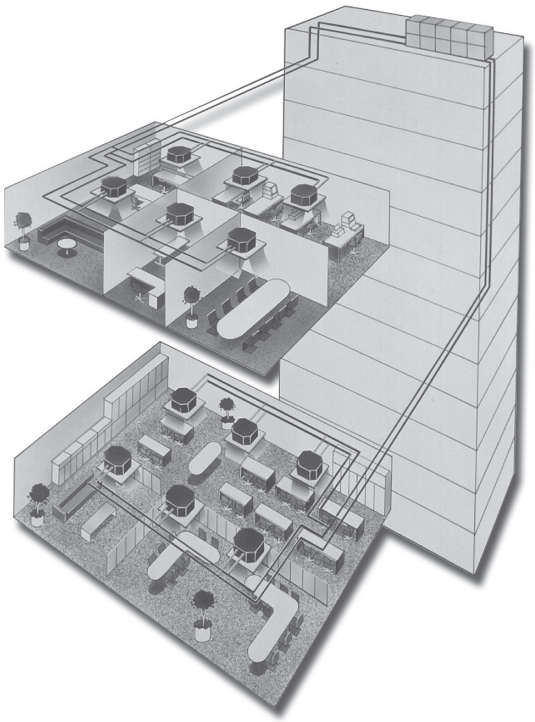
SERVICE MANUAL

INVERTER-DRIVEN MULTI-SPLIT SYSTEM
HEAT RECOVERY AIR CONDITIONERS



Service Manual

< Outdoor Units >

208/230V

(H,Y)VAHR072B32S, (H,Y)VAHR096B32S,
(H,Y)VAHR120B32S, (H,Y)VAHR144B32S,
(H,Y)VAHR168B32S, (H,Y)VAHR192B32S,
(H,Y)VAHR216B32S, (H,Y)VAHR240B32S,
(H,Y)VAHR264B32S, (H,Y)VAHR288B32S,
(H,Y)VAHR312B32S, (H,Y)VAHR336B32S,
(H,Y)VAHR360B32S, (H,Y)VAHR384B32S,
(H,Y)VAHR408B32S, (H,Y)VAHR432B32S

460V

(H,Y)VAHR072B42S, (H,Y)VAHR096B42S,
(H,Y)VAHR120B42S, (H,Y)VAHR144B42S,
(H,Y)VAHR168B42S, (H,Y)VAHR192B42S,
(H,Y)VAHR216B42S, (H,Y)VAHR240B42S,
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(H,Y)VAHR360B42S, (H,Y)VAHR384B42S,
(H,Y)VAHR408B42S, (H,Y)VAHR432B42S

575V

(H,Y)VAHR072B52S, (H,Y)VAHR096B52S,
(H,Y)VAHR120B52S, (H,Y)VAHR144B52S,
(H,Y)VAHR168B52S, (H,Y)VAHR192B52S,
(H,Y)VAHR216B52S, (H,Y)VAHR240B52S,
(H,Y)VAHR264B52S, (H,Y)VAHR288B52S,
(H,Y)VAHR312B52S, (H,Y)VAHR336B52S,
(H,Y)VAHR360B52S, (H,Y)VAHR384B52S,
(H,Y)VAHR408B52S, (H,Y)VAHR432B52S

SM-17006

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 recovery 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 codes. No part of this manual may be reproduced in any way without the expressed written consent of Johnson Controls Inc.
- This heat recovery 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 contractor.
- This manual provides common descriptions, basic, and advanced information to maintain and service this heat recovery air conditioning unit that applies as well for other models.
- This heat recovery 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

Cooling Operation Range		Indoor	°F WB (°C WB)	59 (15) ~ 73 (23)
		Outdoor [1, 2, 3, 6, 10]	°F DB (°C DB)	23 (-5) ~ 122 (50)
		with Snow Protection Hood [4, 6]	°F DB (°C DB)	14 (-10) ~ 109 (43)
		with Low Ambient Kit [5, 6, 8]	°F DB (°C DB)	-10 (-23) ~ 109 (43)
Heating Operation Range		Indoor	°F DB (°C DB)	59 (15) ~ 80 (27)
		Outdoor [7, 8, 9]	°F WB (°C WB)	-13 (-25) ~ 59 (15)
Cooling & Heating Operation Range	Cooling	Indoor	°F WB (°C WB)	59 (15) ~ 73 (23)
		Outdoor [1, 2, 3, 6, 10]	°F DB (°C DB)	23 (-5) ~ 75 (24)
		with Snow Protection Hood [4, 6]	°F DB (°C DB)	14 (-10) ~ 75 (24)
		with Low Ambient Kit [5, 6, 8]	°F DB (°C DB)	-10 (-23) ~ 75 (24)
	Heating	Indoor	°F DB (°C DB)	59 (15) ~ 80 (27)
		Outdoor [7, 10]	°F WB (°C WB)	22 (-6) ~ 59 (15)
		with Snow Protection Hood [4, 6]	°F WB (°C WB)	12 (-11) ~ 59 (15)
		with Low Ambient Kit [5, 6, 8]	°F WB (°C WB)	-11 (-24) ~ 59 (15)

DB: Dry Bulb, WB: Wet Bulb

1. When the system meets the following conditions, the outdoor unit may be thermo-OFF to prevent the compressor from failure.
   • Total capacity of the operating indoor unit is larger than capacity of outdoor unit; and
   • Outdoor air temperature is 100°F DB (38°C DB) or more.
2. If the installation takes place under either one of the following conditions, the maximum connectable indoor unit capacity ratio is 100%.
   • Outdoor air temperature is 109°F (43°C) or more during cooling operation; or
   • Outdoor air temperature is 14°F (-10°C) or less during cooling operation.
3. When installing the snow protection hood or low ambient kit, the upper limit of outdoor air temperature must be 109°F (43°C).
4. 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 18MBH.
   In this case, installing the snow protection hood (optional part) is required.
5. When the outdoor air temperature is 14°F (-10°C) or less during the outdoor unit cooling operation, the minimum connectable indoor unit capacity is 18MBH.
   In this case, installing the Low Ambient Kit (optional part) is required.
6. 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 frost.
   Depending on the operating condition, the outlet air temperature of the indoor unit may be excessively low.
   Pay attention to the direction of the outlet air. Do not place items near the air outlet and under the indoor unit as they may be damaged by condensates that may form if the humidity or the latent heat load is continuously high.
   (for example:
   - using at kitchen or gymnasium; or
   - using at the room that has high population density or introduces outside air; or
   - using humidifier together; or
   - using combustion heater like gas heater together)
7. 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.
8. Operation in the outdoor temperature of 5~-13°F WB (-15~-25°C WB) is assumed to limited conditions such as start-up in early morning. Extended operation in this condition may shorten the life of the compressor.
9. When the outdoor air temperature is 14°F (-10°C) or less, or under the high heating load conditions, the total indoor unit capacity should be less than 100% of the outdoor unit capacity, and the total piping length should be less than 984 ft (300m).
10. There are some limitations of the Height Difference between Outdoor Units and Indoor Units.
    Refer to Installation Manual or Engineering Manual, for details.

- 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.

Interchangeability between Generation 1 and 2 Change-Over Boxes

- Generation 2 change-over box is compatible with the generation 2 outdoor unit.
- Generation 1 change-over box is compatible with the generation 1 outdoor unit when there is no generation 2 change-over box in the same system.
- Generation 1 change-over box is compatible with the generation 2 outdoor unit with limitations of the operating temperature range and the connectable indoor unit capacity ratio.
  See the following table “Limitations for Combination of Generation 1 Change-Over Box and Generation 2 Outdoor Unit” for details.
- Generation 1 and 2 change-over boxes cannot be used in the same system together.
- Production of generation 1 change-over box is discontinued. However, servicing and maintenance is provided until further notice. Regarding order requests for the generation 1 change-over box, contact Tech Support at: 1-844-873-4445 (option 2).

Determining Propriety of Connection between
Change-Over Box and VRF Outdoor Unit (Heat Recovery)

Model of Change-Over Box and VRF Outdoor Unit				Change-Over Box			
				Generation 1		Generation 2	
				Single Branch Type	Multiple Branch Type	Single Branch Type	Multiple Branch Type
				COBS048B21S/C COBS096B21S/C	-	COBS048B22S/C COBS096B22S/C	COB04M132B22S COB08M264B22S COB12M264B22S
VRF Outdoor Unit (Heat Recovery)	Generation 1	208/230V	(H,Y)VAHR072B31S (H,Y)VAHR096B31S (H,Y)VAHR120B31S	○ Available		× Not Available	
		460V	(H,Y)VAHR072B41S (H,Y)VAHR096B41S (H,Y)VAHR120B41S				
	Generation 2 (This Manual)	208/230V	(H,Y)VAHR072B32S (H,Y)VAHR096B32S (H,Y)VAHR120B32S (H,Y)VAHR144B32S (H,Y)VAHR168B32S (H,Y)VAHR192B32S	○ Available		○ Available	
		460V	(H,Y)VAHR072B42S (H,Y)VAHR096B42S (H,Y)VAHR120B42S (H,Y)VAHR144B42S (H,Y)VAHR168B42S (H,Y)VAHR192B42S				
		575V	(H,Y)VAHR072B52S (H,Y)VAHR096B52S (H,Y)VAHR120B52S (H,Y)VAHR144B52S (H,Y)VAHR168B52S (H,Y)VAHR192B52S				

Limitations for Combination of Generation 1 Change-Over Box and Generation 2 Outdoor Unit

Temperature	Cooling Operation Range	Indoor	°F WB (°C WB)	59 (15) ~ 73 (23)
		Outdoor	°F DB (°C DB)	23 (-5) ~ 109 (43)
	Heating Operation Range	Indoor	°F DB (°C DB)	59 (15) ~ 80 (27)
		Outdoor	°F WB (°C WB)	-4 (-20) ~ 59 (15)
	Cooling & Heating Operation Range	Indoor (Cooling Mode)	°F WB (°C WB)	59 (15) ~ 73 (23)
		Indoor (Heating Mode)	°F DB (°C DB)	59 (15) ~ 80 (27)
		Outdoor	°F DB (°C DB) °F WB (°C WB)	23 (-5) ~ 75 (24) 22 (-6) ~ 59 (15)
Connectable Indoor Unit Capacity Ratio		Maximum	100%	
		Minimum	Depending on Outdoor Units (Refer to Table 3.2 for details.)	

DB: Dry Bulb, WB: Wet Bulb

1. Introduction

This manual concentrates on the Outdoor Heat Recovery 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. *Refer back to these safety instructions as needed.*

- This system should be installed by personnel certified by Johnson Controls, Inc. Personnel must be qualified according to local 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, equipment damage, or property 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 1m) 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 drain adaptor. 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 walls, floors, or property within the space.
  - 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 air baffle.
  - A snowy area: Install the outdoor unit on a raised platform that is higher than anticipated snow levels and drifting snow. Provide snow vents.
- 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 tools, 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 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 is 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

⚠ WARNING	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 equipment damage, property damage, personal injury, or death.
- Take measures to ensure that the refrigerant limitations in ASHRAE Standard 15 (Canada: B52), or other local codes, are followed. 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.
- Use refrigerant R410A. The refrigerant oil tends to be affected by foreign matters such as moisture, oxide film, or other non-condensables. 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 following tools listed in Section 3 before performing the 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 will 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, fill the gap between the piping cover and pipes with 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 excessive force to the stop valve at the end of opening. Otherwise, the stop 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 $\pm 15^{o}$.

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 property damage, 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 device* referred to below.
  - If the power supply cables for this device* and the new air conditioner unit are located in close proximity to each other.

    Device*: (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 cable must be a minimum of AWG18 ($0.82mm^2$), 2-Conductor, Stranded Copper. Shielded cable must be considered for applications and routing in areas of high EMI and other sources of potentially excessive electrical noise to reduce the potential for communication errors. When shielded cable is applied, secure properly and terminate cable shield as required 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 supply 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 supply completely before attempting any maintenance for electrical parts. Check to ensure that no residual voltage is present after disconnecting the power supply.
- 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 tripped, 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 supply before starting work on the unit.
- This equipment can be installed with a Ground Fault Circuit Breaker (GFCI), which is a recognized measure for added protection to a properly grounded unit. Install appropriate sized breakers / fuses / overcurrent protection switches, and wiring in accordance with local codes and requirements. The equipment installer is responsible for understanding and abiding by applicable codes and requirements.

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1. Installation

1.1 Outdoor Unit

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

1.2 Change-Over Box

1.2.1 Single Branch Type: COBS048B22S, COBS096B22S

1.2.2 Multiple Branch Type: COB04M132B22S,COB08M264B22S, COB12M264B22S

1.2.3 Single Branch Type (for Chicago): COBS048B22C, COBS096B22C

For more information of the above Change-Over Box, please refer to the Installation Manuals for each product.

1.3 Optional Parts

1.3.1 For Outdoor Unit

1.3.1.1 Drain Adaptor: DBS-TP10A

1.3.1.2 Protection Net

- **Protection Net (Rear): PN-TP20BA , PN-TP20BB, PN-TP20BC**
- **Protection Net (Side): PN-TP20R**
- **Protection Net (Left): PN-TP20L**

1.3.1.3 Snow Protection Hood

- **Snow Protection Hood (Upper): ASG-TP50FAS, ASG-TP50FBS, ASG-TP50FCS**
- **Snow Protection Hood (Rear): ASG-TP50BAS, ASG-TP50BBS, ASG-TP50BCS**
- **Snow Protection Hood (Side): ASG-TP50RS**
- **Snow Protection Hood (Left): ASG-TP50LS**

1.3.1.4 Toppling Prevention Tool: ASG-SW20A

1.3.1.5 Low Ambient Kit

- **Low Ambient Kit (Upper): LAK-DAMPER-S-01, LAK-DAMPER-M-01, LAK-DAMPER-L-01**
- **Low Ambient Kit (Rear): LAK-BACK-S-01, LAK-BACK-M-01, LAK-BACK-L-01**
- **Low Ambient Kit (Side): LAK-SIDE-01**
- **Low Ambient Kit (Left): LAK-6T-LEFT-01**

1.3.1.6 Protection Screen: LAK-NET-S-01, LAK-NET-M-01, LAK-NET-L-01

1.3.2 Piping Kit

1.3.2.1 Piping Connection Kit for 3-Pipes Connection: MC-NP21SX1, MC-NP30SX1

1.3.2.2 Multi-Kit (Line Branch) for 3-Pipes Connection: MW-NP142X3, MW-NP282X3, MW-NP452X3, MW-NP562X3, MW-NP902X3

1.3.2.3 Multi-Kit (Line Branch) for 2-Pipes Connection: MW-NP282A3, MW-NP452A3, MW-NP692A3, MW-NP902A3

1.3.2.4 Multi-Kit (Header Branch) for 3-Pipes Connection: MH-NP288X

1.3.2.5 Multi-Kit (Header Branch) for 2-Pipes Connection: 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 Supply

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

No.	Check Situation	Check Method
1	Is any power supply breaker or fuse open?	Check the voltage (secondary side) of the breaker and also check the continuity of the fuse with a tester.
2	Is the 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 the wiring firmly secured and correctly connected?	Check that the following wiring connections on O.U./I.U. printed circuit boards (PCBs) are not loose. • The connection for thermistors • The connection for the wired controller cable • The communication cable connects to a terminal block at the I.U./O.U. not the printed circuit board. • Power supply wiring is connected to a terminal block not PCB. Check that the wiring connections on O.U./I.U. PCBs are not loose or misconnected on the site according to the “Electrical Wiring Diagram” of the Engineering Manual.

NOTICE:
If the fuse(s) on an I.U. PCB is blown, diagnose the cause of overcurrent and replace the fuse(s).
In addition, check the power supply of optional equipment because the fuse(s) may blow due to an external power supply failure. Turn off power for safety.

Example for Electrical Wiring Connection

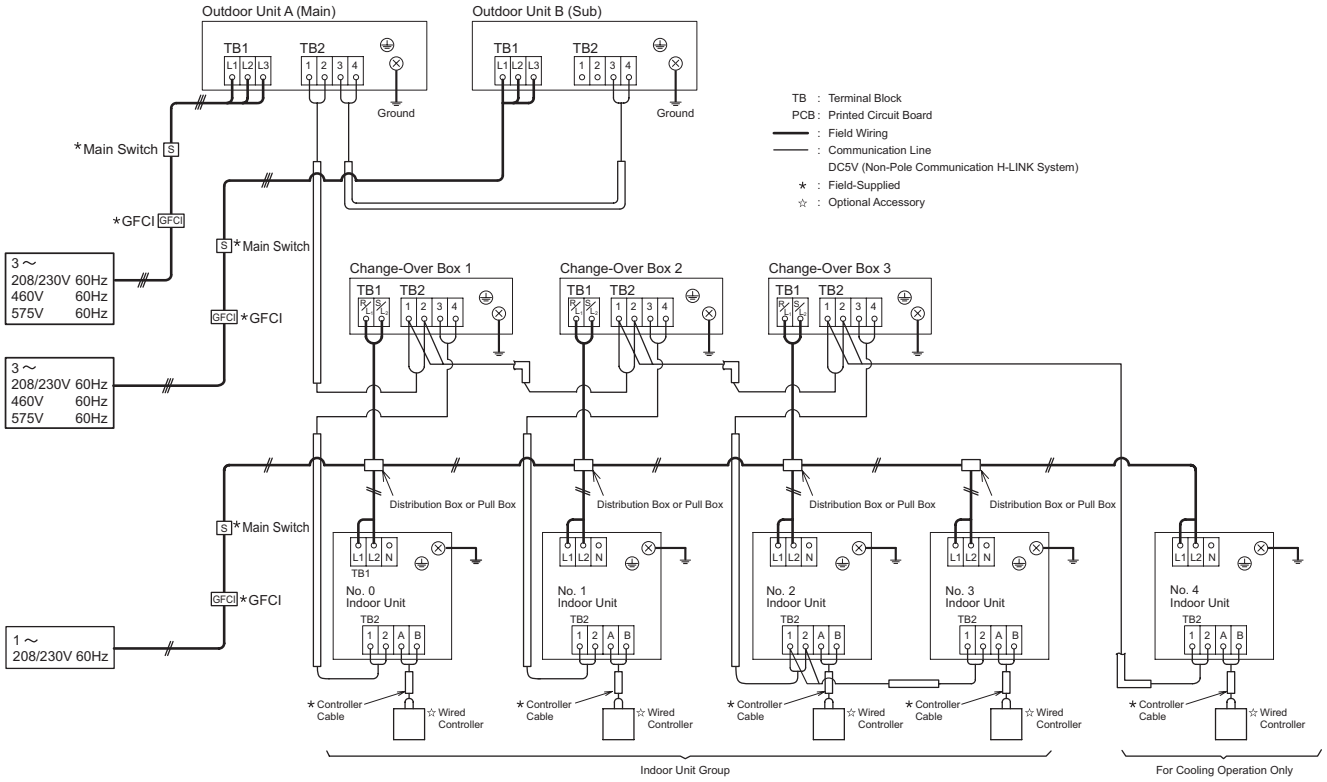


Figure 3.1 Instruction for Electrical Wiring Connection

Table 3.1 Electrical Characteristics and Recommended Wiring Size

208/230V

Model	Outdoor Unit						
	Hz (Hz)	Voltage (V)	Max. (V)	Min. (V)	MCA (A)	MOP (A)	Max. Fuse (A)
(H,Y)VAHR072B32S	60	208/230	253	188	29/26	40/40	40/40
(H,Y)VAHR096B32S	60	208/230	253	188	39/35	50/50	50/50
(H,Y)VAHR120B32S	60	208/230	253	188	46/42	60/50	60/50
(H,Y)VAHR144B32S	60	208/230	253	188	58/52	70/70	70/70
(H,Y)VAHR168B32S	60	208/230	253	188	65/59	80/80	80/80
(H,Y)VAHR192B32S	60	208/230	253	188	76/68	90/90	90/90

Model	Inverter 1	Inverter 2	INV Comp. 1	INV Comp. 2	Fan Motor 1	Fan Motor 2	Wiring Size		
	MOC (A)	MOC (A)	LRA (A)	LRA (A)	Output (kW)	Output (kW)	Power Supply Wiring (AWG)	Ground Wiring (AWG)	Communication Cable (AWG)
(H,Y)VAHR072B32S	22.6	-	50	-	0.75	-	10/10	10/10	18
(H,Y)VAHR096B32S	30.7	-	50	-	0.75	0.75	8/8	8/8	18
(H,Y)VAHR120B32S	20.2	20.2	54	54	0.75	0.75	6/6	6/6	18
(H,Y)VAHR144B32S	25.5	25.5	54	54	0.75	0.75	4/4	4/4	18
(H,Y)VAHR168B32S	28.6	28.6	50	50	0.75	0.75	4/4	4/4	18
(H,Y)VAHR192B32S	33.4	33.4	50	50	0.75	0.75	2/4	2/4	18

460V

Model	Outdoor Unit						
	Hz (Hz)	Voltage (V)	Max. (V)	Min. (V)	MCA (A)	MOP (A)	Max. Fuse (A)
(H,Y)VAHR072B42S	60	460	506	414	15	20	20
(H,Y)VAHR096B42S	60	460	506	414	22	30	30
(H,Y)VAHR120B42S	60	460	506	414	24	30	30
(H,Y)VAHR144B42S	60	460	506	414	30	35	35
(H,Y)VAHR168B42S	60	460	506	414	34	40	40
(H,Y)VAHR192B42S	60	460	506	414	39	50	50

Model	Inverter 1	Inverter 2	INV Comp. 1	INV Comp. 2	Fan Motor 1	Fan Motor 2	Wiring Size		
	MOC (A)	MOC (A)	LRA (A)	LRA (A)	Output (kW)	Output (kW)	Power Supply Wiring (AWG)	Ground Wiring (AWG)	Communication Cable (AWG)
(H,Y)VAHR072B42S	11.5	-	47	-	0.75	-	14	14	18
(H,Y)VAHR096B42S	17.1	-	47	-	0.75	0.75	12	12	18
(H,Y)VAHR120B42S	10.4	10.4	32	32	0.75	0.75	12	12	18
(H,Y)VAHR144B42S	13.2	13.2	32	32	0.75	0.75	10	10	18
(H,Y)VAHR168B42S	14.8	14.8	47	47	0.75	0.75	8	8	18
(H,Y)VAHR192B42S	17.3	17.3	47	47	0.75	0.75	8	8	18

575V

Model	Outdoor Unit						
	Hz (Hz)	Voltage (V)	Max. (V)	Min. (V)	MCA (A)	MOP (A)	Max. Fuse (A)
(H,Y)VAHR072B52S	60	575	660	518	12	15	15
(H,Y)VAHR096B52S	60	575	660	518	16	25	25
(H,Y)VAHR120B52S	60	575	660	518	19	25	25
(H,Y)VAHR144B52S	60	575	660	518	24	30	30
(H,Y)VAHR168B52S	60	575	660	518	27	35	35
(H,Y)VAHR192B52S	60	575	660	518	32	40	40

Model	Inverter 1	Inverter 2	INV Comp. 1	INV Comp. 2	Fan Motor 1	Fan Motor 2	Wiring Size		
	MOC (A)	MOC (A)	LRA (A)	LRA (A)	Output (kW)	Output (kW)	Power Supply Wiring (AWG)	Ground Wiring (AWG)	Communication Cable (AWG)
(H,Y)VAHR072B52S	9.1	-	24	-	0.75	-	16	16	18
(H,Y)VAHR096B52S	12.5	-	24	-	0.75	0.75	14	14	18
(H,Y)VAHR120B52S	8.3	8.3	19	19	0.75	0.75	12	12	18
(H,Y)VAHR144B52S	10.5	10.5	19	19	0.75	0.75	12	12	18
(H,Y)VAHR168B52S	11.8	11.8	24	24	0.75	0.75	10	10	18
(H,Y)VAHR192B52S	13.8	13.8	24	24	0.75	0.75	8	8	18

MCA: Minimum Circuit Ampacity (A)
MOP: Maximum Overcurrent Protective Device (A)
MOC: Maximum Operating Current (A)
LRA: Locked Rotor Ampacity (A)

NOTICE:

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 shall be a minimum of AWG18 (0.82mm^2), 2-Conductor, Stranded Copper. Shielded cable must be considered for applications and routing in areas of high EMI and other sources of potentially excessive electrical noise to reduce the potential for communication errors. When shielded cabling is applied, proper bonding and termination of the cable shield is required as per 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.

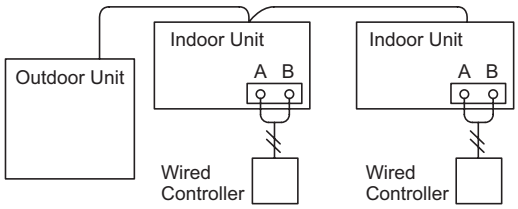
- Adjust wiring size when wiring runs are abnormally long.
  Electrical code must be followed and total voltage drop must not exceed 2%.
- Power supply voltage should be as follow.
  Supply Voltage (208/230V type, 460V type): Rated Voltage within ±10%
  Supply Voltage (575V type): 575V -10%, 600V +10%
  Starting Voltage: Rated Voltage within -15%
  Operating Voltage: Rated Voltage within ±10%
  Imbalance between Phases: within 3%

⚠WARNING

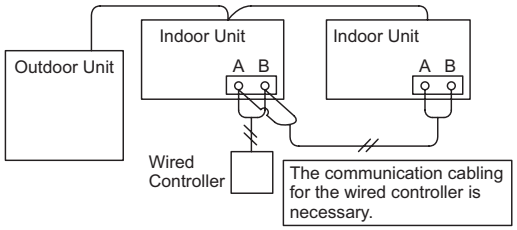
Do not connect the ground wiring to gas piping, water piping, or a lighting conductor.
Gas Piping: An explosion and ignition may occur if there is escaping gas.
Water Piping: There is no effective electrical ground provided when hard vinyl piping is used.
Lightning Conductor: The electrical potential of the earth increases when a lightening conductor is used.

- Wired Controller Connecting Diagram

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



(b) One Wired Controller for Individual Operation Setting

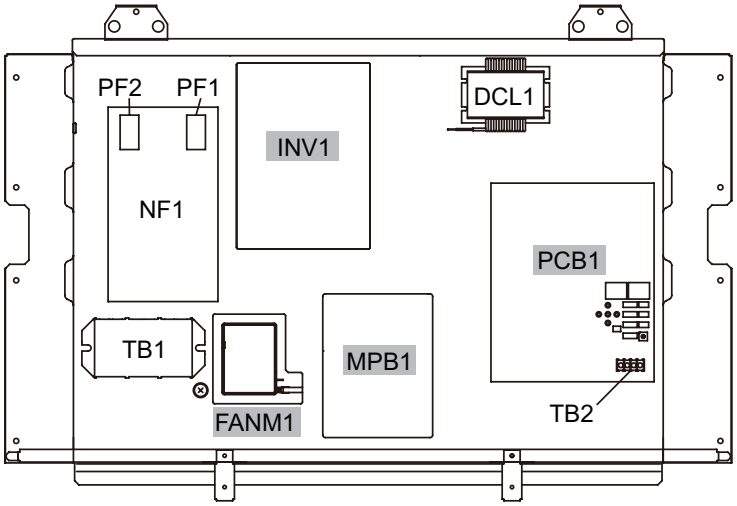


NOTICE:
Thermo-ON: The outdoor unit and some indoor units are running.
Thermo-OFF: The outdoor unit and some indoor units stay on, but don't run.

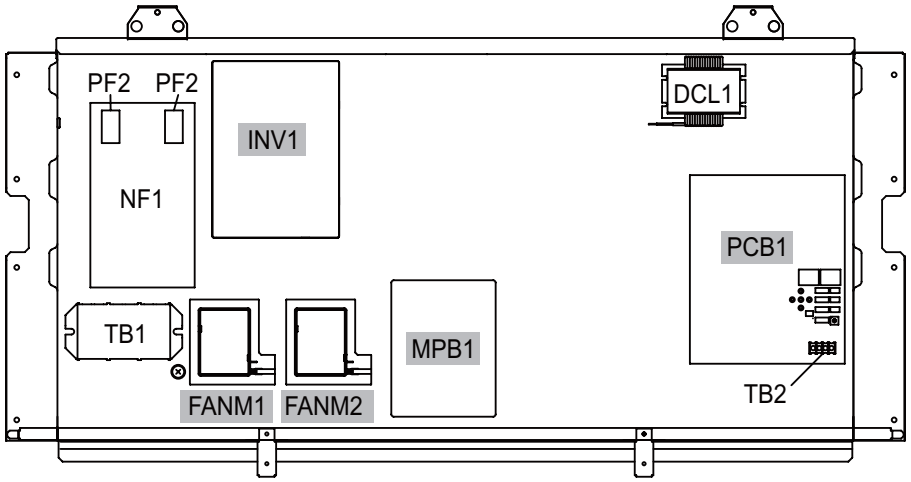
3.1.2 Location of Printed Circuit Boards (PCBs)

● 208/230V Type

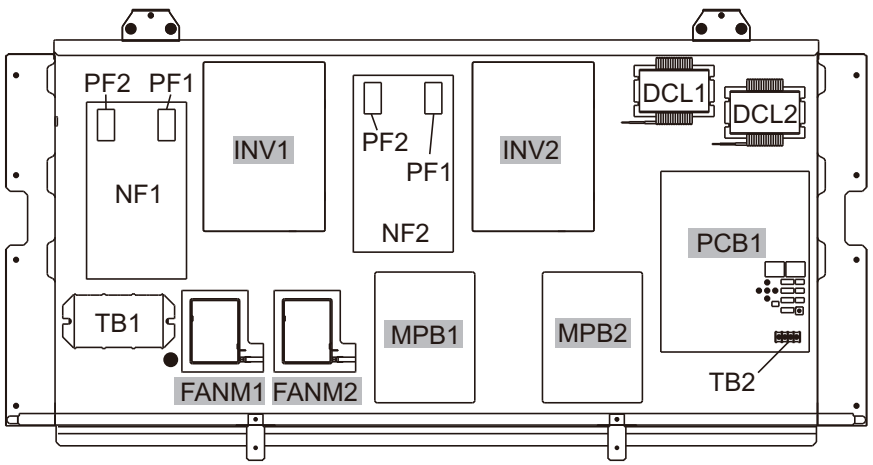
Model: (H,Y)VAHR072B32S



Model: (H,Y)VAHR096B32S

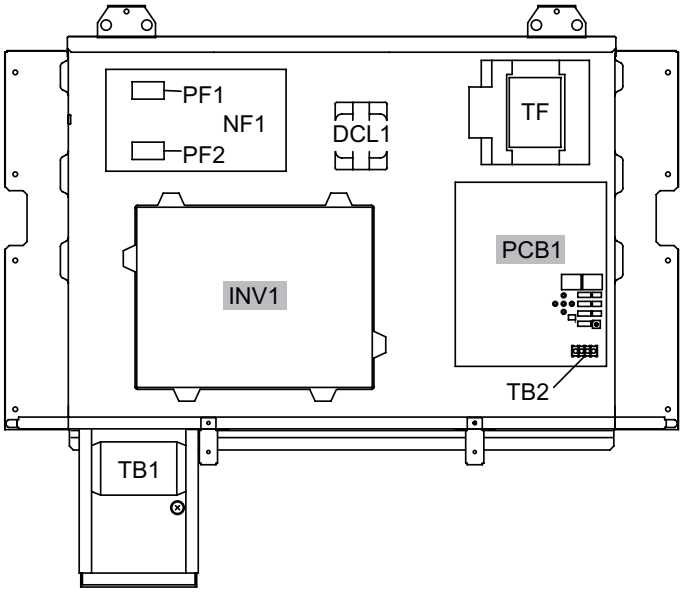


Model: (H,Y)VAHR120 ~ 192B32S

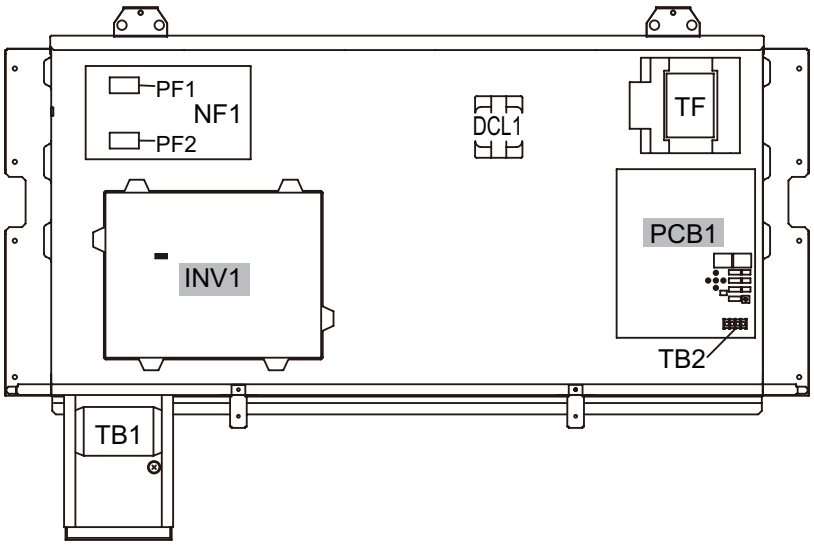


● 460V Type

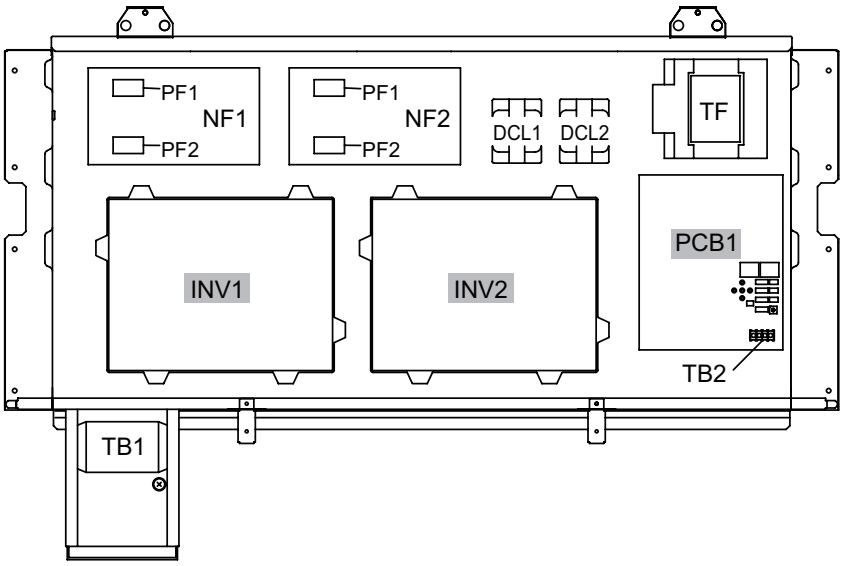
Model: (H,Y)VAHR072B42S



Model: (H,Y)VAHR096B42S

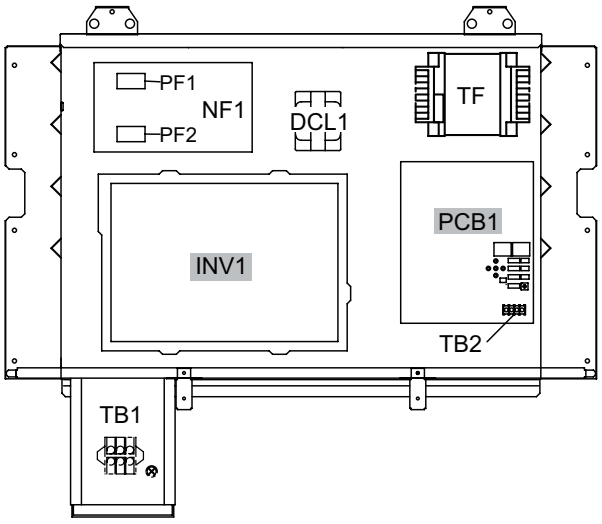


Model: (H,Y)VAHR120 ~ 192B42S

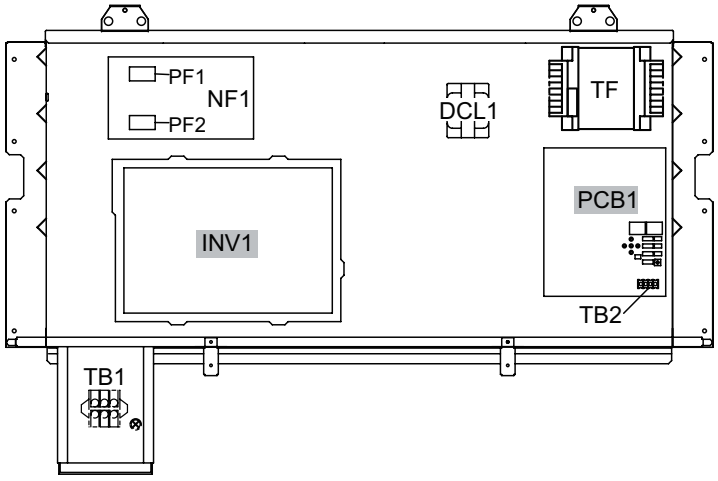


● 575V Type

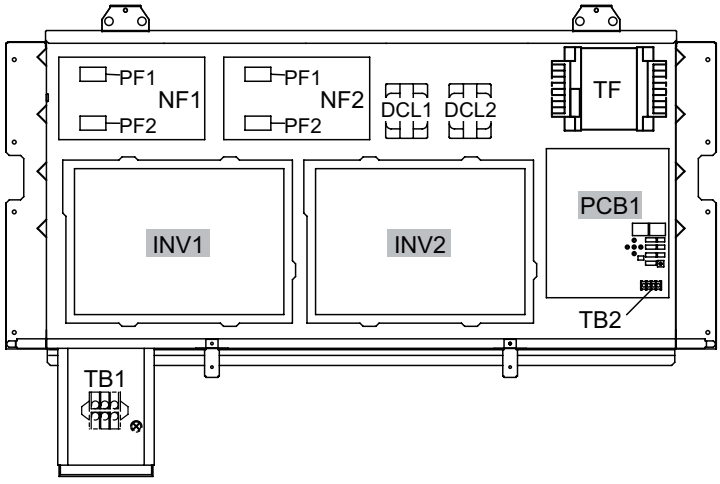
Model: (H,Y)VAHR072B52S



Model: (H,Y)VAHR096B52S



Model: (H,Y)VAHR120 ~ 192B52S

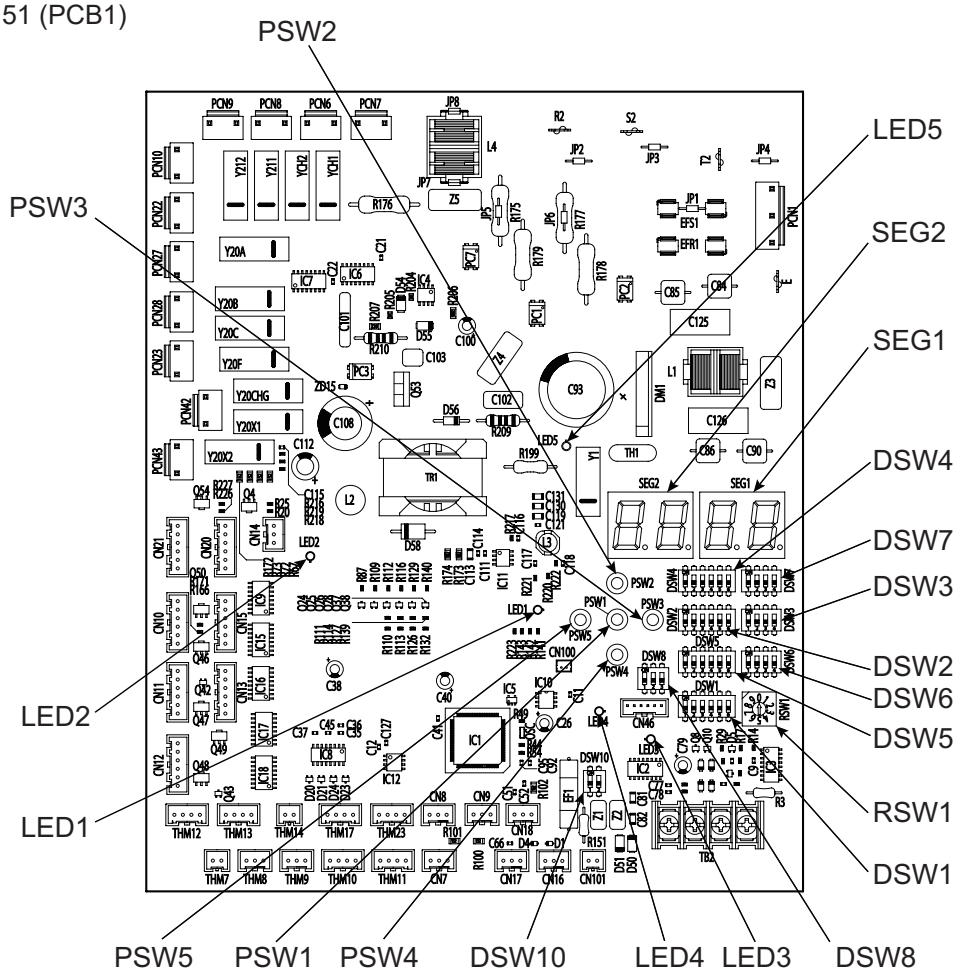


▮ Purpose

Symbol	PCB	Purpose
PCB1	Outdoor Unit PCB	1. Transmitting between Indoor Unit and Outdoor Unit 2. Processing for Sensor Input 3. Processing for DIP Switch Input 4. Operation Control for Above Items 1 to 3. Compressor Operation Control, Bypass Valve Control, Fan Control and Overcurrent Control 5. 7-Segment Indication 6. Processing of Safety Device Input 7. Processing of Relay Output 8. Reverse Phase Detection for Power Supply
INV1, 2 (For 208/230V Type)	Inverter PCB	1. Inverter components are driven by outdoor unit PCB to drive compressor. 2. Overcurrent Control 3. Protection Control for Inverter Part
INV1, 2 (For 460V Type, 575V Type)	Inverter PCB	1. Inverter components are driven by outdoor unit PCB to drive compressor. 2. Overcurrent Control 3. Protection Control for Inverter Part 4. DC Fan Motor Speed Control
FANM1, 2 (For 208/230V Type)	Fan Controller	1. DC Fan Motor Speed Control 2. Overcurrent Control
MPB1, 2 (For 208/230V Type)	Main Power PCB	1. Inverter components are driven by outdoor unit PCB to drive compressor.

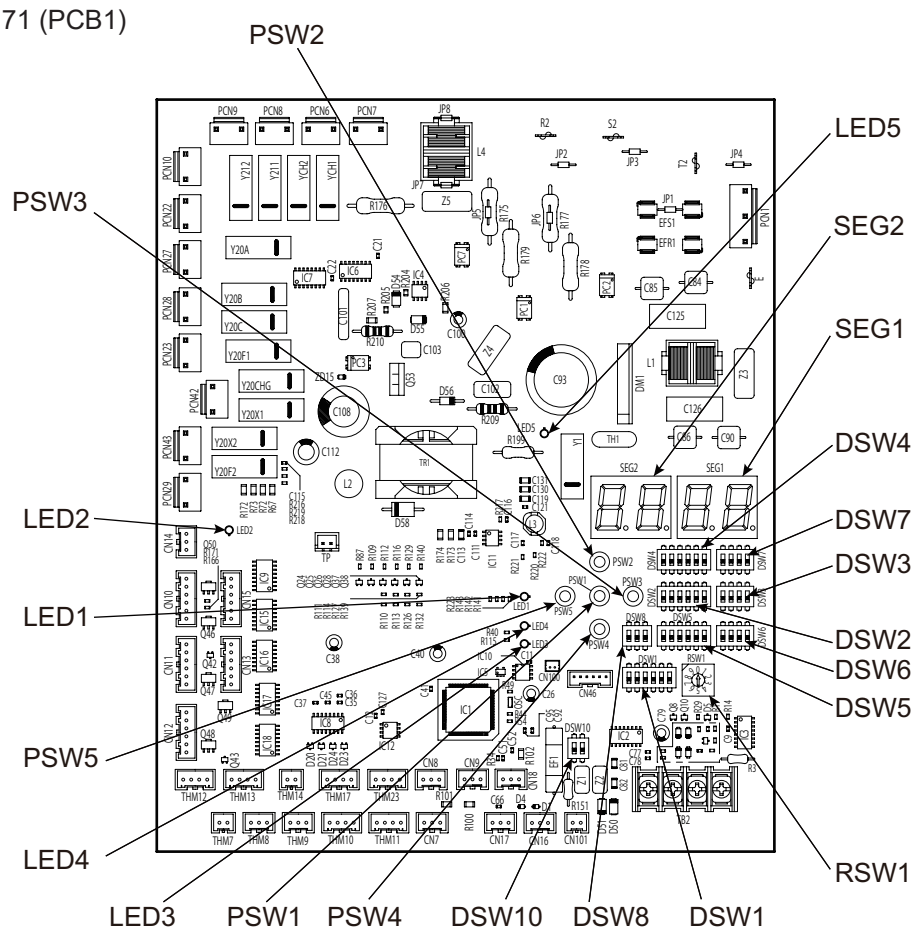
a. Control Printed Circuit Board for 208/230V Type and 460V Type: PCB1 (Outdoor Unit PCB)

PO151 (PCB1)



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

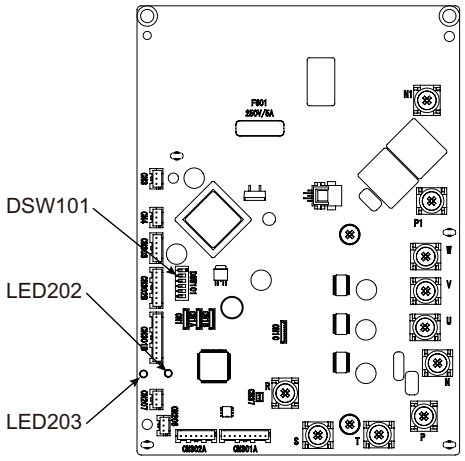
b. Control Printed Circuit Board for 575V Type: PCB1 (Outdoor Unit PCB)



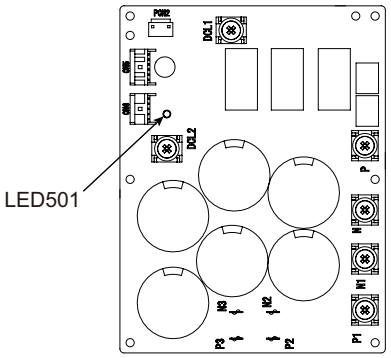
Part Name		Function Information
LEDs	LED1 (Red)	Power Supply Indicator for Outdoor Unit PCB (Low Voltage) Normal Condition: Activated / ON Abnormal Condition: Deactivated / OFF
	LED2 (Green)	This LED2 indicates the communication state between the outdoor unit PCB and inverter PCB. Normal Condition: Flashing 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 (Orange)	This LED4 indicates the communication state between the outdoor units. Normal Condition: Flashing Abnormal Condition: Activated / ON or Deactivated / OFF
	LED5 (Red)	Power Supply Indicator for Outdoor Unit PCB (High Voltage) Normal Condition: Activated / ON Abnormal Condition: Deactivated / OFF
SEGs	SEG1, SEG2	These indicate: “Alarm”, “Protective Safety Device has Tripped” or “Checking Items”.

c. Inverter Printed Circuit Board for 208/230V Type: INV1, 2 (Inverter PCB) and MPB1, 2 (Main Power PCB)

PV151 (INV1,2)

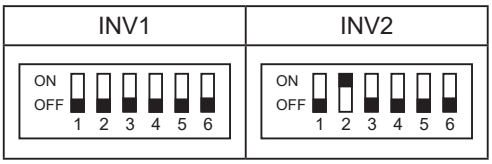


PV153 (MPB1,2)



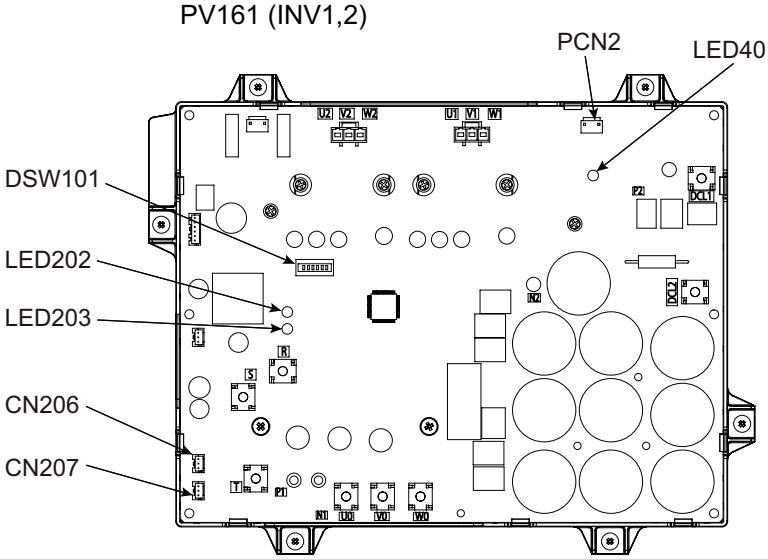
Part Name	Function Information
LED501 (Red) (on MPB1, 2)	Power Supply Indicator for Inverter PCB Normal Condition: Activated / ON Abnormal Condition: Deactivated / OFF
LED202 (Yellow) (on INV1, 2)	This indicates the state of the microcomputer. Normal Condition: Activated / ON Abnormal Condition: Deactivated / OFF
LED203 (Green) (on INV1, 2)	This indicates the state of communication between inverter PCB and fan controller Normal Condition: Activated / ON Abnormal Condition: Deactivated / OFF

• DSW101
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.

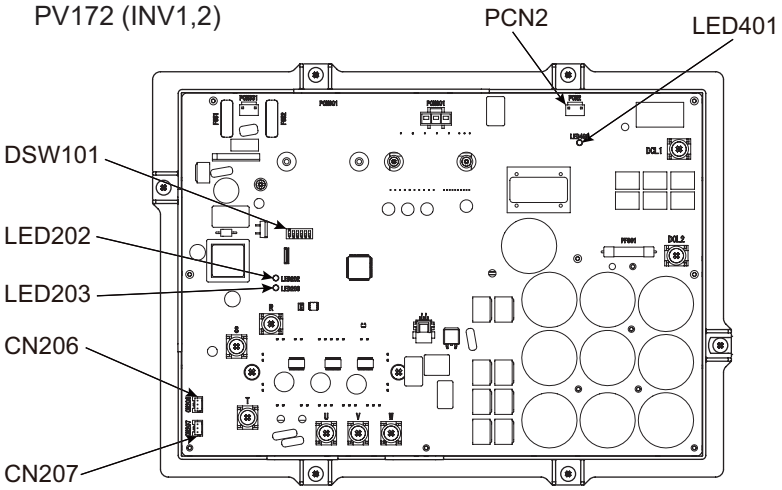


d. Inverter Printed Circuit Board for 460V Type: INV1, 2 (Inverter PCB)

PV161 (INV1,2)

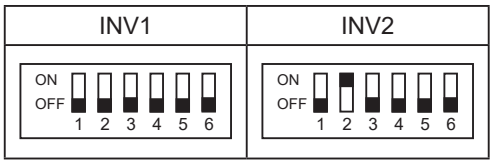


e. Inverter Printed Circuit Board for 575V Type: INV1, 2 (Inverter PCB)



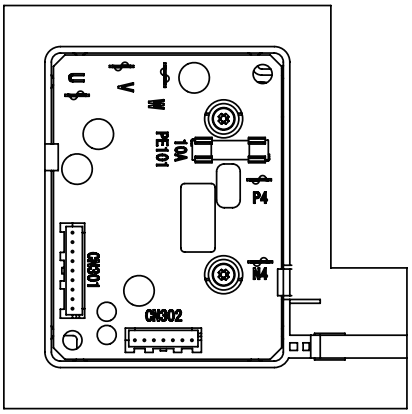
Part Name	Function Information
LED401 (Red)	Power Supply Indicator for Inverter PCB Normal Condition: Activated / ON Abnormal Condition: Deactivated / OFF
LED202 (Yellow)	This indicates the state of the microcomputer. Normal Condition: Activated / ON Abnormal Condition: Deactivated / OFF
LED203 (Green)	This indicates the state of communication between inverter PCB and fan controller Normal Condition: Activated / ON Abnormal Condition: Deactivated / OFF

• DSW101
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.



f. Fan Controller for 208/230V Type: FANM1, 2

PV152 (FANM1,2)



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. When simultaneous operation control of multiple units or room thermostat (thermo) control is operated, the DSW setting is different as shown below.

(1) Outdoor Unit (factory setting)
Turn OFF all power supplies before the setting.
Without turning OFF all power supplies, the changes are not recognized and the settings are invalid. (However, DSW4, 5, 8 and push switches can be operated while the power supply is ON.)
The "■" mark indicates positions of DIP switches.

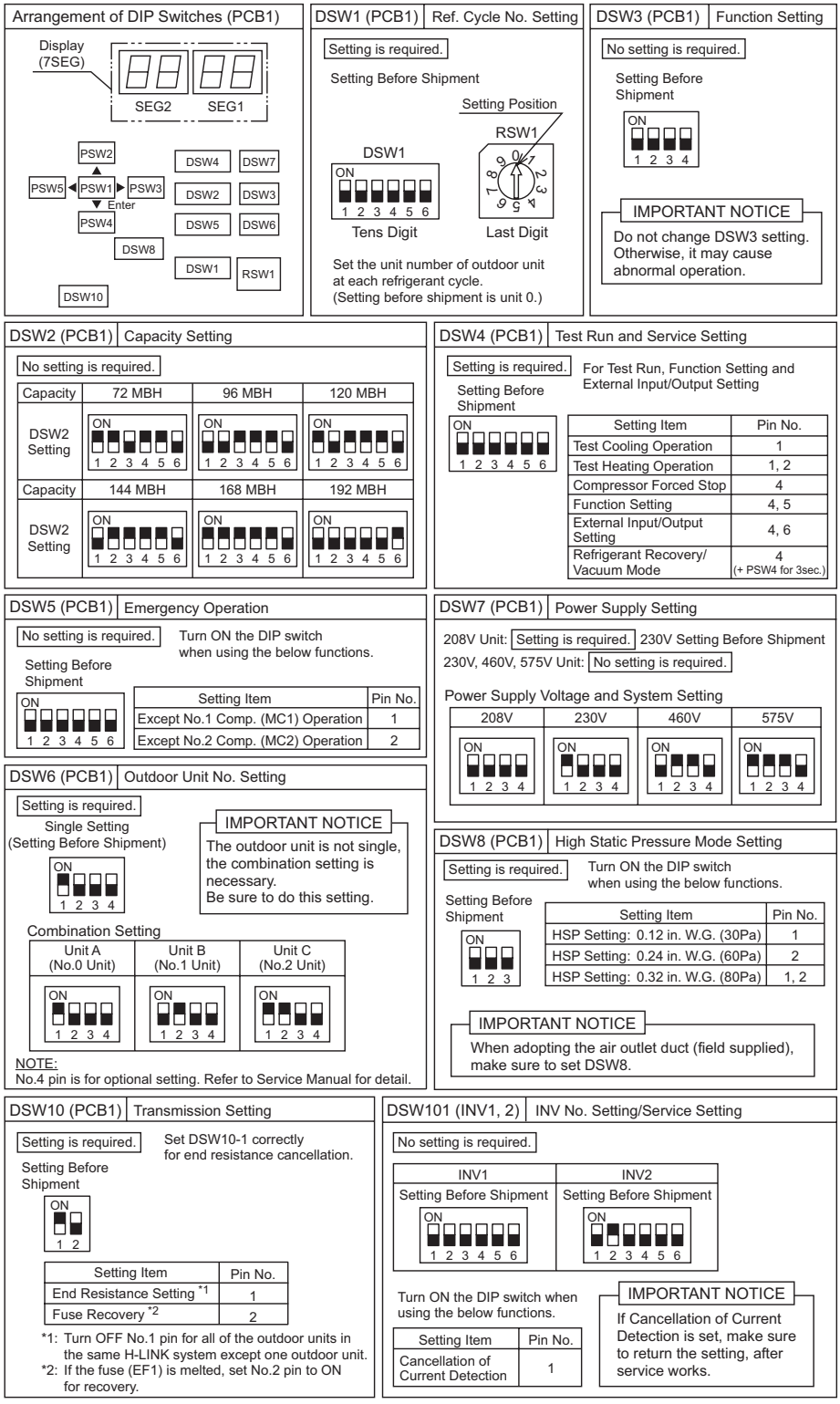


Figure 3.2 DSW Setting

- **High Static Pressure Setting (DSW8-No.1 to 2: ON)**
  Turn ON the DSW8-No.1 to 2 pin for the high static pressure setting.
  This setting enables high static pressure operation up to a maximum of 0.32 in.W.G. (80Pa).
  Use this setting when the outdoor unit is installed in spaces such as a balcony or a floor, a louver or a duct is present, and external static pressure is required.

  NOTICE:
  1. If there is a combination of outdoor units, set this function for all the outdoor units.
  2. While the unit operates in high static pressure mode, the operation sound value increases by 8dB from the nominal value.

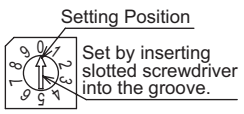
- **Setting for Communication**
  Setting the outdoor unit numbers, system numbers, and end terminal resistance are requirements for this H-LINK system.

- **Setting of Outdoor Unit No.**
  If there are combined outdoor units, set DSW6 as shown below.

Base Unit (Factory Setting)	Combination of Base Unit		
	Unit A (No.0)	Unit B (No.1)	Unit C (No.2)

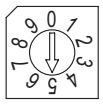
- **Setting of Refrigerant Cycle Numbers**
  In the same refrigerant cycle, set the same cycle number for the outdoor unit and the indoor units as shown below.
  Setting the outdoor unit refrigerant cycle number is required only for the main unit.
  The sub unit settings are not required.

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

	Setting Switch	
	10 digit	1 digit
		
Outdoor Unit	DSW1	RSW1
Indoor Unit	DSW5	RSW2

Ex.: Instance of Setting Refrigerant Cycle No. 25

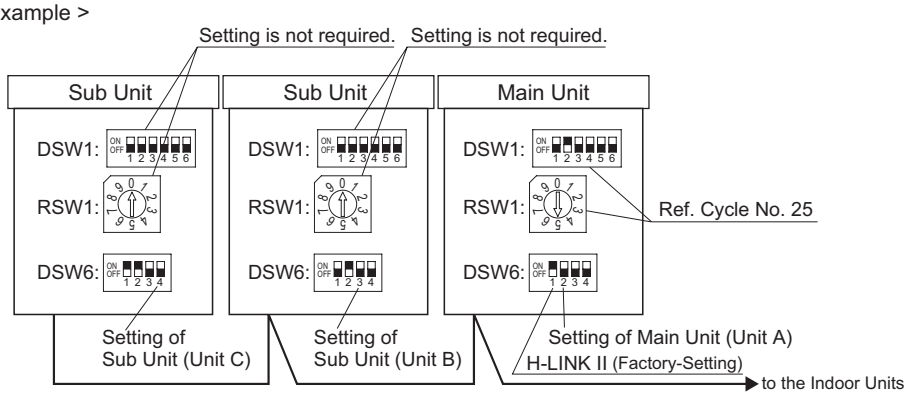
Turn ON No. 2 pin.

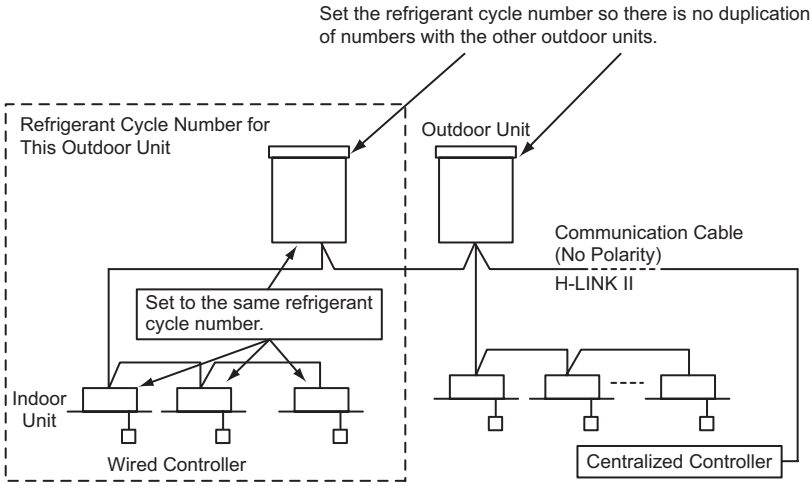


Set Dial No.5.

DSW and RSW factory setting is 0.
The maximum number of refrigerant cycles that can be set is 63.

< Setting Example >





Maximum Number of Connectable Outdoor Units and Indoor Units

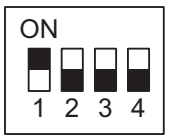
Outdoor Unit	64
Indoor Unit	160

- **DSW6 Setting for Low Ambient Kit**

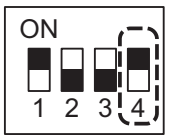
  Turn ON DSW6-No.4 pin on PCB1.
  The darkened square "■" indicates the position of DIP switches.

  NOTE:
  Refer to the "Installation and Maintenance Manual" for the outdoor unit for details on DSW6-No.1 to 3 setting.

Factory Setting



After Setting



- **DSW7 Setting for Rated Voltage**

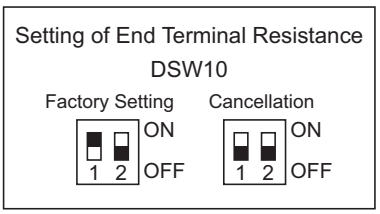
  DSW7 is used for setting the rated voltage for the outdoor unit as shown at the right.
  When the site power supply voltage is different from the factory setting, DSW7 setting is required.

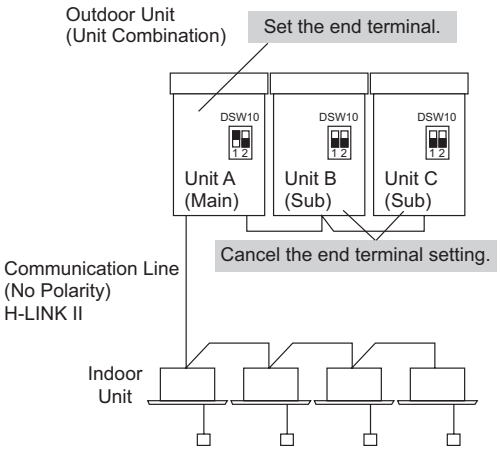
  NOTE:
  The same voltage setting is required for the main unit and sub unit(s). Verify the DSW7 DIP switch settings match the same voltage as the power supply.

Voltage	DSW7 Setting
208V	
230V	
460V	
575V	

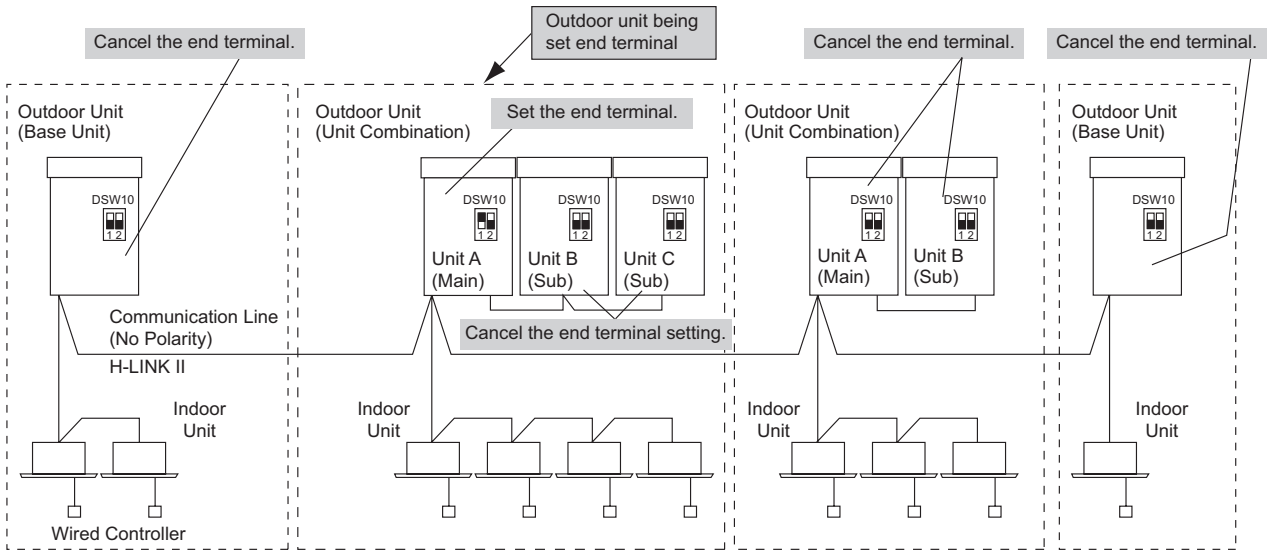
- **Setting of End Terminal Resistance**

  The factory setting for the No. 1 pin of DSW10 (for the setting of end terminal resistance) is to the “ON” position.
  Set all No. 1 pins of DSW10 in the “OFF” position except for the main outdoor Unit A.





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



3.1.4 Checking Wired Controller

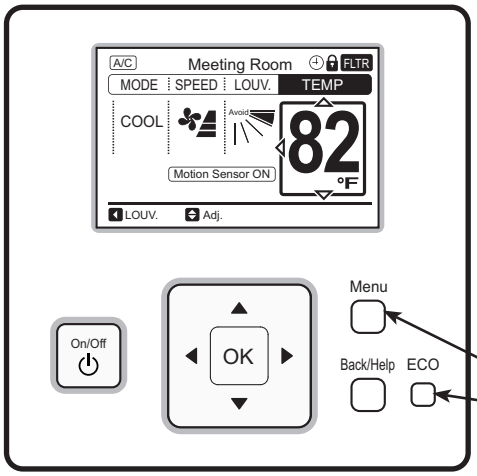
Wired Controller Model: CIW01

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

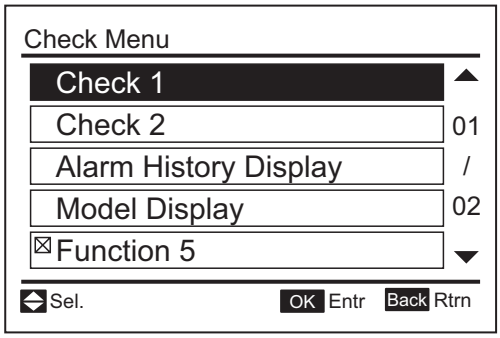
Check Menu Item	Function
Check 1	Sensor condition of air conditioner is monitored and displayed.
Check 2	Sensor data of air conditioner is indicated prior to alarm occurrence.
Alarm History Display	Previous alarm record (date, time, alarm code) is displayed.
Model Display	Model name and manufacturing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

● Setting Method

< Normal Mode Display >



< Check Menu Display >

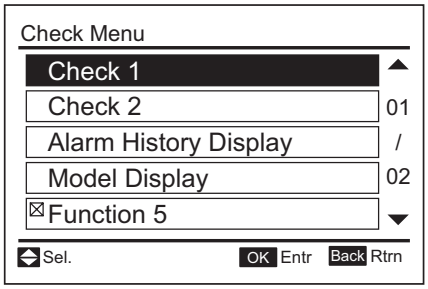


Press and hold “Menu” and “ECO” simultaneously for three seconds during the normal mode.

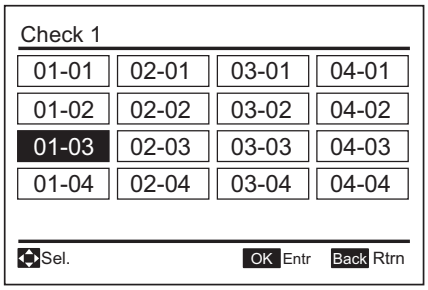
(1) Check 1 and Check 2

(1) Press and hold “Menu” and “ECO” simultaneously for three seconds during the normal mode. The Check Menu is displayed.

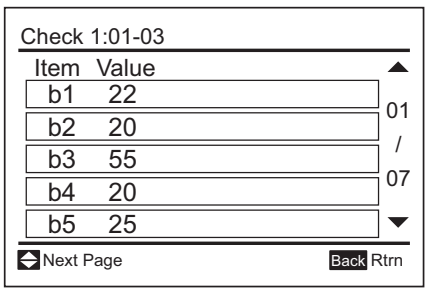
(2) Select “Check 1” (or “Check 2”) from the Check Menu and press “OK”.



(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.



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



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	Number of Operating Compressors
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	Stopping Cause State Indication
16	E1	Times of Abnormality
17	E2	Times of Power Failure
18	E3	Times of Abnormal Transmitting
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
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	Comp. Operating Accumulated Time
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.

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	Number of Operating Compressors
8	q8	Comp. Top Temp.

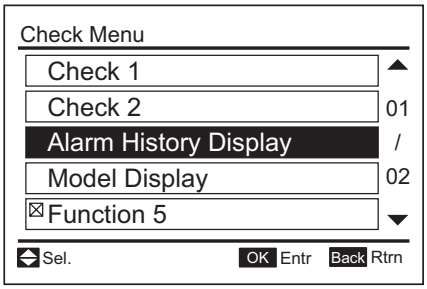
No.	Item	Data Name
9	q9	Discharge Pressure
10	qA	Suction Pressure
11	qb	Control Information
12	qC	Operating Frequency
13	qd	I.U. Expansion Valve
14	qE	O.U. Expansion Valve 1
15	qF	Comp. Current

(2) Alarm History Display

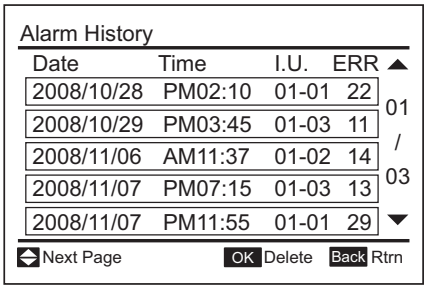
The Alarm History Display is accessed from the Check Menu.

(1) Press and hold “Menu” and “ECO” simultaneously for 3 seconds during the normal mode.
The Check Menu is displayed.

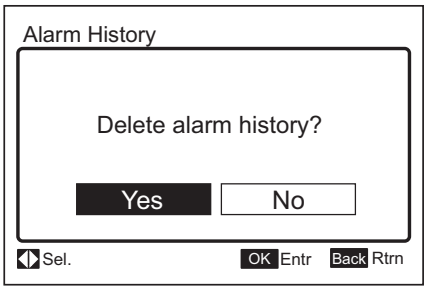
(2) Select “Alarm History Display” from Check Menu and press “OK”.



(3) The Alarm History Display changes by pressing “△“ or “▽“.



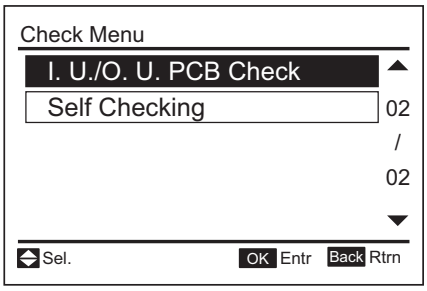
(4) To delete the alarm history, press “OK”. The confirmation screen is displayed.
Select “Yes” and press “OK”. The alarm history is deleted and the screen returns to (3) above.
If “No” is pressed, the screen returns to (3) above.



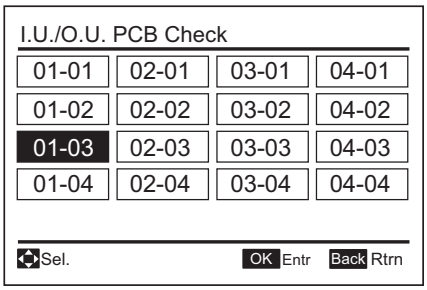
(3) I.U./O.U. PCB Check

(1) Press and hold “Menu” and “ECO” simultaneously for three seconds during the normal mode.
Check Menu is displayed.

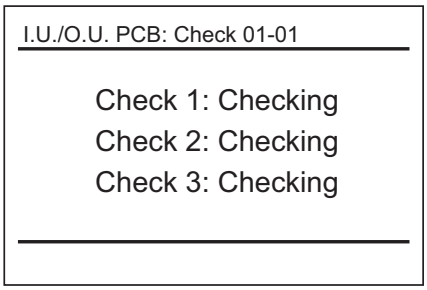
(2) Select “I.U./O.U. PCB Check” from the Check Menu and press “OK”.



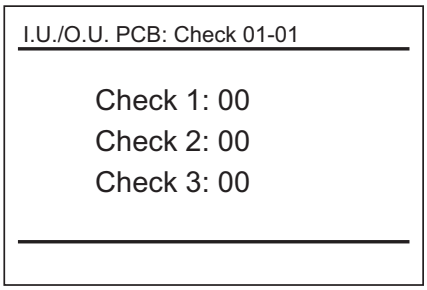
(3) Select the indoor unit to be set by pressing “△ ▽ ◁ ▷” and press “OK”. This screen is NOT displayed when there is only one indoor unit connected with the wired controller. In this case, (4) below is displayed.



(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.



(5) After completing the check, the results of the PCB check are displayed. Press “Back/Help” and return to (3) above.



Results of PCB Checks

Indoor Unit PCB	
No.	Result
00	Normal
01	Abnormality of Inlet Air Temp. Thermistor
02	Abnormality of Outlet Air Temp. Thermistor
03	Abnormality of Liquid Pipe Temp. Thermistor
04	Abnormality of Remote Thermistor
05	Abnormality of Gas Pipe Temp. Thermistor
08	Abnormality of Transmission of Central Station
0A	Abnormality of EEPROM
0b	Zero Cross Input Failure
EE	Abnormality of Transmission of I.U. during Check

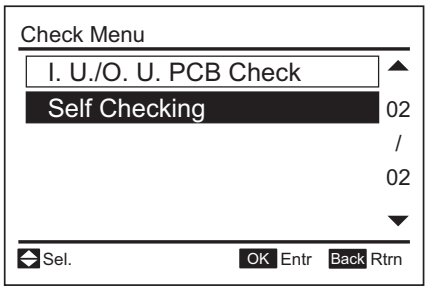
Outdoor Unit PCB	
No.	Result
00	Normal
07	Abnormality of Transmission of Outdoor Unit
F4	ITO Input Failure
F5	PSH Input Failure
F6	Abnormality of Protection Signal Detection Circuit
F7	Abnormality of Phase Detection
F8	Abnormality of Transmission of Inverter
FA	Abnormality of High Pressure Sensor
Fb	Abnormality of Comp. Discharge Gas Temp. Thermistor
FC	Abnormality of Low Pressure Sensor
Fd	Abnormality of Evaporating Temp. Thermistor at Heating
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).

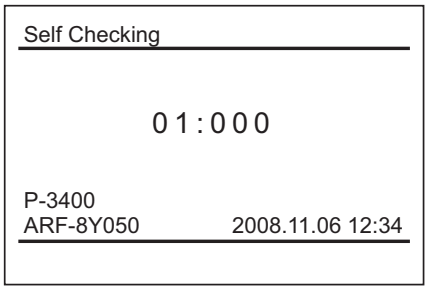
(1) Press and hold “Menu” and “ECO” simultaneously for three seconds during the normal mode (when unit is not operating).
The Check Menu is displayed.

(2) Select “Self Checking” from the Check Menu and press “OK”.

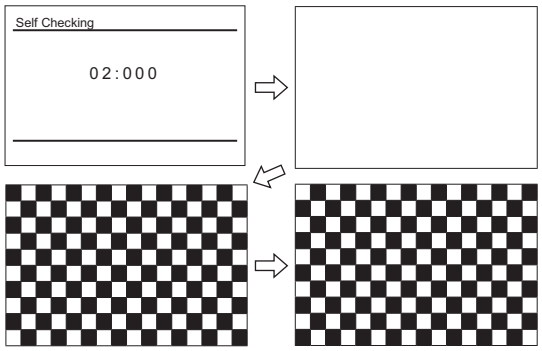


(3) Select the process for “Self Checking”.

* To start self check, press “ECO”.
* To clear EEPROM, press “▽” and “ECO” simultaneously.
→ See EEPROM clear process (15) below.



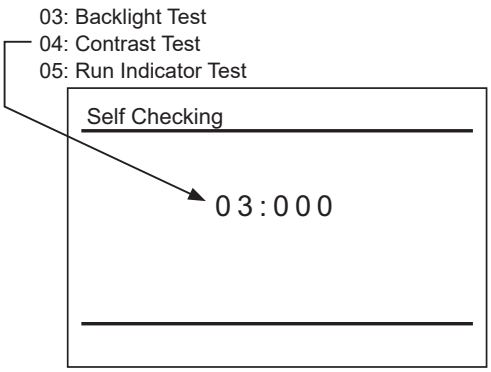
(4) LCD Test
Press “OK” and the screen changes as shown at the right.



(5) Backlight Test
LCD brightness is changed gradually by pressing “OK”.

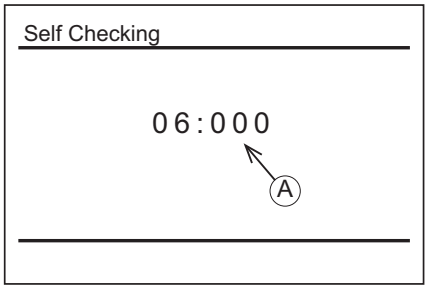
(6) Contrast Test
Contrast of the LCD gradually changes by pressing “OK”.

(7) Run Indicator Test
Press “OK” and the run indicator flashes in red then green twice.

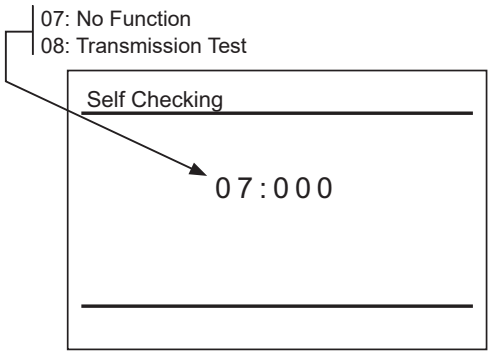


(8) Button Input Test
Press the nine buttons one-by-one. The number indicated with “Ⓐ” counts up as buttons are pressed.

* The order of pressing buttons is random. Do not press more than one button at a time. It will not be counted.

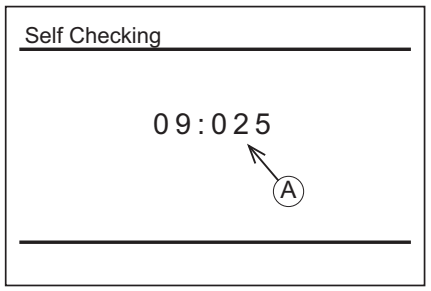


(9) No Function
This function is not used.
Press “OK” to proceed.

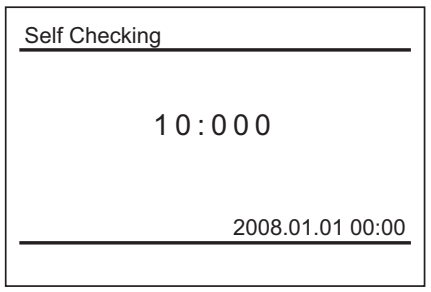


(10) Communication (Transmission) Circuit Test
The wired controller automatically starts to check the communication circuit.

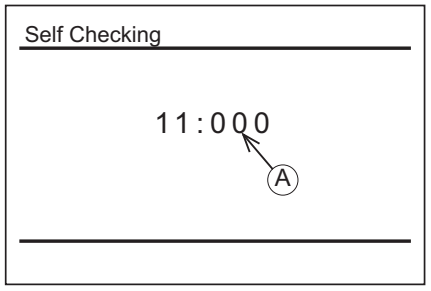
(11) Wired Controller Thermistor Test
The detected temperature by the wired controller thermistor is displayed at “Ⓐ” in the figure at the right.



(12) Date/Time Test
The date and time is changed from “2012.03.04 12:34” to “2008. 01. 01 00:00”.

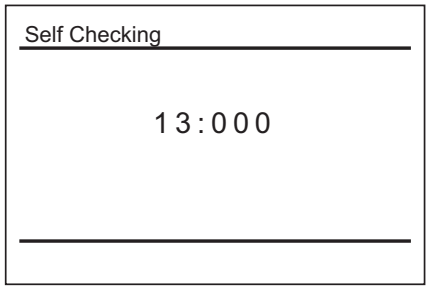


(13) EEPROM Test
< EEPROM Clearing Cancel >
Press “?“ (help).
< EEPROM Clear >
Press “OK” or wait 15 seconds. EEPROM data is cleared. During the process, the numbers indicate the location with “Ⓐ”.
If Ⓐ has a value of “999”, EEPROM is in a faulty condition.
*If “Ⓐ” has “999”, the process does not proceed to the next step.



EEPROM Process

(14) Clear EEPROM
The wired controller automatically starts the EEPROM clearing process.



(15) After several seconds pass, the self checking is completed and the wired controller is automatically restarted.

(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.

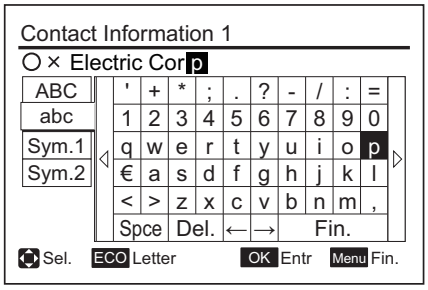
(2) Select “Contact Information” from the Test Run Menu and press “OK”.
Contact Information 1 is displayed.

(3) Press “Back/Help” to change font types.

(4) Press “△ ▽ ◁ ▷” to select letters.

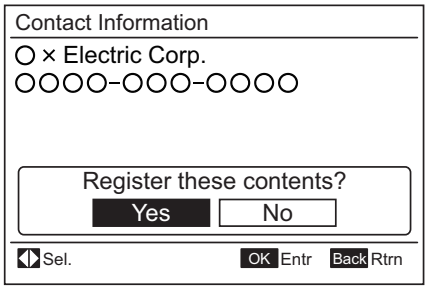
(5) Press “OK” to confirm the letters. (Max.: 28 letters)

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



(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.



3.1.5 Checking Using 7-Segment Display

⚠WARNING

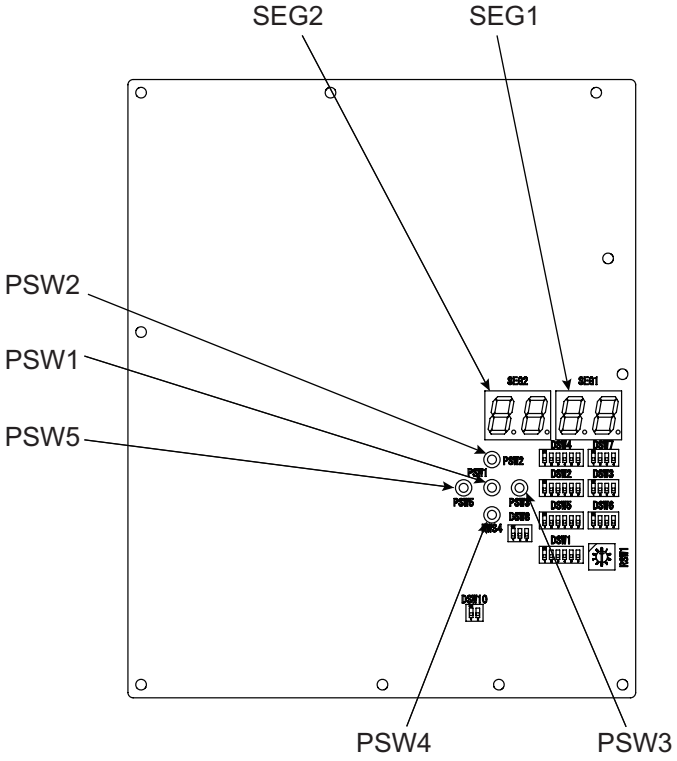
Only an authorized person can check using this method.

- **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 Connected 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. When checking never touch electrical parts and wires without appropriate personal protective equipment (PPE).

- **Location of Push Switches and 7-Segment Display**

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



- **Simple Checking using 7-Segment Display**

1 * Turn on All Indoor Units

* All the Indoor Units Connected in the Same System

2 Turn on the Outdoor Unit

3 Auto-addressing Starts

Outdoor Unit Printed Circuit Board (PCB)

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

Normal Case

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

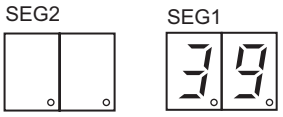
Abnormal Instance

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

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

(B) Alarm code of lower number indoor unit Address No. is displayed when alarm is received from multiple indoor units.

(C) The following 7-segment LED display appears and flashes every 0.5 seconds.



Alarm Code

(D) SEG1 and SEG2 are as follows.

7-Segment Display

<Instance of Unit No. 63, Alarm Code “01”>

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

Indoor Unit No. Alarm Code

● Checking Method Using Checking Mode

Operating conditions and each part of a system can be checked using the 7-segment display on PCB1 in the outdoor unit.

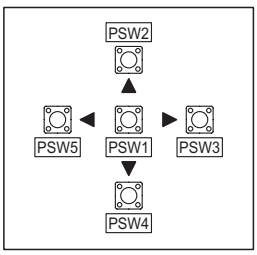
NOTES:
1. Change the Indication Group by pressing PSW5 (◄) and PSW3 (►).
   The first indication of the next or the previous Indication Group is displayed no matter where the current step is at.
2. The indications compatible for all the outdoor units and indoor units connected is displayed for the case of Group (B) and Group (C).

(Example)

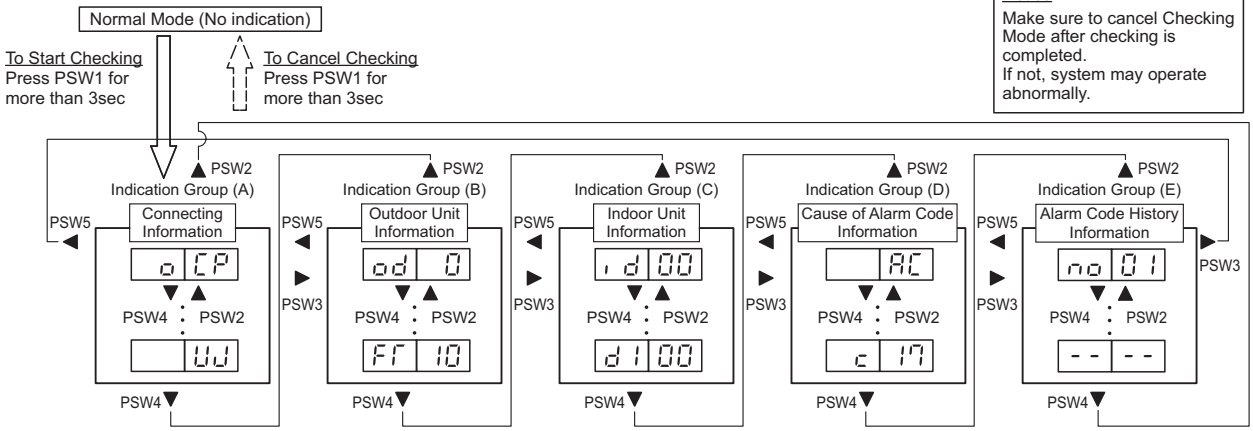
(0-1) Outdoor Unit (No.0) [od 0] →・・・(0-36) Cause Code of Fan Controller Stoppage Code [Fr20]

・・・→ (2-1) Outdoor Unit (No.0) [od 2] →・・・(2-36) Cause Code of Fan Controller Stoppage Code [Fr20]

Arrangement of Push Switches



Notice
Make sure to cancel Checking Mode after checking is completed.
If not, system may operate abnormally.



(B) Connecting Information

This information is displayed at main outdoor unit (Unit A) only.
Press PSW4 (▼) to move forward or PSW2 (▲) to move backward.
The information is displayed alternately as “Item” → “Details”.

Display Details

	Item	7-Segment Display SEG2	7-Segment Display SEG1	Details
1	Total Capacity of Connected Outdoor Units	o	CP	Total Capacity of O.U. Combination Refer to “Outdoor Unit Capacity Table”.
2	O.U. Constitution Quantities	o	AA	Constitution Quantities of O.U. Combination
3	Total Capacity of Connected Indoor Units	i	CP	Total Capacity of Connected Indoor Units
4	Connected I.U. Number	i	AA	Connected Indoor Unit Number
5	Refrigerant Group		GA	Refrigerant Group Number
6	Total Capacity of Operated I.U.		oP	Total Capacity of Operated Indoor Units Refer to “Indoor Unit Capacity Table”.
7	Total Comp. Frequency		Hz	Unit: Hz
8	Accumulated Operation Time		UJ	Unit: Hour (Indication x 10 Hours)

Outdoor Unit Capacity Table

Indication	Type (Capacity) [MBH]	Refrigeration Ton [RT]
72	072	6.0
96	096	8.0
120	120	10.0
144	144	12.0
168	168	14.0
192	192	16.0

NOTE:
In case of combination unit, the indication of outdoor unit capacity is total capacity of each unit.

< Example >
In case of 432 type

432 type = 144 type x 3
144 x 3 = 432
Indication “432” is displayed.

Indoor Unit Capacity Table

Indication	Type (Capacity) [MBH]	Refrigeration Ton [RT]
6	006	0.5
8	008	0.7
12	012	1.0
15	015	1.3
18	018	1.5
24	024	2.0
30	030	2.5
36	036	3.0
48	048	4.0
60	060	5.0
72	072	6.0
96	096	8.0

(C) Outdoor Unit Information

Select that the outdoor unit number display only for Unit A (No.0).
Units B and C (Nos.1 and 2) show each unit number only.
When the selection is changed, press PSW3 (►) to move forward or PSW5 (◄) to move backward.

Unit	Indication
Unit A (No.0)	od 0
Unit B (No.1)	od 1
Unit C (No.2)	od 2

Select the outdoor unit number for menu selection.
Press PSW4 (▼) for detailed information of selected unit number.
Press PSW4 (▼) to move forward or PSW2 (▲) to move backward. The information is displayed alternately as “Item” → “Details”.
Press PSW3 (►) or PSW5 (◄) to change the Outdoor Combination Unit No. to display or to move other Indication Group..

Display Details

Item		7-Segment Display		Details
		SEG2	SEG1 *1	
1	Outdoor Unit No.	od	0	Outdoor Unit No. Indication
2	Outdoor Unit Capacity	CA	0	Unit Capacity Indication Refer to "Outdoor Unit Capacity Table"
3	Output State of Outdoor Micro-Computer	SC	0	Output State of Outdoor Micro-Computer Indication Refer to "Arrangement of Push Switches and 7-Segment Display"
4	Running Frequency of Inverter Compressor MC1	H1	0	Running Frequency of No.1 Compressor Indication [Hz]
5	Running Frequency of Inverter Compressor MC2 *2	H2	0	Running Frequency of No.2 Compressor Indication [Hz]
6	Total Number of Running Compressor	CC	0	Total Number of Running Compressor Indication
7	Outdoor Fan Step	Fo	0	Outdoor Fan Step Indication (0 to 27 [Step])
8	Outdoor Expansion Valve MV1 Opening	E1	0	Outdoor Expansion Valve MV1 Opening Indication [%]
9	Outdoor Expansion Valve MV2 Opening *3	E2	0	Outdoor Expansion Valve MV2 Opening Indication [%]
10	Bypass Expansion Valve MVB Opening	Eb	0	Bypass Expansion Valve MVB Opening Indication [%]
11	High (Discharge) Pressure (Pd)	Pd	0	[psi (Mpa)] *5 Indication of Pressure Sensor Open Circuit: 815 (5.62) Indication of Pressure Sensor Short Circuit: -90 (-0.62)
12	Low (Suction) Pressure (Ps)	PS	0	[psi (Mpa)] *5 Indication of Pressure Sensor Open Circuit: 326 (2.25) Indication of Pressure Sensor Short Circuit: -36 (-0.25)
13	Ambient Air Temperature (Ta)	To	0	[°F (°C)] *5 Indication of Thermistor Open Circuit: -197 (-127) Indication of Thermistor Short Circuit: 260 (127)
14	Discharge Gas Temperature on Top of Compressor MC1 (Td1)	Td	10	[°F (°C)] *5 Indication of Thermistor Open Circuit: 32 (0) Indication of Thermistor Short Circuit: 491 (255)
15	Discharge Gas Temperature on Top of Compressor MC2 (Td2) *2	Td	20	[°F (°C)] *5 Indication of Thermistor Open Circuit: 32 (0) Indication of Thermistor Short Circuit: 491 (255)
16	Outdoor Heat Exchanger Liquid Temperature (Te1)	TE	10	[°F (°C)] *5 Indication of Thermistor Open Circuit: -197 (-127) Indication of Thermistor Short Circuit: 260 (127)
17	Outdoor Heat Exchanger Liquid Temperature (Te2) *4	TE	20	[°F (°C)] *5 Indication of Thermistor Open Circuit: -197 (-127) Indication of Thermistor Short Circuit: 260 (127)
18	Outdoor Heat Exchanger Gas Temperature (Tg)	TG	0	[°F (°C)] *5 Indication of Thermistor Open Circuit: -197 (-127) Indication of Thermistor Short Circuit: 260 (127)
19	Liquid Stop Valve Temperature (Tchg)	TC	H0	[°F (°C)] *5 Indication of Thermistor Open Circuit: -197 (-127) Indication of Thermistor Short Circuit: 260 (127)
20	Subcooling Heat Exchanger Temperature (Tsc)	TS	C0	[°F (°C)] *5 Indication of Thermistor Open Circuit: -197 (-127) Indication of Thermistor Short Circuit: 260 (127)

Display Details

Item		7-Segment Display		Details
		SEG2	SEG1 *1	
21	Inverter Fin Temperature 1	rF	10	[°F (°C)] *5
22	Inverter Fin Temperature 2 *2	rF	20	[°F (°C)] *5
23	Fan Controller Fin Temperature 1	rF.	10	[°F (°C)] *5
24	Fan Controller Fin Temperature 2 *4	rF.	20	[°F (°C)] *5
25	Compressor MC1 Current *6	A1	0	INV1 Primary Current [A]
26	Compressor MC2 Current *2, *6	A2	0	INV2 Primary Current [A]
27	Fan Motor MOF1 Current *6	AF	10	Fan Controller 1 Secondary Current [A]
28	Fan Motor MOF2 Current *4, *6	AF	20	Fan Controller 2 Secondary Current [A]
29	Accumulated Operation Time of Compressor MC1	UJ	10	[10 Hours]
30	Accumulated Operation Time of Compressor MC2 *2	UJ	20	[10 Hours]
31	Accumulated Operation Time of Compressor MC1 (Resettable)	cU	10	[10 Hours] Accumulated operation time can be reset. *7
32	Accumulated Operation Time of Compressor MC2 (Resettable) *2	cU	20	[10 Hours] Accumulated operation time can be reset. *7
33	Cause Code of Inverter Stoppage 1	,F	10	Cause of INV Compressor MC1 Stoppage Refer to "Cause Code of Inverter Stoppage"
34	Cause Code of Inverter Stoppage 2 *2	,F	20	Cause of INV Compressor MC2 Stoppage Refer to "Cause Code of Inverter Stoppage"
35	Cause Code of Fan Controller Stoppage 1	Ff	10	Cause of Fan Motor MOF1 Stoppage Refer to "Cause Code of Fan Controller Stoppage"
36	Cause Code of Fan Controller Stoppage 2 *4	Ff	20	Cause of Fan Motor MOF2 Stoppage Refer to "Cause Code of Fan Controller Stoppage"

*1: The outdoor unit No. is indicated on the one digit of "SEG1".
*2: Indication Item only for Outdoor Unit Model 120MBH or more
*3: Indication Item only for Outdoor Unit Model 168MBH or more
*4: Indication Item only for Outdoor Unit Model 96MBH or more
*5: If Function Setting "Fd"=1, indication unit is converted to [°C] or [MPa] from [°F] or [psi].
*6: The indicated current is reference value. Use a clamp meter for the accurate current value.
*7: To reset the accumulated operation time, press "PSW1+PSW3" for 5 seconds while the accumulated data is indicated.

(D) Indoor Unit Information

This information is indicated at main outdoor unit (Unit A) only.
Select the indoor unit number for the information indication. Press PSW4 (▼) to move forward or PSW2 (▲) to move backward.
The information is displayed alternately as “Item” → “Details”.

Unit No.	Indication
No.0	,d00
No.1	,d01
↓	↓
No.63	,d63

Display Details

Item		7-Segment Display		Details
		SEG2	SEG1 *1	
1	Indoor Unit No.	,d	00	Indoor Unit No. Indication
2	Indoor Unit Capacity	CA	00	Unit Capacity Indication Refer to "Indoor Unit Capacity Table"
3	Indoor Expansion Valve Opening	,E	00	[%]
4	Indoor Heat Exchanger Liquid Piping Temp.	rL	00	[ºF (ºC)] *2
5	Indoor Heat Exchanger Gas Piping Temp.	rG	00	[ºF (ºC)] *2
6	Air Inlet Temp.	r,	00	[ºF (ºC)] *2
7	Air Outlet Temp.	ro	00	[ºF (ºC)] *2
8	Cause Code of Indoor Unit Stoppage	d1	00	Cause of Indoor Unit Stoppage Refer to "Cause Code of Indoor Unit Stoppage"

*1: The indoor unit No. is indicated on the one digit of "SEG1".
*2: If Function Setting "Fd"=1, indication unit is converted to [ºC] from [ºF].

(E) Cause of Alarm Code Information

This information is indicated at main outdoor unit (Unit A) only.
Press PSW4 (▼) to move forward or PSW2 (▲) to move backward.
The information is displayed alternately as “Item” → “Details”.

Display Details

Item		7-Segment Display		Details
		SEG2	SEG1	
1	Alarm Cause Code		AC	Latest O.U. Stoppage Alarm Code Indication Refer to “Alarm Code Table”.
2	Override (Degeneration) Control for Pressure Ratio Decrease Protection	c	11	0: Override (Degeneration) Control is not Activated. 1: Override (Degeneration) Control is Activated.
3	Override (Degeneration) Control for High Pressure Increase Protection	c	13	0: Override (Degeneration) Control is not Activated. 1: Override (Degeneration) Control is Activated.
4	Override (Degeneration) Control for Inverter Fin Temp. Increase Protection	c	14	0: Override (Degeneration) Control is not Activated. 1: Override (Degeneration) Control is Activated.
5	Override (Degeneration) Control for Discharge Gas Temp. Increase Protection	c	15	0: Override (Degeneration) Control is not Activated. 1: Override (Degeneration) Control is Activated.
6	Override (Degeneration) Control for Td SH Decrease Protection	c	16	0: Override (Degeneration) Control is not Activated. 1: Override (Degeneration) Control is Activated.
7	Override (Degeneration) Control for Overcurrent Protection	c	17	0: Override (Degeneration) Control is not Activated. 1: Override (Degeneration) Control is Activated.

(F) Alarm Code History Information

This information is indicated at main outdoor unit (Unit A) only.
If a history of abnormality exists, it is indicated up to a maximum of 15 instances in chronological order.
Press PSW4 (▼) to move forward or PSW2 (▲) to move backward.

Press PSW3 (►) for detailed information.
Press PSW4 (▼) to move forward or PSW2 (▲) to move backward.
Press PSW5 (◄) to return to Data No. Selection.

Data No.	7-Segment Display	
	SEG2	SEG1
1 (Latest Data)	no	01
↓	↓	↓
15 (Oldest Data)	no	15

Display Details

Item		7-Segment Display		Details
		SEG2	SEG1	
1	Unit Accumulated Operation Time	07	08	O.U. Accumulated Operation Time at Stoppage Unit: Hour (Indication x 10 Hours)
2	Cause of Stoppage	AC		Alarm Stoppage
		d1		Retry Stoppage
		C.		Control Information
3	Alarm / Stoppage Cause Code	01	48	Alarm and Stoppage Cause Code O.U. No. is indicated on 10 digit of SEG2. Compressor and fan controller No. are indicated on one digit of SEG2. Alarm and stoppage code are indicated on SEG1.
4	Abnormal Data Indication	.F	12	Inverter stoppage cause code displays when IT code is existing on SEG2.
		FF	12	Fan controller stoppage cause code displays when FT code is existing on SEG2.
		--	--	Except for the above

3.1.6 Checking Alarm Code History

Alarm code history is indicated in the following order while the Check Mode is displayed.

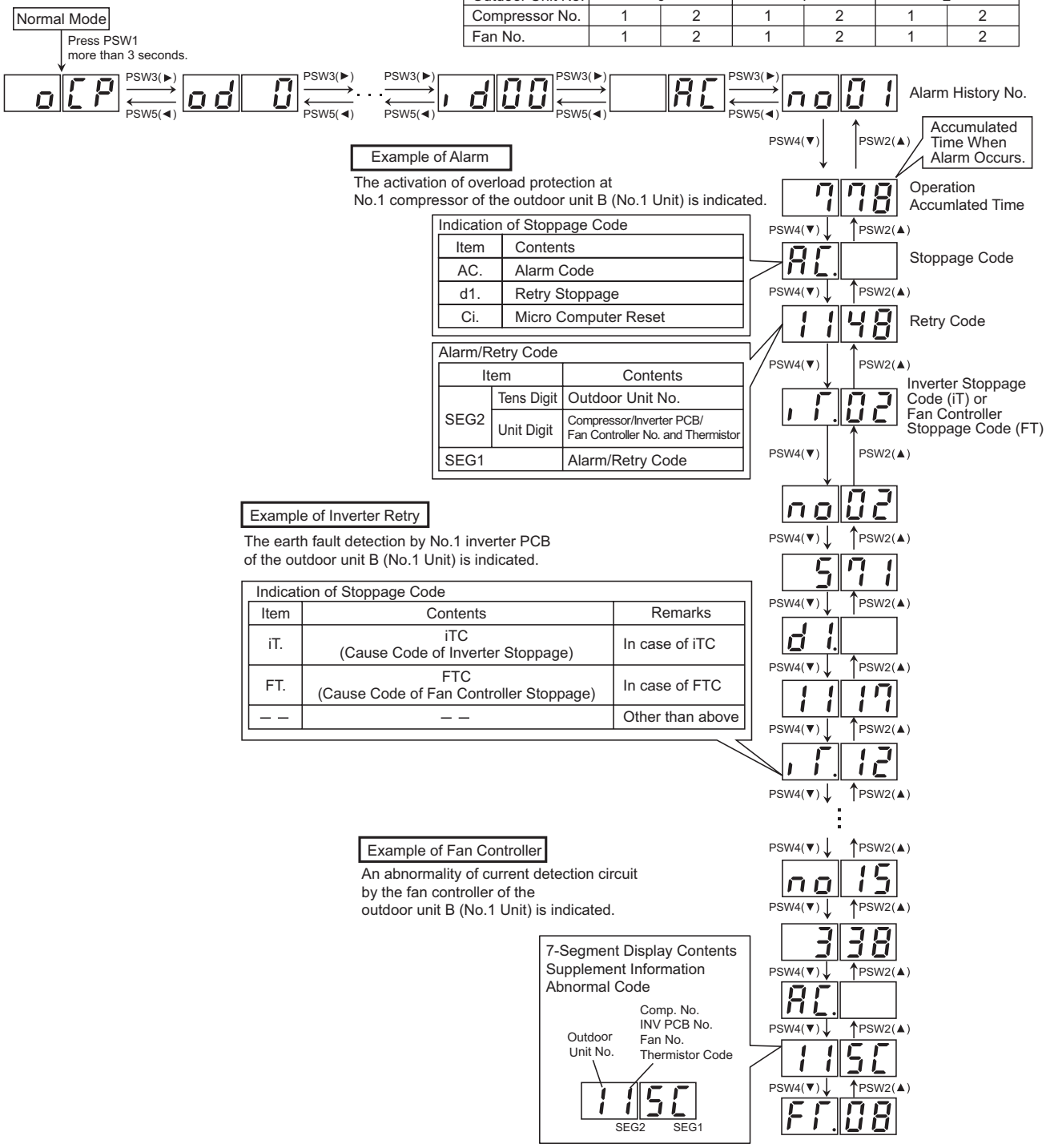
"no01" (latest) ⟷ history data ~ "no15" (oldest) ⟷ history data

Refer to the figure below as an example.

Alarm code history displays a maximum of 15 alarms in order of occurrence.

Subject compressor when alarm/retry code is displayed.
(Example: (H,Y)VAHR432B(3,4,5)2S)

	Outdoor Unit A		Outdoor Unit B		Outdoor Unit C	
Combination of Compressor and Fan	Fan / INV. Comp.	Fan / INV. Comp.	Fan / INV. Comp.	Fan / INV. Comp.	Fan / INV. Comp.	Fan / INV. Comp.
Outdoor Unit No.	0		1		2	
Compressor No.	1	2	1	2	1	2
Fan No.	1	2	1	2	1	2



(1) Register of Alarm Code History

Cause of Stoppage (Alarm Code or Stoppage Code)	Contents	Details of Alarm Code History					
		Time	* Alarm	Alarm Code			Abnormal Data
				O.U. Unit No.	Comp. No. Inverter PCB No.	Fan No.	
02	Activation of protection device	Accumulated Time	AC.	○	○		--
03	Abnormality transmitting between indoor units and outdoor units	Accumulated Time	AC.				--
04	Abnormality transmitting between inverter PCB and outdoor unit PCB	Accumulated Time	AC.	○	○		--
05	Abnormality of power supply phase	Accumulated Time	AC.	○			--
06	Abnormality of inverter voltage	Accumulated Time	AC.	○	○		iTC
d1-18		Accumulated Time	d1.	○	○		iTC
07	Decrease in discharge gas superheat	Accumulated Time	AC.	○			--
d1-16		Accumulated Time	d1.	○			--
08	Increase in discharge gas temperature at the top of compressor	Accumulated Time	AC.	○			--
d1-15		Accumulated Time	d1.	○			--
0A	Abnormality transmitting between outdoor units	Accumulated Time	AC.				--
0b	Incorrect outdoor unit address setting	Accumulated Time	AC.				--
0c	Incorrect outdoor main unit setting	Accumulated Time	AC.				--
21	Abnormality of high pressure sensor	Accumulated Time	AC.	○			--
22	Abnormality of thermistor for outdoor air temperature	Accumulated Time	AC.	○			--
23	Abnormality of thermistor for discharge gas temp. on top of compressor	Accumulated Time	AC.	○	○		--
24	Abnormality of thermistor for outdoor unit heat exchanger liquid pipe (Te/Tchg/Tsc)	Accumulated Time	AC.	○	Thermistor Signal Te1: 1, Te2: 2 Tchg: C, Tsc: S		--
25	Abnormality of thermistor for outdoor unit heat exchanger gas pipe (Tg)	Accumulated Time	AC.	○			--
29	Abnormality of low pressure sensor	Accumulated Time	AC.	○			--
30	Incorrect connection of change-over box	Accumulated Time	AC.				--
31	Incorrect capacity setting of indoor unit and outdoor unit	Accumulated Time	AC.				--
35	Incorrect indoor unit No. setting	Accumulated Time	AC.				--
36	Incorrect indoor unit combination	Accumulated Time	AC.				--
38	Abnormality of picking up circuit for protection in outdoor unit	Accumulated Time	AC.	○			--
3A	Abnormality of outdoor unit capacity	Accumulated Time	AC.				--
3b	Incorrect setting of outdoor unit model combination or voltage	Accumulated Time	AC.				--
3d	Abnormality transmitting between main unit and sub unit(s)	Accumulated Time	AC.				--
3E	Abnormal Combination between Inverter PCB and outdoor unit PCB	Accumulated Time	AC.	○			--
43	Abnormality of low compression ratio	Accumulated Time		○			--
d1-11		Accumulated Time	d1.	○			--

✳ (Details of Alarm)
AC.: Alarm
d1.: Retry
Ci.: Control Information

iTC: Inverter Stoppage Code
FTC: Fan Controller Stoppage Code

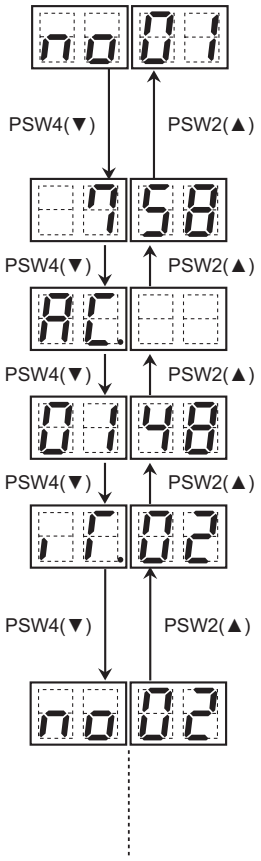
Cause of Stoppage (Alarm Code or Stoppage Code)	Contents	Details of Alarm Code History					
		Time	* Alarm	Alarm Code			Abnormal Data
				O.U. Unit No.	Comp. No. Inverter PCB No.	Fan No.	
44	Abnormality of low-pressure increase	Accumulated Time	AC.	○			--
d1-12		Accumulated Time	d1.	○			--
45	Abnormality of high-pressure increase	Accumulated Time	AC.	○			--
d1-13		Accumulated Time	d1.	○			--
47	Activation of low-pressure decrease protection device (Vacuum operation protection)	Accumulated Time	AC.	○			--
d1-15		Accumulated Time	d1.	○			--
48	Activation of inverter overcurrent protection device	Accumulated Time	AC.	○	○		iTC
d1-17		Accumulated Time	d1.	○	○		iTC
51	Abnormality of inverter current sensor	Accumulated Time	AC.	○	○		iTC
d1-17		Accumulated Time	d1.	○	○		iTC
53	Inverter error signal detection	Accumulated Time	AC.	○	○		iTC
d1-17		Accumulated Time	d1.	○	○		iTC
54	Abnormality of inverter fin temperature	Accumulated Time	AC.	○	○		iTC
d1-17		Accumulated Time	d1.	○	○		iTC
55	Inverter failure	Accumulated Time	AC.	○	○		iTC
d1-17		Accumulated Time	d1.	○	○		iTC
57	Activation of fan controller protection device	Accumulated Time	AC.	○		○	FTC
5A	Abnormality of fan controller fin temperature	Accumulated Time	AC.	○		○	FTC
5b	Activation of overcurrent protection	Accumulated Time	AC.	○		○	FTC
5C	Abnormality of fan controller sensor	Accumulated Time	AC.	○		○	FTC
A1	Detection of External Abnormality	Accumulated Time	AC.	○			--
b5	Incorrect setting of indoor unit connection number	Accumulated Time	AC.				--
EE	Compressor protection alarm	Accumulated Time	AC.				--
d1-05	Instantaneous power failure	Accumulated Time	d1				--
d1-18	Abnormality of inverter and other	Accumulated Time	d1				iTC
d1-26	Abnormality of high pressure decrease	Accumulated Time	d1				--
d1-32	Retry stoppage by indoor unit auto address setting	Accumulated Time	d1				--
Control Information	Micro-computer reset by abnormality of inverter transmission	Accumulated Time	Ci.				1
	Micro-computer reset by abnormality of indoor unit transmission	Accumulated Time	Ci.				3
	Micro-computer reset by abnormality transmitting between outdoor unit and outdoor unit	Accumulated Time	Ci.				4
	Micro-computer reset for abnormality of control state	Accumulated Time	Ci.				6

✳ (Details of Alarm)
AC.: Alarm
d1.: Retry
Ci.: Control Information

iTC: Inverter Stoppage Code
FTC: Fan Controller Stoppage Code

* 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.

(2) Deletion of Alarm Code History
Press PSW1 and PSW3 for five seconds to clear the alarm code history while the history data is displayed. (All history can be deleted.)



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

(A) Protection Control Code

The control information during operation are displayed.
The protection control code is different from the code displayed during unit operation stoppage.

Code	Protection Control	Code	Protection Control
P01	Pressure Ratio Control	P11	Pressure Ratio Decrease Retry
P02	High Pressure Increase Protection	P12	Low Pressure Increase Retry
P03	Inverter Current Protection	P13	High Pressure Increase Retry
P04	Inverter Fin Temp. Increase Protection	P15	Vacuum/Discharge Gas Temp. Increase Retry
P05	Discharge Gas Temp. on Top of Comp. Increase Protection	P16	Discharge Gas SUPER HEAT Decrease Retry
P06	Low Pressure Decrease Protection	P17	Inverter Trip Retry
P09	High Pressure Decrease Protection	P18	Retry Related to Inverter
P0A	Demand Current Control	P26	High Pressure Decrease Retry
P0d	Low Pressure Increase Protection		

NOTE:
Once the override (degeneration) control is activated, PC1 to PC5 is displayed instead of P01 to P05.

(B) Alarm Code Table

Code	Category	Content of Abnormality	Leading Cause
01	Indoor Unit	Activation of Protection Device (Float Switch)	Activation of Float Switch (High Water Level in Condensate Pan, Problem with Condensate Piping, Float Switch, or Condensate Pan)
02	Outdoor Unit	Activation of Protection Device (High Pressure Cut)	Activation of PSH (Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing)
03	Communication	Abnormal Communication between Indoor Units and Outdoor Units	Incorrect Wiring, Loose Terminals, Disconnected Communication Cable, Blowout of Fuse, Indoor Unit Power OFF
04		Abnormal Communication between Inverter PCB and Outdoor PCB	Inverter PCB -Outdoor PCB Communication Failure (Loose Connector, Wire Breaking, Blowout of Fuse)
05	Supply Phase	Abnormality of Power Supply Phases	Incorrect Power Supply, Connection to Reversed Phase, Open-Phase
06	Voltage	Abnormal Inverter Voltage	Outdoor Voltage Decrease, Insufficient Power Capacity
07	Cycle	Decrease in Discharge Gas Superheat	Excessive Refrigerant Charge, Failure of Thermistor, Incorrect Wiring, Incorrect Piping Connection, Expansion Valve Locking at Opened Position (Disconnect Connector)
08		Increase in Discharge Gas Temperature	Insufficient Refrigerant Charge, Pipe Clogging, Failure of Thermistor, Incorrect Wiring, Incorrect Piping Connection, Expansion Valve Locking at Closed Position (Disconnect Connector)
0A	Communication	Abnormal Communication between Outdoor Units	Incorrect Wiring, Breaking Wire, Loose Terminals
0b	Outdoor Unit	Incorrect Outdoor Unit Address Setting	Duplication of Address Setting for Outdoor Units (Sub Units) in Same Refrigerant Cycle Number
0C		Incorrect Outdoor Unit Main Unit Setting	Two (or more) Outdoor Units Set as "Main Unit" Exist in Same Refrigerant Cycle Number
11	Sensor on Indoor Unit	Abnormality of Inlet Air Thermistor	Incorrect Wiring, Disconnecting Wiring, Breaking Wire, Short Circuit
12		Abnormality of Outlet Air Thermistor	
13		Abnormality of Freeze Protection Thermistor	
14		Abnormality of Gas Piping Thermistor	
15		Abnormality of Outdoor Air Thermistor (EconoFresh)	
16		Abnormality of Remote Sensor (DOAS)	
17		Abnormality of Thermistor Built-in Remote Controller (DOAS)	

Code	Category	Content of Abnormality	Leading Cause
18	Indoor Fan Motor	Abnormality of Indoor Fan System	Abnormality of Indoor Fan Motor (Step-Out), Indoor Fan Controller Failure
19		Activation of Protection Device for Indoor Fan	Fan Motor Overheat, Lockup
1A	Indoor Fan Controller	Abnormality of Fan Controller Fin Temperature	Abnormality of Fin Thermistor or Fan Controller, Heat Exchanger Clogging, Abnormality of Fan Motor
1b		Activation of Overcurrent Protection	Abnormality of Fan Motor
1C		Problem with Current Sensor	Abnormality of Fan Controller Current Sensor
1d		Activation Fan Controller Protection	Driver IC Error Signal Detection, Instantaneous Overcurrent
1E		Abnormality of Indoor Fan Controller Voltage	Indoor Voltage Decrease, Insufficient Capacity of Power Supply Wiring
21	Sensor on Outdoor Unit	Abnormality of High Pressure Sensor	Incorrect Wiring, Disconnecting Wiring, Breaking Wire, Short Circuit
22		Abnormality of Outdoor Air Thermistor	
23		Abnormality of Discharge Gas Thermistor on Top of Compressor	
24		Abnormality of Heat Exchanger Liquid Pipe Thermistor	
25		Abnormality of Heat Exchanger Gas Pipe Thermistor	
29		Abnormality of Low Pressure Sensor	
30	System	Incorrect Connection of Change-Over Box	Connection of Change-Over Box to Heat Pump System, Disconnection of Change-Over Box to Heat Recovery System
31		Incorrect Capacity Setting of Outdoor Unit and Indoor Unit	Incorrect Capacity Setting of Outdoor Unit and Indoor Unit, Excessive or Insufficient Indoor Unit Total Capacity Code
35		Incorrect Setting of Indoor Unit No.	Duplication of Indoor Unit No. In same Refrigerant Cycle Number
36		Incorrect of Indoor Unit Combination	Indoor Unit is Designed for R22
38		Abnormality of Picking up Circuit for Protection in Outdoor Unit	Failure of Protection Detecting Device (Incorrect Wiring of Outdoor PCB)
3A	Outdoor Unit	Abnormality of Outdoor Unit Capacity	Outdoor Unit Capacity > 432MBH
3b		Incorrect Setting of Outdoor Unit Models Combination or Voltage	Incorrect Setting of Main and Sub Units(s) Combination or Voltage
3d		Abnormal Communication between Main Unit and Sub Unit(s)	Incorrect Wiring, Disconnect Wire, Breaking Wire, PCB Failure
3E		Abnormal Combination between Inverter PCB and Outdoor PCB	Incorrect Combination between Inverter PCB and Outdoor PCB
43	Protection Device	Activation of Pressure Ratio Decrease Protection	Defective Compression (Failure of Compressor or Inverter, Loose Power Supply Connection)
44		Activation of Low Pressure Increase Protection	Overload at Cooling, High Temperature at Heating, Expansion Valve Locking at Open Position (Loose Connector)
45		Activation of High Pressure Increase Protection	Overload Operation (Heat Exchanger Clogging, Short Circuit of Airflow), Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing
47		Activation of Low Pressure Decrease Protection	Insufficient Refrigerant, Piping Clogging, Expansion Valve Locking at Close Position (Loosen Connector)
48		Activation of Inverter Overcurrent Protection	Overload Operation, Compressor Failure
51	Sensor	Abnormal Inverter Current Sensor	Current Sensor Failure
53	Inverter	Inverter Error Signal Detection	Driver IC Error Signal Detection (Protection for Overcurrent, Voltage Decrease, Short Circuit), Instantaneous Overcurrent
54		Abnormality of Inverter Fin Temperature	Abnormal Inverter Fin Thermistor, Heat Exchanger Clogging, Fan Motor Failure
55		Inverter Failure	Inverter PCB Failure

Code	Category	Content of Abnormality	Leading Cause
57	Fan Controller	Activation of Fan Controller Protection	Driver IC Error Signal Detection (Protection for Overcurrent, Voltage Decrease, Short Circuit), Instantaneous Overcurrent
5A		Abnormality of Fan Controller Fin Temperature	Fin Thermistor Failure, Heat Exchanger Clogging, Fan Motor Failure
5b		Activation of Overcurrent Protection	Fan Motor Failure
5C		Abnormality of Fan Controller Sensor	Failure of Current Sensor (Instantaneous Overcurrent, Increase of Fin Temperature, Voltage Decrease, Grand Fault, Step-Out)
A1	External Input	Detection of External Abnormality	Input Signal by External Abnormality Detection Setting
b0	Indoor Unit	Incorrect Setting of Unit Model Code	Incorrect Setting of Indoor Unit Model
b1		Incorrect Setting of Unit and Refrigerant Cycle Number	64 or More Number is Set for Address or Refrigerant Cycle
b2		Abnormality of EEPROM	EEPROM failure, Incorrect Data of EEPROM
b5		Incorrect Indoor Unit No. Setting	There are 17 or More Non-Corresponding to H-LINK II Units are Connected to One System.
b6		Abnormal Communication between Indoor PCB and Indoor Fan Controller	Communication Failure, Disconnected Communication Cable, Abnormal Connection
C1	Change-Over Box	Incorrect Change-Over Box Connection	2 or More Change-Over Boxes are Connected between Outdoor Unit and Indoor Unit
C2		Incorrect Indoor Unit Connection Number	9 or More I.U. Connected to Single Branch Type Change-Over Box, 7 or More I.U. Connected per a branch of Multiple Branch Type Change-Over Box
C3		Incorrect Indoor Unit Refrigerant Number Setting	Indoor Units of Different Refrigerant Cycle Number are Connected to Change-Over Box
C5		Incorrect Connection Port Setting	Indoor Unit is connected to a port that is set to not used for Multiple Branch Type Change-Over Box
EE	Compressor	Compressor Protection Alarm (It can not be reset from Wired Controller)	This alarm code appears when the following alarms* occurs three times within 6 hours. *02, 07, 08, 39, 43 to 45, 47

(C) Cause of Indoor Unit Stoppage

Code	Cause	Code	Cause
0	Operation OFF, Power OFF	16	Retry due to Decrease of Discharge Gas Superheat
1	Thermo-OFF		
2	Alarm (Not always indicated)	17	Retry due to Inverter Tripping
3	Freeze Protection, Overheating Protection	18	Retry due to Voltage Decrease/ Increase, Other Retry of Inverter
5	Instantaneous Power Failure at Outdoor Unit	19	Expansion Valve Opening Difference Protection
6	Instantaneous Power Failure at Indoor Unit	21	Forced Thermo-OFF for Oil Return
7	Stoppage of Cooling Operation due to High/Low Outdoor Air Temperature Stoppage of Heating Operation due to High Outdoor Air Temperature	22	Enforced Thermo-OFF for Hot Start Control at Crankcase Heater Preheating
		26	Retry due to High Pressure Decrease
9	Stoppage of Reversing Valve Switching Control	28	Stoppage due to Outlet Temperature Decrease in Cooling
10	Demand Enforced Stoppage	30	Stoppage of Thermo-OFF due to Compressor Excepting
11	Retry due to Pressure Ratio Decrease		
12	Retry due to Low Pressure Increase	32	Retry due to Abnormal Communication of Outdoor Unit
13	Retry due to High Pressure Increase	34	Stoppage of Thermo-OFF by Motion Sensor
15	Retry due to Discharge Gas Temperature Increase, Retry due to Low Pressure Decrease	36	Retry after Defrosting Operation
		39	Stoppage of Thermo-OFF due to Power Saving Control

Cancellation of Enforced Thermo-OFF
Press PSW5 for more than 3 seconds.
This function may damage compressor.
Use this function only in unavoidable conditions.

* 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.

(D) Cause of Inverter Stoppage

Code	Cause
1	Driver Circuit Error Signal Detection
2	Instantaneous Overcurrent
3	Inverter Fin Temp. Increase
4	Electronic Thermal Protection (Inverter Overcurrent)
5	Inverter Voltage Decrease
6	Inverter Voltage Increase
8	Abnormal Current Sensor
9	Instantaneous Power Failure Detection
11	Micro Computer Reset
12	Ground Fault Detection
13	Open-Phase Detection
16	Inverter Malfunction
17	Abnormal Control (Abnormal Inrush Current Prevention Circuit)
18	Forced Stoppage by High Pressure Detection
19	Abnormality of Picking up Circuit for Protection
21	Abnormal Compressor Motor (Step-Out)
22	Abnormal Combination of PCB

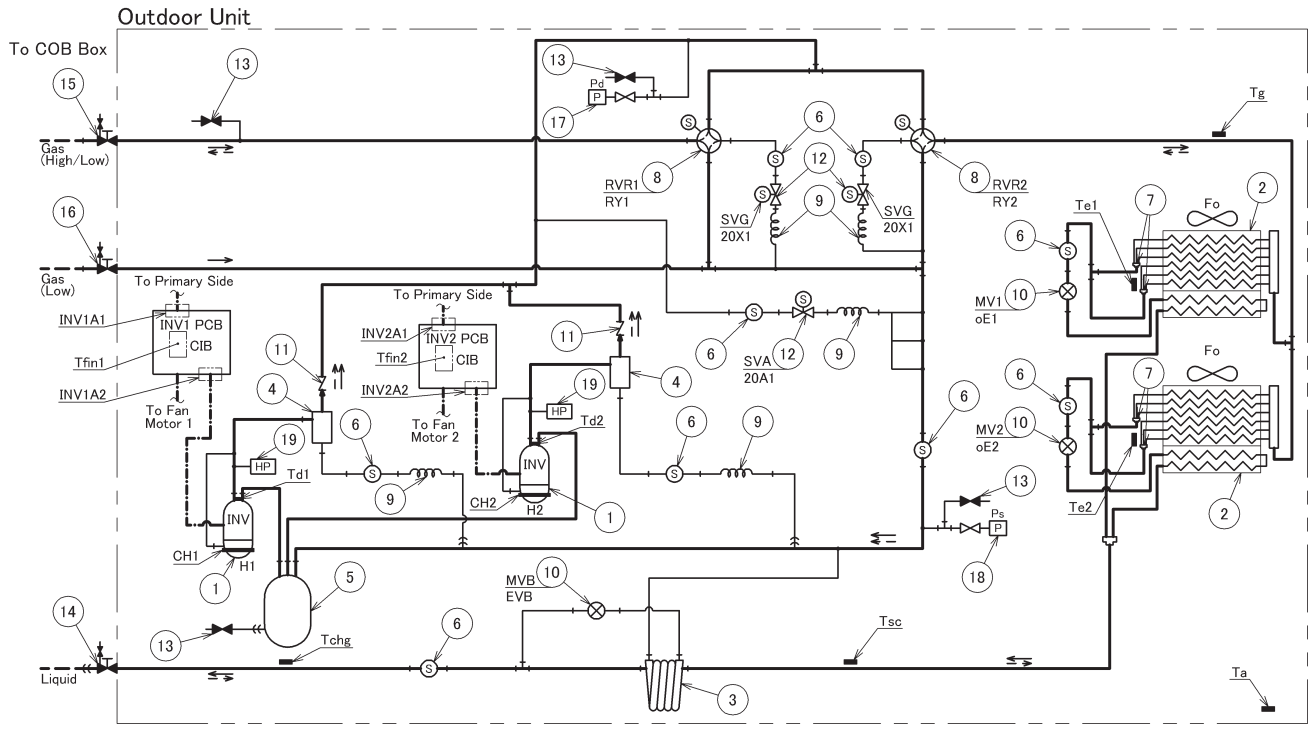
(E) Cause of Fan Controller Stoppage

Code	Cause
1	Driver Circuit Error Signal Detection
2	Instantaneous Overcurrent
3	Fan Controller Fin Temp. Increase
4	Electronic Thermal Protection (Overcurrent)
8	Abnormal Current Sensor
12	Ground Fault Detection
15	Reverse Driving
16	Fan Controller Malfunction
21	Abnormal Fan Motor (Step-Out)
25	Abnormal Instruction Frequency

3.1.7 Checking Using Service Checker

(1) Service Checker Display Items

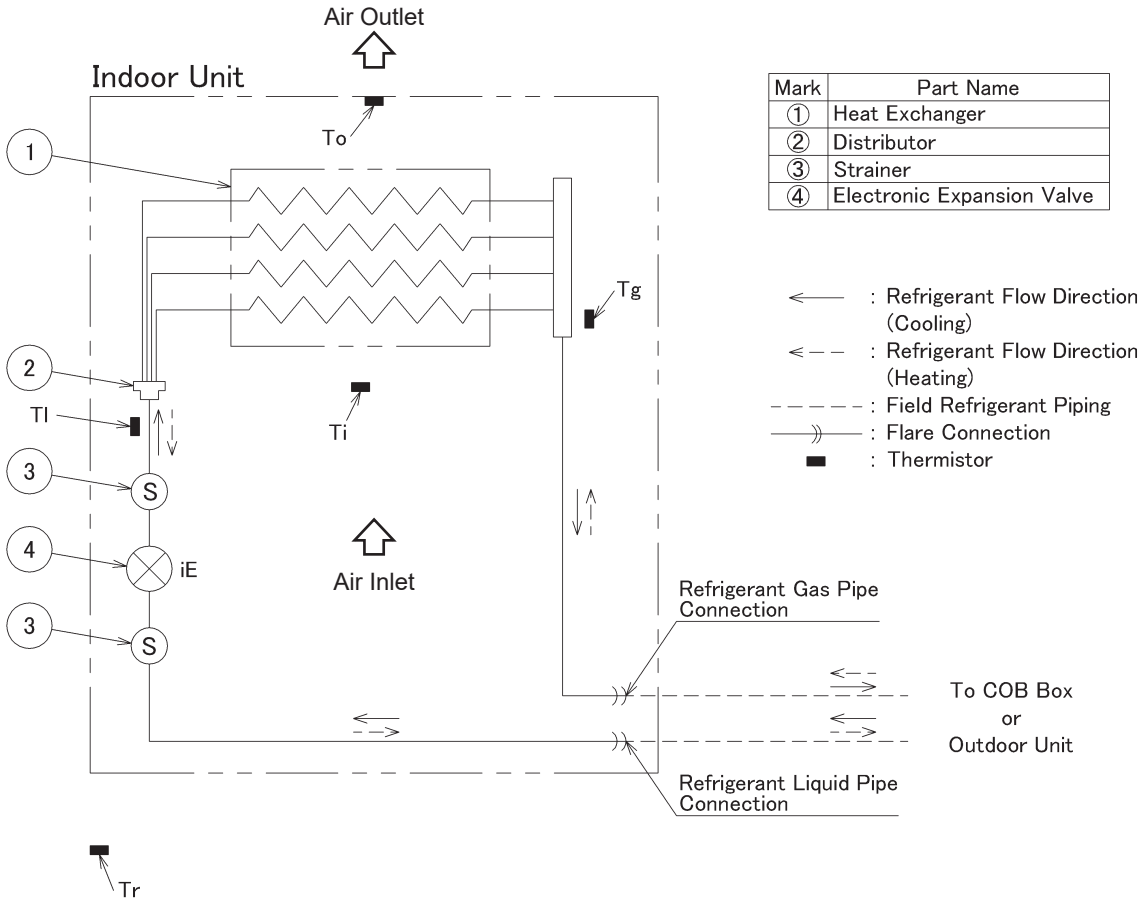
Outdoor Unit
The following examples illustrate 14RT and 16RT.



: Refrigerant Flow Direction (Cooling)
: Refrigerant Flow Direction (Heating)
: Field Refrigerant Piping
: Flare Connection
: Brazing Connection
: Thermistor
: Internal Wiring

Mark	Part Name
①	Compressor
②	Heat Exchanger
③	Double Tube Type Heat Exchanger
④	Oil Separator
⑤	Accumulator
⑥	Strainer
⑦	Distributor
⑧	Reversing Valve
⑨	Capillary Tube
⑩	Electronic Expansion Valve
⑪	Check Valve
⑫	Solenoid Valve
⑬	Access Port
⑭	Stop Valve for Liquid Line
⑮	Stop Valve for (High/Low) Line
⑯	Stop Valve for (Low) Line
⑰	Sensor for Refrigerant Pressure (High Pressure Sensor)
⑱	Sensor for Refrigerant Pressure (Low Pressure Sensor)
⑲	High Pressure Switch for Protection

Indoor Unit



Mark	Part Name
①	Heat Exchanger
②	Distributor
③	Strainer
④	Electronic Expansion Valve

Items in the following table can be identified from the service checker.

Outdoor Unit Information 1

Indication	Description
Alarm Date	Alarm Detection Date
Alarm Time	Alarm Detection Time
Alarm REC No.	Data Record No. at Alarm Detection Record
U.No.	Unit Number
Cycle State	Cycle State (Stop/Cooling/Heating/Defrost)
Run State	Operation State
HEX State	Heat Exchanger State
For Defrost	Preparation for Defrost/Normal
Test Run	Test Run/Normal
Emergency Run	Emergency Operation/Normal
Pro.Code	Protection Code
Pro.Level	Protection Level
INV1 Code	Inverter 1 Stop Reason Code
INV1 State	Inverter 1 Operation State
INV2 Code	Inverter 2 Stop Reason Code
INV2 State	Inverter 2 Operation State
FANCON1 Code	FANCON1 Stop Reason Code
FANCON1 State	FANCON1 Operation State
FANCON2 Code	FANCON2 Stop Reason Code
FANCON2 State	FANCON2 Operation State
Comp1 Run Time	Compressor 1 Operation Time (hr)
Comp2 Run Time	Compressor 2 Operation Time (hr)
Comp1 Mainte	Operation Time since Compressor 1 Maintenance (hr) (Operation time since reset)
Comp2 Mainte	Operation Time since Compressor 2 Maintenance (hr) (Operation time since reset)
FAN1 Valid Power	FANCON1 Valid Power (W)
FAN2 Valid Power	FANCON2 Valid Power (W)
H1	Inverter 1 Compressor Frequency (Hz)
H2	Inverter 2 Compressor Frequency (Hz)
Fo	Outdoor Fan Step
oE1	Expansion Valve (MV1) Opening (%)
oE2	Expansion Valve (MV2) Opening (%)
EVB	Bypass Expansion Valve (MVB) Opening (%)
EVD1	-
EVD2	-
Pd	Discharge Gas Pressure (psi/MPa)
Ps	Suction Gas Pressure (psi/MPa)
Td1	Discharge Gas Temp. for Compressor 1 (°F/°C)
Td2	Discharge Gas Temp. for Compressor 2 (°F/°C)
Td	Discharge Gas Average Temp. (°F/°C) (When stopped: Td = Td1)
TdSH	Discharge Gas Superheat (°F/°C)
Tsc	Subcooler Temp. (°F/°C)
Te1	Evaporation Liquid Line Temp. (°F/°C)
Te2	Evaporation Liquid Line Temp. (°F/°C)
Tchg	Liquid Stop Valve Temp. (°F/°C)
Ta	Outdoor Ambient Temp. (Ta) (°F/°C)
Tfin1	Inverter 1 Fin Temp. (°F/°C)
Tfin2	Inverter 2 Fin Temp. (°F/°C)
Tg1	Evaporation Gas Line Temp. (Tg) (°F/°C)
Tg2	-
Ts	-
INV1A2	Inverter Compressor 1 Secondary Current (A)
INV1A1	Inverter Compressor 1 Primary Current (A)
INV2A2	Inverter Compressor 2 Secondary Current (A)
INV2A1	Inverter Compressor 2 Primary Current (A)
ROM No	Outdoor Unit Control PCB (PCB1) ROM No.

Outdoor Unit Information 2

Indication	Description
i1ROM No	Inverter 1 PCB (INV1) ROM No.
i2ROM No	Inverter 2 PCB (INV2) ROM No.
C11	Compression Ratio Reduction Prevention Restricted Control
C13	High Pressure Increase Prevention Restricted Control
C14	Inverter Module Temp. Increase Prevention Restricted Control
C15	Td Increase Prevention Restricted Control
C16	TdSH Reduction Prevention Restricted Control
C17	Overcurrent Prevention Restricted Control
RY1	Relay for Inverter Compressor 1
RY2	Relay for Inverter Compressor 2
CH1	Relay for Crankcase Heater 1
CH2	Relay for Crankcase Heater 2
Y211	Relay for Reversing Valve 1 (RVR1)
Y212	Relay for Reversing Valve 2 (RVR2)
20A1	Relay for Solenoid Valve (to bypass high/low pressure) (SVA)
20B	-
20C	-
20F	-
20X1	Relay for Solenoid Valve (for blocking high/low pressure) (SVG)
20X2	-
20CHG	Low Ambient Kit (ON: Close)
Info1	Control Information 1
Info2	Control Information 2
Info3	Control Information 3
Info4	Control Information 4

Indoor Unit Information

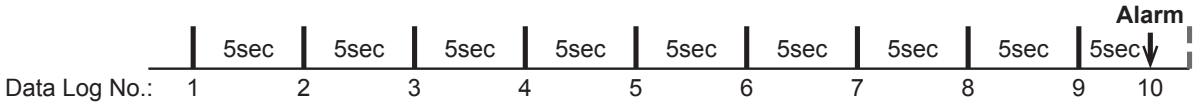
Indication	Description
Sys. No.	System Number
Unit No.	Unit Number
Model	Model Type
Hp	Horse Power
Run/Stop	Operation/Stop
Test Run/No	Test Run/Normal Operation
Run Mode	Operation Mode (Heating/Cooling/Dry/Fan)
Thmo.On	Thermo (On/Off)
Oil Return	Oil Return Control
Air	Airflow Speed (High/Medium/Low/Slow)
iE	Expansion Valve Opening (%) (MV)
Tl	Liquid Pipe Temp. (°F/°C)
Tg	Gas Pipe Temp. (°F/°C)
Ti	Inlet Air Temp. (°F/°C)
To	Outlet Air Temp. (°F/°C)
dT	Inlet and Outlet Air Temp. Difference [Ti-To] (°F/°C)
Ts	Temp. Setpoint (°F/°C)
Setting Adju	Temp. Setpoint Adjusting Value (-4 to 7°F / -2 to 4°C)
Tr	Remote Sensor Temp. (°F/°C)
fd	Requested Frequency (Hz)
d1	Unit Stop Reason
Alarm	Alarm Code
Op1	Optional Setting 1: Room Thermostat
Op2	Optional Setting 2: Cancellation of Heating Setting Temp. Adjustment
Op3	Optional Setting 3: HA Control
Op4	Optional Setting 4: Remote Power On/Off by Mode 1 or Mode 2
Op5	Optional Setting 5: Remote Power On/Off by Pulse
Op6	Optional Setting 6: Circulator During Heating
Op7	Optional Setting 7: Electric Heater Heating for Cooling Only Unit
Op8	Optional Setting 8: Compressor Off by 3-Minute Guard
Rmt.Cont.	Wired Controller Connection

(2) Alarm Log Tracking Function of Service Checker

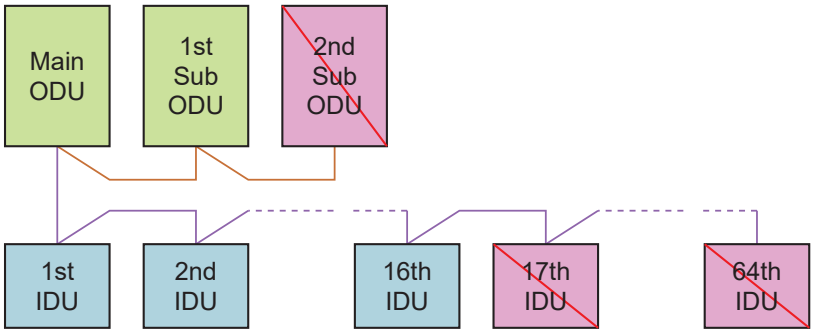
This function works with compatible service checker PSH-4 connected to Control PCB of outdoor unit. Recorded alarm log data of outdoor unit can be collected.
Refer to the manuals of service checker for details.

- Outline of the Function
  With this function, operation data just before unit stoppage by alarm activation can be collected to analyze more details for the cause identification.

(a) In case of main outdoor unit stop with alarm, 10 operation data logs up to the alarm timing with 5 seconds interval are recorded in EEPROM on the Control PCB of main outdoor unit.



(b) Example of system connection is shown in the figure below. Operation data of the main outdoor unit, the first sub outdoor unit and the first 16 indoor units are recorded.



- Service Checker Display Items
  Items in the following table can be identified from the service checker.

Outdoor Unit Information 1

Indication	Description
Alarm Output Date	Alarm Output Date
Alarm Output Time	Alarm Output Time
Alarm Code	Alarm Code
U.No.	Unit Number
Cycle State	Cycle State (Stop/Cooling/Heating/Defrost)
Run State	Operation State
HEX State	Heat Exchanger State
Pro.Code	Protection Code
Pro.Level	Protection Level
H1	Inverter 1 Compressor Frequency (Hz)
H2	Inverter 2 Compressor Frequency (Hz)
Fo	Outdoor Fan Step
oE1	Expansion Valve (MV1) Opening (%)
oE2	Expansion Valve (MV2) Opening (%)
EVB	Bypass Expansion Valve (MVB) Opening (%)
Pd	Discharge Gas Pressure (psi/MPa)
Ps	Suction Gas Pressure (psi/MPa)
Td1	Discharge Gas Temp. for Compressor 1 (°F/°C)
Td2	Discharge Gas Temp. for Compressor 2 (°F/°C)
Tsc	Subcooler Temp. (°F/°C)

Outdoor Unit Information 2

Indication	Description
Te1	Evaporation Liquid Line Temp. (Te1) (°F/°C)
Te2	Evaporation Liquid Line Temp. (Te2) (°F/°C)
Tchg	Liquid Stop Valve Temp. (°F/°C)
Ta	Outdoor Ambient Temp. (Ta) (°F/°C)
Tfin1	Inverter 1 Fin Temp. (°F/°C)
Tfin2	Inverter 2 Fin Temp. (°F/°C)
Tg1	Evaporation Gas Line Temp. (Tg) (°F/°C)
INV1A2	Inverter Compressor 1 Secondary Current (A)
INV1A1	Inverter Compressor 1 Primary Current (A)
INV2A2	Inverter Compressor 2 Secondary Current (A)
INV2A1	Inverter Compressor 2 Primary Current (A)
TdSH1	Discharge Gas Superheat for Compressor 1 (°F/°C)
TdSH2	Discharge Gas Superheat for Compressor 2 (°F/°C)
C11	Compression Ratio Reduction Prevention Restricted Control
C13	High Pressure Increase Prevention Restricted Control
C14	Inverter Module Temp. Increase Prevention Restricted Control
C15	Td Increase Prevention Restricted Control
C16	TdSH Reduction Prevention Restricted Control
C17	Overcurrent Prevention Restricted Control
RY1	Relay for Inverter Compressor 1
RY2	Relay for Inverter Compressor 2
CH1	Relay for Crankcase Heater 1
CH2	Relay for Crankcase Heater 2
Y211	Relay for Reversing Valve 1 (RVR1)
Y212	Relay for Reversing Valve 2 (RVR2)
20A1	Relay for Solenoid Valve (to bypass high/low pressure) (SVA)
20B	-
20C	-
20F	-
20X1	Relay for Solenoid Valve (for blocking high/low pressure) (SVG)
20X2	-
20CHG	-

Indoor Unit Information

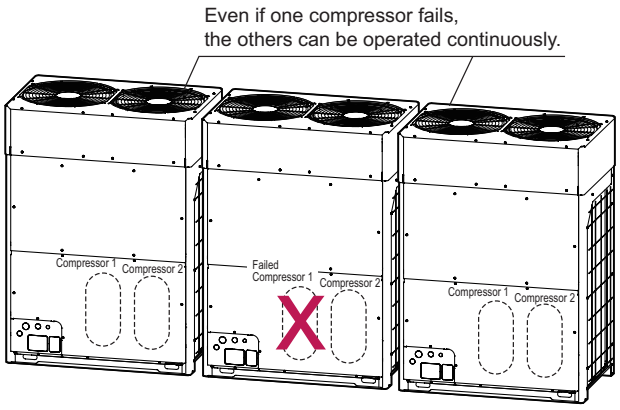
Indication	Description
Unit No.	Unit Number
Run/Stop	Operation/Stop
Run Mode	Operation Mode (Heating/Cooling/Dry/Fan)
Thmo.On	Thermo (On/Off)
Air	Airflow Speed (High/Medium/Low/Slow)
iE	Expansion Valve Opening (%) (MV)
Tl	Liquid Pipe Temp. (°F/°C)
Tg	Gas Pipe Temp. (°F/°C)
Ti	Inlet Air Temp. (°F/°C)
To	Outlet Air Temp. (°F/°C)
dT	Inlet and Outlet Air Temp. Difference [Ti-To] (°F/°C)
d1	Unit Stop Reason

3.1.8 Emergency Operation

(1) Emergency Mode Operation from Wired Controller
((H,Y)VAHR120B(3,4,5)2S to (H,Y)VAHR432B(3,4,5)2S)

If the compressor fails, an emergency operation mode is accessible by the wired controller. Even if the compressor fails, some of the air conditioning operation continues until troubleshooting is performed. This Backup Operation Function prevents the system from coming to a complete stop when the outdoor unit failure occurs.
Emergency operation starts with the wired controller after an alarm occurrence.

NOTE:
The emergency operation can be performed when the specified alarm code occurs.
Refer to the following “Emergency Operation Procedure”.



Emergency Alarm Codes

Following these alarm codes, emergency operation is possible.

Inverter Compressor Failure

- 06: Abnormality of Inverter Voltage
- 23: Abnormality of Discharge Gas Thermistor
- 48: Activation of Overcurrent Protection Device
- 51: Abnormality of Inverter Current Sensor
- 53: Inverter Error Signal Detection
- 54: Abnormality of Inverter Fin Temperature

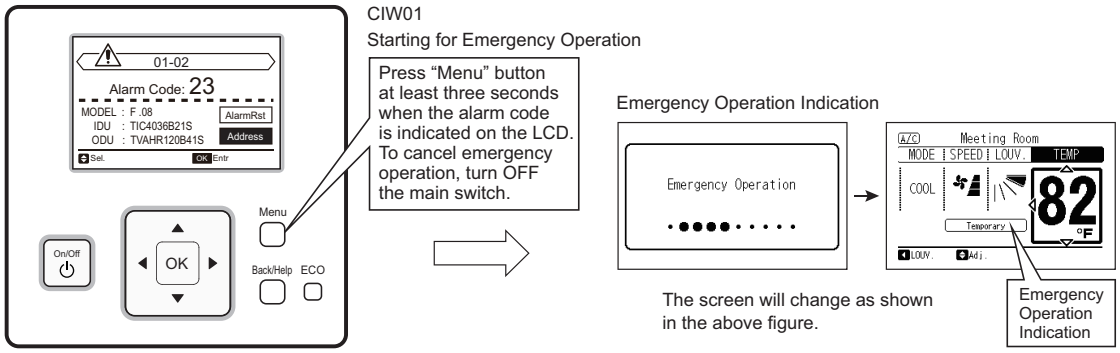
⚠CAUTION

Do not perform emergency operation more than eight hours. Going beyond that may damage the unit.

(a) Emergency Operation Procedure

For CIW01

By pressing “MENU” for three seconds, emergency operation starts.
“Temporary” is displayed on the LCD during this operation.



(b) Operation Condition

This emergency operation is NOT applicable to the compressors installed in the failed outdoor unit.

NOTE:
When an auxiliary heater is connected to the indoor unit and the emergency heat control is operating, there are restrictions to emergency operation from the wired controller (CIW01).

1. During emergency heat control operation, emergency heating is conducted by the auxiliary heater, and the emergency operation cannot be activated from the wired controller.
   To activate the emergency operation, change the setting on the PCB of the outdoor unit in accordance with Section 3.1.8 “(2) Emergency Mode Operation from Outdoor Unit PCB for Compressor Failure”.
2. There is an automatic cooling and heating operation which changes cooling and heating operation depending on room temperature and setpoint on the wired controller.
   During the automatic cooling and heating operation, emergency heating is conducted by the auxiliary heater as described in no.1, and the emergency operation cannot be activated.
   In case the operation is changed from automatic cooling and heating operation to cooling operation, the emergency operation can be activated from the wired controller.
   However in case the automatic cooling and heating operation is changed to heating operation, emergency heating is conducted by the auxiliary heater as described in no.1, and the emergency operation cannot be activated.

⚠CAUTION

- **Emergency operation is available only when the alarm codes above (*) are indicated.**
- **The emergency operation is not available for malfunction of the inverter PCB or fan controller.**
- **This emergency operation is not a normal operation but a temporary operation until qualified service personnel arrive. If the alarm is indicated again during the emergency operation, the alarm cannot be canceled.**
- **Do not perform an emergency operation for more than eight hours. Otherwise, the unit may be damaged.**

(2) Emergency Mode Operation from Outdoor Unit PCB for Compressor Failure

For Combination of Outdoor Units
((H,Y)VAHR216B(3,4,5)2S to (H,Y)VAHR432B(3,4,5)2S)

Alarms Corresponding to Inverter Compressor Failure

06: Abnormality of Inverter Voltage
23: Abnormality of Discharge Gas Thermistor
48: Activation of Overcurrent Protection Device
51: Abnormality of Inverter Current Sensor
53: Inverter Error Signal Detection
54: Abnormality of Inverter Fin Temperature

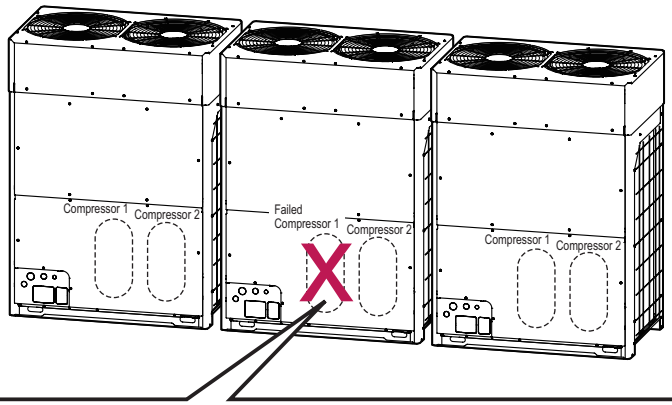
(a) Emergency Mode Operation Procedures

1. Turn OFF all the main switches of the outdoor and indoor units.
2. Disconnect the inverter compressor wiring of the inverter PCB (INV1 or INV2). (Insulate the disconnected terminals.)
3. Stop operation of the failed compressor by setting DSW5 on the PCB1 of outdoor unit as follows.

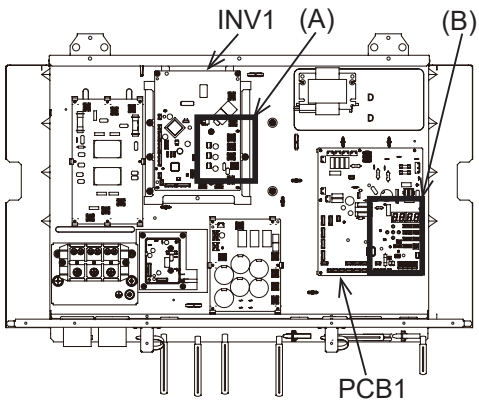
Failed Compressor No.	DSW Setting
Compressor No.1	Turn ON DSW5-No.1 pin.
Compressor No.2	Turn ON DSW5-No.2 pin.

4. Turn ON the power supply.
5. Start the operation with the wired controller.

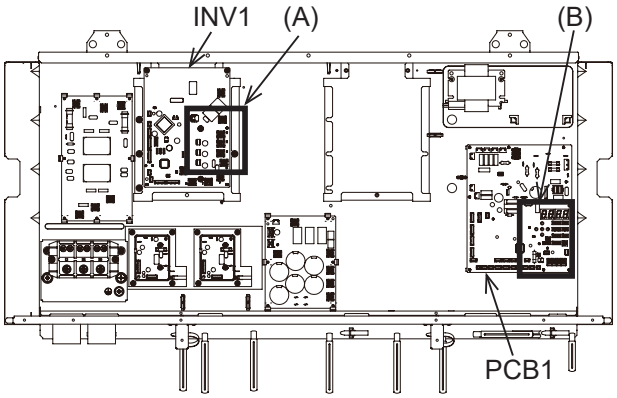
● 208/230V Type



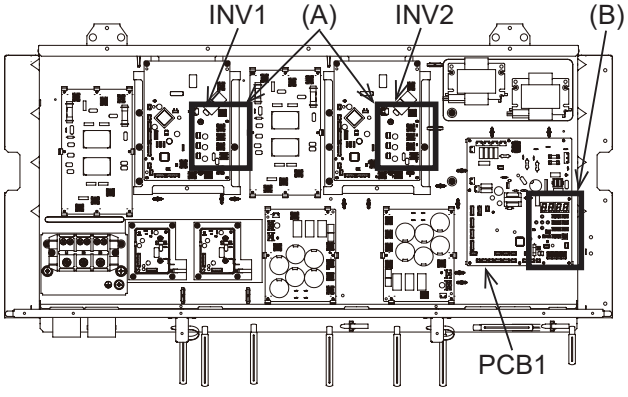
(H,Y)VAHR072B32S



(H,Y)VAHR096B32S

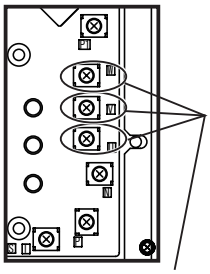


(H,Y)VAHR120~192B32S



(A) Part

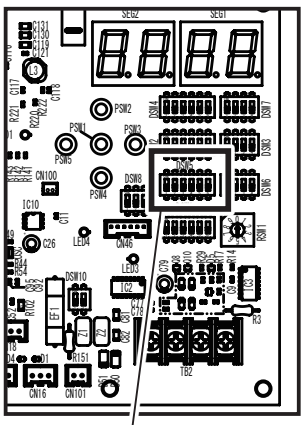
Inverter PCB (INV1 or INV2)



Terminals of Inverter Compressor Wiring (3 pcs.)

(B) Part

Outdoor Unit PCB (PCB1)

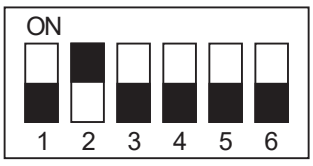


Inverter Compressor 1 Failure

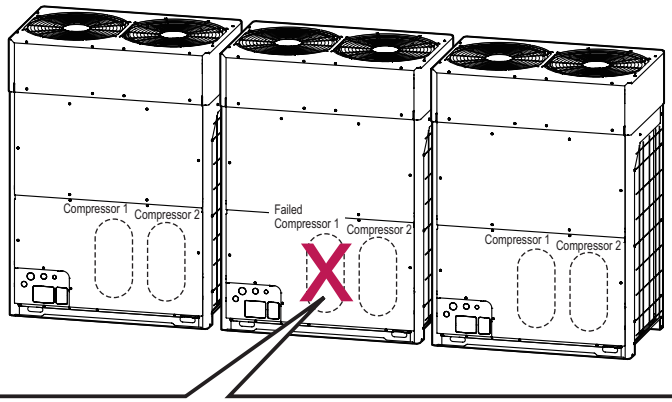
DSW5

Inverter Compressor 2 Failure

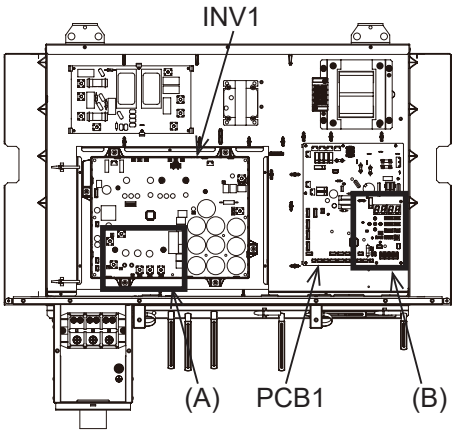
DSW5



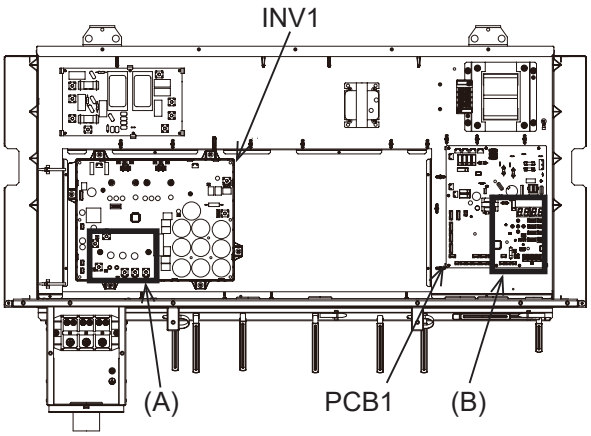
● 460V Type, 575V Type



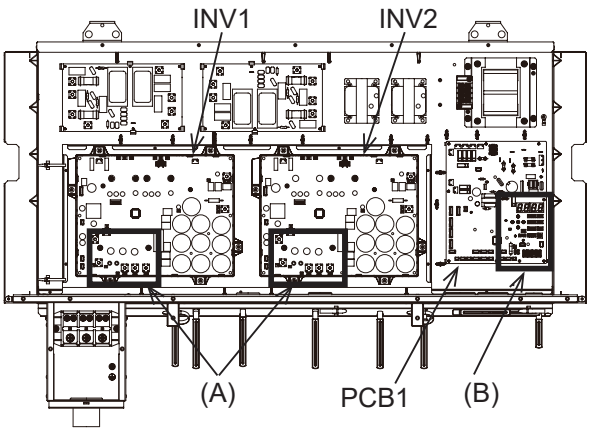
(H,Y)VAHR072B(4,5)2S



(H,Y)VAHR096B(4,5)2S

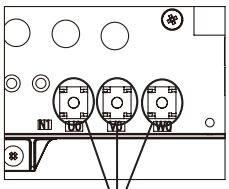


(H,Y)VAHR120~192B(4,5)2S



(A) Part

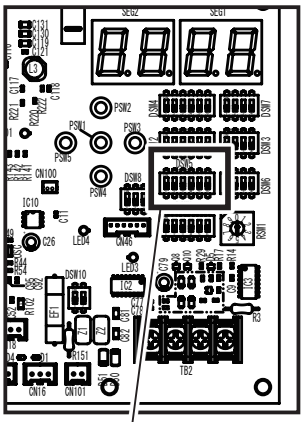
Inverter PCB (INV1 or INV2)



Terminals of Inverter Compressor Wiring (3 pcs.)

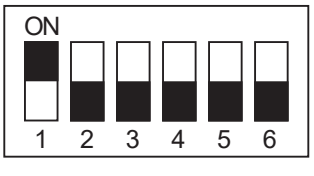
(B) Part

Outdoor Unit PCB (PCB1)



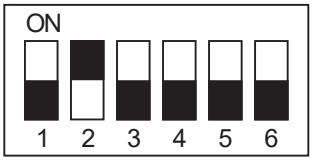
Inverter Compressor 1 Failure

DSW5



Inverter Compressor 2 Failure

DSW5



⚠CAUTION

- **Measure the insulation resistance of the malfunctioning compressor.**
  Do not perform the emergency operation when the insulation resistance is 0Ω.
  The other compressors may be damaged because there is a possibility that refrigerant oil is oxidized.
- **In this emergency operation, compressor frequency cannot be controlled normally.**
  Therefore, an alarm code "07", "43", "44", "45" or "47" may display on the LCD.
- **This emergency operation may not provide sufficient cooling and heating capacity.**
- **This operation is a temporary emergency operation when the compressor is damaged. Therefore, replace it with a new one as soon as possible.**
- **Turn OFF DSW5-No.1 and No.2 of the outdoor unit PCB after replacing the compressor.**
  If this setting is not performed, the compressor will be damaged.

For Outdoor Unit without Combination
((H,Y)VAHR120B(3,4,5)2S to (H,Y)VAHR192B(3,4,5)2S)

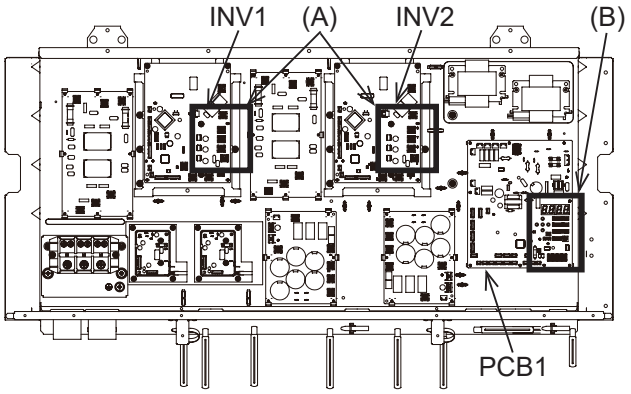
Alarms Corresponding to Inverter Compressor Failure

06: Abnormality of Inverter Voltage
23: Abnormality of Discharge Gas Thermistor
48: Activation of Overcurrent Protection Device
51: Abnormality of Inverter Current Sensor
53: Inverter Error Signal Detection
54: Abnormality of Inverter Fin Temperature

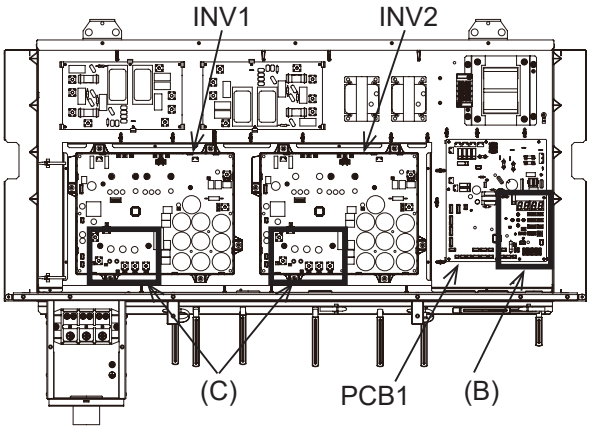
(a) Emergency Mode Operation Procedures

1. Turn OFF all the main switches of outdoor and indoor units.
2. Disconnect the inverter compressor wiring of the inverter PCB (INV1 or INV2).
   (Insulate the disconnected terminals.)
3. Turn DSW5-No.1 or No.2 ON to stop the inverter compressor operation. Not all the compressors in the failed outdoor unit will stop operation. If two compressors are stopped simultaneously, the stoppage cause is supposed to be d1-30 (retry by stopping two of the compressors).
4. Turn ON the power supply.
5. Start the operation with the wired controller.

● 208/230V Type

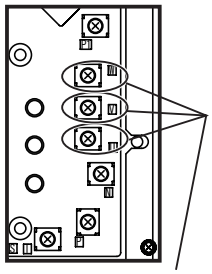


● 460V Type, 575V Type



(A) Part

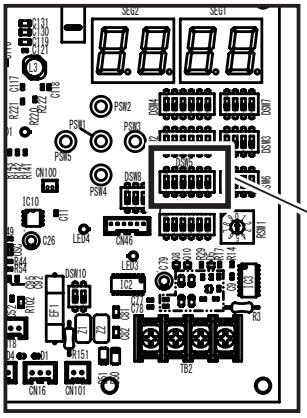
Inverter PCB (INV1 or INV2)



Terminals of Inverter Compressor Wiring (3 pcs.)

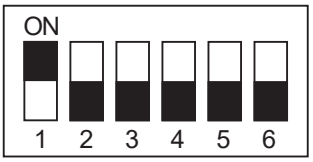
(B) Part

Outdoor Unit PCB (PCB1)



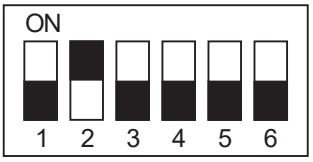
Inverter Compressor 1 Failure

DSW5



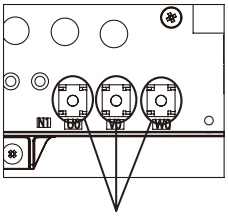
Inverter Compressor 2 Failure

DSW5



(C) Part

Inverter PCB (INV1 or INV2)



Terminals of Inverter Compressor Wiring (3 pcs.)

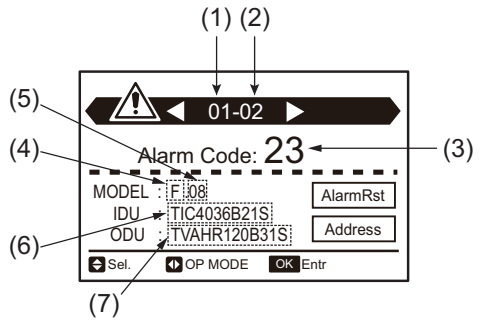
⚠CAUTION

- **Measure the insulation resistance of a failed compressor.**
  Do not perform an emergency operation when the insulation resistance is 0Ω.
  The other compressors may be damaged because there is a possibility that refrigerant oil is oxidized.
- **In this emergency operation, compressor frequency cannot be controlled normally.**
  Therefore, an alarm code "07", "43", "44", "45" or "47" may display on the LCD.
- **This emergency operation may not provide sufficient cooling and heating capacity.**
- **This operation is a temporary emergency operation when the inverter compressor is damaged.**
  Therefore, replace it with the new one as soon as possible.
- **Turn OFF DSW5-No.1 and No.2 of the outdoor unit PCB after replacing the compressor.**
  If this setting is not performed, the inverter compressor will be damaged.

3.2 Troubleshooting Procedures

● Alarm Code Indication of Wired Controller

< CIW01 >



(1) Refrigerant Cycle 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” or “Y”. (Except for the wall mount model.)
When there is a combination of outdoor units, ODU indication is the model of the main outdoor unit (Unit A).
3: The model names are not indicated depending on the unit type.

3.2.1 Alarm Code Table

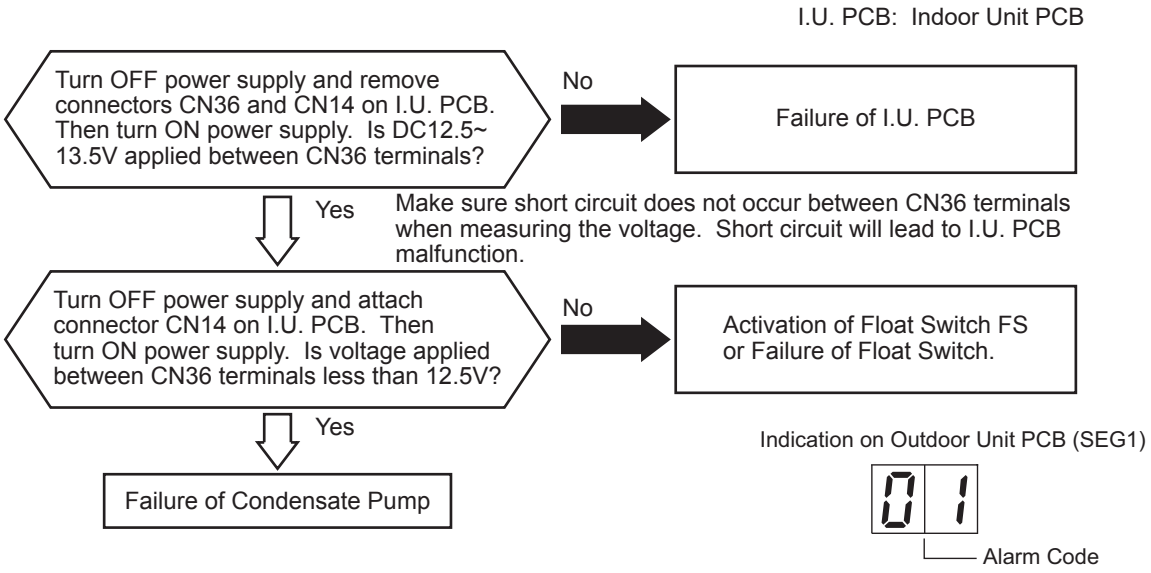
Refer to Section 3.1.6 (2)-(B) “Alarm Code Table”.

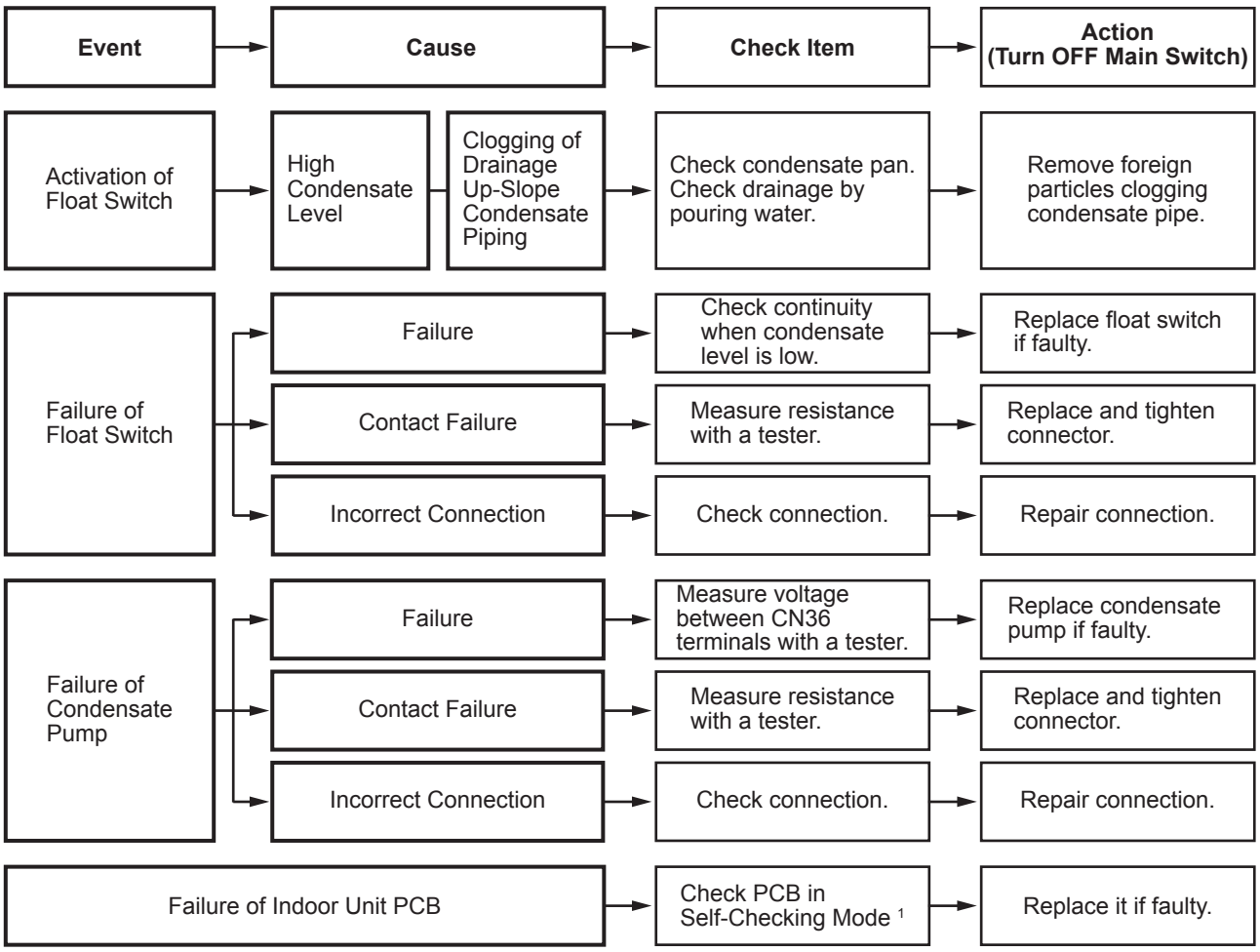
3.2.2 Troubleshooting Using Alarm Codes

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

- 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 indoor unit number and alarm code are flashed on the 7-segment display of the outdoor unit PCB.
  Note 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) above for details.

Alarm Code	Activation of Protection Device in Outdoor Unit

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 outdoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

This alarm code is displayed when the high pressure switch (PSH) is activated during the compressor operation (RY is turned ON).

■ 208/230V Type

O.U. PCB: Outdoor Unit PCB (PCB1)

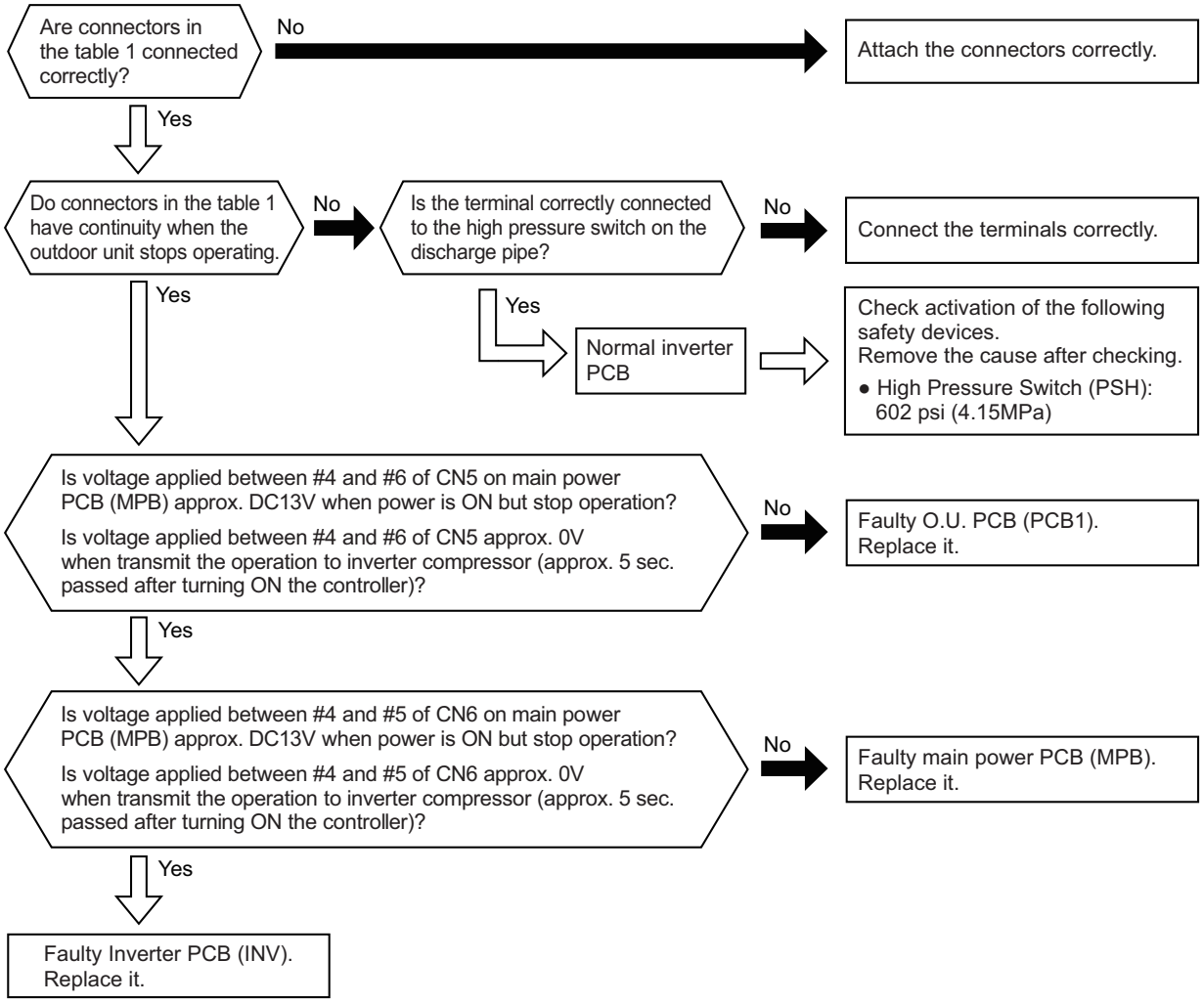


Table 1. Connector Number

PCB	Main Power PCB (MPB)	
Connector	CN5	CN6
Pin No.	#4, #6	#4, #5

■ 460V Type, 575V Type

O.U. PCB: Outdoor Unit PCB (PCB1)

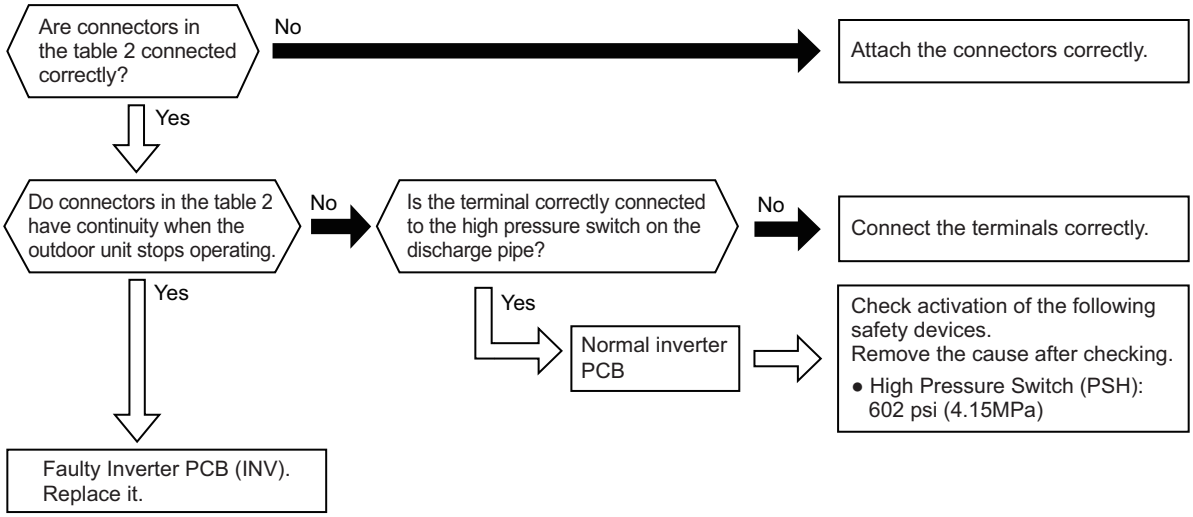
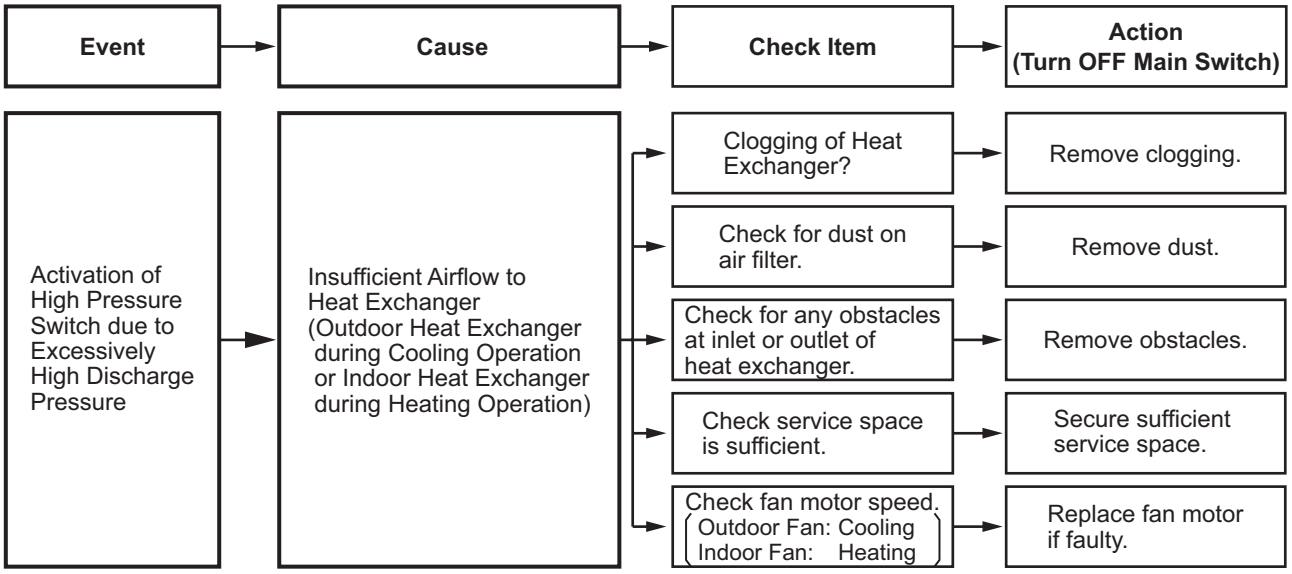


Table 2. Connector Number

PCB	Inverter PCB (INV)
Connector	PCN2
Pin No.	#1, #3

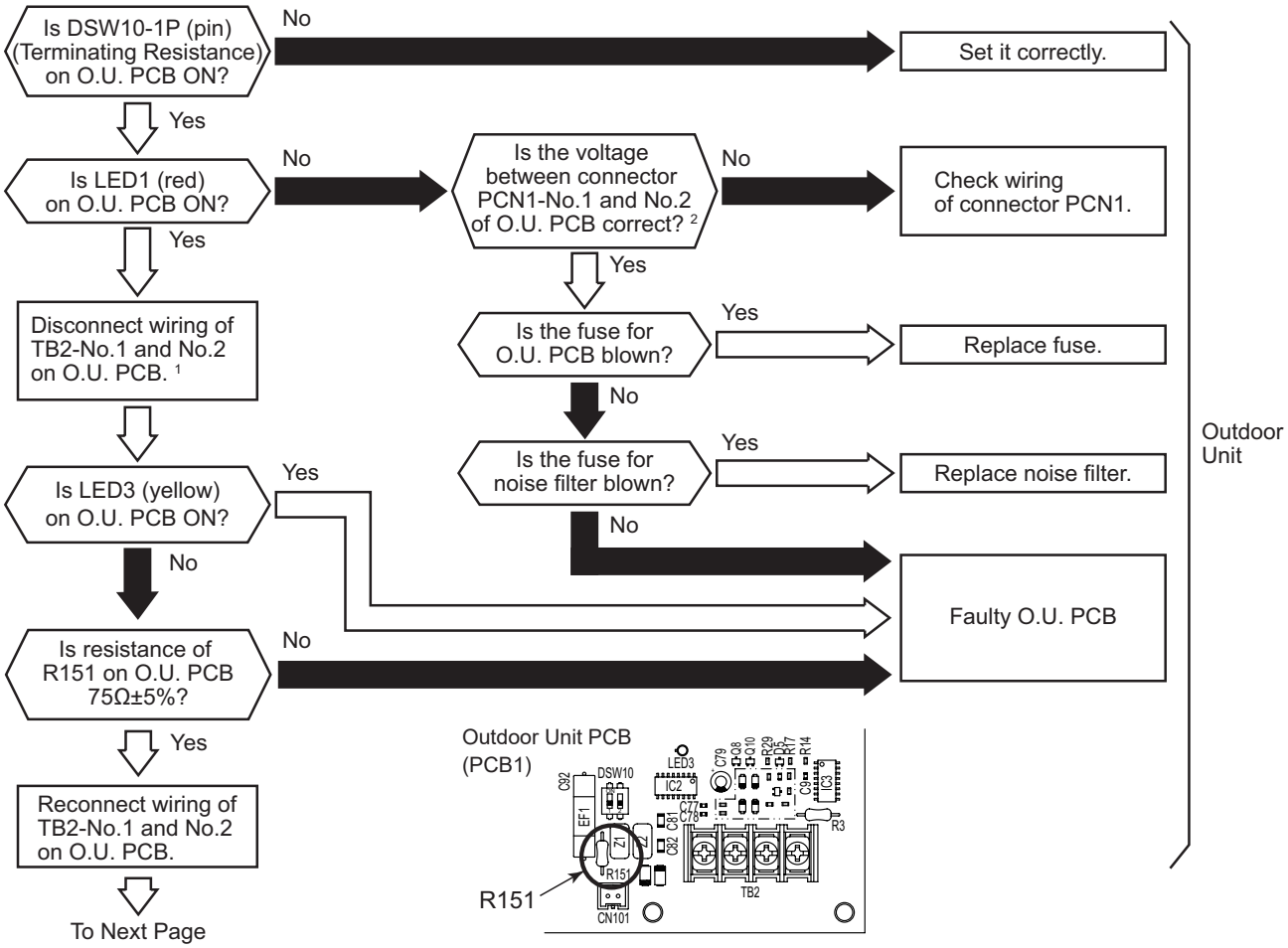


Alarm Code 03	Abnormal Communication between Indoor Units and Outdoor Units

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

This alarm code is displayed when an abnormal condition continues for three minutes after normal communication between indoor units and outdoor units. 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.
When fuses are blown, or the circuit breakers are activated, check the cause of overcurrent and take necessary action.

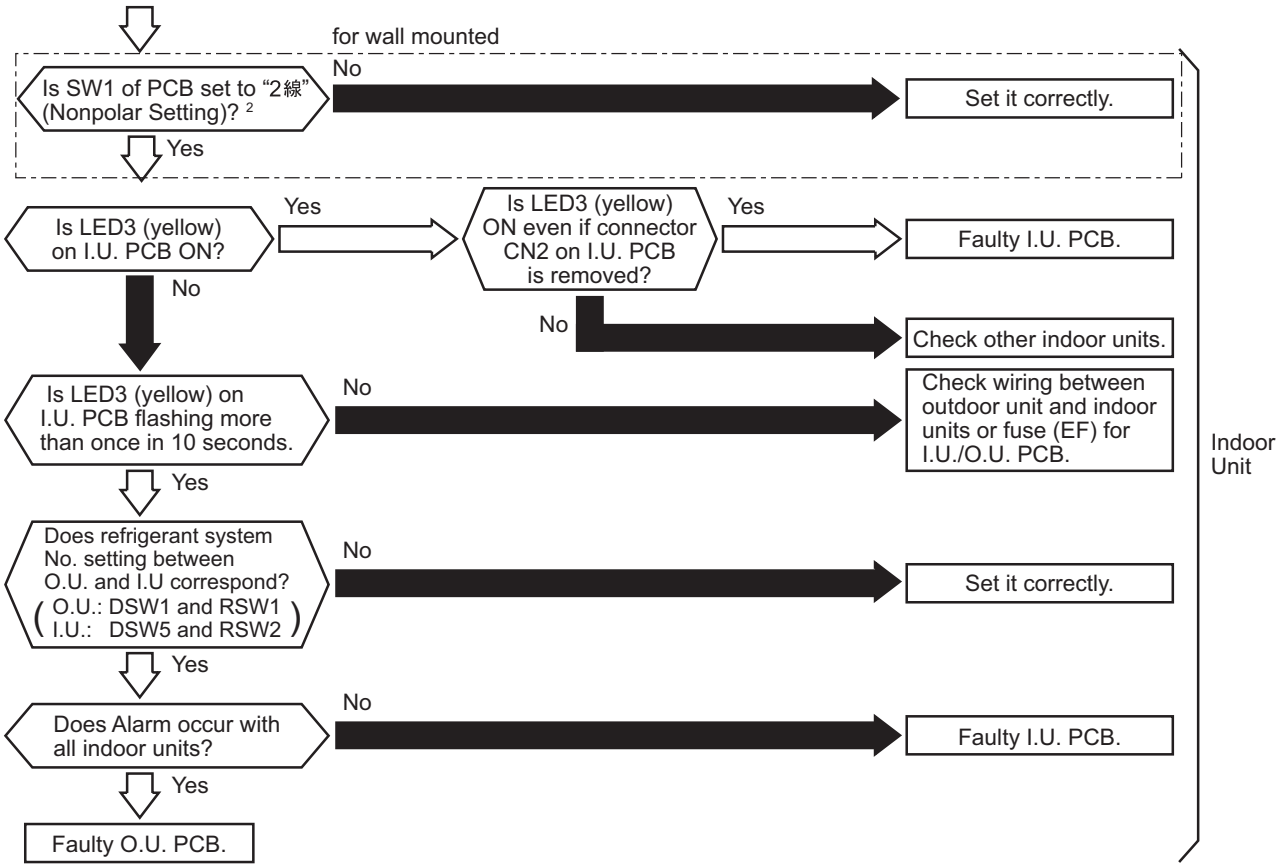
O.U. PCB: Outdoor Unit PCB (PCB1)

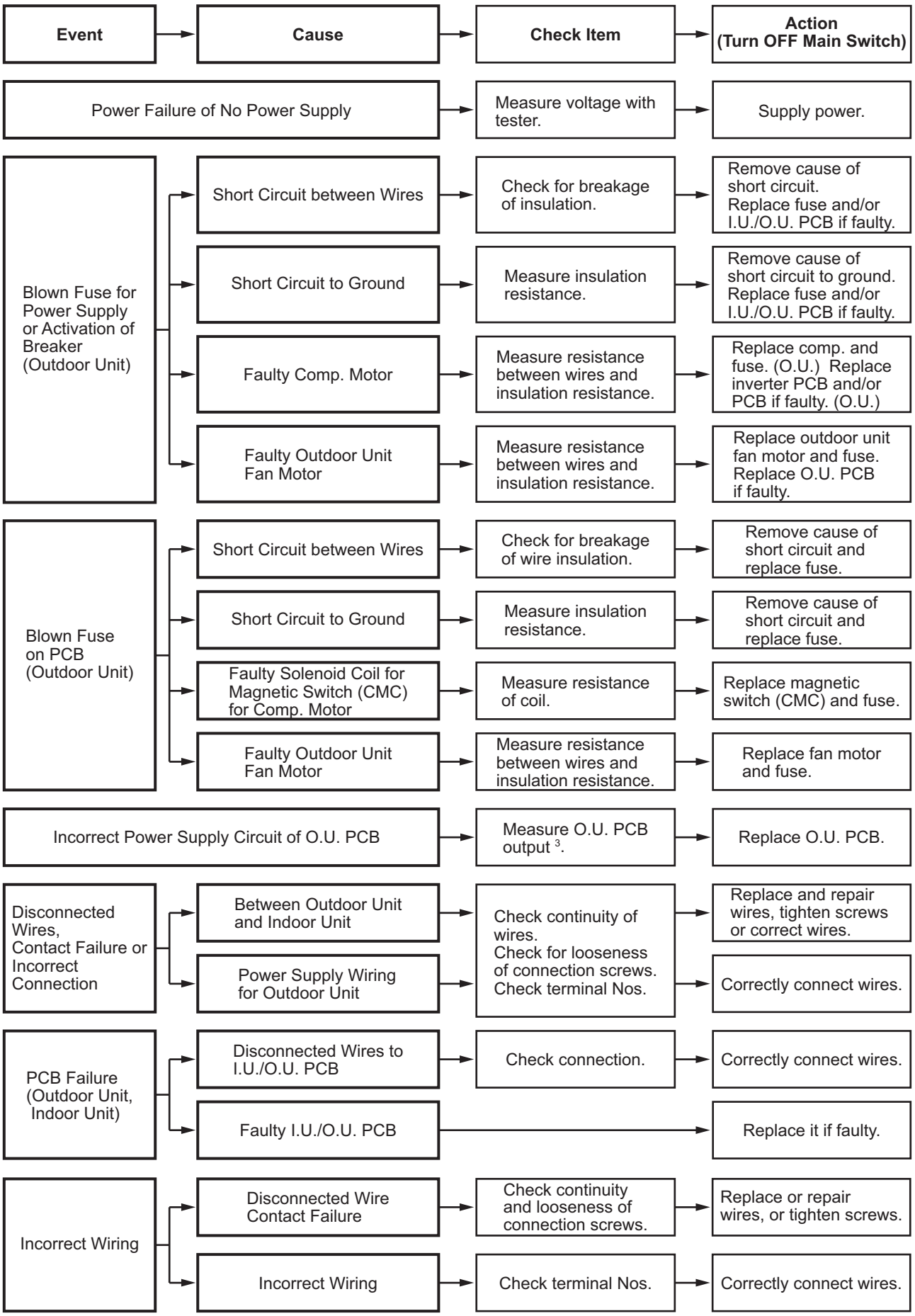


Note 2: Correct Voltage

Power Supply	Connector PCN1 Voltage
208-230V/60Hz	208-230V
460V/60Hz	230V
575V/60Hz	220V

O.U. PCB: Outdoor Unit PCB (PCB1)
I.U. PCB: Indoor Unit PCB





O.U. PCB: Outdoor Unit PCB (PCB1)
I.U. PCB: Indoor Unit PCB

1: If the end terminal resistance (DSW10) is set to OFF for H-LINK connection, set the end terminal resistance to ON when CN2 is disconnected. Set the end terminal resistance to OFF when CN2 is reconnected.

2: Communication setting for the wall mounted: (SW1)

Item	Setting Position
SW1	“2 線” Side

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

3: Refer to Section 4.2.1.3 “Printed Circuit Board ●Checking Procedures for Outdoor Unit PCB” for details.

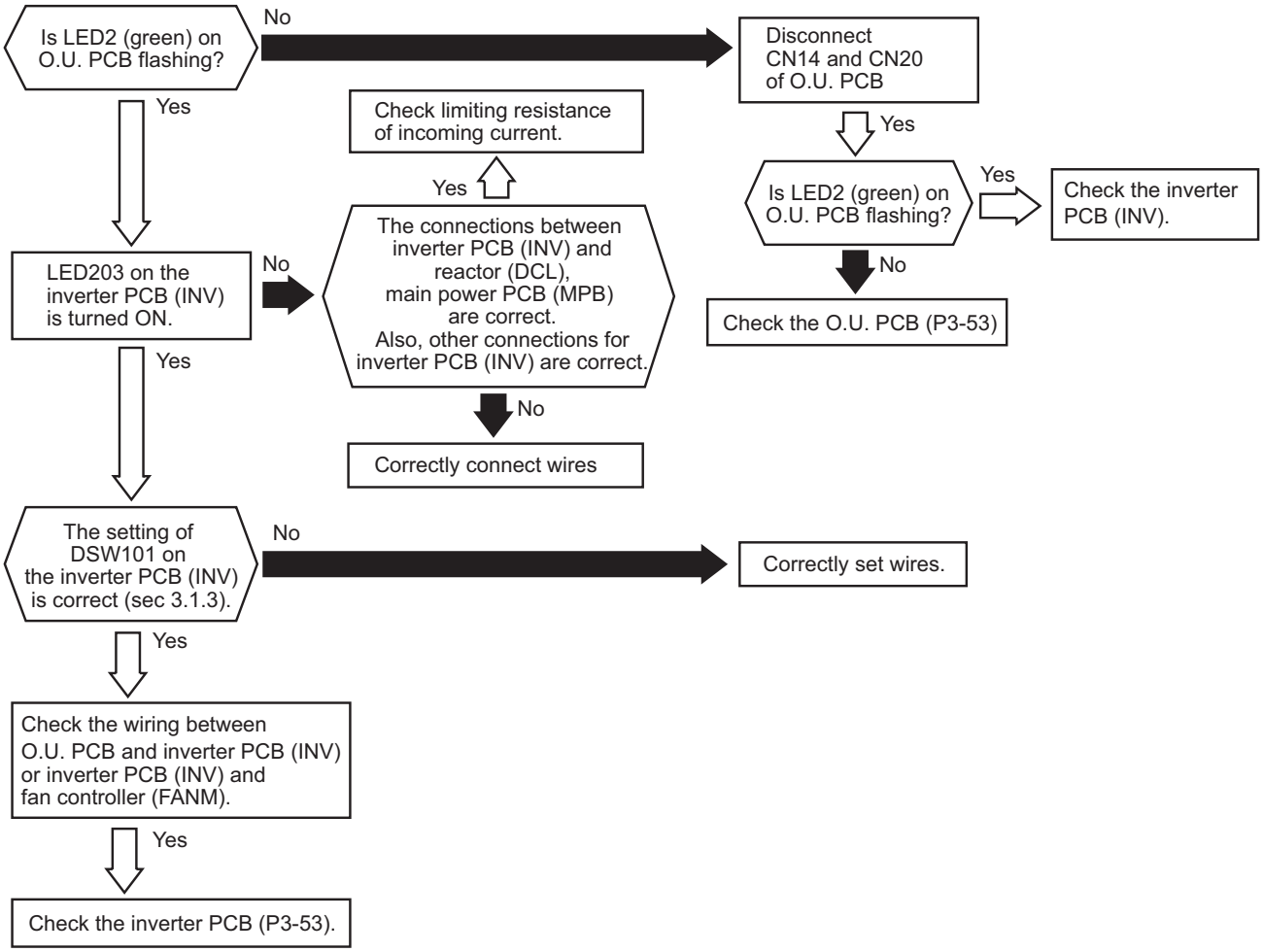
Alarm Code 04	Abnormal Communication between Inverter PCB and Outdoor Unit PCB

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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, the outdoor unit number of abnormal inverter PCB and abnormal inverter PCB number are displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

This alarm code is displayed when an abnormal condition continues for 30 seconds after normal communication between the outdoor unit PCB and the inverter PCB. 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.

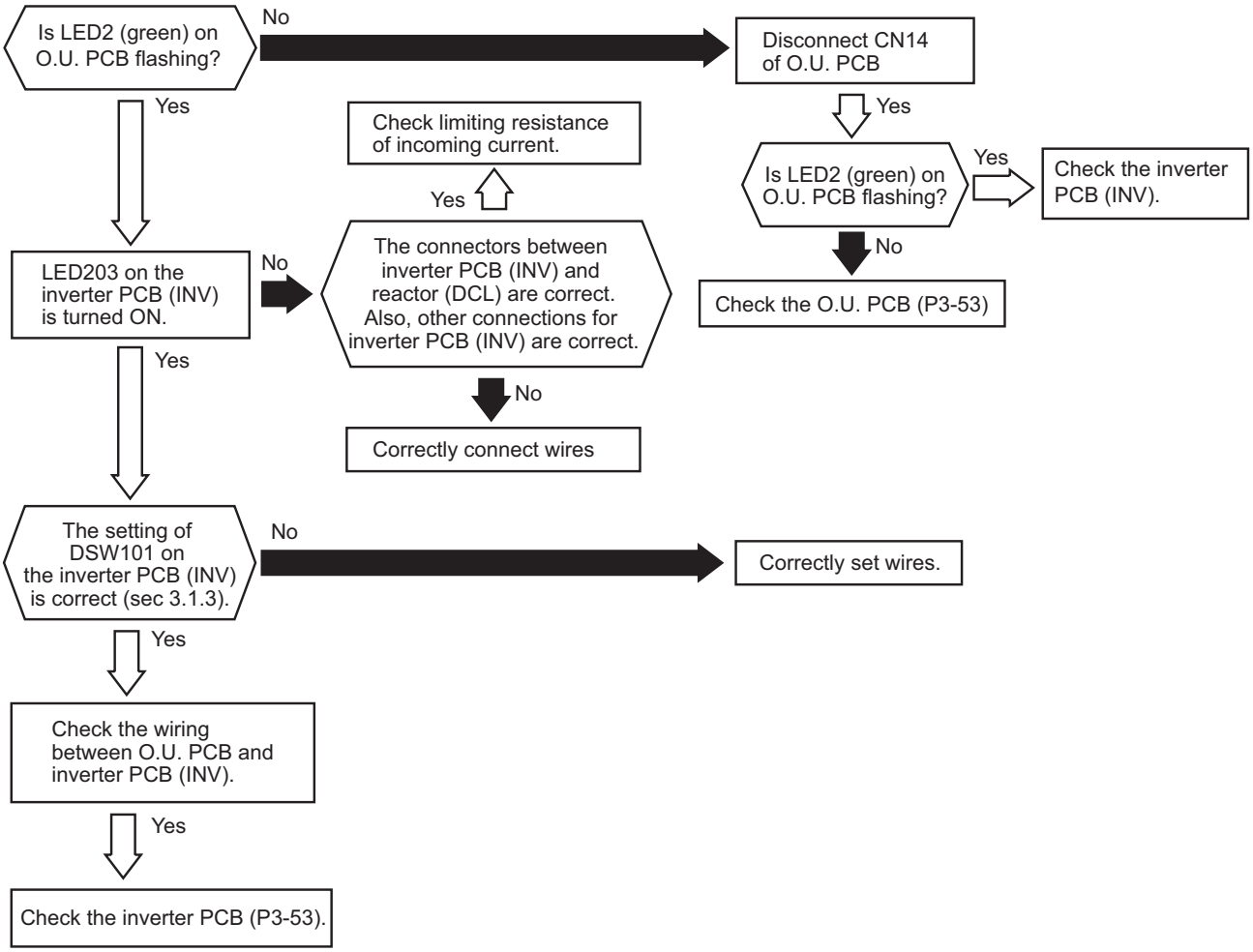
■ 208/230V Type

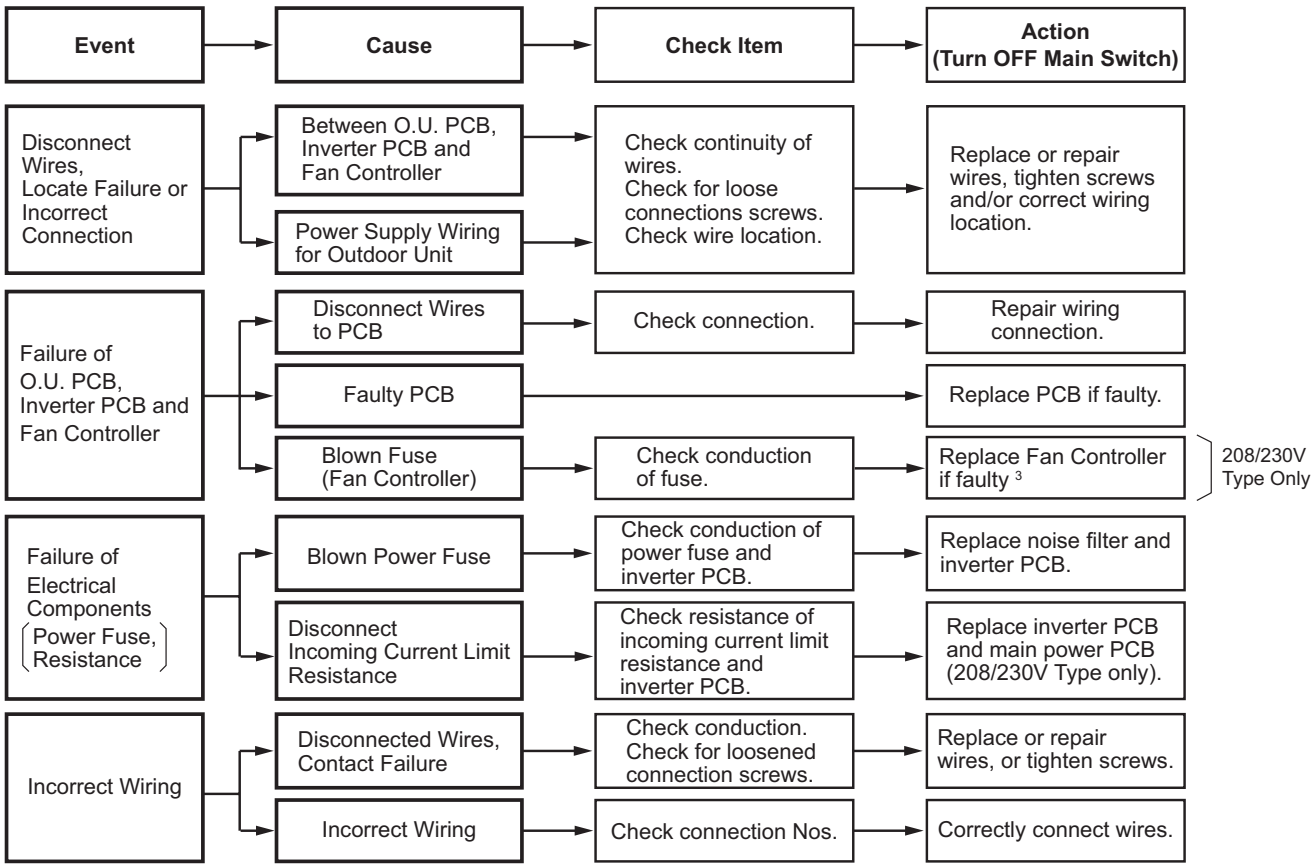
O.U. PCB: Outdoor Unit PCB (PCB1)



■ 460V Type, 575V Type

O.U. PCB: Outdoor Unit PCB (PCB1)





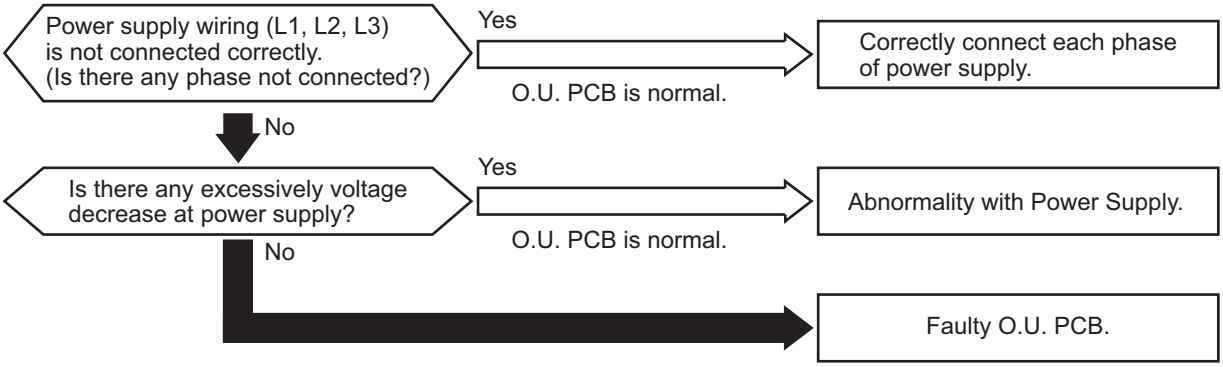
1: When replacing or checking for the inverter part, make sure to perform the electric discharge work according to Section 4.2.1.1 [2] for 208/230V type and Section 4.2.1.2 [2] for 460V type, 575V type “High Voltage Discharge Work for Replacing Parts”.
2: When replacing or checking for the fan controller, make sure to perform the electric discharge work according to Section 4.2.1.1 [2] “High Voltage Discharge Work for Replacing Parts”.
3: When the fuse for the fan controller is blown, the fan controller may be broken too.
In this instance, the fan controller should be replaced.

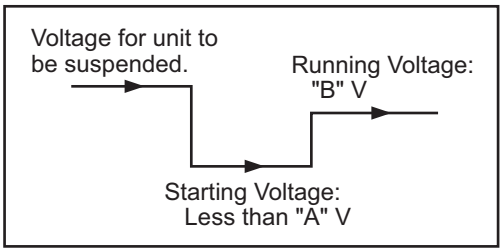
Alarm Code 05	Abnormality of Power Supply Phase

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 outdoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

This alarm code is displayed when one phase of main power supply is not connected.

O.U. PCB: Outdoor Unit PCB (PCB1)





Check Item

Power Supply	"A"	"B"
208/230V, 60Hz	177	188 to 253
460V, 60Hz	391	414 to 506
575V, 60Hz	489	518 to 660

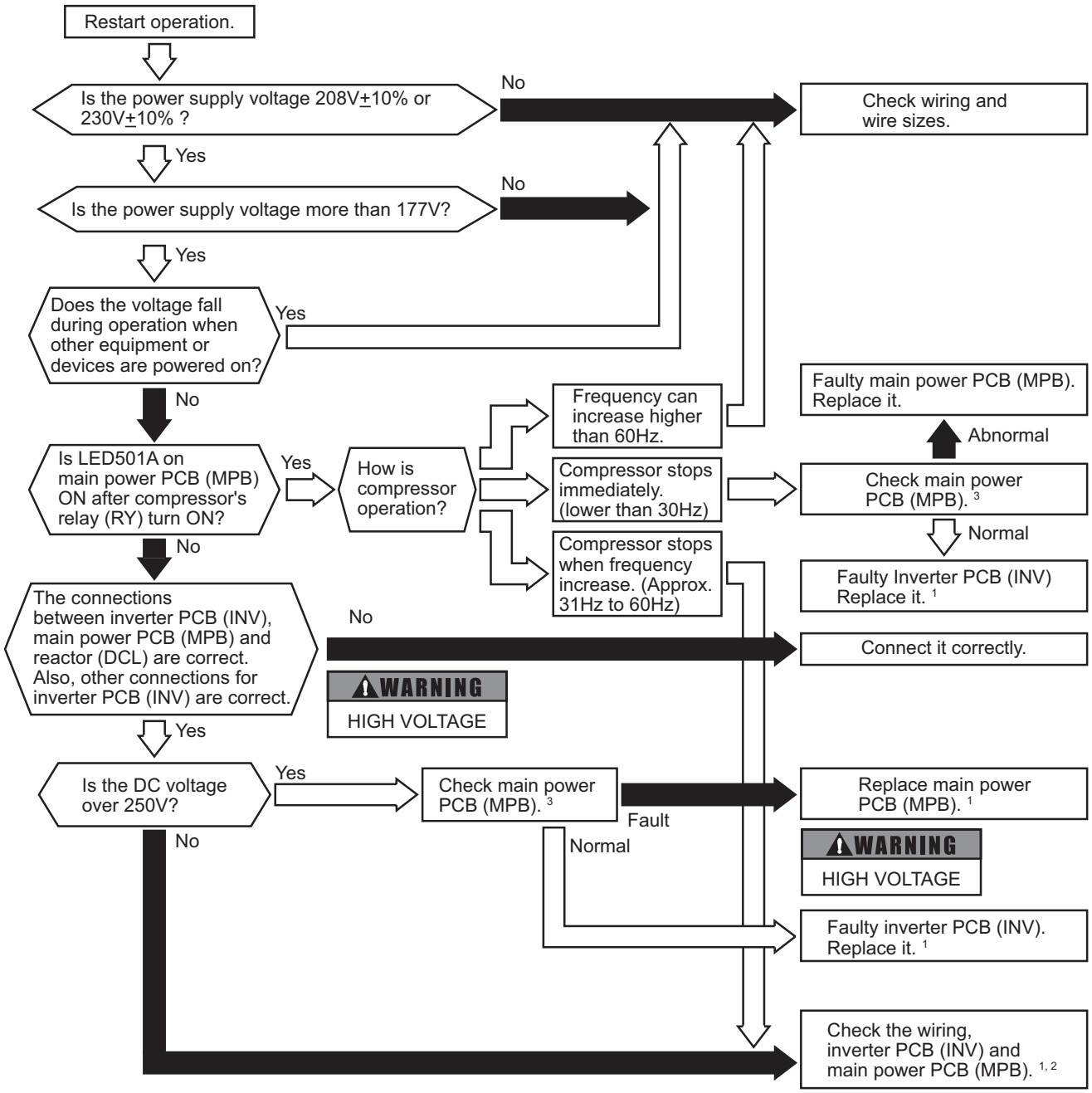
Event	Cause	Check Item	Action (Turn OFF Main Switch)
Activation of Open Phase Sensor in Outdoor Unit	Reverse or Open Phase	Check it according to electrical wiring in item 3.1.1.	Replace wires, repair and tighten screws or correct wiring.
	Faulty O.U. PCB		Replace O.U. PCB if faulty.

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

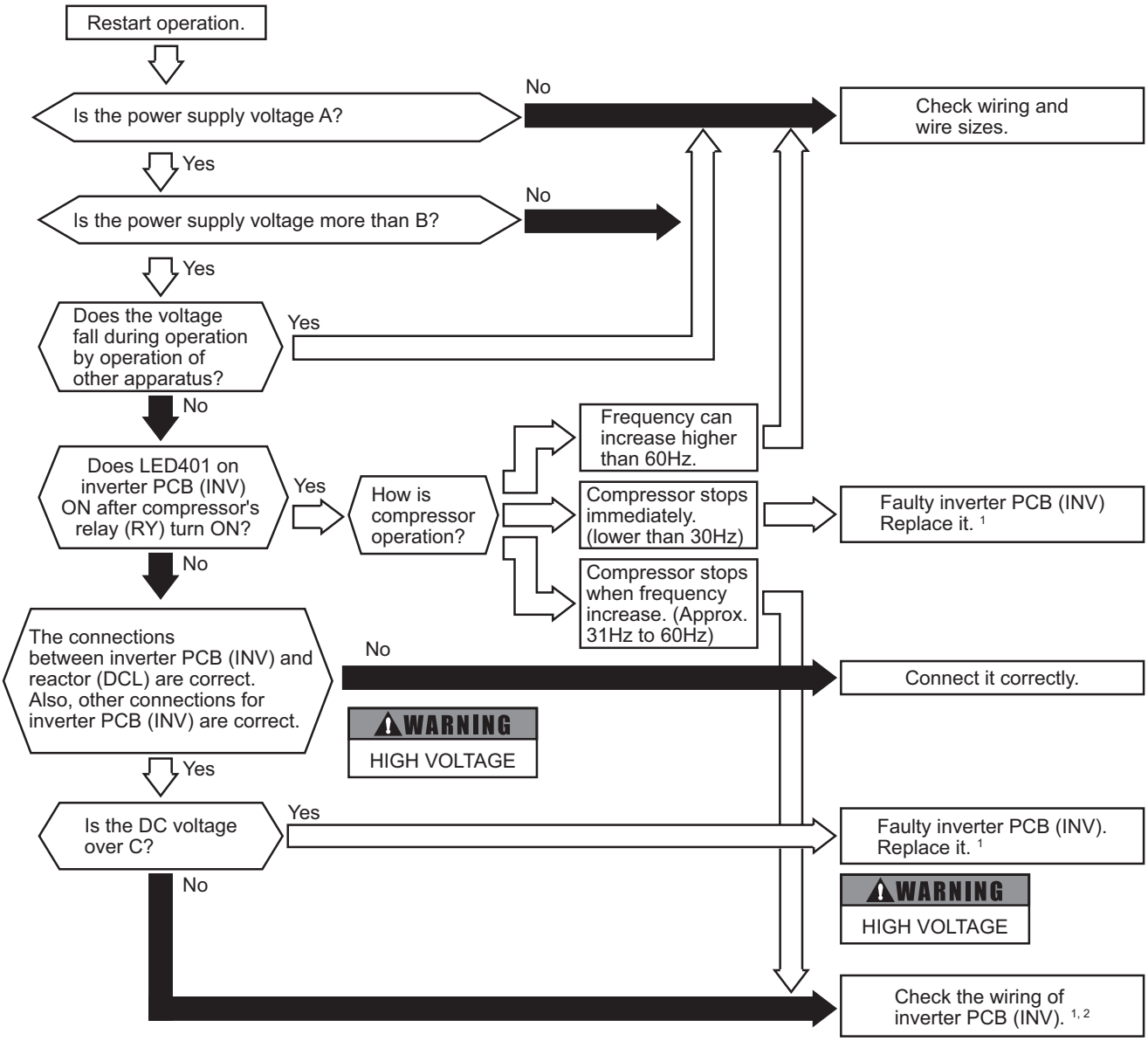
- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address number), the alarm code, the model code[1], the model name[1] and the number of connected indoor units are displayed on the LCD. The alarm code, the outdoor unit number of abnormal inverter PCB and abnormal inverter PCB number are displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

When insufficient voltage is detected between terminals “P” and “N” of 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 automatically restarts.

■ 208/230V Type



■ 460V Type, 575V Type



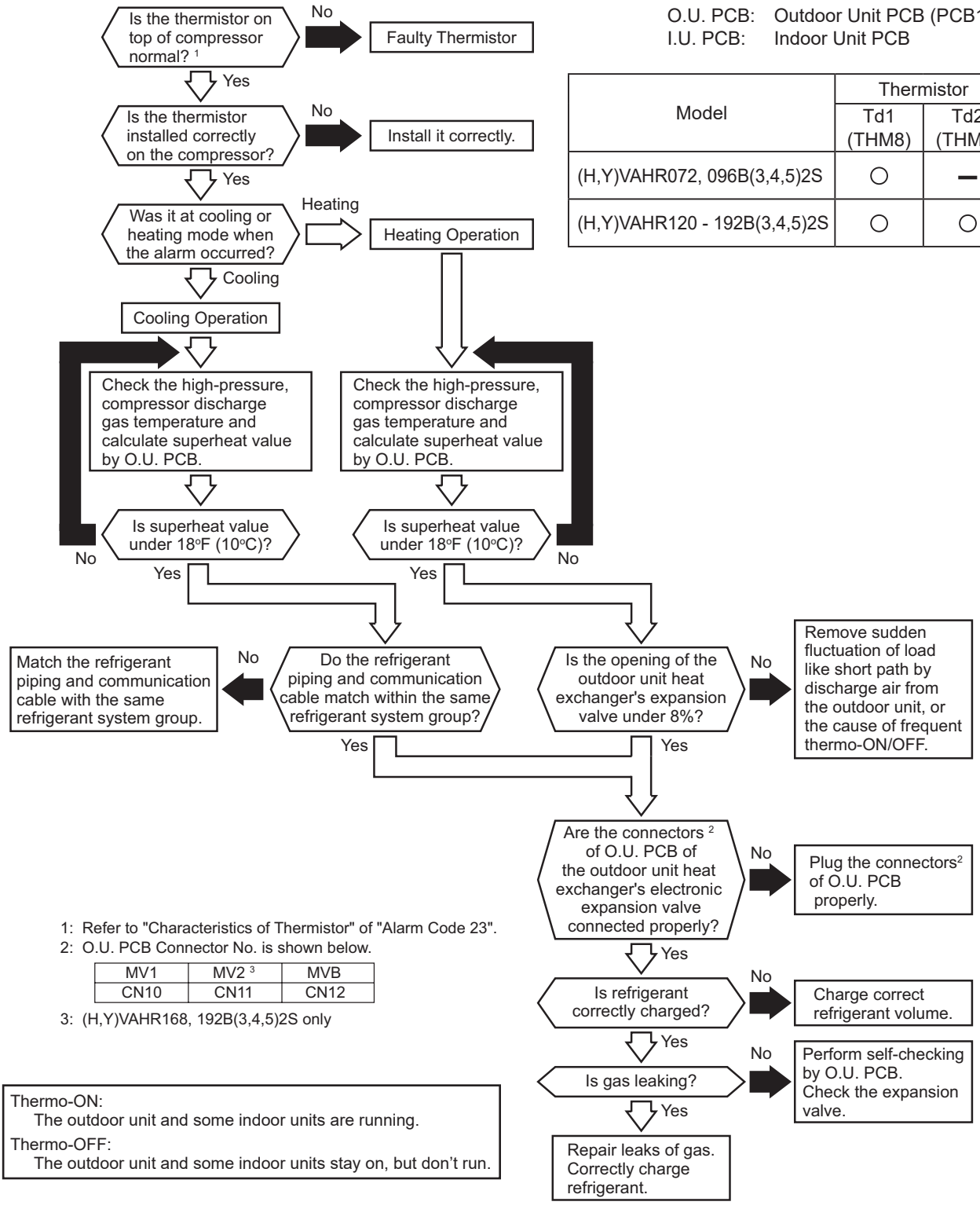
Power Supply	"A"	"B"	"C"
460V, 60Hz	460V ±10%	391V	553V
575V, 60Hz	600V +10% 575V -10%	489V	691V

1: If the capacitor has high voltage, perform the high voltage discharge work according to Section 4.2.1.1 [2] for 208/230V type and Section 4.2.1.2 [2] for 460V type, 575V type.
2: Refer to Section 4.2.1.1 [2] "Testing Inverter Parts (208/230V Type)".
3.: Refer to Section 4.2.1.2 [2] "Testing Inverter Parts (460V Type, 575V Type)".

Alarm Code	Decrease in Discharge Gas Superheat
07	

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 outdoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

If the discharge gas superheat is less than 18°F (10°C) at the top of the compressor continues for 30 minutes, retry operation is performed. However, when the alarm occurs twice within 120 minutes, this alarm code is displayed.



O.U. PCB: Outdoor Unit PCB (PCB1)
I.U. PCB: Indoor Unit PCB

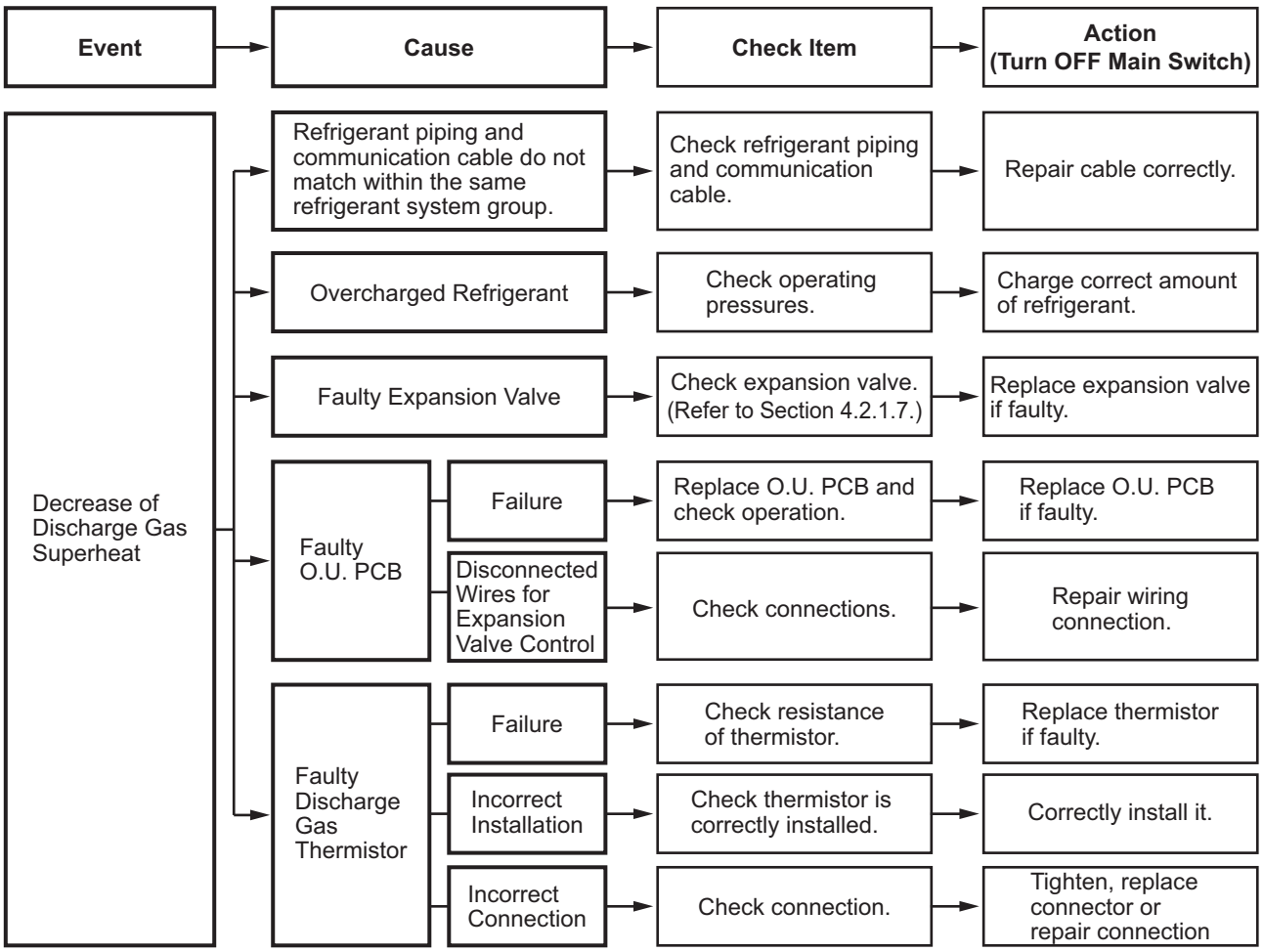
Model	Thermistor	
	Td1 (THM8)	Td2 (THM9)
(H,Y)VAHR072, 096B(3,4,5)2S	○	–
(H,Y)VAHR120 - 192B(3,4,5)2S	○	○

1: Refer to "Characteristics of Thermistor" of "Alarm Code 23".
2: O.U. PCB Connector No. is shown below.

MV1	MV2 3	MVB
CN10	CN11	CN12

3: (H,Y)VAHR168, 192B(3,4,5)2S only

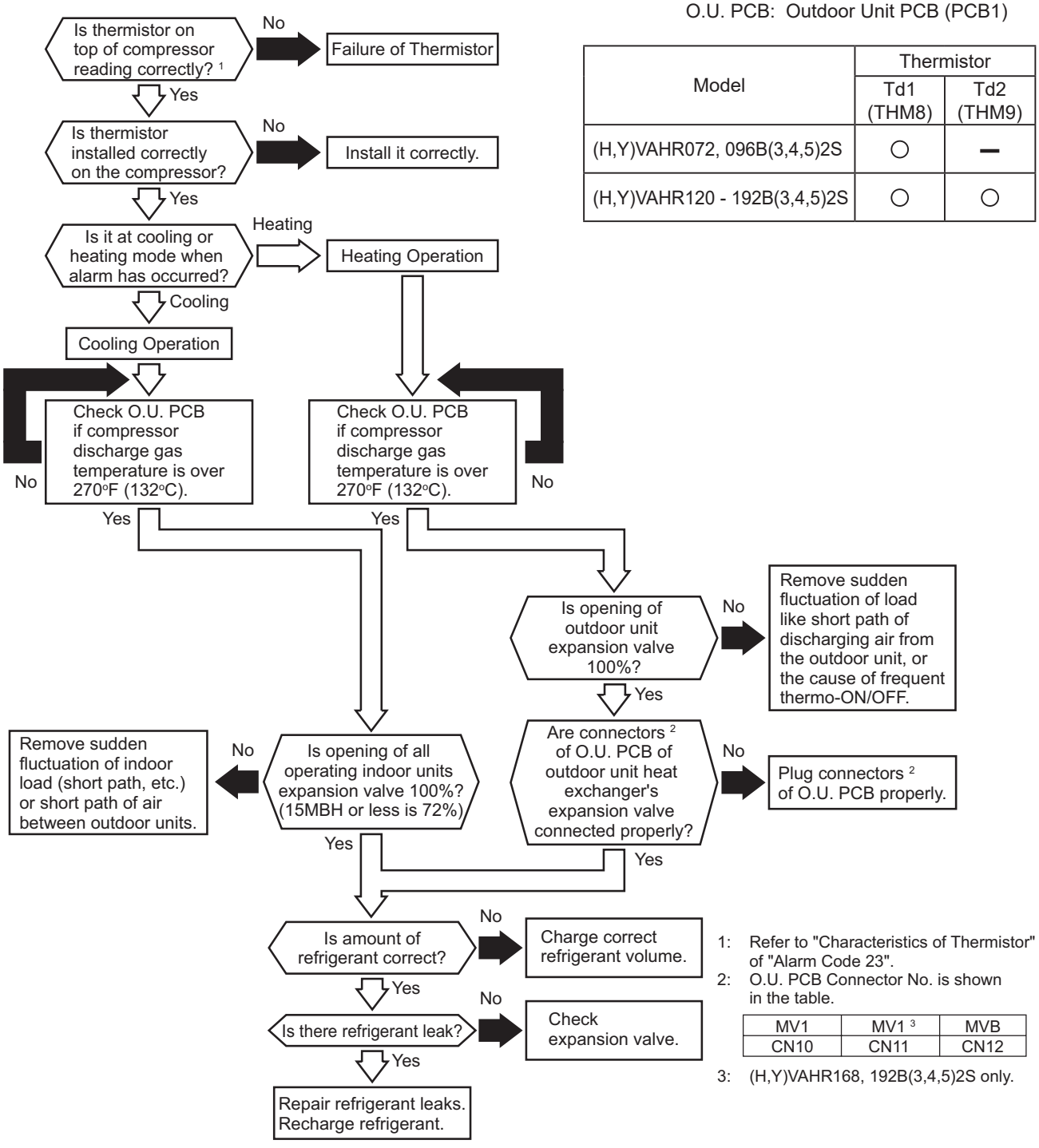
Thermo-ON:
The outdoor unit and some indoor units are running.
Thermo-OFF:
The outdoor unit and some indoor units stay on, but don't run.


Event
Cause
Check Item
Action (Turn OFF Main Switch)
Decrease of Discharge Gas Superheat
Refrigerant piping and communication cable do not match within the same refrigerant system group.
Check refrigerant piping and communication cable.
Repair cable correctly.
Overcharged Refrigerant
Check operating pressures.
Charge correct amount of refrigerant.
Faulty Expansion Valve
Check expansion valve. (Refer to Section 4.2.1.7.)
Replace expansion valve if faulty.
Faulty O.U. PCB
Failure
Replace O.U. PCB and check operation.
Replace O.U. PCB if faulty.
Disconnected Wires for Expansion Valve Control
Check connections.
Repair wiring connection.
Faulty Discharge Gas Thermistor
Failure
Check resistance of thermistor.
Replace thermistor if faulty.
Incorrect Installation
Check thermistor is correctly installed.
Correctly install it.
Incorrect Connection
Check connection.
Tighten, replace connector or repair connection

Alarm Code 08	Increase in Discharge Gas Temperature at the Top of Compressor

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 outdoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

If the temperature at the top of the compressor is above 270°F (132°C) for 10 minutes or above 284°F (140°C) for five seconds during operation, the compressor stops and then the operation is automatically retried. If this occurs again twice in the next 60 minutes, this alarm code is displayed.



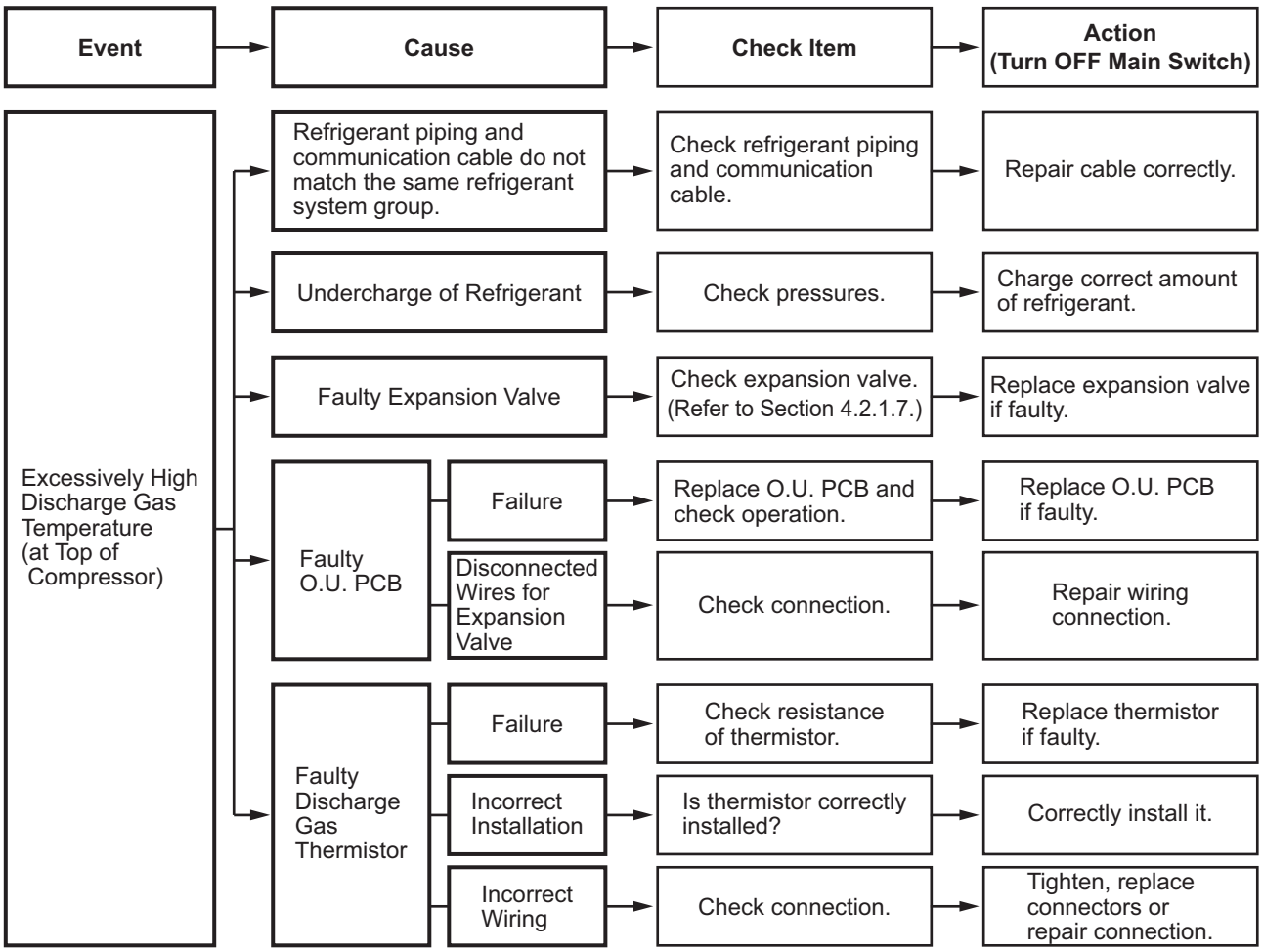
O.U. PCB: Outdoor Unit PCB (PCB1)

Model	Thermistor	
	Td1 (THM8)	Td2 (THM9)
(H,Y)VAHR072, 096B(3,4,5)2S	○	—
(H,Y)VAHR120 - 192B(3,4,5)2S	○	○

1: Refer to "Characteristics of Thermistor" of "Alarm Code 23".
2: O.U. PCB Connector No. is shown in the table.

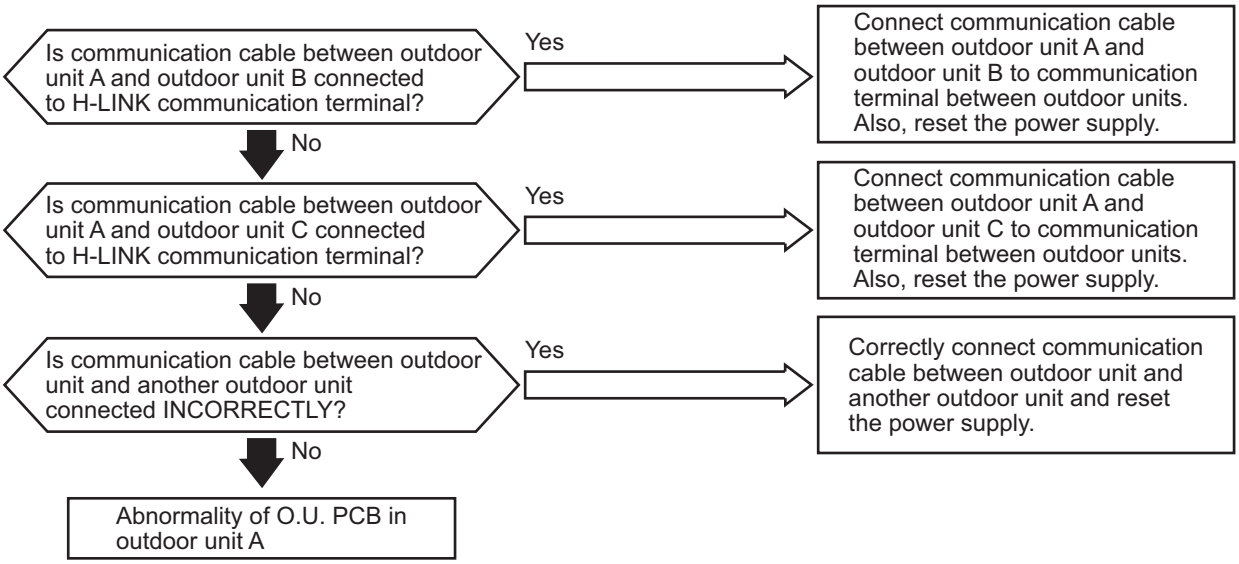
MV1	MV1 3	MVB
CN10	CN11	CN12

3: (H,Y)VAHR168, 192B(3,4,5)2S only.

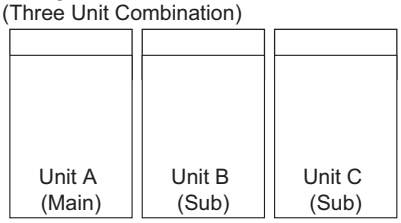

Event
Cause
Check Item
Action (Turn OFF Main Switch)
Excessively High Discharge Gas Temperature (at Top of Compressor)
Refrigerant piping and communication cable do not match the same refrigerant system group.
Check refrigerant piping and communication cable.
Repair cable correctly.
Undercharge of Refrigerant
Check pressures.
Charge correct amount of refrigerant.
Faulty Expansion Valve
Check expansion valve. (Refer to Section 4.2.1.7.)
Replace expansion valve if faulty.
Faulty O.U. PCB
Failure
Replace O.U. PCB and check operation.
Replace O.U. PCB if faulty.
Disconnected Wires for Expansion Valve
Check connection.
Repair wiring connection.
Faulty Discharge Gas Thermistor
Failure
Check resistance of thermistor.
Replace thermistor if faulty.
Incorrect Installation
Is thermistor correctly installed?
Correctly install it.
Incorrect Wiring
Check connection.
Tighten, replace connectors or repair connection.

Alarm Code	Abnormal Communication between Outdoor Units

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

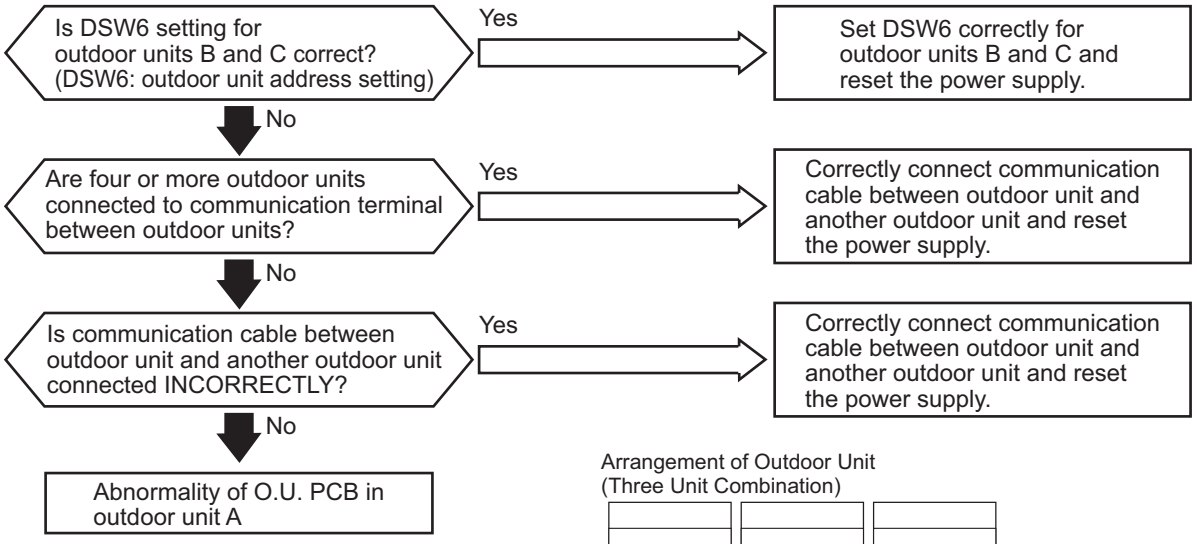


Arrangement of Outdoor Unit
(Three Unit Combination)



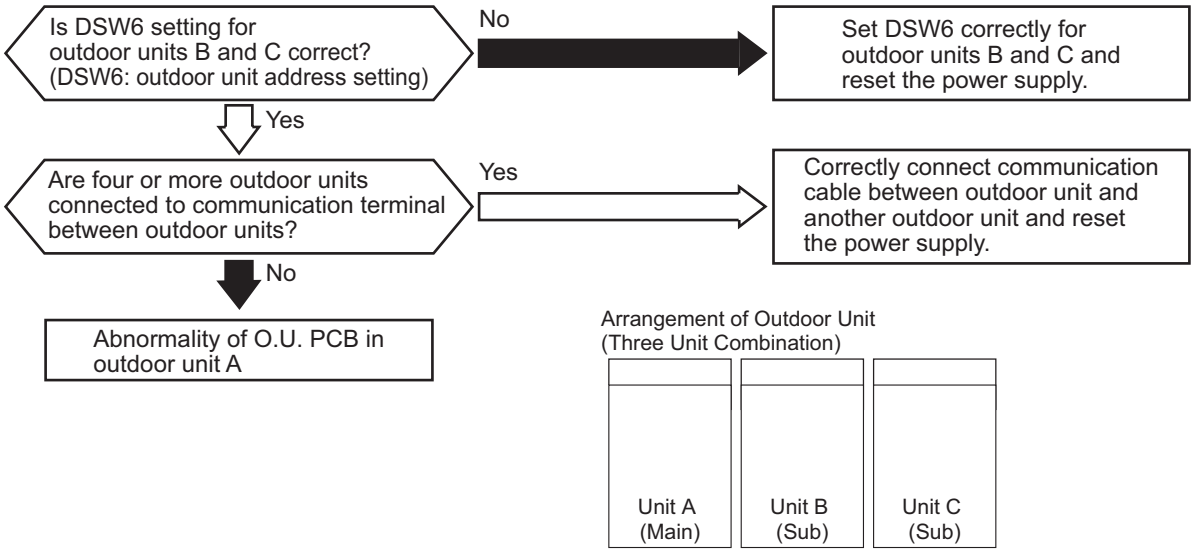
Alarm Code	Incorrect Outdoor Unit Address Setting

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.



Alarm Code	Incorrect Outdoor Unit Main Unit Setting

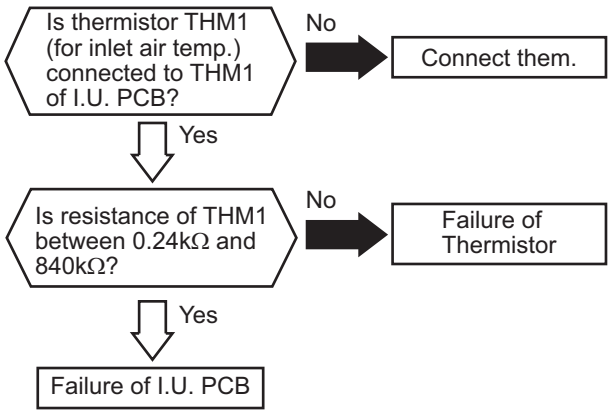
- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address number), the alarm code, the model code[1], the model name[1] and the number of connected indoor units are displayed on the LCD. The alarm code is displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

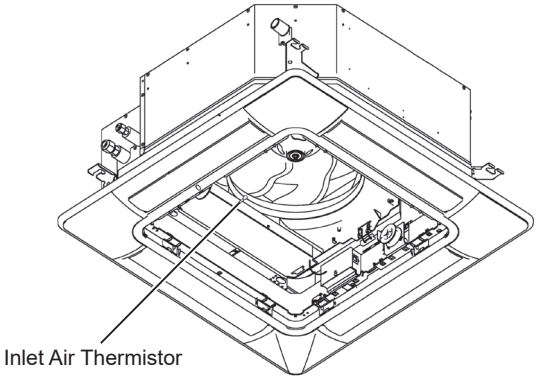


Alarm Code 11	Abnormality of Thermistor for Indoor Unit Inlet Air Temperature (Inlet Air Thermistor)

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

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

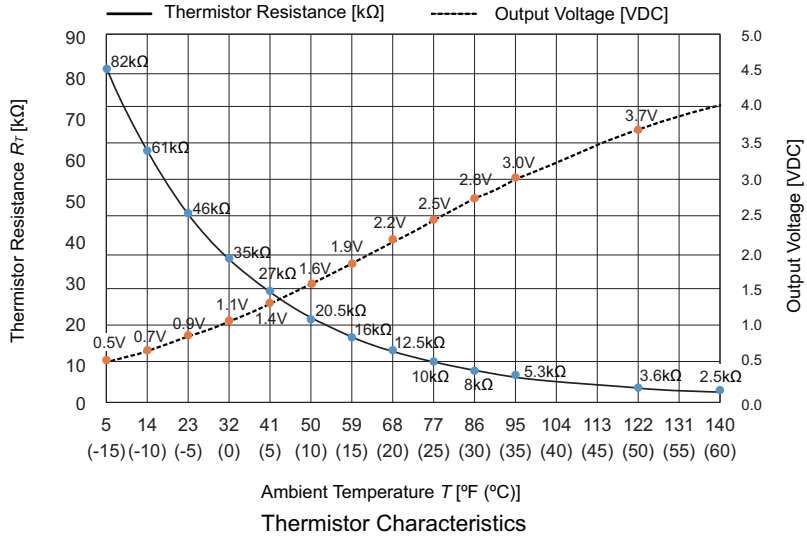




Example of 4-way Cassette Type

Event	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of 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.

NOTICE:
This figure is applicable to the following thermistors.
1. Inlet Air Thermistor (THM1), 2. Liquid Pipe Thermistor (Freeze Protection) (THM3), 3. Gas Pipe Thermistor (THM5), 4. Outlet Air Thermistor (THM2), 5. Outside Air Thermistor or Remote Thermistor (THM4)

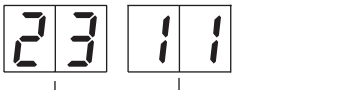


Thermistor Characteristics

R_{25} = 10kΩ
(When T = 77°F (25°C), R_T = 10kΩ)
B = 4050K

$R_T = R_{25} \cdot \exp B(1/T[K] - 1/273.15)$

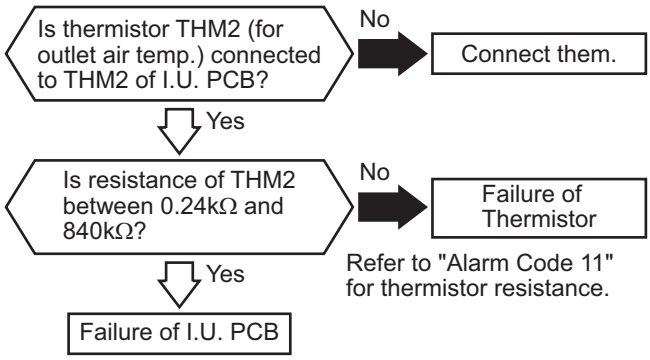
Indication on Outdoor Unit PCB
(Alarm Code 11 ~ 19)

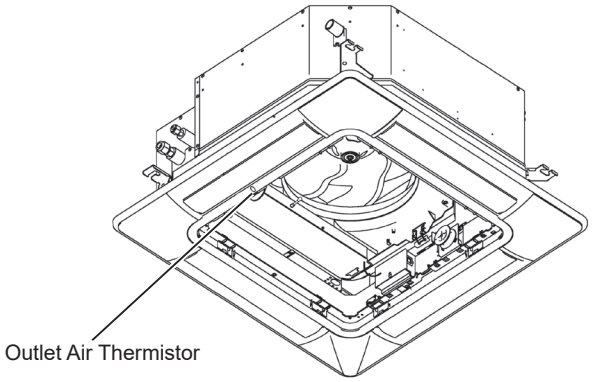


Alarm Code 12	Abnormality of Thermistor for Indoor Unit Outlet Air Temperature (Outlet Air Thermistor)

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

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





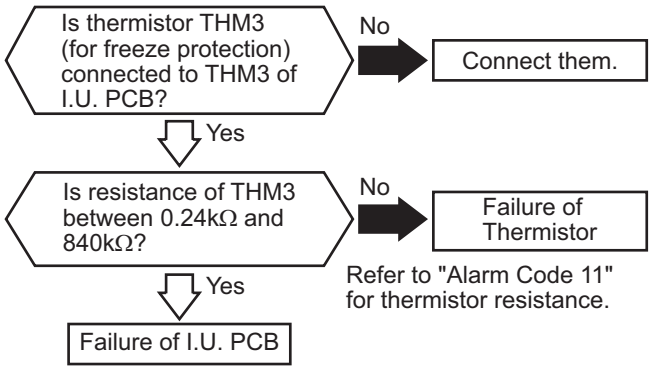
Example of 4-way Cassette Type

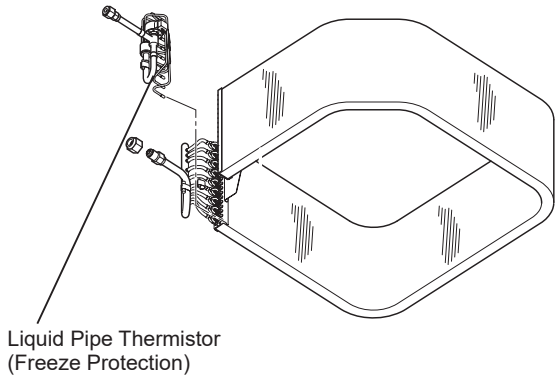
Event	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Outlet Air Thermistor	Failure	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to I.U. PCB.	Correctly connect wires.
Failure of I.U. PCB		Replace I.U. PCB and check operation.	Replace I.U. PCB if faulty.

Alarm Code 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 (refrigerant cycle number - address 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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

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





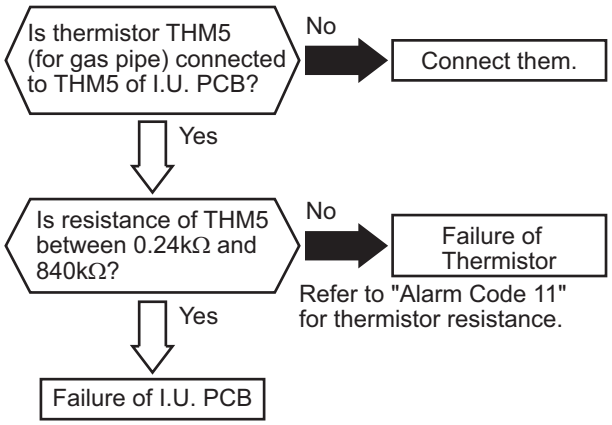
Example of 4-way Cassette Type

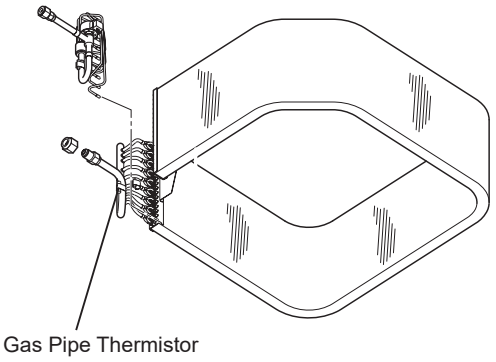
Event	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Freeze Protection Thermistor	Failure	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to I.U. PCB.	Correctly connect wires.
Failure of I.U. PCB		Replace I.U. PCB and check operation.	Replace I.U. PCB if 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 (refrigerant cycle number - address 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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

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





Example of 4-way Cassette Type

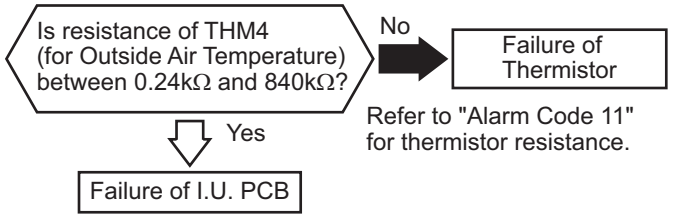
Event	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Thermistor for Indoor Unit Heat Exchanger Gas Pipe Temp.	Failure	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to I.U. PCB.	Correctly connect wires.
Failure of I.U. PCB		Replace I.U. PCB and check operation.	Replace I.U. PCB if faulty.

1: The heating operation is available only during the test run.

Alarm Code 15	Abnormality of Thermistor for Outside Air Temperature (for Ducted (Medium Static) with EconoFresh Kit)

- The RUN indicator (red) flashes.
- The indoor unit number and the alarm code are displayed on the LCD. The alarm code is displayed on the 7-segment display of the outdoor unit PCB.

This alarm code is displayed when a short (0.24kΩ or less) or open sensor (840kΩ or more) is detected during a heating or cooling operation.

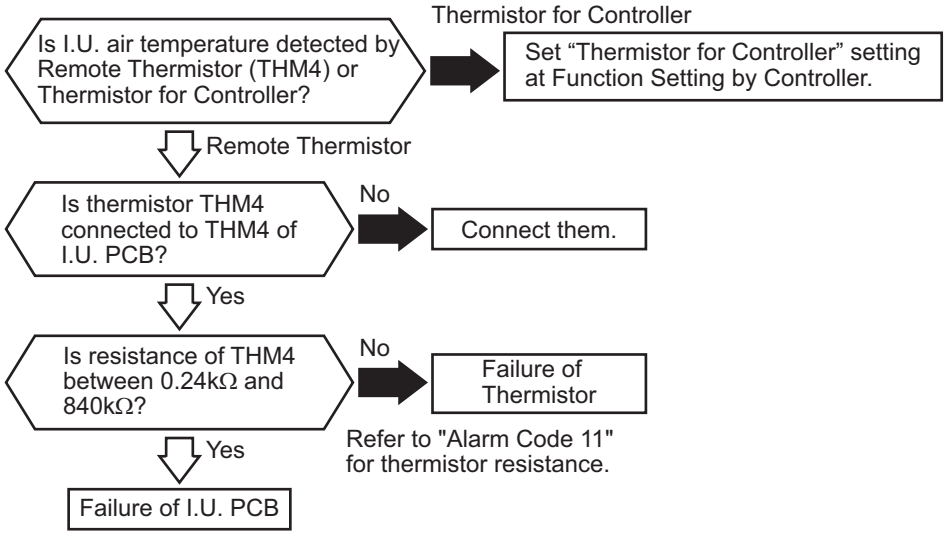


Event	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Thermistor for Outside Air Temperature	Failure	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to I.U. PCB.	Correctly connect wires.
Failure of I.U. PCB		Replace I.U. PCB and check operation.	Replace I.U.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

Alarm Code 16	Abnormality of Remote Thermistor (for DOAS Unit)

- The RUN indicator (red) flashes.
- The indoor unit number and the alarm code are displayed on the LCD. The alarm code is displayed on the 7-segment display of the outdoor unit PCB.

This alarm code is displayed when a short (0.24kΩ or less) or open sensor (840kΩ or more) is detected during a heating, cooling or fan operation.

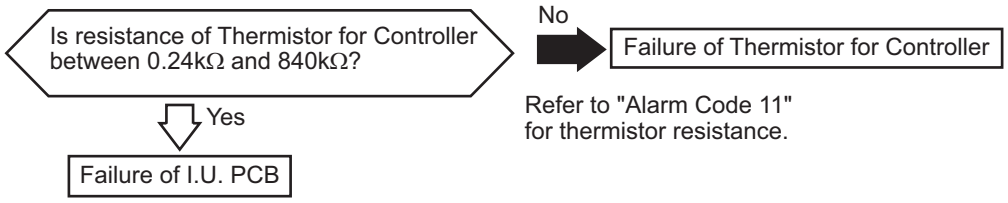


Event	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Remote Thermistor	Failure	Check resistance.	Replace remote thermistor if faulty.
	Incorrect Connection	Check wiring to I.U. PCB.	Correctly connect wires.
Failure of I.U. PCB		Replace I.U. PCB and check operation.	Replace I.U. PCB if faulty.

Alarm Code 17	Abnormality of Thermistor for Controller (for DOAS Unit)

- The RUN indicator (red) flashes.
- The indoor unit number and the alarm code are displayed on the LCD. The alarm code is displayed on the 7-segment display of the outdoor unit PCB.

This alarm code is displayed when a short (0.24kΩ or less) or open sensor (840kΩ or more) is detected during a heating or cooling operation.



Event	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Thermistor for Controller	Failure	Check short-circuit and disconnection wiring.	Replace controller if faulty.
Failure of I.U. PCB		Replace I.U. PCB and check operation.	Replace I.U. PCB if faulty.

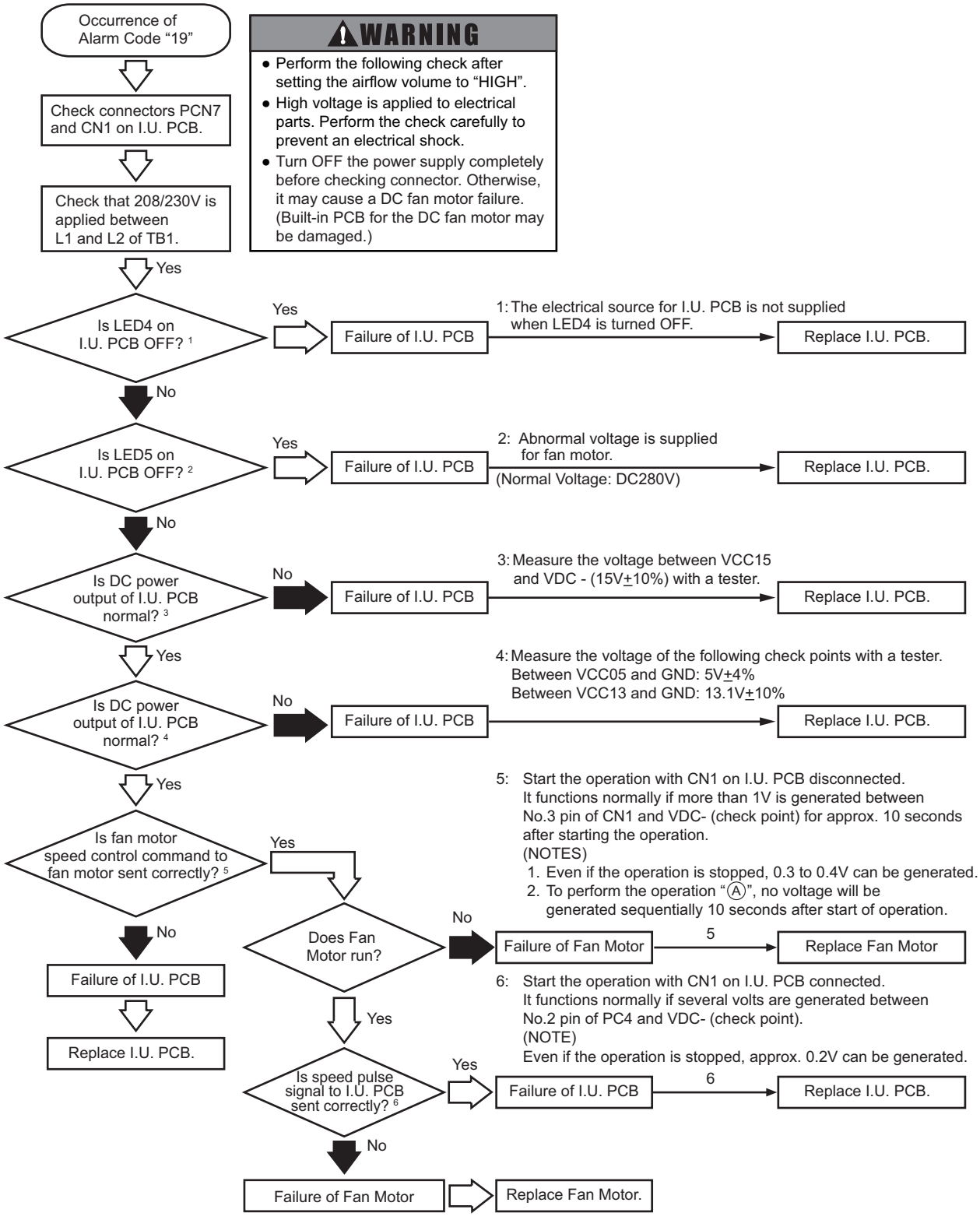
NOTICE:
This DOAS has function using both Remote Thermistor (THM4) and Thermistor for Controller.
While operating by this function,
- even if either of the thermistor is failure, operation can be continued by using detection value measured from an available Thermistor,
- if both of thermistors are failure, this alarm code is displayed.

For this reason, when both Remote Thermistor (THM4) and Thermistor for Controller are using and this alarm code is displayed means both of Thermistor are failure. As for Remote Thermistor (THM4), follow the previous page, “Alarm Code 16: Abnormality of Remote Thermistor (DOAS)” for checking.

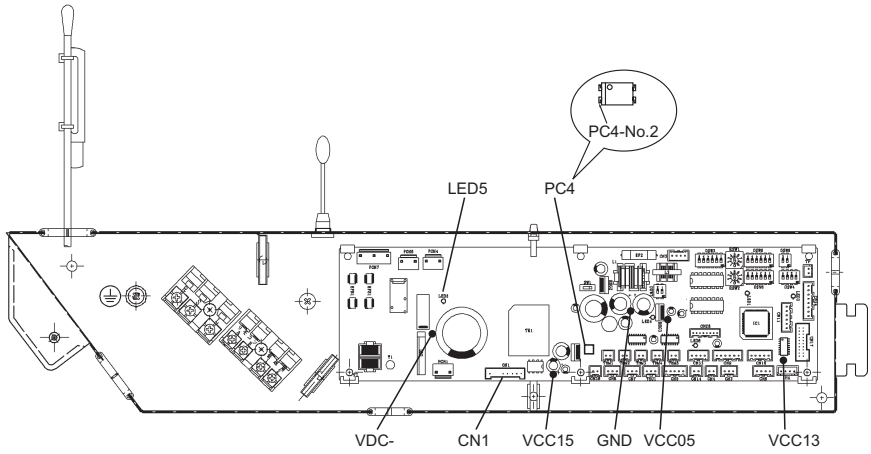
Alarm Code 19	Activation of Protection Device for Indoor Fan Motor (Indoor Unit with DC Motor)

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

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

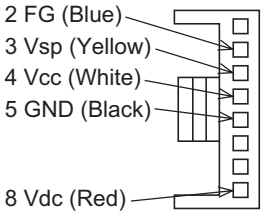


● Example of 4-Way Cassette Type



Checking for Fan Motor

Remove fan motor connector and measure the resistance value between each of the pins (twice, one measurement with +/- leads and the other with -/+ leads). Check whether the resistance value is over or not according to the table shown below. When performing the second measuring, make sure to switch leads (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

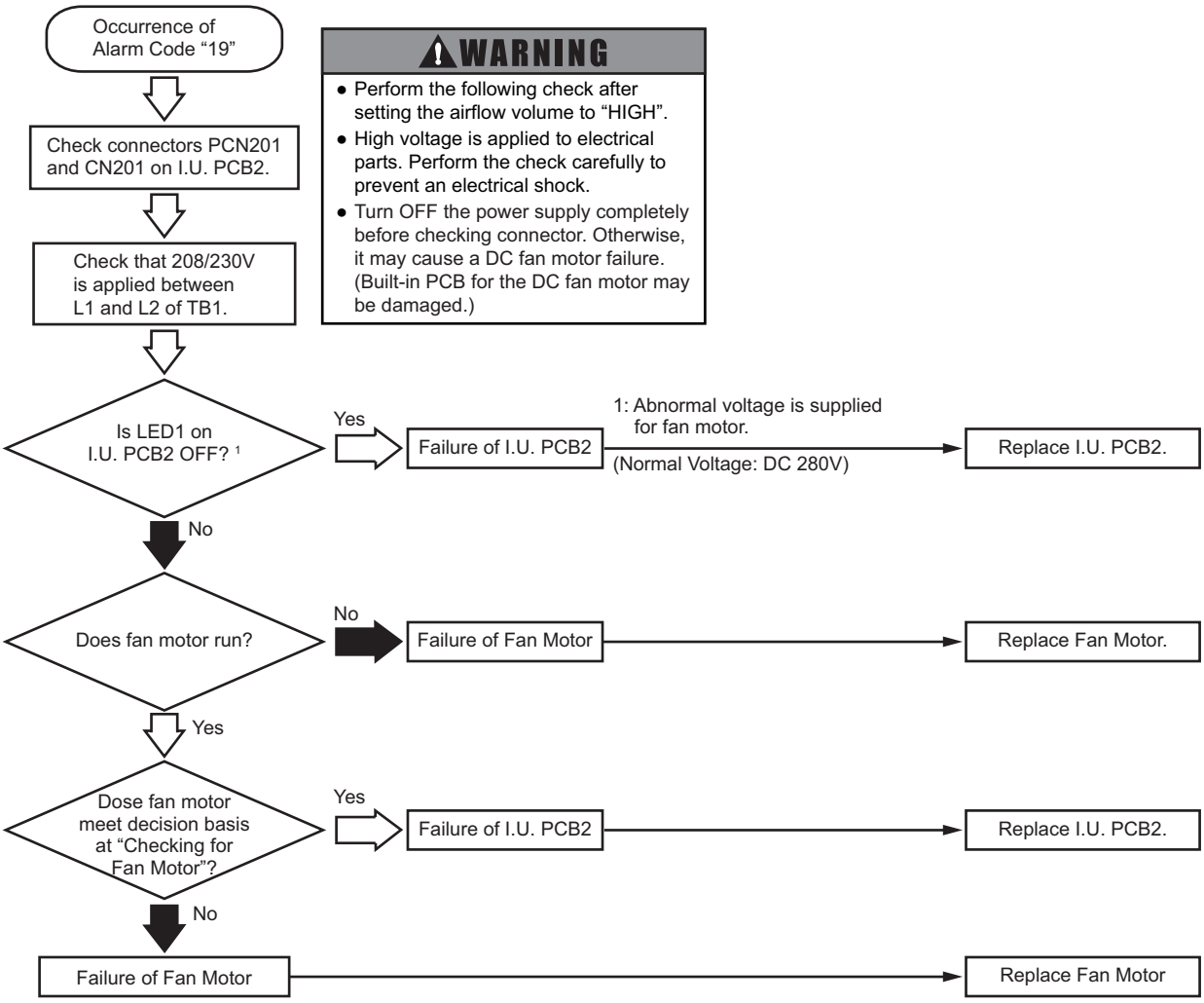
NOTE:

For details, refer to “Service Manual for Indoor Unit”.

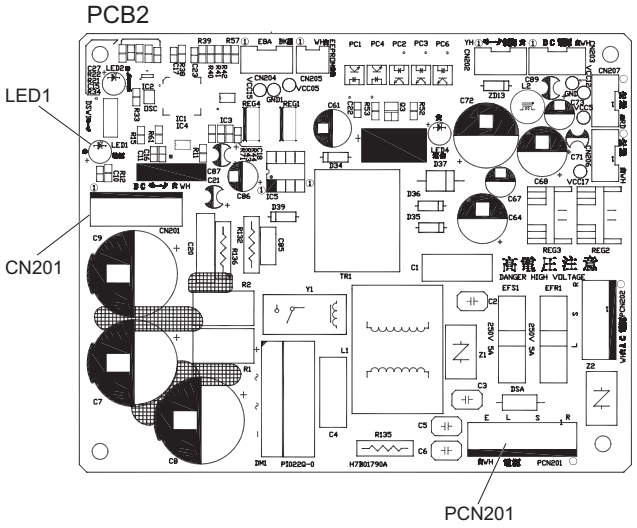
Alarm Code 19	Activation of Protection Device for Indoor Fan Motor (Ducted (Medium Static and Slim) Type)

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

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

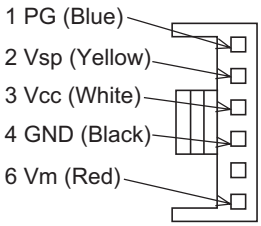


● Ducted Medium Static Type



Checking for Fan Motor

Remove fan motor connector and measure the resistance value between each of the pins (twice, one measurement with +/- leads and the other with -/+ leads). Check whether the resistance value is over or not according to the table shown below. When performing the second measuring, make sure to switch leads (Red/ Black).

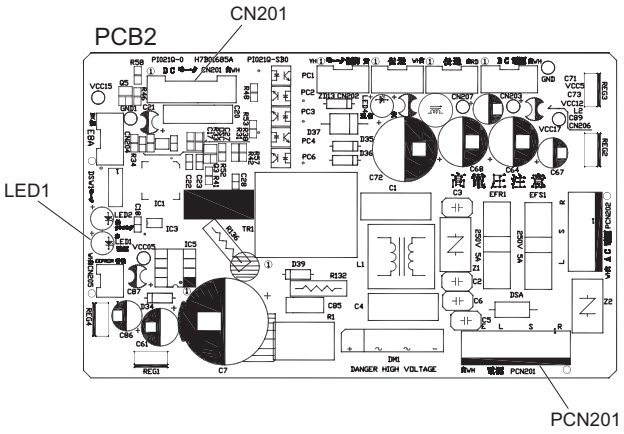


1st		
Tester		Resistance Value
Red	Black	Ω
PG	GND	
Vsp	GND	
Vcc	GND	
Vm	GND	

2nd		
Tester		Resistance Value
Red	Black	Ω
GND	PG	
GND	Vsp	
GND	Vcc	
GND	Vm	

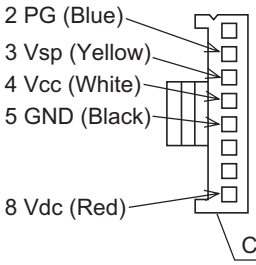
Decision Basis
Resistance values of both 1st and 2nd measurings are over 10

● Ducted Slim Type



Checking for Fan Motor

Remove fan motor connector and measure the resistance value between each of the pins (twice, one measurement with +/- leads and the other with -/+ leads). Check whether the resistance value is over or not according to the table shown below. When performing the second measuring, make sure to switch leads (Red/ Black).



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

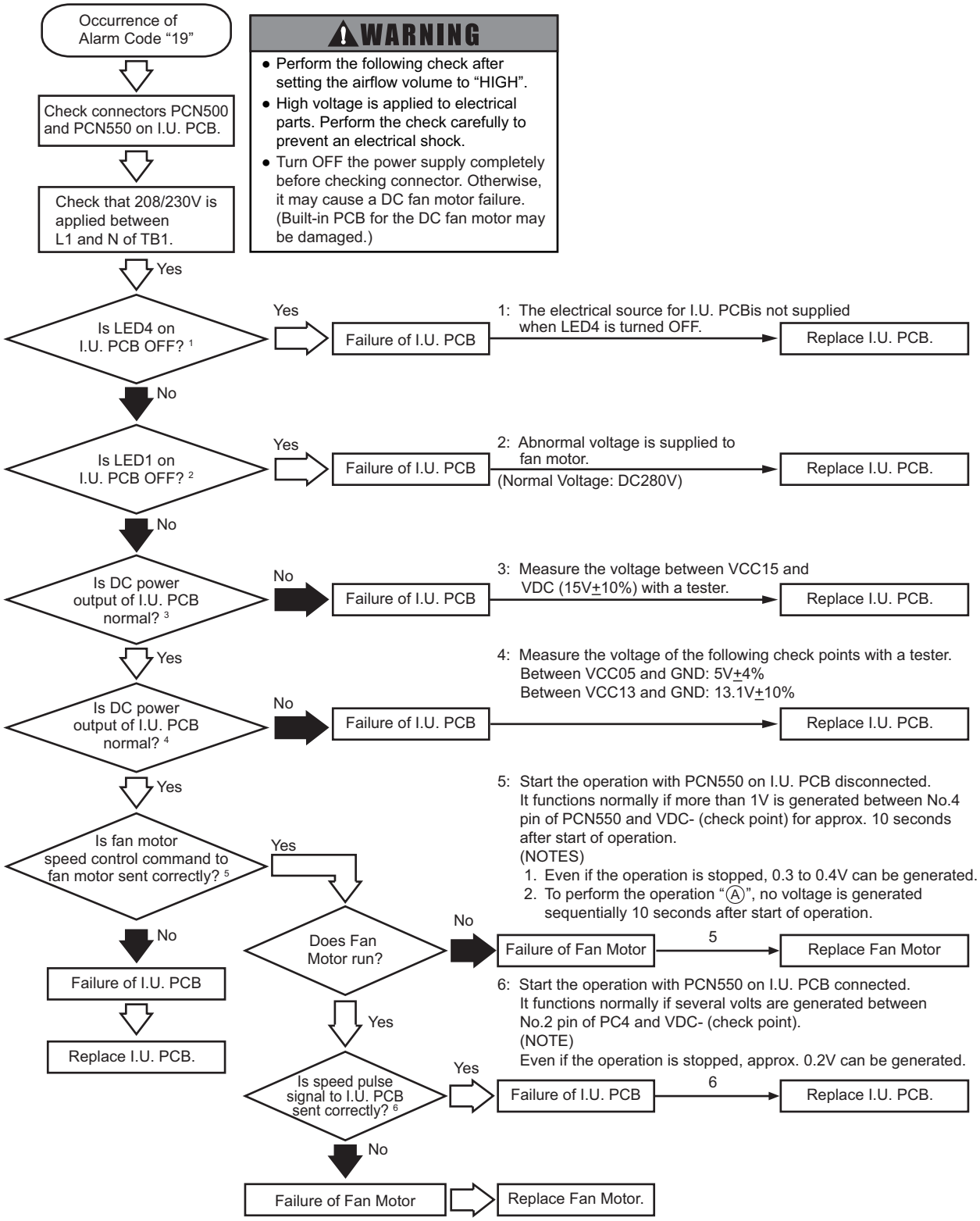
2nd		
Tester		Resistance Value
Red	Black	Ω
GND	PG	
GND	Vsp	
GND	Vcc	
GND	Vdc	

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

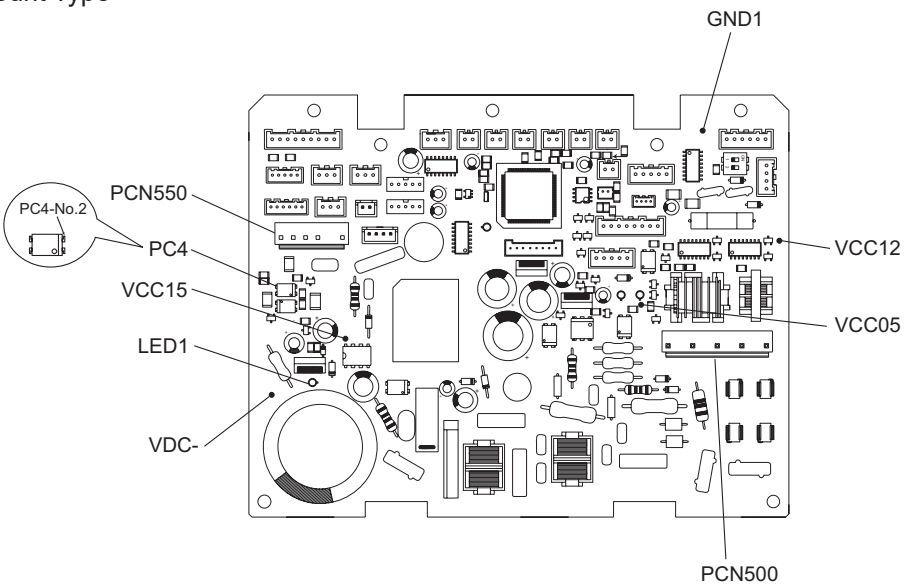
Alarm Code 19	Activation of Protection Device for Indoor Fan Motor (Wall Mount Type)

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

This alarm code is displayed when the indoor fan motor rotates at less than 70 rpm for five seconds(for 40 seconds during auto swing operation) three times in 30 minutes during the operation. (Ⓐ)

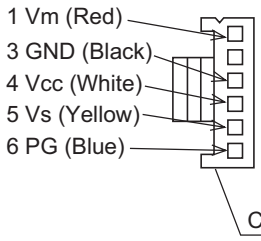


● Wall Mount Type



Checking for Fan Motor

Remove fan motor connector and measure the resistance value between each of the pins (twice, one measurement with +/- leads and the other with -/+ leads). Check whether the resistance value is over or not according to the table shown below. When performing the second measuring, make sure to switch leads (Red/ Black).



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

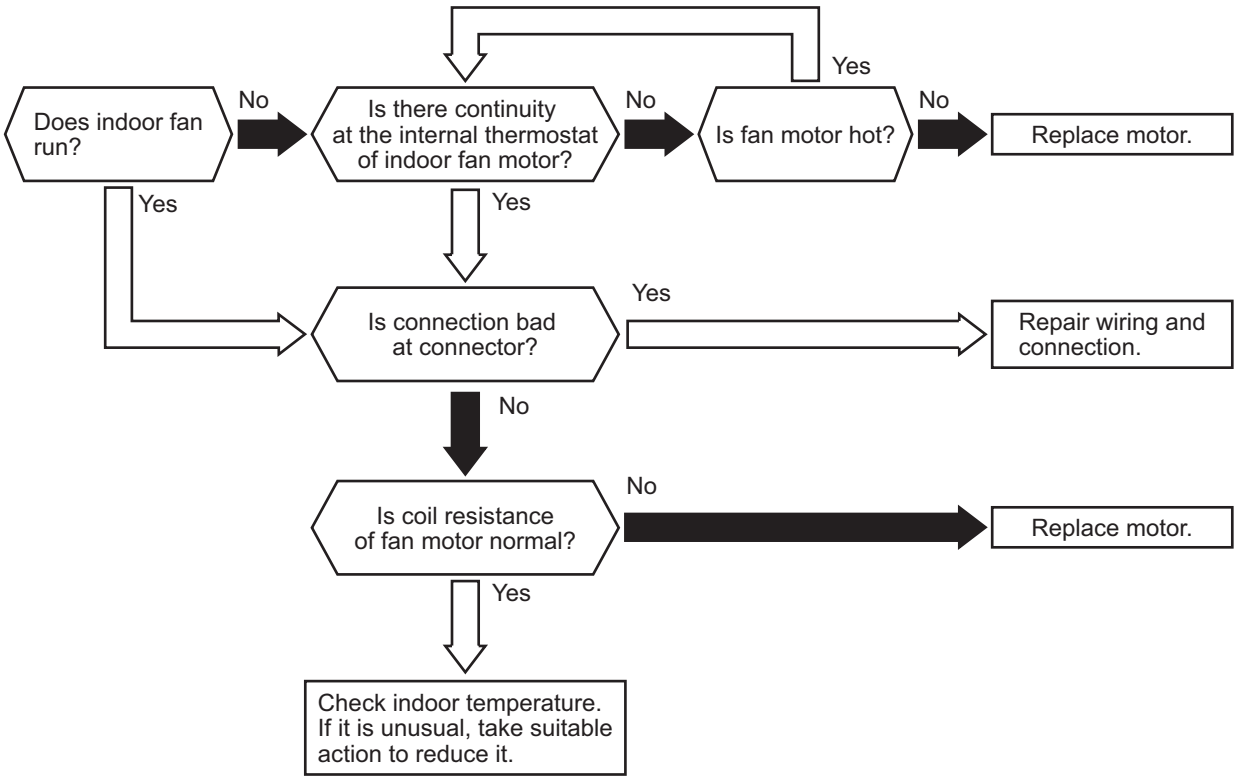
2nd		
Tester		Resistance Value
Red	Black	Ω
GND	FG	
GND	Vsp	
GND	Vcc	
GND	Vdc	

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

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

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

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



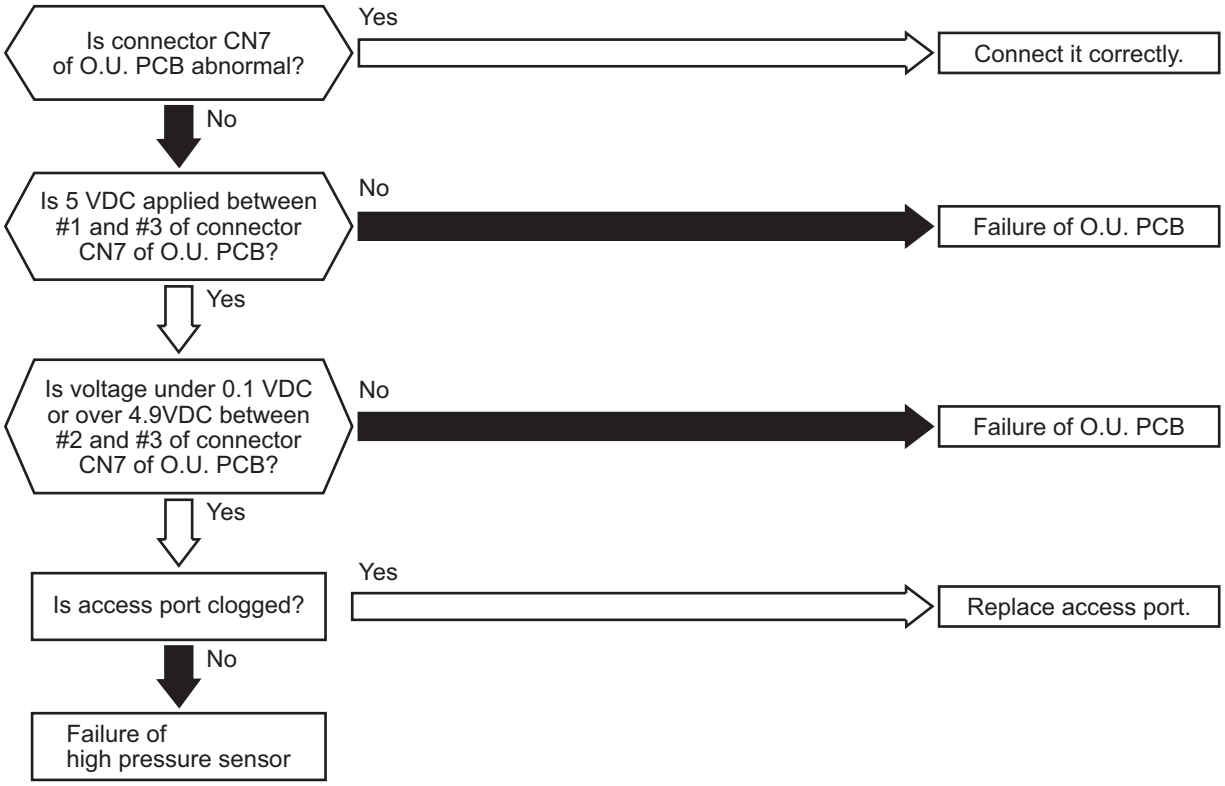
Event	Cause		Check Item	Action (Turn OFF Main Switch)
Activation of Internal Thermostat for Indoor Unit Fan Motor	Faulty Indoor Unit Fan Motor		Measure coil resistance and insulation resistance.	Replace motor if faulty.
	Faulty Internal Thermostat	Failure	Check continuity after fan motor temperature decreases to room temp.	Replace fan motor if no continuity.
		Contact Failure	Measure resistance with a tester.	Correct by tightening. Replace connectors.
		Incorrect Connection	Check connection.	Repair connection.

Alarm Code	Abnormality of High Pressure Sensor for Outdoor Unit

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 outdoor unit number and the alarm code are displayed on the 7-segment display of the indoor unit PCB.
  Note 1: Except for some models.

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

O.U. PCB: Outdoor Unit PCB (PCB1)



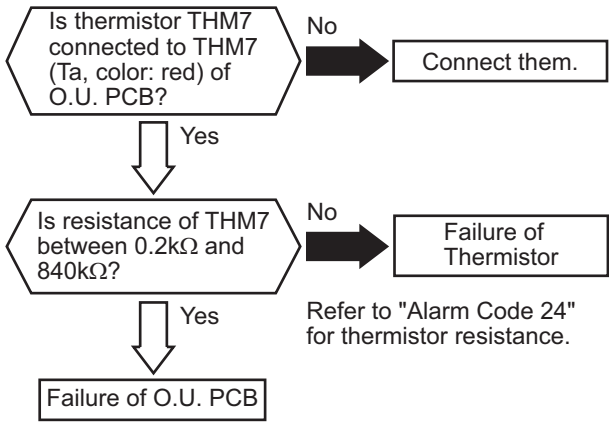
Event	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Thermistor on Top of Compressor	Failure	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to O.U. PCB.	Repair wiring and connection.
Failure of O.U. PCB		Replace O.U. PCB and check operation.	Replace O.U. PCB if faulty.
Indicated Value of Pressure Value is Excessively High or Low	Malfunction of Pressure Sensor due to Faulty Access Port	Check for clogging of access port.	Replace access port.

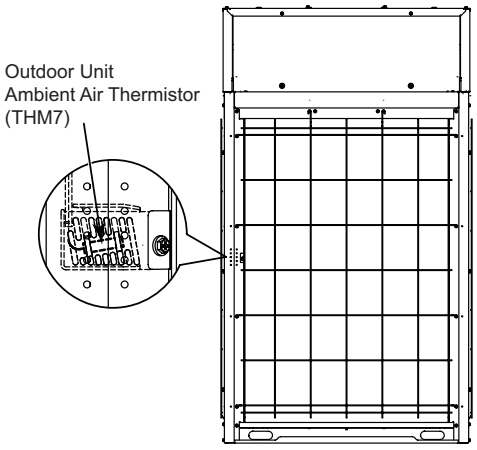
Alarm Code 27	Abnormality of Thermistor for Outdoor Air Temperature (Outdoor Unit Ambient Thermistor)

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 outdoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

This alarm code is displayed when a short (0.2kΩ or less) or open sensor (840kΩ or more) is detected during operation.

O.U. PCB: Outdoor Unit PCB (PCB1)



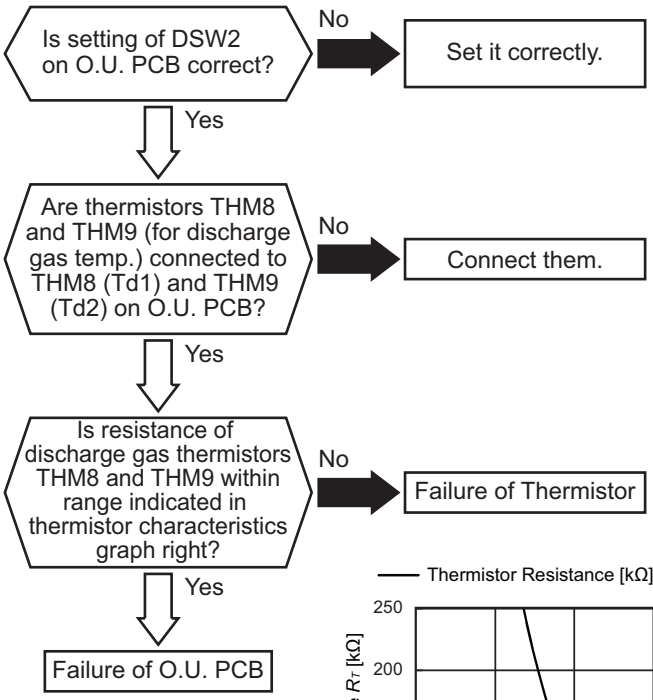


Event	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Thermistor for Outdoor Air Temp.	Failure	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to O.U. PCB.	Repair wiring and connection.
Failure of O.U. PCB		Replace O.U. PCB and check operation.	Replace O.U.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

Alarm Code 23	Abnormality of Thermistor for Discharge Gas Temperature on the Top of Compressor

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 and the outdoor unit number/compressor number with an abnormal thermistor are displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

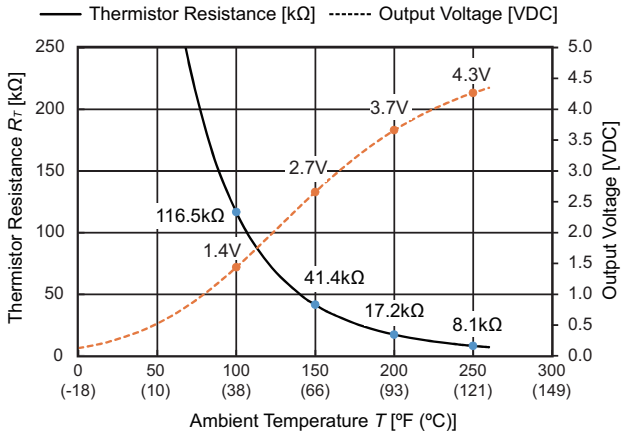
This alarm code is displayed when a short sensor for one minute (0.9kΩ or less) or open sensor (5946kΩ or more) is detected for a second time during operation.



O.U. PCB: Outdoor Unit PCB (PCB1)

Model	Thermistor	
	Td1 (THM8)	Td2 (THM9)
(H,Y)VAHR072, 096B(3,4,5)2S	○	-
(H,Y)VAHR120 ~ 192B(3,4,5)2S	○	○

If there is a combination of outdoor units, abnormalities can be detected for each unit.



R_{25} = 200kΩ
(When T = 77°F (25°C), R_T = 200kΩ)
B = 3920K

$R_T = R_{25} \cdot \exp B(1/T[K] - 1/273.15)$

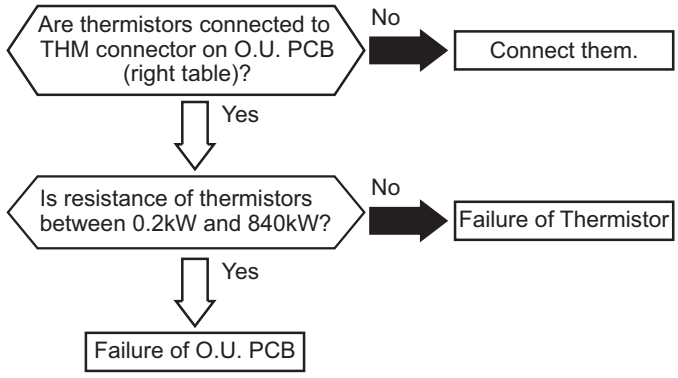
Thermistor Characteristics

Event	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty Discharge Gas Thermistor	Failure	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to O.U. PCB.	Repair wiring and connection.
Faulty O.U. PCB		Replace O.U. PCB and check operation.	Replace O.U. PCB if faulty.
Incorrect Setting of DSW2 on O.U. PCB		Check setting of DSW2 on O.U. PCB.	Correctly set DSW2 on O.U. PCB.

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

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 and the outdoor unit number/compressor number with an abnormal thermistor are displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

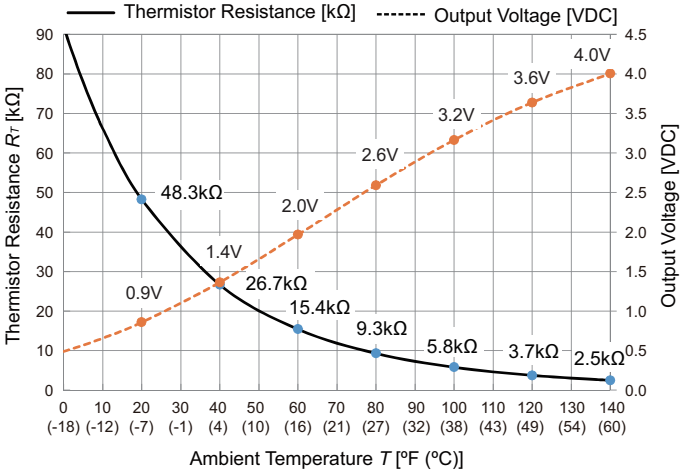
This alarm is displayed when a short (0.2kΩ or less) or open sensor (840kΩ or more) is detected for eight minutes during operation.



Model	Thermistor Symbol (( ): Connector No.)			
	Te1 (THM10)	Te2 (THM11)	Tchg (THM17)	Tsc (THM23)
(H,Y)VAHR072B(3,4,5)2S	○	-	○	○
(H,Y)VAHR096~192B(3,4,5)2S	○	○	○	○

If there is a combination of outdoor units, abnormalities can be detected for each unit.

Te1, Te2: Thermistor for Outdoor Liquid Pipe 1, 2
Tchg: Thermistor for Liquid Stop Valve
Tsc: Thermistor for Supercooling Bypass Line
O.U. PCB: Outdoor Unit PCB (PCB1)



Thermistor Characteristics

R_{25} = 10kΩ
(When T = 77°F (25°C), R_T = 10kΩ)
B = 3950K

$R_T = R_{25} \cdot \exp B(1/T[K] - 1/273.15)$

NOTICE:
This data is applicable to the following thermistors.

1. Ambient Temperature Thermistor (THM7)
2. Evaporation Liquid Line Thermistor (THM10, 11)
3. Evaporation Gas Line Thermistor (THM12)
4. Liquid Stop Valve Thermistor (THM17)
5. Subcooler Thermistor (THM23)

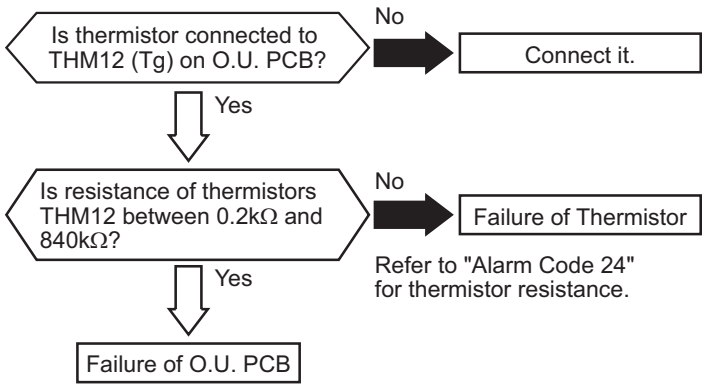
Event	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Thermistor for Evaporating Temperature during Heating	Failure	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to O.U. PCB.	Repair wiring and connection.
Failure of O.U. PCB		Replace O.U. PCB and check operation.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

Alarm Code 25	Abnormality of Thermistor for Outdoor Unit Heat Exchanger Gas Pipe (Tg)

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 outdoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

This alarm is displayed when a short (0.2kΩ or less) or open sensor (840kΩ or more) is detected for eight minutes during operation.

Tg: Thermistor for Outdoor Gas Pipe
O.U. PCB: Outdoor Unit PCB (PCB1)



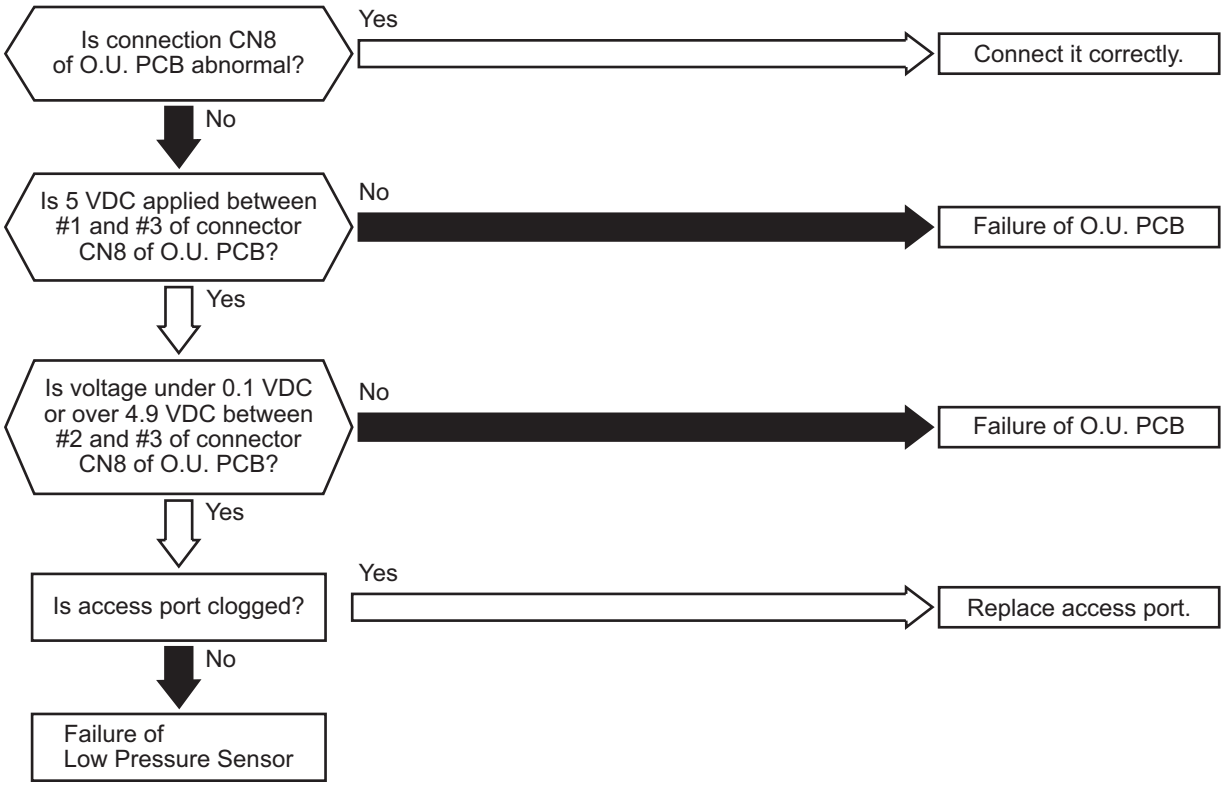
Event	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Outdoor Unit Gas Pipe Thermistor	Failure	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to O.U. PCB.	Repair wiring and connection.
Failure of O.U. PCB		Replace O.U. PCB and check operation.	Replace O.U.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

Alarm Code 29	Abnormality of Low Pressure Sensor for Outdoor Unit

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

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

O.U. PCB: Outdoor Unit PCB (PCB1)



Event	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty Low Pressure Sensor	Failure	Check output voltage is correct.	Replace pressure sensor if faulty.
	Incorrect Connection	Check wiring to O.U. PCB.	Repair wiring and connection.
Faulty O.U. PCB		Replace O.U. PCB and check operation.	Replace O.U. PCB if faulty.
Indicated Value of Pressure Value is Excessively High or Low	Malfunction of Pressure Sensor due to Faulty Access Port	Check for clogging of access port.	Replace access port.

Alarm Code 30	Incorrect Connection of Change-Over Box

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 outdoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

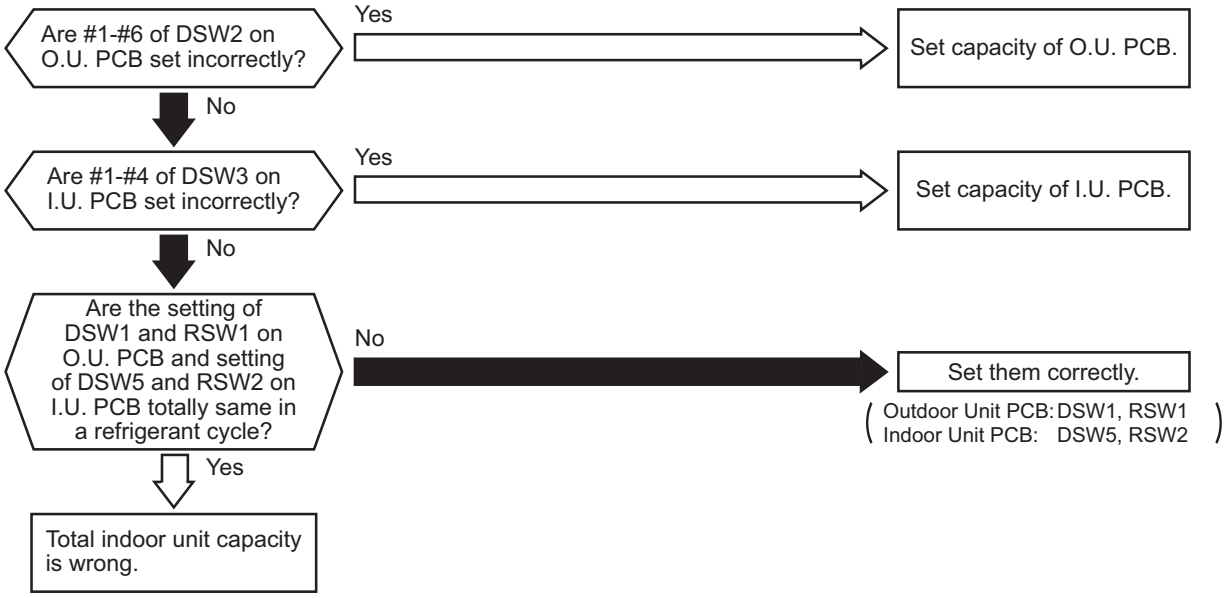
1. This alarm code is displayed when the change-over boxes are connected to the refrigerant cycle system.
2. This alarm code is displayed when the power supply setting, DSW7, DIP switch on the outdoor unit PCB is set incorrectly (#4 is ON).

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

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

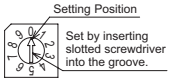
1. Incorrect Capacity Setting of Outdoor Unit and Indoor Unit
- This alarm code is displayed when the capacity setting DIP switch, DSW2, on the outdoor unit PCB, is not set (all the settings from #1 to #6 are OFF) or set incorrectly.
- This alarm code is displayed when the total indoor unit capacity exceed the connectable indoor unit capacity ratio of outdoor unit.

O.U. PCB: Outdoor Unit PCB (PCB1)
I.U. PCB: Indoor Unit PCB



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, DSW2.
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 is from 55% to 130%. [1]
Refrigerant Cycle Setting of Outdoor Unit and Indoor Unit is Different		Check refrigerant cycle setting of O.U. PCB and I.U. PCB.	Set them correctly.

Refrigerant Cycle No. Setting

	Setting Switch	
	10 digit	1 digit
		
Outdoor Unit	DSW1	RSW1
Indoor Unit	DSW5	RSW2

Example of Setting Refrigerant Cycle No.25

Turn ON No. 2 pin. Set Dial No.5.

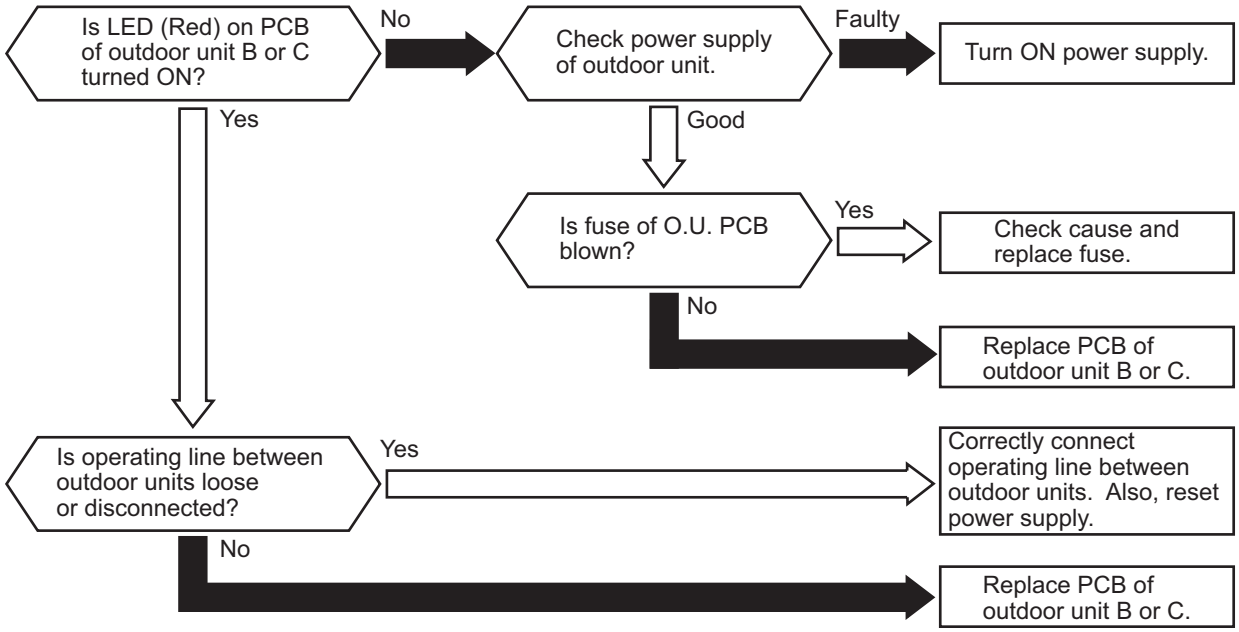
DSW and RSW factory setting is 0.
Maximum in setting refrigerant cycle No. is 63.

1: Refer to “Installation and Maintenance Manual” for details.

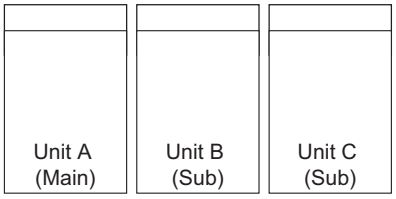
2. Abnormal Communication between Outdoor Units

This alarm code is displayed when an abnormal condition continues for 30 seconds after normal communication between outdoor units, also if the abnormal condition continues for 30 seconds even after the micro-computer is automatically reset.

O.U. PCB: Outdoor Unit PCB (PCB1)



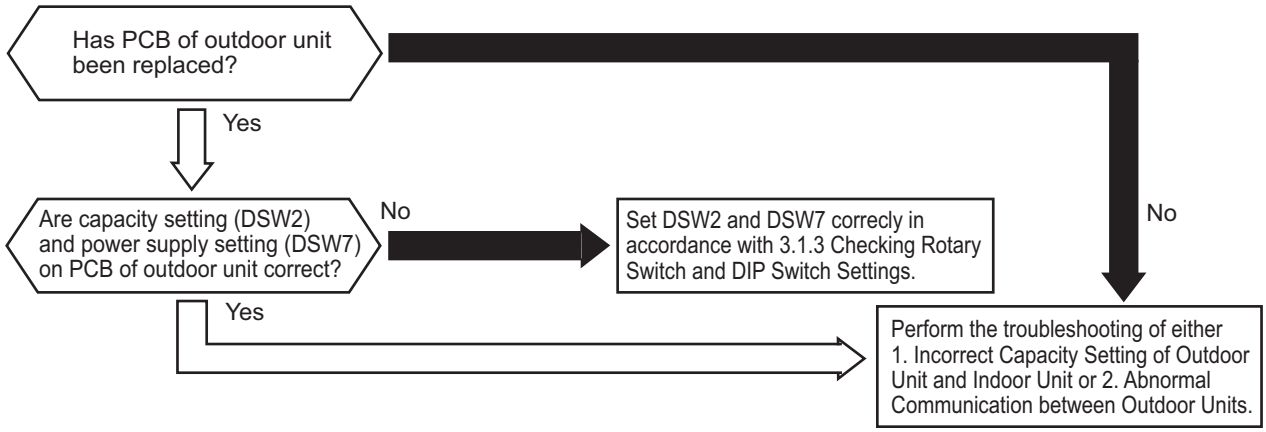
Arrangement of Outdoor Unit
(Three Unit Combination)



NOTICE:
In case the outdoor unit is intended for single unit use but communication cable is incorrectly connected between communication terminal of outdoor units and power supply is turned ON then outdoor unit no. setting is automatically configured and recognized as combination unit.
Alarm may still occur even though the communication cable is removed.
After communication cable is correctly connected and the power supply is reset (or during alarm occurrence), be sure to reset the memory of all the outdoor units PCB1 of incorrectly connected outdoor units by pressing “PSW1+PSW3” for 5 seconds.

3. Incorrect Capacity and Power Supply Setting of Outdoor Unit

This alarm code is displayed when the capacity setting Dip switch, DSW2, and power supply setting Dip switch, DWS7 are set incorrectly.



Alarm Code 35	Incorrect Indoor Unit No. Setting

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

This alarm code is displayed five minutes after power-on of the outdoor unit, if the indoor unit number set by DSW6 and RSW1 duplicates in the same refrigerant group.

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

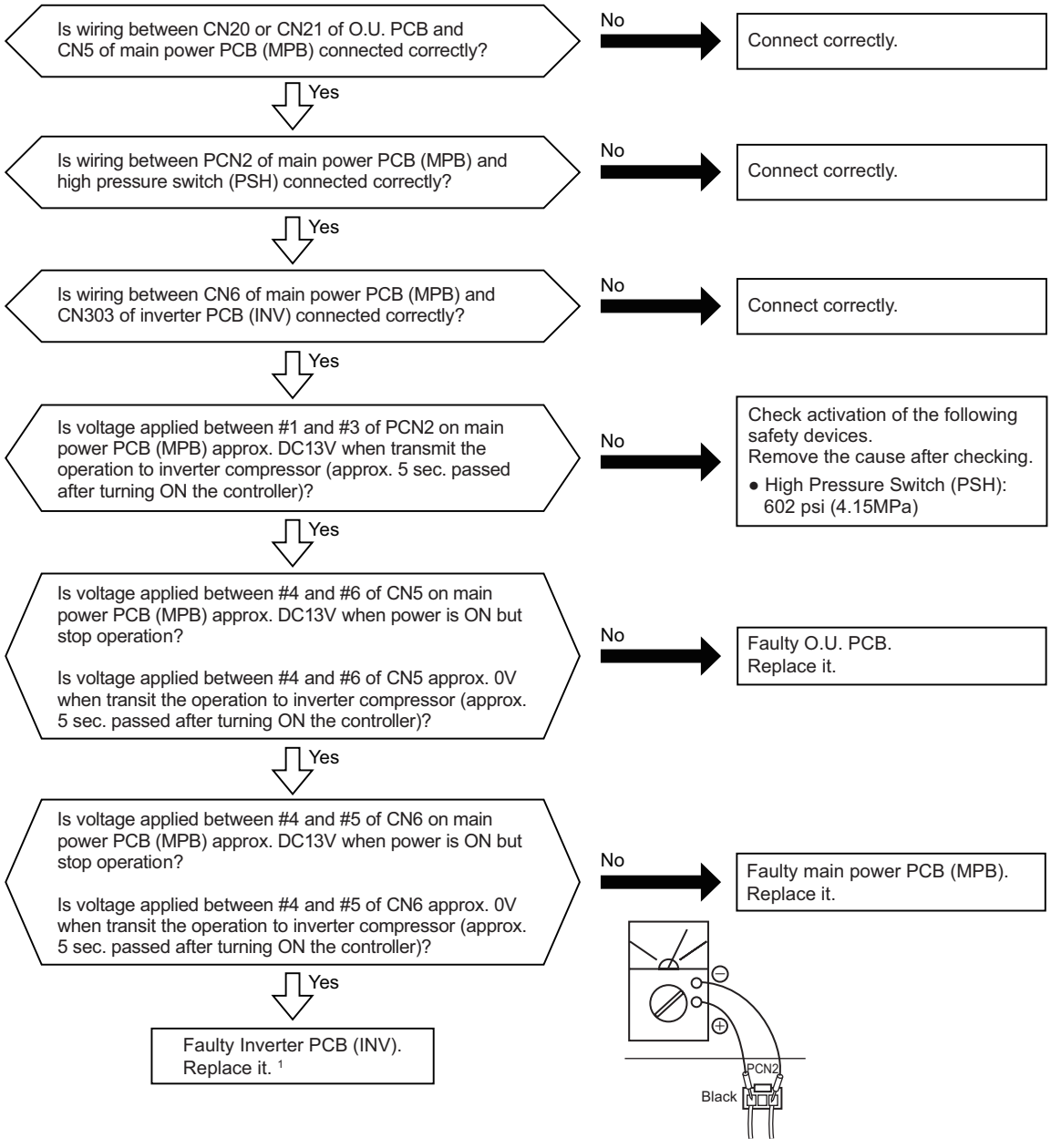
- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address number), the alarm code, the model code[1], the model name[1] and the number of connected indoor units are displayed on the LCD. The alarm code, the outdoor unit number of abnormal inverter PCB, and abnormal PCB number are displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

This alarm code is displayed when DC 13V is applied to connector (refer to the table) at the time operation command is transmitted to inverter compressor (approx. 5 sec. after turning ON the controller.
For troubleshooting, make sure to connect PCN2, CN5, and CN6 to the connectors before attaching the tester as indicated in the figure.
If PCN2 is not connected to the connector when attach the tester, DCI3V is continuously detected and end in checking failure.

Outdoor Unit Type	208/230V			460V, 575V
PCB	Main Power PCB (MPB)			Inverter PCB (INV)
Connector	PCN2	CN5	CN6	PCN2
Pin No.	#1, #3	#4, #6	#4, #5	#1, #3

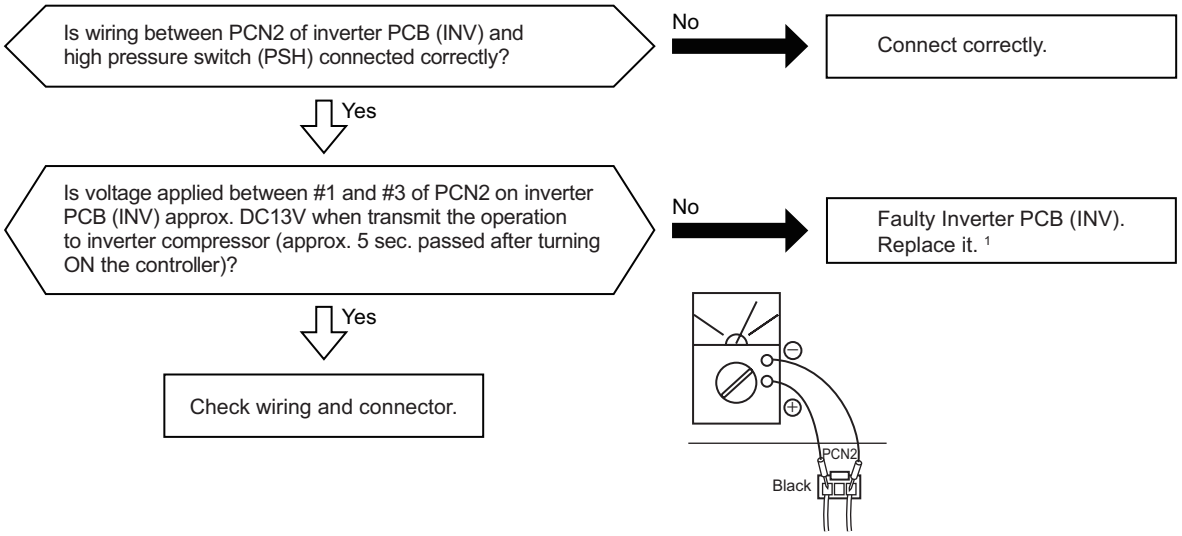
■ 208/230V Type

O.U. PCB: Outdoor Unit PCB (PCB1)



■ 460V Type, 575V Type

O.U. PCB: Outdoor Unit PCB (PCB1)



1: When replacing or checking for the inverter part, make sure to perform the electric discharge work according to Section 4.2.1.1 [2] for 208/230V type and Section 4.2.1.2 [2] for 460V type, 575V type “High Voltage Discharge Work for Replacing Parts”.

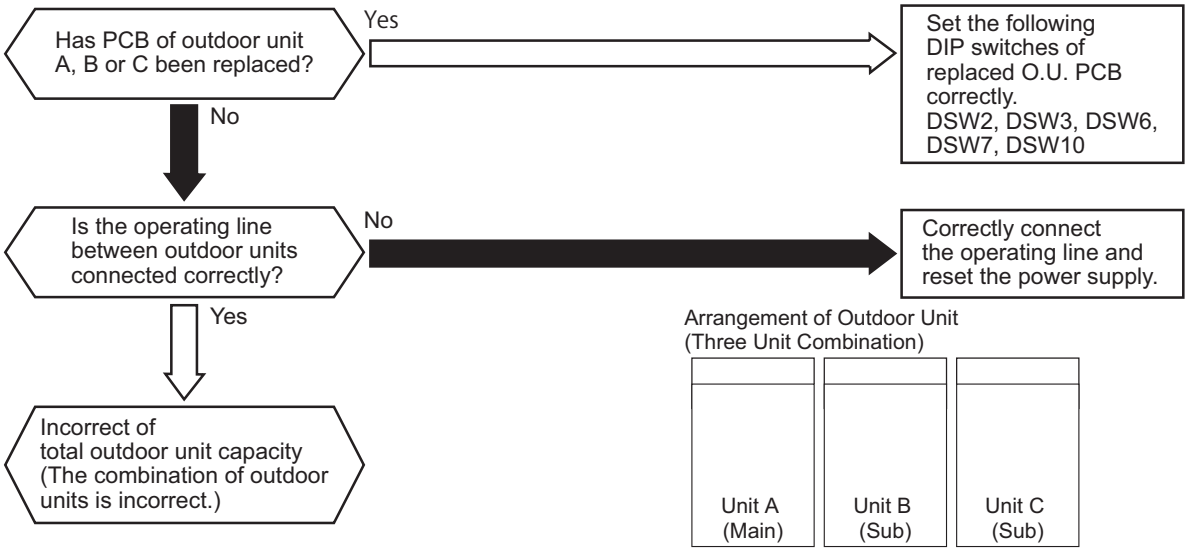
2: This alarm code may display when the high pressure switch (PSH) is connected incorrectly or fails (open fault). The item for alarm code 02 should be checked as well.

Alarm Code 3A	Abnormality of Outdoor Unit Capacity

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

This alarm code is displayed when the total capacity of the outdoor unit connected to the communication terminal between outdoor units exceeds 432 MBH.

O.U. PCB: Outdoor Unit PCB (PCB1)

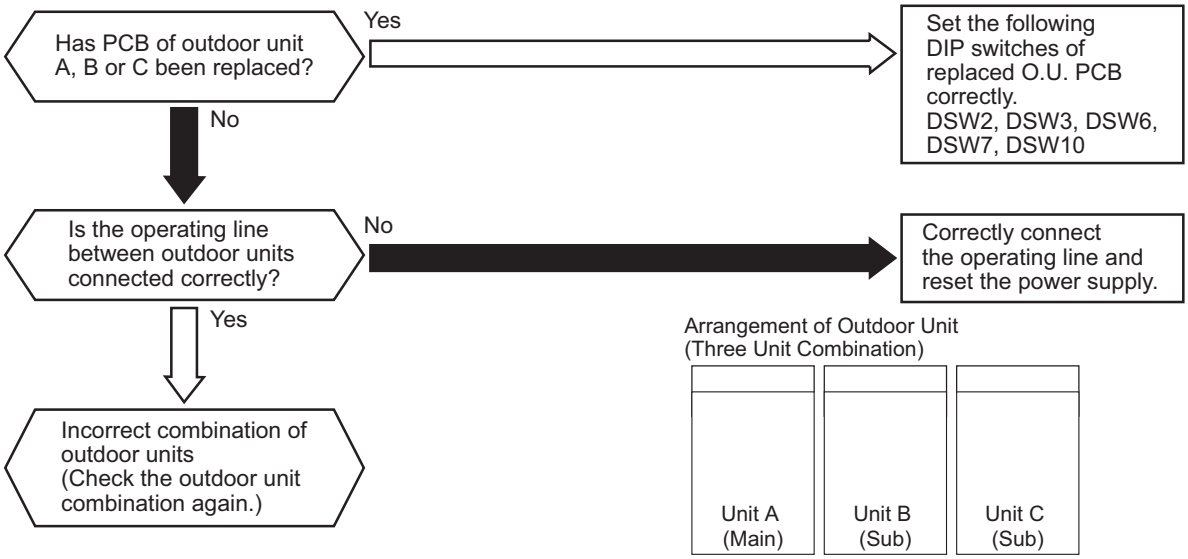


Alarm Code 3b	Incorrect Setting of Outdoor Unit Model Combination or Voltage

- The RUN indicator (Red) flashes.
- The indoor unit number (Refrigerant System No. - Address No.), the alarm code, the model code[1], the model name[1] and the number of connected indoor units are displayed on LCD. The alarm code is displayed on the 7-segment of outdoor unit PCB.
  Note 1: Except for some models.

This alarm code is displayed when the model setting for outdoor unit connected to the communication terminal between outdoor units is incorrect.

O.U. PCB: Outdoor Unit PCB (PCB1)

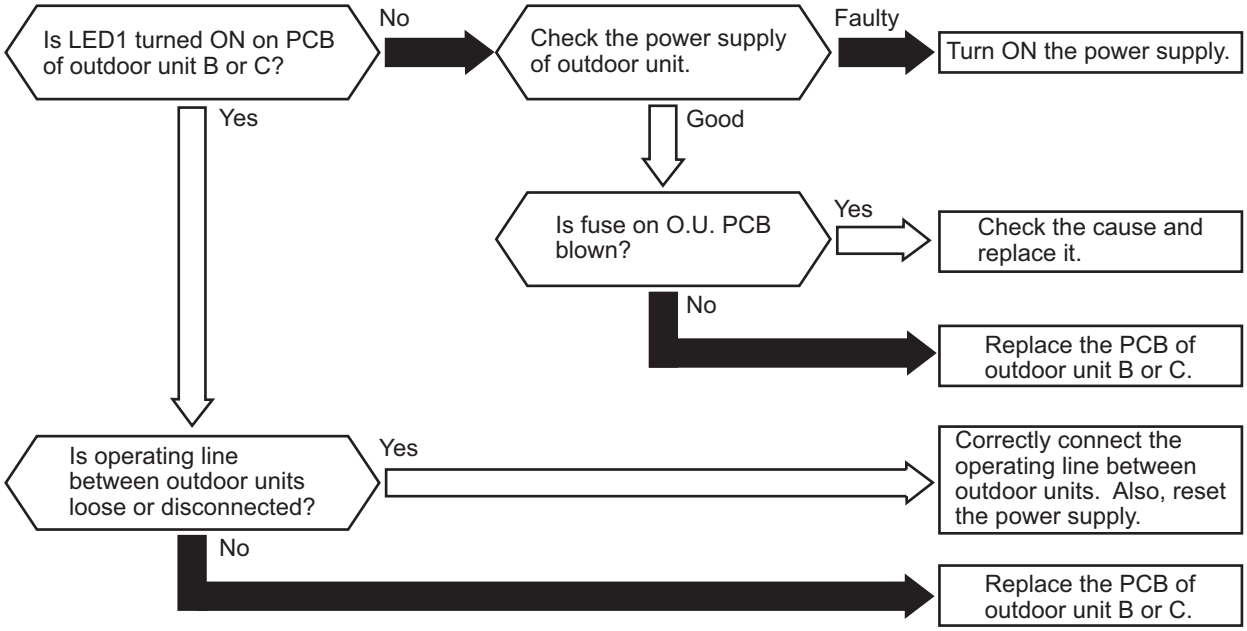


Alarm Code 3d	Abnormal Communication between Main Unit and Sub Unit(s)

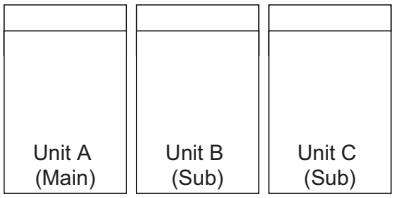
- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address number), the alarm code, the model code[1], the model name[1] and the number of connected indoor units are displayed on the LCD. The alarm code is displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

For combination of outdoor units, this alarm code is displayed when the communication to outdoor Unit B or C is NOT provided for 30 seconds.
(Alarm code “31” is displayed when communication to all the outdoor units connected to the communication terminals between outdoor units is NOT provided.)

O.U. PCB: Outdoor Unit PCB (PCB1)



Arrangement of Outdoor Unit
(Three Unit Combination)

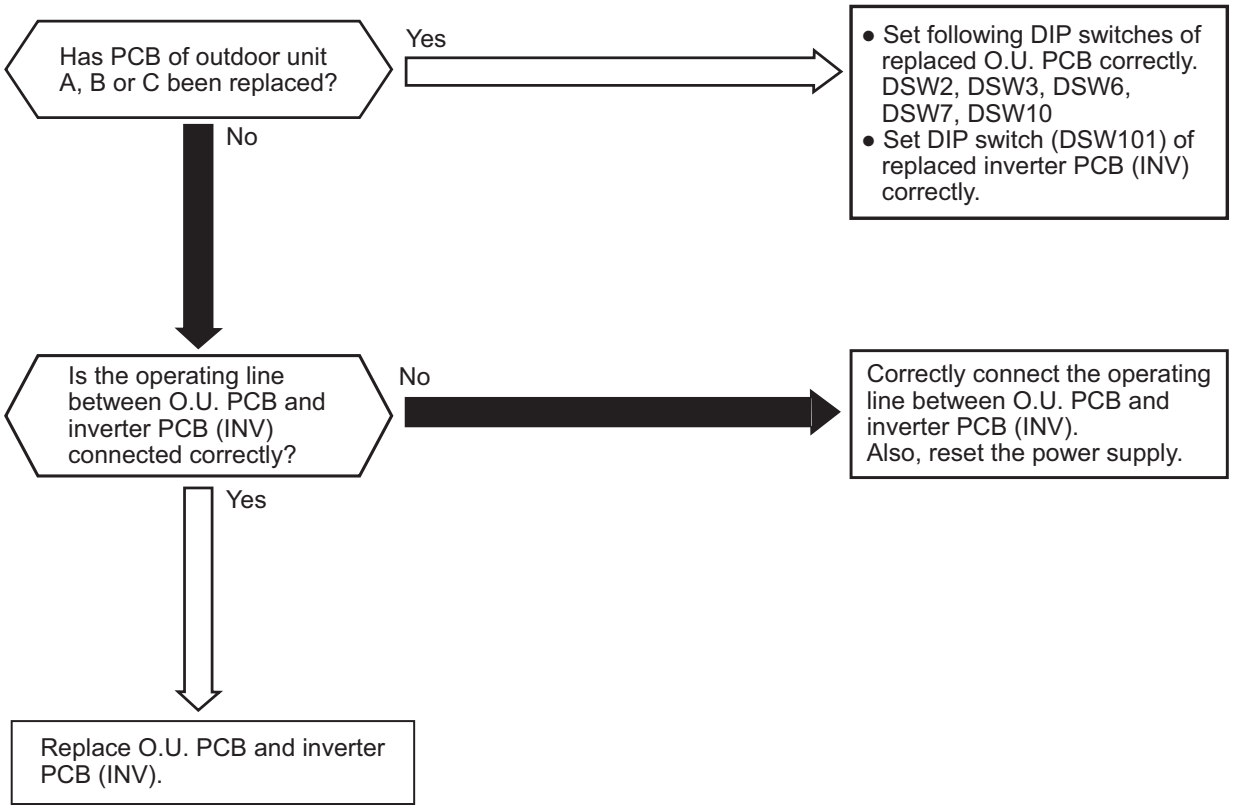


Alarm Code 3E	Abnormal Combination between Inverter PCB and Outdoor PCB

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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, the outdoor unit number of abnormal inverter PCB, and abnormal inverter PCB number are displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

This alarm code is displayed when an incorrect model code setting of the outdoor unit is connected to the terminals between the outdoor units' communication terminal (TB2 No. 3 and 4 terminals on the PCB1 for the outdoor unit combination).

O.U. PCB: Outdoor Unit PCB (PCB1)

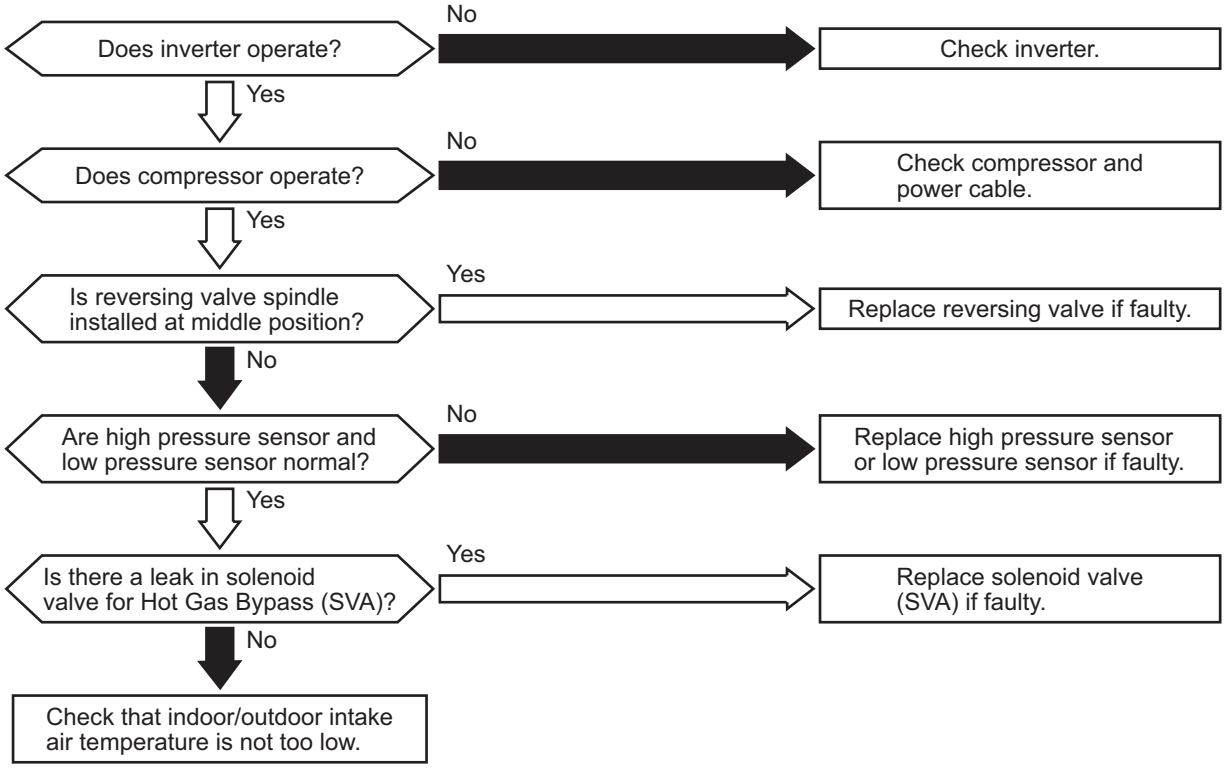


Alarm Code 43	Activation of Low Compression Ratio Protection

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

This alarm code is displayed when the following condition occurs more than twice in an hour.
Compression ratio $\varepsilon = \{(Pd + 14.5\ psi\ (0.1\ MPa)) / (Ps + (8.7\ psi\ (0.06\ MPa))\}$, calculated from a discharge pressure (Pd) and suction pressure (Ps) is lower than 1.8.

O.U. PCB: Outdoor Unit PCB (PCB1)



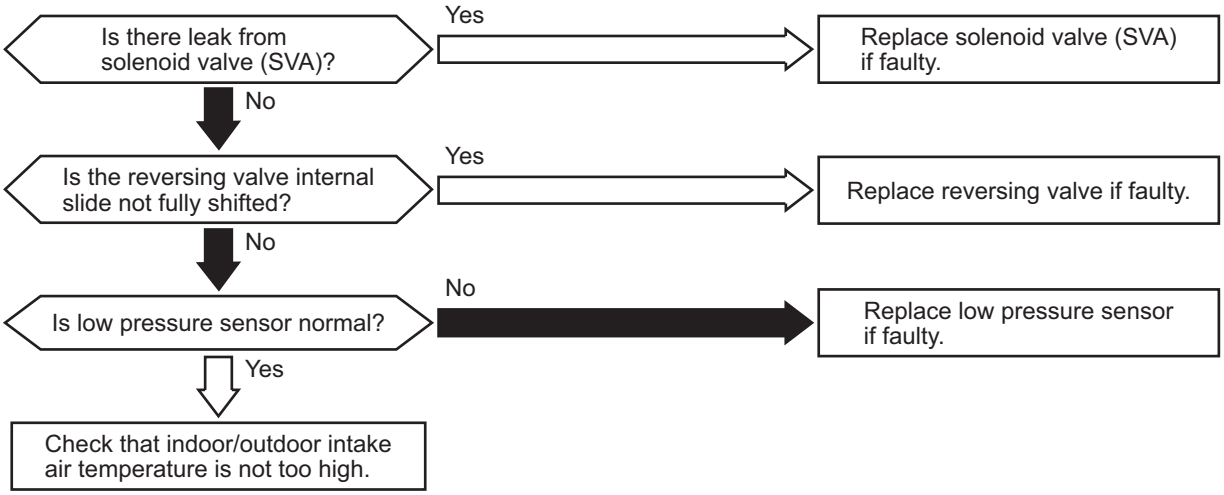
Event	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively Decrease Low Compression Ratio	Inverter is not functioning.	Check inverter.	Repair faulty part.
	Compressor is not operating.	Check compressor.	Replace comp. if faulty.
	Valve Stoppage at Middle Position of Reversing Valve	Measure suction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

Alarm Code 44	Activation of Low Pressure Increase Protection

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

If the suction pressure (Ps) of the compressor is more than 203 psi (1.4 MPa) for a minute, all the compressors stop. 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 (PCB1)



Event	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively Increase Low Suction 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 Suction Air Temperature [1]	Check indoor unit and outdoor unit suction air temp. thermistor.	Replace thermistor if faulty.

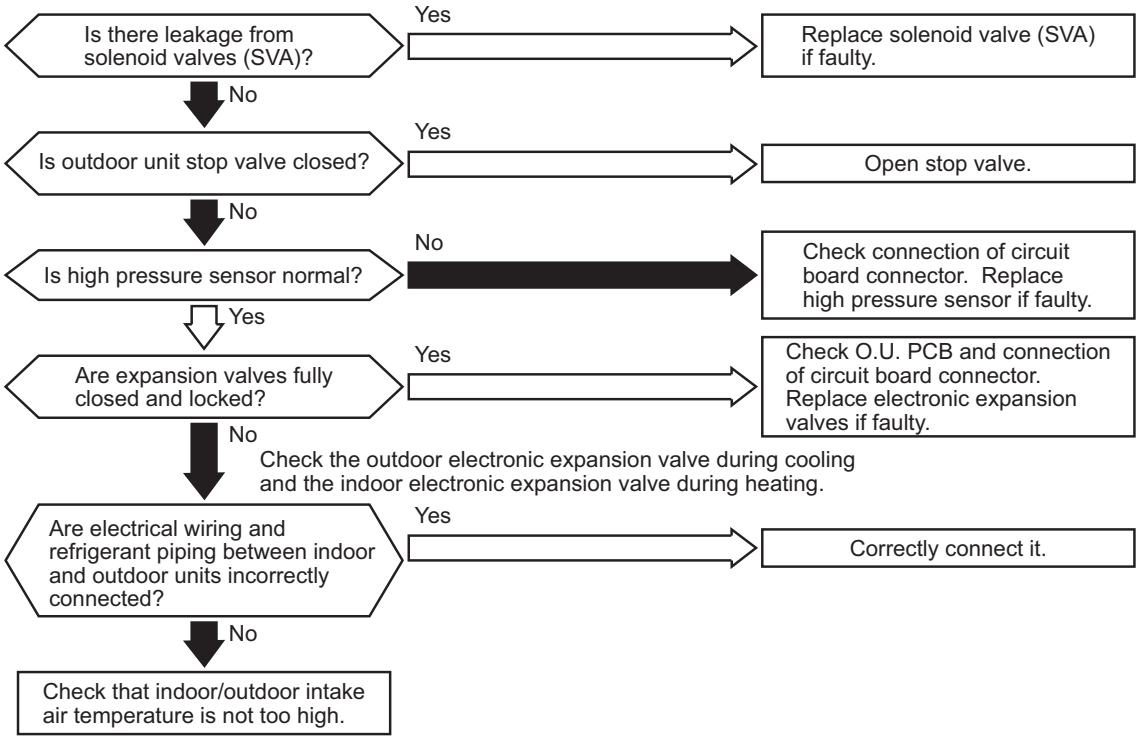
1: Refer to page 3-46, if insufficient Airflow to Heat Exchanger.

Alarm Code 45	Activation of High Pressure Increase Protection

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

If the discharge pressure (Pd) of the compressor is more than 551 psi (3.8 MPa) for two seconds, all the compressors stop. 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 (PCB1)
I.U. PCB: Indoor Unit PCB



Event	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively High Discharge 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 valve.	Open stop valve.
	Abnormal High Pressure Sensor	Check connectors for O.U. PCB.	Replace pressure sensor if faulty.
	Excessively High Indoor Unit and Outdoor Unit Inlet Air Temp.[1]	Check thermistor for indoor unit and outdoor unit inlet air temp.	Replace thermistor if faulty.
	Incorrect Connection between Indoor Unit and Outdoor Unit	Check electrical system and ref. cycle.	Correctly connect them.
	Locked Expansion Valve (Fully Closed)	Check connector for O.U. PCB.	Repair connector for O.U. PCB or expansion valve. Replace it if faulty.
Stoppage of Indoor Fan <Wall Mounted Only>	Blown Fuses	Check continuity of fuses.	Replace fuses.
	Faulty I.U. PCB	Replace I.U. PCB and check operation.	Replace I.U. PCB if faulty.

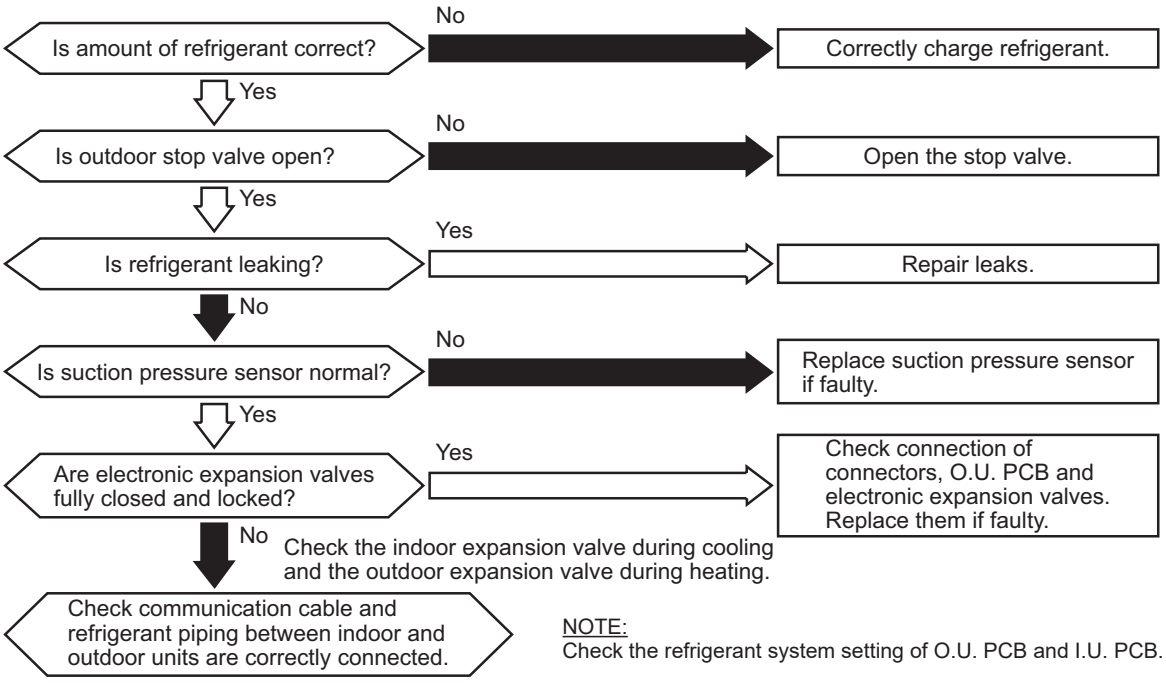
1: Refer to page 3-46, if insufficient Airflow to Heat Exchanger.

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

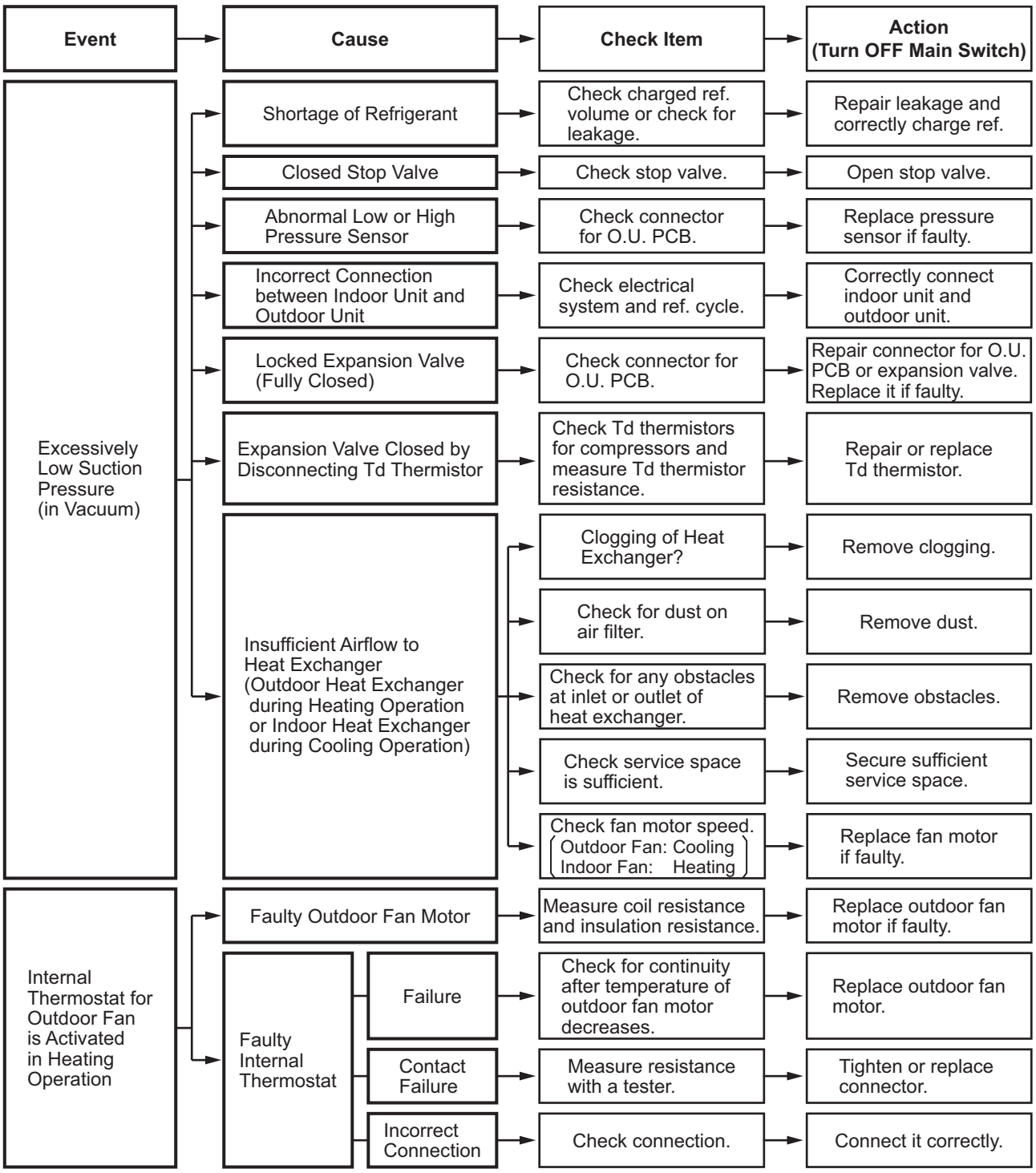
- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address number), the alarm code, the model code[1], the model name[1] and the number of connected indoor units are displayed on the LCD. The alarm code is displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

If the suction pressure (Ps) of the compressor is less than 13 psi (0.09 MPa) for 12 minutes, the compressor stops. If this occurs again twice in the next 60 minutes, this alarm code is displayed.

O.U. PCB: Outdoor Unit PCB (PCB1)
I.U. PCB: Indoor Unit PCB



NOTE:
Check the refrigerant system setting of O.U. PCB and I.U. PCB.


Event
Cause
Check Item
Action (Turn OFF Main Switch)
Excessively Low Suction Pressure (in Vacuum)
Shortage of Refrigerant
Check charged ref. volume or check for leakage.
Repair leakage and correctly charge ref.
Closed Stop Valve
Check stop valve.
Open stop valve.
Abnormal Low or High Pressure Sensor
Check connector for O.U. PCB.
Replace pressure sensor if faulty.
Incorrect Connection between Indoor Unit and Outdoor Unit
Check electrical system and ref. cycle.
Correctly connect indoor unit and outdoor unit.
Locked Expansion Valve (Fully Closed)
Check connector for O.U. PCB.
Repair connector for O.U. PCB or expansion valve. Replace it if faulty.
Expansion Valve Closed by Disconnecting Td Thermistor
Check Td thermistors for compressors and measure Td thermistor resistance.
Repair or replace Td thermistor.
Insufficient Airflow to Heat Exchanger (Outdoor Heat Exchanger during Heating Operation or Indoor Heat Exchanger during Cooling Operation)
Clogging of Heat Exchanger?
Remove clogging.
Check for dust on air filter.
Remove dust.
Check for any obstacles at inlet or outlet of heat exchanger.
Remove obstacles.
Check service space is sufficient.
Secure sufficient service space.
Check fan motor speed. (Outdoor Fan: Cooling Indoor Fan: Heating)
Replace fan motor if faulty.
Internal Thermostat for Outdoor Fan is Activated in Heating Operation
Faulty Outdoor Fan Motor
Measure coil resistance and insulation resistance.
Replace outdoor fan motor if faulty.
Faulty Internal Thermostat
Failure
Check for continuity after temperature of outdoor fan motor decreases.
Replace outdoor fan motor.
Contact Failure
Measure resistance with a tester.
Tighten or replace connector.
Incorrect Connection
Check connection.
Connect it correctly.

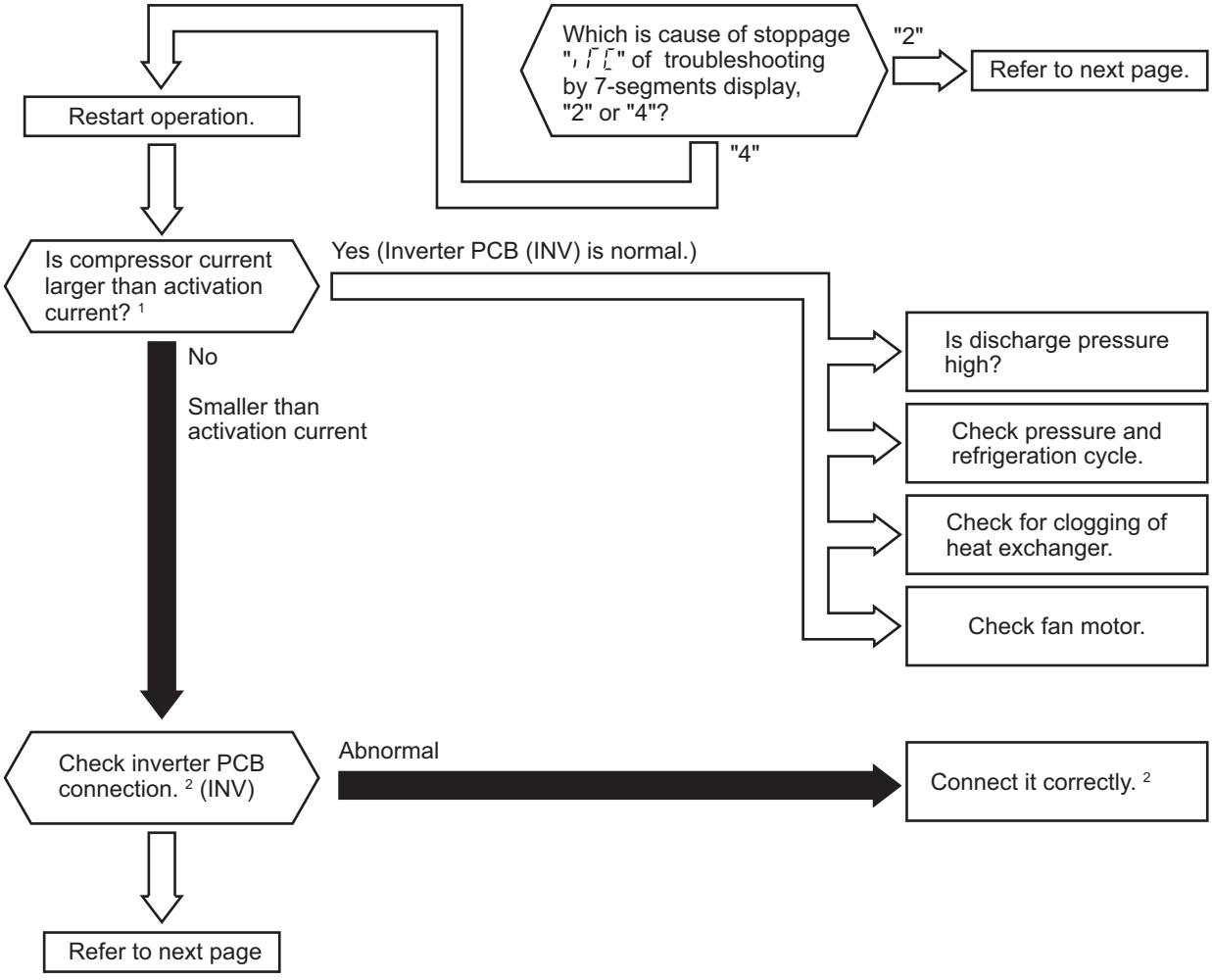
Alarm Code 48	Activation of Inverter Overcurrent Protection (1)

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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, the outdoor unit number of abnormal inverter PCB, and abnormal inverter PCB number are displayed on the 7-segment display of the outdoor unit PCB. Check the inverter stoppage code when this alarm code is displayed.
  Note 1: Except for some models.

This alarm code is displayed when the inverter electronic thermal protection is activated six times within 30 minutes. If this occurs less than six times in 30 minutes, the operation is automatically retried.

Conditions of Activation:
(1) Inverter current with 105% of the rated current runs for 30 seconds continuously.
(2) Inverter current runs intermittently and the accumulated time reaches up to three minutes, in 10 minutes.

O.U. PCB: Outdoor Unit PCB (PCB1)

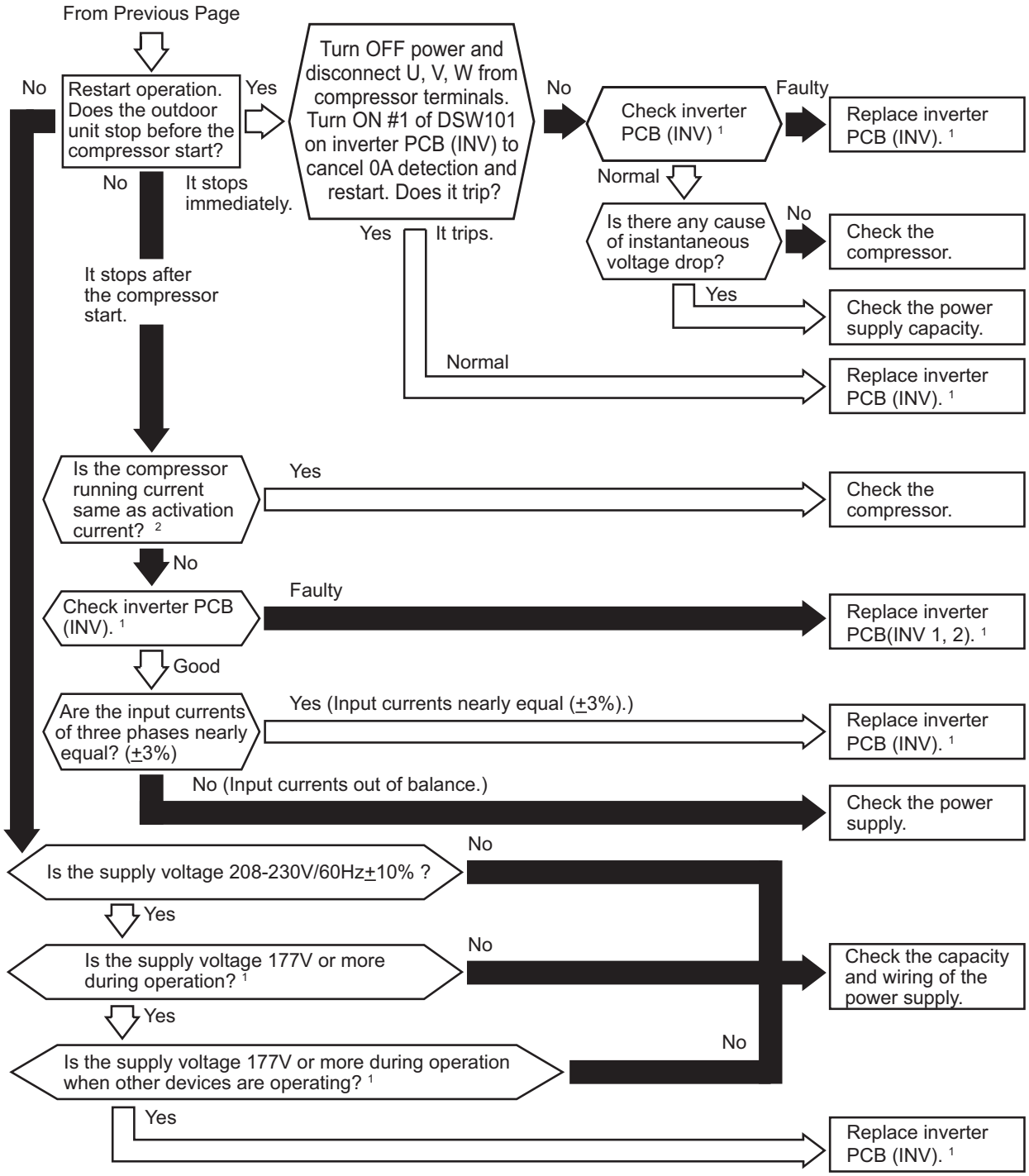


1: Regarding the setting value of activation current, refer to Section 4.2.1.1 [1] for 208/230V type and Section 4.2.1.2 [1] for 460V type, 575V type.
2: Regarding replacing or checking method for inverter parts, refer to Section 4.2.1.1 [2] for 208/230V type and Section 4.2.1.2 [2] for 460V type, 575V type.

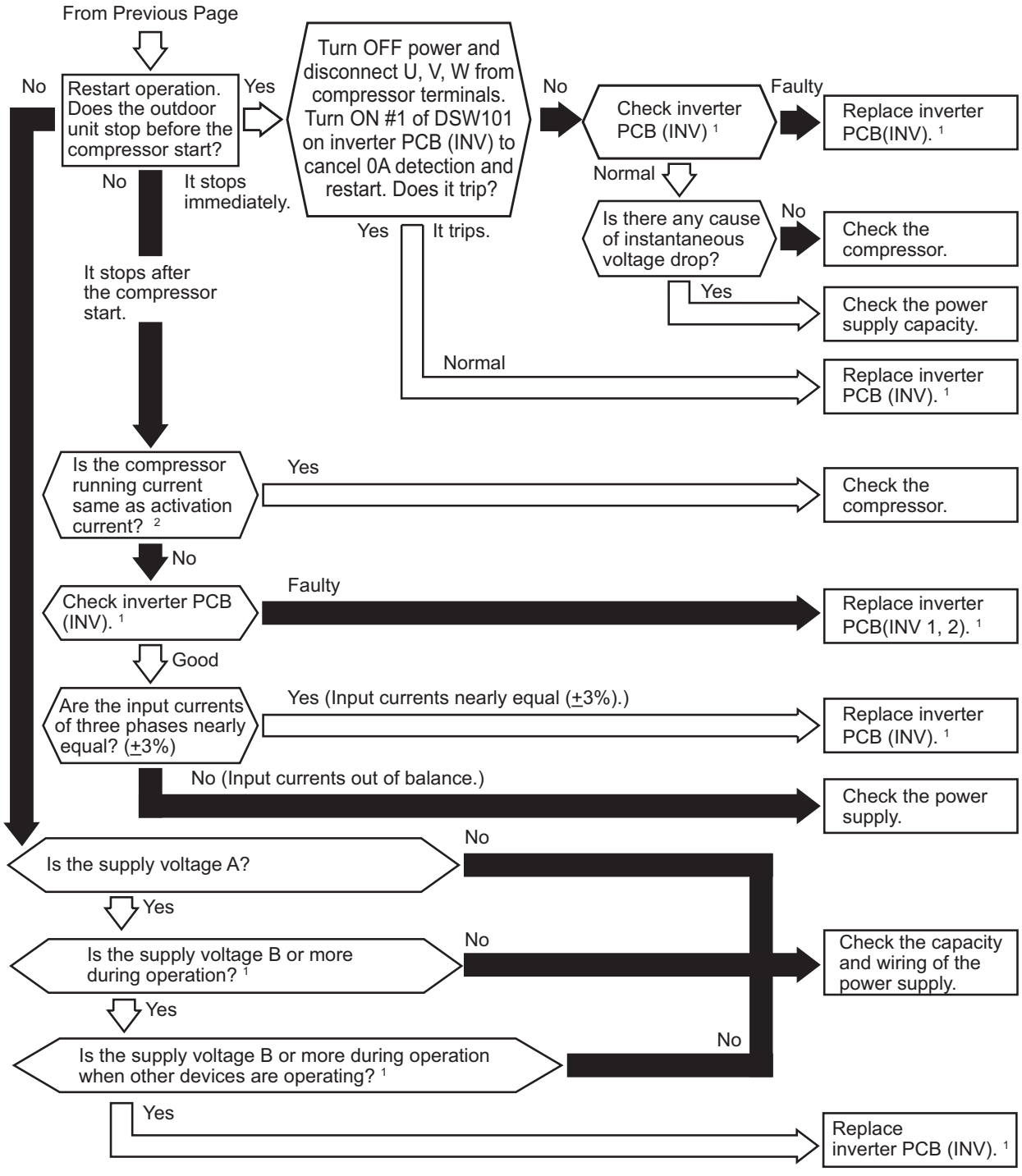
Inverter Stoppage Code

iTC	Cause of Inverter Stoppage
2	Instantaneous Overcurrent
4	Inverter Overcurrent

■ 208/230V Type



■ 460V Type, 575V Type



Power Supply	"A"	"B"
460V, 60Hz	460V ±10%	391V
575V, 60Hz	600V +10% 575V -10%	489V

1: For the maintenance and replacement of inverter PCB, perform the high voltage discharge work according to Section 4.2.1.1 [2] for 208/230V type and Section 4.2.1.2 [2] for 460V type, 575V type.

2: Regarding the setting value of activation current, refer to Section 4.2.1.1 [1] for 208/230V type and Section 4.2.1.2 [1] for 460V type, 575V type.

Alarm Code 51	Abnormality of Current Sensor for Inverter

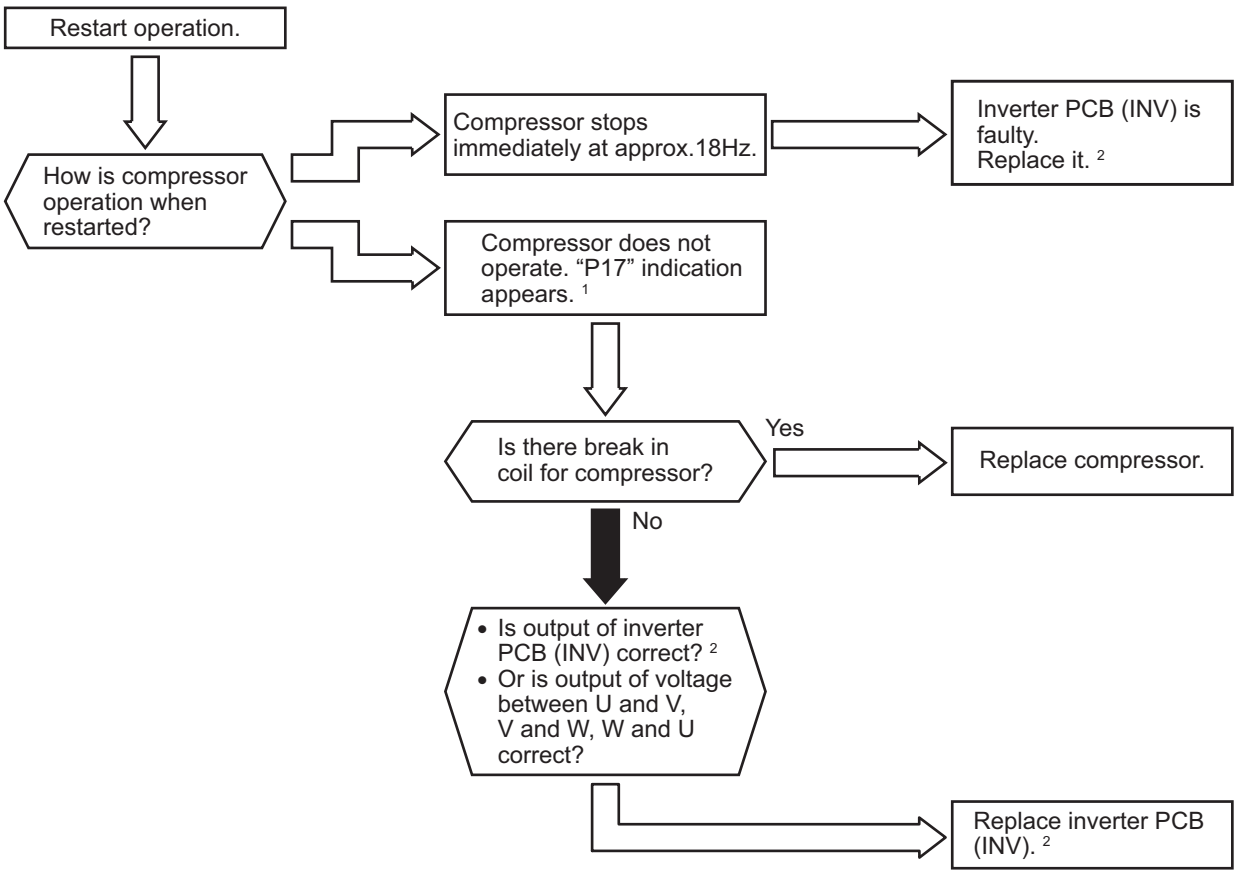
- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address number), the alarm code, the model code[1], the model name[1] and the number of connected indoor units are displayed on the LCD. The alarm code, the outdoor unit number of abnormal inverter PCB, and abnormal inverter PCB number are displayed on the 7-segment display of the outdoor unit PCB. Check the inverter stoppage code when this alarm code is displayed.
  Note 1: Except for some models.

In an instance where abnormal current sensor (0A detecting) occurs three times within 30 minutes, this alarm code is displayed. If this occurs less than three times in 30 minutes, the operation automatically restarts.

Condition of Activation:

(1) Before the fan motor operation is started, the fan controller current beyond ±60% of the rated current.

(2) After phase positioning is completed, the running current for the phase positioning is lower than criterion value.



1: P17 appears on 7-segment display of the outdoor unit PCB.

2: For the maintenance and replacement of inverter PCB, perform the high voltage discharge work according to Section 4.2.1.1 [2] for 208/230V type and Section 4.2.1.2 [2] for 460V type, 575V type.

Inverter Stoppage Code

iTC	Cause of Inverter Stoppage
8	Abnormal Current Sensor

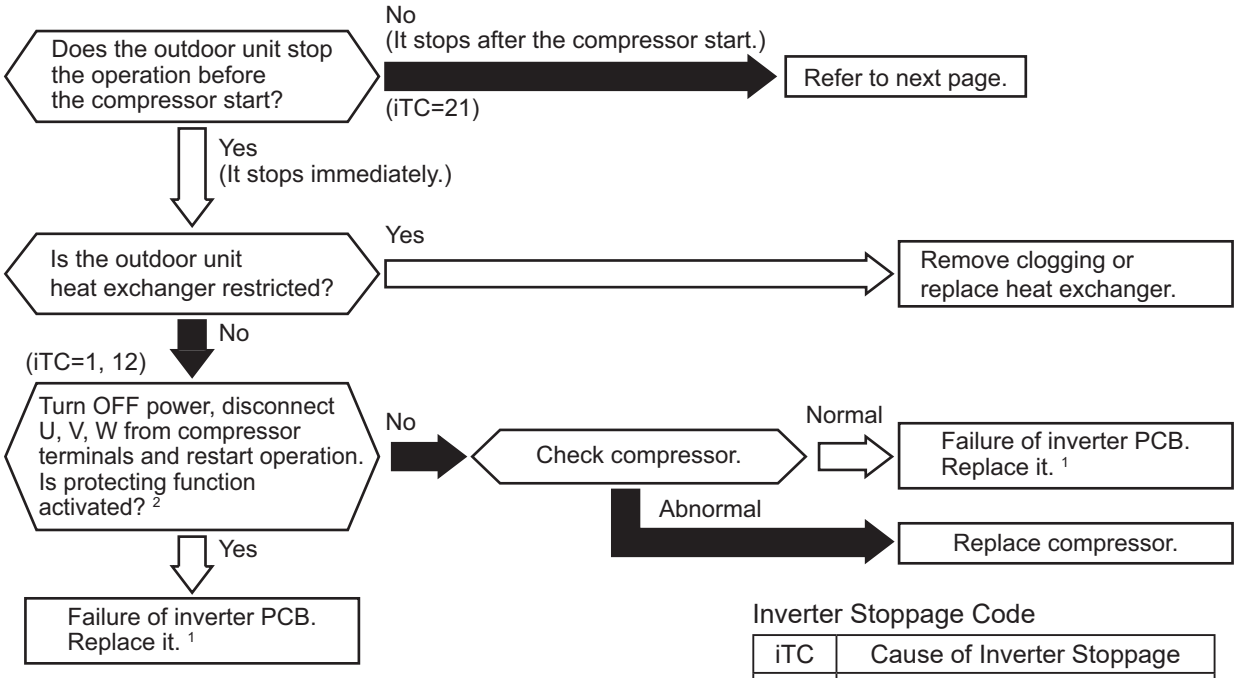
Alarm Code 53	Inverter Error Signal Detection

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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, the outdoor unit number of abnormal inverter PCB, and abnormal inverter PCB number are displayed on the 7-segment display of the outdoor unit PCB. Check the inverter stoppage code when this alarm code is displayed. Check the inverter stoppage code when this alarm code is displayed.
  Note 1: Except for some models.

The inverter PCB has the abnormality detection function. This alarm is displayed when any of the following conditions is met seven times in 30 minutes. If this occurs less than seven times in 30 minutes, the operation automatically restarts.

Condition of Activation:

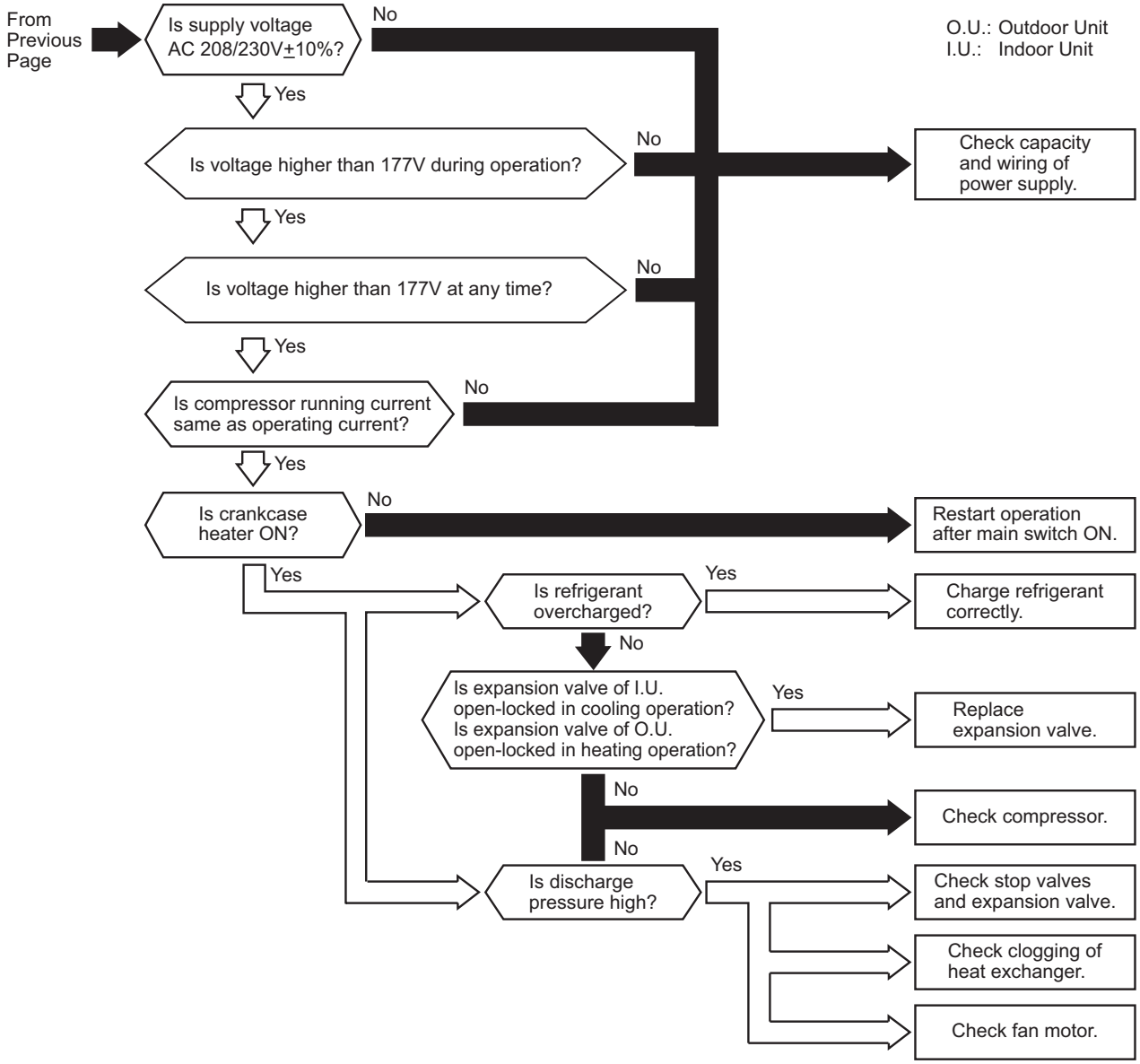
(1) An abnormal current is applied to the inverter PCB due to a short circuit, a ground fault or overcurrent.
(2) The temperature at inverter PCB increases abnormally.
(3) The control voltage decreases.
(4) The angle difference between the shaft in compressor and the shaft in the control program exceeds 60°.



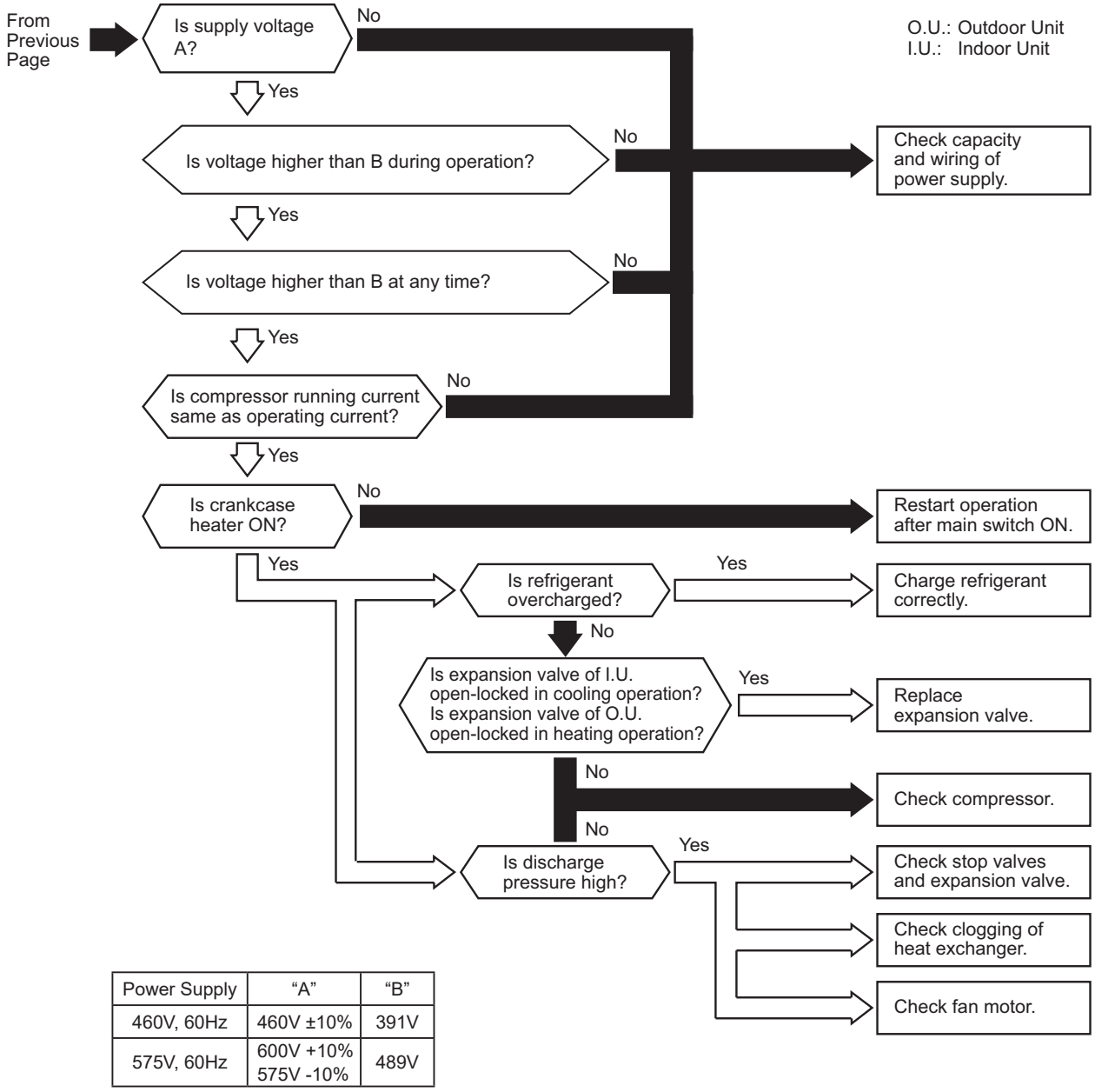
Inverter Stoppage Code

iTC	Cause of Inverter Stoppage
1	Activation of Transistor Module Protection
12	Ground Fault Detection
21	Out-of-Synchronism Detection

■ 208/230V Type



■ 460V Type, 575V Type



Power Supply	"A"	"B"
460V, 60Hz	460V ±10%	391V
575V, 60Hz	600V +10% 575V -10%	489V

These references are from previous page:

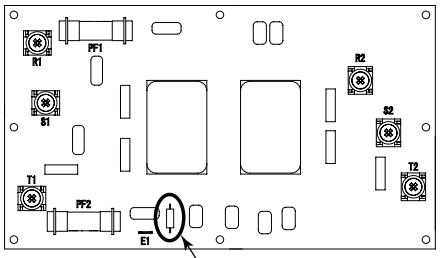
1: For the maintenance and replacement of the inverter PCB, perform the high voltage discharge work according to Section 4.2.1.1 [2] for 208/230V type and Section 4.2.1.2 [2] for 460V type, 575V type.
2: Turn ON the No.1 switch of DSW101 on the inverter PCB when restarting the operation with the terminals of the compressor disconnected. After troubleshooting, turn OFF the No.1 switch of DSW101 on inverter PCB.

NOTICE:
When an excessive surge current is applied to the unit due to lightning or other causes, this alarm code "53" or the inverter stoppage code (iTC) "11" is displayed and the unit cannot be operated. In this case, check the surge absorber/ surge arrester (SA) on the noise filter (NF1, NF2). The surge absorber may be damaged if the inner surface of the surge absorber is black. In that case, replace the surge absorber.
If the inside of the surge absorber is normal, turn OFF the power once and wait for LED501 (red) on the main power PCB (MPB1, 2) (208/230V type) or LED401 (red) on the inverter PCB (INV1, 2) (460V type, 575V type) OFF (approximately five minutes) and turn it ON again.

Position of Surge Absorber

■ 208/230V Type

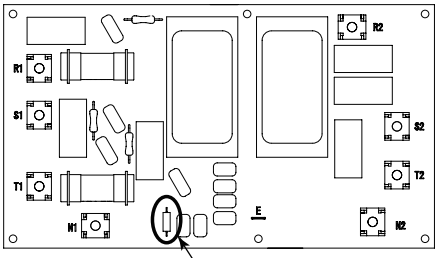
NF151



Surge Absorber (SA)

■ 460V Type

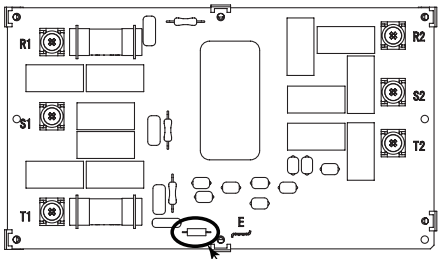
NF161



Surge Absorber (SA)

■ 575V Type

NF172

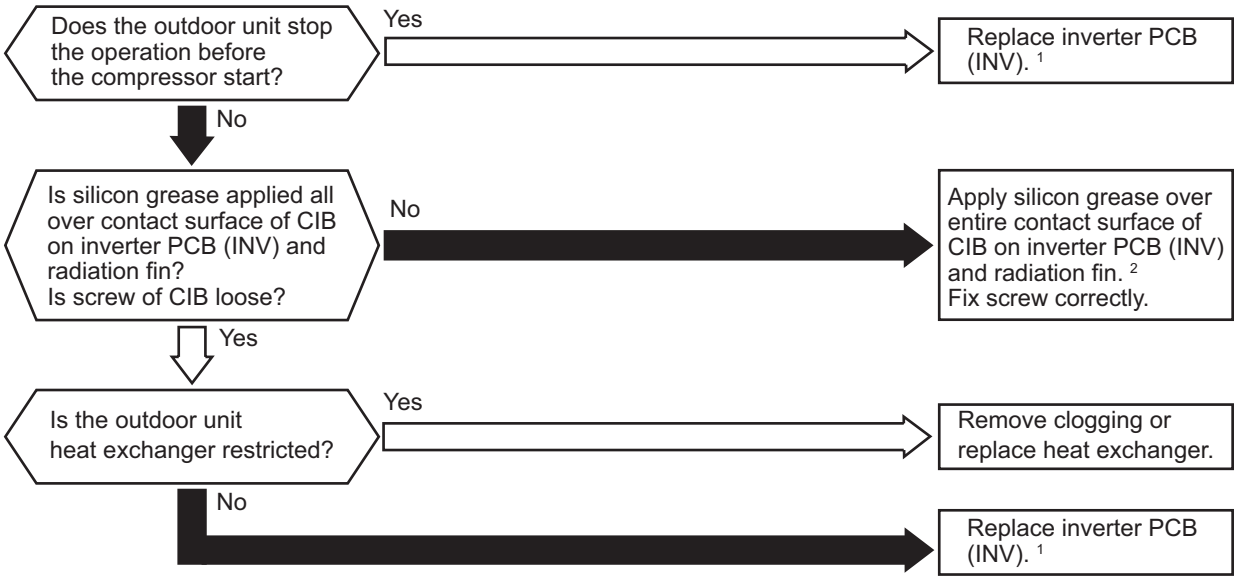


Surge Absorber (SA)

Alarm Code 54	Abnormal Inverter Fin Temperature

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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, the outdoor unit number of abnormal inverter PCB, and abnormal inverter PCB number are displayed on the 7-segment display of the outdoor unit PCB. Check the inverter stoppage code when this alarm code is displayed.
  Note 1: Except for some models.

If the temperature of the radiation fin thermistor exceeds 223 ~ 232°F (106 ~ 115°C) three times in 30 minutes, this alarm code is displayed. If this occurs less than three times in 30 minutes, the operation is automatically retried.



1: For the maintenance and replacement of inverter PCB, perform the high voltage discharge work according to Section 4.2.1.1 [2] for 208/230V type and Section 4.2.1.2 [2] for 460V type, 575V type.
2: Use the silicon grease provided as an accessory (Service Parts No.: P22760).

Inverter Stoppage Code

iTC	Cause of Inverter Stoppage
3	Abnormal Inverter Fin Temperature

Alarm Code	Inverter Failure

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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, the outdoor unit number of abnormal inverter PCB, and abnormal inverter PCB number are displayed on the 7-segment display of the outdoor unit PCB. Check the inverter stoppage code when this alarm code is displayed.
  Note 1: Except for some models.

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

Conditions of Activation: Inverter PCB does not operate normally.

■ 208/230V Type

■ 460V Type, 575V Type

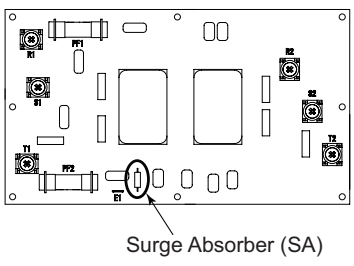
iTC	Cause of Inverter Stoppage
16	Inverter Failure

1: When an excessive surge current is applied to the unit due to lightning or other causes, this alarm code “55” or the inverter stoppage code (iTC) “11” is displayed and the unit cannot be operated. In this case, check the surge absorber/surge arrester (SA) on the noise filter (NF1, NF2). The surge absorber may be damaged if the inner surface of the surge absorber is black. In that case, replace the surge absorber.
If the inside of the surge absorber is normal, turn OFF the power once and wait for LED501 (red) on the main power PCB (MPB1, 2) (208/230V type) or LED401 (red) on the inverter PCB (INV1, 2) (460V type, 575V type) OFF (approximately five minutes) and turn it ON again.

Position of Surge Absorber

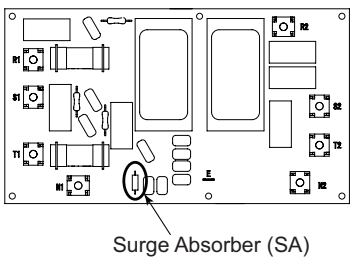
■ 208/230V Type

NF151



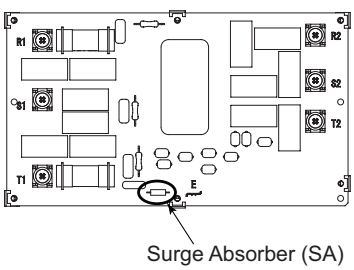
■ 460V Type

NF161



■ 575V Type

NF172



Alarm Code 57	Activation of Fan Controller Protection

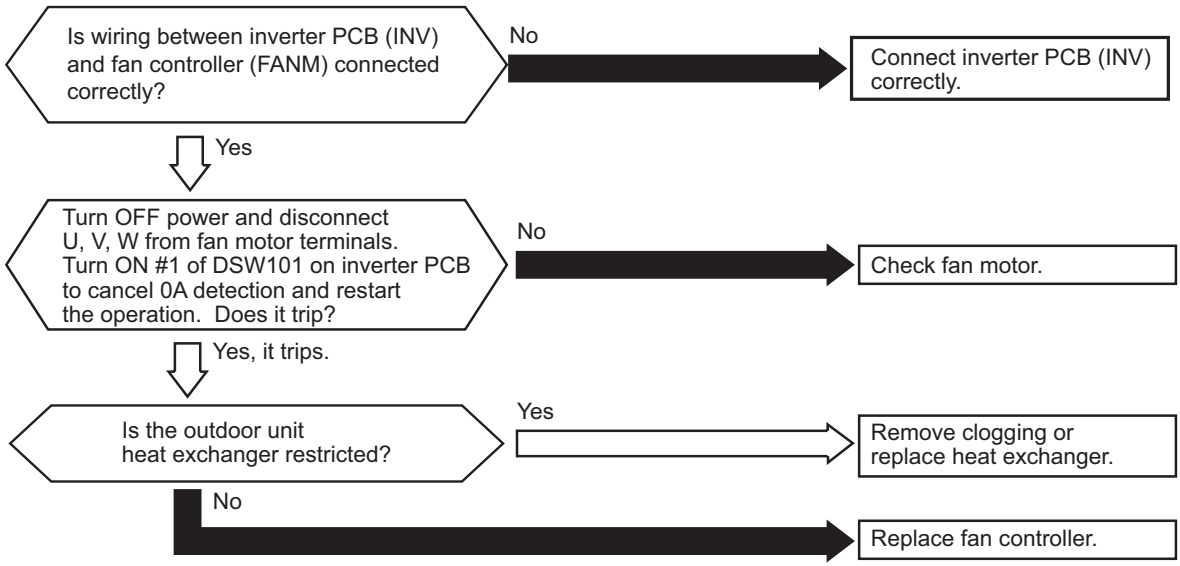
- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address number), the alarm code, the model code[1], the model name[1] and the number of connected indoor units are displayed on the LCD. The alarm code, the outdoor unit number of abnormal fan controller, and abnormal fan controller number are displayed on the 7-segment display of the outdoor unit PCB.[2]
  Check the fan controller stoppage code (FTC) when this alarm code is displayed.
  Note 1: Except for some models.
  Note 2: In case of 460V type and 575V type, the outdoor unit number of abnormal inverter PCB and abnormal inverter PCB number are displayed.

Fan Controller (208/230V type) or inverter PCB (460V type, 575V type) has abnormality-detecting function. This alarm code is displayed when the abnormality is detected 10 times within 30 minutes. If this occurs less than 10 times in 30 minutes, the operation automatically restarts.

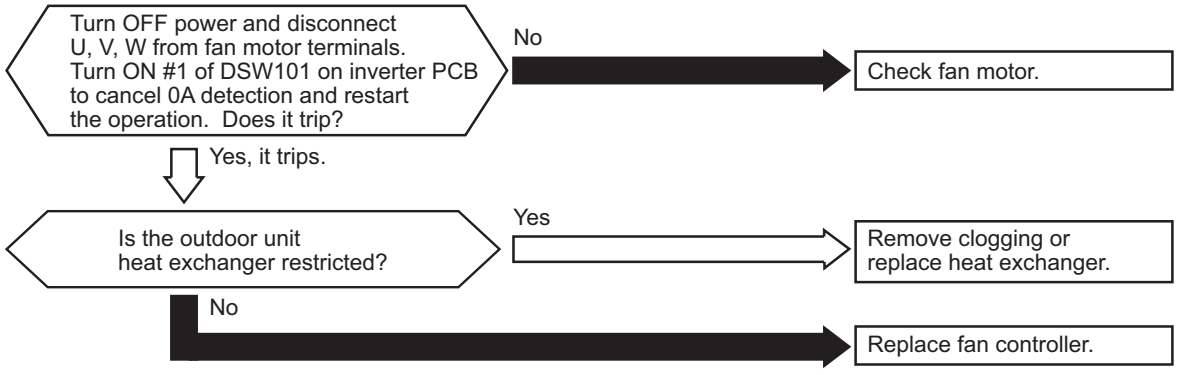
Condition of Activation:

(1) Conditions creating abnormal current flow such as a short-circuit current, a ground-fault or overcurrent occurring at the fan controller or inverter PCB.
(2) The control voltage decreases.

■ 208/230V Type



■ 460V Type, 575V Type

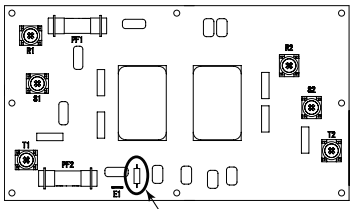


NOTE:
When an excessive surge current is applied to the unit due to lightning or other causes, this alarm code “57” or the inverter stoppage code (iTC) “11” is displayed and the unit cannot be operated. In this case, check to ensure the surge absorber/surge arrester (SA) on the noise filter (NF1, NF2). The surge absorber may be damaged if the inner surface of the surge absorber is black. In that case, replace the surge absorber.
If the inside of the surge absorber is normal, turn OFF the power once and wait for LED501 (red) on the main power PCB (MPB1, 2) (208/230V type) or LED401 (red) on the inverter PCB (INV1, 2) (460V type, 575V type) OFF (approximately five minutes) and turn it ON again.

Position of Surge Absorber

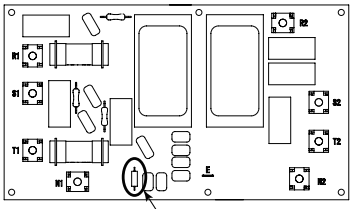
■ 208/230V Type

NF151



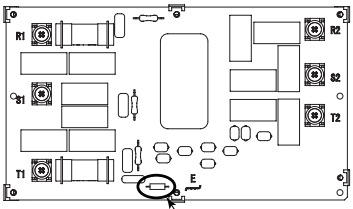
■ 460V Type

NF161



■ 575V Type

NF172



For the maintenance and replacement of the fan controller, perform the high voltage discharge work according to Section 4.2.1.1 [2].

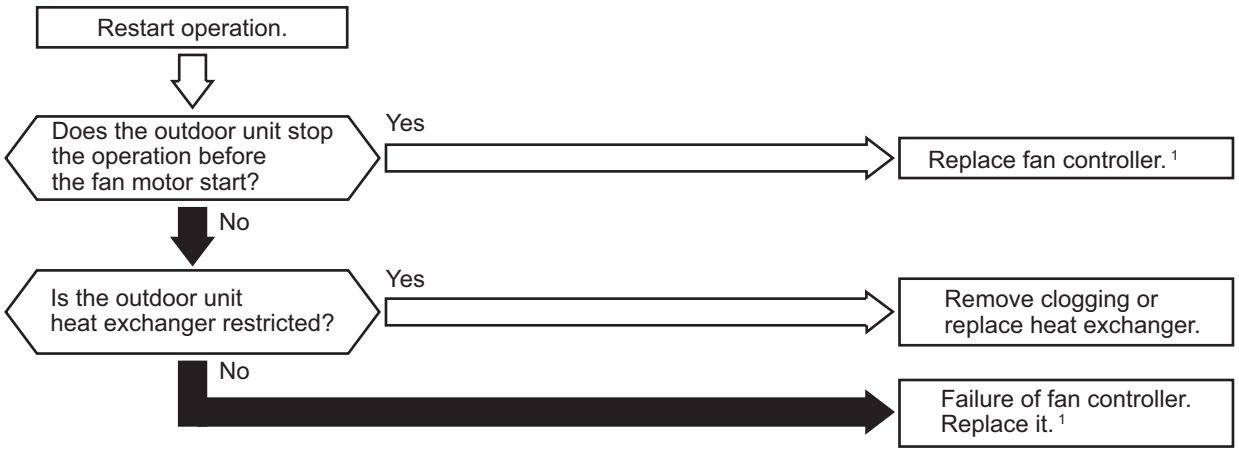
Alarm Code 5A	Abnormality of Fan Controller Fin Temperature

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 and the outdoor unit number of abnormal fan controller, and abnormal fan controller number are displayed on the 7-segment display of the outdoor unit PCB.[2]
  Check the fan controller stoppage code (FTC) when this alarm code is displayed.
  Note 1: Except for some models.
  Note 2: In case of 460V type and 575V type, the outdoor unit number of abnormal inverter PCB and abnormal inverter PCB number are displayed.

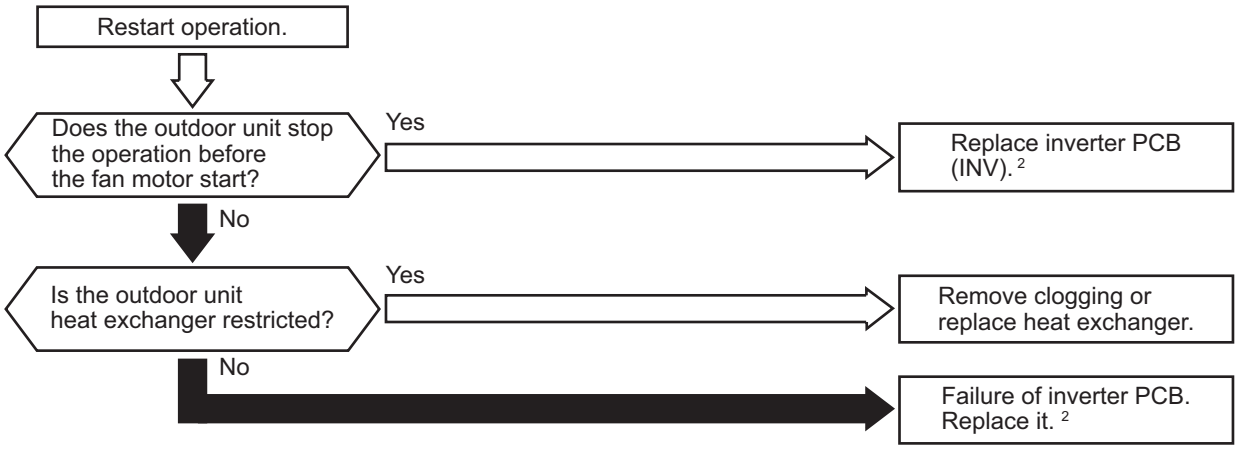
If the temperature of the thermistor inside the transistor module exceeds the temperature in below table 10 times in 30 minutes, the operation stops and this alarm code is displayed. If this occurs less than 10 times in 30 minutes, the operation automatically restarts.

208V/230V Type 460V Type	575V Type
212°F (100°C)	203°F (95°C)

■ 208/230V Type



■ 460V Type, 575V Type



1: For the maintenance and replacement of the fan controller, perform the high voltage discharge work according to Section 4.2.1.1 [2].
2: For the maintenance and replacement of the inverter PCB (PV161, PV172), perform the high voltage discharge work according to Section 4.2.1.2 [2].

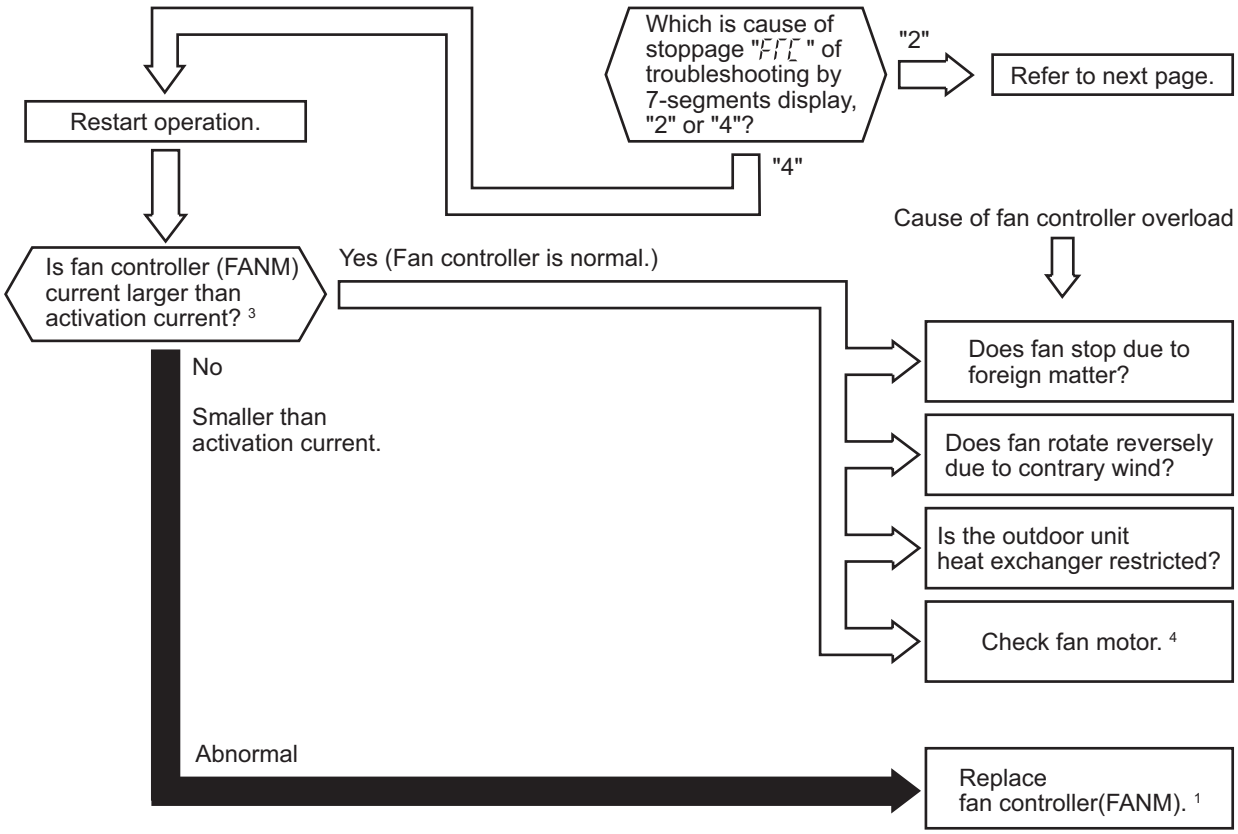
Alarm Code 56	Activation of Fan Controller Overcurrent Protection (1)

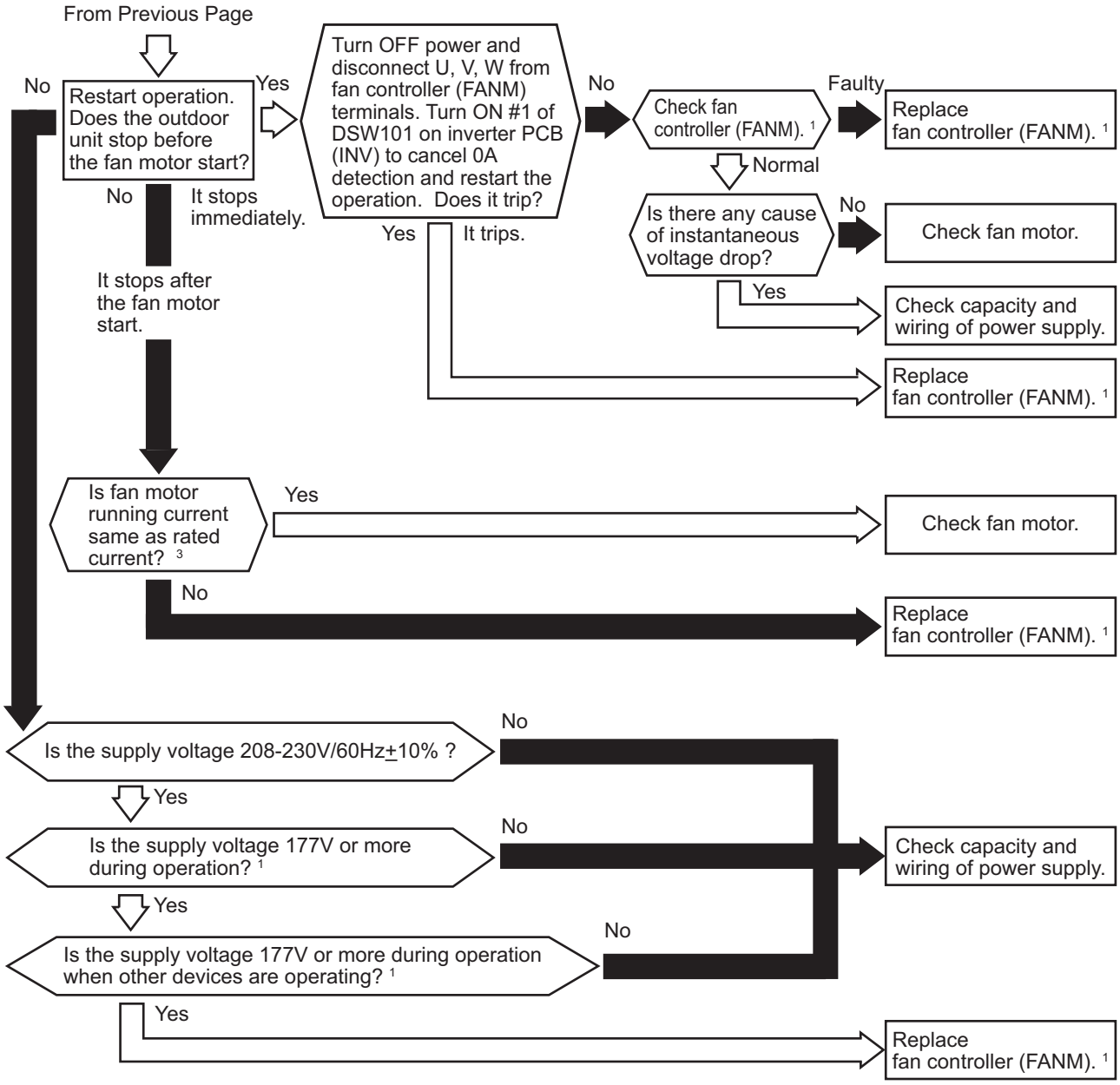
- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address number), the alarm code, the model code[1], the model name[1] and the number of connected indoor units are displayed on the LCD. The alarm code and the outdoor unit number of abnormal fan controller, and abnormal fan controller number are displayed on the 7-segment display of the outdoor unit PCB.[2]
  Check the fan controller stoppage code (FTC) when this alarm code is displayed.
  Note 1: Except for some models.
  Note 2: In case of 460V type and 575V type, the outdoor unit number of abnormal inverter PCB and abnormal inverter
  PCB number are displayed.

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

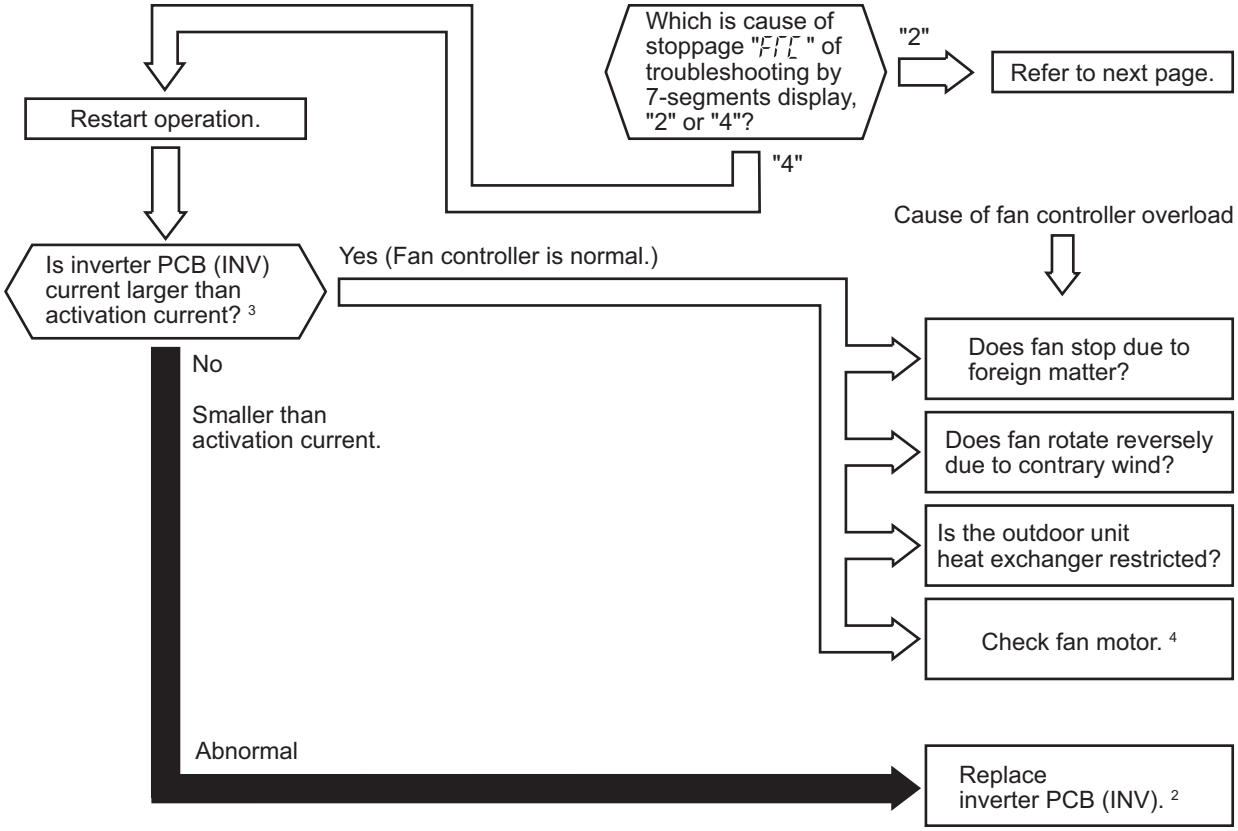
Conditions of Activation:
(1) Electric current with 105% of the rated current runs for 30 seconds continuously.
(2) Electric current runs intermittently and the accumulated time reaches up to three minutes, in 10 minutes.

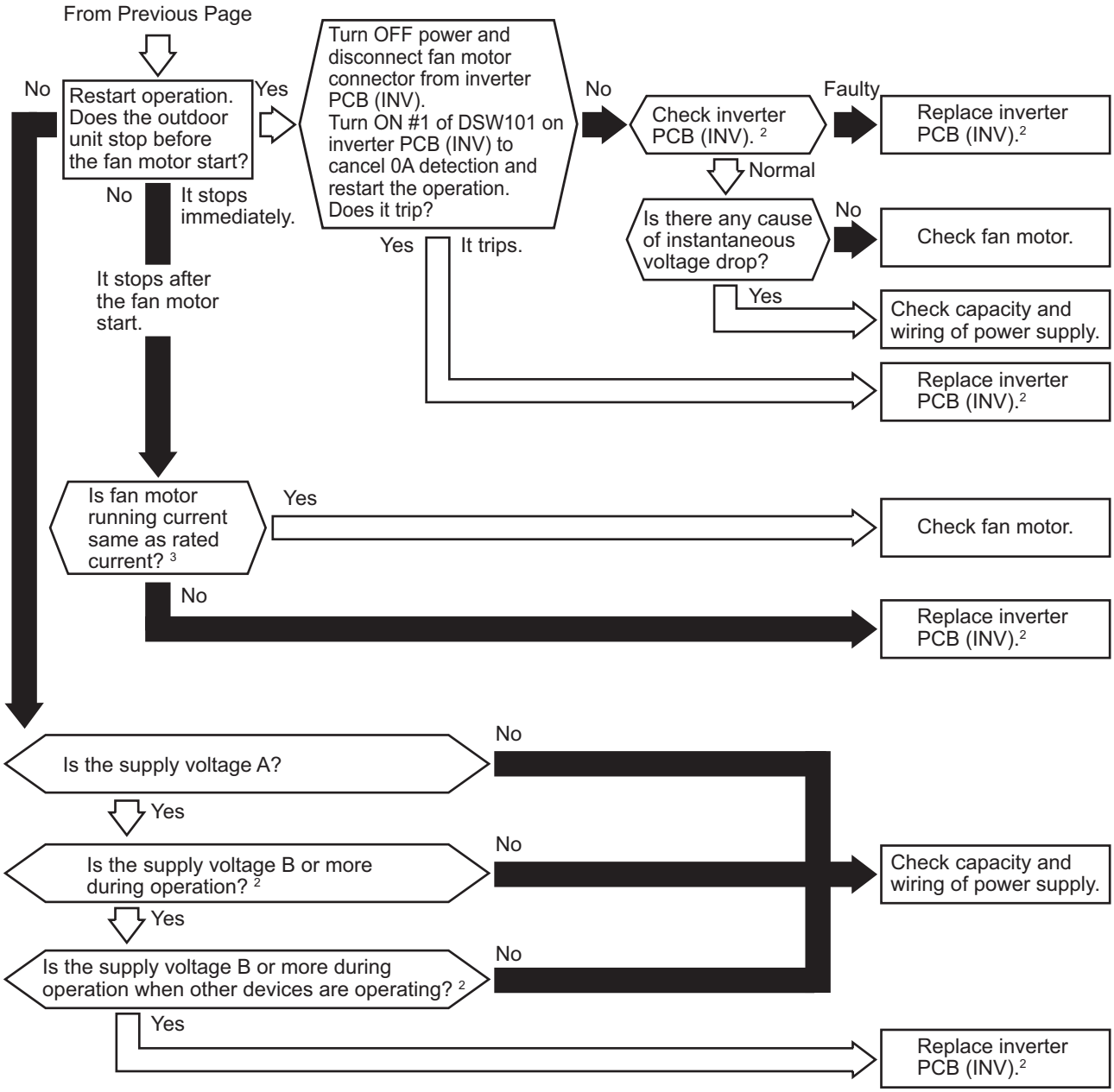
■ 208/230V Type




From Previous Page
No
Restart operation. Does the outdoor unit stop before the fan motor start?
Yes
Turn OFF power and disconnect U, V, W from fan controller (FANM) terminals. Turn ON #1 of DSW101 on inverter PCB (INV) to cancel 0A detection and restart the operation. Does it trip?
No
Check fan controller (FANM). 1
Faulty
Replace fan controller (FANM). 1
Normal
No
It stops immediately.
It stops after the fan motor start.
Yes
It trips.
Is there any cause of instantaneous voltage drop?
No
Check fan motor.
Yes
Check capacity and wiring of power supply.
Replace fan controller (FANM). 1
Is fan motor running current same as rated current? 3
Yes
Check fan motor.
No
Replace fan controller (FANM). 1
Is the supply voltage 208-230V/60Hz±10% ?
No
Yes
Is the supply voltage 177V or more during operation? 1
No
Check capacity and wiring of power supply.
Yes
Is the supply voltage 177V or more during operation when other devices are operating? 1
No
Yes
Replace fan controller (FANM). 1

■ 460V Type, 575V Type





Power Supply	"A"	"B"
460V, 60Hz	460V ±10%	391V
575V, 60Hz	600V +10% 575V -10%	489V

1: For the maintenance and replacement of a fan controller, perform the high voltage discharge work according to Section 4.2.1.1 [2].
2: For the maintenance and replacement of an inverter PCB (PV161, PV172), perform the high voltage discharge work according to Section 4.2.1.2 [2].
3: Regarding the setting value of activation current, refer to Section 4.2.1.1 [1] for 208/230V type and Section 4.2.1.2 [1] for 460V, 575V type.
4: For checking fan motor, refer to the fan motor specification of Section 4.2.1.5.

Alarm Code 51	Abnormality of Fan Controller Sensor

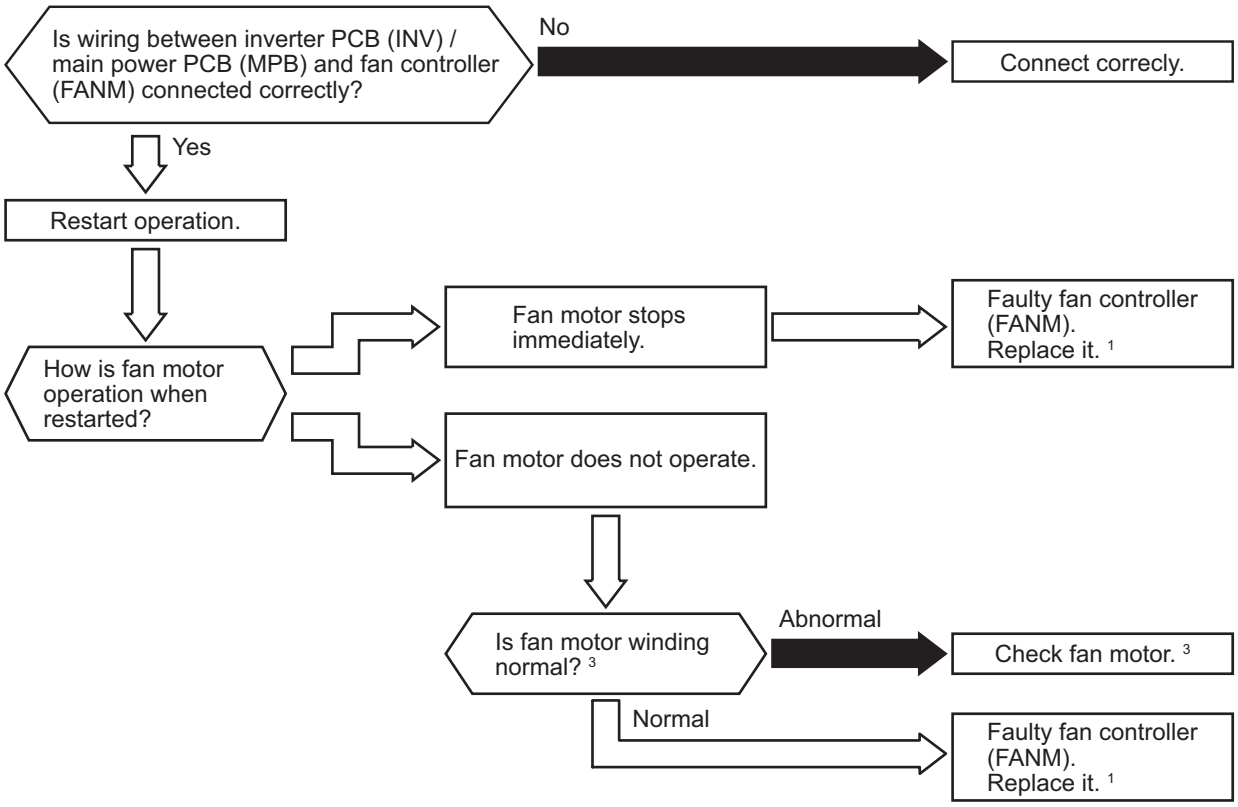
- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address number), the alarm code, the model code[1], the model name[1] and the number of connected indoor units are displayed on the LCD. The alarm code and the outdoor unit number of abnormal fan controller, and abnormal fan controller number are displayed on the 7-segment display of the outdoor unit PCB.[2]
  Check the fan controller stoppage code (FTC) when this alarm code is displayed.
  Note 1: Except for some models.
  Note 2: In case of 460V type and 575V type, the outdoor unit number of abnormal inverter PCB and abnormal inverter PCB number are displayed.

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

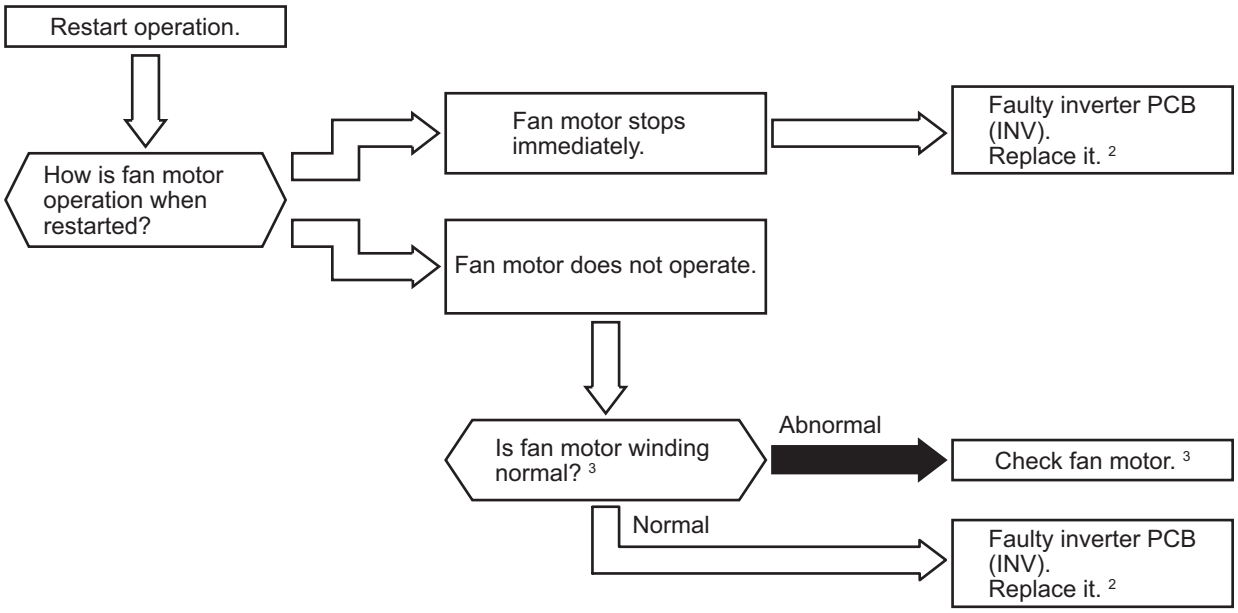
Conditions of Activation:

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

■ 208/230V Type



■ 460V Type, 575V Type



1: For the maintenance and replacement of the fan controller, perform the high voltage discharge work according to Section 4.2.1.1 [2].
2: For the maintenance and replacement of the inverter PCB (PV161, PV172), perform the high voltage discharge work according to Section 4.2.1.2 [2].
3: For checking fan motor, refer to the fan motor specification of Section 4.2.1.5.

Alarm Code	Compressor Protection

This alarm code is displayed when any of the following alarms which could result in serious compressor damage occurs three times in six hours. While this alarm is displayed, alarm reset is not possible.

Alarm Code:	*Information of Abnormality*
02	*Activation of Protection Device in Outdoor Unit*
07	*Decrease in Discharge Gas Superheat*
08	*Increase in Discharge Gas Temperature*
39	*Abnormality of Running Current at Fixed Speed Compressor*
43	*Activation of Low Compression Ratio Protection Device*
44	*Activation of Low Pressure Increase Protection Device*
45	*Activation of High Pressure Increase Protection Device*
47	*Activation of Low Pressure Decrease Protection Device (Vacuum Operation Protection)*

These alarms can be checked by the CHECK Mode 1. Follow the action indicated in each alarm chart. These alarms are cleared only by turning OFF the main power switch to the system. **However, great care must be taken before starting, since there is a possibility of causing serious damage to the compressors.**

Alarm Code	External Abnormality Detection

- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address 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 outdoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
  Note 1: Except for some models.

This alarm code is displayed when the external input is set the control function No.14 is detected an abnormality (input terminals are short-circuited).

Alarm Code	Incorrect Setting of Indoor Unit No. Setting

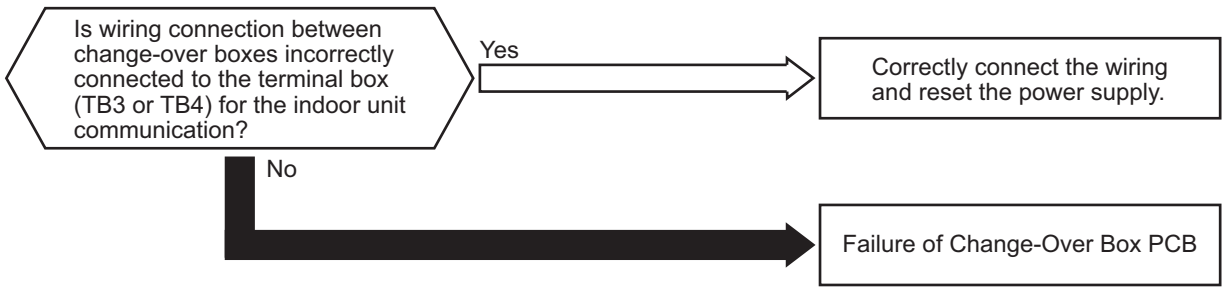
- The RUN indicator (red) flashes.
- The indoor unit number (Ref. system number - I.U. number), the alarm code, the model code[1], the model name[1] and the number of connected indoor units are displayed on the LCD. The alarm code is flashed on the 7-segment display of the outdoor unit PCB.
  Note 1: The alarm code displayed on the wired controller is “35”.
  Note 2: Except for some models.

Condition	Action
The number of connected indoor units not supporting H-LINK II is 17 or greater.	The number of connected indoor units shall be 16 or less.

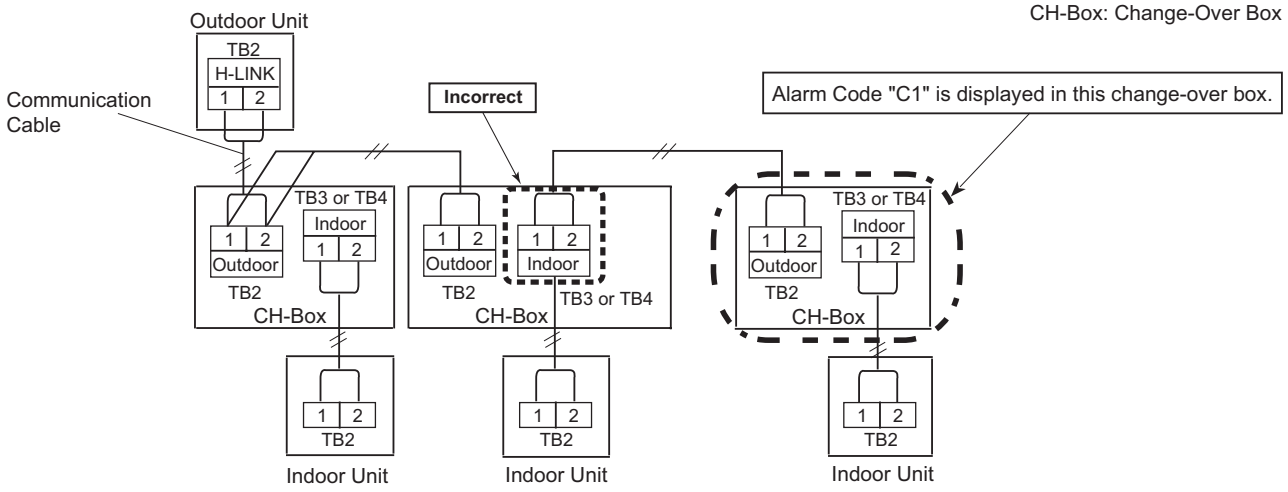
Alarm Code C1	Incorrect Change-Over Box Connection

- The RUN indicator (Red) flashes.
- The indoor unit number, the alarm code, the unit model code and the number of connected indoor units are displayed on the LCD, and the indoor unit number and the alarm code are displayed on the 7-segment display of outdoor unit PCB.
- LED (LED10, 11, 12, 13) on the change-over box PCB flashes.

This alarm code is displayed when two or more change-over boxes are connected between outdoor unit and indoor unit.



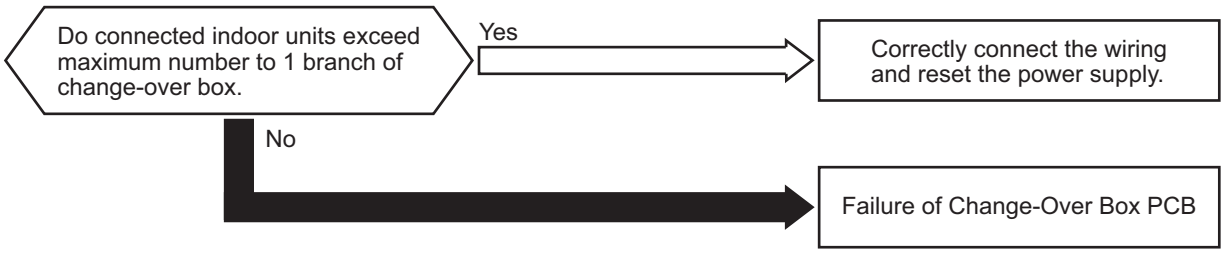
• Alarm Code "C1" is displayed when the units are connected as follows.



Alarm Code C2	Incorrect Indoor Unit Connection Number (Change-Over Box)

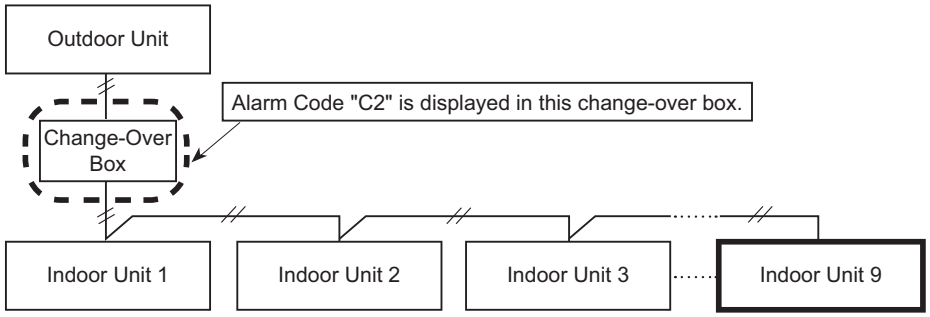
- The RUN indicator (Red) flashes.
- The indoor unit number, the alarm code (“35”), the unit model code and the connected number of indoor units are displayed on LCD of remote controller which is connected to the indoor unit with abnormal change-over box.
- LED (LED10, 11, 12) on the change-over box PCB flashes. (For Multiple Branch Type Change-Over Box, only LED on PCBs with an abnormality flashes.)

This alarm code is displayed when connected indoor units exceed maximum number to 1 branch of change-over box.



• Alarm Code "C2" is displayed when the units are connected as follows.

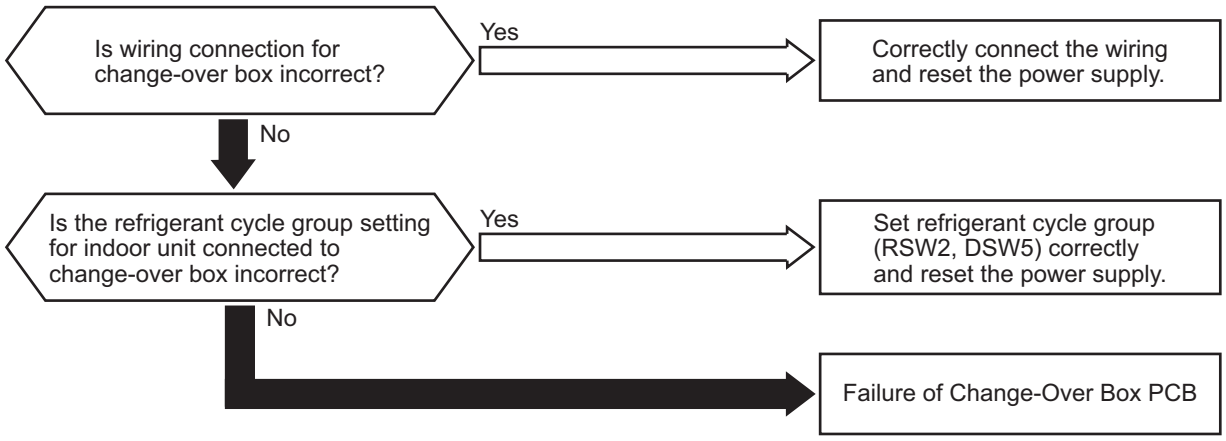
Example: COBS048B22S



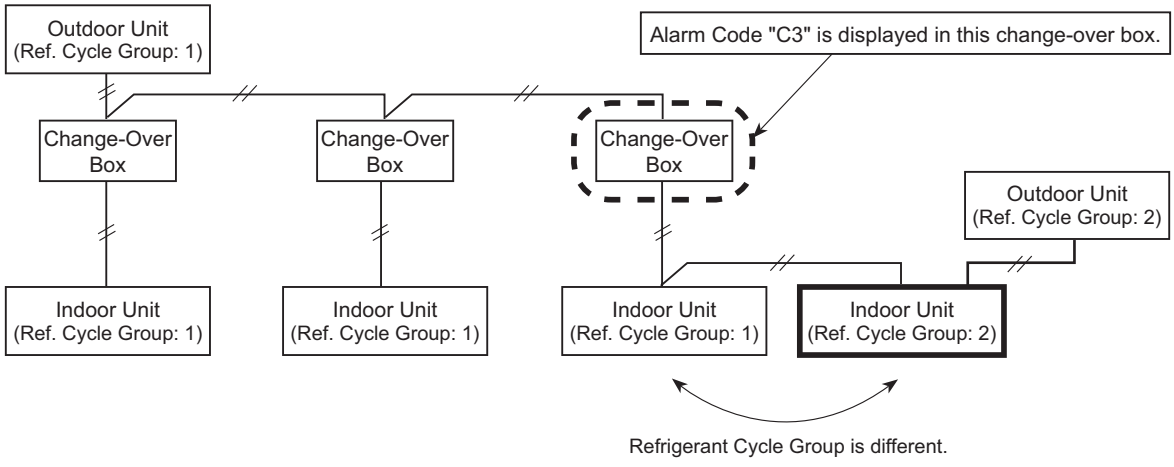
Alarm Code C3	Incorrect Indoor Unit Refrigerant Number Setting (Change-Over Box)

- The RUN indicator (Red) flashes.
- The indoor unit number, the alarm code (“35”), the unit model code and the connected number of indoor units are displayed on LCD of remote controller which is connected to the indoor unit with abnormal change-over box.
- LED (LED11, 12) on the change-over box PCB flashes. (For Multiple Branch Type Change-Over Box, only LED on PCBs with an abnormality flashes.)

This alarm code is displayed when indoor unit with different refrigerant cycle group is connected to change-over box.



• Alarm Code "C3" is displayed when the units are connected as follows.

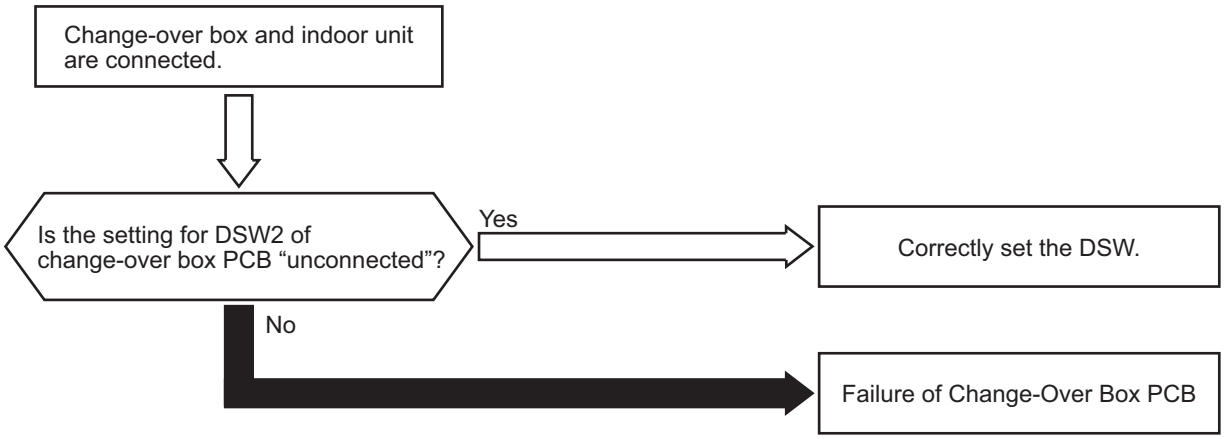


Alarm Code C5	Incorrect Connection Port Setting (Change-Over Box)

- The RUN indicator (Red) flashes.
- The indoor unit number, the alarm code (“35”), the unit model code and the connected number of indoor units are displayed on LCD of remote controller which is connected to the indoor unit with abnormal change-over box.
- LED (LED11, 12, 13) on the change-over box PCB flashes. (For Multiple Branch Type Change-Over Box, only LED on PCBs with an abnormality flashes.)

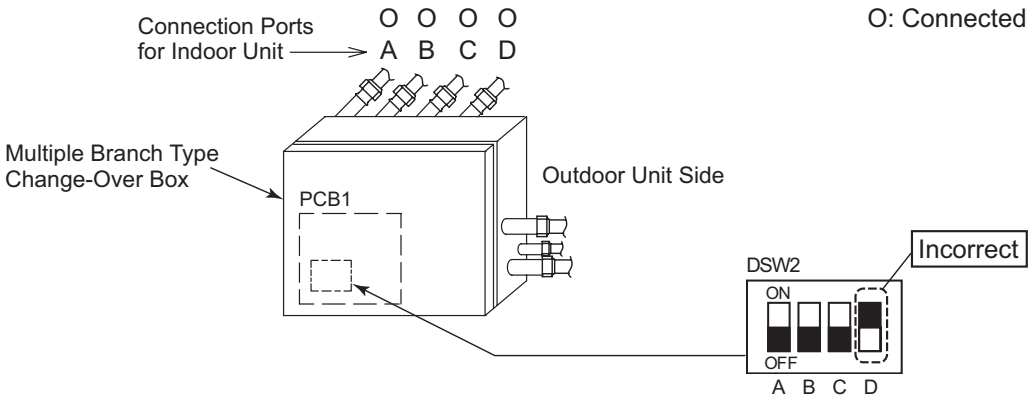
This alarm code is displayed when communication cable for indoor unit is connected to a port of multiple branch type change-over box that is set to “unused”. Setting DSW2 for change-over box PCB is required if any ports are not in use with multiple branch type change-over box.

NOTE:
“03” alarm code is displayed when DSW2 is not set and indoor unit is not connected to change-over box.



• Alarm Code "C5" is displayed when DSW is set as follows.

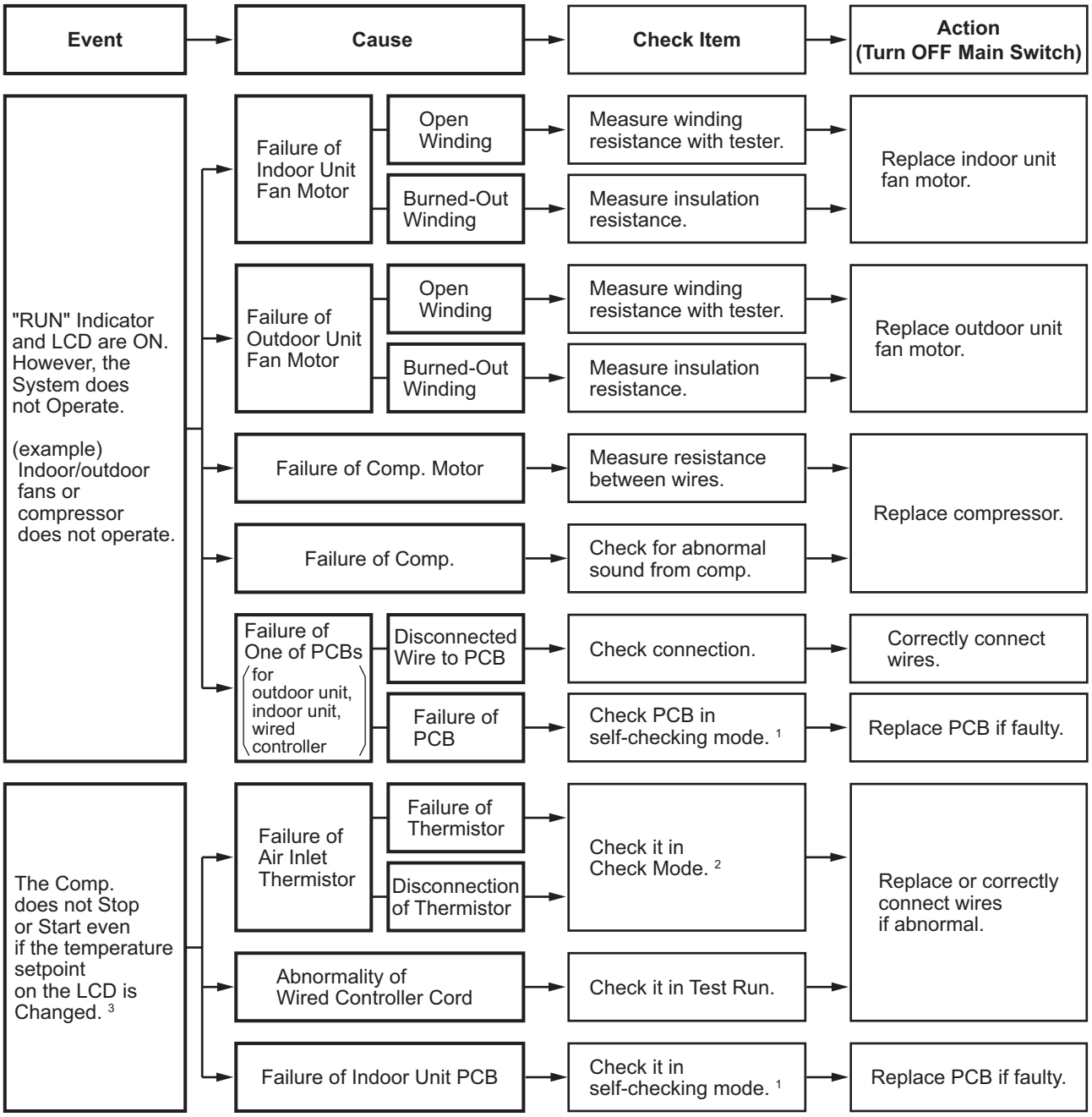
Example of incorrect “D” setting:



3.2.3 Abnormalities of Devices

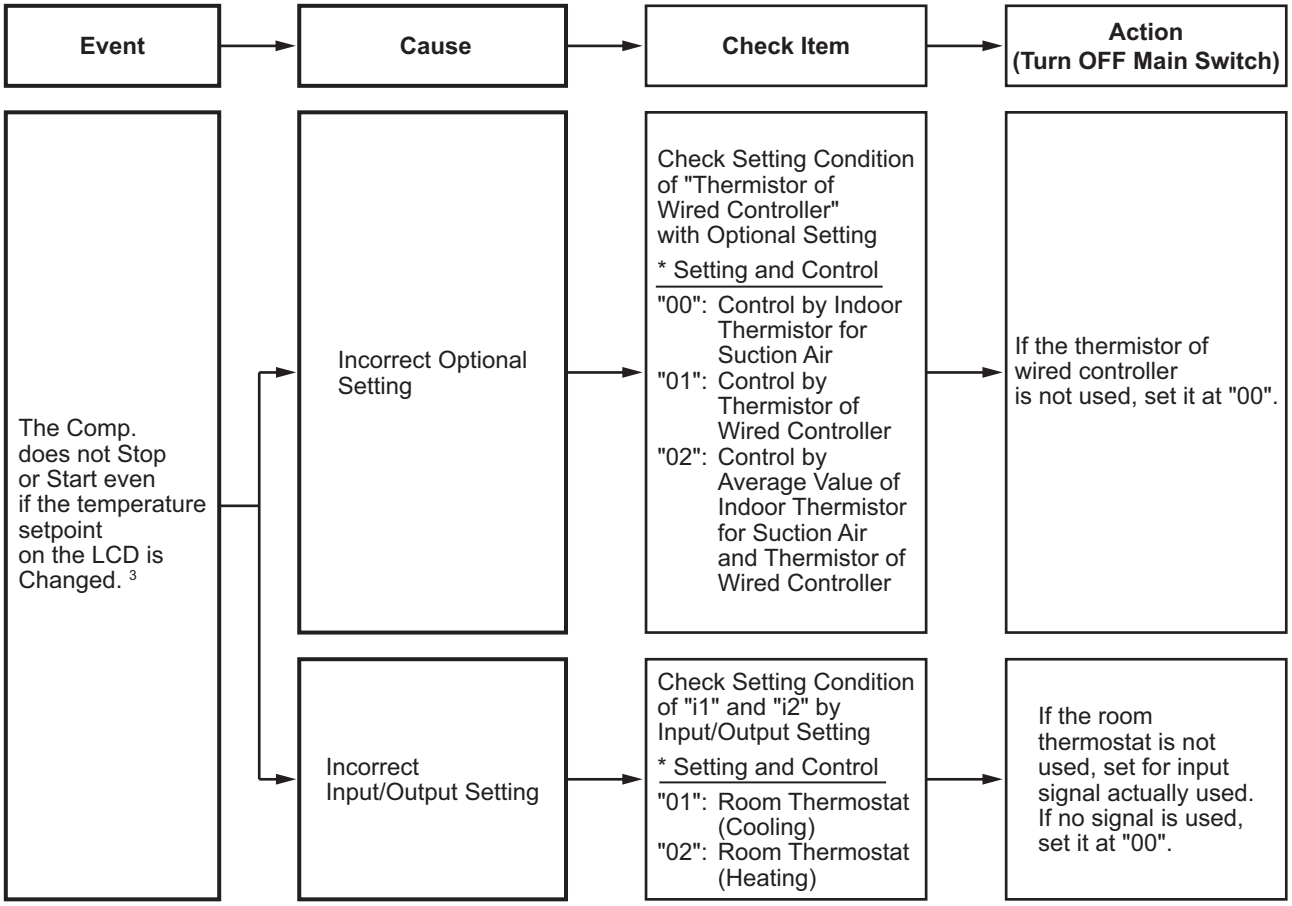
Other Abnormalities	Abnormalities of Devices

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



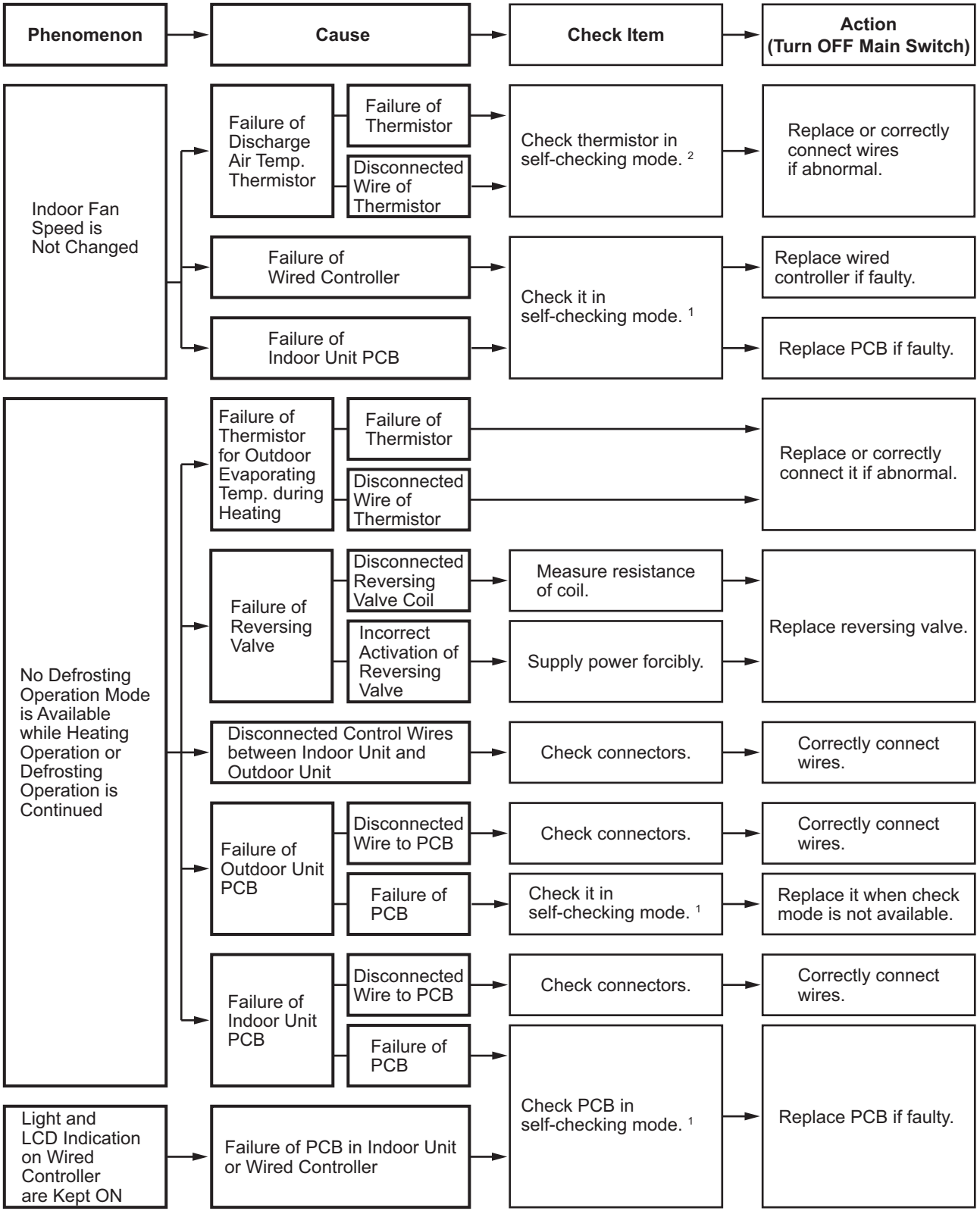
1: For CIW01, refer to Section 3.1.4 (3).
2: For CIW01, refer to Section 3.1.4 (2).
3: Even if controllers are normal, the compressor does not operate under the following conditions.
* Indoor Air Temp. is lower than 69.8°F (21°C) or Outdoor Air Temp. is lower than 23°F (-5°C) during cooling operation.
* 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



1: For CIW01, refer to Section 3.1.4 (3).
2: For CIW01, refer to Section 3.1.4 (2).
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



1: For CIW01, refer to Section 3.1.4 (3).
2: Refer to Section 3.1.4 (2).

Other Abnormalities	Abnormalities of Devices

Event	Cause	Check Item	Action (Turn OFF Main Switch)
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	Discharge pressure does not increase higher than 319 psi (2.2MPa) due to insufficient refrigerant.	Check operation pressure.	Add refrigerant.
	Disconnected Wire for Indoor Fan	Check wiring.	Correctly connect wires.
	Failure of Indoor Unit PCB	Check Indoor Unit PCB.	Replace Indoor Unit PCB.

3.3 Procedures for Checking

3.3.1 Self-Checking of PCBs using Wired Controller

Refer to Section 3.1.4 “Checking Wired Controller”

3.3.2 Self-Checking of Wired Controller

Refer to Section 3.1.4 “Checking Wired Controller”

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 propeller fan installed in the center of the outlet?
3	Fasteners	Are the screws loose due to vibration during transportation? Check that the fasteners are secured firmly during installation, especially for electrical wiring.
4	Refrigerant Leaks	Check that there are NO refrigerant leaks. Flare connections may have become loose because of vibration during transportation.
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. Do NOT apply power to the unit. (Control PCB may be damaged.)
7	Stop Valve Fully Open	Prior to test run, check that the outdoor unit stop valve are completely open.
8	Power Supply Phase	The operation is NOT possible with the incorrect or missing power phase order or lacking phase. • Alarm “03” or “05” is displayed on the LCD of the wired controller. • Alarm “03” or “05” is displayed on the 7-segment display of the outdoor unit. Check the power supply phase according to the caution label attached close to the outdoor unit terminal block or inside of the service cover.
9	Turn ON Crankcase Heater [2]	After completion of item checks 1 to 8, 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..
10	Indoor and Outdoor Temperature	<For Use in both Cooling and Heating Operation> Are indoor and outdoor temperature out of the working range [3]? (Heating operation may not be possible 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 will warm 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 GFCI is activated, check the rated capacity.

2: Stoppage of Compressor Operation

The compressor may NOT be operational for a maximum of four hours if the power supply is NOT turned ON in advance.
At this time, the stoppage Code (d1-22) is displayed on the LCD of wired controller and the forced Thermo-OFF function starts.
If operation of the compressor is necessary, turn ON the power supply of the outdoor unit, wait for 30 seconds and press PSW5 on the outdoor unit PCB for at least three seconds. The forced Thermo-OFF function (d1-22) is cancelled and the compressor operation becomes available.

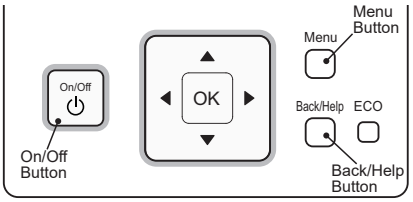
3: Working Range

Refer to "Page i" of Installation Manual for details.

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.

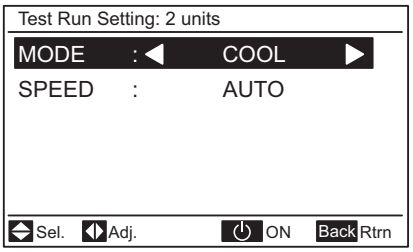
3.4.1 Test Run Using Wired Controller

(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 “ ∆∇ ” and press “OK”.
The Test Run screen is displayed.
NOTE:
For other controllers,
refer to the “Installation Manual” for each controller.



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 Address (The indoor unit address is duplicated.)

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

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

(3) Checking Procedure for Abnormalities

Wired Controller Indication	Fault	Inspection Points after the Power Supply OFF
No Indication	* The power supply is not turned ON. * The connection of the controller cable is incorrect.	1. Connection between Connector and Wires 2. Connecting Points of Controller Cable 3. Contact of Connectors of Controller Cable
	* The connecting wires of power supply line are incorrect or loose.	4. Connection Order of each Terminal Block 5. Screw Fastening of each Terminal Block
Number of connected units is incorrect.	* The electrical wiring between indoor unit and outdoor unit is disconnected, or the power supply is not turned ON. * The setting of unit number is incorrect.	6. RSW Setting on Indoor Unit Printed Circuit Board
	* The connection of control cables between each indoor unit are incorrect. (When one wired controller controls multiple units.)	7. Wire Connecting Order of Bridge Cable 8. Connecting Points of Bridge Cable 9. Contact of Connectors of Bridge Cable

Back to (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 “ △▽◁▷”.
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 connecting wires of operating line are incorrect or loose.	1. Connecting Order of each Terminal Block. The fuse on the PCB may be blown due to miswiring. (Can be recovered only once by the DSW on the PCB) Procedures for Recovery When Transmitting Circuit Fuse is Blown 1. Correct the wiring for the terminal block. 2. Setting positions of the model code are shown below. Indoor Unit PCB: DSW7 (ON / OFF, 1 2) Outdoor Unit PCB: DSW10 (ON / OFF, 1 2) 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 connecting wires of operating line are 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

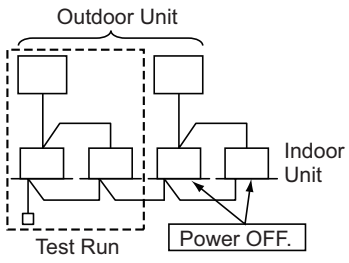
The procedures for the test run from the outdoor unit side are indicated below. Setting of this DIP switch is possible with the power supply ON.

Setting of DIP Switch (Factory Setting)

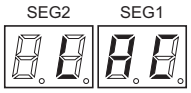
DSW4
Switch for Setting of Service Operation and Function   1. Test Run 2. COOL/HEAT Setting (ON: Heating Operation) 3. OFF (Fixed) 4. Manual Compressor OFF 5. Function Setting 6. External Input/Output Setting

⚠ 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 DSW4 OFF when the test run operation is completed.**

	DIP Switch Setting	Operation	Remarks
Test Run	1. Setting of Operation Mode Cooling: Set DSW4-2 OFF. Heating: Set DSW4-2 ON. 2. Starting Test Run Set DSW4-1 ON and the operation is started after a few to 20 seconds. 	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 DSW4-1 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 DSW4-1 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.  * The setting of DSW4 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.	1. Setting *Compressor Manual OFF: Set DSW4-4 ON. 2. Canceling *Compressor ON: Set DSW4-4 OFF. 	1. When DSW4-4 is ON during compressor operation, the compressor stops operating immediately and the indoor unit is under the condition of Thermo-OFF. 2. When DSW4-4 is OFF, the compressor starts operating after the cancellation of three-minutes guard.	* Do not repeat compressor ON/OFF frequently.
Manual Defrost	1. Manual Defrost Operation Press PSW5 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. 2. Manual Defrost Operation Completion Defrosting operation automatically ends and the heating operation restarts.	1. Defrosting operation is available regardless of frost condition and total time of heating operation. 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 3.3MPa or the unit is Thermo-OFF.	* Do not continuously repeat defrosting operation. * When manual defrosting operation is accepted by PSW5, the time left before starting defrosting operation is indicated on the 7-segment display on the PCB.
Manual Low Ambient Kit	Press PSW3 on the control PCB1 of outdoor unit for at least 3 seconds.	1. "LAC (Low Ambient Cooling)" is displayed on the 7-segment displays while the Test Run.  2. Damper will start to move in close direction. It will remain closed for approximately 60 seconds. 3. Damper will open in approximately 35 seconds by the spring return function. 4. 7-segment displays turn off after damper opens and in approximately 60 seconds. 5. Be sure to perform test run on all outdoor units in multiple module installation.	* Test Run of damper can not be performed during outdoor unit operation. (The outdoor unit can be stopped forcibly by DSW4-No.4=ON of main outdoor unit.) * In case the Test Run does not start even if during stoppage, DSW setting may be incorrect. Verify that all DIP switch settings are correct.

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 DSW4 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 (CN17) 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 is changed or the test run will end.
If necessary, control them after the test run is complete.

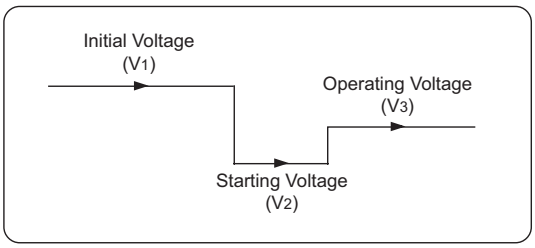
(2) If an alarm code is displayed during the test run, reset the system by turning the main power supply OFF, then back ON. The system should then operate.

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 (V_2).
In order to protect the device, comply with the following normal range of the power supply voltage.

< Voltage Change >



<Normal Range of Power Supply Voltage>
- Supply Voltage (208/230V Type, 460V Type): Rated Voltage ≤ ±10%
- Supply Voltage (575V Type): 600V +10%, 575V -10%
- Operating Voltage (V_3): Rated Voltage ≤ ±10%
- Starting Voltage (V_2): Rated Voltage ≥ -15%
- Voltage Imbalance between Phase: ≤ 3%

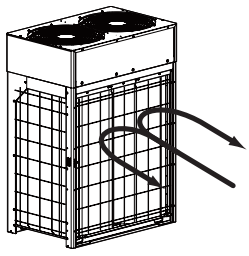
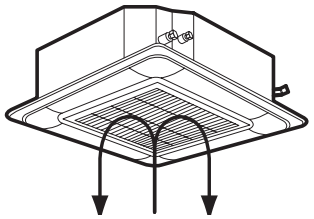
(3) Normal Operating Pressure
Normal operating suction pressure is 29 to 159.5 psi (0.2 to 1.1 MPa) and normal operating discharge pressure is 145 to 507.6 psi (1.0 to 3.5 MPa) when the refrigerant charge quantity is correct. Check the operation pressure in the test run mode.

(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)

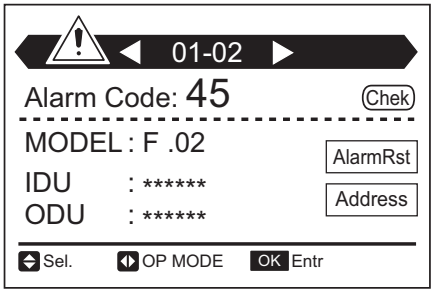
(5) High Pressure Increase Retry (Protection Control)

(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) When the high pressure retry control is activated, alarm code "P 13" is displayed on the 7-segment display of the outdoor unit PCB. If the high pressure retry control occurs three times or more within 30 minutes, alarm code "45" is displayed 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 switch 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.

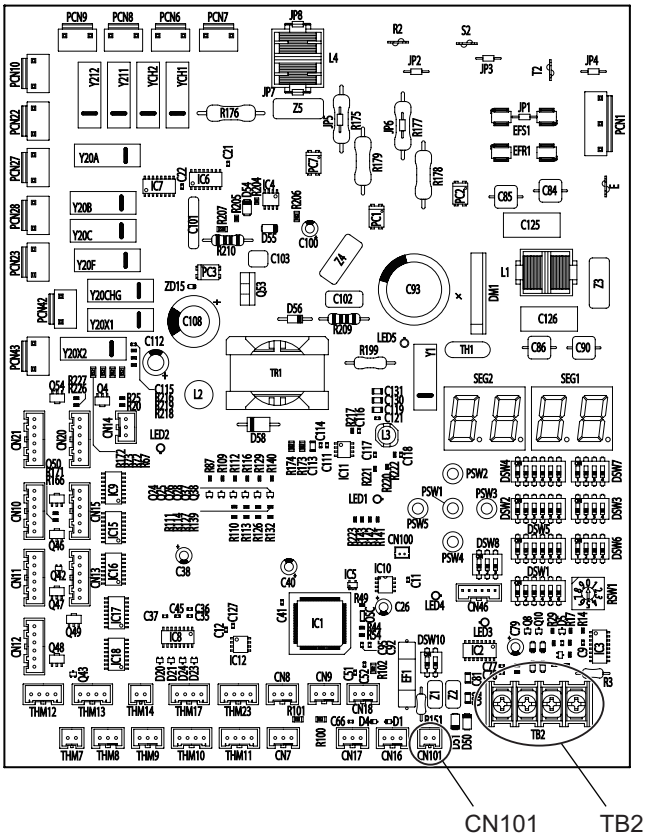
(1) Refrigerant System Check
The most important thing for the refrigerant system is to check that each expansion valve opening and the operating frequency is within the specified range. Each item varies in the value depending on the operating frequency, indoor temperature and ambient temperature.

(2) The service system tester, which automatically calculates Td and SH, facilitates the refrigerant system check. If possible, record the operating cycle data using the service checker.

NOTES:

1. When there are two or more outdoor unit modules in a system, outdoor unit may display “Mainly Heating (Lo)” age for the cycle condition during the compressor stoppage at cooling operation. This is NOT abnormal. “Mainly Heating (Lo)” is displayed for the control reason of the outdoor unit stopped during cooling operation.
2. Service checker can be connected to TB2-No.1 and TB2-No.2 on PCB1 or CN101 connector (H-LINK circuit) on PCB1. When connecting to CN101 connector (XA connector), use “2P Connector Cable” which is a service part (Service Parts No. : P31619).

Outdoor Unit PCB (PCB1)



CHECKLIST FOR TEST OPERATION

CLIENT: _____ INSTALLER: _____ DATE: _____

O.U. 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	<Combination of Base Units> Is DSW6 setting for outdoor unit No. correct?	
2	Are the power supply wire and the communication wire separate from refrigerant pipings?	
3	Is a ground wire connected?	
4	Is there any short circuit?	
5	Is there any voltage abnormality among each phase? (L1-L2, L2-L3, L3-L1)	

(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 Pd and Td. Is Td-SH 27 to 81°F (15 to 45°C) ?	
3	Is Ps 22 to 189 psi (0.15 to 1.3 MPa) ?	
4	Is Pd 145 to 522 psi (1.0 to 3.6 MPa) ? (If the outdoor temperature is high, Pd 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 fan actually running when Fo (Airflow Rate of O.U. Fan) is not "0"?	-	• Fan Motor Failure • O.U. PCB Failure • Condenser Failure	
2	Is the total of iE (I.U. Ex. Valves Opening) abnormally low or high?	-	• Low → Excessive Refrigerant • High → Insufficient Refrigerant or Excessive Pipe Pressure Loss	
3	Is TL (Liquid Pipe Temp. of I.U. Heat Exchanger) lower than Ti (Intake Air Temp. of I.U.)?	It is normal when TL-Ti < -9°F (-5°C).	• TL Thermistor Failure • I.U. Ex. Valve; Fully Closed • Short-Circuit	
4	Is TG (Gas Pipe Temp. of I.U. Heat Exchanger) lower than Ti (Intake Air Temp. of I.U.)? (It is applicable when Intake Air Temp. is 5°F (3°C). higher than Setting Temp.)	It is normal when TG-Ti < -9°F (-5°C).	• TG Thermistor Failure • I.U. Ex. Valve; Fully Closed or Slightly Open • Short-Circuit	
5	Is there any excessive difference in SH (TG-TL) of I.U. heat exchanger among I.U.s? (It is applicable when Intake Air Temp. 5°F (3°C). higher than Setting Temp.)	It is normal if the difference among units is within 13°F (7°C).	• 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 (TG-TL) excessively lower than the other units' value and is iE (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.	• 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 lower than the other units' value and is iE (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.	• 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; b3 (Discharge Air Temp.) - b2 (Intake Air Temp.) indicated on the wired controller 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	Are oE1 and oE2 (O.U. Ex. Valves Opening) abnormally low or high when TdSH is 59°F to 113°F (15°C to 45°C)?	-	• Low → Excessive Refrigerant • High → Insufficient Refrigerant	
2	Is Pd "232" to "522" psi ("1.6" to "3.6" MPa)?	232 - 522 psi (Pd is high when the indoor temperature is high.)	• Low → Solenoid Valve SVA Leakage • High → Excessive Gas Pipe Pressure Loss	
3	Is Ps "22" to "189" psi ("0.15" to "1.3" MPa)?	22 - 189 psi	• 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 iE (I.U. Ex. Valve) is "100"? * The temperature difference between I.U. means the following; b3 (Discharge Air Temp.) - b2 (Intake Air Temp.) indicated on the wired controller by check mode. However, this is applicable only when b2 (Intake Air Temp.) - b1 (Setting Temp.) is higher than 5°F (3°C).	18°F (10°C) and over	• 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.

3.4.5 Reset for Accumulated Operation Time of Compressor 1-2 (cU1□ - cU2□)
(□ : Outdoor Unit No.)

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

<Procedure>
Press PSW1 and PSW3 for five seconds while the accumulated operation time of compressor data is displayed. The accumulated operation time of the compressor is reset.

<Example of Outdoor Unit No. 1 / Compressor 1>

Press PSW4 to display the accumulated operation time of the compressor 1. (Press PSW2 to return to the indication “cU11”.)

PSW4 ↑↓ PSW2

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

⇩

The indication is changed to “0”.

(The accumulated operation time of the compressor 1 is reset.)

NOTE:
In an instance of 216 to 432 MBH, it is required to reset the accumulated operation time for each outdoor unit.

3.4.6 Setting of Forced Open Valve Mode

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

e.g. Refrigerant Recovery Work during Servicing

The following Figure 3.3 indicates the outdoor unit cycle condition when the power supply of outdoor unit is cut off with fully closed EVO.
Recovering refrigerant from the access port of high/low pressure gas stop valve and liquid stop valve under the condition above is incapable because the path of the heat exchanger ( ) is blocked.

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

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

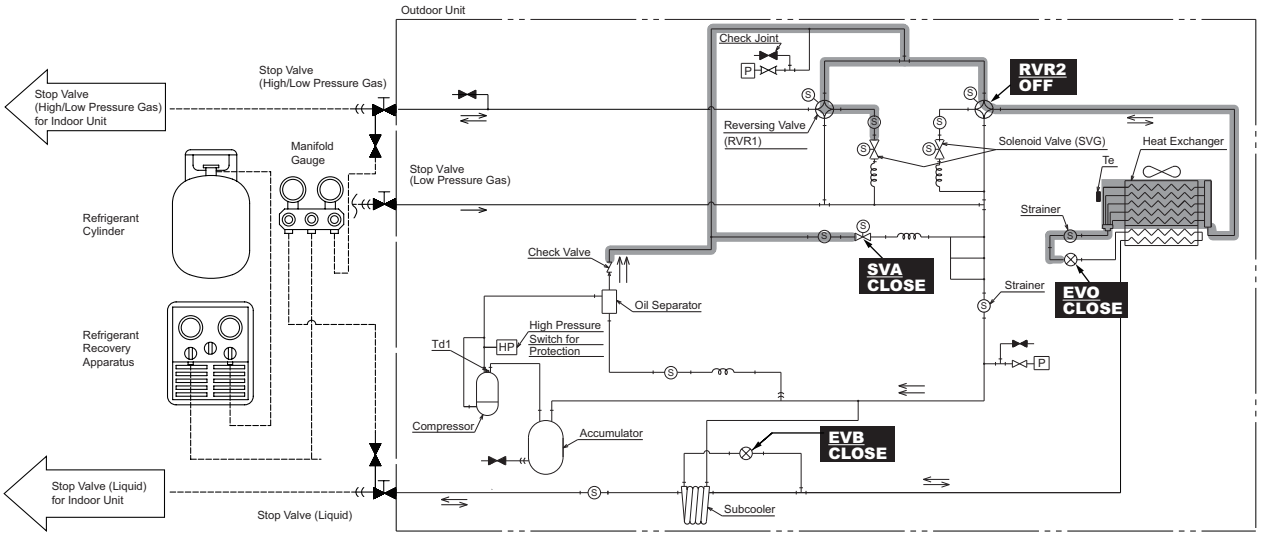


Figure 3.3 Outdoor Unit Cycle Condition

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

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

(2) Setting Procedure
Turn ON the DIP4 - #4 of the main outdoor unit (unit A) and press PSW4 (▼) for 3 seconds.
When this mode is activated, “oPEn” is indicated on the 7-segment display of the outdoor unit.

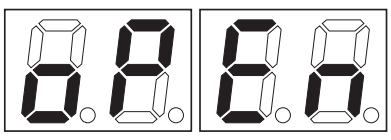


Figure 3.4 Indication "oPEn" on 7-Segment Display

(3) Cancellation
Turn OFF the DIP4 - #4 of the main outdoor unit (unit A).
Make sure the indication “oPEn” on the 7-segment display is turned off after cancellation.

NOTES:

1. Make sure to cancel this mode after refrigerant recovery work, refrigerant evacuation work and air tight test is completed.
2. The cooling operation (include dry operation), heating operation and fan operation for indoor unit, and fan operation for outdoor unit are not available during this mode is activated or for 50 seconds after cancellation (Stoppage Cause Code: d1-10).
(Fan operation is available if the function setting FE = 1 is set. Refer to Section 5.3.2 for the detail.)
3. Make sure to turn ON the power supply of indoor unit and outdoor unit when activate this mode.
Expansion valve and solenoid valve are not activated if the units are not supplied with power.
4. The “Forced Open Valve Mode” will not be functioning properly when expansion valve or solenoid valve is failed.
5. DO NOT activate this mode for the objective other than refrigerant recovery work, refrigerant evacuation work and air tight test.
Otherwise, it may cause unit failure because the operation is stooped by different from normal control.

4. Maintenance

4.1 Maintenance of Outdoor Unit

⚠ DANGER

Apply the specified non-flammable refrigerant (R410A) to the outdoor unit in the refrigerant cycle.
Do not charge materials other than R410A into the unit such as hydrocarbon refrigerants (propane or etc.), oxygen, flammable gases (acetylene or etc.) or poisonous gases when installing, maintaining and moving the unit. These flammables are extremely dangerous and may cause an explosion, fire, and injury.

⚠ WARNING

TURN OFF all POWER supply switches.

4.1.1 Removing Service Cover and Front Cover

(1) Removing Service Cover

(a) Remove six screws that attach the service cover.
(b) Put your hands on the groove at the bottom of the service cover. Then, lift up the service cover slightly and draw it forward. Remove the service cover from the hooks on the right and left sides. (Refer to Fig. 1)

(2) Removing Front Cover

A. Removing Front Cover with Piping Cover

(a) Remove screws that attach the front cover.
(H,Y)VAHR072B(3,4,5)2S: six screws
(H,Y)VAHR096 - 192B(3,4,5)2S: seven screws
(b) Hold the upper side of the front cover. Lift the front cover upward and remove the cover from the hooks on the right and left sides. Then, draw the cover forward. (Refer to Fig. 2)

B. Removing Front Cover Only

(a) Remove the screws that attach the front cover (Refer to the number of the screws shown above). Then, remove the two screws that attach the piping cover. Do not remove the screws circled in the figure.
(b) Hold the upper side of the front cover and lift it upward. Remove the front cover from the piping cover on the left. Then, lean the front cover forward. (Refer to Fig. 3)

(3) Removing Front Cover Assembly (Assy) (only for (H,Y)VAHR168, 192B(3,4,5)2S)

(a) Remove six screws that attach the front cover.
(b) Hold the bottom side of the front cover assembly (assy). Then, lift the cover up slightly and draw it forward to remove the cover from the hooks on the right and left sides.

NOTE:
When attaching/removing the service cover and front cover, take special care to avoid injury from the sharp edges.

⚠WARNING

TURN OFF all POWER supply switches.

Tool	Phillips Screwdriver

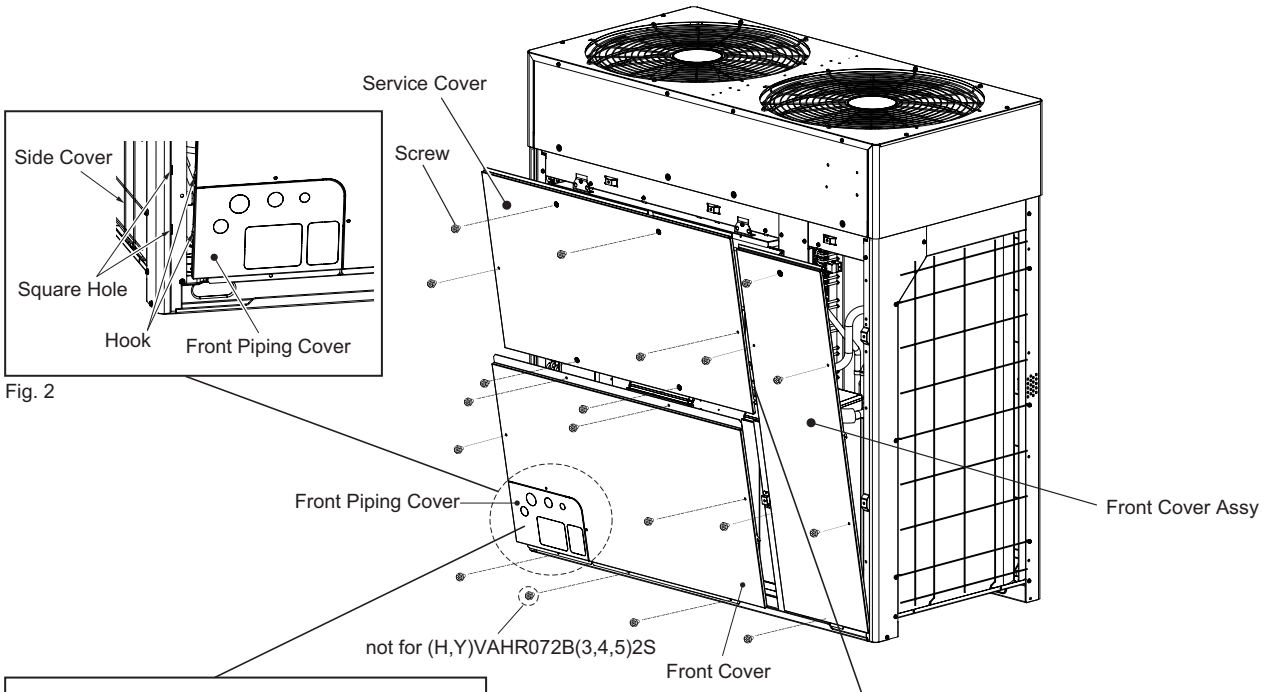


Fig. 2

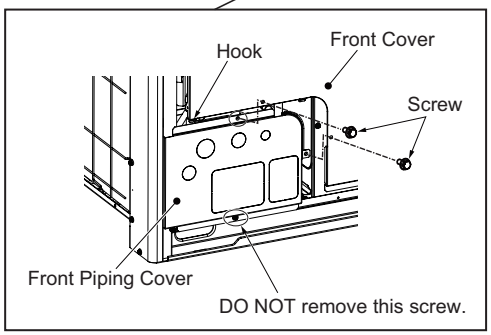


Fig. 3

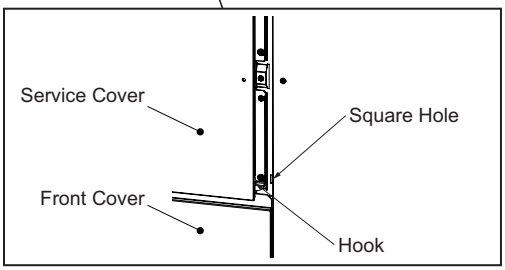


Fig. 1

⚠WARNING

TURN OFF all POWER supply switches.

4.1.2 Attaching Service Cover and Front Cover

(1) Attaching Front Cover Assembly (Assy) (only for (H,Y)VAHR168, 192B(3,4,5)2S)

(a) Insert the hooks of the front cover assembly (assy) into the square holes of the side cover.

(b) DO NOT insert the lower end of the front cover assembly (assy) into the inside of the bottom base. (Refer to Fig. 4)

(2) Attaching Front Cover

(a) Insert the hooks of the front cover into the square holes of the side cover. (Refer to Fig. 5) DO NOT insert the lower end of the front cover into the inside of the bottom base.

(b) Attach the front cover with the screws.

Tool	Phillips Screwdriver

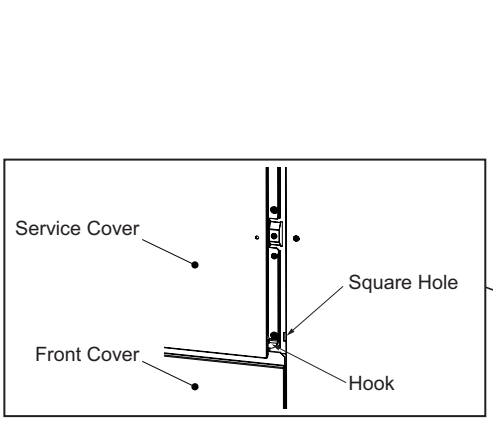
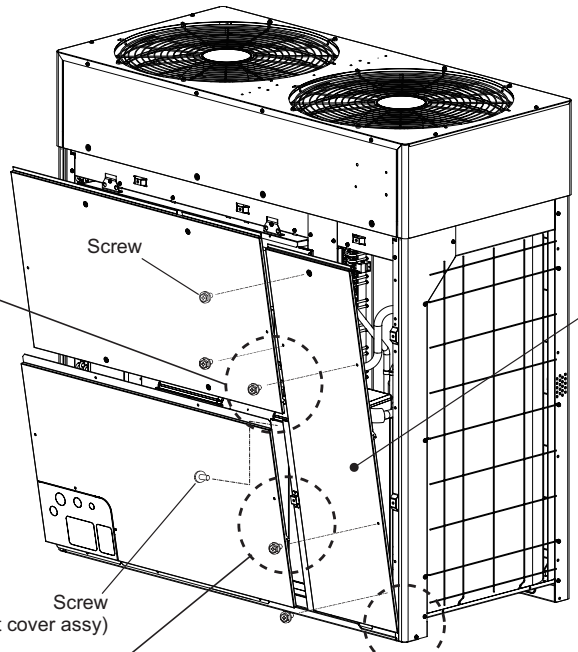


Fig. 6



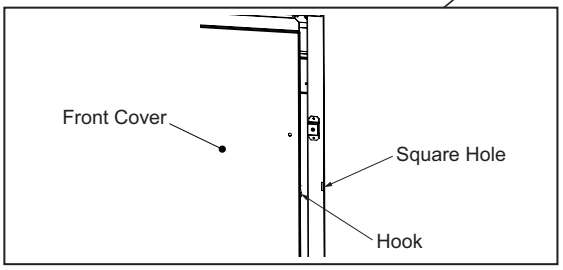


Fig. 5

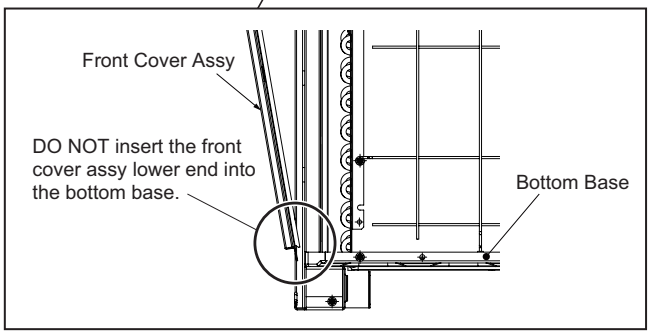


Fig. 4

(3) Attaching Service Cover

(a) First attach the front cover*, then attach the service cover. Insert the hooks of the service cover into the square holes of the side cover. (Refer to Fig. 6)

(b) Attach the front cover with the screws.

NOTE:

* When attaching the front cover, insert the hooks into the square holes of the side cover as shown in the figure. DO NOT insert the lower end of the front cover into the inside of the bottom base.

⚠WARNING

TURN OFF all POWER supply switches.

4.1.3 Removing Air Outlet Grille

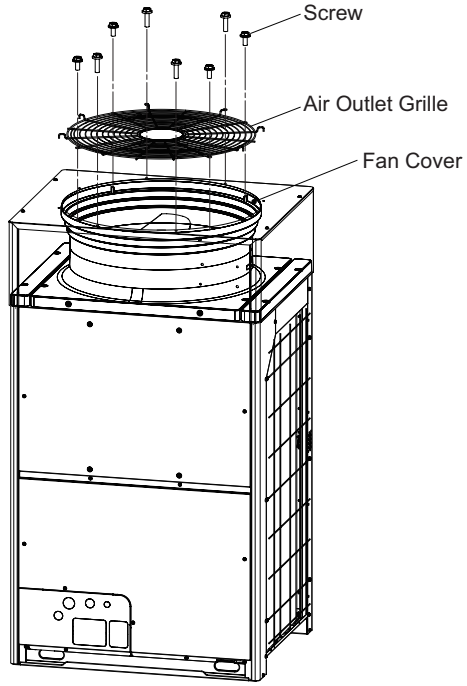
(1) Remove screws attaching the air outlet grille.
(H,Y)VAHR072B(3,4,5)2S: eight screws
(H,Y)VAHR096 - 192B(3,4,5)2S: eight screws each

(2) Remove the air outlet grille.

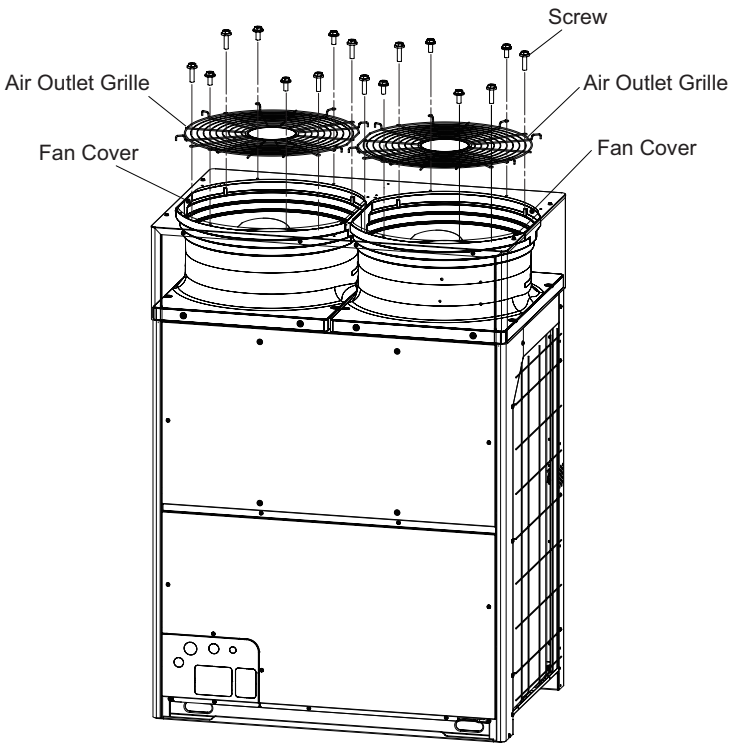
NOTE:
DO NOT apply excessive force to the fan cover (plastic part). Otherwise, deformation and breakage may occur.

Tool	Phillips Screwdriver

(H,Y)VAHR072B(3,4,5)2S



(H,Y)VAHR096 - 192B(3,4,5)2S



⚠WARNING

TURN OFF all POWER supply switches.

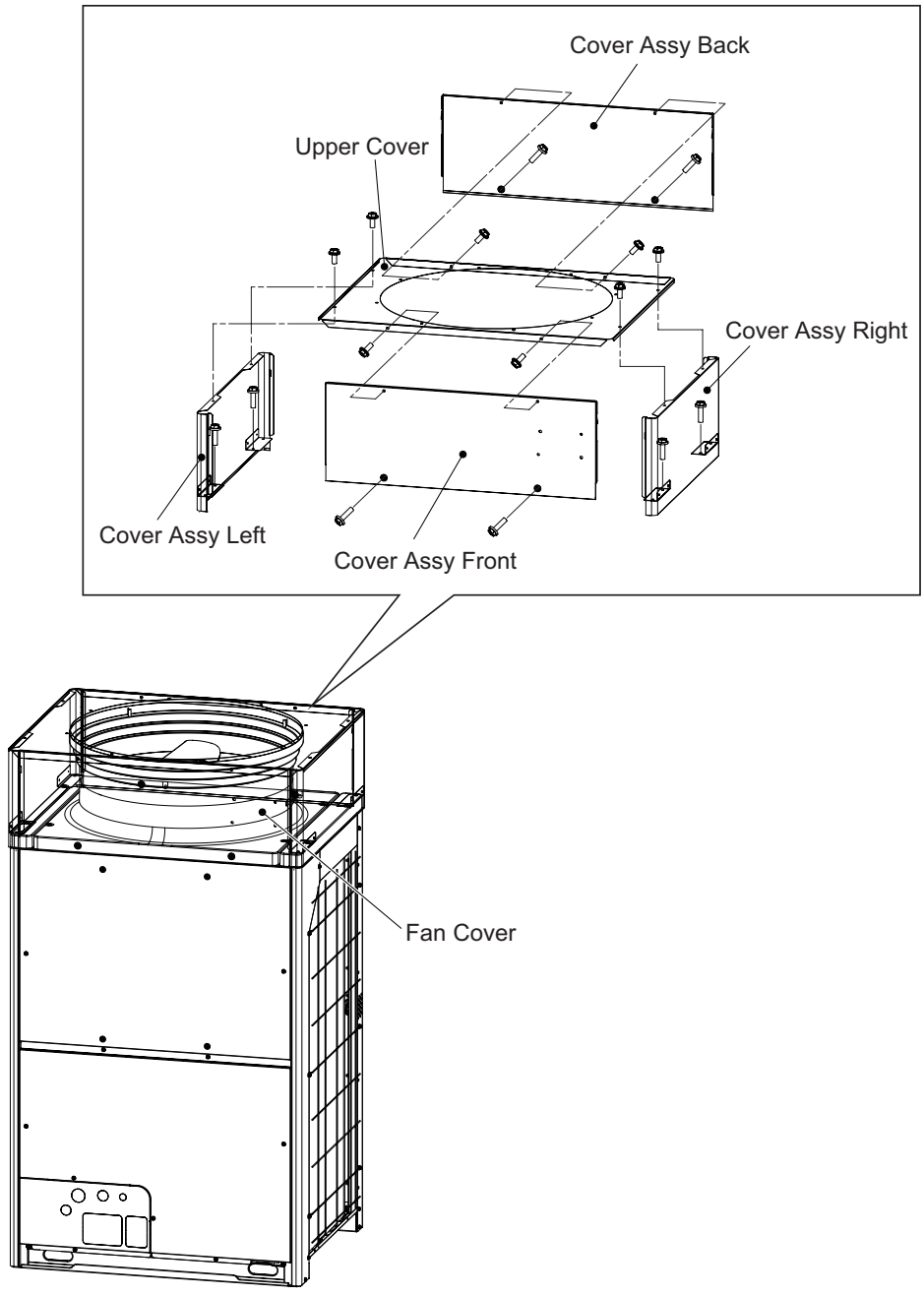
4.1.4 Removing Upper Cover Assembly (Assy) and Fan Cover

(1) Remove the air outlet grille according to Section 4.1.3 “Removing Air Outlet Grille”.

(2) Remove screws securing the upper cover and the front, back, left and right cover assemblies.
(H,Y)VAHR072B(3,4,5)2S: 16 screws
(H,Y)VAHR096 - 192B(3,4,5)2S: 24 screws

Tool	Phillips Screwdriver

(H,Y)VAHR072B(3,4,5)2S

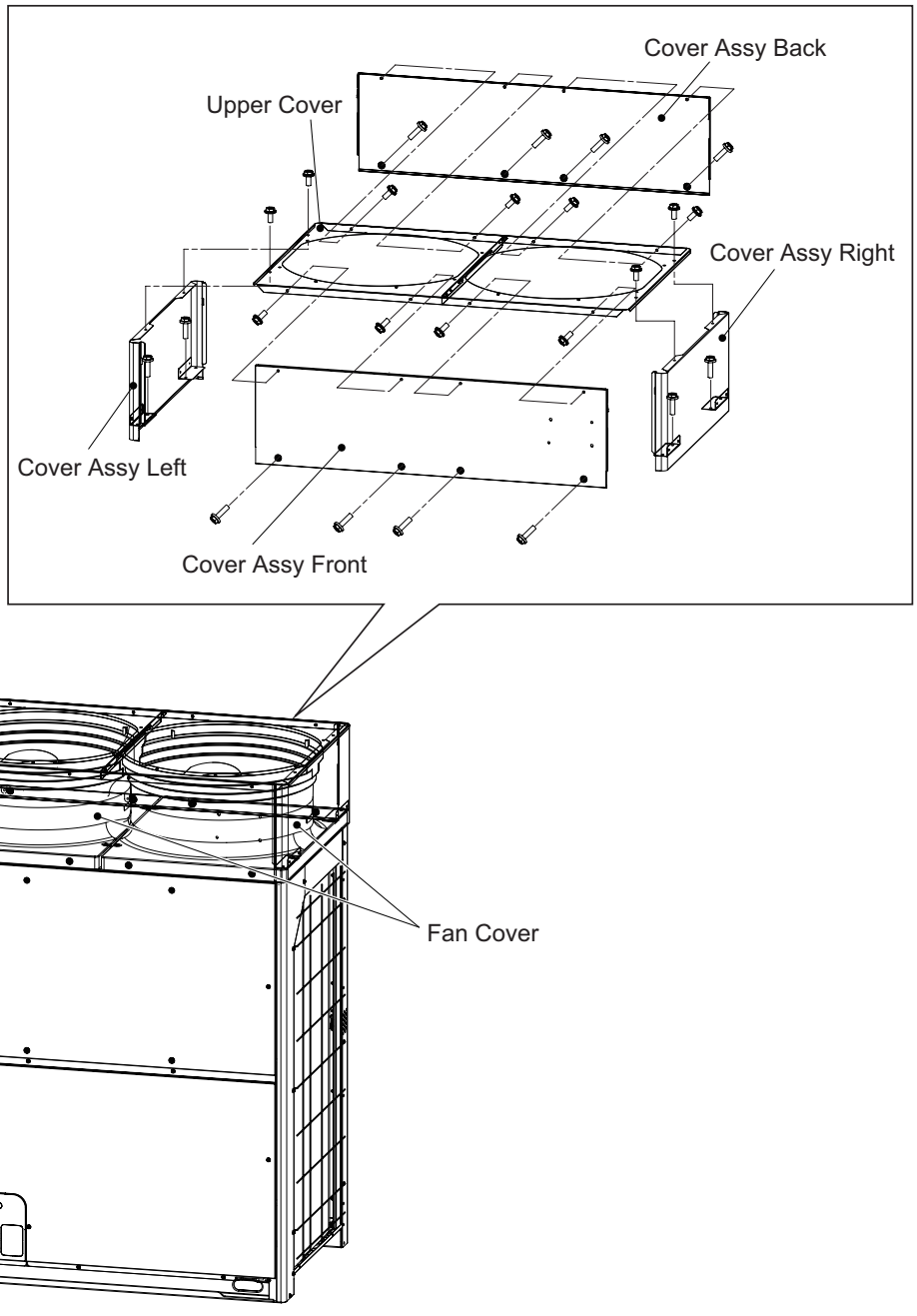


⚠WARNING

TURN OFF all POWER supply switches.

Tool	Phillips Screwdriver

(H,Y)VAHR096 - 192B(3,4,5)2S



⚠WARNING

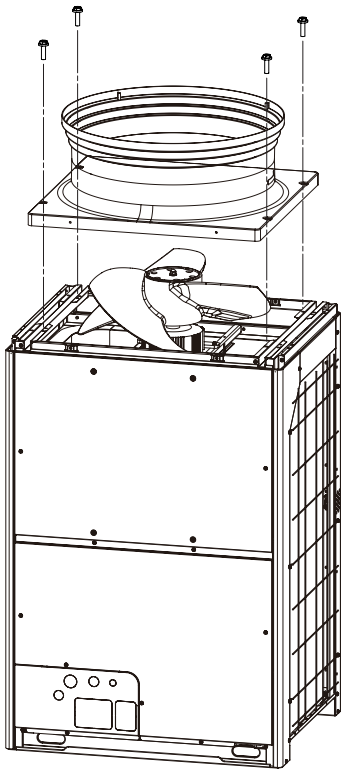
TURN OFF all POWER supply switches.

(2) Remove four screws securing the fan cover.

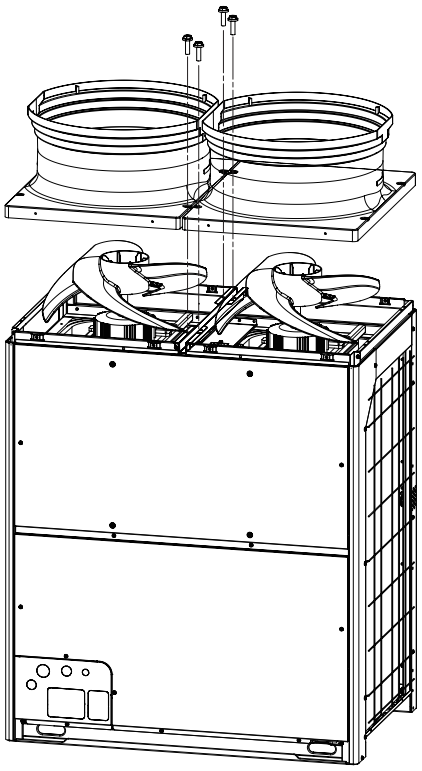
(3) Lift up the fan cover. When removing the fan cover, make sure that it does not come in contact with the fan blades.

Tool	Phillips Screwdriver

(H,Y)VAHR072B(3,4,5)2S



(H,Y)VAHR096 - 192B(3,4,5)2S



⚠WARNING

TURN OFF all POWER supply switches.

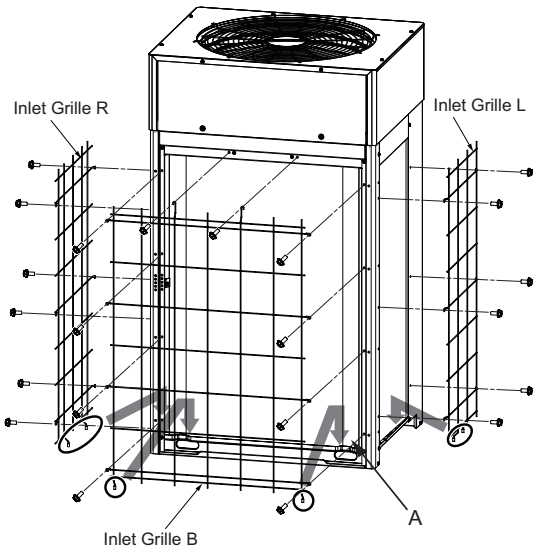
4.1.5 Removing Inlet Grille

(1) Remove screws securing the inlet grille.
(H,Y)VAHR072B(3,4,5)2S: 22 screws
(H,Y)VAHR096 - 144B(3,4,5)2S: 22 screws
(H,Y)VAHR168, 192B(3,4,5)2S: 32 screws

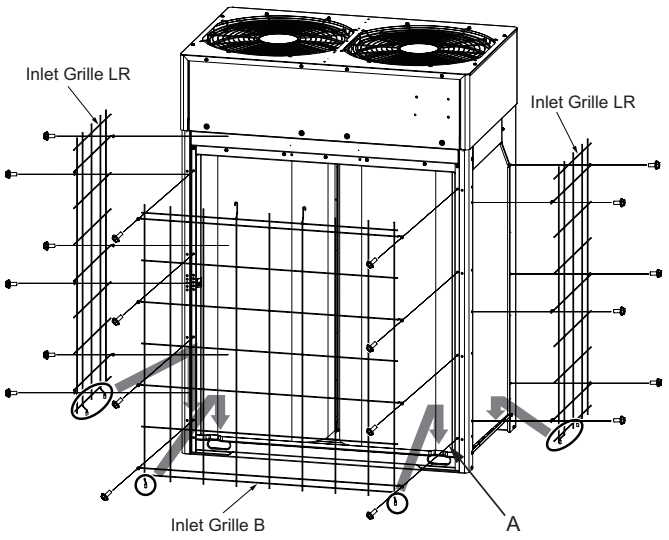
(2) Remove the inlet grille by lifting it up diagonally toward you. (Refer to Fig. A.)

Tool	Phillips Screwdriver

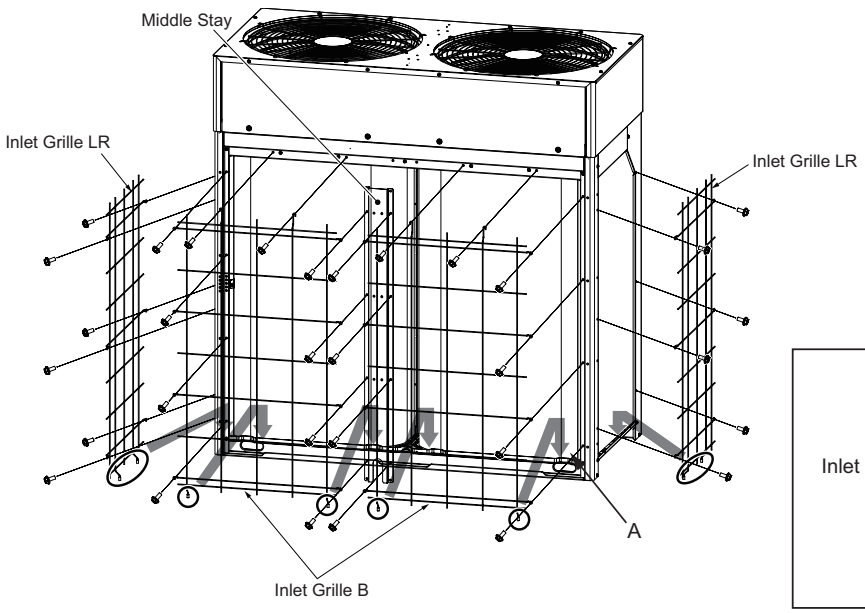
(H,Y)VAHR072B(3,4,5)2S

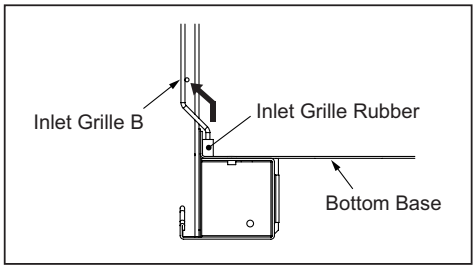


(H,Y)VAHR096 -144B(3,4,5)2S



(H,Y)VAHR168, 192B(3,4,5)2S





A. Side View

⚠WARNING

TURN OFF all POWER supply switches.

4.1.6 Removing Electrical Box Cover

(1) Remove the service cover and front cover according to Section 4.1.1 “Removing Service Cover and Front Cover”.

(2) Remove four screws that attach the electrical box cover and loosen the other two fall-prevention screws[1].

(3) Push the electrical box cover up and draw it forward from the fall-prevention screws[2].

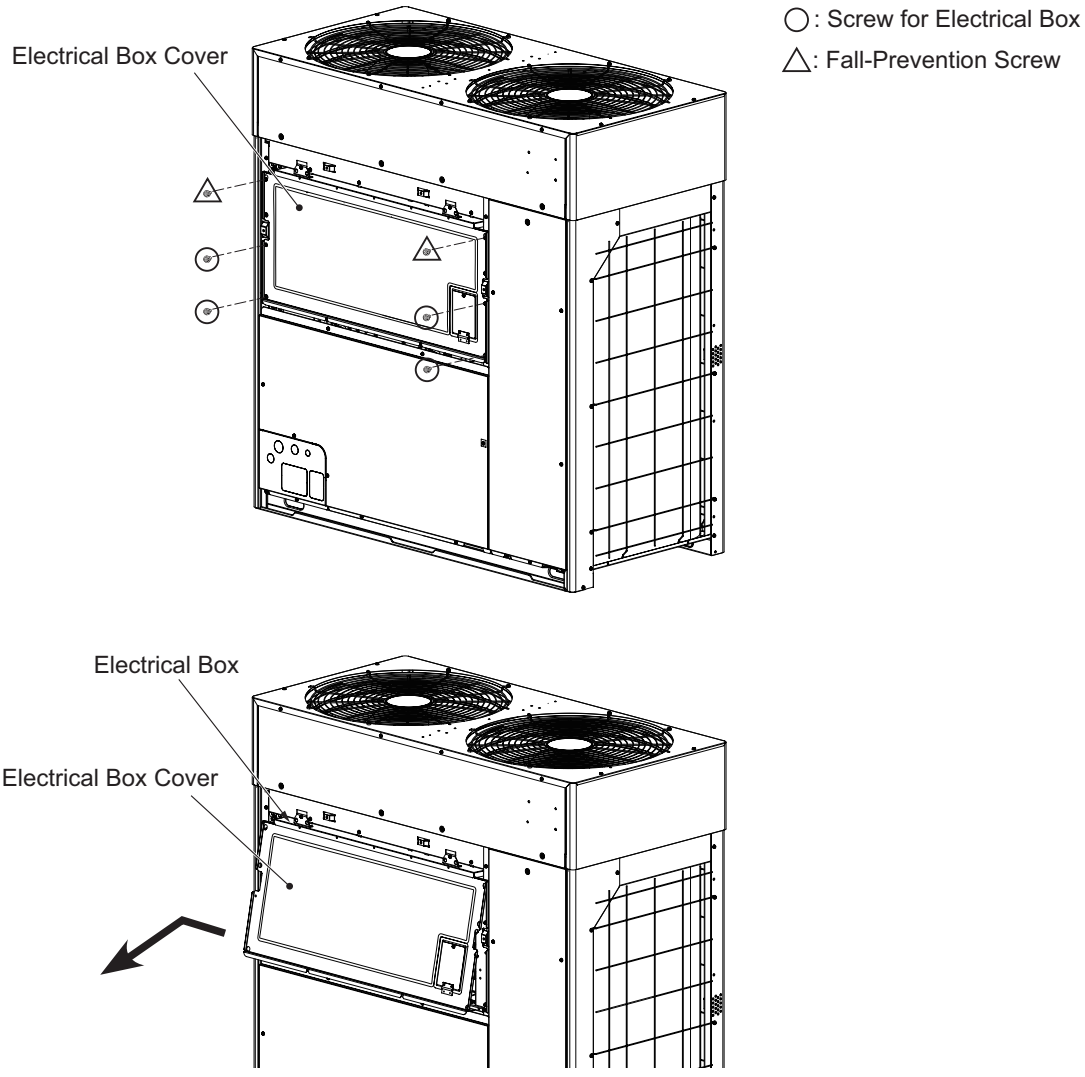
NOTES:

[1] Before removing the screws that attach the electrical box cover, check that the fall-prevention screws are attached to the cover in order to prevent the electrical box cover from dropping off.

[2] Take special care to avoid injury from the front cover edges when removing the electrical box cover.

Tool	Phillips Screwdriver

All Models



⚠WARNING

TURN OFF all POWER supply switches.

4.1.7 Removing Electrical Box

(1) Remove the service cover and front cover according to Section 4.1.1 “Removing Service Cover and Front Cover”.

(2) Remove the electrical box cover according to Section 4.1.6 “Removing Electrical Box Cover”.

(3) Remove the wires from the cable clamps at the bottom of the electrical box.

(4) Remove the screws securing the power supply wiring, compressor wires, transmission wires, and ground wire.

(5) Disconnect the connectors for the fan motor, solenoid valve, and crankcase heater.

(6) Disconnect the connectors for each thermistor, the electronic expansion valve, and pressure sensor on the outdoor unit PCB.

(7) Disconnect the connector for high pressure switch on the main power PCB.

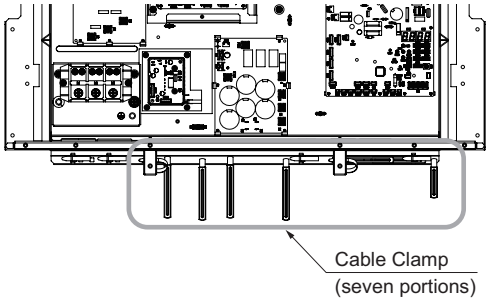
(8) Remove four screws attaching the electrical box and loosen two fall-prevention screws.

(9) Push the electrical box up and pull away from the unit.

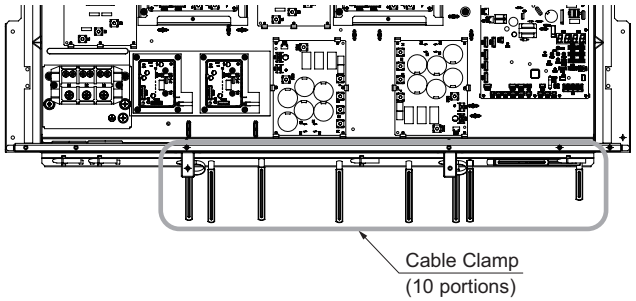
NOTICE:
When removing the electrical box from the outdoor unit, hold the bottom side of the hook on the electrical box. DO NOT hold the center of the electrical box as this may cause damage to the box.

Tool	Phillips Screwdriver

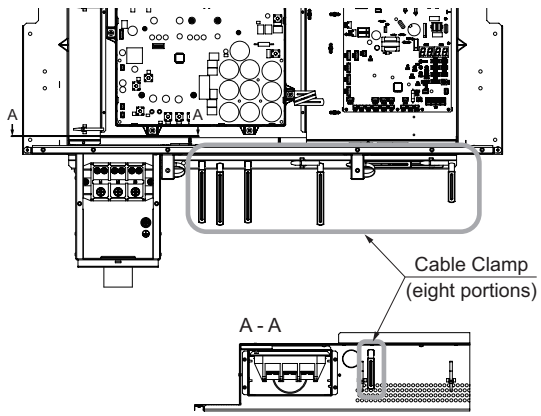
(H,Y)VAHR072B32S



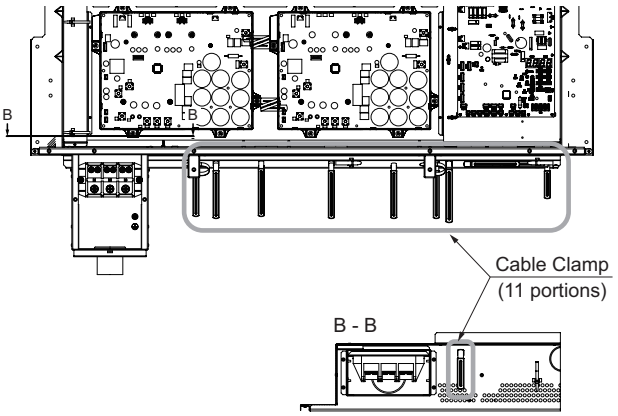
(H,Y)VAHR096 - 192B32S



(H,Y)VAHR072B42S, (H,Y)VAHR072B52S



(H,Y)VAHR096 - 192B42S, (H,Y)VAHR096 - 192B52S

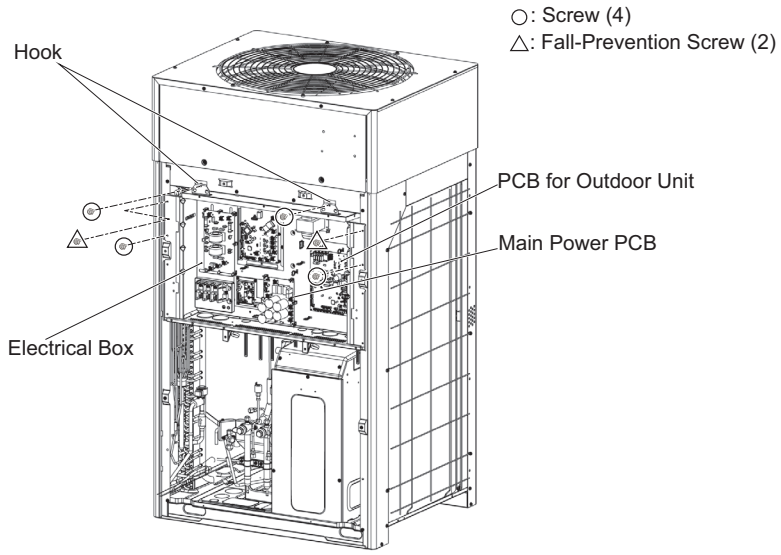


⚠WARNING

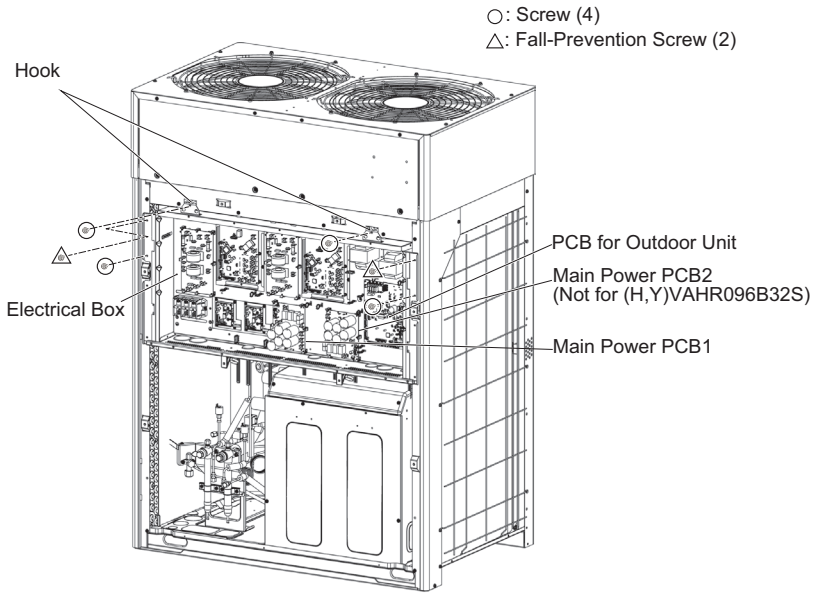
TURN OFF all POWER supply switches.

Tool	Phillips Screwdriver

(H,Y)VAHR072B(3,4,5)2S



(H,Y)VAHR096 - 144B(3,4,5)2S

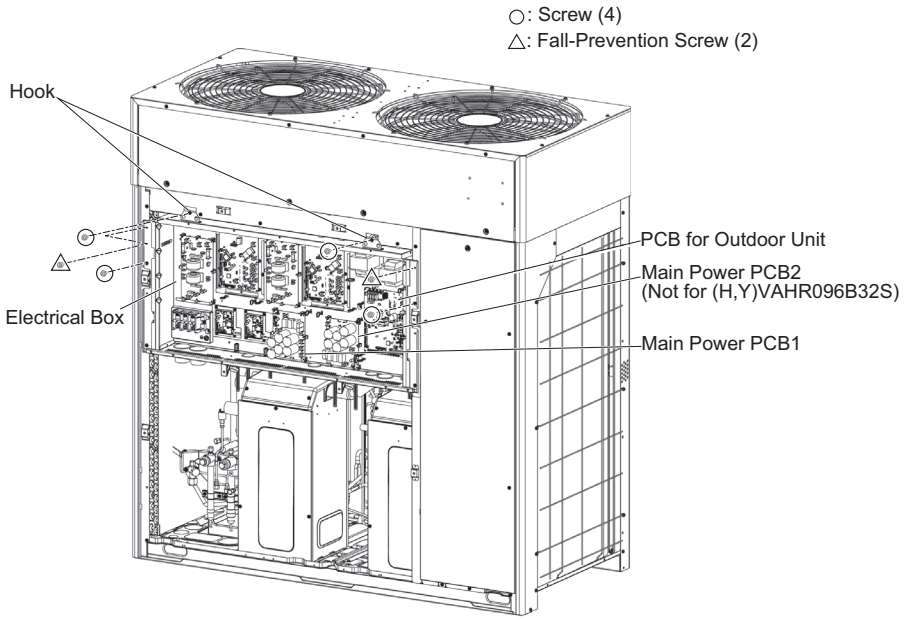


⚠WARNING

TURN OFF all POWER supply switches.

Tool	Phillips Screwdriver

(H,Y)VAHR168, 192B(3,4,5)2S



⚠WARNING

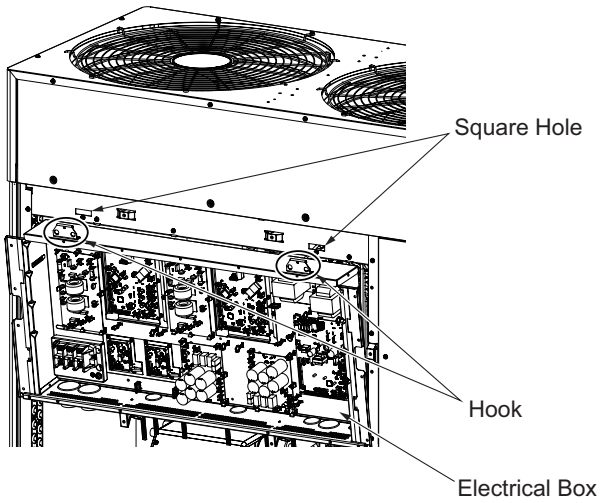
TURN OFF all POWER supply switches.

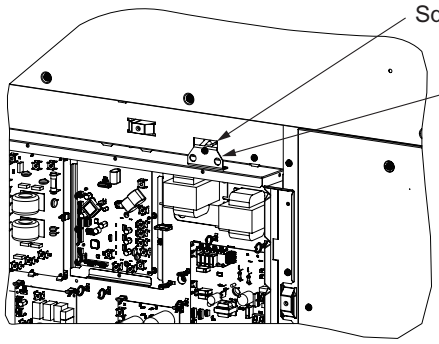
(9) Remove the electrical box from the outdoor unit.

NOTICE:
Be sure to wear protective equipment, and take special care to avoid injury from the sharp panel edges.

Tool	Phillips Screwdriver

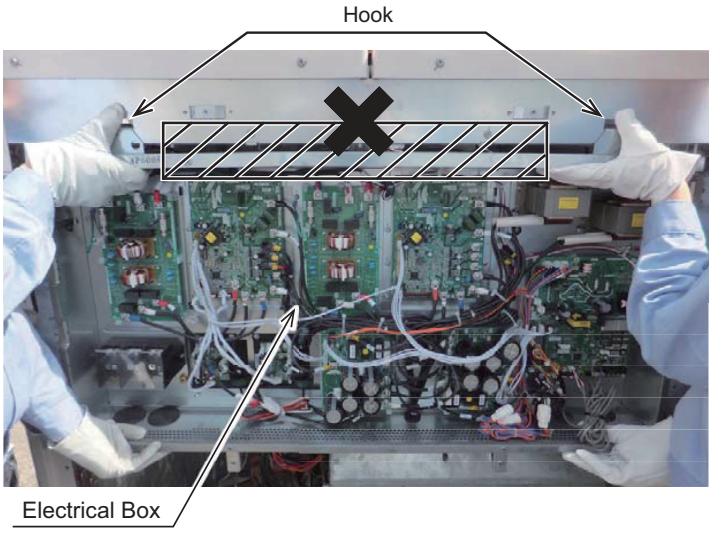
Work in Pairs





Lift the electrical box up and remove hook from square hole.

NOTICE



When removing the electrical box from the outdoor unit, hold the bottom side of the hook on the electrical box as shown in the figure above.
Do not lift the center of the electrical box. This may cause damage to the electrical box.

⚠WARNING

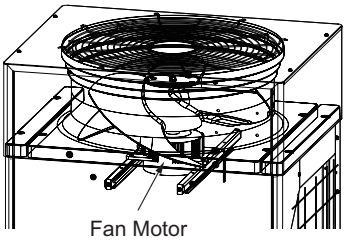
TURN OFF all POWER supply switches.

4.1.8 Removing Outdoor Fan

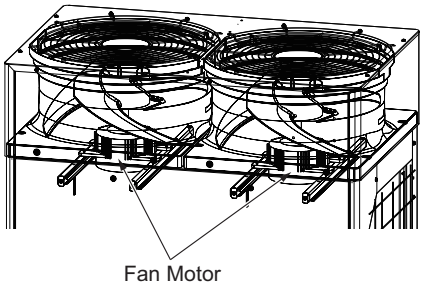
(1) Remove the air outlet grille according to Section 4.1.3 “Removing Air Outlet Grille”.

Tool	Adjustable Wrench, Ratchet, Puller, Phillips Screwdriver, Box Wrench

(H,Y)VAHR072B(3,4,5)2S



(H,Y)VAHR096 - 192B(3,4,5)2S



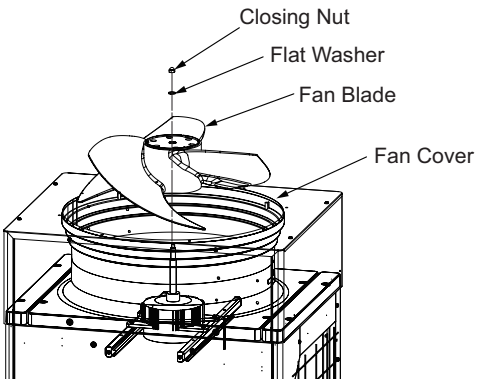
(2) Use a box wrench to remove the locking nut and the flat washer that attaches the fan blade onto the motor shaft with a box wrench.

(3) Remove the fan blade from the motor shaft. When re-installing the fan blade, align the flat part of the blade assembly to the flat part of the motor shaft and slide on.

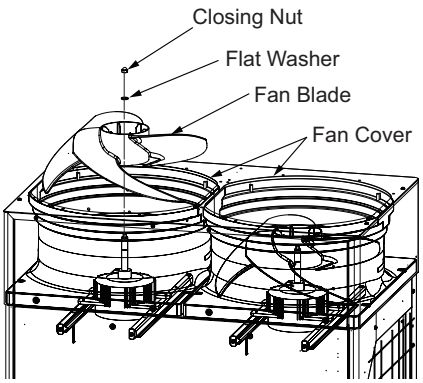
NOTICE:
DO NOT apply an excessive force to the fan cover (plastic part). This may cause damage of breakage.

Tool	Adjustable Wrench, Ratchet, Puller, Phillips Screwdriver, Box Wrench

(H,Y)VAHR072B(3,4,5)2S



(H,Y)VAHR096 - 192B(3,4,5)2S



⚠WARNING

TURN OFF all POWER supply switches.

(4) Removing Fan Motor Wiring Harness

(a) Remove the service cover, front cover and electrical box cover according to Section 4.1.1 “Removing Service Cover and Front Cover” and Section 4.1.6 “Removing Electrical Box Cover”.

(b) Unplug the connector for the fan motor in the electrical box.

(c) Loosen the wiring harness between the electrical box and the fan motor. Then cut the cable band that holds the piping insulation in place.

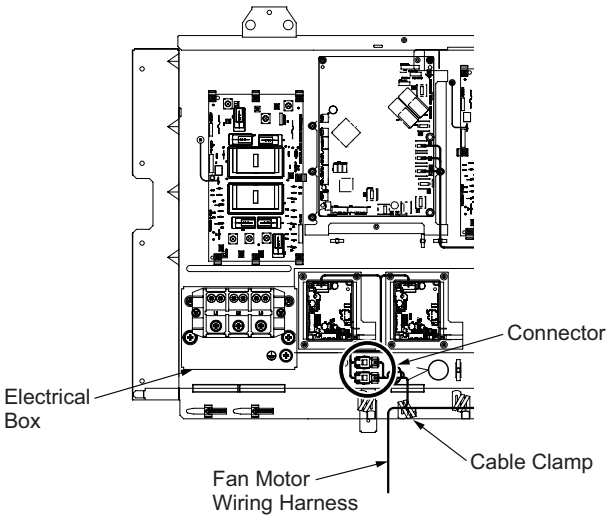
(d) Remove four M6 bolts attaching the fan motor, and remove the fan motor.

(H,Y)VAHR072B(3,4,5)2S: four screws

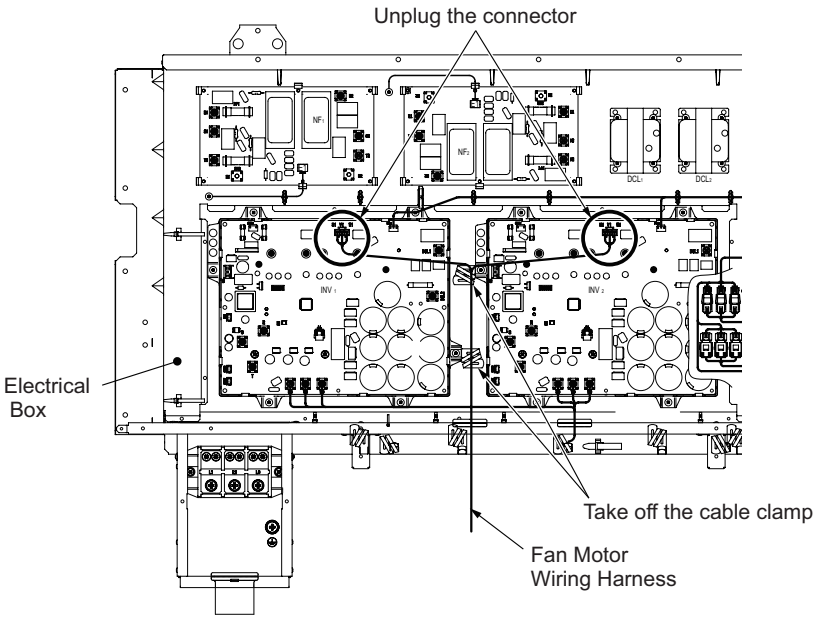
(H,Y)VAHR096 - 192B(3,4,5)2S: eight screws

Tool	Adjustable Wrench, Ratchet, Puller, Phillips Screwdriver, Wire Cutter, Box Wrench

208/230V



460V, 575V

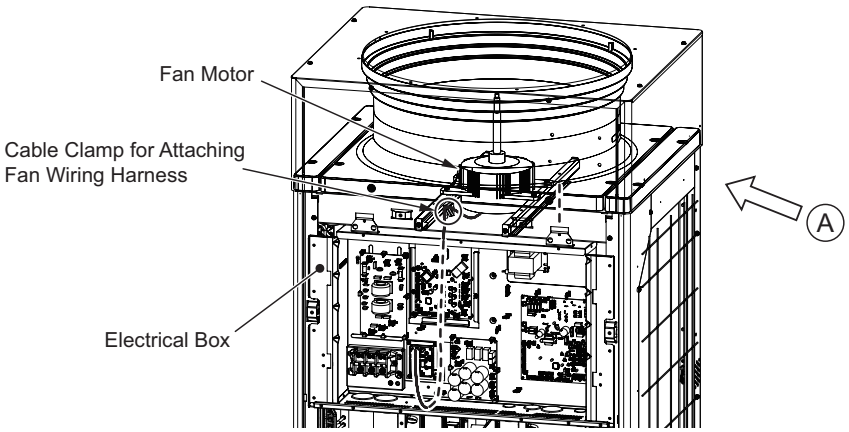


⚠WARNING

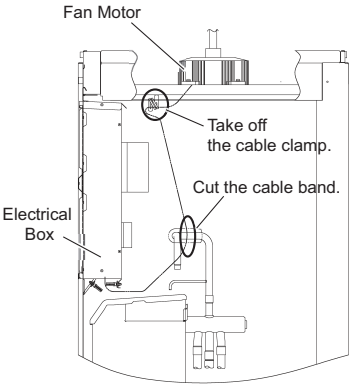
TURN OFF all POWER supply switches.

Tool	Phillips Screwdriver

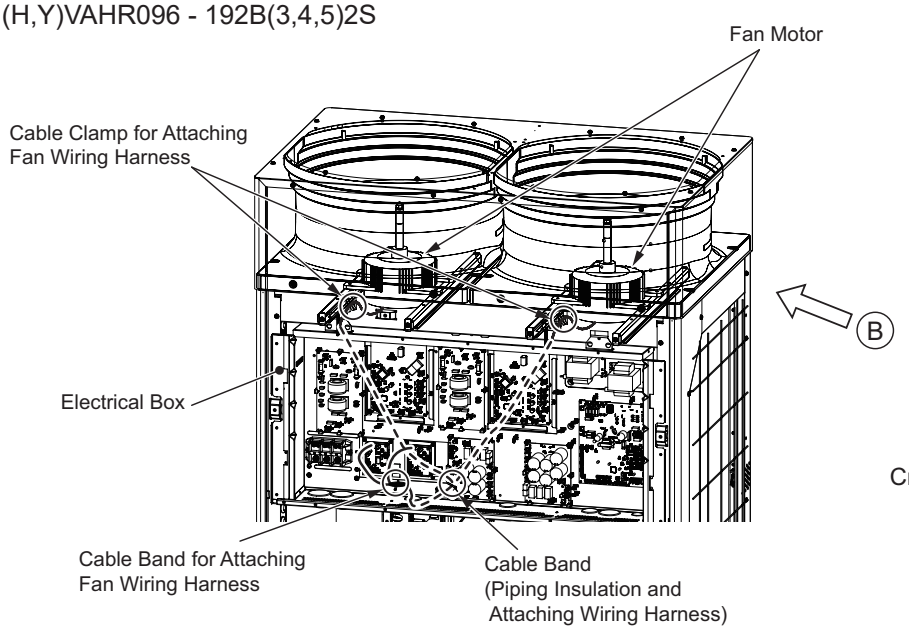
(H,Y)VAHR072B(3,4,5)2S



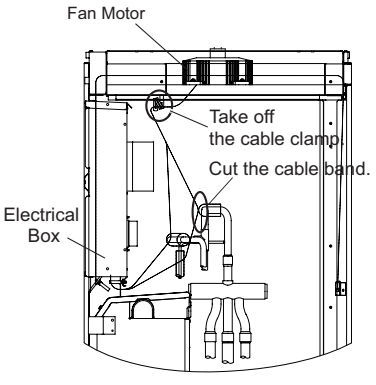
Cross-section Drawing from Ⓐ



(H,Y)VAHR096 - 192B(3,4,5)2S



Cross-section Drawing from Ⓑ



⚠WARNING

TURN OFF all POWER supply switches.

(5) When reassembling the outdoor unit fan, perform the procedures for removal in reverse.

NOTES:

1. Put the edge of the protection tube inside the electrical box when mounting the fan motor. (Make a wire trap.)
2. Attach the fan motor wiring harness to the motor clamp with a cable band to avoid contact with the fan blade. Reattach the piping insulation with cable band.
3. When mounting the fan blade on the motor shaft, make sure the flat part of the fan blade assembly matches the flat part of the motor shaft. Then, slide it onto the motor shaft.
   Once the fan blade assembly is in the correct position, tighten the fan blade assembly onto the motor shaft with 22.1 lbf.ft (30N.m) torque.

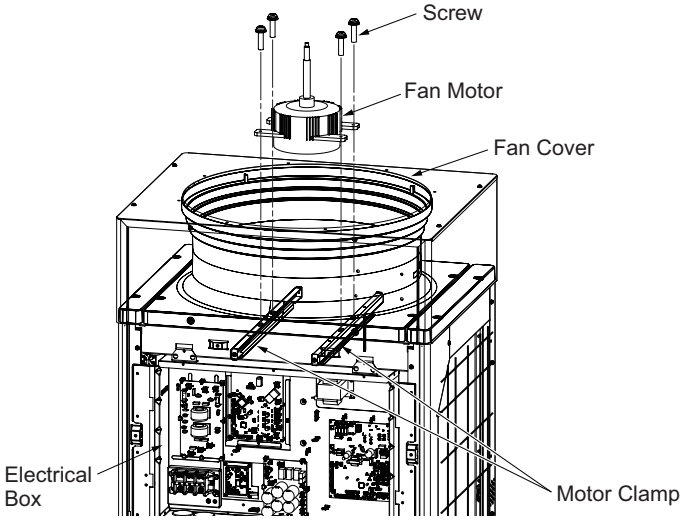
Torque for Tightening Fan Blade
22.1 lbf.ft (30N.m)

4. Reconnect the motor wiring harness plug for the fan motor in the electrical box.

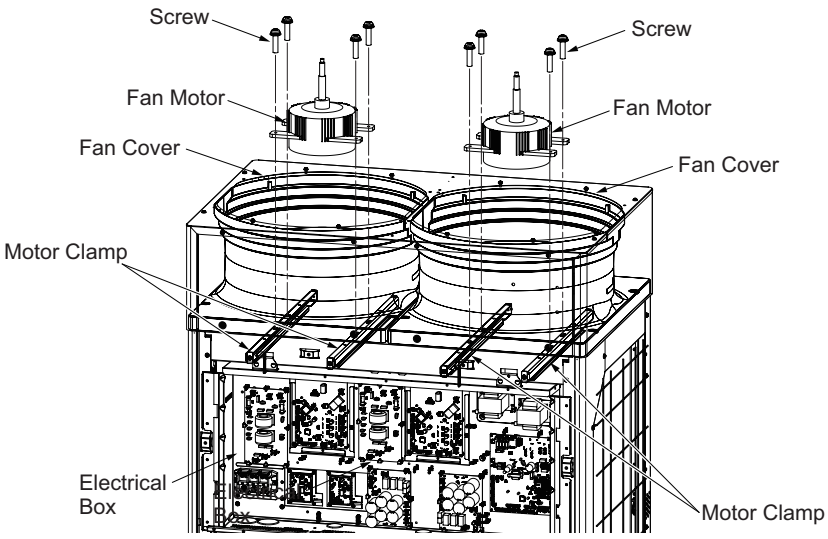
(6) After mounting the fan motor, check from above that gap between the fan blade and the upper cover is even. Also check that there is no noise caused by contact between the fan blade and the upper cover during fan operation.

Tool	Adjustable Wrench, Ratchet, Puller, Phillips Screwdriver, Wire Cutter, Box Wrench

(H,Y)VAHR072B(3,4,5)2S



(H,Y)VAHR096 - 192B(3,4,5)2S



⚠WARNING

TURN OFF all POWER supply switches.

4.1.9 Removing Compressor

(1) Remove the service cover and front cover according to Section 4.1.1 “Removing Service Cover and Front Cover”.

(2) Before starting the following work, collect the refrigerant from the refrigerant cycle into a cylinder.

(3) Collect the refrigerant in the outdoor unit from the low pressure check joint and the high pressure check joint. Check that the pressure does not increase at this time.

If the pressure increase, collect all the refrigerant in the refrigerant cycle. Refer to the item 1.3.6 “Setting of Forced Open Valve Mode” for details.

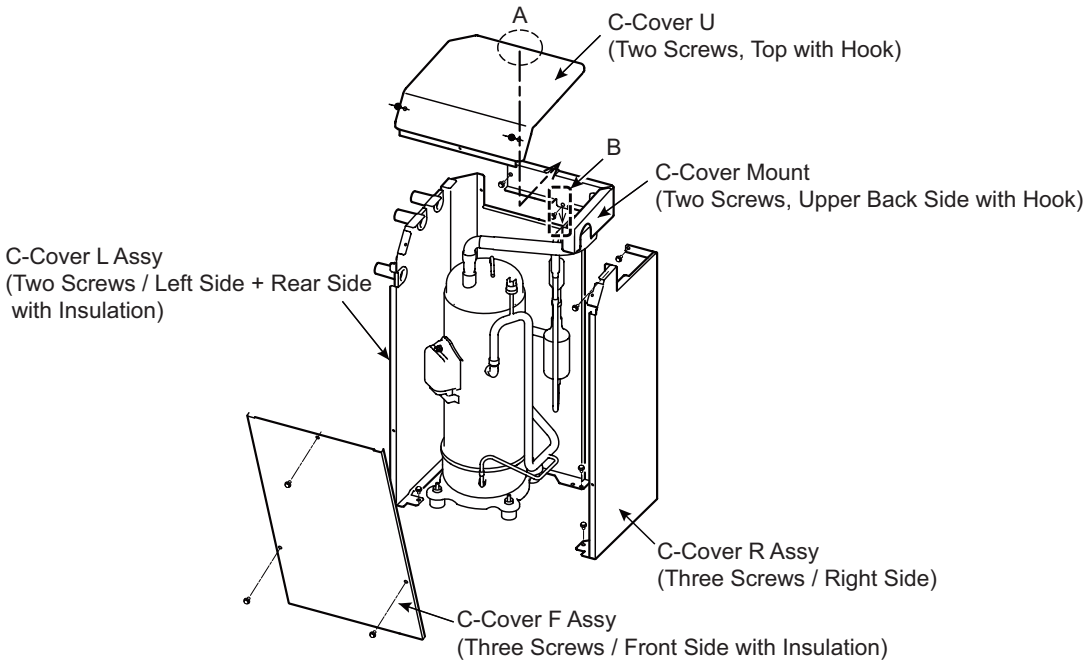
(4) Remove the compressor cover (C-cover) by following the numbers in the figure below.

NOTICE:

- Pay attention not to damage the piping around the compressor when removing the C-cover. Excessive pressure or movement of piping may cause brazed joints to leak.
- Be careful to avoid injury from the sheet metal edges or heat exchanger fins when removing the compressor cover.

Tool	Adjustable Wrench or Ratchet, Phillips Screwdriver, Pliers, Torch, Pipe Cutter, Wire Cutter

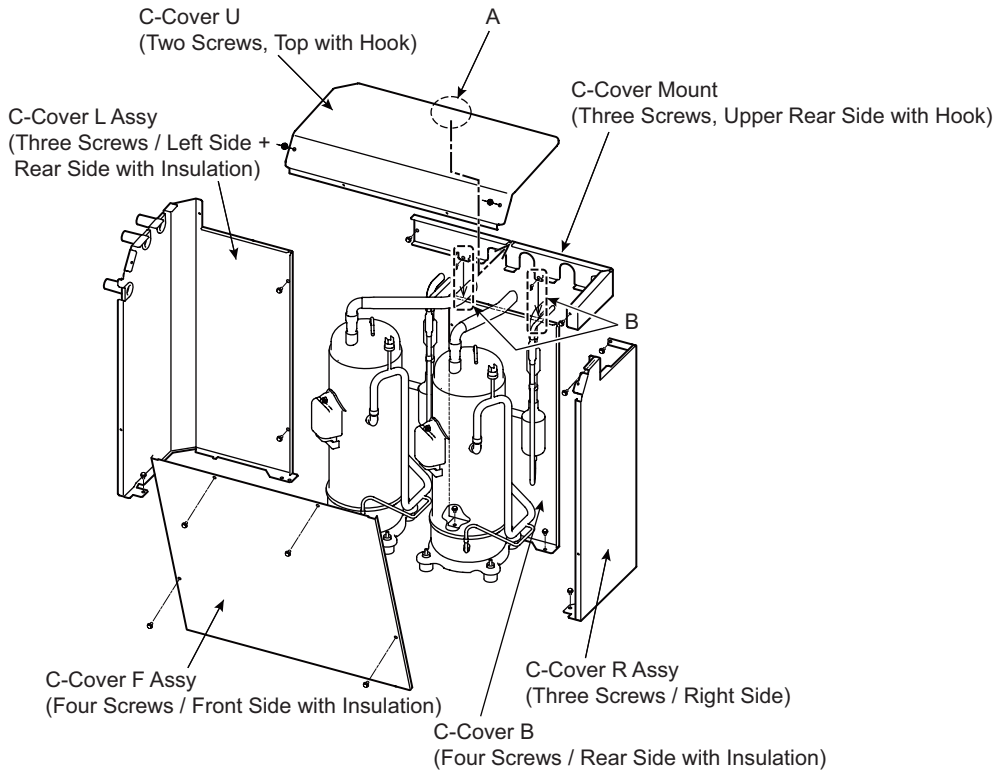
(H,Y)VAHR072, 096, 168, 192B(3,4,5)2S



⚠WARNING

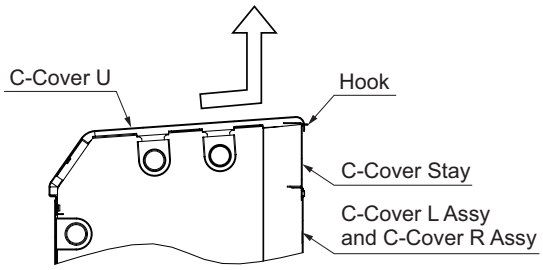
TURN OFF all POWER supply switches.

(H,Y)VAHR120, 144B(3,4,5)2S

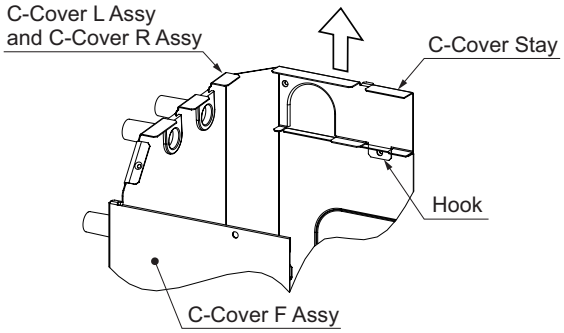


All Models

Details of A
Hook of C-Cover Stay is hooked to the square hole of C-Cover U.
Lift up then remove C-Cover U.



Details of B
Hook of C-Cover Stay is inserted into the square hole of C-Cover L Assy and C-Cover R Assy.
Lift up then remove C-Cover Stay.



⚠WARNING

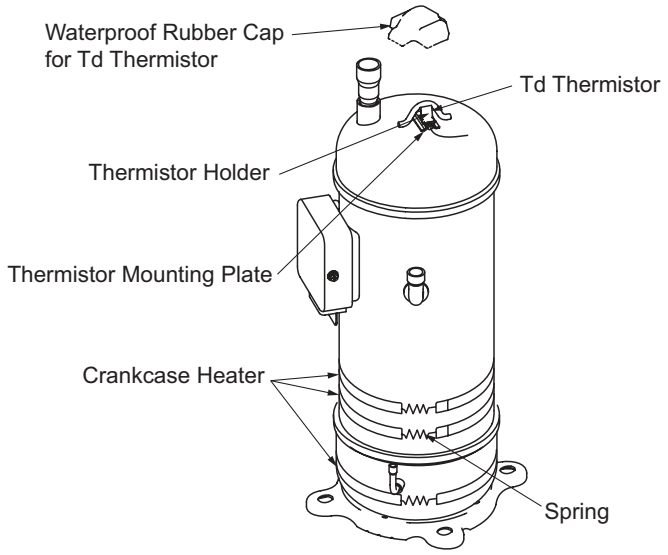
TURN OFF all POWER supply switches.

(5) Remove the Td thermistor on the top of the compressor.

(6) Release the spring for the crankcase heater to remove crankcase heater.

NOTE:
The thermistor holder, thermistor securing plate, and waterproof rubber cap are used again when reassembling. Keep them in a container so that the parts are stored correctly.

Tool	Adjustable Wrench or Ratchet, Phillips Screwdriver, Pliers, Torch, Pipe Cutter, Wire Cutter



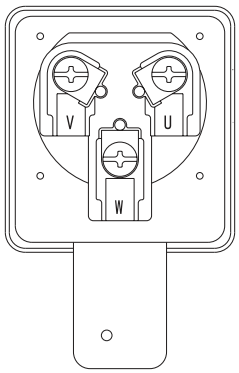
⚠WARNING

TURN OFF all POWER supply switches.

(7) Remove the terminal block box cover for the compressor and disconnect the wiring to the compressor terminals. Match the terminal numbers with the mark band numbers when reassembling. If wiring is connected incorrectly, the compressor may be damaged due to reverse rotation.

Tool	Adjustable Wrench or Ratchet, Phillips Screwdriver, Pliers, Torch, Pipe Cutter, Wire Cutter

Details of Terminal Block Box



NOTES:

1. When replacing the compressor, check for the round terminal condition. If the round terminal is damaged, replace it with a new one.
2. Attach the wiring harness firmly with cable bands.
3. Re-tighten the compressor screws after the replacement.

208/230V

Outdoor Unit Models	Inverter Compressor	
	AA50PHD-A2Y2	DC80PHD-A2Y2
(H,Y)VAHR072B32S		1
(H,Y)VAHR096B32S		1
(H,Y)VAHR120B32S	2	
(H,Y)VAHR144B32S	2	
(H,Y)VAHR168B32S		2
(H,Y)VAHR192B32S		2

460V, 575V

Outdoor Unit Models	Inverter Compressor	
	AA50PHD-D2Y2	DC80PHD-D2Y2
(H,Y)VAHR072B(4,5)2S		1
(H,Y)VAHR096B(4,5)2S		1
(H,Y)VAHR120B(4,5)2S	2	
(H,Y)VAHR144B(4,5)2S	2	
(H,Y)VAHR168B(4,5)2S		2
(H,Y)VAHR192B(4,5)2S		2

⚠WARNING

TURN OFF all POWER supply switches.

(8) Disconnect the discharge and suction pipes and the oil discharge pipe from the compressor. Check that the air pressure in the piping is equal to the atmospheric pressure. Then, cut the pipes at the closer position to the compressor from each brazing part. After cutting the pipes, remove the pipes from the brazing parts of the compressor.

NOTICE:

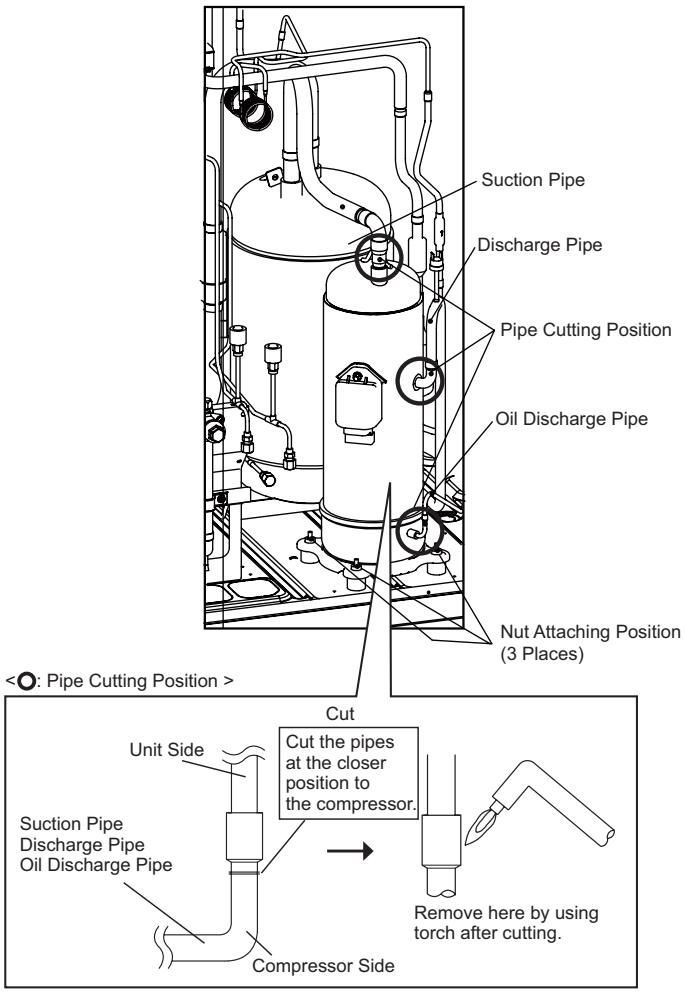
- All the pipes are connected by brazing. When applying the torch to the pipe connections, the oil adhered inside the pipes may burn. Clear the flammable materials from around the compressor before starting the torch work.
- Torch work while applying gas pressure is very dangerous. Make sure to cut the pipes first before starting the torch work.

(9) Disconnect the oil discharge pipe from the compressor. Before disconnecting it, pinch and cut the pipe at the closer position to the compressor from the brazing part so that the refrigerant oil remaining inside the compressor does not spill from the oil discharge pipe.

NOTICE:

- If the oil discharge pipe is disconnected without performing the above procedure (for example, applying torch directly to the brazing part), the refrigerant oil may spill from the oil discharge pipe and catch fire. Make sure to follow the procedure for safety.
- When disconnecting the oil discharge pipe, use an oil pan in case the remaining refrigerant oil spills.
- DO NOT throw out the oil collected in the oil pan. The oil quantity is measured afterward.

Tool	Adjustable Wrench or Ratchet, Phillips Screwdriver, Pliers, Torch, Pipe Cutter, Wire Cutter



⚠WARNING

TURN OFF all POWER supply switches.

(10) Remove three nuts that attach the compressor and remove the compressor.

NOTES:

- When removing the compressor, take special care not to contact with the surrounding pipes. If contacted, the pipes may be deformed.
- While working take special care to avoid injury from the sheet metal edges.
- When removing the compressor that is attached to the oil discharge pipe with the oil discharge pipe, seal the pipe end with tapes so that the refrigerant oil remaining inside the compressor will not spill out from the oil discharge pipe.
- To prevent water and foreign particles entering into the refrigerant cycle, mount the new compressor immediately after removing the old one.
- When removing the compressor, remove the electrical box located above the compressor to make the work easier. The box wrench (3/8 inch (10mm)) is required to remove the nuts that attach the compressor.

(11) Take the remaining refrigerant oil in the compressor from the discharger pipe and measure the oil quantity.

NOTES:

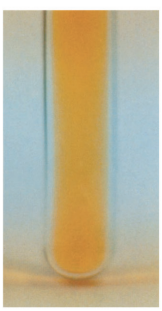
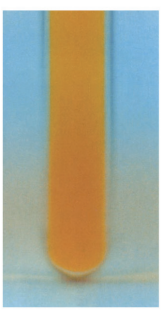
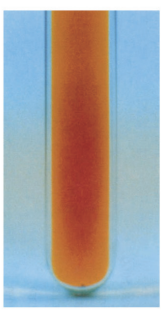
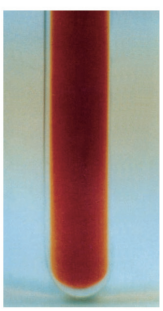
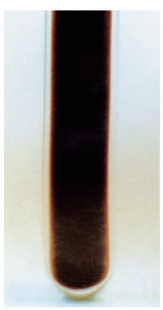
- Additional refrigerant oil charge is required if:
  remaining refrigerant oil quantity in the old compressor is more than the pre-charged refrigerant oil in the new compressor.
- No additional oil charge is required if:
  remaining refrigerant oil quantity in the old compressor is less than the pre-charged refrigerant oil in the new compressor.
- The recharged quantity of the refrigerant oil to the cycle is calculated as follows:
  (Remaining quantity in the old compressor + Collected quantity in Section 4.1.9 (7) + 0.05 gal. (200cc)*)
  - (Initial charged quantity in the compressor for each model)

Compressor	Initial Charged Refrigerant Oil
AA50PHD-A2Y2, D2Y2	0.29 gal. (1100cc)
DC80PHD-A2Y2, D2Y2	0.29 gal. (1100cc)

* 0.05 gal. (200cc): This value is considered not to be removed from the chamber.

- If the refrigerant oil is contaminated, exchange all with new refrigerant oil.
  To check the condition of the refrigerant oil, use the color sample shown below (the color sample can also be used for composite oils). If the refrigerant oil color has turned brown or black then it requires changing.

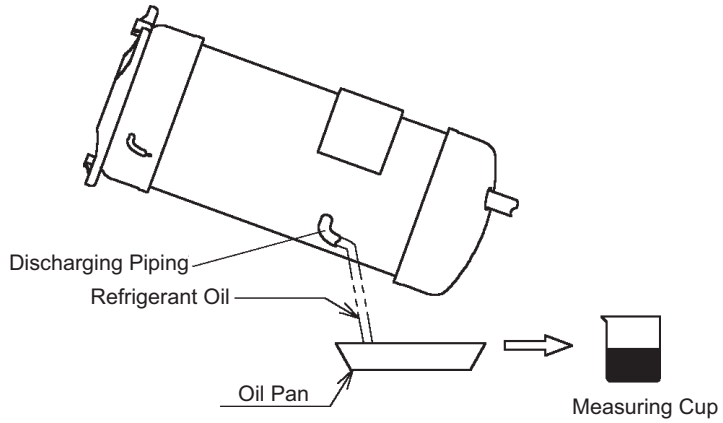
Refrigerant Oil Color Chart

No.	1	2	3	4	5
Refrigerant Oil Color					
Normal			Abnormal. Refrigerant oil change is required.		

⚠WARNING

TURN OFF all POWER supply switches.

Tool	Oil Pan, Measure Cup

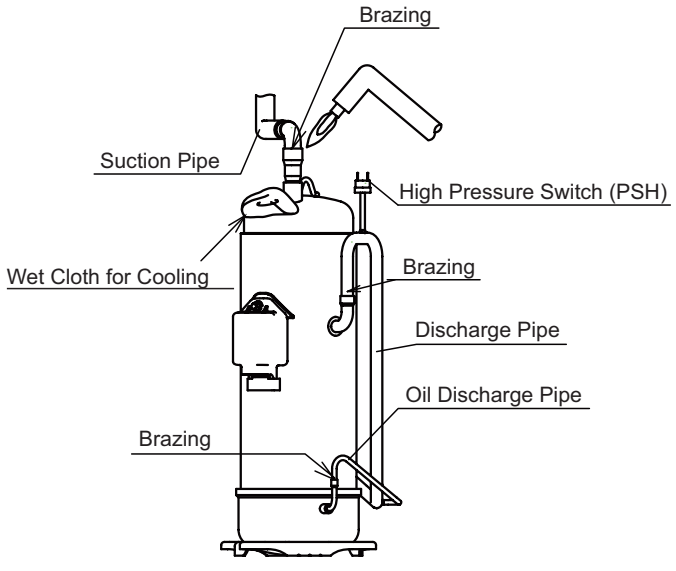


(12) Mount the new compressor. When attaching the nut at the front side, take care not to deform the oil discharge pipe.
Perform brazing according to the following order:
(a) Oil Discharge Pipe
(b) Discharge Pipe
(c) Suction Pipe

NOTES:

- When mounting the new compressor on the base, take special care not to make contact with the piping. If contacted, the piping may become deformed.
- Connect the charging hose with the access port at the low pressure side to release pressure.
- When brazing the suction pipe, ensure the connecting pipe is inserted firmly into the compressor connections and kept cool with damp cloth to ensure brazing materials do not enter into the compressor.

Tool	Torch, Wet Cloth, Pliers



⚠WARNING

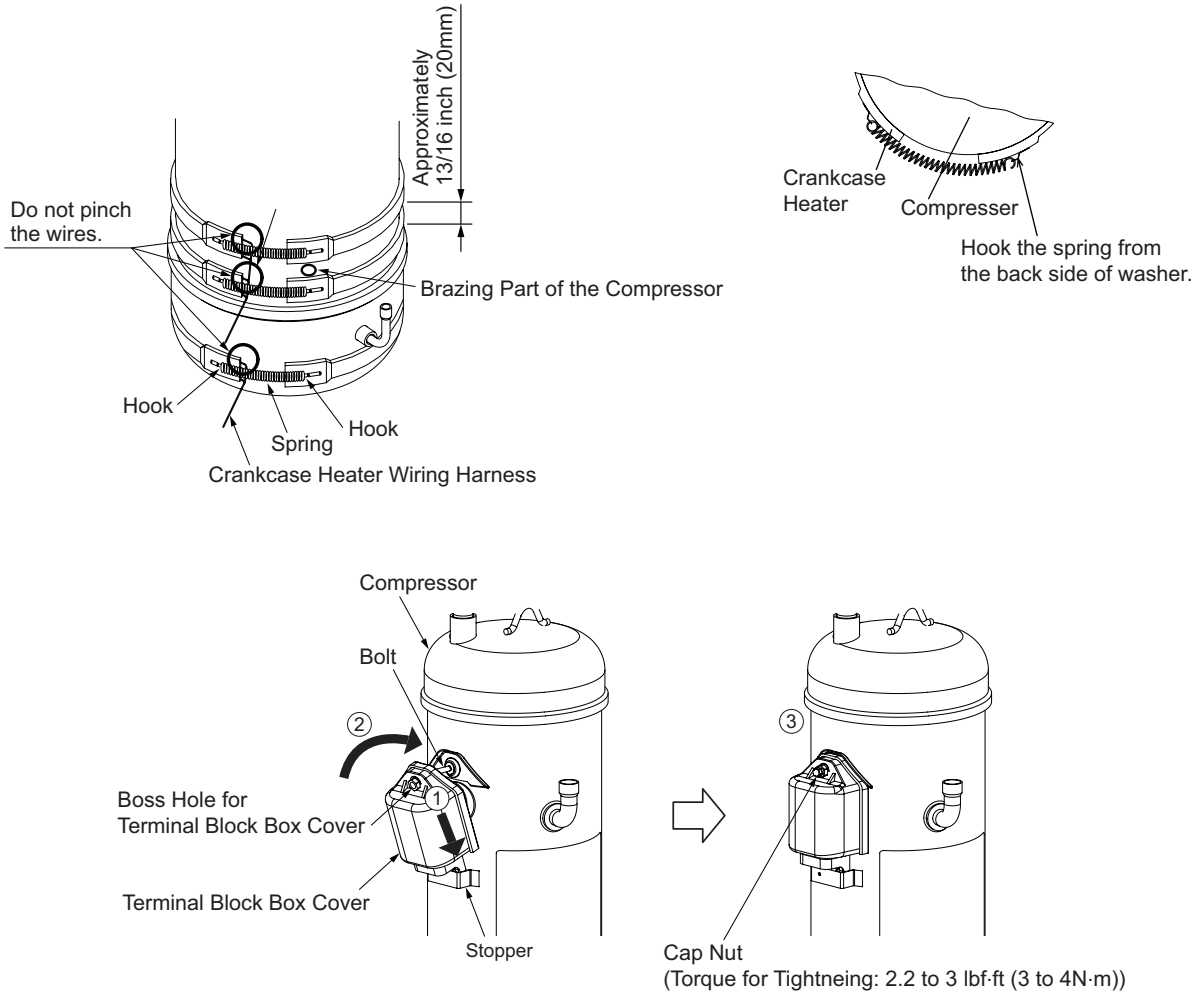
TURN OFF all POWER supply switches.

(13) Wind the crankcase heater around the compressor. Each crankcase heater must be apart approximately 13/16 inch (20mm).

(14) Reassemble the compressor cover (C-cover) using the reverse of the procedure in Section 4.1.9 “Removing Compressor”, (2).

(15) Reconnect all wires according to the procedure on the following pages.

NOTE:
If power line or the crankcase heater wiring harness comes in contact with a high temperature part such as oil discharge pipe of compressor chamber, the wire may be cut or fired.
Check that all of the wires do not come in contact with the compressor, pipe, and edge of the sheet metal.
If contact is made, the wire may be cut or fired.



NOTES:

- Attach the crankcase heater firmly to the compressor and secure it with springs as shown in the figure.
- If there is clearance between the crankcase heater and the compressor due to wire overlapping, excessive heat will be generated there. Then crankcase heater may break down due to overheating. When mounting the reassembled crankcase heater, this point should be taken into account.
- If the crankcase heater wiring harness is pinched between the springs, the wiring harness may be cut due to operating vibration. When reassembling the crankcase heater, attention should be paid to the wiring harness.

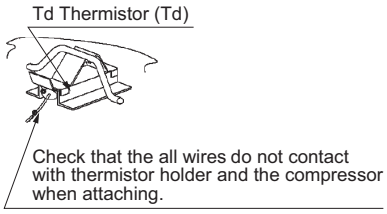
⚠WARNING

TURN OFF all POWER supply switches.

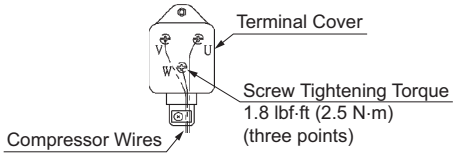
Tool	Adjustable Wrench or Ratchet, Torch, Pipe Cutter

All Models

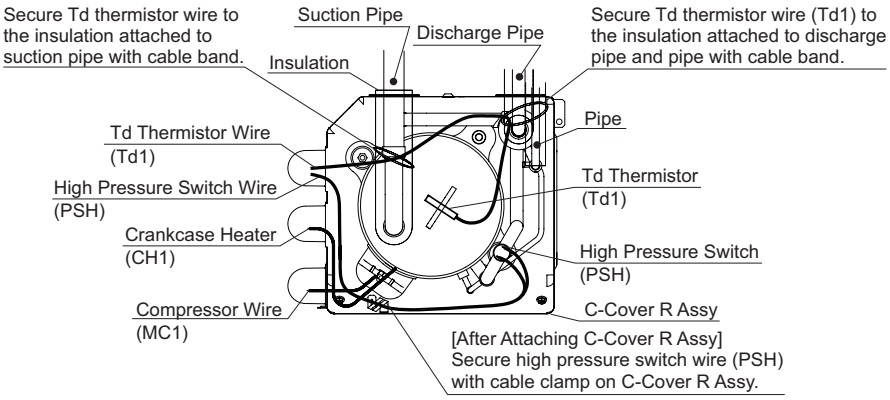
Details of A

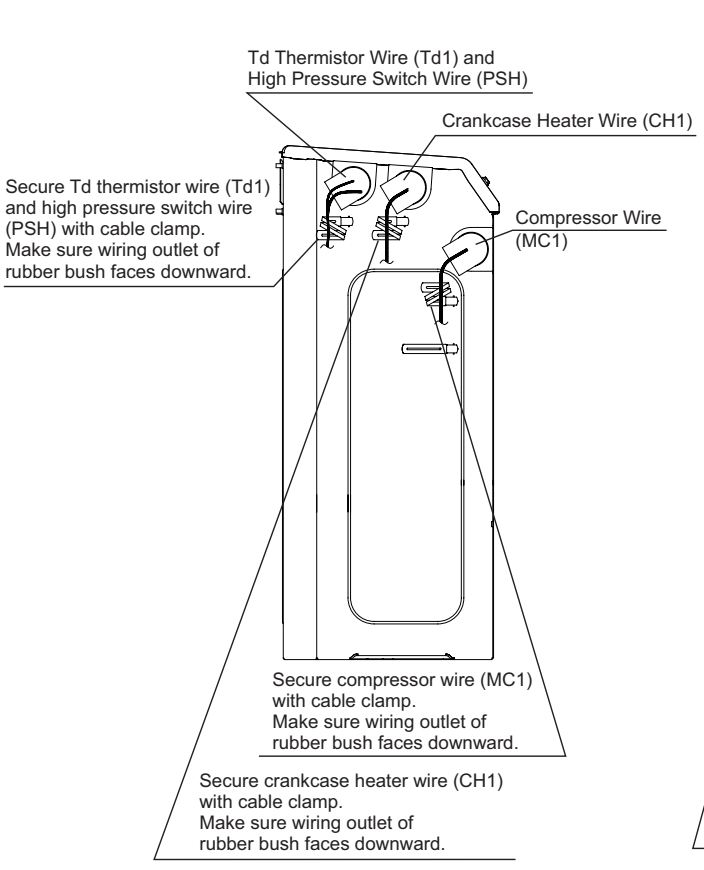


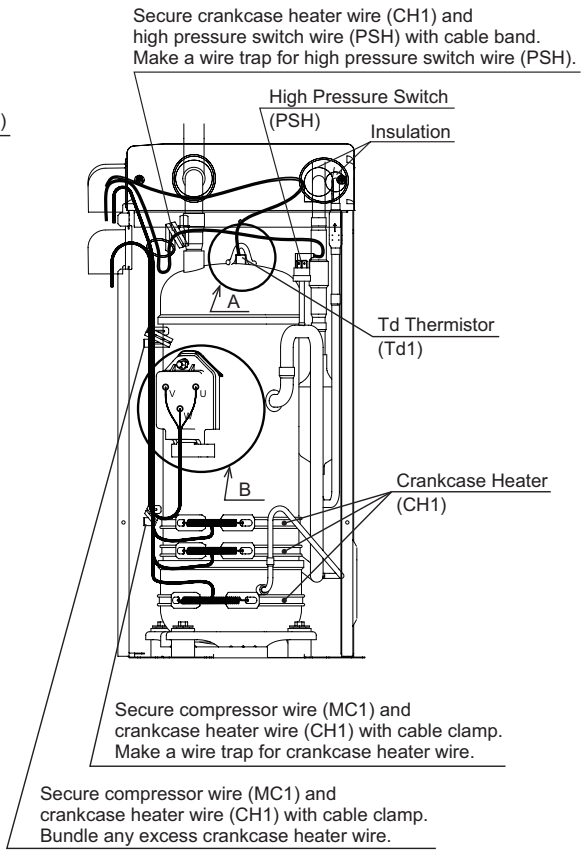
Details of B



(H,Y)VAHR072B(3,4,5)2S





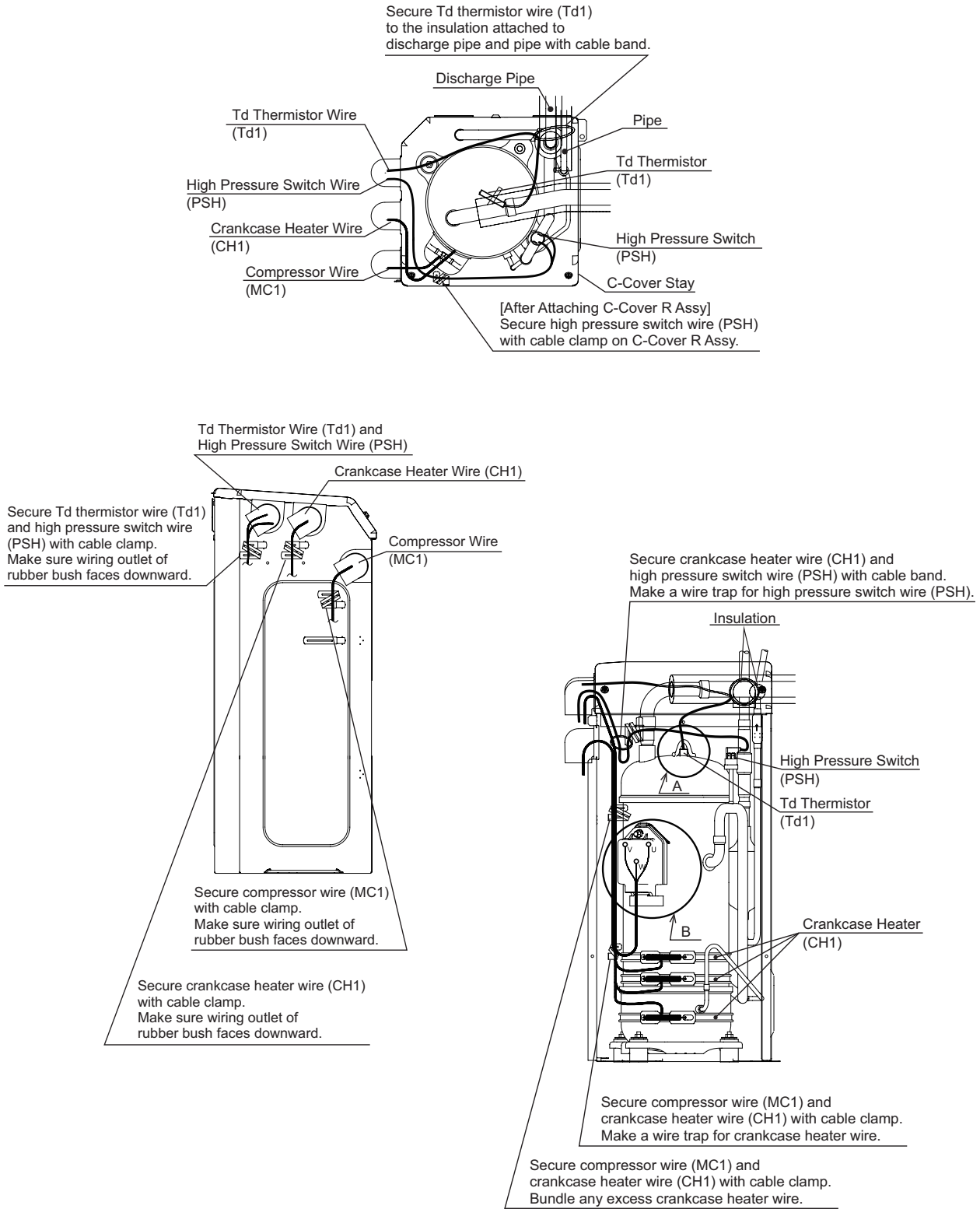


⚠WARNING

TURN OFF all POWER supply switches.

Tool	Adjustable Wrench or Ratchet, Torch, Pipe Cutter

(H,Y)VAHR096, 168, 192B(3,4,5)2S

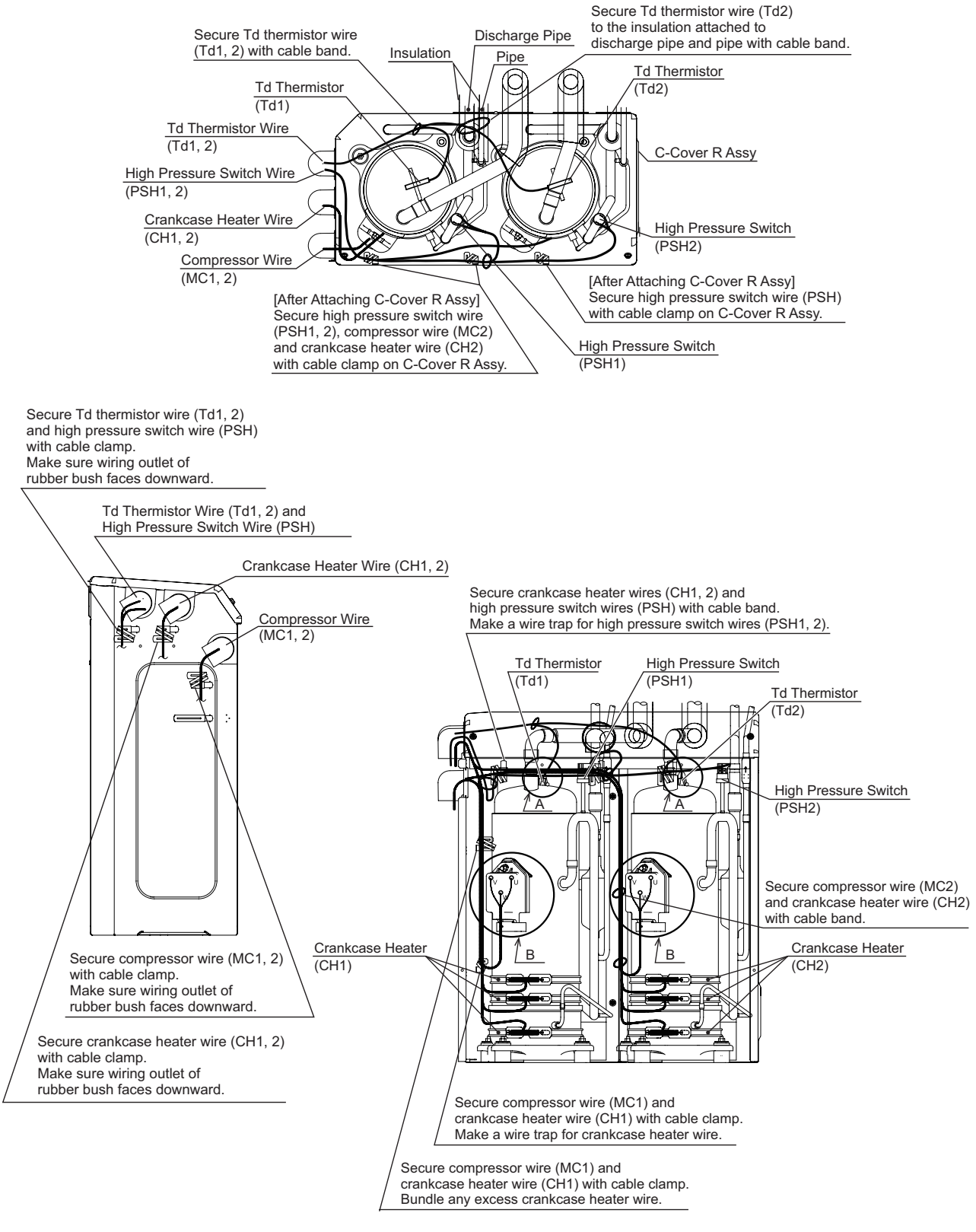


⚠WARNING

TURN OFF all POWER supply switches.

Tool	Adjustable Wrench or Ratchet, Torch, Pipe Cutter

(H,Y)VAHR120, 144B(3,4,5)2S



⚠WARNING

TURN OFF all POWER supply switches.

4.1.10 Replacing Refrigerant Oil

4.1.10.1 Replacing Refrigerant Oil (No Clogging in Return Oil Circuit)

(1) Remove the service cover and front cover according to Section 4.1.1 “Removing Service Cover and Front Cover”.

(2) Close (A) high pressure gas stop valve, (B) low pressure gas stop valve and (C) liquid stop valve.

(3) Collect the refrigerant in the outdoor unit from (E) low pressure access port and (F) high pressure access port. Check that the pressure does not increase at this time.

NOTE:
If the pressure increases, collect all the refrigerant in the refrigerant cycle.

(4) Connect the charge hose (for R410A) to (D) access port for collecting refrigerant oil.

(5) Charge nitrogen (22 psi (0.15 MPa)) from (E) low pressure access port and collect the refrigerant oil in the accumulator by applying pressure (approx. 20 minutes). The residual refrigerant oil indicated in the figure cannot be collected because of the accumulator structure.

NOTE:
Ensure that the pressure on (F) high pressure access port is NOT abnormal when nitrogen is charged.

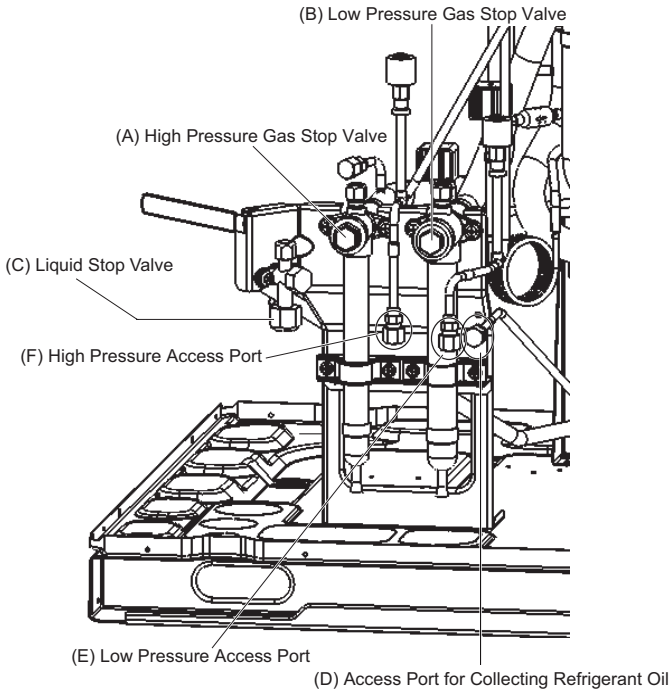
(6) Stop charging nitrogen after the refrigerant oil has been completely collected.
Perform vacuuming from (E) low pressure access port and add the same quantity of oil as the collected refrigerant oil.

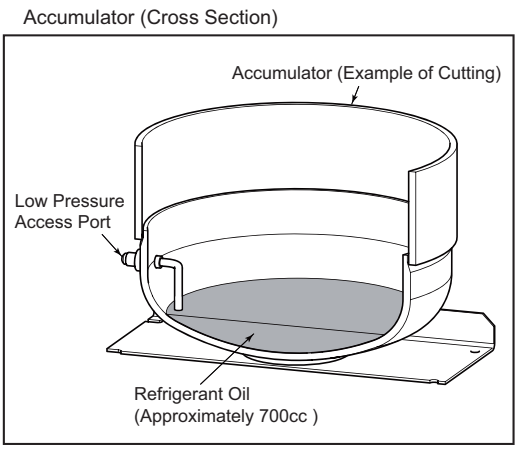
NOTE:
When the collected refrigerant oil is 3L or less, clogging may exist in the return oil circuit.
In that case, replace the return oil circuit according to Section 4.1.10.2 “Replacing Refrigerant Oil (Clogging in Return Oil Circuit) and Replacing Return Oil Circuit”.

(7) When the procedures have been completed, perform vacuuming again from (E) low pressure access port and recharge the refrigerant. After recharging, open the stop valves.

NOTES:
- Use a clean charging hose.
- Charge the refrigerant oil in a short time (within approx. 20 minutes).
  Use a container with a small opening so that the refrigerant oil does not absorb the moisture in the atmosphere.

Tool	Adjustable Wrench or Ratchet





⚠WARNING

TURN OFF all POWER supply switches.

4.1.10.2 Replacing Refrigerant Oil (Clogging in Return Oil Circuit) and Replacing Return Oil Circuit

In the case of replacing the return oil circuit only, the procedures (7) and (8) are not required.

(1) Remove the service cover and front cover according to Section 4.1.1 “Removing Service Cover and Front Cover”.

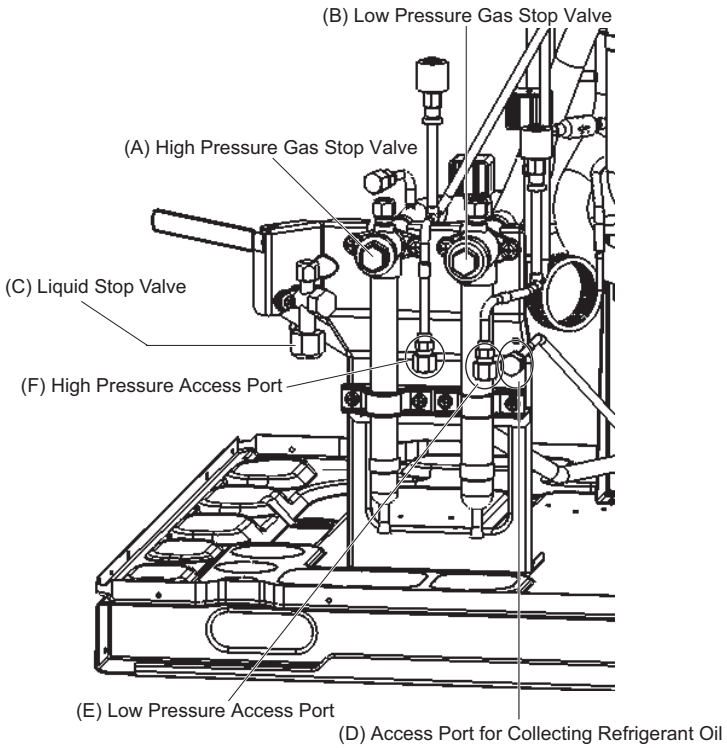
(2) Remove the electrical box, wirings stay according to Section 4.1.7 “Removing Electrical Box”.

(3) Close (A) high pressure gas stop valve, (B) low pressure gas stop valve and (C) liquid stop valve.

(4) Collect the refrigerant in the outdoor unit from (E) low pressure access port and (F) high pressure access port. Check that the pressure does not increase at this time.

NOTE:
If the pressure increases, collect all the refrigerant in the refrigerant cycle.

Tool	Adjustable Wrench or Ratchet



⚠WARNING

TURN OFF all POWER supply switches.

(5) Cut off (G) return oil circuit with (I) accumulator pipe at the cutting position indicated in the figure.

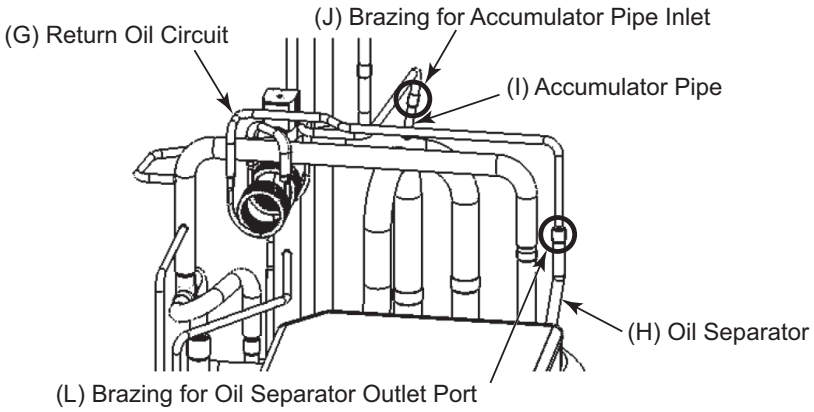
(6) Cut off (G) return oil circuit with (H) oil separator at the point indicated in the figure. Remove (G) return oil circuit from the unit. Then, remove (J) brazing part of accumulator pipe inlet and the (L) brazing part of the oil separator outlet port.

NOTES:

- When cutting (K) (M) return oil circuit pipes off, cut the closer part to (K) (M) return oil circuit to prevent the refrigerant oil remaining in (G) return oil circuit from spilling out.
- When cutting return oil circuit off, do not use a tool spewing swarf such as a saw.
- After cutting off the return oil circuit, remove the cut-off piping from the (L) brazing part of the oil separator outlet port.
- When removing brazing part of (I) accumulator pipe and the (L) brazing part of the oil separator outlet port, refrigerant oil may come out. Prepare the oil pan and such before the work to receive the refrigerant oil.

Tool	Adjustable Wrench or Ratchet

(H,Y)VAHR072B(3,4,5)2S



(7) Connect a charging hose to the (L) brazing part of oil separator outlet port. Then, charge nitrogen (22 psi (0.15 MPa)) from (J) brazing part of accumulator pipe inlet and collect refrigerant oil in (H) oil separator by applying pressure.

NOTE:

In the case that the unit has two return oil circuits and two oil separators ((H,Y)VAHR120-192B(3,4,5)2S), collect the refrigerant oil from one oil separator and then from the other.

(8) Stop charging nitrogen after the refrigerant oil has completely been collected. Perform vacuuming from (E) low pressure access port and add the same quantity of oil as the collected refrigerant oil from (D) access port for collecting refrigerant oil.

NOTE:

In the case of replacing the return oil circuit only, the procedures (7) and (8) are not required.

(9) Connect the return oil pipe for replacement. After connecting the pipe, perform the nitrogen pressurization from (E) low pressure access port. During the work, check that the oil does not spill out from brazing part.

(10) When the procedures have been completed, perform vacuuming again from (E) low pressure access port and recharge the refrigerant. After recharging, open the stop valves.

NOTES:

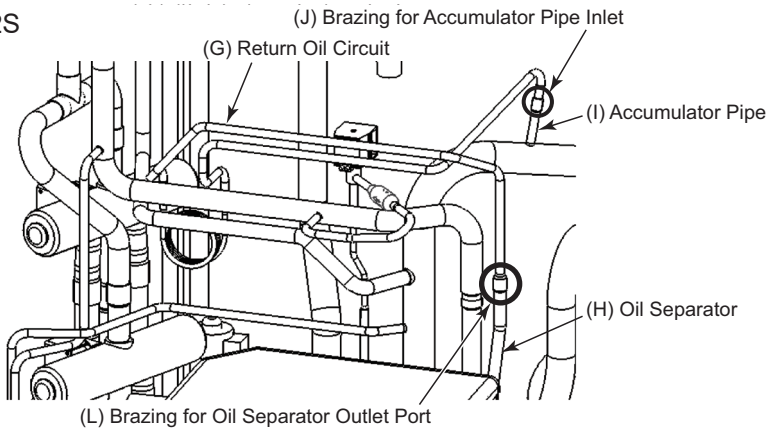
- Use a clean charging hose.
- Charge the refrigerant oil in a short time (within approx. 20 minutes).
  Use a container with a small opening so that the refrigerant oil will not absorb the moisture in the atmosphere.

⚠WARNING

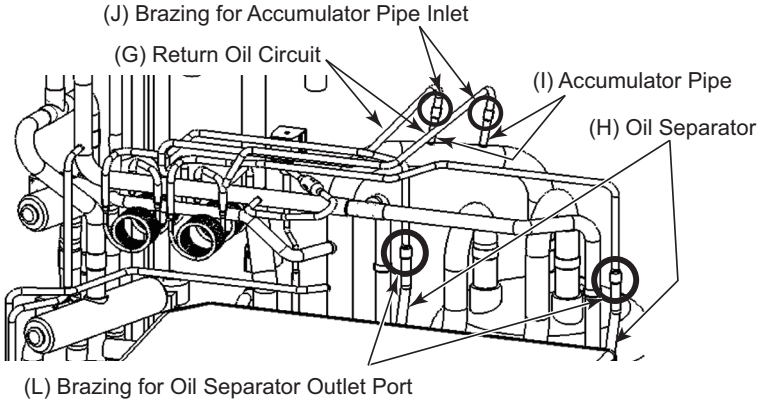
TURN OFF all POWER supply switches.

Tool	Adjustable Wrench or Ratchet

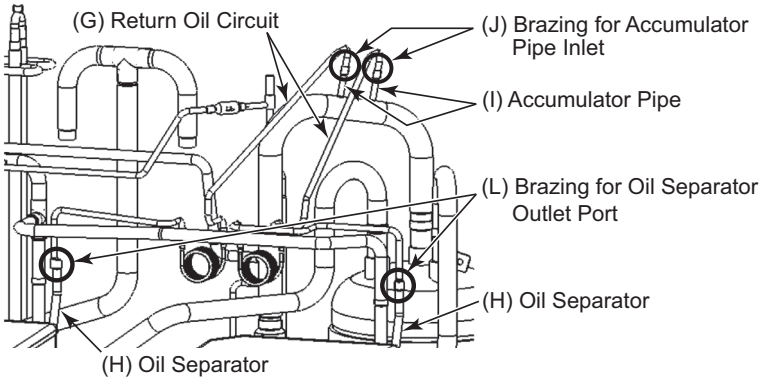
(H,Y)VAHR096B(3,4,5)2S



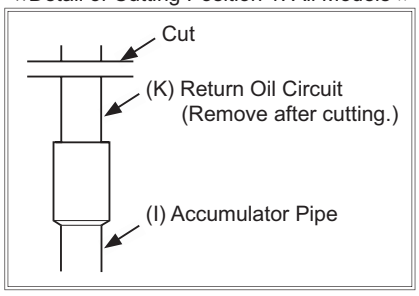
(H,Y)VAHR120, 144B(3,4,5)2S



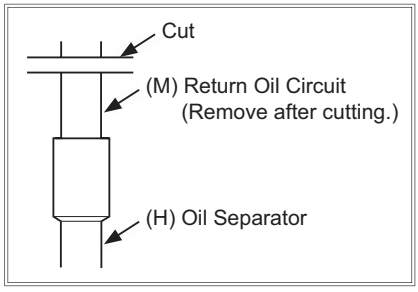
(H,Y)VAHR168, 192B(3,4,5)2S



≪Detail of Cutting Position 1: All Models ≫



≪Detail of Cutting Position2 : All Models≫



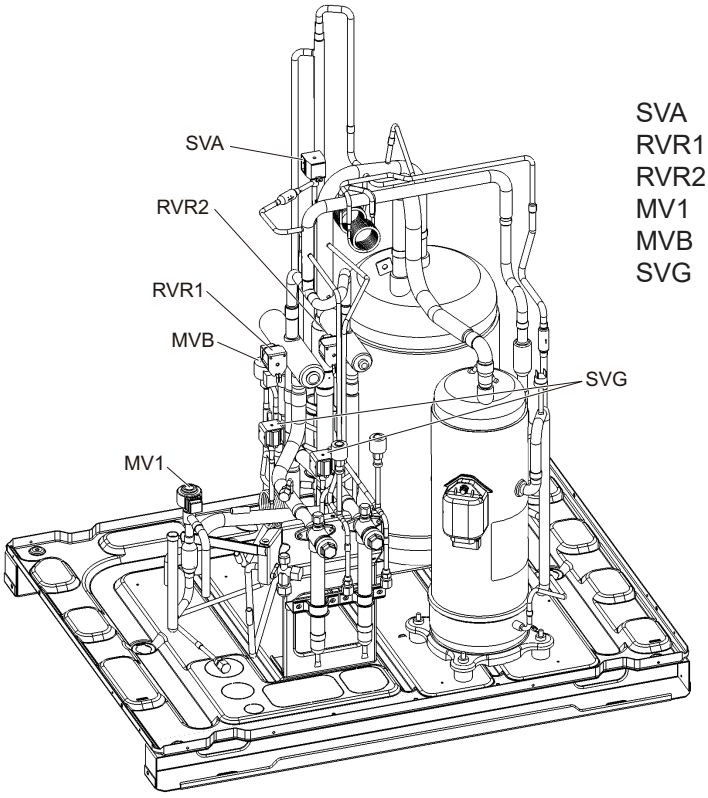
⚠WARNING

TURN OFF all POWER supply switches.

4.1.11 Removing Coils

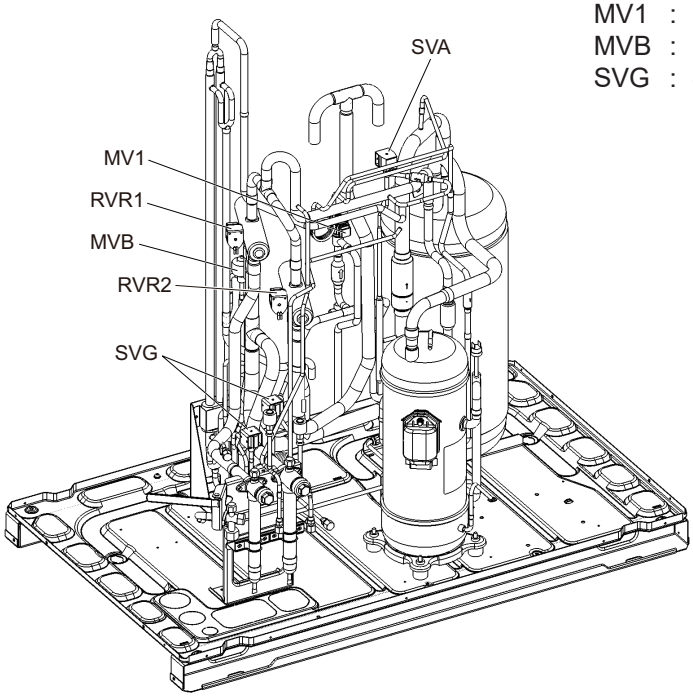
The following figures indicate the position of coils.

(H,Y)VAHR072B(3,4,5)2S



SVA : Solenoid Valve Coil
RVR1 : Reversing Valve Coil
RVR2 : Reversing Valve Coil
MV1 : Expansion Valve Coil
MVB : Expansion Valve Coil
SVG : Solenoid Valve Coil

(H,Y)VAHR096B(3,4,5)2S

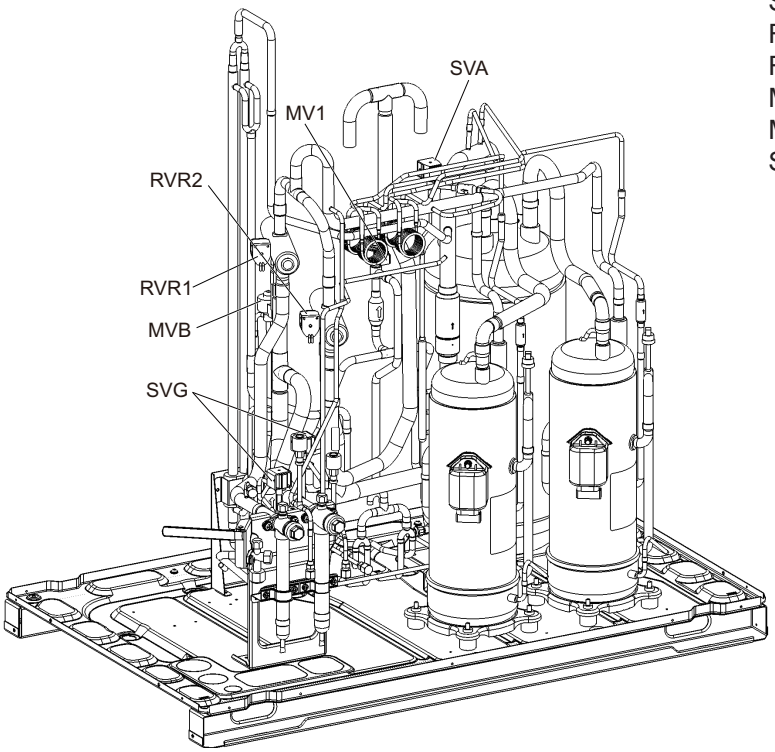


SVA : Solenoid Valve Coil
RVR1 : Reversing Valve Coil
RVR2 : Reversing Valve Coil
MV1 : Expansion Valve Coil
MVB : Expansion Valve Coil
SVG : Solenoid Valve Coil

⚠WARNING

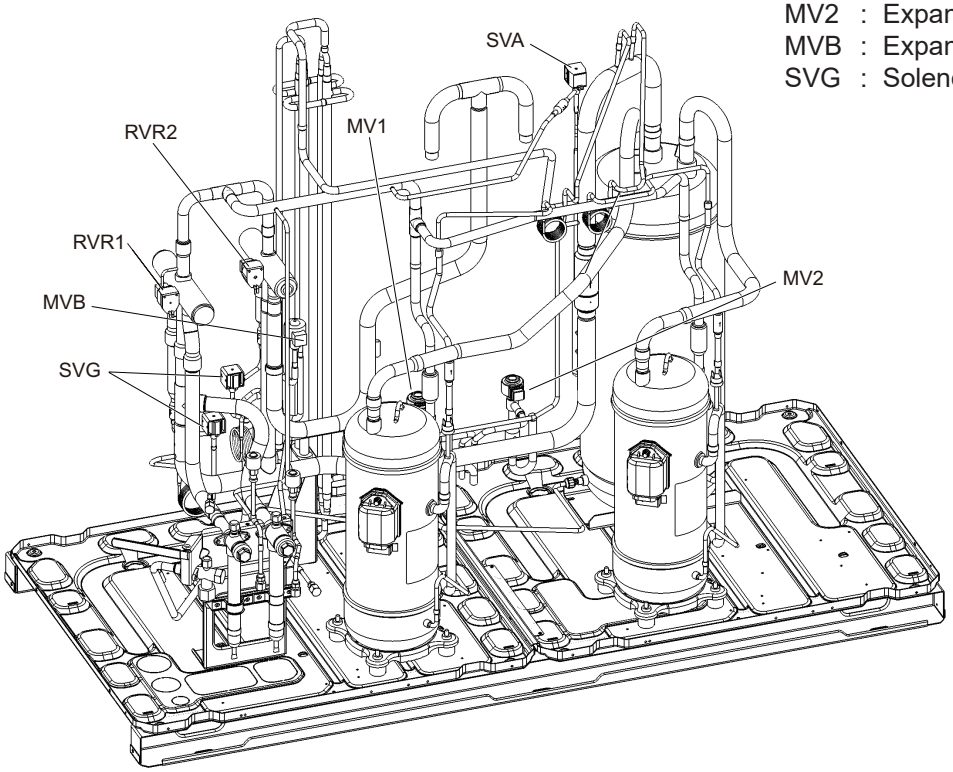
TURN OFF all POWER supply switches.

(H,Y)VAHR120, 144B(3,4,5)2S



SVA : Solenoid Valve Coil
RVR1 : Reversing Valve Coil
RVR2 : Reversing Valve Coil
MV1 : Expansion Valve Coil
MVB : Expansion Valve Coil
SVG : Solenoid Valve Coil

(H,Y)VAHR168, 192B(3,4,5)2S



SVA : Solenoid Valve Coil
RVR1 : Reversing Valve Coil
RVR2 : Reversing Valve Coil
MV1 : Expansion Valve Coil
MV2 : Expansion Valve Coil
MVB : Expansion Valve Coil
SVG : Solenoid Valve Coil

⚠WARNING

TURN OFF all POWER supply switches.

4.1.11.1 Removing Expansion Valve Coil (MV1, MVB)

(1) Remove the service cover and front cover according to Section 4.1.1 “Removing Service Cover and Front Cover”.

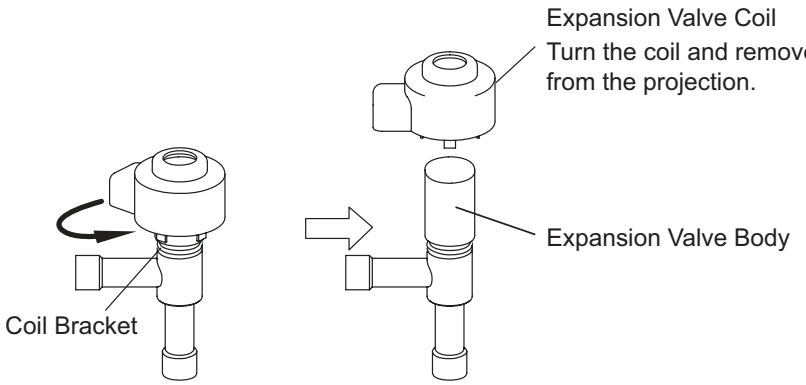
(2) Turn the expansion valve coil in a counterclockwise direction as shown in the figure below. Remove the expansion valve coil bracket from the expansion valve slot. Then, pull the coil upward.

- Pay attention to the thermistor wiring when removing the expansion valve coils.

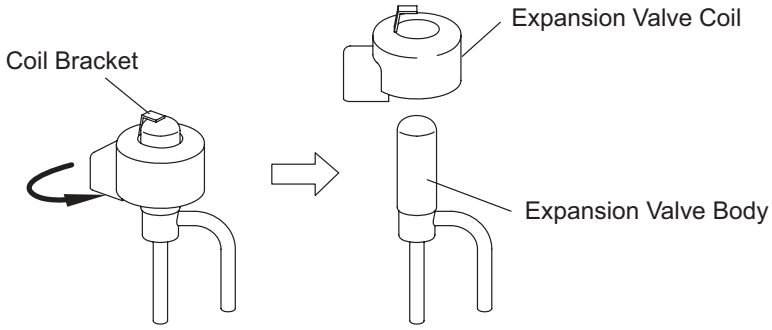
NOTE:
Make sure to remove the coil bracket from the coil slot before pulling the coil out. If not, your hand may hit against the piping. Follow the above procedure carefully to avoid any injuries.

Tool	Pliers

MV1, MV2



MVB



⚠WARNING

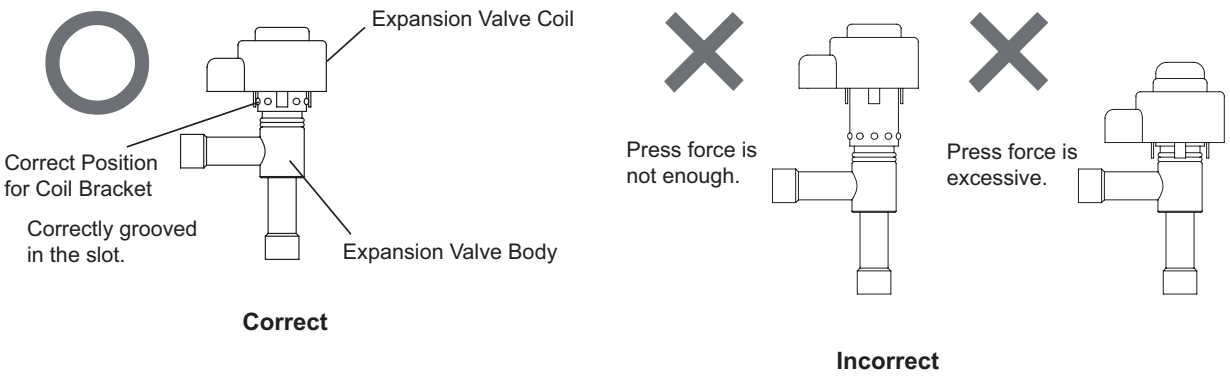
TURN OFF all POWER supply switches.

(3) For replacing the expansion valve coils, press the coil into the expansion valve slot by turning the coil. If an excessive force is applied to the coil, the coil bracket may be deformed. As a result, the coil cannot be attached at the correct position shown in the figure.

• Any slots on the expansion valve inner surface are acceptable to secure.

NOTE:
Do not apply an excessive force to the coil when pressing it into the slot. Otherwise, it may cause damage to the piping.

Tool	Pliers



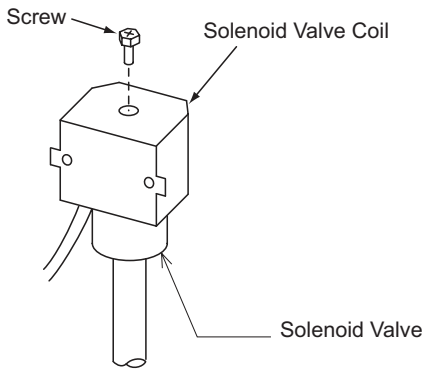
4.1.11.2 Removing Solenoid Valve Coil (SVA, SVG)

(1) Remove the service cover and front cover according to Section 4.1.1 “Removing Service Cover and Front Cover”.

(2) Remove one screw securing the solenoid valve coil with a phillips screwdriver. If the screw is difficult to remove, use a ratchet or an adjustable wrench.

(3) Remove the solenoid valve coil.

Tool	Phillips Screwdriver



⚠WARNING

TURN OFF all POWER supply switches.

4.1.11.3 Removing Solenoid Valve (SVA)

(1) Remove the service cover and front cover according to Section 4.1.1 “Removing Service Cover and Front Cover”.

(2) Close the gas stop valve and the liquid stop valve.

(3) Collect the refrigerant in the outdoor unit from the low pressure access port and the high pressure access port. Check that the pressure does not increase at this time.

NOTE:
If the pressure increases, collect all the refrigerant in the refrigerant cycle.

(4) Remove the solenoid valve coils according to Section 4.1.11.2 “Removing Solenoid Valve Coil”.

(5) Remove the brazing at the position shown in the figure below.

NOTES:

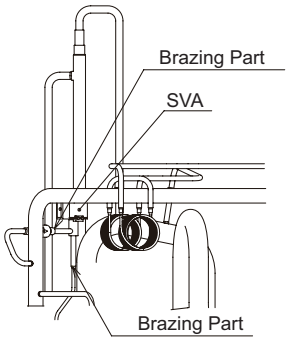
- During brazing work, cover the solenoid valves with wet cloth for cooling.
- Take special care not to burn the connecting wiring and the piping insulation during brazing work.

(6) Reassemble the solenoid valves in the reverse procedure.

Tool	Phillips Screwdriver, Charging Hose, Torch, Wet Cloth, Pliers

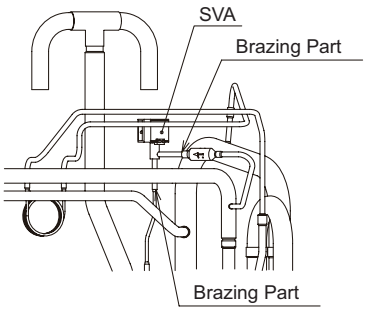
(H,Y)VAHR072B(3,4,5)2S

Removing SVA



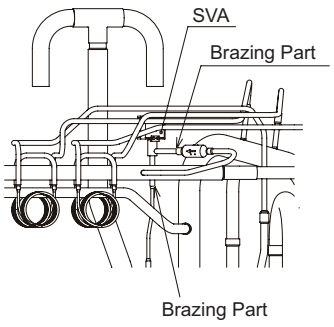
(H,Y)VAHR096B(3,4,5)2S

Removing SVA



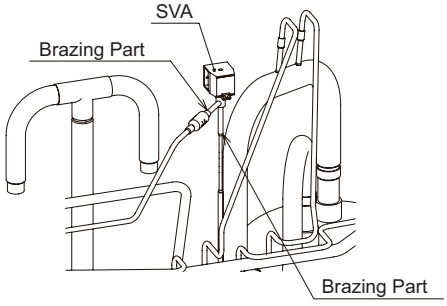
(H,Y)VAHR120, 144B(3,4,5)2S

Removing SVA



(H,Y)VAHR168, 192B(3,4,5)2S

Removing SVA



⚠WARNING

TURN OFF all POWER supply switches.

4.1.11.4 Removing Solenoid Valve (SVG)

(1) Remove the service cover and front cover according to Section 4.1.1 “Removing Service Cover and Front Cover”.

(2) Close the gas stop valve and the liquid stop valve.

(3) Collect the refrigerant in the outdoor unit from the low pressure access port and the high pressure access port. Check that the pressure does not increase at this time.

NOTE:
If the pressure increases, collect all the refrigerant in the refrigerant cycle.

(4) Remove the solenoid valve coils according to Section 4.1.11.2 “Removing Solenoid Valve Coil”.

(5) Remove the brazing at the position shown in the figure below.

NOTES:

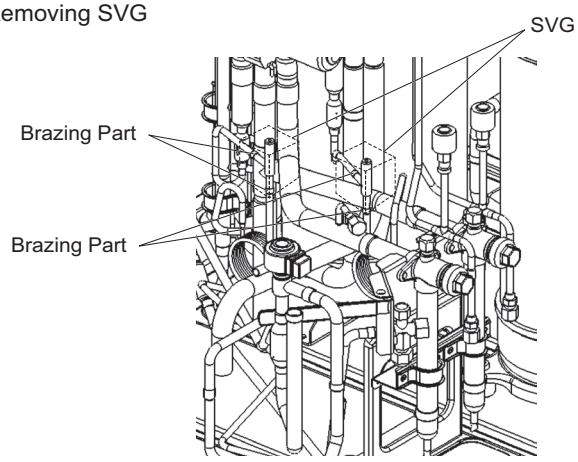
- During brazing work, cover the solenoid valves with wet cloth for cooling.
- Take special care not to burn the connecting wiring and the piping insulation during brazing work.

(6) Reassemble the solenoid valves in the reverse procedure.

Tool	Phillips Screwdriver, Charging Hose, Torch, Wet Cloth, Pliers

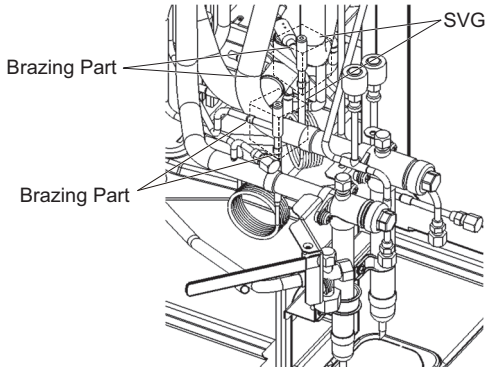
(H,Y)VAHR072B(3,4,5)2S

Removing SVG



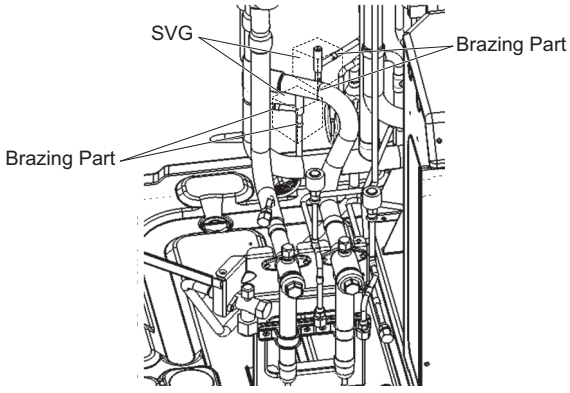
(H,Y)VAHR096, 120, 144B(3,4,5)2S

Removing SVG



(H,Y)VAHR168, 192B(3,4,5)2S

Removing SVG



⚠WARNING

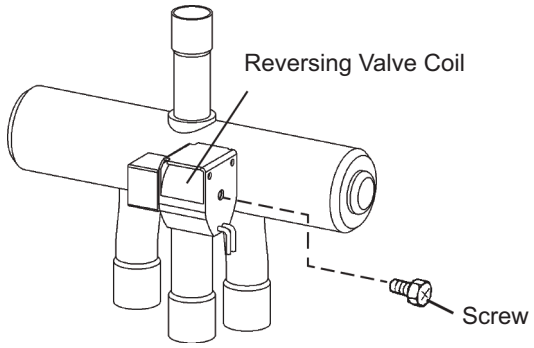
TURN OFF all POWER supply switches.

4.1.11.5 Removing Reversing Valve Coil (RVR1, RVR2)

(1) Remove one screw securing the reversing valve coil with a phillips screwdriver.
If the screw is difficult to remove, use a ratchet or an adjustable wrench.

(2) Remove the reversing valve coils.

Tool	Phillips Screwdriver



This is the unit front view.

4.1.11.6 Removing Reversing Valve

(1) Remove the service cover and front cover according to Section 4.1.1 “Removing Service Cover and Front Cover”.

(2) Remove the electrical box, wirings and E-box stay according to Section 4.1.7 “Removing Electrical Box”.

(3) Before starting the following work, collect the refrigerant from the refrigerant cycle into a cylinder.

(4) The reversing valves are secured at the positions shown in the figure.

(5) Remove the reversing valve coils according to Section 4.1.11.5 “Removing Reversing Valve Coil”.

(6) Remove the brazing portion shown in the figures below by covering the reversing valves and the stop valves with wet cloth for cooling.

NOTES:

- Make sure to remove the brazing portion at the indicated positions in the figures. If not, leakage may occur when reassembling the valves.
- Connect the charging hose to the access port for the gas stop valve before removing the brazing.

(7) Remove the reversing valve assembly.
Remove the brazing as shown in the figures by covering the reversing valves with wet cloth for cooling.
Remove the brazing in the following order:
(a) Brazing at the right and left branch pipes of the three pipes coming from the reversing valve.
(b) Brazing at the center branch pipe of the three pipes coming from the reversing valve.

(8) Reassemble the reversing valves in the reverse procedure.

NOTE:
During brazing work, cover the reversing valves and the stop valves with wet cloth for cooling.

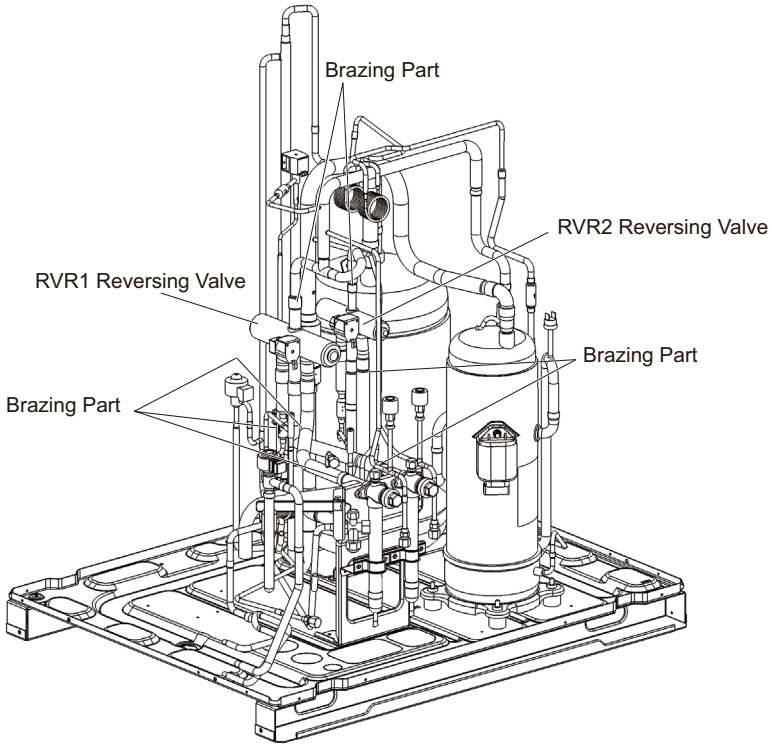
⚠WARNING

TURN OFF all POWER supply switches.

Tool	Adjustable Wrench or Ratchet, Phillips Screwdriver, Torch, Pipe Cutter, Pliers, Charging Hose

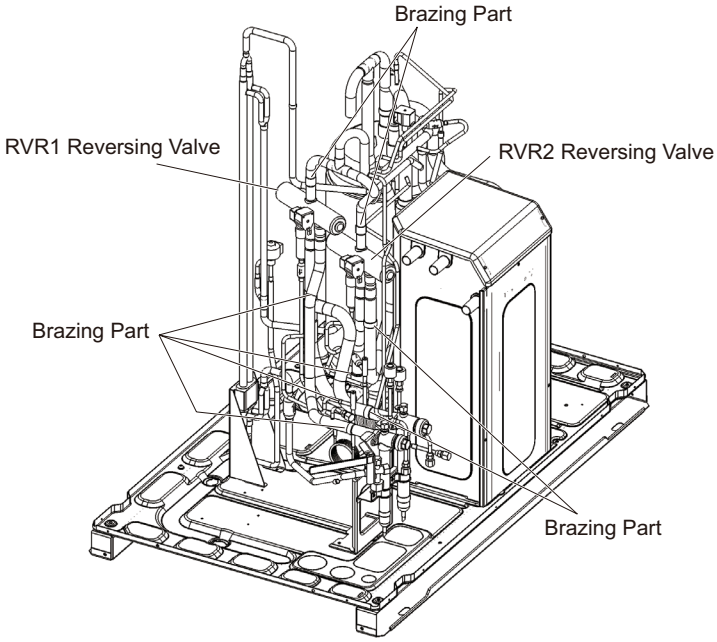
(H,Y)VAHR072B(3,4,5)2S

Reversing Valve Position



(H,Y)VAHR096B(3,4,5)2S

Reversing Valve Position



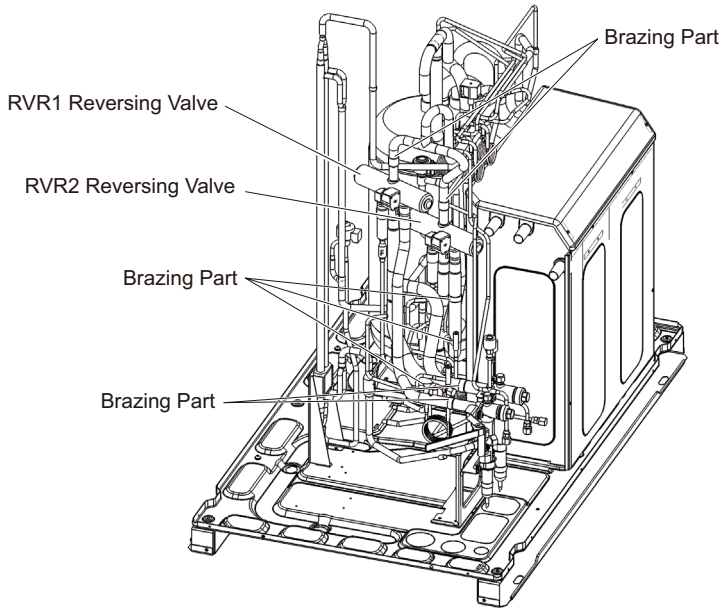
⚠WARNING

TURN OFF all POWER supply switches.

Tool	Adjustable Wrench or Ratchet, Phillips Screwdriver, Torch, Pipe Cutter, Pliers, Charging Hose

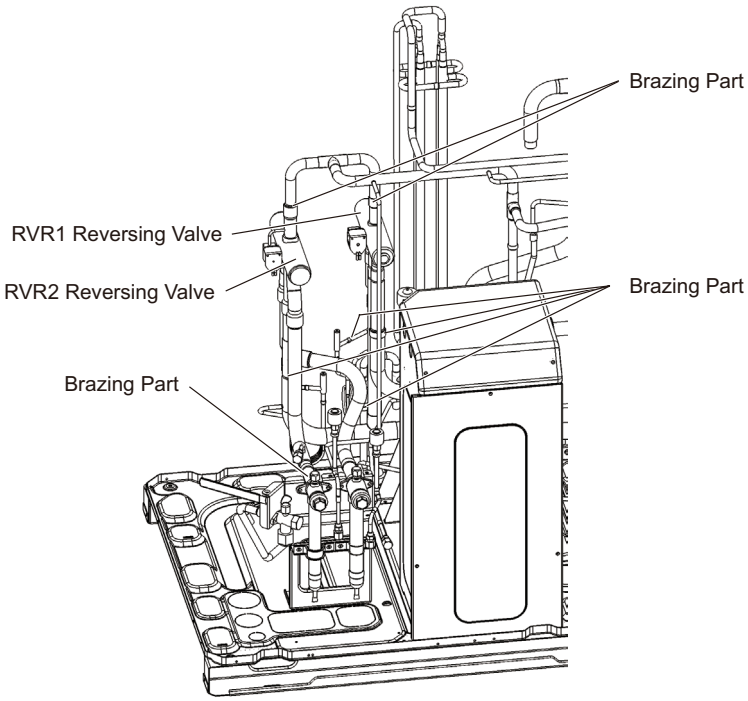
(H,Y)VAHR120, 144B(3,4,5)2S

Reversing Valve Position



(H,Y)VAHR168, 192B(3,4,5)2S

Reversing Valve Position



⚠WARNING

TURN OFF all POWER supply switches.

4.1.12 Removing Stop Valve

(1) Remove the service cover and front cover according to Section 4.1.1 “Removing Service Cover and Front Cover”.

(2) Collect all the refrigerant in the refrigerant cycle.

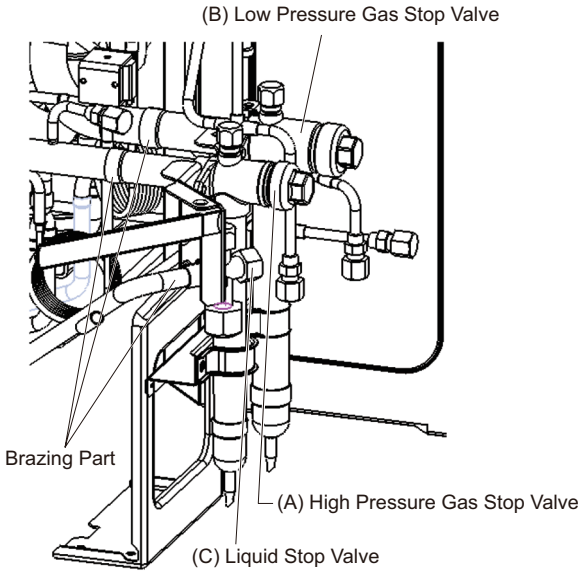
(3) When removing (A) high pressure gas stop valve and (B) low pressure gas stop valve, cover the stop valves with wet cloth for cooling and then remove the brazing.
When removing (C) liquid stop valve, remove the brazing of the pipe for the stop valve as shown in the figure.
NOTE:
When removing the brazing for stop valve, be sure to protect heat exchanger by using sheet metal, etc..

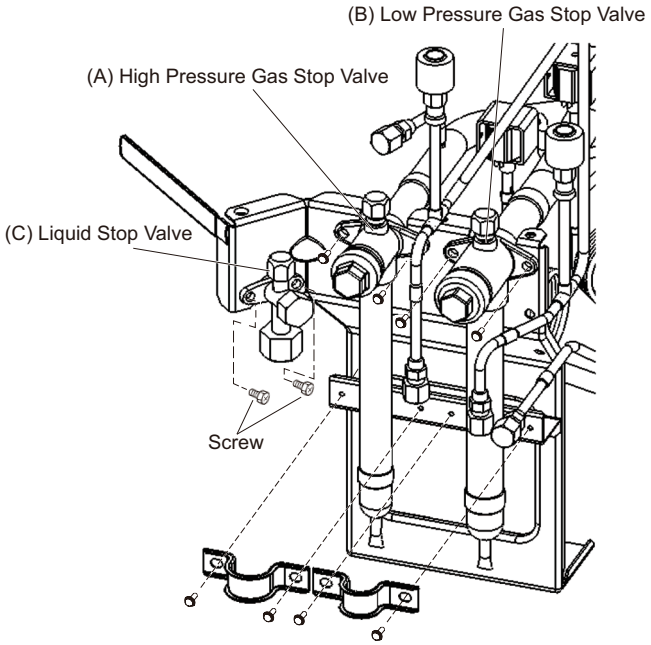
(4) After removing the brazing for the stop valves, remove the screws securing the plates as shown in the figure and pull out the stop valves and the plates.

(5) Reassemble the stop valves in the reverse procedure.
NOTE:
When brazing the stop valves or removing the brazing, cover the stop valves with wet cloth for cooling. Be sure not to burn the connecting wires and piping insulations.

Tool	Wet Cloth, Torch, Pliers, Phillips Screwdriver

Stop Valve Position





⚠WARNING

TURN OFF all POWER supply switches.

4.1.13 Removing High Pressure Switch, High Pressure Sensor, Low Pressure Sensor and Thermistor

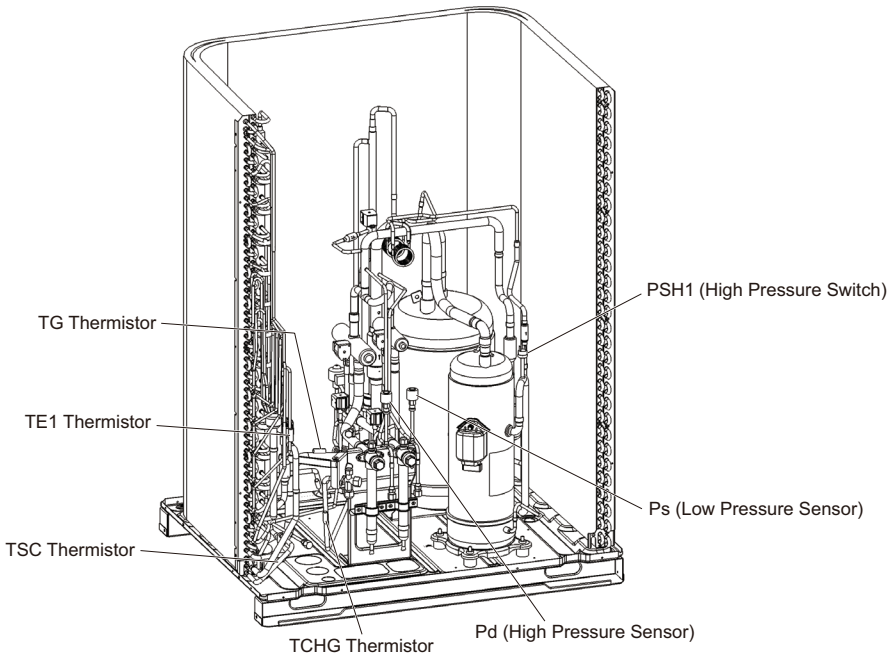
(1) Remove the service cover and front cover according to Section 4.1.1 “Removing Service Cover and Front Cover”.

(2) High Pressure Switch (PSH1 and PSH2), High Pressure Sensor, Low Pressure Sensor and Thermistor (TG, TCHG, TSC, TE1, TE2) are secured as shown in the figure below.

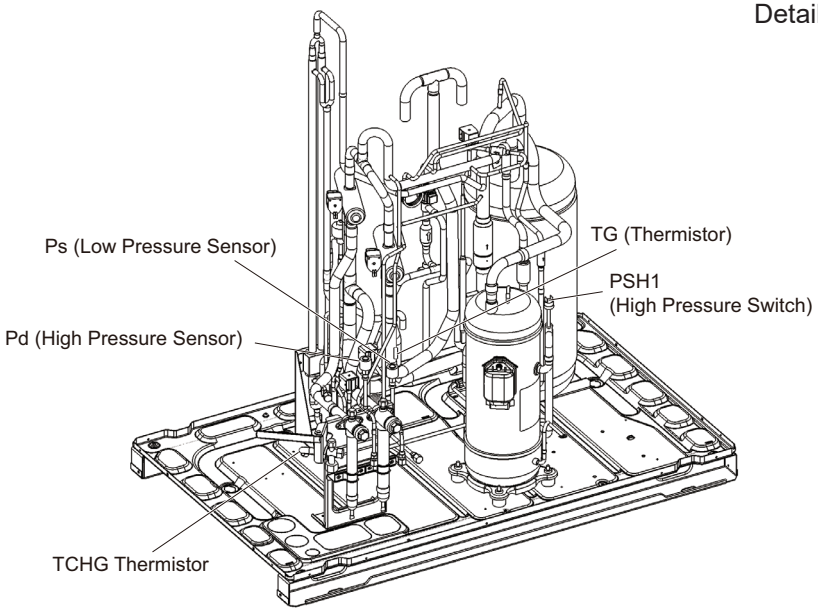
Tool	Adjustable Wrench or Ratchet

High Pressure Switch, High/Low Pressure Sensor Position

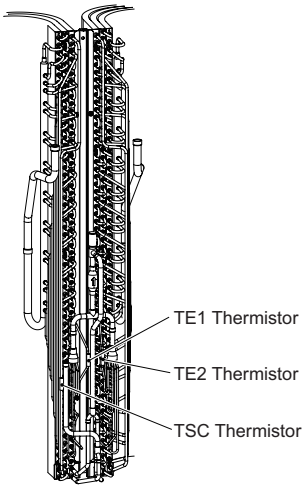
(H,Y)VAHR072B(3,4,5)2S



(H,Y)VAHR096B(3,4,5)2S



Details of the Center of Heat Exchanger

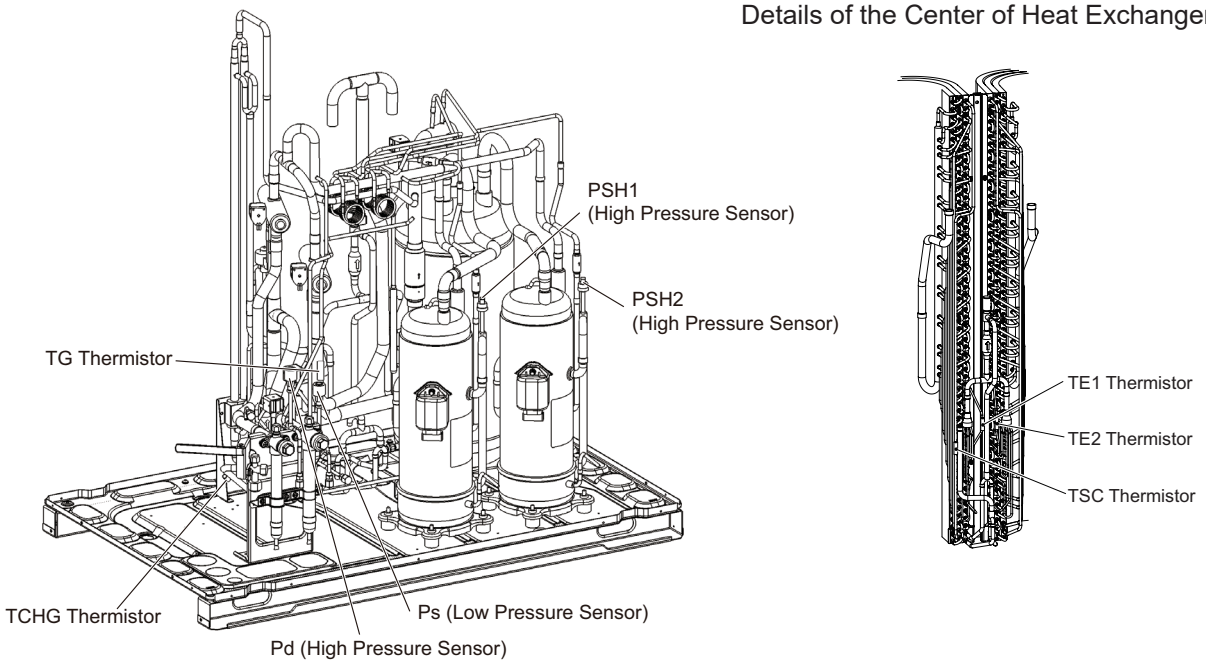


⚠WARNING

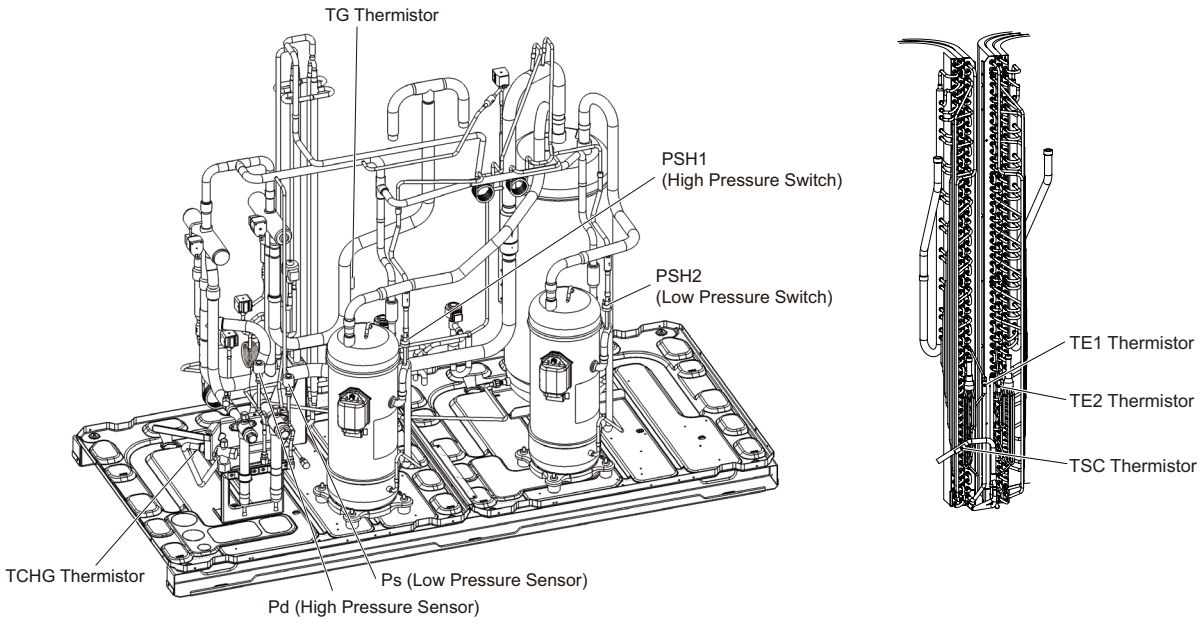
TURN OFF all POWER supply switches.

Tool	Adjustable Wrench or Ratchet

(H,Y)VAHR120, 144B(3,4,5)2S



(H,Y)VAHR168, 192B(3,4,5)2S



⚠WARNING

TURN OFF all POWER supply switches.

4.1.13.1 Removing High Pressure Switch (PSH1 and PSH2)

(1) Collect the refrigerant.

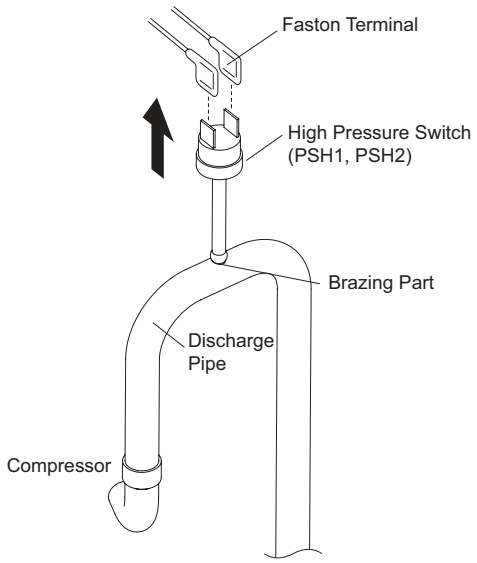
(2) Disconnect wires from pressure switch.

(3) Remove the high pressure switch from the brazing part of the discharge pipe with a torch.

NOTES:

- To prevent water and foreign particles from entering the refrigerant cycle, mount the new high pressure switch immediately after removing the old one. If it is not possible, seal the hole with tape.
- Check that wires for the high pressure switch do not contact with the piping and sheet metal.
- Make sure to secure the insulating sleeve of the faston terminals as shown in the figure.

Tool	Torch, Adjustable Wrench or Ratchet, Phillips Screwdriver, Pliers



4.1.13.2 Removing High Pressure Sensor (Pd) and Low Pressure Sensor (Ps)

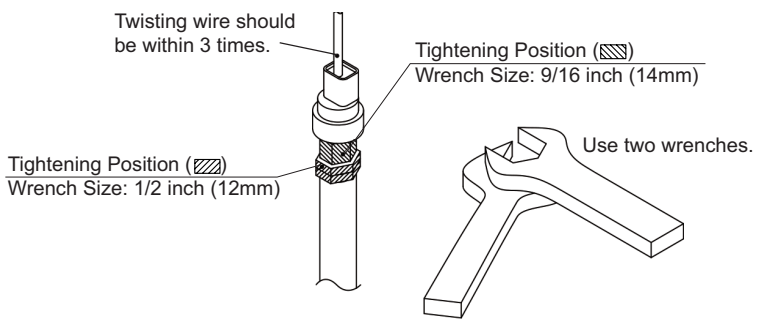
(1) Remove the connector for the pressure sensor wiring from outdoor unit PCB.

NOTE:

First, remove the connector. If not, the wiring may be damaged.

(2) Remove the refrigerant piping for the high pressure sensor or low pressure sensor using two wrenches.

Tool	Adjustable Wrench or Ratchet Phillips Screwdriver, Pliers



NOTE:

Tightening torque differs depending on the model of the pressure sensor to be used. Make sure to check the order number and the recommended tightening torque for the model when connecting the refrigerant piping.

Torque for Tightening
11.1 lbf.ft (15N.m)

⚠WARNING

TURN OFF all POWER supply switches.

4.1.14 Removing Thermistor for Liquid Pipe (TG, TCHG, TE1 and TE2)

(1) Remove the service cover and front cover according to Section 4.1.1 “Removing Service Cover and Front Cover”.

(2) Remove the electrical box cover according to Section 4.1.6 “Removing Electrical Box Cover”.

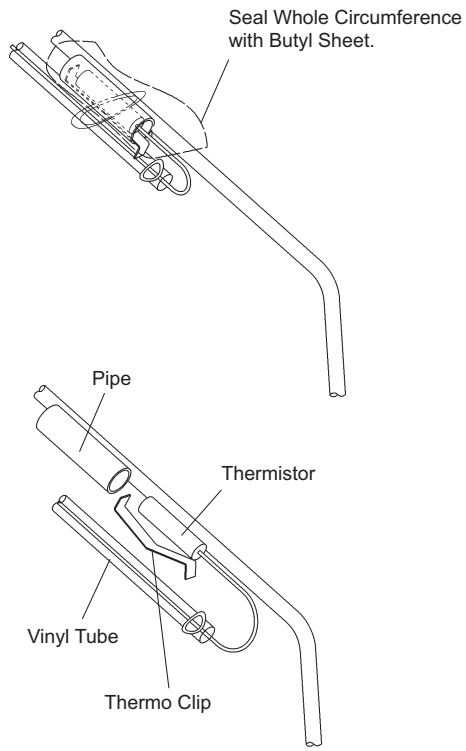
(3) Remove the butyl sheet. Then, remove the thermistor for the liquid pipe by pulling out the thermo clip from the pipe.

NOTE:
When removing the thermistor for the liquid pipe, take special care not to cause damage to your hands or the thermistor with the valve support securing the stop valve.

(4) Reassemble the thermistor for liquid pipe in the reverse procedure.

NOTE:
When reassembling the thermistor, attach the thermistor with the vinyl pipe end downward to prevent water from entering the pipe.

Tool	Wet Cloth, Torch, Pliers, Phillips Screwdriver, Wire Cutter



⚠WARNING

TURN OFF all POWER supply switches.

4.1.15 Removing Thermistor for Ambient Temperature

(1) Remove the service cover and front cover according to Section 4.1.1 “Removing Service Cover and Front Cover”.

(2) Remove the electrical box cover according to Section 4.1.6 “Removing Electrical Box Cover”.

(3) Remove the upper cover assembly (assy) and fan cover according to Section 4.1.4 “Removing Upper Cover Assembly (Assy) and Fan Cover”.

(4) Remove the screws securing the container for the thermistor to the outdoor unit side cover. Hold the container and lift it upward. Remove the container from the hook on the outdoor unit side cover.

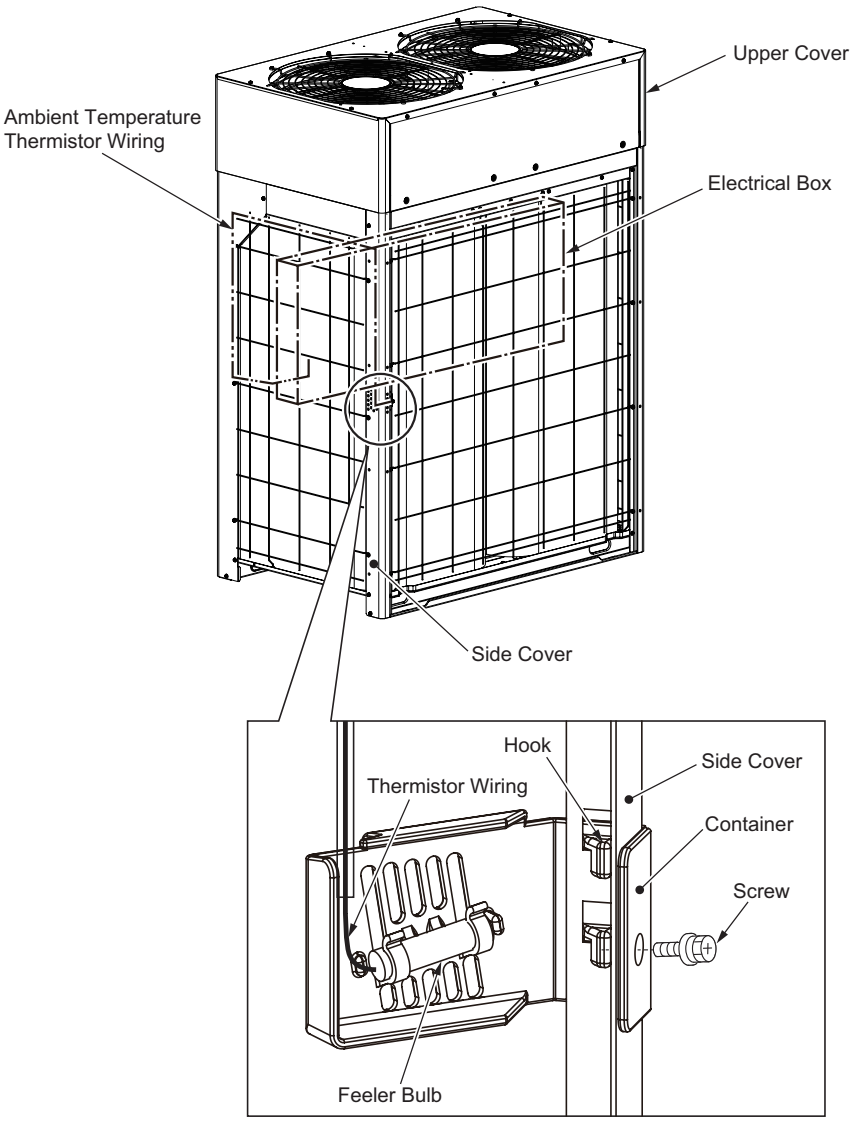
(5) Remove the feeler bulb of the thermistor from the container for the thermistor.

(6) Thermistor wiring is attached at the heat changer, pipings and such. Remove the clamps for the wiring.

(7) Reassemble the thermistor for ambient temperature in the reverse procedure.

Tool	Phillips Screwdriver, Wire Cutter

Thermistor Position for Ambient Temperature (Example: (H,Y)VAHR096B(3,4,5)2S)



⚠WARNING

TURN OFF all POWER supply switches.

4.1.16 Removing Other Electrical Components

NOTES:

- When replacing the components of the radiation fin such as inverter PCB and fan controller, apply conductive silicon grease (Service Parts No.: P22760) slightly over the contact surface of the fin.
- When reassembling the electrical components, match the terminal numbers with the mark band numbers. If incorrectly connected, malfunction may occur or the electrical components may be damaged.
- When securing PCBs or sheet metals for outdoor unit PCB, protect the electric wiring from catching on the sheet metals or the electrical components.
- Make sure to use screws, bushes, and collars when securing inverter PCBs. If not, it may cause equipment malfunction.
- When replacing the outdoor unit PCB and inverter PCB, set the dip switches the same as before replacement of the PCBs. An incorrect setting will cause malfunction. Refer to the instruction manual attached to servicing outdoor unit PCB.
- Do not apply an excessive force to the electrical components on PCBs or PCBs themselves. It may lead to PCBs failure.

⚠WARNING

TURN OFF all POWER supply switches.

4.1.16.1 Removing Outdoor Unit PCB and Electrical Components for Electrical Box

Removing Outdoor Unit PCB

(1) Remove all the connectors for wiring connected to the outdoor unit PCB.

(2) Hold the convex part of the holder attached to the outdoor unit PCB (Part A in the figure, 10 portions) with long nose pliers and pull it out to remove.

Removing Electrical Components

(1) Remove all the wirings connected with the electrical components.

(2) Remove the screws that are attaching the electrical components.

NOTE:

Do not touch the electrical components on the outdoor unit PCBs while LED (red) of the PCB is ON to avoid electrical shock.

Do not bend or apply an excessive force to the outdoor unit PCB. Otherwise, it may cause outdoor unit PCB failure.

NOTES:

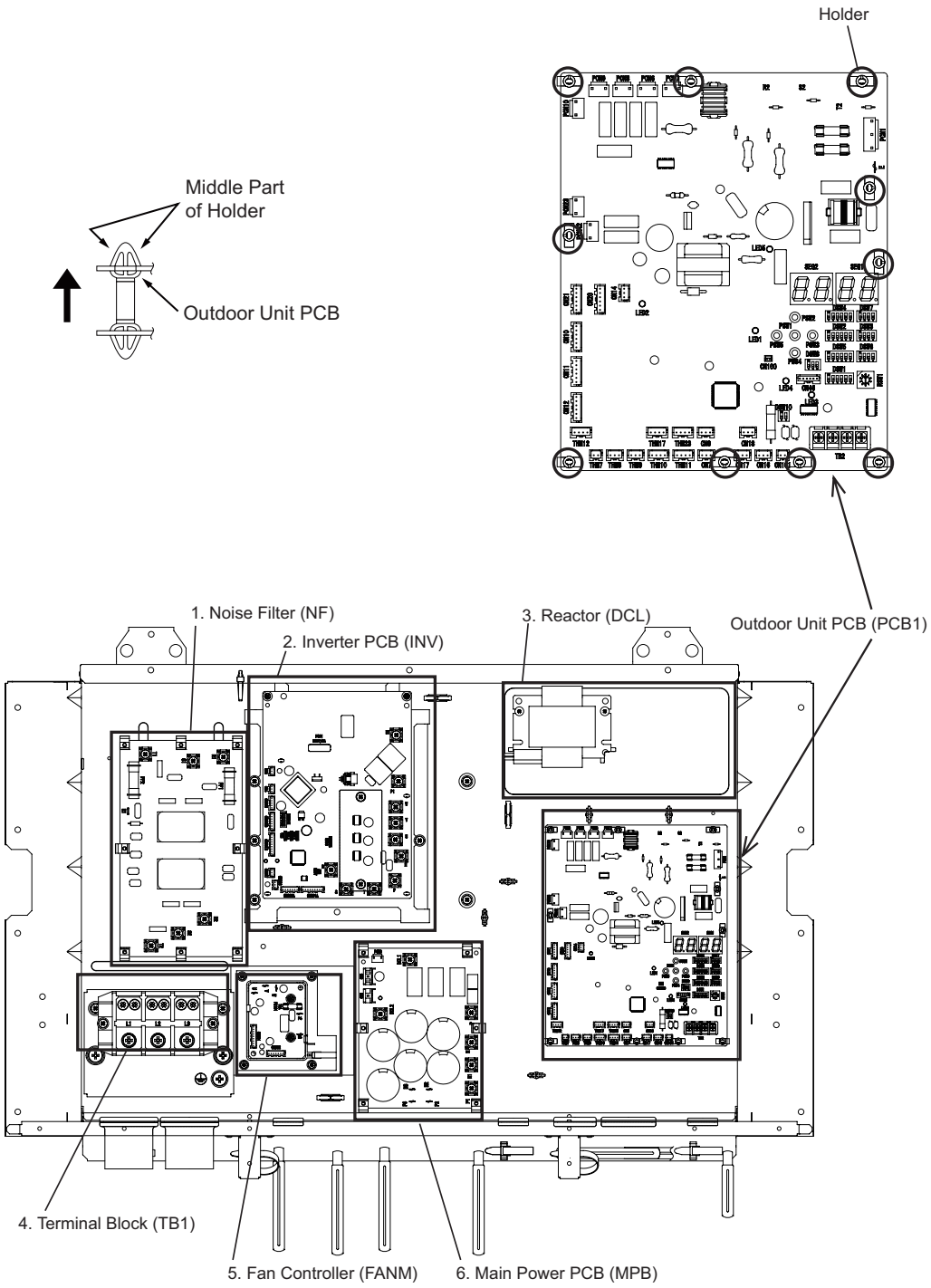
- When reassembling the electrical components, match the terminal numbers with the mark band numbers. If incorrectly connected, malfunction may occur or the electrical components may be damaged.
- When closing the outdoor unit PCB securing plate for reassembly, protect the cables from catching on the plate edges or electrical components.
- The capacitor is charged with electricity even when the power supply is turned off. DO NOT touch the terminals, to avoid an electrical shock.

⚠WARNING

TURN OFF all POWER supply switches.

Tool	Phillips Screwdriver, Long Nose Pliers, Pliers

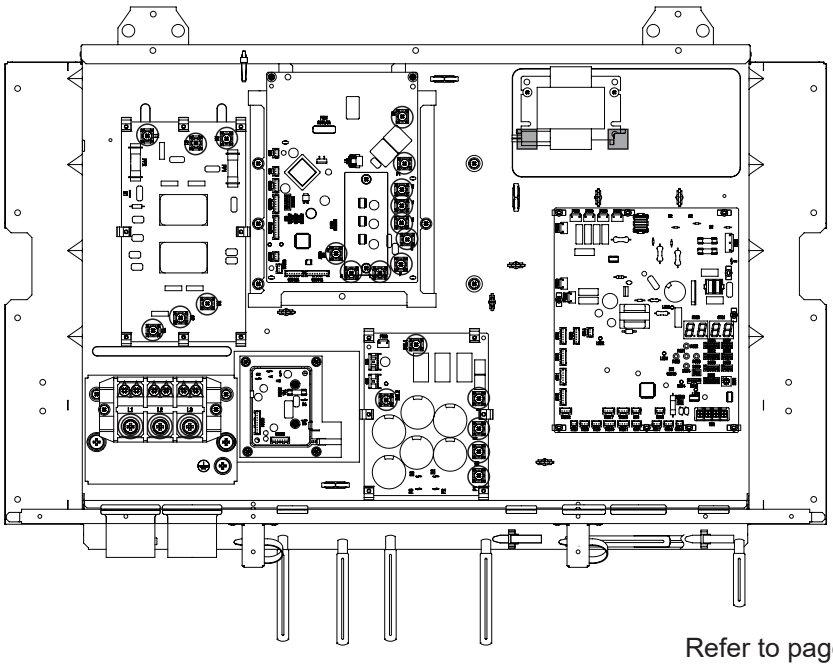
(H,Y)VAHR072B32S



⚠WARNING

TURN OFF all POWER supply switches.

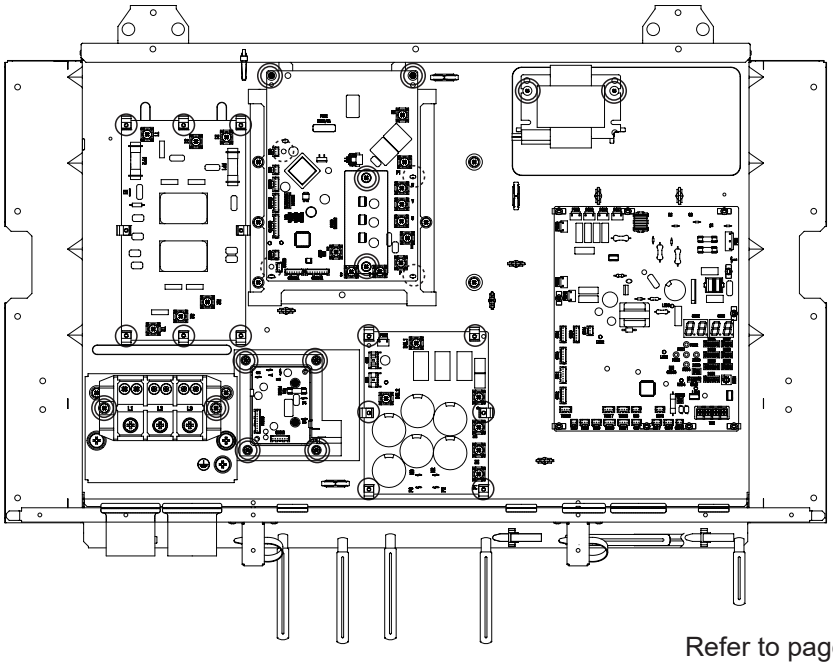
Tool	Phillips Screwdriver, Long Nose Pliers, Pliers



◯ : Securing Screw for Wire (M5)
△ : Securing Screw for Wire (M6)
◎ : Securing Screw for Wire (M8)
■ : Insert Portion

1. Noise Filter (NF)
   Securing Screw (M5) for Wire (six portions)
2. Inverter PCB (INV)
   Securing Screw (M5) for Wire (10 portions)
3. Reactor (DCL)
   Insert Portion (two portions)
4. Terminal Block (TB1)
   Securing Screw (M6) for Wire (six portions)
   Securing Screw (M8) for Wire (three portions)
6. Main Power PCB (MPB)
   Securing Screw (M5) for Wire (six portions)

Refer to page 4-51.



◯ : Board Holder
◎ : Securing Screw for Part
⋯ : Supporting Holder
(No need to remove.)

1. Noise Filter (NF)
   Board Holder (six portions)
2. Inverter PCB (INV)
   Securing Screw for Part (M3) (two portions)
   Securing Screw for Part (M5) (two portions)
3. Reactor (DCL)
   Securing Screw for Part (M4) (two portions)
4. Terminal Block (TB1)
   Securing Screw for Part (M5) (two portions)
5. Fan Controller (FANM)
   Securing Screw for Parts (M4) (four portions)
6. Main Power PCB (MPB)
   Securing Holder (six portions)

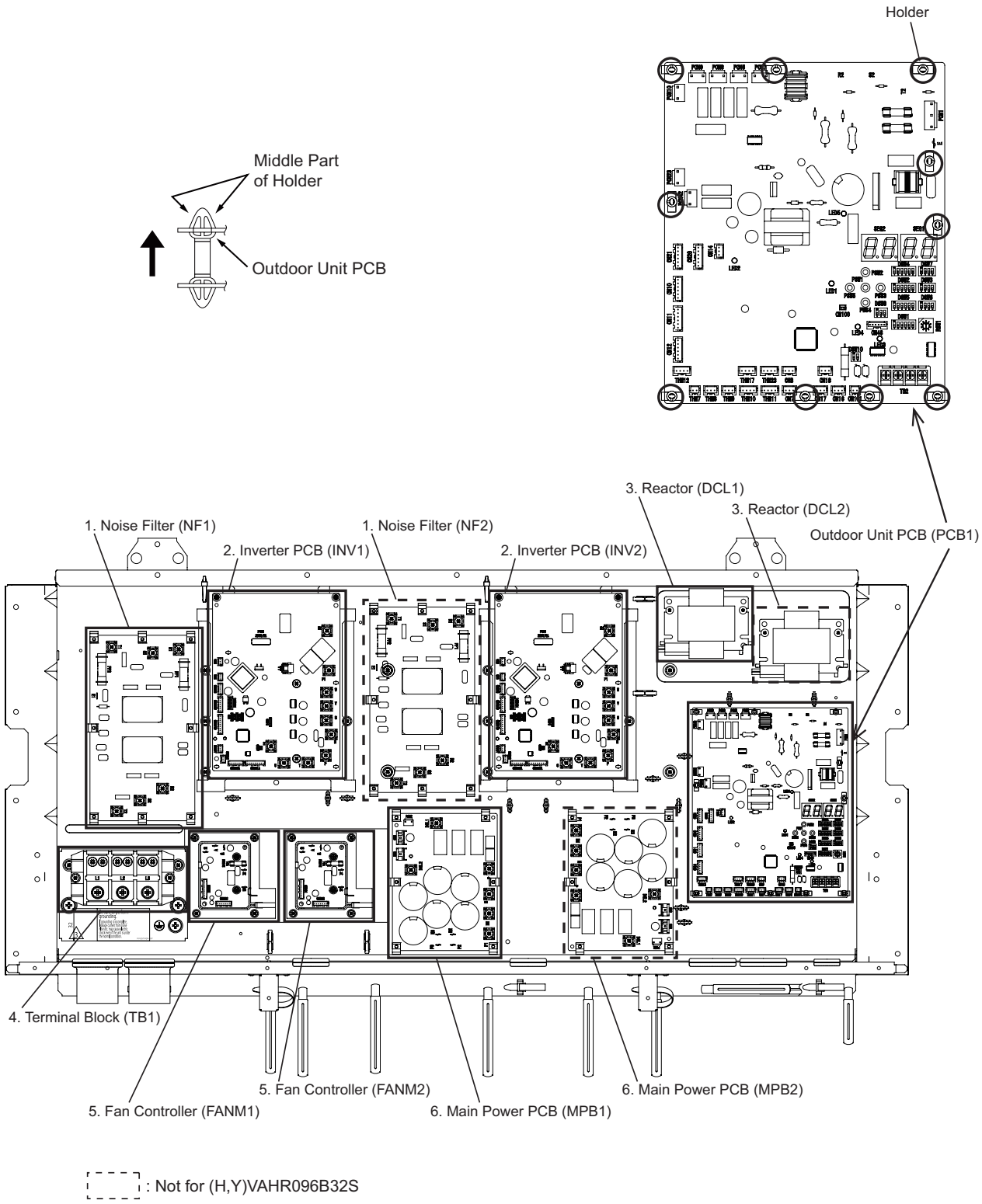
Refer to page 4-51.

⚠WARNING

TURN OFF all POWER supply switches.

Tool	Phillips Screwdriver, Long Nose Pliers, Pliers

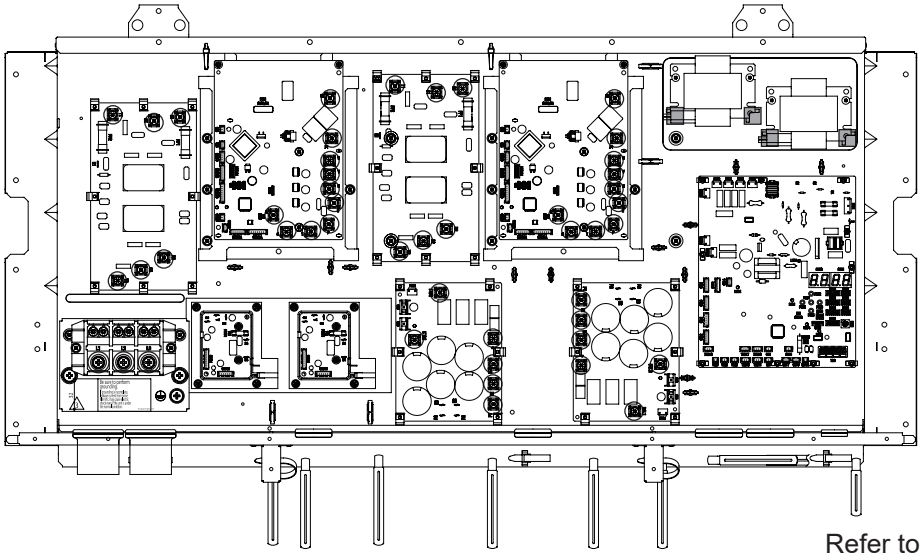
(H,Y)VAHR096 - 192B32S



⚠WARNING

TURN OFF all POWER supply switches.

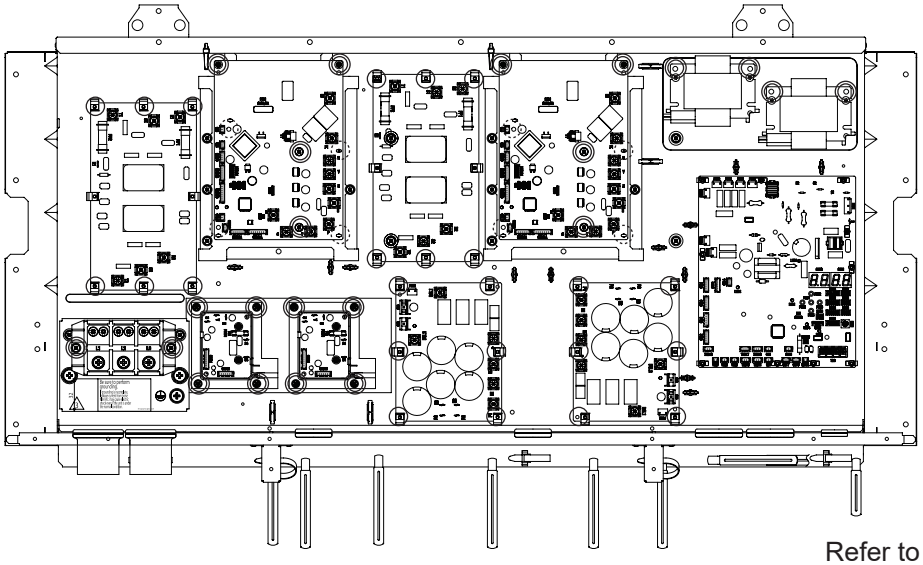
Tool	Phillips Screwdriver, Long Nose Pliers, Pliers



◯ : Securing Screw for Wire (M5)
△ : Securing Screw for Wire (M6)
◎ : Securing Screw for Wire (M8)
■ : Insert Portion

1. Noise Filter (NF1, 2)
   Securing Screw (M5) for Wire (12 portions)
2. Inverter PCB (INV1, 2)
   Securing Screw (M5) for Wire (20 portions)
3. Reactor (DCL1,2)
   Insert Portion (four portions)
4. Terminal Block (TB1)
   Securing Screw (M6) for Wire (six portions)
   Securing Screw (M8) for Wire (three portions)
6. Main Power PCB (MPB1, 2)
   Securing Screw (M5) for Wire (12 portions)

Refer to page 4-53.



◯ : Board Holder
◎ : Securing Screw for Part
◌ : Supporting Holder
(No need to remove.)

1. Noise Filter (NF1, 2)
   Board Holder (12 portions)
2. Inverter PCB (INV1, 2)
   Securing Screw for Part (M3) (four portions)
   Securing Screw for Part (M5) (four portions)
3. Reactor (DCL1, 2)
   Securing Screw for Part (M4) (four portions)
4. Terminal Block (TB1)
   Securing Screw for Part (M5) (two portions)
5. Fan Controller (FANM1, 2)
   Securing Screw for Parts (M4) (eight portions)
6. Main Power PCB (MPB1, 2)
   Board Holder (12 Portions)

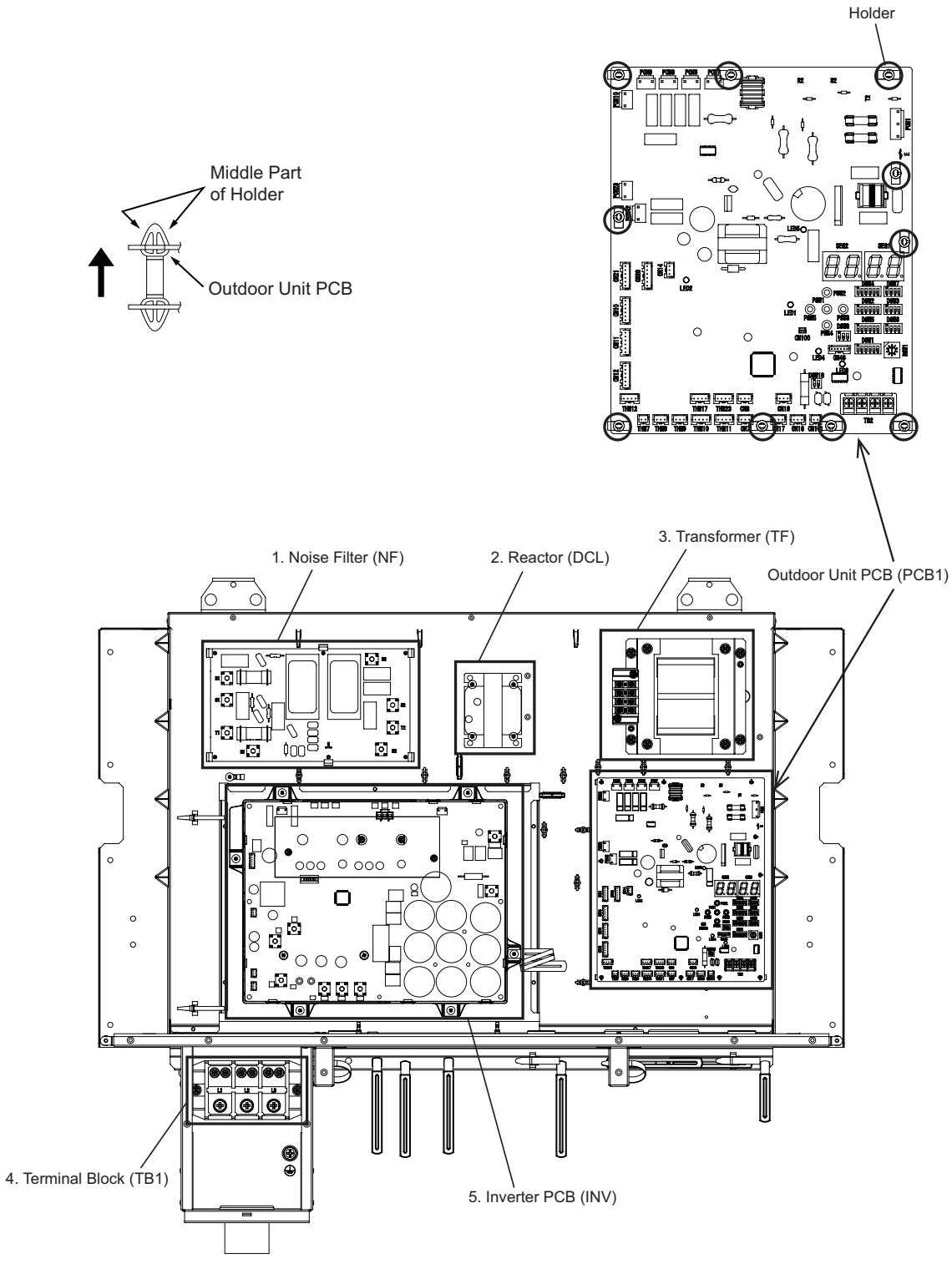
Refer to page 4-53.

⚠WARNING

TURN OFF all POWER supply switches.

Tool	Phillips Screwdriver, Long Nose Pliers, Pliers

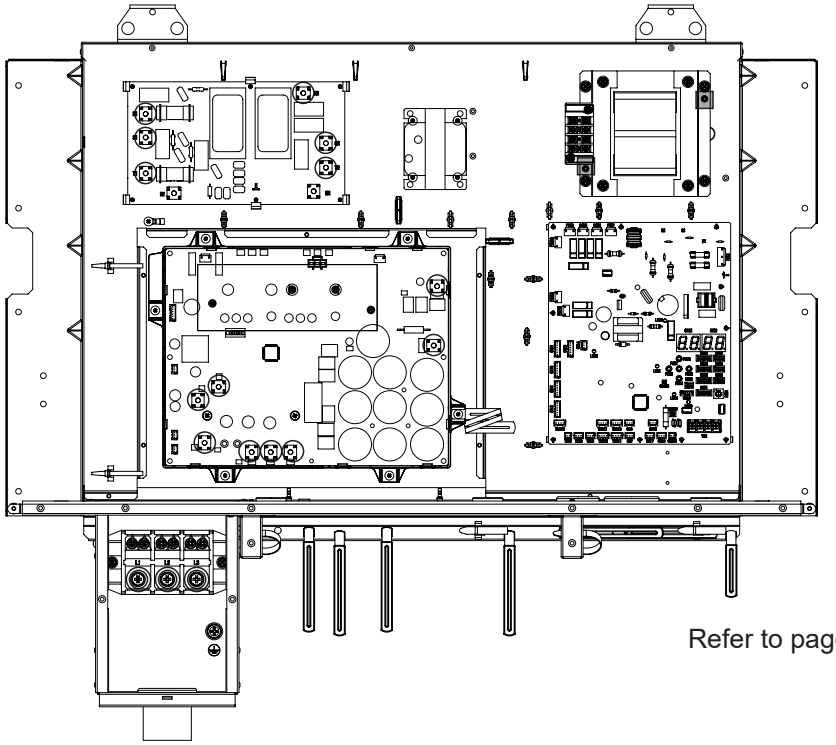
(H,Y)VAHR072B42S



⚠WARNING

TURN OFF all POWER supply switches.

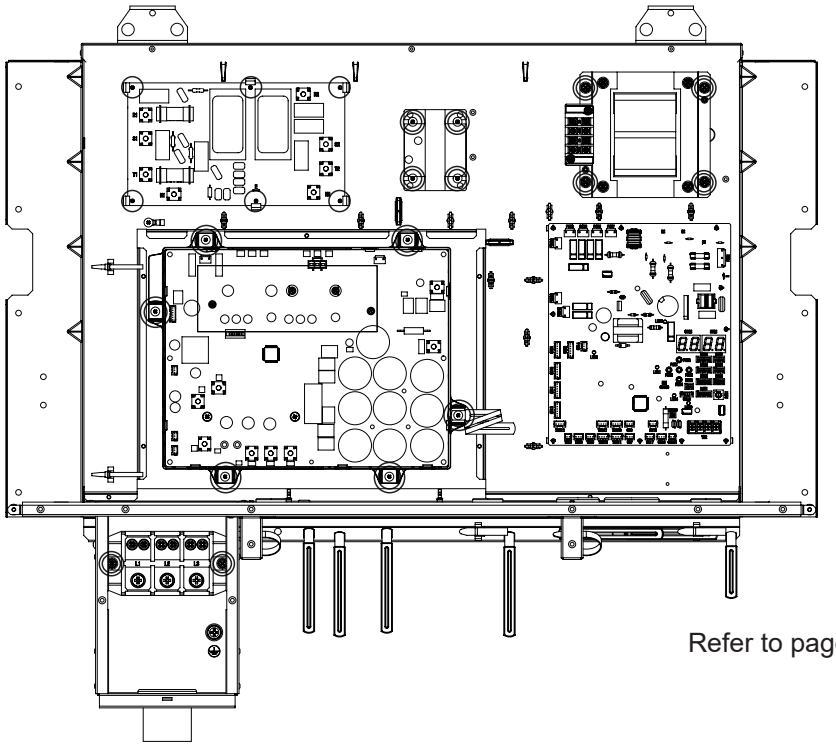
Tool	Phillips Screwdriver, Long Nose Pliers, Pliers



◯ : Securing Screw for Wire (M5)
△ : Securing Screw for Wire (M6)
◎ : Securing Screw for Wire (M8)
■ : Insert Portion

1. Noise Filter (NF)
   Securing Screw for Wire (six portions)
3. Transformer (TF)
   Insert Portion (two portions)
4. Terminal Block (TB1)
   Securing Screw (M6) for Wire (six portions)
   Securing Screw (M8) for Wire (three portions)
5. Inverter PCB (INV)
   Securing Screw for Wire (eight portions)

Refer to page 4-55.



◯ : Board Holder
◎ : Securing Screw for Part

1. Noise Filter (NF)
   Board Holder (six portions)
2. Reactor (DCL)
   Securing Screw for Part (M4) (four portions)
3. Transformer (TF)
   Securing Screw for Part (M5) (four portions)
4. Terminal Block (TB1)
   Securing Screw for Part (M5) (two portions)
5. Inverter PCB (INV)
   Securing Screw for Part (M4) (six portions)

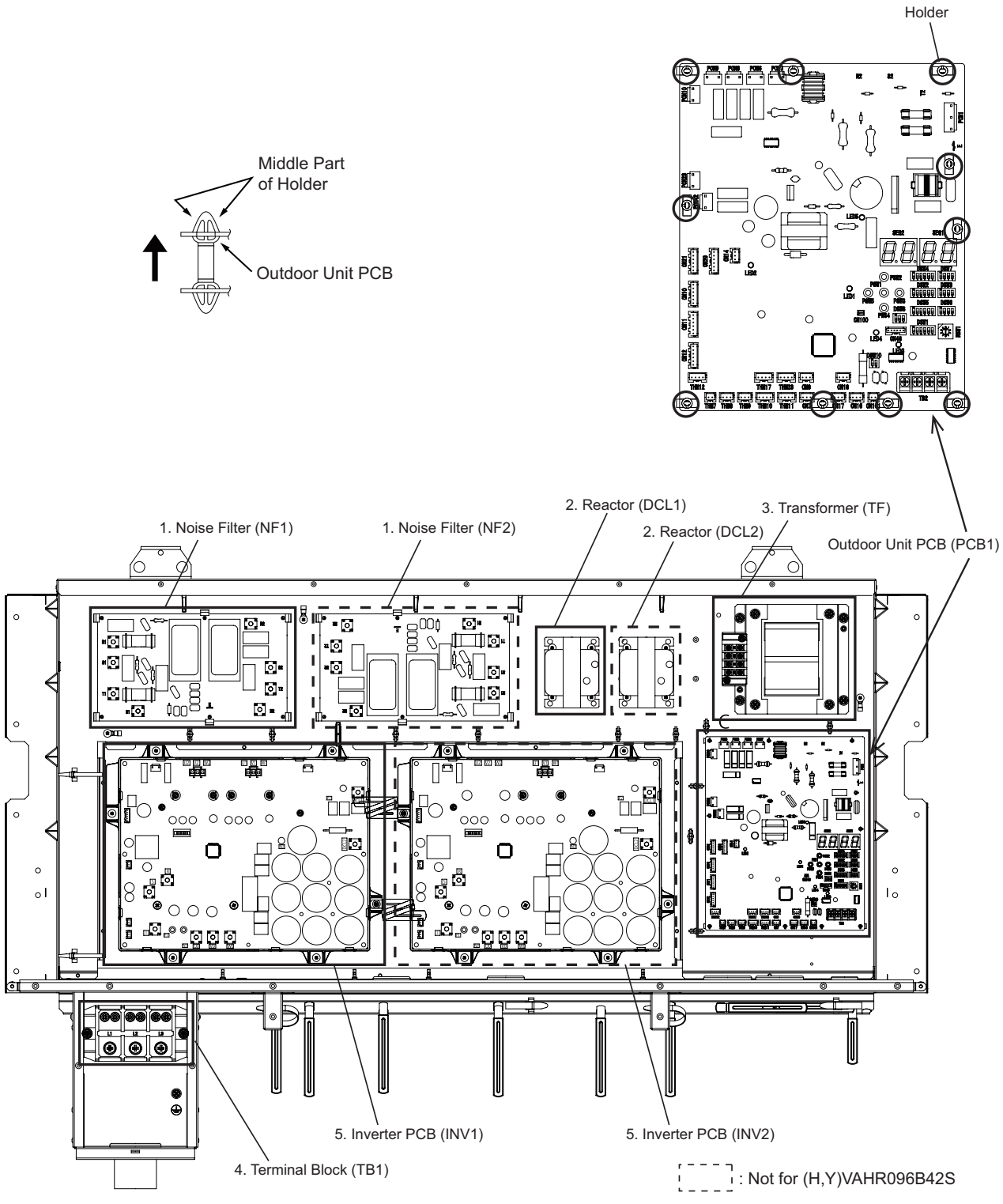
Refer to page 4-55.

⚠WARNING

TURN OFF all POWER supply switches.

Tool	Phillips Screwdriver, Long Nose Pliers, Pliers

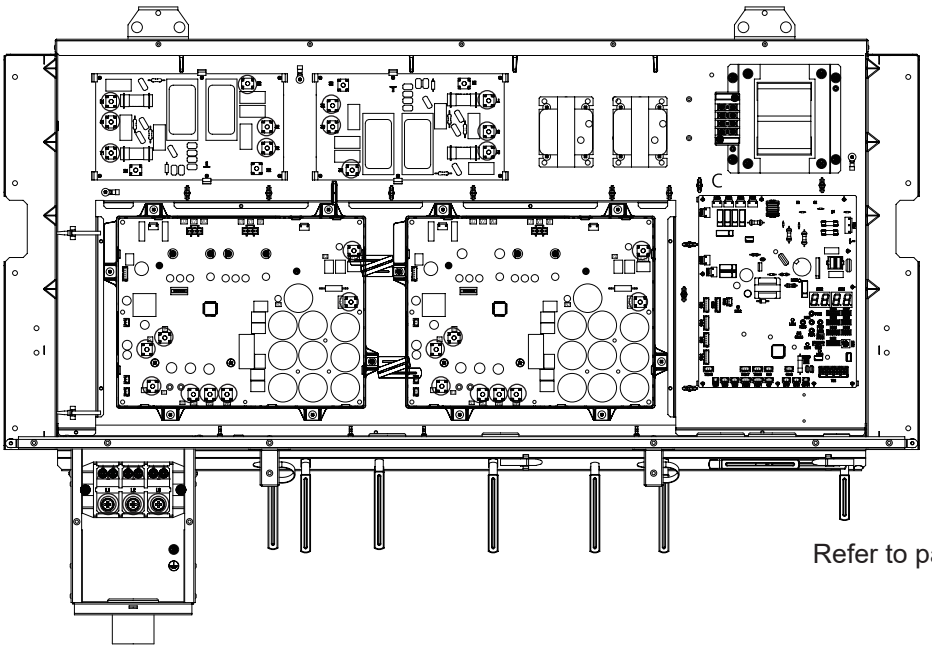
(H,Y)VAHR096 - 192B42S



⚠WARNING

TURN OFF all POWER supply switches.

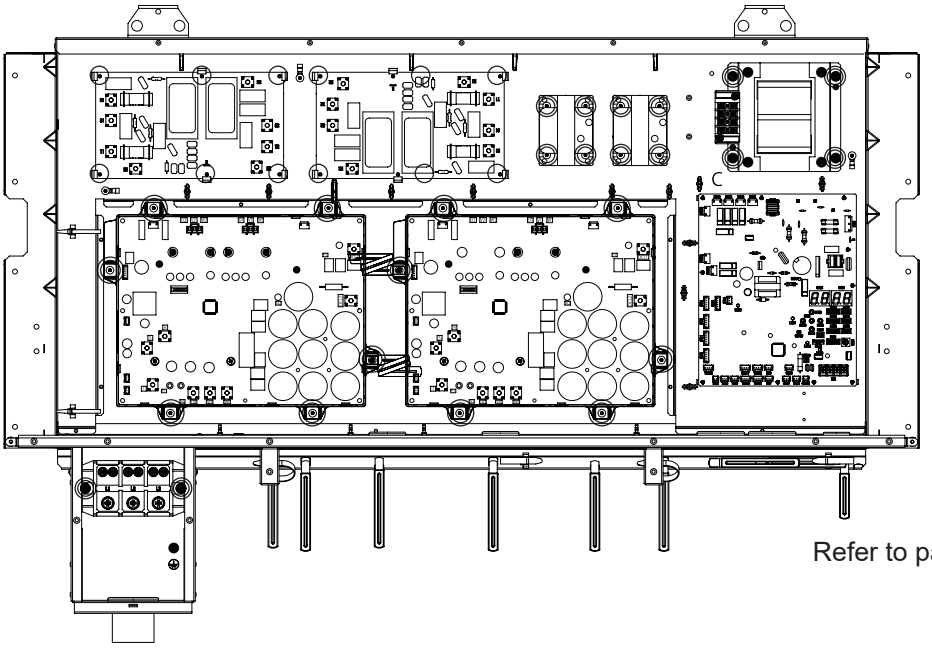
Tool	Phillips Screwdriver, Long Nose Pliers, Pliers



◯ : Securing Screw for Wire (M5)
△ : Securing Screw for Wire (M6)
◎ : Securing Screw for Wire (M8)
■ : Insert Portion

1. Noise Filter (NF1, 2)
   Securing Screw for Wire (12 portions)
3. Transformer (TF)
   Insert Portion (two portions)
4. Terminal Block (TB1)
   Securing Screw (M6) for Wire (six portions)
   Securing Screw (M8) for Wire (three portions)
5. Inverter PCB (INV1, 2)
   Securing Screw for Wire (16 portions)

Refer to page 4-57.



◯ : Board Holder
◎ : Securing Screw for Part

1. Noise Filter (NF1, 2)
   Board Holder (12 portions)
2. Reactor (DCL1, 2)
   Securing Screw for Part (M4) (eight portions)
3. Transformer (TF)
   Securing Screw for Part (M5) (four portions)
4. Terminal Block (TB1)
   Securing Screw for Part (M5) (two portions)
5. Inverter PCB (INV1, 2)
   Securing Screw for Part (M4) (12 Portions)

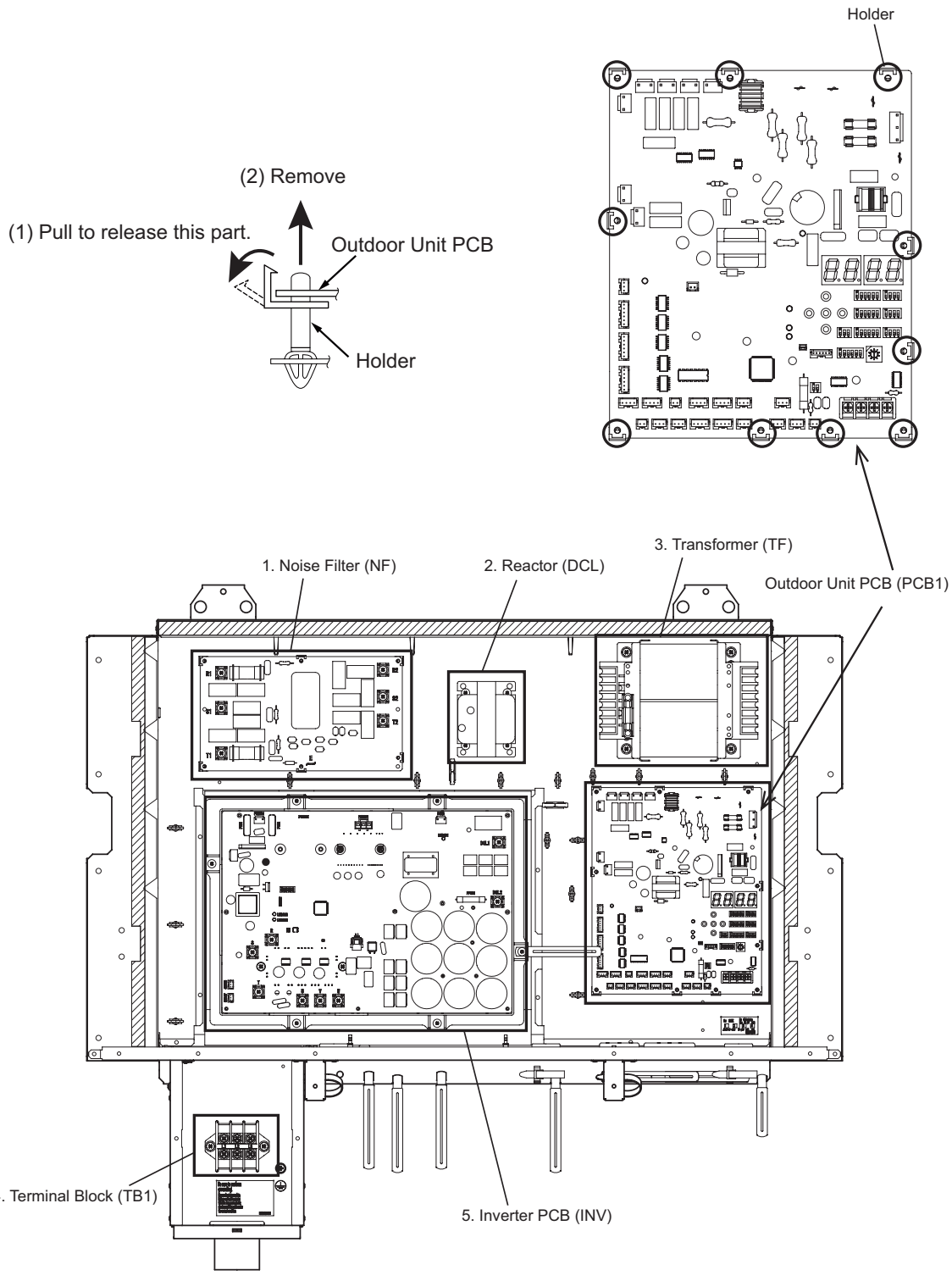
Refer to page 4-57.

⚠WARNING

TURN OFF all POWER supply switches.

Tool	Phillips Screwdriver, Long Nose Pliers, Pliers

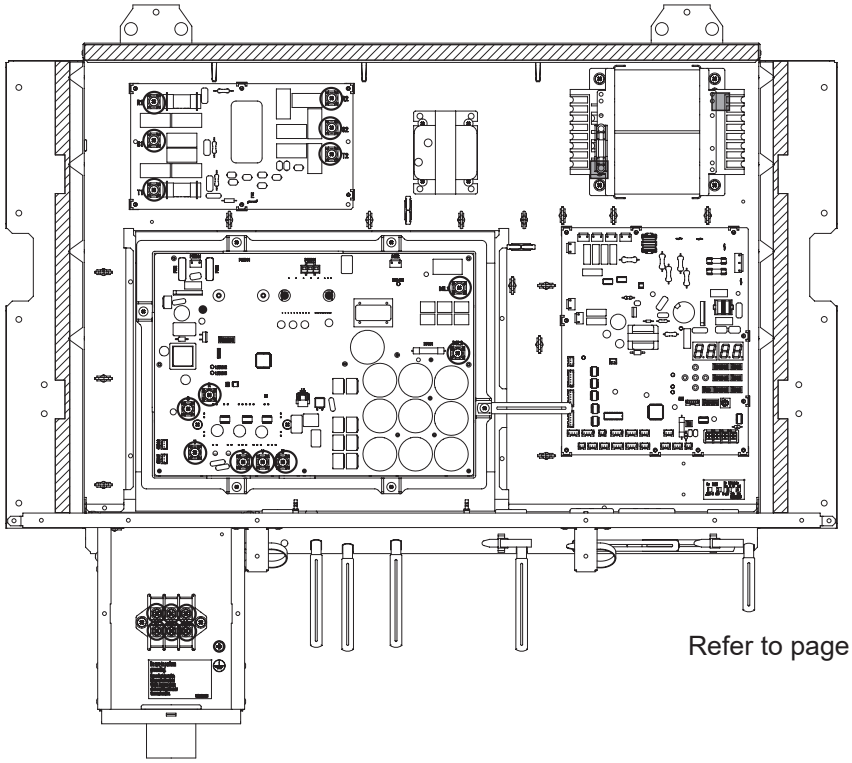
(H,Y)VAHR072B52S



⚠WARNING

TURN OFF all POWER supply switches.

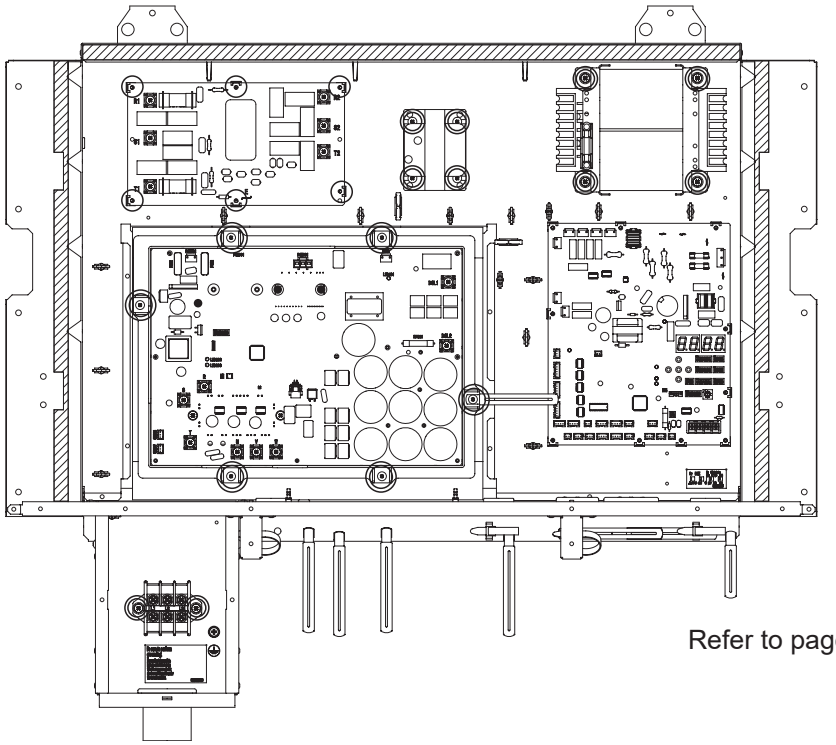
Tool	Phillips Screwdriver, Long Nose Pliers, Pliers



◯ : Securing Screw for Wire (M5)
▩ : Insert Portion

1. Noise Filter (NF)
   Securing Screw for Wire (six portions)
3. Transformer (TF)
   Insert Portion (two portions)
4. Terminal Block (TB1)
   Securing Screw (M5) for Wire (six portions)
5. Inverter PCB (INV)
   Securing Screw for Wire (eight portions)

Refer to page 4-59.



◯ : Board Holder
◎ : Securing Screw for Part

1. Noise Filter (NF)
   Board Holder (six portions)
2. Reactor (DCL)
   Securing Screw for Part (M4) (four portions)
3. Transformer (TF)
   Securing Screw for Part (M5) (four portions)
4. Terminal Block (TB1)
   Securing Screw for Part (M5) (two portions)
5. Inverter PCB (INV)
   Securing Screw for Part (M4) (six portions)

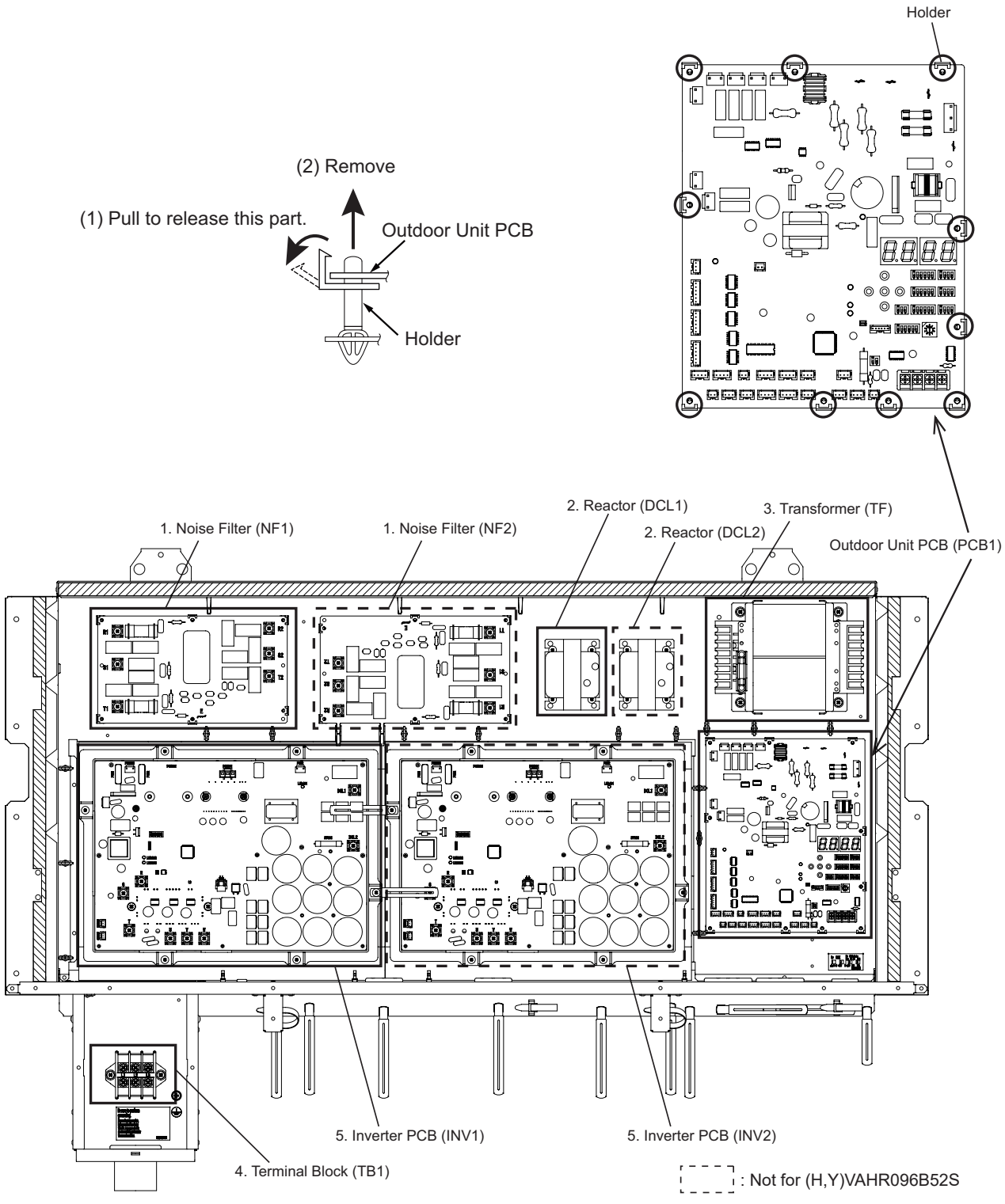
Refer to page 4-59.

⚠WARNING

TURN OFF all POWER supply switches.

Tool	Phillips Screwdriver, Long Nose Pliers, Pliers

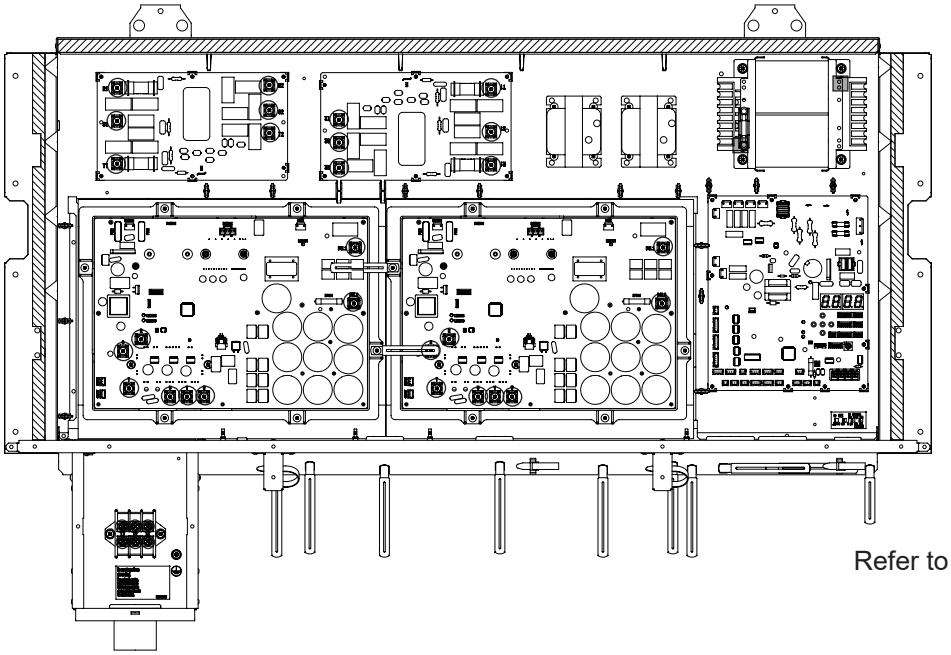
(H,Y)VAHR096 - 192B52S



⚠WARNING

TURN OFF all POWER supply switches.

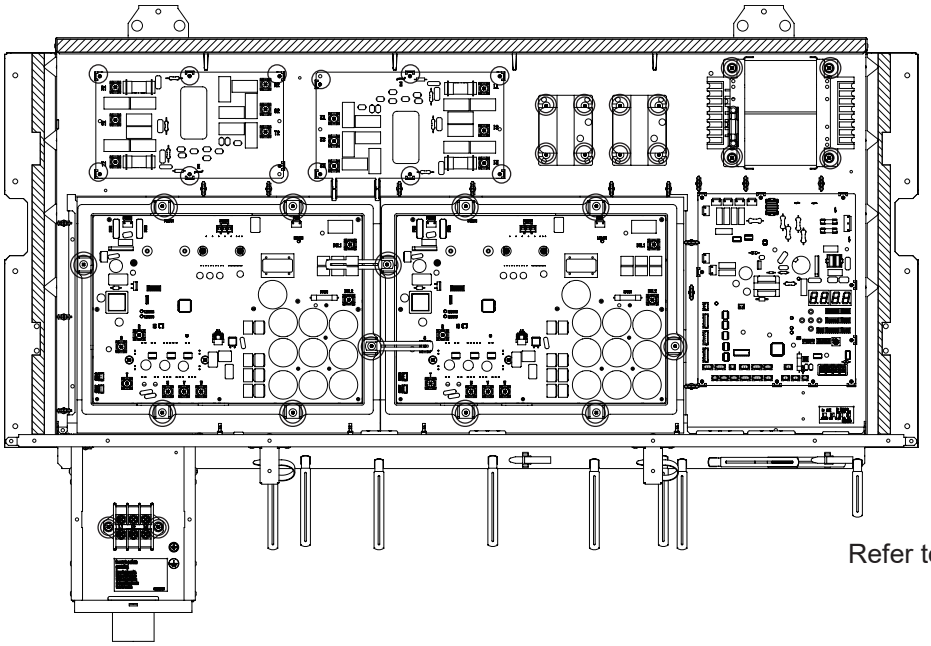
Tool	Phillips Screwdriver, Long Nose Pliers, Pliers



◯ : Securing Screw for Wire (M5)
▩ : Insert Portion

1. Noise Filter (NF1, 2)
   Securing Screw for Wire (12 portions)
3. Transformer (TF)
   Insert Portion (two portions)
4. Terminal Block (TB1)
   Securing Screw (M5) for Wire (six portions)
5. Inverter PCB (INV1, 2)
   Securing Screw for Wire (16 portions)

Refer to page 4-61.



◯ : Board Holder
◎ : Securing Screw for Part

1. Noise Filter (NF1, 2)
   Board Holder (12 portions)
2. Reactor (DCL1, 2)
   Securing Screw for Part (M4) (eight portions)
3. Transformer (TF)
   Securing Screw for Part (M5) (four portions)
4. Terminal Block (TB1)
   Securing Screw for Part (M5) (two portions)
5. Inverter PCB (INV1, 2)
   Securing Screw for Part (M4) (12 Portions)

Refer to page 4-61.

⚠WARNING

Turn OFF all POWER supply switches.
Do not touch any electrical components while LED401 or LED501A (Red) on Inverter PCB is ON. Current may be flowing through the components and cause electric shock.

4.1.16.2 Removing Inverter PCB

(1) Disconnect all the wirings on the Inverter PCB.
208/230V: CN206, CN207, CN303, CN301A, CN302A, CN301B and CN302B
460V, 575V: U1, V1, W1, U2. V2, W2, CN206, CN207, PCN331 and PCN2

NOTE:
CN206, CN207, CN301A, CN302A, CN301B, CN302B, U2, V2 and W2 may not be connected to same models.

(2) Disconnect all the terminal blocks on the Inverter PCB.
208/230V: R, S, T, U, V, W, N, P, N1 and P1
460V, 575V: DCL1, DCL2, U0, V0, W0, R, S and T

(3) After removing screws (Δ portions), remove the inverter PCB.
208/230V: four screws
460V, 575V: six screws

⚠CAUTION

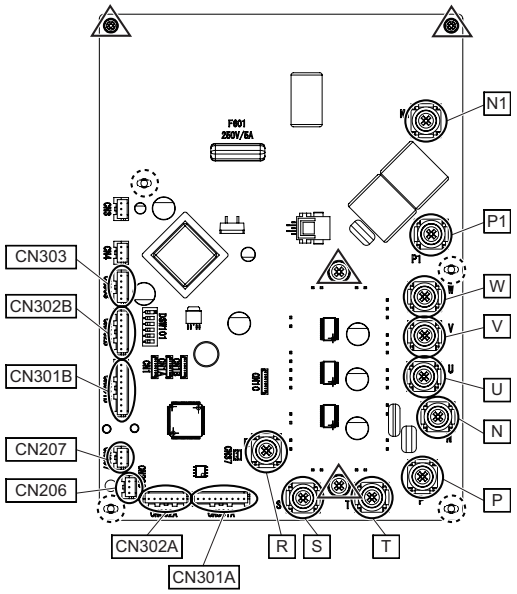
- **Do not touch any electrical components while LED401 or LED501A (red) of inverter PCB is ON. Current may be flowing through the components and may lead to an electrical shock.**
- **When reassembling the electrical components, match the terminal numbers with the marked numbers. If incorrectly connected, malfunction may occur or the electrical components may be damaged.**
- **When closing the outdoor unit PCB mounting plate for reassembly, protect the cables from catching on the plate edges or electrical components.**

⚠WARNING

Turn OFF all POWER supply switches.
Do not touch any electrical components while LED401 or LED501A (Red) on Inverter PCB is ON. Current may be flowing through the components and cause electric shock.

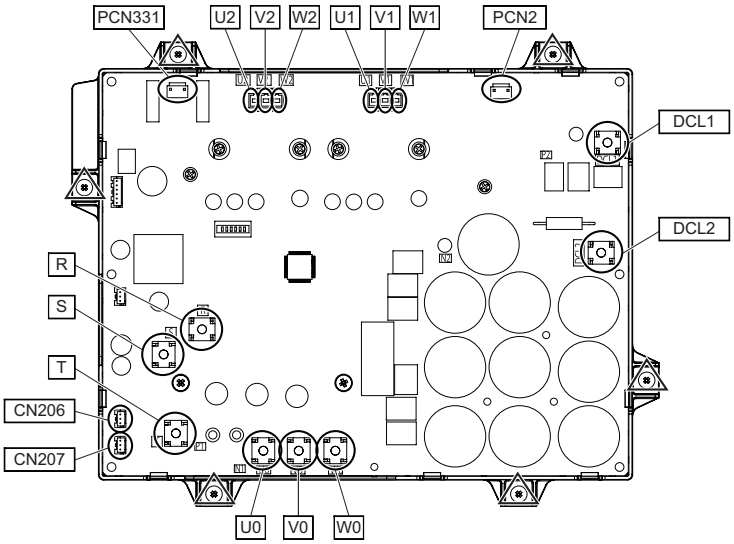
Tool	Phillips Screwdriver

(H,Y)VAHR072 - 192B32S (208/230V)

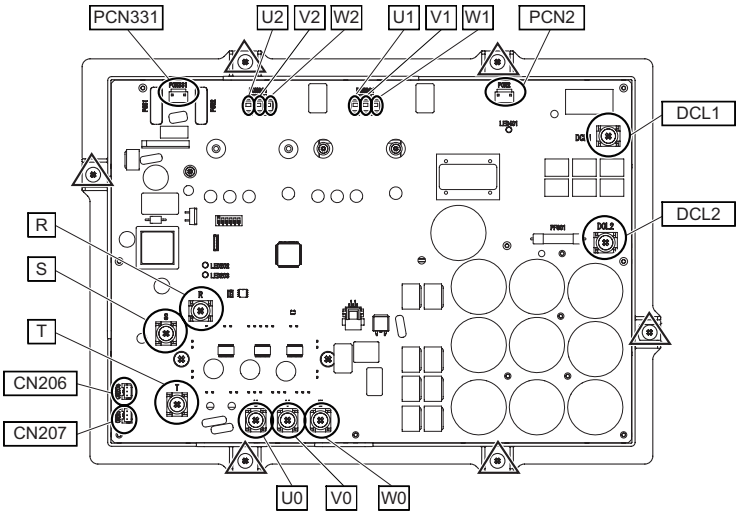


: No need to remove

(H,Y)VAHR072 - 192B42S (460V)



(H,Y)VAHR072 - 192B52S (575V)



⚠WARNING

Turn OFF all POWER supply switches.
Do not touch any electrical components while LED501A (Red) on Inverter PCB is ON.
Current may be flowing through the components and cause electric shock.

4.1.16.3 Removing Inverter PCB from Radiation Fin

Before this work, remove the inverter PCB according to Section 4.1.16.2 “Removing Inverter PCB”.

NOTICE:

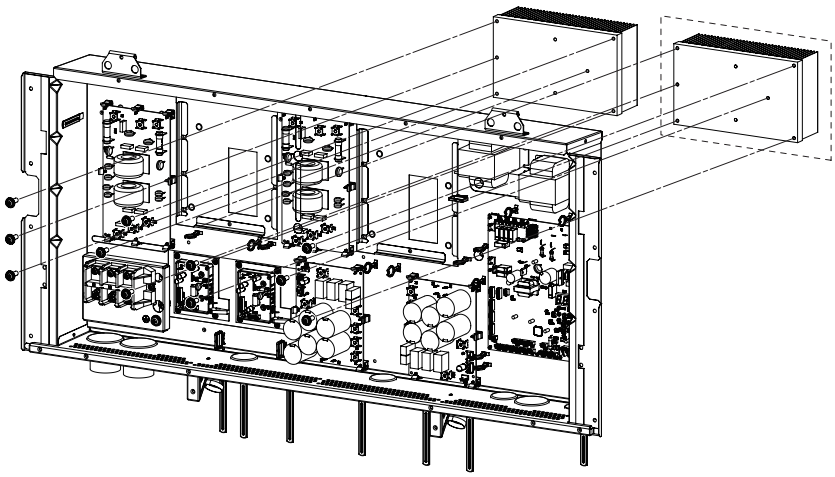
- Do not touch any electrical components while LED501A (red) of inverter PCB is ON. Current may be flowing in the components and cause electric shock.
- Turn OFF all power supply switches before you start checking the electrical components. Make sure to perform the electric discharge work after turning OFF all the power supply. Otherwise, electrical shock may occur caused by residual voltage.
- Refer to Section 3.1.3 “Checking Rotary Switch and DIP Switch Settings” when replacing service parts. Set the DIP switch to the same setting as before replacement.

NOTICE:

- Make sure to perform the electrical discharge work when testing and replacing the inverter components. Refer to Section 4.2.1.1 [2] and 4.2.1.2 [2] “Procedure of Testing Inverter Parts ● High Voltage Discharge Work for Replacing Parts” for the details.
- When reassembling the electrical components, match the terminal numbers to the marked band numbers with the marked band numbers. They are incorrectly connected, malfunction may occur or the electrical components may be damaged.
- When mounting the diode module and transistor module, apply silicon grease evenly over the whole back side of the diode module and the transistor module. Use silicon grease that is provided as an accessory (Service Parts No.: P22760).

Tool	Phillips Screwdriver

(H,Y)VAHR072 - 192B32S (208/230V)



: Not for (H,Y)VAHR072, 096B32S

⚠WARNING

Turn OFF all POWER supply switches.
Do not touch any electrical components while LED501A (Red) on Inverter PCB is ON.
Current may be flowing through the components and cause electric shock.

4.1.16.4 Removing Fan Controller (for 208/230V)

Disconnect all the wirings connected to the fan controller as shown below.

(1) Disconnect the wirings for fan controller (CN301, CN302, P4, N4, U, V, W).

(2) Remove four screws that attach the fan controller so that the fan controller can be removed. (◎ portions)

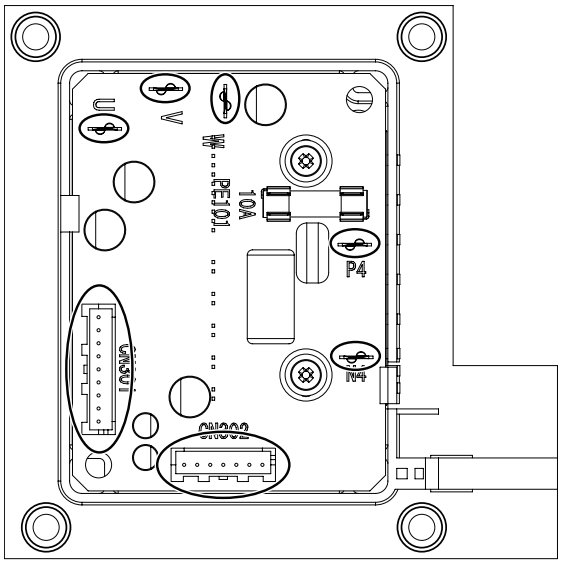
(3) Cut the plastic band and remove the noise filter.

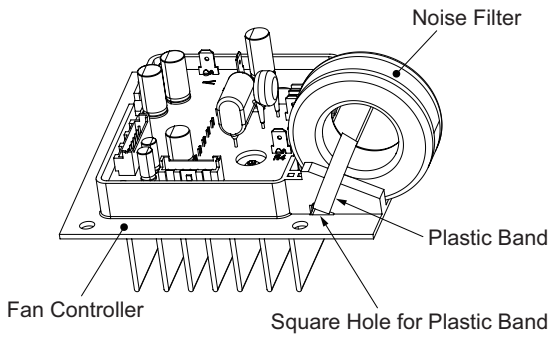
⚠CAUTION

- **Do not apply great force when removing the fan controller, or the soldering will come apart, and a malfunction of the fan controller may occur.**
- **Identify the terminal numbers with the marked band numbers when reassembling. If incorrectly connected, malfunction or damage will occur.**
- **Do not touch any electrical components while LED of the PCB is ON. Do not bend or apply an excessive force to the outdoor unit PCB. Otherwise, it may cause the PCB failure.**
- **Be sure to install the noise filter to the fan controller. Otherwise, the noise filter may break from vibration during unit operation.**
- **Make sure to perform the electrical discharge work when checking and replacing the inverter components. Refer to Section 4.2.1.1 2 and 4.2.1.2 2 "Procedure of Testing Inverter Parts ● High Voltage Discharge Work for Replacing Parts" for the details.**

Tool	Phillips Screwdriver, Long Nose Pliers

(H,Y)VAHR072 - 192B32S (208/230V)





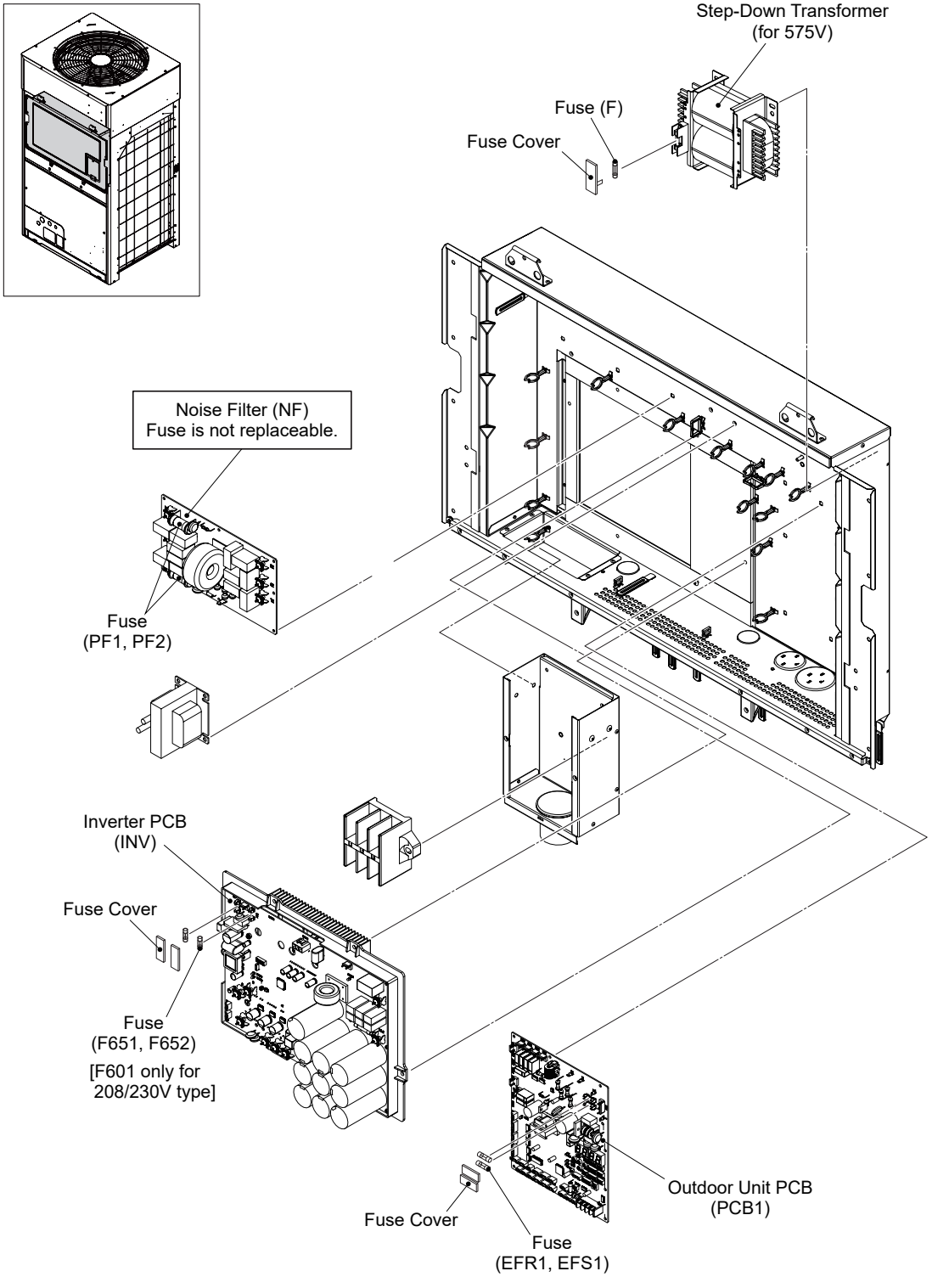
⚠WARNING

Turn OFF all POWER supply switches.
Do not touch any electrical components while LED501A (Red) on Inverter PCB is ON.
Current may be flowing through the components and cause electric shock.

4.1.16.5 Replacing Fuses on Electrical Component for Electrical Box

The following examples illustrate a small cabinet.

Example: (H,Y)VAHR072B52S



⚠WARNING

Turn OFF all POWER supply switches.
Do not touch any electrical components while LED501A (Red) on Inverter PCB is ON.
Current may be flowing through the components and cause electric shock.

Replacing Fuse from Step-Down Transformer (for 575V)

(1) Remove the fuse cover from the fuse holder of the Step-Down Transformer.
(2) Remove the fuse from the fuse holder. When removing the fuse, take care not to damage the fuse holder.
(3) Attach replacement fuse to the fuse holder and reattach the fuse cover.

Replacing Fuses from Inverter PCB (INV)

(1) Remove the fuse covers from the fuse holder of the Inverter PCB (INV).
(2) Remove the fuses from the fuse holder. When removing the fuses, take care not to damage the fuse holder.
(3) Attach replacement fuses to the fuse holder and reattach the fuse covers.

Replacing Fuses from Outdoor Unit PCB (PCB1)

(1) Remove the fuse covers from the fuse holder of the Outdoor Unit PCB (PCB1).
(2) Remove the fuses from the fuse holder. When removing the fuses, take care not to damage the fuse holder.
(3) Attach replacement fuses to the fuse holder and reattach the fuse covers.

NOTES:

- Be sure to match the fuse shown in the Service Parts List.
  If incorrectly selected, malfunction may occur or the electrical components may be damaged.
- In case the fuse on the Noise Filter PCB is open, replace the PCB. Fuses are not replaceable.
- Do not touch the electrical components while LED (red) of the PCB is ON to avoid electrical shock.
- When removing the fuse, take care not to damage the fuse holder.
- Be sure to reattach the fuse cover to the original position to reduce risks while the fuse cover is off during fuse open.

⚠WARNING

TURN OFF all POWER supply switches.

4.1.16.6 Removing Electrical Box

Removing Electrical Box
Remove the electrical box according to Section 4.1.7 “Removing Electrical Box”.

⚠CAUTION

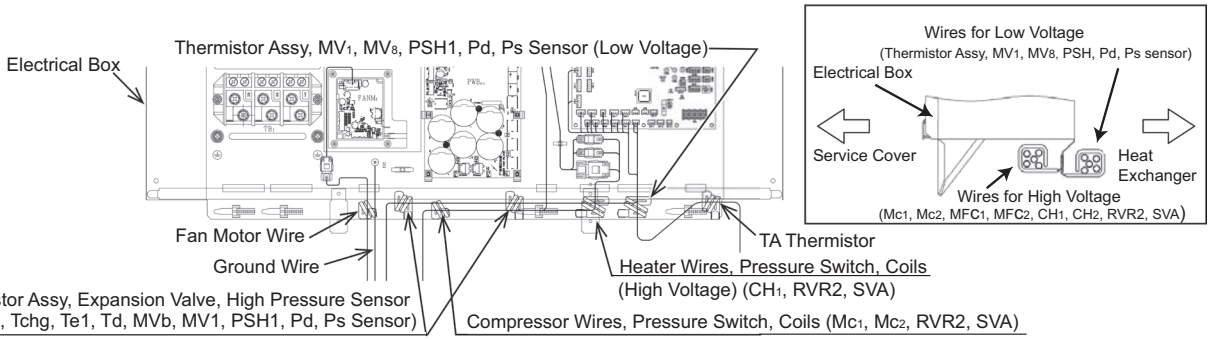
- **Proper handling of removal work must be performed by at least two people to avoid serious injuries.**
- **Check that all wires do not contact the sheet metal or pipes during wiring work. It may cause fire if the casing of the wires is deteriorated due to the vibration of the operation.**

Wiring Work

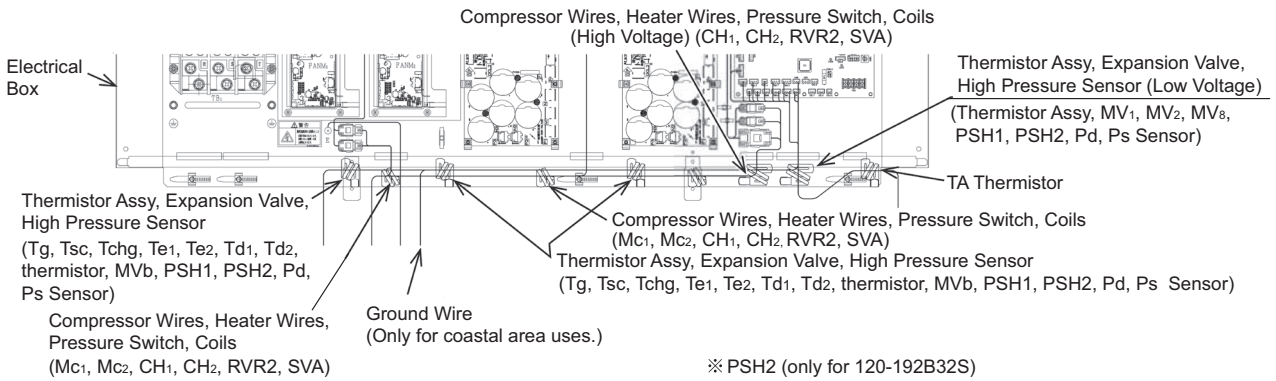
208/230V

(H,Y)VAHR072B32S

How to Orient Wiring Work
The figure below shows the side view of electrical box. Wiring for high and low voltage is separately bundled.



(H,Y)VAHR096 - 192B32S



⚠WARNING

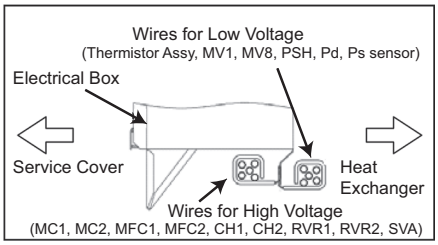
TURN OFF all POWER supply switches.

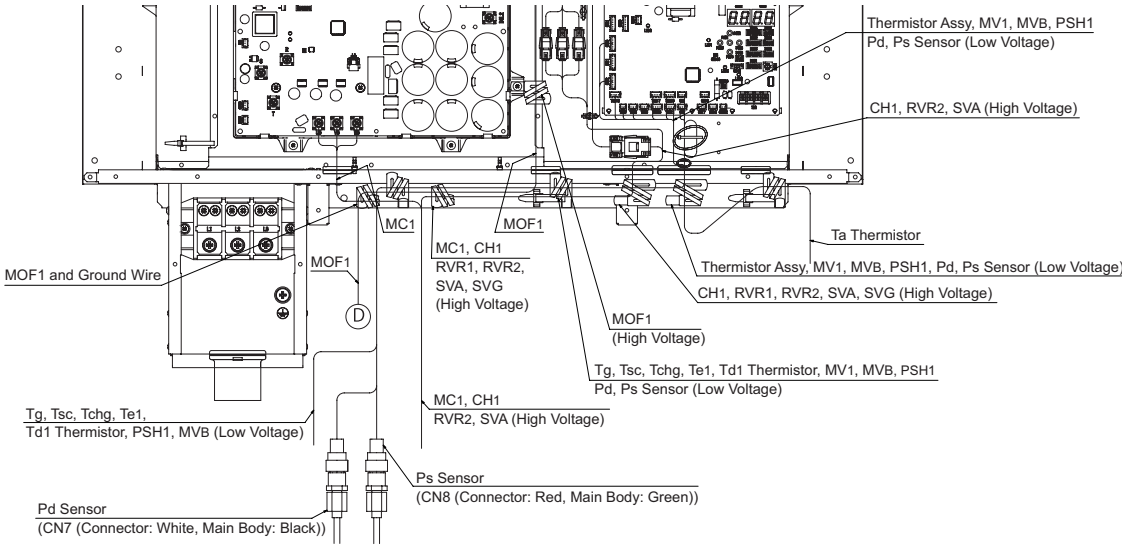
Wiring Work

460V, 575V

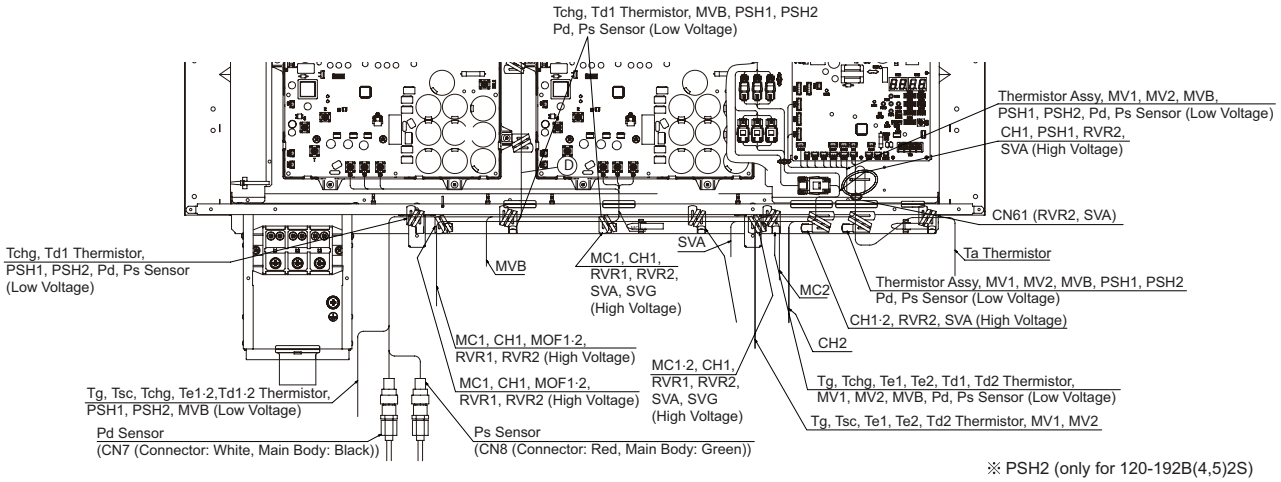
(H,Y)VAHR072B(4,5)2S

How to Orient Wiring Work
The figure below shows the side view of electrical box. Wiring for high and low voltage is separately bundled.





(H,Y)VAHR096 - 192B(4,5)2S



※ PSH2 (only for 120-192B(4,5)2S)

⚠WARNING

TURN OFF all POWER supply switches.

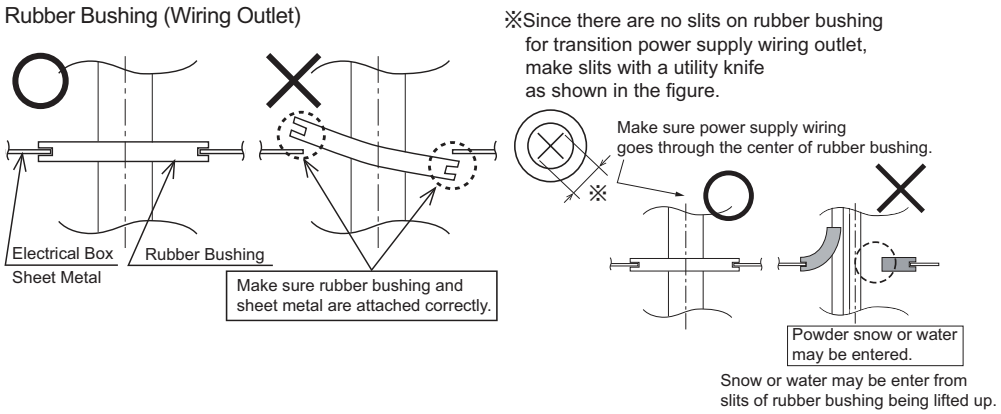
Reassembling Electrical Box

Reassemble the electrical box in the reverse procedure.

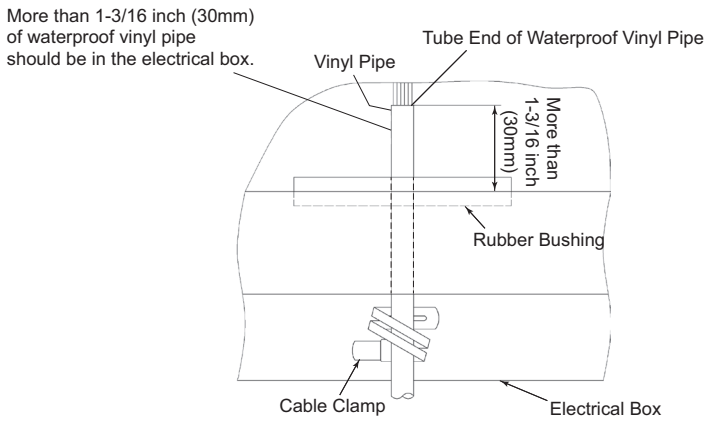
NOTICE:

- Check to ensure that the tube end of waterproof vinyl pipe and the connectors are in the electrical box. Secure them firmly with a cable clamp during wiring as shown in the figure below.
- Secure the wiring that connects each electrical part and the electrical box with a cable band to avoid direct contact with the compressor, piping, and plate edges.
- Secure the wiring neatly with a cord clamp and make sure that the wiring will not be held down by the electrical box cover. Otherwise, the wiring may be damaged when the cover is closed.
- Attach the fan motor wiring with a cable clamp as shown in the figure.
- Make sure rubber bushing and sheet metal are attached correctly. If not, electric components may be damaged by water.

Details of Cable Installation (Rubber Bushing)



Details of Securing the Vinyl Pipe Edge



⚠CAUTION

- **When reassembling the electrical component, match the terminal numbers with the marked band numbers. If incorrectly connected, malfunction may occur or the electrical components may be damaged.**
- **Settings of DIP switches differ according to the model. When replacing the outdoor unit PCB, refer to "Field Work Installations".**

⚠WARNING

TURN OFF all POWER supply switches.

4.1.17 Removing Components for Change-Over Box

4.1.17.1 Removing Service Cover for Electrical Box and Electronic Expansion Valve

(1) Remove the screws securing the electrical box cover and the electronic expansion valve cover.

COBS048, 096B22S

Service Cover for Electrical Box: 2 screws
Service Cover for Electronic Expansion Valve: 2 screws

COB04M132B22S

Service Cover for Electrical Box: 2 screws
Service Cover for Electronic Expansion Valve: 3 screws

COB08M264B22S

Service Cover for Electrical Box: 3 screws
Service Cover for Electronic Expansion Valve: 3 screws

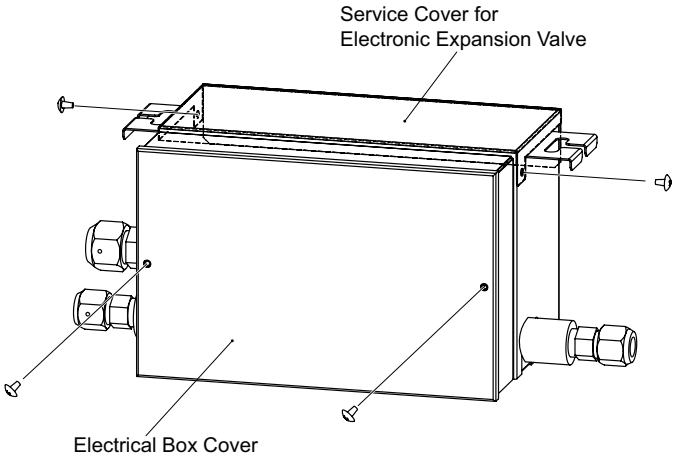
COB12M264B22S

Service Cover for Electrical Box: 4 screws
Service Cover for Electronic Expansion Valve: 3 screws

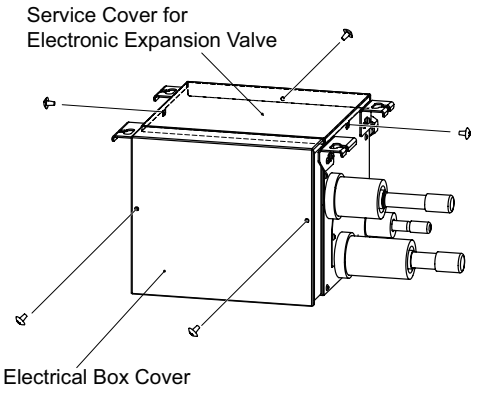
NOTE:
When attaching / removing the service cover, take special care to avoid injury from the sharp edges.

Tool	Phillips Screwdriver

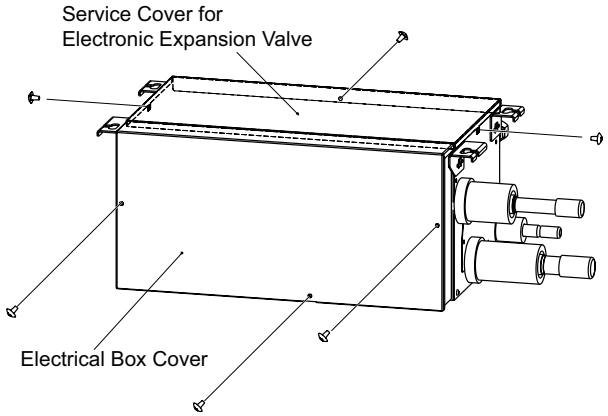
COBS048, 096B22S



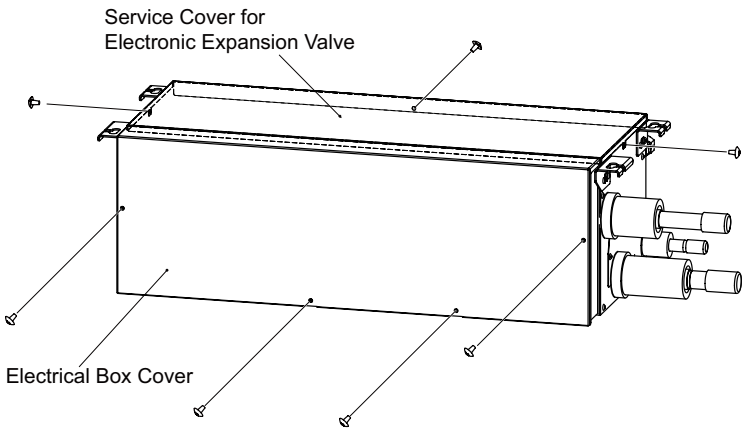
COB04M132B22S



COB08M264B22S



COB12M264B22S



⚠WARNING

TURN OFF all POWER supply switches.

4.1.17.2 Removing Electrical Components

Removing Change-Over Box PCB

(1) Remove all the connectors for wiring connected to the Change-Over Box PCB.

(2) Remove the communication wirings connected to the Change-Over Box PCB. Do not touch the electrical components on the Change-Over Box PCBs during the work. Otherwise, the Change-Over Box PCB may be damaged.

(3) Hold the convex part of the holders securing the Change-Over Box PCB with a long nose pliers and pull it out to remove.

Removing Electrical Components (Terminal Block for Power Source)

COBS048, 096B22S

(1) Remove all the wirings connected to the electrical components.

(2) Remove the screws securing the electrical components.

COB04M132B22S, COB08M264B22S, COB12M264B22S

(1) Remove all the wirings connected to the electrical components.

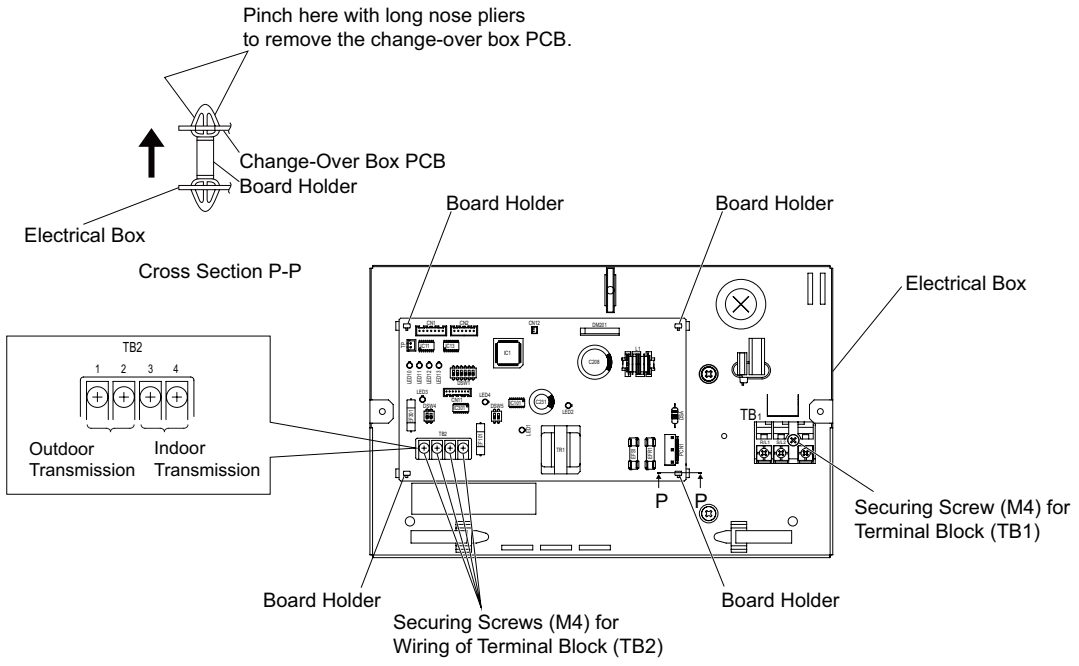
(2) Remove the communication wirings connected to the Terminal Block (TB2).

(3) Remove the screws securing the electrical components.

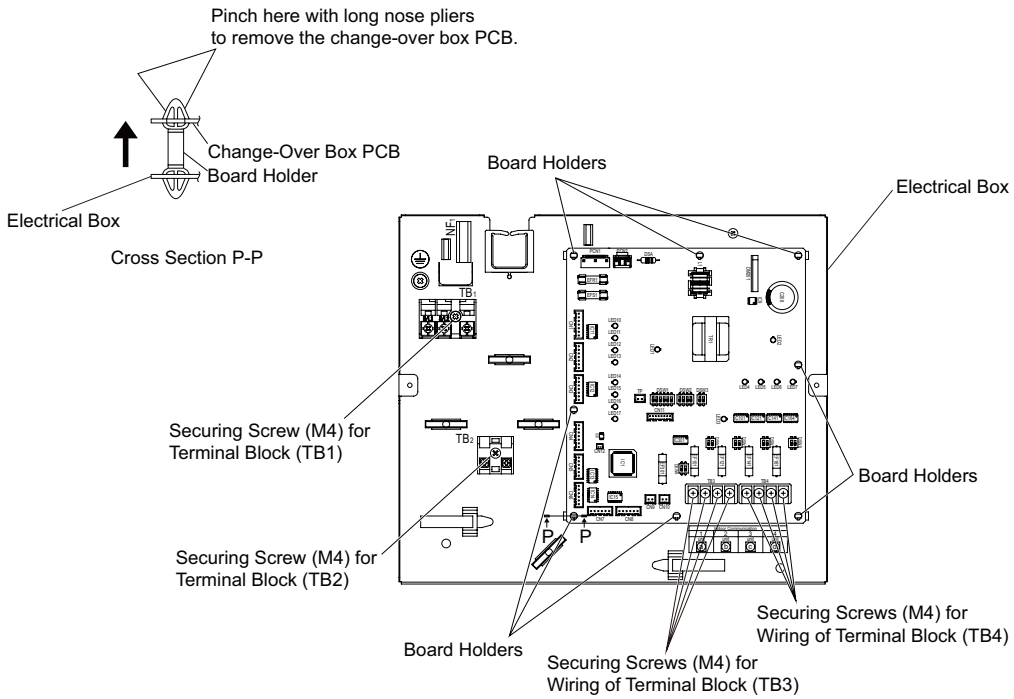
NOTE:
When reassembling the electrical components, match the terminal numbers with the mark band numbers and also match the colors of the connectors on the Change-Over Box PCB with the colors of the connector for wiring. If they are incorrectly connected, malfunction may occur or the electrical components may be damaged.

Tool	Phillips Screwdriver, Long Nose Pliers, Wire Cutter

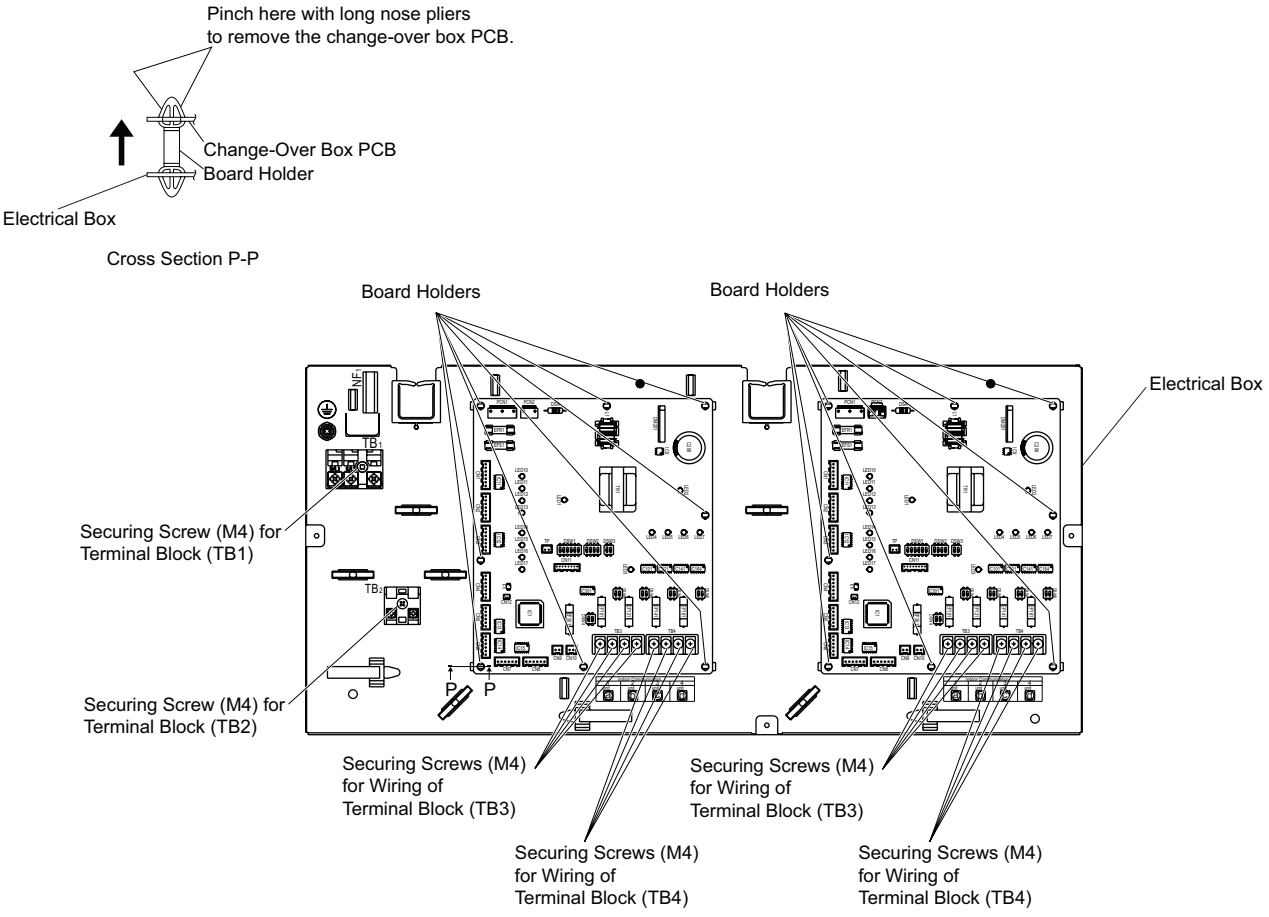
COBS048, 096B22S



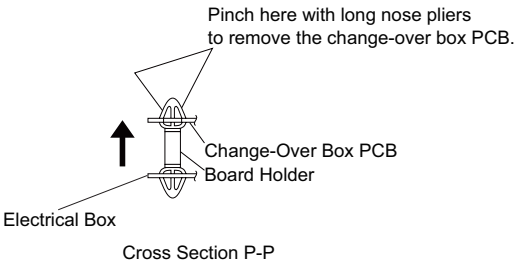
COB04M132B22S



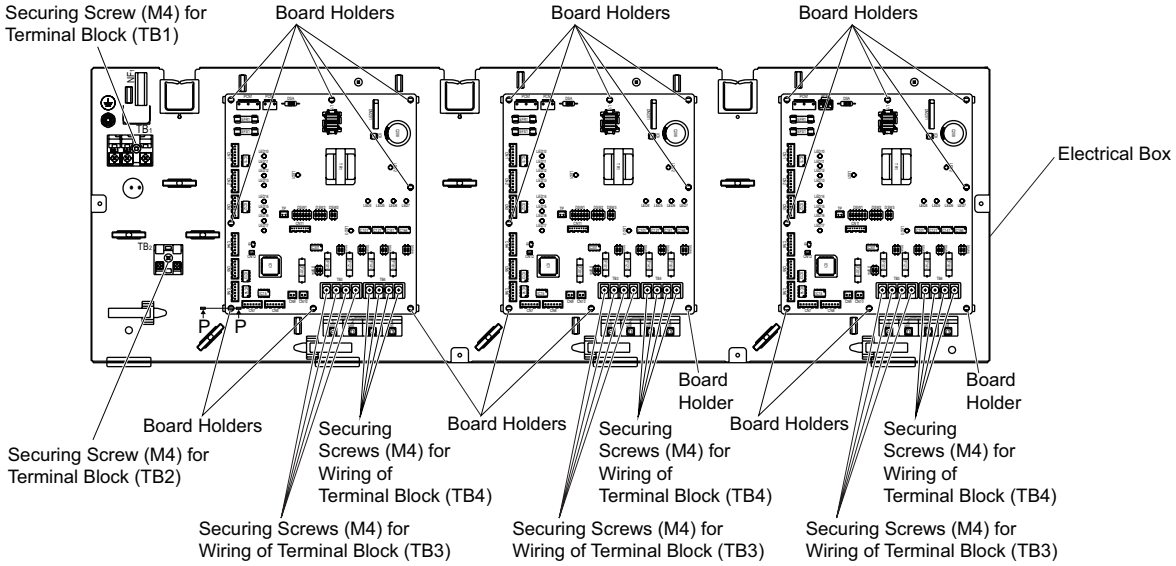
COB08M264B22S



COB12M264B22S



Cross Section P-P



⚠WARNING

TURN OFF all POWER supply switches.

4.1.17.3 Removing Electric Expansion Valve Coil

(1) Remove the front service cover according to Section 2.18.1 “Removing Service Cover for Electrical Box and Electronic Expansion Valve”.

(2) Removing Electronic Expansion Valve (MVD1~4, MVS1~4)

(a) Turn the electronic expansion valve coil. Remove the electronic expansion valve coil bracket from the electronic expansion valve slot.
Then, pull the coil upward and remove it.

(b) When replacing the electronic expansion valve coil, turn the coil bracket and press the coil into the electronic expansion valve slot.

NOTE:

- When replacing the electronic expansion valve, bind up the wirings with a cable band indicated in the figure. Make sure to bind up extra wirings and secure them with a wire clip. If not, water may enter the electrical box.
- When attaching Electronic Expansion Valve Coil to Electronic Expansion Valve, match the marking color in the table below.

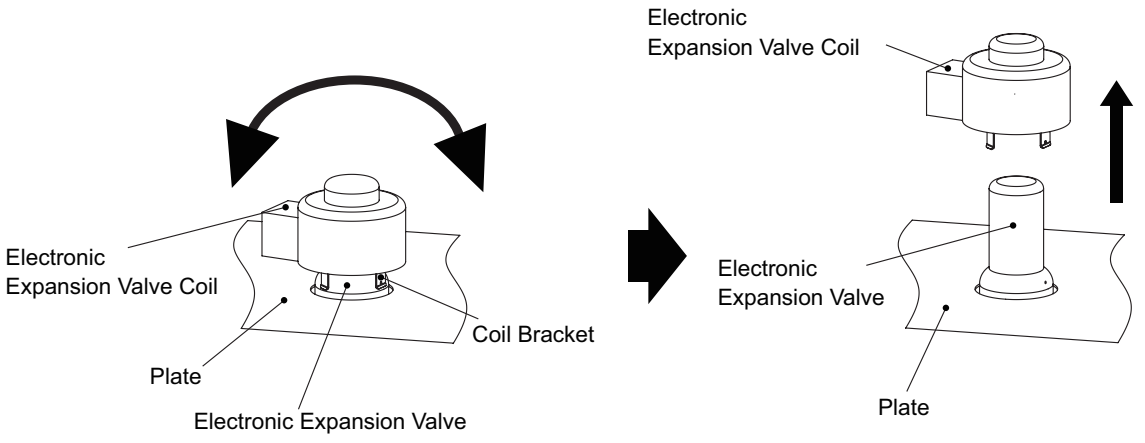
COBS048, 09622S

Mark	Marking Color
MVS1	White
MVD1	Blue

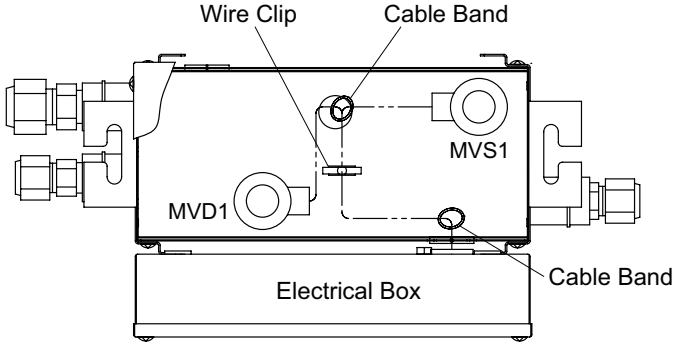
COB04M132, 08M264, 12M264B22S

Mark	Marking Color
MVD1, MVS1	White
MVD2, MVS2	Red
MVD3, MVS3	Blue
MVD4, MVS4	Black

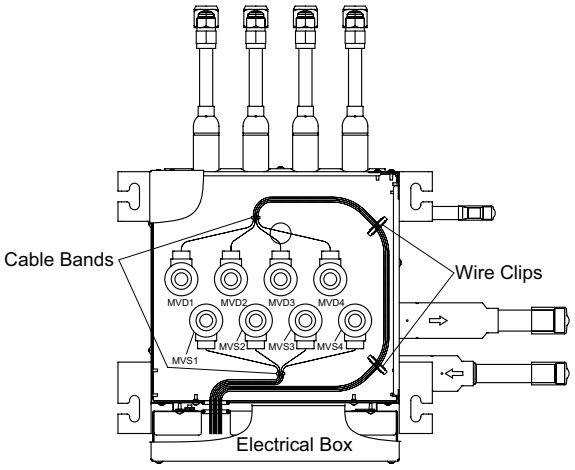
Tool	Wire Cutter



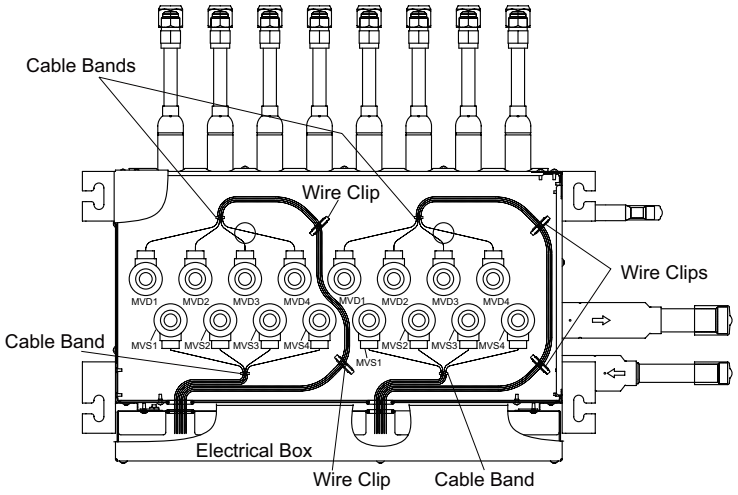
COBS048, 096B22S



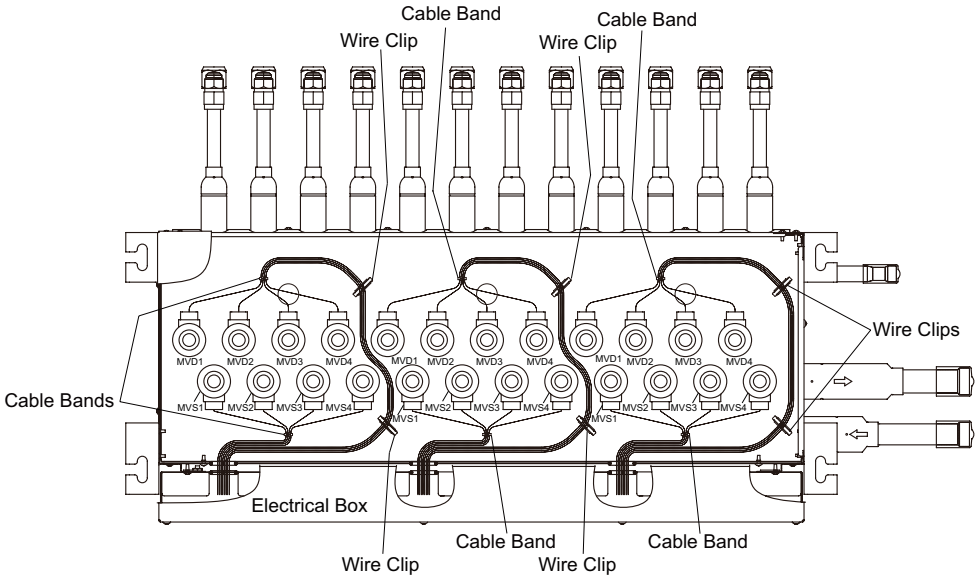
COB04M132B22S



COB08M264B22S



COB12M264B22S



⚠WARNING

TURN OFF all POWER supply switches.

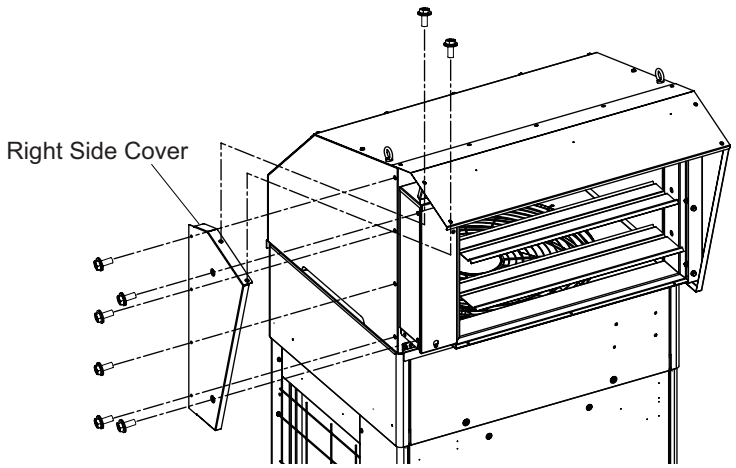
4.1.18 Removing Electrical Components for Low Ambient Kit

4.1.18.1 Removing Control Box Cover for Low Ambient Kit

(1) Remove eight screws (#10-16) securing the right side cover for low ambient kit.

NOTE:
In case of multiple outdoor units installation, the service of the damper actuator must be carried out by removing the upper hood of the unit on the left side of the unit to be serviced.

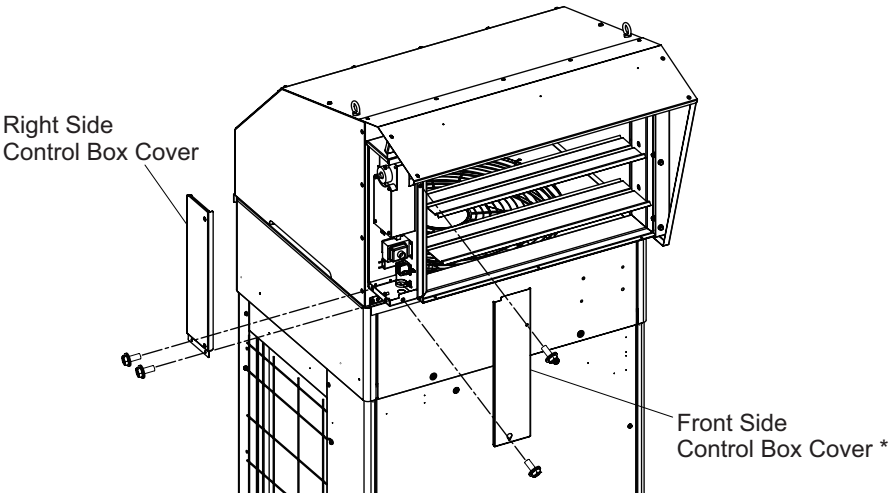
Tool	Nut Driver



(2) Remove two screws (#10-16) securing the front side control box cover for low ambient kit.

(3) Remove two screws (#10-16) securing the right side control box cover for low ambient kit.

Tool	Nut Driver



*: Front Side Control Box Cover can be removed without removing other covers.

⚠WARNING

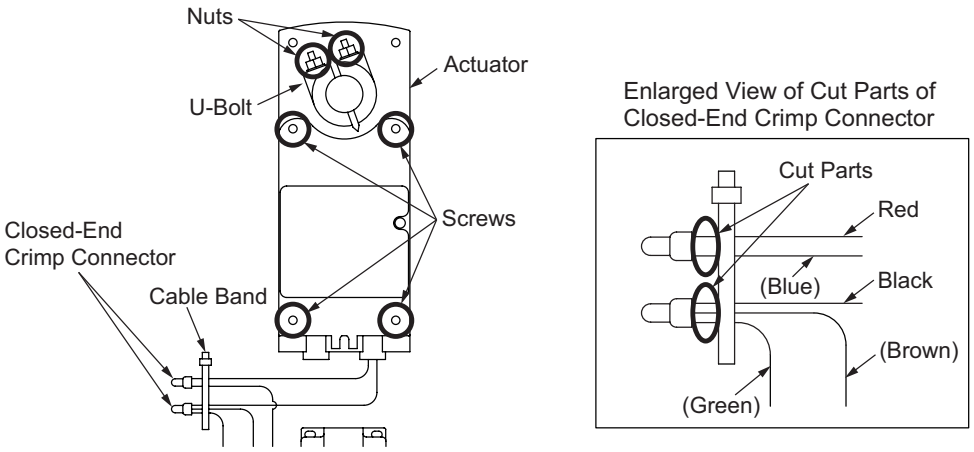
TURN OFF all POWER supply switches.

4.1.18.2 Removing Electrical Components for Low Ambient Kit

Removing Actuator

(1) Loosen two nuts of U-bolt securing the damper shaft.
(2) Cut the cable band (one place) securing the wires.
(3) Cut two wiring (red and black) from the actuator at the root of the closed-end crimp connector.
(4) Remove four screws (#10-32) securing the actuator.

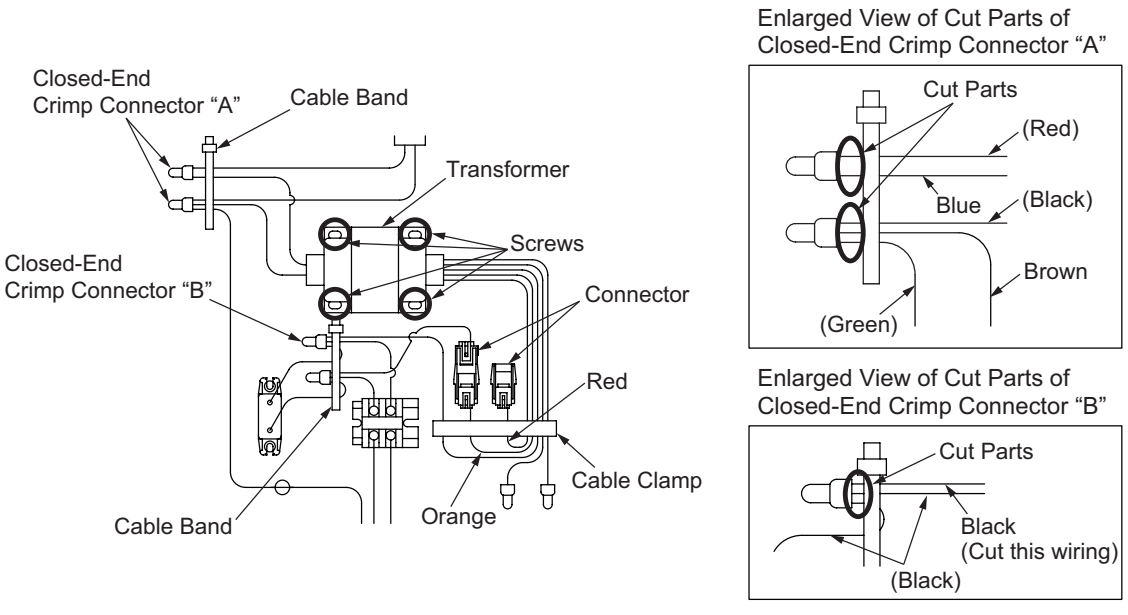
Tool	Adjustable Wrench, Wire Cutter, Nut Driver



Removing Transformer

(1) Remove the wirings from the cable clamp bundling wiring.
(2) Cut two cable bands securing the wiring.
(3) Cut two wiring (blue and brown) from the actuator at the root of the closed-end crimp connector “A”.
(4) Cut the wiring (black) from the terminal block at the root of the closed-end crimp connector “B”.
(5) Remove the connector (colors of wire: red or orange).
(6) Remove four screws (#8-18) securing the transformer.

Tool	Nut Driver, Wire Cutter



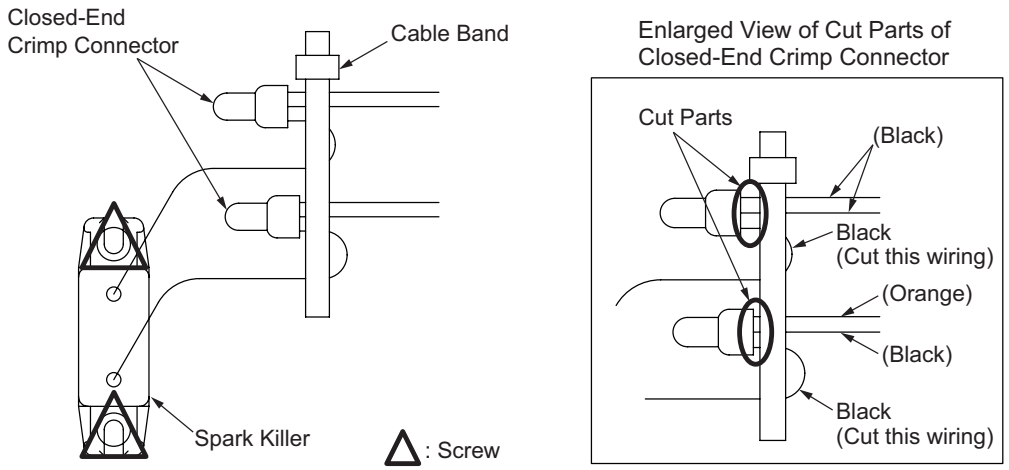
⚠WARNING

TURN OFF all POWER supply switches.

Removing Spark Killer

(1) Cut the cable band (one place) securing the wiring.
(2) Cut two wiring (black) from the spark killer at the root of the closed-end crimp connector.
(3) Remove two screws (#8-18) securing the spark killer.

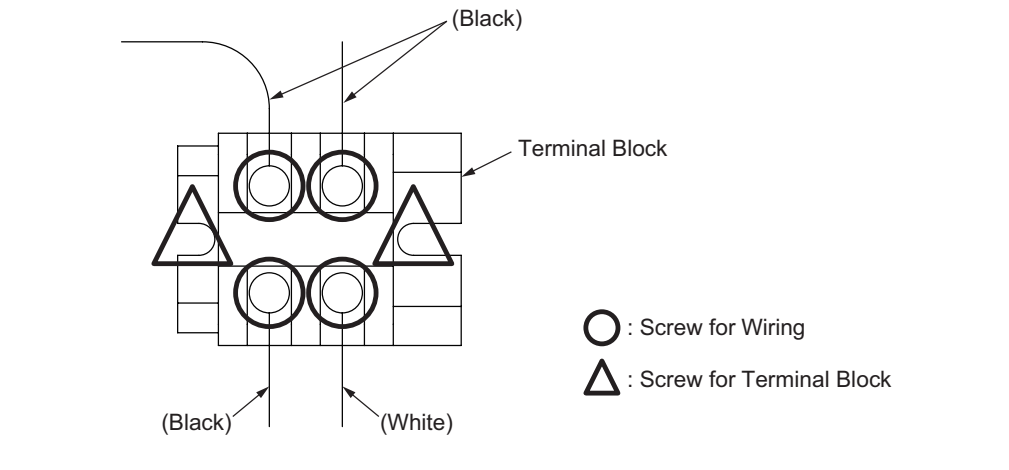
Tool	Nut Driver, Wire Cutter



Removing Terminal Block

(1) Remove four screws securing the wiring.
(2) Remove four screws (#8-18) securing the terminal block.

Tool	Phillips Screwdriver, Nut Driver



⚠WARNING

TURN OFF all POWER supply switches.

4.1.18.3 Removing Conduit Tube for Low Ambient Kit

(1) Remove the service cover, front cover and electrical box of outdoor unit over according to Section 4.1.1 “Removing Service Cover and Front Cover” and Section 4.1.6 “Removing Electrical Box Cover”.

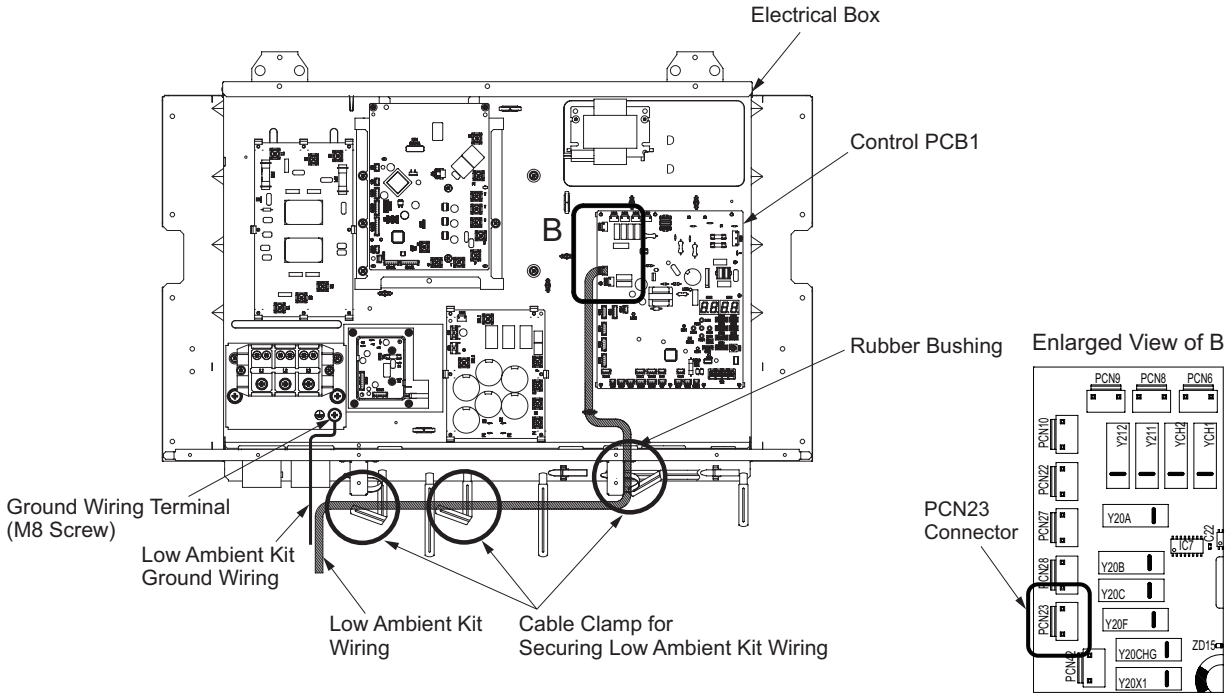
(2) Unplug the PCN23 connector from the PCB1 in the electrical box.

(3) Remove the cable clamps securing the wiring.
(H,Y)VAHR072B(3,4,5)2S: 3 places
(H,Y)VAHR096 - 192B(3,4,5)2S: 4places

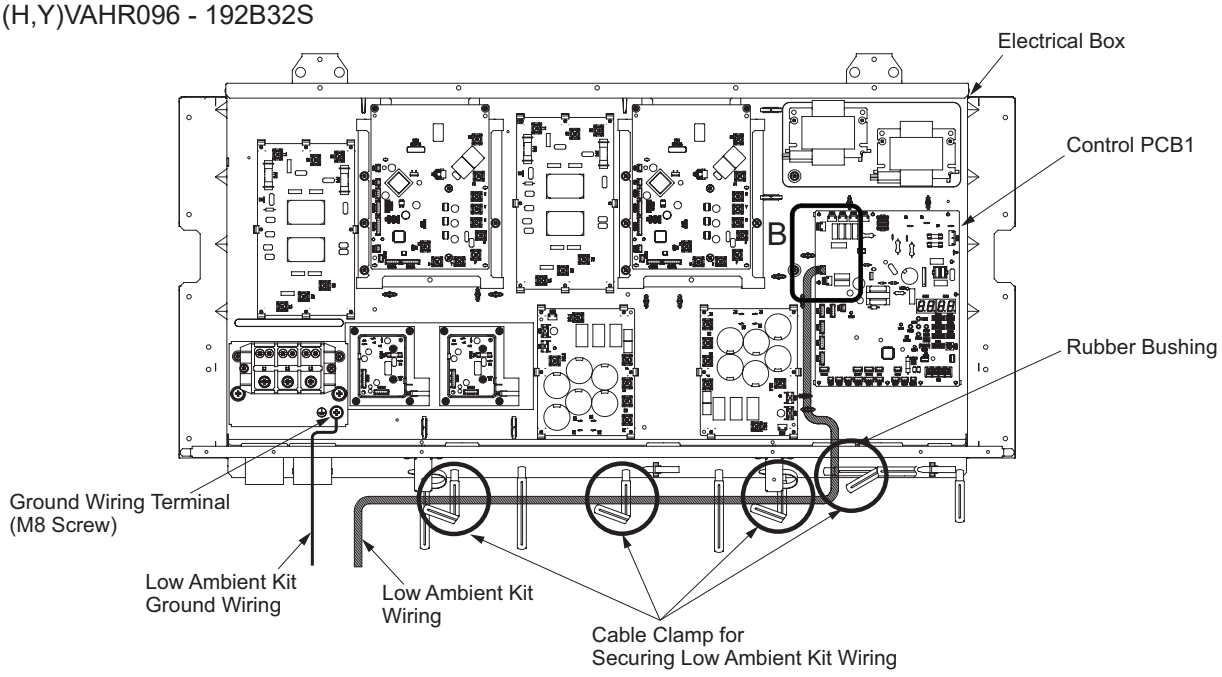
(4) Remove the ground wiring from the ground wiring terminal of the outdoor unit electrical box.

Tool	Phillips Screwdriver, Adjustable Wrench

(H,Y)VAHR072B32S



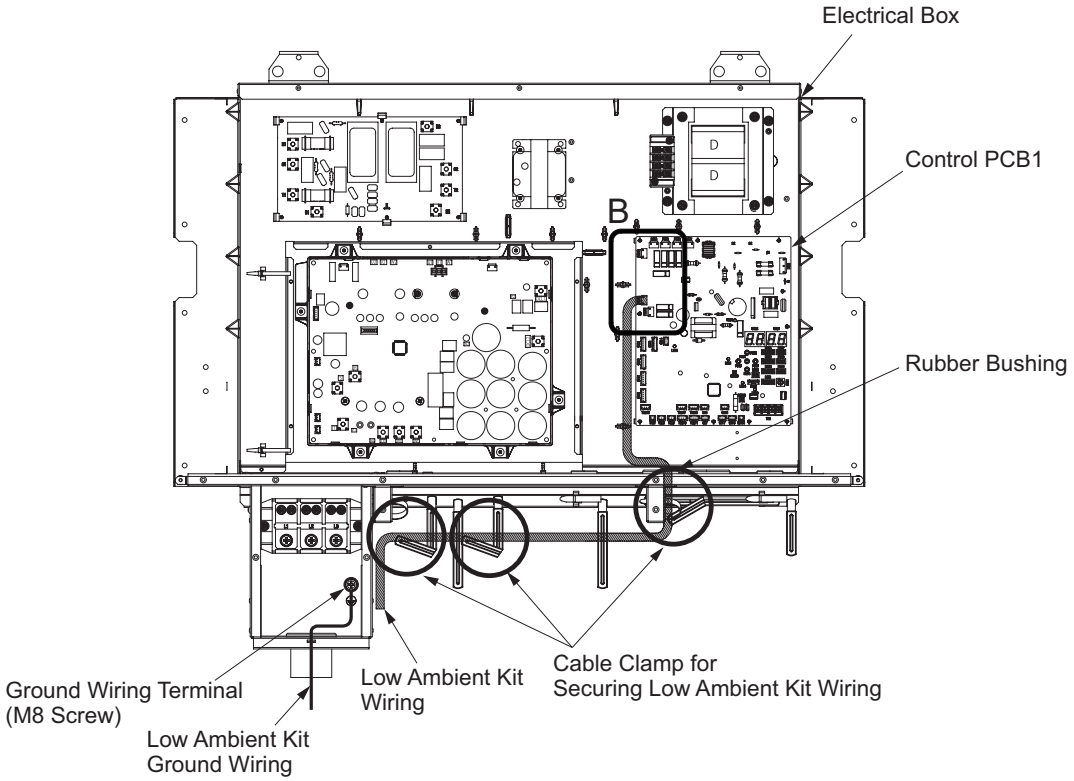
(H,Y)VAHR096 - 192B32S



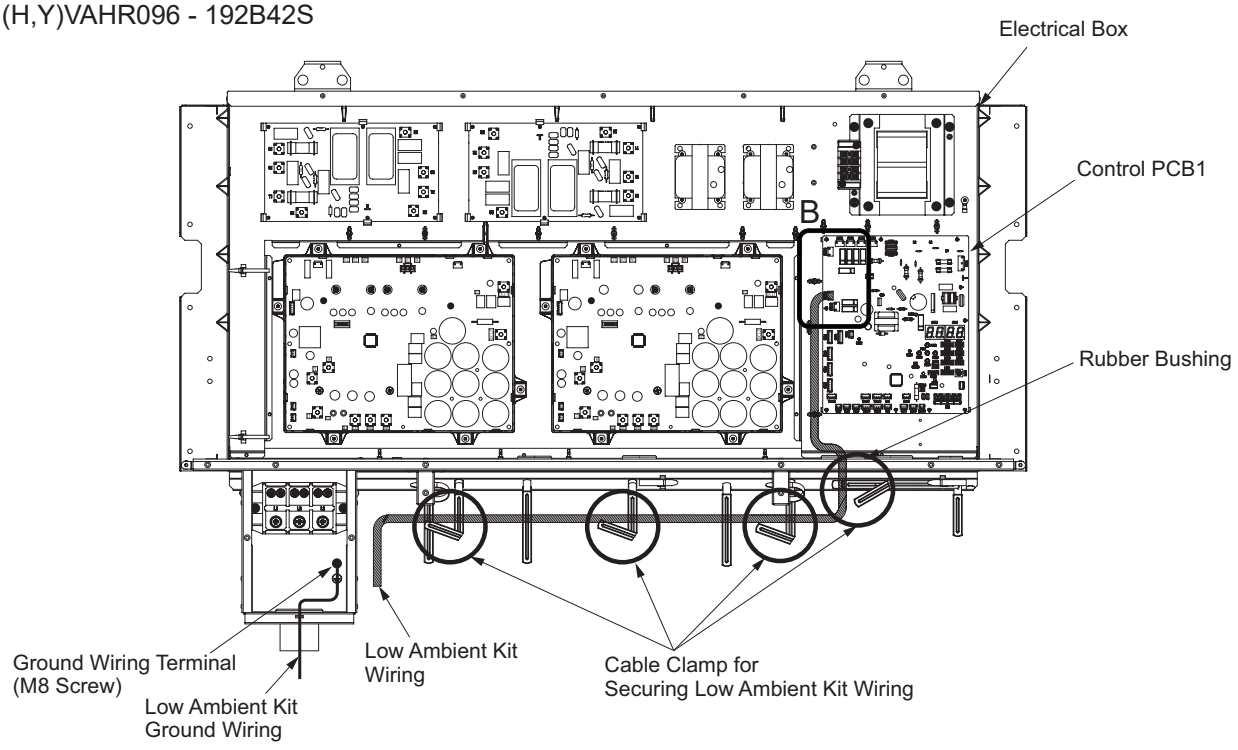
⚠WARNING

TURN OFF all POWER supply switches.

(H,Y)VAHR072B42S



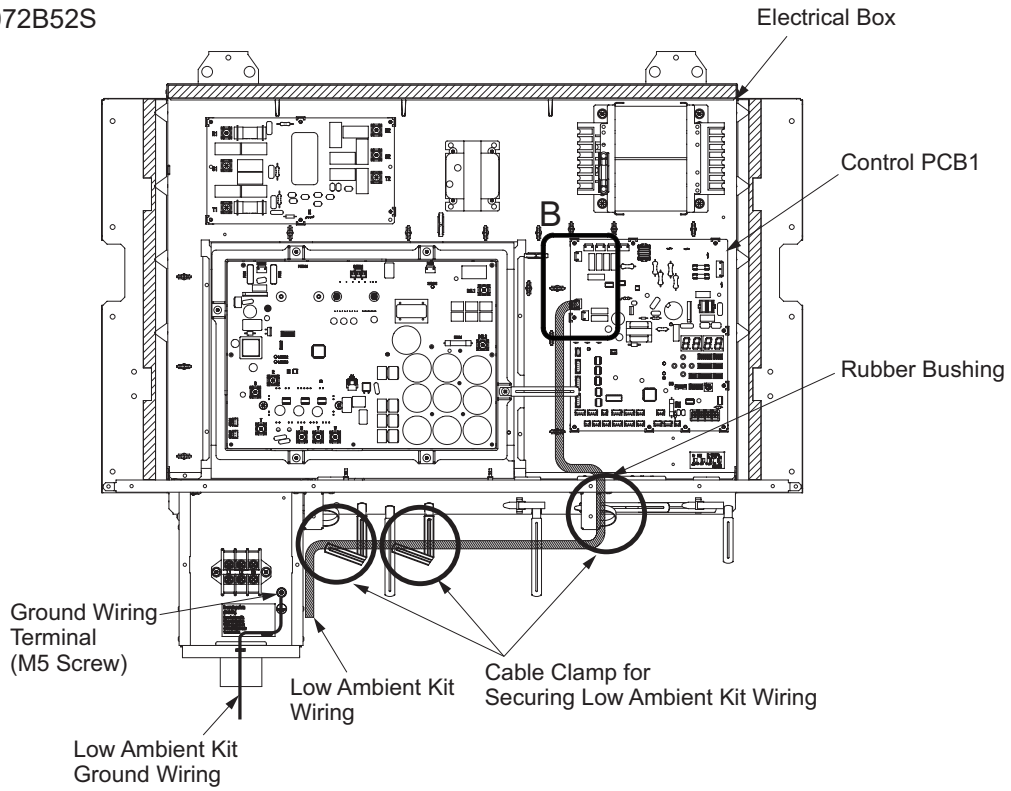
(H,Y)VAHR096 - 192B42S



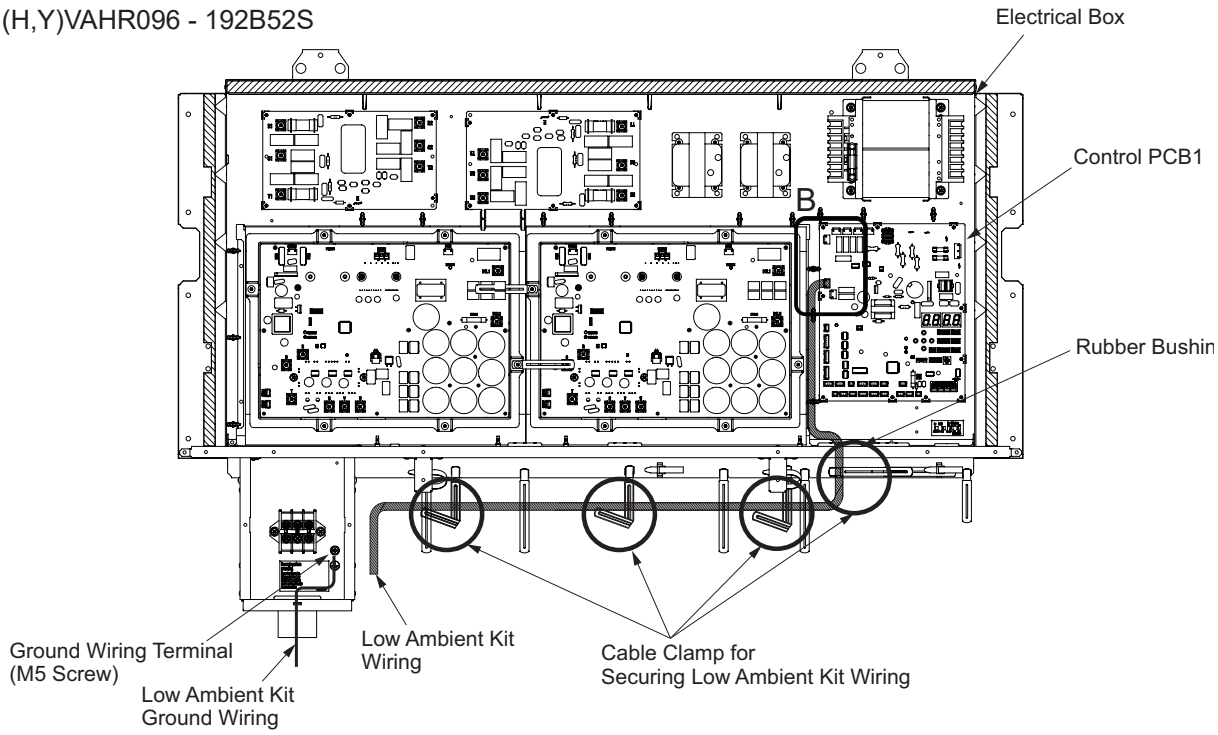
⚠WARNING

TURN OFF all POWER supply switches.

(H,Y)VAHR072B52S



(H,Y)VAHR096 - 192B52S



NOTE:

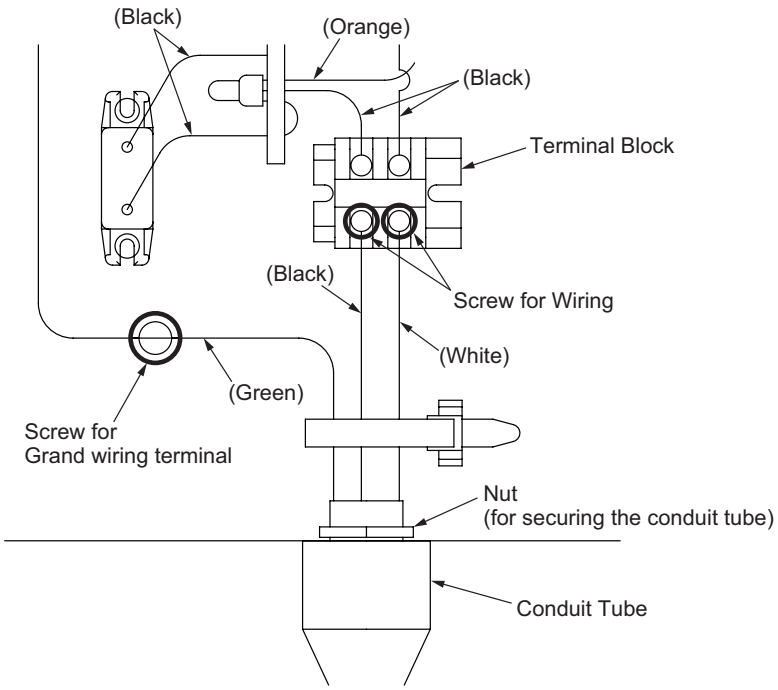
Silk print for PCN23 connector on the PCB1 of 575V type shows “BK” and PCN23 connector color is white. There is mismatch but this is correct.

⚠WARNING

TURN OFF all POWER supply switches.

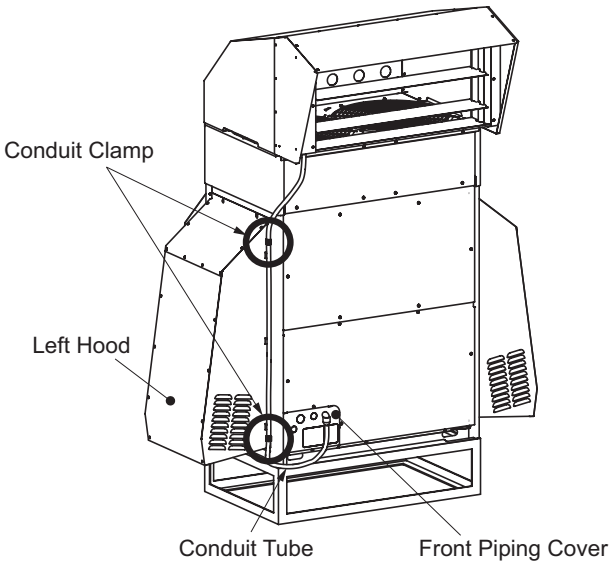
(5) Remove two screws for securing the wiring from the terminal block for the low ambient kit.
(6) Remove screw for securing the ground wiring from the ground wiring terminal for the low ambient kit.
(7) Remove the conduit tube from the control box for the low ambient kit by loosen the nut.

Tool	Phillips Screwdriver, Adjustable Wrench, Flathead Screwdriver



(8) Remove the conduit tube from the knockout hole of the front piping cover for the outdoor unit by loosen the nut.
(9) Remove two screws (#10-16) securing the conduit clamps and left hood.

Tool	Nut Driver



⚠WARNING

TURN OFF all POWER supply switches.

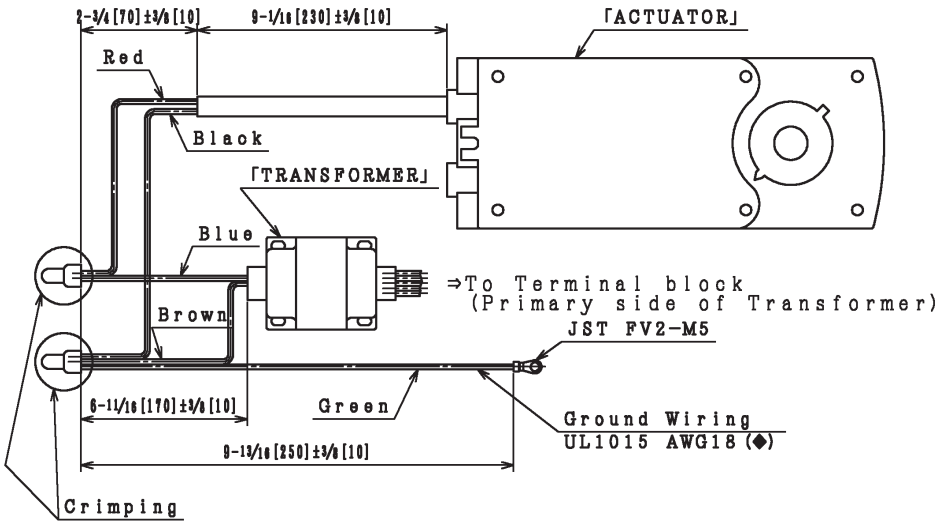
4.1.18.4 Installing Electrical Components

Adjust Wiring Length

Cut the wiring for each electrical component to the length as shown below.
Crimp the wiring and the closed-end crimp connector (field-supplied) when installing electrical components.

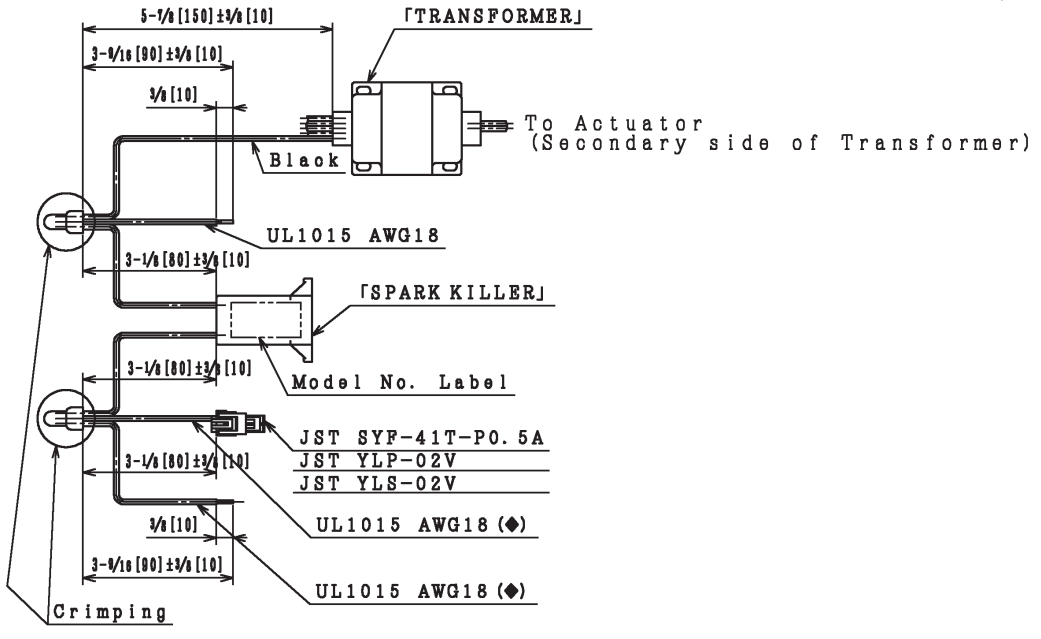
Detail views of wiring for “Transformer” wiring at the secondary side

Unit: inch (mm)



Detail views of wiring for “Transformer” primary side

Unit: inch (mm)



NOTE:
For the wiring (♦)other than attached to the electrical components, use wiring together with the terminal on the connector (field-supplied).

⚠WARNING

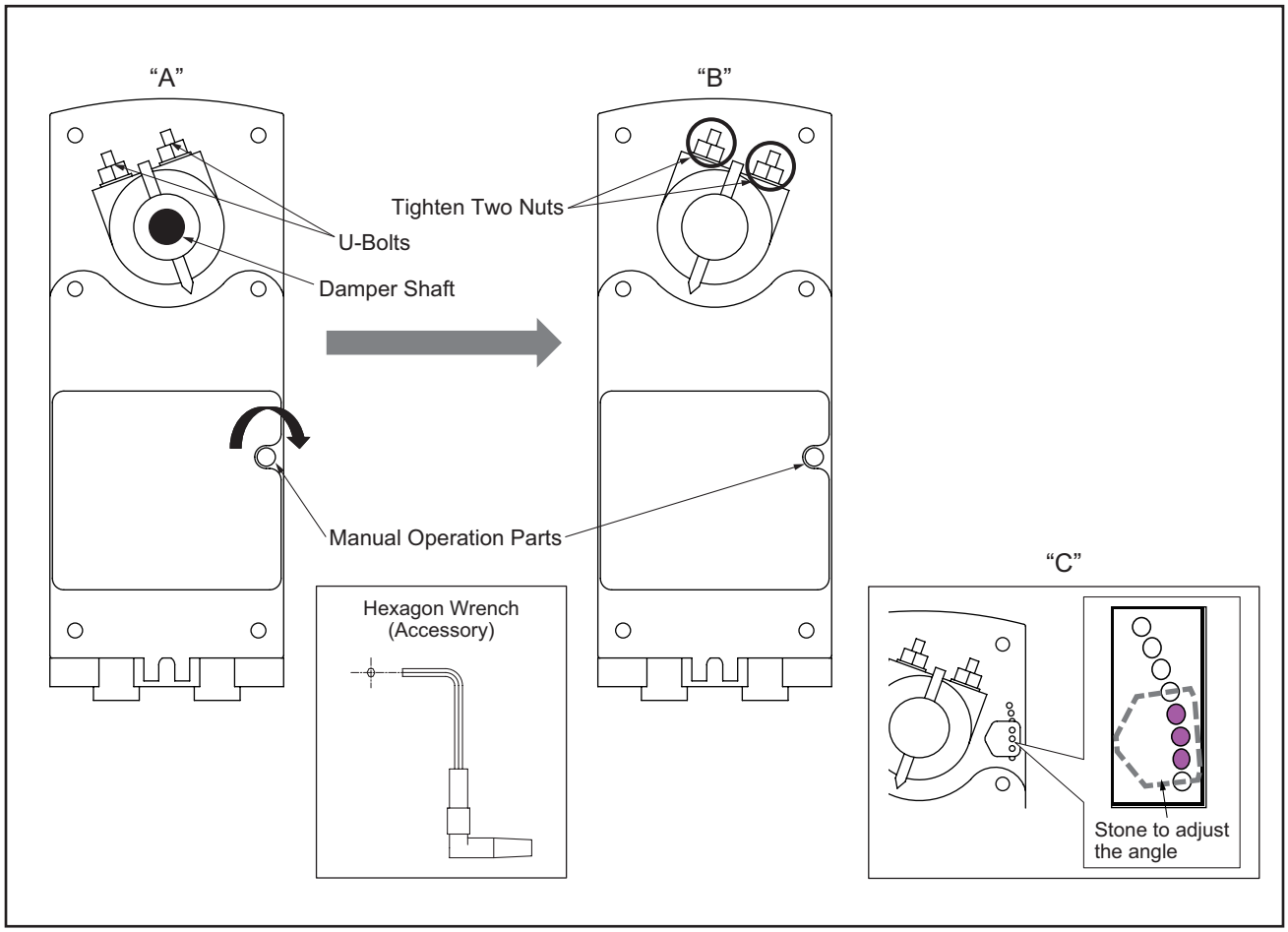
TURN OFF all POWER supply switches.

Installing Actuator

Secure the damper shaft and actuator with U-bolt while the damper in open position when installing actuator. Follow the procedure below.

(1) Turn off the power supply to outdoor unit.
(2) Change the position of U-bolt as shown in the figure “B”.
(3) Insert the hexagon-shaped end of the hexagon wrench (accessory) to the manual operation part on the actuator.
(4) Turn the hexagon wrench clockwise direction.
(5) When U-bolt is turned clockwise to the position where a tool for securing U-bolt can be inserted, then quickly make the hexagon wrench turn halfway in counter-clockwise direction and lock the spring return.
(6) Remove the hexagon wrench. (To prevent the spring return)
(7) Tighten temporarily the two nuts of U-bolt by hand and secure to the damper shaft with 8.1 to 10.3 lbf.ft (11 to 14 N.m) force.
(8) Insert the hexagon wrench to the manual operation part again, turn it counter-clockwise and put U-bolts back to the original position.
(9) Check to ensure that the damper closes to the correct position. Refer to Section 4.2.2.3 “Damper Operation and Damper Opening Check” for details of check method.

Tool	Hexagon Wrench, Adjustable Wrench, Torque Wrench, Phillips Screwdriver



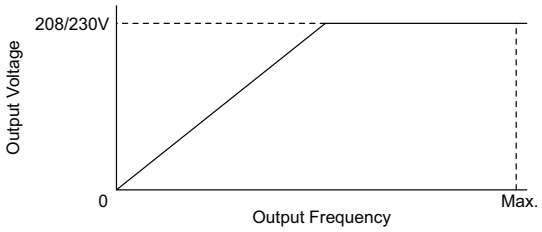
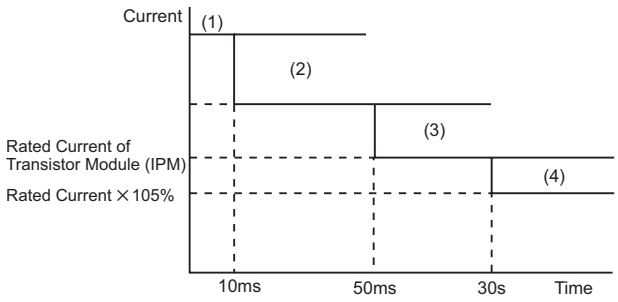
IMPORTANT:
Applying excessive torque to the manual override or running the manual override with a power tool may damage the internal components of the actuator and cause premature failure.

4.2 Main Parts

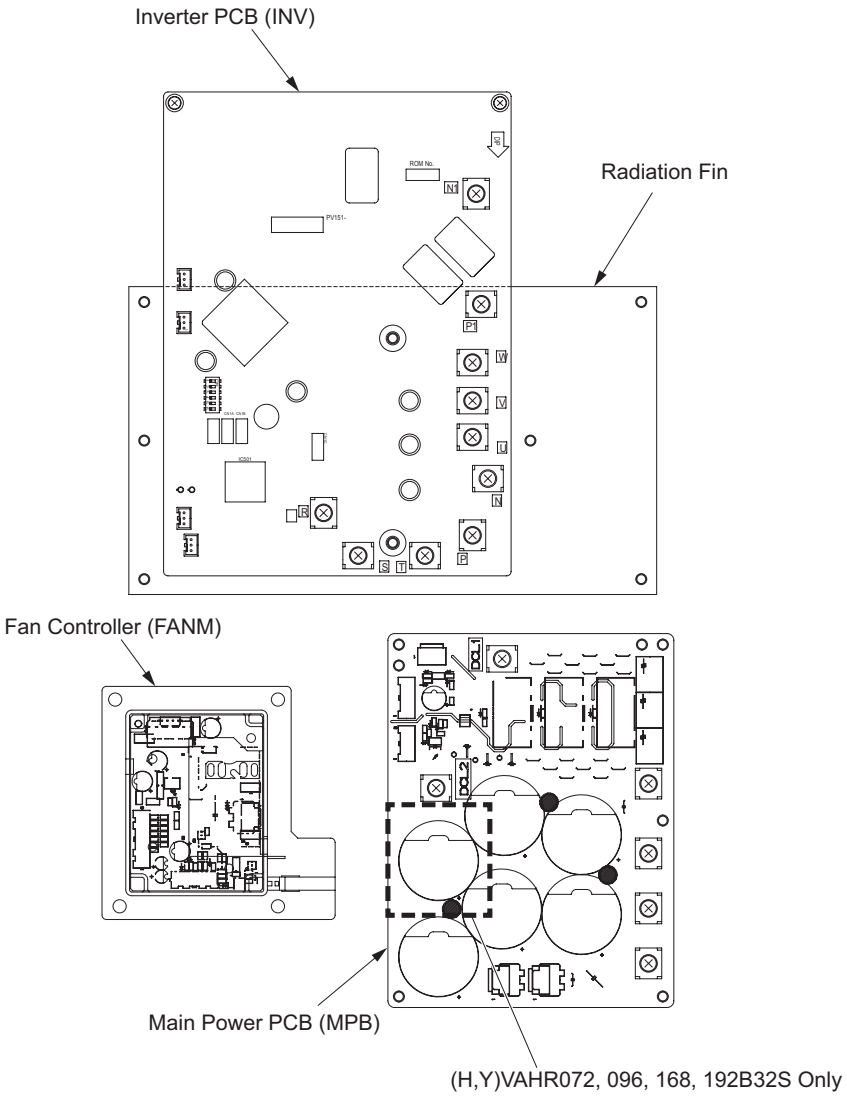
4.2.1 for Outdoor Unit

4.2.1.1 Inverter for 208/230V Type

1 Specifications of Inverter (208/230V Type)

Applicable Model	(H,Y)VAHR120, 144B32S	(H,Y)VAHR072, 096, 168, 192B32S
Applicable Power Supply	208-230V 3PH 60Hz	
Output Voltage (Maximum)	208/230V	
Output Current (Maximum)		
Inverter PCB	38A	48A
Fan Controller	7A	
Control Method	Vector PWM Control	
Range Output Frequency		
Inverter PCB	11Hz to 130Hz	9Hz to 105Hz
Fan Controller	0 to 21.7rps	
Accuracy of Frequency	0.01Hz	
Output / Characteristics		
Soft Control Speed	0.125Hz/s, 0.25Hz/s, 0.5Hz/s, 1Hz/s, 3Hz/s (5 Steps)	
Protection Function		
Excessive High or Low Voltage for Inverter	◆ Stoppage Code for Inverter (Itc)= 5 Excessive Low Voltage at a DC Voltage is Lower than 196V. ◆ Stoppage Code for Inverter (Itc)= 6 Excessive High Voltage at a DC Voltage is Higher than 424V.	
Abnormality of Current Sensor	◆ Stoppage Code for Inverter (Itc)= 8 The wave height value of running current for the phase positioning is less than the determination value before the compressor is started (at completion of the phase positioning).	
Protection Function Overcurrent Protection for Inverter	 ◆ Stoppage Code for Inverter (Itc)= 1 (1) Short-Circuit Trip of Arm (2) Instantaneous Overcurrent Trip ◆ Stoppage Code for Inverter (Itc)= 2 (3) Instantaneous Overcurrent Trip When detecting current is more than rated current of Transistor Module, overcurrent is detected. ◆ Stoppage Code for Inverter (Itc)= 4 (4) Electronic Thermal Trip When the current detected by current sensor exceeds 105% of the rated current continuously for 30 seconds or for 3 minutes in total during a 10-minute period, overcurrent is detected.	
Protection of Power Module (CIB, IPM)	◆ Stoppage Code for Inverter (Itc)= 1 Power module (CIB, IPM) has three protection functions for self-protection. (1) Some of the output terminals between "U" and "V", "V" and "W", "W" and "U" have a short-circuit. (2) Running current reaches the maximum rated current. (3) Control voltage decreases abnormally.	
Fin Temperature Increase	◆ Stoppage Code for Inverter (Itc)= 3 The unit is stopped when the CIB temperature is higher than 222°F (106°C).	◆ Stoppage Code for Inverter (Itc)= 3 The unit is stopped when the CIB temperature is higher than 232°F (111°C).
Earth Detection	◆ Stoppage Code for Inverter (Itc)= 12 The unit is stopped when the compressor is grounded.	

● Arrangement of Inverter Power Unit



(Main Parts)

2 Testing Inverter Parts (208/230V Type)

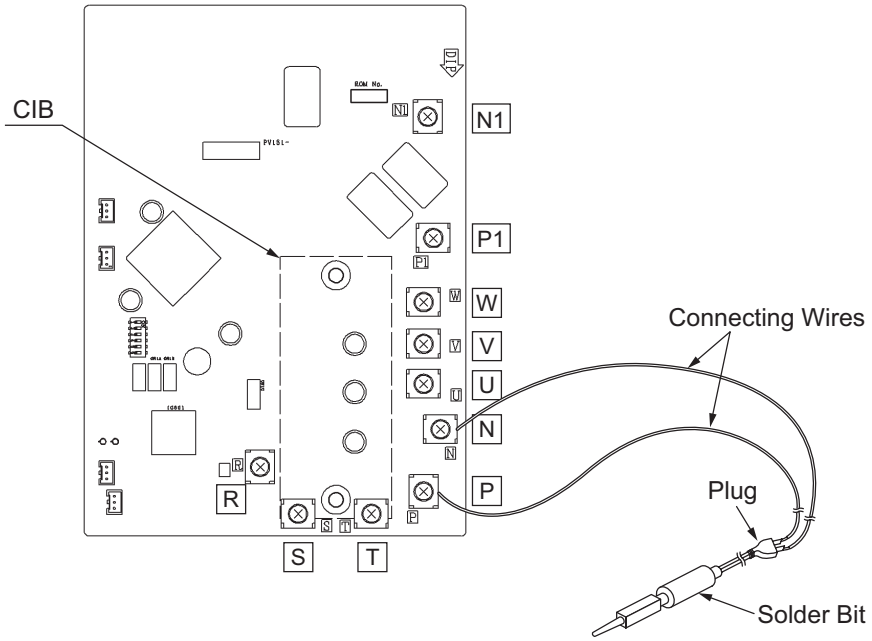
● High Voltage Discharge Work for Replacing Parts

⚠CAUTION

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

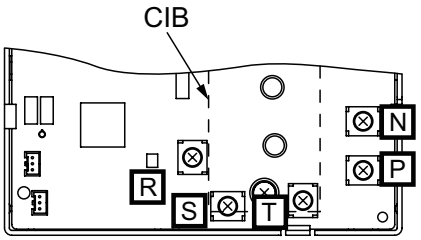
< Procedures >

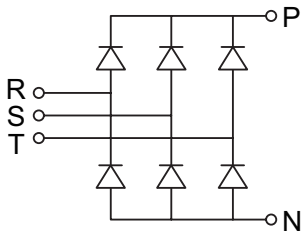
(a) Turn OFF the main switches and wait for three minutes. Check to ensure that no high voltage exists. If LED501 on the main power PCB (MPB) is ON after start-up and LED501 on MPB is OFF after turning OFF power supply, the voltage will decrease to DC50V or less.
(b) Attach connecting wires to a plug of electrical solder bit.
(c) Attach the wires to terminals, P and N on the inverter PCB (INV). => Discharge is started, resulting in hot solder bit.
(d) Wait for two or three minutes and measure the voltage again. Check to ensure that no voltage is charged.



● Testing the Inverter PCB (INV: PV151)

(1) Outer Appearance and Rectifier Circuit of CIB



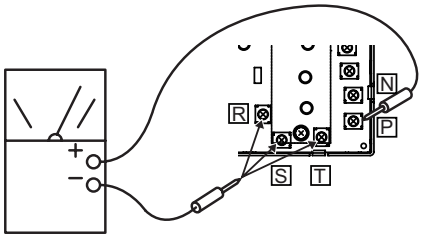


If procedures (a) to (d) are performed and the results are satisfactory, the CIB on the inverter PCB (INV) is normal.

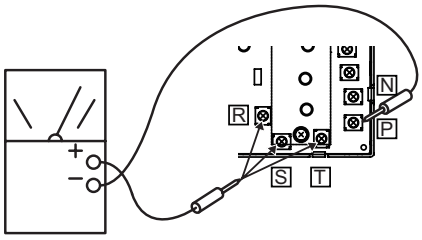
NOTICE

Recommended using an analog tester.

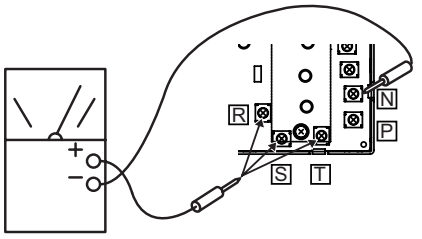
(a) By touching the + side of the tester to the P terminal of the inverter PCB and the - side of tester to R, S, and T of the inverter PCB, measure the resistance.



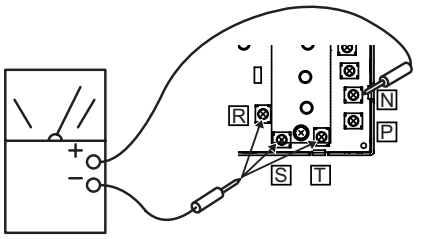
(b) By touching the - side of the tester to the P terminal of the inverter PCB and the + side of tester to R, S, and T of the inverter PCB, measure the resistance.



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

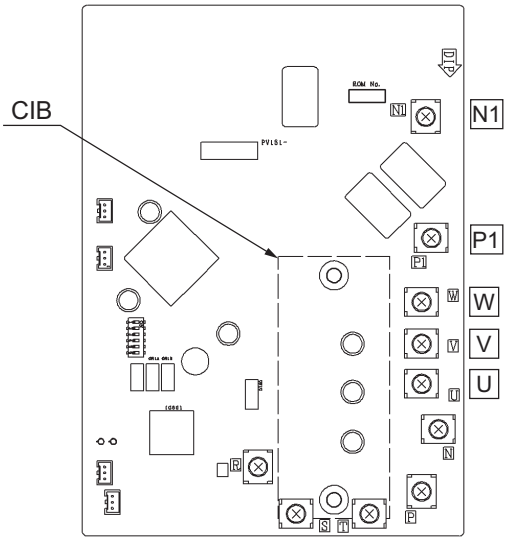


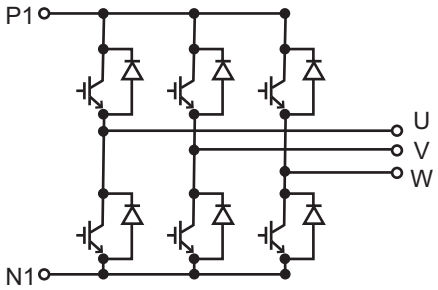
(d) By touching the + side of the tester to the N terminal of the inverter PCB and the - side of tester to R, S, and T of the inverter PCB, measure the resistance



Measurement Point			Criterion	
Item	Tester		Analog Tester	Digital Tester (Diode Check Mode)
	(+)	(-)		
(a)	P	R/S/T	1kΩ or more (Measured Range: 1kΩ)	Over Load
(b)	R/S/T	P	100kΩ or more (Measured Range: 10kΩ)	1.0V or less
(c)	R/S/T	N	1kΩ or more (Measured Range: 1kΩ)	Over Load
(d)	N	R/S/T	100kΩ or more (Measured Range: 10kΩ)	1.0V or less

(2) Internal Circuit of CIB Outlet Part



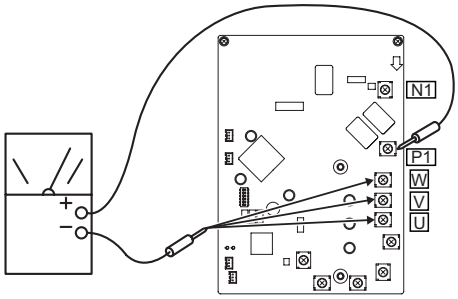


If procedures (a) to (d) are performed and the results are satisfactory, the CIB on the inverter PCB is normal.

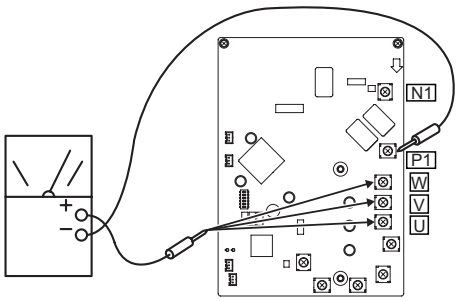
NOTICE

Recommended using an analog tester.

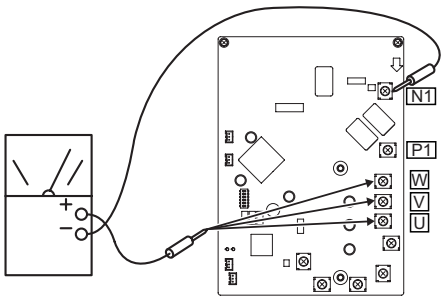
(a) By touching the + side of the tester to the P1 terminal of the inverter PCB and the - side of tester to U, V, and W of the inverter PCB, measure the resistance.



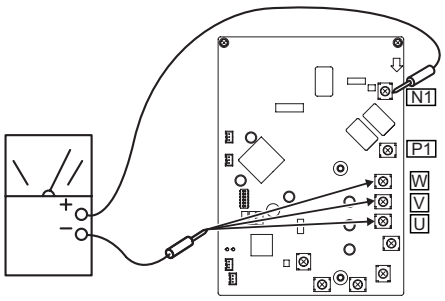
(b) By touching the - side of the tester to the P1 terminal of the inverter PCB and the + side of tester to U, V, and W of the inverter PCB, measure the resistance.



(c) By touching the - side of the tester to the N1 terminal of the inverter PCB and the + side of tester to U, V, and W of the inverter PCB, measure the resistance.



(d) By touching the + side of the tester to the N1 terminal of the inverter PCB and the - side of tester to U, V, and W of the inverter PCB, measure the resistance.



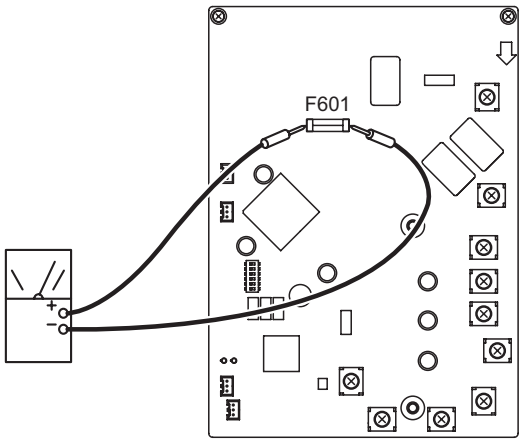
Measurement Point			Criterion	
Item	Tester		Analog Tester	Digital Tester (Diode Check Mode)
	(+)	(-)		
(a)	P1	U/V/W	1kΩ or more (Measured Range: 1kΩ)	Over Load
(b)	U/V/W	P1	100kΩ or more (Measured Range: 10kΩ)	1.0V or less
(c)	U/V/W	N1	1kΩ or more (Measured Range: 1kΩ)	Over Load
(d)	N1	U/V/W	100kΩ or more (Measured Range: 10kΩ)	1.0V or less

(Main Parts)

(3) Testing the Fuse for Inverter Power

By touching the + and - side of the tester on each side of the fuse (F601), measure the resistance.
If the resistance is 0Ω, it is normal.

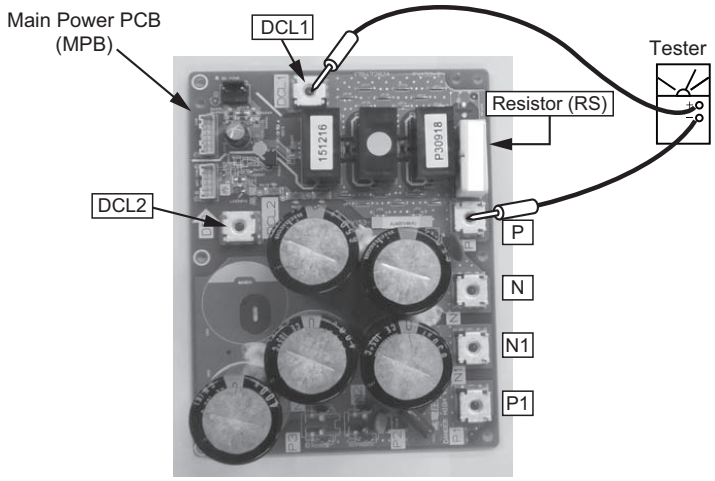
NOTICE:
Set analog, or digital tester at 1kΩ.



● Testing the Main Power PCB (MPB: PV153)

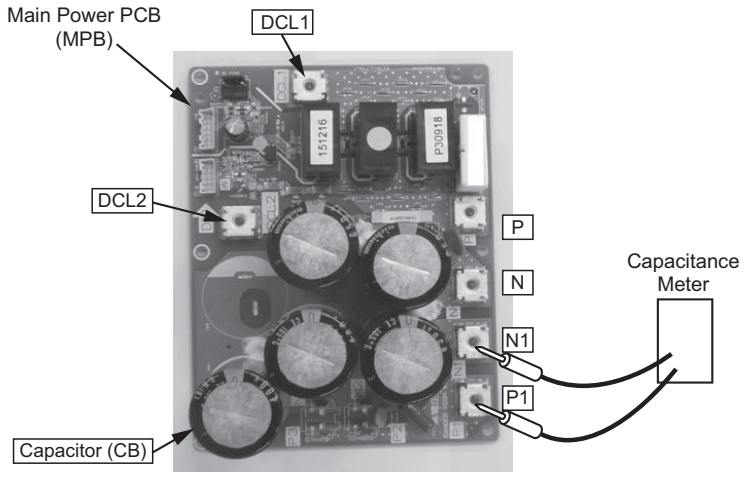
There are the capacitor and resistor on MPB.

(1) Testing the Resistor
Measure the resistance using the tester between the P1 and DCL1 terminal of MPB.
If the resistance is 500Ω±5%, it is normal. (0Ω or ∞Ω: abnormal)



(2) Testing the Capacitor

(a) Check that the capacitor does not show signs of burns or isn't swollen.
(b) Measure the capacitance using the capacitance meter between the P1 and N1 terminal of MPB.
If the capacitance is 3250μF±10% or 3900μF±10%, it is normal.



● Testing Fan Controller Failure

⚠CAUTION

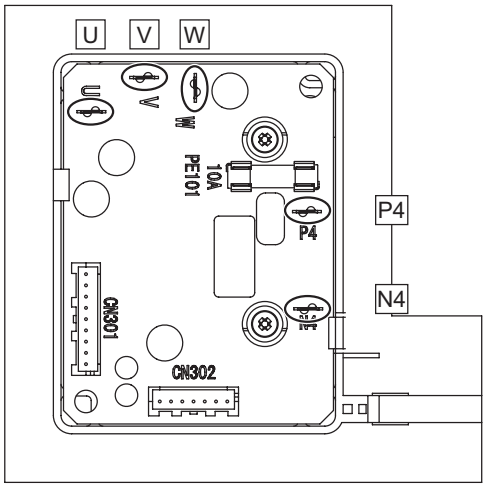
Perform this high voltage discharge work to avoid an electric shock.

NOTICE

Recommend using an analog tester.

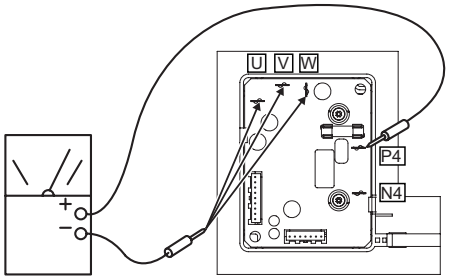
(a) Turn OFF the main supply before this work.
Ensure that LED501 on the main power PCB (MPB) is turned OFF.
If LED501 on MPB is turned ON, an electrical shock may occur from residual voltage over DC 50V to the fan controller (FANM).

(b) Disconnect all the wirings connected to the fan controller.

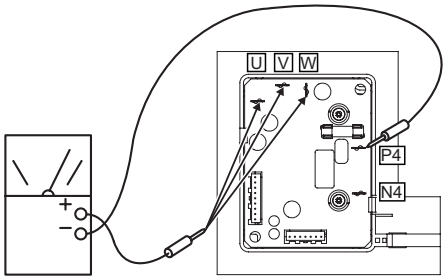


(Main Parts)

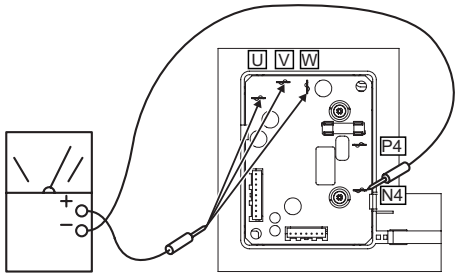
(c) By touching the + side of the tester to the P4 terminal of fan controller and the - side of tester to U, V, and W of the fan controller, measure the resistance.



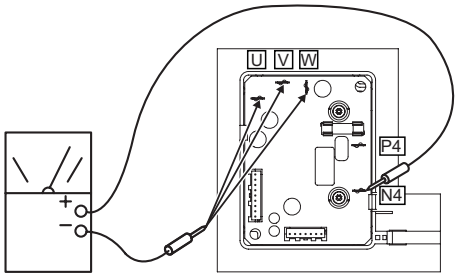
(d) By touching the - side of the tester to the P4 terminal of fan controller and the + side of tester to U, V, and W of the fan controller, measure the resistance.



(e) By touching the - side of the tester to the N4 terminal of fan controller and the + side of tester to U, V, and W of the fan controller, measure the resistance.



(f) By touching the + side of the tester to the N4 terminal of fan controller and the - side of tester to U, V, and W of the fan controller, measure the resistance.

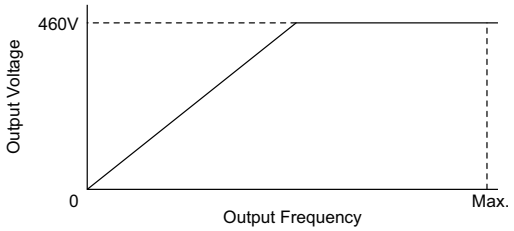
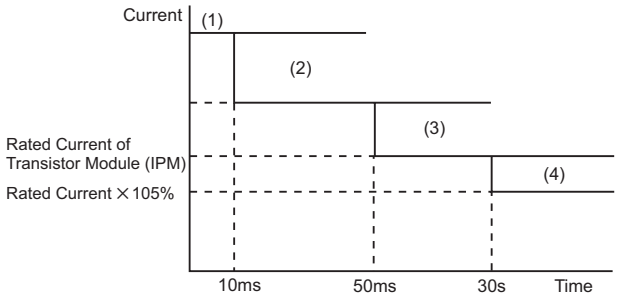


Measurement Point			Criterion	
Item	Tester		Analog Tester	Digital Tester (Diode Check Mode)
	(+)	(-)		
(c)	P4	U/V/W	1kΩ or more (Measured Range: 1kΩ)	Over Load
(d)	U/V/W	P4	900kΩ or more (Measured Range: 10kΩ)	1.0V or less
(e)	U/V/W	N4	1kΩ or more (Measured Range: 1kΩ)	Over Load
(f)	N4	U/V/W	900kΩ or more (Measured Range: 10kΩ)	1.0V or less

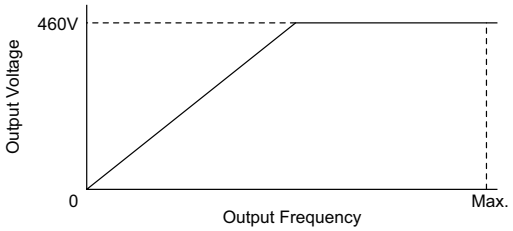
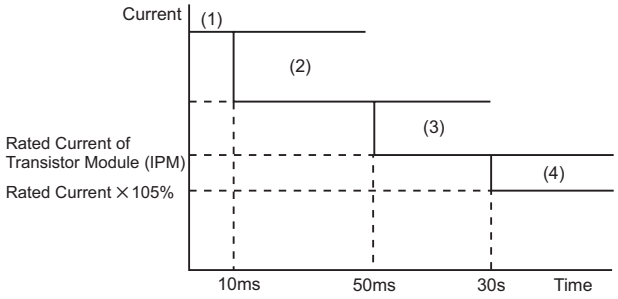
4.2.1.2 Inverter for 460V, 575V Type

1 Specifications of Inverter (460V, 575V Type)

(1) 460V Type

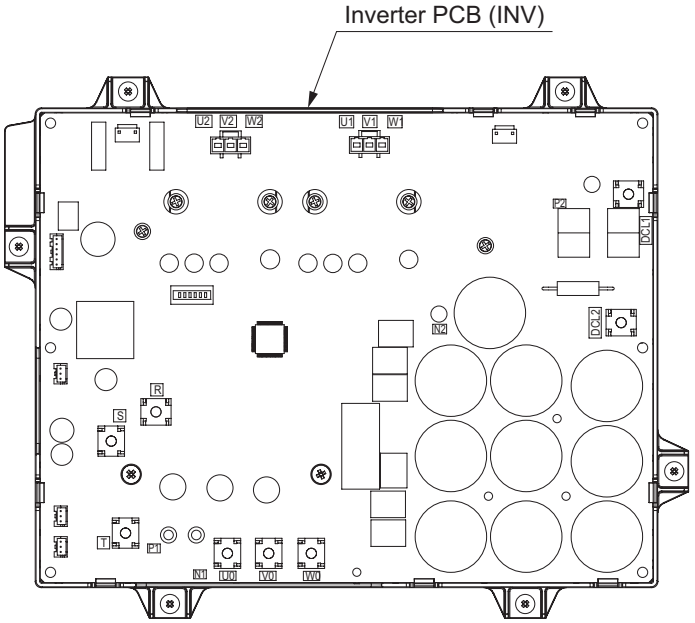
Applicable Model	(H,Y)VAHR120, 144B42S	(H,Y)VAHR072, 096, 168, 192B42S
Applicable Power Supply	460V 3PH 60Hz	
Output Voltage (Maximum)	460V	
Output Current (Maximum)		
Inverter PCB	19.5A	26A
Fan Controller	3.5A	
Control Method	Vector PWM Control	
Range Output Frequency		
Inverter PCB	11Hz to 130Hz	9Hz to 105Hz
Fan Controller	0 to 21.7rps	
Accuracy of Frequency	0.01Hz	
Output / Characteristics		
Soft Control Speed	0.125Hz/s, 0.25Hz/s, 0.5Hz/s, 1Hz/s, 3Hz/s (5 Steps)	
Protection Function		
Excessive High or Low Voltage for Inverter	◆ Stoppage Code for Inverter (Itc)= 5 Excessive Low Voltage at a DC Voltage is Lower than 396V. ◆ Stoppage Code for Inverter (Itc)= 6 Excessive High Voltage at a DC Voltage is Higher than 844V.	
Abnormality of Current Sensor	◆ Stoppage Code for Inverter (Itc)= 8 The wave height value of running current for the phase positioning is less than the determination value before the compressor is started (at completion of the phase positioning).	
Protection Function Overcurrent Protection for Inverter	 ◆ Stoppage Code for Inverter (Itc)= 1 (1) Short-Circuit Trip of Arm (2) Instantaneous Overcurrent Trip ◆ Stoppage Code for Inverter (Itc)= 2 (3) Instantaneous Overcurrent Trip When detecting current is more than rated current of Transistor Module, overcurrent is detected. ◆ Stoppage Code for Inverter (Itc)= 4 (4) Electronic Thermal Trip When the current detected by current sensor exceeds 105% of the rated current continuously for 30 seconds or for 3 minutes in total during a 10-minute period, overcurrent is detected.	
Protection of Power Module (CIB, IPM)	◆ Stoppage Code for Inverter (Itc)= 1 Power module (CIB, IPM) has three protection functions for self-protection. (1) Some of the output terminals between "U" and "V", "V" and "W", "W" and "U" have a short-circuit. (2) Running current reaches the maximum rated current. (3) Control voltage decreases abnormally.	
Fin Temperature Increase	◆ Stoppage Code for Inverter (Itc)= 3 The unit is stopped when the CIB temperature is higher than 230°F (110°C).	
Earth Detection	◆ Stoppage Code for Inverter (Itc)= 12 The unit is stopped when the compressor is grounded.	

(2) 575V Type

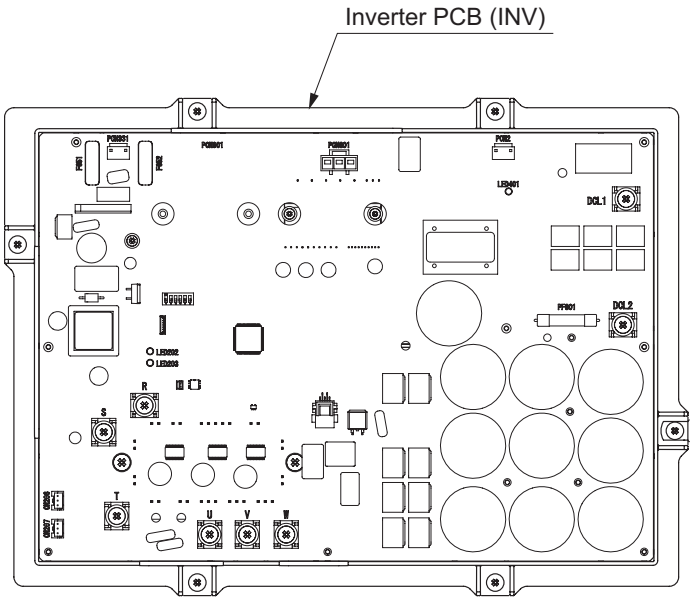
Applicable Model	(H,Y)VAHR120, 144B52S	(H,Y)VAHR072, 096, 168, 192B52S
Applicable Power Supply	575V 3PH 60Hz	
Output Voltage (Maximum)	460V	
Output Current (Maximum)		
Inverter PCB	19A	24A
Fan Controller	3.5A	
Control Method	Vector PWM Control	
Range Output Frequency		
Inverter PCB	11Hz to 130Hz	9Hz to 105Hz
Fan Controller	0 to 21.7rps	
Accuracy of Frequency	0.01Hz	
Output / Characteristics		
Soft Control Speed	0.125Hz/s, 0.25Hz/s, 0.5Hz/s, 1Hz/s, 3Hz/s (5 Steps)	
Protection Function		
Excessive High or Low Voltage for Inverter	◆ Stoppage Code for Inverter (Itc)= 5 Excessive Low Voltage at a DC Voltage is Lower than 570V. ◆ Stoppage Code for Inverter (Itc)= 6 Excessive High Voltage at a DC Voltage is Higher than 1030V.	
Abnormality of Current Sensor	◆ Stoppage Code for Inverter (Itc)= 8 The wave height value of running current for the phase positioning is less than the determination value before the compressor is started (at completion of the phase positioning).	
Protection Function Overcurrent Protection for Inverter	 ◆ Stoppage Code for Inverter (Itc)= 1 (1) Short-Circuit Trip of Arm (2) Instantaneous Overcurrent Trip ◆ Stoppage Code for Inverter (Itc)= 2 (3) Instantaneous Overcurrent Trip When detecting current is more than rated current of Transistor Module, overcurrent is detected. ◆ Stoppage Code for Inverter (Itc)= 4 (4) Electronic Thermal Trip When the current detected by current sensor exceeds 105% of the rated current continuously for 30 seconds or for 3 minutes in total during a 10-minute period, overcurrent is detected.	
Protection of Power Module (CIB, IPM)	◆ Stoppage Code for Inverter (Itc)= 1 Power module (CIB, IPM) has three protection functions for self-protection. (1) Some of the output terminals between "U" and "V", "V" and "W", "W" and "U" have a short-circuit. (2) Running current reaches the maximum rated current. (3) Control voltage decreases abnormally.	
Fin Temperature Increase	◆ Stoppage Code for Inverter (Itc)= 3 The unit is stopped when the CIB temperature is higher than 230°F (110°C).	
Earth Detection	◆ Stoppage Code for Inverter (Itc)= 12 The unit is stopped when the compressor is grounded.	

● Arrangement of Inverter Power Unit

460V Type: PV161



575V Type: PV172



(Main Parts)

2 Testing Inverter Parts (460V, 575V Type)

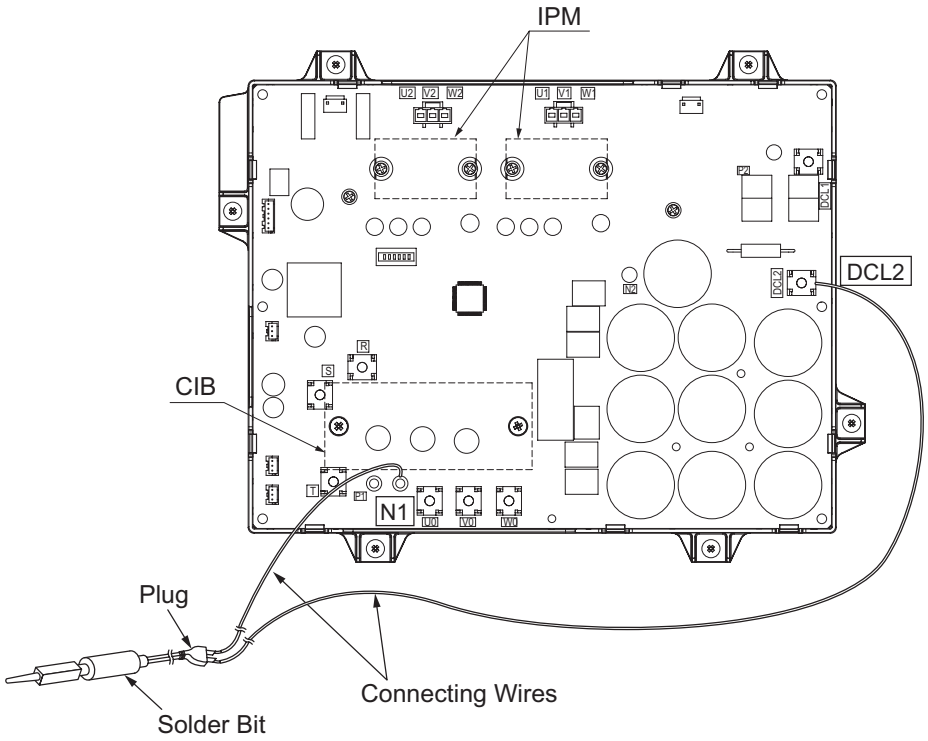
● High Voltage Discharge Work for Replacing Parts

⚠CAUTION

Perform this high voltage discharge work to avoid an electric shock.
Take special care to avoid a short circuit between terminal N1 and DCL2.

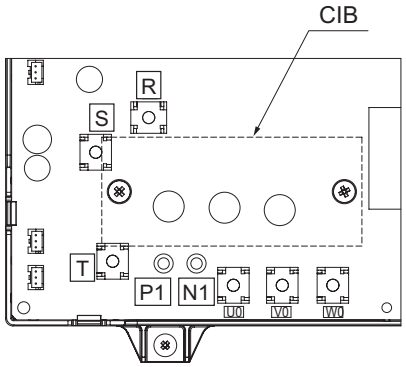
< Procedures >

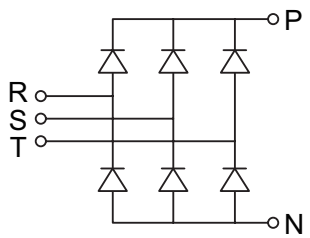
(a) Turn OFF the main switches and wait for three minutes. Check to ensure that no high voltage exists. If LED401 on the inverter PCB (INV) is ON after start-up and LED401 on INV is OFF after turning OFF power supply, the voltage will decrease to DC50V or less.
(b) Attach connecting wires to a plug of electrical solder bit.
(c) Attach the wires to terminals, N1 and DCL2 on the inverter PCB (INV). => Discharge is started, resulting in hot solder bit.
(d) Wait for two or three minutes and measure the voltage again. Check to ensure that no voltage is charged.



● Testing the Inverter PCB (INV: PV161, PV172)

(1) Outer Appearance and Rectifier Circuit of CIB



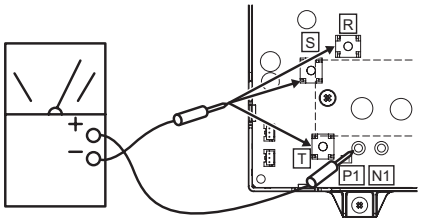


If procedures (a) to (d) are performed and the results are satisfactory, the CIB on the inverter PCB is normal.

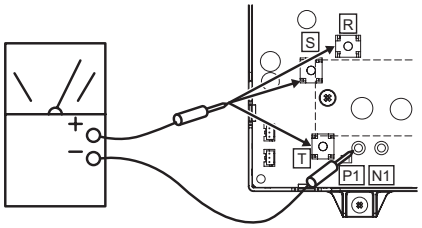
NOTICE

Recommended using an analog tester.

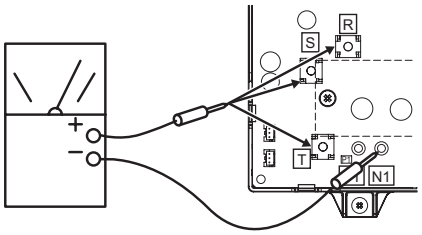
(a) By touching the + side of the tester to the P1 terminal of the inverter PCB and the - side of tester to R, S, and T of the inverter PCB, measure the resistance.



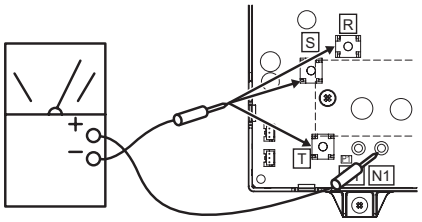
(b) By touching the - side of the tester to the P1 terminal of the inverter PCB and the + side of tester to R, S, and T of the inverter PCB, measure the resistance.



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

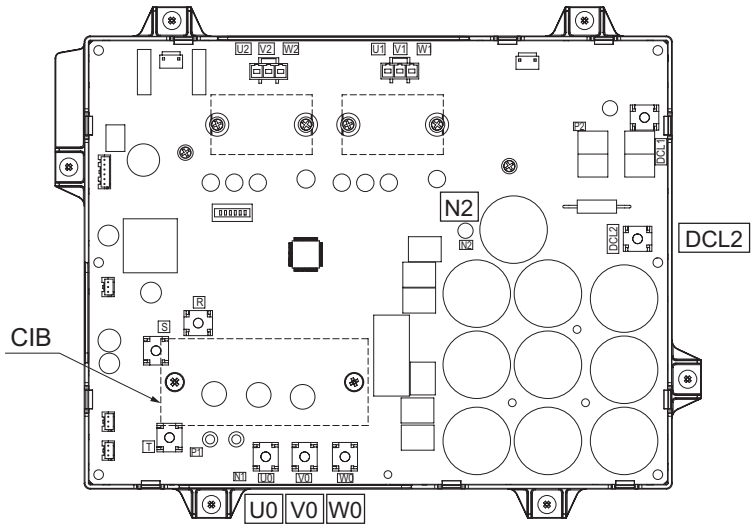


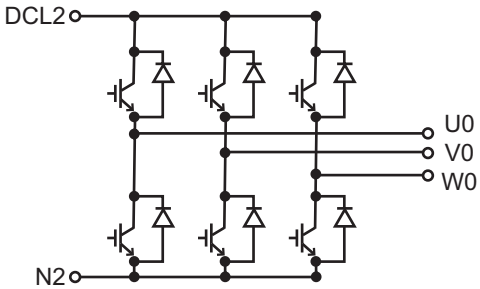
(d) By touching the + side of the tester to the N1 terminal of the inverter PCB and the - side of tester to R, S, and T of the inverter PCB, measure the resistance



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

(2) Internal Circuit of CIB Outlet Part



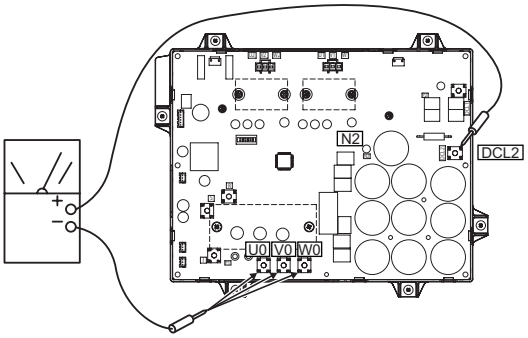


If procedures (a) to (d) are performed and the results are satisfactory, the CIB on the inverter PCB is normal.

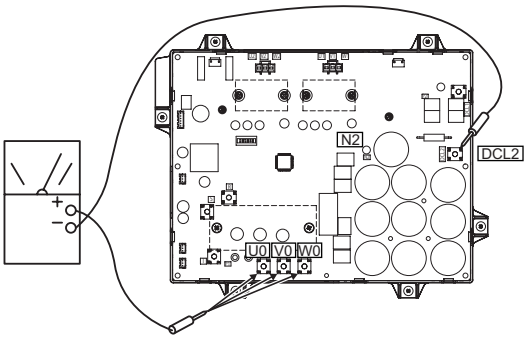
NOTICE

Recommended using an analog tester.

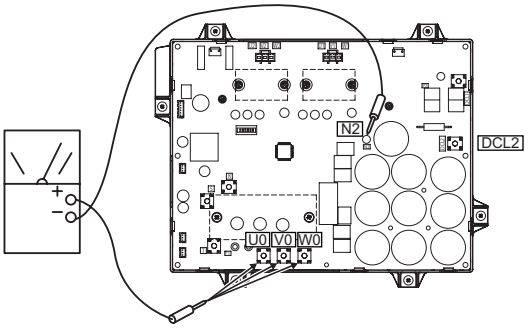
(a) By touching the + side of the tester to the DCL2 terminal of the inverter PCB and the - side of tester to U0, V0, and W0 of the inverter PCB, measure the resistance.



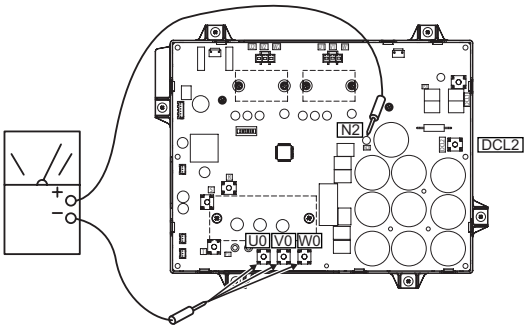
(b) By touching the - side of the tester to the DCL2 terminal of the inverter PCB and the + side of tester toU0, V0, and W0 of the inverter PCB, measure the resistance.



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



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



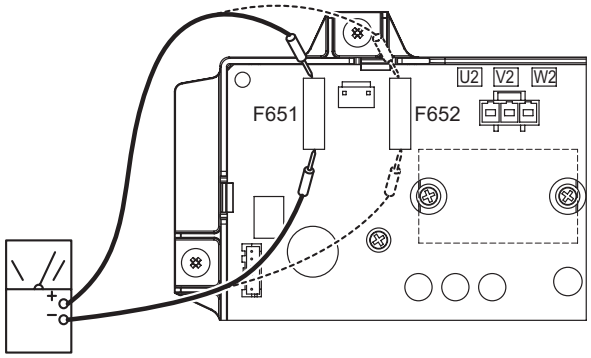
Measurement Point			Criterion	
Item	Tester		Analog Tester	Digital Tester (Diode Check Mode)
	(+)	(-)		
(a)	DCL2	U0/V0/W0	1kΩ or more (Measured Range: 1kΩ)	Over Load
(b)	U0/V0/W0	DCL2	20kΩ or more (Measured Range: 10kΩ)	1.0V or less
(c)	U0/V0/W0	N2	1kΩ or more (Measured Range: 1kΩ)	Over Load
(d)	N2	U0/V0/W0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

(Main Parts)

(3) Testing the Fuse for Inverter Power

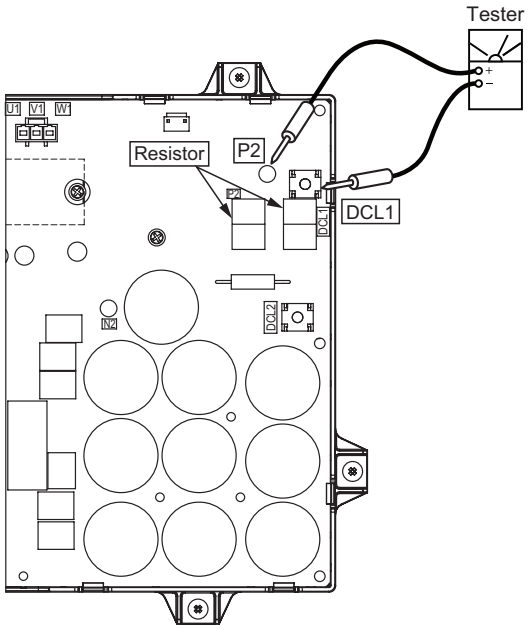
By touching the + and - side of the tester on each side of the fuse (F651, F652), measure the resistance. If the resistance is 0Ω, it is normal.

NOTICE:
Set analog, or digital tester at 1kΩ.



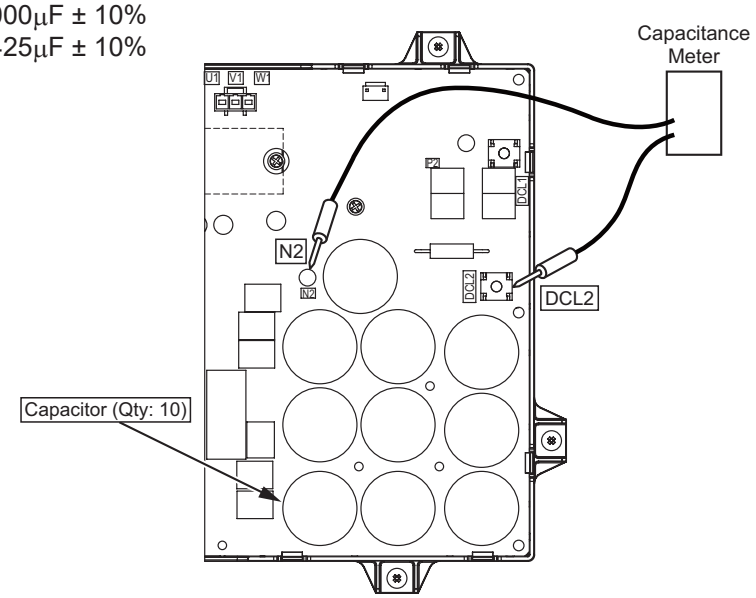
(4) Testing the Resistor

Measure the resistance using the tester between the DCL1 and P2 terminal.
Each resistance should be within the range below.
For PV161: 1kΩ + 5%
For PV172: 1.5kΩ ± 5%
(0Ω or ∞Ω: abnormal)



(5) Testing the Capacitor

(a) Check that the capacitor does not show signs of burns or isn't swollen.
(b) Measure the capacitance using the capacitance meter between the DCL2 and N2 terminal.
Each capacitor should be within the range below.
For PV161: 2000μF ± 10%
For PV172: 1425μF ± 10%



(6) Testing the IPM for Fan Motor

⚠CAUTION

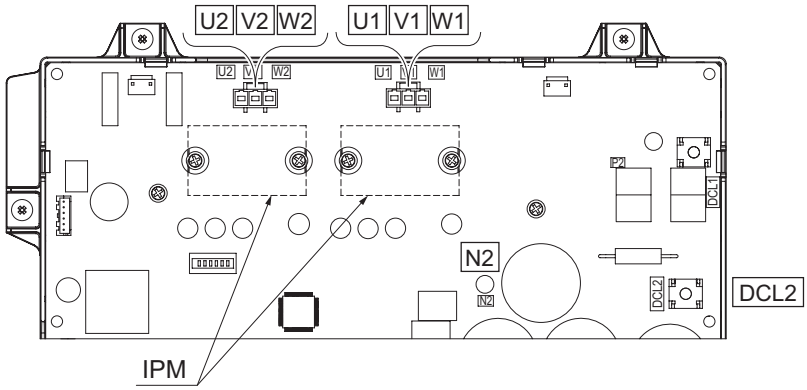
Perform this high voltage discharge work to avoid an electric shock.

NOTICE

Recommend using an analog tester.

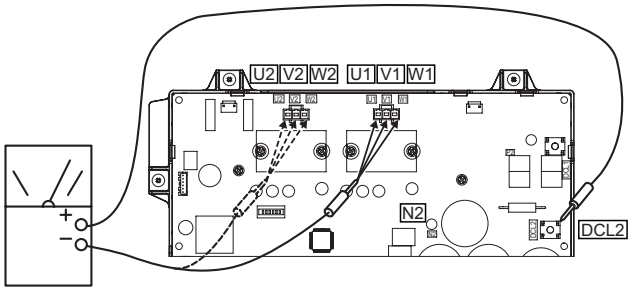
(a) Turn OFF the main supply before this work.
Ensure that LED401 on the inverter (INV) is turned OFF.
If LED401 on INV is turned ON, an electrical shock may occur from residual voltage over DC 50V to the inverter PCB (INV).

(b) Disconnect all the wirings connected to the inverter PCB (INV).

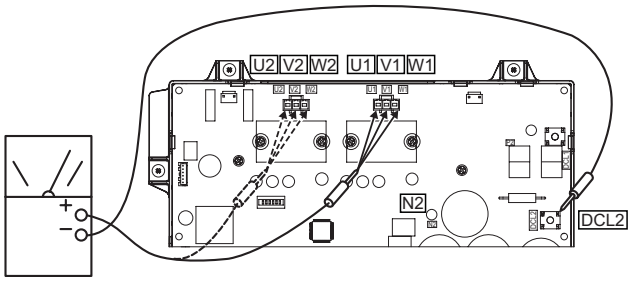


(Main Parts)

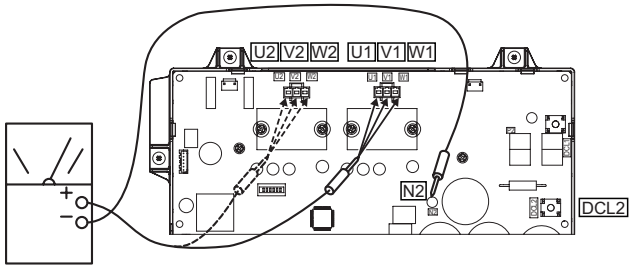
(c) By touching the + side of the tester to the DCL2 terminal of fan controller and the - side of tester to U1, V1, and W1 of the fan controller, measure the resistance.



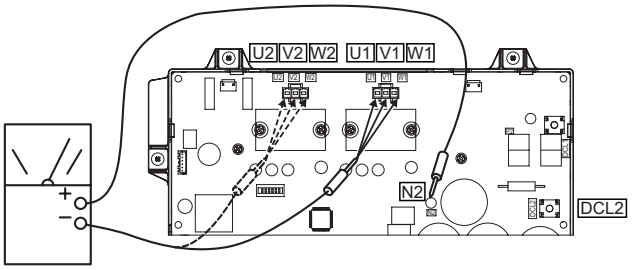
(d) By touching the - side of the tester to the DCL2 terminal of fan controller and the + side of tester to U1, V1, and W1 of the fan controller, measure the resistance.



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



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

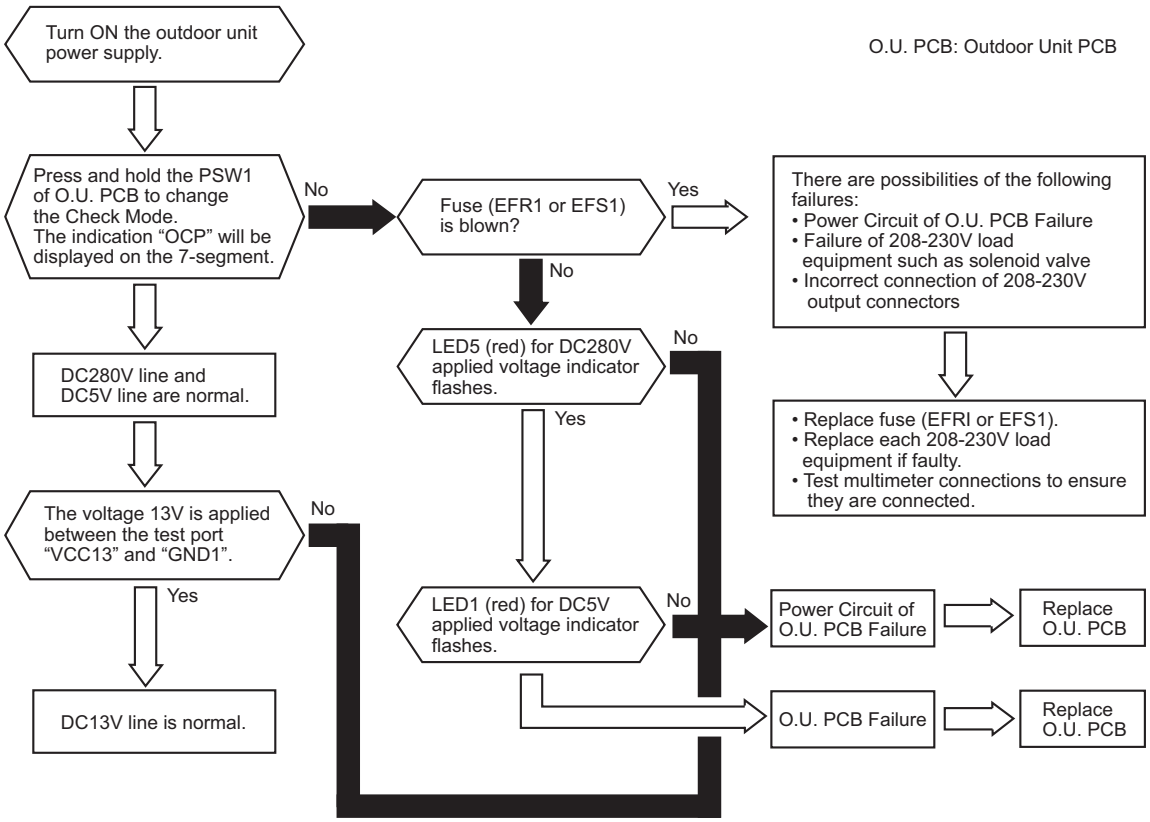


NOTICE:
In case of the outdoor unit is 096MBH, additional test will be required by replacing “U1/V1/W1” with “U2/V2/W2”.

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

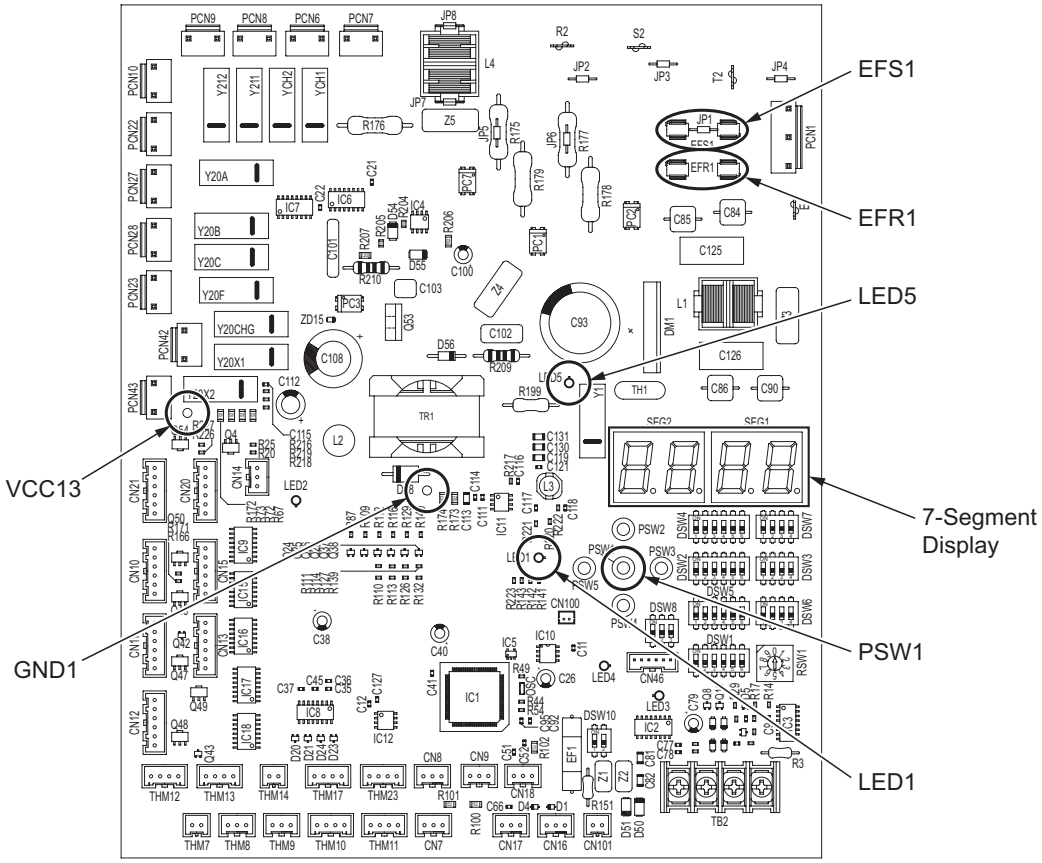
4.2.1.3 Printed Circuit Board

● Checking Procedures for Outdoor Unit PCB



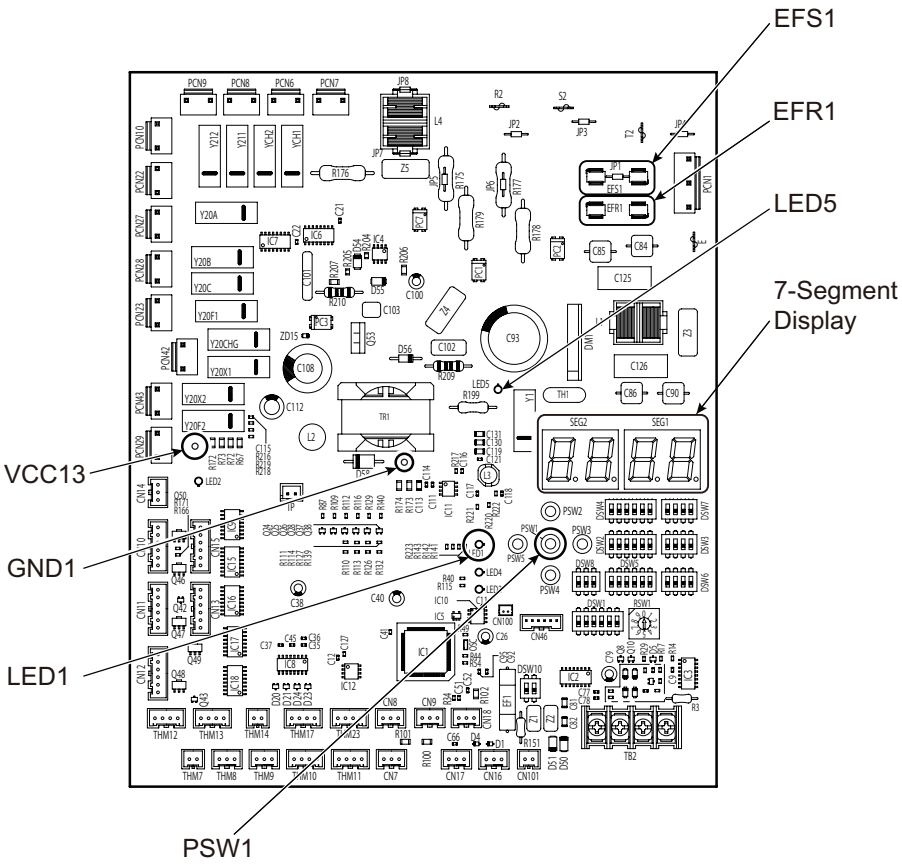
● Outdoor Unit PCB (PCB1: PO151)

Arrangement of Connectors and Check Points.



● Outdoor Unit PCB (PCB1: PO171)

Arrangement of Connectors and Check Points.



4.2.1.4 Scroll Compressor

● Reliable Mechanism for Low Vibration and Low Sound

(1) The rotating direction is definite.

(2) The pressure inside of the compressor housing is high pressure, and the surface temperature of the compressor housing is 140°F (60°C) to 230°F (110°C).

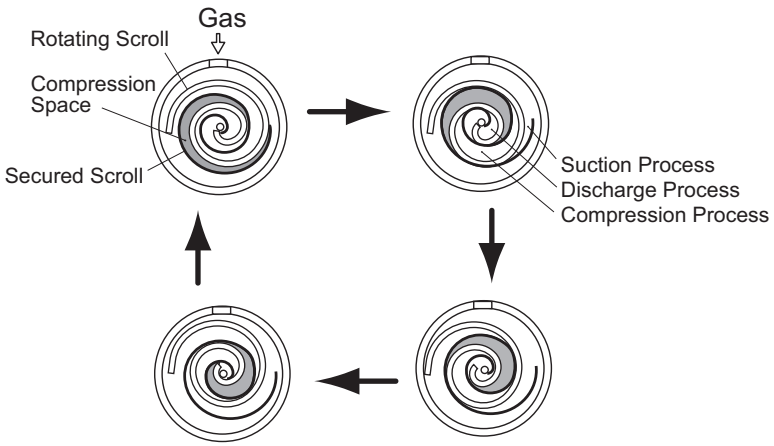
● Principle of Compression

(1) Gas enter the compressor from top at the suction inlet.

(2) Hot gas leaves the compressor from the side mounted discharge gas outlet.

(3) Compressor starts at the beginning of the scroll at a lower pressure, and continues to the outer edge of the scroll where the pressure is greatest and discharged through the side discharge gas port at the center of the compressor.

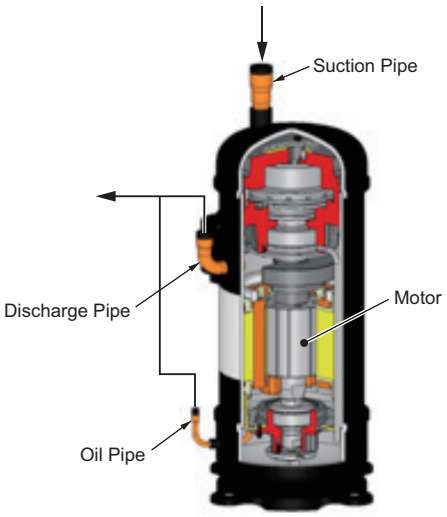
(4) The above procedures (Suction → Compression → Discharge) are repeated continuously.



(Main Parts)

● Structure

The compressor has the structure for oil supply from the outer oil separator.
The inside of the oil separator is at high pressure, and the surface temperature of the oil separator is as high (140°F (60°C) to 230°F (110°C)) as the compressor.



● Compressor Type

Model	Voltage	Inverter Compressor 1	Inverter Compressor 2	Total Quantity
(H,Y)VAHR072, 096B32S	208/230V	DC80PHD-A2Y2	-	1
(H,Y)VAHR120, 144B32S	208/230V	AA50PHD-A2Y2	AA50PHD-A2Y2	2
(H,Y)VAHR168, 192B32S	208/230V	DC80PHD-A2Y2	DC80PHD-A2Y2	2
(H,Y)VAHR072, 096B42S (H,Y)VAHR072, 096B52S	460V 575V	DC80PHD-D2Y2	-	1
(H,Y)VAHR120, 144B42S (H,Y)VAHR120, 144B52S	460V 575V	AA50PHD-D2Y2	AA50PHD-D2Y2	2
(H,Y)VAHR168, 192B42S (H,Y)VAHR168, 192B52S	460V 575V	DC80PHD-D2Y2	DC80PHD-D2Y2	2

● Checking of Compressor Motor

Inverter Compressor	Resistance
AA50PHD-A2Y2	0.125Ω at 167°F (75°C)
DC80PHD-A2Y2	0.089Ω at 167°F (75°C)
AA50PHD-D2Y2	0.495Ω at 167°F (75°C)
DC80PHD-D2Y2	0.346Ω at 167°F (75°C)

NOTE:
The resistance rises when the temperature rises.

● Protective Function

(1) Excessive High or Low Voltage for Inverter

(a) Level of Detection
① In case of 208-230V, 60Hz.
When the voltage of direct current is greater than 424V, abnormalities are detected.
When the voltage of direct current is smaller than 196V, abnormalities are detected.
② In case of 460V/60Hz
When the voltage of direct current is greater than 844V, abnormalities are detected.
When the voltage of direct current is smaller than 396V, abnormalities are detected.
③ In case of 575V/60Hz
When the voltage of direct current is greater than 1030V, abnormalities are detected.
When the voltage of direct current is smaller than 570V, abnormalities are detected.

(b) Function
When abnormalities are detected, the inverter compressor is stopped and transmits the signal code for the cause of the stoppage to outdoor unit PCB.

(c) Cancellation of Protection Function
The transmitted fault will be reset when outdoor unit power has been reset.

(2) Abnormality of Current Sensor

(a) Level of Detection
The value of running current for the phase positioning is less than the determination value before the compressor is started (at completion of the phase positioning).

(b) Function
When abnormalities are detected, the inverter compressor is stopped and transmits the signal code for the cause of the stoppage to outdoor unit PCB.

(c) Cancellation of Protection Function
The transmitted fault will be reset when outdoor unit power has been reset.

(3) Overcurrent Protection for Inverter

(a) Level of Detection
① When the compressor current detected by current sensor excesses the rated current of power module (CIB, IPM), 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 3 minutes in total during a 10-minute period, overcurrent is detected. (Electric Thermal Relay)

(b) Function
When abnormalities are detected, the inverter compressor is stopped and transmit the signal code for the cause of the stoppage to outdoor unit PCB.

(c) Cancellation of Protection Function
The transmitted fault will be reset when outdoor unit power has been reset.

(4) Protection of Power Module (CIB, IPM)

(a) Level of Detection
① When some of the output terminals between “U” and “V”, “V” and “W”, “W” and “U” of power module (CIB, IPM) are short-circuited, an abnormality is detected.
② When the running current of power module (CIB, IPM) reaches the maximum rated current, an abnormality is detected.
③ When the control voltage of power module (CIB, IPM) abnormally decreases, an abnormality is detected.

(b) Function
When abnormalities are detected, the inverter compressor is stopped and the signal code for the cause of the stoppage is transmitted to outdoor unit PCB.

(c) Cancellation of Protection Function
The transmitted fault will be reset when outdoor unit power has been reset.

(Main Parts)

(5) Fin Temperature Increase

(a) Level of Detection

① In case of 208/230V type
When the temperature of internal thermistor exceeds 222°F (106°C) or 232°F (111°C), an abnormality is detected.

② In case of 460V type
When the temperature of internal thermistor exceeds 230°F (110°C), an abnormality is detected.

③ In case of 575V type
When the temperature of internal thermistor exceeds 239°F (115°C), an abnormality is detected.

(b) Function
When abnormalities are detected, the inverter compressor is stopped and the signal code for the cause of the stoppage is transmitted to outdoor unit PCB.

(c) Cancellation of Protection Function
The transmitted fault will be reset when outdoor unit power has been reset.

(6) Earth Detection

(a) Level of Detection

① When the terminal U, V, W and earth of the compressor are short-circuited before compressor activation, abnormalities are detected.

② When the output terminals (U, V, W) of power module (CIB, IPM) are short-circuited, abnormalities are detected.

(b) Function
When abnormalities are detected, the inverter compressor is stopped and the signal code for the cause of the stoppage is transmitted to outdoor unit PCB.

(c) Cancellation of Protection Function
The transmitted fault will be reset when outdoor unit power has been reset.

● 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 transmitted to the outdoor unit PCB when output current exceeds 105% of the maximum output current, and the frequency decreases.
For 10 seconds after the output current decreases lower than 88% of the rated current, the compressor maximum frequency is limited to the specified value.
However, if the target frequency is smaller than the maximum value, the operation is performed according to the target.

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

● Checking of Compressor

CHECK LIST ON COMPRESSOR

CLIENT: _____ MODEL: _____ DATE: _____

Serial No.: _____ Production Date: _____ Checker: _____

No.	Check Item	Check Method	Result	Remarks
1	Are THM8 and THM9 correctly connected? THM8 and THM9: Discharge Gas Thermistor	(1) Are wires of each thermistor correctly connected by viewing? (2) Check to ensure that 7-segment indication of Td1 is higher than Td2 when No.1 comp. is operating. Td1: Temperature of THM8 Td2: Temperature of THM9		
2	Are thermistor, THM8 and THM9 disconnected?	(1) Check to ensure that thermistor on the top of comp. is correctly installed. (2) Check to ensure that actually measured temp. is not greatly different from the indication (Td1, Td2) during check mode.		
3	Is current sensing part on inverter PCB faulty?	(1) Check to ensure that 7-segment indication A1 and A2 are 0 during compressor stopping. (2) Check to ensure that indication A1 and A2 are not 0 during compressor running. (However, A2 is 0 during stopping of No.2 comp.)		
4	Are expansion valves (MV1, MV2 and MVB) correctly connected?	Check to ensure that MV1 to CN10, MV2 to CN11 and MVB to CN12 are correctly connected.		
5	Are expansion valve coils (MV1, MV2 and MVB) correctly installed?	Check to ensure that each coil is correctly installed on the valve.		
6	Are the refrigeration system and electrical wiring system incorrectly connected?	Check to ensure that refrigerant is flowing into indoor units by operating one system only from the outdoor unit.		
7	Is opening of expansion valve completely closed (locked)?	Check the following using the check mode of outdoor units. (1) Liquid Pipe Temp. (TL) < Air Intake Temp. (Ti) during Cooling Operation (2) Liquid Pipe Temp. (TL) > Air Intake Temp. (Ti) during Heating Operation		
8	Is opening of expansion valve fully opened (locked)?	Check to ensure that liquid pipe temp. is lower than air intake temp. of stopped indoor unit when the other indoor units are operating under cooling operation.		
9	Are the relay on the main power PCB (MPB) for 208/230V type or the inverter PCB (INV) for 460V type and 575V type faulty?	Check the main power PCB (MPB) for 208/230V type or the inverter PCB (INV) for 460V type and 575V type.		
10	Is there any voltage abnormality among L1-L2, L2-L3 and L3-L1?	Check to ensure that voltage imbalance is smaller than 3%. Please note that power supply voltage must be as follows. 208/230V type: 208/230V±10% 460V type: 460V±10% 575V type: 575V–10%, 600V+10%		
11	Is the comp. oil acidified during compressor motor burning?	Check to ensure that the oil color is not black.		

*See additional information on the next page.

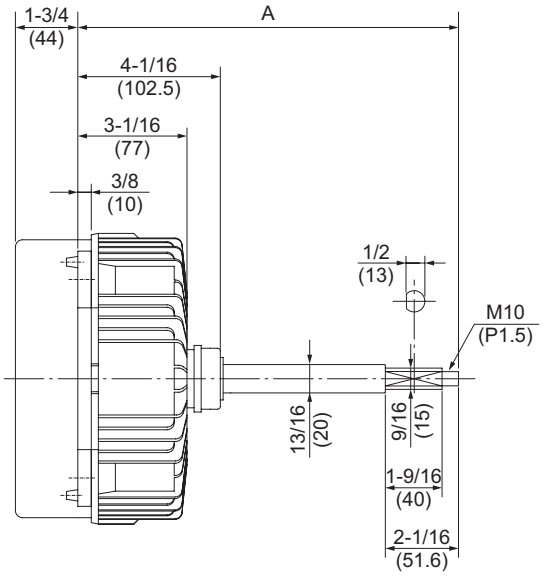
Additional Information for “CHECK LIST ON COMPRESSOR”

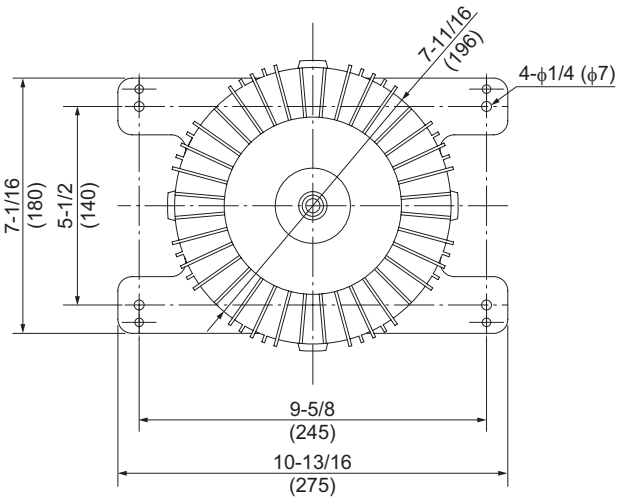
Check Item	Additional Information (Mechanism of Compressor Failure)
1, 2	The liquid refrigerant return volume to the compressor is controlled by the discharge gas temperature Td1 when only No.1 compressor is operating. If Td1 and Td2 are reversely connected, the liquid refrigerant return volume will become smaller by detecting the temperatures even if the actual discharge gas temperature is high. Therefore, this abnormal overheating operation will result in insulation failure of the motor winding.
3	Overcurrent control (operating frequency control) is performed by detecting current by the current sensor. In this case, winding insulation failure will occur, since control is not available in spite of actually high current.
4, 5	During a cooling operation, Pd is controlled by fan revolution of outdoor unit, and Td and SH are controlled by MV of each indoor unit. During a heating operation, Td and SH are controlled by MV1 and MV2. If expansion valves are incorrectly connected, correct control is not available, resulting in compressor failure depending on liquid refrigerant returning conditions or motor winding insulation failure depending on overheating conditions.
6	If the refrigeration system and electrical system are incorrectly connected, abnormally low suction pressure operation is maintained or abnormally high discharge pressure operation is maintained, resulting in giving stress to the compressor, since their correct control is not available.
7	For additional information, refer to Section 4.2.1.7 “Electronic Expansion Valve” in this document.
8	The compressor may be locked due to the liquid return operation during the cooling operation.
9	If the contacting resistance increases, voltage imbalance among each phase will cause abnormal overcurrent.
10	In this case, overcurrent will occur, efficiency will decrease or the motor winding will be excessively heated.
11	In this case, it will result in motor burning or a failed compressor.

4.2.1.5 Fan Motor

inch (mm)

Model	A
(H,Y)VAHR072, 096, 168, 192B32S (H,Y)VAHR072, 096, 168, 192B42S (H,Y)VAHR072, 096, 168, 192B52S	10-9/16 (268.5)
(H,Y)VAHR120, 144B32S (H,Y)VAHR120, 144B42S (H,Y)VAHR120, 144B52S	8-7/8 (224.8)





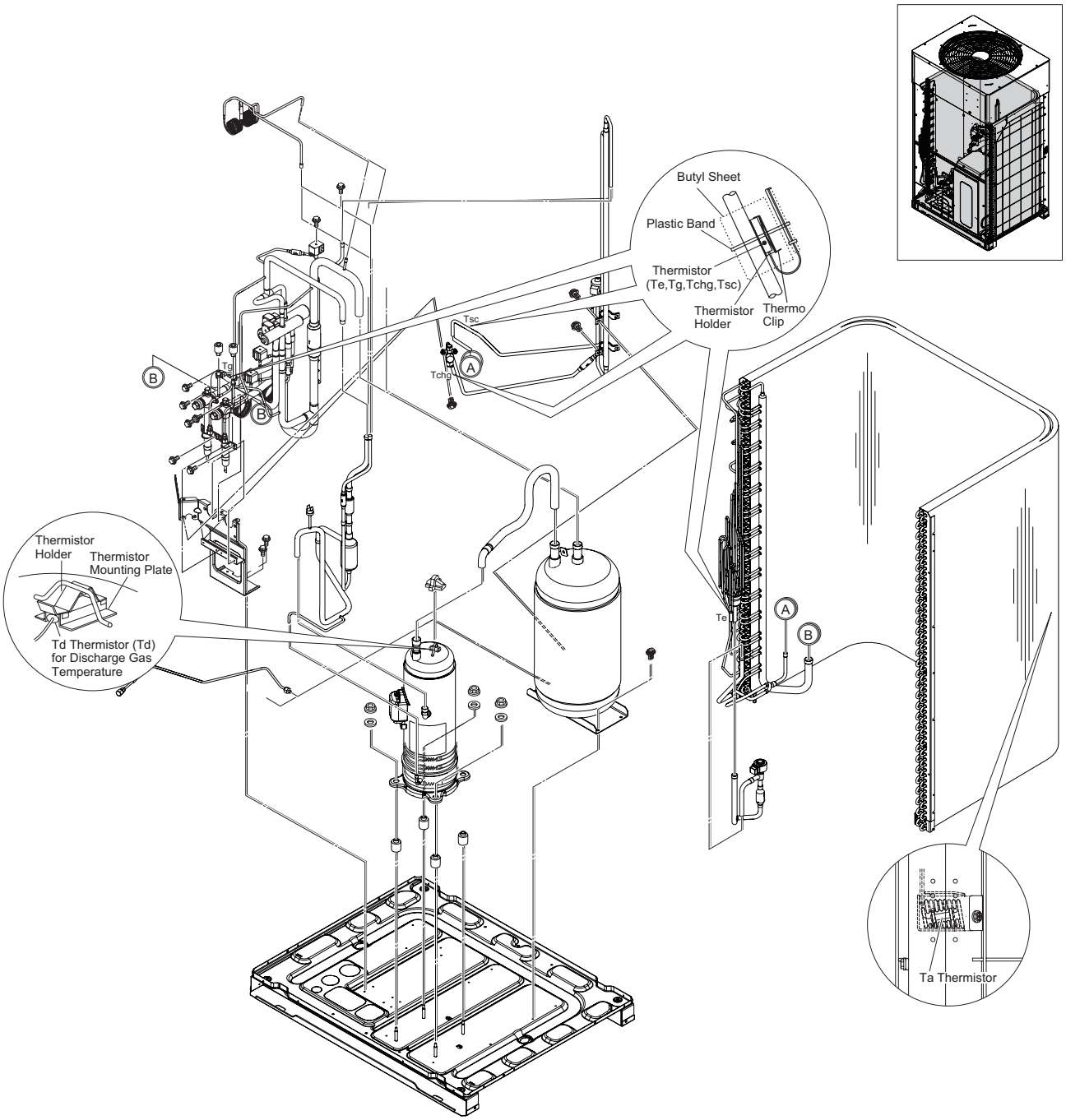
Applicable Model	Rated Voltage	Rated Output	Electrical Wiring Diagram	Resistance
(H,Y)VAHR072 to 192B32S	DC280V	750W	U: Red V: White W: Black	2.62±0.26Ω at 68°F (20°C)
(H,Y)VAHR072 to 192B42S (H,Y)VAHR072 to 192B52S	DC650V			9.42±0.94Ω at 68°F (20°C)

NOTE:
The resistance rises when the temperature rises.

(Main Parts)

4.2.1.6 Thermistor

(1) Position of Thermistor

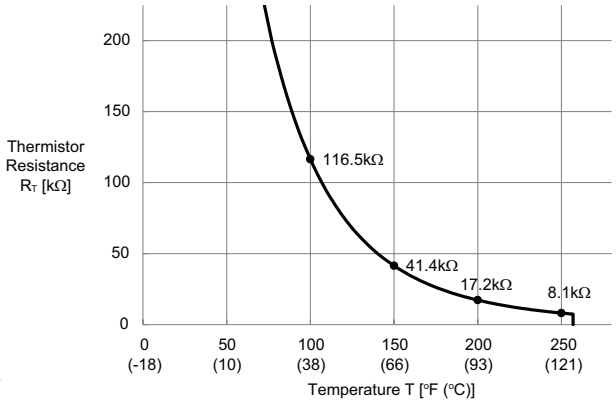


(2) Thermistor for Upper Part Temperature of Compressor

a. A thermistor for the upper part temperature of the compressor is installed to prevent discharge gas from overheating. If discharge gas temperature increases excessively, lubricating oil deterioration occurs. Then the lubricating properties deteriorate, resulting in short compressor life.

b. If discharge gas temperature increases excessively, compressor temperature increases. At the worst, compressor motor winding is burnt out.

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



Thermistor Characteristics

- An electronic expansion valve of outdoor units is opened to return the liquid refrigerant to the compressor through the accumulator, decreasing compressor temperature.
- If the compressor upper part temperature exceeds 270°F (132°C), even if an electronic expansion valve opens, the compressor is stopped in order to protect the compressor.
  In cooling operation, the above function is also available.

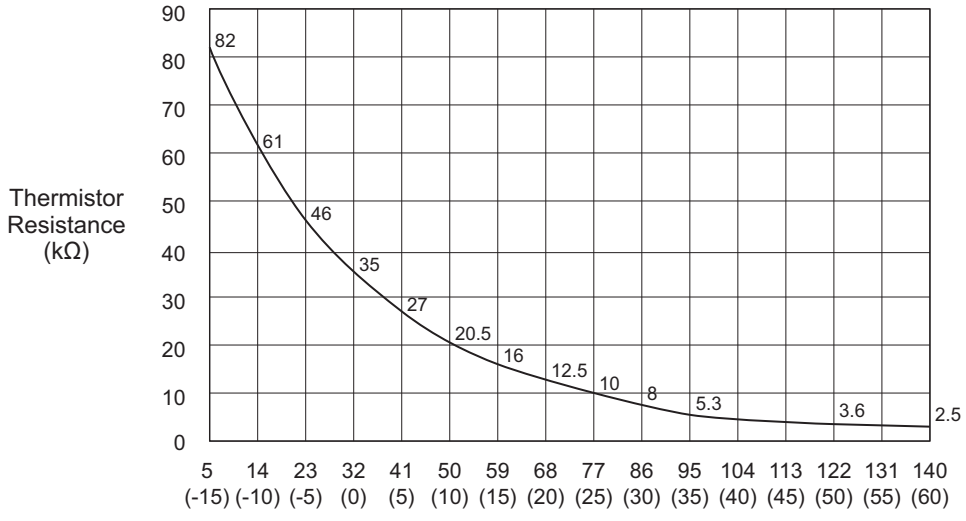
d. If compressor upper part temperature increases excessively, the protection control is activated, and the compressor is stopped according to the following method.

Operation	Upper Part Temperature of Compressor	Defecting Period
Cooling	Over 270°F (132°C)	10 minutes (Continuously)
	Over 284°F (140°C)	5 seconds (Continuously)
Heating	Over 270°F (132°C)	10 minutes (Continuously)
	Over 284°F (140°C)	5 seconds (Continuously)
Defrosting	Over 270°F (132°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 in Heating Operation (For Defrosting)
The characteristics for the thermistor are the same as those of the outdoor ambient temperature thermistor shown in the figure below.

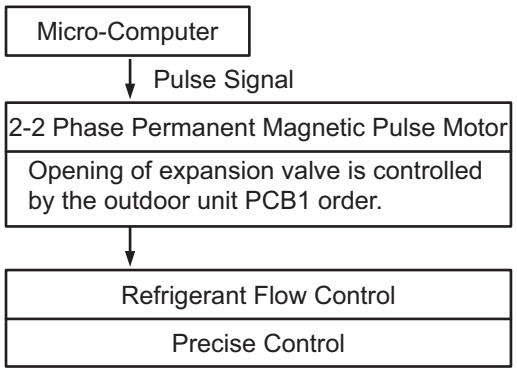
(5) Thermistor for Super Cooling Bypass and Main Line Temperature of Outdoor Unit
The characteristics for the thermistor are the same as those of the outdoor ambient temperature thermistor shown in the figure below.

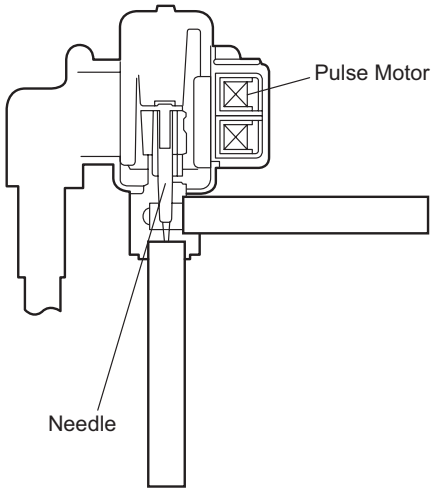


Thermistor Characteristics

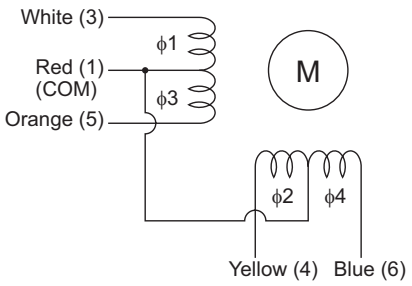
(Main Parts)

4.2.1.7 Electronic Expansion Valve





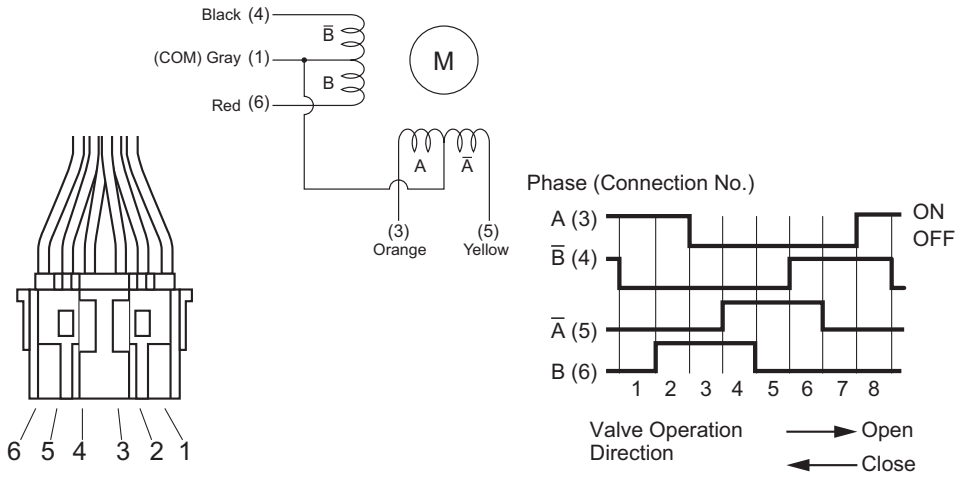
● Specifications for MV1 and MV2

Model	PAM-BBOYGHS-1
Working Temperature Range	-22°F to 158°F (-30°C to 70°C)
Refrigerant Used	R410A
Insulation Resistance	Min. 100MΩ (at 500VDC Megger)
Withstand Voltage	500VAC for 1 Minute or 600VAC for 1 Second
Rated Voltage	DC12V±1.2V
Drive Condition	100 - 200 PPS 2-2 Phase Excitation
Coil Resistance	100Ω (at 68°F (20°C))
Insulation Class	Class E
Wiring Diagram, Drive Circuit and Activation Mode	 < Checking Method > Measure the coil resistances between Red (common) and each phase. The measured resistance value is normal if approximately 100Ω*. *: Ambient Temperature 68°F (20°C)

Phase	1	2	3	4
ϕ1	ON	OFF	OFF	ON
ϕ2	ON	ON	OFF	OFF
ϕ3	OFF	ON	ON	OFF
ϕ4	OFF	OFF	ON	ON

OPEN: 4 → 3 → 2 → 1 → 4
CLOSE: 1 → 2 → 3 → 4 → 1

● Specifications for MVB

Model	UKV-U029E or UKV-A027
Working Temperature Range	-22°F to 158°F (-30°C to 70°C)
Refrigerant Used	R410A
Insulation Resistance	Min. 100MΩ (at 500VDC Megger)
Withstand Voltage	1800VAC for 1 Second
Rated Voltage	DC12V±1.2V
Drive Condition	83±5 PPS 1-2 Phase Excitation
Coil Resistance	46±3Ω (at 68°F (20°C))
Insulation Class	Class E
Wiring Diagram, Drive Circuit and Activation Mode	 Order of Excitation (1-2 Phase Excitation) Connector No. / Color of Lead Wire / Phase 1 / Gray / Common (+) 2 / - / - 3 / Orange / A 4 / Black / B̄ 5 / Yellow / Ā 6 / Red / B < Checking Method > Measure the coil resistances between connector No.1 (common) and each phase. The measured resistance value is normal if approximately 46Ω *). (*): Ambient Temperature 68°F (20°C))

● Checking Method of Electronic Expansion Valve

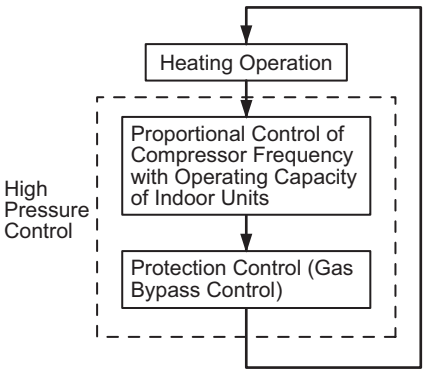
	Outdoor Unit Electronic Expansion Valve
Locked (Fully Closed)	It is abnormal if the liquid pipe pressure does not increase during cooling operation.
Locked (Slightly Open)	It is abnormal if the liquid pipe pressure does not increase and the outlet temperature of the expansion valve decreases after the cooling operation is started.
Locked (Fully Open)	It is abnormal under the following conditions. After heating operation for more than 30 min., the discharge gas temperature of compressor is not 50°F (10°C) higher than the condensing temperature. There is no other fault such as excessive charge of refrigerant.

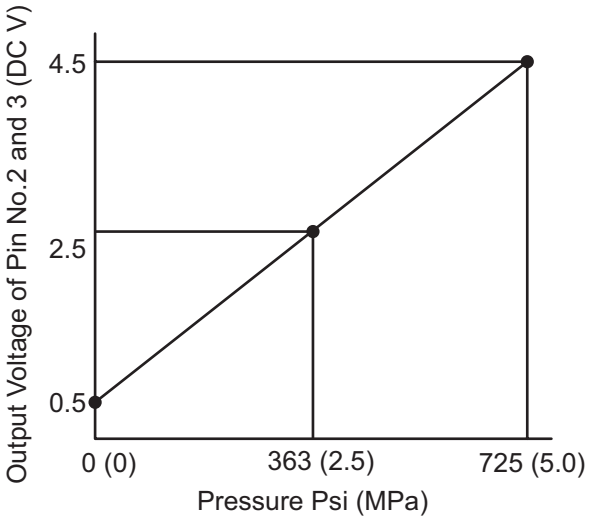
(Main Parts)

4.2.1.8 Pressure Sensor

(1) High Pressure Control

The high pressure during heating 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 of the high pressure sensor during heating operation performs protective control; that is gas by-pass control.



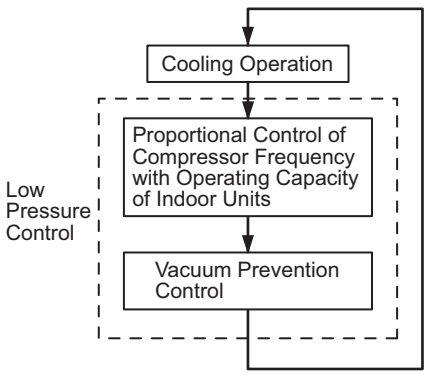


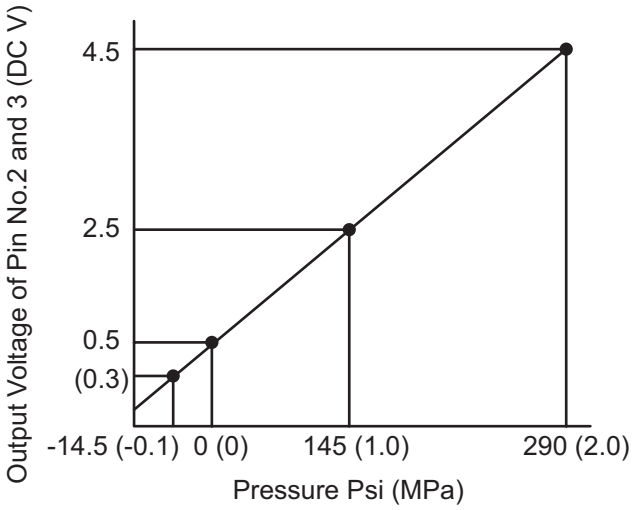
Output Characteristics of High Pressure Sensor

(2) Low Pressure Control

The suction pressure during cooling operation is detected by a low 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 suction pressure is controlled in an appropriate range.

If the suction pressure is excessively low, the cooling can be insufficient and parts composing the refrigeration cycle can be damaged. For this reason, if the output of the low pressure sensor indicates 13.1 psi (0.09MPa) or less and the value is maintained for 12 minutes or longer, the compressor is stopped for the purpose of protection.

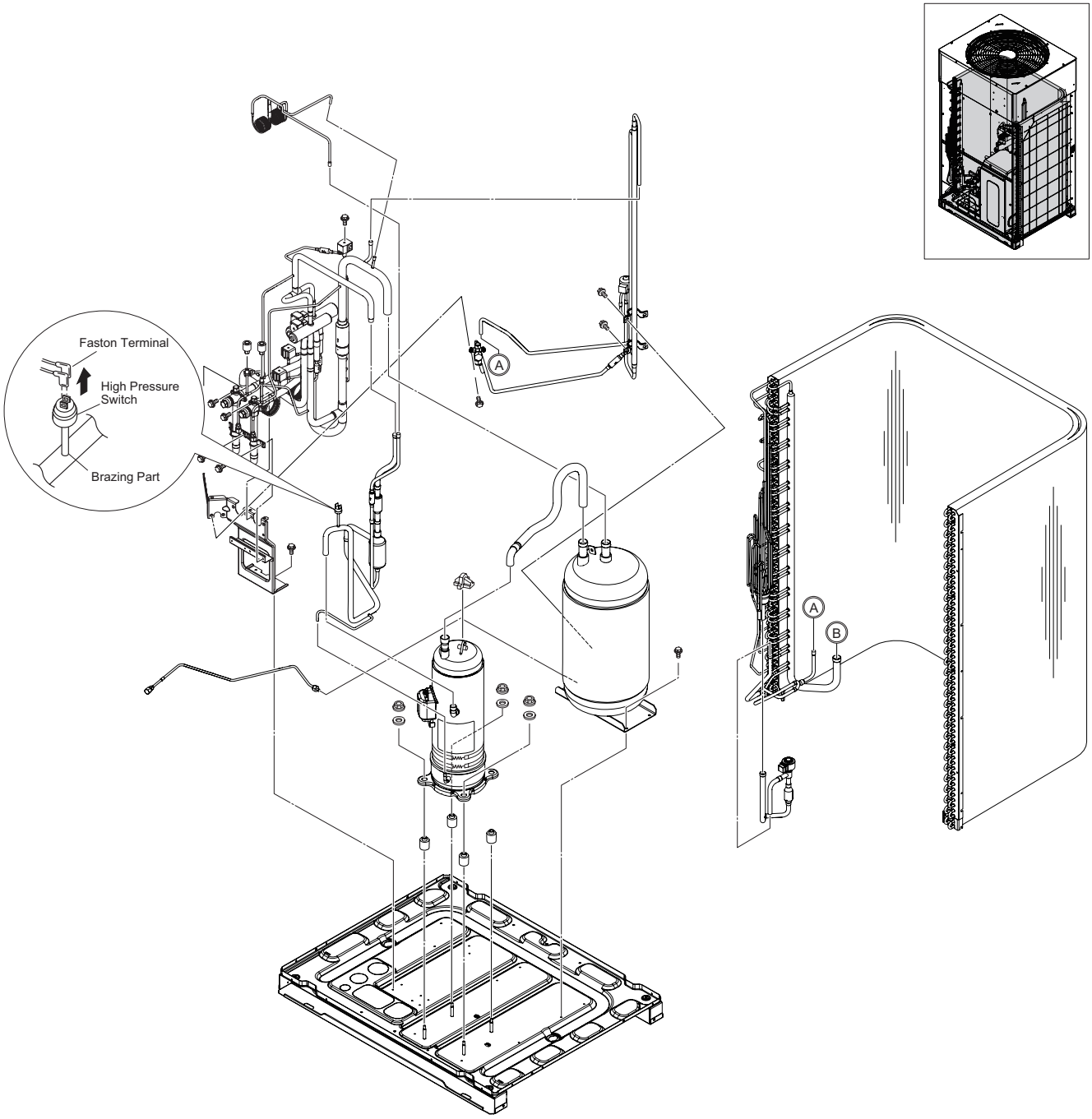




Output Characteristics of Low Pressure Sensor

4.2.1.9 High Pressure Protection Device

If the discharge pressure is excessively high, the compressor and the component parts of the refrigeration cycle can be damaged. Therefore, if the discharge pressure is higher than 601psi (4.15MPa) (R410A), the protection control is activated, and the compressor is stopped.



(Main Parts)

4.2.1.10 Electrical Coil Parts

● Solenoid Valve

Applicable Model	Electrical Coil Model		Resistance
(H,Y)VAHR072 to 192B32S (H,Y)VAHR072 to 192B42S	Coil	FQ-A0520D	1780 to 1840Ω at 68°F (20°C)
	Body	FDF5A11	
	Coil	TEV-SM0AQ2400A1	1696Ω at 68°F (20°C)
	Body	TEV-S2020DQ50	
(H,Y)VAHR072 to 192B52S	Coil	FQ-A0522G	1877 to 2294Ω at 68°F (20°C)
	Body	FDF5A11	

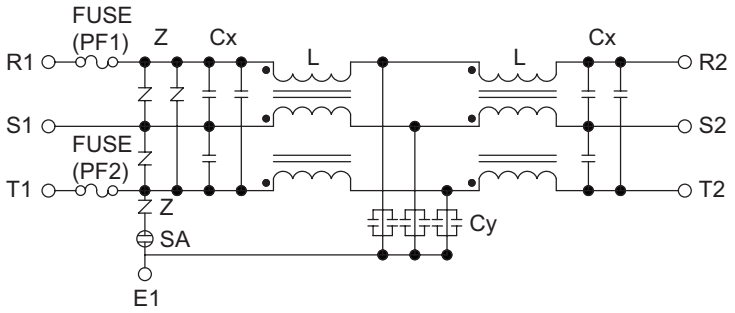
● Reversing Valve

Applicable Model	Electrical Coil Model		Resistance
(H,Y)VAHR072 to 144B32S (H,Y)VAHR072 to 144B42S (H,Y)VAHR072 to 144B52S	Coil	STF-H01AQ2338A1	1567.5±156.8Ω at 68°F (20°C)
	Body	STF-H0712	
(H,Y)VAHR168, 192B32S (H,Y)VAHR168, 192B42S	Coil	STF-01AQ2339A1	1190.35±119Ω at 68°F (20°C)
	Body	STF-1511G	
(H,Y)VAHR168, 192B52S	Coil	STF-01AI2337A1	1357.5±136Ω at 68°F (20°C)
	Body	STF-1511G	

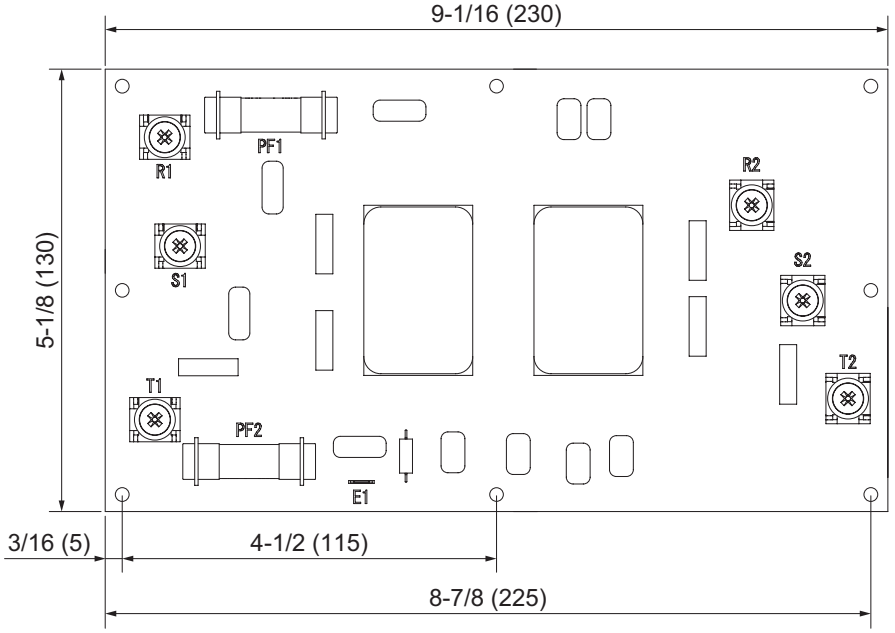
4.2.1.11 Noise Filter (NF1, NF2)

The noise filter decreases the leakage of noise made by the inverter to the power supply side. Terminals indicated with “R2”, “S2” and “T2” are connected to the inverter side. Terminals indicated with “R1”, “S1” and “T1” are connected to the power supply side.

(1) Noise Filter for 208/230V Type

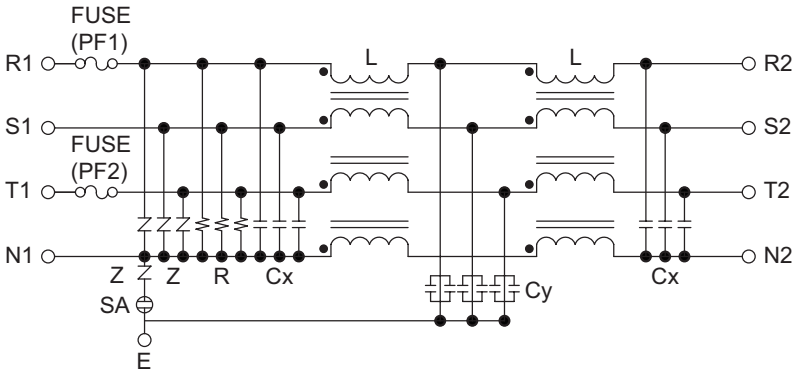
Items	Specifications
Model	NF151
Rated Voltage	AC 208/230V
Rated Current	40A ((H,Y)VAHR120, 144B32S) 50A ((H,Y)VAHR072, 096, 168, 192B32S)
Circuit Diagram	

inch (mm)

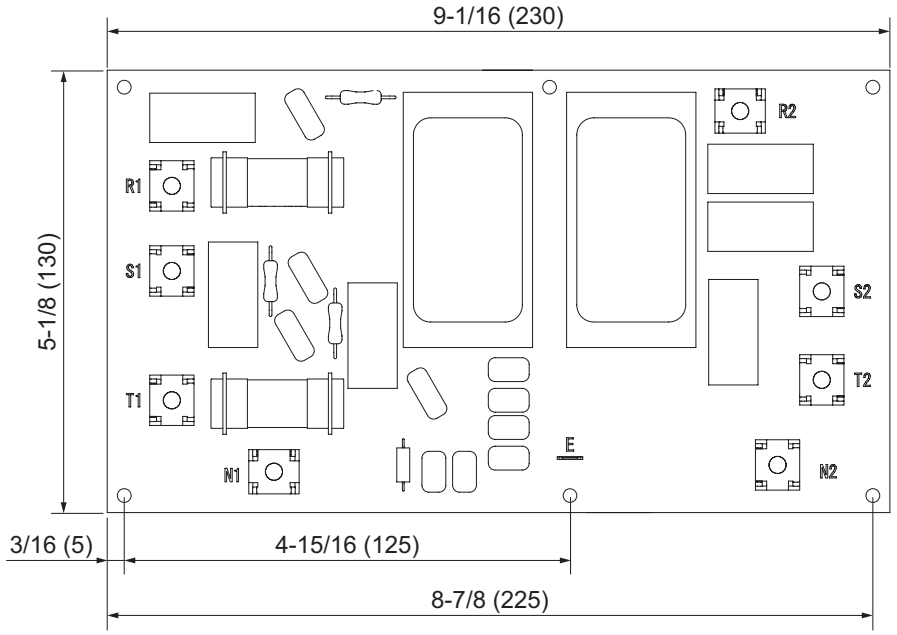


(Main Parts)

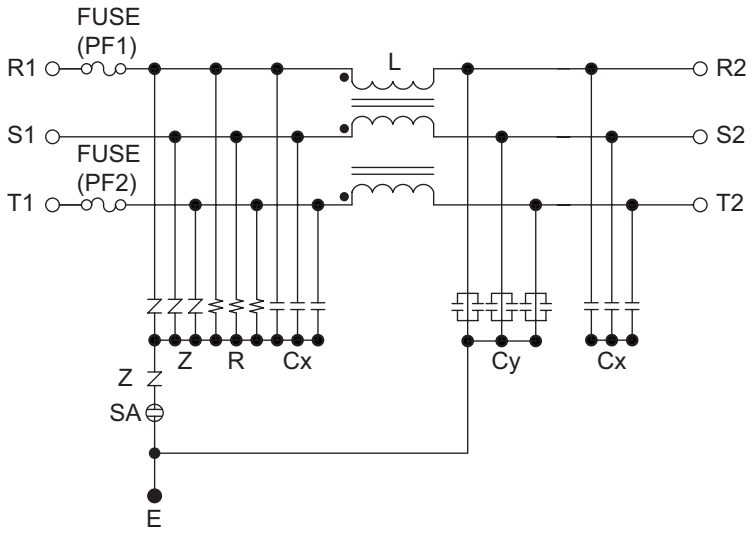
(2) Noise Filter for 460V Type

Items	Specifications
Model	NF161
Rated Voltage	AC 460V
Rated Current	25A
Circuit Diagram	

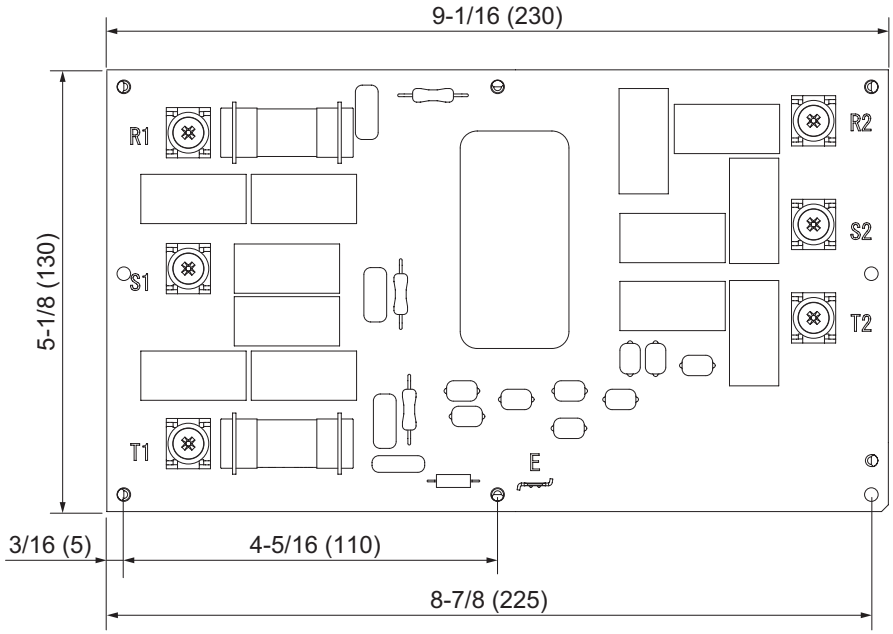
inch (mm)



(3) Noise Filter for 575V Type

Items	Specifications
Model	NF172
Rated Voltage	AC 575V
Rated Current	25A
Circuit Diagram	

inch (mm)



(Main Parts)

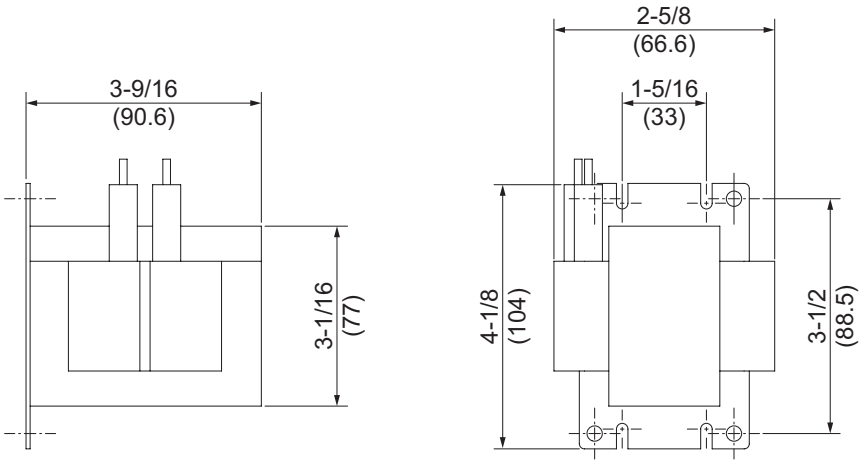
4.2.1.12 Reactor (DCL1, DCL2)

This part is used for smoothing the direct current to the inverter circuit.

(1) Reactor for 208/230V Type

Items	Specifications
Character	0.7mH+15%, -10% (1KHz)
Rated Current	61A
Direct Current Resistance	11.35mΩ±20% (68°F (20°C))

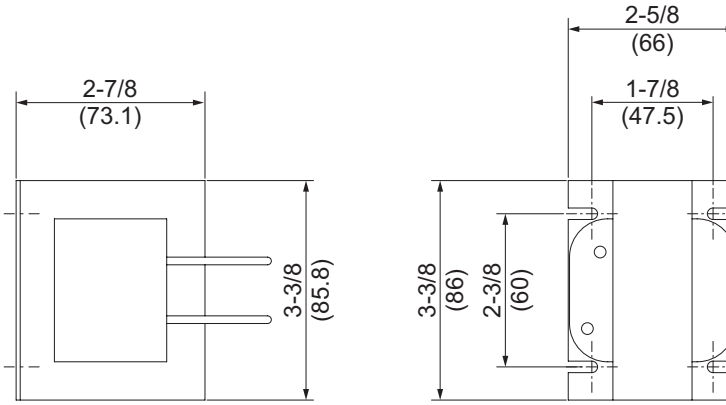
inch (mm)



(2) Reactor for 460V Type, 575V Type

Items	Specifications
Character	1.0mH+15%, -10% (1KHz)
Rated Current	30A
Direct Current Resistance	27.4mΩ±20% (68°F (20°C))

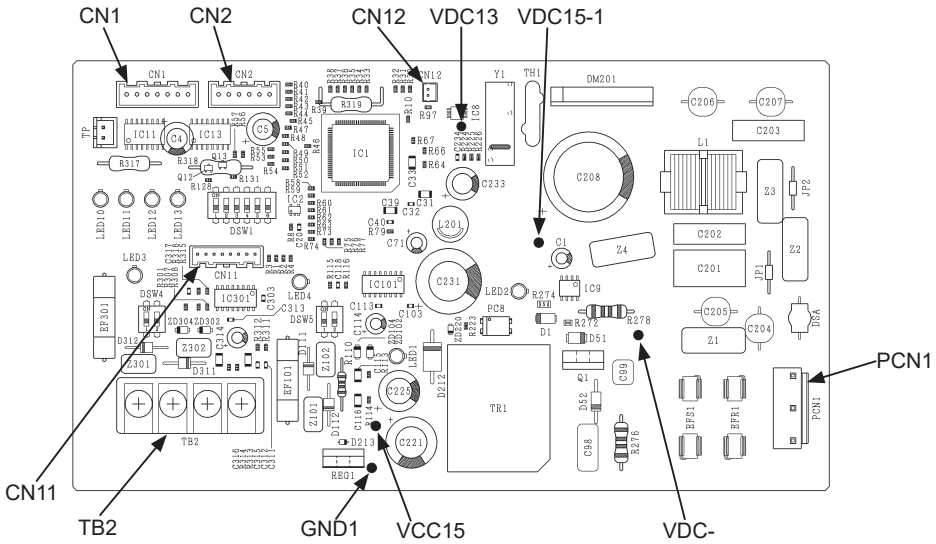
inch (mm)



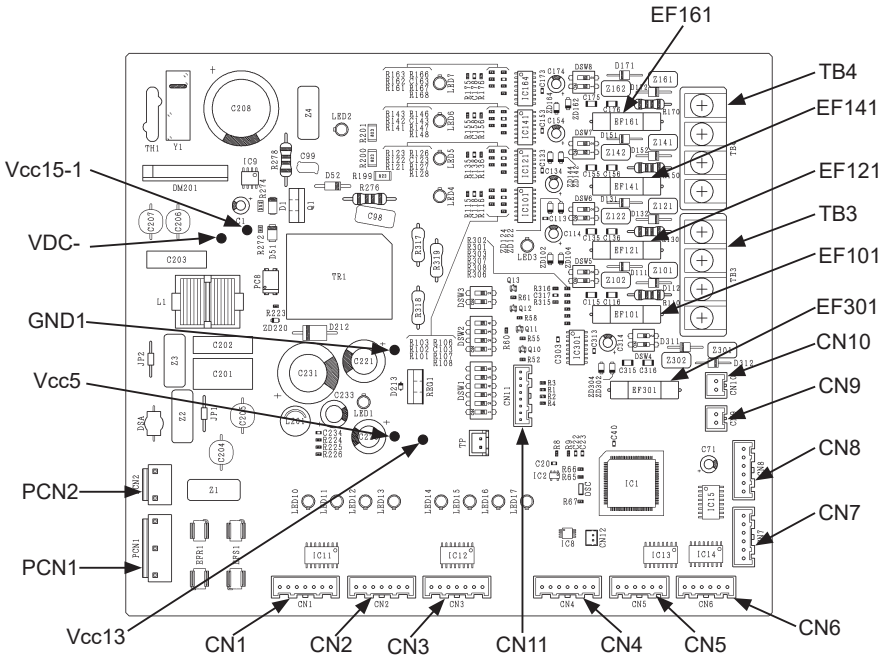
4.2.1.13 Change-Over Box

Printed Circuit Board PCB 1 - 3

COBS048, 096B22S/C



COB04M132, 08M264, 12M264B22S

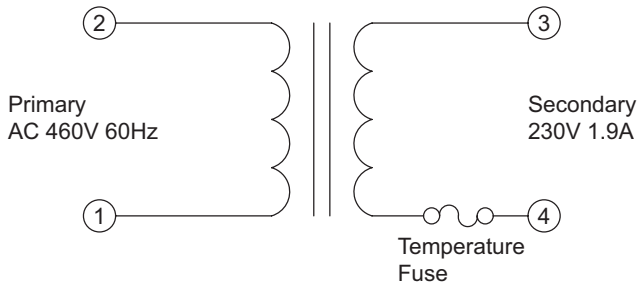


(Main Parts)

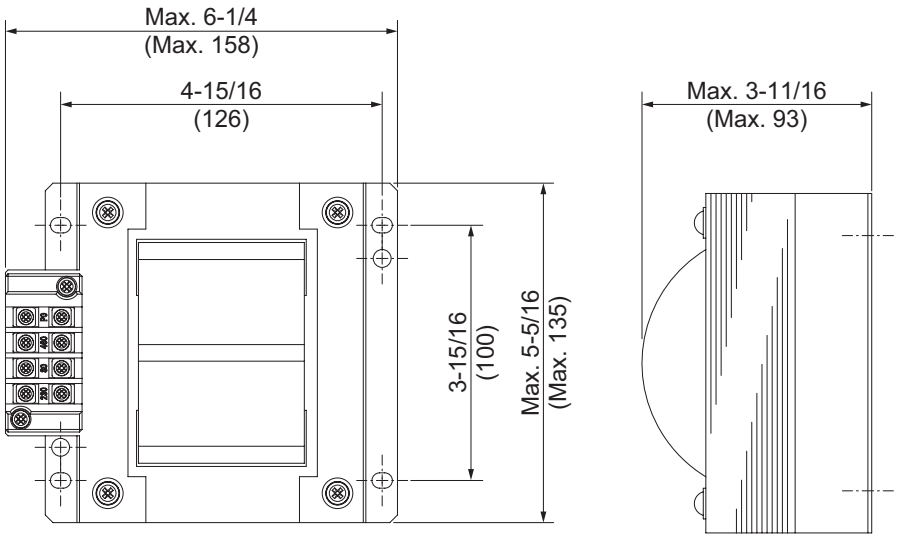
4.2.1.14 Transformer (TF)

This part is used for supplying power voltage to the control and inverter PCB.

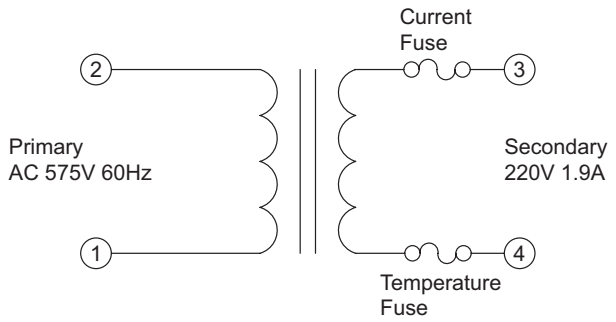
(1) Transformer for 460V Type

Items		Specifications
Rated Voltage	Primary	AC 460V 60Hz
	Secondary	230V
Rated Power		437VA
Circuit Diagram		

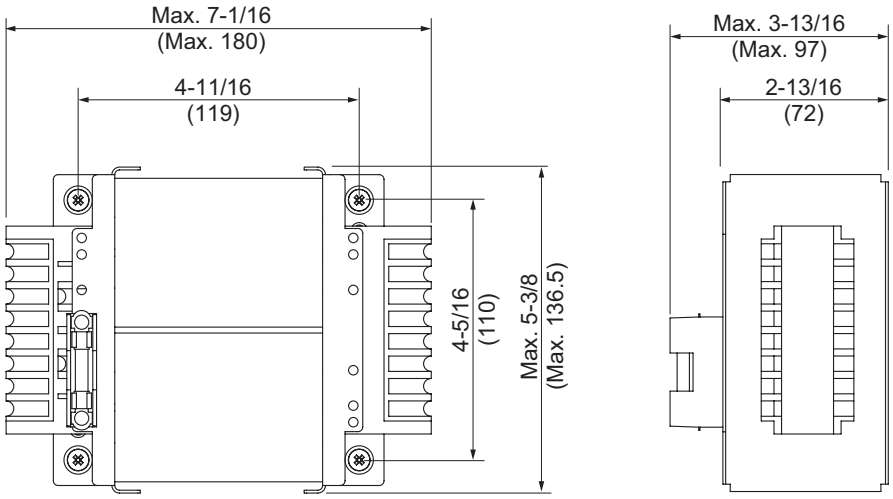
inch (mm)



(2) Transformer for 575V Type

Items		Specifications
Rated Voltage	Primary	AC 575V 60Hz
	Secondary	220V
Rated Power		418VA
Circuit Diagram		

inch (mm)



(Main Parts)

4.2.2 Low Ambient Kit (Upper Hood with Damper, Model: LAK-DAMPER-(S,M,L)-01)

Even during the warranty period, it is recommended to use an anti-corrosion coating to prevent the low ambient kit from rusting under conditions caused by alkaline or corrosive moisture.
In order to prolong the product life, perform routine maintenance to prevent significant aging due to deterioration. Perform the following tasks as part of routine preventative maintenance for the equipment.

4.2.2.1 Red Rust Generation Check

If red rust is generated, scour the rust off.
After rust is removed, prime and re-paint the area.

4.2.2.2 Installation and Assembly Screws

Check for loose screws and retighten when inspection and maintenance is performed. In order to prevent screw breakage, be sure to tighten to the following torque specifications:

* #10-16 Screw: 2.3 ± 0.2 (lbf·ft) [3.1 ± 0.3 (N·m)]
* #10-32 Screw: 2.3 ± 0.2 (lbf·ft) [3.1 ± 0.3 (N·m)]
* #8-18 Screw: 0.9 ± 0.1 (lbf·ft) [1.2 ± 0.1 (N·m)]

4.2.2.3 Damper Operation and Damper Opening Check

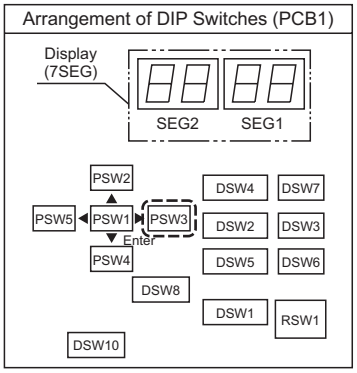
Check the damper operate by performing the Test Run according to the following procedure, and check the closed damper position is in proper range during the Test Run.

(1) Test Run for Low Ambient Kit

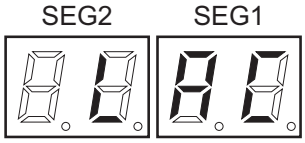
⚠CAUTION

Before Test Run, check to ensure that there are no obstacles between the dampers.

(a) Press PSW3 on the control PCB1 of outdoor unit for at least 3 seconds.



(b) "LAC (Low Ambient Cooling)" is displayed on the 7-segment displays during the Test Run.



(c) The damper begins to close. It remains closed for approximately 60 seconds.

(d) The damper opens approximately 35 second after the spring return function begins.

(e) The 7-segment displays turn off approximately 60 seconds after the damper opens.

NOTES:

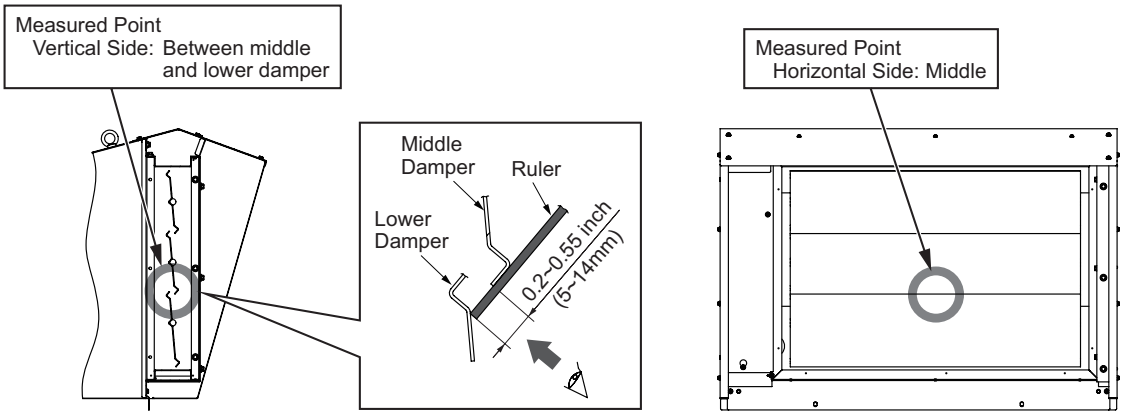
- Test Run of damper can not be performed during outdoor unit operation.
  (The outdoor unit can be stopped forcibly by DSW4-No.4=ON of main outdoor unit.)
- In case the Test Run does not start even if during stoppage, the DSW setting may be incorrect.
  Verify that all DIP switch settings are correct.

(2) Checking Closed Damper Opening for Low Ambient Kit

Measure the damper position according to the following figure when the damper low ambient kit is closed during the Test Run.
Then check the closed damper opening is within proper range.

⚠WARNING

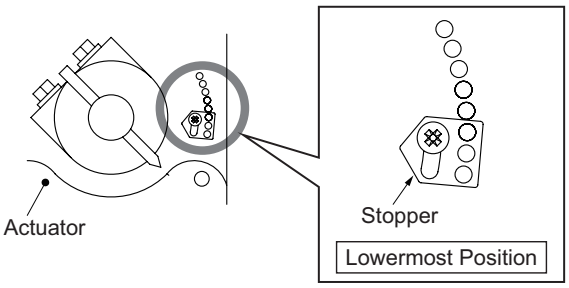
Do NOT insert finger into the gaps between the damper. This could cause serious injury.



- For measurement of the closed damper opening is within the range of “0.2 to 0.55 inch (5 to 14mm)”.
  The closed damper opening is proper.
- For measurement of the closed damper opening is outside the range of “0.2 to 0.55 inch (5 to 14mm)”.
  The closed damper opening is not proper.
  Adjustment of the closed damper opening by adjusting the initial position between damper’s shaft and actuator is required.
  Adjust the position according to the following procedure.

(3) Adjustment of Closed Damper Opening for Low Ambient Kit

(a) Make sure that “Stopper” attached to the actuator is according to the figure below.
Change the position of “Stopper” if it isn’t attached according to the figure.

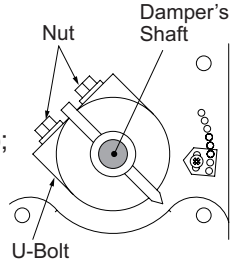


(b) Loosen “U-Bolt” and “Nuts” of actuator, and release the securing damper’s shaft and actuator.

(c) Change the initial position of damper different from previous initial position.
Then, connect damper’s shaft and actuator, and secure them by tightening “Nut”.
(Refer to (g) for retightening “Nut” the nut within the range of tightening torque.)

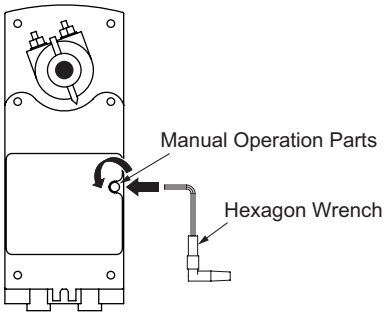
Adjusting Method of Initial Position of Damper Opening

* When the damper opening with closed position is less than 0.2 inch (5 mm);
  The position of damper shall be larger than the previous initial position.
* When the damper opening with closed position is more than 0.55 inch (14 mm);
  The position of damper shall be smaller than the previous initial position.



(Main Parts)

(d) Insert “Hexagon Wrench (accessory)” into “Manual Override” on the actuator.
Then turn “Hexagon Wrench” clockwise to rotate “U-Bolt”.



⚠CAUTION

Applying excessive torque to the manual override or using a power tool to may damage the internal components of the actuator and cause premature failure.

(e) When “U-Bolt” is rotated to the position where the tool for tightening nut can be used, turn “Hexagon Wrench” half way in the opposite direction, stop and secure “U-Bolt”.

(f) Remove “Hexagon Wrench” from “Manual Override” so that “U-Bolt” is secured firmly.

(g) Tighten “U-Bolt” and damper’s shaft with the tool for tightening nut with the tightening torque of 8.1 to 10.3 lbf·ft [11 to 14 N·m].

(h) Insert “Hexagon Wrench” into “Manual Override” again and turn “Hexagon Wrench” clockwise until it clicks into the place.
“U-Bolt” shall return to the initial position by spring-turn of actuator.

(i) Measure the damper opening again in the same way as Section 4.2.2.3 (2) “Checking Closed Damper Opening for Low Ambient Kit” when the low ambient kit is closed.
Then check the closed damper position within proper range.

NOTE:
The actuator requires 27 rotations of the manual override crank from the fully spring return position to fully reposition the actuator hub. At the end of travel, the rotational resistance increases; do not force the actuator hub past this point.

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, DSW4, 5, 8 and push switches can be operated when the power supply is ON.)
The "■" mark indicates the positions of DIP switches.

- **Initial Setting**

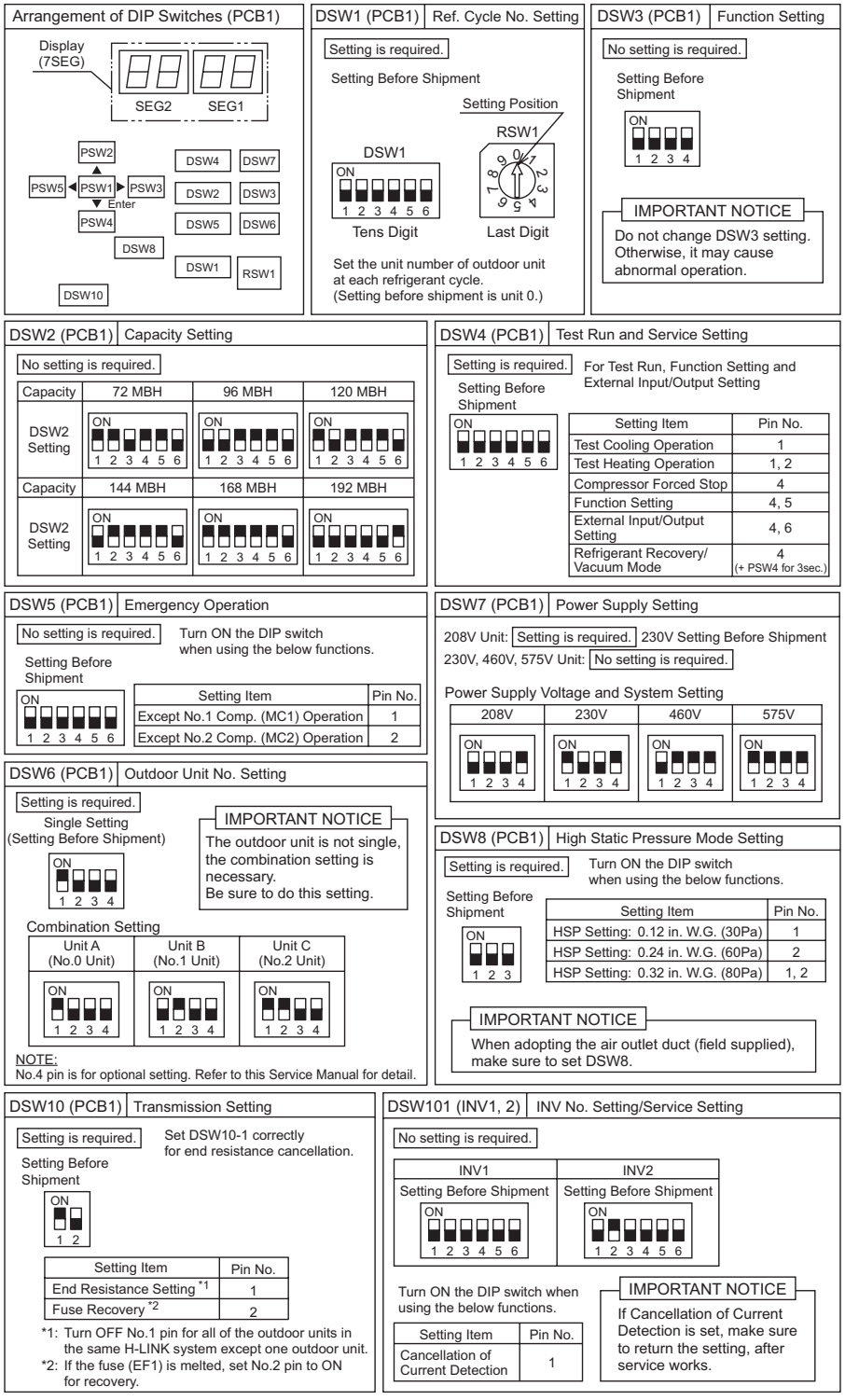


Figure. 5.1 DSW Setting

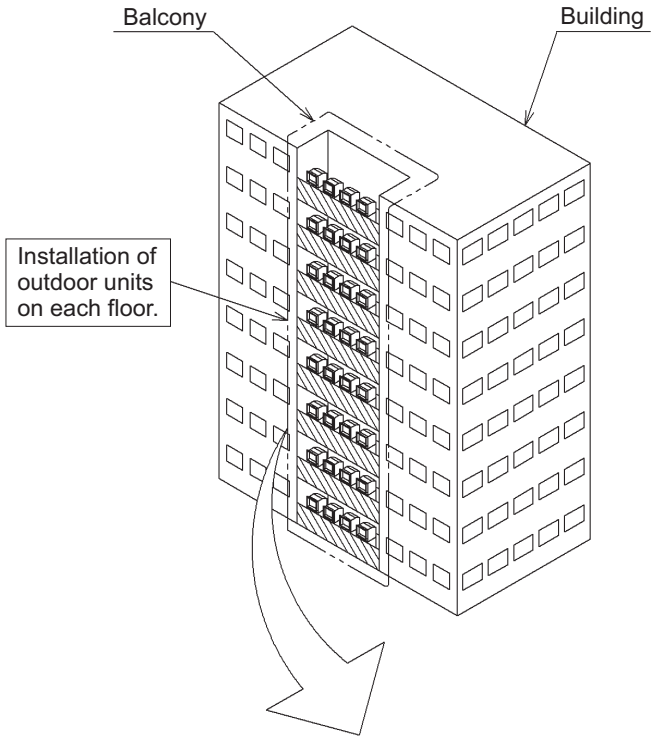
NOTE:
Thermo-ON: The outdoor unit and some indoor units are running.
Thermo-OFF: The outdoor unit and some indoor units stay on, but don't run.

5.2 High Static Pressure Setting (DSW8: ON)

Turn ON the DSW8 for the high static pressure setting.
This setting is required when adopting the field-supplied outlet duct in the field.
This setting enables high static pressure operation up to a maximum of 0.32 in.W.G. (80Pa).
When the outdoor unit is installed in spaces such as a balcony or a floor where an external static pressure is required to secure a louver or a duct, this setting should be used.

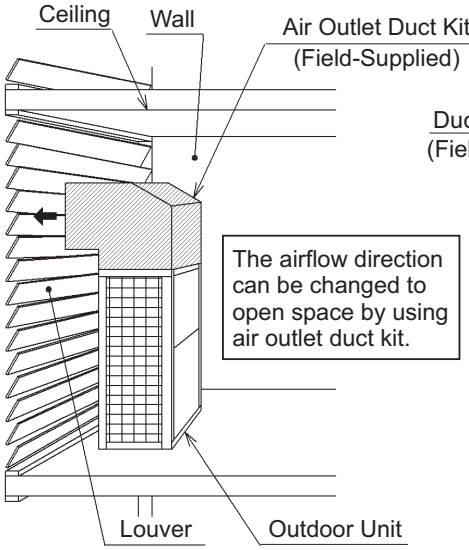
NOTES:

1. If there is a combination of outdoor units, set this function for all the outdoor units.
2. While the unit operates in high static pressure mode, the operation sound value increases by 8dB from the nominal value.

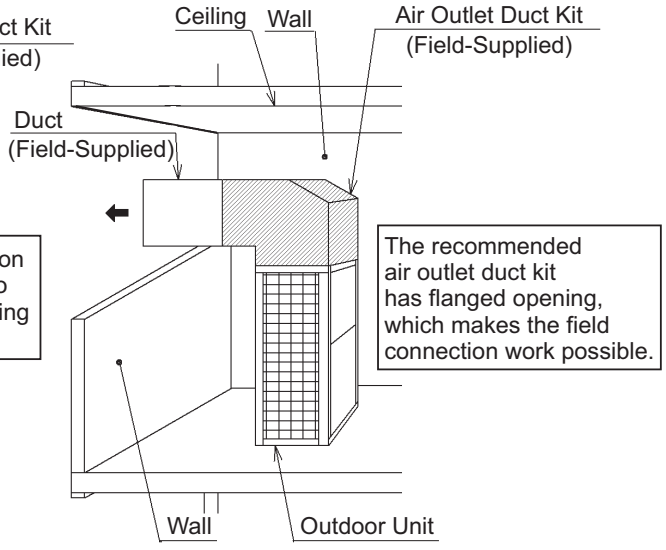


External Static Pressure Setting	DSW8	
	#1	#2
0.12 inW.G.(30Pa)	ON	OFF
0.24 inW.G.(60Pa)	OFF	ON
0.32 inW.G.(80Pa)	ON	ON

< If Open Space is a Louver >



< If Open Space is a Wall >



NOTE:
When installing the duct (field-supplied), make sure not to flow the outlet airflow of the outdoor unit into the air inlet of the outdoor unit. If not, the operation range will be limited due to increasing high pressure in the cooling operation or decreasing low pressure in the heating operation resulting in a malfunction of the unit.

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

- Setting Method
  Setting DSW4 on the outdoor unit Printed Circuit Board (PCB) is required for “External Input and Output Setting” and “Function Setting”. As for a combination of outdoor units, this must be set from DSW4 in outdoor unit A. (Setting from DSW4 in outdoor units B and C is invalid.)

< Transition Method >

[External Input/Output Setting]

■ Start of Setting

Turn ON DSW4-No.4 and turn ON DSW4-No.6.

■ Exit Setting Mode

Turn OFF DSW4-No.6 during indicated External Input/Output Setting Mode. Then, turn OFF DSW4-No.4.

[Function Setting]

■ Start of Setting

Turn ON DSW4-No.4 and turn ON DSW4-No.5.

■ Exit Setting Mode

Turn OFF DSW4-No.5 during indicated Function Setting Mode. Then, turn OFF DSW4-No.4.

After setting, confirm DSW4 setting is the same as the factory setting.

5.3.1 External Input and Output Settings

On the outdoor unit Printed Circuit Board (PCB), there are three input terminals (CN17, CN18 as shown below) to receive external signals and two output terminals (CN16) 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 Opeation 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	Low Noise Setting 1
12	Low Noise Setting 2
13	Low Noise Setting 3
0	No Setting

< Output >

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

The following functions have been already set at the factory.

< Input Terminal >

Input Terminal Name	Connector (Pin No.)	Setting Function	Control Function No.
Input 1	CN17 (1-2)	Fixed Heating Operation Mode	1
Input 2	CN17 (2-3)	Fixed Cooling Operation Mode	2
Input 3	CN18 (1-2)	Demand Stoppage	3

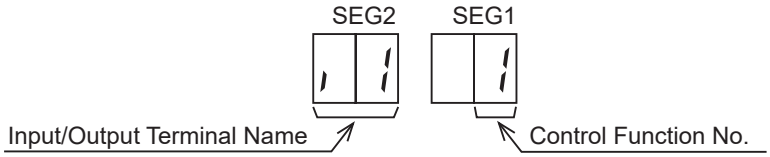
<Output Terminal>

Output Terminal Name	Connector (Pin No.)	Setting Function	Control Function No.
Output 1	CN16 (1-2)	Operation Signal	1
Output 2	CN16 (1-3)	Alarm Signal	2

- Settings for External Input and Output

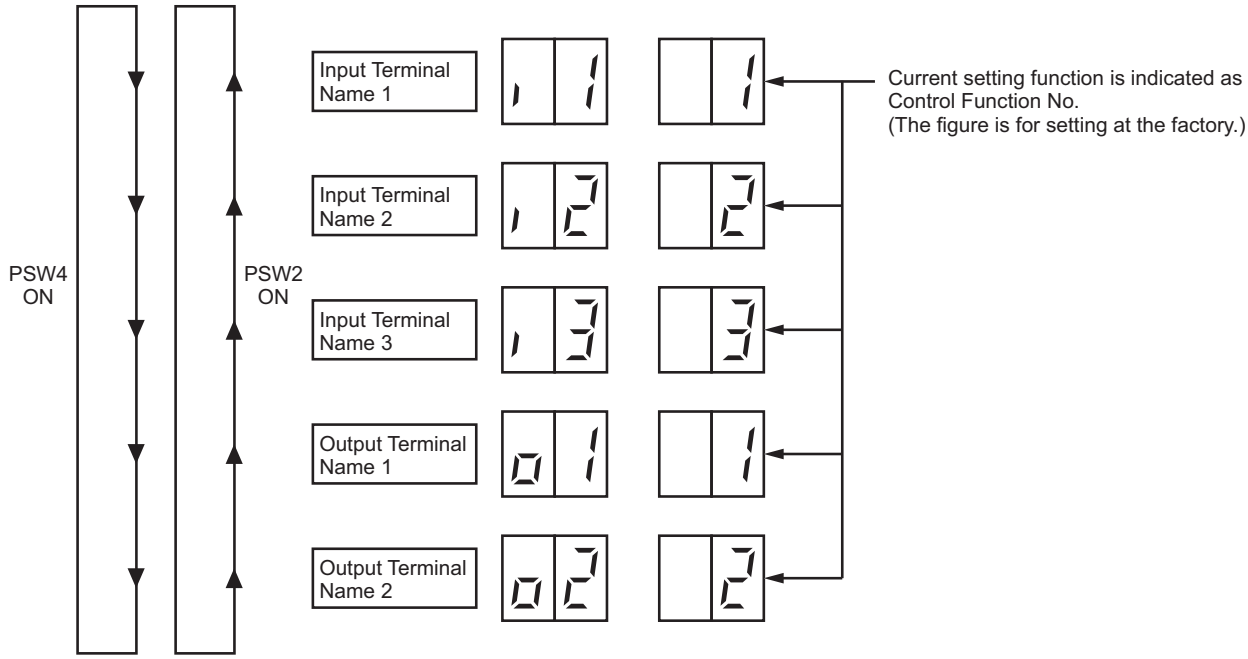
If an alternative setting is required at a site, perform the following procedures.
For a combination of outdoor units, perform the setting for outdoor unit A.

(1) By selecting “External Input and Output Setting”, the following appears on the 7-segment display. (The setting should be performed during an outdoor unit stoppage. Also, set DSW4-No.4 of the outdoor unit PCB to the “ON” side before performing the setting in order to prevent the compressor activation.)

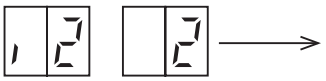


This display indicates Control Function No. 1 (Fixed Heating Operation Mode) is set at input 1.

(2) By pressing PSW2 or PSW4, the input/output terminal name is changed.
The following shows the display changes when PSW2 or PSW4 is pushed.



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



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

(4) After selecting the Control Function No., turn OFF DSW4-No.6. The display will be back to the normal operation. Then turn OFF the DSW4-No.4. Confirm if the DSW4 is set to factory settings. The selected data is stored in the outdoor unit PCB and the “External Input and Output Setting” is completed. The stored data is maintained even when the power supply is cut OFF. Refer to Table 5.1 below for the details for the electrical wiring connection and the required parts.

- 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.

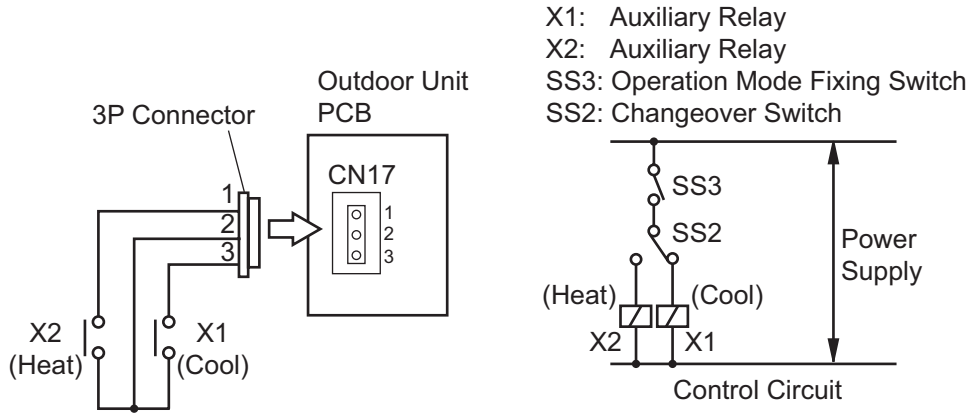
(1) Input Fixing Heating Operation Mode (Control Function No.1),
Input Fixing Cooling Operation Mode (Control Function No.2)

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 CN17: Fixed Heating Operation Mode
Short Circuit between Terminals 2 and 3 of CN17: 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 CN17)
Fixing Cooling Operation at Input 2 (between 3 and 2 pins of CN17)



Wiring Diagram Example of Fixing Operation Mode

(2) Input Demand Stoppage (Control Function No.3),
Input Forced Stoppage (Control Function No.5)

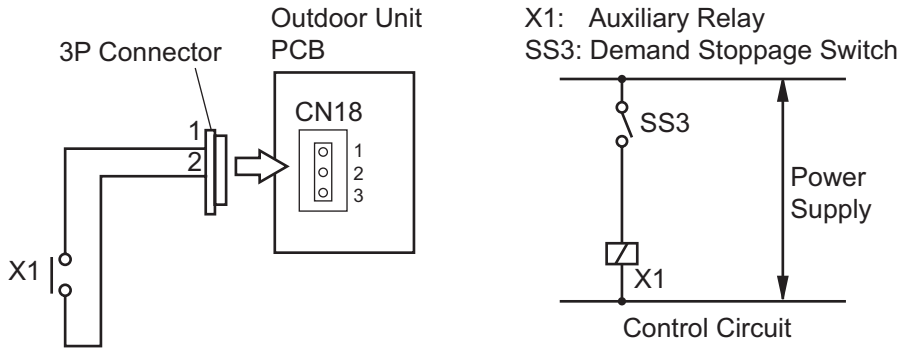
When the input terminals for Demand Stoppage or Forced Stoppage on the outdoor unit PCB are short-circuited while running, the compressor(s) is stopped. The fan motor of indoor unit(s) is operated as shown below.

Demand Stoppage (Control Function No.3)		Cooling: Airflow Setting, Heating Lo Setting
Forced Stoppage (Control Function No.5)	Function Setting "FE"=0	Stop
	Function Setting "FE"=1	Cooling: Airflow Setting, Heating Lo Setting

The stoppage code No. "10" is given. In this case, if the input terminals are opened, operation is resumed.

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

• Setting Example
Demand Stoppage at Input 3 (between 1 and 2 pins of CN18)
Forced Stoppage at Input 3 (between 1 and 2 pins of CN18)



Wiring Diagram Example of Demand Stoppage or Forced Stoppage

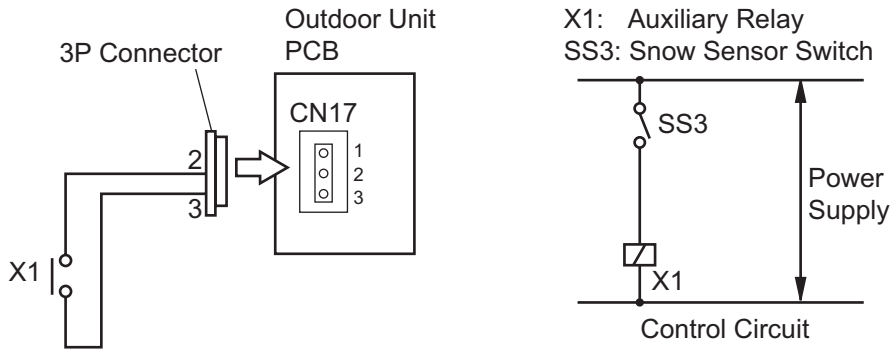
(3) Input Outdoor Fan Motor Start/Stop (Control Function No.4)

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, 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. This method requires a relay or similar to initiate this function. This is a separate method.

An example of basic wiring when the Outdoor Fan Motor Start/Stop (Input 2) is set to 2 and 3 pins of CN17 by an external signal is shown below.

In this section, Switch-ON/Switch-OFF mean:
Switch-ON: Some indoor units are running or staying.
Switch-OFF: All indoor units are stopped.

• Setting Example
Outdoor Fan Motor Start/Stop at Input 2 (between 2 and 3 pins of CN17)



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. If the fan motor or fan controller fail 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.
3. When setting the snow sensor switch for Outdoor Fan Motor Start/Stop, make sure that the continuous operating time is 30 seconds or more. Also Outdoor Fan Motor Start/Stop intervals shall be at least 10 minutes. Otherwise, malfunction of the outdoor fan motors will be caused by frequent starts and stops.

⚠WARNING

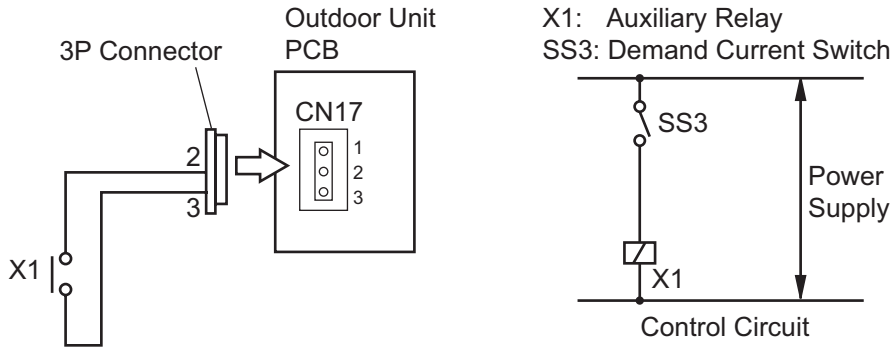
Because of this setting, the outdoor fan can operate even while the outdoor unit (compressor) stops. Display a notice to that effect on a readily visible part of the unit body, in order to avoid injuries caused by an unintended outdoor fan operation.

(4) 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.

• Setting Example
Demand Current Control at Input 2 (between 2 and 3 pins of CN17), Control Function No. 6 to 10



Wiring Diagram Example of Demand Current Control

NOTES:
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% to100%) depending on the operating control conditions such as protection control.

(5) Input Low Noise Setting 1, 2, 3 (Control Function No.11 to 13)

When the input terminals for Low Noise Setting on the outdoor unit PCB are short-circuited, the compressor frequency and outdoor fan rotation frequency are controlled and the operating sound of the outdoor unit will be as shown in the table below.
The operating sound can be set by selecting the Control Function No.

NOTE:

(a) The outdoor unit capacity will decrease because the compressor frequency and outdoor fan motor frequency forcibly decrease. The operating range will also be restricted.

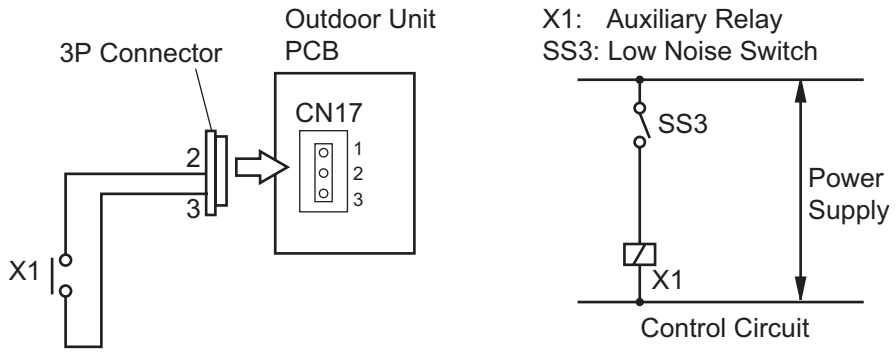
(b) The value on the table below indicate the operating sound (targeted value) of single unit. In some cases, the operating sound may be temporarily higher than the value in the table below. The operating sound of combination units will be higher than the value on the table below.

(c) If Low Noise Setting is always required without input signal, refer to Section 5.3.2.2 (7) “Low Noise Setting”

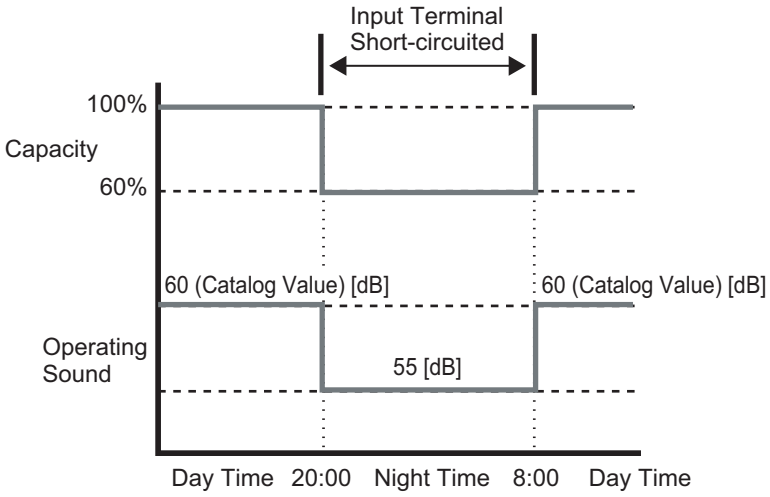
< Control Function No. for Low Noise Setting and Operating Sound/Outdoor Unit Capacity >

Control Function No.	Operating Sound (Targeted Value)	Outdoor Unit Capacity (Specification Ratio)
No Setting	Catalog Value	100%
11 (Low Noise Setting 1)	Catalog Value -2dB	80%
12 (Low Noise Setting 2)	Catalog Value -5dB	60%
13 (Low Noise Setting 3)	Catalog Value -8dB	40%

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



Wiring Diagram Example of Low Noise Setting



[Example] “Low Noise Setting 2” during Night Only

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).

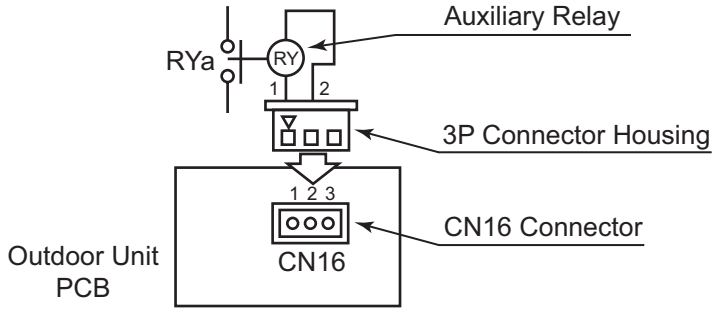
- External Output Function Setting

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 CN16)

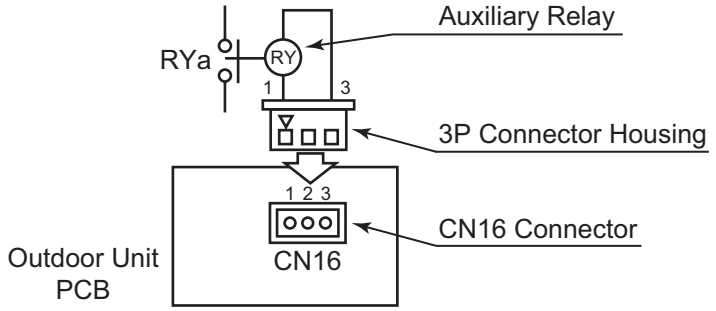


Wiring Diagram Example of Operation Signal

(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 CN16)

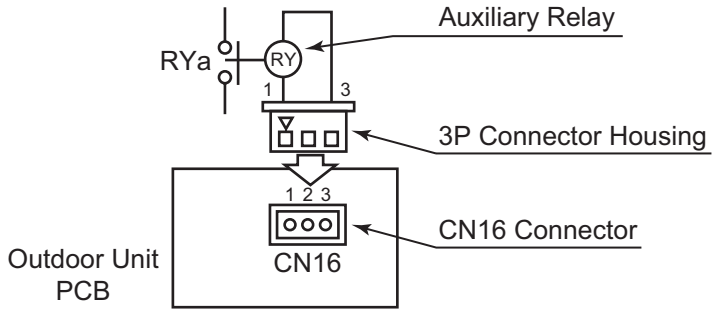


Wiring Diagram Example of Alarm Signal

(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 CN16)

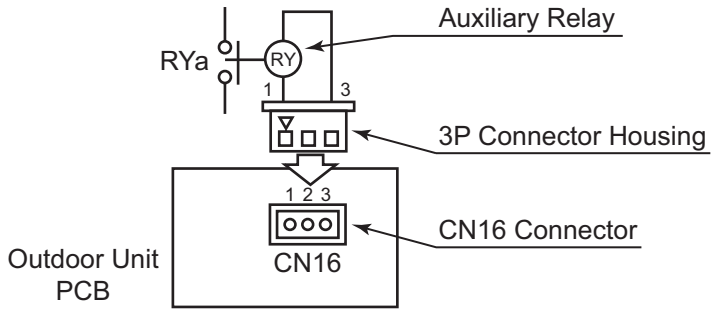


Wiring Diagram Example of Compressor ON Signal

(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 CN16)



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

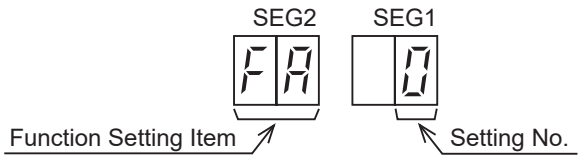
* Do not use the relay with diode built-in.
* Refer to Table 5.1 above for the connector parts.

5.3.2 Function Setting

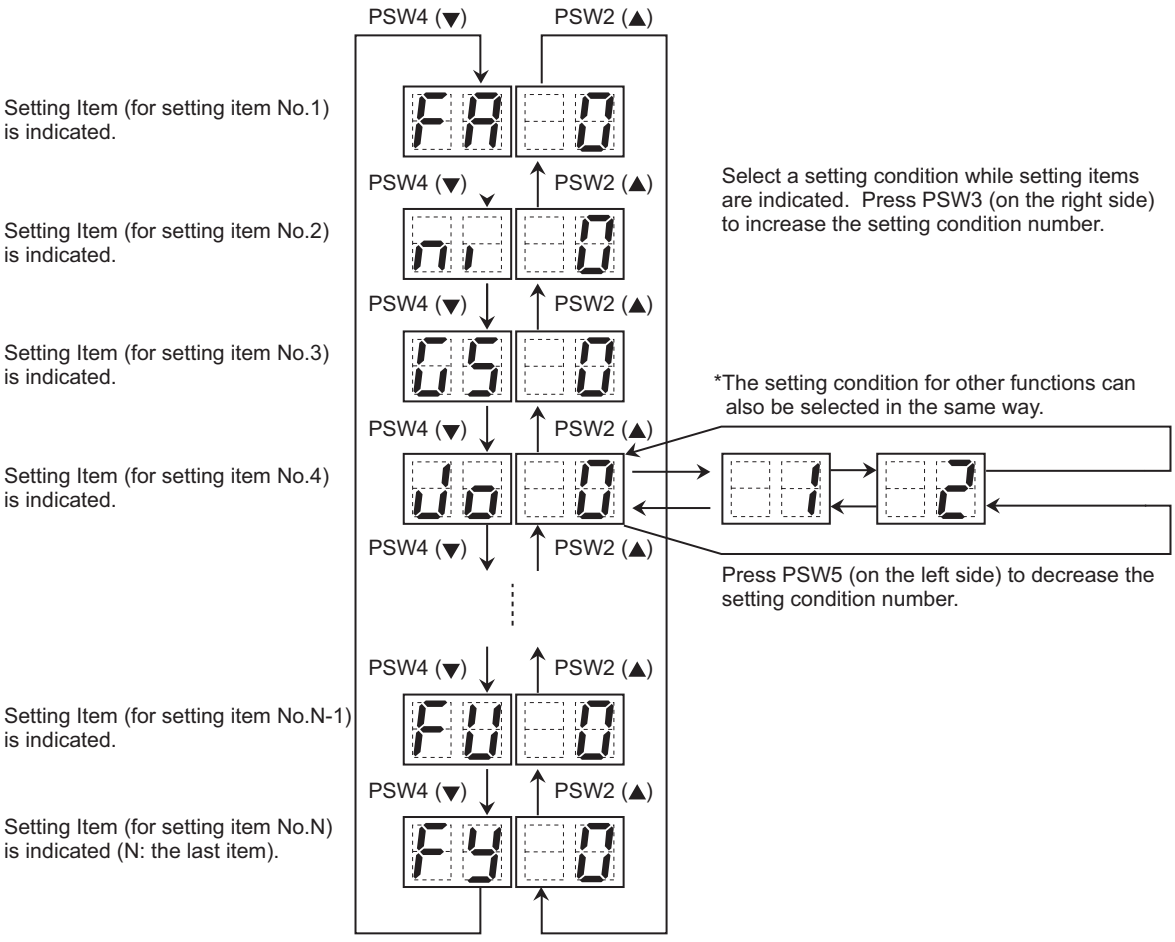
● Refer to Section 5.3 "● Setting Method" for mode transition functions.

NOTE:
The setting should be performed during the outdoor unit stoppage.
For a combination of outdoor units, set it to outdoor unit A. (The setting cannot be performed to outdoor units B and C.) Outdoor unit A is the unit to which the communication cable between the outdoor unit and indoor unit is connected.

(1) By selecting "Function Setting", the following appears on the 7-segment display.
(The setting should be performed during an outdoor unit stoppage. Also, set DSW4-No.4 and No.5 of the outdoor unit PCB to the "ON" side before performing the setting in order to prevent the compressor activation.)



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



(3) After selecting the Function Setting, turn OFF DSW4-No.5. The display will be back to the normal operation. Then turn OFF DSW4-No.4. Confirm if DSW4 is set to factory settings.
The selected data is stored in the outdoor unit PCB and the "Function Setting" is completed. The stored data is maintained even when the power supply is cut OFF.

5.3.2.1 Function Setting Item

No.	Setting Item	7-Segment Display		Contents
		SEG2	SEG1	
1	Circulator Function at Heating Thermo-OFF	FA	00	No setting
			01	Indoor fan forced ON and OFF (2 min. ON / 6 min. OFF)
			02	Indoor fan forced ON and OFF (2 min. ON / 13 min. OFF)
			03	Indoor fan forced ON and OFF (2 min. ON / 28 min. OFF)
			04	Indoor fan stop
2	Night Shift (Low Noise)	n1	00	No setting
			01	Setting of night shift 1
			02	Setting of night shift 2 (Cooling Only)
3	Cancellation of Outdoor Ambient Temperature Limit	CS	00	No setting
			01	For heating
			02	For cooling
			03	For cooling/heating
4	Defrost for Cold Area (Change of Defrost Condition)	Jo	00	No setting
			01	Change of starting defrost condition
			02	Not used
5	SLo (Fan Speed) Defrost Setting	bJ	00	Indoor fan stop when heating operation is activated/during defrost operation
			01	Indoor fan SLo operation during defrost operation
			02	Indoor fan SLo operation when heating operation is activated
			03	Indoor fan SLo operation when heating operation is activated/during defrost operation
			04	Indoor fan SLo operation when heating operation is activated (including Start Up after Defrost)
6	Cancellation of Outdoor Unit Hot Start	HF	00	Hot start control is available
			01	Cancellation of hot start
			02	Not used
			03	Not used
7	Priority Capacity Mode	nU	00	No setting
			01	Change of frequency maximum limit value
			02	Change of frequency maximum limit value and current limit value
			03	Change of frequency maximum limit value, current limit value and fan speed limit value
8	Minimum Evaporating Temperature Setting for Cooling	Hc	00	Initial setting
			01	Minimum 42°F (6°C)
			02	Minimum 44°F (7°C)
			03	Minimum 46°F (8°C)
			04	Minimum 48°F (9°C)
			05	Minimum 50°F (10°C)
			06	Minimum 52°F (11°C)
			07	Minimum 54°F (12°C)
			08	Minimum 56°F (13°C)
			09	Minimum 58°F (14°C)
			10	Minimum 36°F (2°C)
			11	Minimum 38°F (3°C)
			12	Minimum 40°F (4°C)
			13	Minimum 41°F (5°C)
9	Compressor Frequency Control Target Value for Heating (Pd Correction Value)	Hh	00	Initial setting (Pd correction value ±0psi (±0.00MPa))
			01	Correction value -22psi (-0.15MPa)
			02	Correction value -15psi (-0.10MPa)
			03	Correction value -7psi (-0.05MPa)
			04	Correction value -4psi (-0.03MPa)
			05	Correction value +4psi (+0.03MPa)
			06	Correction value +7psi (+0.05MPa)
			07	Correction value +15psi (+0.10MPa)
10	Indoor Expansion Valve Control Target Value for Cooling (SH Correction Value)	SC	00	Initial setting (SH correction value ±0°F (±0°C)
			01	SH correction value -3°F (-2°C)
			02	SH correction value -2°F (-1°C)
			03	SH correction value +2°F (+1°C)
			04	SH correction value +3°F (+2°C)

No.	Setting Item	7-Segment Display		Contents
		SEG2	SEG1	
11	Indoor Expansion Valve Control Target Value for Heating (SC Correction Value)	SH	00	Initial setting (SC correction value ±0°F (±0°C)
			01	SC correction value -11°F (-6°C)
			02	SC correction value -5°F (-3°C)
			03	SC correction value +5°F (+3°C)
			04	SC correction value +11°F (+6°C)
12	Indoor Expansion Valve Opening during Heating Operation Stoppage	S1	00	Initial setting (stoppage unit expansion valve opening) 006-015MBH: 100~300 pulse, 018MBH or over: 200~400 pulse
			01	Expansion valve opening: 150~325 pulse
			02	Expansion valve opening 006-015MBH: 175 pulse, 018MBH or over: 300 pulse
			03	Expansion valve opening 006-015MBH: 100 pulse, 018MBH or over: 150 pulse
			04	Expansion valve opening 006-015MBH: 90 pulse, 018MBH or over: 100 pulse
			05	Expansion valve opening 006-015MBH: 40 pulse, 018MBH or over: 40 pulse
13	Indoor Expansion Valve Opening during Heating Thermo-OFF	So	00	Thermo-OFF unit expansion valve opening (150~325 pulse)
			01	Expansion valve opening 006-015MBH: 175 pulse, 018MBH or over: 300 pulse
			02	Expansion valve opening 006-015MBH: 100 pulse, 018MBH or over: 150 pulse
			03	Expansion valve opening: 40pls
14	Indoor Expansion Valve Initial Opening during Heating Thermo-ON	c1	00	Initial setting (600~1300 pulse)
			01	Compensated start up opening from ratio of indoor unit expansion valve opening during unit operation
			02	Expansion valve opening: 300~650 pulse
			03	Expansion valve opening 006-015MBH: 950 pulse, 018MBH or over: 1500 pulse
			04	Expansion valve opening 006-015MBH: 1440 pulse, 018MBH or over: 2000 pulse
15	Indoor Expansion Valve Initial Opening for Cooling	cb	00	Initial setting
			01	Cooling operation initial opening -5%
			02	Cooling operation initial opening +3%
			03	Cooling operation initial opening +5%
			04	Cooling operation initial opening +10%
16	Outdoor Expansion Valve Initial Opening for Heating	ch	00	Initial setting
			01	Heating operation initial opening -5%
			02	Heating operation initial opening +3%
			03	Heating operation initial opening +5%
			04	Heating operation initial opening +10%
17	Low Noise Setting (Sound Reduction Function, cooling/heating operation range will be restricted.)	db	00	Initial setting
			01	Fan speed limit 20 step
			02	Fan speed limit 072-144MBH: 18 step, 168·192MBH: 17 step
			03	Fan speed limit 072-144MBH: 16 step, 168·192MBH: 15 step
			04	Compressor frequency limit 1
			05	Compressor frequency limit 2
			06	Compressor frequency limit 3
			07	Fan speed limit 20 step and Compressor frequency limit 1
			08	Fan speed limit 072-144MBH: 18 step, 168·192MBH: 17 step and Compressor frequency limit 2
			09	Fan speed limit 072-144MBH: 16 step, 168·192MBH: 15 step and Compressor frequency limit 3
18	Demand Function Setting	dE	00	No demand control
			01	Demand control 40%
			02	Demand control 60%
			03	Demand control 70%
			04	Demand control 80%
			05	Demand control 100%
19	Wave Function Setting	UE	00	No wave function
			01	Minimum limit 40%
			02	Minimum limit 60%
			03	Minimum limit 70%
			04	Minimum limit 80%
20	Protection of Decrease in Outlet Temperature for Cooling	Fb	00	Initial setting
			01	Outlet temperature ≤ 50°F (10°C)
			02	Outlet temperature ≤ 54°F (12°C)
			03	Outlet temperature ≤ 58°F (14°C)

No.	Setting Item	7-Segment Display		Contents
		SEG2	SEG1	
21	Outlet Air Temperature Control for DOAS	Fr	00	Initial setting
			01	Restrain capacity control
			02	Outlet air temperature control
22	Adjustment of Fan Rotation (To avoid a whining sound for the multiple installation.)	Fo	00	Initial setting
			01	Change of fan rotation -12rpm
			02	Change of fan rotation -24rpm
23	Not Prepared	Lr	00	-
24	Thermo-OFF Setting for Outdoor Unit After Defrosting Operation	dS	00	No setting
			01	Thermo-OFF stoppage setting for outdoor unit after defrosting operation
25	Not Prepared	F1	00	-
26	Crankcase Heater Control during Stoppage	F2	00	Not Available
			01	Stoppage for 20 days
			02	Stoppage for 15 days
			03	Stoppage for 10 days
			04	Stoppage for 5 days
			05	Stoppage for 3 days
			06	Stoppage for 2 days
27	Indoor Fan Hot Start Period Setting	F3	00	Initial setting (Max. 12 minutes)
			01	Max. 3 minutes
			02	Max. 6 minutes
			03	Max. 9 minutes
			04	Max. 15 minutes
			05	Max. 30 minutes
			06	Max. 60 minutes
28	Intermittent Operation of Outdoor Fan Motor	F4	00	No intermittent operation
			01	Set outdoor temperature ≤ 38°F (3°C)
			02	Set outdoor temperature ≤ 32°F (0°C)
			03	Set outdoor temperature ≤ 34°F (1°C)
			04	Set outdoor temperature ≤ 36°F (2°C)
			05	Set outdoor temperature ≤ 40°F (4°C)
			06	Set outdoor temperature ≤ 41°F (5°C)
29	Indoor Expansion Valve Control Target value for Cooling (Only for 4-Way Cassette Type) (SH Correction Value)	F5	00	Initial setting (SH correction value ±0°F (±0°C))
			01	SH correction value +2°F (+1°C)
			02	SH correction value +3°F (+2°C)
			03	SH correction value +5°F (+3°C)
			04	SH correction value +7°F (+4°C)
30	Indoor Expansion Valve Opening Lower Limit during Heating SW-OFF	F6	00	Initial setting (stoppage unit expansion valve opening) 006-015MBH: 90 pulse/ 018MBH or over: 90pulse
			01	Expansion valve opening 150~325 pulse
			02	Expansion valve opening 006-015MBH: 175 pulse/ 018MBH or over: 300 pulse
			03	Expansion valve opening 006-015MBH: 100 pulse/ 018MBH or over: 150 pulse
			04	Expansion valve opening 006-015MBH: 90 pulse/ 018MBH or over: 100 pulse
			05	Expansion valve opening 006-015MBH: 40 pulse/ 018MBH or over: 40 pulse
31	Not Prepared	F7	00	-
32	Forced Defrosting after Enforced Stoppage during Defrosting Cycle	F8	00	Initial setting (valid)
			01	Invalid
33	Not Prepared	F9	00	-
34	Not Prepared	FC	00	-
35	Convert Unit in Checking Mode	Fd	00	Initial Setting (Temp: °F, Pressure: psi)
			01	Temp: °C, Pressure: MPa

No.	Setting Item	7-Segment Display		Contents
		SEG2	SEG1	
36	Permit Indoor Fan Operation during Forced Stoppage	FE	00	Indoor fan stop
			01	Indoor fan operating
37	Not Prepared	FF	00	-
38	Not Prepared	FG	00	-
39	Not Prepared	FH	00	-
40	Not Prepared	F1	00	-
41	Not Prepared	FJ	00	-
42	Not Prepared	FL	00	-
43	Not Prepared	Fn	00	-
44	Not Prepared	FP	00	-
45	Not Prepared	Fr	00	-
46	Not Prepared	FU	00	-
47	Not Prepared	FY	00	-

NOTE:
Contact your distributor or contractor for details on items “8” to “16”, “24”, “26”, “27”, “29”, “30” and “32”.

5.3.2.2 Description of Function Setting Item

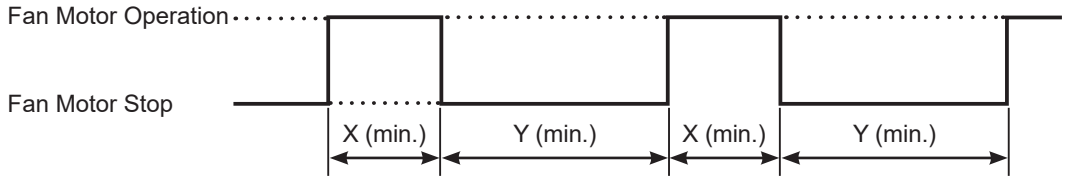
(1) Circulator Function at Heating Thermo-OFF (Function Setting “FA”)

Press “PSW3” and select the setting conditions “0 to 4” in Circulator Function at Heating Thermo-OFF “FA”.

Normally, 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.

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.



Contents of Function Setting Item "FA"

	“FA” Setting Condition				
	0	1	2	3	4
Indoor Fan Motor “LOW” Operation Time X (min.)	(Continuous Operation)	2	2	2	0
Indoor Fan Motor Stop Time Y (min.)	0	6	13	28	Stopped

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

*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”)

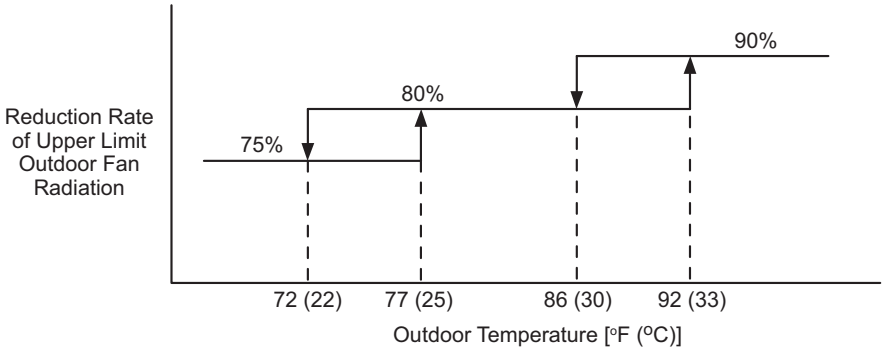
Press “PSW3” and select the setting condition “1” or “2” for the Night Shift (Low Noise) “ ni ”. Then, this function can be set. “ni”=1 reduces the upper limit of the outdoor fan rotation and the compressor frequency as shown below in any operation. “ni”=2 is adapted only for cooling operation. In heating operation, “ni”=2 is same as “ni”=0.

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.

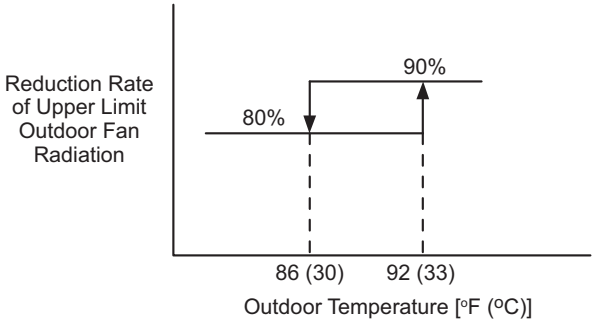
< Night Shift >

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

at Cooling Operation



at Heating Operation



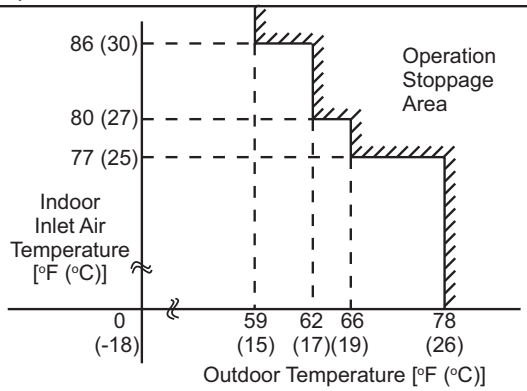
NOTES:

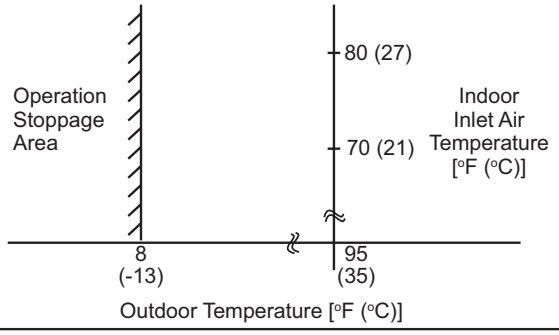
1. Reduction rates are approximate, these may change slightly depending on the outdoor unit model.
2. This function setting is not possible to set the Priority Capacity Mode “nU” and the Low Noise Setting “db” at the same time.

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

Press “PSW3” and select the setting condition “0” to “3” for Cancellation of Outdoor Ambient Temperature limit “ GS ”. 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

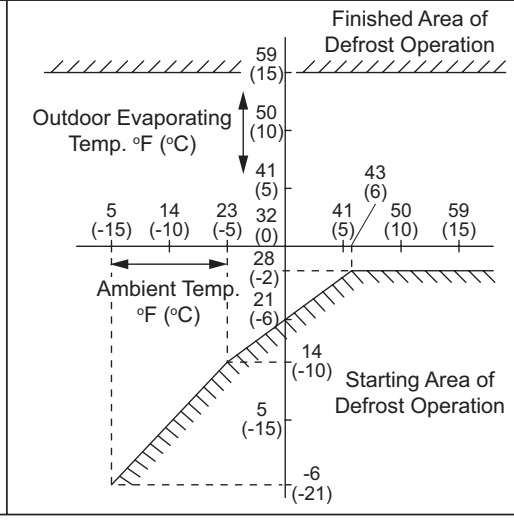
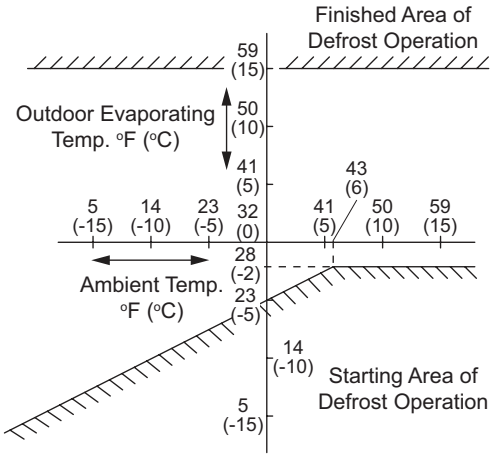
Heating Operation	
The limitation of the permissible outdoor temperature area in heating operation (factory setting) shown in the figure at the right is cancelled. NOTE: When the outdoor ambient temperature limit for heating operation is cancelled, the operation may stop due to increasing high pressure since the protection control is not cancelled.	

Cooling Operation	
The limitation of the permissible outdoor temperature area in cooling operation (factory setting) shown in the figure at the right is canceled. NOTE: When the outdoor ambient temperature limit for cooling operation is cancelled, the operation may stop due to decreasing low pressure since the protection control is not cancelled.	

NOTE:
If this function is set and the outdoor unit operates in the operation stoppage area shown in the above figure for a long time, 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) Defrost for Cold Area (Function Setting “Jo”)

Press “PSW3” and select the setting condition “1” at the Defrost for Cold Area “ Jo ” to change the temperature condition for starting defrost operation.

	Factory Setting “Jo=0”	For Cold Area “Jo=1”
Temperature Condition for Starting Defrost Operation		

(5) SLo Defrost Setting (Function Setting “bJ”)

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

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

(6) Capacity-Focused Mode Setting (Function Setting “nU”)

If the unit capacity seems insufficient during the normal operation, press “PSW3” and select the setting condition “0” to “3” Capacity-Focused Mode Setting “nU”. By setting this function, the target frequency and current limit of the compressor and the fan speed limit are set higher.

NOTE:
Do not use setting conditions “2” and “3” unless the power supply wiring is sufficient ampacity, because the target frequency and current limit of the compressor during the operation are set higher.

“nU” Setting Condition	Compressor Frequency and Current Operation
0	Not Available (Default Setting)
1	Compressor Frequency Limit is Set Higher
2	Compressor Frequency Limit and Current Limit are Set Higher
3	Compressor Frequency Limit, Current Limit and Fan Speed Limit are Set Higher

(7) Low Noise Setting (Function Setting “db”)

Press “PSW3” and select the setting condition “0” to “9” at the Low Noise Setting “db” to reduce the upper limit of the compressor frequency and the outdoor fan rotation.

NOTES:
1. By setting this function, the compressor frequency and the outdoor fan motor rotation frequency are forcibly reduced and so the outdoor unit capacity decreases and the unit operation range is limited.
2. Reduction rates are approximate, these may change slightly depending on the outdoor unit model.
3. The Low Noise Setting “db”=7,8,9 are same operation as Low Noise Setting 1,2,3 by External Input Function Setting.

“db” Setting Condition	Reduction Rate of Upper Limit		
	Compressor Frequency	Outdoor Fan Steps	
		072 - 144MBH	168, 192MBH
0	Not Changed (100%)	Not Changed	Not Changed
1	Not Changed	20 Step	20 Step
2	Not Changed	18 Step	17 Step
3	Not Changed	16 Step	15 Step
4	80%	Not Changed	Not Changed
5	60%	Not Changed	Not Changed
6	40%	Not Changed	Not Changed
7	80%	20 Step	20 Step
8	60%	18 Step	17 Step
9	40%	16 Step	15 Step

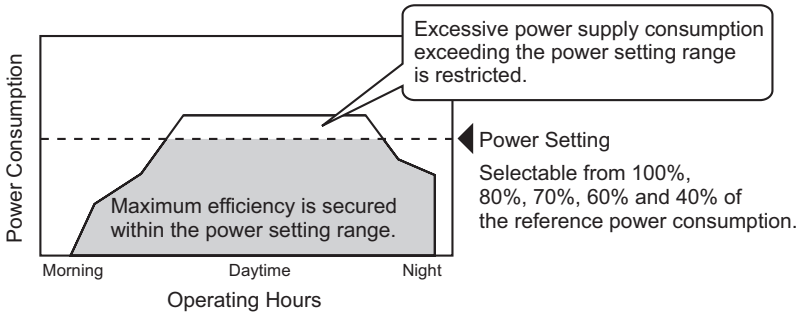
(8) Demand Function Setting (Function Setting “dE”)

Press “PSW3” and select the setting condition “0” to “5”, 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.

NOTE:
If the outdoor unit running current exceeds the maximum limit for twenty minutes, the indoor unit is put under Thermo-OFF condition. In this case, the stoppage code No. “10” is given.
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.

“dE” Setting Condition	Demand Running Current Control
0	Not Available (Default Setting)
1	40%
2	60%
3	70%
4	80%
5	100%

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



Outdoor Unit Capacity [MBH]	Reference Power Consumption [kW]
072	7.5
096	9.5
120	12.5
144	14.5
168	16.5
192	20.0

< 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.

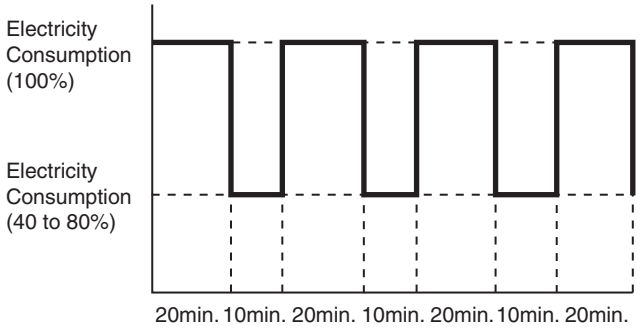
(9) Wave Function Setting (Function Setting “UE”)

Press “PSW3” and select the setting condition “0” to “4”, 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 80% 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	Running Current Lower Limit Setting
0	Not Available (Default Seting)
1	40%
2	60%
3	70%
4	80%



NOTE:

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

When the scheduled operation of “Demand Function Setting” is set from the central controller, refer to the “Installation and Maintenance Manual” for the central controller.

(10) Protection of Decrease in Outlet Temperature for Cooling (Function Setting “Fb”)

Press “PSW3” and select the setting condition “0” to “3” at Protection of Decrease in Outlet Temperature for Cooling “ Fb ”, can be set. When the indoor unit outlet air temperature falls at cooling operation, the compressor frequency forcibly decreases to prevent a drop in outlet air temperature. If the outlet temperature decreases and the temperature is less than the Thermo-OFF condition even after the compressor frequency decreases, the indoor unit becomes Thermo-OFF condition.
(When Thermo-OFF is activated under this condition, the operation will be restarted after three minutes.)

*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.

"Fb" Setting Condition	Outlet Temperature	
	Target Value	at Thermo-OFF
0	-	-
1	50°F (10°C)	44°F (7°C)
2	54°F (12°C)	48°F (9°C)
3	58°F (14°C)	52°F (11°C)

(11) Adjustment of Fan Rotation (Function Setting “Fo”)

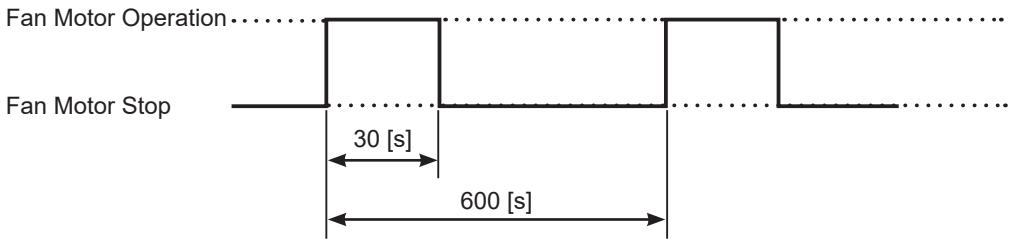
Press “PSW3” and select the setting condition “0” to “2” at Adjustment of Fan Rotation “ Fo ”, so Adjustment of Fan Rotation can be set. If the outdoor unit fans make a whining sound in an instance of multiple installations, set this function to the relevant outdoor units.

"Fo" Setting Condition	Adjustment of Fan Rotation
0	Not Available (Default Setting)
1	-12 rpm
2	-24 rpm

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

(12) Intermittent Operation of Outdoor Fan Motor (Function Setting “F4”)

Press “PSW3” and set Intermittent Operation of Outdoor Fan Motor “ F4 ” (auxiliary function) to protect the outdoor fan motor from snow.
Set this function to the PCB of the outdoor unit A (main outdoor unit).
When the outdoor temperature (selectable from 38°F (3°C), 32°F (0°C), 34°F (1°C), 36°F (2°C), 40°F (4°C) and 41°F (5°C)) reaches the temperature setpoint, all the outdoor fan motors start intermitted operation.
When the outdoor temperature is at least +9°F (+5°C) higher than the temperature setpoint, the outdoor fan motors stop operating.
If the compressor restarts operating, the outdoor fan motors will be restored to normal operation.



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. If the fan motor or fan controller fail 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.

(13) Temperature and Pressure Unit Setting (Function Setting “Fd”)

Press “PSW3” and set Temperature and Pressure Unit “ Fd ” to change the unit setting of temperature and pressure.

"Fd" Setting Condition	Unit
1	Temperature: °F, Pressure: psi (Default Setting)
2	Temperature: °C, Pressure: MPa

5.4 Power Saving Functions from Wired Controller

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

5.4.1 Power Saving Guide

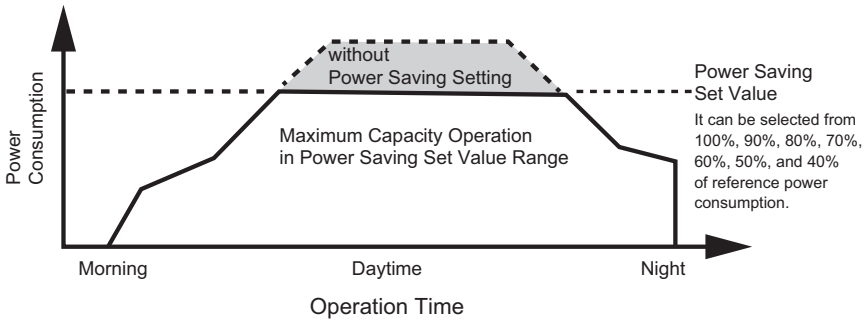
Press “ECO” button then the power saving guide will be displayed to support the setting. Easy access to the confirmation and setting screen from the current setting status screen.

5.4.2 Outdoor Unit Capacity Control

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

< “Peak Cut Control” Function >

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



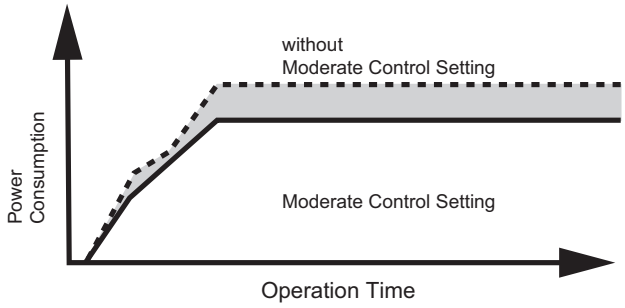
Outdoor Unit Capacity [MBH]	Reference Power Consumption [kW]
072	7.5
096	9.5
120	12.5
144	14.5
168	16.5
192	20.0

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 will be 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 interrupter and equipment fault.

< “Moderate Control” Function >

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

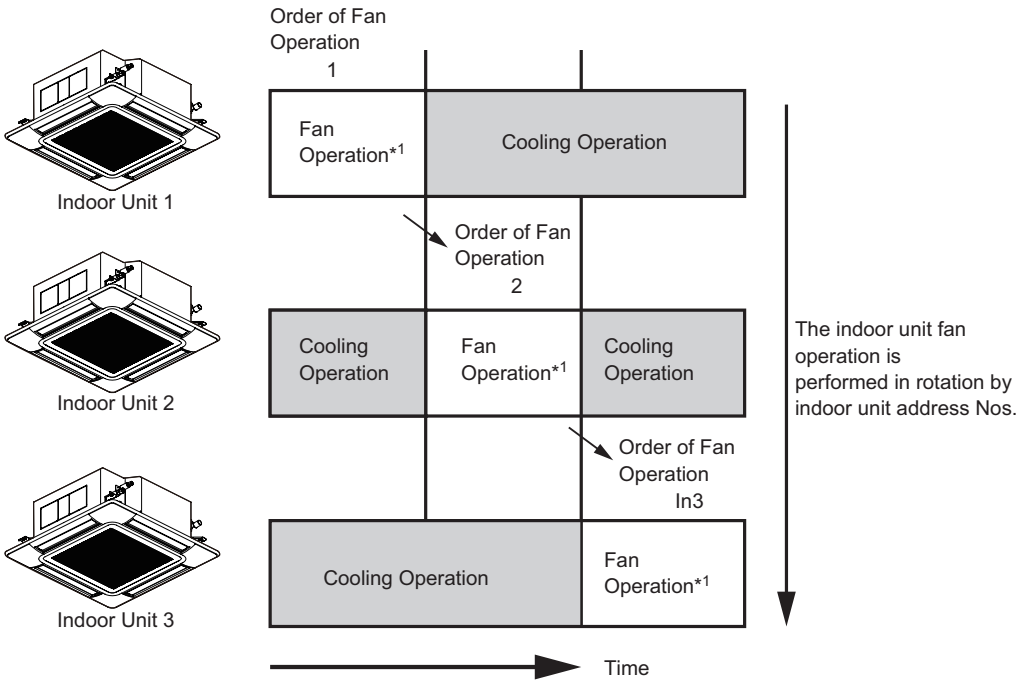


NOTES:

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.

5.4.3 Rotation Control Function

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

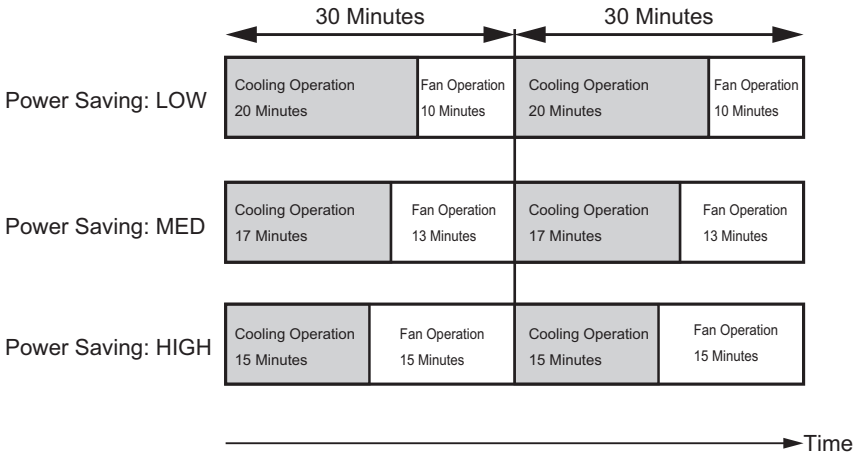


NOTES:

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.

5.4.4 Intermittent Control Function

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

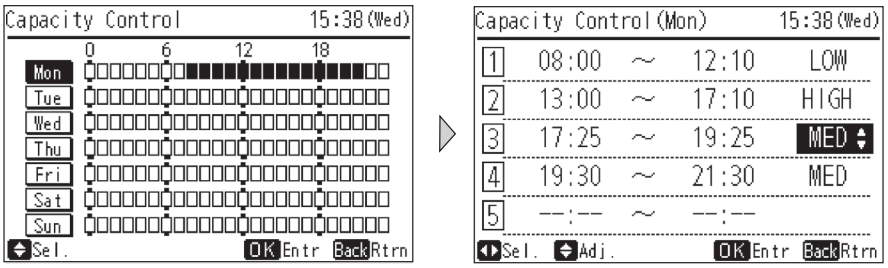


NOTE:

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

5.4.5 Power Saving Schedule Function

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



The display of Noise Reduction Schedule is the same.

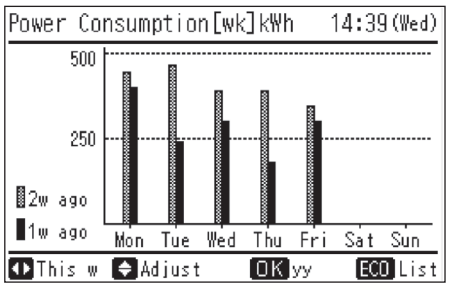
5.4.6 Operation Noise Reduction Schedule Function

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

NOTE:
The operation noise reduction setting may decreases the Cooling/Heating capacity.

5.4.7 Power Consumption Display Function

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



NOTE:
The power consumption for outdoor unit compressor will be displayed.

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 intercept 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) Condensate Pan, Condensate Mechanism and Condensate Pipe
- Condensate Line - Inspect and clean the condensate line at least twice a year.
- Drain-Up Mechanism - Inspect for activation of drain-up mechanism.

(c) Float Switch
- Activation - Inspect for activation of float switch.

6.4 Service and Maintenance Record by 7-Segment Display

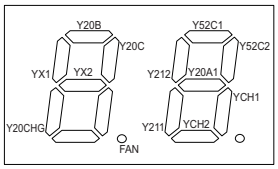
Customer's Name _____ DATE: - -

(1) Information of Connected Outdoor/Indoor Unit Capacity

(1) Test Run Start Time			
(2) Data Collect Start Time			
Checking Mode	Total Capacity of Outdoor Unit Connected	oCP	
	Connected Outdoor Unit Number	oAA	
	Total Capacity of Indoor Unit Connected	iCP	
	Connected Indoor Unit Number	iAA	
	Refrigerant Address	GA	
	Total Capacity of Operating Indoor Unit	oP	
	Total Frequency of Compressor	Ht	
	Accumulated Operating Time of Compressor	UJ	

NOTE:
Refer to Section 3.1.5 "Checking Using 7-Segment Display" for items in check mode.

(2) Information of Outdoor Unit

				Outdoor Unit A			Outdoor Unit B			Outdoor Unit C		
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												
(5) Protection Control Code												
Checking Mode	Input/Output State of Outdoor Micro-Computer SEG1  		SC	52C1	52C2	DC Fan	52C1	52C2	DC Fan	52C1	52C2	DC Fan
				CH1	CH2		CH1	CH2		CH1	CH2	
				21-2	21-1		21-2	21-1		21-2	21-1	
				20A1	20G	20CHG	20A1	20G	20CHG	20A1	20G	20CHG
	Inverter Frequency	Compressor 1	H1									
		Compressor 2	H2									
	Quantity of Compressor		CC									
	Outdoor Fan Step		Fo									
	Outdoor Expansion Valve Opening	Expansion Valve 1	E1									
		Expansion Valve 2	E2									
	Outdoor Bypass Expansion Valve Opening		Eb									
	High Pressure (Discharge Pressure)		Pd									
	Low Pressure (Suction Pressure)		Ps									
	Ambient Air Temperature		To									
	Discharge Temperature (Top of Compressor)	Compressor 1	Td1									
		Compressor 2	Td2									
	Evaporating Temperature (Liquid Pipe)	Liquid Pipe 1	TE1									
		Liquid Pipe 2	TE2									
	Outdoor Gas Pipe Temperature		TG									
	Liquid Stop Valve Temperature		TCH									
	Sub-cooling Temperature		TSC									
	Inverter Fin Temperature	Inverter 1	TF1									
		Inverter 2	TF2									
	Fan Controller Fin Temperature	Fan Controller 1	TF.1									
		Fan Controller 2	TF.2									
	Primary Current of Compressor	Compressor 1	A1									
		Compressor 2	A2									
	Secondary Current of DC Fan	DC Fan 1	AF1									
		DC Fan 2	AF2									
	Accumulated Operating Time of Compressor	Compressor 1	UJ1									
		Compressor 2	UJ2									
	Accumulated Operating Time of Compressor (After Reset)	Compressor 1	cU1									
		Compressor 2	cU2									
	Cause Code of Inverter Stoppage	Compressor 1	iT1									
		Compressor 2	iT2									
		DC Fan 1	FT1									
		DC Fan 2	FT2									

NOTE:
Refer to Section 3.1.5 “Checking Using 7-Segment Display” for items in check mode.

(3) Information of Indoor Unit

Indoor Unit No.						
Indoor Unit Model			(Serial No.)	(Serial No.)	(Serial No.)	(Serial No.)
(1) Test Run Start Time						
(2) Data Collect Start Time						
Checking Mode	Indoor Unit Capacity	CA				
	Indoor Expansion Valve Opening	iE				
	Liquid Pipe Temperature of Indoor Unit	TL				
	Gas Pipe Temperature of Indoor Unit	TG				
	Indoor Unit Inlet Air Temperature	Ti				
	Indoor Unit Outlet Air Temperature	To				
	Cause Code of Indoor Unit Stoppage	d1				

Indoor Unit No.						
Indoor Unit Model			(Serial No.)	(Serial No.)	(Serial No.)	(Serial No.)
(1) Test Run Start Time						
(2) Data Collect Start Time						
Checking Mode	Indoor Unit Capacity	CA				
	Indoor Expansion Valve Opening	iE				
	Liquid Pipe Temperature of Indoor Unit	TL				
	Gas Pipe Temperature of Indoor Unit	TG				
	Indoor Unit Inlet Air Temperature	Ti				
	Indoor Unit Outlet Air Temperature	To				
	Cause Code of Indoor Unit Stoppage	d1				

Indoor Unit No.						
Indoor Unit Model			(Serial No.)	(Serial No.)	(Serial No.)	(Serial No.)
(1) Test Run Start Time						
(2) Data Collect Start Time						
Checking Mode	Indoor Unit Capacity	CA				
	Indoor Expansion Valve Opening	iE				
	Liquid Pipe Temperature of Indoor Unit	TL				
	Gas Pipe Temperature of Indoor Unit	TG				
	Indoor Unit Inlet Air Temperature	Ti				
	Indoor Unit Outlet Air Temperature	To				
	Cause Code of Indoor Unit Stoppage	d1				

Indoor Unit No.						
Indoor Unit Model			(Serial No.)	(Serial No.)	(Serial No.)	(Serial No.)
(1) Test Run Start Time						
(2) Data Collect Start Time						
Checking Mode	Indoor Unit Capacity	CA				
	Indoor Expansion Valve Opening	iE				
	Liquid Pipe Temperature of Indoor Unit	TL				
	Gas Pipe Temperature of Indoor Unit	TG				
	Indoor Unit Inlet Air Temperature	Ti				
	Indoor Unit Outlet Air Temperature	To				
	Cause Code of Indoor Unit Stoppage	d1				

NOTE:
Refer to Section 3.1.5 “Checking Using 7-Segment Display” for items in check mode.

(4) Information of Cause Code of Alarm

(1) Test Run Start Time						
(2) Data Collect Start Time						
Cause Code of Alarm	Alarm Cause Code	AC				
	Degeneracy Control for Pressure Ratio Decrease Protection	c11				
	Degeneracy Control for High Pressure Increase Protection	c13				
	Degeneracy Control for Inverter Fin Temperature Increase Protection	c14				
	Degeneracy Control for Discharge Gas Temperature Increase Protection	c15				
	Degeneracy Control for TdSH Decrease Protection	c16				
	Degeneracy Control for Overcurrent Protection	c17				

(5) Information of Cause Code of Alarm

	No.1	No.2	No.3	No.4	No.5
(1) Unit Accumulated					
(2) Cause of Stoppage					
(3) Alarm Code / Cause Code of Stoppage					
(4) Abnormal Data Indication					

	No.6	No.7	No.8	No.9	No.10
(1) Unit Accumulated					
(2) Cause of Stoppage					
(3) Alarm Code / Cause Code of Stoppage					
(4) Abnormal Data Indication					

	No.11	No.12	No.13	No.14	No.15
(1) Unit Accumulated					
(2) Cause of Stoppage					
(3) Alarm Code / Cause Code of Stoppage					
(4) Abnormal Data Indication					

NOTE:
Refer to Section 3.1.5 “Checking Using 7-Segment Display” for items in check mode.

6.5 Service and Maintenance Record by Wired Controller

Data Sheet for Checking by Wired Controller

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

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					
	No. of Operating Comp.	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 in 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	

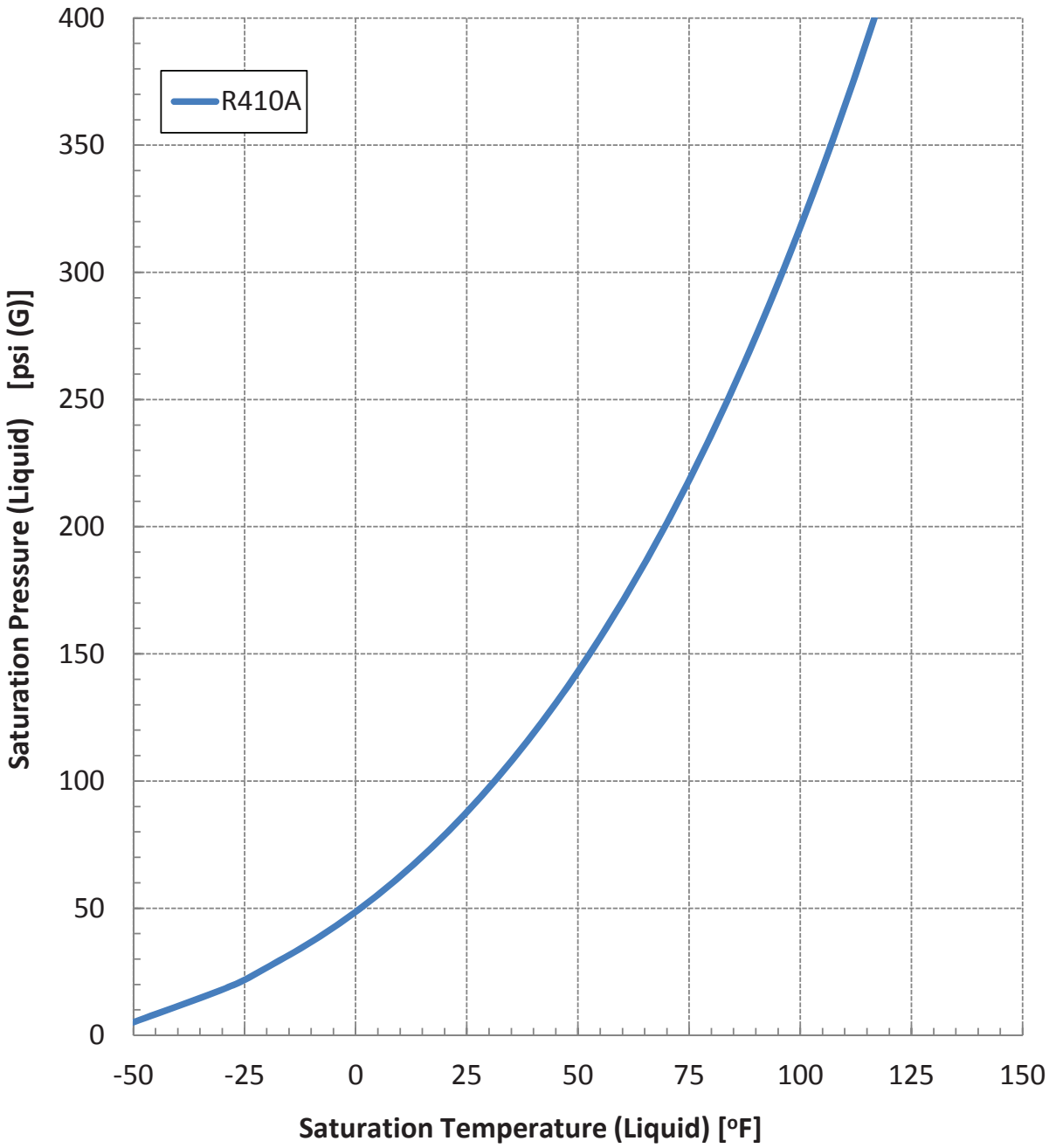
NOTE:
Refer to Section 3.1.4 “Checking Wired Controller” for items in check mode.

6.6 Service and Maintenance Record

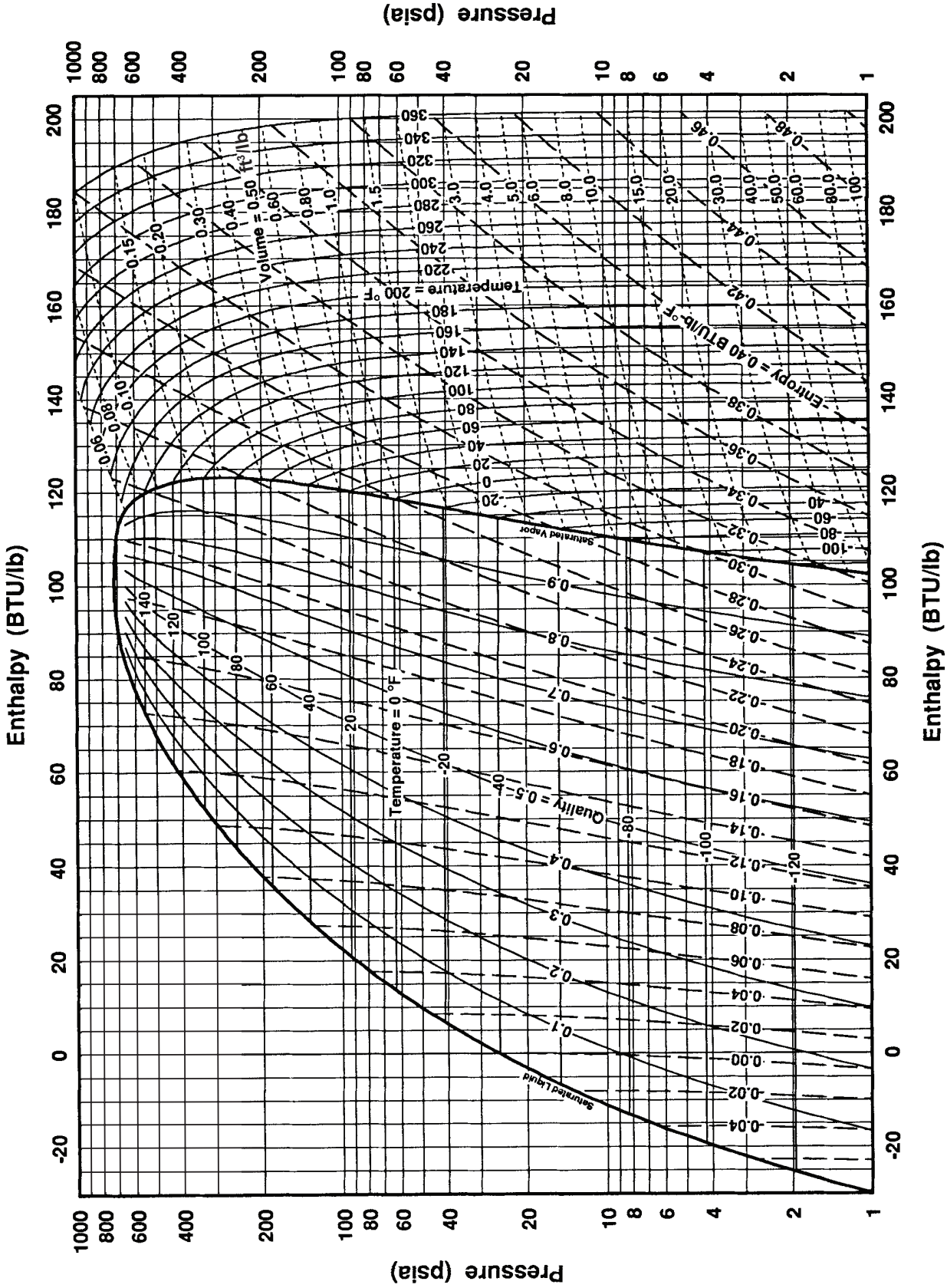
Service and Maintenance Record

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 (VRF Heat Recovery) and Change-Over Box.

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SM-17006-rev.3

Code No. LIT-12012554
Revised August 2019