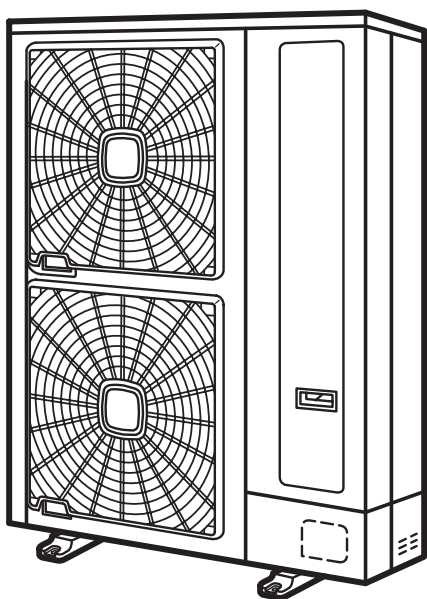


SERVICE MANUAL

INVERTER-DRIVEN MULTI-SPLIT SYSTEM HEAT PUMP AIR CONDITIONERS

Service Manual



< Outdoor Units >

(H,Y,C)VAHP036B21S

(H,Y,C)VAHP048B21S

(H,Y,C)VAHP060B21S

Important Notice

- Johnson Controls Inc. pursues a policy of continuing improvement in design and performance in its products. As such, Johnson Controls Inc. reserves the right to make changes at any time without prior notice.
- Johnson Controls Inc. cannot anticipate every possible circumstance that might involve a potential hazard.
- This heat pump air conditioning unit is designed for standard air conditioning applications only. Do not use this unit for anything other than the purposes for which it was intended for.
- The installer and system specialist shall safeguard against leakage in accordance with local pipefitter and electrical codes. The following standards may be applicable, if local regulations are not available. International Organization for Standardization: (ISO 5149 or European Standard, EN 378). No part of this manual may be reproduced in any way without the expressed written consent of Johnson Controls Inc.
- This heat pump air conditioning unit is operated and serviced in the United States of America and comes with a full complement of the appropriate Safety, Danger, and Caution, warnings.
- If you have questions, please contact your distributor or dealer.
- This manual provides common descriptions, basic and advanced information to maintain and service this heat pump air conditioning unit which you operate as well for other models.
- This heat pump air conditioning unit has been designed for a specific temperature range. For optimum performance and long life, operate this unit within the range limits according to the table below.

Temperature

		Maximum	Minimum
Cooling Operation	Indoor	89°F DB/73°F WB (32°C DB/23°C WB)	69°F DB/59°F WB (21°C DB/15°C WB)
	Outdoor	118°F DB (48°C DB) *1), *2)	14°F DB (-10°C DB) *3), *4)
Heating Operation	Indoor	80°F DB (27°C DB)	59°F DB (15°C DB)
	Outdoor	59°F WB (15°C WB) *5)	-4°F WB (-20°C WB) *6)

DB: Dry Bulb, WB: Wet Bulb

- *1) When the outdoor air temperature is 100°F DB (38°C DB) or more and the outdoor unit operation capacity ratio is 100% or more, the outdoor unit will be Thermo-OFF to protect the compressor from failure.
- *2) When the outdoor air temperature is 109°F (43°C) or more during the outdoor unit cooling operation, the maximum connectable indoor unit capacity ratio is 100%.
- *3) When the outdoor air temperature is 23°F (-5°C) or less during the outdoor unit cooling operation, the minimum connectable indoor unit capacity is 18,000 Btu/h. In this case, install the snow protection hood (optional).
- *4) When operating the outdoor unit under the low cooling load conditions and in the low outdoor air temperature, (approx. 50°F DB (10°C DB) or less), the indoor unit will be Thermo-OFF to prevent the heat exchanger of the indoor unit from being frosted.
- *5) When operating the outdoor unit under the low heating load conditions and the outdoor temperature is 59°F DB (15°C DB) or more, the outdoor unit will be Thermo-OFF to protect the compressor from failure.
- *6) Operation in the outdoor temperature of 5~-4°F WB (-15~-20°C WB) is assumed to limited conditions such as start-up in early morning. Long time operation in this condition may shorten the life of the compressor.

- This manual should be considered as a permanent part of the air conditioning equipment and should remain with the air conditioning equipment.

Product Inspection upon Arrival

1. Upon receiving this product, inspect it for any damages incurred in transit. Claims for damage, either apparent or concealed, should be filed immediately with the shipping company.
2. Check the model number, electrical characteristics (power supply, voltage, and frequency rating), and any accessories to determine if they agree with the purchase order.
3. The standard utilization for this unit is explained in these instructions. Use of this equipment for purposes other than what it designed for is not recommended.
4. Please contact your local agent or contractor as any issues involving installation, performance, or maintenance arise. Liability does not cover defects originating from unauthorized modifications performed by a customer without the written consent of Johnson Controls, Inc. Performing any mechanical alterations on this product without the consent of the manufacturer will render your warranty null and void.



1. Introduction

This manual concentrates on the Outdoor Heat Pump Unit. Read this manual carefully before installation. Read over the installation manual for the Indoor Unit also.


This manual should be considered as a permanent part of the air conditioning equipment and should remain with the air conditioning equipment.

(Transportation/Installation Work) > (Refrigerant Piping Work) > (Electrical Wiring Work) > (Ref. Charge Work) > (Test Run) > (User)

2. Important Safety Instructions

Signal Words	
 WARNING	Indicates a hazardous situation that, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates information considered important, but not hazard-related (for example, messages relating to property damage).

General Precautions

 WARNING	To reduce the risk of serious injury or death, read these instructions thoroughly and follow all warnings or cautions included in all manuals that accompanied the product and are attached to the unit. <i>Refer back to these safety instructions as needed.</i>
--	--

- This system should be installed by personnel certified by Johnson Controls, Inc. Personnel must be qualified according to local, state and national building and safety codes and regulations. Incorrect installation could cause leaks, electric shock, fire or explosion. In areas where Seismic "Performance requirements are specified, the appropriate measures should be taken during installation to guard against possible damage or injury that might occur in an earthquake if the unit is not installed correctly, injuries may occur due to a falling unit.
- Use appropriate Personal Protective Equipment (PPE), such as gloves and protective goggles and, where appropriate, have a gas mask nearby. Also use electrical protection equipment and tools suited for electrical operation purposes. Keep a wet cloth and a fire extinguisher nearby during brazing. Use care in handling, rigging, and setting of bulky equipment.
- When transporting, be careful when picking up, moving and mounting these units. Although the unit may be packed using plastic straps, do not use them for transporting the unit from one location to another. Do not stand on or put any material on the unit. Get a partner to help, and bend with your knees when lifting to reduce strain on your back. Sharp edges or thin aluminum fins on the air conditioner can cut fingers, so wear protective gloves.
- Do not touch or adjust any safety devices inside the indoor or outdoor units. All safety features, disengagement, and interlocks must be in place and functioning correctly before the equipment is put into operation. If these devices are improperly adjusted or tampered with in any way, a serious accident can occur. Never bypass or jump-out any safety device or switch.
- Johnson Controls will not assume any liability for injuries or damage caused by not following steps outlined or described in this manual. Unauthorized modifications to Johnson Controls products are prohibited as they...
 - May create hazards which could result in death, serious injury or equipment damage;
 - Will void product warranties;
 - May invalidate product regulatory certifications;
 - May violate OSHA standards;

NOTICE

Take the following precautions to reduce the risk of property damage.

- Be careful that moisture, dust, or variant refrigerant compounds not enter the refrigerant cycle during installation work. Foreign matter could damage internal components or cause blockages.
- If air filters are required on this unit, do not operate the unit without the air filter set in place. If the air filter is not installed, dust may accumulate and breakdown may result.
- Do not install this unit in any place where silicon gases can coalesce. If the silicon gas molecules attach themselves to the surface of the heat exchanger, the finned surfaces will repel water. As a result, any amount of drainage moisture condensate can overflow from the condensate pan and could run inside of the electrical box, possibly causing electrical failures.
- When installing the unit in a hospital or other facility where electromagnetic waves are generated from nearby medical and/or electronic devices, be prepared for noise and electronic interference Electromagnetic Interference (EMI). Do not install where the waves can directly radiate into the electrical box, controller cable, or controller. Inverters, appliances, high-frequency medical equipment, and radio communications equipment may cause the unit to malfunction. The operation of the unit may also adversely affect these same devices. Install the unit at least 10 ft. (approximately 3m) away from such devices.
- When a wireless controller is used, locate at a distance of at least 3.3 ft. (approximately 1 meter) between the indoor unit and electric lighting. If not, the receiver part of the unit may have difficulty receiving operation commands.
- Do not install the unit in any location where animals and plants can come into direct contact with the outlet air stream. Exposure could adversely affect the animals and plants.
- Do not install the unit with any downward slope to the side of the condensate pipe. If you do, you may have drain water flowing back which may cause leaks.
- Be sure the condensate hose discharges water properly. If connected incorrectly, it may cause leaks.
- Do not install the unit in any place where oil can seep onto the units, such as table or seating areas in restaurants, and so forth. For these locations or social venues, use specialized units with oil-resistant features built into them. In addition, use a specialized ceiling fan designed for restaurant use. These specialized oil-resistant units can be ordered for such applications. However, in places where large quantities of oil can splash onto the unit, such as a factory, even the specialized units cannot be used. These products should not be installed in such locations.

Installation Precautions

WARNING

To reduce the risk of serious injury or death, the following installation precautions must be followed.

- When installing the unit into...
 - A wall: Make sure the wall is strong enough to hold the unit's weight. 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, 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 wind baffle.
 - A snowy area: Install the outdoor unit on a raised platform that is higher than drifting snow. Provide snow protection hood.
- Do not install the unit in the following places. Doing so can result in an explosion, fire, deformation, corrosion, or product failure.
 - Explosive or flammable atmosphere
 - Where 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 sulfide 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 position the condensate pipe for the indoor unit near any sanitary sewers where corrosive gases may be present. If you do, toxic gases can seep into breathable air spaces and can cause respiratory injuries. If the condensate pipe is installed incorrectly, water leakage and damage to the ceiling, floor, furniture, or other possessions may result. If condensate piping becomes clogged, moisture can back up and can drip from the indoor unit. 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, level foundation for the unit to prevent water damage and abnormal vibration.
- 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 inside the unit being installed.
- During transportation, do not allow the backrest of the forklift make contact with the unit, otherwise, it may cause damage to the heat exchanger and also may cause injury when stopped or started suddenly.
- Remove gas inside the closing pipe when the brazing work is performed. If the brazing filler metal is melted with remaining gas inside, the pipes will be blown off and it may cause injury.
- Be sure to use nitrogen gas for an airtight test. If other gases such as oxygen gas, acetylene gas or fluorocarbon gas are accidentally used, it may cause explosion or gas intoxication.

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 left near the Indoor Unit.

Refrigerant Precautions



To reduce the risk of serious injury or death, the following refrigerant precautions must be followed.

- As originally manufactured, this unit contains refrigerant installed by Johnson Controls. Johnson Controls uses only refrigerants that have been approved for use in the unit's intended home country or market. Johnson Controls distributors similarly are only authorized to provide refrigerants that have been approved for use in the countries or markets they serve. The refrigerant used in this unit is identified on the unit's faceplate and/or in the associated manuals. Any additions of refrigerant into this unit must comply with the country's requirements with regard to refrigerant use and should be obtained from Johnson Controls distributors. Use of any non-approved refrigerant substitutes will void the warranty and will increase the potential risk of injury or death.
- If installed in a small room, take measures to prevent the refrigerant from exceeding the maximum allowable concentration in the event that refrigerant gases should escape. The installation should meet the requirements in ASHRAE Standards 15 and 34. If refrigerant gas has leaked during the installation work, ventilate the room immediately.
- Check the design pressure for this product is 601 psi (4.15MPa). The pressure of the refrigerant R410A is 1.4 times higher than that of the refrigerant R22. Therefore, the refrigerant piping for R410A shall be thicker than that for R22. Make sure to use the specified refrigerant piping. If not, the refrigerant piping may rupture due to an excessive refrigerant pressure. Besides, pay attention to the piping thickness when using copper refrigerant piping. The thickness of copper refrigerant piping differs depending on its material.
- The refrigerant R410A is adopted. The refrigerant oil tends to be affected by foreign matters such as moisture, oxide film, (or fat). Perform the installation work with care to prevent moisture, dust, or different refrigerant from entering the refrigerant cycle. Foreign matter can be introduced into the cycle from such parts as expansion valve and the operation may be unavailable.
- To avoid the possibility of different refrigerant or refrigerant oil being introduced into the cycle, the sizes of the charging connections have been changed from R407C type and R22 type. It is necessary to prepare the appropriate tools before performing installation work.
- Use refrigerant pipes and joints which are approved for use with R410A.
- A compressor/unit comprises a pressurized system. Never loosen threaded joints while the system is under pressure and never open pressurized system parts.

- Before installation is complete, make sure that the refrigerant leak test has been performed. If refrigerant gases escape into the air, turn OFF the main switch, extinguish any open flames and contact your service contractor. Refrigerant (Fluorocarbon) for this unit is odorless. If the refrigerant should leak and come into contact with open flames, toxic gas could be generated. Also, because the fluorocarbons are heavier than air, they settle to the floor, which could cause asphyxiation.
- When installing the unit, and connecting refrigerant piping, keep all piping runs as short as possible, and make sure to securely connect the refrigerant piping before the compressor starts operating. If the refrigerant piping is not connected and the compressor activates with the stop valve opened, the refrigerant cycle can become subjected to extremely high pressure, which can cause an explosion or fire.
- Tighten the flare nut with a torque wrench in the specified manner. Do not apply excessive force to the flare nut when tightening. If you do, the flare nut can crack and refrigerant leakage may occur.
- When maintaining, relocating, and disposing of the unit, dismantle the refrigerant piping after the compressor stops.
- When pipes are removed out from under the piping cover, after the insulation work is completed, cover the gap between the piping cover and pipes by a packing (field-supplied). If the gap is not covered, the unit may be damaged if snow, rain water or small animals enter the unit.
- Do not apply an excessive force to the spindle valve at the end of opening. Otherwise, the spindle valve flies out due to refrigerant pressure. At the test run, fully open the gas and liquid valves, otherwise, these devices will be damaged. (It is closed before shipment.)
- If the arrangement for outdoor units is incorrect, it may cause flowback of the refrigerant and result in failure of the outdoor unit.
- The refrigerant system may be damaged if the slope of the piping connection kit exceeds $\pm 15^\circ$.

Electrical Precautions



WARNING

Take the following precautions to reduce the risk of electric shock, fire or explosion resulting in serious injury or death.

- Highly dangerous electrical voltages are used in this system. Carefully refer to the wiring diagram and these instructions when wiring. Improper connections and inadequate grounding can cause serious injury or death.
- Perform all electrical work in strict accordance with this manual and all the relevant regulatory standards.
- Before servicing, open and tag all disconnect switches. Never assume electrical power is disconnected. Check with meter and equipment.
- Only use electrical protection equipment and tools suited for this installation.
- Use specified cables between units.
- The new air conditioner may not function normally in the following instances:
 - If electrical power for the new air conditioner is supplied from the same transformer as the external equipment* referred to below.
 - If the power source cables for this external equipment* and the new air conditioner unit are located in close proximity to each other.

external equipment*: (Example): A lift, container crane, rectifier for electric railway, inverter power device, arc furnace, electric furnace, large-sized induction motor and large-sized switch.

Regarding the cases mentioned above, surge voltage may be inducted into the power supply cables for the packaged air conditioner 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 conditioner unit.
- Communication cabling shall be a minimum of AWG18 (0.82mm²), 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 Johnson Controls guidelines. Plenum and riser ratings for communication cables must be considered per application and local code requirements.
- Use an exclusive power supply for the air conditioner at the unit's rated voltage.

- Be sure to install circuit breakers (ground fault interrupter, isolating switch, molded case circuit breaker and so on), with the specified capacity. Ensure that the wiring terminals are tightened securely to recommended torque specifications.
- Clamp electrical wires securely with a cable clamp after all wiring is connected to the terminal block. In addition, run wires securely through the wiring access channel.
- When installing the power lines, do not apply tension to the cables. Secure the suspended cables at regular intervals, but not too tightly.
- Make sure that the terminals do not come into contact with the surface of the electrical box. If the terminals are too close to the surface, it may lead to failures at the terminal connection.
- Turn OFF and disconnect the unit from the power source when handling the service connector. Do not open the service cover or access panel to the indoor or outdoor units without turning OFF the main power supply.
- After ceasing operation, be sure to wait at least five minutes before turning off the main power switch. Otherwise, water leakage or electrical breakdown may result. Disconnect the power source completely before attempting any maintenance for electrical parts. Check to ensure that no residual voltage is present after disconnecting the power source.
- Do not clean with, or pour water into, the controller as it could cause electric shock and/or damage the unit. Do not use strong detergent such as a solvent. Clean with a soft cloth.
- Check that the ground wire is securely connected. Do not connect ground wiring to gas piping, water piping, lighting conductor, or telephone ground wiring.
- If a circuit breaker or fuse is frequently activated, shut down the system and contact your service contractor.
- Perform all electrical work in accordance with this manual and in compliance with all regulations and safety standards.
- Do not open a service access cover or panel of an indoor or outdoor unit without first turning OFF the power at the main power supply.
- Residual voltage can cause electric shock. At all times, check for residual voltage after disconnecting from the power source before starting work on the unit.
- Use a Ground Fault Circuit Interrupter (GFCI) to reduce the chance of an electric shock.

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1. Installation

1.1 Outdoor Unit

Refer to the Installation Manual for Outdoor Unit (Mini VRF).

1.2 Optional Parts

1.2.1 For Outdoor Unit (Mini VRF)

- 1.2.1.1 Drain Adaptor: DBS-26**
- 1.2.1.2 Airflow Guide: AG-335A**
- 1.2.1.3 Wind Guard: WSP-160A**
- 1.2.1.4 Wind Prevention Tool: THS-335A**
- 1.2.1.5 Snow Protection Hood: ASG-SP11FCS2, ASG-SP11BAS2, ASG-SP11LAS3, ASG-SW20A**
- 1.2.1.6 Protection Net: PN-SP10C1**

1.2.2 Piping Kit

- 1.2.2.1 Multi-Kit between Indoor Units (Branch Type): MW-NP282A3**
- 1.2.2.2 Multi-Kit between Indoor Units (Multi Type): MH-NP224A, MH-NP288A**

For more information of the above Optional Parts, please refer to the Installation Manuals for each product.

2. Operation

Refer to the Operation Manual for Indoor Unit or Controller.

3. Troubleshooting

3.1 Initial Troubleshooting

3.1.1 Checking Electrical Wiring and Power Source

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

No.	Check Situation	Check Method
1	Is any power source breaker or fuse blown?	Check the voltage (Load side) of the breaker and also check the continuity of the fuse with a tester.
2	Is voltage at the secondary side of the transformer correct?	Disconnect at the secondary side of the transformer and measure voltage with 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 loose. <ul style="list-style-type: none">• The connection for thermistors• The connection for the wired controller cable• The connection for communication cable• Each connection for power source 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 source of optional parts because the fuse may blow out because of the power source failure.

- For Outdoor Unit

Example for Electrical Wiring Connection

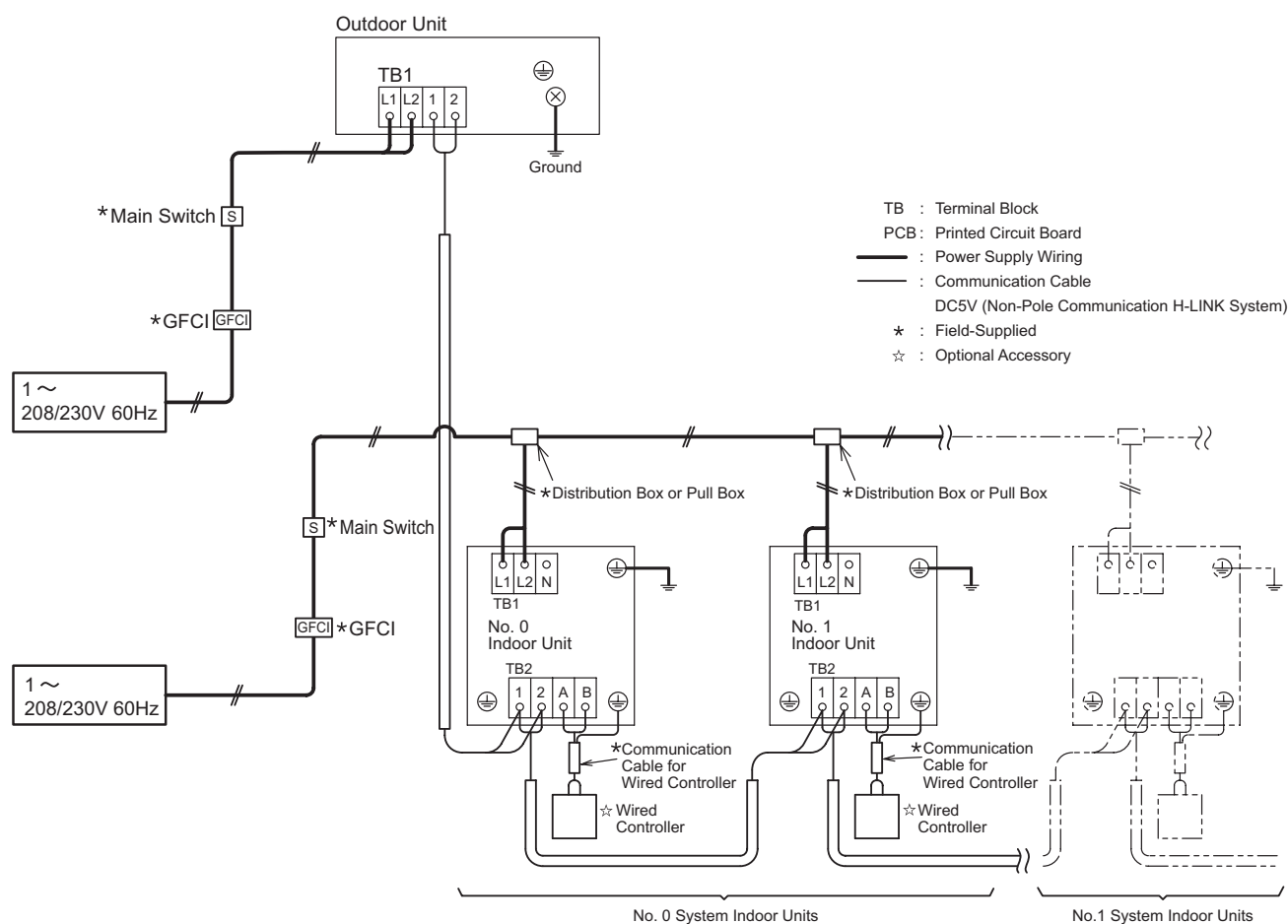


Figure 3.1 Instruction for Electrical Wiring Connection

Table 3.1 Electrical Characteristics and Recommended Wiring Size

Model	Outdoor Unit							INV Comp.	
	Hz [Hz]	Voltage [V]	Max. [V]	Min. [V]	MCA [A]	MOP [A]	Max. Fuse [A]	RLA [A]	LRA [A]
(H,Y,C)VAHP036B21S	60	208/230	253	188	31	40	40	24	30
(H,Y,C)VAHP048B21S	60	208/230	253	188	31	40	40	24	30
(H,Y,C)VAHP060B21S	60	208/230	253	188	31	40	40	24	30

Model	Fan Motor		Wiring Size			Conduit Tube
	Output [kW]	FLA [A]	Power Supply Wiring [AWG]	Ground Wiring [AWG]	Communication Cable [AWG]	for Power Supply Wiring [in. (mm)]
(H,Y,C)VAHP036B21S	0.058+0.058	0.5+0.5	8	8	18	3/4 (19.05)
(H,Y,C)VAHP048B21S	0.058+0.058	0.5+0.5	8	8	18	3/4 (19.05)
(H,Y,C)VAHP060B21S	0.058+0.058	0.5+0.5	8	8	18	3/4 (19.05)

MCA: Minimum Circuit Ampacity (A)

MOP: Maximum Overcurrent Protective Device (A)

RLA: Rated Load Ampacity (A)

LRA: Locked Rotor Ampacity (A)

FLA: Full Load Ampacity (A)

NOTES:

1. Select wire size based on the value of MCA.
2. MOP is used to select the fuse, circuit breaker, or a Ground Fault Circuit Interrupter (GFCI).
3. Communication cabling must be a minimum of AWG18 (0.82mm²), 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 Johnson Controls guidelines. Plenum and riser ratings for communication cables must be considered per application and local code requirements.

CAUTION

Install a multi-pole main switch with a space of 1/8 inch (3.5mm) or more between each phase.

NOTES:

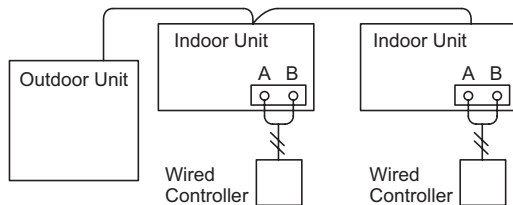
1. When the power supply wiring is longer, select the minimum wiring size when the voltage drop is within 2%.
2. Power voltage ranges are the following.
 - Supply Voltage: Rated Voltage within $\pm 10\%$
 - Starting Voltage: Rated Voltage within -15%
 - Operating Voltage: Rated Voltage within $\pm 10\%$
3. Do not connect the ground wiring to gas piping, water piping, or a lightning conductor.
 - Gas Piping: An explosion and ignition may occur if gas is escaping.
 - Water Piping: There is no effective electrical ground provided when hard vinyl piping is used.
 - Lightning Conductor: The electrical potential of the earth increases when a lightning conductor is used.

- For Indoor Unit

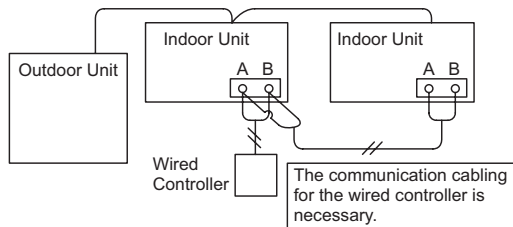
Refer to the Service Manual for Indoor Unit.

- Wired Controller Connecting Diagram

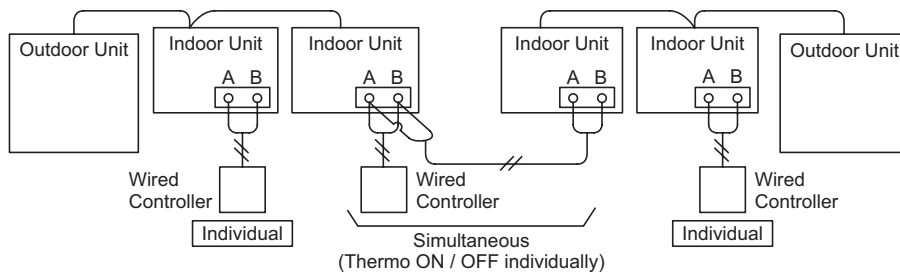
(a) Wired Controllers to each Unit for Individual Operation Setting



(b) One Wired Controller for Individual Operation Setting



(c) Connecting Wired Controller if Connecting between Individual Systems



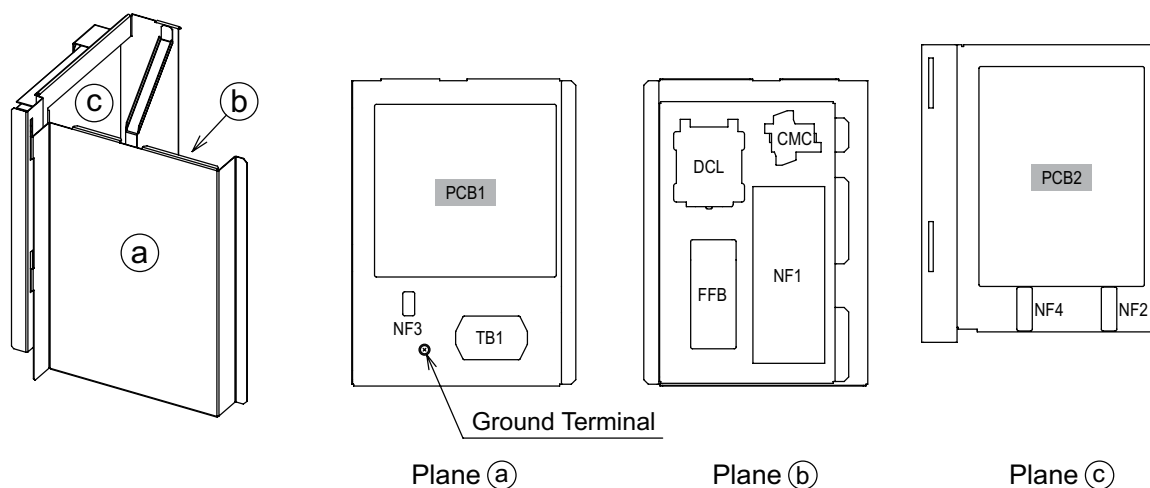
NOTE:

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.

3.1.2 Location of Printed Circuit Boards (PCBs)

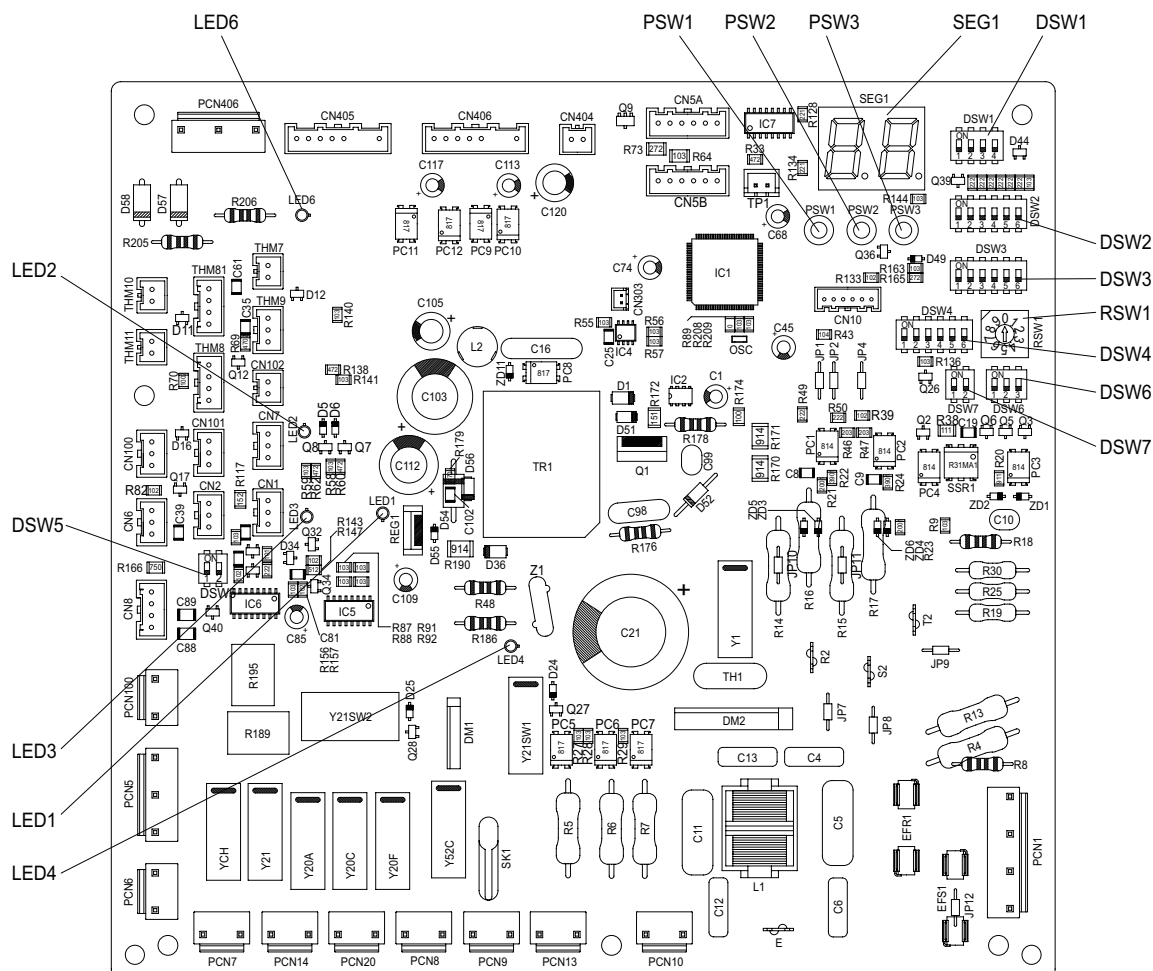
(1) Outdoor Unit



■ Purpose

Symbol	PCB	Purpose
PCB1	Outdoor Unit PCB (for Control)	<ol style="list-style-type: none"> 1. Communicating between Indoor Unit and Outdoor Unit 2. Processing Sensor Input 3. Processing DIP Switch Input 4. Operation Control for Above Items 1 to 3. Compressor Operation Control, Fan Control, Expansion Valve, Reversing Valve, Solenoid Valve, and Overcurrent Control 5. 7-Segment Indication 6. Processing of Safety Device Input 7. Processing of Relay Output 8. Reverse Phase Detection for Power Source
PCB2	Inverter PCB	<ol style="list-style-type: none"> 1. Inverter power part is driven by outdoor unit PCB to drive compressor. 2. Overcurrent Control 3. Protection Control for Inverter Part

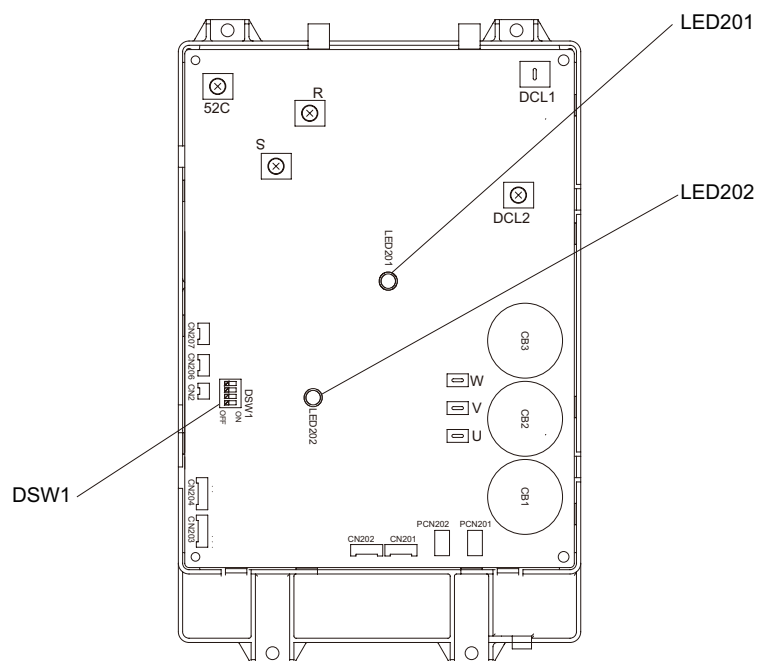
a. Control Printed Circuit Board: PCB1 (Outdoor Unit PCB)



* Further explanation of this diagram can be found on the next page.

Part Name		Function Information
LEDs	LED1 (Red)	Power Source Indicator for Outdoor Unit PCB (Low Voltage) Normal Condition: Activated / ON Abnormal Condition: Deactivated / OFF
	LED2 (Green)	This LED2 indicates the communication state between the outdoor unit PCB and inverter PCB. Normal Condition: Flashing Abnormal Condition: Activated / ON or Deactivated / OFF
	LED3 (Yellow)	This LED3 indicates the communication state between the indoor unit and outdoor unit. Normal Condition: Flashing Abnormal Condition: Activated / ON or Deactivated / OFF
	LED4 (Red)	Power Source Indicator for Outdoor Unit PCB (280VDC) Normal Condition: Activated / ON Abnormal Condition: Deactivated / OFF
	LED6 (Red)	Power Source Indicator for Outdoor Unit PCB (from PCB2) Normal Condition: Activated / ON Abnormal Condition: Deactivated / OFF
SEG	SEG1	This indicates: "Alarm", "Protective Safety Device has Tripped" or "Checking Items".

b. Inverter Printed Circuit Board: PCB2 (Inverter PCB)



Part Name	Function Information
LED201 (Red)	Power Source Indicator for Inverter PCB Normal Condition: Activated / ON Abnormal Condition: Deactivated / OFF
LED202 (Yellow)	This indicates the state of the microcomputer. Normal Condition: Activated / ON Abnormal Condition: Deactivated / OFF

• DSW1

No setting is required.

When setting the No.1 pin to ON, the electric current detection is canceled.
The No.1 pin should be set back to OFF after electrical work.



3.1.3 Checking 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 Run

Setting is required. For Test Run

Setting Before Shipment

Setting Item	Pin No.
Test Cooling Operation	1
Test Heating Operation	1, 2
No setting is required	3
Compressor Forced Stop and Function Setting	4

DSW2 | Function Setting

Setting is required.

Setting Before Shipment

Setting Item	Pin No.
No setting is required	1
	2
	3
	4
Function Setting	5
External Input/Output Setting	6

DSW3 | Capacity and Power Supply Setting

Power Supply	Capacity (MBH)		
	036	048	060
208V	ON Setting is required. 1 2 3 4 5 6	ON 1 2 3 4 5 6	ON 1 2 3 4 5 6
230V	ON No setting is required. 1 2 3 4 5 6	ON 1 2 3 4 5 6	ON 1 2 3 4 5 6

DSW4 | Ref. System No. Setting

Setting is required.

Setting Before Shipment

Setting Position

DSW4

Tens Digit

Last Digit

RSW1

Set the unit number of outdoor unit at each refrigerant system.
(Setting before shipment is unit 0.)

DSW5 | Communication Setting

Setting is required. For End Terminal Resistance Cancellation

Set No.1 pin of DSW5 correctly in the same H-LINK system.
Otherwise, it may cause abnormal transmission.
Refer to "Setting of End Terminal Resistance"

Setting Before Shipment

End Resistance Cancellation

DSW6 | -

No setting is required.

Setting Before Shipment

DSW7 | -

No setting is required.

Setting Before Shipment

- **Setting for Communication**

Setting system numbers and end terminal resistance are requirements for this H-LINK system.

- **Setting of Outdoor Unit No.**

If there are combined outdoor units, set DSW6 as shown below.

- **Setting of Refrigerant System Numbers**

In the same refrigerant system, set the same system number for the outdoor unit and the indoor units as shown below.

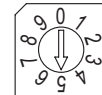
As for setting the indoor unit refrigerant system number, set RSW2 and DSW5 on the indoor unit PCB.

	Setting Switch	
	10 digit	1 digit
Outdoor Unit	DSW4	RSW1
Indoor Unit	DSW5	RSW2

Ex.: Instance of Setting Refrigerant System No. 25



Turn ON No. 2 pin.



Set Dial No.5.

DSW and RSW factory setting is 0. Maximum in setting refrigerant system numbers is 63.

Maximum Number of Connectable Outdoor Units and Indoor Units

Outdoor Unit	64
Indoor Unit	160

● Setting of End Terminal Resistance

Before shipment, No.1 pin of DSW5 is set to “ON”. If the quantity of outdoor units in the same H-LINK II is 2 or more, set No.1 pin of DSW5 to “OFF” from the 2nd refrigerant group outdoor unit. If only one outdoor unit is used, no setting is required.

Setting of End Terminal Resistance

DSW5

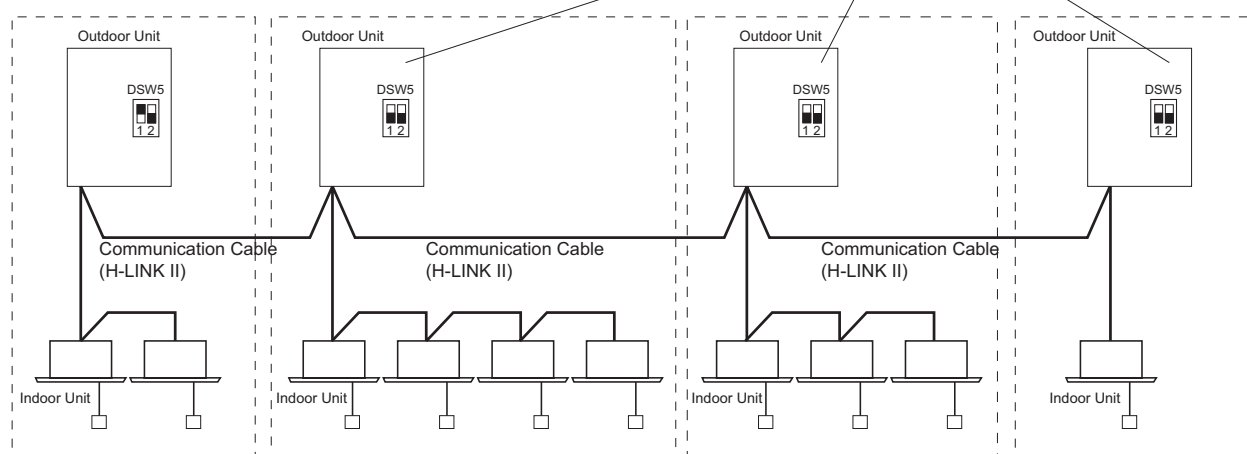
Before Shipment



Cancellation



Turn OFF DSW5 No.1 pin to cancel the end terminal resistance setting.



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

● DSW7 Setting for Rated Voltage

Use the DSW3 No.5 pin to set the power supply voltage for the outdoor unit as shown at the right.

When the site power supply voltage is 208V, setting the DSW3 No.5 pin is required.

NOTES:

1. Verify the DSW setting matches the same voltage as the power supply.
2. All the pins other than the No.5 pin stay the same.
(Refer to the Figure 5.1 DSW Setting)

Power Supply Voltage	DSW3 Setting
280V Setting is required.	<div>ON OFF</div>
230V No setting is required.	<div>ON OFF</div>

3.1.4 Checking Wired Controller

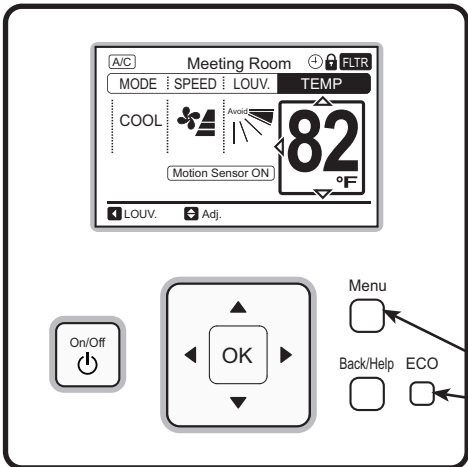
Wired Controller Model: CIW01

Each “Check Menu” item and its function are explained in the following table.

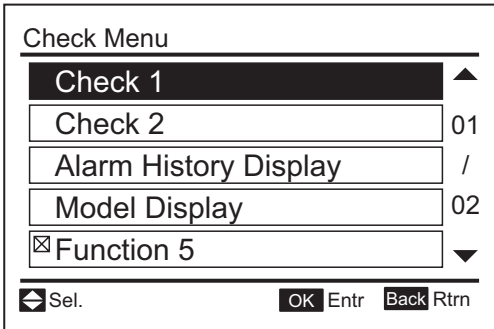
Check Menu Item	Function
Check 1	Sensor condition of air conditioner are monitored and indicated.
Check 2	Sensor data of air conditioner prior to alarm occurrence is indicated.
Alarm History Display	Previous alarm record (date, time, alarm code) is indicated.
Model Display	Model name and manufacturing number are indicated.
I.U./O.U. PCB Check	The result of PCB check is indicated.
Self Checking	Checking of wired controller is carried out.

● Setting Method

Normal Mode Display

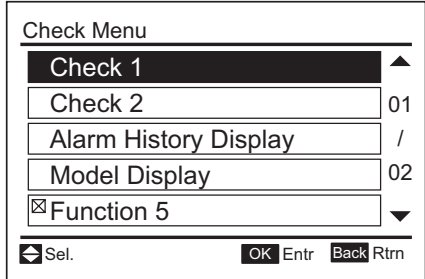
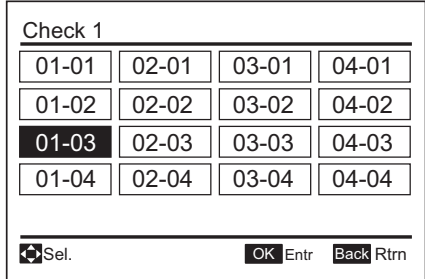
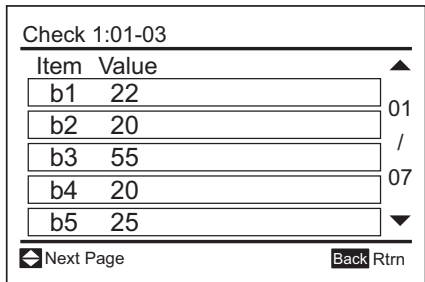
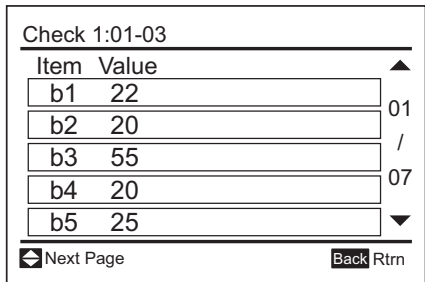


Check Menu Display



Press and hold “Menu” and “ECO” simultaneously for three seconds during the normal mode.

(1) Check 1 and Check 2

<p>(1) Press and hold “Menu” and “ECO” simultaneously for three seconds during the normal mode. The Check Menu is displayed.</p>	
<p>(2) Select “Check 1” (or “Check 2”) from the Check Menu and press “OK”.</p>	
<p>(3) Select the Set Indoor Unit by pressing “△ ▽ ◀ ▶” and press “OK”. This screen is NOT displayed when there is only one indoor unit connected with the wired controller. In this case, (4) below is displayed.</p>	
<p>(4) Press “△” or “▽” to change the screen.</p>	

Features of Check Mode 1

No.	Item	Data Name
1	b1	Set Temp.
2	b2	Inlet Air Temp.
3	b3	Discharge Air Temp.
4	b4	Liquid Pipe Temp.
5	b5	Remote Thermistor Temp.
6	b6	Outdoor Air Temp.
7	b7	Gas Pipe Temp.
8	b8	Evaporating Temp. at Heating
9	b9	Condensing Temp. at Cooling
10	bA	Comp. Top Temp.
11	bb	Thermo Temp. of Wired Controller
12	bC	Not Prepared
13	C1	I.U. Micro-Computer
14	C2	O.U. Micro-Computer
15	d1	Cause Code of Indoor Unit Stoppage
16	E1	Times of Abnormality
17	E2	Times of Power Failure
18	E3	Times of Abnormal Communication
19	E4	Times of Inverter Tripping
20	F1	Louver Sensor State
21	H1	Discharge Pressure

No.	Item	Data Name
22	H2	Suction Pressure
23	H3	Control Information
24	H4	Operating Frequency
25	J1	I.U. Capacity *2
26	J2	O.U. Code
27	J3	System Number (1)
28	J4	System Number (2)
29	L1	I.U. Expansion Valve
30	L2	O.U. Expansion Valve 1
31	L3	O.U. Expansion Valve 2
32	L4	O.U. Expansion Valve B
33	P1	Comp. Current
34	P2	Accumulated Operation Time of Comp.
35	q1	Motion Sensor Reaction Rate *1
36	q2	Radiation Sensor Temp. *1
37	q3	Motion Sensor 1 Reaction Rate *1
38	q4	Motion Sensor 2 Reaction Rate *1
39	q5	Motion Sensor 3 Reaction Rate *1
40	q6	Motion Sensor 4 Reaction Rate *1
41	q7	Setting Temp. Collected Value

*1: The average value for 30 seconds (update cycle time of Check Mode) is displayed on the LCD.

*2: I.U. Capacity Table is below.

Indication	Type (Capacity) [x 1000 Btu/h]	Refrigeration Ton [RT]
6	006	0.5
8	008	0.7
11	012	1.0
16	015	1.3
20	018	1.5
26	024	2.0
32	030	2.5
40	036	3.0
48	048	4.0

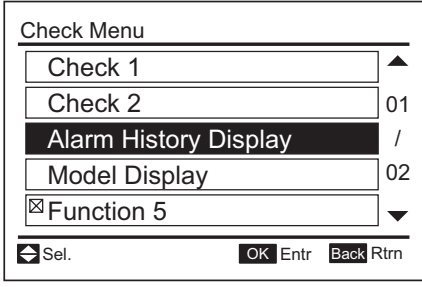
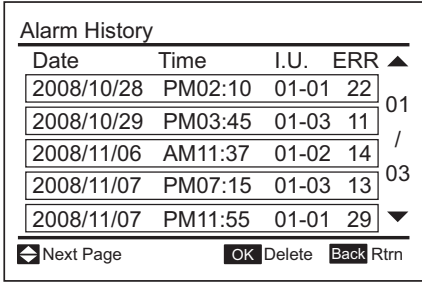
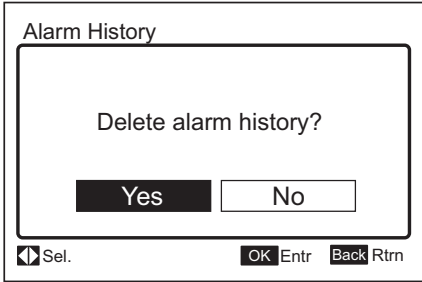
Features of Check Mode 2

No.	Item	Data Name
1	q1	Inlet Air Temp.
2	q2	Discharge Air Temp.
3	q3	Liquid Pipe Temp.
4	q4	Outdoor Air Temp.
5	q5	Gas Pipe Temp.
6	q6	Evaporating Temp. at Heating
7	q7	Condensing Temp. at Cooling
8	q8	Comp. Top Temp.

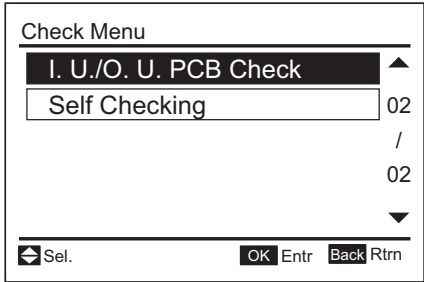
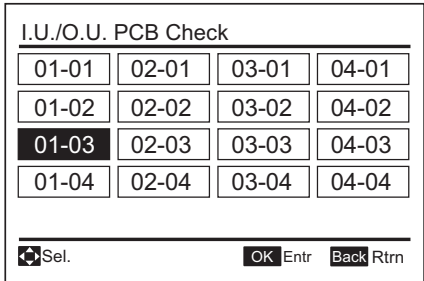
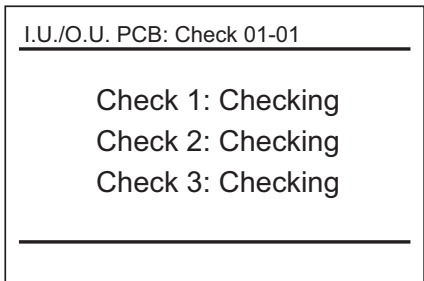
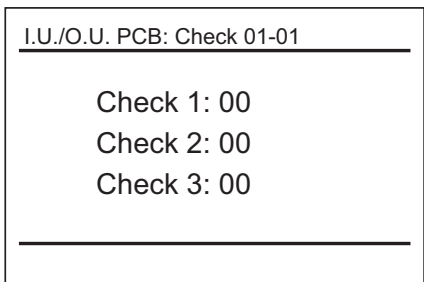
No.	Item	Data Name
9	q9	Discharge Pressure
10	qA	Suction Pressure
11	qb	Control Information
12	qC	Operating Frequency
13	qd	I.U. Expansion Valve
14	qE	O.U. Expansion Valve 1
15	qF	Comp. Current

(2) Alarm History Display

The Alarm History Display is accessed from the Check Menu.

<p>(1) Press and hold "Menu" and "ECO" simultaneously for 3 seconds during the normal mode. The Check Menu is displayed.</p>	
<p>(2) Select "Alarm History Display" from Check Menu and press "OK".</p>	
<p>(4) To delete the alarm history, press "OK". The confirmation screen is displayed. Select "Yes" and press "OK". The alarm history is deleted and the screen returns to (3) above. If "No" is pressed, the screen returns to (3) above.</p>	

(3) I.U./O.U. PCB Check

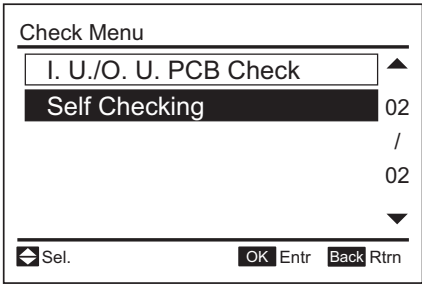
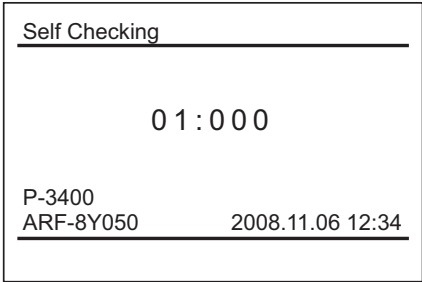
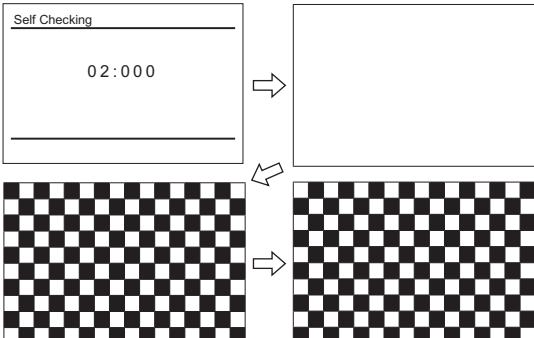
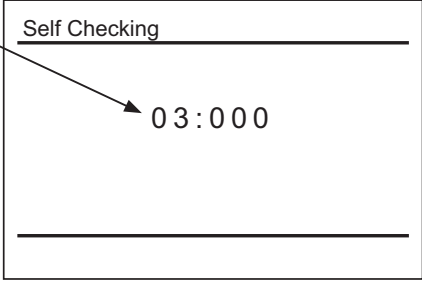
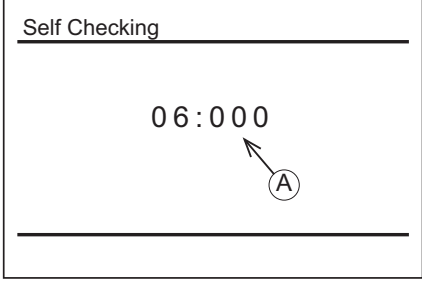
<p>(1) Press and hold "Menu" and "ECO" simultaneously for three seconds during the normal mode. Check Menu is displayed.</p>	
<p>(2) Select "I.U./O.U. PCB Check" from the Check Menu and press "OK".</p>	
<p>(4) The indoor unit PCB and the outdoor unit PCB checks are started. * If "Menu" is pressed during the check, the check is canceled and the screen returns to (2). * If "Back/Help" is pressed during the check, the check is canceled and the screen returns to (3) above.</p>	
<p>(5) After completing the check, the results of the PCB check are indicated. Press "Back/Help" and return to (3) above.</p>	

Results of Check Table

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

(4) Self-Checking

Self-Checking checks the wired controller and clears EEPROM (storage cell inside of the wired controller).

<p>(1) Press and hold "Menu" and "ECO" simultaneously for three seconds during the normal mode (when unit is not operating). The Check Menu is displayed.</p>	
<p>(2) Select "Self Checking" from the Check Menu and press "OK".</p>	
<p>(3) Select the process for "Self Checking".</p> <ul style="list-style-type: none"> * To start self check, press "ECO". * To clear EEPROM, press "▽" and "ECO" simultaneously. → See EEPROM clear process (15) below. 	
<p>(4) LCD Test Press "OK" and the screen changes as shown at the right.</p>	<p>03: Backlight Test 04: Contrast Test 05: Run Indicator Test</p> 
<p>(5) Backlight Test LCD brightness is changed gradually by pressing "OK".</p>	
<p>(6) Contrast Test Contrast of the LCD gradually changes by pressing "OK".</p>	
<p>(7) Run Indicator Test Press "OK" and the run indicator flashes in red and green twice for each.</p>	
<p>(8) Button Input Test Press the nine buttons one-by-one. The number indicated with "(A)" counts up as buttons are being pressed.</p> <ul style="list-style-type: none"> * The order of pressing buttons is random. Do not press more than one button at a time. They are not counted. 	

<p>(9) No Function This function is not used. Press “OK” to proceed.</p>	<div> <div> 07: No Function 08: Transmission Test </div> <div> <div>Self Checking</div> <div>07:000</div> </div> </div>
<p>(10)Communication (Transmission) Circuit Test The wired controller automatically starts to check the communication circuit.</p>	
<p>(11)Wired Controller Thermistor Test The detected temperature by the wired controller thermistor is displayed at “(A)” in the figure at the right.</p>	<div> <div>Self Checking</div> <div>09:025</div> <div>(A)</div> </div>
<p>(12)Date/Time Test The date and time is changed from “2012.03.04 12:34” to “2008. 01. 01 00:00”.</p>	<div> <div>Self Checking</div> <div>10:000</div> <div>2008.01.01 00:00</div> </div>
<p>(13)EEPROM Test < EEPROM Clearing Cancel > Press “?” (help). < EEPROM Clear > Press “OK” or wait 15 seconds. EEPROM data is cleared. During the process, the numbers indicate the location with “(A)”. If (A) has a value of “999”, EEPROM is in a faulty condition. *If “(A)” has “999”, the process does not proceed to the next step.</p>	<div> <div>Self Checking</div> <div>11:000</div> <div>(A)</div> </div>

EEPROM Process

<p>(14)Clear EEPROM The wired controller automatically starts the EEPROM clearing process.</p>	<div> <div>Self Checking</div> <div>13:000</div> </div>
<p>(15)After several seconds pass, the self checking is completed and the wired controller is automatically restarted.</p>	

(5) Contact Information Registration

Contact information can be registered from "Contact Information".

- (1) Press and hold "Menu" and "Back/Help" simultaneously for at least three seconds during the normal mode (when unit is not operating). The Test Run Menu is displayed.

- (2) Select "Contact Information" from the Test Run Menu and press "OK".
Contact Information 1 is displayed.

- (3) Press "Back/Help" to change font types.

- (4) Press "△ ▽ ◀ ▶" to select letters.

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

- (6) Select "Fin." and press "OK" (or simply press "Menu"), (7) is displayed.

Contact Information 1

○ × Electric Corp

ABC	'	+	*	;	.	?	-	/	:	=
abc	1	2	3	4	5	6	7	8	9	0
Sym.1	q	w	e	r	t	y	u	i	o	p
Sym.2	€	a	s	d	f	g	h	j	k	l
	<	>	z	x	c	v	b	n	m	,
	Spce	Del.	←	→	Fin.					

☐ Sel. ☐ ECO Letter ☐ OK Entr ☐ Menu Fin.

- (7) Repeat (3) through (5) to register contact information and continue.
Select "Fin." and press "OK", the confirmation screen is displayed.
(Also, press "Menu" and the confirmation screen is displayed.)

- (8) Select "Yes" and press "OK". The Test Run Menu is displayed after the setting is confirmed.
If "No" is pressed, the screen returns to (3) above.

Contact Information

○ × Electric Corp.

○○○○-○○○-○○○○

Register these contents?

☐ Sel. ☐ OK Entr ☐ Back Rtrn

3.1.5 Checking Using 7-Segment Display

! 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) AC208-230V is applied to the PCB and electrical parts. Never touch electrical parts and wires without appropriate personal protective equipment (PPE) when checking.

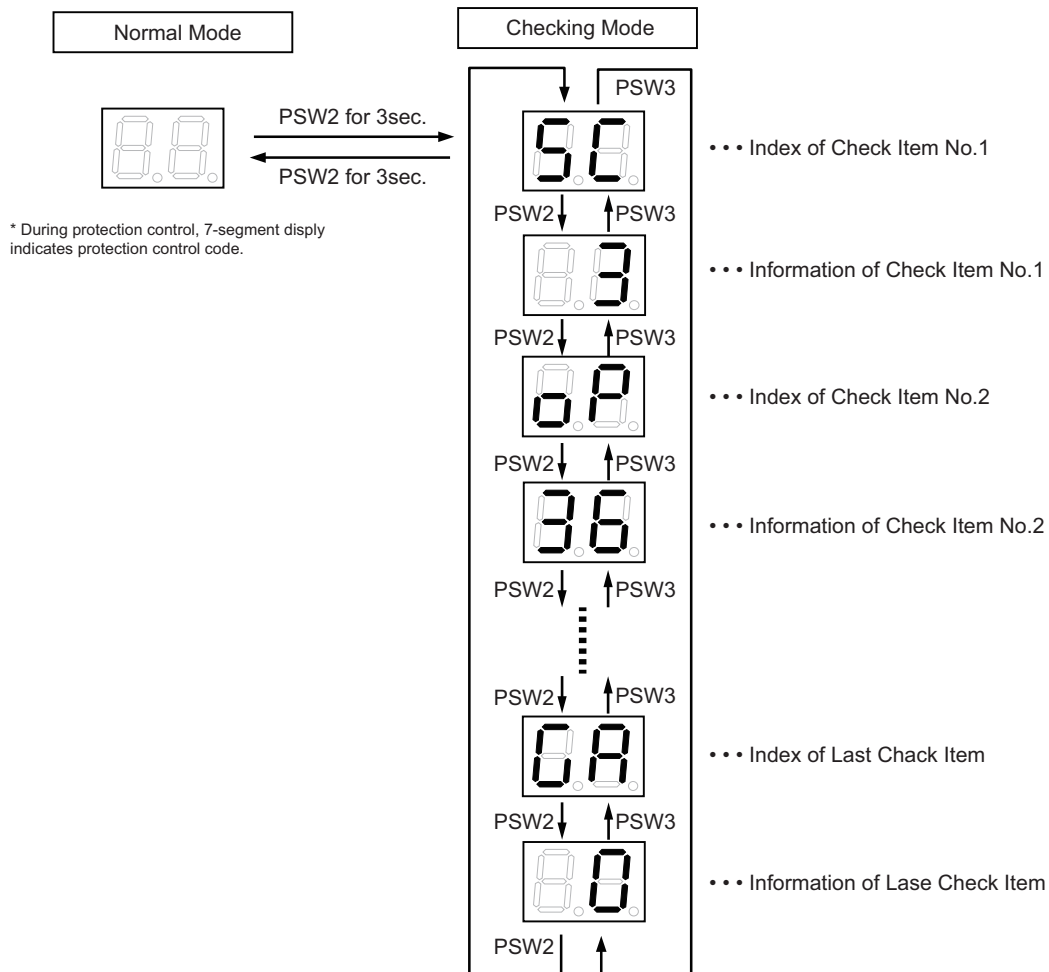
You can check the operating conditions and each part of the refrigerant system temperature condition by 7-segment display (SEG1) on the outdoor unit PCB (PCB1) and push switches (PSW).

To start the checking mode: Press PSW2 for 3 seconds

To move the checking item forward: Press PSW2

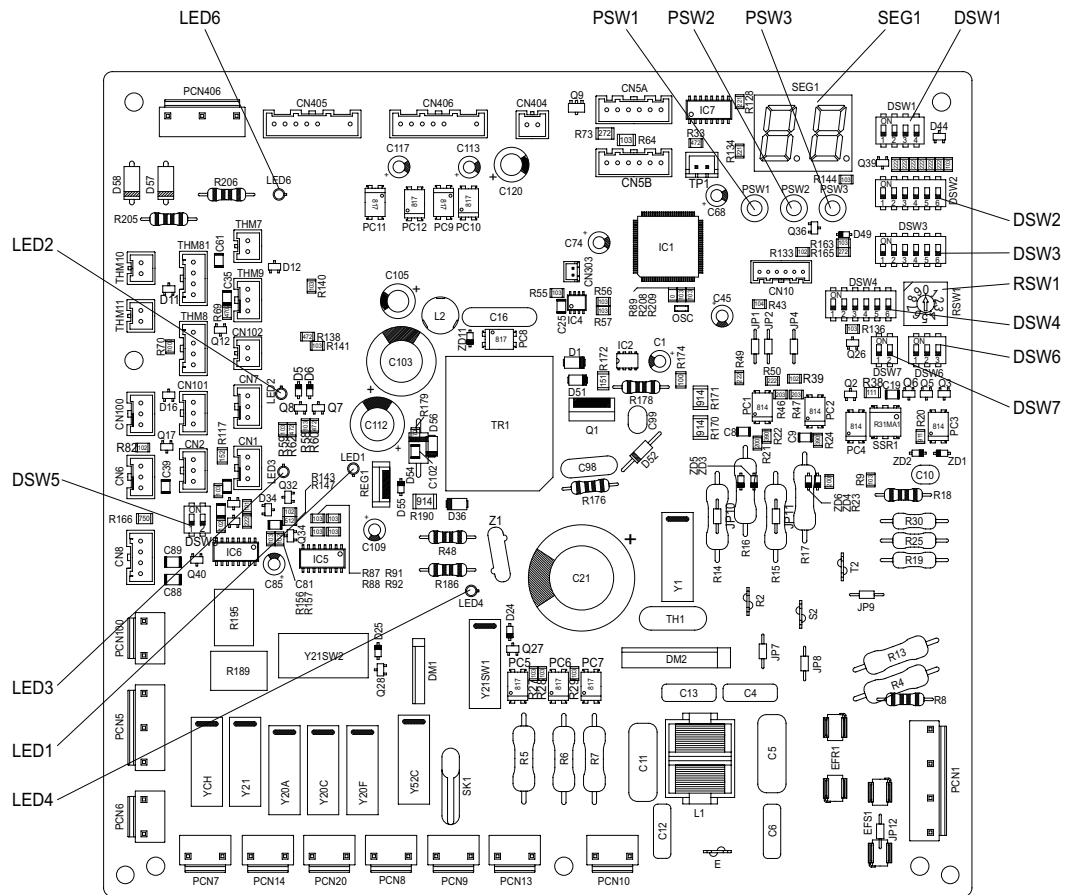
To move the checking item backward: Press PSW3

To cancel the checking mode: Press PSW2 for 3 seconds



(A) Location of Push Switches and 7-Segment Display

The push switches and 7-segment display are located on the PCB1.



(B) Details of 7-Segment Display

Check No.	Item	Indication Data		
		Index	Information (example)	Contents
01	Input/Output State of Outdoor Micro-Computer	SC	83	Indicates only for the segments corresponding to the equipment
02	Total Capacity of Operating Indoor Unit	OP	36	00~199 [MBH] Refer to "(F) Indoor Unit Capacity Table"
03	Control Software No.	SP	12⇒34	Control Software No. in use is indicated.
04	Inverter Software No.	IP	02⇒34	Inverter Software No. in use is indicated.
05	Inverter Order Frequency to Compressor	HI	04	0~115 [Hz]
06	Outdoor Fan Step	FA	15	0~15 [step]
07	Outdoor Electronic Expansion Valve Opening	EO	30	0~100 [%]
08	High Pressure (Discharge Pressure)	PD	84⇒35	1~724 [psi] (*1: 0.1~4.9 [MPa])
09	Low Pressure (Suction Pressure)	PS	81⇒45	1~289 [psi] (*1: 0.0~1.9 [MPa])
10	Discharge Temperature (at the Top of Compressor)	TD	81⇒94	34~288 [°F] (*1: 1~142 [°C])
11	Evaporating Temperature (at Outdoor Unit Heat Exchanger)	TE	80⇒34	-2~176 [°F] (*1: -19~80 [°C])
12	Ambient Air Temperature	TA	80⇒44	-2~176 [°F] (*1: -19~80 [°C])
13	Inverter Fin Temperature	TF	81⇒22	-2~260 [°F] (*1: -19~127 [°C])
14	Inverter Primary Current	AI	12	0~199 [A]
15	Inverter Secondary Current	AI	20	0~199 [A]
16	Indoor Unit Address	IA	00	00~63 (Indoor Unit No.)
17	Indoor Electronic Expansion Valve Opening	EA	20	0~100 [%]
18	Liquid Pipe Temperature of Indoor Unit	LA	80⇒50	-2~260 [°F] (*1: -19~127 [°C])
19	Gas Pipe Temperature of Indoor Unit	GA	81⇒40	-2~260 [°F] (*1: -19~127 [°C])
20	Indoor Unit Inlet Air Temperature	IA	80⇒80	-2~260 [°F] (*1: -19~127 [°C])
21	Indoor Unit Outlet Air Temperature	OA	80⇒60	-2~260 [°F] (*1: -19~127 [°C])
22	Cause Code of Indoor Unit Stoppage	DA	01	00~99 Refer to "(D) Cause Code of Indoor Unit Stoppage"
23	Accumulated Operating Time of Compressor	UU	00⇒00	0~9999
24	Accumulated Operating Time of Compressor(Restorable *4)	UU	00⇒00	0~9999
25	Outdoor Unit Alarm Code	AO	00	00~99 Refer to "(C) Alarm Code"
26	Cause Code of Inverter Stoppage	II	81	00~99 Refer to "(E) Cause Code of Inverter/Fan Stoppage"
27	Cause Code of Fan Stoppage (Lower Outdoor Fan)	FL	00	00~99 This code is the information from Fan module PCB.
28	Cause Code of Fan Stoppage (Upper Outdoor Fan)	FL	00	If Fan module PCB isn't used, "0" is indicated.
29	Abnormal Data Record (No.1)	AI	00 ⇒ ...	Accumulated Operating Time, Alarm Code or Cause Code of I.U. Stoppage, Cause Code of Inverter / Fan Stoppage (Refer to "(G) Abnormal Data Record")
30	Abnormal Data Record (No.2)	AI	00 ⇒ ...	
31	Abnormal Data Record (No.3)	AI	00 ⇒ ...	
32	Abnormal Data Record (No.4)	AI	00 ⇒ ...	
33	Abnormal Data Record (No.5)	AI	00 ⇒ ...	
34	Abnormal Data Record (No.6)	AI	00 ⇒ ...	
35	Abnormal Data Record (No.7)	AI	00 ⇒ ...	
36	Abnormal Data Record (No.8)	AI	00 ⇒ ...	
37	Abnormal Data Record (No.9)	AI	00 ⇒ ...	
38	Total Capacity of Indoor Unit Connected	CP	36	00~199 [MBH] Refer to "(F) Indoor Unit Capacity Table"
39	Connected Indoor Unit Number	AA	82	0~64 [pcs]
40	Refrigerant Address	CA	80	0~63 (Refrigerant System. No.)

SEG1



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

*2 When information number is higher than 100, the last two digits flash.

Example:

When number is "-19", SEG1 displays 19

When number is "120", SEG1 flashes 20

*3 Alternately upper 2 digits and lower 2 digits are indicated every 0.5 sec.

Example:

When number is "194", SEG1 displays 88 ⇒ 94 alternately every 0.5 sec.

When number is "0", SEG1 displays 80 ⇒ 00 alternately every 0.5 sec.

When number is "-15", SEG1 displays 88 ⇒ 15 alternately every 0.5 sec.

*4 For resetting the Accumulated Operating Time(Restorable), press PSW1 for 5sec. while the Accumulated Operating Time(Restorable) is indicated.

(C) Alarm Code

Alarm 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, Problem of Drain Piping, Float Switch, or Drain Pan)
02	Outdoor unit	Activation of Protection Device (High Pressure Cut)	Activation of PSH (Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing)
03	Communication	Abnormal Communication between Indoor and Outdoor	Incorrect Wiring, Loose Terminals, Disconnected Communication Cable, Blowout of Fuse, Outdoor Unit Power OFF
04	Communication	Abnormal Communication between Inverter PCB and Outdoor PCB	Inverter PCB-Outdoor PCB Communication Failure (Loose Connector, Wire Breaking, Blown of Fuse)
05*	Supply Phase	Abnormality of Power Supply Phases	Incorrect Power Supply, Incorrect Connection (Reversed Phase), Open-Phase
06	Voltage	Abnormal Inverter 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	Abnormality of Inlet Air Thermistor	Incorrect Wiring, Disconnected Wiring, Broken Wire, Short Circuit
12		Abnormality of Outlet Air Thermistor	
13		Abnormality of Freeze Protection	
14		Abnormality of Gas Piping Thermistor	
15		Abnormality of Outdoor Air Thermistor (ECONO)	
19	Fan Motor	Activation of Protection Device for Indoor	Fan Motor Overheat, Lockup
20	Sensor on Outdoor Unit	Abnormality of Discharge Gas Thermistor on Top of Compressor	Incorrect Wiring, Disconnected Wiring, Broken Wire, Short Circuit
21		Abnormality of High Pressure Sensor	
22		Abnormality of Outdoor Air Thermistor	
24		Abnormality of Heat Exchanger Piping Thermistor	
29		Abnormality of Low Pressure Sensor	
31	System	Incorrect Capacity Setting of Outdoor Unit and Indoor Unit	Incorrect Capacity Setting of Outdoor Unit and Indoor Unit, Excessive or Insufficient Indoor Unit Total Capacity Code
35		Incorrect Setting of Indoor Unit No.	Duplication of Indoor Unit No. in same Refrigerant Group
38		Problem with Protective Pick up Circuit in Outdoor Unit	Failure of Protection Detecting Device (Incorrect Wiring of Outdoor PCB)
43	Protection Device	Activation of Pressure Ratio Decrease Protection	Defective Compression (Failure of Compressor or Inverter, Loose Power Supply Connection)
44		Activation of Low Pressure Increase Protection	Overload at Cooling, High Temperature at Heating, Expansion Valve Locking at Open Position(Loose Connector)
45		Activation of High Pressure Increase Protection	Overload Operation (Heat Exchanger Clogging, Short Circuit of Airflow), Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing
47		Activation of Low Pressure Decrease Protection	Insufficient Refrigerant, Piping Clogging, Expansion Valve Locking at Close Position (Loosen Connector)
48		Activation of Inverter Overcurrent	Overload Operation, Compressor Failure
51	Inverter	Abnormality of Current Sensor for Inverter	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	Fan Controller	Abnormality of Fan Motor	Fan Motor Failure (Fan Motor Locking, Increase Fan Motor Temperature, Blown Fuse)
5b		Activation of Overcurrent Protection	Fan Motor Failure
5C		Problem with Fan Controller Sensor	Failure of Current Sensor
b1	Outdoor Unit No. Setting	Incorrect Setting of Unit and Refrigerant System Number	There are 64 or More Numbers Set for Refrigerant System.
b5	Indoor Unit No. Setting	Incorrect Indoor Unit Connection No. Setting	There are 17 or More Non-Corresponding to H-LINK II Units are Connected to One System.
EE	Compressor	Compressor Protection Alarm	This alarm code appears when the following alarms occurs three times within 6 hours. 02, 07, 08, 39, 43, 44, 45, 47

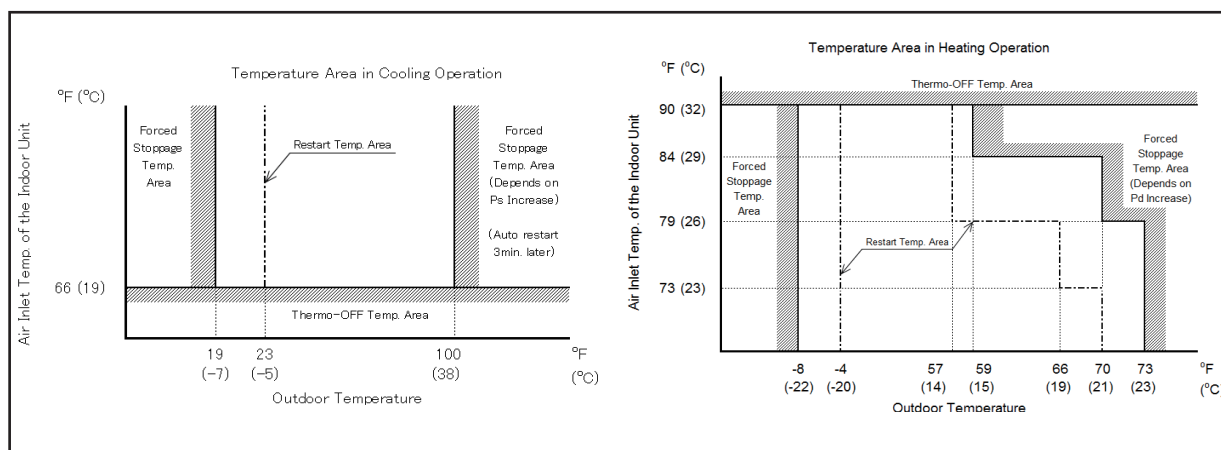
NOTES:

- 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.
- The outdoor unit is designed for single phase. Accordingly, the alarm code "05" is not available. (*)

(D) Cause Code of Indoor Unit Stoppage (dR)

Code (SEG1)	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
15	Retry due to Discharge Gas Temperature Increase Retry due to Low Pressure Decrease
16	Retry due to Discharge Gas SUPERHEAT Decrease

Code (SEG1)	Item
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 Valve Opening Difference Protection
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
33	Forced Thermo-OFF
34	Forced Thermo-OFF
35	Retry due to Abnormal Operating Mode (Reversing Valve Switching Failure)
36	Retry after Defrosting Operation
39	Forced Thermo-OFF for the Indoor Units Rotation
41	Forced Thermo-OFF for the Outdoor Unit Control



NOTES:

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".

(E) Cause Code of Inverter Stoppage (, r)

Code (SEG1)	Cause	Corresponding of Cause Code of I.D. Stoppage	Remark	
			Indication during Retry	Alarm Code
1	IPM Error	17	P7	53
2	Instantaneous Overcurrent	17	P7	48
3	Inverter Fin Thermistor Protection Activation	17	P7	54
4	Electronic Thermal Protection	17	P7	48
5	Inverter Voltage Decrease	18	P8	06
6	Overvoltage	18	P8	06
7	Abnormal Communication	18	-	-
8	Abnormal Current Detection	17	P7	51
9	Instantaneous Power Failure Detection	18	-	-
11	Reset of Micro-Computer for Inverter	18	-	-
12	Ground Fault Detection from Compressor	17	P7	53
13	Open Phase Detection	18	P8	-
16	Inverter Malfunction	18	-	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	P7	53
22	Abnormal PCB setup	-	-	31
23	EERPOM Error	-	-	55

(F) Indoor Unit Capacity Table (oP,CP)

Code	Capacity (MBH)
06	6
08	8
12	12
15	15
18	18
24	24
30	30
36	36
40	40

(G) Abnormal Data Record

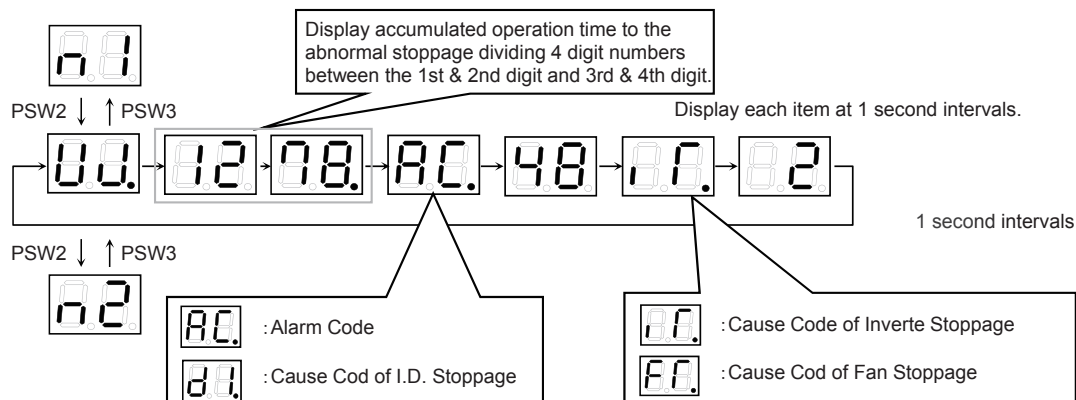
"Abnormal Data Record"(n1 ~ n9) in checking item can record recent abnormal stoppages.

(The maximum number of recordable is 9. n1 is the latest one.)

In case of abnormal stoppage in following table, accumulated operation time when abnormal happened, alarm code/cause code of I.D. stoppage, and cause code of inverter/fan stoppage are recorded.

Example:

No. of Abnormal Data	n1
Accumulated Operation Time	1278 h
Alarm Code	48
Cause Code of Inverter Stoppage	2



Alarm Code or Cause Code of I.D. Stoppage	Contents	Cause code of inverter/fan stoppage	
		ITC	FTC
02	Activation of protection device (High Pressure Cut)	--	--
04	Abnormality communication between inverter PCB and outdoor unit PCB	--	--
05	Abnormality of power supply phase	--	--
06	Activation of inverter voltage increase/decrease protection	5,6	--
d1-18	Activation of discharge gas superheat decrease protection	--	--
07	Activation of discharge gas superheat decrease protection	--	--
d1-16	Activation of discharge gas superheat decrease protection	--	--
08	Activation of discharge gas temperature increase protection	--	--
d1-15	Activation of discharge gas temperature increase protection	--	--
20	Abnormality of thermistor for discharge gas temp. on top of compressor (Td)	--	--
21	Abnormality of high pressure sensor (Pd)	--	--
22	Abnormality of thermistor for outdoor air temperature (Ta)	--	--
24	Abnormality of thermistor for outdoor unit heat exchanger liquid pipe (Te)	--	--
31	Incorrect capacity setting of indoor unit and outdoor unit	--	--
38	Abnormality of picking up circuit for protection in outdoor unit	--	--
45	Activation of high pressure increase protection	--	--
d1-13	Activation of high pressure increase protection	--	--
47	Activation of low pressure decrease protection	--	--
d1-15	Activation of low pressure decrease protection	--	--
48	Activation of overcurrent protection	2,4	--
d1-17	Activation of overcurrent protection	2,4	--
51	Abnormality of current sensor for inverter	8	--
d1-17	Abnormality of current sensor for inverter	8	--
53	Activation of inverter PCB protection device	1,12,21	--
d1-17	Activation of inverter PCB protection device	1,12,21	--
54	Activation of inverter fin temperature increase protection	3	--
d1-17	Activation of inverter fin temperature increase protection	3	--
55	Inverter failure	0,9,10,11,13, 14,15,16,23	--
d1-18	Inverter failure	0,9,10,11,13, 14,15,16,23	--
57	Abnormality of Outdoor Fan Motor	--	1,12,24
5b	Activation of overcurrent protection for outdoor fan	--	2
5C	Abnormality of outdoor fan controller sensor	--	8
EE	Compressor protection alarm	--	--
d1-05	Instantaneous power failure at the outdoor unit	--	--
d1-26	Retry due to high pressure decrease	--	--
A1	Abnormality of Active Filter	--	--
d1-35	Reversing valve switching failure	--	--

NOTE:

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

3.1.6 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	P1	Pressure Ratio Protection Control
2	P2	High Pressure Increase Protection Control
3	P3	Inverter Current Protection Control
4	P4	Inverter Fin Temperature Increase Protection Control
5	P5	Discharge Temperature Increase Protection Control
6	P6	Low Pressure Decrease Protection Control
7	PA	Demand Current Control
8	Pd	Low Pressure Increase Protection Control
9	P9	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	①	② *1	①
	Prohibited Decrease	②	②	②	②

*1: Discharge Temperature Increase Protection Control (P5) is higher than the following protection controls.

- a) Low Pressure Decrease Protection Control (P6)
- b) Demand Current Control (PA)

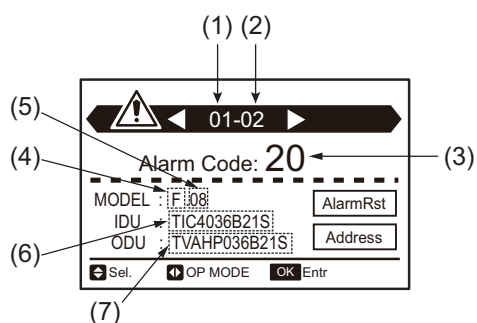
Protection Control Code and Retry Control Code

Indication (SEG1)	Protection Control	Remark
 1	Pressure Ratio Protection Control	To control the compressor frequency for prevention of operation with high/low pressure ratio.
 2	High Pressure Increase Protection Control	To control the compressor frequency for prevention of high pressure increase.
 3	Inverter Current Protection Control	To control the compressor frequency for prevention of inverter current increase in the outdoor unit during operation.
 4	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.
 5	Discharge Temperature Increase Protection Control	To control the compressor frequency for prevention of discharge gas temperature increase during operation.
 6	Low pressure Decrease Protection Control	To control the compressor frequency for prevention of low pressure decrease.
 9	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.
 A	Demand Current Control	To control the compressor frequency for fixing the inverter primary current around the set value (40~100% of rated current for cooling).
 d	Low Pressure Increase Protection Control	To control the compressor frequency for prevention of low pressure increase.
 7	Inverter Trip Retry	To stop the unit operation temporarily for protection of the compressor and inverter. The operation will be restarted or stopped depending on the retry frequency.
 8	Insufficient Voltage/ Open Phase Detection Retry	

3.2 Troubleshooting Procedures

● Alarm Code Indication of Wired Controller

< CIW01 >



- (1) Refrigerant System No. (*1)
- (2) Indoor Unit No. (*1)
- (3) Alarm Code
- (4) Unit Model Code
- (5) Total Number of Indoor Units in the Same System as the Indoor Unit Having Trouble
- (6) Indoor Unit Model (*2) (*3)
- (7) Outdoor Unit Model (*2) (*3)

(*1): If two or more indoor units having trouble are connected to the wired controller, the indicated indoor unit is selectable.

(*2): The initial of model names are indicated as "T". These "T" are replaced with "H", "Y" or "C". (Except for the wall mount model.)

(*3): The model names are not indicated depending on the unit type.

3.2.1 Alarm Code Table

Refer to Section 3.1.5 (C) "Alarm Code Table".

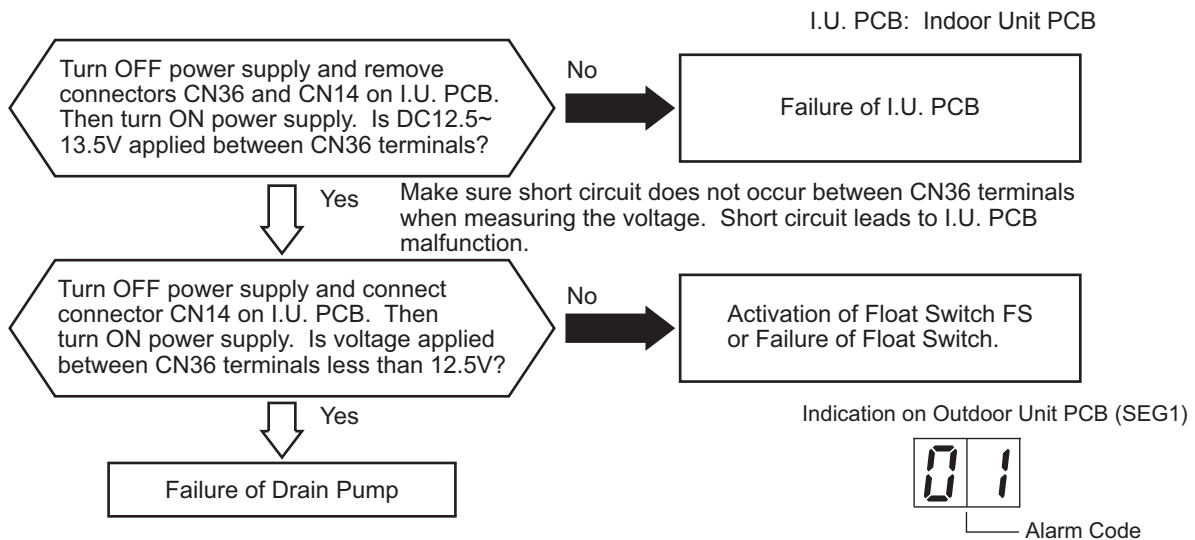
3.2.2 Troubleshooting Using Alarm Codes

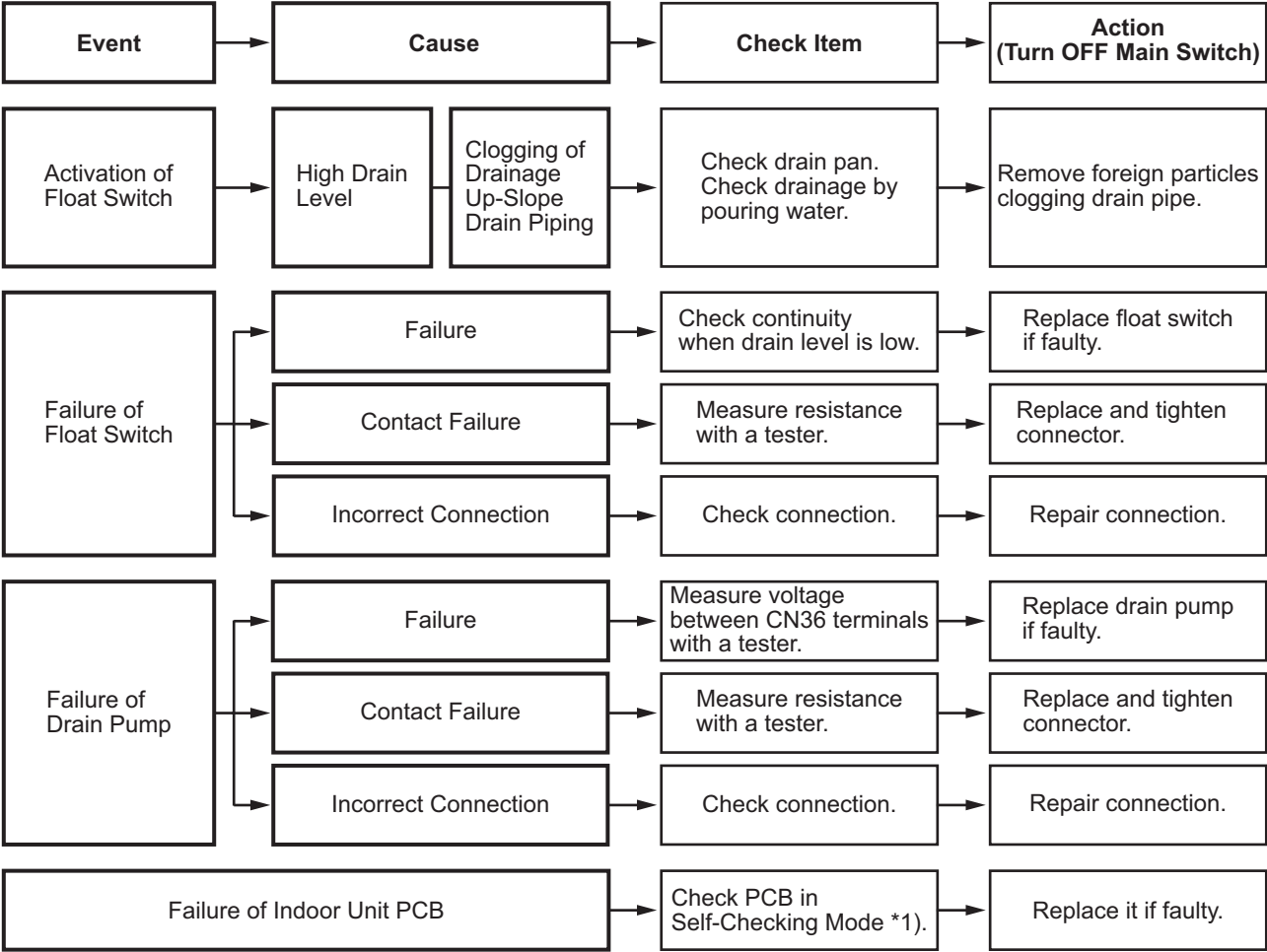
Alarm Code	01	Activation of Protection Device (Float Switch) in Indoor Unit
------------	----	---

- The RUN indicator (red) flashes.
 - 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 of the outdoor unit PCB.
- ^{*1)} Except for some models.

★ Example of 4-way Cassette Type

This alarm code is displayed when the contact between #1 and #2 of CN14 on the I.U. PCB is opened for over 120 seconds during the cooling, dry, fan, or heating operation.





*1): Refer to Section 3.1.4 (3) “I.U./O.U. PCB Check” above for details.

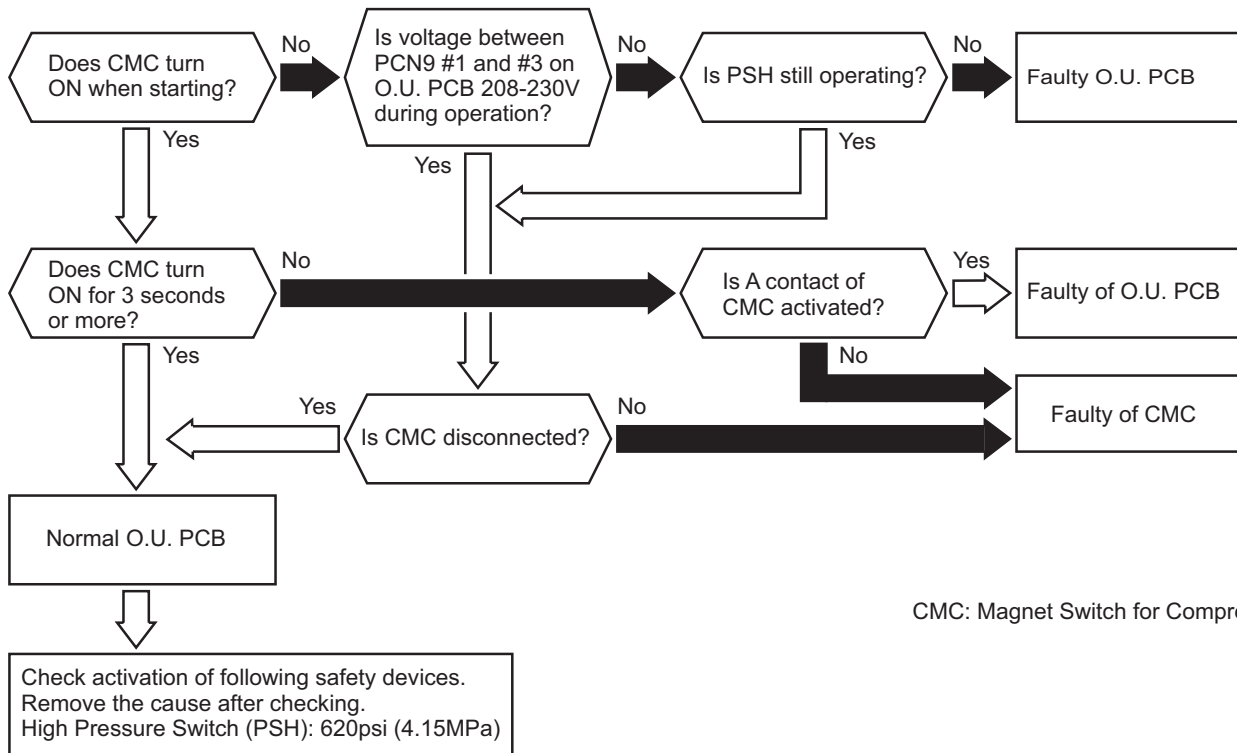
Alarm
Code

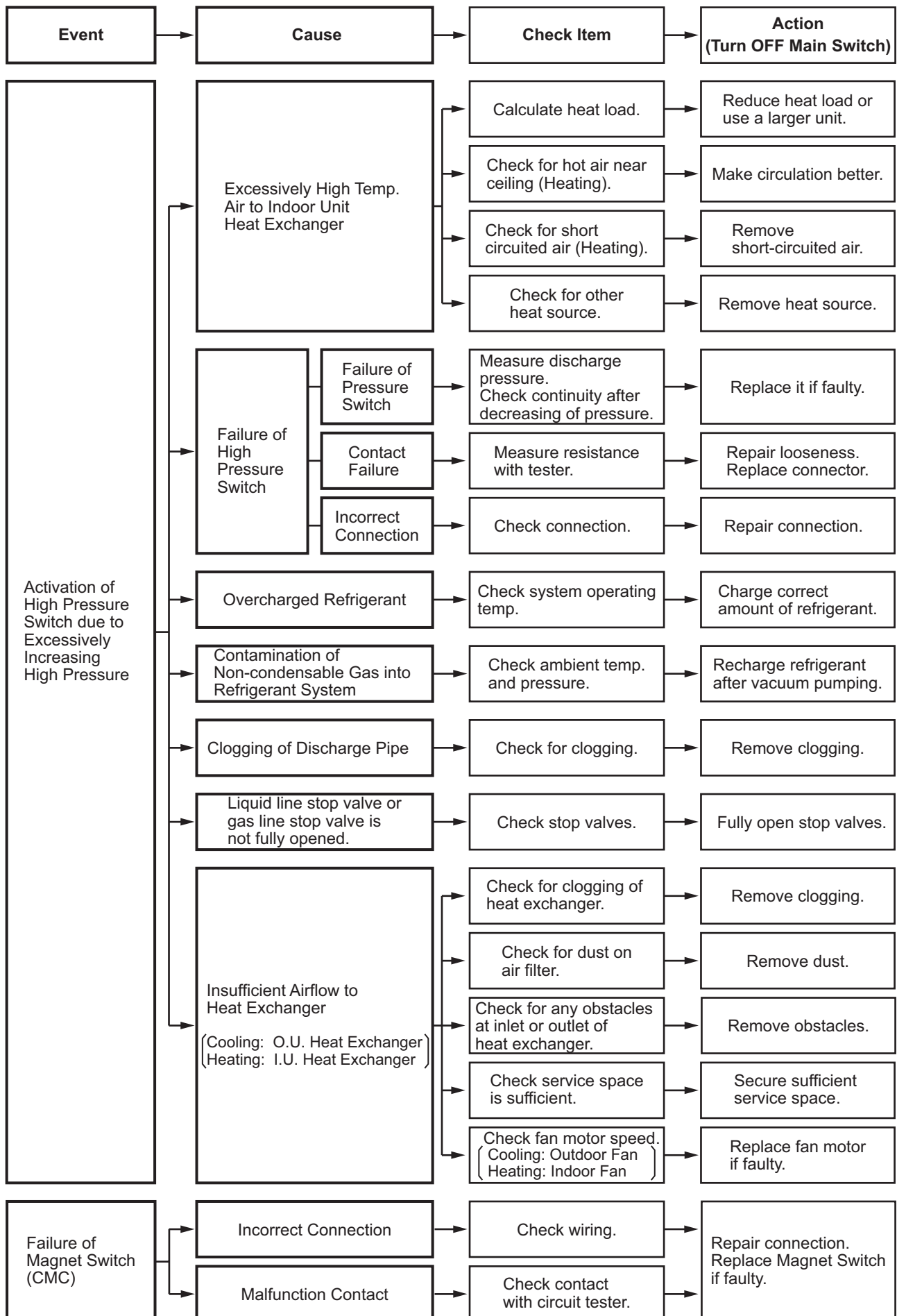
02

Activation of Protection Device (High Pressure Switch) in Outdoor Unit (Except Alarm Code 41 and 42)

- The RUN indicator (Red) flashes.
 - 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 of the outdoor unit PCB.
- ^{*1)} Except for some models.

★ This alarm code is displayed when the protection device (high pressure switch: PSH) is activated during the compressor operation (Y52C: ON).





Alarm
Code

03

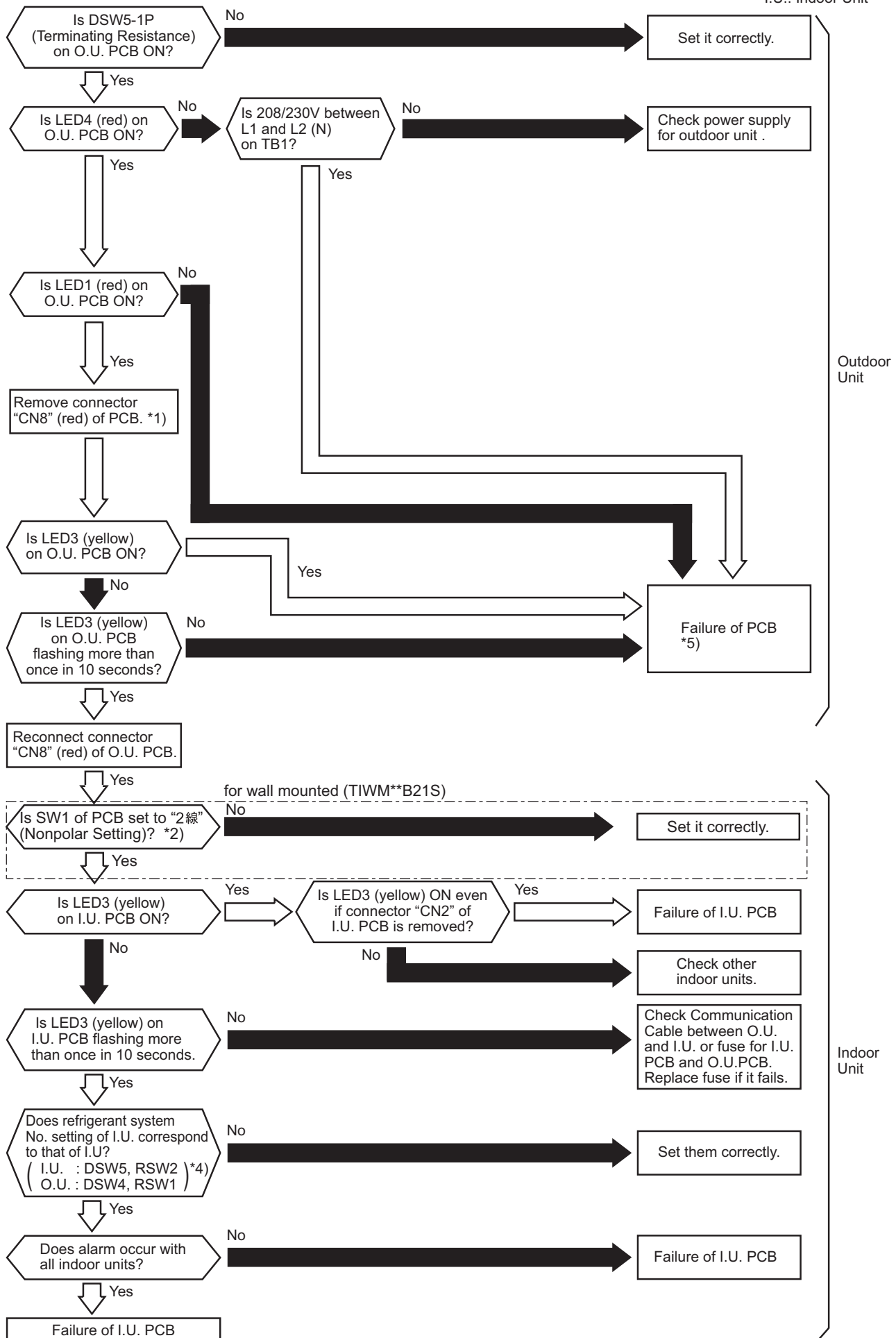
Abnormal Communication between Indoor Unit and Outdoor Unit

- The RUN indicator (Red) flashes.
- 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 of the outdoor unit PCB.

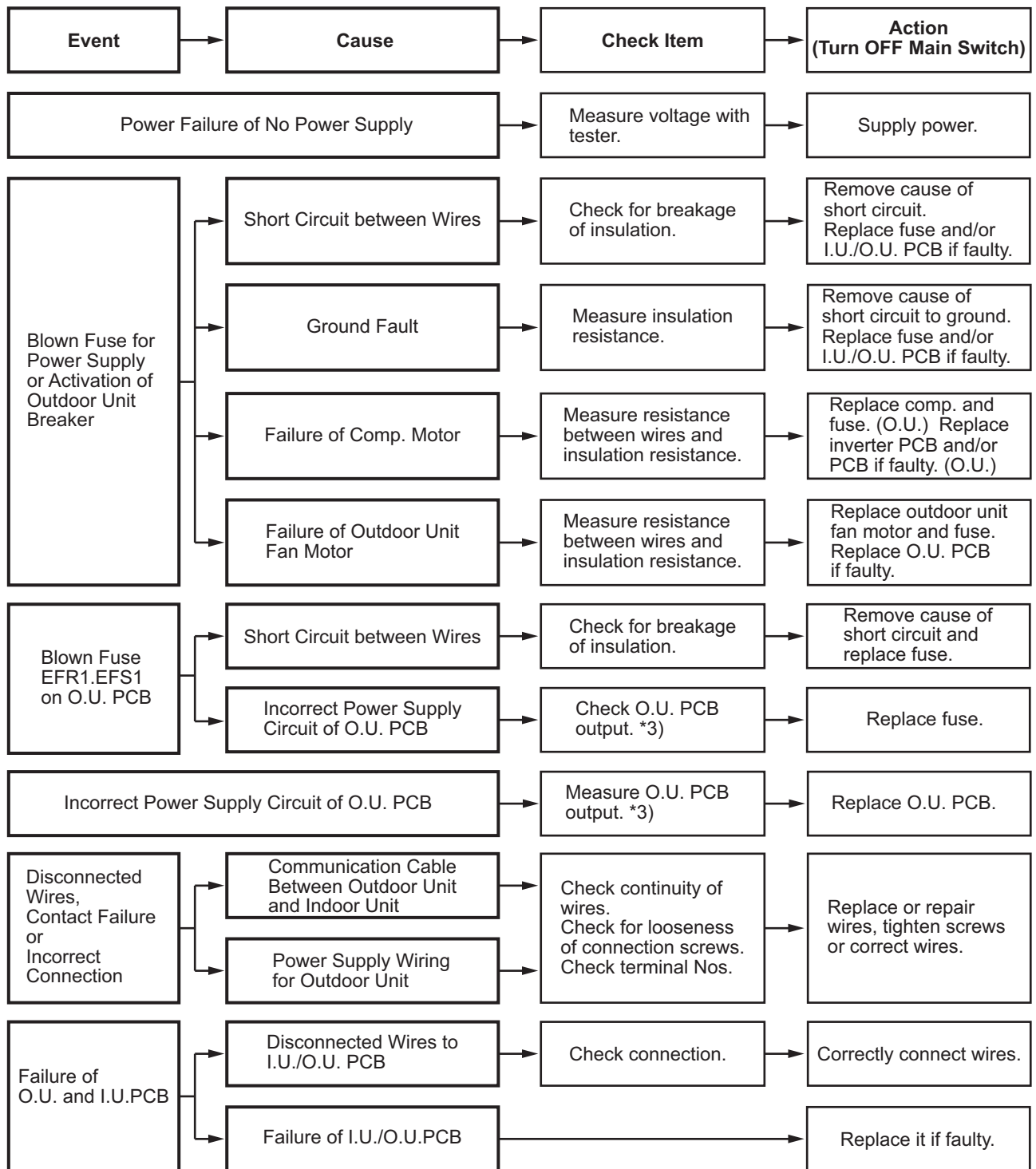
^{*1)} Except for some models.

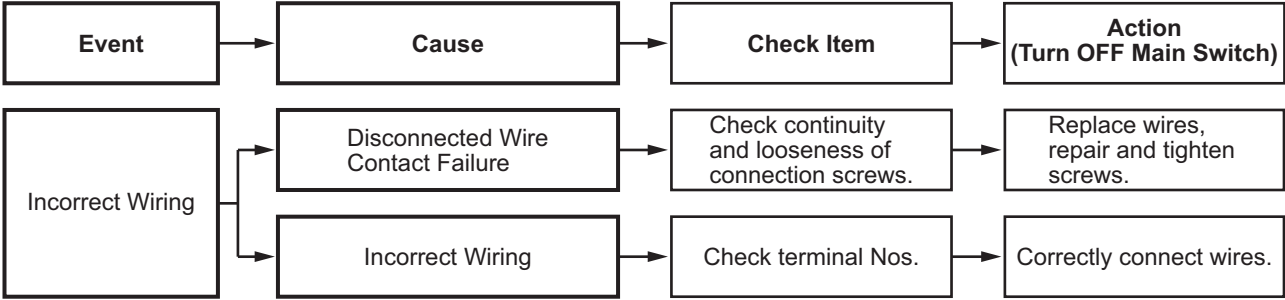
- ★ When fuses are blown, or the circuit breakers are activated, check the cause of overcurrent and take necessary action.
- ★ This alarm code is displayed when an abnormal condition continues for three minutes after normal communication between indoor units and outdoor units, and also the abnormal condition continues for 30 seconds even after the micro-computer is automatically reset. If communication failure occurs from the beginning, the alarm code is displayed after 30 seconds from start up.

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



TROUBLESHOOTING





*1): In the case that the end terminal resistance (DSW5-1) is set to OFF for H-LINK connection, set the end terminal resistance to ON when CN8 is disconnected. Set the end terminal resistance to OFF when CN8 is reconnected.

*2): Communication Setting for FSN3 Series RPK and FSN2 Series RPK, RCI, RPF and RPF1 Models (SW1)

Item	Setting Position
SW1	“2 線” Side (for H-LINK/H-LINK II)

SW1 for transmission on the indoor unit PCB is set to “ 2 線 ” by default. No setting is required for SW1.
 If it is set to “ 3 線 ”, the alarm 03 will occur.

- *3): 12VDC between VCC12 and GND2
 5VDC between VCC05 and GND1
 12VDC between VCC12 and GND1
 15VDC between VCC15 and GND1
 24VDC between VCC24 and GND1
 12VDC between VCC12T and GND1

*4): The rotary switch (RSW2) is not available depending on the indoor unit model.

*5): Refer to Section 3.3.3 “Checking Method for Outdoor Unit PCB (PCB1)” about troubleshooting.

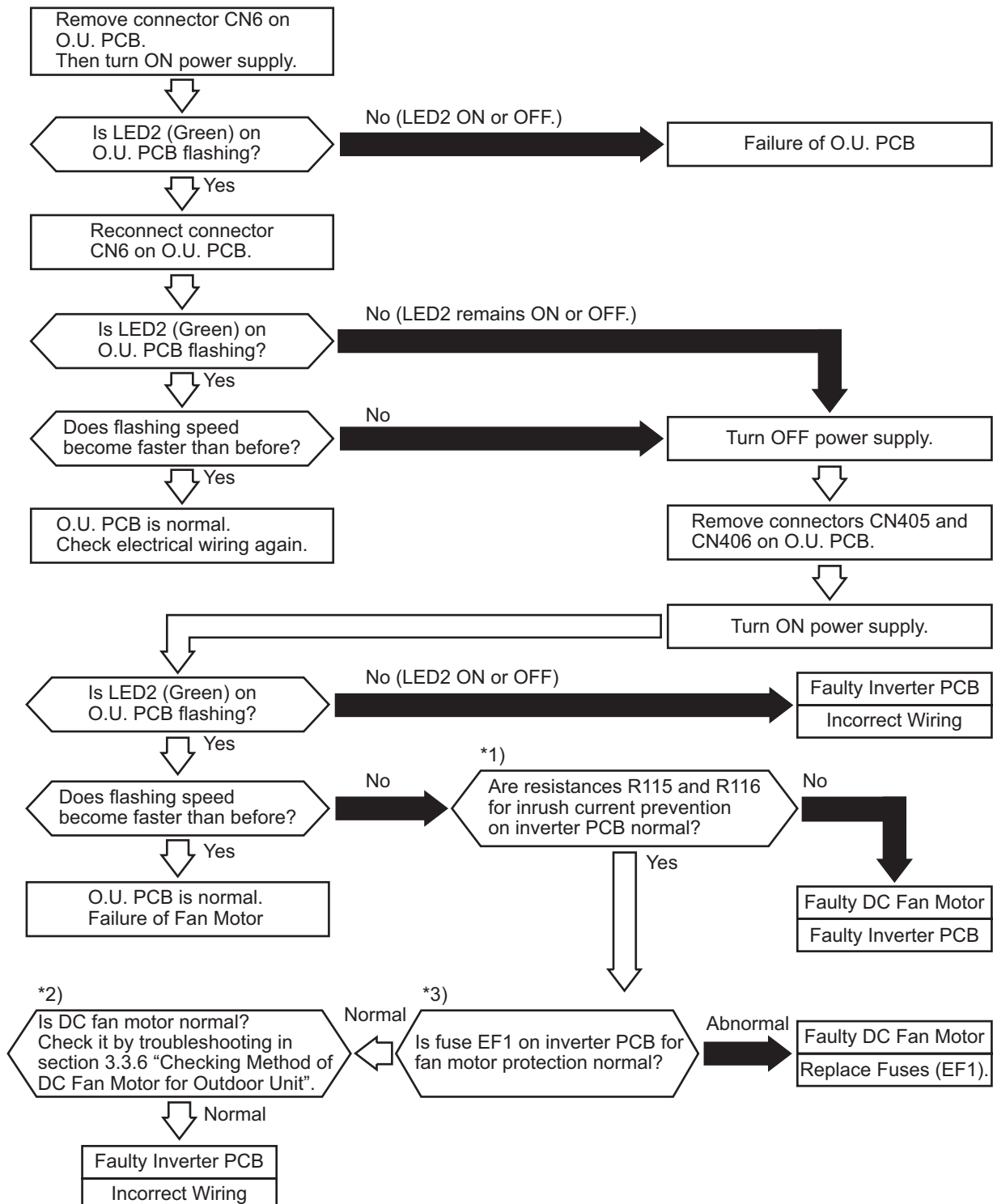
Alarm
Code

04

Abnormal Communication between Inverter PCB and Outdoor Unit PCB

- The RUN indicator (Red) flashes.
 - 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 of the outdoor unit PCB.
- ^{*1)} Except for some models.

- ★ This alarm code is displayed after the operation is stopped when an abnormal communication occurs between the inverter PCB and the outdoor unit PCB.



- *1): Carefully perform the troubleshooting of the resistance for inrush current prevention (R115/R116) on inverter PCB. If the resistance for inrush current prevention (R115/R116) fails, the transmission failure occurs.
- *2): Carefully perform the troubleshooting of DC fan motor.
If the DC fan motor fails, the normal inverter PCB may be damaged.
- *3): Perform the troubleshooting of the fuse “EF1” on inverter PCB for fan motor protection. If the fuses for fan motor protection fail, DC fan motor is not operating normally.

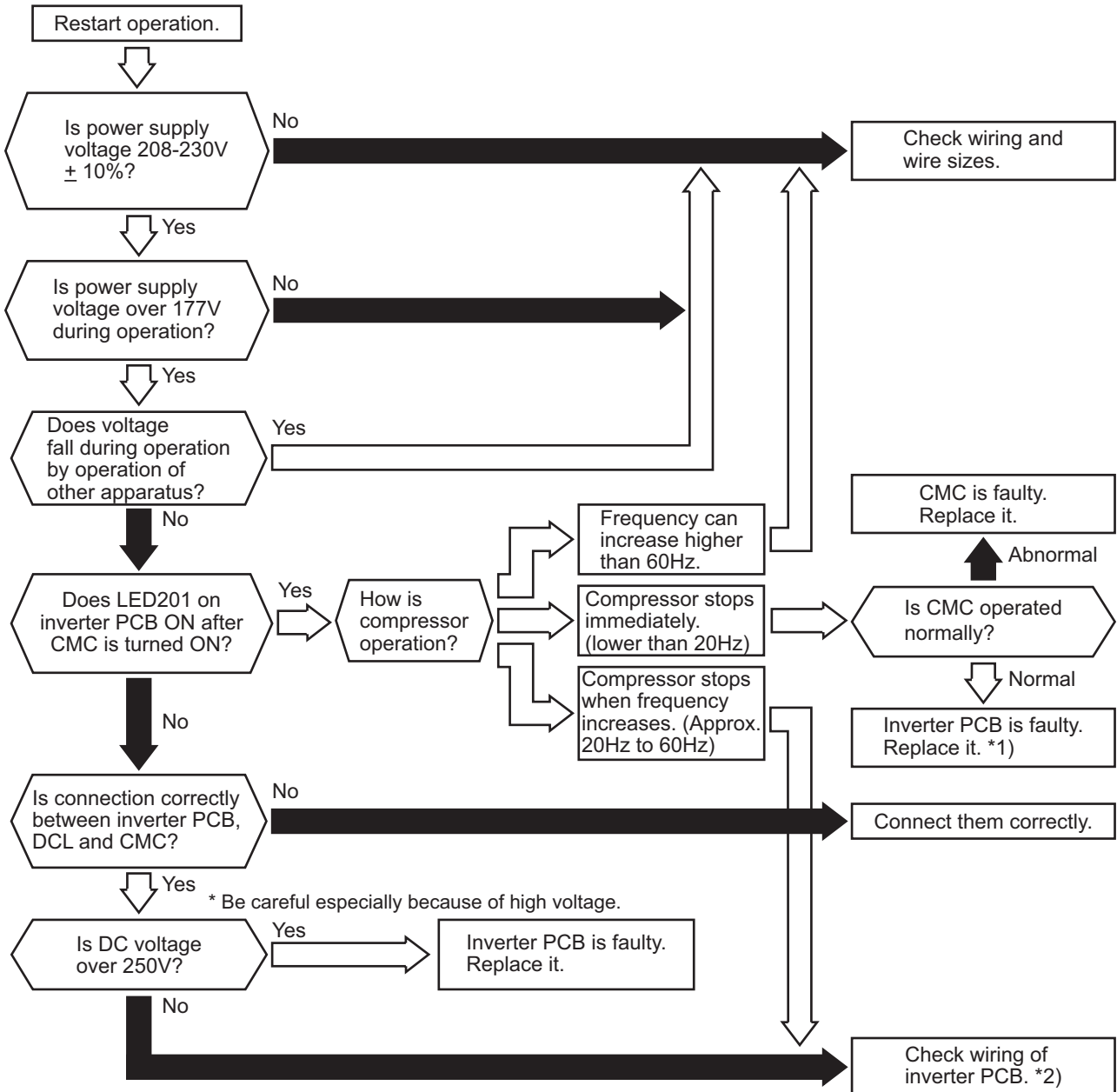
Alarm
Code

06

Abnormal Inverter Voltage (Insufficient Inverter Voltage or Overvoltage)

- The RUN indicator (Red) flashes.
 - 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 of 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

^{*1)}: If there is high residual voltage, make sure to perform high voltage discharge according to Section 3.3.5 "High Voltage Discharge Work for Replacing Parts."

^{*2)}: For maintenance, check the wiring connection according to Section 3.3.5 (3) "Checking Method for Inverter Module."

Alarm
Code

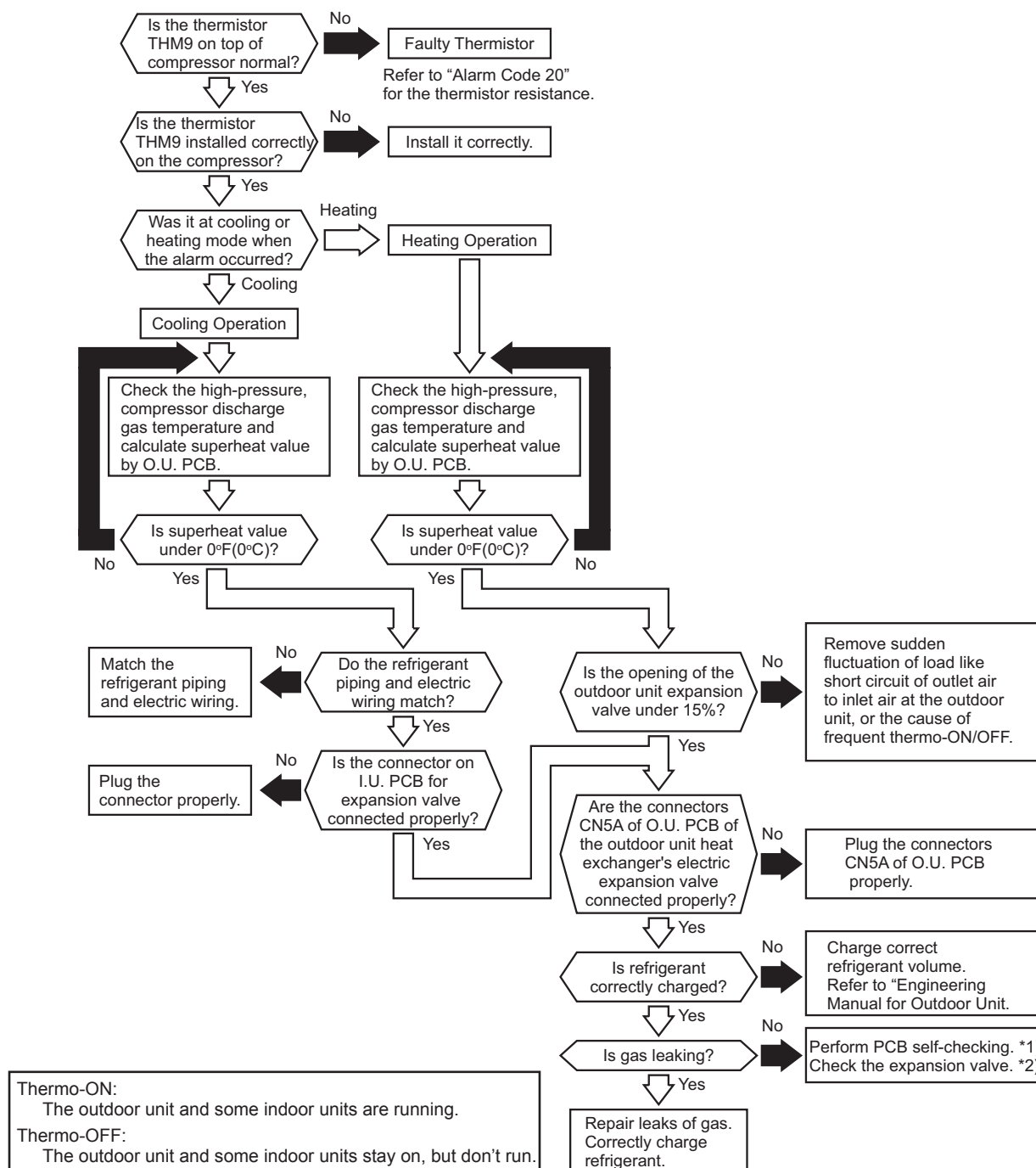
07

Decrease in Discharge Gas Superheat

- The RUN indicator (Red) flashes.
- 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 of the outdoor unit PCB.

^{*1)} Except for some models.

- ★ If the temperature at the top of the compressor 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.



^{*1)}: Refer to Section 3.1.4 (3) "I.U/O.U. PCB check".

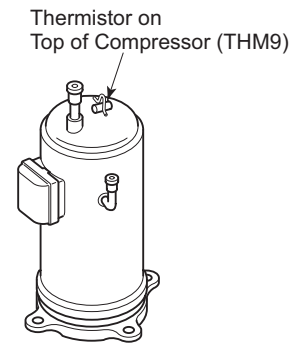
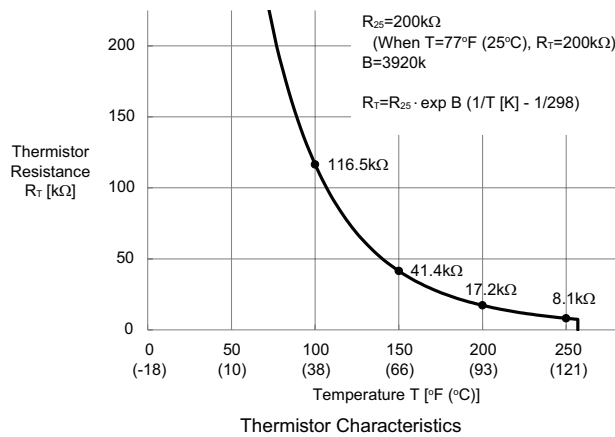
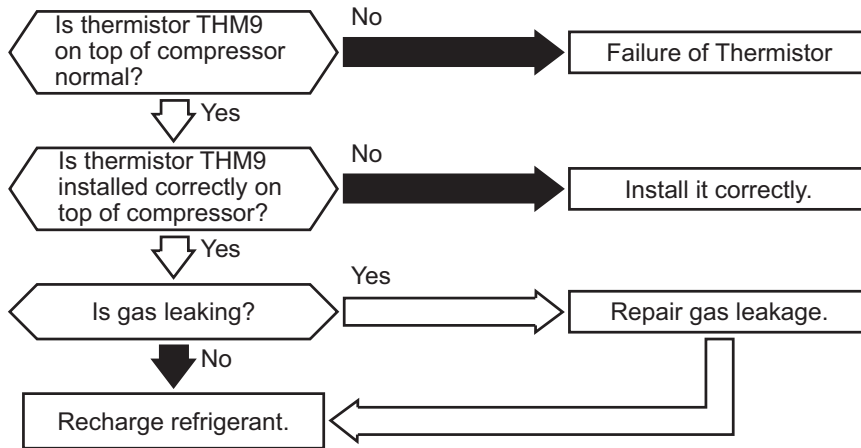
^{*2)}: Refer to Section 3.3.5 "Checking Method of Electronic Expansion Valve".

Alarm Code **08**

Excessively High Discharge Gas Temperature at Top of Compressor

- The RUN indicator (Red) flashes.
 - 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 of the outdoor unit PCB.
- ^{*1)} Except for some models.

★ This alarm code is displayed when the temperature at the top of the compressor is above 239°F (115°C) for 10 minutes or above 257°F (125°C) for 5 seconds during cooling/heating operation.

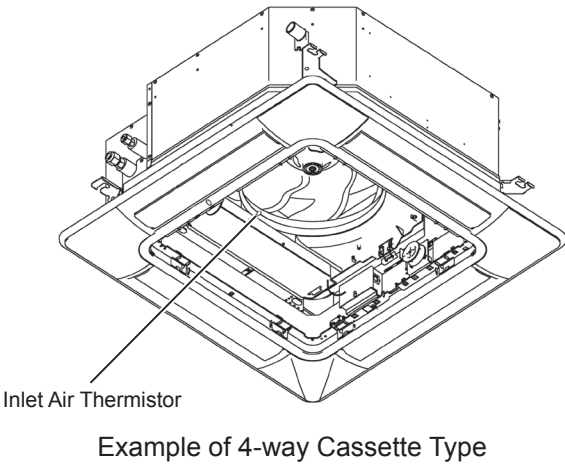
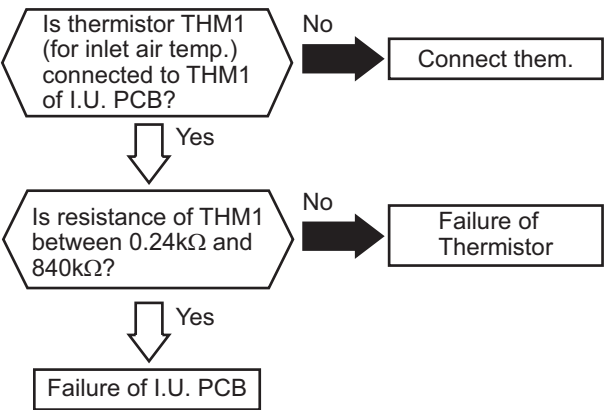


Alarm Code
11

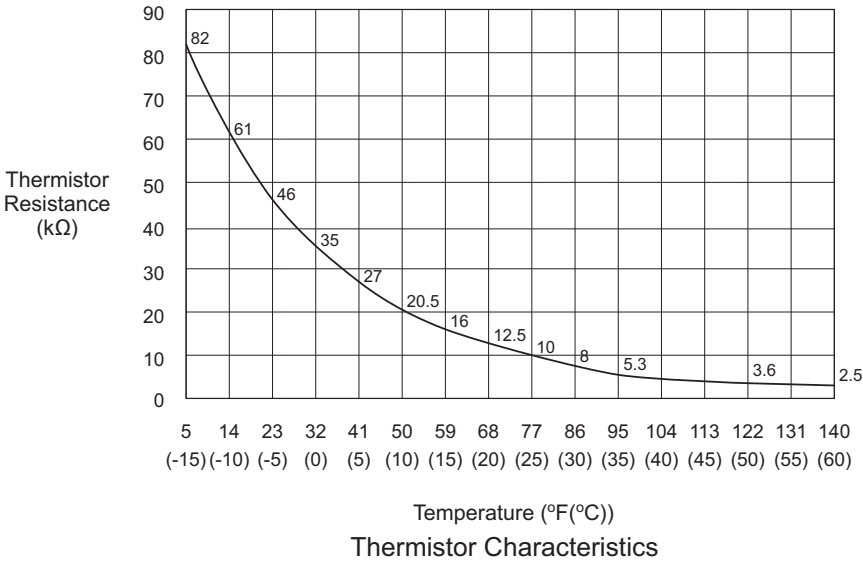
Abnormality of Thermistor for Indoor Unit Inlet Air Temperature
(Inlet Air Thermistor)

- The RUN indicator (red) flashes.
 - 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 of the outdoor unit PCB.
- *1) Except for some models.

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



Event	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Inlet Air Thermistor	Failure	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check connection.	Correctly connect wires.
Failure of I.U. PCB		Replace I.U. PCB and check operation.	Replace I.U. PCB if faulty.



Indication on Outdoor Unit PCB
(Alarm Code 11 ~ 19)



Alarm Code
(11 ~ 19)

NOTE:
For detail, refer to “Service Manual for Indoor Unit”.

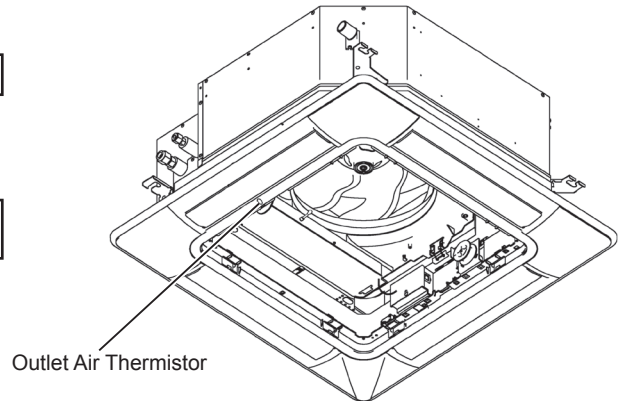
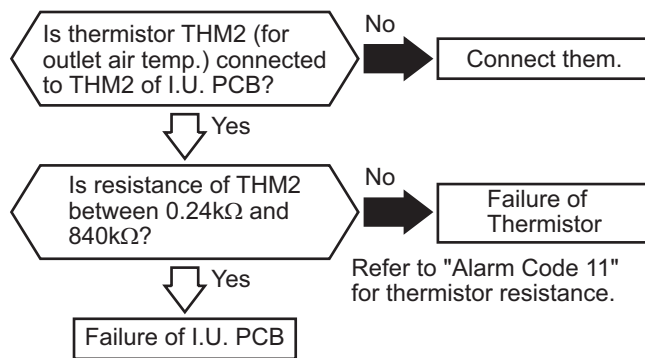
Alarm
Code

12

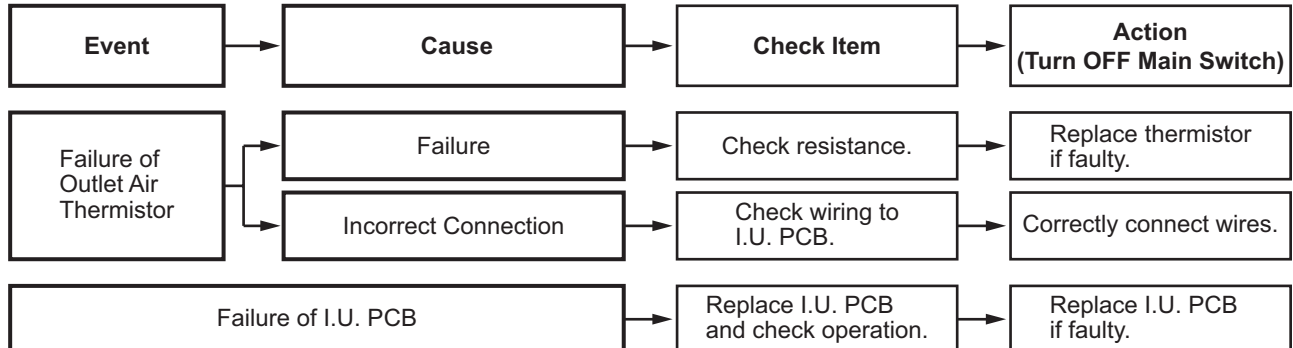
Abnormality of Thermistor for Indoor Unit Outlet Air Temperature (Outlet Air Thermistor)

- The RUN indicator (red) flashes.
 - 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 of the outdoor unit PCB.
- ^{*1)} Except for some models.

★ This alarm code is displayed when a short circuit ($0.24\text{k}\Omega$ or less) or disconnection ($840\text{k}\Omega$ or more) of the thermistor is detected during a heating or cooling operation. The operation automatically restarts when the malfunction is removed.



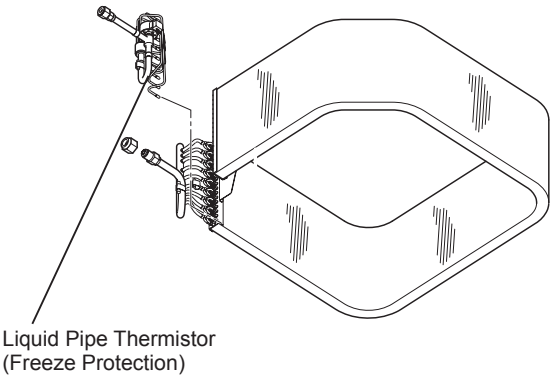
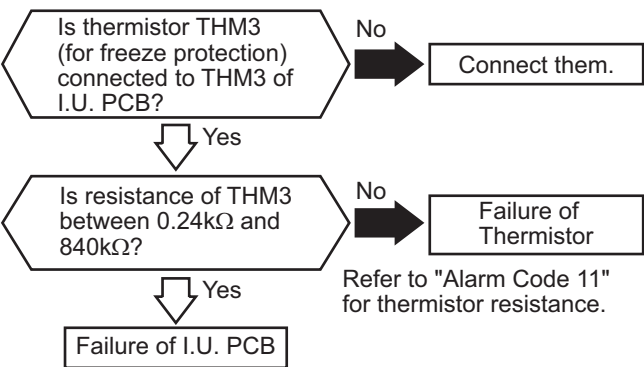
Example of 4-way Cassette Type



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

- The RUN indicator (red) flashes.
 - 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 of the outdoor unit PCB.
- ^{*1)} Except for some models.

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



Example of 4-way Cassette Type

Event	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Freeze Protection Thermistor	Failure	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to I.U. PCB.	Correctly connect wires.
Failure of I.U. PCB		Replace I.U. PCB and check operation.	Replace I.U. PCB if faulty.

Alarm
Code

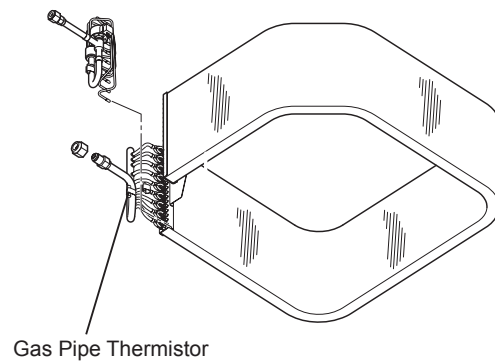
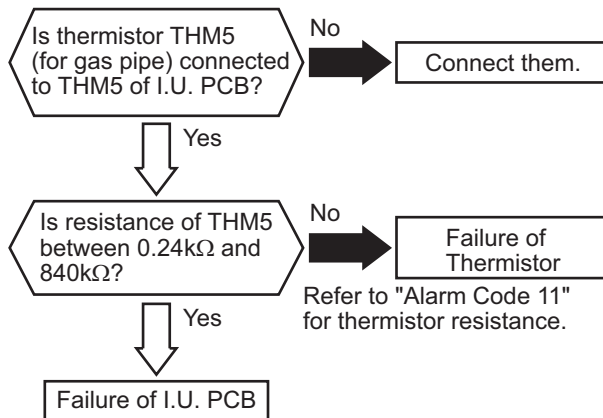
14

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

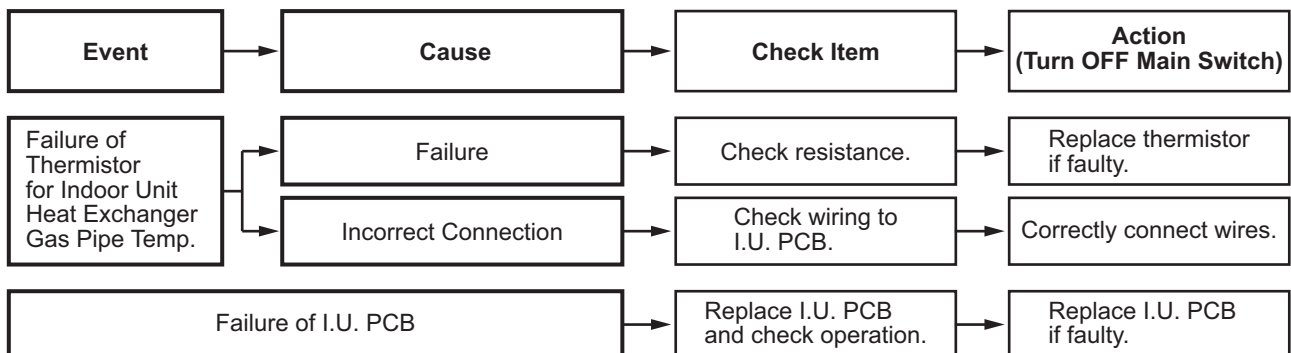
- The RUN indicator (red) flashes.
- The indoor unit number (Ref. system number - I.U. number), the alarm code, the model code^{*1)}, the model name^{*1)} and the number of connected indoor units are displayed on the LCD. The alarm code is flashed on the 7-segment display of the outdoor unit PCB.

^{*1)} Except for some models.

- ★ This alarm code is displayed when a short circuit ($0.24\text{k}\Omega$ or less) or disconnection ($840\text{k}\Omega$ or more) of the thermistor is detected during a heating^{*1)} or cooling operation. The operation automatically restarts when the malfunction is removed.



Example of 4-way Cassette Type

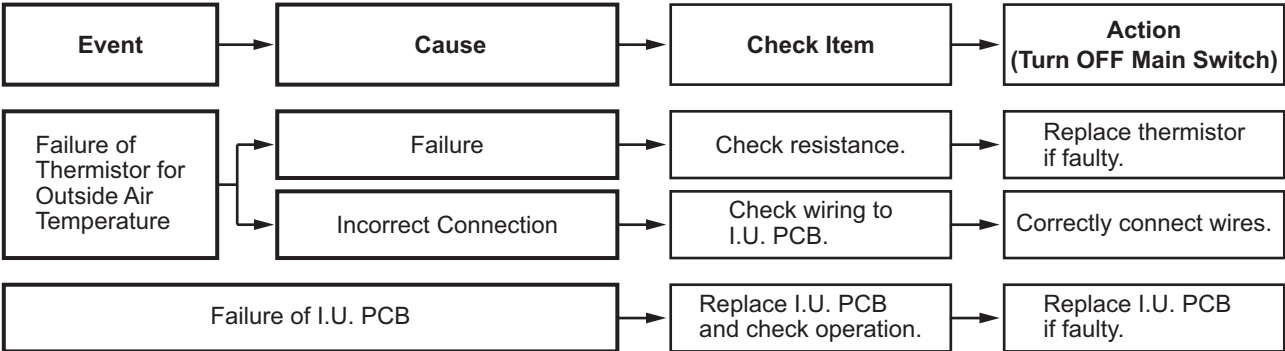
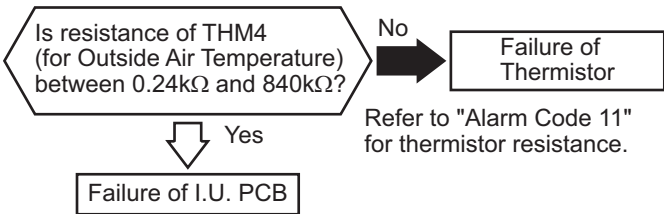


^{*1)} The heating operation is available only during the test run.

Alarm Code	15	Abnormality of Thermistor for Outside Air Temperature (for Econo Fresh)
------------	----	--

- The RUN indicator (red) flashes.
 - 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 of the outdoor unit PCB.
- ^{*1)} Except for some models.

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



Alarm
Code

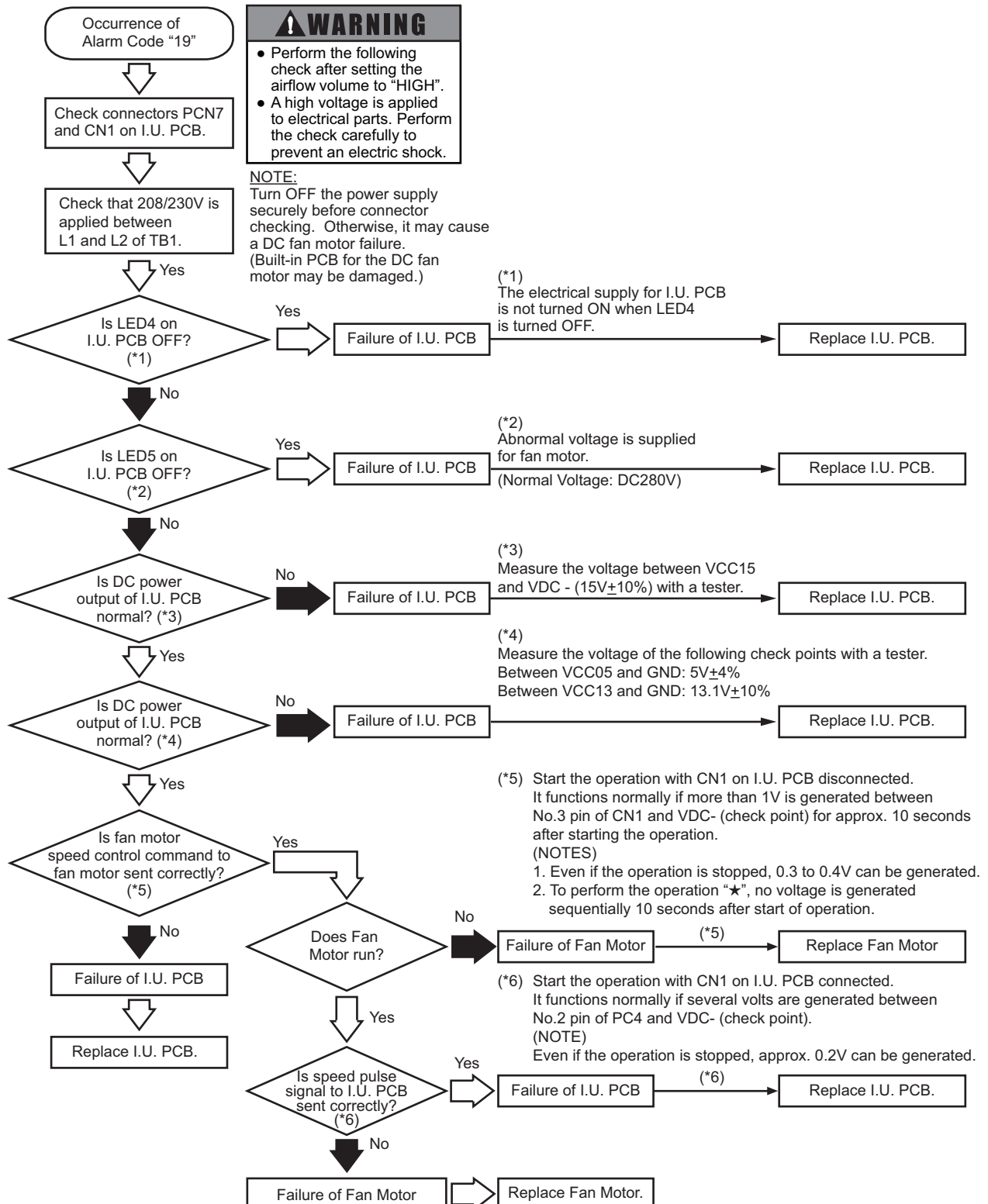
19

Activation of Protection Device for Indoor Fan Motor

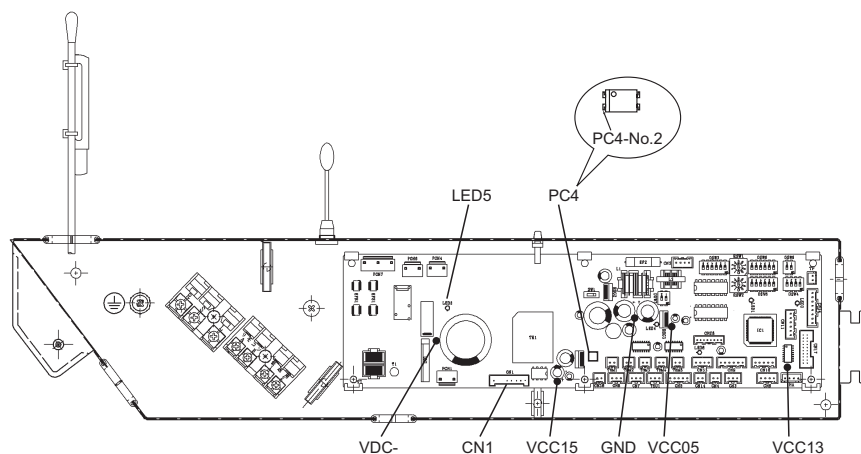
- The RUN indicator (red) flashes.
 - The indoor unit number (Ref. system number - I.U. number), the alarm code, the model code^{*1)}, the model name^{*1)} and the number of connected indoor units are displayed on the LCD. The alarm code is flashed on the 7-segment display of the outdoor unit PCB.
-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

★ Example of 4-way Cassette Type (as Indoor Unit with DC Motor)

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

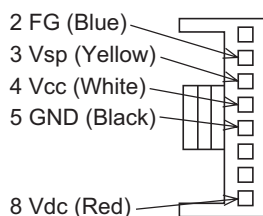


● Example of 4-Way Cassette Type



< Checking for Fan Motor >

Remove the connector of the fan motor and measure the resistance value between each of the pins (twice). Check whether the resistance value is over or not according to the table shown below. When performing the second measuring, make sure to change the tester (Red/ Black).



1st		
Tester		Resistance Value
Red	Black	Ω
FG	GND	
Vsp	GND	
Vcc	GND	
Vdc	GND	

2nd		
Tester		Resistance Value
Red	Black	Ω
GND	FG	
GND	Vsp	
GND	Vcc	
GND	Vdc	

Decision Basis
Resistance values of both 1st and 2nd measurings are over 10

NOTE:

For detail, refer to "Service Manual for Indoor Unit".

Alarm
Code

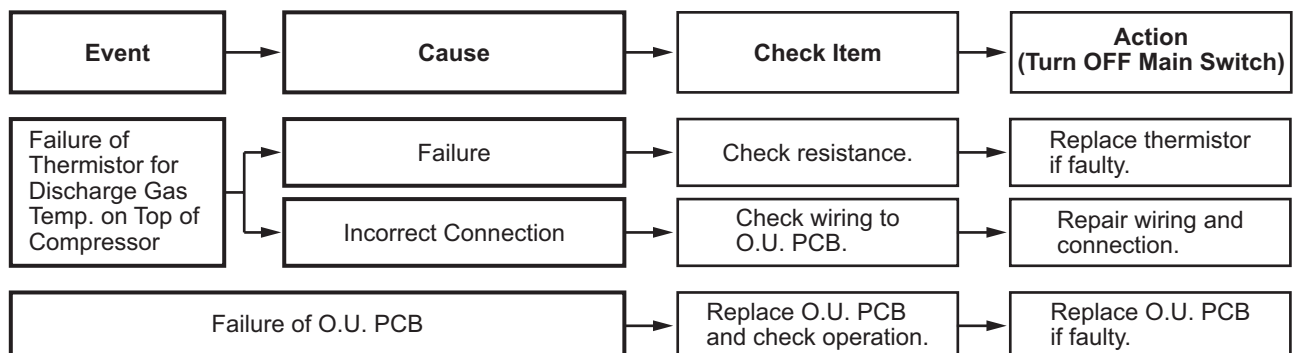
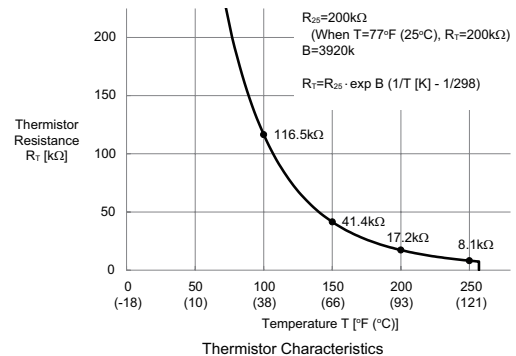
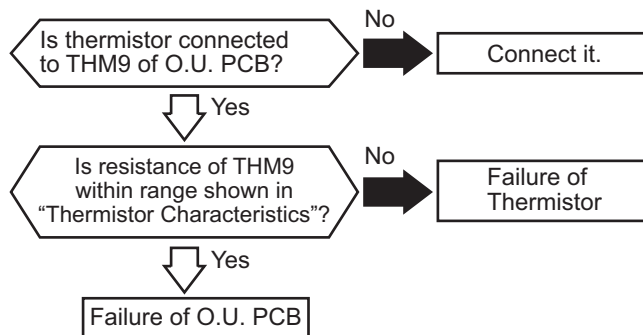
20

Abnormality of Discharge Gas Thermistor on Top of Compressor

- The RUN indicator (Red) flashes.
- 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 of the outdoor unit PCB.

^{*1)} Except for some models.

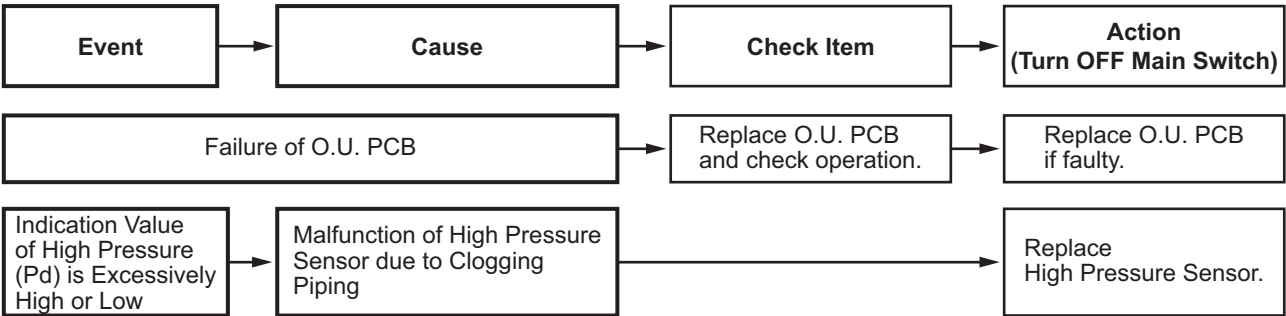
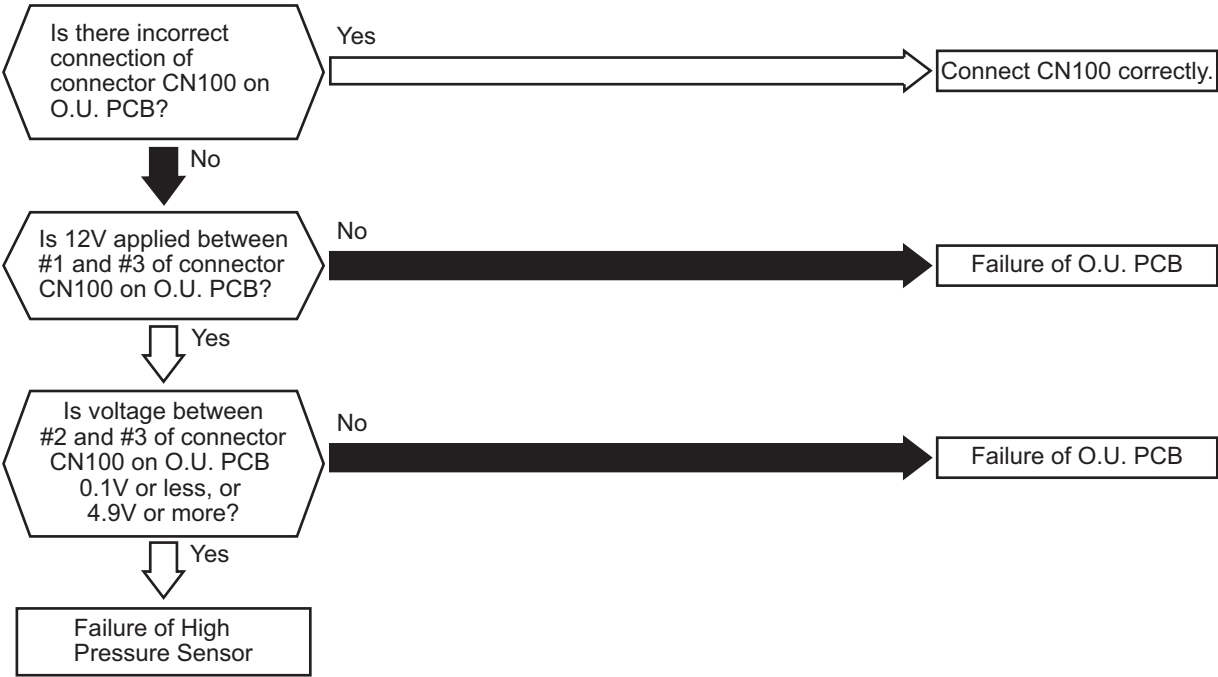
- ★ This alarm code is displayed when a short circuit (0.9kΩ or less) or disconnection (5946kΩ or more) of the thermistor is detected during heating or cooling operation.



Alarm Code	21	Abnormality of High Pressure Sensor
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- The RUN indicator (Red) flashes.
 - 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 of the outdoor unit PCB.
- ^{*1)} Except for some models.

★ This alarm code is displayed when output voltage of the high pressure sensor decreases to 0.1V or less, or increases to 4.9V or more during operation.



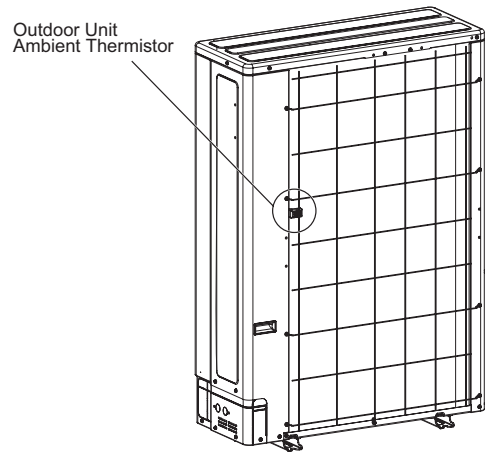
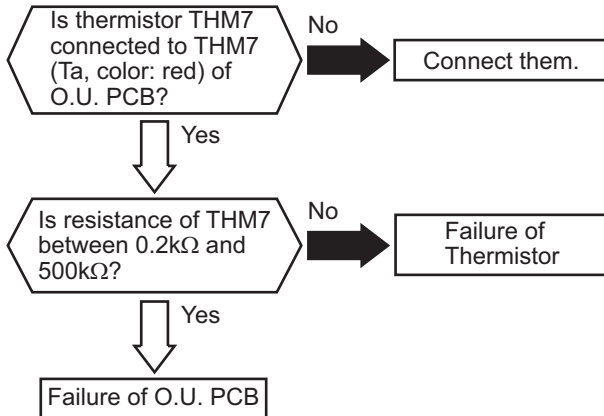
Alarm
Code

22

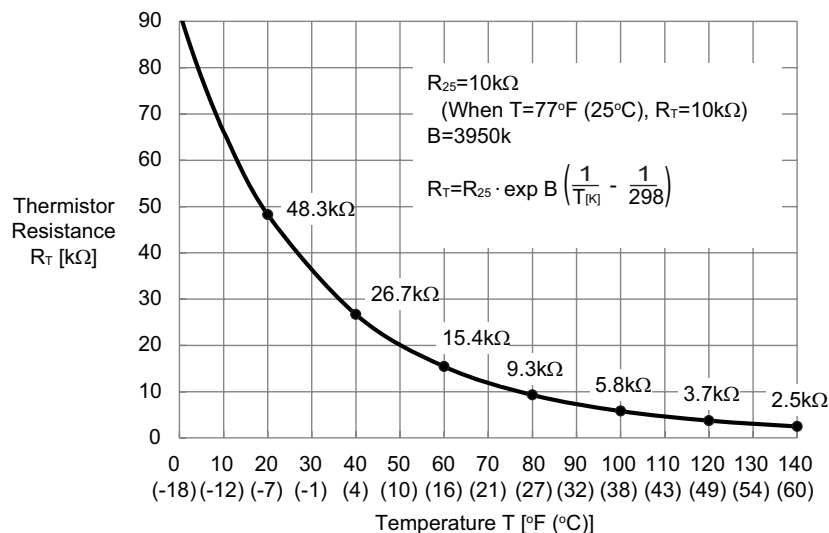
Abnormality of Outdoor Air Thermistor (Outdoor Unit Ambient Thermistor)

- The RUN indicator (Red) flashes.
 - 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 of the outdoor unit PCB.
- ^{*1)} Except for some models.

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



Event	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Thermistor for Outdoor Air Temp.	Failure	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to 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.



Thermistor Characteristics

Alarm
Code

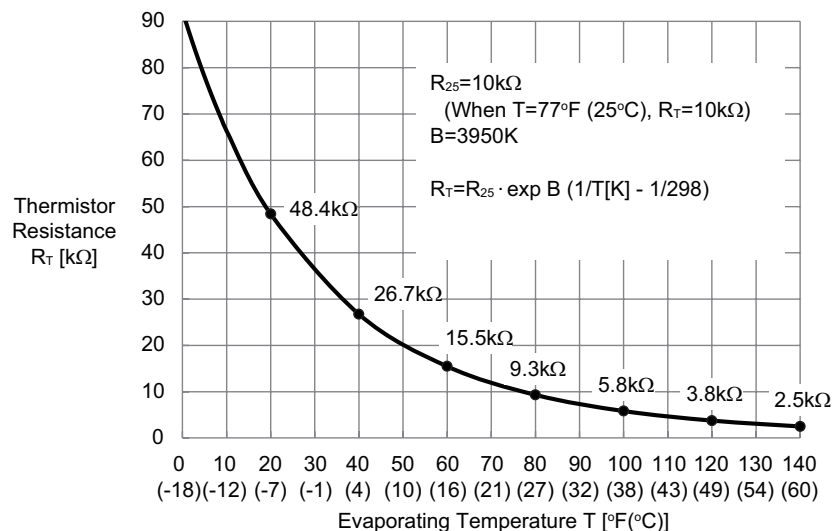
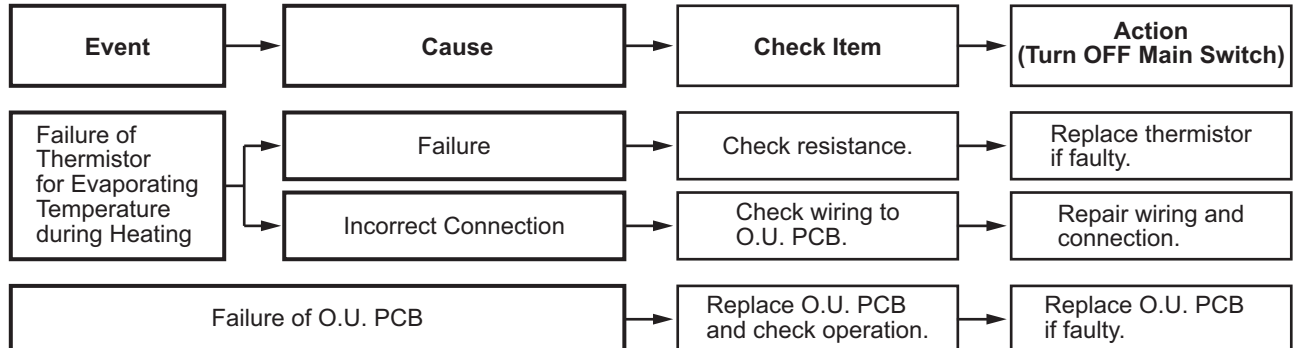
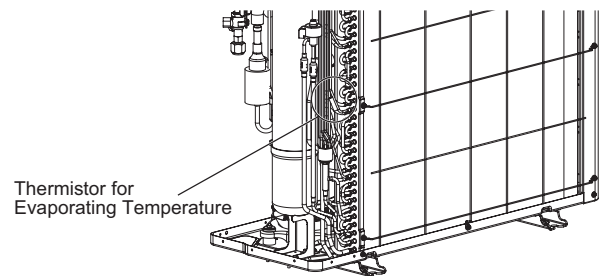
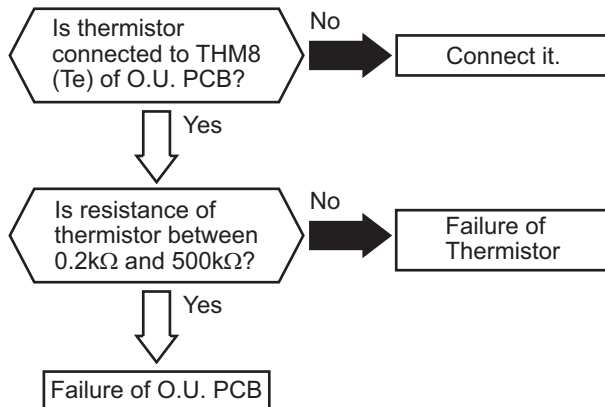
24

Abnormality of Thermistor for Evaporating Temperature
during Heating Operation (Outdoor Unit Evaporating Thermistor)

- The RUN indicator (Red) flashes.
- 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 of the outdoor unit PCB.

^{*1)} Except for some models.

- ★ This alarm code is displayed when a short circuit ($0.2\text{k}\Omega$ or less) or disconnection ($500\text{k}\Omega$ or more) of the thermistor is detected during heating or cooling operation.



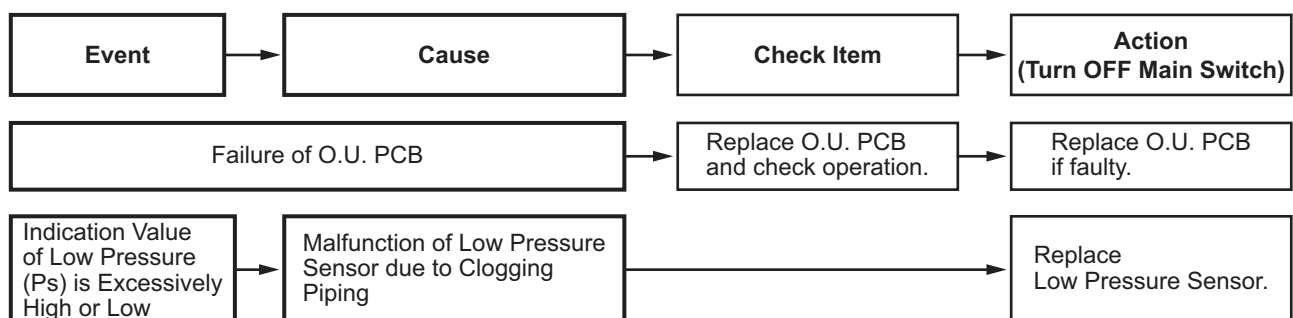
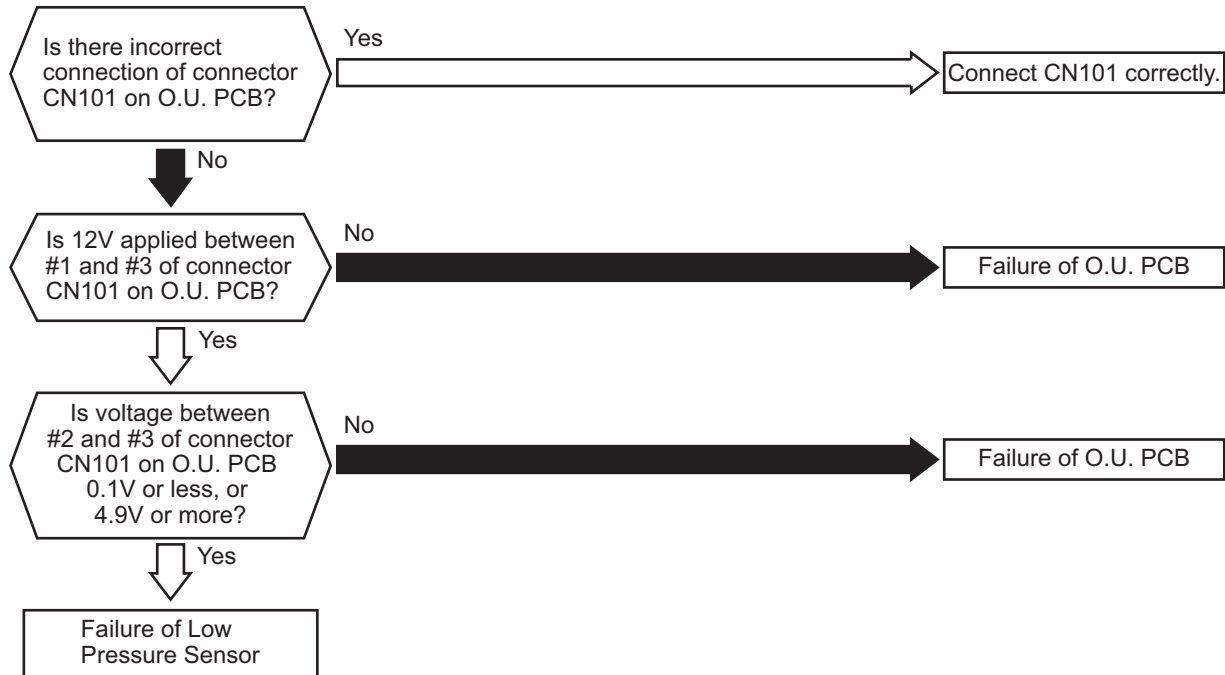
Thermistor Characteristics

Alarm Code **29**

Abnormality of Low Pressure Sensor

- The RUN indicator (Red) flashes.
 - 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 of the outdoor unit PCB.
- ^{*1)} Except for some models.

★ This alarm code is displayed when output voltage of the low pressure sensor decreases to 0.1V or less, or increases to 4.9V or more during operation.



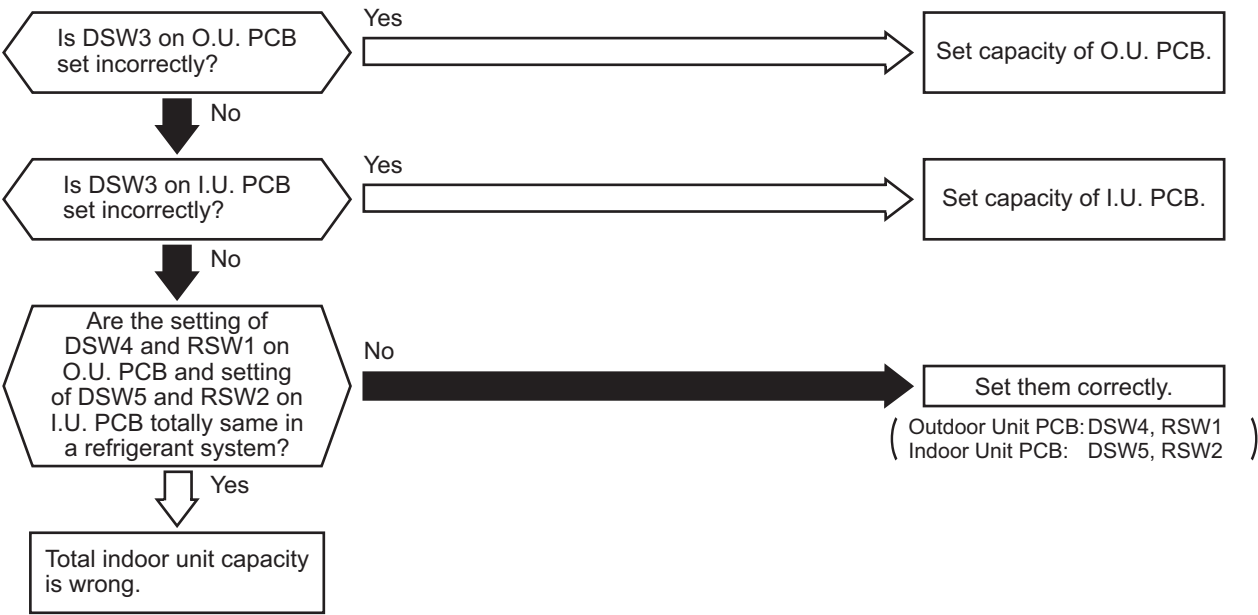
Alarm Code	31	Incorrect Capacity Setting of Outdoor Unit and Indoor Unit
------------	----	--

- The RUN indicator (Red) flashes.
 - 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 of the outdoor unit PCB.
- ^{*1)} Except for some models.

- ★ This alarm code is displayed when an undefined setting is set to DSW3 (for capacity and power supply setting) on the outdoor unit PCB.
- ★ This alarm code is displayed when the total indoor unit capacity is outside the range of connectable indoor unit capacity ratio^{*2)}.

^{*2)} Connectable Indoor Unit Capacity



Outdoor Unit Model	Connectable Indoor Unit Capacity Ratio	
	Maximum	Minimum
(H,Y,C)VAHP036B21S	130%	60%
(H,Y,C)VAHP048B21S	130%	60%
(H,Y,C)VAHP060B21S	105%	60%



TROUBLESHOOTING

Event	Cause	Check Item	Action (Turn OFF Main Switch)
	Incorrect Capacity Setting of Indoor Unit	Check combination of indoor units and capacity setting of I.U. PCB.	Correctly set DIP switch, DSW3.
	Incorrect Capacity Setting of Outdoor Unit	Check capacity setting of O.U. PCB.	Correctly set DIP switch, DSW3.
	Total Indoor Unit Capacity Connected to Outdoor Unit is Beyond Permissible Range	Check outdoor unit model by calculating total indoor units capacity.	Ensure that total indoor unit capacity.*2)
	Refrigerant System Setting of Outdoor Unit and Indoor Unit is Different	Check refrigerant system setting of O.U. PCB and I.U. PCB.	Set them correctly.

Refrigerant System No. Setting

	Setting Switch	
	10 digit	1 digit
		 Setting Position Set by inserting slotted screwdriver into the groove.
Outdoor Unit	DSW4	RSW1
Indoor Unit	DSW5	RSW2

Example of Setting Refrigerant System No.25



Turn ON No. 2 pin.



Set Dial No.5.

DSW and RSW factory setting is 0.
Maximum in setting refrigerant system No. is 63.

Alarm Code	35	Incorrect Setting of Indoor Unit Number
------------	----	---

- The RUN indicator (Red) flashes.
- 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 of the outdoor unit PCB.

^{*1)} Except for some models.

- ★ This alarm code is displayed in 3 to 5 minutes after power-on of outdoor unit, when the indoor unit No. set by DSW6 and RSW1 on I.U. PCB in the same refrigerant system No. duplicates.
- ★ This alarm code is displayed when 11 or more indoor units are connected to one outdoor unit.
- ★ This alarm code is displayed when the refrigerant system No. and the address setting value are 64 or more. (The alarm code "b1" is displayed on the wired controller.)
- ★ This alarm code is displayed when refrigerant system No. set by DSW4 and RSW1 on O.U. PCB in the same H-LINK II system duplicates.

NOTE:

In the case of H-LINK system, this alarm code may be displayed when DSW4 and RSW1 (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

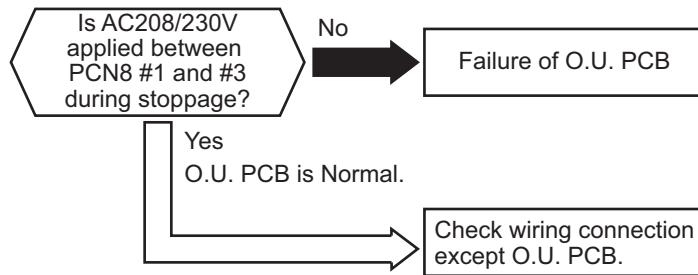
38

Problem with Picking up Circuit for Protection in Outdoor Unit

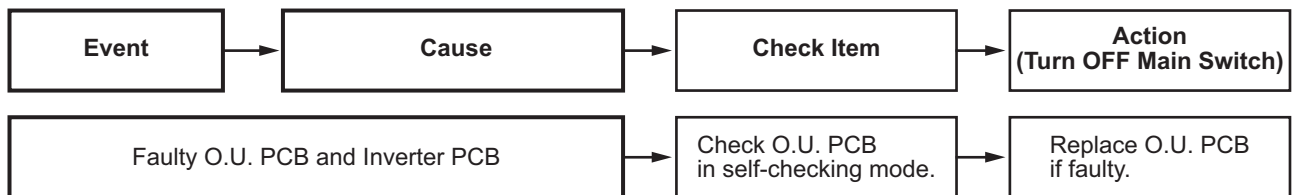
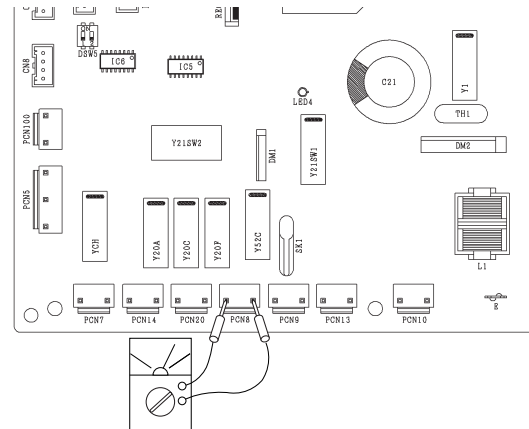
- The RUN indicator (Red) flashes.
- The indoor unit number (Ref. system number - I.U. number), the alarm code, the model code^{*1)}, the model name^{*1)} and the number of connected indoor units are displayed on the LCD. The alarm code is flashed on the 7-segment display of the outdoor unit PCB.

^{*1)} Except for some models.

- ★ This alarm code is displayed when the outdoor unit PCB detects the protection device (PSH) is activated while Y52C is turned OFF.



	Connector No. for Check
Connector	PCN8
Pin No.	#1 and #3



NOTE:

This alarm code may be displayed at starting the operation when the high pressure switch (PSH) is connected incorrectly or fails (open fault). The item for alarm code 02 should be checked as well.

Alarm
Code

43

Activation of Pressure Ratio Decrease Protection

- The RUN indicator (red) flashes.
- 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 of the outdoor unit PCB.

*1) Except for some models.

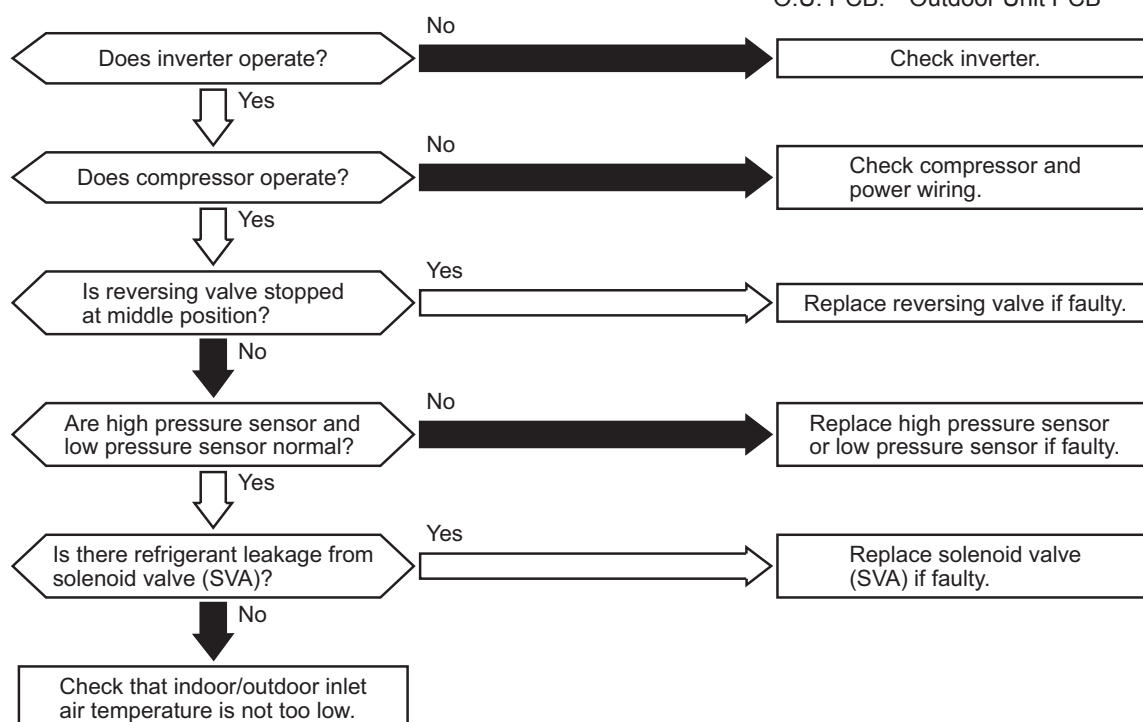
- ★ If the pressure ratio $\epsilon^{*2)}$ is less than 1.5 for a minute, the compressor stops. The operation automatically restarts after three minutes. If this occurs again twice in the next 30 minutes, this alarm code is displayed.

$$\begin{aligned} *2) \text{ Pressure Ratio } \epsilon &= (Pd[\text{psi}] + 15)/(Ps[\text{psi}] + 15) \\ &(\epsilon = (Pd[\text{MPa}] + 0.1)/(Ps[\text{MPa}] + 0.1)) \end{aligned}$$

Pd: high pressure (discharge pressure)

Ps: low pressure (suction pressure)

O.U. PCB: Outdoor Unit PCB



Event	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively Low Pressure Ratio	Inverter is not functioning.	Check inverter.	Repair faulty part.
	Compressor is not operating.	Check compressor.	Replace comp. if faulty.
	Valve Stoppage at Middle Position of Reversing Valve	Measure suction pipe temp. of reversing valve.	Replace reversing valve if faulty.
	Abnormality of High or Low Pressure Sensor	Check connector for O.U. PCB, power supply and pressure indication.	Replace sensor if faulty.
	Excessively Low Indoor Inlet Air Temperature	Check indoor unit and outdoor unit air temp. thermistor.	Replace thermistor if faulty.
	Leakage from Solenoid Valve (SVA)	Check Solenoid Valve.	Replace SVA if there is leakage.

Alarm
Code

44

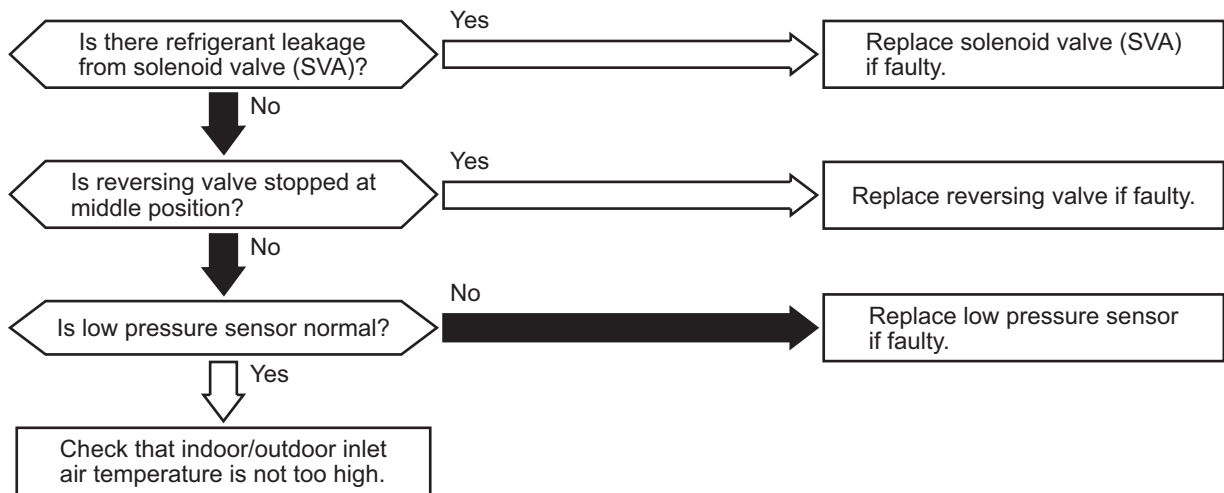
Activation of Low Pressure Increase Protection

- The RUN indicator (red) flashes.
- 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 of the outdoor unit PCB.

^{*1)} Except for some models.

- ★ If the suction pressure (Ps) of the compressor is more than 203 psi (1.4 MPa) for a minute, the compressor stops. The operation automatically restarts after three minutes. If this occurs again twice in the next 30 minutes, this alarm code is displayed.

O.U. PCB: Outdoor Unit PCB



Event	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively Increasing Low Pressure	Leakage from Solenoid Valve (SVA)	Check outlet pipe temp. of solenoid valve (SVA).	Check connecting wires. Replace solenoid valve (SVA) if faulty.
	Valve Stoppage at Middle Position of Reversing Valve	Measure suction gas pipe temp. of reversing valve.	Replace reversing valve if faulty.
	Abnormal Suction Pressure Sensor	Check connectors of O.U. PCB and power supply.	Replace sensor if faulty.
	Excessively High Indoor Unit and Outdoor Unit Inlet Air Temperature	Check indoor unit and outdoor unit inlet air temp. thermistor.	Replace thermistor if faulty.

Alarm
Code

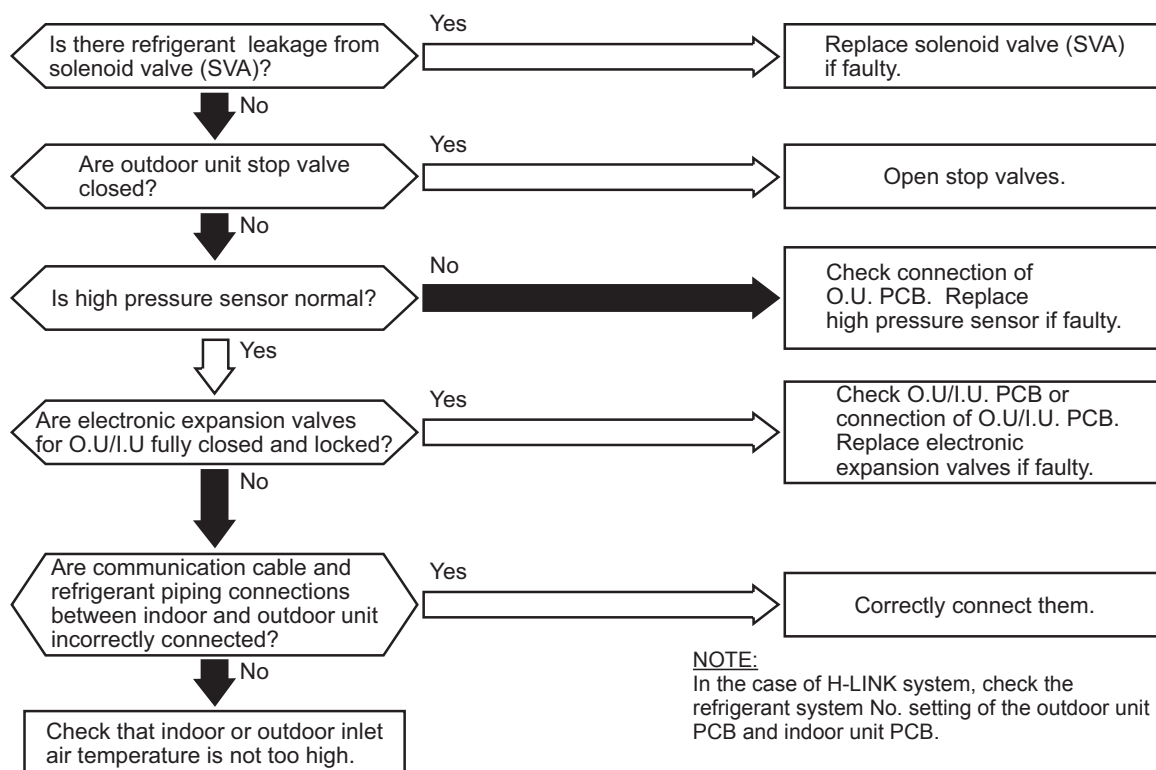
45

Activation of High Pressure Increase Protection

- The RUN indicator (Red) flashes.
- 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 of the outdoor unit PCB.

^{*1)} Except for some models.

- ★ If the high pressure (Pd) of the compressor is more than 551 psi (3.8 MPa) for a minute, the compressor stops. The operation automatically restarts after three minutes. If this occurs again twice in the next 30 minutes, this alarm code is displayed.



Event	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively Increasing High Pressure	Leakage from Solenoid Valve (SVA)	Check outlet temp. of solenoid valve (SVA).	Check connection. Replace solenoid valve (SVA) if faulty.
	Closed Stop Valve	Check stop valves.	Open stop valves.
	Abnormal High Pressure Sensor	Check connecting condition and output voltage of connector CN100 (on O.U. PCB) for high pressure sensor.	Replace high pressure sensor if faulty.
	Excessively High Temperature of Inlet Air for Outdoor Unit or Indoor Unit	Check thermistor for indoor unit and outdoor unit inlet air temp.	Replace inlet air thermistor if faulty.
	Incorrect Connection between Indoor Unit and Outdoor Unit	Check electrical system and ref. system.	Correctly connect them.
	Locked Expansion Valve (Fully Closed)	Check condition of connector CN100 on O.U. PCB.	Repair connector for O.U. PCB or expansion valve. Replace it if faulty.

Alarm
Code

47

Activation of Low Pressure Decrease Protection

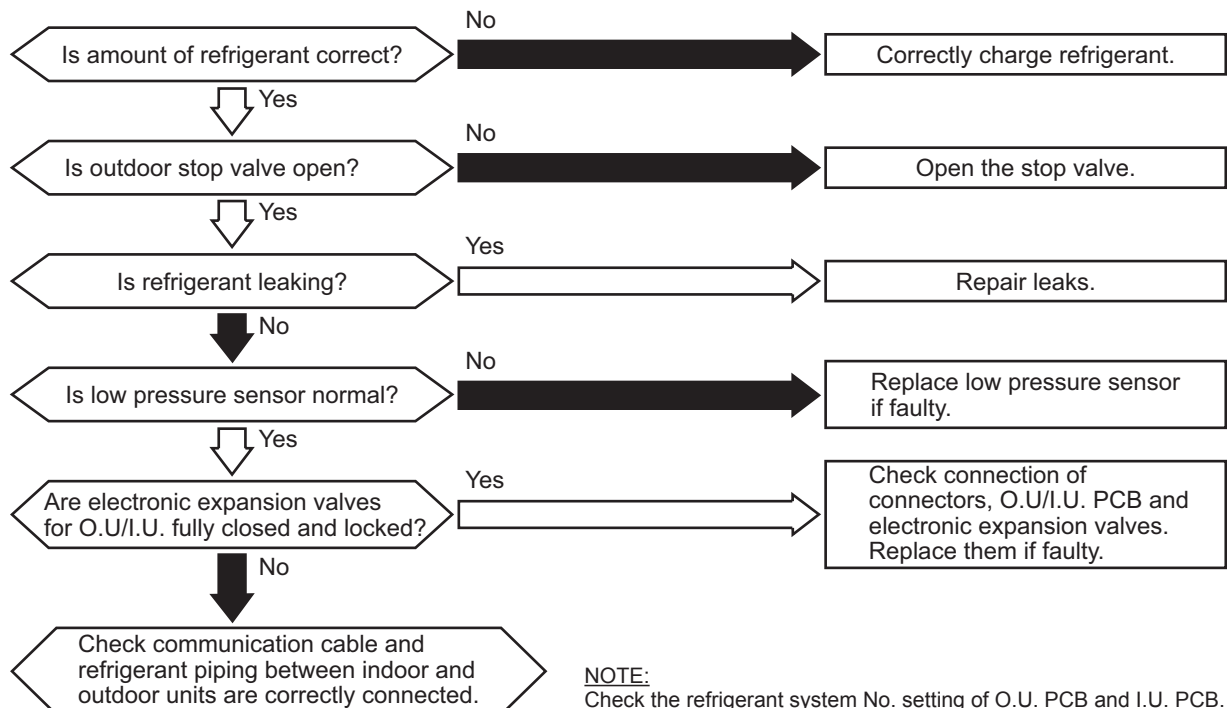
- The RUN indicator (Red) flashes.
- The indoor unit number (Ref. system number - I.U. number), the alarm code, the model code^{*1)}, the model name^{*1)} and the number of connected indoor units are displayed on the LCD. The alarm code is flashed on the 7-segment display of the outdoor unit PCB.

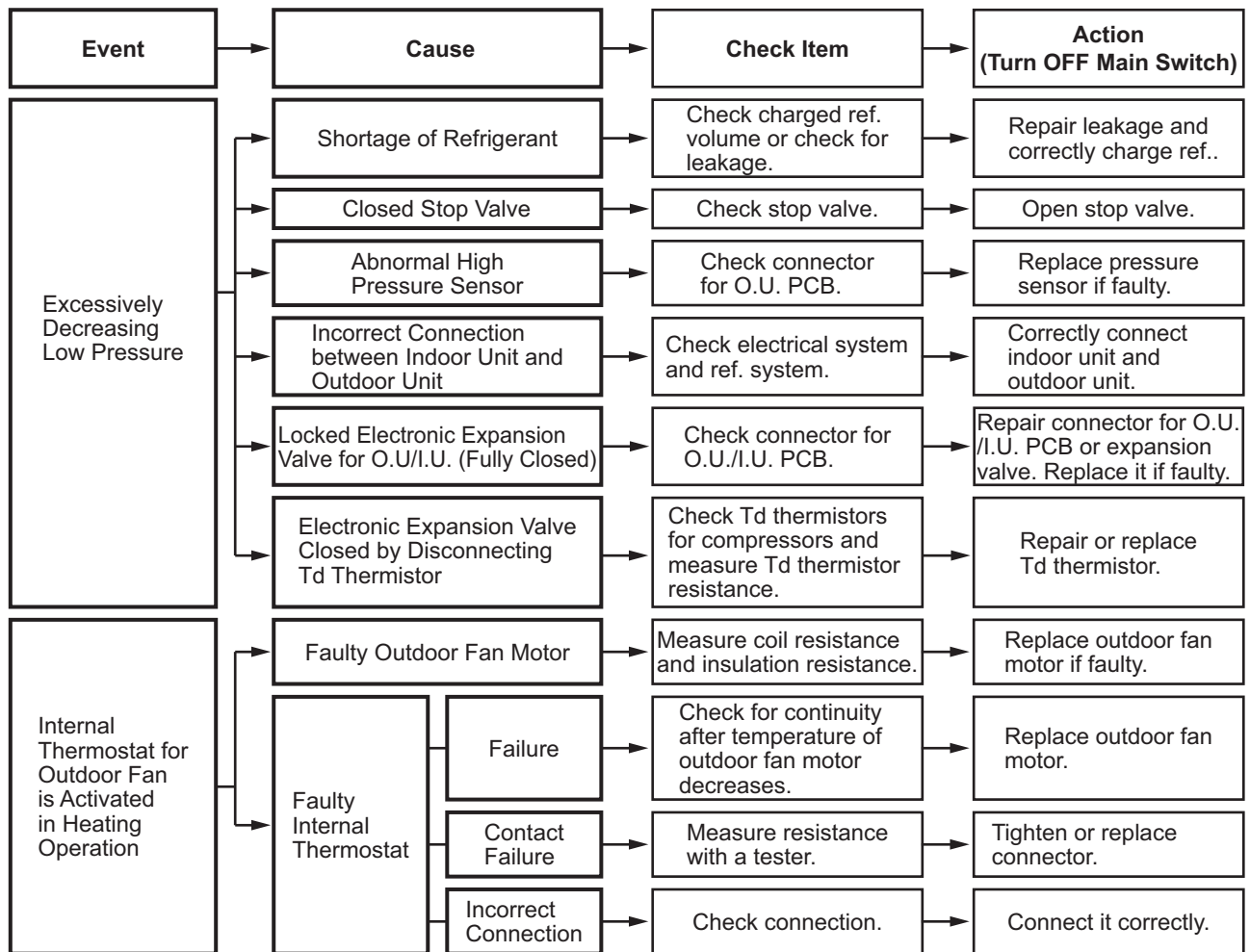
^{*1)} Except for some models.

- ★ If the low pressure (Ps) of the compressor is less than 13 psi (0.09 MPa) for 12 minutes, the compressor stops. The operation automatically restarts after three minutes. If this occurs again twice in the next 60 minutes, this alarm code is displayed.

O.U. PCB: Outdoor Unit PCB

I.U. PCB: Indoor Unit PCB





Alarm
Code

48

Activation of Inverter Overcurrent Protection

- The RUN indicator (red) flashes.
- 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 of the outdoor unit PCB. Check the inverter stoppage code when this alarm code is displayed.

^{*1)} Except for some models.

- ★ 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^{*2)} instantaneously.

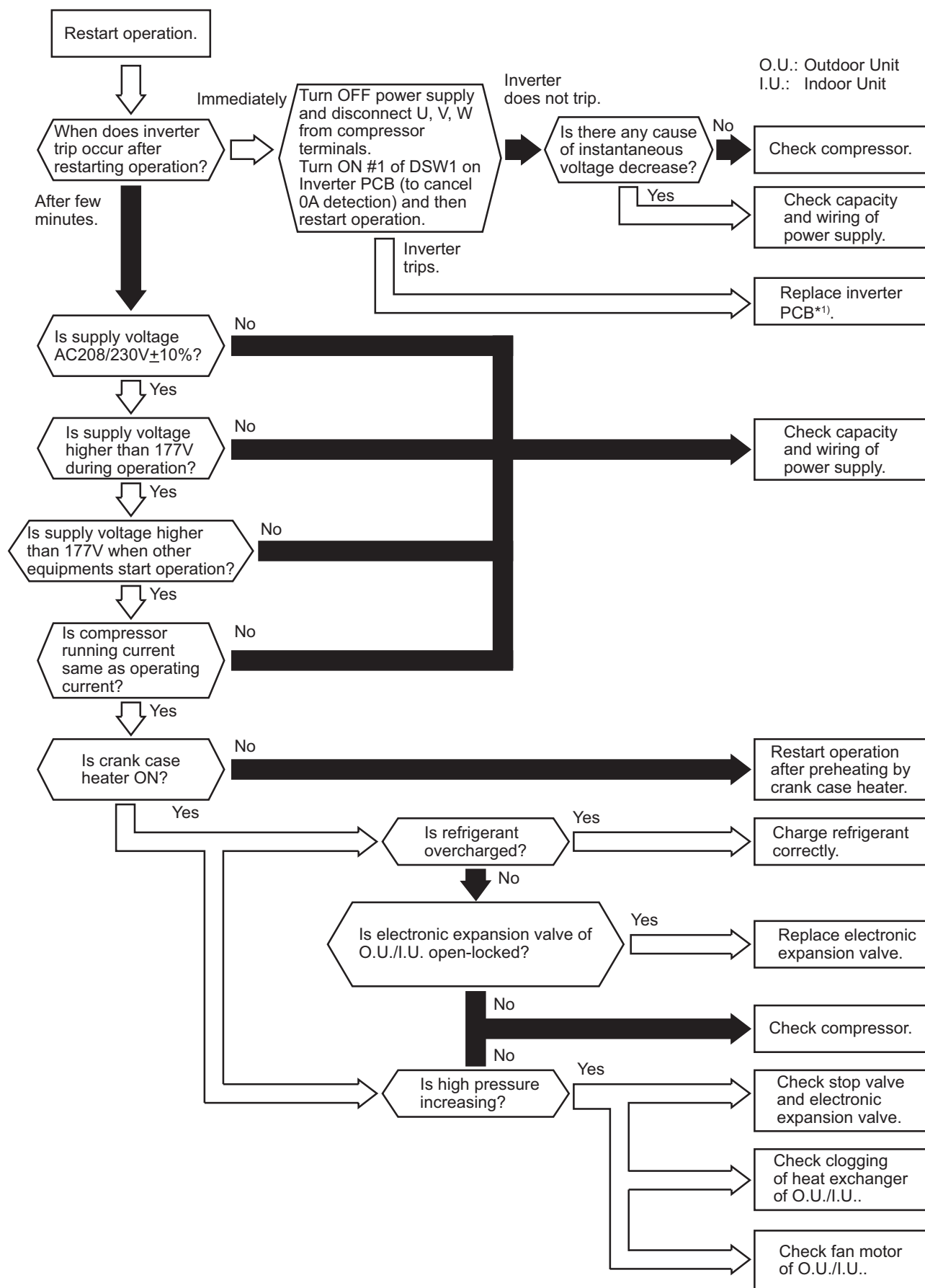
- (2) Inverter electronic thermal protection (Cause code of inverter stoppage = 4)

Inverter primary/secondary current is higher than 105% of the rated current^{*2)} for 30 seconds continuously, or

Inverter primary/secondary current is higher than 105% of the rated current^{*2)} intermittently for 3 minutes per 10 minutes.

^{*2)} Inverter rated current

Primary Current	30.0A
Secondary Current	21.5A



*1) The maintenance and replacement for inverter PCB should be performed surely according to Section 3.3.4 "Checking Method for Inverter PCB" after performing the voltage discharge work.

Alarm
Code

51

Abnormality of Current Sensor for Inverter

- The RUN indicator (Red) flashes.
- 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 of the outdoor unit PCB. Check the inverter stoppage code when this alarm code is displayed.

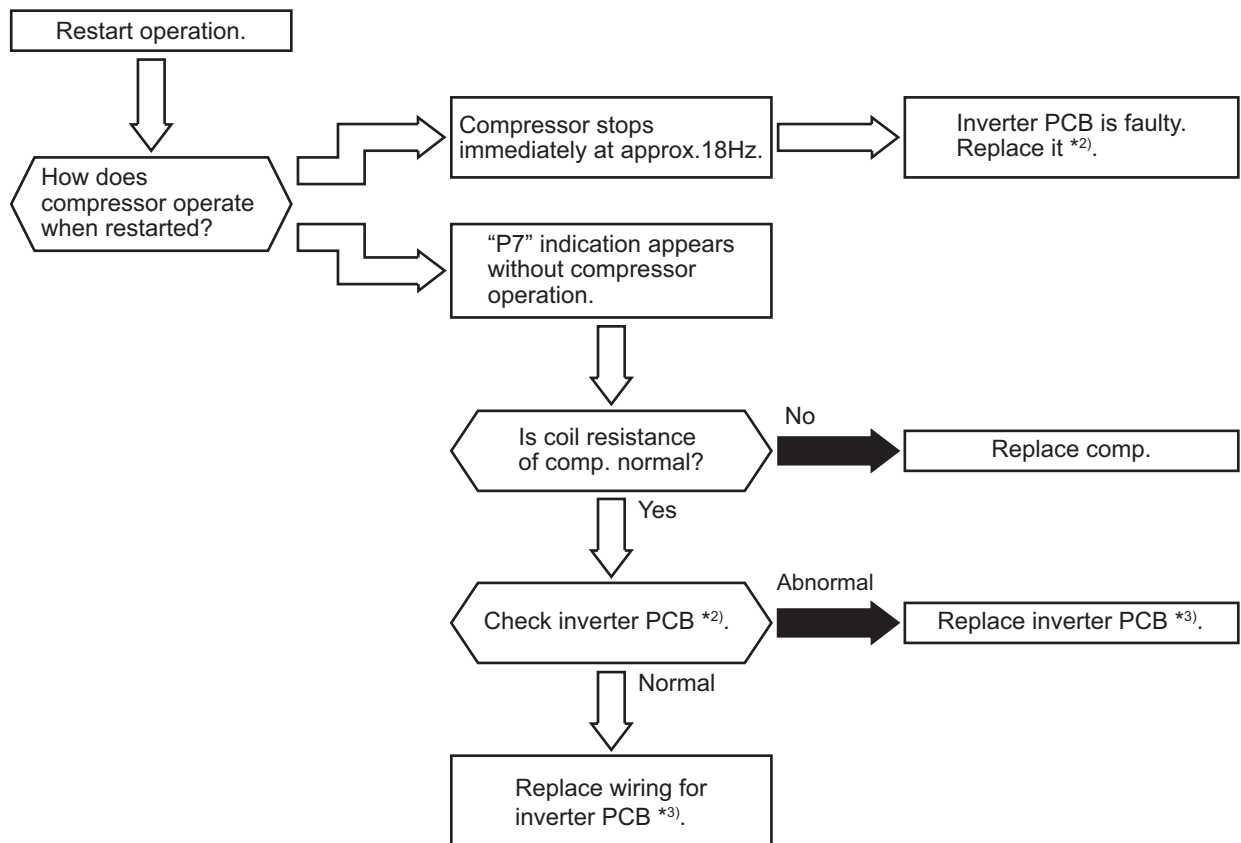
^{*1)} Except for some models.

- ★ If abnormal current detection occurs, the compressor stops. The operation automatically restarts after three minutes. If this occurs again twice in the next 30 minutes, this alarm code is displayed.

Condition of Activation:

Abnormal current detection (Cause code of inverter stoppage = 8)

- (1) Picking up circuit for inverter current is not central value before the compressor starts operation, or
- (2) Inverter secondary current is excessively low when the compressor starts operation.



^{*1)} The indication appears on 7-segment display of the outdoor unit PCB.

^{*2)} Refer to Section 3.3.4 "Checking Method for Inverter PCB" for checking.

^{*3)} The maintenance and replacement for inverter PCB should be performed carefully after performing the voltage discharge work according to Section 3.3.4 (2) "High Voltage Discharge Work for Replacing Parts".

Alarm Code	53	Inverter Error Signal Detection
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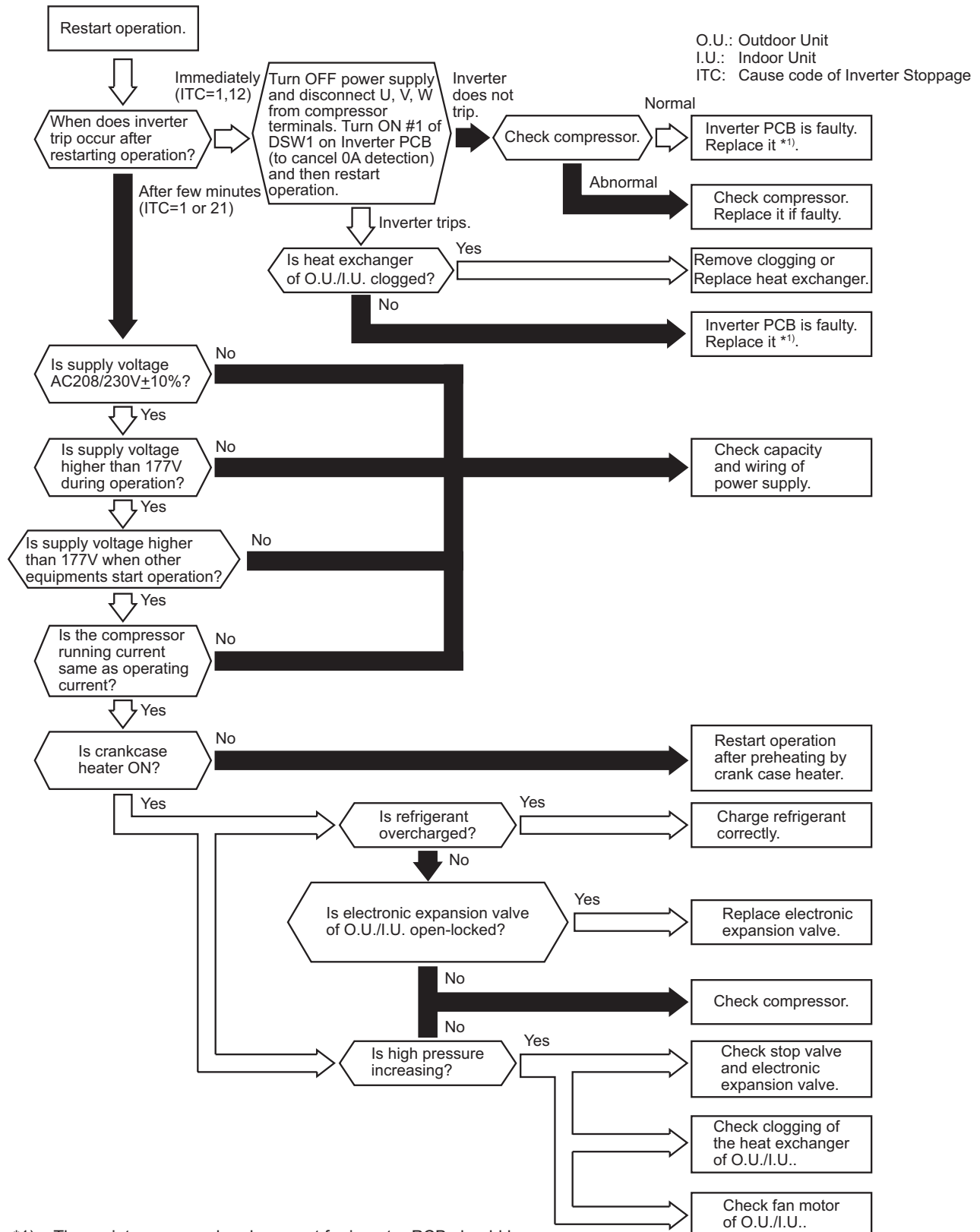
- The RUN indicator (Red) flashes.
- The indoor unit number (Ref. system number - I.U. number), the alarm code, the model code^{*1)}, the model name^{*1)} and the number of connected indoor units are displayed on the LCD. The alarm code is flashed on the 7-segment display of the outdoor unit PCB. Check the inverter stoppage code when this alarm code is displayed.

*1) Except for some models.

- ★ If IPM(transistor module) error, ground fault detection or step-out detection occurs, the compressor stops. The operation automatically restarts after three minutes. If this occurs again six times in the next 30 minutes, this alarm code is displayed.

Condition of Activation:

- (1) IPM 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°.



*1) The maintenance and replacement for inverter PCB should be performed surely after performing the voltage discharge work according to Section 3.3.4 (2) "High Voltage Discharge Work for Replacing Parts".

When this alarm code is displayed, the outdoor fan motor may be damaged.
Surely perform the troubleshooting according to Section 3.3.6 "Checking Method of DC Fan Motor for Outdoor Unit".
If the fan motor is damaged, the normal inverter PCB may be damaged.

Alarm
Code

54

Abnormality of Inverter Fin Temperature

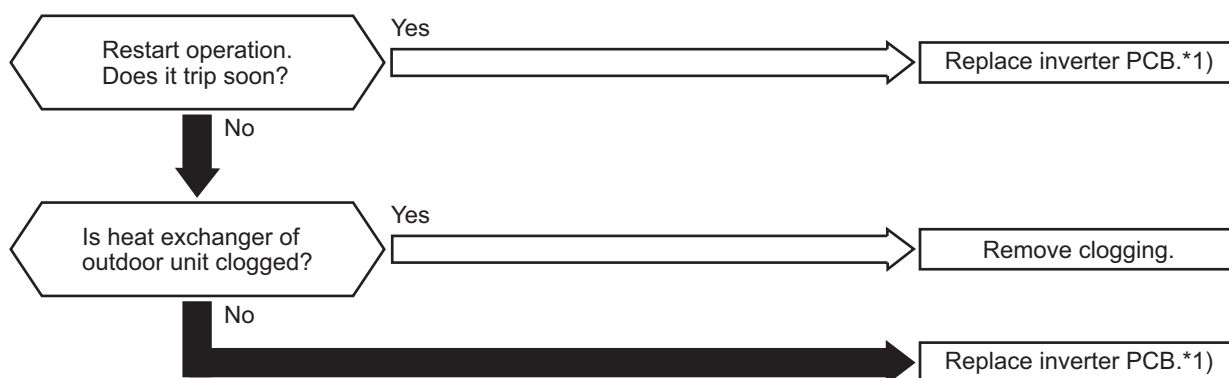
- The RUN indicator (Red) flashes.
- The indoor unit number (Ref. system number - I.U. number), the alarm code, the model code^{*1)}, the model name^{*1)} and the number of connected indoor units are displayed on the LCD. The alarm code is flashed on the 7-segment display of the outdoor unit PCB. Check the inverter stoppage code when this alarm code is displayed.

^{*1)} Except for some models.

- ★ 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 194°F (90°C).



- ^{*1)} The maintenance and replacement for inverter PCB should be performed after performing surely the voltage discharge work according to Section 3.3.4 (2) "High Voltage Discharge Work for Replacing Parts".

Alarm
Code

55

Inverter Failure

- The RUN indicator (Red) flashes.
- 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 of the outdoor unit PCB. Check the inverter stoppage code when this alarm code is displayed.

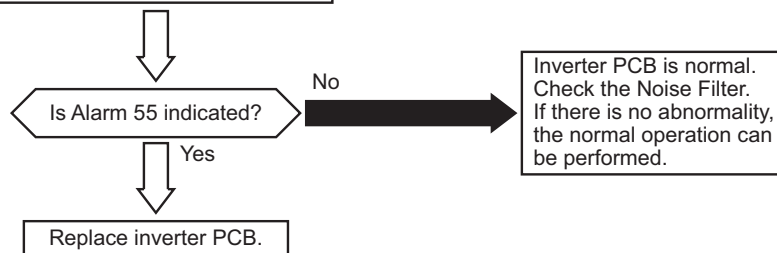
*1) Except for some models.

- ★ If inverter malfunction or communication error between the outdoor unit PCB and inverter PCB occurs, the compressor stops. The operation automatically restarts after three minutes. If this occurs again twice in the next 30 minutes, this alarm code is displayed.

Condition of Activation:

- (1) Inverter Malfunction (Cause code of inverter stoppage = 16)
Inverter has not operated for three seconds, although outdoor unit PCB requests operation.
- (2) Communication Error (Cause code of inverter stoppage = 17)
The control condition between the magnet switch(CMC) and request frequency from outdoor unit CB is discordance.

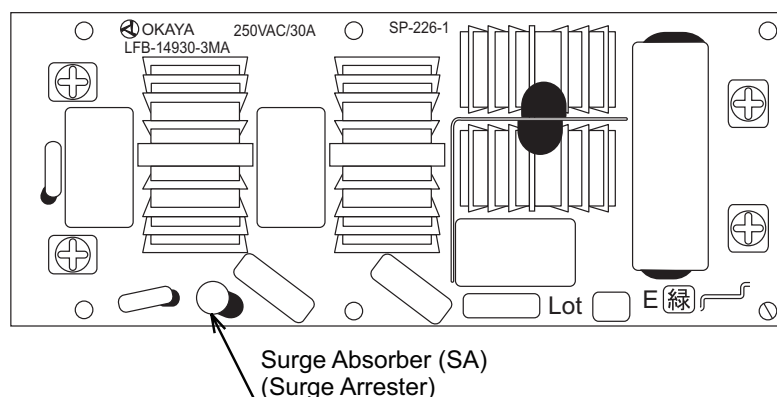
Turn off the power supply and wait until LED 201 on inverter PCB is turned off. Then turn on the power supply and restart operation.



NOTE:

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 (lrc=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 (NF1). 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.

Position of Surge Absorber (on Noise Filter "NF1")



Alarm
Code

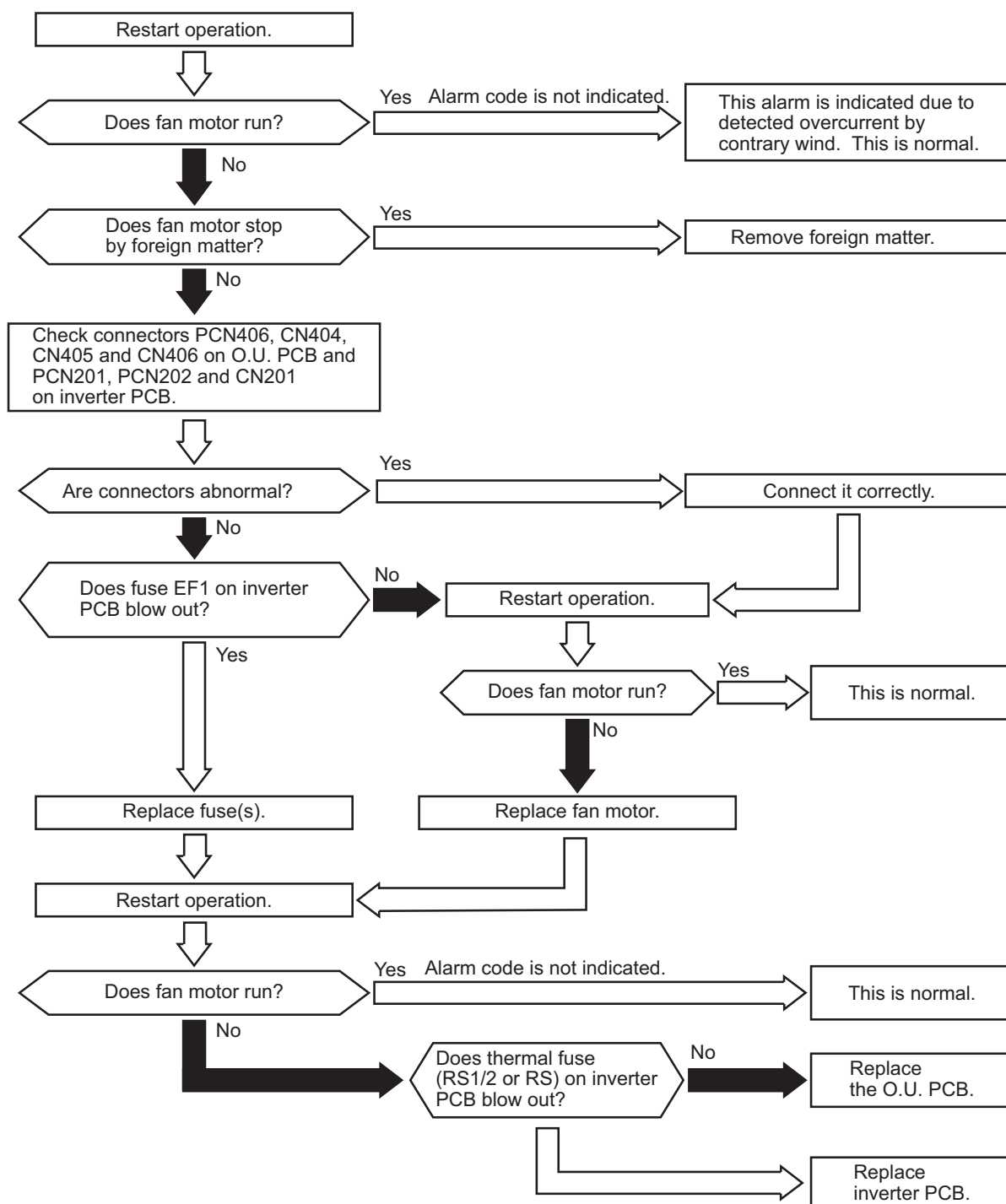
57

Abnormality of Fan Motor

- The RUN indicator (Red) flashes.
- 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 of the outdoor unit PCB.

^{*1)} Except for some models.

- ★ 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.

**NOTE:**

Refer to Section 3.3.6 "Checking Method of DC Fan Motor for Outdoor Unit" about the troubleshooting.

Alarm
Code

60

Incorrect Setting of Unit Model Code

- The RUN indicator (Red) flashes.
- 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 of the outdoor unit PCB.

^{*1)} Except for some models.

- ★ This alarm code is displayed in the following condition. Check the unit model code setting (DSW4) of I.U. PCB after turning OFF the power supply.

Condition	Action
The unit model code setting (DSW4) is not set (all pins are "OFF"), or is set for the incorrect indoor unit type.	Set DSW4 correctly according to the DIP switch setting in "Installation and Maintenance Manual".

Alarm
Code

61

Incorrect Setting of Unit and Refrigerant System Number

- The RUN indicator (Red) flashes.
- 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 of the outdoor unit PCB.

^{*1)} Except for some models.

- ★ 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.	<p>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".)</p> <p>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".)</p>
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
Code65^{*1)}

Incorrect Setting of Indoor Unit No. Setting

- The RUN indicator (Red) flashes.
- 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 of the outdoor unit PCB.

^{*1)} The alarm code displayed on the wired controller is "35".

^{*2)} Except for some models.

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 is 16 and before.

Alarm Code	EE	Compressor Protection
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- ★ 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.

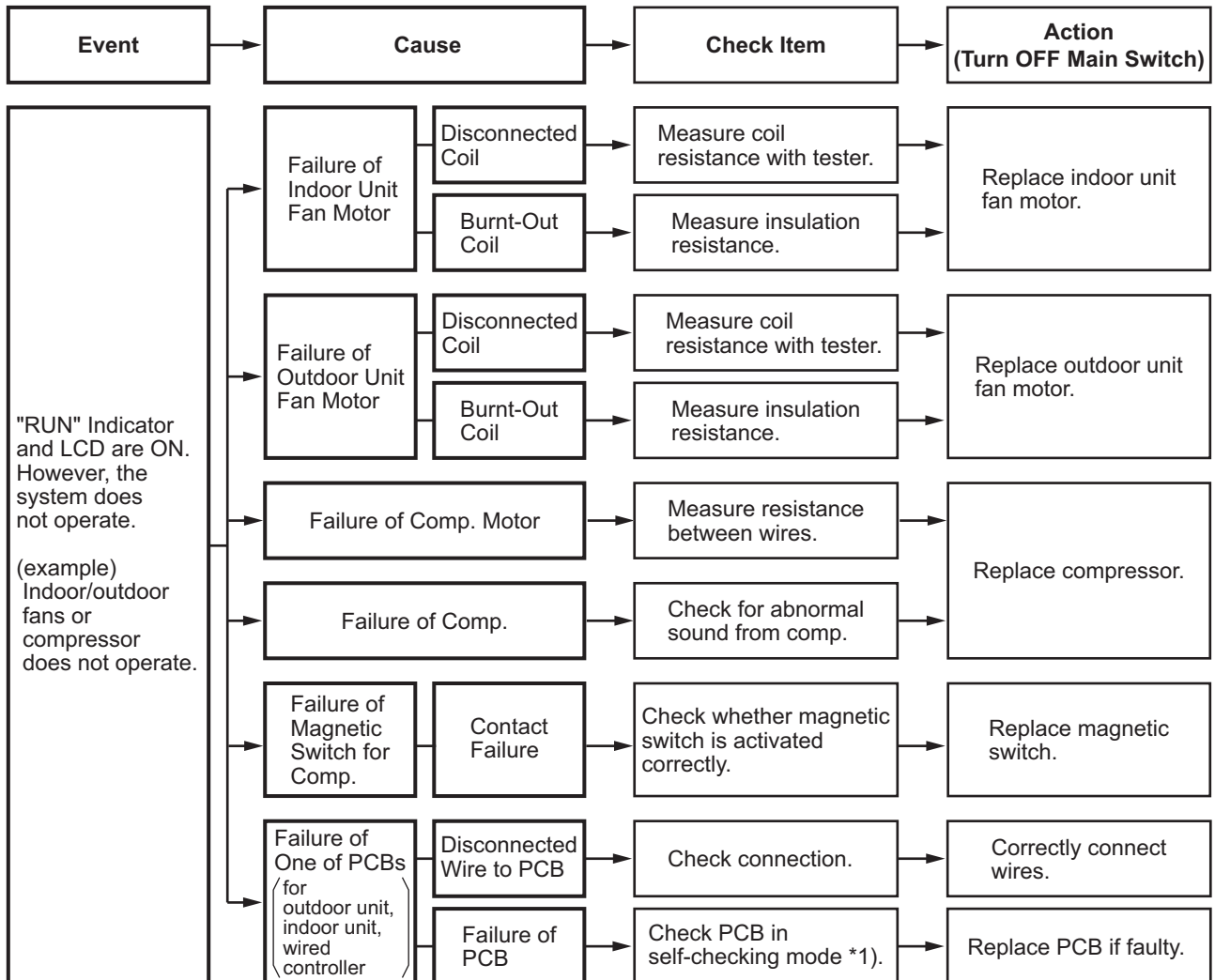
These alarms are cleared only by turning OFF the main power supply to the system. **Do not restart the operation without taking any necessary action, since there is a possibility of causing serious damages to the compressors.**

TROUBLESHOOTING

3.2.3 Abnormalities of Devices

Other Abnormalities	Abnormalities of Devices
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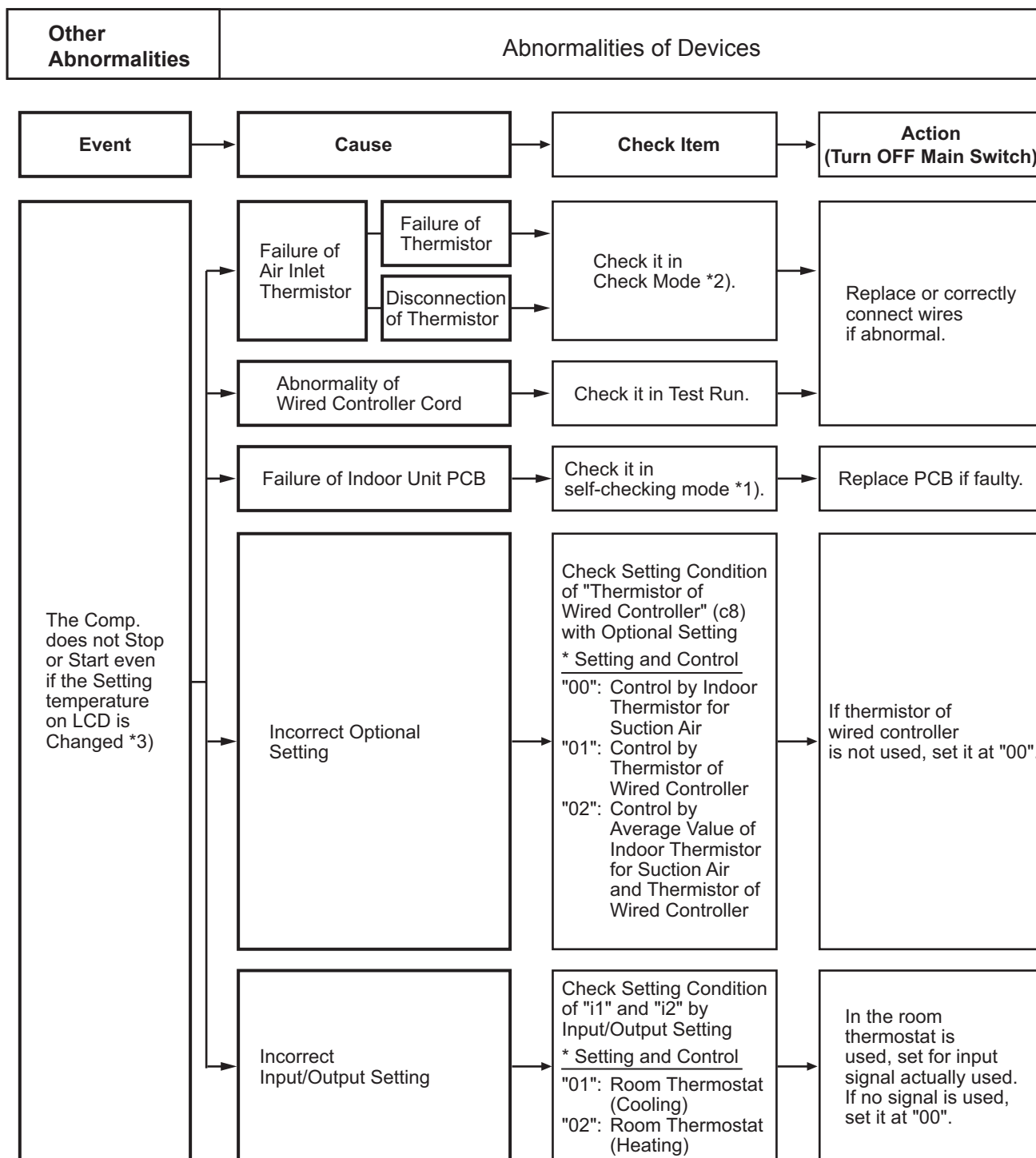
If there is no abnormality (Alarm Code) indicated on the wired controller, and normal operation is not available, take necessary action according to the following procedures.



*1): For CIW01, refer to Section 3.1.4 (3).

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

- * Indoor Air Temp. is lower than 69.8°F (21°C) or Outdoor Air Temp. is lower than 23°F (-5°C) during cooling operation.
- * Indoor Air Temp. is higher than 86°F (30°C) or Outdoor Air Temp. is higher than 73.4°F (23°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): For CIW01, refer to Section 3.1.4 (3).

*2): For CIW01, refer to Section 3.1.4 (1).

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

* Indoor Air Temp. is lower than 69.8°F (21°C) or Outdoor Air Temp. is lower than 23°F (-5°C) during cooling operation.

* Indoor Air Temp. is higher than 86°F (30°C) or Outdoor Air Temp. is higher than 73.4°F (23°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.

Other Abnormalities	Abnormalities of Devices			
Event	Cause		Check Item	Action (Turn OFF Main Switch)
Indoor Fan Speed is Not Changed	Failure of Outlet Air Temp. Thermistor	Failure of Thermistor	Check thermistor in Self-Checking mode *2).	Replace or correctly connect wires if abnormal.
		Disconnected Wire of Thermistor		
	Failure of Wired Controller	Check it in self-checking mode *3).	Replace wired controller if faulty.	
	Failure of Indoor Unit PCB	Check it in self-checking mode *1).	Replace PCB if faulty.	
No Defrosting Operation Mode is Available while Heating Operation or Defrosting Operation is Continued	Failure of Thermistor for Outdoor Evaporating Temp. during Heating	Failure of Thermistor		Replace or correctly connect it if abnormal.
		Disconnected Wire of Thermistor		
	Failure of Reversing Valve	Disconnected Reversing Valve Coil	Measure resistance of coil.	Replace reversing valve.
		Incorrect Activation of Reversing Valve	Supply power forcibly.	
	Disconnected Control Wires between Indoor Unit and Outdoor Unit	Check connectors.	Correctly connect wires.	
	Failure of Outdoor Unit PCB	Disconnected Wire to PCB	Check connectors.	Correctly connect wires.
		Failure of PCB	Check it in self-checking mode *1).	Replace it when check mode is not available.
	Failure of Indoor Unit PCB	Disconnected Wire to PCB	Check connectors.	Correctly connect wires.
		Failure of PCB		
Light and LCD Indication on Wired Controller are Kept ON	Failure of PCB in Indoor Unit or Wired Controller	Check PCB in self-checking mode *1).		

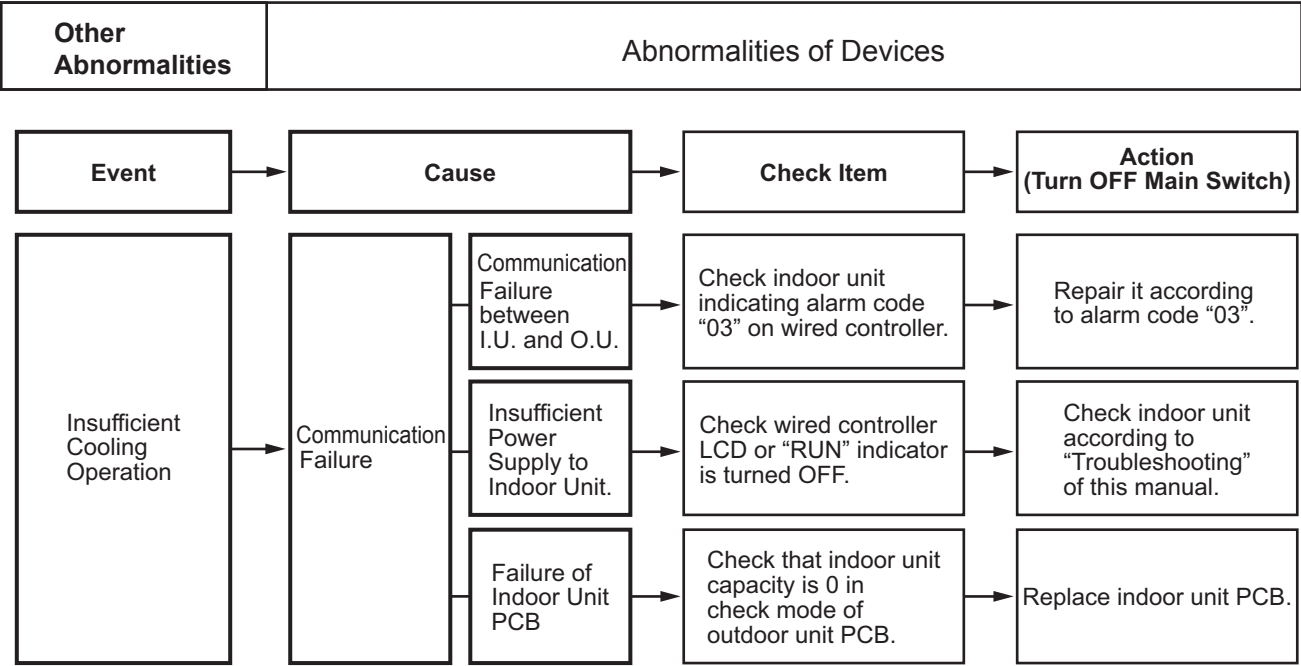
*1): For CIW01, refer to Section 3.1.4 (3).

*2): For CIW01, refer to Section 3.1.4 (1).

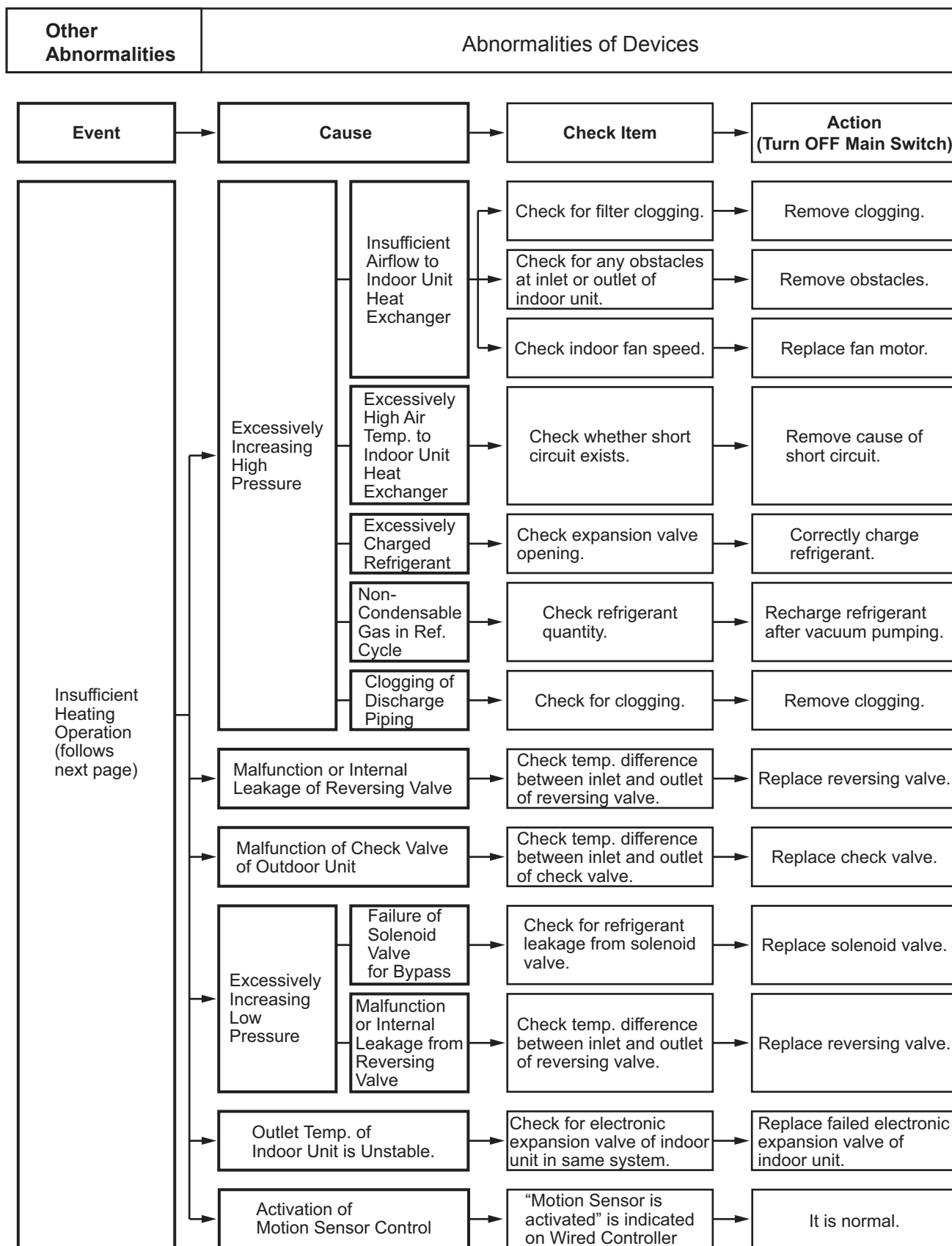
*3): For CIW01, refer to Section 3.1.4 (4).

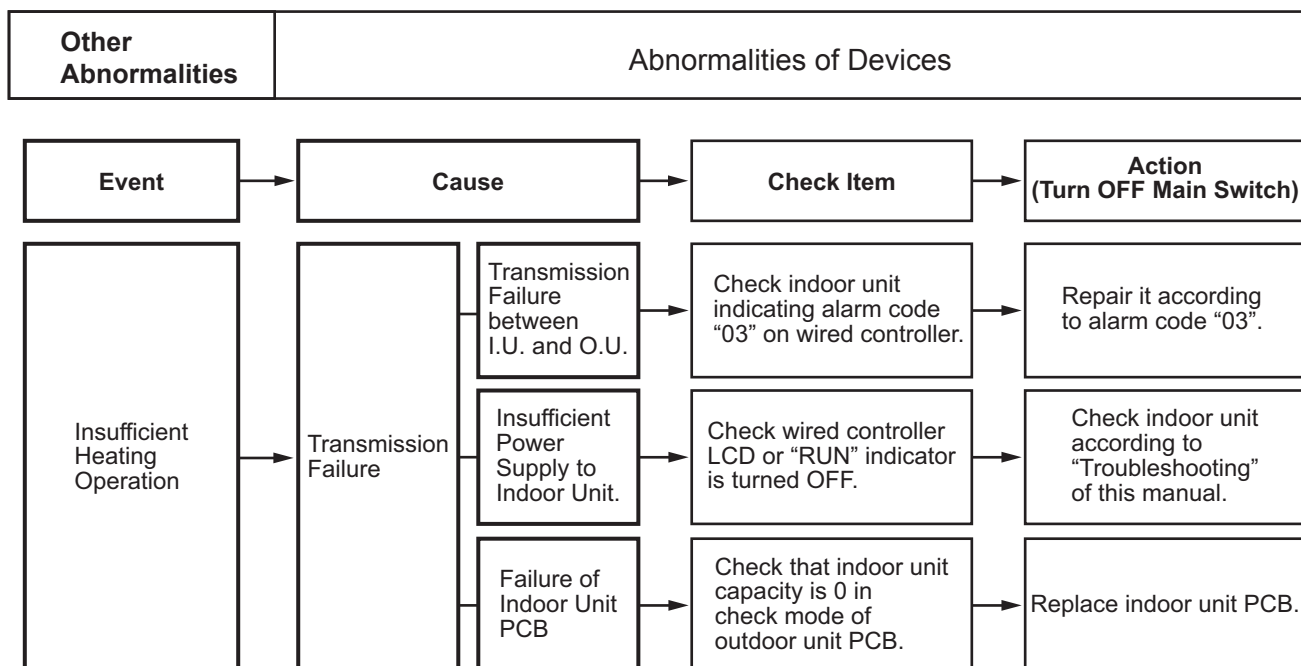
Other Abnormalities	Abnormalities of Devices		
Event	Cause	Check Item	Action (Turn OFF Main Switch)
Insufficient Cooling Operation (follows next page)	Indoor Heat Load is Larger than Cooling Capacity	Calculate heat load.	Use a larger unit.
	Excessively Decreasing Low Pressure	Gas Leakage or Shortage of Refrigerant	Measure superheat.
		Correctly charge refrigerant after repairing gas leakage.	
		Excessively Small Diameter or Long Piping	Measure and check field-supplied pipes.
		Use correct pipes.	
		Incorrect Activation of Check Valve of Outdoor Unit	Check whether or not temp. difference exists before/after check valve.
		Replace check valve for outdoor unit.	
		Failure or Malfunction of Electronic Expansion Valve	Check for any clogging.
			Remove clogging.
			Check connection cord and connector.
			Replace connector.
			Is there operation sound from coil?
			Replace coil.
			Is thermistor on compressor normal?
			Replace thermistor.
			Is thermistor installed correctly on compressor?
			Correctly install it.
		Clogged Strainer in Indoor Unit	Check temp. difference at inlet and outlet of strainer.
		Replace strainer in indoor unit.	
		Clogging at Gas Piping	Check temp. difference.
		Remove clogging.	
		Insufficient Airflow to Indoor Unit Heat Exchanger	Check for clogged air filter.
			Clean air filter.
			Check for obstacle at inlet or outlet.
			Remove obstacles.
		Excessively Low Air Temp. to Indoor Unit Heat Exchanger	Insufficient revolution of indoor unit fan motor?
			Replace fan motor.
			Check short-circuited indoor unit air.
			Remove cause of short-circuited.
	Activation of Motion Sensor Control	"Motion Sensor is activated" is indicated on Wired Controller	It is normal.

Other Abnormalities	Abnormalities of Devices			
Event	Cause		Check Item	Action (Turn OFF Main Switch)
Insufficient Cooling Operation (follows next page)	Excessively Increasing High Pressure	Insufficient Airflow to Outdoor Unit Heat Exchanger	Check clogging of outdoor unit heat exchanger.	Remove clogging.
			Obstacles at inlet or outlet of outdoor unit heat exchanger?	Remove obstacles.
			Is service space for outdoor unit sufficient?	Secure sufficient service space.
			Correct fan speed?	Replace fan motor.
		Excessively High Air Temp. to Outdoor Unit Heat Exchanger	Short-circuited outdoor unit air	Remove cause of short-circuit.
			Any other heat load near outdoor unit?	Remove heat source.
		Excessively Charged Refrigerant	Check expansion valve opening.	Correctly charge refrigerant.
		Non-Condensable Gas in Cycle	Check each temp. and pressure.	Charge refrigerant after vacuum pumping.
		Clogging of Discharge Piping	Check for clogging.	Remove clogging.
		Failure or Malfunction of Expansion Valve	Check for clogging.	Remove clogging.
			Check for connecting wire and connector.	Replace connector.
			Is there operation sound from coil?	Replace coil.
			Is thermistor on compressor normal?	Replace thermistor.
			Is thermistor installed correctly on compressor?	Correctly install it.
		Malfunction or Internal Leakage from Reversing Valve	Check temp. difference between inlet and outlet of reversing valve.	Replace reversing valve.
	Excessively Decreasing High Pressure	Failure of Solenoid Valve for Bypass	Check leakage from solenoid valve.	Replace solenoid valve.
		Malfunction or Internal Leakage from Reversing Valve	Check temp. difference between inlet and outlet of reversing valve.	Replace reversing valve.
	Outlet Temp. of Indoor Unit is Unstable.	Check for electronic expansion valve of indoor unit in the same system.		Replace failed electronic expansion valve of indoor unit.



Other Abnormalities	Abnormalities of Devices			
Event	Cause	Check Item	Action (Turn OFF Main Switch)	
Insufficient Heating Operation (follows next page)	Indoor Heat Load is Larger than Heating Capacity	Calculate heat load.	Use larger unit.	
	Excessively Decreasing Low Pressure	Gas Leakage or Insufficient Refrigerant Charge	Measure superheat.	Correctly charge refrigerant after gas leakage check and repair.
		Excessively Small Diameter or Long Piping	Measure field-supplied pipes.	Use specified pipes.
		Failure or Malfunction of Electronic Expansion Valve	Check for clogging.	Remove clogging.
			Check for connecting cord and connector.	Replace connector.
			Is there operation sound from coil?	Replace coil.
			Is thermistor on compressor normal?	Replace thermistor.
			Is thermistor installed correctly on compressor?	Correctly install it.
		Clogging of Indoor Unit/ Outdoor Unit Strainer	Check temp. difference between inlet and outlet of strainer.	Replace strainer for outdoor unit or indoor unit.
		Clogging of Suction Piping	Check temp. difference of each part.	Remove clogging.
		Insufficient Airflow to Outdoor Unit Heat Exchanger	Is outdoor unit heat exchanger clogged?	Remove clogging.
			Are there any obstacles at inlet or outlet of outdoor unit?	Remove obstacles.
			Is service space for outdoor unit sufficient?	Secure sufficient service space.
			Check outdoor fan speed.	Replace fan motor.
		Excessively Low Air Temp. to Outdoor Unit Heat Exchanger	Check for any short-circuited outdoor unit air.	Remove cause of short circuit.
Defrosting is Insufficiently Completed	Check thermistor for defrosting.	Replace thermistor for defrosting.		





Other Abnormalities	Abnormalities of Devices		
Event	Cause	Check Item	Action (Turn OFF Main Switch)
Cooling or Heating Operation with Abnormal Sound	Foreign Particles Inside Fan Casing	Check it by viewing.	Remove foreign particles.
	Indoor Unit Fan Wheel Contacts Casing	Check it by viewing.	Adjust position of fan runner.
	Outdoor Unit Propeller Fan Comes in Contact with Fan Shroud	Check it by viewing.	Adjust position of propeller fan.
	Abnormal Sound from Compressor	Failure of Installation	Check each part is tightly secured.
		Liquid Ref. Compression	Check expansion valve opening.
		Wear or Breakage of Internal Comp. Parts	Is there any abnormal sound from inside of compressor?
		Crankcase Heater does Not Get Warm	Check resistance of crankcase heater or fuse.
	Buzzing Sound from Magnetic Contactor	Check surface of contacts.	Replace magnetic switch.
	Abnormal Vibration of Cabinets	Check each tightening screws.	Tightly secure it.
Outdoor Fan does Not Operate even when Compressor is Operating	Obstacle at Outdoor Fan	Check obstacles.	Remove obstacles.
	Preparatory State for Heating Operation	Wait for switching of reversing Valve. (1 to 3 minutes)	If the reversing valve is not switched, check for insufficient refrigerant.
Indoor Fan does Not Operate even when Compressor is Operating	Disconnected Wire for Indoor Fan	Check wiring.	Correctly connect wires.
	Failure of AC Chopper	Check AC chopper.	Replace AC chopper.

Other Abnormalities	Abnormalities of Devices (Motion and Radiation Sensor for 4-Way Cassette Type)		
Event	Cause	Check Item	Action (Turn OFF Main Switch)
“Motion Sensor is activated” is indicated on Wired Controller LCD.	Reaction rate is always 100%.	Check the “Check Mode 1: q1” on the wired controller. ↓ Check if there is motion sensor with “Reaction rate always 100%”.	True: Replace motion and radiation sensors PCB. False: Replace control PCB.
Operation Stops though Someone is Present.	Reaction rate is always 0%.	Operate under detection area of motion sensor and check the “Check Mode 1: q1” on the wired controller. ↓ Check if there are motion sensors with “Reaction rate always 0%”.	True: Replace motion and radiation sensors PCB. False: Sensitivity may be low. Adjust the [Optional Function: K6] to [01: High Sensitivity] and see if there are any changes. If the symptom continues, replace motion and radiation sensors PCB.
Not Operating in “Avoid Air” or “Receive” though Someone is Present.			
Operation Continues though No One is Present.	Motion sensor setting is disabled on the wired controller.	Check setting on the wired controller.	Correct the setting.
	Motion sensor setting of No presence is set to other than “Stop” on the wired controller.	Check setting on the wired controller.	Correct the setting.
	There are heat sources other than human in the detecting area of the sensor.	Check heat source (a moving object whose temperature is different from surroundings).	Remove it.
	There is sensor with high sensitivity.	Stop the operation from the wired controller, no motion in the detection area of the motion sensor and check the “Check Mode 1: q1”. ↓ Check if there is no motion sensor with “Reaction rate 0%”.	True: Replace motion and radiation sensors PCB. False: No problem. Adjust the [Optional Function: K6] to [02: Low Sensitivity] and see if there are any changes. If the symptom continues, replace motion and radiation sensors PCB.
		Operating in “Avoid Air” or “Receive”.	
Operating in “Avoid Air” or “Receive” though No One is Present.	15 minutes has not passed since someone left the room.	Check the louver operation after no one has been in the room for more than 15 minutes.	Not operating in “Avoid Air” or “Receive”. This is normal operation.
	There are heat sources other than human in the detection area of the sensor.	Check heat source (a moving object whose temperature is different from surroundings).	Remove it.
“Radiation Sensor is activated” is indicated on Wired Controller LCD.	Radiation sensor element is abnormal.		Replace motion and radiation sensors PCB.

Other Abnormalities	Abnormalities of Devices (Motion and Radiation Sensor for 4-Way Cassette Type)		
Event	Cause	Check Item	Action (Turn OFF Main Switch)
Operation of Heating Radiation Sensor though the Room is already Heated.	Setpoint on the wired controller is high and the difference against the radiated temperature is big.	Immediately after "Radiation Sensor is activated" indication on wired controller LCD, check the "Check Mode 1: q2". ↓ Check if there is more than 7°F (4°C) difference between the radiated temperature and the setpoint on the wired controller.	True: No problem. This control targets the setpoint on the wired controller with heating operation. If setpoint is high, this control is activated even though the room is heated. False: Replace control PCB.
	Radiated temperature is detected as low.	Stop the operation from the wired controller and check the "Check Mode 1: q2". ↓ Check if there is more than 18°F (10°C) differences between the temperature near to the floor*1 and radiated temperature.	True: Replace motion and radiation sensors PCB. False: Adjust the [Optional Function: K7] to [01: Upward] and see if there are any changes. If the symptom continues then replace motion and radiation sensors PCB.
No Operation of Heating Radiation Sensor though the Room is Cold.	Radiation sensor setting is disabled on the wired controller.	Check setting on the wired controller.	Correct the setting.
	There is a heat sources other than human in the detection area of the sensor.	Check heat source (a moving object whose temperature is different from surroundings).	Remove it. Depending on the heat source, the control is hard to operate.
	Setpoint on the wired controller is low and the difference against the radiated temperature is small.	Immediately after "Radiation Sensor is activated" indication on wired controller LCD, check the "Check Mode 1: q2". ↓ Check if there is less than 5°F (3°C) difference between the radiated temperature and the setpoint on the wired controller.	True: No problem. This control does not operate when the difference between setpoint on the wired controller and radiated temperature is small. False: Replace control PCB.
	Radiated temperature is detected as high.	Stop the operation from the wired controller and check the "Check Mode 1: q2". ↓ Check if there is more than 18°F (10°C) difference between the temperature near to the floor*1 and radiated temperature.	True: Replace motion and radiation sensors PCB. False: Adjust the [Optional Function: K7] to [02: Downward] and see if there are any changes. If the symptom continues, replace motion and radiation sensors PCB.
Motion Sensor Setting is not indicated on the Wired Controller.	Communication error between indoor unit control PCB and motion and radiation sensors PCB.	Check connection and connectors.	If the symptom continues, replace motion and radiation sensors PCB.

*1) Prepare thermometer for checking. Make sure there are no heat sources before taking measurement.

Other Abnormalities	Abnormalities of Devices (Motion Sensor except for 4-Way Cassette Type)	
Event	Cause / Check Item	Action (Turn OFF Main Switch)
"Motion Sensor is activated" is NOT Indicated on Wired Controller LCD.	Check connection of connector.	Connect it securely.
Operation Stops though Someone is Present.	Check reaction rate (Check Mode 1: q1) (Reaction rate is always 0%: abnormal)	Replace motion sensor.
	Check connection of connector.	Connect it securely.
Operation Continues though No One is Present.	Check reaction rate (Check Mode 1: q1) (Reaction rate is always 100%: abnormal)	Replace motion sensor.
	Check heat source (a moving object whose temperature is different from atmosphere).	Remove it.
	Check connection of connector.	Connect it securely.

3.3 Procedures for Checking

3.3.1 Self-Checking of PCBs using Wired Controller

Refer to Section 3.1.4 (3) "I.U/O.U. PCB Check"

3.3.2 Self-Checking of Wired Controller

Refer to Section 3.1.4 (4) "Self-Checking"

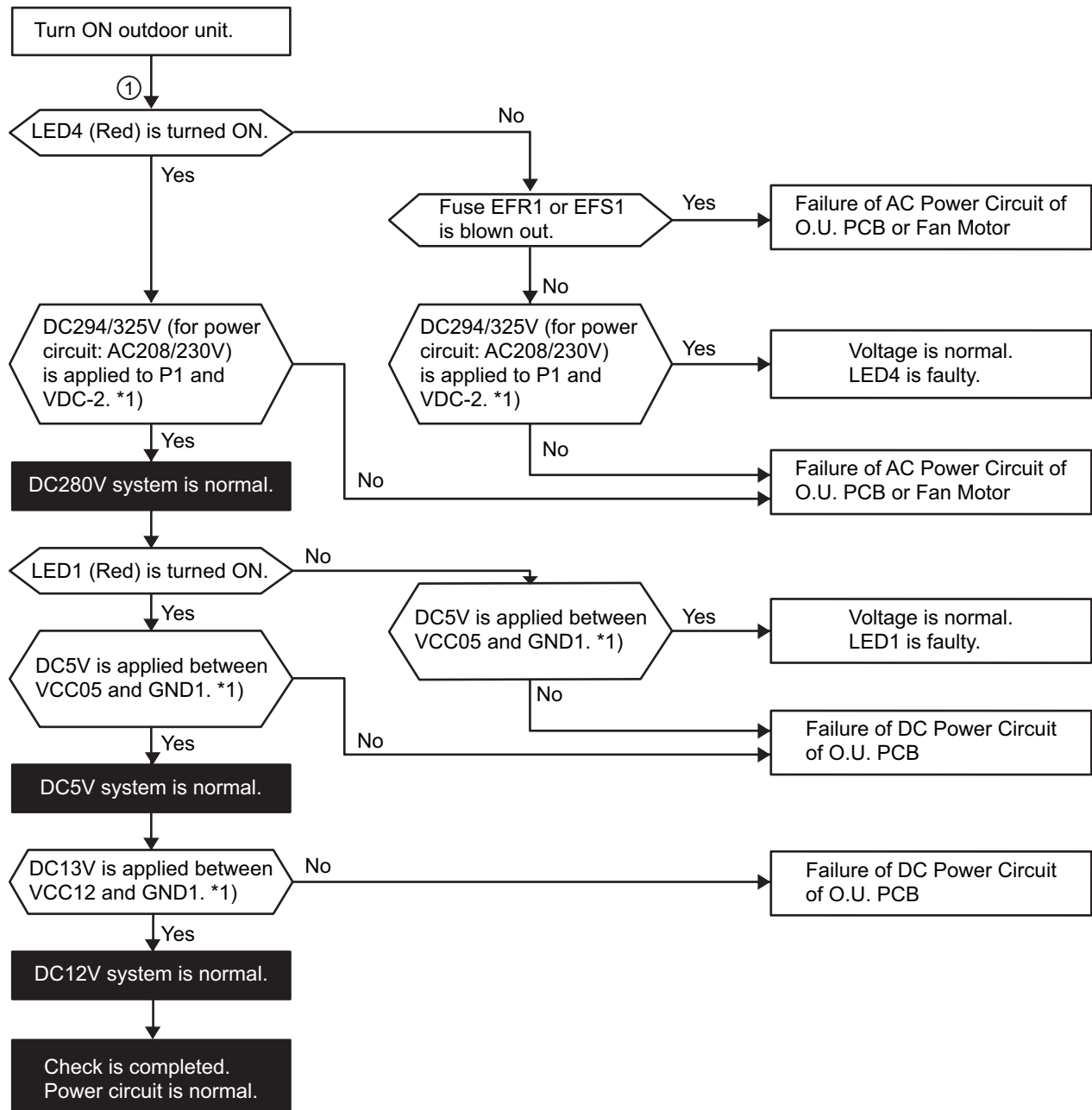
3.3.3 Checking Method for Outdoor Unit PCB (PCB1)

(1) Checking Power Circuit

Check the power circuit on O.U. PCB in following procedures. Refer to the figure on next page about the positions of LEDs, fuses and check points. Refer about check points by a circuit tester and judgment value as well.

⚠ CAUTION

- Pay attention to an electric shock when the voltage is measured by a circuit tester.
- Do not contact the test lead to unspecified check points when measuring by circuit tester. It may cause failure of terminal and circuit tester.



- *1) The following table shows the check points and the normal range of voltage in the case that the voltage on O.U. PCB is measured by a circuit tester. The setting of circuit tester shall be set within the DC voltage measurement range when the following voltages are measured.

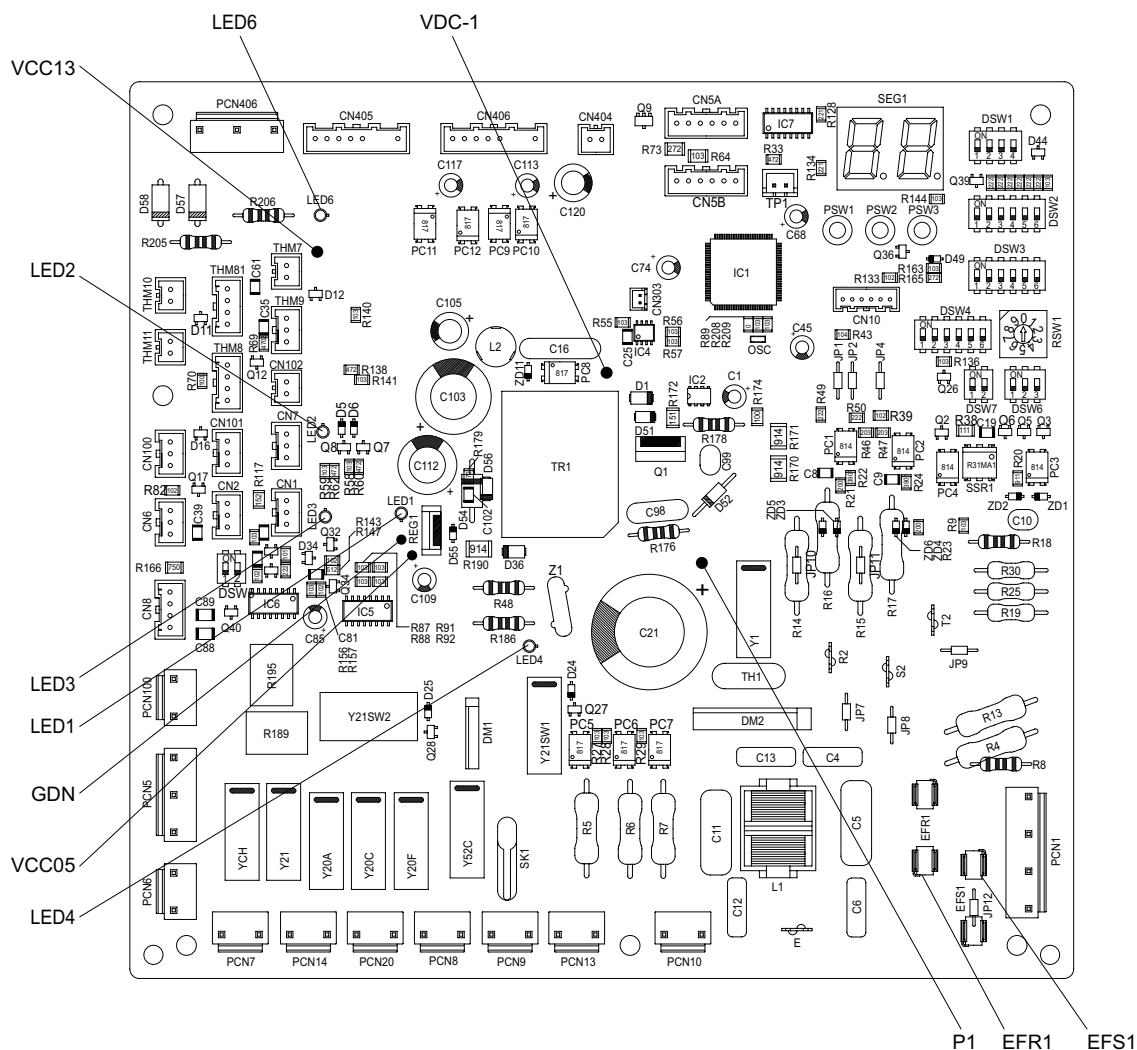
Check Point		Normal Range (V)
(+) Side of Tester	(-) Side of Tester	
P1	VDC-2	Power Supply AC228/253V (rms): approx. 322/358VDC Power Supply AC208/230V (rms): approx. 294/325VDC Power Supply AC188/207V (rms): approx. 266/293VDC
VCC05	GND1	4.5VDC ~ 5.5VDC
VCC13		11.5VDC ~13.5VDC

CAUTION

When the voltage is measured by a circuit tester, the range should be set within the DC voltage measurement. If the setting is not correct, it may cause failure of O.U. PCB and circuit tester.

- Outdoor Unit Printed Circuit Board (PCB1)
The positions of LEDs, connectors, etc. on O.U. PCB are as follow.

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

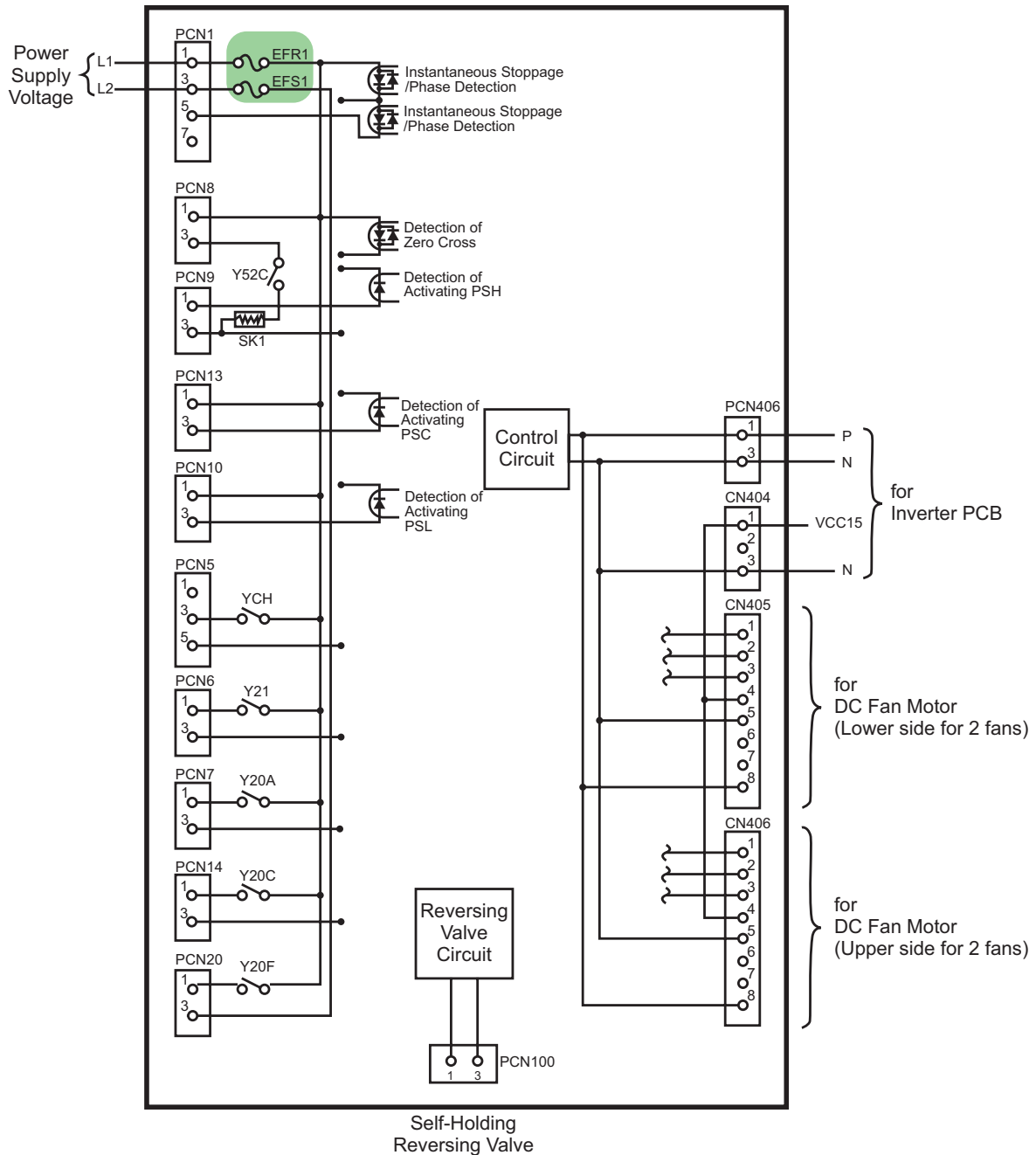


(2) Checking Item for Fuse

The purpose, capacity and causes of fuse melted are shown in below.
Additionally, the figure for inside O.U. PCB is as follow.

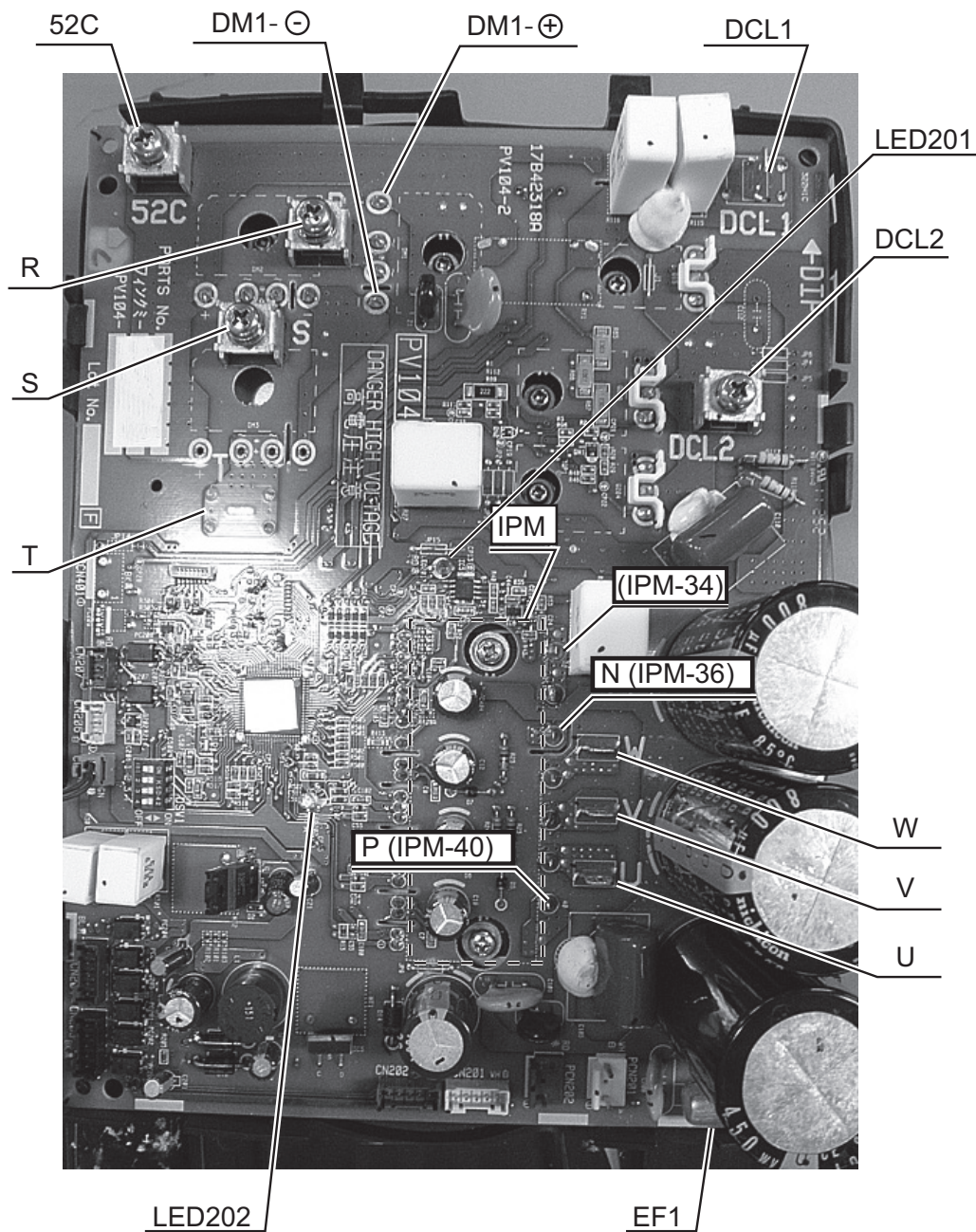
Fuse	Capacity	Purpose	Normal Voltage Range
EFR1 EFS1	5A	Protection for short circuiting of control circuit (208/230V)	Failure of solenoid valve, etc. (208/230V) Failure of O.U. PCB

Sequence Circuit for O.U. PCB (PO141)



3.3.4 Checking Method for Inverter PCB

(1) Detail of Check Points



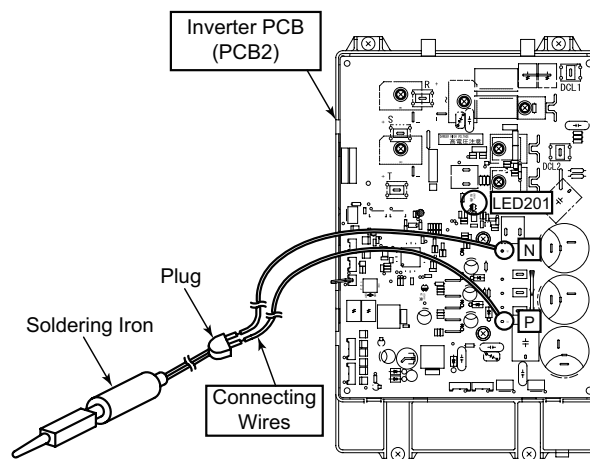
(2) High Voltage Discharge Work for Replacing Parts

! 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 P and N (soldering portion) on inverter PCB. (The discharge voltage can perform even when connecting the wires to terminals #1(P) and #3(N) of connector "PCN201".)
- (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.



(3) Checking Method for Inverter Module

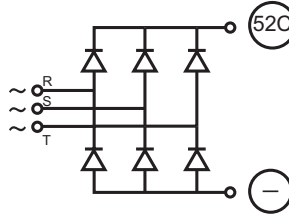
< In Case of Using Analog Tester >

● Rectifier Circuit of Inverter PCB

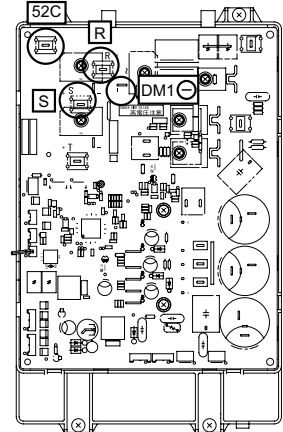
Remove all the terminals of the inverter PCB before check.

If items (a) to (h) are performed and all items are satisfied, the inverter PCB is non-defective.

(Measure the resistance under 1 k Ω range of a circuit tester.)



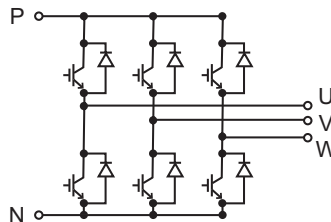
- By placing the \oplus side of tester to 52C on inverter PCB and the \ominus side of tester to R and S terminals on inverter PCB, measure the resistance. If all the resistances are more than 1 k Ω , it is normal.
- By placing the \ominus side of tester to 52C on inverter PCB and the \oplus side of tester to R and S terminals on inverter PCB, measure the resistance. If all the resistances are more than 100 k Ω , it is normal.
- By placing the \ominus side of tester to the \ominus side of DM1 (soldering portion) on inverter PCB and the \oplus side of tester to R and S terminals on inverter PCB, measure the resistance. If all the resistances are more than 1 k Ω , it is normal.
- By placing the \oplus side of tester to the \ominus side of DM1 (soldering portion) on inverter PCB and the \ominus side of tester to R and S terminals on inverter PCB, measure the resistance. If all the resistances are more than 100 k Ω , it is normal.



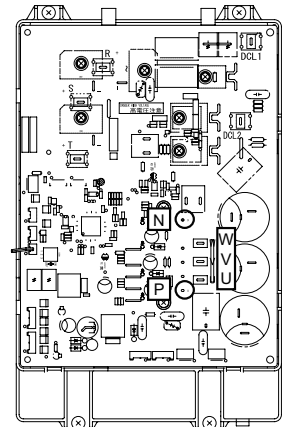
Place wires to specified terminal.

Circuit Tester

Refer to (1)
"Detail of Check Points"
about details.



- By placing the \oplus side of tester to P (soldering portion) on inverter PCB and the \ominus side of tester to U, V and W terminals on inverter PCB, measure the resistance. If all the resistances are more than 1 k Ω , it is normal.
- By placing the \ominus side of tester to P (soldering portion) on inverter PCB and the \oplus side of tester to U, V and W terminals on inverter PCB, measure the resistance. If all the resistances are more than 30 k Ω , it is normal. (The resistance value increases gradually during measurement.)
- By placing the \ominus side of tester to N (soldering portion) on inverter PCB and the \oplus side of tester to U, V and W terminals on inverter PCB, measure the resistance. If all the resistances are more than 1 k Ω , it is normal.
- By placing the \oplus side of tester to N (soldering portion) on inverter PCB and the \ominus side of tester to U, V and W terminals on inverter PCB, measure the resistance. If all the resistances are more than 30 k Ω , it is normal. (The resistance value increases gradually during measurement.)



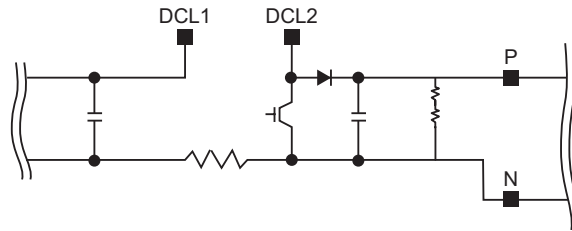
Place wires to specified terminal.

Circuit Tester

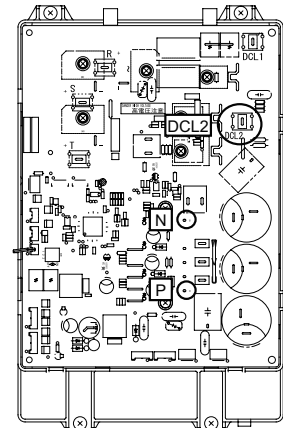
Refer to (1)
"Detail of Check Points"
about details.

● ACT Circuit of Inverter PCB

If items (i) to (m) are performed and all items are satisfied, the inverter PCB is non-defective.
(Measure the resistance under 1 kΩ range of a circuit tester.)



- (i) Perform the rectifier circuit checking according to the item (a) through (h).
- (j) By placing the (+) side of tester to DCL2 on inverter PCB and the (-) side of tester to P (soldering portion) on inverter PCB, measure the resistance.
If the resistance is more than 100 kΩ, it is normal.
- (k) By placing the (-) side of tester to DCL2 on inverter PCB and the (+) side of tester to P (soldering portion) on inverter PCB, measure the resistance.
If the resistance is more than 1 kΩ, it is normal.
- (l) By placing the (+) side of tester to DCL2 on inverter PCB and the (-) side of tester to N (soldering portion) on inverter PCB, measure the resistance.
If the resistance is more than 100 kΩ, it is normal.
- (m) By placing the (-) side of tester to DCL2 on inverter PCB and the (+) side of tester to N (soldering portion) on inverter PCB, measure the resistance.
If the resistance is more than 10 kΩ, it is normal.
(The resistance value increases gradually during measurement.)



Place wires to specified terminal.

Circuit Tester

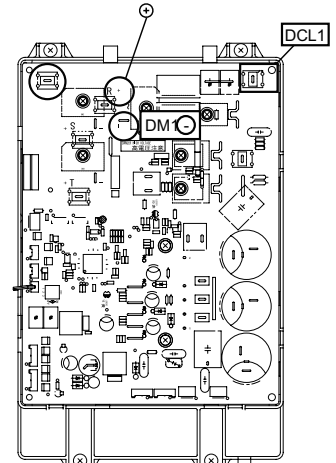
Refer to (1)
"Detail of Check Points"
about details.

- ## ● Checking Method of Resistance for Inrush Current Prevention (Built-in Thermal Fuse)
- (Measure the resistance under 1 kΩ range of a circuit tester.)

By placing the (+) side of tester to the (+) side of DM1 (soldering portion) on inverter PCB and the (-) side of tester to DCL1 on inverter PCB, measure the resistance.

If the resistance is around 500Ω, it is normal.

If the resistance is 0Ω or infinity Ω, it is abnormal.



Place wires to specified terminal.

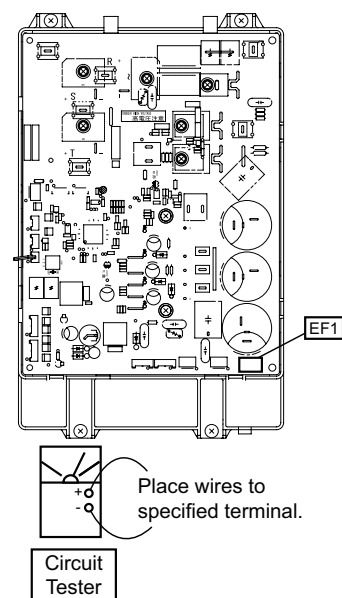
Circuit Tester

Refer to (1)
"Detail of Check Points"
about details.

- Checking Method of Fuse for Fan Motor Protection (EF1)
(Measure it under 1 kΩ range of a circuit tester.)

By placing the ⊕ and ⊖ side of tester to EF1 on inverter PCB, measure the resistance.

If the resistance is 0Ω, it is normal.



Refer to (1)
"Detail of Check Points"
about details.

< In Case of Using Digital Tester >

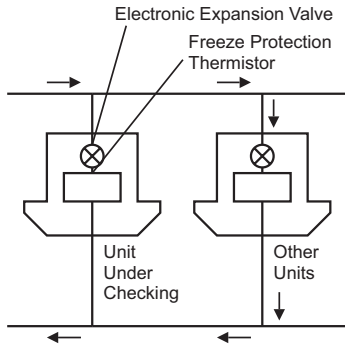
Measure the each checking element by a tester. The checking result shall be as following table.

Tester Probe	Analog Tester Result	Digital Tester Result
(+)52C, (-)R	More than 100k Ohm	OverLoad
(-)52C, (+)R	More than 1k Ohm	0.5V or smaller
(-)N2, (+)R	More than 100k Ohm	OverLoad
(+)N2, (-)R	More than 1k Ohm	0.5V or smaller
(+)52C, (-)S	More than 100k Ohm	OverLoad
(-)52C, (+)S	More than 1k Ohm	0.5V or smaller
(-)N2, (+)S	More than 100k Ohm	OverLoad
(+)N2, (-)S	More than 1k Ohm	0.5V or smaller
(+)P2, (-)DCL2	More than 100k Ohm	OverLoad
(-)P2, (+)DCL2	More than 1k Ohm	0.5V or smaller
(+)P, (-)U	More than 100k Ohm	OverLoad
(-)P, (+)U	More than 1k Ohm	0.5V or smaller
(-)N2, (+)U	More than 100k Ohm	OverLoad
(+)N2, (-)U	More than 1k Ohm	0.5V or smaller
(+)P, (-)V	More than 100k Ohm	OverLoad
(-)P, (+)V	More than 1k Ohm	0.5V or smaller
(-)N2, (+)V	More than 100k Ohm	OverLoad
(+)N2, (-)V	More than 1k Ohm	0.5V or smaller
(+)P, (-)W	More than 100k Ohm	OverLoad
(-)P, (+)W	More than 1k Ohm	0.5V or smaller
(-)N2, (+)W	More than 100k Ohm	OverLoad
(+)N2, (-)W	More than 1k Ohm	0.5V or smaller

NOTE:

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

3.3.5 Checking Method of Electronic Expansion Valve

	for Indoor Unit	for Outdoor Unit
Locked with Fully Closed	Check for the liquid pipe temperature during the heating operation. It is abnormal if the temperature does not increase.	It is abnormal if the liquid pipe pressure does not increase during the cooling operation.
Locked with Slightly Opened	It is abnormal under the following conditions; The temperature of freeze protection thermistor becomes lower than the inlet air temperature when the unit under checking is stopped and other units are under the 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 with Fully Opened		It is abnormal under the following conditions; After heating operation for more than 30 min., the discharge gas temperature of compressor is not +18°F (+10°C) higher than the condensing temperature and there is no other faults such as excessive charge of refrigerant, etc.

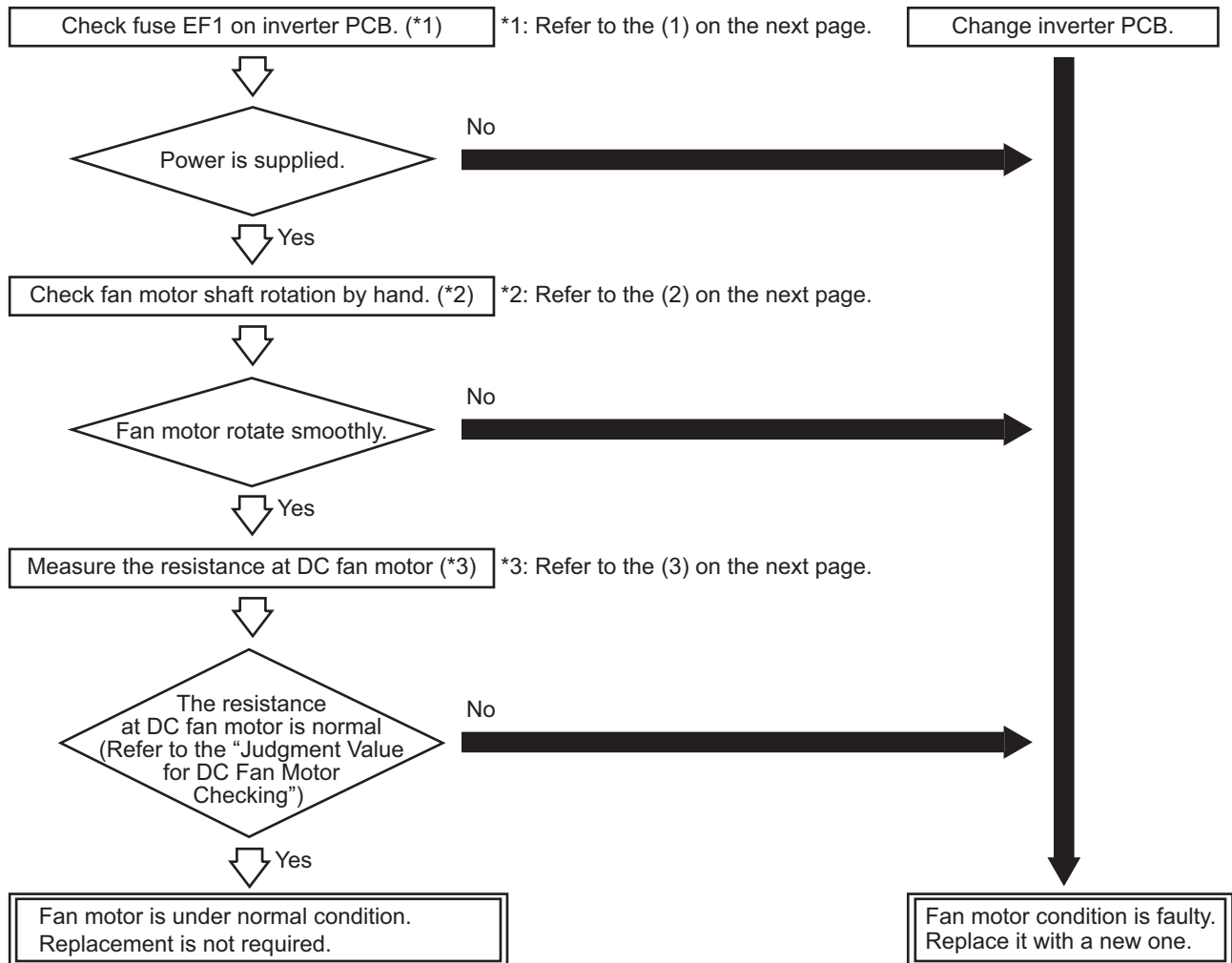
3.3.6 Checking Method of DC Fan Motor for Outdoor Unit

CAUTION

Turn OFF all power supply switches before performing troubleshooting. If not, this troubleshooting may not be performed correctly, and also components may be damaged.

< Procedure >

When the inverter PCB is damaged and the alarm code "03", "04" or "53" is indicated, DC fan motor also may be damaged. If the inverter PCB is operated with faulty DC fan motor, the inverter PCB and fuses may be damaged. Accordingly, when replacing the inverter PCB, check the DC fan motor in the following procedure.



- (1) Check Fuse EF1 on inverter PCB

In case of blown fuse, there may be the possibility of over current caused by fan motor malfunction. Change the inverter PCB (PWB2) and fan motor.

- (2) Disconnect the connector of DC fan motor (CN405/CN406) from O.U. PCB, and rotate the fan motor shaft by hand.

NOTE:

Remove the propeller fan for checking fan motor rotation. It will rotate easily if propeller fan is attached.

It is normal when the fan motor shaft rotates smoothly.

It is abnormal if the fan motor shaft does not rotate smoothly or continuously when rotating the fan motor shaft by hand. If the short-circuit occurs in the electronic circuit of DC fan motor, the fan motor shaft does not rotate smoothly due to braking of the built-in magnets.

- (3) Measure the resistance at DC fan motor.

Necessary Tool: Circuit Tester

(a) Disconnect the connector of DC fan motor (CN405/CN406) from O.U. 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.

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 below.

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

(Open fault: infinity, Short-circuit fault: several Ω to several k Ω)

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.

DC Fan Motor Type	Wiring Color for Measurement (Normal Value) [Ω]			
	Red-Black (Vm-GND)	White-Block (Vcc-GND)	Yellow-Black (Vsp-GND)	Blue-Black (FG-GND)
SIC-82FX-D858-1 SIC-82FX-D858-2	1,100k Ω	40k Ω	220k Ω	∞

Vm: Power supply for DC fan motor.

VCC: Power supply for drive circuit.

VSP: Input of directive voltage for rotation speed adjustment.

FG: Output of detection signal for rotation.

NOTE:

For the fan motor failure diagnosis, check Red-Black wiring and Blue-Black wiring. If the fan motor is faulty, the resistance of one side of the wire will be ∞ but the other side will be a few hundreds Ω to several Ω .

When connected to the checker, the resistance will be gradually increased because of the power supply from the checker if the fan motor is faulty but the resistance will be ∞ if the fan motor is under normal condition.

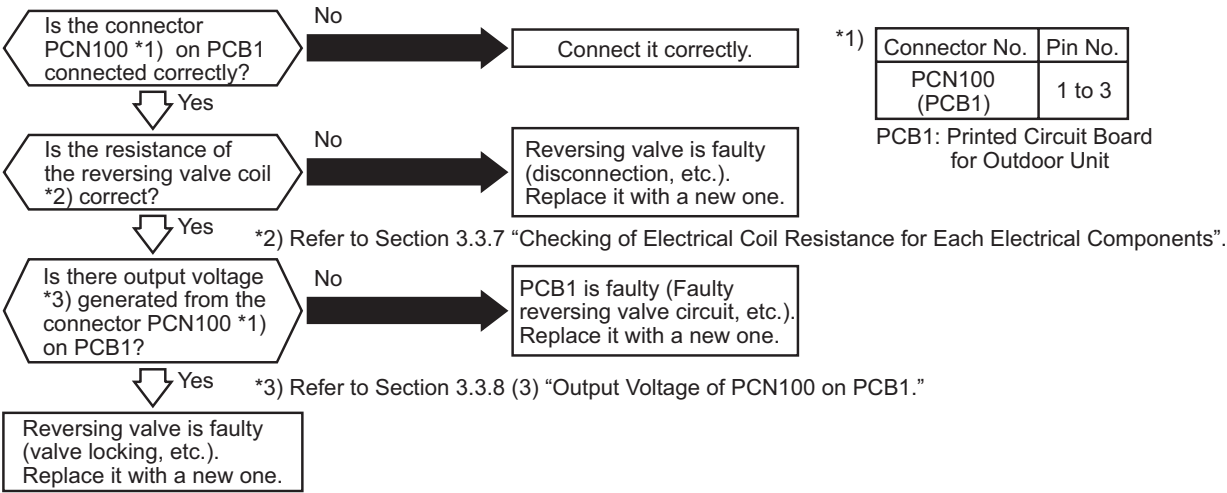
3.3.7 Checking of Electrical Coil Resistance for each Electrical Components

Parts	Type	Resistance (Ω)	
Solenoid Valve Coil	SR or SRN	1600Ω	at 68°F (20°C)
Reversing Valve Coil	VHV-H01AP1880A1	1617Ω	at 68°F (20°C)
Compressor	HA36PHD-A1S2	0.456Ω	at 167°F (75°C)
Magnet Switch	FC-0UL	1404Ω	at 68°F (20°C)

3.3.8 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) Troubleshooting of Reversing Valve



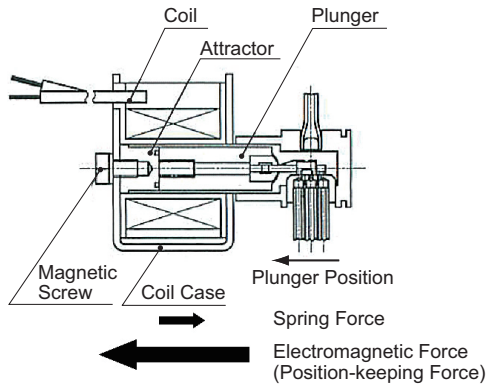
(2) Actions of Reversing Valve

The self-holding type reversing valve coil is applied for this outdoor unit series. The comparison with the solenoid-operated type coil is indicated below.

• Solenoid-operated Type (Former Type)

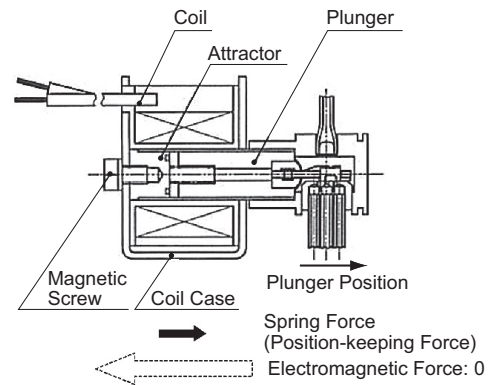
Operation Mode: Heating
Reversing Valve Coil: ON

Electric Current Applied
Current is applied to the reversing valve coil and so attraction is generated. The plunger position is kept by the electromagnetic force.

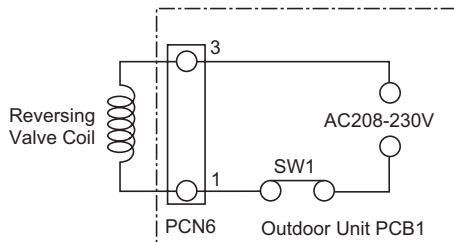


Operation Mode: Cooling
Reversing Valve Coil: OFF

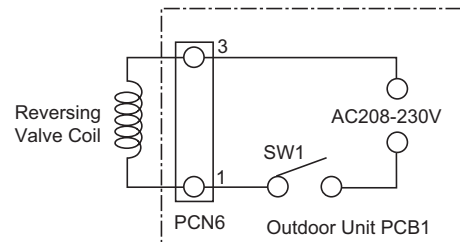
No Electric Current Applied
No current is applied to the reversing valve coil and so no attraction is generated. The plunger position is kept by spring force.



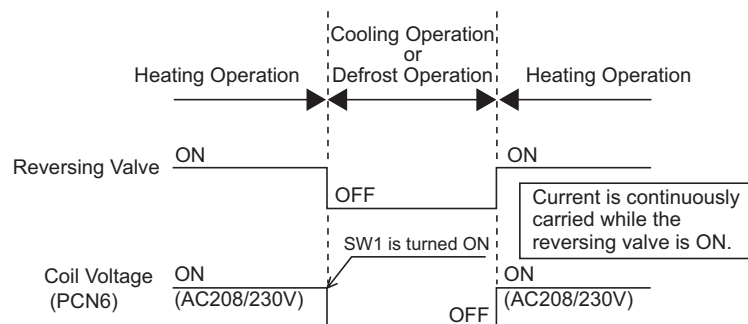
< Electrical Circuit >



< Electrical Circuit >



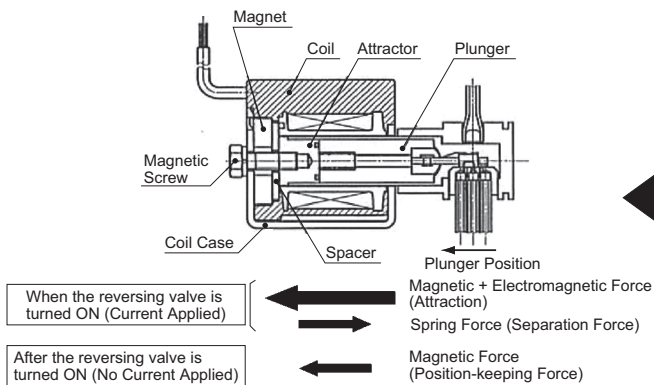
< Time Chart >



- Self-holding Type

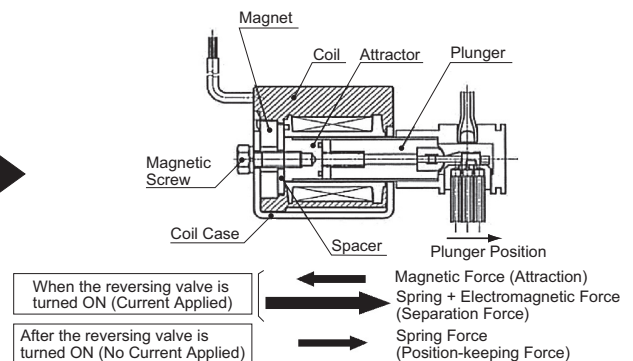
Operation Mode: Cooling → Heating
Reversing Valve: OFF → ON

When current is applied to the reversing valve coil, an electromagnetic force headed in the same direction as the magnetic force is generated, and the valve is turned ON by their attraction. After the valve is turned ON, the plunger position is kept by magnetic force with no current applied.



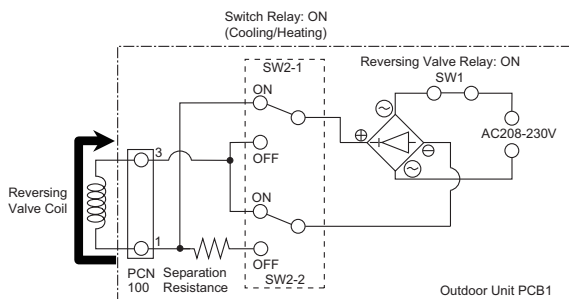
Operation Mode: Heating → Cooling
Reversing Valve: ON → OFF

When current is applied to the reversing valve coil, an electromagnetic force headed in the direction opposite to the magnetic force is generated, and the valve is turned OFF by their separation force. After the valve is turned OFF, the plunger position is kept by spring force.



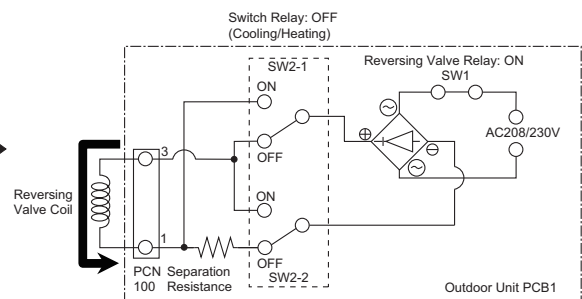
< Electrical Circuit >

When the reversing valve relay is turned ON, current is applied to the coil. After the reversing valve relay is turned OFF, no current is applied.

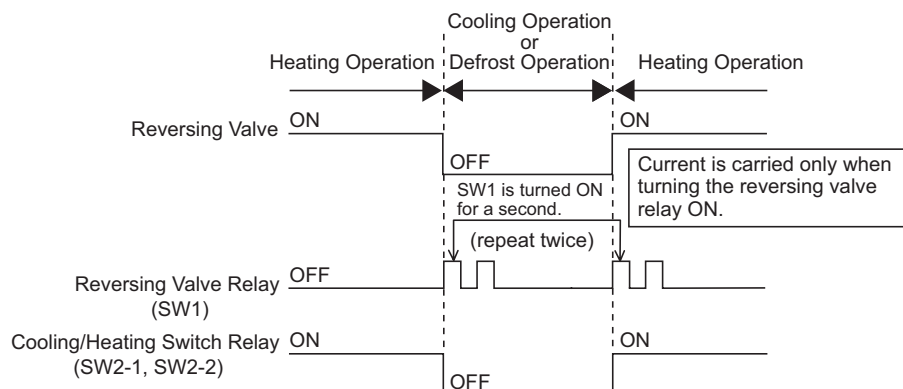


< Electrical Circuit >

When the reversing valve relay is turned ON, current is applied to the coil. After the reversing valve relay is turned OFF, no current is applied.



< Time Chart >



(3) Output Voltage of PCN100 on PCB1

	Reversing Valve: ON	Reversing Valve: OFF
Test Lead (+ Side)	PCN100-1	PCN100-3
Test Lead (- Side)	PCN100-3	PCN100-1
Appropriate Range of Voltage	Power Supply Voltage AC208V (rms): approx. DC294V Power Supply Voltage AC230V (rms): approx. DC325V	Power Supply Voltage AC208V (rms): approx. DC130V Power Supply Voltage AC230V (rms): approx. DC144V

NOTE:

1. The values may differ depending on testers. Appropriate output voltage is DC70~360V.
2. Refer to Section 3.3.8 (1) "Troubleshooting of Reversing Valve" if there is no output voltage or the reversing valve does not switch.

3.4 Test Run

Turn OFF all the power supply switches.

Use a tester and make sure that all the switches are turned OFF.

Before the test run, check that the unit is appropriately installed according to the Installation and 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 installed in the center of the casing? Is the fan motor installed away from the casing? (The fan motor should NOT be touched by the casing.)
3	Fasteners	Are the screws loose due to vibration during transportation? Check that the fasteners are secured firmly during installation, <u>especially for electrical wiring.</u>
4	Refrigerant Leaks	<u>Check that there are NO refrigerant leaks.</u> The tightening part of the pipe (flare part) may be loose because of vibration during transport.
5	DSW Setting	Check that the DSW setting is the same as the factory setting. (Refer to Section 3.1.3.)
6	Insulation ^{*1)}	Measure resistance between electrical component terminal and ground with a tester. It is normal if the resistance is 1MΩ and over. If 1MΩ or less, do not perform the operation due to insulation failure of electrical parts. <u>Do NOT apply electricity to the terminal board of operating line. (Control PCB may be damaged.)</u>
7	Stop Valve Fully Open	Prior to test run, check that the stop valve of the outdoor unit is completely open.
8	Turn ON Crankcase Heater	After completion of item checks 1 to 7, turn ON the power supply of the outdoor unit. Apply power to the outdoor unit(s) at least 12 hours prior to operation of the system for preheating of the compressor oil..
9	Indoor and Outdoor Temperature	<For Use in both Cooling and Heating Operation> Is indoor temperature DB80°F (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 66°F (19°C) or over.) To perform the test run, set the test run mode with the wired controller.

***1): Insulation Resistance**

- If the unit has been turned OFF for long periods, insulation resistance may decrease 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 or less, an insulation failure of another 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 warms up automatically. Check the insulation resistance again after applying current for at least three hours. (Preheating time depends on the air condition, piping length or refrigerant condition.)
- Before the leakage breaker is activated, check the rated capacity.

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.

3.4.1 Test Run Using Wired Controller

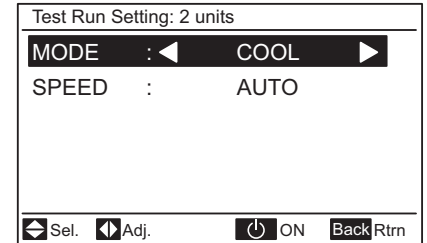
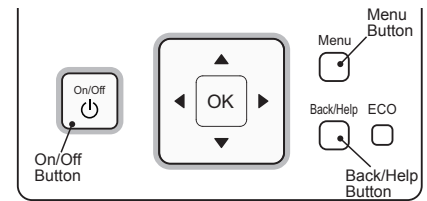
(1) Wired Controller (CIW01)

- (1) Turn ON the power supply of the indoor and outdoor units.
- (2) Set the TEST RUN mode with the wired controller.

Press and hold the "Menu" and the "Back/Help" buttons simultaneously for more than three seconds. Select "Test Run" by pressing " $\Delta \nabla$ " and press "OK". The Test Run screen is displayed.

NOTE:

For other controllers, refer to "Installation Manual" of each controller.



NOTE:

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

Normal

→ If "TEST RUN" and the total number of the units connected to the wired controller (for example "2 units") are indicated on the wired controller, the connection of the controller cable is correct.

- * The total number of indoor units connected is indicated on the liquid crystal display (LCD).
- * If the indicated number is not equal to the actual number of connected indoor units, the auto-address function is not performed correctly due to incorrect wiring, or electromagnetic interference. Turn OFF the power supply, and correct the wiring after checking the following points (Do not repeat turning ON and OFF within 10 seconds.)
 - (a) The power supply for the indoor unit is NOT turned ON or the incorrect wiring.
 - (b) Loose connection between Indoor Units or Wired Controller.
 - (c) Incorrect Setting of Indoor Unit Number (The indoor unit address is duplicated.)

Abnormal

→ If no indication or "00" appears, or the number of the units indicated is less than the actual number of the units, there is an abnormality.

(3) Checking Procedure for Abnormalities

Wired Controller Indication	Fault	Inspection Points after the Power Supply is OFF
No Indication	<ul style="list-style-type: none"> * The power supply is not turned ON. * The connection of the controller cable is incorrect. * The connecting wires of power supply line are incorrect or loose. 	<ol style="list-style-type: none"> 1. Connection between Connector and Wires 2. Connecting Points of Controller Cable 3. Contact of Connectors of Controller Cable 4. Connection Order of each Terminal Block 5. Screw Fastening of each Terminal Block
Counting number of connected units is incorrect.	<ul style="list-style-type: none"> * The communication cable between indoor unit and outdoor unit is disconnected, or the power supply is not turned ON. * The setting of unit number is incorrect. * The connection of communication cables between each indoor unit are incorrect. (When one wired controller controls multiple units.) 	<ol style="list-style-type: none"> 6. RSW Setting on Indoor Unit Printed Circuit Board 7. Wire Connecting Order of Bridge Cable 8. Connecting Points of Bridge Cable 9. Contact of Connectors of Bridge Cable

Back to (1) after checking

Move to (4) on the next page. ←

(4) Press "On/Off" button.

Normal

→ The test run operation is started. The operation mode, the airflow volume, the airflow direction and the test run time can be set on the Test Run screen.
Select the item by pressing " $\Delta \nabla \triangleleft \triangleright$ ".
The test run is completed by pressing the "Back/Help" button during the stoppage or "On/Off" button during the operation.

Abnormal

→ If the units do not start or the operation light on the wired controller flashes, there is an abnormality.

(5) Checking Procedure for Abnormalities

Wired Controller Indication	Unit Condition	Fault	Inspection Points when the Power Supply is OFF
The operation light flashes. (1 time/1 sec.) And the Unit No. and Alarm Code "03" flash.	The unit does not start.	The power supply is not turned ON.	
		The connection of communication cable is incorrect or loose.	1. Connecting Order of each Terminal Block. The fuse on the indoor unit PCB may be blown due to miswiring. (Can be recovered only once by the DSW on the PCB) Procedures for Recovery When Communication Circuit Fuse is Blown 1. Correct the wiring for the terminal block. 2. Setting positions of the model code are shown below. <div data-bbox="1128 884 1281 1012" data-label="Diagram"> <p>The diagram shows a rectangular component labeled 'Indoor Unit PCB'. Inside, there is a switch labeled 'DSW7'. The switch has two positions: 'ON' (indicated by an upward arrow) and 'OFF' (indicated by a downward arrow). Below the switch, there are two small squares labeled '1' and '2'.</p> </div> 2. Screw Fastening of each Terminal Block. 3. Connecting Order of Power Line Between Indoor Units and Outdoor Unit.
The operation light flashes. (1 time/2 sec.)	The unit does not start.	The connection of controller cable is incorrect.	This is the same as above items 1 through 3.
Other alarm codes or indications than those above (Refer to the Alarm Code Table.)	The unit does not start, or starts once and then stops.	The connection of the thermistors or other connectors are incorrect. Tripping of protector exists.	An authorized service person should check the unit using the Alarm Code Table in this manual.
The operation light flashes. (1 time/1 sec.) And the Unit No. 00 . Alarm Code dd and Unit Code E.00 flash.	The unit does not start.	The connection of communication cable is incorrect or loose.	An authorized service person should check the unit using the Alarm Code Table in this manual.

Back to (1) after checking

3.4.2 Test Run from Outdoor Unit Side

The procedures for the test run from the outdoor unit side are indicated below. Setting of this DIP switch is possible with the power supply ON.

Setting of DIP Switch (Factory Setting)

DSW1	
Switch for Setting of Service Operation and Function	
	1. Test Run
	2. COOL/HEAT Setting (ON: Heating Operation)
	3. OFF (Fixed)
	4. Manual Compressor OFF

! WARNING

- Do not touch any other electrical part when operating switches on the PCB.
- Do not attach or detach the service cover when the power supply for the outdoor unit is supplied and the outdoor unit is operated.
- Turn all the DIP switches of DSW1 OFF when the test run operation is completed.

	DIP Switch Setting	Operation	Remarks
Test Run	1. Setting of Operation Mode Cooling: Set DSW1-2 OFF. Heating: Set DSW1-2 ON. 	1. The indoor unit automatically starts operating when the test run of the outdoor unit is set. 2. The ON/OFF operation can be performed from the wired controller or DSW1-1 of the outdoor unit. 3. The operation continues for two hours without Thermo-OFF.	* Note that the indoor units operate in conjunction with the test run operation of the outdoor unit. * If the test run is started from the outdoor unit and stopped from the wired controller, the test run function of the wired controller is cancelled. However, the test run function of the outdoor unit is not cancelled. Check to ensure that the DSW1-1 of the outdoor unit PCB is turned OFF. * If multiple indoor units are connected with one wired controller, perform the test run operation individually for each refrigerant system one by one. Then, make sure to turn the power supply OFF for the indoor units in other refrigerant systems not included in the test run.
	2. Starting Test Run Set DSW1-1 ON and the operation is started after a few to 20 seconds. When heating operation , leave DSW1-2 at ON. 		 * The setting of DSW1 is not required for the test run from the wired controller.

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.

	DIP Switch Setting	Operation	Remarks
Manual OFF of Comp.	<p>1. Setting *Compressor Manual OFF: Set DSW1-4 ON.</p> <p>1 2 3 4</p> <p>2. Canceling *Compressor ON: Set DSW1-4 OFF.</p> <p>1 2 3 4</p>	<p>1. When DSW1-4 is ON during compressor operation, the compressor stops operating immediately and the indoor unit is under the condition of Thermo-OFF.</p> <p>2. When DSW1-4 is OFF, the compressor starts operating after the cancellation of three-minutes guard.</p>	<p>* Do not repeat compressor ON/OFF frequently.</p>
Manual Defrost	<p>1. Manual Defrost Operation Press PSW1 for more than three seconds during heating operation, and the defrosting operation starts after two minutes. This function is not possible within five minutes after starting heating operation.</p> <p>2. Manual Defrost Operation Completion Defrosting operation automatically ends and the heating operation restarts.</p>	<p>1. Defrosting operation is available regardless of frost condition and total time of heating operation.</p> <p>2. Defrosting operation is not performed when the temperature of outdoor heat exchanger is higher than 50°F(10°C), high pressure is higher than 464psi (3.2MPa) or the unit is Thermo-OFF.</p>	<p>* Do not continuously repeat defrosting operation. * When manual defrosting operation is accepted by PSW1, the time left before starting defrosting operation is indicated on the 7-segment display on the PCB.</p> <p>Time Left (Every Four Seconds)</p>

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.

When the test run operation is complete, turn all switches of DSW1 OFF.

- (1) If the wired controller is set to a different mode, the test run function will not start.
In this case, perform the following actions before the test run.
Wired Controller: STOP
Central Station: STOP and Wired Controller is available mode.
COOL/HEAT Change-Over Switch: Connector (CN1) of outdoor unit PCB is open.
During the test run mode, do not control the wired controller, the central station and cool/heat change-over switch. Otherwise, the operation mode will be changed or the test run will end.
If necessary, control them after the test run is complete.
- (2) If an alarm code is indicated during the test run, reset the system by turning the main power supply OFF, then back ON. The system should then operate.

3.4.3 Checking the Test Run

(1) Indoor and Outdoor Fan

Check that the indoor fan and outdoor fan rotate correctly and the airflow is smooth.

(2) Power Supply Voltage

Check the power supply.

If the power supply is abnormal, contact the electric power company.

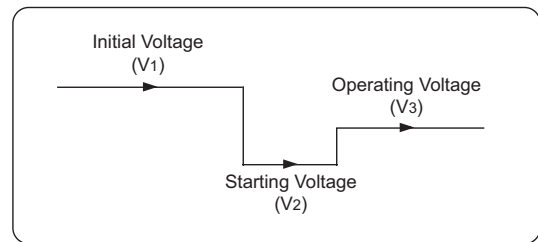
Usually, voltage drop will occur when starting the operation as shown in the figure (V₂).

In order to protect the device, comply with the following normal range of the power supply voltage.

<Normal Range of Power Supply Voltage>

- Supply Voltage: Rated Voltage $\leq \pm 10\%$
- Starting Voltage (V₂): Rated Voltage $\geq -15\%$
- Operating Voltage (V₃): Rated Voltage $\leq \pm 10\%$

< Voltage Change >



(3) Normal Operating Pressure

Normal operating low pressure is 29 to 159.5 psi (0.2 to 1.1 MPa) and normal operating high pressure (Pd) is 145 to 507.6 psi (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	601 psi (4.15MPa)

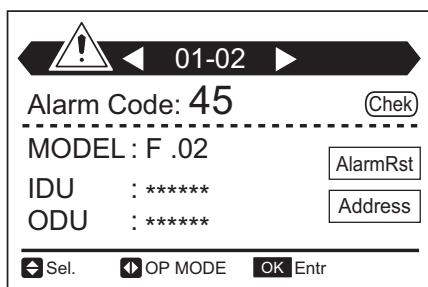
(5) High Pressure Increase Retry (Protection Control)

(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.

For CIW01



NOTE:

High pressure may not increase until the high pressure retry is activated because of the temperature condition.

3.4.4 Checklist for Refrigerant System

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

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

(1) Refrigerant System Check

The most important thing for the refrigerant system is to check that each electronic expansion valve opening and the operating frequency is within the specified range. Each item varies in the value depending on the operating frequency, indoor temperature and ambient temperature.

- (2) The service system checker (PSH-4), which automatically calculates TdSH, facilitates the refrigerant system check. If possible, record the operating cycle data using the service system tester.

CHECKLIST FOR TEST OPERATION

CLIENT: _____ INSTALLER: _____ DATE: _____

O.D.MODEL: _____ O.U.SERIAL NO.: _____ CHECKER: _____

I.U. Model								
I.U. Serial No.								

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

Piping Length: _____ feet Additional Refrigerant Charge: _____ lb

(1) General

No.	Check Item	Result
1	Is DSW setting for outdoor unit correct?	
2	Are the power supply wiring and the communication cable separate from refrigerant pipings?	
3	Is a ground wiring connected?	
4	Is there any short circuit?	
5	Is power supply voltage within 208/230V \pm 10% ?	

(2) Refrigerant System

a. Operation (Cooling/Heating)

No.	Check Item	Result
1	Operate all the units ("TEST RUN" mode).	
2	Operate all the indoor units at "HIGH" speed.	

b. Sampling Data (Cooling/Heating, Indoor Temperature 70°F~86°F (21°C~30°C))

No.	Check Item	Result
1	Check the operating data after 20-minute operation.	
2	Check <u>Pd</u> and <u>Td</u> . Is TdSH +27 ~ +81°F (+15 ~ 45°C)	
3	Is <u>Ps</u> 22 to 189 psi (0.15 to 1.3 MPa) ?	
4	Is <u>Pd</u> 145 to 522 psi (1.0 to 3.6 MPa) ? (If the outdoor temperature is high, <u>Pd</u> becomes high.)	

NOTE:

The symbol with an underline ____ indicates an item to check.

(3) Check Item after Sampling Data

a. Cooling Operation (It is applicable when the outdoor temperature is higher than 59°F(15°C).)

No.	Check Item	Standard	Causes	Result
1	Is <u>Fo</u> (Airflow Rate of O.U. Fan) is not "0"?	-	<ul style="list-style-type: none"> Fan Motor Failure O.U. PCB Failure Condenser Failure 	
2	Is the total of <u>iE</u> (I.U. Ex. Valves Opening) abnormally low or high?	-	<ul style="list-style-type: none"> Low → Excessive Refrigerant High → Insufficient Refrigerant or Excessive Pipe Pressure Loss 	
3	Is <u>TL</u> (Liquid Pipe Temp. of I.U. Heat Exchanger) lower than <u>Ti</u> (Inlet Air Temp. of I.U.)?	It is normal when $TL - Ti < -9^{\circ}F (-5^{\circ}C)$.	<ul style="list-style-type: none"> TL Thermistor Failure I.U. Ex. Valve; Fully Closed Short-Circuit 	
4	Is <u>TG</u> (Gas Pipe Temp. of I.U. Heat Exchanger) lower than <u>Ti</u> (Inlet Air Temp. of I.U.)? (It is applicable when Inlet Air Temp. is +5°F (+3°C). higher than Setting Temp.)	It is normal when $TG - Ti < -9^{\circ}F (-5^{\circ}C)$.	<ul style="list-style-type: none"> TG Thermistor Failure I.U. Ex. Valve; Fully Closed or Slightly Open Short-Circuit 	
5	Is there any excessive difference in SH (<u>TG-TL</u>) of I.U. heat exchanger among I.U.s? (It is applicable when Inlet Air Temp. +5°F (+3°C). higher than Setting Temp.)	It is normal if the difference among units is within $\pm 13^{\circ}F (\pm 7^{\circ}C)$.	<ul style="list-style-type: none"> TL/TG Thermistor Failure I.U. Ex. Valve; Fully Open, Slightly Open or Fully Closed 	
6	Is there any I.U. with the I.U. heat exchanger SH (<u>TG-TL</u>) excessively lower than the other units' value and is <u>En</u> (I.U. Ex. Valves Opening) lower than "5%"?	It is normal if SH of the unit is up to -5°F (-3°C) lower than the other units.	<ul style="list-style-type: none"> I.U. Ex. Valve; Locked and Fully Open Mismatched Wiring and Piping 	
7	Is there any I.U. with the I.U. heat exchanger SH (TG-TL) excessively higher than the other units' value and is <u>En</u> (I.U. Ex. Valves Opening) lower than "100%"?	It is normal if SH of the unit is up to +5°F (+3°C) higher than the other units.	<ul style="list-style-type: none"> I.U. Ex. Valve; Locked and Slightly Open or Closed Mismatched between Wiring and Piping 	
8	Is the temperature difference between I.U.s* more than 13°F (7°C)? * The temperature difference between I.U.s means the following; <u>in</u> (Inlet Air Temp.) - <u>on</u> (Outlet Air Temp.) indicated on 7-segment display by check mode..	+13°F (+7°C) and over	-	

b. Heating Operation (It is applicable when outdoor temperature is higher than 32°F(0°C).)

No.	Check Item	Standard	Causes	Result
1	Is <u>EO</u> (O.U. Ex. Valves Opening) abnormally low or high when TdSH is +27°F tp +81°F (+15°C to +45°C)?	-	<ul style="list-style-type: none"> Low → Excessive Refrigerant High → Insufficient Refrigerant 	
2	Is <u>Pd</u> "232" to "522" psi ("1.6" to "3.6" MPa)?	232 - 522 psi (Pd is high when the indoor temperature is high.)	<ul style="list-style-type: none"> Low → Solenoid Valve SVA Leakage High → Excessive Gas Pipe Pressure Loss 	
3	Is <u>Ps</u> "22" to "189" psi ("0.15" to "1.3" MPa)?	22 - 189 psi	<ul style="list-style-type: none"> Low → O.U. Short-circuit Low/High → O.U. Fan Motor Failure, Fan Module Failure or Outdoor Ambient Thermistor Failure 	
4	Is the temperature difference between I.U.s* more than +18°F (+10°C) when <u>iE</u> (I.U. Ex. Valve) is 100% ? * The temperature difference between I.U. means the following; <u>on</u> (Outlet Air Temp.) - <u>in</u> (Inlet Air Temp.) indicated on 7-segment display by check mode. However, this is applicable only when (Inlet Air Temp.) - (Setting Temp.) is higher than +5°F (+3°C).	+18°F (+10°C) and over	<ul style="list-style-type: none"> Failure in PCB, Wiring, I.U. Ex. Valve and Coil Excessive Pipe Pressure Loss Thermistor Failure for Discharge Air 	

NOTE:

The symbol with an underline indicates a checking item and the mark " " indicates checking data.

4. Maintenance

4.1 Outdoor Unit

WARNING

TURN OFF all power supply switches.

NOTICE

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

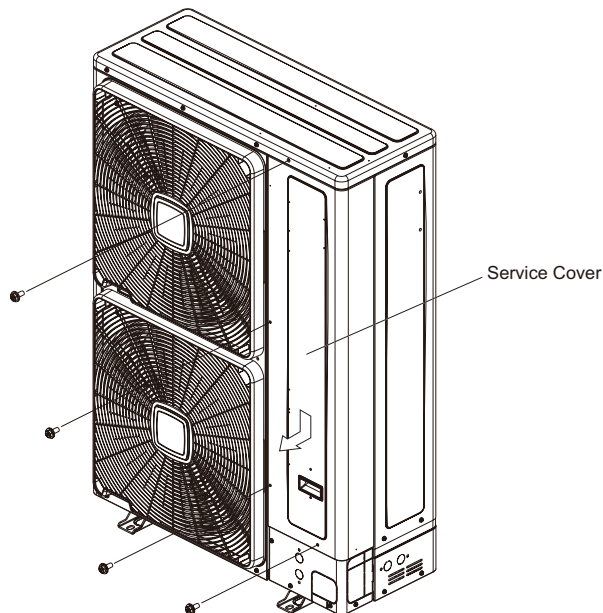
To attach new parts after replacement, reverse the removal procedure.

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.

4.1.1 Removing Service Cover

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

Tool	Gloves, Phillips Screwdriver
------	------------------------------



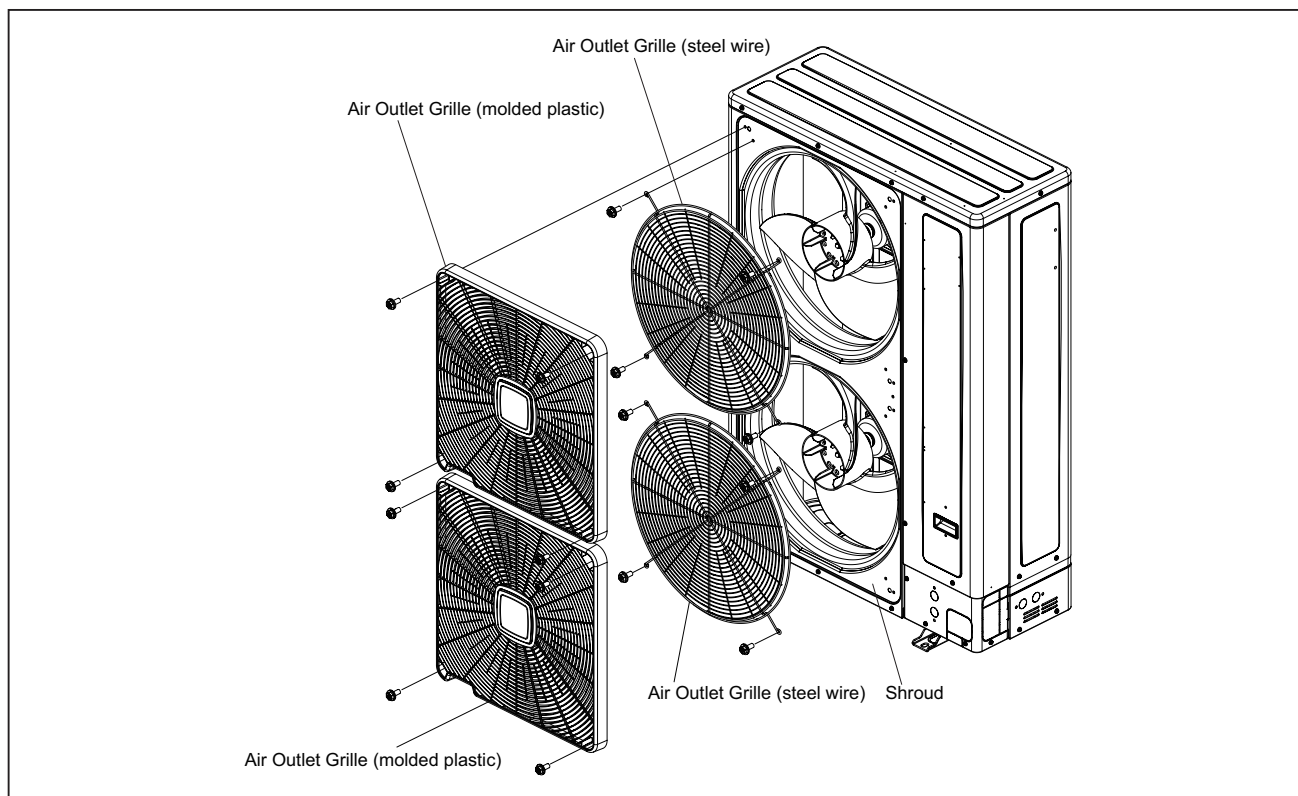
! WARNING

TURN OFF all power supply switches.

4.1.2 Removing Air Outlet Grille

Remove four securing screws for each air outlet grille (molded plastic).
Then remove four securing screws for each air outlet grille (steel wire).

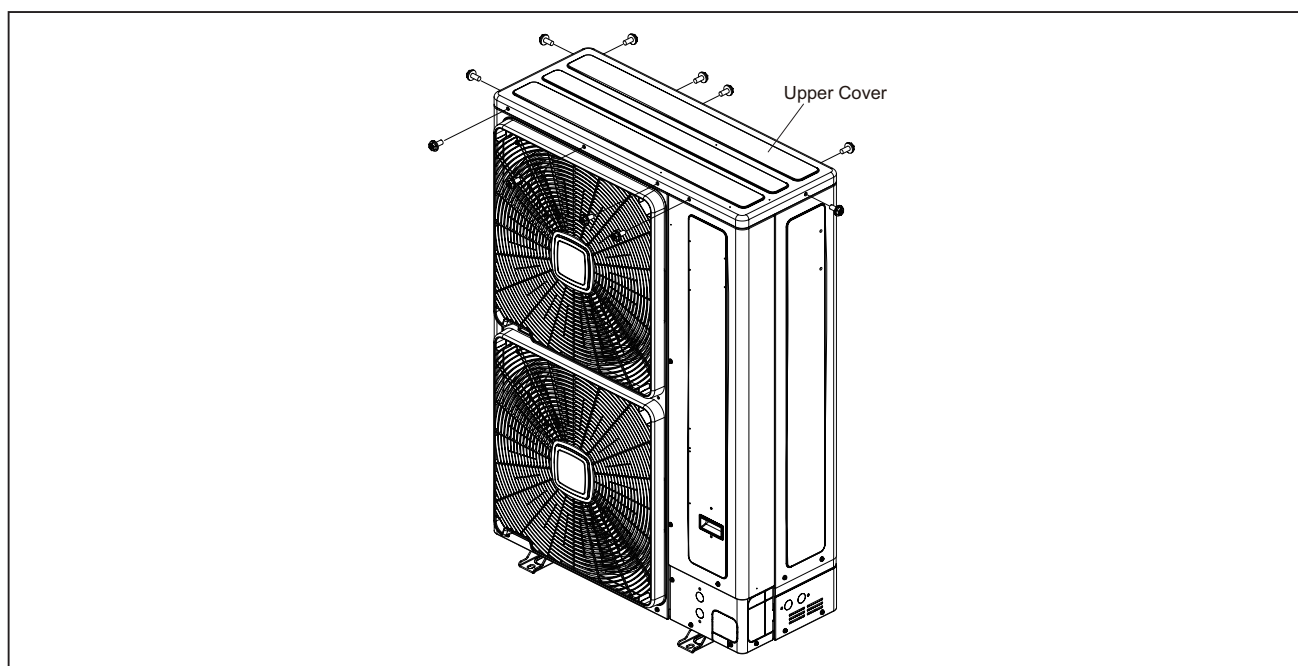
Tool	Gloves, Phillips Screwdriver
------	------------------------------



4.1.3 Removing Upper Cover

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

Tool	Gloves, Phillips Screwdriver
------	------------------------------



! WARNING

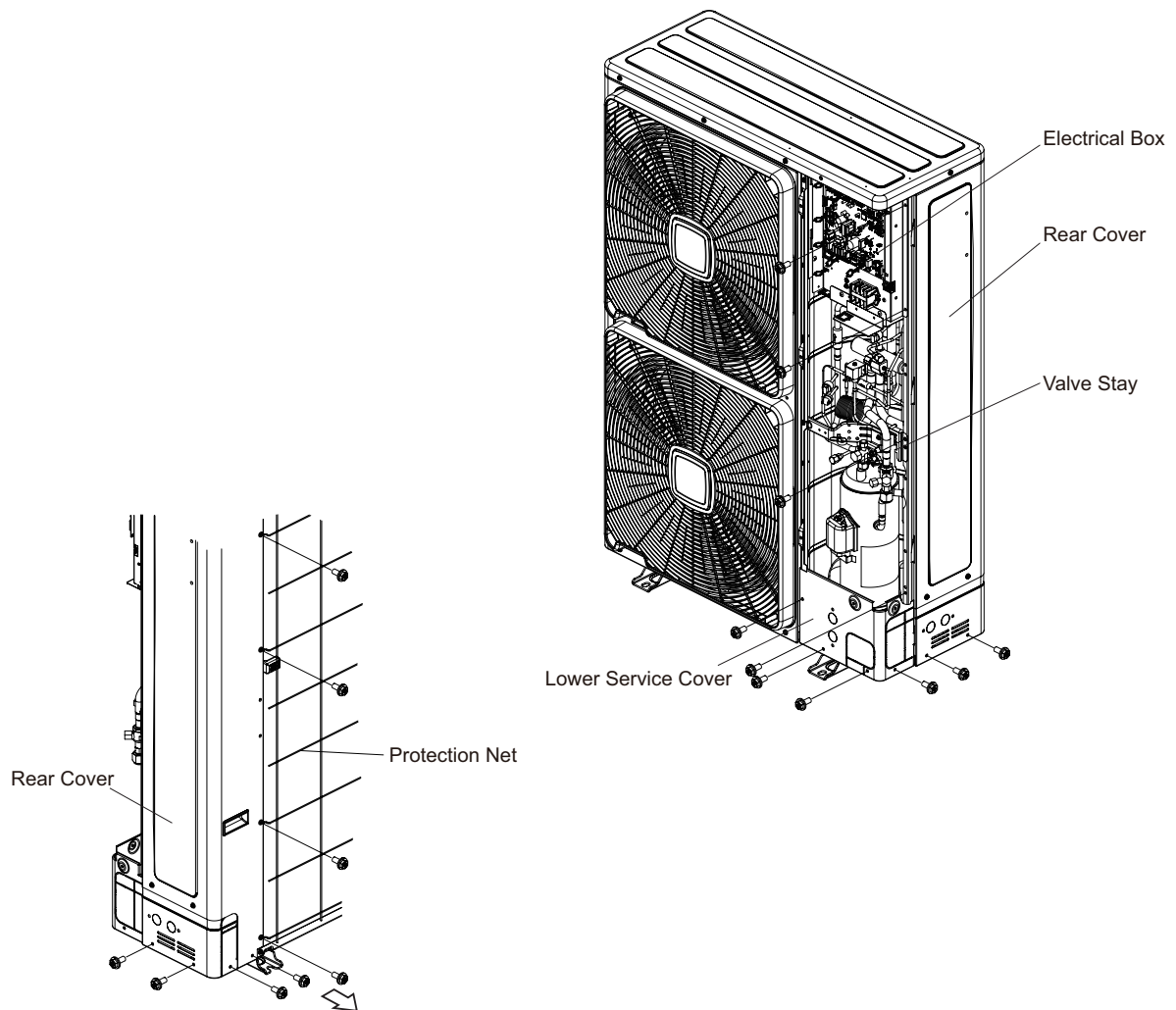
TURN OFF all power supply switches.

4.1.4 Removing Lower Service Cover and Rear Cover

- (1) Remove the service cover according to Section 4.1.1 "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 4.1.3 "Removing Upper Cover."
- (5) Remove ten securing screws for rear cover.
- (6) Remove the rear cover by pulling it backward.

Tool

Gloves, Phillips Screwdriver



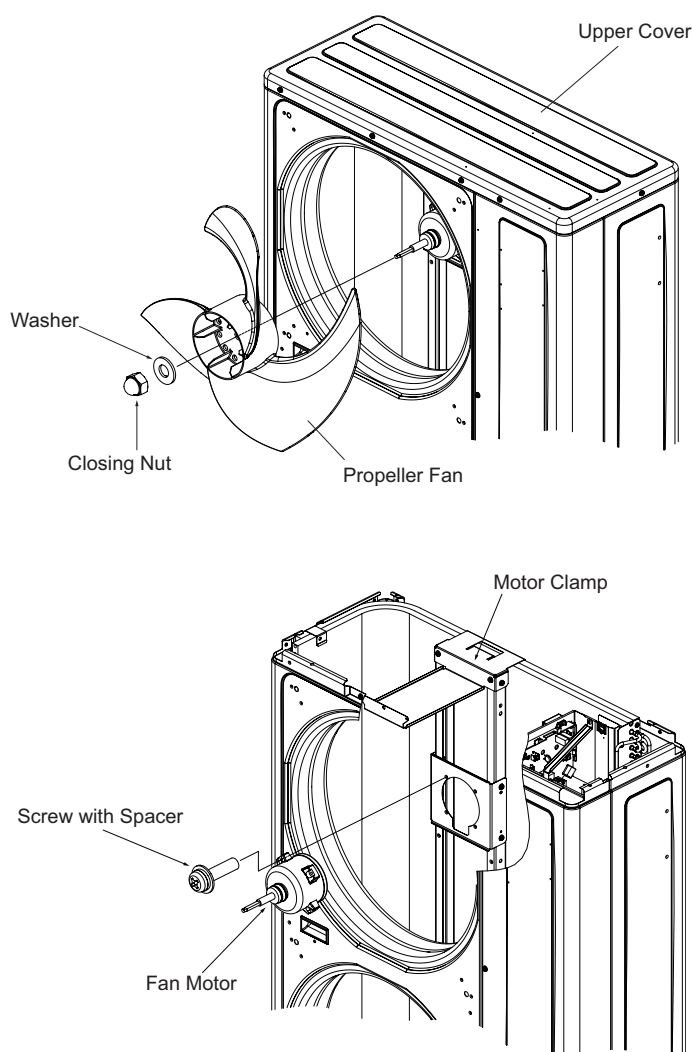
! WARNING

TURN OFF all power supply switches.

4.1.5 Removing Outdoor Fan Motor

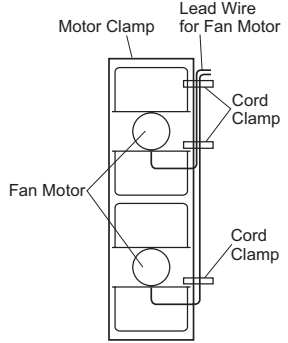
- (1) Remove the air outlet grille according to Section 4.1.2 “Removing Air Outlet Grille.”
- (2) Remove the upper cover according to Section 4.1.3 “Removing Upper Cover.”
- (3) Remove the closing nut and the washer securing the propeller fan to the motor shaft with a socket wrench 1/2 inch (13mm). Then 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 4.1.1 “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



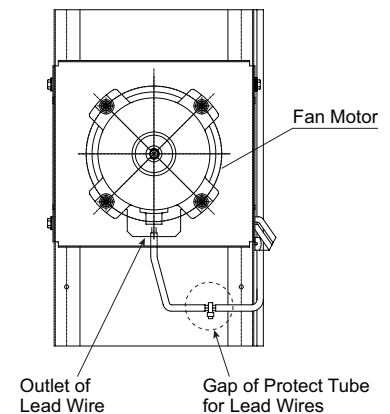
! WARNING

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	O.U. PCB CN406 (Red)	O.U. PCB CN405 (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 15 lbf·ft (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.



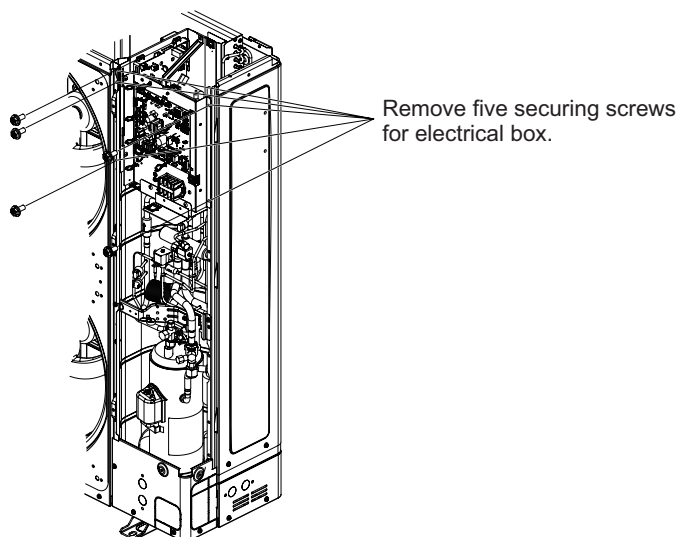
! WARNING

TURN OFF all power supply switches.

4.1.6 Removing Electrical Box

- (1) Remove the service cover according to Section 4.1.1 "Removing Service Cover."
- (2) Remove the upper cover according to Section 4.1.3 "Removing Upper Cover."
- (3) Remove five securing screws for electrical box.
- (4) Remove the electrical box lifting it upward.

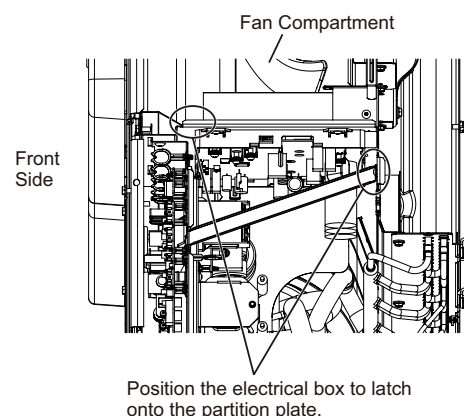
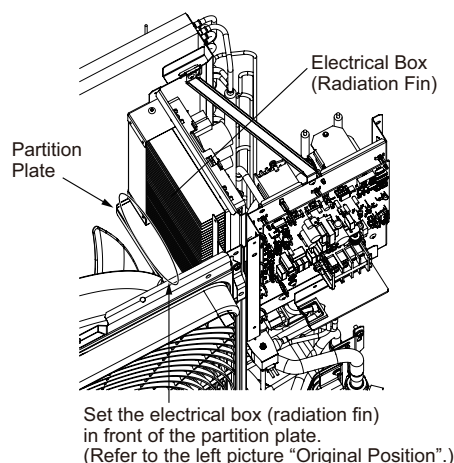
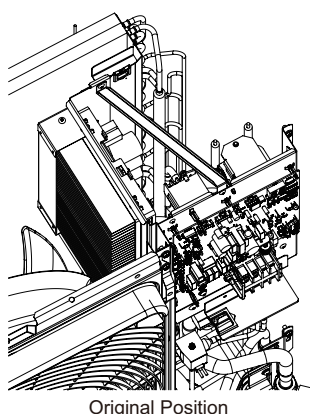
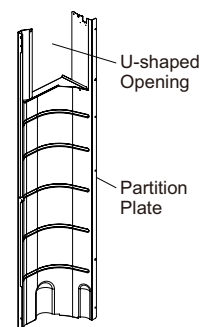
Tool	Phillips Screwdriver
------	----------------------



NOTES:

Remove the electrical box after disconnecting wires.

1. Remove the reversing valve coil according to Section 4.1.10 "Removing Reversing Valve Coil."
2. Remove the expansion valve coil according to Section 4.1.11 "Removing Electronic Expansion Valve Coil."
3. Remove the solenoid valve coil according to Section 4.1.12 "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 (There are five clamps on the partition plate, and one clamp on the valve stay).
8. When mounting the electrical box, join and fit the electrical box and the partition plate into the outdoor unit. (Insert the radiation fin into the U-shaped opening of partition plate, and locate it to the fan compartment side. Then position the electrical box to latch it onto the partition plate.)



! WARNING

TURN OFF all power supply switches.

4.1.7 Removing Compressor

- (1) Remove the service cover according to Section 4.1.1 "Removing Service Cover."
- (2) Remove the lower service cover and the rear cover according to Section 4.1.4 "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:

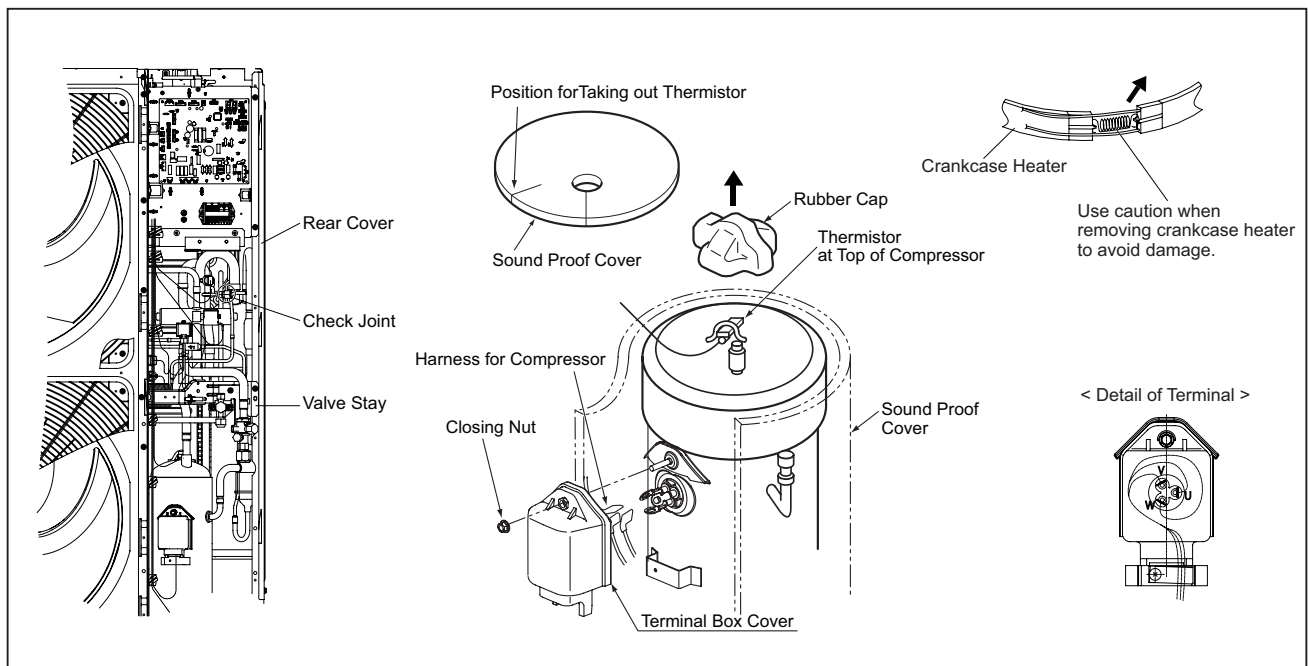
Write down or photograph wiring and terminal designations to prevent mis-wiring of replacement compressor as shown below.

If the read wiring is connected incorrectly to the terminal, the compressor may be damaged due to reverse rotation.

- (6) Remove the rubber cap and the thermistor at top of compressor.
- (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 securing the compressor. Tilting the compressor forward, lift it up and remove it.

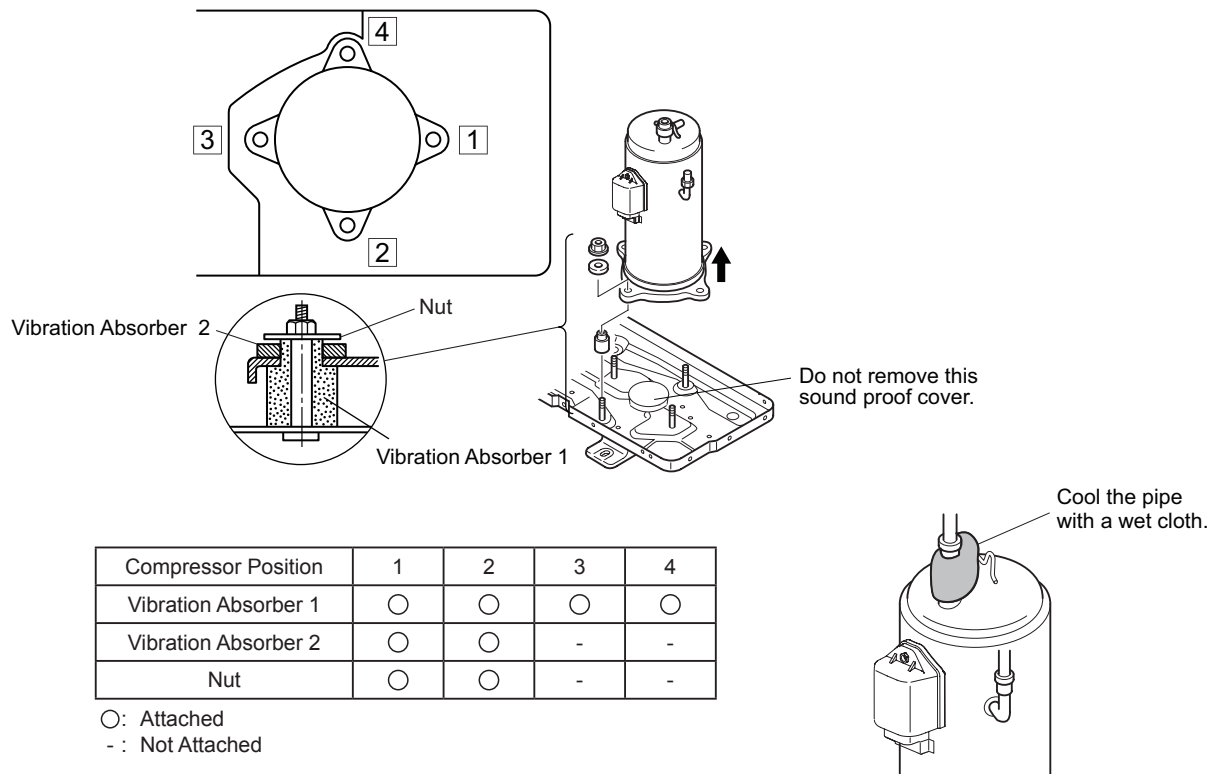
NOTE:

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



! WARNING

TURN OFF all power supply switches.

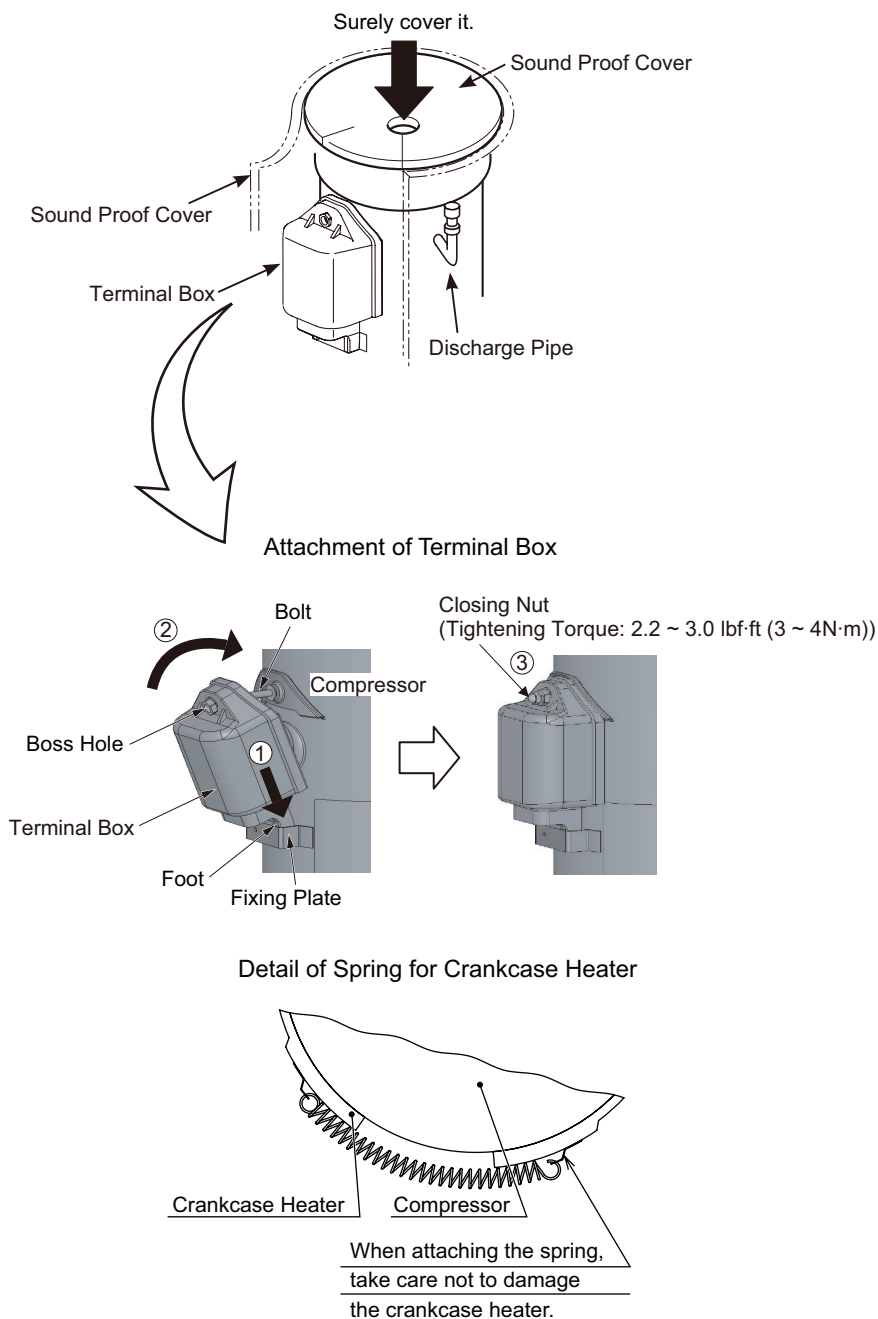
- (12) To mount the new compressor after replacement, reverse the removal procedure.
- Ensure the terminals of the compressor wiring are not loose or damaged. If burned or otherwise damaged they must be replaced.
 - Tightly secure the terminal box by tightening the closing nut (Tightening Torque: 2.2~3.0 lbf·ft (3~4 N·m)).
 - Attach the sound proof cover to the top of the compressor.
 - Wrap the sound proof cover around the terminal box and the discharge pipe.
 - 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.

4.1.8 Removing High Pressure Switch and Pressure Sensor.

- (1) Remove the service cover according to Section 4.1.1 "Removing Service Cover."
- (2) Recover the refrigerant from check joints according to Section 4.1.7 "Removing Compressor."

[Removing High Pressure Switch and High Pressure Sensor]

- (3) Disconnect the faston terminals of 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 (CN100) on the outdoor unit PCB is disconnected.

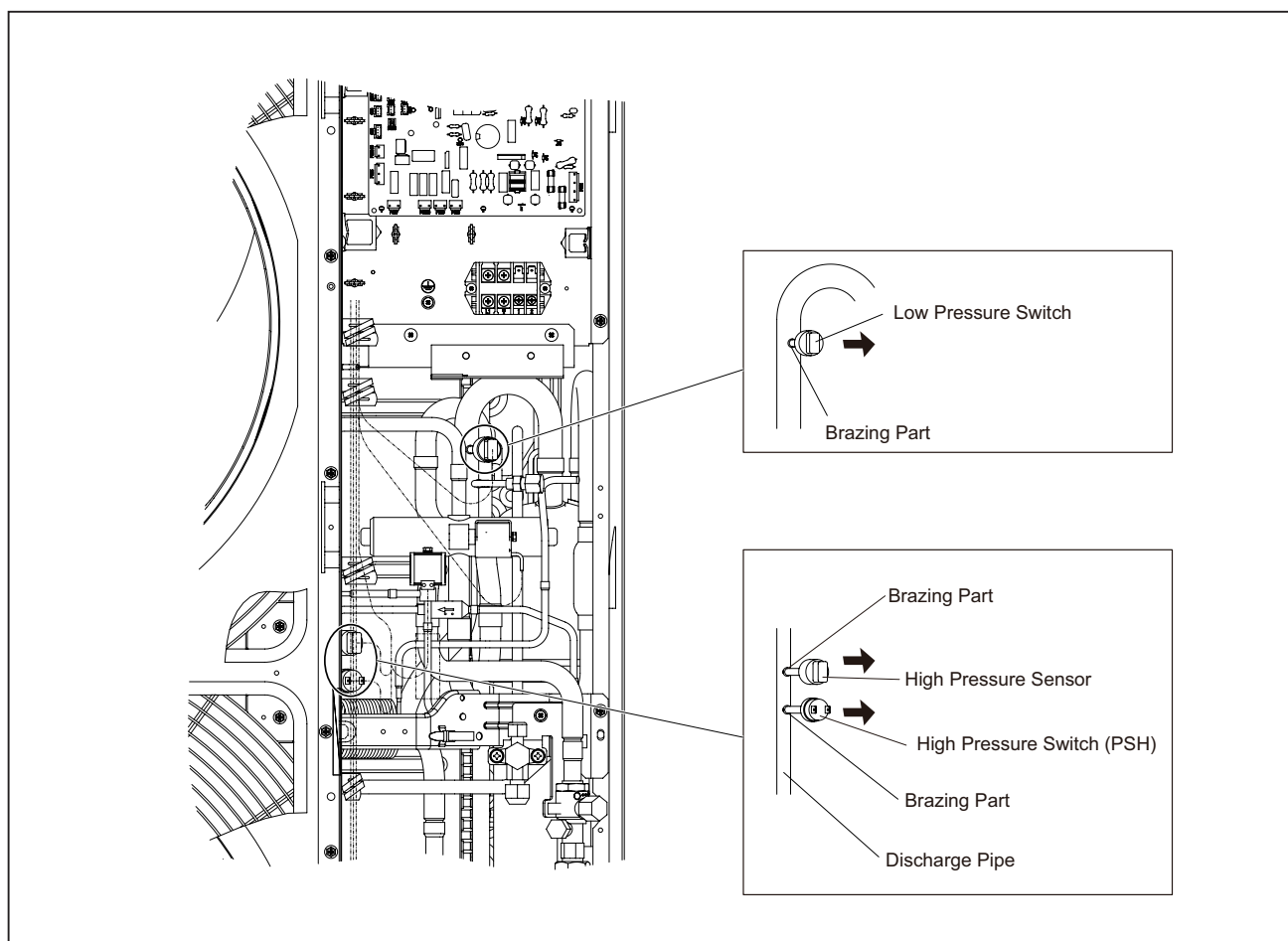
[Removing Low Pressure Sensor]

- (3) Carefully unsolder the low pressure sensor from the discharge pipe.

NOTE:

Check to ensure that the connector (CN101) 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.

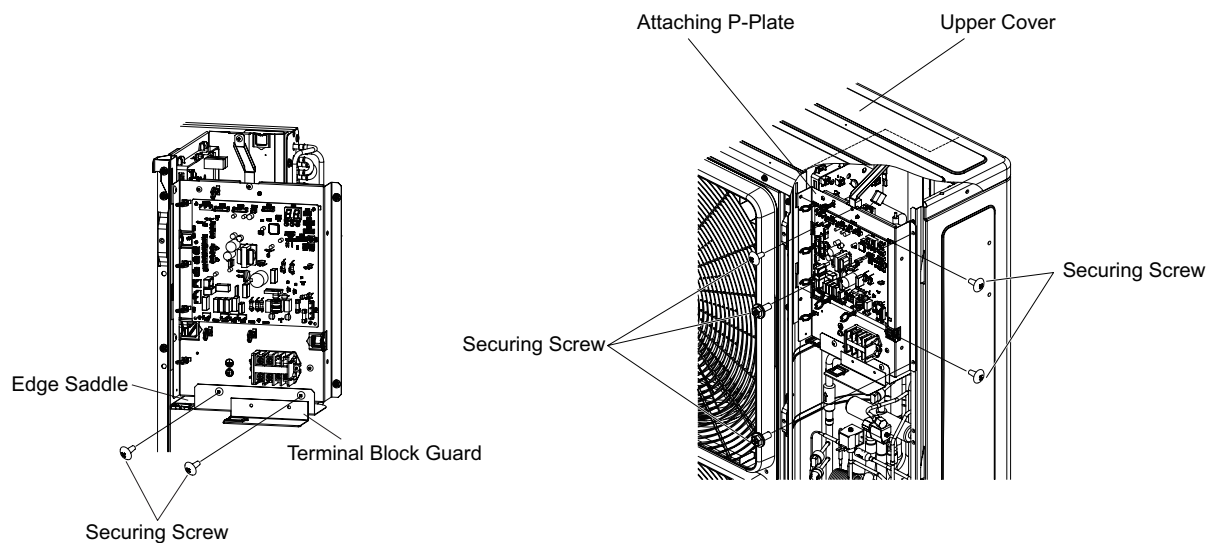
⚠ WARNING

TURN OFF all power supply switches.

4.1.9 Opening Electrical Box (Attaching P-Plate)

- (1) Remove the service cover according to Section 4.1.1 "Removing Service Cover."
- (2) Remove harness of compressor from edge saddle.
- (3) Remove the terminal block guard after removing two securing screws for the guard.
- (4) Remove five securing screws for electrical box.
- (5) Disconnect the connector of fan motor and thermistor on the outdoor unit PCB.
- (6) Open the Attaching P-Plate rotating it approximately 90° counterclockwise.

Tool	Phillips Screwdriver (Long)
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⚠ 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.

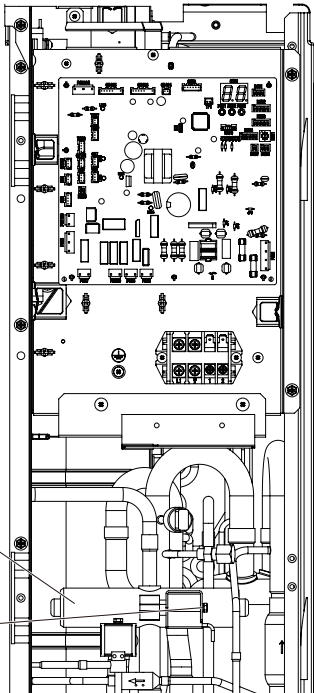
4.1.10 Removing Reversing Valve Coil

- (1) Remove the service cover according to Section 4.1.1 "Removing Service Cover."
- (2) Disconnect the connector (PCN100) 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
------	--



Reversing Valve

Securing Screw for
Reversing Valve Coil

⚠ 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.

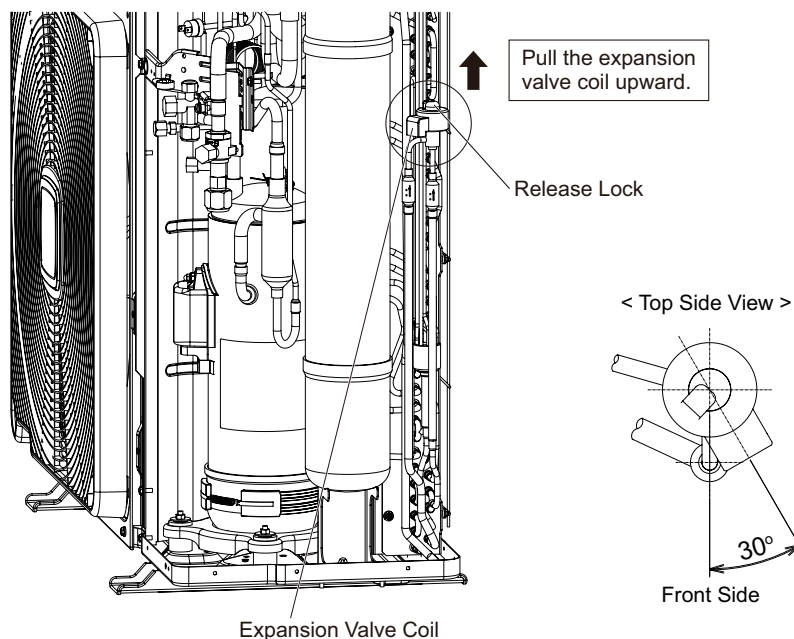
4.1.11 Removing Electronic Expansion Valve Coil

- (1) Remove the service cover according to Section 4.1.1 "Removing Service Cover."
- (2) Remove the lower service cover and the rear cover according to Section 4.1.4 "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
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⚠ 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.

4.1.12 Removing Solenoid Valve Coil (SVA)

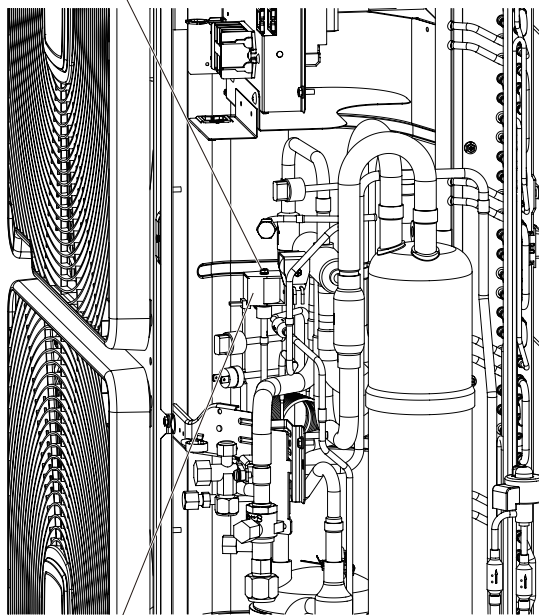
- (1) Remove the service cover according to Section 4.1.1 “Removing Service Cover.”
- (2) Disconnect the connector (PCN7 (SVA)) on the outdoor unit PCB.
- (3) Remove one securing screw for solenoid valve coil (SVA) and slide the solenoid valve coil (SVA) upward.
- (4) To install a new solenoid valve coil, reverse the removal procedure.

NOTE:

Return and secure all wiring to original positions after replacing coil.

Tool	Phillips Screwdriver
------	----------------------

Securing Screw for Solenoid Valve Coil



Solenoid Valve Coil (SVA)

! WARNING

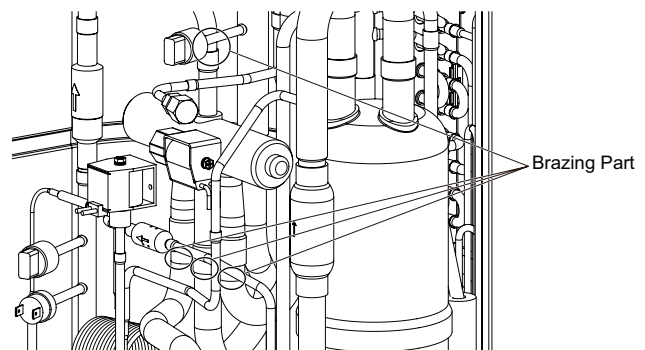
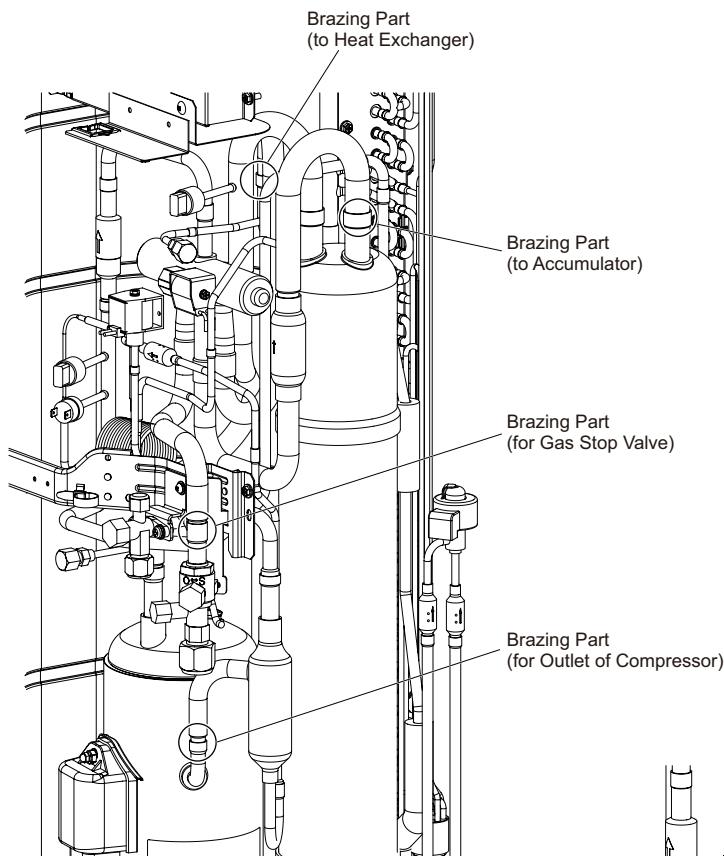
TURN OFF all power supply switches.

4.1.13 Removing Reversing Valve

- (1) Remove the service cover according to Section 4.1.1 "Removing Service Cover."
- (2) Remove the upper cover according to Section 4.1.3 "Removing Upper Cover."
- (3) Remove the lower service cover and the rear cover according to Section 4.1.4 "Removing Lower Service Cover and Rear Cover."
- (4) Recover the refrigerant from check joints according to Section 4.1.7 "Removing Compressor."
- (5) Remove the reversing valve coil according to Section 4.1.10 "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.

4.1.14 Removing Electronic Expansion Valve and Solenoid Valve

- (1) Remove the service cover according to Section 4.1.1 "Removing Service Cover."
- (2) Remove the front piping cover and the rear cover according to Section 4.1.4 "Removing Lower Service Cover and Rear Cover."
- (3) Recover the refrigerant from check joints according to Section 4.1.7 "Removing Compressor."
- (4) Remove the coils according to Section 4.1.11 "Removing Electronic Expansion Valve Coil" and Section 4.1.12 "Removing Solenoid Valve Coil."
- (5) Remove the brazed parts as shown in the figures.

Electronic Expansion Valve (EVO) Brazed Parts: 2

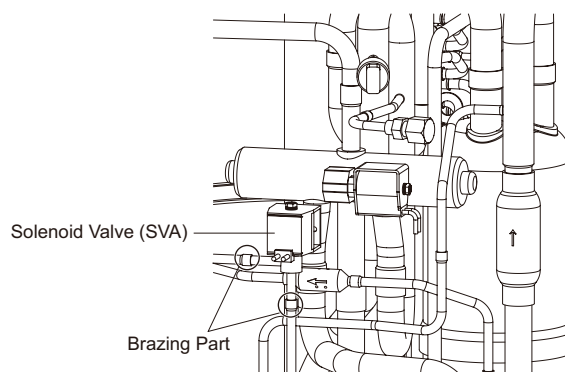
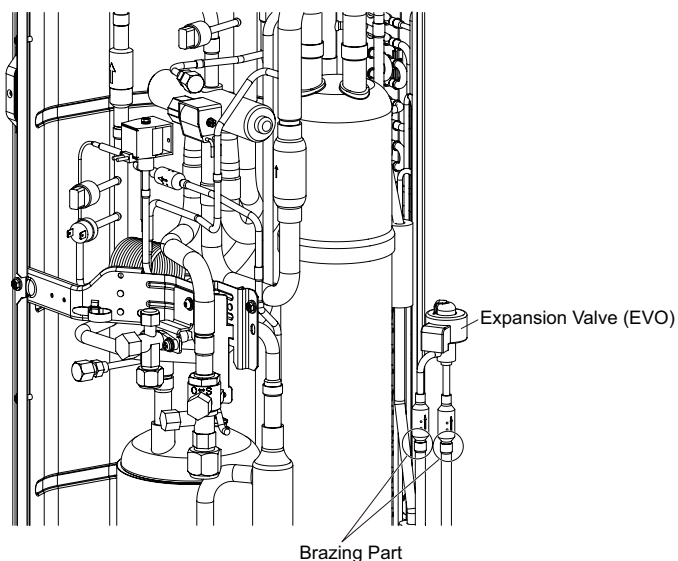
Solenoid Valve (SVA) Brazed Parts: 2

- (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
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⚠ 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

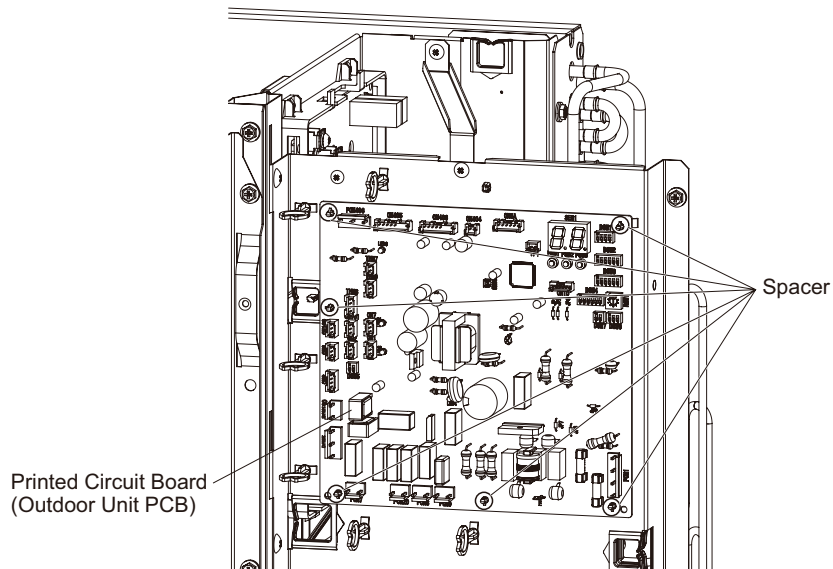
TURN OFF all power supply switches.

4.1.15 Removing Printed Circuit Board (Outdoor Unit PCB)

- (1) Remove the service cover according to Section 4.1.1 "Removing Service Cover."
- (2) Disconnect all connectors from the outdoor unit PCB.
- (3) Remove the outdoor unit 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 "DIP Switch Setting" 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.

4.1.16 Removing Inverter PCB

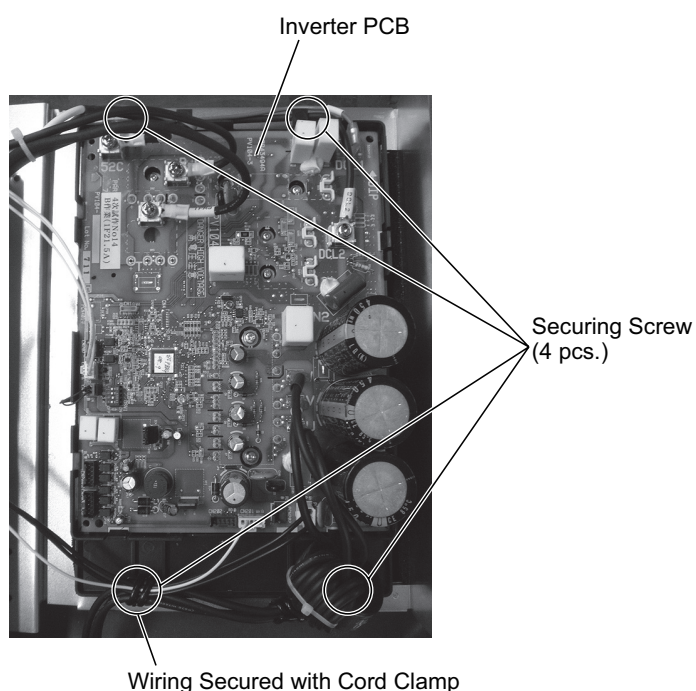
- (1) Remove the service cover according to Section 4.1.1 "Removing Service Cover."
- (2) Open the power plate rotating it approximately 90° counterclockwise according to Section 4.1.9 "Opening Electrical Box (Attaching P-Plate)."
- (3) Disconnect all connectors connected to the inverter PCB.
- (4) Remove four 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 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 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.

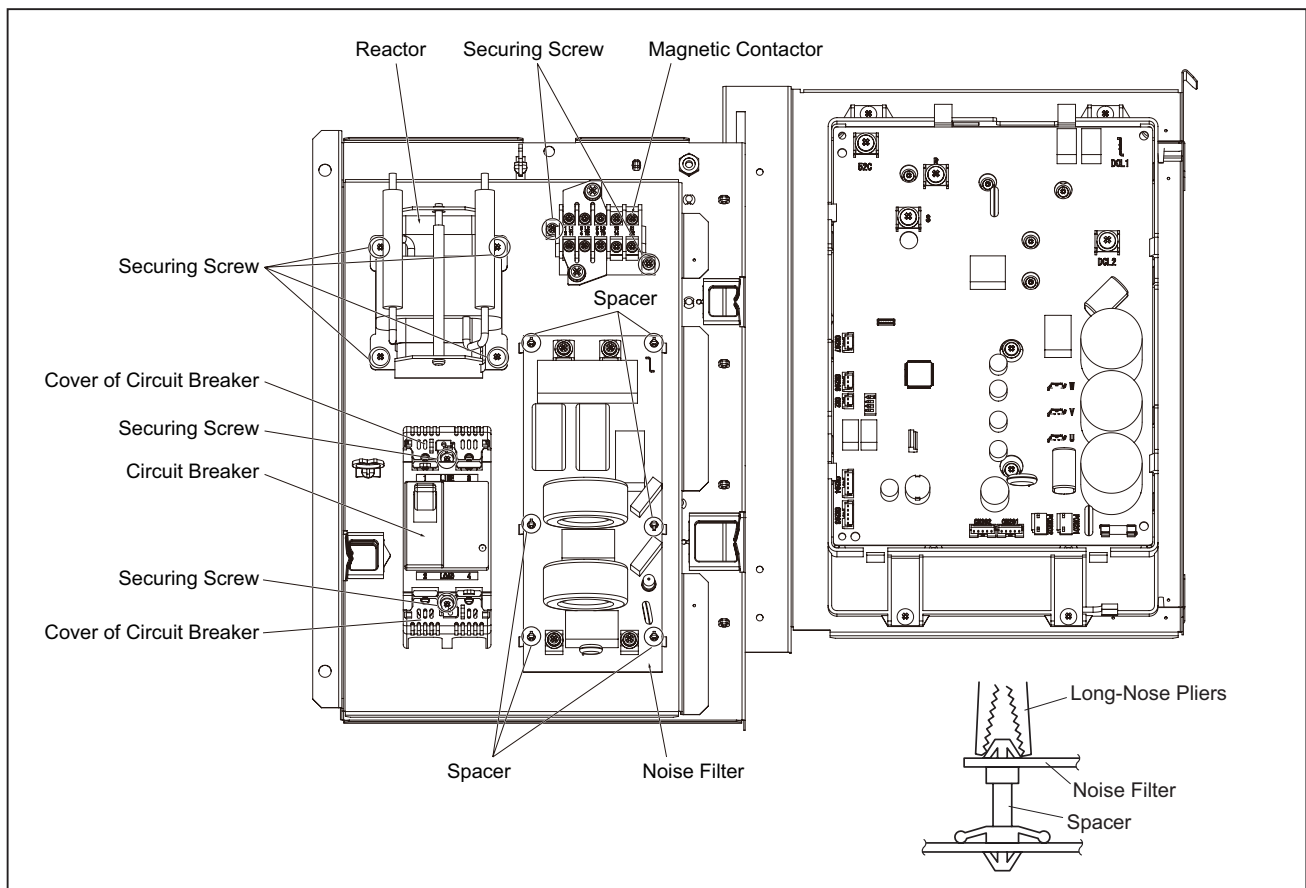
4.1.17 Removing Other Electrical Components

- (1) Remove the service cover according to Section 4.1.1 "Removing Service Cover."
- (2) Open the power plate rotating it approximately 90° counterclockwise according to Section 4.1.9 "Opening Electrical Box (Attaching P-Plate)."
- (3) Removing Electrical Components
 - (a) Disconnect all the lead wires connecting with the magnetic contactor (CMC).
(Use No.3 size Phillips Screwdriver.) Remove two securing screws for the magnetic contactor and remove the magnetic contactor.
 - (b) Remove four securing screws for the reactor and remove the reactor (DCL).
 - (c) Disconnect all wiring connected to the noise filter (NF1).
Remove the noise filter by the top of the six plastic spacers while gently pulling board away from enclosure.
 - (d) Remove the cover of breaker (FFB). (two places)
Disconnect all wiring connected to breaker.
Remove two securing screws for the circuit breaker and remove the circuit breaker.

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 damaged or possible injury.

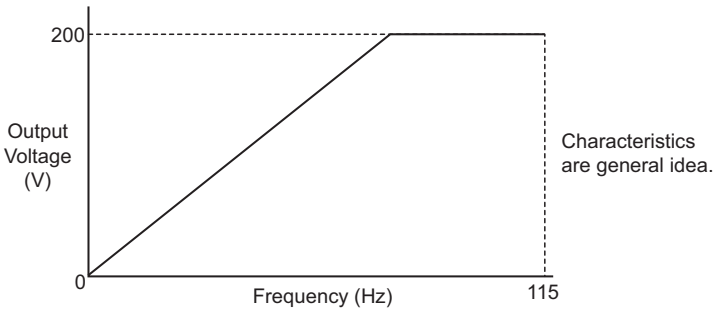
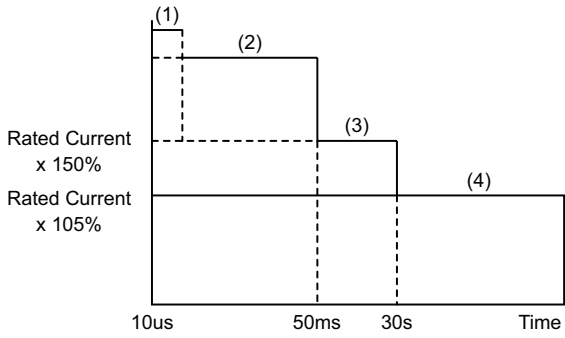
Tool	Phillips Screwdriver, Long-Nose Pliers, Stubby Phillip Screwdriver, No.3 size Phillips Screwdriver
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4.2 Main Parts

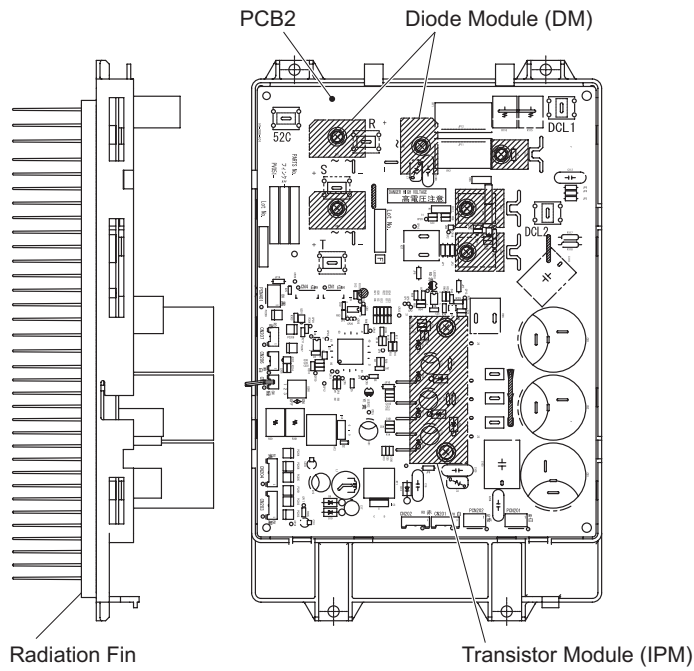
4.2.1 Inverter

(1) Specifications of Inverter

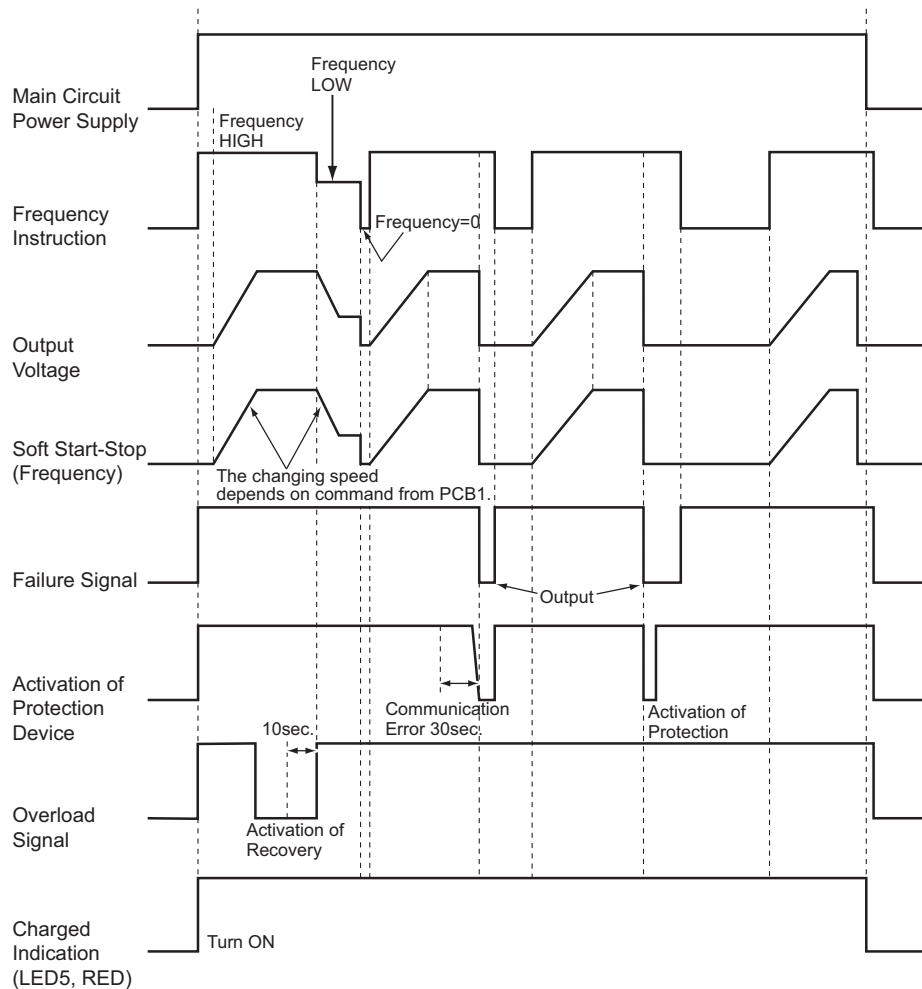
Applicable Model	(H,Y,C)VAHP036 - 060B21S
Power Supply	AC 1Ph 208/230V / 60Hz
Output Voltage (Maximum)	3Ph 200V
Output Current (Maximum)	21.5A
Control Method	Vector Control
Range of Output Frequency	10 to 115Hz
Accuracy of Frequency	0.01Hz at Applicable Frequency Range
Output / Characteristics	
Soft 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 194V DC or higher than 400V DC. Cause of Abnormality: Failure of Inverter PCB, Decreasing Capacity of Condenser, Incorrect Wiring
Abnormality of Current Sensor (0A Detection)	<p>(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).</p> <p>(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).</p> <p>Cause of Abnormality: Failure of Current Sensor (on Inverter PCB) Failure of IPM, Failure of Compressor, Disconnected Wiring</p>
Overcurrent Protection for Inverter (Electronic Thermal/ Instantaneous Overcurrent)	 <p>(1) Short-Circuit Trip of Arm (2) Instantaneous Overcurrent Trip } Internal Protection of IPM</p> <p>(3) Instantaneous Overcurrent Trip: It is detected when current value is over rated current x 150%.</p> <p>(4) Electronic Thermal Trip: Condition is maintained longer than 30 seconds or accumulated longer than 3 minutes during 10 minutes sampling time.</p>
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 \geq Rated Current x 105% Current Value \leq Rated Current x 88%
Fin Temperature Increase	The unit is stopped when the fin temperature is higher than 194°F (90°C).
Ground-Fault Detection	The unit is stopped when the compressor shorts to ground at start-up.

(Main Parts)

(2) Arrangement of Inverter Power Unit



(3) Inverter Time Chart



(4) Protective Function

(i) Excessive High or Low Voltage for Inverter

(a) Level of Detection

When the voltage of direct current is greater than 400V, an abnormality is detected.

When the voltage of direct current is smaller than 194V, 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.

(ii) 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.

(iii) 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.

(iv) 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)**(v) Fin Temperature Increase****(a) Level of Detection**

When the temperature of internal thermistor exceeds more than 194°F (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.

(vi) Earth Detection**(a) Level of Detection**

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

(b) Function

When 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

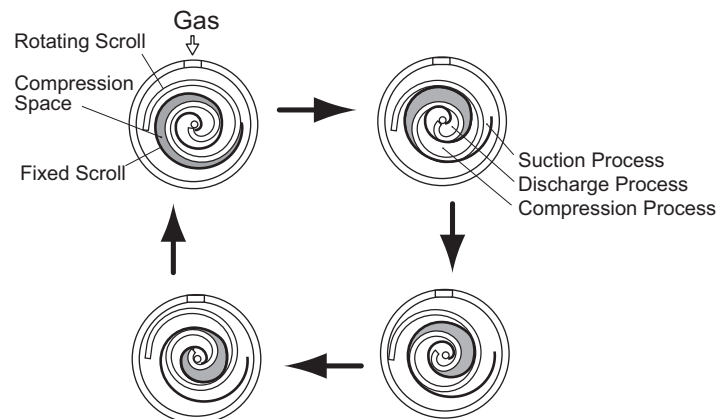
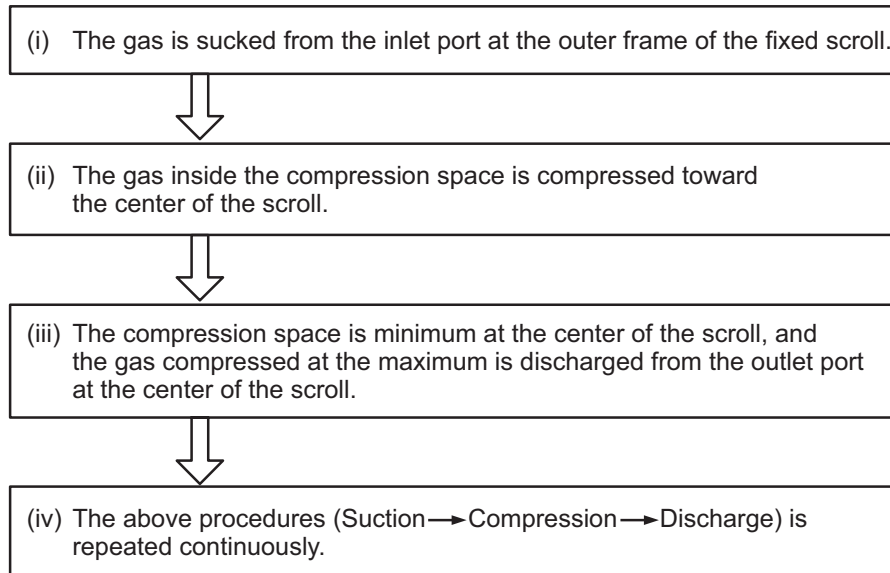
After the operation described in the above item (b) is performed for 10 seconds, this control is canceled.

4.2.2 Scroll Compressor

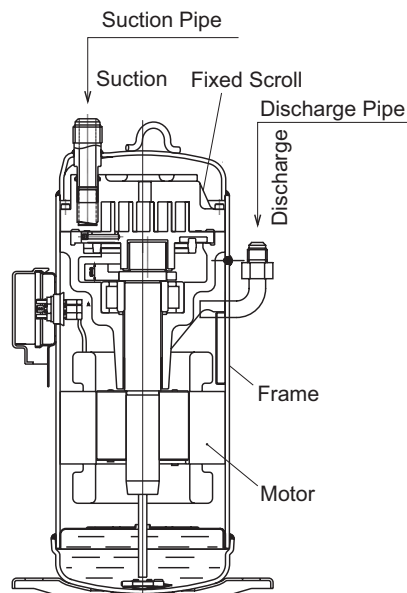
(1) Reliable Mechanism for Low Vibration and Low Sound

- (i) The rotating direction is definite.
- (ii) The pressure inside of the chamber is high pressure, and the surface temperature of the chamber is 140°F to 230°F (60°C to 110°C).

(2) Principle of Compression



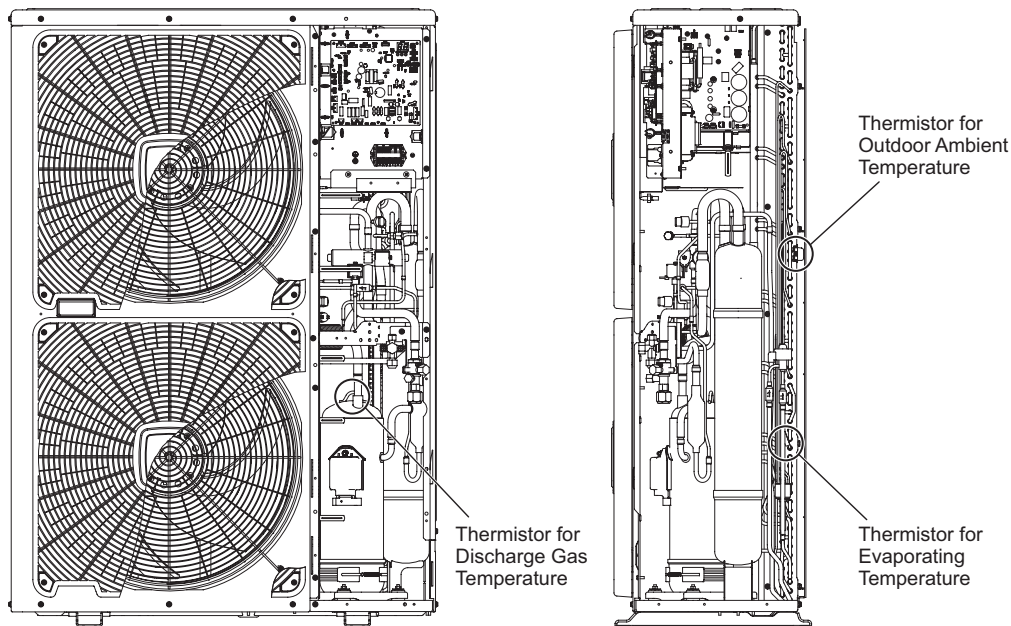
(3) Structure



(Main Parts)

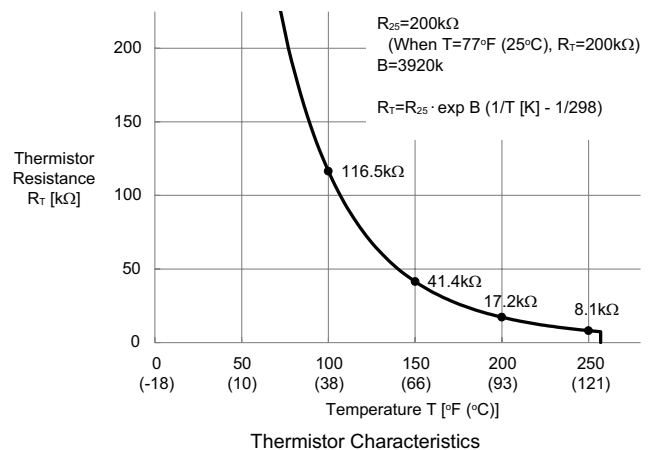
4.2.3 Thermistor

(1) Position of Thermistor



(2) Thermistor for Discharge Gas Temperature of Compressor (For Prevention of Discharge Gas Overheating)

- A thermistor for discharge gas temperature of the compressor is installed to prevent discharge gas from overheating. If discharge gas temperature increases excessively lubricating oil deterioration occurs and lubricating properties deteriorate, resulting in short compressor life.
- If discharge gas temperature increases excessively, compressor temperature increases. At the worst, compressor motor winding will be burnt out.
- When discharge gas temperature of compressor increases during operation, the unit is controlled according to the following method.



- An electronic expansion valve and high pressure refrigerant is returned to the compressor through the accumulator, decreasing compressor temperature.
 - If the discharge gas temperature of compressor increases exceeding 270°F (132°C) even if an electronic expansion valve opens, the compressor is stopped, in order to protect the compressor.
- (d) If discharge gas temperature of compressor increases excessively, the protection control is activated and the compressor is stopped according to the following method.

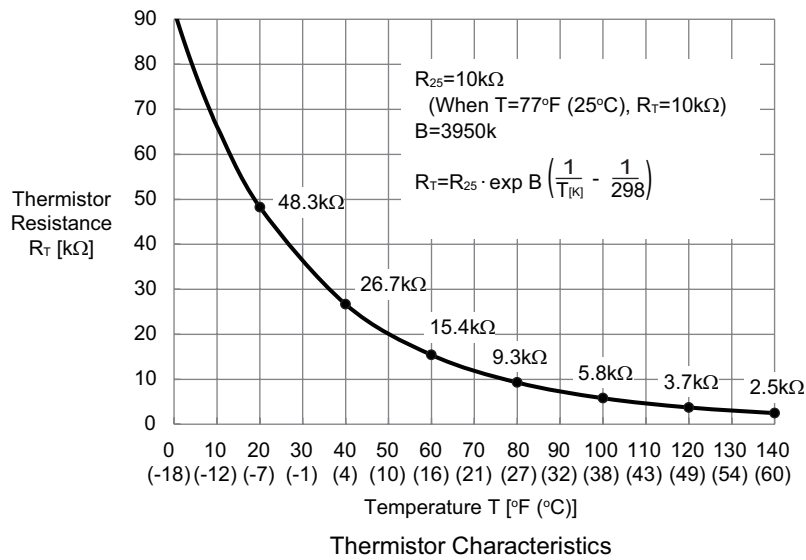
Operation	Discharge Gas Temperature of Compressor	Defecting Period
Cooling	Over 239°F (115°C)	10 minutes (Continuously)
	Over 257°F (125°C)	5 seconds (Continuously)
Heating	Over 239°F (115°C)	10 minutes (Continuously)
	Over 257°F (125°C)	5 seconds (Continuously)

(3) Thermistor for Outdoor Ambient Temperature

The thermistor resistance characteristics are shown in the figure below.

(4) Thermistor for Evaporating Temperature of Outdoor Unit

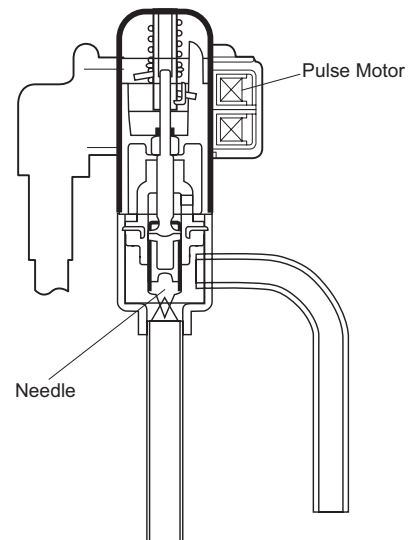
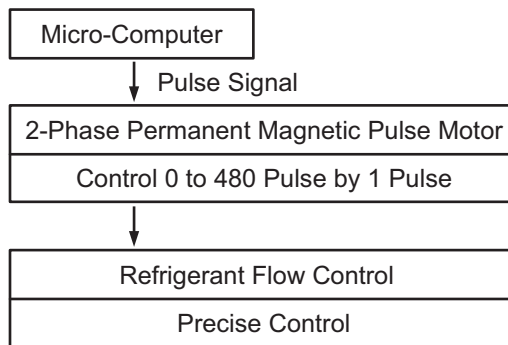
The characteristics for the thermistor is the same with the value of thermistor for outdoor ambient temperature as shown in the figure below.



MAINTENANCE

(Main Parts)

4.2.4 Electronic Expansion Valve for Outdoor Units

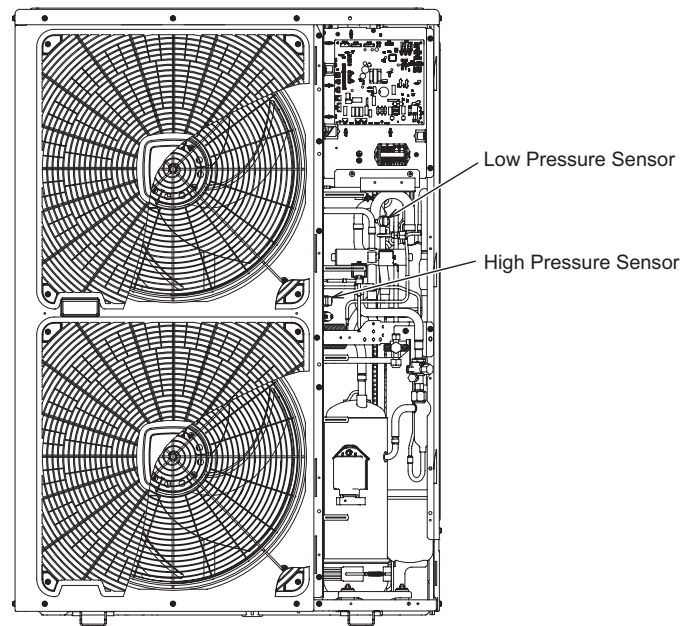


Specifications

Items	Specifications
Type	UKV Series
Refrigerant Used	R410A
Working Temperature Range	-22°F to 158°F (-30°C to 70°C) [Operating Time of Coil: less than 50%]
Mounting Direction	Drive Shaft in Vertical Direction within an Angle of 45° as Maximum
Flow Direction	Reversible
Drive Method	4-Phase Pulse Motor Method
Rated Voltage	DC12V±10%
Drive Condition	63PPS 1, 2 Phase Excitation
Coil Resistance (each Phase)	46Ω±3Ω (at 20°C)
Wiring Diagram, Drive Circuit and Activation Mode	<p>The diagram shows the wiring for the valve. It includes a motor (M) connected to a 4-phase pulse motor circuit. The circuit is powered by DC12V. The activation mode is shown as a timing diagram with four phases: A, B, A-bar, and B-bar. The valve position is indicated as 'Close' and 'Open' with arrows. The activation mode is labeled 'Activation'.</p>

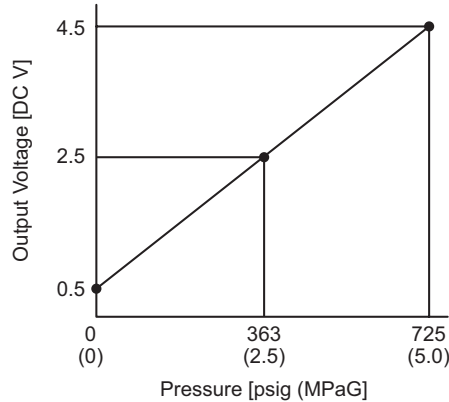
4.2.5 Pressure Sensor

(1) Position of Pressure Sensor



(2) High Pressure Sensor

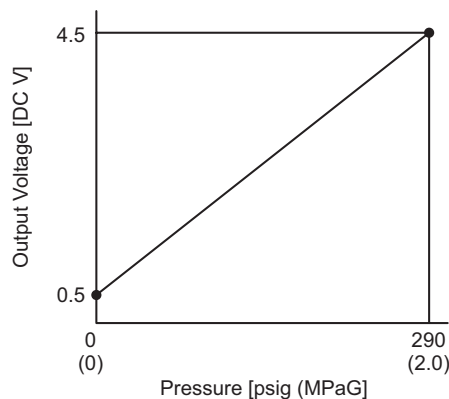
The high pressure during operation is detected by a high pressure sensor, and compressor frequencies are controlled by the proportional controlling method with operating capacity of indoor units (or PID Control for Compressor Frequency) so that the high pressure is controlled in an appropriate range. 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

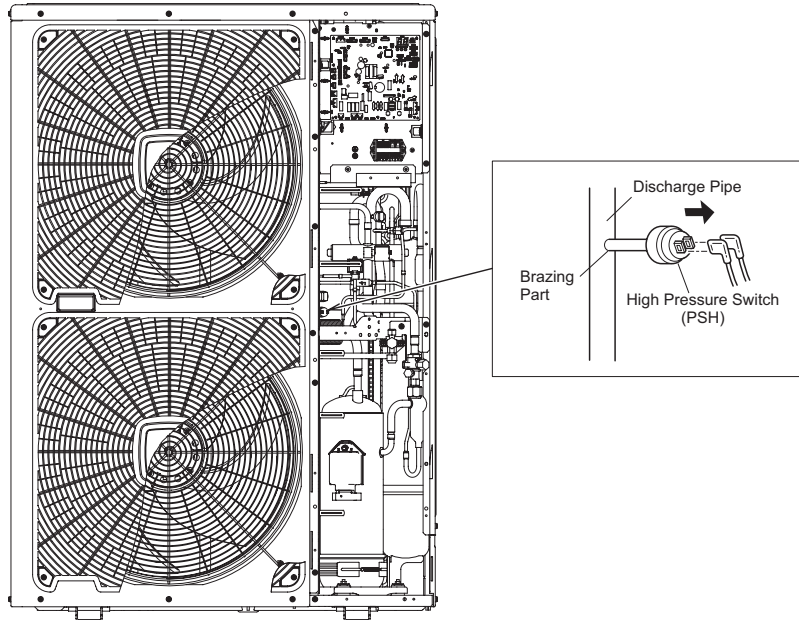
MAINTENANCE

(Main Parts)

4.2.6 High Pressure Switch

High Pressure Switch (for Protection)

When the high pressure reaches 601 psi (4.15MPa), compressor is stopped to protect the refrigerant cycle components.



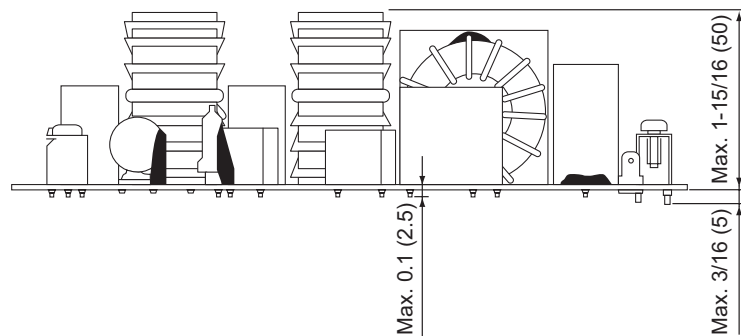
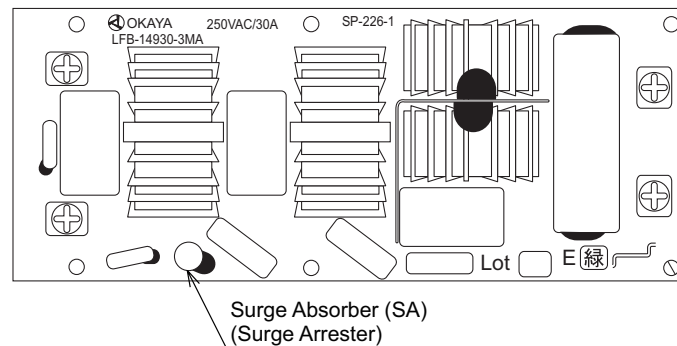
4.2.7 Noise Filter (NF1)

The noise filter decreases the leakage of noise made by the inverter to the power supply side. Terminals indicated with “LOAD” are connected to the inverter side and terminals indicated with “LINE” to the power supply side.

208/230V 60Hz (NF1)

Items	Specifications
Model	LFB-14930-3MA
Rated Current	AC 208/230V, 30A
Permissible Temperature Range	-13°F to 140°F (-25°C to 60°C)
Circuit Diagram	

[inch (mm)]



MAINTENANCE

(Main Parts)

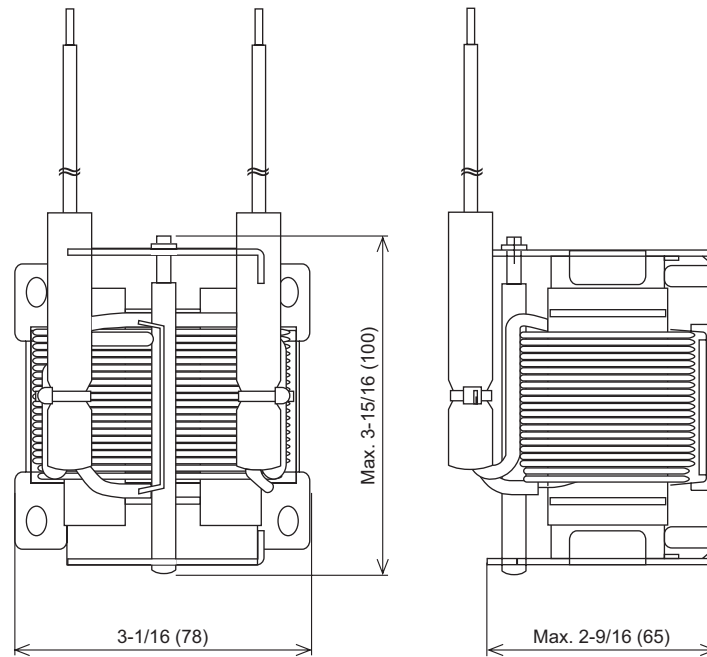
4.2.8 Reactor (DCL)

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

208/230V 60Hz (DCL)

Items	Specifications
Character	0.8mH (at 1kHz)
Rated Current	DC 25A
Direct Current Resistance	31mΩ (at 68°F (20°C))
Permissible Temperature Range	-4°F to 140°F (-20°C to 60°C)

[inch (mm)]



5. External Input/Output and Function Setting

5.1 DIP Switch Settings of Outdoor Unit

TURN OFF all power supply before setting.

Without turning OFF the power supply, the switches will not work and the settings will be invalid.

(However, No.1, 2 and 4 pins of DSW1, No.5 and 6 pins of DSW2 and push switches can be operated when the power supply is ON.)

The “■” mark indicates the positions of DIP switches.

• Initial Setting

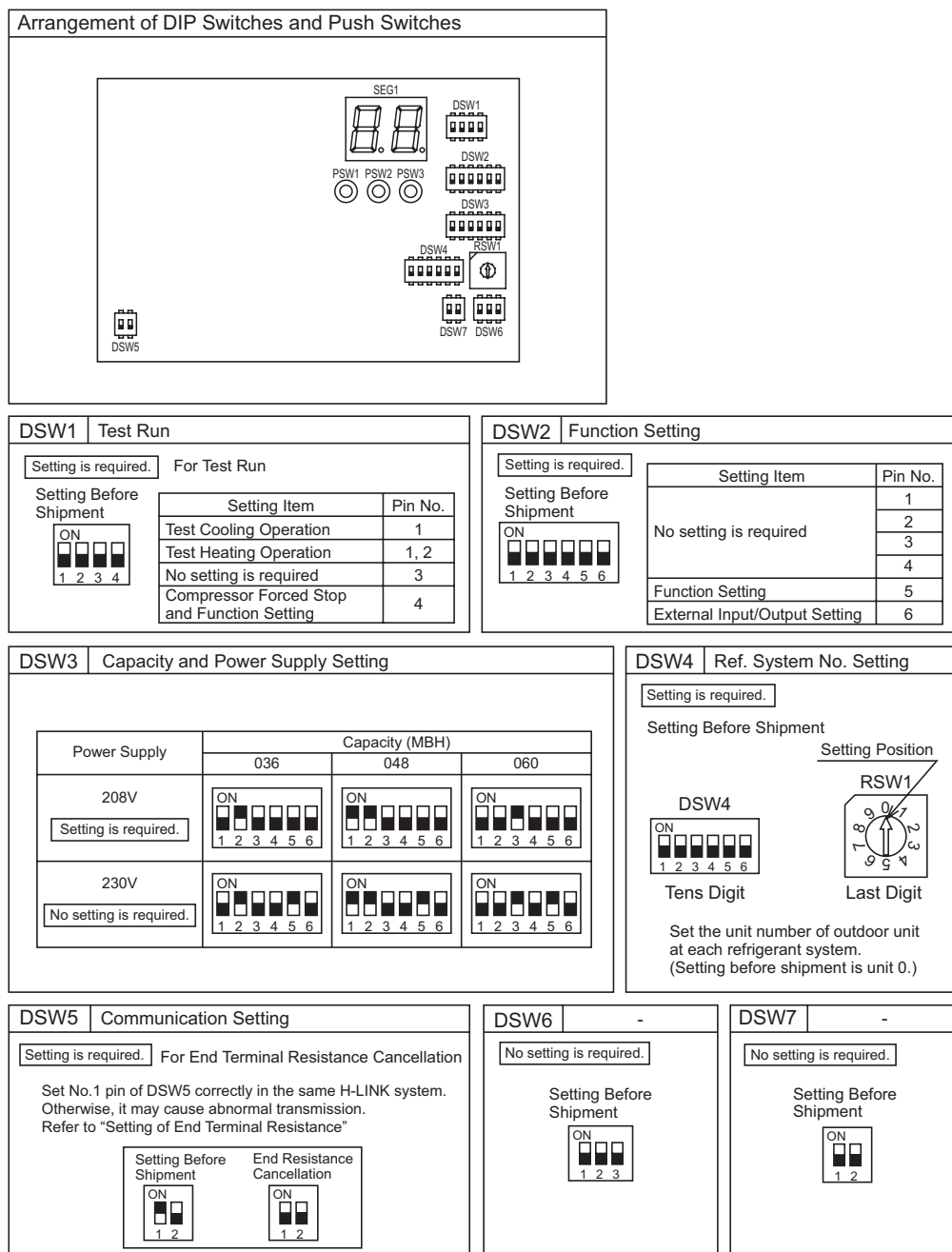


Figure 5.1 DSW Setting

NOTE:

Thermo-ON: The outdoor unit and some indoor units are running.

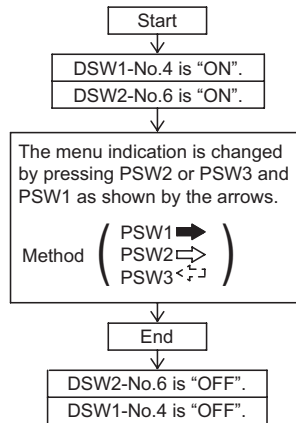
Thermo-OFF: The outdoor unit and some indoor units stay on, but don't run.

For detail, refer to Section 3.1.3 “Checking Rotary Switch and DIP Switch Settings”.

5.2 External Input/Output and Function Setting Mode for Outdoor Unit

5.2.1 External Input / Output Setting Method

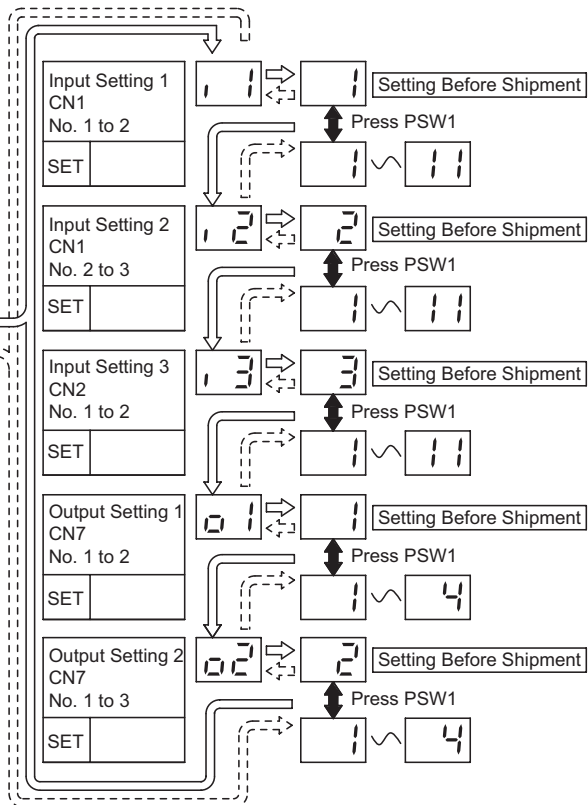
The setting should be performed during the outdoor unit stoppage.
This setting is not available during the operation, the check mode and the function setting.



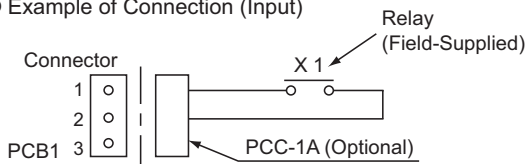
NOTES:

- Record the function No. of each setting when setting the optional function. The example is for setting 1.
- 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.

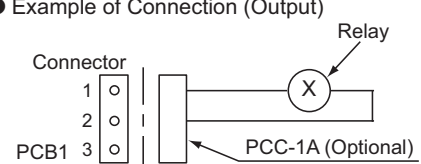
Example
SET 1



● Example of Connection (Input)



● Example of Connection (Output)



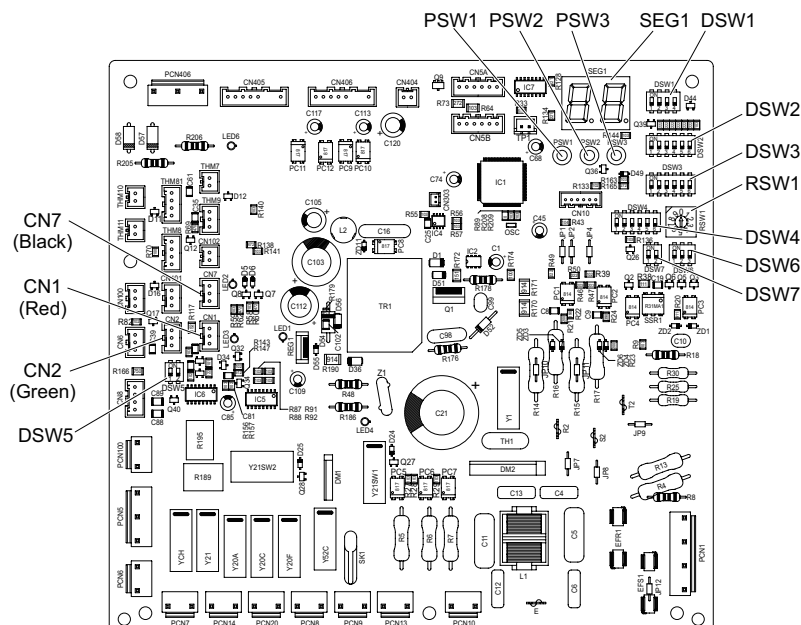
● Specifications of Relay

Specifications	Remarks
Mini-Power Relay MY1F (or 2F) made by OMRON Co.	208V / 230V

● Specifications of Relay

Specifications
Mini-Power Relay LY2F DC12V made by OMRON Co.

Arrangement of Push Switches on PCB1



5.2.2 External Input and Output Settings

On the outdoor unit Printed Circuit Board (PCB1), 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 40%
7	Demand Current Control 60%
8	Demand Current Control 70%
9	Demand Current Control 80%
10	Demand Current Control 100%
11 *1)	No Setting

*1): Control Function No.11 is valid only when applied to Input Setting 3.

Output

Control Function No.	Setting Function for Output
1	Operation Signal
2	Alarm Signal
3	Compressor ON Signal
4	Defrosting Signal

The following functions have been already set at the factory.

Input/Output Terminal

Input 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

• External Input Function Setting

The following signals can be received by the outdoor unit PCB. Refer to Table 5.1 below for the required main parts.

(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

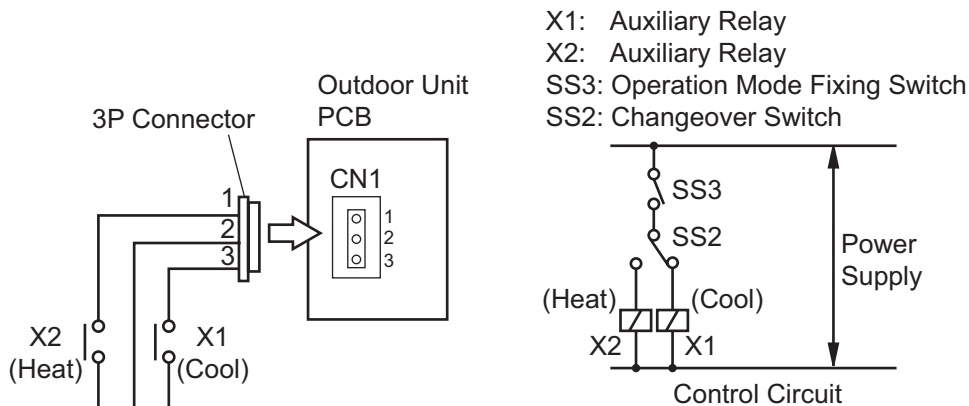
Short Circuit between Terminals 2 and 3 of CN1: Fixed Cooling Operation Mode

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 1 (between 1 and 2 pins of CN1)

Fixing Cooling Operation at Input 2 (between 3 and 2 pins of CN1)



Wiring Diagram Example of Fixing Operation Mode

(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:

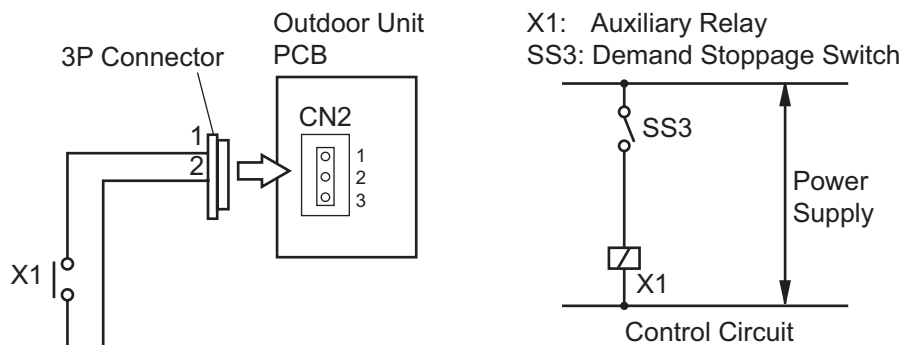
When demand control (ON/OFF) is performed, it is recommended that the control (ON/OFF) time is set appropriately according to the heat load. Also, set the demand control time approximately once in 15 minutes at the minimum in consideration for saving energy.

*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 Stoppage at Input 3 (between 1 and 2 pins of CN2)



Wiring Diagram Example of Demand Stoppage

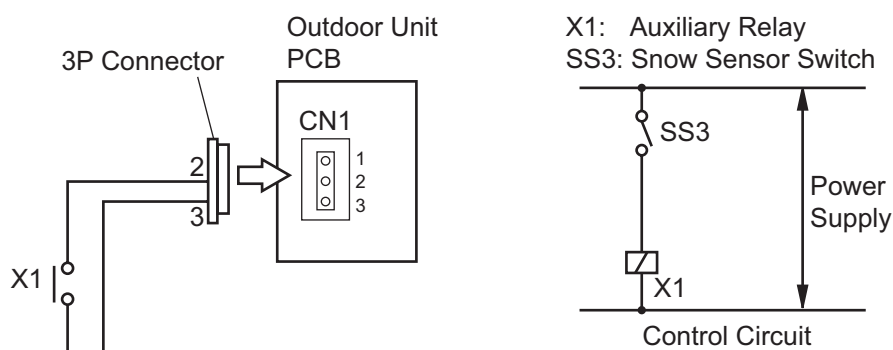
(3) [Input] Outdoor Fan Motor Start/Stop (Control Function No.4)

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 50°F (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 Switch-OFF or Thermo-OFF of the Switch-ON). Therefore, this function will not be possible even if the input signal is sent during the normal cooling or heating operation.

An example of a basic wiring when the Outdoor Fan Motor Start/Stop (Input 2) is set to 2 and 3 pins of CN1 by an external signal is shown below.

- Setting Example
Outdoor Fan Motor Start/Stop at Input 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 50°F (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.
5. The operation pattern of the outdoor fan can be changed by Function Setting "Fo". Refer to Section 5.2.3.2 (13) "Intermittent Operation of Outdoor Fan Motor".

! 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.

- * Switch-ON: Some indoor units are running or staying.
- Switch-OFF: All indoor units are stopped.

(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.

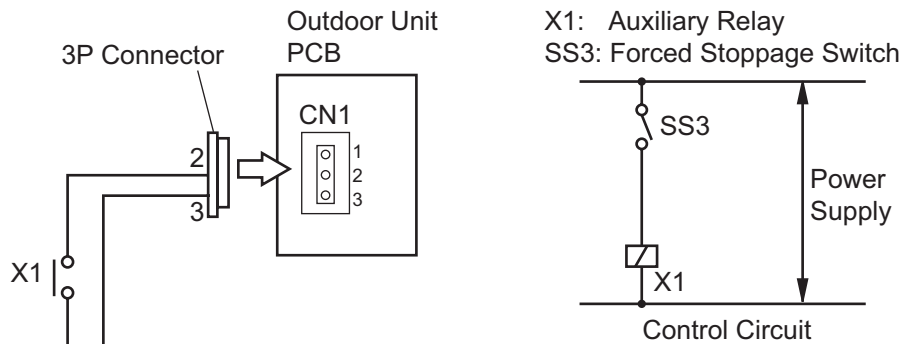
NOTE:

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 2 (between 2 and 3 pins of CN1)



Wiring Diagram Example of Forced Stoppage

(5) [Input] Demand Current Control 40, 60, 70, 80, 100% (Control Function No.6 to 10)

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%, 60% or 40% 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.

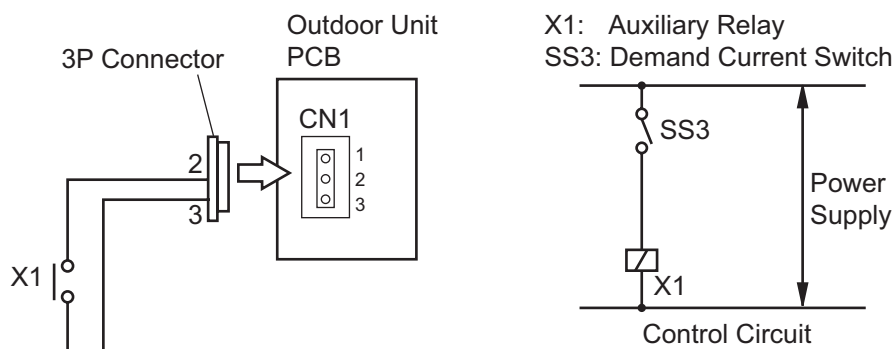
NOTE:

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.

Outdoor Unit Capacity [MBH]	Reference Power Consumption [KW]
036	3.9
048	4.5
060	4.5

- Setting Example
Demand Current Control at Input 2 (between 2 and 3 pins of CN1), Control Function No. 6 to 10



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 40% to 100%) depending on the operating control conditions such as protection control.

Table 5.1 Specifications of Required Main Parts

Parts		Specifications	Remarks
Auxiliary Relay (X1, X2)		Mini-Power Relay, (Model: MY1F or MY2F) made by OMRON	208V/230V
Change-Over Switch (SS2, SS3)		Manual Switch	208V/230V
3 Pin Connector Cord		Model: PCC-1A (Connected to JST Connector, XARP-3)	Five Cords with Connectors as One Set
Electric Wiring (Inside of Unit)	Low Volt.	AWG22	lower than 24V
	208/230V	AWG18-20	
Electric Wiring (Outside of Unit)	Low Volt.	AWG18-20	lower than 24V
	208/230V	AWG14	

NOTES:

1. Make the wiring to the terminals as short as possible.
2. Do not run the wirings too closely to the high voltage cable. Keep at least 12 in. (30cm) between the wiring and the high voltage cable. (Crossing cables is okay.)
If it is necessary to run the wirings closer than 12 in. (30cm) to the high voltage cable, insert the low voltage cable(s) into a metal tube and ground it at one end. If sealed wirings are used at the low voltage wiring side, ground it at one end of the shielded wirings.
3. The maximum length should be within 230 ft. (70m).

- External Output Function Setting

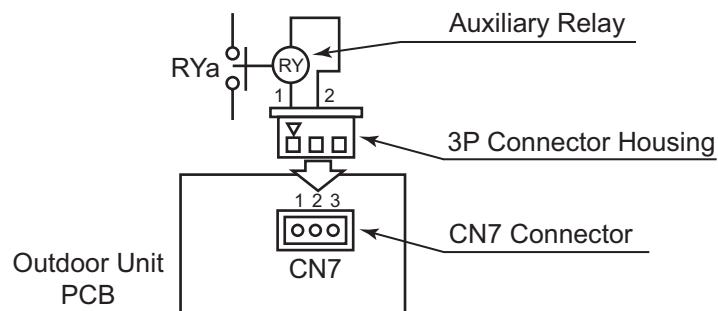
The following signals can be picked up from the outdoor unit PCB.
Refer to Table 5.2 for the required auxiliary relay.

(1) **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 1 (between 1 and 2 pins of CN7)



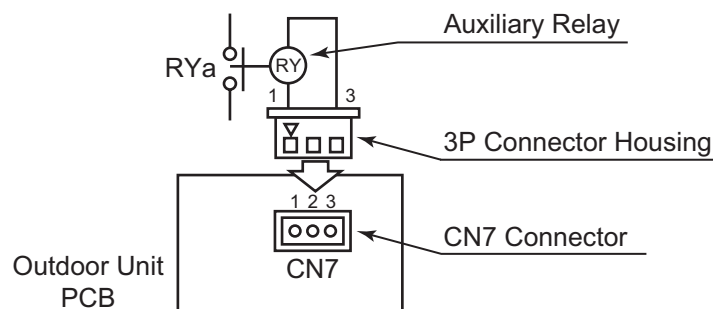
Wiring Diagram Example of Operation Signal

(2) **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 2 (between 1 and 3 pins of CN7)

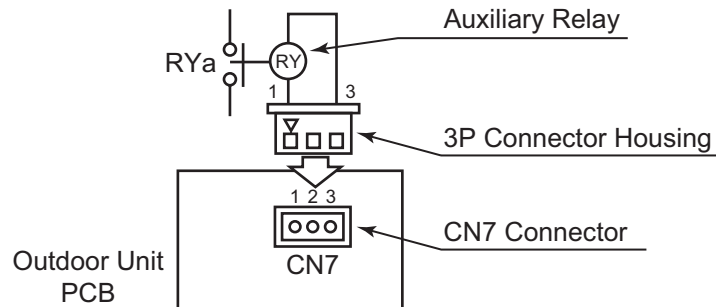


Wiring Diagram Example of Alarm Signal

(3) 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 2 (between 1 and 3 pins of CN7)

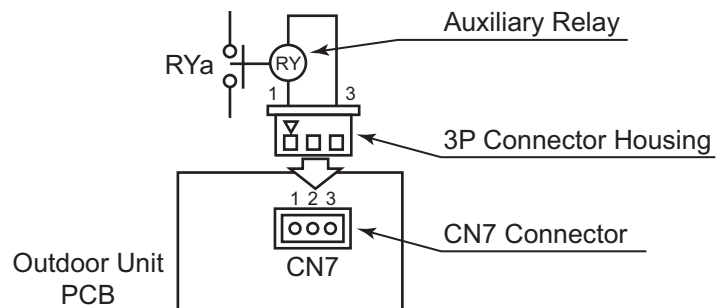


Wiring Diagram Example of Compressor ON Signal

(4) 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 2 (between 1 and 3 pins of CN7)



Wiring Diagram Example of Defrosting Signal

Table 5.2 Specifications of Required Auxiliary Relay

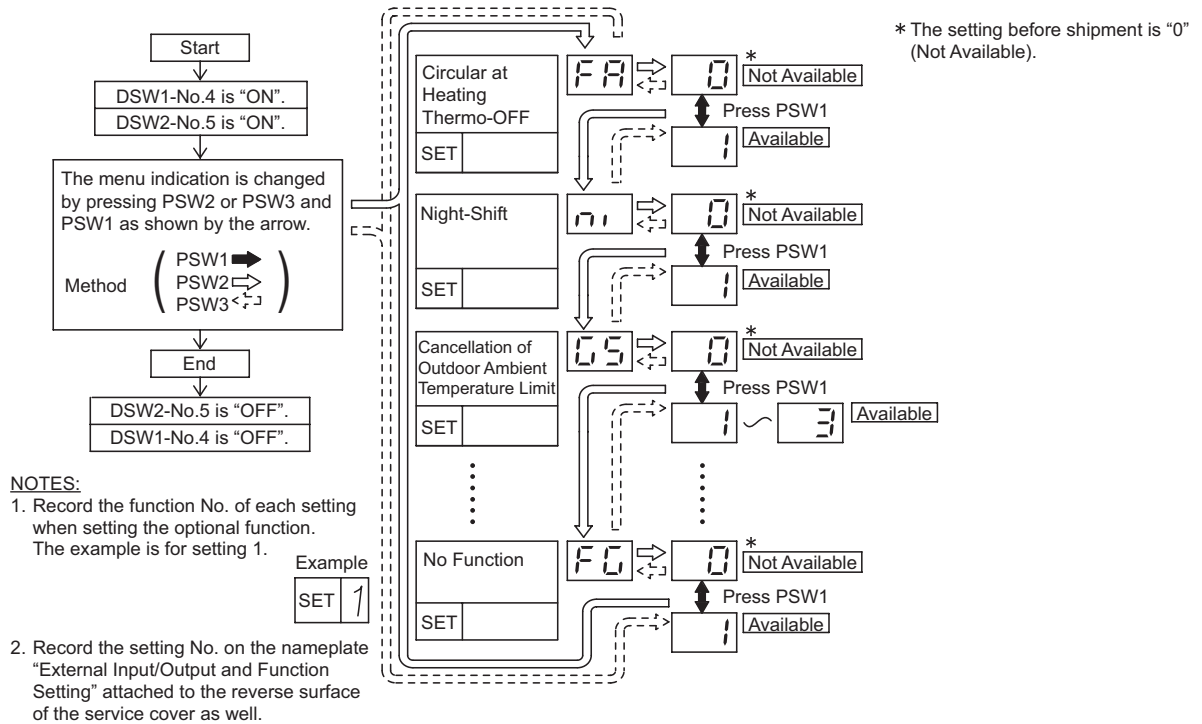
Parts	Specifications
Auxiliary Relay *	High-Power Relay, LY2F DC12V made by OMRON

* Do not use the relay with diode built-in.

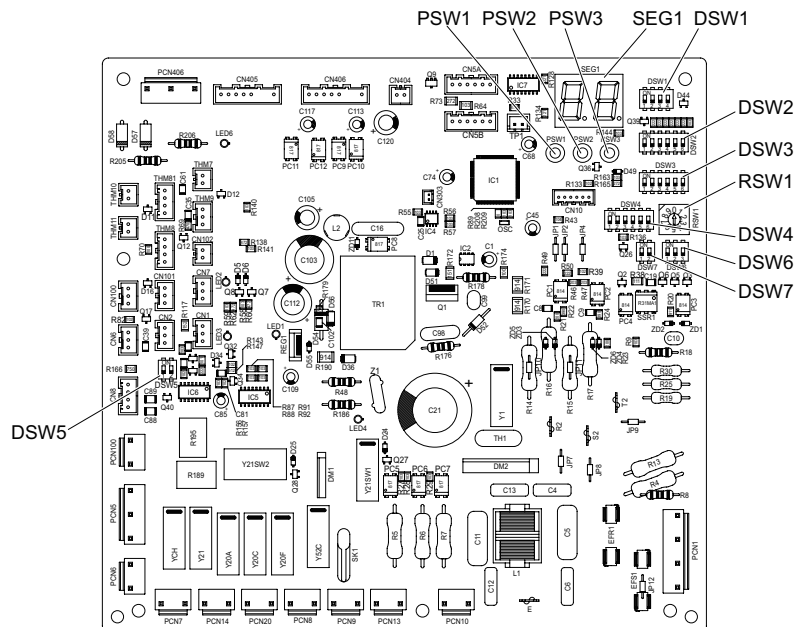
* Refer to Table 5.1 above for the connector parts.

5.2.3 Function Setting

The function setting should be performed during the outdoor unit stoppage.
This setting is not available during External Input / Output Setting.



Arrangement of Push Switches on PCB1



5.2.3.1 Function Setting Item

No.	Setting Item	7-Segment Display		Contents
		Item	No.	
1	Circulator Function at Heating Thermo-OFF	FR	0	No setting (continuously operation)
			1	Indoor fan forced ON and OFF (2min. ON/6min. OFF)
2	Night Shift (Low Noise)	n	0	No setting
			1	Setting night shift for cooling
3	Cancellation of Outdoor Ambient Temperature Limit	DS	0	No setting (valid)
			1	Cancellation for heating
			2	Cancellation for cooling
			3	Cancellation for cooling and heating
4	Change of Defrost Condition	DO	0	No setting
			1	Defrost for cold area
			2	Defrost for warm area
5	SLo (IU Fan Speed) Defrost Setting	bU	0	No setting (Indoor fan stoppage during defrost operation)
			1	Indoor fan SLo operation when heating operation is activated/during defrost operation
6	Cancellation of Hot Start	Hf	0	No setting
			1	Cancellation of hot start
7	Priority Capacity Mode	nU	0	No setting
			1	Change of correction factor for compressor frequency (pattern1)
			2	Change of correction factor for compressor frequency (pattern2)
			3	Change of correction factor for compressor frequency (pattern3)
8	Compressor Frequency Control Target Value for Cooling	Hc	0	No setting
			1	Change of upper limit for compressor frequency of cooling operation
9	Compressor Frequency Control Target Value for Heating	Hh	0	No setting
			1	Change of upper limit for compressor frequency of heating operation
10	Compressor Frequency Fixed Mode	Sc	0	No setting
			1	Fixed frequency mode
11	IU Electronic Expansion Valve Opening during Heating Operation Stoppage	S,	0	No setting
			1	Expansion valve opening: pattern1
			2	Expansion valve opening: pattern2
12	IU Electronic Expansion Valve Opening during Heating Thermo-OFF	So	0	No setting
			1	Expansion valve opening: pattern1
			2	Expansion valve opening: pattern2
13	IU Electronic Expansion Valve Opening during Heating Thermo-ON	c,	0	No setting
			1	Expansion valve opening: pattern1
			2	Expansion valve opening: pattern2
14	Sound Reduced Function	db	0	No setting
			1	Low Noise Setting 1
			2	Low Noise Setting 2
			3	Low Noise Setting 3
			4	Low Noise Setting 1
			5	Low Noise Setting 2
			6	Low Noise Setting 3
			7	Low Noise Setting 1
			8	Low Noise Setting 2
			9	Low Noise Setting 3
15	Demand Function Setting	dE	0	No Setting
			1	Valid demand function all time
16	Wave Function Setting	UE	0	No setting
			1	Valid wave function (20min. 100% demand/10min. minimum setting)
17	Protection of Decrease in Outlet Temperature of Cooling	Fb	0	No setting
			1	Cooling outlet temperature decrease protection1
			2	Cooling outlet temperature decrease protection2
18	Outlet Temperature Control (DOAS)	Ff	0	No setting
			1	Restrain capacity control
			2	Outlet air temperature control

No.	Setting Item	7-Segment Display		Contents
		Item	No.	
19	Not Prepared	E1	0	
			1	
20	Thermo-OFF Setting for Outdoor Unit After Defrosting Operation	d5	0	No setting (continuously operation)
			1	Valid forced stoppage after defrost operation
21	Intermittent Operation of Outdoor Fan Motor (Snow Prevention)	F1	0	No setting (continuously outdoor fan operation when "input function No.4"=ON)
			1	Intermittent outdoor fan operation (30sec. ON/570sec. OFF)
			2	Intermittent outdoor fan operation (60sec. ON/540sec. OFF)
			3	Intermittent outdoor fan operation (120sec. ON/480sec. OFF)
			4	Intermittent outdoor fan operation (300sec. ON/300sec. OFF)
22	Not Prepared	F2	0	
			1	
23	Not Prepared	F3	0	
			1	
24	Invalid Electronic Expansion Valve Opening Difference Protection	F4	0	No Setting (valid)
			1	Invalid electronic expansion valve opening deference protection
25	Not Prepared	F5	0	
			1	
26	Not Prepared	F6	0	
			1	
27	Not Prepared	F7	0	
			1	
28	Crankcase Heater Control during Stoppage	F8	0	No setting (Preheating during outdoor unit stoppage)
			1	Power saving during outdoor unit stoppage (without preheating by crankcase heater)
29	Invalid Motion Sensor during Prepare Defrost	F9	0	No setting
			1	Invalid starting defrost by motion sensor detecting "no human activity (absent)"
30	Convert Unit in Checking Mode	F┐	0	No setting (indication unit: [°F] or [psij])
			1	Convert indication unit: [°C] or [MPa]
31	Not Prepared	Fd	0	
			1	
32	Permit Indoor Fan Operation during Forced Stoppage	FE	0	No setting (Indoor fan stoppage during forced stoppage by DSW1-4 or input function No.5)
			1	Permit indoor fan operation during forced stoppage
33	Not Prepared	FF	0	
			1	
34	Not Prepared	F┐	0	
			1	

NOTE:

Contact your distributor or contractor for details on items "10" to "13", "17", "20", "24" and "32".

5.2.3.2 Description of Function Setting Item

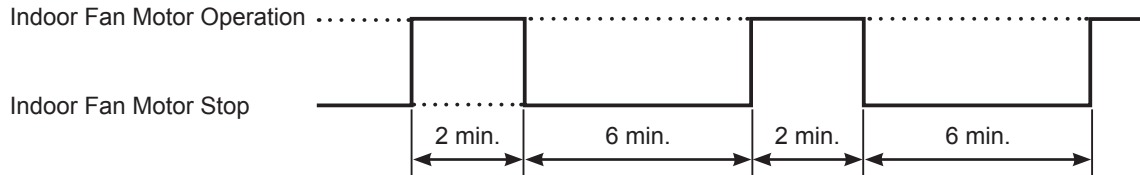
(1) Circulator Function at Heating Thermo-OFF (Function Setting “FA”)

Press “PSW1” and select the setting conditions “0” or “1” in Circulator Function at Heating Thermo-OFF “ \overline{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.

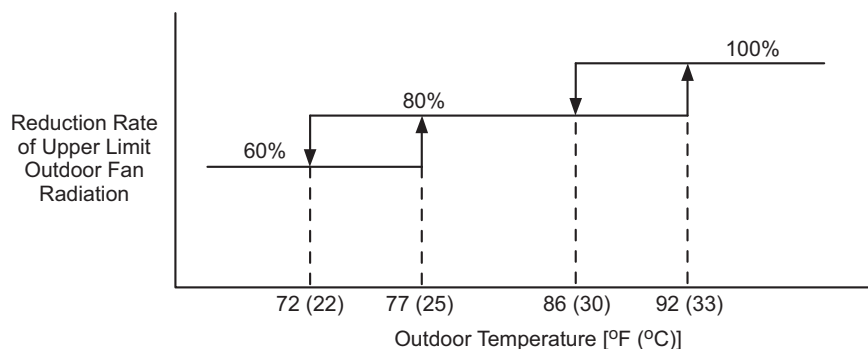
(2) Night Shift (Low Noise) (Function Setting “ni”)

Press “PSW1” and select the setting condition “0” or “1” for the Night Shift (Low Noise) “ \overline{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” Setting Condition	Operation	Reduction Rate of Maximum for Cooling (Including Dry Operation)	
		Outdoor Fan Rotation	Compressor Frequency
0	No Effect (Default Setting)	Not Changed (=110%)	Not Changed (=100%)
1	Night Shift	Shown as below	45% (when Outdoor Ambient Temp. is 86°F (30°C) or less.)



NOTE:

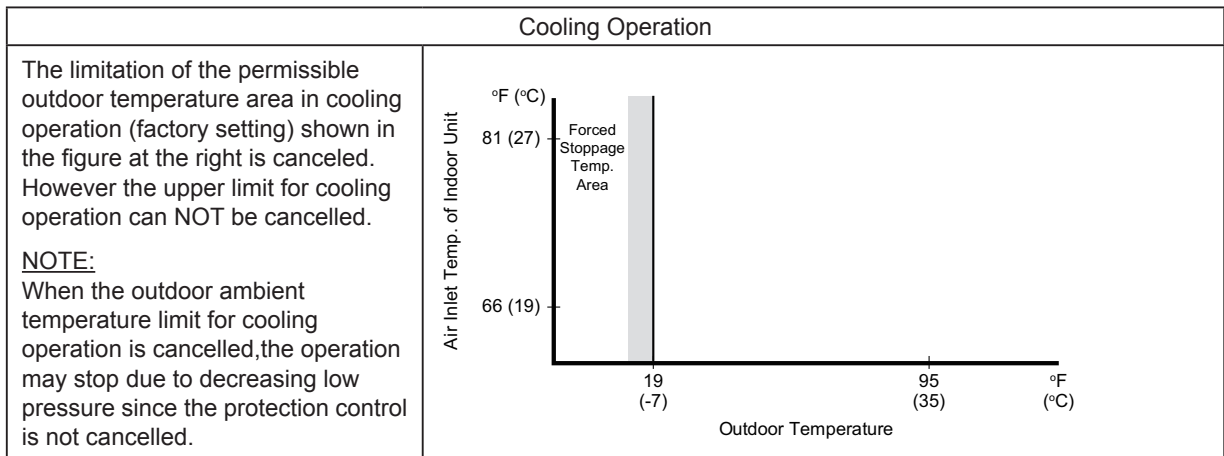
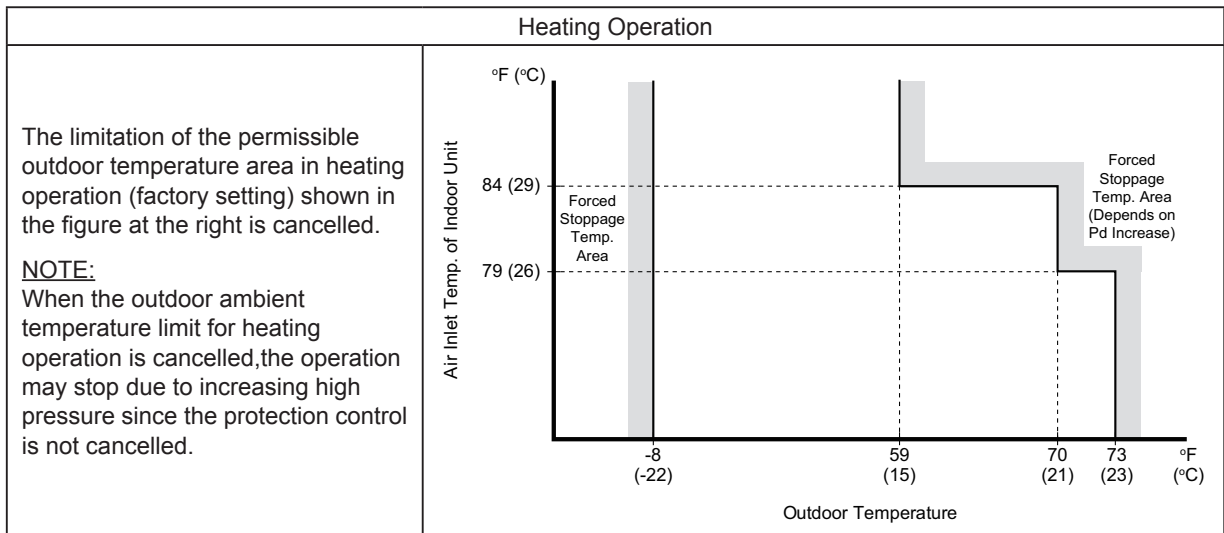
Reduction rates are approximate, these may change slightly depending on the outdoor unit model.

(3) Cancellation of Outdoor Ambient Temperature Limit (Function Setting “GS”)

Press “PSW1” and select the setting condition “0” to “3” for Cancellation of Outdoor Ambient Temperature limit “ $\overline{U5}$ ”. Then, this function can be set.

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

“GS” Setting Condition	Operation Mode for Cancellation
0	Not Available (Default Setting)
1	Heating
2	Cooling
3	Heating/Cooling



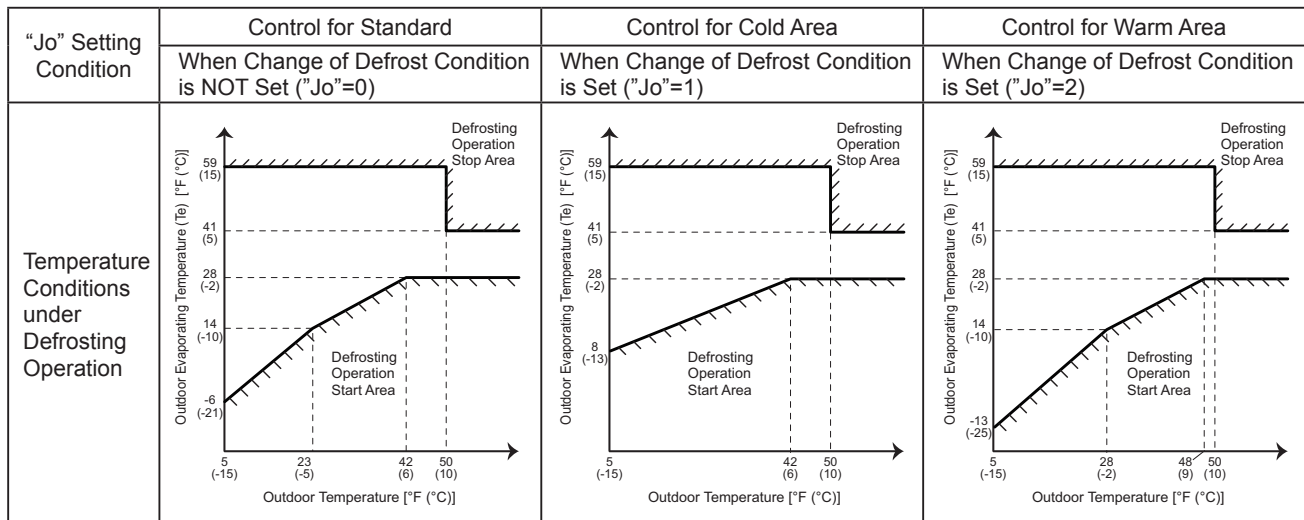
NOTE:

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.

(4) Change of Defrost Condition (Function Setting “Jo”)

Press “PSW1” and select the setting condition “0” to “2” for Change of Defrost Condition “ Jo ”. This function changes the defrost condition as shown below.



(5) 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.

(6) Priority Capacity Mode Setting (Function Setting “nU”)

If the cooling capacity seems insufficient during the normal operation, press “PSW1” and select the setting condition “0” to “3” Priority Capacity Mode Setting “ nU ”. By setting this function, the target frequency of the compressor is set higher only for cooling operation.

“nU” Setting Condition	Target Frequency of Compressor
0	Not Available (Default Setting)
1	Default Setting +30%
2	Default Setting +50%
3	Default Setting +100%

NOTE:

The upper limit frequency of the compressor can NOT be changed by Priority Capacity Mode Setting.

(7) Compressor Frequency Control Target Value for Cooling (Function Setting “Hc”)

If the cooling 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 Cooling “ H_c ”. By setting this function, the target frequency and upper limit of the compressor are set higher for cooling operation.

“Hc” Setting Condition	Compressor Frequency	
	Target Frequency	Upper Limit
0	Not Available (Default Setting)	
1	Default Setting +20%	Default Setting +20%

NOTE:

Increase rates are approximate, these may change slightly depending on the outdoor unit model.

(8) Compressor Frequency Control Target Value for Heating (Function Setting “Hh”)

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 “ H_h ”. By setting this function, the initial frequency and PID control target of the compressor are set higher for heating operation.

“Hh” Setting Condition	Compressor Frequency	
	Initial Frequency	Target Pd (PID control)
0	Default Setting	Depends on Ps (the maximum target Pd=421psi (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.

(9) Sound Reduced Function (Function Setting “db”)

Press “PSW1” and select the setting condition “0” to “9” at the Sound Reduced Function (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	
		Compressor Frequency	Outdoor Fan Rotation
0	No Setting (Default)	100%	110%
1	Low Noise Setting 1	80%	100%
2	Low Noise Setting 2	70%	100%
3	Low Noise Setting 3	60%	100%
4	Same as “db”=1		
5	Same as “db”=2		
6	Same as “db”=3		
7	Same as “db”=1		
8	Same as “db”=2		
9	Same as “db”=3		

Outdoor Unit Capacity [MBH]	Sound Pressure Level [dB]		
	Low Noise Setting 1	Low Noise Setting 2	Low Noise Setting 3
036	-1	-2	-3
048	-1	-2	-3
060	-2	-3	-4

NOTES:

1. Cooling and heating capacity may drop to 80%, 70% and 60% in each setting mode.
2. Regarding time schedule setting, refer to the Installation Manual for the Wired Controller.

(10) Demand Function Setting (Function Setting “dE”)

Press “PSW1” and select the setting condition “0” or “1”, 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.

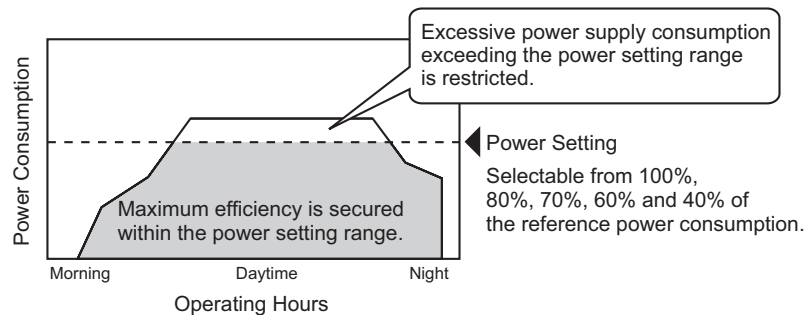
“dE” Setting Condition	Demand Running Current Control
0	Not Available (Default Setting)
1	Valid demand function all time

NOTES:

1. Demand current control level depends on External Input Function Setting.
If multiple demand current control levels are set for External Input, the minimum level is applied.
(For example, If “i1”=6 (Demand Current Control 40%) and “i2”=9 (Demand Current Control 80%) are set for External Input Function Setting when “dE”=1 is set, Demand Current Control 40% is always valid during operation.)
2. If no demand current control level is set for External Input Function Setting when “dE”=1 is set, Demand Current Control 100% is always valid during operation.
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.

- Demand Control

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



Outdoor Unit Capacity [MBH]	Reference Power Consumption [KW]
036	3.9
048	4.5
060	4.5

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.

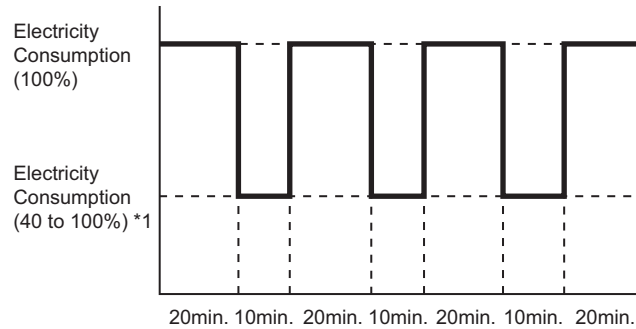
(11) Wave Function Setting (Function Setting "UE")

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 40% to 100% as shown in the figure.

NOTE:

If Demand Current Control by External Input Function is set and the external input signal is available, this function is not performed during Demand Current Control by External Input Function is performed.

"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 External Input Function Setting.
If multiple demand current control levels are set for External Input, the minimum level is applied.
(For example, If "i1"=6 (Demand Current Control 40%) and "i2"=9 (Demand Current Control 80%) are set for External Input Function Setting when "UE"=1 is set the lower maximum limit is Demand Current Control 40%.)
2. If any demand current control level is not set for External Input Function Setting when "UE"=1 is set, Demand Current Control 100% is always valid during operation.
3. 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.

(12) Protection of Decrease in Outlet Temperature for Cooling (Function Setting "Fb")

Press "PSW1" and select the setting condition "0" to "2" at Protection of Decrease in Outlet Temperature for Cooling "Fb", can be set. When the indoor unit outlet air temperature is less than 54°F (12°C) at cooling operation, the compressor frequency forcibly decreases to prevent a drop in outlet air temperature.

"Fb" Setting Condition	Protection Decrease in Outlet Temperature for Cooling	
	Compressor Frequency	Solenoid Valve for High/Low Pressure Bypass
0 (Default Setting)	-	-
1	Valid *1)	Valid *2)
2	Valid *1)	-

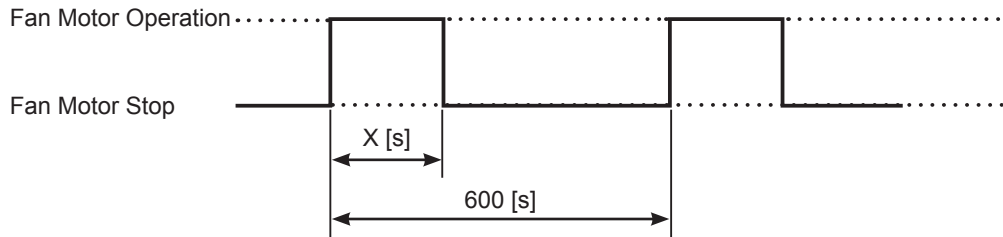
NOTES:

- *1) When "Fb"=1 or 2 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 54°F(12°C) for 3min., besides "NOTE" 1 above, the solenoid valve for high/low pressure bypass is opened to reduce refrigerant flow.

(13) Intermittent Operation of Outdoor Fan Motor (Function Setting "F1")

Press "PSW1" and set Intermittent Operation of Outdoor Fan Motor "F1" (auxiliary function) to change the pattern of the outdoor fan operation by External Input Function Setting.

The table below shows the operation pattern for this function.



"F1" Setting Condition	Intermittent Operation Pattern (operating time of outdoor fan: X [s])
0 (Default Setting)	600s (Continuously operation)
1	30s
2	60s
3	120s
4	300s

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 without external input signal.
Set External Input Function Setting and prepare the auxiliary relay according to Section 5.2.2 (3) "Outdoor Fan Motor Start/Stop". (This operation pattern is available when input signal is ON and outdoor ambient temperature is 50°F(10°C) or less.)
3. If the fan motor fails during the outdoor fan motor start/stop operation, stop all the outdoor fans to suspend the operation. Check the alarm code and deal properly with the failure next time the compressor is operated.

! 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.

(14) Crankcase Heater Control during Stoppage (Function Setting "F8")

Press "PSW1" and select the setting condition "0" or "1" at Crankcase Heater Control during Stoppage "F8".
 If "F8"=1 is set, preheating during stoppage is invalid for reduction power consumption.
 However it takes maximum four hours until the compressor preheating is completed before starting operation. In this case, the indoor units are stopped by enforced Thermo-OFF as the stoppage code No."22".
 (Even if turned ON the unit from wired controller, the compressor can not start operation immediately.
 This function can be used to reduce power consumption, but the usability of the product may be deteriorated.)

"F8" Setting Condition	Crankcase Heater Control during Stoppage
0	Preheating (Default Setting)
1	Power saving mode (Preheating is invalid)

NOTE:

The enforced Thermo-OFF by the stoppage code No."22"(The Outdoor Unit Hot Start) can be cancelled by PSW1 or Function Setting "HT".
 However the compressor operation without preheating may cause the compressor damaged.
 Do not cancelle the enforced stoppage for general use.

(15) Invalid Motion Sensor during Prepare Defrost (Function Setting "F9")

Press "PSW1" and select the setting condition "0" or "1" at Invalid Motion Sensor during Prepare Defrost "F9".

If "F9"=1 is set, starting defrost operation by absent detection is invalid.
 (When "F9"=0 (Default Setting) is set, if the motion sensors of all indoor units detect the rooms are unoccupied during defrost stand-by, defrost operation is forcibly started to complete defrost operation before people coming back.)

"F9" Setting Condition	Starting Defrost Operation by absent detection
0	Valid (Default Setting)
1	Invalid

(16) Convert Unit in Checking Mode (Function Setting "FC")

Press "PSW1" and select the setting condition "0" or "1" at Convert Unit in Checking Mode "F6".
 This function can convert the indication unit in checking mode as follows.

"FC" Setting Condition	Indicate Unit in Checking Mode	
	Temperature	Pressure
0 (Default Setting)	°F	psi
1	°C	MPa

5.3 Functions from Wired Controller

The functions are available from the wired controller COW01 as follows.

Regarding setting procedure, refer to the “Operation Manual” for the Wired Controller.

5.3.1 Power Saving Function

NOTE:

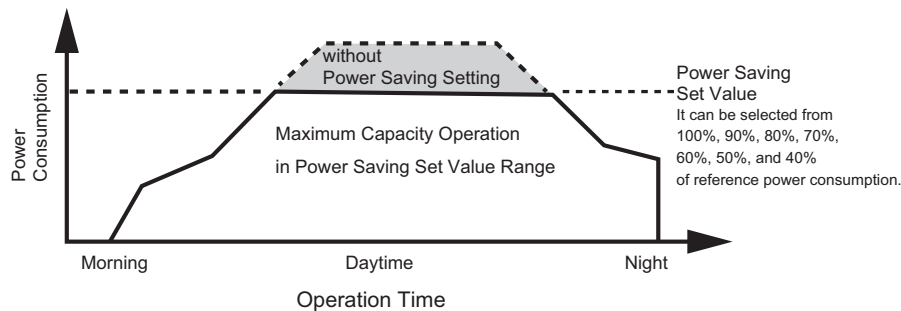
The following functions (1)~(3) cannot be operated at the same time.

(1) Outdoor Unit Capacity Control

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

“Peak Cut Control” Function

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



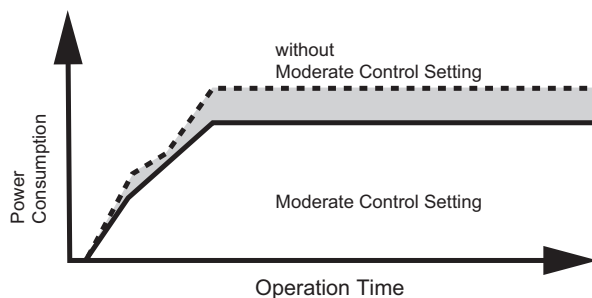
Outdoor Unit Capacity [MBH]	Reference Power Consumption [KW]
036	3.9
048	4.5
060	4.5

NOTES:

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

“Moderate Control” Function

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

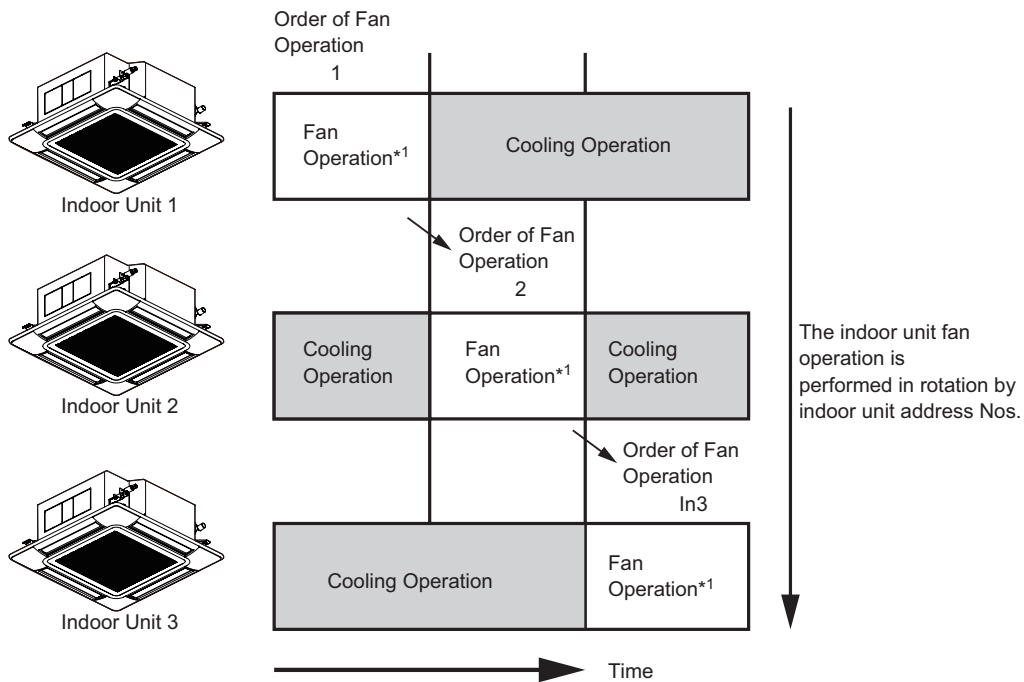


NOTES:

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

(2) Rotation Control Function

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

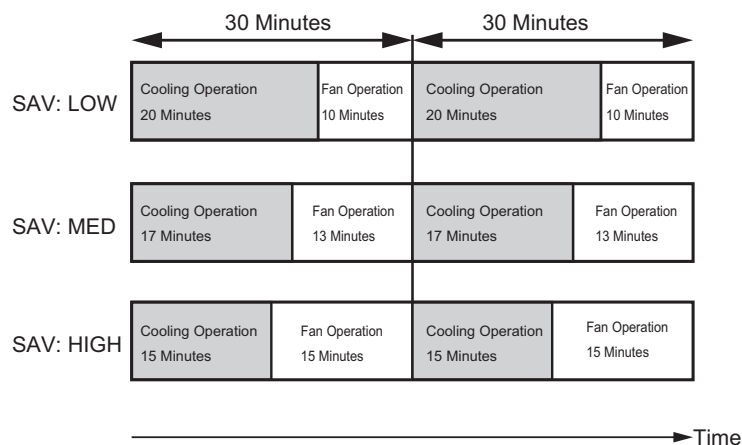


NOTES:

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

(3) Intermittent Control Function

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



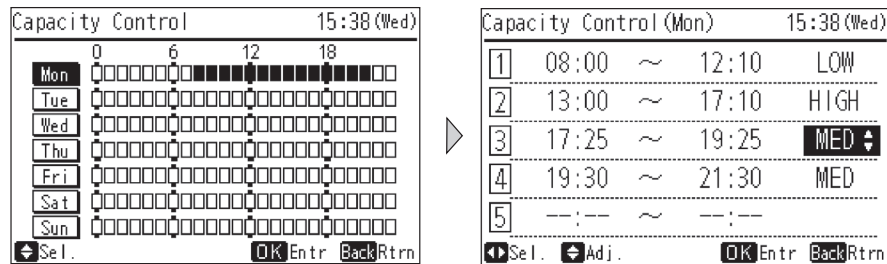
NOTE:

The fan mode is repeated in the interval of five minutes (SAV: LOW), ten minutes (SAV: MED) and fifteen minutes (SAV: HIGH) during heating operation.

5.3.2 Schedule Function

(1) Power Saving Schedule Function

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



The display of Noise Reduction Schedule is the same.

(2) Operation Noise Reduction Schedule Function

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

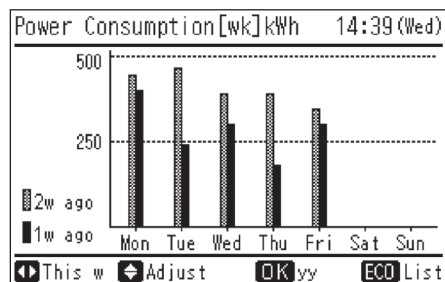
NOTE:

The operation noise reduction setting may decrease the Cooling/Heating capacity.
For detail, refer to Section 5.2.3.2 (9) "Sound Reduced Function".

5.3.3 Indication Function

(1) Power Consumption Display Function

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



NOTE:

The power consumption for outdoor unit compressor is displayed.

(2) Power Saving Guide

Press "ECO" button and then the power saving guide is displayed to support the setting. Easy access to the confirmation and setting screen from the current setting status screen.

5.3.4 Comfort Function

(1) Quick Function

This function is used when decreasing/increasing the indoor temperature quickly.
This function operates as follows for 30 minutes from the operation start-up.

This function is only available when the operation mode is COOL or HEAT.
The unit starts each time in quick mode until the setting is canceled.

Setting Condition	Compressor Frequency			Indoor Fan
	Upper Limit	Target Frequency	Variation Width	
Default Setting	-	-	-	-
COOL	Default Setting +20%	Default Setting +20%	Default Setting +200%	Automatically
HEAT	Default Setting +20%	Default Setting +20%	Default Setting +50%	-

NOTES:

1. If this function is set, indoor fan speed is automatically controlled regardless fan speed setting from wired controller. (If there is an upper/lower limit of airflow, do not use this function.)
In case of Ducted (EconoFresh), do not use this function. If it is used for Ducted (EconoFresh), the thermal load of the room may significantly increase depending on the outdoor temperature conditions.
2. The upper limit and target frequency of the compressor are same as Function Setting "Hc" or "Hh".
3. This function may increase power consumption.

(2) Power Up Setting

If the cooling/heating capacity seems insufficient during the normal operation, set this function.
By setting this function, the target frequency and upper limit of the compressor are set higher as follows.

Setting Condition	Power Up Mode			
	Compressor Frequency for Cooling Operation		Compressor Frequency for Heating Operation	
	Upper Limit	Target Frequency	Upper Limit	Target Frequency
0 (Default Setting)	-	-	-	-
1	Default Setting +20%	Default Setting +20%	-	-
2	-	-	Default Setting +20%	Default Setting +20%
3	Default Setting +20%	Default Setting +20%	Default Setting +20%	Default Setting +20%

NOTE:

The upper limit and target frequency of the compressor are same as Function Setting "Hc" or "Hh".

6. Field Work Instructions

Refer to Section 3 “Troubleshooting” when dealing with problems or difficulties.
If you cannot solve the problem, contact your distributor or contractor.

6.1 Caution for Refrigerant Leakage

- Special Attention Regarding Refrigerant Gas Leakage

Make sure that the entire VRF system meets ASHRAE Standard 15 or, any local codes, regarding Safety. The ASHRAE Standard 15 provides safeguards for life, limb, health, and property, and prescribes safety requirements.

The standard is recognized as the main guide for personal safety involving refrigeration systems. It strives to ensure a safe application of refrigerant systems by limiting the maximum charge so that a complete discharge due to a leak into a small, occupied, and enclosed room can never exceed the allowable limit.

6.2 Modifications of Charging Refrigerants Other than Those Specified by Johnson Controls

DANGER

Johnson Controls' 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 Johnson Controls does not take any responsibility for unit failure, malfunction, or any accidents caused by charging non-specified refrigerants or others as noted above.**

6.3 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.

(e) Crankcase Heater

- Activation - Apply power to the outdoor unit(s) at least 12 hours prior to operation of the system for preheating of the compressor oil.

(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) Drain Pan, Condensate Mechanism and Condensate Pipe

- Drain 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.

6.4 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.	SP														
	Inverter Software No.	iP														
	Inverter Order Frequency to Compressor	H1														
	Outdoor Fan Step	Fo														
	Outdoor Expansion Valve Opening	Eo														
	High Pressure (Discharge Pressure)	Pd.														
	Low Pressure (Suction Pressure)	Ps.														
	Discharge Temperature	Td														
	Evaporating Temperature	TE														
	Ambient Air Temperature	To														
	Inverter Fin Temperature	TF														
	Inverter Primary Current	A1														
	Inverter Secondary Current	A2														
	Checking for Indoor Unit	Indoor Unit Address	n-													
		Indoor Expansion Valve Opening	E-													
		Liquid Pipe Temperature of Indoor Unit	L-													
		Gas Pipe Temperature of Indoor Unit	u-													
		Indoor Unit Inlet Air Temperature	i-													
		Indoor Unit Outlet Air Temperature	o-													
		Cause Code of Indoor Unit Stoppage	d-													
	Accumulated Operating Time of Compressor	UJ														
		cJ														
	Outdoor Unit Alarm Code	AC														
	Cause Code of Inverter Stoppage	iT														
	Cause Code of Fan Stoppage (Lower)	FT														
Cause Code of Fan Stoppage (Upper)	FT.															
Total Capacity of Indoor Unit Connected	CP															
Connected Indoor Unit Number	AA															
Refrigerant Address	GA															

NOTE:

Refer to Section 3.1.5 (B) "Detail of 7-Segment Display" for items of checking mode.

6.5 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 3.1.4 "Checking Wired Controller" 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:

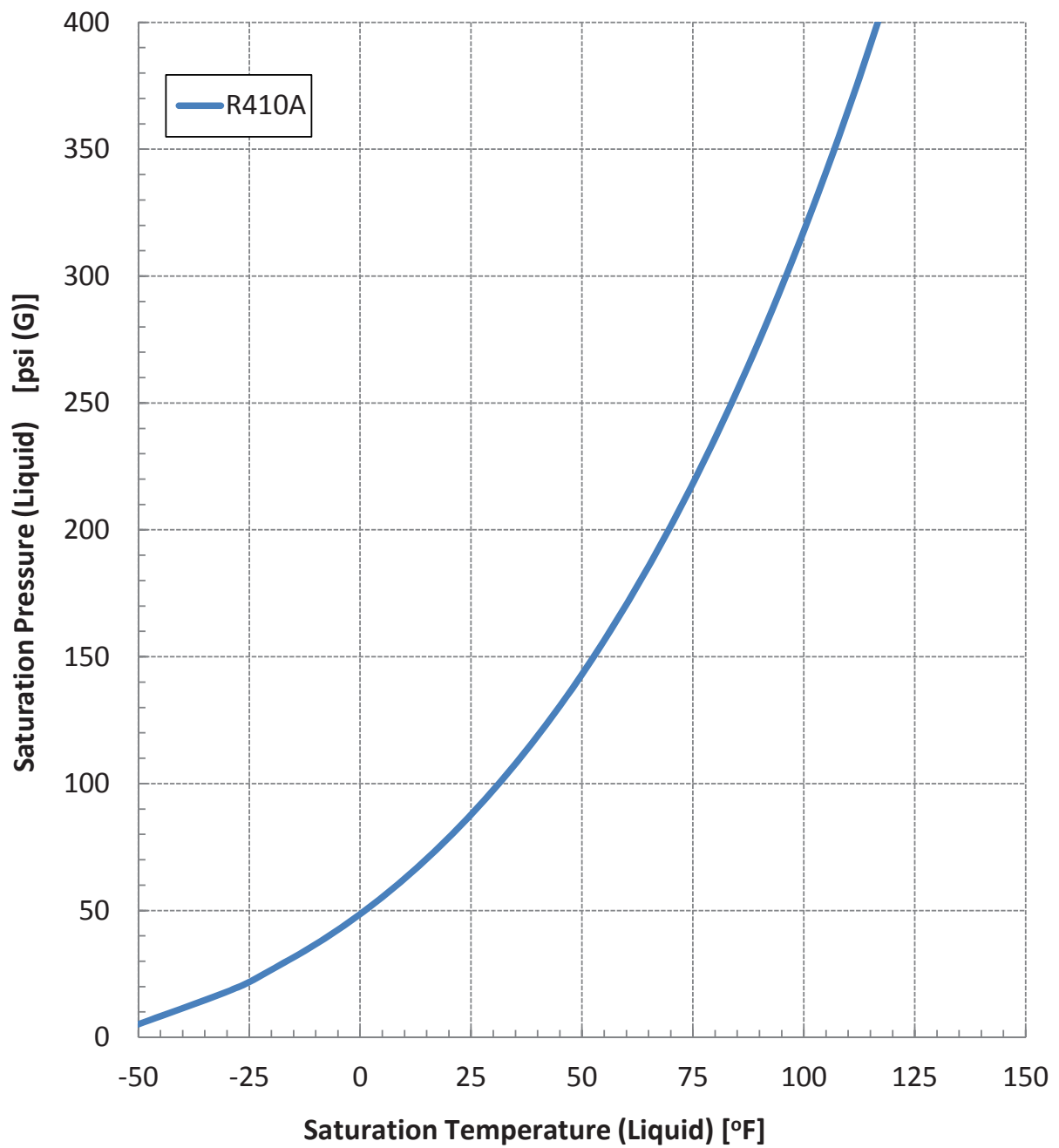
Refer to Section 3.1.4 "Checking Wired Controller" for items of check mode.

6.6 Service and Maintenance Record

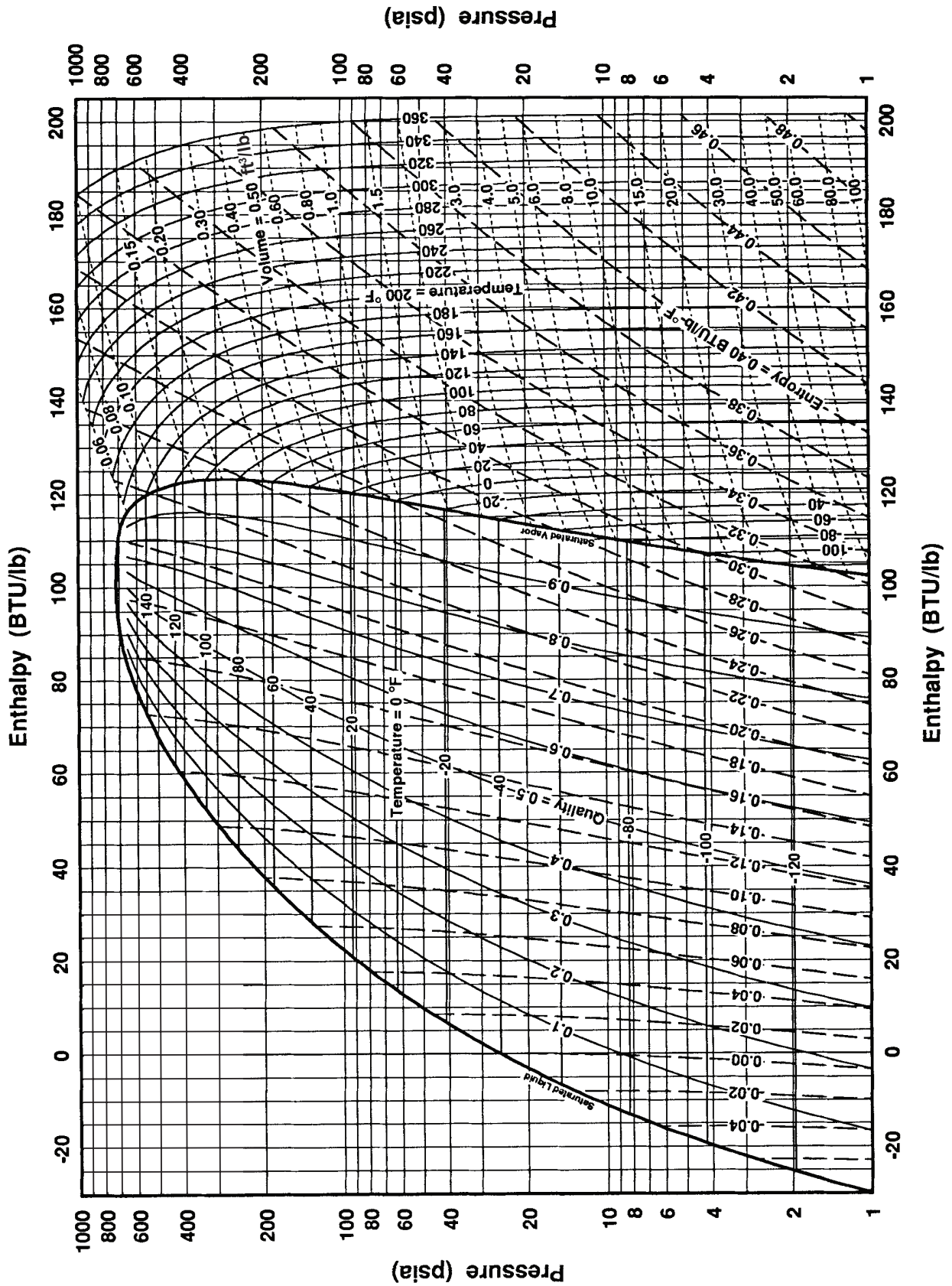
Service and Maintenance Record

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 by 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

6.7 Saturation Curve for Refrigerant



6.8 Mollier Chart for R410A



7. Service Parts List

SERVICE PARTS LIST

Refer to the Service Parts List for Outdoor Unit (Mini VRF).

