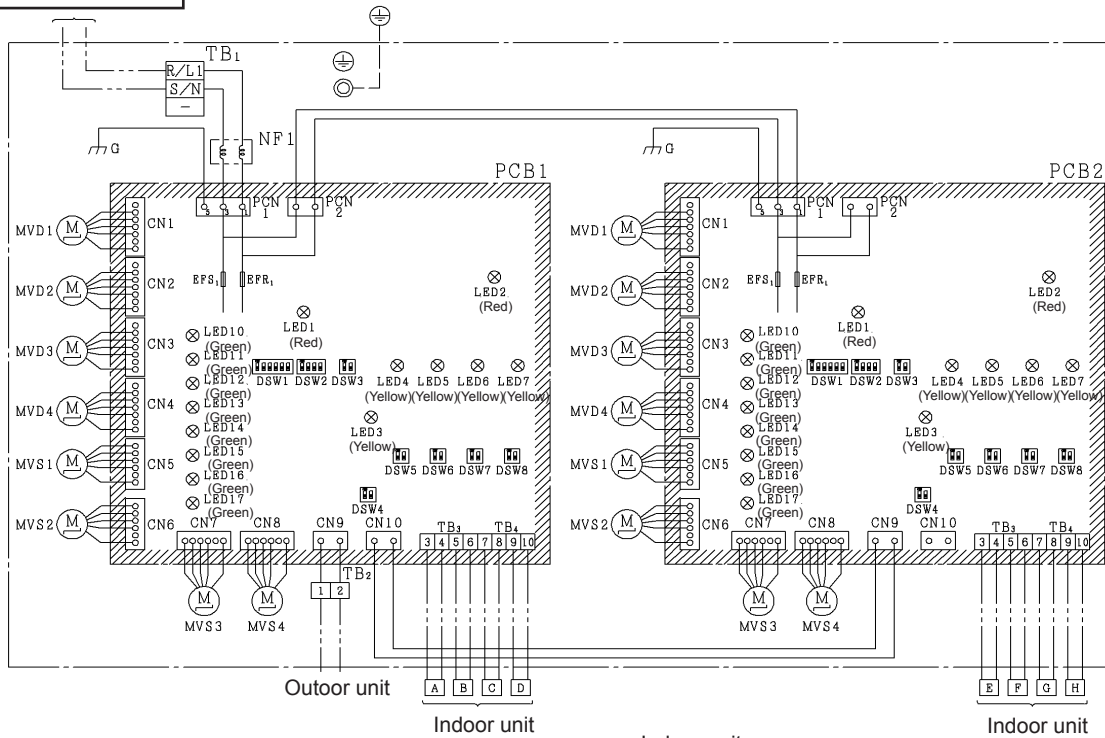
Mark	Torque tighten the terminal	Screw Size
TB1	1.0~1.3 (Nm)	M4
TB2	1.0~1.3 (Nm)	
TB3,4	0.7~1.1 (Nm)	M3.5

Indoor unit	Mark
Indoor unit A	TB3-3 MVD 1
	TB3-4 MVS 1
Indoor unit B	TB3-5 MVD 2
	TB3-6 MVS 2
Indoor unit C	TB4-7 MVD 3
	TB4-8 MVS 3
Indoor unit D	TB4-9 MVD 4
	TB4-10 MVS 4

Mark	Name	Remark
PCB1	Printed circuit board	
TB1	Terminal Block	for Power Supply
TB2	Terminal Block	for Communication (Outdoor unit)
TB3, 4	Terminal Block	for Communication (Indoor unit)
MVD <sub>1-4</sub>	Electronic Expansion Valve	
MVS <sub>1-4</sub>	Electronic Expansion Valve	
EFR <sub>1</sub> , EFS <sub>1</sub>	Fuse	
LED1	LED(Red)	Power status
LED2	LED(Red)	DC Power Status
LED3	LED(Yellow)	Communication (Outdoor Unit)
LED4~7	LED(Yellow)	Communication (Indoor Unit)
LED10~17	LED(Green)	
DSW1~3	DIP Switch	
DSW4	DIP Switch	Communication (Outdoor Unit)
DSW5~8	DIP Switch	Communication (Indoor Unit)

**CH-AP08MSSX**

1N~230V 50Hz



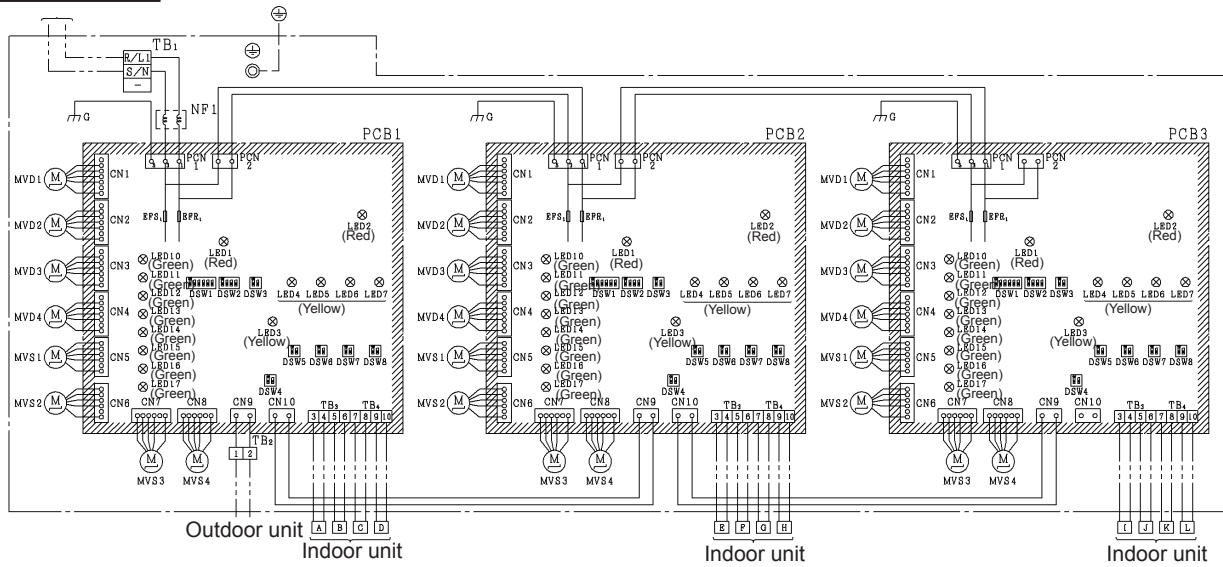
Mark	Torque tighten the terminal	Screw Size
TB1	1.0~1.3 (Nm)	M4
TB2	1.0~1.3 (Nm)	
TB3.4	0.7~1.1 (Nm)	M3.5

Indoor unit	Mark	Indoor unit	Mark				
Indoor unit A	TB3-3	MVD 1	Indoor unit E	TB3-3	MVD 1		
	TB3-4	MVS 1		TB3-4	MVS 1		
	Indoor unit B	TB3-5		MVD 2	Indoor unit F	TB3-5	MVD 2
		TB3-6		MVS 2		TB3-6	MVS 2
Indoor unit C	TB4-7	MVD 3	Indoor unit G	TB4-7	MVD 3		
	TB4-8	MVS 3		TB4-8	MVS 3		
Indoor unit D	TB4-9	MVD 4	Indoor unit H	TB4-9	MVD 4		
	TB4-10	MVS 4		TB4-10	MVS 4		

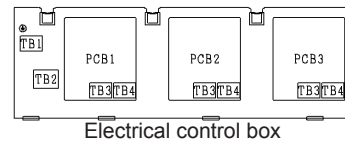
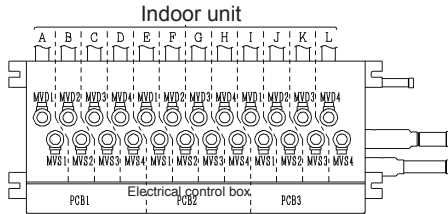
Mark	Name	Remark
PCB1,2	Printed circuit board	
TB1	Terminal Block	for Power Supply
TB2	Terminal Block	for Communication (Outdoor unit)
TB3, 4	Terminal Block	for Communication (Indoor unit)
MVD <sub>1-4</sub>	Electronic Expansion Valve	
MVS <sub>1-4</sub>	Electronic Expansion Valve	
NF1	Noise filter	
EFR <sub>1</sub> , EFS <sub>1</sub>	Fuse	
LED1	LED(Red)	Power status
LED2	LED(Red)	DC Power Status
LED3	LED(Yellow)	Communication (Outdoor Unit)
LED4~7	LED(Yellow)	Communication (Indoor Unit)
LED10~17	LED(Green)	
DSW1~3	DIP Switch	
DSW4	DIP Switch	Communication (Outdoor Unit)
DSW5~8	DIP Switch	Communication (Indoor Unit)

**CH-AP12MSSX**

1N~230V 50Hz



Arrangement of electronic expansion valves (view from above)



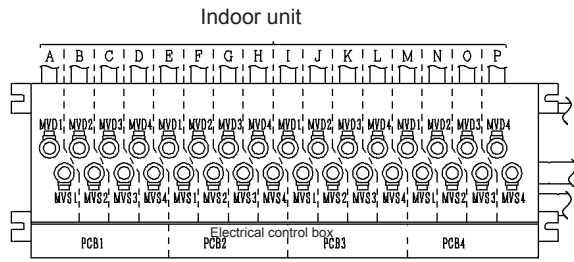
Mark	Torque tighten the terminal	Screw Size
TB1	1.0~1.3 (Nm)	M4
TB2	1.0~1.3 (Nm)	
TB3,4	0.7~1.1 (Nm)	M3.5

Indoor unit	Mark	Indoor unit	Mark	Indoor unit	Mark				
Indoor unit A	PCB1	TB3-3	MVD 1	Indoor unit E	PCB2	TB3-3	MVD 1		
		TB3-4	MVS 1			TB3-4	MVS 1		
		TB3-5	MVD 2			Indoor unit J	PCB3	TB3-5	MVD 2
		TB3-6	MVS 2					TB3-6	MVS 2
Indoor unit B	PCB1	TB4-7	MVD 3	Indoor unit G	PCB2	TB4-7		MVD 3	
		TB4-8	MVS 3			TB4-8		MVS 3	
Indoor unit C	PCB1	TB4-9	MVD 4	Indoor unit H	PCB2	TB4-9	MVD 4		
		TB4-10	MVS 4			TB4-10	MVS 4		
Indoor unit D	PCB1	TB3-7	MVD 2	Indoor unit I	PCB2	TB3-7	MVD 2		
		TB3-8	MVS 2			TB3-8	MVS 2		
		TB4-7	MVD 3			Indoor unit K	PCB3	TB4-7	MVD 3
		TB4-8	MVS 3					TB4-8	MVS 3
Indoor unit F	PCB2	TB4-9	MVD 4	Indoor unit L	PCB3	TB4-9		MVD 4	
		TB4-10	MVS 4			TB4-10		MVS 4	

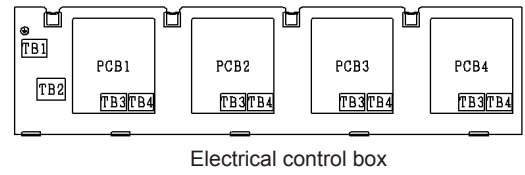
Mark	Name	Remark
PCB1~3	Printed circuit board	
TB1	Terminal Block	for Power Supply
TB2	Terminal Block	for Communication (Outdoor unit)
TB3, 4	Terminal Block	for Communication (Indoor unit)
MVD <sub>1-4</sub>	Electronic Expansion Valve	
MVS <sub>1-4</sub>	Electronic Expansion Valve	
EFR <sub>1</sub> , EFS <sub>1</sub>	Fuse	
LED1	LED(Red)	Power status
LED2	LED(Red)	DC Power Status
LED3	LED(Yellow)	Communication (Outdoor Unit)
LED4~7	LED(Yellow)	Communication (Indoor Unit)
LED10~17	LED(Green)	
DSW1~3	DIP Switch	
DSW4	DIP Switch	Communication (Outdoor Unit)
DSW5~8	DIP Switch	Communication (Indoor Unit)







Arrangement of electronic expansion valves (view from above)



Electrical control box

Mark	Torque tighten the terminal	Screw Size
TB1	1.0~1.3 (Nm)	M4
TB2	1.0~1.3 (Nm)	
TB3.4	0.7~1.1 (Nm)	M3.5

Indoor unit	Mark	Indoor unit	Mark				
Indoor unit A	PCB1	Indoor unit E	PCB2				
				TB3-3	MVD 1	TB3-3	MVD 1
TB3-4		MVS 1		TB3-4	MVS 1		
Indoor unit B		TB3-5		MVD 2	Indoor unit F	TB3-5	MVD 2
		TB3-6		MVS 2		TB3-6	MVS 2
Indoor unit C		TB4-7		MVD 3	Indoor unit G	TB4-7	MVD 3
		TB4-8		MVS 3		TB4-8	MVS 3
Indoor unit D		TB4-9		MVD 4	Indoor unit H	TB4-9	MVD 4
		TB4-10		MVS 4		TB4-10	MVS 4

Indoor unit	Mark	Indoor unit	Mark				
Indoor unit I	PCB3	Indoor unit M	PCB4				
				TB3-3	MVD 1	TB3-3	MVD 1
TB3-4		MVS 1		TB3-4	MVS 1		
Indoor unit J		TB3-5		MVD 2	Indoor unit N	TB3-5	MVD 2
		TB3-6		MVS 2		TB3-6	MVS 2
Indoor unit K		TB4-7		MVD 3	Indoor unit O	TB4-7	MVD 3
		TB4-8		MVS 3		TB4-8	MVS 3
Indoor unit L		TB4-9		MVD 4	Indoor unit P	TB4-9	MVD 4
		TB4-10		MVS 4		TB4-10	MVS 4

Mark	Name	Remark
PCB1~4	Printed circuit board	
TB1	Terminal Block	for Power Supply
TB2	Terminal Block	for Communication (Outdoor unit)
TB3, 4	Terminal Block	for Communication (Indoor unit)
MVD <sub>1-4</sub>	Electronic Expansion Valve	
MVS <sub>1-4</sub>	Electronic Expansion Valve	
EFR <sub>1</sub> , EFS <sub>1</sub>	Fuse	
LED1	LED(Red)	Power status
LED2	LED(Red)	DC Power Status
LED3	LED(Yellow)	Communication (Outdoor Unit)
LED4~7	LED(Yellow)	Communication (Indoor Unit)
LED10~17	LED(Green)	
DSW1~3	DIP Switch	
DSW4	DIP Switch	Communication (Outdoor Unit)
DSW5~8	DIP Switch	Communication (Indoor Unit)





# 3 . Control system

## Index

3.1	Control system .....	34
3.1.1	Cycle control.....	34
3.1.2	Compressor operation control.....	35
3.1.2.1	Compressor rotation control.....	35
3.1.2.2	Compressor frequency control.....	40
3.1.3	Heat exchanger mode control .....	43
3.1.4	Outline of the control system.....	45
3.2	Standard operation sequence .....	46
3.2.1	Cooling operation .....	46
3.2.2	Dry operation.....	48
3.2.3	Antifreeze protection control during the cooling or dry operation .....	50
3.2.4	Heating operation .....	51
3.2.5	Defrost operation.....	53
3.2.6	Excessive high discharge air temperature prevention control (depending on the indoor unit model).....	54
3.3	Protection control .....	55
3.3.1	Control of CH-Box .....	62
3.4	Control and safety devices .....	64
3.4.1	Compressor protection .....	64
3.4.1.1	Outdoor unit .....	64
3.4.1.2	CH-Box.....	64

## 3.1 Control system

### 3.1.1 Cycle control

Control device	Cooling operation (*)		Heating operation Cooling and Heating operation		Defrosting
	Control Category	Purpose of Control	Control Category	Purpose of Control	Condition
Compressor inverter frequency	Total I.U. Operating Capacity	Inverter Frequency Control is carried out to make I.U. air inlet temperature to temperature setpoint.	Total I.U. Operating Capacity	Inverter Frequency Control is carried out to make I.U. air inlet temperature to temperature setpoint.	All the compressors operating
Electronic expansion valve for the outdoor unit heat exchanger.	Capacity control	Completely open (the opening of the electronic expansion valve is dependent on the refrigerant cycle conditions)	O.U. Heat Exchanger SH	PI control is carried out to achieve the targeted value of O.U. heat exchanger SH.	Fully open
Electronic expansion valve for the supercooling heat exchanger.	Tsc - Tchg	PI Control is carried out to achieve the target value of Tsc - Tchg.	Tchg - Tsc	PI Control is carried out to achieve the target value of Tchg - Tsc.	Tsc - Tchg
Electronic Expansion Valve for I.U. Heat Exchanger	I.U. Heat Exchanger SH	PI control is carried out to achieve the targeted value of I.U. heat exchanger SH.	I.U. Heat Exchanger SC	Controls supercooling of I.U. liquid thermistor to achieve the targeted value.	I.U. Heat Exchanger SH Control
Outdoor unit fan	Pd control	PI control is carried out to achieve the targeted value of Pd.	Ps Control	PI control is carried out to achieve the targeted value of Ps.	Stop
Gas Bypass Valve (SVA)	1. Increase in Pd protection 2. Decrease in Ps protection	1. Pd > 3.6 MPa: ON 2. Ps < 0.2 MPa: ON	1. Increase in Pd protection 2. Decrease in Ps protection	1. Pd > 3.5 MPa: ON 2. Ps < 0.1 MPa: ON	Closed
High and low pressure shut-off valve (SVG) (Only for Heat Recovery, 3 pipes)	Shut-off of high and low pressure in the cycle during stoppage	Compressor operating: ON Compressor stopped: OFF	Shut-off of high and low pressure in the cycle during stoppage	Compressor operating: ON Compressor stopped: OFF	Open

#### NOTE

(\*)Dry operation is included in the cooling operation.

<b>Pd</b>	Discharge pressure	<b>Tsc</b>	Subcooler Temperature
<b>Ps</b>	Suction pressure	<b>Tchg</b>	Liquid Stop Valve Temperature
<b>SH</b>	Superheat	<b>O.U</b>	Outdoor Unit
<b>I.U</b>	Indoor Unit		

### 3.1.2 Compressor operation control

#### 3.1.2.1 Compressor rotation control

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

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

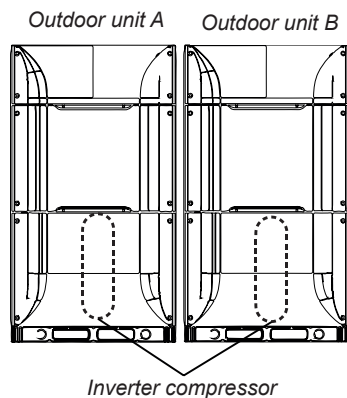
In case of switch-OFF or thermo-OFF after 120 minutes of operation, the inverter compressor with the shortest operation time will be preferably turned on.

#### NOTE

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

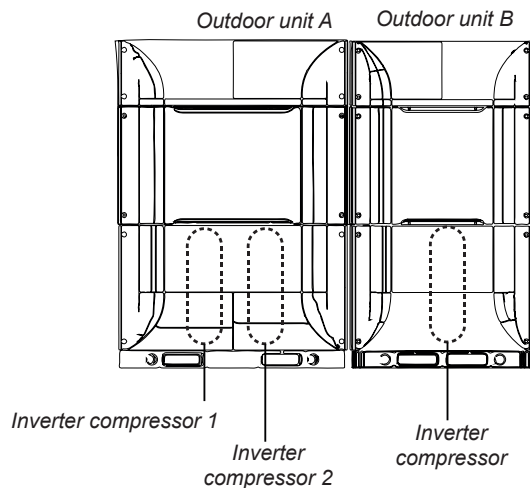
The operating sequence of the compressor rotation is described below.

#### RAS-26FSXNSE and RAS-(20-24)FSXNPE



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

#### RAS-(28/30/32/38)FSXNSE and RAS-(26-32)FSXNPE

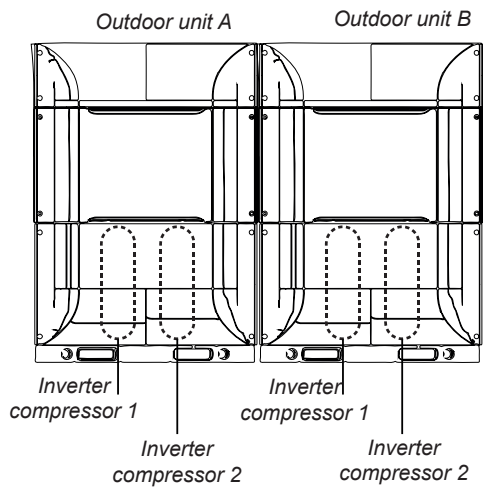


	Outdoor unit A	Outdoor unit B
Last time	1	2
Currently	2	1
Next time	1	2

#### NOTE

*When turning ON the outdoor unit A, the inverter compressor 1 or 2 with the shortest operating time will operate preferentially.*

**RAS-(34/36/40/42/44/46/48)FSXNSE and RAS-(34/36)FSXNPE**



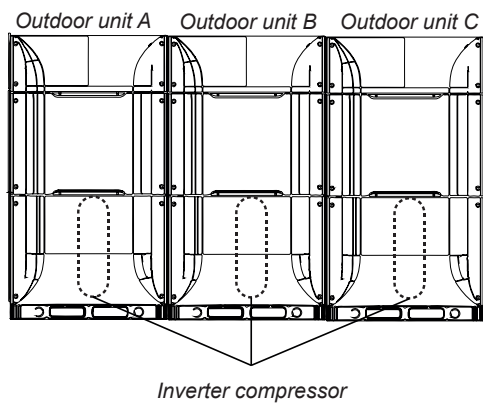
	Outdoor unit A	Outdoor unit B
Last time	1	2
Currently	2	1
Next time	1	2



**NOTE**

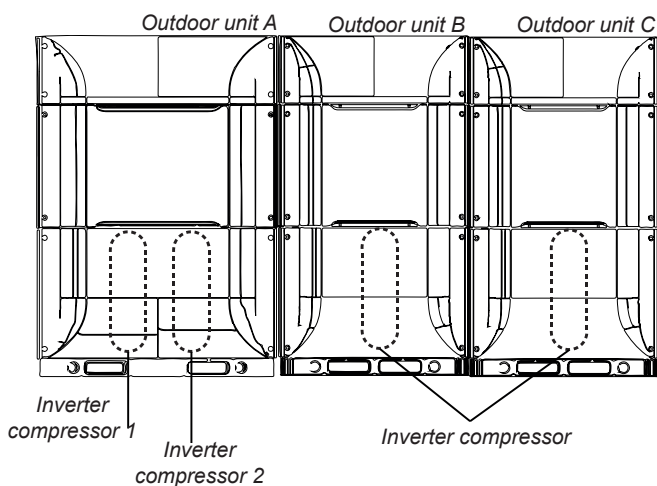
When turning ON the outdoor units, the inverter compressor of each outdoor unit with the shortest operating time will operate preferentially.

**RAS-(38-42)FSXNPE**



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

**RAS-(44/46)FSXNPE**



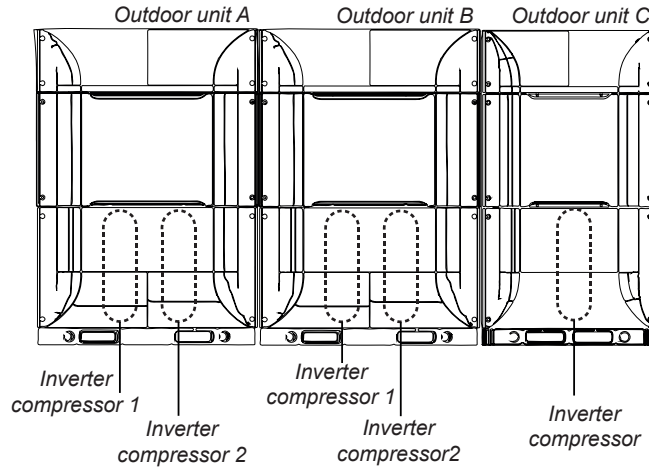
	Outdoor unit A	Outdoor unit B	Outdoor unit C
Last time	1	2	3
Currently	2	3	1
Next time	3	1	2



**NOTE**

When turning ON the outdoor unit A, the inverter compressor 1 or 2 with the shortest operating time will operate preferentially.

**RAS-50FSXNSE and RAS-(48/50)FSXNPE**

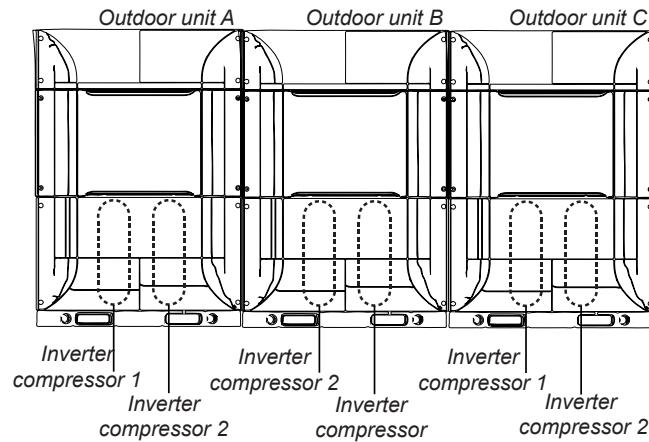


	Outdoor unit A	Outdoor unit B	Outdoor unit C
Last time	1	2	3
Currently	2	3	1
Next time	3	1	2

**i NOTE**

When turning ON the outdoor units, the inverter compressor of the outdoor unit A and B with the shortest operating time will operate preferentially.

**RAS-(52-72)FSXNSE and RAS-(52/54)FSXNPE**

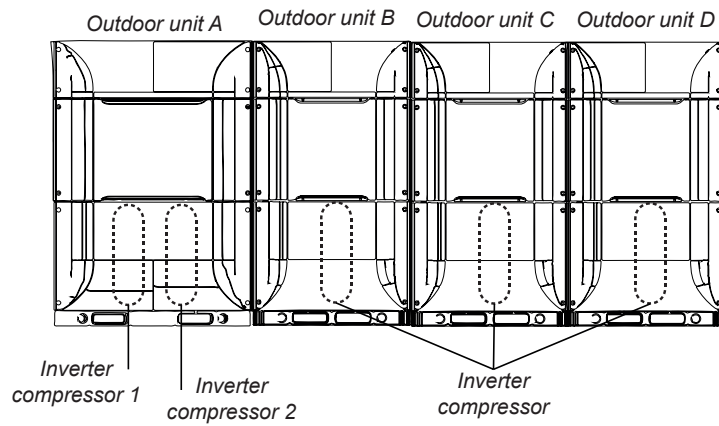


	Outdoor unit A	Outdoor unit B	Outdoor unit C
Last time	1	2	3
Currently	2	3	1
Next time	3	1	2

**i NOTE**

When turning ON the outdoor units, the inverter compressor of each outdoor unit with the shortest operating time will operate preferentially.

**RAS-(56/58)FSXNPE**



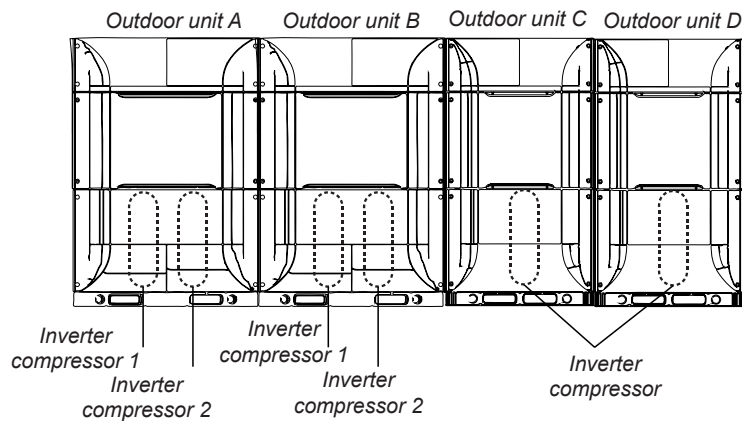
	Outdoor unit A	Outdoor unit B	Outdoor unit C	Outdoor unit D
Last time	1	2	3	4
Currently	4	1	2	3
Next time	3	4	1	2



**NOTE**

When turning ON the outdoor units, the inverter compressor of each outdoor unit with the shortest operating time will operate preferentially.

**RAS-(60)FSXNPE**



	Outdoor unit A	Outdoor unit B	Outdoor unit C	Outdoor unit D
Last time	1	2	3	4
Currently	4	1	2	3
Next time	3	4	1	2

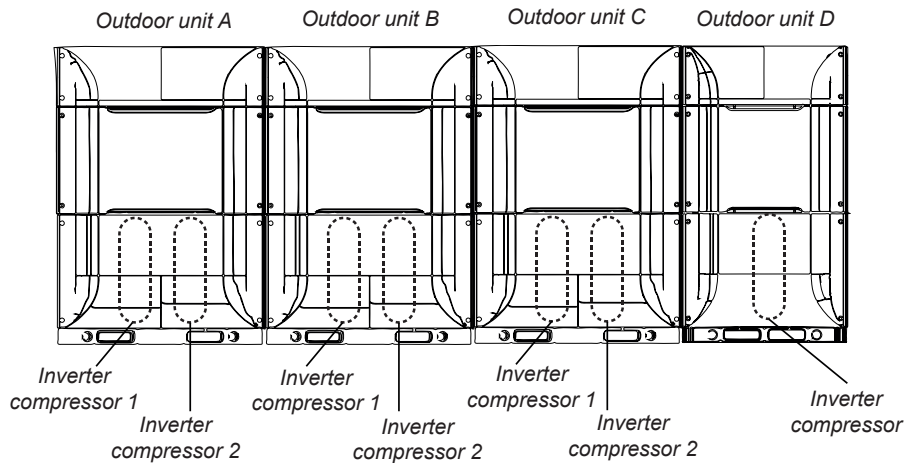


**NOTE**

When turning ON the outdoor units, the inverter compressor of each outdoor unit with the shortest operating time will operate preferentially.



**RAS-(74/80/86)FSXNSE and RAS-62FSXNPE**

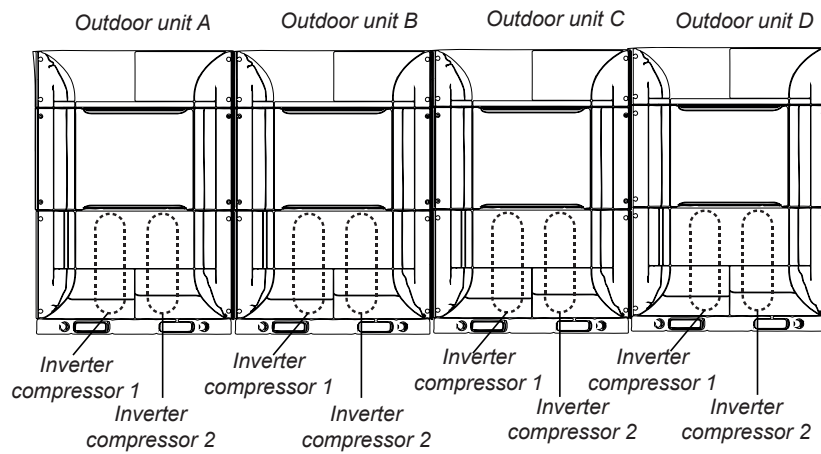


	Outdoor unit A	Outdoor unit B	Outdoor unit C	Outdoor unit D
Last time	1	2	3	4
Currently	4	1	2	3
Next time	3	4	1	2

**i** NOTE

When turning ON the outdoor units, the inverter compressor of each outdoor unit with the shortest operating time will operate preferentially.

**RAS-(76/78/82/84/88-96)FSXNSE and RAS-(64-72)FSXNPE**



	Outdoor unit A	Outdoor unit B	Outdoor unit C	Outdoor unit D
Last time	1	2	3	4
Currently	4	1	2	3
Next time	3	4	1	2

**i** NOTE

When turning ON the outdoor units, the inverter compressor of each outdoor unit with the shortest operating time will operate preferentially.

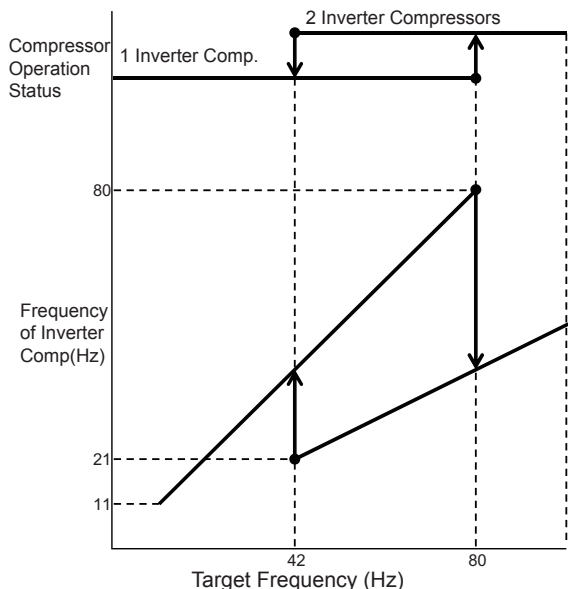
### 3.1.2.2 Compressor frequency control

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

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

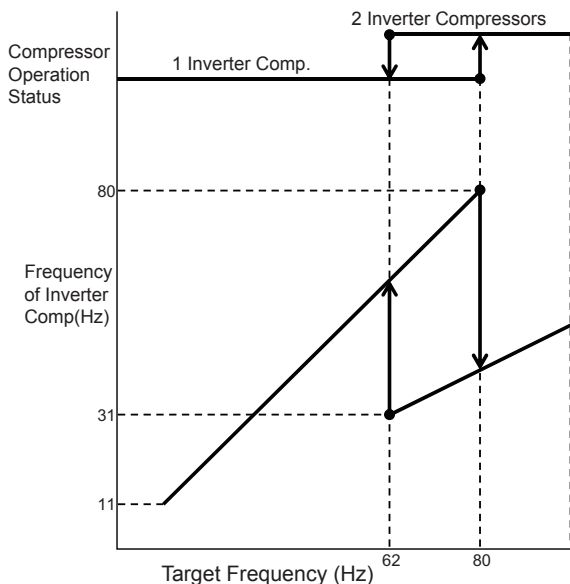
◆ **In case of single outdoor unit with two inverter compressors installed**

#### RAS-(16-20)FSXNSE and RAS-16FSXNPE



Target frequency (Hz)	Each Compressor Frequency (Hz)					
	Increase direction			Decrease direction		
	Comp. Operation Status	No.1 Comp.	No.2 Comp.	Comp. Operation Status	No.1 Comp.	No.2 Comp.
11.0	1	11.0	-	1	11.0	-
41.0	1	41.0	-	1	41.0	-
42.0	1	42.0	-	2	21.0	21.0
80.0	1	80.0	-	2	40.0	40.0
81.0	2	40.5	40.5	2	40.5	40.5

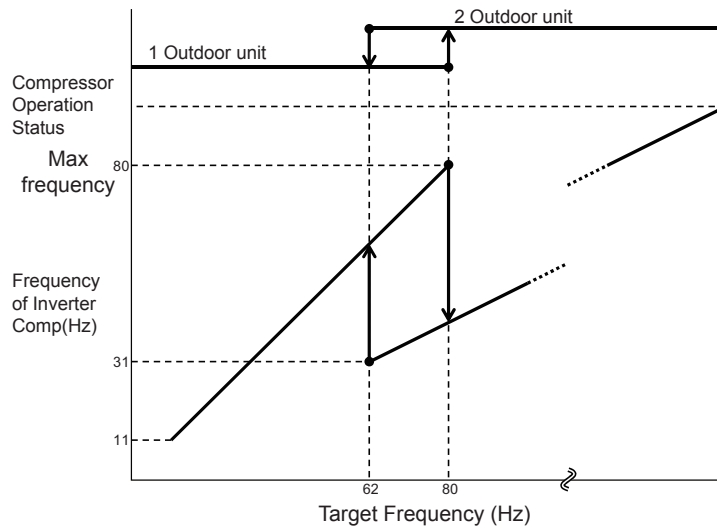
#### RAS-(22/24)FSXNSE and RAS-18FSXNPE



Target frequency (Hz)	Each Compressor Frequency (Hz)					
	Increase direction			Decrease direction		
	Comp. Operation Status	No.1 Comp.	No.2 Comp.	Comp. Operation Status	No.1 Comp.	No.2 Comp.
11.0	1	11.0	-	1	11.0	-
61.0	1	61.0	-	1	61.0	-
62.0	1	62.0	-	2	31.0	31.0
80.0	1	80.0	-	2	40.0	40.0
81.0	2	40.5	40.5	2	40.5	40.5

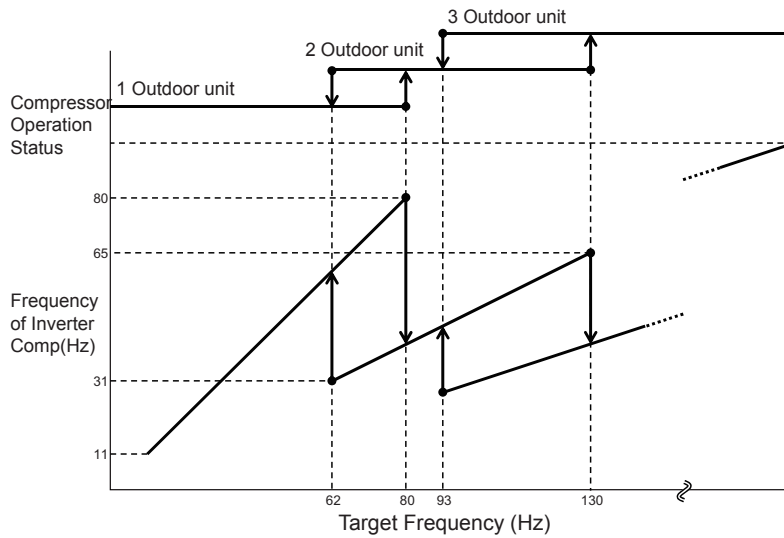
◆ In case of multiple outdoor units

**RAS-(26-48)FSXNSE and RAS-(20-36)FSXNPE**



Target frequency (Hz)	Each Compressor Frequency (Hz)					
	Increase direction			Decrease direction		
	Comp. Operation Status	Outdoor unit (A).	Outdoor unit (B).	Comp. Operation Status	Outdoor unit (A).	Outdoor unit (B).
11.0	1	11.0	-	1	11.0	-
61.0	1	61.0	-	1	61.0	-
62.0	1	62.0	-	2	31.0	31.0
80.0	1	80.0	-	2	40.0	40.0
81.0	2	40.5	40.5	2	40.5	40.5

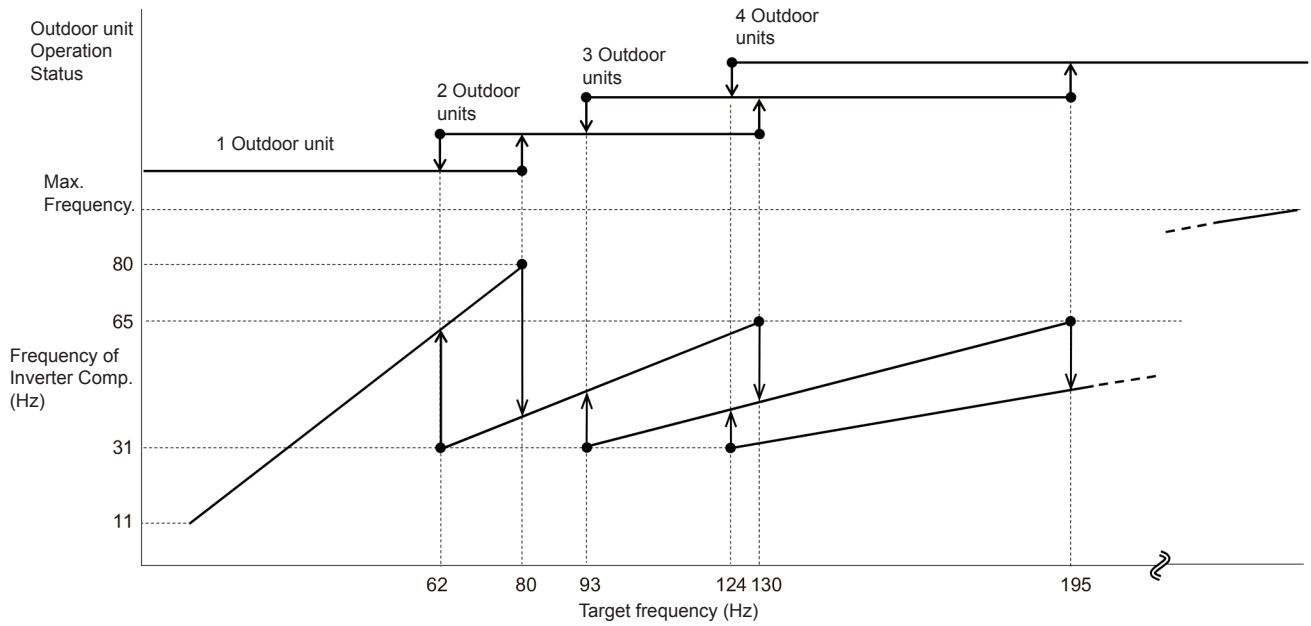
**RAS-(50-72)FSXNSE and RAS-(38-54)FSXNPE**



Target frequency (Hz)	Each Compressor Frequency (Hz)							
	Increase direction				Decrease direction			
	Comp. Operation Status	Outdoor unit (A).	Outdoor unit (B).	Outdoor unit (C).	Comp. Operation Status	Outdoor unit (A).	Outdoor unit (B).	Outdoor unit (C).
11.0	1	11.0	-	-	1	11.0	-	-
61.0	1	61.0	-	-	1	61.0	-	-
62.0	1	62.0	-	-	2	31.0	31.0	-
80.0	1	80.0	-	-	2	40.0	40.0	-
81.0	2	40.5	40.5	-	2	40.5	40.5	-
92.0	2	46.0	46.0	-	2	46.0	46.0	-
93.0	2	46.5	46.5	-	3	31.0	31.0	31.0
130.0	2	65.0	65.0	-	3	43.3	43.3	43.3
131.0	3	43.6	43.6	43.6	3	43.6	43.6	43.6



**RAS-(74-96)FSXNSE and RAS-(56-72)FSXNPE**



Target frequency (Hz)	Each Compressor Frequency (Hz)									
	Comp. Operation Status	Increase direction				Decrease direction				
		Outdoor unit (A).	Outdoor unit (B).	Outdoor unit (C).	Outdoor unit (D).	Comp. Operation Status	Outdoor unit (A).	Outdoor unit (B).	Outdoor unit (C).	Outdoor unit (D).
11.0	1	11.0	-	-		1	11.0	-	-	
61.0	1	61.0	-	-		1	61.0	-	-	
62.0	1	62.0	-	-		2	31.0	31.0	-	
80.0	1	80.0	-	-		2	40.0	40.0	-	
81.0	2	40.5	40.5	-		2	40.5	40.5	-	
92.0	2	46.0	46.0	-		2	46.0	46.0	-	
93.0	2	46.5	46.5	-		3	31.0	31.0	31.0	
123.0	2	61.5	61.5			3	41.0	41.0	41.0	
124.0	2	62.0	62.0			4	31.0	31.0	31.0	31.0
130.0	2	65.0	65.0	-		4	32.5	32.5	32.5	32.5
131.0	3	43.6	43.6	43.6		4	32.7	32.7	32.7	32.7
195.0	3	65.0	65.0	65.0		4	48.7	48.7	48.7	48.7
196.0	4	49.0	49.0	49.0	49.0	4	49.0	49.0	49.0	49.0

### 3.1.3 Heat exchanger mode control

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

#### NOTE

- RVR1: Reversing valve (only for Heat recovery (3 pipes)).
- RVR2: Reversing valve.
- MV1: Electronic expansion valve (for the outdoor unit).
- MVB: Electronic expansion valve (for supercooling Heat exchanger).
- TSC: Thermistor for Subcooler Temperature
- TCHG: Thermistor for Liquid Stop Valve Temperature.
- (\*): Only for heat recovery system.

#### 1 Outdoor Unit Heat exchanger mode:

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

#### 2 Expansion valve control method:

- Pd: normally, fully open (the opening depends on the refrigerant cycle conditions). PI control is carried out to reach the discharge pressure objective value when it decreases.
- Tsc - Tchg and Tchg - Tsc : PI control is carried out to reach temperature difference between Tsc and Tchg objective value.
- HEX: Heat exchanger SH: PI control is carried out to reach the heat exchanger SH objective value.

#### Number of outdoor unit: 1

Heat exchanger mode		Cooling mode	Mainly cooling mode (*)		Mainly heating mode (*)		Heating mode	Defrost mode
		COND	D1	D1-1	D4	EVAP	DEF1	
Heat exchanger condition		COND	COND	cond	EVAP	EVAP	COND	
Reversing valve	RVR2	OFF	OFF	OFF	ON	ON	OFF	
	RVR1	ON	OFF	OFF	OFF	OFF	ON	
Expansion valve	MV1	Fully open	Pd		HEX	HEX	Fully open	
	MVB	Tsc - Tchg	Tsc - Tchg	Closed	Tchg - Tsc	Tchg - Tsc	Tsc - Tchg	

#### Number of outdoor unit: 2

Heat exchanger mode		Cooling mode	Mainly cooling mode (*)		Mainly heating mode (*)		Heating mode	Defrost mode		
		COND	D1	D2	D3	D4	EVAP	DEF2	DEF1	
								With CH unit (*)	Without CH unit	
Main outdoor unit	Heat exchanger condition	COND	COND	COND	cond	EVAP	EVAP	COND/EVAP	COND	
	Reversing valve	RVR2	OFF	OFF	OFF	OFF	ON	ON	ON/OFF	OFF
		RVR1	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON
	Expansion valve	MV1	Pd	Pd		Pd	HEX	HEX	Fully open / HEX	Fully open
MVB		Tsc - Tchg	Tsc - Tchg	Closed	Tchg - Tsc	Tchg - Tsc	Tchg - Tsc	Tsc - Tchg / Tchg - Tsc	Tsc - Tchg	
Secondary outdoor unit	Heat exchanger condition	COND	COND	evap	EVAP	EVAP	EVAP	COND/EVAP	COND	
	Reversing valve	RVR2	OFF	OFF	ON	ON	ON	ON	ON/OFF	OFF
		RVR1	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON
	Expansion valve	MV1	Pd	Pd	Closed	HEX	HEX	HEX	Fully open / HEX	Fully open
MVB		Tsc - Tchg	Tsc - Tchg	Closed	Tchg - Tsc	Tchg - Tsc	Tchg - Tsc	Tsc - Tchg / Tchg - Tsc	Tsc - Tchg	

**Number of outdoor unit: 3**

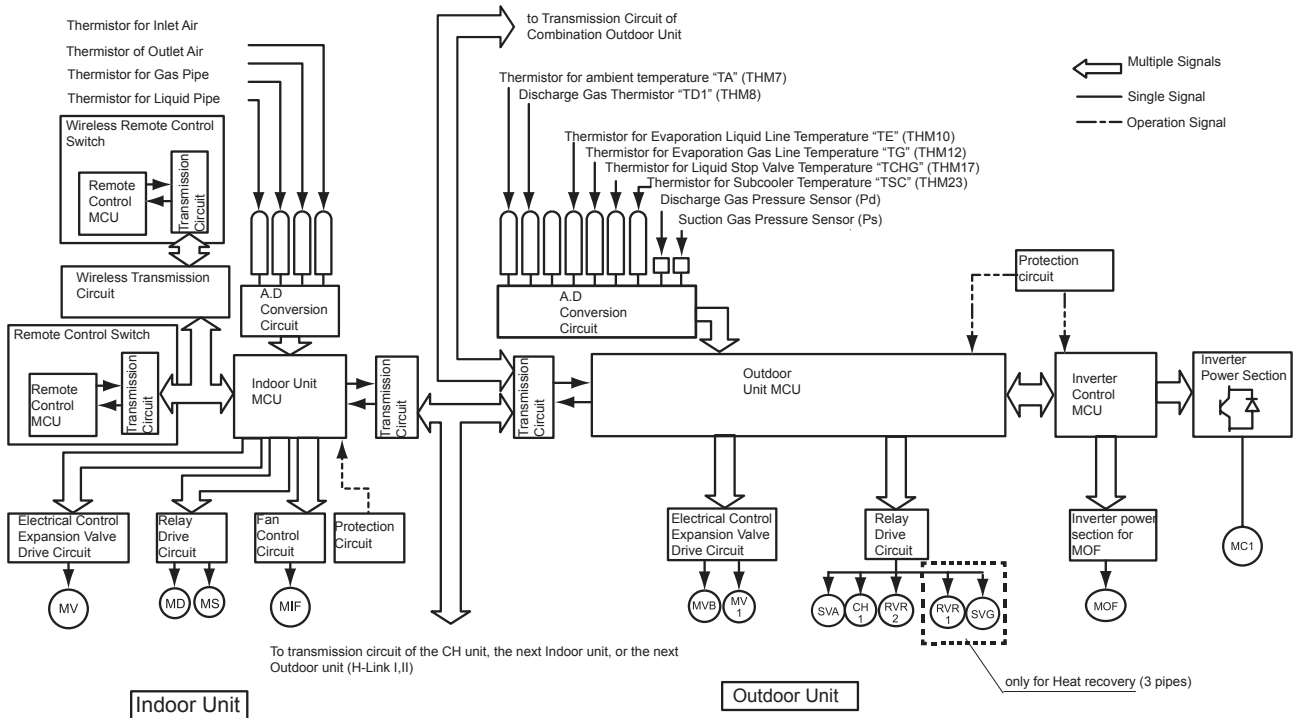
Heat exchanger mode		Cooling mode	Mainly cooling mode (*)			Mainly heating mode (*)				Heating mode	Defrost mode		
			COND	D1	D2-1	D2-2	D2-3	D3-1	D3-2		D4	EVAP	DEF2
		With CH unit (*)								Without CH unit			
Main outdoor unit	Heat exchanger condition	COND	COND	COND	COND	cond	cond	cond	EVAP	EVAP	COND/EVAP	COND	
	Reversing valve	RVR2	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF/ON	OFF
		RVR1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
	Expansion valve	MV1	Pd	Pd			Pd			HEX	HEX	Fully open/HEX	Fully open
MVB		Tsc - Tchg	Tsc - Tchg			Tchg - Tsc				Tchg - Tsc	Tsc - Tchg/Tchg - Tsc	Tsc - Tchg	
Secondary outdoor unit	Heat exchanger condition	COND	COND	evap	evap	EVAP	EVAP	EVAP	EVAP	EVAP	COND/EVAP	COND	
	Reversing valve	RVR2	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	OFF/ON	OFF
		RVR1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
	Expansion valve	MV1	Pd	Pd	Closed		HEX			HEX	Fully open/HEX	Fully open	
MVB		Tsc - Tchg	Tsc - Tchg	Closed		Tchg - Tsc			Tchg - Tsc	Tsc - Tchg/Tchg - Tsc	Tsc - Tchg		
Secondary outdoor unit	Heat exchanger condition	COND	COND	COND	evap	evap	EVAP	EVAP	EVAP	EVAP	COND/EVAP	COND	
	Reversing valve	RVR2	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	OFF/ON	OFF
		RVR1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
	Expansion valve	MV1	Pd	Pd	Closed	Closed	HEX			HEX	Fully open/HEX	Fully open	
MVB		Tsc - Tchg	Tsc - Tchg	Closed	Closed	Tchg - Tsc			Tchg - Tsc	Tsc - Tchg/Tchg - Tsc	Tsc - Tchg		

**Number of outdoor unit (only heat pump): 4**

Heat exchanger mode		Cooling mode		Heating mode		Defrost mode		
		COND		EVAP		DEF1		
Main outdoor unit	Heat exchanger condition		COND		EVAP		COND	
	Reversing valve	RVR2	OFF		ON		OFF	
		RVR1	ON		OFF		ON	
	Expansion valve	MV1	Fully open		HEX		Fully open	
MVB		Tsc - Tchg		Tchg - Tsc		Tsc - Tchg		
Secondary outdoor unit	Heat exchanger condition		COND		EVAP		COND	
	Reversing valve	RVR2	OFF		ON		OFF	
		RVR1	ON		OFF		ON	
	Expansion valve	MV1	Fully open		HEX		Fully open	
MVB		Tsc - Tchg		Tchg - Tsc		Tsc - Tchg		
Secondary outdoor unit	Heat exchanger condition		COND		EVAP		COND	
	Reversing valve	RVR2	OFF		ON		OFF	
		RVR1	ON		OFF		ON	
	Expansion valve	MV1	Fully open		HEX		Fully open	
MVB		Tsc - Tchg		Tchg - Tsc		Tsc - Tchg		
Secondary outdoor unit	Heat exchanger condition		COND		EVAP		COND	
	Reversing valve	RVR2	OFF		ON		OFF	
		RVR1	ON		OFF		ON	
	Expansion valve	MV1	Fully open		HEX		Fully open	
MVB		Tsc - Tchg		Tchg - Tsc		Tsc - Tchg		

### 3.1.4 Outline of the control system

The figure below shows the outline of the control system.

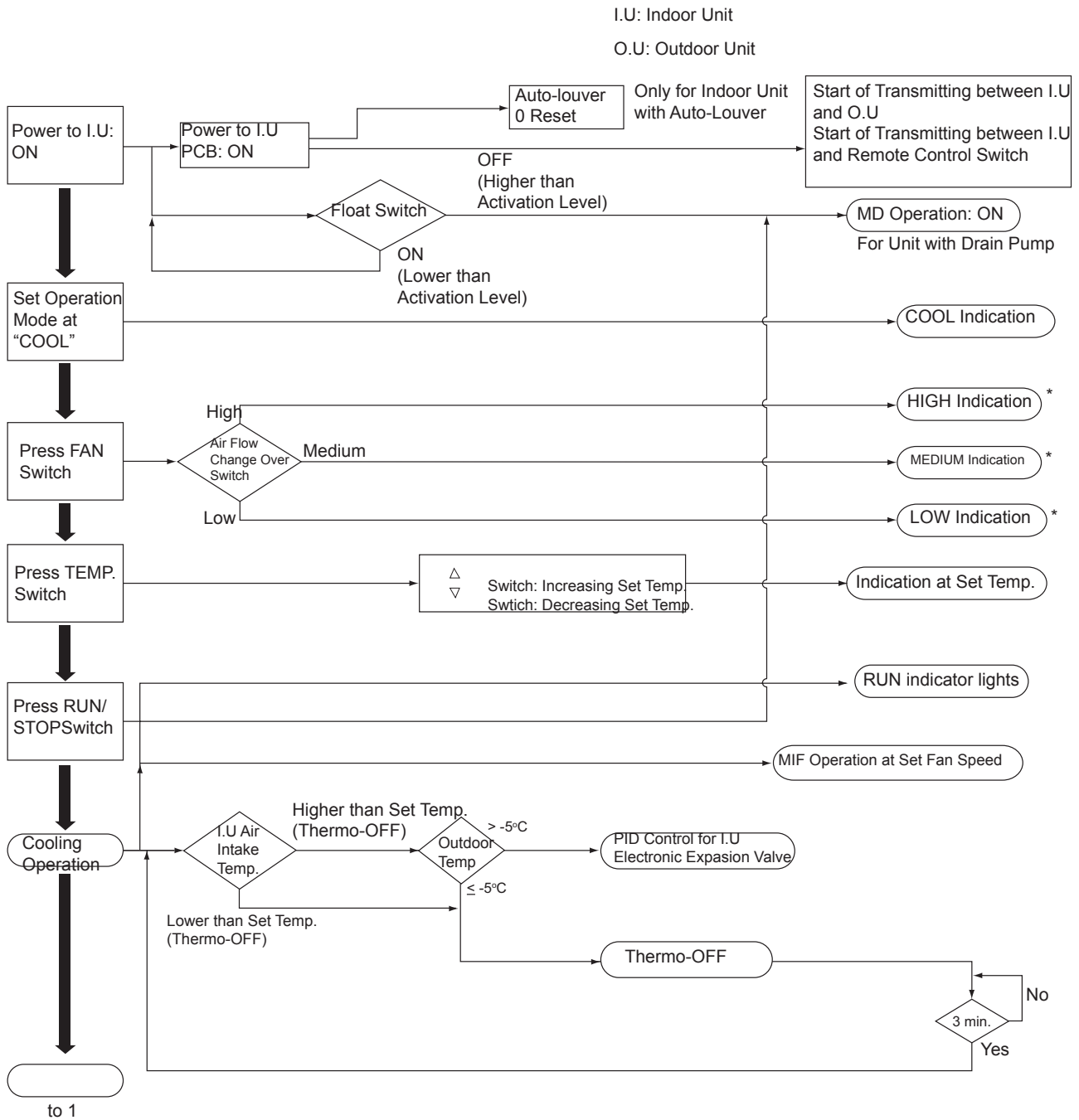


3

Symbol	Description
THM	Thermistor
MCU	Microcontroller
MC1	DC motor (for Inverter compressor)
MOF	DC motor (for outdoor unit fan)
MIF	Motor (for the indoor unit fan)
MS	Motor (for the automatic louver)
MD	Motor (for the drain pump)
MV	Electronic expansion valve (for the indoor unit)
MV1	Electronic expansion valve (for the outdoor unit)
MVB	Electronic expansion valve (for supercooling Heat exchanger)
SVA	Solenoid valve
SVG	Solenoid valve (only for heat recovery (3 pipes))
RVR1	Reversing valve (only for heat recovery (3 pipes))
RVR2	Reversing valve
CH1	Compressor heater resistance

### 3.2 Standard operation sequence

#### 3.2.1 Cooling operation



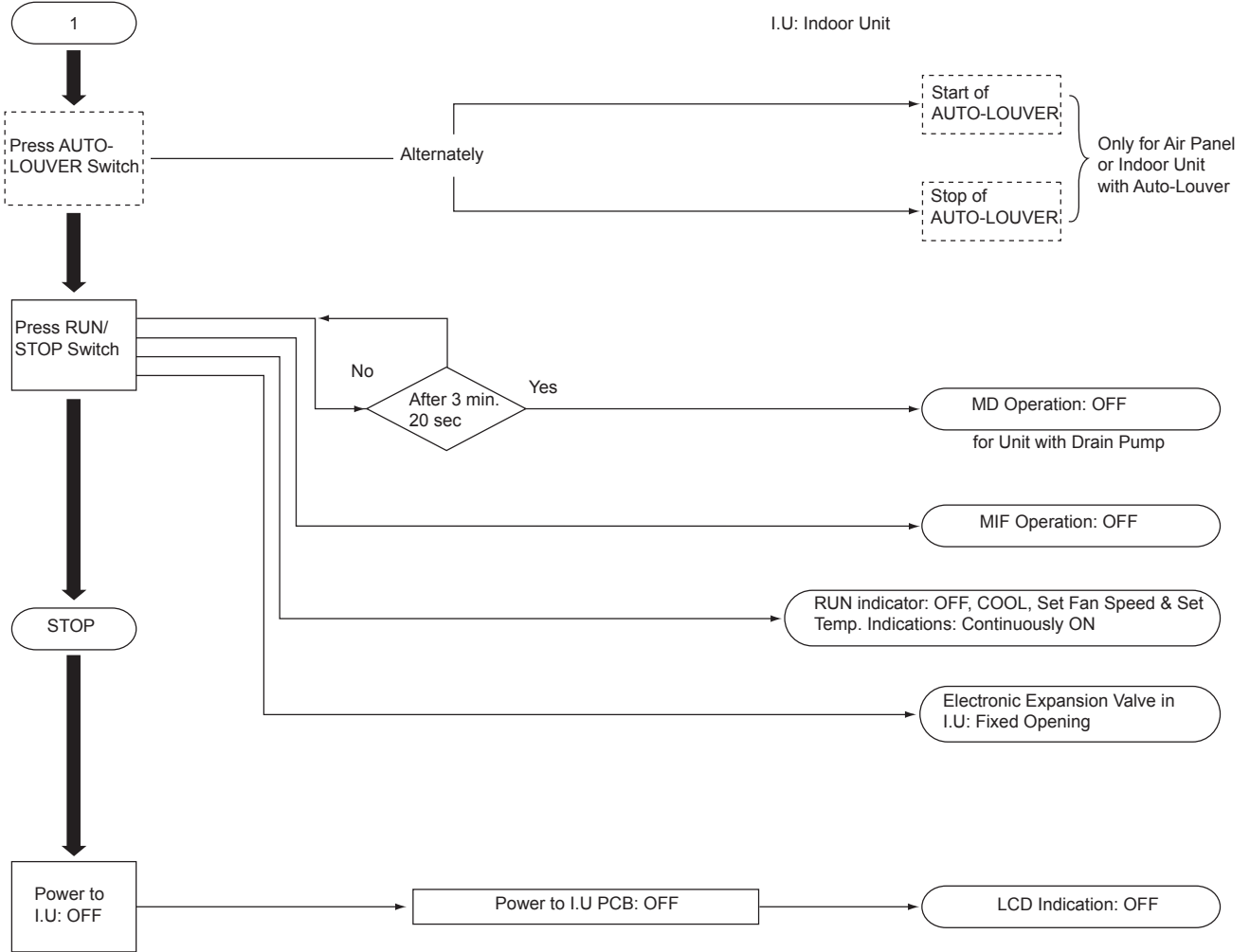
**i** NOTE

(\*) For RPI-8.0FSN3E and RPI-10.0FSN3E, the fan speed is "HIGH" and "LOW" only. By pressing the FAN SPEED SWITCH of Remote Control Switch, the indication of LCD is changed as  $\text{Hi} \rightarrow \text{Me} \rightarrow \text{Lo}$ , but the actual fan speed is as shown in the table right.

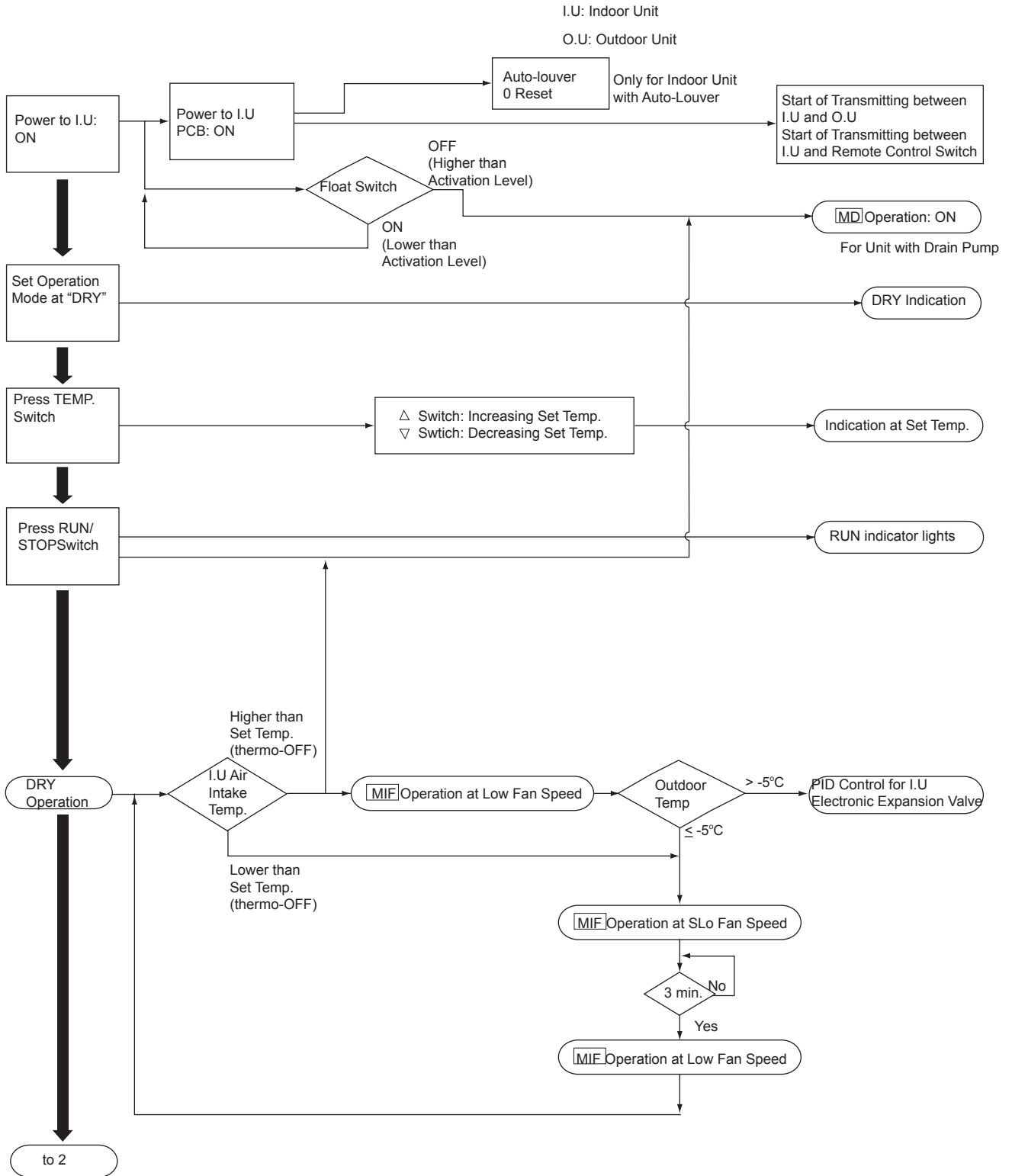
LCD Indication	Actual Fan Speed
HIGH	HIGH
MED	MED
LOW	LOW



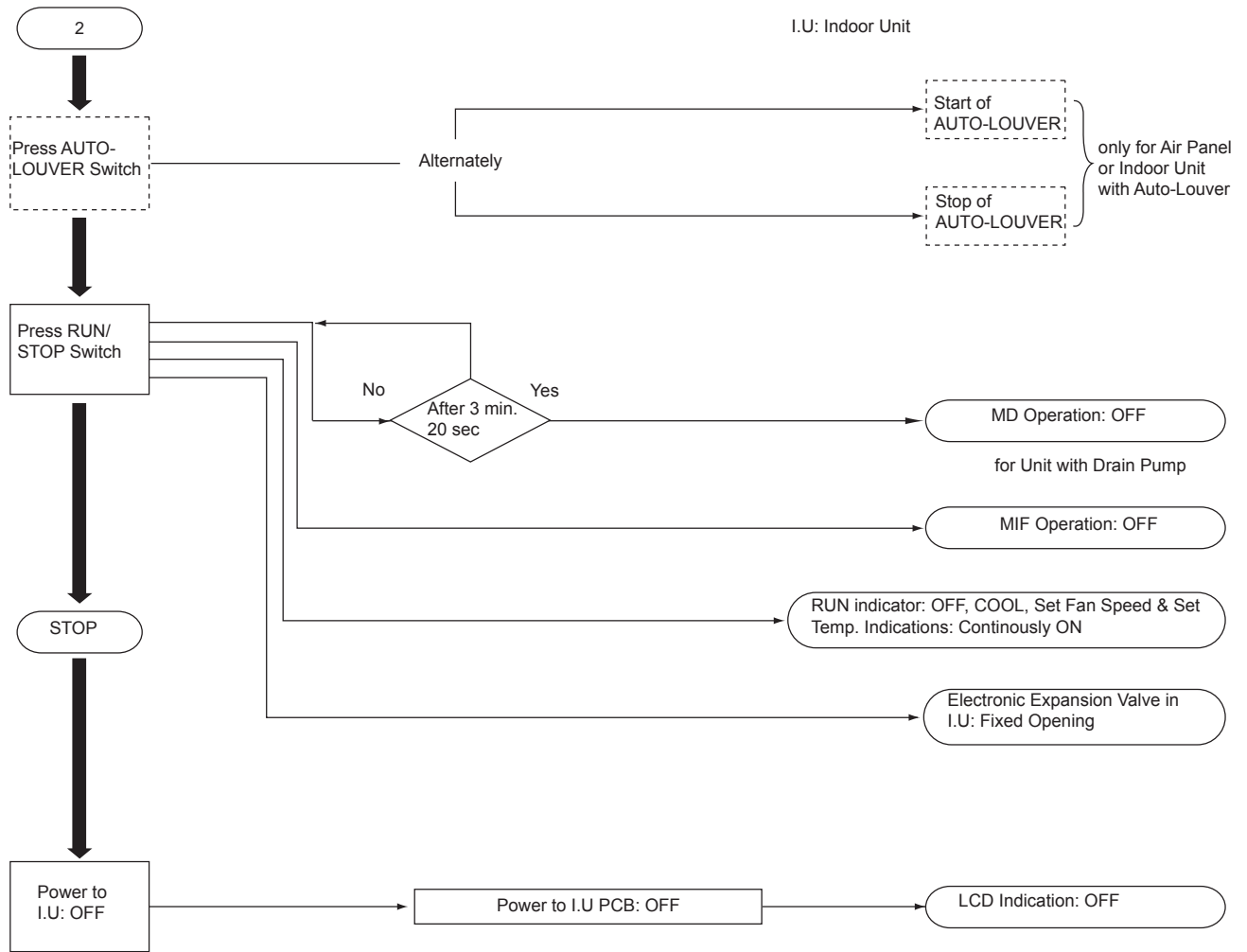
**Cooling operation (continued)**



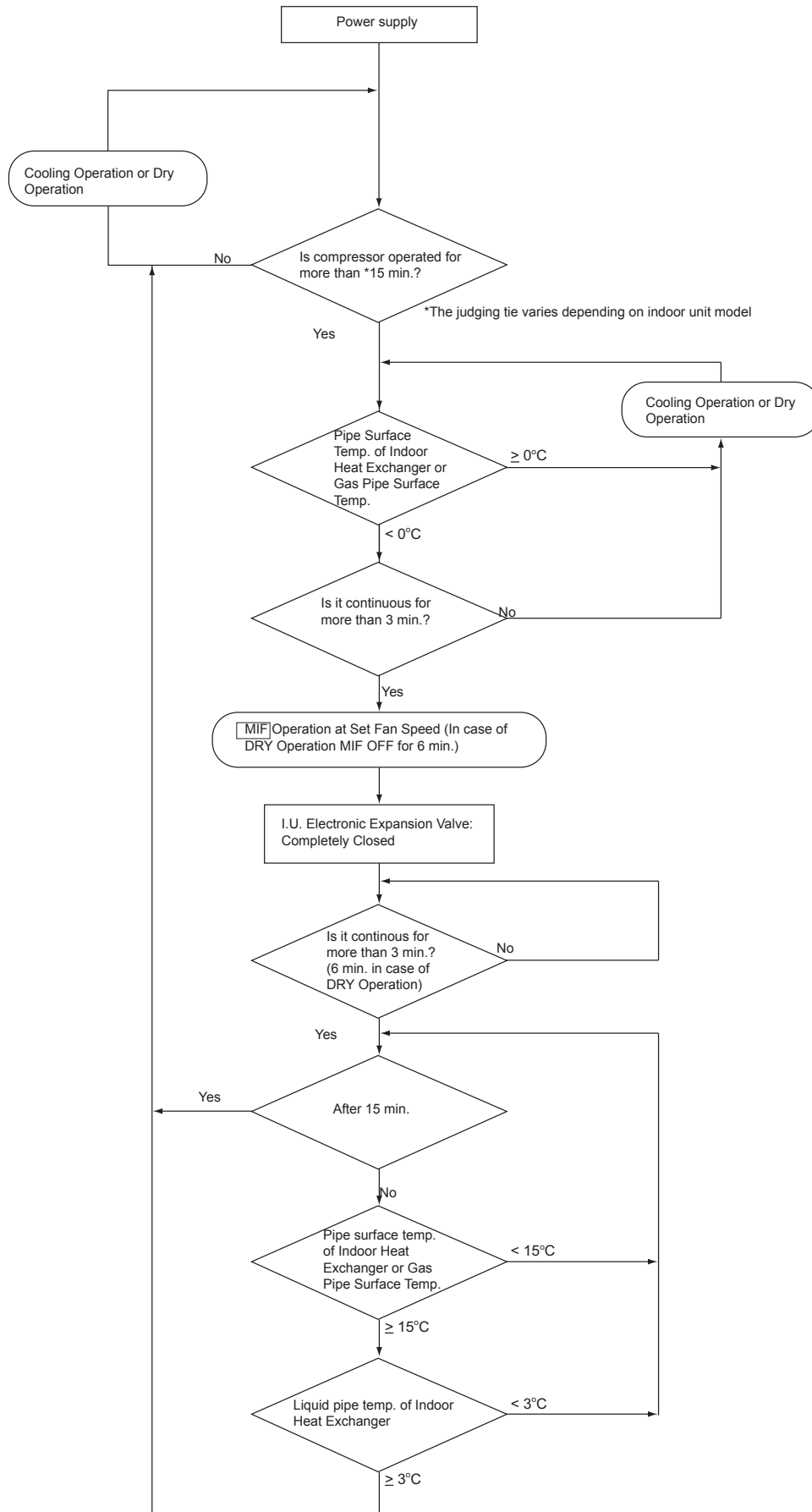
3.2.2 Dry operation



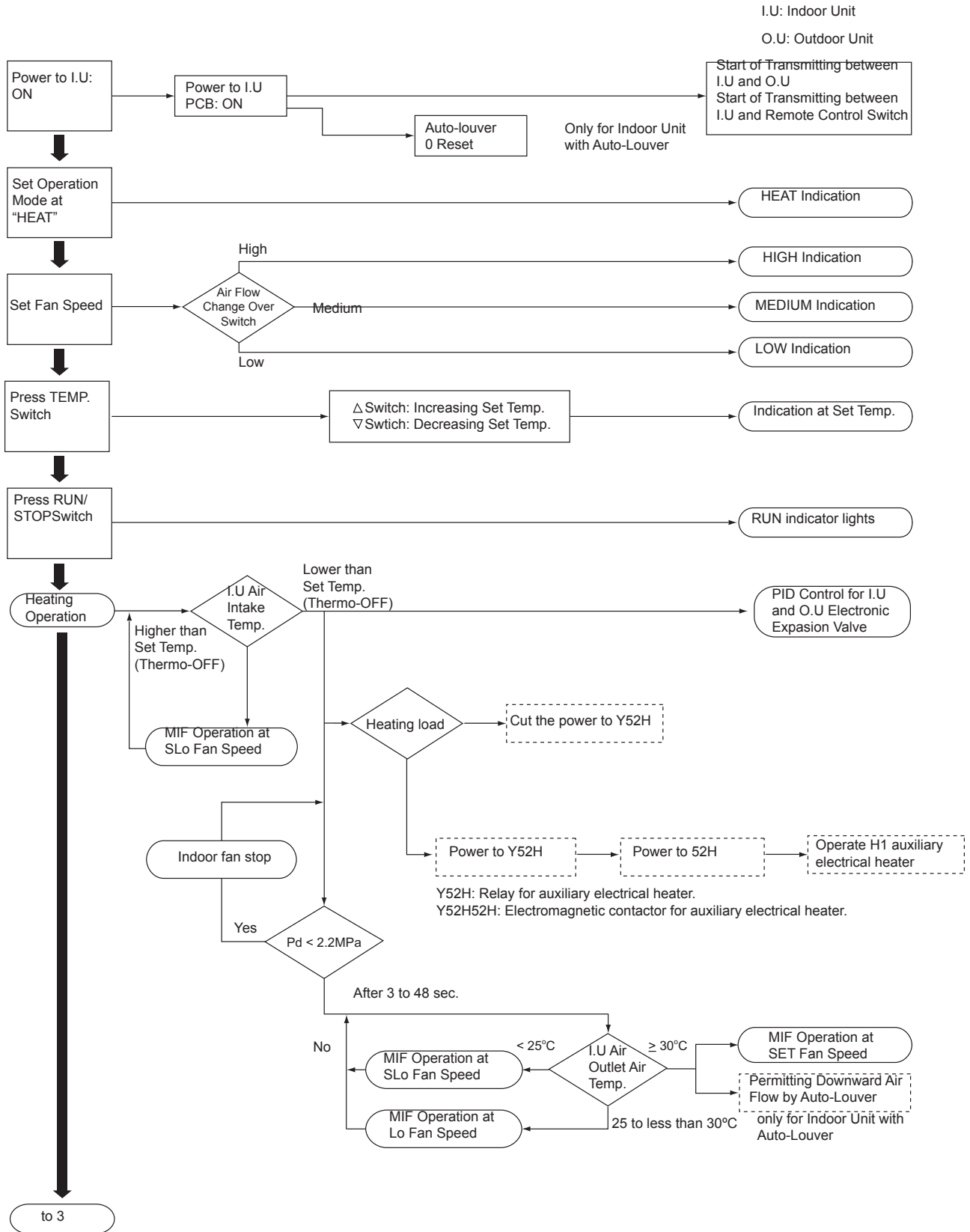
**Dry operation (continued)**



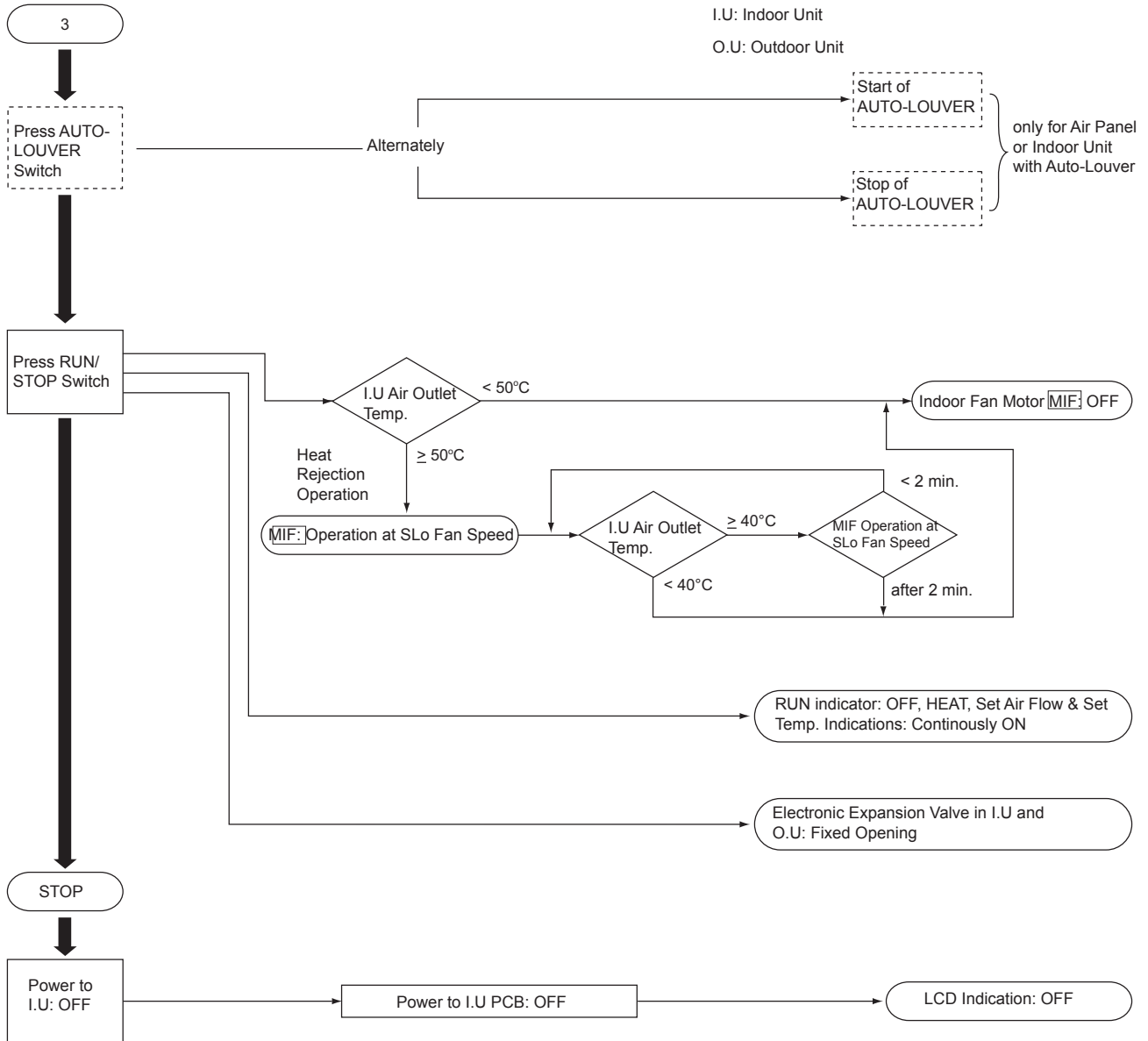
**3.2.3 Antifreeze protection control during the cooling or dry operation**



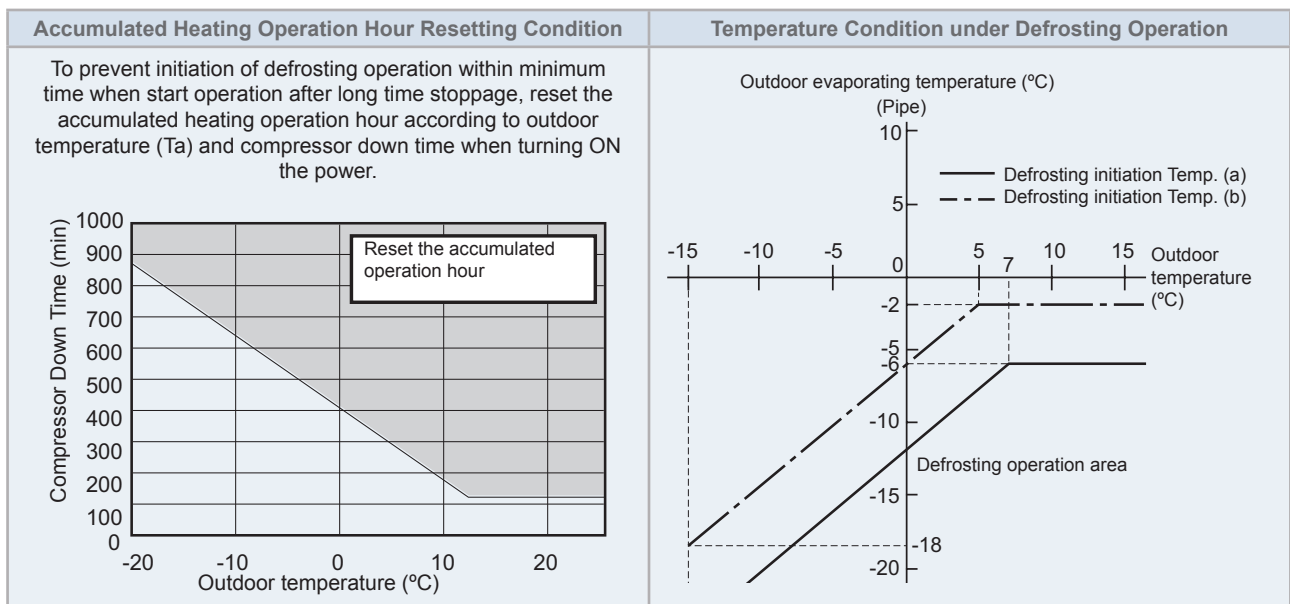
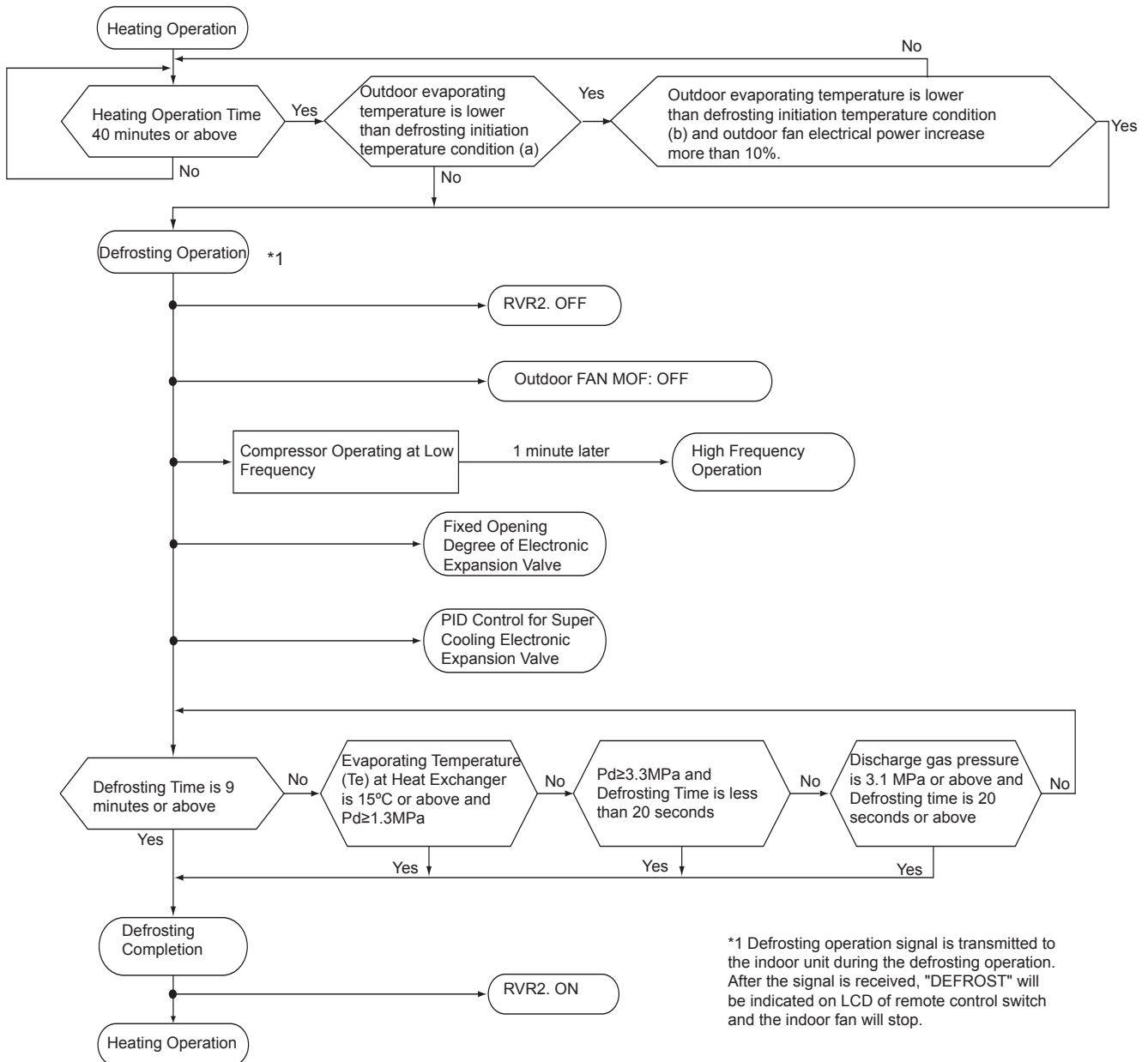
3.2.4 Heating operation



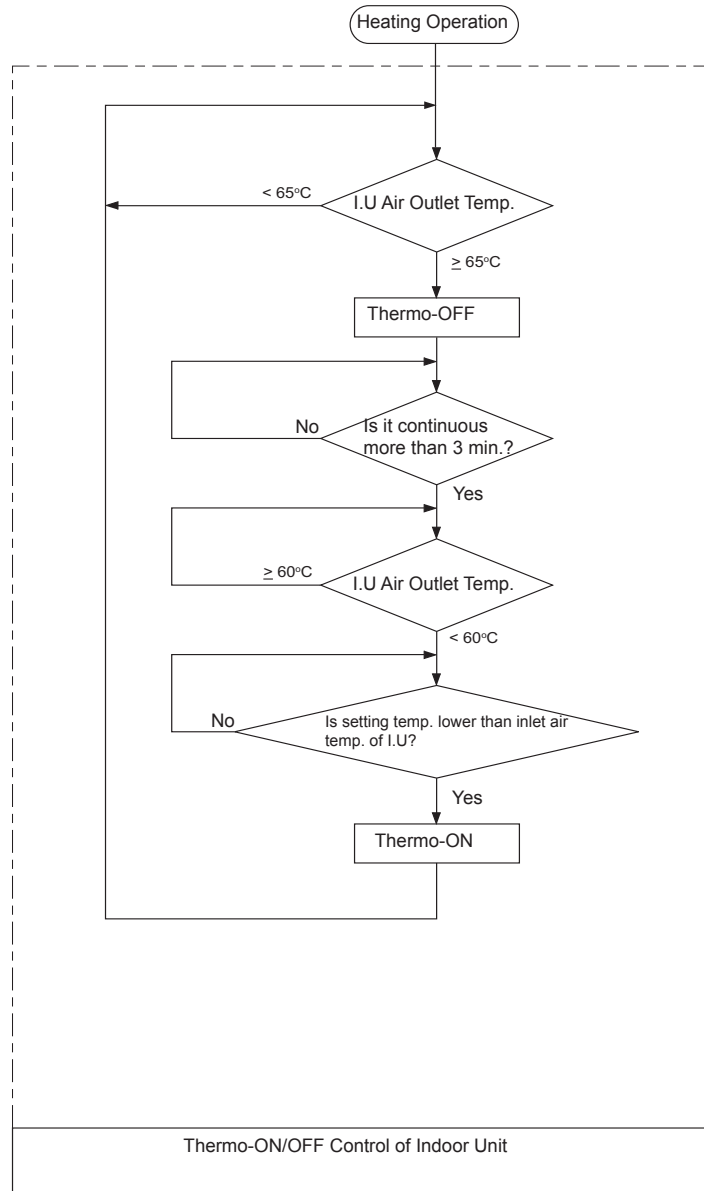
**Heating operation (continued)**



3.2.5 Defrost operation



**3.2.6 Excessive high discharge air temperature prevention control (depending on the indoor unit model)**





### 3.3 Protection control

Whenever protection control sequences are activated, the corresponding code is displayed on the 7-segment LED array of the main control board.

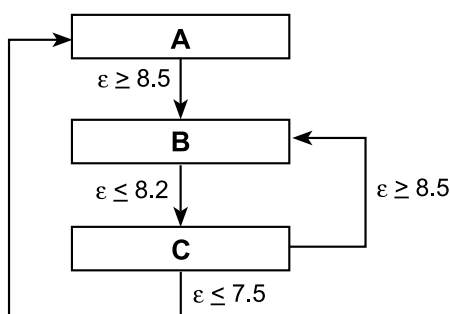
Protection control code is displayed when a unit protection mode has been initiated. The code will disappear once the cause of protection has been addressed.

Indication	Protection control contents	Code During Degeneration control
P01	Pressure Ratio Protection Control	Pc1
P02	High Pressure Increase Protection Control	Pc2
P03	Inverter Current Protection Control	Pc3
P04	Inverter Fin Temperature Increase Protection Control	Pc4
P05	Discharge Temperature Increase Protection Control	Pc5
P06	Low Pressure Decrease Protection Control	-
P09	High Pressure Decrease Protection Control	
P0A	Demand Current Control	
P0d	Low Pressure Increase Protection Control	

#### ◆ 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.



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

#### **i** NOTE

- With a combination of base units, the control in the figure is performed for the entire number of outdoor units to be connected.
- In order to carry out this control, the pressure ratio of each outdoor unit is calculated and the maximum value is used.

Pressure ratio  $\epsilon = (Pd + 0.01) / (Ps + 0.06)$

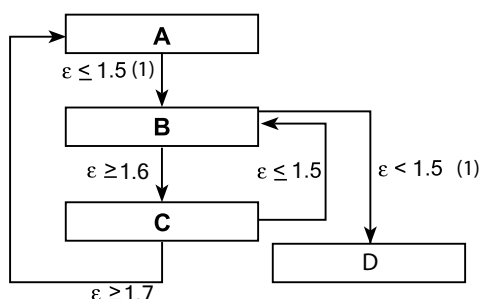
Pressure ratio  $\epsilon = (Pd + 15) / (Ps + 9)$

*Pd*: High pressure sensor detected value.

*Ps*: Low pressure sensor detected value.

##### b. Low Compression Ratio Protection Function

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



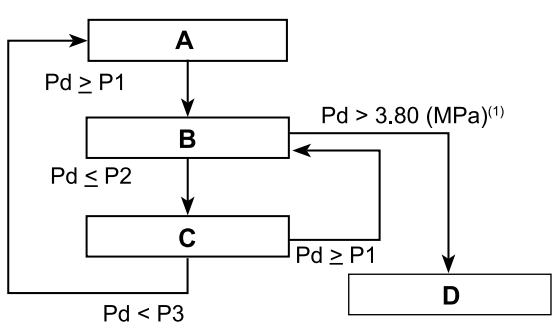
<b>A</b>	Normal operation
<b>B</b>	Forced increase in frequency (0.25 Hz/s)
<b>C</b>	Not allowing frequency decreases (only frequency increase are allowed)
<b>D</b>	Abnormal Stoppage (cause of stoppage d1-11)
<b>(1)</b>	for 1 min.

#### **i** NOTE

- With a combination of base units, the control in the figure is performed for the entire number of outdoor units to be connected.
- The pressure ratio is calculated in each outdoor unit, and this control uses the minimum value.
- $\epsilon$ : 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	Forced decrease in frequency (1.5 Hz/s)
C	Not allowing frequency increases (only frequency decreases are allowed)
D	Abnormal stoppage (cause of stoppage d1-13)
(1)	For 2 seconds

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

Units in MPa.

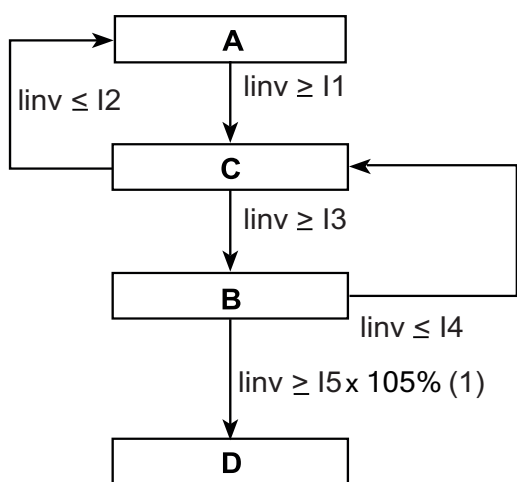
**NOTE**

- With a combination of base units, the control in the figure is performed for the entire number of outdoor units to be connected.
- High pressure is detected in each outdoor unit, and this control uses the maximum value.
- Pd: high pressure sensor detected value.

◆ **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	Forced decrease in frequency (3.0 Hz/s)
C	Not allowing frequency increases (only frequency decreases are allowed)
D	Abnormal stoppage (cause of stoppage d1-17)
(1)	For 30 seconds or totally 3 min. in 10 min.

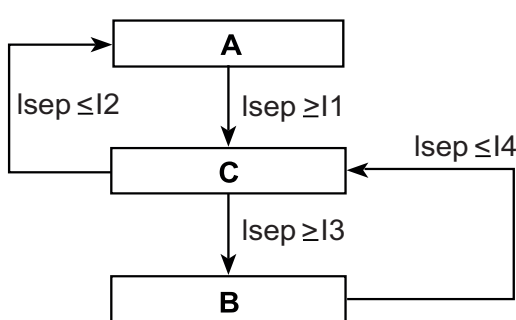
**NOTE**

- With a combination of base units, the control in the figure is performed for each outdoor unit connected. When there is outdoor unit in Prohibition of Frequency Increase, all the outdoor units in operation are prohibited to increase frequency. When there is outdoor unit in Frequency Forced Decrease, all the outdoor units in operation are forced to decrease frequency.
- In case of two inverter PCB installed in an outdoor unit, the max. current value detected at each inverter PCB is utilized.
- linv: Detected Value of Inverter Secondary Current Sensor

Model	I1	I2	I3	I4	I5
RAS-(8/10)FSXNSE RAS-(16-20)FSXNSE RAS-(5-8)FSXNPE RAS-16FSXNPE	18.0	18.5	19.0	19.5	19.5
RAS-10FSXNPE	24.5	25.0	25.5	26.0	26.0
RAS-(12/14)FSXNSE RAS-(22/24)FSXNSE RAS-(12/14)FSXNPE RAS-18FSXNPE	24.5	25.0	25.5	26.0	26.0

Units in Amp.

b. Primary current protection for each inverter PCB



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

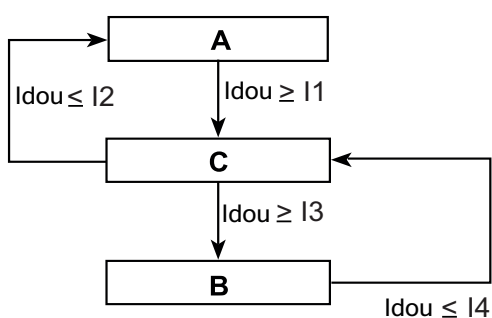
**NOTE**

- With a combination of base units, the control in the figure is performed for each outdoor unit connected. When there is outdoor unit in Prohibition of Frequency Increase, all the outdoor units in operation are prohibited to increase frequency. When there is outdoor unit in Frequency Forced Decrease, all the outdoor units in operation are forced to decrease frequency.
- In case of two inverter PCB installed in an outdoor unit, the max. current value detected at each inverter PCB is utilized.
- Isep: Inverter Primary Current.

Model	I1	I2	I3	I4
RAS-(8-24)FSXNSE	26.5	27.5	27.5	28.0
RAS-(5-18)FSXNPE				

Units in Amp

c. Primary current protection for each outdoor unit



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

**NOTE**

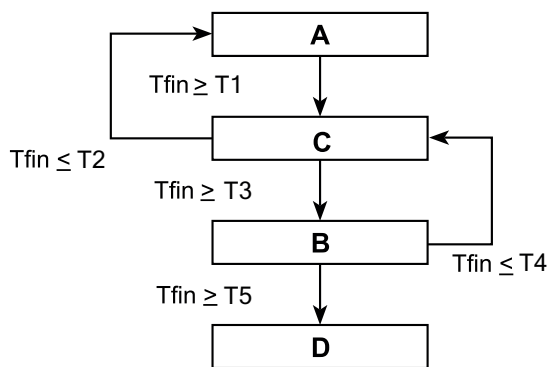
- With a combination of base units, the control in the figure is performed for each outdoor unit connected. When there is outdoor unit in prohibition of frequency increase, all the outdoor units in operation are prohibited to increase frequency. When there is outdoor unit in frequency forced decrease, all the outdoor units in operation are forced to decrease frequency.
- Idou: total value of primary current of all the inverter PCB in an outdoor unit

Model	I1	I2	I3	I4	Model	I1	I2	I3	I4
RAS-8FSXNSE	13.0	14.0	14.0	14.5	RAS-5FSXNPE	9.1	10.1	10.1	10.6
RAS-10FSXNSE	18.6	19.6	19.6	20.1	RAS-6FSXNPE	9.7	10.7	10.7	11.2
RAS-12FSXNSE	20.9	21.9	21.9	22.4	RAS-8FSXNPE	12.5	13.5	13.5	14.0
RAS-14FSXNSE	26.2	27.2	27.2	27.7	RAS-10FSXNPE	16.4	17.4	17.4	17.9
RAS-16FSXNPE	29.8	30.8	30.8	31.3	RAS-12FSXNPE	20.3	21.3	21.3	21.8
RAS-18FSXNSE	34.0	35.0	35.0	35.5	RAS-14FSXNPE	24.8	25.8	25.8	26.3
RAS-20FSXNSE	40.5	41.5	41.5	42.0	RAS-16FSXNPE	29.5	30.5	30.5	31.0
RAS-22FSXNSE	41.0	42.0	42.0	42.5	RAS-18FSXNPE	30.9	31.9	31.9	32.4
RAS-24FSXNSE	48.9	49.9	49.9	50.4					

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

**NOTE**

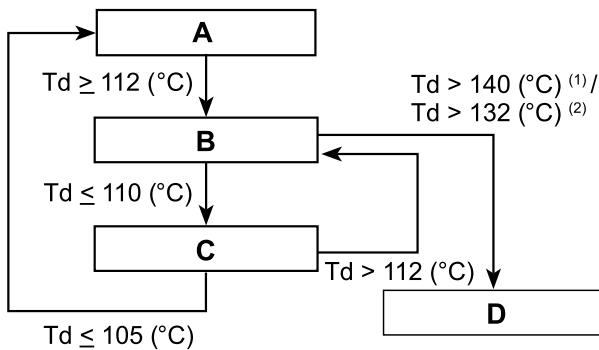
- In the case of base unit combinations, the control of the figure is carried out for the whole outdoors units to be connected.
- In order to carry out this control, the inverter fin temperature of each outdoor unit is calculated and the maximum value is used.
- *Tfin*: inverter fin temperature sensor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

Model	T1	T2	T3	T4
RAS-(8-24)FSXNSE	102	100	104	110
RAS-(5-18)FSXNPE				

units in °C

◆ **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.



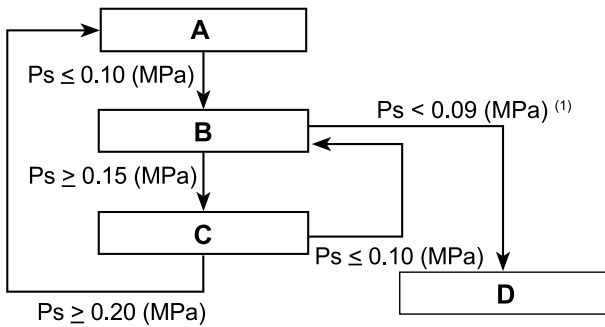
A	Normal operation
B	Forced decrease in frequency (1.0 Hz/s)
C	Not allowing frequency increases (only frequency decreases are allowed)
D	Abnormal stoppage (cause of stoppage d1-15)
(1)	For 5 seconds
(2)	For 10 minutes

**NOTE**

- With a combination of base units, the control in the figure is performed for the entire number of outdoor units to be connected.
- Discharge temperature is detected in each outdoor unit, and this control uses the maximum value.
- In case of two inverter compressors installed in an outdoor unit, the max. temperature detected at each inverter compressor is utilized.
- *Td*: discharge gas temperature sensor detected value.

◆ **P06: Low pressure decrease protection control**

Low Pressure Decrease Protection Control is performed in order to protect the compressor from a transitional decrease of suction pressure.



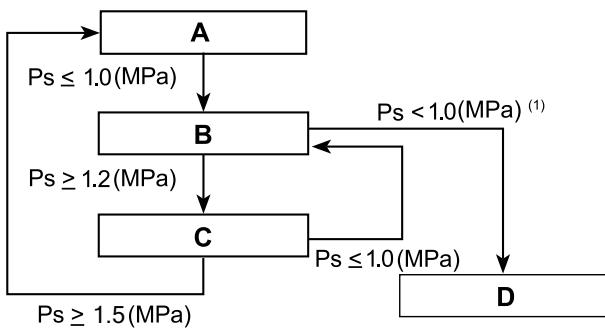
A	Normal operation
B	Forced decrease in frequency (0.25 Hz/s)
C	Not allowing frequency increases (only frequency decreases are allowed)
D	Abnormal stoppage (cause of stoppage d1-15)
(1)	For 12 minutes

**NOTE**

- With a combination of base units, the control in the figure is performed for the entire number of outdoor units to be connected.
- Low pressure is detected in each outdoor unit, and this control uses the minimum value.
- Ps: Detected Value of Low Pressure Sensor.

◆ **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	Forced increase in frequency (0.125 Hz/s)
C	Not allowing frequency decreases (only frequency increases are allowed)
D	Abnormal stoppage (cause of stoppage d1-26)
(1)	For 1 hour

**NOTE**

- In the case of base unit combinations, the control of the figure is carried out for the whole outdoor units to be connected.
- High pressure is detected in each outdoor unit, and this control uses the minimum value.
- 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.

- The demand signal is input from the centralized operation controller.
- 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.
- The demand function settings are set from the outdoor unit PCB.
- The wave function is set from the outdoor unit PCB.
- 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.

**Cancellation Condition**

The input signal is stopped at each condition (a) to (e).

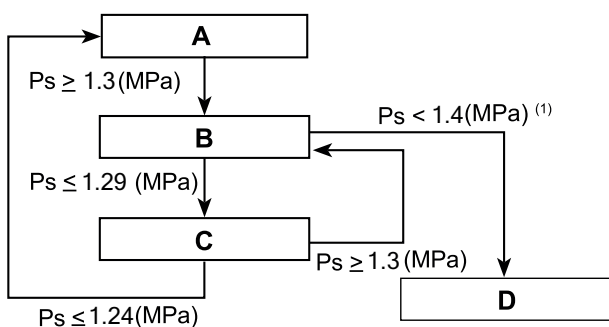
**NOTE**

This function is not available when the compressor starts or during a defrosting operation.



◆ **P0d: Low pressure increase protection control**

The compressor operation frequency is controlled to protect the compressor from suction pressure transitional increasing.



A	Normal operation
B	Forced increase in frequency (0.125 Hz/s)
C	Not allowing frequency decreases (only frequency increases are allowed)
D	Abnormal stoppage (cause of stoppage d1-12)
(1)	For 1 min

**NOTE**

- With a combination of base units, the control in the figure is performed for the entire number of outdoor units to be connected.
- Low pressure is detected in each outdoor unit, and this control uses the maximum value.
- Ps: detected value of low pressure sensor.

◆ **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	P01	Pressure Ratio Protection Control
2	P02	High Pressure Increase Protection Control
3	P03	Inverter Current Protection Control
4	P04	Inverter Fin Temperature Increase Protection Control
5	P05	Discharge Temperature Increase Protection Control
6	P06	Low Pressure Decrease Protection Control
7	P0A	Demand Current Control
8	P0d	Low Pressure Increase Protection Control
9	P09	High Pressure Decrease Protection Control

		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
	Prohibited Decrease	②	②	②	②

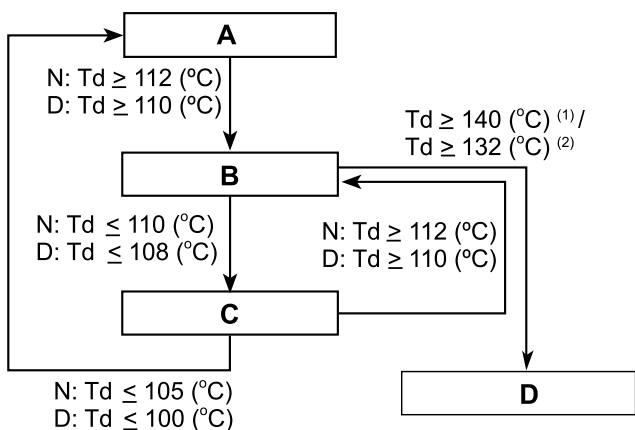
◆ **Degeneration control**

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**

- 1 Pressure ratio decrease protection control.
- 2 Discharge pressure increase protection control.
- 3 Inverter overcurrent protection control.
- 4 Inverter fin temperature increase protection control.
- 5 Discharge temperature increase protection control.

Example of discharge temperature increase protection control:



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

◆ Oil return control

Oil return control is performed in order to avoid insufficient oil supply to the compressor caused by long time low frequency operation. This control is utilized to return the oil flow out to the indoor unit side from the compressor.

**Activating condition**

This control function is started the compressor runs below the specified speed for 1 hour continuously (refer to the table below)

Compressor speed for oil return control:

Type of Unit	Cooling Operation	Heating Operation
≤ 8HP	32.0	32.0
10HP	38.0	38.0
12HP, 14HP	50.0	54.0
16HP to 24HP	66.0	72.0
26HP to 36HP	96.0	108.0
38HP to 54HP	132.0	156.0
56HP to 72HP	176.0	190.0
74HP to 96HP	240.0	240.0

Units in Hz

**Detail of control**

**Compressor:**

Increase the compressor speed above the required value to return the oil to the compressor.

**Expansion Valve:**

(In the Case of Cooling Operation) Open the expansion valve of the indoor unit under thermo-ON.

(In the Case of Heating Operation) Open the expansion valve of the outdoor unit.

**Deactivating Condition:**

This control function is cancelled when the oil return control continues for more than 60 sec. (for cooling operation) /120 sec. (for heating operation).



### 3.3.1 Control of CH-Box

Single branch type: CH-AP160SSX, CH-AP280SSX

Multiple branch type: CH-AP04MSSX, CH-AP08MSSX, CH-AP12MSSX, CH-AP16MSSX

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

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

**i** **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.*

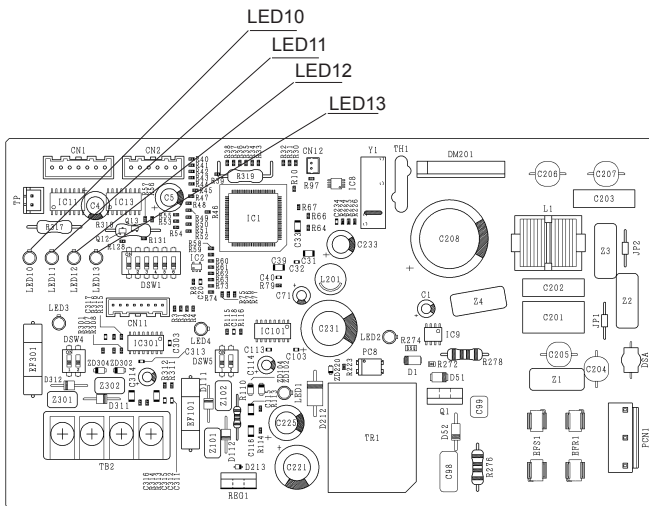
**1** Checking method of CH-Box performance.

Check the LED on the PCB of CH-Box to inspect the expansion valve opening.

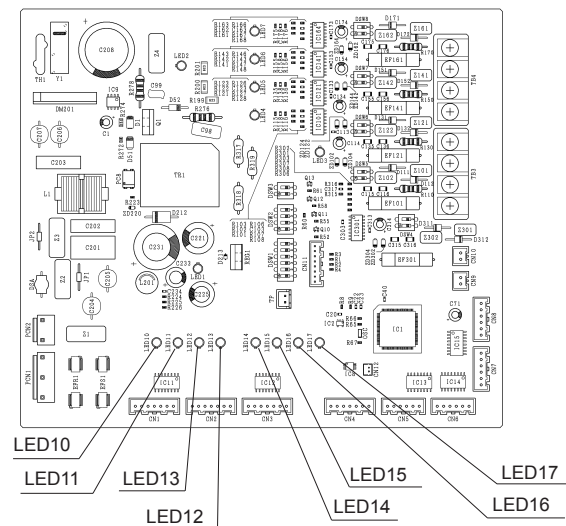
Refer to the table below for the relation between expansion valve opening and LEDs.

LED	Expansion valve		LED Display
	Single branch type	Multiple branch type	
LED10	MVD1	MVD1	Light ON: Fully Open OFF: Closed  Flashing: Other than the above (Half open and the others)
LED11	MVS1	MVD2	
LED12		MVD3	
LED13		MVD4	
LED14		MVS1	
LED15		MVS2	
LED16		MVS3	
LED17		MVS4	

PCB1 (PI163) of Single Branch Type CH-Box



Multiple Branch Type CH-Box





## 2 CH-Box expansion valve opening at OFF or with each operation mode

Outdoor unit operation mode	Reversing Valve (RVR1)	Indoor Unit Operation Mode when connected to CH-Box		Expansion Valve Opening of Indoor Unit (pls)	Expansion Valve Opening of CH-Box (pls)	
					MVS	MVD
Right after Switching Reversing Valve (Within 2 minutes after d1-09 stoppage)	RVR1 ON	HEATING · COOLING			6000	6000
	RVR1 OFF	HEATING	SW OFF thermo-OFF	40 or less	6000 or 500	500 or 25
			thermo-ON	more than 40	500 or 25	6000 or 500
		COOLING		-	500 or 25	6000 or 500
Normal Operation (other than the above)	RVR1 ON	HEATING		-	6000 or 500	500 or 25
		COOLING		-	500	6000
	RVR1 OFF	HEATING · COOLING		-	6000	500
Defrosting		-	-	-	Maintain the opening before defrosting	

- Refer to the table below for the indoor unit operation mode for each indoor unit operation mode.
- When indoor units in cooling mode and indoor units in heating mode are connected to the CH-Box at the same time, priority is given to the operation mode of the first unit selected

Indoor Unit Operation Mode	Operation Mode
COOLING	Cooling Mode, Fan Mode, Dry
HEATING	Heating Mode

**NOTE**

When the unit is at thermo-OFF or stopped, the operation mode remains the same as the operation mode immediately before.

## 3.4 Control and safety devices

### 3.4.1 Compressor protection

#### 3.4.1.1 Outdoor unit

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

1. 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-(8-12)FSXNSE	RAS-14FSXNSE	RAS-(16-24)FSXNSE
<b>For Compressor</b>					
Pressure switches			Automatic restart, non adjustable (each one for each compressor)		
High pressure	Disconnection	MPa	4.15 <sup>-0.05</sup> <sub>-0.15</sub>	4.15 <sup>-0.05</sup> <sub>-0.15</sub>	4.15 <sup>-0.05</sup> <sub>-0.15</sub>
	Connection	MPa	3.20 <sup>±0.15</sup>	3.20 <sup>±0.15</sup>	3.20 <sup>±0.15</sup>
Fuse capacity (3N~ 400V 50Hz)		A	50	50	50
Oil heater					
Oil heater capacity		W	37.3 x 3	37.3 x 3	37.3 x 6
CCP timer			Not adjustable		
Time setting		min.	3	3	3
<b>For DC fan module</b>					
Fuse capacity (3N~ 400V 50Hz)		A	5	10	5

Model			RAS-(5-6)FSXNPE	RAS-(8-14)FSXNPE	RAS-(16-18)FSXNPE
<b>For Compressor</b>					
Pressure switches			Automatic restart, non adjustable (each one for each compressor)		
High pressure	Disconnection	MPa	4.15 <sup>-0.05</sup> <sub>-0.15</sub>	4.15 <sup>-0.05</sup> <sub>-0.15</sub>	4.15 <sup>-0.05</sup> <sub>-0.15</sub>
	Connection	MPa	3.20 <sup>±0.15</sup>	3.20 <sup>±0.15</sup>	3.20 <sup>±0.15</sup>
Fuse capacity (3N~ 400V 50Hz)		A	50	50	50
Oil heater					
Oil heater capacity		W	37.3 x 3	37.3 x 3	37.3 x 6
CCP timer			Not adjustable		
Time setting		min.	3	3	3
<b>For DC fan module</b>					
Fuse capacity (3N~ 400V 50Hz)		A	5	10	5

#### 3.4.1.2 CH-Box

Model	CH-AP(160-280)SSX, CH-AP(04-16)MSSX	
Fuse for control circuit	A	5

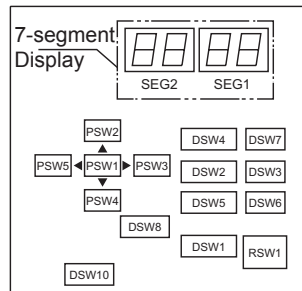
# 4 . Optional functions

## Index

4.1	Menu mode accessing (by 7-segment display).....	66
4.1.1	Check mode .....	66
4.1.2	External input and output setting.....	66
4.1.3	Function setting .....	66
4.2	External input and output setting (by 7-segment display) .....	67
4.2.1	Available control functions.....	67
4.2.2	Setting of external input and output.....	68
4.2.3	External input function setting .....	69
4.2.4	External output function setting .....	73
4.3	Function setting (by 7-segment display).....	74
4.3.1	Sequence of the function setting .....	74
4.3.2	Function setting .....	78
4.3.4	Circulator function at heating Thermo-OFF (FA).....	84
4.3.5	Night-shift (low noise)(ni).....	84
4.3.6	Cancellation of the outdoor ambient temperature limit (GS) .....	85
4.3.7	Defrost for cold area (Jp).....	86
4.3.8	SLo defrost setting (bJ) .....	87
4.3.9	Priority capacity mode setting (nU) .....	87
4.3.10	Low noise setting (db) .....	87
4.3.11	Demand function setting.....	88
4.3.12	Wave function setting (UE).....	89
4.3.13	Cold draft protection (Fb) .....	89
4.3.14	Adjustment of fan rotation (Fo).....	90
4.3.15	Outdoor fan motor intermitted operation setting (F4) .....	90
4.4	Power saving function from wired controller.....	91
4.4.1	Power Saving Guide.....	91
4.4.2	Outdoor Unit Capacity Control .....	91
4.4.3	Rotation control function.....	92
4.4.4	Intermittent control function .....	92
4.4.5	Power Saving Schedule Function .....	93
4.4.6	Operation noise reduction schedule function .....	93
4.4.7	Operation noise reduction schedule function .....	93

## 4.1 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.

### 4.1.1 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

### 4.1.2 External input and output setting

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

Start setting	Exit setting
1° Turn ON DSW4 PIN4 2° Turn ON DSW4 PIN6	1° Turn OFF DSW4 PIN6 during indicated external Input/Output setting mode 2° Turn OFF DSW4 PIN4

### 4.1.3 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
1° Turn ON DSW4 PIN4, 2° Turn ON DSW4 PIN5	1° Turn OFF DSW4 PIN5 during indicated function setting mode 2° Turn OFF DSW4-PIN4



#### NOTE

- After setting, confirm DSW4 setting is same as setting before shipment.
- Release "Menu Mode" after the setting is completed. Otherwise, the air conditioner may not operate appropriately.

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

### 4.2.1 Available control functions

The outdoor unit PCB1 has three input terminals (CN17, CN18) that receive external signals and two output terminals (CN16) that send signals to the exterior. The control functions are available by setting input and output terminals as shown below:

Control function number	Setting of input functions	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	
11	Low noise level setting 1	
12	Low noise level setting 2	
13	Low noise level setting 3	
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	CN17 (1-2)	Setting the heating mode	1
Input 2	CN17 (2-3)	Setting the cooling mode	2
Input 3	CN18 (1-2)	Stoppage demand	3

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



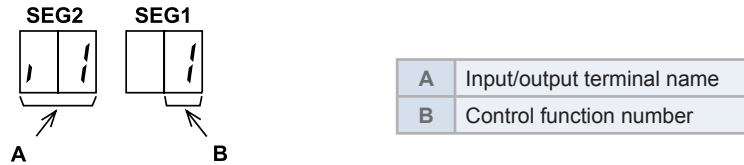
#### NOTE

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

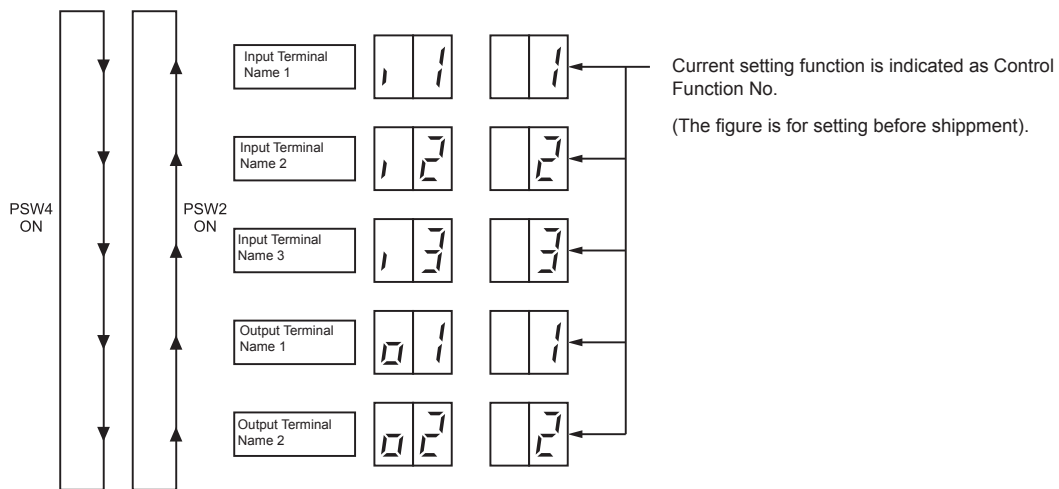
### 4.2.2 Setting of external input and output.

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

- 1 Selecting “External Input and Output Setting” it will be displayed on the 7-segment display. (The setting must be carried out during the stoppage of the outdoor unit. Also, the DSW4 PIN4 of the outdoor unit PCB1 must be set to “ON” before the modification in order to prevent activation of the compressor).  
This display shows the control function No. 1 (fixed heating operation mode) is set at input 1.

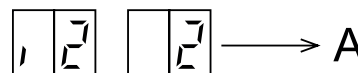


- 2 Pressing PSW2 and PSW4 changes the input/output terminal name. The following shows the display changes when PSW2 or PSW4 are pushed.



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

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



- 4 After selecting the Control Function No, turn OFF DSW4 PIN6. The display will be back to the normal operation. Then turn OFF the DSW4 PIN4. Confirm if the DSW4 is set to factory settings. 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 “Specifications of required main parts” table for the details for the electrical wiring connection and the required parts.

### Specifications of required main parts

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

#### 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.

### 4.2.3 External input function setting

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

- ◆ **Fixing heating operation mode (Control function n° 1)**
- ◆ **Fixing cooling operation mode (Control function n° 2)**

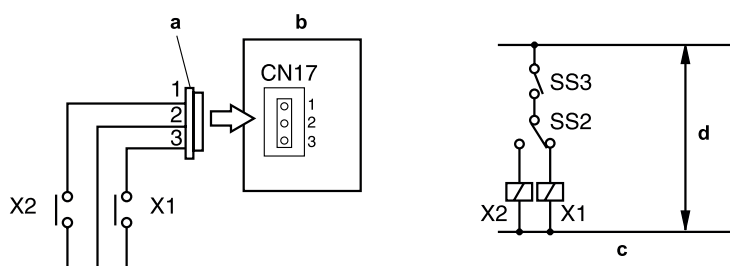
When the input terminals for setting the operation mode of the outdoor unit PCB1 are short-circuited, the operation mode can be fixed for cooling or heating mode.

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

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

#### Setting example:

- Fixing Heating Operation at Input 1 (between 1 and 2 pins of CN17)
- Fixing Cooling Operation at Input 2 (between 3 and 2 pins of CN17)



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 n° 3) Forced stoppage (Control function n° 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 No.3)		Cooling: Airflow Setting, Heating Lo Setting
Forced Stoppage (Control Function No.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 CN18 to set the stoppage demand.
- Short-circuit terminals 1 and 2 (input 3) of CN18 to set the stoppage forced.

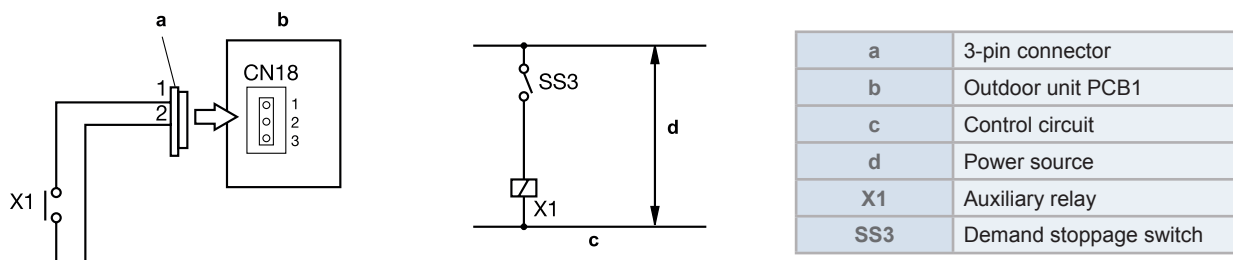
The stoppage code is number 10. By disconnecting the demand switch contact, restarting is available.

#### **i** 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 CN18)
- Forced Stoppage at Input 3 (between 1 and 2 pins of CN18)



### ◆ Outdoor unit fan motor start/stop (Control function n° 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.

#### **i** NOTES

- 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 all the outdoor fan motor to suspend the operation. Check the alarm code and deal properly with the failure next time the compressor is operated.
- 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.

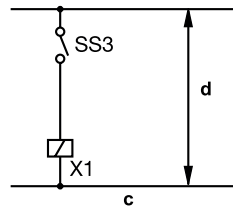
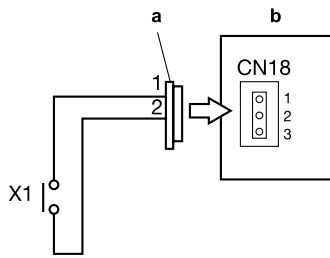
#### **!** CAUTION

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 CN18)



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 n° 6 to 10)**

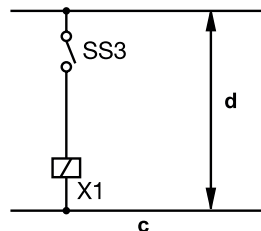
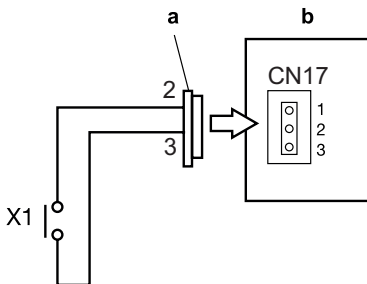
When the demand current control input terminals for the outdoor unit PCB1 are short-circuited, the compressor frequency is controlled by the maximum current limit of the outdoor unit, which is set at 100%, 80%, 70%, 60% and 40%. If the outdoor unit running current exceeds the maximum limit for twenty minutes, the indoor unit is put under Thermo-OFF condition. In this case, the stoppage code No. "10" is given. When the input terminal is opened during the demand current control, its control is released.

**i 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 CN17), Control Function No. 6 to 10.



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

◆ **Low noise setting 1, 2, 3 (Control function n° 11 to 13)**

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

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

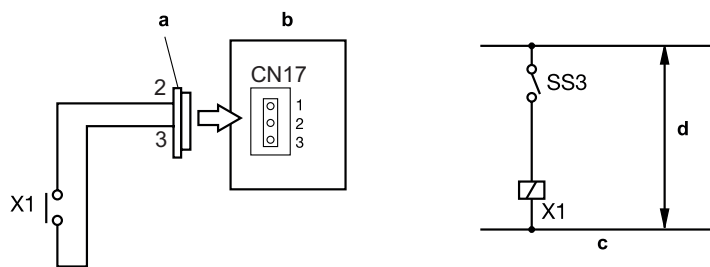
Control function number	Operating sound (targeted value)		Outdoor unit capacity (specification ratio)
No setting	Catalogue value		100%
11 (Low noise level setting 1)	RAS-(5/6)FSXNPE	74.5 dB(A)	80%
	RAS-(8-14)FSXNSE RAS-(8-14)FSXNPE	77.5 dB(A)	
	RAS-(16-24)FSXNSE RAS-(16-18)FSXNPE	82.5 dB(A)	
12 (Low noise level setting 2)	RAS-(8-14)FSXNSE RAS-(5-14)FSXNPE	72.5 dB(A)	60%
	RAS-(16-24)FSXNSE RAS-(16/18)FSXNPE	77.5 dB(A)	
13 (Low noise level setting 3)	RAS-(8-14)FSXNSE RAS-(5-14)FSXNPE	67.5 dB(A)	40%
	RAS-(16-24)FSXNSE RAS-(16/18)FSXNPE	72.5 dB(A)	

**NOTE**

- The capacity of the outdoor unit will decrease because the compressor frequency and the outdoor unit fan frequency necessarily decreases. The range of operation may be restricted.
- In some cases, the sound operation (key values) can be temporarily higher than the values in the table. In case of combination unit sound will be higher than the values showed in the table.
- If low noise setting is always required without input signal, refer to item "4.3.10 Low noise setting (db)."

**Setting example**

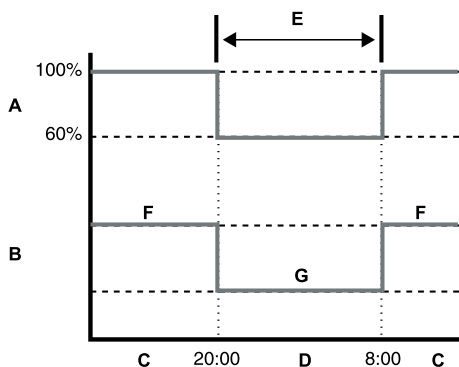
Low Noise Setting at Input 2 (between 2 and 3 pins of CN17), Control Function No. 12



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

**Example:**

"Low noise setting 2" during night time only:



<b>A</b>	Capacity
<b>B</b>	Operating sound
<b>C</b>	Day time schedule
<b>D</b>	Night time schedule
<b>E</b>	Input terminal short-circuited
<b>F</b>	82 (Catalogue value) [dB(A)]
<b>G</b>	72.5 [dB(A)]

#### 4.2.4 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 made by OMRON

#### NOTE

- (\*) Do not use the relays made with diodes.
- \* Refer to the table "Specifications of required main parts" for the connector parts.

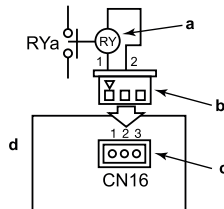
#### ◆ Operation signal (Control function n°1)

This function is used to receive the operation signal.

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

#### Setting example:

Operation Signal at Output 1 (between 1 and 2 pins of CN16).



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

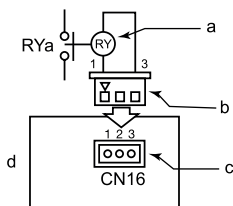
#### ◆ Alarm signal (Control function n°2)

This function is used to receive the alarm signal.

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

#### Setting example:

Alarm Signal at Output 2 (between 1 and 3 pins of CN16).



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

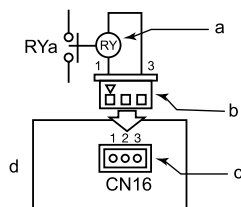
#### ◆ Compressor ON signal (Control function n°3)

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 CN16)

#### Setting example:

Compressor ON Signal at Output 2 (between 1 and 3 pins of CN16).



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

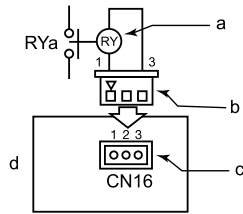
### ◆ Defrosting signal (Control function n°4)

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 CN16).



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

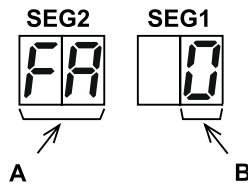
## 4.3 Function setting (by 7-segment display)

### 4.3.1 Sequence of the function setting

This setting must be carried out during stoppage of the outdoor unit.

For a combination of outdoor units, set it to the main outdoor unit. (The setting cannot be performed to sub outdoor units.) The main outdoor unit is the unit to which the communication cable between the outdoor unit and indoor unit is connected. Set DSW4 PIN4 and PIN5 of the outdoor unit PCB to ON position before performing in order to prevent the compressor from being activated.

- 1 By selecting "Function Setting", the following appears on the 7-segment display. (The setting should be performed during an outdoor unit stoppage.)



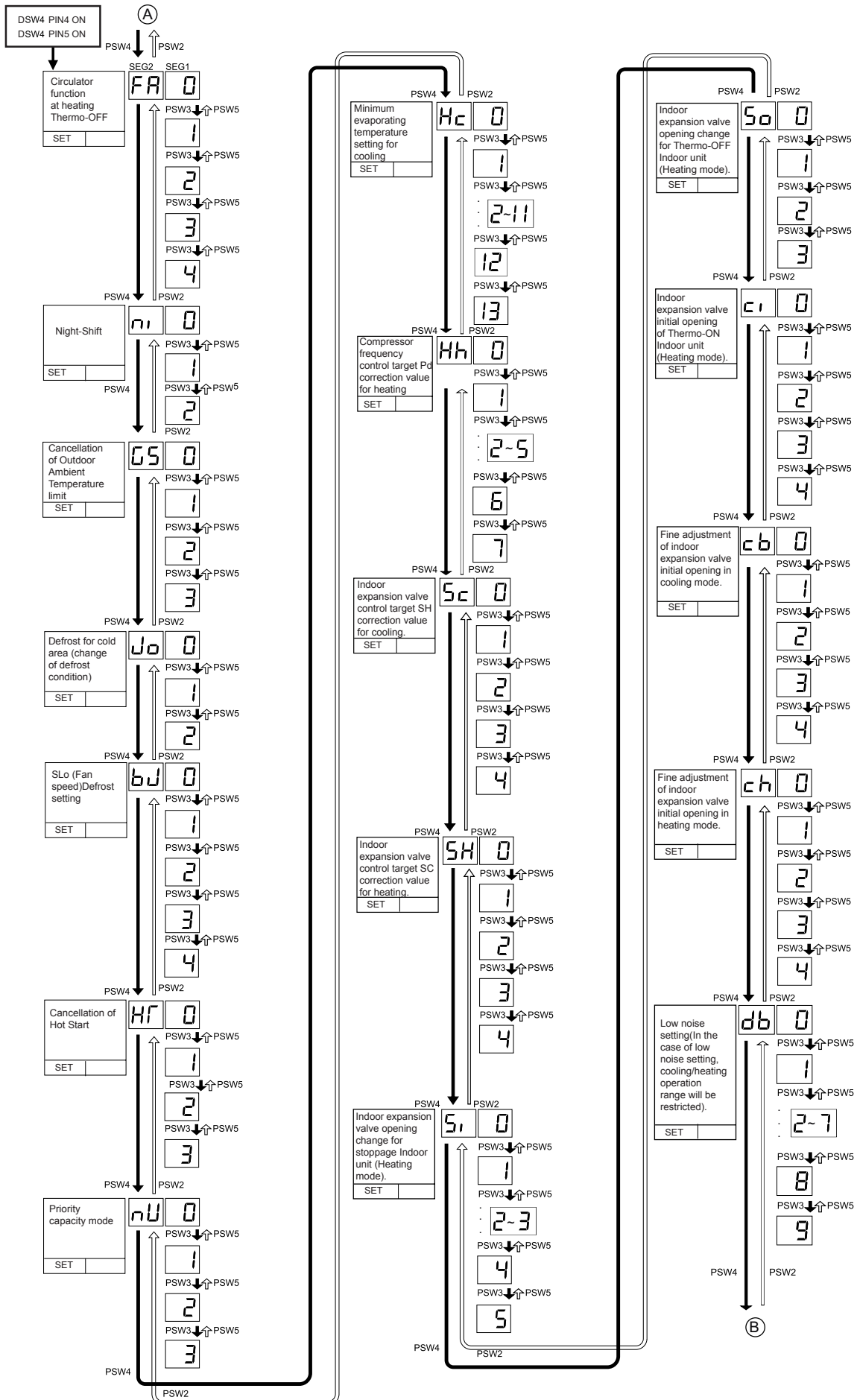
A	Function setting item
B	Setting No.

#### **i** NOTE

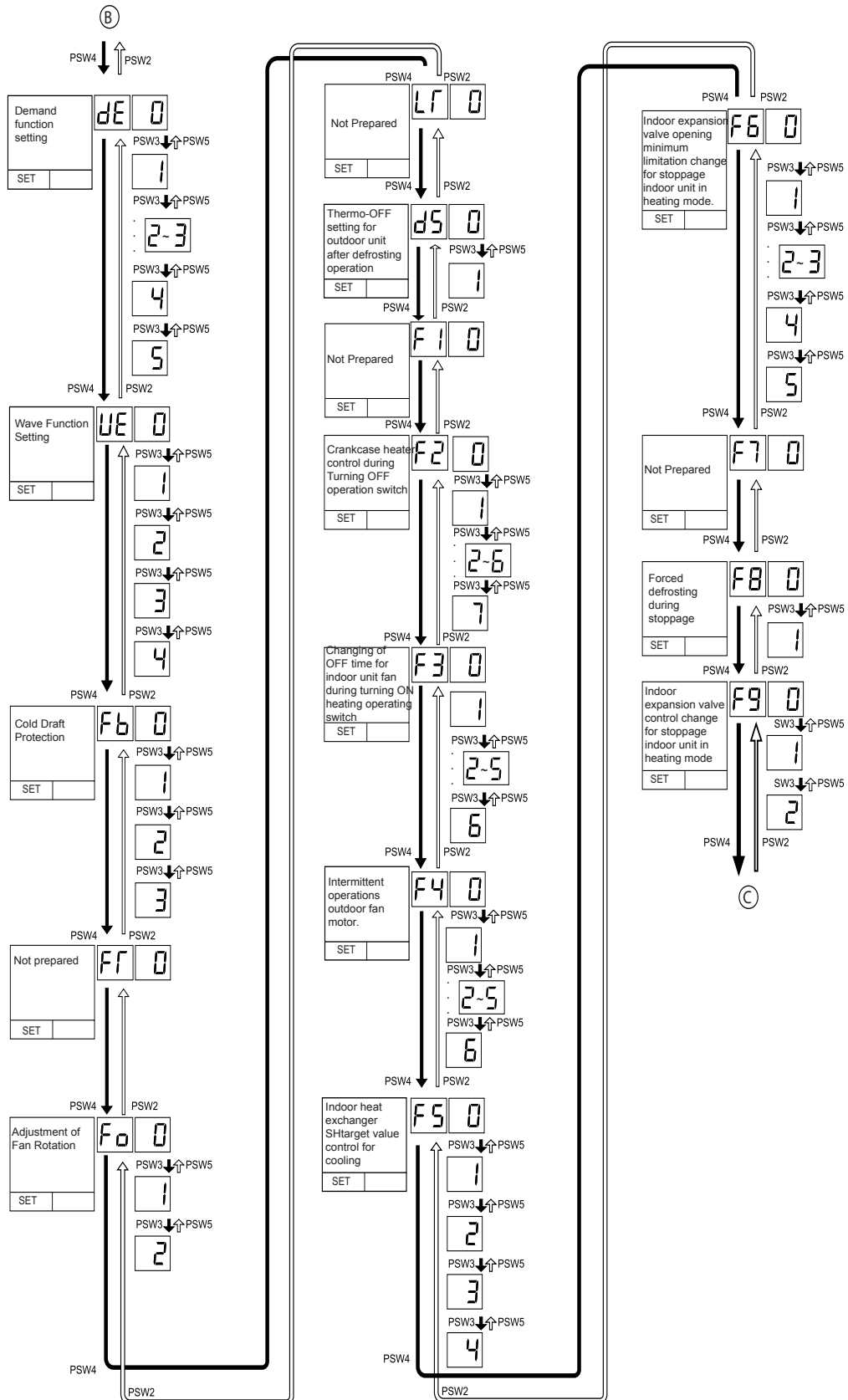
After the setting is completed, check that "Menu" is not shown in the display, otherwise the air conditioner may not operate correctly.

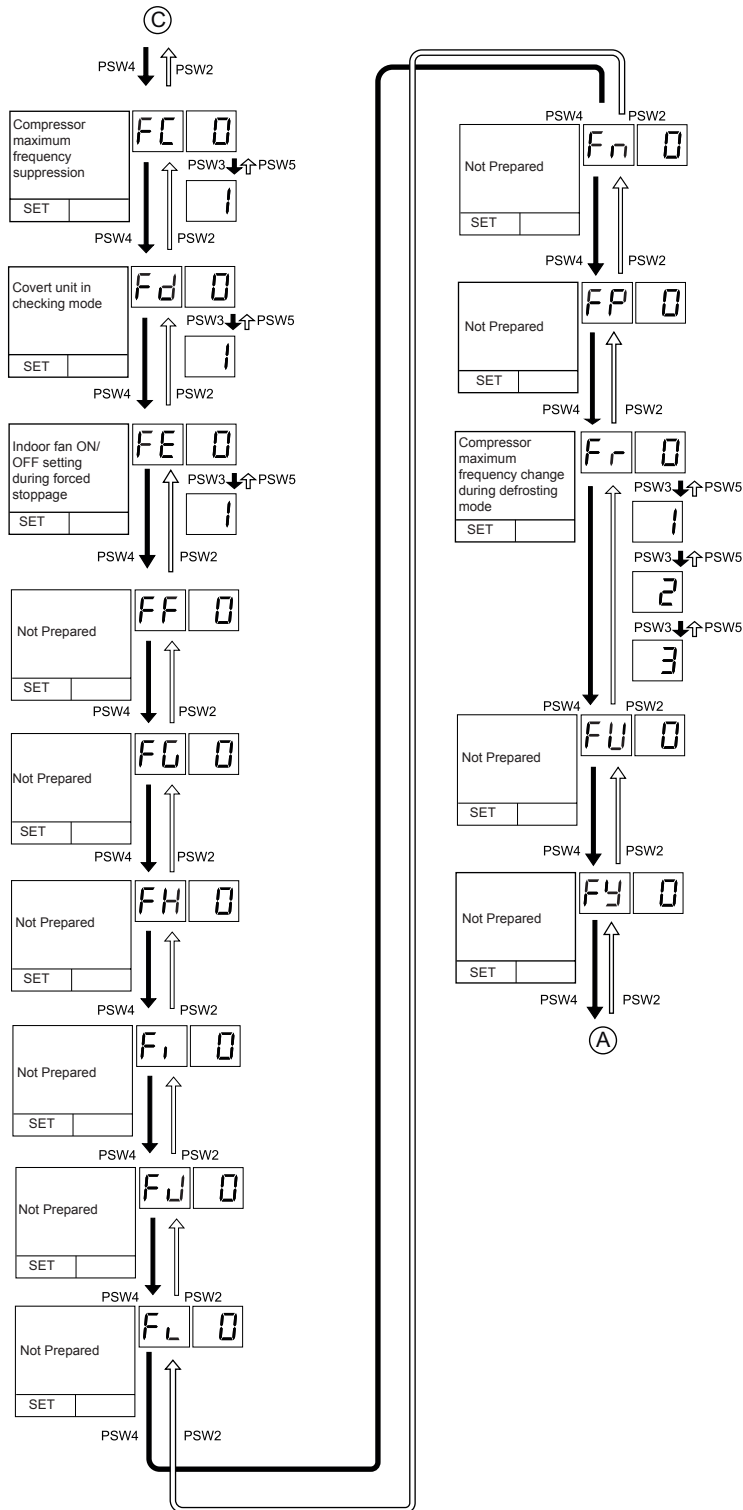
- 2 By pressing PSW2 or PSW4, the function setting item is changed. After selecting the "Function Setting", press PSW3 or PSW5, and then choose the Setting No. The following shows the display changes when PSW is pushed.

Function setting (by 7-segment display)



Function setting (by 7-segment display)





- 3 After selecting the Function Setting, turn OFF DSW4 PIN5. The display will be back to the normal operation. Then turn OFF DSW4-No.4. Confirm if DSW4 is set to factory settings. The selected data is stored in the outdoor unit PCB1 and the "Function Setting" is completed. The stored data is maintained even when the power source is cut OFF.



## 4.3.2 Function setting

No.	Setting Item	7-Segment Display		Contents
		SEG2	SEG1	
1	Circulator function at Heating Thermo-OFF	FR	00	No setting
			01	Indoor unit fan forced ON and OFF (2 min. ON / 6 min. OFF)
			02	Indoor unit fan forced ON and OFF (2 min. ON / 13 min. OFF)
			03	Indoor unit fan forced ON and OFF (2 min. ON / 28 min. OFF)
			04	Indoor unit fan stop
2	Night-Shift	ni	00	No setting
			01	Setting of night-shift 1 (for Cooling / Heating)
			02	Setting of night-shift 2 (for Cooling only)
3	Cancellation of Outdoor Ambient Temperature Limit	OS	00	No setting
			01	For heating
			02	For cooling
			03	For cooling/heating
4	Defrost for Cold Area (Change of Defrost Condition)	Jo	00	No setting
			01	Condition 2 of defrost operation
			02	Not used
5	SLo (Fan Speed)Defrost Setting	bJ	00	Indoor unit fan stop when heating operation is activated/during defrost operation
			01	Indoor unit fan SLo operation during defrost operation
			02	Indoor unit fan SLo operation when heating operation is activated
			03	Fan operation when heating operation is activated/ Indoor fan SLo operation during defrost operation
			04	Indoor unit fan SLo operation when heating operation is activated (including Start Up after Defrost)
6	Cancellation of Hot Start	HF	00	Hot start control is available
			01	Cancellation of hot start
			02	Not used
			03	Not used
7	Priority Capacity Mode	nU	00	No setting
			01	Change of frequency maximum limit value
			02	Change of current limit value
			03	Change of frequency maximum limit value, current limit value and fan speed limit
8	Minimum Evaporating Temperature Setting for Cooling	Hc	00	Initial setting
			01	Minimum 6°C
			02	Minimum 7°C
			03	Minimum 8°C
			04	Minimum 9°C
			05	Minimum 10°C
			06	Minimum 11°C
			07	Minimum 12°C
			08	Minimum 13°C
			09	Minimum 14°C
			10	Minimum 2°C
			11	Minimum 3°C
			12	Minimum 4°C
13	Minimum 5°C			
9	Compressor Frequency Control Target Pd Correction Value for Heating	Hh	00	Initial setting (Pd targeted value 0.00(MPa))
			01	Pd Targeted value -0.15(MPa)
			02	Pd Targeted value -0.10(MPa)
			03	Pd Targeted value -0.05(MPa)
			04	Pd Targeted value -0.03(MPa)
			05	Pd Targeted value +0.03(MPa)
			06	Pd Targeted value +0.05(MPa)
07	Pd Targeted value +0.10(MPa)			



No.	Setting Item	7-Segment Display		Contents
		SEG2	SEG1	
10	Indoor Expansion Valve Control Target SH Correction Value for Cooling	5C	00	Initial setting (SH targeted value +0°C)
			01	SH Targeted value -2°C
			02	SH Targeted value -1°C
			03	SH Targeted value +1°C
			04	SH Targeted value +2°C
11	Indoor Expansion Valve Control Target SC Correction Value for Heating	5H	00	Initial setting (SC targeted value +0°C)
			01	SC Targeted value -6°C
			02	SC Targeted value -3°C
			03	SC Targeted value +3°C
			04	SC Targeted value +6°C
12	Indoor Expansion Valve Opening Change for Stoppage Indoor Unit in Heating Mode	5i	00	Initial setting (stoppage unit expansion valve opening) 0.8~2.0HP: 100~300 pulse, 2.5HP or over: 200~400 pulse
			01	Expansion valve opening: 150~325 pulse
			02	Expansion valve opening 0.8~2.0HP: 175 pulse, 2.5HP or over: 300 pulse
			03	Expansion valve opening 0.8~2.0HP: 100 pulse, 2.5HP or over: 150 pulse
			04	Expansion valve opening 0.8~2.0HP: 90 pulse, 2.5HP or over: 100 pulse
			05	Expansion valve opening 0.8~2.0HP: 40 pulse, 2.5HP or over: 40 pulse
13	Indoor Expansion Valve Opening Change for Thermo-OFF Indoor Unit in Heating Mode	5o	00	Thermo-OFF unit expansion valve opening (150~325 pulse)
			01	Expansion valve opening 0.8~2.0HP: 175 pulse, 2.5HP or over: 300 pulse
			02	Expansion valve opening 0.8~2.0HP: 100 pulse, 2.5HP or over: 150 pulse
			03	Expansion valve opening 0.8~2.0HP: 40 pulse, 2.5HP or over: 40 pulse
14	Indoor Expansion Valve Initial Opening of Thermo-ON Indoor Unit in Heating Mode	c i	00	Initial setting (600~1300 pulse)
			01	Expansion Valve Opening 600~1300 pulse
			02	Expansion Valve Opening 600~650 Pulse
			03	Expansion Valve Opening 0.8~2.0HP: 950 Pulse 2.5 and 3HP or greater: 1500 Pulse
			04	Expansion Valve Opening 0.8~2.0HP: 1440 Pulse 2.5 and 3HP or greater: 2000 Pulse
15	Fine Adjustment of Indoor Expansion Valve Initial Opening in Cooling Mode	c b	00	Initial setting
			01	Cooling operation initial opening -5%
			02	Cooling operation initial opening +3%
			03	Cooling operation initial opening +5%
			04	Cooling operation initial opening +10%
16	Fine Adjustment of Indoor Expansion Valve Initial Opening in Heating Mode	c h	00	Initial setting
			01	Heating operation initial opening -5%
			02	Heating operation initial opening +3%
			03	Heating operation initial opening +5%
			04	Heating operation initial opening +10%
17	Low Noise Setting (In the case of low noise setting, cooling/heating operation range will be restricted.)	db	00	Initial setting
			01	Fan rotation maximum limit 1
			02	Fan rotation maximum limit 2
			03	Fan rotation maximum limit 3
			04	Frequency limit 1
			05	Frequency limit 2
			06	Frequency limit 3
			07	Operation sound value, 5 and 6HP: 74.5dB(A) / 8~14HP: 77.5dB(A) / 6~24HP: 82.5dB(A)
			08	Operation sound value, 6~14HP: 72.5dB(A) / 16~24HP: 77.5dB(A)
			09	Operation sound value, 6~14HP: 69.5dB(A) / 16~24HP: 72.5dB(A)
18	Demand Function Setting	dE	00	No demand control
			01	Demand control 40%
			02	Demand control 60%
			03	Demand control 70%
			04	Demand control 80%
			05	Demand control 100%

No.	Setting Item	7-Segment Display		Contents
		SEG2	SEG1	
19	Wave Function Setting	UE	00	No wave function
			01	Minimum limit 40%
			02	Minimum limit 60%
			03	Minimum limit 70%
			04	Minimum limit 80%
20	Cold Draft Protection (Protection in Decrease in Indoor Temperature for Cooling)	Fb	00	Initial setting
			01	Indoor unit outlet temperature > 10°C
			02	Indoor unit outlet temperature > 12°C
			03	Indoor unit outlet temperature > 14°C
21	Not prepared	Ff	00	-
22	Adjustment of Fan Rotation (To avoid a whining sound for the multiple installation.)	Fo	00	Initial Setting
			01	Change of fan rotation -15rpm
			02	Change of fan rotation -30rpm
23	Not Prepared	Lf	00	-
24	Thermo-OFF Setting for Outdoor Unit After Defrosting Operation	dS	00	No setting
			01	Thermo-OFF stoppage setting for outdoor unit after defrosting operation
25	Not Prepared	F1	00	-
26	Crankcase Heater Control during Turning OFF Operation Switch	F2	00	No setting
			01	Optional Switch OFF for 20 Days
			02	Optional Switch OFF for 15 Days
			03	Optional Switch OFF for 10 Days
			04	Optional Switch OFF for 5 Days
			05	Optional Switch OFF for 3 Days
			06	Optional Switch OFF for 2 Days
			07	Optional Switch OFF for 0 Days
27	Changing of OFF Time for Indoor Unit Fan during Turning ON Heating Operation Switch	F3	00	Initial Setting (Max. 12 minutes)
			01	Max. 3 minutes
			02	Max. 6 minutes
			03	Max. 9 minutes
			04	Max. 15 minutes
			05	Max. 30 minutes
			06	Max. 60 minutes
28	Intermittent Operation of Outdoor Fan Motor	F4	00	No intermittent operation
			01	Set outdoor temperature ≤ 3°C
			02	Set outdoor temperature ≤ 0°C
			03	Set outdoor temperature ≤ 1°C
			04	Set outdoor temperature ≤ 2°C
			05	Set outdoor temperature ≤ 4°C
			06	Set outdoor temperature ≤ 5°C
29	Indoor Heat Exchanger SH Target Value Control for Cooling  (Only for RCI-FSN4 Series)	F5	00	Initial setting (Heat Exchange target value +0°C)
			01	Heat Exchange SH target value +1°C
			02	Heat Exchange SH target value +2°C
			03	Heat Exchange SH target value +3°C
			04	Heat Exchange SH target value +4°C
30	Indoor Expansion Valve Opening Minimum Limitation Change for stoppage indoor unit in Heating Mode	F6	00	Initial Setting (Stoppage Unit Expansion Valve Opening) 0.8HP~2.0HP: 90 Pulse, 2.5~3.0HP or greater: 90 Pulse
			01	Expansion Valve Opening 150~325 Pulse
			02	Expansion Valve Opening 0.8HP~2.0HP: 175 Pulse 2.5HP or greater: 300 Pulse
			03	Expansion Valve Opening 0.8HP~2.0HP: 100 Pulse 2.5HP or greater: 150 Pulse
			04	Expansion Valve Opening 0.8HP~2.0HP: 90 Pulse 2.5HP or greater: 100 Pulse
			05	Expansion Valve Opening 0.8HP~2.0HP: 40 Pulse 2.5HP or greater: 40 Pulse

## Function setting (by 7-segment display)

No.	Setting Item	7-Segment Display		Contents
		SEG2	SEG1	
31	Not Prepared	F7	00	-
32	Forced Defrosting during Stoppage	F8	00	Initial Setting (OFF)
			01	This function is ON.
33	Indoor Expansion Valve Control Change for Stoppage Indoor Unit in Heating Mode	F9	00	SC Control for Stoppage Unit
			01	40 Pulse
			02	SC Control for Operation Unit
34	Compressor Maximum Frequency Suppression	FC	00	Initial Setting (Maximum Frequency: 130Hz)
			01	Maximum Frequency: 110Hz
35	Convert Unit in Checking Mode	Fd	00	Initial Setting (Temp: °F, Pressure: psi)
			01	Temp: °C, Pressure: MPa
36	Indoor Fan ON/OFF Setting during Forced Stoppage	FE	00	Initial Setting (Indoor Unit Fan: OFF)
			01	Indoor Unit Fan: ON
37	Not Prepared	FF	00	-
38	Not Prepared	FG	00	-
39	Not Prepared	FH	00	-
40	Not Prepared	Fi	00	-
41	Not Prepared	FJ	00	-
42	Not Prepared	FL	00	-
43	Not Prepared	Fn	00	-
44	Not Prepared	FP	00	-
45	Compressor Maximum Frequency Change during Defrosting Mode	Fr	00	Initial Setting
			01	Maximum Frequency Setting 1
			02	Maximum Frequency Setting 2
			03	Maximum Frequency Setting 3
46	Not Prepared	FU	00	-
47	Not Prepared	FY	00	-

## ◆ Record settings

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

	Item	SEG2	SEG1	SET
1	Circulator function at Heating Thermo-OFF	FR	0	<input type="text"/>
2	Night-Shift	n i	0	<input type="text"/>
3	Cancellation of Outdoor Ambient Temperature Limit	OS	0	<input type="text"/>
4	Defrost for Cold Area (Change of Defrost Condition)	do	0	<input type="text"/>
5	SLo (Fan Speed)Defrost Setting	bd	0	<input type="text"/>
6	Cancellation of Hot Start	HF	0	<input type="text"/>
7	Priority Capacity Mode	nU	0	<input type="text"/>
8	Minimum Evaporating Temperature Setting for Cooling	Hc	0	<input type="text"/>
9	Compressor Frequency Control Target Pd Correction Value for Heating	Hh	0	<input type="text"/>
10	Indoor Expansion Valve Control Target SH Correction Value for Cooling	SC	0	<input type="text"/>
11	Indoor Expansion Valve Control Target SC Correction Value for Heating	SH	0	<input type="text"/>
12	Indoor Expansion Valve Opening Change for Stoppage Indoor Unit in Heating Mode	S i	0	<input type="text"/>
13	Indoor Expansion Valve Opening Change for Thermo-OFF Indoor Unit in Heating Mode	So	0	<input type="text"/>
14	Indoor Expansion Valve Initial Opening of Thermo-ON Indoor Unit in Heating Mode	c i	0	<input type="text"/>
15	Fine Adjustment of Indoor Expansion Valve Initial Opening in Cooling Mode	cb	0	<input type="text"/>
16	Fine Adjustment of Indoor Expansion Valve Initial Opening in Heating Mode	ch	0	<input type="text"/>
17	Low Noise Setting (In the case of low noise setting, cooling/heating operation range will be restricted.)	db	0	<input type="text"/>
18	Demand Function Setting	dE	0	<input type="text"/>
19	Wave Function Setting	WE	0	<input type="text"/>
20	Cold Draft Protection (Protection in Decrease in Indoor Temperature for Cooling)	Fb	0	<input type="text"/>
21	Not Prepared	FF	0	<input type="text"/>
22	Adjustment of Fan Rotation (To avoid a whining sound for the multiple installation.)	Fo	0	<input type="text"/>
23	Not Prepared	LF	0	<input type="text"/>
24	Thermo-OFF Setting for Outdoor Unit After Defrosting Operation	dS	0	<input type="text"/>
25	Not Prepared	F1	0	<input type="text"/>
26	Crankcase Heater Control during Turning OFF Operation Switch	F2	0	<input type="text"/>
27	Changing of OFF Time for Indoor Unit Fan during Turning ON Heating Operation Switch	F3	0	<input type="text"/>
28	Intermittent Operation of Outdoor Fan Motor	F4	0	<input type="text"/>
29	Indoor Heat Exchanger SH Target Value Control for Cooling (Only for RCI-FSN3 Series)	F5	0	<input type="text"/>

Item		SEG2	SEG1	SET
30	Indoor Expansion Valve Opening Minimum Limitation Change for stoppage indoor unit in Heating Mode	F6	0	<input type="text"/>
31	Not Prepared	F7	0	<input type="text"/>
32	Forced Defrosting during Stoppage	F8	0	<input type="text"/>
33	Indoor Expansion Valve Control Change for Stoppage Indoor Unit in Heating Mode	F9	0	<input type="text"/>
34	Compressor Maximum Frequency Suppression	FC	0	<input type="text"/>
35	Convert Unit in Checking Mode	Fd	0	<input type="text"/>
36	Indoor Fan ON/OFF Setting during Forced Stoppage	FE	0	<input type="text"/>
37	Not Prepared	FF	0	<input type="text"/>
38	Not Prepared	FG	0	<input type="text"/>
39	Not Prepared	FH	0	<input type="text"/>
40	Not Prepared	Fi	0	<input type="text"/>
41	Not Prepared	FJ	0	<input type="text"/>
42	Not Prepared	FL	0	<input type="text"/>
43	Not Prepared	Fn	0	<input type="text"/>
44	Not Prepared	FP	0	<input type="text"/>
45	Compressor Maximum Frequency Change during Defrosting Mode	Fr	0	<input type="text"/>
46	Not Prepared	FU	0	<input type="text"/>
47	Not Prepared	Fy	0	<input type="text"/>

#### 4.3.4 Circulator function at heating Thermo-OFF (FA)

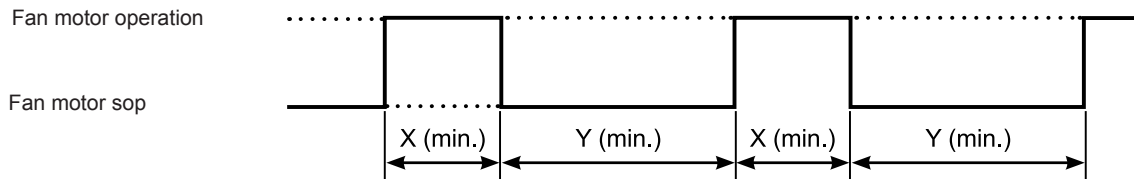
Press PSW3 and select the setting of the condition “0” to “4” of the indoor unit fan control during the Thermo-OFF in heating mode “F<sub>H</sub>”.

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.



#### Contents of Function Setting Item “FA”

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

#### NOTE

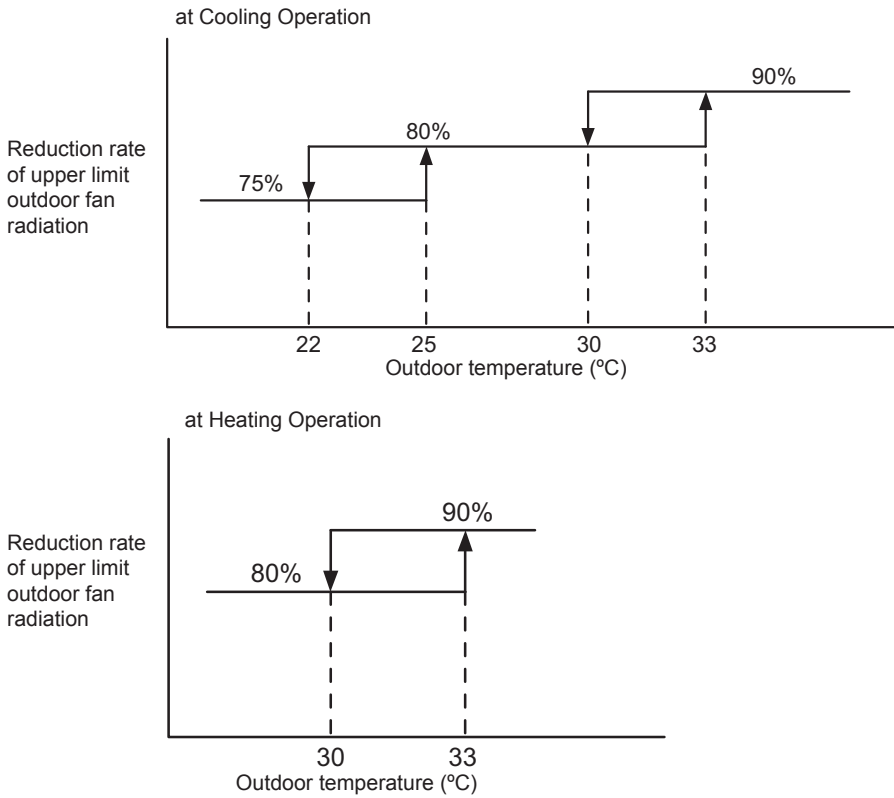
In case using the function setting No.2 to 4, install the remote sensor (THM-R2A: Optional). Because the time period of stopping the indoor fan becomes longer, the detected value of the suction air thermistor for indoor unit becomes high, and it may take time to Thermo-ON.

#### 4.3.5 Night-shift (low noise)(ni)

Press PSW3 and select the setting for condition “1” or “2” of the night shift (low noise) “*n*” consequently, the function can be set. “*n*”=1 reduces the upper limit of the outdoor fan rotation and the compressor frequency as shown below in any operation. “*n*”=2 is adapted only for cooling operation. In heating operation, “*n*”=2 is same as “*n*”=0.

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.

“ <i>n</i> ” Setting Condition	Operation	Reduction Rate of Maximum			
		Outdoor Fan Rotation		Compressor Frequency	
		Cooling (Including Dry Operation)	Heating	Cooling (Including Dry Operation)	Heating
0	No Effect (Default Setting)	Not Changed (=100%)	Not Changed (=100%)	Not Changed (=100%)	Not Changed (=100%)
1	Night Shift1	Shown as below	Shown as below	60%	60%
2	Night Shift2 (only for Cooling)	Shown as below	Not Changed	60%	Not Changed



**i** 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.

**4.3.6 Cancellation of the outdoor ambient temperature limit (GS)**

Press PSW3 and select the setting condition “0” to “3” at the cancellation of outdoor ambient temperature limit of 5. 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.

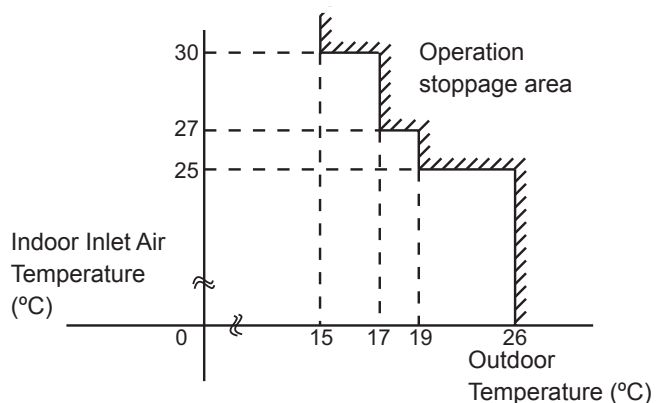
Setting condition	Operation mode for cancellation
0	Not available (default setting)
1	Heating
2	Cooling
3	Heating/Cooling

◆ Heating operation

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

**i** 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.

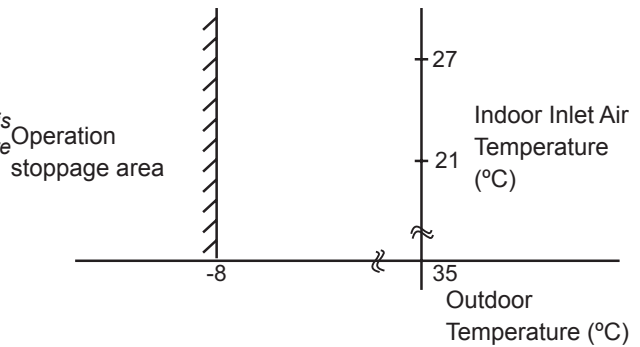


◆ Cooling operation

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

**i** 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

**4.3.7 Defrost for cold area (Jp)**

Press PSW3 and select the setting condition "1" at the defrost for the cold area "Jp". to change the temperature condition for starting defrost operation

Setting condition	Standard specifications	Cold area specifications
	When change of defrost condition is not set "Jp=0"	When change of defrost condition is set "Jp=1"
Temperature conditions under defrosting operation		
	<p>A: Outdoor evaporation temperature (pipe) (°C)                      B: Defrost operation in the stop area.                      C: Outdoor temperature (°C)                      D: Defrost operation in the start area.</p>	



### 4.3.8 SLo defrost setting (bJ)

Press PSW3 and select the settings condition “0” to “4” 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
2	SLo Speed	STOP	STOP
3	SLo Speed	SLo Speed	SLo Speed
4	SLo Speed	STOP	SLo Speed

#### NOTE

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

### 4.3.9 Priority capacity mode setting (nU)

Press PSW3 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.

Setting condition	Compressor frequency and current operation
0	Default setting
1	Compressor Frequency Limit is Set Higher
2	Compressor Frequency Limit and Current Limit are Set Higher
3	Compressor Frequency Limit, Current Limit and Fan Speed Limit are Set Higher

### 4.3.10 Low noise setting (db).

Press PSW3 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 (targeted value)	Outdoor unit capacity (to specification)
		Standard Type: <18HP High Efficiency Type: 14HP	Standard Type: >20HP High Efficiency Type: >16HP		
0	Not changed	Not changed		Catalog value	100%
1	Not changed	20 steps	20 steps	-	-
2	Not changed	18 steps	17 steps	-	-
3	Not changed	16 steps	16 steps	-	-
4	80%	Not changed		-	-
5	60%	Not changed		-	-
6	40%	Not changed		-	-
7	80%	20 steps	20 steps	Setting 1: 5HP, 6HP: 74.5dB (A) 8HP to 14HP: 77.5dB (A) 16HP to 24HP: 82.5dB (A)	80%
8	60%	18 steps	17 steps	Setting 2: 50 dB(A) 5HP to 14HP: 72.5dB (A) 16HP to 24HP: 77.5dB (A)	60%
9	40%	16 steps	15 steps	Setting 3: 45 dB(A)	40%

### 4.3.11 Demand function setting

Press PSW3 and select the settings for conditions “0” to “5” to set the demand function “ $\Delta E$ ”. 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.



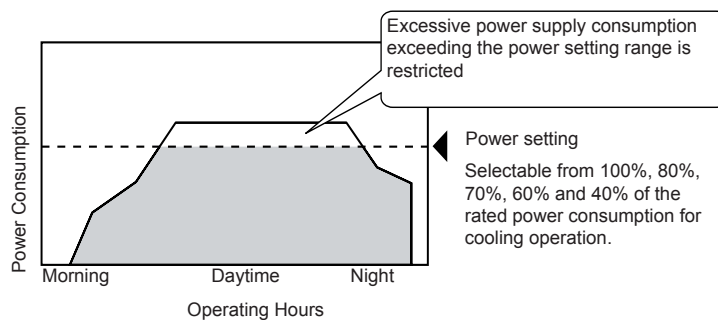
#### NOTE

- 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 No. “10” is given.
- In the case that the demand current control by external input is set and the external input signal is available, this function is not available even when the demand current control by external input signal is performed.

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

#### Demand control

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



**i** NOTE

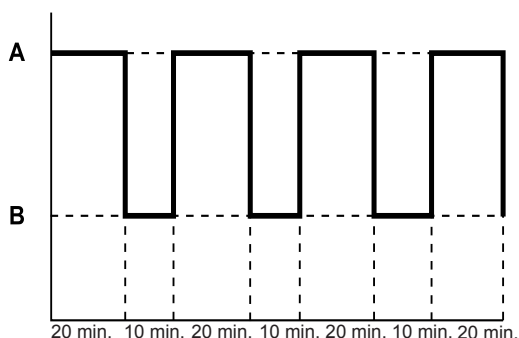
- The demand current control (%) is value criterion. The value used for this control is calculated from the current, and therefore is different from the value indicated by a wattmeter. If it is required that the maximum power consumption is managed precisely, a field-supplied demand controller should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

**4.3.12 Wave function setting (UE)**

Press PSW3 and select the settings condition “0” to “4” to set wave function setting “UE”. The maximum running current limit changes from 40% to 80%, as shown in the attached figure.

**i** NOTE

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



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

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

**i** 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.

**4.3.13 Cold draft protection (Fb)**

Press PSW3 and select the setting condition “0” to “3” to set the cold draft protection “Fb”. When the indoor unit discharge air temperature drops falls down at cooling operation, the outdoor unit fan stops and the compressor frequency decreases to prevent a drop in discharge air temperature. If the outlet temperature decreases and the temperature is less than Thermo-OFF condition even after the compressor frequency decreases, the indoor unit becomes Thermo-OFF condition. (When Thermo-OFF is activated under this condition, the operation will be restarted after 3 minutes).

**i** 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	10 °C	7 °C
2	12 °C	9 °C
3	14 °C	11 °C

#### 4.3.14 Adjustment of fan rotation (Fo)

Press PSW3 and select the setting condition “0” or “2” to set the fan rotation setting “F<sub>α</sub>”.

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

Setting condition	Adjustment of fan rotation
0	Not available (default setting)
1	-12 rpm
2	-24 rpm



#### NOTE

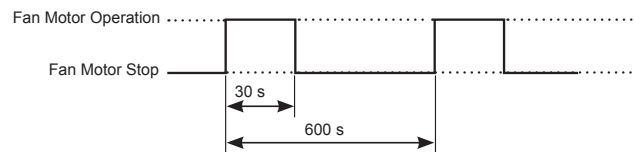
By setting this function, the outdoor fan rotation is slightly reduced, so the outdoor unit capacity may decrease and the operation range may be limited.

#### 4.3.15 Outdoor fan motor intermitted operation setting (F4)

Press PSW3 and select the setting condition “0” to “6” to set the outdoor fan intermitted operation setting “F<sub>4</sub>” (auxiliary function) to protect the outdoor fan motor from snow.

When the outdoor temperature (selectable from 3°C, 0°C, 1°C, 2°C, 4°C and 5°C) reaches the setting temperature, the setting temperature, all the outdoor fan motors start intermittent operation. When the outdoor temperature is at least 5°C higher than the setting temperature, the outdoor fan motors stop operating.

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



#### NOTE

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



#### DANGER

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

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

## 4.4 Power saving function from wired controller

### 4.4.1 Power Saving Guide

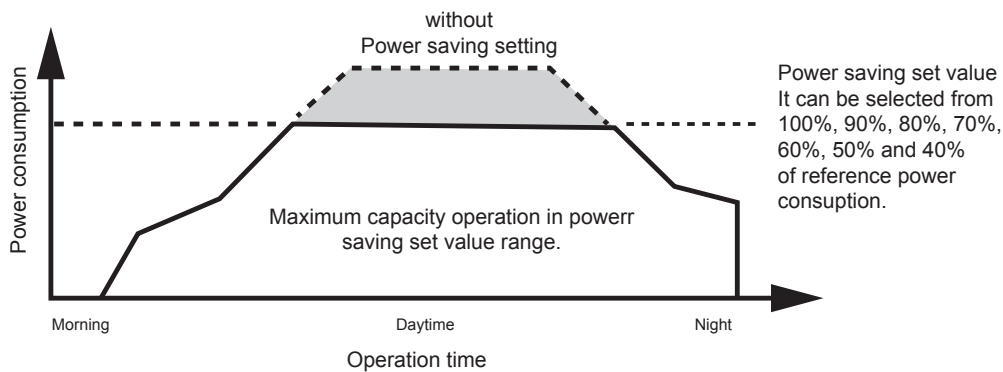
Press “ECO” button then the power saving guide will be displayed to support the setting. Easy access to the confirmation and setting screen from the current setting status screen.

### 4.4.2 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.

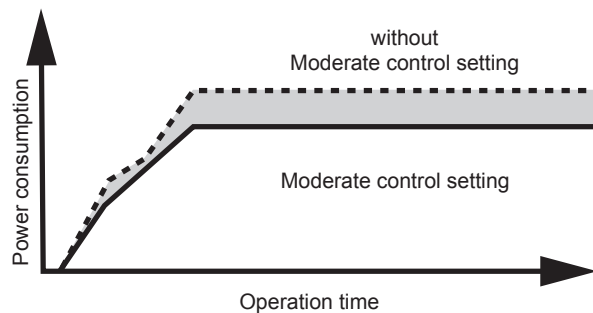


#### **i** NOTE

- 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.

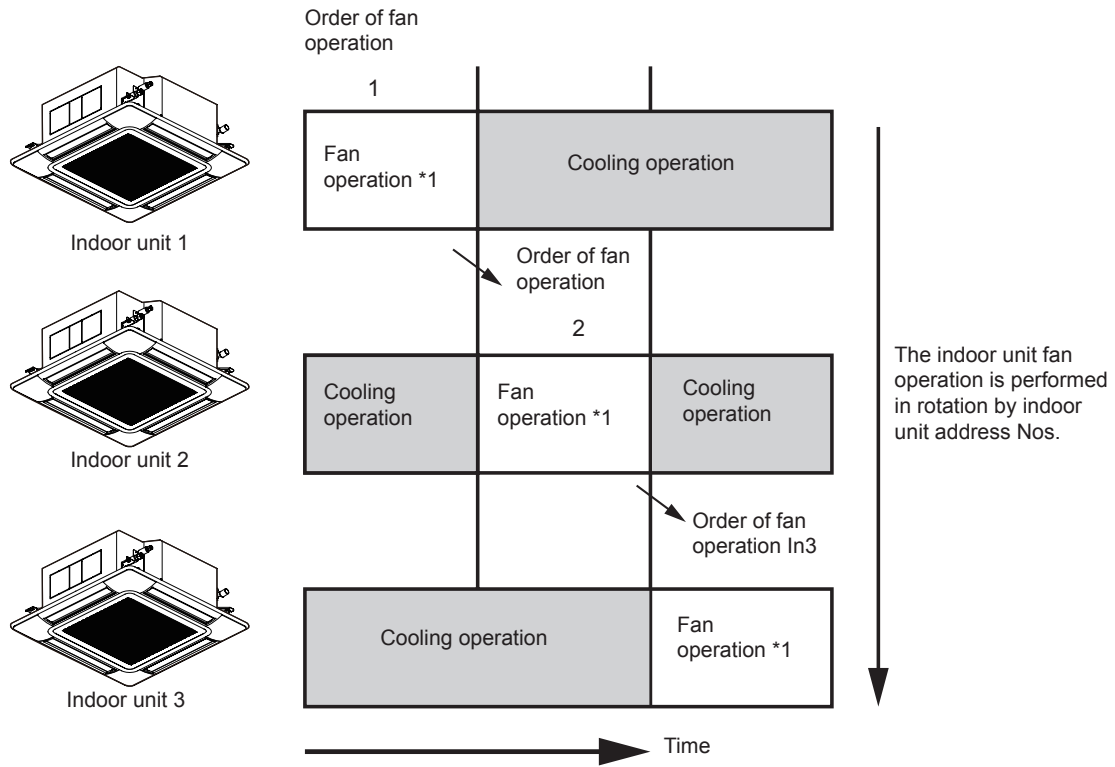


#### **i** NOTE

- 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.

### 4.4.3 Rotation control function

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

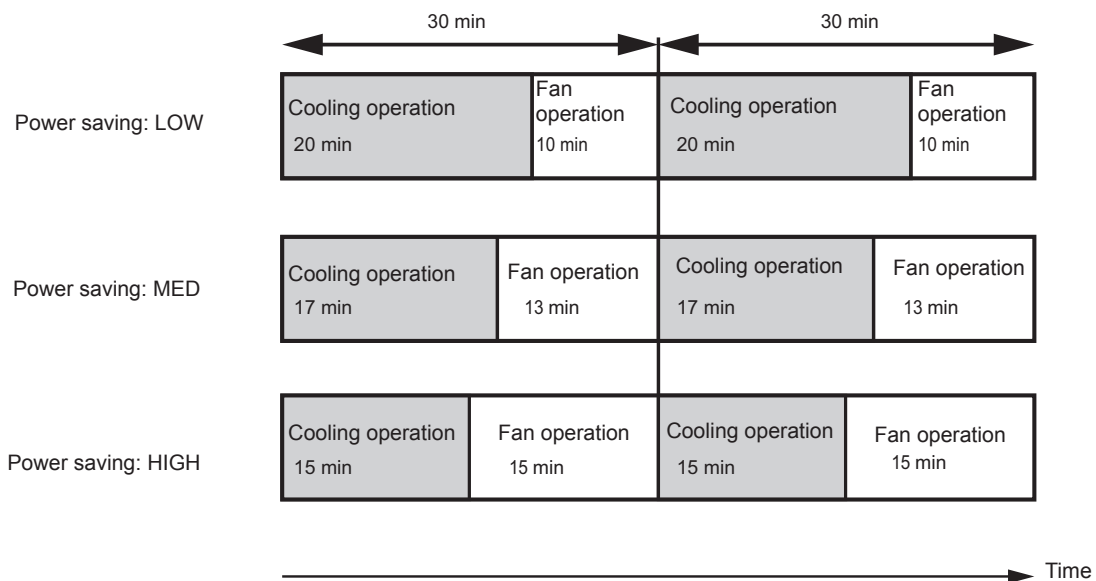


**i** NOTE

- (\*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.

### 4.4.4 Intermittent control function

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

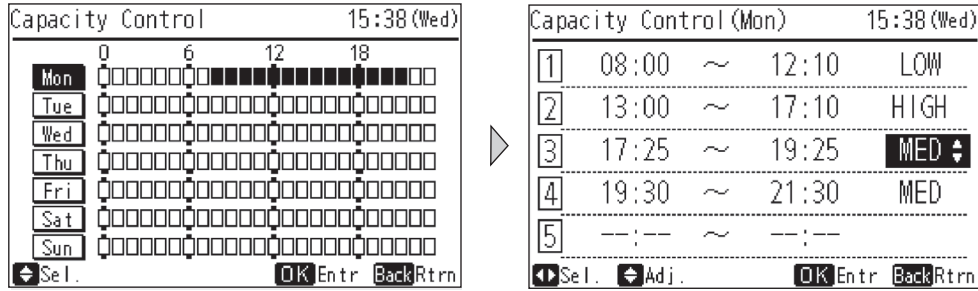


**i** NOTE

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

### 4.4.5 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.

### 4.4.6 Operation noise reduction schedule function

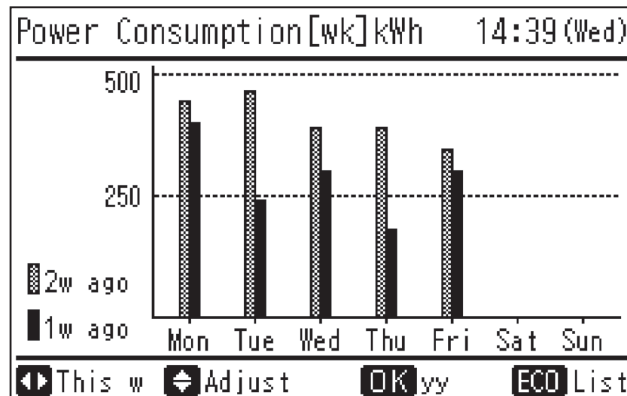
The operation noise reduction schedule function is utilized to set the operation noise reduction schedule up to five settings a day each day of the week.

**i** NOTE

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

### 4.4.7 Operation noise reduction schedule 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.



**i** NOTE

The power consumption for outdoor unit compressor will be displayed.







# 5 . Test run

## Index

5.1	Preliminary checks .....	96
5.2	Before the test run.....	97
5.3	Test run using the PC-ARFPE remote control switch (example).....	98
5.4	Test run from the outdoor unit .....	100
5.5	Checking at test run .....	102
5.6	Reset for accumulated operation time of compressor 1-2 (cU1-cU2) .....	103
5.7	Setting of forced open valve mode.....	104
5.8	Refrigerant cycle checklist.....	106
5.9	Test run check list.....	109

## 5.1 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. As with the test run for the indoor unit, check the Installation and maintenance manual for the indoor unit and the CH unit.**

- Make sure that the refrigerant pipes and the communication cables between the outdoor and indoor units are connected to the same refrigerant cycle. Failure to do so could lead to abnormal operations or a serious accident. Check that the setting of the refrigerant cycle DSW (DSW1 and RSW1 on outdoor units, DSW5 and RSW2 on indoor units) and of the unit number (DSW6 RSW1) 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: TB2 1, 2, 3, 4 / Indoor unit: TB2 1, 2, A, B / CH unit: TB2 1, 2, 3, 4).
- Check that all the cables, L1, L2, L3 and N (R, S and T) are correctly connected to the power supply line. If they are not correctly connected, the unit will not work and the remote control will indicate alarm code "05". When this happens, check and change the phase of the power supply line according to the sheet on the back of the service cover.

### CAUTION

*Make sure that the unit's main power supply line switch has been on for more than 12 hours, to heat the compressor oil with the heating resistors.*

- If several base units have been combined, stick the main unit label in a visible place (outdoor unit 1), so outdoor unit A can be easily identified. Do not stick the main label on the secondary unit (outdoor units 2 and 3).

### NOTE

- *Make sure the electric components in the installation (earth leakage breaker, circuit breaker, cables, connectors and cable terminals) have been selected correctly in line with the electrical data given in this Manual. Also ensure that these components meet the local and national codes.*
- *Use shielded cables (> 0.75 mm<sup>2</sup>) for the communication installation wiring to avoid electromagnetic noise (the shielded cable must have a total length shorter than 1000 m, and its size must comply with local codes).*
- *Check the connection of the power supply wiring terminals (terminals "L1 to L1 (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.*

## 5.2 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. RSW, DSW and LED functions, see "RSW, DSWs and LEDs functions" in chapter 8.
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. <ul style="list-style-type: none"> <li>• Alarm "03" or "05" will be displayed on the remote control LCD screen.</li> <li>• Alarm "03" or "05" will be displayed on the outdoor unit 7 segment display.</li> </ul> Check the power phase in accordance with the caution label located near the terminal board of the outdoor unit or on the back side of the service cover.
9	Turn ON crankcase heater **	Once items 1 to 8 have been completed, turn ON power supply to the outdoor unit. The electricity is provided to the crankcase heater to heat the compressor. The compressor may be damaged if not pre-heated. Therefore, the compressor must be activated after the power supply is turned ON for at least 12 hours.
10	Indoor and outdoor temperature	To be used with cooling and heating operation: Is the indoor temperature 27 °C DB or lower during the heating operation? (The heating operation may not be operated due to the activation of the operating overload prevention with an ambient temperature of 19 °C or over). In order to carry out the operational test, set the test mode via the remote control.

### NOTE

#### \* Insulation resistance

In the case that the unit has been turned OFF for large periods of time, the insulation resistance may be reduced to 1 MΩ or less because the refrigerant is maintained in the compressor. Check the following points.

- 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).

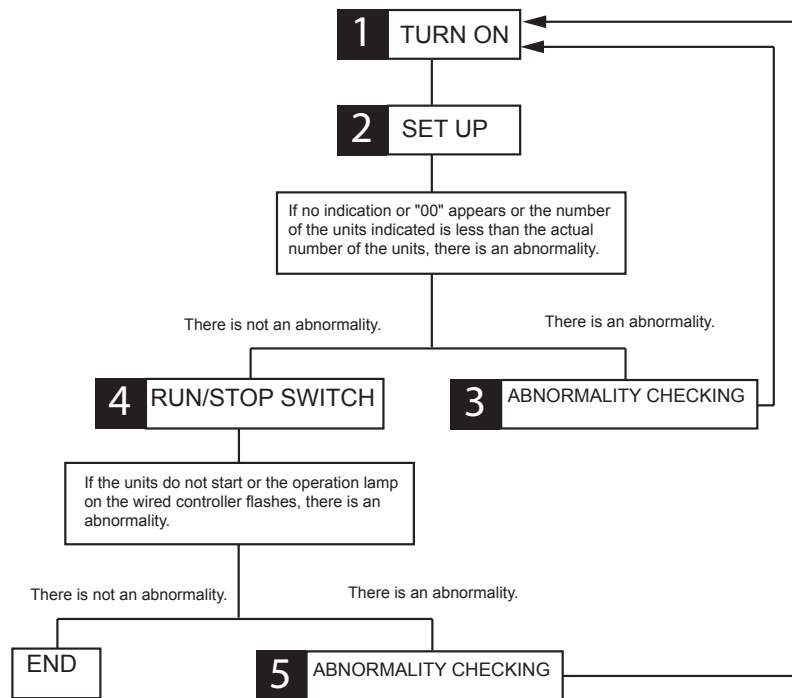
Before connecting the circuit breaker, check the rated capacity.

#### \*\* 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, turn ON the power supply to the outdoor unit, wait 30 seconds and press PSW5 on PCB1 of the outdoor unit for at least 3 seconds. The forced Thermo-OFF function (d1-22) will be cancelled and the operation of the compressor will be available.

### 5.3 Test run using the PC-ARFPE remote control switch (example)



#### Step 1

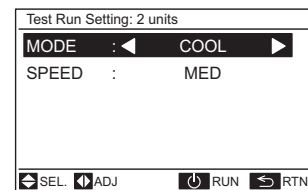
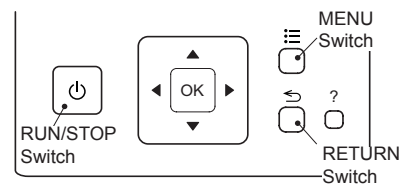
Turn ON the power source of the indoor and outdoor units.

#### 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.



#### **i** NOTE

For other remote control switches such as PC-AWR, PC-ARH, 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).

#### **i** 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 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.

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). (*)
The operation lamp flashes. (1 time/2 sec.)	The unit does not start.	The connection of remote control cable is incorrect.	2. Screw fastening of each terminal board. 3. Connecting order of power line between indoor units and outdoor unit.
Other alarm codes or indications than those above (Refer to the alarm code table.)	The unit does not start, or starts once and then stops.	The connection of the thermistors or other connectors are incorrect. Tripping of protector exists, or else.	Check the unit by the alarm code table in the service manual (by authorized service persons only).
The operation lamp flashes. (1 time/1 sec.) And the Unit No. 00. Alarm Code dd and Unit Code E.00 flash.	The unit does not start.	The connecting wires of operating line are incorrect or loosened.	Check the unit by the alarm code table in the service manual (by authorized service persons only).

(\*) Procedures for recovery when transmitting circuit fuse is blown out:


- a. Correct the wiring for the terminal board.
- b. Setting positions of the model code are shown below.

Indoor unit PCB	Outdoor unit PCB
DSW7	DSW10
	

After checking procedure back to Step 1.




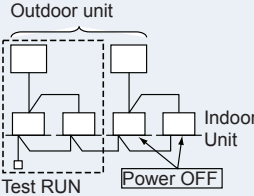



## 5.4 Test run from the outdoor unit

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):

DSW4	
Switch for setting of service operation and function	
	<ol style="list-style-type: none"> <li>1 Test run</li> <li>2 COOL / HEAT setting (ON: heating mode) (OFF: heating mode)</li> <li>3 OFF (fixed)</li> <li>4 Manual compressor OFF</li> <li>5 Function selection</li> <li>6 External input signal selection</li> </ol>

### 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 DSW4 OFF when the test run operation is completed.

	Setting the DSW	Operation	Remarks
Test run	<p>1. Setting the operation mode.</p>  <p>Cooling: Set DSW4 PIN2 OFF</p>  <p>Heating: Set DSW4 PIN2 ON</p> <p>2. Start of the test run.</p> <p>Set DSW4-PIN1 ON and the operation starts after approximately 20 seconds.</p>  <p><b>NOTE</b></p> <p><i>In the heating mode, leave DSW4-PIN2 in the ON position.</i></p>	<p>1. The indoor unit automatically starts operating when the test run of the outdoor unit is set.</p> <p>2. The ON/OFF can be performed from the remote control or DSW4 PIN1 on the outdoor unit.</p> <p>3. The operation continues for 2 hours without Thermo-OFF.</p>	<p>Note that the indoor units operate in conjunction with the test run operation of the outdoor unit.</p> <p>If the test run is started from the outdoor unit and stopped from the remote control switch, the test run function of the remote control switch is cancelled. However, the test run of the outdoor unit is not cancelled. Check that DSW4 PIN1 of the outdoor unit PCB1 is turned OFF.</p> <p>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.</p>  <p>The setting of DSW4 is not required for the test run from the remote control switch.</p>
Manual OFF of the compressor	<p>1. Setting. Compressor manual OFF set DSW4 PIN4 to the ON position.</p>  <p>2. Reset. Compressor ON: set DSW4 PIN4 in the OFF position.</p> 	<p>1. When DSW4 PIN4 is ON during the compressor operation, the compressor stops operating immediately and the indoor unit is under the condition of Thermo-OFF.</p> <p>2. When DSW4 PIN4 is OFF, the compressor starts to operating after the cancellation of 3-minutes guard.</p>	<p>Do not repeat the compressor ON/OFF with frequency.</p>
Manual defrost	<p>1. Manual defrost operation. Press PSW5 for more than 3 seconds during the heating operation, and the defrosting operation is started after 2 minutes. This function is not available within 5 minutes after starting heating operation.</p> <p>2. Manual defrost operation completion. Defrosting operation automatically ends and the heating operation restarts.</p>	<p>1. Defrost operation is available regardless of the frost condition and total time of the heating operation.</p> <p>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 .</p>	<p>Do not repeat defrosting operation frequently.</p> <p>When manual defrosting operation is accepted by PSW5, the time left before starting defrosting operation is indicated on the 7-segment indicator on the PCB.</p>  <p>Time left (Every 4 seconds)</p>

When the test run operation is completed, turn all the switches of DSW4 OFF.

- 1 If the remote control switch is set to a different mode, the test run function will not start. In this case, perform the following actions before the test run.
  - Wired remote Control Switch: STOP
  - Central Station: STOP and Remote Control Switch is available mode.
  - COOL/HEAT Changeover Switch: Connector (CN17) of outdoor unit PCB is opened.
  - During the test run mode, do not control the 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.

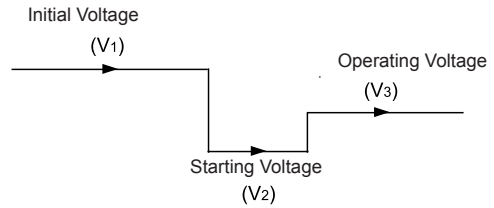
## 5.5 Checking at test run

- 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 (V<sub>2</sub>).

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  $\leq \pm 10\%$
- Starting voltage (V<sub>2</sub>): rated voltage  $\geq -15\%$
- Operating voltage (V<sub>3</sub>): rated voltage  $\leq \pm 10\%$
- Imbalance voltage between phase:  $\leq 3\%$



- 3 Normal operating pressure.

Normal operating suction pressure is 0.2 at 1.1 MPa and the normal operating discharge pressure is 1.0 at 3.5 MPa when the refrigerant charge quantity is correct. Check the operating pressure in the test run mode.

- 4 High pressure switch.

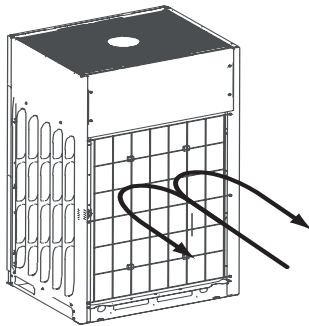
Check the operating pressure of the high pressure switch in the following table.

Refrigerant	Operating pressure
R410A	4.15 MPa

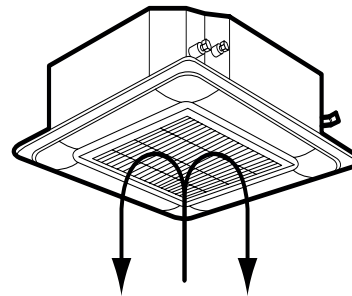
- 5 High pressure increase retry (protection control)

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

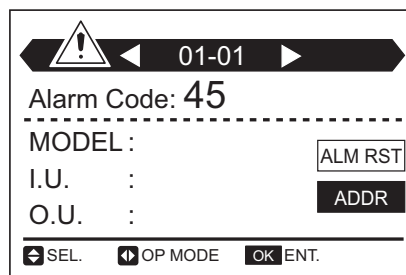
Cover the air inlet of the outdoor unit during the cooling operation



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



- b. When the high pressure retry control is activated, alarm code "P 13" will be indicated on the 7 segment display of the outdoor unit 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.




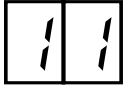
## 5.6 Reset for accumulated operation time of compressor 1-2 (cU1-cU2)

There are accumulated operation time of compressor after maintenance and after starting operation. The following procedure shows how to reset the accumulated operation time of compressor after maintenance. Perform it for each outdoor unit.

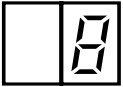

### ◆ Procedure

Press PSW1 and PSW3 for 5 seconds while the accumulated operation time of compressor data is displayed. The accumulated operation time of compressor is reset.



### ◆ Example of compressor 1

  Press PSW4 to display the accumulated operation time of the compressor 1. (Press PSW2 to return to the indication "cU1".)

PSW4 ↑↓ PSW2

  Press PSW1 and PSW3 for 5 seconds while the accumulated operation time is displayed



  The indication will be changed to "0".  
(The accumulated operation time of compressor 1 is reset)

### NOTE

*In the case of the combined units (26HP to 96HP), reset the accumulated operation time is required for each outdoor units.*

## 5.7 Setting of forced open valve mode

This mode is utilized to simplify the refrigerant recovery work, refrigerant evacuation work and air tight test during servicing by fully opening the expansion valves of outdoor unit (EVO, EVB) and the expansion valve of indoor unit (EVI), and opening the solenoid valve of outdoor unit (SVA).

### Example. Refrigerant recovery work during servicing

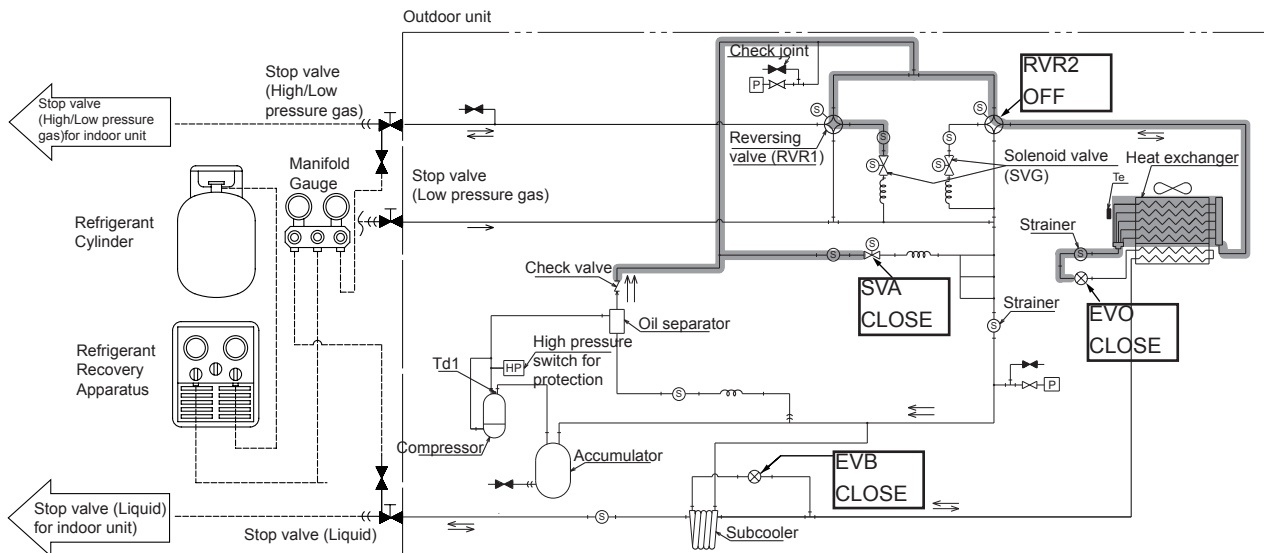
The following figures indicate the outdoor unit cycle condition when the power source of outdoor unit is cut off with fully closed EVO.

Recovering refrigerant from the access port of gas stop valve and liquid stop valve under the condition above is incapable because the path of the heat exchanger ( ) is blocked.

The following valves are forcibly opened during the "Forced Open Valve Mode" is activated.

- Expansion Valve for Outdoor Unit (EVO)
- Expansion Valve for Outdoor Unit Subcooling Heat Exchanger Bypass (EVB)
- Solenoid Valve for Outdoor Unit High-Low Pressure Bypass (SVA)
- Expansion Valve for Indoor Unit (EVI)

### FSXN(S/P)E - Heat Recovery



### **i** NOTE

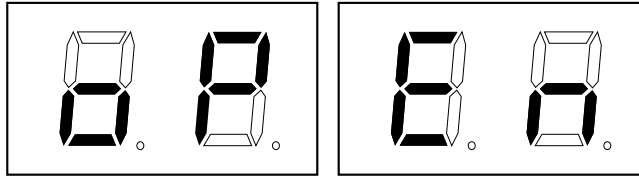
There might be the possibility that the refrigerant recovery work for outdoor unit (when exchange the cycle parts of outdoor unit, etc.) is not successfully completed if not activate the "Forced Open Valve Mode". Make sure to activate this mode when conduct refrigerant recovery work for outdoor unit.

### 1 Applicable Unit

Outdoor Unit (Main Outdoor Unit: Unit A). The mode is adopted to the sub outdoor units automatically if the mode is set to the main outdoor unit.

### 2 Setting Procedure

Turn ON the DSW4 PIN4 of the main outdoor unit (unit A) and press PSW4 (▼) for 3 seconds. When this mode is activated, "oPEn" is indicated on the 7-segment display of the outdoor unit.



### 3 Cancellation

Turn OFF the DSW4 PIN4 of the main outdoor unit (unit A). Make sure the indication "oPEn" on the 7-segment display is turned off after cancellation.

#### NOTE

- Make sure to cancel this mode after refrigerant recovery work, refrigerant evacuation work and air tight test is completed.
- The cooling operation (include dry operation), heating operation and fan operation for indoor unit, and fan operation for outdoor unit are not available during this mode is activated or for 50 seconds after cancellation (Stoppage Cause Code: d1-10). (Fan operation is available if the function setting FE = 1 is set. Refer to 6.2.2, item "Demand stoppage (Control function n° 3) Forced stoppage (Control function n° 5)" for the detail.)
- Make sure to turn ON the power supply of indoor unit and outdoor unit when activate this mode. Expansion valve and solenoid valve are not activated if the units are not supplied with power.
- The "Forced Open Valve Mode" will not be functioning properly when expansion valve or solenoid valve is failed.
- DO NOT activate this mode for the objective other than refrigerant recovery work, refrigerant evacuation work and air tight test. Otherwise, it may cause unit failure because the operation is stooped by different from normal control.

## 5.8 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	<b>Combination of base units</b> Is the setting of DSW6 correct for the outdoor unit number?	
2	Are the power source wire and the transmission wire separated from the refrigerant pipes?	
3	Is the earth wire connected?	
4	Is there any short-circuit?	
5	Is there any voltage anomaly between each phase? (R-S, S-T, T-R)	

### 2 Refrigerant cycle

#### a. Operation (cooling/heating)

No.	Check item	Result
1	Start-up all the units ("TEST RUN" mode).	
2	Start-up all the indoor units in HIGH speed.	
3	In the case that the constant speed compressor is repeatedly turned ON and OFF, turn off the indoor unit (small capacity).	

#### b. Data samples (cooling/heating, indoor temperature 21 – 30 °C)

No.	Check item	Result
1	Check the operating data after it has been operating for 20 minutes.	
2	Check Pd and Td. Is Td-SH between 15 and 45 °C?	
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).

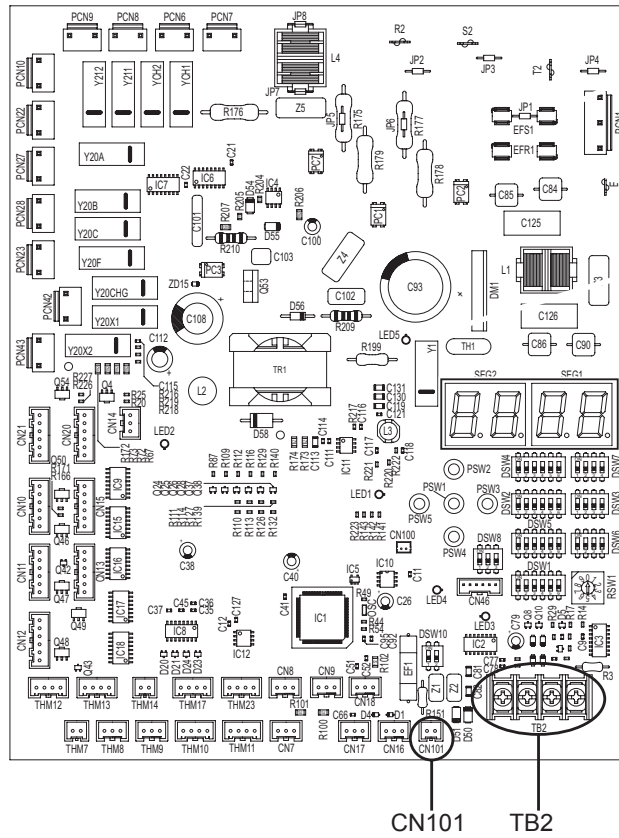
No.	Check item	Standard	Causes	Result
1	Is the fan currently operating when Fo (airflow rate of outdoor unit fan) is not "0"?	—	<ul style="list-style-type: none"> <li>Fan motor failure</li> <li>PCB1 failure</li> <li>Condenser failure</li> </ul>	
2	Is TL (indoor unit heat exchanger liquid pipe temperature) lower than Ti (Indoor unit air inlet temperature)?	It is normal when TL-Ti < -5 °C.	<ul style="list-style-type: none"> <li>TL thermistor failure</li> <li>Indoor unit expansion valve fully closed</li> <li>Short-circuit</li> </ul>	
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 when TG-Ti < -5 °C.	<ul style="list-style-type: none"> <li>TL thermistor failure</li> <li>Indoor unit expansion valve fully closed or partially open</li> <li>Short-circuit</li> </ul>	
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.	<ul style="list-style-type: none"> <li>L / TG thermistor failure</li> <li>Indoor unit expansion valve fully open, partially open or completely closed</li> </ul>	
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.	<ul style="list-style-type: none"> <li>Indoor unit expansion valve locked when fully open</li> <li>Mismatched wiring and piping</li> </ul>	
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.	<ul style="list-style-type: none"> <li>Indoor unit expansion valve locked when partially open or closed</li> <li>Mismatched cabling and piping</li> </ul>	
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 °C 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 - 45°C"? TdSH = Td - Saturated vapor refrigerant temperature	15 - 45 °C	<ul style="list-style-type: none"> <li>Low: excessive refrigerant.</li> <li>High: insufficient refrigerant.</li> <li>O.U. Ex. Valve; Locked and Slightly Open or Closed.</li> </ul>	
2	Is Pd between "1.5" and "3.3"?	1.5 - 3.3	<ul style="list-style-type: none"> <li>Low: solenoid valve SVA leak .</li> <li>High: excessive pressure loss in the gas pipe.</li> </ul>	
3	Is Ps between "0.15" and "1.3"?	0.15 - 1.3	<ul style="list-style-type: none"> <li>Low: outdoor unit short-circuit.</li> <li>low/high: outdoor unit fan motor failure, fan module failure or outdoor unit ambient temperature thermistor failure.</li> </ul>	
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 °C and over	<ul style="list-style-type: none"> <li>Failure such as PCB, wiring, indoor unit expansion valve and coil</li> <li>Excessive pressure loss in the pipe.</li> <li>Thermistor failure for air discharge</li> </ul>	

**i** NOTE

- The symbol with an underline \_\_\_\_\_ indicates checking item and the mark “ ” indicates checking data.
- When there are two or more outdoor unit modules in a system, outdoor unit may display “Mainly Heating (Lo)” age for the cycle condition during the compressor stoppage at cooling operation. This is NOT abnormal. “Mainly Heating (Lo)” is displayed for the control reason of the outdoor unit stopped during cooling operation.
- Service checker can be connected to TB2-No.1 and TB2-No.2 on PCB1 or CN101 connector (H-LINK circuit) on PCB1. When connecting to CN101 connector (XA connector), use “2P Connector Cable”. which is a service part.



**5.9 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	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? \_\_\_\_\_







# 6 . Electrical checks of the main parts

## Index

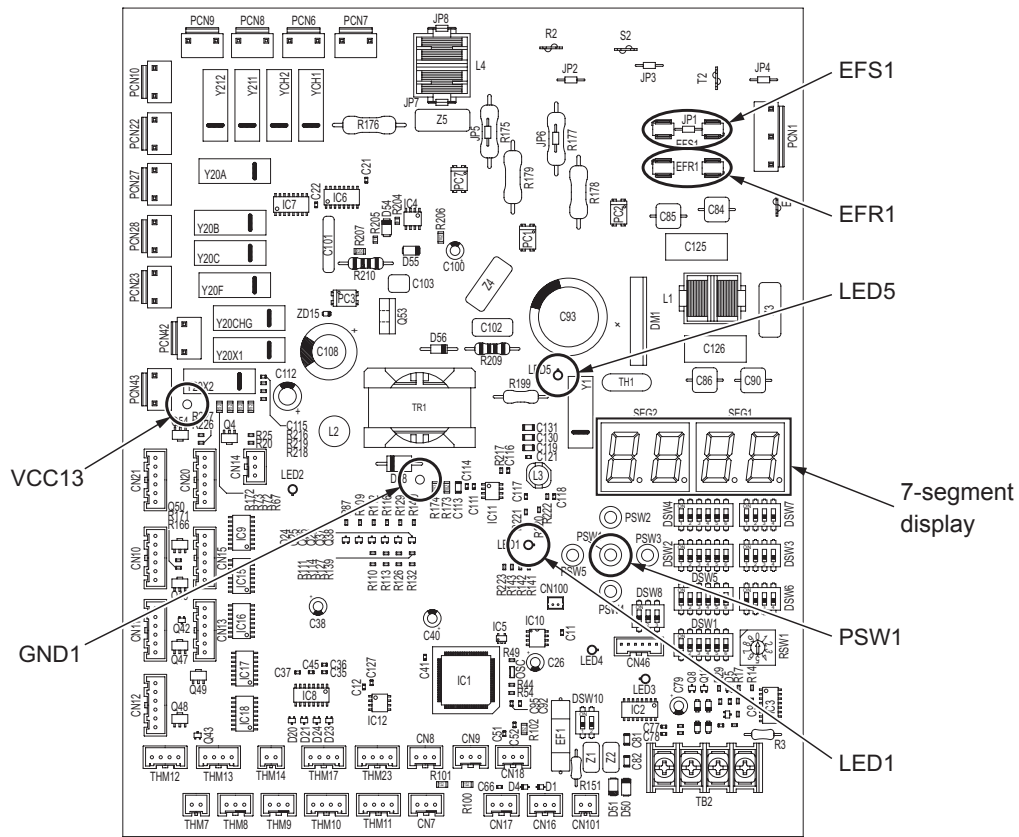
6.1	Outdoor unit PCB (PCB1) .....	113
6.1.1	Arrangement of connectors and check points .....	113
6.1.2	Checking procedures for outdoor unit PCB1 .....	113
6.2	Inverter (INV1, INV2).....	114
6.2.1	Inverter specifications.....	114
6.2.2	High voltage discharge work for replacing parts .....	116
6.2.3	Checking method of inverter PCB (INV).....	116
6.2.4	Protection function.....	122
6.2.5	Overload protection control .....	123
6.3	Scroll compressor.....	124
6.3.1	Reliable mechanism for low vibration and low sound.....	124
6.3.2	Compression principles .....	124
6.3.3	Structure.....	125
6.3.4	Compressor type .....	125
6.3.5	Checking of compressor motor .....	125
6.3.6	Check list on compressor .....	126
6.3.7	Additional information for “check list on compressor” .....	126
6.4	Fan motor .....	127
6.5	Thermistors .....	128
6.5.1	Thermistor positions for RAS-(8-12)FSXNSE and RAS-(5/6)FSXNPE .....	128
6.5.2	Thermistor positions for RAS-14FSXNSE and RAS-(8-14)FSXNPE .....	129
6.5.3	Thermistor positions for RAS-(16/18)FSXNSE .....	130
6.5.4	Thermistor positions for RAS-(20-24)FSXNSE and RAS-(16/18)FSXNPE.....	131
6.5.5	Thermistor (Td) for discharge gas temperature.....	132
6.5.6	Thermistor for the outdoor ambient temperature.....	132
6.5.7	Thermistor for the evaporating temperature of the outdoor unit in the heating operation (For defrosting)..	132
6.5.8	Thermistor for super cooling bypass and main line temperature of outdoor unit .....	132
6.6	Electronic expansion valve (MV1, MV2, MVB).....	133
6.6.1	Specifications for MV1 and MV2 .....	133
6.6.2	Specifications for MVB .....	134
6.7	Pressure sensor (Pd) .....	135
6.7.1	High pressure control .....	135
6.7.2	Low pressure control .....	135
6.8	High pressure protection device (PSH).....	136

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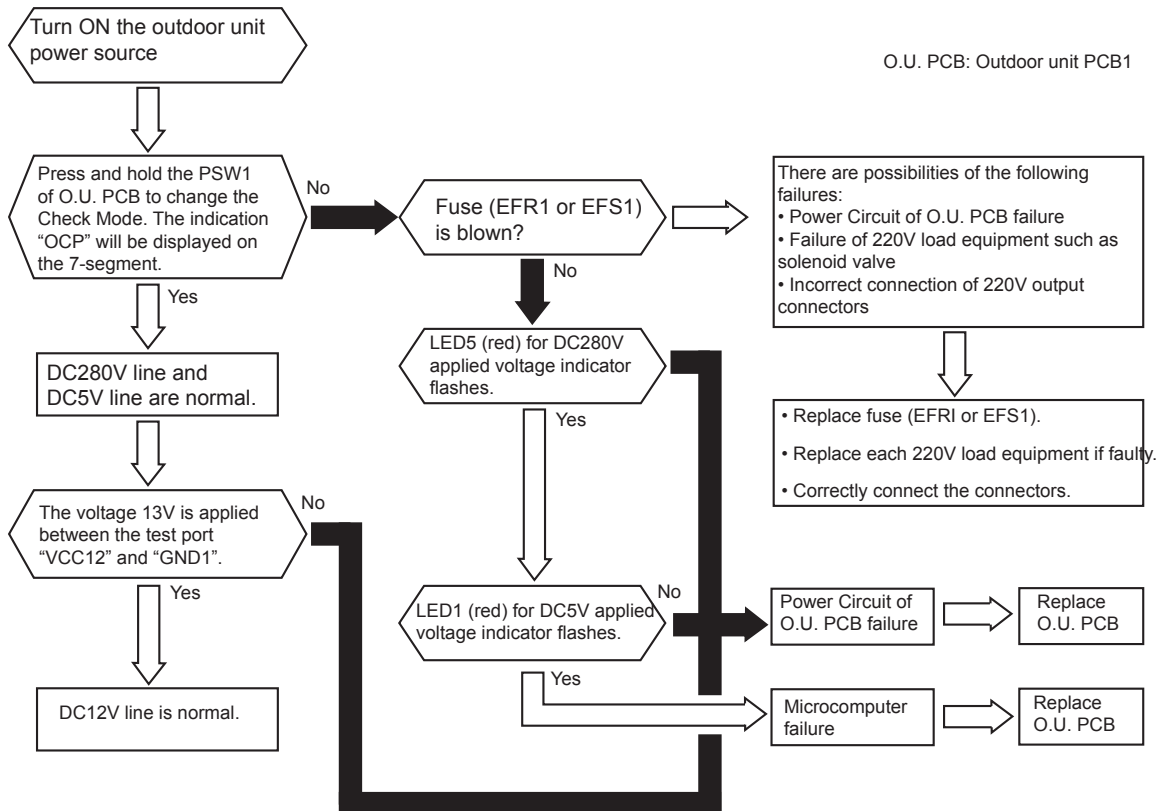
6.9	Electrical Coil Parts .....	137
6.10	Noise filter (NF1, NF2) .....	137
6.11	Reactor (DCL1 and DCL2).....	138
6.12	CH-Box PCB (PCB1).....	139
6.12.1	Check points PCB1 of single type CH-Box .....	139
6.12.2	Check points PCB1-4 of multi type CH-Box.....	139
6.12.3	Specifications for MVD1 and MVS1 .....	140

## 6.1 Outdoor unit PCB (PCB1)

### 6.1.1 Arrangement of connectors and check points

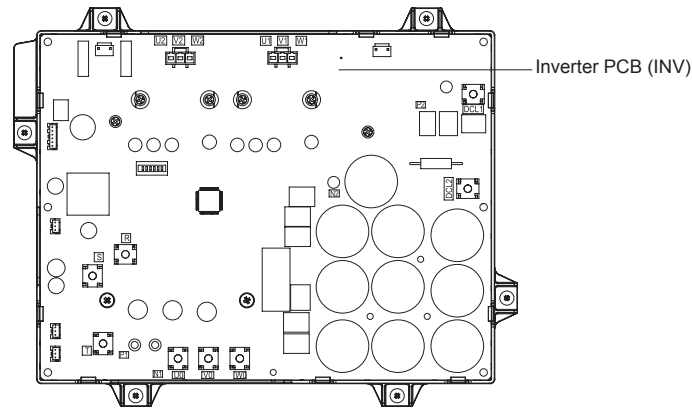


### 6.1.2 Checking procedures for outdoor unit PCB1

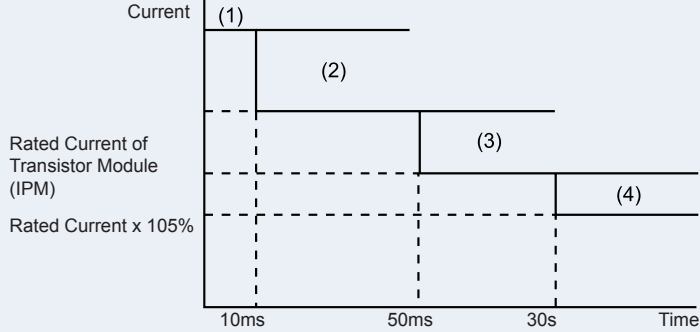


## 6.2 Inverter (INV1, INV2)

### 6.2.1 Inverter specifications



Applicable models	Standard	RAS-8FSXNSE, RAS-10FSXNSE, RAS-16FSXNSE, RAS-20FSXNSE		RAS-12FSXNSE, RAS-14FSXNSE, RAS-22FSXNSE, RAS-24FSXNSE
	High Efficiency	RAS-5-8FSXNPE, RAS-16FSXNPE		RAS-10FSXNPE, RAS-12FSXNPE, RAS-14FSXNPE, RAS-18FSXNPE
Applicable power source		3N~ 400V 50Hz		
Maximum output voltage		415V (Depends on power source voltage)		
Maximum output current	Inverter PCB	19.5A	26A	
	Fan controller	3.5A		
Control method		Vector control PWM (Pulse width modulator)		
Output frequency range	Inverter PCB	11Hz to 130Hz	11Hz to 100Hz	9Hz to 105Hz
	Fan controller	0 to 21.7rps		
Frequency accuracy		0.01 Hz		
Output / characteristics		<p>The graph plots Output voltage (V) on the y-axis against Output frequency (Hz) on the x-axis. The y-axis has a mark at 220V. The x-axis has marks at 0 and Max. A solid line starts at the origin (0,0) and rises linearly to a point where the voltage is 220V. From this point, a horizontal dashed line extends to the right, representing constant voltage up to the maximum frequency. A vertical dashed line drops from the end of the horizontal line to the x-axis at the 'Max.' mark.</p>		
Speed rate		0.125 Hz/s, 0.25 Hz/s, 0.5 Hz/s, 1 Hz/s, 3 Hz/s (5 steps)		
Excessively high or low inverter voltage		Abnormality code for inverter (iT) = 5, Excessive low voltage at DC voltage is lower than 396V Abnormality code for inverter (iT) = 6, Excessive high voltage at DC voltage is higher than 844V		
Malfunction in the current sensor		Abnormality code for inverter (iT) = 8 The wave height value of running current for the phase positioning is less than the determination value before the compressor is started (at completion of the phase positioning).		

<p>Protection function: Overcurrent protection for Inverter</p>	 <p>Abnormality code for inverter (iT) = 1</p> <ol style="list-style-type: none"> <li>1 Short-Circuit trip of arm</li> <li>2 Instantaneous overcurrent trip</li> </ol> <p>Abnormality code for inverter (iT) = 2</p> <ol style="list-style-type: none"> <li>3 Instantaneous overcurrent trip, when detecting current is more than rated current of transistor module, overcurrent is detected.</li> </ol> <p>Abnormality code for inverter (iT) = 4</p> <ol style="list-style-type: none"> <li>4 Electronic Thermal Trip, when the current detected by current sensor exceeds 105% of the rated current continuously for 30 seconds or for 3 minutes in total during a 10-minute period, overcurrent is detected.</li> </ol>
<p>Protection of Transistor module (IPM)</p>	<p>Abnormality code for inverter (iT) = 1</p> <p>Power Module (CIB, IPM) has three protection function for self-protection.</p> <ol style="list-style-type: none"> <li>1 Some of the output terminals between “U” and “V”, “V and “W”, “W” and “U” have a short-circuit.</li> <li>2 Running current reaches the maximum rated current.</li> <li>3 Control voltage decreases abnormally.</li> </ol>
<p>Overload control</p>	<p>The overload control is controlled as follows.</p> <ul style="list-style-type: none"> <li>• Condition of Activation: When the running current is more than 105% of the rated current.</li> <li>• Condition of Cancellation: When the running current is less than 88% of the rated current.</li> </ul>
<p>Fin temperature increase</p>	<p>Stoppage Code for Inverter (iTC) = 3</p> <p>The unit is stopped when the CIB and IPM temperature is higher than 110°C.</p>
<p>Earth detection</p>	<p>Stoppage Code for Inverter (iTC) = 12</p> <p>The unit is stopped when the compressor is grounded</p>

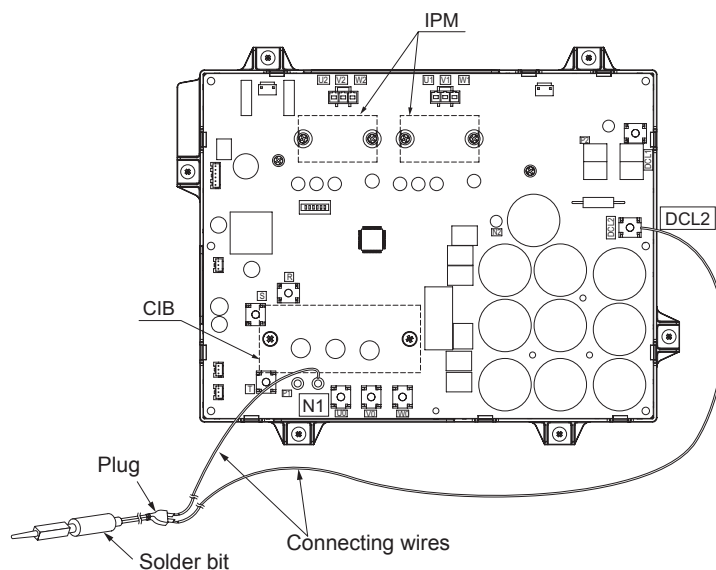
## 6.2.2 High voltage discharge work for replacing parts

### ⚠ CAUTION

- Perform this high voltage discharge work to avoid an electric shock.
- Take special care to avoid a short circuit between terminal P and N.

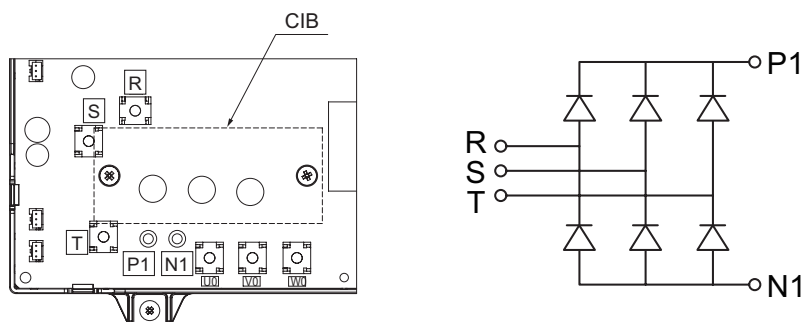
### ◆ Procedures

- Turn OFF the main switches and wait for three minutes. Check to ensure that no high voltage exists. If LED401 on the inverter PCB (INV) is ON after start-up and LED401 on INV is OFF after turning OFF power source, the voltage will decrease to DC50V or less.
- Connect connecting wires to an electrical solder bit.
- Connect the wires to terminals, N1 and DCL2 on the inverter PCB (INV). Discharging is started, resulting in hot solder bit.
- Wait for two or three minutes and measure the voltage again. Check to ensure that no voltage is charged



## 6.2.3 Checking method of inverter PCB (INV)

### ◆ Outer appearance and rectifier circuit of CIB

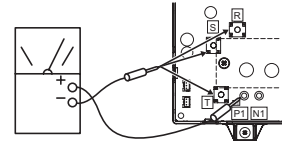


If procedures (a) to (d) are performed and the results are satisfactory, the CIB on the inverter PCB is normal.

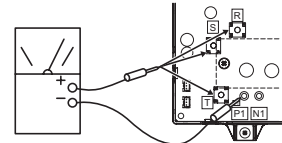
### **i** NOTE

Recommended using an analogue tester.

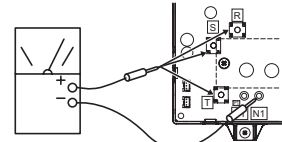
a. By touching the + side of the tester to the P1 terminal of the inverter PCB and the - side of tester to R, S, and T of the inverter PCB, measure the resistance.



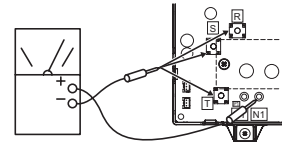
b. By touching the - side of the tester to the P1 terminal of the inverter PCB and the + side of tester to R, S, and T of the inverter PCB, measure the resistance.



c. By touching the - side of the tester to the N1 terminal of the inverter PCB and the + side of tester to R, S, and T of the inverter PCB, measure the resistance.

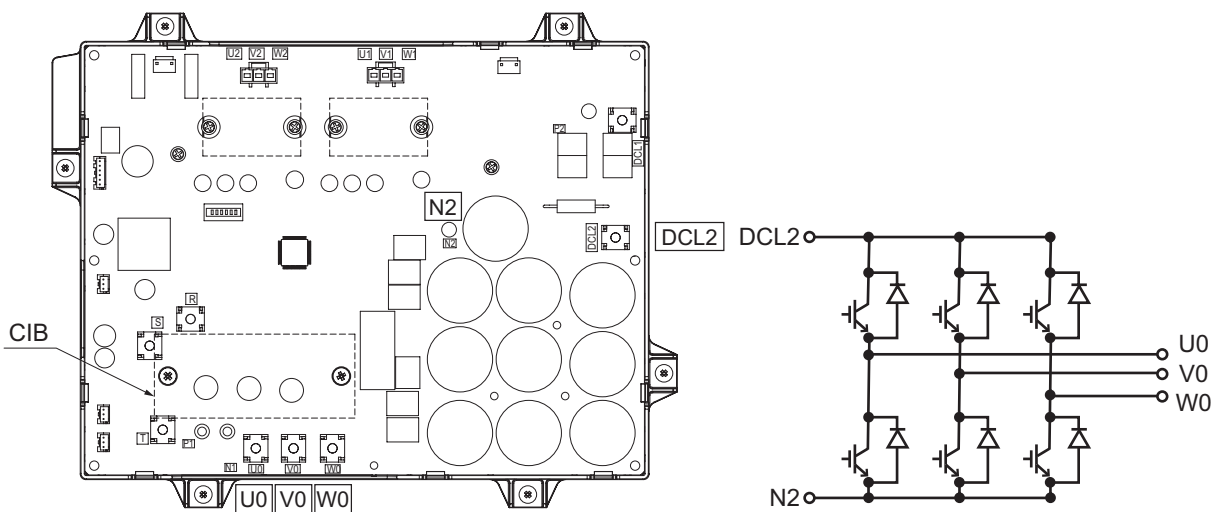


d. By touching the + side of the tester to the N1 terminal of the inverter PCB and the - side of tester to R, S, and T of the inverter PCB, measure the resistance



Item	Measurement Point		Criterion	
	Tester		Analogue Tester	Digital Tester
(+)	(-)			
(a)	P1	R/S/T	1kΩ or more (Measured Range: 1kΩ)	Over Load
(b)	R/S/T	P1	30kΩ or more (Measured Range: 10kΩ)	1.0V or less
(c)	R/S/T	N1	1kΩ or more (Measured Range: 1kΩ)	Over Load
(d)	N1	R/S/T	30kΩ or more (Measured Range: 10kΩ)	1.0V or less

◆ Internal circuit of CIB outlet part

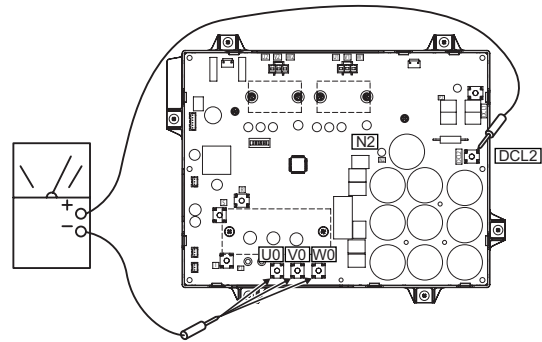


If procedures (a) to (d) are performed and the results are satisfactory, the CIB on the inverter PCB is normal.

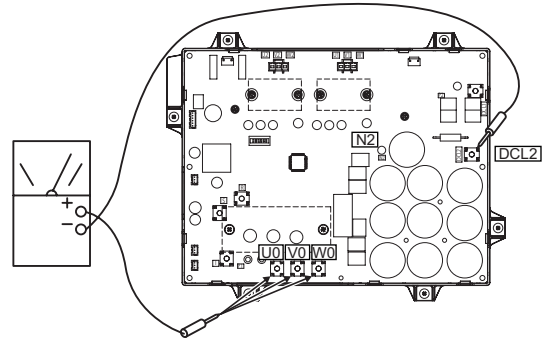
**i** NOTE

Recommended using an analogue tester.

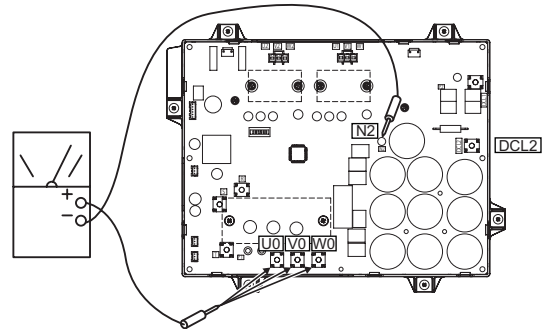
- a. By touching the + side of the tester to the DCL2 terminal of the inverter PCB and the - side of tester to U0, V0, and W0 of the inverter PCB, measure the resistance.



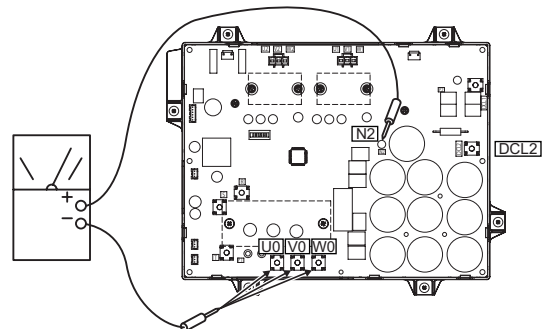
- b. By touching the - side of the tester to the DCL2 terminal of the inverter PCB and the + side of tester to U0, V0, and W0 of the inverter PCB, measure the resistance.



- c. By touching the - side of the tester to the N2 terminal of the inverter PCB and the + side of tester to U0, V0, and W0 of the inverter PCB, measure the resistance.



- d. By touching the + side of the tester to the N2 terminal of the inverter PCB and the - side of tester to U0, V0, and W0 of the inverter PCB, measure the resistance.



Item	Measurement Point		Criterion	
	Tester		Analogue Tester	Digital Tester
(+)	(-)			
(a)	DCL2	U0/V0/W0	1kΩ or more (Measured Range: 1kΩ)	Over Load
(b)	R/S/T	DCL2	20kΩ or more (Measured Range: 10kΩ)	1.0V or less
(c)	U0/V0/W0	N2	1kΩ or more (Measured Range: 1kΩ)	Over Load
(d)	N2	U0/V0/W0	20kΩ or more (Measured Range: 10kΩ)	1.0V or less

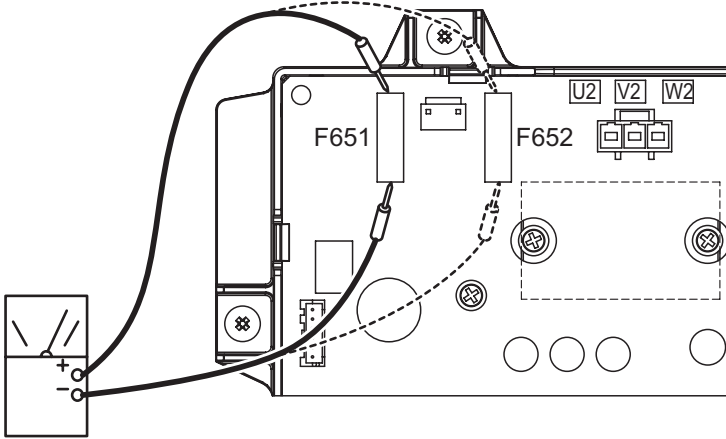


### ◆ Testing the fuse for inverter power

By touching the + and - side of the tester on each side of the fuse (F651, F652), measure the resistance. If the resistance is  $0\Omega$ , it is normal.

#### NOTE

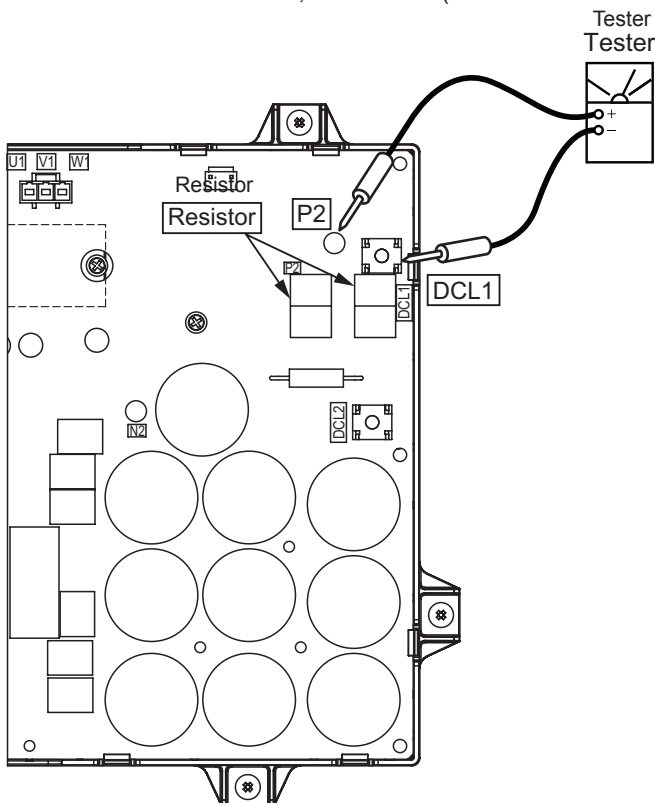
Set analog, or digital tester at  $1\text{ k}\Omega$ .



### ◆ Testing the resistor

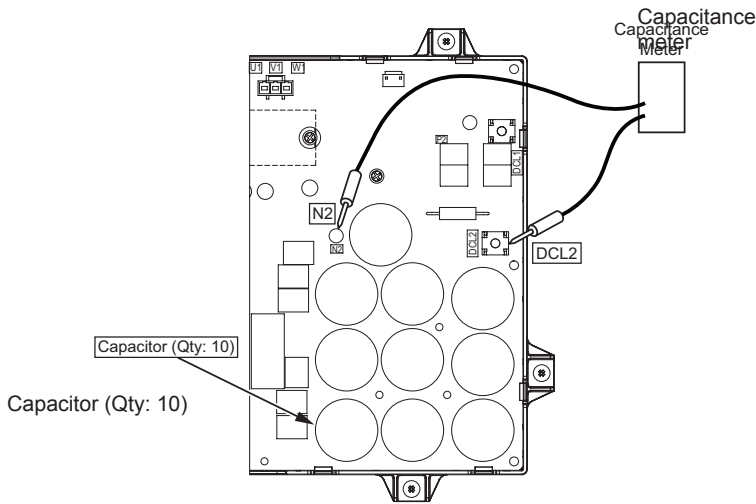
Measure the resistance using the tester between the DCL1 and P2 terminal.

If the resistance is  $1\text{ k}\Omega \pm 5\%$ , it is normal. ( $0\Omega$  or  $\infty\Omega$ : abnormal)



### ◆ Testing the Capacitor

- 1 Check that the capacitor does not show signs of burns or isn't swollen.
- 2 Measure the capacitance using the capacitance meter between the DCL2 and N2 terminal.  
If the capacitance is  $2000\text{ mF} \pm 10\%$ , it is normal.



◆ **Testing the IPM for fan motor**

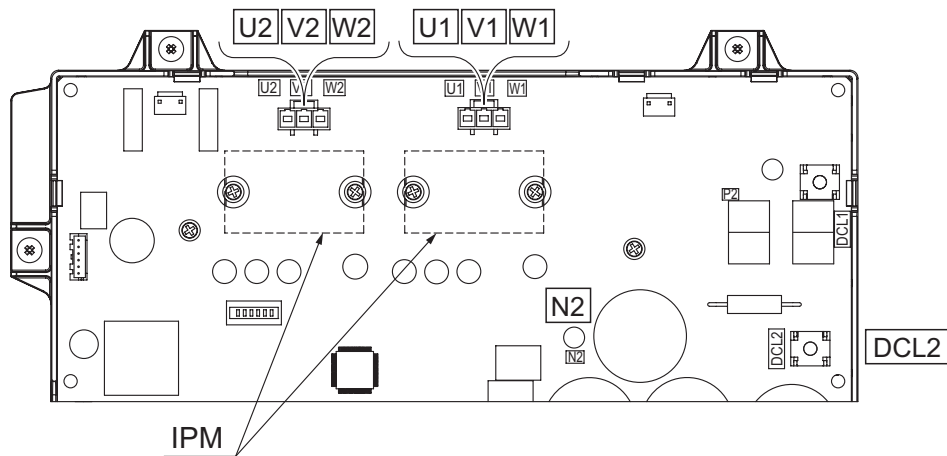
**⚠ CAUTION**

Perform this high voltage discharge work to avoid an electric shock.

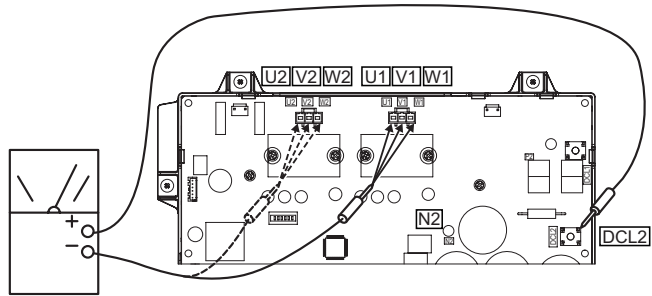
**i NOTE**

Recommend using an analogue tester

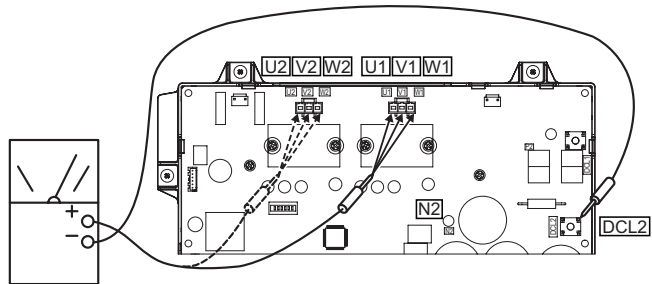
- a. Turn OFF the main source before this work. Ensure that LED401 on the inverter (INV) is turned OFF. If LED401 on INV is turned ON, an electrical shock may occur from residual voltage over DC 50V to the inverter PCB (INV).
- b. Disconnect all the wirings connected to the inverter PCB (INV).



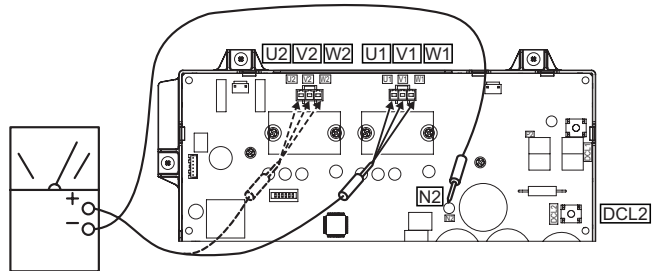
- c. By touching the + side of the tester to the DCL2 terminal of fan controller and the - side of tester to U1, V1, and W1 of the fan controller, measure the resistance.



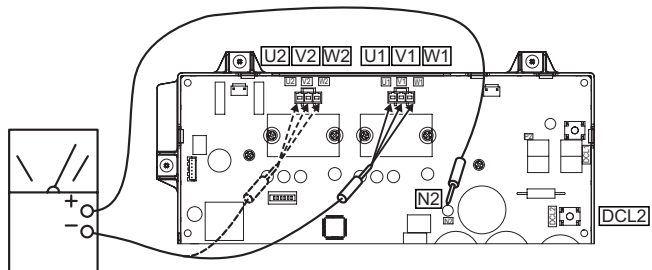
- d. By touching the - side of the tester to the DCL2 terminal of fan controller and the + side of tester to U1, V1, and W1 of the fan controller, measure the resistance.



- e. By touching the - side of the tester to the N2 terminal of fan controller and the + side of tester to U1, V1, and W1 of the fan controller, measure the resistance.



- f. By touching the + side of the tester to the N2 terminal of fan controller and the - side of tester to U1, V1, and W1 of the fan controller, measure the resistance.



**i** NOTE

In case of the outdoor unit is RAS-14FS(X)NSE / RAS-8FS(X)NPE - FAS-14FS(X)NPE, additional test will be required by replacing "U1/V1/W1" with "U2/V2/W2".

Item	Measurement Point		Criterion	
	Tester		Analogue Tester	Digital Tester
(+)	(-)			
(c)	DCL2	U1/V1/W1 (U2/V2/W2)	1kΩ or more (Measured Range: 1kΩ)	Over Load
(d)	U1/V1/W1 (U2/V2/W2)	DCL2	20kΩ or more (Measured Range: 10kΩ)	1.0V or less
(e)	U1/V1/W1 (U2/V2/W2)	N2	1kΩ or more (Measured Range: 1kΩ)	Over Load
(f)	N2	U1/V1/W1 (U2/V2/W2)	20kΩ or more (Measured Range: 10kΩ)	1.0V or less

## 6.2.4 Protection function

### 1 Excessively high or low Inverter voltage

#### a. Level of detection at 400 V 50 Hz:

- ◆ When the voltage of direct current is greater than 844V, abnormalities are detected.
- ◆ When the voltage of direct current is smaller than 396V, abnormalities are detected.

#### b. Function:

- ◆ When abnormalities are detected, the inverter compressor is stopped and transmit the signal code of stoppage cause to outdoor unit PCB1.

#### c. Cancellation of the protection function:

- ◆ The transmitted fault will be reset when outdoor unit power is cut off.

### 2 Abnormality of Current Sensor

#### a. Level of detection:

- ◆ The wave height value of running current for the phase positioning is less than the determination value before the compressor is started (at completion of the phase positioning).

#### b. Function:

- ◆ When abnormalities are detected, the inverter compressor is stopped, and transmit the signal code for the cause of the stoppage to outdoor unit PCB.

#### c. Cancellation of the protection function:

- ◆ The transmitted fault will be reset when outdoor unit power is cut off.

### 3 Inverter overcurrent protection

#### a. Level of detection:

- ◆ When the compressor current detected by current sensor exceeds the rated current of power module (CIB, IPM), overcurrent is detected. (Instantaneous Overcurrent)
- ◆ When the current detected by current sensor exceeds 105% of the rated current continuously for 30 seconds or for 3 minutes in total during a 10-minute period, overcurrent is detected. (Electric Thermal Relay)

#### b. Function:

- ◆ When abnormalities are detected, the inverter compressor is stopped and transmit the signal code for the cause of the stoppage to outdoor unit PCB.

#### c. Cancellation of the protection function:

- ◆ The transmitted fault will be reset when outdoor unit power is cut off.

### 4 Transistor module (IPM) protection

#### a. Level of detection:

- ◆ When some of the output terminals between "U" and "V", "V" and "W", "W" and "U" of power module (CIB, IPM) are short-circuited, an abnormality is detected.
- ◆ When the running current of power module (IPM) reaches the maximum rated current, an abnormality is detected.
- ◆ When the control voltage of power module (IPM) abnormally decreases, an abnormality is detected.

#### b. Function:

- ◆ When abnormalities are detected, the inverter compressor is stopped and the signal code for the cause of the stoppage is transmitted to outdoor unit PCB.

#### c. Cancellation of the protection function:

- ◆ The transmitted fault will be reset when outdoor unit power is cut off.

**5** Fin temperature increase**a.** Level of detection:

- ◆ When the temperature of internal thermistor exceeds 110°C, an abnormality is detected.

**b.** Function:

- ◆ When abnormalities are detected, the inverter compressor is stopped and the signal code for the cause of the stoppage is transmitted to outdoor unit PCB1.

**c.** Cancellation of the protection function:

- ◆ The transmitted fault will be reset when outdoor unit power has been reset.

**6** Earth detection**a.** Level of detection:

- ◆ When the terminal U, V, W and earth of the compressor are short-circuited before compressor activation, abnormalities are detected..
- ◆ When the output terminals (U, V, W) of power module (CIB, IPM) are short-circuited, abnormalities are detected.

**b.** Function:

- ◆ When abnormalities are detected, the inverter compressor is stopped and the signal code for the cause of the stoppage is transmitted to outdoor unit PCB1.

**c.** Cancellation of the protection function:

- ◆ Communication signal the cause of the stoppage cause is canceled when remote control switch is off or main power source is cut off.

**6.2.5 Overload protection 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 transmitted to the outdoor unit PCB 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 compressor maximum frequency is limited to the specified value. However, if the frequency order is smaller than the maximum value, the operation is performed according to the order.

**3** Cancellation of the protection function:

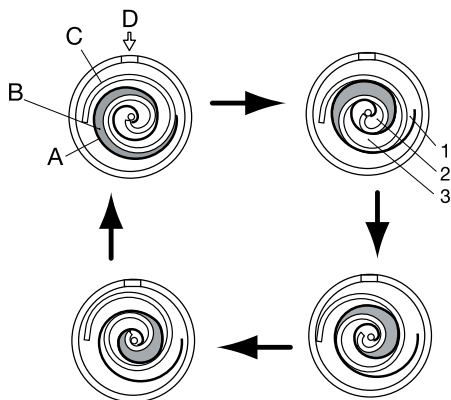
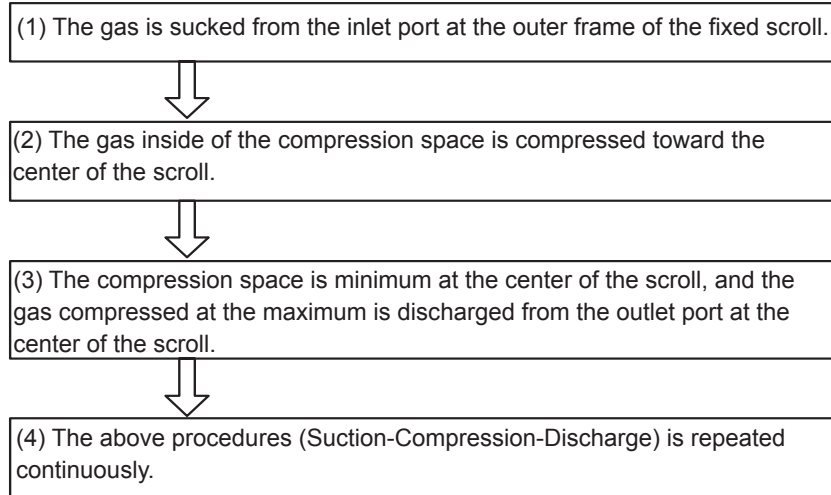
- After the operation described in the above item is performed for 10 seconds, this control is canceled.

### 6.3 Scroll compressor

#### 6.3.1 Reliable mechanism for low vibration and low sound

- 1 The direction of rotation is definite.
- 2 The pressure inside the chamber is high pressure and its surface temperature is between 60 °C and 110 °C.

#### 6.3.2 Compression principles

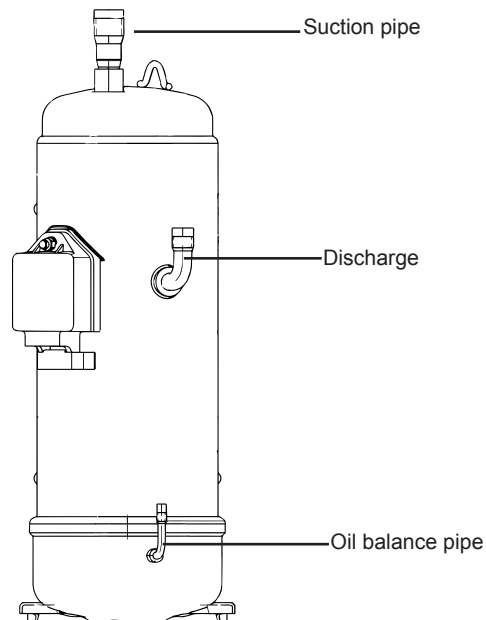


A	Fixed scroll
B	Compression space
C	Rotating scroll
D	Gas
1	Suction process
2	Discharge process
3	Compression process

### 6.3.3 Structure

The compressor has a structure for supplying oil from the outdoor oil separator.

Inside the oil separator, the pressure is high and the surface temperature of the oil separator is between 60 °C and 110 °C just like the compressor.



### 6.3.4 Compressor type

Model	Voltage	Inverter Compressor 1	Inverter Compressor 2	Total quantity
RAS-8FSXNSE, RAS-10FSXNSE RAS-5FSXNPE, RAS-8FSXNPE	400V 50Hz	DC50PHD-D2Y2		1
RAS-10FSXNPE		DB65PHD-D2Y2		1
RAS-12FSXNSE, RAS-14FSXNSE RAS-12FSXNPE, RAS-14FSXNPE		DC80PHD-D2Y2		1
RAS-16FSXNSE - RAS-20FSXNPE RAS-16FSXNPE		AA50PHD-D2Y2	AA50PHD-D2Y2	2
RAS-22FSXNSE, RAS-24FSXNSE RAS-18FSXNPE		DC80PHD-D2Y2	DC80PHD-D2Y2	2

### 6.3.5 Checking of compressor motor

Inverter Compressor	Resistance
AA50PHD-D2Y2	0.495Ω at 75°C
DB65PHD-D2Y2	0.320Ω at 75°C
DC80PHD-D2Y2	0.346Ω at 75°C

### 6.3.6 Check list on compressor

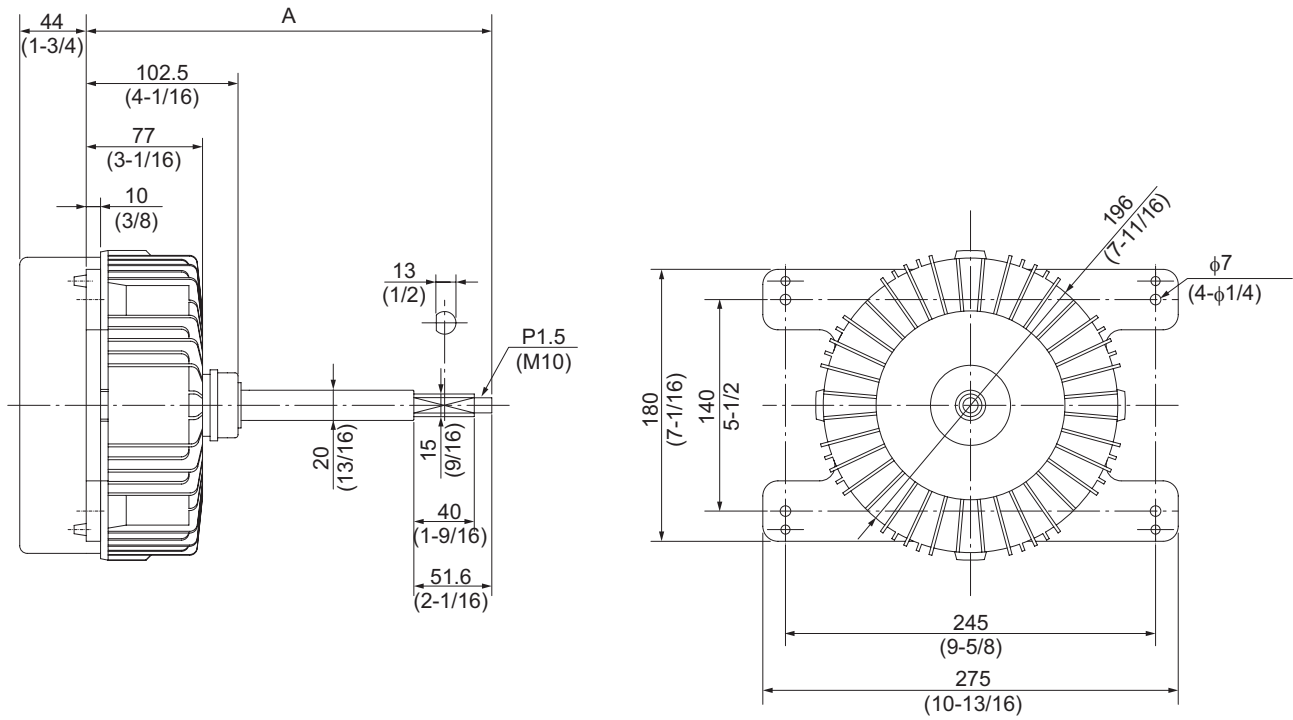
No.	Check Item	Check Method	Result	Remarks
CLIENT: _____ MODEL: _____ DATE: _____				
Serial No: _____ Production date: _____ Checker: _____				
1	Are THM8 and THM9 correctly connected? THM8 and THM9: Discharge Gas Thermistor	(1) Are wires of each thermistor correctly connected by viewing? (2) Check to ensure that 7-segment indication of Td1 is higher than Td2 when No.1 comp. is operating.  Td1: Temperature of THM8, Td2: Temperature of THM9		
2	Are thermistor, THM8 and THM9 disconnected?	(1) Check to ensure that thermistor on the top of comp. is correctly installed. (2) Check to ensure that actually measured temp. are greatly different from the indication (Td1, Td2) during check mode.		
3	Is current sensing part on inverter PCB (INV) faulty?	(1) Check to ensure that 7-segment indication A1 and A2 are 0 during compressor stopping. (2) Check to ensure that indication A1 and A2 are not 0 during compressor running. (However, A2 is 0 during stopping of No.2 comp.)		
4	Are expansion valves (MV1, MV2 and MVB) correctly connected?	Check to ensure that MV1 to CN10, MV2 to CN11 and MVB to CN12 are correctly connected.		
5	Are expansion valve coils (MV1, MV2 and MVB) correctly installed?	Check to ensure that each coil is correctly installed on the valve.		
6	Are the refrigeration system and electrical wiring system incorrectly connected?	Check to ensure that refrigerant is flowing into indoor units by operating one system only from the outdoor unit.		
7	Is opening of expansion valve completely closed (locked)?	Check the following using the check mode of outdoor units. (1) Liquid Pipe Temp. (TL) < Air Intake Temp. (Ti) during Cooling Operation (2) Liquid Pipe Temp. (TL) > Air Intake Temp. (Ti) during Heating Operation		
8	Is opening of expansion valve fully opened (locked)?	Check to ensure that liquid pipe temp. is lower than air intake temp. of stopped indoor unit when the other indoor units are operating under cooling operation.		
9	Are the relay on the main power PCB (PCB2) faulty?	Check the main power PCB (PCB2).		
10	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 220V or 400V/380 - 415V/380V+10%.		
11	Is the comp. oil acidified during compressor motor burning?	Check to ensure that the oil color is not black.		

### 6.3.7 Additional information for “check list on compressor”

Check Item	Additional Information (Mechanism of Compressor Failure)
1,2	The liquid refrigerant return volume to the compressor is controlled by the discharge gas temperature Td1 when only No.1 compressor is operating. If Td1 and Td2 are reversely connected, the liquid refrigerant return volume will become smaller by detecting the temperatures even if the actual discharge gas temperature is high. Therefore, this abnormal overheating operation will result in insulation failure of the motor winding.
3	Overcurrent control (operating frequency control) is performed by detecting current by the current sensor. In this case, winding insulation failure will occur, since control is not available in spite of actually high current.
4, 5	During a cooling operation, Pd is controlled by fan revolution of outdoor unit, and Td and SH are controlled by MV of each indoor unit. During a heating operation, Td and SH are controlled by MV1 and MV2. If expansion valves are incorrectly connected, correct control is not available, resulting in compressor failure depending on liquid refrigerant returning conditions or motor winding insulation failure depending on overheating conditions.
6	If the refrigeration system 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.
7	For additional information, refer to page 3-26 in this document.
8	The compressor may be locked due to the liquid return operation during the cooling operation
9	If the contacting resistance increases, voltage imbalance among each phase will cause abnormal overcurrent.
10	In this case, overcurrent will occur, efficiency will decrease or the motor winding will be excessively heated.
11	In this case, it will result in motor burning or a failed compressor.



**6.4 Fan motor**



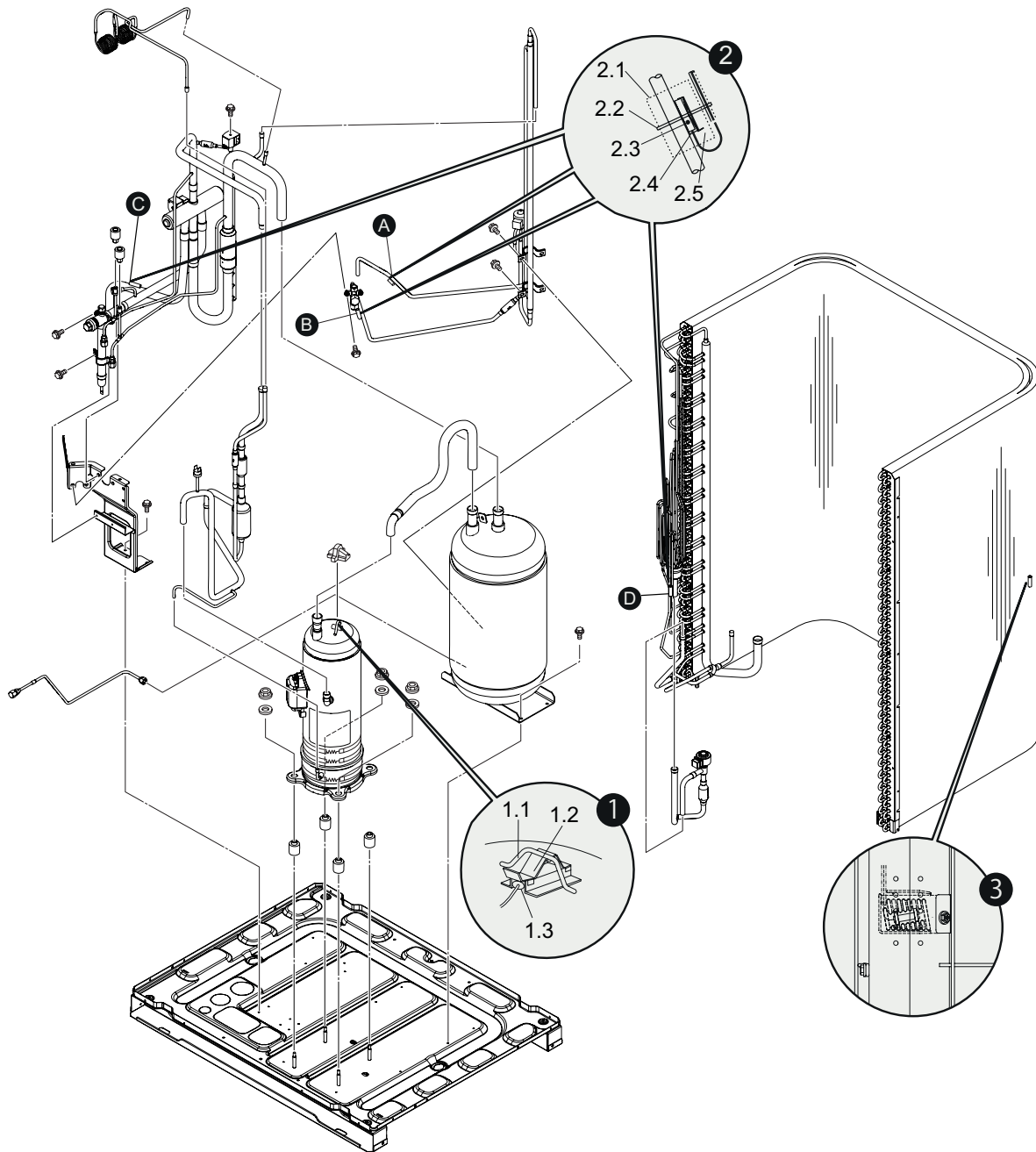
Model	A
RAS-8 - 12FSXNPE, RAS-20 - 24FSXNPE RAS-5, 6FSXNPE, RAS-16, 18FSXNPE	268.5 mm
RAS-14FSXNSE - RAS-18FSXNSE RAS-8FSXNPE - RAS-14FSXNPE	224.8 mm

Applicable Model	Power Source Voltage	Rated Voltage	Rated Output	Electrical Wiring Diagram	Resistance
RAS-(8-24)FSXNSE RAS-(5-18)FSXNPE	400V 50Hz	DC650V	750W		9.42+0.94Ω at 20 °C

6

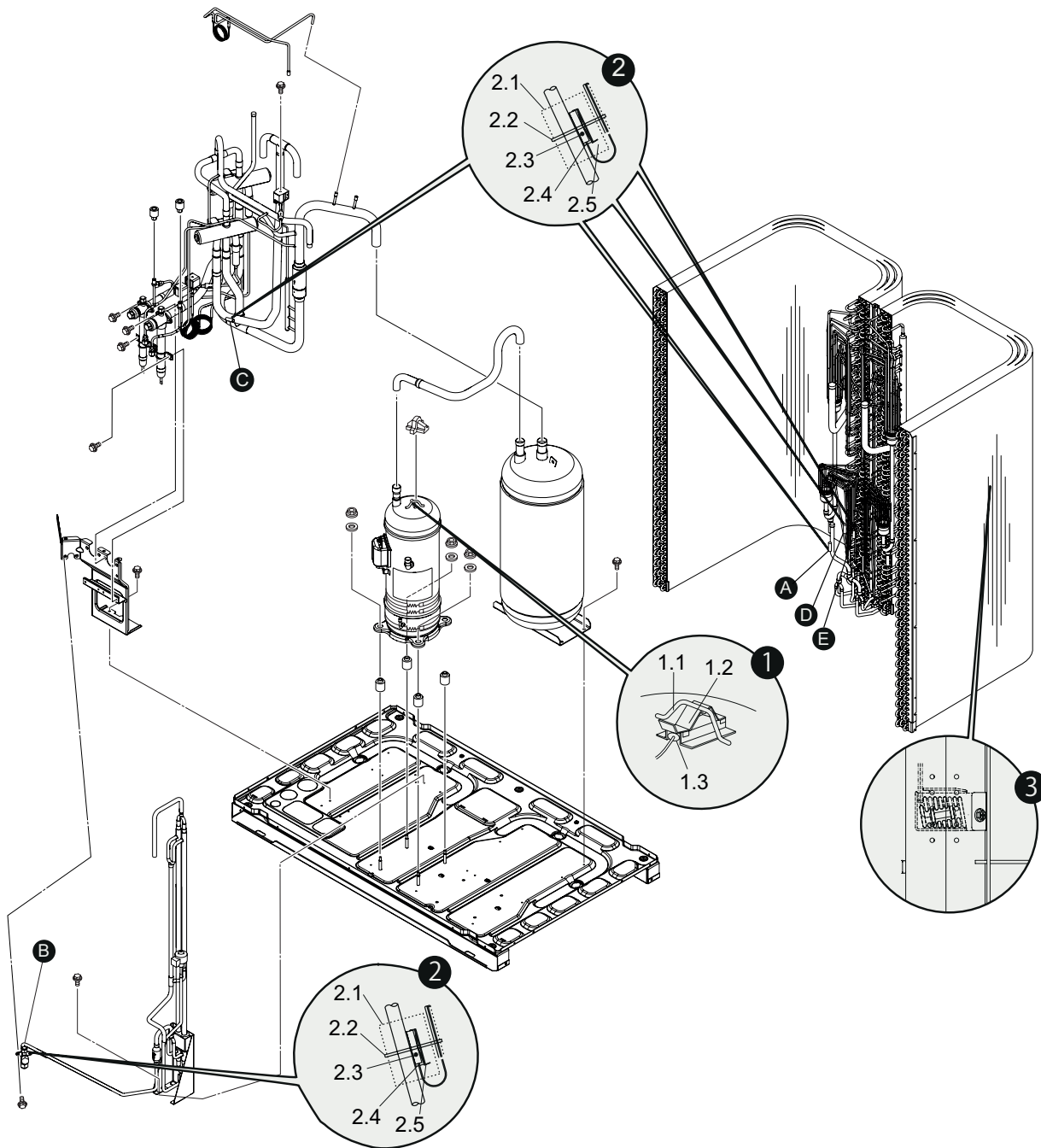
## 6.5 Thermistors

### 6.5.1 Thermistor positions for RAS-(8-12)FSXNSE and RAS-(5/6)FSXNPE



N°	Name	Uds	N°	Name	Uds.
1	Td1 (THM8) - thermistor for discharge gas temperature	1	2.4	Thermistor holder	4
1.1	Thermistor holder	1	2.5	Thermo clip	4
1.2	Thermistor fixing plate	1	A	Tsc (THM23) - thermistor (for super-cooler)	1
1.3	Td1 thermistor	1	B	Tchg (THM17) - thermistor (Super-cooling main line)	1
2	<b>Thermistors for pipe temperature</b>	4	C	Tg (THM12) - thermistor (Gas evaporation line)	1
2.1	Butyl sheet	4	D	Te (THM10) - thermistor (Liquid evaporation line)	1
2.2	Plastic band	4	3	<b>Ta (THM7) thermistor for outdoor ambient temp.</b>	1
2.3	Thermistor (A, B, C, D)	4			

**6.5.2 Thermistor positions for RAS-14FSXNSE and RAS-(8-14)FSXNPE**

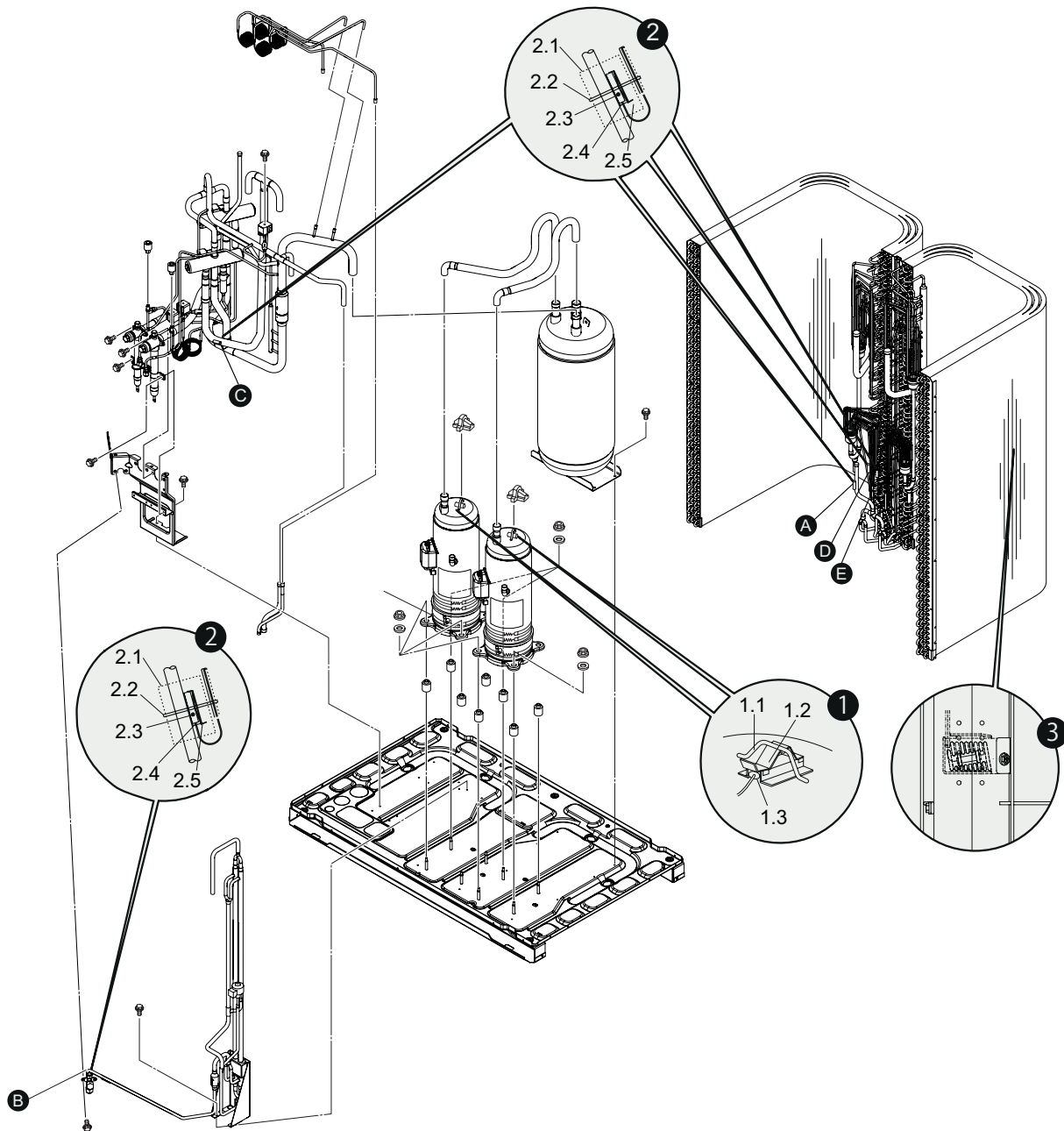


6

N°	Name	Uds
1	Td1 (THM8) - thermistor for discharge gas temp.	1
1.1	Thermistor holder	1
1.2	Thermistor fixing plate	1
1.3	Td1 thermistor	1
2	<b>Thermistors for pipe temperature</b>	5
2.1	Butyl sheet	5
2.2	Plastic band	5
2.3	Thermistor (A, B, C, D, E)	5

N°	Name	Uds.
2.4	Thermistor holder	5
2.5	Thermo clip	5
A	Tsc (THM23) - thermistor (for super-cooler)	1
B	Tchg (THM17) - thermistor (Super-cooling main line)	1
C	Tg (THM12) - thermistor (Gas evaporation line)	1
D	Te1 (THM10) - thermistor (Liquid evaporation line)	1
E	Te2 (THM11) - thermistor (Liquid evaporation line)	1
3	Ta thermistor (for outdoor ambient temperature)	1

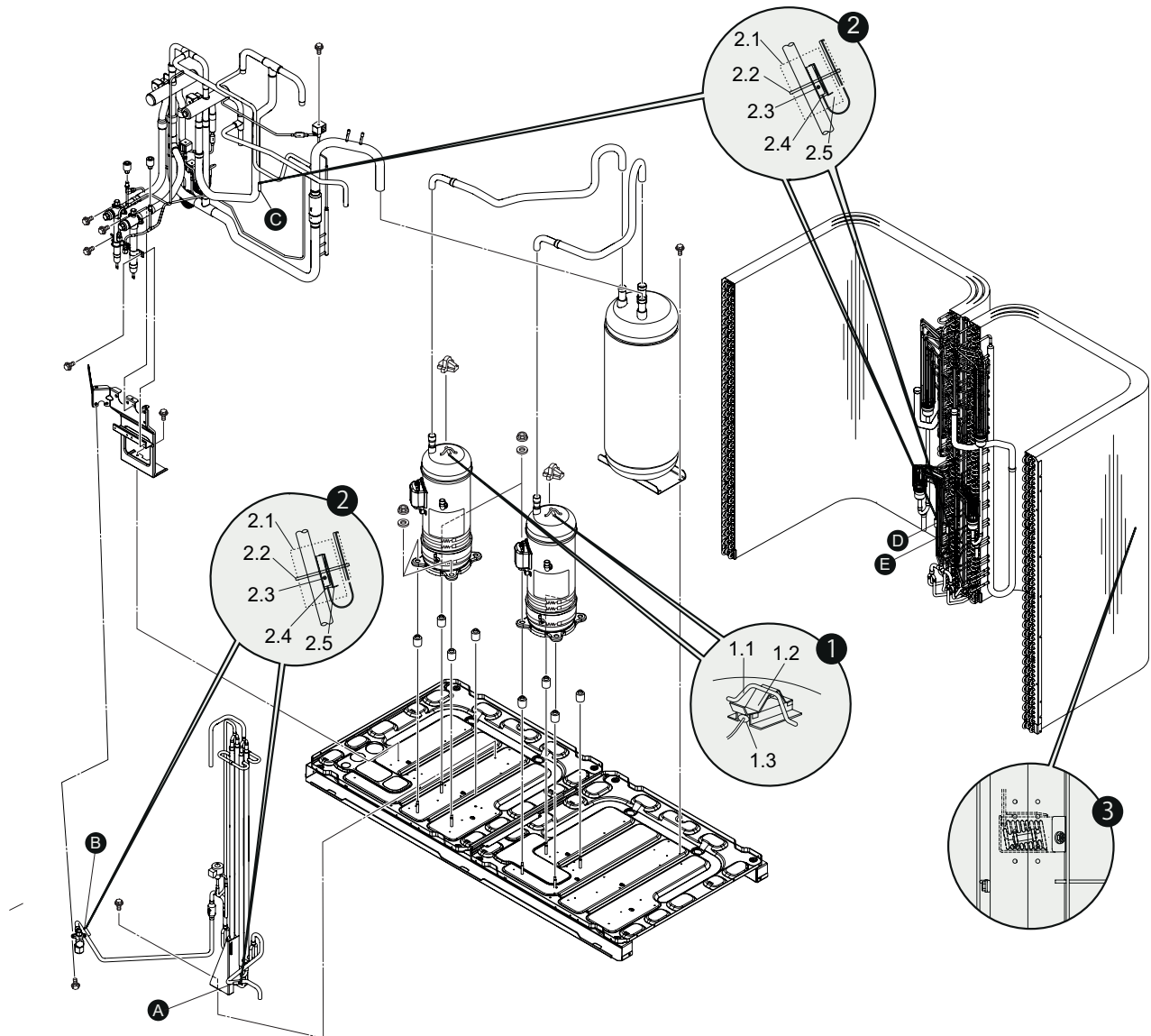
**6.5.3 Thermistor positions for RAS-(16/18)FSXNSE**



N°	Name	Uds
1	Td1, Td2 (THM8) - thermistor for discharge gas temp.	2
1.1	Thermistor holder	2
1.2	Thermistor fixing plate	2
1.3	Td1, Td2 thermistor	2
2	<b>Thermistors for pipe temperature</b>	5
2.1	Butyl sheet	5
2.2	Plastic band	5
2.3	Thermistor (A, B, C, D, E)	5

N°	Name	Uds.
2.4	Thermistor holder	5
2.5	Thermo clip	5
A	Tsc (THM23) - thermistor (for super-cooler)	1
B	Tchg (THM17) - thermistor (Super-cooling main line)	1
C	Tg (THM12) - thermistor (Gas evaporation line)	1
D	Te1 (THM10) - thermistor (Liquid evaporation line)	1
E	Te2 (THM11) - thermistor (Liquid evaporation line)	1
3	<b>Ta thermistor (for outdoor ambient temperature)</b>	1

### 6.5.4 Thermistor positions for RAS-(20-24)FSXNSE and RAS-(16/18)FSXNPE

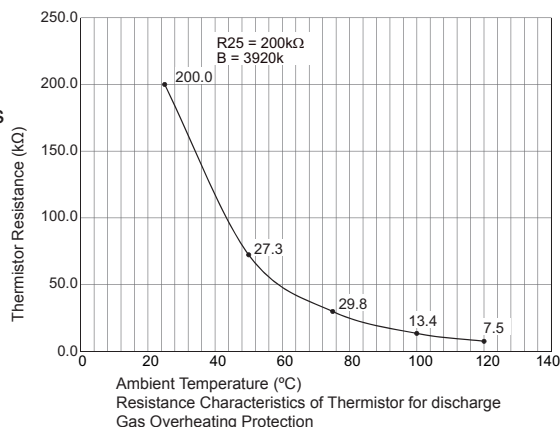


6

N°	Name	Uds	N°	Name	Uds.
1	Td1, Td2 (THM8) - thermistor for discharge gas temp.	2	2.4	Thermistor holder	5
1.1	Thermistor holder	2	2.5	Thermo clip	5
1.2	Thermistor fixing plate	2	A	Tsc (THM23) - thermistor (for super-cooler)	1
1.3	Td1, Td2 thermistor	2	B	Tchg (THM17) - thermistor (Super-cooling main line)	1
2	Thermistors for pipe temperature	5	C	Tg (THM12) - thermistor (Gas evaporation line)	1
2.1	Butyl sheet	5	D	Te1 (THM10) - thermistor (Liquid evaporation line)	1
2.2	Plastic band	5	E	Te2 (THM11) - thermistor (Liquid evaporation line)	1
2.3	Thermistor (A, B, C, D, E)	5	3	Ta thermistor (for outdoor ambient temperature)	1

**6.5.5 Thermistor (Td) for discharge gas temperature.**

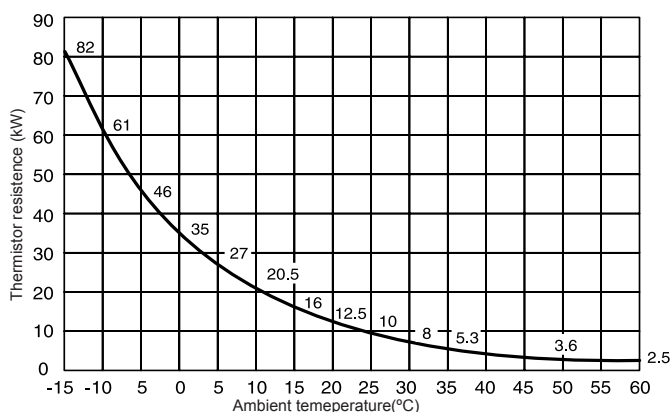
- 1 The thermistor for the temperature of the upper part of the compressor is installed for the purpose of preventing discharge gas due to overheating. If the discharge gas temperature increases excessively, the lubricating oil deteriorates and loses its properties and consequently, the compressor's life is shortened.
- 2 If the discharge gas temperature increases excessively, the compressor temperature increases. Consequently, the compressor motor will burn out.
- 3 When the temperature of the upper part of the compressor increases during heating operation, the unit is controlled according to the following method:
  - a. The expansion valve of the outdoor unit opens to return the liquid refrigerant to the compressor through the accumulator, decreasing the compressor's temperature.
  - b. If the temperature of the upper part of the compressor increases over 132 °C, even if the expansion valve opens, the compressor stops in order to protect itself. This procedure is also available in the cooling operation.
- 4 If the temperature of the upper part of the compressor increases excessively, protection control will be activated and the compressor will stop according to the following method:



Operation	Temperature of the upper part of the compressor	Stopping period
Cooling	Over 132 °C	10 minutes (continuous)
	Over 140 °C	5 seconds (continuous)
Heating	Over 132 °C	10 minutes (continuous)
	Over 140 °C	5 seconds (continuous)
Defrosting	Over 132 °C	5 seconds (continuous)

**6.5.6 Thermistor for the outdoor ambient temperature**

Thermistor resistance characteristics are shown in the figure.



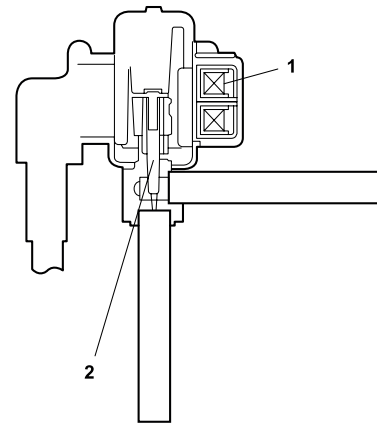
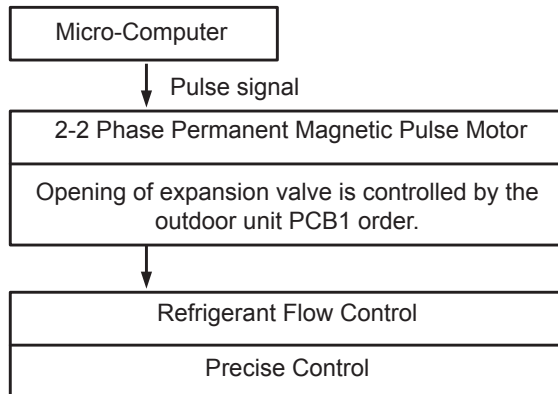
**6.5.7 Thermistor for the evaporating temperature of the outdoor unit in the heating operation (For defrosting)**

The thermistor resistance characteristics are the same as in the outdoor ambient temperature thermistor.

**6.5.8 Thermistor for super cooling bypass and main line temperature of outdoor unit**

The thermistor resistance characteristics are the same as in the outdoor ambient temperature thermistor.

## 6.6 Electronic expansion valve (MV1, MV2, MVB)



1	Pulse motor
2	Needle

### 6.6.1 Specifications for MV1 and MV2

Items	Specifications																									
Models	PAM-BBOYGHS-1 (MV)																									
Working temperature range	-30 °C to 70 °C																									
Refrigerant Used	R410A																									
Insulation Resistance	Min. 100MΩ (at 500VDC Megger)																									
Withstand Voltage	500VAC for 1 Minute or 600VAC for 1 Second																									
Rated voltage	DC 12 V ± 1.2 V																									
Drive condition	100 - 200 PPS 2-2 phase excitation																									
Coil resistance (for each phase)	100 Ω (at 20 °C)																									
Insulation Class	Class E																									
Wiring diagram, drive circuit and activation mode	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> </div> <div style="text-align: center;"> </div> </div> <table border="1" style="margin-top: 10px;"> <thead> <tr> <th>Phase</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>ON</td> <td>OFF</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td>2</td> <td>ON</td> <td>ON</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>3</td> <td>OFF</td> <td>ON</td> <td>ON</td> <td>OFF</td> </tr> <tr> <td>4</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>ON</td> </tr> </tbody> </table> <p style="margin-top: 5px;">                     OPEN: 4 - 3 - 2 - 1 - 4                      CLOSE: 1 - 2 - 3 - 4 - 1                 </p> <div style="margin-top: 10px;"> <p><b>Checking Method</b></p> <p>Measure the coil resistances between Red (common) and each phase. The measured resistance value is normal if approximately 100W*1).</p> <p>*1: Ambient Temperature 20°C</p> </div>	Phase	1	2	3	4	1	ON	OFF	OFF	ON	2	ON	ON	OFF	OFF	3	OFF	ON	ON	OFF	4	OFF	OFF	ON	ON
Phase	1	2	3	4																						
1	ON	OFF	OFF	ON																						
2	ON	ON	OFF	OFF																						
3	OFF	ON	ON	OFF																						
4	OFF	OFF	ON	ON																						

**6.6.2 Specifications for MVB**

Items	Specifications																					
Models	UKV-U029E or UKV-A027																					
Working temperature range	-30 °C to 70 °C																					
Refrigerant Used	R410A																					
Insulation Resistance	Min. 100MΩ (at 500VDC Megohmmeter)																					
Withstand Voltage	1800VAC for 1 Second																					
Rated voltage	DC 12 V ± 1.2 V																					
Drive condition	83+5 PPS 1-2 Phase Excitation																					
Coil resistance (for each phase)	46+3Ω (at 20°C)																					
Insulation Class	Class E																					
Wiring diagram, drive circuit and activation mode	<table border="1"> <thead> <tr> <th>Connector No.</th> <th>Color of Lead Wire</th> <th>Phase</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Gray</td> <td>Common (x)</td> </tr> <tr> <td>2</td> <td>-</td> <td>-</td> </tr> <tr> <td>3</td> <td>Orange</td> <td>A</td> </tr> <tr> <td>4</td> <td>Black</td> <td>B̄</td> </tr> <tr> <td>5</td> <td>Yellow</td> <td>Ā</td> </tr> <tr> <td>6</td> <td>Red</td> <td>B</td> </tr> </tbody> </table> <p>Checking Method                      Measure the coil resistances between connector No.1 (common) and each phase.                      The measured resistance value is normal if approximately 46Ω*.                      (*1: Ambient Temperature 20°C)</p>	Connector No.	Color of Lead Wire	Phase	1	Gray	Common (x)	2	-	-	3	Orange	A	4	Black	B̄	5	Yellow	Ā	6	Red	B
Connector No.	Color of Lead Wire	Phase																				
1	Gray	Common (x)																				
2	-	-																				
3	Orange	A																				
4	Black	B̄																				
5	Yellow	Ā																				
6	Red	B																				

◆ **Checking method of electronic expansion valve**

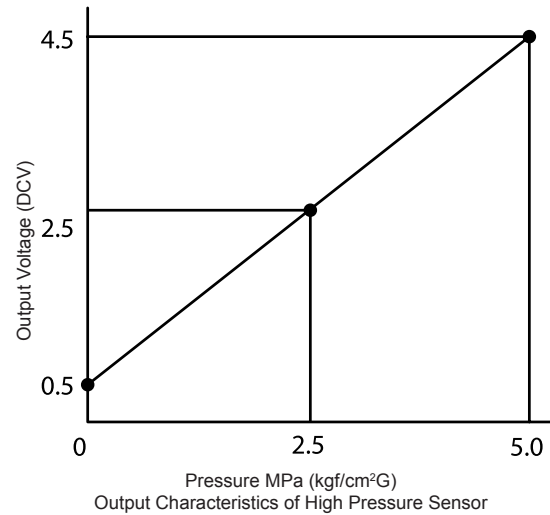
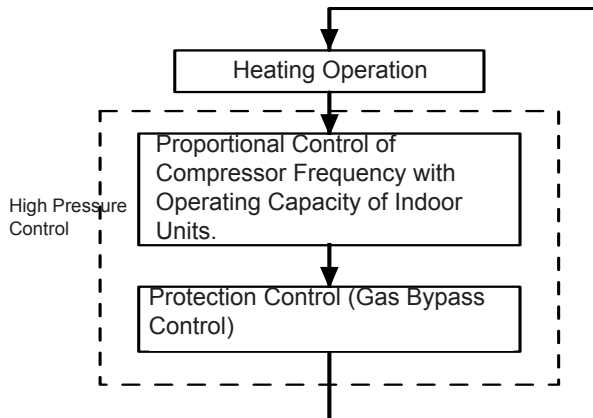
Outdoor Unit Electronic Expansion Valve	
<b>Locked (Fully Closed)</b>	It is abnormal if the liquid pipe pressure does not increase during cooling operation.
<b>Locked (Slightly Open)</b>	It is abnormal if the liquid pipe pressure does not increase and the outlet temperature of the expansion valve decreases after the cooling operation is started.
<b>Locked (Fully Open)</b>	It is abnormal under the following conditions. After heating operation for more than 30 min., the discharge gas temperature of compressor is not 10°C higher than the condensing temperature and there is no other fault such as excessive charge of refrigerant.



## 6.7 Pressure sensor (Pd)

### 6.7.1 High pressure control

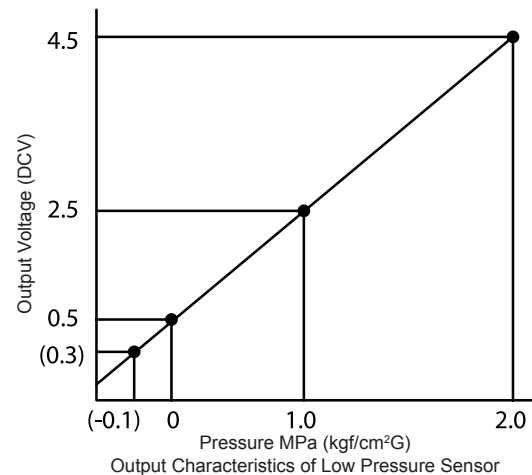
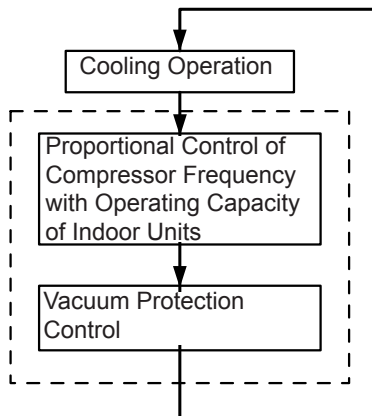
The high pressure is detected during the heating mode by means of a high pressure sensor and the compressor frequencies are controlled by the proportional control method with operating capacity of the indoor units (or PID control for the compressor frequency); therefore, the high pressure is controlled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



### 6.7.2 Low pressure control

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

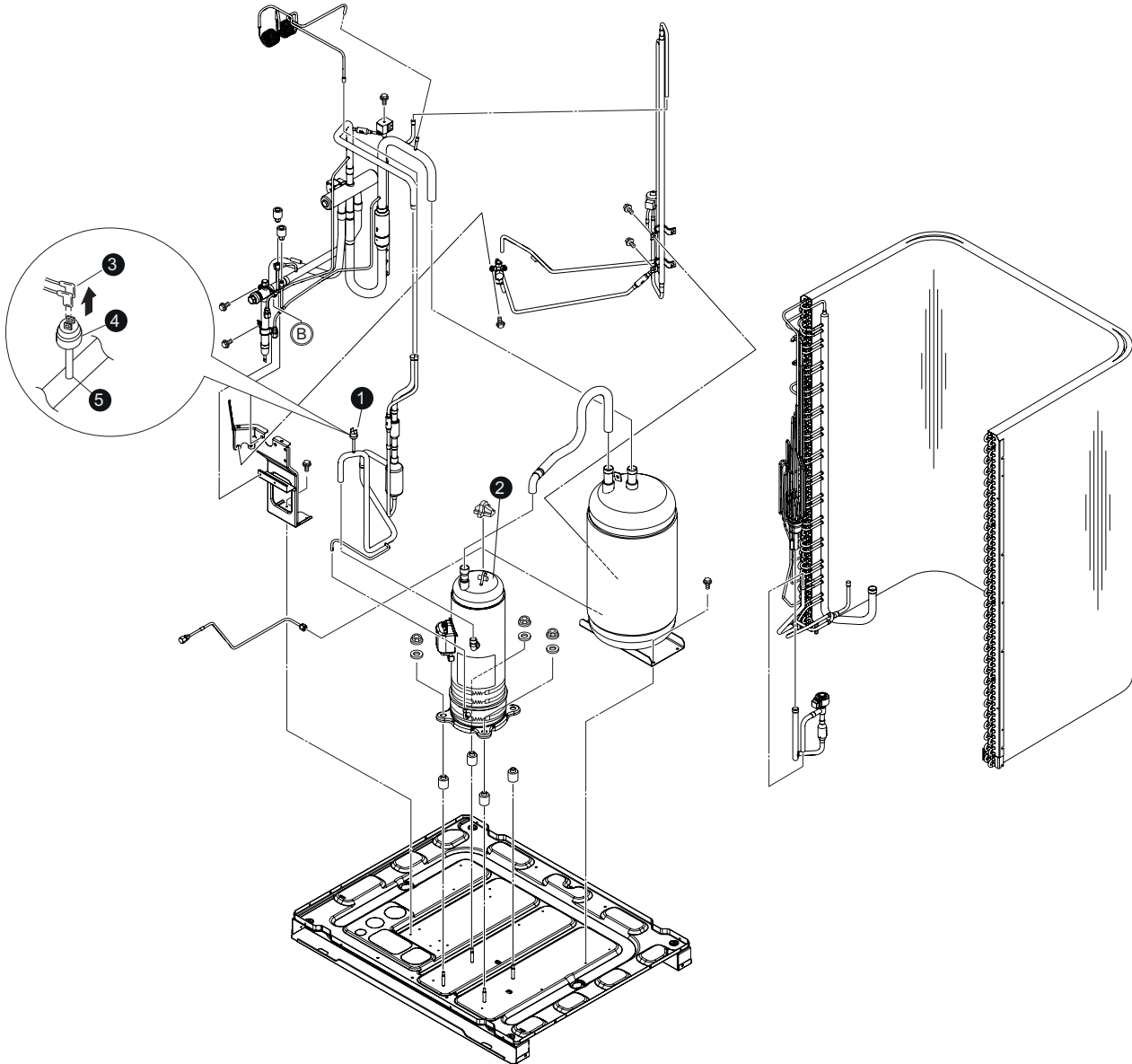
If the suction pressure is excessively low, the cooling may not be sufficient and the parts of the refrigerant cycle may be damaged. For this reason, if the output of the low pressure sensor indicates vacuum and a constant value for twelve or more minutes, the compressor stops in order to protect itself.



## 6.8 High pressure protection device (PSH)

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

**Example: RAS-8FSXNSE**



1	PSH
2	Inverter compressor
3	Faston terminal
4	High pressure switch
5	Welding

## 6.9 Electrical Coil Parts

### ◆ Solenoid Valve (SVA)

Applicable Model	Electrical Coil Model		Resistance	
RAS-8FSNSE to 24FSNSE	-	Coil	FQ-A0520D	2142+214Ω at 20°C
RAS-5FSNPE to 18FSNPE		Body	FDF5A11	
RAS-8FSXNSE to 24FSXNSE	SVA	Coil	FQ-A0520D	
		Body	FDF5A11	
RAS-5FSXNPE to 18FSXNPE	SVG	Coil	TEV-SM0AJ2066A1	2496+174.7Ω at 20°C
		Body	TEV-S2020DQ50	

### ◆ Reversing valve (RVR)

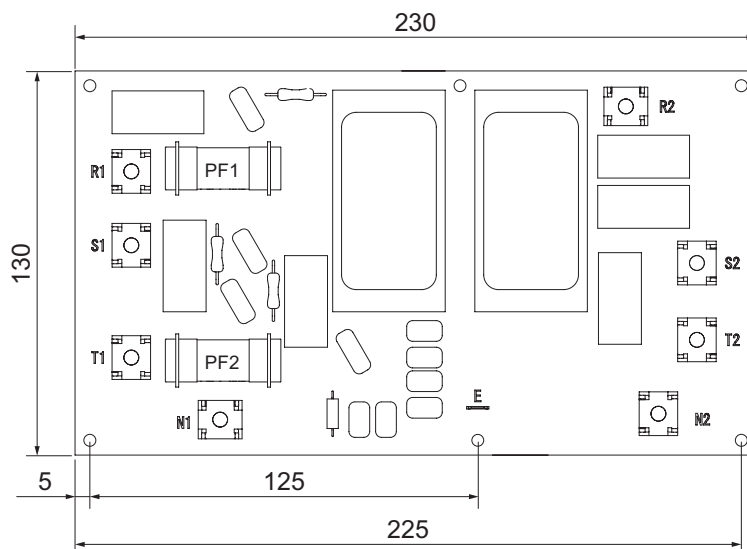
Applicable Model	Electrical Coil Model		Resistance	
RAS-8FSXNSE to 18FSXNSE	-	Coil	STF-H01AQ2338A1	1567.5+156.8Ω at 20°C
RAS-5FSXNPE to 14FSXNPE		Body	STF-H0712	
RAS-20FSXNSE to 24FSXNSE	-	Coil	STF-01AQ2339A1	1190.35+119Ω at 20°C
RAS-16FSXNPE and 18FSXNPE		Body	STF-1511G	

## 6.10 Noise filter (NF1, NF2)

The noise filter decreases the noise caused by the inverter to the power supply line. The terminals that indicate "LOAD" are connected to the inverter and terminals that indicate "LINE" are connected to the power supply line.

### ◆ NF1

Items	Specifications
Model	NF161
Rated Current	AC 400 V
Rated Current	28A
Circuit diagram	



**NOTE**  
All measurements are in mm.

## 6.11 Reactor (DCL1 and DCL2)

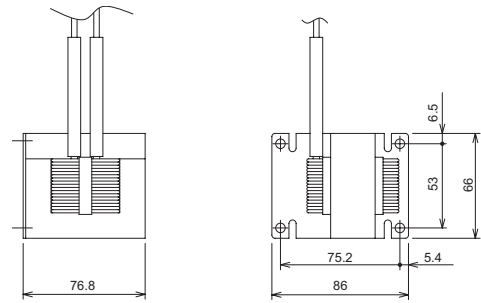
This part is used to change the alternating current to direct current for the inverter.

### ◆ DCL1

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

#### NOTE

All measurements are in mm.

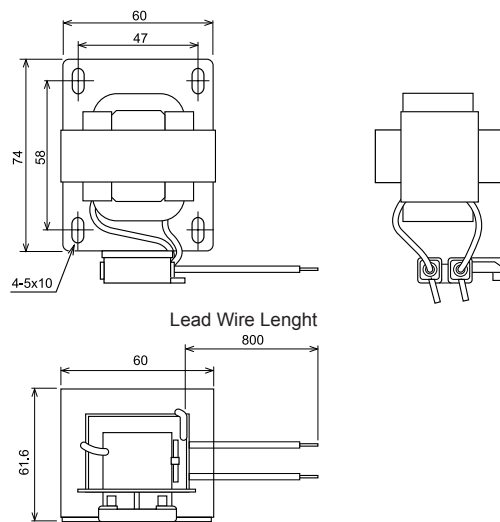


### ◆ DCL2

Item	Specifications
Condition	3.0 mH
Rated current	10 A
Direct current resistance	0.13 Ω ± 10% (at 25 °C)
Allowed temperature range	-10 °C to 180 °C

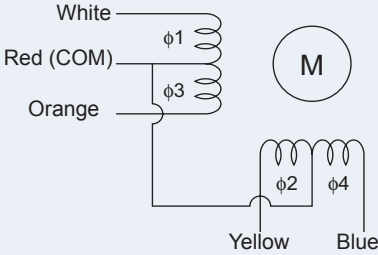
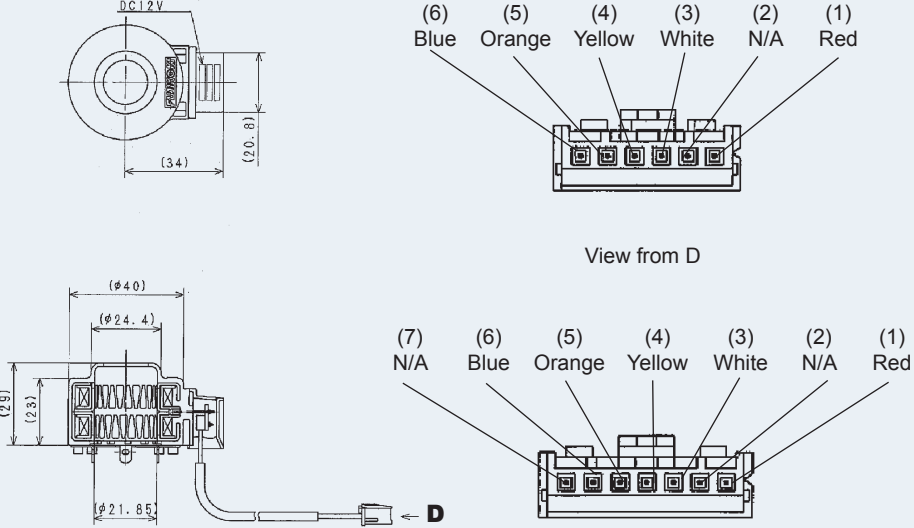
#### NOTE

All measurements are in mm.





**6.12.3 Specifications for MVD1 and MVS1**

Items	Specifications																																		
Models	PAM-MD12HS-17 - PAM-MD12HS-26																																		
Working temperature range	-30 °C to 70 °C																																		
Refrigerant Used	R410A																																		
Insulation Resistance	Min. 100MΩ (at 500VDC Megohmmeter)																																		
Withstand Voltage	500VAC for 1 minute or 600VAC for 1 second																																		
Rated voltage / operating voltage	DC 12 V ± 1.2 V																																		
Driving current	80mA/phase (at 12VDC 20°C)																																		
Coil resistance (for each phase)	150Ω+10%/phase (at 20oC)																																		
Insulation Class	Class E																																		
Wiring diagram, drive circuit and activation mode	 <table border="1"> <thead> <tr> <th rowspan="2">Connector No.</th> <th rowspan="2">Color of Lead Wire</th> <th colspan="4">Switching mode</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>White (3)</td> <td>ON</td> <td>OFF</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td>2</td> <td>Yellow (4)</td> <td>ON</td> <td>ON</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>3</td> <td>Orange (5)</td> <td>OFF</td> <td>ON</td> <td>ON</td> <td>OFF</td> </tr> <tr> <td>4</td> <td>Blue (6)</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>ON</td> </tr> </tbody> </table> <p><b>Movement Method</b></p> <p>OPEN: 1 - 2 - 3 - 4 - 1 CLOSE: 4 - 3 - 2 - 1 - 4</p> <p><b>Checking Method</b></p> <p>Measure the coil resistances between connector No.1 (common) and each phase.</p> <p>The measured resistance value is normal if approximately 150Ω *.</p> <p>(*): Ambient Temperature 20°C</p>	Connector No.	Color of Lead Wire	Switching mode				1	2	3	4	1	White (3)	ON	OFF	OFF	ON	2	Yellow (4)	ON	ON	OFF	OFF	3	Orange (5)	OFF	ON	ON	OFF	4	Blue (6)	OFF	OFF	ON	ON
Connector No.	Color of Lead Wire			Switching mode																															
		1	2	3	4																														
1	White (3)	ON	OFF	OFF	ON																														
2	Yellow (4)	ON	ON	OFF	OFF																														
3	Orange (5)	OFF	ON	ON	OFF																														
4	Blue (6)	OFF	OFF	ON	ON																														
Appearance																																			

# 7 . Troubleshooting

## Index

7.1	Initial troubleshooting .....	142
7.1.1	Checking the electrical wires and the power source .....	142
7.1.2	Checking by 7-segment display .....	143
7.1.3	Checking of the alarm code history .....	144
7.1.4	Emergency mode operation from the remote control (only for RAS-(16-96)FSXNSE and RAS-(16-72)FSXNPE) .....	148
7.1.5	Emergency mode operation from the outdoor unit PCB1 for compressor failure (only for RAS-(26-96)FSXNSE and RAS-(20-72)FSXNPE) .....	149
7.1.6	Failure of the power supply to indoor units and the remote control switch .....	150
7.1.7	Abnormal transmission between remote control switch and indoor unit .....	151
7.1.8	Abnormal operation of the devices .....	152
7.2	Procedure for troubleshooting .....	163
7.2.1	Alarm codes of wired controller .....	163
7.2.2	Alarm code CH-Box: .....	166
7.3	Troubleshooting by alarm code .....	167
7.4	Troubleshooting in the check mode by using the remote control switch (PC-ARFPE example) .....	228
7.4.1	Setting method .....	228
7.5	Troubleshooting by using the 7-segment display .....	236
7.5.1	Before carrying out checks .....	236
7.5.2	Location of the pushswitches and the 7-segment display .....	236
7.5.3	Protection control code on the 7-segment display .....	236
7.5.4	Activation condition of the protection retry control code .....	238
7.5.5	Check method by checking mode .....	240
7.6	RSW, DSWs and LEDs functions .....	247
7.6.1	Outdoor unit .....	247
7.6.1.1	Location of print circuit boards (PCBs) .....	247
7.6.1.2	Purpose .....	247
7.6.2	CH-Box .....	250

## 7.1 Initial troubleshooting

### 7.1.1 Checking the electrical wires and the power source

No.	Item to check	Check method
1	Is the power source breaker or the fuse blown out?	Check the voltage (secondary side) of the breaker and using a tester, check the conductivity of the fuse.
2	Is the transformer's secondary voltage correct?	Remove the transformer's secondary connection and check the voltage using a tester.
3	Is the electrical wiring properly secured and are the connections correctly fixed?	<p>Check that the following wiring connection on outdoor unit/indoor unit PCBs is not loosened.</p> <ul style="list-style-type: none"> <li>- <i>The connection for thermistors</i></li> <li>- <i>The connection for the communication cable.</i></li> <li>- <i>The communication cable connects to a terminal block at the outdoor unit / indoor unit not PCB.</i></li> <li>- <i>Power supply wiring is connected to a terminal block, not PCB.</i></li> <li>- <i>The connection for transformer.</i></li> <li>- <i>Each connection for power source line.</i></li> </ul> <p>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.</p>

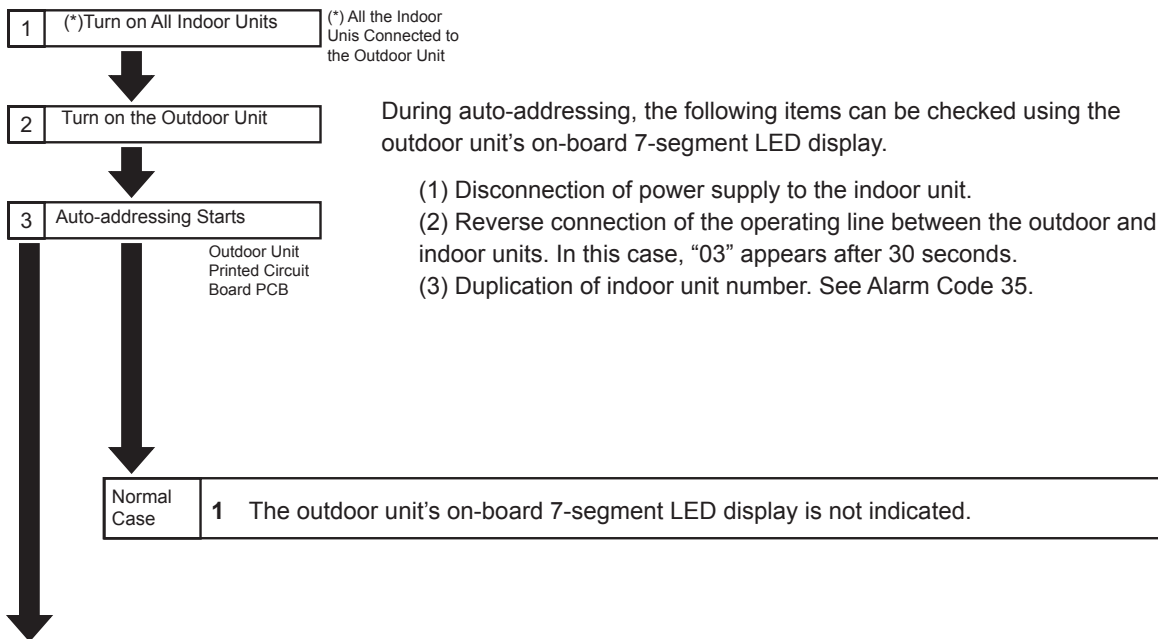


#### NOTE

*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.*



### 7.1.2 Checking by 7-segment display



Abnormal Case

2 The outdoor unit's on-board 7-segment LED display indicates the followings if there is something wrong.

a. Alarm code will be displayed on the 7-segment when alarm is received from indoor unit in normal mode.

As for the following alarm codes, however, alarm code will be displayed on the 7-segment when alarm is detected by outdoor unit itself.

Alarm Code "03" (Abnormal Transmission between Indoor Unit and Outdoor Unit)  
Alarm Code "35" (Incorrect Indoor and Outdoor Unit No.Setting)

b. Alarm code of smaller indoor unit address No. will be displayed when alarm is received from multiple indoor units.

c. The following 7-segment is displayed and flashed every 0.5 seconds.

SEG2

SEG1

Alarm Code

d. SEG1 and SEG2 are as follows.

7-Segment Display

In Case of unit No. 63, Alarm code "01"

SEG2: Indoor Unit No. (0-63)  
SEG1: Alarm Code

SEG2

SEG1



### 7.1.3 Checking of the alarm code history

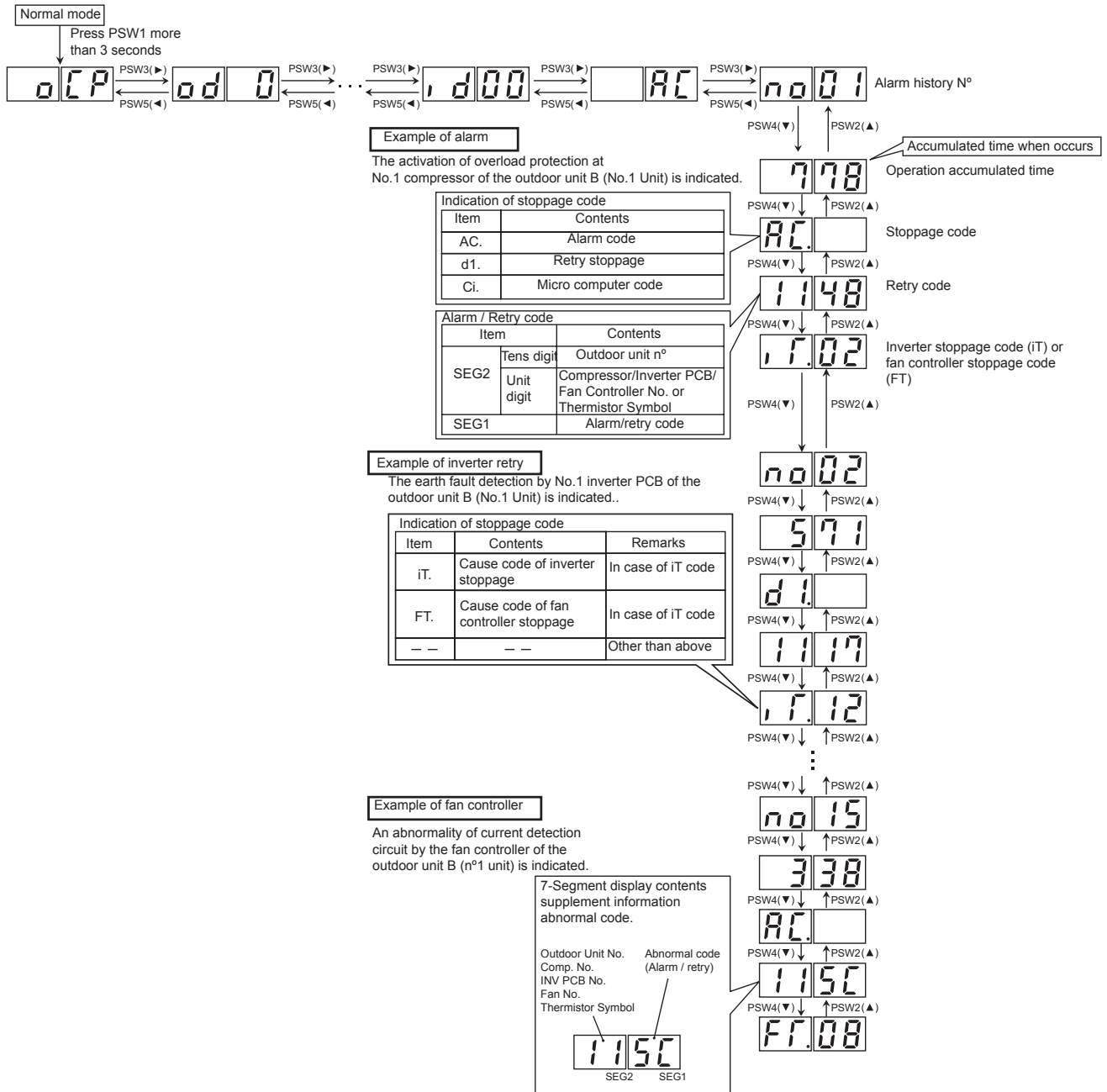
Alarm code history is indicated in the following order while the check mode is displayed.

“no01 (latest) ← → history data ~ “no15” (oldest) ← → history data

Refer to the figure below as an example. The alarm code is displayed only on PCB1 of the outdoor unit A.

**i** NOTE

Alarm code history is displayed up to 15 cases at the maximum in alarm occurrence order.



## ◆ Alarm code history record

Cause of stoppage (alarm code or stoppage code)	Contents	Alarm code history indication					
		Time	Alarm (1)	Alarm code			Abnormal data
				Outdoor unit No.	Compressor No.	Fan No.	
02	Activation of the protection device	Accumulated time	AC	O	O		--
03	Abnormality transmitting between the indoor and outdoor units	Accumulated time	AC				--
04	Abnormality transmitting between the inverter PCB and the outdoor unit PCB1	Accumulated time	AC	O	O		--
05	Abnormal power source phase	Accumulated time	AC	O			--
06	Abnormal Inverter voltage	Accumulated time	AC	O	O		iTC
d1-18		Accumulated time	d1	O	O		iTC
07	Decrease in discharge gas super-heat	Accumulated time	AC	O			--
d1-16		Accumulated time	d1	O			--
08	Temperature increase of the discharge gas at the upper part of the compressor	Accumulated time	AC	O			--
d1-15		Accumulated time	d1	O			--
0A	Abnormality transmitting between outdoor units	Accumulated time	AC				--
0b	Incorrect outdoor unit address setting	Accumulated time	AC				--
0c	Incorrect setting of the main outdoor unit	Accumulated time	AC				--
21	Abnormality high pressure sensor	Accumulated time	AC	O			--
22	Abnormality of thermistor for outdoor air temperature	Accumulated time	AC	O			--
23	Abnormality of discharge gas temperature thermistor at the upper part of the compressor	Accumulated time	AC	O	O		--
24	Abnormality of the liquid pipe thermistor of the outdoor unit's heat exchanger (Te/Tchg/Tsc)	Accumulated time	AC	O	Thermistor signal Te1: 1, Te2: 2 Tchg: C, Tsc: S		--
25	Abnormality of the gas pipe thermistor of the outdoor unit's heat exchanger (Tg)	Accumulated time	AC	O			--
29	Abnormality of low pressure sensor	Accumulated time	AC	O			--
30	Incorrect connection of change-over box.	Accumulated time	AC				--
31	Incorrect capacity setting on outdoor and indoor unit	Accumulated time	AC				--
35	Incorrect indoor unit number setting	Accumulated time	AC				--
36	Incorrect indoor unit combination	Accumulated time	AC				--
38	Abnormality of the collection circuit for outdoor unit protection	Accumulated time	AC	O			--
3A	Abnormal outdoor unit capacity	Accumulated time	AC				--
3b	Incorrect setting of voltage or combination of outdoor unit models	Accumulated time	AC				--
3d	Abnormality transmitting between the main unit and the secondary unit(s)	Accumulated time	AC				--
3E	Abnormal combination between inverter PCB and outdoor unit PCB1	Accumulated time	AC	O			--
43	Abnormality of low compression ratio	Accumulated time		O			--
d1-11		Accumulated time	d1	O			--
44	Abnormality of low pressure increase	Accumulated time	AC	O			--
d1-12		Accumulated time	d1	O			--
45	Abnormality of high pressure increase	Accumulated time	AC	O			--
d1-13		Accumulated time	d1	O			--

Cause of stoppage (alarm code or stoppage code)	Contents	Alarm code history indication					
		Time	Alarm (1)	Alarm code			Abnormal data
				Outdoor unit No.	Compressor No.	Fan No.	
47	Activation of the low pressure decrease protection device (Vacuum operation protection)	Accumulated time	AC	O			--
d1-15		Accumulated time	d1	O			--
48	Activation of the Inverter overcurrent protection device	Accumulated time	AC	O	O		iTC
d1-17		Accumulated time	d1	O	O		iTC
51	Abnormal Inverter current sensor	Accumulated time	AC	O	O		iTC
d1-17		Accumulated time	d1	O	O		iTC
53	Inverter error signal detection	Accumulated time	AC	O	O		iTC
d1-17		Accumulated time	d1	O	O		iTC
54	Abnormal Inverter fin temperature	Accumulated time	AC	O	O		iTC
d1-17		Accumulated time	d1	O	O		iTC
55	Inverter failure	Accumulated time	AC	O	O		iTC
d1-18		Accumulated time	d1	O	O		iTC
57	Activation of the fan controller protection device	Accumulated time	AC	O		O	FTC
5A	Abnormal of fan controller fin temperature	Accumulated time	AC	O		O	FTC
5b	Activation of overcurrent protection	Accumulated time	AC	O		O	FTC
5C	Abnormality of a fan controller sensor	Accumulated time	AC	O		O	FTC
A1	Detection of external abnormality	Accumulated time	AC	O			--
b5	Incorrect setting of indoor unit connection number	Accumulated time	AC				--
EE	Compressor protection alarm	Accumulated time	AC				--
d1-05	Instant power failure	Accumulated time	d1				--
d1-18	Inverter malfunction and others	Accumulated time	d1				iTC
d1-26	Abnormality of high pressure decrease	Accumulated time	d1				--
d1-32	Retry stoppage due to automatic address setting of the indoor unit	Accumulated time	d1				--
Control information	Restarting of the microcomputer due to an Inverter malfunction	Accumulated time	Ci				1
	Restarting of the microcomputer due to an indoor unit transmission malfunction	Accumulated time	Ci				3
	Restarting of the microcomputer due to a transmission malfunction between the indoor unit and the outdoor unit	Accumulated time	Ci				4
	Restarting of the microcomputer due to a status control malfunction	Accumulated time	Ci				6

## (1) Alarm details:

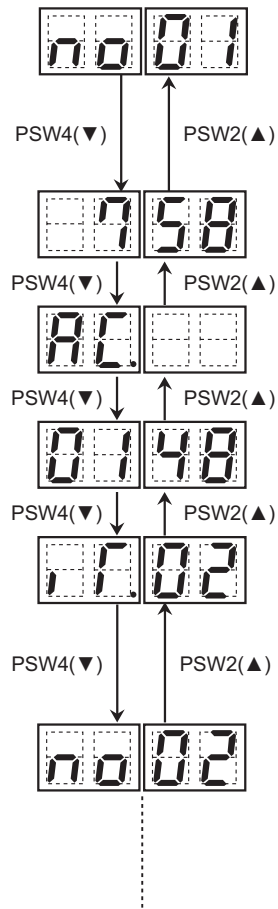
- AC.: alarm.
- d1.: retry.
- Ci.: control information.

iTC: Inverter stoppage code.

FTC: Fan controller stoppage code.

◆ **Deletion of the alarm code history**

Press PSW1 and PSW3 for five seconds to delete the alarm code history while it is shown on the display (the entire history can be deleted).



In order to delete all the history, press PSW1 and PSW3 (▶) for 5 seconds while history is displayed.

### 7.1.4 Emergency mode operation from the remote control (only for RAS-(16-96)FSXNSE and RAS-(16-72)FSXNPE)

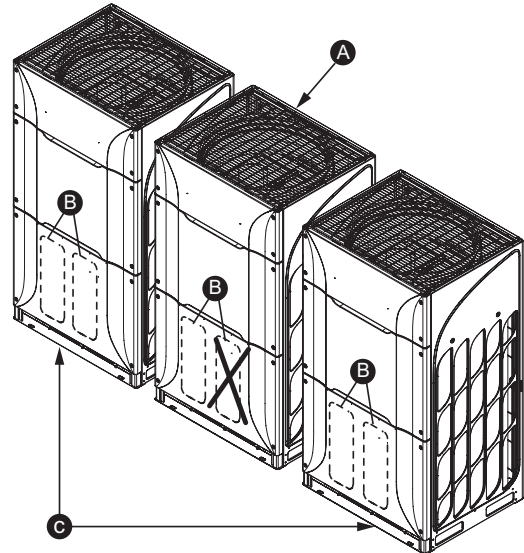
If the compressor fails, the emergency mode operation is available from the remote control.

Even if the compressor fails, the operation of the air conditioner is continuously available until the troubleshooting and problem resolution procedure is carried out.

A	Outdoor unit failed
B	Compressor
C	Even though one unit has failed, the other units can operate continuously

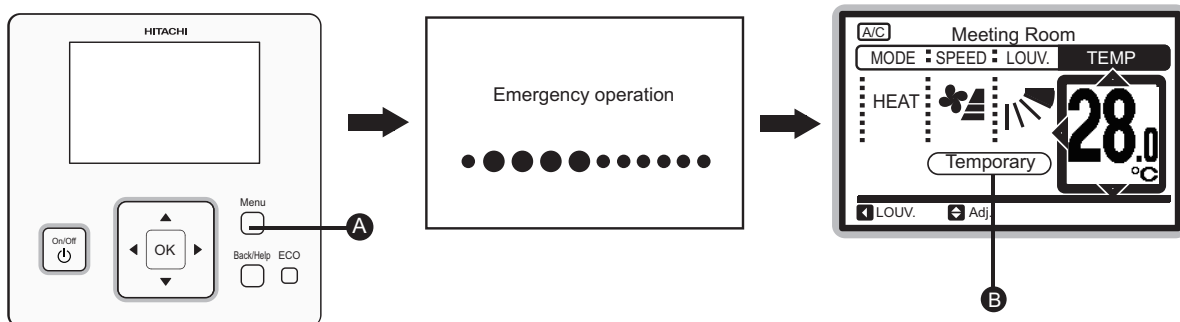
The emergency operation can be activated when the following alarm codes are displayed on the remote control screen:

Inverter compressor failure	
Alarm code	Description of the failure
06	Abnormal inverter voltage
23	Abnormal discharge gas thermistor
48	Activation of the inverter overcurrent protection device
51	Abnormal inverter current sensor
53	Inverter error signal detection
54	Abnormal inverter radiator temperature



#### ◆ Procedure (remote control PC-ARFPE example)

By pressing “MENU” for 3 seconds (A), emergency operation mode starts. “Temporary” is displayed on the LCD during this operation (B).



#### ◆ Operating condition

The emergency operation is not applicable to the outdoor unit whose compressor has failed.

#### **i** NOTE

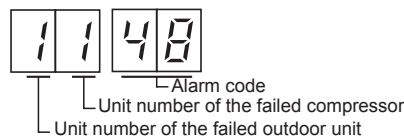
- The emergency operation is only available when all the indoor units and the connected remote controllers are H-LINKII.
- The emergency operation is only available when the alarm codes shown in the previous table are displayed.
- The emergency operation is not available in case of failure of the inverter PCB or the fan controller.
- The emergency operation is not a normal operating mode but a temporary operating mode until technical service maintenance personnel arrive. If the alarm is indicated again during the emergency operation, the alarm cannot be cancelled.
- Do not run the emergency operation for more than eight hours. Otherwise, it may damage the unit.
- Power off the system in order to release the emergency operation.

### 7.1.5 Emergency mode operation from the outdoor unit PCB1 for compressor failure (only for RAS-(26-96)FSXNSE and RAS-(20-72)FSXNPE)

Inverter compressor failure	
Alarm code	Description of the failure
04	Abnormal Inverter voltage
06	Abnormal discharge gas thermistor
23	Activation of the Inverter overcurrent protection device
48	Abnormal Inverter current sensor
51	Inverter error signal detection
52	Abnormal Inverter radiator temperature
53	Inverter error signal detection
54	Abnormal inverter fin temperature

#### ◆ Alarm code

The number of the failed outdoor unit, the number of the failed compressor and the alarm code are displayed on 7-segment of the outdoor unit PCB1.



#### ◆ Procedure

- 1 Turn OFF the main switches to all the indoor and outdoor units.
- 2 Disconnect the inverter compressor wiring of the inverter PCB (INV1 or INV2) terminals according to the following procedure. Be sure to insulate the disconnected terminals.

The number of failed compressor	Procedure
Inverter compressor 1	Disconnect the power supply wiring for the inverter compressor from the inverter PCB (INV1) terminals.
Inverter compressor 2	Disconnect the power supply wiring for the inverter compressor from the inverter PCB (INV2) terminals.

- 3 Turn DSW5 ON to stop the compressor operation according to the table below. If either is set, NONE of the compressor in the failed outdoor unit will operate. If all compressor of the failed outdoor unit are not operated, fully close the stop valves (for gas/liquid).

The number of failed compressor	Procedure
Inverter compressor 1	Turn ON DSW5-No. 1
Inverter compressor 2	Turn ON DSW5-No. 2

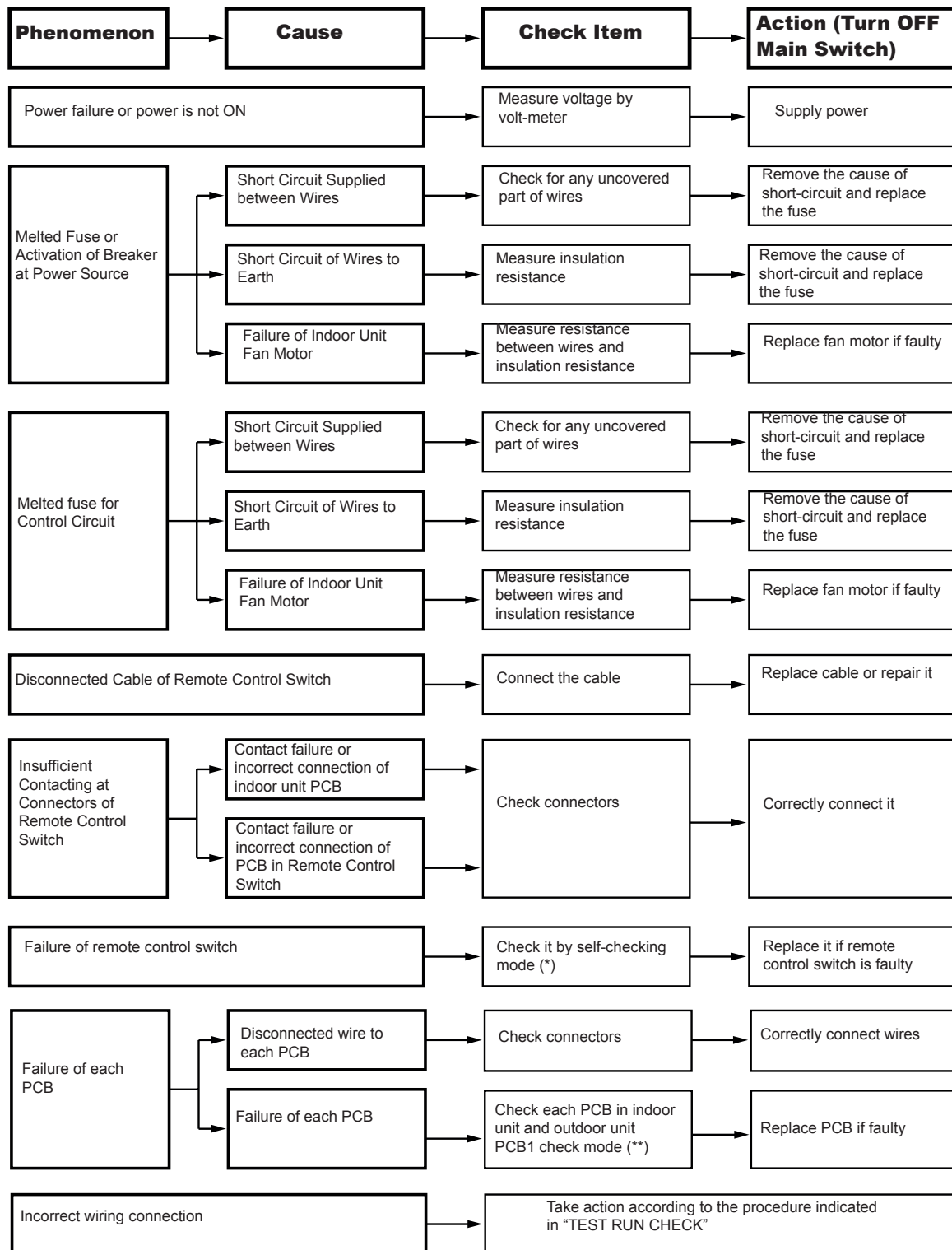
- 4 Turn ON the power supply.
- 5 Start operation using the remote control switch.

#### NOTE

- Measure the insulation resistance of the Inverter compressor. Do not activate the emergency operation when the insulation resistance is 0 Ω. Another compressor may suffer damage due to the possibility that refrigerant oil may be oxidized.
- In emergency operation, the compressor frequency can not normally be controlled. Consequently, alarm codes "07", "43", "44", "45" or "47" can be displayed on the LCD.
- The emergency operation cannot provide sufficient cooling and heating capacity.
- The emergency operation is a temporary mode of operation used when the Inverter compressor is damaged. Therefore, replace it with a new one as soon as possible.
- Turn DSW5-1 and DSW5-2 OFF on PCB1 of the outdoor unit after replacing the compressor. If this setting is not carried out, the Inverter compressor will be damaged.

### 7.1.6 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.



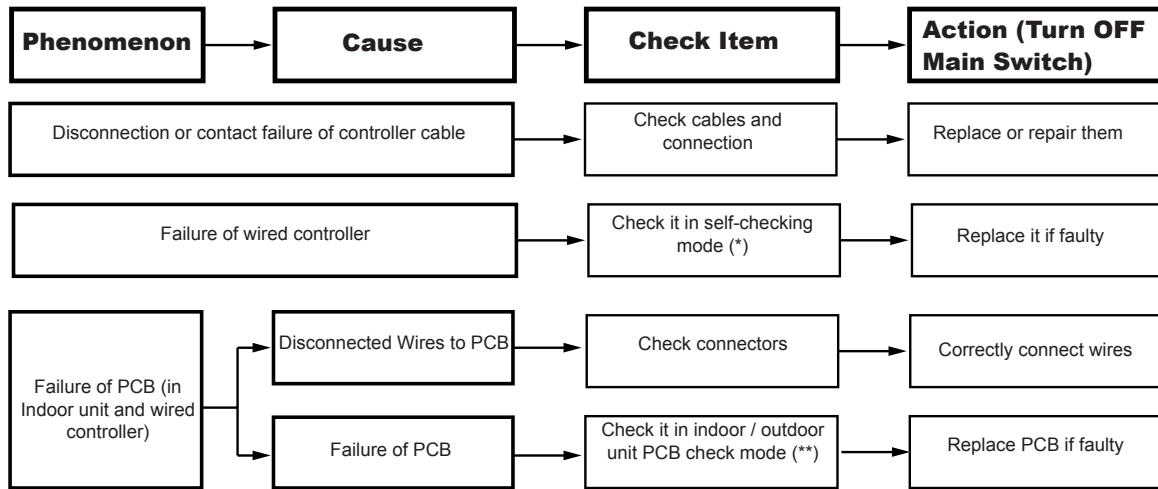
**i** NOTE

- (\*): Refer to the item "Self checking". in this chapter.
- (\*\*): Refer to the item "I.U. / O.U. PCB Check" in this chapter.



### 7.1.7 Abnormal transmission between remote control switch and indoor unit

- The RUN indicator on the remote control: Flashes every two seconds.

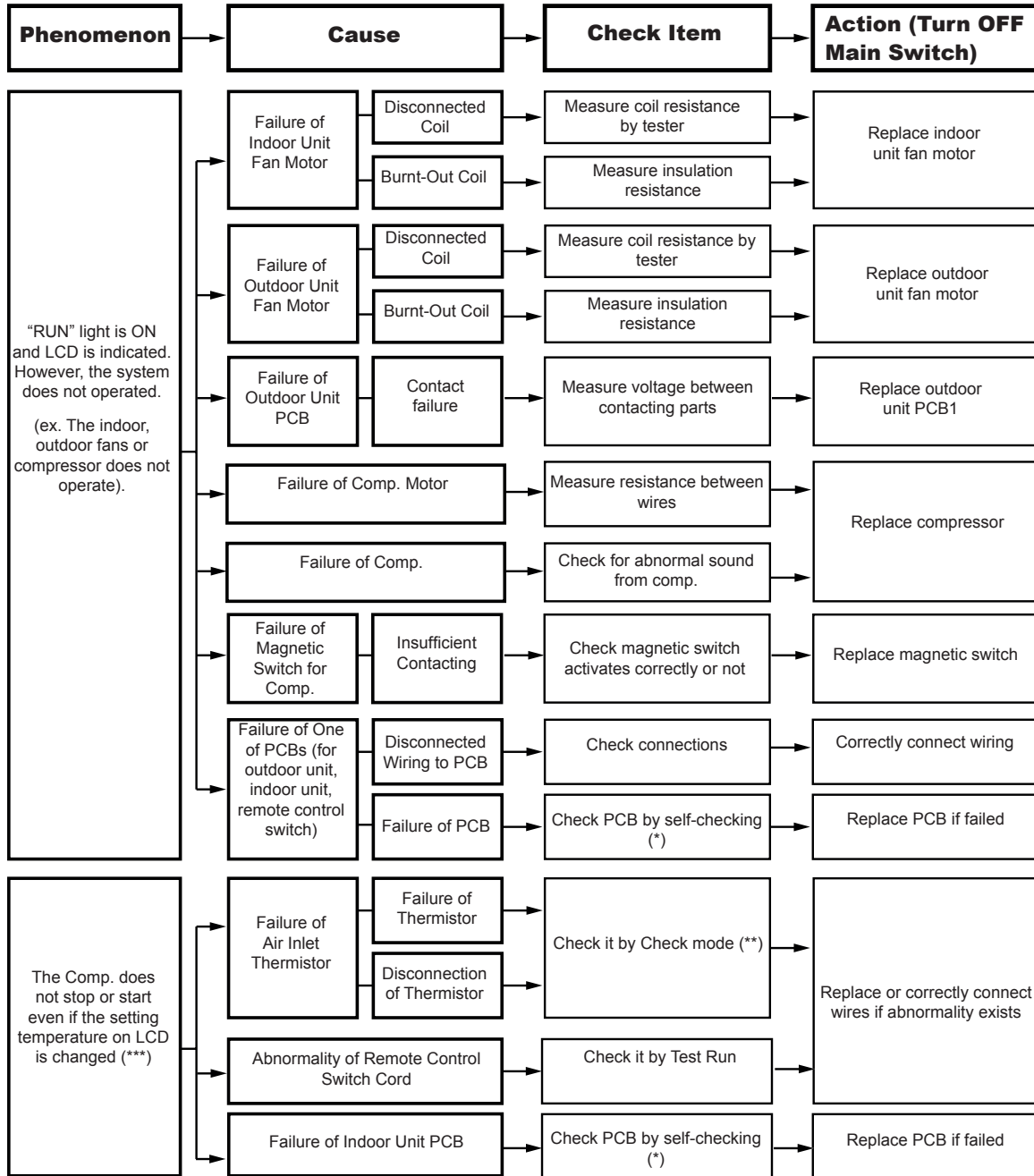


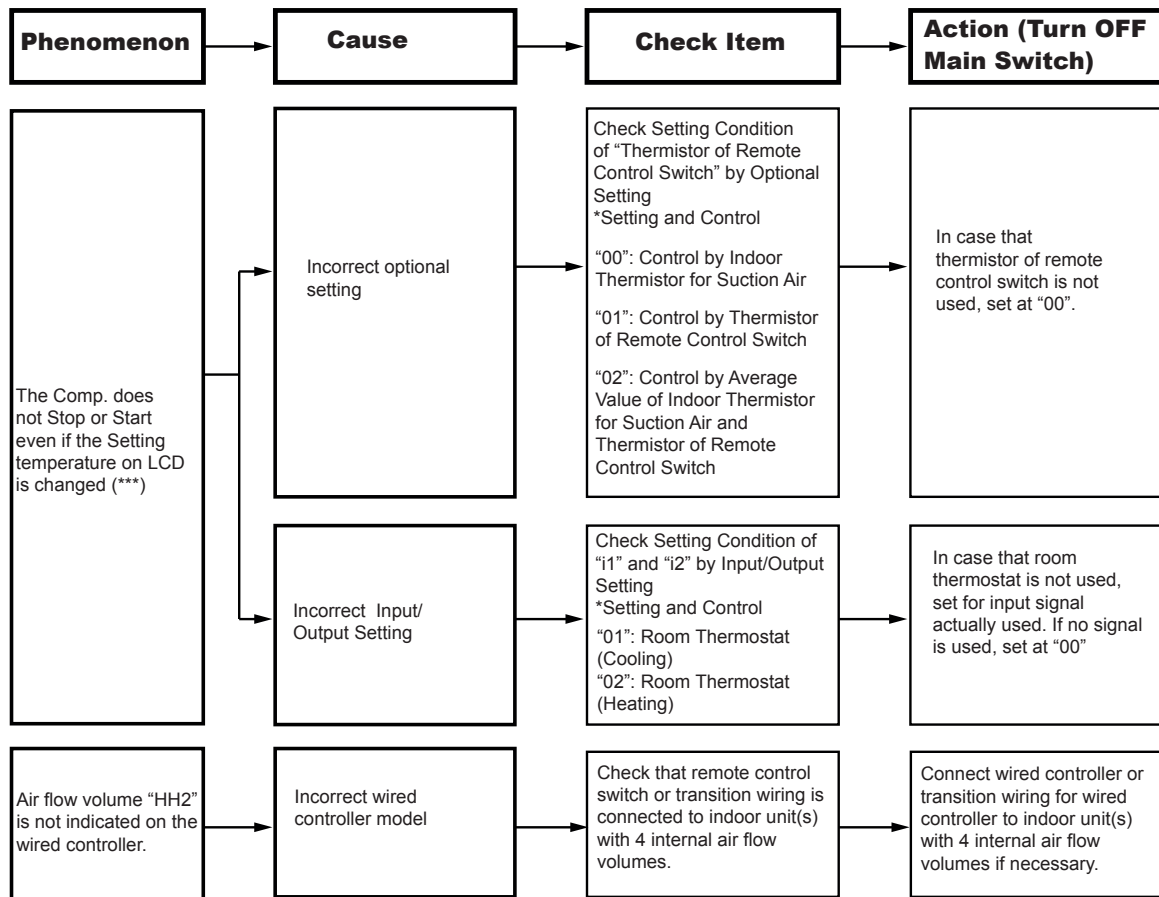
**i** NOTE

- (\*): Refer to the item "Self checking". in this chapter.
- (\*\*): Refer to the item "I.U. / O.U. PCB Check" in this chapter.

### 7.1.8 Abnormal operation of the devices

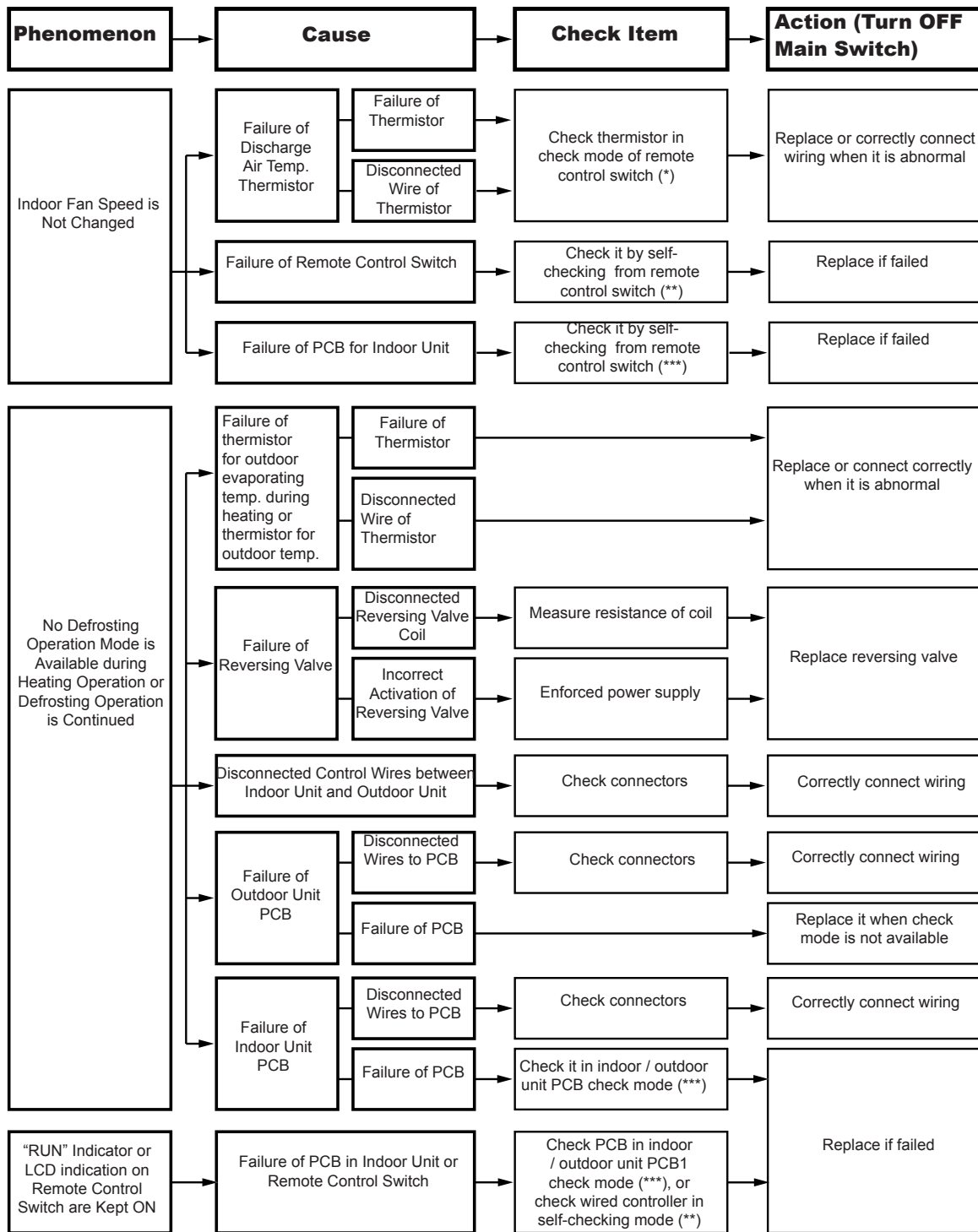
In the case no anomalies are detected (alarm codes) in the remote control switch, and normal operation is not available, carry out the required actions in accordance with the procedures described below.





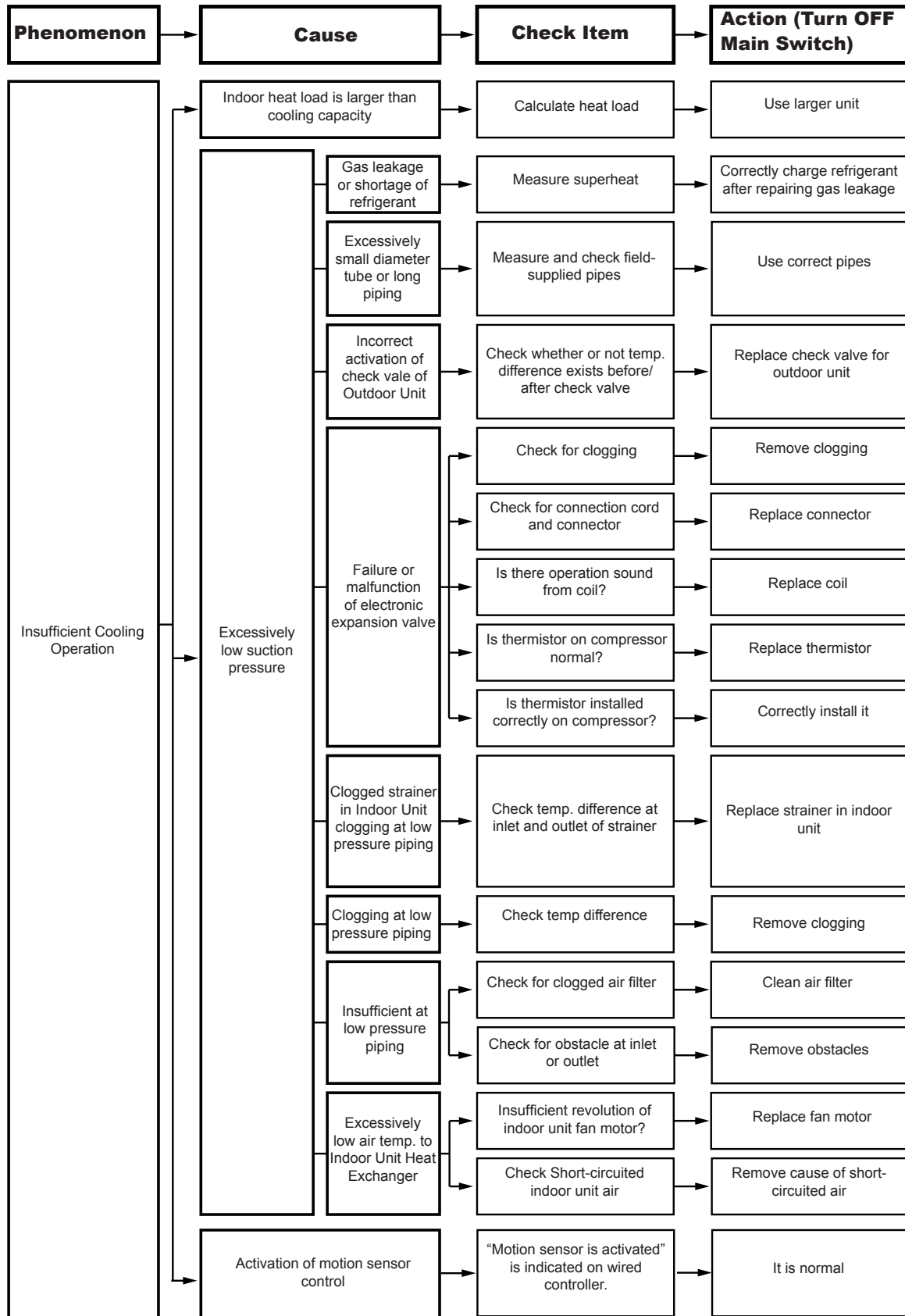
**i** NOTE

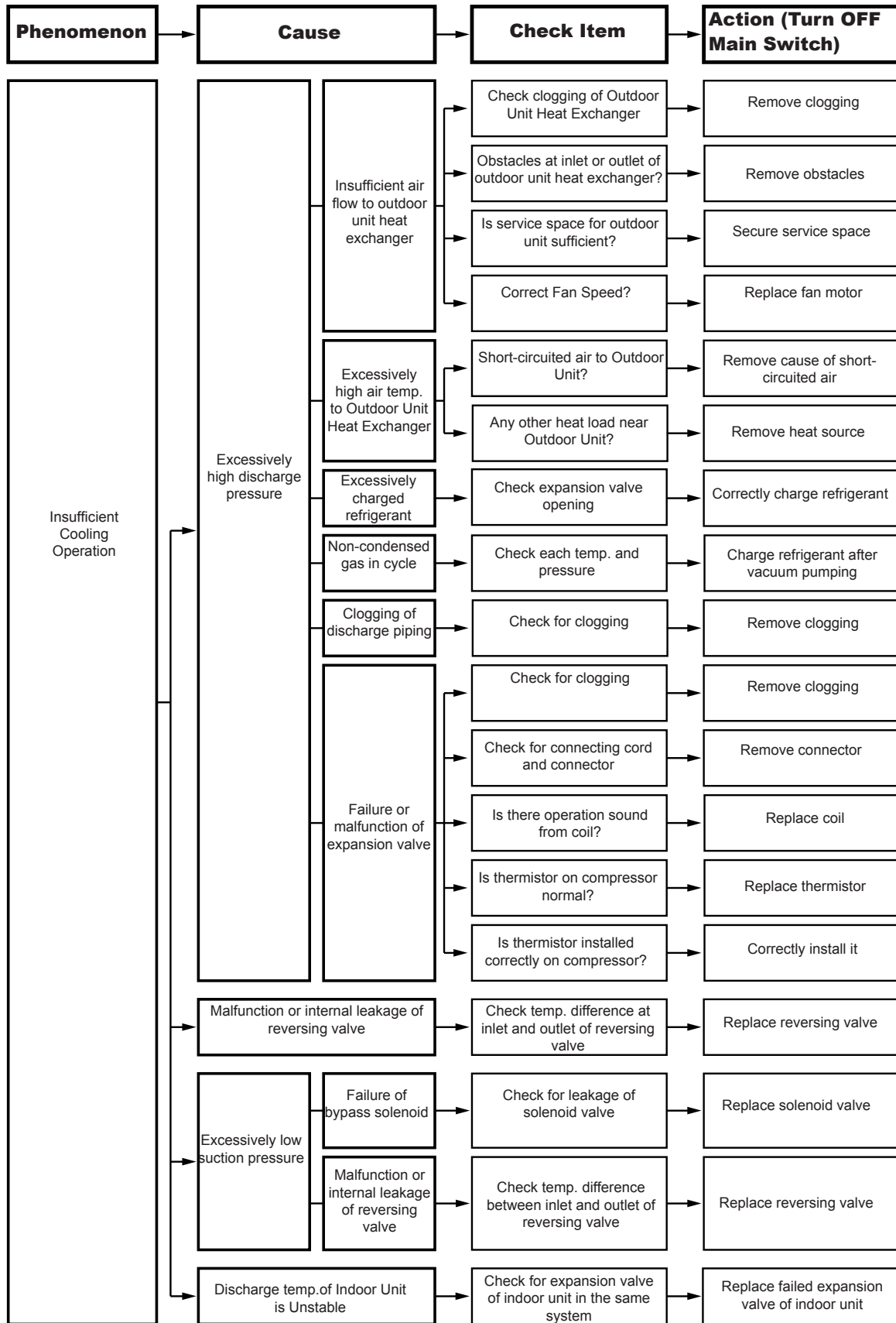
- (\*): Refer to the item "Self checking". in this chapter.
- (\*\*): Refer to the item "I.U. / O.U. PCB Check" in this chapter.
- (\*\*\*) : Even if the controllers are correct, the compressor does not operate under the following conditions:
  - Indoor air temperature is lower than -21 °C or the outdoor air temperature lower than -5 °C during the cooling operation.
  - Indoor air temperature is higher than 30 °C or outdoor air temperature higher than 23 °C during the heating operation.
  - When the cooling (or heating) operation signal is sent to the outdoor unit and a different mode as heating (or cooling) operation signal is sent to the indoor units.
  - When the demand or emergency stop signal is sent to the outdoor unit.

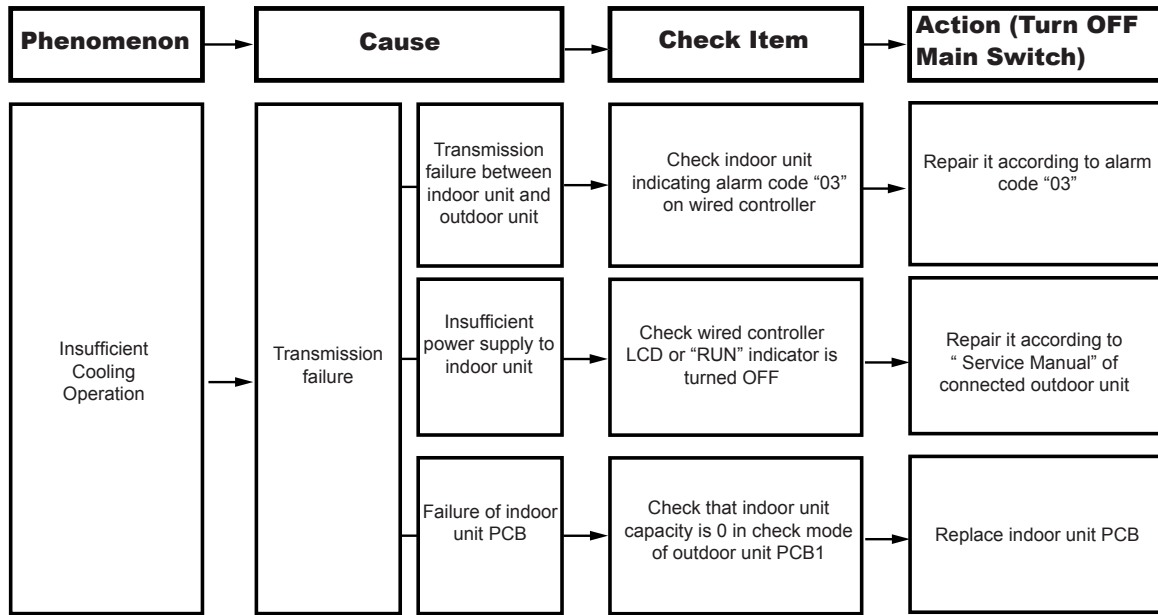


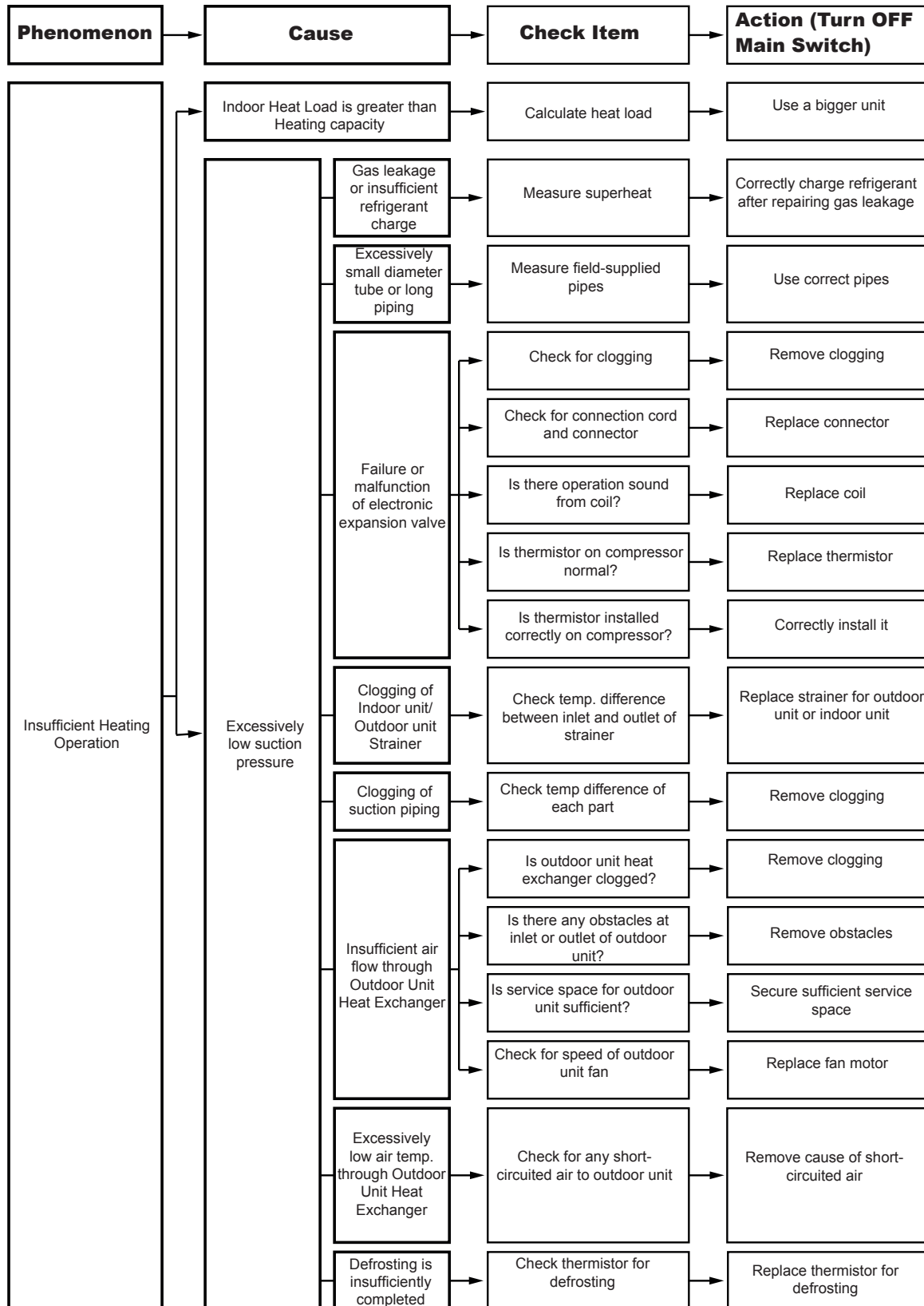
**i** NOTE

- (\*): Refer to the item "7.4 Troubleshooting in the check mode by using the remote control switch (PC-ARFPE example)" in this chapter.
- (\*\*): Refer to the item "Self checking" in 1.4 chapter.
- (\*\*\*): Refer to the item "I.U. / O.U. PCB Check" in 1.4 chapter.

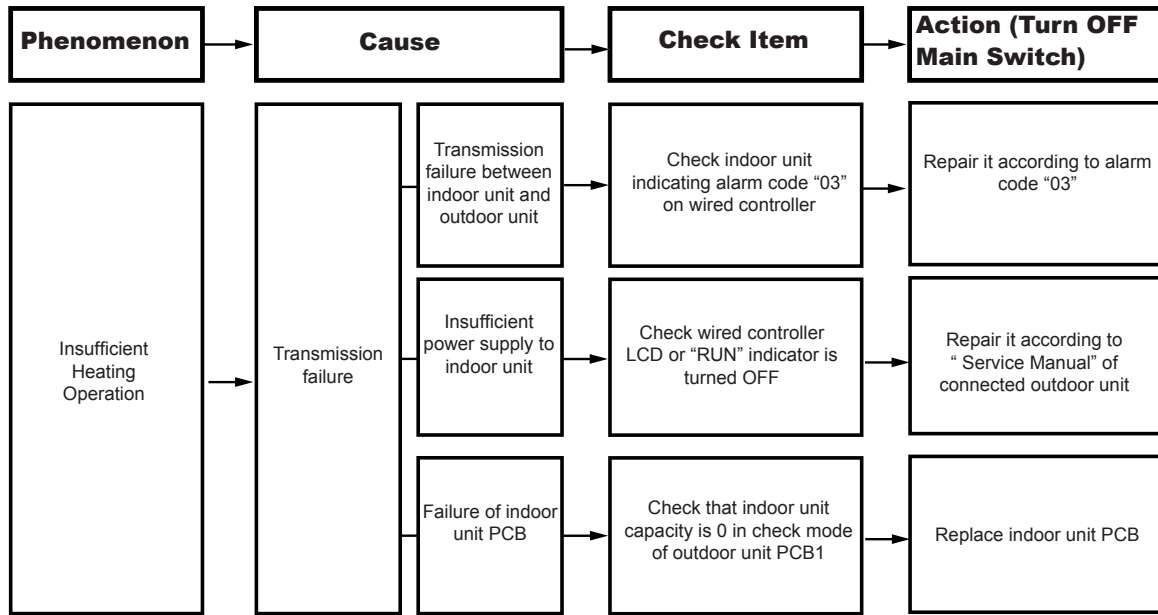


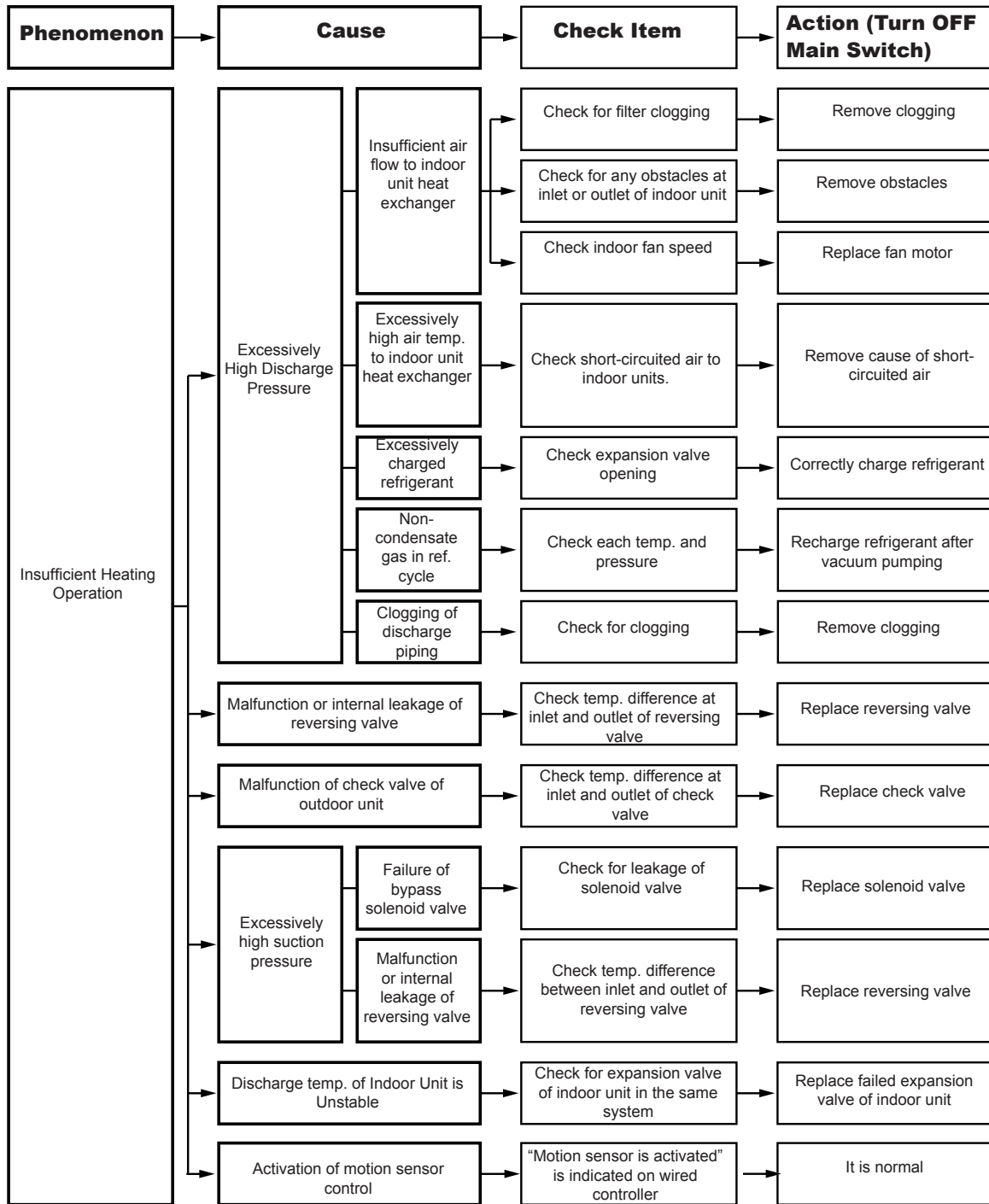


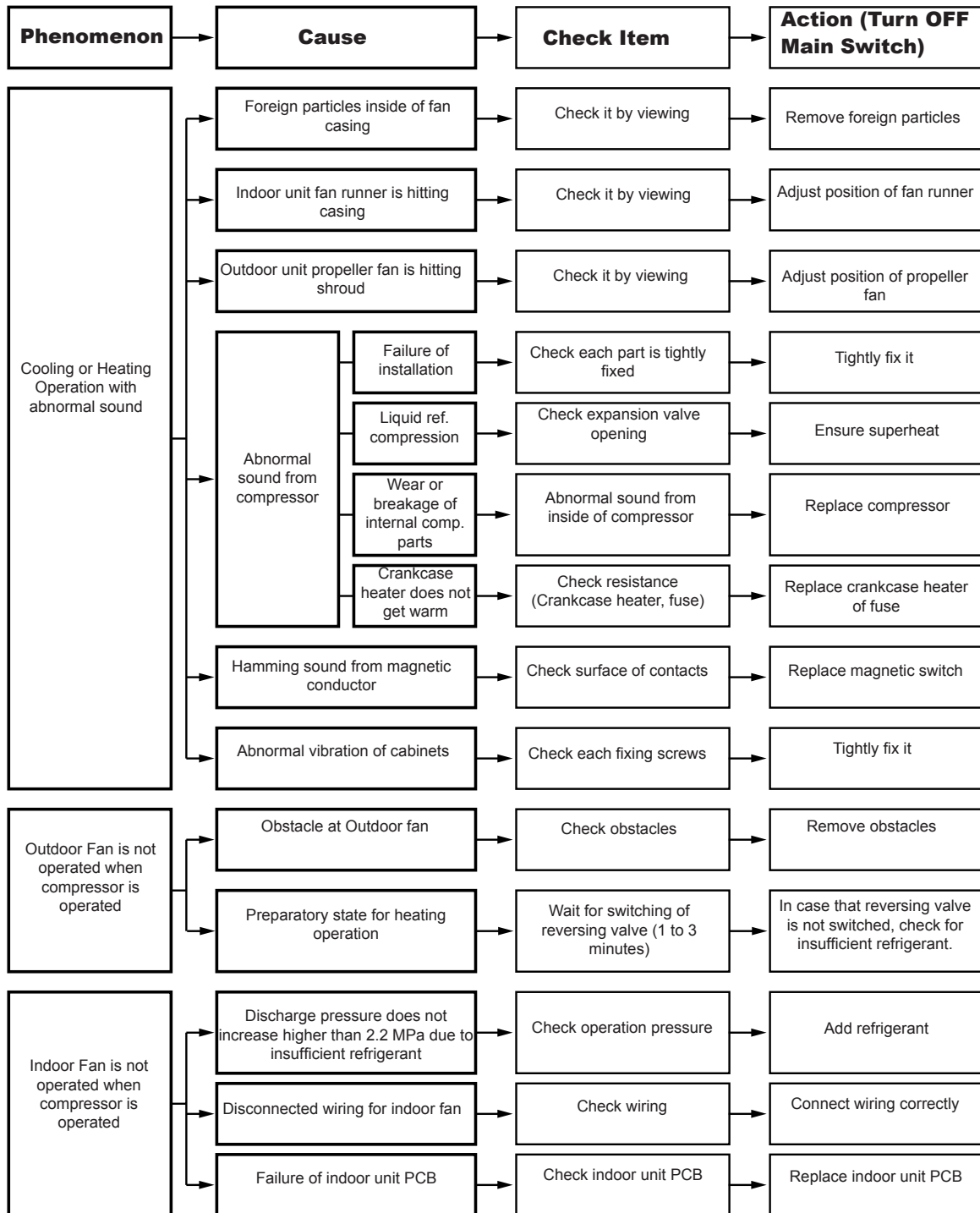


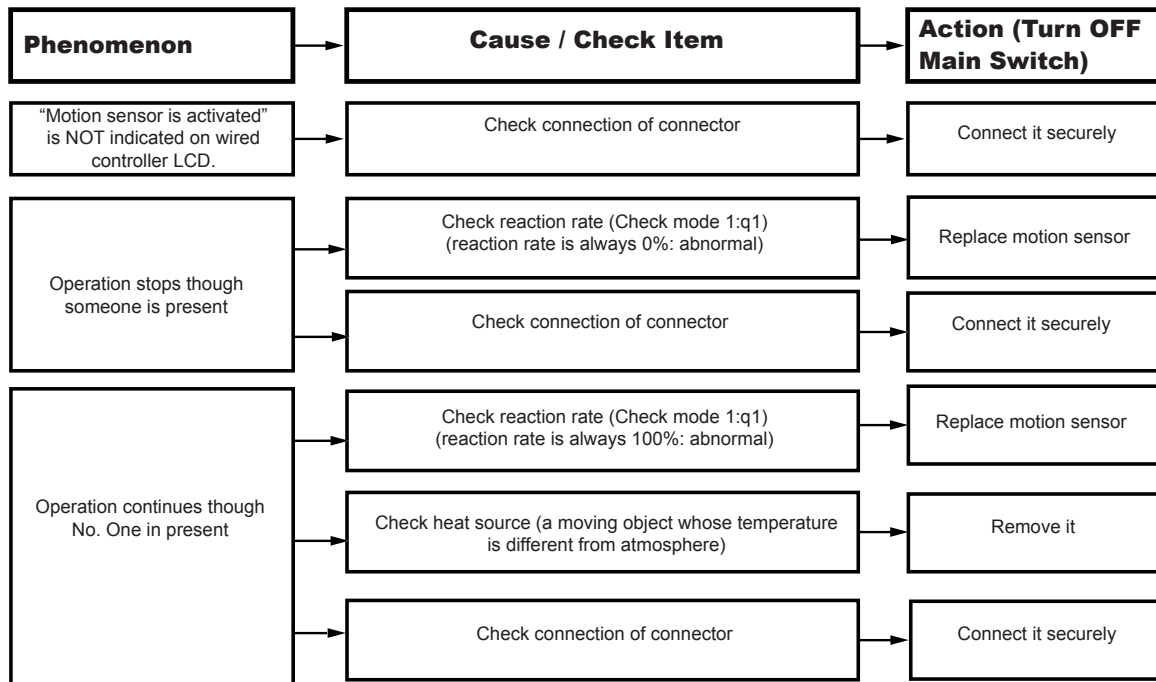










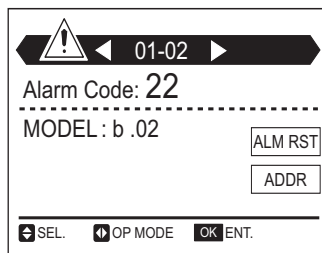


## 7.2 Procedure for troubleshooting

### 7.2.1 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-ARFPE



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.

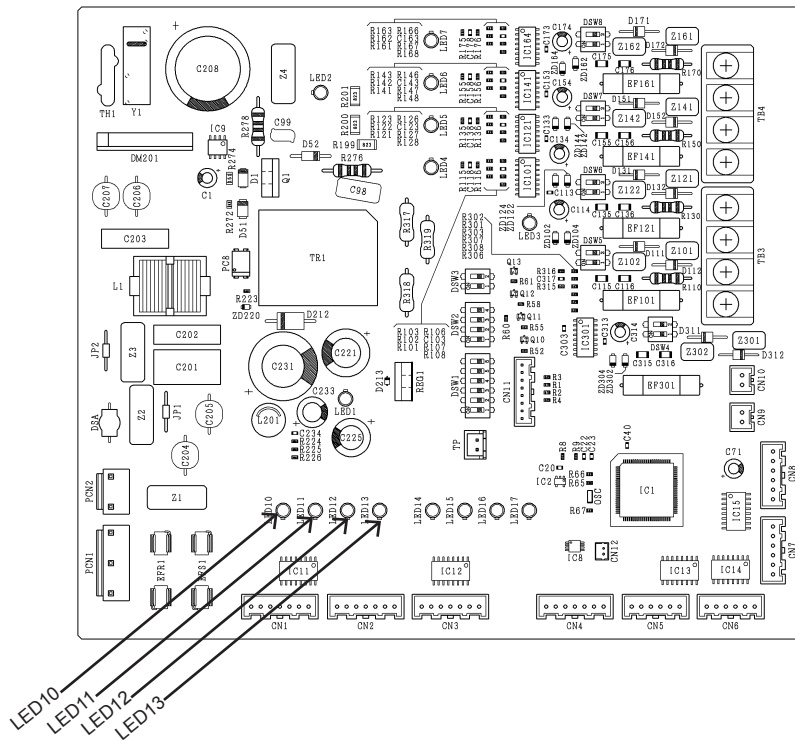
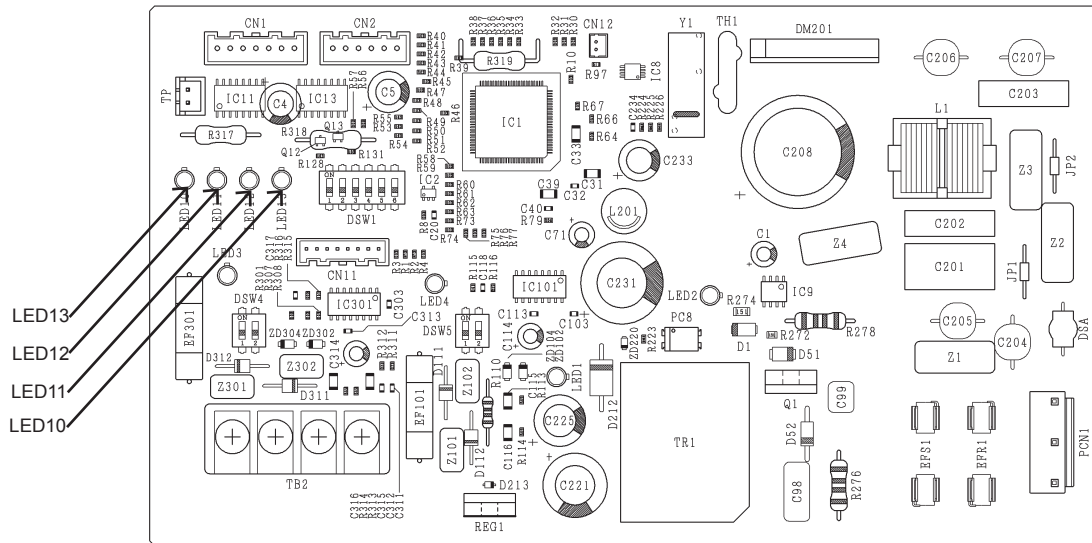
Code	Category	Content of Abnormality	Leading Cause
01	Indoor Unit	Activation of Protection Device (Float Switch)	Activation of Float Switch (High Water Level in Drain Pan, Abnormality of Drain Pipe, Float Switch, or Drain Pan)
02	Outdoor Unit	Activation of Protection Device (High Pressure Cut)	Activation of PSH (Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing)
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, Connection to Reversed Phase, 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)
0A	Communication	Abnormal Communication between Outdoor Units	Incorrect Wiring, Breaking Wire, Loose Terminals
0b	Outdoor Unit	Incorrect Outdoor Unit Address Setting	Duplication of Address Setting for Outdoor Units (Sub Units) in Same Refrigerant Cycle Number
0C		Incorrect Outdoor Unit Main Unit Setting	Two (or more) Outdoor Units Set as "Main Unit" Exist in Same Refrigerant Cycle Number

Code	Category	Content of Abnormality	Leading Cause
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)	
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
21	Sensor on Outdoor Unit	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.
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 No. In same Refrigerant Cycle Number
36		Incorrect of Indoor Unit Combination	Indoor Unit is Designed for R22
38		Abnormality of Picking up Circuit for Protection in Outdoor Unit	Failure of Protection Detecting Device (Incorrect Wiring of Outdoor PCB)
3A	Outdoor Unit	Abnormality of Outdoor Unit Capacity	Outdoor Unit Capacity > permitted maximum.
3b		Incorrect Setting of Outdoor Unit Models Combination or Voltage	Incorrect Setting of Main and Sub Units(s) Combination or Voltage
3d		Abnormal Communication between Main Unit and Sub Unit(s)	Incorrect Wiring, Disconnect Wire, Breaking Wire, PCB Failure
3E		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

Code	Category	Content of Abnormality	Leading Cause
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
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)
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
b5		Incorrect Indoor Unit No. 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
C1		CH-Box	Incorrect CH-Box Connection
C2	Incorrect Indoor Unit Connection Number		9 or More Indoor Units Connected to CH-Box
C3	Incorrect Indoor Unit Refrigerant Number Setting		Indoor units of different refrigerant cycle number are connected to CH-Box
C4	Incomplatible outdoor unit connection (CH-Box)		
C5	Incorrect connection port setting		Indoor unit is connected to a port that is set to not used for multiple branch type CH-Box
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

**7.2.2 Alarm code CH-Box:**

The alarm code is indicated by LED on the CH-Box PCB:



LED				Alarm Code	Content of abnormality
4	5	6	7		
O	O	X	X	03	Abnormal transmission between CH and outdoor unit
X	X	O	O	03	Abnormal transmission between CH and indoor unit
O	O	O	O	C1	There are 2 or more CH units connected between the outdoor and indoor units.
O	O	O	X	C2	There are 9 or more indoor units connected to the CH unit
X	O	O	X	C3	Indoor units from different refrigerant cycles have been connected to the CH unit.

O: Flashing (turn ON; 0.5 sec / turn OFF; 0.5 sec).

X: Turn OFF.

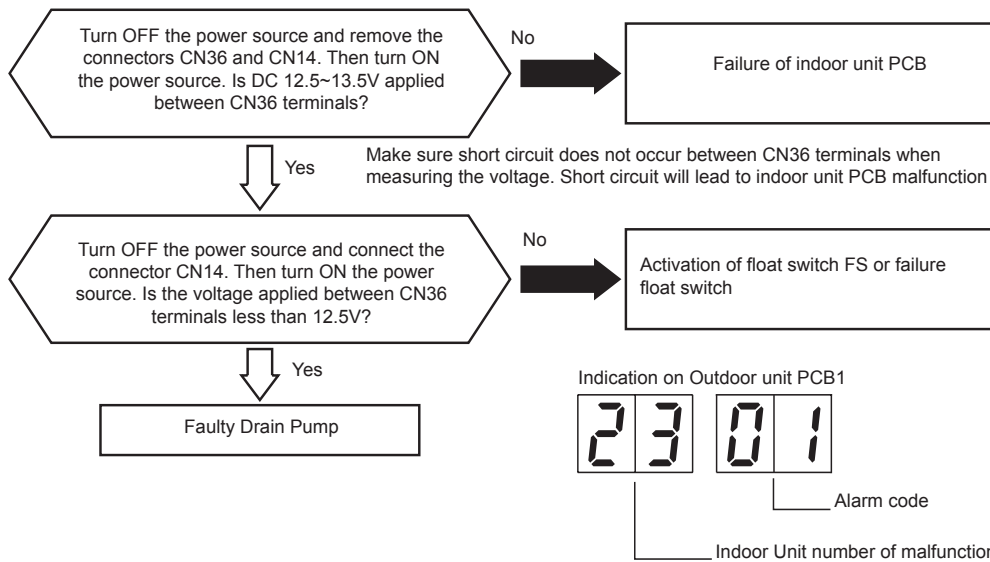


### 7.3 Troubleshooting by alarm code

Alarm code	<b>01</b>	Activation of the Indoor unit protection device (float switch) in indoor unit.
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Example of RCI-(1.0-6.0)FSN4 type

This alarm code is displayed when the contact between number 1 and number 2 of CN14 on the indoor unit PCB is opened for over 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	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 CN36 terminals by tester	Repair drain pump if faulty
	Contact failure	Measure resistance by tester	Repair looseness and replace connector
	Incorrect connection	Check connections	Repair connection
Failure indoor unit PCB		Check PCB by self-checking (*)	Replace it if failure

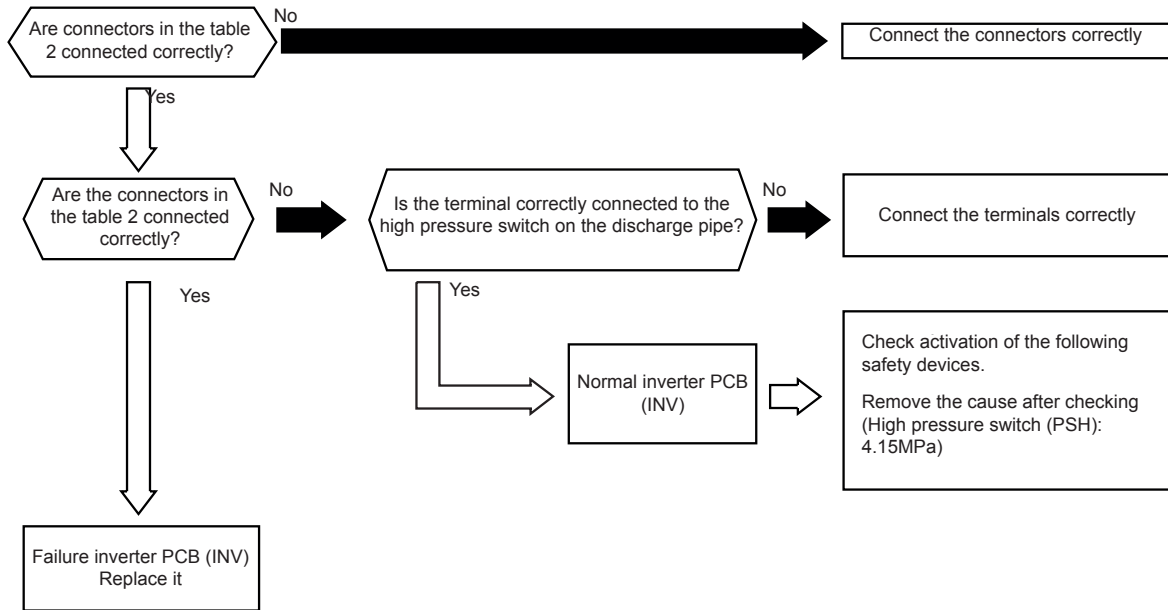
**i** NOTE

(\*)Refer to the chapter "7.4 Troubleshooting in the check mode by using the remote control switch (PC-ARFPE example)".

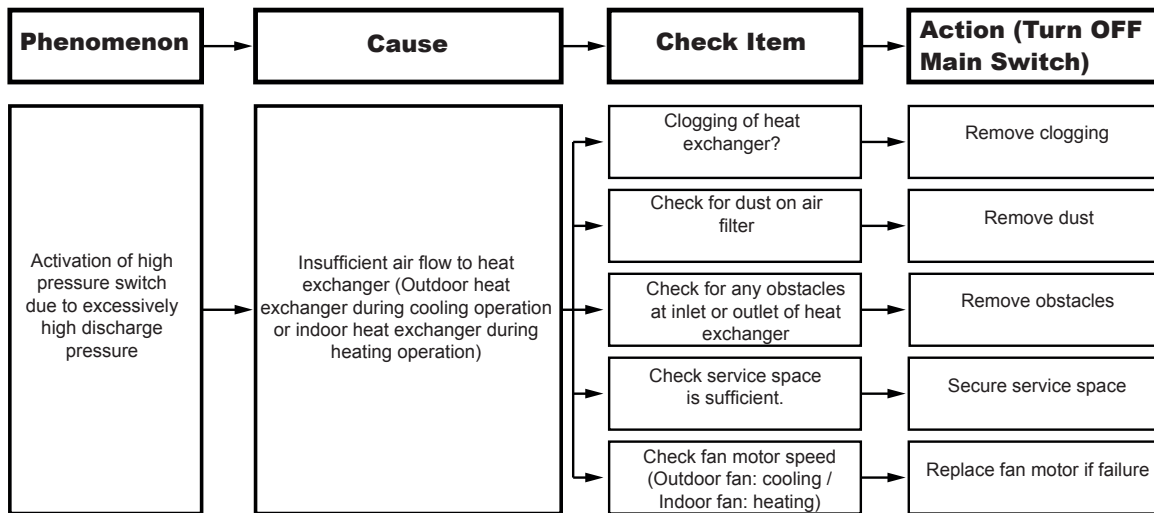


Alarm code	<b>02</b>	Activation of the outdoor unit protection device
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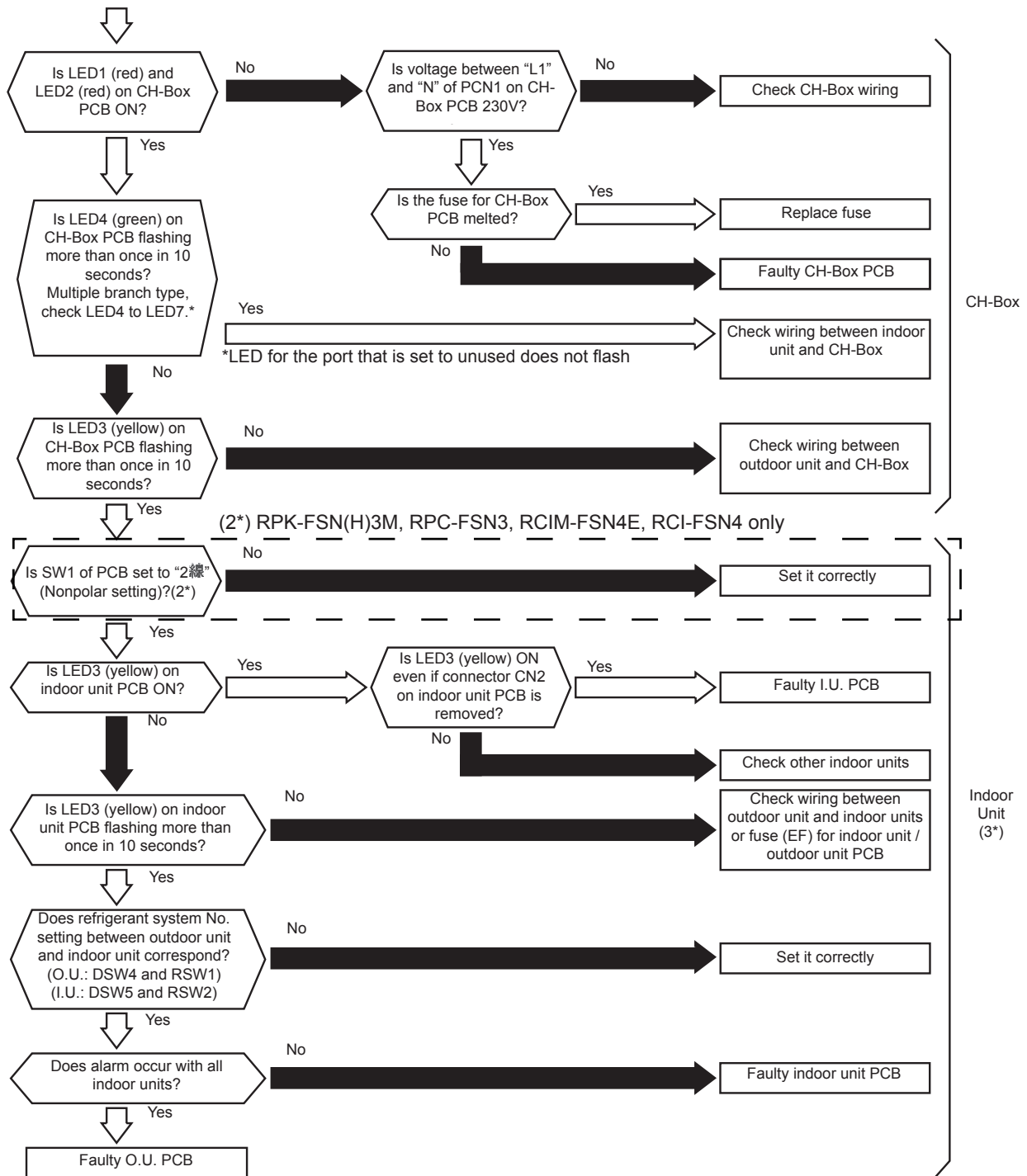
This alarm is indicated when one of the safety devices is activated during the compressor running (Y52C is turned ON).



PCB	Inverter PCB (INV)
Connector	PCN2
Pin number	1,3




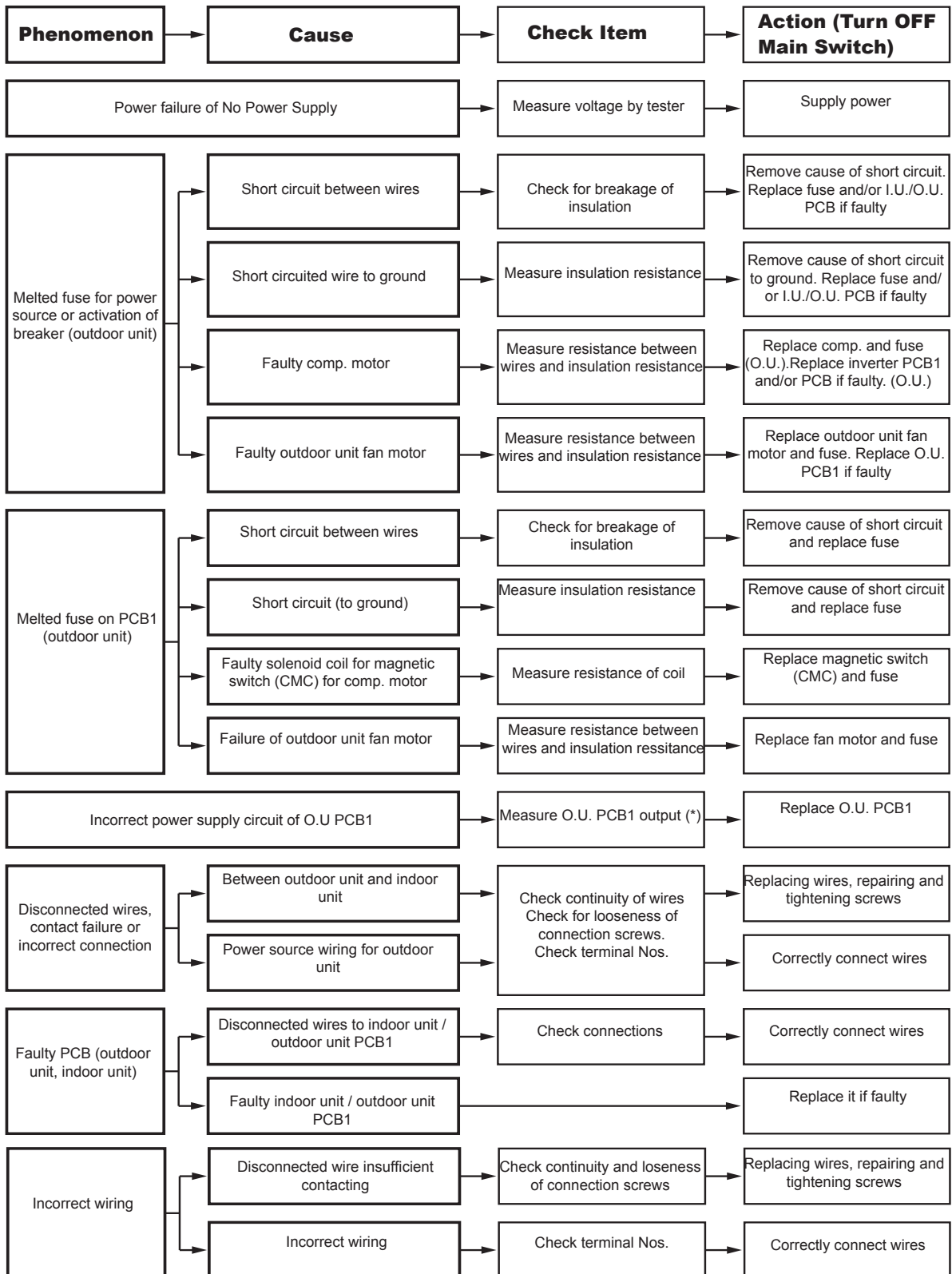




**i** NOTE

- (1\*) In the case that terminating resistance (DSW10) is set to OFF for H-LINK connection, set the end terminal resistance to ON when CN2 is disconnected. Set the end terminal resistance to OFF when CN2 is reconnected.
- (2\*) Refer to service manual of the indoor unit for details.
- (3\*) Transmission setting for the wall mounted (SW1): for communication on the indoor unit PCB is set to “2線” by default. No setting is required for SW1. If it is set to “3線”, alarm 03 will occur.

Item	Setting position
SW1	<div style="display: flex; align-items: center; justify-content: center;"> <span style="margin-right: 5px;">3線</span>  <span style="margin-left: 5px;">2線</span> </div>



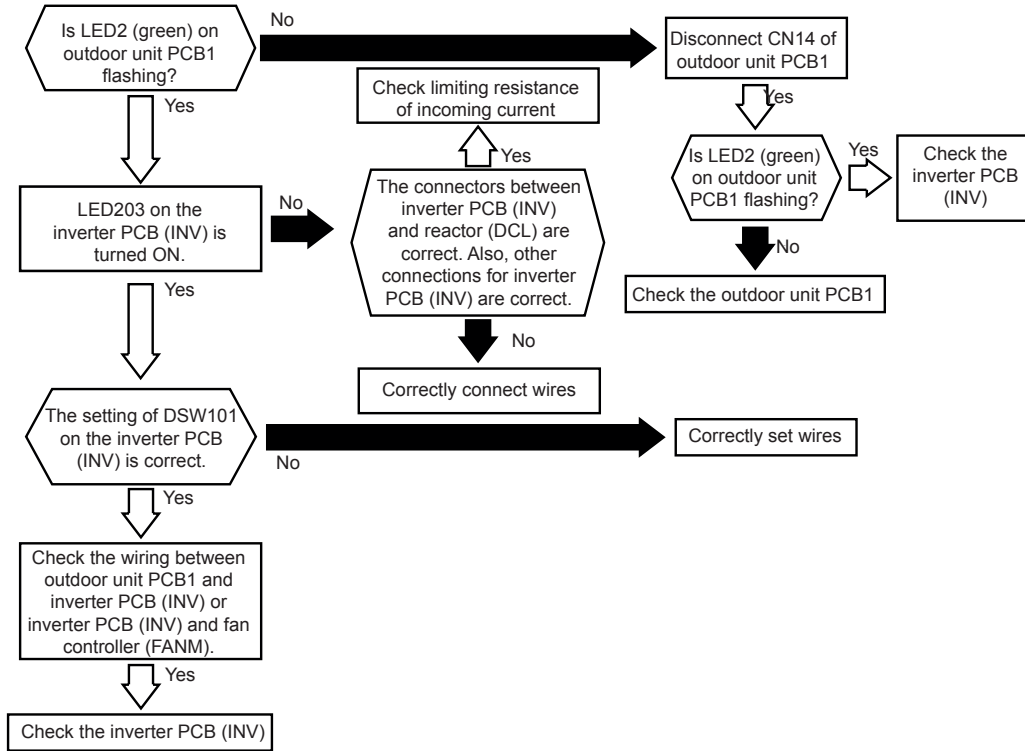
**i** NOTE

(\*) Refer to outdoor unit PCB1 check method for details.



Alarm code	<b>04</b>	Abnormal transmission between Inverter PCB and the outdoor unit PCB1.
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This alarm is indicated when an anomaly is maintained for 30 seconds after the normal transmission between PCB1 of the outdoor unit and the inverter PCB, and also if the anomaly condition is maintained for 30 seconds after the microcomputer is automatically reset. The alarm is indicated when abnormal transmission is maintained for 30 seconds after the outdoor unit is turned on.



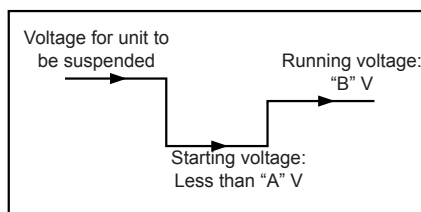
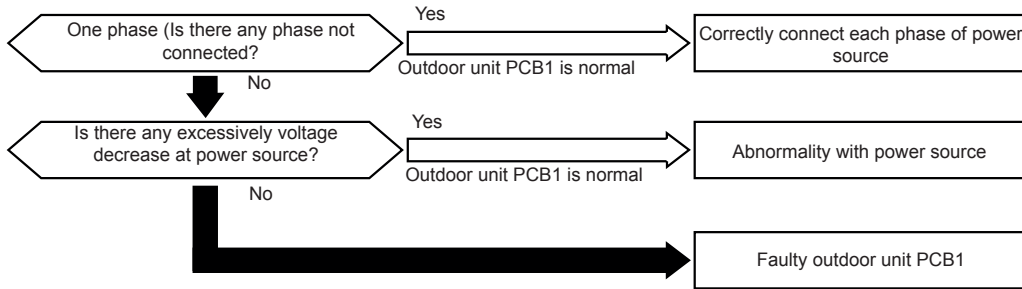
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Disconnected wires, contact failure or incorrect connection	Between outdoor unit PCB1, inverter PCB and fan controller	Check continuity of wires Check for looseness of connection screws. Check terminal connection number.	Replacing wires, repairing, tightening screws and incorrect wiring
	Power source wiring for outdoor unit		
Faulty PCB (outdoor PCB1, inverter PCB)	Disconnected wires to PCB1	Check connections	Repair wiring connections
	Faulty PCB		Replace PCB if faulty
Faulty electrical components (Power fuse, resistance)	Melted power fuse	Check conductivity of power fuse, power transistor, and diode module	Replace power fuse, power transistor, and diode module
	Disconnected incoming current limit resistance	Check resistance of incoming current limit resistance	Replace incoming current limit resistance
Incorrect wiring	Disconnected wire insufficient contacting	Check continuity and looseness of connection screws	Replacing wires, repairing and tightening screws
	Incorrect wiring	Check connection numbers.	Correctly connect wires

**i** NOTE

When replacing or checking for the inverter part, make sure to perform the electric discharge work according to the item "6.2.2 High voltage discharge work for replacing parts"

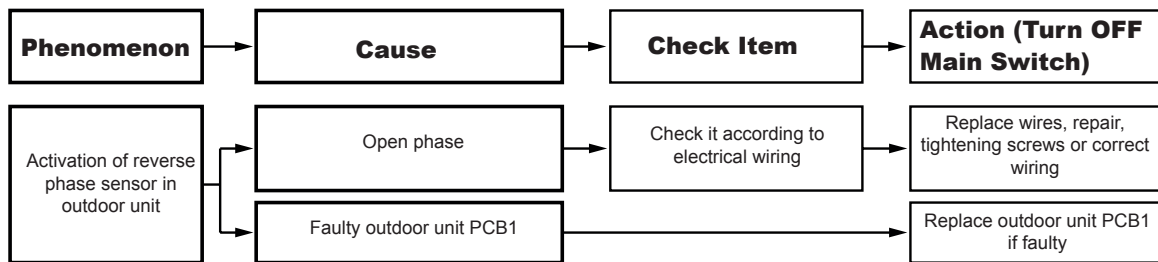
Alarm code	<b>05</b>	Abnormal power source phase.
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This alarm is indicated when the main power source phase is reversely connected or one phase is not connected.



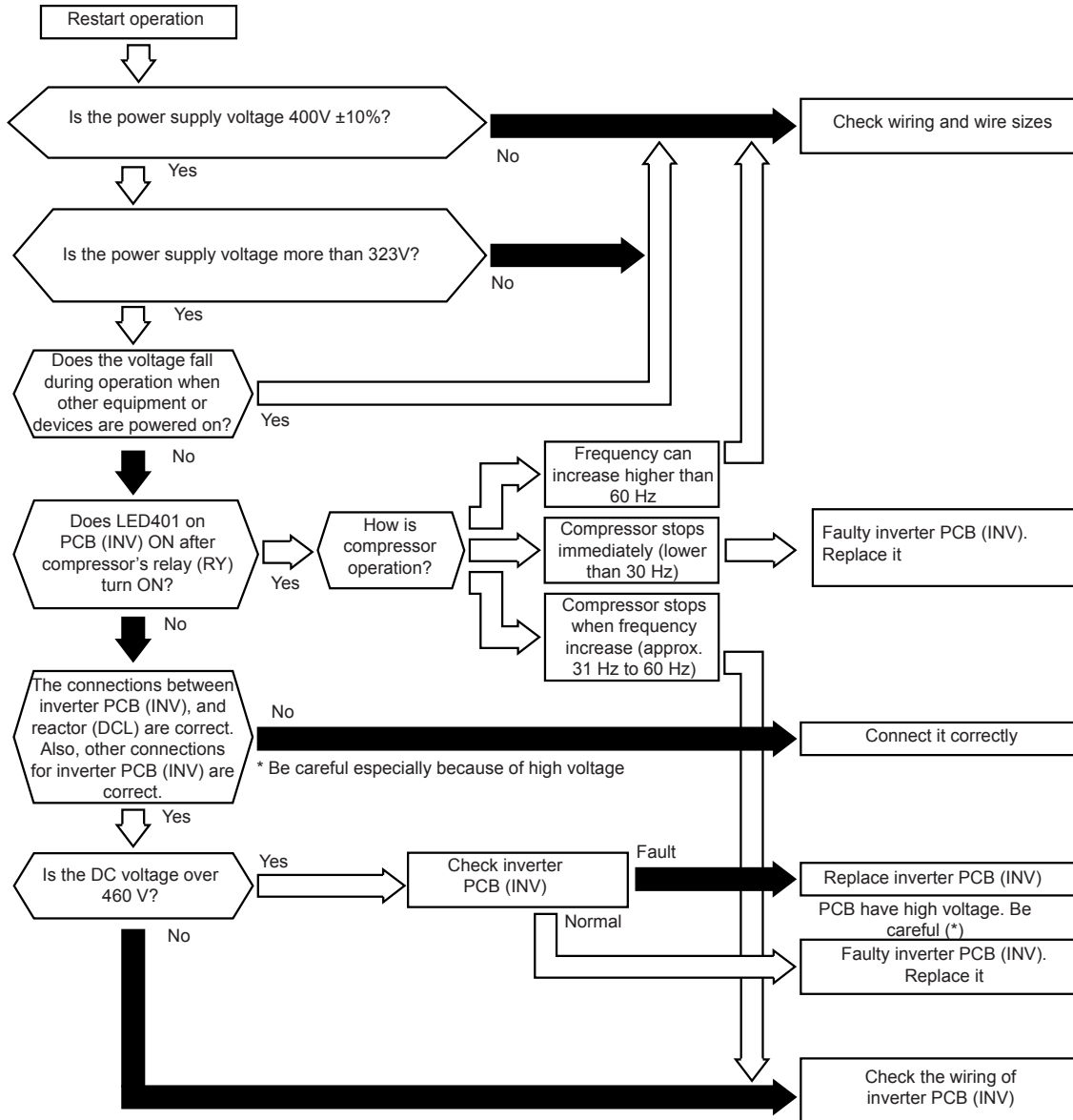
Check item

Power supply	"A"	"B"
400 V 50 Hz	340	360 to 440



Alarm code	<b>06</b>	Abnormal Inverter voltage (Insufficient inverter voltage or over voltage)
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This alarm is indicated when the voltage between terminal "P" and "N" of the inverter PCB is insufficient and occurs 3 times within a 30 minute period. If it occurs less than 2 times, a retry is carried out.



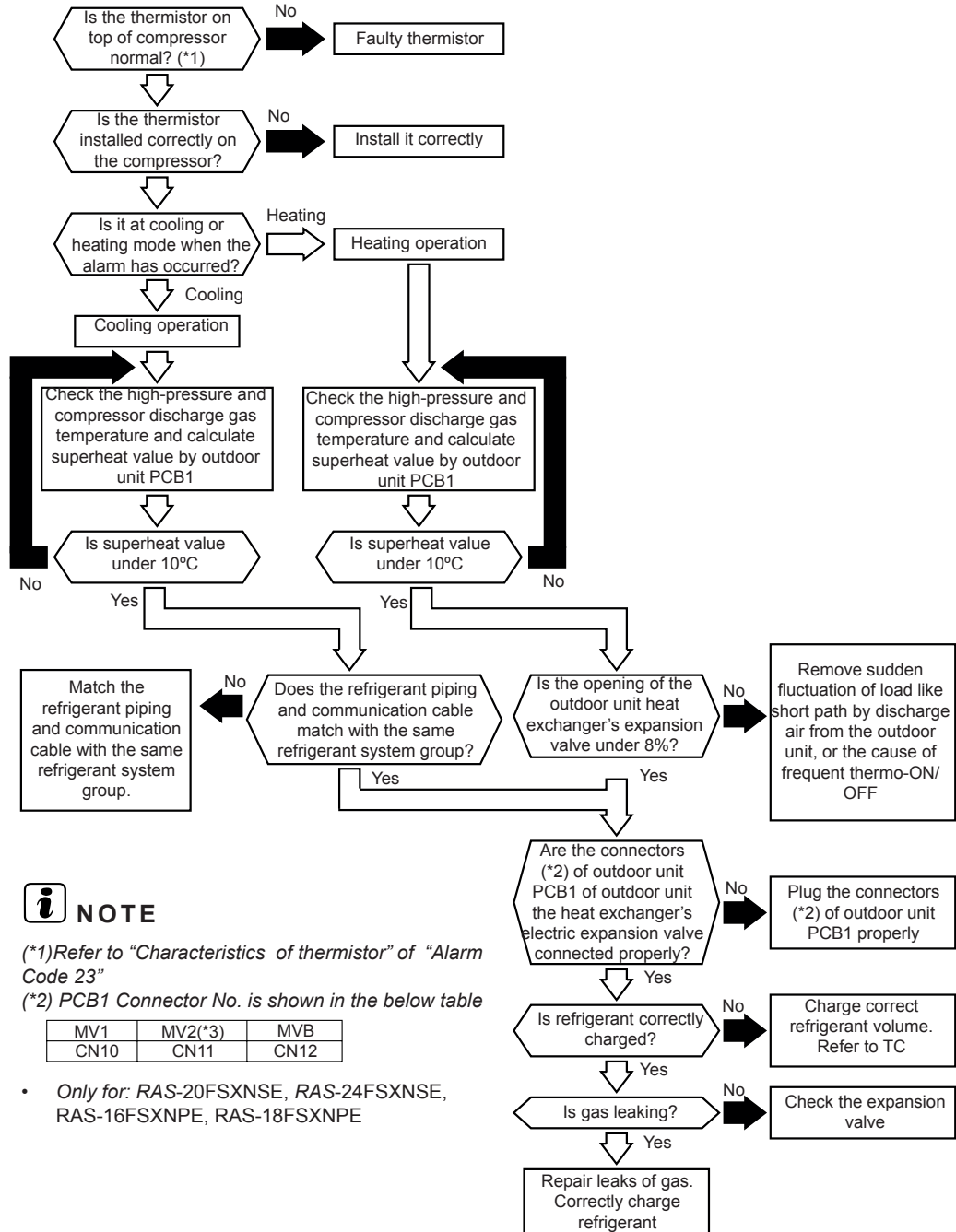
**i** NOTE

Refer to the item "6.2.2 High voltage discharge work for replacing parts" for checking procedures of the inverter PCB. If high voltage remains, perform the high voltage discharge work according to this item.



Alarm code	07	Drop in discharge gas superheat.
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In the case that the discharge gas superheat is less than 10 degrees on the upper part of the compressor is maintained for 30 minutes, a retry operation is carried out. However, when the alarm occurs twice in 2 hours, the alarm code is indicated.



**NOTE**

(\*1) Refer to "Characteristics of thermistor" of "Alarm Code 23"

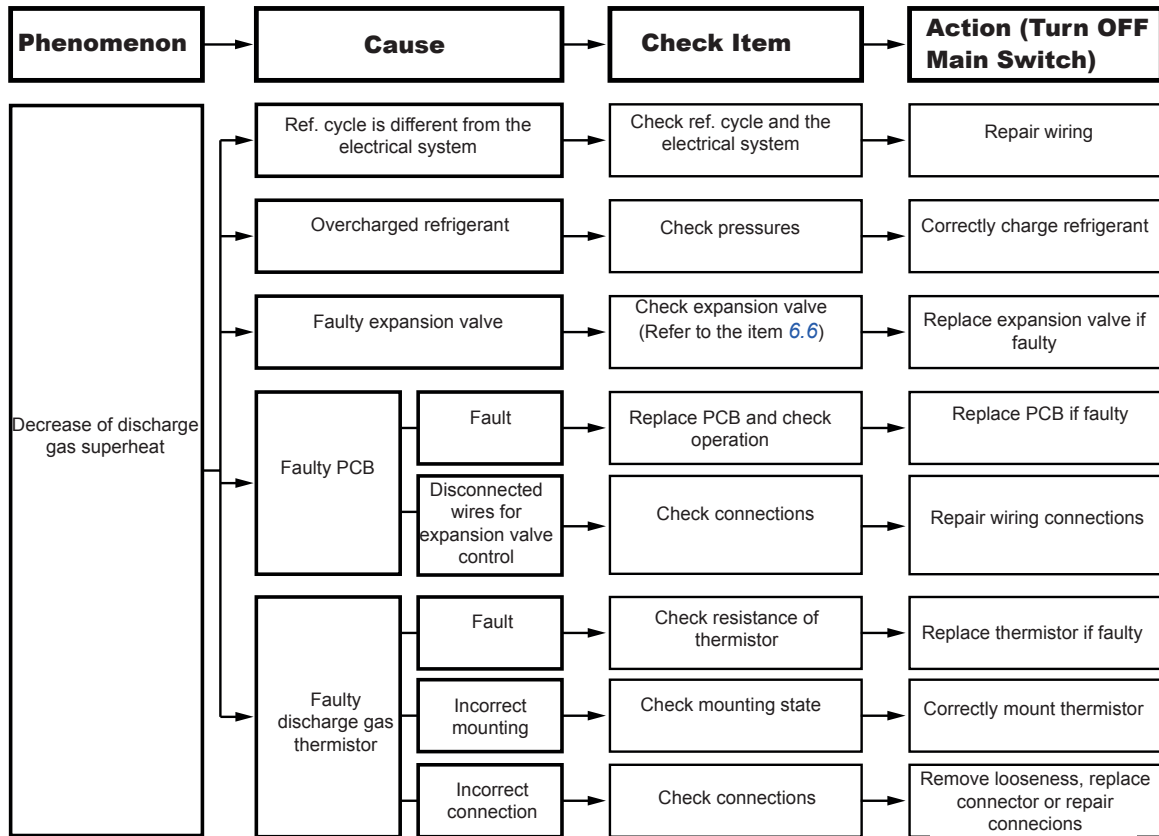
(\*2) PCB1 Connector No. is shown in the below table

MV1	MV2(*3)	MVB
CN10	CN11	CN12

- Only for: RAS-20FSXNSE, RAS-24FSXNSE, RAS-16FSXNPE, RAS-18FSXNPE

Model	Thermistor	
	Td1 (THM8)	Td2 (THM9)
RAS-(8-14)FSXNSE RAS-(5-14)FSXNPE	○	-
RAS-(16-24)FSXNSE RAS-(16/18)FSXNPE	○	○

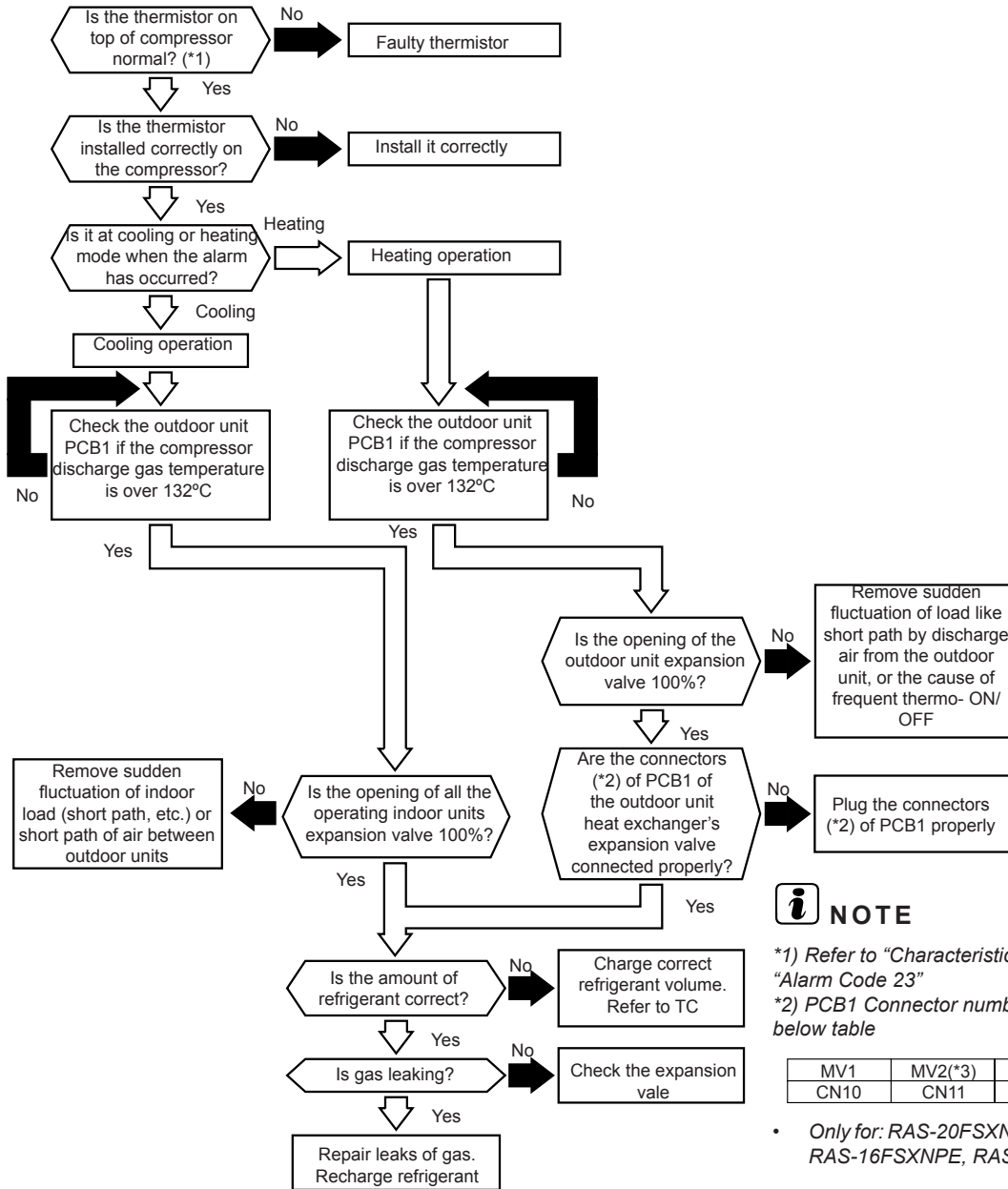




Alarm code	<b>08</b>	Increase in discharge gas temperature at the upper part of the compressor.
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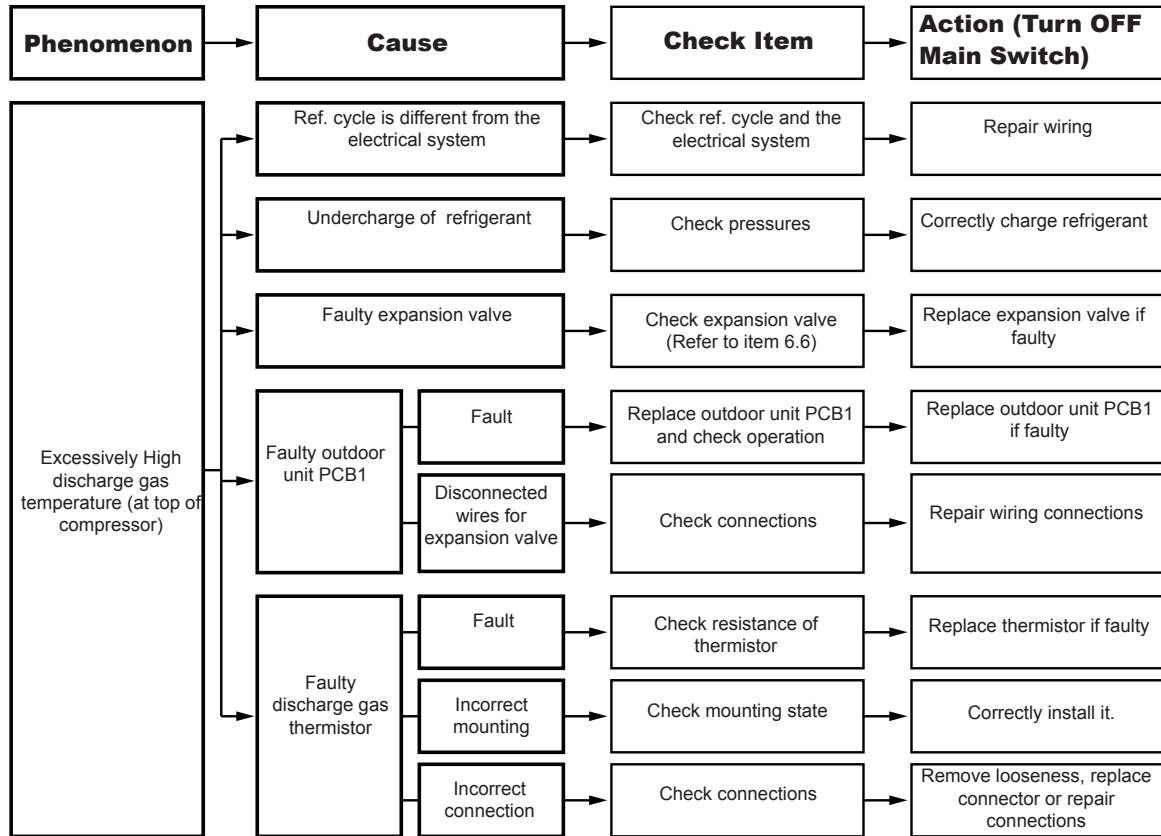
This alarm is displayed when the following conditions occurs three times in one hour:

The temperature of the thermistor on the upper part of the compressor is maintained higher than 132 °C for 10 minutes or the temperature of the thermistor on the upper part of the compressor is maintained higher than 140 °C for 5 seconds.

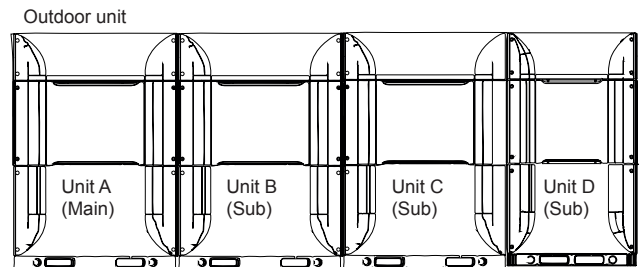
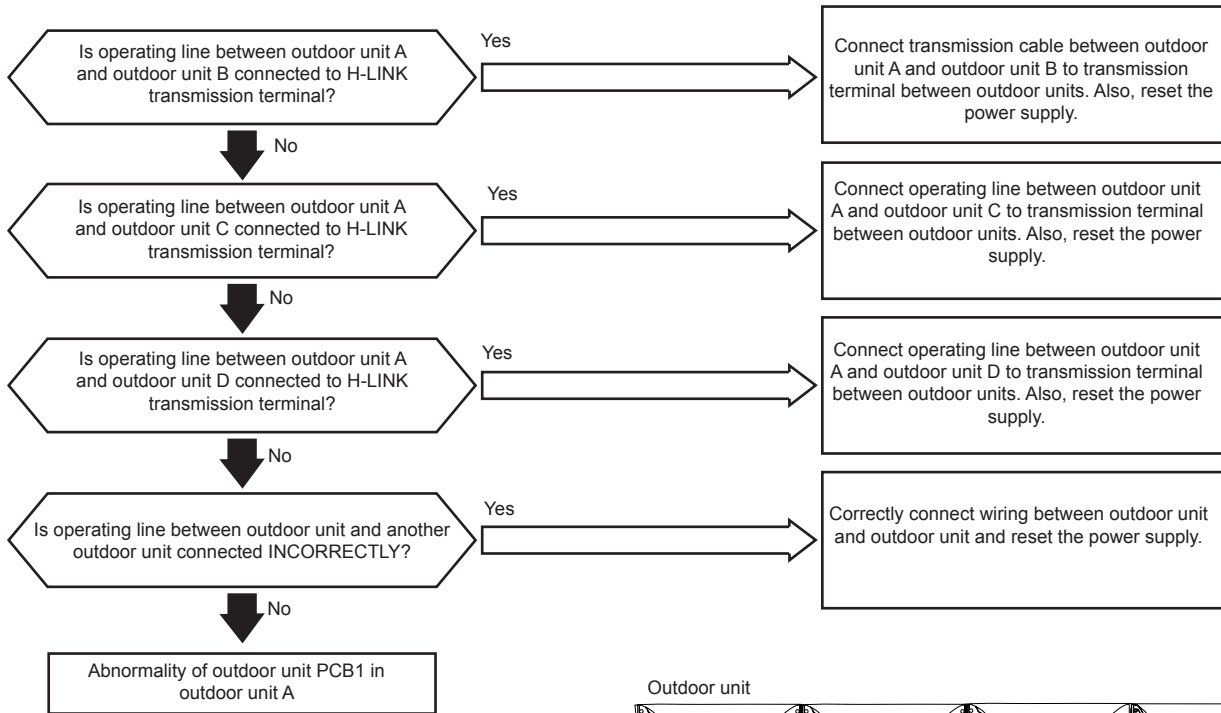


Model	Thermistor	
	Td1 (THM8)	Td2 (THM9)
RAS-(8-14)FSXNSE RAS-(5-14)FSXNPE	○	-
RAS-(16-24)FSXNSE RAS-(16/18)FSXNPE	○	○





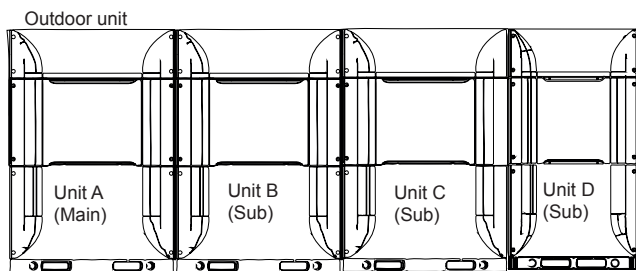
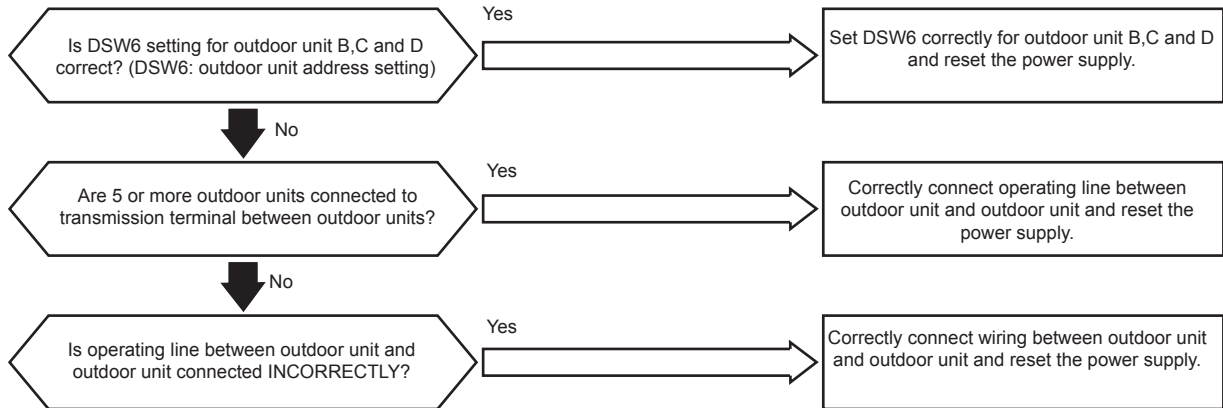
Alarm code	<b>0A</b>	Abnormal transmission between outdoor units.
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**i** NOTE

(Sub): Secondary unit.

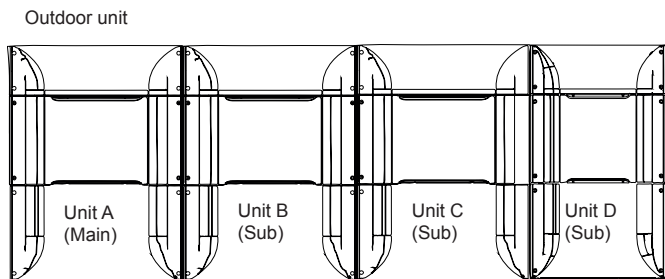
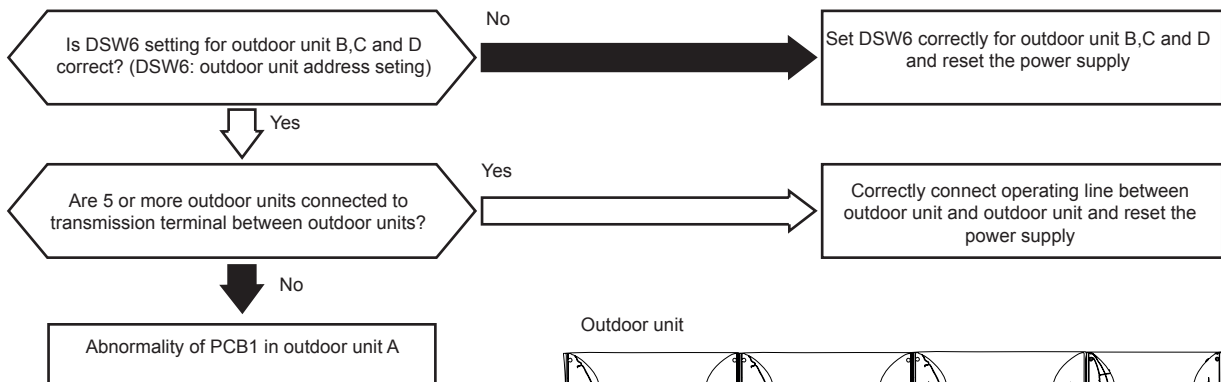
Alarm code	<b>06</b>	Incorrect outdoor unit address setting.
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**i** NOTE

(Sub): Secondary unit.

Alarm code	<b>0C</b>	Incorrect outdoor main unit setting.
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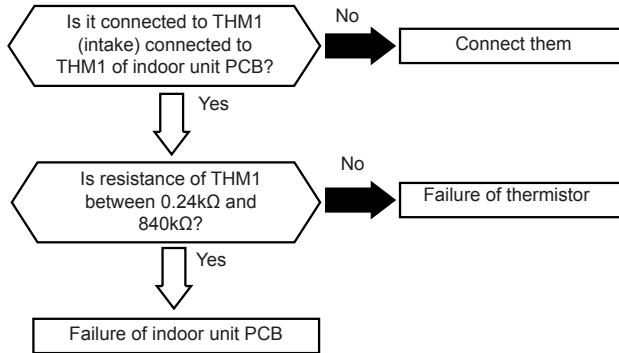


**i** NOTE

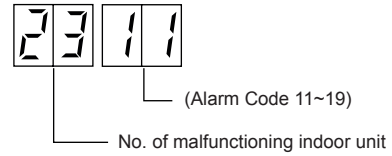
(Sub): Secondary unit.

Alarm code	11	Abnormal operation of thermistor for indoor unit inlet air temperature (air inlet thermistor).
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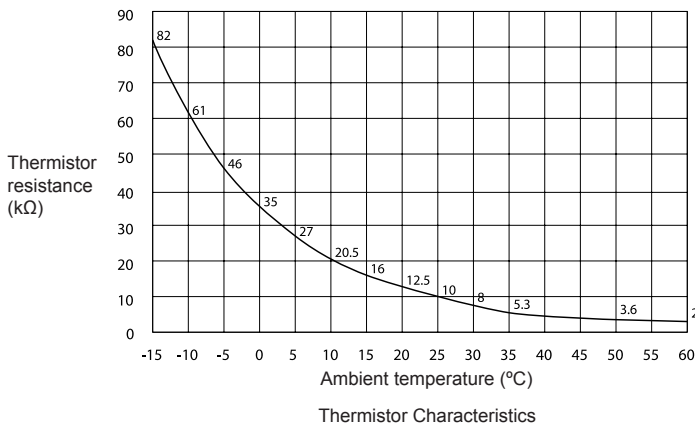
This alarm is indicated when the thermistor is short-circuited (less than 0.24 kΩ or less) or cut (greater than 840 kΩ) during the cooling or heating operation. The system automatically restarts when the fault is eliminated.



Outdoor unit PCB1 Display indication (Alarm Code 11~19)



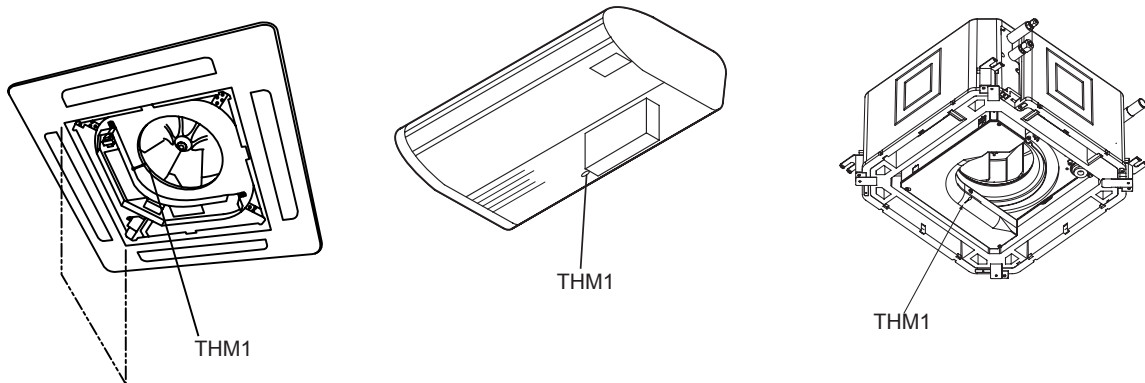
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty intake air thermistor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check connection	Connect wiring correctly
Faulty indoor unit PCB		Replace PCB and check operation	Replace indoor unit PCB if faulty



**i NOTE**

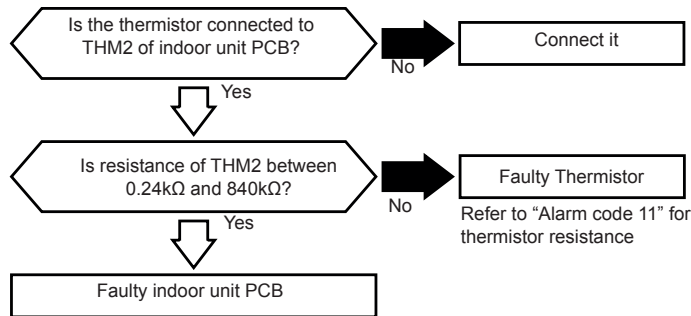
This data is applicable to the following thermistors:

- Inlet air thermistor (THM1).
- Liquid pipe thermistor (freeze protection) (THM3).
- Gas pipe thermistor (THM5).
- Outlet air thermistor (THM2).
- Outside air thermistor or remote thermistor (THM4).

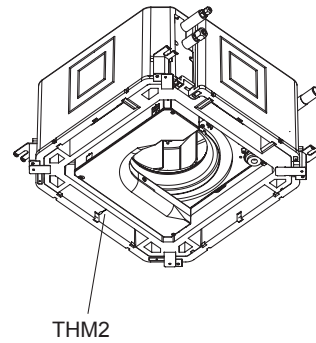
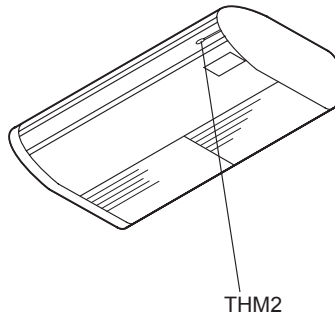
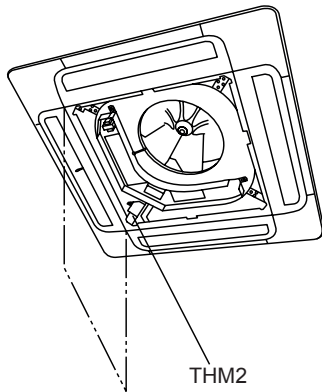


Alarm code	<b>12</b>	Abnormal operation of thermistor for indoor unit discharge air temperature (air outlet thermistor).
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This alarm is indicated when the thermistor is short-circuited (less than 0.24 kΩ) or cut (greater than 840 kΩ) during the cooling or heating operation. The system automatically restarts when the fault is eliminated.



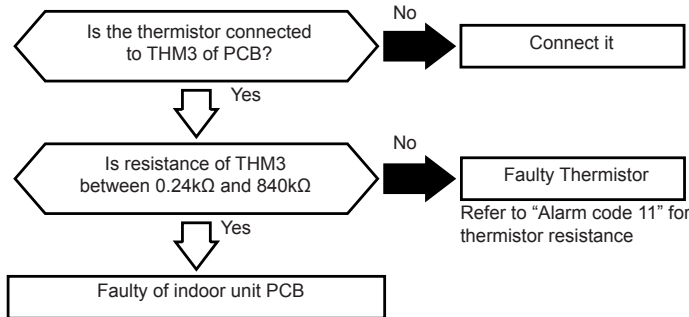
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty air outlet thermistor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check connection to indoor unit PCB	Connect wiring correctly
Faulty indoor unit PCB		Replace indoor unit PCB and check operation	Replace indoor unit PCB if faulty



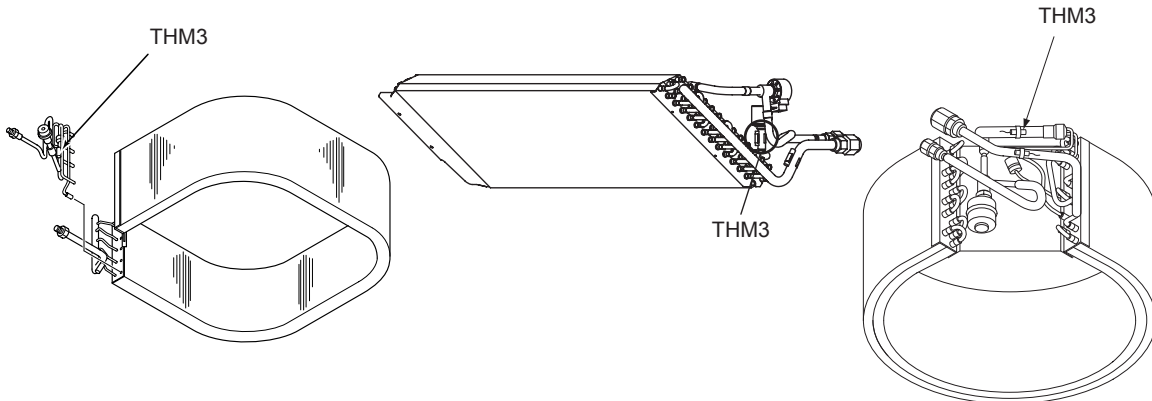


Alarm code	<b>13</b>	Abnormal operation of thermistor for indoor unit heat exchanger liquid refrigerant pipe temperature (freeze protection thermistor).
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This alarm is indicated when the thermistor is short-circuited (less than 0.24 kΩ) or cut (greater than 840 kΩ) during the cooling or heating operation. The system automatically restarts when the fault is eliminated.

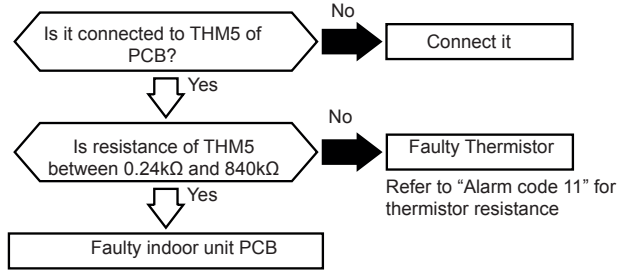


Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty freeze protection thermistor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to indoor unit PCB	Connect wiring correctly
Faulty indoor unit PCB		Replace indoor unit PCB and check operation	Replace indoor unit PCB if faulty



Alarm code	<b>14</b>	Abnormal operation of thermistor for indoor unit heat exchanger gas refrigerant pipe temperature (gas pipe thermistor).
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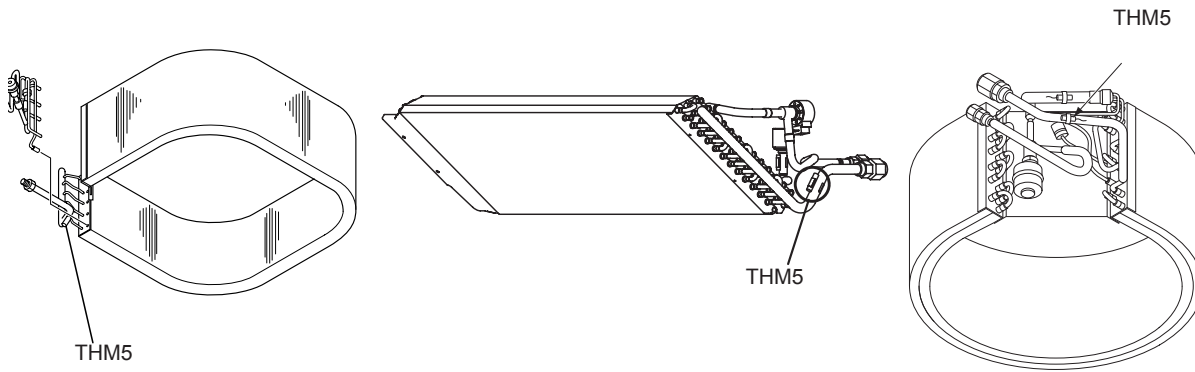
This alarm is indicated when the thermistor is short-circuited (less than 0.24 kΩ) or cut (greater than 840 kΩ) during the cooling or heating<sup>(\*)</sup> operation. The system automatically restarts when the fault is eliminated.



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty gas pipe thermistor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to indoor unit PCB	Connect wiring correctly
Faulty indoor unit PCB		Replace PCB and check operation	Replace PCB if faulty

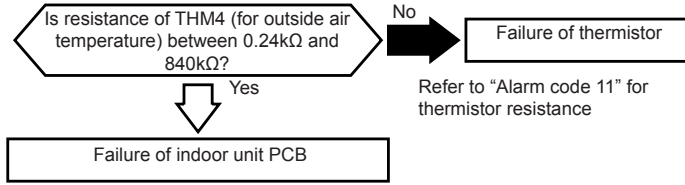
**i** NOTE

<sup>(\*)</sup>The heating operation is available only during the test run.



Alarm code	15	Abnormal operation of thermistor for outside air temperature (for ducted with econofresh kit).
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This alarm is indicated when the thermistor is short-circuited (less than 0.24 kΩ) or cut (greater than 840 kΩ) during the cooling or heating operation. The system automatically restarts when the fault is eliminated.

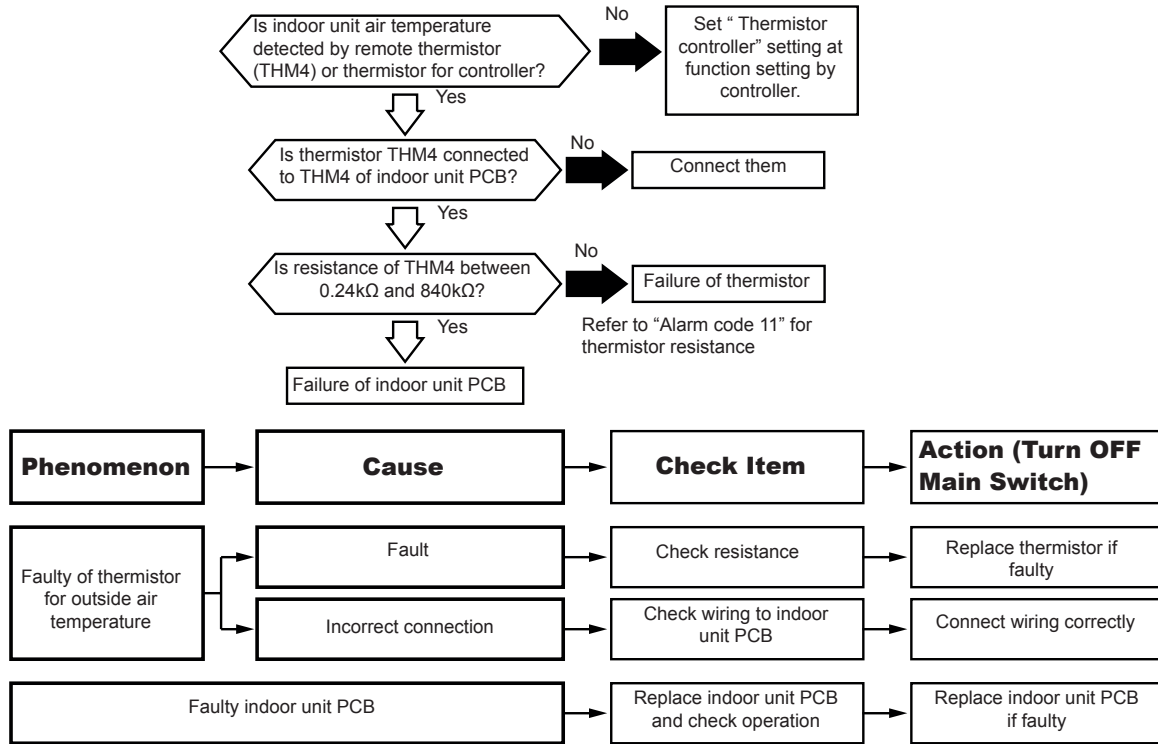


Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty of thermistor for outside air temperature	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to indoor unit PCB	Connect wiring correctly
Faulty indoor unit PCB		Replace indoor unit PCB and check operation	Replace indoor unit PCB if faulty

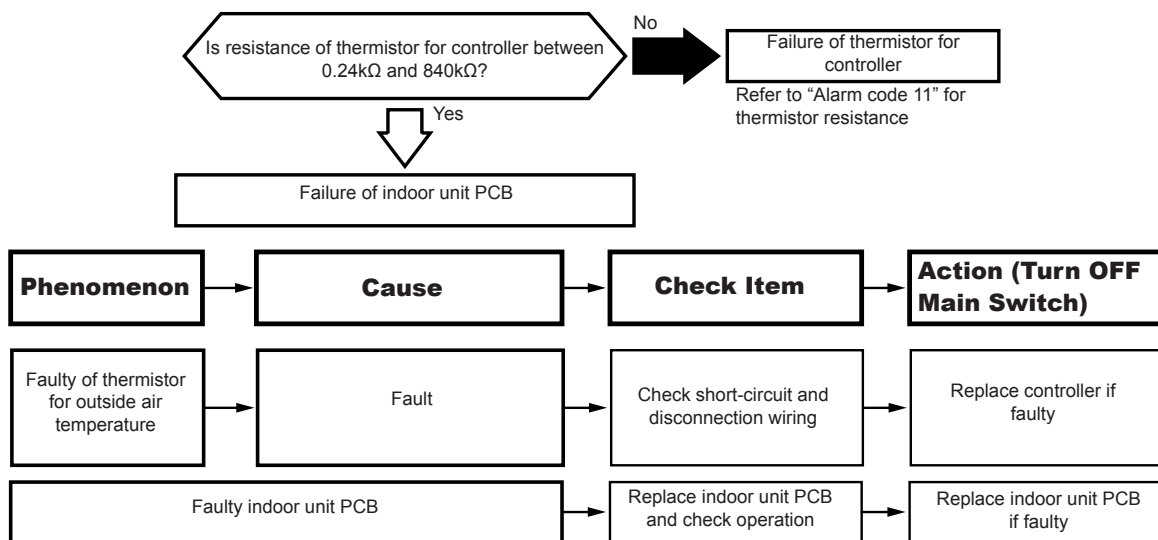


Alarm code	<b>15</b>	Abnormal operation of remote thermistor.
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This alarm is indicated when the thermistor is short-circuited (less than 0.24 kΩ) or cut (greater than 840 kΩ) during the cooling, heating operation. The system automatically restarts when the fault is eliminated.

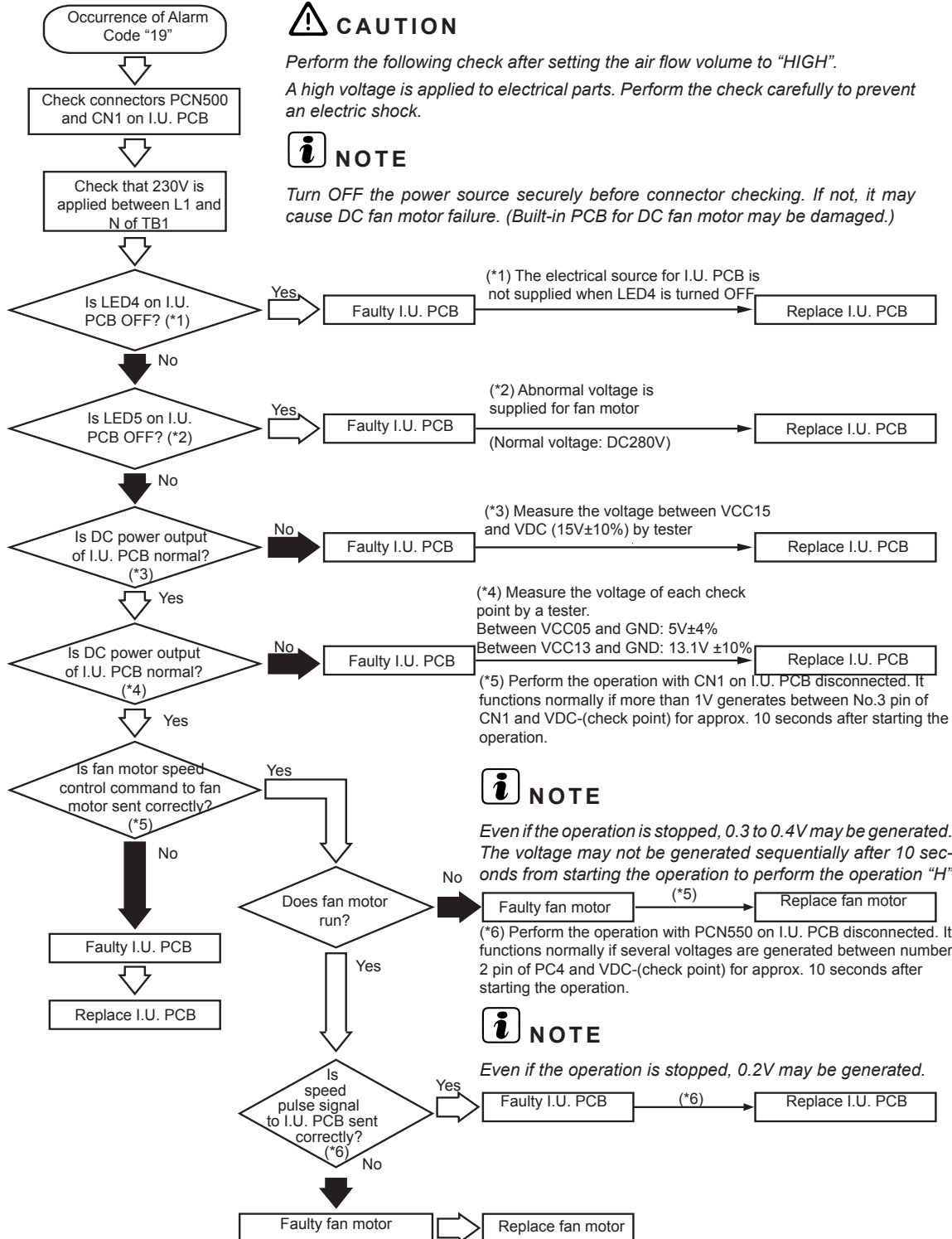


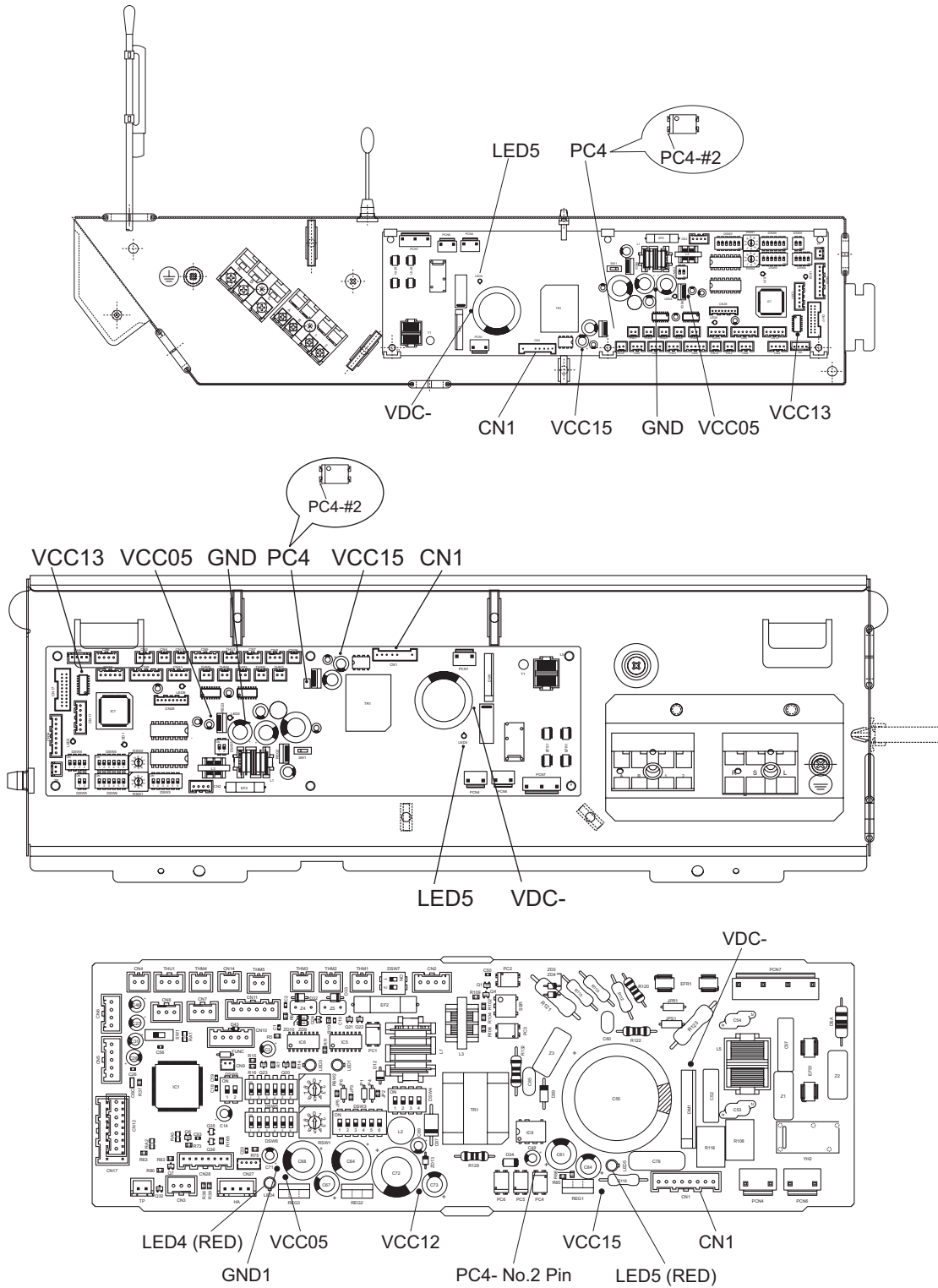
Alarm code	<b>17</b>	Abnormality of remote controller thermistor
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Alarm code	<b>19</b>	Activation of the protection device for the indoor unit fan motor (Indoor unit with DC motor).
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This alarm is indicated when the following condition occur 3 times in 30 minutes: the indoor unit fan motor rotates less than 70 rpm for 5 seconds (for 40 seconds during auto swing operation) while it is operating.



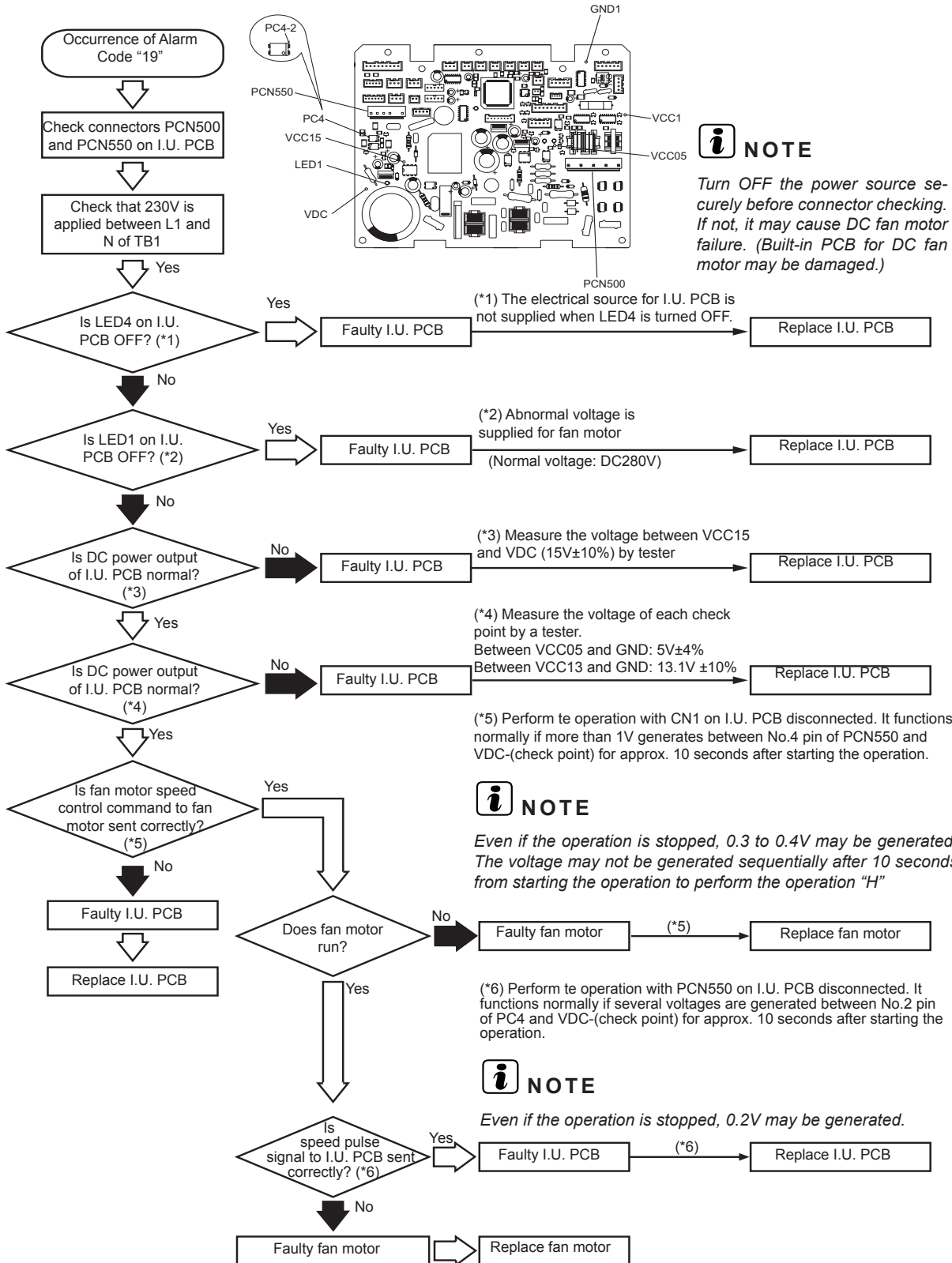


Alarm code	19	Activation of the protection device for the indoor unit fan motor (RPK models).
------------	----	---

This alarm is indicated when the following condition occur 3 times in 30 minutes: the indoor unit fan motor rotates less than 70 rpm for five seconds while it is operating.

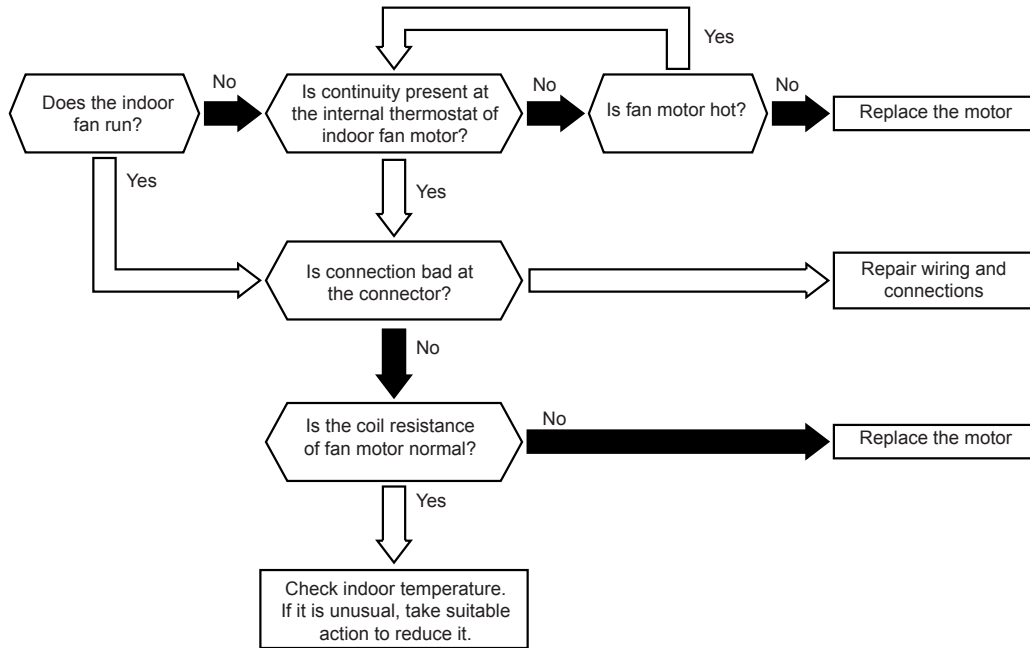
**CAUTION**

Perform the following check after setting the air flow volume to "HIGH".  
A high voltage is applied to electrical parts. Perform the check carefully to prevent an electric shock.



Alarm code	<b>19</b>	Activation of the protection device for the indoor unit fan motor (Indoor unit with AC motor).
------------	-----------	--

This alarm code is indicated when over approximately 1 A is applied to the indoor unit fan motor.

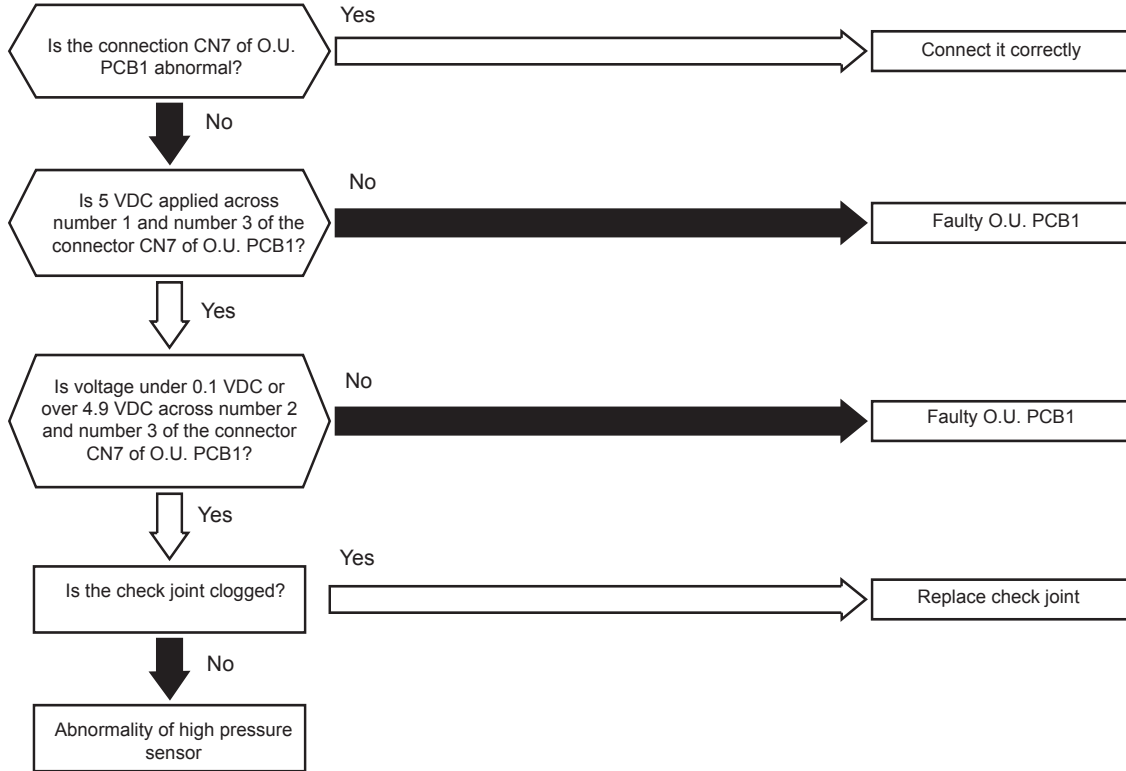


Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)	
Activation of internal thermostat for indoor unit fan motor	Faulty indoor unit fan motor	Measure coil resistance and insulation resistance	Replace motor if faulty	
	Faulty internal thermostat	Fault	Check continuity after fan motor temperature decreases to room temp.	Replace fan motor if no continuity
		Insufficient contacting	Measure resistance by tester	Correct looseness. Replace connectors
		Incorrect connection	Check connections	Repair connections



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

This alarm is indicated when the pressure sensor voltage decreases lower than 0.1V or increases higher than 4.9V during the operation.



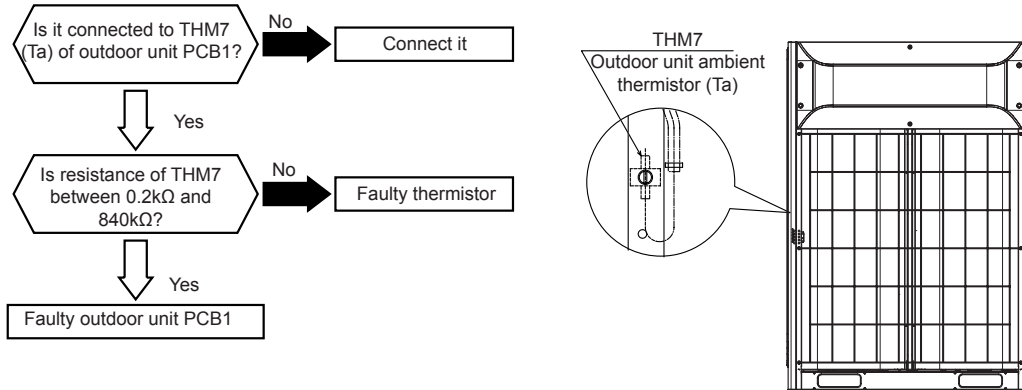
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty high pressure sensor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check connections	Repair wiring and connections
Faulty outdoor unit PCB1		Replace outdoor unit PCB1 and check operation	Replace outdoor unit PCB1 if faulty
Indicated pressure value is excessively high or low	Malfunction of pressure sensor due to faulty check joint	Check for clogging of check joint	Replace check joint



Alarm code	22	Abnormal operation of the thermistor for outdoor air temperature (outdoor unit ambient thermistor).
------------	----	---

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

This alarm is indicated when the thermistor is short-circuited (less than 0.2 kΩ) or cut (greater than 840 kΩ) during the operation.



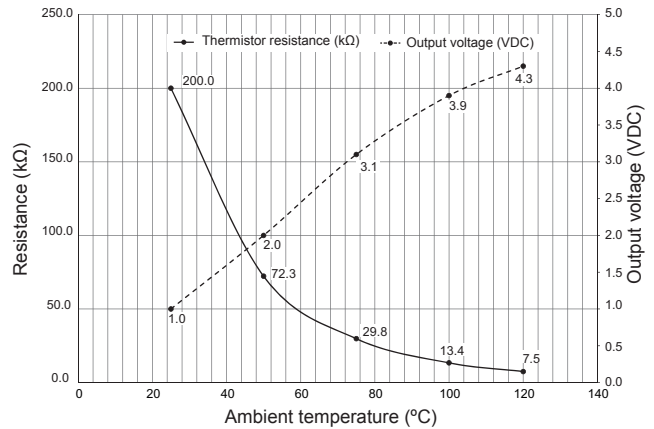
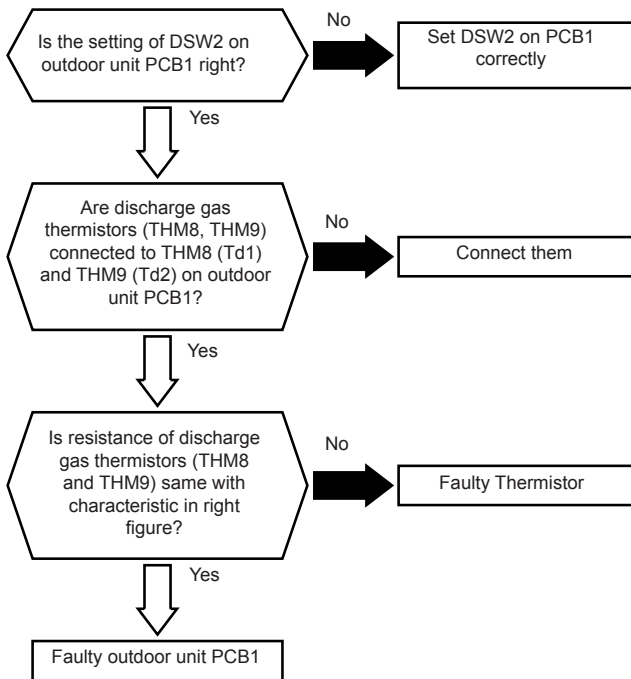
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty outdoor unit ambient thermistor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to outdoor unit PCB1	Repair wiring and connections
Faulty outdoor unit PCB1		Replace outdoor unit PCB1 and check operation	Replace outdoor unit PCB1 if faulty

Alarm code	<b>23</b>	Abnormal operation of thermistor for discharge gas temperature at the upper part of the compressor.
------------	-----------	---

**NOTE**

For the combination of outdoor units, the alarm code is displayed on PCB of outdoor unit A. Additionally for the outdoor unit number and compressor number with abnormal thermistor, check the alarm code history.

This alarm is indicated when the thermistor is short-circuited (less than 0.9 kΩ) or cut (greater than 5946 kΩ) during the operation.



$$R_{25} = 200k\Omega$$

When T=25°C, RT= 200kΩ

$$B=3920K$$

$$R_T = R_{25} \cdot \exp B (1/T[K]-1-298)$$

Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty discharge gas thermistor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to outdoor unit PCB1	Repair wiring and connections
Faulty outdoor unit PCB1		Replace outdoor unit PCB1 and check operation	Replace outdoor unit PCB1 if faulty
Incorrect setting of DSW2 on outdoor unit PCB1		Check setting of DSW2 on outdoor unit PCB1	Correctly set DSW2 on outdoor unit PCB1

Model	Thermistor	
	Td1 (THM8)	Td2 (THM9)
RAS-(8-14)FSXNSE RAS-(5-14)FSXNPE	○	-
RAS-(16-24)FSXNSE RAS-(16/18)FSXNPE	○	○

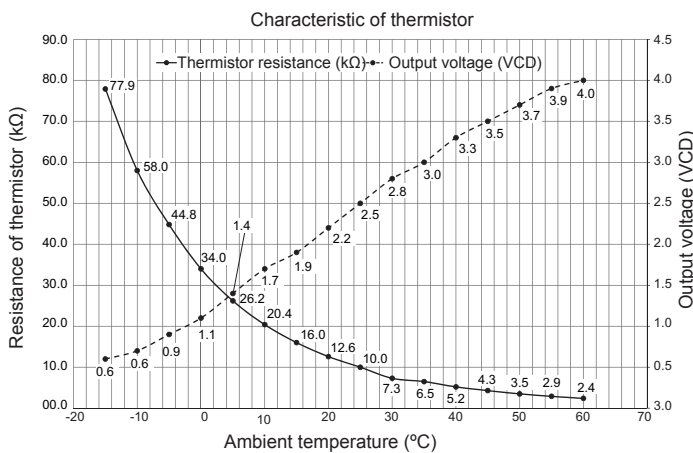
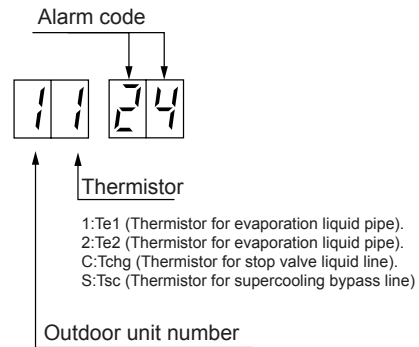
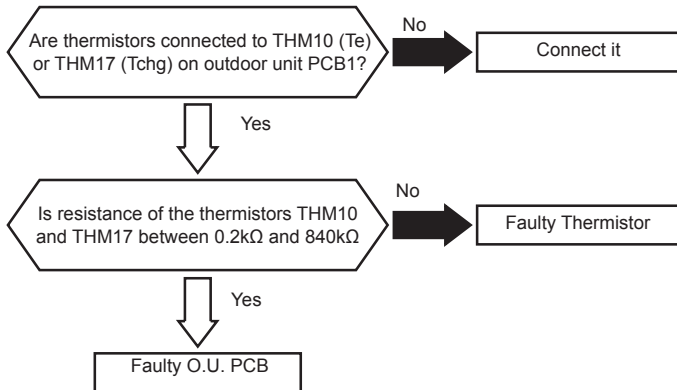


Alarm code	24	Abnormal operation of the thermistor for the outdoor unit heat exchanger liquid pipe (Te/Tchg).
------------	----	---

**i NOTE**

For the combination of outdoor units, the alarm code is displayed on PCB of outdoor unit A. Additionally for the outdoor unit number and compressor number with abnormal thermistor, check the alarm code history.

This alarm is indicated when the thermistor is short-circuited (less than 0.2 kΩ) or cut (greater than 840 kΩ) for 8 minutes during operation.



**i NOTE**

This data is applicable to the following thermistors:

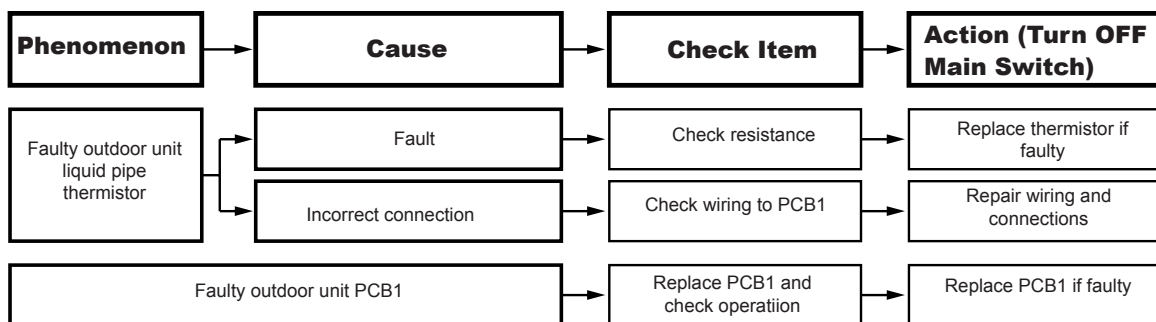
- Ambient temperature thermistor (THM7)
- Evaporation liquid line thermistor (THM10, THM11)
- Evaporation gas line thermistor (THM12)
- Super cooling main line thermistor (THM17)
- Super cooling bypass line thermistor (THM23)

$$R_{25} = 200k\Omega$$

When T=25°C, R<sub>T</sub>= 200kΩ

$$B = 3920K$$

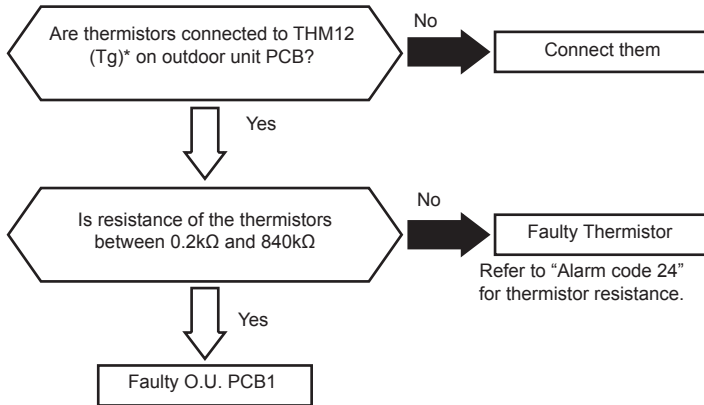
$$R_T = R_{25} \cdot \exp B (1/T[K]-1-298)$$



Model	Thermistor			
	Te1 (THM10)	Te2 (THM11)	Tcgh(THM17)	Tsc(THM23)
RAS-(8-14)FSXNSE RAS-(5-14)FSXNPE	○	-	○	○
RAS-(16-24)FSXNSE RAS-(16/18)FSXNPE	○	○	○	○

Alarm code	25	Abnormal operation of the thermistor for the outdoor unit heat exchanger gas pipe (Tg).
------------	----	---

This alarm is indicated when the thermistor is short-circuited (less than 0.2 kΩ) or cut (greater than 840 kΩ) for 8 minutes during operation.



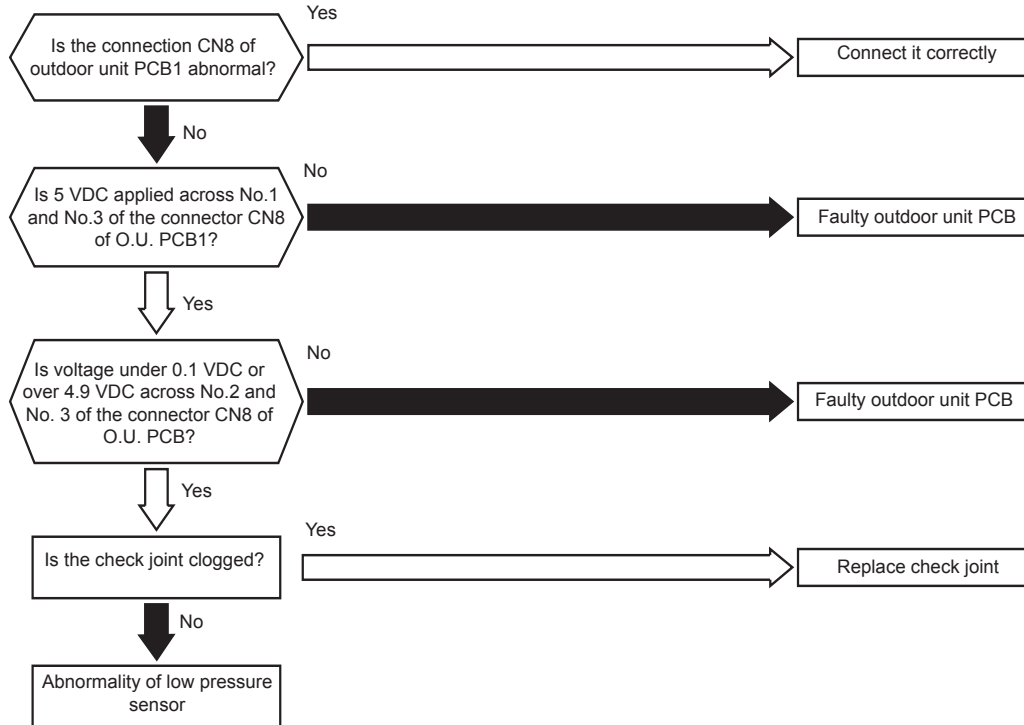
**NOTE**  
(Tg)\*: Thermistor for evaporation gas line.

Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty outdoor unit gas pipe thermistor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to outdoor unit PCB1	Repair wiring and connections
Faulty PCB1		Replace outdoor unit PCB1 and check operation	Replace PCB1 if faulty



Alarm code	<b>29</b>	Abnormal operation of the low pressure sensor for the outdoor unit.
------------	-----------	---

This alarm is indicated when the pressure sensor voltage decreases lower than 0.1V or increases higher than 4.9V during operation.



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty low pressure sensor	Fault	Check output voltage is correct	Replace thermistor if faulty
	Incorrect connection	Check wiring to outdoor unit PCB1	Repair wiring and connections
Failure outdoor unit PCB1		Replace outdoor unit PCB1 and check operation	Replace outdoor unit PCB1 if faulty
Indicated pressure value is excessively high or low	Malfunction of pressure sensor due to faulty check joint	Check for clogging of check joint	Replace check joint

Alarm code	<b>30</b>	Incorrect connection of CH-Box
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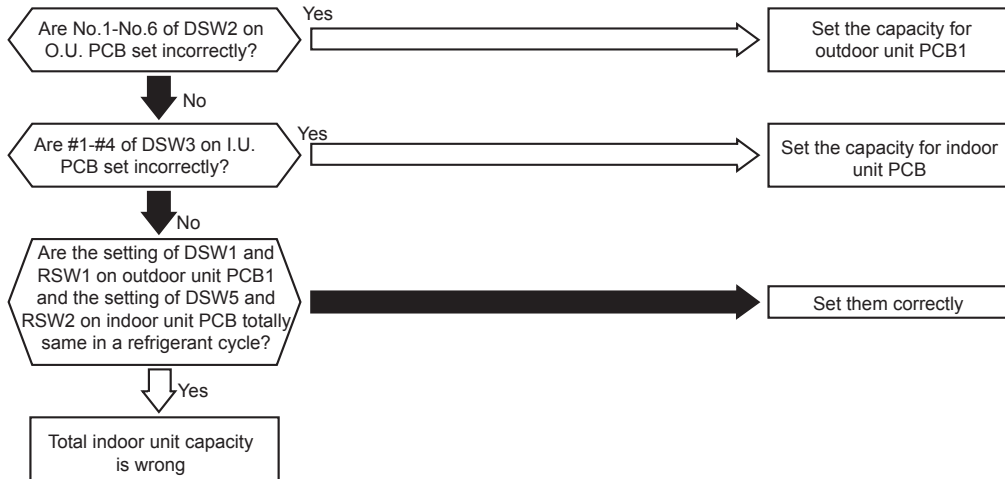
This alarm code is displayed when CH-Boxes are connected to the refrigerant cycle system.

This alarm code is displayed when the power supply setting, DSW7, DSWs on the outdoor unit PCB1 is set incorrectly (number 4 is ON)

Alarm code	31	Incorrect capacity setting of the outdoor and indoor unit.
------------	----	--

This alarm is indicated when the capacity setting DIP switch, DSW2 on PCB1 of the outdoor unit is not set (all the contacts from No.1 to No.6 are in the OFF position) or it is incorrectly set.

This alarm is indicated when the total indoor unit capacity is lower than 50% or higher than the maximum limit established for the combined outdoor unit capacity.



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Incorrect capacity setting of indoor unit		Check combination of indoor units and capacity setting on indoor unit PCB	Correctly set DSW, DSW3
Incorrect capacity setting of outdoor unit		Check capacity setting on outdoor unit PCB1	Correctly set dip switch, DSW2
Total indoor unit capacity connected to the outdoor unit is beyond permissible range		Check outdoor unit model by calculating total indoor units capacity	Ensure that total indoor unit capacity is from 50% to 130%
Refrigerant cycle setting of outdoor unit and indoor unit is different		Check refrigeration cycle setting on outdoor unit PCB1 and indoor unit PCB	Set them correctly

	Setting of the refrigerant cycle number		Setting example of the refrigerant cycle number 25	
	 DSW1	 RSW1	 DSW1	 RSW1
<b>Outdoor unit</b>	DSW1, (10 digits)	RSW1, (1 digit)		
<b>Indoor unit (H-LINK II)</b>	DSW5	RSW2		

Setting before shipment RSW1 and DSW1 is 0.

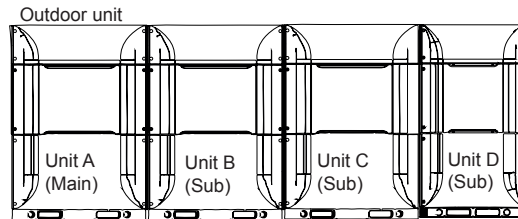
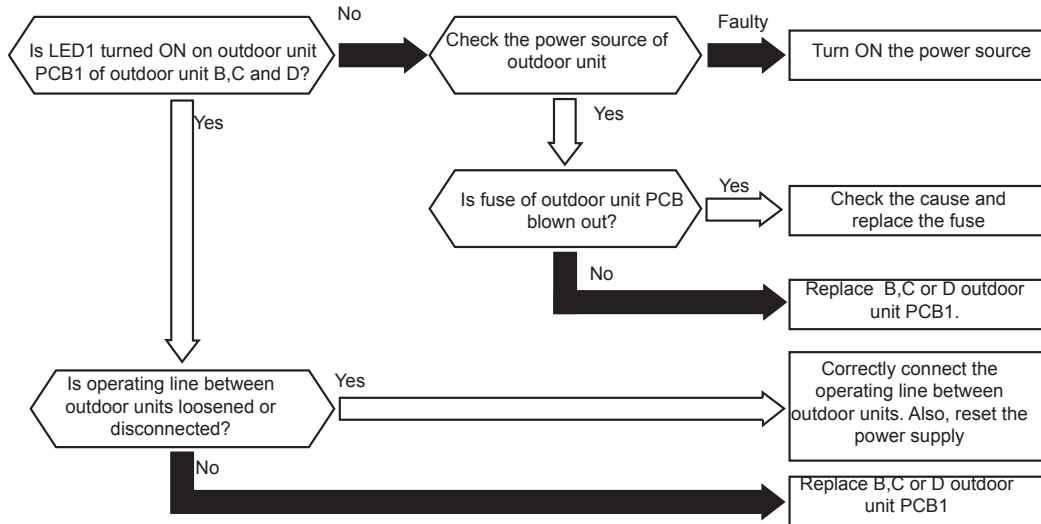
Maximum refrigerant cycle number setting: 63.



Alarm code	31	Abnormal transmission between outdoor units.
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This alarm is indicated when the following conditions occur after maintaining a normal transmission between the outdoors units.

- The anomaly is maintained for 30 seconds.
- The anomaly is maintained for 30 seconds after the microcomputer automatically reset.



**NOTE**

(Sub): Secondary unit.



Alarm code	<b>35</b>	Incorrect indoor unit number setting.
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This alarm is indicated 5 minutes after power is supplied to the outdoor unit when the indoor unit number connected to the outdoor unit is duplicated by the DSW6 and RSW1 setting.

**NOTE**

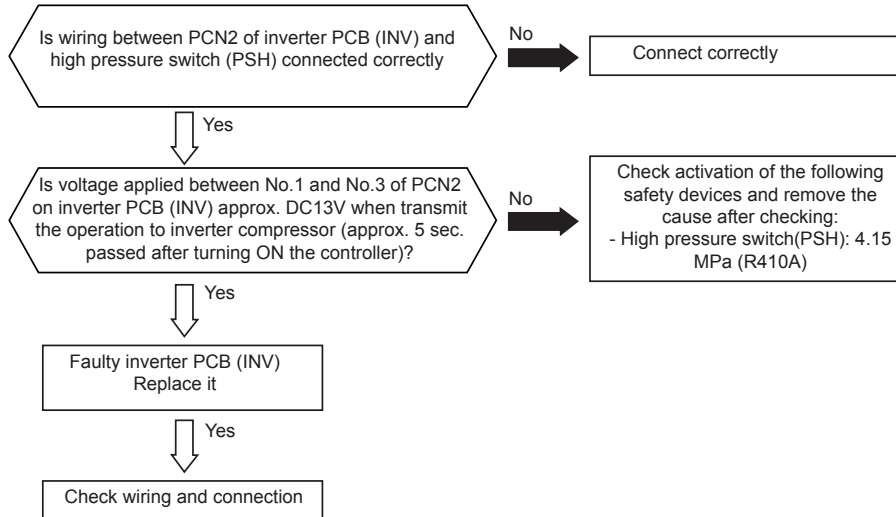
- *In the case of H-LINK systems, this alarm code is indicated when DSW1 and RSW1 of PCB1 of the outdoor unit and DSW5 and RSW2 of the PCB of the indoor unit are incorrectly set. In this case, set them properly after turning OFF the main power switch and turn ON again the main power switch.*
- *When the setting of the refrigerant cycle number of the outdoor unit (H-LINK II) and one of the outdoor unit (H-LINK) is duplicated, alarm code "35" can be ON and OFF repeatedly.*

Alarm code	<b>36</b>	Incorrect indoor unit combination.
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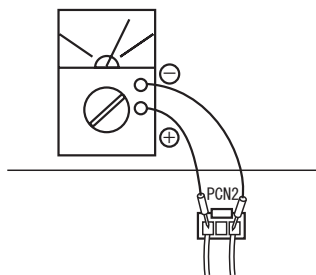
This alarm is indicated when the indoor unit connected to the outdoor unit is designed for other refrigerants (R22, R407C,...).

Alarm code	<b>38</b>	Abnormality of picking up circuit for protection in the outdoor unit.
------------	-----------	---

This alarm code is displayed when DC13V is applied to the main circuit PCB connector at the time inverter compressor operation command is transmitted to outdoor unit PCB1 (approximately 5 sec passed after turning ON RUN/STOP switch). Make sure to connect each wiring to PCN2, CN5 and CN6 before use tester. If PCN2 wiring is not connected correctly when using the tester, DC13V is continuously detected and end in checking failure.



PCB	Inverter PCB (INV)
Connector	PCN2
Pin No.	No.1, No.2

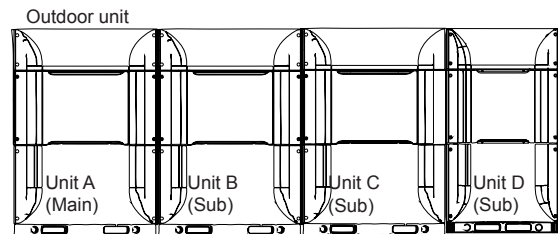
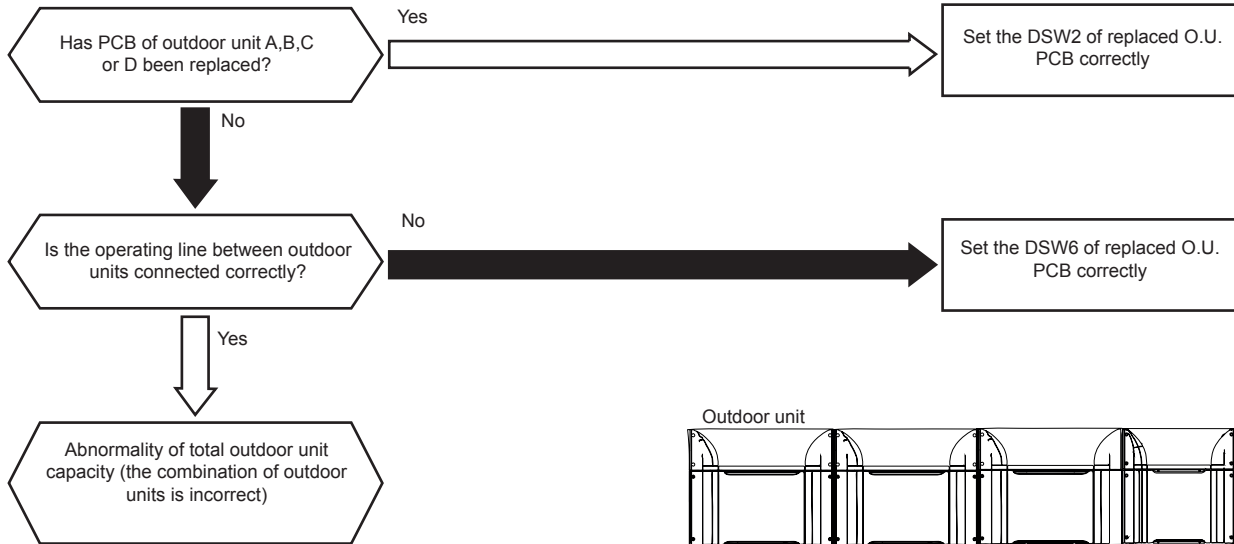


**i** NOTE

- For the maintenance or replacement of inverter PCB, perform the high voltage discharge work according to the item "6.2.2 High voltage discharge work for replacing parts"
- If the high pressure switch (PSH) failure (open phase or disconnecting wiring), this alarm code may occur. Check alarm code 02 trouble shooting too.

Alarm code	<b>3A</b>	Abnormal outdoor unit capacity.
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This alarm is indicated when the total capacity of the outdoor unit connected to the transmission terminal between outdoor units exceeds the maximum total power allowed.

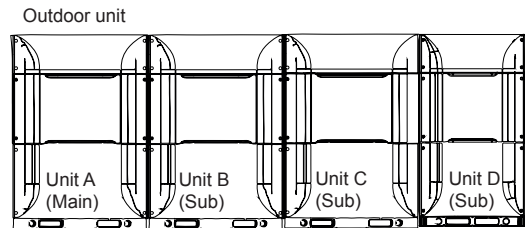
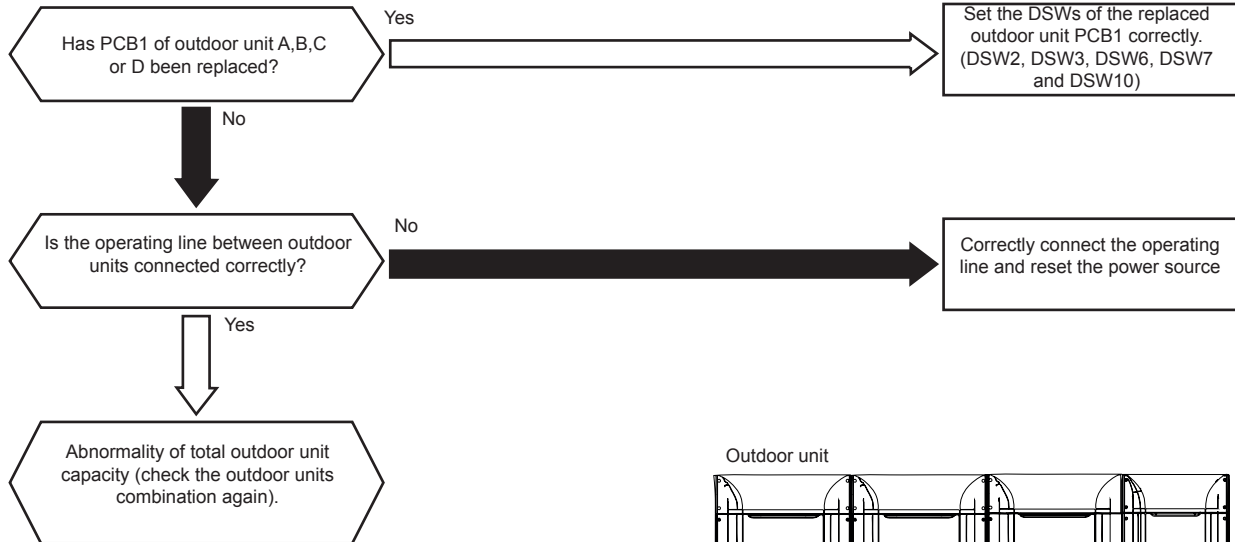


**NOTE**

(Sub): Secondary unit(s).

Alarm code	3b	Incorrect setting of outdoor unit model combination or voltage.
------------	----	---

This alarm is indicated when the model setting of the outdoor unit connected to the transmission terminal between outdoor units.

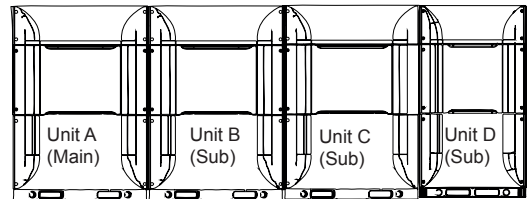
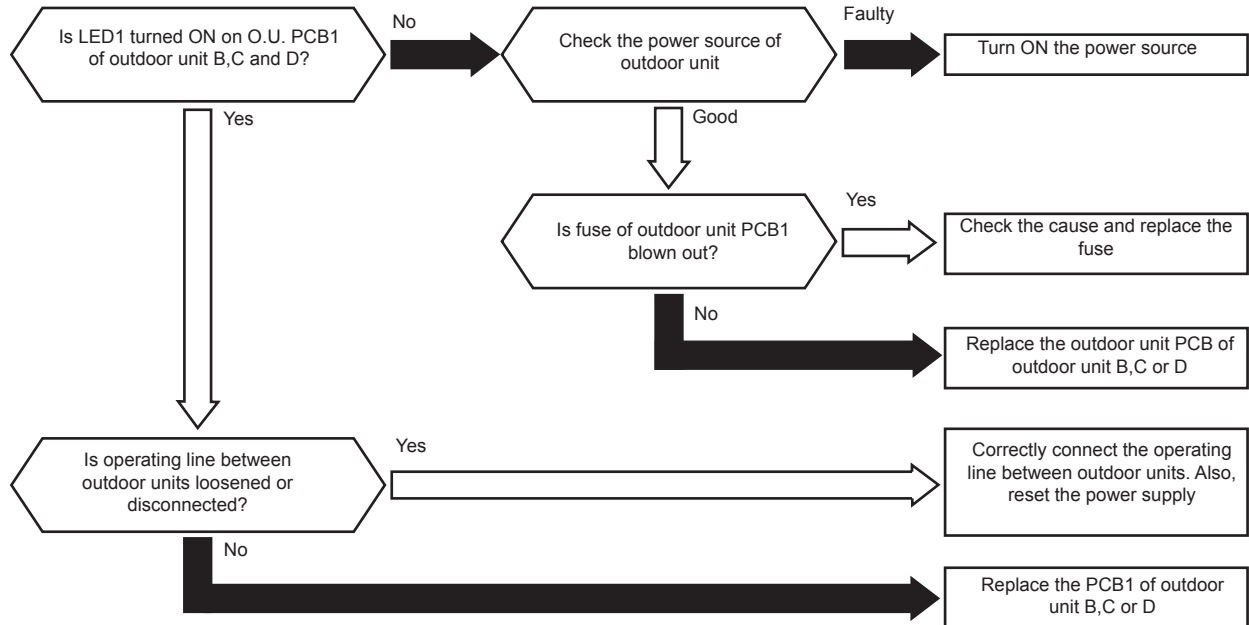


**NOTE**

(Sub): Secondary unit.

Alarm code	<b>3d</b>	Abnormal transmission between the main unit and the secondary unit(s).
------------	-----------	--

This alarm is indicated when the transmission to outdoor unit B, C or D is not maintained for 30 seconds ( alarm code "31" will be indicated when the transmission to all the outdoor units connected to transmission terminals between outdoor units is not provided).

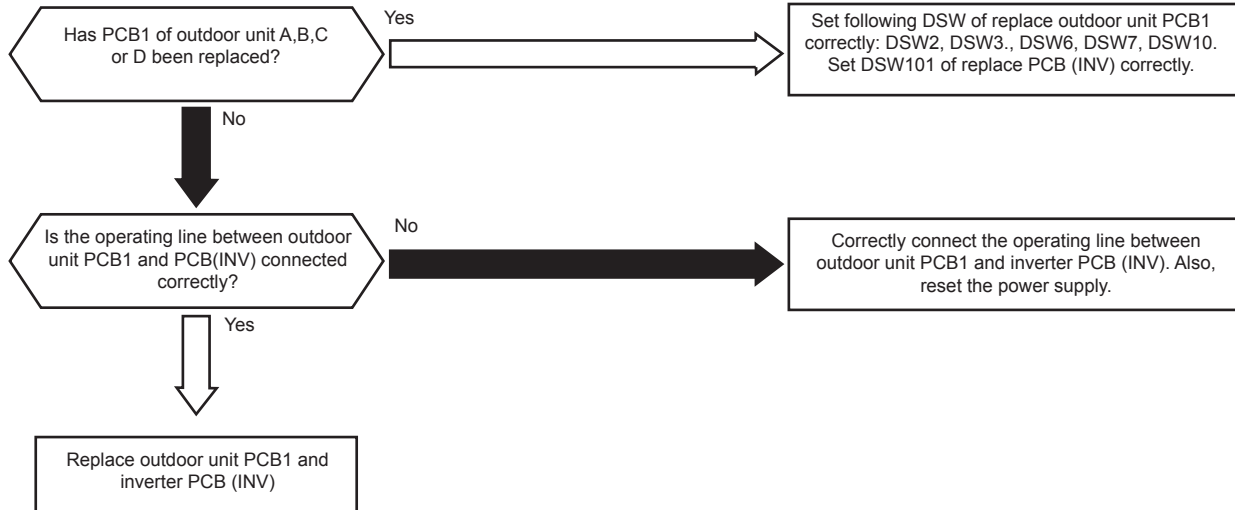


**NOTE**

(Sub): Secondary unit.

Alarm code	<b>3E</b>	Incorrect combination of outdoor unit inverter PCBs.
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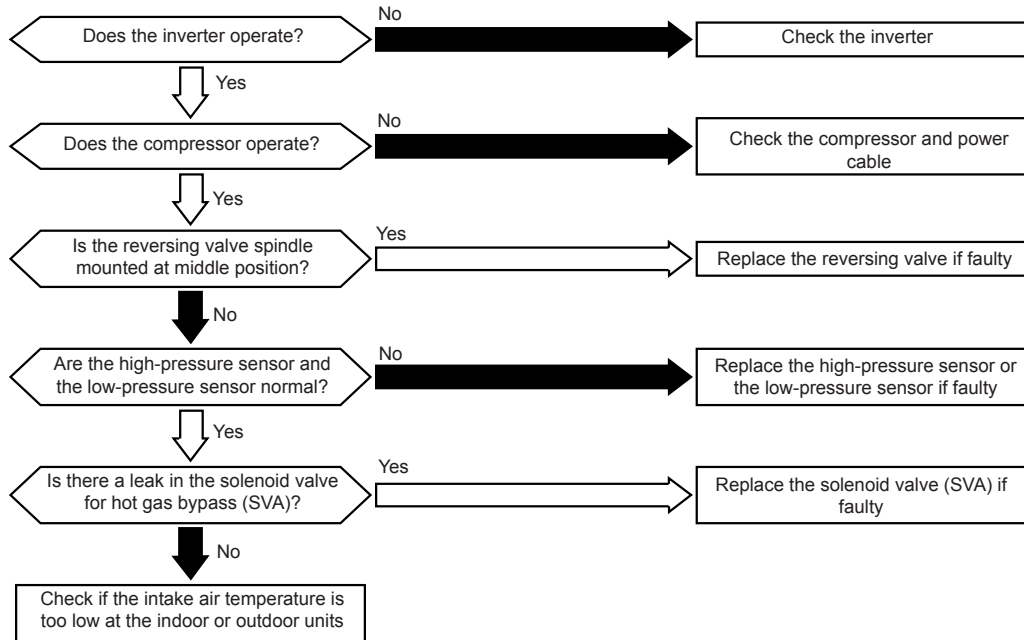
This alarm code is indicated when an incorrect model code setting of the outdoor unit is connected to the terminals between the outdoor units communication terminal (TB2 number 3 and 4 terminals on the PCB1 for the outdoor unit combination).



Alarm code	43	Activation of the low compression ratio protection device.
------------	----	--

This alarm is indicated when the following condition occurs more than twice in an 30 minutes. If the following condition is continued for one minute, all the compressors may be stopped and the unit automatically refried after 3 minutes.

Compression ratio,  $\epsilon = ((Pd + 0.1) / (Ps + 0.06))$  (calculated from the discharge pressure (Pd MPa) and the suction pressure (Ps MPa) is less than 1.5.

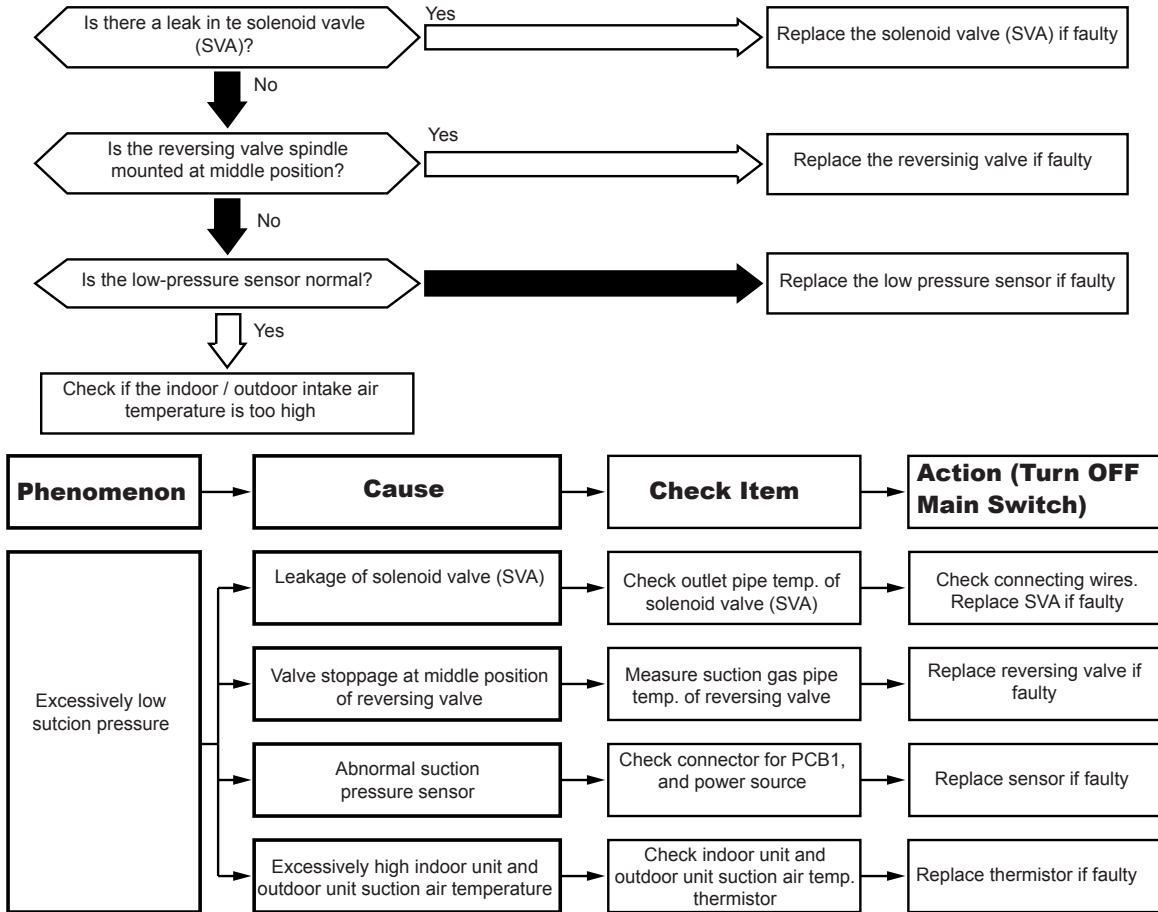


Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively low compression ratio	Inverter is not functioning	Check inverter	Repair faulty part
	Compressor is not operating	Check compressor	Replace comp. if faulty
	Valve stoppage at middle position of reversing valve	Measure suction pipe temp. of reversing valve	Replace reversing valve if faulty
	Abnormality of high or low pressure sensor	Check connector for outdoor unit PCB1, power source and pressure indication	Replace sensor if faulty
	Excessively low indoor intake air temperature	Check indoor unit and outdoor unit air temp. thermistor	Replace thermistor if faulty
	Leakage from solenoid valve (SVA)	Check solenoid valve	Replace SVA if leaking



Alarm code	44	Activation of the low pressure increase protection device.
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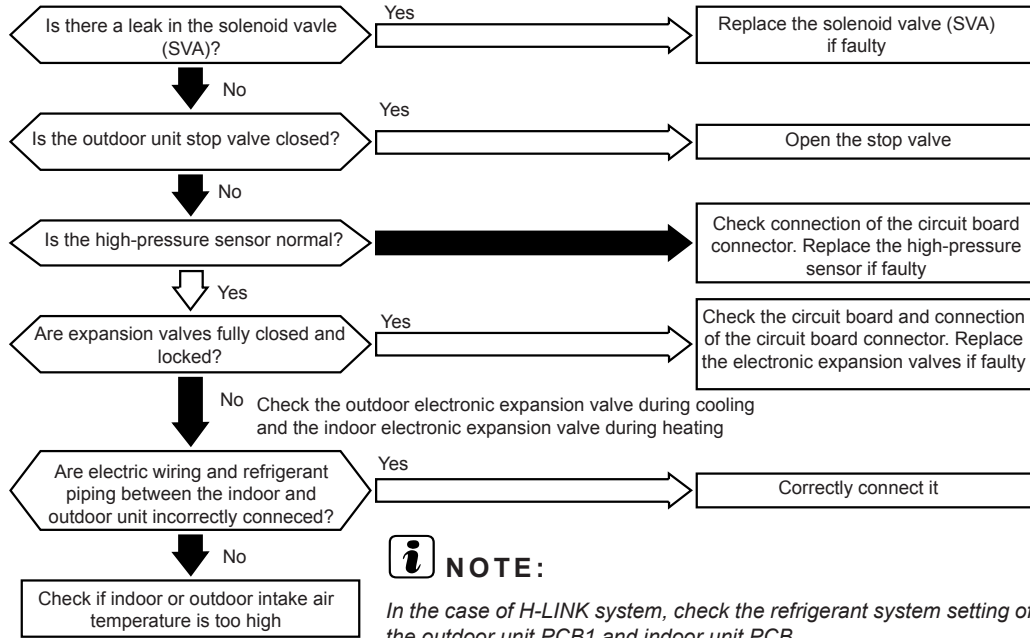
This alarm is indicated when the following condition occurs 3 times in 30 minutes: the suction pressure (Ps) continues to be higher than 1.4MPa for more than a minute, all the compressors stop and then retry the operation after 3 minutes.





Alarm code	45	Activation of the high pressure increase protection device.
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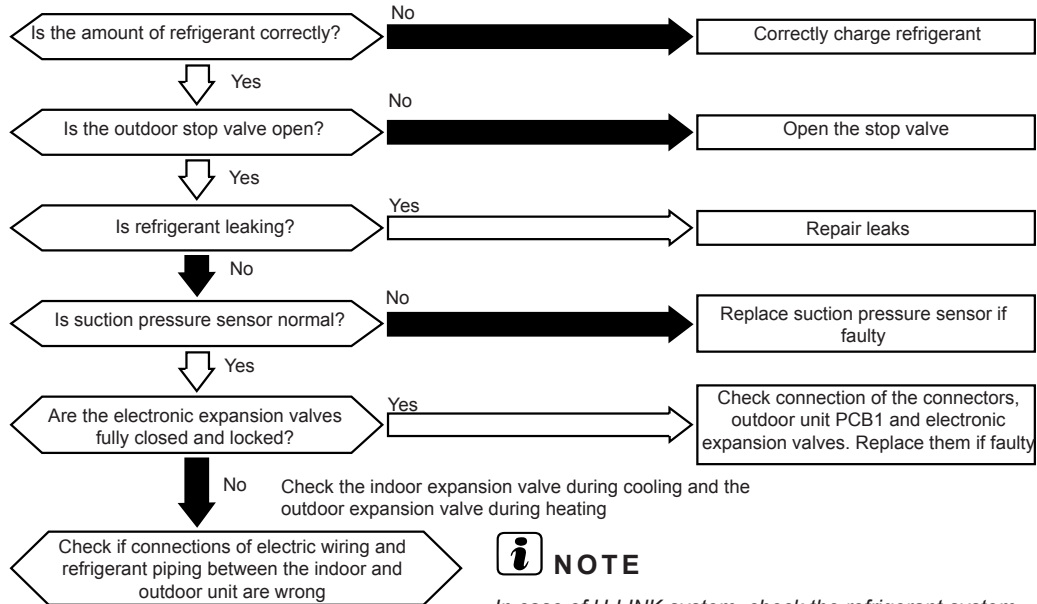
If the discharge pressure (Pd) of the compressor is more than 3.8 MPa for 2 seconds, all the compressors stop and the operation is automatically retried after 3 minutes. If this occurs again twice in the next 30 minutes, this alarm code is displayed.



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively high discharge pressure	Leakage of solenoid valve (SVA)	Check outlet pipe temp. of solenoid valve (SVA)	Check connecting wires. Replace SVA if faulty
	Closed stop valve	Check stop valve	Open stop valve
	Abnormal high pressure sensor	Check connectors for outdoor unit PCB1	Replace pressure sensor if faulty
	Excessively high indoor unit and outdoor unit inlet air temperature	Check indoor unit and outdoor unit inlet air temp. thermistor	Replace thermistor if faulty
	Incorrect connection between indoor unit and outdoor unit	Check electrical system and refrigerant cycle	Correctly connect
	Locked expansion valve with fully closed	Check connectors for PCB	Repair connector for PCB or expansion valve. Replace if faulty
Stoppage of indoor fan (wall type 1.0 to 3.0 HP only)	Melted fuses	Check continuity of fuses	Replace fuses
	Faulty I.U. PCB	Replace I.U. PCB and check operation	Replace I.U. PCB if faulty

Alarm code	<b>47</b>	Activation of the low pressure decrease protection device (Vacuum operation protection).
------------	-----------	--

This alarm is indicated when the following condition occurs 2 or more times in 1 hour: the suction pressure (Ps) is lower than 0.09 MPa for more than 12 minutes.



**i NOTE**  
In case of H-LINK system, check the refrigerant system setting of the outdoor PCB1 and indoor PCB.

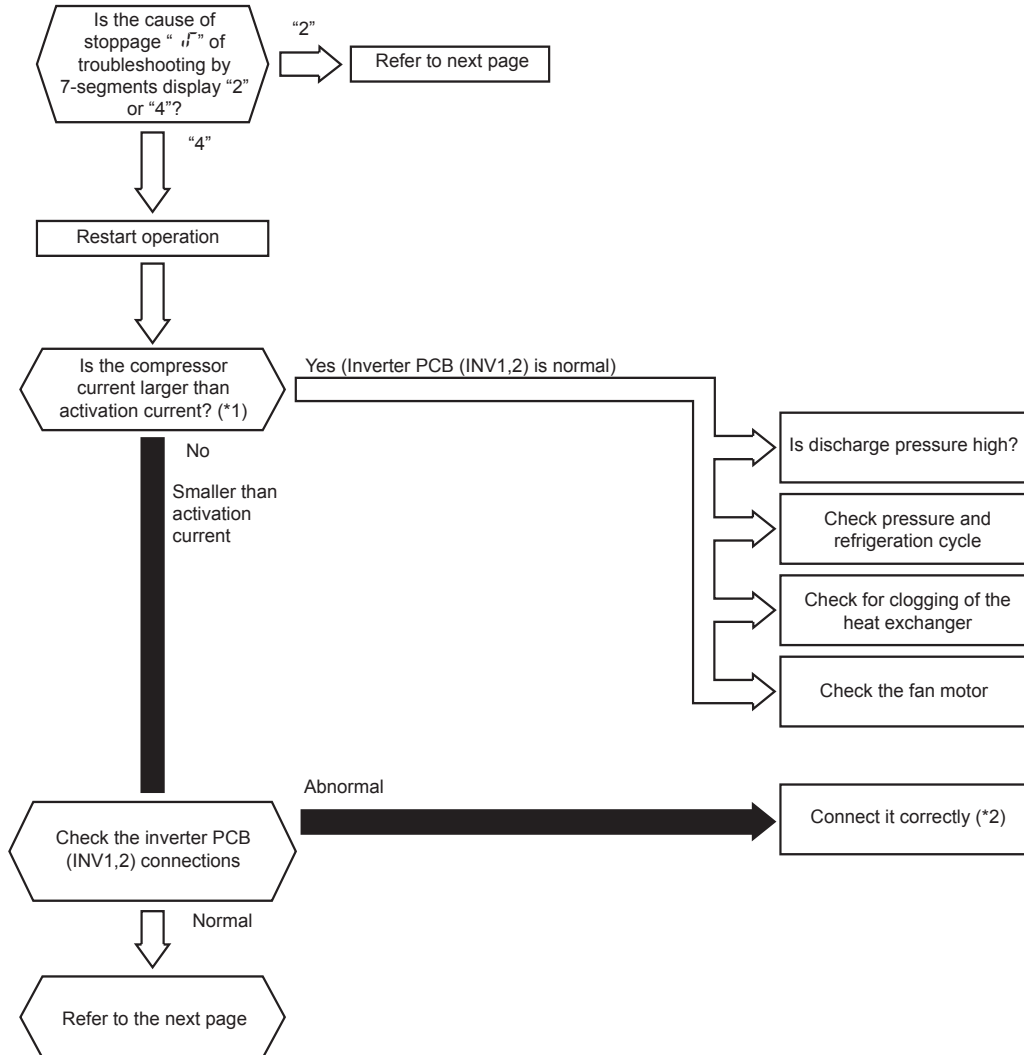
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)	
Excessively low suction pressure (in vacuum)	Shortage of refrigerant	Check refrigerant charged volume or check for leakage	Repair leakage and correctly charge	
	Closed stop valve	Check stop valve	Open stop valve	
	Abnormal low or high pressure sensor	Check connectors for outdoor unit PCB1	Replace pressure sensor if faulty	
	Incorrect connection between indoor unit and outdoor unit	Check electrical system and refrigerant cycle	Correctly connect between indoor unit and outdoor unit	
	Locked expansion valve with fully closed	Check connector for outdoor unit PCB1	Repair connector for outdoor unit PCB1 or expansion valve. Replace if faulty	
	Closed expansion valve by disconnecting Td thermistor	Check Td thermistors for compressors and measure Td thermistor resistance	Repair or replace Td thermistor	
Internal thermostat for outdoor fan is activated in heating operation	Faulty outdoor fan motor	Measure coil resistance and insulation resistance	Remove outdoor fan motor if faulty	
	Faulty internal thermostat	Fault	Check for conduction after temperature of outdoor fan motor is decreased	Remove outdoor fan motor
		Incorrect contact	Measure resistance by tester	Remove looseness and replace connector
		Incorrect connection	Check connection	Correctly connect

Alarm code	48	Activation of Inverter overcurrent protection device (1).
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This alarm is indicated when the inverter electronic thermal protection is activated 6 times in 30 minutes (retry operation is carried out up to 5 times).

Activation conditions:

- Inverter current with 105% of the rated current runs continuously for 30 seconds.
- Inverter current runs intermittently and the accumulated time is reaches up to 3 minutes in a 10 minute period.



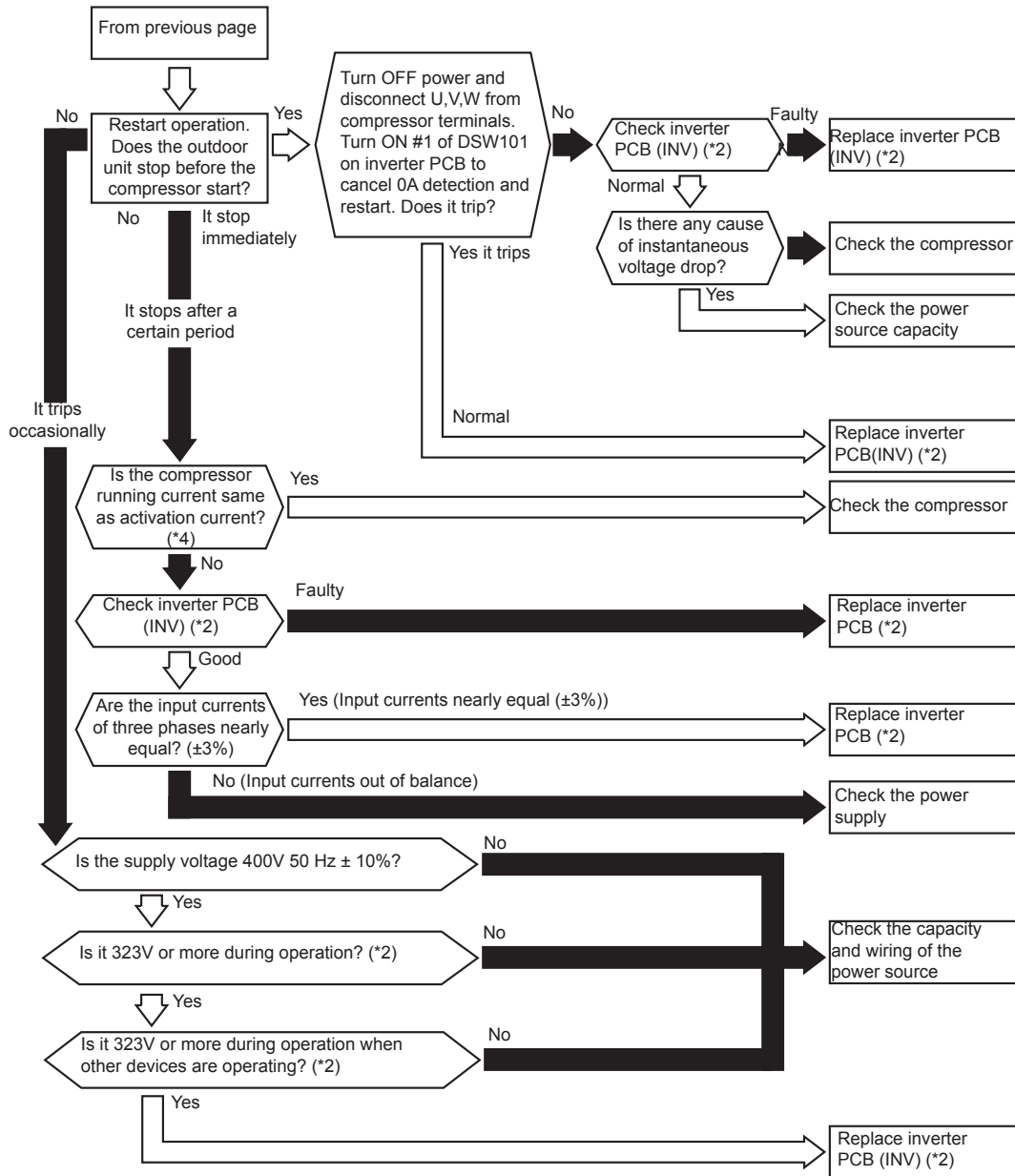
iTC	Cause of inverter stoppage
2	Instantaneous overcurrent
4	Inverter overcurrent

**i NOTE**

(\*1): Regarding the activation current value setting, refer to  
 (\*2): Regarding the checking or replacement of the diode module, refer to



Alarm code	<b>48</b>	Activation of Inverter overcurrent protection device (2).
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**i** NOTE

(\*1): Regarding the activation current value setting, refer to item "6.2 Inverter (INV1, INV2)"

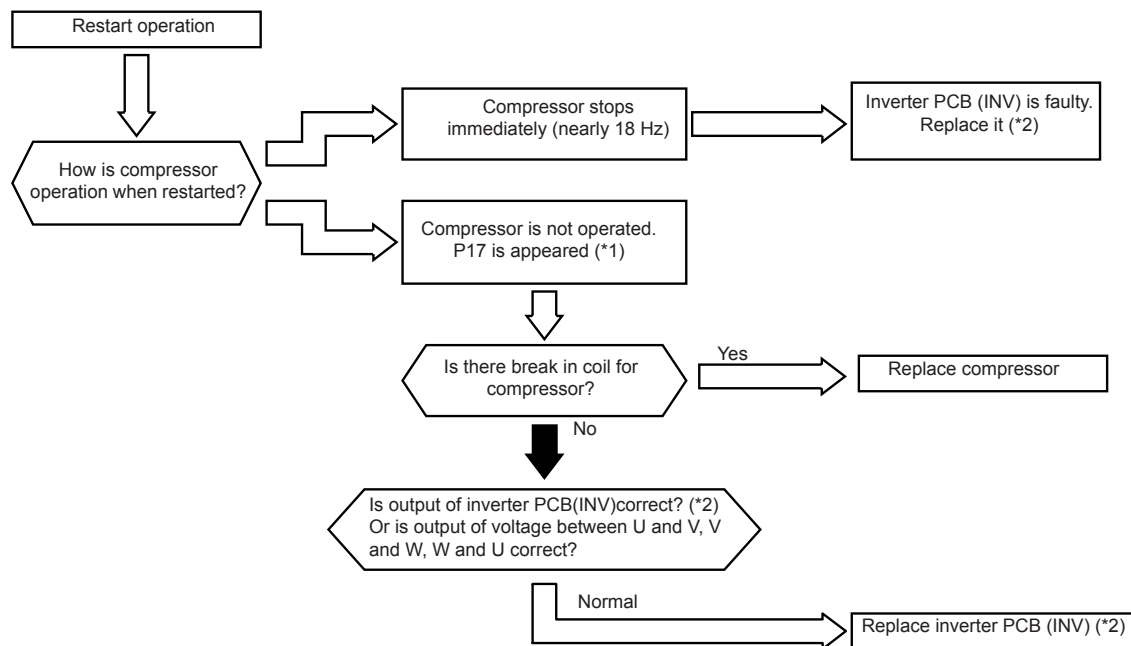
(\*2): For the maintenance and replacement of inverter PCB, perform the high voltage discharge work according to "6.2.2 High voltage discharge work for replacing parts".

Alarm code	<b>51</b>	Abnormal Inverter current sensor.
------------	-----------	-----------------------------------

This alarm is indicated when an abnormality of current transformer (0A detecting) occurs 3 times within 30 minutes (retry operation is carried up for the first two times).

Activation condition:

- When the compressor frequency is maintained between 15 and 18 Hz after the compressor is started, one of the absolute running current values detected by the current transformer in each phase U+, U-, V+ and V- is equal or less than 1.5 A.
- The wave height value of running current for the phase positioning is less than 5A before the compressor is started (at completing the phase positioning).



### **i** NOTE

- (\*1): P17 is displayed on the 7-segment display of the outdoor unit PCB1.
- (\*2): For the maintenance and replacement of inverter PCB, perform the high voltage discharge work according to the "6.2.2 High voltage discharge work for replacing parts"

ITC	Cause of inverter stoppage
1	Activation of transistor module protection
8	Abnormal current sensor
12	Ground fault detection
21	Out of synchronism detection

Alarm code

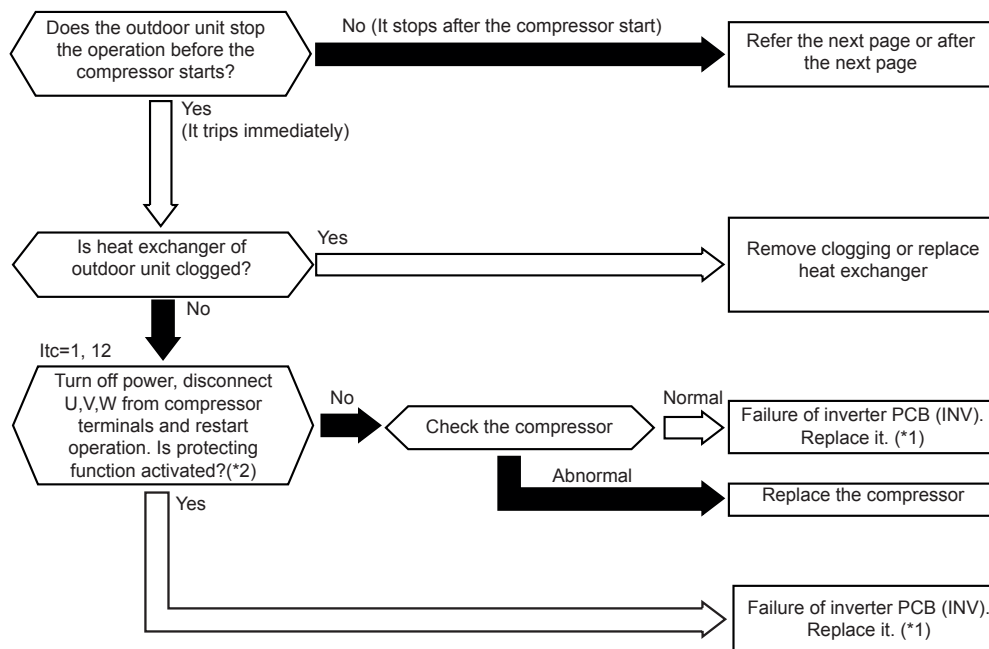
**53**

Inverter error signal detection.

This alarm is indicated when the IMP (transistor module) detects an abnormal function 7 times in 30 minutes (retry operation is carried out up to sixth times).

Activation conditions:

- Abnormal current is applied to the inverter current sensor due to a short circuit, a ground fault or overcurrent.
- Abnormal increase of temperature in the transistor module.
- Decrease in control voltage.
- The angle difference between the shaft in compressor and the shaft in the control program exceeds 60°.

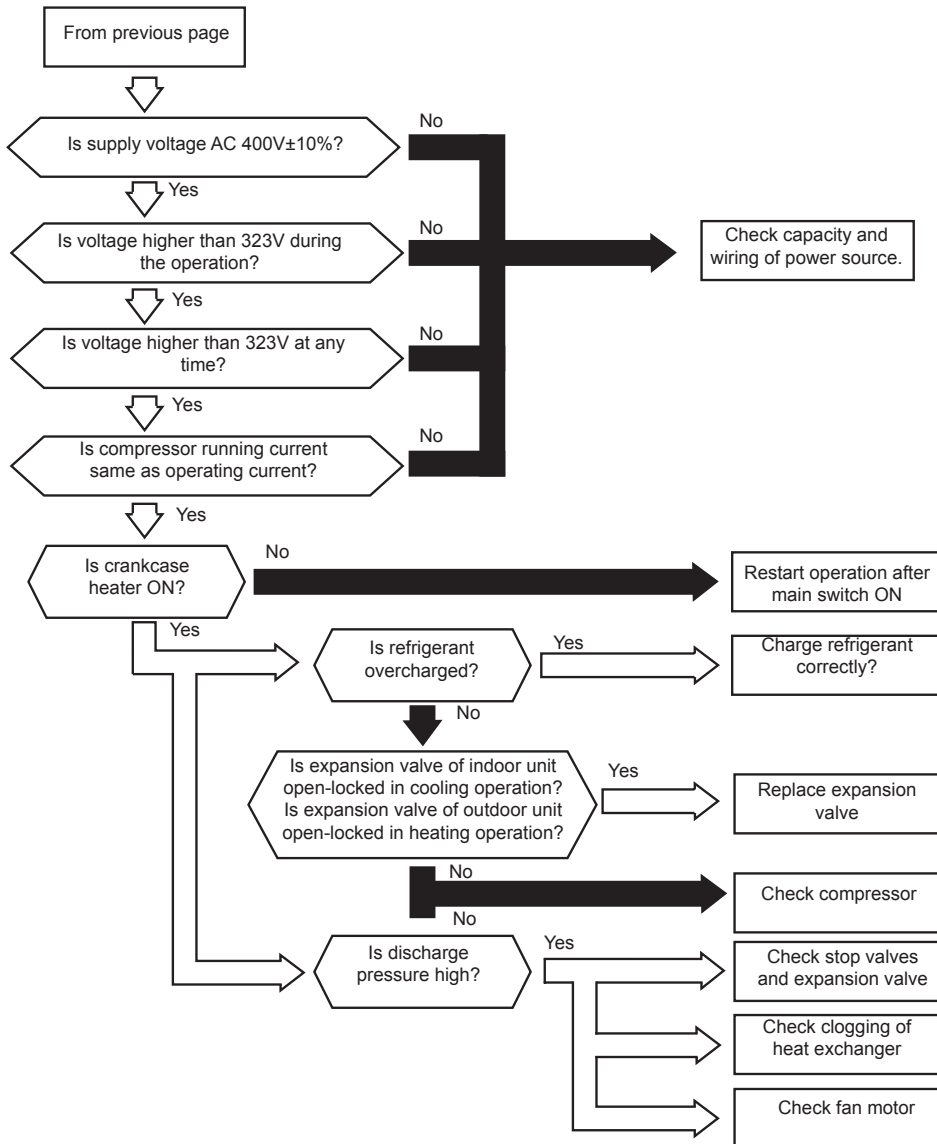


ITC	Cause of inverter stoppage
1	Activation of transistor module protection
12	Ground fault detection
21	Out-of-synchronism detection

**NOTE**

- (\*1) For the maintenance and replacement of the inverter PCB, perform the high voltage discharge work according to the item "6.2.2 High voltage discharge work for replacing parts"
- (\*2): Turn ON the No.1 switch of DSW101 on the inverter PCB (INV) when restarting the operation with the terminals of the compressor disconnected. After troubleshooting, turn OFF the No.1 switch of DSW101 on inverter PCB (INV).

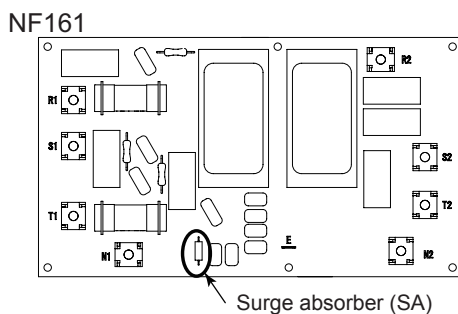
Alarm code	53	Inverter error signal detection (2).
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**i NOTE**

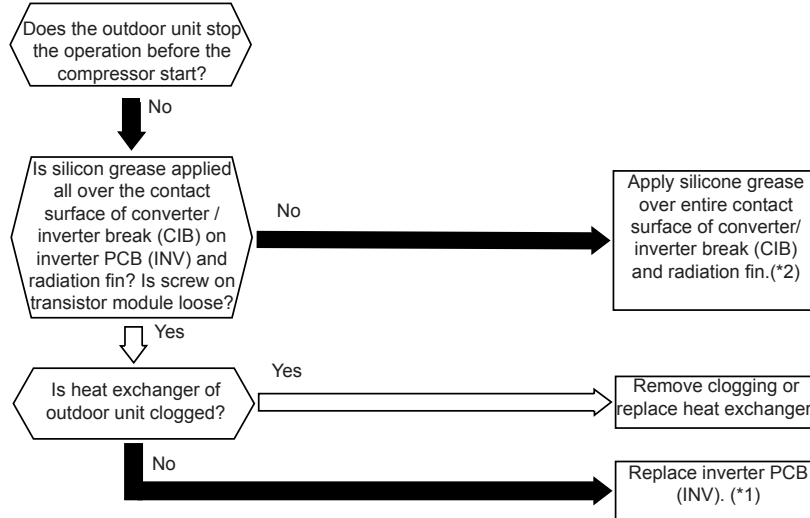
- When an excessive surge current is applied to the unit due to lightning or other causes, this alarm code "53" or the inverter stoppage code (iTC) "11" will be indicated and the unit cannot be operated. In this case, check the surge absorber/surge arrester (SA) on the noise filter (NF1, NF2). The surge absorber may be damaged if the inner surface of the surge absorber is black. In that case, replace the surge absorber. If the inside of the surge absorber is normal, turn OFF the power once and wait for LED501 (red) on the main circuit PCB (PCB2) (220V) or LED401 (red) on the inverter PCB (INV) OFF (approximately five minutes) and turn it ON again.
- For the maintenance and replacement of the inverter PCB (INV), perform the high voltage discharge work according to the "6.2.2 High voltage discharge work for replacing parts"

**Position of surge absorber**



Alarm code	54	Abnormal inverter fin temperature.
------------	----	------------------------------------

This alarm is indicated when an abnormality of inverter fin temperature occurs 3 times in 30 minutes (retry operation is carried out up to the second time the anomaly occurs). Activation condition: the radiation fin temperature exceeds 106 °C.



**NOTE**

- (\*1): For the maintenance and replacement of inverter PCB (INV), perform the high voltage discharge work according to the item “6.2.2 High voltage discharge work for replacing parts”
- (\*2): Use the silicon grease provided as an accessory (05SZ0015).

ITC	Cause of inverter stoppage
3	Abnormal inverter fin temperature



Alarm code	<b>55</b>	Inverter failure.
------------	-----------	-------------------

An abnormality is detected when the actual frequency from the inverter PCB is less than 10Hz after the inverter frequency is output from the outdoor unit PCB to the inverter PCB. This alarm code is displayed when this occurs 3 times in 30 minutes. If it occurs less than 3 times in 30 minutes, the operation is automatically retried.

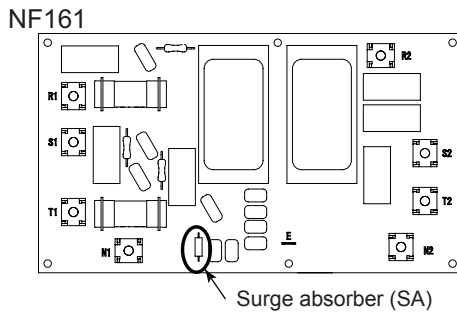


### NOTE

When an excessive surge current is applied to the unit due to lightning or other causes, this alarm code "55" or the inverter stoppage code (iTC) "11" will be indicated and the unit can not be operated. In this case, check the surge absorber/surge arrester (SA) on the noise filter (NF1, NF2). The surge absorber may be damaged if the inner surface of the surge absorber is black. In that case, replace the surge absorber.

If the inside of the surge absorber is normal, turn OFF the power once and wait for LED501 (red) on the main circuit PCB (PCB2) (220V) or LED401 (red) on the inverter PCB (INV) OFF (approximately five minutes) and turn it ON again.

### Position of surge absorber

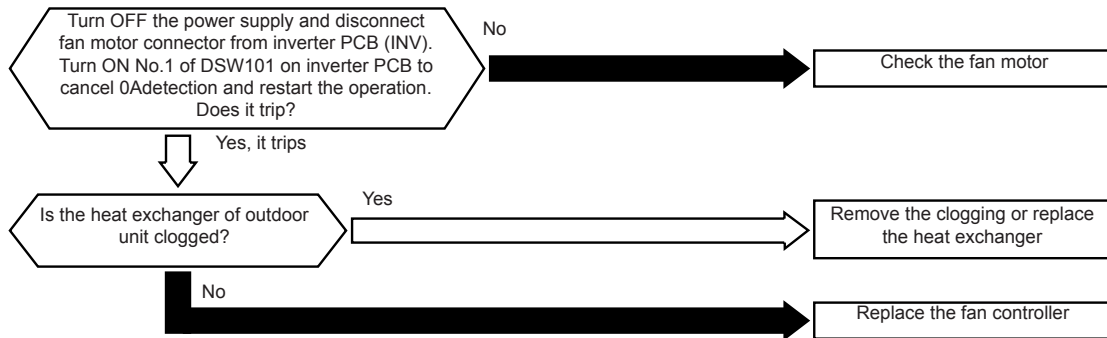


Alarm code	57	Activation of fan controller protection.
------------	----	--

This alarm is indicated when the IMP (transistor module) detects an abnormality function 10 times in 30 minutes (retry operation is performed instead carried out up to the ninth time).

Activation conditions:

- Abnormal current to the transistor module, such as a short-circuit or earth leakage, or overcurrent occurs at the transistor module.
- Decrease in control voltage.

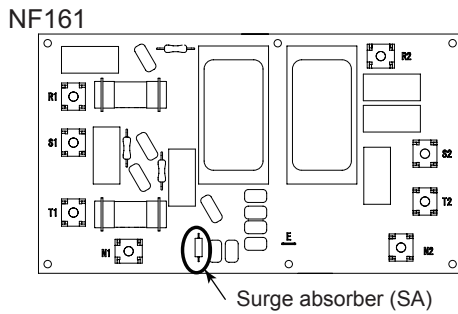


**i NOTE**

When an excessive surge current is applied to the unit due to lightning or other causes, this alarm code "57" or the inverter stoppage code (iTC) "11" will be indicated and the unit cannot be operated. In this case, check to ensure the surge absorber/surge arrester (SA) on the noise filter (NF1, NF2). The surge absorber may be damaged if the inner surface of the surge absorber is black. In that case, replace the surge absorber.

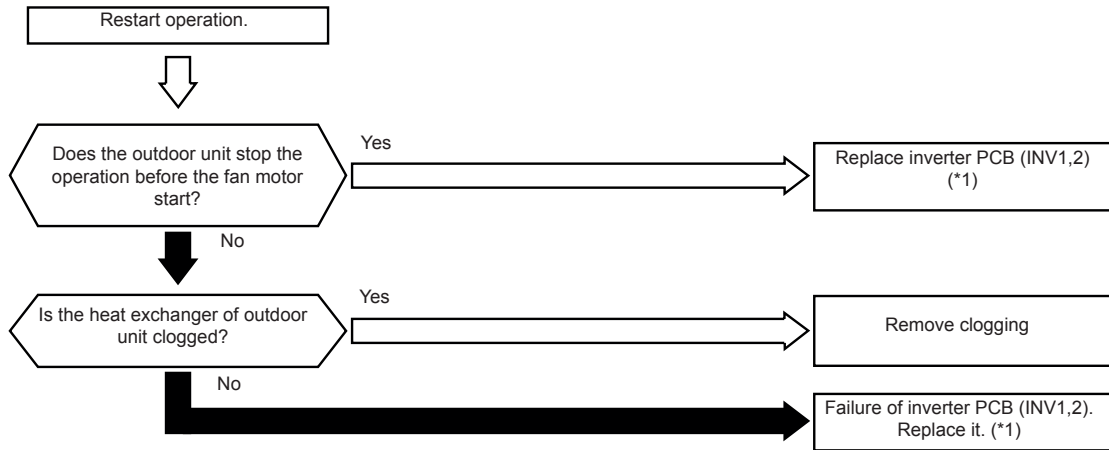
If the inside of the surge absorber is normal, turn OFF the power once and wait for LED401 (red) on the inverter PCB (INV) OFF (approximately five minutes) and turn it ON again.

**Position of surge absorber**



Alarm code	<b>5A</b>	Abnormal fan controller fin temperature.
------------	-----------	--

This alarm is indicated when the fan controller fin temperature anomaly occurs 10 times in 30 minutes (retry operation is carried out up to 9 times). Activation condition: this alarm is indicated when the thermistor temperature inside the transistor module increases over 100 °C.

**NOTE**

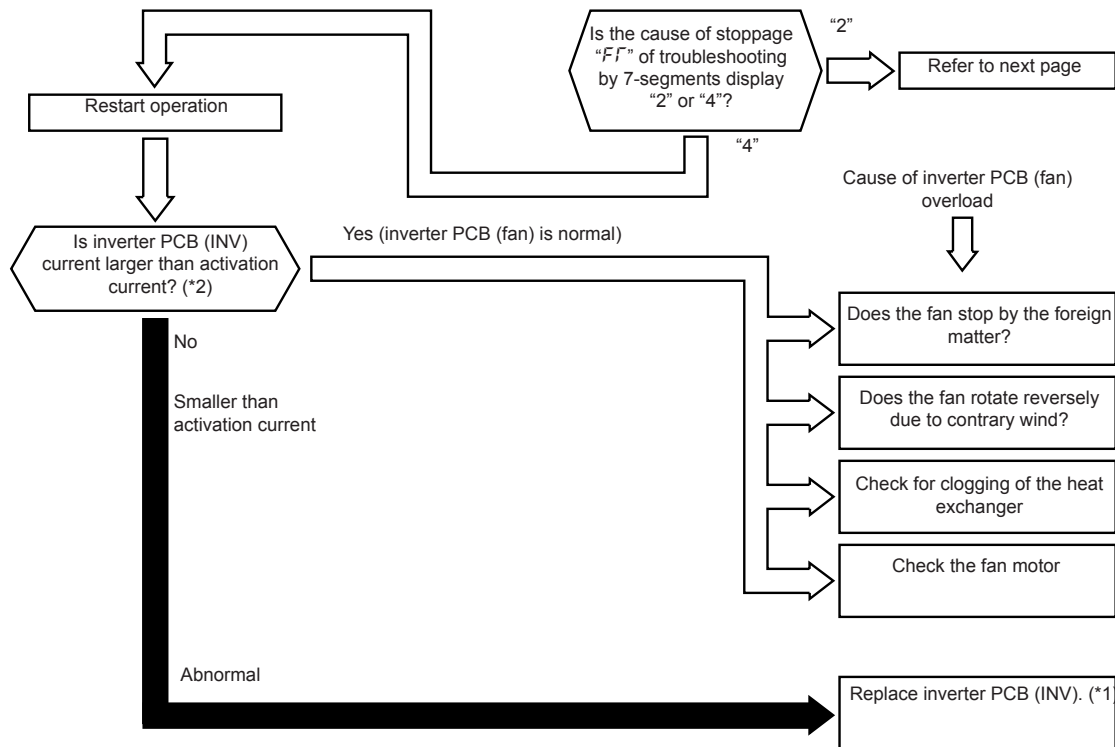
- (\*1): For the maintenance and replacement of the inverter PCB, perform the high voltage discharge work according to item "6.2.2 High voltage discharge work for replacing parts"

Alarm code	<b>5b</b>	Activation of fan controller overcurrent protection device (1).
------------	-----------	---

In this case, the outdoor unit number of abnormal inverter PCB is displayed. Check the fan controller stoppage code when this alarm code is displayed.

Activation condition:

- Electrical current with 105% of the rated current runs continuously for 30 seconds.
- Electrical current runs intermittently and the accumulated time reaches to 3 minutes in a 10 minute period.

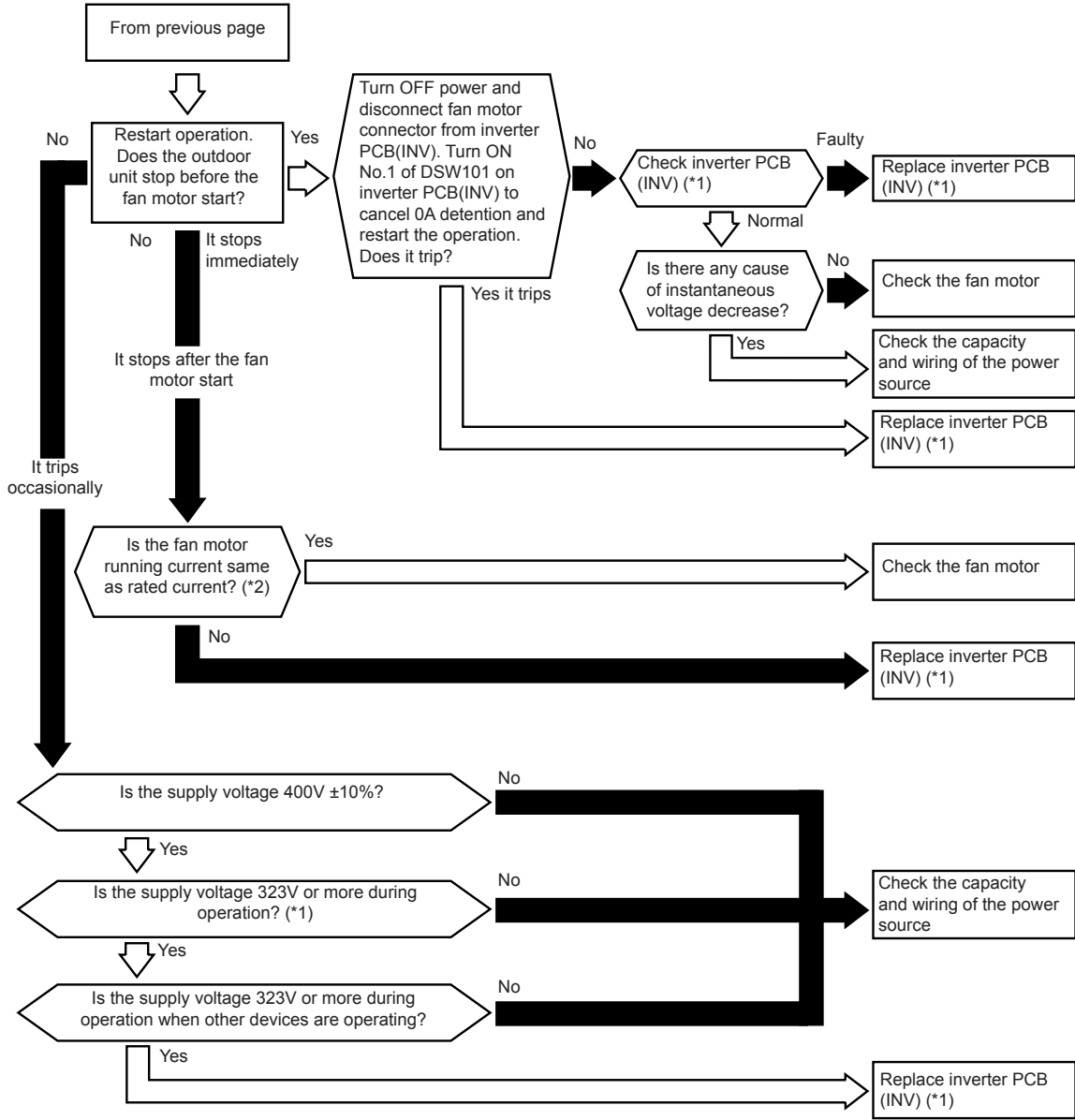


**i** NOTE

- (\*1): For the maintenance and replacement of an inverter PCB, perform the high voltage discharge work according to item "6.2.2 High voltage discharge work for replacing parts"
- (\*2): Regarding the setting value of activation current, refer to the item "6.2 Inverter (INV1, INV2)"

Alarm code	5b	Activation of fan controller overcurrent protection device (2).
------------	----	---

This alarm is indicated when the instantaneous overcurrent occurs 10 times in 30 minutes (retry operation is carried out up to 9 times). Activation condition: the running current exceeds the rated current of transistor module.



**i** NOTE

**i** NOTE

- (\*1): For the maintenance and replacement of an inverter PCB, perform the high voltage discharge work according to item "6.2.2 High voltage discharge work for replacing parts"
- (\*2): Regarding the setting value of activation current, refer to the item "6.2 Inverter (INV1, INV2)"



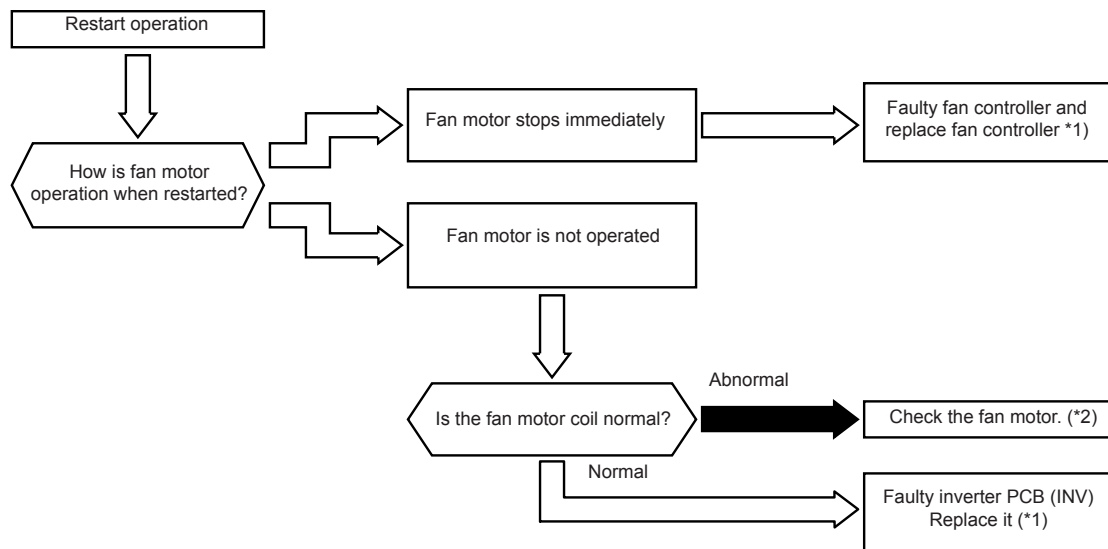
Alarm code	<b>5C</b>	Abnormal fan controller sensor.
------------	-----------	---------------------------------

In this case, the outdoor unit number of abnormal inverter PCB and abnormal inverter PCB number are displayed. Check the fan controller stoppage code when this alarm code is displayed.

This alarm code is displayed when the fan controller electronic thermal protection is activated 10 times within 30 minutes. If this occurs less than 10 times in 30 minutes, the operation automatically restarts.

This alarm is indicated when the following conditions occur:

- Electric current with 105% of the rated current runs for 30 seconds continuously.
- Before the fan motor operation is started (at completing the phase positioning), the wave height value of the running current for the phase positioning is less than criterion value.



### **i** NOTE

- (\*1): For the maintenance and replacement of the inverter PCB, perform the high voltage discharge work according to the [“6.2.2 High voltage discharge work for replacing parts”](#)
- (\*2): For checking fan motor, refer to the fan motor specification of the [“6.2 Inverter \(INV1, INV2\)”](#)

Alarm code	<b>EE</b>	Compressor protection.
------------	-----------	------------------------

This alarm code is displayed when any of the following alarms causing serious compressor damages occurs 3 times in 6 hours. While this alarm is displayed, alarm reset is unavailable.

Alarm code	Content of anomaly
02	Activation of protection device (high pressure cut)
07	Decrease in discharge gas superheat
08	Increase in discharge gas temperature at the upper part of the compressor
43	Activation of the low compression ratio protection device
44	Activation of the low pressure increase protection device
45	Activation of the high pressure increase protection device
47	Activation of the low pressure decrease protection device (Vacuum operation protection)

### NOTE

- These alarms can be checked by the CHECK Mode 1. Follow the action indicated in each alarm chart.
- These alarms are cleared only by turning OFF the main power switch to the system.

### CAUTION

Great care must be taken before starting, since there is a possibility of causing serious damages to the compressors.

Alarm code	<b>A1</b>	External abnormality detection.
------------	-----------	---------------------------------

This alarm code is displayed when the external input is set the control function number 14 is detected an abnormality (input terminals are short-circuited).

Alarm code	<b>b0</b>	Incorrect setting of the unit model code
------------	-----------	--

This alarm code is indicated when the unit model code setting (DSW4) is not set (all pins are "OFF"), or is set for the incorrect indoor unit type. Check the unit model code setting (DSW4) of indoor unit PCB after turning OFF the power source. Set DSW4 correctly.

Alarm code	<b>b1</b>	Incorrect setting of unit and refrigerant cycle number
------------	-----------	--

This alarm code is indicated in the following condition. Check the settings of the dip switch (DSW) and the rotary switch (RSW) after turning OFF the power source.

Conditions	Countermeasures:
The unit unit number setting (DSW6 and RSW1) or the refrigerant cycle unit number setting (DSW5 and RSW2) is set as "64" or more, or more than 2 pins of DSW5 or DSW6 are set.	Unit number setting / refrigerant cycle number setting starting from "1" (recommended). <ul style="list-style-type: none"> <li>- Set the unit number and the refrigerant cycle number from "1" to "63". (Setting number for the 64th unit shall be "0".)</li> </ul> Unit number setting / refrigerant cycle number setting starting from "0". <ul style="list-style-type: none"> <li>- Set the unit number and the refrigerant cycle number from "0" to "63." (Setting number for the 64th unit shall be "63")</li> </ul>
The unit unit number setting and the refrigerant cycle unit number setting are set between "16" and "63," and the indoor unit does not support H-LINK II.	Set the unit number and the refrigerant cycle unit number between "0" and "15".

Alarm code	<b>b5</b>	Incorrect setting of indoor unit connection number.
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**NOTE**

*"b5" is displayed on the remote control switch screen*

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

Conditions:                   The number of the connected indoor units not supporting H-LINK II are 17 or more.

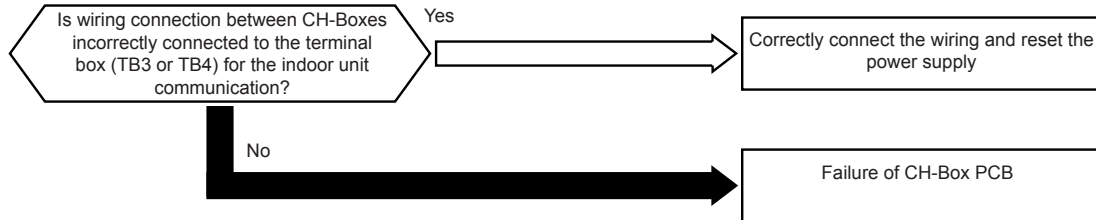
Countermeasures:         The number of the connected indoor units must be 16 or less.



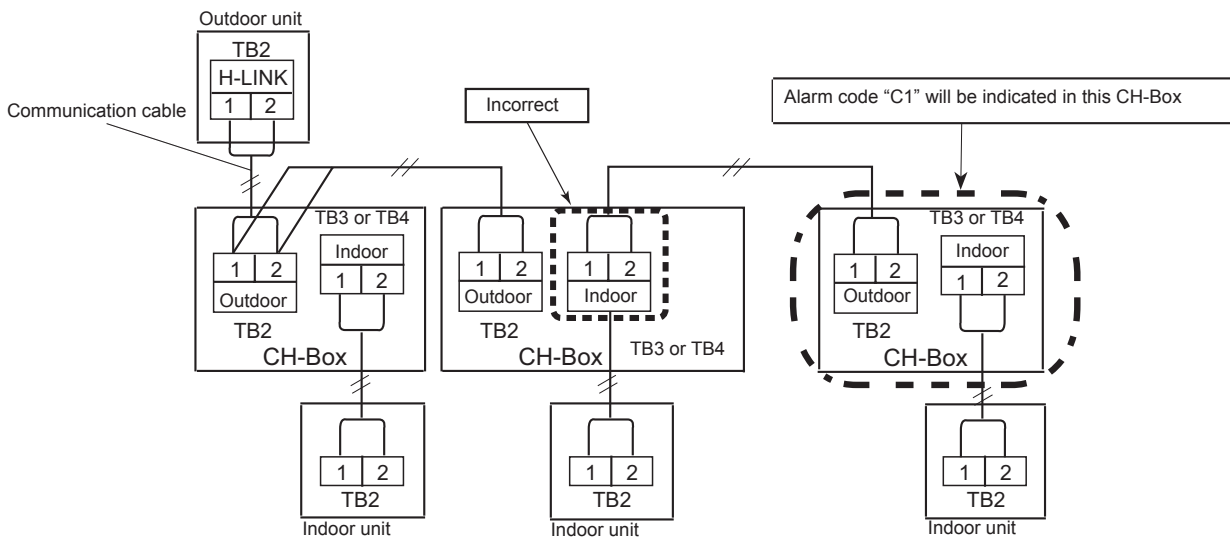
Alarm code	<b>C1</b>	Incorrect indoor unit connection (CH-Box).
------------	-----------	--

LED (LED10, 11, 12, 13) on CH-Box PCB flashes.

This alarm is indicated when 2 or more CH-Boxes are connected between the outdoor unit and the indoor unit.



- Alarm code "C1" will be indicated when the units are connected as follows.

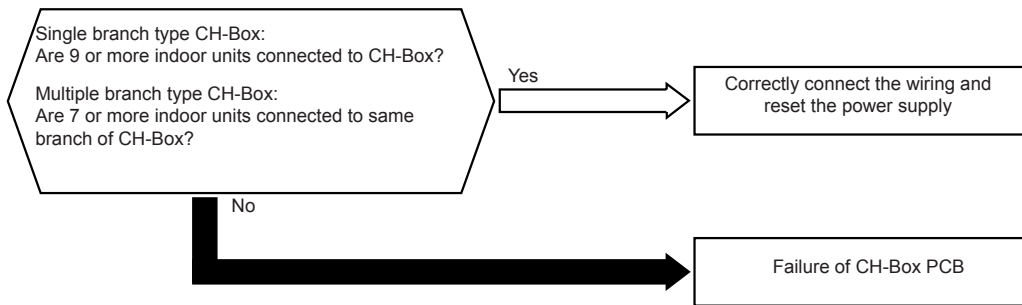


Alarm code	C2	Incorrect indoor unit connection number setting (CH-Box).
------------	----	---

The unit number, alarm code ("35") and the unit code are alternately indicated in the temperature setting section of the indoor unit connected to the CH-Box.

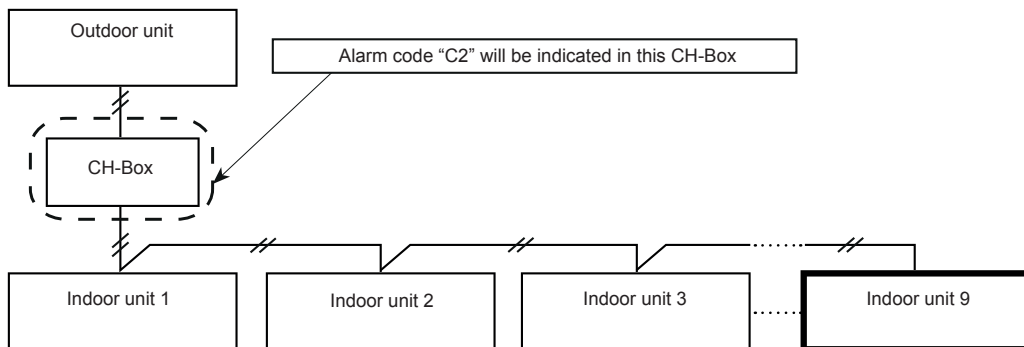
LED (LED10, 11, 12) on CH-Box PCB flashes (for multiple branch type CH-Box, only LED on PCBs with abnormality flashes).

This alarm is indicated when 9 or more indoor units are connected to the CH-Box.



- Alarm code "C2" will be indicated when the units are connected as follows.

Example: Single branch type CH-Box

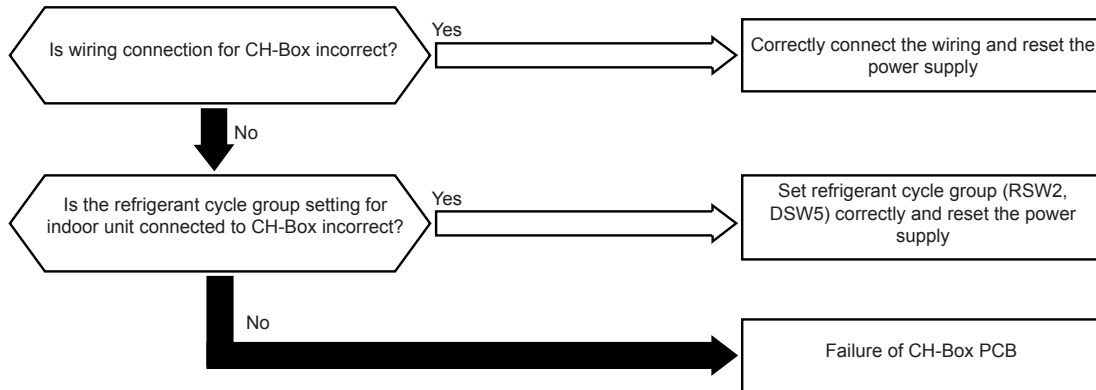


Alarm code	C3	Incorrect indoor unit connection (CH-Box).
------------	----	--

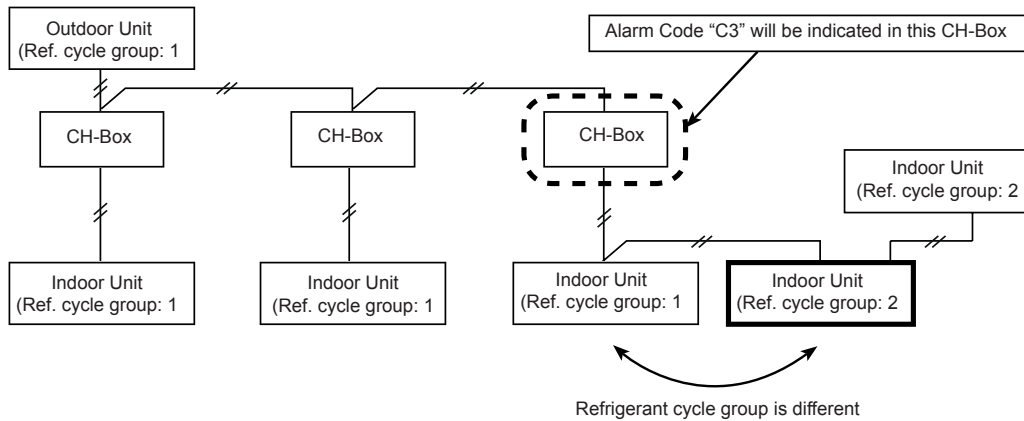
The unit number, alarm code ("35") and the unit code are alternately indicated in the temperature setting section of the indoor unit connected to the CH-Box.

LED (LED5, 6) in PCB(1) of the CH-Box flashes.

This alarm is indicated when an indoor unit with a different refrigerant cycle group is connected to the CH-Box.



- Alarm code "C3" will be indicated when the units are connected as follows.

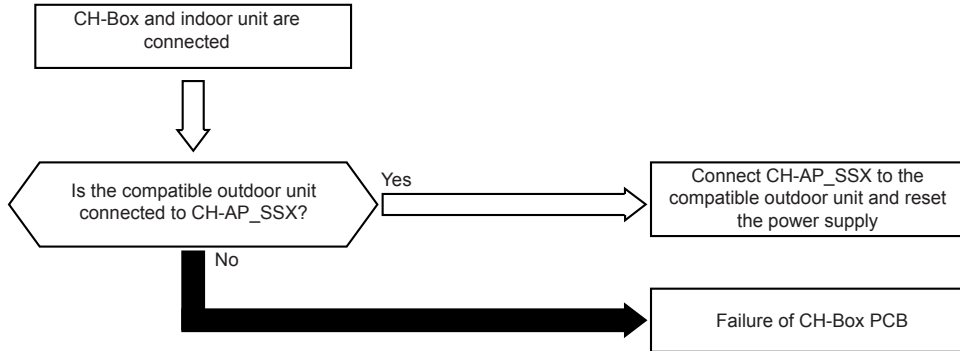


Alarm code	C4	Incorrect indoor unit connection (CH-Box).
------------	----	--

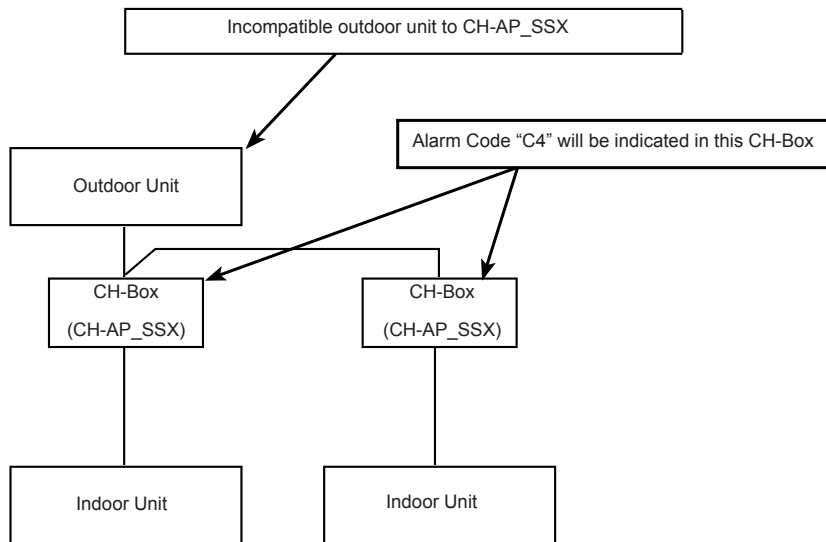
The unit number, alarm code ("35") and the unit code are alternately indicated in the temperature setting section of the indoor unit connected to the CH-Box.

LED (LED10, 13) on CH-Box PCB flashes.

This alarm code is displayed when incompatible outdoor unit is connected to CH-AP\_S SX.



- Alarm code "C4" will be indicated when the units are connected as follows.

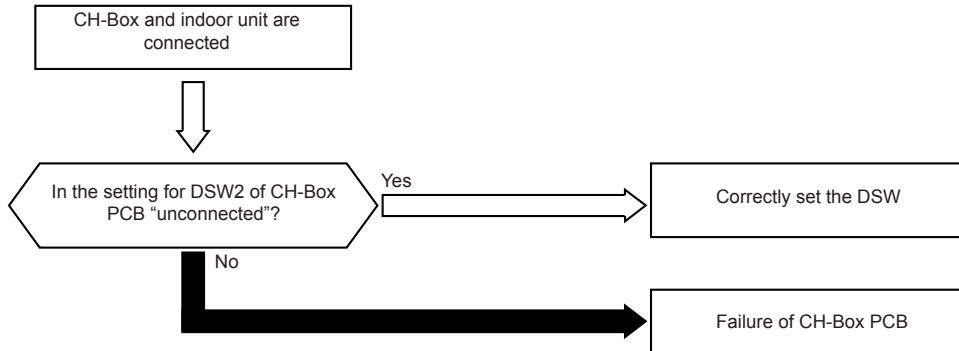


Alarm code	<b>C5</b>	Incorrect indoor unit connection (CH-Box).
------------	-----------	--

LED (LED11, 12, 13) on CH-Box PCB flashes (for multiple branch type CH-Box, only LED on PCBs with abnormality flashes).

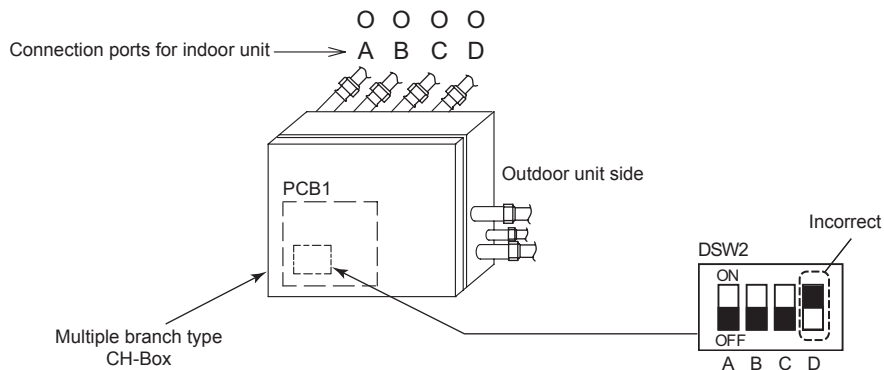
This alarm code is displayed when communication cable for indoor unit is connected to a port of multiple branch type CH-Box that is set to "unused". Setting DSW2 for CH-Box PCB is required if any ports are not in use with multiple branch type CH-Box.

03 alarm code is displayed when DSW2 is not set and indoor unit is not connected to CH-Box.



- Alarm code "C5" will be indicated when the DSW is set as follows.

Example of incorrect "D" setting:



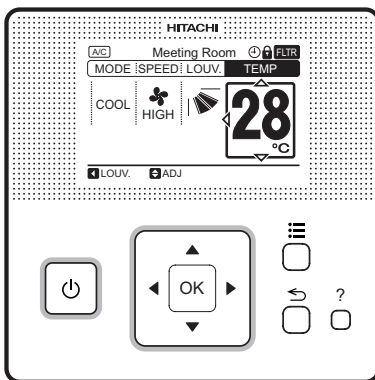
## 7.4 Troubleshooting in the check mode by using the remote control switch (PC-ARFPE example)

### 7.4.1 Setting method

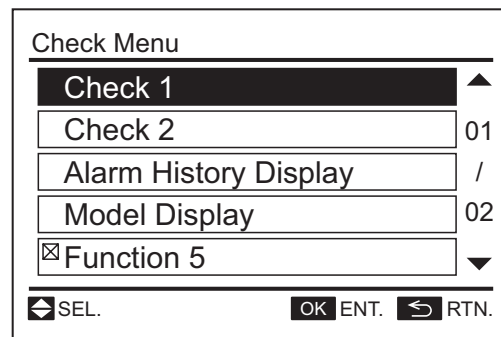
Each “Check menu” item and it’s function are explained in the following table:

Check menu item	Function
Check 1	Sensor condition of air conditioner will be monitored and indicated
Check 2	Sensor data of air conditioner prior to alarm occurrence will be indicated
Alarm history display	Previous alarm record (date, time, alarm code) will be indicated
Model display	Model name and manufacturing number will be indicated
I.U. / O.U. PCB Check	The result of PCB check will be indicated
Self checking	Checking of remote control switch will be carried out

Normal mode display



Check menu display



Press and hold “☰” (menu) and “?” (help) simultaneously for 3 seconds during the normal mode.

#### ◆ Check 1 and check 2

<p>(1) Press and hold “☰” (menu) and “?” (help) simultaneously for 3 seconds during the normal mode. The check menu is displayed.</p>	
<p>(2) Select “Check 1” (or “Check 2”) form the check menu and press “OK”.</p>	

(4) Press “△” or “▽” to change the screen.

Check 1:01-03	
Item	Value
b1	22
b2	20
b3	55
b4	20
b5	25

Next Page      RTN.

### Items of Check mode 1


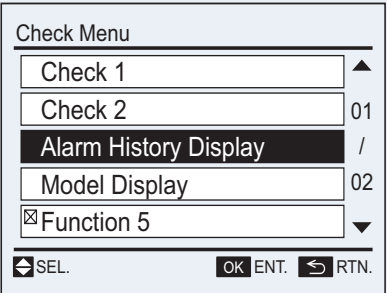
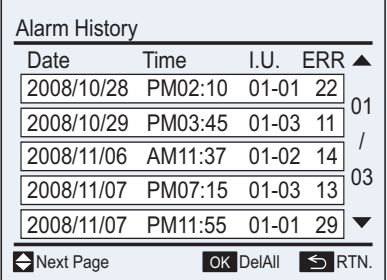


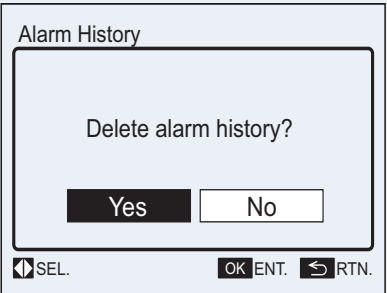
No.	Item	Data name	No.	Item	Data name
1	b1	Set Temp.	18	E3	Times of Abnormal Transmitting
2	b2	Inlet Air Temp.	19	E4	Times of Inverter Tripping
3	b3	Discharge Air Temp.	20	F1	Louver Sensor State
4	b4	Liquid Pipe Temp.	21	H1	Discharge Pressure
5	b5	Remote Thermistor Temp.	22	H2	Suction Pressure
6	b6	Outdoor Air Temp.	23	H3	Control Information
7	b7	Gas Pipe Temp.	24	H4	Operating Frequency
8	b8	Evaporating Temp. at Heating	25	J1	I.U. Capacity
9	b9	Condensing Temp. at Cooling	26	J2	O.U. Code
10	bA	Comp. Top Temp.	27	J3	Refrigerant Cycle Number (1)
11	bb	Thermo Temp. of Remote Control Switch	28	J4	Refrigerant Cycle Number (2)
12	bC	Not Prepared	29	L1	I.U. Expansion Valve
13	C1	I.U. Micro-Computer	30	L2	O.U. Expansion Valve 1
14	C2	O.U. Micro-Computer	31	L3	O.U. Expansion Valve 2
15	d1	Stopping Cause State Indication	32	L4	O.U. Expansion Valve B
16	E1	Times of Abnormality	33	P1	Comp. Current
17	E2	Times of Power Failure	34	q1	Motion Sensor Reaction Rate (0 ~ 100%)

### Items of Check mode 2

No.	Item	Data name	No.	Item	Data name
1	q1	Inlet Air Temp.	9	q9	Discharge Pressure
2	q2	Discharge Air Temp.	10	qA	Suction Pressure
3	q3	Liquid Pipe Temp.	11	qb	Control Information
4	q4	Outdoor Air Temp.	12	qC	Operating Frequency
5	q5	Gas Pipe Temp.	13	qd	I.U. Expansion Valve
6	q6	Evaporating Temp. at Heating	14	qE	O.U. Expansion Valve 1
7	q7	Condensing Temp. at Cooling	15	qF	Comp. Current
8	q8	Comp. Top Temp.			


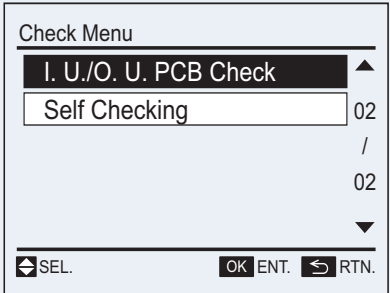
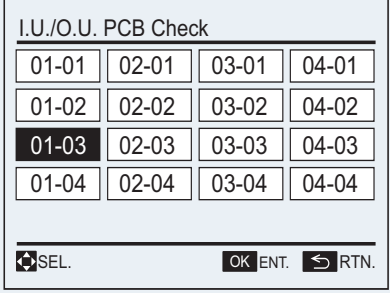




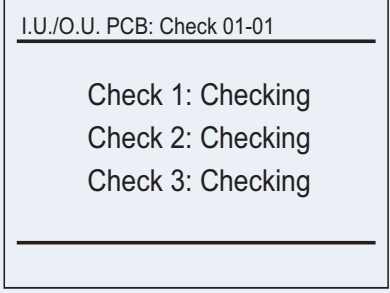

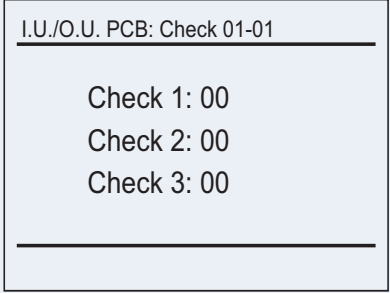
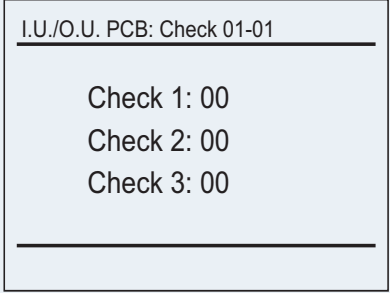
◆ **Alarm history display**

The alarm history display is available to be set from the check menu.

<p>(1) Press and hold “” (menu) and “?” (help) simultaneously for 3 seconds during the normal mode. The check menu is displayed.</p>	
<p>(2) Select “Alarm History Menu” form the check menu and press “OK”.</p>	
<p>(3) The alarm history display is switched by pressing “” or “”.</p> <p>(4) To delete the alarm history, press “OK”. The confirmation screen will be displayed. Select “YES” and press “OK”. The alarm history is deleted and the screen will return to (3). If “NO” is pressed, the screen will return to (3).</p>	



◆ I.U. / O.U. PCB Check

<p>(1) Press and hold “” (menu) and “?” (help) simultaneously for 3 seconds during the normal mode. The check menu is displayed.</p>	 <p>Check Menu I. U./O. U. PCB Check ▲ Self Checking 02 / 02 ▼ SEL. OK ENT. RTN.</p>
<p>(2) Select “I.U./O.U. PCB Check” form the check menu and press “OK”.</p>	 <p>I.U./O.U. PCB Check 01-01 02-01 03-01 04-01 01-02 02-02 03-02 04-02 01-03 02-03 03-03 04-03 01-04 02-04 03-04 04-04 SEL. OK ENT. RTN.</p>
<p>(3) Select the set indoor unit by pressing “   ” and press “OK”. (This screen is NOT displayed when the number of indoor unit connected with the remote control switch is 1 (one). In this case, (4) will be displayed.)</p>	 <p>I.U./O.U. PCB: Check 01-01 Check 1: Checking Check 2: Checking Check 3: Checking</p>
<p>(4) The indoor unit PCB and the outdoor unit PCB check are started. * If “” (menu) is pressed during the check, the check is canceled and the screen will return to (2). * If return is pressed during the check, the check is canceled and the screen will return to (3).</p>	 <p>I.U./O.U. PCB: Check 01-01 Check 1: 00 Check 2: 00 Check 3: 00</p>
<p>(5) After completing the check, the result of PCB check will be indicated. Press return and return to (3).</p>	 <p>I.U./O.U. PCB: Check 01-01 Check 1: 00 Check 2: 00 Check 3: 00</p>

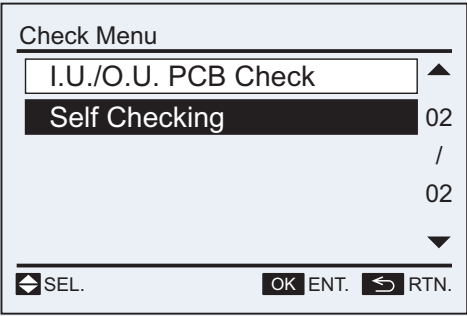
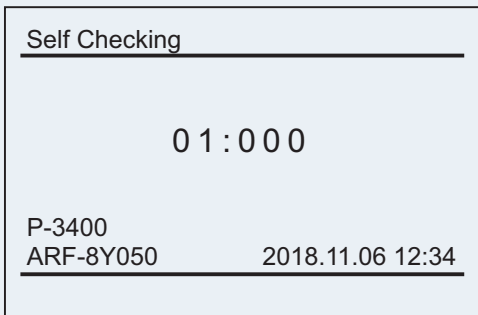


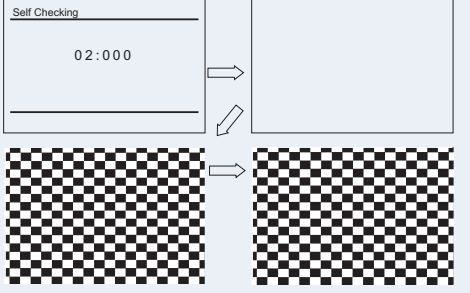
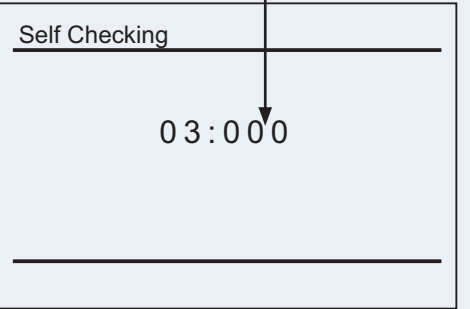
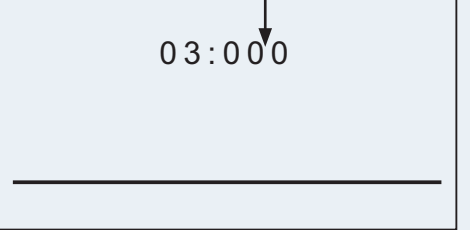
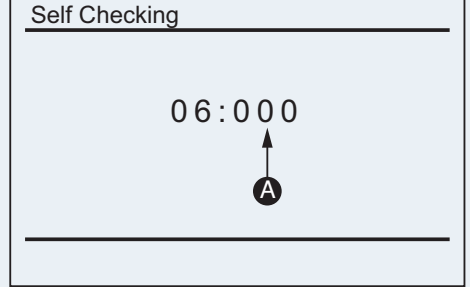
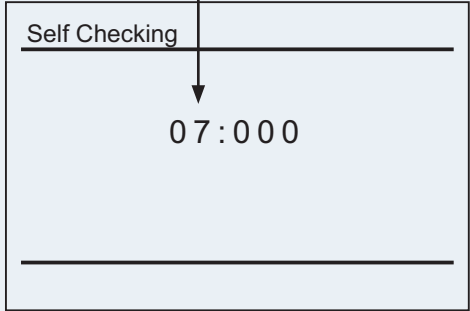

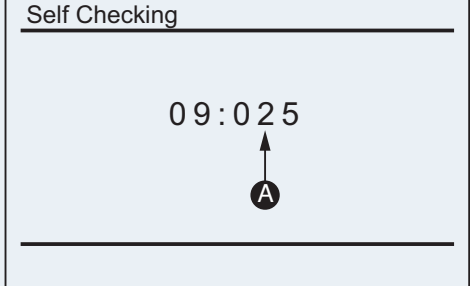
**Result of check table:**

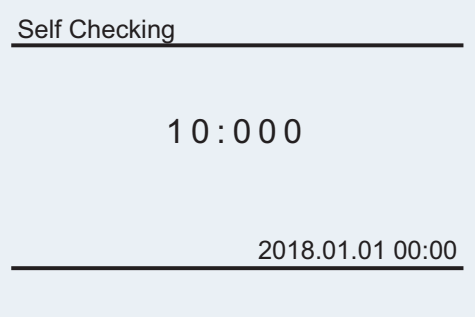
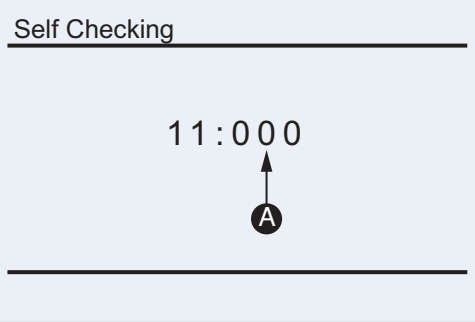
Indoor Unit PCB		Outdoor Unit PCB	
00	Normal	00	Normal
01	Abnormality of Inlet Air Temp. Thermistor	07	Abnormality of Transmission of Outdoor Unit
02	Abnormality of Outlet Air Temp. Thermistor	F4	ITO Input Failure
03	Abnormality of Liquid Pipe Temp. Thermistor	F5	PSH Input Failure
04	Abnormality of Remote Thermistor	F6	Abnormality of Protection Signal Detection Circuit
05	Abnormality of Gas Pipe Temp. Thermistor	F7	Abnormality of Phase Detection
08	Abnormality of Transmission of Central Station	F8	Abnormality of Transmission of Inverter
0A	Abnormality of EEPROM	FA	Abnormality of High Pressure Sensor
0b	Zero Cross Input Failure	Fb	Abnormality of Comp. Discharge Gas Temp. Thermistor
EE	Abnormality of Transmission of I.U. during Check	FC	Abnormality of Low Pressure Sensor
		Fd	Abnormality of Evaporating Temp. Thermistor at Heating
		FF	Abnormality of Ambient Air Temp. Thermistor

**◆ Self checking**

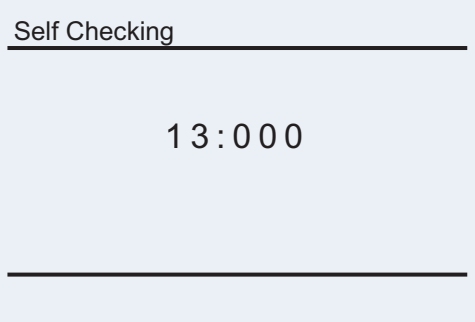
The self checking performs to check the wired controller and to clear EEPROM (storage cell inside of the wired controller).

<p>(1) Press and hold "≡" (menu) and "?" (help) simultaneously for 3 seconds during the normal mode. The check menu is displayed.</p>	
<p>(2) Select "Self Checking" from the check menu and press "OK".</p>	
<p>(3) Select the process for "Self Checking". "Δ ∇ ◁ ▷"</p> <ul style="list-style-type: none"> <li>To start self check, press "?" (help).</li> <li>To clear EEPROM, press "∇" and "?" (help) simultaneously.</li> </ul> <p>See EEPROM clear process (15).</p>	


<p>(4) LCD Test Press "OK" and the screen will be switched as shown in the figure.</p>	
<p>(5) Backlight test LCD brightness is changed gradually by pressing "OK"</p>	<p>03: Backlight test 04: Contrast test 05: Run indicator test</p>
<p>(6) Contrast test Contrast of the LCD gradually changes by pressing "OK"</p>	
<p>(7) Run Indicator Test Press "OK" and the run indicator will flash in red and green twice for each.</p>	
<p>(8) Switch Input Test Press the 9 switches one by one. The number indicated with "A" will count up as switch being pressed.  * The order of pressing switch is at random. Do not press more than 1 (one) button for it will not be counted.</p>	
<p>(9) No Function This function is not used. Press "OK" to proceed.</p>	<p>07: No function 08: Transmission test</p> 
<p>(10) Transmission Circuit Test The wired controller automatically starts to check the transmission circuit.</p>	
<p>(11) Wired Controller Thermistor Test The detected temperature by wired controller thermistor is displayed at "A" in the right figure.</p>	

<p>(12) Date/Time Test</p> <p>The date and time is switched from “2012.03.04 12:34” to “2008. 01. 01 00:00”.</p>	 <p>Self Checking</p> <hr/> <p>10:00</p> <hr/> <p>2018.01.01 00:00</p> <hr/>
<p>(13) EEPROM Test</p> <p>EEPROM Clearing Cancel</p> <ul style="list-style-type: none"> <li>• Press “?” (help).</li> </ul> <p>EEPROM Clear</p> <ul style="list-style-type: none"> <li>• Press “OK” or wait 15 seconds. EEPROM data will be cleared. During the process, the numbers will be indicated on where is located with “A”.</li> <li>• If A has value of “999”, EEPROM is in a faulty condition.</li> <li>• *In case “A” has “999”, the process does not proceed to next step.</li> </ul>	 <p>Self Checking</p> <hr/> <p>11:00</p> <p style="text-align: center;">↑ A</p> <hr/>
<p>(14) After the several seconds are passed, the self checking is completed and the wired controller is automatically restarted.</p>	

### EEPROM Process





<p>(15) Clear EEPROM</p> <p>The wired controller will automatically start EEPROM clearing process.</p>	 <p>Self Checking</p> <hr/> <p>13:00</p> <hr/>
<p>(16) After the several seconds are passed, the self checking is completed and the wired controller is automatically restarted.</p>	

### ◆ Contact information registration


(1) Press and hold  (menu) and return simultaneously for at least 3 seconds during the normal mode (when unit is not operated). The test run menu will be displayed.


(2) Select "Contact Information" from the test run menu and press "OK".  
The contact information 1 will be displayed.

(3) Press "?" (help) to change font type.

(4) Press     to select letter.

(5) Press "OK" to confirm the letter. (Max.: 28 letters)

(6) Select "FIN." and press "OK" (or simply press  (menu)), (7) will be displayed.


(7) Repeat (3)~(5) to register contact information 2.  
Select "FIN" and press "OK", the confirmation screen will be displayed.  
(Also, press  (menu) and the confirmation screen will be displayed.)

(8) Select "Yes" and press "OK". The test run menu *will be displayed after the setting is confirmed.*  
If "No" is pressed, the screen will return to (3).

Contact Information 1

○ × Electric Cor p

ABC	'	+	*	;	.	?	-	/	:	=
abc	1	2	3	4	5	6	7	8	9	0
Sym.1	q	w	e	r	t	y	u	i	o	p
Sym.2	€	a	s	d	f	g	h	j	k	l
	<	>	z	x	c	v	b	n	m	,
	Spce	Del.	←	→					Fin.	

 Sel. **ECO** Letter **OK** Entr **Menu** Fin.


Contact Information

○ × Electric Corp.

○○○○-○○○-○○○○

Register these contents?

**Yes**

 Sel. **OK** Entr **Back** Rtrn

## 7.5 Troubleshooting by using the 7-segment display

### NOTE

Only the authorized person can carry out checks using this method.

The operating conditions and each part of the refrigerant cycle can be checked with the 7-segment display and push switches on the PCB1 in the outdoor unit.

### 7.5.1 Before carrying out checks

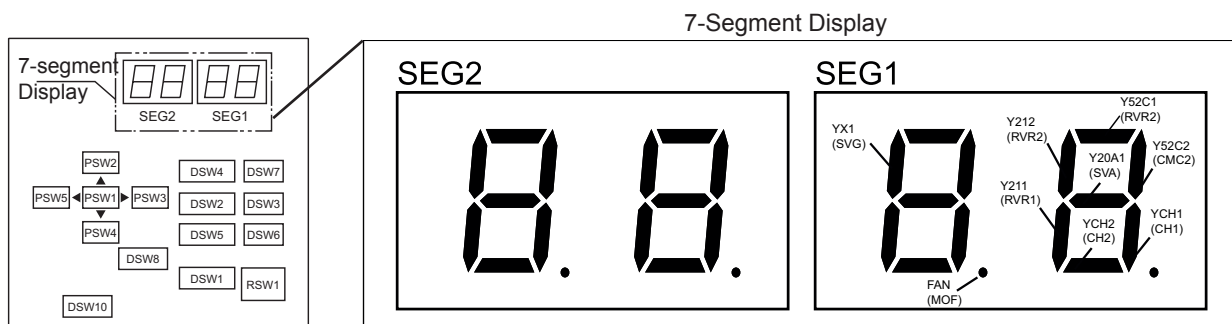
- 1 Turn ON the main power supply switch. Wait more than 20 seconds before starting the checks.
- 2 Check items:
  - Connection information.
  - Information of the outdoor unit.
  - Information of the indoor unit.
  - Information of the cause of the alarm code.
  - Alarm code historical information.
- 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.

### 7.5.2 Location of the pushswitches and the 7-segment display

The pushswitches and the 7-segment display are located on PCB1.



### 7.5.3 Protection control code on the 7-segment display

- A protection control code is displayed on the 7-segment display during the operation when the protection control has been activated.
- A protection control code is displayed while the function is operating, and it is cancelled when it is released.
- When several protection controls are activated, the code number with the highest priority is displayed (see below for the order of priority).

- 1 Higher priority will be given to the protection control related with the frequency control.

- |   |  |
|---|--|
| <1> Pressure ratio control                        | <6> Low pressure decrease protection                       |
| <2> High pressure increase protection             | <7> Demand current control (running current limit control) |
| <3> Current protection                            | <8> Low pressure increase protection                       |
| <4> Inverter fin temperature increase protection  | <9> High pressure decrease protection                      |
| <5> Discharge gas temperature increase protection |  |

- 2 Regarding the retry control, the latest retry code will be indicated unless the protection control related with the frequency control is indicated.

Code			Protection control	Code during the degeneration control		
P	0	1	Pressure ratio protection control	P	c	1
P	0	2	High pressure increase protection	P	c	2
P	0	3	Inverter current protection	P	c	3
P	0	4	Inverter fin temperature increase protection	P	c	4
P	0	5	Discharge gas temperature increase protection at the upper part of the compressor	P	c	5
P	0	6	Low pressure decrease protection	Without		
P	0	9	High pressure decrease protection			
P	0	A	Demand current protection control			
P	0	d	Low pressure increase protection			

Code			Retry control	Code during the degeneration control		
P	1	1	Pressure ratio decrease retry	Without		
P	1	2	Low pressure increase retry			
P	1	3	High pressure increase retry			
P	1	4	Constant speed compressor overcurrent retry			
P	1	5	Discharge gas temperature increase retry / Low pressure decrease retry			
P	1	6	Discharge gas super-heat decrease retry			
P	1	7	Inverter anomaly retry			
P	1	8	Abnormal Inverter voltage retry / Inverter failure retry			
P	2	6	High pressure decrease retry			

 **NOTE**

- 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.
- In the case that the degeneration control is activated, indications Pc1 to Pc5 are displayed instead of P01 to P05.

### 7.5.4 Activation condition of the protection retry control code

The protection control or the retry control is carried out to prevent abnormal operation. The activation conditions are listed in the following table.

Code	Protection control	Activation conditions	Notes	
P01	Pressure ratio protection control	Compression ratio $\varepsilon \geq 8.5$ or compression ratio $\varepsilon \leq 2.0$	-	
P02	High pressure increase protection	Discharge pressure Pd $\geq 3.45$ (in cooling mode) Pd $\geq 3.35$ (in heating mode and in heat recovery mode)	-	
P03	Inverter current protection	Inverter output current $\geq$ (a) A	-	
		Inv. Comp.		(a)
		DA50PHD		17.5
		DA65PHD		19.5
P04	Inverter fin temperature increase protection	Inverter fin temperature $\geq 80$ °C	-	
P05	Discharge gas temperature increase protection	Temperature of the upper part of the compressor Td $\geq 112$ °C	-	
P06	Low pressure decrease protection	Suction pressure Ps $\leq 0.1$ MPa	-	
P09	High pressure decrease protection	Discharge pressure Pd $\leq 1.0$ MPa	-	
P0A	Demand current protection control	Compressor running current $\geq$ 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 $\geq 1.3$ MPa	-	



Code	Retry control	Activation conditions	Notes
P11	Pressure ratio decrease retry	Pressure ratio $\varepsilon < 1.8$	When activating three times in thirty minutes, alarm code "43" is indicated.
P12	Low pressure increase retry	$P_s > 1.4$ MPa	When activating three times in thirty minutes, alarm code "44" is indicated.
P13	High pressure increase retry	$P_d \geq 3.8$ MPa	When activating three times in thirty minutes, alarm code "45" is indicated.
P15	Discharge gas temperature increase retry	Discharge gas temperature $\geq 132$ °C for more than 10 minutes, or Discharge gas temperature $\geq 140$ °C for more than 5 seconds	When activating three times in sixty minutes, alarm code "08" is indicated.
	Low pressure decrease retry	$P_s < 0.09$ 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 $\leq T_c + 10$ °C more than 30 minutes $T_c$ : 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 $\geq 100$ °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	$P_d < T_a / 130 + 0.1$ MPa more than 4 minutes, or $P_d < 1.0$ MPa more than 60 minutes $T_a$ : Ambient temperature	No alarm.

Ps: Compressor suction pressure; Pd: compressor discharge pressure.

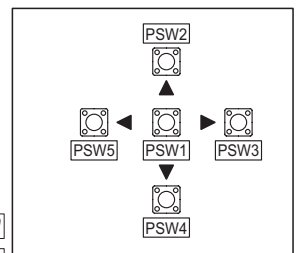
### 7.5.5 Check method by checking mode

Operating conditions and each part of a system can be checked using the 7-segment display on the PCB1 in the outdoor unit.

**i NOTE**

- Change the indication group by pressing PSW5 (◀) and PSW3 (▶).  
The first of the next or the previous indication group will be indicated no matter where the current step is at.
- The indications compatible for all the outdoor units and indoor units connected will be indicated for the case of group (B) and group (C)

Arrangement of Push switches (PSW)

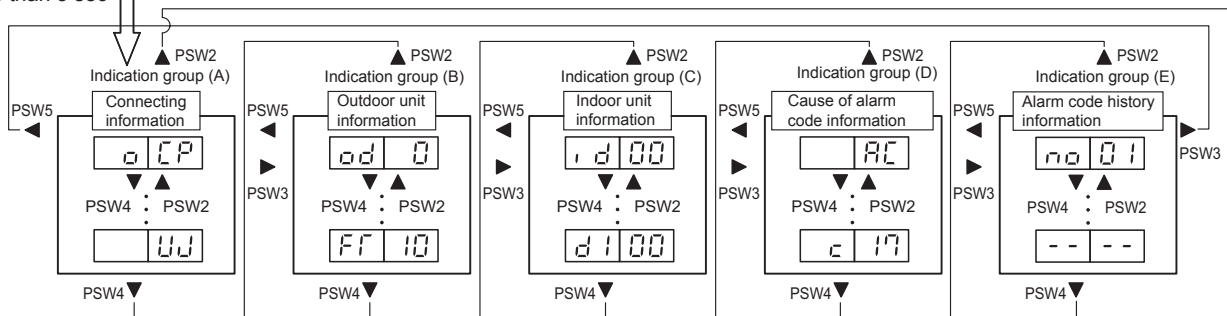


(0-1) Outdoor unit (No.0) 0d 0 → ... Cause code of fan controller stoppage code FF20

... → (2-1) Outdoor unit (No.0) 0d 2 → ... Cause code of fan controller stoppage code FF20

Normal mode (no indication)

To start checking: Press PSW1 for more than 3 sec  
To cancel checking: Press PSW1 for more than 3 sec



**i NOTE**

Ensure the check mode is cancelled after the checks have been carried out.

**◆ Connection information**

This information is indicated on unit A (main unit) only.

Press PSW4 (▼) to move forward or PSW2 (▲) to move back.

This information will be alternatively indicated as "Item" → "Details".

Item	7-segment display		Details
	SEG2	SEG1	
1	0	CP	Total capacity of the combination of outdoor units Refer to the "Capacity table for the outdoor units".
2	0	RR	Constitution quantities of outdoor unit combination
3	,	CP	Total capacity of the connected indoor units
4	,	RR	Number of connected indoor units
5		CR	Refrigerant group number (0 to 64)
6		oP	Total capacity of the operating indoor units. Refer to the "Capacity table for the indoor units".
7		Ht	Units: Hz
8		UU	Units: hour (indication x 10 hours)

### ◆ Information for the outdoor unit

Select the outdoor unit combination number to be displayed only for the example of Unit A (number 0).

Units B and C (numbers 1 and 2) show each unit number only.

When changing the selection, press PSW3 (▶) to move forward or PSW5 (◀) to move back.

Select the outdoor unit combination number for indication.

Unit	Indication
Unit A (No. 0)	od 0
Unit B (No. 1)	od 1
Unit C (No. 2)	od 2

Press PSW4 (▼) for detailed information of selected unit number.

Press PSW4 (▼) to move forward or PSW2 (▲) to go backward.

The information will be indicated alternately as "Item"→ "Details".

Press PSW3 (▶) or PSW5 (◀) to change the outdoor combination unit number to be indicated or to move other indication group.

Indication details:

Item	7-segment display		Details
	SEG2	SEG1 (*1)	
1 Outdoor unit number	od	0	Outdoor unit number indication
2 Capacity of the outdoor unit	CR	0	Unit capacity indication. Refer to the "Capacity table for the outdoor units".
3 Output status of the outdoor unit microcomputer	SC	0	Output status of the outdoor unit microcomputer. Refer to section "location of push switches and the 7-segment display".
4 Running frequency of the Inverter compressor MC1	H1	0	Running frequency of number 1 compressor indication (Hz)
5 Running frequency of the Inverter compressor MC2 (*2)	H2	0	Running frequency of number 2 compressor indication (Hz)
6 Total number of compressors running	CC	0	Indication of the total number of compressors running
7 Outdoor fan step	Fa	0	Outdoor fan step indication (0 to 27 steps)
8 Opening of the expansion valve MV1 of outdoor unit	E1	0	Opening indication of the expansion valve MV1 for outdoor unit (Unit: %)
9 Opening of the expansion valve MV2 of outdoor unit	E2	0	Opening indication of the expansion valve MV2 for outdoor unit (Unit: %)
10 Opening of the expansion valve MVB of the outdoor unit for bypass	Eb	0	Opening indication of the expansion valve MVB for the bypass indication (Unit: %)
11 Discharge pressure (High)	Pd	0	Thermistor open circuit indication: 5.52 MPa Thermistor short-circuit indication: -0.52 MPa
12 Suction pressure (Low)	Ps	0	Thermistor open circuit indication: 2.25 MPa Thermistor short-circuit indication: -0.25 MPa
13 Ambient air temperature (Ta)	Ta	0	Thermistor open circuit indication: -127 °C Thermistor short-circuit indication: 127 °C
14 Discharge gas temperature at the upper part of the compressor MC1 (TD1)	Td	0	Thermistor open circuit indication: 0 °C Thermistor short-circuit indication: 255 °C
15 Discharge gas temperature at the upper part of the compressor MC2 (Td2) (*2)	Td	20	Thermistor open circuit indication: 0 °C Thermistor short-circuit indication: 255 °C
16 Outdoor heat exchanger liquid temperature (Te1)	TE	0	Thermistor open circuit indication: -127 °C Thermistor short-circuit indication: 127 °C

Item	7-segment display		Details	
	SEG2	SEG1 (*1)		
17	Outdoor heat exchanger liquid temperature (Te2) (*4)	FE	20	Thermistor open circuit indication: - 127 °C Thermistor short-circuit indication: 127 °C
18	Gas temperature in the outdoor unit heat exchanger (Tg)	FG	0	Thermistor open circuit indication: - 127 °C Thermistor short-circuit indication: 127 °C
19	Liquid stop valve temperature (Tchg)	FL	H0	Thermistor open circuit indication: - 127 °C Thermistor short-circuit indication: 127 °C
20	Subcooling heat exchanger temperature (Tsc)	FS	00	Thermistor open circuit indication: - 127 °C Thermistor short-circuit indication: 127 °C
21	Inverter fin temperature 1	FF	10	Unit: °C
22	Inverter fin temperature 2 (*2)	FF	20	Unit: °C
23	Fan controller fin temperature 1	FF	10	Units °C
24	Fan controller fin temperature 2 (*4)	FF	20	Units °C
25	Compressor MC1 current (*5)	R1	0	INV1 Primary current. Unit: A
26	Compressor MC2 current (*2),(*5)	R2	0	INV2 Primary current. Unit: A
27	Fan motor MFO1 current (*5)	RF	10	Fan controller 1 secondary current Unit: A
28	Fan motor MFO2 current (*4),(*5)	RF	20	Fan controller 2 secondary current Unit: A
29	Compressor MC1 accumulated operating time	UJ	10	Unit: hour (indication x 10 hours)
30	Compressor MC2 accumulated operating time (*2)	UJ	20	Unit: hour (indication x 10 hours)
31	Compressor MC1 accumulated operating time (resettable)	UJ	10	Unit: hour (Indication x 10 hours) The accumulated operating time can be reset. (*6)
32	Compressor MC1 accumulated operating time (resettable) (*2)	UJ	20	Unit: hour (Indication x 10 hours) The accumulated operating time can be reset. (*6)
33	Cause of the Inverter stoppage 1	, F	10	Refer to the "Inverter stoppage cause table".
34	Cause of the Inverter stoppage 2 (*2)	, F	20	Refer to the "Inverter stoppage cause table".
35	Cause code of fan controller stoppage 1	FF	10	Cause of fan motor MOF1 stoppage. Refer to "Cause code of fan controller stoppage"
36	Cause code of fan controller stoppage 2 (*4)	FF	20	Cause of fan motor MOF2 stoppage. Refer to "Cause code of fan controller stoppage"

 **NOTE**

(\*1): The outdoor unit number is indicated on the one digit of "SEG1".

(\*2): Indication item only for outdoor unit model: 16 HP or more.

(\*3): Indication item only for outdoor unit model: FSXNSE 20HP or more, FSXNPE 16HP or more.

(\*4): Indication item only for outdoor unit model: FSXNSE 14HP or more, FSXNPE 8HP or more.

(\*5): The indicated current is reference value. Use a clamp meter for the accurate current value.

(\*6): To reset the accumulated operation time, press "PSW1+PSW3" for five seconds while the accumulated data is indicated.

**Capacity table for the outdoor units.**

Indication	Capacity (kW)	Horsepower (HP)
40	14.0	5.0
48	16.0	6.0
64	22.4	8.0
80	28.0	10.0
96	33.5	12.0
112	40.0	14.0
128	45.0	16.0
144	50.0	18.0
160	56.0	20.0
176	61.5	22.0
192	67.0	24.0

** NOTE**

In case of combination unit, the indication of outdoor unit capacity is total capacity of each unit.

Example:

In the case of 432 type:

432 type = 144 type x 3

144 x 3 = 432

Indication "432" will be displayed.

**◆ Indoor unit information**

This information is indicated on unit A (main unit) only.

Select the indoor unit number for information indication. Press PSW4 (▼) to move forward or PSW2 (▲) to move backward. This information will be alternatively indicated as "Item" → "Details".

Unit no.	Indication
No. 0	, d00
No. 1	, d0 1
↓	↓
No. 63	, d63

Item	7-segment display		Details
	SEG2	SEG1 (*1)	
1 Alarm cause code	, d	00	Indoor unit number indication.
2 Capacity of the indoor unit	CR	00	Unit capacity indication. Refer to the "Capacity table for the indoor units".
3 Opening of the expansion valve	, E	00	Unit: %
4 Heat exchanger liquid pipe temperature	FL	00	Unit: °C
5 Heat exchanger gas pipe temperature	FG	00	Unit: °C
6 Air inlet temperature	F,	00	Unit: °C
7 Air outlet temperature	Fo	00	Unit: °C
8 Unit stoppage cause code	d 1	00	Indoor unit stoppage cause code indication. Refer to the "Indoor unit stoppage cause table".

** NOTE**

(\*1) The indoor unit number is indicated on the one digit of "SEG1".

**Capacity table for the indoor units.**

Indication	Capacity (kW)	Horsepower (HP)	Indication	Capacity (kW)	Horsepower (HP)
3	1.1	0.4	20	7.1	2.8
5	1.8	0.6	22	8.0	3.0
6	2.2	0.8	26	9.0	3.3
8	2.8	1.0	32	11.2	4.0
10	3.6	1.3	40	14.0	5.0
11	4.0	1.5	48	16.0	6.0
13	4.5	1.8	64	22.4	8.0
14	5.0	2.0	80	28.0	10.0
16	5.6	2.3	128	45.0	16.0
18	6.3	2.5	160	56.0	20.0

**◆ Cause for alarm code information**

This information is indicated in unit A (main unit) only. Press PSW4 (▼) to move forward or PSW2 (▲) to go back.

This information will be indicated alternating as "Item" → "Details". Indication details:

Item		7-segment display		Details
		SEG2	SEG1	
1	Alarm cause code		R $\bar{E}$	Outdoor unit latest stoppage alarm code indication. Refer to the "Alarm codes table".
2	Degeneracy control for pressure ratio decrease protection	$\bar{E}$	11	$\bar{E}$ : degeneracy control is not activated. 1: degeneracy control is activated.
3	Degeneracy control for high pressure increase protection	$\bar{E}$	13	$\bar{E}$ : degeneracy control is not activated. 1: degeneracy control is activated.
4	Degeneracy control for Inverter fin temperature increase protection	$\bar{E}$	14	$\bar{E}$ : degeneracy control is not activated. 1: degeneracy control is activated.
5	Degeneracy control for discharge gas temperature increase protection	$\bar{E}$	15	$\bar{E}$ : degeneracy control is not activated. 1: degeneracy control is activated.
6	Degeneracy control for TdSH decrease protection	$\bar{E}$	1E	$\bar{E}$ : degeneracy control is not activated. 1: degeneracy control is activated.
7	Degeneracy control for overcurrent protection	$\bar{E}$	17	$\bar{E}$ : degeneracy control is not activated. 1: degeneracy control is activated.

### ◆ Alarm code history information

This information is indicated in unit A (main unit) only. If a story of abnormality exists, it is indicated up to a maximum of a 15 instances in chronological order.

Press PSW4 (▼) to move forward or PSW2 (▲) to go back.

Press PSW3 (▶) for detailed information.

Press PSW5 (◀) to return to the unit number combination selection.

Number of data	7-segment display	
	SEG2	SEG1
Number 1 (lastest data)	no	01
↓	↓	↓
Number 15 (oldest data)	no	15

Indication details:

Item	7-segment display		Details
	SEG2	SEG1	
1 Unit accumulated operating time	07	08	Outdoor unit accumulated operating time when the stoppage is carried out Unit: hour (indication x 10 hours)
2 Cause for stoppage	R		Alarm stoppage
	d		Retry stoppage
	E		Control information
3 Alarm / Stoppage cause code	01	48	Alarm and stoppage cause code. The outdoor unit number is indicated in 10 digit of SEG2. The compressor and fan controller number are indicated in one digit of SEG2. The alarm and stoppage cause code are indicated in SEG1.
4 Abnormal data indication	i	12	The Inverter stoppage cause code is indicated when the IT code exists in SEG2.
	F	12	The fan controller stoppage cause code is indicated when the FT code exists in SEG2.
	--	--	With the exception of the above.

**Cause of inverter stoppage (check the item  $i\bar{f}$ )**

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
21	Abnormal compressor motor (Step-out)
22	Abnormal combination of PCB
25	Abnormal instruction frequency

**Cause for fan controller stoppage (Check the item  $F\bar{f}$ )**

Code	Cause
1	Driver IC error signal detection
2	Instantaneous overcurrent
3	Fan Controller Fin Temp. Increase
4	Electronic Thermal Protection (Overcurrent)
8	Abnormal Current Sensor
12	Ground Fault Detection
15	Reverse Driving
16	Fan Controller Malfunction
21	Abnormal Fan Motor (Step-Out)
25	Abnormal Instruction Frequency

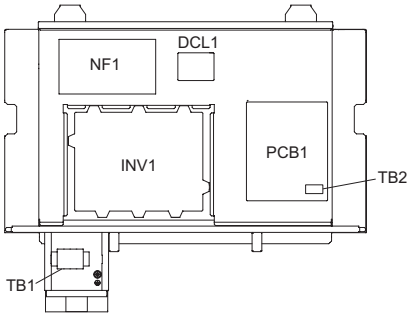


## 7.6 RSW, DSWs and LEDs functions

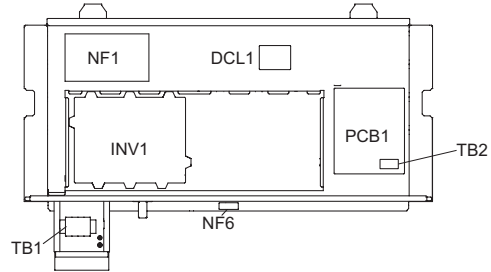
### 7.6.1 Outdoor unit

#### 7.6.1.1 Location of print circuit boards (PCBs)

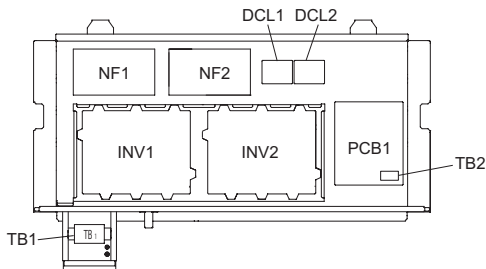
##### ◆ RAS-(8-12)FSXNSE - RAS-(5/6)FSXNPE



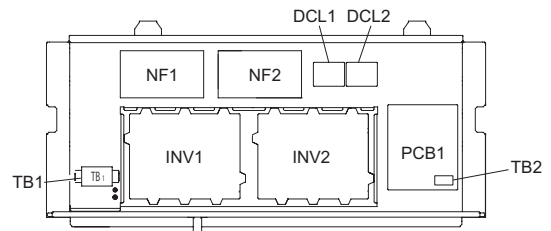
##### ◆ RAS-14FSXNSE - RAS-(8-14)FSXNPE



##### ◆ RAS-(16/18)FSXNSE



##### ◆ RAS-(22/24)FSXNSE - RAS-(16/18)FSXNPE

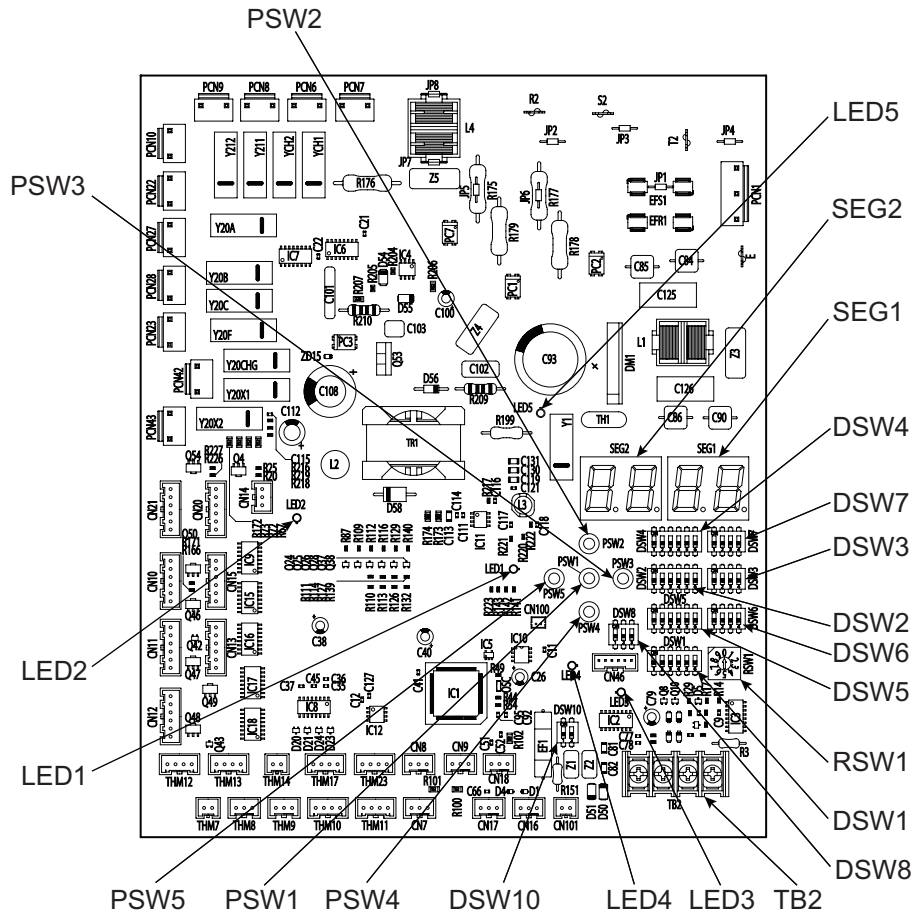


#### 7.6.1.2 Purpose

Symbol	PCB	Purpose
PCB1	Outdoor unit PCB	<ol style="list-style-type: none"> <li>1. Transmission between the indoor and outdoor units.</li> <li>2. Processing for sensor input.</li> <li>3. Processing for dip switch input.</li> <li>4. Operation control for parts 1 to 3. Compressor operating control, control of the bypass valve, fan control and overcurrent control.</li> <li>5. 7-segment display indication.</li> <li>6. Processing of the safety device input.</li> <li>7. Processing of the relay output.</li> <li>8. Detection of reverse phase for power source.</li> </ol>
INV1, 2	Inverter PCB	<ol style="list-style-type: none"> <li>1. Inverter components are driven by outdoor unit PCB to drive compressor.</li> <li>2. Overcurrent control.</li> <li>3. Protection control for inverter part.</li> <li>4. DC fan motor speed control.</li> </ol>

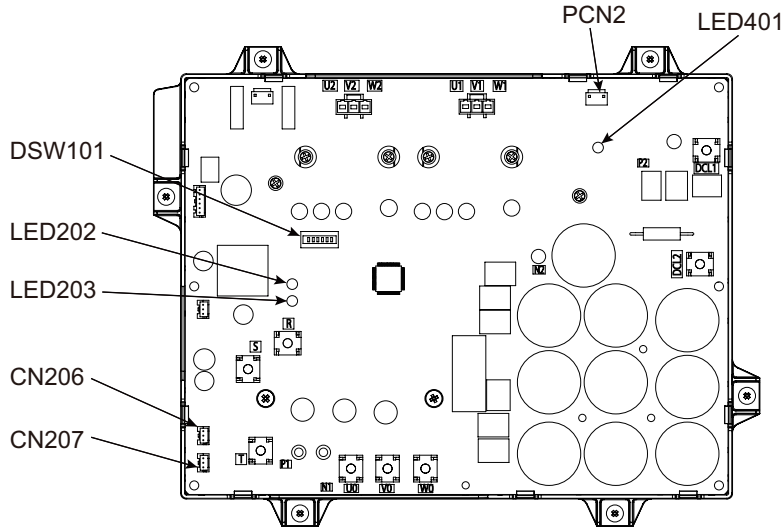


**Printed circuit board for control: PCB1**



Part name		Contents of functions
LEDs	LED1 (Red)	PCB1 power indication (Low voltage). Normal condition: activated. Abnormal condition: not activated.
	LED2 (Green)	LED2 indicates the transmission status between outdoor unit PCB1 and inverter PCB. Normal condition: flashing. Abnormal condition: activated or not activated.
	LED3 (Yellow)	LED3 indicates the transmission status between the indoor and outdoor units. Normal condition: flashing. Abnormal condition: activated or not activated.
	LED4 (orange)	LED4 indicates the transmission status between outdoor units. Normal condition: flashing. Abnormal condition: activated or not activated.
	LED5 (Red)	PCB1 power indication (High voltage). Normal condition: activated. Abnormal condition: not activated.
SEGs	SEG1, SEG2	Indicate the following: "Alarm", "Safety protection device has been activated" or "Checking items".

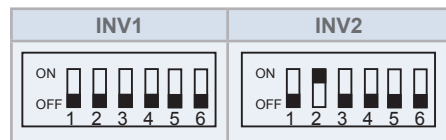
**Inverter printed circuit board for control: INV1,2**



Part name	Contents of functions
LED401 (Red)	Power source indicator for inverter PCB. Normal condition: activated. Abnormal condition: not activated.
LED201 (Yellow)	This indicates the state of the microcomputer Normal condition: activated. Abnormal condition: not activated.
LED202 (Green)	This indicates the state of communication between inverter PCB and fan controller. Normal condition: activated. Abnormal condition: not activated.

**DSW101**

No setting is required for outdoor unit installation. When setting the number 1 pin to ON, the electric current detection is cancelled. The number 1 pin should be set back to OFF after electrical work.



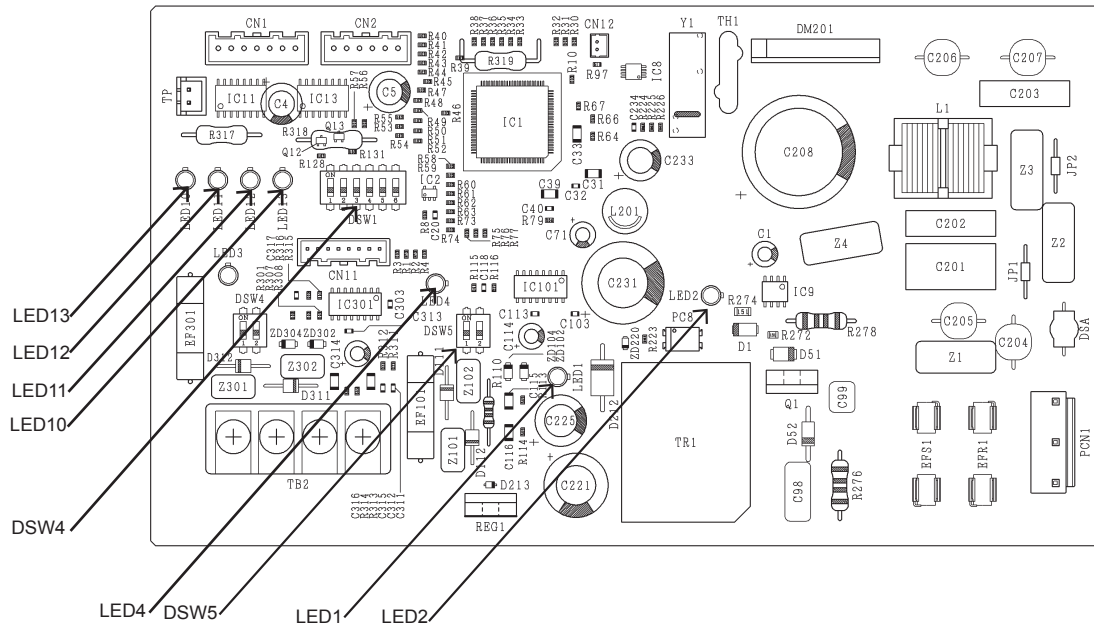
**CAUTION**

Before modifying the DSW settings, the power supply must be disconnected. Otherwise, the new setting will not be valid.

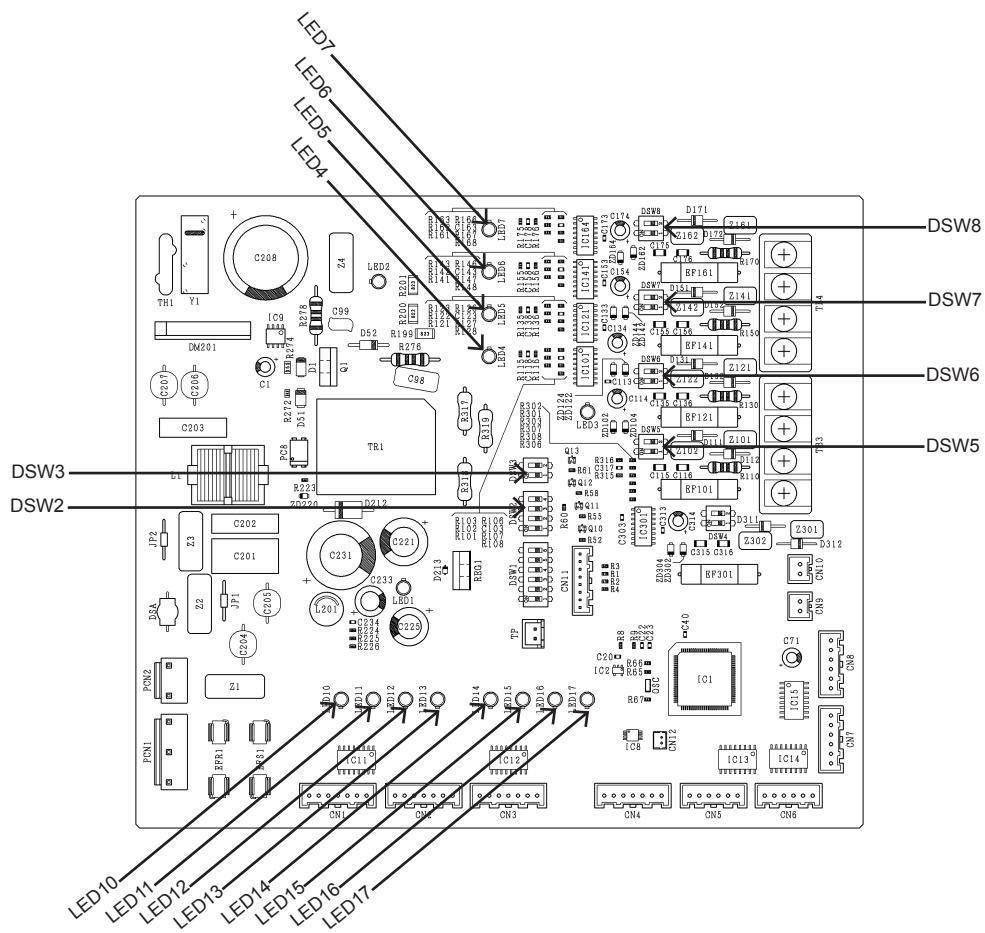


**7.6.2 CH-Box**

**PCB1 of single branch type CH-Box**



**PCB1-4 of multiple branch type CH-Box**



Part name			Contents of functions
LED1 (Red)	O	O	Power source indication for CH-Box PCB. (For AC Power supply)
LED2 (Red)	O	O	Power source indication for CH-Box PCB. (For DC Power supply)
LED3 (Yellow)	O	O	This indicates the state of communication between CH-Box and outdoor unit.
LED4 (Yellow)	O	O	This indicates the state of communication between CH-Box and indoor unit.
LED5-7 (Yellow)	X	O	
LED10 (Green)	O	O	Operation confirmation of expansion valve.  Check the alarm codes
LED11 (Green)	O	O	
LED12 (Green)	O	O	
LED13 (Green)	O	O	
LED14 (Green)	X	O	
LED15 (Green)	X	O	
LED16 (Green)	X	O	
LED17 (Green)	X	O	

**NOTE**

- X: Not available.
- O: Available.



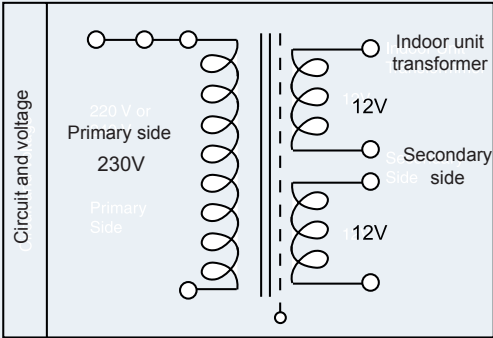
# 8 . Maintenance notes

## Index

8.1	Checking the power source and the wiring connection .....	254
8.2	Burnt-out compressor due to an insufficient refrigerant charge .....	254
8.3	Alarm code "31" .....	255
8.4	Not cooling well due to insufficient installation space for the outdoor unit .....	255
8.5	Precautions in the event of refrigerant leaks .....	256
	8.5.1 Maximum permissible concentration of hydrofluorocarbon (HFC) .....	256
	8.5.2 Calculation of the refrigerant concentration.....	256
	8.5.3 Countermeasures in the event of refrigerant leaks .....	257
8.6	Maintenance work .....	257
8.7	Service and maintenance table through the 7-segment display .....	258
8.8	Service and maintenance table through the remote control switch.....	261
8.9	Service and maintenance table .....	263
8.10	Saturation curve for refrigerant.....	264
8.11	Mollier chart for R410A.....	265

## 8.1 Checking the power source and the wiring connection

Check the following items in the case of abnormal operation:

No.	Check item	Procedure
1	Is the breaker of the fuse cut out?	Check the secondary voltage of the breaker and the fuse by means of a tester.
2	Is the secondary power source on the transformer correct?	<p>Disconnect the secondary side of the transformer and check the voltage by means of a tester.</p> 
3	Is the wiring loosened or incorrectly connected?	<p>Check the wiring connection on the PCB.</p> <ul style="list-style-type: none"> <li>• Thermistor connectors</li> <li>• Connector of the remote control cable</li> <li>• Connector of the transformer</li> </ul> <p>Each connector in a high-voltage circuit. Check the connectors according to the electrical wiring diagram.</p>

## 8.2 Burnt-out compressor due to an insufficient refrigerant charge

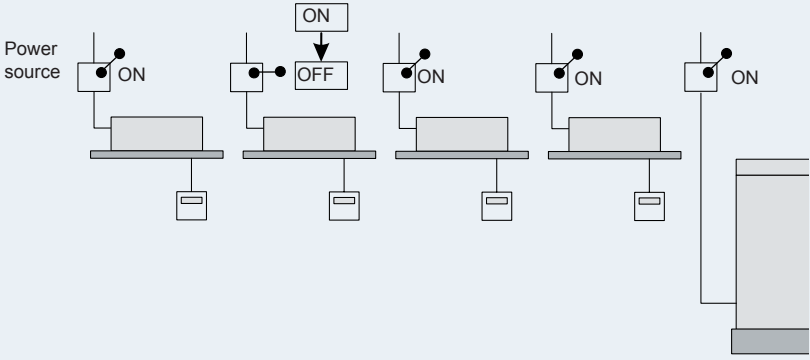
Question and answer for the field work

Example: Burnt-out compressor due to an insufficient refrigerant charge	
Phenomenon	After commissioning, the alarm code "08" sometimes occurred and the compressors were burnt out after operating for two months.
Cause	The refrigerant piping work was performed during the 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	<ol style="list-style-type: none"> <li>1. The compressor was replaced with a new compressor.</li> <li>2. The correct refrigerant amount was charged according to the refrigerant piping length and the connected indoor units.</li> </ol>
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.



### 8.3 Alarm code "31"

Question and answer for the field work

Example: Alarm code "31"	
Phenomenon	Alarm code "31" sometimes occurred and the system stopped.
Cause	<p>The combination of the indoor units and the outdoor unit was the following.</p>  <p>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.</p>
Countermeasure	All the main switches for the indoor units were always ON.

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

Question and answer for the field work

Example: Not cooling well due to insufficient installation space for outdoor unit	
Phenomenon	Cooling operation was well performed through the intermediate season. However, the cooling operation was not well available when the outdoor temperature was higher than 35 °C.
Cause	<p>As the outdoor units were installed without a sufficient installation space, the hot discharge air from other outdoor units was circulated.</p> <p>In this case, though the outdoor temperature was 35 °C, the actual suction air temperature was nearly 50 °C and the protection system for excessively high suction pressure was activated, the frequency of the compressor was decreased and the cooling capacity was also decreased accordingly.</p> <p>As the outdoor units in-line were installed back to back with a distance of 600 mm between each outdoor unit's back, the hot discharged air from other outdoor units was circulated.</p>
Countermeasure	To protect the unit from a short circuit, fences were mounted at the discharge air side as shown.

## 8.5 Precautions in the event of refrigerant leaks

### CAUTION

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

#### 8.5.1 Maximum permissible concentration of hydrofluorocarbon (HFC)

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

### DANGER

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

The maximum permissible concentration of HFC R410A gas in the air is 0.44 kg/m<sup>3</sup>, according to standard EN 378-1. Consequently, effective measures must be adopted to maintain the concentration of R410A gas in the air below 0.44 kg/m<sup>3</sup> in case of leakage.

#### 8.5.2 Calculation of the refrigerant concentration

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

$$R / V = C$$

$R$ : total quantity of refrigerant charged (kg).

$V$ : volume of the room (m<sup>3</sup>).

$C$ : concentration of refrigerant (= 0.44 kg/m<sup>3</sup> for R410A gas).

Particularly for the SET FREE series, whose outdoor units can be connected to multiple indoor units at a distance, the refrigerant charge is greater than for individual units.

### DANGER

*Check that the room where the indoor units will be installed can maintain the refrigerant concentration below the lower limit established in case of leakage. Otherwise, take the necessary action to correct this situation.*

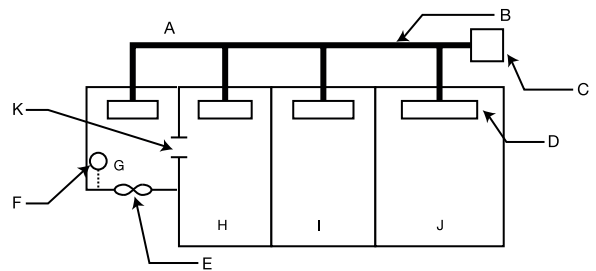
### 8.5.3 Countermeasures in the event of refrigerant leaks

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

- 1 Opening without shutter to permit the circulation of fresh air in the room.
- 2 Opening without door measuring 0.15%, or greater, of the floor surface.
- 3 A ventilator with a capacity of at least 0.4 m<sup>3</sup>/min per refrigeration ton or greater, connected to a gas leak detector, should be installed.
- 4 Special attention should be given to areas where the refrigerant may be deposited and stay in the room, such as basements or similar, as it is heavier than air.

Example:

A	Refrigerant charge: 60 kg	G	The smallest opening room
B	Refrigerant piping	H	Small room
C	Outdoor unit	I	Medium-sized room
D	Indoor unit	J	Large room
E	Mechanical ventilation equipment	K	Opening
F	Gas leak detector		



#### NOTE

- The gas leakage quantity for each room (large, medium-sized, small and the smallest) should be calculated as 60 kg.
- The gas concentration of each room should not exceed the limit value, 0.44 kg/m<sup>3</sup>.

## 8.6 Maintenance work

### For outdoor and indoor units

(A) Fan and fan motor.

- Lubrication. All the fan motors are lubricated and sealed in the factory. Consequently, lubrication is not necessary.
- Noise and vibrations. Check there are no strange noises or vibrations.
- Rotation. Check that fan rotates clockwise and that the speed is suitable.
- Insulation. Check the electric insulation resistance.

(B) Heat exchanger.

- Clogging. Check regularly that there is no accumulated dirt or dust. Regarding the outdoor unit, also check there are no obstacles for the air circulation such as pieces of paper, twigs, grass, etc. If necessary, remove them.

(C) Pipe connection.

- Leakage. Check there is no leakage in the connections of the refrigerant pipes.

(D) Cabinet.

- Stains and lubricant. Check there are no stains or lubricant.
- Tightening of screws. Check all screws are correctly tightened. If not, tighten them to the prescribed torque.
- Insulation. Check for imperfections in the thermal insulation of the unit cabinet and repair if necessary.

(E) Electrical equipment.

- Activation. Check the normal operation of the magnetic contactor, auxiliary relay, PCB, etc.
- State of the power supply line. Check the power supply, the current consumption (amperage) and the phase balance in particular. Check that there are no contact faults caused by loose terminals, rusty contacts, foreign objects or other causes. Check the electric insulation resistance.

(F) Control and protection devices.

- Setting. Do not readjust the setting in the field, except those indicated in section *“Only for outdoor units”*.

**Only for outdoor units**

## (A) Compressor.

- Noise and vibrations. Check there are no strange noises or vibrations.
- Activation. Check that the voltage drop of the power supply line is within 16% at start-up and within 2% during operation.

## (B) Reversing valve.

- Activation. Check there is no abnormal activation noise.

## (C) Filter.

- Clogging. Check there are no differences in temperature between the two ends.

## (D) Earthing connection wire.

- Earth line. Check the continuity to earth.

## (E) Compressor crankcase heater.

- Activation. The crankcase heater should be activated at least 12 hours before start-up, by switching ON the main power source.

**Only for indoor units**

## (A) Air filter.

- Cleanliness. Check regularly that there is no accumulated dirt or dust.

## (B) Drain pan, drain-up mechanism and drain pipe.

- Drain line. Check and clean the drainage system at least twice a year.
- Drain-up mechanism. Check the activation of the drain-up mechanism.

## (C) Float switch.

- Activation. Check the activation of the float switch.

**8.7 Service and maintenance table through the 7-segment display**

Customer's name: _____		Date: _____
Outdoor unit model (Serial number: _____)	RAS- (Serial number: _____)	RAS- (Serial number: _____)
1. Operation mode		
2. Start time of test run		
3. Start time of data collection		
4. Reading the data on the 7-segment display in the outdoor unit		
4.1 Protection control code		
4.2 Operation capacity		
4.2.1 Total connection capacity of the outdoor unit	oCP	
4.2.2 Quantity of outdoor units connected	oAA	
4.2.3 Total connection capacity of the indoor unit	iCP	
4.2.4 Quantity of indoor units connected	iAA	
4.2.5 Refrigeration system address	GA	
4.2.6 Operation capacity of the indoor units	oP	

Service and maintenance table through the 7-segment display

Customer's name: _____		Date: _____															
Outdoor unit model (Serial number: _____)		RAS- (Serial number: _____)								RAS- (Serial number: _____)							
4.2.7 Total frequency	Hz																
4.2.8 Accumulated operation time of the unit	UJ																
4.3 Information of the outdoor unit																	
4.3.1 Capacity of the outdoor unit	CA																
4.3.2 Outdoor unit microcomputer output	SC	52C <sub>1</sub>	52C <sub>2</sub>	CH <sub>1</sub>	CH <sub>2</sub>	A <sub>1</sub>	A <sub>2</sub>	21 <sub>1</sub>	21 <sub>2</sub>	52C <sub>1</sub>	52C <sub>2</sub>	CH <sub>1</sub>	CH <sub>2</sub>	A <sub>1</sub>	A <sub>2</sub>	21 <sub>1</sub>	21 <sub>2</sub>
		FAN	20B	20C	20F <sub>1</sub>	20F <sub>2</sub>	20CHG	X <sub>1</sub>	X <sub>2</sub>	FAN	20B	20C	20F <sub>1</sub>	20F <sub>2</sub>	20CHG	X <sub>1</sub>	X <sub>2</sub>
4.3.3 Inverter frequency	H1																
4.3.4 Quantity of compressors running	CC																
4.3.5 Step of the outdoor unit fan	Fo																
4.3.6 Outdoor unit expansion valve opening	E1																
	Eb																
4.3.7 Discharge pressure	Pd																
4.3.8 Suction pressure	Ps																
4.3.9 Outdoor temperature	To																
4.3.10 Discharge gas temperature	Td1																
	Td2																
4.3.11 Heat exchanger liquid temperature	TE																
4.3.12 Heat exchanger gas temperature	TG																
4.3.13 Automatic refrigerant charge temperature	TCH																
4.3.14 Gas bypass temperature	TbG																
4.3.15 Temperature in the Inverter fin	TFi																
4.3.16 Fan controller temperature	TFF																
4.3.17 Compressor running current	A1																
	A2																
4.3.18 Fan running current	AF																
4.3.19 Accumulated operation time of compressor	UJ1																
	UJ2																
4.3.20 Accumulated operation time of the compressor (available for timer reset)	cU1																
	cU2																
4.3.21 Cause code for stoppage of the Inverter	iT																



## Service and maintenance table through the 7-segment display

Customer's name: _____		Date: _____	
Outdoor unit model (Serial number: _____)		RAS- (Serial number: _____)	RAS- (Serial number: _____)
4.3.22 Cause code for stoppage of the fan controller	FT		
4.4 Information of the indoor unit			
Indoor unit capacity	CA		
Indoor unit expansion valve opening	iE		
Heat exchanger liquid temperature	TL		
Heat exchanger gas temperature	TG		
Inlet air temperature	Ti		
Outlet air temperature	To		
Cause code for stoppage of the indoor unit	d1		

Detailed information of the outdoor unit microcomputer output from the above table (4.3.2):

Mark	Description of mark	Parts mark in wiring diagram
52C <sub>1</sub>	Contactor of relay (Y <sub>52C1</sub> ) on PCB1 for Inverter compressor	CMC1
52C <sub>2</sub>	Contactor of relay (Y <sub>52C2</sub> ) on PCB1 for constant speed compressor	CMC2
CH <sub>1</sub>	Contactor of relay (Y <sub>CH1</sub> ) on PCB1 for crankcase heater	CH1
CH <sub>2</sub>	Contactor of relay (Y <sub>CH2</sub> ) on PCB1 for crankcase heater	CH2
20A <sub>1</sub>	Contactor of relay (Y <sub>20A1</sub> ) on PCB1 for solenoid valve	SVA
20A <sub>2</sub>	-	-
21 <sub>1</sub>	Contactor of relay (Y <sub>211</sub> ) on PCB1 for reversing valve	RVR1
21 <sub>2</sub>	Contactor of relay (Y <sub>212</sub> ) on PCB1 for reversing valve	RVR2
FAN	-	-
20B	-	-
20C	-	-
20F <sub>1</sub>	-	-
20F <sub>2</sub>	-	-
20CHG	-	-
X <sub>1</sub>	Contactor of relay (Y <sub>x1</sub> ) on PCB1 for solenoid valve	SVG
X <sub>2</sub>	-	-

## 8.8 Service and maintenance table through the remote control switch

Data sheet for the checks using the remote control switch:

Time	:	:	:	:	:		
I.U. model							
I.U. serial number							
I.U. number / Alarm code							
	Check mode 1	Check mode 2	1 · 2	1 · 2	1 · 2	1 · 2	1 · 2

B Temperature indication							
Temperature setting	b1	--					
Inlet air temperature	b2	91					
Discharge air temperature	b3	92					
Liquid pipe temperature	b4	93					
Remote thermistor temperature	b5	--					
Outlet air temperature	b6	94					
Gas pipe temperature	b7	95					
Evaporating temperature in heating mode	b8	96					
Control information	b9	97					
Temperature of the upper part of the compressor	bA	98					
Thermo temp. of remote control switch	bb	--					

C Indication of the microcomputer state							
I.U. microcomputer	C1	--					
O.U. microcomputer	C2	--					

D Stoppage cause state indication							
Stoppage cause state indication	d1	--					

E Alarm fault							
Abnormal times	E1	--					
Power failure times	E2	--					
Abnormal transmission times	E3						
Inverter trip times	E4	--					

F Automatic louver state							
Louver sensor state	F1	--					

H Pressure and frequency state indication							
Discharge pressure	H1	99					
Suction pressure	H2	9A					
Control information	H3	9b					
Operating frequency	H4	9C					

J Indication of the I.U. capacity							
I.U. capacity (x 1/8 HP)	J1	--					
O.U. code	J2	--					
Refrigerant cycle number	J3	--					
Refrigerant cycle number	J4	--					

L Expansion valve opening							
I.U. expansion valve	L1	9d					
O.U. expansion valve 1	L2	9E					
O.U. expansion valve 2	L3	--					
O.U. expansion valve B	L4	--					

P Running current indication (reference)							
Compressor current	P1	9F					



**NOTE**

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

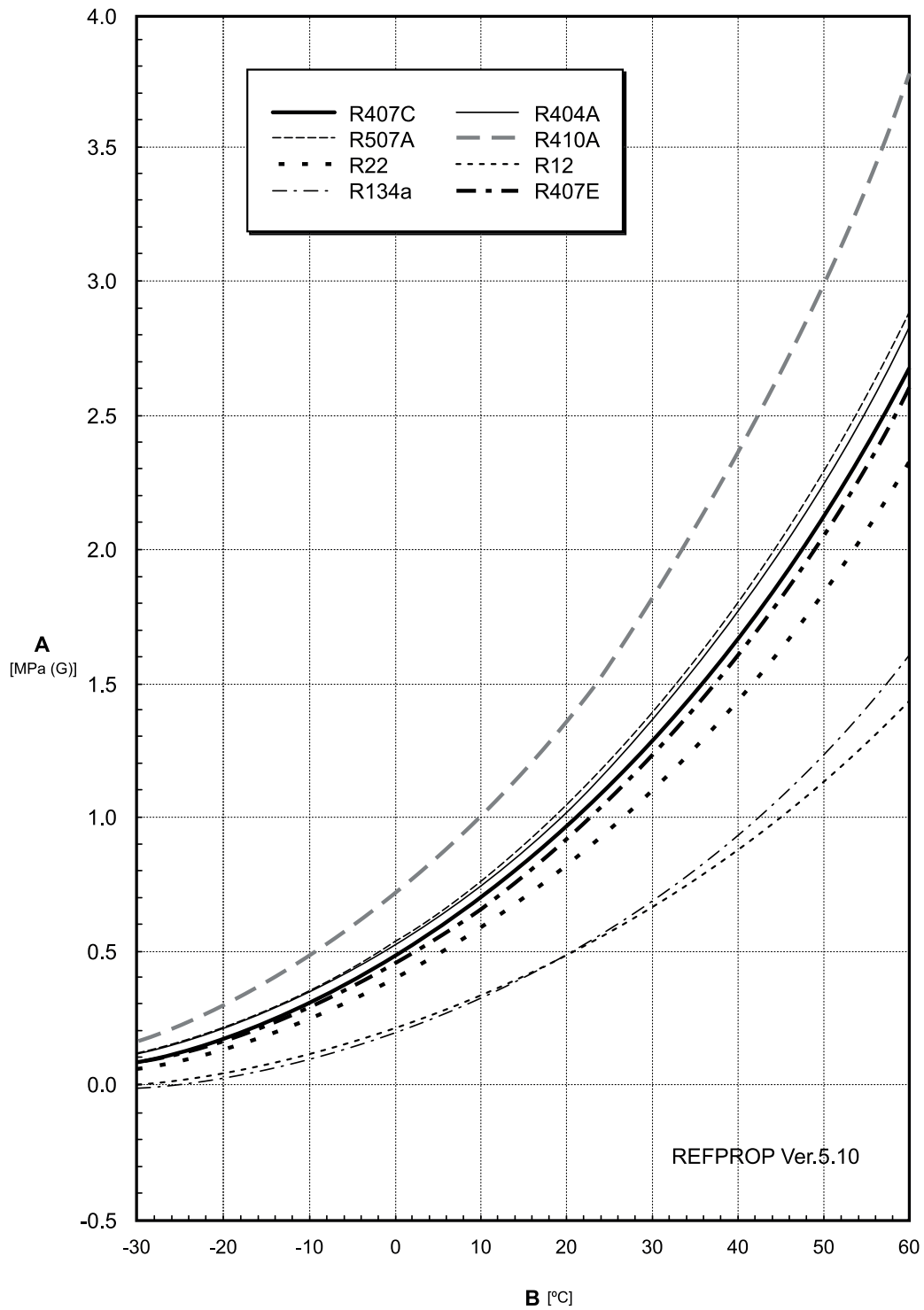
Customer: _____	Result
Installation date: _____	
System number: _____	
Inspection date: _____	
Inspection technician: _____	



## 8.9 Service and maintenance table

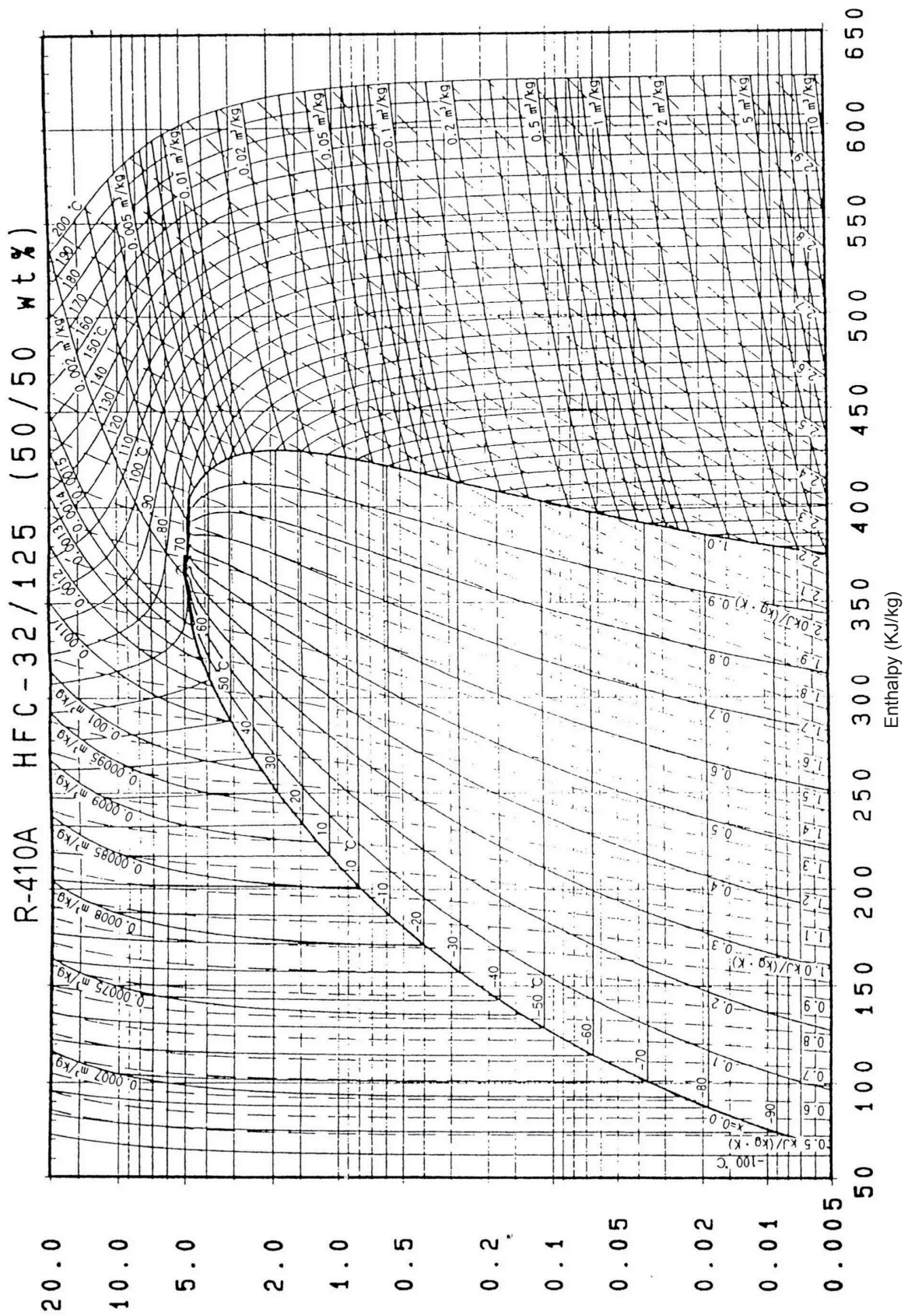
No.	Check item	Action	Judgement	
			Yes	No
1	Is the service space sufficient?		Yes	No
2	Is there a short circuit in the discharge air?		Yes	No
3	Any heat influence?		Yes	No
4	Is the earth wire connected?		Yes	No
5	Refrigerant pipe		Correct	Incorrect
6	Fixing of units		Correct	Incorrect
7	Are the internal and external surfaces damaged?		Yes	No
8	Are the screws and bolts tightened?	Tighten if loose.	Tightened	Not tightened
9	Are the terminal screws tightened?	Tighten the screws on the terminals with a Philips screwdriver.	Tightened	Not tightened
10	Are the compressor terminals tightened?	Push all the terminals.	Push	Not push
11	Insulation resistance	Measure the insulation resistance with a multimeter. Fan and compressor: Motor: greater than 3 MΩ. Others: greater than 3 MΩ.	Correct	Incorrect
12	Are there drainage problems in the water flow?	Check the smooth flow with a little water.	Correct	Incorrect
13	Is there leakage in the compressor?	Check there is no leakage.	Correct	Incorrect
14	Is there leakage in the outdoor heat exchanger?	Check there is no leakage.	Correct	Incorrect
15	Is there leakage in the indoor heat exchanger?	Check there is no leakage.	Correct	Incorrect
16	Is there leakage in the 4-way valves?	Check there is no leakage.	Correct	Incorrect
17	Is there leakage in the check valve?	Check there is no leakage.	Correct	Incorrect
18	Is there leakage in the accumulator?	Check there is no leakage.	Correct	Incorrect
19	Is there leakage in the strainer?	Check there is no leakage.	Correct	Incorrect
20	Is there leakage in the expansion valve?	Check there is no leakage.	Correct	Incorrect
21	Is there leakage in the piping?	Check there is no leakage.	Correct	Incorrect
22	Check the direction of the fans	See the air flow volume.	Correct	Incorrect
23	Check the voltage of each phase	Greater than 220 V.	Correct	Incorrect
24	Vibrations and noise	Check the compressor, the piping, the fan, etc.	Correct	Incorrect
25	Activation of the operation modes	Activate the COOL switch, the HEAT switch, the STOP switch and the TEMP switch.	Correct	Incorrect
26	Cut-out of the high pressure switch	Check the current activation valve.	Correct	Incorrect
27	Activate the drain-up mechanism	Check it is activated during cooling mode.	Correct	Incorrect
28	Indoor inlet air temperature DB/WB	—	(°C) DB	(°C) WB
29	Indoor outlet air temperature DB/WB	—	(°C) DB	(°C) WB
30	Outdoor inlet air temperature DB/WB	—	(°C) DB	(°C) WB
31	Outdoor outlet air temperature DB/WB	—	(°C) DB	(°C) WB
32	High pressure switch	—	MPaG	
33	Low pressure switch	—	MPaG	
34	Operating voltage	—	V	
35	Operating current	—	A	
36	Instructions for the customer for cleaning the filters	—	Done	Not yet
37	Instructions for the customer for the cleaning procedure	—	Done	Not yet
38	Instructions for the customer for operation	—	Done	Not yet

**8.10 Saturation curve for refrigerant**



A	Saturation pressure (Liquid)
B	Saturation temperature (Liquid)

8.11 Mollier chart for R410A



Pressure (MPa)  
 collect refrigerant

How to



The refrigerant collection method when replacing the parts (compressor or cycle parts) of outdoor unit.

Process No.	Procedure	Remarks
1	Turn OFF the main switch of O.U.	-
2	Connect manifold to the check joint at low and high pressure side in O.U.	-
3	Turn ON the main switch of O.U.	-
4	<p><b>In case that compressor operates</b> Perform pre-refrigerant collection during cooling test run.</p> <ul style="list-style-type: none"> <li>Turn ON the dip switch (DSW4#1) of O.U. PCB1 and start the test run.</li> <li>The test run should be performed for approx. 20 min, (until Ps&gt;0.3 MPa, Td&gt;75 °C)</li> <li>Check the suction pressure "Ps" on 7-seg. of O.U. PCB1.</li> <li>Close the gas valve immediately. Perform the forced stoppage by turning on the dip switch (DSW4#4) when Ps is ≤0.2 MPa.</li> <li>Cancel cooling operation (by DSW4#1 is OFF).</li> <li>Cancel the forced stoppage (by DSW4#4 is OFF). <b>In case that compressor does not operate</b></li> <li>Close all the gas stop valves (at low and high pressure sides).</li> </ul>	After closing the gas stop valve, the decrease of Ps value is fast. To guarantee the reliability of the Comp., make sure that the decrease does not reach Ps<0.1 MPa when performing the forced stoppage.
5	Close the liquid stop valve completely.	-
6	Collect refrigerant by a refrigerant collector. Collect the refrigerant from the check joints at low and high pressure sides in O.U. All the refrigerant of O.U. side is collected by a refrigerant collector.	<ul style="list-style-type: none"> <li>The discharge of the refrigerant in the atmosphere is strictly forbidden. Make sure that the refrigerant is collected by a refrigerant collector.</li> <li>Measure the quantity of the collected refrigerant and record it.</li> </ul>
7	After collecting the refrigerant, remove the charge hose at the collector side, so that the inside of the refrigerant cycle will be the atmosphere pressure.	<ul style="list-style-type: none"> <li>Make sure that there is no pressure increase after collecting the refrigerant and then remove the charge hose.</li> <li>Make sure that the refrigerant cycle is the atmosphere pressure. Otherwise, problems such as the blowing of gas and the suction of the cutting material will occur when removing the Comp.</li> </ul>
8	Turn OFF the main switch of O.U.	-
9	Perform replacing Comp., return oil circuit or electrical parts.	Removing electrical box may be required. Measure the quantity of the refrigerant oil and record it.
10	Charge the refrigerant oil as the same quantity as the collected refrigerant oil. Perform the vacuuming from the check joint at a low and high pressure sides. Connect the charge hose to the charge port of return oil circuit and charge the refrigerant oil.	<ul style="list-style-type: none"> <li>When the refrigerant oil is collected from the accumulator or compressor, calculation for recharge amount is required.</li> <li>Use a clean charge hose.</li> <li>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).</li> </ul>
11	Disconnect the charge hose from the charger port of return oil circuit. Perform the vacuuming from the check joint at low and high pressure sides.	-
12	Recharge the collected refrigerant (process No.6) from the check joint at high pressure side. For the remained quantity: Fully open the liquid and gas stop valve and set DSW4#1 to ON side of O.U. PCB1. Then recharge it from the liquid stop valve check joint during cooling operation.	-
13	Check the liquid and gas stop valves are fully opened.	-

O.U.: Outdoor unit.

7-seg.: 7-segment.

Comp.: Compressor.

The refrigerant collection method when replacing indoor unit.

Process No.	Procedure	Remarks
1	Turn OFF the main switch of O.U. and I.U.	-
2	Close all the gas stop valves (at low and high pressure side) of O.U. and the liquid and gas stop valve completely.	-
3	Collect the refrigerant by a refrigerant collector. Collect the refrigerant from the gas stop valves (at low and high pressure sides) of O.U. and the check joint of the liquid stop valve. Collect all the refrigerant in the I.U. side by refrigerant collector.	<ul style="list-style-type: none"> <li>The discharge of the refrigerant in the atmosphere is strictly forbidden. Make sure that the refrigerant is collected by a refrigerant collector.</li> <li>Measure the quantity of the collected refrigerant and record it.</li> </ul>
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.	<ul style="list-style-type: none"> <li>Make sure that there is no pressure increase after collecting the refrigerant and then remove the charge hose.</li> <li>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.</li> </ul>
5	Perform replacing I.U.	-
6	Perform the vacuuming from the gas stop valves (at low and high pressure sides) of O.U. and the check joint of the liquid stop valve.	-
7	Recharge the collected refrigerant (Process No.3) from the liquid stop valve.	-
8	Check the liquid and gas stop valves are fully opened.	-

O.U.: Outdoor unit.

I.U.: Indoor unit.

Comp.: Compressor.





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