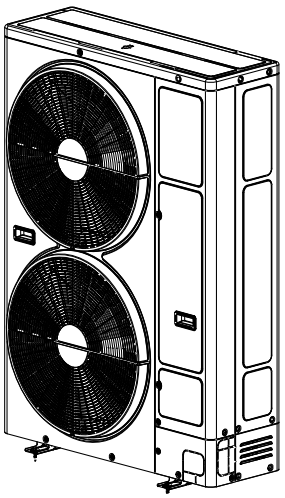
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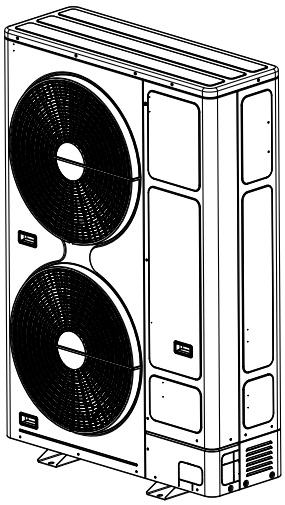
TECHNICAL CATALOGUE

HEAT PUMP AIR CONDITIONERS

- SET FREE mini-HNSQ SERIES VRF CONDITIONERS SYSTEM -



RAS-080~090HNBSTQ



RAS-100~120HNBSTQ

Technical Catalogue

< Outdoor Units >

Power Supply	Model
380-415V/3Ph/50Hz 380V/3Ph/60Hz	RAS-080HNBSTQ RAS-090HNBSTQ RAS-100HNBSTQ RAS-110HNBSTQ RAS-120HNBSTQ

TCY12022011B **Date: September. 2022**

Dear users:

Thank you for choosing and using our products. For your better understanding and use of this product, be sure to read and comply with the following items before use.

IMPORTANT NOTICE

Signal words (danger, warning and caution) are used to identify severity of hazard. Definitions for identifying hazard severity are provided below with their respective signal words:

⚠DANGER : Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠WARNING : Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠CAUTION : Used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTE : Useful information for operation and/or maintenance.

- This manual should be considered as a permanent part of the air conditioning equipment and should remain with the air conditioning equipment.
- This manual gives a common description and information for this air conditioner which you operate as well for other models.
- Hitachi pursues a policy of continuing improvement in design and performance of products. The right is therefore reserved to vary specifications without notice.
- Hitachi cannot anticipate every possible circumstance that might involve a potential hazard. This air conditioner is designed for standard air conditioning only. Do not use this air conditioner for other purposes such as drying clothes, refrigerating foods or for any other cooling process.
- Do not install the unit in the following places, otherwise, it may lead to a fire, deformation, corrosion or failure.
  - * Places where oil (including machinery oil) splashes.
  - * Places where sulfide gas drifts such as in hot spring.
  - * Places where flammable gas may generate or flow.
  - * Places where strong wind with high salinity blows such as coast regions, or places with an atmosphere of acidity or alkalinity.
- Do not install the unit in the place where silicon gas drifts. If the silicon gas attaches to the surface of heat exchanger, the fin surface repels water. As a result, drain water splashes outside of the drain pan and splashed water runs inside of electrical box. In the end, water leakage or electrical devices failure may occur.
- Do not install the unit in the place where the breeze directly catches the animals and plants. It could adversely affect the animals and plants.
- Installation and service engineering must comply with local standards, laws and regulations.
- As public inaccessible appliances, the indoor units are required to be installed at a height of no lower than 2.5m.
- The installation of the air conditioner can only be carried out by the dealer or professionals. Installation by customers themselves may lead to water leakage, electric shock or a fire.
- If you have any questions, please contact your dealer or designated service center of Hitachi.
- To protect the environment, please do not discard the product at will, and Hitachi can provide recycling services in accordance with the relevant provisions of the country and provide replaceable parts in accordance with national standard requirements.
- This air conditioner has been designed for the following temperatures , please operate the air conditioner within the ranges.

Temperature (℃)

		Maximum	Minimum
Cooling Operation	Indoor	32DB/23WB	21DB/15WB
	Outdoor	52DB *	-5DB
Heating Operation	Indoor	30DB	15DB
	Outdoor	23DB/17WB	-20DB/-21WB

* 48DB~52DB, operation control range

DB: Dry Bulb, WB: Wet Bulb

⚠ DANGER

- Do not perform installation work, refrigerant piping work, drain pump installation, drain piping and electrical wiring without referring to installation manual. If the instructions are not followed, it may lead to water leakage, electric shock or a fire. In case of fire, cut off the power at the first time; do not touch the electrical parts by hand to avoid electric shock.
- These products are equipped with electrical parts, so do not pour water into the indoor units or outdoor units, or it will lead to a serious electrical failure.
- Do not open the service cover of the indoor or outdoor units without turning OFF the main power supply, otherwise it may lead to a serious accident. (In any cases, users are not allowed to open the service cover).
- Do not touch or adjust safety devices inside the indoor or outdoor units. Otherwise, it may lead to a serious accident.
- Refrigerant R410A for this unit is incombustible, non-toxic and odorless; however if the refrigerant leaked and contacted with fire, toxic gas will generate. Also because the R410A is heavier than air, its accumulation near floor surface could lead to difficulty with breathing. Turn OFF the main switch, extinguish any naked flames and contact your service contractor, if refrigerant leakage occurs. Do not charge oxygen, acetylene or other flammable and poisonou gases into the refrigeration cycle when performing a leakage test or an air-tightness test. These types of gases can lead to an explosion. It is recommended that nitrogen be used for these tests.
- Refrigerant safety leakage standards for construction and operation systems are determined in accordance with local regulations or standards.
- Use an ELB (Earth Leakage Breaker, with an actuation time of 0.1s or less) at or above medium induction speed, otherwise it may lead to an electric shock or a fire.
- For installation, firmly connect the refrigerant pipe before the compressor starts operating.
- For maintenance, relocation and disposal, remove the refrigerant pipe after the compressor stops.
- Do not perform a short-circuit to the protection device such as a pressure switch when operating. It may lead to a fire or explosion.

⚠ WARNING

- Do not use any sprays such as insecticide, lacquer, hair spray or other flammable gases within approximately one (1) meter from the system.
- If circuit breaker is frequently activated, stop the system and contact your or service contractor.
- Check that the earth wire is securely connected. If the unit is not properly earthed, it may lead to electric shock. Do not connect the earth wire to gas piping, water piping, lighting conductor or earth wire of a telephone.
- Before performing any brazing work, check to ensure that there is no flammable materials around. When charging refrigerant be sure to wear leather gloves to prevent from cold injuries.
- Protect the wires, electrical parts and the like from rats or other small animals. If not, rats may gnaw at unprotected parts, which may lead to a fire.
- Fix the cables securely. External forces on the terminals could lead to a fire.
- Provide a sufficiently strong foundation. If not, the unit may fall down and it may lead to injuries.
- Perform electrical work according to installation manual, relevant regulations and standards.
- If the instructions are not followed, an electrical failure and a fire may occur due to insufficient capacity and inadequate performance. Use specified cables between units, otherwise, an electrical failure or a fire may occur. Ensure that the outdoor unit is not covered with ice or snow before use.
- This appliance can be used by children aged from 8 years and above, and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and maintenance shall not be done by children without supervision.
- The A-weighted emission sound pressure level at workstations does not exceed 70 dB(A).

⚠CAUTION

- Do not step on or put any objects on the product.
- Do not put any foreign materials on or inside the unit.
- Do not install the indoor unit, outdoor unit, remote control switch and cable within approximately 3 meters from strong electromagnetic wave radiators such as medical equipment.
- Starting the unit after longtime idleness requires the compressor temperature to meet the starting requirements or reach a certain heating time.

NOTE:

- It is recommended that the room be ventilated every 3 to 4 hours.
  In some cases, the air conditioner may not work properly in the following cases.

* In case that the power supplied by the power transformer is less than or equal to the electric power of the air conditioner.

* In case that the large power-consuming equipment is too close to the power supply wiring of the air conditioner, large surge voltage may be inducted in the power supply wiring of the air conditioner.

- The capacity may decrease according to the outdoor air temperature. Therefore, it is recommended that auxiliary equipment be used on the job site when the unit is installed in a high temperature region.
- The repair and maintenance of this air conditioner can only be carried out by professionals.

IMPORTANT NOTICE



Correct Disposal of this product

This marking indicates that this product should not be disposed with other household wastes. To prevent possible harms to the environment or human health from uncontrolled waste disposal, recycle it responsibly to promote the sustainable reuse of material resources. Please return your used device through the return and collection systems or to contact your retailers, they can take this product for environmentally safe recycling.

CHECKING UPPON DELIVERY

- Upon receiving this product, inspect it for any shipping damage.
  Claims for damage, either apparent or concealed, in a written form, should be filed immediately with the shipping company.
- Check the model number, electrical characteristics (power supply, voltage and frequency) and accessories to determine if they are correct. The standard utilization of the unit shall be explained in these instructions. Please contact your local agent, as the occasion arises.

Hitachi's liability shall not cover defects arising from the alteration performed by customers without Hitachi's consent in a written form.

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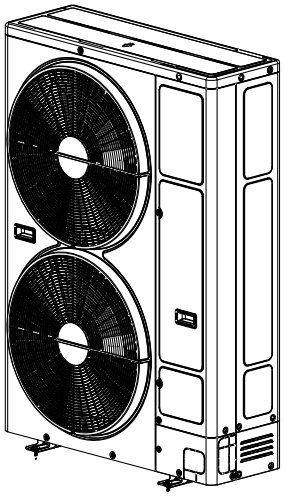
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DESIGN

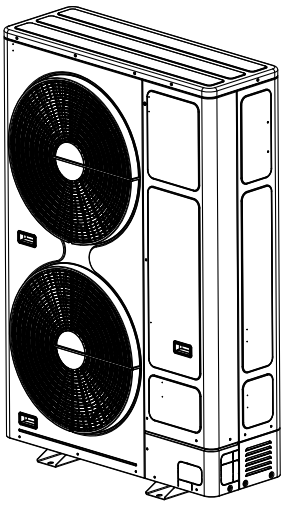
1. Introduction

1.1 Line-Up of Outdoor Unit

Capacity	HP	8	9	10	11	12
	kW	22.4	24.1	28.0	30.0	33.5
Model		RAS-080HNBSTQ	RAS-090HNBSTQ	RAS-100HNBSTQ	RAS-110HNBSTQ	RAS-120HNBSTQ



RAS-080~090HNBSTQ



RAS-100~120HNBSTQ

1.2 Application Case

The following indoor units can be combined with the outdoor unit.

Table 1.1 Indoor Unit Type List

Type	Nominal Power (HP)																	
	0.6	0.8	1.0	1.3	1.5	1.6	1.8	2.0	2.3	2.5	3.0	3.3	4.0	5.0	6.0	8.0	10.0	12.0
Low-ESP Ducted Type		●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	
Mid-ESP Ducted Type		●	●	●	●		●	●	●	●								
High-ESP Ducted Type											●	●	●	●	●	●	●	
Compact Ducted Type		●	●	●	●		●	●	●	●								
4-way Cassette Type			●		●			●	●	●	●		●	●	●			
Mini 4-way Cassette Type	●	●	●		●			●		●								
1-way Cassette Type		●	●	●	●	●		●		●	●							
2-way Cassette Type		●	●		●			●		●	●		●	●	●			
Floor Concealed Type			●		●			●		●								
Ceiling & Floor Type							●	●	●	●	●	●	●	●				
Ceiling Suspended					●			●		●	●		●	●	●			
Wall Mounted Type		●	●	●	●		●	●	●	●	●							
Fresh Air Unit														●		●	●	●
DX-kit								●					●		●		●	

●: Available

- The number of connectable indoor units with the outdoor unit is as follows. Comply with the condition as follows when installing the unit.

Outdoor Unit	Recommended Number of Connectable I.U.	Maximum Number of Connectable I.U.	Connectable Indoor Unit Capacity Ratio	
			Minimum	Maximum
RAS-080HNBSTQ	11	12	50%	130%
RAS-090HNBSTQ	11	12	50%	130%
RAS-100HNBSTQ	12	13	50%	130%
RAS-110HNBSTQ	13	16	50%	130%
RAS-120HNBSTQ	13	19	50%	130%

NOTES:

1. The connectable indoor unit capacity ratio can be calculated as follows:
   Connectable Indoor Unit Capacity Ratio = Total Indoor Unit Capacity / Outdoor Unit Capacity.
2. In cold areas (where the outdoor air temperature may be lower than -10ºC) or areas with extremely high temperature (where the outdoor air temperature may be higher than 43°C), the recommended number of connected units is not encouraged to be exceeded and the capacity ratio is not recommended to be greater than 100%.
   Otherwise, under certain operating limits, the temperature difference between the inlet and outlet air temperatures of the indoor unit may decrease, or the indoor unit may not reach high wind operation for a long time when it is started.
3. For the system which all the indoor units operate simultaneously, the total indoor unit capacity should be not bigger than the outdoor unit capacity. Otherwise, a decrease in operating performance and an increase in the operating limit can result in an overload.
4. For the system under which all the indoor units do not operate simultaneously, the total indoor unit capacity is available up to 130% or the number of connectable indoor units can be up to maximum,but the performance of each indoor unit will be reduced.
5. The maximum number of connectable indoor units differs depending on the model, capacity, environment and installation location of connected indoor units.
6. A system configuration with a combination ratio of more than 130% is unacceptable. Alarm activation and operation failure may occur.
7. For optional spare parts, please contact your local salesperson.

2. General Data

2.1 Key Parameter

Capacity				8HP	9HP	10HP	11HP	12HP
Model				RAS-080HNBSTQ	RAS-090HNBSTQ	RAS-100HNBSTQ	RAS-110HNBSTQ	RAS-120HNBSTQ
Power Supply				3N~ 380-415V 50Hz 3N~ 380V 60Hz				
Cooling Operation	Nominal Capacity		kW	22.4	24.1	28.0	30.0	33.5
	Power Consumption		kW	6.36	7.20	8.20	9.10	10.60
	EER		W/W	3.52	3.35	3.41	3.30	3.16
Heating Operation	Nominal Capacity		kW	25.0	26.0	31.5	33.0	37.5
	Power Consumption		kW	6.31	7.18	8.70	9.50	10.11
	COP		W/W	3.96	3.62	3.62	3.47	3.71
Sound Pressure Level ※1	Normal mode(Cooling/Heating)		dB(A)	55/56	56/57	58/61	59/61	59/61
	Silent mode		dB(A)	49	50	47	48	48
Cabinet Color ※ 2			—	Natural Gray		Grayish White		
Outer Dimensions	Height		mm	1380	1380	1650	1650	1650
	Width		mm	950	950	1100	1100	1100
	Depth		mm	320	320	390	390	390
Packing Dimensions	Height		mm	1520	1520	1806	1806	1806
	Width		mm	1070	1070	1185	1185	1185
	Depth		mm	470	470	530	530	530
Net Weight			kg	122	122	147	165	165
Gross Weight			kg	136	136	162	180	180
Refrigerating Installation	Compressor	Type	—	Rotary				
		Quantity	—	1	1	1	1	1
	Refrigeration Oil	Type	—	α68HES-H		FW68DA or FVC68D		
		Charge	L	1.8	1.8	2.0	2.0	2.0
	Refrigerant Charge	Type	—	R410A				
		Before Shipment	kg	5.9	5.9	5.5	6.5	6.5
	Refrigerant Flow Control		—	Micro-computer Control Expansion Valve				
	Heat Exchanger Type			Multi-way Cross-flow Finned Tube Type				
	Gas Pipe		mm	Φ19.05	Φ19.05	Φ22.2	Φ25.4	Φ25.4
			in.	3/4	3/4	7/8	1	1
	Liquid Pipe		mm	Φ9.53	Φ9.53	Φ12.7	Φ12.7	Φ12.7
			in.	3/8	3/8	1/2	1/2	1/2
Fan	Condenser Fan Quantity		—	2	2	2	2	2
	Air Flow Rate		m³/min	122	122	163	163	163
	Power		kW	0.138×2	0.138×2	0.14×2	0.14×2	0.14×2

Notes:

The above cooling and heating capacities show the capacities when the outdoor unit is operating with the 100% rating of indoor units.

Cooling Operation Conditions

Indoor Air Inlet Temperature: 27°C DB
19°C WB

Outdoor Air Inlet Temperature: 35°C DB

Heating Operation Conditions

Indoor Air Inlet Temperature 20°C DB

Outdoor Air Inlet Temperature: 7°C DB
6°C WB

Piping Length: 7.5m, Piping Lift: 0m

※1. The above noise values are measured in the anechoic chamber without reflected echo, therefore the impact of the reflected echo must be taken into consideration at the scene.

Measurement point: 1m from the service cover surface and 1.5m from floor level.

※2. The final appearance of outdoor units is subject to the actual products.

2.2 Component Data

Outdoor Heat Exchanger, Fan and Fan Motor

Model				RAS-080HNBSTQ	RAS-090HNBSTQ	RAS-100HNBSTQ	RAS-110HNBSTQ	RAS-120HNBSTQ
Heat Exchanger	Heat exchanger type		-	Multi-way cross-flow finned tube type				
	Tube	Material	-	Copper				
		Outside diameter	mm	7				
		Rows	-	3	3	2	3	3
	Fin	Material	-	Aluminum				
		Pitch	mm	1.4	1.4	1.4	1.4	1.4
	Quantity		-	1	1	1	1	1
	Max. operating pressure		Mpa	4.15				
	Max. frontal area		m^2	1.220	1.220	1.570	1.570	1.570
Fan Part	Fan	Type	-	Axial-flow Fan				
		Quantity	-	2	2	2	2	2
		Outside diameter	mm	544	544	600	600	600
	Fan motor	Type	-	DC				
		Start-up mode	-	Soft driving				
		Nominal output power	W	138×2	138×2	140×2	140×2	140×2
		Quantity	-	2	2	2	2	2
		Insulation grade	-	E	E	E	E	E

Parameters of Compressor

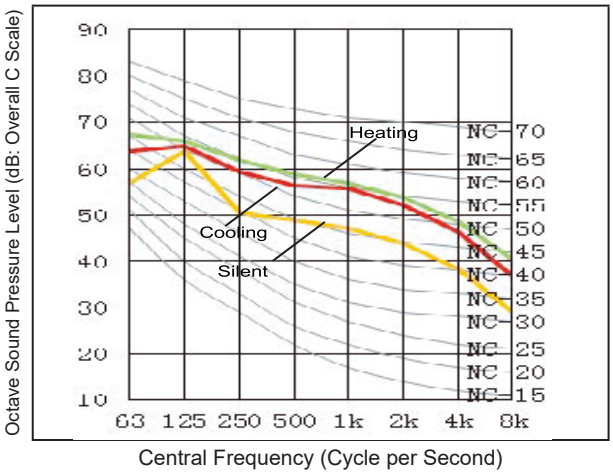
Compressor Model			ATH550SDTC8FQ	ATE650SKTQ9JK
Design Pressure	High Side	Mpa	4.15	4.15
	Low Side	Mpa	2.21	2.21
Compressor Motor	Model	-	Brushless DC motor	Brushless DC motor
	Start-up Mode	-	VFD	VFD
	Polarities	-	4	6
	Insulation Grade	-	E	E
Refrigerator Oil	Brand	-	α68HES-H	FVC68D
	Volume	L	1.8	2

Outdoor Unit Models	Compressor	
	Model	Quantity
RAS-080HNBSTQ	ATH550SDTC8FQ	1
RAS-090HNBSTQ		
RAS-100HNBSTQ	ATE650SKTQ9JK	1
RAS-110HNBSTQ		
RAS-120HNBSTQ		

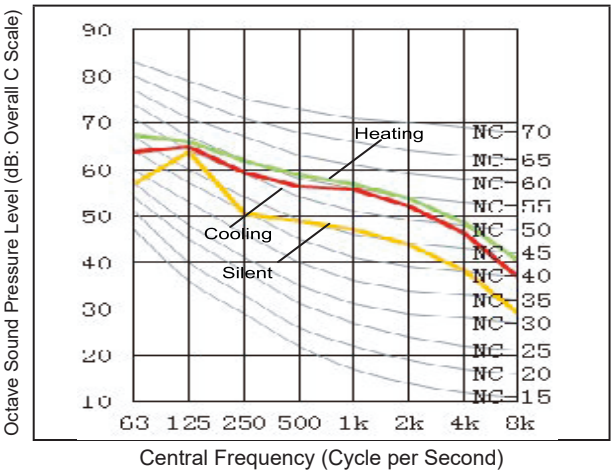
2.3 Sound Data

Measurement point: 1m from the service cover surface and 1.5m from floor level.

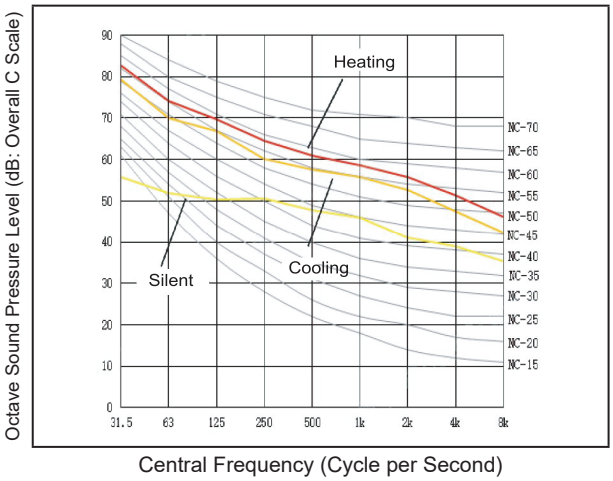
RAS-080HNBSTQ



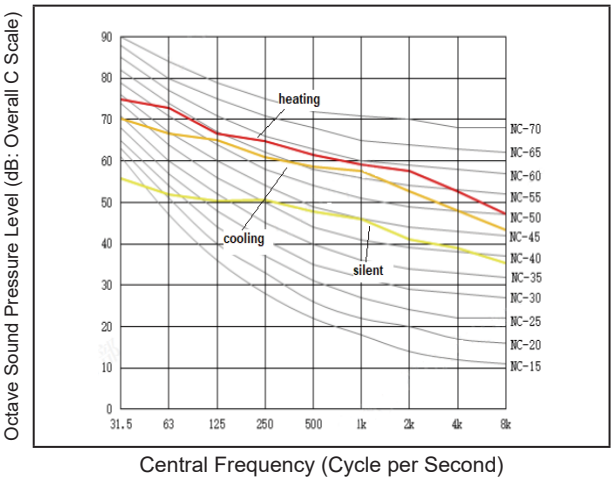
RAS-090HNBSTQ



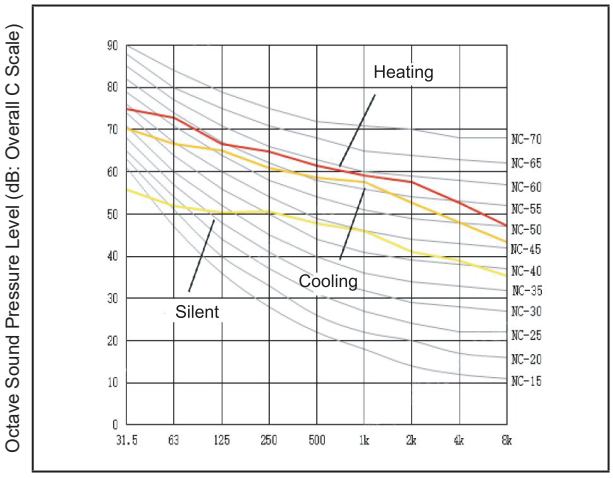
RAS-100HNBSTQ



RAS-110HNBSTQ

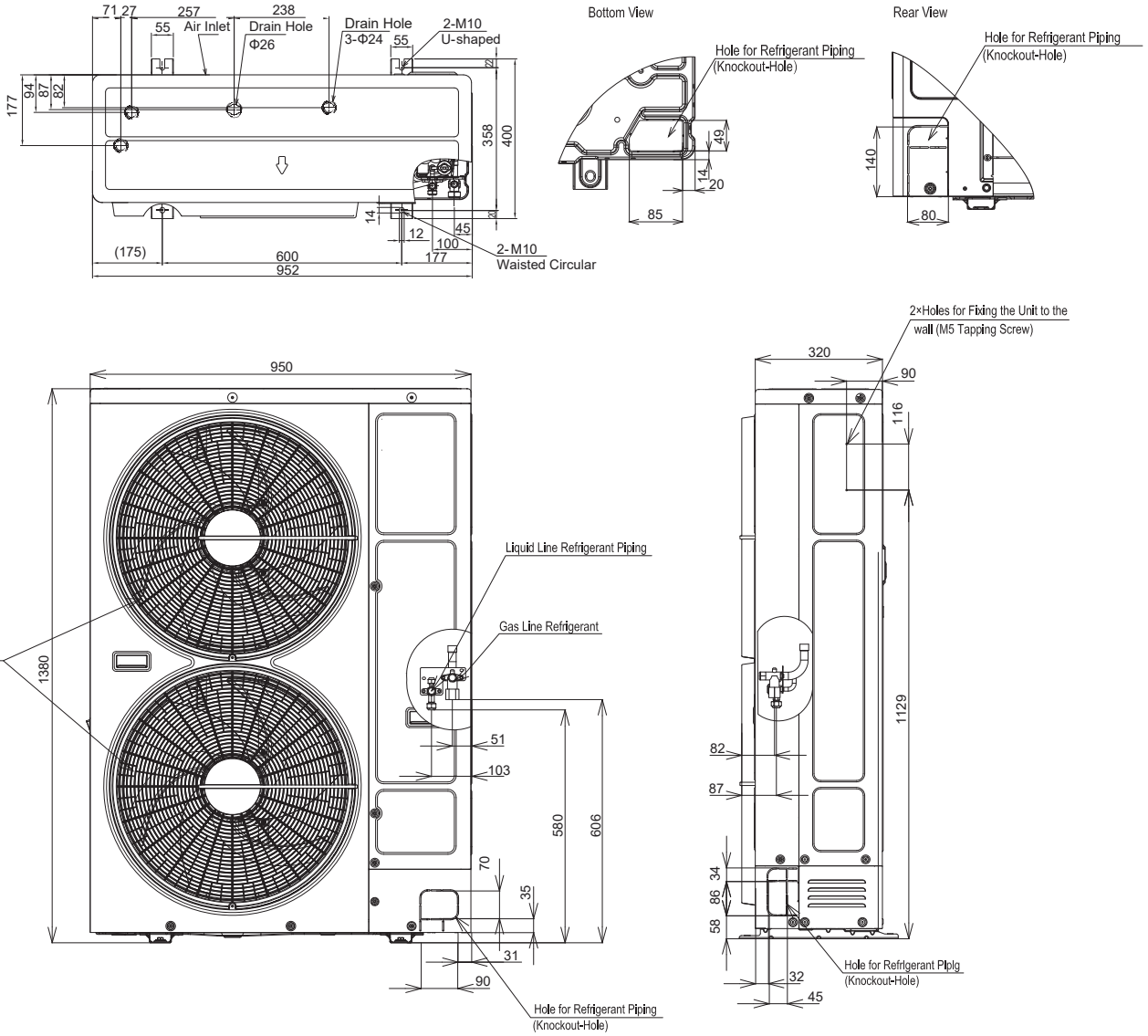


RAS-120HNBSTQ

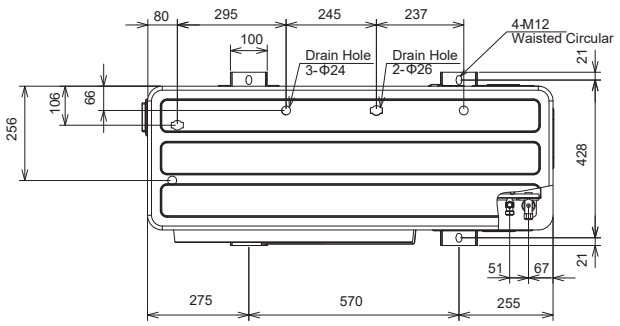


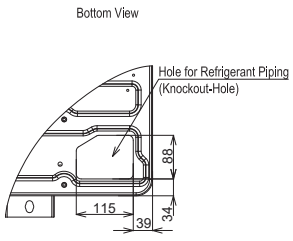
2.4 Dimensional Data

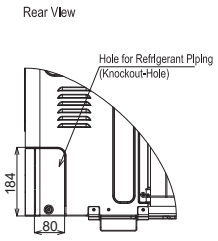
Model: RAS-080~090HNBSTQ

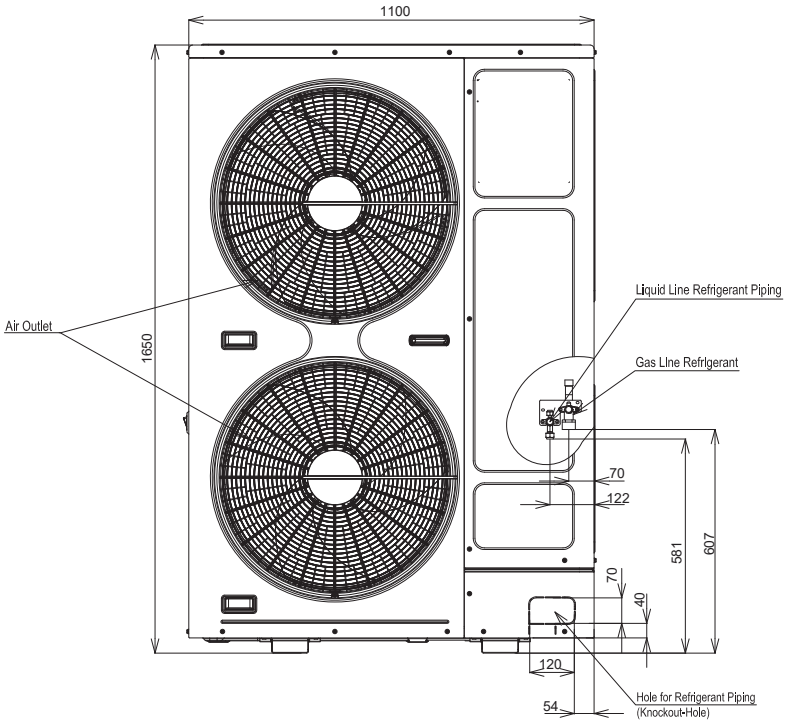


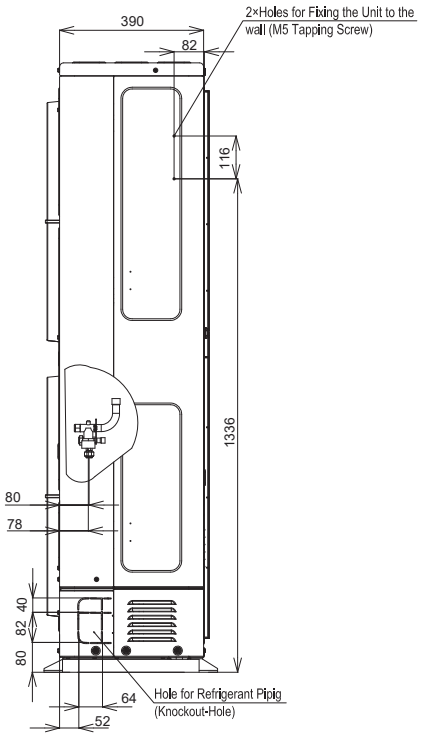
Model: RAS-100~120HNBSTQ





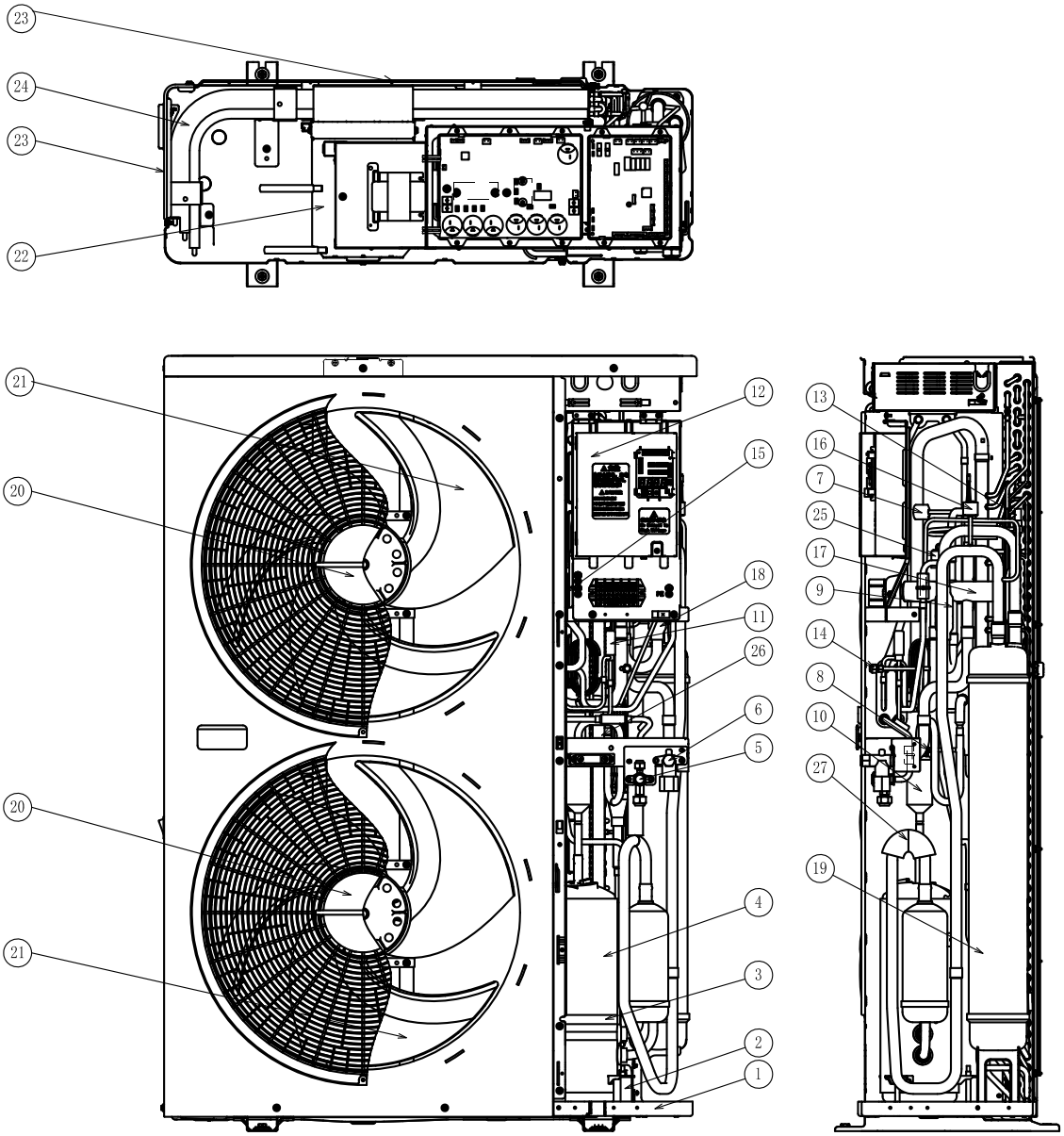






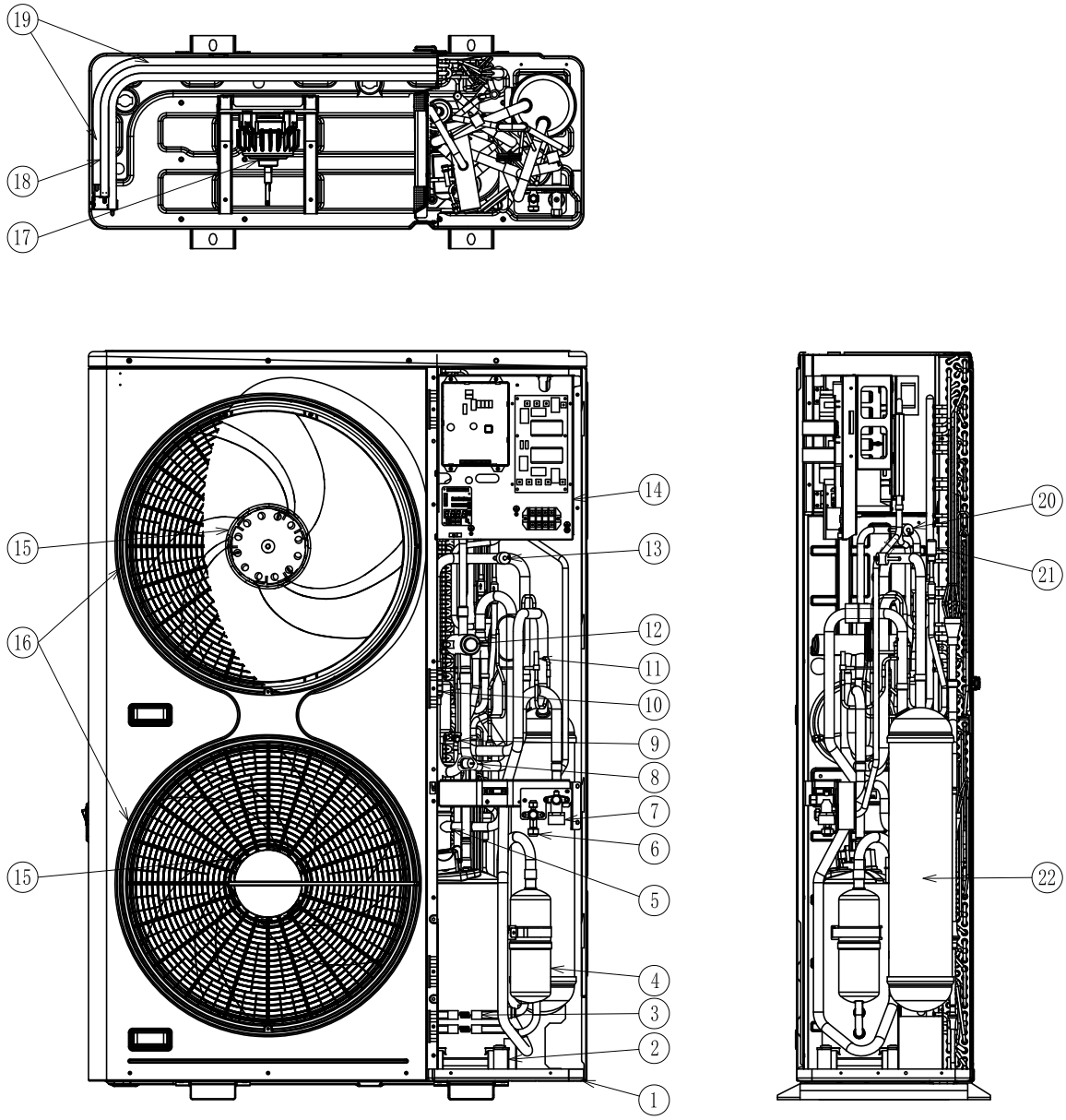
2.5 Structure

Model: RAS-080~090HNBSTQ



NO.	Part Name	NO.	Part Name	NO.	Part Name
1	Baseplate	10	Oil Separator	19	Accumulator
2	Damping Rubber	11	Electronic Expansion Valve (EVB)	20	Air Outlet
3	Crankcase Heater (CH)	12	Electrical Box	21	Fan
4	Compressor	13	Solenoid Valve (SVA)	22	Fan Motor
5	Liquid Stop Valve	14	Service Valve	23	Air Inlet
6	Gas Stop Valve	15	Check Valve	24	Heat Exchanger
7	High Pressure Sensor (Pd)	16	Low Pressure Sensor (Ps)	25	Electronic Expansion Valve (EVO)
8	High Pressure Switch (PSH)	17	4-Way Reversing Valve (RVR)	26	Damping Rubber
9	Filter	18	Filter	27	Damping Rubber

Model：RAS-100~120HNBSTQ



NO.	Part Name	NO.	Part Name
1	Baseplate	12	4-Way Reversing Valve (RVR)
2	Damping Rubber	13	Low Pressure Sensor (Ps)
3	Crankcase Heater (CH)	14	Electrical Box
4	Compressor	15	Fan
5	Oil Separator	16	Air Outlet
6	Liquid Stop Valve	17	Fan Motor
7	Gas Stop Valve	18	Heat Exchanger
8	High Pressure Switch (PSH)	19	Air Inlet
9	Service Valve	20	High Pressure Sensor (Pd)
10	Filter	21	Electronic Expansion Valve (EVO)
11	Solenoid Valve	22	Accumulator

2.6 Electrical Data

Model	Power Source	Rated Current (A)	Power Source Cable Size	Transmitting Cable Size	ELB		FUSE (A)
			EN60335-1 *1 (mm²)	EN60335-1 *1 (mm²)	Nominal Current (A)	Nominal Sensitive Current (mA)	
RAS-080HNBSTQ	380-415V 3N~50Hz	21.0	4.0	0.75	25	30	25
RAS-090HNBSTQ		24.0	4.0	0.75	32	30	32
RAS-100HNBSTQ		26.0	6.0	0.75	32	30	32
RAS-110HNBSTQ	380V 3N~60Hz	26.0	6.0	0.75	32	30	32
RAS-120HNBSTQ		26.0	6.0	0.75	32	30	32

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

ELB: Earth Leakage Breaker

NOTES:

(1) Connect the power supply wirings to the terminal block TB1 and ground wiring to the terminal in the electrical control box. The ELB (Earth leakage breaker), FUSE and S (Main switch) must be installed to each power source of outdoor unit.

(2) Connect the shielded twisted pair transmission cables between the outdoor unit and indoor units to the terminals 1 and 2 on the terminal block. The installation must consider the application and local code requirements.

(3) Connect the transmission cables between the indoor unit and wired controller to the terminals A and B on the terminal block.

(4) The transmission cable should be separated from the power supply wiring.

Keep at least 5cm distance between the transmission cable and the power supply wiring, and also at least.1.5m distance between the transmission cable and power supply wiring for other electrical devices. If it is not secured, put the power supply wiring into the metal conduit tube to separate from other wirings.

(5) Do not connect the power supply wiring to the terminals 1 and 2 on the terminal block for transmission wiring. Otherwise, printed circuit board may be damaged.

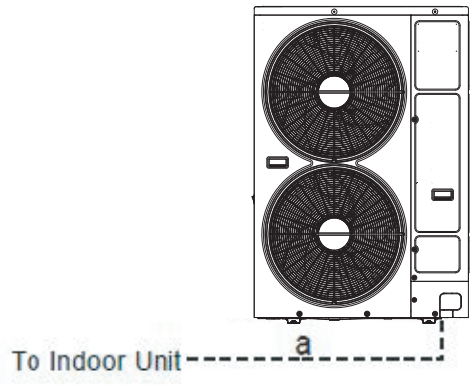
(6) Connect the ground wire for the outdoor/indoor units. The ground wiring work under the condition of 100Ω (max.) ground resistance should be performed by the qualified person.

(7) Tighten screws for the terminal block according to the following table:

Current (A)	Wire Size (mm^2)	
i≤6	2.5	※1: DO NOT connect wires in series when the current exceeds 63A.
6<i≤10	2.5	
10<i≤16	2.5	
16<i≤25	4	
25<i≤32	6	
32<i≤40	10	
40<i≤63	16	
63<i	*1	

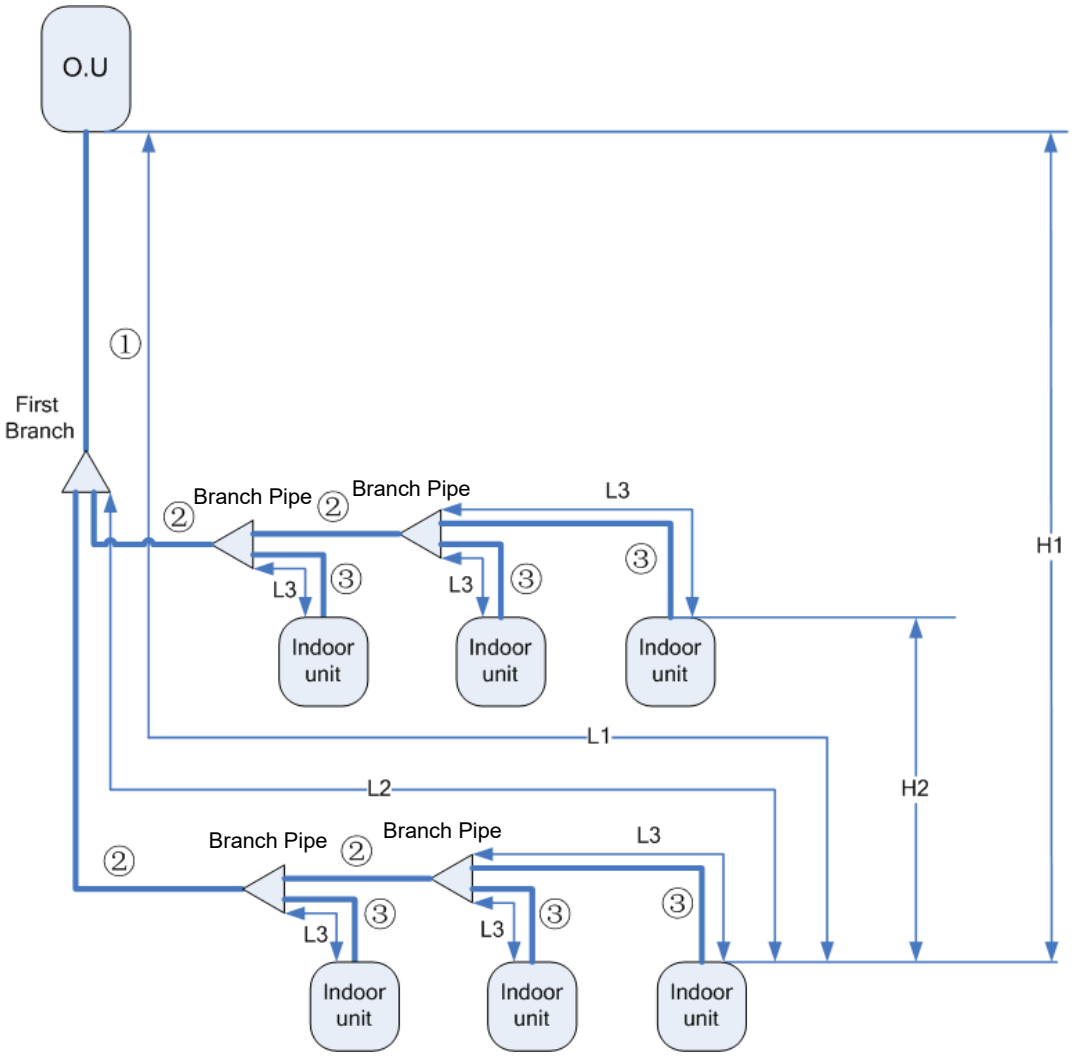
3. Piping System

3.1 Connection of Refrigerant Pipes



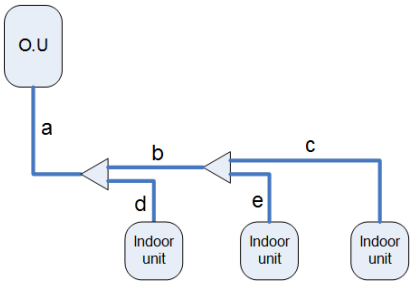
Model		080	090	100	110	120
Tube Size Φ (mm)	Gas	19.05	19.05	22.2	25.4	25.4
	Liquid	9.52	9.52	12.7	12.7	12.7

3.2 Pipe Connection Design Guidance



Item		Mark	Allowable Piping Length	
Total Piping Length			RAS-080~090HNBSTQ	RAS-100~120HNBSTQ
		-	≤300m	≤250m
Maximum Piping Length	Actual Length	L1	≤80m	≤100m
	Equivalent Length		≤110m	≤130m
Maximum Piping Length between Branch of 1st Branch and Each Indoor Unit		L2	≤40m	≤40m
Maximum Piping Length between Each Branch and Each Indoor Unit		L3	≤15m	≤15m
Height Difference between Outdoor Unit and Indoor Units	Outdoor Unit is Higher	H1	≤50m	≤50m
	Outdoor Unit is Lower		≤40m	≤40m
Height Difference between Indoor Units		H2	≤15m	≤15m

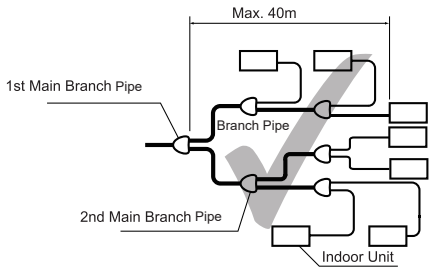
Item	Mark	Details
Total Piping Length	a+b+c+d+e	The total amount of all piping actual length.
Maximum Piping Length	a+b+c	The actual piping length between the stop valve of the outdoor unit and the terminal indoor unit.
Piping Length	-	The actual length of pipe takes no account for equivalent lengths for pressure drops of elbows.
Equivalent Piping Length	-	The combination of the straight pipe length plus the equivalent length of elbows and other pressure drop calculations.



NOTICE:

Comply with the following conditions when installing the unit.

1. Allowable total piping length may not reach maximum because of the limitation of maximum additional refrigerant amount. Make sure the additional refrigerant volume does not exceed the maximum additional refrigerant amount.
2. If the piping length (L3) between each branch and indoor unit is considerably longer than other indoor unit, refrigerant may not flow well, lessening performance compared to other models.
3. It is allowable to make one or two main branch pipes.
   The word “Main Branch Pipe” indicates the branch pipe with both branches connected to another branch pipe.



※If the number of “Main Branch Pipe” exceeds 2, please contact technical support engineer of HITACHI.

① First branch:

Outdoor Unit Capacity (HP)	Model
8.0~9.0	E-102SN
10.0~12.0	E-162SN

NOTE:

When maximum length of the equivalent refrigerant pipe (L1) from the outdoor unit pipe to the indoor unit is over 100m, the pipe size of gas line from outdoor unit to first branch should be increased one size with the reducer (field-supplied).

② Pipe after first branch

Total Indoor Unit Capacity	Gas Φ (mm)	Liquid Φ (mm)	Model
Q < 6HP	15.88	9.53	E-102SN
6HP ≤ Q < 9HP	19.05	9.53	
9HP≤ Q < 12HP	22.2	9.53	
12HP ≤ Q < 16HP	25.4	12.7	E-162SN

NOTE:

Even if the equivalent refrigerant piping length (L1) is more than 100m, no need to increase the pipe size after first branch. If the branch pipe size is larger than the first branch, adjust the branch pipe size to the first branch. In case that the selected pipe size after the first branch is larger than the pipe size before the first branch, use the same pipe size as the one before the first branch.

③ Pipe between last branch and indoor unit

4-Way Cassette Type and Mini 4-Way Cassette Type

Indoor Unit (HP)	Gas pipe (Φmm)	Liquid pipe (Φmm)
0.8~2.0	12.7	6.35
2.3~6.0	15.88	9.53

Others

Indoor Unit (HP)	Gas pipe (Φmm)	Liquid pipe (Φmm)
0.8~1.6	12.7	6.35
1.8~2.0	15.88	6.35
2.2~6.0	15.88	9.53
8.0	19.05	9.53
10.0	22.20	9.53

NOTE:

(1) When the liquid piping length is longer than 15m, use Φ9.53mm pipe and reducer (field-supplied) instead of Φ 6.35mm pipe.

(2) The pipe diameter should be the same as the indoor unit piping connection size.

3.3 Calculation of Additional Refrigerant

Although refrigerant has been charged into this unit, additional refrigerant charge is required. Determine the additional refrigerant quantity according to the following procedure, and charge it into the system. Record the additional refrigerant quantity to facilitate maintenance and servicing activities thereafter.

Calculating Method of Additional Refrigerant Charge (W kg)

	Pipe Diameter (Φ mm)	Total Piping Length (m)	Refrigerant Charge (kg/m)	Additional Charge for liquid piping (kg)	Model
W: Additional refrigerant charge for liquid piping	12.7		×0.085		RAS-080/090HNBSTQ
			×0.12		RAS-100/110/120HNBSTQ
	9.53		×0.05		RAS-080/090HNBSTQ
			×0.07		RAS-100/110/120HNBSTQ
	6.35		×0.02		RAS-080/090HNBSTQ
			×0.03		RAS-100/110/120HNBSTQ
	Total Additional Charge For Liquid Piping (W) =				

Maximum Additional Refrigerant Charge

Total additional charge must not exceed the maximum additional refrigerant charge indicated in the following table. Accordingly, allowable total piping length may become shorter than maximum value due to the limitation of maximum additional refrigerant amount.

Ref. Charge of O.U.

Outdoor Unit Models	W0: Outdoor unit refrigerant charge (kg)	Maximum additional refrigerant charge (kg)
RAS-080HNBSTQ	5.9	8.2
RAS-090HNBSTQ	5.9	8.2
RAS-100HNBSTQ	5.5	13.5
RAS-110HNBSTQ	6.5	13.5
RAS-120HNBSTQ	6.5	13.5

NOTES:

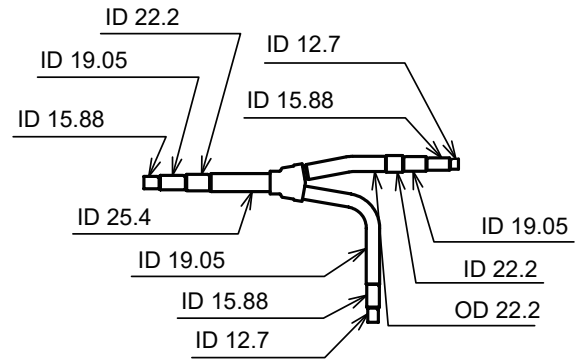
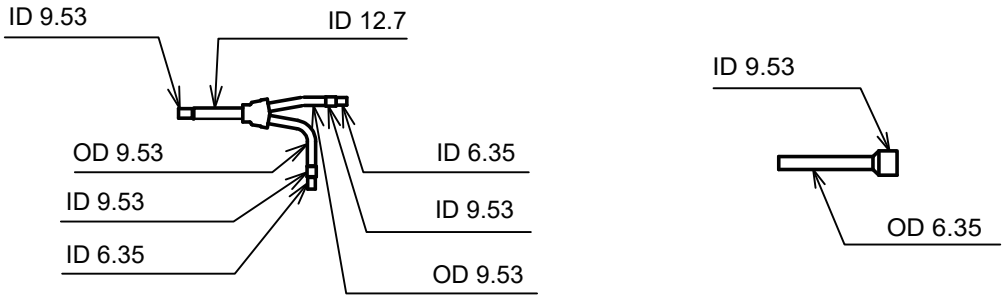
- W0 is outdoor unit refrigerant charge before shipment.

1. Charging Work
   Charge refrigerant (R410A) into the system according to INSTALLATION chapter.
2. Record of Additional Charge
   Total refrigerant charge of this system is calculated in the following formula.
   Total Ref. Charge = W + Wo
   This System = ☐ + ☐ = ☐ kg

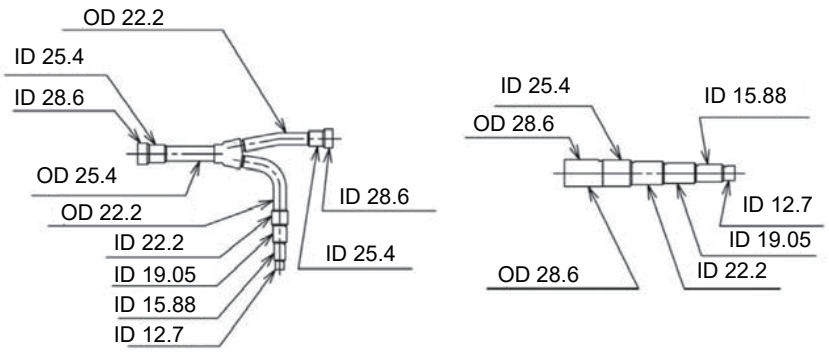
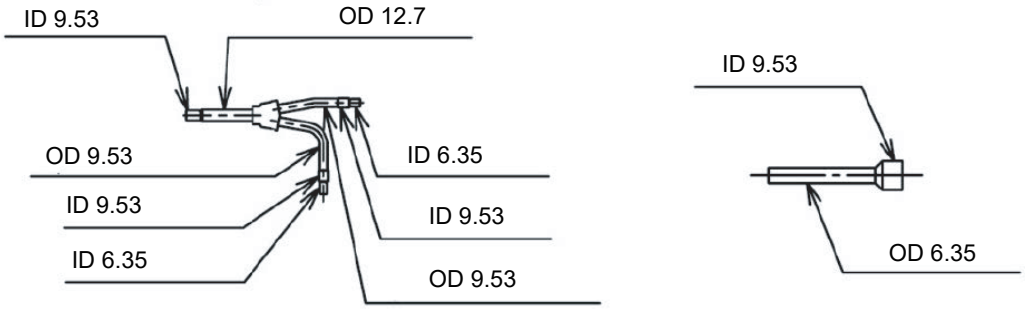
Total Additional Charge(W): ☐ kg
Total Refrigerant Charge: ☐ kg
Date of Charging: ☐ / ☐ / ☐

3.4 Piping Connection Branch Pipe Dimensions (optional)

Unit: mm

Model	E-102SN
Gas Pipe	
Liquid Pipe	

Unit: mm

Model	E-162SN
Gas Pipe	
Liquid Pipe	

4. Capacities and Selection Data

4.1 Procedure for Selection of the System

This section explains the procedure to select the most suitable outdoor unit, with the values to be taken into account and the necessary steps to be carried out.

This procedure allows to select the unit with the best characteristics to provide the greatest level of efficiency and comfort considering the building layout, the specifications of the indoor units to be installed and the distribution of air and refrigerant flows.

The ease of access for installation and maintenance work must be taken into account when selecting the location for installation of the outdoor unit.

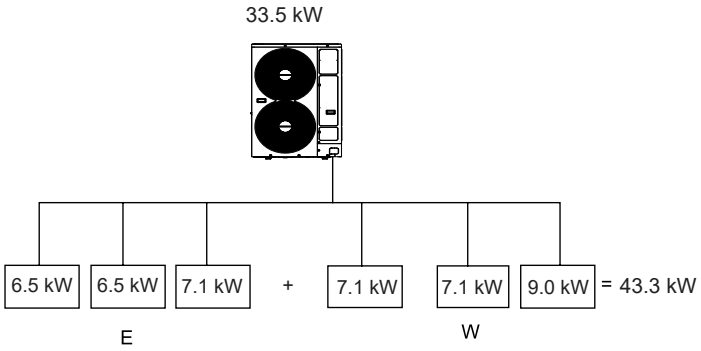
4.1.1 Unique features of the system

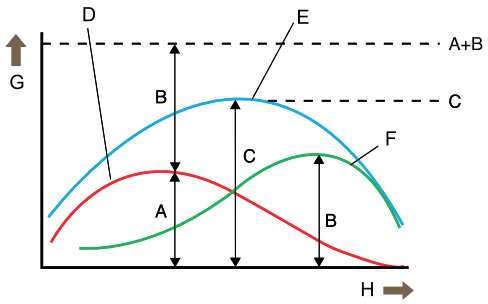
The system boasts some unique features that must be taken into account before selecting the outdoor unit.

Possibility of installing a reduced total unit capacity.

In comparison with other air conditioning systems requiring the indoor and outdoor nominal capacities to be equal, the system allows the connection of a total combined indoor capacity as low as 50% and as high as 130% of the nominal capacity of the outdoor unit. This possibility is explained in the following example:

The diagram shows a typical building with a morning peak heat load on the east zone equivalent to a 20.1 kW unit. In the afternoon, a peak equivalent to a 23.2 kW unit occurs on the west zone.





Indoor unit capacity
E: East zone (20.1 kW)
W: West zone (23.2 kW)

A: morning peak heat load in the eastern area
B: evening peak heat load in the western area
C: maximum simultaneous load for the entire building
D: eastern area load

E: total load
F: western area load
G: load
H: time

In this case, a conventional system would require the installation of a 43.3 kW outdoor unit, matching the total installed indoor capacity (20.1 kW + 23.2 kW). However, the maximum simultaneous load in the whole building occurs at noon, and is equal to 33.5 kW of unit capacity. Therefore, a 33.5 kW outdoor unit could be selected, directing its capacity to either the east or the west zone as dictated by the system controls.

NOTE:

- The maximum required loads of east and west zone must not be simultaneous.
- In systems in which all the indoor units are operated simultaneously, the total indoor capacity must not exceed the nominal capacity of the outdoor unit. Otherwise, poor performance or a narrowing of the operation range in overload conditions may occur.

The ratio of total combined capacity is calculated with the following formula:

Ratio of total combined capacity = (Total capacity of the indoor units / Capacity of the outdoor unit) x 100%
= (43.3 kW / 33.5 kW) x 100% ≈129%

4.1.2 Selection parameters

To select the outdoor units, it will be necessary to consult and/or use a series of parameters shown in tables and graphics presented in the different chapters of this handbook. A summarized list is shown below:

For cooling and heating capacities: refer to Enigneering Data.

For cooling correction factor depending on the piping length: 4.2 “Capacity Correction Based on Refrigerant Piping Length”.

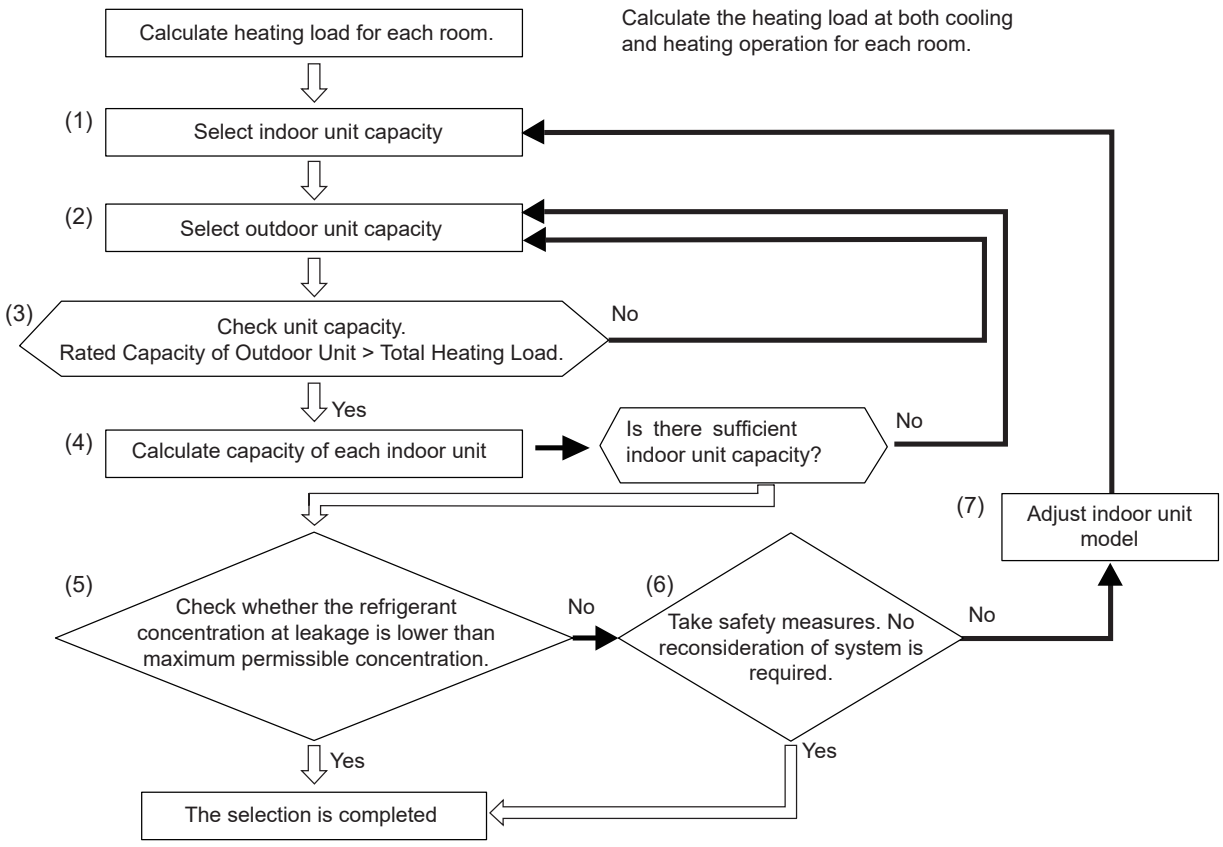
For heating correction factor depending on the piping length: 4.2 “Capacity Correction Based on Refrigerant Piping Length”.

For sensible heat factor: VRF Indoor Units Technical Catalog.

In case of an installation with ducts (outdoor unit with RPIL indoor unit) the fan performance for duct calculations should be considered. The RPIL units are designed with difference static pressure ranges in order to fulfill all installation necessities.

4.1.3 Check points for system installation

For selecting the unit capacity, perform the system selection with checking the refrigerant concentration at leakage in order not to exceed the maximum permissible concentration.



(1) Selecting indoor unit capacity.

Set temporarily the indoor unit model and capacity in each room as following:

Heating Load for each room < Capacity of Indoor Unit

At this time, consider the correction factor according to room temperature.

Then, sum up each indoor unit capacity (The calculation is required for cooling and heating operation).

Capacity of Indoor Unit = Norminal capacity of Indoor Unit x correction Factor (room temperature)

Correction factor according to room temperature: When the estimated load for each room differs from the rated capacity (cooling: 27.0 ºC DB/19 ºC WB; heating: 20ºC DB), select the outdoor unit capacity at the estimated load from “Engineering Data”.

Correction Factor (room temperature) = Outdoor unit capacity at estimated load / Rated outdoor unit capacity

(2) Selecting outdoor unit capacity.

Set temporarily the outdoor unit capacity according to the total connectable indoor unit capacity at the item (1). Then, calculate maximum outdoor unit capacity with considering the correction factors according to temperature condition, piping length and lift, defrosting correction factor (for heating operation) .

The calculation is required for cooling and heating operation:

Outdoor unit capacity = Outdoor unit capacity at estimated load x Correction factors

Outdoor unit capacity at estimated load:

When calculating heating load for outdoor unit, check the ambient temperature. If the ambient temperature differs from the temperature indicated in the rated capacity (cooling: 35ºC DB; heating: 7ºC DB / 6ºC WB), select the outdoor unit capacity at the estimated load from Engineering Data.

Correction factor according to piping length:

- Select the correction factor according to 4.2 “Capacity Correction Based on Refrigerant Piping Length”.

Correction factor according to defrosting condition (for heating operation):

- Select the correction factor according to 4.3 “Correction Factor According to Defrosting Operation”.

(3) Checking unit capacity.

Compare the outdoor unit capacity calculated in the item (2) with the total heating load.

(4) Calculating each indoor unit capacity.

Recalculate the indoor unit capacity as follows. (The calculation is required for cooling and heating operation.)

Unit capacity for each room = Outdoor Unit Capacity (value at item 2) x (indoor unit capacity in concerned room / Total indoor unit capacity)

If the outdoor unit capacity is insufficient against the necessary heating load for each room, recalculate it from the item (2) after the outdoor unit capacity is increased.

(5) Checking Refrigerant Concentration at Refrigerant Leakage < Permissible Refrigerant Concentration.

(6) Taking Safety Measure (Reconsideration of system is not required.)

(7) Correction of outdoor unit model if the condition of both (5) and (6) are negative.

NOTE

- When select the temperature, consider that the ambient temperature increases by short circuit. Especially, if multiple outdoor units are installed or there is obstacle around the outdoor unit, pay attention to increase the ambient temperature.
- For selecting temperature at the heating operation in the ducted and cassette indoor unit type, consider the temperature irregularity between the floor and the ceiling surface. The temperature around the ceiling surface normally becomes 2ºC higher than the floor surface during the heating operation.
- For selecting indoor unit capacity, if the sensible heating load is considered, consider the sensible heat factor together.
- In the case that the total indoor unit capacity exceeds the outdoor unit capacity, the temperature is low or the piping length is long, if the indoor units operate simultaneously, the air outlet temperature decreases so that may be felt uncomfortably. Therefore, the facility should be designed that the cooling/heating capacity for indoor unit calculated from the cooling/heating capacity for system is more than the heating load.

4.1.4 Selection procedure example

Given conditions

Once considered the system possibilities, it's the moment to start with the selection procedure. In order to do this, it has been assumed an installation consisting of several rooms with different required cooling loads and temperature conditions.

Total load required for each room

Concept	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7
Estimated cooling load (kW)	3.6	3.6	3.0	3.0	3.6	3.6	3.0
Estimated heating load (kW)	4.0	4.0	3.4	3.4	4.0	4.0	3.4

Temperature conditions:

Operating conditions		Cooling	Heating
Indoor air inlet temperature	DB(°C)	27.0	20
	WB(°C)	19.0	—
Outdoor air inlet temperature	DB(°C)	30.0	1.0
	WB(°C)	—	0.0

- DB: dry bulb; WB: wet bulb.

Piping connection conditions:

Equivalent pipe length between outdoor unit and indoor units: 60 m.

Pipe height: 25 m.

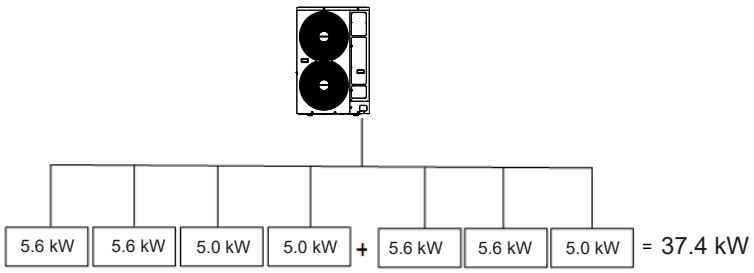
Appropriate selection of indoor units and nominal capacity

Example: selection of RPIL ducted indoor units.

The pre-selected capacity of the different indoor units has not been the immediately higher in all the units, in order to apply safety factor considering the different correction factors existing, which will reduce the capacity.

Concept	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7
Model selected	RPIL-2.0*	RPIL-2.0*	RPIL-1.8*	RPIL-1.8*	RPIL-2.0*	RPIL-2.0*	RPIL-1.8*
Estimated cooling load (kW)	5.6	5.6	5.0	5.0	5.6	5.6	5.0
Estimated heating load (kW)	5.8	5.8	5.6	5.6	5.8	5.8	5.6

Then, it's shown a diagram of the installation resulting: 33.5 kW



The resulting total indoor unit capacity is 37.4 kW.The outdoor unit with the exact capacity is the 37.4 kW model, but the possibility "Reduced total outdoor unit capacity" allows the RAS-120HNBSTQ model (nominal capacity: 33.5 kW) to be selected. Thus, it's allowed at the outdoor unit to be up to 12% smaller capacity when compared with other air conditioning systems.

Total combination horsepower = (Total indoor unit capacity / Outdoor unit capacity) x 100%
= (37.4 kW / 33.5 kW) x100% ≈ 112%

NOTE:

The maximum simultaneous load on the installation must not be higher than 33.5 kW for this example. To determine the outdoor unit pre-selected nominal cooling and heating capacity, it's necessary to refer to Engineering Data, in which the total capacity combination (112%) and the temperature condition have been taken into consideration.

Concept	Room 1+2+3+4+5+6+7	Outdoor unit pre-selected capacity (RAS-120HNBSTQ ~112%)
Total cooling load (kW)	37.4	34.0
Total heating load (kW)	40.0	39.2

NOTES:

- If the air inlet temperature for the indoor unit or outdoor unit is not contained in the capacity tables, an interpolation should be carried out using the values above and below the air inlet temperature.
- If the total combination capacity is not shown in the capacity tables (for example, 115%), an interpolation should be carried out using the values above and below (110% and 120%) the total combination.

Next step will be the capacity correction using the different correction factors shown in this chapter.

Correction factor according to piping length:

According to 4.2 “Capacity Correction Based on Refrigerant Piping Length”.

- Cooling capacity correction factor depending on the pipe length =0.908.
- Heating capacity correction factor depending on the pipe length =0.954.

Correction factor according to defrosting condition (for heating operation):

According to 4.3 “Correction Factor According to Defrosting Operation”.

- Outdoor inlet air temp.(ºC DB)=1, then Defrost correction factor = 0.857.

Actual capacity of the outdoor unit

Actual maximum capacity of the outdoor unit = (Outdoor unit pre-selected capacity) x (Correction factor according to pipe length and height) x (Correction factor according to defrosting operation) x (Correction factor according to altitude)

Cooling: (34.0 kW) x (0.908) x (1.0) = 30.9 kW.

Heating: (39.2 kW) x (0.954) x (0.857) = 32.0 kW.

Actual capacity of each indoor unit.

Actual capacity of each indoor unit = (Actual maximum capacity of the outdoor unit) x (Nominal capacity of each indoor units / Total nominal capacity of each indoor unit)

RPIL-2.0*

Cooling: 30.9 × (5.6 / (5.6+5.6+5.0+5.0+5.6+5.6+5.0)) = 4.6 kW.

Heating: 32.0 × (5.8 / (5.8+5.8+5.6+5.6+5.8+5.8+5.6)) = 4.6 kW.

RPIL-1.8*

Cooling: 30.9 × (5.0 / (5.6+5.6+5.0+5.0+5.6+5.6+5.0)) = 4.1 kW.

Heating: 32.0 × (5.6 / (5.6+5.6+5.0+5.0+5.6+5.6+5.0)) = 4.5 kW.

Results:

Concept	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7
Model selected	RPIL-2.0*	RPIL-2.0*	RPIL-1.8*	RPIL-1.8*	RPIL-2.0*	RPIL-2.0*	RPIL-1.8*
Actual cooling capacity (kW)	4.6	4.6	4.1	4.1	4.6	4.6	4.1
Actual heating capacity (kW)	4.6	4.6	4.5	4.5	4.6	4.6	4.5
Estimated cooling load (kW)	3.6	3.6	3.0	3.0	3.6	3.6	3.0
Estimated heating load (kW)	4.0	4.0	3.4	3.4	4.0	4.0	3.4

Concept	Room 1+2+3+4+5+6+7
Actual cooling capacity (kW)	30.9
Actual heating capacity (kW)	32.0
Estimated cooling load (kW)	23.4
Estimated heating load (kW)	26.2

As can be seen, the actual total cooling and heating capacity are higher than the estimated total cooling and heating load. Therefore, it can be said that the RAS-120HNBSTQ unit meets the minimum cooling and heating requirements set for the system.

NOTE:
If the actual total cooling / heating capacity calculated is lower than the estimated total cooling / heating load, the calculation must be done again with the unit immediately.

4.2 Capacity Correction Based on Refrigerant Piping Length

< Cooling Capacity >

Correction factor for cooling capacity according to piping length.

The cooling capacity should be corrected according to the following formula:

CCA=CC×F

CCA: Actual corrected cooling capacity

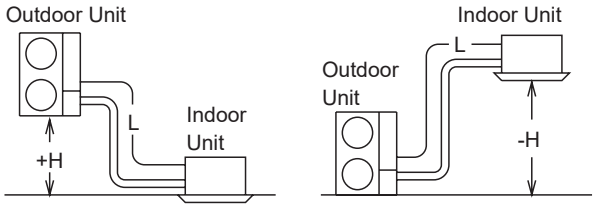
CC: Cooling capacity in the performance table

F: Correction factor based on the equivalent piping length

The correction factors are shown in the following figure.

Equivalent piping length for

- one 90° elbow is 0.5m.
- one 180° bend is 1.5m.
- one branch pipe is 0.5m.



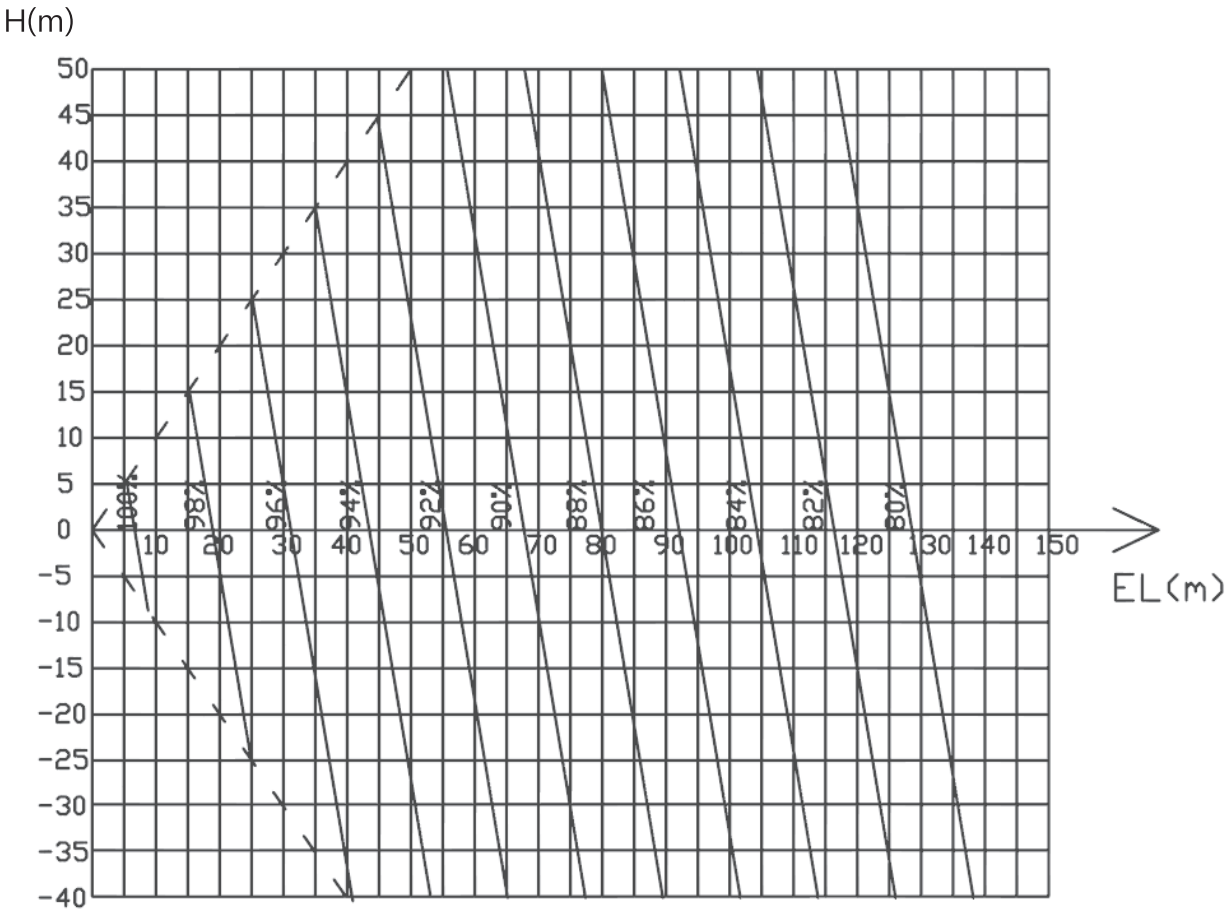
H: Vertical Distance Between Indoor Unit and Outdoor Unit

EL: Equivalent Total Distance Between Indoor Unit and Outdoor Unit (Equivalent One-Way Piping Length)

H>0: Position of Outdoor Unit Higher Than Position of Indoor Unit

L: Actual One-Way Piping Length Between Indoor Unit and Outdoor Unit

* H and EL please refer to Refrigerant Piping Work



<Heating Capacity >

Correction factor for cooling capacity according to piping length.

The heating capacity should be corrected according to the following formula:

HCA=HC×F

HCA: actual corrected cooling capacity

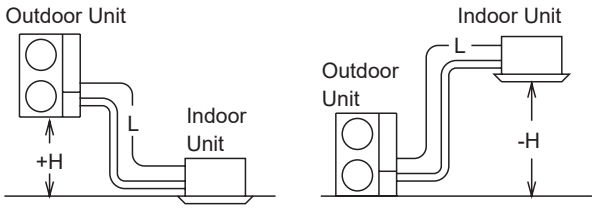
HC: cooling capacity in the performance table

F: correction factor based on the equivalent piping length

The correction factors are shown in the following figure

Equivalent piping length for

- one 90° elbow is 0.5m.
- one 180° bend is 1.5m.
- one branch pipe is 0.5m.



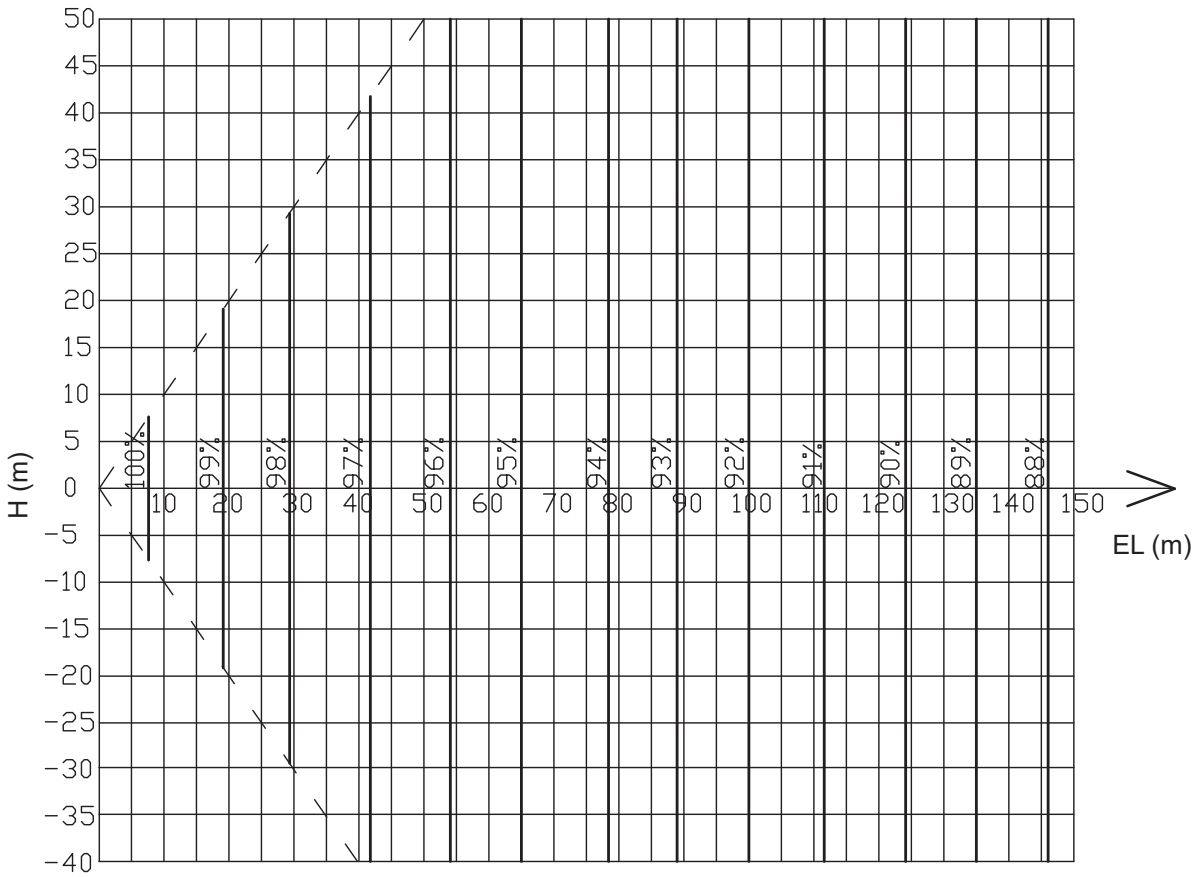
H: Vertical Distance Between Indoor Unit and Outdoor Unit

EL: Equivalent Total Distance Between Indoor Unit and Outdoor Unit (Equivalent One-Way Piping Length)

H>0: Position of Outdoor Unit Higher Than Position of Indoor Unit

L: Actual One-Way Piping Length Between Indoor Unit and Outdoor Unit

* H and EL please refer to Refrigerant Piping Work



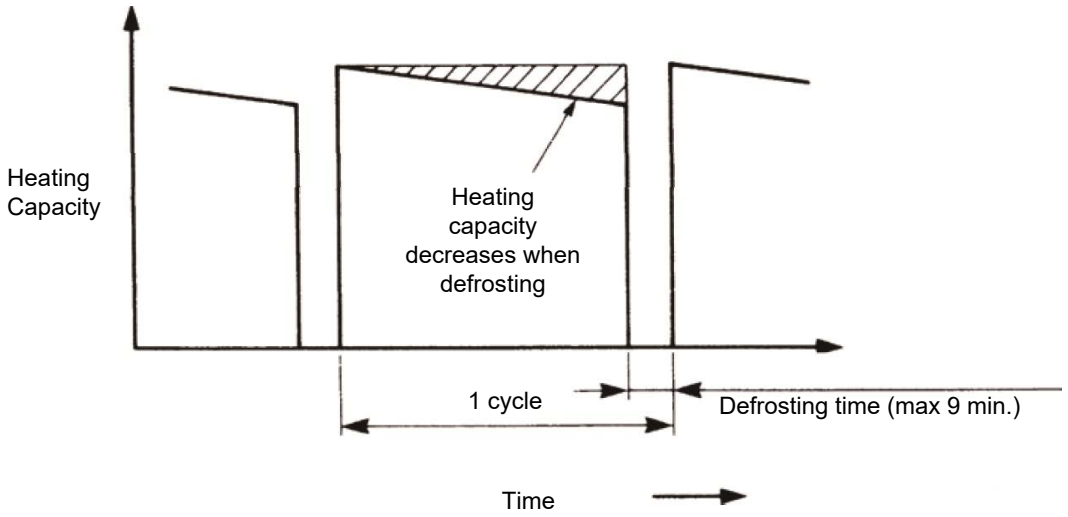
4.3 Correction Factor According to Defrosting Operation

The heating capacity in the preceding paragraph does not include defrost operation periods.

Therefore, capacity should be corrected as follows:

Corrected Heating Capacity = Correction Factor x Heating Capacity

Outdoor Inlet Air Temp. (ºC DB) (Humidity=85% RH)	-7	-5	-3	0	3	5	7
Correction Factor	0.95	0.93	0.88	0.85	0.87	0.90	1.00



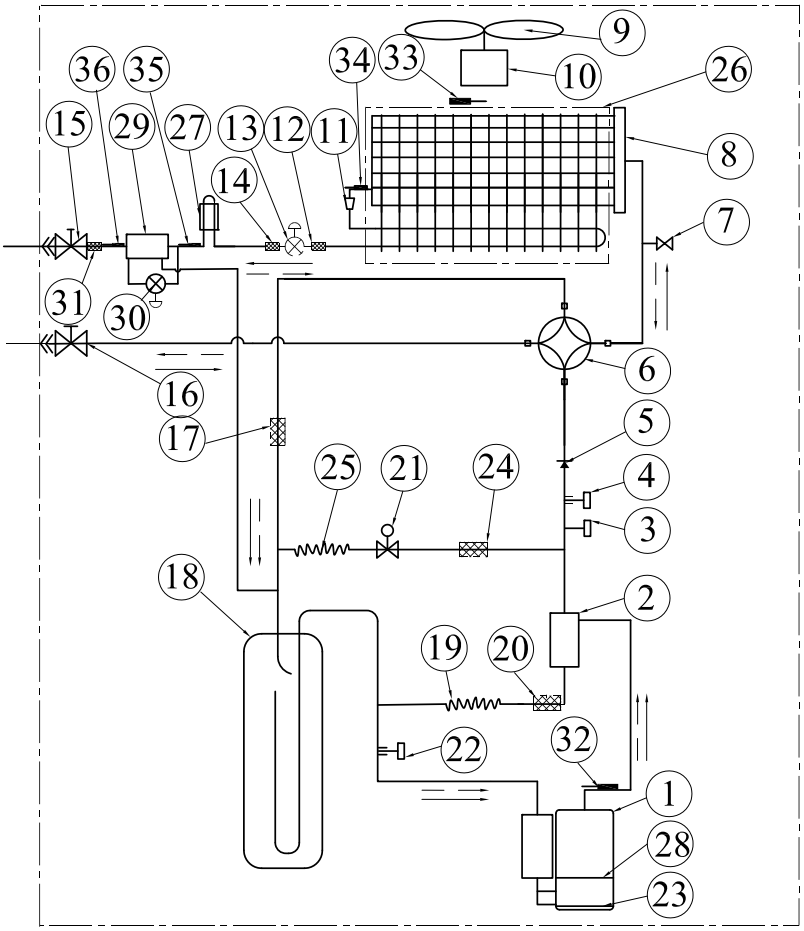
NOTES:

- The correction factor is not available for special conditions like snowfall or operation in a transitional period.
- When the outdoor inlet air temperature is higher than 7 ºC, this correction coefficient is 1.0. And when the outdoor inlet air temperature is lower than -7 ºC, this correction coefficient is 0.95.
- If the outdoor inlet air temperature is not shown in the above table (for example, 1 ºC), an interpolation should be carried out using the values before and after (0 ºC and 3 ºC) the outdoor inlet air temperature.

5. Control System

5.1 Refrigerant Cycle

Model: RAS-080~090HNBSTQ



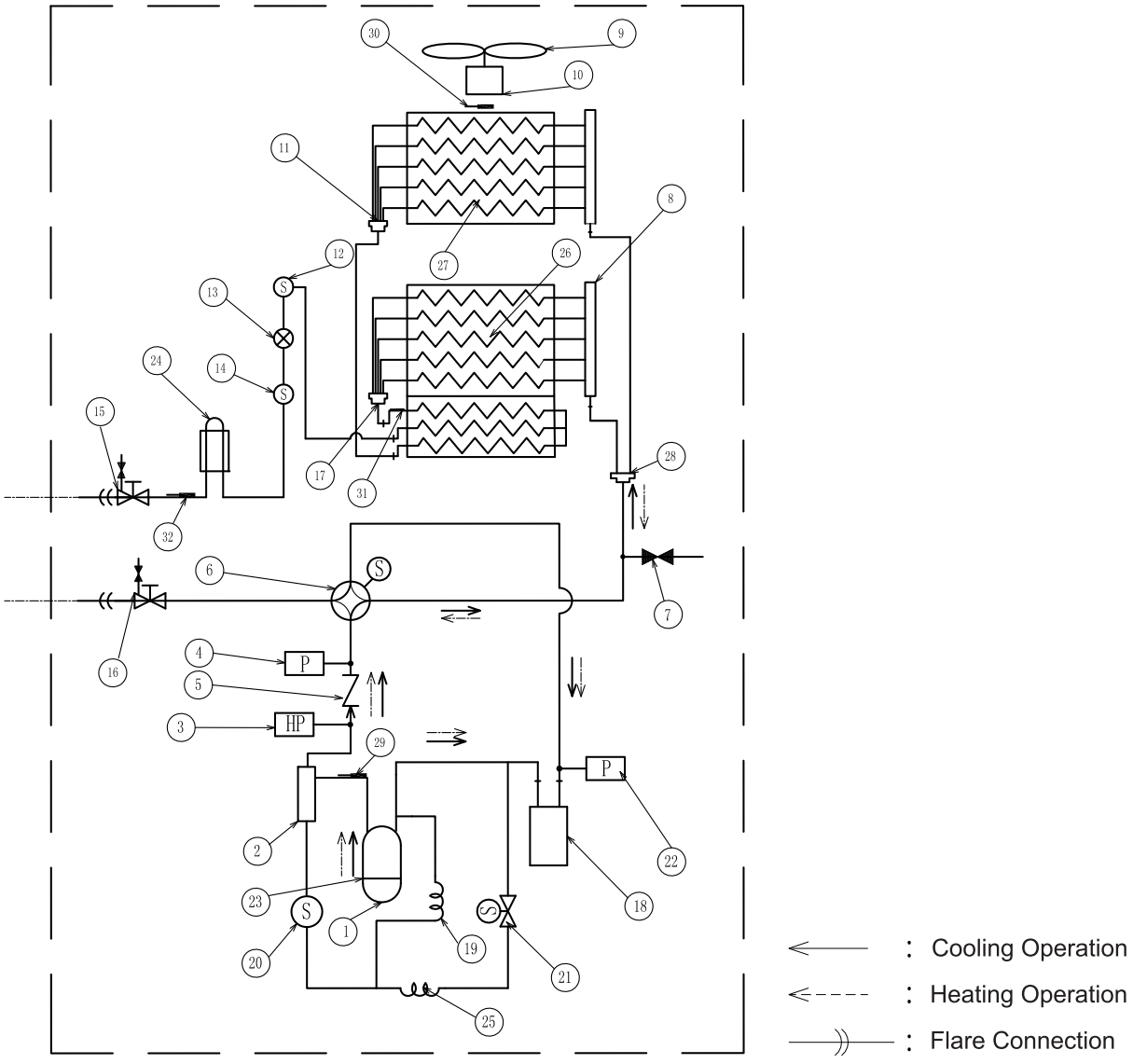
: Cooling Operation

: Heating Operation

: Flare Connection

NO.	Part Name	NO.	Part Name	NO.	Part Name
1	Compressor	13	Electronic Expansion Valve (EVO)	25	Capillary Tube
2	Oil Separator	14	Filter	26	Heat Exchanger
3	High Pressure Switch (PSH)	15	Liquid Stop Valve	27	Refrigerant Cooler
4	High Pressure Sensor (Pd)	16	Gas Stop Valve	28	Crankcase Heater (CH)
5	Check Valve	17	Filter	29	Plate Heat Exchanger
6	4-Way Reversing Valve (RVR)	18	Accumulator	30	Electronic Expansion Valve (EVB)
7	Service Valve	19	Capillary Tube	31	Filter
8	Distributor	20	Filter	32	Thermistor for Discharge Gas Temperature (Td)
9	Fan	21	Solenoid Valve (SVA)	33	Thermistor for Outdoor Unit Ambient (Ta)
10	Fan Motor	22	Low Pressure Sensor (Ps)	34	Thermistor for Heat Exchanger Liquid Pipe Temperature (Te)
11	Distributor	23	Crankcase Heater (CH)	35	Thermistor for Refrigerant Cooler (Tsc)
12	Filter	24	Filter	36	Thermistor for Outdoor Unit Heat Exchanger Liquid Pipe (Tchg)

Model: RAS-100~120HNBSTQ



NO.	Part Name	NO.	Part Name	NO.	Part Name
1	Compressor	12	Filter	23	Heat Exchanger
2	Oil Separator	13	Electronic Expansion Valve (EVO)	24	Refrigerant Cooling Assembly
3	High Pressure Switch (PSH)	14	Filter	25	Capillary
4	High Pressure Sensor (Pd)	15	Liquid Stop Valve	26	Heat Exchanger
5	Check Valve	16	Gas Stop Valve	27	Heat Exchanger
6	4-Way Reversing Valve (RVR)	17	Distributor	28	Distributor
7	Service Valve	18	Accumulator	29	Thermistor for Discharge Gas Temperature (Td)
8	Distributor	19	Capillary	30	Thermistor for Outdoor Unit Ambient (Ta)
9	Fan	20	Filter	31	Thermistor for Heat Exchanger Liquid Pipe Temperature (Te)
10	Fan Motor	21	Solenoid Valve (SVA)	32	Thermistor for Refrigerant Cooler (Tsc)
11	Distributor	22	Low Pressure Sensor (Ps)		

5.2 Control Logic

No.	Item		Details
1	Cooling Operation	Comp. Frequency Control	To determine the compressor frequency depending on (a),(b) and (c).
		I.U. Electronic Exp. Valve Control	● Quasi PI Control: To determine the I.U. electronic expansion valve opening so as to keep (d) at an optimum value. To change the I.U. electronic expansion valve opening when the number of operating indoor units is changed.
		O.U. Electronic Exp. Valve Control	EVO: 480pls (Fully Opened)
		Outdoor Fan Control	To control the fan steps so that High Pressure is within a stable temperature range.
		Reversing Valve Control	Reversing Valve: OFF
		Control of Solenoid Valve for High/ Low Pressure Bypass (SVA)	At Start-up and when High Pressure Increase Protection activated: ON
		High/Low Pressure Control	SVA: ON (during Operation Stop)
2	Heating Operation	Comp. Frequency Control	● PI Control: To determine the compressor frequency so as to keep High Pressure. To determine the compressor frequency from (a) and(c) when heating operation is started or the number of operating indoor units is changed.
		I.U. Electronic Exp. Valve(EVI) Control	● To determine the I.U. electronic expansion valve opening so that the indoor liquid pipe temperature (trl) is at an optimum level. To change the I.U. electronic expansion valve opening when the number of operating indoor units is changed.
		O.U. Electronic Exp. Valve(EVO) Control	● Quasi PI Control: To determine the O.U. electronic expansion valve opening so as to keep the temperature at the top of the compressor at an optimum level. When Operating Indoor Unit Number Changed: To determine the O.U. electronic expansion valve opening from the compressor frequency ratio before/after the change and Quasi PI Control.
		Outdoor Fan Control	The fan steps are dependent on Ta in the beginning. After that to control the fan steps so that Pd is within a stable pressure range.
		Reversing Valve Control	Reversing Valve: ON
		Control of Solenoid Valve for High/ Low Pressure Bypass (SVA)	At Start-up and when High Pressure Increase Protection activated: ON
		High/Low Pressure Control	SVA: ON (during operation stop)
3	Defrost Operation	Comp. Frequency Control	Fixed Compressor Frequency
		I.U. Electronic Exp. Valve Control	To determine the I.U. electronic expansion valve opening depending on the discharge temperature of the compressor (Td).
		O.U. Electronic Exp. Valve Control	EVO: 480pls (Fully Opened)
		Outdoor Fan Control	To stop the outdoor fan.
		Reversing Valve Control	Reversing Valve: OFF
		Control of Solenoid Valve for High/ Low Pressure Bypass (SVA)	at Start-up: ON
4	Comp. Preheating Control		Crankcase Heater Control

a . Difference between Indoor Inlet Air Temperature and Setting Temperature

b . Amount of Temperature Difference Change

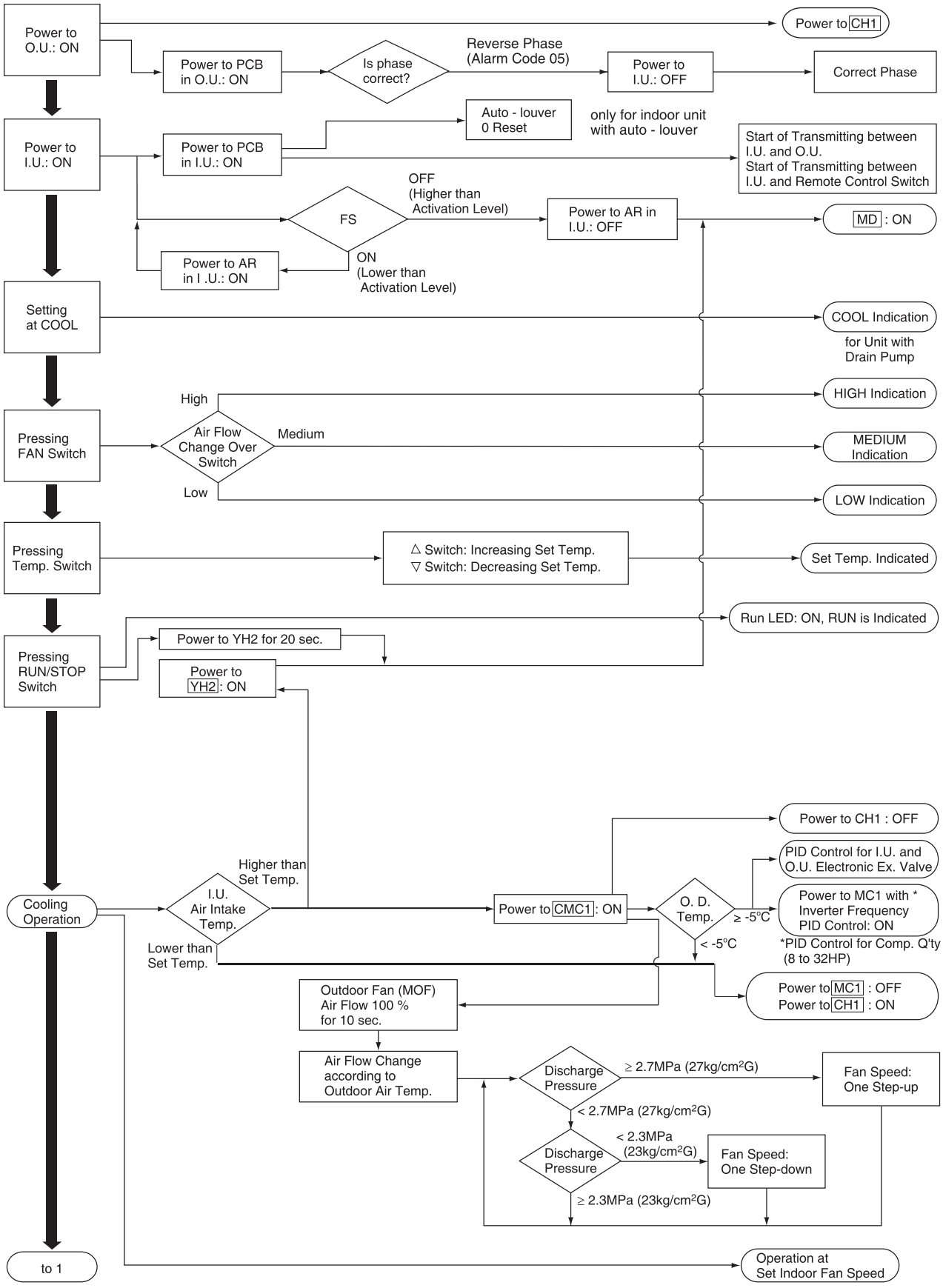
c . Capacity Ratio between Operating Indoor Unit and Outdoor Unit

d . Temperature Difference between Indoor Gas Pipe and Indoor Liquid Pipe
(= Indoor Gas Pipe Temperature - Indoor Liquid Pipe Temperature)

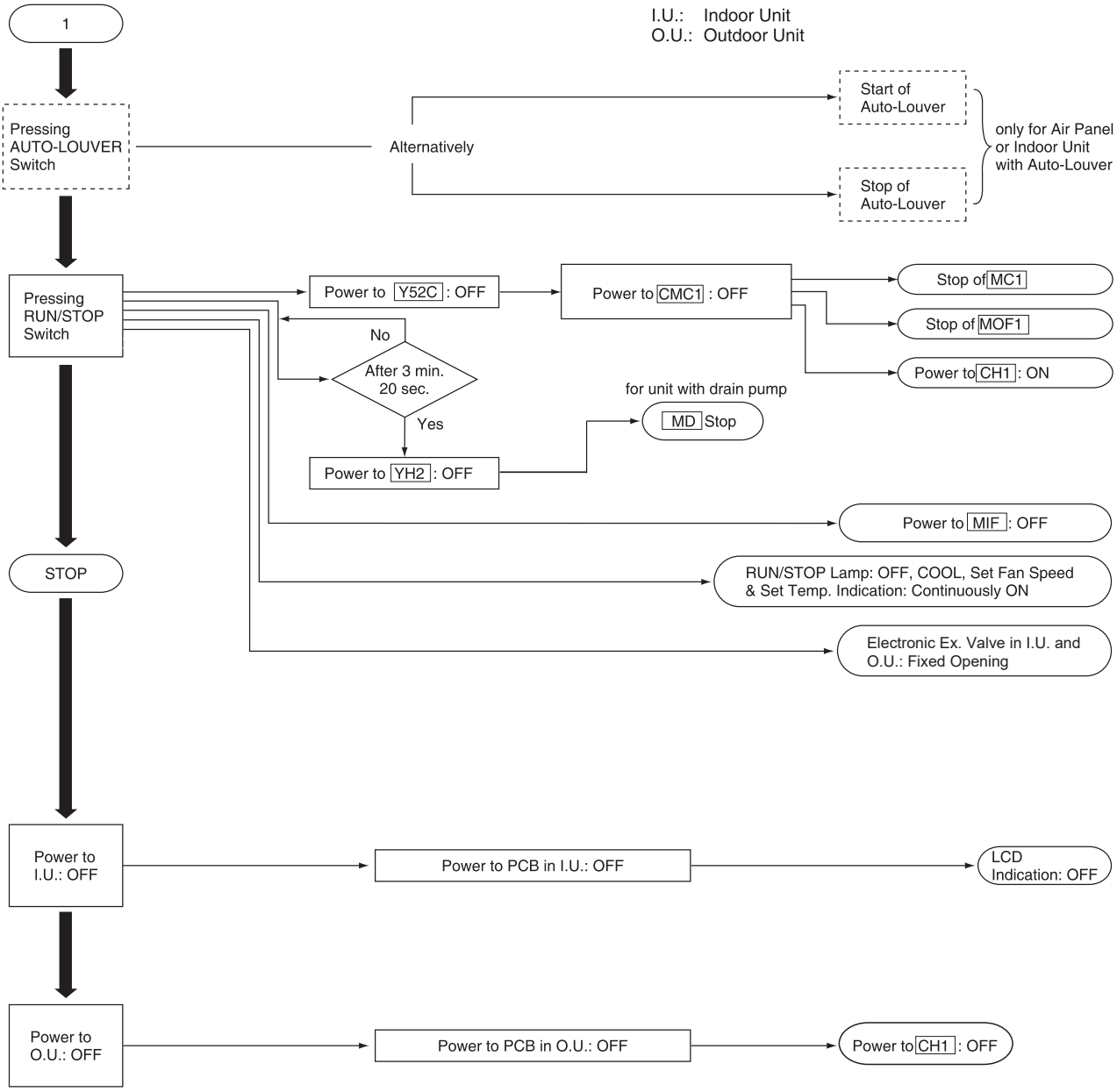
5.3 Standard Operation Sequence

Cooling Operation

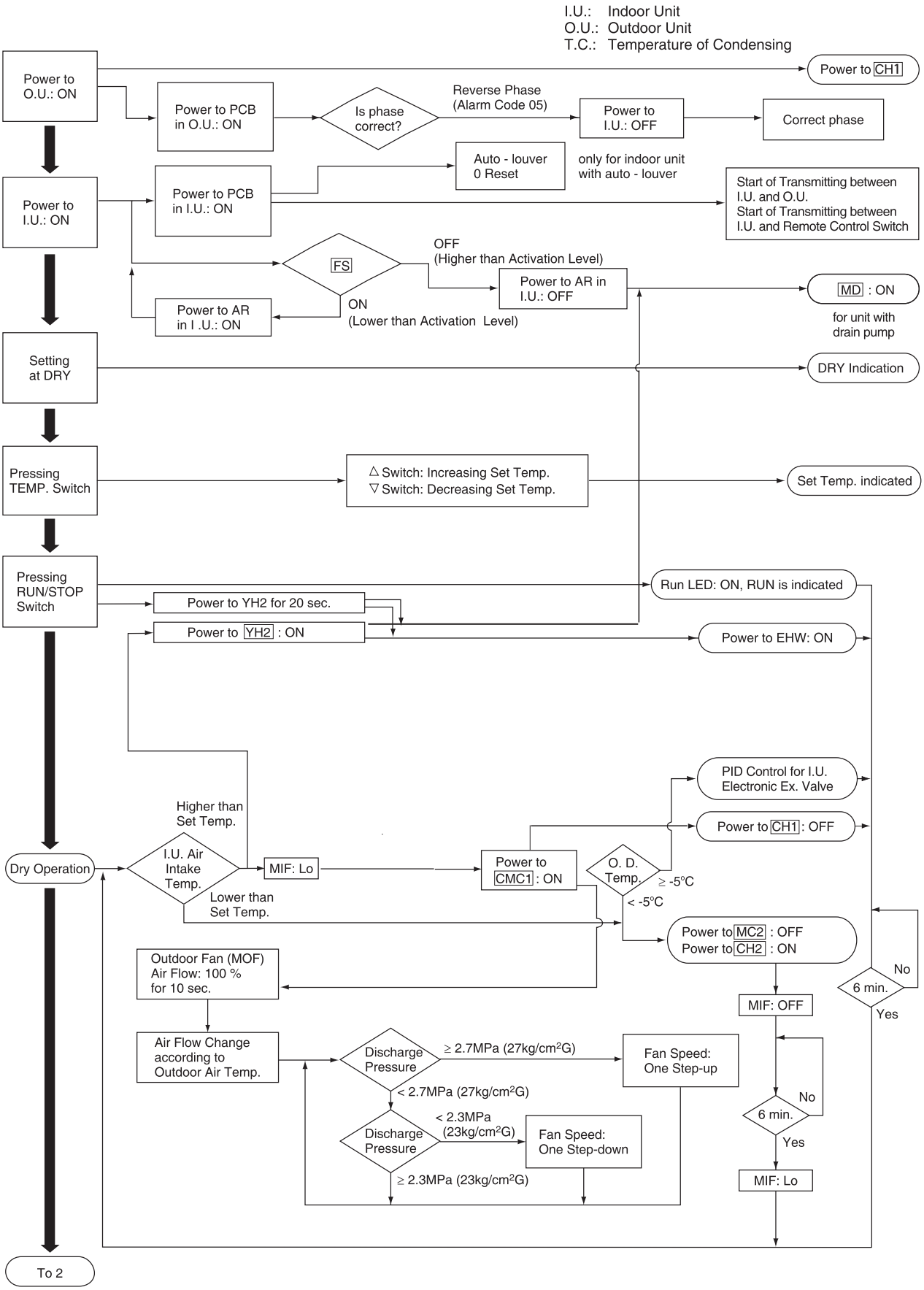
I.U.: Indoor Unit
O.U.: Outdoor Unit
T.C.: Temperature of Condensing



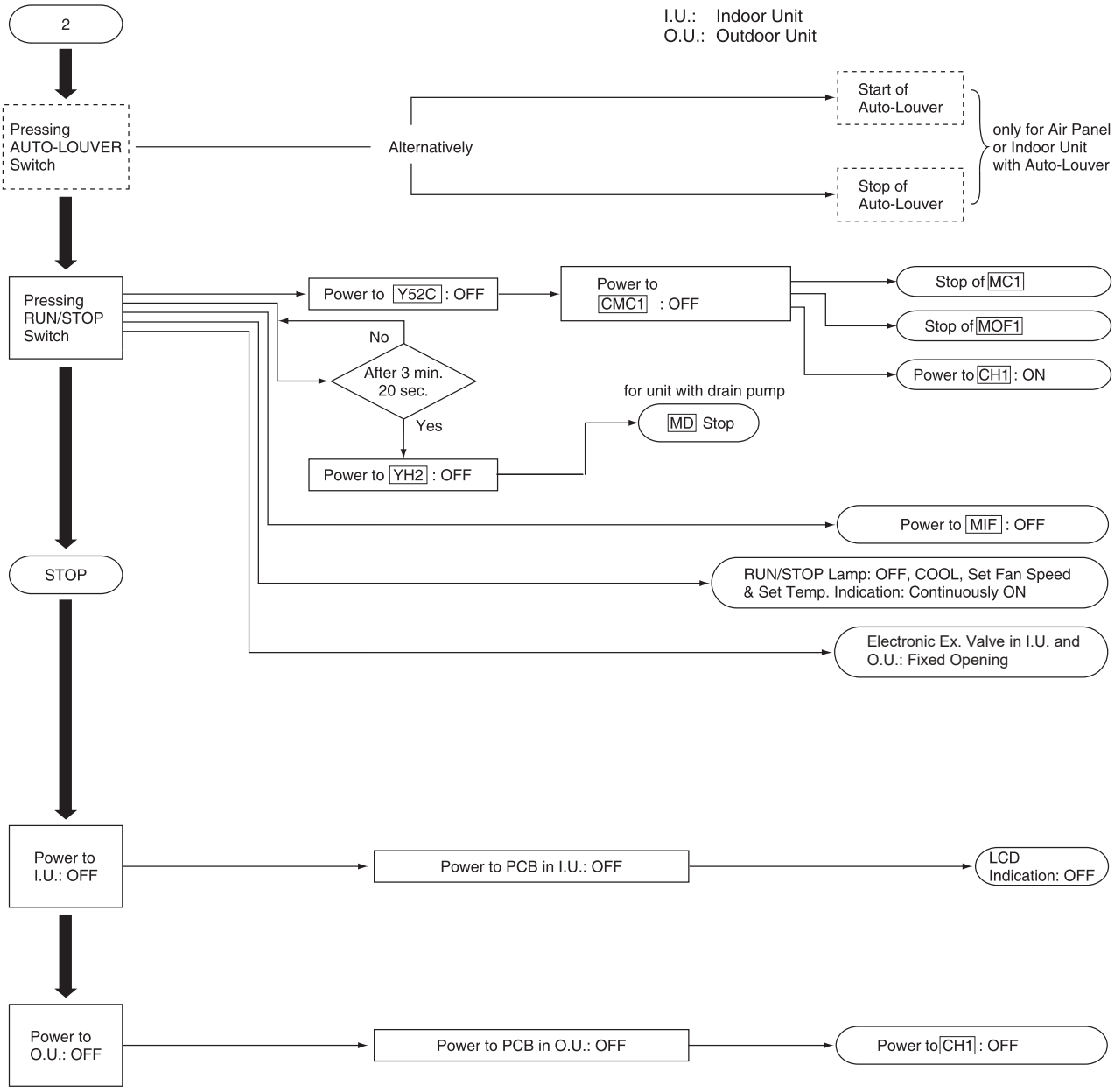
Cooling Operation



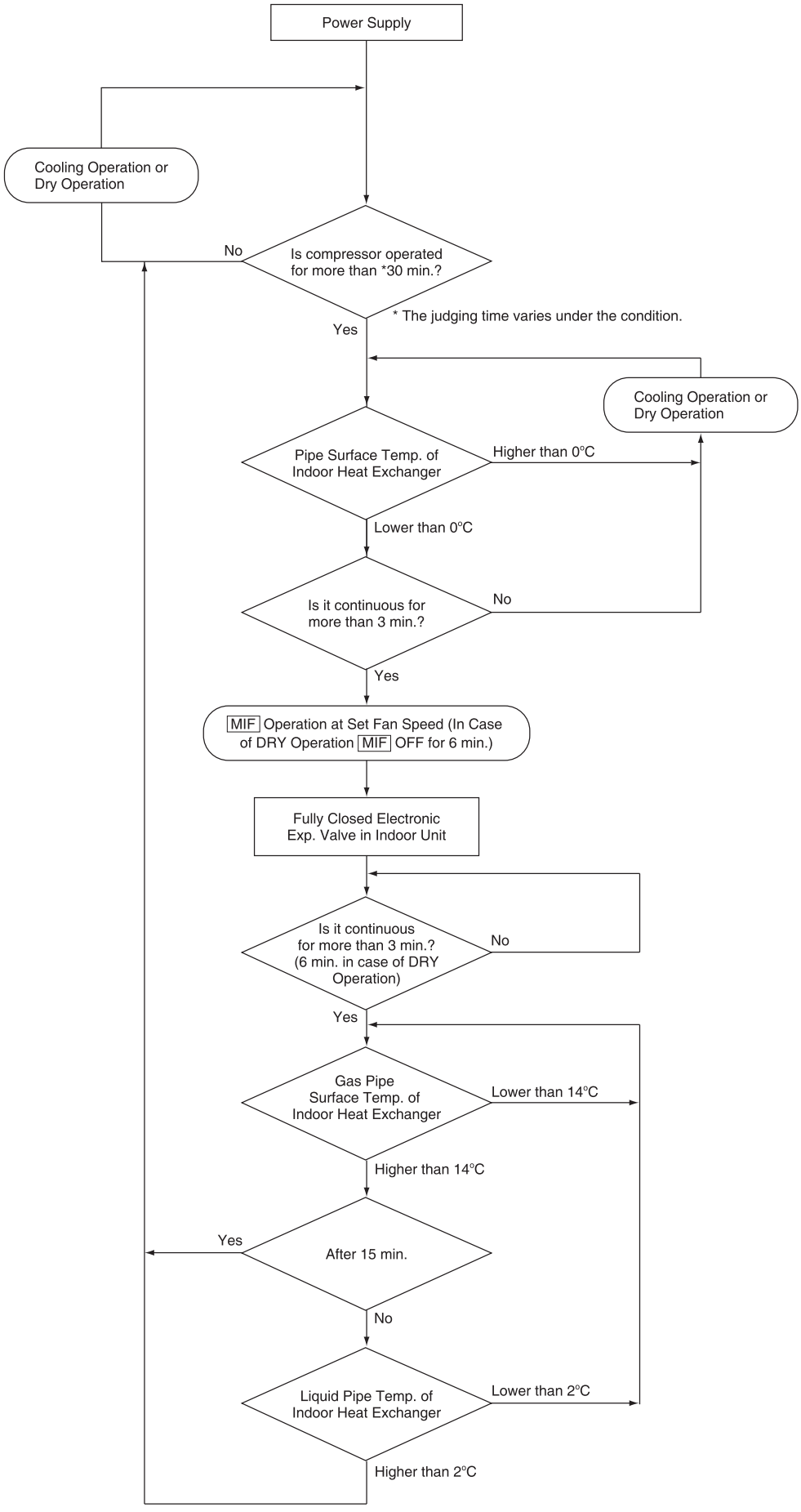
Dry Operation



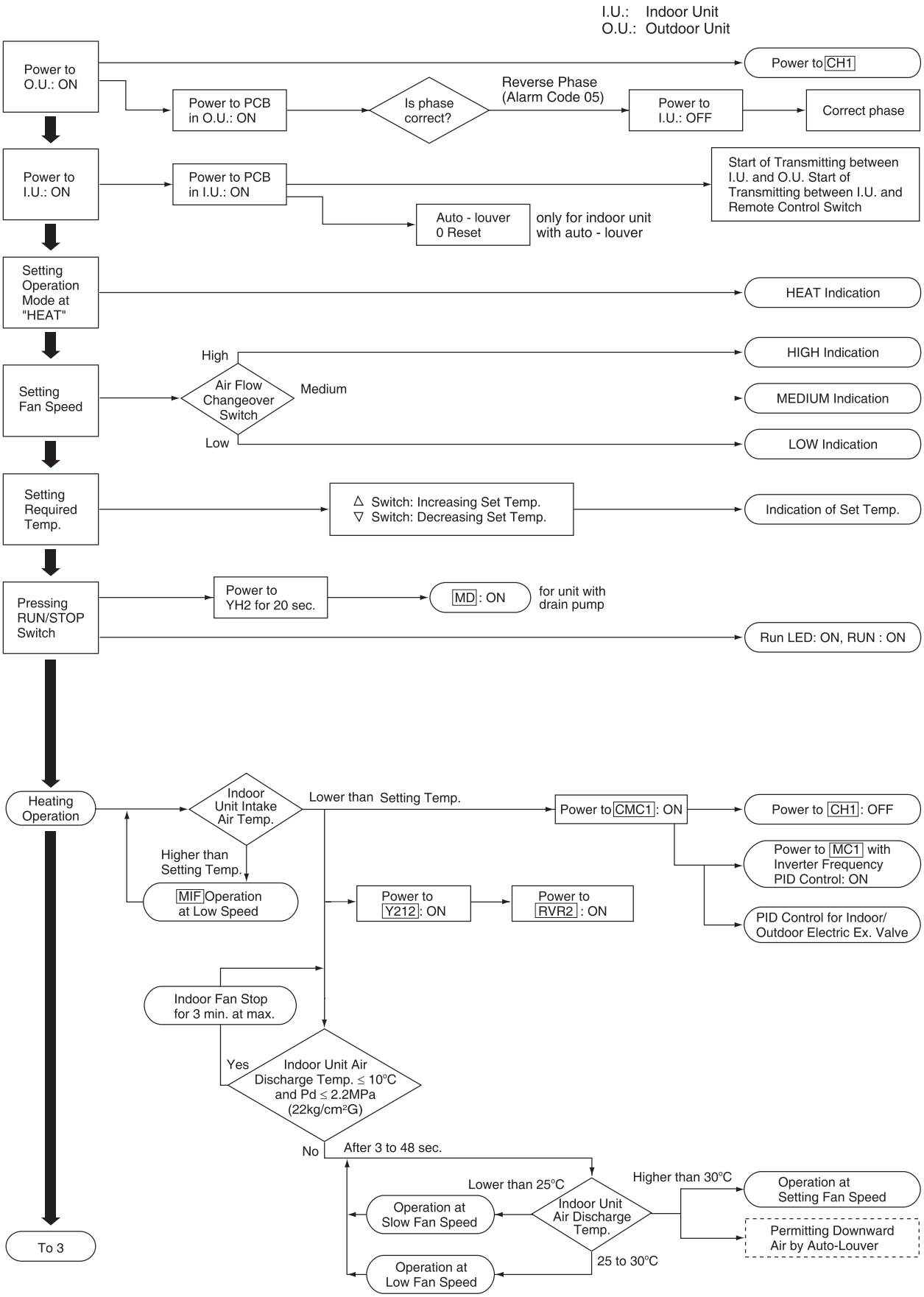
Dry Operation



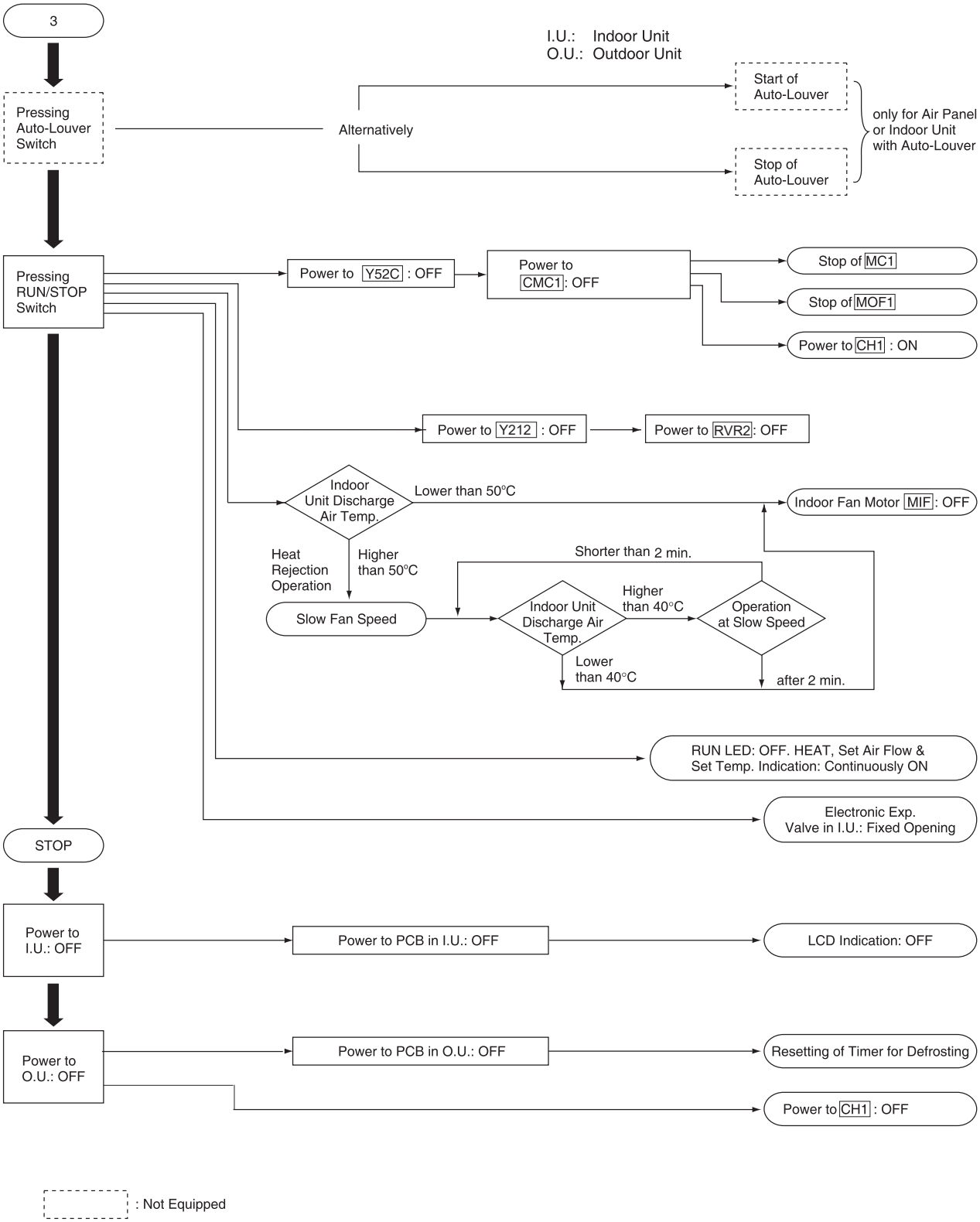
Freezing Protection Control during Cooling or Dry Operation



Heating Operation



Heating Operation



Defrosting Operation Control

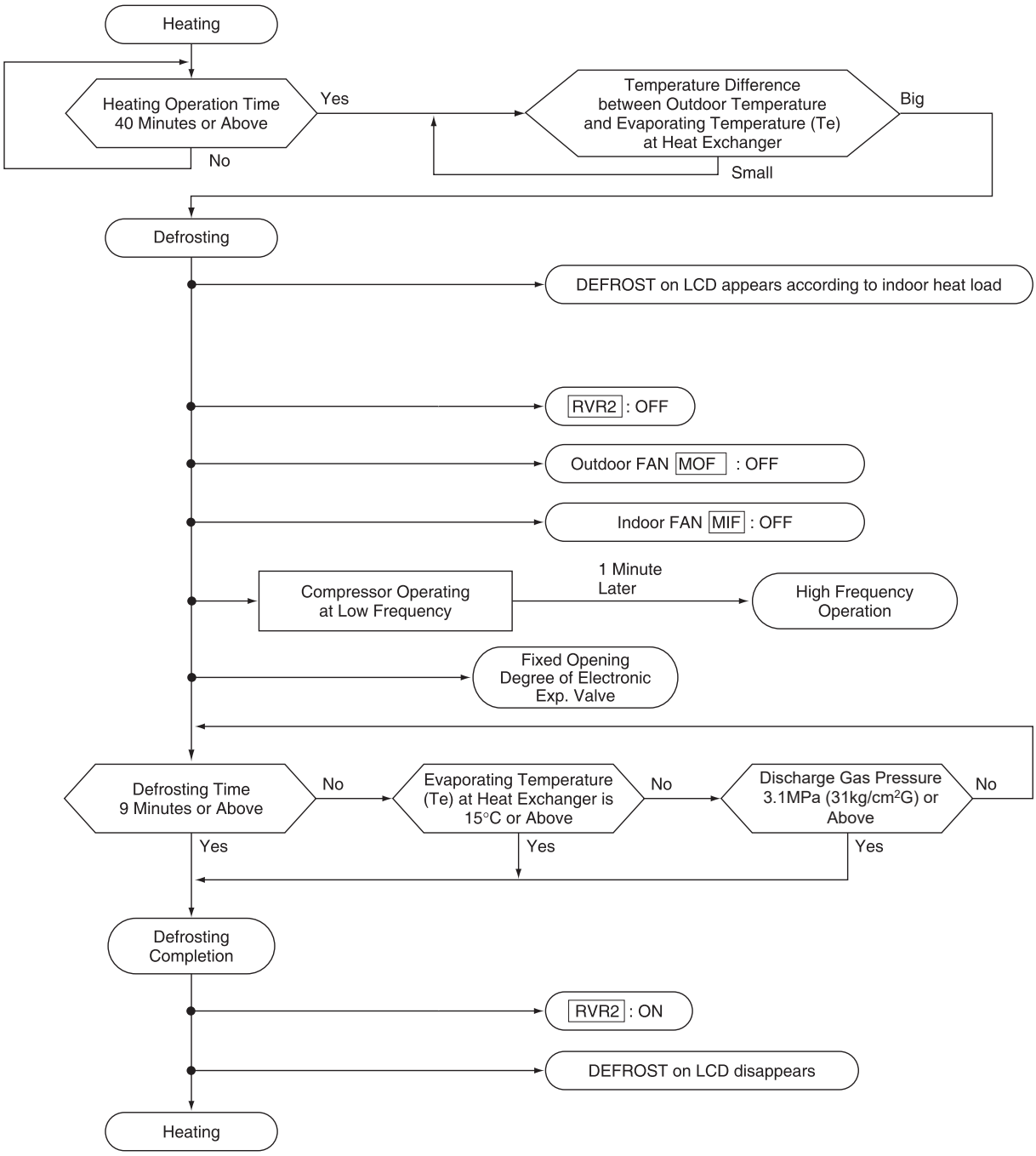


Table.5.1

CH	Crankcase Heater	in O.U.
FS	Float Switch	in I.U.
YH2	Relay for Condensate Pump Motor	in I.U.
MD	Condensate Pump Motor	in I.U.
MIF	Indoor Fan Motor	in I.U.
Y52C	Relay for Magnet Switch	in O.U.
CMC	Magnet Switch	in O.U.
MC	Compressor Motor	in O.U.
MOF	Outdoor Fan Motor	in O.U.
RVR	Reversing Valve	in O.U.

Part name	Mark	Port	Purpose
Electronic expansion valve of outdoor unit	EVO	CN5A (MV1)	During heating, throttle the liquid refrigerant.
High Pressure Sensor of Outdoor Unit	Pd	CN4 (Pd)	Measure the discharge pressure of the compressor
Low Pressure Sensor of Outdoor Unit	Ps	CN9 (Ps)	Measure the suction pressure of the compressor
High Pressure Switch of Outdoor Unit	PSH	PCN401 (63H1)	Prevent the system pressure from exceeding 4.15MPa
Low Pressure Switch of Outdoor Unit	PSL	PCN60 (63H2)	Prevent the system pressure from being lower than 0.05MPa
Thermistor for Discharge Gas Temperature	Td	THM9 (Td)	Measure the compressor discharge temperature
Thermistor for Heat Exchanger Liquid Pipe Temperature	Te	THM8 (Te)	Measure the evaporation temperature of the system during heating operation
Thermistor for Outdoor Unit Ambient	Ta	THM7 (To1)	Measure the outdoor ambient temperature
Thermistor for Refrigerant Cooler	Tsc	THM19 (Tsc)	Measure the temperature of refrigerant cooler
Crankcase Heater of Outdoor Unit	CH	PCN5 (CH)	Heat the oil at the bottom of the compressor
Reversing Valve of Outdoor Unit	RVR	PCN6 (21)	Change the status of outdoor heat exchanger (evaporator or condenser)
Solenoid Valve for Hot Gas Bypass	SVA	PCN7 (20A)	When the system pressure is too high or too low, balance the system pressure
Oil return solenoid valve	SVF	PCN12 (20B)	Ensure the oil return

< Defrost Operation >

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

(1) Standard Defrost
This operation starts according to the outdoor temperature, the outdoor evaporating temperature and the operating time.

(2) Forced Defrost
This operation starts when the indoor unit repeats Thermo-ON/OFF* operation and therefore cannot start the “Standard Defrost.”

(3) Manual Defrost
This operation starts when the push switch “PSW1” on the outdoor unit PCB is pressed for more than 3 seconds during maintenance, etc. (This function cannot be used when the pressure and the outdoor evaporating temperature is high or at the beginning of the operation.)

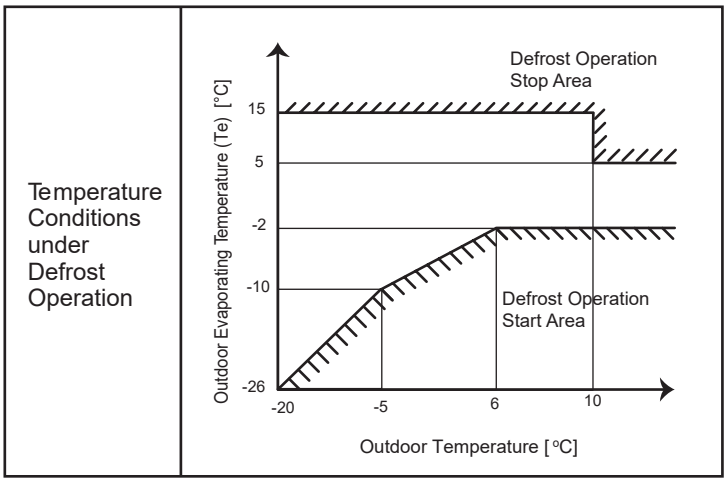
NOTE:
Do not repeatedly use “Manual Defrost” frequently.

* 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.

< Condition for Starting Defrost Operation >

(1) Standard Defrost

(a) Temperature Condition



(b) Condition of Operating Time for Defrost Operation Start

The defrost operation starts when the temperature condition shown in “(a) Temperature Condition” is met after a heating operation of 30 to 120 minutes. The heating operation time is determined by estimating the amount of frost on the heat exchanger.

(2) Forced Defrost

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

(a) The reversing valve is “ON” for more than 120 minutes.

(b) The outdoor temperature is 10 °C or lower.

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

(d) The compressor is operated continuously for more than 90 seconds.

(e) The outdoor evaporating temperature is lower than 5°C right before the operation starts.

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

< Condition for Completing Defrost Operation >

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

(1) The outdoor evaporating temperature reaches 25°C within 2 minutes after the defrost operation starts.

(2) The outdoor evaporating temperature reaches 15°C (the outdoor temperature < 10°C) and high pressure reaches 1.5MPa after a lapse of 2 minutes or more from the defrost operation start.

(3) The outdoor evaporating temperature reaches 5°C (the outdoor temperature > 10°C) after a lapse of 2 minutes or more from the defrost operation start.

(4) The temperature at the top of the compressor reaches 132°C.

(5) The pressure switch for control is “ON”.

(6) The high pressure reaches 3.3MPa within 20 seconds after the defrost operation starts.

(7) The high pressure reaches 3.1MPa after a lapse of 2 minutes or more from the defrost operation start.

(8) More than 9 minutes have passed from the defrost operation start.

NOTE:

The defrost operation does not start immediately even if the above conditions are met, because these conditions may be met temporarily depending on the refrigerant system variability.

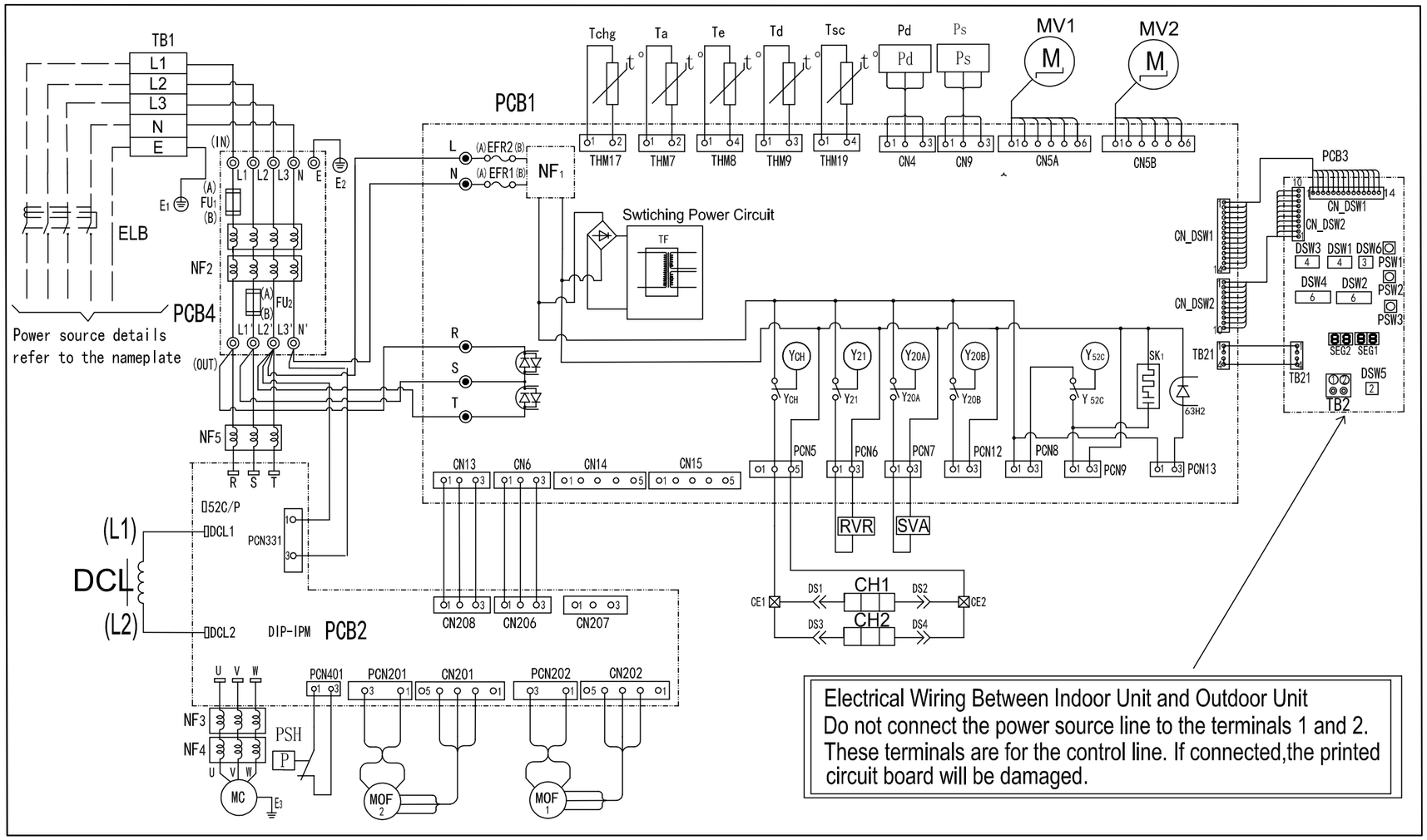
The defrost operations start when these conditions are met continuously for a certain period of time.

5.4 Electrical Wiring Diagram

RAS-080/090HNBSTQ

Electrical Operation or Periodic Inspection is Allowed Only After the Main Power is Turned Off for Ten Minutes

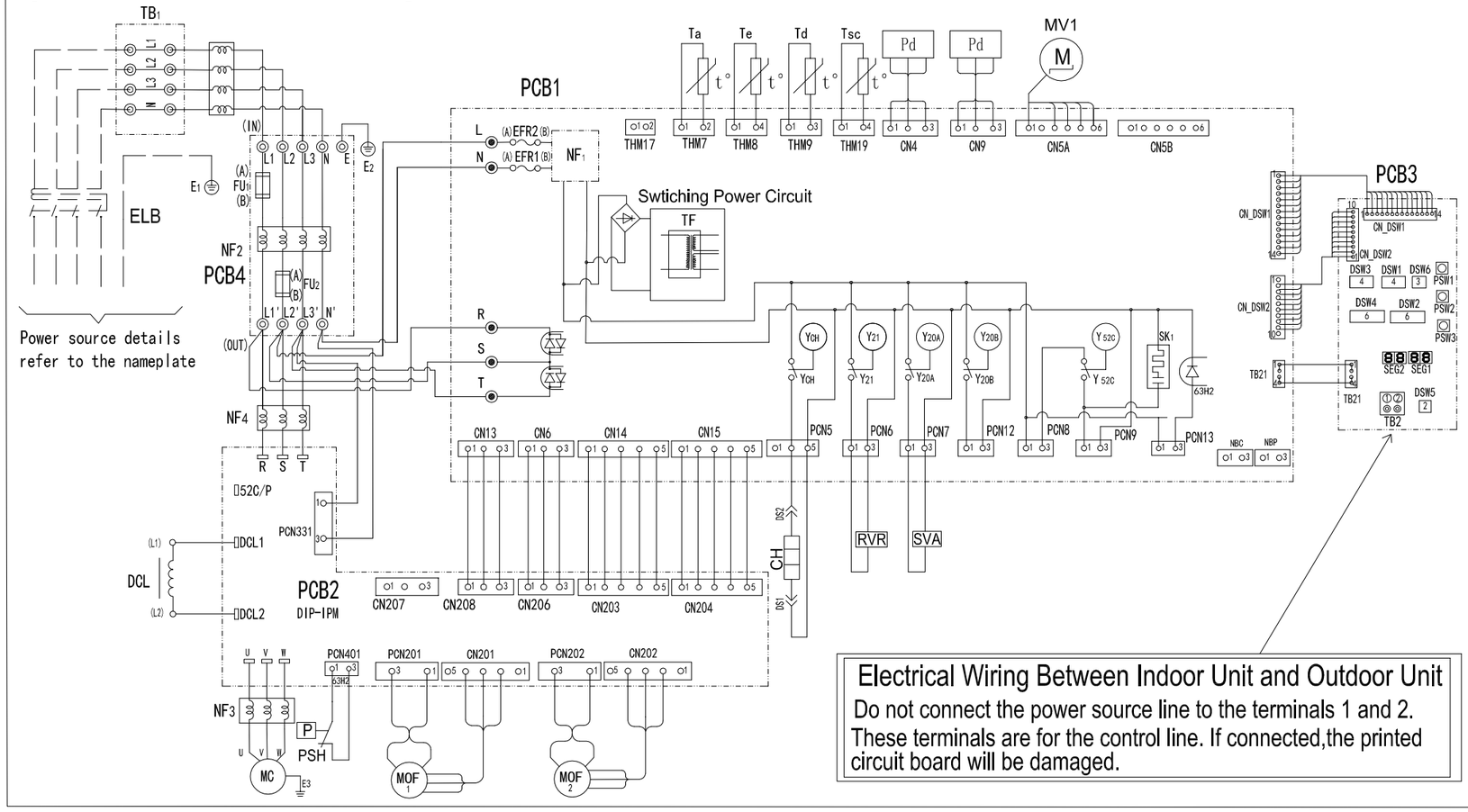
[ELECTRICAL WIRING DIAGRAM]



MARK	NAME
MC	Motor for Compressor
MOF_1	Motor for Out Fan
MOF_2	Motor for Out Fan
$FU_{1\sim2}$	Fuse
$MV_{1\sim2}$	Micro-Computer Control Expansion Valve
RVR	Reversing Valve Relay
SVA	Solenoid Valve for Hot Gas Bypass
PSH	High Pressure Switch
P_d	Refrigerant pressure sensor (vent side)
P_s	Refrigerant pressure sensor
$TB_{1\sim2}$	Terminal Board
TF	Transformer
$PCB_{1\sim4}$	Printed circuit board
$EFR_{1\sim2}$	Fuse
Y_{52C}	Relay(CMC)
Y_{21}	Relay(RAR)
Y_{CH}	Relay(CH)
Y_{20A}	Relay(SVA)
Y_{20B}	Relay
THM7	Thermister
THM8	Thermister
THM9	Thermister
THM17	Thermister
THM19	Thermister
DCL	Reactor
CN、PCN	Terminal
$NF_{1\sim5}$	Noise Filter
PSW1	Push switch on PCB3
PSW2	Push switch on PCB3
PSW3	Push switch on PCB3
DSW1	Dip switch on PCB3
DSW2	Dip switch on PCB3
DSW3	Dip switch on PCB3
DSW4	Dip switch on PCB3
DSW5	Dip switch on PCB3
DSW6	Dip switch on PCB3
$CH_{1\sim2}$	Crankcase Heater
$CE_{1\sim2}$	Terminal
$E_{1\sim3}$	Ground line

⚠ Electrical Operation or Periodic Inspection is Allowed Only After the Main Power is Turned Off for Ten Minutes

[ELECTRICAL WIRING DIAGRAM]



Electrical Wiring Between Indoor Unit and Outdoor Unit

Do not connect the power source line to the terminals 1 and 2.
These terminals are for the control line. If connected,the printed circuit board will be damaged.

MARK	NAME
MC	Motor for Compressor
MOF_1	Motor for Out Fan
MOF_2	Motor for Out Fan
$FU_{1\sim2}$	Fuse
MV_1	Micro-Computer Control Expansion Valve
RVR	Reversing Valve Relay
SVA	Solenoid Valve for Hot Gas Bypass
PSH	High Pressure Switch
P_d	Refrigerant pressure sensor (vent side)
P_s	Refrigerant pressure sensor
$TB_{1\sim2}$	Terminal Board
TF	Transformer
$PCB_{1\sim4}$	Printed circuit board
$EFR_{1\sim2}$	Fuse
Y_{21}	Relay(RAR)
Y_{CH}	Relay(CH)
Y_{20A}	Relay(SVA)
THM7	Thermister(Air)
THM8	Thermister(Pipe)
THM9	Thermister(Td)
THM19	Thermister(Refrigerant pipe)
DCL	Reactor
CN、PCN	Connector
$NF_{1\sim4}$	Noise Filter
PSW1	Push switch on PCB3
PSW2	Push switch on PCB3
PSW3	Push switch on PCB3
DSW1	Dip switch on PCB3
DSW2	Dip switch on PCB3
DSW3	Dip switch on PCB3
DSW4	Dip switch on PCB3
DSW5	Dip switch on PCB3
DSW6	Dip switch on PCB3
CH	Crankcase Heater
$E_{1\sim3}$	Ground line

INSTALLATION

1. Safety Summary

<Signal Words>

- Signal words are used to identify levels of hazard seriousness.
- Definitions for identifying hazard levels are provided below with their respective signal words.

⚠ DANGER DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE NOTICE is used to address practices not related to personal injury.

NOTICE NOTE is useful information for operation and/or maintenance.

⚠ DANGER

- Do not perform installation work, refrigerant piping work, drain pump, drain piping and electrical wiring connection without referring to our installation manual. If the instructions are not followed, it may result in a water leakage, electric shock or a fire.
- Use the specified non-flammable refrigerant (R410A) to the outdoor unit in the refrigerant cycle. Do not charge material other than R410A into the unit such as hydrocarbon refrigerants (propane or etc.), oxygen, flammable gases (acetylene or etc.) or poisonous gases when installing, maintaining and moving. These flammable gases are extremely dangerous and may cause an explosion, a fire and injury.
- Do not pour water into the indoor or outdoor unit. These products are equipped with electrical parts. If poured, it will cause a serious electrical shock.
- Do not open the service cover or access panel for the indoor or outdoor units without turning OFF the main power supply
- Do not touch or adjust safety devices inside the indoor unit or outdoor units. If these devices are touched or readjusted, it may cause a serious accident.
- Refrigerant leakage can cause difficulty with breathing due to insufficient air. Turn OFF the main switch, extinguish any naked flame and contact your service contractor, if refrigerant leakage occurs.
- Make sure that the refrigerant leakage test should be performed. Refrigerant (Fluorocarbon) for this unit is incombustible, non-toxic and odorless. However if the refrigerant is leaked and is contacted with fire, toxic gas will generate. Also because the fluorocarbon is heavier than air, the floor surface will be filled with it, which could cause suffocation.
- The installer and system specialist shall secure safety against refrigerant leakage according to local regulations or standards.
- Use an ELB (Earth Leakage Breaker). In the event of fault, there is danger of an electric shock or a fire if it is not used.
- Do not install the outdoor unit where there is high level of oil mist, flammable gases, salty air or harmful gases such as sulfur.
- For installation, firmly connect the refrigerant pipe before the compressor starts operating. For maintenance, relocation and disposal, remove the refrigerant pipe after the compressor stops.
- Do not perform a short-circuit of the protection device such as a pressure switch when operating. It may cause a fire and explosion.
- The A-weighted emission sound pressure level do not exceed 70 dB(A).

⚠ WARNING

- Do not use any sprays such as insecticide, lacquer, hair spray or other flammable gases within approximately one meter from the system.
- If circuit breaker or fuse is often activated, stop the system and contact your service contractor.
- Check that the ground wire is securely connected. If the unit is not correctly grounded, it may lead to electric shock. Do not connect the ground wiring to gas piping, water piping, lightning conductor or ground wiring for telephone.
- Connect a fuse of specified capacity.
- Before performing any brazing work, check to ensure that there is no flammable material around. When using refrigerant be sure to wear leather gloves to prevent cold injuries.
- Protect the wires, electrical parts, etc. from rats or other small animals. If not protected, rats may gnaw at unprotected parts and which may lead to a fire.
- Fix the cables securely. External forces on the terminals could lead to a fire.
- Provide a sufficiently strong foundation. If not, the unit may fall down and it may lead to injuries.
- Do not install the unit in a place where oil, vapor, organic solvent and corrosive gas (ammonia, sulfur compound and acid) may be present in quantities. It may cause refrigerant leakage due to corrosion， electrical shock, deteriorated performance and breakage.
- Perform electrical work according to Installation Manual and all the relevant regulation and standards. If the instructions are not followed, an electrical shock and fire may occur due to insufficient capacity and inadequate performance.
- Use specified cables between units and choose the cables correctly. If not, an electrical shock or fire may occur.
- Ensure that the wiring terminals are tightened securely with the specified torques. If not, generating fire or electrical shock at the terminal connection part may occur.
- If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.
- This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities， or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- Children should be supervised to ensure that they do not play with the appliance.
- This appliance can be used by children aged from 8 years and above and persons with reduced physical， sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved.
- Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.
- The appliances are not intended to be operated by means of an external timer or separate remote-control system.
- Keep the appliance and its cord out of reach of children under the age of 8.

⚠ CAUTION

- Do not step or put any material on the product.
- Do not put any foreign material on the unit or inside the unit.
- Provide a strong and correct foundation so that:
  a. The outdoor unit is not on an incline.
  b. Abnormal sound does not occur.
  c. The outdoor unit will not fall down due to a strong wind or earthquake.

NOTICE

- Do not install the indoor unit, outdoor unit, remote control switch and cable within approximately 3 meters from strong electromagnetic wave radiators such as medical equipment.
- Supply electrical power to the system to energize the oil heater for 12 hours before startup after a long shutdown.
- Make sure that the outdoor unit is not covered with snow or ice, before operation.
- In some cases, the packaged air conditioner may not be operated normally under the following cases.
  * In case that electrical power for the packaged air conditioner is supplied from the same power transformer as the device*.
  * In case that the power source wires for the device* and the packaged air conditioner are located close to each other.
  Device*: (Ex) Lift, container crane, rectifier for electric railway, inverter power device, arc furnace, electric furnace, large-sized induction motor and large-sized switch. It consumes a large quantity of electrical power.
  Regarding the cases mentioned above, surge voltage may be inducted into the power supply cables for the packaged air conditioning due to a rapid change in power consumption of the device and an activation of a switch.
  Check field regulations and standards before performing electrical work in order to protect the power supply for the new air conditioning unit.

NOTE

- It is recommended that the room be ventilated every 3 to 4 hours.
- The heating capacity of the heat pump unit is decreased according to the outdoor air temperature. Therefore, it is recommended that auxiliary heating equipment be used in the field when the units are installed in a low temperature region.

2. Before Installation

2.1 Necessary Tools and Instrument List for Installation

No.	Tool	No.	Tool
1	Handsaw	12	Wrench
2	Phillips Screwdriver, Slotted Screwdriver	13	Scale
3	Vacuum Pump	14	Charging Cylinder
4	Refrigerant Gas Hose	15	Gauge Manifold
5	Megohmmeter	16	Wire Cutters
6	Copper Pipe Bender	17	Gas Leak Detector
7	Manual Water Pump (for Indoor Unit)	18	Leveller
8	Pliers	19	Crimper for Solderless Terminals
9	Pipe Cutter	20	Hoist (for Indoor Unit)
10	Brazing Kit	21	Ammeter
11	Hexagon Wrench	22	Voltage Meter

It is recommended to use specially designated tools for handling R410A refrigerant.

■ : Interchangeability is available with current R22
▼ : Prohibited
● : only for Refrigerant R410A (not interchangeable with R22)
★ : only for Refrigerant R407C (not interchangeable with R22)

Measuring Instrument and Tool		Interchangeability with R22		Reason of Non-Interchangeability and Attention (○: Strictly Required)	Use
		R410A	R407C		
Refrigerant Pipe	Pipe Cutter, Chamfering Reamer	■	■	-	Cutting Pipe Removing Burrs
	Flaring Tool	■	■	* The flaring tools for R407C are applicable to R22. * If using flaring tube, make dimension of tube larger for R410A. * In case of hard temper pipe, flaring is not available.	Flaring for Tubes
	Extrusion Adjustment Gauge	●	-		Dimensional Control for Extruded Portion of Tube after Flaring
	Pipe Bender	■	■	* In case of hard temper pipe, bending is not available. Use elbow for bend and braze.	Bending
	Expanding Tool	■	■	* In case of hard temper pipe, expanding of tube is not available. Use socket for connecting tube.	Expanding Tubes
	Torque Wrench	●	■	* For 12.7mm D., 15.88mm D., wrench size is up 2mm.	Connection of Flare Nut
		■	■	* For 6.35mm D., 9.52mm D., 19.05mm D., wrench size is the same.	
	Brazing Tool	■	■	* Perform correct brazing work.	Brazing for Tubes
	Nitrogen Gas	■	■	* Strict control against pollution (Blow nitrogen during brazing.)	Prevention from Oxidation during Brazing
	Lubrication Oil (for Flare Surface)	●	★	Use a synthetic oil which is equivalent to the oil used in the refrigeration cycle. Synthetic oil absorbs moisture quickly.	Applying Oil to the Flared Surface
Vacuum Drying Refrigerant Charge	Refrigerant Cylinder	●	★	* Check refrigerant cylinder color. ○ Liquid refrigerant charging is required regarding zeotropic refrigerant."	Refrigerant Charging
	Vacuum Pump	■	■	○ It is required to mount a vacuum pump adapter (check valve) to prevent oil of the vacuum pump from being pulled when the vacuum pump stops.	Vacuum Pumping
	Adapter for Vacuum Pump (Check Valve)	※●	★		
	Manifold Valve	●	★	○ Use manifold and charging hoses designed for each refrigerant as design pressure is different. Do not share manifold and charging hoses with other refrigerant type to prevent mixing of different type of refrigerant oil. (If use, it may cause cycle choking or compressor failure.) Standard of Connection Diameter; R410A: UNF1/2, R407C: UNF7/16.	Vacuum Pumping, Vacuum Holding, Refrigerant Charging and Check of Pressures
	Charging Hose	●	★		
	Charging Cylinder	▼	▼	* Use the weight scale.	-
	Weight Scale	■	■	-	Measuring Instrument for Refrigerant Charging
	Refrigerant Gas Leakage Detector	※●	★	* Use a detector designed for each refrigerant as detecting method is different.	Gas Leakage Check

※: Interchangeability with R407C.

2.2 Structure

Refer to “Design 2.6 Structure”

2.3 Refrigerant Cycle Diagram

Refer to “Design 5.1 Refrigerant Cycle”.

2.4 Combination of Indoor Unit and Outdoor Unit

The range of the connectable indoor unit capacity ratio is 50%~130%.

*The connectable indoor unit capacity ratio can be calculated as follows:

Connectable Indoor Unit Capacity Ratio = Total Indoor Unit Capacity / Total Outdoor Unit Capacity.

The number of indoor units that can be connected to an outdoor unit is defined in the following table:

Outdoor Unit Model	Rated Capacity (kW)	Min. Total Capacity of the connectable indoor units (kW)	Max. Total Capacity of the connectable indoor units (kW)	Numbers of the connectable indoor units (Q'ty)	Min. Capacity at Individual Operation (kW)
80	22.4	11.2	29.1	1(*1)~12	1.8
90	24.1	12.1	31.3	1(*1)~12	1.8
100	28.0	14.0	36.4	1(*1)~13	1.8
110	30.0	15.5	40.3	1(*1)~16(*2)	1.8
120	33.5	16.8	43.5	1(*1)~19(*2)	1.8

* 1 When only one indoor unit is connected, the connectable indoor unit capacity ratio must be 100%.

* 2 To ensure the heating performance in winter, the recommended number of the connectable indoor units should not exceed 13. If it exceeds, please contact your distributor or dealer.

NOTE:

(1) It is suggested that the total capacity of indoor units which are operated simultaneously should not exceed the capacity of outdoor units under the following conditions. Otherwise, there is a decrease in operating performance.

◆ When there are some round-way cassette indoor units and wall-mounted indoor units in the system;

◆ When the outdoor air temperature is 43° C or more during the outdoor unit cooling operation;

◆ When the outdoor air temperature is lower than -10°C during the outdoor unit heating operation.

(2) For the same system, if the connectable indoor unit capacity ratio is over than 100%, and which all the indoor units operate simultaneously, capacity of every indoor unit should be less than its rated capacity.

2.5 Factory supplied Accessories

The accessories are packed with the outdoor unit, please check that in the package.

Accessory	Quantity
Installation Manual	 ×1
Plastic Bag	 ×1
Cord Clamp (Big)	 ×1
Cord Clamp (Small)	×2
Washer	 ×4
Accessory Pipe Pouch	 ×1
	 ×1
Magnetic Ring (Big)	 ×1
Magnetic Ring (Small)	 ×1

NOTE:

If any of these accessories are not packed with the unit, please contact your distributor.

2.6 Transportation

Transport the product as near to the installation location before unwrapping the package.

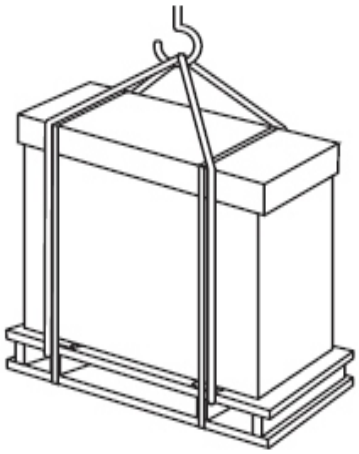
⚠ CAUTION

- Do not put any material or stand on the product. Apply two lifting wires onto the outdoor unit, when lifting it by crane.
- The Method of Hanging

  When hanging the unit, ensure a balance of the unit, ensure its safety and lift up smoothly.

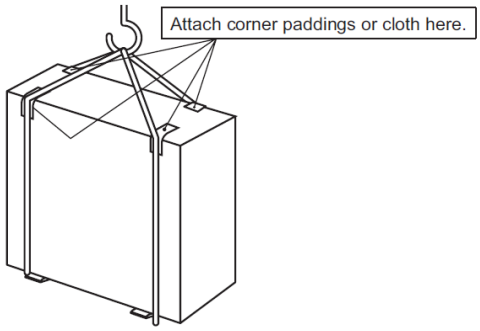
  (a)Do not unwrap the package unless the hanging work is finished.

  (b)The hanging work can be conducted according to the figure below.



NOTE:

- Make sure the unit is horizontal while lifting.
- Do not hook with the plastic bands.
- If the unit is lifted after unwrapping the package, protect the unit with the corner paddings or cloth.



⚠ WARNING

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

3. Outdoor Unit Installation

3.1 Installation Location and Precautions

◆ When installing the unit into:

- A wall: Make sure the wall is strong enough to hold the weight of the unit. It may be necessary to construct a strong wood or metal frame to provide added support.
- A room: Properly insulate any refrigerant tubing run inside a room to prevent “sweating” that can cause dripping and water damage to wall and floors.
- Damp or uneven areas: Use a raised concrete pad or concrete blocks to provide a solid and level foundation for the unit to prevent water damage and abnormal vibration.
- An area with high winds: Securely anchor the outdoor unit down with bolts and a metal frame. Provide a suitable wall for wind prevention (field-supplied).
- A snowy area: Install the outdoor unit on a raised platform that is higher than drifting snow. Provide snow roof for snow prevention (field-supplied).

◆ Do not install the unit in the following places. Otherwise, it can result in an explosion, fire, deformation, corrosion, or product failure.

- Explosive or flammable atmosphere.
- Where a fire, oil, steam, or powder can directly enter the unit, such as in close proximity or directly above a kitchen stove.
- Where oil (including machinery oil) may be present.
- Where corrosive gases such as chlorine, bromine, or sulphide can accumulate, such as near a hot tub or hot spring.
- Where dense, salt-laden airflow is heavy, such as in coastal regions.
- Where the air quality is of high acidity.
- Where harmful gases can be generated from decomposition.

◆ Do not install the indoor unit where such dripping can cause moisture damage or uneven locations: Use a raised concrete pad or concrete blocks to provide a solid and level foundation for the unit to prevent water damage and abnormal vibration. Do not position the drain pipe for the indoor unit near any sanitary sewers where corrosive gases may be present.

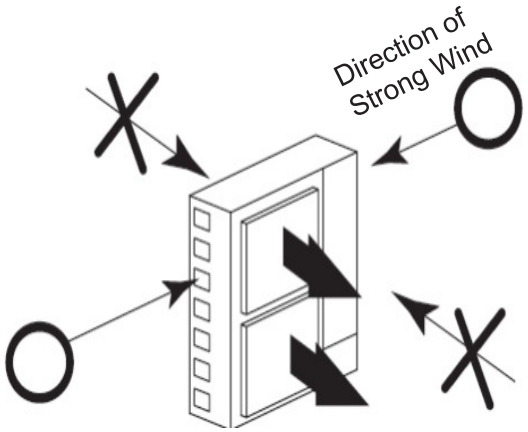
◆ Before performing any brazing work, be sure that there are no flammable materials or open flames nearby.

◆ Perform a test run to ensure normal operation. Safety guards, shields, barriers, covers, and protective devices must be in place while the compressor/unit is operating. During the test run, keep fingers and clothing away from any moving parts.

◆ Clean up the site when finished, remembering to check that no metal scraps or bits of wiring have been left behind inside the unit being installed.

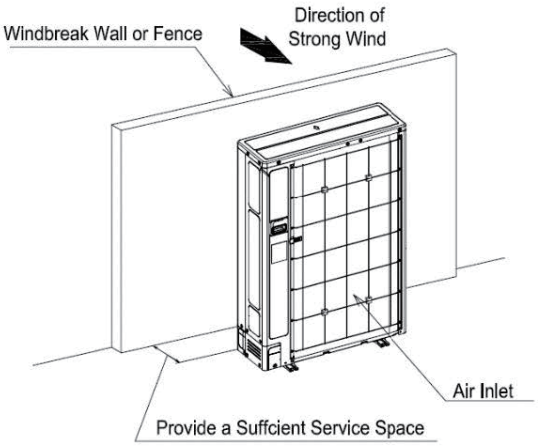
◆ After installation work for the system has been completed, explain the “Safety Precautions”, the proper use and maintenance of the unit to the customer according to the information in all manuals that came with the system. All manuals and warranty information must be given to the user or be left near the Indoor Unit.

◆ Select a direction where a strong wind does not blow to the air outlet surface or the air inlet surface.



Air Outlet

◆If a suitable location cannot be found, the windbreak wall or fence should be installed to prevent a strong wind from blowing to air inlet or outlet of the outdoor unit. And make sure to provide sufficient space around the outdoor unit for operation and maintenance.



NOTE:

◆If strong wind blows direct to the air outlet, the needed airflow volume cannot be maintained and the outdoor unit may be difficult to operate normally.

◆If excessively strong wind blows to the air outlet consecutively, it may cause the propeller fan or the fan motor breakage by high speed rotation or overload.

◆If the local altitude exceeds 2000m, indicate the actual installation altitude in the following formula.

Altitude	( ) m

⚠ CAUTION

Pay attention to the sharp edges of the fins to avoid any injury.

3.2 Service Space

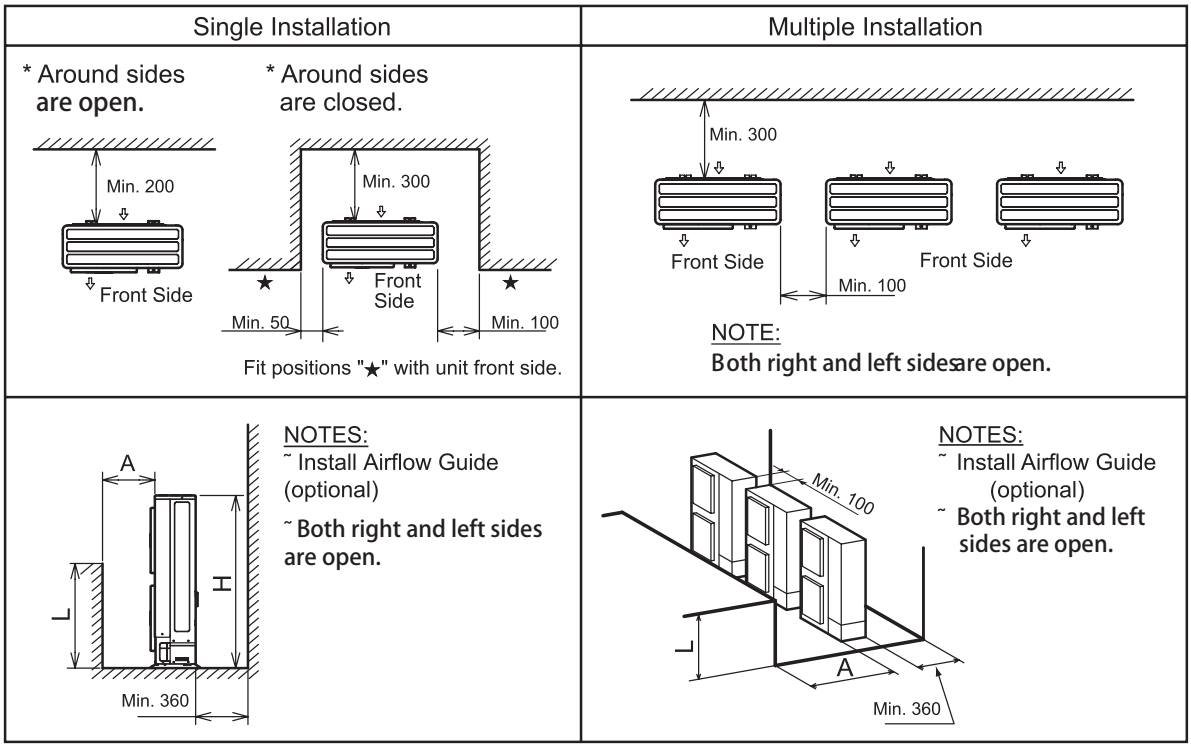
When the outdoor unit is installed, the allowed service space is as follows:

- ◆ If there is not enough service space for air inlets and outlets, it may result in a performance drop-off and mechanical issues due to insufficient air intake.
- ◆ Additionally, adequate service space is required for service maintenance access.

(1)Obstacles on the inlet side

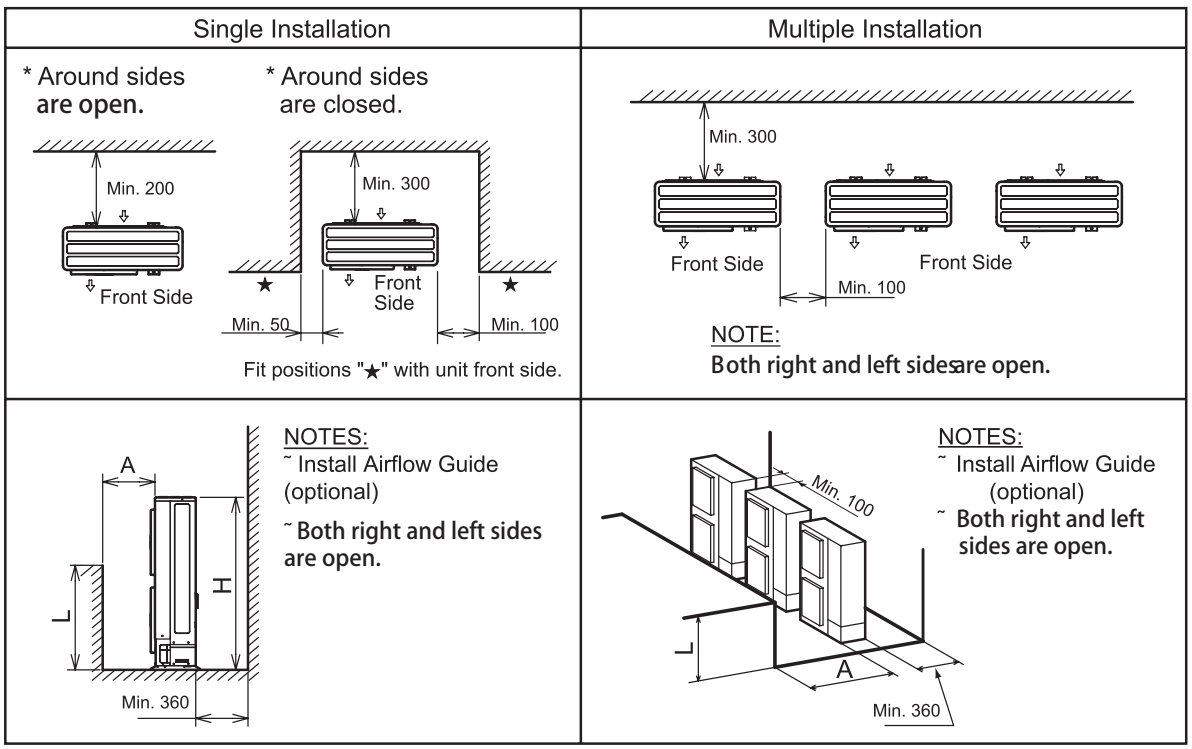
(a)There is no obstacle in the upper side.

Unit: mm



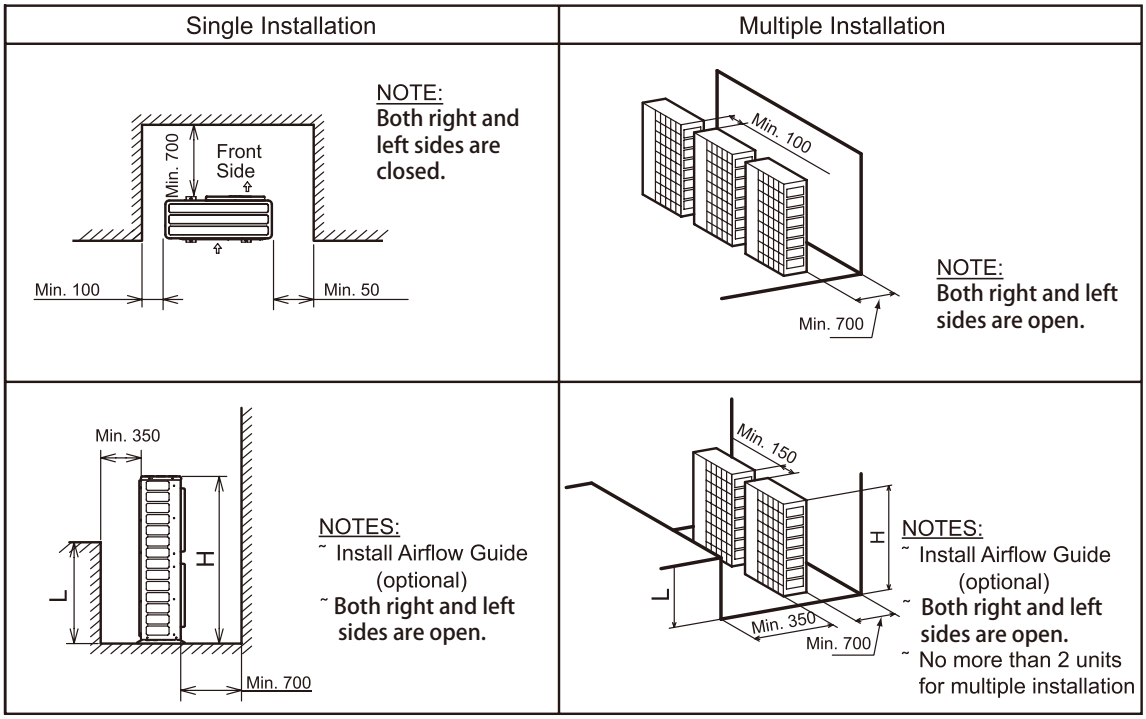
(b) There are obstacles in the upper side. Unit

Unit: mm



(2)Obstacles on the outlet side and no obstacle in the upper side

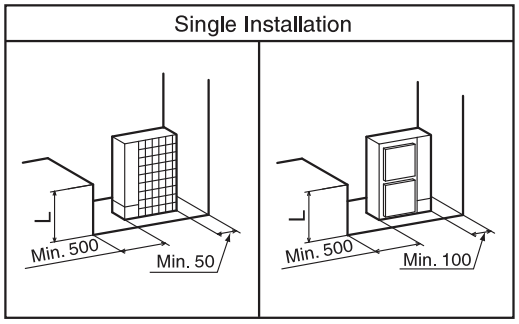
Unit: mm



(3)Obstacles on the right and left sides of single installation

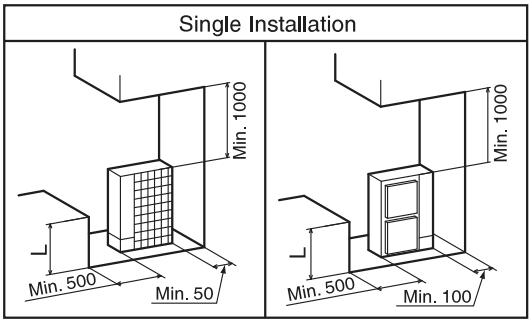
(a)There is no obstacle in the upper side.

Unit: mm



(b)There are obstacles in the upper side.

Unit: mm



NOTE:

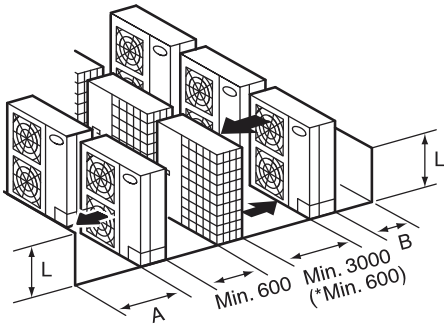
If L is greater than H, install the outdoor unit on the foundation so that H is greater than or equal to L.

H: Outdoor unit height + foundation height

L	A
0<L≤1/2H	600 or more
1/2H<L≤H	1400 or more

In this case, ensure that the foundation is firm, and do not allow short circuit of air flow. In all cases, short circuit of air flow is not allowed when installing outdoor unit.

(4)Multi-row and multiple installations.



Unit: mm

Keep a distance of more than 150mm between other units and do not put obstacles on the right and left sides.

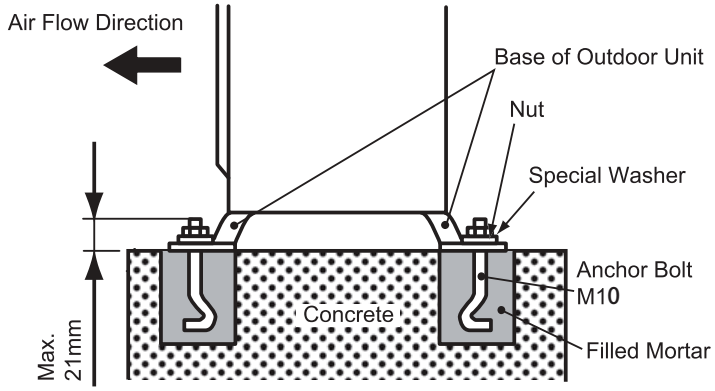
L	A	B
0<L≤1/2H	600 or more	300 or more
1/2H<L≤H	1400 or more	350 or more

NOTE:

- If L is greater than H, install the outdoor unit on the foundation so that H is greater than or equal to L. In this case, ensure that the foundation is firm, and do not allow short circuit of air flow. When the mark * dimension is secured, be sure to mount the airflow guide.

3.3 Installation Work

(1)Secure the outdoor unit with the anchor bolts.

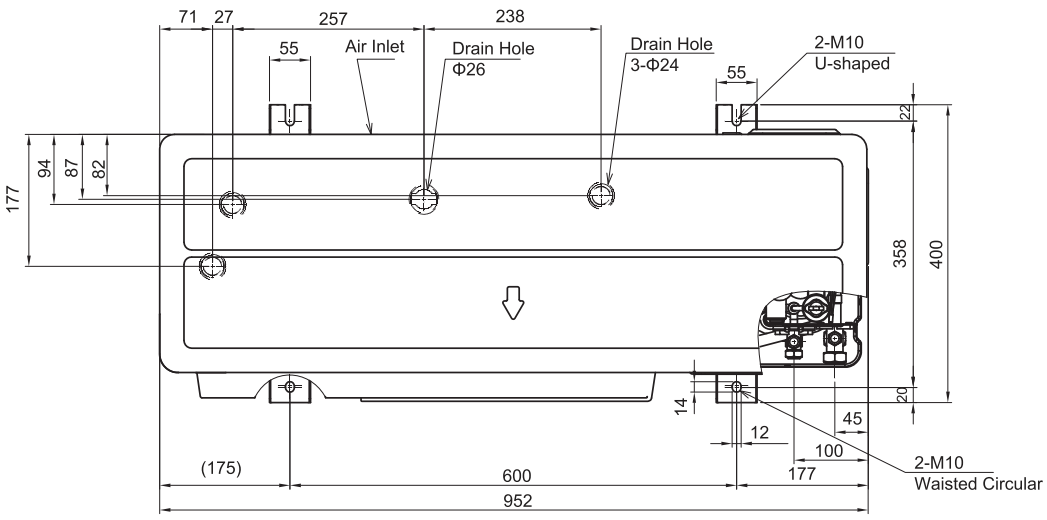


Fix the outdoor unit to the anchor bolts by special washer of field-supplied accessory.

(2) When installing the outdoor unit, fix the unit by anchor bolts.

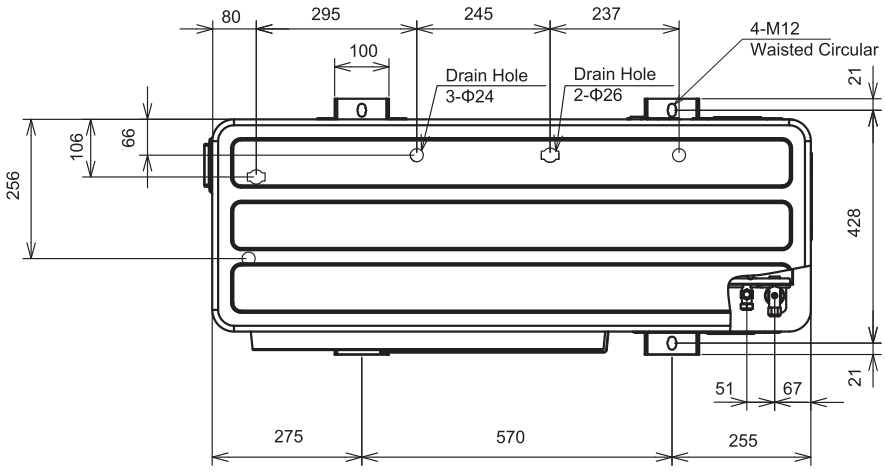
- Model: 080~090

Unit: mm

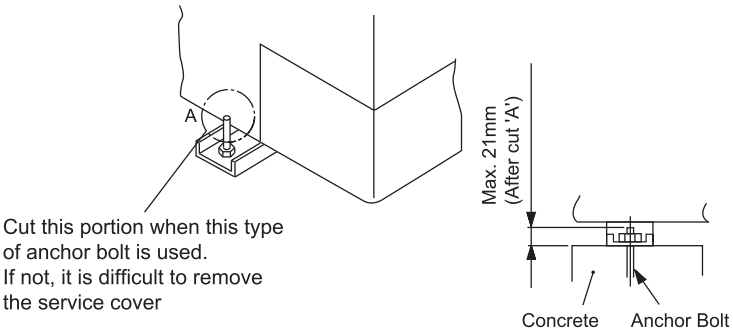


- Model: 100~120

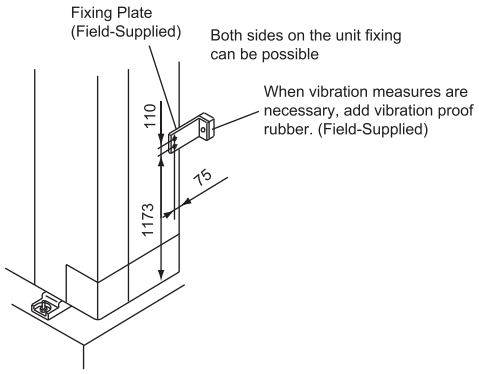
Unit: mm



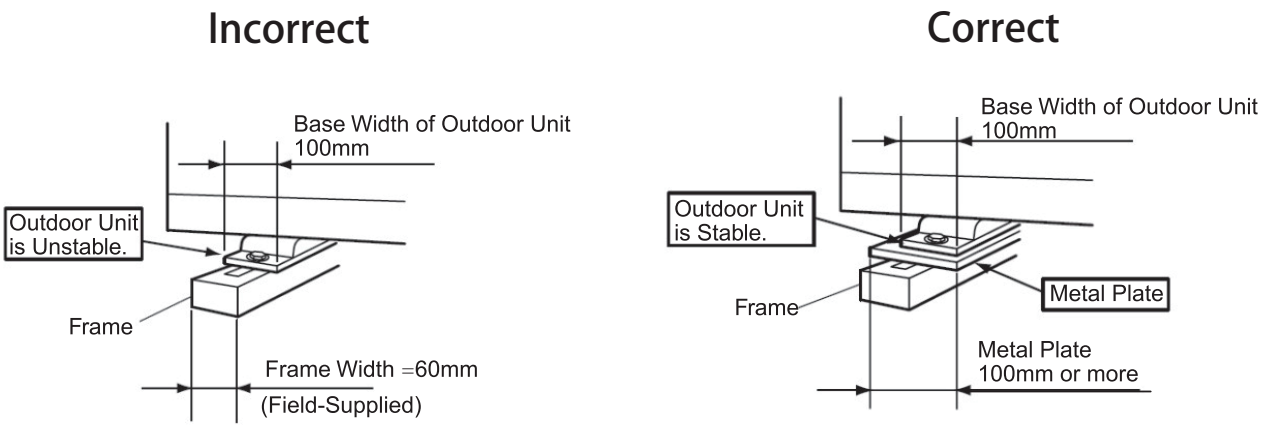
(3) Example of fixing outdoor unit by anchor bolts.



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



(5) The unit will condensate in heating mode. And the condensate will freeze in colder climates, which may cause the road slippery if not properly managed.
(6) The drain holes are working during the heating and defrosting operation. Choose a place where well drainage is available, or provide a groove for drainage.
(7) The whole of the base of the outdoor unit should be installed on a foundation. When using vibration-proof mat, it should also be positioned in the same way.
When installing the outdoor unit on a field-supplied frame, use metal plates to adjust the frame width for stable installation as shown in Fig. 3.1.



Recommended Metal Plate Size (Field-Supplied)
Material: Hot-Rolled Mild Steel Plate (SPHC)
Plate Thickness: 4.5T

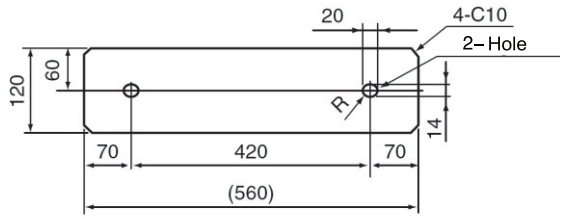


Fig. 3.1 Frame and Base Installation

4. Refrigerant Piping Work

⚠ WARNING

- The design pressure for this product is 601 psi (4.15MPa). The pressure required for refrigerant R410A is 1.4 times higher than that of the refrigerant R22. That means that the refrigerant piping for R410A must be thicker than that for R22. Make sure to use specified refrigerant piping. Otherwise, the refrigerant piping may rupture due to an excessive refrigerant pressure. Pay close attention to the piping thickness when using copper refrigerant piping.
- Ensure that the stop valves are closed before removing the flare nut of the stop valves.

⚠ CAUTION

When handling the refrigerant, be sure to wear leather gloves to prevent injuries.

4.1 Precaution for Refrigerant Piping

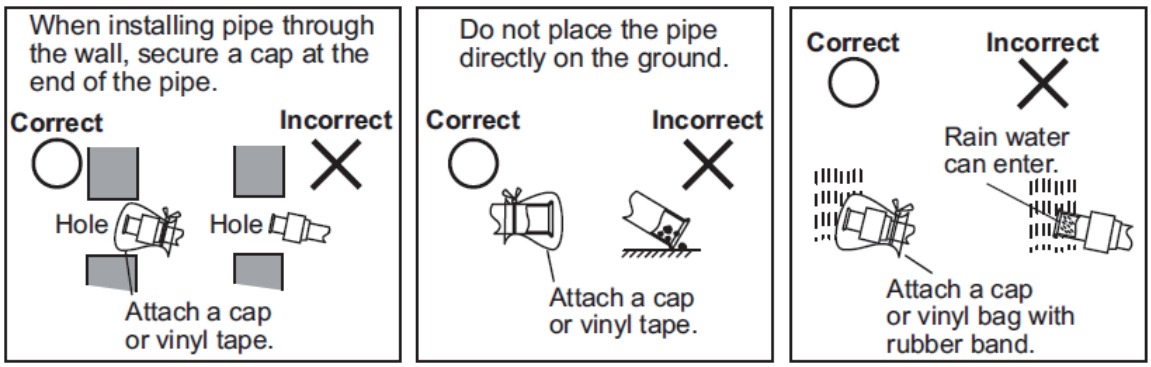
(1) Use the copper pipe for refrigerant piping.

(2) Keep the copper pipes clean. Make sure there is no dust or moisture inside the pipes. Blow nitrogen or dry, compressed air into the pipes to remove any dust or foreign materials before connecting them. Do not use any cutting tools such as a grinder or saw which could produce metal particles.

(3) Take special care to prevent pollution or moisture settling from going into the interior pipe during piping work.

(4) Avoid performing the piping connection work for outdoor unit in the rain.

(5) Refrigerant pipe ends



(6) Piping Thickness and Material

The thickness of refrigerant pipe differs depending on design pressure. For copper tube, pay attention to pipe selection, because the piping thickness differs depending on its material.

Diameter (Φd)	R410A	
	Thickness	Material
Φ6.35	0.8mm	O
Φ9.53	0.8mm	O
Φ12.7	0.8mm	O
Φ15.88	1.0mm	O
Φ19.05	1.0mm	1/2H
Φ22.2	1.2mm	1/2H
Φ25.4	1.2mm	1/2H

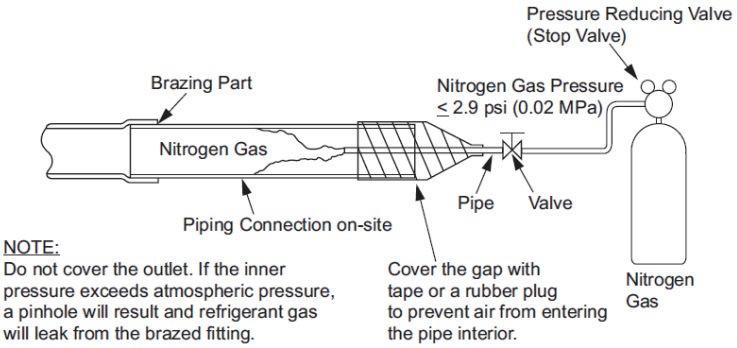
NOTE:

- Do not use the pipe whose allowable pressure is less than 4.15MPa.
- The reference value of the refrigerant piping thickness is indicated in the table above.
- Do not use the pipe which is considerably different from the reference value.

(7) Cautions for Brazing Work

(A) For piping connections, complete non-oxidation brazing with a nitrogen charge. If brazing the pipes without the nitrogen substitution, a large amount of oxidized scaling will be generated in the piping. This oxidized scaling can cause clogging inside the expansion valve, solenoid valve, accumulator, and compressor, which can damage the unit.

Do not use field-supplied antioxidant which can corrode pipes and degrade the refrigerant oil.



NOTE:

- Make sure to use nitrogen. Nitrogen gas pressure shall be 0.02 MPa or less.
- Make sure to use the pressure-reducing valve.
- Do not use field-supplied antioxidant.

(B) Use a type of flux with a low chlorine concentration.

(C) Wash the weld joints to remove all flux completely after completing brazing work.

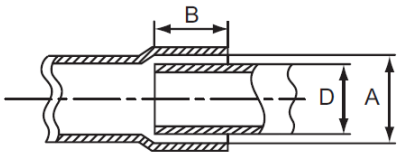
NOTE:

- To avoid oxidation and scaling, perform brazing at the appropriate temperature.

(D) To prevent gas leakage at the brazing connection, refer to the table for the insertion depth and the gap for joint pipe.

Unit: mm

Diameter (ΦD)	Min. Insertion Depth (B)	Gap (A - D)
5≤D <8	6	0.05 - 0.35
8≤D <12	7	
12≤D <16	8	0.05 - 0.45
16≤D <25	10	

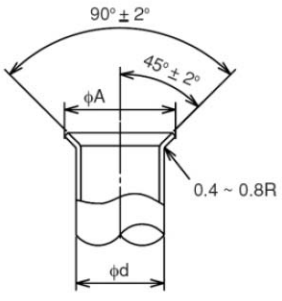


(8) Cautions for Flaring Work

(A) Perform the flaring work as shown below:

Unit: mm

Diameter (Φd)	$A^{+0}_{-0.4}$
	R410A
6.35	9.1
9.52	13.2
12.7	16.6
15.88	19.7
19.05	(*)



(*): It is impossible to perform flaring work with hard temper pipe. Use an accessory pipe with a flare.

(B) Flare Nut Dimension
The minimum thickness of joint and flare nut dimension are selected from the table below:

Minimum Thickness of Joint

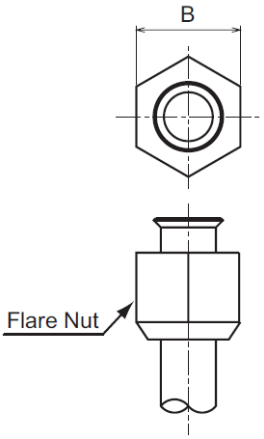
Unit: mm

Diameter(Φd)	R410A
6.35	0.5
9.52	0.6
12.7	0.7
15.88	0.8
19.05	0.8

Flare Nut Dimension B

Unit: mm

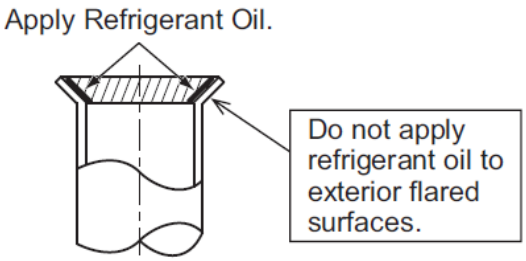
Diameter(Φd)	R410A
6.35	17
9.52	22
12.7	26
15.88	29
19.05	36



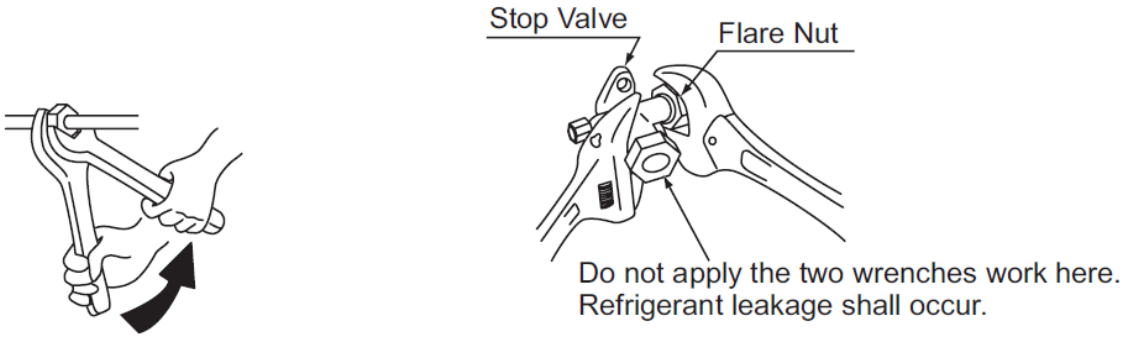
NOTE:

- Do not use a thin joint other than the ones shown in the table above.

(C) Verify that there are no scratches, metal particles, gaps, or deformations at the flared end before making connections to the system.
(D) Apply refrigerant oil (field-supplied) slightly on the flare surface of the pipe and flare nut before performing flaring work. Tighten the flare nut with the specified torque settings using two wrenches. Perform flaring work to the liquid piping side before treating the gas piping side. Verify that no gas leakage has occurred after completing flaring work.



(E) Be sure to use two wrenches as shown.



Tightening work for stop valve

Required Tightening Torque for Flare Nut

Pipe Diameter (mm)	Tightening Torque
Φ6.35	14~18 N・m
Φ9.52	34~42 N・m
Φ12.7	50~62 N・m
Φ15.88	63~77 N・m
Φ19.05	90~110 N・m

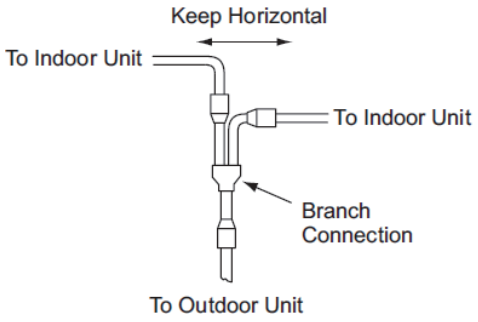
4.2 Model of Branch Pipe

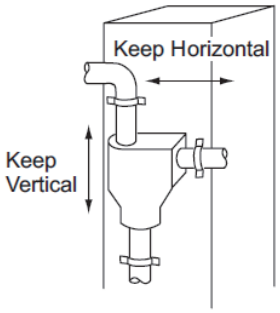
Refer to “Design 3.4 Piping Connection Branch Pipe Dimensions (Optional)”.

Precaution for branch pipe connection

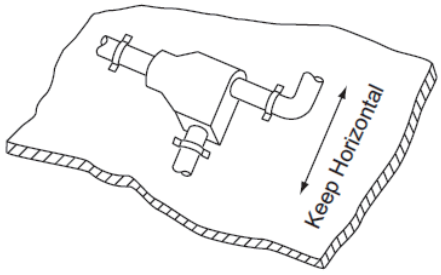
Use the branch pipe to connect the outdoor/indoor units. Mount the branch pipes to a pillar, a wall, or a ceiling.

Keep the inlet pipe of the branch pipe straight, and the length of the straight pipe is no less than 0.5 meter

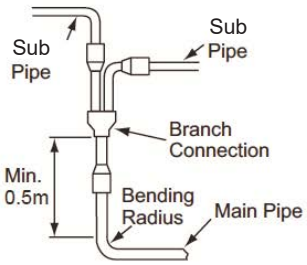
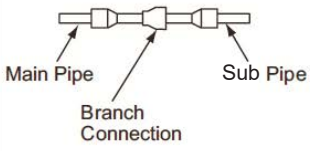
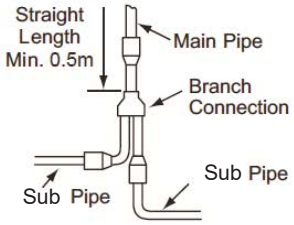
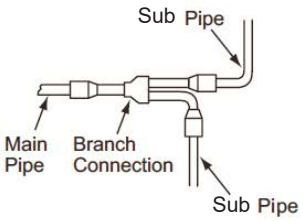




Secure the Branch Pipe to the surface of Pillar or Wall.



Securing the Branch Pipe to Ceiling Surface or Beam

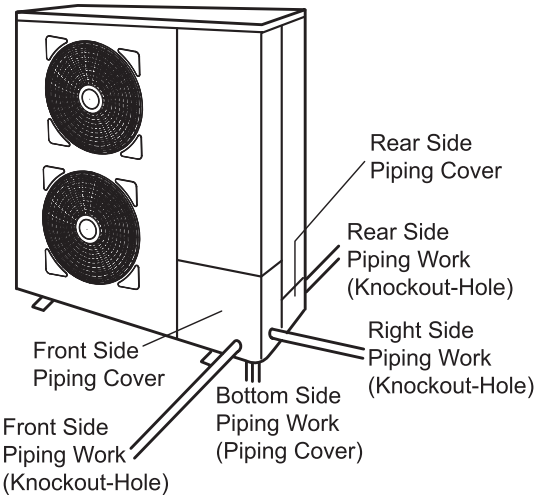
Upper Side	Upper Side	Upper Side	Upper Side
			
CORRECT	CORRECT	CORRECT	INCORRECT

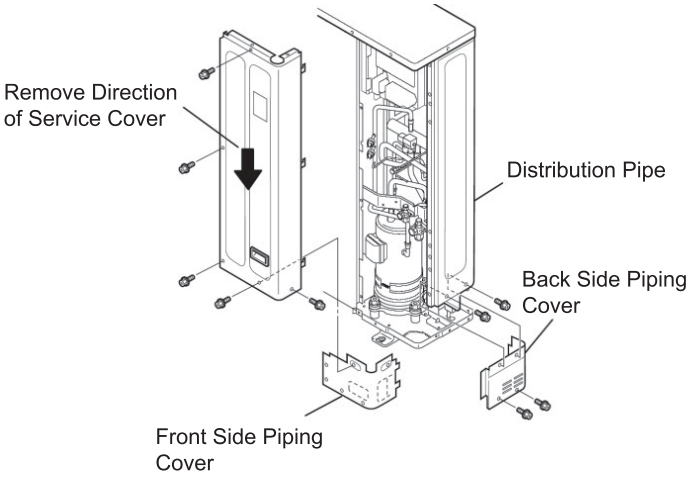
4.3 Refrigerant Piping Size

Refer to “Design 3.1 Connection of Refrigerant Pipes” and “Design 3.2 Pipe Connection Design Guidance”.

4.4 Refrigerant Piping Work for Outdoor Unit

(1) The refrigerant piping can be installed in four directions (front, right, bottom or rear side) as shown in the following figures.





Attention for Removing Service Cover

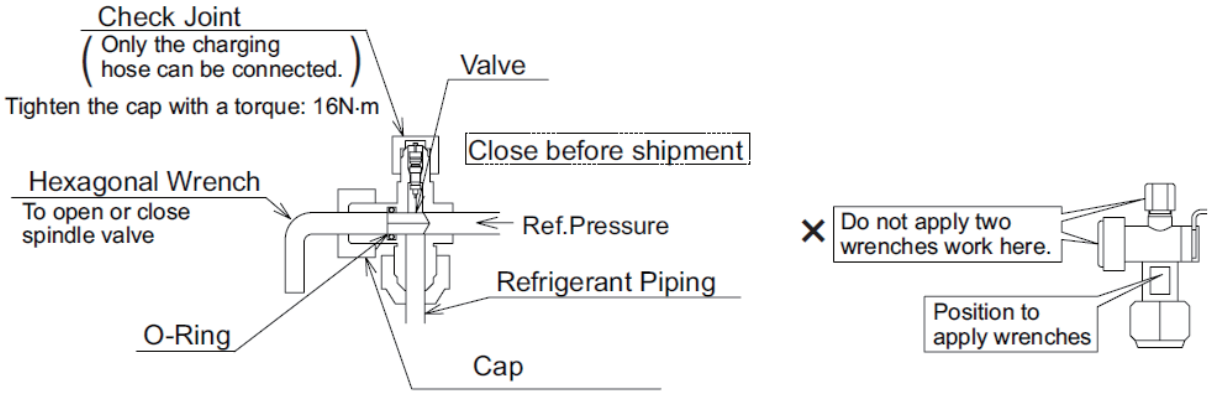
– Procedures of Removing Cover –

1) Remove the screws according to the figure above.

NOTE:
Remove the screws and hold the service cover with your hands. If not, the service cover may fall down.

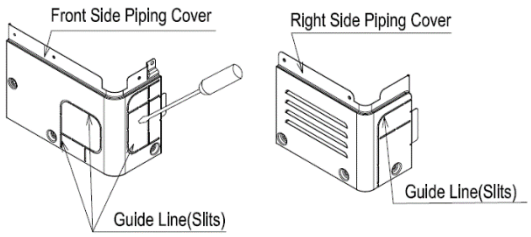
2) Slowly push the service cover downward.

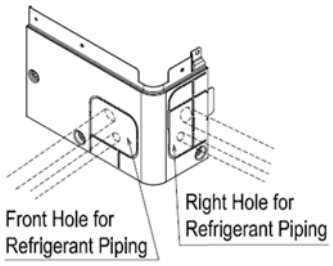
(2) Use securely two wrenches at the following position when removing or installing the pipe. (If not, refrigerant leakage may occur.)



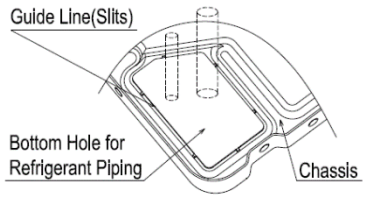
Controlling torque of hexagonal wrench		
Model	Gas side stop valve	Liquid side stop valve
080~120	15 N·m	7~9 N·m

(3) If the direction of the refrigerant piping has been chosen, please remove the piping cover from the unit, punch out the holes following the guide line with a screwdriver and a hammer. Then, deburr the holes and attach insulation (field-supplied) for protection of cables and pipes.

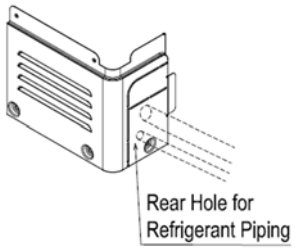




(a)Front and Right Side Piping Work



(b) Bottom Side Piping Work



(c) Rear Side Piping Work

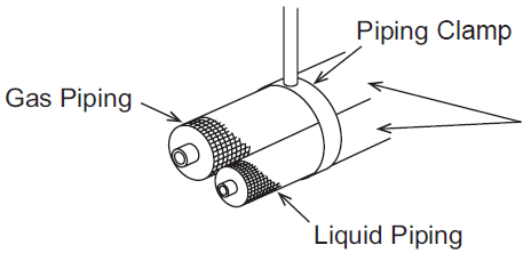
NOTICE

- Protect cables and refrigerant pipes from the edges of the holes with insulations, etc. (Field- supplied).
- Prevent the cables from contacting with the refrigerant piping and the hot components of the unit directly.
- For the right side and rear side piping work, secure enough space for the piping.

(4)Be sure to attach the piping cover to prevent rain water from going into the unit. Completely seal the penetration parts of the pipes with field-supplied insulation in order to prevent rain water from going into the unit.
(5)Use a pipe bender or an elbow (field-supplied) for bending work while connecting pipes.

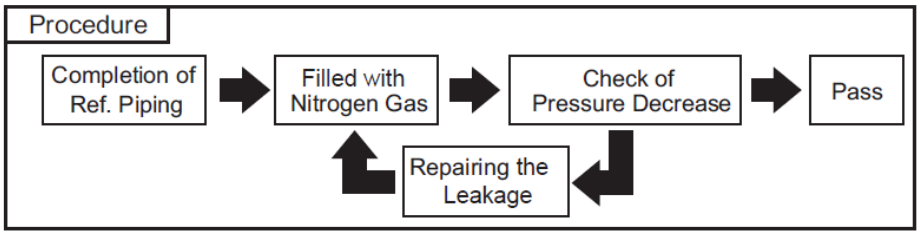
4.5 Air-Tightness Test

(1)The stop valves should be closed completely (factory-setting). Do not open the stop valves until all the refrigerant piping connections, air-tightness test, and vacuum have been completed.
(2) The refrigerant used for the outdoor unit is R410A. Use the manifold gauge and the charging hose for exclusive use of R410A.
(3) Connect the indoor/outdoor units with refrigerant piping. Mount the piping to a stable wall or ceiling with the piping clamp at interval 1.5 meters. Otherwise, the piping may be damaged.
(4) Securely insulate the gas piping and liquid piping separately.



NOTE:
Due to gas and liquid piping will stretch or contract at different rates due to changing refrigerant temperatures.
Do not fasten gas and liquid piping together.
Distortion and deformation of the piping can occur.

(5) Connect the manifold gauge and the charging hoses to the check joints of the stop valves with a nitrogen tank. Perform the air-tightness test at 4.15 MPa for the test pressure.
(6) For the air-tightness test, please use a leak detector or forming agent to detect the joints and stop valves for the piping connection. If there is a leakage, please repair it and repeat the air-tightness test operation.
(7) If there is no leakage, the nitrogen gas should be discharged from the refrigerant pipes and the airtightness test is finished.
(8) Make sure to insulate the joints for the piping connection as well. Seal the gap between the piping cover and pipes with the field-supplied packing after insulation work is completed.



⚠ CAUTION

- The air-tightness test should be performed on the gas stop valve and the liquid stop valve simultaneously. Otherwise, the air-tightness test is invalid.
- Use the pressure gauge and the charging hose for exclusive use of R410A.

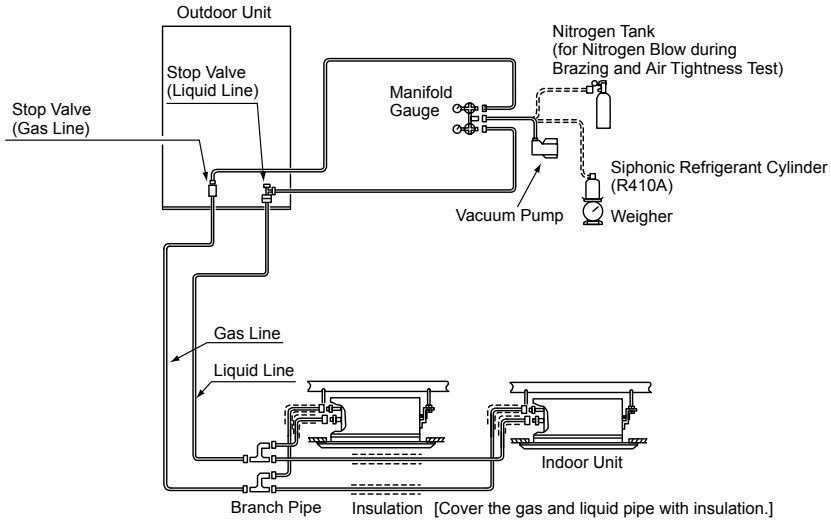
4.6 Vacuuming

(1) Connect the manifold gauge and the charging hoses to the check joints of the stop valves with a vacuum pump.
(2) Vacuum the refrigerant piping of the system with the vacuum pump until the pressure reaches -0.1MPa or lower. And then, continue the vacuum pumping work for more than one hour.
(3) After that, turn off the vacuum pump and then observe the pressure for more than two hours.
(4) If the pressure is higher than -0.1MPa obviously, the gas leak is suspected. Please check the leak position and eliminate it. Then repeat the vacuuming work again.

⚠ CAUTION

- The vacuuming should be performed on the gas stop valve and the liquid stop valve simultaneously. Otherwise, air may be left in the system and lead the system to be damaged.
- The tools are used for exclusive use of R410A.

Never use the refrigerant charged in the outdoor unit for air purging. Insufficient refrigerant will lead to failure.



Insulate the liquid pipe for prevention of the capacity decrease according to the ambient air conditions and the dewing on the pipe surface by the low pressure.

Check to ensure that there is no gas leakage. When large amount of the refrigerant leaks, the troubles as follows may occur;
1. Oxygen Deficiency
2. Generation of Harmful Gas Due to Chemical Reaction with Fire.

⚠ CAUTION

- **At the test run, fully open the spindle. If not, the devices will be damaged.**
- **An excess or a shortage of refrigerant is the main cause of trouble to the units. Charge the correct refrigerant quantity according to the description of label at the inside of service cover.**
- **Check for refrigerant leakage carefully. If a severe refrigerant leakage occurs, it will cause difficulty with breathing, or harmful gases would generate when there is open fire in the room.**

4.7 Additional Refrigerant Charge Calculation

Refer to “Design 3.3 Calculation of Additional Refrigerant”.

4.8 Additional Refrigerant Charge Work

(1) The additional refrigerant charge is required according to the calculation.
(2) Before charge work, make sure that the stop valves are fully closed.
(3) Charge the additional refrigerant from the check joint of liquid stop valve.
(4) After refrigerant has been charged, fully open the liquid stop valve and gas stop valve.
(5) If it is impossible to charge the required quantity of refrigerant, follow the procedure below.
(A) Fully open the gas stop valve.
(B) Operate the compressor in the cooling mode and charge the additional refrigerant from the check joint of the liquid stop valve. At this time, keep the liquid stop valve slightly open.
(C) After the refrigerant is charged, fully open the liquid stop valve and the gas stop valve.
(D) Carefully calculate any additional refrigerant quantity for charging. If the quantity of additional refrigerant is not correct, it might cause the system in an abnormal condition. The additional refrigerant must be charged as liquid.

NOTICE

- Do not apply excessive force to the stop valves after fully opening the valves.
- At the test run, fully open the gas and liquid stop valves.

NOTICE

Fill in the label attached to the unit with the amount of refrigerant charged and Tonnes of CO2 equivalent of fluorinated greenhouse gases contained on the installation.

NOTE

- This equipment Contains fluorinated greenhouse gases.
- Refrigerant: R410A ,
  global warming potential (GWP) value : 2088.
- Weight (kg) of Refrigerant charged before shipment:
  Reference to the nameplate [_ _ _] ① kg.
- Weight (kg) of Refrigerant charged additionally on site:
  Reference to the manual [_ _ _] ② kg.
- Weight (kg) of Refrigerant charged totally:
  ③=(①+②), [_ _ _] kg.
- Tonnes of CO_2 equivalent of fluorinated greenhouse gases contained :③×2088/1000, [_ _ _] tCO_2eq.

H7D09278A

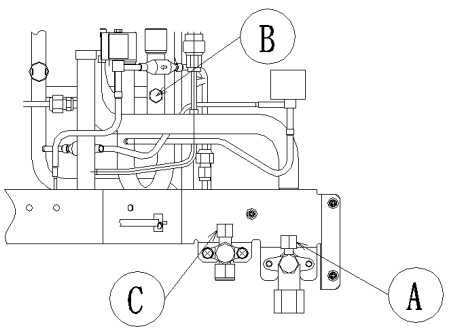
WARNING

- **Only use R410A as refrigerant. Other substances may cause explosions and accidents.**
- **R410A is fluorinated greenhouse gases. Its global warming potential (GWP) value is 2088. Do NOT vent these gases into the atmosphere.**
- **Tonnes of CO2 equivalent of fluorinated greenhouse gases contained is calculated by GWP value of the refrigerant × Total refrigerant charge [kg] / 1000 on the label.**

4.9 Pressure Measurement

When the pressure is measured, it can be applied by the check joints as the following figures. Connect the pressure gauge according to the table below, because high pressure side and low pressure side change by operation mode.

Item	Cooling Operation	Heating Operation
Check joint for gas stop valve “A”	Low Pressure	High Pressure
Check joint for piping “B”	High Pressure	Low Pressure
Check joint for liquid stop valve “C”	High Pressure	High Pressure



NOTE:

- Special Attention Regarding Refrigerant Gas Leakage

Pay attention to the critical gas concentration to avoid accidental refrigerant gas leakage before installing air conditioning systems.

$$\frac{\text{R: Total Quantity of Charged Refrigerant (kg)}}{\text{V: Room Volume } (m^3)} \leq \text{C: Critical Concentration } (0.42 kg/m^3)$$

* This value should be decided according to the each country's regulation such as ISO5149,EN378 and ASHRAE Standard 15. In the case that the calculated critical concentration is higher than this value, take the following actions:
1) Provide a gas leakage detector and exhaust fan controlled by its gas leakage detector.
2) Provide effective opening in the wall or door for ventilation to next door so that the critical gas concentration can be maintained lower than the above value. (Provide an opening with area greater than 0.15% of the floor surface at the lower part of a door.)

⚠ CAUTION

1.Maximum Permissible Concentration of HFC GAS R410A

The refrigerant R410A is an incombustible and non-toxic gas.

However, if leakage occurs and gas fills a room, it may cause suffocation.

Once leakage occurs, it is a must to take effective actions to make the concentration of R410A lower than 0.42 kg/m^3.

2.Calculation of Refrigerant Concentration

(1) Calculate the total quantity of refrigerant R (kg) charged in the system connecting all the indoor units of target rooms.

(2) Calculate the volume of the room installing this unit V (m^3).

3.Calculate the refrigerant concentration C (kg/m^3) of the room according to the above equation.

Please follow local codes or regulations, if any.

5. Electrical Wring

⚠ WARNING

- Turn off the main power switch of the indoor unit and the outdoor unit, then wait for more than 10 minutes before electrical wiring work or a periodical check is performed.
- Ensure that the indoor fan and the outdoor fan have been stopped before electrical wiring work or a periodical check is performed.
- Protect the wirings, electrical parts, and so on. from rats or other small animals. If not, rats may gnaw at unprotected parts and which may lead to a fire.
- Avoid the wirings touching the refrigerant pipes, plate edges and electrical parts inside the unit. If not, the wirings will be damaged and a fire may occur.
- Secure the cables. External forces on the terminals can lead to a fire.

NOTICE

- The indoor unit fan may continue to operate for up to five minutes following the heating cycle to dissipate residual heat from the indoor unit.

5.1 General Check

(1) Make sure that the field-supplied electrical components (main power switches, circuit breakers, wires, conduit connectors and wire terminals) have been properly selected according to the electrical characteristics indicated in the table 5.1. Make sure that the components comply with the local national standards and rules.
◆ Supply electrical power to each outdoor unit. An ELB (Earth Leakage Breaker), fuse and main switch should be used for each outdoor unit. If not, it will be cause of fire or electrical shock.
(2) Ensure that the power supply voltage is within ±10% of the rated voltage. If the power supply voltage is too low, the system cannot start due to the voltage drop.
(3) Check the size of the electrical wires.
(4) Ensure that the ground wiring for the outdoor unit and indoor unit are connected. If not, it will cause a fire or an electrical shock.
(5) Communication cabling shall be a minimum of 0.75mm^2, 2-Conductor, Stranded Copper. Shielded cable must be considered for applications and routing in areas of high EMI and other sources of potentially excessive electrical noise to reduce the potential for communication errors. When shielded cabling is applied, proper bonding and termination of the cable shield is required as per guidelines. Plenum and riser ratings for transmission cables must be considered per application and local code requirements.
◆ In case of where the power source for the air conditioning is supplied from the same power transformer as the device with high electricity consumption*.
◆ In case of where the power supply wiring for the device* and for the air conditioning are located close to each other.
* Example: Lift, container crane, rectifier for electric railway, inverter power device, arc furnace, electric furnace, large-sized induction motor, and large-sized switch.
In the instances mentioned above, an induction surge of the power supply wiring for the air conditioning could occur due to a rapid change in electricity consumption of the device and activation of the switch. Therefore, check the field regulations and standards before performing electrical work in order to protect the power supply wiring for the air conditioning.

5.2 Electrical Wiring Connection

Connect the electrical wiring according to the following figures:

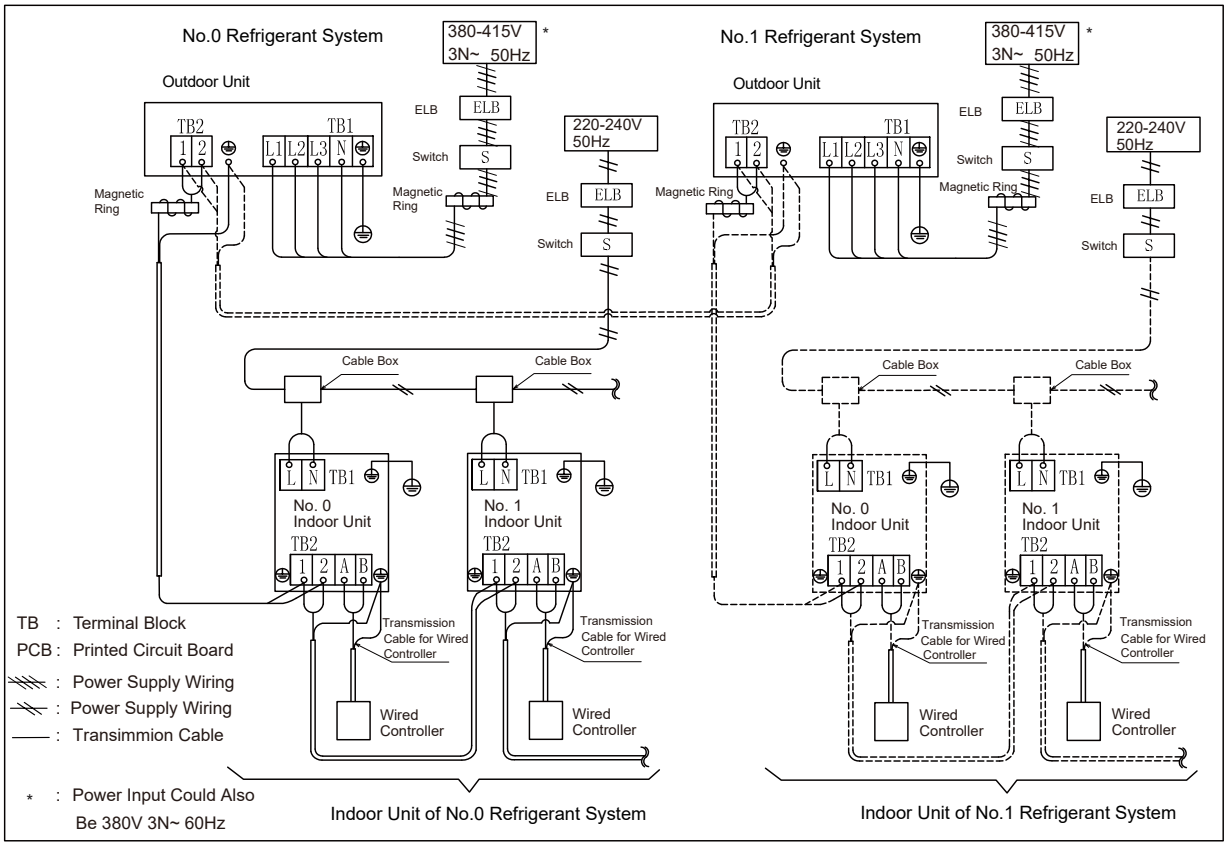


Table 5.1 Electrical Data and Recommended Characteristics

Model	Power Source	Maximum Running Ampacity (A)	Power Supply Wiring (Cores×mm²)	Transmission cable (Cores×mm²)	ELB	
					Rated Ampacity (A)	Rated Sensitive Ampacity (mA)
080	380~415V 3N~ 50Hz	21.0	5×4.0	2×0.75	25	30
90		24.0	5×4.0	2×0.75	32	30
100~120	380V 3N~ 60Hz	26.0	5×6.0	2×0.75	32	30

(1) Connect the power supply wirings to the terminal block TB1 and ground wiring to the terminal in the electrical control box. The ELB (Earth leakage breaker), FUSE and S (Main switch) must be installed to each power source of outdoor unit.
(2) Connect the shielded twisted pair transmission cables between the outdoor unit and indoor units to the terminals 1 and 2 on the terminal block. The installation must consider the application and local code requirements.
(3) Connect the transmission cables between the indoor unit and wired controller to the terminals A and B on the terminal block.
(4) The transmission cable should be separated from the power supply wiring.
Keep at least 5cm distance between the transmission cable and the power supply wiring, and also at least.1.5m distance between the transmission cable and power supply wiring for other electrical devices. If it is not secured, put the power supply wiring into the metal conduit tube to separate from other wirings.
(5) Do not connect the power supply wiring to the terminals 1 and 2 on the terminal block for transmission wiring. Otherwise, printed circuit board may be damaged.
(6) Connect the ground wire for the outdoor/indoor units. The ground wiring work under the condition of 100Ω (max.) ground resistance should be performed by the qualified person.
(7) Tighten screws for the terminal block according to the following table:

Size	Tightening Torque
M4	1.0~1.3 N·m
M5	2.0~2.4 N·m
M6	4.0~5.0 N·m
M8	9.0~11.0 N·m
M10	18.0~23.0 N·m

⚠ WARNING

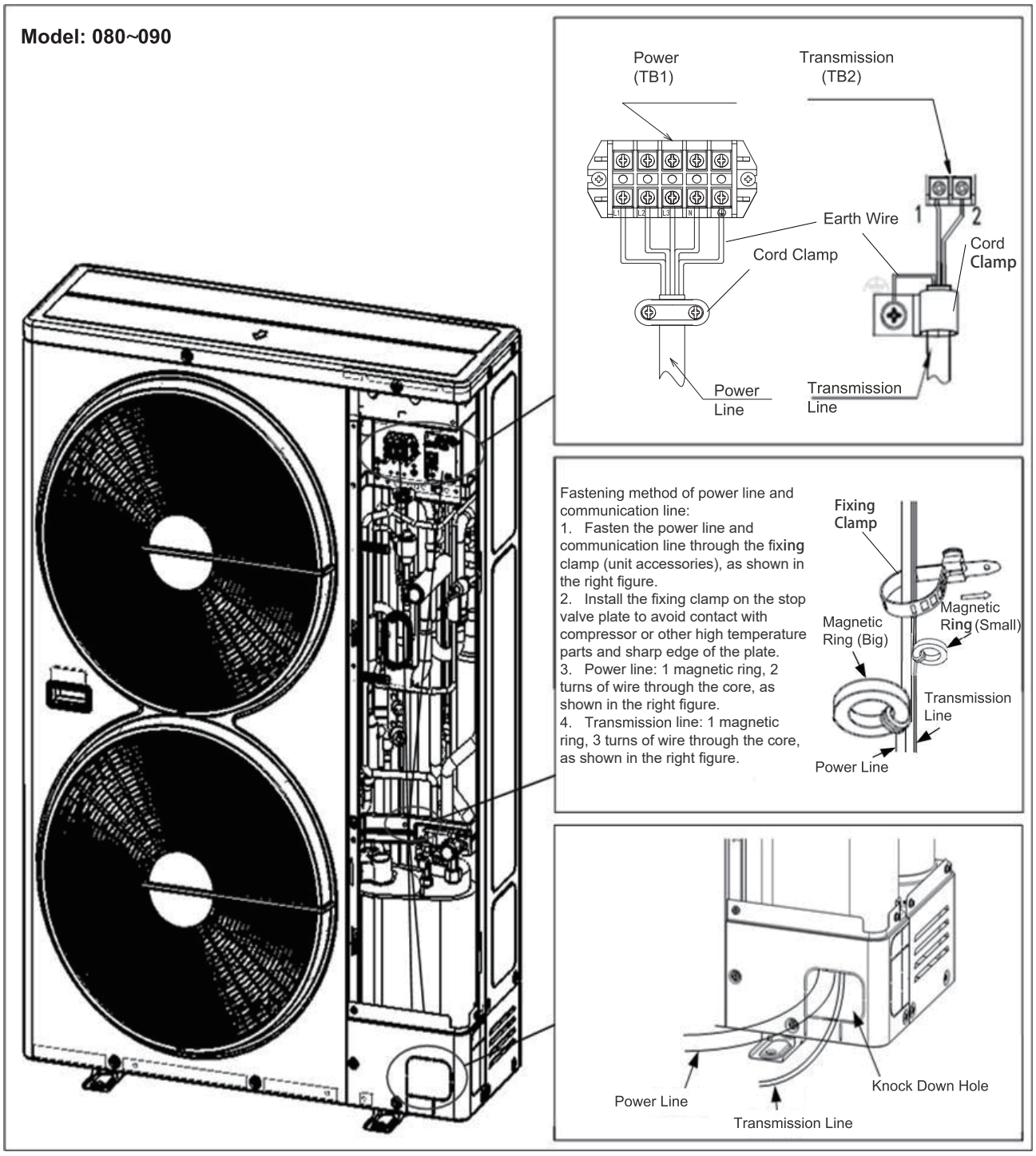
- The ELB (Earth leakage breaker), FUSE and S (Main switch) must be installed to each power source of outdoor unit and indoor units. If not, it may cause an electrical shock or fire.
- Perform the electrical work according to the regulations of each region and this installation and maintenance manual. A separate, dedicated electrical circuit must be used. If the electrical wiring work is performed incorrectly or there is a capacity shortage of the power circuit, it will cause an electric shock or fire.
- Check that the ground wire is securely connected. Otherwise, it may lead to an electrical shock. Do not connect the ground wiring to gas piping, water piping, lightning conductor, or telephone ground wirings.
- In the electrical wiring connection for RAS-080~120HNBSTQ, do not connect the live wires (L1/L2/L3) to the terminals N of the terminal block TB1. Otherwise, printed circuit board may be damaged.

5.3 Electrical Wiring for Outdoor Unit

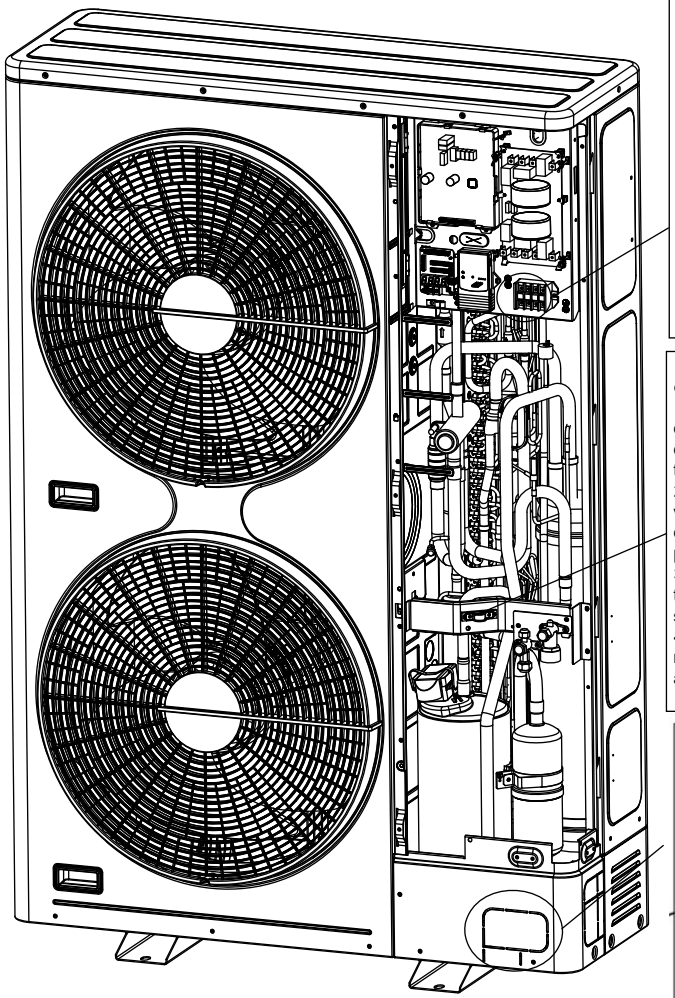
Avoid the wirings touching the refrigerant pipes, plate edges and electrical parts inside the unit. If not, the wirings will be damaged and a fire may occur.

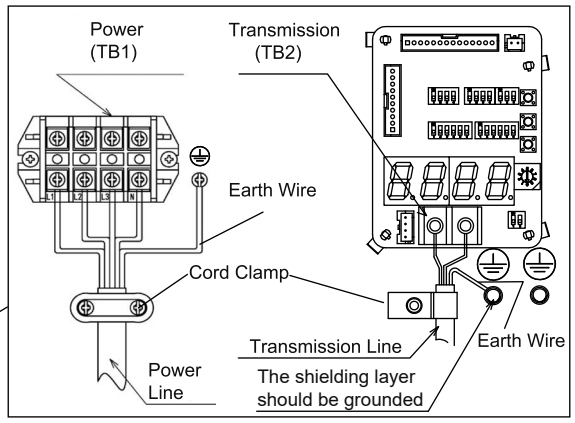
Terminal block for power source and control circuit

Model: 080~090



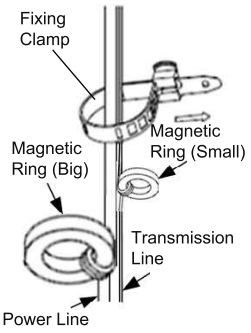
Model: 100~120

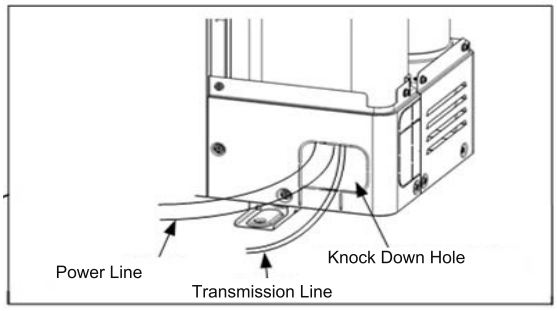




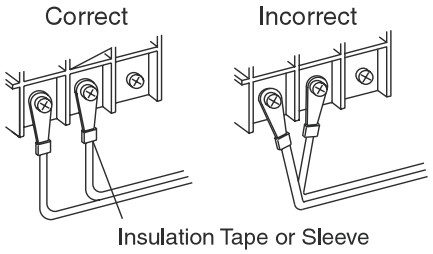
Fastening method of power line and communication line:

1. Fasten the power line and communication line through the fixing clamp (unit accessories), as shown in the right figure.
2. Install the fixing clamp on the stop valve plate to avoid contact with compressor or other high temperature parts and sharp edge of the plate.
3. Power line: 1 magnetic ring, 2 turns of wire through the core, as shown in the right figure.
4. Transmission line: 1 magnetic ring, 3 turns of wire through the core, as shown in the right figure.

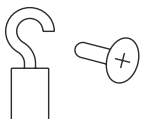




Keep a distance between each wiring terminal and attach insulation tape or sleeve as shown in the figure.



Do not use a solderless terminal when a single wire is used. If used, it causes abnormal heating at the caulking portion of the terminal.
If a single wire is used connect the wire directly as shown in the figure.



NOTES

(1) Field wiring shall be in conformity to local laws and regulations, and all wiring operations must be performed by qualified professionals.
(2) Refer to relevant standards for above-noted power cord size.
(3) Where power cord is connected through junction box in series, be sure to determine the total current and choose wires based on the table below.
(4) As a minimum, the chosen power cord shall be compliant with requirements on neoprene sheathed wire #57 as stated in IEC60245-1, while the power cord shall be made from copper conductor.
(5) The wiring specifications for transmission cable shall not be lower than that for RVV(S)P shielded wires or equivalent, and the shielding layer shall be grounded.
(6) A switch that can ensure all-pole disconnection shall be installed between power supply and air conditioning unit in such a manner that the contact spacing shall not be less than 3mm.
(7) Once the power cord is damaged, the dealer or the professionals from designated maintenance department must be contacted in a timely manner for repair and replacement.
(8) For the installation of power cord, the ground wire must be longer than the current-carrying conductor.

Current (A)	Wire Size (mm^2)	
i≤6	2.5	※1: DO NOT connect wires in series when the current exceeds 63A.
6<i≤10	2.5	
10<i≤16	2.5	
16<i≤25	4	
25<i≤32	6	
32<i≤40	10	
40<i≤63	16	
63<i	※1	

(9) This equipment complies with IEC 61000-3-12 provided that the short-circuit power Ssc is greater than or equal to the following table.

MODELS SITUATION REGARDING IEC 61000-3-12 Ssc "xx" (kVA)	Model	Ssc“xx” (kVA)
This equipment complies with IEC 61000-3-12 provided that the short-circuit power Ssc is greater than or equal to xx(see Ssc column) at the interface point between the user's supply and the public system. It is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the equipment is connected only to a supply with a short-circuit power Ssc greater than or equal to xx(see Ssc column).	RAS-080HNBSTQ	1659
	RAS-090HNBSTQ	1896
	RAS-100HNBSTQ	2054
	RAS-110HNBSTQ	2054
	RAS-120HNBSTQ	2054

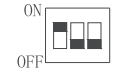
6. DIP Switch Setting of Outdoor Unit

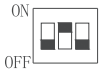
There are several DIP switches in the outdoor unit, which is designed for test and diagnosis conveniently. It has the advantages that it can monitor the real-time status of the outdoor unit, display the alarm codes and view the historical alarm codes and so on.

<table>
<tr><th>DSW1</th><th>DSW2</th><th>DSW4</th><th>DSW5</th></tr>
<tr>
<td>Test Operation Setting
 

All OFF: Factory Setting
1 ON : Test Run for Cooling
1 and 2 ON :Test Run for Heating</td>
<td>Optional Function Setting
 

All OFF: Factory Setting
5 ON : Function Setting Mode
6 ON :External Input/Output Setting Model</td>
<td>Refrigerant Cycle No. Setting
 
</td>
<td>Transmission Setting
 
</td>
</tr>
<tr><th></th><th>DSW3</th><th colspan="2">DSW6</th></tr>
<tr>
<td></td>
<td>Model Setting
Check the Label of Electrical Wiring Diagram</td>
<td colspan="2">Piping Length Setting
Factory Setting
 

Height Difference≥20m Indoor Unit is above
 

Height Difference≥25m Outdoor Unit is above
 
</td>
</tr>
</table>

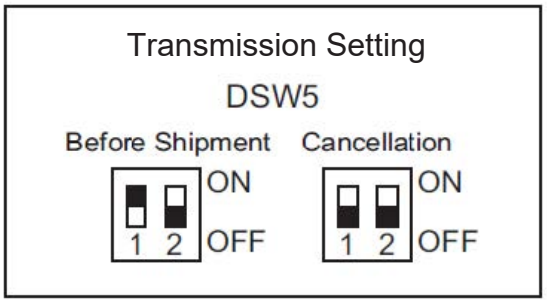
(1) The mark of "■" indicates the position of DIP switches. Set the DIP switches according to the introduction of DIP switches inside of the outdoor unit.

(2) Setting for Transmitting

It is required to set the refrigerant cycle No. of outdoor unit with H-LINK II system.

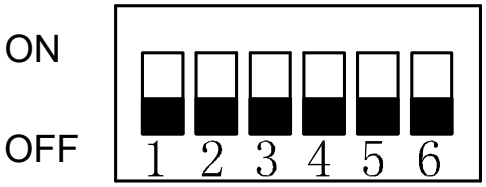
(3) Transmission Setting

Before shipment, No. 1 pin of DSW5 is set at the "ON" side. If there are 2 or more units in the same communication system, set No. 1 pin of DSW5 at the "OFF" side from the 2nd refrigerant group outdoor unit. If only one outdoor unit is used, no setting is required.



(4) Setting Refrigerant Cycle No.

In the same refrigerant cycle, set the same refrigerant cycle No. for the outdoor unit and the indoor units as shown below with DSW4. The range of refrigerant cycle No. is between 0 and 63.



NOTE: The mark of "●" indicates the ON position of DIP switches;
The mark of "○" indicates the OFF position of DIP switches.

Refrigerant Cycle NO.	DSW4						Refrigerant Cycle NO.	DSW4					
	1	2	3	4	5	6		1	2	3	4	5	6
0	○	○	○	○	○	○	32	○	○	○	○	○	●
1	●	○	○	○	○	○	33	●	○	○	○	○	●
2	○	●	○	○	○	○	34	○	●	○	○	○	●
3	●	●	○	○	○	○	35	●	●	○	○	○	●
4	○	○	●	○	○	○	36	○	○	●	○	○	●
5	●	○	●	○	○	○	37	●	○	●	○	○	●
6	○	●	●	○	○	○	38	○	●	●	○	○	●
7	●	●	●	○	○	○	39	●	●	●	○	○	●
8	○	○	○	●	○	○	40	○	○	○	●	○	●
9	●	○	○	●	○	○	41	●	○	○	●	○	●
10	○	●	○	●	○	○	42	○	●	○	●	○	●
11	●	●	○	●	○	○	43	●	●	○	●	○	●
12	○	○	●	●	○	○	44	○	○	●	●	○	●
13	●	○	●	●	○	○	45	●	○	●	●	○	●
14	○	●	●	●	○	○	46	○	●	●	●	○	●
15	●	●	●	●	○	○	47	●	●	●	●	○	●
16	○	○	○	○	●	○	48	○	○	○	○	●	●
17	●	○	○	○	●	○	49	●	○	○	○	●	●
18	○	●	○	○	●	○	50	○	●	○	○	●	●
19	●	●	○	○	●	○	51	●	●	○	○	●	●
20	○	○	●	○	●	○	52	○	○	●	○	●	●
21	●	○	●	○	●	○	53	●	○	●	○	●	●
22	○	●	●	○	●	○	54	○	●	●	○	●	●
23	●	●	●	○	●	○	55	●	●	●	○	●	●
24	○	○	○	●	●	○	56	○	○	○	●	●	●
25	●	○	○	●	●	○	57	●	○	○	●	●	●
26	○	●	○	●	●	○	58	○	●	○	●	●	●
27	●	●	○	●	●	○	59	●	●	○	●	●	●
28	○	○	●	●	●	○	60	○	○	●	●	●	●
29	●	○	●	●	●	○	61	●	○	●	●	●	●
30	○	●	●	●	●	○	62	○	●	●	●	●	●
31	●	●	●	●	●	○	63	●	●	●	●	●	●

⚠ CAUTION

Turn off all power switch before setting Dip-Switch.

7. Test Run

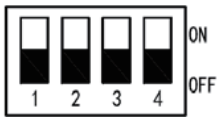
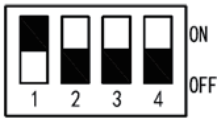
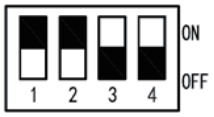
Test run of outdoor units and indoor units should be performed one by one sequentially. And record the results in the table 7.1.

7.1 Before Test Run

(1) Do not operate the system until all the points have been examined and cleared.
Check to ensure that the refrigerant piping and transmission between outdoor unit and indoor units are connected to the same refrigerant cycle. If not, it will cause an abnormal operation and a serious accident.
Check to ensure that the resistance to ground is more than 1 megohm, by measuring the resistance between ground and the terminal of the electrical parts. If not, do not operate the system until the electrical leakage is found and repaired. Do not connect the power supply wiring to the terminals for transmission.
Check to ensure that the liquid stop valve and the gas stop valves are fully open.
Check to ensure that the power supply of air conditioning has been turn on for more than 12 hours, in order to warm the compressor oil by the crankcase heater.
(2) Pay attention to the following items while the system is running.
Do not touch the compressor and the discharge gas pipes by hand, because their surface is very hot, it may lead to be scalded.
Do not touch any electrical components, otherwise, it may cause an electrical shock.
(3) Turn off the main power switch to the indoor unit and the outdoor unit and wait for more than 10 minutes before electrical wiring work or a periodical check is performed.

7.2 Test Run by DIP Switch of Outdoor Unit

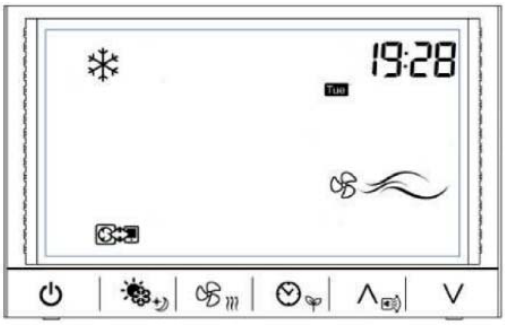
(1) Turn on the power supply of the outdoor units and indoor units for more than 12 hours, the 7-segment display is lighting.
(2) Check the 7-segment display of the outdoor unit. If there is any alarm code blinking, please examine and clear it by referring to the table of alarm codes.
(3) Operate the air conditioning in the cooling or heating operation according to the ambient temperature. The DIP switch setting is shown as below. The operation will start in 1 minute after the DIP switch setting is done.

DIP Switch	Original State	Cooling Operation	Heating Operation
DSW1			

(4) The indoor unit automatically starts operating when the test run of the outdoor unit is set. The operation continues for 2 hours without thermo-off, switch the DSW1 to the original state, defrosting or a malfunction will happen.
(5) During test run, if any malfunction happens, please examine and clear it according to the table of alarm codes.
(6) If the test run has been finished, please switch the DSW1 to the original state. Otherwise, the air conditioning will not work normally.

7.3 Test Run by Wired Controller

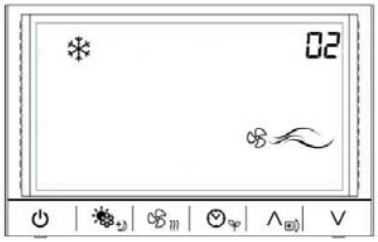
(1) Turn on the power supply of the outdoor and indoor units for more than 12 hours.
(2) The Liquid Crystal Display (LCD) of the wired controller is shown as below:



(3) Press and hold the MODE " " and INCREASE " " simultaneously for at least 5 seconds, the test run menu will be displayed.

☒ The total numbers of indoor units connected to the same wired controller is displayed on the LCD. A twin combination (one set with two indoor units) is identified as "02".

☒ The icon of operation mode " " and the icon of fan " " are blinking.

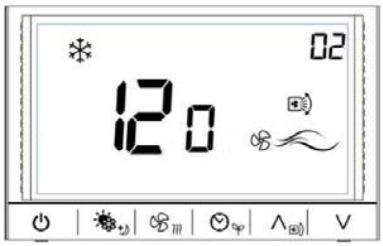


◆ Press the FAN " " to set the fan speed of the indoor units.

◆ Press the ON/OFF " " to turn on the air conditioning.

◆ The default setting for the test run time is a 120-minutes OFF timer. It can be adjusted by pressing the INCREASE " " and DECREASE " ". The range of the timer is between 30 minutes and 600 minutes, with an interval of 30 minutes.

(4) After setting the test run menu, the LCD will be displayed as follow:



NOTE:

◆ Louver angle switch is in auto swing mode.

◆ If the multiple indoor units are operated simultaneously and controlled by one wired controller, the all setting in the wired controller is applied to every indoor unit which is connected to the same wired controller.

(5) Set the other wired controllers to test the other indoor units.

(6) To finish the test run, wait two hours (as a default setting), or press ON/OFF " ", or press the MODE " " and INCREASE " " simultaneously for at least 5 seconds.

(7) During the test run, if any malfunction happens, please examine and clear it by referring to the table of alarm codes.

(8) If the indicated number of the wired controller is different with the actual connected indoor units, the auto-address function is not performed correctly due to incorrect wiring, turn off the power supply and correct the wiring after checking the following points:

Indicated Number	Malfunction	Turn off the power supply to check
None	◆ Power supply for indoor unit is not turned on or incorrect wiring; ◆ Power supply for outdoor unit is not turned on or incorrect wiring; ◆ Incorrect wiring of wired controller.	◆ The terminal block for transmission wiring in the indoor unit; ◆ The terminal block for transmission wiring in the wired controller; ◆ The wiring is connected to the wrong terminals; ◆ The screws for the terminal block are loosen.
Less than the actual connected	◆ Power supply for indoor unit is not turned on; ◆ Disconnect the transmission cables between outdoor unit and indoor units.	

Table 7.1 Test Run and Maintenance Record

Model:	SERIAL No.:	COMPRESSOR MFG. No.
CUSTOMER'S NAME AND ADDRESS:		DATE:

1. Is the rotation direction of the indoor unit fan correct?
2. Is the rotation direction of the outdoor unit fans correct?
3. Are there any abnormal compressor sounds?
4. Has the unit been in operation at least twenty (20) minutes?
5. Check Room Temperature

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

6. Check Outdoor Ambient Temperature:
   Inlet: DB °C，WB °C;
   Outlet: DB °C，WB °C.
7. Check Refrigerant Temperature:
   Liquid Temperature: °C
   Discharge Temperature: °C
8. Check Pressure:
   Discharge Pressure： MPa
   Suction Pressure ： MPa
9. Check Voltage:
   Rated Voltage: V
   Operating Voltage: L-N V
   Starting Voltage: V
10. Check the Input Running Current of the Compressor:
    Running Current： A

11. Is the refrigerant charge correct?	
12. Do the operation control devices operate correctly?	
13. Do the safety devices operate correctly?	
14. Has the unit been checked for refrigerant leakage?	
15. Is the unit clean inside and outside?	
16. Are all cabinet panels mounted?	
17. Are all cabinet panels free from rattles?	
18. Is the indoor unit filter clean?	
19. Are the indoor unit heat exchanger and outdoor unit heat exchanger clean?	
20. Are the stop valves open?	
21. Does the drain water flow smoothly from the drain pipe?	

Table 7.2 Alarm Code

Alarm Code	Malfunction	Reason
01	Activation of Protection Device (Float Switch)	Activation of Float Switch , High Water Level in Drain Pan
02	Activation of Protection Device (High Pressure Cut)	Activation of PSH (Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing)
03	Abnormal Communication between Indoor and Outdoor Units	Incorrect Wiring, Loose Terminals, Disconnect Wire, Blowout of Fuse, Outdoor Unit Power OFF
05	Abnormality of Power Supply Phases	Incorrect Power Source, Connection to Reversed Phase, Open-Phase
06	Abnormal Inverter Voltage	Outdoor Voltage Drop, Insuff cient Power Capacity
07	Decrease in Discharge Gas Superheat	Excessive Refrigerant Charge, Failure of Thermistor, Incorrect Wiring, Incorrect Piping Connection, Expansion Valve Locking at Opened Position (Disconnect Connector)
08	Increase in Discharge Gas Temperature	Insufficient Refrigerant Charge, Pipe Clogging, Failure of Thermistor, Incorrect Wiring. Incorrect Piping Connection, Expansion Valve Locking at Closed Position (Disconnect Connector)
11	Abnormality of Inlet Air Thermistor	Incorrect Wiring, Disconnecting Wiring Breaking Wire, Short Circuit
12	Abnormality of Outlet Air Thermistor	
13	Freeze Protection Thermistor	
14	Abnormality of Gas Piping Thermistor	
16	Abnormality of Remote Sensor (DOAS)	
17	Abnormality of Thermistor Built-in Wired Controller	
21	Abnormality of High Pressure Sensor	Incorrect Wiring, Severed or Disconnecting Wiring, Short Circuit
22	Abnormality of Outdoor Air Thermistor	
23	Abnormality of Discharge Gas Thermistor	
24	Abnormality of Heat Exchanger Liquid Pipe Thermistor	
29	Abnormality of Low Pressure Sensor	
31	Incorrect Capacity Setting of Outdoor Unit and Indoor Unit	Incorrect Capacity Code Setting of Combination Excessive or Insufficient Indoor Unit Total Capacity Code
35	Incorrect Setting of Indoor Unit No.	Duplication of Indoor Unit No. in same Refrigerant Group
36	Incorrect of Indoor Unit Combination	Outdoor unit, indoor unit different Tier, brand exception combination
38	Abnormality of Picking up Circuit for Protection in Outdoor Unit	Failure of Protection Detecting Device (Incorrect Wiring of Outdoor PCB)
43	Activation of Pressure Ratio Decrease Protection Device	Defective Compression (Failure of Compressor of Inverter, Loose Power Supply Connection)
44	Activation of Low Pressure Increase Protection Device	Overload at Cooling, High Temperature at Heating, Expansion Valve Locking (Loose Connector)
45	Activation of High Pressure Increase Protection Device	Overload Operation (Clogging, Short Circuit), Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing
47	Activation of Low Pressure Decrease Protection Device (Vacuum Operation Protection)	Insufficient Refrigerant, Refrigerant Piping, Clogging, Expansion Valve Locking at Open Position (Loose Connector)
48	"Activation of Inverter Overcurrent Protection Device"	Overload Operation, Compressor Failure
51	Problem with Inverter Current Sensor	Current Sensor Failure
53	Inverter Error Signal Detection	"Driver IC Error Signal Detection (Protection for Overcurrent, Low Voltage, Short Circuit)"
54	Abnormality of Inverter Fin Temperature	"Abnormal Inverter Fin Thermistor, Heat Exchanger Clogging, Fan Motor Failure"
55	Inverter Failure	Inverter PCB Failure
57	Activation of Fan Controller Protection	"Driver IC Error Signal Detection (Protection for Overcurrent, Low Voltage, Short Circuit), Instantaneous Overcurrent"
b1	"Incorrect Outdoor Unit Address No. or Unit Number Setting"	Over 64 Number is Set for Address or Refrigerant Cycle.
b5	"Incorrect Indoor Unit Connection No. Setting"	More than 18, Non-Corresponding to H-LINK II Units are Connected to One System.
EE	Compressor Protection Alarm (It cannot be reset from remote Controller)	If the alarms (02; 07; 08; 43; 44; 45; 47) occur three times within 6 hours, the alarm code appears.

◆ When the alarm codes in the brackets have appeared, it means that the malfunctions are from the indoor unit.

8. Safety and Control Device Setting

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

(1) High Pressure Switch: This switch cuts out the operation of the compressor when the discharge pressure exceeds the setting.

(2) Crankcase Heater: This band type heater protects against oil foaming during cold starting, as it is energized while the compressor is stopped.

Model		080~090	100~120
High Pressure Switch		Automatic Reset, Non-Adjustable	
Cut-Out	MPa	4.15	
Cut-In	MPa	3.2	
Fuse Capacity	A	40	
Crankcase Heater	W	88	80
CCP Timer Setting Time	Min	Non-Adjustable 3	
Fuse Capacity for Control Circuit PCB	A	5	

9. Technical Parameters

Technical parameters							
RAS-080HNBSTQ							
Outdoor side heat exchanger of air conditioner/heat pump: air							
Indoor side heat exchanger of air conditioner/heat pump: air							
Type: compressor driven vapour compression							
Driver of compressor: electric motor							
Indication if the heater is equipped with a supplementary heater: no							
Parameters shall be declared for the average heating season							
Item	Symbol	Value	Unit	Item	Symbol	Value	unit
cooling							
Rated cooling capacity	$P_{rated,c}$	22.4	kW	Seasonal space cooling energy efficiency	$\eta_{s,c}$	258.9	%
Declared capacity for cooling, at indoor temperature 27(19) °C and outdoor temperature Tj				Declared energy efficiency ratio, at indoor temperature 27(19) °C and outdoor temperature Tj			
Tj = 35 °C	Pdc	22.4	kW	Tj = 35 °C	EERd	3.52	—
Tj = 30 °C	Pdc	16.8	kW	Tj = 30 °C	EERd	4.52	—
Tj = 25 °C	Pdc	10.6	kW	Tj = 25 °C	EERd	7.71	—
Tj = 20 °C	Pdc	5.6	kW	Tj = 20 °C	EERd	11.18	—
co-efficient for air conditioners	Cdc	0.25					
Power consumption in modes other than 'active mode'							
off mode	P_{OFF}	0.02	kW	crankcase heater mode	P_{CK}	0	kW
thermostat-off mode(cooling)	P_{TO}	0	kW	standby mode	P_{SB}	0.02	kW
heating							
Rated heating capacity	$P_{rated,h}$	25.0	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	148.5	%
Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance (*)/Average season, at indoor temperature 20 °C and outdoor temperature Tj			
Tj = – 7 °C	Pdh	15.1	kW	Tj = – 7 °C	COPd	2.34	—
Tj = 2 °C	Pdh	9.4	kW	Tj = 2 °C	COPd	3.47	—
Tj = 7°C	Pdh	5.9	kW	Tj = 7 °C	COPd	5.71	—
Tj = 12 °C	Pdh	4.3	kW	Tj = 12 °C	COPd	7.04	—
Tj = bivalent temperature	Pdh	15.1	kW	Tj = bivalent temperature	COPd	2.34	—
Tj = operating limit	Pdh	13.3	kW	Tj = operating limit	COPd	2.15	—
Bivalent temperature				Operating limit temperature			
heating/Average	Tbiv	-7	°C	heating/Average	Tol	-10	°C
heating/Warmer	Tbiv	—	°C	heating/Warmer	Tol	—	°C
heating/Colder	Tbiv	—	°C	heating/Colder	Tol	—	°C
Degradation co-efficient heat pumps	Cdh	0.25					
Power consumption in modes other than 'active mode'							
off mode	P_{OFF}	0.02	kW	Back-up heating capacity	elbu	0	kW
thermostat-off mode(heating)	P_{TO}	0.02	kW	Type of energy input			
crankcase heater mode	P_{CK}	0.01	kW	standby mode	P_{SB}	0.02	kW
Other items							
Capacity control	variable			air flow rate, outdoor measured		7320	m^3/h
Sound power level , indoor/outdoor measured	LWA	-/77	dB(A)				
Global warming potential	GWP	2088	$kgCO_2$ eq.				
Note	The above performance data is obtained on the basis of the performance of this outdoor unit, with a 100%-combination of ceiling ducted type indoor units.						
Contact details	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd. No. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, China						

Technical parameters

RAS-090HNBSTQ							
Outdoor side heat exchanger of air conditioner/heat pump: air							
Indoor side heat exchanger of air conditioner/heat pump: air							
Type: compressor driven vapour compression							
Driver of compressor: electric motor							
Indication if the heater is equipped with a supplementary heater: no							
Parameters shall be declared for the average heating season							
Item	Symbol	Value	Unit	Item	Symbol	Value	unit
cooling							
Rated cooling capacity	$P_{rated,c}$	24.1	kW	Seasonal space cooling energy efficiency	$\eta_{s,c}$	250.2	%
Declared capacity for cooling, at indoor temperature 27(19) °C and outdoor temperature Tj				Declared energy efficiency ratio, at indoor temperature 27(19) °C and outdoor temperature Tj			
Tj = 35 °C	Pdc	24.1	kW	Tj = 35 °C	EERd	3.35	—
Tj = 30 °C	Pdc	17.8	kW	Tj = 30 °C	EERd	4.34	—
Tj = 25 °C	Pdc	11.3	kW	Tj = 25 °C	EERd	7.40	—
Tj = 20 °C	Pdc	5.6	kW	Tj = 20 °C	EERd	10.96	—
co-efficient for air conditioners	Cdc	0.25					
Power consumption in modes other than 'active mode'							
off mode	P_{OFF}	0.02	kW	crankcase heater mode	P_{CK}	0	kW
thermostat-off mode(cooling)	P_{TO}	0	kW	standby mode	P_{SB}	0.02	kW
heating							
Rated heating capacity	$P_{rated,h}$	26.0	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	140.3	%
Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance (*)/Average season, at indoor temperature 20 °C and outdoor temperature Tj			
Tj = – 7 °C	Pdh	15.7	kW	Tj = – 7 °C	COPd	2.2	—
Tj = 2 °C	Pdh	9.5	kW	Tj = 2 °C	COPd	3.26	—
Tj = 7 °C	Pdh	6.3	kW	Tj = 7 °C	COPd	5.48	—
Tj = 12 °C	Pdh	4.4	kW	Tj = 12 °C	COPd	6.62	—
Tj = bivalent temperature	Pdh	15.7	kW	Tj = bivalent temperature	COPd	2.2	—
Tj = operating limit	Pdh	14.3	kW	Tj = operating limit	COPd	2.06	—
Bivalent temperature				Operating limit temperature			
heating/Average	Tbiv	-7	°C	heating/Average	Tol	-10	°C
heating/Warmer	Tbiv	—	°C	heating/Warmer	Tol	—	°C
heating/Colder	Tbiv	—	°C	heating/Colder	Tol	—	°C
Degradation co-efficient heat pumps	Cdh	0.25					
Power consumption in modes other than 'active mode'							
off mode	P_{OFF}	0.02	kW	Back-up heating capacity	elbu	0	kW
thermostat-off mode(heating)	P_{TO}	0.02	kW	Type of energy input			
crankcase heater mode	P_{CK}	0.01	kW	standby mode	P_{SB}	0.02	kW
Other items							
Capacity control	variable			air flow rate, outdoor measured		7320	m^3/h
Sound power level , indoor/outdoor measured	LWA	-/78	dB(A)				
Global warming potential	GWP	2088	$kgCO_2$ eq.				
Note	The above performance data is obtained on the basis of the performance of this outdoor unit, with a 100%-combination of ceiling ducted type indoor units.						
Contact details	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd. No. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, China						

Technical parameters

RAS-100HNBSTQ							
Outdoor side heat exchanger of air conditioner/heat pump: air							
Indoor side heat exchanger of air conditioner/heat pump: air							
Type: compressor driven vapour compression							
Driver of compressor: electric motor							
Indication if the heater is equipped with a supplementary heater: no							
Parameters shall be declared for the average heating season							
Item	Symbol	Value	Unit	Item	Symbol	Value	unit
cooling							
Rated cooling capacity	$P_{rated,c}$	28.0	kW	Seasonal space cooling energy efficiency	$\eta_{s,c}$	252.2	%
Declared capacity for cooling, at indoor temperature 27(19) °C and outdoor temperature Tj				Declared energy efficiency ratio, at indoor temperature 27(19) °C and outdoor temperature Tj			
Tj = 35 °C	Pdc	28.0	kW	Tj = 35 °C	EERd	3.41	—
Tj = 30 °C	Pdc	20.6	kW	Tj = 30 °C	EERd	4.42	—
Tj = 25 °C	Pdc	13.2	kW	Tj = 25 °C	EERd	7.38	—
Tj = 20 °C	Pdc	7.1	kW	Tj = 20 °C	EERd	11.13	—
co-efficient for air conditioners	Cdc	0.25					
Power consumption in modes other than 'active mode'							
off mode	P_{OFF}	0.02	kW	crankcase heater mode	P_{CK}	0	kW
thermostat-off mode(cooling)	P_{TO}	0	kW	standby mode	P_{SB}	0.02	kW
heating							
Rated heating capacity	$P_{rated,c}$	31.5	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	130.6	%
Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance (*)/Average season, at indoor temperature 20 °C and outdoor temperature Tj			
Tj = – 7 °C	Pdh	18.9	kW	Tj = – 7 °C	COPd	2.04	—
Tj = 2 v	Pdh	11.4	kW	Tj = 2 °C	COPd	3.07	—
Tj = 7 °C	Pdh	7.5	kW	Tj = 7 °C	COPd	4.94	—
Tj = 12 °C	Pdh	4.4	kW	Tj = 12 °C	COPd	6.15	—
Tj = bivalent temperature	Pdh	18.9	kW	Tj = bivalent temperature	COPd	2.04	—
Tj = operating limit	Pdh	17.1	kW	Tj = operating limit	COPd	2.00	—
Bivalent temperature				Operating limit temperature			
heating/Average	Tbiv	-7	°C	heating/Average	Tol	-10	°C
heating/Warmer	Tbiv	—	°C	heating/Warmer	Tol	—	°C
heating/Colder	Tbiv	—	°C	heating/Colder	Tol	—	°C
Degradation co-efficient heat pumps	Cdh	0.25					
Power consumption in modes other than 'active mode'							
off mode	P_{OFF}	0.02	kW	Back-up heating capacity	elbu	0	kW
thermostat-off mode(heating)	P_{TO}	0.02	kW	Type of energy input			
crankcase heater mode	P_{CK}	0.01	kW	standby mode	P_{SB}	0.02	kW
Other items							
Capacity control	variable			air flow rate, outdoor measured		9780	m^3/h
Sound power level , indoor/outdoor measured	LWA	-/80	dB(A)				
Global warming potential	GWP	2088	$kgCO_2$ eq.				
Note	The above performance data is obtained on the basis of the performance of this outdoor unit, with a 100%-combination of ceiling ducted type indoor units.						
Contact details	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd. No. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, China						

Technical parameters

RAS-110HNBSTQ

Outdoor side heat exchanger of air conditioner/heat pump: air

Indoor side heat exchanger of air conditioner/heat pump: air

Type: compressor driven vapour compression

Driver of compressor: electric motor

Indication if the heater is equipped with a supplementary heater: no

Parameters shall be declared for the average heating season

Item	Symbol	Value	Unit	Item	Symbol	Value	unit
cooling							
Rated cooling capacity	$P_{rated,c}$	30.0	kW	Seasonal space cooling energy efficiency	$\eta_{s,c}$	241.3	%
Declared capacity for cooling, at indoor temperature 27(19) °C and outdoor temperature Tj				Declared energy efficiency ratio, at indoor temperature 27(19) °C and outdoor temperature Tj			
Tj = 35 °C	Pdc	30.0	kW	Tj = 35 °C	EERd	3.30	—
Tj = 30 °C	Pdc	22.1	kW	Tj = 30 °C	EERd	4.11	—
Tj = 25 °C	Pdc	14.3	kW	Tj = 25 °C	EERd	7.11	—
Tj = 20 °C	Pdc	7.8	kW	Tj = 20 °C	EERd	10.93	—
co-efficient for air conditioners	Cdc	0.25					
Power consumption in modes other than 'active mode'							
off mode	P_{OFF}	0.02	kW	crankcase heater mode	P_{CK}	0	kW
thermostat-off mode(cooling)	P_{TO}	0	kW	standby mode	P_{SB}	0.02	kW
heating							
Rated heating capacity	$P_{rated,h}$	33.0	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	140.3	%
Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance (*)/Average season, at indoor temperature 20 °C and outdoor temperature Tj			
Tj = – 7 °C	Pdh	19.7	kW	Tj = – 7 °C	COPd	2.21	—
Tj = 2 °C	Pdh	12.1	kW	Tj = 2 °C	COPd	3.24	—
Tj = 7°C	Pdh	8.0	kW	Tj = 7 °C	COPd	5.43	—
Tj = 12 °C	Pdh	4.5	kW	Tj = 12 °C	COPd	6.83	—
Tj = bivalent temperature	Pdh	19.7	kW	Tj = bivalent temperature	COPd	2.21	—
Tj = operating limit	Pdh	18.0	kW	Tj = operating limit	COPd	2.04	—
Bivalent temperature				Operating limit temperature			
heating/Average	Tbiv	-7	°C	heating/Average	Tol	-10	°C
heating/Warmer	Tbiv	—	°C	heating/Warmer	Tol	—	°C
heating/Colder	Tbiv	—	°C	heating/Colder	Tol	—	°C
Degradation co-efficient heat pumps	Cdh	0.25					
Power consumption in modes other than 'active mode'							
off mode	P_{OFF}	0.02	kW	Back-up heating capacity	elbu	0	kW
thermostat-off mode(heating)	P_{TO}	0.02	kW	Type of energy input			
crankcase heater mode	P_{CK}	0.01	kW	standby mode	P_{SB}	0.02	kW
Other items							
Capacity control	variable			air flow rate, outdoor measured		9780	m^3/h
Sound power level , indoor/outdoor measured	LWA	-/81	dB(A)				
Global warming potential	GWP	2088	$kgCO_2$ eq.				
Note	The above performance data is obtained on the basis of the performance of this outdoor unit, with a 100%-combination of ceiling ducted type indoor units.						
Contact details	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd. No. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, China						

Technical parameters

RAS-120HNBSTQ							
Outdoor side heat exchanger of air conditioner/heat pump: air							
Indoor side heat exchanger of air conditioner/heat pump: air							
Type: compressor driven vapour compression							
Driver of compressor: electric motor							
Indication if the heater is equipped with a supplementary heater: no							
Parameters shall be declared for the average heating season							
Item	Symbol	Value	Unit	Item	Symbol	Value	unit
cooling							
Rated cooling capacity	$P_{rated,c}$	33.5	kW	Seasonal space cooling energy efficiency	$\eta_{s,c}$	233.0	%
Declared capacity for cooling, at indoor temperature 27(19) °C and outdoor temperature Tj				Declared energy efficiency ratio, at indoor temperature 27(19) °C and outdoor temperature Tj			
Tj = 35 °C	Pdc	33.5	kW	Tj = 35 °C	EERd	3.16	—
Tj = 30 °C	Pdc	24.8	kW	Tj = 30 °C	EERd	3.95	—
Tj = 25 °C	Pdc	15.6	kW	Tj = 25 °C	EERd	6.83	—
Tj = 20 °C	Pdc	8.5	kW	Tj = 20 °C	EERd	10.71	—
co-efficient for air conditioners	Cdc	0.25					
Power consumption in modes other than 'active mode'							
off mode	P_{OFF}	0.02	kW	crankcase heater mode	P_{CK}	0	kW
thermostat-off mode(cooling)	P_{TO}	0	kW	standby mode	P_{SB}	0.02	kW
heating							
Rated heating capacity	$P_{rated,c}$	37.5	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	148.8	%
Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance (*)/Average season, at indoor temperature 20 °C and outdoor temperature Tj			
Tj = – 7 °C	Pdh	22.4	kW	Tj = – 7 °C	COPd	2.35	—
Tj = 2 °C	Pdh	13.7	kW	Tj = 2 °C	COPd	3.45	—
Tj = 7 °C	Pdh	8.9	kW	Tj = 7 °C	COPd	5.66	—
Tj = 12 °C	Pdh	4.9	kW	Tj = 12 °C	COPd	7.27	—
Tj = bivalent temperature	Pdh	22.4	kW	Tj = bivalent temperature	COPd	2.35	—
Tj = operating limit	Pdh	20.3	kW	Tj = operating limit	COPd	2.17	—
Bivalent temperature				Operating limit temperature			
heating/Average	Tbiv	-7	°C	heating/Average	Tol	-10	°C
heating/Warmer	Tbiv	—	°C	heating/Warmer	Tol	—	°C
heating/Colder	Tbiv	—	°C	heating/Colder	Tol	—	°C
Degradation co-efficient heat pumps	Cdh	0.25					
Power consumption in modes other than 'active mode'							
off mode	P_{OFF}	0.02	kW	Back-up heating capacity	elbu	0	kW
thermostat-off mode(heating)	P_{TO}	0.02	kW	Type of energy input			
crankcase heater mode	P_{CK}	0.01	kW	standby mode	P_{SB}	0.02	kW
Other items							
Capacity control	variable			air flow rate, outdoor measured		9780	m^3/h
Sound power level , indoor/outdoor measured	LWA	-/82	dB(A)				
Global warming potential	GWP	2088	$kgCO_2$ eq.				
Note	The above performance data is obtained on the basis of the performance of this outdoor unit, with a 100%-combination of ceiling ducted type indoor units.						
Contact details	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd. No. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, China						

SERVICE

1. Troubleshooting

1.1 Initial Troubleshooting

1.1.1 Checking of Electrical Wiring and Power Supply

Check the following items for any abnormality in the activation of the system.

No.	Check Situation	Check Method
1	Is any power supply breaker or fuse blown?	Check the voltage (secondary side) of the breaker and also check the continuity of the fuse by a tester.
2	Is voltage at the secondary side of the transformer correct?	Disconnect at the secondary side of the transformer and measure voltage by a tester.
3	Is wiring firmly secured and correctly connected?	Check that the following wiring connection on O.U./I.U. printed circuit boards (PCBs) is not loosened. • The connection for thermistors • The connection for the wired controller cable • The connection for communication cable • Each connection for power supply line Check that the wiring connection on O.U./I.U. PCBs is not loose or misconnected on the site according to the “Electrical Wiring Diagram” of the Engineering Manual.

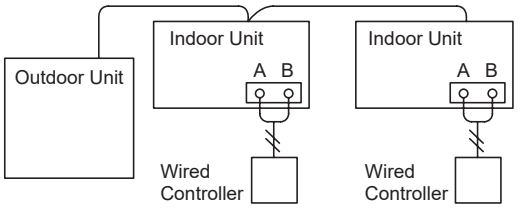
NOTE:

If the fuse(s) on an I.U. PCB blows out, diagnose the cause of overcurrent and recover the fuse(s).

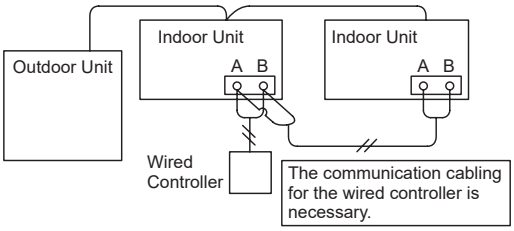
In addition, check the power supply of optional parts because the fuse may blow out because of the power supply failure.

- For Indoor Unit
  Refer to the Service Manual for Indoor Unit.

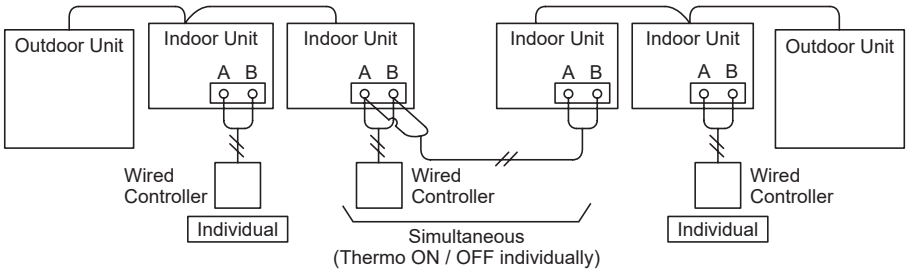
- Wired Controller Connecting Diagram
  (a) Wired Controllers to each Unit for Individual Operation Setting



  (b) One Wired Controller for Individual Operation Setting



  (c) Connecting Wired Controller if Connecting between Individual Systems

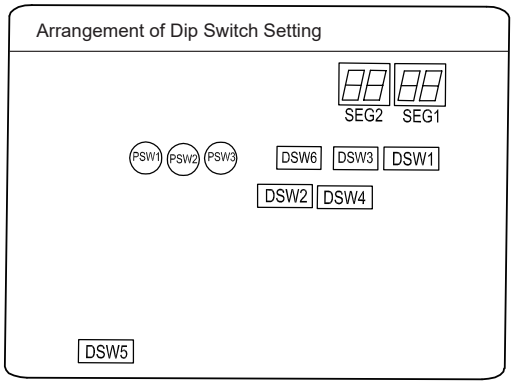


  NOTE:
  Thermo-ON: The outdoor unit and some indoor units are running.
  Thermo-OFF: The outdoor unit and some indoor units stay on, but don't run.

1.1.2 Checking of Rotary Switch and DIP Switch Settings

The following diagram indicates the factory settings of DSWs on PCBs in the indoor and outdoor units.

(1) Outdoor Unit (factory setting)
  Turn OFF all power supplies before performing settings.
  DIP switch settings cannot be changed without first disconnecting from the power supply.
  (However, No.1, 2, and 4, pins of DSW1, No.5 and 6 pin of DSW2 and push switches can be operated when power supply is ON.)
  The darkened square "■" indicates the position of DIP switches.
  Arrangement of DIP Switches and Push Switches



DSW1 Test Operation Setting

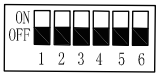
Setting is required.
Setting Before Shipment



	Setting Item	Pin No.
1	Test Cooling Operation	
2	Test Heating Operation	
3	High Static Pressure Function	
4	Compressor Forced Stop	

DSW2 Optional Function Setting

Setting is required.
Setting Before Shipment



	Setting Item	Pin No.
1	Optional Function Setting	
2	External Input/Output Setting	

DSW3 Capacity and Power Supply Setting

Setting is required. Setting Before Shipment

RAS-080HNBSTQ



RAS-090HNBSTQ



RAS-100HNBSTQ



RAS-110HNBSTQ

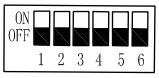


RAS-120HNBSTQ

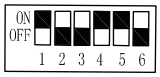


DSW4 Ref. Cycle No. Setting(0~63)

Setting is required.
Setting Before Shipment



Example:
In Case of Setting Ref. Cycle No.25



Calculation in binary: $25=2^{(1-1)}+2^{(4-1)}+2^{(5-1)}$
Set the unit number of outdoor unit at each refrigerant system.
(Setting before shipment is unit 0.)

DSW5 Transmission Setting

Setting is required. For End Terminal Resistance Cancellation

Setting Before Shipment



Cancellation



If there is more than one refrigerant system in the same communication line, set all No.1 pins of DSW10 to the “OFF” position except one outdoor unit.

DSW6 Piping Length Setting

Setting is required.
Setting Before Shipment



	Setting Item	Pin No.
1	I.U. is located higher than O.U.≥ 20m	
2	O.U. is located higher than I.U.≥ 25m	

1.2 Troubleshooting Procedure

1.2.1 Checking of Using 7-Segment Display

- Simple Checking by 7-Segment Display

1 ✳ Turn on All Indoor Units

✳ All the Indoor Units Connected to the Outdoor Unit

2 Turn on the Outdoor Unit

3 Auto-addressing Starts

Outdoor Unit Printed Circuit Board PCB

During auto-addressing, the following items can be checked using the outdoor unit's on-board 7-segment LED display.
(1) Disconnection of power supply to the indoor unit.
(2) Reverse connection of the operating line between the outdoor and indoor units.
In this case, "03" appears after 30 seconds.
(3) Duplication of indoor unit number. See Alarm Code 35.

Normal Case

(1) The outdoor unit's on-board 7-segment LED display is not indicated.

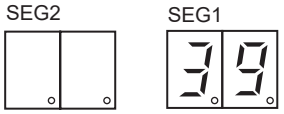
Abnormal Case

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

(A) Alarm code will be displayed on the 7-segment when alarm is received from indoor unit in normal mode.
As for the following alarm codes, however, alarm code will be displayed on the 7-segment when alarm is detected by outdoor unit itself.
- Alarm Code “03” (Abnormal Transmission between Indoor Unit and Outdoor Unit)
- Alarm Code “35” (Incorrect Indoor and Outdoor Unit No. Setting)

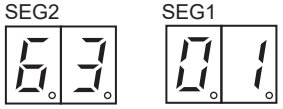
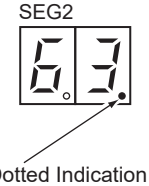
(B) Alarm code of smaller indoor unit address No. will be displayed when alarm is received from multiple indoor units.

(C) The following 7-segment is displayed and flashed every 0.5 seconds.



Alarm Code

(D) SEG1 and SEG2 are as follows.

7-Segment Display	Dotted Indication	Remarks
<In Case of Unit No. 63, Alarm Code “01”> SEG2: Indoor Unit No. (0~63) SEG1: Alarm Code  Indoor Unit No. Alarm Code	 Dotted Indication	In the case that 2 refrigerant cycle groups exist, one refrigerant cycle group is shown without dotted indication. The other refrigerant cycle group is shown with dotted indication.

⚠ WARNING

Only an authorized person can check using this method.

- Before Checking

(1) Turn ON the main power supply. Wait for more than 20 seconds to start checking.

(2) Checking Items

* Expansion Valve Opening

* Temperature Readings from Thermistors

* Number of Indoor Units Connecting in the Same System

(3) Check the locations of 7-segment and push switches.

(4) High voltage is applied to the PCB and electrical parts. Never touch electrical parts and wires without appropriate personal protective equipment (PPE) when checking.

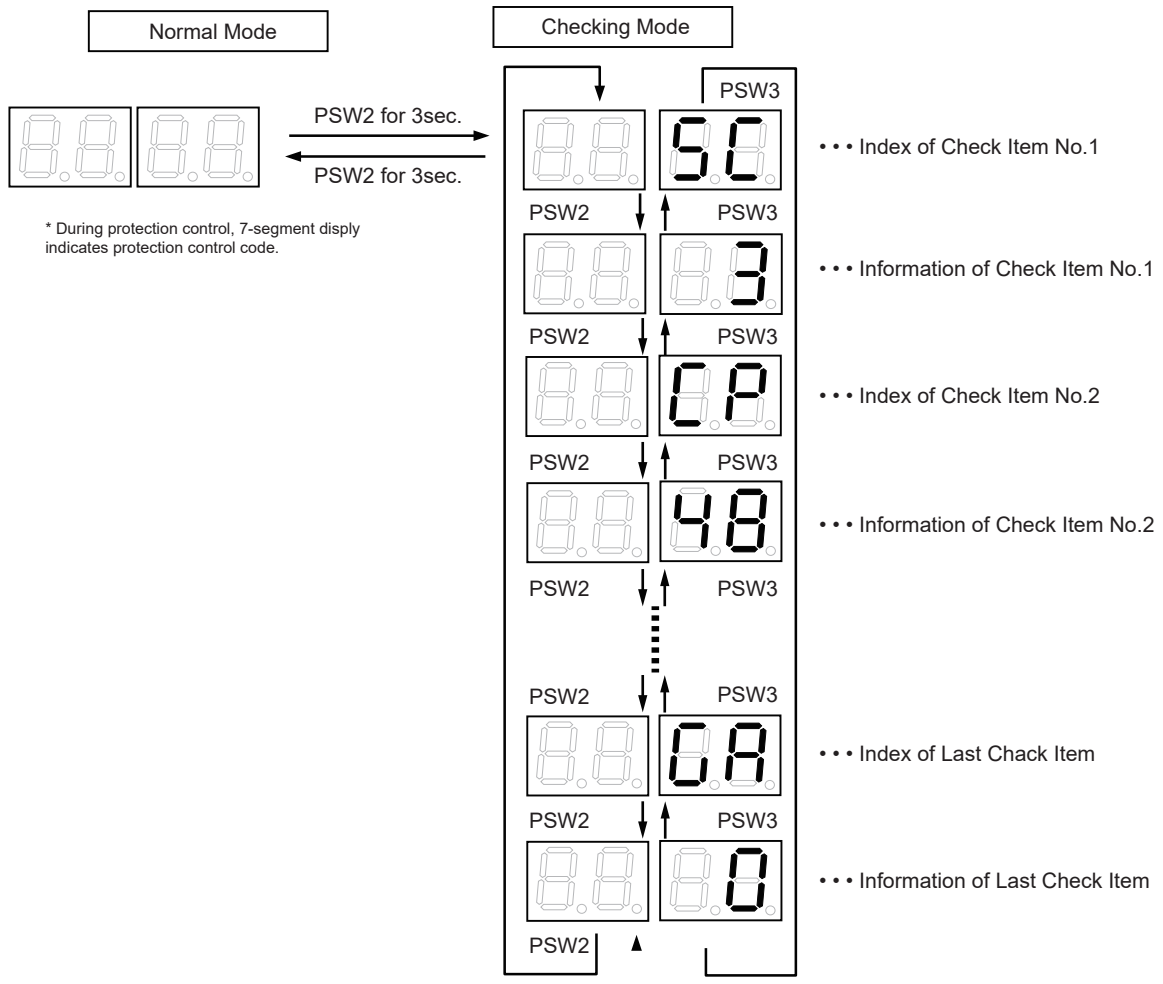
You can check the operating conditions and each part of the refrigerant system temperature condition by 7-segment display (SEG1,2) on the outdoor unit PCB and push switches (PSW).

To start the checking mode: Press PSW2 for 3 seconds

To move the checking item forward: Press PSW2

To move the checking item backward: Press PSW3

To cancel the checking mode: Press PSW2 for 3 seconds



Details of 7-Segment Display

Check No.	Item	Indication Data	
		Index	Contents
01	Input/Output State of Outdoor Micro-Computer	88 SE	Outdoor chip output state, this show the status of relays on PCB.
02	Capacity of Outdoor Unit	88 CA	0～999 Refer to "(1) Outdoor Unit Capacity Table"
03	Total Capacity of Operating Indoor Unit	88 bP	0～999 Refer to "(2) Indoor Unit Capacity Table"
04	Inverter Order Frequency to Compressor	88 Hz	0～115 [Hz]
05	Number to Running Compressor	88 CC	0～1 [pc]
06	Outdoor Fan Step	88 Fb	0～15 [step]
07	Outdoor Electronic Expansion Valve Opening	88 EA	0～100 [%]
08	High Pressure (Discharge Pressure)	88 Pd	-0.55～5.52 [MPa](-80～800 [psi]) *1 Indication of Sensor Open Circuit: 5.62 MPa(815 psi) Indication of Sensor Short Circuit: -0.62 MPa(-90 psi)
09	Low Pressure (Suction Pressure)	88 PS	-0.22～2.21 [MPa](-32～320 [psi]) *1 Indication of Sensor Open Circuit: 2.25 MPa(326 psi) Indication of Sensor Short Circuit: -0.25 MPa(-36 psi)
10	Discharge Temperature (at the Discharge Pipe near the Compressor)	88 Cd	1～142 [°C](34～288 [°F]) *1 Indication of Sensor Open Circuit: 255 °C (491 °F) Indication of Sensor Short Circuit: 0 °C (32 °F)
11	Evaporating Temperature (at Outdoor Unit Heat Exchanger)	8F Ed	-46～80 [°C](-50～176 [°F]) *1 Indication of Sensor Open Circuit: 127 °C (260 °F) Indication of Sensor Short Circuit: -127 °C (-197 °F)
12	Ambient Air Temperature	88 Ed	-46～80 [°C](-50～176 [°F]) *1 Indication of Sensor Open Circuit: 127 °C (260 °F) Indication of Sensor Short Circuit: -127 °C (-197 °F)
13	Temperature of Refrigerant Cooler	8F SC	-46～80 [°C](-50～176 [°F]) *1 Indication of Sensor Open Circuit: 127 °C (260 °F) Indication of Sensor Short Circuit: -127 °C (-197 °F)
14	Inverter Primary Current	88 AI	0～255 [A]
15	Indoor Electronic Expansion Valve Opening (0~63)	dE 00 ～ dE 63	No. 0 Indoor Unint ～ No. 63 Indoor Unint 0～100 [%]
16	Liquid Pipe Temperature of Indoor Unit (0~63)	dL 00 ～ dL 6E	No. 0 Indoor Unint ～ No. 63 Indoor Unint -62～127 [°C](-80～260 [°F]) *1
17	Gas Pipe Temperature of Indoor Unit (0~63)	dG 00 ～ dG 63	No. 0 Indoor Unint ～ No. 63 Indoor Unint -62～127 [°C](-80～260 [°F]) *1
18	Inlet Air Temperature of Indoor Unit (0~63)	dA 00 ～ dA 63	No. 0 Indoor Unint ～ No. 63 Indoor Unint -62～127 [°C](-80～260 [°F]) *1
19	Outlet Air Temperature of Indoor Unit (0~63)	db 00 ～ db 63	No. 0 Indoor Unint ～ No. 63 Indoor Unint -62～127 [°C](-80～260 [°F]) *1
20	Capacity of Outdoor Unit (0~63)	CA 00 ～ CA 63	No. 0 Indoor Unint ～ No. 63 Indoor Unint 0～999 Refer to "(2) Indoor Unit Capacity Table"
21	Cause Code of Indoor Unit (0~63)	8A 00 ～ 8A 63	No. 0 Indoor Unint ～ No. 63 Indoor Unint 0～99 Refer to "(3) Cause Code of I.U. or O.U. Stoppage"
22	The Degeneration Control of Pressure Ratio Decrease Protection	88 d1	0: The Degeneration Control is not Activated 1: The Degeneration Control is Activated
23	The Degeneration Control of High Pressure Increase Protection	88 d3	0: The Degeneration Control is not Activated 1: The Degeneration Control is Activated
24	The Degeneration Control of Inverter Temp. Increase Protection	88 d4	0: The Degeneration Control is not Activated 1: The Degeneration Control is Activated
25	The Degeneration Control of Discharge Temp. Increase Protection	88 d5	0: The Degeneration Control is not Activated 1: The Degeneration Control is Activated
26	The Degeneration Control of TdSH Decrease Protection TdSH: Superheat of Discharge Gas	88 d6	0: The Degeneration Control is not Activated 1: The Degeneration Control is Activated
27	The Degeneration Control of Overcurrent Protection	88 d7	0: The Degeneration Control is not Activated 1: The Degeneration Control is Activated

Check No.	Item	Indication Data	
		Index	Contents
28	Accumulated Operating Time of Compressor	00 08	0～9999(× 10 hours) If it exceeds 9999, it is displayed as: .0
29	Accumulated Operating Time of Compressor(Restorable)	20 08	0～9999(× 10 hours)
30	Outdoor Unit Alarm Code	08 AC	0～99 Refer to "(4) Alarm Code Table"
31	Cause Code of Inverter Stoppage	08 CE	0～16 Refer to "(5) Cause Code of Inverter/Fan Stoppage"
32	Abnormal Data Record (No.1~No.15)	A0 01 ～ A0 15	No. 1 Abnormal Data Record(Latest) ～ No. 15 Abnormal Data Record *Refer to "(6) Abnormal Data Record"
33	Total Capacity of Indoor Unit Connected	08 CP	0~9999 1: Refer to "(2) Indoor Unit Capacity Table"
34	Connected Indoor Unit Number	08 NN	0~64 (Pc)
35	Refrigerant System Address	08 CA	0~63

*1 If Function Setting “Fd”=1, indication unit is converted to [°F] or [psi] from [°C] or [MPa].

(1) Cause Code of I.U. or O.U. Stoppage

Code	Item
00	Operation OFF, Power OFF
01	Thermo-OFF
02	Alarm
03	Freeze Protection Overheating Protection
05	Instantaneous Power Failure at the Outdoor Unit
06	Instantaneous Power Failure at the Indoor Unit
07	Stoppage of Cooling Operation due to High/Low Outdoor Air Temperature Stoppage of Heating Operation due to High Outdoor Air Temperature
10	Demand. Forced Stoppage
11	Retry due to Pressure Ratio Decrease
12	Retry due to Ps Increase
13	Retry due to Pd Increase

Code	Item
15	Retry due to Discharge Gas Temperature Increase Retry due to Low Pressure Decrease
16	Retry due to Discharge Gas SUPERHEAT Decrease
17	Instantaneous Overcurrent of Inverter Retry Electronic Thermal Activation of Inverter Retry Abnormal Current Sensor of Inverter Retry
18	Retry due to Inverter Voltage Decrease Retry due to Inverter Overvoltage
19	Electronic Expansion Valve Opening Difference Protection
20	Operation Mode Clash With Other Indoor Unit
21	Forced Thermo-OFF for Oil Return
22	The Outdoor Unit Hot Start
26	Retry due to High Pressure Decrease
28	Cooling Air Discharge Temperature Decrease
42	Abnormal Temperature of Refrigerant Cooler (TSC)

1. The cause code of indoor unit stoppage is not always “02” (Alarm) during stoppage by the abnormality.
   If the unit is under Thermo-OFF by other cause of stoppage before “02” (Alarm) occurs, the previous cause code of indoor unit stoppage remains.
2. When the communication between the inverter PCB and the outdoor unit PCB is disconnected for 30 seconds, the outdoor micro-computer will be reset. Accordingly when the alarm code “04” (Communication Failure between Inverter PCB and Outdoor Unit PCB) occurs, the cause code of indoor unit stoppage may be indicated “05”.
3. When the communication between the indoor unit and the outdoor unit is disconnected for 3 minutes, the indoor micro-computer will be reset. Accordingly when the alarm code “03” (Communication Failure between Indoor Unit and Outdoor Unit) occurs, the cause code of indoor unit stoppage may be indicated “06”.

(2)Alarm Code

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	Transmission	Abnormality between Indoor and Outdoor	Incorrect Wiring, Loose Terminals, Disconnect Wire, Blowout of Fuse, Outdoor Unit Power OFF
04		Abnormality between Inverter PCB and Outdoor Unit PCB	Inverter PCB - Outdoor Unit PCB Transmission Failure (Loose Connector, Wire Breaking, Blowout of Fuse)
05	Supply Phase	Abnormality Power Supply Phases	Incorrect Power Supply, Connection to Reversed Phase, Open-Phase
06	Voltage	Abnormal Inverter Voltage	Outdoor Voltage Drop, Insufficient Power Capacity
06.		Abnormal Fan Controller Voltage	Outdoor Voltage Drop, Insufficient Power Capacity
07	Cycle	Decrease in Discharge Gas Superheat	Excessive Refrigerant Charge, Failure of Thermistor, Incorrect Wiring, Incorrect Piping Connection, Expansion Valve Locking at Opened Position (Disconnect Connector)
08		Increase in Discharge Gas Temperature	Insufficient Refrigerant Charge, Pipe Clogging Failure of Thermistor, Incorrect Wiring, Incorrect Piping Connection, Expansion Valve Locking at Closed Position (Disconnect Connector)
11	Sensor on Indoor Unit and Controller	Inlet Air Thermistor/ Inlet Water Thermistor	Incorrect Wiring, Disconnecting Wiring Breaking Wire, Short Circuit
12		Outlet Air Thermistor/ Outlet Water Thermistor	
13		Freeze Protection Thermistor	
14		Gas Piping Thermistor	
15		Abnormality of Indoor Air Thermistor (Total Heat Exchanger)	
16		Abnormality of Remote Control Thermistor	
17		Abnormality of Thermistor in Wire Controller	
19	Fan Motor	Activation of Protection Device for Indoor Fan	Fan Motor Overheat, Locking
21	Sensor on Outdoor Unit	High Pressure Sensor	Incorrect Wiring, Disconnecting Wiring Breaking Wire, Short Circuit
22		Outdoor Air Thermistor	
23		Discharge Gas Thermistor on Top of Compressor	
24		Heat Exchanger Liquid Pipe Thermistor or Tsc Thermistor	
29		Low Pressure Sensor	
31	System	Incorrect Capacity Setting of Outdoor Unit and Indoor Unit/water module	Incorrect Capacity Code Setting of Combination Excessive or Insufficient Indoor Unit /Water Module Total Capacity Code
35		Incorrect Setting of Indoor Unit No.	Duplication of Indoor Unit No. in same Ref. Gr.
36		Incorrect 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 Unit PCB)
43	Protection Device	Activation of Low Compression Ratio Protection Device	Defective Compression (Failure of Compressor of Inverter, Loose Power Supply Connection)
44		Activation of Low Pressure Increase Protection Device	Overload at Cooling, High Temperature at Heating, Expansion Valve Locking (Loose Connector)
46		Activation of High Pressure Decrease Protection Device	Insufficient Refrigerant, Blow-by of the Reversing Valve
47		Activation of Low Pressure Decrease Protection Device (Vacuum Operation Protection)	Insufficient Refrigerant, Refrigerant Piping, Clogging, Expansion Valve Locking at Open Position (Loose Connector)
48		Activation of Inverter Overcurrent Protection Device	Overload Operation, Compressor Failure
51	Sensor	Abnormal Inverter Current Sensor	Current Sensor Failure
53	Inverter	Inverter Error Signal Detection	Driver IC Error Signal Detection (Protection for Overcurrent, Low Voltage, Short Circuit)
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	Incorrect Wiring between PCB,Driver IC and Fan-motor (Broken,wrong wiring)
EE	Compressor	Compressor Protection Alarm (It can not be reset from remote controller)	This alarm code appears when the following alarms* occurs three times within 6 hours. *02, 07, 08, 43 to 45, 47
A6	Inverter	Abnormality of Refrigerant Cooling Module Temperature	Insufficient Refrigerant, or Abnormal EVO
b1	Outdoor Unit No. Setting	Incorrect Setting of Unit and Refrigerant Cycle No.	Over 64 Number is Set for Address or Refrigerant Cycle.
b5	Indoor Unit No. Setting	Incorrect Indoor Unit Connection Number Setting	More than 17 Non-Corresponding to H-LINK II Units are Connected to One System.

NOTES:

1. When the RUN indicator flashes every 4 seconds, the communication failure between the indoor unit and the wired controller (Loosening at connector, Incorrect Wiring, Disconnecting Wiring, Breaking Wire) occurs.
2. The outdoor unit is designed for single phase. Accordingly, the alarm code “05” is not available.

(3) Cause Code of Inverter Stoppage (iTC)

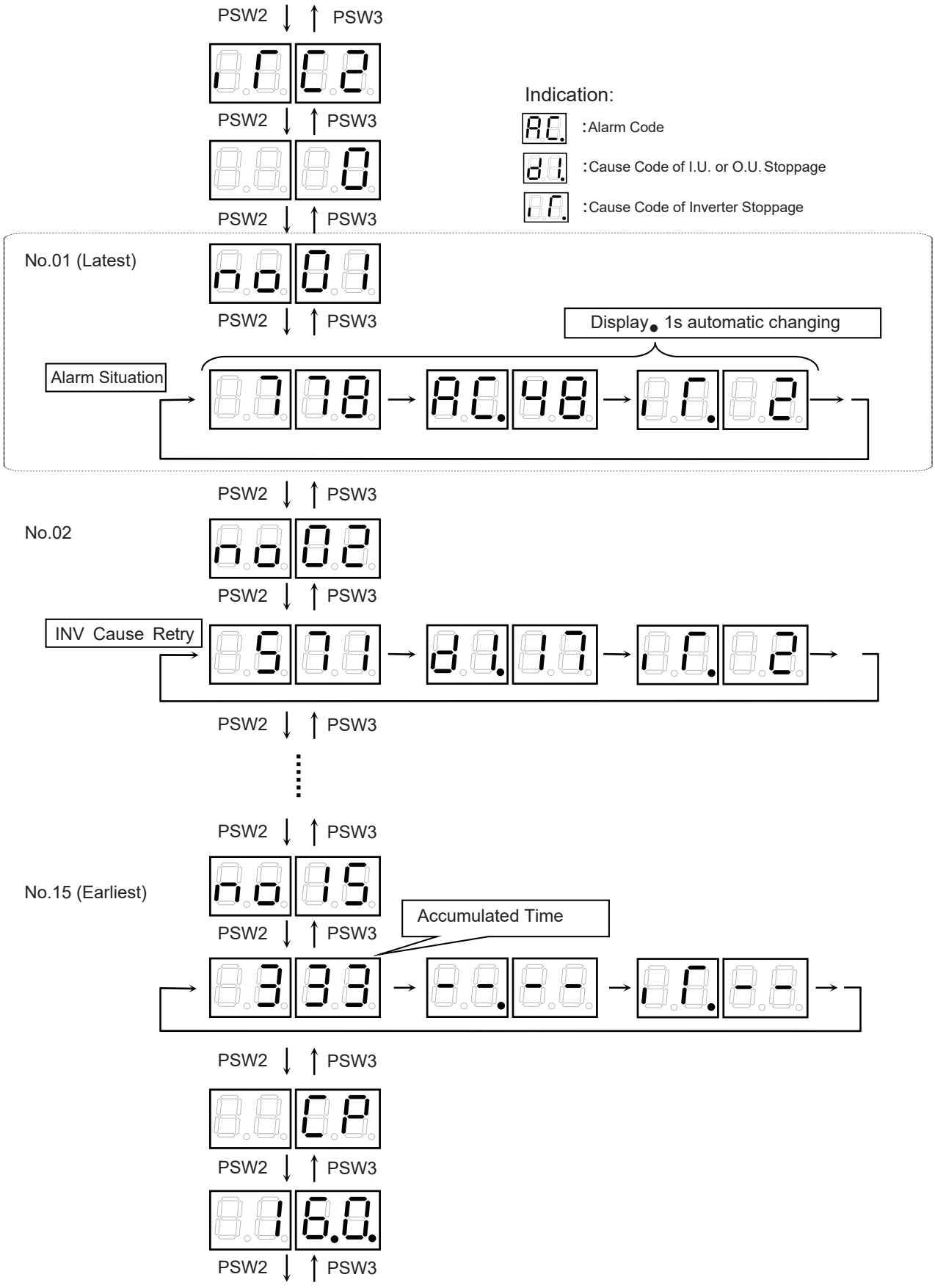
Code (SEG1)	Cause	Corresponding of Cause Code of I.U. or O.U. Stoppage	Remark	
			Indication during Retry	Alarm Code
1	IPM Error	17	P17	53
2	Instantaneous Overcurrent	17	P17	48
3	Inverter Fin Thermistor Protection Activation	17	P17	54
4	Electronic Thermal Protection	17	P17	48
5	Inverter Voltage Decrease	18	P18	06
6	Overvoltage	18	P18	06
7	Abnormal Communication	18	-	04
8	Abnormal Current Detection	17	P17	51
9	Instantaneous Power Failure Detection	18	-	-
11	Reset of Micro-Computer for Inverter	18	-	-
12	Ground Fault Detection from Compressor	17	P17	53
13	Open Phase Detection	18	-	-
16	Inverter Malfunction	18	P18	55
17	Communication Error	18	-	55
18	Protection Device Actuation (PSH)	-	-	02
19	Abnormal Protective Device	-	-	38
20	Early Return Protective Device	18	-	-
21	Step-Out Detection	17	P17	53
22	Abnormal PCB setup	-	-	31
23	EERPOM Error	-	-	55

(4) Abnormal Data Record

“Abnormal Data Record”(No.01 ~ No.15) in checking item can record recent abnormal stoppages.
(The maximum number of recordable is 15. No. 01 is the latest one.)
In case of abnormal stoppage in following table, accumulated operation time when abnormal happened, alarm code/cause code of I.U. or O.U. stoppage, and cause code of inverter stoppage are recorded.

Example:

No. of Abnormal Data	NO.01
Accumulated Operation Time	1278 h
Alarm Code	48
Cause Code of Inverter Stoppage	2


PSW2
PSW3
Indication:
: Alarm Code
: Cause Code of I.U. or O.U. Stoppage
: Cause Code of Inverter Stoppage
No.01 (Latest)
Display 1s automatic changing
Alarm Situation
No.02
INV Cause Retry
No.15 (Earliest)
Accumulated Time

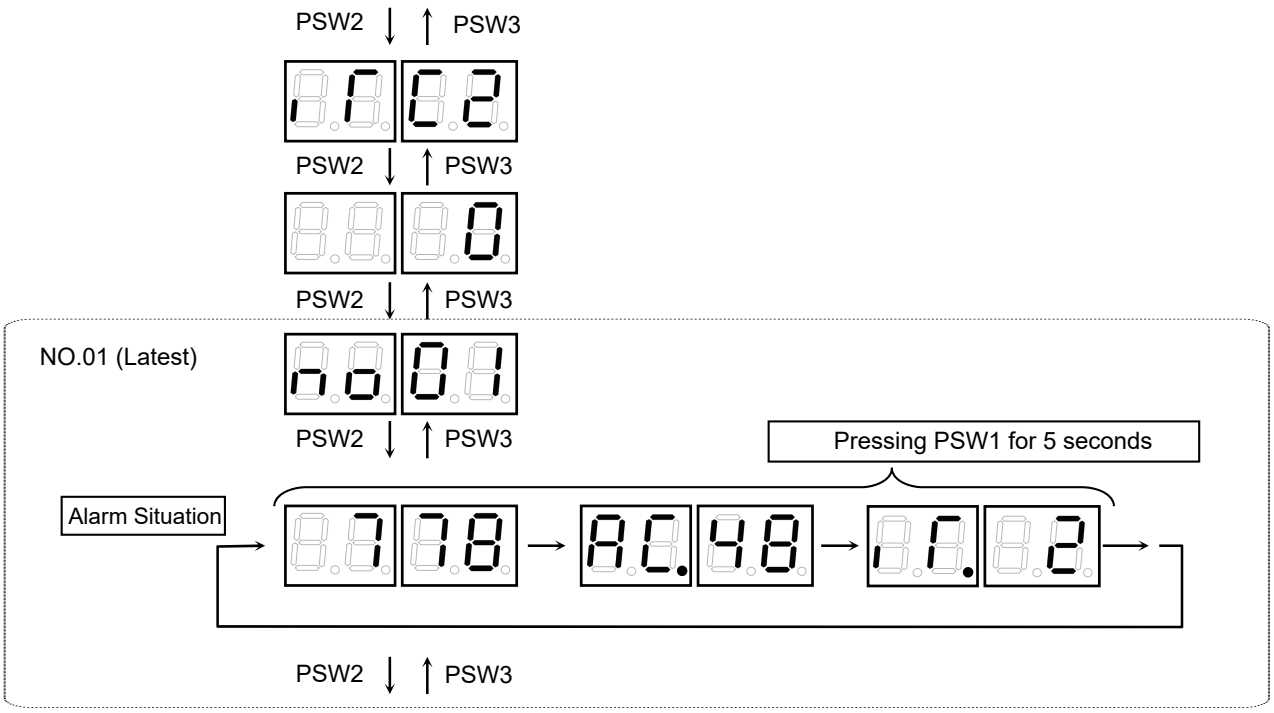
Alarm Code or Cause Code of I.U. or O.U. Stoppage	Contents	Cause code of inverter stoppage	
		ITC	FTC
02	Activation of the safety device (high pressure switch) in the outdoor unit	- -	- -
03	Abnormal Transmitting between Indoor and Outdoor Units	- -	- -
04	Abnormal Transmitting between Inverter PCB and Outdoor Unit PCB	- -	- -
05	Abnormal Power Supply Phase	- -	- -
06 d1-18	Abnormal Inverter Voltage (Insufficient Inverter Voltage or Overvoltage)	5,6	5,6
07 d1-16	Activation of discharge gas superheat decrease protection	- -	- -
08 d1-15	Activation of discharge gas temperature increase protection	- -	- -
21	Abnormality of high pressure sensor (Pd)	- -	- -
22	Abnormality of thermistor for outdoor air temperature (Ta)	- -	- -
23	Abnormality of thermistor for discharge gas temp. (Td)	- -	- -
24	Abnormality of thermistor for outdoor unit heat exchanger liquid pipe (Te)	- -	- -
29	Abnormality of Low Pressure Sensor for outdoor unit (Ps)	- -	- -
31	Incorrect capacity ratio with indoor unit and outdoor unit	- -	- -
32	Abnormal communication of other indoor units	- -	- -
35	Incorrect indoor unit No. setting	- -	- -
36	Incorrect indoor unit combination	- -	- -
38	Abnormality of picking up circuit for protection in outdoor unit	- -	- -
43 d1-11	Abnormality of low compression ratio	- -	- -
— d1-12	Activation of low pressure increase protection	- -	- -
46 d1-26	Activation of high-pressure decrease protection device (Vacuum operation protection)	- -	- -
47 d1-15	Activation of low pressure decrease protection	- -	- -
48 d1-17	Activation of overcurrent protection	2,4	- -
51 d1-17	Abnormality of current sensor for inverter	8	- -
53 d1-17	Activation of inverter module protection device	1,12	- -
54 d1-17	Activation of inverter fin temperature increase protection	3	- -
55 d1-18	Inverter failure	0,9,10,11,13, 14,15,16	- -
57	Abnormality of Outdoor Fan Motor	- -	- -
b5	Incorrect setting of indoor unit connection number	- -	- -
EE	Compressor protection alarm	- -	- -
d1-05	Instantaneous power failure at the outdoor unit	- -	- -
d1-13	Activation of high pressure increase protection	- -	- -
A6	Abnormality of refrigerant cooling module temperature	- -	- -
d1-42		- -	- -

iTC: Inverter Stoppage Code d1: Cause Code of I.U. or O.U. Stoppage

NOTE:

All History will be erased by pressing PSW1 for 5 seconds when Abnormal Data Record is displayed.

* Deletion of Alarm Code History



1.2.2 Checking of Protection Control Information

Protection control code is displayed on 7-segment display while a protection control is activated. It is turned OFF when the protection control is canceled. If several protection controls are activated, the code of the protection control with highest priority will be displayed. Also if several retry control is activated, the code of the latest retry control will be displayed.

Rank Order.	Indication	Protection Control Performed
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	Prohibition of Increase	Prohibition of Decrease
① Higher Rank Order of Protection Control Function	Forced Decrease	①	①	①	①
	Forced Increase	①	①	①	①
	Prohibited Increase	②	②	② *1	①
	Prohibited Decrease	②	②	②	②

*1: Discharge Temperature Increase Protection Control (P05) is higher than the following protection controls.

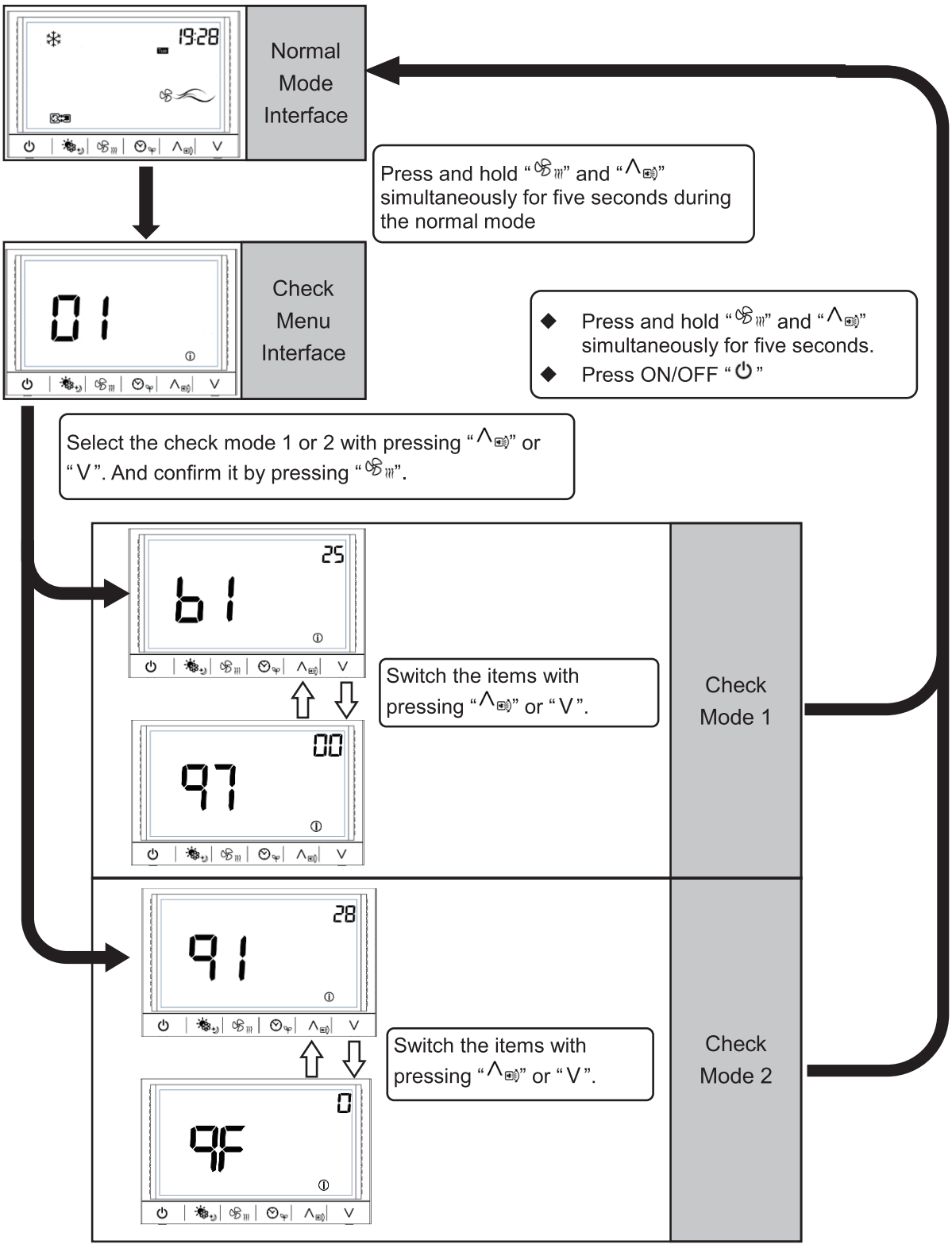
a) Low Pressure Decrease Protection Control (P06)

b) Demand Current Control (P0A)

Indication	Protection Control	Remark
P01	Pressure Ratio Protection Control	To control the compressor frequency for prevention of operation with high/low pressure ratio.
P02	High Pressure Increase Protection Control	To control the compressor frequency for prevention of high pressure increase.
P03	Inverter Current Protection Control	To control the compressor frequency for prevention of inverter current increase in the outdoor unit during operation.
P04	Inverter Fin Temperature Increase Protection Control	To control the compressor frequency for prevention of inverter fin temperature increase. The inverter fin temperature is detected at the inverter PCB.
P05	Discharge Temperature Increase Protection Control	To control the compressor frequency for prevention of discharge gas temperature increase during operation.
P06	Low pressure Decrease Protection Control	To control the compressor frequency for prevention of low pressure decrease.
P09	High Pressure Decrease Protection Control	To control the compressor frequency for prevention of high pressure decrease, which would interrupt smooth refrigerant distribution to indoor units with different height and oil supply to the compressor.
P0A	Demand Current Control	To control the compressor frequency for fixing the inverter primary current around the set value (60~100% of rated current for cooling).
P0d	Low Pressure Increase Protection Control	To control the compressor frequency for prevention of low pressure increase.

1.2.3 Check Mode by Wired Controller

Each “Check Menu” item and its function is explained in the following figure:



NOTE:

If one wired controller is connected to more than 2 indoor units, the address of the indoor unit should be selected firstly by entering the check menu interface. If one wired controller is connected to only one indoor unit, the step is skipped.

Check Menu Item	Function	Operation
Check 1	Sensor condition of air conditioner will be monitored and indicated.	Press and hold " " and " " simultaneously for five seconds during the normal mode, and select "Check 01".
Check 2	Sensor data of air conditioner prior to alarm occurrence will be indicated.	Press and hold " " and " " simultaneously for five seconds during the normal mode, and select "Check 02".
Alarm History Display *1	Previous alarm record (date, time, alarm code) will be indicated.	Press and hold " " for five seconds during the normal mode, and select "Alarm History Display".

*1: Please refer to the Service Manual for Indoor Unit.

(1) Features of Check Mode 1

No.	Item	Data Name	No.	Item	Data Name
1	b1	Set Temperature for I.U.	22	H2	Suction Pressure
2	b2	Inlet Air Temperature for I.U.	23	H3	Control Information
3	b3	Outlet Air Temperature for I.U.	24	H4	Operating Frequency
4	b4	Liquid Pipe Temp. for I.U.	25	J1	I.U. Capacity
5	b5	Wireless Controller Temp.	26	J2	O.U. Code
6	b6	Outdoor Air Temp.	27	J3	Refrigerant System No. (1)
7	b7	Gas Pipe Temp. for I.U.	28	J4	Refrigerant System No. (2)
8	b8	Evaporating Temp. at Heating for O.U.	29	L1	I.U. Expansion Valve
9	b9	Condensing Temp. at Cooling for O.U.	30	L2	O.U. Expansion Valve 1
10	bA	Comp. Discharge Temp.	31	L3	O.U. Expansion Valve 2
11	bb	Wired Controller Temp.	32	L4	O.U. Expansion Valve B
12	bC	Not Prepared	33	P1	Comp. Current
13	C1	I.U. Micro-Computer	34	P2	Accumulated Operation Time of Comp. (×10 hours)
14	C2	O.U. Micro-Computer	35	q1	Motion Sensor Reaction Rate
15	d1	Cause Code of Indoor Unit Stoppage	36	q2	Radiation Sensor Temp.
16	E1	Times of Abnormality	37	q3	Motion Sensor 1 Reaction Rate
17	E2	Times of Power Failure	38	q4	Motion Sensor 2 Reaction Rate
18	E3	Times of Abnormal Communication	39	q5	Motion Sensor 3 Reaction Rate
19	E4	Times of Inverter Tripping	40	q6	Motion Sensor 4 Reaction Rate
20	F1	Louver Sensor State	41	q7	Setting Temp. Corrected Value
21	H1	Discharge Pressure			

NOTE:

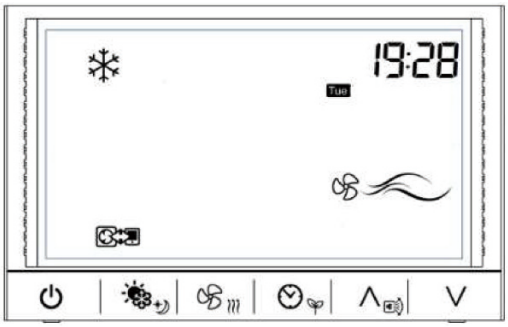
I.U.: Indoor Unit; O.U.: Outdoor Unit.

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

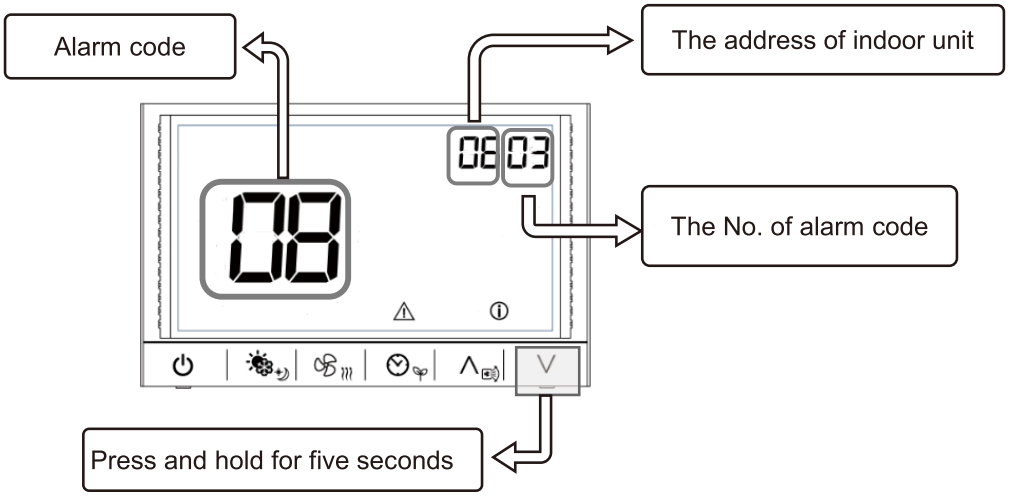
NOTE:
I.U.: Indoor Unit; O.U.: Outdoor Unit.

(3) Alarm History Display

The Alarm History Display is accessed from the Check Menu.
(A)The figure shows the normal mode interface.



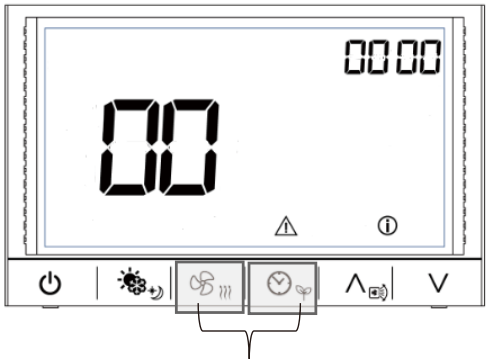
(B) Press and hold "⋁ " for five seconds during the normal mode, and the history alarm code would display.
The codes can be checked by pressing "⋀" or " ⋁".



(C) Press the "⋁" for five seconds or press ON/OFF "⏻", the alarm history display is disappeared and it will show the normal mode interface.

(4) To Reset Alarm History Display

Press and hold "" and "" simultaneously for five seconds during the alarm code history display, and all the alarm history would be deleted. The the No. of error, the No. of indoor unit and the error code will display "00" as shown in the following figure.



Press and hold "" and "" simultaneously for five seconds.

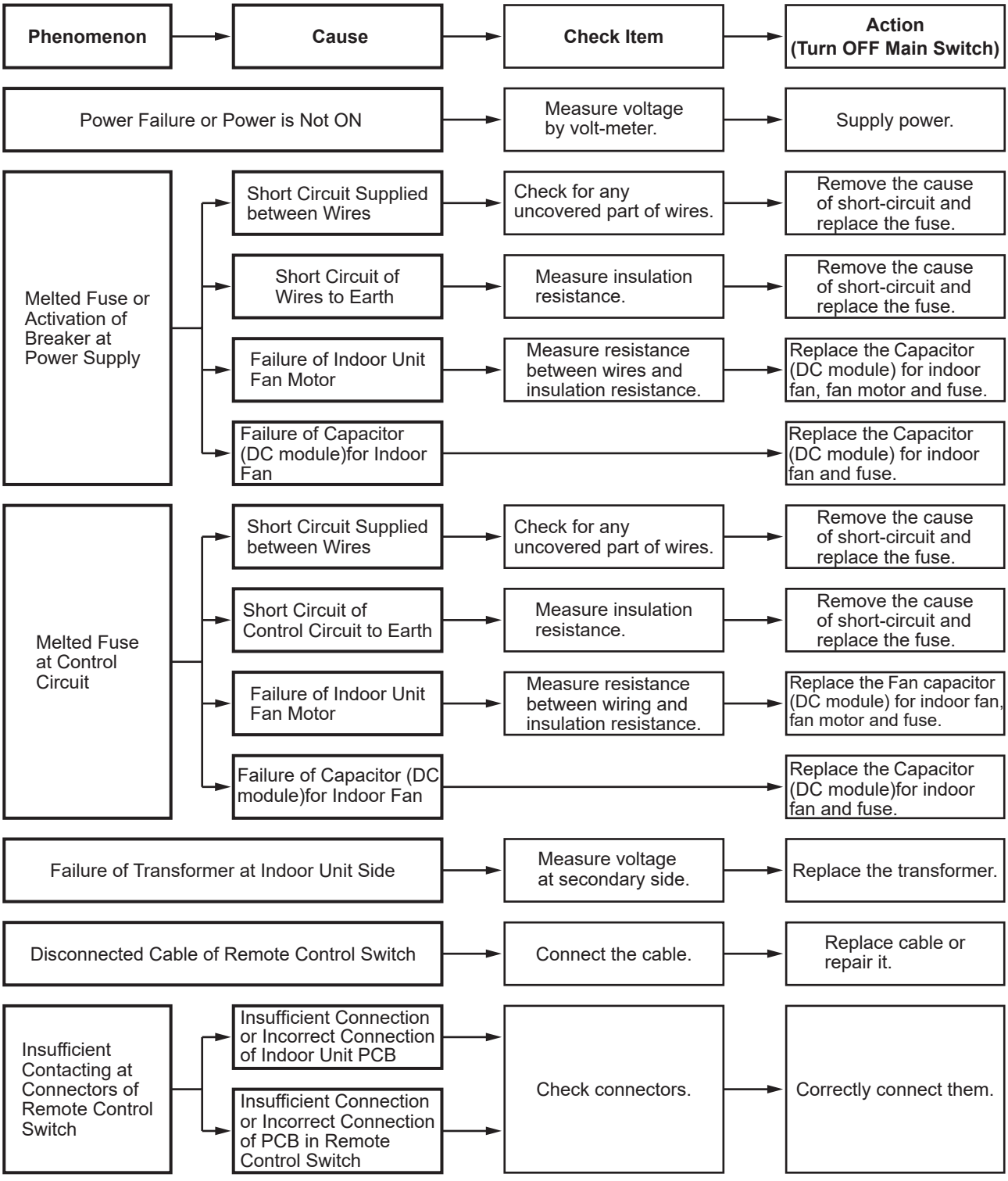
Press the "V" for five seconds or press ON/OFF "", the alarm history display is disappeared and it will show the normal mode interface.

NOTE:

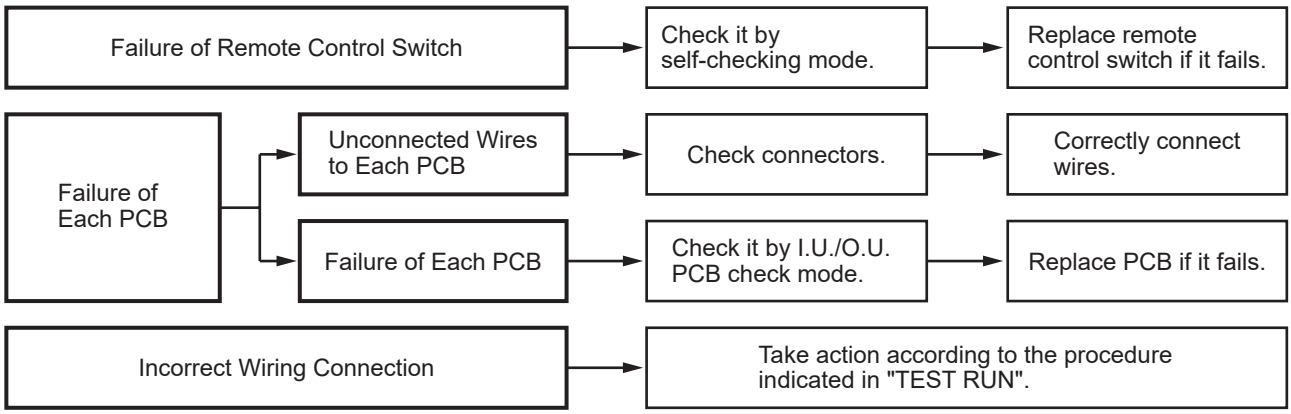
- The maximum history alarm codes can be recorded by the wired controller is 30.

1.2.4 Failure of Power Supply to Indoor Unit and Remote Control Switch

- Lights and LCD are not Indicated.
- Not Operated.
  If fuses are melted or a breaker is activated, investigate the cause of over current and take necessary actions.

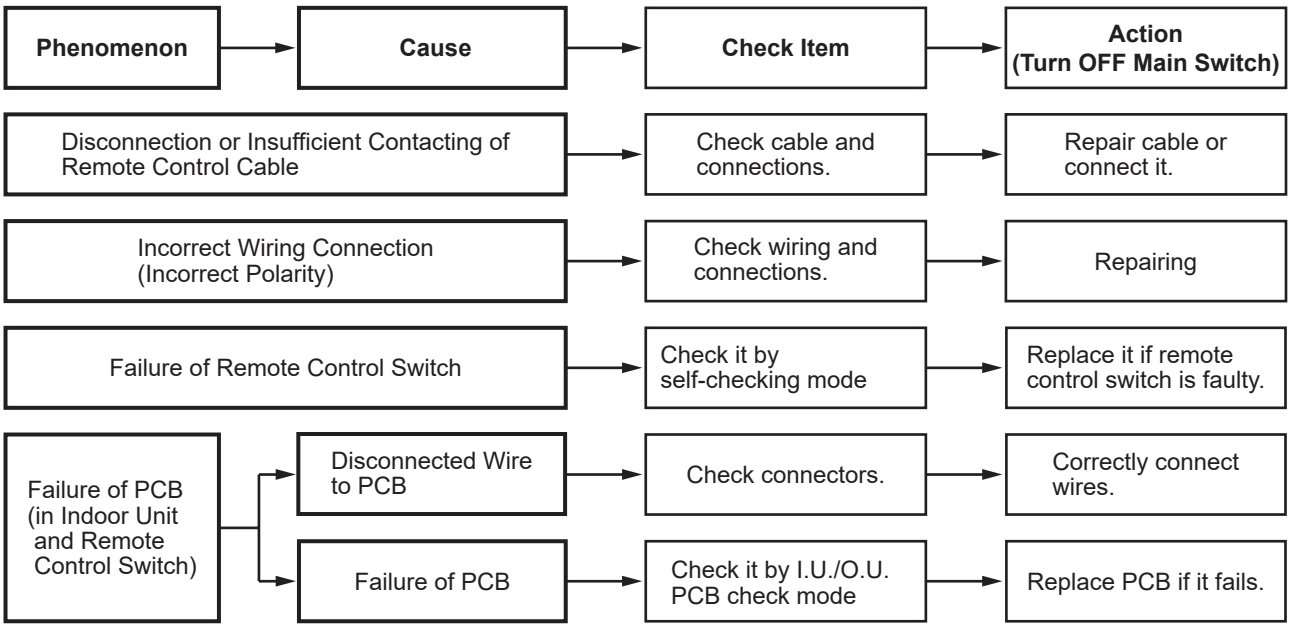


(1.2.4 Failure of Power Supply to Indoor Unit and Remote Control Switch)



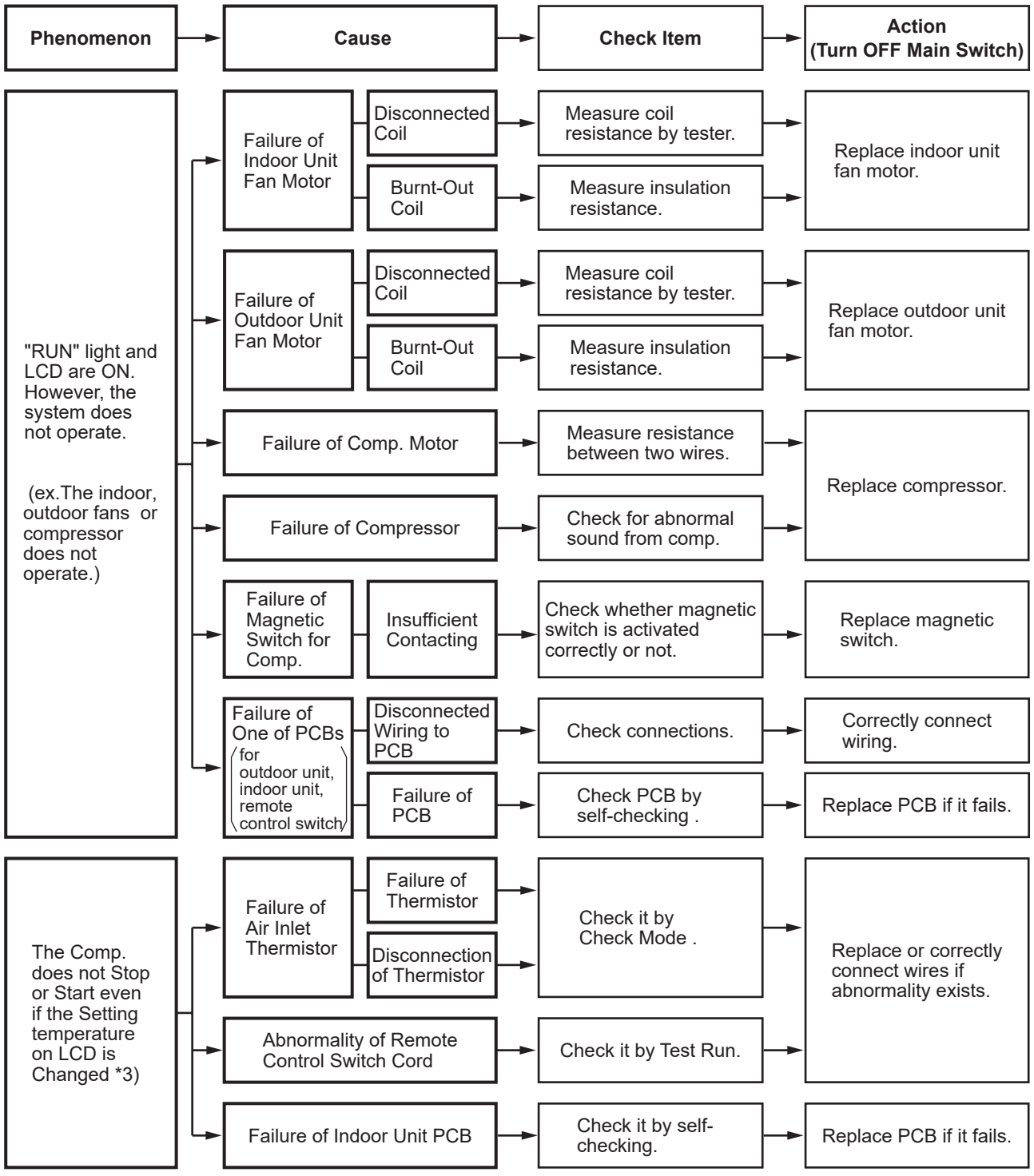
1.2.5 Abnormal Transmission between Remote Control Switch and Indoor Unit

- "RUN" Lamp on Remote Control Switch:
  Flashing every 2 seconds

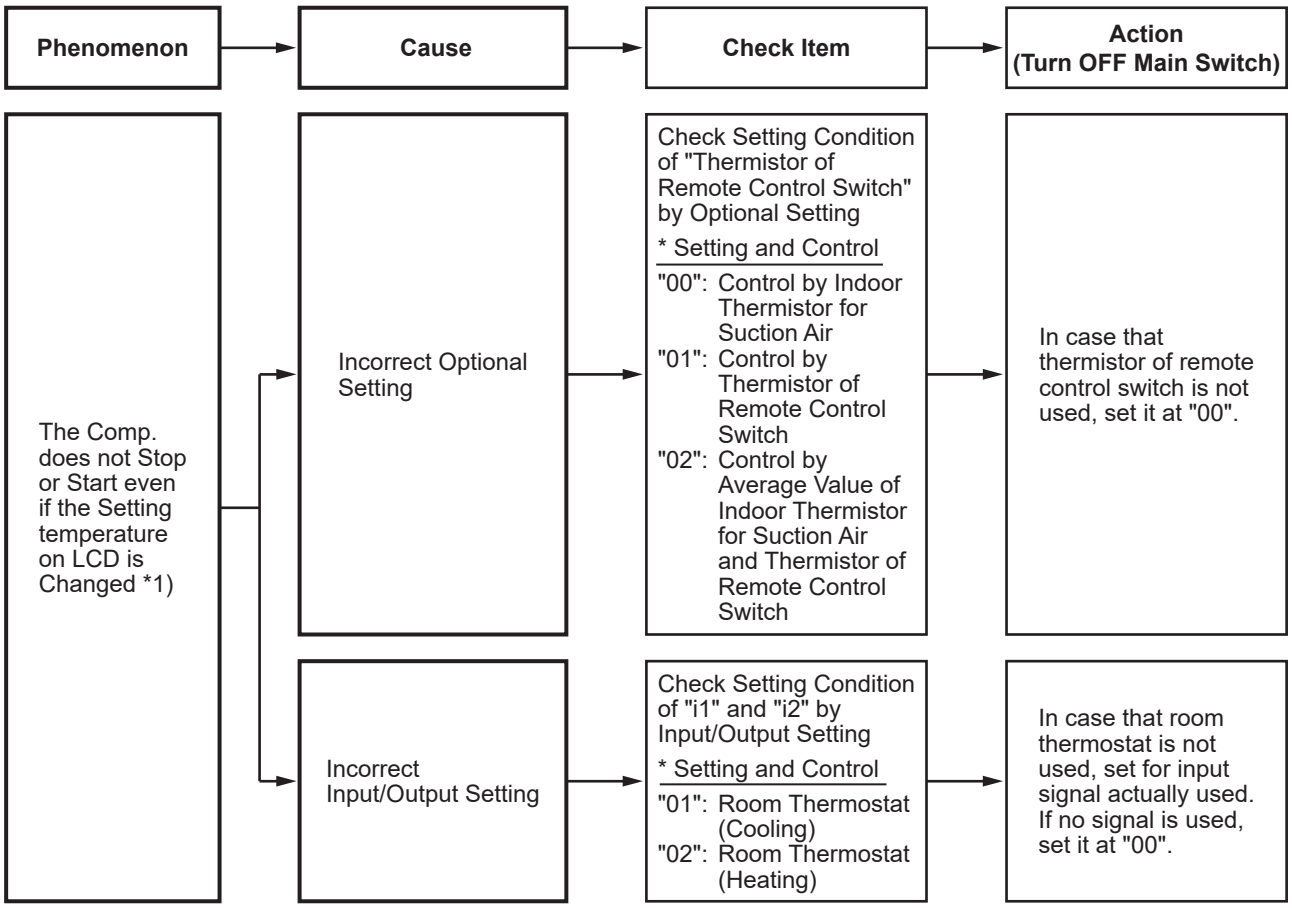


1.2.6 Abnormalities of Devices

In the case that no abnormality (Alarm Code) is indicated on the remote control switch, and normal operation is not available, take necessary actions according to the following procedures.



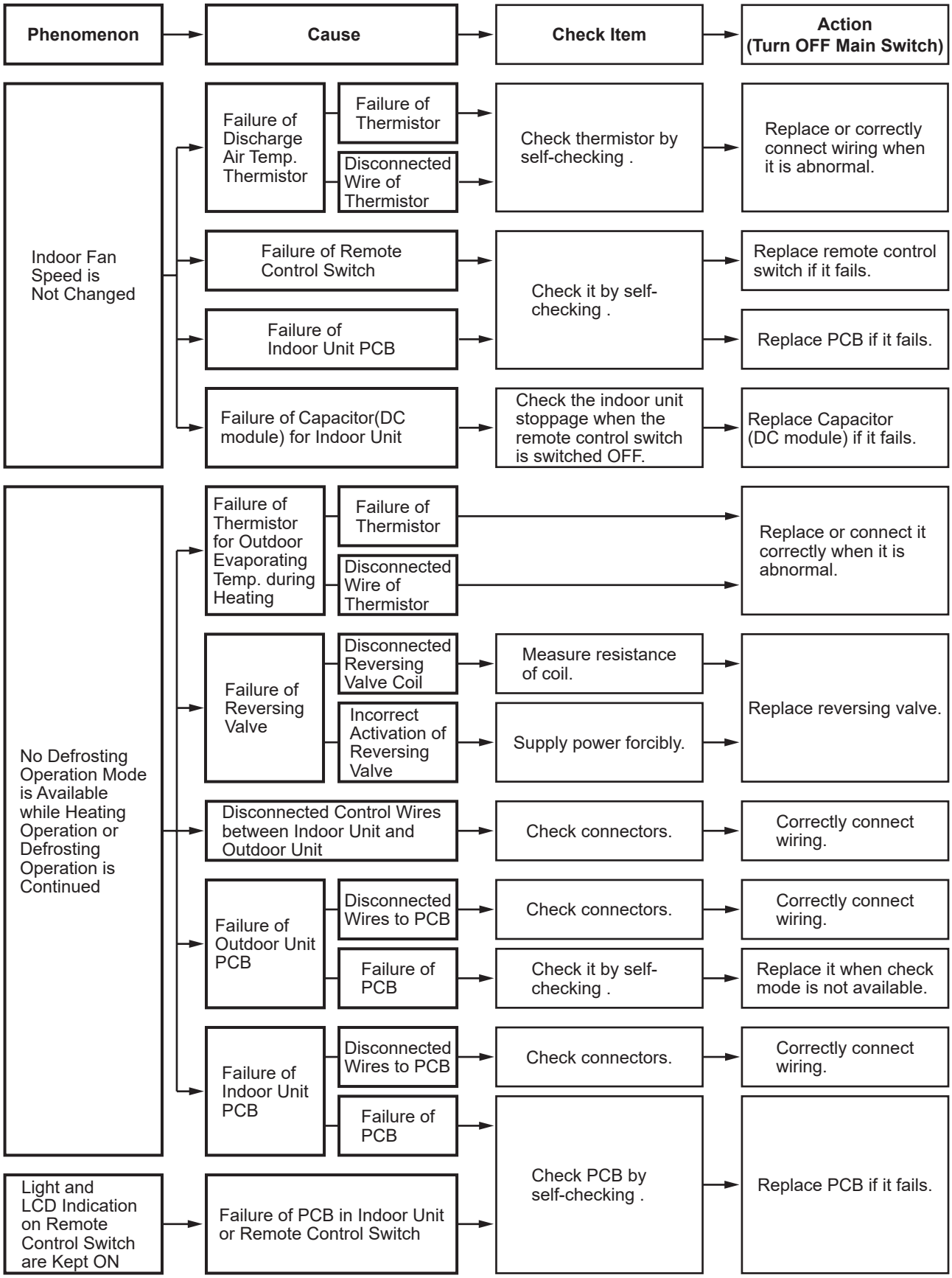
(1.2.6 Abnormalities of Devices)



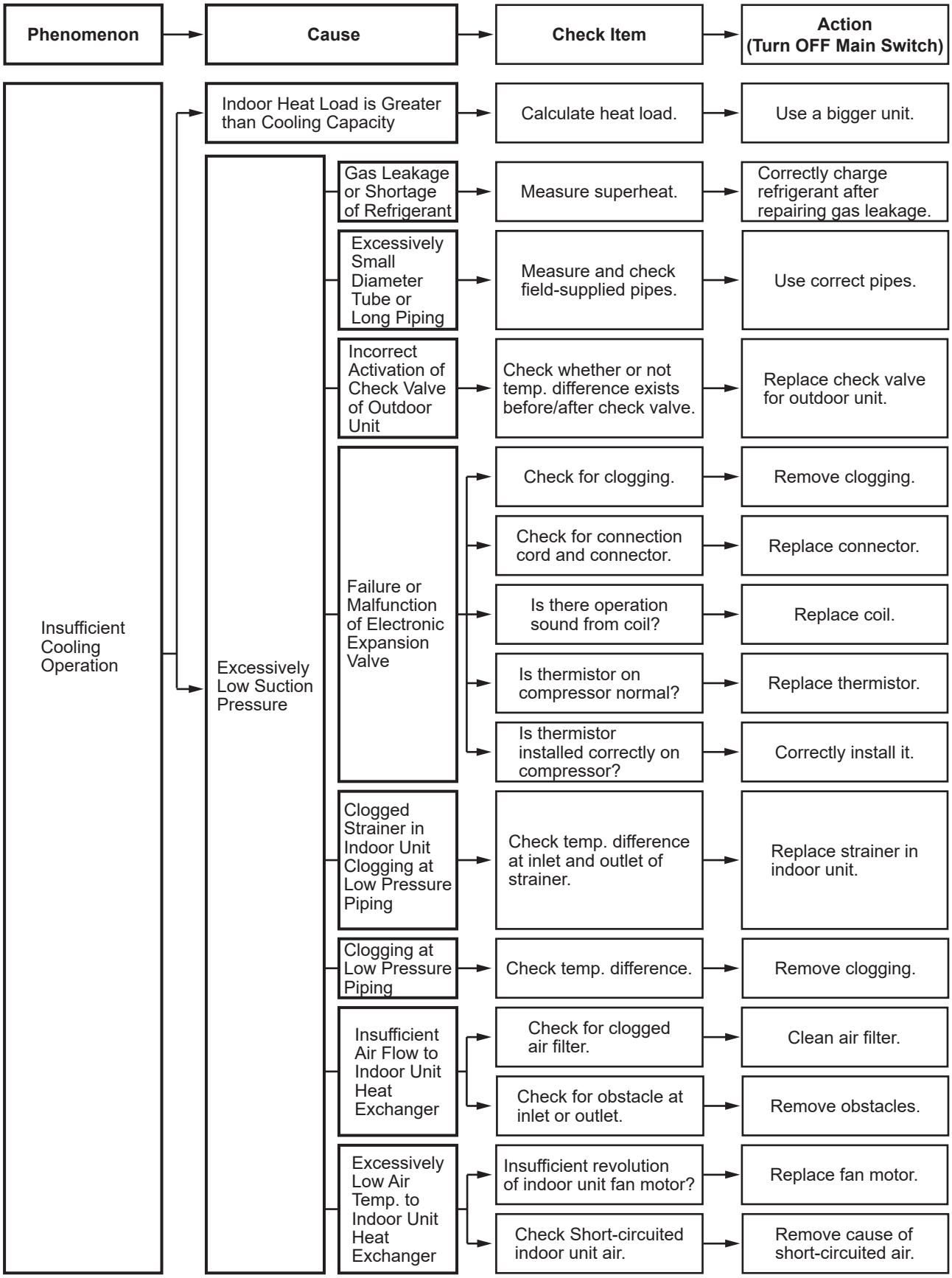
*1): Even if controllers are normal, the compressor does not operate under the following conditions.

* Indoor Air Temp. is lower than 21°C or Outdoor Air Temp. is lower than -5°C during cooling operation.
* Indoor Air Temp. is higher than 30°C or Outdoor Air Temp. is higher than 26°C during heating operation.
* When a cooling (or heating) operation signal is given to the outdoor unit and a different operation signal is given to indoor units.
* When demand signal or emergency stop signal is given to outdoor unit.

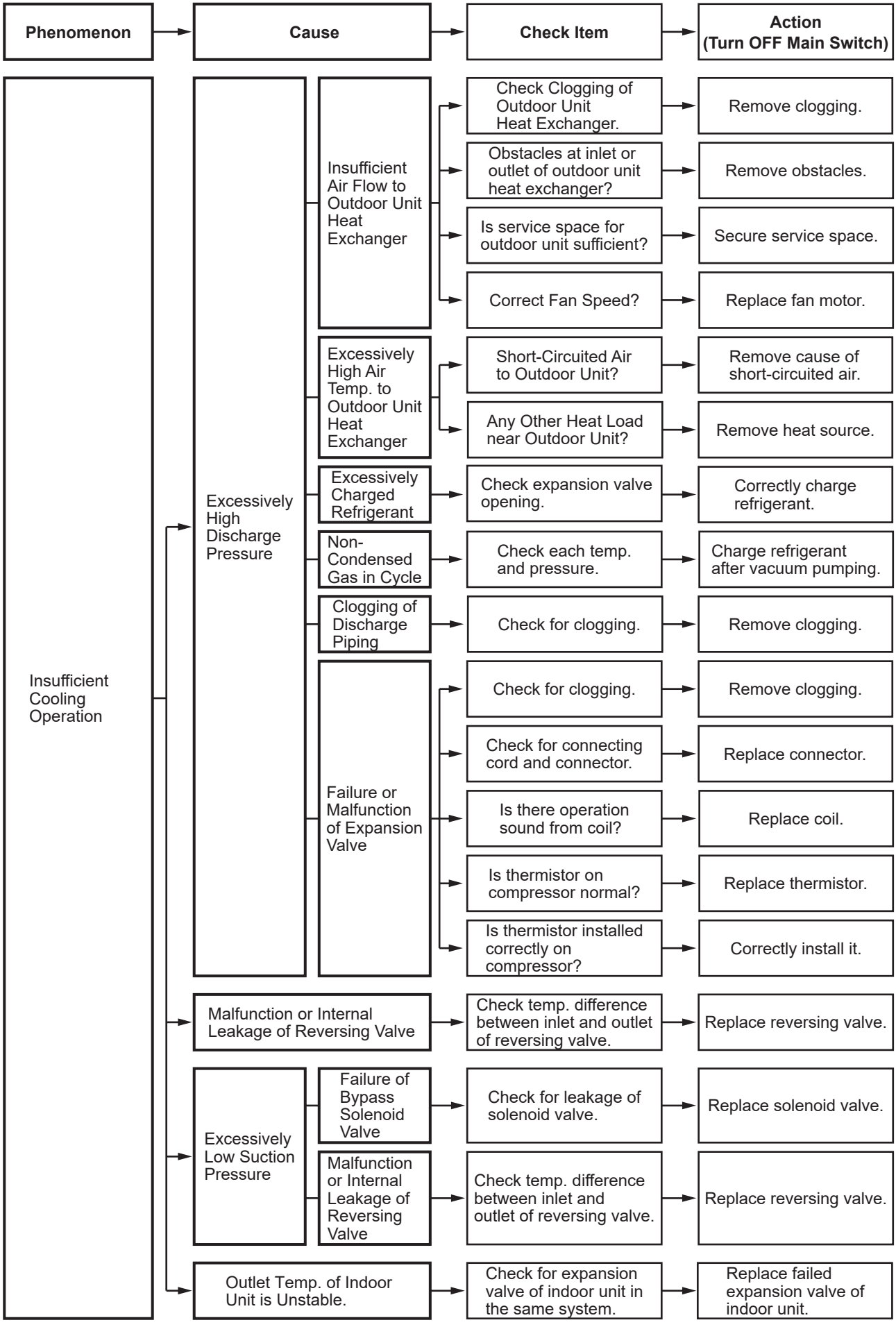
(1.2.6 Abnormalities of Devices)



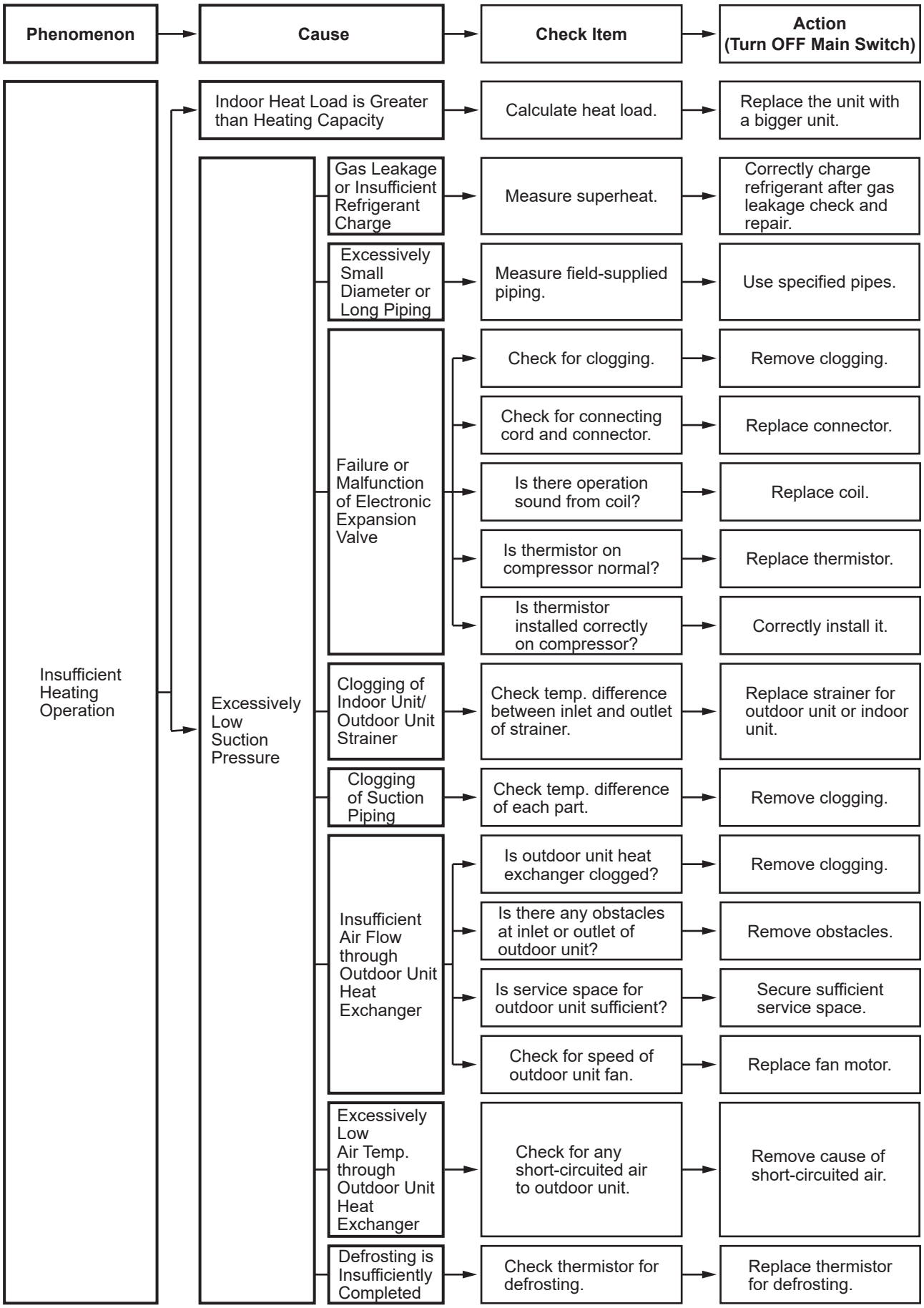
(1.2.6 Abnormalities of Devices)



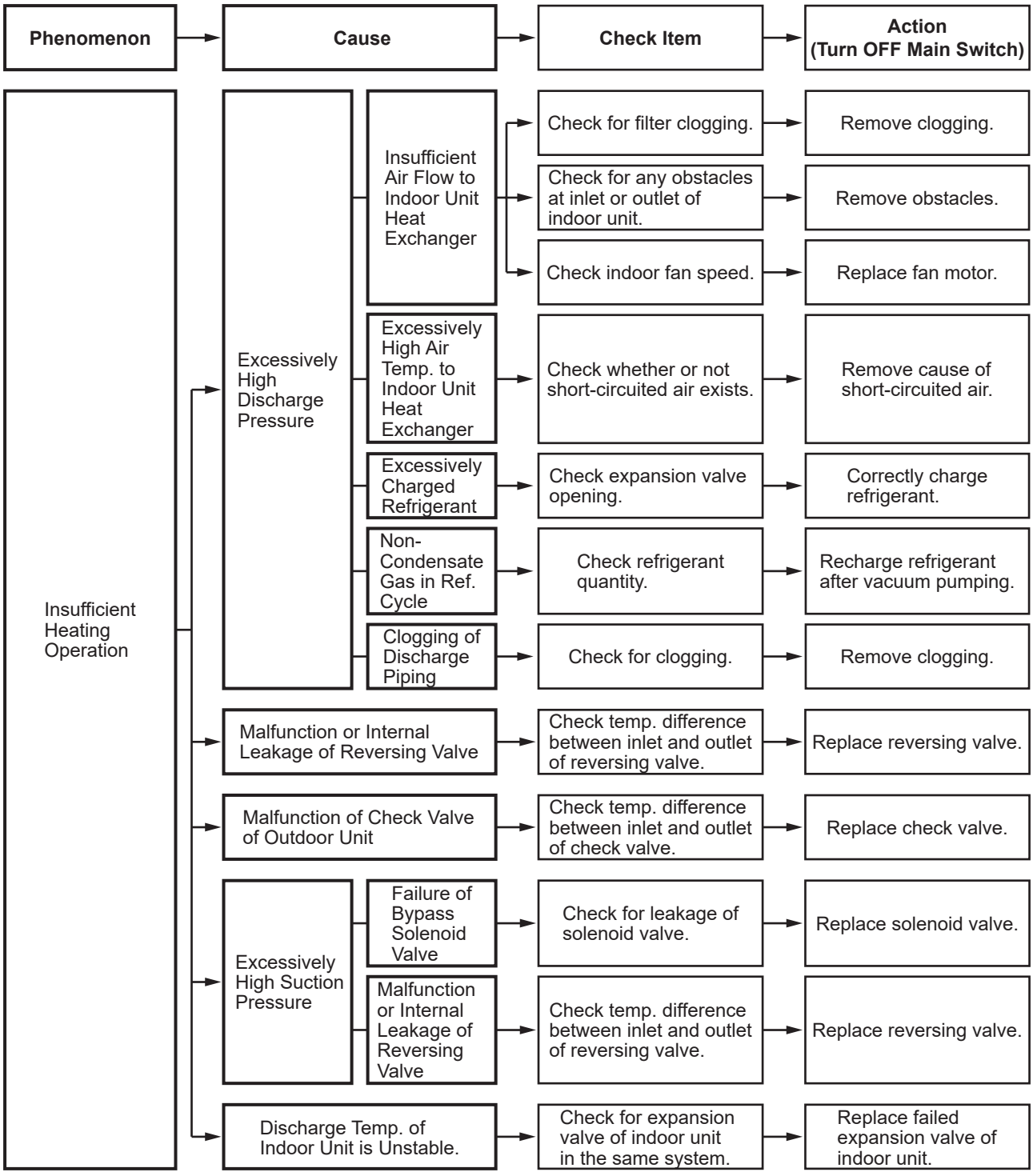
(1.2.6 Abnormalities of Devices)



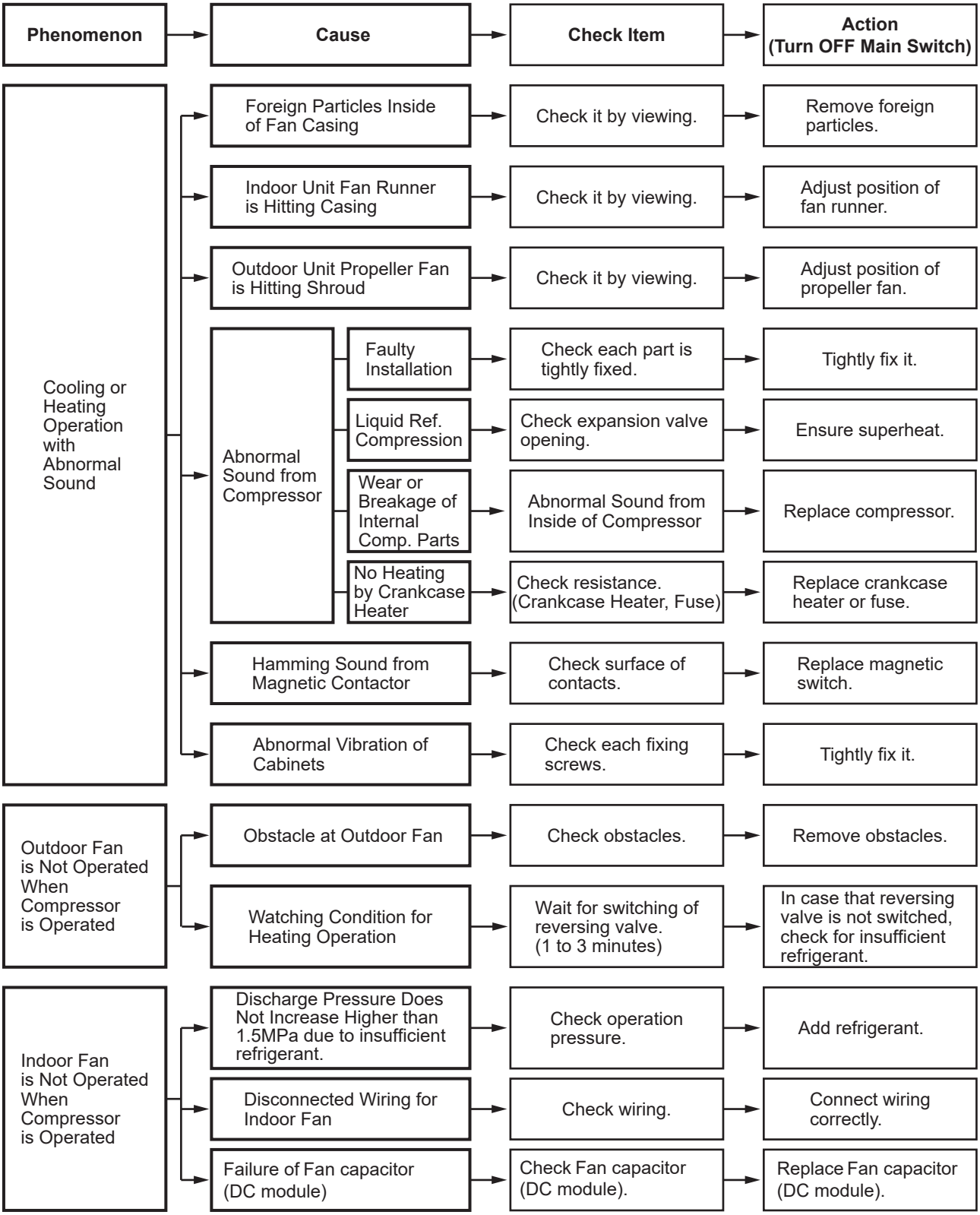
(1.2.6 Abnormalities of Devices)



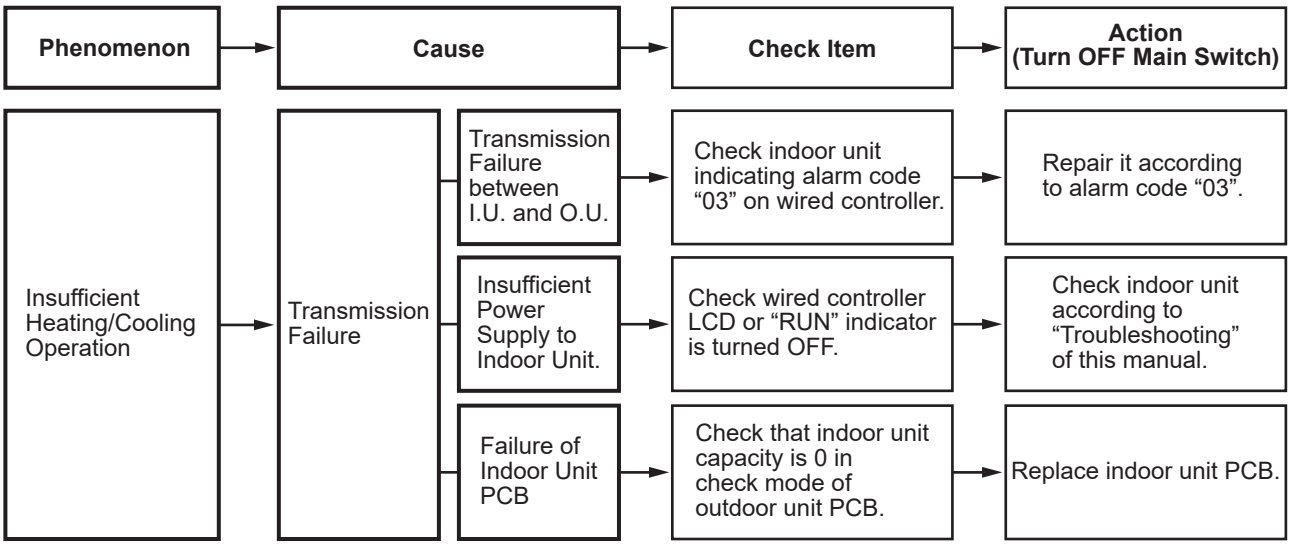
(1.2.6 Abnormalities of Devices)



(1.2.6 Abnormalities of Devices)



(1.2.6 Abnormalities of Devices)



1.2.7 Troubleshooting by Alarm Code

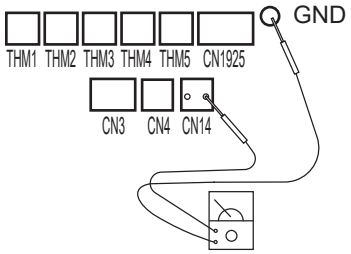
Alarm Code 01	Activation of Protection Device (Float Switch) in Indoor Unit

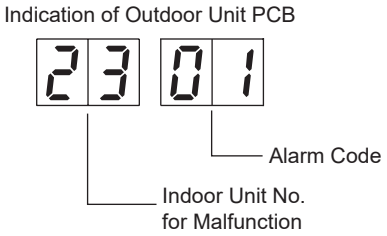
- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7-segment of outdoor unit PCB.

★ H This alarm code is indicated when the contact between #1 and #2 of CN14 is opened for over 120 seconds during the cooling, dry, fan or heating operation.

I.U. PCB: Indoor Unit PCB





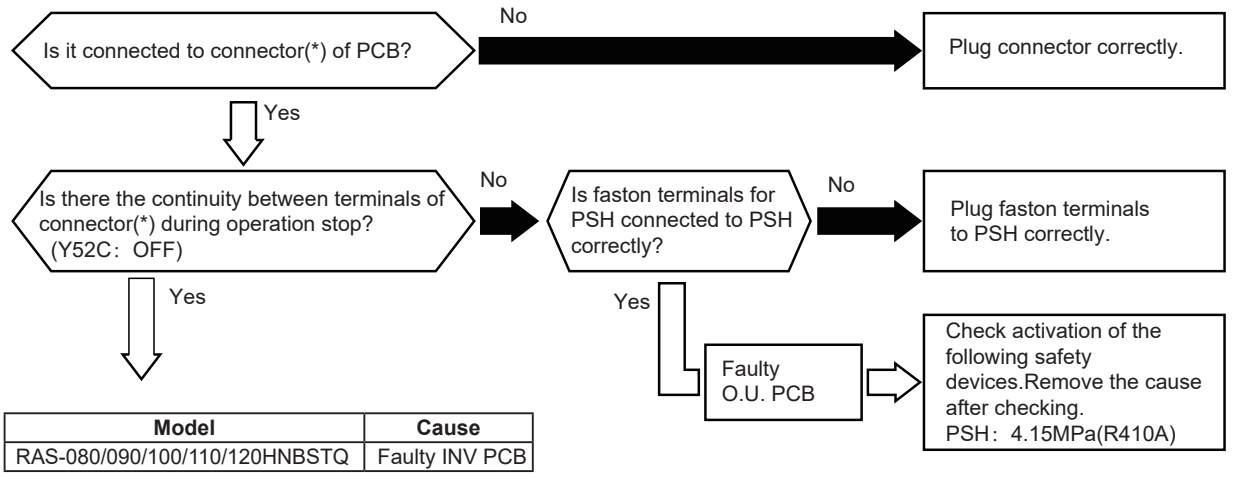


Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
Activation of Float Switch	High Drain Level	Clogging of Drainage Up-Slope Drain Piping	Check drain pan. Check drainage by pouring water.	Remove foreign particles clogging the drainage.
	Faulty Float Switch	Fault	Check conduction when drain level is low.	Replace float switch if faulty.
		Faulty Contacting	Measure resistance by tester.	Repair looseness and replace connector.
		Faulty Connection	Check connections.	Repair connection.
Faulty Indoor Unit PCB			Check PCB by self-checking .	Replace it if faulty.

Alarm Code 02	Activation of the safety device (high pressure switch) in the outdoor unit

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

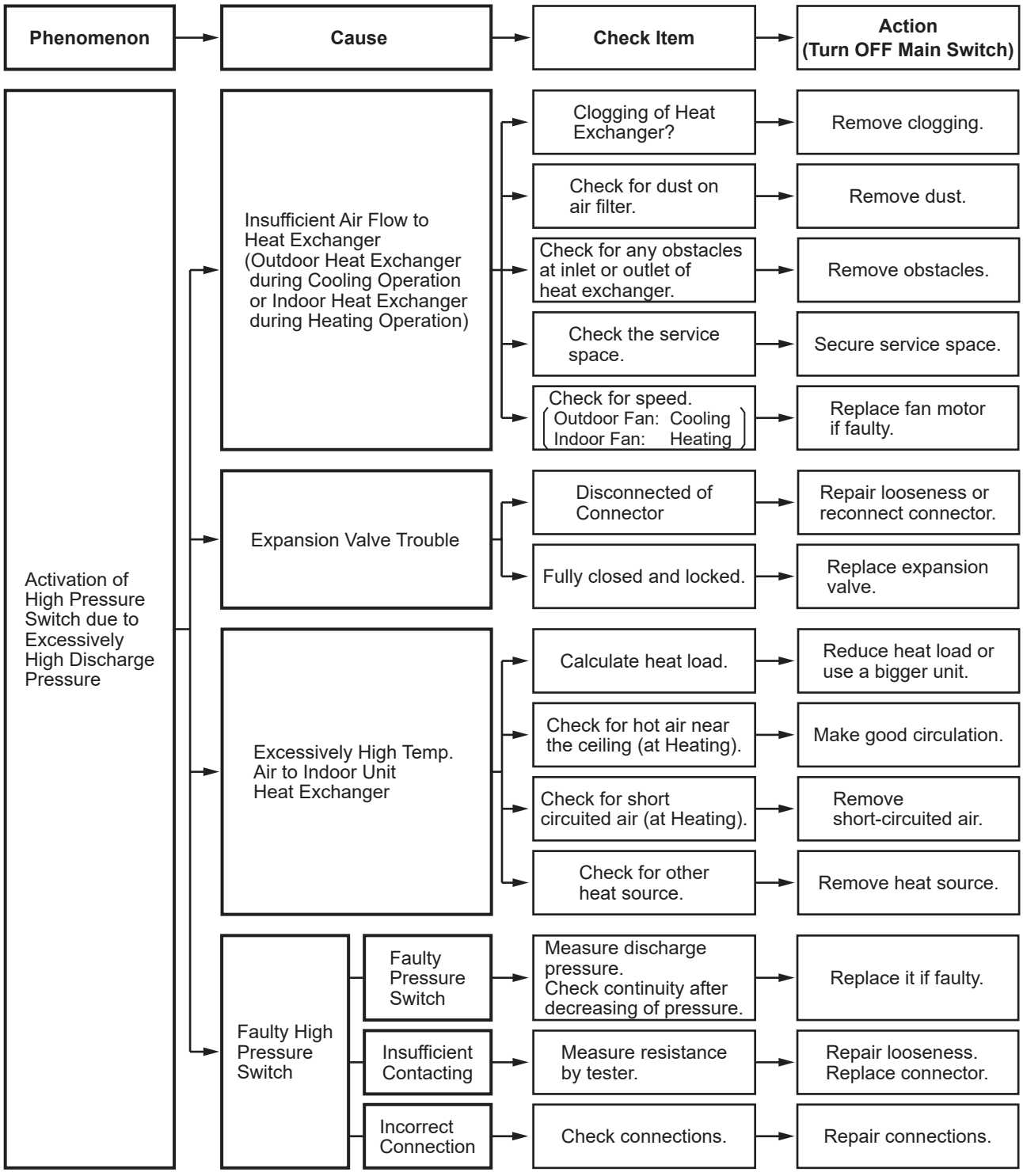
★ This alarm code is indicated when the high pressure switch (PSH) is activated during the compressor operation.

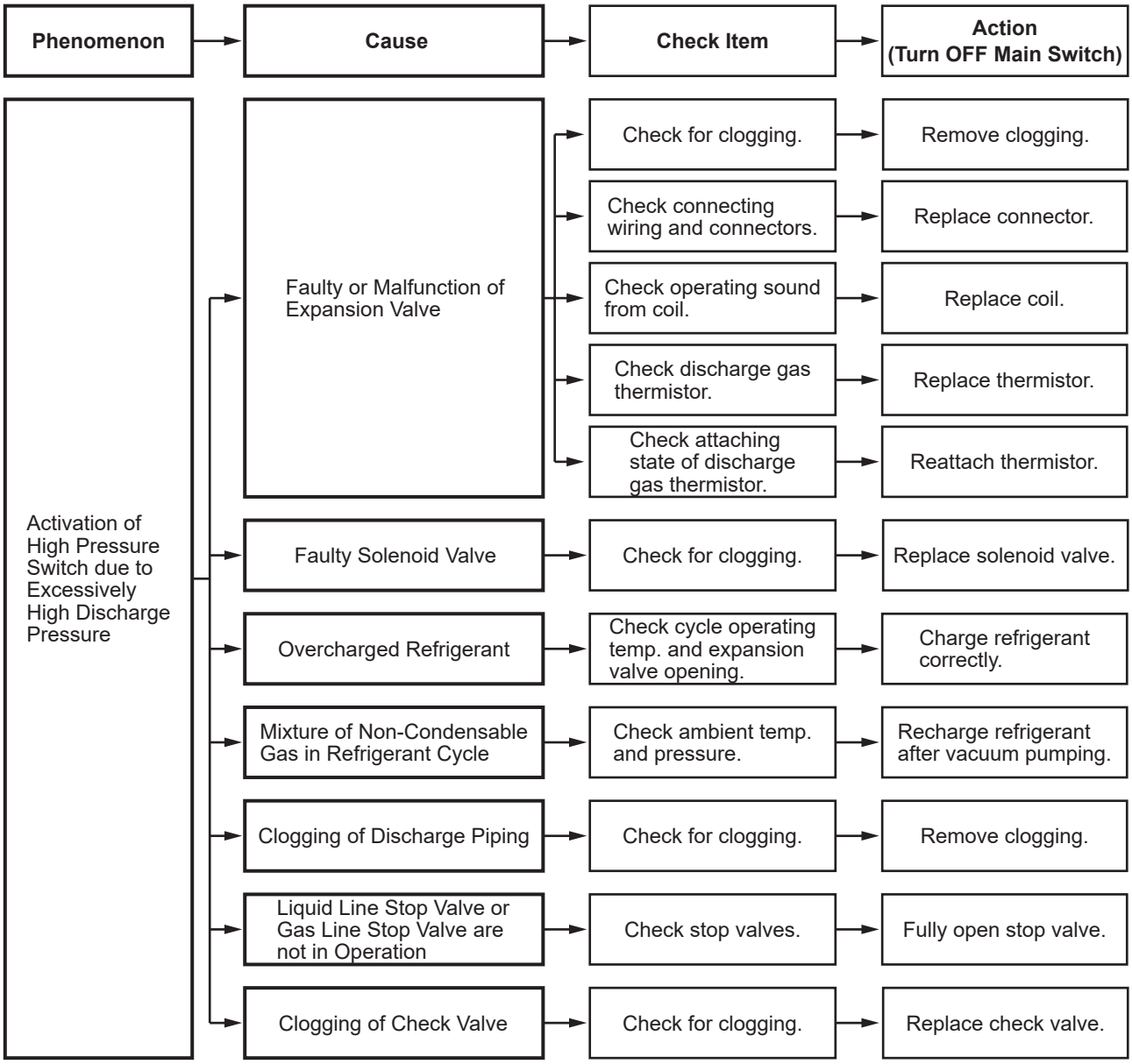


Model	Cause
RAS-080/090/100/110/120HNBSTQ	Faulty INV PCB

(*)

Model	PCB connector	Pin
RAS-080/090/100/110/120HNBSTQ	PCN401 (INV PCB)	#1-#3


Phenomenon
Cause
Check Item
Action (Turn OFF Main Switch)
Activation of High Pressure Switch due to Excessively High Discharge Pressure
Insufficient Air Flow to Heat Exchanger (Outdoor Heat Exchanger during Cooling Operation or Indoor Heat Exchanger during Heating Operation)
Clogging of Heat Exchanger?
Remove clogging.
Check for dust on air filter.
Remove dust.
Check for any obstacles at inlet or outlet of heat exchanger.
Remove obstacles.
Check the service space.
Secure service space.
Check for speed. (Outdoor Fan: Cooling Indoor Fan: Heating)
Replace fan motor if faulty.
Expansion Valve Trouble
Disconnected of Connector
Repair looseness or reconnect connector.
Fully closed and locked.
Replace expansion valve.
Excessively High Temp. Air to Indoor Unit Heat Exchanger
Calculate heat load.
Reduce heat load or use a bigger unit.
Check for hot air near the ceiling (at Heating).
Make good circulation.
Check for short circuited air (at Heating).
Remove short-circuited air.
Check for other heat source.
Remove heat source.
Faulty High Pressure Switch
Faulty Pressure Switch
Measure discharge pressure. Check continuity after decreasing of pressure.
Replace it if faulty.
Insufficient Contacting
Measure resistance by tester.
Repair looseness. Replace connector.
Incorrect Connection
Check connections.
Repair connections.


Phenomenon
Cause
Check Item
Action (Turn OFF Main Switch)
Activation of High Pressure Switch due to Excessively High Discharge Pressure
Faulty or Malfunction of Expansion Valve
Check for clogging.
Remove clogging.
Check connecting wiring and connectors.
Replace connector.
Check operating sound from coil.
Replace coil.
Check discharge gas thermistor.
Replace thermistor.
Check attaching state of discharge gas thermistor.
Reattach thermistor.
Faulty Solenoid Valve
Check for clogging.
Replace solenoid valve.
Overcharged Refrigerant
Check cycle operating temp. and expansion valve opening.
Charge refrigerant correctly.
Mixture of Non-Condensable Gas in Refrigerant Cycle
Check ambient temp. and pressure.
Recharge refrigerant after vacuum pumping.
Clogging of Discharge Piping
Check for clogging.
Remove clogging.
Liquid Line Stop Valve or Gas Line Stop Valve are not in Operation
Check stop valves.
Fully open stop valve.
Clogging of Check Valve
Check for clogging.
Replace check valve.

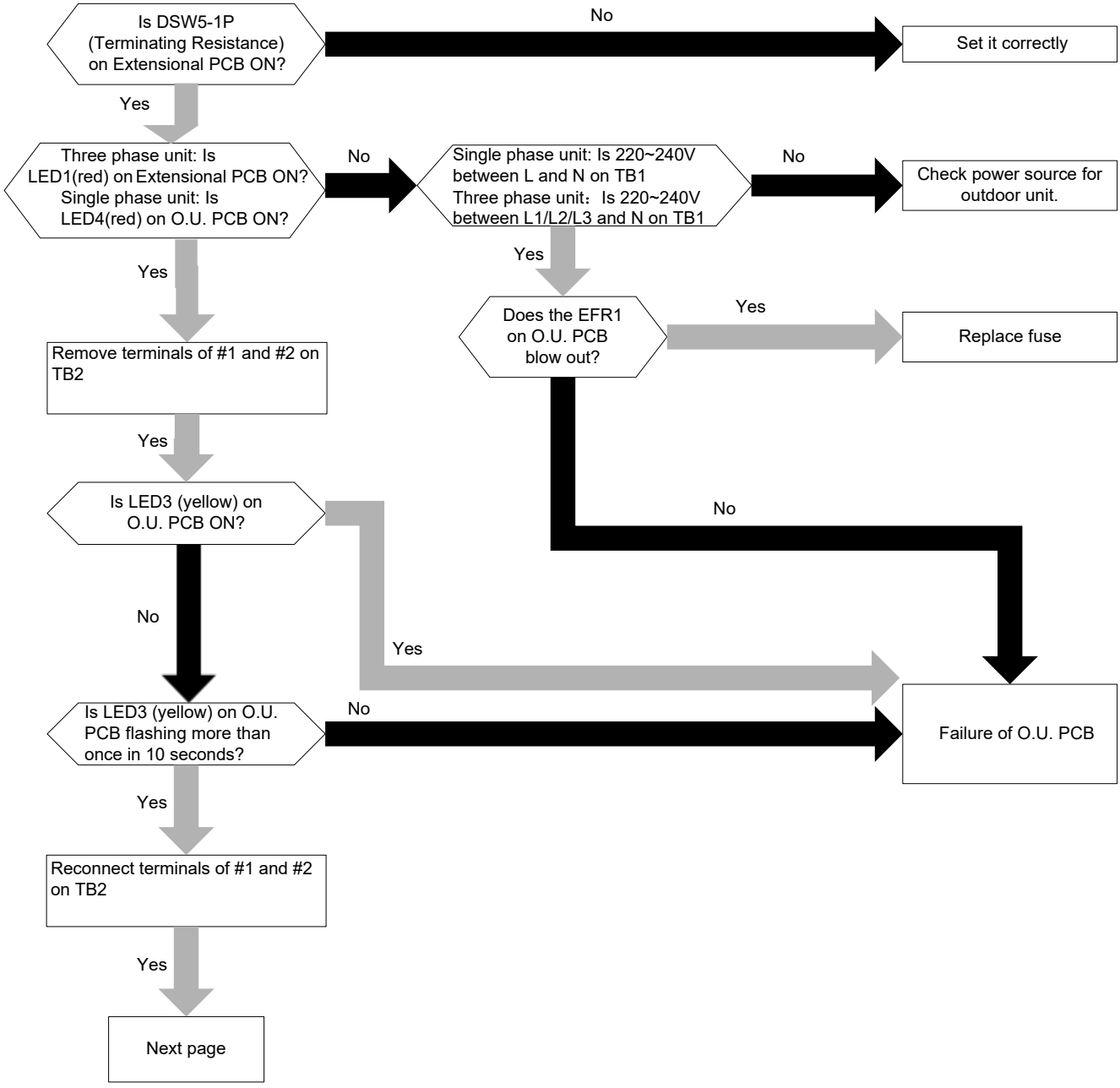
Alarm Code 03	Abnormal Transmitting between Indoor and Outdoor Units

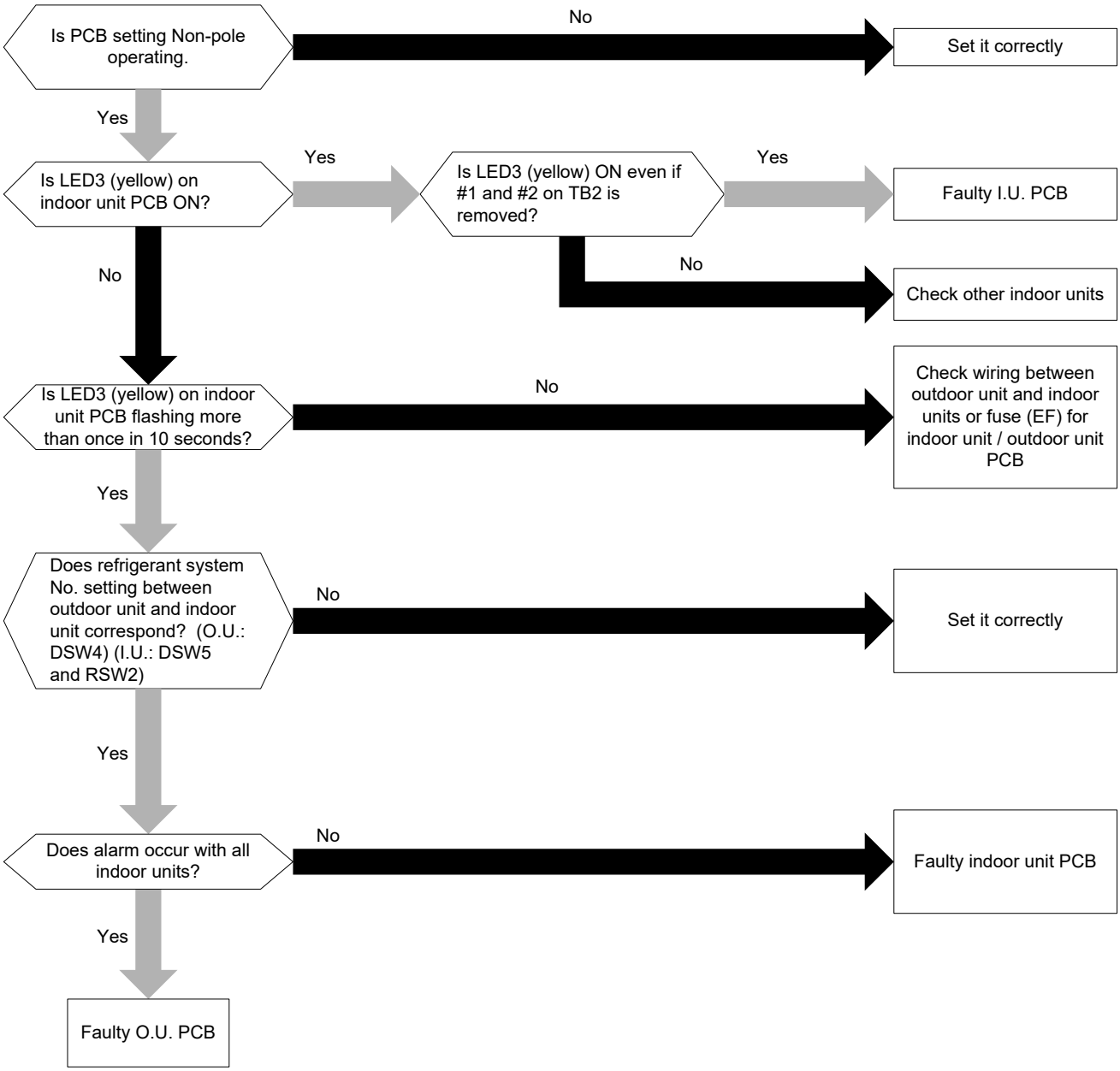
- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
- The unit number and the alarm code are displayed on the display of the outdoor unit PCB.

★ This alarm is displayed when an abnormal operation is maintained for three minutes after the normal transmission between the indoor units and the outdoor unit. Also, an abnormal operation is maintained for 30 seconds after the micro-computer is automatically reset.

★ The alarm is displayed when the abnormal transmission is maintained for 30 seconds from the starting of the outdoor unit.

★ Investigate the cause of the overcurrent and take the necessary action when the fuses are blown out or the breaker for the outdoor unit is activated.




Is PCB setting Non-pole operating.
No
Set it correctly
Yes
Is LED3 (yellow) on indoor unit PCB ON?
Yes
Is LED3 (yellow) ON even if #1 and #2 on TB2 is removed?
Yes
Faulty I.U. PCB
No
No
Check other indoor units
Is LED3 (yellow) on indoor unit PCB flashing more than once in 10 seconds?
No
Check wiring between outdoor unit and indoor units or fuse (EF) for indoor unit / outdoor unit PCB
Yes
Does refrigerant system No. setting between outdoor unit and indoor unit correspond? (O.U.: DSW4) (I.U.: DSW5 and RSW2)
No
Set it correctly
Yes
Does alarm occur with all indoor units?
No
Faulty indoor unit PCB
Yes
Faulty O.U. PCB

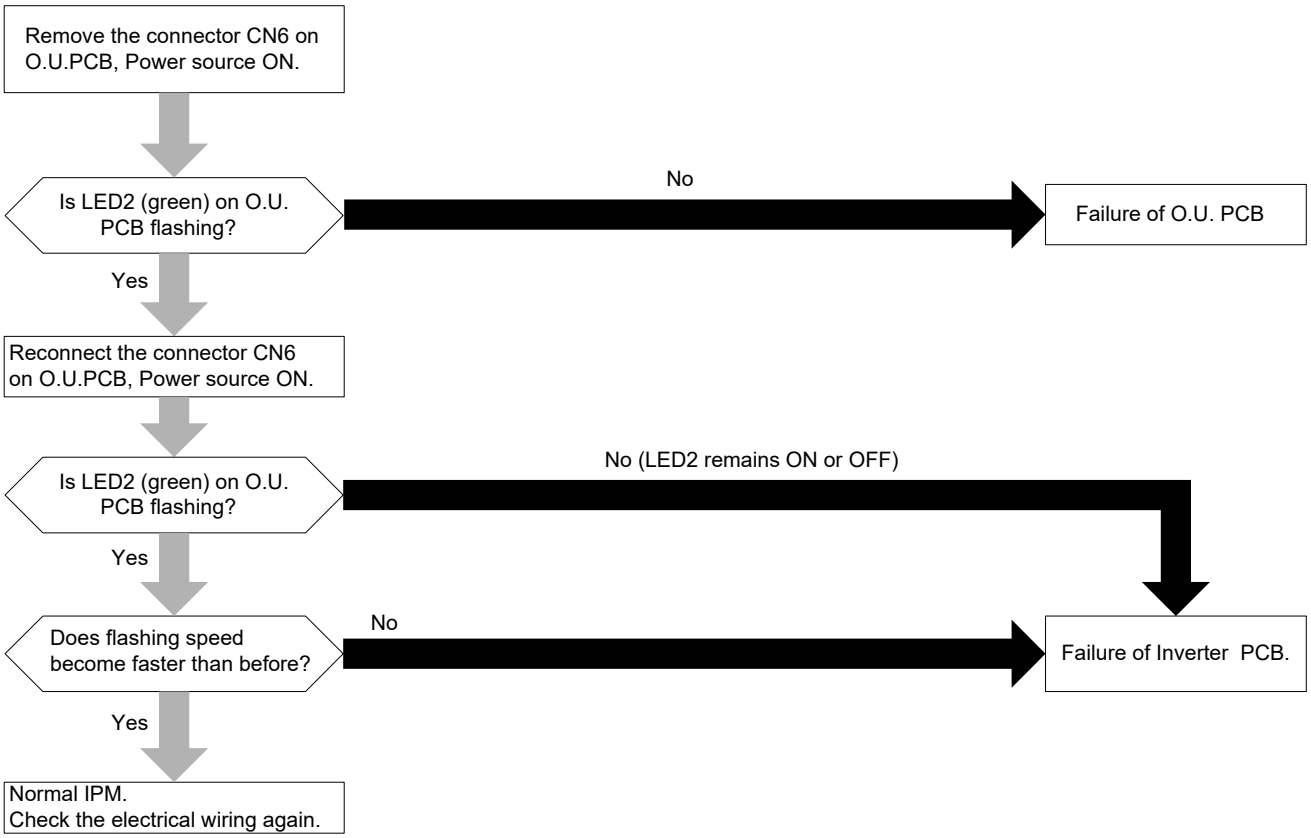
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Power Failure of No Power Supply		Measure voltage by tester.	Supply power.
Melted Fuse for Power Supply or Activation of Breaker (Outdoor Unit)	Short Circuit between Wires	Check for breakage of insulation.	Remove cause of short circuit. Replace fuse and/or I.U./O.U. PCB if faulty.
	Short Circuited Wire to Ground	Measure insulation resistance.	Remove cause of short circuit to ground. Replace fuse and/or I.U./O.U. PCB if faulty.
	Faulty Comp. Motor	Measure resistance between wires and insulation resistance.	Replace comp. and fuse. (O.U.) Replace inverter PCB and/or PCB if faulty. (O.U.)
	Faulty Outdoor Unit Fan Motor	Measure resistance between wires and insulation resistance.	Replace outdoor unit fan motor and fuse. Replace O.U. PCB if faulty.
Melted Fuse on PCB (Outdoor Unit)	Short Circuit between Wires	Check for breakage of insulation.	Remove cause of short circuit and replace fuse.
	Short Circuit (to Ground)	Measure insulation resistance.	Remove cause of short circuit and replace fuse.
	Faulty Solenoid Coil for Magnetic Switch (CMC) for Comp. Motor	Measure resistance of coil.	Replace magnetic switch (CMC) and fuse.
	Failure of Outdoor Unit Fan Motor	Measure resistance between wires and insulation resistance.	Replace fan motor and fuse.
Incorrect Power Supply Circuit of O.U. PCB		Measure O.U. PCB output.	Replace O.U. PCB.
Disconnected Wires Insufficient Contacting or Incorrect Connection	Between Outdoor Unit and Indoor Unit	Check continuity of wires. Check for looseness of connection screws. Check terminal Nos.	Replacing wires, repairing and tightening screws.
	Power Supply Wiring for Outdoor Unit		Correctly connect wires.
Faulty PCB (Outdoor Unit, Indoor Unit)	Disconnected Wires to I.U./O.U. PCB	Check connections.	Correctly connect wires.
	Faulty I.U./O.U.PCB		Replace it if faulty.
Incorrect Wiring	Disconnected Wire Insufficient Contacting	Check continuity and looseness of connection screws.	Replacing Wires, Repairing and Tightening Screws
	Incorrect Wiring	Check terminal Nos.	Correctly connect wires.

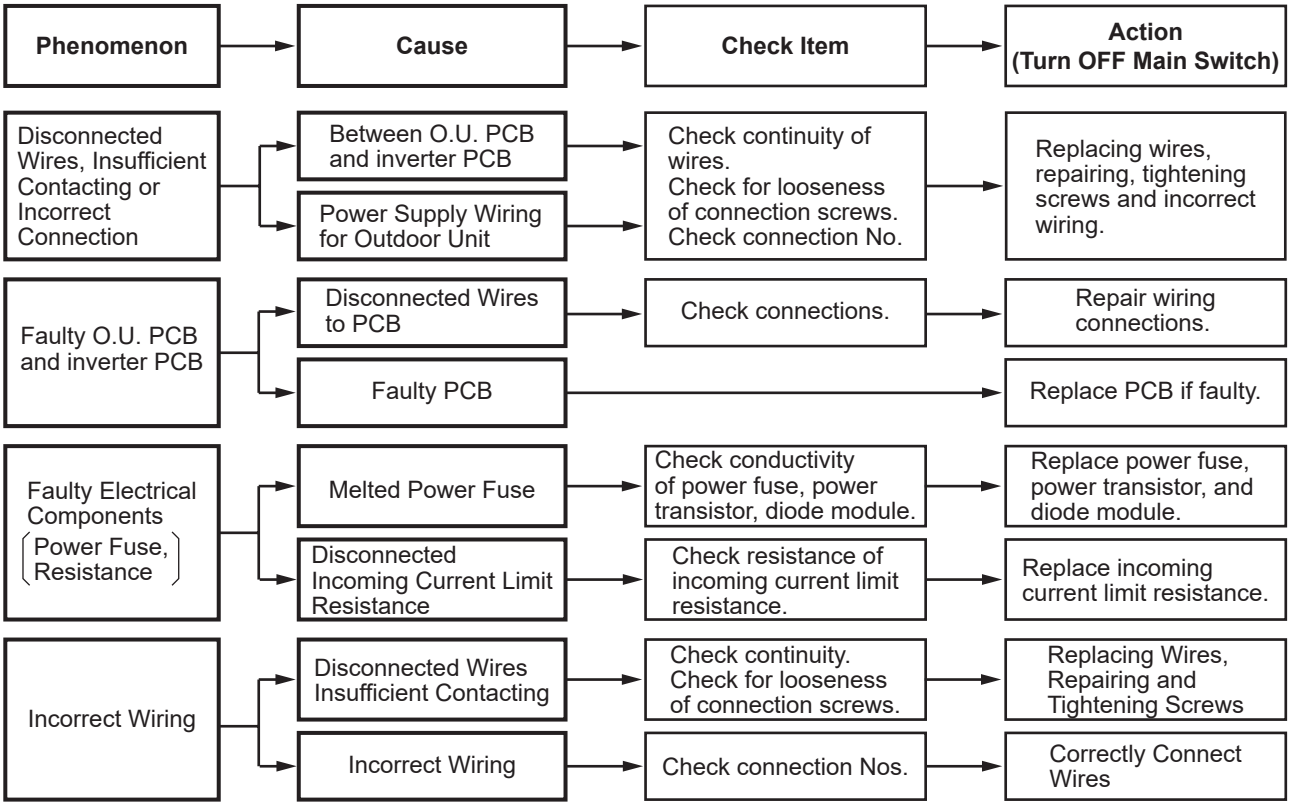
O.U. PCB: Outdoor Unit PCB
I.U. PCB: Indoor Unit PCB

Alarm Code 04	Abnormal Transmitting between Inverter PCB and Outdoor Unit PCB

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

★ This alarm code is indicated when abnormality continues for 30 seconds after normal transmitting between the outdoor unit PCB and inverter PCB, and also abnormality continues for 30 seconds after the microcomputer is automatically reset. The alarm is indicated when the abnormal transmitting continues for 30 seconds from starting of the outdoor unit.



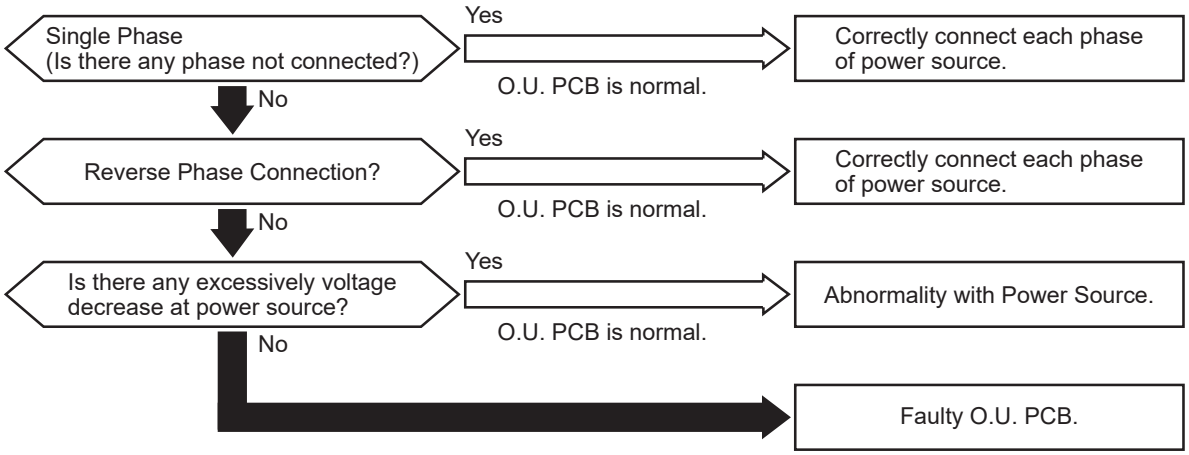

Phenomenon
Cause
Check Item
Action (Turn OFF Main Switch)
Disconnected Wires, Insufficient Contacting or Incorrect Connection
Between O.U. PCB and inverter PCB
Power Supply Wiring for Outdoor Unit
Check continuity of wires. Check for looseness of connection screws. Check connection No.
Replacing wires, repairing, tightening screws and incorrect wiring.
Faulty O.U. PCB and inverter PCB
Disconnected Wires to PCB
Faulty PCB
Check connections.
Repair wiring connections.
Replace PCB if faulty.
Faulty Electrical Components
Power Fuse, Resistance
Melted Power Fuse
Disconnected Incoming Current Limit Resistance
Check conductivity of power fuse, power transistor, diode module.
Check resistance of incoming current limit resistance.
Replace power fuse, power transistor, and diode module.
Replace incoming current limit resistance.
Incorrect Wiring
Disconnected Wires Insufficient Contacting
Incorrect Wiring
Check continuity. Check for looseness of connection screws.
Check connection Nos.
Replacing Wires, Repairing and Tightening Screws
Correctly Connect Wires

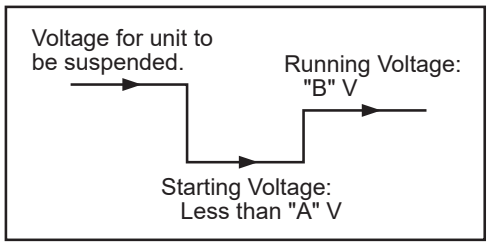
Alarm Code 05	Abnormal Power Supply Phase

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7-segment of outdoor unit PCB.

★This alarm code is indicated when the main power supply phase is reversely connected or one phase is not connected.

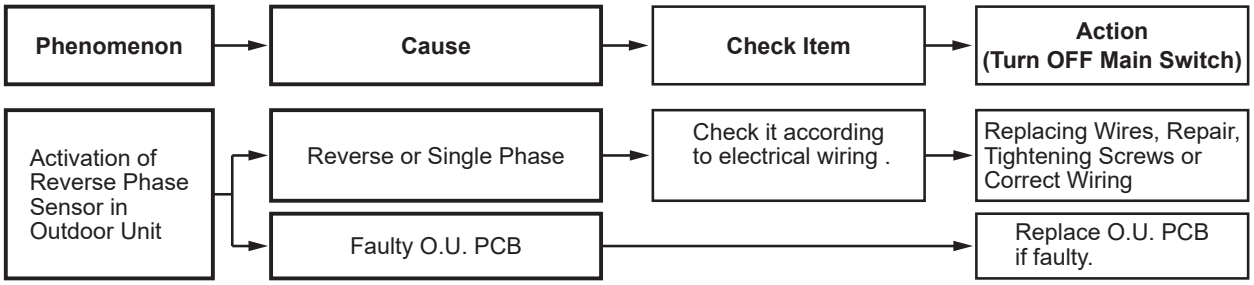
O.U. PCB: Outdoor Unit PCB





Check Item

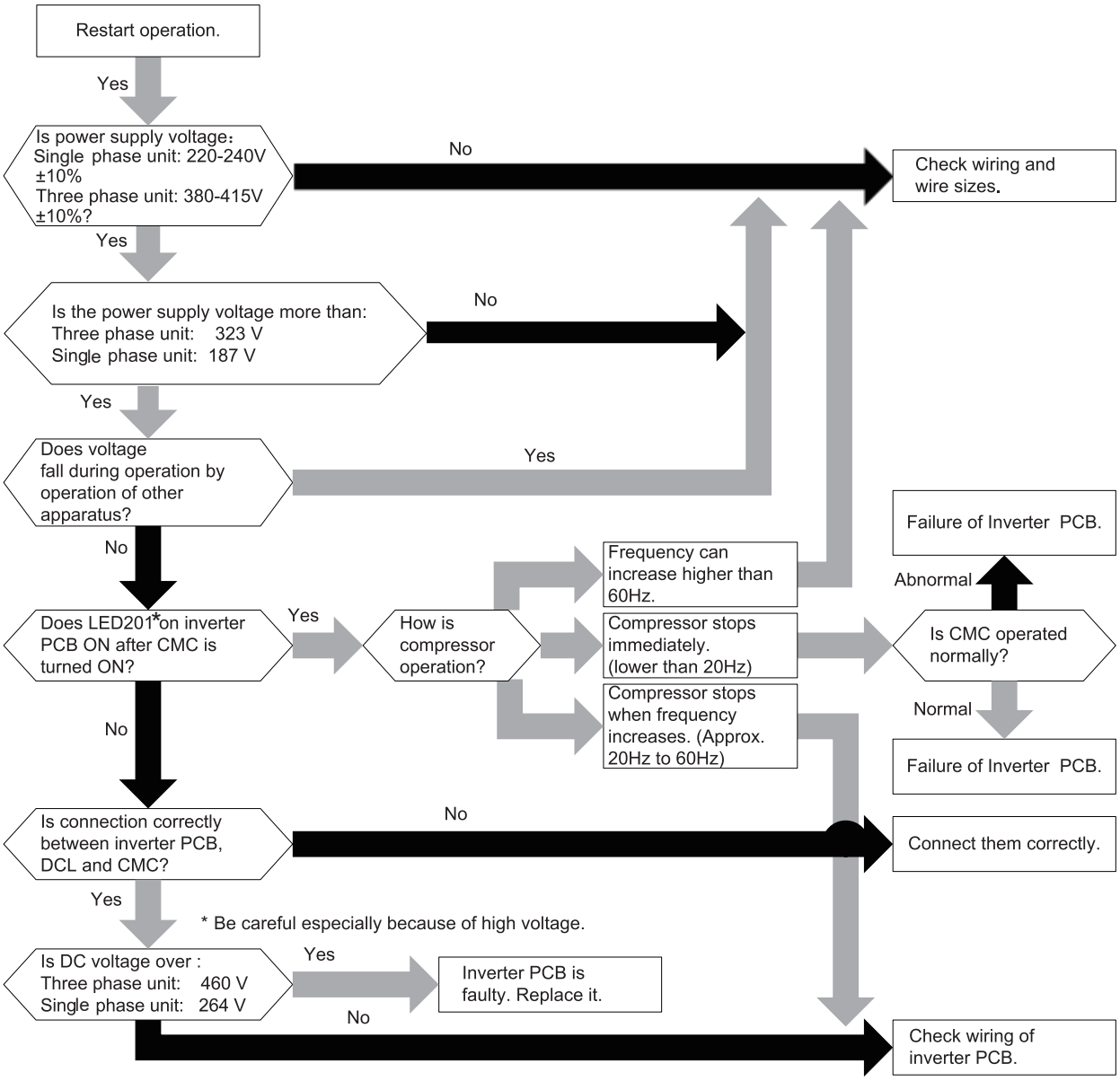
Power Supply	"A"	"B"
380-415V/50Hz	323	342 to 456
380V/60Hz	323	342 to 418



Alarm Code 06	Abnormal Inverter Voltage (Insufficient Inverter Voltage or Overvoltage)

- The RUN indicator (Red) is flashing.
- The indoor unit number (Ref. system number - I.U. number), the alarm code, the model code*1), the model name*1) and the number of connected indoor units are displayed on the LCD. The alarm code is flashed on the 7-segment display on the outdoor unit PCB.
  *1) Except for some models.

★ When either insufficient voltage or overvoltage is detected between the terminal R-S on the inverter PCB three times in 30 minutes, the operation stops and this alarm code is displayed. If this occurs less than three times in 30 minutes, the operation is automatically retried.



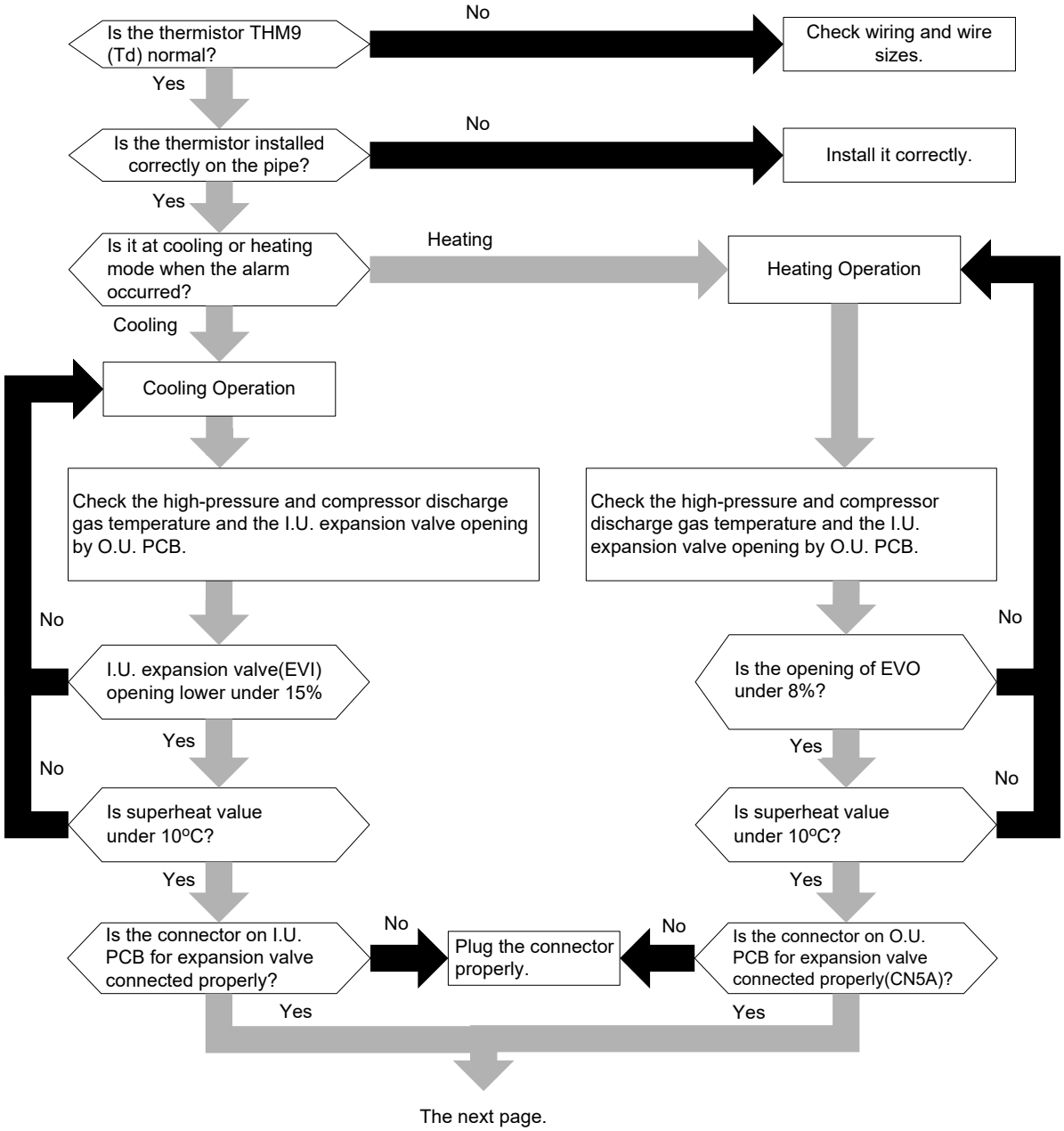
CMC: Magnet Switch for Compressor
DCL: Reactor
* For Model 089-090, LED201 is applicable
For Model 100-120, LED 401 is applicable

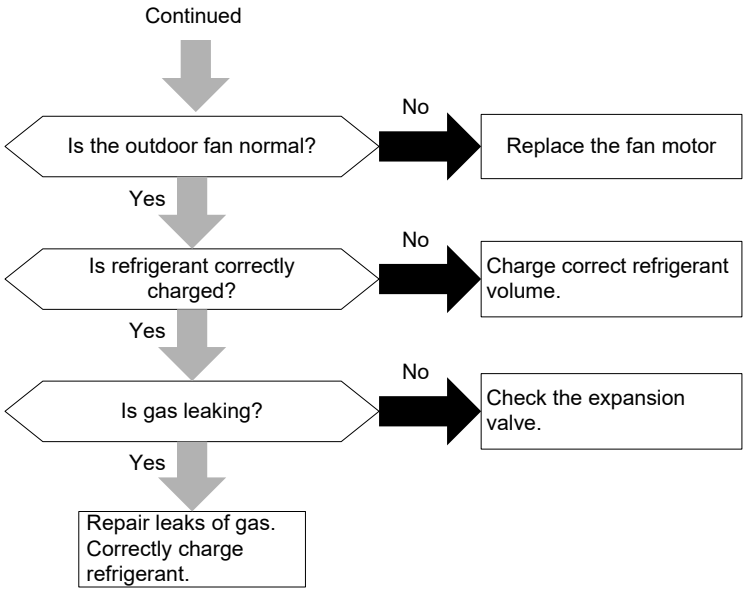
Alarm Code 07	Decrease in Discharge Gas Superheat

- The RUN indicator (Red) is flashing.
- The indoor unit number (Ref. system number - I.U. number), the alarm code, the model code*1), the model name*1) and the number of connected indoor units are displayed on the LCD. The alarm code is flashed on the 7-segment display on the outdoor unit PCB.
  *1) Except for some models.

★ If the temperature of compressor discharge gas is below the estimated condensing temperature for 30 minutes during operation, the compressor stops and then the operation is automatically retried after three minutes. If this occurs again twice in the next 120 minutes, this alarm code is displayed.

★ This alarm code is displayed when an abnormality cannot be detected by the step-out detection, caused by locking of compressor shaft.





Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
Decrease of Discharge Gas Superheat	Ref. Cycle is Different from the Electrical System		Check ref. cycle and the electrical system.	Repair wiring.
	Overcharged Refrigerant		Check pressures.	Correctly charge refrigerant.
	Faulty Expansion Valve		Check expansion valve.	Replace expansion valve if faulty.
	Faulty PCB	Fault	Replace PCB and check operation.	Replace PCB if faulty.
		Disconnected Wires for Expansion Valve Control	Check connections.	Repair wiring connections.
	Faulty Discharge Gas Thermistor	Fault	Check resistance of thermistor.	Replace thermistor if faulty.
		Incorrect Mounting	Check mounting state.	Correctly mount thermistor.
		Incorrect Connection	Check connections.	Remove looseness, replace connector or repair connections.

Alarm Code 09	Increase in Discharge Gas Temperature of Compressor

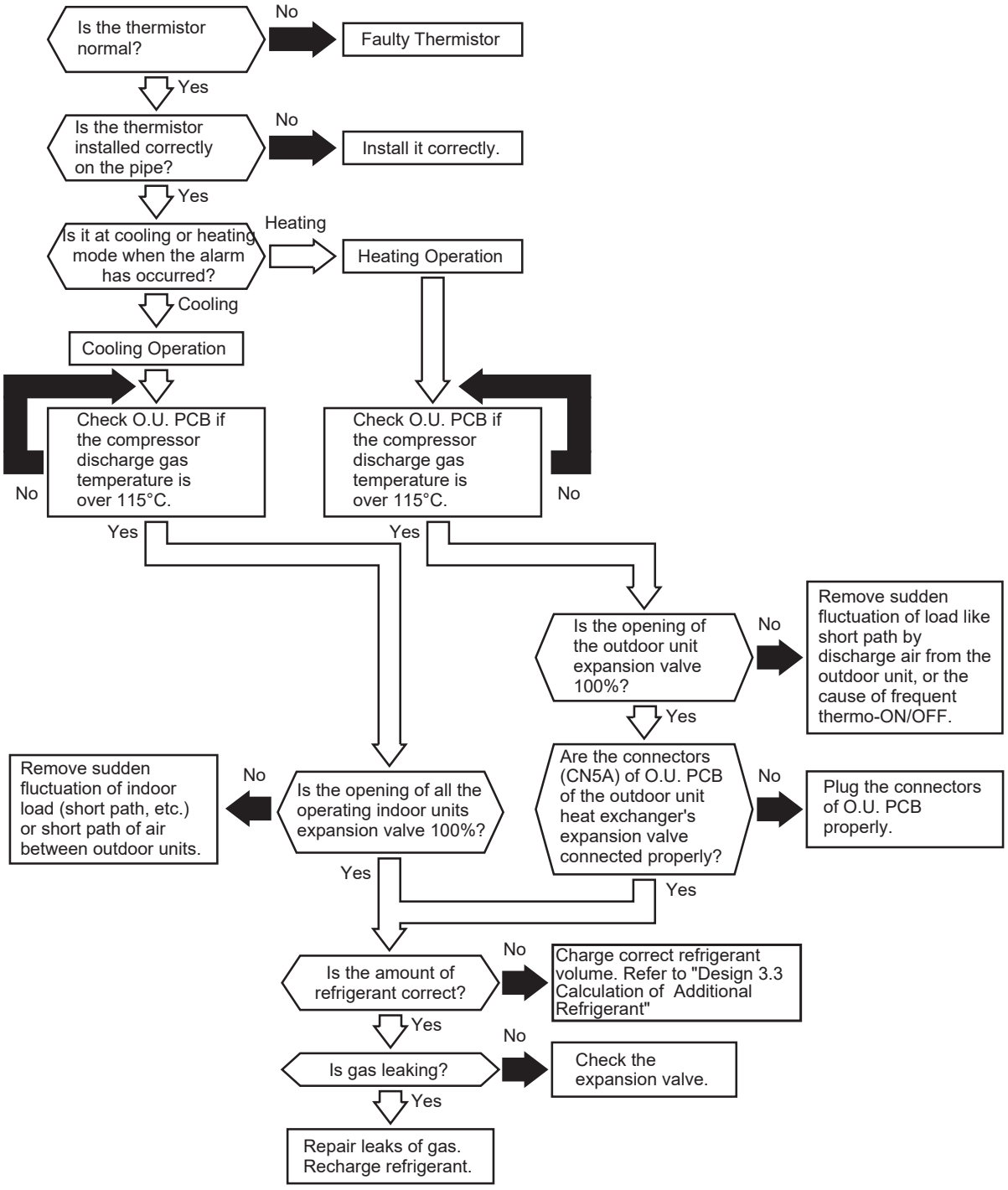
- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

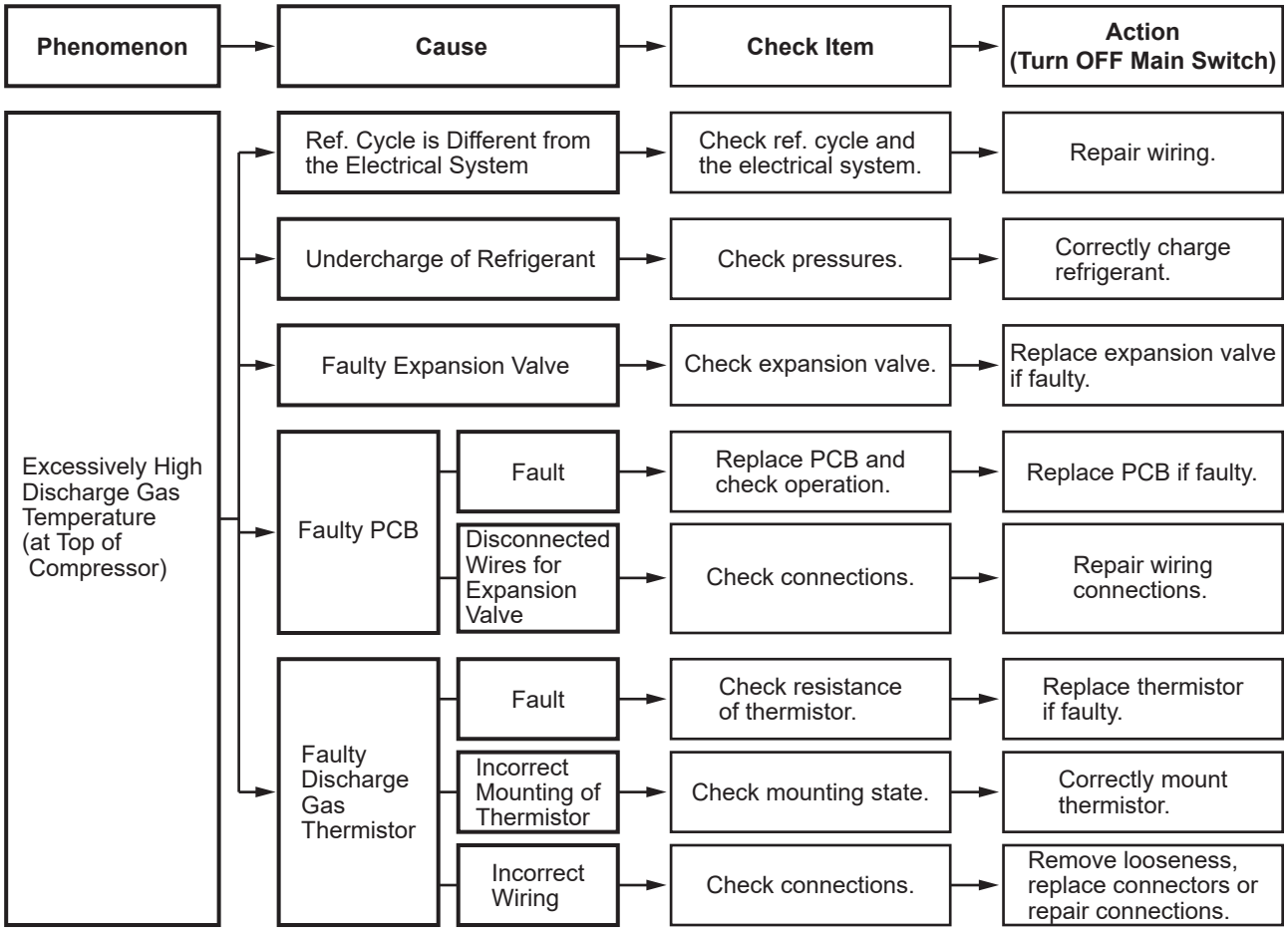
★ When either of the following conditions occurs, retry operation is performed. However, if it occurs three times within one hour, this alarm code is indicated;

(1) The temperature of the thermistor on the top of the compressor is kept higher than 115°C for 10 minutes.

(2) The temperature of the thermistor on the top of the compressor is kept higher than 122°C for 5 seconds.

O.U. PCB: Outdoor Unit PCB

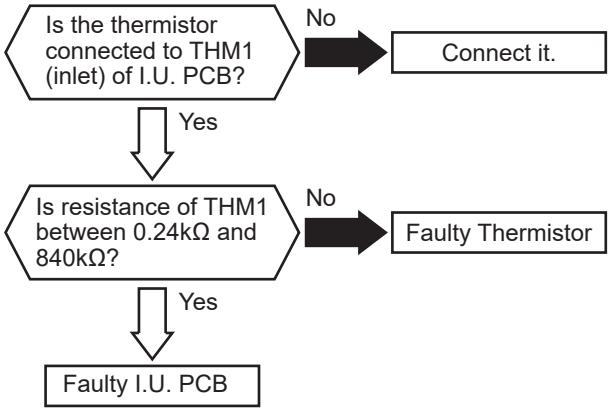



Phenomenon
Cause
Check Item
Action (Turn OFF Main Switch)
Excessively High Discharge Gas Temperature (at Top of Compressor)
Ref. Cycle is Different from the Electrical System
Check ref. cycle and the electrical system.
Repair wiring.
Undercharge of Refrigerant
Check pressures.
Correctly charge refrigerant.
Faulty Expansion Valve
Check expansion valve.
Replace expansion valve if faulty.
Faulty PCB
Fault
Replace PCB and check operation.
Replace PCB if faulty.
Disconnected Wires for Expansion Valve
Check connections.
Repair wiring connections.
Faulty Discharge Gas Thermistor
Fault
Check resistance of thermistor.
Replace thermistor if faulty.
Incorrect Mounting of Thermistor
Check mounting state.
Correctly mount thermistor.
Incorrect Wiring
Check connections.
Remove looseness, replace connectors or repair connections.

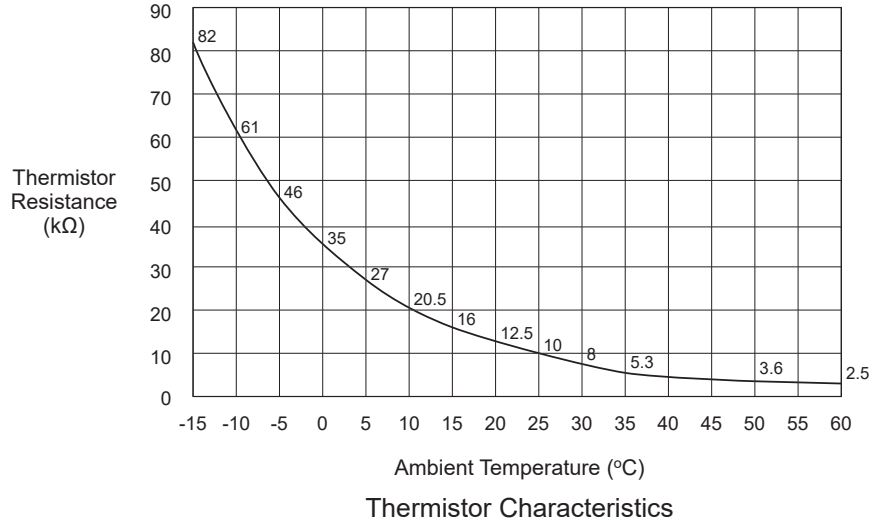
Alarm Code 11	Abnormality of Thermistor for Indoor Unit Inlet Air Temperature (Inlet Air Thermistor)

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

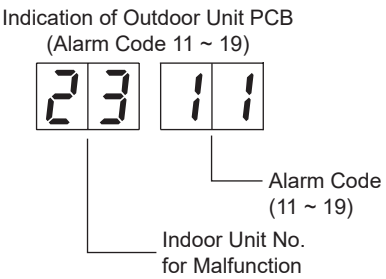
★ This alarm code is indicated when a short circuit (less than 0.24kΩ) or disconnection (more than 840kΩ) of the thermistor is detected during the heating or cooling operation. The operation is automatically restarted when the malfunction is removed.



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty Inlet Air Thermistor	Fault	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check connection.	Connect wiring correctly.
Faulty I.U. PCB		Replace I.U. PCB and check operation.	Replace I.U. PCB if faulty.



Thermistor Characteristics



NOTE:

This figure is applicable to the following thermistors.

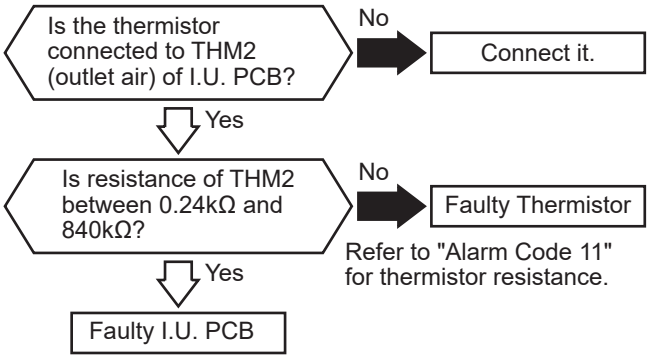
1. Inlet Air Thermistor (THM1)
2. Liquid Pipe Thermistor (Freeze Protection) (THM3)
3. Gas Pipe Thermistor (THM5)
4. Outlet Air Thermistor (THM2)(Some indoor units are not. Please refer to the technical manual of indoor units.)

Alarm Code 12	Abnormality of Thermistor for Indoor Unit Outlet Air Temperature (Outlet Air Thermistor)

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

★ This alarm code is indicated when a short circuit (less than 0.24kΩ) or disconnection (more than 840kΩ) of the thermistor is detected during the heating or cooling operation. The operation is automatically restarted when the malfunction is removed.

★ Some indoor units are not outlet air thermistor. Please refer to the technical manual of indoor units.

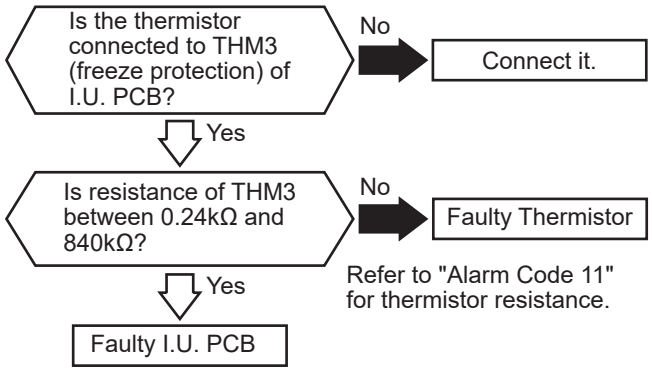


Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty Outlet Air Thermistor	Fault	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to I.U. PCB.	Connect wiring correctly.
Faulty I.U. PCB		Replace I.U. PCB and check operation.	Replace I.U. PCB if faulty.

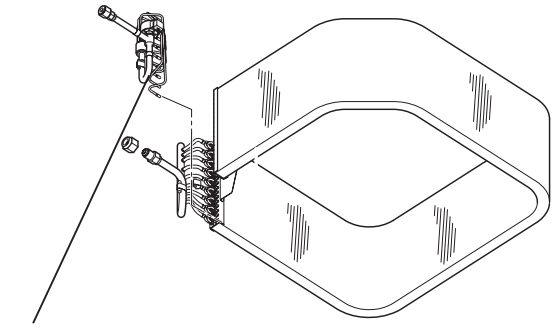
Alarm Code 13	Abnormality of Thermistor for Liquid Refrigerant Pipe Temperature at Indoor Unit Heat Exchanger (Freeze Protection Thermistor)

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

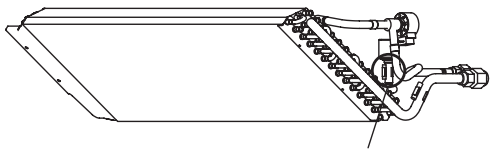
★ This alarm code is indicated when a short circuit (less than 0.24kΩ) or disconnection (more than 840kΩ) of the thermistor is detected during the heating or cooling operation. The operation is automatically restarted when the malfunction is removed.



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 I.U. PCB.	Connect wiring correctly.
Faulty I.U. PCB		Replace I.U. PCB and check operation.	Replace I.U. PCB if faulty.



THM3
Liquid Pipe Thermistor (Freeze Protection)

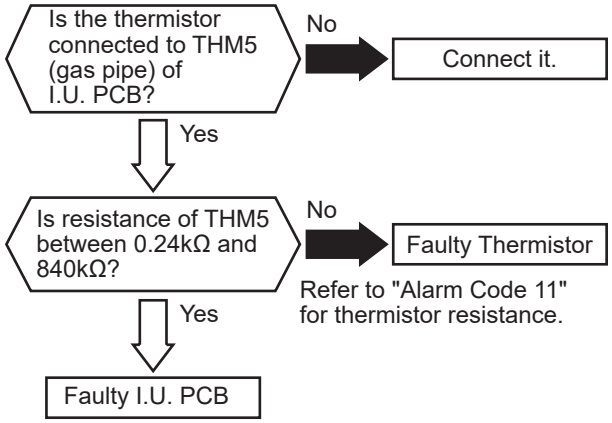


THM3
Liquid Pipe Thermistor (Freeze Protection)

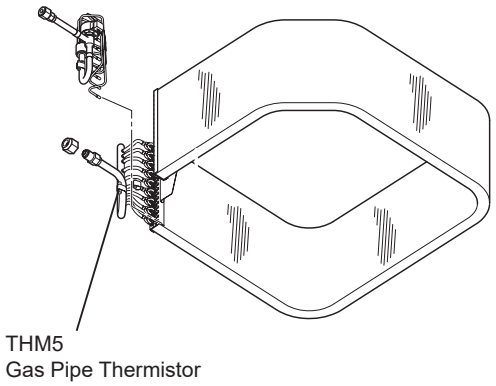
Alarm Code 14	Abnormality of Thermistor for Gas Refrigerant Pipe Temperature at Indoor Unit Heat Exchanger (Gas Pipe Thermistor)

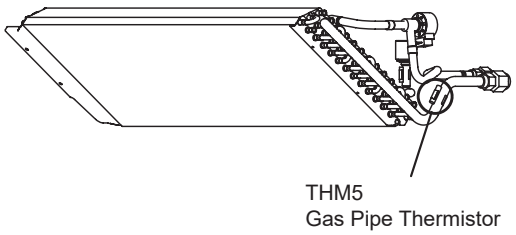
- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

★ This alarm code is indicated when a short circuit (less than 0.24kΩ) or disconnection (more than 840kΩ) of the thermistor is detected during the heating or cooling operation. The operation is automatically restarted when the malfunction is removed.



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty Thermistor for Indoor Unit Heat Exchanger Gas Pipe Temp.	Fault	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to I.U. PCB.	Connect wiring correctly.
Faulty I.U. PCB		Replace I.U. PCB and check operation.	Replace I.U. PCB if faulty.

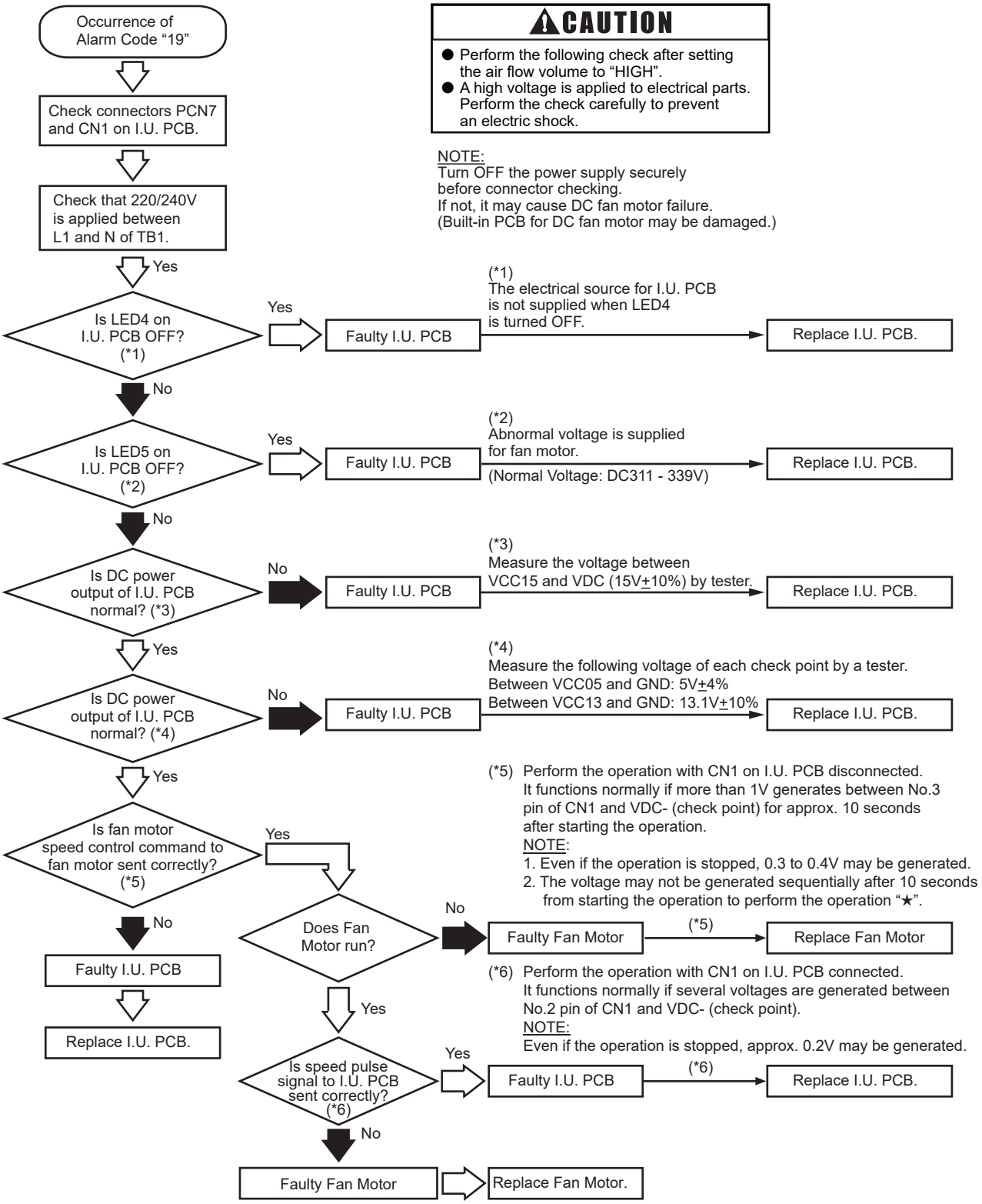




Alarm Code 19	Activation of Protection Device for Indoor Fan Motor (Indoor Unit with DC Motor)

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

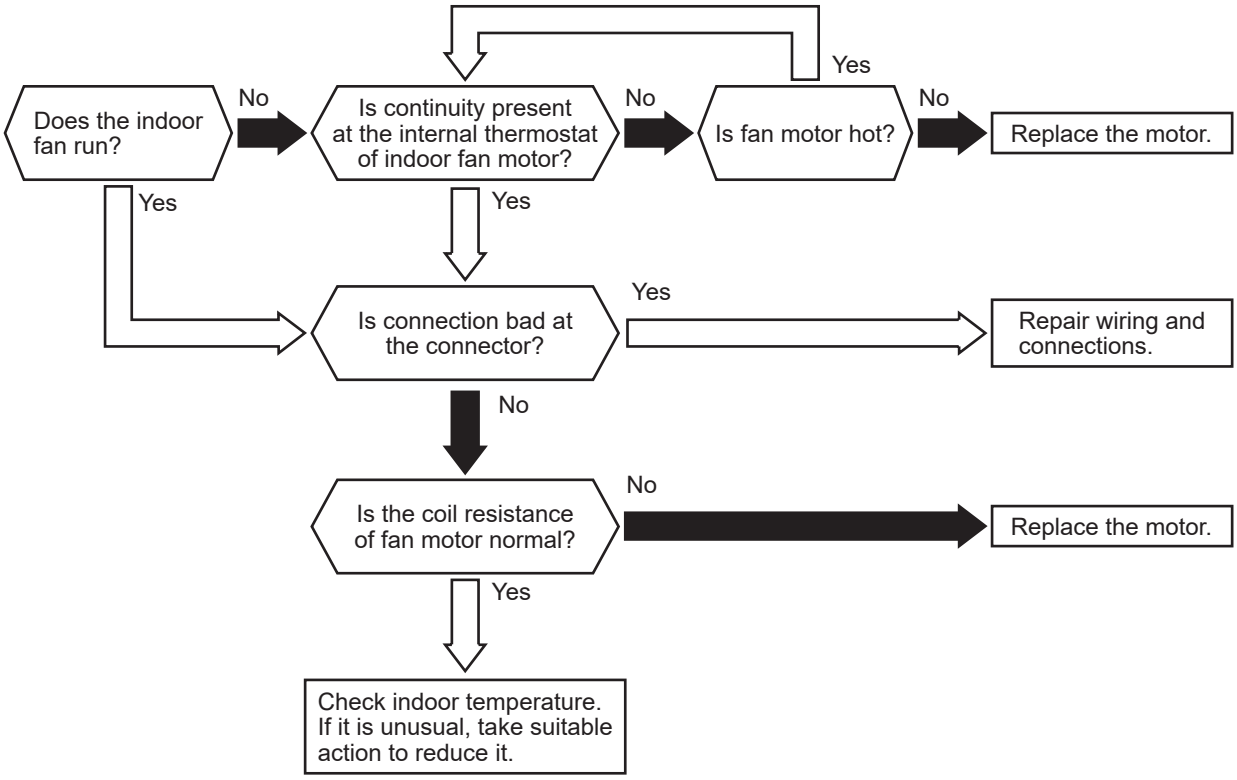
★ This alarm code is indicated when the indoor fan motor rotates at less than 70rpm for 5 seconds three times in 30 minutes during the operation.



Alarm Code 19	Activation of Protection Device for Indoor Fan Motor (Indoor Unit with AC Motor)

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

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



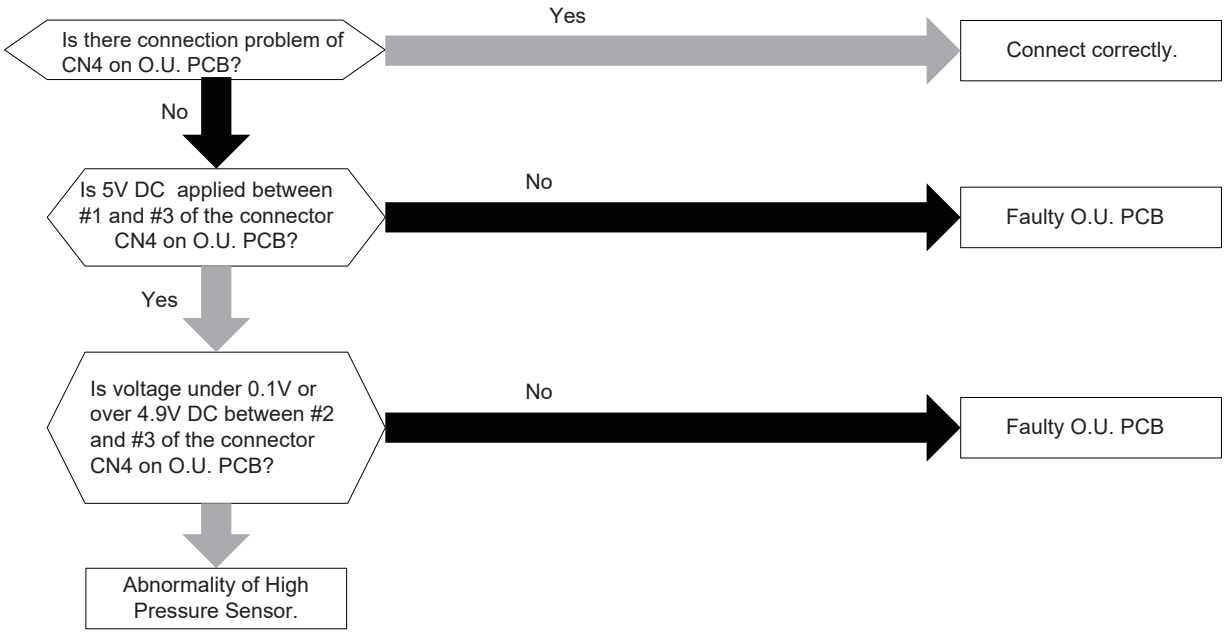
Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
Activation of Internal Thermostat for Indoor Unit Fan Motor	Faulty Indoor Unit Fan Motor		Measure coil resistance and insulation resistance.	Replace motor if faulty.
	Faulty Internal Thermostat	Fault	Check continuity after fan motor temperature 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	Abnormality of High Pressure Sensor for Outdoor Unit (Pd)

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

★ This alarm code is indicated when the pressure sensor voltage decreases to 0.1V or less or increases to 4.9V or more during running.

O.U. PCB: Outdoor Unit PCB



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Indication Value of High Pressure (Pd) is Excessively High or Low	Fault	Check output characteristics *1)	Replace High Pressure Sensor if faulty.
	Incorrect Connection	Check wiring to O.U. PCB.	Repair wiring and connections.
Faulty O.U. PCB		Replace O.U. PCB and check operation.	Replace O.U. PCB if faulty.

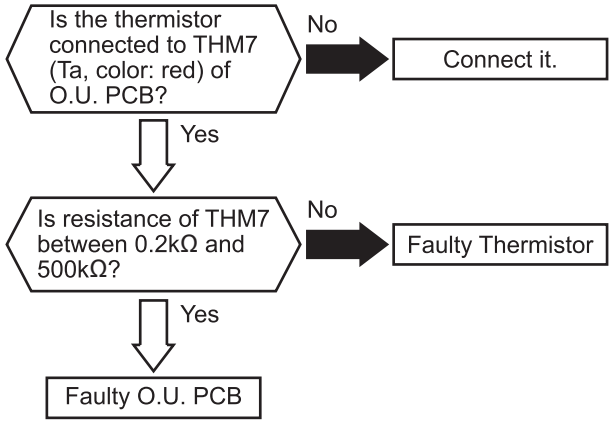
*1) Check output characteristics refer to "2.5.3 pressure sensor"

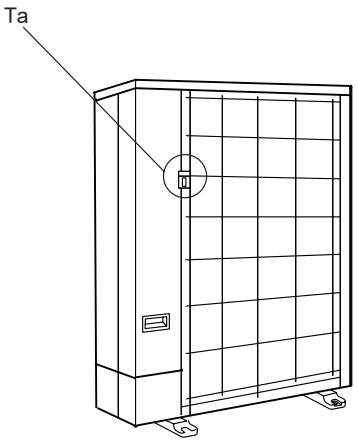
Alarm Code 22	Abnormality of Thermistor for Outdoor Unit Ambient (Ta)

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

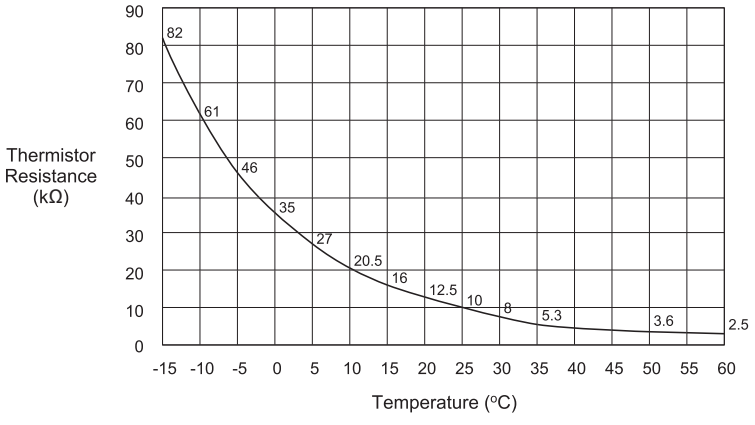
★ This alarm code is indicated when a short circuit (less than 0.2kΩ) or disconnection (more than 500kΩ) of the thermistor is detected during the operation.

O.U. PCB: Outdoor Unit PCB





Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty Thermistor for Outdoor Unit Ambient	Fault	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to O.U. PCB.	Repair wiring and connections.
Faulty O.U. PCB1		Replace O.U. PCB1 and check operation.	Replace O.U. PCB1 if faulty.



Thermistor Characteristics

NOTE:
This figure is applicable to the following thermistors.

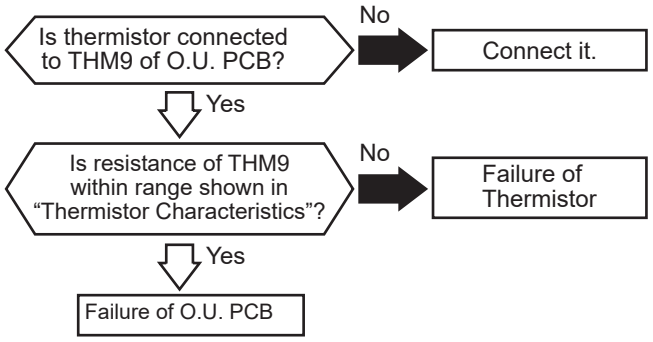
1. Ta (THM7),
2. Te (THM8)
3. Tsc (THM19),

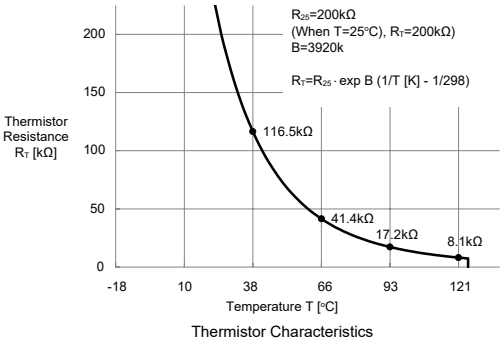
Alarm Code 23	Abnormality of Thermistor for Discharge Gas Temperature(Td)

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB. (For the combination of outdoor units, the alarm code is displayed on PCB of outdoor unit A.) Additionally for the outdoor unit number and compressor number with abnormal thermistor, check the alarm code history.

★ This alarm code is indicated when a short circuit (less than 0.9kΩ) for a second or disconnection (more than 5946kΩ) of the thermistor is detected during the operation.

O.U. PCB: Outdoor Unit PCB



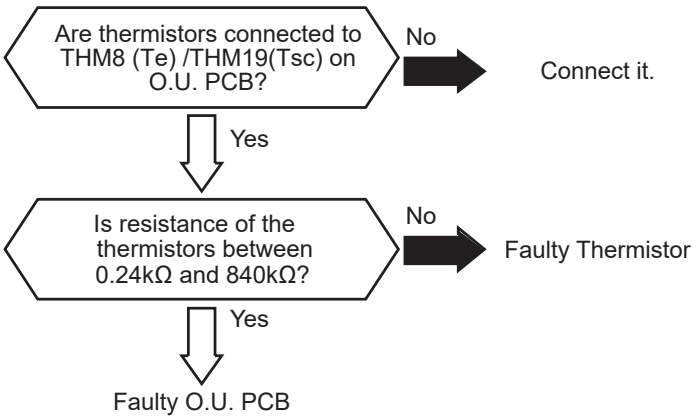


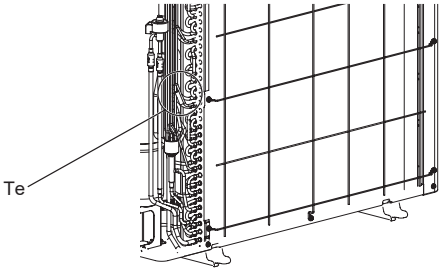
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty Discharge Gas Thermistor	Fault	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to O.U. PCB.	Repair wiring and connections.
Faulty O.U. PCB		Replace O.U. PCB and check operation.	Replace O.U. PCB if faulty.

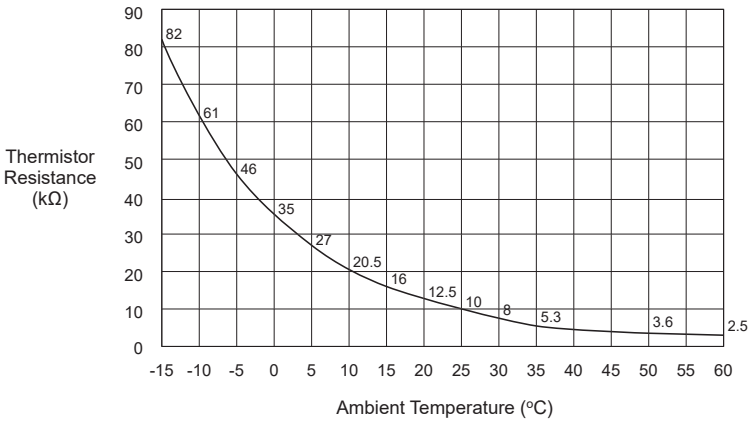
Alarm Code 24	Abnormality of Thermistor for Evaporating Temperature during Heating Operation (Te) and Refrigerant Cooler(Tsc)

- The RUN indicator (Red) is flashing.
- The indoor unit number (Ref. system number - I.U. number), the alarm code and the number of connected indoor units are displayed on the LCD. The alarm code is flashed on the 7-segment display o the outdoor unit PCB.

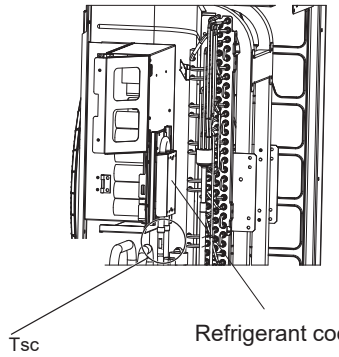
★ This alarm code is displayed when a short circuit (0.24kΩ or less) or disconnection (840kΩ or more) of the thermistor is detected during heating or cooling operation.







Thermistor Characteristics



O.U. PCB: outdoor unit PCB

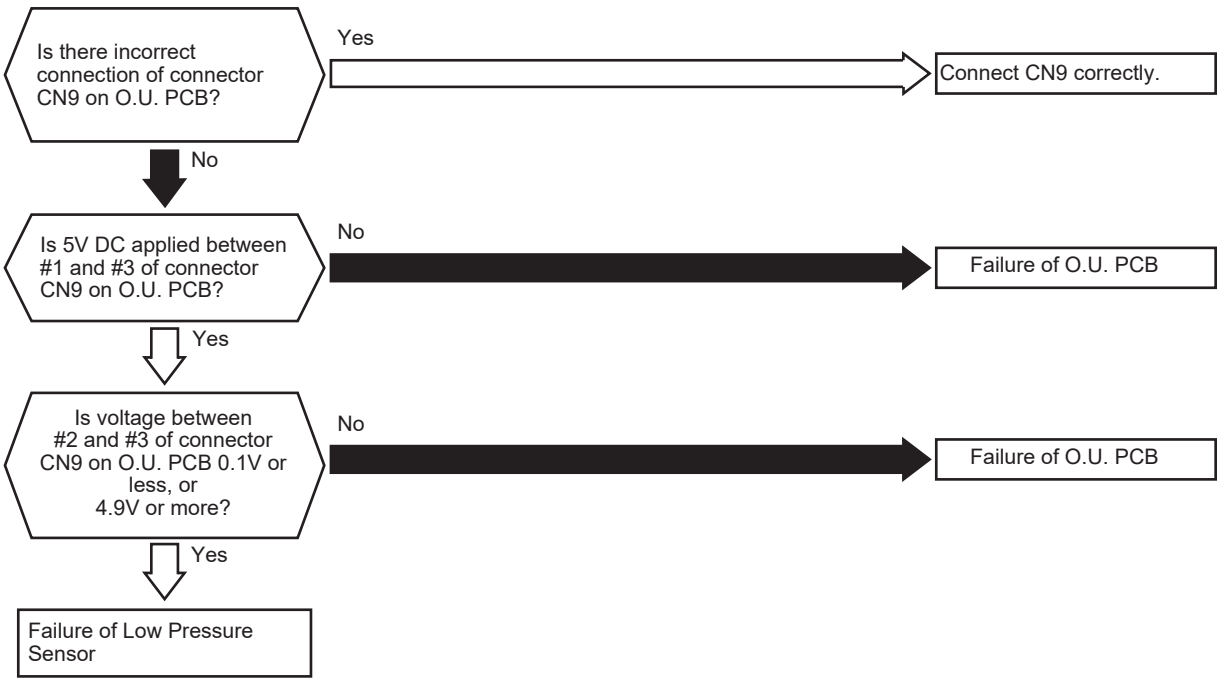
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Thermistor	Failure	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to O.U. PCB.	Repair wiring and connection.
Failure of O.U. PCB		Replace O.U. PCB. and check operation.	Replace O.U. PCB if faulty.

Alarm Code 29	Abnormality of Low Pressure Sensor for Outdoor Unit (Ps)

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

★ This alarm code is indicated when the pressure sensor voltage decreases to 0.1V or less or increases to 4.9V or more during running.

O.U. PCB: Outdoor Unit PCB



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Indication Value of Low Pressure (Ps) is Excessively High or Low	Fault	Check output characteristics *1)	Replace Low Pressure Sensor if faulty.
	Incorrect Connection	Check wiring to O.U. PCB.	Repair wiring and connections.
Faulty O.U. PCB		Replace O.U. PCB and check operation.	Replace O.U. PCB if faulty.

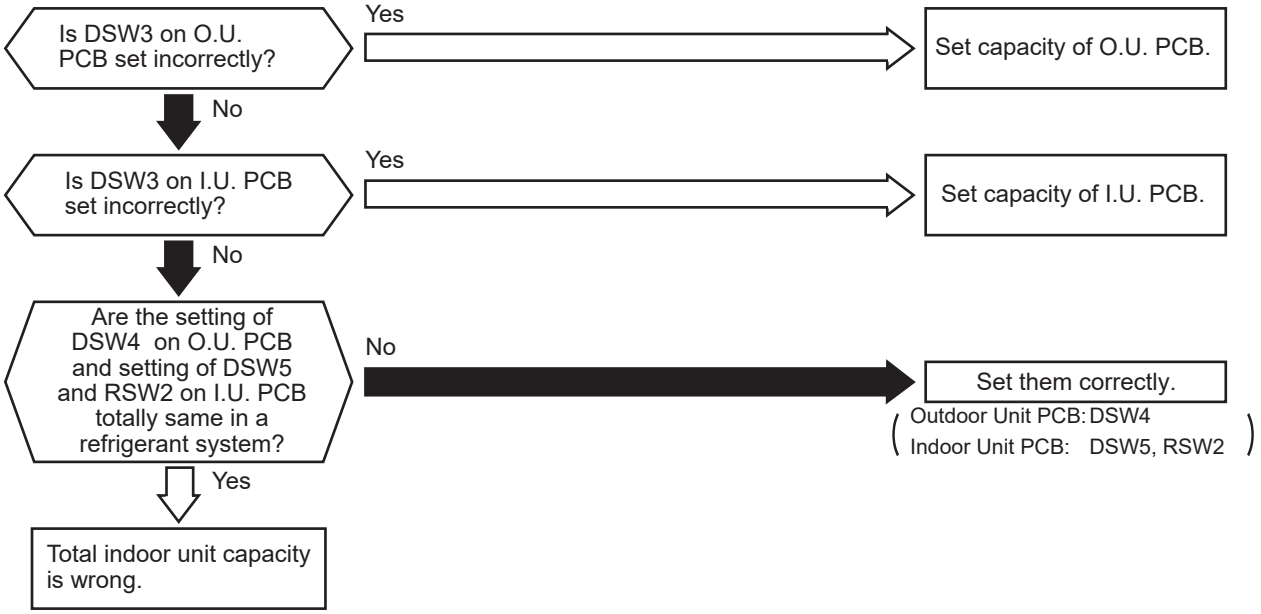
*1) Check output characteristics refer to "2.5.3 pressure sensor"

Alarm Code 31	Incorrect Capacity Setting of Indoor Unit and Outdoor Unit

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

★ This alarm code is indicated when the capacity setting dip switch, DSW3 on the outdoor unit PCB is not set (all the settings from #1 to #4 are OFF) or set incorrectly.

★ This alarm code is indicated when the total indoor unit capacity is smaller than 50% or greater than 130% of the combined outdoor unit capacity.



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Incorrect Capacity Setting of Indoor Unit		Check combination of indoor units and capacity setting on I.U. PCB.	Correctly set DIP switch, DSW3.
Incorrect Capacity Setting of Outdoor Unit		Check capacity setting on O.U. PCB.	Correctly set DIP switch, DSW3.
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%.
Refrigeration Cycle Setting of Outdoor Unit and Indoor Unit is Different		Check refrigeration cycle setting on O.U. PCB and I.U. PCB.	Set them correctly.

Alarm Code 35	Incorrect Indoor Unit No. Setting

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

★ This alarm code is displayed when the duration of automatic addressing of indoor unit exceeds 5 minutes after power-on of outdoor unit.
★ This alarm code is displayed when the number of connected indoor units exceeds the maximum allowed .*1)
★ This alarm code is displayed when refrigerant system No. set by DSW4 on O.U. PCB in the same H-LINK II system duplicates.
*1) For the value of maximum number of connectable I.U., please refer to “Design 1.2 Application Case”.

NOTE:

- In the case of H-LINK II system, this alarm code may be displayed when DSW4 (for refrigerant system No. setting) on the outdoor unit PCB and DSW5 and RSW2 (for refrigerant system No. setting) on the indoor unit PCB are not set correctly. In this case, turn OFF the power supply and set them correctly, and turn ON the power supply again. (The rotary switch RSW2 is not available depending on the indoor unit model.)

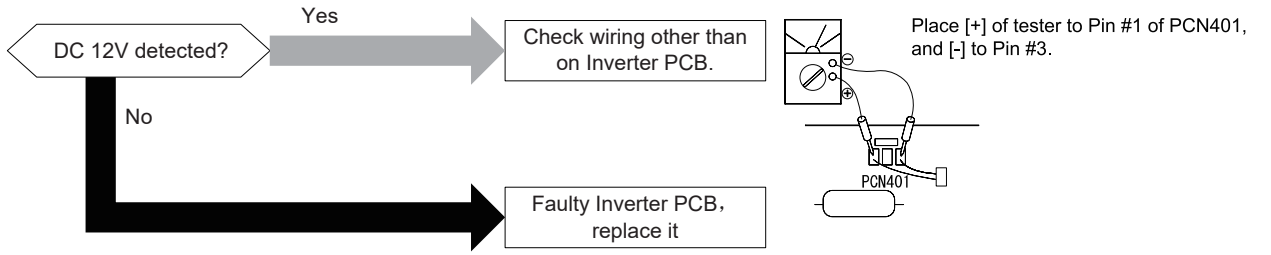
Alarm Code 36	Incorrect Indoor Unit Combination

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

★ This alarm code is indicated when the indoor unit connected to the outdoor unit is for other refrigerants (R22 or R407C).

Alarm Code 38	Abnormality of Picking up Circuit for Protection in Outdoor Unit

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.
- The alarm code appears if approx. DC12V is supplied to the Inverter PCB connector (see table below) when the inverter operation is commanded (after five seconds following activation of the remote control switch).
  Place the tester as shown in the diagram below to check the connector of PCN401. The connector shall remain inserted. DC12V will constantly be detected and disturb the diagnosis if the connector of PCN401 is pulled out.



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Activation of Picking up Circuit for Protection	Starting Outdoor Unit at Activation of Pickig up Circuit for Protection	Alarm Code History: “02” before “38”.	Refer to Alarm Code “02”
Abnormality of Picking up Circuit for Protection	Incorrect Connection	Check voltage supplied to connectors.	Repair wiring connections.
Faulty O.U. PCB or inverter PCB			Replace O.U. PCB. or inverter PCB

*1): This alarm code may be indicated when the high pressure switch (PSH) is connected incorrectly or fails (open fault). The item for alarm code 02 should be checked as well.

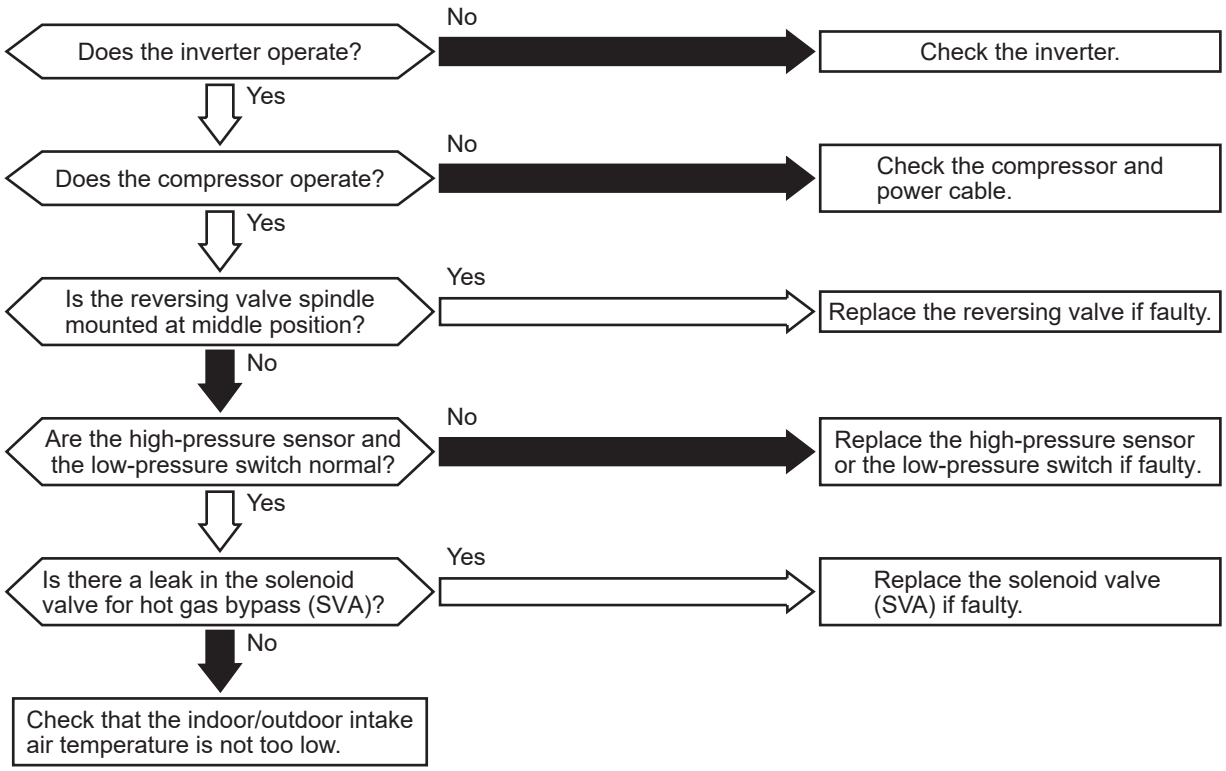
Alarm Code 43	Activation of Low Compression Ratio Protection Device

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7-segment of outdoor unit PCB.

★ If the pressure ratio ε*1) is less than 1.0 for 1 minute or less than 1.5 for 5 minute, the compressor stops. The operation automatically restarts after three minutes. If this occurs again twice in the next 30 minutes, this alarm code is displayed.

*1) Pressure Ratio ε = (Pd[MPa] + 0.1)/(Ps[MPa] + 0.06))
Pd: high pressure (discharge pressure)
Ps: low pressure (suction pressure)

O.U. PCB: Outdoor Unit PCB



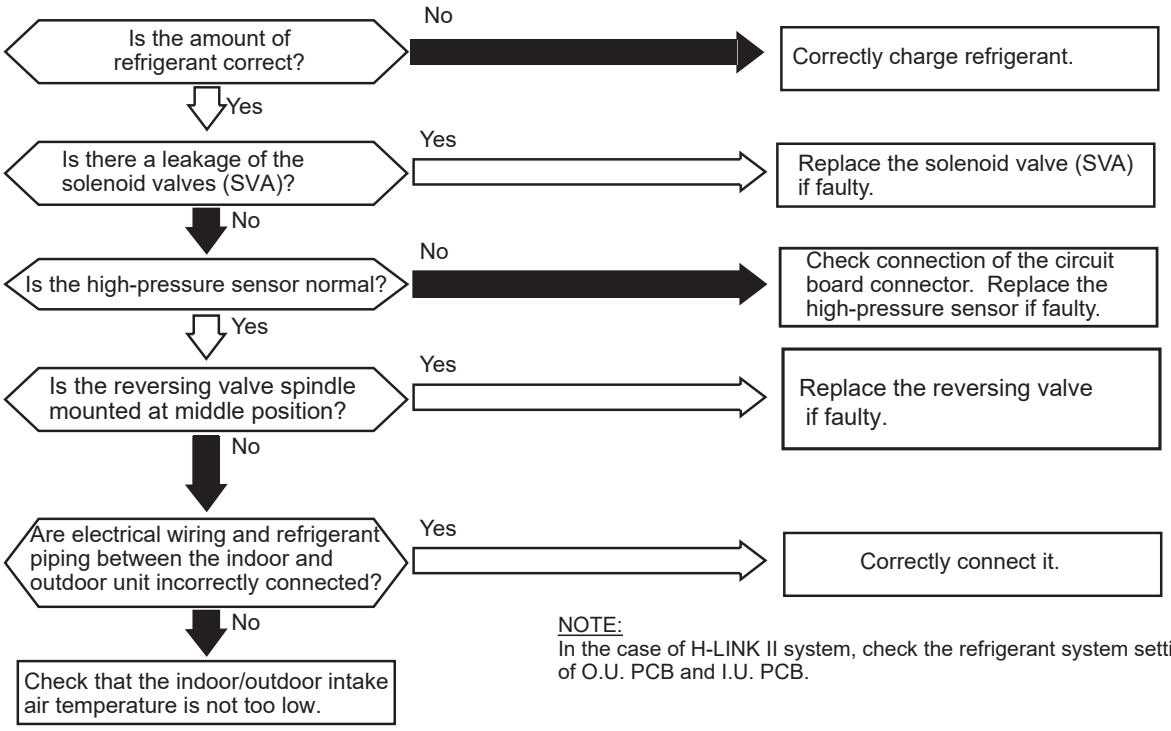
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively Low Compression Ratio	Inverter is not Functioning	Check inverter.	Repair faulty part.
	Compressor is not Operating	Check compressor.	Replace comp. if faulty.
	Valve Stoppage at Middle Position of Reversing Valve	Measure suction pipe temp. of reversing valve.	Replace reversing valve if faulty.
	Abnormality of High Pressure Sensor or Low Pressure Switch	Check connector for O.U. PCB, power supply and pressure indication.	Replace components 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 leakage occurs.

Alarm Code 46	Activation of High Pressure Decrease Protection Device

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

★ When the discharge pressure (Pd) continues to be lower than 1.0MPa for 30 minutes,a ll the compressors stop and then retry the operation after 3 minutes.
This alarm code is indicated when this occurs once more within the next 35 minutes.

O.U. PCB: Outdoor Unit PCB
I.U. PCB: Indoor Unit PCB



NOTE:
In the case of H-LINK II system, check the refrigerant system setting of O.U. PCB and I.U. PCB.

Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively Low Discharge Pressure	Shortage of Ref.	Check charged ref. volume or check for leakage.	Repair leakage and correctly charge.
	Leakage of Solenoid Valve (SVA)	Check Solenoid Valve.	Replace SVA if leakage occurs.
	Abnormal High Pressure Sensor	Check connectors for O.U. PCB.	Replace pressure sensor if faulty.
	Valve Stoppage at Middle Position of Reversing Valve	Measure suction pipe temp. of reversing valve.	Replace reversing valve if faulty.
	Incorrect Connection between Indoor Unit and Outdoor Unit	Check electrical system and ref. cycle.	Correctly connect them.
	Excessively Low Indoor/ outdoor Intake Air Temperature	Check indoor unit and outdoor unit air temp. thermistor.	Replace thermistor if faulty.

Alarm Code 47	Activation of Low Pressure Decrease Protection Device (Vacuum Operation Protection)

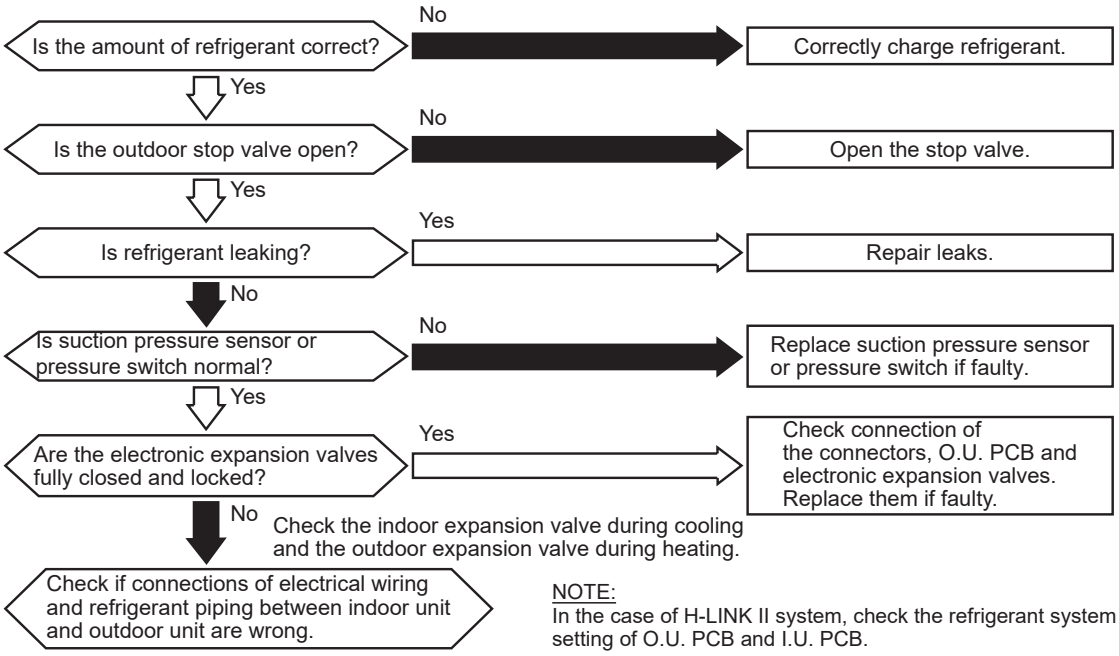
- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

★ This alarm code is indicated when a suction pressure (Ps) is lower than 0.09MPa for over 12 minutes and the same condition occurs twice or more within one hour.

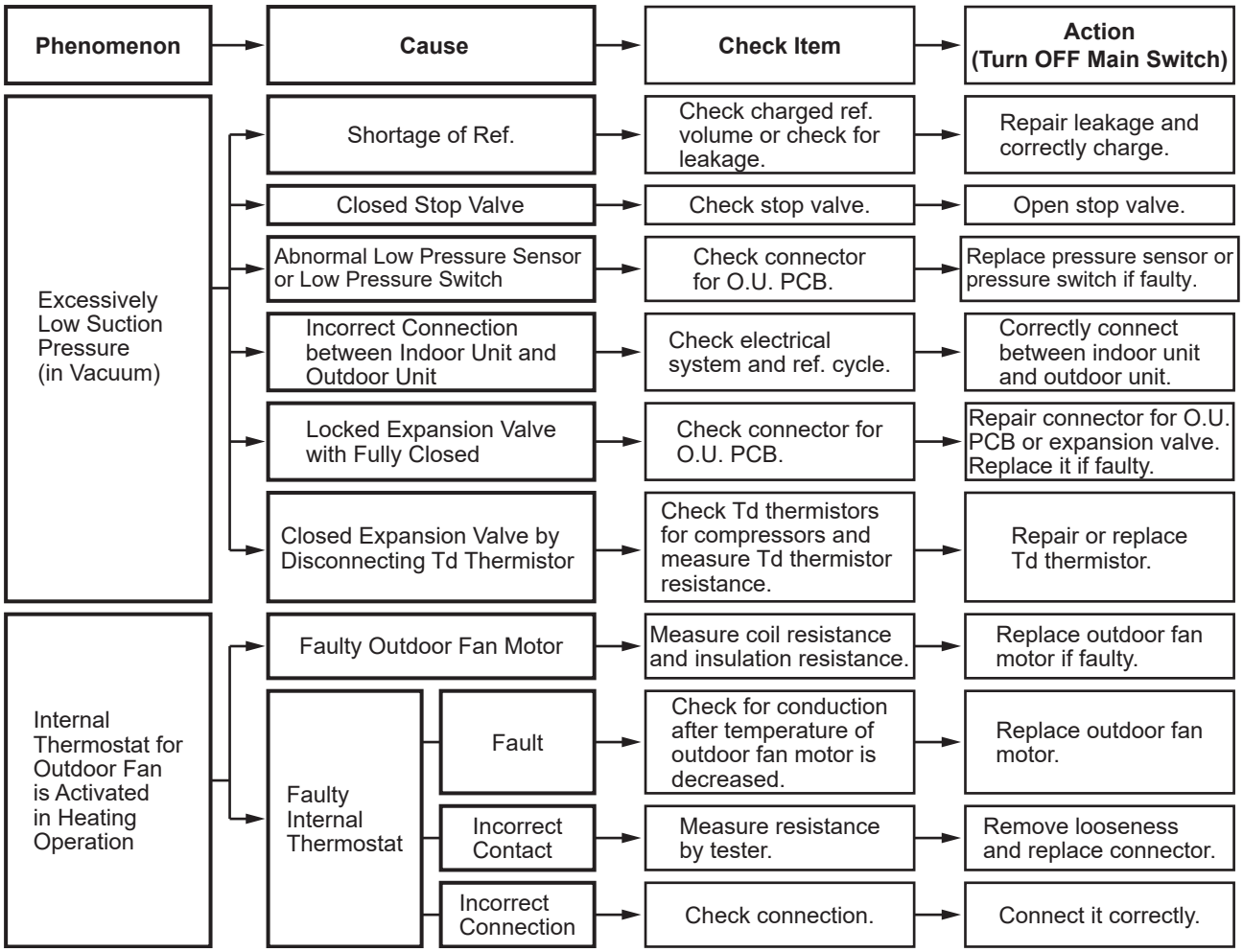
★ This alarm code is indicated when The action of low pressure switch(PSL) lasts for 30 seconds and the same condition occurs twice or more within one hour.

Low preesure switch	RAS-080/090/100/110/120HNBSTQ

O.U. PCB: Outdoor Unit PCB
I.U. PCB: Indoor Unit PCB



NOTE:
In the case of H-LINK II system, check the refrigerant system setting of O.U. PCB and I.U. PCB.


Phenomenon
Cause
Check Item
Action (Turn OFF Main Switch)
Excessively Low Suction Pressure (in Vacuum)
Shortage of Ref.
Check charged ref. volume or check for leakage.
Repair leakage and correctly charge.
Closed Stop Valve
Check stop valve.
Open stop valve.
Abnormal Low Pressure Sensor or Low Pressure Switch
Check connector for O.U. PCB.
Replace pressure sensor or pressure switch if faulty.
Incorrect Connection between Indoor Unit and Outdoor Unit
Check electrical system and ref. cycle.
Correctly connect between indoor unit and outdoor unit.
Locked Expansion Valve with Fully Closed
Check connector for O.U. PCB.
Repair connector for O.U. PCB or expansion valve. Replace it 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.
Replace outdoor fan motor if faulty.
Faulty Internal Thermostat
Fault
Check for conduction after temperature of outdoor fan motor is decreased.
Replace outdoor fan motor.
Incorrect Contact
Measure resistance by tester.
Remove looseness and replace connector.
Incorrect Connection
Check connection.
Connect it correctly.

Alarm Code 48	Activation of Inverter Overcurrent Protection Device (1)

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

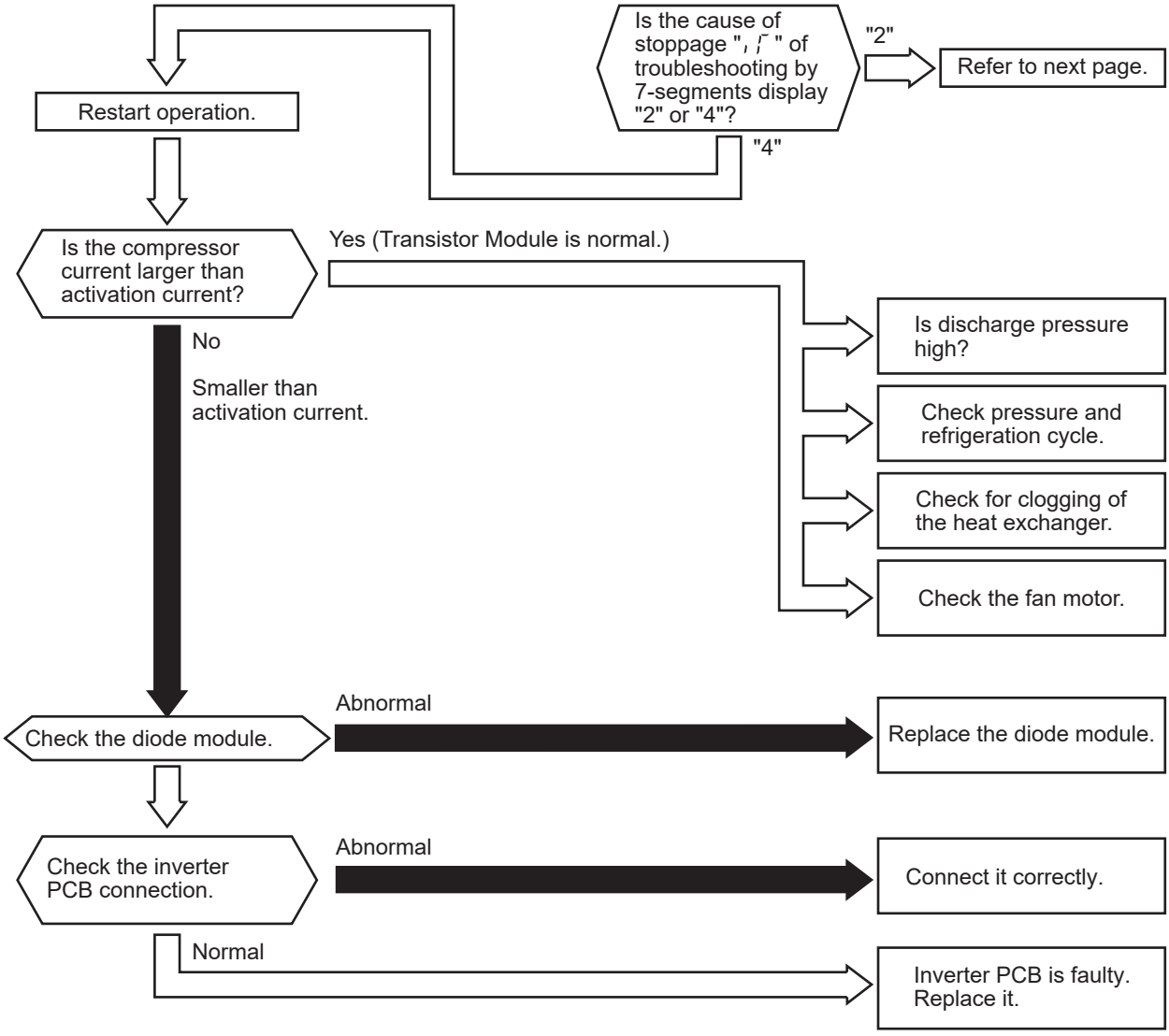
★ This alarm code is indicated when inverter electronic thermal protection is activated six times within 30 minutes. (Retry operation is performed up to the occurrence of five times.)

Conditions of Activation:

(1) Inverter current with 105% of the rated current runs for 30 seconds continuously.

(2) Inverter current runs intermittently and the accumulated time reaches up to 3 minutes, in 10 minutes.

O.U. PCB: Outdoor Unit PCB



iTC	Cause of inverter stoppage
2	Instantaneous overcurrent
4	Inverter overcurrent

Alarm Code 48	Activation of Inverter Overcurrent Protection Device (2)

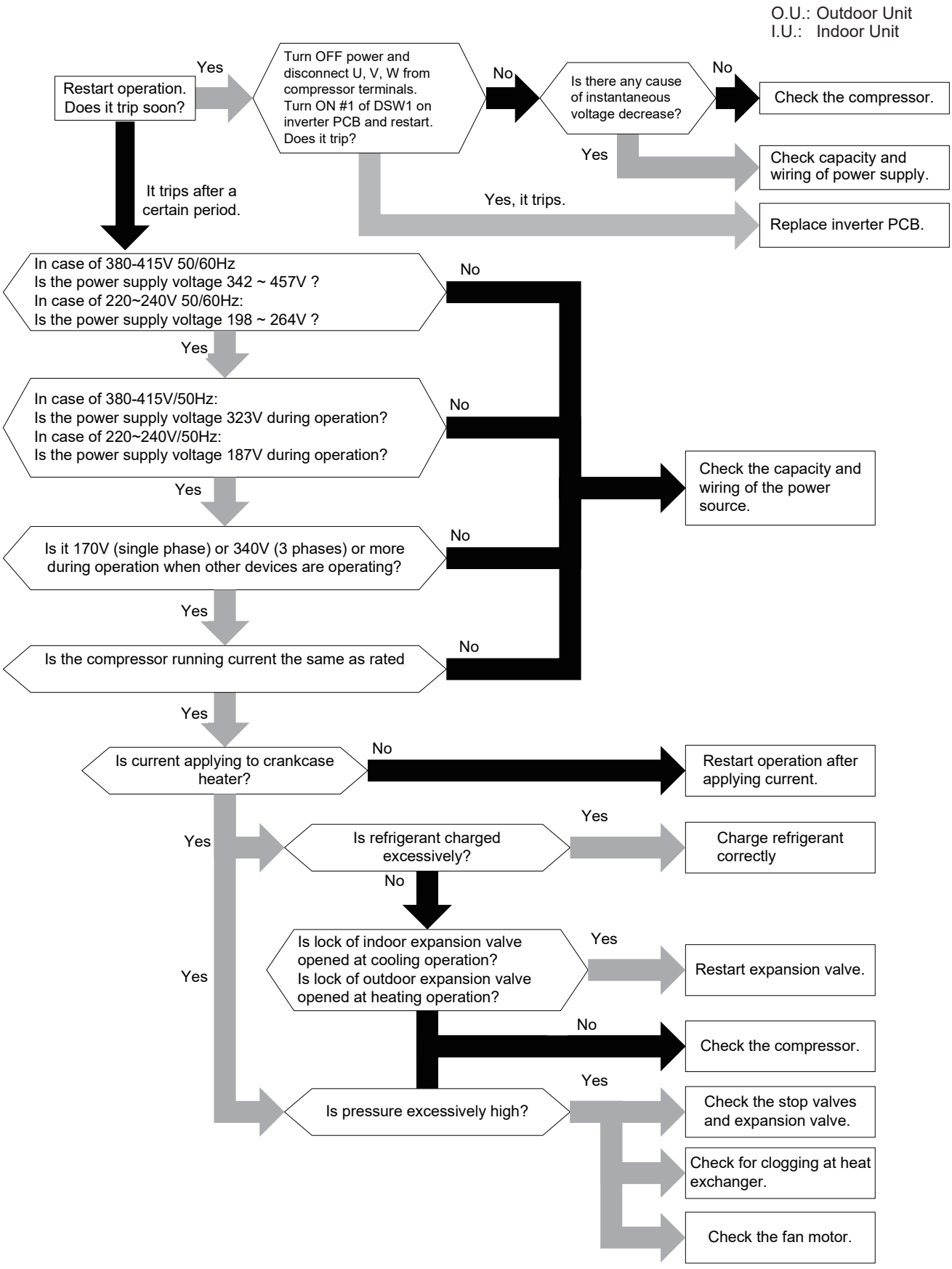
- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

★ If instantaneous overcurrent or electronic thermal protection occurs on inverter as follows, the compressor stops. The operation automatically restarts after three minutes. If this occurs again five times in the next 30 minutes, this alarm code is displayed.

Condition of Activation:

(1) Instantaneous overcurrent (Cause code of inverter stoppage = 2)
Inverter secondary current is higher than 150% of the rated current instantaneously.

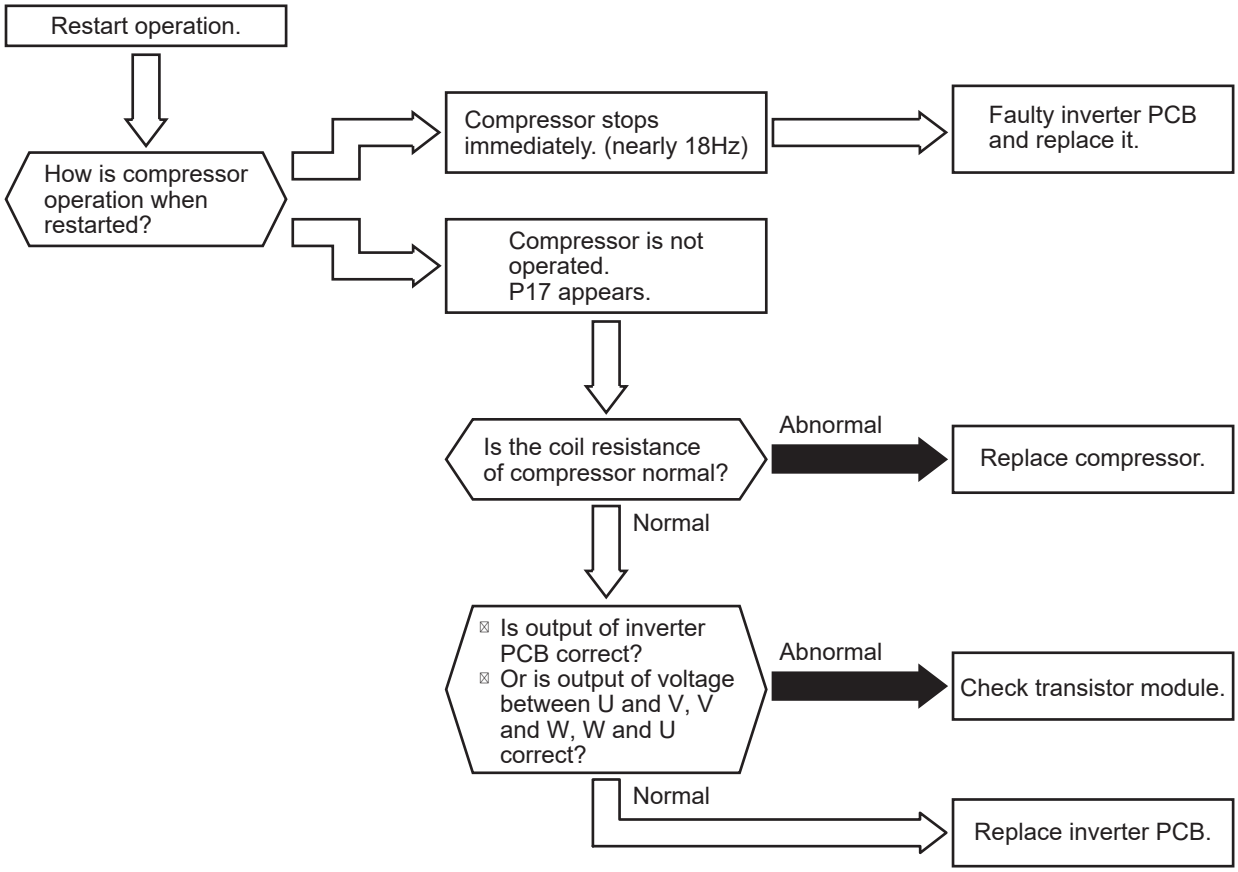
(2) Inverter electronic thermal protection (Cause code of inverter stoppage = 4)
Inverter primary/secondary current is higher than 105% of the rated current for 30 seconds continuously, or Inverter primary/secondary current is higher than 105% of the rated current intermittently for 3 minutes per 10 minutes.


O.U.: Outdoor Unit
I.U.: Indoor Unit
Restart operation. Does it trip soon?
Yes
Turn OFF power and disconnect U, V, W from compressor terminals. Turn ON #1 of DSW1 on inverter PCB and restart. Does it trip?
No
Is there any cause of instantaneous voltage decrease?
No
Check the compressor.
Yes
Check capacity and wiring of power supply.
It trips after a certain period.
Yes, it trips.
Replace inverter PCB.
In case of 380-415V 50/60Hz
Is the power supply voltage 342 ~ 457V ?
In case of 220~240V 50/60Hz:
Is the power supply voltage 198 ~ 264V ?
No
Yes
In case of 380-415V/50Hz:
Is the power supply voltage 323V during operation?
In case of 220~240V/50Hz:
Is the power supply voltage 187V during operation?
No
Yes
Is it 170V (single phase) or 340V (3 phases) or more during operation when other devices are operating?
No
Yes
Is the compressor running current the same as rated
No
Yes
Check the capacity and wiring of the power source.
Is current applying to crankcase heater?
No
Restart operation after applying current.
Yes
Yes
Is refrigerant charged excessively?
Yes
Charge refrigerant correctly
No
Is lock of indoor expansion valve opened at cooling operation?
Is lock of outdoor expansion valve opened at heating operation?
Yes
Restart expansion valve.
Yes
No
Check the compressor.
Is pressure excessively high?
Yes
Check the stop valves and expansion valve.
Check for clogging at heat exchanger.
Check the fan motor.

Alarm Code 51	Abnormality of Current Sensor

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

★ In case that the abnormality of current transformer (0A detecting) occurs three times within 30 minutes, this alarm code is indicated at the third time.
(Retry operation is performed for the first two times.)
Condition of Activation:
(1) When the frequency of compressor is maintained at 15 to 18Hz after compressor is started, one of the absolute value of running current detected by the current transformer at each phase U+, U-, V+ and V- is less than 1.5A (including 1.5A).
(2) 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).



iTC	Cause of inverter stoppage
8	Abnormal current sensor or imbalance of U/V/W

Alarm Code 53	Inverter Error Signal Detection

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

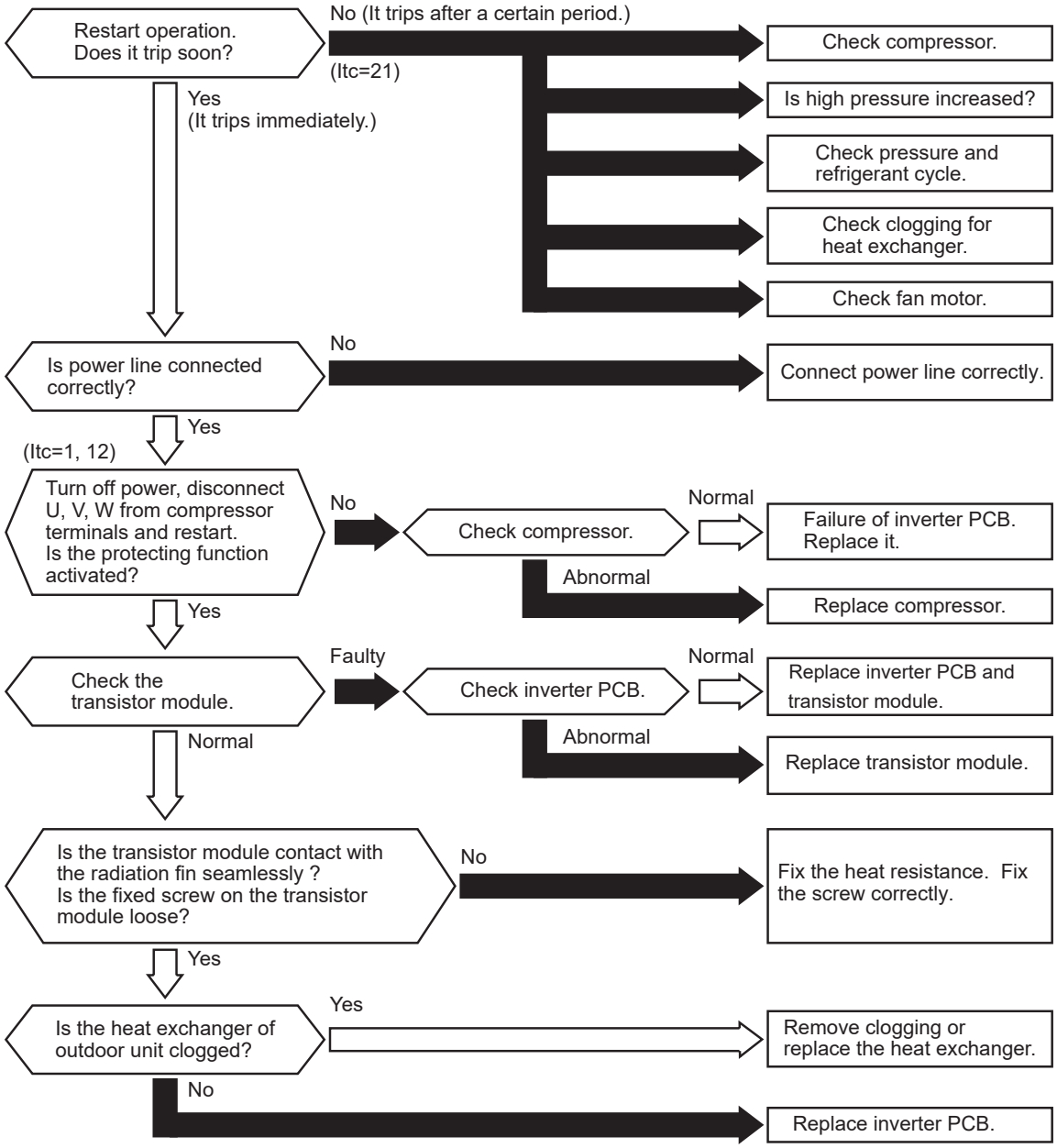
★ IPM (Transistor Module) has abnormality-detecting function.
This alarm code is indicated when the abnormality is detected seven times within 30 minutes.
(Retry operation is performed for the first 6 times.)

Condition of Activation:

(1) IPM Error (Cause code of inverter stoppage = 1)
Inverter PCB detects IPM fault signal due to abnormal current, control voltage decrease or etc.

(2) Ground Fault Detection from Compressor (Cause code of inverter stoppage = 12)
Inverter PCB detects overcurrent when checking ground fault before compressor starts operation.

(3) Step-Out Detection (Cause code of inverter stoppage = 21)
The angle difference between the shaft in compressor and the shaft in the control program exceeds 60°.

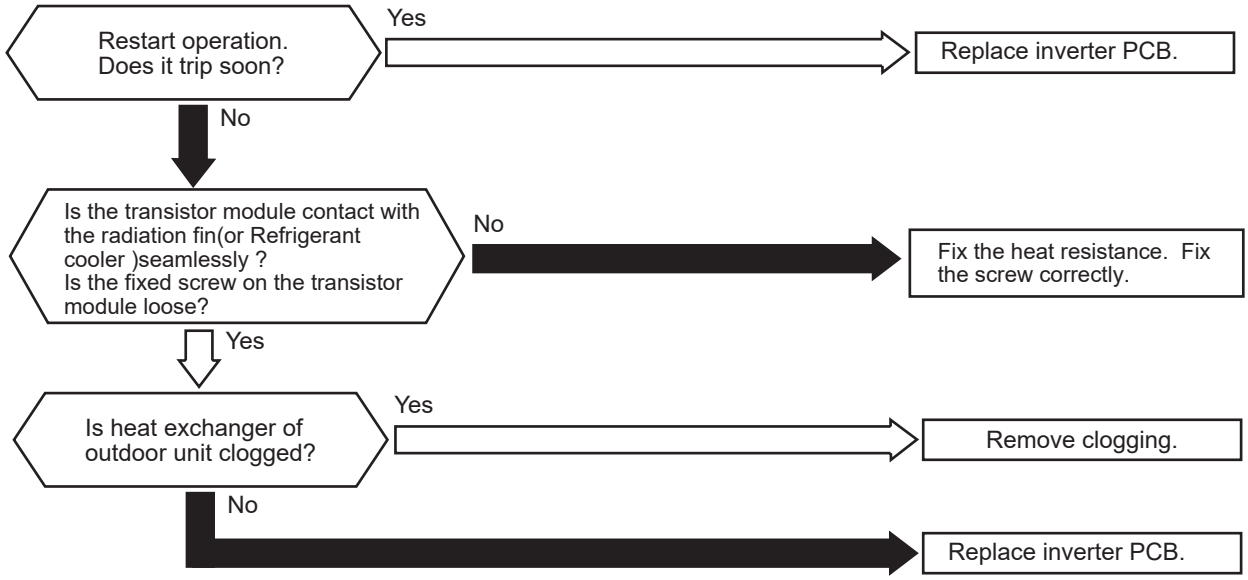


Alarm Code 54	Abnormality of Inverter Fin Temperature

- The RUN indicator (Red) is flashing.
- The indoor unit number (Ref. system number - I.U. number), the alarm code and the number of connected indoor units are displayed on the LCD. The alarm code is flashed on the 7-segment display of the outdoor unit PCB. Check the inverter stoppage code when this alarm code is displayed.

★ When the following condition occurs three times in 30 minutes, the operation stops and this alarm code is displayed. If this occurs less than three times in 30 minutes, the operation automatically restarts.

Condition of Activation:
(1) Inverter fin thermistor protection activation (Cause code of inverter stoppage = 3)
The temperature of inverter fin exceeds 80°C.



* The maintenance and replacement for inverter PCB should be performed after performing surely the voltage discharge.

Alarm Code 55	Inverter Failure

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

★ This alarm code is indicated when the following phenomenon occurs three times in 30 minutes.
(Retry operation is performed for the first two times.)
Actual frequency from inverter PCB is less than 10Hz (after inverter frequency output from outdoor unit PCB).
Conditions of Activation: Inverter PCB does not operate normally.

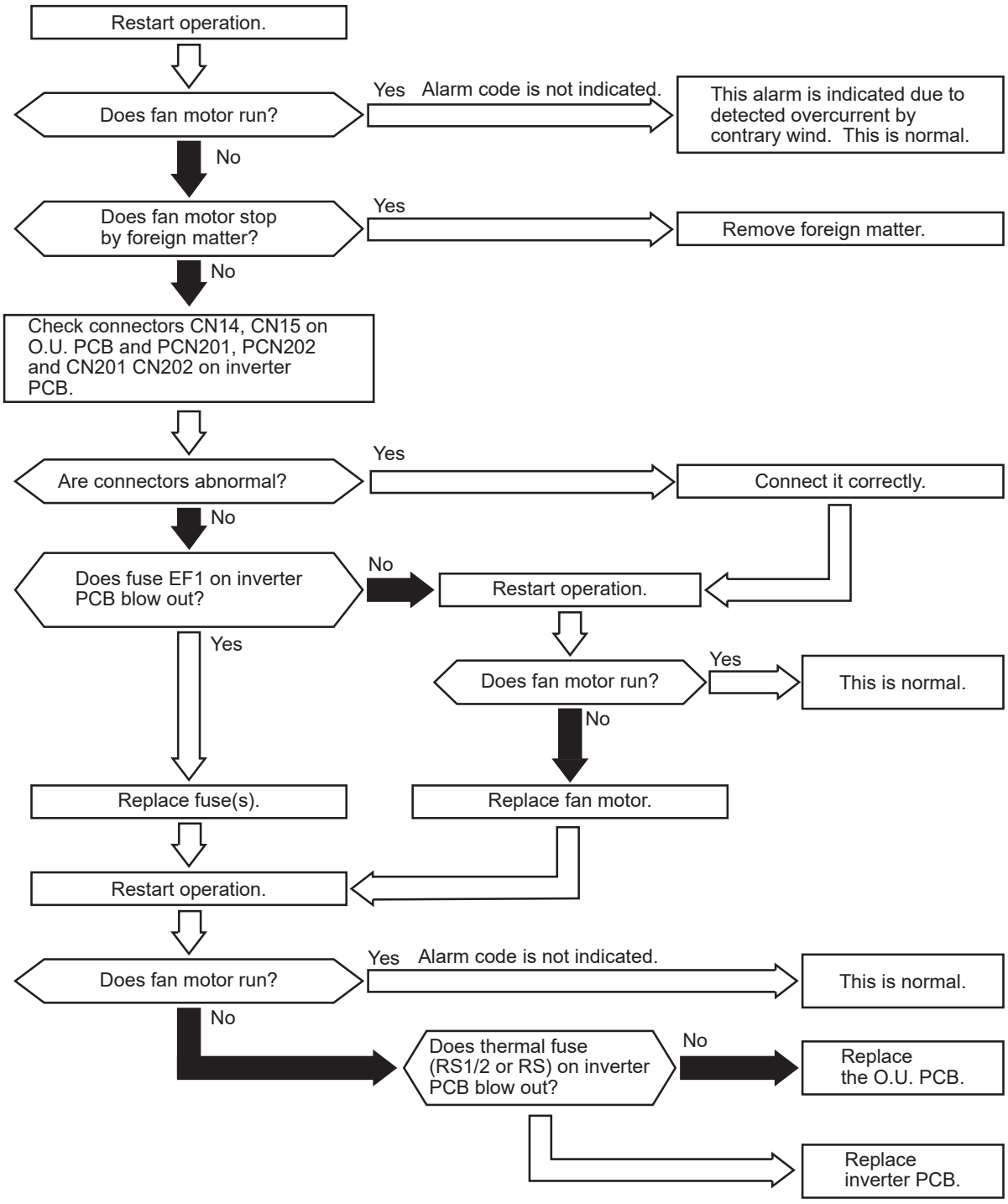


*1): When the excessive surge current is applied to the unit due to lightning or other causes, this alarm code or the cause code of inverter stoppage (Itc=11) will be displayed on the 7-segment display on O.U. PCB and the unit can not be operated. In this case, check to ensure the surge absorber (SA) on the noise filter. The surge absorber may be damaged if the inner surface of the surge absorber is changed to black. If the surge absorber is damaged, replace the noise filter. If the surge absorber does not have abnormality, turn OFF the power supply once and wait until LED201 (red) goes off on inverter PCB in approx. 5 min. Then, turn ON again.

Alarm Code 57	Abnormality of Fan Motor

- The RUN indicator (Red) is flashing.
- The indoor unit number (Ref. system number - I.U. number), the alarm code, the model code, the model name and the number of connected indoor units are displayed on the LCD. The alarm code is flashed on the 7-segment display of the outdoor unit PCB.

★ If the revolution of the fan motor is less than 10rpm 10 seconds after the fan motor starts operation, the fan motor stops. The fan motor restarts operation automatically after 10 seconds (During this, the compressor continues to operate). If this occurs again nine times in the next five minutes, this alarm code is displayed. This alarm is caused by locking or electrical abnormality of the fan motor.



Alarm Code	Incorrect Setting of Unit and Refrigerant Cycle Number

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the number of connected indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

★ This alarm code is displayed in the following conditions. Check the settings of the DIP switches (DSW) and the rotary switches (RSW) after turning OFF the power supply.

Conditions	Action
The unit No. setting (DSW6 and RSW1) or the refrigerant system No. setting (DSW5 and RSW2) on I.U. PCB is set as “64” or more, or more than 2 pins of DSW5 or DSW6 are set.	a . Unit No. Setting / Ref. System No. Setting Starting from “1” (recommended) Set the unit No. and the refrigerant system No. from “1” to “63”. (Setting No. for the 64th unit is “0”.) b . Unit No. Setting / Ref. System No. Setting Starting from “0” Set the unit No. and the refrigerant system No. from “0” to “63.” (Setting No. for the 64th unit is “63”.)
The unit No. setting and the refrigerant system No. setting are set between “16” and “63,” and the indoor unit does not support H-LINK II.	Set the unit No. and the refrigerant system No. between “0” and “15.”

Alarm Code	Incorrect Setting of Indoor Unit Number for H-LINK II Type

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code*1), the unit model code and the number of connected indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.
  *1): The alarm code indicated on the remote control switch is “35”.

Condition	Action
The number of the connected indoor units not supporting H-LINK II is 17 and after.	The number of the connected indoor units shall be 16 and before.

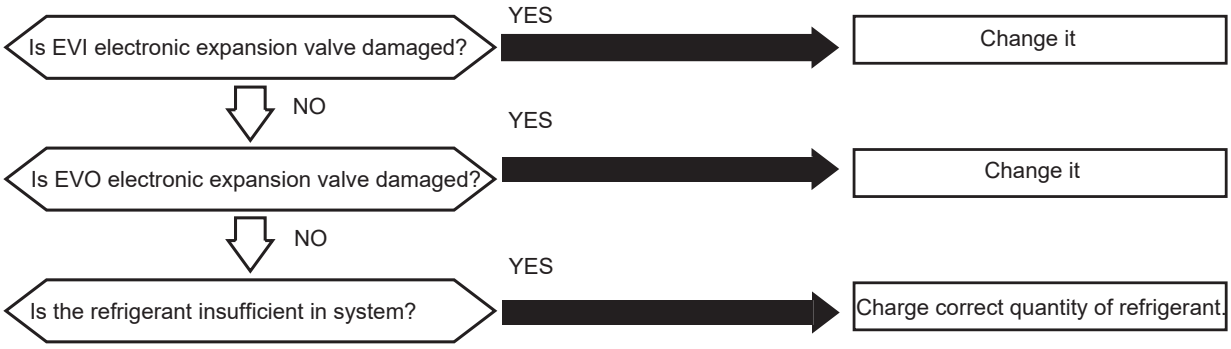
Alarm Code	Abnormality of Refrigerant Cooling Module Temperature(Tsc)

- The RUN indicator (Red) is flashing.
- The indoor unit number, the alarm code, the unit model code and the connected number of indoor units are displayed on LCD. Meanwhile, the indoor unit number and the alarm code are displayed on the 7- segment of outdoor unit PCB.

★ This alarm code is indicated when the following conditions occurs twice or more within the next 60 minutes.

(1) The temperature of super cooler inlet pipe is lower than ambient temperature.
(2) The inverter fin temperature is lower than ambient temperature.

O.U. PCB: outdoor unit PCB
I.U. PCB: indoor unit PCB



Alarm Code	Compressor Protection

★ This alarm code appears when one of the following alarms occurs three times within 6 hours, which may result in serious compressor damages, if the outdoor unit is continuously operated without removing the cause.

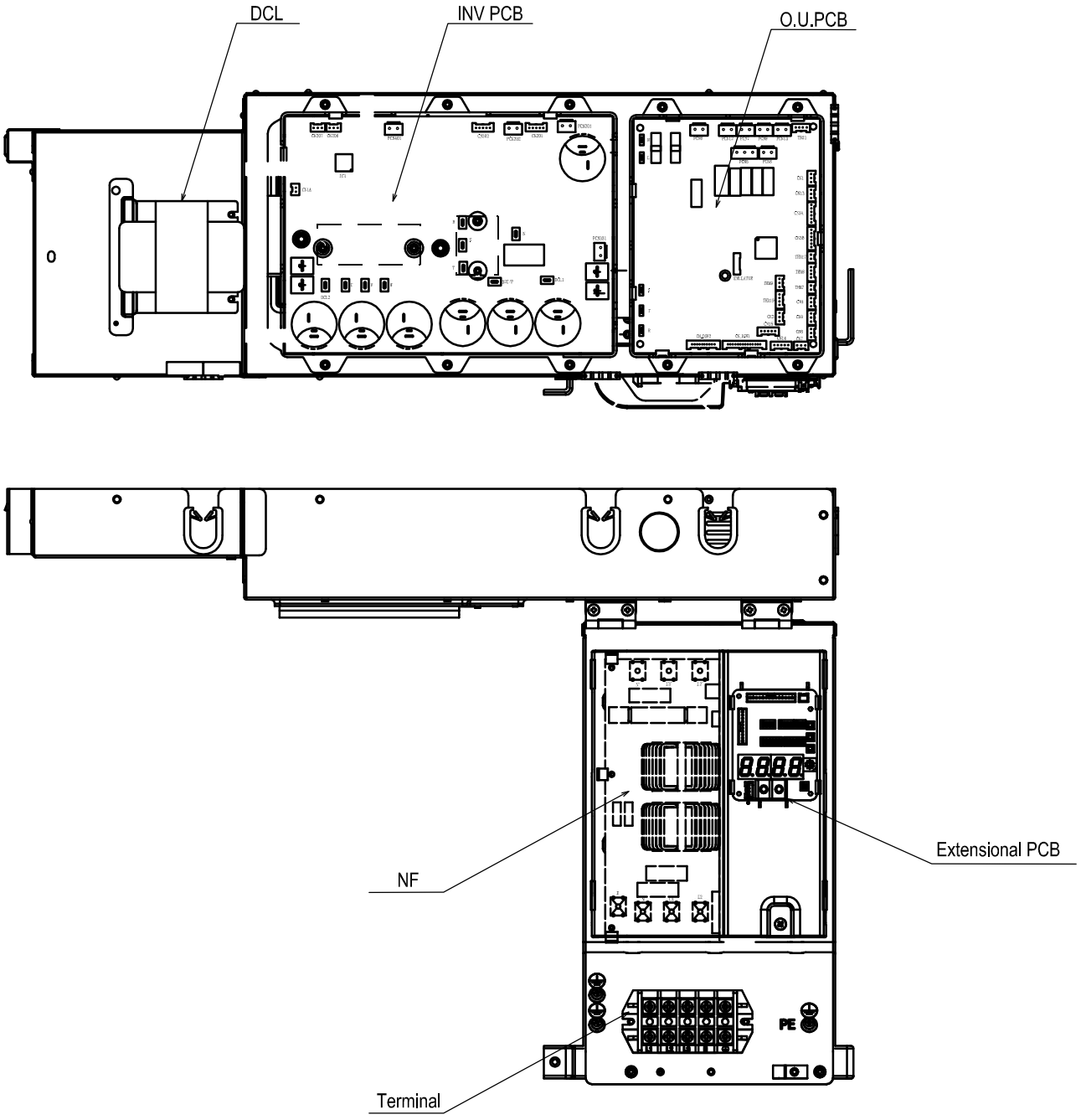
Alarm Code	Content of Abnormality
02	Activation of Protection Device (High Pressure Switch) in Outdoor Unit
07	Decrease in Discharge Gas Superheat
08	Excessively High Discharge Gas Temperature at Top of Compressor
43	Activation of Pressure Ratio Decrease Protection
44	Activation of Low Pressure Increase Protection
45	Activation of High Pressure Increase Protection Device
47	Activation of Low Pressure Decrease Protection

These alarms are able to be checked by the CHECK Mode. Follow the action indicated in each alarm chart.
These alarms are cleared only by turning OFF the main power supply to the system. Do not restart the operation without taking any necessary action, since there is a possibility of causing serious damages to the compressors.

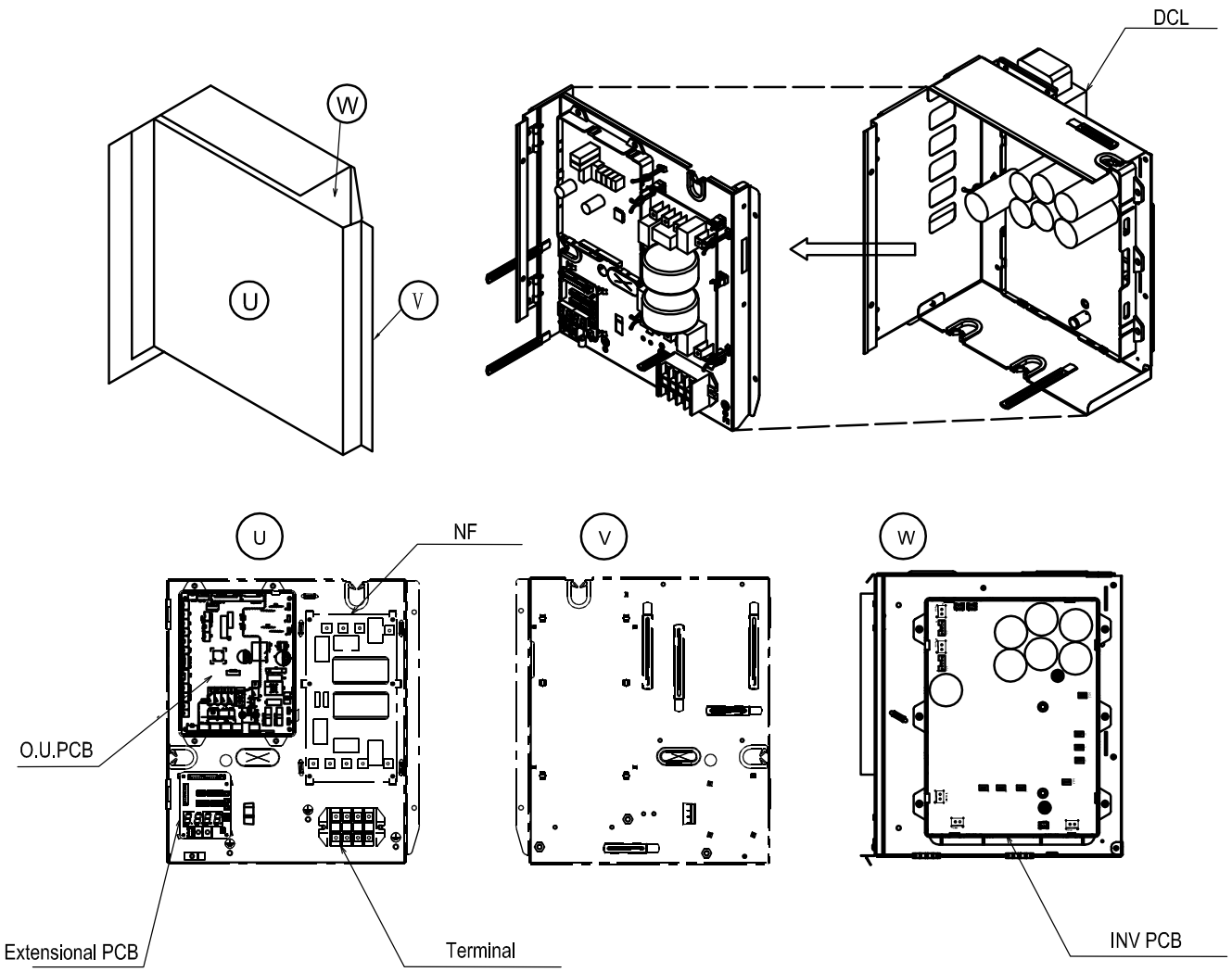
1.2.8 Function of RSW, DSWs and LEDs

1.2.8.1 Arrangement Inside Electrical Box

- RAS-080/090HNBSTQ



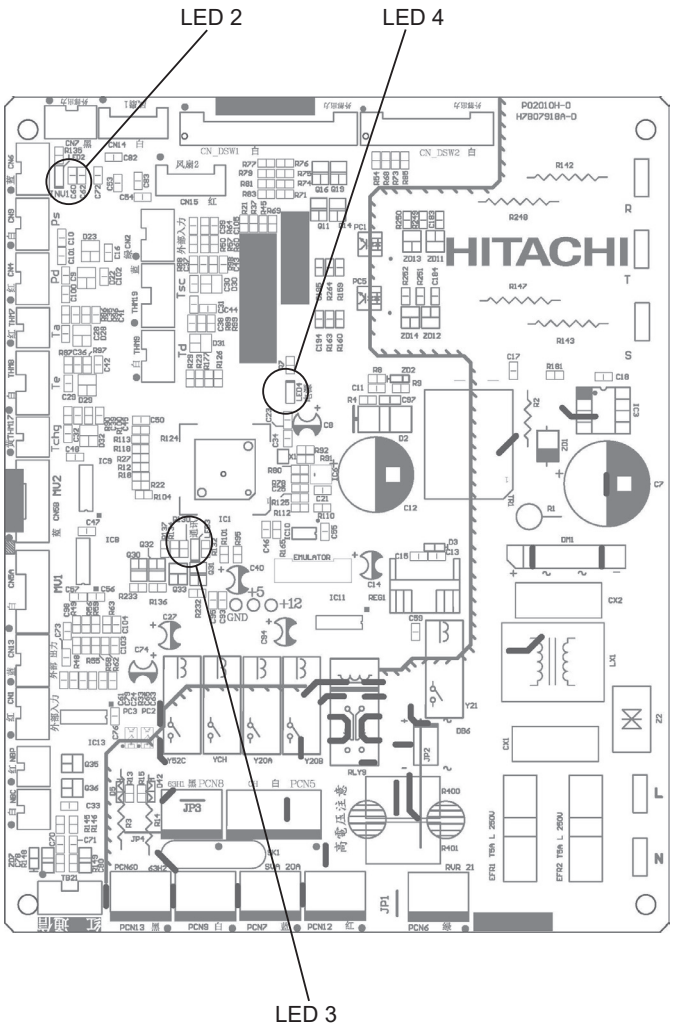
- RAS-100/110/120HNBSTQ

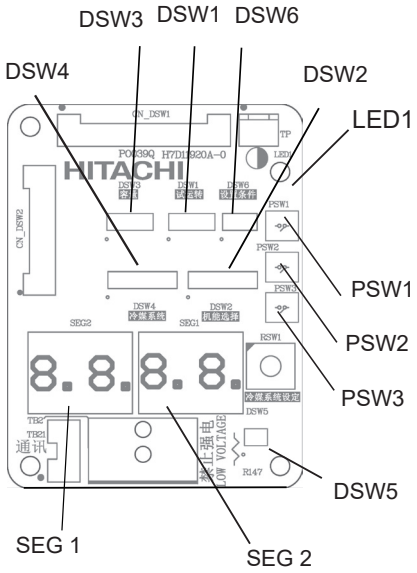


1.2.8.2 LEDS and SEGS on PCB

Part Name		Contents of Functions
LEDs	LED1 (Red) or LED4(Red)	Power Supply Indication for Outdoor Unit PCB (Low Voltage) Normal Condition: Activated Abnormal Condition: Deactivated
	LED2 (Green)	This LED2 indicates the transmission state between the outdoor unit PCB and inverter PCB. Normal Condition: Flashing Abnormal Condition: Activated or Deactivated
	LED3 (Yellow)	This LED3 indicates the transmission state between the indoor unit and outdoor unit. Normal Condition: Flashing Abnormal Condition: Activated or Deactivated
SEGs	SEG1, SEG2	These indicate the following “Alarm”, “Protective Safety Device has Tripped” or “Checking Items”.

RAS-080~120HNBSTQ

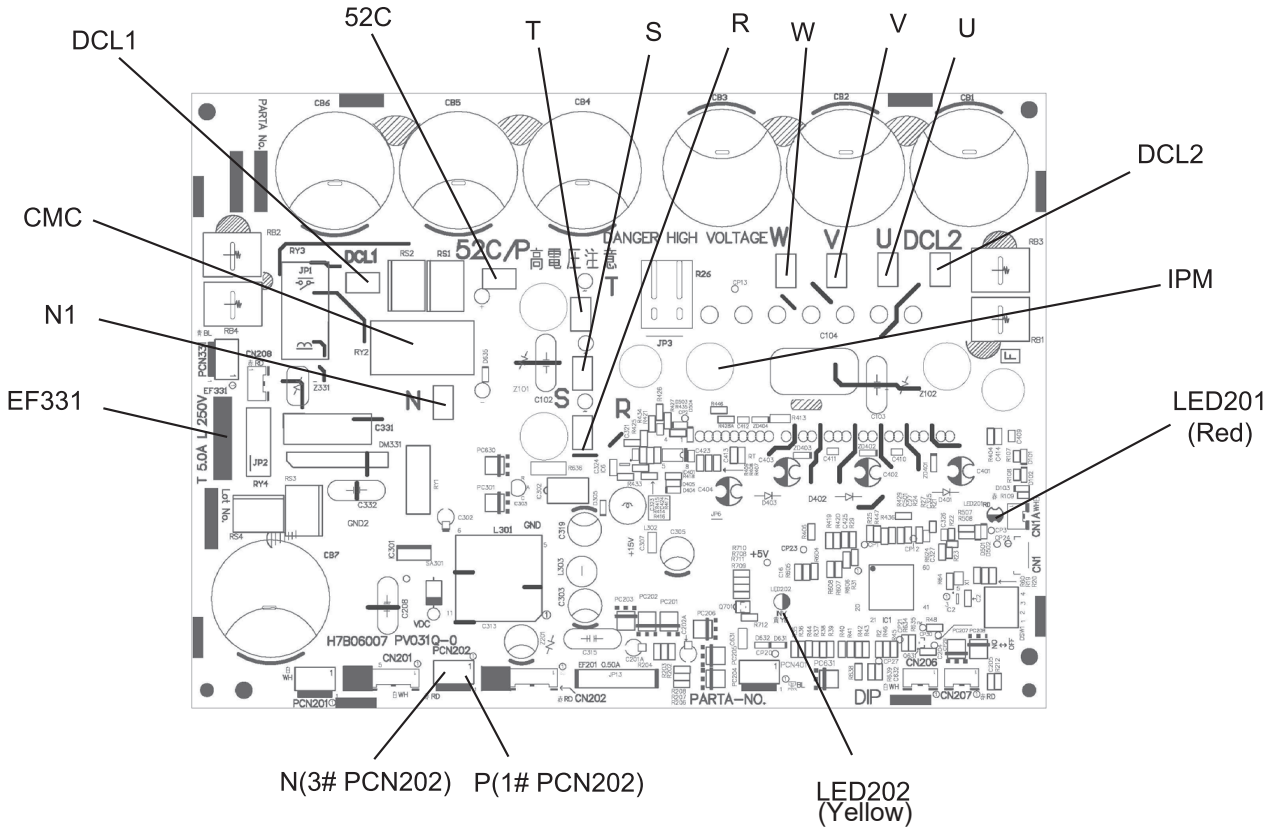




1.2.9 Checking of Inverter PCB

<Procedure>

RAS-080/090HNBSTQ



High Voltage Discharge Work for Replacing Parts

⚠CAUTION

Safely perform this high voltage discharge work to prevent electric shock.

a . Check whether the high voltage still exists in the inverter PCB after power is disconnected. When the unit is operated, LED201 is turned ON on inverter PCB. At the time of power off the unit, LED201 is turned OFF. In this case, the residual voltage is less than DC50V.

b . Plug connecting wires to a soldering iron (field-supplied)

c . Connect the wires to terminals #1(P) and #3(N) of connector “PCN202” on inverter PCB.

d . Measure the residual voltage again after 2 or 3 minutes. Check to ensure that no high voltage is remaining.

Discharging is started, and the soldering iron is warmed up.

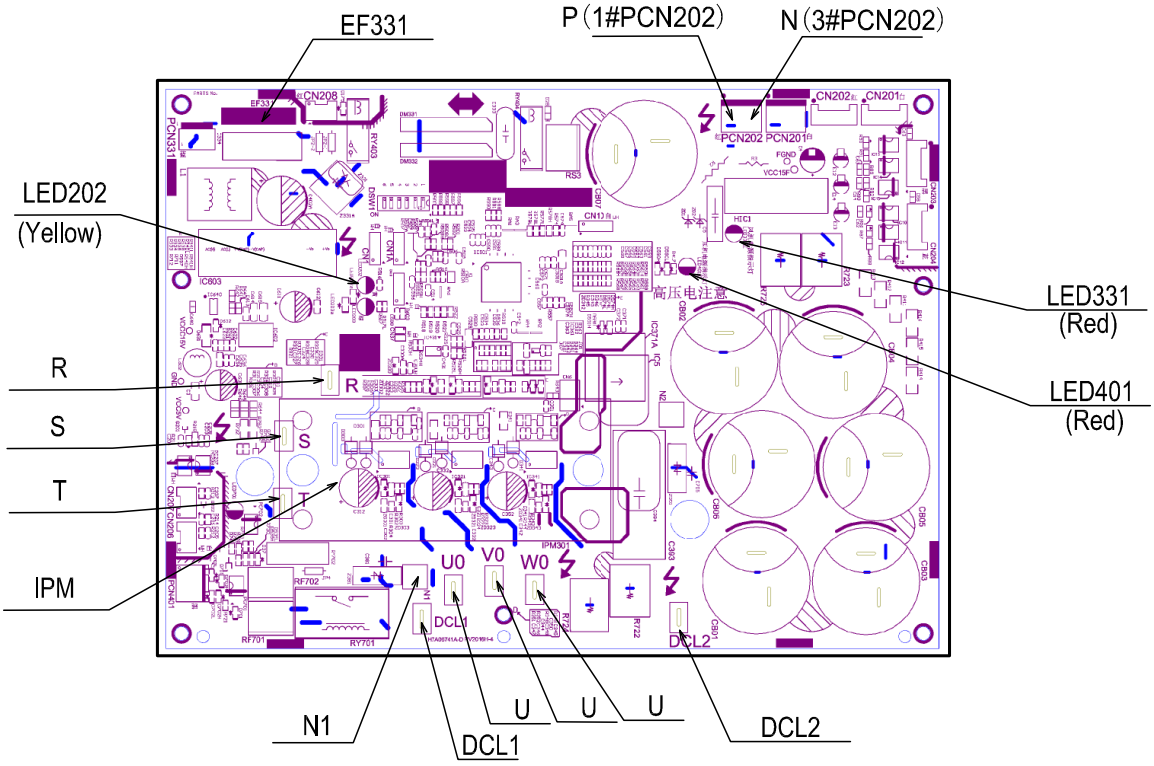
Do not contact or short-circuit P (⊕) and N (⊖), when performing the discharge work.

Measure the each checking element by a tester. The checking result shall be as following table.

Tester Probe	Result
(+)52C, (-)R or S or T	More than 100 kΩ
(-)52C, (+)R or S or T	More than 10 kΩ
(-)N, (+)R or S or T	More than 100 kΩ
(+)N, (-)R or S or T	More than 10 kΩ
(+)P, (-)U or V or W	More than 100 kΩ
(-)P, (+)U or V or W	More than 30 kΩ
(-)N, (+)U or V or W	More than 100 kΩ
(+)N, (-)U or V or W	More than 30 kΩ
(+)DCL2, (-)P	More than 10 kΩ
(-)DCL2, (+)P	More than 100 kΩ
(+)DCL2, (-)N	More than 10 kΩ
(-)DCL2, (+)N	More than 10 kΩ
EF3311(+)(-)	0Ω (normal)

NOTE:
The polar character of tester probes are as follows. Red(+), Black(-)

RAS-100/110/120HNBSTQ



a . Check whether the high voltage still exists in the inverter PCB after power is disconnected. When the unit is operated, LED401 is turned ON on inverter PCB. At the time of power off the unit, LED401 is turned OFF.
In this case, the residual voltage is less than DC50V.

b . Plug connecting wires to a soldering iron (field-supplied).

c . Connect the wires to terminals #1(P) and #3(N) of connector “PCN202” on inverter PCB.

d . Measure the residual voltage again after 2 or 3 minutes. Check to ensure that no high voltage is remaining.

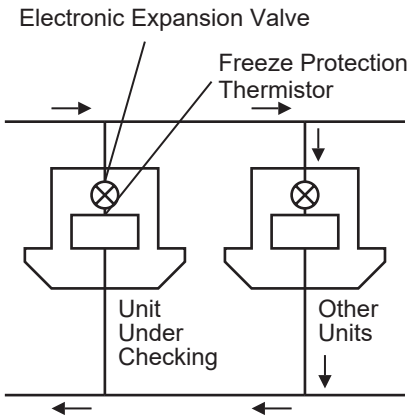
Discharging is started, and the soldering iron is warmed up.
Do not contact or short-circuit P (+) and N (-), when performing the discharge work.

Measure the each checking element by a tester. The checking result shall be as following table.

Tester Probe	Result
(-)N1, (+)R or S or T	More than 100 kΩ
(+)N1, (-)R or S or T	More than 10 kΩ
(+)DCL1, (-)U or V or W	More than 100 kΩ
(-)DCL1, (+)U or V or W	More than 30 kΩ
(-)DCL1, (+)R or S or T	More than 10 kΩ
(+)DCL1, (-)R or V or W	More than 100 kΩ
(+)DCL2, (-)DCL1	More than 30 kΩ
(-)DCL2, (+)DCL1	More than 100 kΩ
(+)DCL2, (-)N	More than 1 kΩ
(-)DCL2, (+)N	More than 100 kΩ
EF3311(+)(-)	0Ω (normal)

NOTE:
The polar character of tester probes are as follows. Red(+), Black(-)

1.2.10 Checking Method of Electronic Expansion Valve

	Indoor Unit Electronic Expansion Valve	Outdoor Unit Electronic Expansion Valve
Locked (Fully Closed)	Check for the liquid pipe temperature during heating operation. It is abnormal if the temperature does not increase.	It is abnormal if the liquid pipe pressure does not increase during cooling operation
Locked (Slightly Open)	It is abnormal under the following conditions; The temperature of freeze protection thermistor becomes lower than the suction air temperature when the unit under checking is stopped and the other units are in cooling operation.	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.
Locked (Fully Open)		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 faults such as excessive charge of refrigerant, etc.

1.2.11 Checking of DC Fan motor

When INV PCB is faulty and Alarm 03, 04 or 53 appears, the fan motor may also be damaged. To prevent INV PCB damage which may result from operation combined with a faulty fan motor, check also if the fan motor is not damaged when IPM is replaced.

Procedure in case of error diagnosis

(1) Remove fan motor connectors for DC fan motor from the INV PCB and turn the fan motor shaft by hand.

Normal: The fan motor shaft turns smoothly.

Faulty: No continuous rotary torque movement felt when turning the motor by hand. This occurs because the internal magnet of the fan motor breaks the movement when the internal electronic circuit of the fan motor has a short-circuit fault.

(2) Measure the fan motor resistance:

a . Disconnect the connector of DC fan motor from INV PCB.

b . Connect the black test lead wire to the pin terminal of black wiring for the connector of DC fan motor.

c . Connect the red test lead wire to each measuring pin terminal for the connector of DC fan motor.

Wiring Color for Measurement (Normal Value)			
Red-Black	White-Black	Yellow-Black	Blue-Black
1MΩ or greater	about 40kΩ	about 220kΩ	∞

NOTE:

If the wires are connected other way around the resistance can not be measured correctly.

It is normal when the resistance is the same or closed as the normal values in the table up.

It is abnormal if the resistance is completely different from the normal values in the table up.

(Open fault: infinity; Short-circuit fault: several Ω to several kΩ)

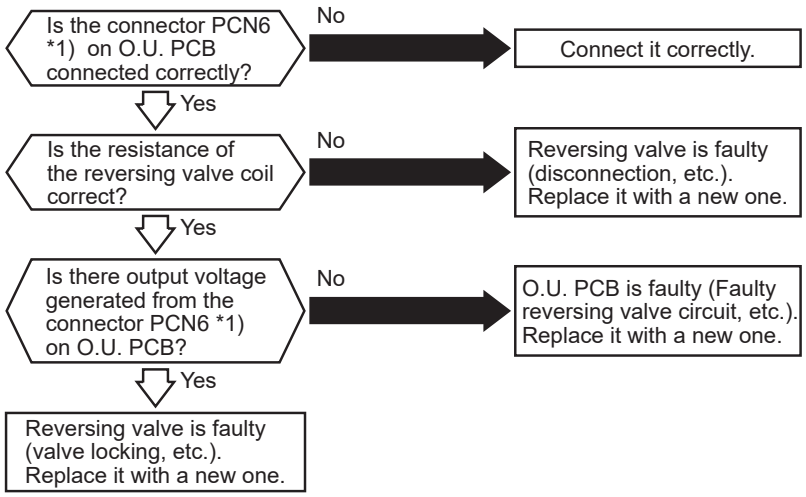
The condition of open fault and short-circuit fault in the electronic circuit of DC fan motor can be checked if the value shows abnormality.

1.2.12 Checking of Electrical Coil Resistance for each Electrical Components

Parts	Type	Resistance	Unit models
Reversing Valve Coil	STF-H01AP	1600Ω at 20°C	RAS-080~120HNBSTQ
Solenoid Valve Coil	FQ-A0522G	2085Ω at 20°C	RAS-080~120HNBSTQ
Solenoid Valve Coil	UKV-A029E	46Ω at 20°C	RAS-080~120HNBSTQ
Electronic expansion valve coil	UKV-A040E	46Ω at 20°C	RAS-080/090HNBSTQ
Compressor	ATH550SDTC8FQ	0.536Ω at 20°C	RAS-080/090HNBSTQ
	ATE650SKTQ9JK	0.278Ω at 20°C	RAS-100/110/120HNBSTQ

1.2.13 Checking of Reversing Valve

If outdoor unit does not start the heating operation or defrosting operation, there may be a malfunction of the reversing valve. The troubleshooting is indicated below.



*1)

Connector No.	Pin No.
PCN6 (O.U. PCB)	1 to 3

2. Maintenance

⚠WARNING

Ensure that there is no refrigerant inside the outdoor unit during brazing work and disassembly of refrigeration system pipe components. Ensure that the system pressure is not greater than the external atmospheric pressure.

2.1 Outdoor Unit——RAS-080/090HNBSTQ

⚠WARNING

TURN OFF all power supply switches.

NOTICE

Removing main parts should be performed according to the following procedures.

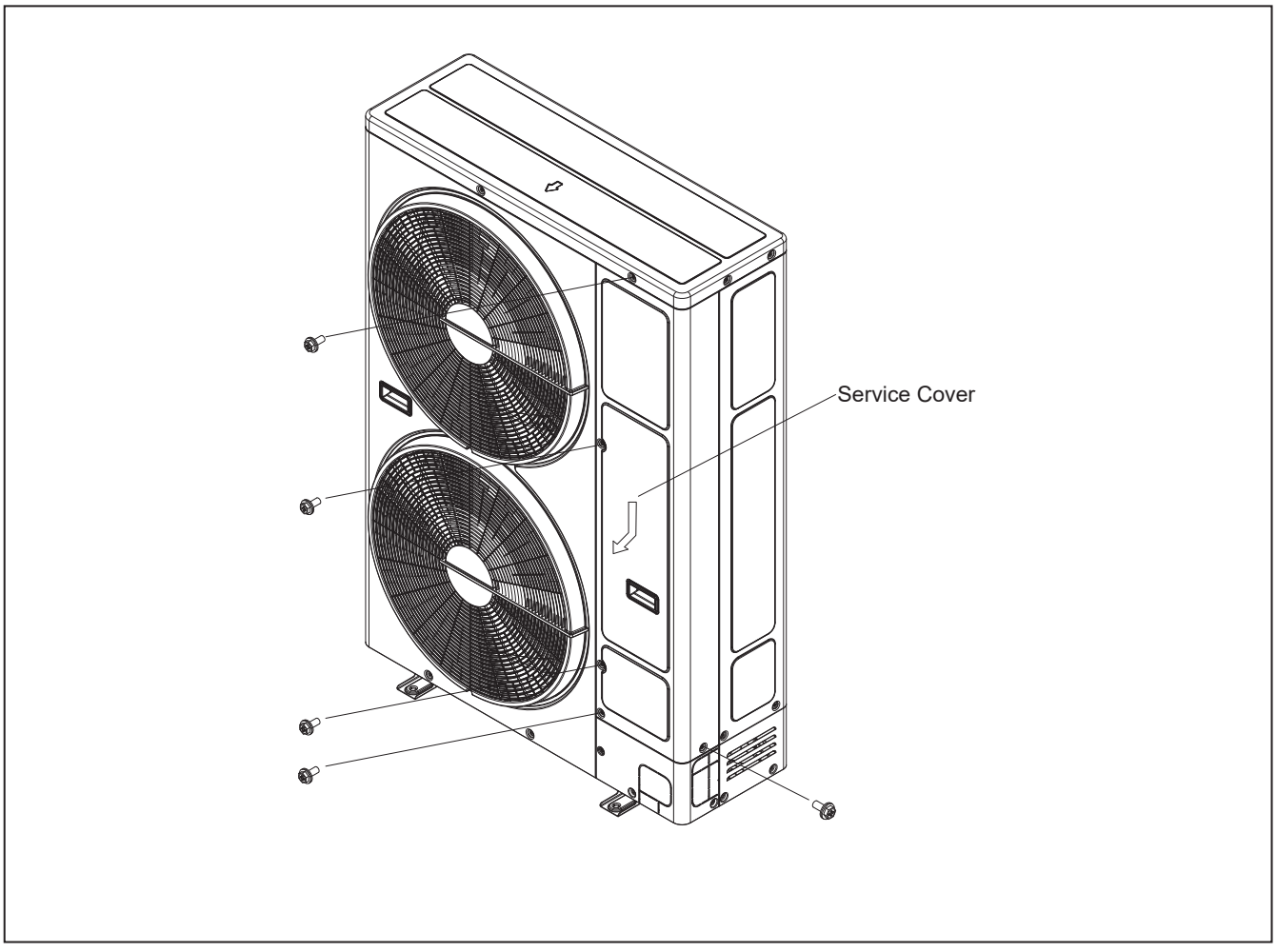
To attach new parts after replacement, reverse the removal procedure.

To prevent contamination of the refrigerant by water or foreign materials, do not expose the refrigerant parts open to atmosphere for long periods. If necessary, seal pipe ends using caps or tape.

2.1.1 Removing Service Cover

Remove the service cover drawing it downward after removing five securing screws for the service cover. When removing the service cover, take special care not to drop it.

Tool	Gloves, Phillips Screwdriver



⚠WARNING

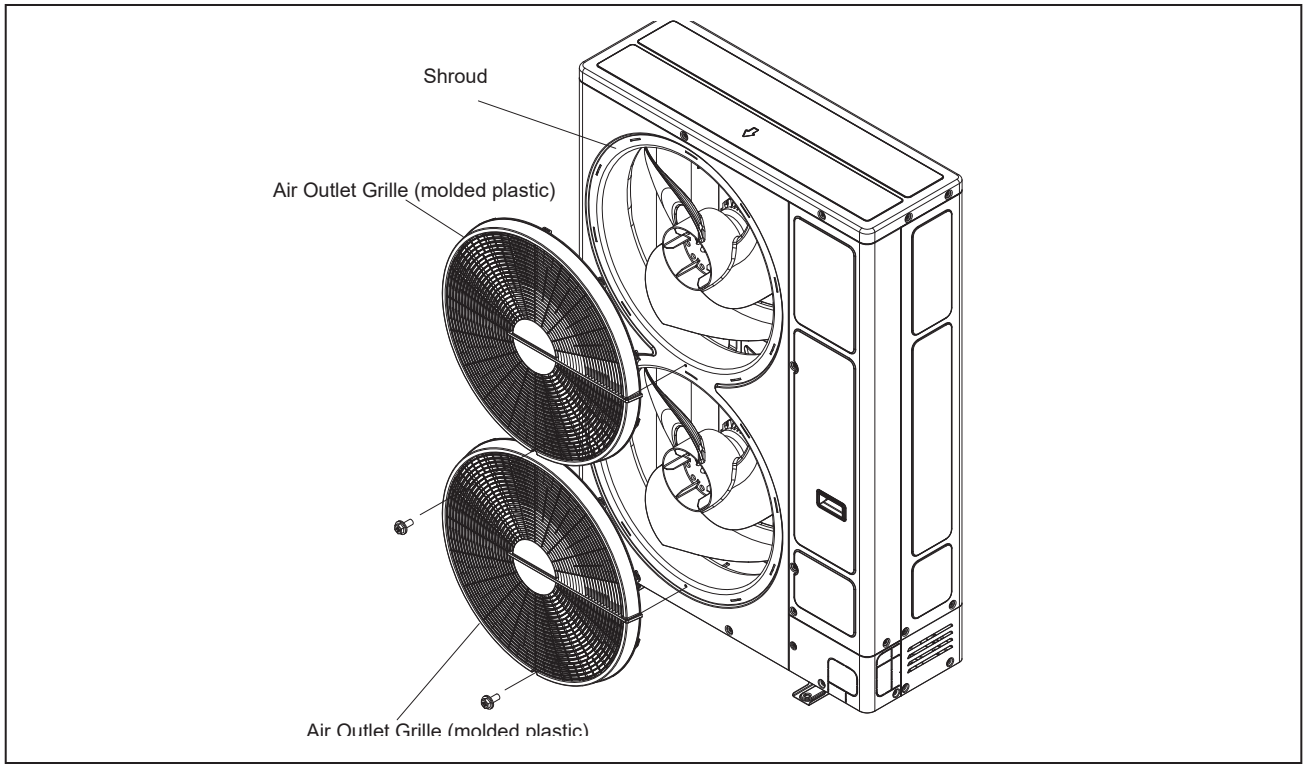
TURN OFF all power supply switches.

2.1.2 Removing Air Outlet Grille

(1) Remove one securing screws for air outlet grille (molded plastic).

(2) Rotate each air outlet grille slightly to the right and remove air outlet grille.

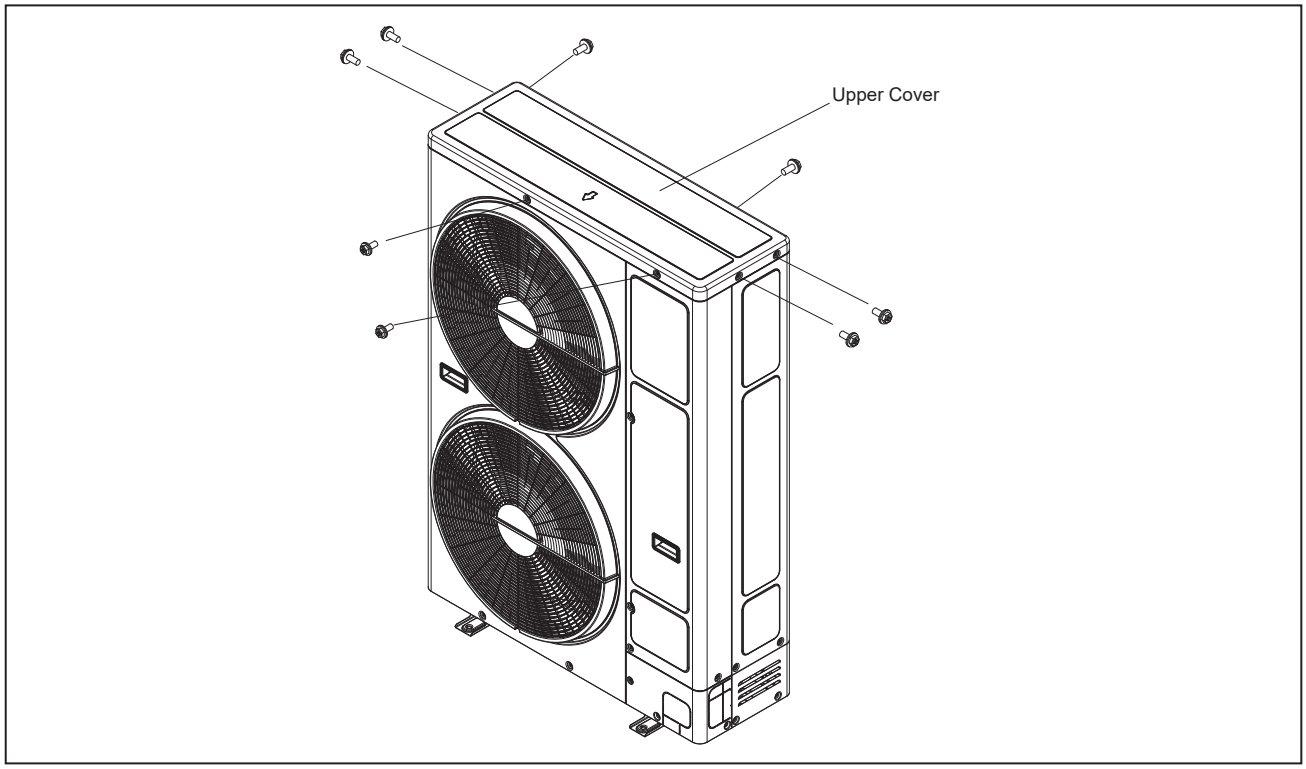
Tool	Gloves, Phillips Screwdriver



2.1.3 Removing Upper Cover

After removing eight securing screws for the upper cover, lift the upper cover up.

Tool	Gloves, Phillips Screwdriver



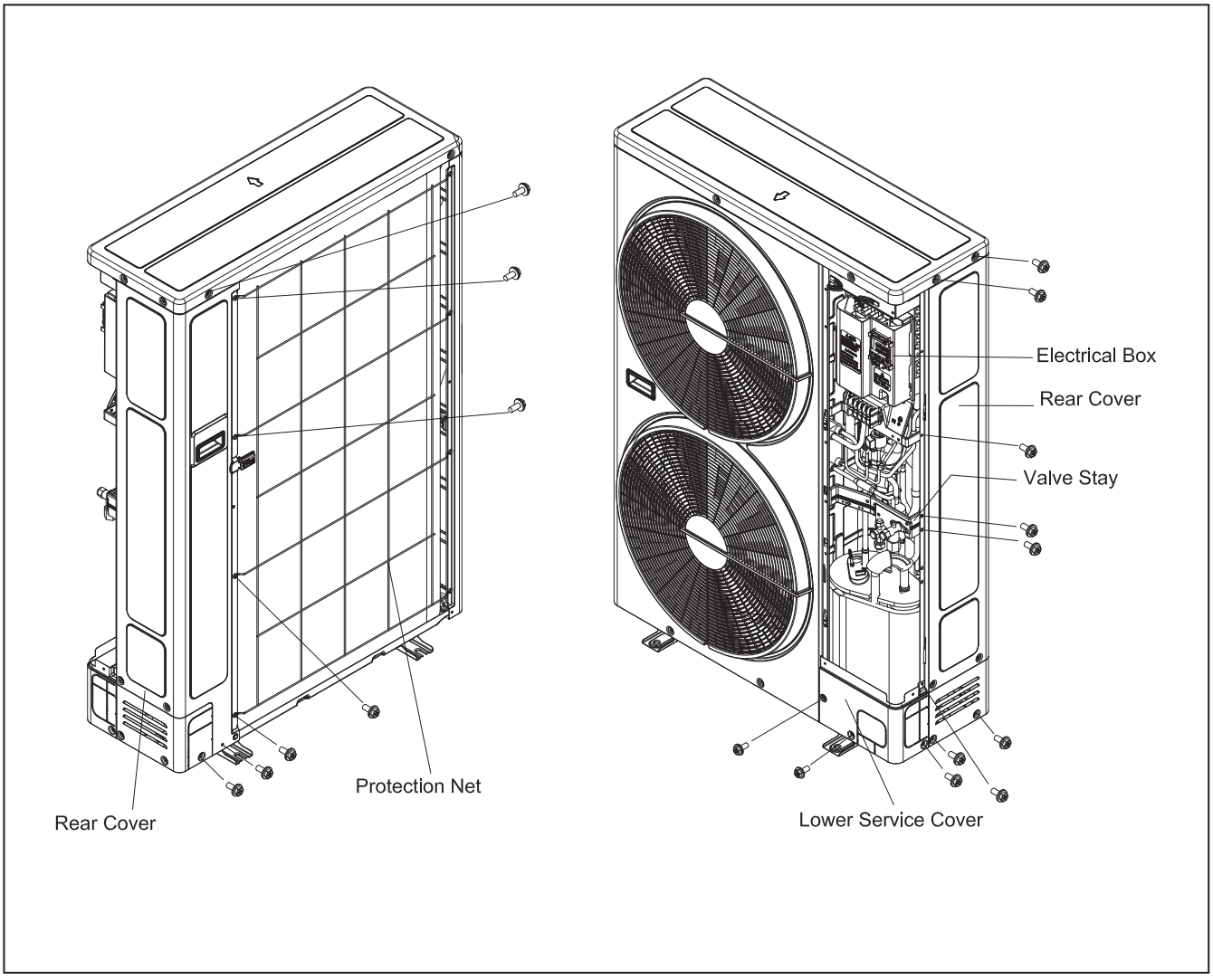
⚠WARNING

TURN OFF all power supply switches.

2.1.4 Removing Lower Service Cover and Rear Cover

(1) Remove the service cover according to Section 2.1.1 “Removing Service Cover”.
(2) Remove four securing screws for the lower service cover.
(3) Remove the lower service cover pulling it forward.
(4) Remove fourteen securing screws for rear cover.
(5) Remove the rear cover by pulling it backward.

Tool	Gloves, Phillips Screwdriver



⚠WARNING

TURN OFF all power supply switches.

2.1.5 Removing Outdoor Fan Motor

(1) Remove the air outlet grille according to Section 2.1.2 “Removing Air Outlet Grille.”

(2) Remove the upper cover according to Section 2.1.3 “Removing Upper Cover.”

(3) Remove the closing nut and the washer securing the propeller fan to the motor shaft with a socket wrench 13mm
Then remove the propeller fan from the motor shaft. (If it is difficult to remove, a corrosion or puller may be needed.)

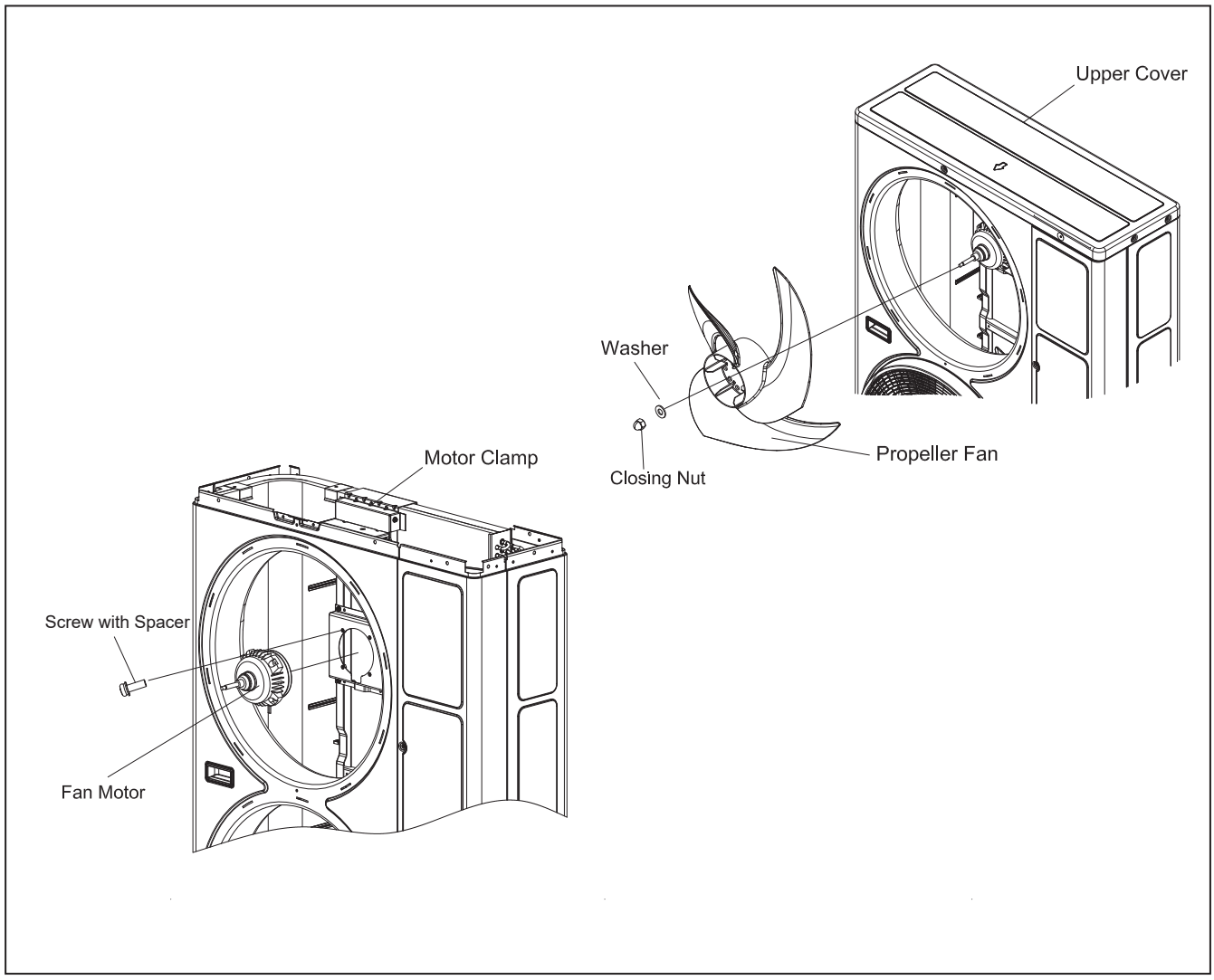
(4) Removing Fan Motor

(a) Remove the service cover according to Section 2.1.1 “Removing Service Cover.”

(b) Disconnect the connectors for the fan motors from the outdoor unit PCB in the electrical box.

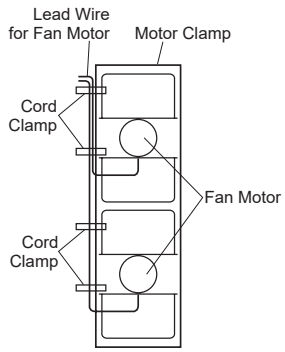
(c) Remove four spacer screws securing the fan motor.

Tool	Gloves, Phillips Screwdriver, Adjustable Wrench, Puller, Nipper



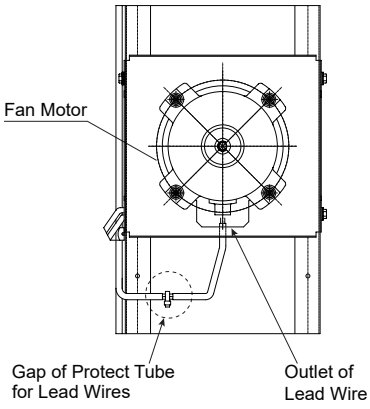
⚠WARNING

TURN OFF all power supply switches.

Fan Motor Qty	Connector		Securing Screw for Fan Motor		Securing Positions of Motor Clamp and Wires
	Upper Fan Motor	Lower Fan Motor	Upper Fan Motor	Lower Fan Motor	
2	INV PCB CN202(Red) PCN202(Red)	INV PCB CN201(White) PCN201(White)	M4 (Screw with Spacer) x 4	M4 (Screw with Spacer) x 4	

NOTES:

1. Mount the fan motor so that the wiring harness is at the bottom.
   (Adjust the position not to touch the propeller fan to shroud.)
2. Secure the wiring for the motor with the provided clamp taking care to route and secure the wiring away from the propeller fan.
3. Mount the fan motor so that the gap of wiring harness is at lowest position.
4. Reinstalling Propeller Fan
   Carefully align the D cut hole of propeller fan to match the shaft and slide on slowly. Once the propeller fan hits the stop on motor shaft, finger start closing nut and tighten to approximately 20 N·m.
5. After carefully routing and securing the wiring harness, reconnect motor connectors at the main PCB.
   Ensure motor connectors are color matched at the PCB connections.
6. Once motor(s) have been installed, reinstall metal and plastic air outlet grilles being careful to not over tighten.



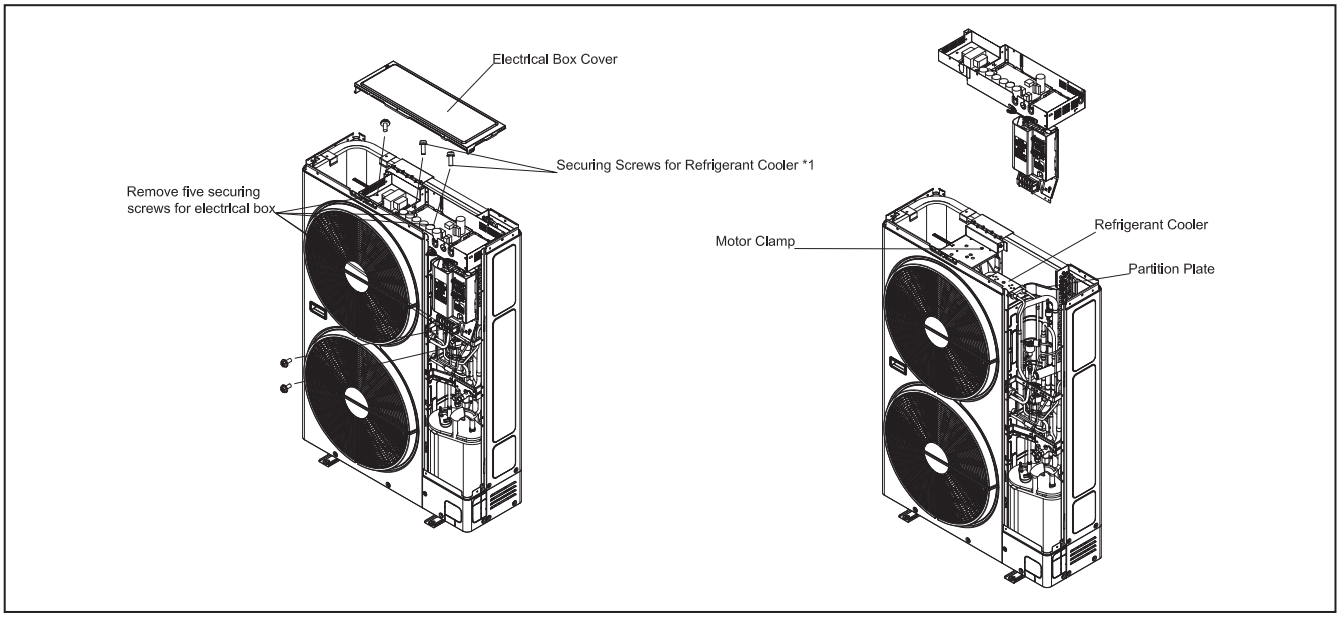
⚠WARNING

TURN OFF all power supply switches.

2.1.6 Removing Electrical Box

(1) Remove the service cover according to Section 2.1.1 “Removing Service Cover.”
(2) Remove the upper cover according to Section 2.1.3 “Removing Upper Cover.”
(3) Remove electrical box cover.
(4) Remove five securing screws for electrical box.
(5) Remove the electrical box lifting it upward.

Tool	Phillips Screwdriver



NOTES:

Remove the electrical box after disconnecting wires.

1. Remove the reversing valve coil according to Section 2.1.10 “Removing Reversing Valve Coil.”
2. Remove the expansion valve coil according to Section 2.1.11 “Removing Electronic Expansion Valve Coil.”
3. Remove the solenoid valve coil according to Section 2.1.12 “Removing Solenoid Valve Coil.”
4. Disconnect the faston terminals from high pressure switch and pressure sensor.
5. Disconnect both fan motor connectors and thermistors from the outdoor unit PCB.
6. Disconnect the compressor wires in the terminal box of compressor.
7. Loosen all cord clamps.
8. When mounting the electrical box, join and fit the electrical box and the partition plate into the outdoor unit. (Position the electrical box to latch it onto the partition plate,the motor clamp and the refrigerant cooler.)

*1) When tightening the electrical box and refrigerant cooler again, please use a torque screwdriver (torque requirement: 3 N.m), otherwise the INV PCB or refrigerant cooler will be damaged.

⚠WARNING

TURN OFF all power supply switches.

2.1.7 Removing Compressor

(1) Remove the service cover according to Section 2.1.1 “Removing Service Cover.”

(2) Remove the lower service cover and the rear cover according to Section 2.1.4 “Removing Lower Service Cover and Rear Cover.”
In the case that the outdoor unit is located near the wall, remove refrigerant piping and move the outdoor unit away from the wall.

(3) Recover the refrigerant from check joints (reversing valve piping).

(4) Remove the valve stay.

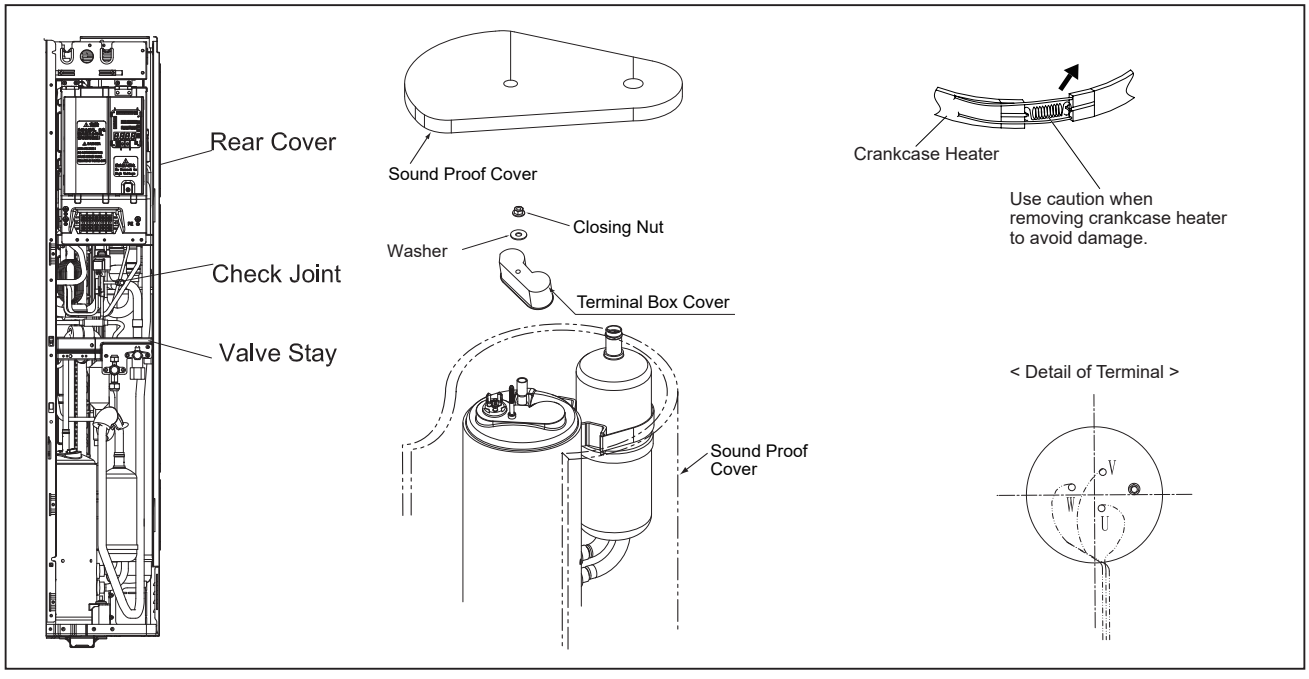
(5) Open the sound proof cover wrapped around the compressor, remove the terminal box cover for the compressor and disconnect the lead wiring.
NOTE:
Write down or photograph wiring and terminal designations to prevent mis-wiring of replacement compressor as shown below.
If the lead wiring is connected incorrectly to the terminal, the compressor may be damaged due to reverse rotation.

(6) Remove the rubber cap.

(7) Remove the crankcase heater as shown below.

(8) Remove the sound proof cover.

Tool	Phillips Screwdriver, Charging Hose, Refrigerant Recovery Machine and Cylinder



NOTES:

1. The compressor and piping are connected by brazing. Before brazing work, ensure that there is no flammable material nearby, as remaining oil inside the piping may ignite.
2. To prevent contamination of the refrigerant by water or foreign materials, do not expose the refrigerant parts to atmosphere for long periods. If necessary, seal the pipe ends using caps or tape.
3. Remove the caps for piping of the new compressor right before replacement. When replacing the compressor, seal the suction and discharge pipes with tape to prevent water and foreign particles from entering the compressor, and remove it right before brazing work.

⚠WARNING

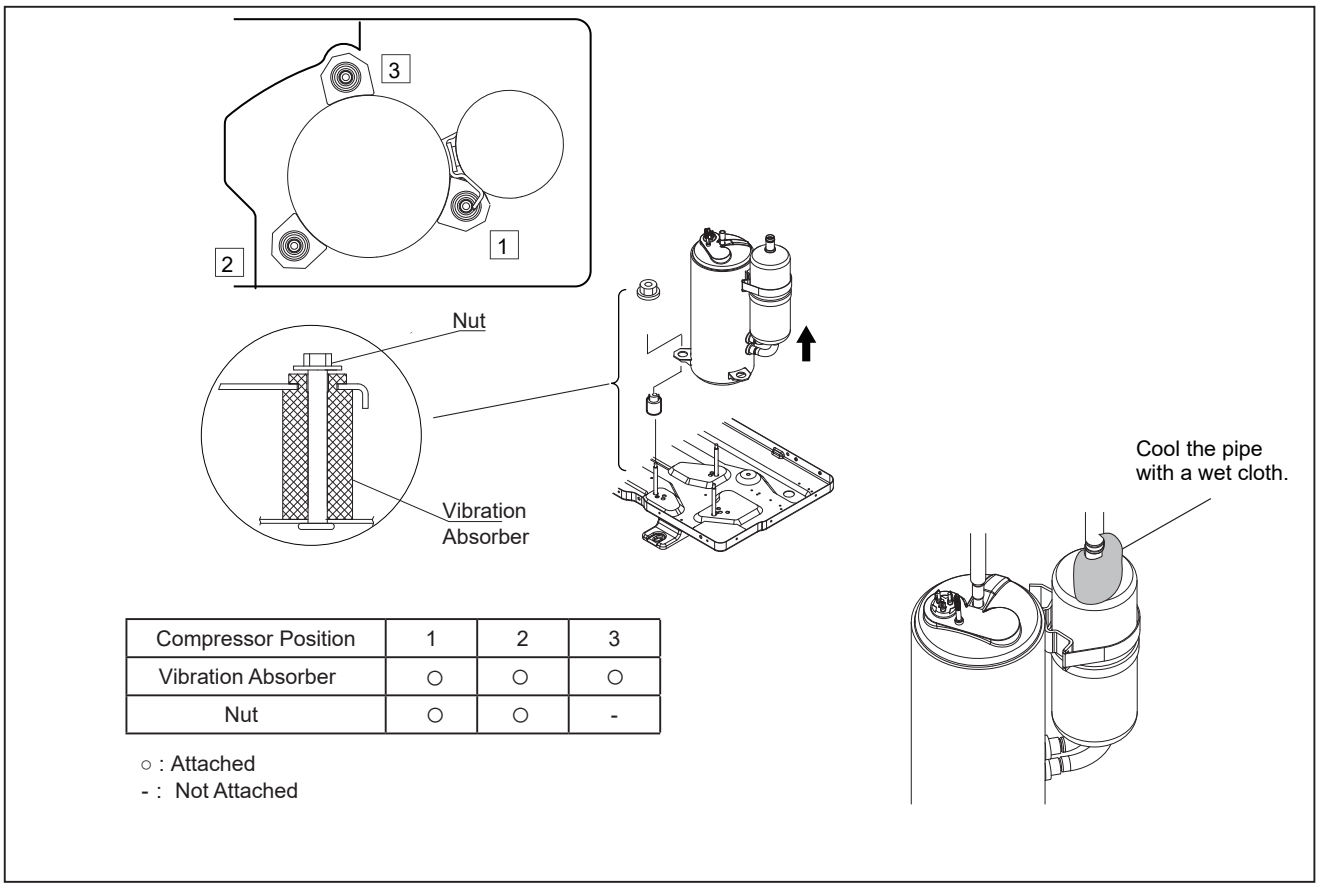
TURN OFF all power supply switches.

(9) Disconnect the suction pipe and discharge pipe from the compressor with a torch.
Ensure that wiring and electrical parts are kept away from the brazing area.
If not, they may catch fire at brazing work

(10) Remove all the bolts that hold the compressor. Tilting the compressor forward, lift it up and remove it.
NOTE:
When removing the compressor, the discharge refrigerant line will have to be moved out of the way.
Take care to not damage or kink this line.

(11) When performing the brazing work for the replaced compressor, work quickly and do not overheat piping and fittings.
Cool area with a wet cloth to help prevent oxidation. Carefully not let the solder or dust flows into the compressor.

Tool	Spanner or Adjustable Wrench, Torch, Wet Cloth



Compressor Position	1	2	3
Vibration Absorber	○	○	○
Nut	○	○	-

○ : Attached
- : Not Attached

⚠WARNING

TURN OFF all power supply switches.

(12) To mount the new compressor after replacement, reverse the removal procedure.

(a) Ensure the terminals of the compressor wiring are not loose or damaged. If burned or otherwise damaged they must be replaced.

(b) Tightly secure the terminal box by tightening the closing nut (Tightening Torque: 3~4 N·m).

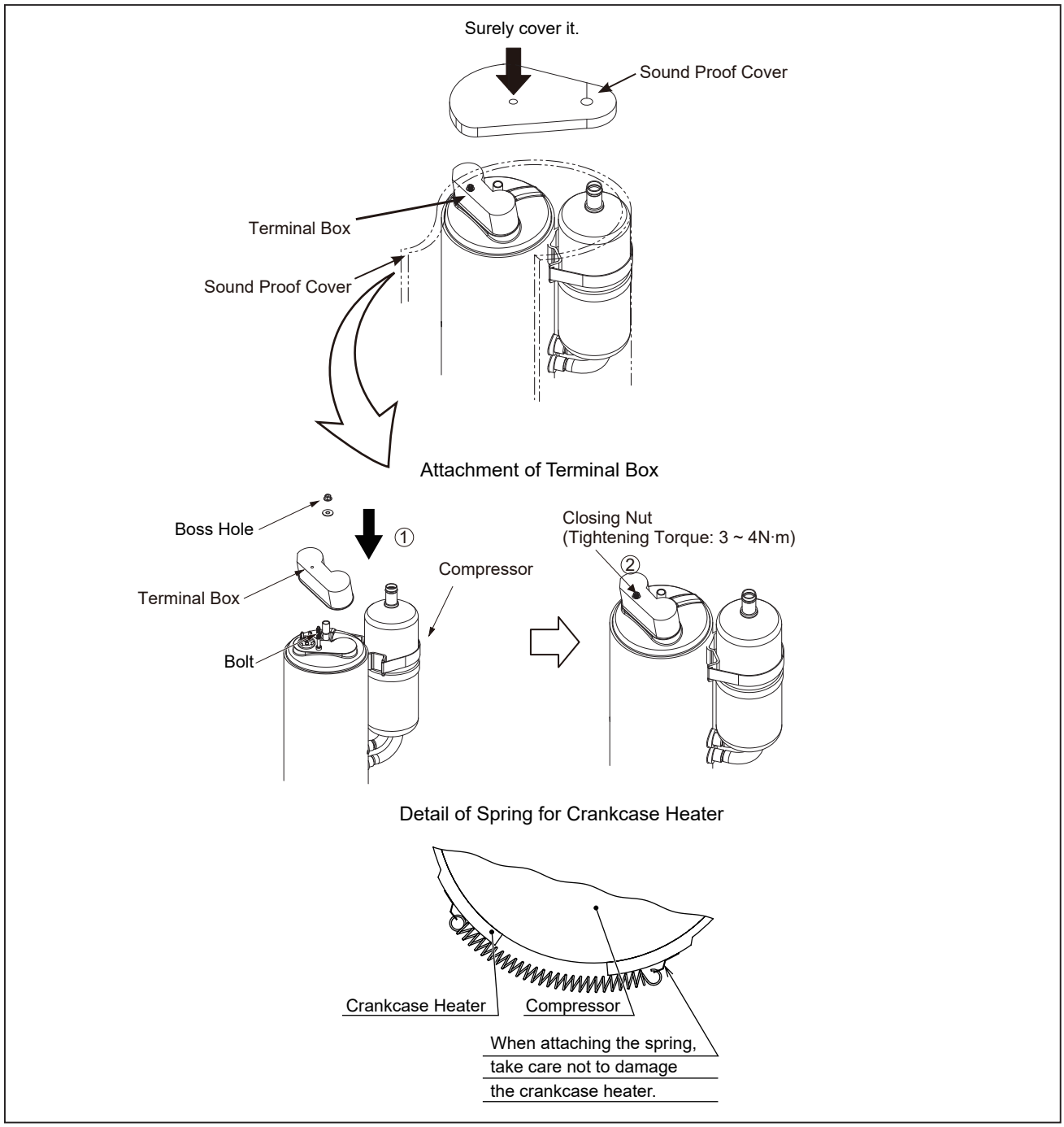
(c) Attach the sound proof cover to the top of the compressor.

(d) Wrap the sound proof cover around the terminal box and the discharge pipe.

(e) Carefully reattach the crankcase heater ensuring there are no gaps between it and the compressor.

NOTE:
Ensure all wiring is secured or clamped correctly. Keep all wiring away from sharp edges and piping.

Tool	Adjustable Wrench, Torch, Wet Cloth



⚠WARNING

TURN OFF all power supply switches.

2.1.8 Removing Pressure Switch and Pressure Sensor

(1) Remove the service cover according to Section 2.1.1 “Removing Service Cover.”

(2) Recover the refrigerant from check joints according to Section 2.1.7 “Removing Compressor.”

[Removing High Pressure Switch and High Pressure Sensor]

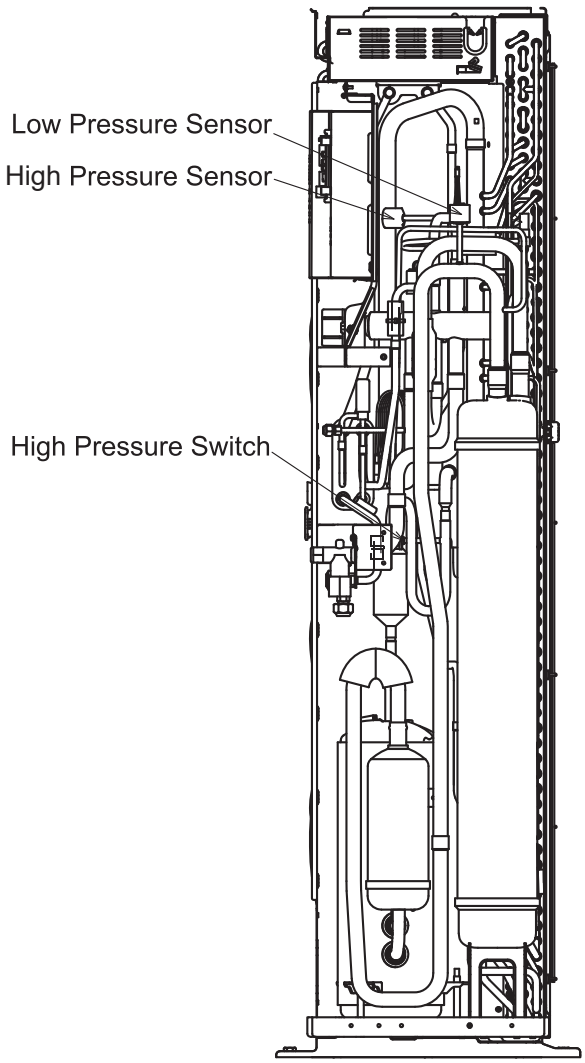
(3) Disconnect the connector (PCN401) on the INV PCB for the high pressure switch.

(4) Carefully unsolder the high pressure switch and the high pressure sensor from the discharge pipe (if necessary).
NOTE:
When removing the high pressure sensor. Check to ensure that the connector (CN4) on the outdoor unit PCB is disconnected.

[Removing Low Pressure Switch]

(5) Carefully unsolder the low pressure sensor from the discharge pipe.
NOTE:
Check to ensure that the connector (PCN60) on the outdoor unit PCB is disconnected.

Tool	Phillips Screwdriver, Charging Hose, Torch



⚠ DANGER

- Do not touch any electrical components when LED201 (red) on the inverter PCB and LED1 (red) on the outdoor unit PCB are turned ON. It may cause an electric shock.
- Check to ensure that LED201 (red) on inverter PCB is turned OFF when opening the Attaching P-Plate.

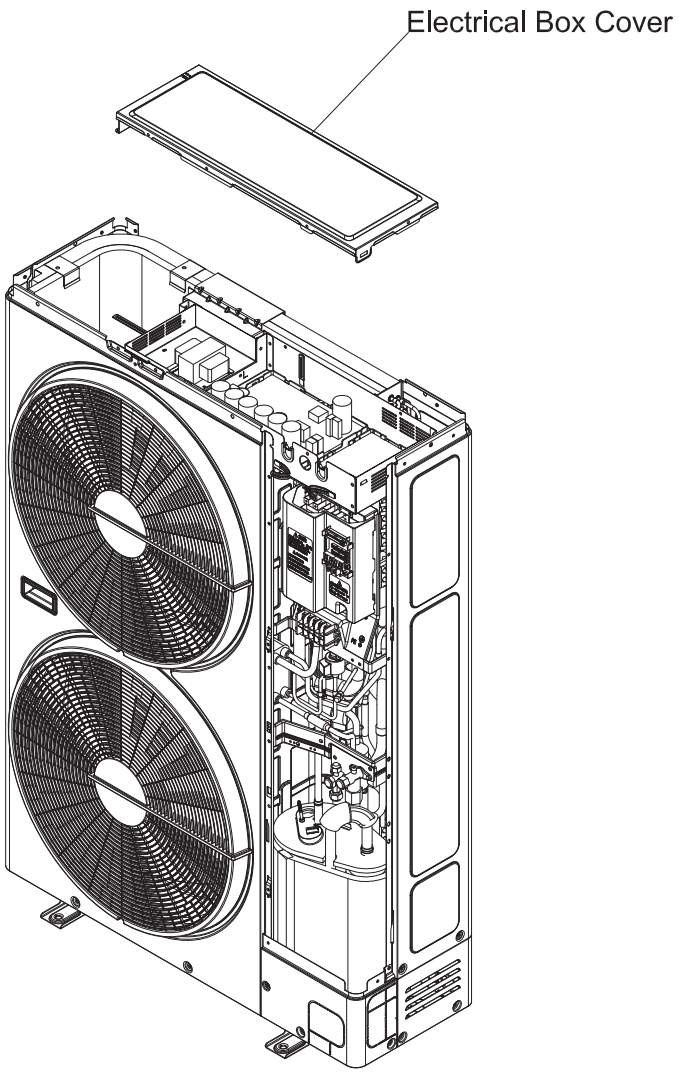
⚠ WARNING

TURN OFF all power supply switches.

2.1.9 Opening Electrical Box

(1) Remove the service cover according to Section 2.1.1 “Removing Service Cover.”
(2) Remove harness of compressor from edge saddle.
(3) Remove the upper cover according to Section 2.1.3 “Removing Upper Cover.”
(4) Remove the electrical box cover.

Tool	Phillips Screwdriver (Long)



⚠ DANGER

- Do not touch the electrical components when LED201 (red) on the inverter PCB and LED1 (red) on the outdoor unit PCB are turned ON. It may cause an electric shock.
- Check to ensure that LED201 (red) on inverter PCB is turned OFF when opening the Attaching P-Plate.

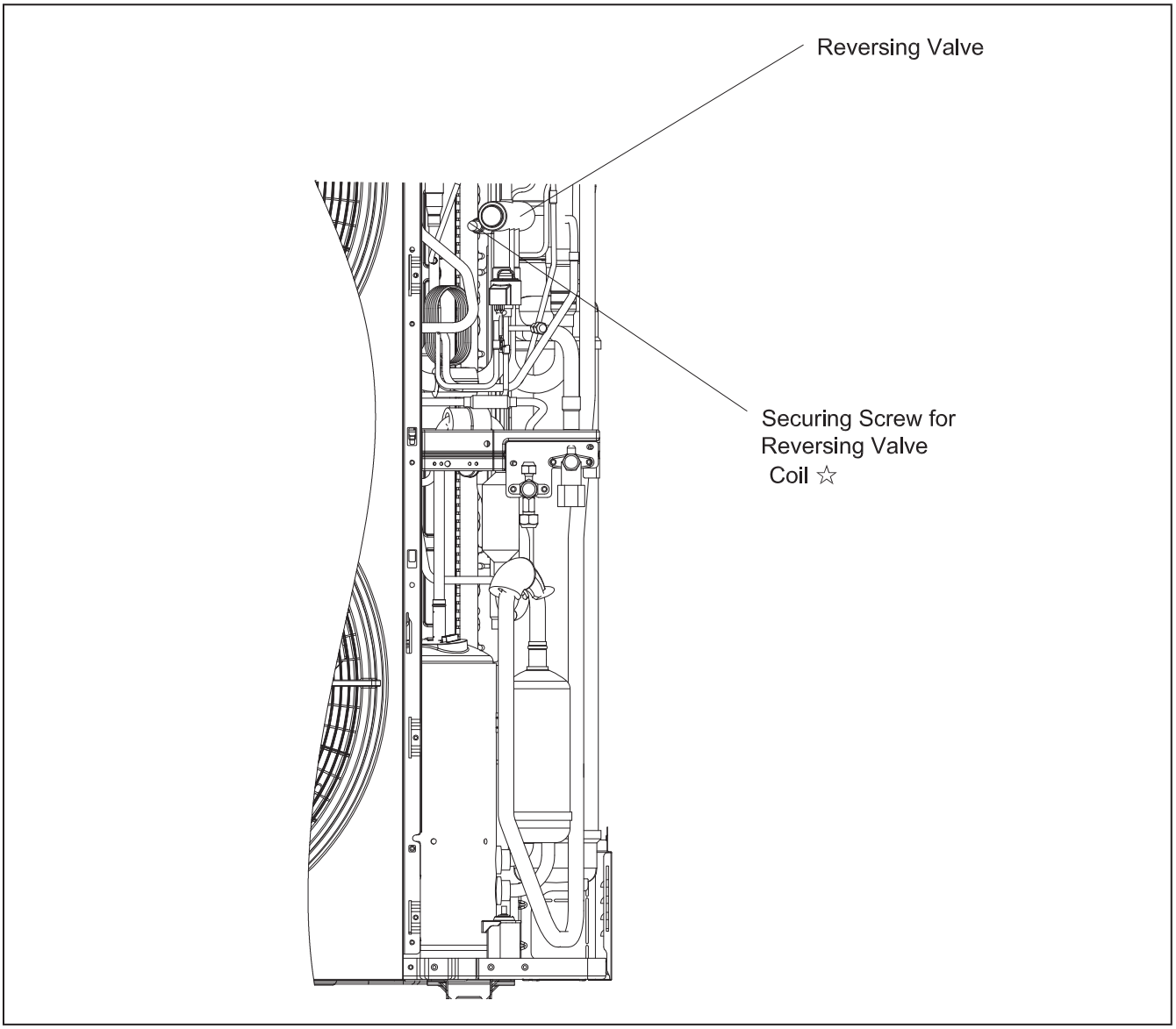
⚠ WARNING

TURN OFF all power supply switches.

2.1.10 Removing Reversing Valve Coil

(1) Remove the service cover according to Section 2.1.1 “Removing Service Cover.”
(2) Remove the upper cover according to Section 2.1.3 “Removing Upper Cover.”
(3) Disconnect the connector (PCN6) on the outdoor unit PCB in the electrical box.
(4) Remove the reversing valve coil by removing one securing screw for reversing valve.
(5) To replace the reversing valve coil, reverse the removal procedure.
NOTE:
★ Return all wiring to the original position.
★ The screws for fixing the coil shall not be discarded. After maintenance, the same type of screws must be used to fix the coil.

Tool	Phillips Screwdriver, Stubby Phillips Screwdriver



⚠ DANGER

- Do not touch the electrical components when LED201 (red) on the inverter PCB and LED1 (red) on the outdoor unit PCB are turned ON. It may cause an electric shock.
- Check to ensure that LED201 (red) on inverter PCB is turned OFF when opening the Attaching P-Plate.

⚠ WARNING

TURN OFF all power supply switches.

2.1.11 Removing Electronic Expansion Valve Coil

(1) Remove the service cover according to Section 2.1.1 “Removing Service Cover.”

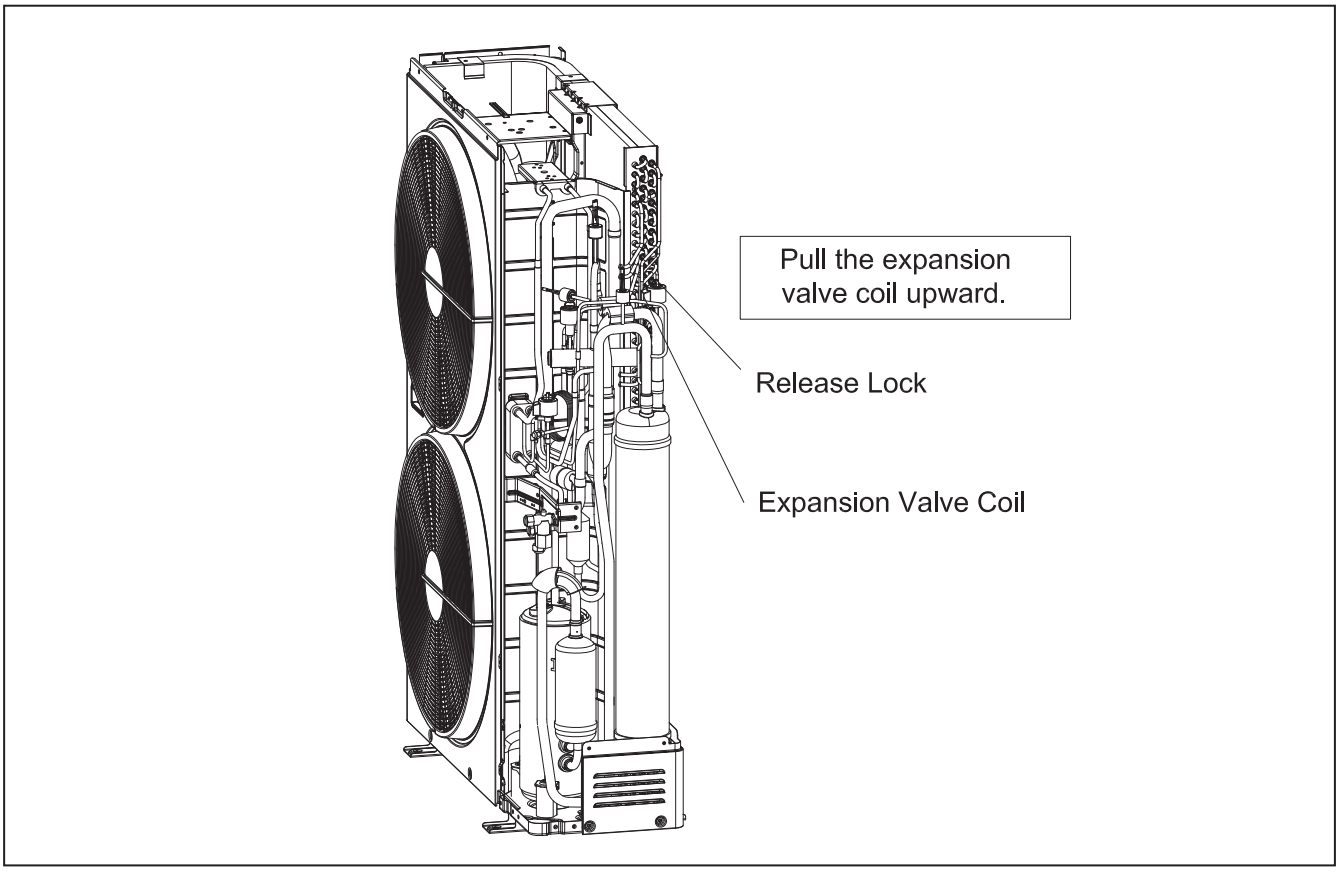
(2) Remove the lower service cover and the rear cover according to Section 2.1.4 “Removing Lower Service Cover and Rear Cover.”

(3) Disconnect the connector (CN5A) on the outdoor unit PCB.

(4) Pull the expansion valve coil upward until it slides off of valve body.
(It may be easier to remove the expansion valve coil by pulling it upward while rotating it.)

(5) To attach the new expansion valve coil, reverse the removal procedure. Ensure the orientation of the expansion valve is as shown below. The expansion valve coil has a lock mechanism. After attaching the expansion valve coil, rotate it until it clicks.
NOTE:
Return and secure all wiring to original positions after replacing coil.

Tool	Phillips Screwdriver, Nipper, Band



⚠ DANGER

- Do not touch the electrical components when LED1 (red) on the outdoor unit PCB is turned ON. It may cause an electric shock.

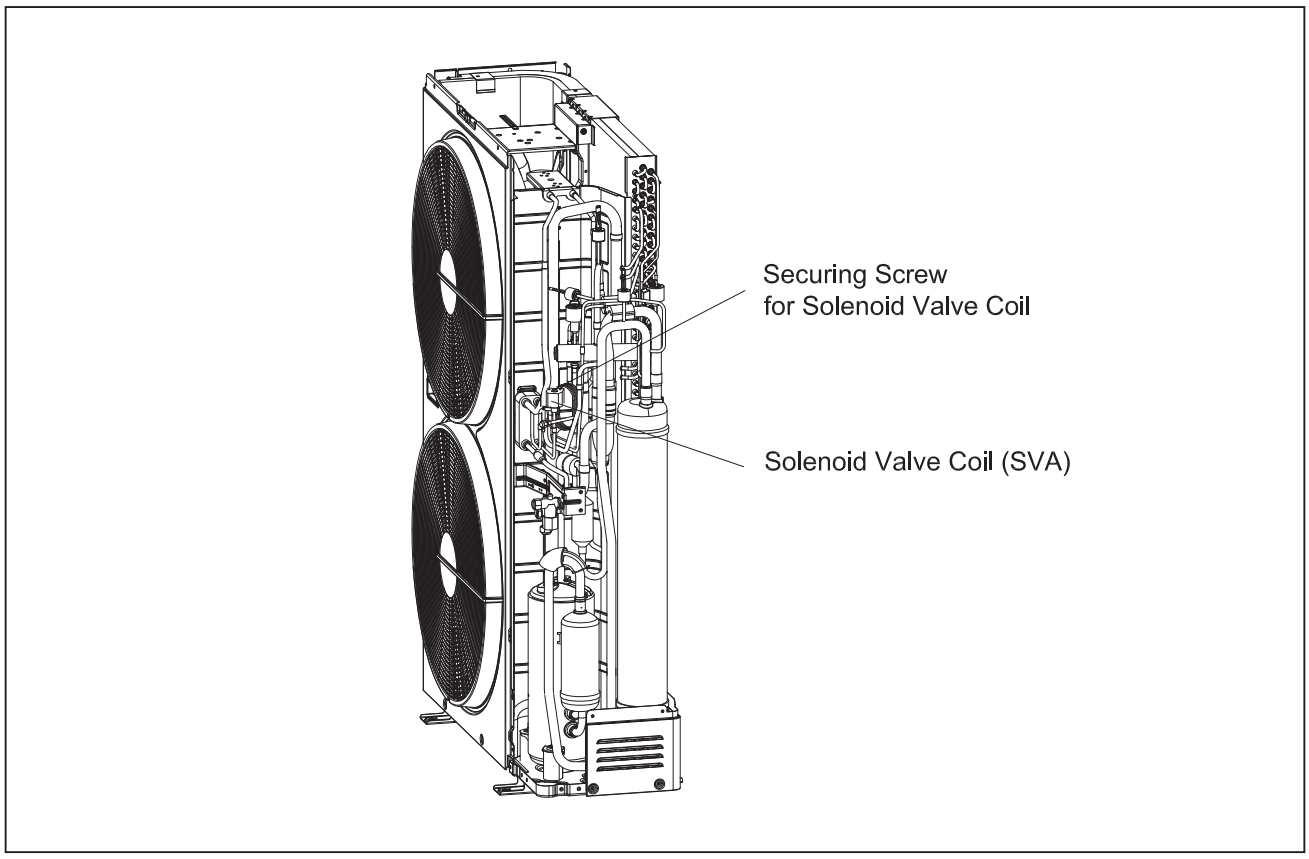
⚠ WARNING

TURN OFF all power supply switches.

2.1.12 Removing Solenoid Valve Coil (SVA)

(1) Remove the service cover according to Section 2.1.1 “Removing Service Cover.”
(2) Disconnect the connector (PCN7 (SVA)) on the outdoor unit PCB.
(3) Remove one securing screw for solenoid valve coil (SVA) and slide the solenoid valve coil (SVA) upward.
(4) To install a new solenoid valve coil, reverse the removal procedure.
NOTE:
Return and secure all wiring to original positions after replacing coil.

Tool	Phillips Screwdriver



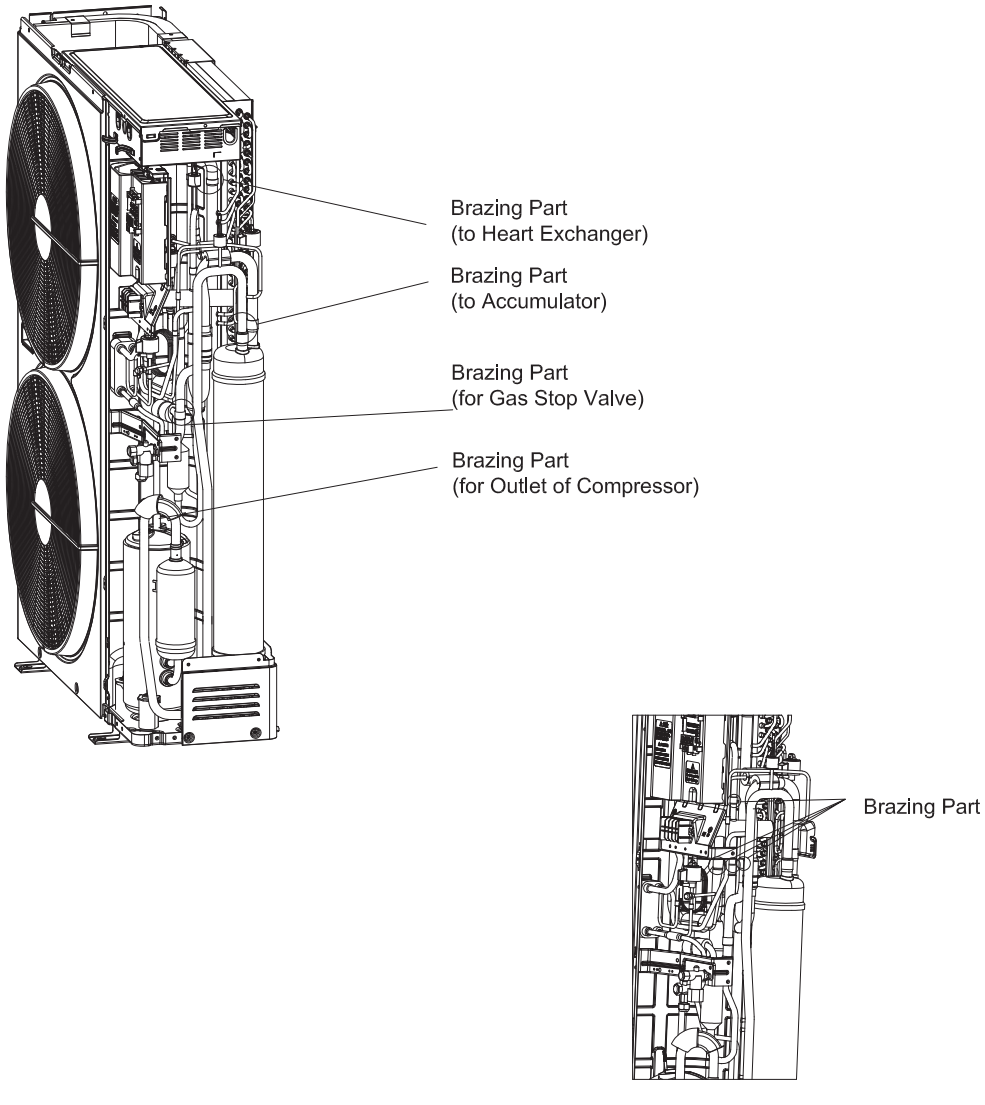
⚠WARNING

TURN OFF all power supply switches.

2.1.13 Removing Reversing Valve

(1) Remove the service cover according to Section 2.1.1 “Removing Service Cover.”
(2) Remove the upper cover according to Section 2.1.3 “Removing Upper Cover.”
(3) Remove the lower service cover and the rear cover according to Section 2.1.4 “Removing Lower Service Cover and Rear Cover.”
(4) Recover the refrigerant from check joints according to Section 2.1.7 “Removing Compressor.”
(5) Remove the reversing valve coil according to Section 2.1.10 “Removing Reversing Valve Coil.”
(6) Remove the reversing valve assemblies from the secured positions (four brazed parts).
  (a) Remove the reversing valve and the gas stop valve while cooling the valve bodies with a wet cloth.
  (b) Perform the brazing work while keeping the flame away from electrical wiring and piping insulation
(7) Remove the reversing valve from the assemblies. (four parts)
  Remove/Attach the reversing valve while cooling the valve bodies with a wet cloth.
(8) To attach the new reversing valve after replacement, reverse the removal procedure.
  Route and secure all wiring to original position.

Tool	Phillips Screwdriver, Charging Hose, Torch, Wet Cloth, Adjustable Wrench



⚠WARNING

TURN OFF all power supply switches.

2.1.14 Removing Electronic Expansion Valve and Solenoid Valve

(1) Remove the service cover according to Section 2.1.1 “Removing Service Cover.”

(2) Remove the front piping cover and the rear cover according to Section 2.1.4 “Removing Lower Service Cover and Rear Cover.”

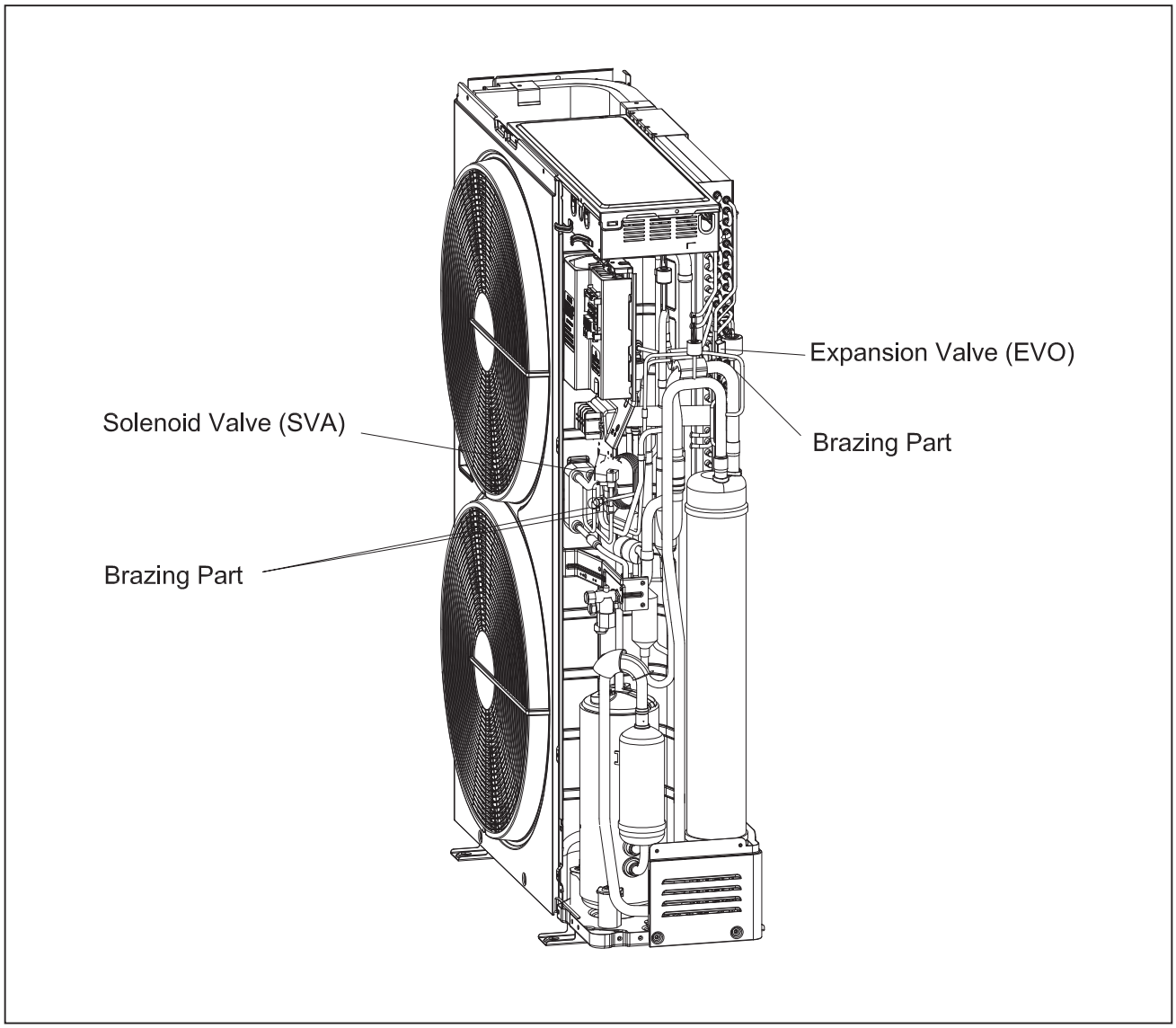
(3) Recover the refrigerant from check joints according to Section 2.1.7 “Removing Compressor.”

(4) Remove the coils according to Section 2.1.11 “Removing Electronic Expansion Valve Coil” and Section 2.1.12 “Removing Solenoid Valve Coil.”

(5) Remove the brazed parts as shown in the figures
Electronic Expansion Valve (EVO) Brazed Parts: 2
Solenoid Valve (SVA) Brazed Parts: 2
(a) Remove the electronic expansion valve and the solenoid valve after cooling the valve bodies with a wet cloth.
(b) Perform the brazing work while keeping the flame away from electrical wiring and piping insulation.

(6) To attach the new valves after replacement, reverse the removal procedure.
NOTE:
After valve replacement, route and secure all wiring to original position.

Tool	Phillips Screwdriver, Charging Hose, Torch, Wet Cloth, Adjustable Wrench



⚠ DANGER

- Do not touch the electrical components when LED1 (red) on the outdoor unit PCB is turned ON. It may cause an electric shock.
- Do not touch the electrical components on the outdoor unit PCB. The outdoor unit PCB may be damaged if stressed or mishandled.

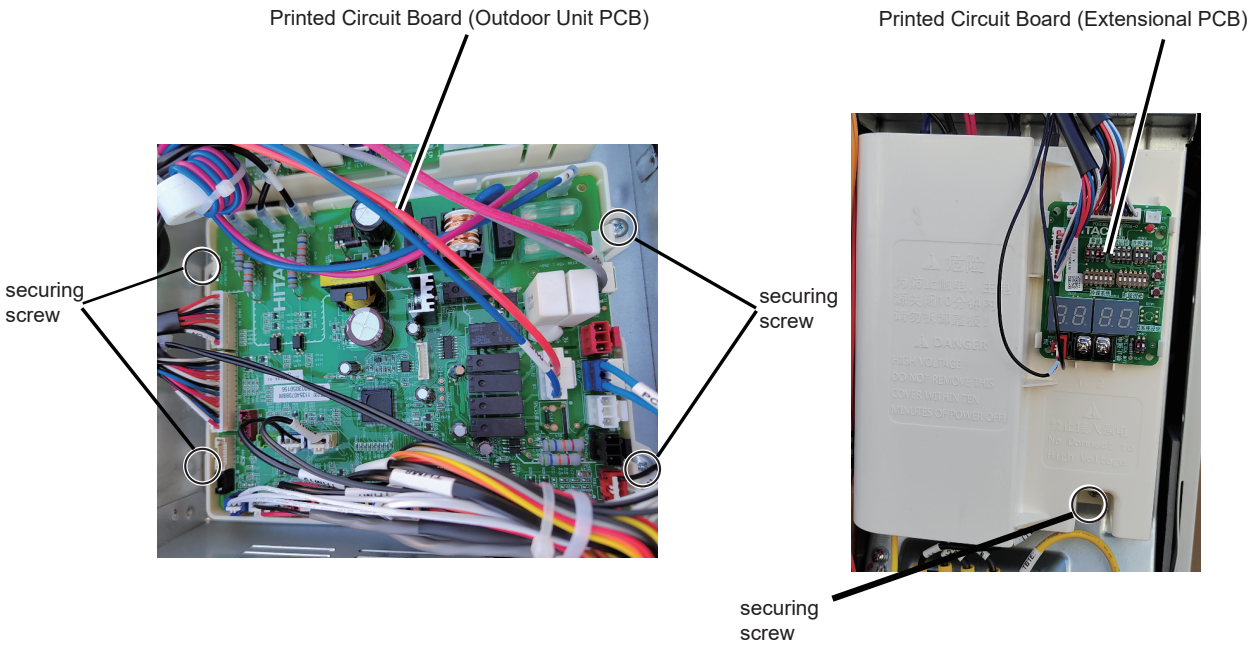
⚠ WARNING

TURN OFF all power supply switches.

2.1.15 Removing Printed Circuit Board (Outdoor Unit PCB)

(1) Remove the service cover according to Section 2.1.1 “Removing Service Cover.”
(2) Remove the upper cover according to Section “2.1.3 Removing Upper Cover.”
(3) Remove electrical box cover.
(4) Disconnect all connectors from the outdoor unit PCB and extensional PCB.
(5) Remove four securing screw for the outdoor unit PCB.
(6) Remove the extension PCB by squeezing the spacer ends with long-nose pliers.

Tool	Phillips Screwdriver, Long-Nose Pliers, Stubby Phillips Screwdriver



NOTE:
Replacement PCB will have all DIP switches set to factory default. Refer to “Service:1.1.2 Checking of Rotary Switch and DIP Switch Settings” for correct outdoor unit setup.

⚠ DANGER

- Do not touch the electrical components when LED201 (red) on the inverter PCB and LED1 (red) on the outdoor unit PCB are turned ON. It may cause an electric shock.
- Check to ensure that LED201 (red) on inverter PCB is turned OFF when opening the Attaching P-Plate.

⚠ WARNING

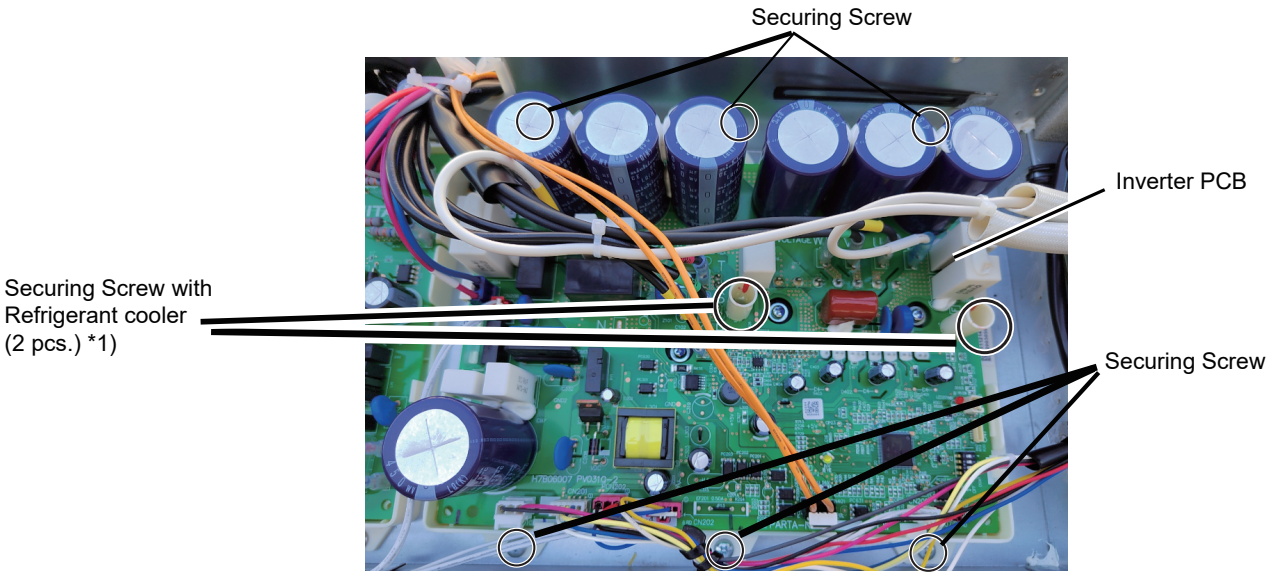
TURN OFF all power supply switches.

2.1.16 Removing Inverter PCB

(1) Remove the service cover according to Section 2.1.1 “Removing Service Cover.”
(2) Open the power plate rotating it approximately 90° counterclockwise according to Section 2.1.9 “Opening Electrical Box (Attaching P-Plate).”
(3) Disconnect all connectors connected to the inverter PCB.
(4) Remove eight securing screws for inverter PCB.
NOTE:
The two securing screws at the bottom have cord clamps attached to them.
When removing securing screws, the cord clamps are also removed.
(5) The inverter PCB can be removed by pulling uptoward. (The plastic case and the radiation fin are also removed together.)

NOTE:
When attaching the inverter PCB, connect the wiring to the correct terminals of the new board or damage will occur.

Tool	Phillips Screwdriver, Long-Nose Pliers, Stubby Phillips Screwdriver



*1) When tightening the INV PCB and refrigerant cooler again, please use a torque screwdriver (torque requirement: 3 N.m), otherwise the INV PCB or refrigerant cooler will be damaged.

⚠ DANGER

- Do not touch the electrical components when LED201 (red) on the inverter PCB and LED1 (red) on the outdoor unit PCB are turned ON. It may cause an electric shock.
- Check to ensure that LED201 (red) on inverter PCB is turned OFF when opening the Attaching P-Plate.

⚠ WARNING

TURN OFF all power supply switches.

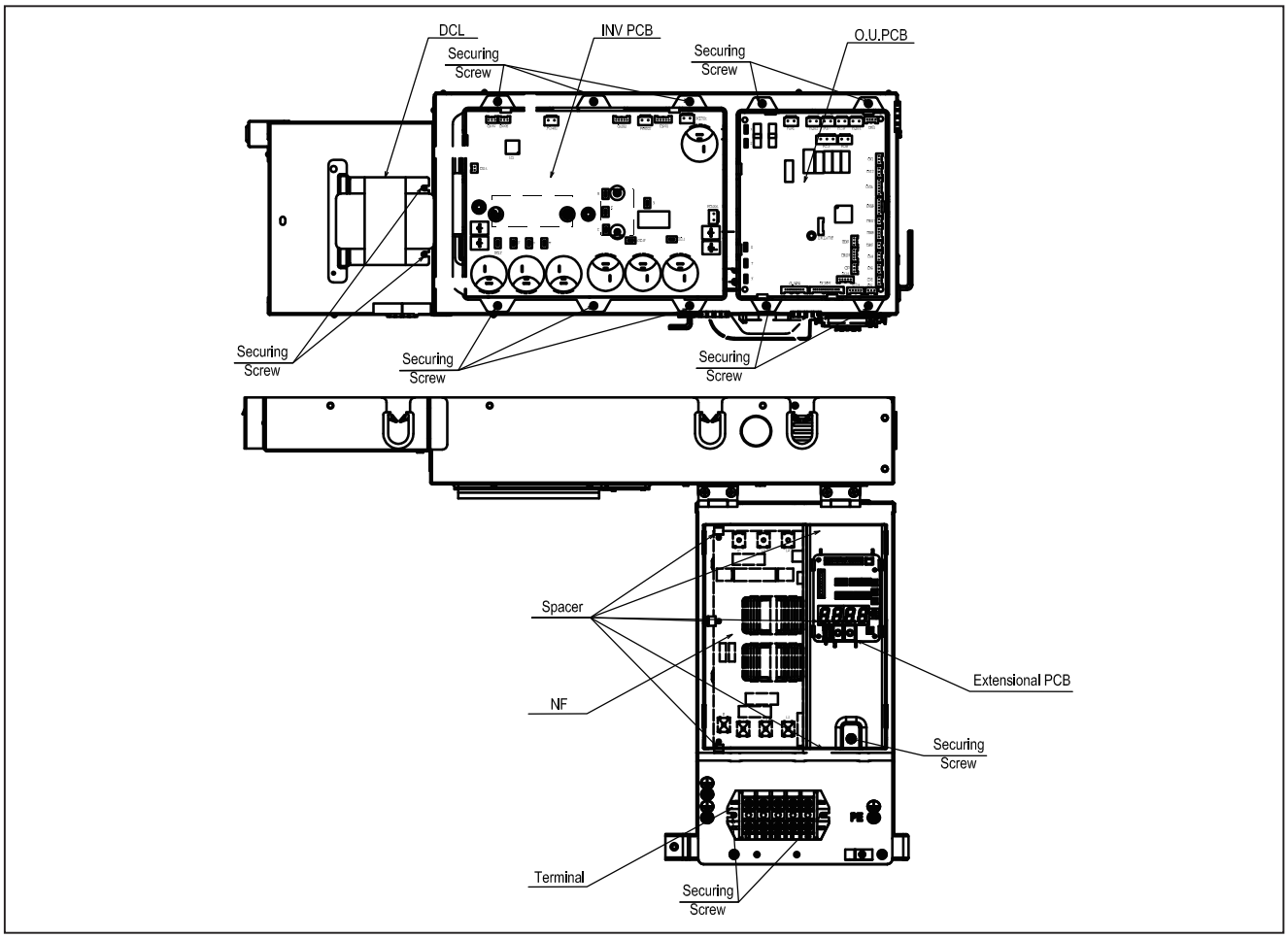
2.1.17 Removing Other Electrical Components

(1) Remove the service cover according to Section 2.1.1 “Removing Service Cover.”
(2) Remove the upper cover according to Section 2.1.3 “Removing Upper Cover.”
(3) Remove electrical box cover.
(4) Removing Electrical Components.
  (a) Remove two securing screws for the reactor and remove the reactor (DCL).
  (b) Remove the Terminal Board. (two places)
    Disconnect all wiring connected to terminal board.

NOTE:

After a component has been replaced, ensure all wiring has been reconnected to the correct terminals or connectors. Failure to do so will result in damage or possible injury.

Tool	Phillips Screwdriver, Long-Nose Pliers, Stubby Phillips Screwdriver



2.2 Outdoor Unit——RAS-100/110/120HNBSTQ

⚠WARNING

TURN OFF all power supply switches.

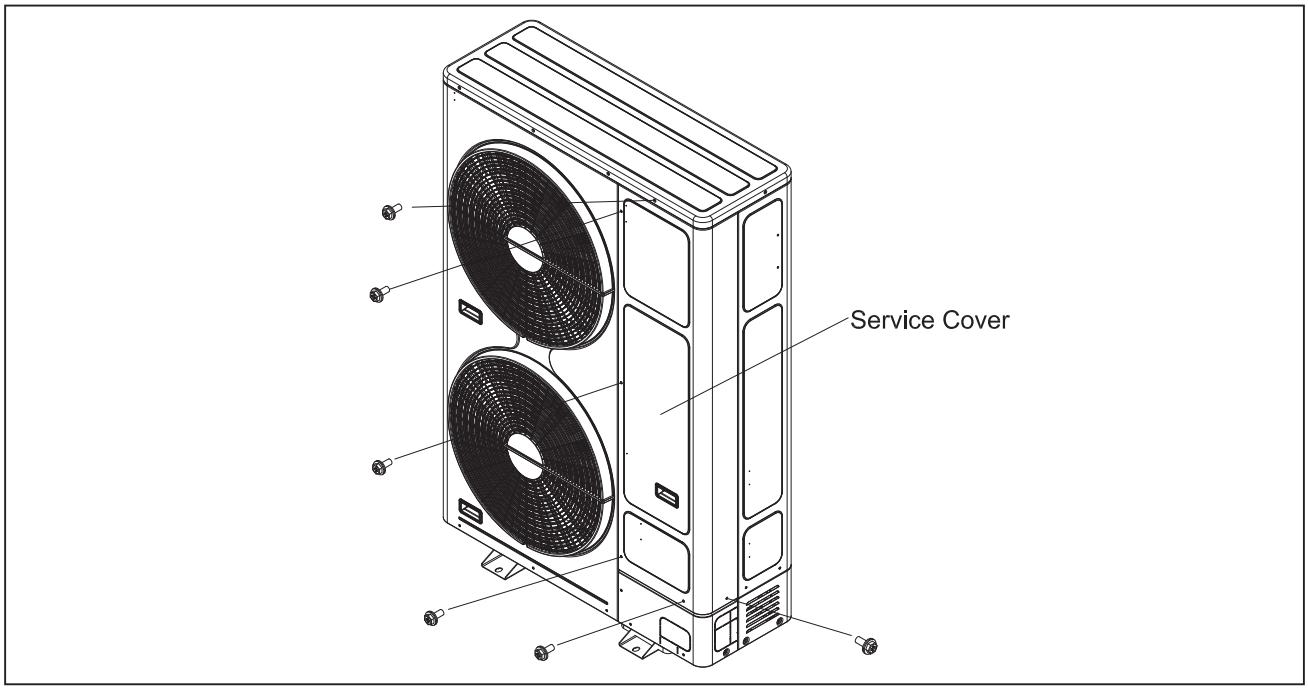
NOTICE

Removing main parts should be performed according to the following procedures.
To attach new parts after replacement, reverse the removal procedure.
To prevent contamination of the refrigerant by water or foreign materials, do not expose the refrigerant parts open to atmosphere for long periods. If necessary, seal pipe ends using caps or tape.

2.2.1 Removing Service Cover

Remove the service cover drawing it downward after removing six securing screws for the service cover. When removing the service cover, take special care not to drop it.

Tool	Gloves, Phillips Screwdriver



⚠WARNING

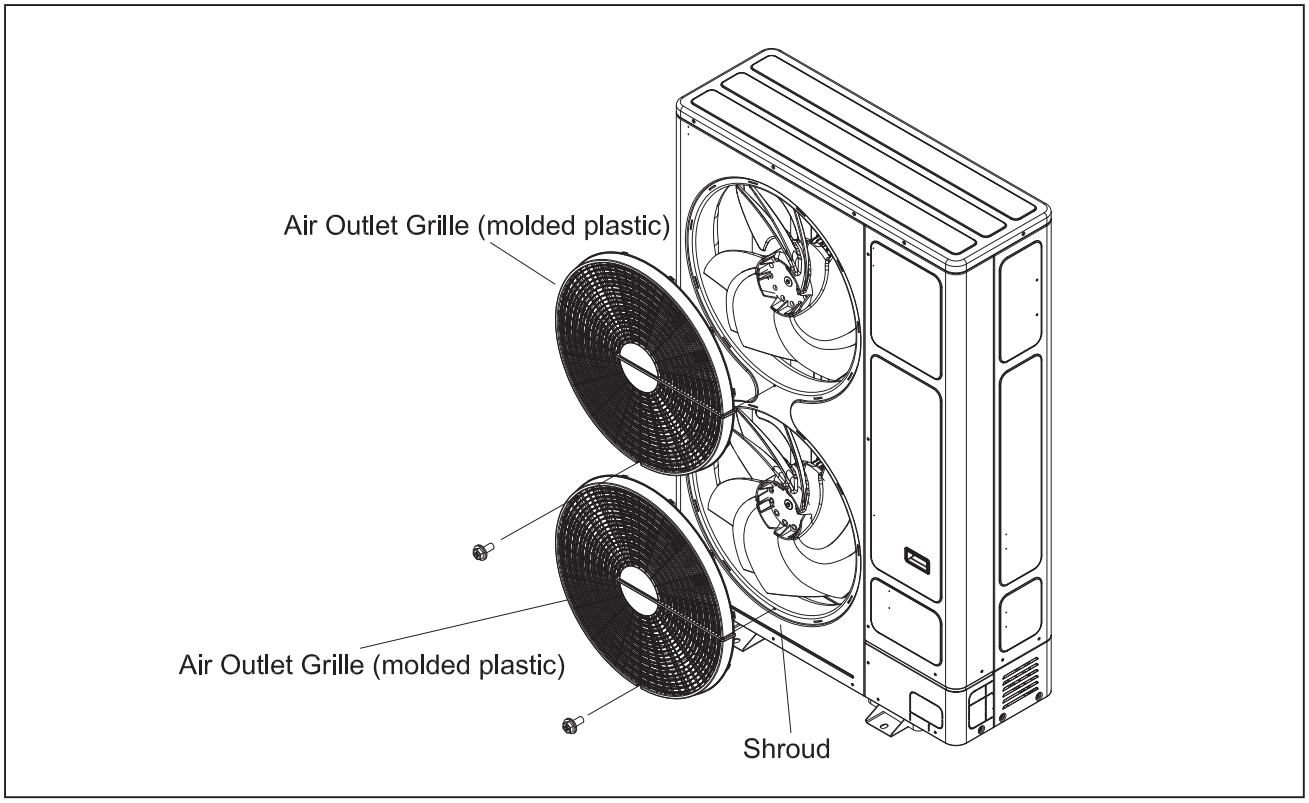
TURN OFF all power supply switches.

2.2.2 Removing Air Outlet Grille

(1) Remove one securing screws for each air outlet grille (molded plastic).

(2) Rotate each air outlet grille slightly to the right and romove air outlet grille.

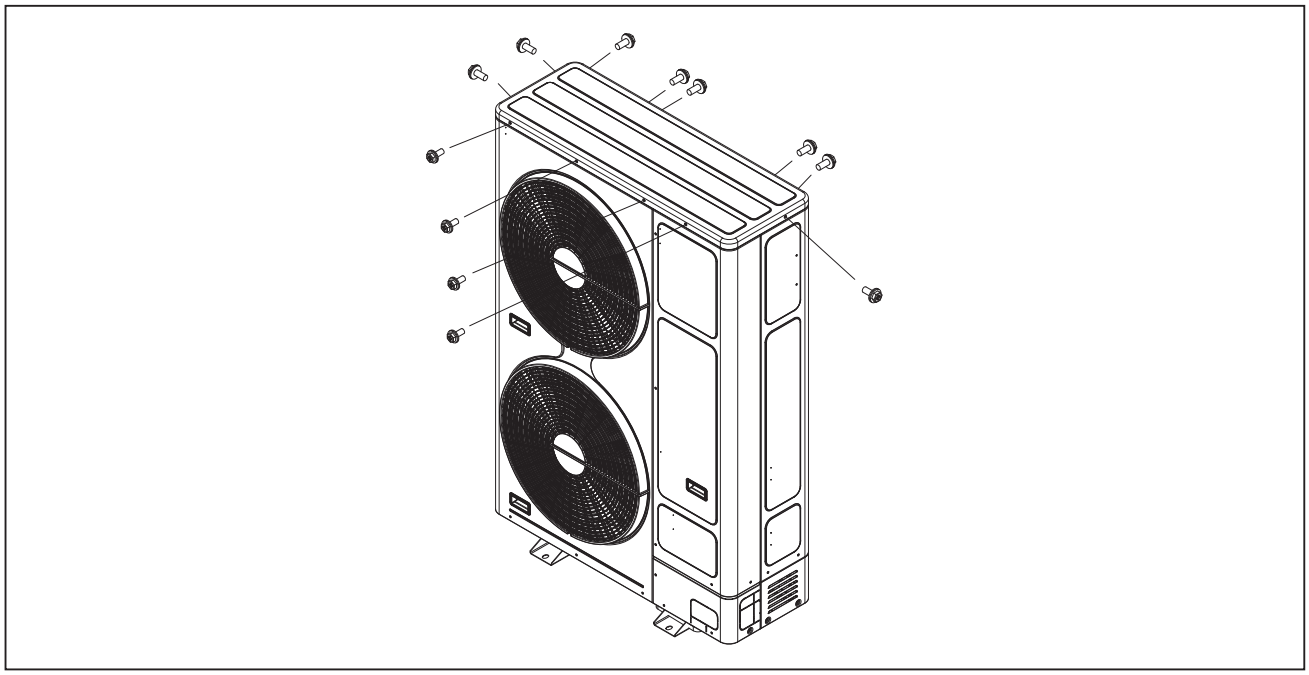
Tool	Gloves, Phillips Screwdriver



2.2.3 Removing Upper Cover

After removing twelve securing screws for the upper cover, lift the upper cover up.

Tool	Gloves, Phillips Screwdriver



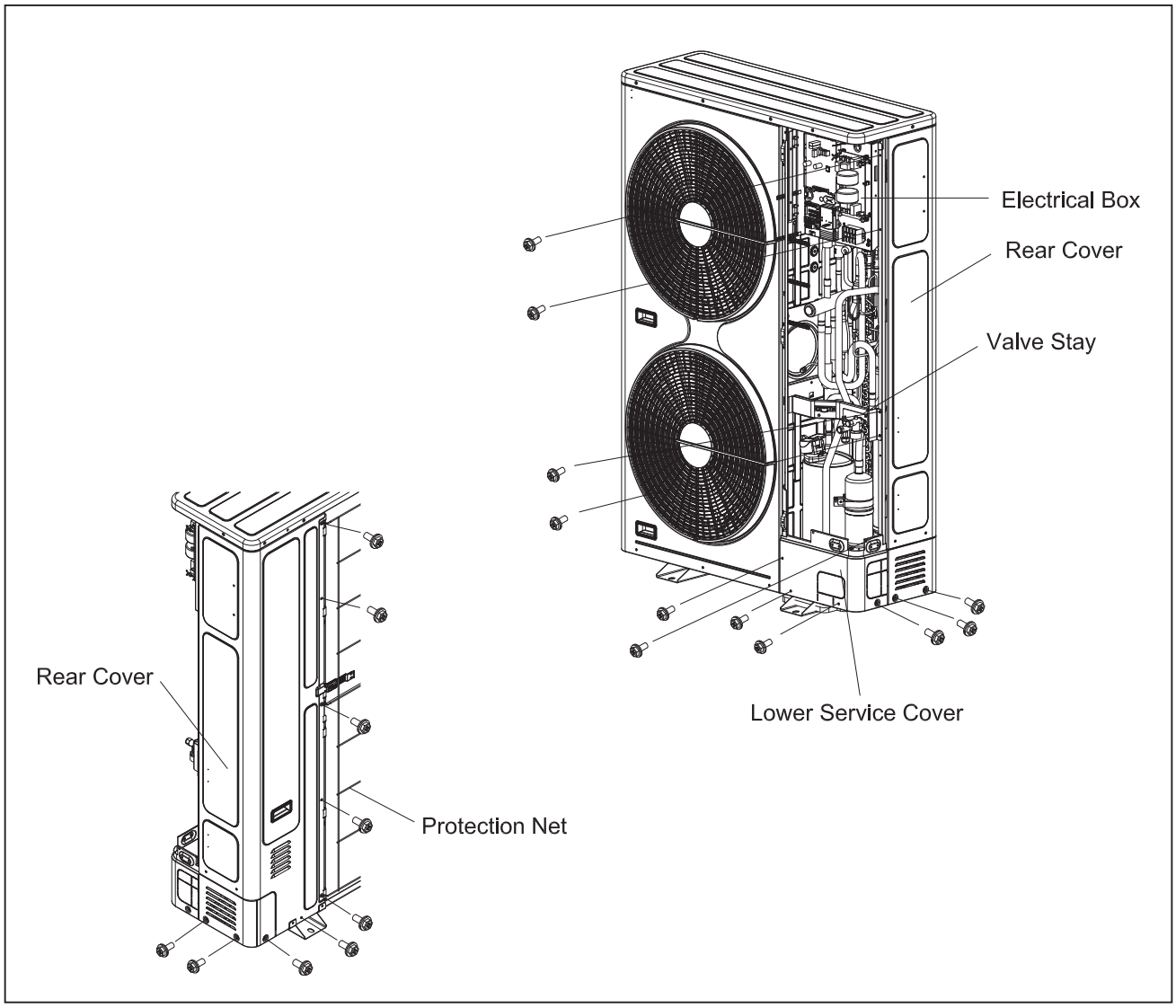
⚠WARNING

TURN OFF all power supply switches.

2.2.4 Removing Lower Service Cover and Rear Cover

(1) Remove the service cover according to Section 2.2.1 “Removing Service Cover”.
(2) Remove five securing screws for the lower service cover.
(3) Remove the lower service cover pulling it forward.
(4) Remove the upper cover according to Section 2.2.3 “Removing Upper Cover.”
(5) Remove thirteen securing screws for rear cover.
(6) Remove the rear cover by pulling it backward.

Tool	Gloves, Phillips Screwdriver



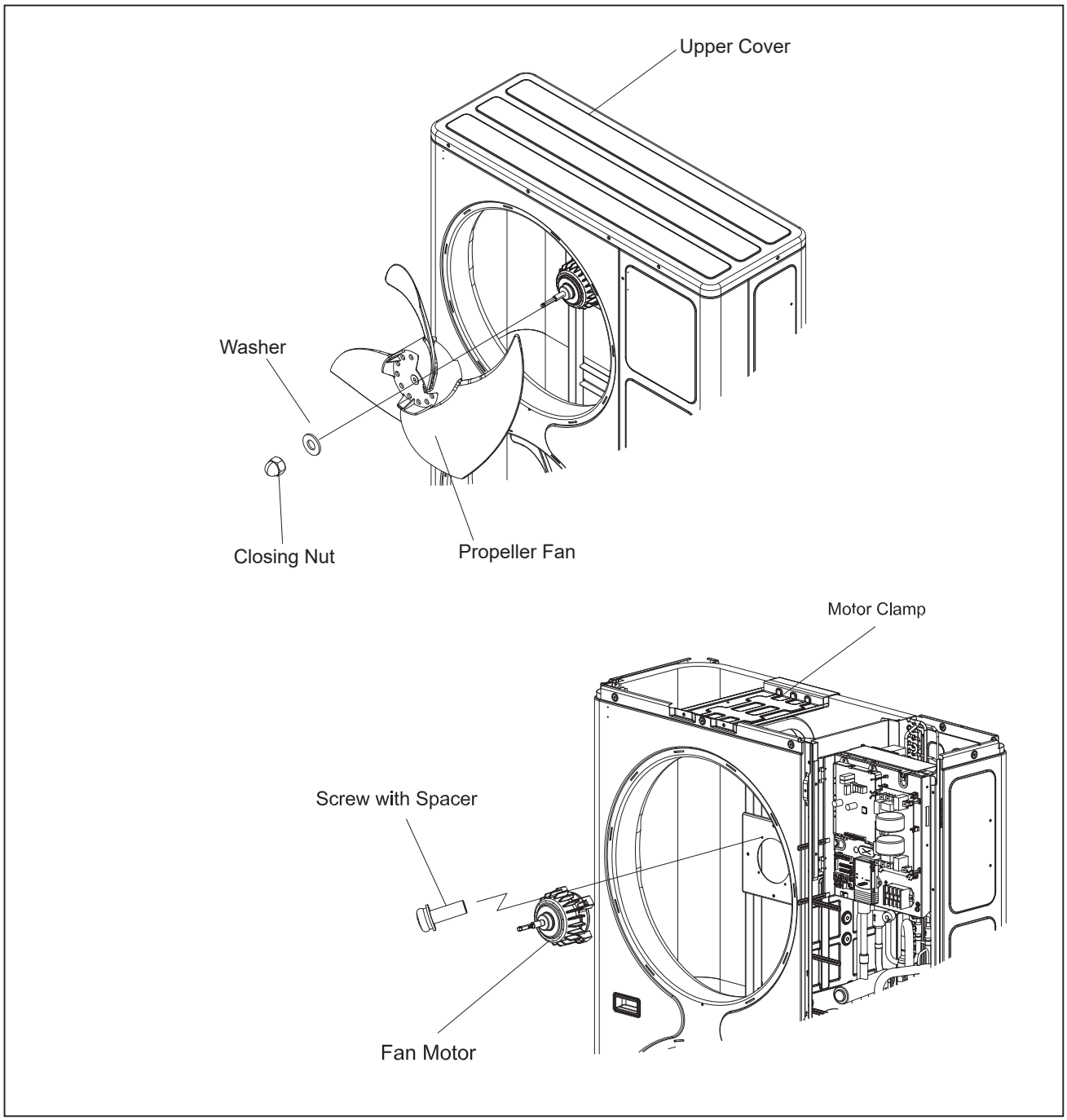
⚠WARNING

TURN OFF all power supply switches.

2.2.5 Removing Outdoor Fan Motor

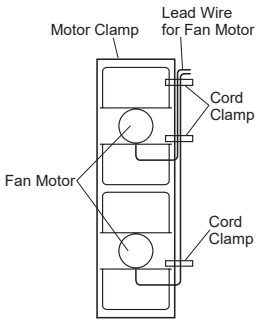
(1) Remove the air outlet grille according to Section 2.2.2 “Removing Air Outlet Grille.”
(2) Remove the upper cover according to Section 2.2.3 “Removing Upper Cover.”
(3) Remove the closing nut and the washer securing the propeller fan to the motor shaft with a socket wrench 13mm. Then remove the propeller fan from the motor shaft. (If it is difficult to remove, a corrosion or puller may be needed.)
(4) Removing Fan Motor
  (a) Remove the service cover according to Section 2.2.1 “Removing Service Cover.”
  (b) Disconnect the connectors for the fan motors from the outdoor unit PCB in the electrical box.
  (c) Remove four spacer screws securing the fan motor.

Tool	Gloves, Phillips Screwdriver, Adjustable Wrench, Puller, Nipper



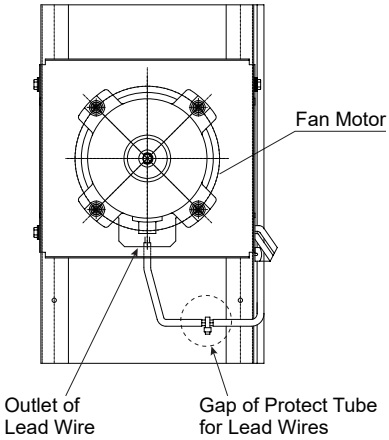
⚠WARNING

TURN OFF all power supply switches.

Fan Motor Qty	Connector		Securing Screw for Fan Motor		Securing Positions of Motor Clamp and Wires
	Upper Fan Motor	Lower Fan Motor	Upper Fan Motor	Lower Fan Motor	
2	INV PCB CN202(Red) PCN202(Red)	INV PCB CN201(White) PCN201(White)	M4 (Screw with Spacer) x 4	M4 (Screw with Spacer) x 4	

NOTES:

1. Mount the fan motor so that the wiring harness is at the bottom.
   (Adjust the position not to touch the propeller fan to shroud.)
2. Secure the wiring for the motor with the provided clamp taking care to route and secure the wiring away from the propeller fan.
3. Mount the fan motor so that the gap of wiring harness is at lowest position.
4. Reinstalling Propeller Fan
   Carefully align the D cut hole of propeller fan to match the shaft and slide on slowly. Once the propeller fan hits the stop on motor shaft, finger start closing nut and tighten to approximately 20 N·m.
5. After carefully routing and securing the wiring harness, reconnect motor connectors at the main PCB.
   Ensure motor connectors are color matched at the PCB connections.
6. Once motor(s) have been installed, reinstall metal and plastic air outlet grilles being careful to not over tighten.



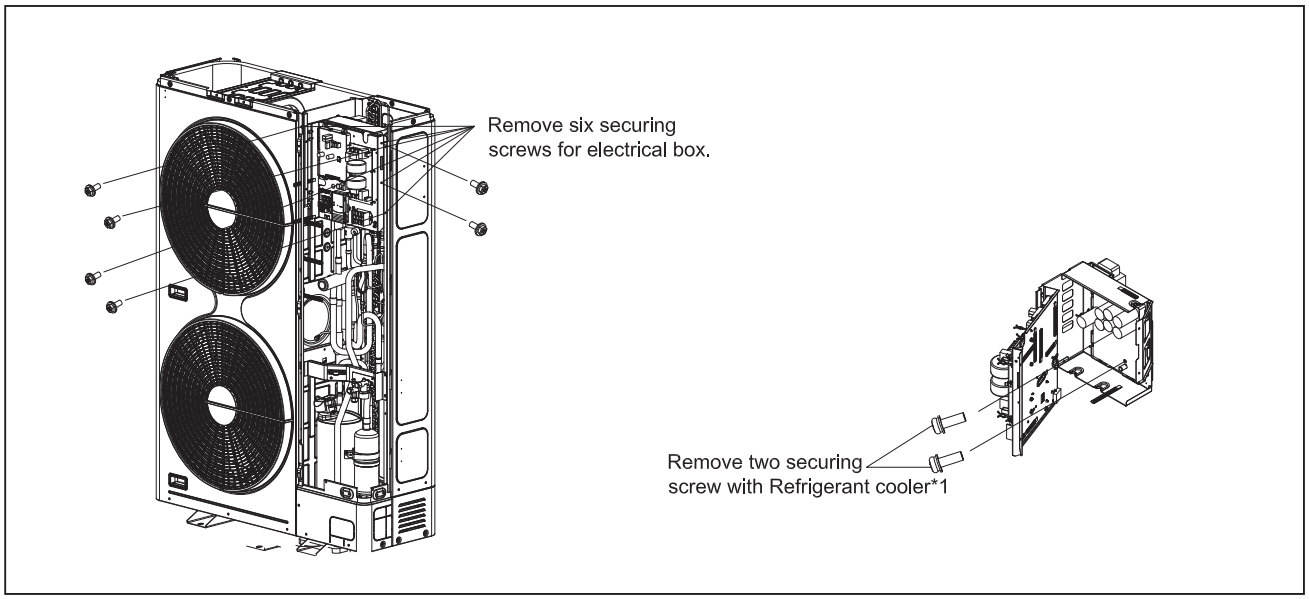
⚠WARNING

TURN OFF all power supply switches.

2.2.6 Removing Electrical Box

(1) Remove the service cover according to Section 2.2.1 “Removing Service Cover.”
(2) Remove the upper cover according to Section 2.2.3 “Removing Upper Cover.”
(3) Remove six securing screws for electrical box.
(4) Open the attaching P-Plate rotating it approximately 90° counterclockwise.
(5) Remove two securing screws for refrigerant cooler.
(6) Remove the electrical box lifting it upward.

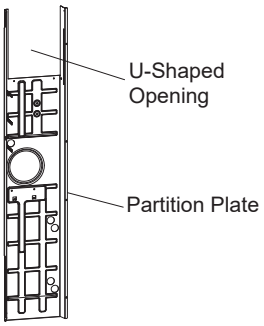
Tool	Phillips Screwdriver

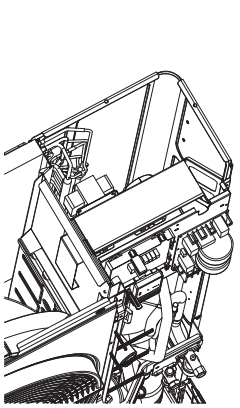


NOTES:

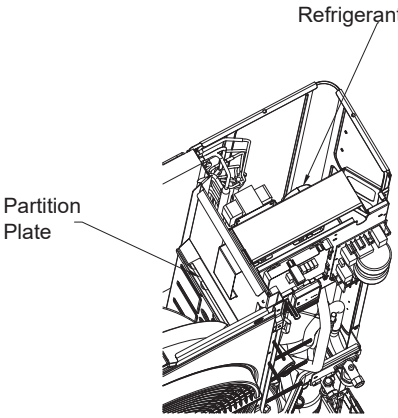
Remove the electrical box after disconnecting wires.

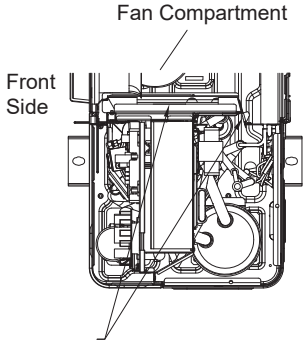
1. Remove the reversing valve coil according to Section 2.2.10 “Removing Reversing Valve Coil.”
2. Remove the expansion valve coil according to Section 2.2.11 “Removing Electronic Expansion Valve Coil.”
3. Remove the solenoid valve coil according to Section 2.2.12 “Removing Solenoid Valve Coil.”
4. Disconnect the faston terminals from high pressure switch and pressure sensor.
5. Disconnect both fan motor connectors and thermistors from the outdoor unit PCB.
6. Disconnect the compressor wires in the terminal box of compressor.
7. Loosen all cord clamps.
8. When mounting the electrical box, join and fit the electrical box and the partition plate into the outdoor unit. (*1) When tightening the electrical box and refrigerant cooler again, please use a torque screwdriver (torque requirement:3 N.m), otherwise the INV PCB or refrigerant cooler will be damaged.)





Original Position





Position the electrical box to latch onto the partition plate.

⚠WARNING

TURN OFF all power supply switches.

2.2.7 Removing Compressor

(1) Remove the service cover according to Section 2.2.1 “Removing Service Cover.”

(2) Remove the lower service cover and the rear cover according to Section 2.2.4 “Removing Lower Service Cover and Rear Cover.”
In the case that the outdoor unit is located near the wall, remove refrigerant piping and move the outdoor unit away from the wall.

(3) Recover the refrigerant from check joints (reversing valve piping).

(4) Remove the valve stay.

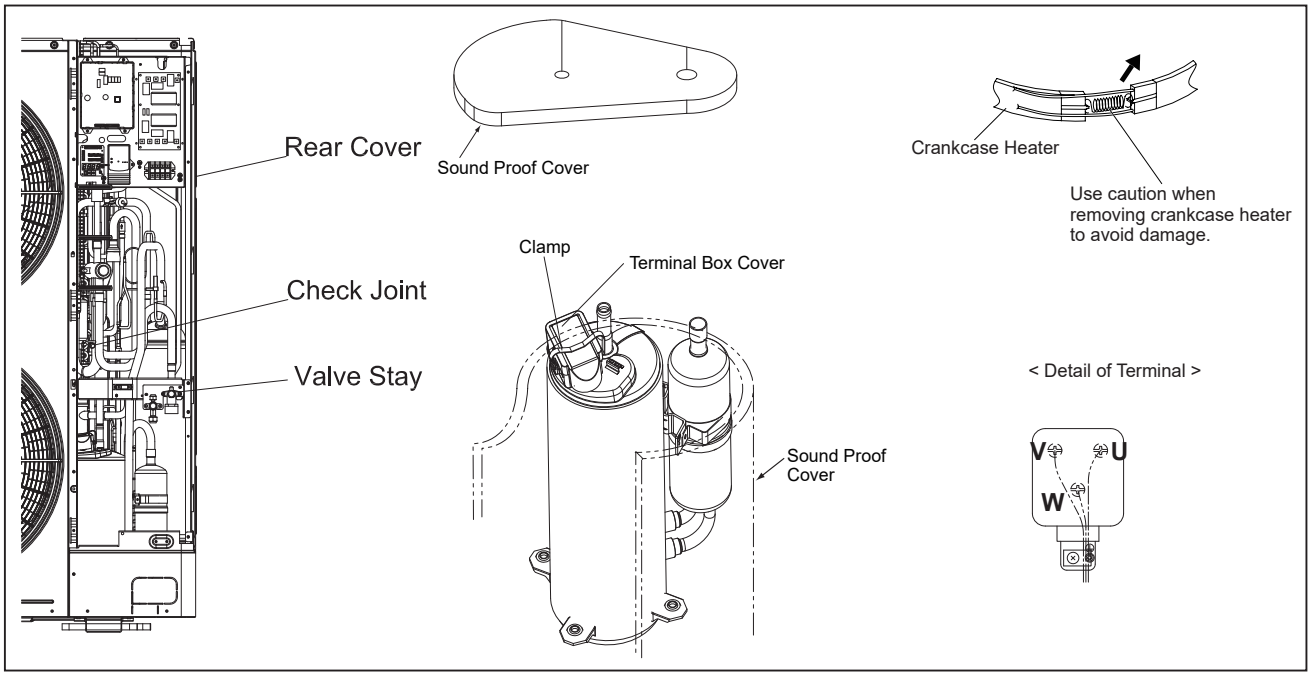
(5) Open the sound proof cover wrapped around the compressor, remove the terminal box cover for the compressor and disconnect the lead wiring.
NOTE:
Write down or photograph wiring and terminal designations to prevent mis-wiring of replacement compressor as shown below.
If the lead wiring is connected incorrectly to the terminal, the compressor may be damaged due to reverse rotation.

(6) Remove the rubber cap.

(7) Remove the crankcase heater as shown below.

(8) Remove the sound proof cover.

Tool	Phillips Screwdriver, Charging Hose, Refrigerant Recovery Machine and Cylinder



NOTES:

1. The compressor and piping are connected by brazing. Before brazing work, ensure that there is no flammable material nearby, as remaining oil inside the piping may ignite.
2. To prevent contamination of the refrigerant by water or foreign materials, do not expose the refrigerant parts to atmosphere for long periods. If necessary, seal the pipe ends using caps or tape.
3. Remove the caps for piping of the new compressor right before replacement. When replacing the compressor, seal the suction and discharge pipes with tape to prevent water and foreign particles from entering the compressor, and remove it right before brazing work.

⚠WARNING

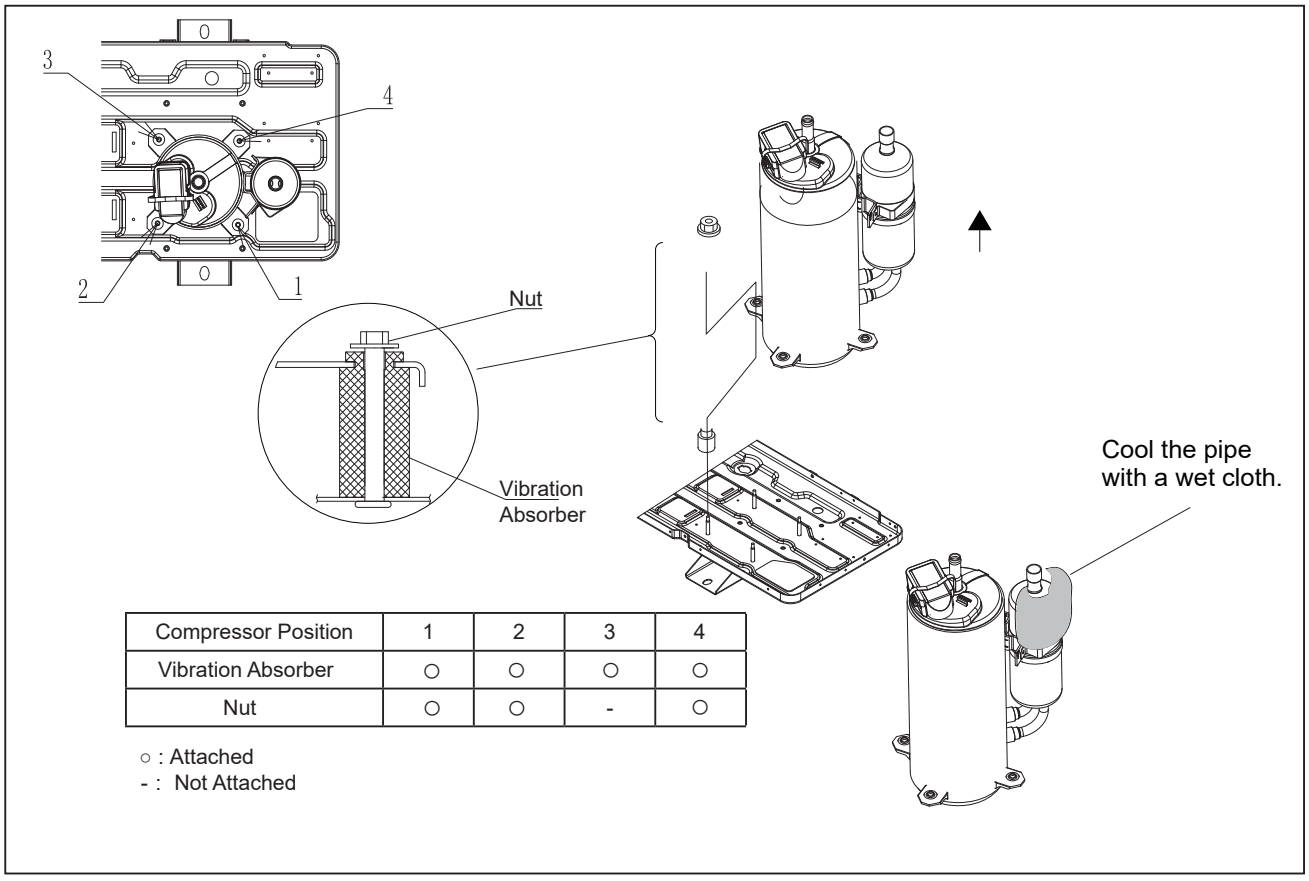
TURN OFF all power supply switches.

(9) Disconnect the suction pipe and discharge pipe from the compressor with a torch.
Ensure that wiring and electrical parts are kept away from the brazing area.
If not, they may catch fire at brazing work.

(10) Remove all the bolts that hold the compressor. Squeeze the two ends of the clamp inward, and lift up slightly to remove the clamp. Tilting the compressor forward, lift it up and remove it.
NOTE:
When removing the compressor, the discharge refrigerant line will have to be moved out of the way.
Take care to not damage or kink this line.

(11) When performing the brazing work for the replaced compressor, work quickly and do not overheat piping and fittings.
Cool area with a wet cloth to help prevent oxidation. Carefully not let the solder or dust flows into the compressor.

Tool	Spanner or Adjustable Wrench, Torch, Wet Cloth



Compressor Position	1	2	3	4
Vibration Absorber	○	○	○	○
Nut	○	○	-	○

○ : Attached
- : Not Attached

⚠WARNING

TURN OFF all power supply switches.

(12) To mount the new compressor after replacement, reverse the removal procedure.

(a) Ensure the terminals of the compressor wiring are not loose or damaged. If burned or otherwise damaged they must be replaced.

(b) Align the clamp with the caging device and press down.

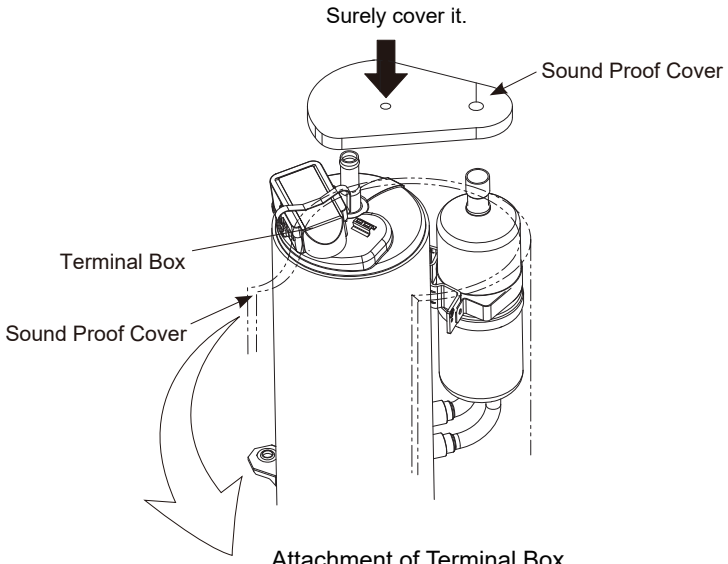
(c) Attach the sound proof cover to the top of the compressor.

(d) Wrap the sound proof cover around the terminal box and the discharge pipe.

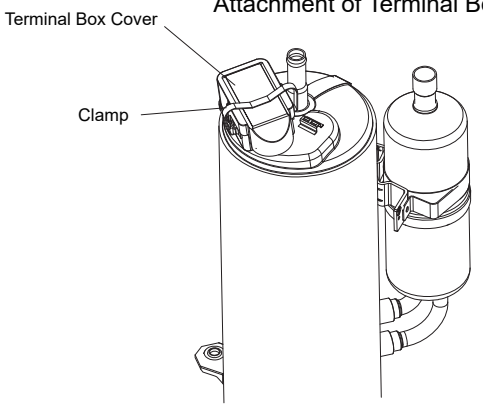
(e) Carefully reattach the crankcase heater ensuring there are no gaps between it and the compressor.

NOTE:
Ensure all wiring is secured or clamped correctly. Keep all wiring away from sharp edges and piping.

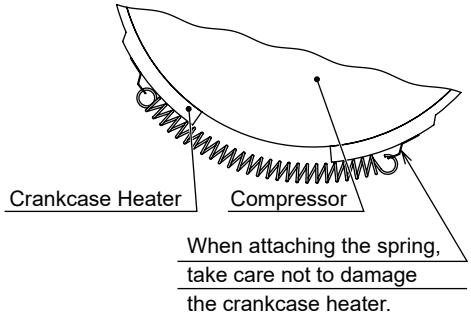
Tool	Adjustable Wrench, Torch, Wet Cloth



Attachment of Terminal Box



Detail of Spring for Crankcase Heater



⚠WARNING

TURN OFF all power supply switches.

2.2.8 Removing High Pressure Switch and Pressure Sensor.

(1) Remove the service cover according to Section 2.2.1 “Removing Service Cover.”

(2) Recover the refrigerant from check joints according to Section 2.2.7 “Removing Compressor.”

[Removing High Pressure Switch and High Pressure Sensor]

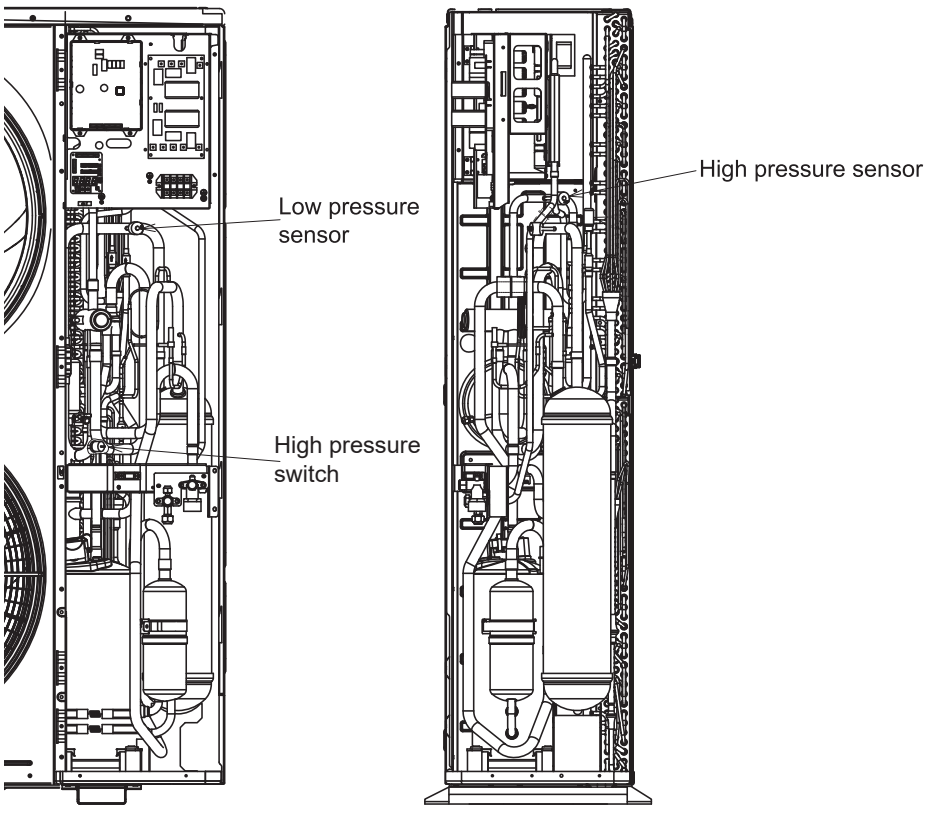
(3) Disconnect the the connector (PCN8) on the O.U. PCB for the high pressure switch.

(4) Carefully unsolder the high pressure switch and, if necessary, the high pressure sensor from the discharge pipe.
NOTE:
The procedure (3) is not required when removing the high pressure sensor. However, check to ensure that the connector (CN4) on the outdoor unit PCB is disconnected.

[Removing Low Pressure Sensor]

(5) Carefully unsolder the low pressure sensor from the discharge pipe.
NOTE:
Check to ensure that the connector (CN9) on the outdoor unit PCB is disconnected.

Tool	Phillips Screwdriver, Charging Hose, Torch



⚠ DANGER

- Do not touch any electrical components when LED401 (red) on the inverter PCB and LED4 (red) on the outdoor unit PCB are turned ON. It may cause an electric shock.
- Check to ensure that LED401 (red) on inverter PCB is turned OFF when opening the Attaching P-Plate.

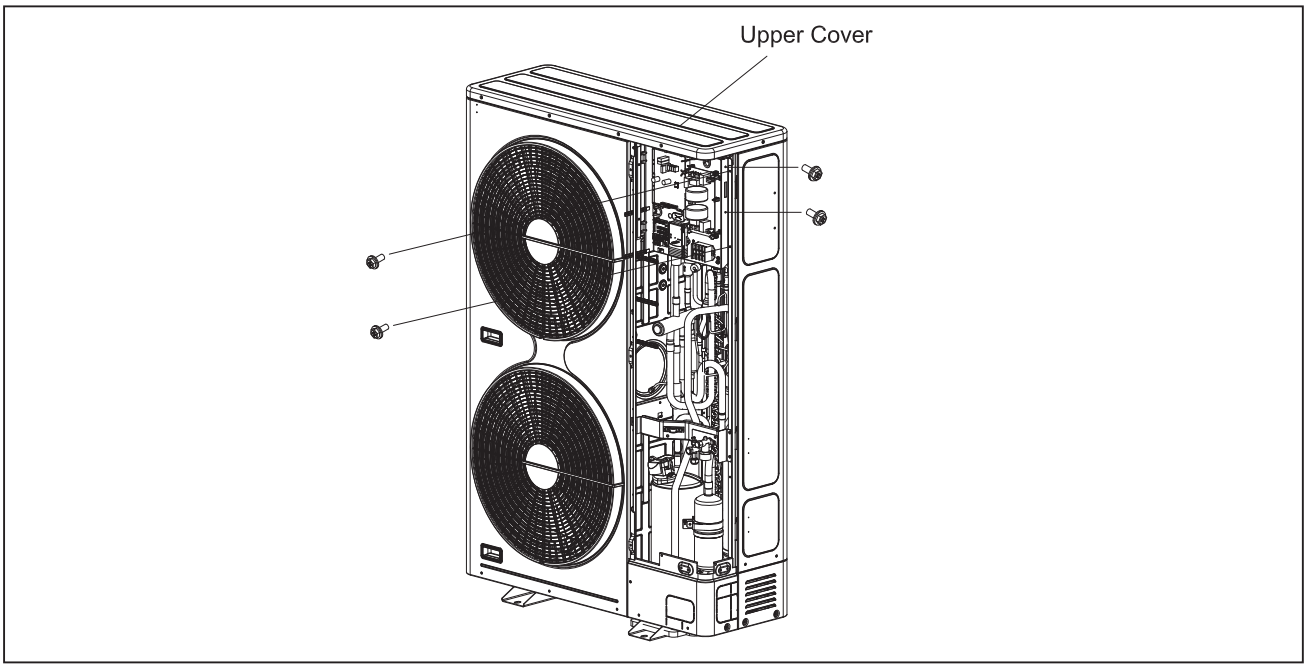
⚠ WARNING

TURN OFF all power supply switches.

2.2.9 Opening Electrical Box

(1) Remove the service cover according to Section 2.2.1 “Removing Service Cover.”
(2) Remove harness of compressor from edge saddle.
(3) Remove four securing screws for electrical box.
(4) Disconnect the connector of fan motor and thermistor on the outdoor unit PCB.
(5) Open the attaching P-Plate rotating it approximately 90° counterclockwise.

Tool	Phillips Screwdriver (Long)



⚠ DANGER

- Do not touch the electrical components when LED401 (red) on the inverter PCB and LED4 (red) on the outdoor unit PCB are turned ON. It may cause an electric shock.
- Check to ensure that LED401 (red) on inverter PCB is turned OFF when opening the Attaching P-Plate.

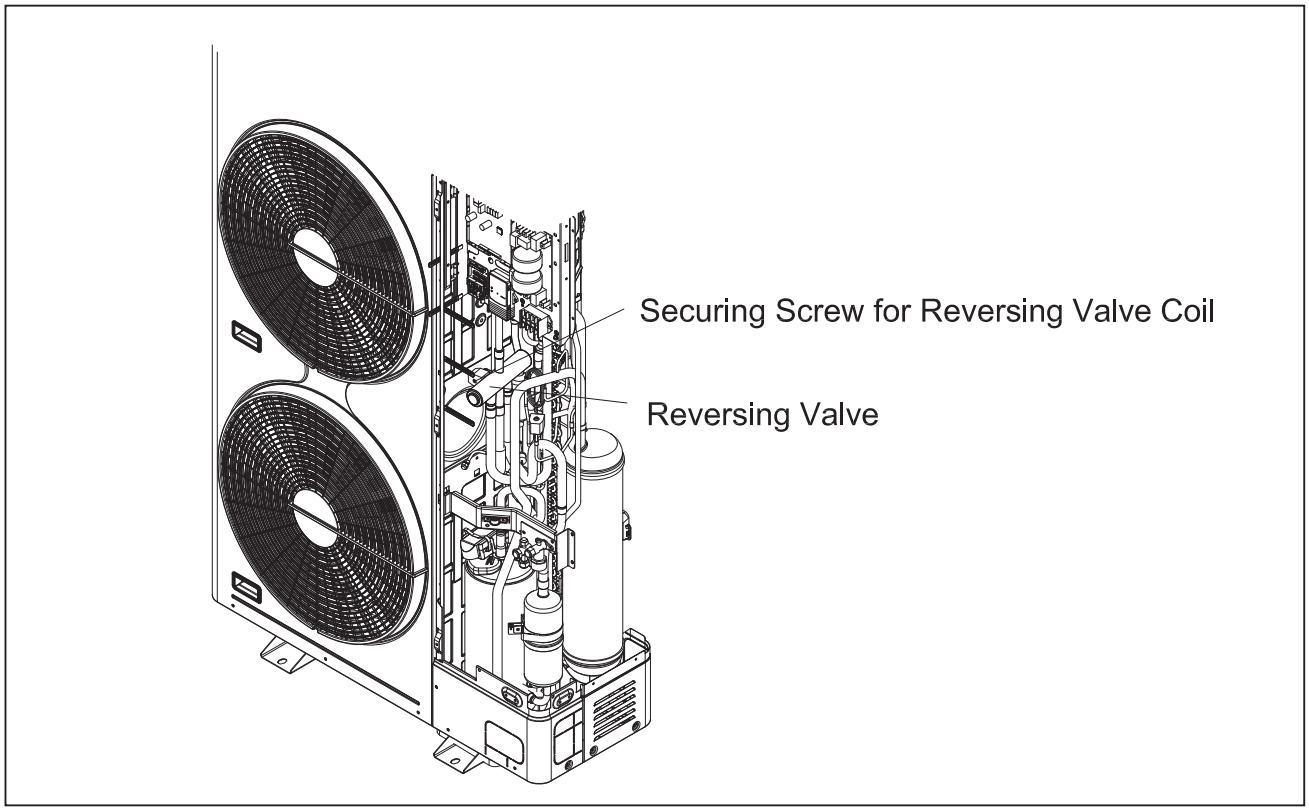
⚠ WARNING

TURN OFF all power supply switches.

2.2.10 Removing Reversing Valve Coil

(1) Remove the service cover according to Section 2.2.1 “Removing Service Cover.”
(2) Disconnect the connector (PCN6) on the outdoor unit PCB in the electrical box.
(3) Remove the reversing valve coil by removing one securing screw for reversing valve.
(4) To replace the reversing valve coil, reverse the removal procedure.
NOTE:
Return all wiring to the original position.

Tool	Phillips Screwdriver, Stubby Phillips Screwdriver



⚠ DANGER

- Do not touch the electrical components when LED401 (red) on the inverter PCB and LED4 (red) on the outdoor unit PCB are turned ON. It may cause an electric shock.
- Check to ensure that LED401 (red) on inverter PCB is turned OFF when opening the Attaching P-Plate.

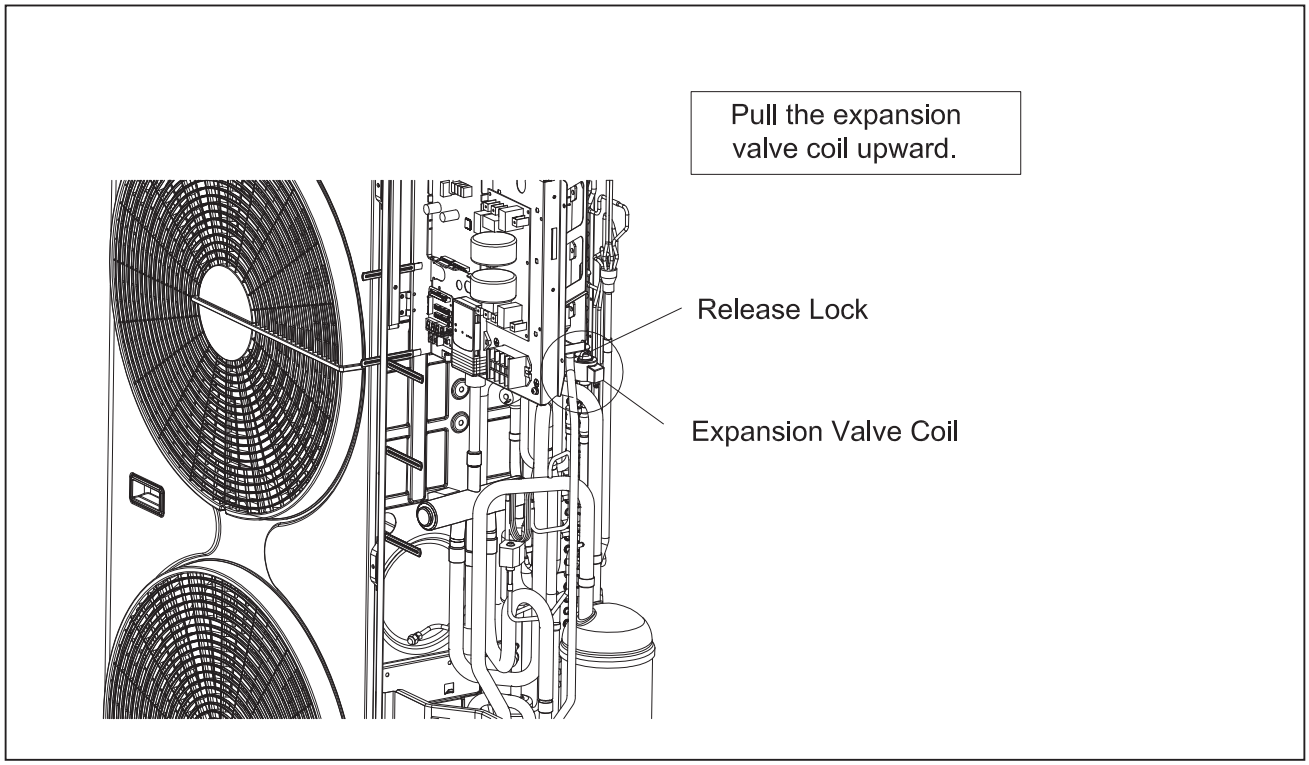
⚠ WARNING

TURN OFF all power supply switches.

2.2.11 Removing Electronic Expansion Valve Coil

(1) Remove the service cover according to Section 2.2.1 “Removing Service Cover.”
(2) Remove the lower service cover and the rear cover according to Section 2.2.4 “Removing Lower Service Cover and Rear Cover.”
(3) Disconnect the connector (CN5A) on the outdoor unit PCB.
(4) Pull the expansion valve coil upward until it slides off of valve body.
(It may be easier to remove the expansion valve coil by pulling it upward while rotating it.)
(5) To attach the new expansion valve coil, reverse the removal procedure. Ensure the orientation of the expansion valve is as shown below. The expansion valve coil has a lock mechanism. After attaching the expansion valve coil, rotate it until it clicks.
NOTE:
Return and secure all wiring to original positions after replacing coil.

Tool	Phillips Screwdriver, Nipper, Band



⚠ DANGER

Do not touch the electrical components when LED4 (red) on the outdoor unit PCB is turned ON. It may cause an electric shock.

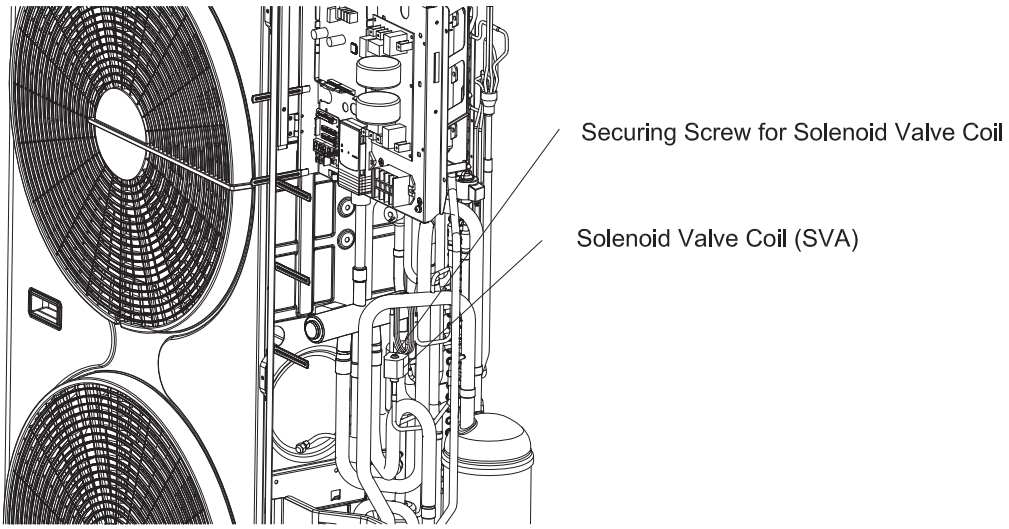
⚠ WARNING

TURN OFF all power supply switches.

2.2.12 Removing Solenoid Valve Coil (SVA)

(1) Remove the service cover according to Section 2.2.1 “Removing Service Cover.”
(2) Disconnect the connector (PCN7 (SVA)) on the outdoor unit PCB.
(3) Remove one securing screw for solenoid valve coil (SVA) and slide the solenoid valve coil (SVA) upward.
(4) To install a new solenoid valve coil, reverse the removal procedure.
NOTE:
Return and secure all wiring to original positions after replacing coil.

Tool	Phillips Screwdriver



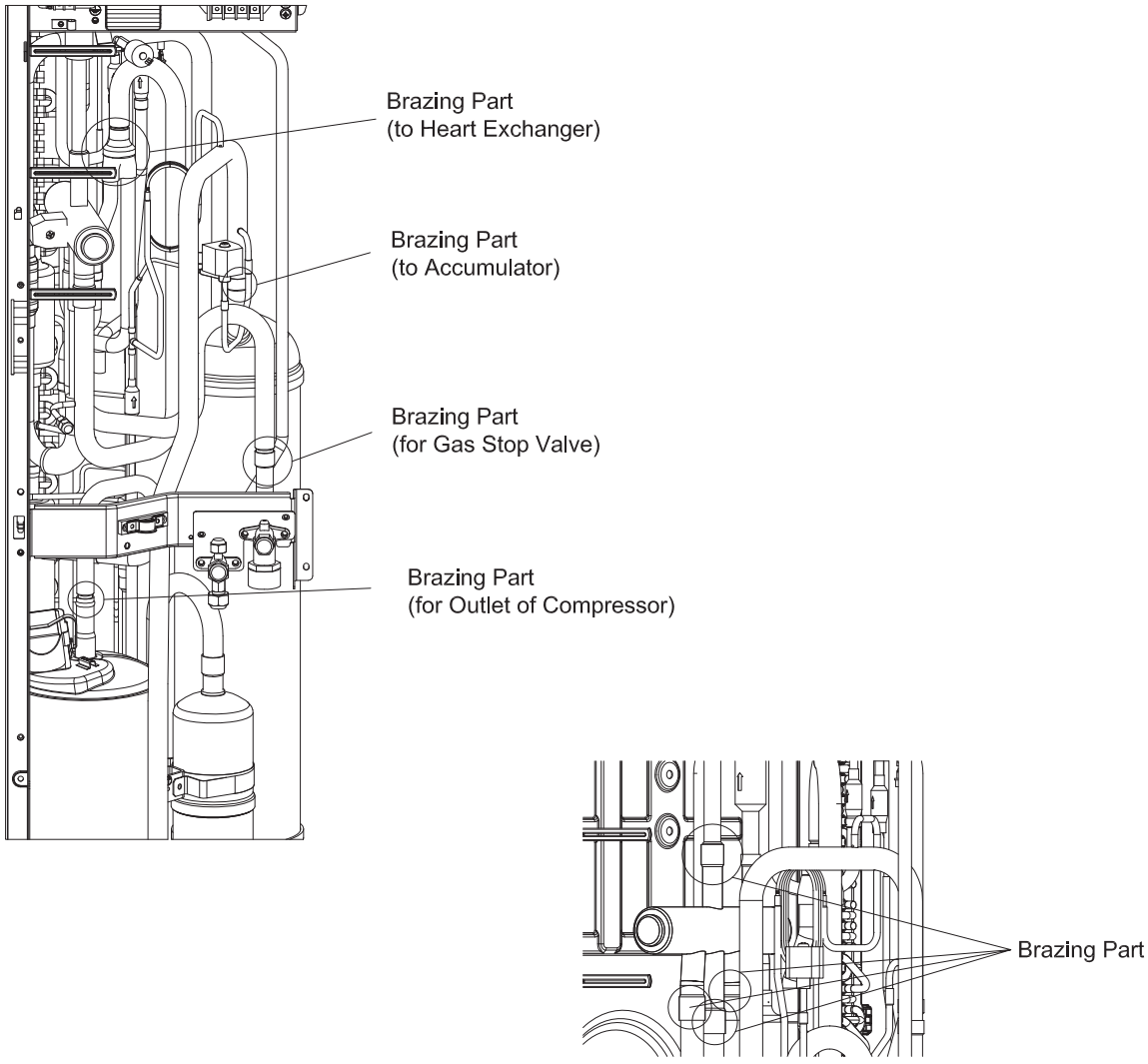
⚠WARNING

TURN OFF all power supply switches.

2.2.13 Removing Reversing Valve

(1) Remove the service cover according to Section 2.2.1 “Removing Service Cover.”
(2) Remove the upper cover according to Section 2.2.3 “Removing Upper Cover.”
(3) Remove the lower service cover and the rear cover according to Section 2.2.4 “Removing Lower Service Cover and Rear Cover.”
(4) Recover the refrigerant from check joints according to Section 2.2.7 “Removing Compressor.”
(5) Remove the reversing valve coil according to Section 2.2.10 “Removing Reversing Valve Coil.”
(6) Remove the reversing valve assemblies from the secured positions (four brazed parts).
  (a) Remove the reversing valve and the gas stop valve while cooling the valve bodies with a wet cloth.
  (b) Perform the brazing work while keeping the flame away from electrical wiring and piping insulation.
(7) Remove the reversing valve from the assemblies. (four parts) .
  Remove/Attach the reversing valve while cooling the valve bodies with a wet cloth.
(8) To attach the new reversing valve after replacement, reverse the removal procedure.
  Route and secure all wiring to original position.

Tool	Phillips Screwdriver, Charging Hose, Torch, Wet Cloth, Adjustable Wrench



⚠WARNING

TURN OFF all power supply switches.

2.2.14 Removing Electronic Expansion Valve and Solenoid Valve

(1) Remove the service cover according to Section 2.2.1 “Removing Service Cover.”

(2) Remove the front piping cover and the rear cover according to Section 2.2.4 “Removing Lower Service Cover and Rear Cover.”

(3) Recover the refrigerant from check joints according to Section 2.2.7 “Removing Compressor.”

(4) Remove the coils according to Section 2.2.11 “Removing Electronic Expansion Valve Coil” and Section 2.2.12 “Removing Solenoid Valve Coil.”

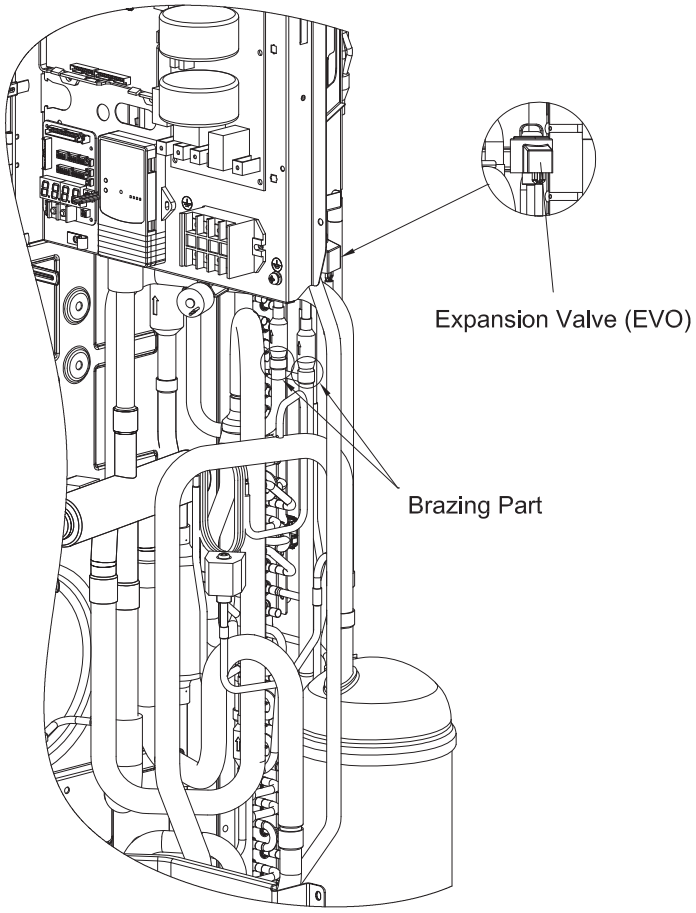
(5) Remove the brazed parts as shown in the figures
Electronic Expansion Valve (EVO) Brazed Parts: 2
Solenoid Valve (SVA) Brazed Parts: 2

(a) Remove the electronic expansion valve and the solenoid valve after cooling the valve bodies with a wet cloth.

(b) Perform the brazing work while keeping the flame away from electrical wiring and piping insulation.

(6) To attach the new valves after replacement, reverse the removal procedure.
NOTE:
After valve replacement, route and secure all wiring to original position.

Tool	Phillips Screwdriver, Charging Hose, Torch, Wet Cloth, Adjustable Wrench



⚠ DANGER

- Do not touch the electrical components when LED4 (red) on the outdoor unit PCB is turned ON. It may cause an electric shock.
- Do not touch the electrical components on the outdoor unit PCB. The outdoor unit PCB may be damaged if stressed or mishandled.

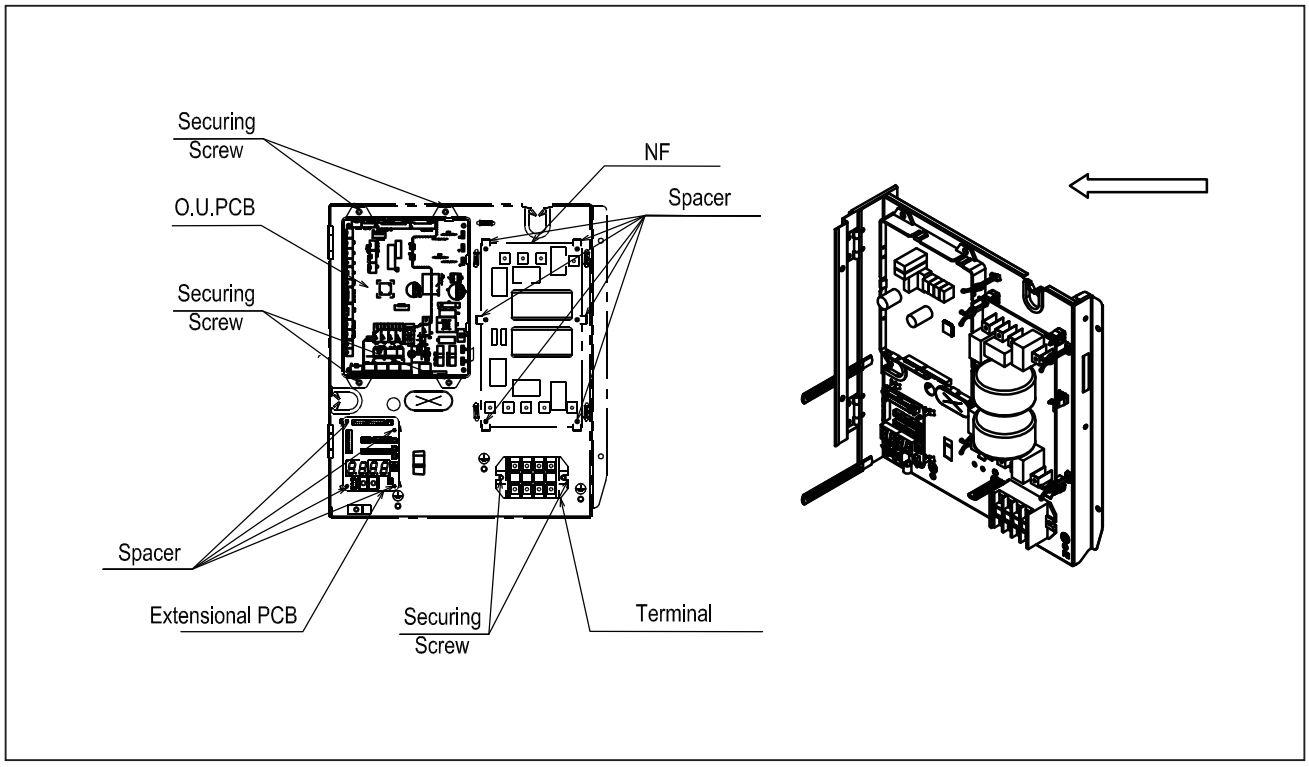
⚠ WARNING

TURN OFF all power supply switches.

2.2.15 Removing Printed Circuit Board (Outdoor Unit PCB)

(1) Remove the service cover according to Section 2.2.1 “Removing Service Cover.”
(2) Disconnect all connectors from the outdoor unit PCB.
(3) Remove the outdoor unit PCB by squeezing the spacer ends.

Tool	Phillips Screwdriver, Stubby Phillips Screwdriver



NOTE:
Replacement PCB will have all DIP switches set to factory default. Refer to “Service:1.1.2 Checking of Rotary Switch and DIP Switch Settings” for correct outdoor unit setup.

⚠ DANGER

- Do not touch the electrical components when LED401 (red) on the inverter PCB and LED4 (red) on the outdoor unit PCB are turned ON. It may cause an electric shock.
- Check to ensure that LED401 (red) on inverter PCB is turned OFF when opening the Attaching P-Plate.

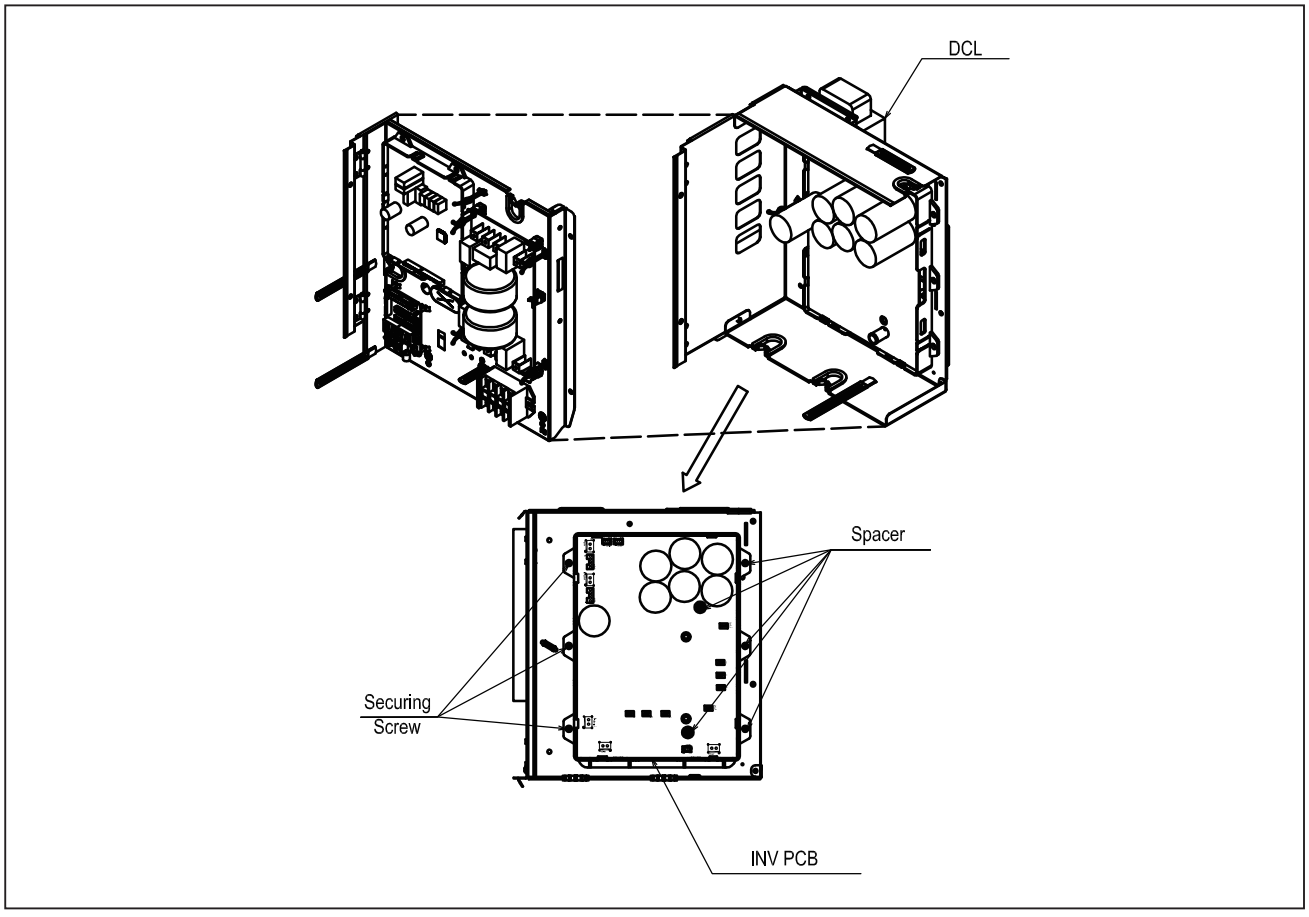
⚠ WARNING

TURN OFF all power supply switches.

2.2.16 Removing Inverter PCB

(1) Remove the service cover according to Section 2.2.1 “Removing Service Cover.”
(2) Open the power plate rotating it approximately 90° counterclockwise according to Section 2.2.9 “Opening Electrical Box.”
(3) Disconnect all connectors connected to the inverter PCB.
(4) Remove eight securing screws for inverter PCB.
(5) The inverter PCB can be removed by pulling toward right. (The plastic case and the radiation fin are also removed together.)

Tool	Phillips Screwdriver, Long-Nose Pliers, Stubby Phillips Screwdriver



NOTE:
When attaching the inverter PCB, connect the wiring to the correct terminals of the new board or damage will occur.

⚠ DANGER

- Do not touch the electrical components when LED401 (red) on the inverter PCB and LED4 (red) on the outdoor unit PCB are turned ON. It may cause an electric shock.
- Check to ensure that LED401 (red) on inverter PCB is turned OFF when opening the Attaching P-Plate.

⚠ WARNING

TURN OFF all power supply switches.

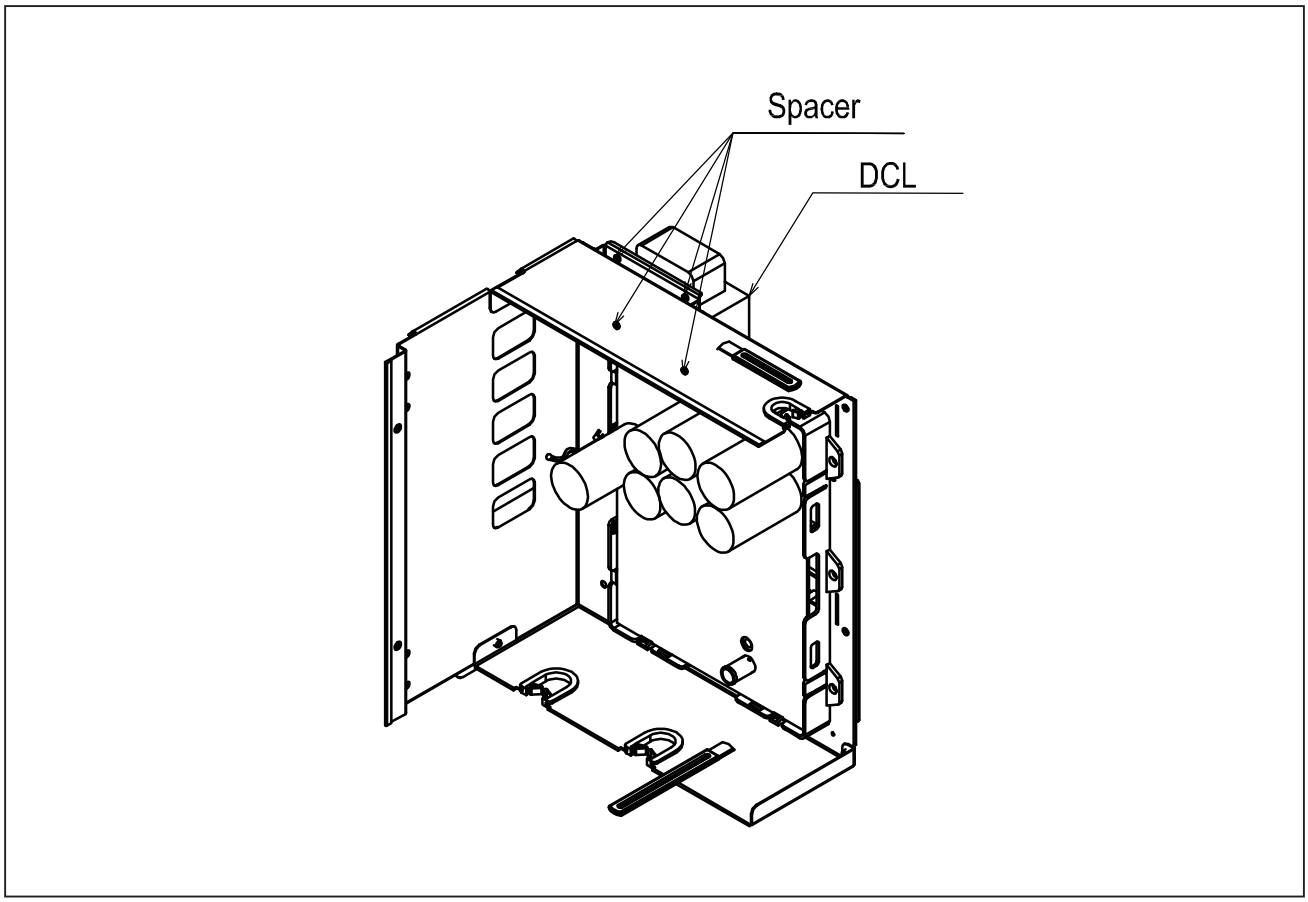
2.2.17 Removing Other Electrical Components

(1) Remove the service cover according to Section 2.2.1 “Removing Service Cover.”
(2) Open the power plate rotating it approximately 90° counterclockwise according to Section 2.2.9 “Opening Electrical Box.”
(3) Removing Electrical Components
  (a) Remove four securing screws for the reactor and remove the reactor (DCL).

NOTE:

After a component has been replaced, ensure all wiring has been reconnected to the correct terminals or connectors. Failure to do so will result in damage or possible injury.

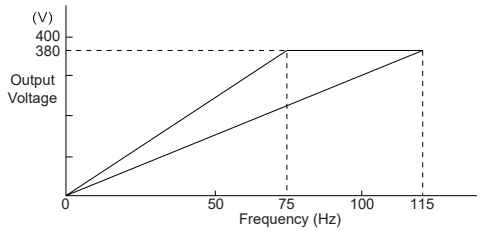
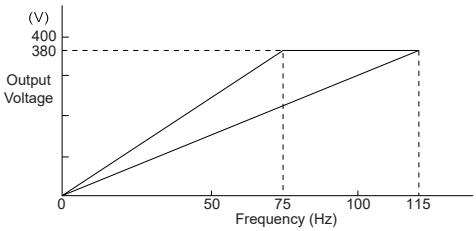
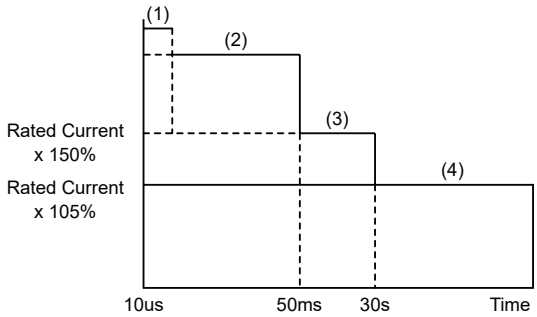
Tool	Phillips Screwdriver, Long-Nose Pliers, Stubby Phillip Screwdriver



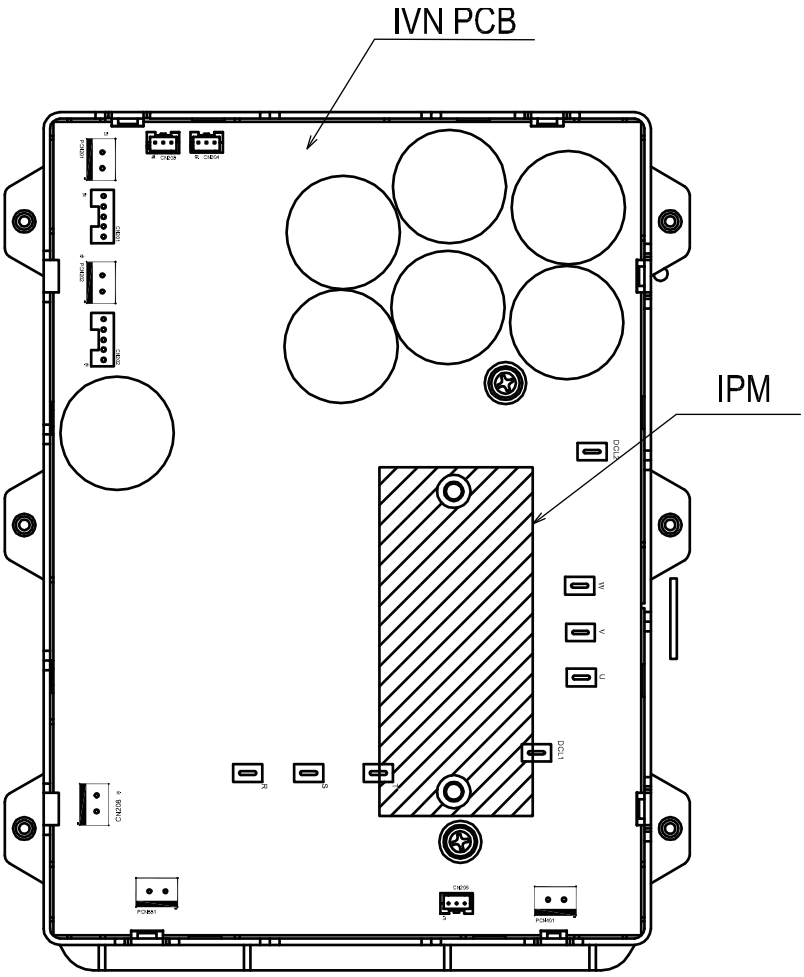
2.3 Main Parts

2.3.1 Inverter

(1) Specifications of Inverter

Applicable Model	RAS-080/090HNBSTQ	RAS-100/110/120HNBSTQ
Power Supply	380-415V 3N~50/60Hz	380-415V 3N~ 50/60Hz
Output Voltage (Maximum)	415V	415V
Output Current (Maximum)	21.5A	23.5A
Control Method	Vector Control	
Range of Output Frequency	10 to 115Hz	10 to 115Hz
Accuracy of Frequency	0.1Hz at Applicable Frequency Range	0.1Hz at Applicable Frequency Range
Output / Characteristics		
Soft Start / Stop	0.125Hz/s, 0.25Hz/s, 0.5Hz/s, 1Hz/s, 3Hz/s (5 Steps)	
Protection Function Excessive High or Low Voltage for Inverter	Voltage output is stopped, when voltage is lower than 350VDC or higher than 750V DC. Cause of Abnormality: Failure of Inverter PCB, Decreasing Capacity of Condenser, Incorrect Wiring.	Voltage output is stopped, when voltage is lower than 350V DC or higher than 750V DC. Cause of Abnormality: Failure of Inverter PCB, Decreasing Capacity of Condenser, Incorrect Wiring.
Abnormality of Current Sensor (0A Detection)	(1) When the compressor operating frequency is between 15Hz and 18Hz after compressor is started, one of the effective value of running current at each phase is less than 1.5A (including 1.5A). (2) 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). Cause of Abnormality: Failure of Current Sensor (on Inverter PCB) Failure of IPM, Failure of Compressor, Disconnected Wiring"	
Overcurrent Protection for Inverter (Electronic Thermal/ Instantaneous Overcurrent)		
	(1) Short-Circuit Trip of Arm (2) Instantaneous Overcurrent Trip } Internal Protection of IPM (3) Instantaneous Overcurrent Trip: It is detected when current value is over rated current x 150%. (4) Electronic Thermal Trip: Condition is maintained longer than 30 seconds or accumulated longer than 3 minutes during 10 minutes sampling time.	
Protection of Dip IPM of Inverter PCB	The transistor module has three protection functions for self-protection. (1) Some of the output terminals "U", "V" or "W" are short-circuited. (2) Running current of Dip IPM of Inverter PCB reaches the maximum rated current. (3) Control voltage of Dip IPM of Inverter PCB abnormally decreases.	
Overload Control	Overload control is cancelled when Current Value > Rated Current x 105% Current Value < Rated Current x 88%	
Fin Temperature Increase	The unit is stopped when the fin temperature is higher than 90°C.	
Ground-Fault Detection	The unit is stopped when the compressor shorts to ground at start-up.	

RAS-80/90/100/110/120



(3) Protective Function

(A) Excessive High or Low Voltage for Inverter

(a) Level of Detection

When the voltage of direct current is greater than (A) V, an abnormality is detected.
When the voltage of direct current is smaller than (B) V, an abnormality is detected.

Power supply	380~415V 50Hz
(A)	750
(B)	350

(b) Function

When an abnormality is detected, the inverter compressor is stopped and the cause code of inverter stoppage is communicated to outdoor unit PCB.

(c) Cancellation of Protection Function

Communication the cause code of inverter stoppage is canceled when the wired controller is off or main power supply is cut off.

(B) Abnormality of Current Sensor

(a) Level of Detection

① When the compressor's operating frequency reaches 15 to 18Hz after the compressor starts, the effective value of running current at each phase is 1.5A or less.
② The wave height value of running current for the phase positioning is less than 5A before the compressor is started (at completing the phase positioning).

(b) Function

When an abnormality is detected, the inverter compressor is stopped, and the cause code of inverter stoppage is communicated to outdoor unit PCB.

(c) Cancellation of Protection Function

Communication the cause code of inverter stoppage is canceled when the wired controller is off or main power supply is cut off.

(C) Overcurrent Protection for Inverter

(a) Level of Detection

① When the current detected by current sensor reaches 150% of the rated current, overcurrent is detected. (Instantaneous Overcurrent)
② When the current detected by current sensor exceeds 105% of the rated current continuously for 30 seconds or for more than 3 minutes in total during a 10 minutes period, overcurrent is detected. (Electric Thermal Relay)

(b) Function

When an abnormality is detected, the inverter compressor is stopped and the cause code of inverter stoppage is communicated to outdoor unit PCB.

(c) Cancellation of Protection Function

Communication the cause code of inverter stoppage is canceled when the wired controller is off or main power supply is cut off.

(D) Protection of Dip IPM of Inverter PCB

(a) Level of Detection

① When some of the output terminals between "U" and "V", "V" and "W", "W" and "U" of Dip IPM of inverter PCB are short-circuited, an abnormality is detected.
② When the running current of Dip IPM of inverter PCB reaches the maximum rated current, an abnormality is detected.
③ When the control voltage of Dip IPM of inverter PCB abnormally decreases, an abnormality is detected.

(b) Function

When an abnormality is detected, the inverter compressor is stopped and the cause code of inverter stoppage is communicated to outdoor unit PCB.

(c) Cancellation of Protection Function

Communication the cause code of inverter stoppage is canceled when the wired controller is off or main power supply is cut off.

(Main Parts)

(E) Fin Temperature Increase

(a) Level of Detection
When the temperature of internal thermistor exceeds more than 90°C, an abnormality is detected.

(b) Function
When an abnormality is detected, the inverter compressor is stopped and the cause code of inverter stoppage is communicated to outdoor unit PCB.

(c) Cancellation of Protection Function
Communication the cause code of inverter stoppage is canceled when the wired controller is off or main power supply is cut off

(F) Earth Detection

(a) Level of Detection
When the starting current of the compressor reaches 80% of the ovecurrent protection value, an abnormality is detected.

(b) Function
When an abnormality is detected, the inverter compressor is stopped and the cause code of inverter stoppage is communicated to outdoor unit PCB.

(c) Cancellation of Protection Function
Communication the cause code of inverter stoppage is canceled when the wired controller is off or main power supply is cut off

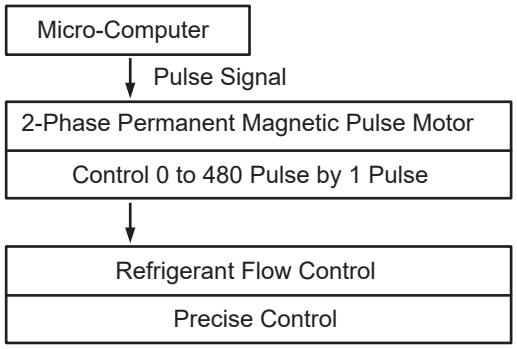
(5) Overload Protection Control

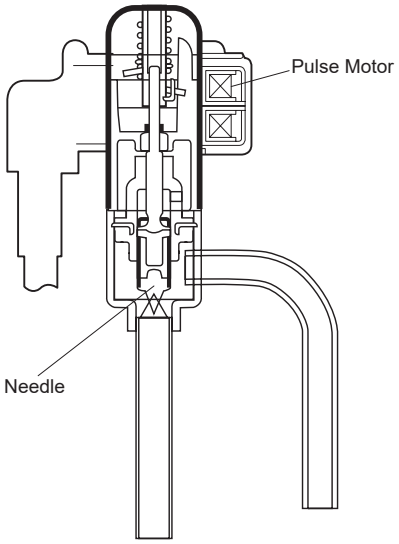
(a) Level of Detection
When the output current exceeds 105% of the maximum output current, an abnormality is detected.

(b) Function
An overload signal is issued when output current exceeds 105% of the maximum output current, and the frequency decreases.
For 10 seconds after the output current decreases lower than 88% of the rated current, the 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.

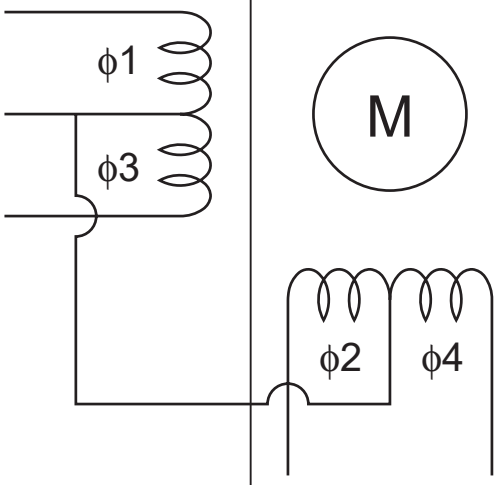
(c) Cancellation of Protection Function
After the operation described in the above item (b) is performed for 10 seconds, this control is canceled.

2.3.2 Electronic Expansion Valve for Outdoor Units





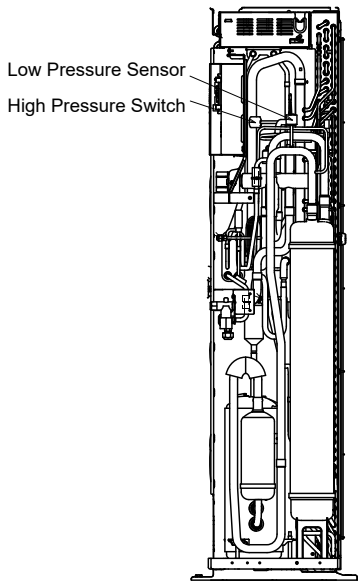
Specification

Items	Specification	
Models to be Applied	For Main Cycle (EVO)	
Type	CAM Series	UKV Series
Refrigerant Used	R410A	
Working Temperature Range	-30°C - 70°C	
Mounting Direction	Drive shaft in Vertical Direction within an Angle of 45° as Maximum	Drive shaft in Vertical Direction within an Angle of 45° as Maximum
Flow Direction	Reversible	
Rated Voltage	DC12V±15%	DC12V±10%
Drive Condition	30 - 90 PPS 1-2 Phase Excitation	63 PPS 1-2 Phase Excitation
Coil Resistance	46Ω ± 4Ω (at 20°C)	46Ω ± 3Ω (at 20°C)
Wiring Diagram, Drive Circuit and Activation Mode		

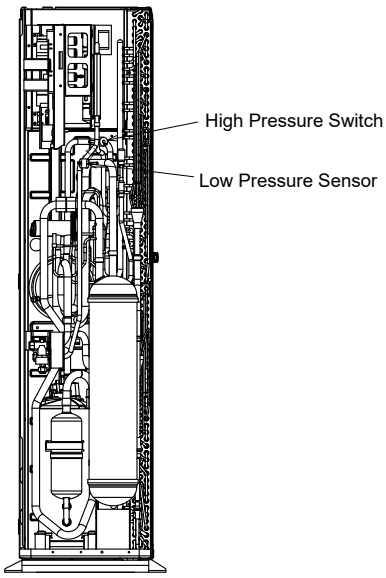
2.3.3 Pressure Sensor

(1) Position of Pressure Sensor

RAS-080~090HNBSTQ



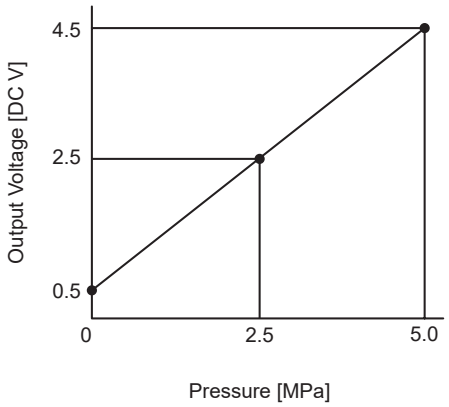
RAS-100~120HNBSTQ



(2) High Pressure Sensor

The high pressure during operation is detected by a high pressure sensor, and compressor frequencies are controlled by the proportional controlling method with operating capacity of indoor units (or PID Control for Compressor Frequency) so that the high pressure is controlled in an appropriate range.

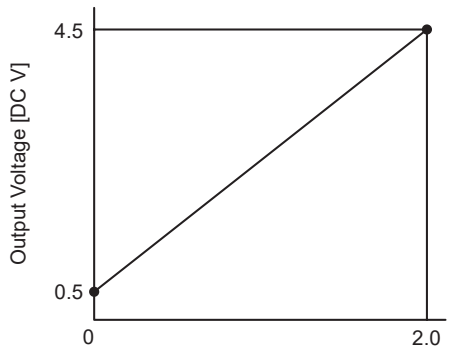
The output characteristics of the high pressure sensor are as follows.



Output Characteristics of High Pressure Sensor

(3) Low Pressure Sensor

The low pressure during operation is detected by a low pressure sensor for protecting excessive increase/decrease. The output characteristics of the low pressure sensor are as follows.

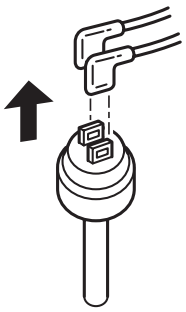


Output Characteristics of Low Pressure Sensor

(Main Parts)

2.3.4 Pressure Switch

High Pressure Switch (for Protection)
When the high pressure reaches 4.15MPa, compressor is stopped to protect the refrigerant cycle components.

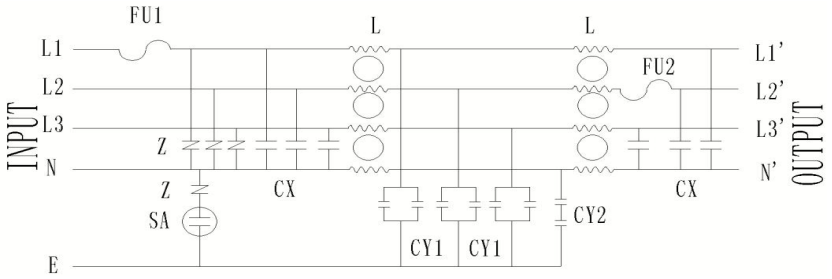


High Pressure Switch(PSH)

2.3.5 Noise Filter (NF1)

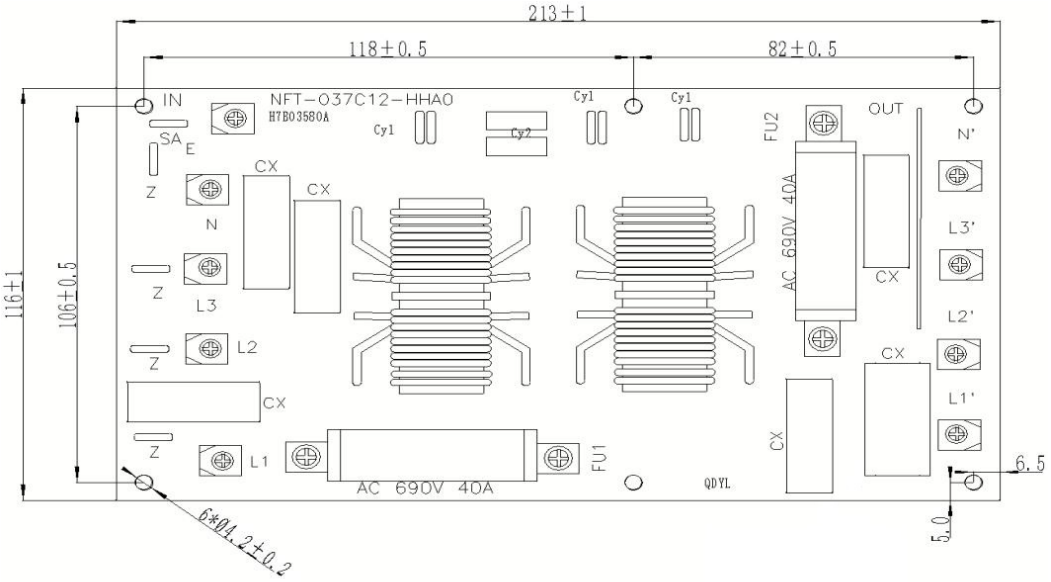
The noise filter decreases the leakage of noise made by the inverter to the power supply side. Terminals indicated with "OUTPUT" are connected to the inverter side and terminals indicated with "INPUT" to the power supply side.

380-415V 3N~ 50/60Hz (NF)

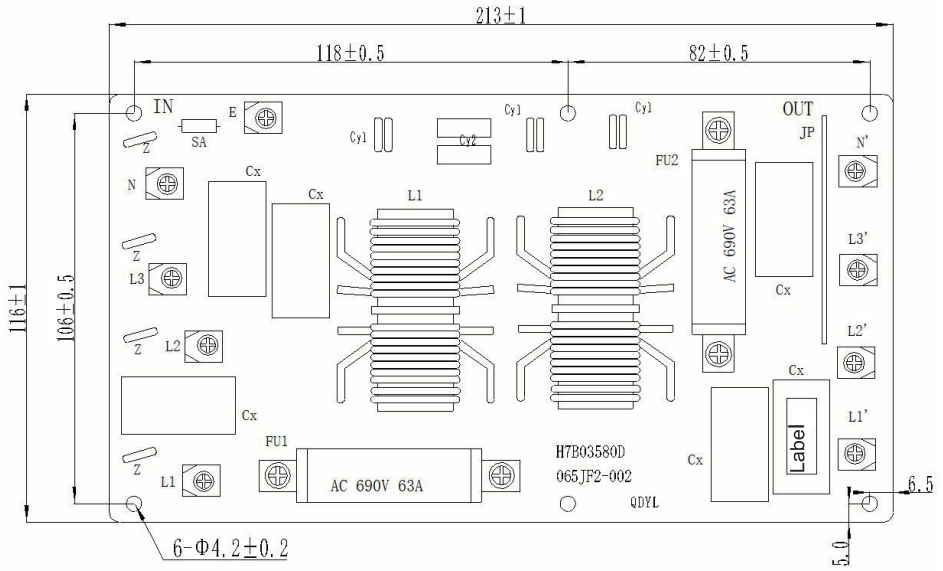
Items	Specification
Model	NFT-037C12-HHA0 / 065JF2-002
Rated Current	AC 380/415V, 37A
Permissible Temperature Range	-25°C to 60°C
Circuit Diagram	

RAS-080/090HNBSTQ

(mm)



RAS-100/110/120HNBSTQ



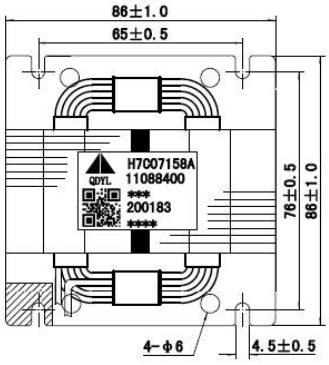
(Main Parts)

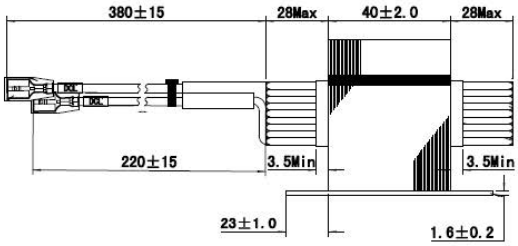
2.3.6 Reactor (DCL)

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

Model	RAS-080~120HNBSTQ
Items	Specification
Character	1.0mH ± 10% (at 1kHz)
Rated Current	AC 28A
Direct Current Resistance	30mΩ (at 20°C)
Permissible Temperature Range	-20°C to 60°C

RAS-080~120HNBSTQ (mm)





3. External Input/Output and Function Setting

3.1 DIP Switch Settings of Outdoor Unit

TURN ON the power supply before setting.

External input/output and function setting by the No.5 and 6 pins of DSW2 and push switches operated.

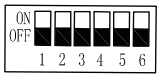
The "■" mark indicates the positions of DIP switches.

- **Initial Setting**

DSW2 Optional Function Setting

Setting is required.

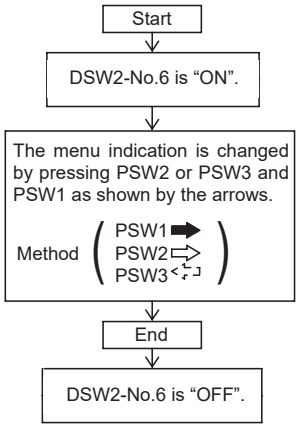
Setting Before Shipment

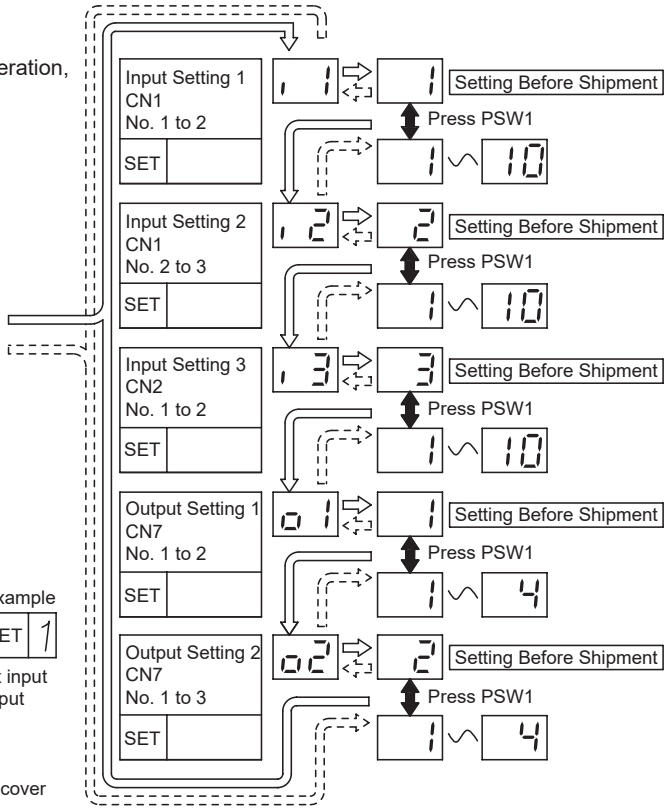


	Setting Item	Pin No.
1	Optional Function Setting	
2	External Input/Output Setting	

3.2 External Input / Output Setting Method

The setting should be performed during the outdoor unit stoppage.
This setting is not available during the operation, the check mode and the function setting.





NOTES:

1. Record the function No. of each setting when setting the optional function. The example is for setting 1.

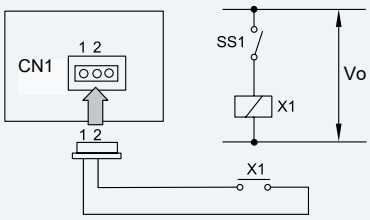
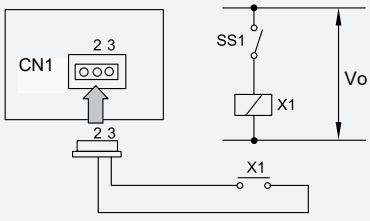
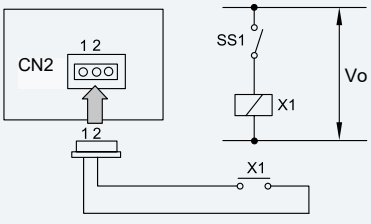
Example: SET | 1

2. The same function cannot be set to a different input terminal. If it is set, the setting of the larger input No. is not available.
   Record the setting No. on the nameplate “External Input/Output and Function Setting” attached to the reverse surface of the service cover as well.

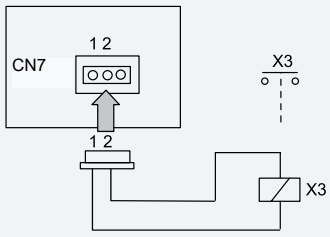
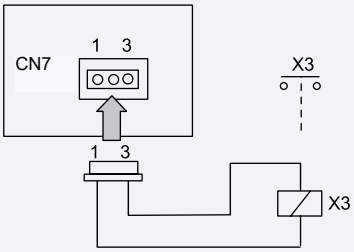
Connection

The system has the following connections: Vo=220~240V

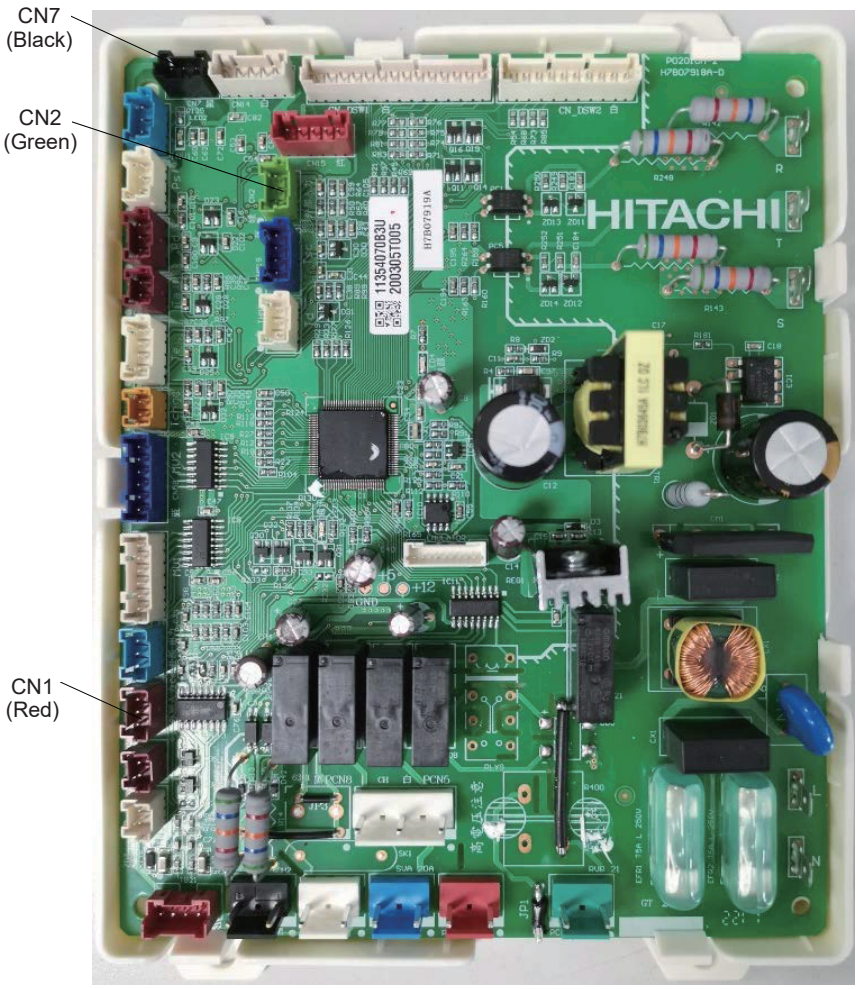
Input connections

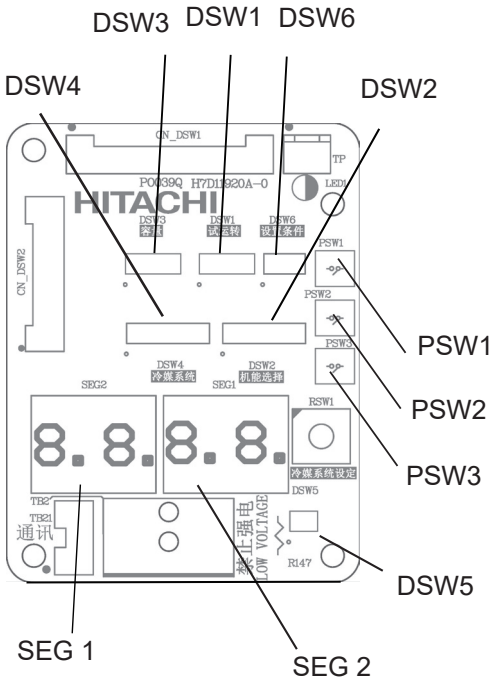
Indication	Connections
i1	
i2	
i3	

Output connections

Indication	Connections
o1	
o2	

Arrangement of Push Switches on PCB1





3.3 External Input and Output Settings

On the outdoor unit Printed Circuit Board (O.U.PCB), there are three input terminals (CN1, CN2 as shown below) to receive external signals and two output terminals (CN7 as shown below) to send signals out. Control functions shown in these tables are available when setting input and output terminals.

Input

Control Function No.	Setting Function for Input
1	Fixing Heating Operation Mode
2	Fixing Cooling Operation Mode
3	Demand Stoppage
4	Outdoor Fan Motor Start/Stop
5	Forced Stoppage
6	Demand Current Control 60%
7	Demand Current Control 70%
8	Demand Current Control 80%
9	Demand Current Control 100%
0	No Setting

Output

Control Function No.	Setting Function for Output
1	Operation Signal
2	Alarm Signal
3	Compressor ON Signal
4	Defrosting Signal
0	No Setting

The following functions have been already set before shipment.

Input/Output Terminal

Terminal Name	Connector (Pin No.)	Factory Setting	
		Control Function No.	Setting Function
Input Setting 1	CN1 (1-2)	1	Fixing Heating Operation Mode
Input Setting 2	CN1 (2-3)	2	Fixing Cooling Operation Mode
Input Setting 3	CN2 (1-2)	3	Demand Stoppage
Output Setting 1	CN7 (1-2)	1	Operation Signal
Output Setting 2	CN7 (1-3)	2	Alarm Signal

Note:

The same function cannot be set for different input terminals. If the function has been set, the setting with large function number will be cleared.

For example, if the setting contents of “Input Setting 1” and “Input Setting 2” are repeated, the setting contents of “Input Setting 2” will be cleared.

External Input Function Setting

The following signals can be received by the outdoor unit PCB. Refer to Table 3.1 below for the required main parts.

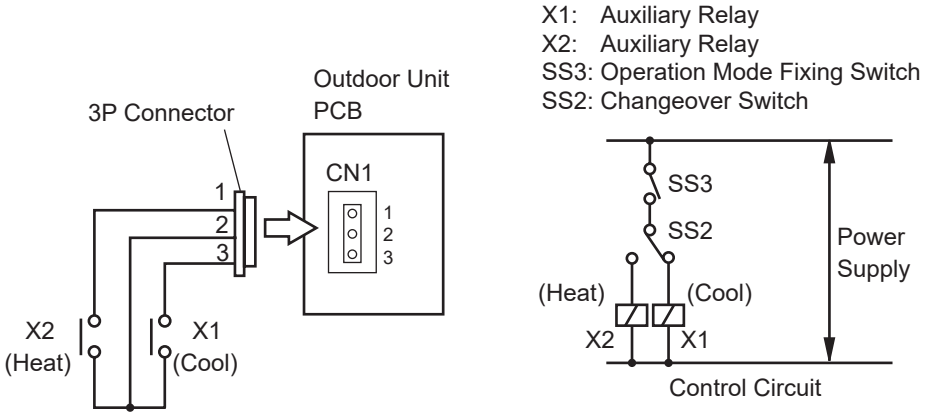
3.3.1 Input Fixing Heating Operation Mode (Control Function No.1)
Input Fixing Cooling Operation Mode (Control Function No.2)

When the input terminals for the setting operation mode on the outdoor unit PCB are short-circuited, the operation mode can be set at the cooling or heating mode.

Short Circuit between Terminals 1 and 2 of CN1: Fixed Heating Operation Mode
Short Circuit between Terminals 2 and 3 of CN1: Fixed Cooling Operation Mode

During this set heating (or cooling) mode, no cooling (or heating) operation is possible. The indoor units under the cooling or dry operation (or heating operation) will be changed to the Thermo-OFF condition during this mode, and stoppage code No. “20” is given.

• Setting Example
Fixing Heating Operation at "Input Setting 1" (between 1 and 2 pins of CN1)
Fixing Cooling Operation at "Input Setting 2" (between 3 and 2 pins of CN1)



Wiring Diagram Example of Fixing Operation Mode

3.3.2 Input Demand Stoppage (Control Function No.3)

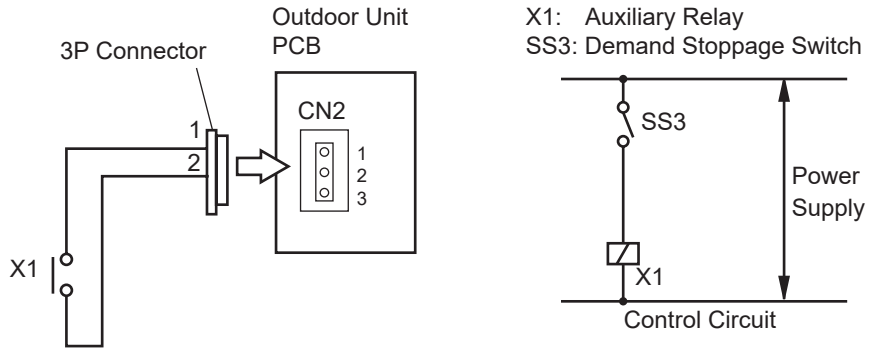
When the input terminals for Demand Stoppage on the outdoor unit PCB are short-circuited while running, the compressor is stopped. (In this case, the indoor unit(s) is put under Thermo-OFF condition. Cooling operation: Air-flow setting, Heating operation: Lo setting)

The stoppage code No. “10” is given. In this case, if the input terminals are opened, operation is resumed.

NOTE:

When demand control (ON/OFF) is performed, it is recommended that the control (ON/OFF) time is set appropriately according to the heat load. Also, set the demand control time approximately once in 15 minutes at the minimum in consideration for saving energy.

• Setting Example
Demand Stoppage at "Input Setting 3" (between 1 and 2 pins of CN2)

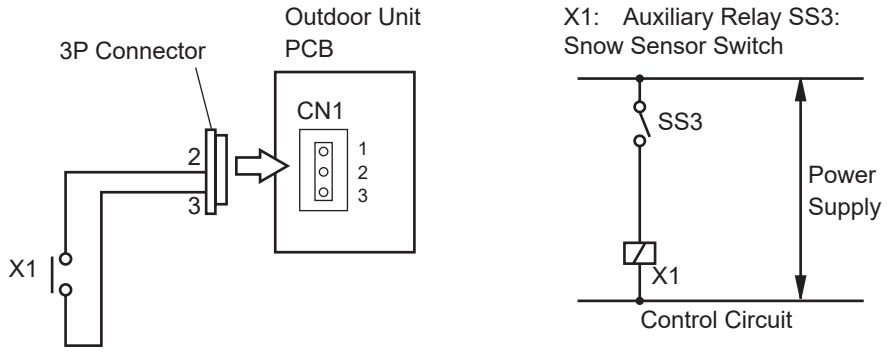


Wiring Diagram Example of Demand Stoppage

3.3.3 Input Outdoor Fan Motor Start/Stop (Control Function No.4)

This is an auxiliary function to protect the outdoor unit from snow. When the input terminals for Outdoor Fan Motor Start/Stop on the outdoor unit PCB are short-circuited during the compressor stoppage, if outdoor ambient temperature is 10°C or less, 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 the compressor power-OFF or thermo-OFF of the compressor power-ON). Therefore, this function will not be possible even if the input signal is sent during the normal cooling or heating operation.
An example of a basic wiring when “the Outdoor Fan Motor Start/Stop”(Control Function No.4) is set at “Input Setting 2”(between 2 and 3 pins of CN1) by an external signal is shown below.

• Setting Example
Outdoor Fan Motor Start/Stop at "Input Setting 2" (between 2 and 3 pins of CN1)



Wiring Diagram Example of Outdoor Fan Motor Start/Stop

NOTES:

1. 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 protection hood (optional). Otherwise, abnormal vibrations because of an imbalanced propeller fan will be caused.
2. This function can NOT operate the outdoor fan when outdoor ambient temperature is higher than (10°C).
3. If the fan motor fails during this function, stop all the outdoor fans to suspend this function. Check the alarm code and deal properly with the failure next time the compressor is operated.
4. 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 Outdoor Fan Motor Start/Stop intervals shall be at least 10 minutes.
   Otherwise, malfunction of the outdoor fan motors will be caused by frequent starts and stops.

⚠WARNING

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.

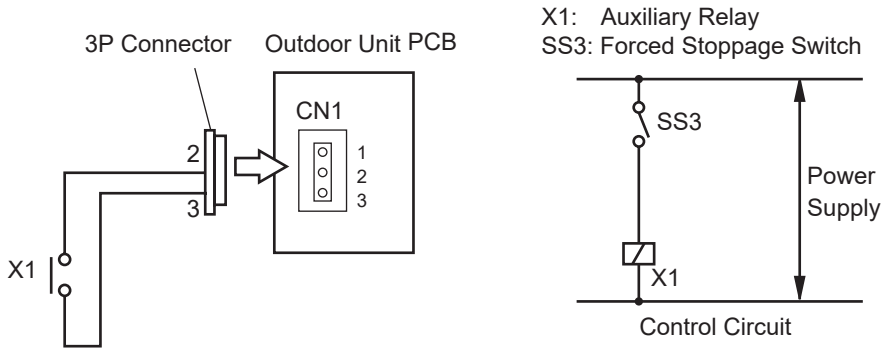
3.3.4 Input Forced Stoppage (Control Function No.5)

When the input terminals for Forced Stoppage on the outdoor unit PCB are short-circuited while running, the compressors and the indoor fan motors are stopped. The stoppage code No. “10” is given.
In this case, if the input terminals are opened, operation is resumed.

NOTE:
When demand control (ON/OFF) is performed, it is recommended that the control (ON/OFF) time is set appropriately according to the heat load. Also, set the demand control time approximately once in 15 minutes at the minimum in consideration for saving energy.

*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.

• Setting Example
Forced Stoppage at "Input Setting 2" (between 2 and 3 pins of CN1)



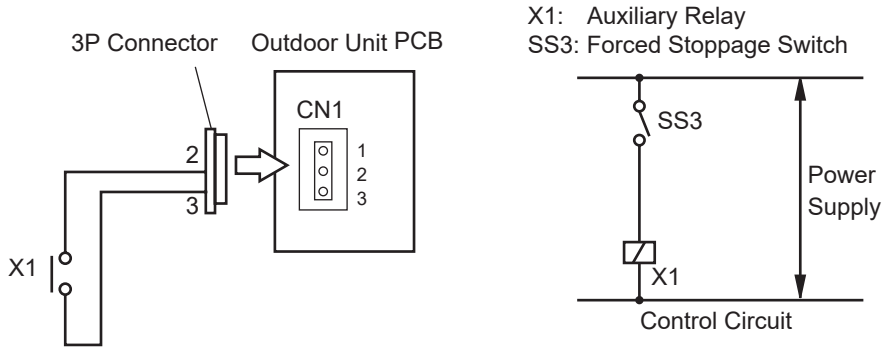
Wiring Diagram Example of Forced Stoppage

3.3.5 Input Demand Current Control 60%, 70%, 80%, 100% (Control Function No.6 to 9)

When the input terminals for Demand Current Control on the outdoor unit PCB are short-circuited, the compressor frequency is controlled so that the maximum limit of the outdoor running current is set to 100%, 80%, 70%, or 60% of the reference power consumption.
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.

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.

• Setting Example
Demand Current Control at "Input Setting 2" (between 2 and 3 pins of CN1), Control Function No. 6 to 9



Wiring Diagram Example of Demand Current Control

NOTE:

1. The Demand Current Control (%) is value criterion. The value used for this control is calculated from the current, and therefore is different from the value indicated by a wattmeter. If it is required that the maximum power consumption is managed precisely, a field-supplied demand controller should be used.
2. The actual value may temporarily be higher than the indicated value (by 60% to100%) depending on the operating control conditions such as protection control.

<The value of the control current>

Model	The Value (100%) /A
RAS-080HNBSTQ	9.5
RAS-090HNBSTQ	13.5
RAS-100HNBSTQ	14
RAS-110HNBSTQ	17
RAS-120HNBSTQ	17

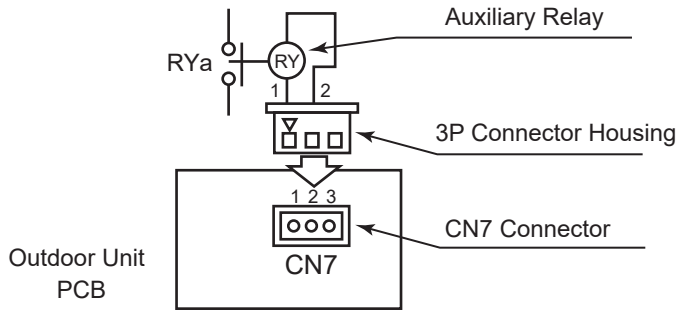
External Output Function Setting

The following signals can be picked up from the outdoor unit PCB. Refer to Table 3.2 for the required auxiliary relay.

3.3.6 Output Operation Signal (Control Function No.1)

This function is utilized to receive the operation signal.
Auxiliary relay contacting (RYa) is closed during the operation. The operation signal will be sent to output terminals when the indoor units are operating. (Even when one indoor unit is operating, the signal will be sent.) This function can be used for circulator or humidifier operation.

• Setting Example
Operation Signal at "Output Setting 1" (between 1 and 2 pins of CN7)

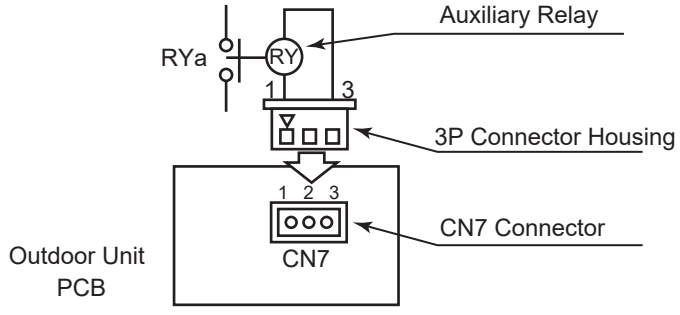


Wiring Diagram Example of Operation Signal

3.3.7 Output Alarm Signal (Control Function No.2)

This function is utilized to receive the alarm signal.
Auxiliary relay contacting (RYa) is closed when the alarm occurs. The alarm signal will be sent to output terminals when the alarm occurs from the indoor units. (The signal will be sent even when the alarm occurs from one indoor unit.)

• Setting Example
Alarm Signal at "Output Setting 2" (between 1 and 3 pins of CN7)

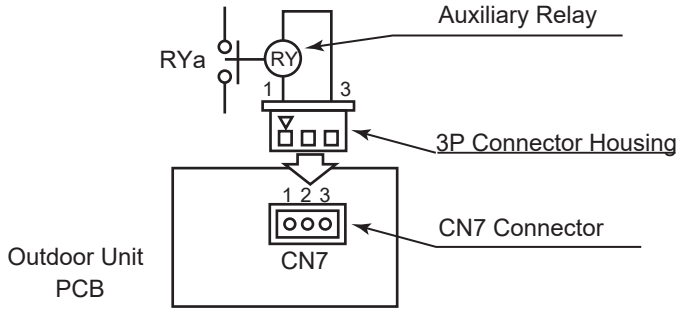


Wiring Diagram Example of Alarm Signal

3.3.8 Output Compressor ON Signal (Control Function No.3)

This function is utilized to receive the compressor operation signal. Auxiliary relay contacting (RYa) is closed during the compressor operation.

• Setting Example
Compressor ON Signal at "Output Setting 2" (between 1 and 3 pins of CN7)

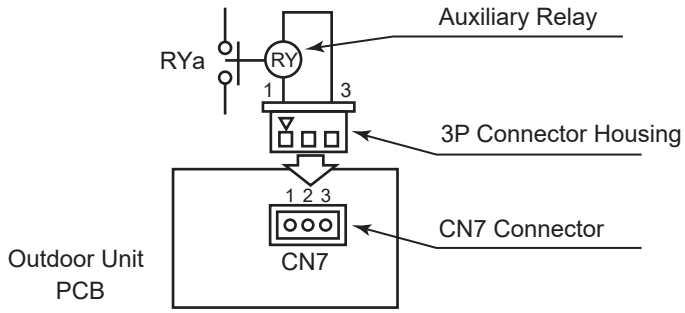


Wiring Diagram Example of Compressor ON Signal

3.3.9 Output Defrosting Signal (Control Function No.4)

This function is utilized to receive the defrosting signal. Auxiliary relay contacting (RYa) is closed during the defrosting.

• Setting Example
Defrosting Stoppage at "Output Setting 2" (between 1 and 3 pins of CN7)



Wiring Diagram Example of Defrosting Signal

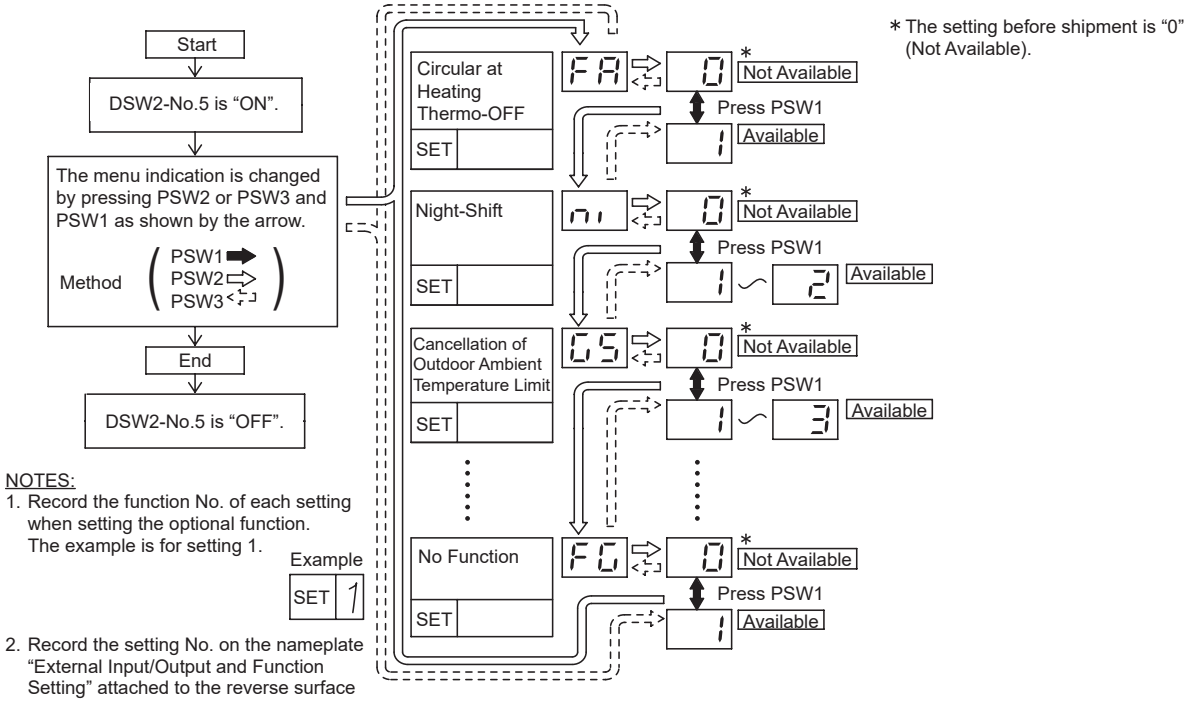
Table 3.2 Specifications of Required Auxiliary Relay

Parts	Specification
Auxiliary Relay *	High-Power Relay, LY2F DC12V made by OMRON

* Do not use the relay with diode built-in.
* Refer to Table 3.1 above for the connector parts.

3.4 Function Setting

The function setting should be performed during the outdoor unit stoppage. This setting is not available during External Input / Output Setting.



NOTES:

1. Record the function No. of each setting when setting the optional function. The example is for setting 1.

Example

SET	1

2. Record the setting No. on the nameplate “External Input/Output and Function Setting” attached to the reverse surface of the service cover as well.

3.4.1 Function Setting Item

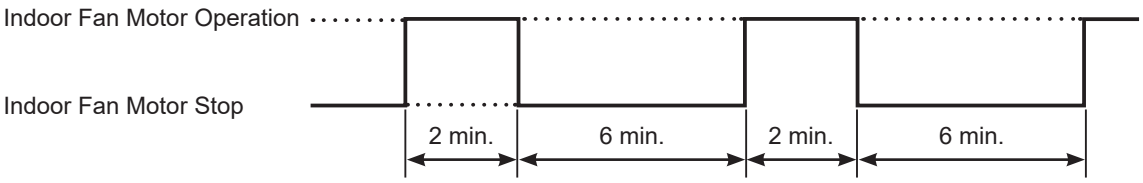
No.	Setting Item	7-Segment Display		Contents
		Item	No.	
1	Circulator Function at Heating Thermo-OFF	FA	00	No setting (continuously operation)
			01	Indoor fan forced ON and OFF (2min. ON/6min. OFF)
2	Night Shift (Low Noise)	Ni	00	No setting
			01	Setting night shift
			02	Setting of auto night shift
3	Cancellation of Outdoor Ambient Temperature Limit for Heating	GH	00	No setting
			01	Outdoor ambient temperature limit is ineffective
4	Cancellation of Outdoor Ambient Temperature Limit for cooling	GC	00	No setting
			01	Outdoor ambient temperature limit is ineffective
5	Defrost for Cold Area (Change of Defrost Condition)	Jo	00	No setting
			01	Condition 2 of defrost operation for cold area
6	SLo (IU Fan Speed) Defrost Setting	bJ	00	No setting (Indoor fan stoppage during defrost operation)
			01	Indoor fan SLo operation when heating operation is activated/during defrost operation
7	Cancellation of Hot Start	HT	00	No setting (Hot start control is available)
			01	Cancellation of hot start
8	Priority Capacity Mode for Cooling	cU	00	No setting
			01	Adjust the opening of the EVI and compressor speed to improve the cooling capacity
			02	Adjust the compressor speed to improve the cooling capacity for high ambient temperature
9	Priority Capacity Mode for Heating	hU	00	No setting
			01	Adjust the compressor speed to improve the heating capacity
10	Energy Saving Mode for Cooling	SC	00	No setting
			01	Energy saving mode is effective
11	Energy Saving Mode for Heating	SH	00	No setting
			01	Energy saving mode is effective
12	Low Noise Setting	dB	00	No setting
			01	Low noise setting mode 1 (The noise reduce 5dB)
13	Demand Function Setting	dE	00	No setting
			01	When input demand control setting,set value 100%.
			02	When input demand control setting,set value 80%.
			03	When input demand control setting,set value 60%.
14	Wave Function Setting	UE	00	No setting
			01	Rated current ratio 100% for 20 minutes / demand set rated current ratio (100% 80% / 60%) for 10 minutes.
15	Low Outlet Temperature Protection In Cooling Mode1	Fb	00	No setting
			01	Outlet temperature of indoor units≥15°C
16	Low Outlet Temperature Protection In Cooling Mode2	Fc	00	No setting
			01	Outlet temperature of indoor units≥10°C
17	Outlet air Temperature Control(Fresh Air Unit or AHU)	F2	00	No setting
			01	The mode setting is effective
18	Restrain Capacity Control(Fresh Air Unit or AHU)	F3	00	No setting
			01	The mode setting is effective

3.4.2 Circulator Function at Heating Thermo-OFF (Function Setting “FA”)

Press “PSW1” and select the setting conditions “0” or “1” in Circulator Function at Heating Thermo-OFF “ FA ”. Normally (“FA”=0), the fan speed is changed to “LOW” at heating Thermo-OFF. (It is possible for the room temperature to be too high at the heating Thermo-OFF.) However, the indoor fan motor is operated at “LOW” and stopped repeatedly by setting this function (“FA”=1).

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

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



* In this section, Thermo-ON/Thermo-OFF mean for the indoor unit.
  Thermo-ON: The indoor unit is running.
  Thermo-OFF: The indoor unit stays on, but doesn’t run.

3.4.3 Night Shift (Function Setting “ni”)

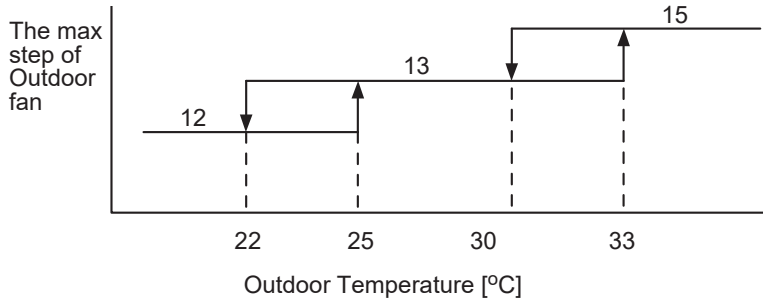
Press “PSW1” and select the setting condition “0” to “1” for the Night Shift or Auto Night Shift“ ni ”.
Then, this function can be set.

“ni”=1 reduces the upper limit of the outdoor fan rotation and the compressor frequency as shown below in cooling operation.

The Night Shift operation should be used if the capacity has the margin to be allowed for the capacity decrease and the low sound operation is required especially in the nighttime.

Night Shift ni=1

(1) Outdoor Fan



(2) Frequency Range (Cooling Operation)

Outdoor Unit Capacity (HP)		Maximum Frequency (Hz)		Maximum Frequency (Hz)	Target Operating Noise (dB)
8	When Night Shift is not Set ni=0	70	When Night Shift is Set ni=1	60	47
9		70		60	48
10		80		60	48
11		89		60	49
12		89		60	49

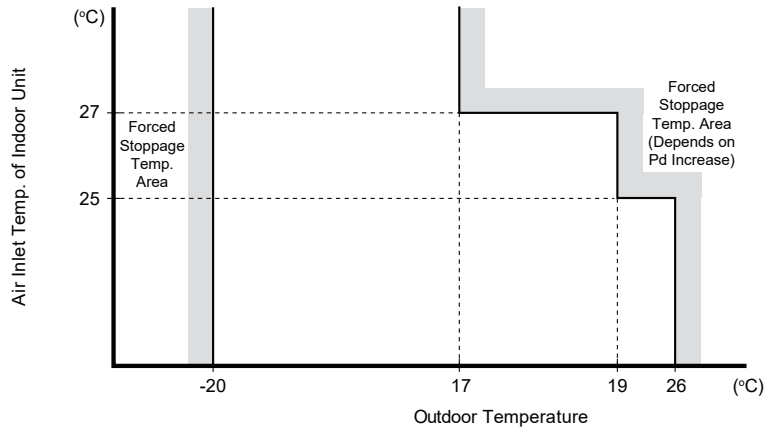
3.4.4 Cancellation of Outdoor Ambient Temperature Limit for Heating (Function Setting “GH”)

Press “PSW1” and select the setting condition “0” or to “1” for Cancellation of Outdoor Ambient Temperature limit “ GH ”. Then, this function can be set.
The heating operation is continued even under a high outdoor temperature.

“GH” Setting Condition	Operation Mode for Cancellation
0	Not Available (Default Setting)
1	Outdoor ambient temperature limit is ineffective

Heating Operation

The limitation of the permissible outdoor temperature area in heating operation (factory setting) shown in the figure at the right is cancelled.
NOTE:
When the outdoor ambient temperature limit for heating operation is cancelled, the operation may stop due to increasing high pressure since the protection control is not cancelled.
The outdoor ambient temperature limit for heating operation may be different depending on the outdoor unit model.



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, some alarm codes by abnormal operation may occur and the outdoor unit may be damaged since outdoor ambient temperature limit control is cancelled.
If the alarm codes occur frequently, contact your distributor or contractor.

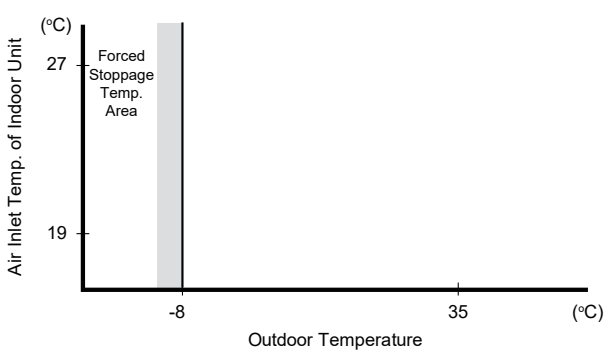
3.4.5 Cancellation of Outdoor Ambient Temperature Limit for cooling (Function Setting “GC”)

Press “PSW1” and select the setting condition “0” or “1” for Cancellation of Outdoor Ambient Temperature limit “ GC ”. Then, this function can be set.
The cooling operation is continued even under a low temperature.

“GH” Setting Condition	Operation Mode for Cancellation
0	Not Available (Default Setting)
1	Outdoor ambient temperature limit is ineffective

Cooling Operation

The limitation of the permissible outdoor temperature area in cooling operation (factory setting) shown in the figure at the right is canceled. However the upper limit for cooling operation can NOT be cancelled.
NOTE:
When the outdoor ambient temperature limit for cooling operation is cancelled, the operation may stop due to decreasing low pressure since the protection control is not cancelled.
The outdoor ambient temperature limit for heating operation may be different depending on the outdoor unit model.

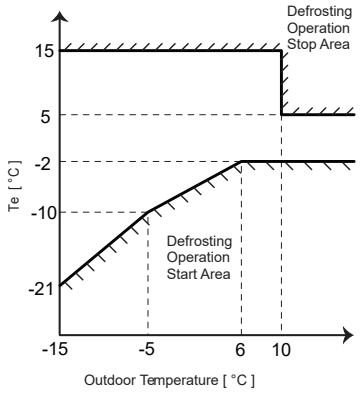
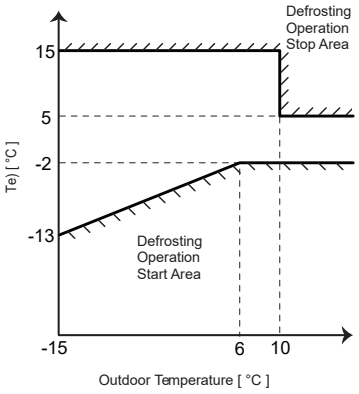


NOTE:

If this function is set and the outdoor unit operates in the operation stoppage area shown in the above figure for a long time, some alarm codes by abnormal operation may occur and the outdoor unit may be damaged since outdoor ambient temperature limit control is cancelled.
If the alarm codes occur frequently, contact your distributor or contractor.

3.4.6 Change of Defrost Condition (Function Setting “Jo”)

Press “PSW1” and select the setting condition “0” or “1” for Change of Defrost Condition “ Jo ”. This function changes the defrost condition as shown below.

“Jo” Setting Condition	Control for Standard When Change of Defrost Condition is NOT Set (”Jo”=0)`	Control for Cold Area When Change of Defrost Condition is Set (”Jo”=1)
Temperature Conditions under Defrosting Operation		

3.4.7 SLo Defrost Setting (Function Setting “bJ”)

Press “PSW1” and select the setting condition “0” or “1” at SLo Defrost Setting “ bJ ”.
Indoor fan operation is stopped during the defrost operation, after the defrost operation and at the start of the heating operation. However, this function allows indoor fan to operate at SLo speed during the defrost operation, after the defrost operation or at the start of the heating operation.

“bJ” Setting Condition	Indoor Fan Operation		
	at Start of Compressor Operation in Heating Operation	During Defrost Operation	After Defrost Operation
0	STOP	STOP	STOP
1	SLo Speed *1)	SLo Speed	SLo Speed *1)

NOTE:

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

3.4.8 Priority Capacity Mode for Cooling (Function Setting “cU”)

If the cooling capacity seems insufficient during the normal operation, press “PSW1” and select the setting condition “0” to “1” Priority Capacity Mode Setting “ cU ”. By setting this function, the target frequency of the compressor is set higher only for cooling operation.

“cU” Setting Condition	Target Frequency of Compressor
0	Not Available (Default Setting)
1	Default Setting +20%

NOTE:

1. The upper limit frequency of the compressor can NOT be changed by Priority Capacity Mode Setting.
2. Increase rates are approximate, these may change slightly depending on the outdoor unit model.

3.4.9 Priority Capacity Mode for Heating (Function Setting “hU”)

If the heating capacity seems insufficient during the normal operation, press “PSW1” and select the setting condition “0” or “1” at the Compressor Frequency Control Target Value for Heating “ hU ”. By setting this function, the initial frequency and PID control target of the compressor are set higher for heating operation.

“hU” Setting Condition	Compressor Frequency	
	Initial Frequency	Target Pd (PID control)
0	Default Setting	Depends on Ps (the maximum target Pd=2.9MPa)
1	Default Setting +20%	Always the maximum target Pd

NOTES:

1. Increase rates are approximate, these may change slightly depending on the outdoor unit model.
2. The maximum target Pd may decrease depending on the temperature difference between inlet temperature of indoor unit and setting temperature.

3.4.10 Low Noise Setting (Function Setting “dB”)

Press “PSW1” and select the setting condition “0” to “1” at the Low Noise Setting “dB” to reduce the upper limit of the compressor frequency and the outdoor fan rotation.

NOTES:

1. 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.
2. Reduction rates are approximate, these may change slightly depending on the outdoor unit model.

“dB” Setting Condition		Reduction Rate of Upper Limit
		Outdoor Fan Rotation
0	No Setting (Default)	100%
1	Low Noise Setting 1	80%

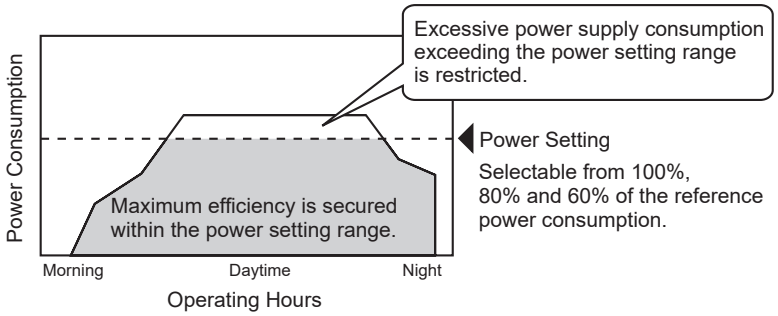
Outdoor Unit Capacity (HP)	Operating Noise (Target Value)	Capacity (Compared to dB=0)
8	50	80%
9	51	85%
10	51	80%
11	52	85%
12	52	85%

3.4.11 Demand Function Setting (Function Setting “dE”)

Press “PSW1” and select the setting condition “0” to “3”, so that Demand Function Setting “ dE ” can be set. 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 PCB. The table below shows the limit of the operating current for this function.

“dE” Setting Condition	Demand Running Current Control
0	Not Available (Default Setting)
1	Demand Running Current 100% Valid
2	Demand Running Current 80% Valid
3	Demand Running Current 60% Valid

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



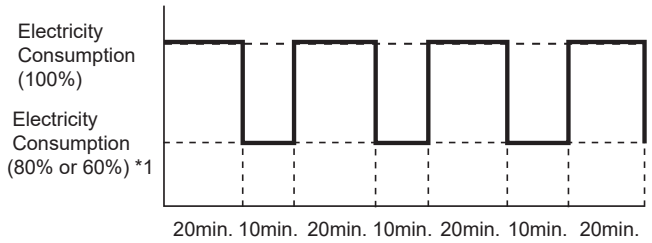
NOTES for Facility:

1. The demand current control (%) is value criterion. The value used for this control is calculated from the current, and therefore is different from the value indicated by a wattmeter. If it is required that the maximum power consumption is managed precisely, a field-supplied demand controller should be used.
2. The actual value may temporarily be higher than the indicated value shown above depending on the operating control conditions such as protection control.
3. 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.
4. The 100% current value please refer to “Service 3.3.5 Input Demand Current Control”.

3.4.12 Wave Function Setting (Function Setting “UE”)

Press “PSW1” and select the setting condition “0” or “1”, so that Wave Function Setting “ UE ” can be set. While this function is activated, the maximum limit of running current is changed from 100% to 80% or 60% depending on the setting of Demand Function Setting “ dE ” as shown in the figure.

“UE” Setting Condition	Wave Function
0	Not Available (Default Setting)
1	Valid wave function



NOTES:

1. The upper maximum limit is always Demand Current Control 100%.
   The lower maximum limit depends on Demand Function Setting “ dE ”.
2. 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 central controller, refer to the “Service Manual” or the “Installation and Maintenance Manual” for the central controller.

3.4.13 Low Outlet Temperature Protection In Cooling Mode1 (Function Setting “Fb”)

Press “PSW1” and select the setting condition “0” or “1” , so that Low Outlet Temperature Protection In Cooling Mode1 “ Fb ” can be set.

When the indoor unit outlet air temperature is less than 12°C at cooling operation, the compressor frequency forcibly decreases to prevent a drop in outlet air temperature.

“Fb” Setting Condition	Low Outlet Temperature Protection In Cooling Mode1	
	Compressor Frequency	Solenoid Valve for High/Low Pressure Bypass
0 (Default Setting)	-	-
1	Valid *1)	Valid *2)

NOTES:

*1) When “Fb”=1 is set, the compressor frequency decreases depending on outlet temperature of indoor unit.

*2) When “Fb”=1 is set, if outlet temperature has been less than 15°C for 3min., besides “NOTE” 1 above, the solenoid valve for high/low pressure bypass is opened to reduce refrigerant flow.

3.4.14 Low Outlet Temperature Protection In Cooling Mode2 (Function Setting “Fc”)

Press “PSW1” and select the setting condition “0” or “1” , so that Low Outlet Temperature Protection In Cooling Mode2 “ Fc ” can be set.

When the indoor unit outlet air temperature is less than 12°C at cooling operation, the compressor frequency forcibly decreases to prevent a drop in outlet air temperature.

“Fc” Setting Condition	Low Outlet Temperature Protection In Cooling Mode1	
	Compressor Frequency	Solenoid Valve for High/Low Pressure Bypass
0 (Default Setting)	-	-
1	Valid *1)	Valid *2)

NOTES:

*1) When “Fb”=1 is set, the compressor frequency decreases depending on outlet temperature of indoor unit.

*2) When “Fb”=1 is set, if outlet temperature has been less than 10°C for 3min., besides “NOTE” 1 above, the solenoid valve for high/low pressure bypass is opened to reduce refrigerant flow.

4. Field Work Instructions

Refer to Section 1 “Troubleshooting” when dealing with problems or difficulties. If you cannot solve the problem, contact your distributor or contractor.

4.1 Caution for Refrigerant Leakage

In the room where the packaged air conditioner is installed, the refrigerant gas should be controlled not to exceed the limit concentration in case of the refrigerant leakage.

The incombustible and non-toxic refrigerant R410A is adopted for this unit. If by any chance the refrigerant gas leaks and fills the room, it may lead to suffocation.
Accordingly, the refrigerant charging quantity is larger than general individual unit. ***Before the indoor unit installation, confirm that the room can keep the lower gas concentration than the limit value in order to take the emergency countermeasures when the gas leakage occurs.***

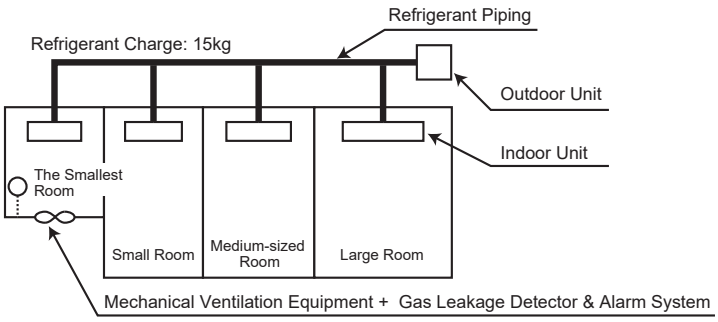
The limit concentration is calculated according to the following formula:

$$\frac{\text{Totally Charged Refrigerant Quantity in System (kg)}}{\text{Room Space for each Indoor Unit (m}^3\text{)}} \leq \text{Critical Concentration} \quad *$$

* This value should be decided according to the each country’s regulation.

If the room to install this unit is not able to keep the gas concentration lower than the limit value, please take the following actions.

- Make the effective opening for ventilation (such as opening without door or opening with over 0.15% of the floor area at the upper and lower part of the door) between one room and the next in order to keep the lower gas concentration than the limit.



NOTE:

1. The gas leakage quantity for each room (large, medium-sized, small and the smallest) should be calculated as 15kg.
2. The gas concentration of each room should not exceed the limit value. *

⚠ DANGER

HITACHI’s air conditioners are designed and manufactured based on using specified refrigerants.

The applicable refrigerants are specified for each unit’s models.

Using any refrigerants besides the specified refrigerants may cause mechanical problems, malfunction, and failure, and in the worst case, it endangers safety seriously and may cause a fire or an explosion. Therefore, Do not charge non-specified refrigerants or any of the following in the refrigerant system of a unit.

* Hydrocarbon Refrigerants such as Propane
* Oxygen, or Flammable Gases such as Acetylene
* Poisonous Gases

The types of refrigerants are indicated in the Installation and Maintenance Manuals, Engineering Manuals, Service Manuals, and the specification label for each unit.

Be aware that HITACHI Air Conditioning does not take any responsibility for unit failure, malfunction, or any accidents caused by charging non-specified refrigerants or others as noted above.

4.2 Maintenance Work

(1) For Outdoor Unit and Indoor Unit

(a) Fan and Fan Motor

- Lubrication - All fan motors are pre-lubricated and sealed at the factory. Therefore, no lubricating maintenance is required.
- Sound and Vibration - Inspect for abnormal sounds or vibration.
- Rotation - Check that the fan rotates counterclockwise and inspect the rotating speed.
- Insulation - Inspect for electrical insulation resistance.

(b) Heat Exchanger

- Clogging - Inspect for any accumulated dirt and dust and remove any at regular intervals. As for an outdoor unit, other obstacles such as growing grass and pieces of paper, which might interrupt air flow, should also be removed.

(c) Piping Connection

- Leakage - Inspect for refrigerant leakage at piping connections.

(d) Cabinet

- Stain and Lubricant - Inspect for any stain or lubricant and remove it, if any.
- Securing Screw - Inspect for loose or missing screws and secure or replace as required.
- Insulation - Inspect for peeling thermal insulation material on the cabinet and repair it, if any.

(e) Electrical Equipment

- Activation - Inspect for abnormal activation of the magnetic contactor, auxiliary relay, or printed circuit board (PCB).
- Line Condition - Pay attention to working voltage, amperage and phase balance.
  Inspect for faulty contact caused by loosened terminal connections, oxidized contacts, foreign matter, and other items. Inspect for electrical insulation resistance.

(f) Control and Protective Devices

- Setting - Do not readjust the setting in the field.

(2) For Outdoor Unit Only

(a) Compressor

- Sound and Vibration - Inspect for abnormal sounds or vibration.
- Activation - Check that the voltage drop of the power supply line is within 16% at start and within 2% during operation.

(b) Reversing Valve

- Activation - Inspect for any abnormal activating sound.

(c) Strainer

- Clogging - Check that there is no temperature difference between the ends

(d) Ground Wiring

- Ground Line - Inspect for continuity to the earth ground.

(3) For Indoor Unit Only

(a) Air Filter

- Cleaning - Inspect for, and remove, any accumulated dirt and dust and remove according to the “Engineering Manual”.

(b) Condensate Pan, Condensate Mechanism and Condensate Pipe

- Condensate Line - Inspect and clean the condensate line at least twice a year.
- Drain-Up Mechanism - Inspect for activation of drain-up mechanism.

(c) Float Switch

- Activation - Inspect for activation of float switch

4.3 Service and Maintenance Record by 7-Segment Display

Customer's Name _____ DATE: - -

Outdoor Unit Model (Serial No.)			(Serial No.)						(Serial No.)						
(1) Operation Mode															
(2) Test Run Start Time															
(3) Data Collect Start Time															
(4) Read Out Data from 7-Segment in Outdoor Unit															
Protection Control Code															
Checking Mode	Input/Output State of Outdoor Micro-Computer	SC	Y20A	Y21	Y52C	Fan2	Fan1	YCH	Y20A	Y21	Y52C	Fan2	Fan1	YCH	
	Total Capacity of Operating Indoor Unit	oP													
	Control Software No.	–													
	Inverter Software No.	–													
	Inverter Order Frequency to Compressor	H1													
	Outdoor Fan Step	Fo													
	Outdoor Expansion Valve Opening	oE1													
	High Pressure (Discharge Pressure)	Pd.													
	Low Pressure (Suction Pressure)	Ps.													
	Discharge Temperature	Td													
	Evaporating Temperature	TE													
	Ambient Air Temperature	To													
	Refrigerant Cooler Temperature	Tsc													
	Inverter Primary Current	A1													
	Inverter Secondary Current	A2													
	Checking for Indoor Unit: Indoor Unit Address	n-													
	Checking for Indoor Unit: Indoor Expansion Valve Opening	iE													
	Checking for Indoor Unit: Liquid Pipe Temperature of Indoor Unit	TL													
	Checking for Indoor Unit: Gas Pipe Temperature of Indoor Unit	TG													
	Checking for Indoor Unit: Indoor Unit Inlet Air Temperature	Ti													
	Checking for Indoor Unit: Indoor Unit Outlet Air Temperature	To													
	Checking for Indoor Unit: Cause Code of Indoor Unit Stoppage	d1													
	Accumulated Operating Time of Compressor	UJ1													
		cUJ1													
	Outdoor Unit Alarm Code	AC													
	Cause Code of Inverter Stoppage Total	iTc													
	Capacity of Indoor Unit Connected	CP													
	Connected Indoor Unit Number	AA													
	Refrigerant Address	GA													

NOTE:
Refer to Section "Service 1.2.1 Detail of 7-Segment Display" for items of checking mode.

4.4 Service and Maintenance Record by Wired Controller

Data Sheet for Checking by Wired Controller

Time				:	:	:	:	:
I.U. Model								
I.U. Serial No.								
I.U. No. / Alarm Code								
		Check Mode 1	Check Mode 2	1 • 2	1 • 2	1 • 2	1 • 2	1 • 2
B	Temp. Indication							
	Set Temp.	b1	- -					
	Inlet Air Temp.	b2	q1					
	Discharge Air Temp.	b3	q2					
	Liquid Pipe Temp.	b4	q3					
	Remote Thermistor Temp.	b5	- -					
	Outdoor Air Temp.	b6	q4					
	Gas Pipe Temp.	b7	q5					
	Evaporating Temp. at Heating	b8	q6					
	Condensing Temp. at Cooling	b9	q7					
	Comp. Top Temp.	bA	q8					
	Thermo Temp. of Wired Controller	bb	- -					
	Not Prepared	bC	- -					
C	Micro-Computer State Indication							
	I.U. Micro-Computer	C1	- -					
	O.U. Micro-Computer	C2	- -					
D	Stopping Cause State Indication							
	Cause Code of Indoor Unit Stoppage	d1	- -					
E	Alarm Occurrence							
	Times of Abnormality	E1	- -					
	Times of Power Failure	E2	- -					
	Times of Abnormal Communication	E3	- -					
	Times of Inverter Tripping	E4	- -					
F	Automatic Louver State							
	Louver Sensor State	F1	- -					
H	Pressure, Frequency State Indication							
	Discharge Pressure	H1	q9					
	Suction Pressure	H2	qA					
	Control Information	H3	qb					
	Operating Frequency	H4	qC					
J	I.U. Capacity Indication							
	I.U. Capacity	J1	- -					
	O.U. Code	J2	- -					
	Refrigerant System Number	J3	- -					
	Refrigerant System Number	J4	- -					
L	Opening of Expansion Valve							
	I.U. Expansion Valve	L1	qd					
	O.U. Expansion Valve 1	L2	qE					
	O.U. Expansion Valve 2	L3	- -					
	O.U. Expansion Valve B	L4	- -					

NOTE:

Refer to Section “Service 1.2.3 Check Mode by Remote Control Switch---1.2.3.1 checke mode” for items of check mode.

P	Compressor Condition Indication (Reference)							
	Comp. Current	P1	qF					
	Accumulated Operation Time of Comp.	P2	- -					
Q	Sensor Condition Indication							
	Motion Sensor Response Rate	q1	- -					
	Radiation Sensor Temp.	q2	- -					
	Motion Sensor1 Response Rate	q3	- -					
	Motion Sensor2 Response Rate	q4	- -					
	Motion Sensor3 Response Rate	q5	- -					
	Motion Sensor4 Response Rate	q6	- -					
	Setting Temp. Collected Value	q7	- -					

Client:	
Installation Date:	
System No.:	
Date Checked:	
Checked by:	

Result	

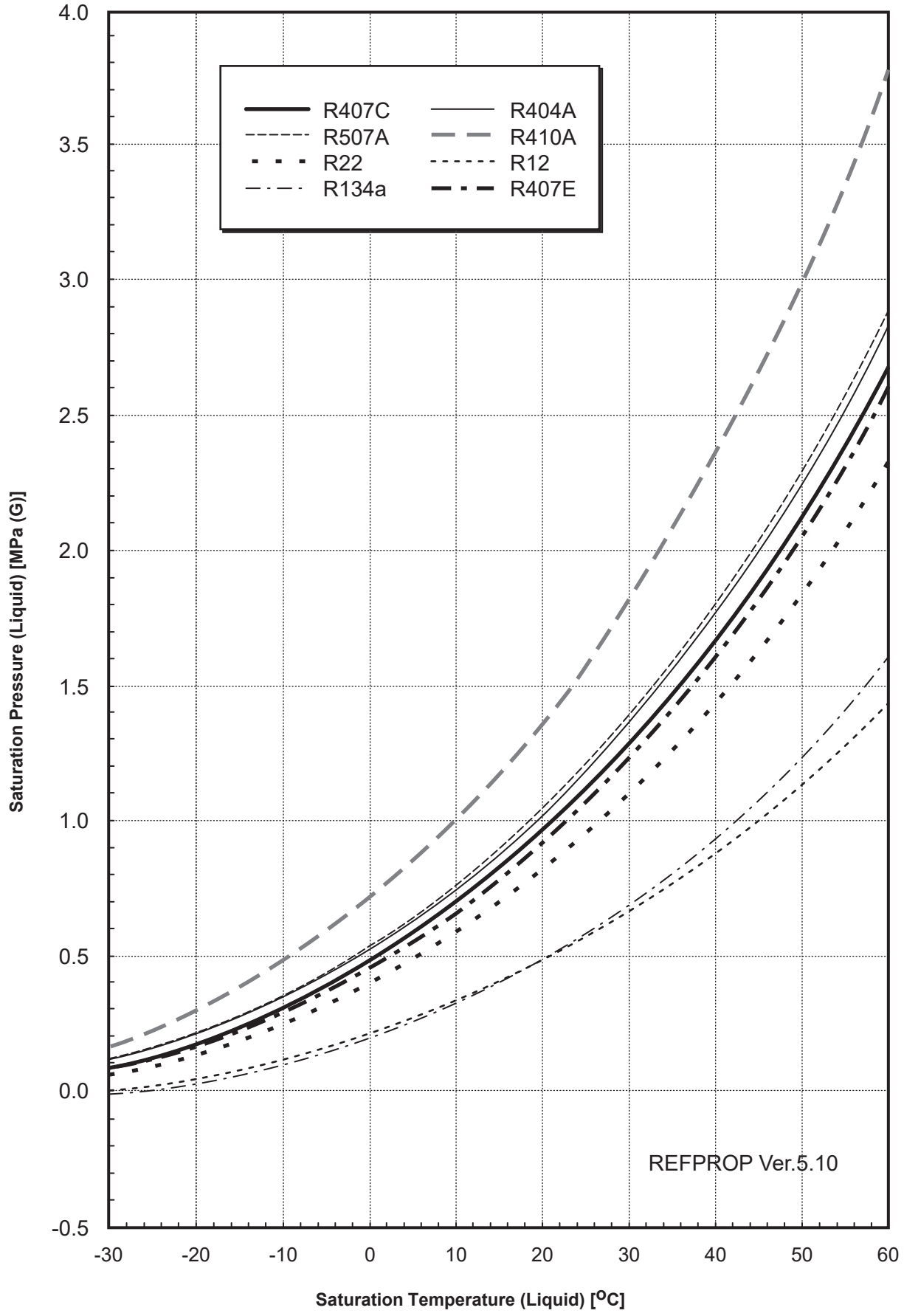
NOTE:
Refer to Section “Service 1.2.3 Check Mode by Remote Control Switch---1.2.3.1 checke mode” for items of check mode.

4.5 Service and Maintenance Record

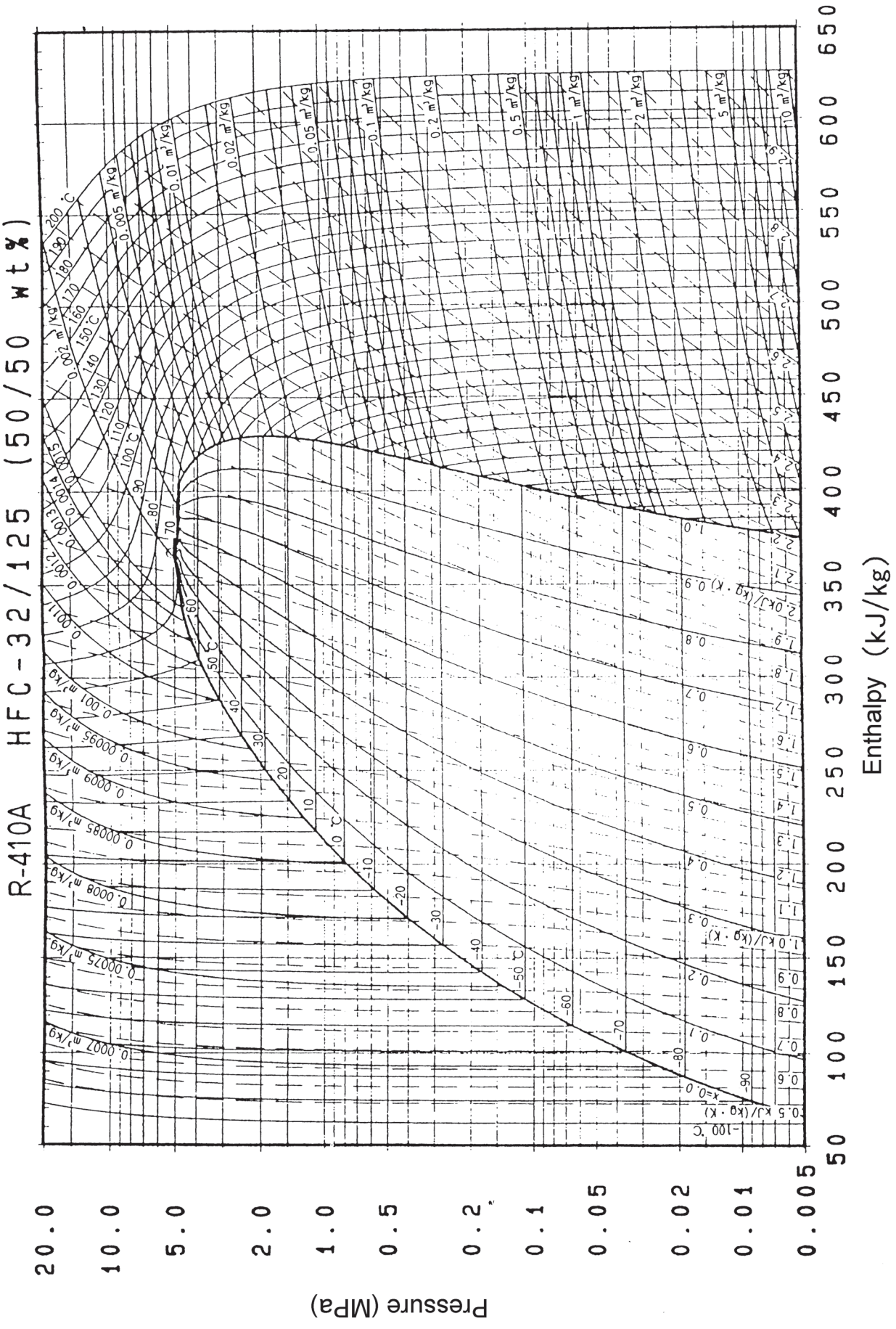
Service and Maintenance Record

No.	Check Item	Action	Judgment
1	Is service space sufficient?		YES or NO
2	Short Circuit of Discharged Air?		YES or NO
3	Any Heat Influence		YES or NO
4	Is ground wiring connected?		YES or NO
5	Refrigeration Piping		GOOD or NOT GOOD
6	Fixing of Units		GOOD or NOT GOOD
7	Any Damage on External or Internal Surface?		YES or NO
8	Checking of Screws and Bolts	Tighten them if they are loosened.	TIGHTENED or NOT TIGHTENED
9	Tightening of Terminal Screws	Tighten all terminal screws with a Phillips screwdriver.	TIGHTENED or NOT TIGHTENED
10	Are compressor terminals tightly fixed?	Check all compressor terminals are tightly fixed.	GOOD or NOT GOOD
11	Insulation Resistance	Measure insulation resistance with insulation resistance-meter. Comp. and Fan Motor: greater than 3MΩ Others: greater than 3MΩ	GOOD or NOT GOOD
12	Does condensate water smoothly flow?	Check for smooth flow of pouring water.	GOOD or NOT GOOD
13	Check for leakage at compressor.	Check for any leakage.	GOOD or NOT GOOD
14	Check for leakage at outdoor heat exchanger.	Check for any leakage.	GOOD or NOT GOOD
15	Check for leakage at indoor heat exchanger.	Check for any leakage.	GOOD or NOT GOOD
16	Check for leakage at reversing valve.	Check for any leakage.	GOOD or NOT GOOD
17	Check for leakage at check valve.	Check for any leakage.	GOOD or NOT GOOD
18	Check for leakage at accumulator.	Check for any leakage.	GOOD or NOT GOOD
19	Check for leakage at strainer.	Check for any leakage.	GOOD or NOT GOOD
20	Check for leakage at electronic expansion valve.	Check for any leakage.	GOOD or NOT GOOD
21	Check for leakage at piping.	Check for any leakage.	GOOD or NOT GOOD
22	Check direction of fans.	by Viewing or Airflow volume	GOOD or NOT GOOD
23	Voltage among each phase.	Check the voltage is within the specified range	GOOD or NOT GOOD
24	Vibration and Sound	Check fan, compressor, piping.	GOOD or NOT GOOD
25	Activation of Each Operation Mode	Check activation of COOL, HEAT, STOP and TEMP. switches.	GOOD or NOT GOOD
26	High Pressure Cut-out Switch	Check actual activation value.	GOOD or NOT GOOD
27	Check activation of drain-up mechanism.	Check it during cooling operation.	GOOD or NOT GOOD
28	Indoor Inlet Air Temp. (DB/WB)		°F DB/ °F WB
29	Indoor Outlet Air Temp. (DB/WB)		°F DB/ °F WB
30	Outdoor Inlet Air Temp. (DB/WB)		°F DB/ °F WB
31	Outdoor Outlet Air Temp. (DB/WB)		°F DB/ °F WB
32	High Pressure Sensor		psi(G)
33	Low Pressure Sensor		psi(G)
34	Operating Voltage		V
35	Operating Current		A
36	Instruction for Cleaning of Air Filter to Client		DONE or NOT YET
37	Instruction for Cleaning Method to Client		DONE or NOT YET
38	Instruction for Operation to Client		DONE or NOT YET

4.6 Saturation Curve for Refrigerant



4.7 The Pressure-enthalpy Diagram for R410A



5. Test Run

Turn OFF all the power supply switches.
Use a tester and make sure that all the switches are turned OFF.

Before test run, check that the unit is appropriately installed according to Installation & Maintenance Manual. After that, inspect the following items.

Check Item		Contents
1	Damage	Are the unit appearance and inside of the unit damaged?
2	Fan Motor	Is the fan motor runner mounted in the center of the casing? Is the fan motor mounted away from the casing? (The fan motor should NOT be touched with the casing.)
3	Screw Part	Are the screws loosened due to the vibration during transportation? Check that the screw part is fixed firmly when installing, especially for the screw of electrical wiring.
4	Refrigerant Leakage	Check that there is NO refrigerant leakage. The tightening part of pipe (flared part) may be loosened due to the vibration during transportation.
5	DSW Setting	Check the DSW setting is the same as before shipping.
6	Insulation*	Measure resistance between electrical component terminal and ground with a tester. It is normal if the resistance is 1MΩand over. If 1MΩ or less, do not perform the operation due to insulation failure of electrical charge part. Do NOT apply electricity to the terminal block of operating line. (Control PCB may be damaged.)
7	Stop Valve Fully Opening	Prior to test run, check that the stop valve of the outdoor unit is completely open.
8	Power Supply Phase	The operation is NOT available with the incorrect power phase order or lacking phase. • Alarm “05” will be indicated on the LCD of remote control switch. • “05” will be indicated on the 7-segment of outdoor unit. Check the power supply phase according to the caution label attached close to the outdoor unit terminal block or rear side of the service cover.
9	Turn ON Crankcase Heater *	After completion of the check item 1 to 8, turn ON the power supply of the outdoor unit. The electricity is supplied for the crankcase heater to warm the compressor. The compressor may be damaged without preheating. Therefore, the compressor should be activated after the power supply is turned ON for at least 12 hours.
10	Indoor and Outdoor Temperature	<For Use in both Cooling and Heating Operation> Is indoor temperature DB 27°C or less during heating operation? (Heating operation may not be operated due to the activation of the overload operation prevention under the ambient temperature of 19°C or over.) To perform the test run, set the test run mode by the remote control switch.

<* Insulation Resistance>

In case that the unit has been turned OFF for long periods, insulation resistance may decreases to 1MΩ or less because the refrigerant is retained in the compressor. Check the following points.

(a) Disconnect the cables of the compressor and measure the insulation resistance of the compressor itself. If the resistance is 1MΩ and over, insulation failure of other electrical charge part has occurred.

(b) If the resistance is 1MΩ or less, reconnect the compressor and turn ON the main power supply. The compressor will be warmed up automatically. Check the insulation resistance again after applying current for at least 1 hours. (Preheating time depends on the air condition, piping length or refrigerant condition.)

Before the leakage breaker is activated, check the rated capacity.

<* Stoppage of Compressor Operation>

The operation may not be available within 1 hours after turning ON the power supply due to the unheated crankcase (stoppage code: d1-22, the ambient temperature is below - 10°C). If the compressor should be within 1 hours, turn ON the power and wait for more than 30 seconds. Press PSW 1 on the outdoor PCB for more than 3 seconds. The forced thermo-OFF function (d1-22) is cancelled and the compressor operation is available.

5.1 Test Run

Refer to “Installation 7. Test Run” .

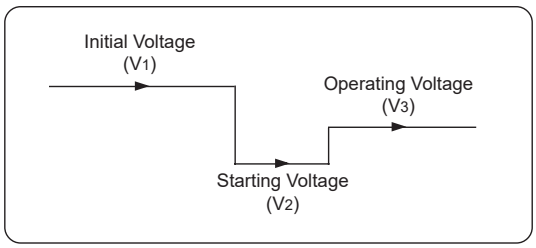
5.2 Checking the Test Run

(1) Indoor and Outdoor Fan
Check that the indoor fan and outdoor fan rotate correctly and the airflow is smooth.
Power Supply Voltage

(2) Check the power supply.
If the power supply is abnormal, contact the electric power company. Usually, voltage drop will occur when starting the operation as shown in the figure (V_2).
In order to protect the device, comply with the following normal range of the power supply voltage.
<Normal Range of Power Supply Voltage>

- Supply Voltage: Rated Voltage ≤ ±10%
- Starting Voltage (V_2): Rated Voltage ≥ -15%
- Operating Voltage (V_3): Rated Voltage ≤ ±10%

< Voltage Change >



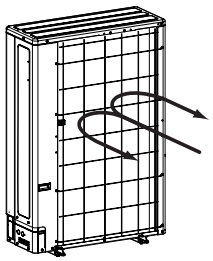
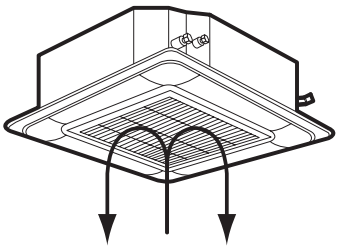
(3) Normal Operating Pressure
Normal operating low pressure is 0.2 to 1.1 MPa and normal operating high pressure (Pd) is 1.0 to 3.5 MPa when the refrigerant charge quantity is correct. Check the operation pressure in the test run mode.

(4) High Pressure Switch
Check the operation pressure of the high pressure switch in the table below.

Refrigerant	Operation Pressure
R410A	4.15MPa

(5) High Pressure Increase Retry (Protection Control)

(a) High pressure will increase when the following procedure is performed.

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

(b) If the high pressure retry control occurs three times or more within 30 minutes, alarm code “45” is indicated on the LCD of the wired controller or the 7-segment display of the outdoor unit PCB.

NOTE:
High pressure may not increase until the high pressure retry is activated because of the temperature condition.

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