

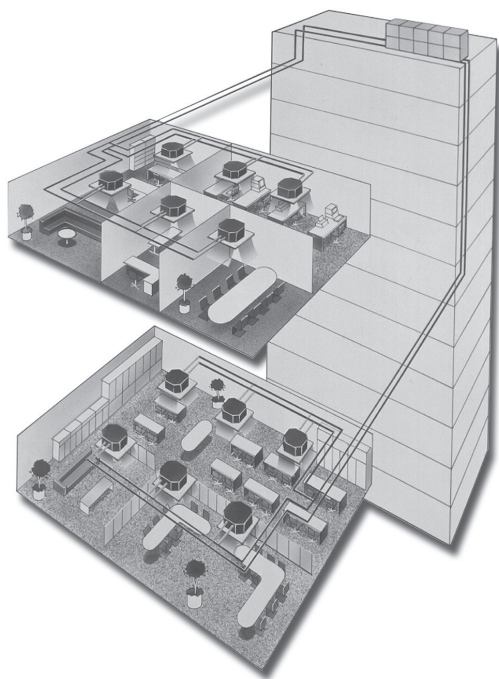
SERVICE MANUAL

INVERTER-DRIVEN MULTI-SPLIT SYSTEM HEAT PUMP AIR CONDITIONERS

Service Manual

< Outdoor Units (Low Ambient VRF Heat Pump) >

(H,Y)VAHP072(3,4)1CW
(H,Y)VAHP096(3,4)1CW
(H,Y)VAHP144(3,4)1CW
(H,Y)VAHP168(3,4)1CW
(H,Y)VAHP192(3,4)1CW
(H,Y)VAHP288(3,4)1CW



Important Notice

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

Temperature

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

DB: Dry Bulb, WB: Wet Bulb

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

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

Product Inspection upon Arrival

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



1. Introduction

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


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

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

2. Important Safety Instructions

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

General Precautions

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

NOTICE

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

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

Installation Precautions

⚠ WARNING


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

- When installing the unit into...
 - A wall: Make sure the wall is strong enough to hold the unit's weight. It may be necessary to construct a strong wood or metal frame to provide added support.
 - A room: Properly insulate any refrigerant tubing run inside a room to prevent "sweating" that can cause dripping and water damage to wall and floors.
 - Damp or uneven areas: Use a raised concrete pad or concrete blocks to provide a solid, level foundation for the unit to prevent water damage and abnormal vibration.
 - An area with high winds: Securely anchor the outdoor unit down with bolts and a metal frame. Provide a suitable air baffle.
 - A snowy area: Install the outdoor unit on a raised platform that is higher than 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 drain 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 drainpipe is installed incorrectly, water leakage and damage to the ceiling, floor, furniture, or other possessions may result. If condensate piping becomes clogged, moisture can back up and can drip from the indoor unit. Do not install the indoor unit where such dripping can cause moisture damage or uneven locations: Use a raised concrete pad or concrete blocks to provide a solid, level foundation for the unit to prevent water damage and abnormal vibration.
- Before performing any brazing work, be sure that there are no flammable materials or open flames nearby.
- Perform a test run to ensure normal operation. Safety guards, shields, barriers, covers, and protective devices must be in place while the compressor/unit is operating. During the test run, keep fingers and clothing away from any moving parts.
- Clean up the site when finished, remembering to check that no metal scraps or bits of wiring have been left inside the unit being installed.
- During transportation, do not allow the backrest of the forklift make contact with the unit, otherwise, it may cause damage to the heat exchanger and also may cause injury when stopped or started suddenly.
- Remove gas inside the closing pipe when the brazing work is performed. If the brazing filler metal is melted with remaining gas inside, the pipes will be blown off and it may cause injury.
- Be sure to use nitrogen gas for an airtight test. If other gases such as oxygen gas, acetylene gas or fluorocarbon gas are accidentally used, it may cause explosion or gas intoxication.

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

Refrigerant Precautions

 WARNING	<p>To reduce the risk of serious injury or death, the following refrigerant precautions must be followed.</p>
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- As originally manufactured, this unit contains refrigerant installed by Johnson Controls. Johnson Controls uses only refrigerants that have been approved for use in the unit's intended home country or market. Johnson Controls distributors similarly are only authorized to provide refrigerants that have been approved for use in the countries or markets they serve. The refrigerant used in this unit is identified on the unit's faceplate and/or in the associated manuals. Any additions of refrigerant into this unit must comply with the country's requirements with regard to refrigerant use and should be obtained from Johnson Controls distributors. Use of any non-approved refrigerant substitutes will void the warranty and will increase the potential risk of injury or death.
- If installed in a small room, take measures to prevent the refrigerant from exceeding the maximum allowable concentration in the event that refrigerant gases should escape. Refrigerant gases can cause asphyxiation (0.026 lbs/ft³ (0.42 kg/m³) based on ISO 5149 for R410A). Consult with your distributor for countermeasures (ventilation system and so on). If refrigerant gas has leaked during the installation work, ventilate the room immediately.
- Check the design pressure for this product is 601 psi (4.15MPa). The pressure of the refrigerant R410A is 1.4 times higher than that of the refrigerant R22. Therefore, the refrigerant piping for R410A shall be thicker than that for R22. Make sure to use the specified refrigerant piping. If not, the refrigerant piping may rupture due to an excessive refrigerant pressure. Besides, pay attention to the piping thickness when using copper refrigerant piping. The thickness of copper refrigerant piping differs depending on its material.
- The refrigerant R410A is adopted. The refrigerant oil tends to be affected by foreign matters such as moisture, oxide film, (or fat). Perform the installation work with care to prevent moisture, dust, or different refrigerant from entering the refrigerant cycle. Foreign matter can be introduced into the cycle from such parts as expansion valve and the operation may be unavailable.
- To avoid the possibility of different refrigerant or refrigerant oil being introduced into the cycle, the sizes of the charging connections have been changed from R407C type and R22 type. It is necessary to prepare the appropriate tools before performing installation work.
- Use refrigerant pipes and joints which are approved for use with R410A.
- A compressor/unit comprises a pressurized system. Never loosen threaded joints while the system is under pressure and never open pressurized system parts.

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

Electrical Precautions



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

- Highly dangerous electrical voltages are used in this system. Carefully refer to the wiring diagram and these instructions when wiring. Improper connections and inadequate grounding can cause serious injury or death.
- Perform all electrical work in strict accordance with this installation and maintenance 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 source 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 cabling shall be a minimum of AWG18 (0.82mm²), 2-Conductor, Stranded Copper. Shielded cable must be considered for applications and routing in areas of high EMI and other sources of potentially excessive electrical noise to reduce the potential for communication errors. When shielded cabling is applied, proper bonding and termination of the cable shield is required as per Johnson Controls guidelines. Plenum and riser ratings for communication cables must be considered per application and local code requirements.
- Use an exclusive power supply for the air conditioner at the unit's rated voltage.

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

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1. Installation

1.1 Outdoor Unit

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1. Introduction

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- 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 quenching cloth and a fire extinguisher nearby during brazing. Use care in handling, rigging, and setting of bulky equipment.
- When transporting, be careful when picking up, moving and mounting these units. Although the unit may be packed using plastic straps, do not use them for transporting the unit from one location to another. Do not stand on or put any material on the unit. Get a partner to help, and bend with your knees when lifting to reduce strain on your back. Sharp edges or thin aluminum fins on the air conditioner can cut fingers, so wear protective gloves.
- Do not touch or adjust any safety devices inside the indoor or outdoor units. All safety features, disengagement, and interlocks must be in place and functioning correctly before the equipment is put into operation. If these devices are improperly adjusted or tampered with in any way, a serious accident can occur. Never bypass or jump-out any safety device or switch.
- Johnson Controls will not assume any liability for injuries or damage caused by not following steps outlined or described in this manual. Unauthorized modifications to Johnson Controls products are prohibited as they...
 - May create hazards which could result in death, serious injury or equipment damage;
 - Will void product warranties;
 - May invalidate product regulatory certifications;
 - May violate OSHA standards;

NOTICE

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

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

Installation Precautions

⚠ WARNING

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

- When installing the unit into...
 - A wall: Make sure the wall is strong enough to hold the unit's weight. It may be necessary to construct a strong wood or metal frame to provide added support.
 - A room: Properly insulate any refrigerant tubing run inside a room to prevent "sweating" that can cause dripping and water damage to wall and floors.
 - Damp or uneven areas: Use a raised concrete pad or concrete blocks to provide a solid, level foundation for the unit to prevent water damage and abnormal vibration.
 - An area with high winds: Securely anchor the outdoor unit down with bolts and a metal frame. Provide a suitable air baffle.
 - A snowy area: Install the outdoor unit on a raised platform that is higher than 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 drain 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 drainpipe is installed incorrectly, water leakage and damage to the ceiling, floor, furniture, or other possessions may result. If condensate piping becomes clogged, moisture can back up and can drip from the indoor unit. Do not install the indoor unit where such dripping can cause moisture damage or uneven locations: Use a raised concrete pad or concrete blocks to provide a solid, level foundation for the unit to prevent water damage and abnormal vibration.
- Before performing any brazing work, be sure that there are no flammable materials or open flames nearby.
- Perform a test run to ensure normal operation. Safety guards, shields, barriers, covers, and protective devices must be in place while the compressor/unit is operating. During the test run, keep fingers and clothing away from any moving parts.
- Clean up the site when finished, remembering to check that no metal scraps or bits of wiring have been left inside the unit being installed.
- During transportation, do not allow the backrest of the forklift make contact with the unit, otherwise, it may cause damage to the heat exchanger and also may cause injury when stopped or started suddenly.
- Remove gas inside the closing pipe when the brazing work is performed. If the brazing filler metal is melted with remaining gas inside, the pipes will be blown off and it may cause injury.
- Be sure to use nitrogen gas for an airtight test. If other gases such as oxygen gas, acetylene gas or fluorocarbon gas are accidentally used, it may cause explosion or gas intoxication.

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

Refrigerant Precautions

⚠ 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 injury or death.
- If installed in a small room, take measures to prevent the refrigerant from exceeding the maximum allowable concentration in the event that refrigerant gases should escape. Refrigerant gases can cause asphyxiation (0.026 lbs/ft³ (0.42 kg/m³) based on ISO 5149 for R410A). Consult with your distributor for countermeasures (ventilation system and so on). If refrigerant gas has leaked during the installation work, ventilate the room immediately.
- Check the design pressure for this product is 601 psi (4.15MPa). The pressure of the refrigerant R410A is 1.4 times higher than that of the refrigerant R22. Therefore, the refrigerant piping for R410A shall be thicker than that for R22. Make sure to use the specified refrigerant piping. If not, the refrigerant piping may rupture due to an excessive refrigerant pressure. Besides, pay attention to the piping thickness when using copper refrigerant piping. The thickness of copper refrigerant piping differs depending on its material.
- The refrigerant R410A is adopted. The refrigerant oil tends to be affected by foreign matters such as moisture, oxide film, (or fat). Perform the installation work with care to prevent moisture, dust, or different refrigerant from entering the refrigerant cycle. Foreign matter can be introduced into the cycle from such parts as expansion valve and the operation may be unavailable.
- To avoid the possibility of different refrigerant or refrigerant oil being introduced into the cycle, the sizes of the charging connections have been changed from R407C type and R22 type. It is necessary to prepare the 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.

INSTALLATION

- 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, cover the gap between the piping cover and pipes by a packing (field-supplied). If the gap is not covered, the unit may be damaged if snow, rain water or small animals enter the unit.
- Do not apply an excessive force to the spindle valve at the end of opening. Otherwise, the spindle valve flies out due to refrigerant pressure. At the test run, fully open the gas and liquid valves, otherwise, these devices will be damaged. (It is closed before shipment.)
- If the arrangement for outdoor units is incorrect, it may cause flowback of the refrigerant and result in failure of the outdoor unit.
- The refrigerant system may be damaged if the slope of the piping connection kit exceeds $\pm 15^\circ$.

Electrical Precautions

WARNING

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

- Highly dangerous electrical voltages are used in this system. Carefully refer to the wiring diagram and these instructions when wiring. Improper connections and inadequate grounding can cause serious injury or death.
- Perform all electrical work in strict accordance with this manual and all the relevant regulatory standards.
- Before servicing, open and tag all disconnect switches. Never assume electrical power is disconnected. Check with meter and equipment.
- Only use electrical protection equipment and tools suited for this installation.
- Use specified cables between units.
- The new air conditioner may not function normally in the following instances:
 - If electrical power for the new air conditioner is supplied from the same transformer as the device* referred to below.
 - If the power source 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 cabling shall be a minimum of AWG18 (0.82mm²), 2-Conductor, Stranded Copper. Shielded cable must be considered for applications and routing in areas of high EMI and other sources of potentially excessive electrical noise to reduce the potential for communication errors. When shielded cabling is applied, proper bonding and termination of the cable shield is required as per Johnson Controls guidelines. Plenum and riser ratings for communication cables must be considered per application and local code requirements.
- Use an exclusive power supply for the air conditioner at the unit's rated voltage.













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

3. Before Installation

3.1 Factory-Supplied Accessories

Check to ensure that the following accessories are packed with the outdoor unit.

inch (mm)

Accessory		72 Type	96 Type	Remarks
Cable Clamp	For Fixing Power Supply Wiring and PVC Tube	 x 1	 x 1	
Cable Band		 x 5	 x 5	
Screw (One for Fixing Cord Clamp, Two for Spare)		 x 3	 x 3	
PVC Tube		 x 2	 x 2	ID 1/2 (12)
Rubber Bushing	For Power Supply Wiring (Bottom Base)	 x 1	 x 1	OD 2-5/16 (58)
	For Communication Cable (Piping Cover)	 x 2	 x 2	OD 1-1/2 (38)

NOTE

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

3.2 Necessary Tools and Instrument List for Installation

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

Use specially designated tools for handling R410A refrigerant.

INSTALLATION

◇: Interchangeability is available with current R22
X: Prohibited

●: Only for Refrigerant R410A (No Interchangeability with R22)
◆: Only for Refrigerant R407C (No Interchangeability with R22)

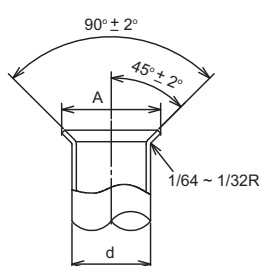
Measuring Instrument and Tool		Interchangeability with R22		Reason of Non-Interchangeability and Attention (★: Strictly Required)	Use
		R410A	R407C		
Refrigerant Pipe	Pipe Cutter, Chamfering Reamer	◇	◇	-	Cutting Pipe Removing Burrs
	Flaring Tool	◇ ●	◇	* The flaring tools for R407C are applicable to R22. * If using flaring tube, make dimension of tube larger for R410A.	Flaring for Tubes
	Extrusion Adjustment Gauge	●	-	* In case of hard temper pipe, flaring is not available.	Dimensional Control for Extruded Portion of Tube after Flaring
	Pipe Bender	◇	◇	* In case of hard temper pipe, bending is not available. Use elbow for bend and braze.	Bending
	Expanding Tool	◇	◇	* In case of hard temper pipe, expanding of tube is not available. Use socket for connecting tube.	Expanding Tubes
	Torque Wrench	●	◇	* For 1/2 inch D. (12.7mm), 5/8 inch D. (15.88mm), spanner size is up 3/32 inch (2mm).	Connection of Flare Nut
		◇	◇	* For 1/4 inch D. (6.35mm), 3/8 inch D. (9.52mm), 3/4 inch D. (19.05mm), spanner size is the same.	
	Brazing Tool	◇	◇	* Perform correct brazing work.	Brazing for Tubes
	Nitrogen Gas	◇	◇	* Strict Control against Contamin (Blow nitrogen during brazing.)	Prevention from Oxidation during Brazing
	Lubrication Oil (for Flare Surface)	●	◆	* Use a synthetic oil which is equivalent to the oil used in the refrigeration cycle. * Synthetic oil absorbs moisture quickly.	Applying Oil to the Flared Surface
Vacuum Drying Refrigerant Charge	Refrigerant Cylinder	●	◆	* Check refrigerant cylinder color. ★ Liquid refrigerant charging is required regarding zeotropic refrigerant.	Refrigerant Charging
	Vacuum Pump	◇	◇	★ The current ones are applicable. However, it is required to mount a vacuum pump adapter which can prevent from reverse flow when a vacuum pump stops, resulting in no reverse oil flow.	Vacuum Pumping
	Adapter for Vacuum Pump	* ●	◆		
	Manifold Valve	●	◆	* No interchangeability is available due to higher pressures when compared with R22. ★ Do not use current ones to the different refrigerant. If used, mineral oil will flow into the cycle and cause sludges, resulting in clogging or compressor failure.	Vacuum Pumping, Vacuum Holding, Refrigerant Charging and Check of Pressures
	Charging Hose	●	◆	Connection diameter is different; R410A: UNF1/2, R407C: UNF7/16.	
	Charging Cylinder	×	×	* Use the weight scale to ensure proper charging of the unit.	-
	Weight Scale	◇	◇	-	Measuring Instrument for Refrigerant Charging
	Refrigerant Gas Leakage Detector	* ●	◆	* The current gas leakage detector (R22) is not applicable due to different detecting method.	Gas Leakage Check

*: Interchangeability with R407C.

3.3 Flaring and Joint

• Flaring Dimension

Perform the flaring work as shown below.



Diameter (d)	inch (mm)
	A ⁺⁰ -0.02 (-0.4)
	R410A
1/4 (6.35)	0.36 (9.1)
3/8 (9.52)	0.52 (13.2)
1/2 (12.7)	0.65 (16.6)
5/8 (15.88)	0.78 (19.7)
3/4 (19.05)	(*)

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

• Joint Selection

If hard temper pipe is used, the flaring work cannot be performed. In this case, use a joint selected from the table below.

< Minimum Thickness of Joint >

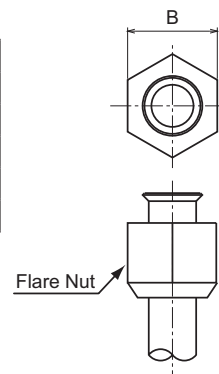
Diameter	inch (mm)
	R410A
1/4 (6.35)	0.020 (0.5)
3/8 (9.52)	0.024 (0.6)
1/2 (12.7)	0.028 (0.7)
5/8 (15.88)	0.031 (0.8)
3/4 (19.05)	0.031 (0.8)
7/8 (22.2)	0.035 (0.9)
1-1/8 (28.58)	0.039 (1.0)
1-3/8 (34.93)	0.047 (1.2)
1-5/8 (41.28)	0.057 (1.45)

< Flare Nut Dimension B >

Diameter	inch (mm)
	R410A
1/4 (6.35)	21/32 (17)
3/8 (9.52)	7/8 (22)
1/2 (12.7)	1-1/32 (26)
5/8 (15.88)	1-5/32 (29)
3/4 (19.05)	1-13/32 (36)

NOTE:

Do not use a thin joint other than the ones shown in the table at the left.



• Piping Thickness and Material

Use the pipe as below.

The thickness of refrigerant pipe differs depending on design pressure.

For copper pipe, pay attention to pipe selection, because the piping thickness differs depending on its material.

Outer Diameter	inch (mm)	
	R410A	
	Thickness	Temper
1/4 (6.35)	0.03 (0.76)	Annealed
3/8 (9.52)	0.032 (0.81)	Annealed
1/2 (12.7)	0.032 (0.81)	Annealed
5/8 (15.88)	0.035 (0.89)	Annealed
3/4 (19.05)	0.035 (0.89)	Hard Temper (or Annealed)
7/8 (22.2)	0.045 (1.14)	Hard Temper
1-1/8 (28.58)	0.050 (1.27)	Hard Temper
1-3/8 (34.93)	0.065 (1.65)	Hard Temper
1-5/8 (41.28)	0.072 (1.83)	Hard Temper

NOTES:

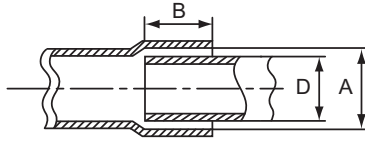
- Do not use the pipe that allowable pressure is less than 601 psi (4.15MPa).
- The reference value of the refrigerant piping thickness is indicated in the table at left.

Do not use the pipe which is considerably different from the reference value.

INSTALLATION

- Processing at Brazing Connection

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



inch (mm)		
Diameter (D)	Min. Insertion Depth (B)	Gap (A - D)
$3/16 \leq D < 5/16$ ($5 \leq D < 8$)	1/4 (6)	0.002 - 0.014 (0.05 - 0.35)
$5/16 \leq D < 15/32$ ($8 \leq D < 12$)	9/32 (7)	
$15/32 \leq D < 5/8$ ($12 \leq D < 16$)	5/16 (8)	0.002 - 0.018 (0.05 - 0.45)
$5/8 \leq D < 31/32$ ($16 \leq D < 25$)	13/32 (10)	
$31/32 \leq D < 1-3/8$ ($25 \leq D < 35$)	15/32 (12)	0.002 - 0.022 (0.05 - 0.55)
$1-3/8 \leq D < 1-25/32$ ($35 \leq D < 45$)	9/16 (14)	

3.4 Line-Up of Outdoor Units

- (1) This outdoor unit series capacity range is from 72 MBH to 288 MBH. 144 MBH to 288 MBH are made of 72 MBH and 96 MBH combinations.
- (2) The outdoor unit of 144 to 288 MBH consists of the combination of two or three base units.
The capacities not shown in the table below are unavailable.

< 208/230V >

Base Unit

Capacity (MBH)	72	96
Model	(H,Y)VAHP072B31CW	(H,Y)VAHP096B31CW

Combination of Base Units

Capacity (MBH)	144	168	192	288
Model	(H,Y)VAHP144B31CW	(H,Y)VAHP168B31CW	(H,Y)VAHP192B31CW	(H,Y)VAHP288B31CW
Combination	(H,Y)VAHP072B31CW	(H,Y)VAHP096B31CW	(H,Y)VAHP096B31CW	(H,Y)VAHP096B31CW
	(H,Y)VAHP072B31CW	(H,Y)VAHP072B31CW	(H,Y)VAHP096B31CW	(H,Y)VAHP096B31CW
	-	-	-	(H,Y)VAHP096B31CW

< 460V >

Base Unit

Capacity (MBH)	72	96
Model	(H,Y)VAHP072B41CW	(H,Y)VAHP096B41CW

Combination of Base Units

Capacity (MBH)	144	168	192	288
Model	(H,Y)VAHP144B41CW	(H,Y)VAHP168B41CW	(H,Y)VAHP192B41CW	(H,Y)VAHP288B41CW
Combination	(H,Y)VAHP072B41CW	(H,Y)VAHP096B41CW	(H,Y)VAHP096B41CW	(H,Y)VAHP096B41CW
	(H,Y)VAHP072B41CW	(H,Y)VAHP072B41CW	(H,Y)VAHP096B41CW	(H,Y)VAHP096B41CW
	-	-	-	(H,Y)VAHP096B41CW

3.5 Combinations of Indoor Units and Outdoor Units

Table 3.1 Indoor Unit Type List

Indoor Unit Type			Capacity (MBH)										
			6	8	12	15	18	24	30	36	48	72	96
Ducted	Ducted (High Static)	(H,Y)IDH_B21S					○	○	○	○	○	○	○
	Ducted (Medium Static)	(H,Y>IDM_B21S	○	○	○	○	○	○	○	○			
	Ducted (Slim)	(H,Y)IDS_B21S	○	○	○	○	○						
	Ducted (EconoFresh)	(H,Y>IDM_B21E							○	○	○		
	DOAS	(H,Y)DOA_B21S											○
Non-Ducted	Ceiling-Mounted 4-Way Cassette	(H,Y)IC4_B21S			○	○	○	○	○	○			
	Ceiling-Mounted 4-Way Cassette Mini	(H,Y)ICM_B21S		○	○	○	○						
	Ceiling-Mounted 2-Way Cassette	(H,Y)IC2_B21S					○	○					
	Ceiling-Mounted 1-Way Cassette	(H,Y)IC1_B21S	○	○	○	○							
	Wall-Mounted	TIWM_B21S	○	○	○	○	○	○					
	Ceiling Suspended	(H,Y)ICS_B21S				○		○	○	○			
	Floor Exposed	(H,Y)IFE_B21S	○	○	○	○							
	Floor Concealed	(H,Y)IFC_B21S	○	○	○	○							

○ : Available

- The number of indoor units that can be connected to an outdoor unit is defined in Table 3.2: Comply with the following conditions when selecting a system.
- A maximum and minimum total capacity against the nominal outdoor unit capacity can be obtained through combination of indoor units.

Table 3.2 System Combination

Outdoor Unit Capacity (MBH)	Minimum Capacity at Individual Operation (MBH)	Maximum Number of Connectable I.U.	Recommended Number of Connected I.U.	Connectable Indoor Unit Capacity Ratio *3)	
				Maximum *2)	Minimum
72	6 *1)	15	10	130%	60%
96		16	10	110%	60%
144		31	18	130%	60%
168		30	18	110%	60%
192		33	18	110%	60%
288		50	32	110%	60%

*1) When the outdoor air temperature is 23°F (-5°C) or cooler during the outdoor unit cooling operation, the minimum connectable indoor unit capacity is 18,000 Btu/h. A snow protection hood (optional part) should be installed.

*2) When the outdoor air temperature is 109°F (43°C) or warmer during the outdoor unit cooling operation, the maximum connectable indoor unit capacity ratio is 100%.

*3) When the outdoor air temperature is lower than 14°F (-10°C) select the combination of indoor units and outdoor unit as the total capacity of indoors not to exceed the capacity of outdoor unit.

NOTES:

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

$$\text{Connectable Indoor Unit Capacity Ratio} = \text{Total Indoor Unit Capacity} / \text{Total Outdoor Unit Capacity}$$
- For the system under which all the indoor units operate simultaneously, the total indoor unit capacity should be less than the outdoor unit capacity. Otherwise, a decrease in operating performance and an increase in the operating limit can result in an overload.
- For the system under which all the indoor units do not operate simultaneously, the total indoor unit capacity is available up to 130% against the outdoor unit capacity.
- A maximum number of connectable indoor units differs depending on the model, capacity, environment and installation location of connected indoor units. Refer to the "Engineering Manual" for the selection.
- When operating the outdoor unit in cold areas with temperatures of 14°F (-10°C), or under the high heating load conditions, the total indoor unit capacity should be less than 100% against the outdoor unit capacity and the total piping length should be less than 984.3ft (300m).
- If some indoor units start operating simultaneously at a low outdoor air temperature, the airflow may be less than the setting airflow on wired controller for maintaining indoor comfort.
- The airflow volume for indoor units of 6 and 8 MBH is set higher than that for indoor units of 12 MBH or more. Make sure to select appropriate indoor units for installation where cold drafts may occur during heating operation. If installing indoor units in such locations, refer to the recommended number of indoor units that can be connected.

3.6 Caution about Outdoor Unit Installation

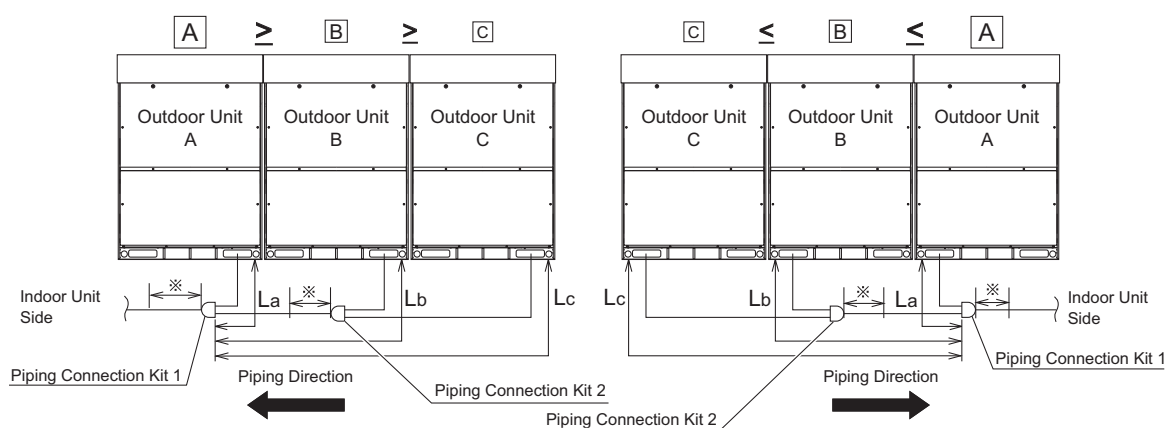
When the installation and piping work for the multiple outdoor units are performed, it is required that the arrangement for outdoor units and piping length be determined. Perform the installation work in strict accordance with the following restrictions.

NOTICE

If the arrangement for outdoor units is incorrect, it may cause flowback of the refrigerant and result in failure of the outdoor unit.

< Restrictions for Two and Three Units Combination >

- (1) When using a combination of two and three outdoor units, align the outdoor units from largest capacity to smallest as $A \geq B \geq C$ and outdoor unit "A" connected to the piping connection kit 1.
- (2) The piping length between the piping connection kit 1 and the outdoor unit should be $L_a \leq L_b \leq L_c \leq 32.8 \text{ ft (10m)}$.



※: Maintain a straight-line distance of 19-11/16 inch (500mm) or more for piping after the piping connection kit.

3.7 Piping Work between Outdoor Units

When installing a combination unit, a piping connection kit is needed for each additional unit but not for the base unit: (72, 96 types).

Applicable Outdoor Unit		Model	Piping Set
Outdoor Unit Capacity (MBH)	Outdoor Unit Number		
144 - 192	2	MC-NP20A1	1
288	3	MC-NP30A1	1

NOTE:

The piping connection kit (MC-NP**A1) consists of branch pipes for gas and liquid. Interconnecting pipe is not included in these kits (Field-Supplied).

4. Outdoor Unit Installation

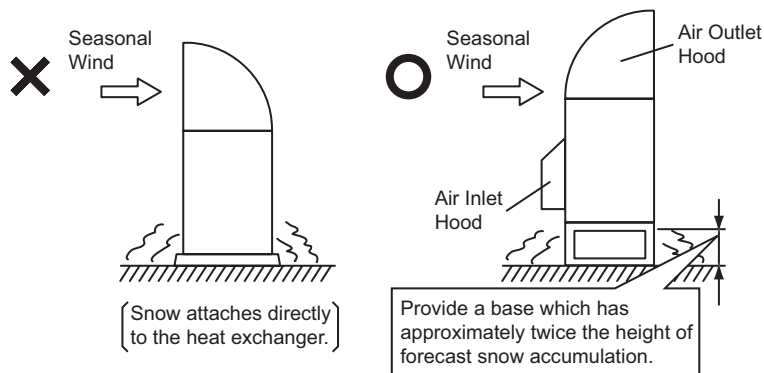
4.1 Installation Location and Precautions

! WARNING

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

- When installing the unit into...
 - A wall: Make sure the wall is strong enough to hold the unit's weight. It may be necessary to construct a strong wood or metal frame to provide added support.
 - A room: Properly insulate any refrigerant tubing run inside a room to prevent "sweating" that can cause dripping and water damage to wall and floors.
 - Damp or uneven areas: Use a raised concrete pad or concrete blocks to provide a solid, level foundation for the unit to prevent water damage and abnormal vibration.
 - An area with high winds: Securely anchor the outdoor unit down with bolts and a metal frame. Provide a suitable wind baffle (field-supplied).
 - A snowy area: Install the outdoor unit on a raised platform that is higher than drifting snow. Provide snow protection hood (optional part (*)).
- 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 a fire, oil, steam or powder can directly enter the unit, such as nearby or 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.
- During heating or defrosting operation, drain water is discharged. Provide adequate drainage around the foundation. If installing the unit on a roof or a balcony, provide the additional drainage around the foundation to prevent water dripping on a person or forming ice in winter.
- Before performing any brazing work, be sure that there are no flammable materials or open flames nearby.
- Perform a test run to ensure normal operation. Safety guards, shields, barriers, covers, and protective devices must be in place while the compressor/unit is operating. During the test run, keep fingers and clothing away from any moving parts.
- Clean up the site when finished, remembering to check that no metal scraps or bits of wiring have been left behind inside the unit being installed.

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

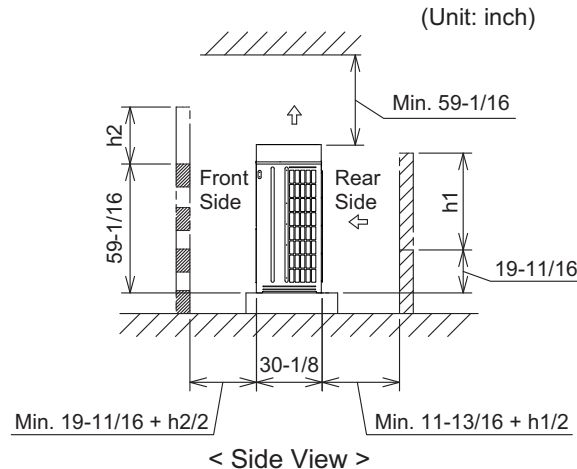


* Refer to the "Engineering Manual" for details of the optional part.

4.2 Service Space

When an outdoor unit is installed, allow sufficient clearance as follows:

- If there is insufficient clearance for air inlets and outlets, it may result in a performance drop-off and mechanical issues due to insufficient air intake.
- Additionally, adequate clearance is required for service maintenance access.



- If there are no walls on the front and rear sides, clearance for service access is required as follows:
 - * Front Side: Minimum 19-11/16 inch (500mm)
 - * Rear Side: Minimum 11-13/16 inch (300mm)
 - * Right and Left Sides: Minimum 3/8 inch (10mm)

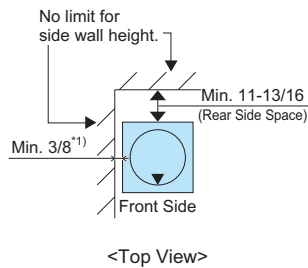
(In an instance where the snow protection hood (optional part) or the air outlet duct (field-supplied) is mounted to the unit, a minimum gap of 1-15/16 inch (50mm) is required.)
- If the wall on the front side is over 59-1/16 inch (1,500mm) high, a clearance of (19-11/16 inch (500mm) + h2/2) for the front side is required.
- If the wall on the rear side is over 19-11/16 inch (500mm) high, a clearance of (11-13/16 inch (300mm) + h1/2) for the rear side is required.
- When the units are surrounded by walls on more than two sides, observe the necessary clearance indicated in the diagram above.
- For walls on more than two sides, secure adequate clearance for service access space as shown in the following illustrations.
- If the space between the unit and an obstacle above the unit is less than 59-1/16 inch (1,500mm) or the space above the unit is closed, set up the duct at the air outlet side in order to prevent short circuit.
- Make sure there is enough space in case the unit needs to be serviced and any of the four sides would need to be opened or removed.

INSTALLATION

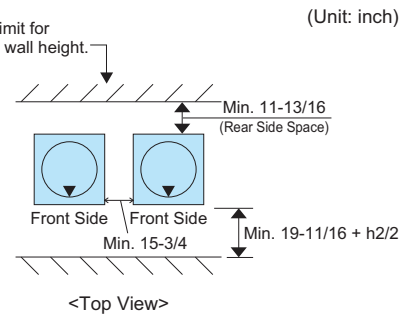
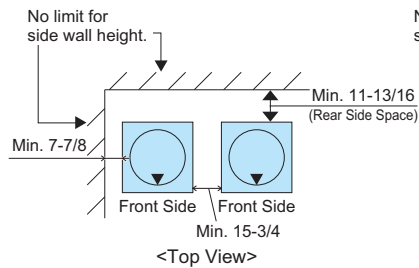
1) Walls on Two Sides

If units are installed adjacent to tall buildings where there are two open sides, the minimum rear side clearance must be at least 11-13/16 inch (300mm).

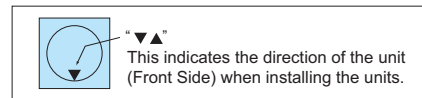
• Single Installation



• Multiple / Serial Installation

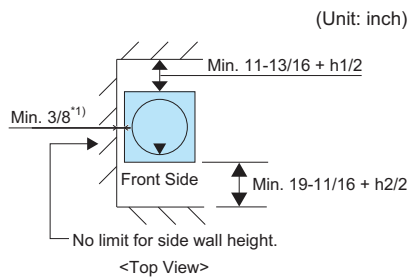


*1): If using the snow protection hood (optional part) or the air outlet duct (field-supplied) is adopted, a minimum spacial clearance of 1-15/16 inch is required.



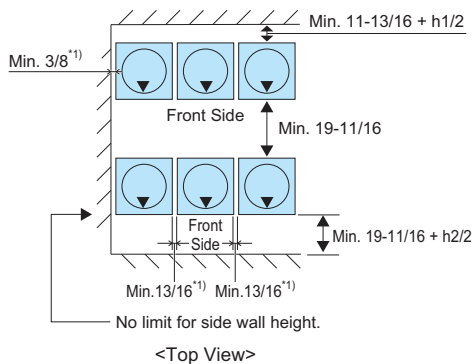
2) Walls on Three Sides

• Single Installation

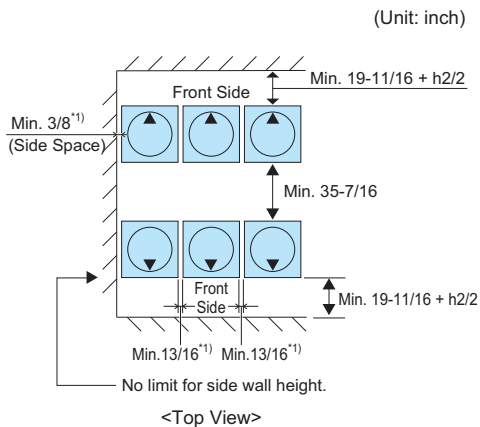


• Multiple / Serial Installation

< Installation in the Same Direction >



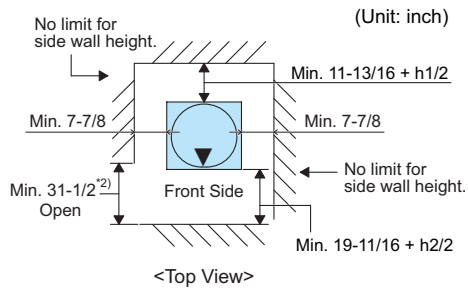
< Rear to Rear Installation >



*1): If the snow protection hood (optional part) or the air outlet duct (field-supplied) is adopted, a minimum spacial clearance of 1-15/16 inch is required.

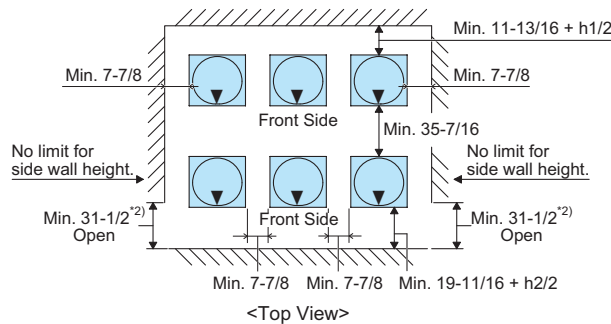
3) Walls on Four Sides

• Single Installation

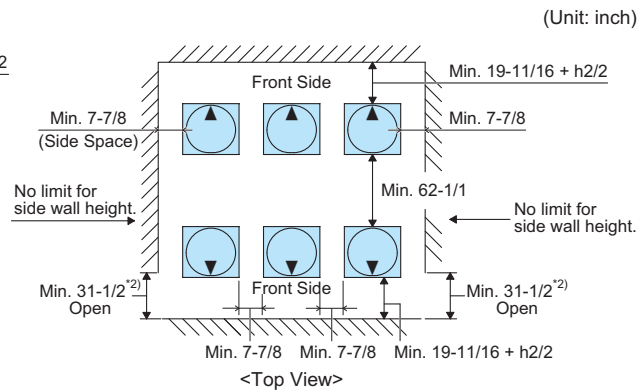


• Multiple / Serial Installation

< Installation in the Same Direction >



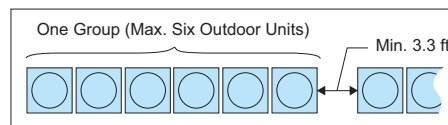
< Rear to Rear Installation >



*2): Partly open a wall if the unit is surrounded by walls on four sides.

NOTE

1. Keep the upper side open to prevent mutual interference of inlet and outlet air of each outdoor unit.
2. The figure dimensions indicate sufficient clearance dimensions around outdoor units for operation and maintenance at typical installation conditions as follows. [Operation Mode: Cooling Operation, Outside Temp.: 95°F (35°C)]
In the following situations when compared to the installation condition, an appropriate clearance dimension is required by calculating airflow current.
* When the outdoor unit ambient temperature is higher.
* When there is a fear that a short circuit is likely to occur.
3. For multiple installations, one group will consist of a maximum of six outdoor units.
Maintain a 3.3 ft (1m) spacial distance between each unit group.



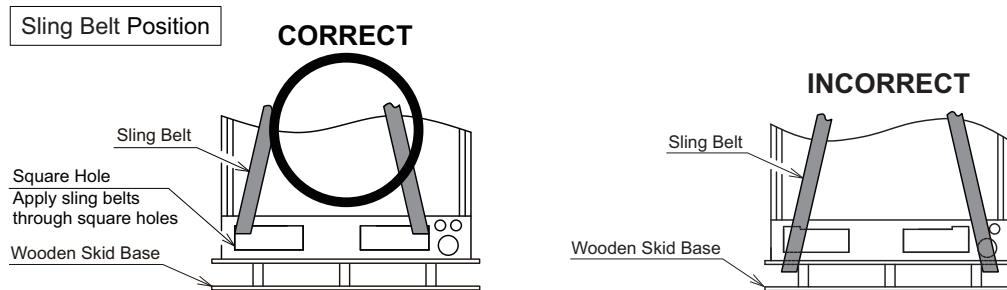
5. Transportation and Installation Work

5.1 Transportation

Transport the product as close to the installation location as practical before unpacking.
When using a crane, hang the unit according to the description of the outdoor unit packing.

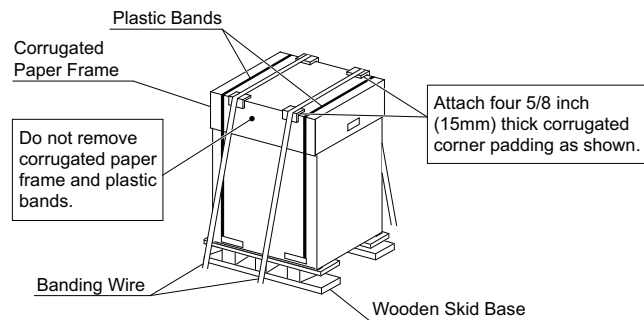
! WARNING

- Do not hang the unit with the sling belts at the wooden skid base.



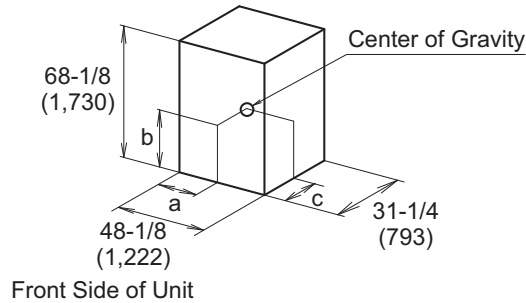
! CAUTION

- Transportation and Storage:**
 - The protective corrugated cardboard is not strong enough to resist rough handling.
 - Secure with two sling belts when hoisting the outdoor unit with a crane.
- Transportation and Banding Wire:**
 - To protect the unit, do not remove any packing.
 - Do not stack or place any material on top of the product.
 - Apply banding wire to both sides of the packaged unit as shown at right.



Take special care when hanging or moving the outdoor unit because its center of mass is off-center and unbalanced. See the diagram below.

Center of Gravity



Voltage Type	inch (mm)		
	a	b	c
208/230V	20-7/8 (530)	22-13/16 (580)	12 (305)
460V	19-11/16 (500)	21-5/8 (550)	11-13/16 (300)

Hanging Method

- (1) Suspend the unit (with wooden skid base) in its packing with two sling belts as shown in Figure 5.1.
- (2) Do not use banding wire.
- (3) Ensure that the unit is balanced.
- (4) Ensure safety while hoisting the unit gently in order not to cause the unit to tip.

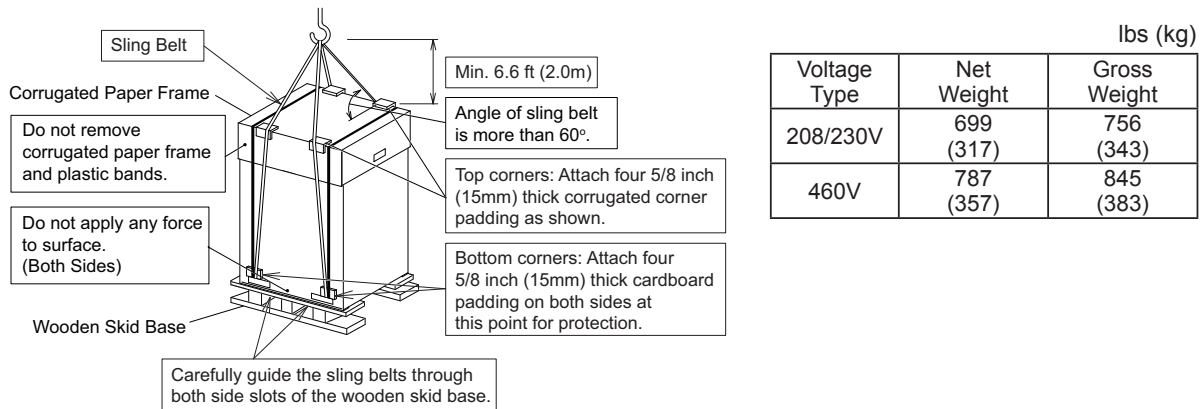


Figure 5.1 Hanging Unit on Wooden Skid Base for Transportation

- (5) Hang the unit without a wooden skid base with two sling belts as shown in Figure 5.2.

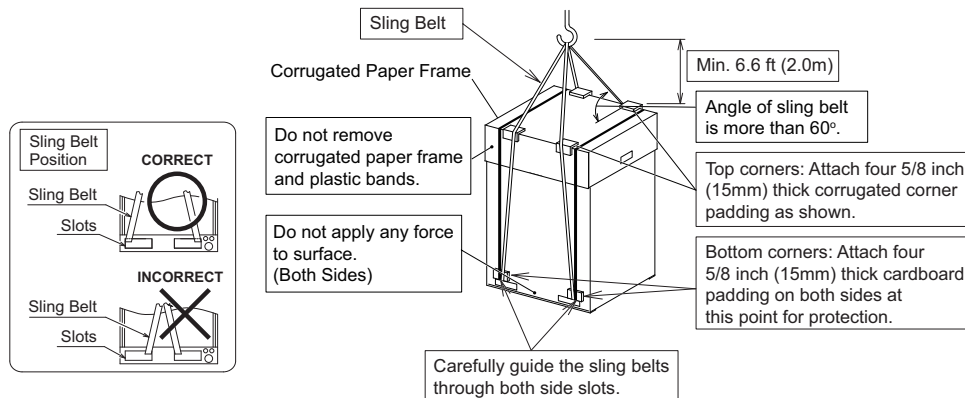
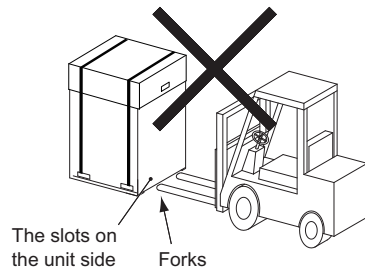


Figure 5.2 Hanging Unit without Wooden Skid Base

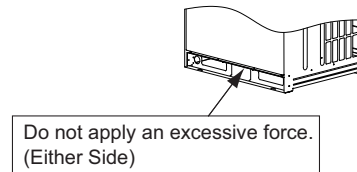
INSTALLATION

When using a forklift, do not insert forks into the slots at the unit side panels. The unit can sustain damage.



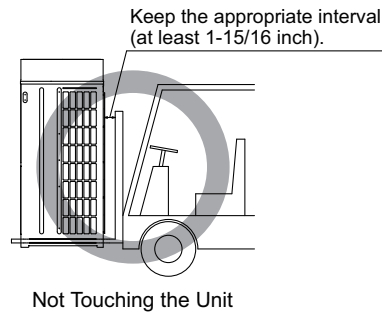
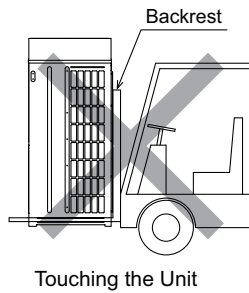
Do not apply excessive force to the squared slots with forks or other materials. The bottom of the unit can become deformed.

- * Do not push the bottom base with forks.
- * Do not use a roller.



CAUTION

During transportation, do not allow the backrest of the forklift to come into contact with the unit. Sudden forward movement on the forklift can cause damage to the unit heat exchanger.



NOTE

If transporting after unpacking, protect the unit with corrugated material, styrofoam, bubble pack, or a tarp.

5.2 Handling of Outdoor Unit

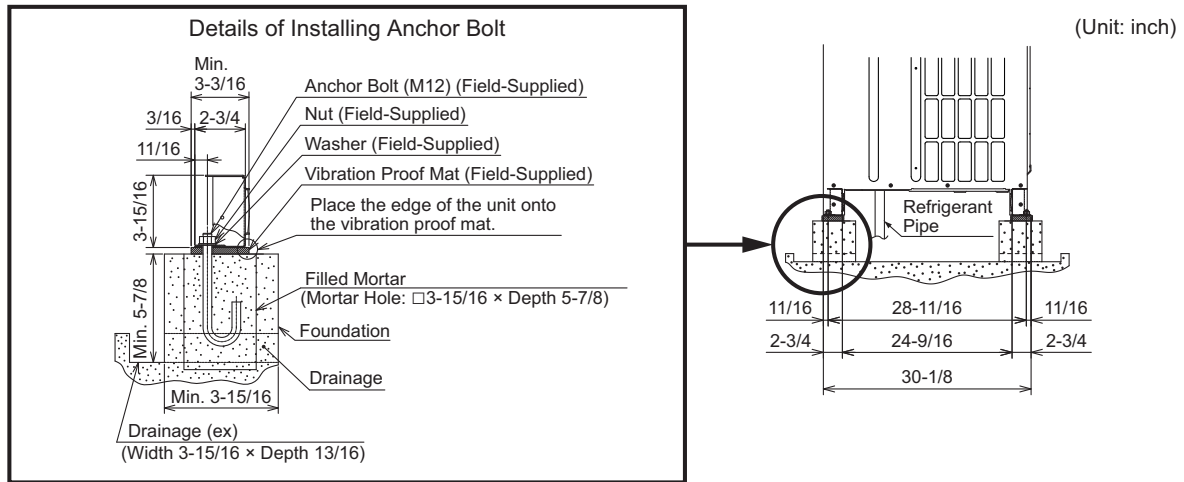
WARNING

Do not place or leave any foreign objects: (cables, tools), inside the outdoor unit or control module and verify that nothing remains there prior to installation and test run. Damage and fire can result due to carelessness.

5.3 Installation Work

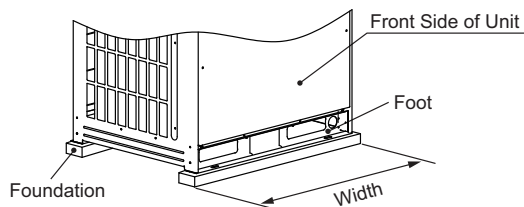
5.3.1 Concrete Foundations

- (1) The height of the foundation should be more than 5-7/8 inch (150mm) above the ground.
- (2) Provide adequate drainage around the foundation.



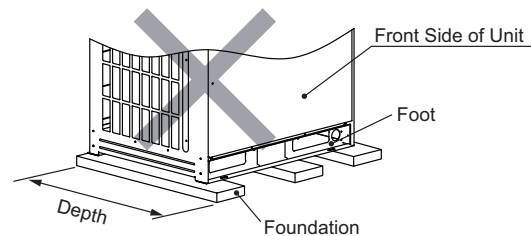
* Provide a concrete foundation as shown below.

CORRECT

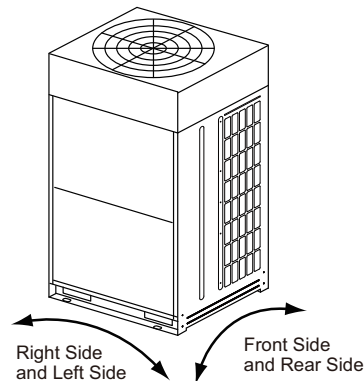


* Do not use a concrete foundation such as seen here. The footing for the outdoor unit can become deformed.

INCORRECT



- (3) Install the outdoor unit in the front-rear and right-left direction horizontally. (Use a level.) Verify that the gradient slope in all four directions (front, rear, right, and left) falls within 3/8 inch (10mm).



- (4) Provide a strong, level, and stable foundation so that:
 - a. The outdoor unit does not lean to one side.
 - b. Noises are not heard from within.
 - c. The outdoor unit remains stable and upright in the face of strong winds and seismic events.

INSTALLATION

- (5) When installing the outdoor unit, secure the unit with anchor bolts and field-supplied vibration-proof mats. Refer to Figure 5.3 for the location of holes for anchor bolts.

(Unit: inch)

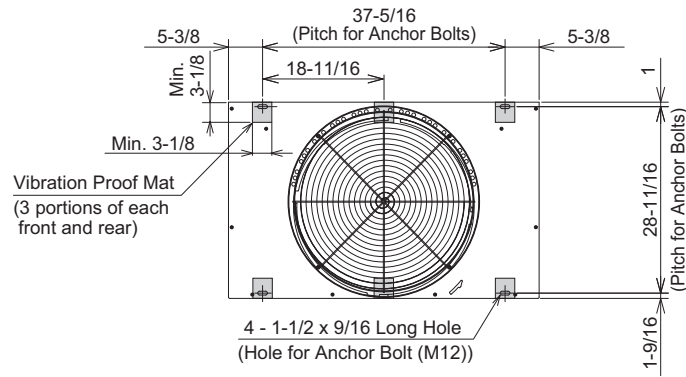


Figure 5.3 Positions of Anchor Bolts

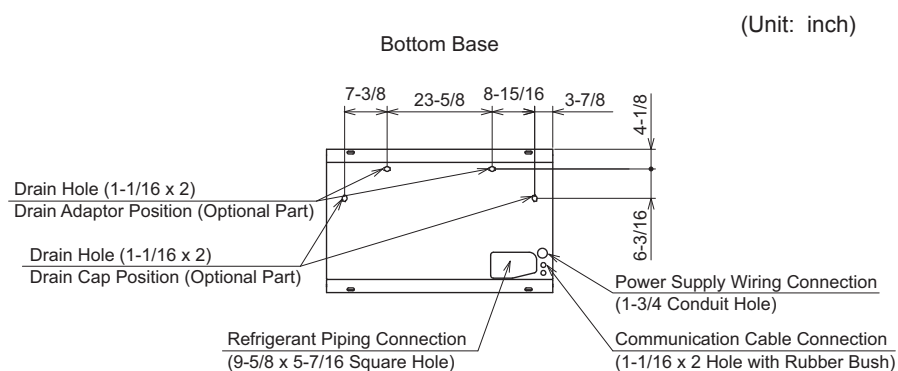
5.3.2 Condensate Treatment

Condensation is discharged during heating and defrosting operations. (Rain water is also discharged.)
Comply with the following conditions.

- (1) Choose a place where good drainage is available, or provide a drainage ditch.
- (2) Do not install the unit over walkways. Condensation can spill onto people.
If installing the unit in such a place, utilize the additional condensation drainage pan.
- (3) When drain piping is necessary for the outdoor unit, use the optional drain adaptor: (DBS-TP10A).
Do not use the drain adaptor in the cold area. Condensate in the drain piping can freeze, resulting in a fractured pipeline.

NOTICE:

Even when the drain adaptor is used, moisture may drain slightly from screw holes.
Provide a second condensation drainage pan under the outdoor unit as necessary.



- Drain Adaptor (Optional Parts)

A drain adaptor is used for a condensation pipe connection in order to use an outdoor unit bottom base as a condensation drainage pan.

Name	Model
Drain Adaptor	DBS-TP10A

Component Formation of Drain Adaptor

Model	Parts Name	Material / Color	Qty.	Application
DBS-TP10A	Drain Adaptor	PP / Black	2	Connecting for Drain Piping
	Drain Cap	PP / Black	2	Cover for Drain Hole
	Rubber Cap	CR / Black	4	Sealing for Adaptor and Cap

6. Refrigerant Piping Work

WARNING

- The pressure for this product is 601 psi (4.15MPa). The pressure required for refrigerant R410A is 1.4 times higher than that of the refrigerant R22. That means that the refrigerant piping for R410A must be thicker than that for R22. Make sure to use specified refrigerant piping. Otherwise, the refrigerant piping may rupture due to an excessive refrigerant pressure. Pay close attention to the piping thickness when using copper refrigerant piping. The thickness of copper refrigerant piping differs depending on its material.
- Check to ensure that no pressure exists inside the stop valve before removing the flange.

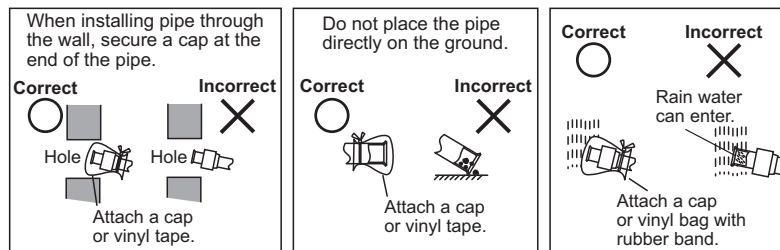
CAUTION

- Ensure that the corresponding pipe connections for the liquid, and gas piping are properly connected to the equipment, as specified in the installation instructions.
- When handling the refrigerant, be sure to wear leather gloves to prevent injuries.

6.1 Piping Materials

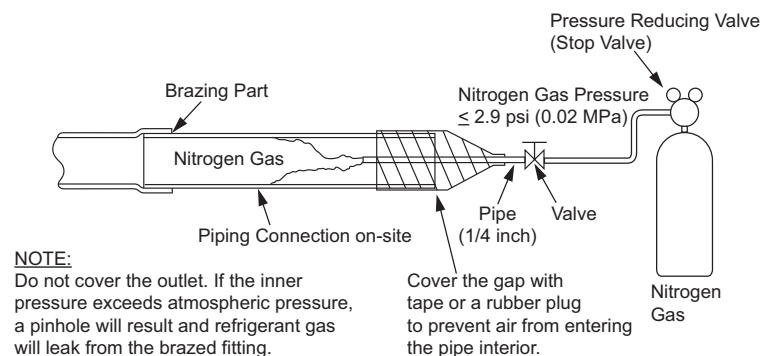
- (1) Obtain locally-supplied copper pipes.
- (2) Use the copper pipe for refrigerant piping.
- (3) Pay close attention to pipe thickness.
- (4) Use clean copper pipes. Make sure there is no dust or moisture inside the pipes. Blow nitrogen or dry compressed air into the pipes to remove any dust or foreign materials before connecting them. Do not use any tools which produce a lot of swarf such as a saw or grinder.
- (5) Take special care to prevent contamination or moisture settling on interior pipe surfaces during piping work.
- (6) Avoid performing the piping connection work for outdoor units in the rain.

• Cautions for Refrigerant Pipe Ends



• Brazing Work

- (1) Brazing work must be performed by an authorized installer in order to prevent any problems.
- (2) For piping connections, complete non-oxidation brazing with a nitrogen charge. If brazing the pipes without the nitrogen substitution, a large amount of oxidized scaling will be generated in the piping. This oxidized scaling can cause clogging inside the expansion valve, solenoid valve, accumulator, and compressor, which can prevent the unit from operating properly. Do not use the field-supplied antioxidant which can corrode pipes and degrade the refrigerant oil.



NOTES:

1. Make sure to use nitrogen. Nitrogen gas pressure shall be 2.9 psi (0.02 MPa) or less. **DO NOT** use the following gases.

Oxygen:	This is flammable and causes oxidation degradation of refrigerant oil.
Carbon Dioxide:	This can cause decreased performance over drier periods.
Freon Gas:	This emits harmful gases if exposed to fire.

2. Make sure to use the pressure-reducing valve.
3. Do not use field-supplied antioxidant.

- (3) Use a type of flux with a low chlorine concentration.
- (4) Remove all flux completely after completing brazing work.

NOTICE:

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

INSTALLATION

- Cautions for Piping Connection Work

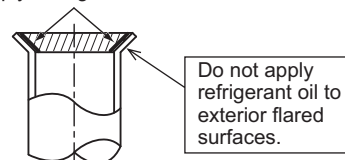
- (1) Verify that there are no scratches, swarf, gaps, or deformations at the flared end before making connections to the system.
- (2) Before tightening the flare nut, apply a small amount of oil (field-supplied) to the backside of the flare. (Do not apply any oil to the flare face or the threads.) Tighten the liquid pipe flare nut to the specified torque while using a back-up wrench to prevent damage to the unit. Ensure that the flare connections are leak free upon completion of the work.

NOTE:

Refrigerant oil is field-supplied.

[Ethereal Oil: FVC68D (Idemitsu Kousan Co. Ltd.)]

Apply Refrigerant Oil.



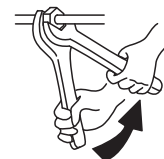
- (3) Be sure to use the accessory flare nuts for indoor unit connections.

< Required Tightening Torque >

Pipe Size	Tightening Torque
1/4 inch (6.35 mm)	10.3 - 13.3 ft·lbs (14 - 18 N·m)
3/8 inch (9.52 mm)	25.1 - 31.0 ft·lbs (34 - 42 N·m)
1/2 inch (12.7 mm)	36.1 - 45.0 ft·lbs (49 - 61 N·m)
5/8 inch (15.88 mm)	50.2 - 60.5 ft·lbs (68 - 82 N·m)
3/4 inch (19.05 mm)	73.8 - 88.5 ft·lbs (100 - 120 N·m)

NOTE:

As for the tightening torque for liquid stop valve, according to Section 6.2.1 "Stop Valve" < Liquid Valve > of the tightening torque table.

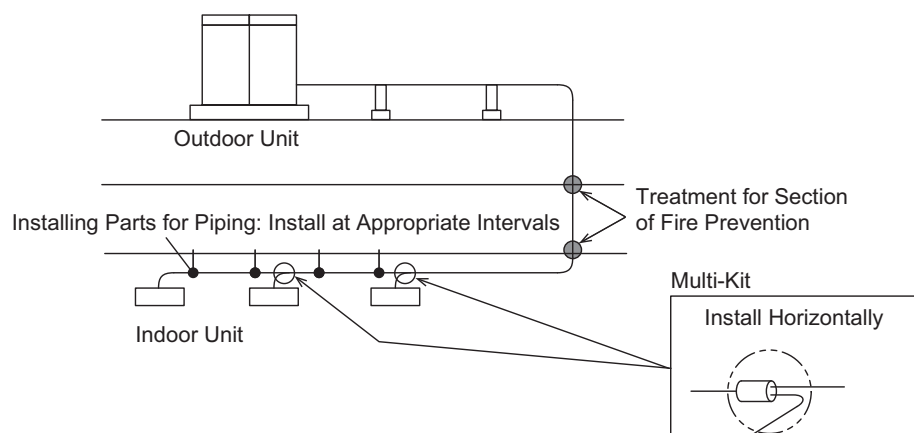


Use two wrenches as shown.

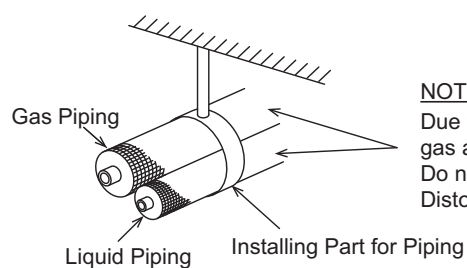
- (4) When the temperature and humidity inside the ceiling exceed 80°F (27°C)/RH80%, apply additional insulation of approximately 3/8 inch (10mm) in thickness to the accessory insulation. It prevents the formation of condensation on the surface of the insulation (refrigerant pipe only).
- (5) Perform the airtight test at (601 psi (4.15MPa) for the test pressure).
- (6) Perform cold insulation work by wrapping tape around flared and reducer connections. Also, insulate all the refrigerant pipes.
- (7) Connect the indoor/outdoor units with refrigerant piping. Secure the piping to prevent it from coming into contact with weak structures such as a wall or ceiling. Otherwise, strange noises may be heard due to vibration in the piping.

• Caution for Installing and Securing Piping

[Example for Pipe Support]



[Secure for Liquid Piping, Gas Piping]



NOTE:

Due to changing refrigerant temperatures, gas and liquid piping will stretch. Do not fasten gas and liquid piping together with tape. Distortion and deformation of the piping can occur.

NOTICE:

When assembling piping onsite with hidden elbow or socket joints, provide a service access doorway to facilitate close-up examination of interconnecting components.

Table 6.1 Piping Size of Outdoor Unit

Outdoor Unit Capacity (MBH)	inch (mm)	
	Gas	Liquid
72, 96	7/8 (22.2)	3/8 (9.52)
144 - 192	1-1/8 (28.58)	5/8 (15.88)
288	1-3/8 (34.93)	3/4 (19.05)

Table 6.2 Piping Size of Indoor Unit

Indoor Unit Capacity (MBH)	inch (mm)	
	Gas	Liquid
6 - 15	1/2 (12.7)	1/4 (6.35)
18 - 48	5/8 (15.88)	3/8 (9.52)
72	3/4 (19.05)	3/8 (9.52)
96	7/8 (22.2)	3/8 (9.52)

6.2 Piping Connection Work

Comply with the restrictions for refrigerant piping (permissible length, height difference) in Section 6.5 “Piping Work Conditions” and “Piping Branch Restriction”. If not, the outdoor unit can become damaged or fail. The stop valves will be closed completely (factory-setting) when refrigerant piping connections are performed. Do not open these stop valves until all the refrigerant piping connections, airtight testing, and vacuuming have been completed.

6.2.1 Stop Valve

< Gas Valve >

- (1) Make sure that all the spindles are closed completely.
- (2) Connect the charging hose to the service port and release the gas inside the piping.
- (3) Cut the end of the closing pipe and ensure that no residual gas exists inside the gas piping.
- (4) Remove the closing pipe from the brazing portion with a torch. Be careful that the flame doesn't burn the stop valve.

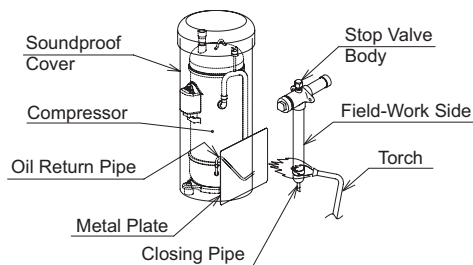
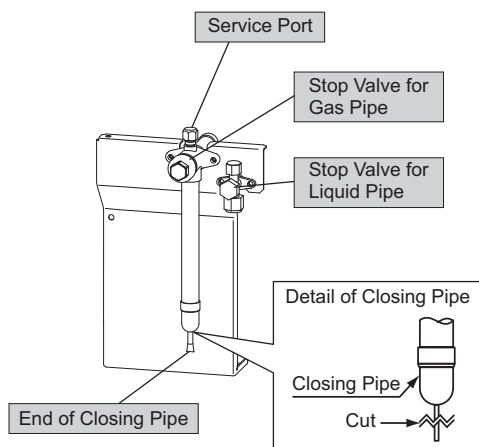


Figure 6.1

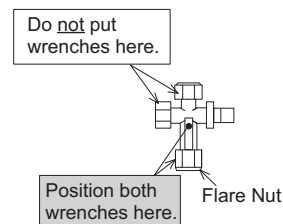
! WARNING

- Remove gas inside the closing pipe before the brazing work is performed. If the brazing filler metal melts with residual gas inside, the piping will explode and injuries can result.
- Do not expose surrounding parts and the oil return pipe of the compressor to flames when a torch is used. If the oil return piping is exposed to the fire, high temperature oil will spurt and cause a fire or injury.

< Liquid Valve >

Tighten the flare nut for the liquid stop valve according to the following torque. If excessive force is applied to the flare nut, refrigerant leakage may occur from the spindle part. (To prevent leakage, place two wrenches at the positions as shown at the right when removing and connecting piping.)

Model Type	Tightening Torque
72 and 96	24.3 - 31.0 ft·lbs (33 - 42 N·m)



CAUTION

- Do not apply an excessive force to the spindle valve after fully opening the spindle.
- At the test run, fully open the spindle. If it is not fully opened, the devices will be damaged.

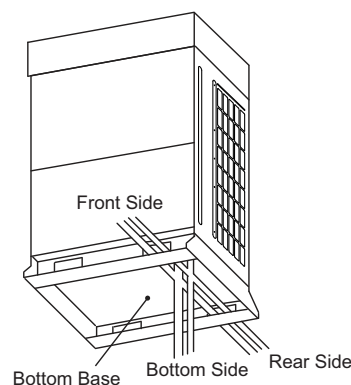
6.2.2 Piping Connection Method

Perform the piping connection work for each outdoor unit.

NOTE:

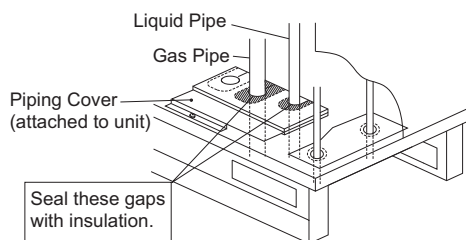
Ensure that the refrigerant pipe is connected to the same refrigerant system.

- Firmly secure the piping in order to avoid vibration and excessive force exerted on the valve.
- (1) Piping can be installed in three directions (front, rear, or bottom side) from the bottom base.
For vibration protection, properly secure piping connections and check that no excessive force is applied to the stop valve.

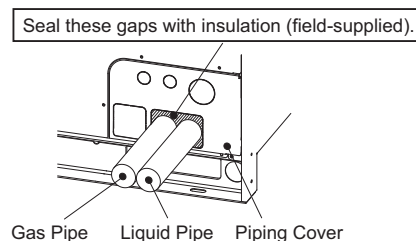


- (2) Follow the installation procedures in Section 6.2.1.
- (3) Connect the piping in accordance with Figures 6.1 and 6.2 on the following page.
- (4) Seal the gap between the bottom base or front piping cover and pipes with the insulation.

● For Piping from Bottom Base



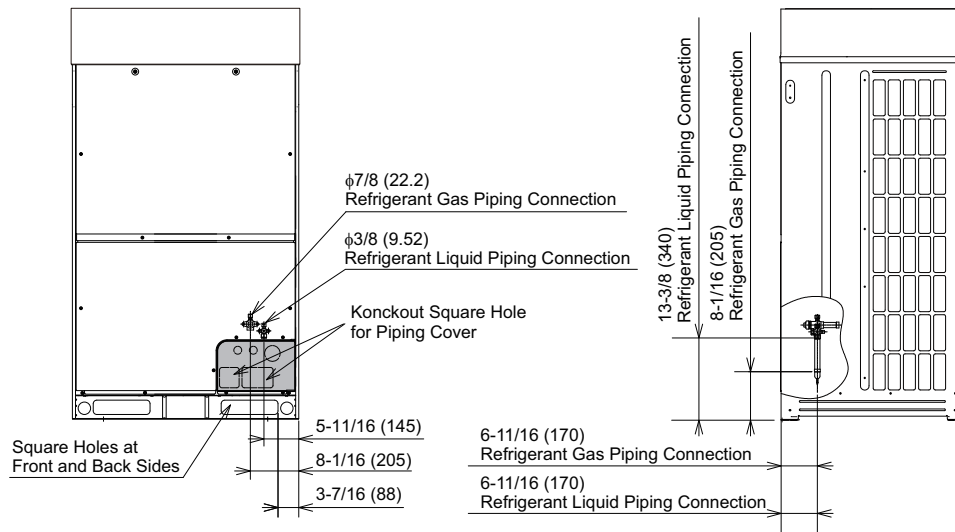
● For Piping from Front Piping Cover



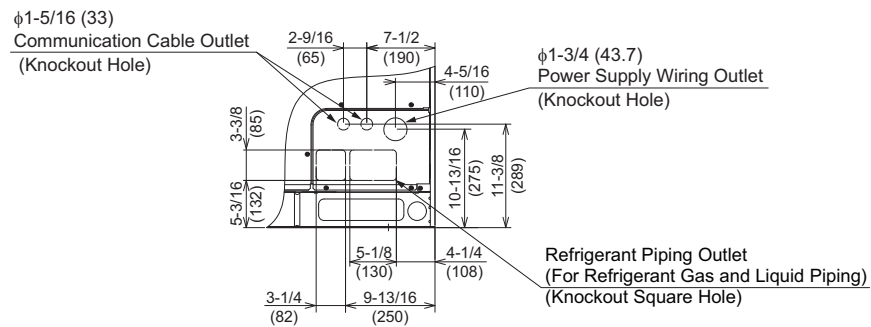
INSTALLATION

- Prepare refrigerant piping for assembly.
Refer to Figure 6.2 for the position for piping connections.

Unit: inch (mm)



< Detail of Piping Cover >

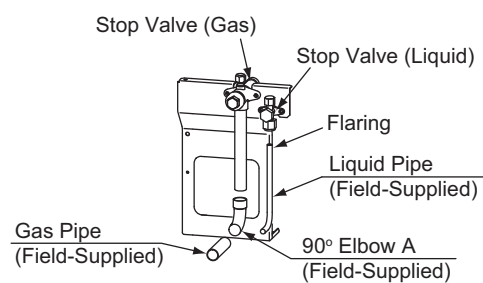


Field Piping (*)	
Gas	Liquid
7/8 (22.2)	3/8 (9.52)

(*): Using the accessory pipe (refer to Section 3.1 "Factory-Supplied Accessories"), combine the piping size.

Figure 6.2 Refrigerant Piping Connection

- Details of Stop Valve Piping Connection



NOTES:

1. Ensure that the closing pipe of the gas stop valve is removed first.
2. Refer to Figure 6.1 above for the flaring work.

6.3 Piping Work between Outdoor Units

Select the pipe size according to Section 6.4 "Piping Size between Outdoor Units".

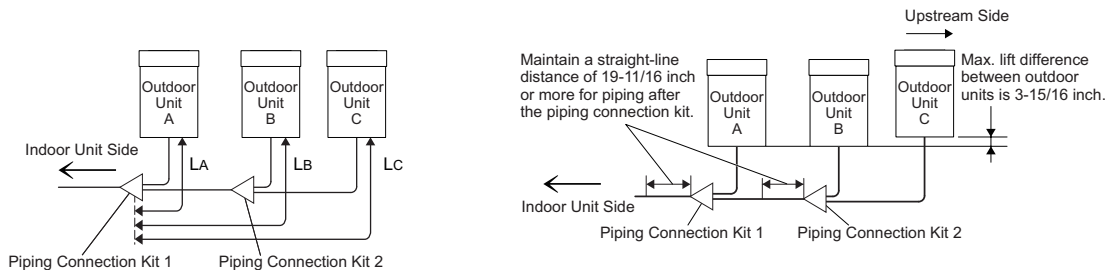
For refrigerant piping between multiple outdoor units, use the optional piping connection kit.

The arrangement for outdoor units should be determined depending on the piping direction when the refrigerant piping work and installation work are planned. When the outdoor unit is installed, perform the installation work according to the following restrictions.

- (1) Piping length between piping connection kit 1 and each outdoor unit should be

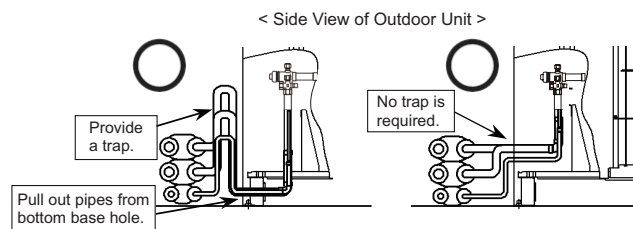
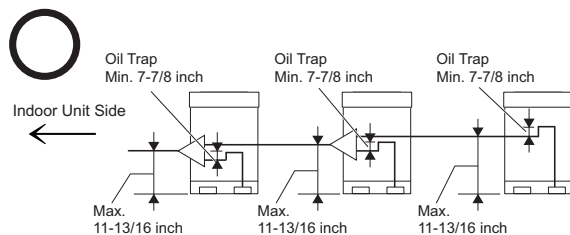
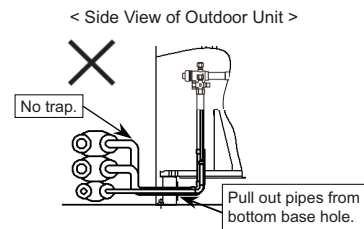
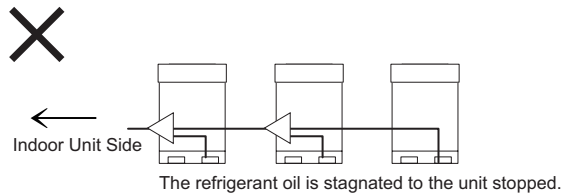
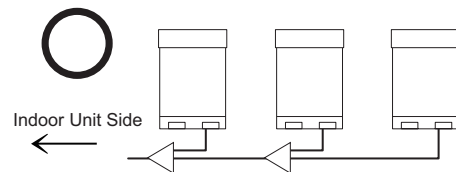
$$L_A \leq L_B \leq L_C \leq 32.8 \text{ ft (10m)}.$$

Maintain a straight-line distance of 19-11/16 inch (500mm) or more for piping after the piping connection kit 1.



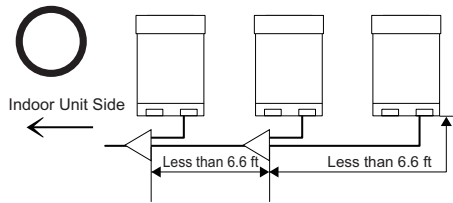
- (2) Place the piping connection kit lower than the outdoor unit piping connection.

When the piping connection kit is installed higher than the outdoor unit piping connection, maintain a maximum clearance of 11-13/16 inch (300mm) between the piping connection kit and the bottom of the outdoor unit. Also, install an oil trap (minimum 7-7/8 inch (200mm)) between the piping connection kit and the outdoor unit.

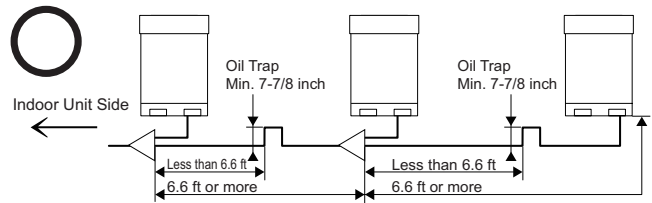


- (3) When piping length between outdoor units is 6.6 ft (2m) or more, an oil trap for the gas piping should be installed so that any accumulation of refrigerant oil cannot occur.

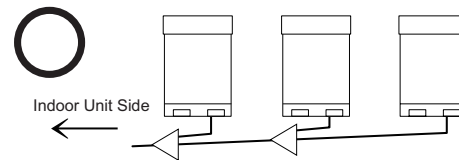
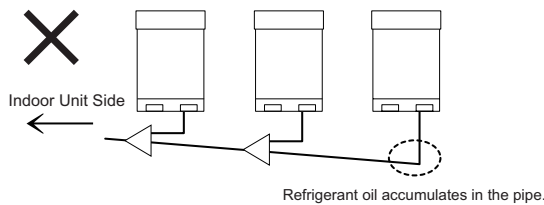
• Less than 6.6 ft (2m)



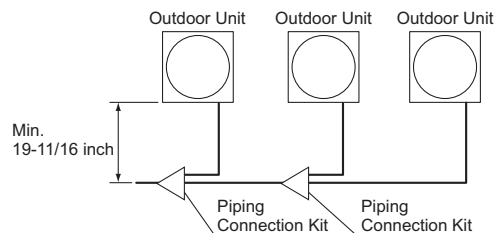
• 6.6 ft (2m) or More



- (4) Place the outdoor unit pipe horizontally or with the pipe slanted downward towards the indoor unit side so that accumulation of refrigerant oil does not occur in the pipe.

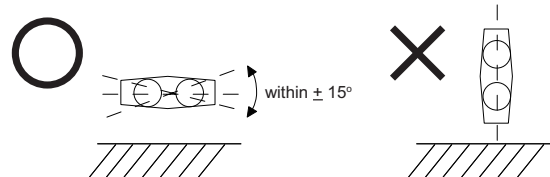


- (5) For servicing, if the pipe is installed in front of the outdoor unit, make sure minimum clearance of 19-11/16 inch (500mm) between the outdoor unit and piping connection kits. (When the compressor is replaced, minimum clearance of 19-11/16 inch (500mm) is required.)



- (6) Direction of Piping Connection Kit

Place the piping connection kit so it is vertical to the ground (the slope must be within $\pm 15^\circ$) as shown in the figure.



NOTICE

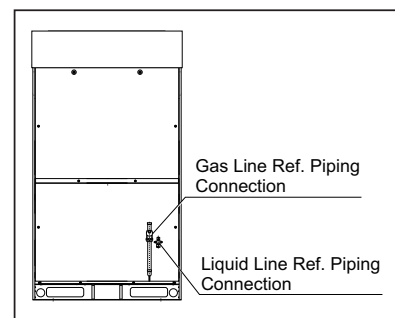
The refrigerant system may be damaged if the slope of the piping connection kit exceeds $\pm 15^\circ$.

INSTALLATION

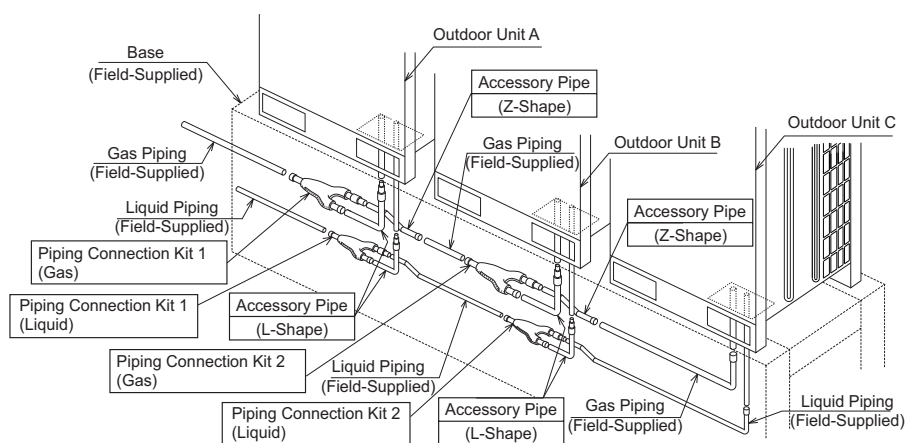
- Construction Example

The following figures show the examples of three units combination.

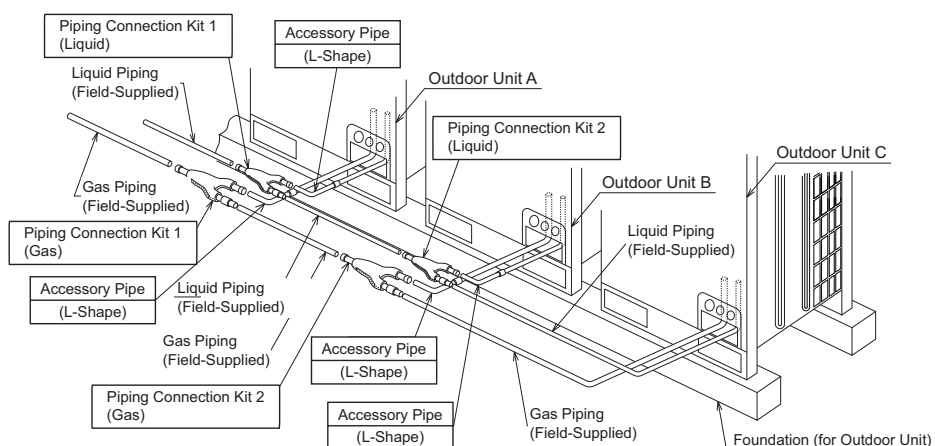
Regarding the piping work for Combination Unit, refer to the "Installation and Maintenance Manual" attached to the piping connection kit.



< Downward Piping Connection >

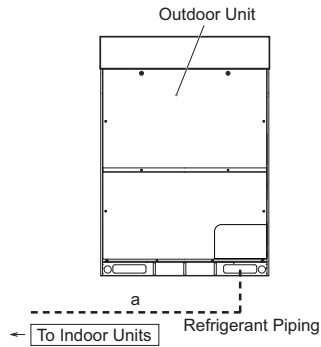


< Front Side Piping Connection >



6.4 Piping Size between Outdoor Units

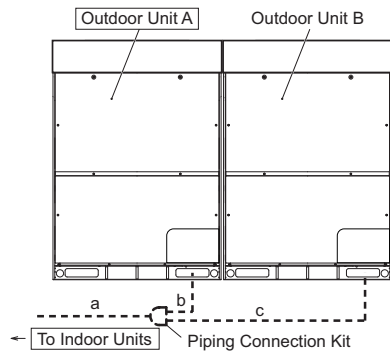
Base Unit



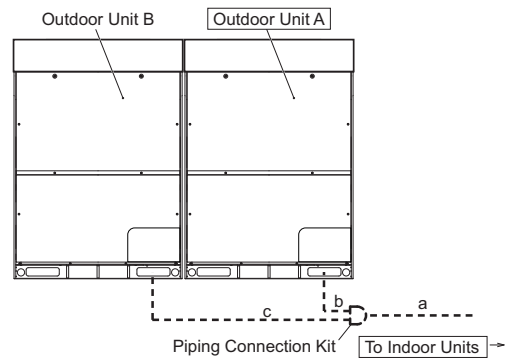
			inch (mm)	
Model Type			72	96
Piping Size	a	Gas	7/8 (22.2)	7/8 (22.2)
		Liquid	3/8 (9.52)	3/8 (9.52)

Two Units Combination

(Indoor Unit on Left Side)



(Indoor Unit on Right Side)



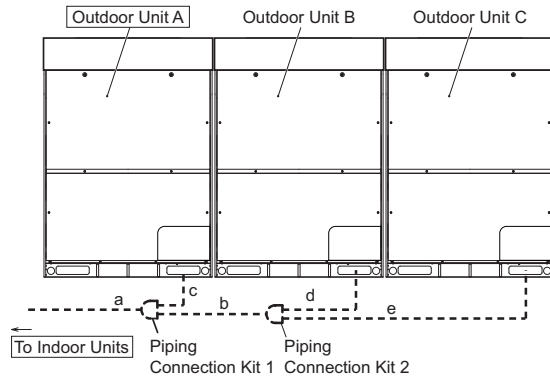
					inch (mm)
Model Type		144	168	192	
Combination Unit	Outdoor Unit A		72	96	96
	Outdoor Unit B		72	72	96
Piping Connection Kit		MC-NP20A1			
Piping Size	a	Gas	1-1/8 (28.58)	1-1/8 (28.58)	1-1/8 (28.58)
		Liquid	5/8 (15.88)	5/8 (15.88)	5/8 (15.88)
	b	Gas	7/8 (22.2)	7/8 (22.2)	7/8 (22.2)
		Liquid	3/8 (9.52)	3/8 (9.52)	3/8 (9.52)
	c	Gas	7/8 (22.2)	7/8 (22.2)	7/8 (22.2)
		Liquid	3/8 (9.52)	3/8 (9.52)	3/8 (9.52)

* Install the outdoor unit and piping connections in accordance to whatever is applicable to your situation. Refer to the table for the outdoor unit model, the piping connection kit model, and the piping diameter.

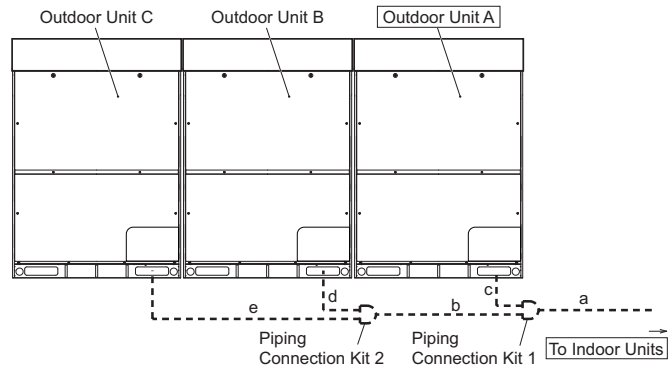
INSTALLATION

Three Units Combination

(Indoor Unit on Left Side)



(Indoor Unit on Right Side)



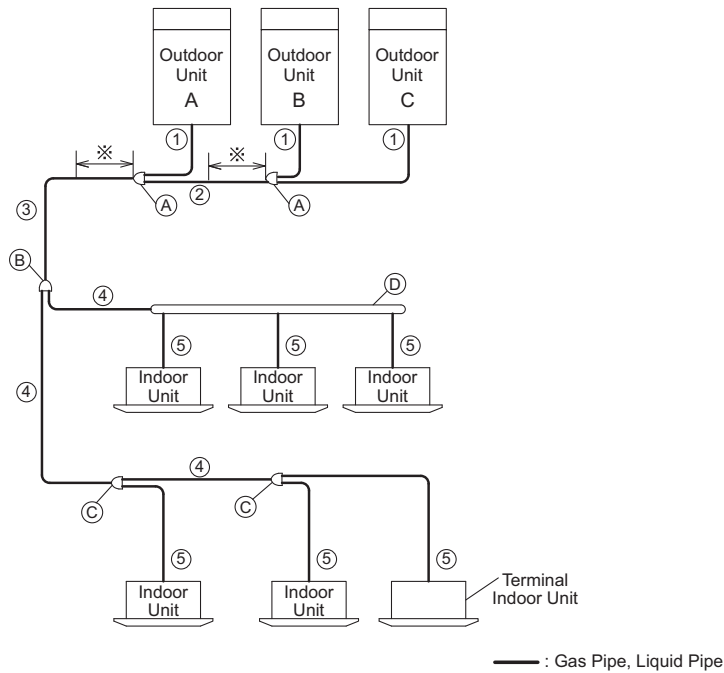
inch (mm)

Model Type		288
Combination Unit	Outdoor Unit A	96
	Outdoor Unit B	96
	Outdoor Unit C	96
Piping Connection Kit		MC-NP30A1
Piping Size	a	Gas 1-3/8 (34.93)
		Liquid 3/4 (19.05)
	b	Gas 1-1/8 (28.58)
		Liquid 5/8 (15.88)
	c	Gas 7/8 (22.2)
		Liquid 3/8 (9.52)
	d	Gas 7/8 (22.2)
		Liquid 3/8 (9.52)
	e	Gas 7/8 (22.2)
		Liquid 3/8 (9.52)

* Install the outdoor unit and piping connections in accordance to whatever is applicable to your situation. Refer to the table for the outdoor unit model, the piping connection kit model, and the piping diameter.

6.5 Piping Size and Multi-Kit Selection

For selecting the pipe sizes ① between the outdoor unit and the piping connection kit, the piping size ② between the piping connection kits and piping connection kit (A), refer to Section 6.4 "Piping Size between Outdoor Units".



Multi-Kit (Optional Parts)

< Line Branch >

③ First Branch

Outdoor Unit Capacity (MBH)	Model
72, 96	MW-NP282A2
144 - 192	MW-NP692A2
288	MW-NP902A2

< Header Branch >

④ Header Branch

Total Indoor Unit Capacity (MBH)	No. of Header Branches	Model
36 - 60	4	MH-NP224A
36 - 72	8	MH-NP288A

⑤ Line Branch after First Branch

Total Indoor Unit Capacity (MBH)	Model
≤ 86	MW-NP282A2
87 - 125	MW-NP452A2
126 - 185	MW-NP692A2
≥ 186	MW-NP902A2

NOTE:

If ⑤ "Line Branch after First Branch" is larger than ③ "First Branch", use the same model as ③ "First Branch".

INSTALLATION

Refer to the figure on the previous page.

Piping Size < inch (mm) >

③ [Main Pipe Diameter]

(Base Unit or Piping Connection Kit 1 to First Branch)

Outdoor Unit Capacity (MBH)	Equivalent Piping Length			
	< 328.1 ft (100m)		≥ 328.1 ft (100m) *1)	
	Gas	Liquid	Gas	Liquid
72, 96	7/8 (22.2)	3/8 (9.52)	1-1/8 (28.58)	1/2 (12.7)
144 - 192	1-1/8 (28.58)	5/8 (15.88)	1-3/8 (34.93)	3/4 (19.05)
288	1-3/8 (34.93)	3/4 (19.05)	1-5/8 (41.28)	7/8 (22.2)

*1): In some cases, it is required to prepare the reducer (field-supplied).

④ [Diameter of Pipe after First Branch]

Total Indoor Unit Capacity (MBH)	Piping Length between First Branch and Indoor Unit			
	≤ 131.2 ft (40m)		> 131.2 ft (40m) *1)	
	Gas	Liquid	Gas	Liquid
≤ 41	5/8 (15.88)	3/8 (9.52)	3/4 (19.05)	1/2 (12.7)
42 - 65	3/4 (19.05)	3/8 (9.52)	7/8 (22.2)	1/2 (12.7)
66 - 86	7/8 (22.2)	3/8 (9.52)	1-1/8 (28.58)	1/2 (12.7)
87 - 113	1-1/8 (28.58)	1/2 (12.7)	1-1/8 (28.58)	5/8 (15.88)
114 - 125	1-1/8 (28.58)	1/2 (12.7)	1-3/8 (34.93)	5/8 (15.88)
126 - 155	1-1/8 (28.58)	5/8 (15.88)	1-3/8 (34.93)	3/4 (19.05)
156 - 185	1-3/8 (34.93)	5/8 (15.88)	1-3/8 (34.93)	3/4 (19.05)
186 - 257	1-3/8 (34.93)	3/4 (19.05)	1-5/8 (41.28)	7/8 (22.2)
≥ 258	1-5/8 (41.28)	3/4 (19.05)	1-5/8 (41.28)	7/8 (22.2)

*1): If piping length from the multi-kit at the first branch to the terminal indoor unit exceeds 131.2 ft (40m), according to "Piping Branch Restriction" in Section 6.5 when installing. In some cases, it is required to prepare the reducer (field-supplied).

NOTE:

If the size of ④ "Pipe after First Branch" is larger than the size of ③ "Main Pipe", adjust the size of ④ "Pipe after First Branch" to the same size as ③ "Main Pipe".

⑤ [Diameter of Pipe between Multi-Kit and Indoor Unit]

Indoor Unit Capacity (MBH)	Gas	Liquid
6 - 15	1/2 (12.7)	1/4 (6.35) *1)
18 - 48	5/8 (15.88)	3/8 (9.52)
72	3/4 (19.05)	3/8 (9.52)
96	7/8 (22.2)	3/8 (9.52)

*1): When liquid piping length is longer than 49.2 ft (15m), use 3/8 inch (9.52mm) diameter piping with the reducer (accessory pipe for Multi-Kit).

NOTE:

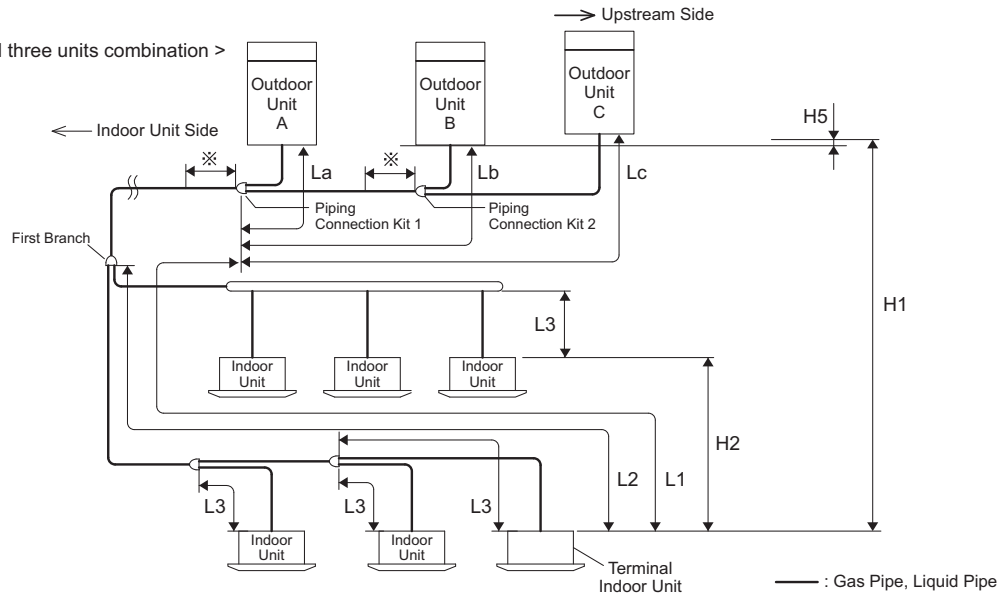
The pipe diameter should be the same as the indoor unit piping connection size.

● Piping Work Conditions

Comply with the following when installing the unit.

[Example]

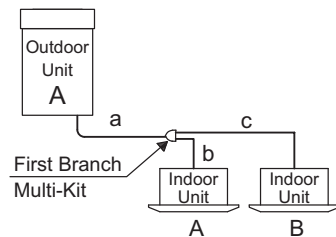
< For two and three units combination >



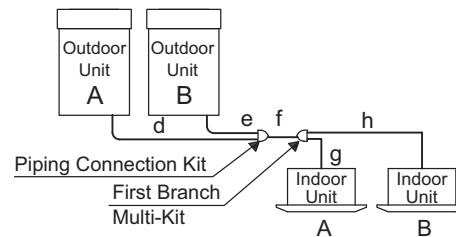
※ Maintain a straight-line distance of 19-11/16 inch (500mm) or more for piping after the piping connection kit.

Item	Mark	Details
Total Piping Length	Ex1	$a+b+c$
	Ex2	$d+e+f+g+h$
Maximum Piping Length	Ex1	$a+c$
	Ex2	$f+h$
Piping Length	-	The actual length of pipe that takes no account for equivalent lengths for pressure drops of elbows.
Equivalent Piping Length	-	The combination of the straight pipe length plus the equivalent length of elbows and other pressure drop calculations.

Example1) If a Line Branch Including Main Branch



Example 2) If Utilizing a Piping Connection Kit



INSTALLATION

Item		Mark	Allowable Piping Length	
			≤ the recommended number of connected indoor unit	> the recommended number of connected indoor unit
Total Piping Length		-	≤ 1,640 ft (500m)	≤ 984 ft (300m)
Maximum Piping Length	Actual Length	L1	≤ 541 ft (165m)	≤ 541 ft (165m)
	Equivalent Length		≤ 623 ft (190m)	≤ 623 ft (190m)
Maximum Piping Length between Multi-kit of 1st Branch and Each Indoor Unit		L2	≤ 295 ft (90m)	≤ 131 ft (40m)
Maximum Piping Length between Each Multi-kit and Each Indoor Unit		L3	≤ 131 ft (40m)	≤ 98 ft (30m)
Piping Length between Piping Connection Kit 1 and Each Outdoor Unit		La, Lb, Lc	≤ 32 ft (10m)	≤ 32 ft (10m)
Height Difference between Outdoor Units and Indoor Units	O.U. is Higher	H1	≤ 164 ft (50m)	≤ 164 ft (50m)
	O.U. is Lower		≤ 131 ft (40m)	≤ 131 ft (40m)
Height Difference between Indoor Units		H2	≤ 98 ft (30m)	≤ 98 ft (30m)
Height Difference between Outdoor Units		H5	≤ 0.3 ft (0.1m)	≤ 0.3 ft (0.1m)

NOTICE

Comply with the following conditions when installing the unit.

- For a combination of two or three outdoor units, the outdoor unit "A" should be connected to the piping connection of Kit 1. (Refer to Section 6.4 for outdoor unit models.) Refer to the Piping Kit Installation Manual for piping details.
- The piping length between outdoor units should be $L_a \leq L_b \leq L_c \leq 32.8$ ft (10m).
(If the piping length is incorrect, there may be a failure of outdoor units caused by a refrigerant back-up.)
- Maintain a straight-line distance of 19-11/16 inch (500mm) or more for piping after the piping connection kit.
- The condition of refrigerant piping installation is different depending on the connected number of indoor units. Refer to Table 3.2 "System Combination" above for details.
- Allowable total piping length may not exceed 1,640 ft (500m) because of the limitation of maximum additional refrigerant amount as described in the following table. Make sure that the additional refrigerant volume does not exceed the maximum additional refrigerant amount as shown below.

Outdoor Unit Capacity (MBH)	72, 96	144 - 192	288
Max. Additional Refrigerant Charge: lbs (kg)	61.7 (28)	112.5 (51)	138.9 (63)

- If the piping length (L3) between each multi-kit and indoor unit is considerably longer than other indoor unit, refrigerant may not flow well, lessening performance compared to other models.
(Recommended Piping Length: Within 49.2 ft (15m))
- When the piping length from the multi-kit to the first branch to the terminal indoor unit exceeds 131.2 ft (40m), refer to "Piping Branch Restrictions", Section 6.5.
- When installing Energy Recovery Ventilation in the system, the piping length between Energy Recovery Ventilation and the outdoor unit must be within 49.2 ft (15m).
- When completing on-site piping, install bent piping or horizontal loop piping to absorb any expansion or contraction due to changing temperatures.

● Piping Branch Restriction

In the following instances, there is no limit to the number of main piping branches.

If the piping length L2 from the Multi-Kit at the first branch to the farthest indoor unit is over 131.2 ft (40m), follow the instructions below when performing the field-supplied piping work.

(Example 1) : Installation with Main Piping Branch (*)

Piping length from the Multi-Kit at the first branch to the terminal indoor unit is within 131.2 - 295.3 ft (40 - 90m).

- (1) If the pipe length L2 is over 131.2 ft (40m), the size of gas and liquid pipes “b and c” or “g and h” should be selected according to Table ④ below, “Diameter of Pipe after First Branch”.

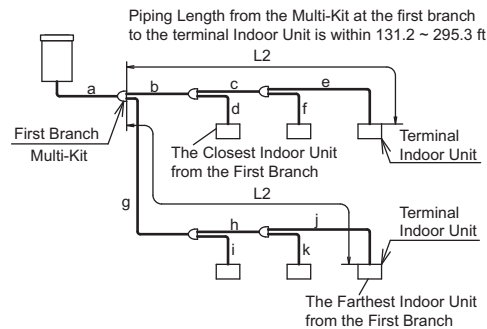
* If the size of (a) is smaller than the size of (b, g) after selecting the size according to Table ④ below, “Diameter of Pipe after First Branch”, adjust the size of (a) so it is the same size as (b, g).

If the size of (a) is larger than the size indicated in Table ③ below, “Main Pipe Diameter” of (Equivalent Piping Length ≥ 328.1 ft), adjust the size of (a) so it is the same size according to Table ③ below, “Main Pipe Diameter” of (Equivalent Piping Length ≥ 328.1 ft).

In this instance, if the size of (b, c, g, h) is larger than the size of each before the branch, adjust the size of (b, c, g, h) to the same size as each before the branch.

- (2) The difference between the piping length from the first branch to the farthest indoor unit and the piping length from the first branch to the closest indoor unit must be within 131.2 ft (40m).

* $(g+h+j)-(b+d) \leq 131.2$ ft (40m)



(Example 2): Installation without Main Piping Branch (*)

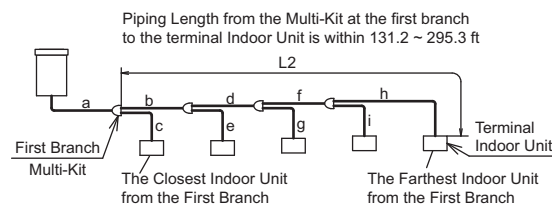
Piping length from the Multi-Kit at the first branch to the terminal indoor unit is within 131.2 - 295.3 ft (40 - 90m).

- (1) If the pipe length L2 is over 131.2 ft (40m), the size of gas and liquid pipes “b, d and f” should be selected according to Table ④ below, “Diameter of Pipe after First Branch”.

* If the size of (a) is smaller than the size of (b) after selecting the size according to Table ④ below, “Diameter of Pipe after First Branch”, adjust the size of (a) so it is the same size as (b).

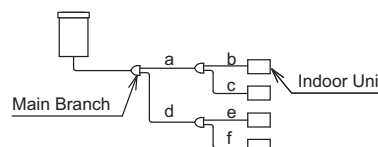
If the size of (a) is larger than the size indicated in Table ③ below, “Main Pipe Diameter” of (Equivalent Piping Length ≥ 328.1 ft), adjust the size of (a) so it is the size according to Table ③ below, “Main Pipe Diameter” of (Equivalent Piping Length ≥ 328.1 ft).

In this case, if the size of (b, d, f) is larger than the size of each before the branch, adjust the size of (b, d, f) to the same size as each before the branch.



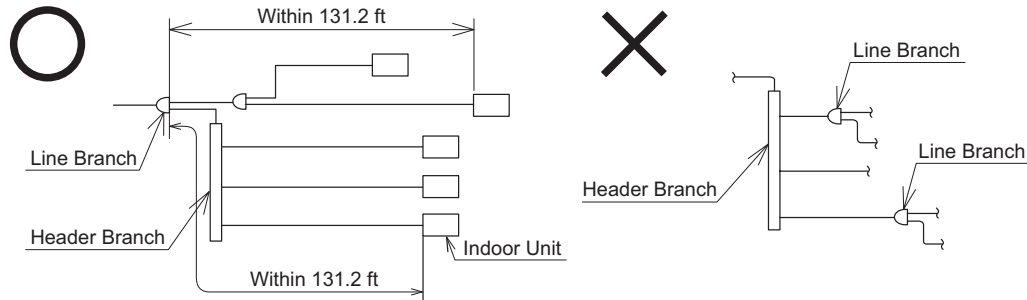
(*): Main Piping Branch:

Both branches of piping from a Multi-Kit are connected to the next Multi-Kits.



INSTALLATION

A header branch can be used with a line branch at the three pipes segment and two pipes segment. A header branch can also be used after the second branch. Do not connect a line branch to a header branch. When using a header branch, make sure that the piping length L2 from the Multi-Kit at the first branch to the farthest indoor unit is within 131.2 ft (40m).



- The number of indoor units connectable to outdoor unit is as follows:
Comply with the following conditions when installing the unit.
- A maximum total capacity and a minimum total capacity against the nominal outdoor unit capacity can be obtained by combination of the indoor units.

Outdoor Unit Capacity (MBH)	72	96	144	168	192	288
Maximum Number of Connectable I.U.	15	16	31	30	33	50
Recommended Number of Connectable I.U.	10	10	18	18	18	32

NOTES:

1. For a system under which all the indoor units are supposed to operate simultaneously, the total indoor unit capacity should be less than outdoor unit capacity. Otherwise, it may cause a decrease of operating performance and operating limit in overload operation.
2. For the system under which all the indoor units are not supposed to operate simultaneously, the total indoor unit capacity is available 100% or more against the outdoor unit capacity. Refer to Table 3.2 "System Combination" for detail.
3. When operating the outdoor unit in cold area with temperatures of 14°F (-10°C), or under the high heating load conditions, the total indoor unit capacity should be 100% or less against the outdoor unit capacity and the total piping length should be 984.3ft (300m) or less.
4. The airflow volume for indoor units of 6 and 8 MBH is set higher than that for indoor units of 12 MBH or more. Make sure to select appropriate indoor units when installing indoor units where cold draft may occur during heating operation. If installing indoor units in such places, refer to the recommended number of connectable indoor units.
5. When installing an Energy Recovery Ventilation (ERV) unit, the additional load must be considered when calculating the maximum units that can be attached.

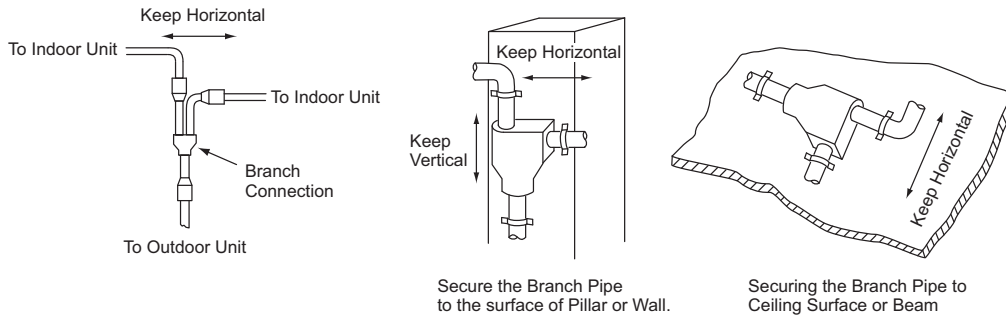
6.6 Multi-Kit Connection

Use the branch piping kit to ensure proper piping.

Do not use a T-Joint. Secure the branch pipes horizontally to a pillar, a wall, or a ceiling.

NOTE:

When installing the piping by securing plates, wrap the branch pipe with an insulation or slip a cushioning between the pipe and the plate. Then secure it to the wall.



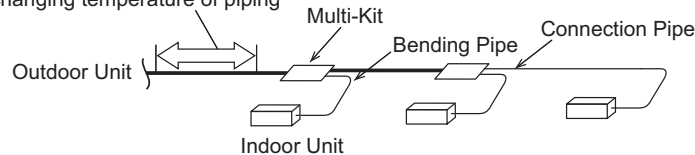
< Installation Posture of Branch Piping >

<p>Upper Side</p> <p>Min. 1.6 ft</p> <p>Bending Radius</p> <p>Main Pipe</p> <p>Branch Connection</p> <p>Branch Pipe</p> <p>CORRECT</p>	<p>Upper Side</p> <p>Main Pipe</p> <p>Branch Connection</p> <p>Branch Pipe</p> <p>CORRECT</p>	<p>Upper Side</p> <p>Straight Length Min. 1.6 ft</p> <p>Main Pipe</p> <p>Branch Connection</p> <p>Branch Pipe</p> <p>CORRECT</p>	<p>Upper Side</p> <p>Main Pipe</p> <p>Branch Connection</p> <p>Branch Pipe</p> <p>INCORRECT</p>
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[Piping Form from Multi-Kit to Indoor Unit]

Ex. Recommended To prevent pipe damage, use bending pipes from each Indoor Unit to the Multi-Kit.

Piping stretches during operation because of changing temperature of piping



Ex. Not Recommended

Piping stretches during operation because of changing temperature of piping



NOTICE:

When on-site piping, install the bend pipes or the horizontal loop pipes to absorb stretched pipes that is due to the changing temperature of refrigerant pipes.

7. Electrical Wiring

! WARNING

- The indoor unit fan may continue to operate for up to five minutes following the heating cycle to dissipate residual heat from the indoor unit.
- Check to ensure that the indoor fan and the outdoor fan have stopped before electrical wiring work or a periodical check is performed.
- Insulate electrical wiring, drain piping, and electrical components from threats posed by burrowing animals and temperature extremes. Failure to do so can over time, deteriorate system performance.
- Electrical cables should not come into contact with refrigerant piping, plate edges, and electrical components inside the unit.
- Use a medium sensing speed Ground Fault Circuit Interrupter (GFCI) with an activation speed of 0.1 second or less). If not, electric shock or a fire can result.
- Secure the cables. External forces on the terminals can lead to fire.
- Tighten screws according to the following torque.
 - M4: 0.7 to 1.0 ft·lbs (1.0 to 1.3 N·m)
 - M5: 1.5 to 1.8 ft·lbs (2.0 to 2.5 N·m)
 - M6: 3.0 to 3.7 ft·lbs (4.0 to 5.0 N·m)
 - M8: 6.6 to 8.1 ft·lbs (9.0 to 11.0 N·m)
 - M10: 13.3 to 17.0 ft·lbs (18.0 to 23.0 N·m)
- Set DSW7 on the PCB1 according to each power supply shown in the figure below.

DSW7	Power Supply Setting and Service Setting
208V Unit:	Setting is required.
230V, 460V Unit:	No setting is required.
208V, 230V Unit: 230V Setting Before Shipment 460V Unit: 460V Setting Before Shipment	
208V	230V
ON	ON
1 2 3 4	1 2 3 4
460V	
ON	
1 2 3 4	

- Use the specified cables for wiring between the outdoor unit and indoor units. Selecting incorrect cables will cause an electric shock or a fire. Communication cabling shall be a minimum of AWG18 (0.82mm²), 2-Conductor, Stranded Copper. Shielded cable must be considered for applications and routing in areas of high EMI and other sources of potentially excessive electrical noise to reduce the potential for communication errors. When shielded cabling is applied, proper bonding and termination of the cable shield is required as per Johnson Controls guidelines. Plenum and riser ratings for communication cables must be considered per application and local code requirements.
- Tightly secure the electrical wirings to the terminal block according to the specified torque. If tightening the terminals is not completed, heat generation, an electric shock or a fire will occur at the terminal connections.

7.1 General Check

- (1) Make sure that the field-supplied electrical components (main power switches, circuit breakers, wires, conduit connectors and wire terminals) have been properly selected according to the electrical characteristics indicated in Table 7.1. Make sure that the components comply with National Electrical Code (NEC) standards.
 - Supply electrical power to each outdoor unit. This equipment can be installed with a Ground Fault Circuit Interrupter (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 to local, state and NEC codes and requirements. The equipment installer is responsible for understanding and abiding by applicable codes and requirements. Failure to use a GFCI could result in electric shock or fire.
 - The power sources for the indoor unit and outdoor unit should be supplied respectively. Connect the power supply wiring to each indoor unit group connected to the same outdoor unit. This equipment can be installed with a Ground Fault Circuit Interrupter (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 to local, state and NEC codes and requirements. The equipment installer is responsible for understanding and abiding by applicable codes and requirements. Failure to use a GFCI could result in electric shock or fire.
- (2) Check to ensure that the power supply voltage is within $\pm 10\%$ of the rated voltage.
If the power supply voltage is too low, the system cannot start due to the voltage drop.
- (3) Check the size of the electrical wires.
- (4) Communication cabling should be a minimum of AWG18 (0.82mm²), 2-Conductor, Stranded Copper. Shielded cable must be considered for applications and routing in areas of high EMI and other sources of potentially excessive electrical noise to reduce the potential for communication errors. When shielded cabling is applied, proper bonding and termination of the cable shield is required as per Johnson Controls guidelines. Plenum and riser ratings for communication cables must be considered per application and local code requirements.
 - In an instance where the power source for the packaged air conditioner is supplied from the same power transformer as the device with high electricity consumption*
 - In an instance where the power supply wiring for the device* and for the packaged air conditioner are located close to each other.

* Example: Lift, container crane, rectifier for electric railway, inverter power device, arc furnace, electric furnace, large-sized induction motor, and large-sized switch.

In the instances mentioned above, an induction surge of the power supply wiring for the packaged air conditioner could occur due to a rapid change in electricity consumption of the device and activation of the switch. Therefore, check the field regulations and standards before performing electrical work in order to protect the power supply wiring for the packaged air conditioner.
- (5) Check to ensure that the ground cable for the outdoor unit, and indoor unit are connected.

7.2 Electrical Wiring Connection

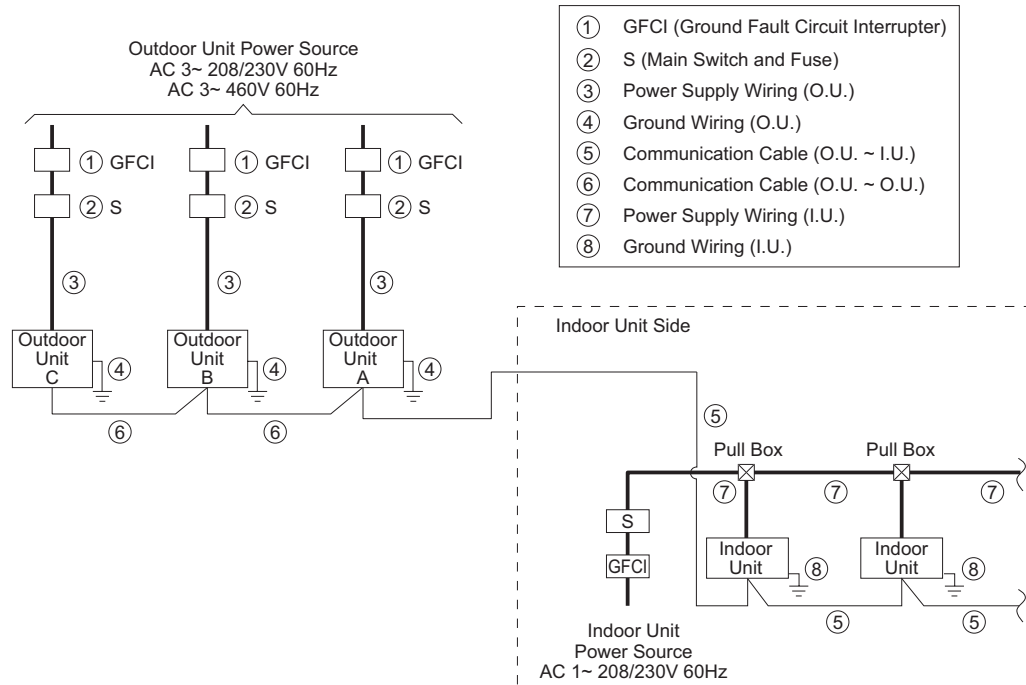
WARNING

- **This equipment can be installed with a Ground Fault Circuit Interrupter (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 to local, state and NEC codes and requirements. The equipment installer is responsible for understanding and abiding by applicable codes and requirements. Failure to use a GFCI could result in electric shock or fire.**
- **Perform the electrical work according to the regulations of each region and this manual. A separate, dedicated electrical circuit must be used. If the electrical wiring work is performed incorrectly or there is a capacity shortage of the power circuit, it will cause an electric shock or a fire.**
- **Check that the ground wire is securely connected. If the unit is not correctly grounded, it may lead to an electrical shock.**
Do not connect the ground wiring to gas piping, water piping, lighting conductor, or telephone ground cables.

INSTALLATION

(1) Power Source Wiring

Supply the power sources to each outdoor unit and indoor unit group respectively.
Using this method is a basic principle of power supply wiring.



(2) Electrical Characteristics

Table 7.1 Electrical Characteristics and Recommended Wiring Size

Model	Outdoor Unit							INV Comp.	
	Hz (Hz)	Voltage (V)	Max. (V)	Min. (V)	MCA (A)	MOP (A)	Max. Fuse (A)	RLA (A)	LRA (A)
(H,Y)VAHP072B31CW	60	208/230	253	188	51/46	72/65	70/60	24.2/22.0	150
(H,Y)VAHP096B31CW	60	208/230	253	188	51/46	72/65	70/60	24.2/22.0	150
(H,Y)VAHP072B41CW	60	460	506	414	24	34	30	15.3	75
(H,Y)VAHP096B41CW	60	460	506	414	24	34	30	15.3	75

Model	Fix Speed Comp.		Fan Motor		Wiring Size		
	RLA (A)	LRA (A)	Output (kW)	FLA (A)	Power Supply Wiring (AWG)	Ground Wiring (AWG)	Communication Cable (AWG)
(H,Y)VAHP072B31CW	28.8/26.0	155	1.2	5.6/5.1	6	6	18
(H,Y)VAHP096B31CW	28.8/26.0	155	1.2	5.6/5.1	6	6	18
(H,Y)VAHP072B41CW	12.2	74	1.2	9	12	12	18
(H,Y)VAHP096B41CW	12.2	74	1.2	9	12	12	18

MCA: Minimum Circuit Ampacity (A)

MOP: Maximum Overcurrent Protective Device (A)

RLA: Rated Load Ampacity (A)

LRA: Locked Rotor Ampacity (A)

FLA: Full Load Ampacity (A)

NOTES:

1. Select wire size based on the value of MCA.
2. MOP is used to select the fuse, circuit breaker, or a Ground Fault Circuit Interrupter (GFCI).
3. Communication cabling shall be a minimum of AWG18 (0.82mm²), 2-Conductor, Stranded Copper. Shielded cable must be considered for applications and routing in areas of high EMI and other sources of potentially excessive electrical noise to reduce the potential for communication errors. When shielded cabling is applied, proper bonding and termination of the cable shield is required as per Johnson Controls guidelines. Plenum and riser ratings for communication cables must be considered per application and local code requirements.

⚠ CAUTION

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

NOTES:

1. When the power supply wiring is longer, select the minimum wiring size which the voltage drop is within 2%.
2. Power supply voltage should be satisfied with the followings.
 - Supply Voltage: Rated Voltage within $\pm 10\%$
 - Starting Voltage: Rated Voltage within -15%
 - Operating Voltage: Rated Voltage within $\pm 10\%$
 - Imbalance between Phases: within 3%
3. Do not connect the ground wiring to gas piping, water piping, or a lightning conductor.
 - Gas Piping: An explosion and ignition may occur if 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 lightning conductor is used.

7.3 Electrical Wiring for Outdoor Unit

Connect the electrical wiring according to the following figure:

- Connect the power supply wires to L1, L2 and L3 for the three-phase power source on the terminal block TB1 and ground wiring to the terminal in the electrical control box.
- Connect the communication cables between the outdoor and indoor units to the TB2 terminals 1 and 2 on the PCB1. As for the communication cables between outdoor units in the same refrigerant system, connect them to the TB2 terminals 3 and 4 on the PCB1. When shielded cabling is applied (M4), 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. Communication cabling shall be a minimum of AWG18 (0.82mm²), 2-Conductor, Stranded Copper.

- Insert the communication cables into the PVC tube "VW-1 600V" (Accessory) to separate from the power supply wirings and the communication cables in the outdoor unit. Local codes will need to be followed.

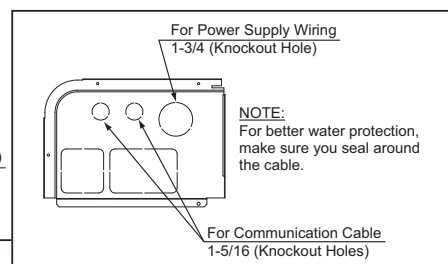
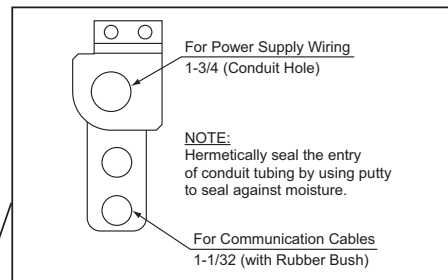
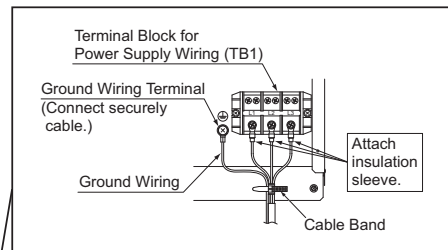
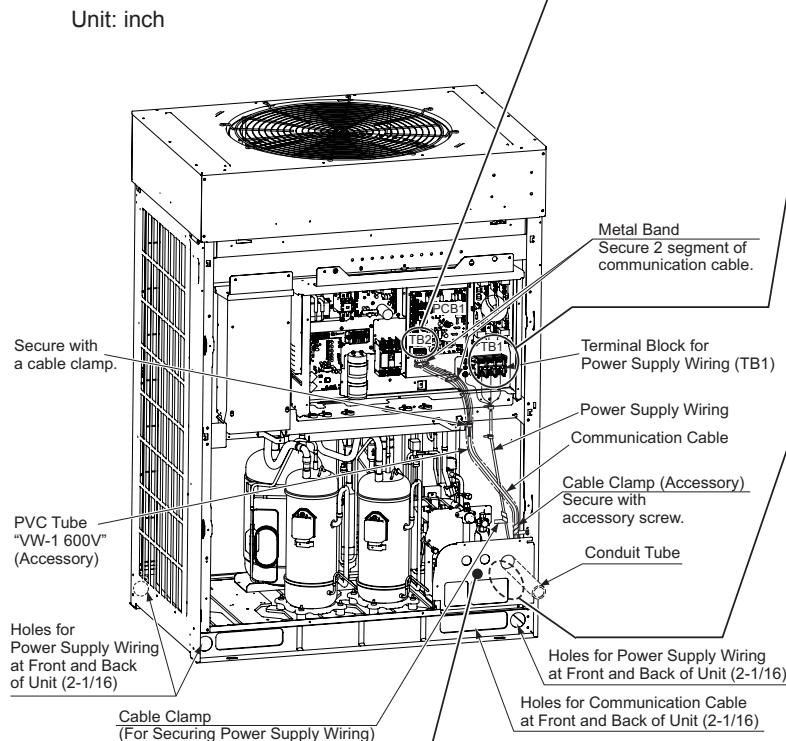
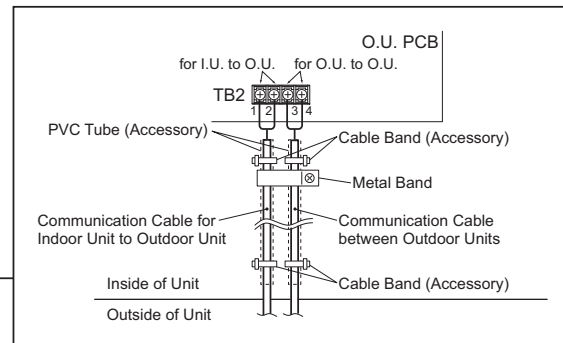
Then, tighten both ends of the PVC tubing with the cable bands (accessory) in order to secure the PVC tubing to the communication cables.

When the rated voltage of the communication cables (local code) are 600V or more, it is not required to insert them into the PVC tube "VW-1 600V" (accessory).

- Tighten screws for the terminal block according to the following table.

< Required Tightening Torque >

Size	Tightening Torque	
M4	0.7 to 1.0 ft·lbs	(1.0 to 1.3 N·m)
M5	1.5 to 1.8 ft·lbs	(2.0 to 2.4 N·m)
M6	3.0 to 3.7 ft·lbs	(4.0 to 5.0 N·m)
M8	6.6 to 8.1 ft·lbs	(9.0 to 11.0 N·m)
M10	13.3 to 17.0 ft·lbs	(18.0 to 23.0 N·m)



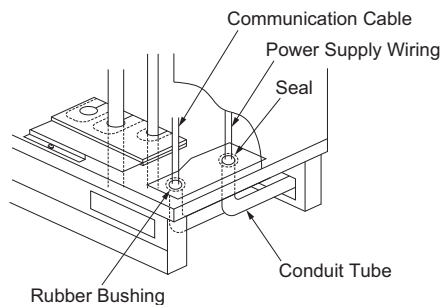
⚠ CAUTION

Be sure to note the following points when running cables under the unit using conduit tubing.
(The pipe cover needs to be removed before performing piping and wiring.)

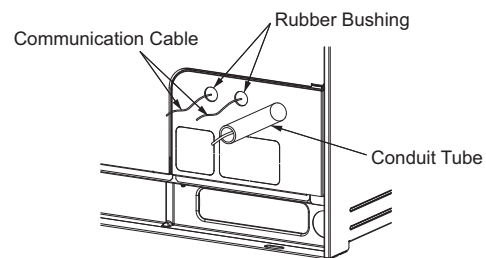
NOTES:

1. When installing the power supply wiring, use the field-supplied conduit tube as shown below. Remove the rubber bushing from the unit for the conduit tubing installation.
2. When installing the communication cables, run them through the rubber grommet attached to the unit.
3. Maintain at least 5 inch (127mm) between the power supply wiring and communication cables.
4. Prevent cables from touching or rubbing up against refrigerant piping, plate edges, and electrical components inside the unit.
5. Completely seal the end of conduit tube with sealing materials to prevent the rain from entering the conduit tube. (In case of wiring from bottom base)
6. Create a drainage hole at the lowest part of the conduit tube. (In case of wiring from bottom base)

● For Wiring from Bottom Base



● For Wiring from Front Piping Cover



⚠ CAUTION

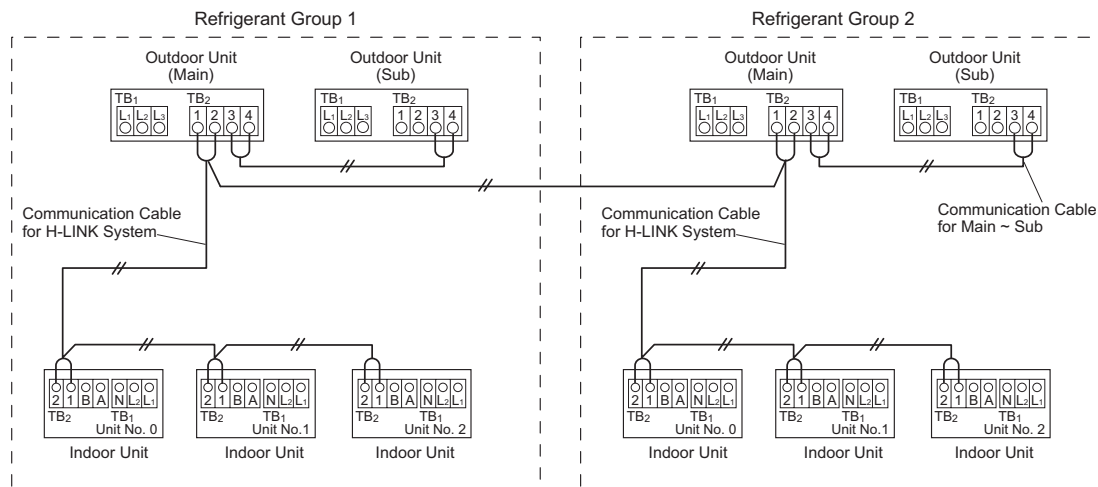
Tightly secure the power supply wiring using a cable clamp inside the unit.

7.4 Electrical Wiring Connections of Indoor Unit, and Outdoor Unit

- (1) Connect a power supply wiring to each outdoor unit. Connect a Ground Fault Circuit Interrupter (GFCI), fuse, and main switch (S) to each outdoor unit.
- (2) Connect a power supply wiring to each indoor unit group connected to the same outdoor unit. (Total operating current be less than 12A.)
Connect a Ground Fault Circuit Interrupter (GFCI), fuse, and main switch (S) to each indoor unit group.
- (3) Connect the communication cable between indoor units, and outdoor units, as shown in Figure 7.1.
- (4) Connect the communication cables in the same refrigerant system unit. (If the refrigerant piping of indoor unit is connected to the outdoor unit, also connect the communication cables to the same indoor unit.) Connecting the refrigerant piping and communication cables to the different refrigerant systems may lead to malfunction.
- (5) Use communication cabling that is a minimum of AWG18 (0.82mm²), 2-Conductor, Stranded Copper. Shielded cable must be considered for applications and routing in areas of high EMI and other sources of potentially excessive electrical noise to reduce the potential for communication errors. When shielded cabling is applied, proper bonding and termination of the cable shield is required as per Johnson Controls guidelines. Plenum and riser ratings for communication cables must be considered per application and local code requirements. (Do not use Tri-Core or anything beyond.)

- (6) Use the same kind of cables in the same H-LINK system.
- (7) Maintain at least 5 inch (127mm) between the communication cables and the power supply wiring, and also min. 5 ft (1.5m) between the communication cables and power supply wiring for other electrical device. If these cables are not secured, sleeve the power supply wiring into the metallic conduit tubing to separate them from the other cables. Make sure power supply wiring are well-grounded.
- (8) Connect the following communication cables to the terminals 1 and 2 on terminal block (TB2) in the outdoor unit A (main unit).
 - between outdoor unit and indoor unit
 - between outdoor unit and outdoor unit in other refrigerant systems
- (9) Do not connect the power supply wiring to the terminal block for transmission wiring (TB2). All the printed circuit boards in the same refrigerant system will be damaged.
- (10) Connect the ground wiring to the outdoor/indoor units. The ground wiring work under the condition of 100Ω (max.) ground resistance must be performed by a authorized personnel.
- (**) Connect the communication cables between outdoor units in the same refrigerant system to the terminals 3 and 4 on TB2.

• Communication Cabling



NOTES:

1. For the combination units, DSW settings of Main and Sub are required.
2. An alarm occurs if the communication cables between main outdoor unit and sub outdoor units are connected to the terminals 1 and 2 for H-LINK system.
3. In an alarm is triggered on the LCD of Main outdoor unit, follow the "7-segment" display at the Main outdoor unit for verification purposes.
4. Perform a function setting at the Main outdoor unit.
5. Maximum number of refrigerant groups with one central controller is 64 (for H-LINK II).
Maximum number of indoor units to be connected is 160 (for H-LINK II).

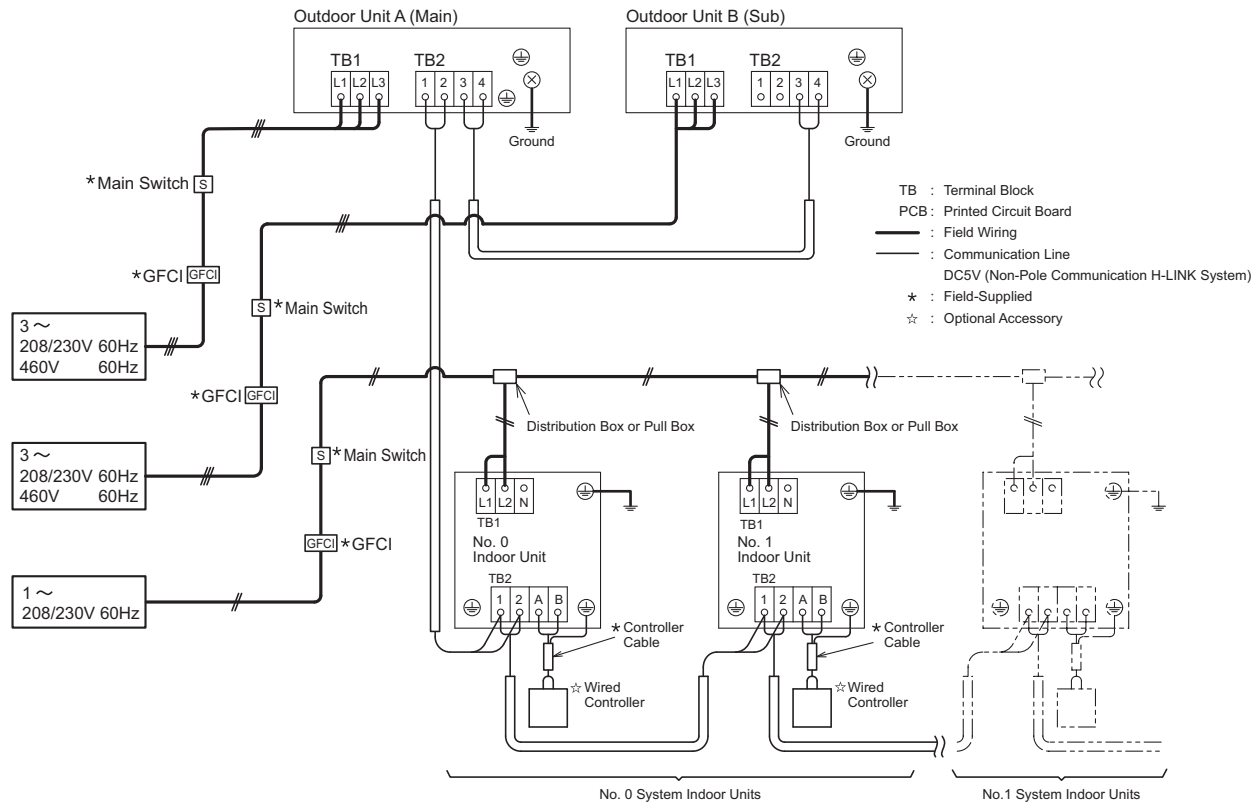


Figure 7.1 Illustration of Electrical Wiring Connections

7.5 DIP Switch Setting of Outdoor Unit

Turn OFF all power sources before performing settings.

DIP switch settings cannot be set without first disconnecting from the power source. (However, No.1, 2, 4, and 6 pins of DSW4, No.4 pin of DSW7 and push switches can be operated when power source is ON.) The darkened square "■" indicates the position of DIP switches.

NOTE

- By using switch DSW4, the unit is started 10 to 20 seconds after the switch adjustment is made.
- To simplify service and maintenance, number this outdoor unit to help distinguish it from the other outdoor units.
Record the unit number in the box right.



Arrangement of Dip Switches

Push Switches

DSW1 Ref. Cycle No. Setting

Setting is required.

Setting Before Shipment

Setting Position

DSW1

Tens Digit

Last Digit

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

DSW2 Capacity Setting

No setting is required.

Capacity [x 1000 Btu/h]	72	96
DSW2 Setting	ON	ON

DSW4 Test Run and Service Setting

Setting is required.

For Test Run, Function Setting and External Input/Output Setting

Setting Before Shipment

Setting Item	Pin No.
Test Cooling Operation	1
Test Heating Operation	1, 2
Compressor Forced Stop and Function Setting	4
External Input/Output Setting	4, 6

DSW5 Emergency Operation / Test Run and Service / High Static Pressure Mode Setting

No setting is required.

Turn ON the dip switch when use the below functions.

Setting Before Shipment

Setting Item	Pin No.
Except No.1 Comp. Operation	1
Except No.2 Comp. Operation	2
Refrigerant Amount Judgement	4
High Static Pressure Mode ※	5

※ IMPORTANT NOTICE

In case of installing the air outlet duct kit (field-supplied), make sure to turn ON DSW5-No.5.

DSW6 Outdoor Unit No. Setting

Setting is required.

IMPORTANT NOTICE

The outdoor unit is not single, the combination setting is necessary. Be sure to do this setting.

Single Setting (Setting Before Shipment)

Combination Setting

Unit A (No.0 Unit)	Unit B (No.1 Unit)	Unit C (No.2 Unit)
ON	ON	ON

DSW7 Power Supply Setting and Service Setting

208V Unit: Setting is required.

230V, 460V Unit: No setting is required.

208V, 230V Unit: 230V Setting Before Shipment

460V Unit: 460V Setting Before Shipment

Setting Item	Pin No.
Except Hot Gas Defrost Operation	3
Function Setting	4

DSW10 Transmission Setting

Setting is required.

For End Resistance Cancellation

Set DSW10-No.1 correctly in the same H-LINK system. Otherwise, it may cause abnormal transmission.

Setting Before Shipment

End Resistance Cancellation

Figure 7.2 DSW Setting

• High Static Pressure Setting (No.5 pin of DSW5: ON)

Turn ON the No.5 pin of DSW5 for the high static pressure setting.

This setting enables the high static pressure operation up to maximum of 0.24 in.W.G. (60Pa).

NOTES:

- In an instance where there are combined outdoor units, set this function for all the outdoor units.
- While the unit operates in a high static pressure mode, the operation sound value increases by 3dB from the nominal value.

● **Setting for Transmitting**

Setting the outdoor unit Nos., refrigerant system Nos. and end terminal resistance 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)
ON OFF 1 2 3 4	ON OFF 1 2 3 4	ON OFF 1 2 3 4	ON OFF 1 2 3 4

● **Setting of Refrigerant System No.**

In the same refrigerant system, set the same refrigerant system No. for the outdoor unit and the indoor units as shown below.

Setting outdoor unit refrigerant system No. is required only for the main unit.

The sub unit settings are not required.

As for setting indoor unit refrigerant system No., set RSW2 and DSW5 on the indoor unit PCB.

	Setting Switch	
	10 digit	1 digit
	ON OFF 1 2 3 4 5 6	Setting Position Set by inserting slotted screwdriver into the groove.
Outdoor Unit	DSW1	RSW1
Indoor Unit (H-LINK II)	DSW5	RSW2

Example: If Setting Refrigerant System No. 25



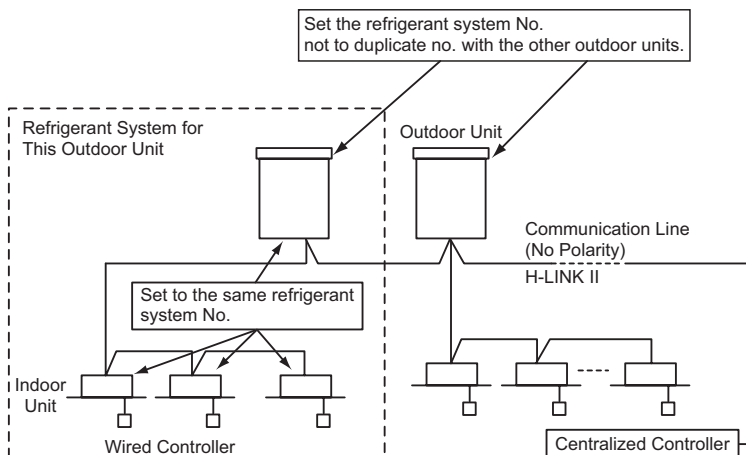
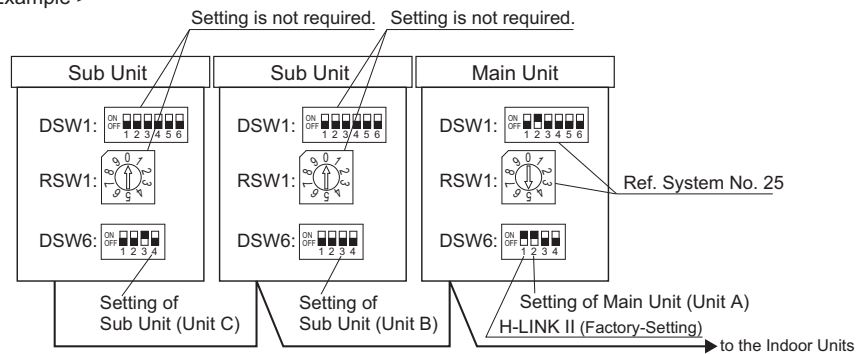
Turn ON No. 2 pin.



Set Dial No.5.

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

< Setting Example >



Maximum Number of Connectable Outdoor Units and Indoor Units (for H-LINK II)

Outdoor Unit	64
Indoor Unit	160

NOTE:

For installing the outdoor unit and the indoor unit on the same communication cable, which cannot be used for H-LINK II, maximum number of connectable indoor units is 128.

INSTALLATION

• DSW7 Setting for Rated Voltage

DSW7 is used for setting of rated voltage for the outdoor unit as shown at right.

When the site power source voltage is different from factory setting, a DSW7 setting is required.

NOTE:

The same voltage setting is required to the main unit and sub unit(s).

Voltage	DSW7 Setting
208V	ON OFF <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> 1 2 3 4
230V	ON OFF <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 1 2 3 4
460V	ON OFF <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> 1 2 3 4

• Setting of End Terminal Resistance

Before shipment, No.1 pin of DSW10 (for the setting of end terminal resistance) is in the "ON" position.

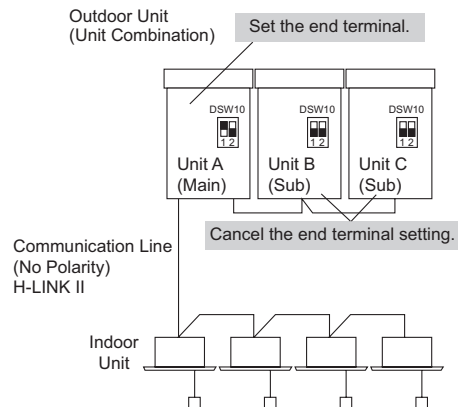
In the case of one refrigerant system in the same H-LINK II, set all No.1 pin of DSW10 in the "OFF" position except the main outdoor unit A.

Setting of End Terminal Resistance

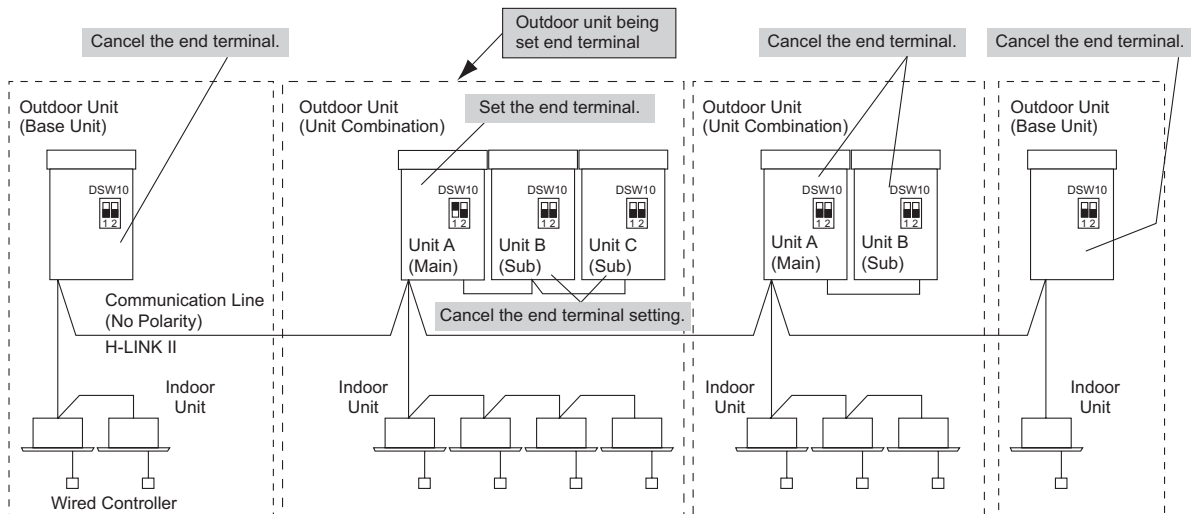
DSW10

Before Shipment	Cancellation
ON OFF <input checked="" type="checkbox"/> <input type="checkbox"/> 1 2	ON OFF <input checked="" type="checkbox"/> <input type="checkbox"/> 1 2

In a situation of one refrigerant system in the same H-LINK II, set all No.1 pin of DSW10 in the "OFF" position except the main outdoor unit A.




If more than one refrigerant system is in the same H-LINK II, set all No.1 pin of DSW10 to the "OFF" position except the main outdoor unit A.



• Automatic Simple Judgment System for Refrigerant Amount (No.4 pin of DSW5)

This function is NOT available for this outdoor unit.

If No.4 pin of DSW5 is turned ON, 7-segment display flashes "  ", which means forced termination of this function.

• Function Setting

External Input/Output and Function Setting

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

[External Input/Output Setting]

■ Start of Setting

Turn ON DSW4-No.4.
Turn ON DSW4-No.6.

External Input/Output Setting Mode
"iO S f"

For the setting mode, refer to ① below.

■ Exit Setting Mode

Turn OFF DSW4-No.6 during indicated
External Input/Output Setting Mode.
Turn OFF DSW4-No.4.

After setting, confirm DSW4 setting is same as setting before shipment,
and DSW7 setting is correct.

[Function Setting]

■ Start of Setting

Turn ON DSW4-No.4.
Turn ON DSW7-No.4.

Function Setting Mode
"F u n c"

For the setting mode, refer to ② below.

■ Exit Setting Mode

Turn OFF DSW7-No.4 during indicated
Function Setting Mode.
Turn OFF DSW4-No.4.

Details of Checking Mode should be
according to the exhibit of
"Checking Method by 7-Segment Display"
attached to the back side of the service cover.

NOTE:
Release "Menu Mode" after
the setting is completed.
Otherwise, the air conditioner
may not operate appropriately.

② [Function Setting]

By pressing the push-switches PSW3 (▶) and PSW5 (◀),
the setting can be changed.
PSW4 (▼): forward, PSW2 (▲): backward
Refer to the Service Manual for more details.

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

< Example >

1

① [External Input/Output Setting]

By pressing the push-switches PSW3 (▶) and PSW5 (◀),
the function No. can be selected.
PSW4 (▼): forward, PSW2 (▲): backward

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

< Example >

1

Item	SEG2	SEG1	SET
1 Input Setting 1 CN17 [1-2 pin]	1	1	
2 Input Setting 2 CN17 [2-3 pin]	2	2	
3 Input Setting 3 CN18 [1-2 pin]	3	3	
4 Output Setting 1 CN16 [1-2 pin]	0	1	
5 Output Setting 2 CN16 [1-3 pin]	0	2	

(Setting Before Shipment)

Before shipping, the input/output function settings are specified to each
input/output terminal according to above table. The details of
function No. and external input/output settings are as shown below.

Setting of External Input/Output Function

Function No.	Input	Output
1	Fixing Heating Operation Mode	Operation Signal
2	Fixing Cooling Operation Mode	Alarm Signal
3	Demand Stoppage	Compressor ON Signal
4	Outdoor Fan Motor Start/Stop	Defrost Signal
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	No Setting

The same input/output function setting cannot be set to different
input/output terminals.
If set, a setting of larger function number becomes invalid.

Example: When setting of input 1 and input 2 are same, input 2 will be invalid.

Item	SEG2	SEG1	SET
1 Circulator Function at Heating Thermo-OFF	F A	0	
2 Night-Shift (Low Noise)	n 1	0	
3 Cancellation of Outdoor Ambient Temperature Limit	O S	0	
4 Not Prepared	J o	0	
5 SLo (Fan Speed) Defrost Setting	b u	0	
6 Cancellation of Hot Start	H r	0	
7 Priority Capacity Mode	n U	0	
8 Compressor Frequency Control Target Value for Cooling	H c	0	
9 Compressor Frequency Control Target Value for Heating	H h	0	
10 Indoor Expansion Valve Control Target Value for Cooling	S c	0	
11 Indoor Expansion Valve Control Target Value for Heating	S h	0	
12 Indoor Expansion Valve Opening during Heating Operation Stoppage	S i	0	
13 Indoor Expansion Valve Opening during Heating Thermo-OFF	S o	0	
14 Indoor Expansion Valve Initial Opening during Heating Thermo-ON	c i	0	
15 Indoor Expansion Valve Initial Opening for Cooling	c b	0	
16 Outdoor Expansion Valve Initial Opening for Heating	c h	0	
17 Sound Reduced Function	d b	0	
18 Demand Function Setting	d E	0	
19 Wave Function Setting	U E	0	
20 Protection of Decrease in Outlet Temperature for Cooling	F b	0	
21 Outlet Temperature Control (DOAS)	F r	0	
22 Adjustment of Fan Rotation (for multiple installation)	F o	0	
23 Not Prepared	L r	0	
24 Thermo-OFF Setting for Outdoor Unit After Defrosting Operation	d S	0	
25 Energy Saving Mode	F i	0	
26 Crankcase Heater Control during Stoppage	F 2	0	
27 Changing Time for Indoor Fan Hot Start	F 3	0	
28 Intermittent Operation of Outdoor Fan Motor	F 4	0	
29 Indoor Expansion Valve Control Target Value for Cooling (Only for 4-Way Cassette Type)	F 5	0	
30 Indoor Expansion Valve Opening Limit during Heating SW-OFF	F 6	0	
31 Invalid Capacity Control by Compressor for Cooling	F 7	0	
32 Forced Defrosting after Enforced Stoppage during Defrosting Cycle	F 8	0	
33 Changing Application Range for Hot Gas Defrost Operation	F 9	0	
34 Changing Available Operating Range for Demand Control	F C	0	
35 Changing Unit	F d	0	

8. Additional Refrigerant Charge

8.1 Airtight Test

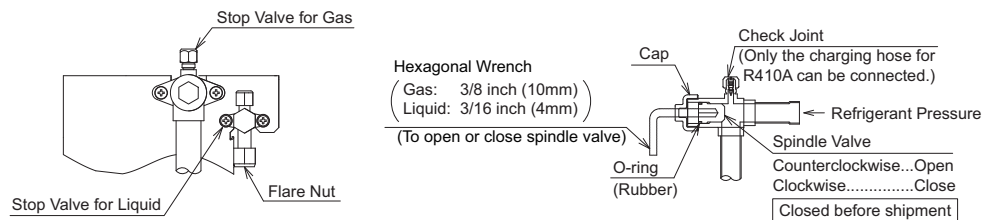
- (1) Check to ensure that spindles of the stop valves for gas and liquid pipes are closed completely before airtight test.
- (2) The refrigerant used for this outdoor unit is R410A. Use the manifold gauge and the charging hose for exclusive use of R410A.

< Tightening Check of Stop Valves >

After connecting the pipe, remove the caps of stop valves for gas and liquid. Tighten the open-close spindle in the closing direction according to the following tightening torque.

• Caution for Operation of Stop Valves

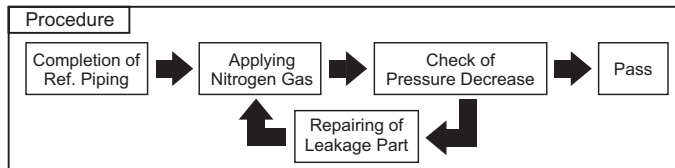
- (a) Remove the stop valve caps before performing the airtight test after connecting the refrigerant piping. Tighten the spindle (valve) in clockwise direction.
- (b) Perform the work after warming the spindle with a hair dryer etc. when controlling the stop valve in a cold area. (The spindle O-ring will harden at low temperature, causing the O-ring material to contract by volume, and refrigerant leakage can occur.)
- (c) Do not apply excessive force after fully opening the spindle (Tightening Torque: < 3.7 ft·lbs (5.0 N·m)). (A back seat (hard stop), is not provided, allowing complete removal of the valve stem.)
- (d) Tighten caps securely according to the following torque specifications after each spindle valve is opened.



ft·lbs (N·m)						
Spindle (Valve)		Flare Nut	Cap		Check Joint	
Gas Valve	Liquid Valve	Liquid Valve	Gas Valve	Liquid Valve	Gas Valve	Liquid Valve
18 (25)	5 (7)	26 (35)	31 - 35 (42 - 47)	19 (25)	6 - 7 (8 - 10)	8 (11)

< Airtight Test Method >

- (1) Connect the manifold gauge to the check joints of the liquid line and the gas line stop valves using charging hoses with a vacuum pump or a nitrogen cylinder.
Perform the airtight test.
Do not open the stop valves. Apply nitrogen gas pressure of 601 psi (4.15MPa).
For checking gas leakage, use the leak detector or forming agent. If there is any leakage, fix the leaking part.
- (2) For checking gas leakage, do not use a forming agent which generates ammonia.
Additionally, do NOT use any household detergent as forming agent with potentially unknown or harmful ingredients.
The recommended forming agent to detect leaking refrigerant gas is shown below.



Recommended Forming Agent	Manufacturer
Güproflex	Yokogawa & CO.,Ltd

NOTE:

Nitrogen Gas should be sufficiently charged for each check joints (gas line side, and for liquid line side).
If not performed in this manner, the expansion valve for the outdoor unit, or indoor unit can close up, making any airtight test impossible.

! WARNING

Be sure to use nitrogen gas for the airtight test. If other gases such as oxygen gas, acetylene gas or fluorocarbon gas are accidentally used, it may cause an explosion or gas asphyxiation.

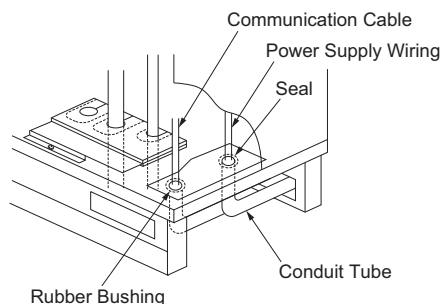
< Insulation Work >

- (1) Securely insulate the gas piping side and liquid piping side individually.
Make sure to insulate the union flare nut for the piping connection as well.
- (2) Seal the gap between the bottom base or front piping cover and pipes with the insulation.

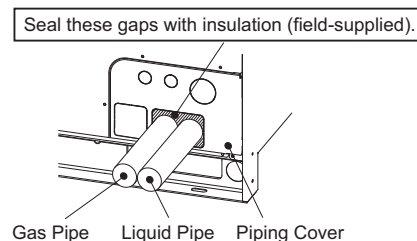
NOTICE:

If the gap is not sealed, damage can occur from rain, snow, animals, or insects that can gain entry.

● For Wiring from Bottom Base



● For Piping from Front Piping Cover



8.2 Vacuuming

- (1) Connect a manifold gauge and vacuum pump to the check joints (Gas Stop Valve and Liquid Stop Valve).
- (2) Continue vacuum pumping work until the pressure reaches -14.5 psi (-0.1MPa, -756mmHg) or lower for one to two hours.
Once the desired vacuum pressure has been reached, turn OFF the pump and leave the gauge for one hour. Verify that the pressure inside the manifold gauge has not increased.
- (3) Tighten the caps on the check joint according to torque specs (as indicated in Section 8.1-(2)-(d), after vacuum pumping work is complete.
- (4) If the pressure inside the gauge does not reach -14.5 psi (-0.1MPa, -756mmHg), a gas leak is suspected.
- (5) Inspect for any gas leakage once again. If no leakage exists, resume vacuum pumping for another one to two hours. If moisture remains inside the piping, the compressor may be damaged.

NOTICE

1. Use tools or measuring instruments exclusively devised for use with R410A.
2. DO NOT perform vacuum pumping work with the valves of the outdoor units open. Otherwise, refrigerant charged before shipment can leak out and the operation can result in failure.

8.3 Charging Work

- (1) An additional refrigerant charge is required according to total piping length. Refer to Table 8.1.
- (2) After vacuum pumping work, check that the gas valve, and liquid stop valve are fully closed. Charge the additional refrigerant from the check joint of liquid stop valve (acceptable error must be within 1.1 lbs (0.5 kg)).
- (3) After refrigerant has been charged, fully open the liquid stop valve and gas stop valves.

NOTE:

Gas remaining at the O-ring or screw component may emit a hissing sound when removing the spindle cap. However, this is not leaking gas.

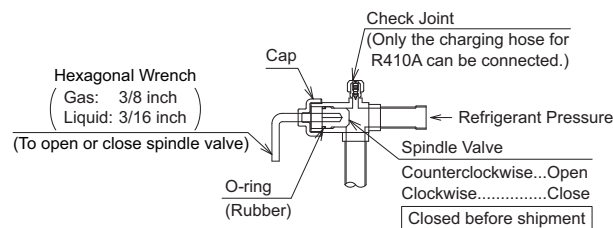
- (4) If it proves impossible to dispense the specified (charged) quantity of refrigerant, follow the procedure below.
 - (a) Fully open the stop valve at the gas line side.

NOTICE

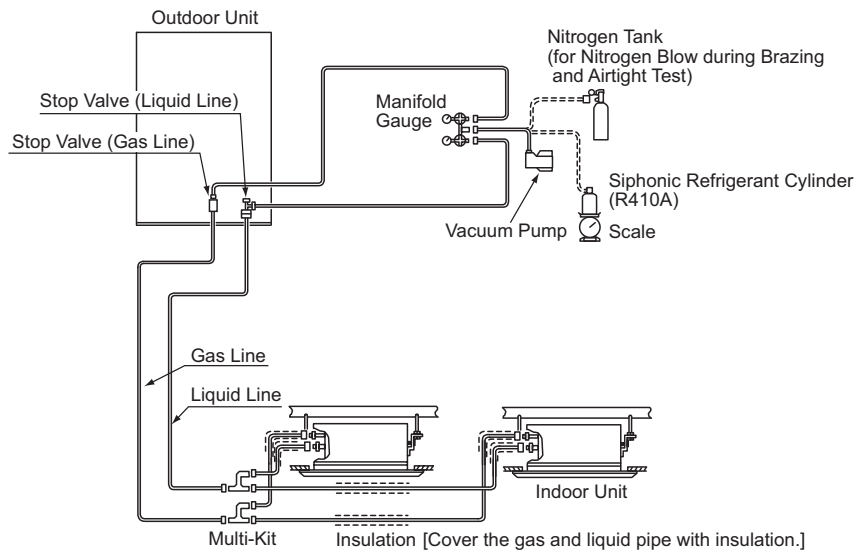
Do not apply excessive force to the spindle valve after fully opening the spindle. Otherwise, the spindle valve will blow out due to refrigerant pressure. At the test run, fully open the spindle valve. Otherwise, these devices will be damaged. (It is closed before shipment.)

< Caution for Opening Stop Valve >

1. Do not apply an excessive force after fully opening the spindle (Tightening Torque: < 3.7 ft·lbs (5.0 N·m)). (This valve does not have a hard stop when opening, and allows for the complete removal of the valve stem.)
2. Securely tighten the caps according to the torque specs (Section 8.1-(2)-(d) after each spindle valve is opened.



- (b) Operate the compressor in the cooling mode and charge the additional refrigerant from the check joint of the liquid stop valve. An acceptable error must fall within 1.1 lbs (0.5 kg). At this time, keep the liquid stop valve slightly open.
- (c) After the refrigerant is charged, fully open the liquid stop valve and the gas stop valve.
- (d) Carefully calculate any additional refrigerant quantity for charging. If the quantity of additional refrigerant is not correct, it might cause a compressor failure. The additional refrigerant must be charged in a liquid condition.
- (e) Refrigerant charge from the check joint on the gas stop valve can lead to compressor failure. Be sure to charge refrigerant from the check joint on the liquid stop valve.



Charge the correct refrigerant quantity according to Table 8.1. If not, a compressor may be damaged due to an excess or insufficient refrigerant charge.

Refrigerant charge from check joint of gas stop valve may lead to compressor failure. Be sure to charge refrigerant from the check joint of liquid stop valve.

Insulate the liquid piping and gas piping completely to avoid decreasing of performance and dewing on the surface of the pipe.

Insulate the flare nut and union of the piping connection with insulation.

Check to ensure that there is no gas leakage. If a large refrigerant leakage occurs, it will cause difficulty with breathing or harmful gases would occur if a fire was being used in the room.

8.4 Additional Refrigerant Charge Calculation

Table 8.1 Additional Refrigerant Charge Calculation

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

Determine what additional quantity of refrigerant according to the following procedures, and charge it into the system. Record the additional refrigerant quantity to facilitate maintenance and servicing activities thereafter.

(1) Calculating Method of Additional Refrigerant Charge (WT lbs)

No.	Symbol	Contents	Additional Charge																																														
1	W1	<div>① Additional Refrigerant Charge Calculation for Liquid Piping (W1 lbs)</div> <table><tr><th>Pipe Diameter inch (mm)</th><th>Total Piping Length (ft)</th><th>Refrigerant Amount for 1 ft Pipe</th><th>Additional Charge (lbs)</th></tr><tr><td>7/8 (22.2)</td><td></td><td>× 0.24 =</td><td></td></tr><tr><td>3/4 (19.05)</td><td></td><td>× 0.17 =</td><td></td></tr><tr><td>5/8 (15.88)</td><td></td><td>× 0.11 =</td><td></td></tr><tr><td>1/2 (12.7)</td><td></td><td>× 0.074 =</td><td></td></tr><tr><td>3/8 (9.52)</td><td></td><td>× 0.038 =</td><td></td></tr><tr><td>1/4 (6.35)</td><td></td><td>× 0.016 =</td><td></td></tr><tr><td colspan="4">Total Additional Charge For Liquid Piping =</td></tr></table> <div>② Minimum Additional Refrigerant Charge for Liquid Piping (lbs)</div> <table><tr><th>Outdoor Unit Type (x 1,000 Btu/h)</th><th>72</th><th>96</th><th>144</th><th>168</th><th>192</th><th>288</th></tr><tr><td>Minimum Additional Refrigerant Charge</td><td>4.4</td><td>4.4</td><td>8.8</td><td>8.8</td><td>8.8</td><td>13.2</td></tr></table> <div>In case the calculated quantity (①) is less than the minimum quantity (②) then add ② as the additional refrigerant charge quantity for liquid piping (W1).</div>	Pipe Diameter inch (mm)	Total Piping Length (ft)	Refrigerant Amount for 1 ft Pipe	Additional Charge (lbs)	7/8 (22.2)		× 0.24 =		3/4 (19.05)		× 0.17 =		5/8 (15.88)		× 0.11 =		1/2 (12.7)		× 0.074 =		3/8 (9.52)		× 0.038 =		1/4 (6.35)		× 0.016 =		Total Additional Charge For Liquid Piping =				Outdoor Unit Type (x 1,000 Btu/h)	72	96	144	168	192	288	Minimum Additional Refrigerant Charge	4.4	4.4	8.8	8.8	8.8	13.2	lbs
Pipe Diameter inch (mm)	Total Piping Length (ft)	Refrigerant Amount for 1 ft Pipe	Additional Charge (lbs)																																														
7/8 (22.2)		× 0.24 =																																															
3/4 (19.05)		× 0.17 =																																															
5/8 (15.88)		× 0.11 =																																															
1/2 (12.7)		× 0.074 =																																															
3/8 (9.52)		× 0.038 =																																															
1/4 (6.35)		× 0.016 =																																															
Total Additional Charge For Liquid Piping =																																																	
Outdoor Unit Type (x 1,000 Btu/h)	72	96	144	168	192	288																																											
Minimum Additional Refrigerant Charge	4.4	4.4	8.8	8.8	8.8	13.2																																											
2	W2	<div>Depending on connection of indoor unit type, additional refrigerant charge is required. Select adequate refrigerant amount from the table below.</div> <div>Additional Refrigerant Charge for Each Indoor Unit Connected (W2 lbs)</div> <table><tr><th>Capacity (x 1,000 Btu/h)</th><th>6</th><th>8</th><th>12</th><th>15</th><th>18</th><th>24</th><th>30</th><th>36</th><th>48</th></tr><tr><td>Indoor Unit Type (H,Y)IDM***B21S</td><td>0</td><td>0</td><td>0.26</td><td colspan="2">0.35</td><td>0.55</td><td>0.66</td><td>1.1</td><td>0</td></tr><tr><td>(H,Y)IC4***B21S</td><td>-</td><td>-</td><td colspan="3">0.55</td><td colspan="2">1.1</td><td colspan="2">-</td></tr></table> <div>NOTE: Maximum additional refrigerant charge must not exceed 4.4 lbs.</div>	Capacity (x 1,000 Btu/h)	6	8	12	15	18	24	30	36	48	Indoor Unit Type (H,Y)IDM***B21S	0	0	0.26	0.35		0.55	0.66	1.1	0	(H,Y)IC4***B21S	-	-	0.55			1.1		-		lbs																
Capacity (x 1,000 Btu/h)	6	8	12	15	18	24	30	36	48																																								
Indoor Unit Type (H,Y)IDM***B21S	0	0	0.26	0.35		0.55	0.66	1.1	0																																								
(H,Y)IC4***B21S	-	-	0.55			1.1		-																																									
3	W3	<div>Calculation Method for Additional Refrigerant Charge (W3 lbs)</div> <div>If the capacity of combined Indoor Unit is larger than 072 MBH, the additional refrigerant charge must be 2.2 lbs/unit.</div> <div><div></div> × 2.2 lbs/unit = <div></div></div>	lbs																																														
4	W4	<div>The Ratio of Indoor Unit Connection Capacity (Indoor Unit Total Capacity/Outdoor Unit Capacity) Additional Charge (W4 lbs)</div> <div>Determine the ratio of indoor unit connection capacity.</div> <table><tr><th>Condition</th><th>Refrigerant Amount</th></tr><tr><td>I.U. Capacity Ratio is less than 100%</td><td>0.0 lbs</td></tr><tr><td>I.U. Capacity Ratio is 100% or more</td><td>1.1 lbs</td></tr></table>	Condition	Refrigerant Amount	I.U. Capacity Ratio is less than 100%	0.0 lbs	I.U. Capacity Ratio is 100% or more	1.1 lbs	lbs																																								
Condition	Refrigerant Amount																																																
I.U. Capacity Ratio is less than 100%	0.0 lbs																																																
I.U. Capacity Ratio is 100% or more	1.1 lbs																																																
5	WT	<div>Calculation of Additional Charge (WT lbs) = W1 + W2 + W3 + W4 =</div> <div>NOTE: When the total capacity of the following indoor unit connected is 50% or more of the outdoor unit capacity, then add 1.2 times of the above total additional refrigerant charge (WT).</div> <div>● 4-Way Cassette Type: (H,Y)IC4***B21S</div> <div>● 1-Way Cassette Type: (H,Y)IC1***B21S</div> <div>● Wall Mount Type: TIWM***B21S</div>	lbs																																														

NOTE:

Ensure that the total additional charge WT does not exceed the maximum additional refrigerant charge quantity as shown in the table on the following page.

< Max. Additional Refrigerant Charge Quantity Allowed >

Outdoor Unit Capacity (x 1,000 Btu/h)	72, 96	144 - 192	288
Max. Additional Ref. Charge Quantity (lbs)	61.7	112.5	138.9

< Initial Ref. Charge Amount of O.U. (Before Shipment) (W0 lbs) >

Outdoor Unit Capacity (x 1,000 Btu/h)	72, 96
W0 Outdoor Unit Ref. Charge (lbs)	17.0

NOTE:

W0 is the outdoor unit refrigerant charge prior to shipment.

If there is a combination of base units, calculate the total refrigerant charge prior to shipment of those combined outdoor units.

(2) Record of Additional Charge

Total refrigerant charge of this system is calculated in the following formula.

$$\text{Total Ref. Charge} = \text{WT lbs} + \text{W0 lbs} = \boxed{} \text{ lbs}$$

NOTE:

When refrigerant is recovered or charged due to repairs, operating, or adjusting the unit, record the refrigerant quantity again.

NOTICE

1. Emissions of the fluorocarbons without any reason are prohibited.
2. For disposal and maintenance of this product, recovery of fluorocarbons is required.

8.5 Automatic Simple Judgment System for Refrigerant Amount

NOTE

1. This function is applicable when outdoor air temperature is 32 to 109°F DB (0 to 43°C DB) and indoor air temperature is 50 to 90°F DB (10 to 32°C DB).
2. An operation check or condition check shall be performed by checking the PCB1 for the outdoor unit. During the checking, do not remove the front cover. Otherwise, the checking will not be conducted normally due to pressure increase. For combination outdoor unit, the inspection shall be conducted at Unit A. Service covers for Unit B, or C must be closed.

- (1) Refrigerant quantity check operation can be performed using the automatic judgment function after completing refrigerant charging, but depending on the installation and conditions, the result may be judged as excessive refrigerant, insufficient refrigerant, or abnormal termination. Therefore, charge with the refrigerant amount calculated in the previous section regardless of this automatic judgment function result.

< Procedure of Refrigerant Quantity Check Operation >

- Reassemble all cover except for the electrical control box cover and service cover of Unit A.
- Turn ON the power supply of indoor unit and outdoor unit in the refrigerant system to perform the refrigerant quantity check operation. (Apply power to the outdoor unit(s) at least 12 hours prior to operation of the system for preheating of the compressor oil.)
- Turn ON the No.4 pin of DSW5 (PCB1).
The 7-segment display will be indicated as follows.

FC CH

- Check the 7-segment display and press PSW1. The outdoor fan and compressor will be in standby mode and the 7-segment display will indicate as follows: (Maximum five minutes)

Ch. 01

The outdoor fan and compressor will activate and the 7-segment display will indicate as follows:

Ch. 02

- (2) Judgment takes 30 to 40 minutes. Refer to the table below for results.
When the judgment result is excessive refrigerant, insufficient refrigerant, or abnormal termination, find out the cause of irregularity and perform the refrigerant quantity check again.

< Judgment Result Indication >

7-segment Indication	Result	Remarks
End	Sufficient Refrigerant	The refrigerant quantity is sufficient. * Turn No.4 pin of DSW5 OFF and perform Test Run.
Ch. Hi	Excessive Refrigerant	The refrigerant quantity is excessive. * Calculate the additional refrigerant quantity according to the piping length. Collect the excess refrigerant and charge with the correct amount of refrigerant.
Ch. Lo	Insufficient Refrigerant	The refrigerant quantity is insufficient. * Check if the additional refrigerant has been charged. * Calculate the additional refrigerant quantity according to the piping length and charge the refrigerant. <u>NOTE:</u> If the deficit reading still does not disappear, charge the additional refrigerant . In that case, standard additional refrigerant quantity is 1.1 lb (0.5kg) per one time.
Ch.	Abnormal Termination	Find out the cause of abnormal termination as shown below. After resolving the cause of abnormal termination, restart the check refrigerant quantity operation. (1) Was the No.4 pin of DSW5 ON before the power supply was turned ON? (2) Are all indoor units ready and waiting, before the No.4 pin of DSW5 is turned ON? (3) Was the outdoor ambient air temperature within the acceptable range (32 to 109°F DB (0 to 43°C DB)? (In some cases, when the connected indoor unit number exceeds the recommended number and the outdoor ambient air temperature exceeds 95°F DB (35°C DB), this check refrigerant quantity operation cannot be performed.) (4) Is the indoor ambient air temperature within the acceptable range (50 to 90°F DB (10 to 32°C DB)? (5) Is the total indoor units operation capacity ratio 30% (indoor units capacity ratio), or less? Especially, if the indoor ambient air temperature is 15% or less, the total indoor unit operation capacity will be 30% (indoor units capacity ratio) or less and if this is the case, sometimes this refrigerant quantity check cannot be performed. (6) Is switch No.4 pin of DSW4 (compressor-forced stoppage) OFF?

- (3) Turn OFF the No.4 pin of DSW5 when the refrigerant quantity becomes sufficient.
Wait for at least three minutes after turning OFF the No.4 pin of DSW5 OFF and then the outdoor unit is ready to run.

NOTE:

During the check of refrigerant quantity operation, the 7-segment display may change over to display the protection control code by the activation of protection control. However, this is normal. As for the protection control code, refer to the spec sheet attached to the inside of the outdoor unit service cover.

• Special Attention Regarding Refrigerant Gas Leakage

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

$$\frac{\text{Totally Charged Refrigerant Quantity in System (lbs)}}{\text{Room Space for each Indoor Unit (ft}^3\text{)}} \leq \text{Critical Concentration (lbs/ft}^3\text{)}$$

\uparrow

0.019 lbs/ft³ (0.3 kg/m³) *

* In case of KHK S 0010, this value should be decided according to each country's regulation.

If the calculated critical concentration is higher than 0.019 lbs/ft³ (0.3kg/m³), take the following actions:

- 1) Provide a gas leakage detector and exhaust fan(s) controlled by its gas leakage detector.
- 2) Provide each effective opening at the wall or door for ventilation to next door so that the critical gas concentration can be maintained lower than the above value.
(Provide an opening of more than 0.15% of the floor surface at the lower part of a door.)

! CAUTION

1. Maximum Permissible Concentration of HFC GAS R410A

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

However, if leakage occurs and gas fills a room, it may cause suffocation. The maximum permissible concentration of HFC gas, R410A in air is 0.019 lbs/ft³ (0.3 kg/m³), according to the refrigeration and air conditioning facility standard (KHK S 0010) by the KHK (High Pressure Gas Protection Association) Japan. Therefore, some effective measure must be taken to lower the R410A concentration in air below 0.019 lbs/ft³ (0.3 kg/m³), in case of leakage.

As for R410A, this consideration is applied similarly.

2. Calculation of Refrigerant Concentration

- (1) Calculate the total quantity of refrigerant R (lbs) charged into the system connecting all the indoor units, rooms.
- (2) Calculate the room space where this unit is to be installed V (ft³) of each room.
- (3) Calculate the refrigerant concentration C (lbs/ft³) of the room according to the following equation.

$$\frac{\text{R: Total Quantity of Charged Refrigerant (lbs)}}{\text{V: Room Space Where This Unit Is to Be Installed (ft}^3\text{)}} = \text{C: Refrigerant Concentration} \leq 0.019 \text{ lbs/ft}^3 \text{ (0.3 kg/m}^3\text{)} *$$

If local codes or regulations are specified, follow them.

9. Test Run

Test Run should be performed in accordance with Section 9.2. Use Table 9.1 for recording the Test Run.

WARNING

An electrical shock will occur if there is residual voltage.

Turn OFF power at the power source completely before attempting any electrical maintenance work.

Verify that no residual voltage exists after turning OFF the power at the power source.

NOTICE

Do not activate the system until all issues have been examined and cleared.

Test Run of indoor unit: refer to the installation and maintenance manual which is attached to the indoor unit.

9.1 Before Test Run

- (1) Check to ensure that the refrigerant piping and communication lines between indoor and outdoor units are connected into the same refrigerant system. If not, the result will be abnormal operation with a potentially serious accident.
Verify that all DIP switch settings for the refrigerant system numbers: (DSW1 and RSW1 [O.U.], DSW5 and RSW2 [I.U.]) and the unit number (RSW) for indoor units are applicable to the system.
Confirm that all DIP switch settings on the printed circuit board for indoor and outdoor units are correct. Pay special attention to the setting for outdoor unit number, the refrigerant system number, and end terminal resistance. Refer to Section 7; "Electrical Wiring".
- (2) Verify that electrical resistance is more than 1 megaohm, by measuring the resistance between ground and the terminal for electrical components. If the electrical resistance is less than 1 megohm, do not operate the system until the source of electrical current outflow is found and fixed; (Refer to "Caution for Insulation Resistance" for details.)
Do not impress the voltage on the terminals for communication lines; (Outdoor Unit: TB2 1, 2, 3, 4 / Indoor Unit: TB2 A, B, 1, 2). Otherwise, failure can result.
- (3) Verify that each wire, L1, L2, and L3, is correctly connected at the power source.
If any one of those is incorrectly connected, the unit will not operate and the wired controller will display the alarm code "05". In this case, check and change the phase of the power source according to the spec sheet attached to the reverse back surface of the service cover.
- (4) Apply power to outdoor unit(s) at least 12 hours prior to operation of the system to allow for adequate pre-heating of the compressor oil.
The outdoor unit does not operate for at most four hours after power supply (Stoppage Code d1-22). If operation resumes within four hours, release the protection control as follows:
 1. Supply power to the outdoor unit.
 2. Wait for 30 seconds.
 3. Push PSW5 on the outdoor PCB for more than three seconds in order to release the d1-22.
 If using a wired controller for release:
 - * Press and hold "Menu" and "Back/Help" simultaneously for at least 3 seconds. The test run menu will be displayed.
 - * Press "△" or "▽" to select "Cancel Preheating Control". Press "OK" and cancel the pre-heating control.

NOTE:
As for other controllers, refer to the "Installation and Maintenance Manual" attached to each controller.
- (5) Be sure to close the service cover at the front lower side when the test run is performed.

⚠ CAUTION**Caution for Insulation Resistance**

If the total unit insulation resistance is lower than one megaohm, the compressor insulation resistance may be lower, due to refrigerant being retained in the compressor. This can occur if the unit has not been used over prolonged periods of time.

1. Disconnect the cables to the compressor and measure the insulation resistance of the compressor itself. If the resistance value is over one megaohm, then an insulation failure has occurred in other electrical parts.
2. If the insulation resistance is less than one megaohm, reconnect the compressor cables from the inverter PCB. Then, turn on the main power to apply current to the crankcase heater.
After applying current for more than three hours, measure insulation resistance again. (Depending on the air conditions, length of piping, or refrigerant conditions, it may be necessary to apply the current for a longer period of time.)

If the GFCI (Ground Fault Circuit Interrupter) is activated, check the recommended size shown in Table 7.1.

NOTICE

Confirm that field-supplied electrical components (main switch fuse, fuse-free breaker, Ground Fault Circuit Interrupters (GFCI's) breakers, wires, conduit connectors and wire terminals) have been properly selected according to the electrical data shown in Table 7.1, and ensure that these components comply with national and local electrical codes.

9.2 Test Run

This test run method is for the wired controller. As for other controllers, refer to the “Installation and Maintenance Manual” attached to each controller.

- (1) Check to ensure that stop valves for gas and liquid of the outdoor unit are fully opened.
(In the case of combined outdoor units, check to ensure that all stop valves of the outdoor units are fully opened.)
- (2) Perform the test run of indoor units one by one sequentially, and then check the accordance of the refrigerant piping system and the electrical wiring system. (If the multiple indoor units are operated simultaneously, the system accordance cannot be inspected.)
- (3) Perform the test run according to the following procedure. Ensure that the unit operates without any problem.

NOTE:

In the case that two controllers (main and sub) are installed to the system, perform the test run from the main controller.

< Test Run by Wired Controller >

- (a) Press and hold “Menu” and “Back/Help” simultaneously for at least 3 seconds. The test run menu will be displayed.
- (b) Select “Test Run” by pressing “ $\Delta \nabla$ ” and press “OK”.
The test run screen will be displayed.

- The total number of indoor units connected are displayed on the Liquid Crystal Display (LCD). A twin combination (one set with two indoor units) is identified as “2 units”, and a triple combination (of one set with three indoor units) is identified as “3 units”.

NOTE:

When a “00 unit” is identified, the auto-address function may be activated. Cancel “Test Run” mode and reset it.

- 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 electronic noise (EMI). Turn OFF the power supply, and correct the wiring after checking the following areas: (Do not repeat turning ON and OFF within 10 seconds.)

* The power supply for the indoor unit is NOT turned ON or there is incorrect wiring.

* A loose connection between indoor units or the wired controller.

* Incorrect Setting of Indoor Unit Address (The indoor unit address is overlapped.)

- (c) Start the Test Run.

- Press “ ⏻ On/Off”. The Test Run operation will start. The operation mode, the airflow volume, the airflow direction and the Test Run time can be set on the Test Run screen. Select the item by pressing “ $\Delta \nabla$ ” and set the detail by pressing “ $\triangleleft \triangleright$ ”.
The default setting for the Test Run time is a two-hour OFF timer.
- Check the temperature conditions.
Unit operation cannot be performed if the conditions are out of range.
Refer to the table below for a working range.

< Example >

The cooling operation is not performed if the outdoor temperature is below 14°F DB (-10°C DB).

		Cooling Operation	Heating Operation
Indoor Temperature	Minimum	69°F DB/59°F WB (21°C DB/15°C WB)	59°F DB (15°C DB)
	Maximum	89°F DB/73°F WB (32°C DB/23°C WB)	80°F DB (27°C DB)
Outdoor Temperature	Minimum	14°F DB (-10°C DB) *	-13°F WB (-25°C WB) *
	Maximum	118°F DB (48°C DB) *	59°F WB (15°C WB) *

DB: Dry Bulb, WB: Wet Bulb

*: Refer to “Page i” for details.



Test Run Screen

Test Run Setting: 2 units

MODE : ◀ COOL ▶

SPEED : AUTO

◀ Sel. Adj. ⏻ ON Back Rtn

- (d) Press “△” or “▽”, select “LOUV.” and select “” (auto swing) by pressing “◀” or “▶”.
The auto-swing operation will start. Check the operating sound at the louvers.
If an abnormal sound emanates from the louvers, it may be caused by a deformation in the decorative panel due to incorrect installation. In this case, carefully reinstall the decorative panel without further damage. If no weird sounds are generated, press “◀” or “▶” again to halt the auto-swing operation.
- (e) Though the temperature detections by the thermistors are invalid, the protection devices are valid during the Test Run. If an alarm is triggered, refer to Table 9.2, Alarm Code and perform troubleshooting. Then perform the Test Run again
- (f) According to the label “Checking Method by Seven-Segment Display” attached to the back side of the service cover of the outdoor unit, check the temperature, the pressure and the operation frequency of the specified portions, and check the number of the connected indoor units on 7-segment displays.
- (g) To finish the Test Run, wait two hours (as a default setting) or press “ On/Off” switch again.
- With the operation LED flashing two seconds ON and two seconds OFF, this is an indication that the system is searching for irregularities in communication between indoor units and the wired controller. This could boil down to loose or disconnected wires, components, and incorrect wiring.
 - A small sound may be heard from the outdoor unit after turning ON at the power source because the electrical expansion valve is activated to adjust the opening. Therefore, there is no mechanical fault with the unit.
 - Sound may be emitted from the outdoor unit for a few seconds after running or stopping the compressor, starting or finishing the defrosting, and so on. It generates because of the pressure difference inside the compressor piping. Therefore, there is no problem with the unit.

! WARNING

Do NOT run the air conditioner units to check the electrical wiring until the Test Run preparations have been completed.

< Test Run from Outdoor Unit Side >


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

Setting of DIP Switch (Factory Setting)

The darkened square indicates the position of the DIP switch.

DSW4

Switch for Setting of Service Operation and Function



ON
OFF

1

2

3

4

5

6

1. Test Run
2. COOL/HEAT Setting
(ON: Heating Operation)
3. OFF (Fixed)
4. Manual Compressor OFF
5. OFF (Fixed)
6. OFF (External Input/Output Setting)

! WARNING

- Do not touch any other electrical part when operating switches on the PCB.
- Do not attach or detach a service cover when the power source for the outdoor unit is supplied and the outdoor unit is operated.
- Turn all DIP switches of DSW4 OFF when the test run operation is completed.

INSTALLATION


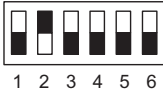

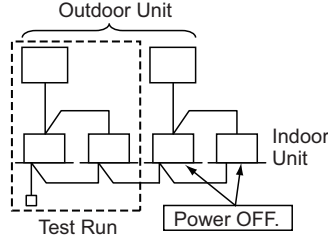


	DIP Switch Setting	Operation	Remarks
Test Run	<p>1. Setting of Operation Mode</p> <p>Cooling: Set No.2 pin of DSW4 OFF.</p>  <p>1 2 3 4 5 6</p> <p>Heating: Set No.2 pin of DSW4 ON.</p>  <p>1 2 3 4 5 6</p> <p>2. Starting Test Run</p> <p>Set No.1 pin of DSW4 ON and the operation is started after a few ~ 20 seconds.</p> <p>Example: Cooling Operation</p>  <p>1 2 3 4 5 6</p> <p>↑ If heating operation leave No.2 pin of DSW4 at ON.</p>	<p>1. The indoor unit automatically starts operating when the test run of the outdoor unit is set.</p> <p>2. The ON/OFF operation can be performed from the wired controller or No.1 pin of DSW4 of the outdoor unit.</p> <p>3. The operation continues for two hours without Thermo-OFF.</p>	<p>* Note that indoor units operate in conjunction with the test run operation for the outdoor unit.</p> <p>* 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 canceled. However, the test run function of the outdoor unit is not canceled. Check to ensure that the No.1 pin of DSW4 of the outdoor unit PCB is turned OFF.</p> <p>* 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 source OFF for the indoor units in other refrigerant systems not selected for the test run operation.</p>  <p>* A setting of DSW4 is not required for the test run from the wired controller.</p>
Manual OFF of Comp.	<p>1. Setting</p> <p>*Compressor Manual OFF: Set No.4 pin of DSW4 ON.</p>  <p>1 2 3 4 5 6</p> <p>2. Canceling</p> <p>*Compressor ON: Set No.4 pin of DSW4 OFF.</p>  <p>1 2 3 4 5 6</p>	<p>1. When No.4 pin of DSW4 is ON during compressor operation, the compressor shuts down immediately and the indoor unit assumes the condition of Thermo-OFF.</p> <p>2. Once No.4 pin of DSW4 is placed back into the off position, the compressor will be enabled for restart following a three minute safety delay.</p>	<p>* Do not repeat compressor ON/OFF frequently.</p>

Table 9.1 Test Run and Maintenance Record

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

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

Inlet:	No. 1	DB	/WB	°F,	No. 2	DB	/WB	°F,	No. 3	DB	/WB	°F,	No. 4	DB	/WB	°F
Outlet:		DB	/WB	°F,		DB	/WB	°F,		DB	/WB	°F,		DB	/WB	°F
Inlet:	No. 5	DB	/WB	°F,	No. 6	DB	/WB	°F,	No. 7	DB	/WB	°F,	No. 8	DB	/WB	°F
Outlet:		DB	/WB	°F,		DB	/WB	°F,		DB	/WB	°F,		DB	/WB	°F
6. Check Outdoor Ambient Temperature

Inlet:	DB	°F,	WB	°F
Outlet:	DB	°F,	WB	°F
7. Check Refrigerant Temperature

Liquid Temperature:	°F
Discharge Gas Temperature:	°F
8. Check Pressure

Discharge Pressure:	Psi
Suction Pressure:	Psi
9. Check Voltage

Rated Voltage:	V						
Operating Voltage:	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">L₁-L₂</td> <td style="width: 33%;">V,</td> <td style="width: 33%;">L₁-L₃</td> <td style="width: 33%;">V,</td> <td style="width: 33%;">L₂-L₃</td> <td style="width: 33%;">V</td> </tr> </table>	L ₁ -L ₂	V,	L ₁ -L ₃	V,	L ₂ -L ₃	V
L ₁ -L ₂	V,	L ₁ -L ₃	V,	L ₂ -L ₃	V		
Starting Voltage:	V						
Phase Imbalance:	$1 - \frac{V}{V_m} =$						
10. Check Compressor Input Running Current

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

Table 9.2 Alarm Code

Code	Category	Content of Abnormality	Leading Cause
01	Indoor Unit	Activation of Protection Device (Float Switch)	Activation of Float Switch (High Water Level in Condensation Drainage Pan, Problem with Drain Piping, Float Switch, or Condensation Drainage Pan)
02	Outdoor Unit	Activation of Protection Device (High Pressure Cut)	Activation of PSH (Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing)
03	Communication	Operational Irregularities between Indoor and Outdoor	Incorrect Wiring, Loose Terminals, Disconnected Wire, Blown Fuse, Outdoor Unit Power OFF
04		Problem between Inverter PCB and Outdoor PCB	Inverter PCB - Outdoor PCB Communication Failure (Loose Connector, Wire Breaking, Blown Fuse)
04.		Problem between Fan Controller and Outdoor PCB	Fan Controller - Outdoor PCB Communication Failure (Loose Connector, Wire Breaking, Blown Fuse)
05	Supply Phase	Problem of Power Source Phases	Incorrect Power Source, Connection to Reversed Phase, Open-Phase
06	Voltage	Abnormal Inverter Voltage	Outdoor Voltage Drop, Insufficient Power Capacity
06.		Abnormal Fan Controller Voltage	Outdoor Voltage Drop, Insufficient Power Capacity
07	Cycle	Decrease in Superheated Discharge Gas	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	Problem between Outdoor and Outdoor	Incorrect Wiring, Broken Wire, Loose Terminals
0b	Outdoor Unit	Incorrect Outdoor Unit Address Setting	Duplication of Address Setting for Outdoor Units (Sub Units) in Same Refrigerant System
0C		Incorrect Outdoor Unit Main Unit Setting	Two (or more) Outdoor Units Set as "Main Unit" Exist in Same Refrigerant System
11	Sensor on Indoor Unit	Inlet Air Thermistor	Incorrect Wiring, Disconnected Wiring Breaking Wire, Short Circuit
12		Outlet Air Thermistor	
13		Freeze Protection Thermistor	
14		Gas Piping Thermistor	
15		Outdoor Air Thermistor (ECONO)	
16		Remote Sensor (DOAS)	
17		Thermistor Built-in Remote Controller (DOAS)	
19	Fan Motor	Activation of Protection Device for Indoor Fan	Fan Motor Overheat, Lockup
21	Sensor on Outdoor Unit	High Pressure Sensor	Incorrect Wiring, Severed or Disconnected Wiring, Short Circuit
22		Outdoor Air Thermistor	
23		Discharge Gas Thermistor on Top of Compressor	
24		Heat Exchanger Liquid Pipe Thermistor	
25		Heat Exchanger Gas Pipe Thermistor	
29		Low Pressure Sensor	

Code	Category	Content of Abnormality	Leading Cause
31	System	Incorrect Capacity Setting of Outdoor Unit and Indoor Unit	Incorrect Capacity Code Setting of Combination Excessive or Insufficient Indoor Unit Total Capacity Code
35		Incorrect Setting of Indoor Unit No.	Duplication of Indoor Unit No. in same Refrigerant Group
36		Incorrect Indoor Unit Combination	Indoor Unit is Designed for R22
38		Problem with Protective Pickup Circuit in Outdoor Unit	Failure of Protection Detecting Device (Incorrect Wiring of Outdoor PCB)
39	Compressor	Problem with Running Current at Constant Speed Compressor	Overcurrent, Blown Fuse, Current Sensor Failure, Instantaneous Power Failure, Voltage Drop, Abnormal Power Supply
3A	Outdoor Unit	Problem with Running Outdoor Unit Capacity	Outdoor Unit Capacity > 360 MBH
3b		Incorrect Setting of Outdoor Unit Models Combination or Voltage	Incorrect Setting of Main and Sub Unit(s) Combination or Voltage
3d		Communication Problem between Main Unit and Sub Unit(s)	Incorrect Wiring, Disconnected Wire, Broken Wire, PCB Failure
3E		Communication Problem between Inverter PCB and Outdoor PCB	Incorrect Combination between Inverter PCB and Outdoor PCB
43	Protection Device	Activation of Compression Ratio Decrease Protection Device	Defective Compression (Failure of Compressor or Inverter, Loose Power Supply Connection)
44		Activation of Low Pressure Increase Protection Device	Overload at Cooling, High Temperature at Heating, Expansion Valve Locking (Loose Connector)
45		Activation of High Pressure Increase Protection Device	Overload Operation (Clogging, Short-Pass), Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing
47		Activation of Low Pressure Decrease Protection Device (Vacuum Operation Protection)	Insufficient Refrigerant, Refrigerant Piping, Clogging, Expansion Valve Locking at Open Position (Loose Connector)
48		Activation of Inverter Overcurrent Protection Device	Overload Operation, Compressor Failure
51	Sensor	Problem with Inverter Current Sensor	Current Sensor Failure
53	Inverter	Inverter Error Signal Detection	Driver IC Error Signal Detection (Protection for Overcurrent, Low Voltage, Short Circuit)
54		Abnormality of Inverter Fin Temperature	Abnormal Inverter Fin Thermistor, Heat Exchanger Clogging, Fan Motor Failure
55		Inverter Failure	Inverter PCB Failure
57	Fan Controller	Activation of Fan Controller Protection	Driver IC Error Signal Detection (Protection for Overcurrent, Low Voltage, 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		Problem with Fan Controller Sensor	Failure of Current Sensor (Instantaneous Overcurrent, Increase of Fin Temperature, Low Voltage, Ground Fault, Step-Out)
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
b1	Outdoor Unit No. Setting	Incorrect Setting of Unit and Refrigerant System Number	There are 64 or more numbers Set for Address or Refrigerant System.
b5	Indoor Unit No. Setting	Incorrect Indoor Unit Connection No. Setting	There are 17 or More Non-Corresponding to H-LINK II Units are Connected to One System.

10. Safety and Control Device Setting

- Compressor Protection

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

- (1) High Pressure Switch: This switch cuts out the operation of the compressor when the discharge pressure exceeds the setting.
- (2) Oil Heater: This band type heater protects against oil foaming during cold starting, as it is energized while the compressor is stopped.

< 208/230V 60Hz >

Model		(H,Y)VAHP072B31CW	(H,Y)VAHP096B31CW
High Pressure Increase Protection		Automatic Reset, Non-Adjustable	
High Pressure Increase Protection Control	psi (MPa)	551 (3.80)	551 (3.80)
Pressure Switch		(for each compressor)	
Cut-Out	psi	601 -7 -21	601 -7 -21
	(MPa)	(4.15 -0.05) -0.15)	(4.15 -0.05) -0.15)
Cut-In	psi (MPa)	464 ±21 (3.20 ±0.15)	464 ±21 (3.20 ±0.15)
For Inverter Compressor		Automatic Reset, Non-Adjustable	
Over Current			
Inverter Current Protection Control	A	45.0	45.0
Breaker	A	50.0	50.0
Over Heat		Automatic Reset, Non-Adjustable	
Discharge Temperature Increase Protection Control	for 5sec °F	284	284
	(°C)	(140)	(140)
	for 10min °F	270	270
	(°C)	(132)	(132)
For Fixed Speed Compressor		Automatic Reset, Non-Adjustable	
Over Current			
Abnormality Running Current Control	A	32	32
Breaker	A	29	29
Over Heat		Automatic Reset, Non-Adjustable	
Discharge Temperature Increase Protection Control	for 5sec °F	284	284
	(°C)	(140)	(140)
	for 10min °F	270	270
	(°C)	(132)	(132)
For Fan Motor		Automatic Reset, Non-Adjustable	
Over Current Protection Control	A	7	7
Fuse	A	16	16

< 460V 60Hz >

Model		(H,Y)VAHP072B41CW	(H,Y)VAHP096B41CW
High Pressure Increase Protection		Automatic Reset, Non-Adjustable	
High Pressure Increase Protection Control	psi (MPa)	551 (3.80)	551 (3.80)
Pressure Switch		(for each compressor)	
Cut-Out	psi	601 -7 -21	601 -7 -21
	(MPa)	(4.15 -0.05) -0.15)	(4.15 -0.05) -0.15)
Cut-In	psi (MPa)	464 ±21 (3.20 ±0.15)	464 ±21 (3.20 ±0.15)
For Inverter Compressor		Automatic Reset, Non-Adjustable	
Over Current			
Inverter Current Protection Control	A	23.5	23.5
Breaker	A	30.0	30.0
Over Heat		Automatic Reset, Non-Adjustable	
Discharge Temperature Increase Protection Control	for 5sec °F	284	284
	(°C)	(140)	(140)
	for 10min °F	270	270
	(°C)	(132)	(132)
For Fixed Speed Compressor		Automatic Reset, Non-Adjustable	
Over Current			
Abnormality Running Current Control	A	14.5	14.5
Breaker	A	15	15
Over Heat		Automatic Reset, Non-Adjustable	
Discharge Temperature Increase Protection Control	for 5sec °F	284	284
	(°C)	(140)	(140)
	for 10min °F	270	270
	(°C)	(132)	(132)
For Fan Motor		Automatic Reset, Non-Adjustable	
Over Current Protection Control	A	7	7
Breaker	A	10	10

1.2 Optional Parts

1.2.1 For Outdoor Unit

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1.2.1.1 Drain Adaptor: DBS-TP10A

This drain adaptor is for the drain pipe connection in order to enable use of the outdoor unit bottom base as a drain pan.

Install it as follows.

IMPORTANT NOTICE:

- Read and understand this manual before using this drain adaptor.
- Perform the test run after installation to check for abnormalities.
- Forward this information to the building owner and request that they maintain all the equipment manuals.
- Signal words are used to identify levels of hazard seriousness.
Definitions for identifying hazard levels are provided below with their respective signal words.



: Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

1. Applicable Outdoor Unit

Applicable Outdoor Unit	(H,Y)VAH(P,R)072, 096, 120B(3,4)1S (H,Y)VAHP072, 096B(3,4)1CW
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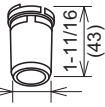


NOTE:

The applicable outdoor unit may be different depending on the product series. Be sure to confirm with the product catalog before installation.

2. Before Installation

Check that all the following accessories are packed with the unit before installation.

Unit: inch (mm)

No.	Accessory	Qty.	Remarks
①	Drain Adaptor (VP20 Equivalent)  Outer Diameter $\phi 31/32$ ($\phi 25$) (Inner Diameter $\phi 25/32$ ($\phi 20$))	2	Connecting for Drain Piping
②	Rubber Cap 	4	Fixing for ① Adaptor and ③ Cap
③	Drain Cap 	2	Plug for Drain Hole

3. Installation Work

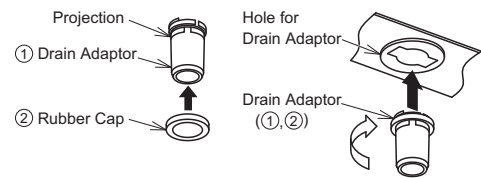


Place the outdoor unit on a flat foundation or block and secure it at least 3-15/16 inch (100mm) higher than the ground. For smooth drainage, install the outdoor unit with a slight incline on the drainage side (rear side).

3.1 Installation of Drain Adaptor

The drain adaptor is for the drain pipe connection so as to use the outdoor unit bottom base as a drain pan.

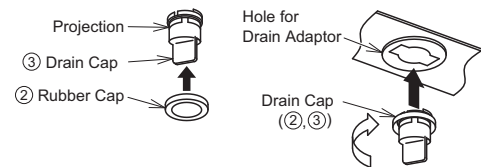
- (1) Put the ② rubber cap in the ① drain adaptor (to the upper part of the drain adaptor projection) in the direction of the arrow.
- (2) Put the drain adaptor in the hole for the drain adaptor of the outdoor unit bottom base until it is securely fixed. (approx. 40°)
(The drain adaptor can be fit into the bottom base until it stops.)



3.2 Installation of Drain Cap

The drain cap is a component to cover a hole.

- (1) Put the ② rubber cap in the ③ drain cap (to the upper part of the drain adaptor projection) in the direction of the arrow.
- (2) Put the drain cap in the hole for the drain adaptor of the outdoor unit bottom base until it is securely fixed. (approx. 40°)
(The drain cap can be fit into the bottom base until it stops.)

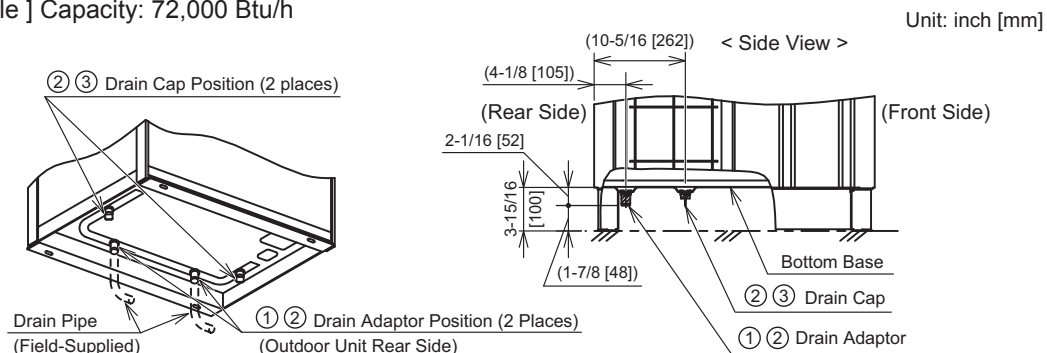


CAUTION

Use a rubber cap when fixing the drain adaptor and drain cap. (No rubber cap may lead to water leakage.) After fixing, ensure that there is no water leakage from the drain cap by pouring water into the bottom base and then draining it from the drain adaptor.

< Installation Position >

[Example] Capacity: 72,000 Btu/h



CAUTION

Securely fix the drain adaptor, rubber cap and drain cap at the bottom base so it doesn't become loose when connecting the drain pipe.

4. Utilization in Cold Area

CAUTION

Do not use the drain adaptor in an area where drain water may be frozen.
(The drain water in the drain pipe may be frozen and then the drain pipe may crack.)

- (1) In a snow area, water from the heat exchanger may be frozen on the surface of the bottom base. This may lead to poor drainage. Therefore, do not use the drain adaptor in this type of area.
- (2) In the drainage method according to this manual, some of the defrost drain water dripped from the inlet protection grille may flow out over the bottom base of the product.
To prevent this, provide a drain pan larger than the bottom surface of the product. Secure the drain pan and the discharge pipe between the bottom part of the product and the foundation prior to discharge.

1.2.1.2 Protection Net

• Protection Net (Rear): PN-TP10BA, PN-TP10BB

This protection net is to protect the outdoor unit heat exchanger from external damages such as being hit by a ball. Install it as instructed in this manual.

IMPORTANT NOTICE:

- Read and understand this manual before using this protection net.
- Perform the test run after installation to check for abnormalities.
- Forward this information to the building owner and request that they maintain all the equipment manuals.
- Signal words are used to identify levels of hazard seriousness.
Definitions for identifying hazard levels are provided below with their respective signal words.



: Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

1. Applicable Unit

Name	Protection Net (for Rear Side Installation)	
Model	PN-TP10BA	PN-TP10BB
Required Qty.	1	1
Applicable Outdoor Unit	(H,Y)VAH(P,R)072B(3,4)1S	(H,Y)VAH(P,R)096, 120B(3,4)1S (H,Y)VAHP072, 096B(3,4)1CW

NOTE:

The applicable outdoor unit may be different depending on the product series. Be sure to confirm with the product catalog before installation.

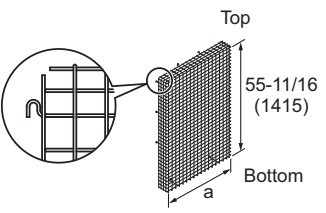

2. Installation Work

- (1) Be sure to securely tighten the protection net with the supplied screws (accessories).
If the screws are not securely tightened, it may cause vibration or abnormal sound.
If they are over-tightened, the screw thread will be broken. When tightening the screws, make sure to follow the tightening torque below.
 - Tightening Torque (M5 Screw): 1.8±0.7 ft·lbs (2.5±1.0 N·m)
- (2) Apply touch-up coating at the screw holes of the outdoor unit in order to prevent rusting (field-supplied).
- (3) Secure enough service space with consideration for attaching/detaching the protection net.
 - Service Space with Protection Net: Service Space for Outdoor Unit + Min. 5-7/8 inch (150mm)
- (4) Do not step on the protection net or the outdoor unit to prevent falls resulting in injury.
- (5) Fallen leaves or some other objects may be caught by the protection net and piled up. Be sure to check for accumulation and clean the protection net periodically.
- (6) The protection net may freeze because of cold weather.
- (7) It is not possible to use the snow protection hood for the rear side inlet and air outlet at the same time.

3. Before Installation

Check that all the following accessories are packed with the unit before installation.

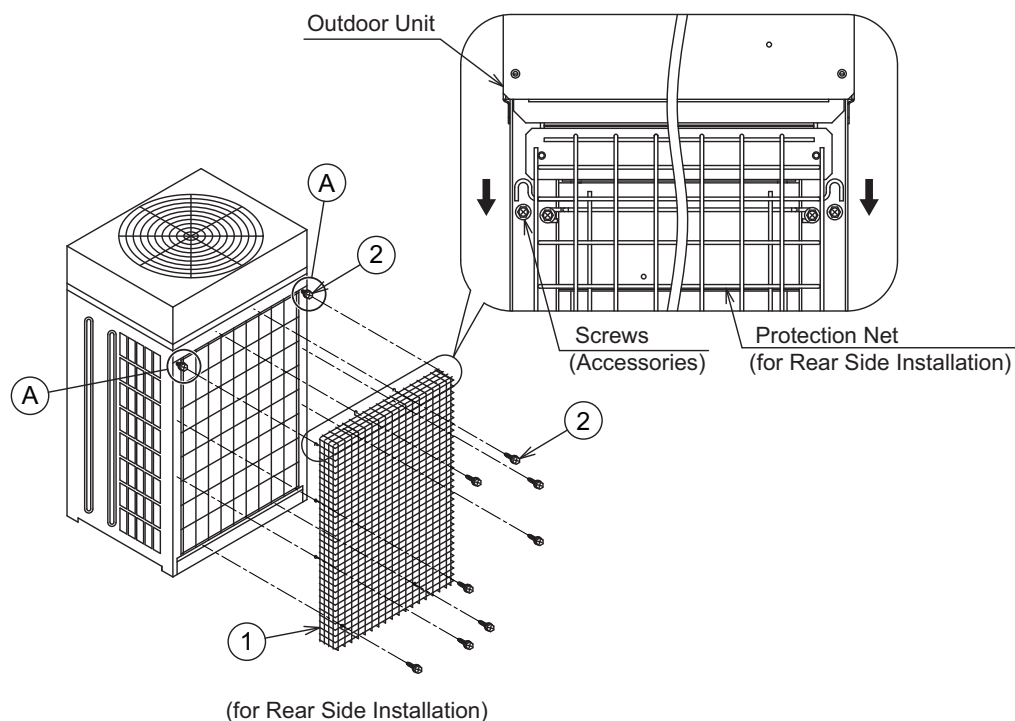
Unit: inch (mm)

No.	Accessory	Qty.		Remarks
		PN-TP10BA	PN-TP10BB	
①	Protection Net (for Rear Side Installation)		1	-
②	Screw	 M5 x 15/32L (12L) (with Washer)	11 (1)	11 (1)
				(1): Spare

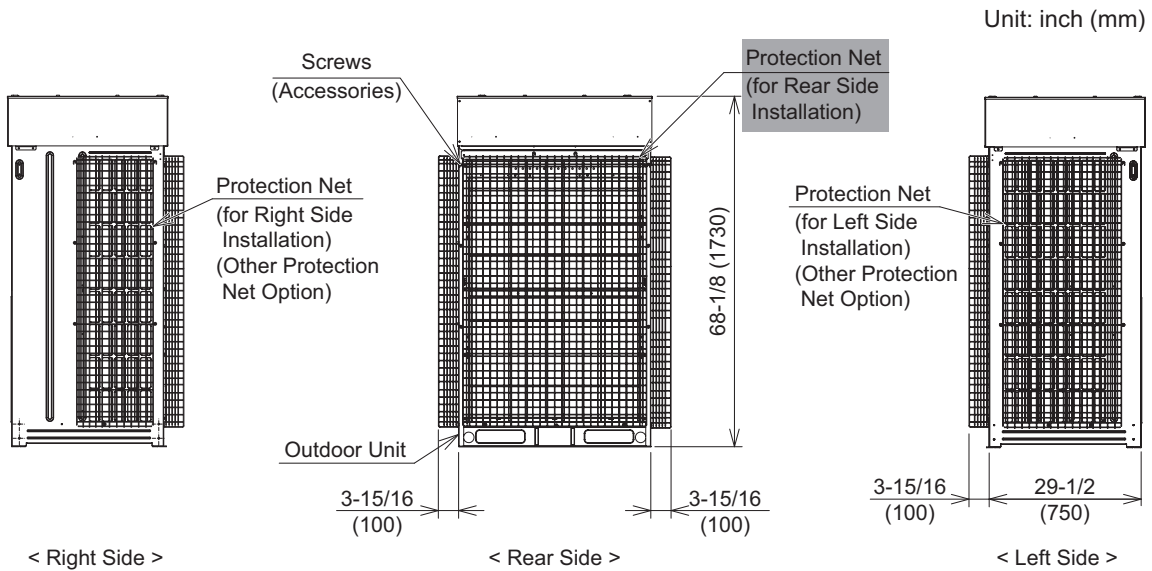
4. Installation Procedures

Before installation, confirm the outdoor unit model. If the protection net is available to install, follow the installation procedures.

- (1) Tighten loosely two screws ② at the top of the outdoor unit rear side (A), and set the protection net (for rear side installation) ① over the top. Securely tighten the other eight screws ② except for the top (A) two screws, and finally, tighten the top (A) two screws securely.



5. Installation Appearance



Available Combinations

Applicable Outdoor Unit	Model	
	(H,Y)VAH(P,R)072B(3,4)1S	(H,Y)VAH(P,R)096, 120B(3,4)1S (H,Y)VAHP072, 096B(3,4)1CW
Protection Net for Rear Side	PN-TP10BA	PN-TP10BB
Protection Net for Left Side	PN-TP10L	
Protection Net for Right Side	PN-TP10R	

NOTES:

- This manual applies only to the combination indicated with .
For other protection net options, refer to each installation manual.
- Install the required protection net depending on the installation condition.

● Protection Net (Right): PN-TP10R

This protection net is to protect the outdoor unit heat exchanger from external damages such as being hit by a ball. Install it following the instructions below.

IMPORTANT NOTICE:

- Read and understand this manual before using this protection net.
- Perform the test run after installation to check for abnormalities.
- Forward this information to the building owner and request that they maintain all the equipment manuals.
- Signal words are used to identify levels of hazard seriousness.
Definitions for identifying hazard levels are provided below with their respective signal words.



: Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

1. Applicable Unit

Name	Protection Net (for Right Side Installation)
Model	PN-TP10R
Required Qty.	1
Applicable Outdoor Unit	(H,Y)VAH(P,R)072, 096, 120B(3,4)1S (H,Y)VAHP072, 096B(3,4)1CW

NOTE:

The applicable outdoor unit may be different depending on the product series. Be sure to confirm with the product catalog before installation.

2. Installation Work

- (1) Be sure to securely tighten the protection net with the supplied screws (accessories).
If the screws are not securely tightened, it may cause vibration or abnormal sound.
If they are over-tightened, the screw thread will be broken. When tightening the screws, make sure to follow the tightening torque below.
 - Tightening Torque (M5 Screw): 1.8±0.7 ft·lbs (2.5±1.0 N·m)
- (2) Apply touch-up coating at the screw holes of the outdoor unit in order to prevent rusting (field-supplied).
- (3) Secure enough service space with consideration for attaching/detaching the protection net.
 - Service Space with Protection Net: Service Space for Outdoor Unit + Min. 5-7/8 inch (150mm)
- (4) Do not step on the protection net or the outdoor unit in order to prevent a fall resulting in injury.
- (5) Fallen leaves or some other objects may be caught by the protection net and piled up. Be sure to check for accumulation and clean the protection net periodically.
- (6) The protection net may freeze in cold weather.
- (7) It is not possible to use the snow protection hood along with a right side inlet.

3. Before Installation

Check that all the following accessories are packed with the unit before installation.

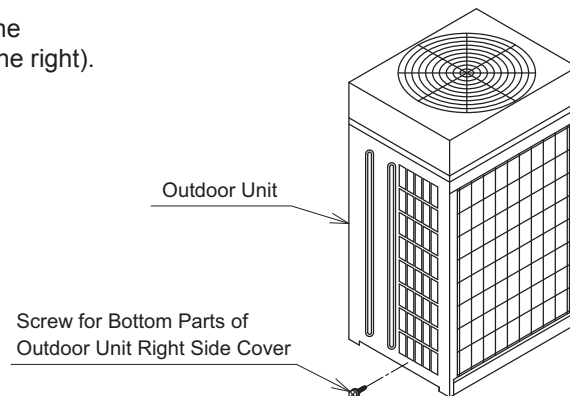
Unit: inch (mm)

No.	Accessory	Qty.	Remarks
		PN-TP10R	
①	Protection Net (for Right Side Installation) 	1	
②	Screw M5 x 15/32L (12L) (with Washer)	8 (1)	(1): Spare

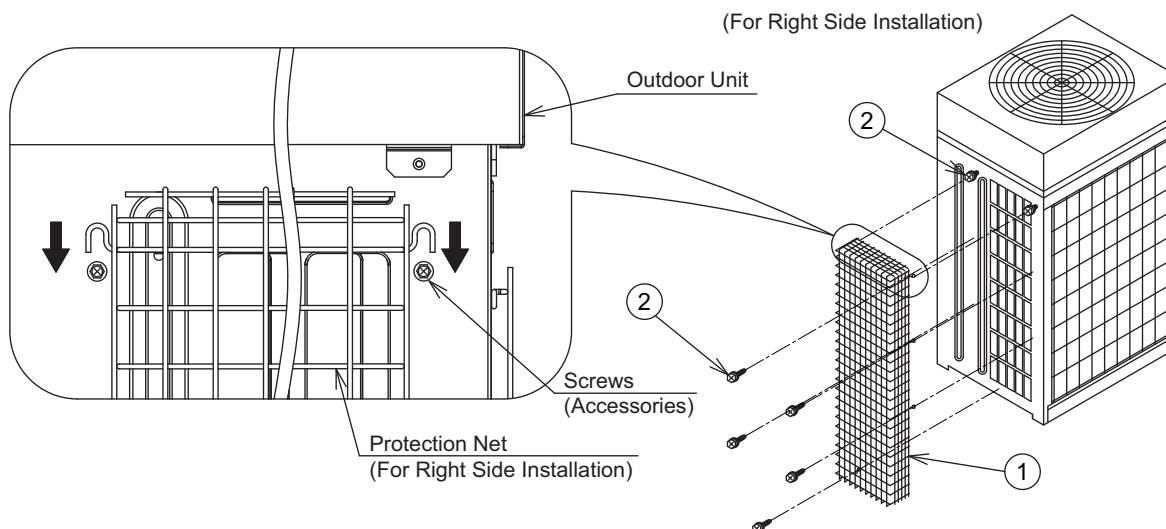
4. Installation Procedures

Before installation, confirm the outdoor unit model. If the protection net is available to install, follow the installation procedures.

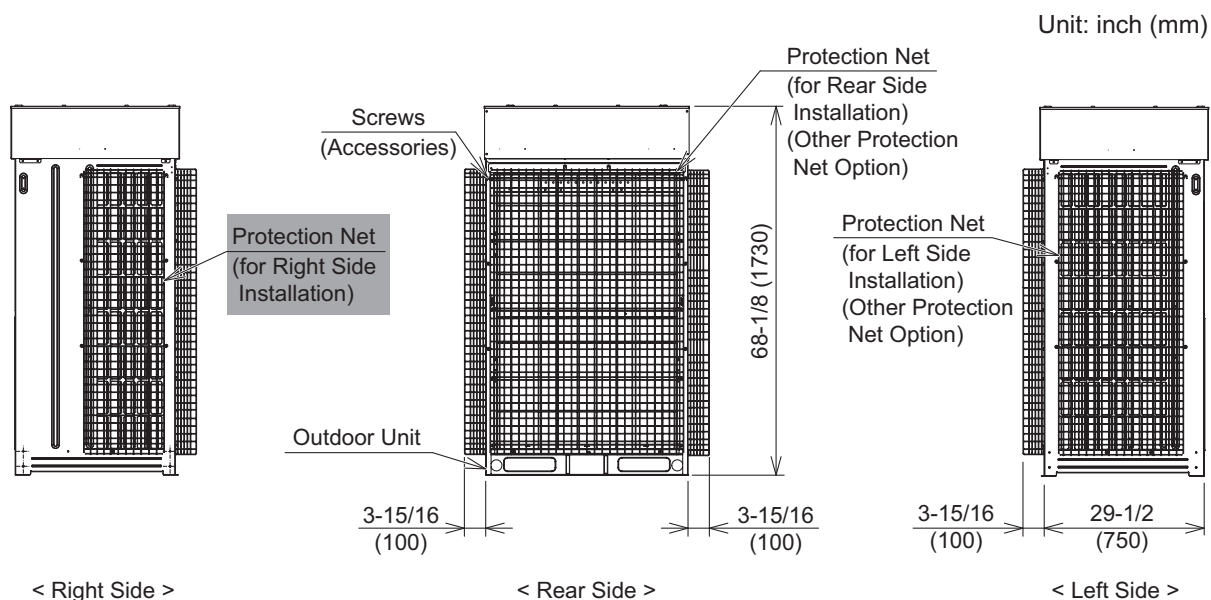
- (1) Remove the one screw for the bottom parts of the outdoor unit right side cover (see the figure on the right).



- (2) Tighten loosely two screws ② at the top of the outdoor unit right side, and set the protection net (for right side installation) ① over the top. Securely tighten the other five screws ② except for the top two screws, and finally, tighten the top two screws securely.



5. Installation Appearance



Available Combinations

Applicable Outdoor Unit	Model	
	(H,Y)VAH(P,R)072B(3,4)1S	(H,Y)VAH(P,R)096, 120B(3,4)1S (H,Y)VAHP072, 096B(3,4)1CW
Protection Net for Rear Side	PN-TP10BA	PN-TP10BB
Protection Net for Left Side	PN-TP10L	
Protection Net for Right Side	PN-TP10R	

NOTES:

- This manual applies only to the combination indicated with .
For other protection net options, refer to each installation manual.
- Install the required protection net depending on the installation condition.

● Protection Net (Left): PN-TP10L

This protection net is to protect the outdoor unit heat exchanger from external damages such as being hit by a ball. Install it following the directions below.

IMPORTANT NOTICE:

- Read and understand this manual before using this protection net.
- Perform the test run after installation to check for abnormalities.
- Forward this information to the building owner and request that they maintain all the equipment manuals.
- Signal words are used to identify levels of hazard seriousness.
Definitions for identifying hazard levels are provided below with their respective signal words.



: Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

1. Applicable Unit

Name	Protection Net (for Left Side Installation)
Model	PN-TP10L
Required Qty.	1
Applicable Outdoor Unit	(H,Y)VAH(P,R)072, 096, 120B(3,4)1S (H,Y)VAHP072, 096B(3,4)1CW

NOTE:

The applicable outdoor unit may be different depending on the product series. Be sure to confirm with the product catalog before installation.

2. Installation Work

- (1) Be sure to securely tighten the protection net with the supplied screws (accessories).
If the screws are not securely tightened, it may cause vibration or abnormal sound.
If they are over-tightened, the screw thread will be broken. When tightening the screws, make sure to follow the tightening torque below.
 - Tightening Torque (M5 Screw): 1.8 ± 0.7 ft·lbs (2.5 ± 1.0 N·m)
- (2) Apply touch-up coating at the screw holes of the outdoor unit in order to prevent rusting (field-supplied).
- (3) Secure enough service space with consideration for attaching/detaching the protection net.
 - Service Space with Protection Net: Service Space for Outdoor Unit + Min. 5-7/8 inch (150mm)
- (4) Do not step on the protection net or the outdoor unit in order to prevent falls resulting in injury.
- (5) Fallen leaves or some other objects may be caught by the protection net and piled up. Be sure to check for accumulation and clean the protection net periodically.
- (6) The protection net may freeze in cold weather.
- (7) It is not possible to use the snow protection hood along with the left side inlet.

3. Before Installation

Check that all the following accessories are packed with the unit before installation.

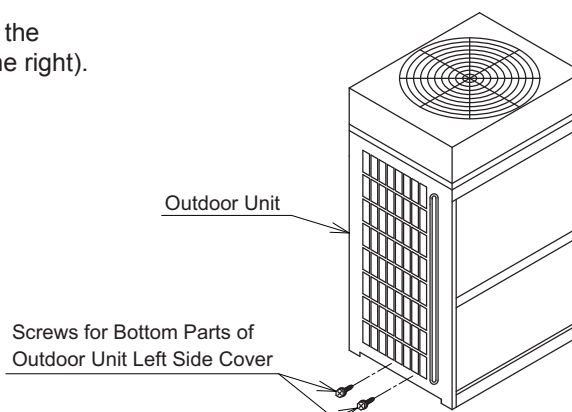
Unit: inch (mm)

No.	Accessory	Qty.	Remarks
		PN-TP10L	
①	Protection Net (for Left Side Installation) 	1	
②	Screw M5 x 15/32L (12L) (with Washer)	9 (1)	(1): Spare

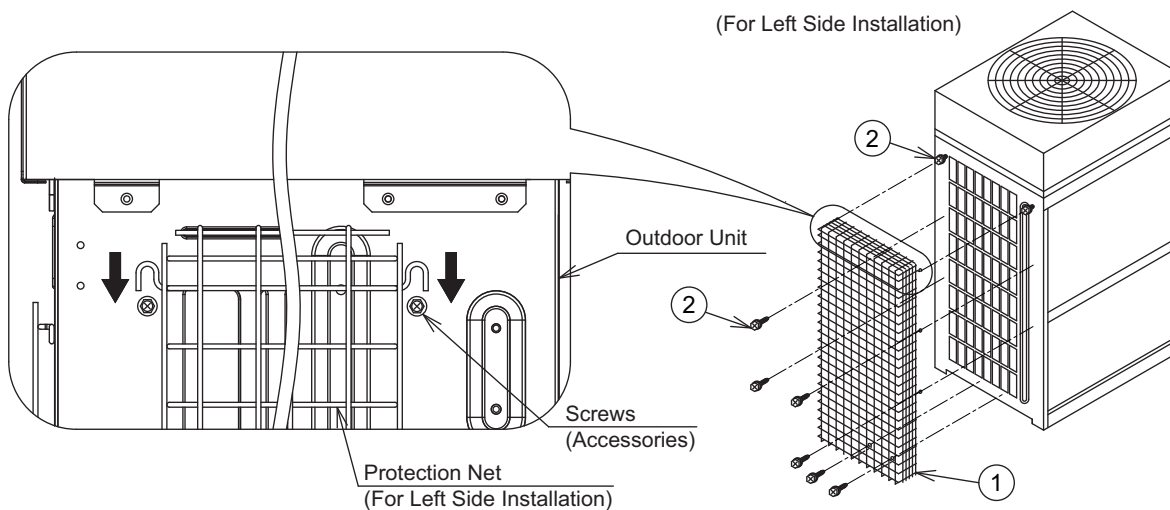
4. Installation Procedures

Before installation, confirm the outdoor unit model. If the protection net is available to install, follow the installation procedures.

- (1) Remove the two screws for the bottom parts of the outdoor unit left side cover (see the figure on the right).

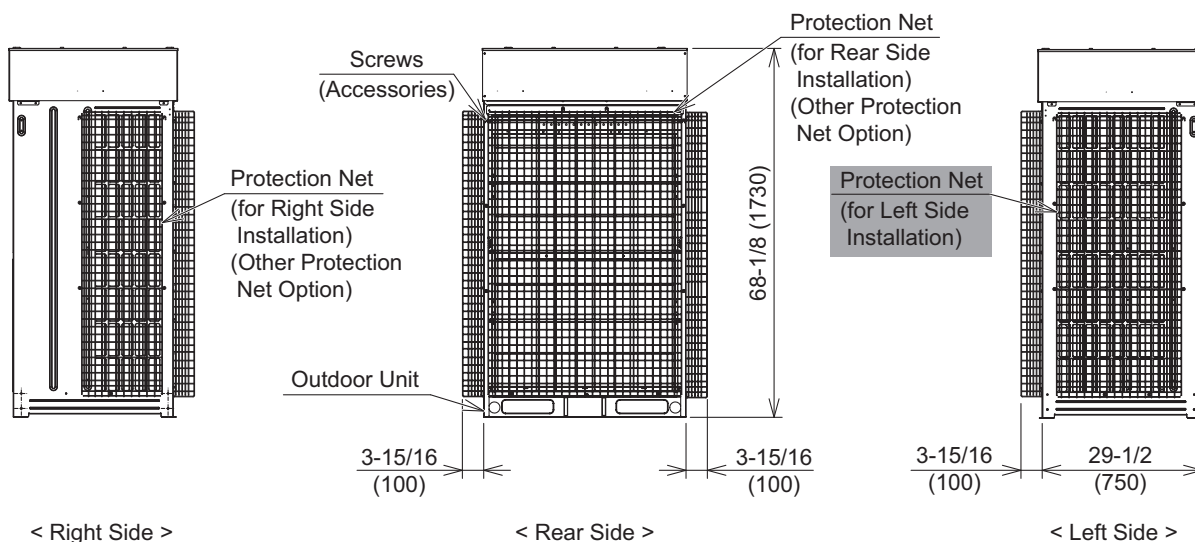


- (2) Tighten loosely two screws ② at the top of the outdoor unit left side, and set the protection net (for left side installation) ① over the top. Securely tighten the other six screws ② except for the top two screws, and finally, tighten the top two screws securely.



5. Installation Appearance

Unit: inch (mm)



Available Combinations

Applicable Outdoor Unit	Model	
	(H,Y)VAH(P,R)072B(3,4)1S	(H,Y)VAH(P,R)096, 120B(3,4)1S (H,Y)VAHP072, 096B(3,4)1CW
Protection Net for Rear Side	PN-TP10BA	PN-TP10BB
Protection Net for Left Side	PN-TP10L	
Protection Net for Right Side	PN-TP10R	

NOTES:

- This manual applies only to the combination indicated with .
For other protection net options, refer to each installation manual.
- Install the required protection net depending on the installation condition.

1.2.1.3 Snow Protection Hood

• Snow Protection Hood (Upper): ASG-TP20FAS1, ASG-TP20FBS1

This snow protection hood prevents snow from entering the outdoor unit and to prevent strong winds from blowing against the heat exchanger. Be sure to read this manual carefully for correct performance before installation work.

IMPORTANT NOTICE:

- Johnson Controls pursues a policy of continuous improvement in design and performance of products. We reserve the right to vary specifications without notice.
- No part of this manual may be reproduced without Johnson Controls' written permission.
- Keep this manual for future reference.
- Johnson Controls cannot anticipate every possible circumstance that might involve a potential hazard.
- This kit is designed for a combination of Johnson Control air conditioners. Do not use this kit by itself or in combination with other companies' air conditioners.
- To hold the snow protection hood properly to the outdoor unit against the strong wind or earthquake, stay or safety wire rope shall be used for reinforced installation. Use the field-supplied safety wire rope to prevent outdoor unit from overturning.
- Perform a test run after installation to check for abnormalities.
- Signal words are used to identify levels of hazard seriousness. Definitions for identifying hazard levels are provided below with their respective 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.

1. Applicable Unit

Name	Hood for Air Outlet	
Model	ASG-TP20FAS1	ASG-TP20FBS1
Applicable Outdoor Unit	(H,Y)VAH(P,R)072B(3,4)1S	(H,Y)VAH(P,R)096, 120B(3,4)1S (H,Y)VAHP072, 096B(3,4)1CW

NOTE:

The applicable outdoor unit may be different depending on the product series. Be sure to confirm with the product catalogue before installation.

2. Installation Work

- (1) After the snow protection hood is installed, electromagnetic noise at the air outlet side may slightly increase. Therefore, it is necessary to carefully consider the air discharge direction when installed.
- (2) Be sure to tighten the snow protection hood securely to the top panel and side panel of the outdoor unit with the supplied screws (accessories). Not doing so may cause vibration or abnormal noise.
- (3) There must be no obstacles in the air discharge direction of the snow protection hood. If there are, it may cause a short circuit or an insufficient airflow rate.
- (4) Do not install other outdoor units in the direction of air outlet. If the air blown out of the snow protection hood is sucked into the other outdoor unit, it may cause of a malfunction of the unit.
- (5) The wind loads which the outdoor unit receives changes by attaching the snow protection hood. The required installation strength will also change in strong wind. Therefore, recheck the strength of the anchor bolts of the outdoor unit.
- (6) If the snow protection hood is installed, cooling/heating performance may be slightly lowered depending on the usage conditions.

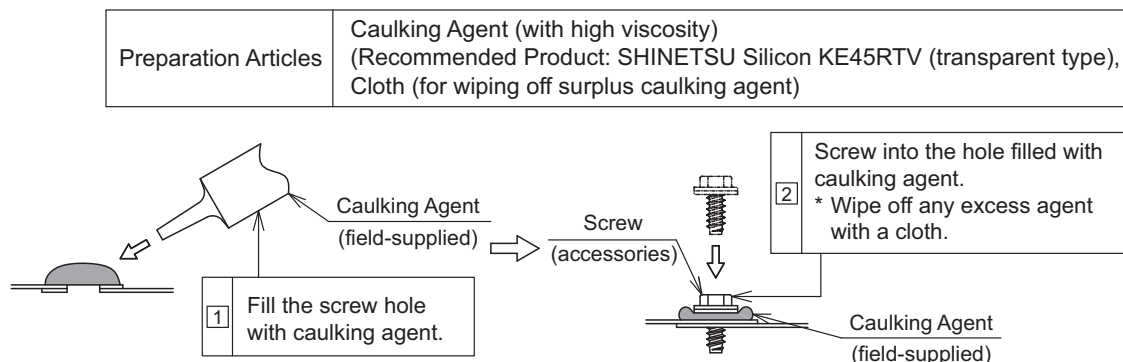
⚠ WARNING

To hold the snow protection hood properly to the outdoor unit against a strong wind or an earthquake, safety wire rope should be used for reinforced installation. Use the field-supplied safety wire rope to prevent the outdoor unit from overturning.

⚠ CAUTION

- Install the snow protection hood so as to avoid facing directly toward seasonal or strong winds.
- Apply touch-up coating or caulking (field-supplied) at the screw holes of the outdoor unit in order to prevent rusting.
- Even though the hood is stainless, salt or iron may cause rust. Be aware of this during installation or maintenance.
- The snow protection hood is heavy-weight. More than two people are required for installation. Be sure to wear protective equipment (such as gloves).
- The screws and the snow protection hood must be protected from scratches or scrapes. If they aren't, it may be the cause of rusting. Handle with care when the snow protection hood is installed and assembled.

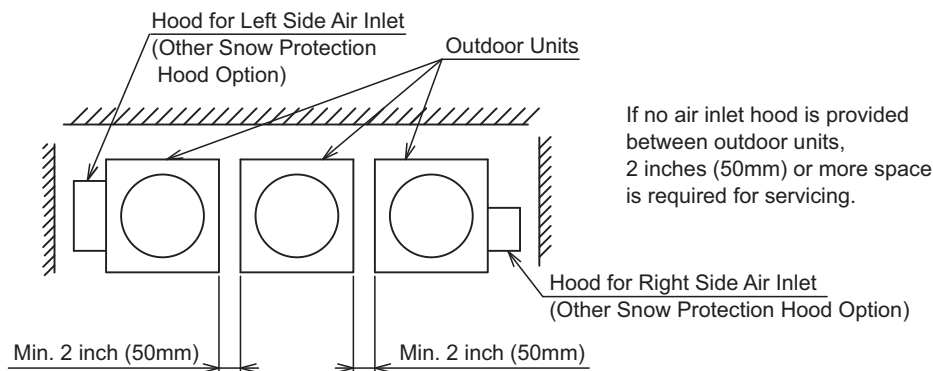
< Caulking Procedures (Example) >



3. Selection of Installation Location

- (1) Install the outdoor unit at the suitable height with consideration for snow accumulation. Increase the base height or additionally provide the frame under the unit (higher than snow accumulation), and fix the outdoor unit securely with anchor bolts.
- (2) Secure enough service space with consideration for snow accumulation height and snow removal operation.
- (3) There must be no obstacles in the air discharge direction.
- (4) Be sure to apply touch-up coating or caulking agent at the screw attaching portions for rustproofing.
- (5) In case of multiple outdoor units installation, provide the service space as shown below.



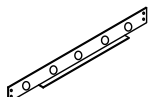
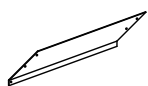
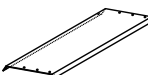








< Service Space for Multiple Outdoor Units Installation >



4. Before Installation

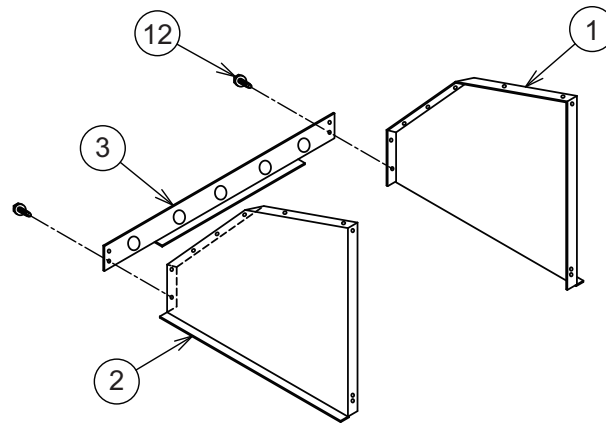
Check that all the following accessories are packed with the unit before installation.

Unit: inch (mm)

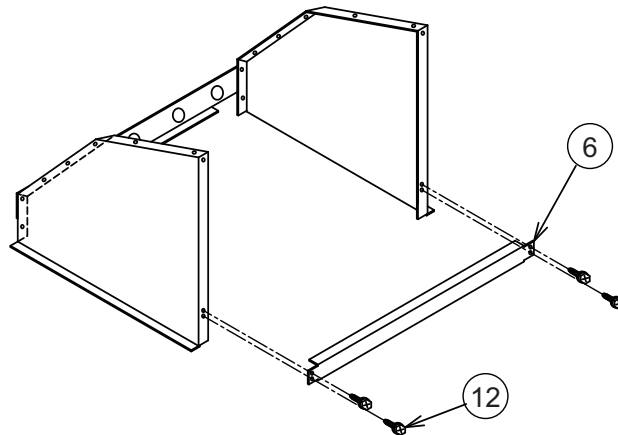
No.	Accessory	Qty.		Remarks	
		ASG-TP20FAS1	ASG-TP20FBS1		
①	Right Side Plate		1	1	
②	Left Side Plate		1	1	
③	Faceplate (1)		1	1	
④	Faceplate (2)		1	1	
⑤	Faceplate (3)		1	1	
⑥	Horizontal Plate		1	1	
⑦	Fixing Plate for Left Side (Front Side)		1	1	
⑧	Fixing Plate for Left Side (Rear Side)		1	1	
⑨	Fixing Plate for Right Side (Front Side)		1	1	
⑩	Fixing Plate for Right Side (Rear Side)		1	1	
⑪	Screw (for Installation)	 M5 x 15/32L (12L) (tapping screw type B)	10 (2)	10 (2)	For installation: accepting burring TP hole (2): Spare
⑫	Screw (for Assembling)	 M5 x 9/16L (14L) (tapping screw type C)	34 (2)	36 (2)	For installation: accepting weld nut (2): Spare
⑬	Drill Screw	 M4 x 1/2L (13L)	2	2	For prepared hole

5. Installation Procedures

- (1) Set the faceplate (1) (3) with its protruding part on the inside, and fix it with the right side plate (1) and left side plate (2) together (two places) by using screws for assembling (12).



- (2) Tighten the horizontal plate (6) (in four places) by using screws for assembling (12).

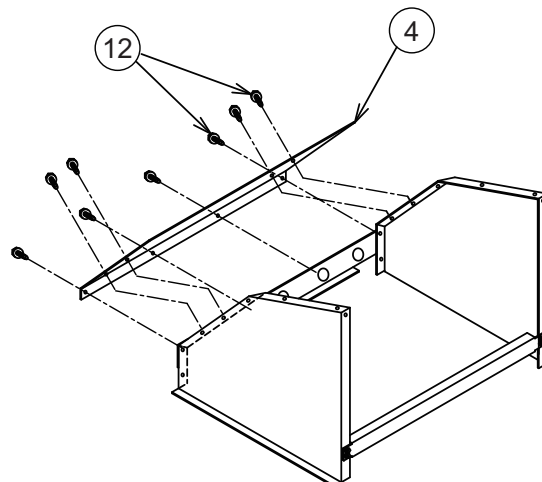


- (3) Tighten the faceplate (three pieces) (4) by using screws for assembling (12).

[Screws for Assembling (12)]

ASG-TP20FAS1: 7 places

ASG-TP20FBS1: 8 places

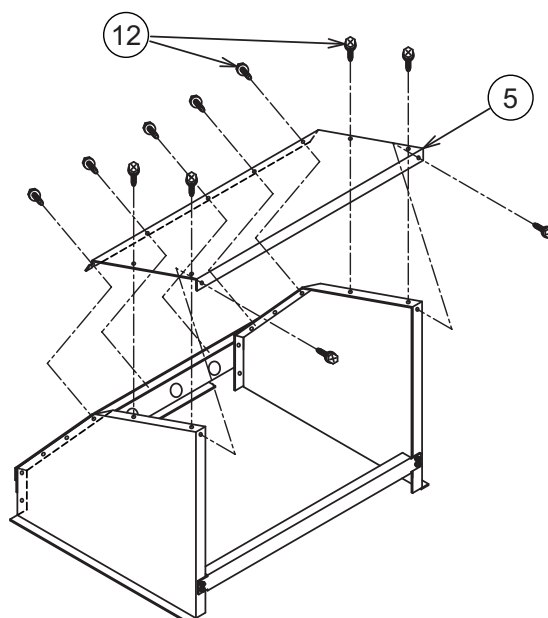


- (4) Tighten the faceplate (3) (⑤) by using screws for assembling (⑫).

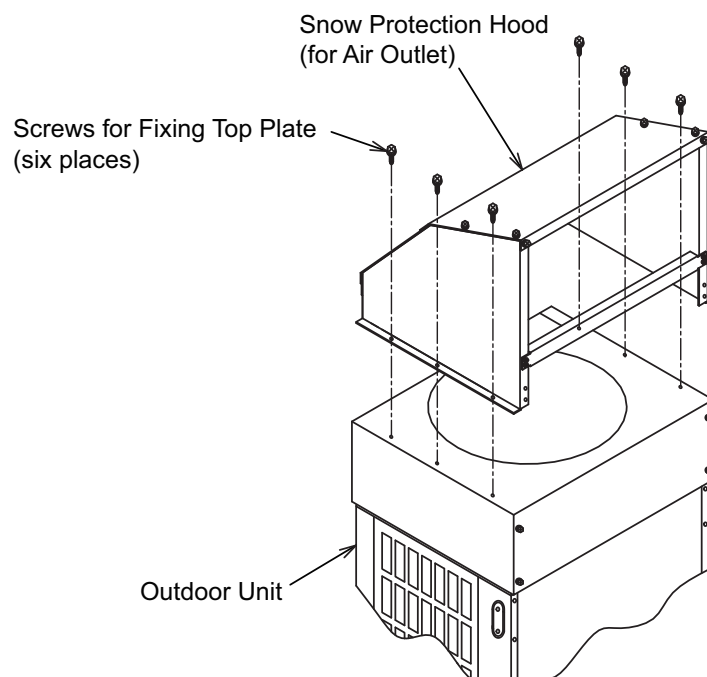
[Screws for Assembling (⑫)]

ASG-TP20FAS1: 11 places

ASG-TP20FBS1: 12 places

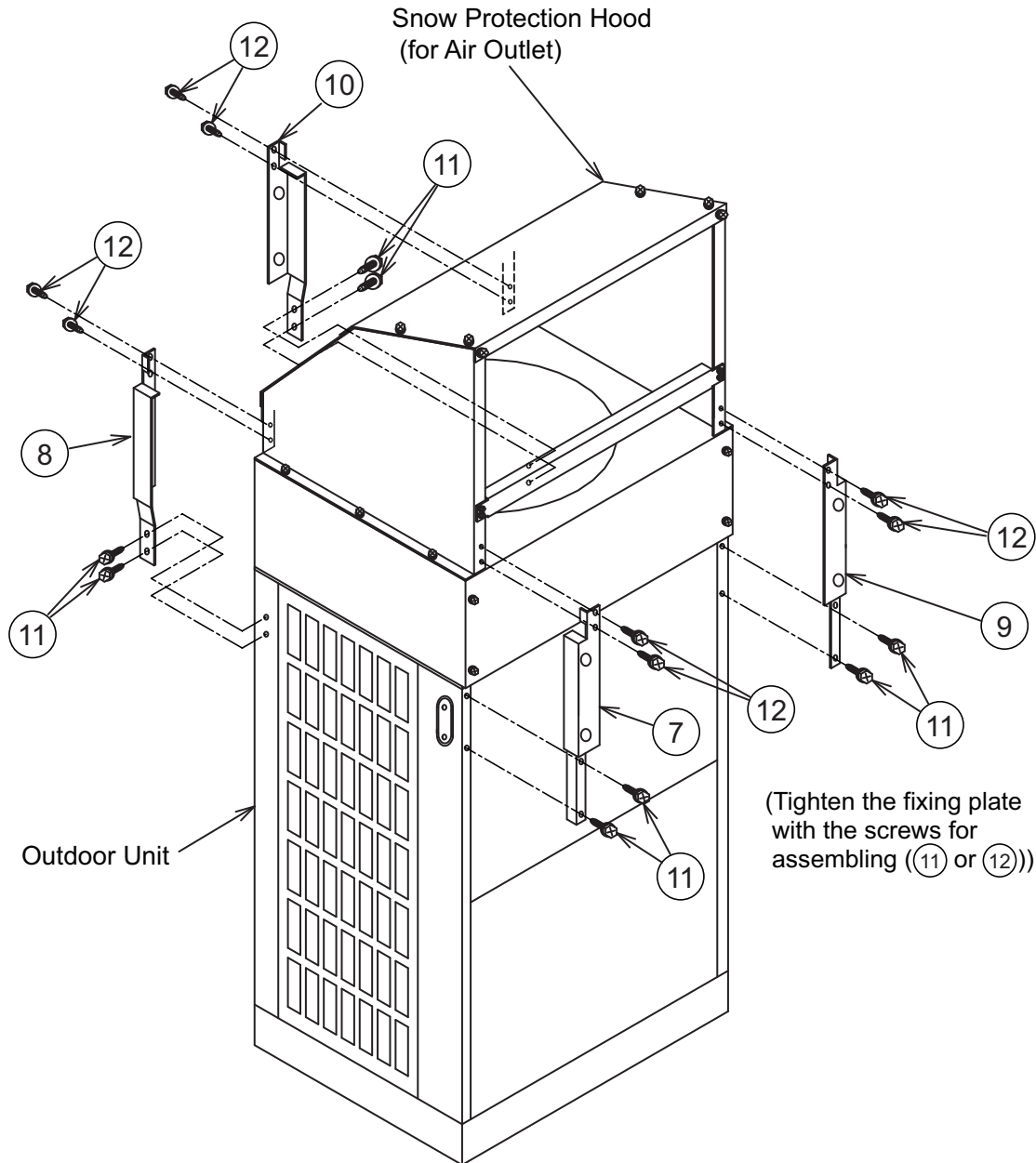


- (5) Remove the screws for securing the outdoor unit top plate (six places), then secure the snow protection hood (for the air outlet) with those removed screws.



INSTALLATION

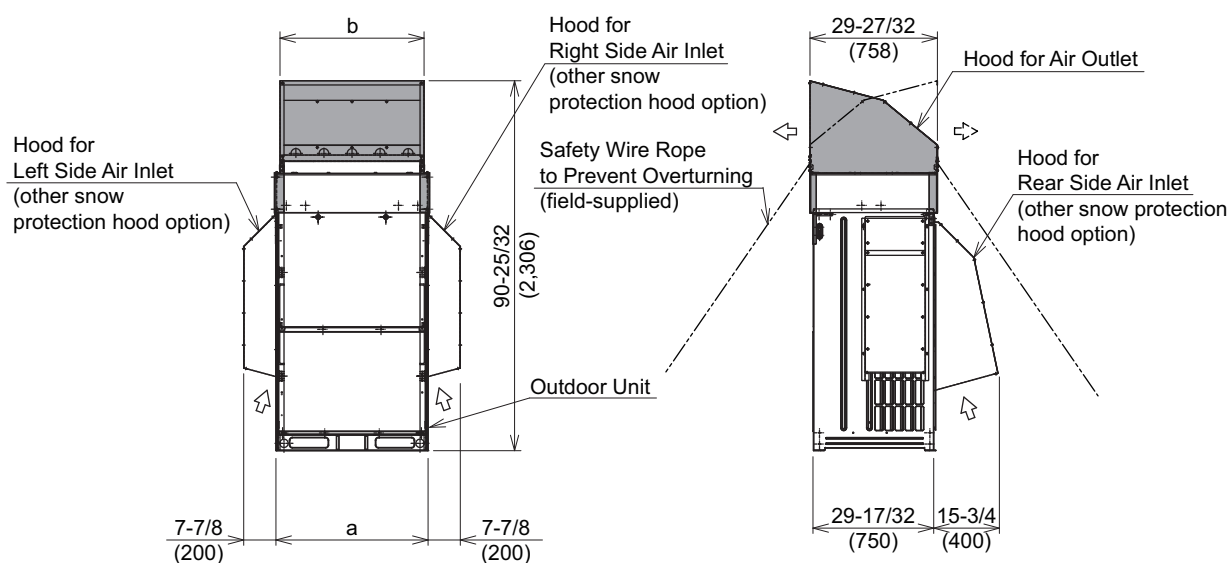
- (6) Tighten the fixing plate for the left side (front side) (⑦), fixing plate for the left side (rear side) (⑧), fixing plate for the right side (front side) (⑨), fixing plate for the right side (rear side) (⑩) with the screws for assembling (16 places) (⑪ or ⑫). Use the screws in specified positions as shown in the figure.



6. Installation Appearance

Unit: inch (mm)

Dimension	a	b
Applicable Outdoor Unit		
(H,Y)VAH(P,R)072B(3,4)1S	37-5/16 (948)	35-11/32 (898)
(H,Y)VAH(P,R)096, 120B(3,4)1S (H,Y)VAHP072, 096B(3,4)1CW	47-5/8 (1,210)	45-19/32 (1,158)



Available Combinations

Applicable Outdoor Unit	Model	
	(H,Y)VAH(P,R)072B(3,4)1S	(H,Y)VAH(P,R)096, 120B(3,4)1S (H,Y)VAHP072, 096B(3,4)1CW
Hood for Air Outlet	ASG-TP20FAS1	ASG-TP20FBS1
Hood for Rear Side Air Inlet	ASG-TP20BAS1	ASG-TP20BBS1
Hood for Left Side Air Inlet	ASG-TP20LS2	
Hood for Right Side Air Inlet	ASG-TP20RS2	

NOTE:

This manual applies only to the combination indicated with .
For other snow protection hood options, refer to each installation manual.

7. Maintenance and Servicing

Even if during the warranty period, the snow protection hood becomes rusted under conditions that are caused by alkaline or corrosive moisture, recommendations are to provide salt damage resistance products to prevent such damage. In order to prolong the product life, perform periodical maintenance to prevent significant aging due to deterioration. Carry out the following periodical inspection and maintenance works in conjunction with air conditioners' inspection.

(1) Red Rust Generation and Coating Film Check

If red rust is generated, or coating film is peeled/cracked, scour the rust off or apply touch-up coating. When recoating such parts, be sure to grind the coating using sandpaper (#180 to 230) before re-applying coating agent. Wear protective equipment such as vinyl gloves when handling the coating agent to prevent contact with skin.

(2) Retightening Screws for Installation and Assembly

Check for loose screws and retighten when inspection and maintenance is performed. In order to prevent screw breakage, be sure to tighten with the following torques:

* M5 Tapping Screw Type C for Assembling ⑫: 2.6 ± 0.7 [lbf-ft] (3.5 ± 1.0 [N•m])

* M5 Tapping Screw Type B for Installation ⑪: 1.8 ± 0.7 [lbf-ft] (2.5 ± 1.0 [N•m])

• Snow Protection Hood (Rear): ASG-TP20BAS1, ASG-TP20BBS1

This snow protection hood prevents snow from entering the outdoor unit and prevents strong winds from blowing against the heat exchanger. Be sure to read this manual carefully for correct performance before installation work.

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- Keep this manual for future reference.
- Johnson Controls cannot anticipate every possible circumstance that might involve a potential hazard.
- This kit is designed for a combination of Johnson Control air conditioners. Do not use this kit by itself or in combination with other companies' air conditioners.
- To hold the snow protection hood properly to the outdoor unit against the strong wind or earthquake, stay or safety wire rope shall be used for reinforced installation. Use the field-supplied safety wire rope to prevent outdoor unit from overturning.
- Perform a test run after installation to check for abnormalities.
- Signal words are used to identify levels of hazard seriousness. Definitions for identifying hazard levels are provided below with their respective 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.

1. Applicable Unit

Name	Hood for Rear Side Air Inlet	
Model	ASG-TP20BAS1	ASG-TP20BBS1
Applicable Outdoor Unit	(H,Y)VAH(P,R)072B(3,4)1S	(H,Y)VAH(P,R)096, 120B(3,4)1S (H,Y)VAHP072, 096B(3,4)1CW

NOTE:

The applicable outdoor unit may be different depending on the product series. Be sure to confirm with the product catalogue before installation.

2. Installation Work

- (1) After the snow protection hood is installed, electromagnetic noise at the air outlet side may slightly increase. Therefore, it is necessary to carefully consider the air discharge direction when installed.
- (2) Be sure to tighten the snow protection hood securely to the top panel and side panel of the outdoor unit with the supplied screws (accessories). Not doing so may cause vibration or abnormal noise.
- (3) There must be no obstacles in the air discharge direction of the snow protection hood. If there are, it may cause a short circuit or an insufficient airflow rate.
- (4) Do not install other outdoor units in the direction of the air outlet. If the air blown out of the snow protection hood is sucked into the other outdoor unit, it may cause a malfunction of the unit.
- (5) The wind loads which the outdoor unit receives changes by attaching the snow protection hood. The required installation strength will also change in strong wind. Therefore, recheck the strength of the anchor bolts of the outdoor unit.
- (6) If the snow protection hood is installed, cooling/heating performance may be slightly lowered depending on the usage conditions.

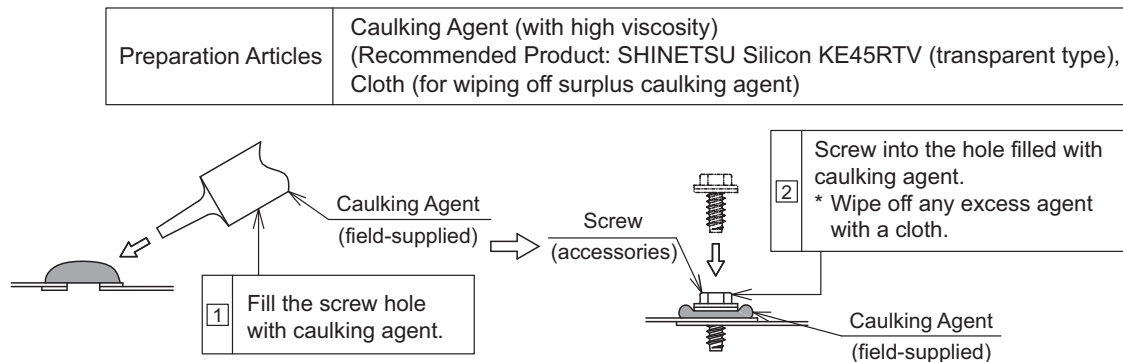
⚠ WARNING

To hold the snow protection hood properly to the outdoor unit against a strong wind or an earthquake, safety wire rope should be used for reinforced installation. Use the field-supplied safety wire rope to prevent the outdoor unit from overturning.

⚠ CAUTION

- Install the snow protection hood so as to avoid facing directly toward seasonal or strong winds.
- Apply touch-up coating or caulking (field-supplied) at the screw holes of the outdoor unit in order to prevent rusting.
- Even though the hood is stainless, salt or iron may cause rust. Be aware of this during installation or maintenance.
- The snow protection hood is heavy-weight. More than two people are required for installation. Be sure to wear protective equipment (such as gloves).
- The screws and the snow protection hood must be protected from scratches or scrapes. If they aren't, it may be the cause of rusting. Handle with care when the snow protection hood is installed and assembled.

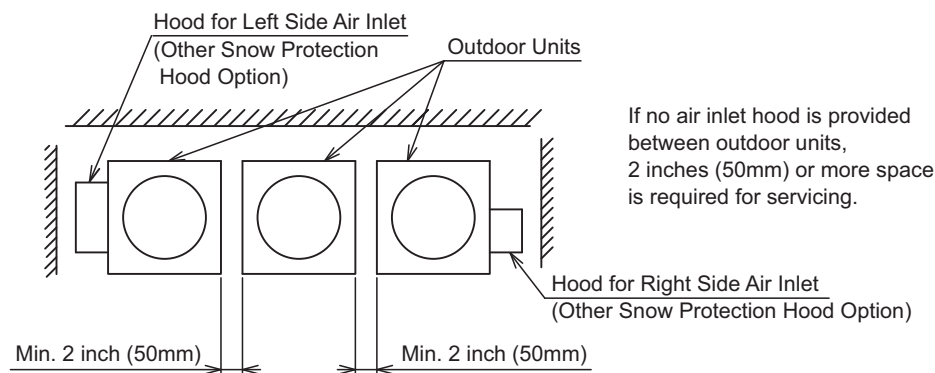
< Caulking Procedures (Example) >



3. Selection of Installation Location

- (1) Install the outdoor unit at a suitable height with consideration for snow accumulation. Increase the base height or additionally provide the frame under the unit (higher than snow accumulation), and fix the outdoor unit securely with anchor bolts.
- (2) Secure enough service space with consideration for snow accumulation height and snow removal operation.
- (3) There must be no obstacles in the air discharge direction.
- (4) Be sure to apply touch-up coating or caulking agent at the screw attaching portions for rustproofing.
- (5) In an instance of multiple outdoor units being installed, provide service space as shown below.



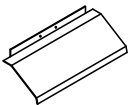



< Service Space for Multiple Outdoor Units Installation >



4. Before Installation

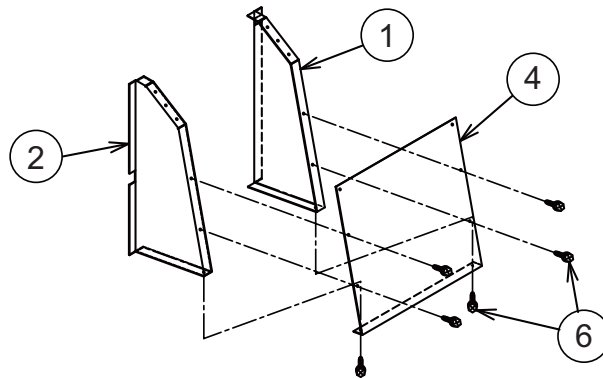
Check that all the following accessories are packed with the unit before installation.

Unit: inch (mm)

No.	Accessory		Qty.		Remarks
			ASG-TP20BAS1	ASG-TP20BBS1	
①	Right Side Plate		1	1	
②	Left Side Plate		1	1	
③	Faceplate (Top Side)		1	1	
④	Faceplate (Back Side)		1	1	
⑤	Screw (for Installation)	 M5 x 15/32L (12L) (tapping screw type B)	8 (2)	8 (2)	For installation: accepting burring TP hole (2): Spare
⑥	Screw (for Assembling)	 M5 x 9/16L (14L) (tapping screw type C)	17 (2)	18 (2)	For installation: accepting weld nut (2): Spare

5. Installation Procedures

- (1) Assemble the faceplate for the back side (④) with the right side plate (①) and left side plate (②), and tighten by using six screws for assembling (⑥).

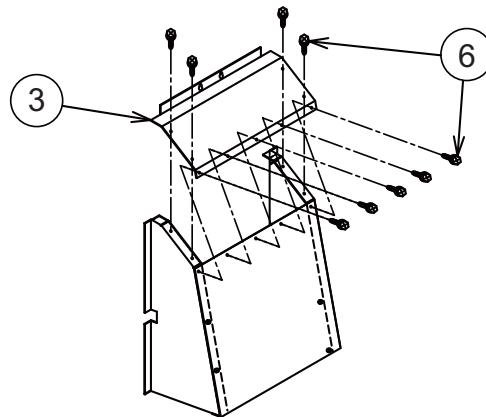


- (2) Fix the faceplate for the top side by tightening with screws for assembling.

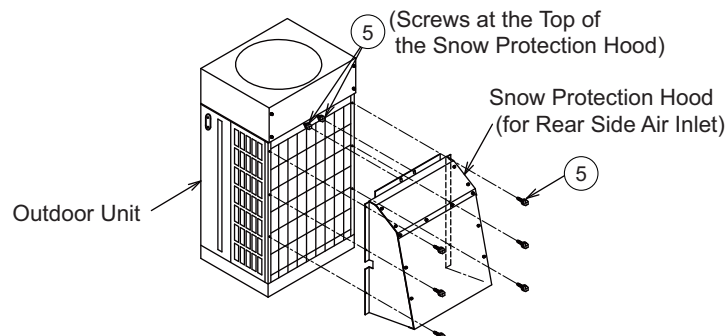
[Screws for Assembling (⑥)]

ASG-TP20BAS1: 9 places

ASG-TP20BBS1: 10 places



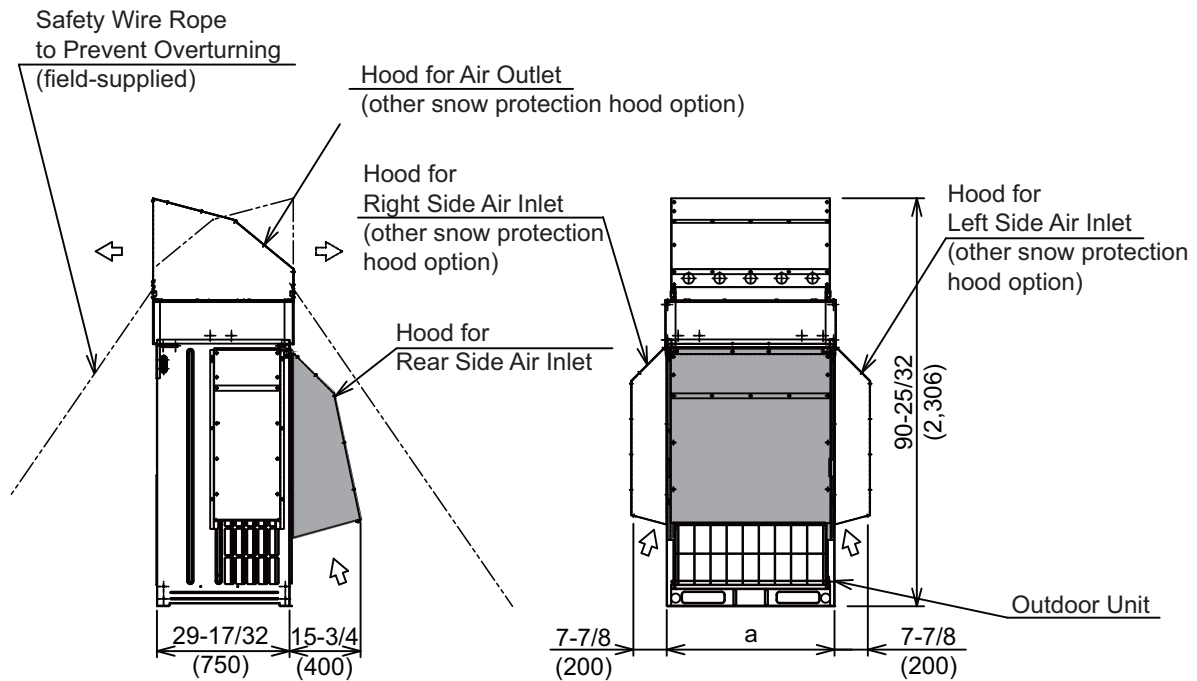
- (3) Tighten loosely two screws (for installation) at the top of the snow protection hood (⑤) to the outdoor unit, and set the snow protection hood (for rear side air inlet) to the outdoor unit. Tighten the other six screws (⑤) except for the top two screws, and finally tighten the top two screws securely.



6. Installation Appearance

Unit: inch (mm)

Dimension	a
Applicable Outdoor Unit	
(H,Y)VAH(P,R)072B(3,4)1S	37-5/16 (948)
(H,Y)VAH(P,R)096, 120B(3,4)1S (H,Y)VAHP072, 096B(3,4)1CW	47-5/8 (1,210)



Available Combinations

Applicable Outdoor Unit	Model	
	(H,Y)VAH(P,R)072B(3,4)1S	(H,Y)VAH(P,R)096, 120B(3,4)1S (H,Y)VAHP072, 096B(3,4)1CW
Hood for Air Outlet	ASG-TP20FAS1	ASG-TP20FBS1
Hood for Rear Side Air Inlet	ASG-TP20BAS1	ASG-TP20BBS1
Hood for Left Side Air Inlet	ASG-TP20LS2	
Hood for Right Side Air Inlet	ASG-TP20RS2	

NOTE:

This manual applies only to the combination indicated with .
For other snow protection hood options, refer to each installation manual.

7. Maintenance and Servicing

Even if during the warranty period, the snow protection hood becomes rusted under conditions that are caused by alkaline or corrosive moisture, recommendations are to provide salt damage resistance products to prevent such damage.

In order to prolong product life, perform periodical maintenance to prevent significant aging due to deterioration. Carry out the following periodical inspection and maintenance works in conjunction with air conditioners' inspection.

(1) Red Rust Generation and Coating Film Check

If red rust is generated, or coating film is peeled/cracked, scour the rust off or apply touch-up coating. When recoating such parts, be sure to grind the coating using sandpaper (#180 to 230) before re-applying coating agent. Wear protective equipment such as vinyl gloves when handling the coating agent to prevent contact with skin.

(2) Retightening Screws for Installation and Assembly

Check for loose screws and retighten when inspection and maintenance is performed. In order to prevent screw breakage, be sure to tighten with the following torques:

* M5 Tapping Screw Type C for Assembling ⑥: 2.6 ± 0.7 [lbf-ft] (3.5 ± 1.0 [N•m])

* M5 Tapping Screw Type B for Installation ⑤: 1.8 ± 0.7 [lbf-ft] (2.5 ± 1.0 [N•m])

• Snow Protection Hood (Right): ASG-TP20RS2

This snow protection hood prevents snow from entering the outdoor unit and prevents strong winds from blowing against the heat exchanger. Be sure to read this manual carefully for correct performance before installation work.

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- Johnson Controls cannot anticipate every possible circumstance that might involve a potential hazard.
- This kit is designed for a combination of Johnson Control air conditioners. Do not use this kit by itself or in combination with other companies' air conditioners.
- To hold the snow protection hood properly to the outdoor unit against the strong wind or earthquake, stay or safety wire rope shall be used for reinforced installation. Use the field-supplied safety wire rope to prevent outdoor unit from overturning.
- Perform a test run after installation to check for abnormalities.
- Signal words are used to identify levels of hazard seriousness. Definitions for identifying hazard levels are provided below with their respective 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.

1. Applicable Unit

Name	Hood for Right Side Air Inlet
Model	ASG-TP20RS2
Required Qty.	1
Applicable Outdoor Unit	(H,Y)VAH(P,R)072, 096, 120B(3,4)1S (H,Y)VAHP072, 096B(3,4)1CW

NOTE:

Applicable outdoor unit may be different depending on the product series. Be sure to confirm with the product catalogue before installation.

2. Installation Work

- (1) After the snow protection hood is installed, electromagnetic noise at the air outlet side may slightly increase. Therefore, it is necessary to carefully consider the air discharge direction when installed.
- (2) Be sure to tighten the snow protection hood securely to the top panel and side panel of the outdoor unit with the supplied screws (accessories). Not doing so may cause vibration or abnormal noise.
- (3) There must be no obstacles in the air discharge direction of the snow protection hood. If there are, it may cause a short circuit or an insufficient airflow rate.
- (4) Do not install other outdoor units in the direction of the air outlet. If the air blown out of the snow protection hood is sucked into the other outdoor unit, it may cause a malfunction of the unit.
- (5) The wind loads which the outdoor unit receives changes by attaching the snow protection hood. The required installation strength will also change in strong wind. Therefore, recheck the strength of the anchor bolts of the outdoor unit.
- (6) If the snow protection hood is installed, cooling/heating performance may be slightly lowered depending on the usage conditions.

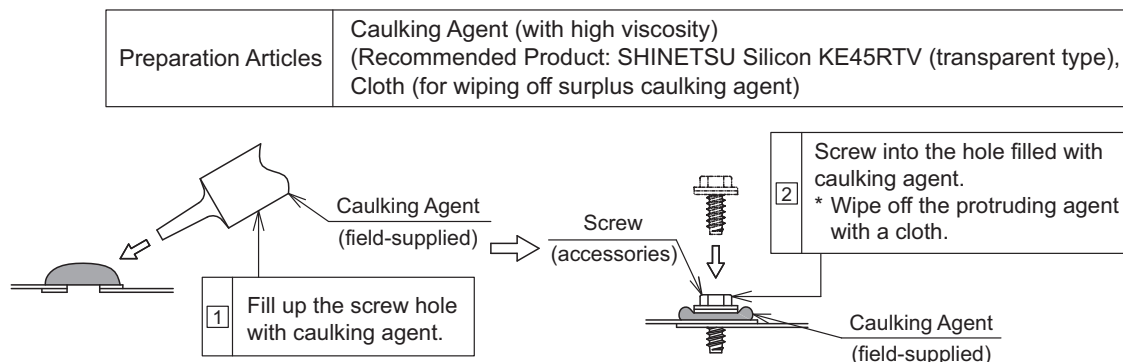
⚠ WARNING

To hold the snow protection hood properly to the outdoor unit against the strong wind or earthquake, stay or safety wire rope shall be used for reinforced installation. Use the field-supplied safety wire rope to prevent outdoor unit from overturning.

⚠ CAUTION

- Install the snow protection hood to avoid direct facing to the seasonal or strong wind.
- Apply touch-up coating or caulking at the screw holes of the outdoor unit in order to prevent rusting. (field-supplied)
- Even though the stainless, it may rust by contacting with salt or iron. Pay good attention when installation or maintenance.
- The snow protection hood is heavy-weight. More than two personnel are required for installation and be sure to wear the protective equipment (such as gloves).
- The screws and the snow protection hood must be protected from scratch or scrape. If not, it may cause of rusting. Handle with care when the snow protection hood is installed and assembled.

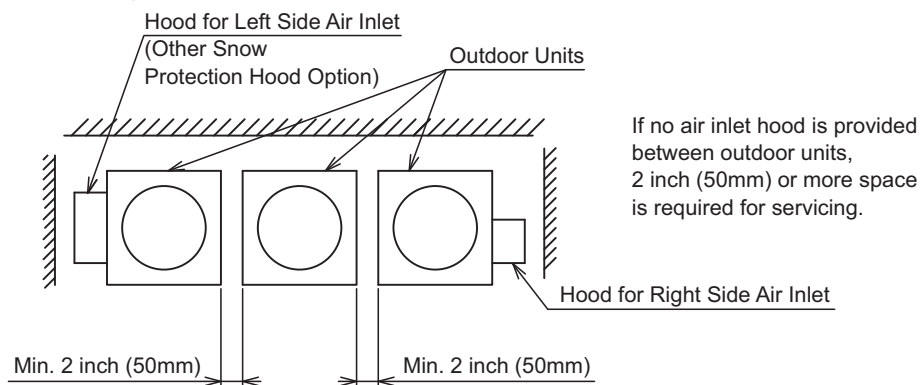
< Caulking Procedures (Example) >



3. Selection of Installation Place

- (1) Install the outdoor unit at the suitable height with consideration for snow accumulation. Increase the base height or additionally provide the frame under the unit (higher than snow accumulation), and fix the outdoor unit securely with anchor bolts.
- (2) Secure enough service space with consideration for snow accumulation height and snow removal operation.
- (3) There must be no obstacles in the air discharge direction.
- (4) Be sure to apply touch-up coating or caulking agent at the screw attaching portions for rustproofing.
- (5) In case of multiple outdoor units installation, provide the service space as shown below.


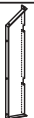
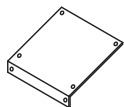



< Service Space for Multiple Outdoor Units Installation >



4. Before Installation

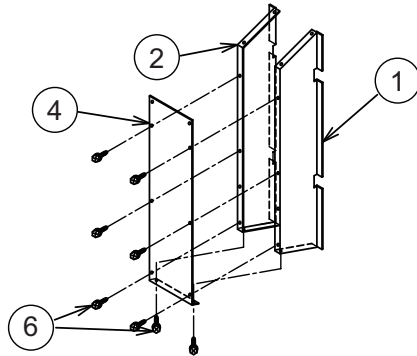
Check that all the following accessories are packed with the unit before installation.

Unit: inch (mm)

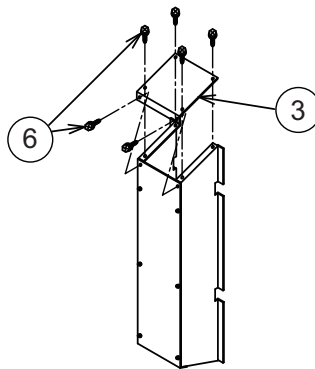
No.	Accessory		Qty.	Remarks
			ASG-TP20RS2	
①	Right Side Plate		1	
②	Left Side Plate		1	
③	Faceplate (Top Side)		1	
④	Faceplate (Back Side)		1	
⑤	Screw (for Installation)	 M5 x 15/32L (12L) (tapping screw type B)	8 (2)	For installation: accepting burring TP hole (2): Spare
⑥	Screw (for Assembling)	 M5 x 9/16L (14L) (tapping screw type C)	16 (2)	For installation: accepting weld nut (2): Spare

5. Installation Procedures

- (1) Tighten the faceplate (back side) ((4)) with the right side plate ((1)) and left side plate ((2)) together (8 places) by using screws for assembling ((6)).



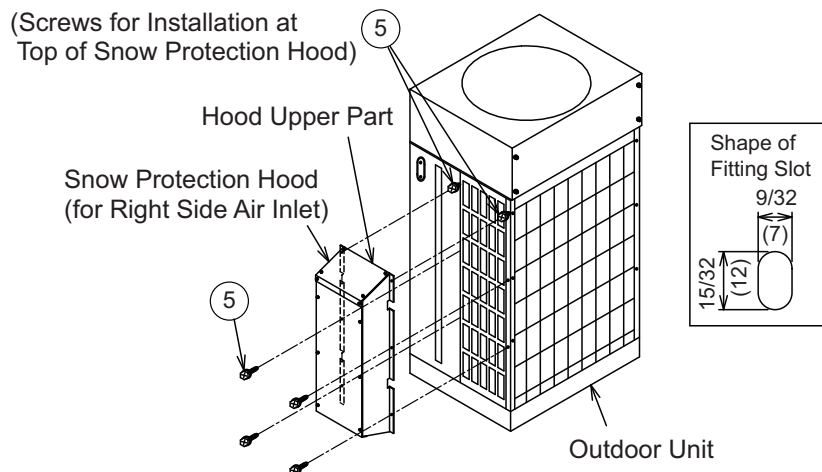
- (2) Tighten the faceplate (top side) ((3)) (6 places) by using screws for assembling ((6)).



- (3) Tighten loosely two screws (for installation) at the top of the snow protection hood ((5)) to the outdoor unit, and set the snow protection hood (for right side air inlet) to the outdoor unit. Tighten the other four screws ((5)) except for the top two screws, and finally tighten the top two screws securely.

NOTE:

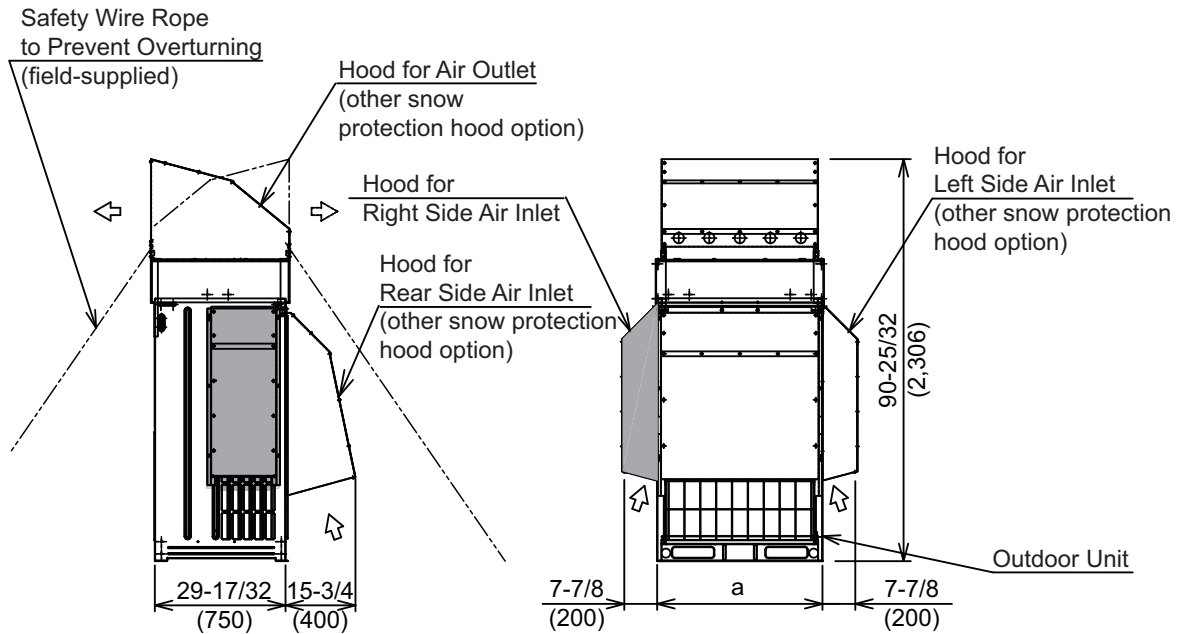
The fitting slots for the hood are adjustable with the securing positions within $\pm 1/8$ inch ($\pm 3\text{mm}$). For hood installation, there must be no gap between the outdoor unit top plate and the hood upper part. If there is a gap, ice may form inside the hood.



6. Installation Appearance

Unit: inch (mm)

Dimension	a
Applicable Outdoor Unit	
(H,Y)VAH(P,R)072B(3,4)1S	37-5/16 (948)
(H,Y)VAH(P,R)096, 120B(3,4)1S (H,Y)VAHP072, 096B(3,4)1CW	47-5/8 (1,210)



Available Combinations

Applicable Outdoor Unit	Model	
	(H,Y)VAH(P,R)072B(3,4)1S	(H,Y)VAH(P,R)096, 120B(3,4)1S (H,Y)VAHP072, 096B(3,4)1CW
Hood for Air Outlet	ASG-TP20FAS1	ASG-TP20FBS1
Hood for Rear Side Air Inlet	ASG-TP20BAS1	ASG-TP20BBS1
Hood for Left Side Air Inlet	ASG-TP20LS2	
Hood for Right Side Air Inlet	ASG-TP20RS2	

NOTE:

This manual applies only to the combination indicated with .
For other snow protection hood options, refer to each installation manual.

7. Maintenance and Servicing

Even if during the warranty period, the snow protection hood may be rust under the salt damage or rusty conditions (such a place that acid-, alkaline- or corrosive moisture is always filled with). It is recommended to provide the salt damage-resistance/serious salt damage-resistance products (made-to-order) if the snow protection hood is used under such condition.

In order to prolong the product life, perform the periodical maintenance to prevent significant aging due to the deterioration. Carry out the following periodical inspection and maintenance works in conjunction with air conditioners' inspection.

(1) Red Rust Generation and Coating Film Check

If red rust is generated, or coating film is peeled/cracked, scour the rust off or apply touch-up coating. When re-coat such portions afterwards, be sure to grind the coating by sandpapers (#180 – 230) before applying coating agent. The coating agent may give bad effects to your skin. Wear the protective equipment such as vinyl gloves when handling coating agent to prevent contacting with skin.

(2) Retightening Screws for Installation and Assembly

Check for loose screws and retighten when inspection and maintenance is performed. In order to prevent screw breakage, be sure to tighten with the following torques:

* M5 Tapping Screw Type C for Assembling ⑥: 2.6 ± 0.7 [lbf-ft] (3.5 ± 1.0 [N•m])

* M5 Tapping Screw Type B for Installation ⑤: 1.8 ± 0.7 [lbf-ft] (2.5 ± 1.0 [N•m])

• Snow Protection Hood (Left): ASG-TP20LS2

This snow protection hood prevents snow from entering the outdoor unit and prevents a strong wind from blowing against the heat exchanger. Be sure to read this manual carefully for correct performance before installation work.

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- This kit is designed for a combination of Johnson Control air conditioners. Do not use this kit by itself or in combination with other companies' air conditioners.
- To hold the snow protection hood properly to the outdoor unit against the strong wind or earthquake, stay or safety wire rope shall be used for reinforced installation. Use the field-supplied safety wire rope to prevent outdoor unit from overturning.
- Perform a test run after installation to check for abnormalities.
- Signal words are used to identify levels of hazard seriousness. Definitions for identifying hazard levels are provided below with their respective signal words.

WARNING

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CAUTION

: Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

1. Applicable Unit

Name	Hood for Left Side Air Inlet
Model	ASG-TP20LS2
Required Qty.	1
Applicable Outdoor Unit	(H,Y)VAH(P,R)072, 096, 120B(3,4)1S (H,Y)VAHP072, 096B(3,4)1CW

NOTE:

The applicable outdoor unit may be different depending on the product series. Be sure to confirm with the product catalogue before installation.

2. Installation Work

- (1) After the snow protection hood is installed, electromagnetic noise at the air outlet side may slightly increase. Therefore, it is necessary to carefully consider the air discharge direction when installed.
- (2) Be sure to tighten the snow protection hood securely to the top panel and side panel of the outdoor unit with the supplied screws (accessories). Not doing so may cause vibration or abnormal noise.
- (3) There must be no obstacles in the air discharge direction of the snow protection hood. If there are, it may cause a short circuit or an insufficient airflow rate.
- (4) Do not install other outdoor units in the direction of the air outlet. If the air blown out of the snow protection hood is sucked into the other outdoor unit, it may cause a malfunction of the unit.
- (5) The wind loads which the outdoor unit receives changes by attaching the snow protection hood. The required installation strength will also change in strong wind. Therefore, recheck the strength of the anchor bolts of the outdoor unit.
- (6) If the snow protection hood is installed, cooling/heating performance may be slightly lowered depending on the usage conditions.

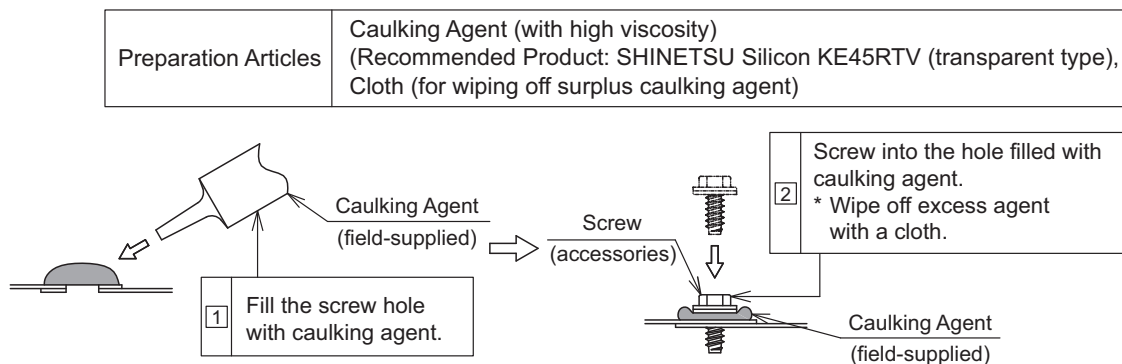
⚠ WARNING

To hold the snow protection hood properly to the outdoor unit against a strong wind or an earthquake, safety wire rope should be used for reinforced installation. Use the field-supplied safety wire rope to prevent the outdoor unit from overturning.

⚠ CAUTION

- Install the snow protection hood so as to avoid facing directly toward seasonal or strong winds.
- Apply touch-up coating or caulking (field-supplied) at the screw holes of the outdoor unit in order to prevent rusting.
- Even though the hood is stainless, salt or iron may cause rust. Be aware of this during installation or maintenance.
- The snow protection hood is heavy-weight. More than two people are required for installation. Be sure to wear protective equipment (such as gloves).
- The screws and the snow protection hood must be protected from scratches or scrapes. If they aren't, it may be the cause of rusting. Handle with care when the snow protection hood is installed and assembled.

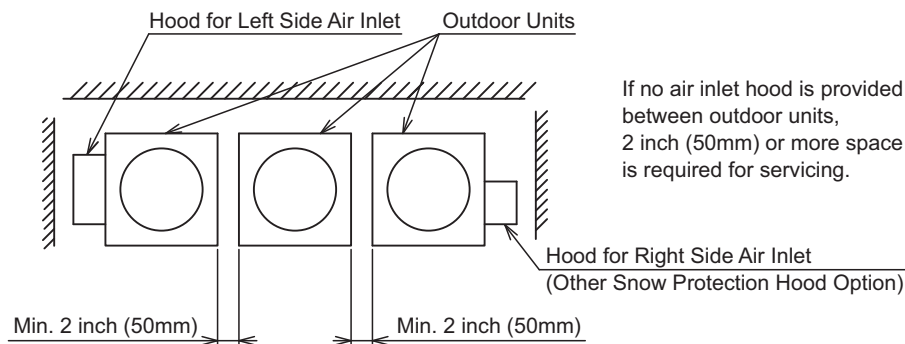
< Caulking Procedures (Example) >



3. Selection of Installation Location

- (1) Install the outdoor unit at a suitable height with consideration for snow accumulation. Increase the base height or additionally provide the frame under the unit (higher than snow accumulation), and fix the outdoor unit securely with anchor bolts.
- (2) Secure enough service space with consideration for snow accumulation height and snow removal operation.
- (3) There must be no obstacles in the air discharge direction.
- (4) Be sure to apply touch-up coating or caulking agent at the screw attaching portions for rustproofing.
- (5) In an instance of multiple outdoor units being installed, provide service space as shown below.


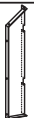
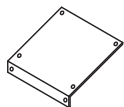



< Service Space for Multiple Outdoor Units Installation >



4. Before Installation

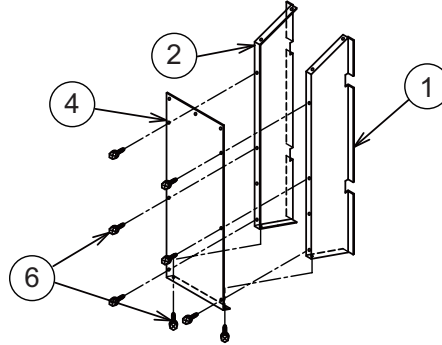
Check that all the following accessories are packed with the unit before installation.

Unit: inch (mm)

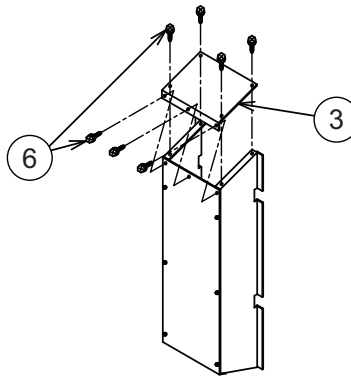
No.	Accessory		Qty.	Remarks
			ASG-TP20LS2	
①	Right Side Plate		1	
②	Left Side Plate		1	
③	Faceplate (Top Side)		1	
④	Faceplate (Back Side)		1	
⑤	Screw (for Installation)	 M5 x 15/32L (12L) (tapping screw type B)	8 (2)	For installation: accepting burring TP hole (2): Spare
⑥	Screw (for Assembling)	 M5 x 9/16L (14L) (tapping screw type C)	17 (2)	For installation: accepting weld nut (2): Spare

5. Installation Procedures

- (1) Tighten the faceplate (back side) (④) with the right side plate (①) and left side plate (②) together (8 places) by using screws for assembling (⑥).



- (2) Tighten the faceplate (top side) (③) (7 places) by using screws for assembling (⑥).

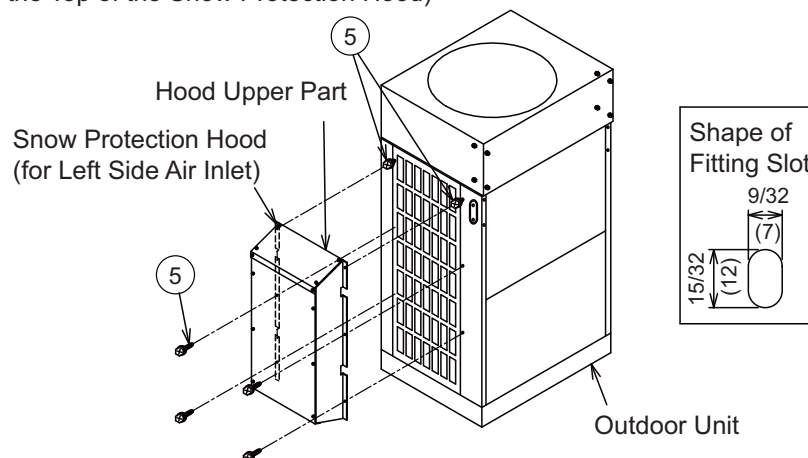


- (3) Tighten loosely two screws (for installation) at the top of the snow protection hood (⑤) to the outdoor unit, and set the snow protection hood (for left side air inlet) to the outdoor unit. Tighten the other four screws (⑤) except for the top two screws, and finally tighten the top two screws securely.

NOTE:

The fitting slots for the hood are adjustable in its fixing position within $\pm 1/8$ inch ($\pm 3\text{mm}$). For hood installation, there must be no gap between the outdoor unit top plate and the hood upper part. If there is a gap, ice may form inside the hood.

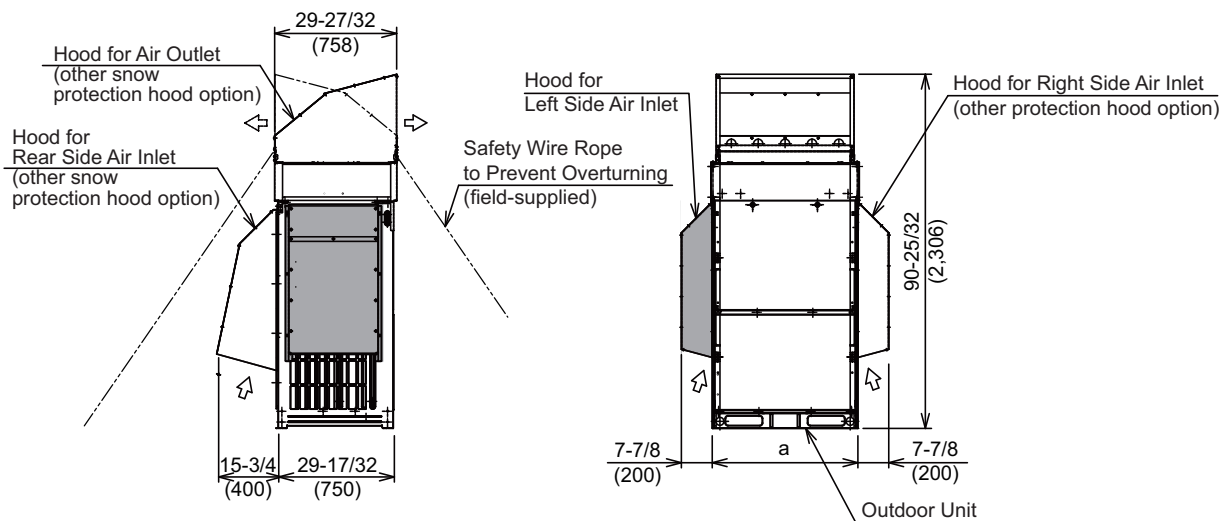
(Screws for Installation at
the Top of the Snow Protection Hood)



6. Installation Appearance

Unit: inch (mm)


Dimension	a
Applicable Outdoor Unit	
(H,Y)VAH(P,R)072B(3,4)1S	37-5/16 (948)
(H,Y)VAH(P,R)096, 120B(3,4)1S (H,Y)VAHP072, 096B(3,4)1CW	47-5/8 (1,210)



Available Combinations

Applicable Outdoor Unit	Model	
	(H,Y)VAH(P,R)072B(3,4)1S	(H,Y)VAH(P,R)096, 120B(3,4)1S (H,Y)VAHP072, 096B(3,4)1CW
Hood for Air Outlet	ASG-TP20FAS1	ASG-TP20FBS1
Hood for Rear Side Air Inlet	ASG-TP20BAS1	ASG-TP20BBS1
Hood for Left Side Air Inlet	ASG-TP20LS2	
Hood for Right Side Air Inlet	ASG-TP20RS2	

NOTE:

This manual applies only to the combination indicated with .
For other snow protection hood options, refer to each installation manual.

7. Maintenance and Servicing

Even if during the warranty period, the snow protection hood becomes rusted under conditions that are caused by alkaline or corrosive moisture, recommendations are to provide salt damage resistance products to prevent such damage.

In order to prolong product life, perform periodical maintenance to prevent significant aging due to deterioration. Carry out the following periodical inspection and maintenance works in conjunction with air conditioners' inspection.

(1) Red Rust Generation and Coating Film Check

If red rust is generated, or coating film is peeled/cracked, scour the rust off or apply touch-up coating. When recoating such parts, be sure to grind the coating using sandpaper (#180 to 230) before re-applying coating agent. Wear protective equipment such as vinyl gloves when handling the coating agent to prevent contact with skin.

(2) Retightening Screws for Installation and Assembly

Check for loose screws and retighten when inspection and maintenance is performed. In order to prevent screw breakage, be sure to tighten with the following torques:

- * M5 Tapping Screw Type C for Assembling ⑥: 2.6 ± 0.7 [lbf-ft] (3.5 ± 1.0 [N•m])
- * M5 Tapping Screw Type B for Installation ⑤: 1.8 ± 0.7 [lbf-ft] (2.5 ± 1.0 [N•m])

1.2.1.4 Toppling Prevention Tool: ASG-SW20A

This Toppling Prevention Tool is to prevent the outdoor unit from overturning by strong winds or an earthquake (when the Snow Protection Hood is attached). Install it as instructed in this manual.

IMPORTANT NOTICE:

- Read and understand this manual before using this Toppling Prevention Tool.
- Perform the test run after installation to check for abnormalities.
- Forward this information to the building owner and request that they maintain all the equipment manuals.
- Signal words are used to identify levels of hazard seriousness.
Definitions for identifying hazard levels are provided below with their respective signal words.



: Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

1. Applicable Unit

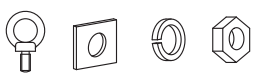
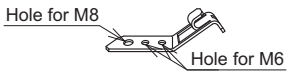


Name	Toppling Prevention Tool	
Model	ASG-SW20A	
Required Qty.	1	1
Applicable Outdoor Unit	Top Flow Type 72,000 to 120,000 Btu/h	Side Flow Type 36,000 to 60,000 Btu/h

NOTE:

The applicable outdoor unit may be different depending on the product series. Be sure to confirm with the product catalog before installation.

2. Before Installation

Check that all the following accessories are packed with the unit before installation.

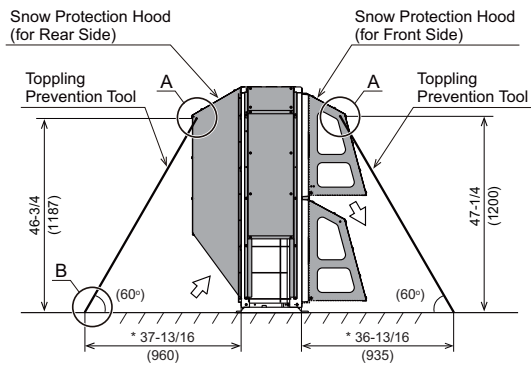
No.	Accessory		Qty.
①	Eyebolt (SUS, M6)	 (with Square Washer, Spring Washer and Nut)	4 sets for each
②	Securing Plate (SUS)		4
③	Wire (SUS)	 $\phi 1/16$ inch (2mm) x 66 ft (20m)	1
④	Fastening Fitting		8

3. Installation Procedures

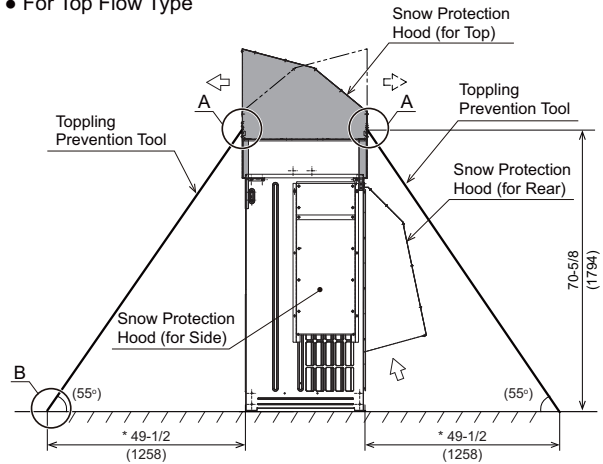
- (1) Refer to figure A below and attach the eyebolt (①) to the $\phi 5/16$ inch (8mm) hole on the lower part of the Snow Protection Hood.
- (2) Tighten the securing plate (②) to the foundation with the anchor bolt for assembling.
Refer to figure B below and tighten the anchor bolt.
Insert the wire (③) to the fastening fitting (④) in the tightening direction.
Pull the wire with pliers and adjust it to be tight and securely hold the unit in place.
- (3) Cut the extra length of the wire with cutting pliers after adjustment.

Unit: inch (mm)

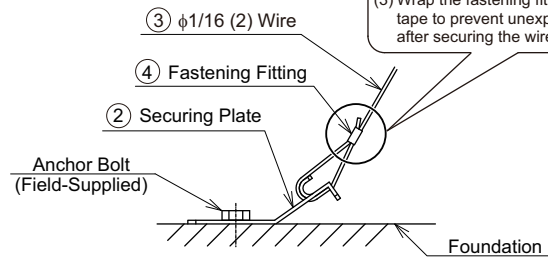
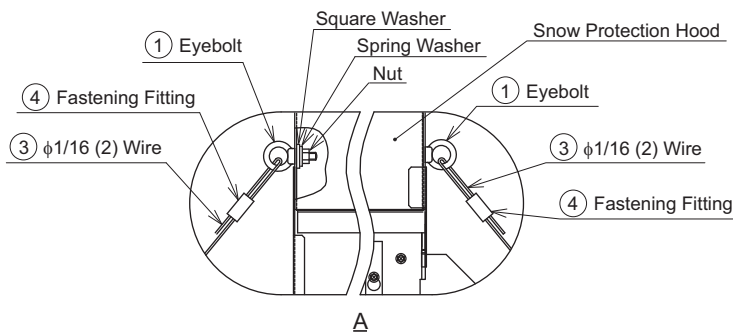
• For Side Flow Type



• For Top Flow Type



* The estimated dimensions of installation with a recommended wire angle.



The arrow indicates the insert direction of the wire

Pull the lever to disengage locking mechanism to adjust wire tension. Re-engage lever after proper tension.

< Caution for Installation >

- (1) To prevent split wire edge, wrap up the wire with plastic tape when cutting for length adjustment.
- (2) It may be difficult to unlock the fastening fitting while applying tension to the wire. Pay attention for sudden change in wire tension when unlock the fastening fitting.
- (3) Wrap the fastening fitting with plastic tape to prevent unexpected unlocking after securing the wire position.

1.2.1.5 Seismic Kit: SSK-TP10A

During an earthquake this Seismic Kit prevents destruction or damage to the outdoor unit by improving its strength and fracture toughness.

IMPORTANT NOTICE:

- Johnson Controls pursues a policy of continuous improvement in design and performance of products. We reserve the right to vary specifications without notice.
- No part of this manual may be reproduced without Johnson Controls' written permission.
- Keep this manual for future reference.
- Johnson Controls cannot anticipate every possible circumstance that might involve a potential hazard.
- This kit is designed for a combination of Johnson Control air conditioners. Do not use this kit by itself or in combination with other companies' air conditioners.
- Read and understand this manual before using this Seismic Kit.
- Be sure to follow this "Important Notice" related to safety.
- Perform a test run after installation to check for abnormalities.
- Signal words are used to identify levels of hazard seriousness. Definitions for identifying hazard levels are provided below with their respective signal words.



: Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

1. Applicable Unit

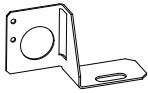
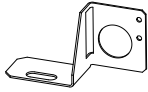



Name	Seismic Kit
Model	SSK-TP10A
Required Qty.	x 1
Applicable Outdoor Unit	(H,Y)VAHP***B(3,4)1S (H,Y)VAHR***B(3,4)1S (H,Y)VAHP***B(3,4)1CW

2. Installation Work

- (1) Be sure to use supplied bolts and secure them when you install the Seismic Kit to the outdoor unit.
- (2) The additional service space is required to install the Seismic Kit.

3. Before Installation

Check that all the following accessories are packed with the unit before installation.

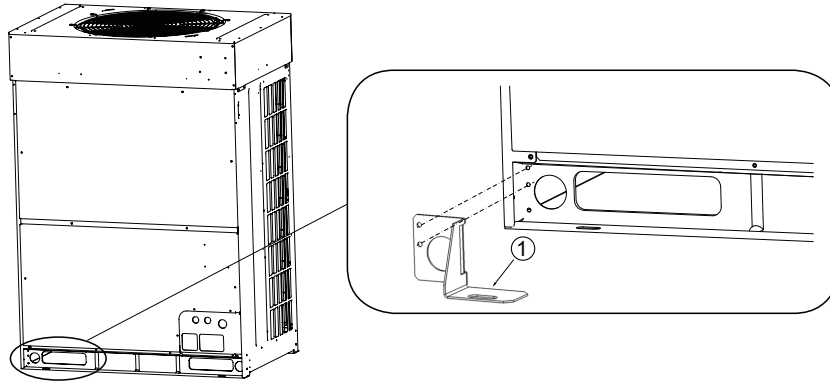
No.	Accessory		Qty.	Remarks
①	Left Support		2	
②	Right Support		2	
③	Washer		4 (1)	(1): Spare
④	Bolt (M5)		8 (2)	(2): Spare
⑤	Nut (M5)		8 (2)	(2): Spare

4. Seismic Kit Installation Procedures

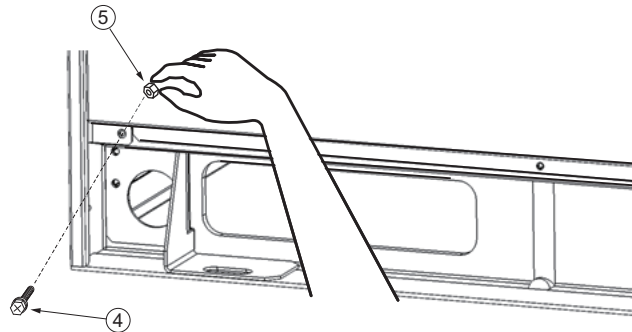
After confirming the outdoor unit model, install the Seismic Kit according to the following procedures. Install the Seismic Kit securely with the supplied bolts. If you don't tighten the bolts well enough, the unit may vibrate. If you screw the bolts too tightly, you may damage the bolt threads.

[for Front Left]

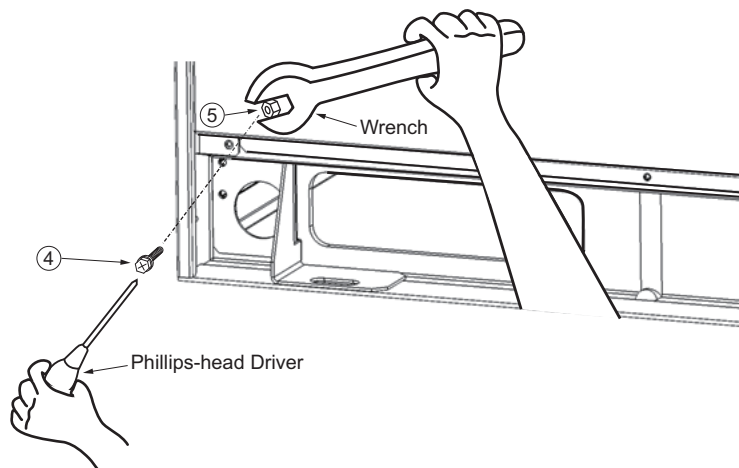
- (1) Adjust the installation hole position of the left support (①) to the outdoor unit bottom base.



- (2) Attach the left support (①) to the outdoor unit with bolts (④) through the installation hole. Put a hand into the square hole on the outdoor unit bottom base to temporarily fasten the bolt and the nut (⑤) (two portions).



- (3) The nut (⑤) with an adjustable wrench or etc., then securely tighten the bolt (④) with a Phillips-head driver from the front of the outdoor unit (two portions).

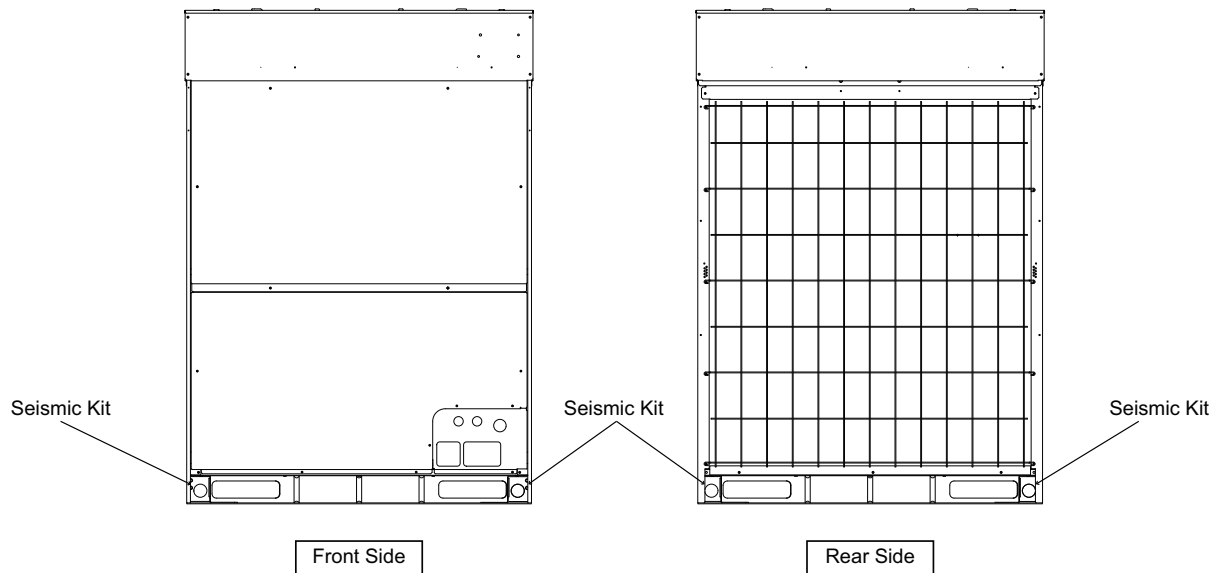


- (4) Install the left support (①) to the back left of the outdoor unit bottom base and the right support (②) to the front and back right of the outdoor unit bottom base.

NOTE:

The washer (③) included with this product is for the outdoor unit's installation. Stick the washer (③) to the outdoor unit with duct tape or keep the washer (③) in the outdoor unit accessory bag.

5. Installation Appearance



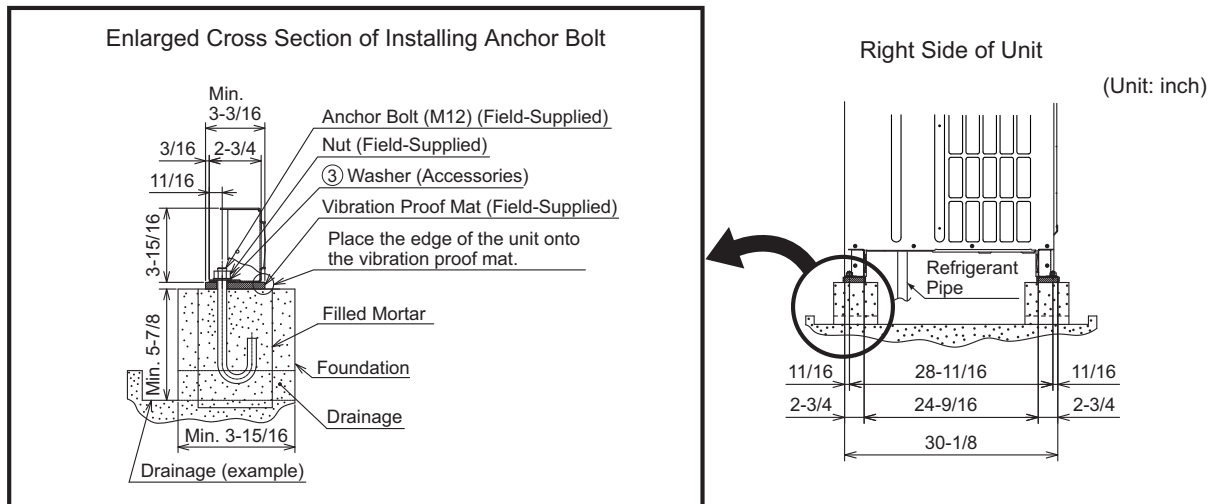
6. Outdoor Unit Installation Procedure

CAUTION

Install the Seismic Kit to the outdoor unit before you install the outdoor unit at the site. Install the outdoor unit with an anchor bolt (M12) attached at the installation position with the nut (M12) through the washer (③). Fasten the bolt tightly.

NOTE:

To secure the earthquake-resistant strength of the outdoor unit, use the washer (③) for the installation. Refer to the "Outdoor Unit Installation Manual" to the installation work.



1.2.2 Piping Kit

- Table of Contents -

1.2.2.1 Piping Connection Kit

 • MC-NP20A1, MC-NP30A11-120

1.2.2.2 Multi-Kit (Line Branch)

 • MW-NP282A2, MW-NP452A2, MW-NP692A2, MW-NP902A21-130

1.2.2.3 Multi-Kit (Header Branch)

 • MH-NP224A, MH-NP288A.....1-139

1.2.2.1 Piping Connection Kit

• MC-NP20A1, MC-NP30A1

1. Applicable Outdoor Units

These multiple piping connecting kits can be applied to the R410A VRF systems.

2. Transportation

Transport this product as close to the installation site as is practical before unpacking. Do not discard any foam packaging as it is used as insulation for the joint kits after pressure testing is complete



Important Notice

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

Signal Words

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

General Precautions

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

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

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

- Be careful that moisture, dust, or variant refrigerant compounds not enter the refrigerant cycle during installation work. Foreign matter could damage internal components or cause blockages.
- If air filters are required on this unit, do not operate the unit without the air filter set in place. If the air filter is not installed, dust may accumulate and breakdown may result.
- Do not install this unit in any place where silicon gases can coalesce. If the silicon gas molecules attach themselves to the surface of the heat exchanger, the finned surfaces will repel water. As a result, any amount of drainage moisture condensate can overflow from the drain 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.

INSTALLATION

- When a wireless controller is used, locate at a distance of at least 3.3 ft. (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 drain 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



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

- When installing the unit into...
 - A wall: Make sure the wall is strong enough to hold the unit's weight. It may be necessary to construct a strong wood or metal frame to provide added support.
 - A room: Properly insulate any refrigerant tubing run inside a room to prevent "sweating" that can cause dripping and water damage to wall and floors.
 - Moist 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.
 - 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 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 a fire, oil, steam or powder can directly enter the unit, such as nearby or 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 drain 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 drainpipe is installed incorrectly, water leakage and damage to the ceiling, floor, furniture, or other possessions may result. If the condensate piping becomes clogged, water may drip from the indoor unit. Do not install the indoor unit where such dripping can cause moisture damage or uneven locations: Use a raised concrete pad or concrete blocks to provide a solid, level foundation for the unit to prevent water damage and abnormal vibration.
- Before performing any brazing work, be sure that there are no flammable materials or open flames nearby.
- Perform a test run to ensure normal operation. Safety guards, shields, barriers, covers, and protective devices must be in place while the compressor/unit is operating. During the test run, keep fingers and clothing away from any moving parts.
- Clean up the site when finished, remembering to check that no metal scraps or bits of wiring have been left inside the unit being installed.

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

Refrigerant Precaution

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 injury or death.
- If installed in a small room, take measures to prevent the refrigerant from exceeding the maximum allowable concentration in the event that refrigerant gases should escape. Refrigerant gases can cause asphyxiation (0.026lbs/ft³ (0.42 kg/m³) based on ISO 5149 for R410A). Consult with your distributor for countermeasures (ventilation system and so on). If refrigerant gas has leaked during the installation work, ventilate the room immediately.
- 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.
- A compressor/unit comprises a pressurized system. Never loosen threaded joints while the system is under pressure and never open pressurized system parts.
- When maintaining, relocating, and disposing of the unit, dismantle the refrigerant piping after the compressor stops.

Electrical Precautions

WARNING

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

- Highly dangerous electrical voltages are used in this system. Carefully refer to the wiring diagram and these instructions when wiring. Improper connections and inadequate grounding can cause serious injury or death.
- 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.
- Communication cabling shall be a minimum of AWG18 (0.82mm²), 2-Conductor, Stranded Copper. Shielded cable must be considered for applications and routing in areas of high EMI and other sources of potentially excessive electrical noise to reduce the potential for communication errors. When shielded cabling is applied, proper bonding and termination of the cable shield is required as per Johnson Controls guidelines. Plenum and riser ratings for communication cables must be considered per application and local code requirements.
- Use an exclusive power supply for the air conditioner at the unit's rated voltage.
- Be sure to install circuit breakers (ground fault interrupter, isolating switch, molded case circuit breaker and so on), with the specified capacity. Ensure that the wiring terminals are tightened securely to recommended torque specifications.
- Clamp electrical wires securely with a cord clamp after all wiring is connected to the terminal block. In addition, run wires securely through the wiring access channel.

INSTALLATION

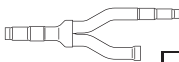
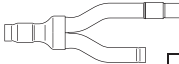
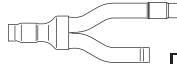
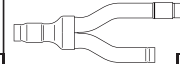
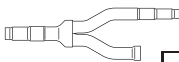
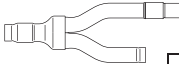
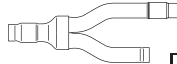
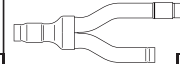
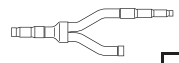
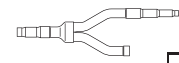
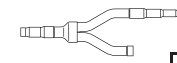
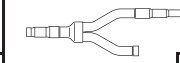












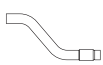





















- When installing the power lines, do not apply tension to the cables. Secure the suspended cables at regular intervals, but not too tightly.
- Make sure that the terminals do not come into contact with the surface of the electrical box. If the terminals are too close to the surface, it may lead to failures at the terminal connection.
- Turn OFF and disconnect the unit from the power source when handling the service connector. Do not open the service cover or access panel to the indoor or outdoor units without turning OFF the main power supply.
- After stopping operation, be sure to wait at least five minutes before turning off the main power switch. Otherwise, water leakage or electrical breakdown may result. Disconnect the power source completely before attempting any maintenance for electrical parts. Check to ensure that no residual voltage is present after disconnecting the power source.
- Do not clean with, or pour water into, the controller as it could cause electric shock and/or damage the unit. Do not use strong detergent such as a solvent. Clean with a soft cloth.
- Check that the ground wire is securely connected. Do not connect ground wiring to gas piping, water piping, lighting conductor, or telephone ground wiring.
- If a circuit breaker or fuse is frequently activated, shut down the system and contact your service contractor.

CAUTION

Do not place any material on this product

3. Before Installation

IMPORTANT! Confirm the number of the following parts kit by referencing the model number printed on the package before opening. Do NOT intermix any foreign objects within this kit. Verify that no foreign objects are present inside any kit components prior to installation.

Name of Parts		MC-NP20A1	MC-NP21A1	MC-NP30A1				
		 Qty.	 Qty.	Piping Connection Kit 1		Piping Connection Kit 2		
				 Qty.		 Qty.		
Branch Pipe for High/Low Pressure Gas Line		 1	 1	 1		 1		
Branch Pipe for Liquid Line		 1	 1	 1		 1		
Accessory	Insulation for High/Low Pressure Gas Line	 1 set	 1 set	 1 set		 1 set		
	Insulation for Liquid Line	 1 set	 1 set	 1 set		 1 set		
	Reducer for High/Low Pressure Gas Line Connection (For Connecting Pipe (Field-Supplied))	 1	 1	 1		 1		
		 1	 1	 1		 1		
		 1	 1	 1		 1		
		- None	 1	 2	 1	 1	 2	
	Reducer for Liquid Line Connection (For Connecting Pipe (Field-Supplied))	 1	 1	 1		 1		
		 1	- None	- None		- None		
	Tape		 2	 2	 2		 2	

NOTE:

If any of these parts are missing, please contact your distributor. Do not discard any foam packaging as it is used as insulation for the joint kits after pressure testing is complete.

4. Installation Work

4.1 Piping Connection Size

The ends of the multi-kits are finished as shown in the following figures. Cut the end of the pipe to correspond with the pipe size.

CAUTION

Allow adequate space for elbow, angled, and irregular piping arrangements to compensate for expansion and contraction brought on by temperature change.

INSTALLATION

Model	Branch Pipe for High/Low Pressure Gas Line	Branch Pipe for Liquid Line	Reducer for High/Low Pressure Gas Line	Reducer for Liquid Line
MC-NP20A1				
MC-NP21A1				
MC-NP30A1	Piping Connection Kit 1 	Piping Connection Kit 2 		
	Piping Connection Kit 2 			

Unit: inch, ID: Inner Diameter, OD: Outer Diameter

(※): When installing the “Branch Pipe for High/Low Pressure Gas Line” for “Piping Connection Kit 2”, install “Long Reducer” at “To Piping Connection Kit 1” side of “Piping Connection Kit 2”. Otherwise, it could result in abnormal oil distribution between each of the outdoor units.

4.2 Installation Position

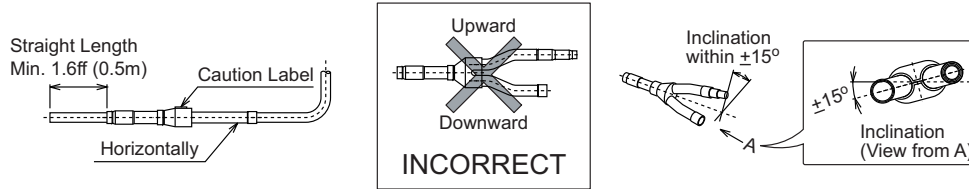
• Horizontal Installation

Locate the branch pipes to become the “Y” union pipe section with the affixed caution label.

(Inclination within $\pm 15^\circ$)

Make the straight section a minimum of 1.6ft (0.5m) after the vertical bend.

Incorrect installation can result in the failure of the outdoor unit.



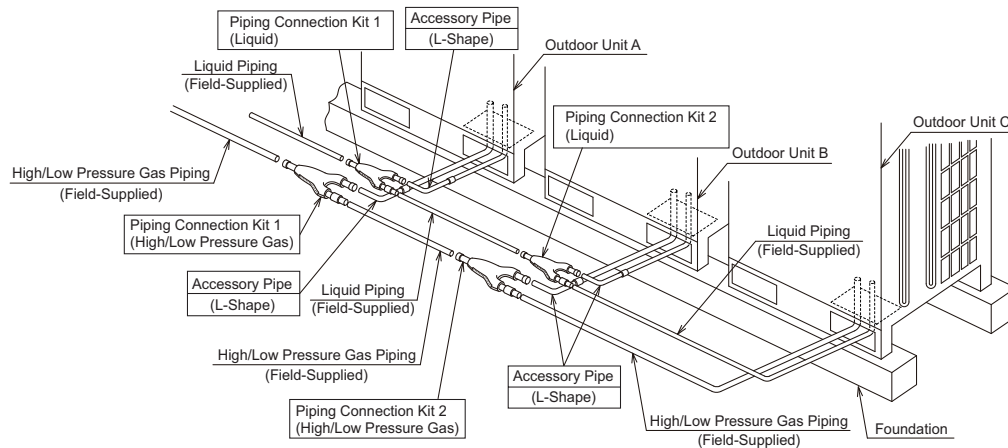
4.3 Piping Connection

Perform piping connections work by referring to the figure below.

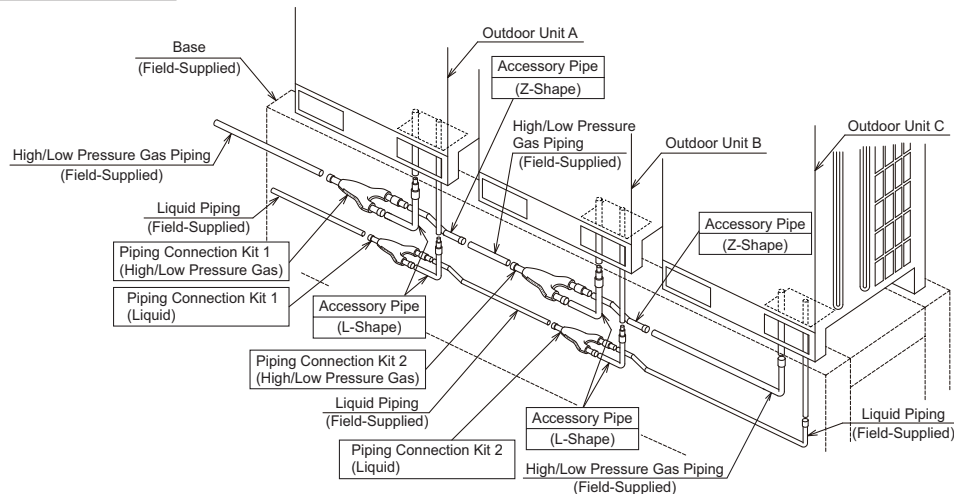
Refer to the installation and maintenance manual for outdoor units for piping length between outdoor units and between piping connection kits.

Example: Combination of three Outdoor Units

Front Side or Rear Side Piping Connection



Downward Piping Connection



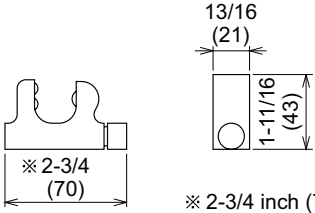
NOTE:

Use the field-supplied connecting pipe in accordance with the installation and maintenance manual for the outdoor units. If necessary, use a reducer (accessory).

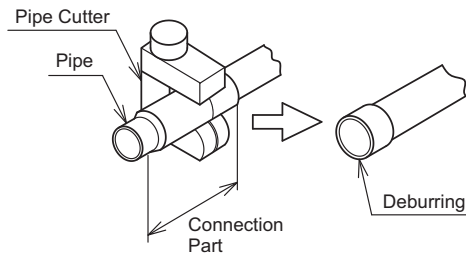
INSTALLATION

4.4 Piping Work

- When the branched pipe size is 7/8 inch (22.2mm) or less in inner diameter, a field-supplied mini-pipe cutter is required.

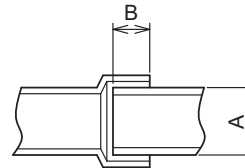
		inch (mm)	
Recommended Mini-Pipe Cutter	Available Cut Size	Rotating Radius	
	3/16 - 1-1/8 (5 - 29)	2 inches (51)	

- Use clean copper piping with no dust or moisture on internal surfaces present. When connecting refrigerant piping, cut copper pipes with a pipe cutter as shown below. Blow-out the pipes with nitrogen or compressed air to remove any dust or metal filings. Do not use a saw or a grindstone which can leave behind large amounts of filings and cutting residue.

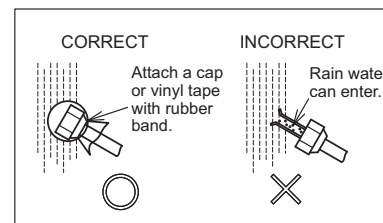
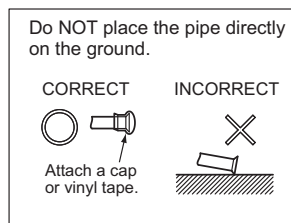
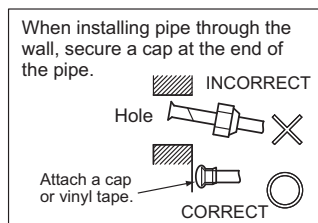


- When cutting the pipe, allow for an adequate depth for brazing as shown in the following table.

inch (mm)	
Diameter (A)	Min. Insertion Depth (B)
$3/16 \leq A < 5/16$ (5 ≤ A < 8)	1/4 (6)
$5/16 \leq A < 15/32$ (8 ≤ A < 12)	9/32 (7)
$15/32 \leq A < 5/8$ (12 ≤ A < 16)	5/16 (8)
$5/8 \leq A < 31/32$ (16 ≤ A < 25)	13/32 (10)
$31/32 \leq A < 1-3/8$ (25 ≤ A < 35)	15/32 (12)
$1-3/8 \leq A < 1-25/32$ (35 ≤ A < 45)	9/16 (14)



• Caution for Refrigerant Piping



4. Make sure that all stop valves of the outdoor unit are closed completely.
5. Bleed nitrogen gas through refrigerant lines when brazing. Pressure should not exceed 2.9psi (0.02MPa).

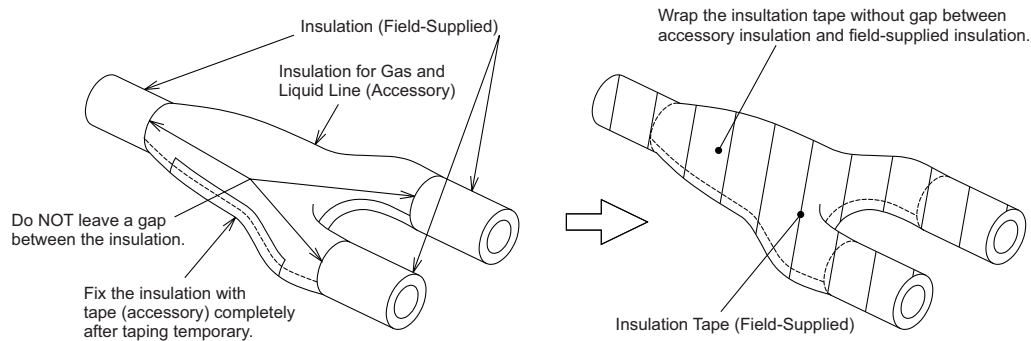
⚠ DANGER

Make sure that a test for leakage of refrigerant gases has been performed. The refrigerant used for this unit (HFC R410A), is a non-flammable, non-toxic, and odorless gas. However if refrigerant should leak and make contact with sparks, fire; toxic gas will be generated. Also, because the fluorocarbon is heavier than air, the floor surface will be filled with it, which could cause suffocation.

6. The air-tight test pressure for this product is 601psi (4.15MPa).
7. Install the field-supplied insulation with these multi-kits to each branch (liquid side and gaseous side), with tape. Also, apply the field-supplied insulation for these units.

NOTE

When polyethylene foam is applied, a thickness of 13/32 inch (10mm) for liquid piping and 19/32 to 25/32 inch (15 to 20mm) for gas piping is recommended. (Use a grade of insulation with heat resistance value of 212°F (100°C) for gas piping.)



⚠ CAUTION

- Perform insulation work only when the surface temperature of the pipe material has cooled to room temperature. Anything done immediately after brazing can cause the insulation to melt.
- During piping work, always cover over or plug the open end to keep the inside free of dust and moisture.

After installation, it is recommended that the customer retain this manual for future reference.

1.2.2.2 Multi-Kit (Line Branch)**• MW-NP282A2, MW-NP452A2, MW-NP692A2, MW-NP902A2****1. Applicable Outdoor Units**

These multiple line branches can be applied to the R410A VRF systems.

2. Transportation

Transport this product as close to the installation site as practical before unpacking. Do not discard any foam packaging as it is used as insulation for the joint kits after pressure testing is complete.






Do not place any material on this product.

Important Notice

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

Signal Words	
 WARNING	Indicates a hazardous situation that, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates information considered important, but not hazard-related (for example, messages relating to property damage).
General Precautions	
 WARNING	To reduce the risk of serious injury or death, read these instructions thoroughly and follow all warnings or cautions included in all manuals that accompanied the product and are attached to the unit. <i>Refer back to these safety instructions as needed.</i>

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

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

- Be careful that moisture, dust, or variant refrigerant compounds not enter the refrigerant cycle during installation work. Foreign matter could damage internal components or cause blockages.
- If air filters are required on this unit, do not operate the unit without the air filter set in place. If the air filter is not installed, dust may accumulate and breakdown may result.
- Do not install this unit in any place where silicon gases can coalesce. If the silicon gas molecules attach themselves to the surface of the heat exchanger, the finned surfaces will repel water. As a result, any amount of drainage moisture condensate can overflow from the drain 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. (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 drain 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



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

- When installing the unit into...
 - A wall: Make sure the wall is strong enough to hold the unit's weight. It may be necessary to construct a strong wood or metal frame to provide added support.
 - A room: Properly insulate any refrigerant tubing run inside a room to prevent "sweating" that can cause dripping and water damage to wall and floors.
 - Moist 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.
 - 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 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 a fire, oil, steam or powder can directly enter the unit, such as nearby or 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 drain 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 drainpipe is installed incorrectly, water leakage and damage to the ceiling, floor, furniture, or other possessions may result. If the condensate piping becomes clogged, water may drip from the indoor unit. Do not install the indoor unit where such dripping can cause moisture damage or uneven locations: Use a raised concrete pad or concrete blocks to provide a solid, level foundation for the unit to prevent water damage and abnormal vibration.
- Before performing any brazing work, be sure that there are no flammable materials or open flames nearby.
- Perform a test run to ensure normal operation. Safety guards, shields, barriers, covers, and protective devices must be in place while the compressor/unit is operating. During the test run, keep fingers and clothing away from any moving parts.
- Clean up the site when finished, remembering to check that no metal scraps or bits of wiring have been left inside the unit being installed.

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

Refrigerant Precaution

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 injury or death.
- If installed in a small room, take measures to prevent the refrigerant from exceeding the maximum allowable concentration in the event that refrigerant gases should escape. Refrigerant gases can cause asphyxiation (0.026lbs/ft³ (0.42 kg/m³) based on ISO 5149 for R410A). Consult with your distributor for countermeasures (ventilation system and so on). If refrigerant gas has leaked during the installation work, ventilate the room immediately.
- 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.
- A compressor/unit comprises a pressurized system. Never loosen threaded joints while the system is under pressure and never open pressurized system parts.
- When maintaining, relocating, and disposing of the unit, dismantle the refrigerant piping after the compressor stops.

Electrical Precautions

WARNING

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

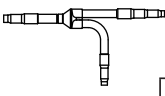
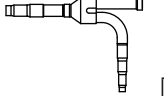
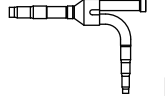
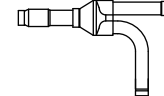

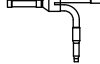



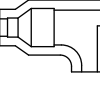






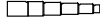









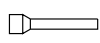








- Highly dangerous electrical voltages are used in this system. Carefully refer to the wiring diagram and these instructions when wiring. Improper connections and inadequate grounding can cause serious injury or death.
- Before servicing, open and tag all disconnect switches. Never assume electrical power is disconnected. Check with meter and equipment.
- Only use electrical protection equipment and tools suited for this installation.
- Use specified cables between units.
- Communication cabling shall be a minimum of AWG18 (0.82mm²), 2-Conductor, Stranded Copper. Shielded cable must be considered for applications and routing in areas of high EMI and other sources of potentially excessive electrical noise to reduce the potential for communication errors. When shielded cabling is applied, proper bonding and termination of the cable shield is required as per Johnson Controls guidelines. Plenum and riser ratings for communication cables must be considered per application and local code requirements.
- Use an exclusive power supply for the air conditioner at the unit's rated voltage.
- Be sure to install circuit breakers (ground fault interrupter, isolating switch, molded case circuit breaker and so on), with the specified capacity. Ensure that the wiring terminals are tightened securely to recommended torque specifications.
- Clamp electrical wires securely with a cord clamp after all wiring is connected to the terminal block. In addition, run wires securely through the wiring access channel.

INSTALLATION

- When installing the power lines, do not apply tension to the cables. Secure the suspended cables at regular intervals, but not too tightly.
- Make sure that the terminals do not come into contact with the surface of the electrical box. If the terminals are too close to the surface, it may lead to failures at the terminal connection.
- Turn OFF and disconnect the unit from the power source when handling the service connector. Do not open the service cover or access panel to the indoor or outdoor units without turning OFF the main power supply.
- After stopping operation, be sure to wait at least five minutes before turning off the main power switch. Otherwise, water leakage or electrical breakdown may result. Disconnect the power source completely before attempting any maintenance for electrical parts. Check to ensure that no residual voltage is present after disconnecting the power source.
- Do not clean with, or pour water into, the controller as it could cause electric shock and/or damage the unit. Do not use strong detergent such as a solvent. Clean with a soft cloth.
- Check that the ground wire is securely connected. Do not connect ground wiring to gas piping, water piping, lighting conductor, or telephone ground wiring.
- If a circuit breaker or fuse is frequently activated, shut down the system and contact your service contractor.

3. Before Installation

IMPORTANT! Confirm the number of the following parts kit by referencing the model number printed on the package before opening. Do NOT intermix any foreign objects within this kit. Verify that no foreign objects are present inside any kit components prior to installation.

Name of Parts		MW-NP282A2	MW-NP452A2	MW-NP692A2	MW-NP902A2
		Qty.	Qty.	Qty.	Qty.
Branch Pipe for High/Low Pressure Gas Line		 1	 1	 1	 1
Branch Pipe for Liquid Line		 1	 1	 1	 1
Accessory	Insulation for High/Low Pressure Gas Line	 1 set	 1 set	 1 set	 1 set
	Insulation for Liquid Line	 1 set	 1 set	 1 set	 1 set
	Reducer for High/Low Pressure Gas Line Connection (For Connecting Pipe (Field-Supplied))	— None	 1	 1	 1
		— None	— None	 1	 1
		— None	— None	 2	 1
		— None	— None	— None	 1
		— None	— None	— None	 2
	Reducer for Liquid Line Connection (For Connecting Pipe (Field-Supplied))	 2	 1	 1	 1
		— None	 2	— None	 1
	Tape	 2	 2	 2	 2

NOTE: If any of these parts are missing, please contact your distributor. Do not discard any foam packaging as it is used as insulation for the joint kits after pressure testing is complete.

4. Installation Work

4.1 Piping Connection Size

The ends of the multi-kits are finished as shown in the following figures. Cut the end of the pipe to correspond with the pipe size.

CAUTION

Allow adequate space for elbow, angled, and irregular piping arrangements to compensate for expansion and contraction brought on by temperature change.

Model	Branch Pipe for High/Low Pressure Gas Line	Branch Pipe for Liquid Line	Reducer for High/Low Pressure Gas Line	Reducer for Liquid Line
MW-NP282A2				
MW-NP452A2				
MW-NP692A2				
MW-NP902A2				

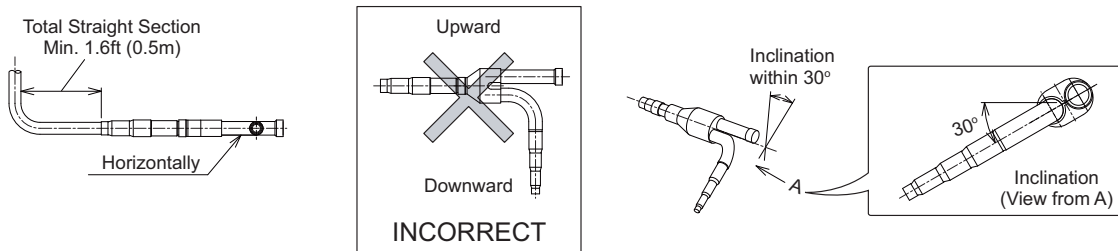
Unit: inch, ID: Inner Diameter, OD: Outer Diameter

INSTALLATION

4.2 Installation Position

1. Horizontal Installation

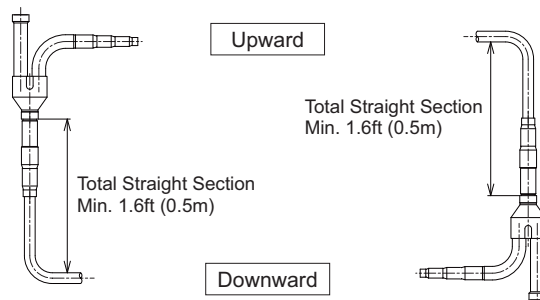
Locate the "Y" union pipe section on the same horizontal plane. (Inclination within 30°)
Make the straight section a minimum of 1.6ft (0.5m) after the vertical bend.



2. Vertical Installation

Straight section of the pipe connection on the outdoor unit side is made as follows:

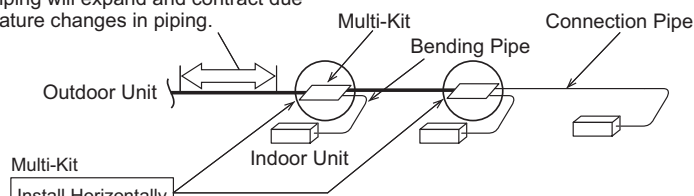
- The collective pipe connection part is installed upward, the straight section must be a minimum of 1.6ft (0.5m).
- The collective pipe connection part is installed downward, the straight section must be a minimum of 1.6ft (0.5m).



3. Piping Form from Multi-Kit to Indoor Unit

Example: Recommended From each Indoor Unit to Multi-Kit have bending pipes and they will not tend to be deformed.

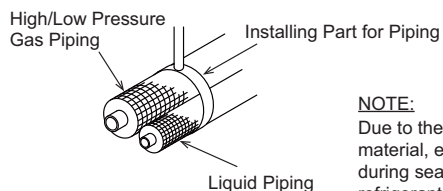
Copper Piping will expand and contract due to temperature changes in piping.



NOTE:

When on site piping is installed using soft or hard copper make sure that the piping is installed to allow for movement of the piping. Caused by contraction and expansion of the piping due to temperature changes.

[Fixing for Liquid Piping, Low Pressure Gas Piping and High/Low Pressure Gas Piping]

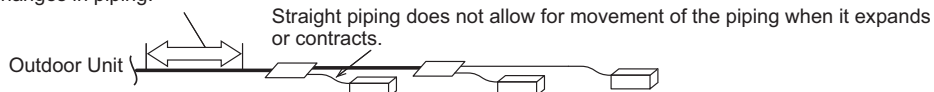


NOTE:

Due to the properties of copper piping material, expansion and contraction take place during seasons of heat and cold. Do not strap gas refrigerant and piping containing liquids together as deformation and cracks can result.

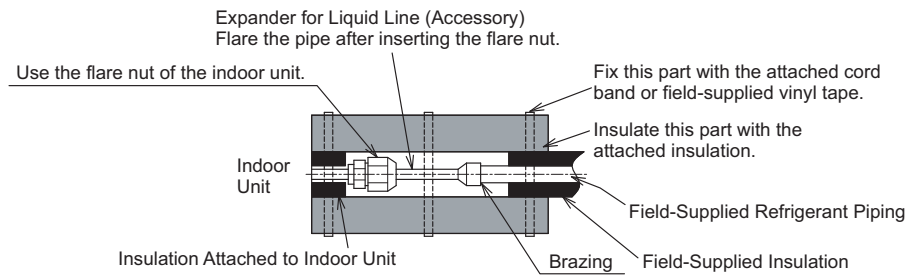
Example: Recommended

Copper Piping will expand and contract due to temperature changes in piping.



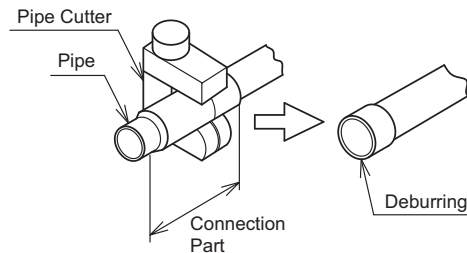
4.3 Connection Procedure for Piping Joint

When connecting liquid piping for the unit with a capacity 15 MBH or smaller, and when the length of piping is 49.2ft (15m) or longer, use a piping diameter size of 3/8 inch (9.52mm). Secure the connecting pipe as shown below. Use the insulation attached to the indoor unit.



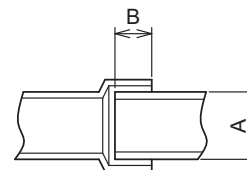
4.4 Piping Work

1. Use clean copper pipes without any moisture or foreign materials on inner surface of pipes. When connecting refrigerant pipe, cut the copper pipes with a pipe cutter as shown below. Also blow-out the pipes with nitrogen or compressed air to ensure that no dust remains inside the pipe. Do NOT use a saw, a grindstone or others which causes a large amount of cutting powder.

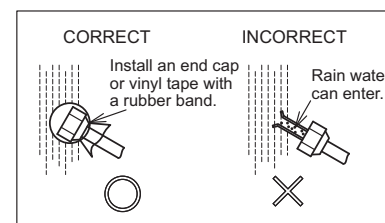
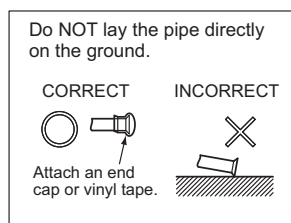
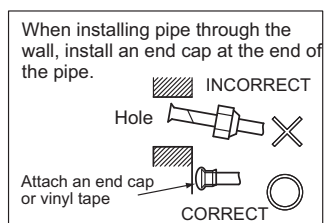


2. When cutting the pipe, allow for an adequate depth for brazing as shown in the following table.

inch (mm)	
Diameter (A)	Min. Insertion Depth (B)
$3/16 \leq A < 5/16$ ($5 \leq A < 8$)	1/4 (6)
$5/16 \leq A < 15/32$ ($8 \leq A < 12$)	9/32 (7)
$15/32 \leq A < 5/8$ ($12 \leq A < 16$)	5/16 (8)
$5/8 \leq A < 31/32$ ($16 \leq A < 25$)	13/32 (10)
$31/32 \leq A < 1-3/8$ ($25 \leq A < 35$)	15/32 (12)
$1-3/8 \leq A < 1-25/32$ ($35 \leq A < 45$)	9/16 (14)



• Caution for Refrigerant Piping



INSTALLATION

3. Make sure that all stop valves on the outdoor unit are closed completely.
4. Blow-out the inside of the pipes with nitrogen gas before brazing. Bleed nitrogen gas through refrigerant lines when brazing. Pressure should not exceed 2.9psi (0.02MPa).

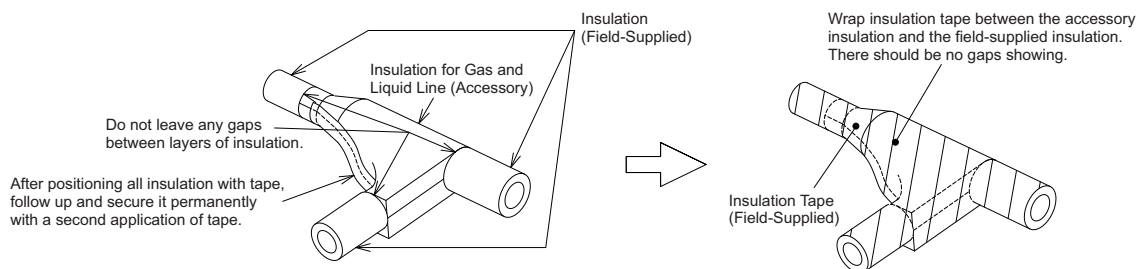
⚠ DANGER

Make sure that a test for leakage of refrigerant gases has been performed. The refrigerant used for this unit (HFC R410A), is a non-flammable, non-toxic, and odorless gas. However if refrigerant should leak and make contact with sparks, fire; toxic gas will be generated. Also, because the fluorocarbon is heavier than air, the floor surface will be filled with it, which could cause suffocation.

NOTE

When polyethylene foam is applied, a thickness of 13/32 inch (10mm) for liquid piping and 19/32 to 25/32 inch (15 to 20mm) for gas piping is recommended. (Use a grade of insulation with a heat resistance of 212°F (100°C) for gas piping.)

5. The airtight test pressure of this product is 601psi (4.15MPa).
6. Install the field-supplied insulation with these multi-kits to each branch (liquid side and gaseous side), with tape. Also, apply the field-supplied insulation for these units.



⚠ CAUTION

- Perform insulation work only when the surface temperature of the pipe material has cooled to room temperature. Anything done immediately after brazing can cause the insulation to melt.
- During piping work, always cover over or plug the open end to keep the inside free of dust and moisture.

After installation, it is recommended that the customer retain this manual for future reference.

1.2.2.3 Multi-Kit (Header Branch)

• MH-NP224A, MH-NP288A

1. Applicable Outdoor Units

These multiple header branches can be applied to the R410A VRF systems.

2. Transportation




Transport this product as close to the installation site as practical before unpacking. Do not discard any foam packaging as it is used as insulation for the joint kits after pressure testing is complete.

Important Notice

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

Signal Words	
 WARNING	Indicates a hazardous situation that, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates information considered important, but not hazard-related (for example, messages relating to property damage).
General Precautions	
 WARNING	To reduce the risk of serious injury or death, read these instructions thoroughly and follow all warnings or cautions included in all manuals that accompanied the product and are attached to the unit. <i>Refer back to these safety instructions as needed.</i>

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

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

- Be careful that moisture, dust, or variant refrigerant compounds not enter the refrigerant cycle during installation work. Foreign matter could damage internal components or cause blockages.
- If air filters are required on this unit, do not operate the unit without the air filter set in place. If the air filter is not installed, dust may accumulate and breakdown may result.
- Do not install this unit in any place where silicon gases can coalesce. If the silicon gas molecules attach themselves to the surface of the heat exchanger, the finned surfaces will repel water. As a result, any amount of drainage moisture condensate can overflow from the drain 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. (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 drain hose discharges water properly. If connected incorrectly, it may cause leaks.
- Do not install the unit in any place where oil can seep onto the units, such as table or seating areas in restaurants, and so forth. For these locations or social venues, use specialized units with oil-resistant features built into them. In addition, use a specialized ceiling fan designed for restaurant use. These specialized oil-resistant units can be ordered for such applications. However, in places where large quantities of oil can splash onto the unit, such as a factory, even the specialized units cannot be used. These products should not be installed in such locations.

Installation Precautions



WARNING

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

- When installing the unit into...
 - A wall: Make sure the wall is strong enough to hold the unit's weight. It may be necessary to construct a strong wood or metal frame to provide added support.
 - A room: Properly insulate any refrigerant tubing run inside a room to prevent "sweating" that can cause dripping and water damage to wall and floors.
 - Moist 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.
 - 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 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 a fire, oil, steam or powder can directly enter the unit, such as nearby or 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 drain 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 drainpipe is installed incorrectly, water leakage and damage to the ceiling, floor, furniture, or other possessions may result. If the condensate piping becomes clogged, water may drip from the indoor unit. Do not install the indoor unit where such dripping can cause moisture damage or uneven locations: Use a raised concrete pad or concrete blocks to provide a solid, level foundation for the unit to prevent water damage and abnormal vibration.
- Before performing any brazing work, be sure that there are no flammable materials or open flames nearby.
- Perform a test run to ensure normal operation. Safety guards, shields, barriers, covers, and protective devices must be in place while the compressor/unit is operating. During the test run, keep fingers and clothing away from any moving parts.
- Clean up the site when finished, remembering to check that no metal scraps or bits of wiring have been left inside the unit being installed.

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

Refrigerant Precaution

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 injury or death.
- If installed in a small room, take measures to prevent the refrigerant from exceeding the maximum allowable concentration in the event that refrigerant gases should escape. Refrigerant gases can cause asphyxiation (0.026lbs/ft³ (0.42 kg/m³) based on ISO 5149 for R410A). Consult with your distributor for countermeasures (ventilation system and so on). If refrigerant gas has leaked during the installation work, ventilate the room immediately.
- 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.
- A compressor/unit comprises a pressurized system. Never loosen threaded joints while the system is under pressure and never open pressurized system parts.
- When maintaining, relocating, and disposing of the unit, dismantle the refrigerant piping after the compressor stops.

Electrical Precautions

WARNING

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

- Highly dangerous electrical voltages are used in this system. Carefully refer to the wiring diagram and these instructions when wiring. Improper connections and inadequate grounding can cause serious injury or death.
- 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.
- Communication cabling shall be a minimum of AWG18 (0.82mm²), 2-Conductor, Stranded Copper. Shielded cable must be considered for applications and routing in areas of high EMI and other sources of potentially excessive electrical noise to reduce the potential for communication errors. When shielded cabling is applied, proper bonding and termination of the cable shield is required as per Johnson Controls guidelines. Plenum and riser ratings for communication cables must be considered per application and local code requirements.
- Use an exclusive power supply for the air conditioner at the unit's rated voltage.
- Be sure to install circuit breakers (ground fault interrupter, isolating switch, molded case circuit breaker and so on), with the specified capacity. Ensure that the wiring terminals are tightened securely to recommended torque specifications.
- Clamp electrical wires securely with a cord clamp after all wiring is connected to the terminal block. In addition, run wires securely through the wiring access channel.

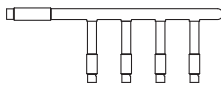
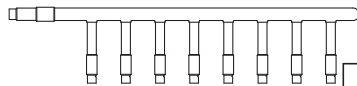
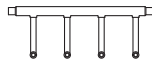
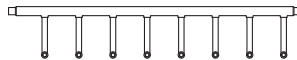


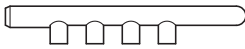













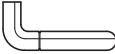
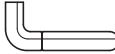


- When installing the power lines, do not apply tension to the cables. Secure the suspended cables at regular intervals, but not too tightly.
- Make sure that the terminals do not come into contact with the surface of the electrical box. If the terminals are too close to the surface, it may lead to failures at the terminal connection.
- Turn OFF and disconnect the unit from the power source when handling the service connector. Do not open the service cover or access panel to the indoor or outdoor units without turning OFF the main power supply.
- After stopping operation, be sure to wait at least five minutes before turning off the main power switch. Otherwise, water leakage or electrical breakdown may result. Disconnect the power source completely before attempting any maintenance for electrical parts. Check to ensure that no residual voltage is present after disconnecting the power source.
- Do not clean with, or pour water into, the controller as it could cause electric shock and/or damage the unit. Do not use strong detergent such as a solvent. Clean with a soft cloth.
- Check that the ground wire is securely connected. Do not connect ground wiring to gas piping, water piping, lighting conductor, or telephone ground wiring.
- If a circuit breaker or fuse is frequently activated, shut down the system and contact your service contractor

CAUTION

Do not lay any material on this product.

3. Before Installation

IMPORTANT! Confirm the number of the following parts kit by referencing the model number printed on the package before opening. Do NOT intermix any foreign objects within this kit. Verify that no foreign objects are present inside any kit components prior to installation.

Name of Parts		MH-NP224A			MH-NP288A		
		Qty.			Qty.		
Branch Pipe for Gas Line							
		1			1		
Branch Pipe for Liquid Line							
		1			1		
Accessories	Insulation for Gas Line						
		1			1		
	Insulation for Liquid Line						
		1			1		
	Closing Pipe	For Gas Line φ1/2	For Liquid Line φ1/4	For Liquid Header φ3/8	For Gas Line φ1/2	For Liquid Line φ1/4	For Liquid Header φ3/8
		 2	 2	 1	 6	 6	 1
	Expander for Gas Line						
		None			2		
	Expander for Liquid Line						
	4			8			
Insulation for Closing Pipe							
	2 sets			6 sets			
Insulation for Liquid Line							
	4 sets			8 sets			
Tape							
	24			48			

Unit: inch

NOTE : If any of these parts are missing, please contact your distributor. Do not discard any foam packaging as it is used as insulation for the joint kits after pressure testing is complete.

4. Installation Work

4.1 Piping Connection Size

The ends of the multi-kits are finished as shown in the following figures. Cut the end of the pipe to correspond with the pipe size.

CAUTION

Allow adequate room for elbow, angled, and irregular piping arrangements to compensate for expansion and contraction brought on by temperature change.

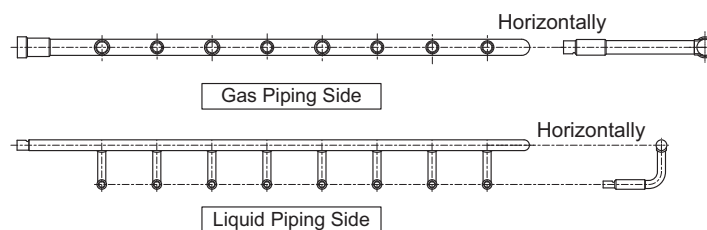
Models	Gas Line	Liquid Line	Expander	Closing Pipe
MH-NP224A			(For Gas Line)	<p>Qty.: 2</p>
			(For Liquid Line)	<p>Qty.: 2</p>
MH-NP288A			(For Gas Line)	<p>Qty.: 6</p>
			(For Liquid Line)	<p>Qty.: 6</p>

Unit: inch, ID: Inner Diameter, OD: Outer Diameter

4.2 Installation Position

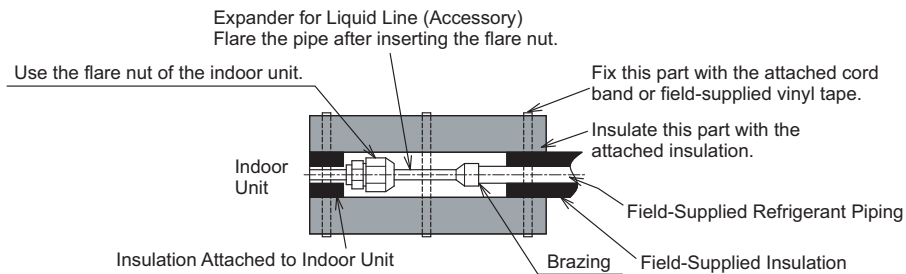
Perform to install horizontally always.

(Example: Model MH-NP288A)



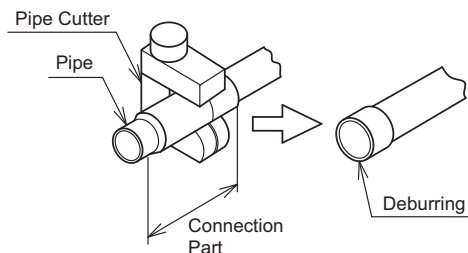
4.3 Connection Procedure for Piping Joint

When connecting liquid piping for a unit with a capacity of 15 MBH or smaller, and with a length of piping 49.2ft (15m) or longer, apply a piping size of 3/8 inch (9.52mm). Secure the connecting pipe as shown in the figure below. Use the insulation attached to the indoor unit.



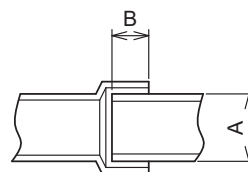
4.4 Piping Work

- Use clean copper pipes without any moisture or foreign materials on inner surface of pipes. When connecting refrigerant pipe, cut the copper pipes with a pipe cutter as shown below. Also blow-out the pipes with nitrogen or compressed air to ensure that no dust remains inside the pipe. Do NOT use a saw, a grindstone or others which causes a large amount of cutting powder.

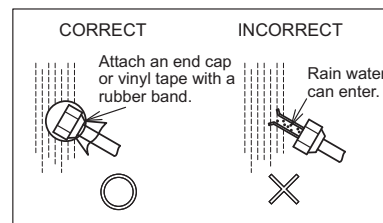
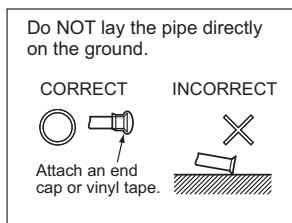
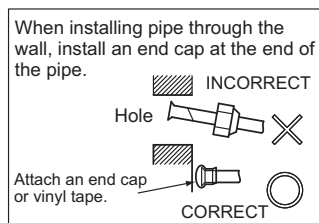


- When cutting piping, secure the adequate depth for brazing as shown in the following table.

inch (mm)	
Diameter (A)	Min. Insertion Depth (B)
$3/16 \leq A < 5/16$ ($5 \leq A < 8$)	1/4 (6)
$5/16 \leq A < 15/32$ ($8 \leq A < 12$)	9/32 (7)
$15/32 \leq A < 5/8$ ($12 \leq A < 16$)	5/16 (8)
$5/8 \leq A < 31/32$ ($16 \leq A < 25$)	13/32 (10)
$31/32 \leq A < 1-3/8$ ($25 \leq A < 35$)	15/32 (12)
$1-3/8 \leq A < 1-25/32$ ($35 \leq A < 45$)	9/16 (14)



• Caution for Refrigerant Piping



- (3) Make sure that all stop valves for the outdoor unit are closed completely.
- (4) Bleed nitrogen gas through refrigerant lines when brazing. Pressure should not exceed 2.9psi (0.02MPa).

⚠ DANGER

Make sure that a test for leakage of refrigerant gases has been performed. The refrigerant used for this unit (HFC R410A), is a non-flammable, non-toxic, and odorless gas. However if refrigerant should leak and make contact with sparks, fire; toxic gas will be generated. Also, because the fluorocarbon is heavier than air, the floor surface will be filled with it, which could cause suffocation.

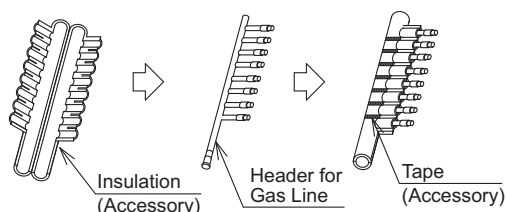
- (5) The air-tight test pressure of this product is 601psi (4.15MPa).
- (6) Install the field-supplied insulation with these multi-kits to each branch (liquid side and gaseous side), with tape. Also, apply the field-supplied insulation for these units.

NOTE

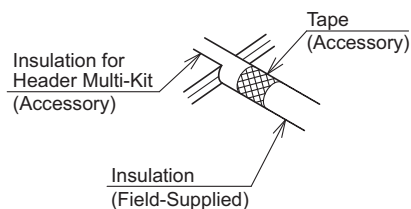
When polyethylene foam is applied, a thickness of 13/32 inch (10mm) for liquid piping and 19/32 to 25/32 inch (15 to 20mm) for gas piping is recommended. (Use a grade of insulation with a heat resistance value of 212°F (100°C) for gas piping.)

For Gas Side

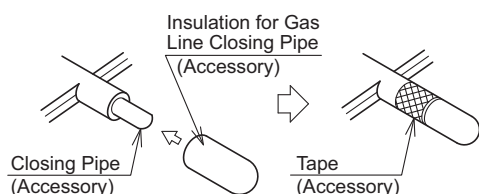
- a) Cover the gas header with the insulation as shown below.



- b) Seal the joint portion of insulation with tape (accessory).

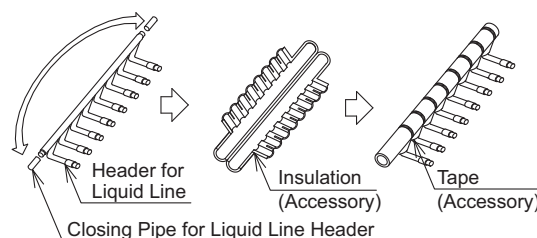


- c) Attach the insulation (accessory) to the closed-off end of pipe. Then seal the joint portion with tape (accessory).

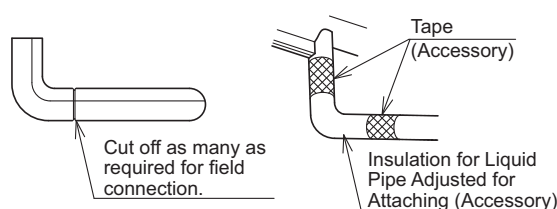


For Liquid Side

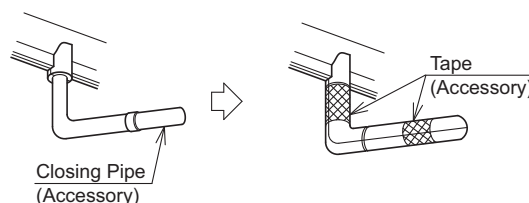
- a) Braze the pipe cap to the open end of the liquid header, opposite the liquid line connection. Cover the liquid line header with the insulation after pipe temperature decreases to room temperature.



- b) Cut the sections of insulation for liquid piping as often as required.



- c) Seal the joint for the closed-off end of pipe with tape (accessory) after attaching the liquid pipe insulation.

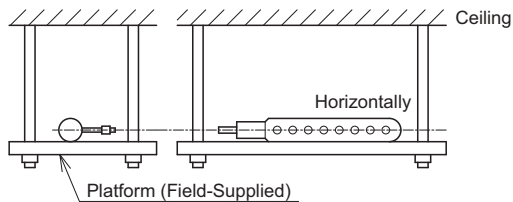


INSTALLATION

- **Caution for Installation**

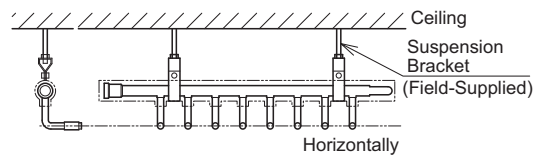
Branch Pipe for Gas Line

Install the branch pipe horizontally by placing it on the platform.



Branch Pipe for Liquid Line

Suspend the branch pipe from the ceiling so that the branch pipe port openings are horizontal.



⚠ CAUTION

- Perform insulation work only when the surface temperature of the pipe material has cooled to room temperature. Anything done immediately after brazing can cause insulation to melt.
- During piping work, always cover over or plug the open end to keep the inside free of dust and moisture.

After installation, it is recommended that the customer retain this manual for future reference.

2. Operation

- Refer to the Service Manual for Indoor Unit or Controller.

3. Troubleshooting

3.1 Initial Troubleshooting

3.1.1 Checking Electrical Wiring and Power Source

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

No.	Check Situation	Check Method
1	Is any power source 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?	<p>Check that the following wiring connections on O.U./I.U. printed circuit boards (PCBs) are not loose.</p> <ul style="list-style-type: none">• The connection for thermistors• The connection for the wired controller cable• The connection for communication cabling• Each connection for power source line <p>Check that the wiring connection on O.U./I.U. PCBs are not loose or misconnected on the site according to the "Electrical Wiring Diagram" of the Engineering Manual.</p>

NOTE:

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 source of optional parts because the fuse may blow out by the power source failure. Turn off power for safety.

Example for Electrical Wiring Connection

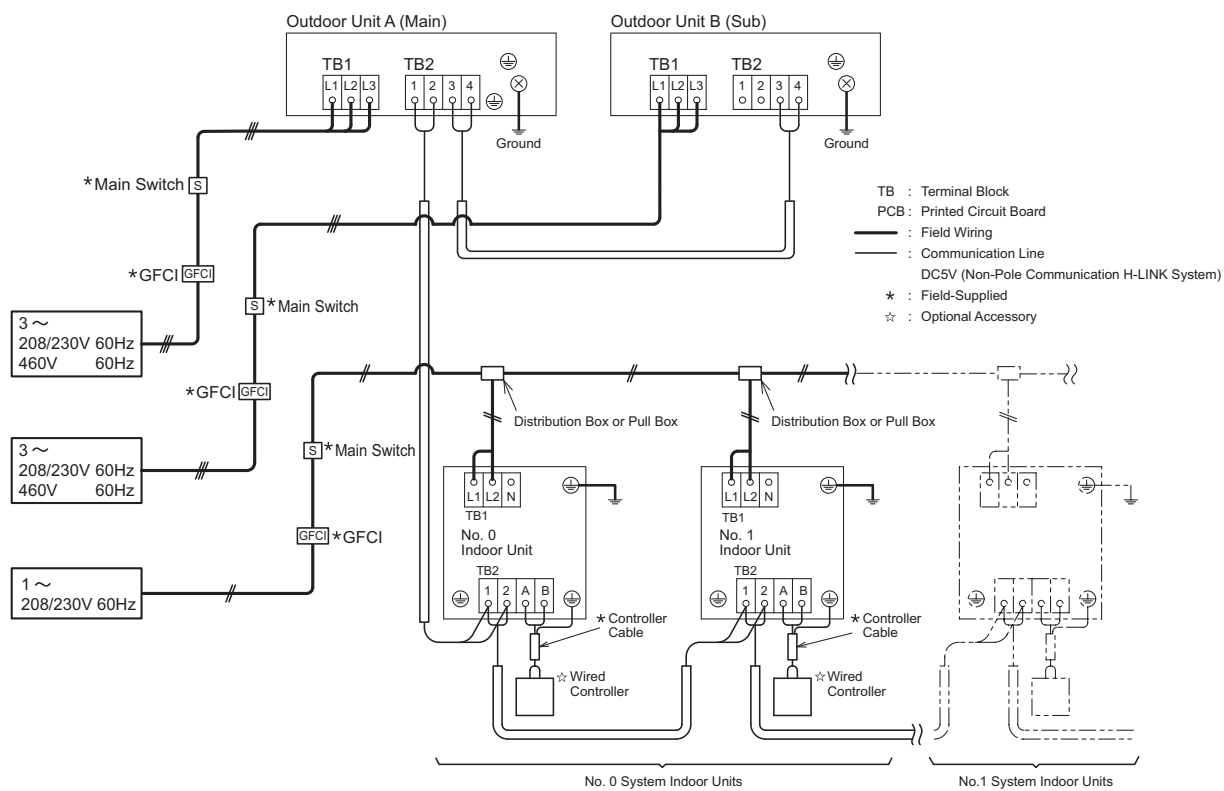


Figure 1.1 Instruction for Electrical Wiring Connection

Table 1.1 Electrical Characteristics and Recommended Wiring Size

Model	Outdoor Unit							INV Comp.	
	Hz (Hz)	Voltage (V)	Max. (V)	Min. (V)	MCA (A)	MOP (A)	Max. Fuse (A)	RLA (A)	LRA (A)
(H,Y)VAHP072B31CW	60	208/230	253	188	51/46	72/65	70/60	24.2/22.0	150
(H,Y)VAHP096B31CW	60	208/230	253	188	51/46	72/65	70/60	24.2/22.0	150
(H,Y)VAHP072B41CW	60	460	506	414	24	34	30	15.3	75
(H,Y)VAHP096B41CW	60	460	506	414	24	34	30	15.3	75

Model	Fix Speed Comp.		Fan Motor		Wiring Size		
	RLA (A)	LRA (A)	Output (kW)	FLA (A)	Power Supply Wiring (AWG)	Ground Wiring (AWG)	Communication Cable (AWG)
(H,Y)VAHP072B31CW	28.8/26.0	155	1.2	5.6/5.1	6	6	18
(H,Y)VAHP096B31CW	28.8/26.0	155	1.2	5.6/5.1	6	6	18
(H,Y)VAHP072B41CW	12.2	74	1.2	9	12	12	18
(H,Y)VAHP096B41CW	12.2	74	1.2	9	12	12	18

MCA: Minimum Circuit Ampacity (A)
 MOP: Maximum Overcurrent Protective Device (A)
 RLA: Rated Load Ampacity (A)
 LRA: Locked Rotor Ampacity (A)
 FLA: Full Load Ampacity (A)

NOTES:

1. Select wire size based on the value of MCA.
2. MOP is used to select the fuse, circuit breaker, or a Ground Fault Circuit Interrupter (GFCI).
3. Communication cabling shall be a minimum of AWG18 (0.82mm²), 2-Conductor, Stranded Copper. Shielded cable must be considered for applications and routing in areas of high EMI and other sources of potentially excessive electrical noise to reduce the potential for communication errors. When shielded cabling is applied, proper bonding and termination of the cable shield is required as per Johnson Controls guidelines. Plenum and riser ratings for communication cables must be considered per application and local code requirements.

⚠ CAUTION

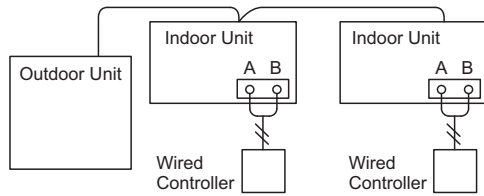
Install a multi-pole main switch with a space of 1/8 inch (3.5mm) or more between each phase.

NOTES:

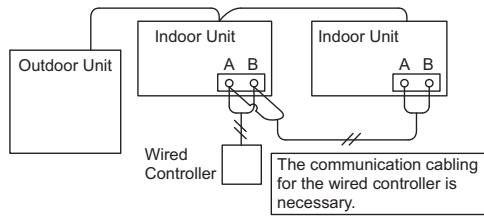
1. When the power supply wiring is longer, select the minimum wiring size which the voltage drop is within 2%.
2. Power supply voltage should be satisfied with the followings.
 - Supply Voltage: Rated Voltage within $\pm 10\%$
 - Starting Voltage: Rated Voltage within -15%
 - Operating Voltage: Rated Voltage within $\pm 10\%$
 - Imbalance between Phases: within 3%
3. Do not connect the ground wiring to gas piping, water piping, or a lightning conductor.
 - Gas Piping: An explosion and ignition may occur if 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 lightning conductor is used.

- Wired Controller Connecting Diagram

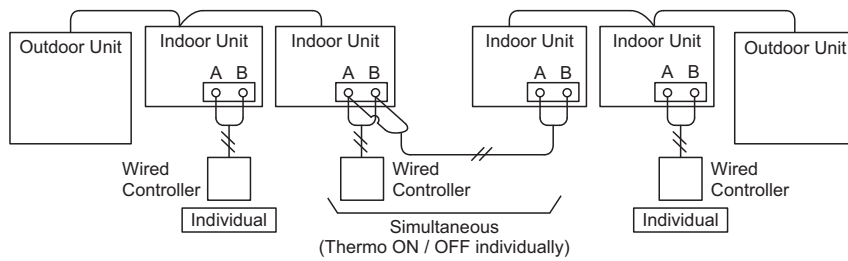
(a) Wired Controllers to each Unit for Individual Operation Setting



(b) One Wired Controller for Individual Operation Setting



(c) Connecting Wired Controller if Connecting between Individual Systems



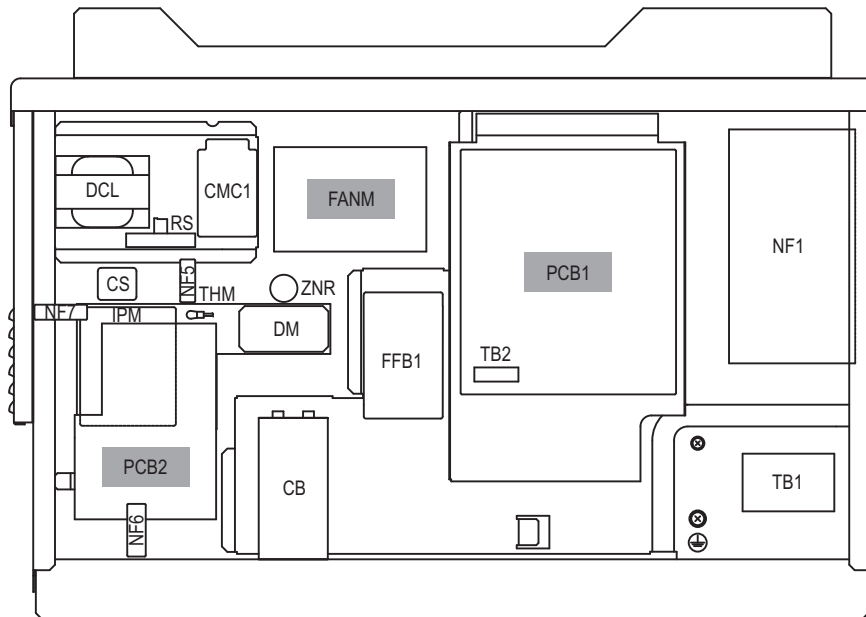
NOTE:

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

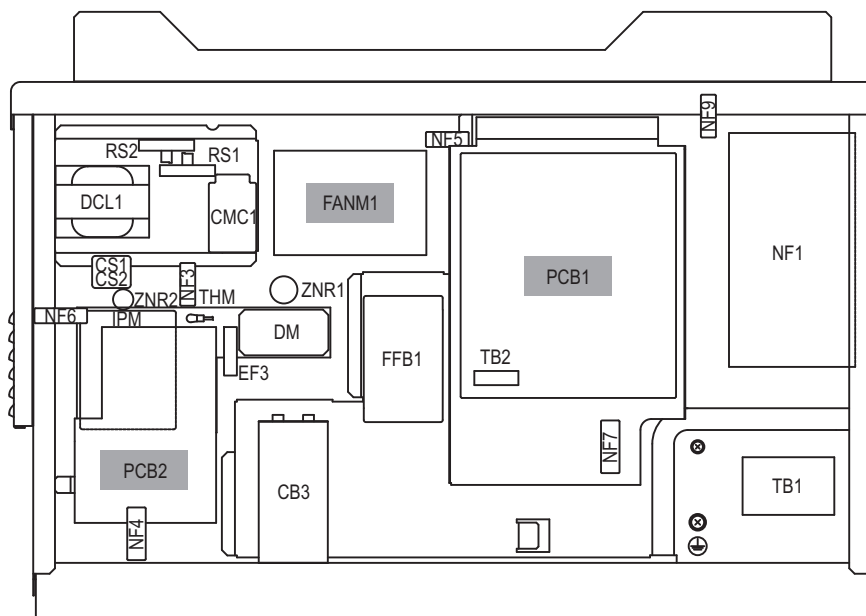
Thermo-OFF: The outdoor unit and some indoor units stay on, but don't run.

3.1.2 Location of Printed Circuit Boards (PCBs)

Model: (H,Y)VAHP072B31CW and (H,Y)VAHP096B31CW



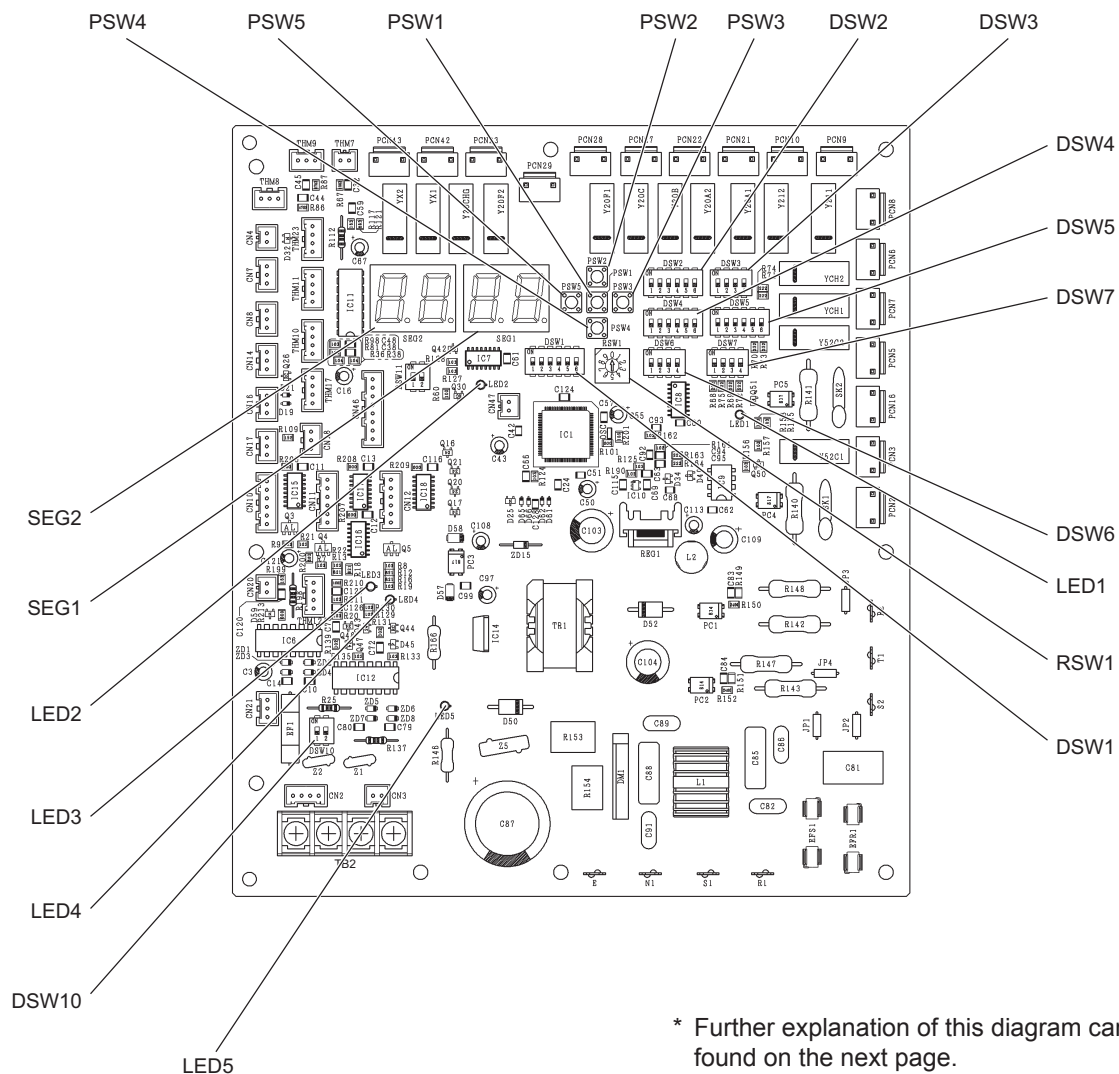
Model: (H,Y)VAHP072B41CW and (H,Y)VAHP096B41CW



Purpose

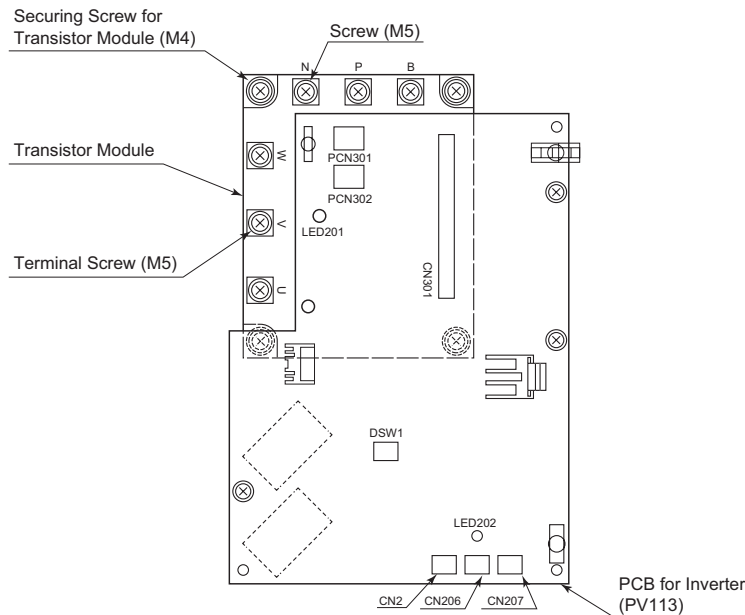
Symbol	PCB	Purpose
PCB1	Outdoor Unit PCB (for Control)	<ol style="list-style-type: none"> 1. Transmitting between Indoor Unit and Outdoor Unit 2. Processing for Sensor Input 3. Processing for DIP Switch Input 4. Operation Control for Above Items 1 to 3. Compressor Operation Control, Bypass Valve Control, 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 Source
PCB2	Inverter PCB	<ol style="list-style-type: none"> 1. Inverter power part is driven by outdoor unit PCB to drive compressor. 2. Overcurrent Control 3. Protection Control for Inverter Part
FANM	Fan Controller	<ol style="list-style-type: none"> 1. DC Fan Motor Speed Control 2. Overcurrent Control

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



Part Name		Function Information
LEDs	LED1 (Red)	Power Source Indicator for Outdoor Unit PCB (Low Voltage) Normal Condition: Activated / ON Abnormal Condition: Deactivated / OFF
	LED2 (Green)	This LED2 indicates the communication state between the outdoor unit PCB and inverter PCB. Normal Condition: Flashing Abnormal Condition: Activated / ON or Deactivated / OFF
	LED3 (Yellow)	This LED3 indicates the communication state between the indoor unit and outdoor unit. Normal Condition: Flashing Abnormal Condition: Activated / ON or Deactivated / OFF
	LED4 (Orange)	This LED4 indicates the communication state between the outdoor units. Normal Condition: Flashing Abnormal Condition: Activated / ON or Deactivated / OFF
	LED5 (Red)	Power Source 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".

b. Inverter Printed Circuit Board: PCB2 (Inverter PCB) and Transistor Module



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

• DSW1

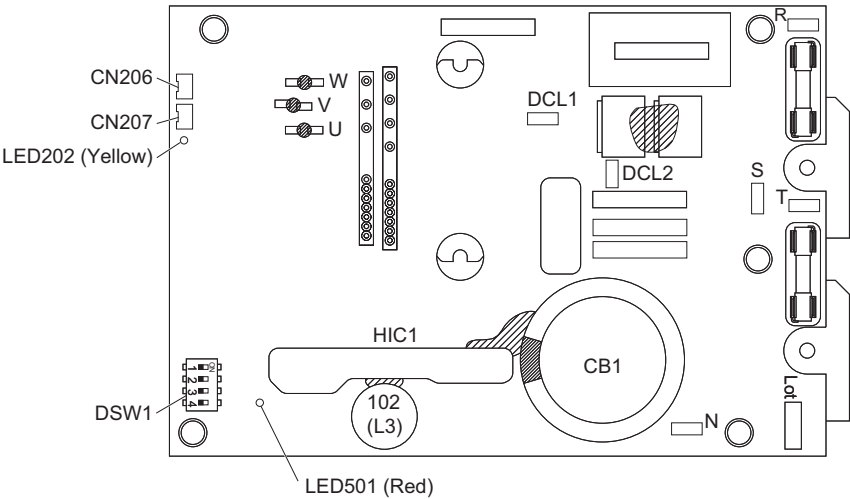
No setting is required.

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

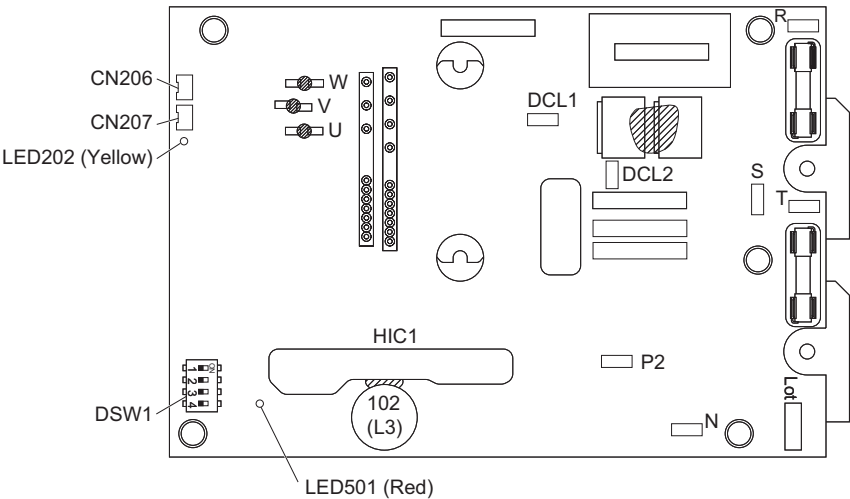


c. FANM (Fan Controller)

< 208/230V 60Hz >



< 460V 60Hz >



Part Name	Function Information
LED501 (Red)	Power Source Indicator for the Fan Controller Normal Condition: Activated / ON Abnormal Condition: Deactivated / OFF
LED202 (Yellow)	This indicates the state of the microcomputer. Normal Condition: Activated / ON Abnormal Condition: Deactivated / OFF

• DSW1
No setting is required.



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 thermo control is operated, the DSW setting will be different as shown below.

(1) Outdoor Unit (factory setting)

Turn OFF all power sources before the setting.

Without turning OFF all power sources, the switches do not work and the settings are invalid.

(However, DSW4-No.1, 2, 4 and push switches can be operated while the power source is ON.)

The "■" mark indicates positions of DIP switches.

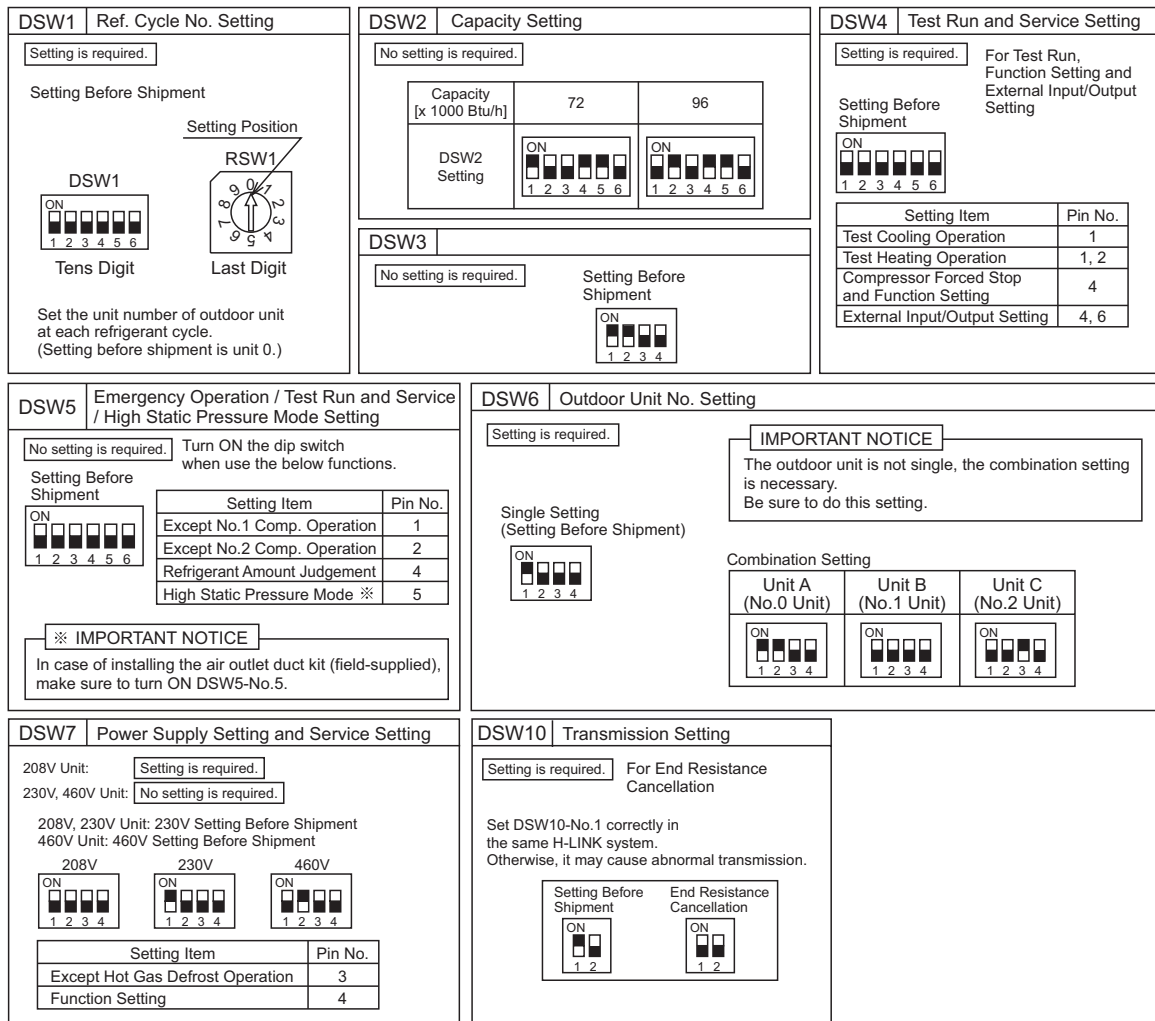


Figure 1.2 DSW Setting

● High Static Pressure Setting (DSW5-No.5: ON)

Turn ON the DSW5-No.5 pin for the high static pressure setting.

This setting enables high static pressure operation up to a maximum of 0.24 in.W.G. (60Pa).

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 3dB 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



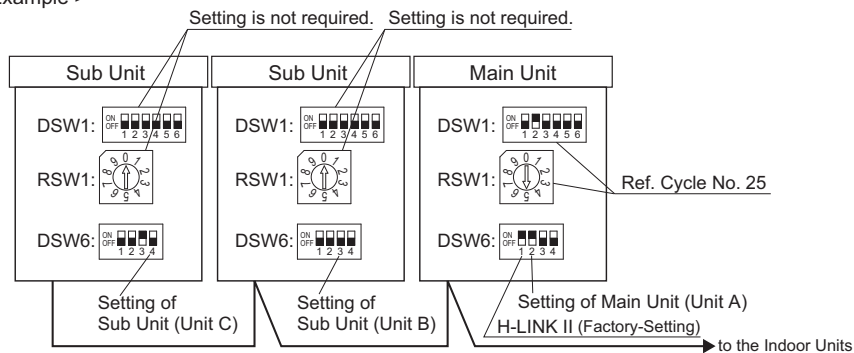
Turn ON No. 2 pin.



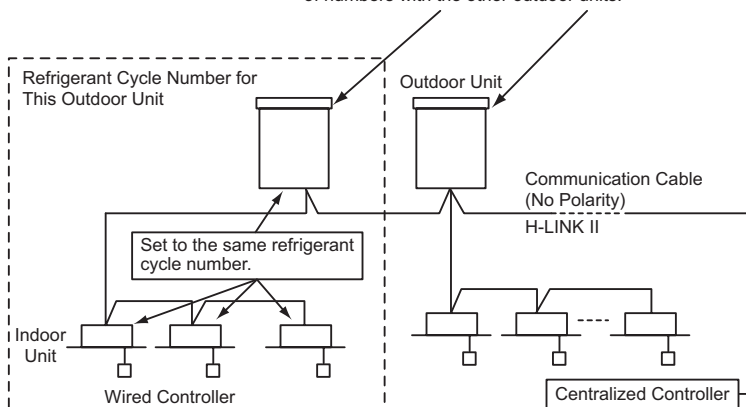
Set Dial No.5.

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

< Setting Example >



Set the refrigerant cycle number so there is no duplication of numbers with the other outdoor units.



Maximum Number of Connectable Outdoor Units and Indoor Units

Outdoor Unit	64
Indoor Unit	160

DSW7 Setting for Rated Voltage

DSW7 is used for setting of rated voltage for the outdoor unit as shown at the right.

When the site power source 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 source.

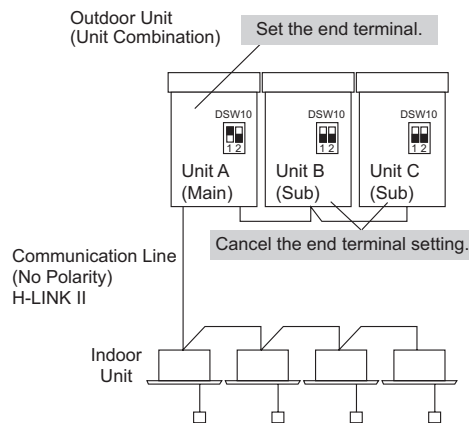
Voltage	DSW7 Setting
208V	<div>ON OFF</div> <div>1 2 3 4</div>
230V	<div>ON OFF</div> <div>1 2 3 4</div>
460V	<div>ON OFF</div> <div>1 2 3 4</div>

Setting of End Terminal Resistance

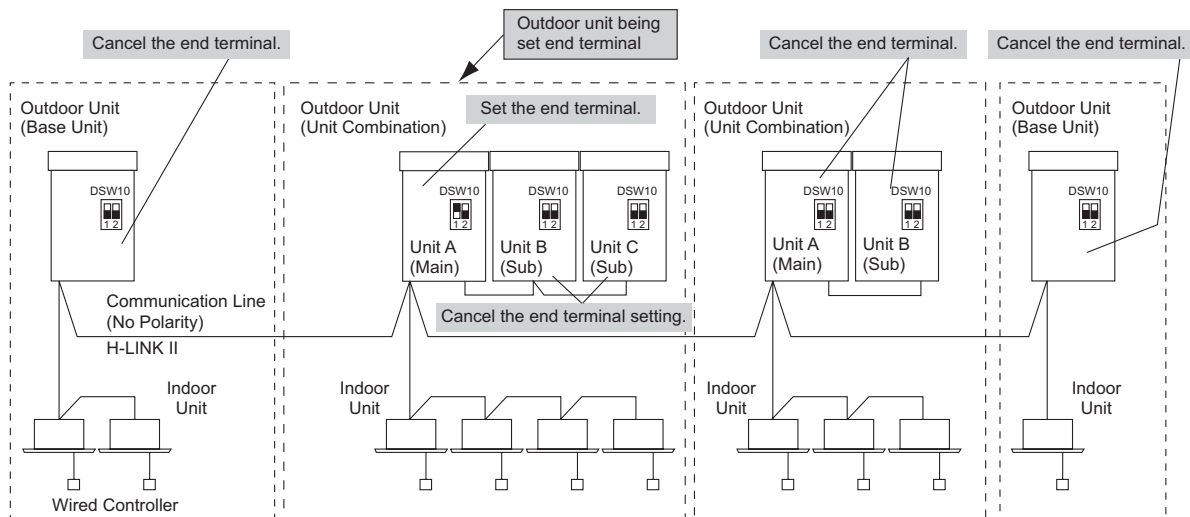
The factory setting for the No. 1 pin of DSW10 (for the setting of end terminal resistance) is in the "ON" position.

If there is one number in the same communication line (H-LINK II), set all No. 1 pins of DSW10 in the "OFF" position except the main outdoor Unit A.

Setting of End Terminal Resistance DSW10	
Factory Setting	Cancellation
<div>ON OFF</div> <div>1 2</div>	<div>ON OFF</div> <div>1 2</div>



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



3.1.4 Checking Wired Controller

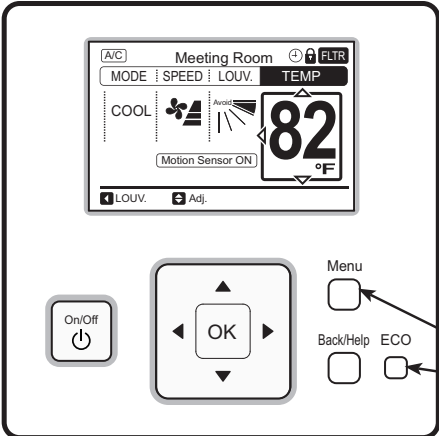
Wired Controller Model: CIW01

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

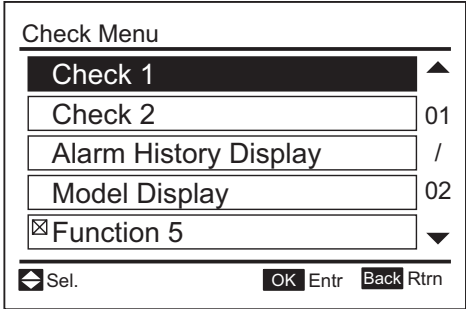
Check Menu Item	Function
Check 1	Sensor condition of air conditioner will be monitored and indicated.
Check 2	Sensor data of air conditioner prior to alarm occurrence will be indicated.
Alarm History Display	Previous alarm record (date, time, alarm code) will be indicated.
Model Display	Model name and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

● Setting Method

< Normal Mode Display >

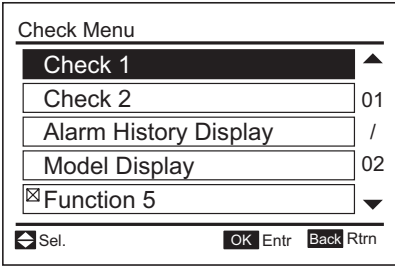
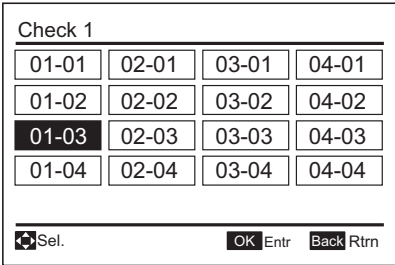
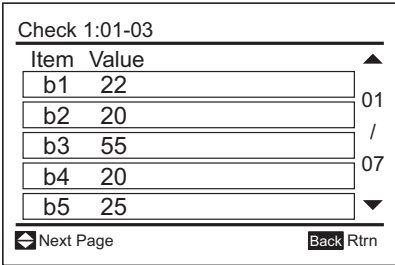
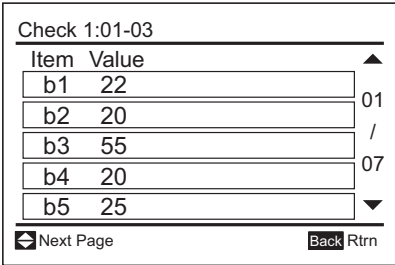


< Check Menu Display >



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

(1) Check 1 and Check 2

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

Features of Check Mode 1

No.	Item	Data Name
1	b1	Set Temp.
2	b2	Inlet Air Temp.
3	b3	Discharge Air Temp.
4	b4	Liquid Pipe Temp.
5	b5	Remote Thermistor Temp.
6	b6	Outdoor Air Temp.
7	b7	Gas Pipe Temp.
8	b8	Evaporating Temp. at Heating
9	b9	Condensing Temp. at Cooling
10	bA	Comp. Top Temp.
11	bb	Thermo Temp. of Wired Controller
12	bC	Not Prepared
13	C1	I.U. Micro-Computer
14	C2	O.U. Micro-Computer
15	d1	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.

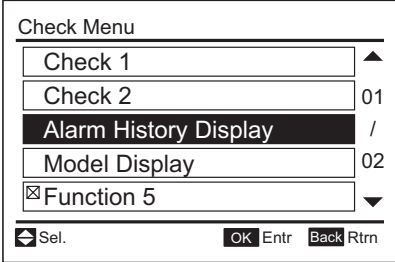
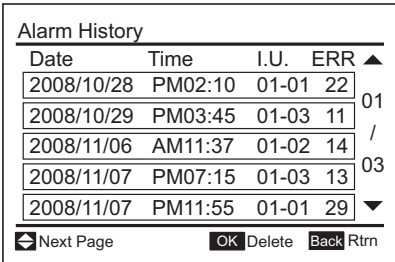
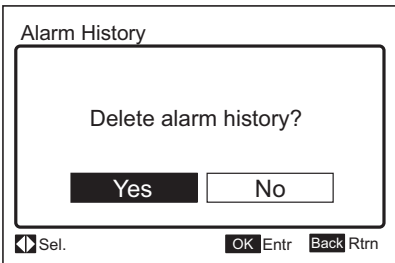
Features of Check Mode 2

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	Condensing Temp. at Cooling
8	q8	Comp. Top Temp.

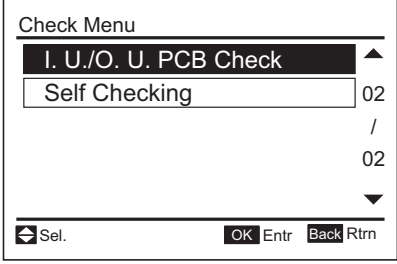
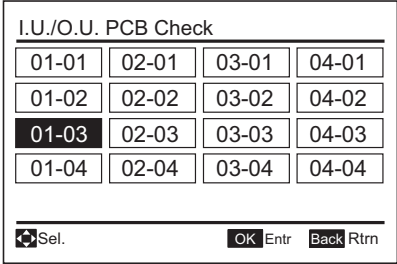
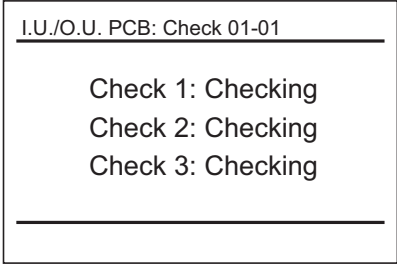
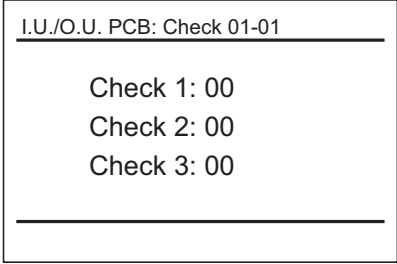
No.	Item	Data Name
9	q9	Discharge Pressure
10	qA	Suction Pressure
11	qb	Control Information
12	qC	Operating Frequency
13	qd	I.U. Expansion Valve
14	qE	O.U. Expansion Valve 1
15	qF	Comp. Current

(2) Alarm History Display

The Alarm History Display is accessed from the Check Menu.

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

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

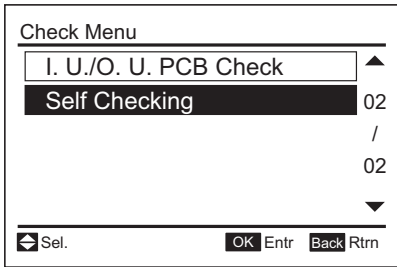
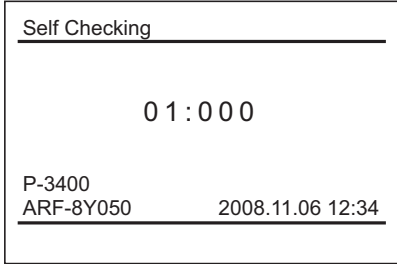
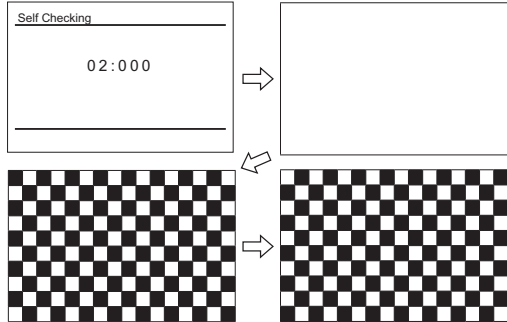
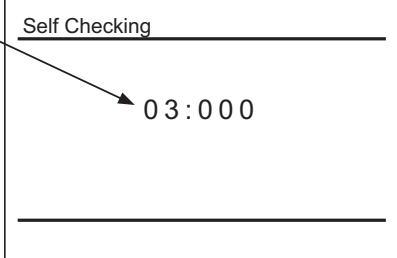
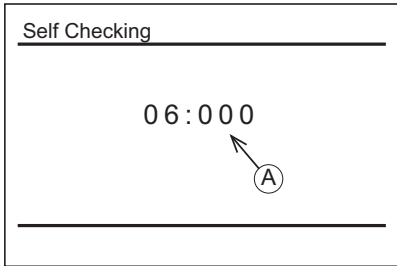
<p>(1) Press and hold "Menu" and "ECO" simultaneously for three seconds during the normal mode. Check Menu is displayed.</p>	
<p>(2) Select "I.U./O.U. PCB Check" from the Check Menu and press "OK".</p>	
<p>(3) Select the indoor unit to be set by pressing "Δ ∇ ◀ ▶" and press "OK". This screen is NOT displayed when there is only one indoor unit connected with the wired controller. In this case, (4) below will be displayed.</p>	
<p>(4) The indoor unit PCB and the outdoor unit PCB checks are started. * If "Menu" is pressed during the check, the check is canceled and the screen will return to (2). * If "Back/Help" is pressed during the check, the check is canceled and the screen will return to (3) above.</p>	
<p>(5) After completing the check, the results of the PCB check will be indicated. Press "Back/Help" and return to (3) above.</p>	

< Results of Check Table >

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

(4) Self-Checking

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

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

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

EEPROM Process

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

(5) Contact Information Registration

Contact information can be registered from “Contact Information”.

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

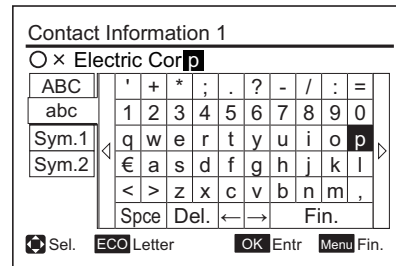
(2) Select “Contact Information” from the Test Run Menu and press “OK”.
Contact Information 1 will be displayed.

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

(4) Press “ Δ ∇ \triangleleft \triangleright ” to select letters.

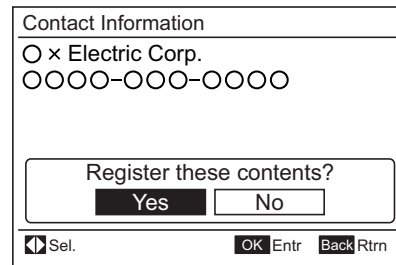
(5) Press “OK” to confirm the letters. (Max.: 28 letters)

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



(7) Repeat (3) through (5) to register contact information and continue.
Select “Fin.” and press “OK”, the confirmation screen will be displayed.
(Also, press “Menu” and the confirmation screen will be displayed.)

(8) Select “Yes” and press “OK”. The Test Run Menu will be displayed after the setting is confirmed.
If “No” is pressed, the screen will return to (3) above.



3.1.5 Checking Using 7-Segment Display

**WARNING**

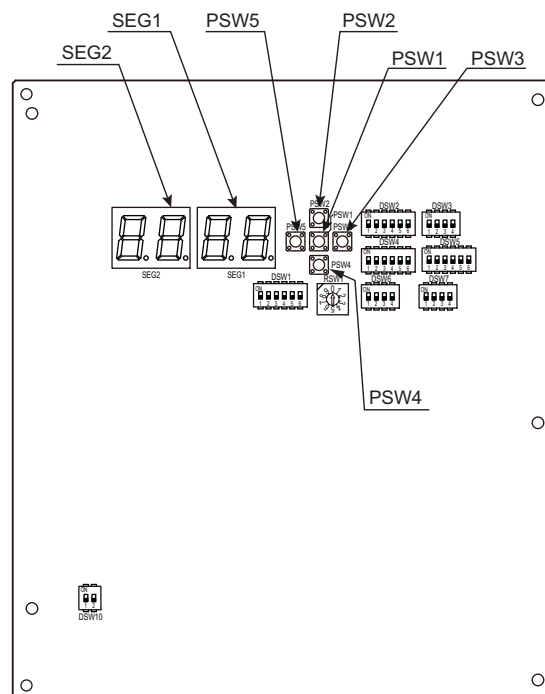
Only an authorized person can check using this method.

- **Before Checking**

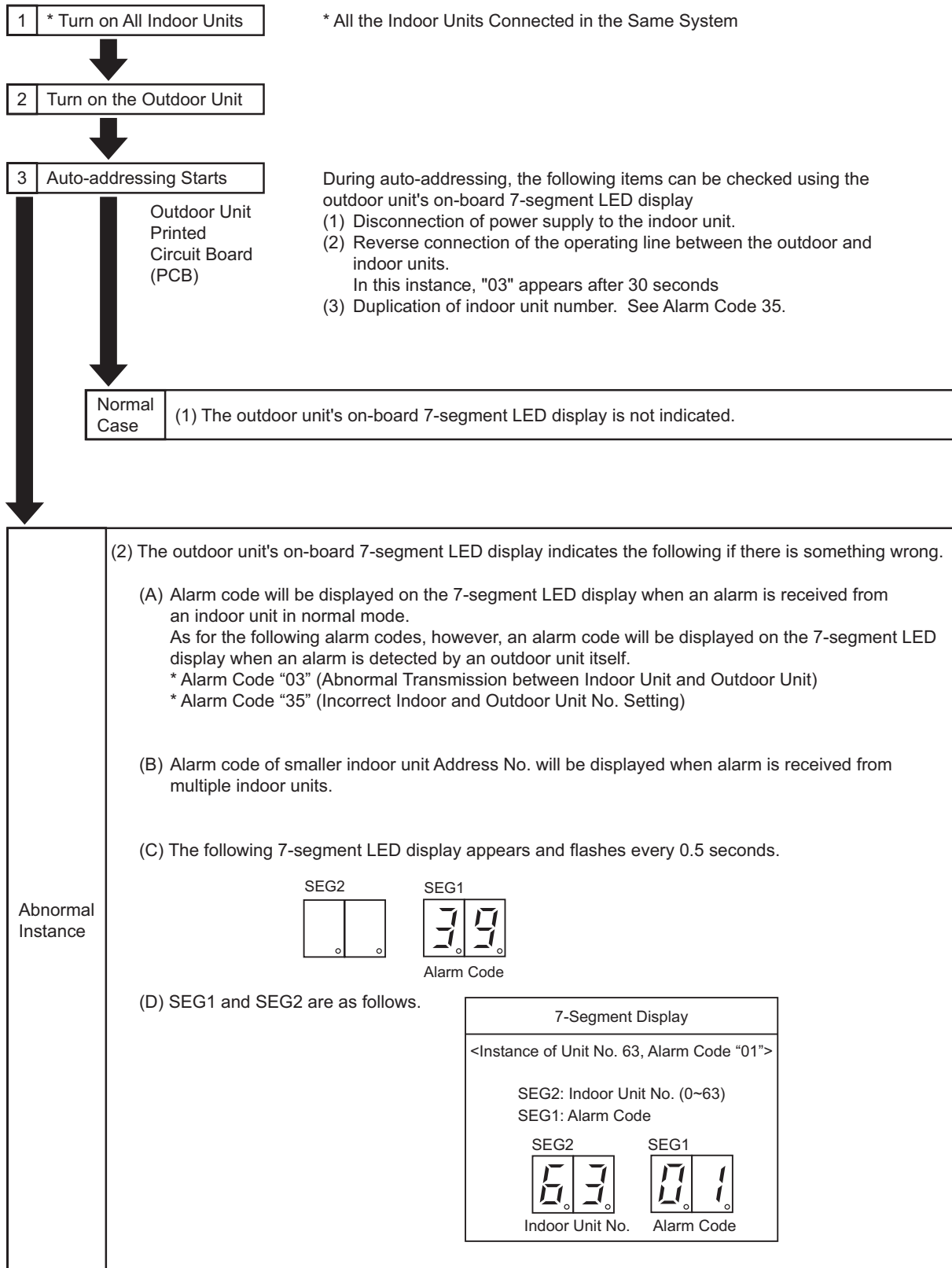
- 1) Turn ON the main power source. Wait for more than 20 seconds to start checking.
- 2) Checking Items
 - * Expansion Valve Opening
 - * Temperature Readings from Thermistors
 - * Number of Indoor Units Connecting in the Same System
- 3) Check the locations of 7-segment and push switches.
- 4) AC208-230V is applied to the PCB and electrical parts. Never touch electrical parts and wires without appropriate personal protective equipment (PPE) when checking.

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

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

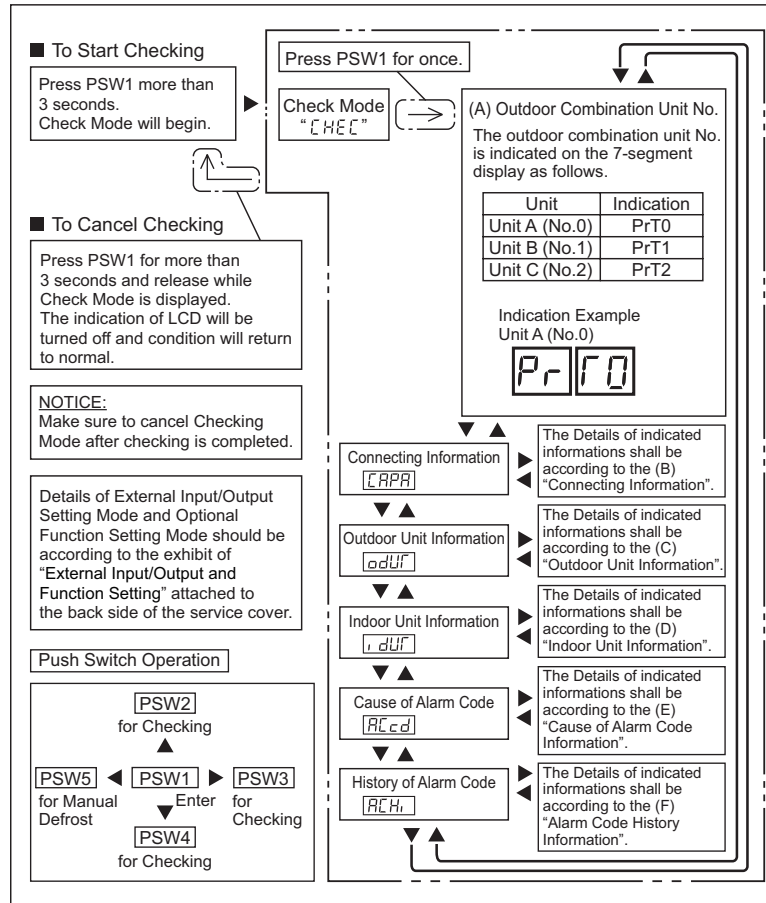


• Simple Checking using 7-Segment Display



• Checking Method Using Checking Mode

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



(B) Connecting Information

This information is indicated on Unit A (No. 0) only.

Press PSW4 (▼) to move forward or PSW2 (▲) to move backward.

The information will be indicated alternately as "Item" → "Details".

Indication Details

Item	7-Segment Display		Details
	SEG2	SEG1	
1 Total Capacity of Connected Outdoor Units	0	CP	Total Capacity of O.U. Combination Refer to "Outdoor Unit Capacity Table".
2 O.U. Constitution Quantities	0	RR	Constitution Quantities of O.U. Combination
3 Total Capacity of Connected Indoor Units	,	CP	Total Capacity of Connected Indoor Units
4 Connected I.U. Number	,	RR	Connected Indoor Unit Number
5 Refrigerant Group		CR	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		UU	Unit: Hour (Indication x 10 Hours)

Outdoor Unit Capacity Table

Indication	Type (Capacity) [x 1000 Btu/h]	Refrigeration Ton [RT]
72	072	6.0
96	096	8.0

NOTE:

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

< Example >

In case of 288 type

288 type = 096 type x 3

96 x 3 = 288

Indication "288" will be displayed.

Indoor Unit Capacity Table

Indication	Type (Capacity) [x 1000 Btu/h]	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
72	064	6.0
96	080	8.0

(C) Outdoor Unit Information

Select the outdoor unit number to be displayed only for the example of Unit A (No.0).

Units B and C (Nos.1 and 2) show each unit number only.

When the selection is changed, press PSW4 (▼) to forward or PSW2 (▲) to backward.

Select the outdoor unit number for indication.

Press PSW3 (►) for detailed information of selected unit number.

Press PSW4 (▼) to move forward or PSW2 (▲) to move backward. The information will be indicated alternately as "Item" → "Details".

Press PSW5 (◀) to return to Outdoor Combination Unit No. Selection.

Unit	Indication
Unit A (No.0)	0000
Unit B (No.1)	0001
Unit C (No.2)	0002

Details of Indication

Item	7-Segment Display		Details
	SEG2	SEG1*3)	
1 Outdoor Unit Capacity	CR	0	Unit Capacity Indication Refer to "Outdoor Unit Capacity Table"
2 Output State of Outdoor Micro-Computer	5C	0	Output State of Outdoor Micro-Computer Indication Refer to "Location of Push Switches and 7-Segment Display"
3 Running Frequency of Inverter Compressor MC1	H1	0	Running Frequency of INV. Compressor Indication (Hz)
4 Total Number of Running Compressor	CC	0	Total Number of Running Compressor Indication
5 Air Flow Rate	F0	0	Air Flow Rate Indication (0 to 25 Steps)
6 Outdoor Expansion Valve MV1 Opening	E1	0	Outdoor Expansion Valve MV1 Opening Indication (Unit: %)
7 Outdoor Expansion Valve MVB Opening for Bypass	E6	0	Expansion Valve Opening for Bypass Indication (Unit: %)
8 Discharge Pressure (High)	Pd	0	Unit: Psi Indication of Thermistor Open Circuit: 815 Indication of Thermistor Short Circuit: -90
9 Suction Pressure (Low)	PS	0	Unit: Psi Indication of Thermistor Open Circuit: 326 Indication of Thermistor Short Circuit: -36
10 Ambient Air Temperature (Ta)	ra	0	Unit: °F Indication of Thermistor Open Circuit: -197 Indication of Thermistor Short Circuit: 261
11 Discharge Gas Temperature on the Top of Compressor MC1 (TD1)	rd	10	Unit: °F Indication of Thermistor Open Circuit: 32 Indication of Thermistor Short Circuit: 491
12 Discharge Gas Temperature on the Top of Compressor MC2 (TD2)	rd	20	Unit: °F Indication of Thermistor Open Circuit: 32 Indication of Thermistor Short Circuit: 491
13 Evaporating Temperature TE at Heating	re	0	Unit: °F Indication of Thermistor Open Circuit: -197 Indication of Thermistor Short Circuit: 261
14 Outdoor Heat Exchanger Gas Temperature	re	0	Unit: °F Indication of Thermistor Open Circuit: -197 Indication of Thermistor Short Circuit: 261
15 Supercooling Temperature	re	40	Unit: °F Indication of Thermistor Open Circuit: -197 Indication of Thermistor Short Circuit: 261
16 Supercooling Temperature at Bypass	rb	00	Unit: °F Indication of Thermistor Open Circuit: -197 Indication of Thermistor Short Circuit: 261
17 Inverter Fin Temperature	rf	0	Unit: °F
18 Fan Controller Fin Temp.	rf	00	Unit: °F
19 Compressor MC1 Current*1)	R1	0	Unit: A
20 Compressor MC2 Current*1)	R2	0	Unit: A
21 Fan Motor (MOF1) Current*1)	RF	0	Unit: A
22 Accumulated Operation Time of Compressor MC1	UU	10	Unit: Hour (Indication x 10 Hours)
23 Accumulated Operation Time of Compressor MC2	UU	20	Unit: Hour (Indication x 10 Hours)
24 Accumulated Operation Time of Compressor MC1	cU	10	Unit: Hour (Indication x 10 Hours) Accumulated operation time can be reset.*2)
25 Accumulated Operation Time of Compressor MC2	cU	20	Unit: Hour (Indication x 10 Hours) Accumulated operation time can be reset.*2)
26 Cause of Inverter Stoppage	i r	10	Refer to "Inverter Stoppage Cause Table" Comp. No. O.U. No.
27 Cause of Fan Controller Stoppage	Ff	10	Refer to "Fan Controller Stoppage Cause Table" Fan Controller No. O.U. No.

*1) The indicated current is reduced value. Use a clamp meter for the accurate current value.

*2) For resetting the accumulated operation time, press "PSW1 + PSW3" for 5 seconds while the accumulated data is displayed.

(Example)

SEG2	SEG1
rd	20

*3) The outdoor unit No. is indicated on the one digit of "SEG1".

(D) Indoor Unit Information

This information is indicated on Unit A (No. 0) only.

Select the indoor unit number for the information indication. Press PSW4 (▼) to move forward or PSW2 (▲) to move backward.

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

NOTE:

For indoor unit connecting to change-over box, “.” will be indicated next to “d”.

(Example)
Instance of change-over box connecting to Indoor Unit No.5; the indication is as shown at the left.

(Example)

Instance of change-over box connecting to Indoor Unit No.5; the indication is as shown at the left.

Select the outdoor unit number for indication.

Press PSW3 (►) for detailed information of selected unit number

Press PSW4 (▼) to move forward or PSW2 (▲) to move backward. The information will be indicated alternately as “Item” → “Details”.

Press PSW5 (◀) to return to the Outdoor Combination Unit No. Selection.

Details of Indication

Item		7-Segment Display		Details
		SEG2	SEG1 *1)	
1	Indoor Unit Capacity	CR	00	Unit Capacity Indication Refer to “Indoor Unit Capacity Table”.
2	Expansion Valve Opening	, E	00	Unit: %
3	Heat Exchanger Liquid Piping Temp.	FL	00	Unit: °F
4	Heat Exchanger Gas Piping Temp.	FG	00	Unit: °F
5	Air Inlet Temp.	FI	00	Unit: °F
6	Air Outlet Temp.	FO	00	Unit: °F
7	Unit Stoppage Cause Code	d1	00	Indoor Unit Stoppage Cause Code Indication Refer to “Cause of Indoor Unit Stoppage Table”.

*1) The indoor unit number is indicated on “SEG1”.

(Example)
SEG2 SEG1
FG 00

(E) Cause of Alarm Code Information

This information is indicated on Unit A (No. 0) only.

Press PSW4 (▼) to move forward or PSW2 (▲) to move backward.

The information will be indicated alternately as “Item” → “Details”.

Details of Indication

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

(F) Alarm Code History Information

This information is indicated on Unit A (No. 0) 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

Details of Indication

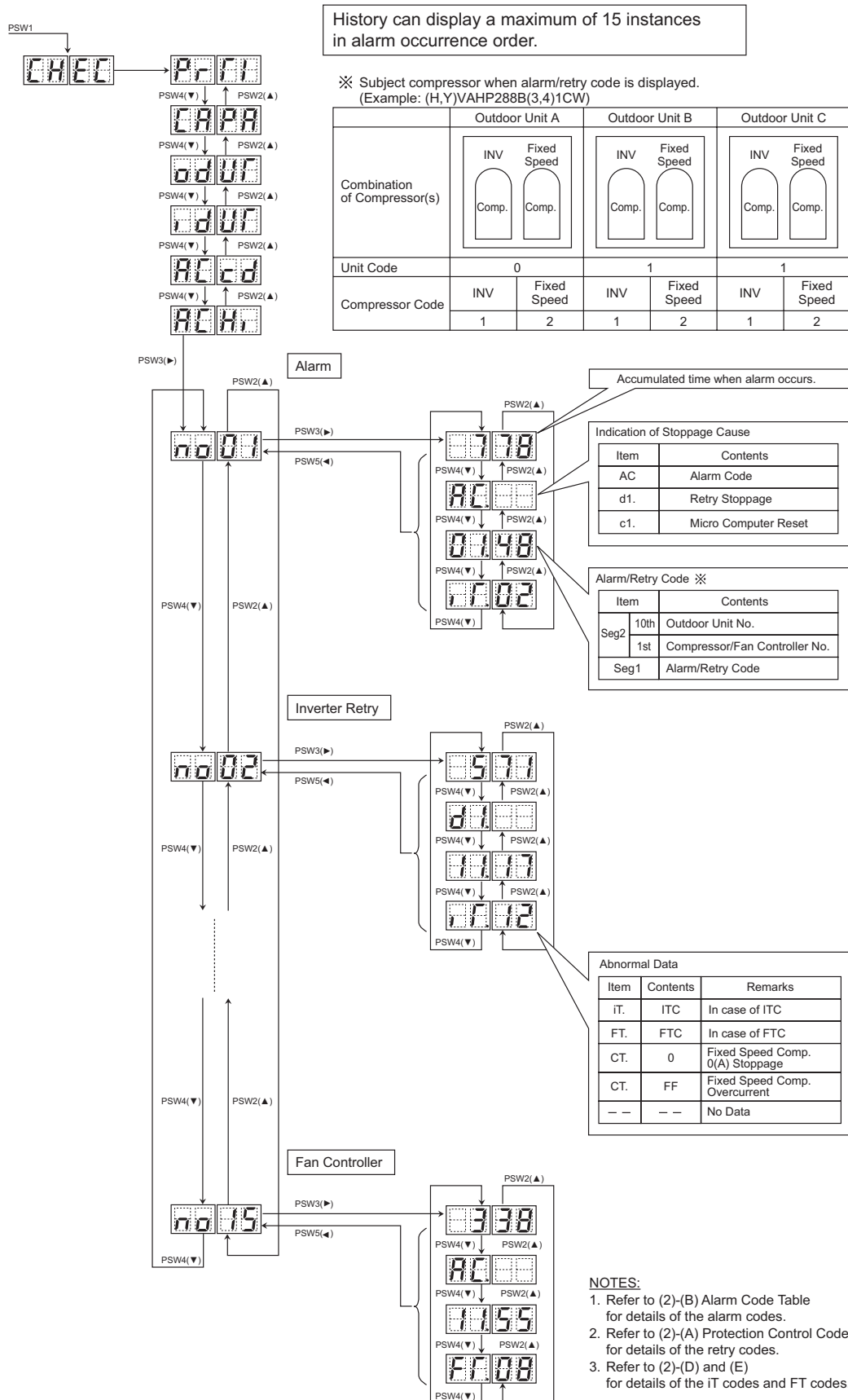
Item	7-Segment Display		Details
	SEG2	SEG1	
1 Unit Accumulated Operation Time	07	08	O.U. Accumulated Operation Time at Stoppage Unit: Hour (Indication x 10 Hours)
2 Cause of Stoppage	RC		Alarm Stoppage
	d1		Retry Stoppage
	C1		Control Information
3 Alarm / Stoppage Cause Code	01	48	Alarm and Stoppage 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	1f	12	Inverter stoppage cause code is indicated when IT code is existing on SEG2.
	Ff	12	Fan controller stoppage cause code is indicated when FT code is existing on SEG2.
	Cf	0	Stoppage cause of constant speed compressor abnormal current is 0A stoppage.
	Cf	Ff	Overcurrent Stoppage of Constant Speed Comp.
	--	--	No Data

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.



(1) Register of Alarm Code History

Cause of Stoppage (Alarm Code or Stoppage Code)	Contents	Indication of Alarm Code History					
		Time	* Alarm	Alarm Code			Abnormal Data
				O.U. Unit No.	Comp. 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.	○	○		--
04.	Abnormality transmitting between fan controller and outdoor unit PCB	Accumulated Time	AC.	○		○	--
05	Abnormality of power source phase	Accumulated Time	AC.	○			--
06	Abnormality of inverter voltage	Accumulated Time	AC.	○	○		iTC
d1-18		Accumulated Time	d1.	○	○		iTC
06.	Abnormality of fan controller voltage	Accumulated Time	AC.	○		○	FTC
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)	Accumulated Time	AC.	○	Thermistor Signal Te: E Tchg: C		--
25	Abnormality of thermistor for outdoor unit heat exchanger gas pipe (Tg/TbG)	Accumulated Time	AC.	○	Thermistor Signal TG: G TbG: b		--
29	Abnormality of low pressure sensor	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.	○			--
39	Abnormality of running current at constant speed compressor	Accumulated Time	AC.	○			CT Detected Value
d1-14		Accumulated Time	d1.	○			
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	Accumulated Time	AC.	○			--

* (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	Indication of Alarm Code History				
		Time	* Alarm	Alarm Code		
				O.U. Unit No.	Comp. No.	Fan No.
43	Abnormality of low compression ratio	Accumulated Time		○		
d1-11		Accumulated Time	d1.	○		
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.	○	○	
d1-17		Accumulated Time	d1.	○	○	
51	Abnormality of inverter current sensor	Accumulated Time	AC.	○	○	
d1-17		Accumulated Time	d1.	○	○	
53	Inverter error signal detection	Accumulated Time	AC.	○	○	
d1-17		Accumulated Time	d1.	○	○	
54	Abnormality of inverter fin temperature	Accumulated Time	AC.	○	○	
d1-17		Accumulated Time	d1.	○	○	
55	Inverter failure	Accumulated Time	AC.	○	○	
d1-17		Accumulated Time	d1.	○	○	
57	Activation of fan controller protection device	Accumulated Time	AC.	○		○
5A	Abnormality of fan controller fin temperature	Accumulated Time	AC.	○		○
5b	Activation of overcurrent protection	Accumulated Time	AC.	○		○
5C	Abnormality of fan controller sensor	Accumulated Time	AC.	○		○
b5	Incorrect setting of indoor unit connection number	Accumulated Time	AC.			
EE	Compressor protection alarm	Accumulated Time	AC.			
A1	Abnormality of Active Filter	Accumulated Time	AC.	○		
d1-05	Instantaneous power failure	Accumulated Time	d1			
d1-18	Abnormality of inverter and other	Accumulated Time	d1			
d1-26	Abnormality of high pressure decrease	Accumulated Time	d1			
d1-32	Retry stoppage by indoor unit auto address setting	Accumulated Time	d1			
d1-36	Retry stoppage by outdoor unit thermo-OFF stoppage after defrosting operation	Accumulated Time	d1			
Control Information	Micro-computer reset by abnormality of inverter transmission	Accumulated Time	Ci.			
	Micro-computer reset by abnormality of fan controller transmission	Accumulated Time	Ci.			
	Micro-computer reset by abnormality of indoor unit transmission	Accumulated Time	Ci.			
	Micro-computer reset by abnormality transmitting between outdoor unit and outdoor unit	Accumulated Time	Ci.			
	Micro-computer reset for abnormality of control state	Accumulated Time	Ci.			

* (Details of Alarm)

AC.: Alarm

d1.: Retry

Ci.: Control Information

iTC: Inverter Stoppage Code

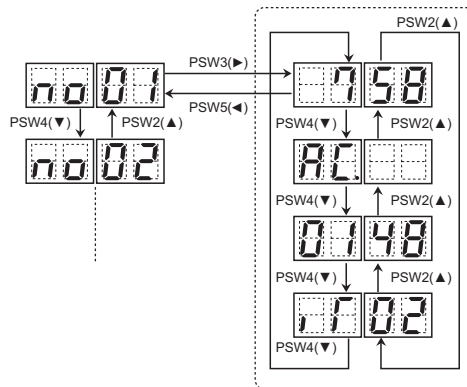
FTC: Fan Controller Stoppage Code

*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	P14	Overcurrent Retry of Constant Speed Comp.
P05	Discharge Gas Temp. on Top of Comp. Increase Protection	P15	Vacuum/Discharge Gas Temp. Increase Retry
P06	Low Pressure Decrease Protection	P16	Discharge Gas SUPER HEAT Decrease Retry
P09	High Pressure Decrease Protection	P17	Inverter Trip Retry
P0A	Demand Current Control	P18	Retry Related to Inverter
P0d	Low Pressure Increase Protection	P26	High Pressure Decrease Retry

NOTE: If the degeneration control is activated, the indications PC1 to PC5 are indicated 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 Condensation Drainage Pan, Problem with Drain Piping, Float Switch, or Condensation Drainage Pan)
02	Outdoor Unit	Activation of Protection Device (High Pressure Cut)	Activation of PSH (Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing)
03	Communication	Operational Irregularities between Indoor and Outdoor	Incorrect Wiring, Loose Terminals, Disconnect Wire, Blowout of Fuse, Outdoor Unit Power OFF
04		Problem between Inverter PCB and Outdoor PCB	Inverter PCB - Outdoor PCB Communication Failure (Loose Connector, Wire Breaking, Blown of Fuse)
04.		Problem between Fan Controller and Outdoor PCB	Fan Controller - Outdoor PCB Communication Failure (Loose Connector, Wire Breaking, Blown of Fuse)
05	Supply Phase	Problem of Power Source Phases	Incorrect Power Source, Connection to Reversed Phase, Open-Phase
06	Voltage	Abnormal Inverter Voltage	Outdoor Voltage Drop, Insufficient Power Capacity
06.		Abnormal Fan Controller Voltage	Outdoor Voltage Drop, Insufficient Power Capacity
07	Cycle	Decrease in Superheated Discharge Gas	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	Problem between Outdoor and Outdoor	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 System
0C		Incorrect Outdoor Unit Main Unit Setting	Two (or more) Outdoor Units Set as "Main Unit" Exist in Same Refrigerant Cycle System
11	Sensor on Indoor Unit	Inlet Air Thermistor	Incorrect Wiring, Disconnecting Wiring Breaking Wire, Short Circuit
12		Outlet Air Thermistor	
13		Freeze Protection Thermistor	
14		Gas Piping Thermistor	
15		Outdoor Air Thermistor (ECONO)	
16		Remote Sensor (DOAS)	
17		Thermistor Built-in Remote Controller (DOAS)	
19	Fan Motor	Activation of Protection Device for Indoor Fan	Fan Motor Overheat, Lockup
21	Sensor on Outdoor Unit	High Pressure Sensor	Incorrect Wiring, Severed or Disconnecting Wiring, Short Circuit
22		Outdoor Air Thermistor	
23		Discharge Gas Thermistor on Top of Compressor	
24		Heat Exchanger Liquid Pipe Thermistor	
25		Heat Exchanger Gas Pipe Thermistor	
29		Low Pressure Sensor	

Code	Category	Content of Abnormality	Leading Cause
31	System	Incorrect Capacity Setting of Outdoor Unit and Indoor Unit	Incorrect Capacity Code Setting of Combination Excessive or Insufficient Indoor Unit Total Capacity Code
35		Incorrect Setting of Indoor Unit No.	Duplication of Indoor Unit No. in same Refrigerant Group
36		Incorrect Indoor Unit Combination	Indoor Unit is Designed for R22
38		Problem with Protective Pickup Circuit in Outdoor Unit	Failure of Protection Detecting Device (Incorrect Wiring of Outdoor PCB)
39	Compressor	Problem with Running Current at Constant Speed Compressor	Overcurrent, Blown Fuse, Current Sensor Failure, Instantaneous Power Failure, Voltage Drop, Abnormal Power Supply
3A	Outdoor Unit	Problem with Running Outdoor Unit Capacity	Outdoor Unit Capacity > 288 MBH
3b		Incorrect Setting of Outdoor Unit Models Combination or Voltage	Incorrect Setting of Main and Sub Unit(s) Combination or Voltage
3d		Communication Problem between Main Unit and Sub Unit(s)	Incorrect Wiring, Disconnect Wire, Breaking Wire, PCB Failure
3E		Communication Problem between Inverter PCB and Outdoor PCB	Incorrect Combination between Inverter PCB and Outdoor PCB
43	Protection Device	Activation of Compression Ratio Decrease Protection Device	Defective Compression (Failure of Compressor of Inverter, Loose Power Supply Connection)
44		Activation of Low Pressure Increase Protection Device	Overload at Cooling, High Temperature at Heating, Expansion Valve Locking (Loose Connector)
45		Activation of High Pressure Increase Protection Device	Overload Operation (Clogging, Short-Pass), Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing
47		Activation of Low Pressure Decrease Protection Device (Vacuum Operation Protection)	Insufficient Refrigerant, Refrigerant Piping, Clogging, Expansion Valve Locking at Open Position (Loose Connector)
48		Activation of Inverter Overcurrent Protection Device	Overload Operation, Compressor Failure
51	Sensor	Problem with Inverter Current Sensor	Current Sensor Failure
53	Inverter	Inverter Error Signal Detection	Driver IC Error Signal Detection (Protection for Overcurrent, Low Voltage, Short Circuit)
54		Abnormality of Inverter Fin Temperature	Abnormal Inverter Fin Thermistor, Heat Exchanger Clogging, Fan Motor Failure
55		Inverter Failure	Inverter PCB Failure
57	Fan Controller	Activation of Fan Controller Protection	Driver IC Error Signal Detection (Protection for Overcurrent, Low Voltage, 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		Problem with Fan Controller Sensor	Failure of Current Sensor (Instantaneous Overcurrent, Increase of Fin Temperature, Low Voltage, Ground Fault, Step-Out)
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
b1	Outdoor Unit No. Setting	Incorrect Setting of Unit and Refrigerant Cycle Number	There are 64 or More Number is Set for Address or Refrigerant Cycle.
b5	Indoor Unit No. Setting	Incorrect Indoor Unit Connection No. Setting	There are 17 or More Non-Corresponding to H-LINK II Units are Connected to One System.

(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, Activation of Float Switch	17	Retry due to Inverter Tripping
2	Alarm	18	Retry due to Voltage Decrease, Other Retry of Inverter
3	Freeze Protection, Overheating Protection	19	Expansion Valve Opening Change Protection
5	Instantaneous Power Failure at Outdoor Unit/Reset	21	Enforced Thermo-OFF
6	Instantaneous Power Failure at Indoor Unit/Reset	22	Enforced Thermo-OFF (Hot Start Control at Crankcase Heater Preheating) Refer to Cancellation Method
7	Stoppage of Cooling Operation due to Low Outdoor Air Temp. Stoppage of Heating Operation due to High Outdoor Air Temp.	26	Retry due to High Pressure Decrease
9	Stoppage of Reversing Valve Switching Control	28	Stoppage due to Outlet Temp. Decrease in Cooling
10	Demand Enforced Stoppage	30	Stoppage of Thermo-OFF due to Compressor Excepting
11	Retry due to Pressure Ratio Decrease	32	Retry due to Abnormal Transmission of Outdoor Unit
12	Retry due to Low Pressure Increase	36	Retry after Defrosting Operation
13	Retry due to High Pressure Increase	39	Stoppage of Thermo-OFF due to Energy Saving Control
14	Retry due to Abnormal Current of Constant Speed Compressor		
15	Retry due to Vacuum Abnormality, Discharge Gas Temp. Increase		

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

NOTE:

Even if stoppage Alarm "02" is not always indicated.

* 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 IC Error Signal Detection
2	Instantaneous Overcurrent
3	Fin Temp. Increase
4	Electronic Thermal Activation (Inverter Overcurrent)
5	Voltage Decrease
6	Voltage Increase
7	Abnormal INV. Transmission
8	Abnormal Current Sensor
9	Instantaneous Power Failure Detection
11	Micro Computer Reset
12	Ground Fault Detecting
13	Abnormal Power Source Phase
16	Inverter Retry
17	Abnormal Control
21	Abnormal Fan Motor (Step-out)
22	Abnormal Setting of PCB

(E) Cause of Fan Controller Stoppage

Code	Cause
1	Driver IC Error Signal Detection
2	Instantaneous Overcurrent
3	Fin Temp. Increase
4	Electronic Thermal Activation
5	Voltage Decrease
6	Voltage Increase
7	Abnormal INV. Transmission
8	Abnormal Current Sensor
9	Instantaneous Power Failure Detection
11	Micro Computer Reset
12	Ground Fault Detecting
15	Reverse Driving
16	Inoperative Fan Motor Detection
17	Abnormal Control
21	Abnormal Fan Motor (Step-out)

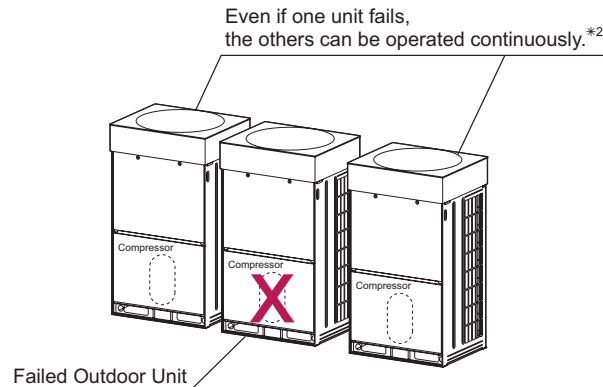
3.1.7 Emergency Operation

(1) Emergency Mode Operation from Wired Controller ((H,Y)VAHP144B(3,4)1CW to (H,Y)VAHP288B(3,4)1CW)

If the compressor fails, an emergency operation mode is accessible by the wired controller. Even if the compressor fails, the air conditioning operation is continuously available until troubleshooting is performed.

This Backup Operation Function prevents the system from coming to a complete stop when the outdoor unit failure occurs. *1

Emergency operation starts with the wired controller after an alarm occurrence. *3



NOTE:

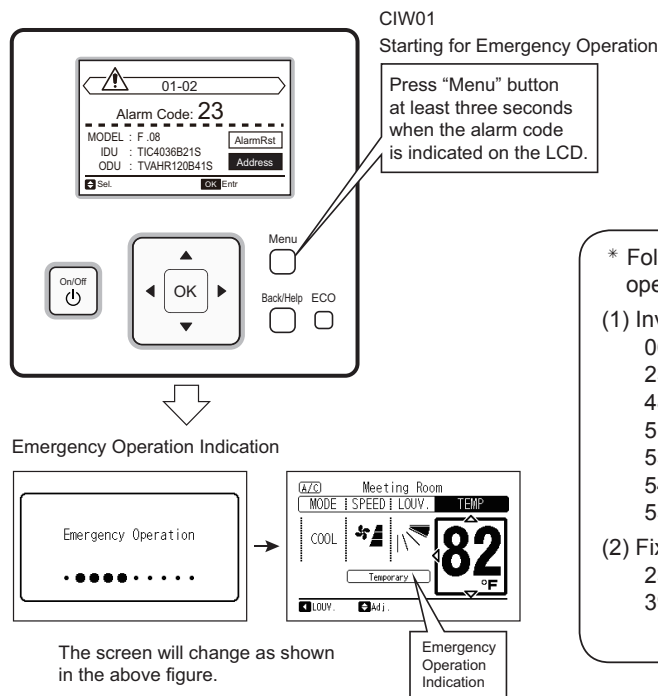
- *1: At least two outdoor units are required for this function.
- *2: Do not perform emergency operation more than eight hours. Going beyond that may damage the unit.
- *3: The emergency operation can be performed when the specified alarm code occurs. Refer to the following.

(a) Procedure

<For CIW01>

By pressing "MENU" for three seconds, emergency operation starts.

"EMG" is displayed on the LCD during this operation.



* Following these alarm codes, emergency operation is possible.

- (1) 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
 - 55: Inverter Failure
- (2) Fixed Speed Compressor Failure
 - 23: Abnormality of Discharge Gas Thermistor
 - 39: Abnormality of Running Current at Fixed Speed Compressor

(b) Operation Condition

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

NOTES:

- 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 the service people come. 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

① For Combination of Outdoor Units

((H,Y)VAHP144B(3,4)1CW to (H,Y)VAHP288B(3,4)1CW)

<Alarms Corresponding to Inverter Compressor Failure>

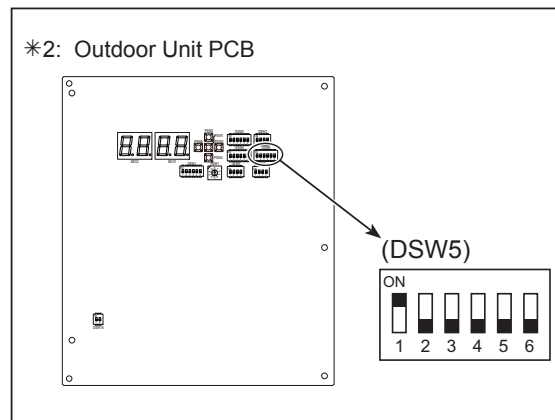
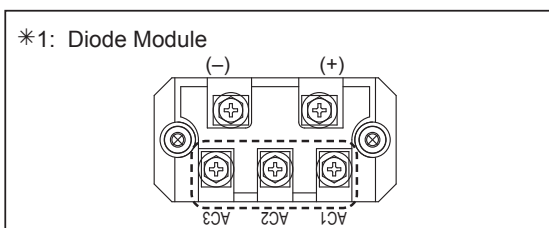
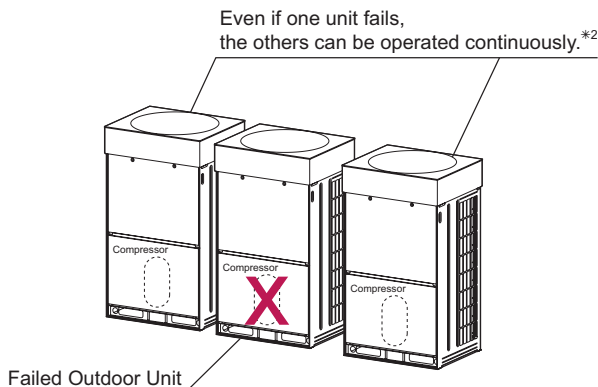
- 04: Abnormal Communication between inverter PCB and Outdoor Unit PCB
- 06: Abnormality of Inverter Voltage
- 23: Abnormality of Discharge Gas Thermistor
- 48: Activation of Overcurrent Protection Device
- 51: Abnormality of Inverter Current Sensor
- 53: Inverter Error Signal Detection
- 54: Abnormality of Inverter Fin Temperature
- 55: Inverter Failure

<Alarms Corresponding to Fixed Speed Compressor Failure>

- 23: Abnormality of Discharge Gas Thermistor
- 39: Abnormality of Running Current at Fixed Speed Compressor

(a) Procedures

1. Turn OFF all the main switches of the outdoor and indoor units.
2. If the inverter compressor is faulty, disconnect the wiring (U, V, W) of the diode module.
(Insulate the disconnected terminals.) *1
3. Turn DSW5-No.1 or No.2 ON to stop the compressor operation. If either is set, NONE of the compressors in the failed outdoor unit will operate. *2
For the heat pump system, fully close the stop valves (for gas/liquid) of the failed outdoor unit.
4. Turn ON the power supply.
5. Start the operation with the wired controller.



PROCEDURE REMINDERS:

- 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 be indicated 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.

② For Outdoor Unit without Combination

[at Inverter Compressor Failure]

((H,Y)VAHP072B(3,4)1CW and (H,Y)VAHP096B(3,4)1CW)

This operation is an emergency operation by the fixed speed compressor when the inverter compressor fails.

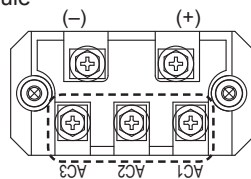
<Alarms Corresponding to Inverter Compressor Failure>

- 04: Abnormal Communication between inverter PCB and Outdoor Unit PCB
- 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
- 55: Inverter Failure

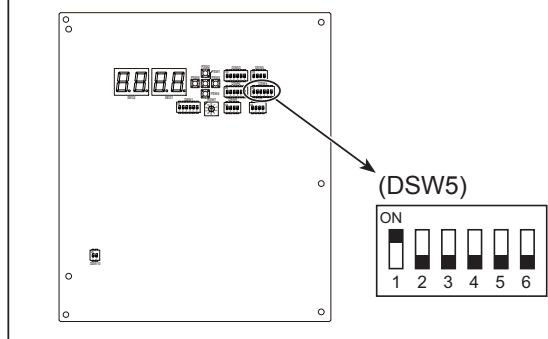
(a) Procedures

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

*1: Diode Module



*2: Outdoor Unit PCB



(b) Operation Condition

< Indoor Unit Operation Capacity >

The compressor is forced to stop for compressor protection under the following condition:

Total Capacity of Thermo ON I.U. < 50% of O.U. Capacity and

Total Capacity of Thermo ON I.U. < 90kBtu/h

(A lack of a thermo ON indoor unit may lead to a fixed speed compressor failure because the compressor is operated and stopped repeatedly.)

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.

PROCEDURE REMINDERS:

- 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.
- Total operating capacity of indoor unit should be 90kBtu/h and over.
(Less than 90kBtu/h: Forced stoppage)
- In this emergency operation, compressor frequency cannot be controlled normally.
Therefore, an alarm code "07", "43", "44", "45" or "47" may be indicated 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.

[at Fixed Speed Compressor Failure]

((H,Y)VAHP072B(3,4)1CW and (H,Y)VAHP096B(3,4)1CW)

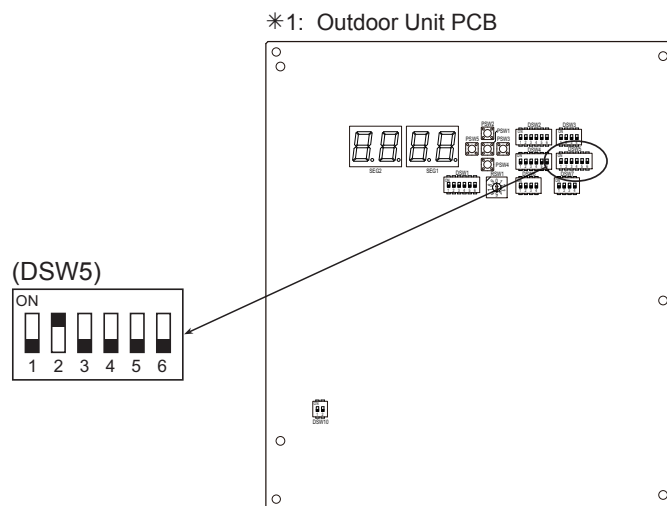
This operation is an emergency operation by the inverter compressor when the fixed speed compressor fails.

<Alarms Corresponding to Fixed Speed Compressor Failure>

- 23: Abnormality of Discharge Gas Thermistor
- 39: Abnormality of Running Current at Fixed Speed Compressor

(a) Procedures

1. Turn OFF all the main switches of the outdoor and indoor units.
2. Turn ON DSW5-No.2 to stop the fixed compressor operation. Not all the compressors in the failed outdoor unit will stop the operation. If two compressors are stopped simultaneously, the stoppage cause is supposed to be d1-30. *1
3. Turn ON the power supply.
4. Start the operation with the wired controller.



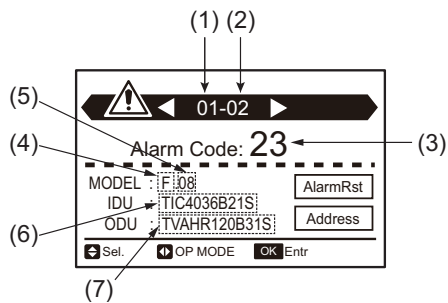
PROCEDURE REMINDERS:

- Measure the insulation resistance of the fixed speed 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 be indicated on the LCD.
- This emergency operation may not provide sufficient cooling and heating capacity.
- This operation is a temporary emergency operation when the fixed speed compressor is damaged.
Therefore, replace it with a new one as soon as possible.
- Turn OFF DSW5 of the outdoor unit PCB after replacing the compressor.
If this setting is not performed, the fixed speed compressor will not operate.

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" shall be 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".

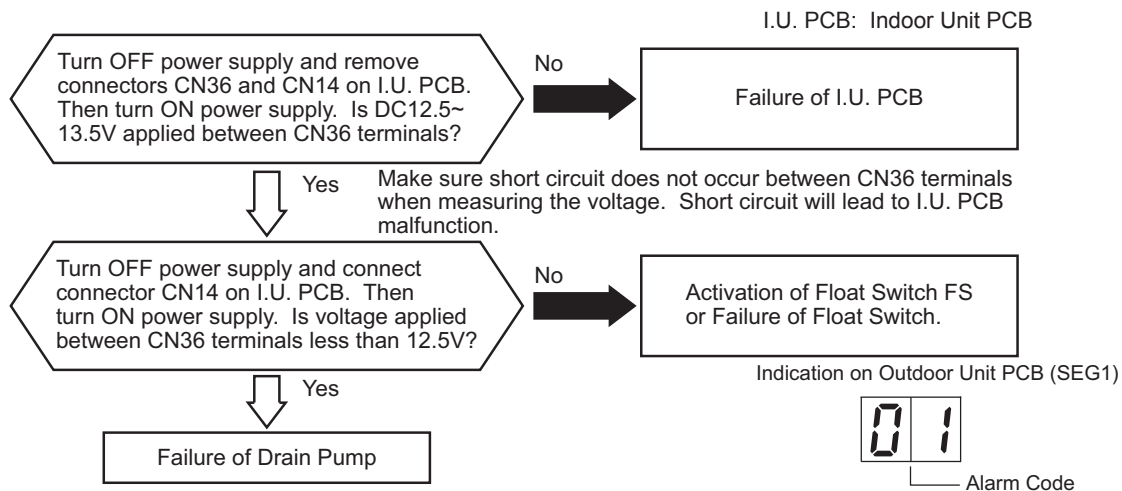
3.2.2 Troubleshooting Using Alarm Codes

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

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

★ Example of 4-way Cassette Type

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



TROUBLESHOOTING

Event	Cause		Check Item	Action (Turn OFF Main Switch)
Activation of Float Switch	High Drain Level	Clogging of Drainage Up-Slope Drain Piping	Check drain pan. Check drainage by pouring water.	Remove foreign particles clogging drain pipe.
Failure of Float Switch	Failure		Check continuity when drain level is low.	Replace float switch if faulty.
	Contact Failure		Measure resistance with a tester.	Replace and tighten connector.
	Incorrect Connection		Check connection.	Repair connection.
Failure of Drain Pump	Failure		Measure voltage between CN36 terminals with a tester.	Replace drain pump if faulty.
	Contact Failure		Measure resistance with a tester.	Replace and tighten connector.
	Incorrect Connection		Check connection.	Repair connection.
Failure of Indoor Unit PCB			Check PCB in Self-Checking Mode *1).	Replace it if faulty.

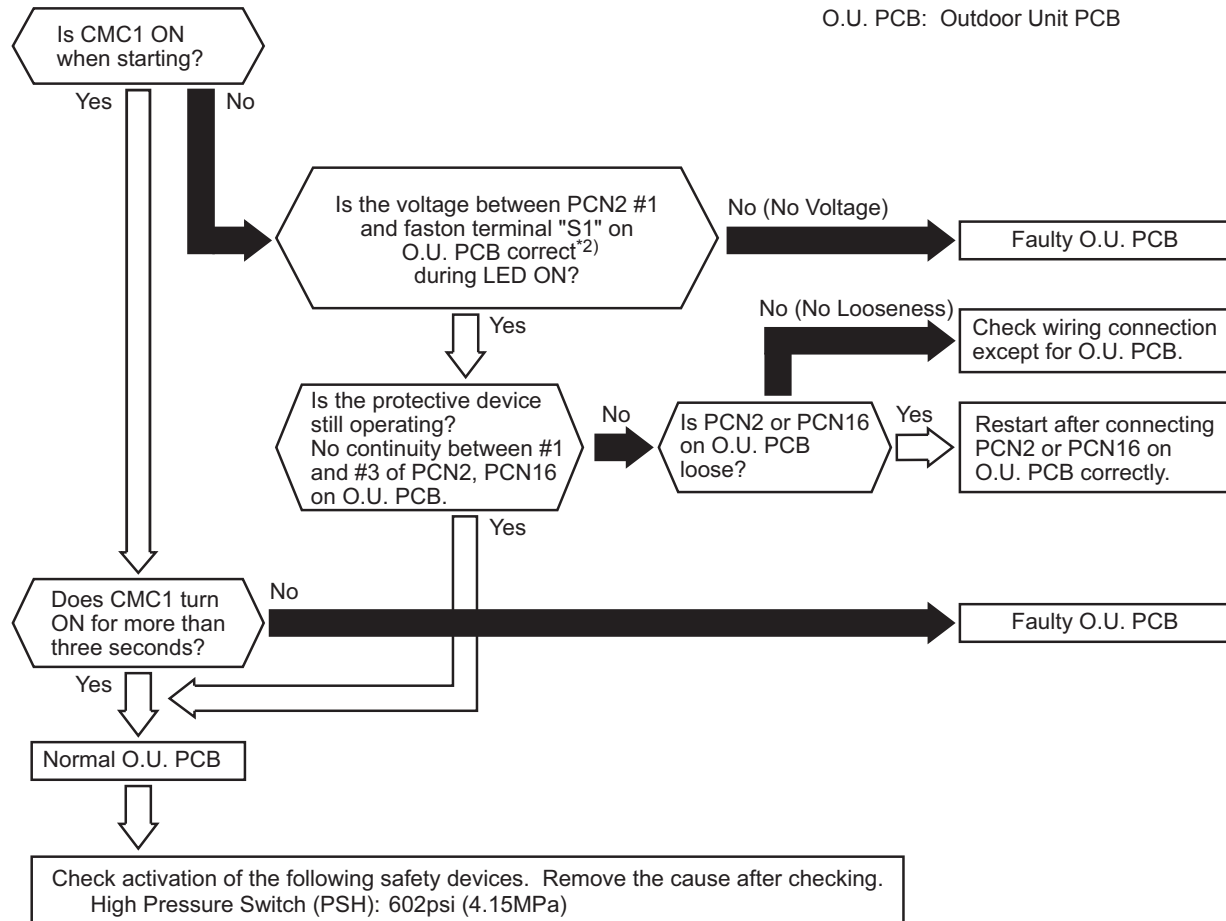
*1): Refer to Section 3.1.4 (3) above for details.

Alarm Code **02**

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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
- ^{*1)} Except for some models.

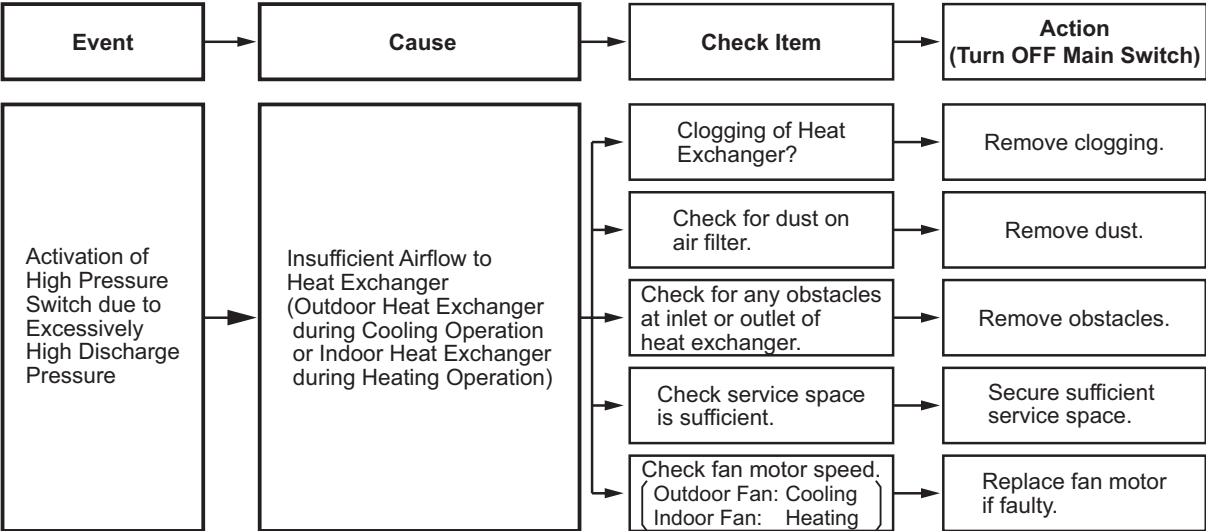
★ This alarm code is indicated when the high pressure switch (PSH) is activated during the compressor operation (Y52C is turned ON).



^{*2)}: CMC Voltage and Number of Pressure Switch

Model	Correct Voltage between PCN2#1 and Faston Terminal S1	High Pressure Switch	
		PSH1 (PCN2)	PSH2 (PCN16)
(H,Y)VAHP072B31CW (H,Y)VAHP096B31CW	208/230V	O	O
(H,Y)VAHP072B41CW (H,Y)VAHP096B41CW	220V	O	O

TROUBLESHOOTING



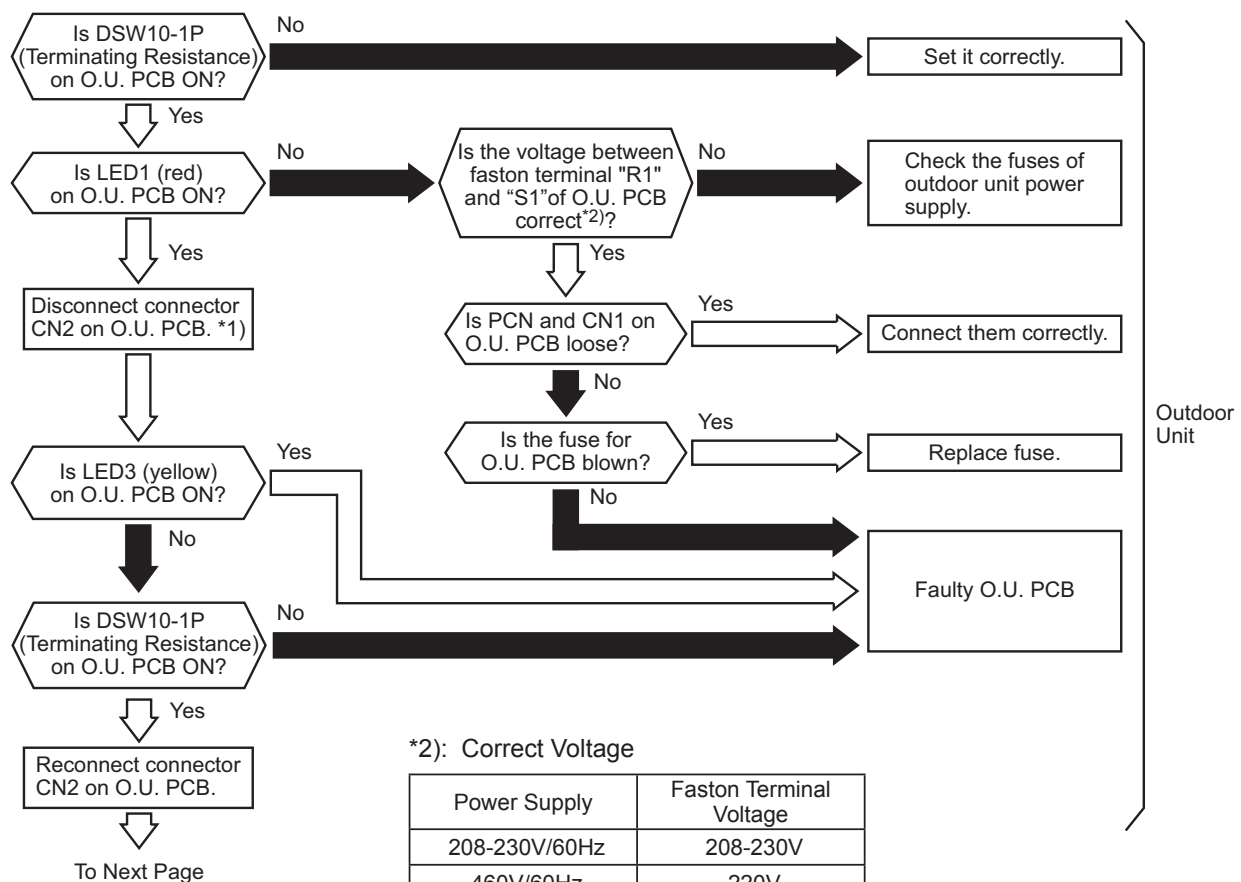
Alarm
Code

03

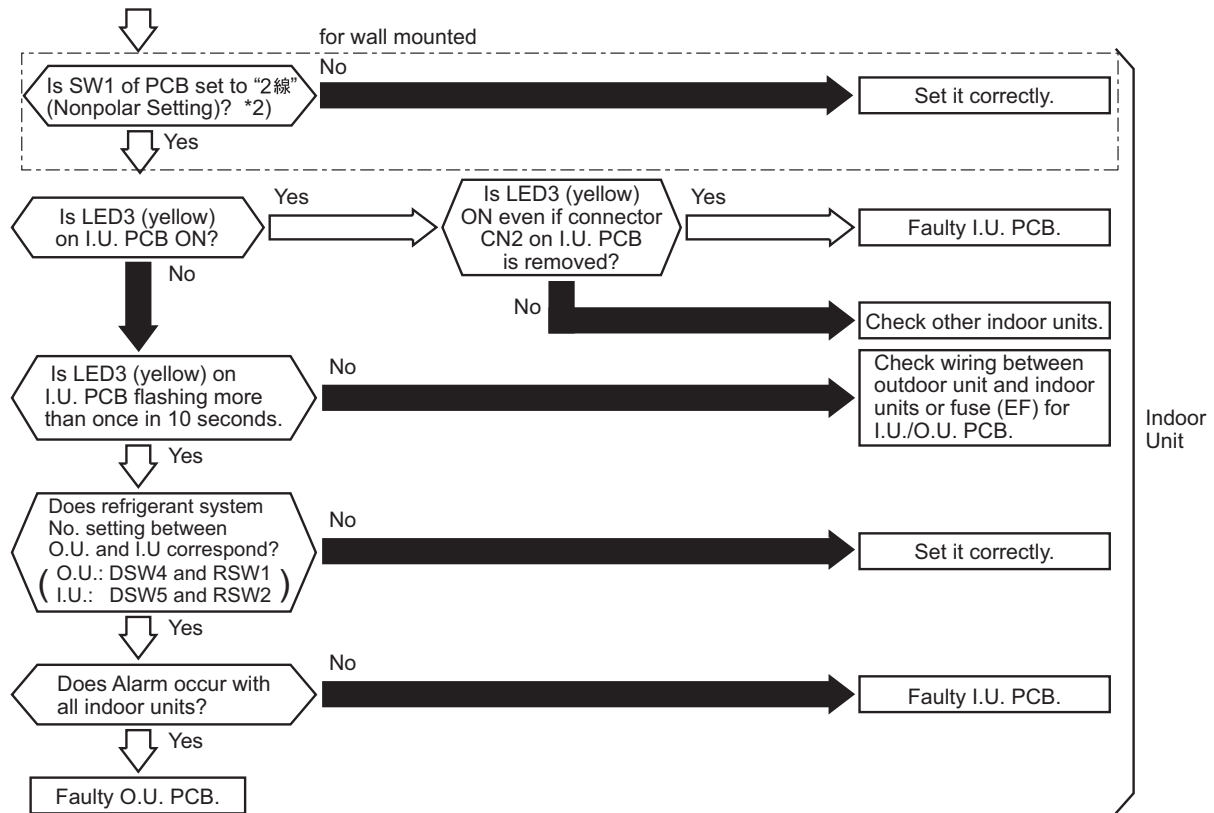
Abnormal Communication between Indoor Units and Outdoor Units

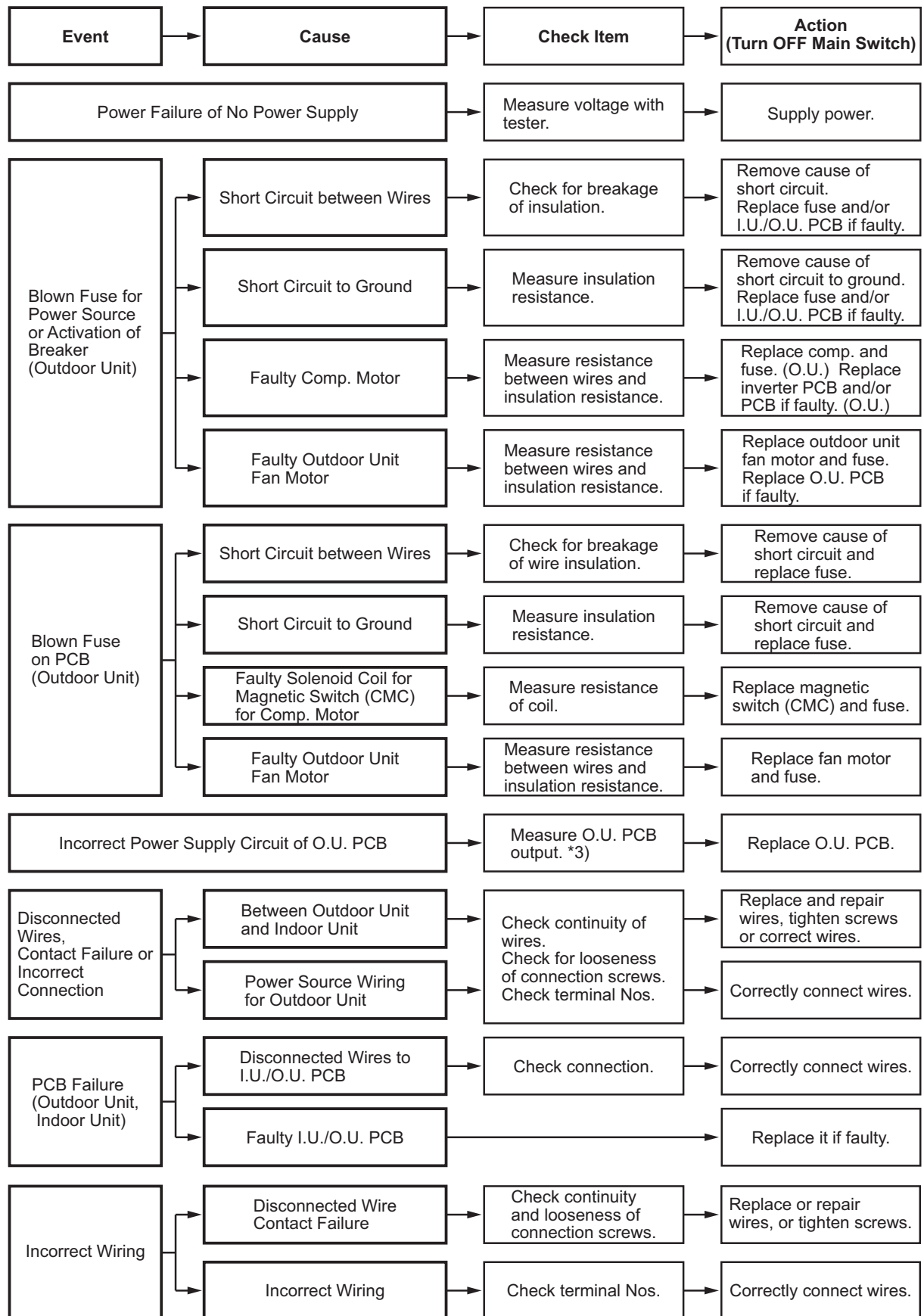
- The RUN indicator (red) flashes.
 - The indoor unit number (refrigerant cycle number - address number), the alarm code, the model code*¹⁾, the model name*¹⁾ and the number of connected indoor units are displayed on the LCD, and the indoor unit number and the alarm code are displayed on the 7-segment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

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



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





O.U. PCB: Outdoor Unit PCB

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

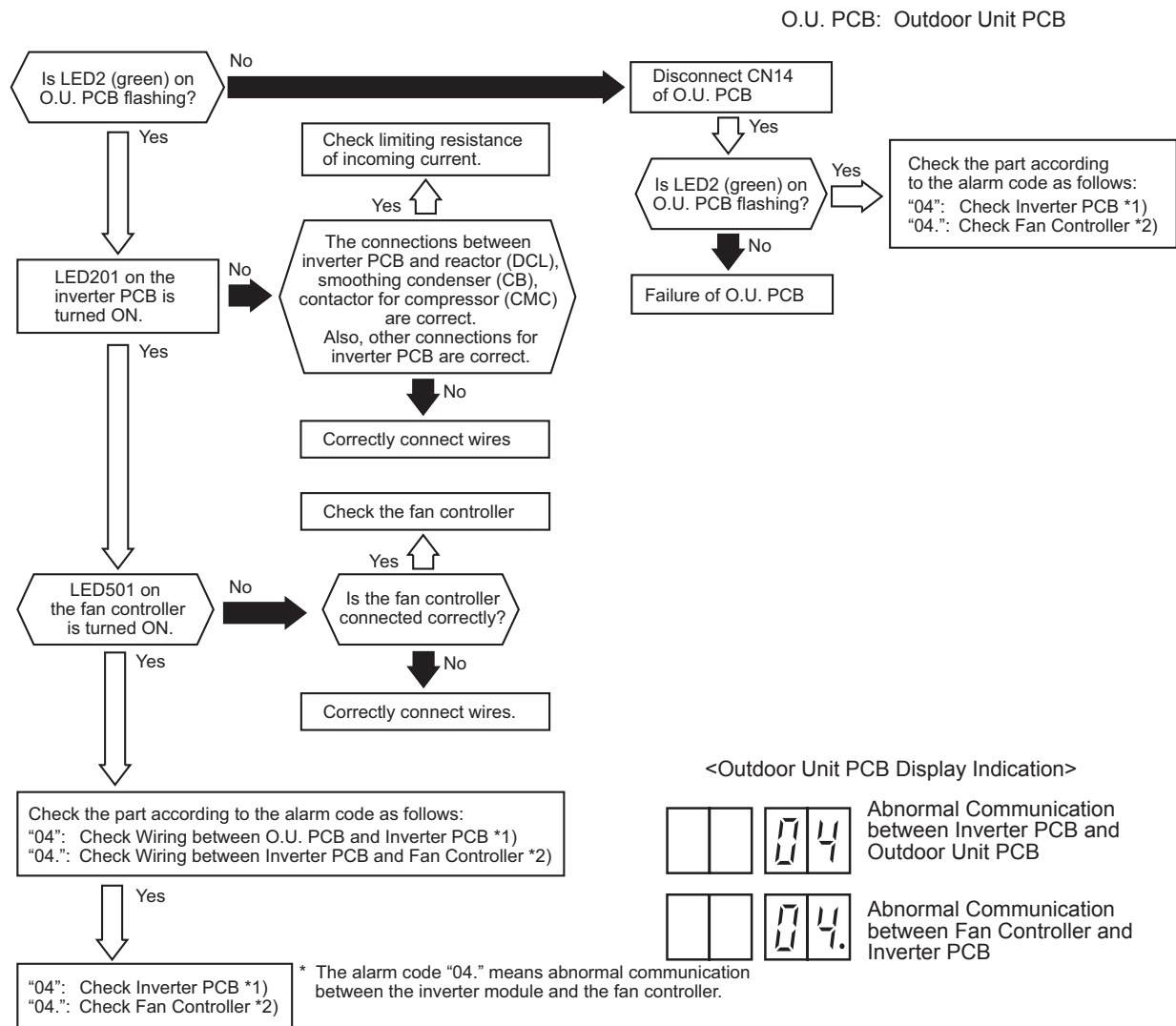
SW1 for communication on the indoor unit PCB is set to "2 線" by default. No setting is required for SW1. If it is set to "3 線", alarm 03 will occur.

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

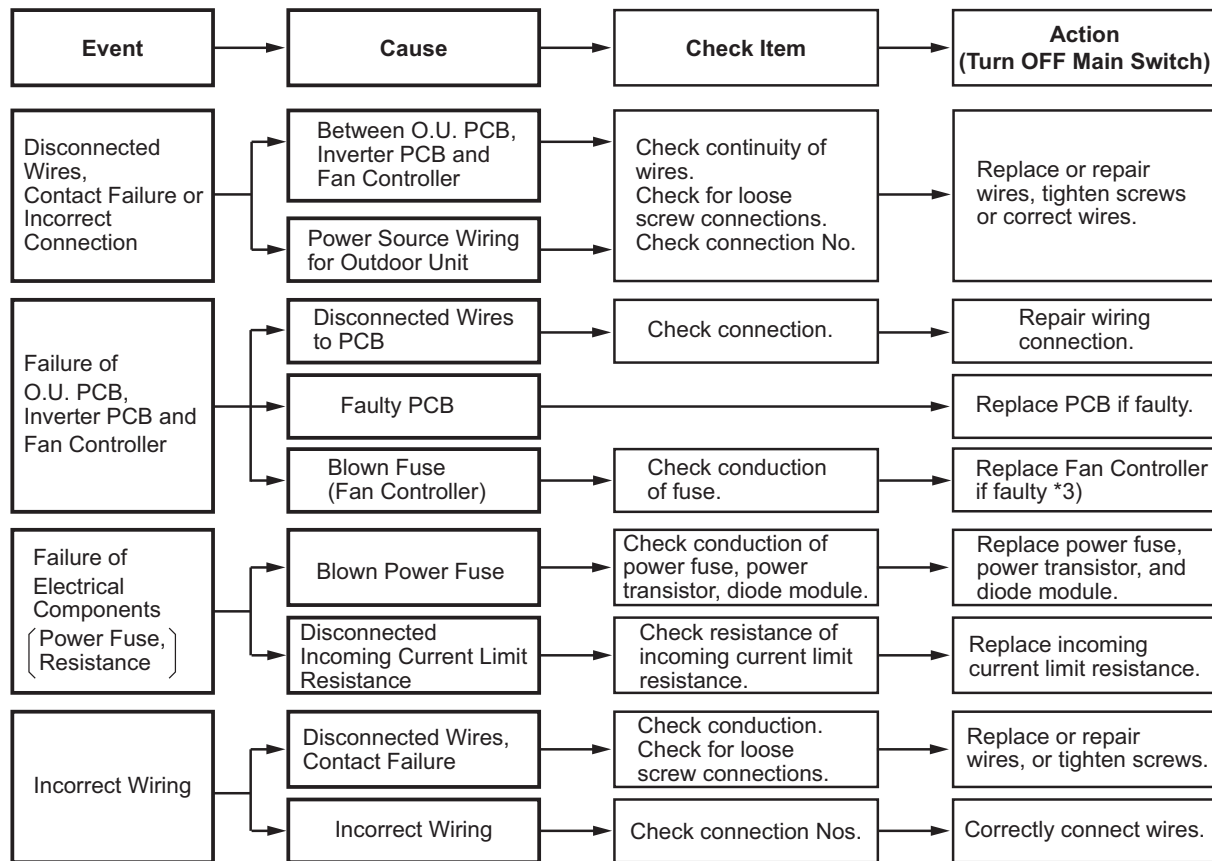
Alarm Code 04	Abnormal Communication between Inverter PCB and Outdoor Unit PCB
Alarm Code 04.	Abnormal Communication between Inverter PCB and Fan Controller

- 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.
- *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.



TROUBLESHOOTING



- *1): When replacing or checking for the inverter part, make sure to perform the electric discharge work according to Section 4.2.1.1 "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 "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

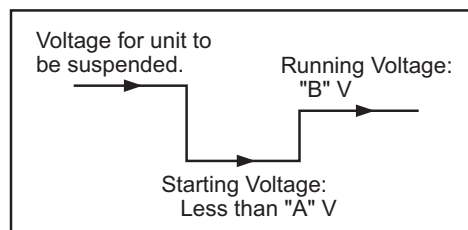
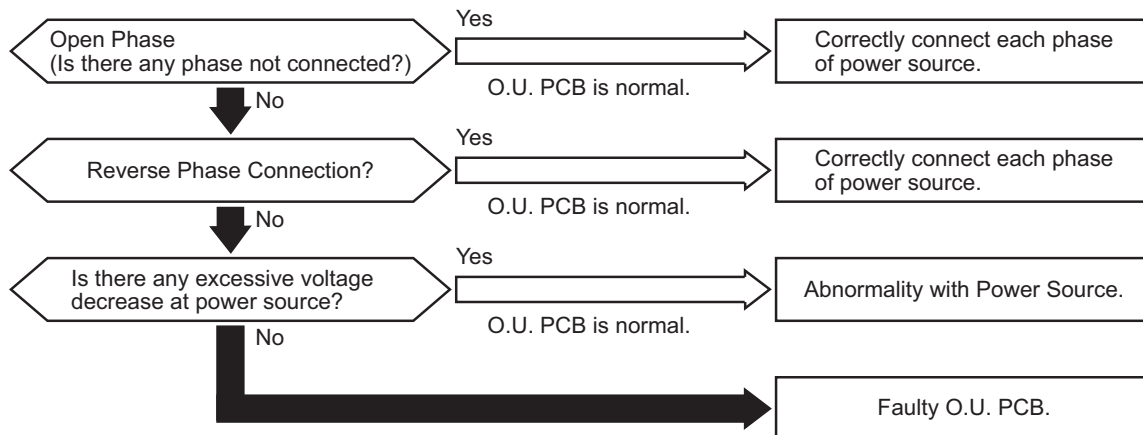
05

Abnormality of Power Source 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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
- *1) Except for some models.

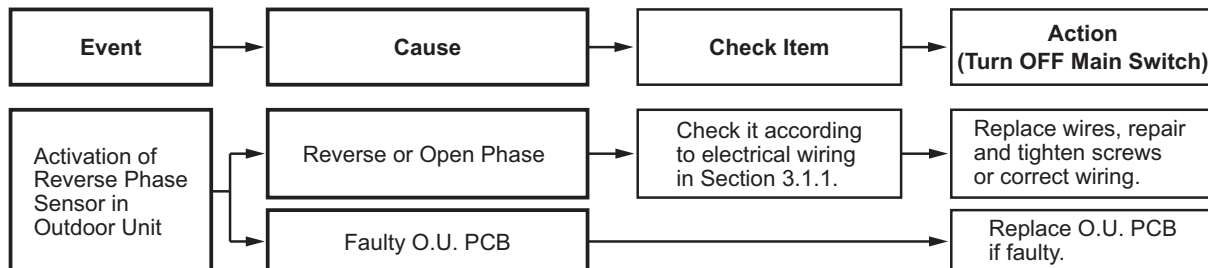
★ This alarm code is displayed when the main power source phase is reversely connected or one phase is not connected.

O.U. PCB: Outdoor Unit PCB



Check Item

Power Supply	"A"	"B"
208-230V/60Hz	177	188 to 253
460V/60Hz	391	414 to 506



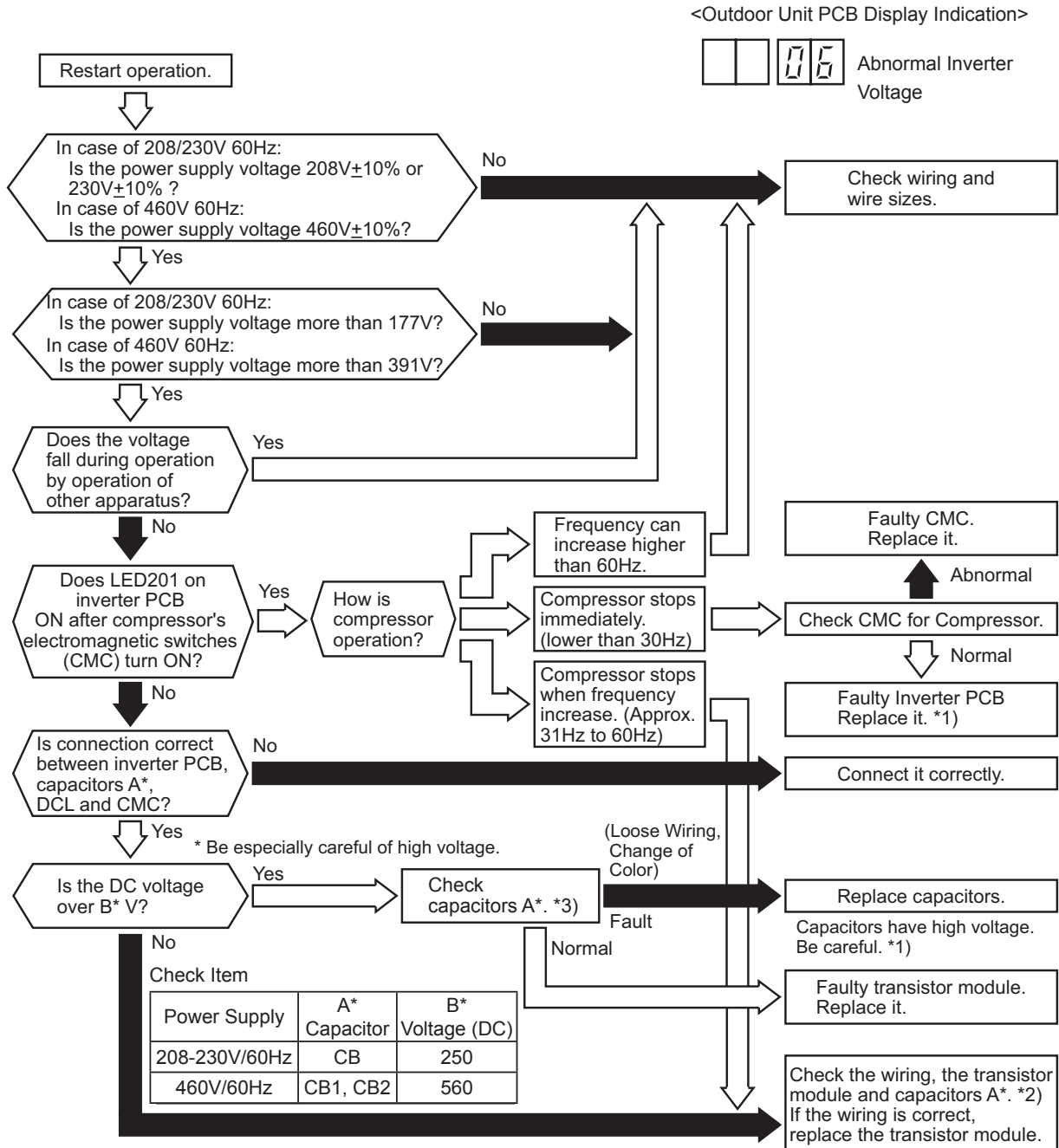
Alarm
Code

06

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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
- ^{*1)} Except for some models.

- ★ When insufficient voltage is detected between terminals “P” and “N” of the transistor module (IPM) 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.



^{*1)}: If the capacitor has high voltage, perform the high voltage discharge work according to Section 4.2.1.1.

^{*2)}: Refer to Section 4.2.1.1 for checking procedures for the transistor module.

^{*3)}: Refer to Section 4.2.1.1 for checking procedures for the capacitor.

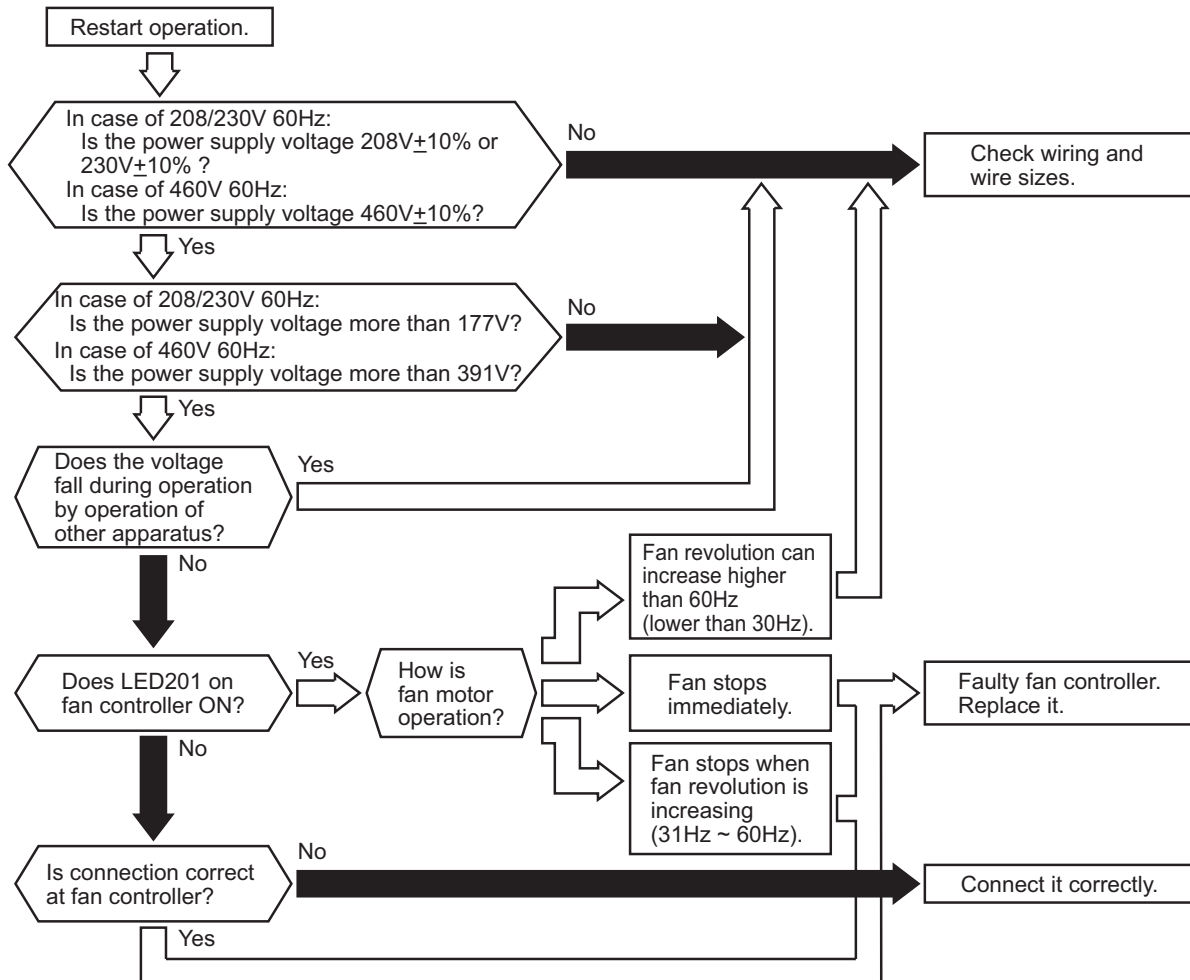
Alarm
Code

06.

Abnormal Fan Controller Voltage
(Insufficient Fan Controller 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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
- *1) Except for some models.

- ★ When insufficient voltage or overvoltage is detected between terminals “R” and “S” of the fan controller 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.



<Outdoor Unit PCB Display Indication>

Abnormal Fan Controller
Voltage

*1): If the fan controller has high voltage, perform the high voltage discharge work according to Section 4.2.1.1.

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

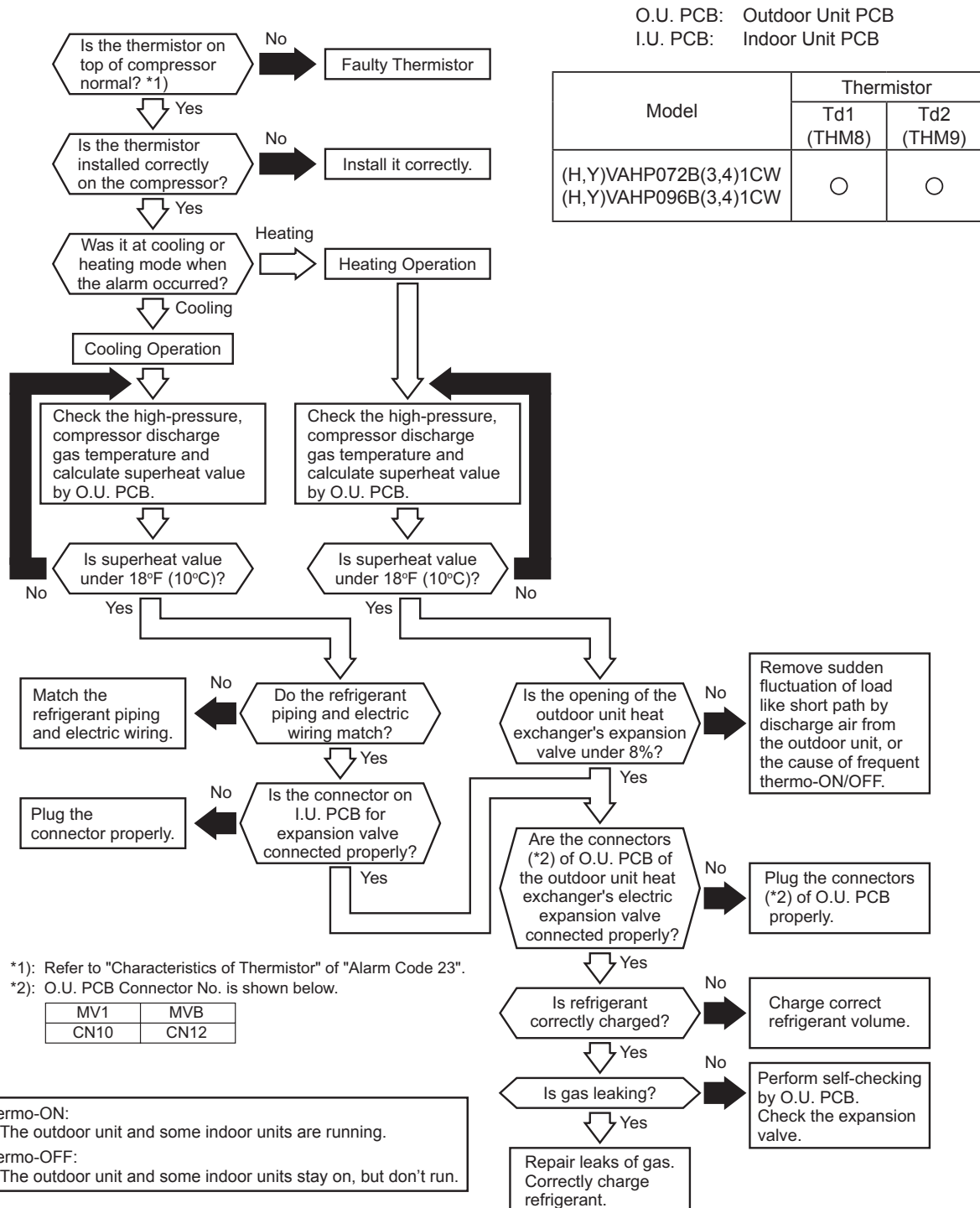
Alarm
Code

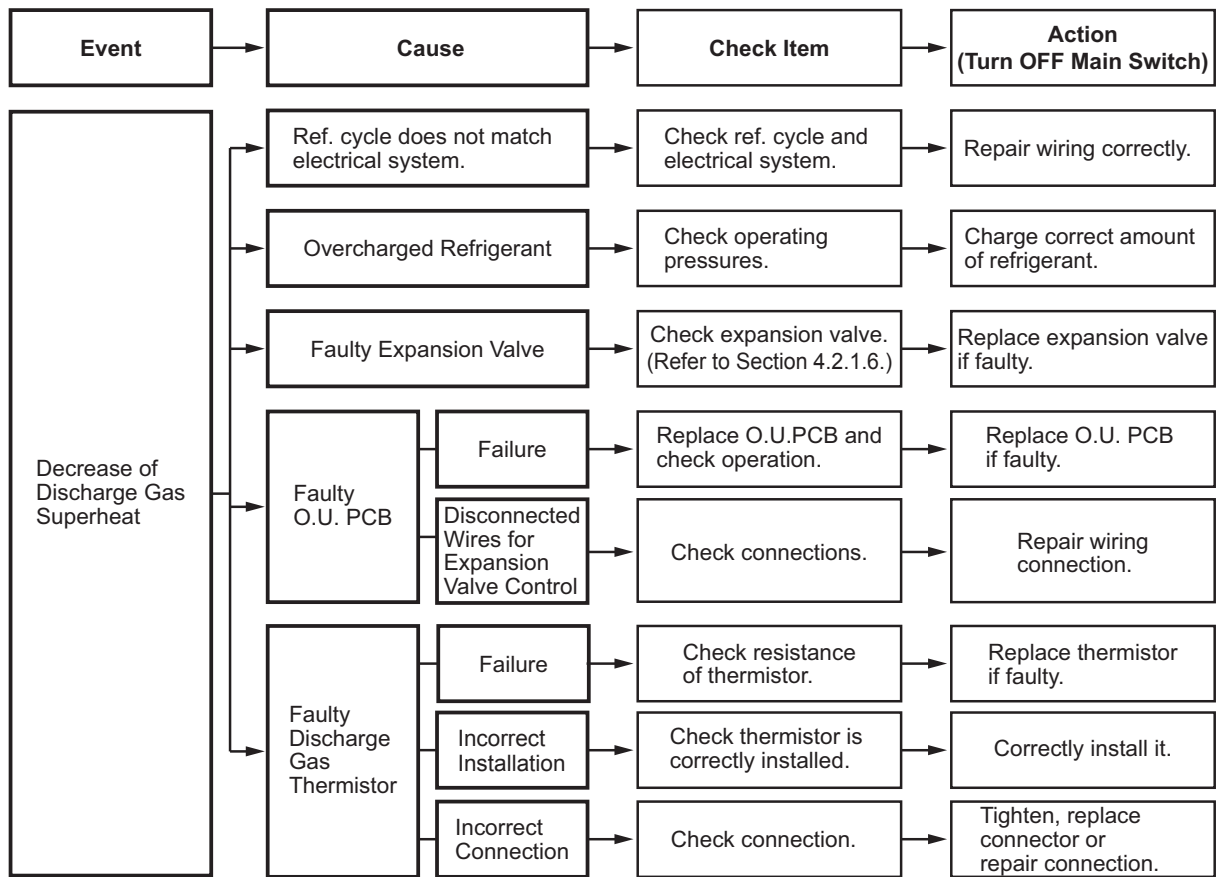
07

Decrease in Discharge Gas Superheat

- 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.
- ^{*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 indicated.





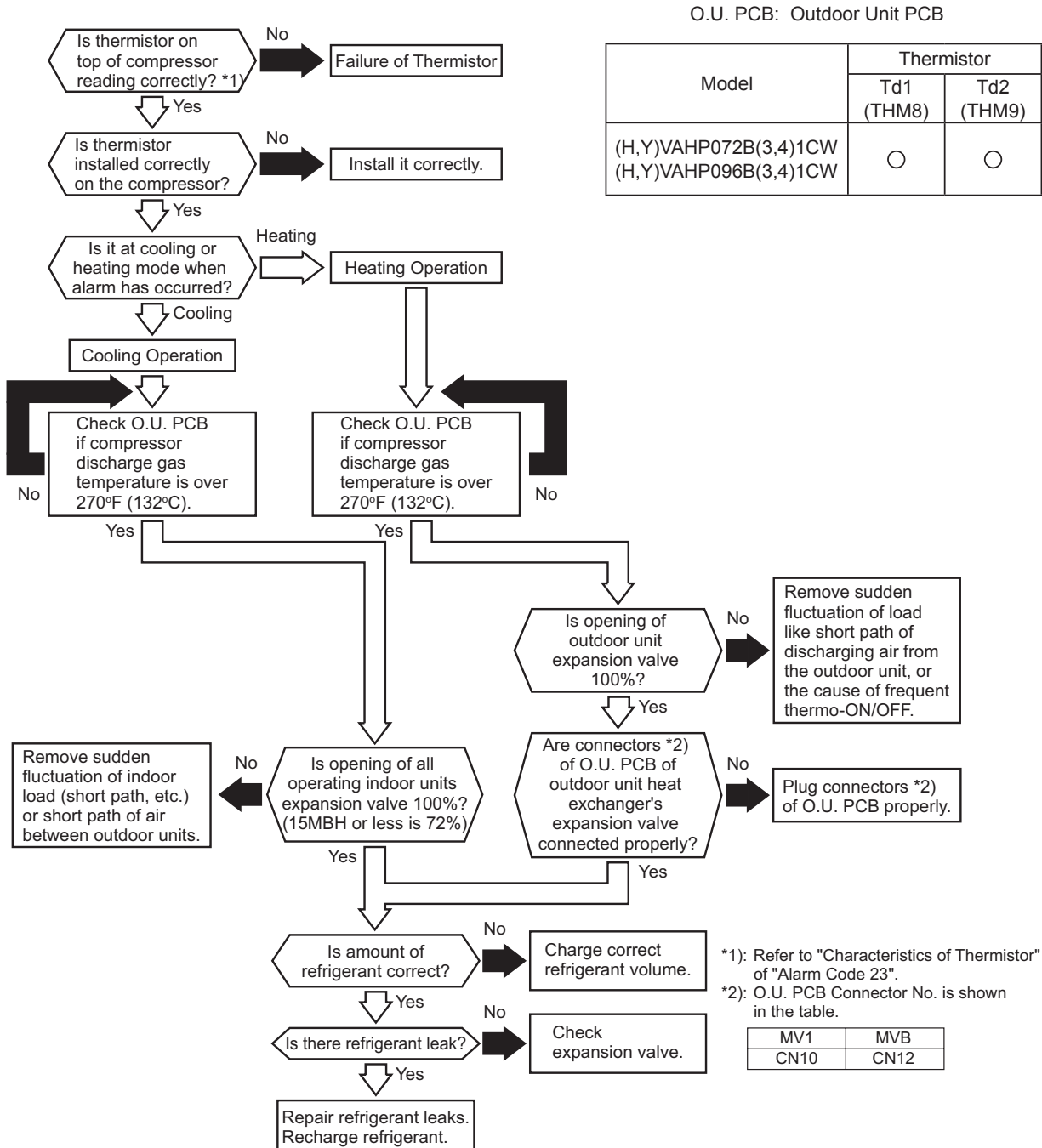
Alarm
Code

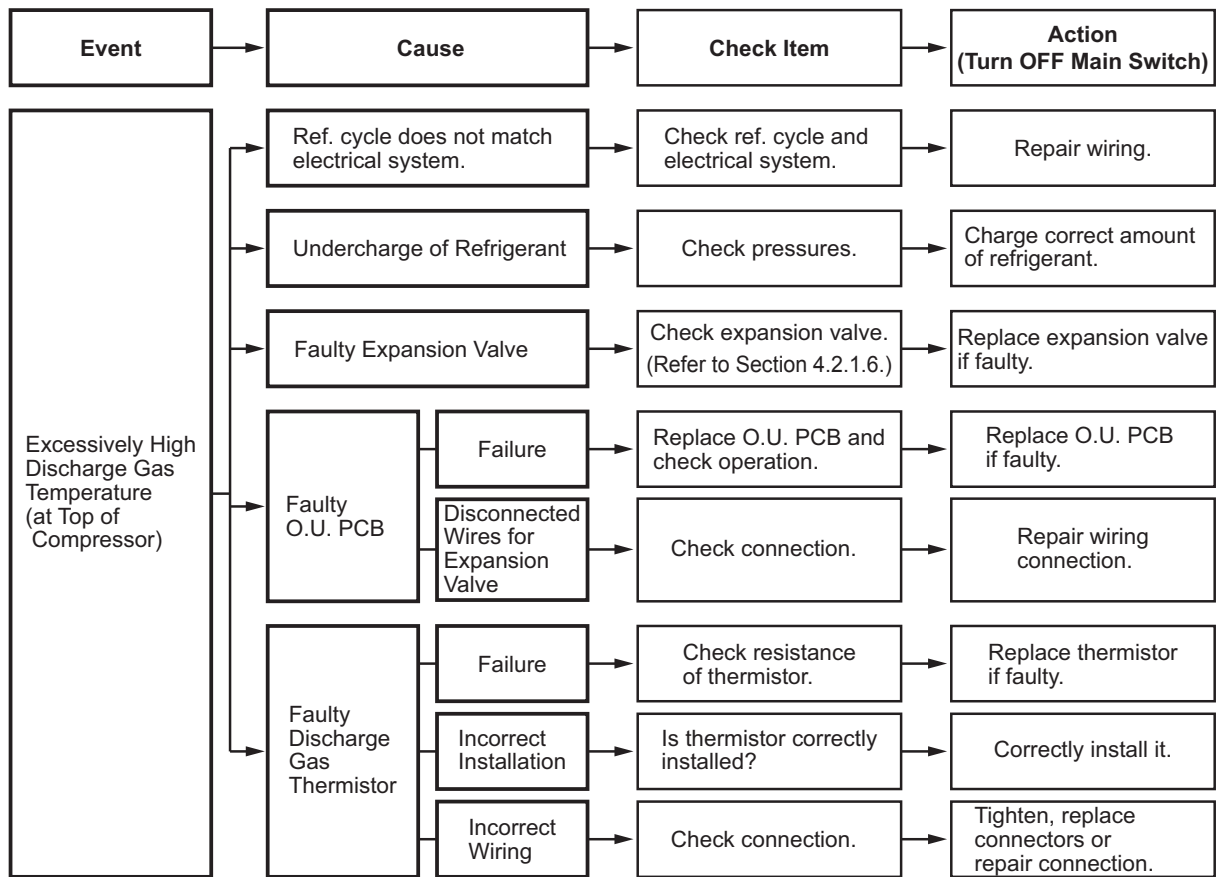
08

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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
- *1) Except for some models.

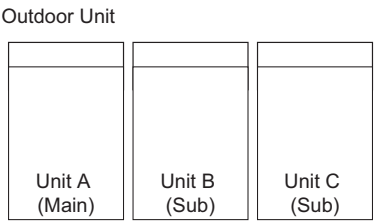
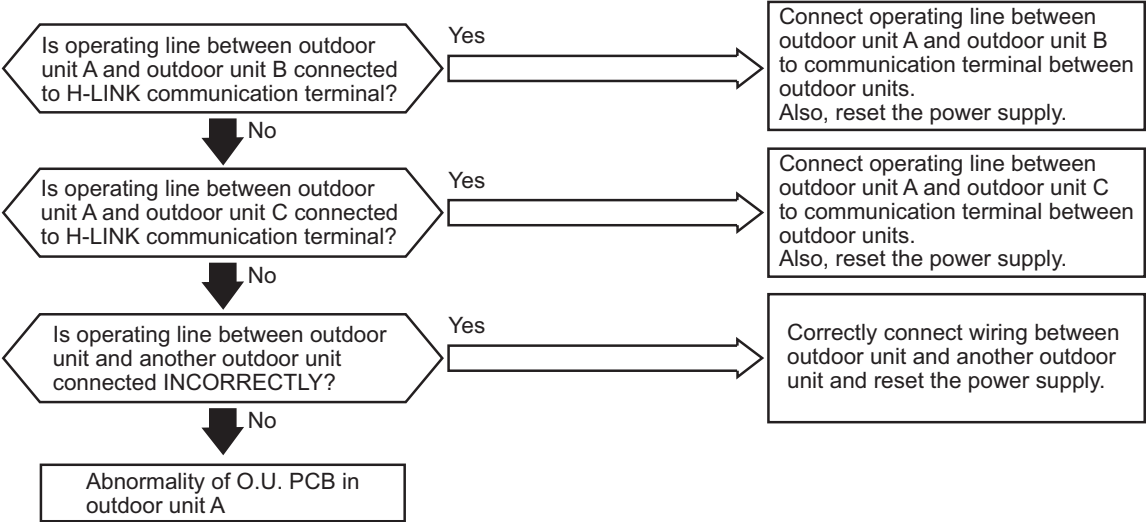
- ★ If the temperature at the top of the compressor is above 270°F (132°C) for 10 minutes or above 284°F (140°C) for five seconds during operation, the compressor stops and then the operation is automatically retried. If this occurs again twice in the next 60 minutes, this alarm code is displayed.





Alarm Code	0A	Abnormal Communication between Outdoor Units
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- 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.
- *1) Except for some models.

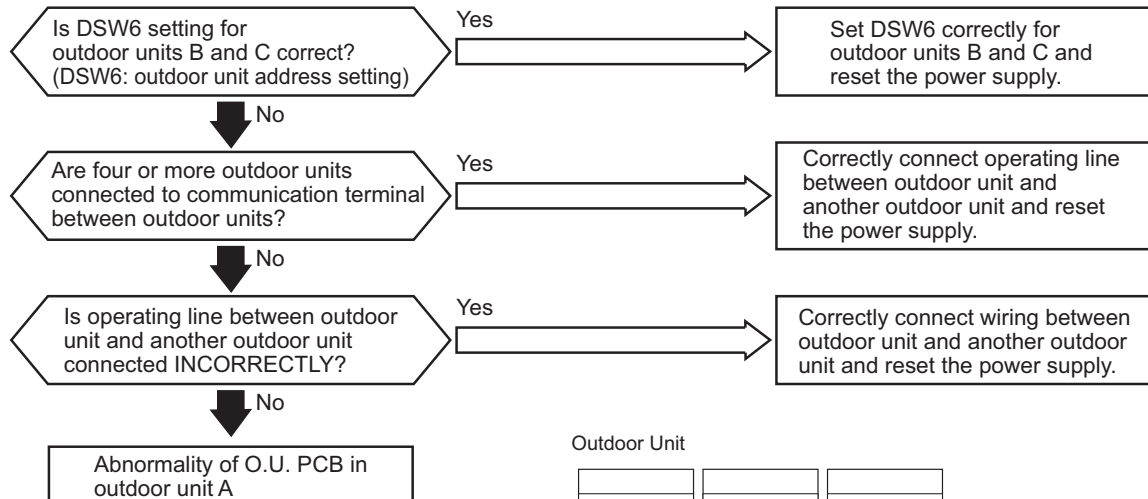


Alarm
Code

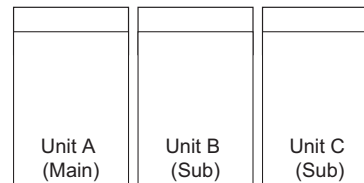
06

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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
- *1) Except for some models.



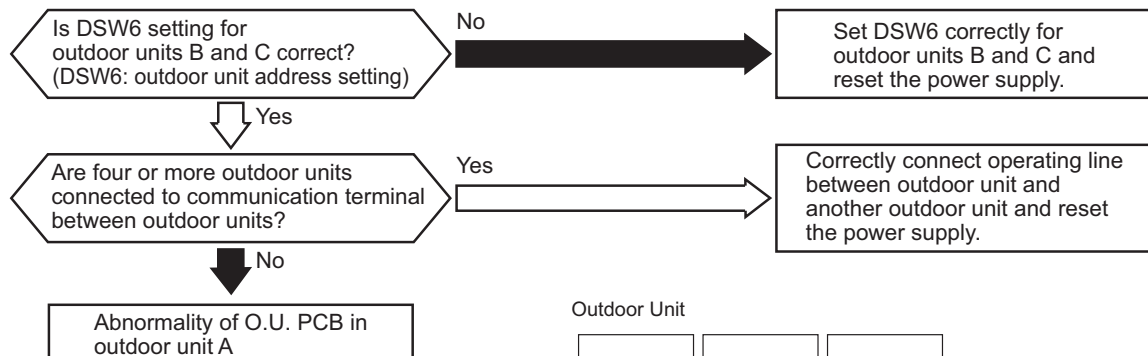
Outdoor Unit

Alarm
Code

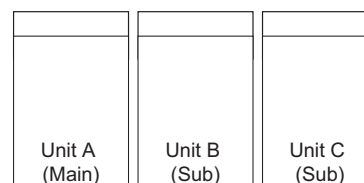
07

Incorrect Setting of Main 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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
- *1) Except for some models.



Outdoor Unit



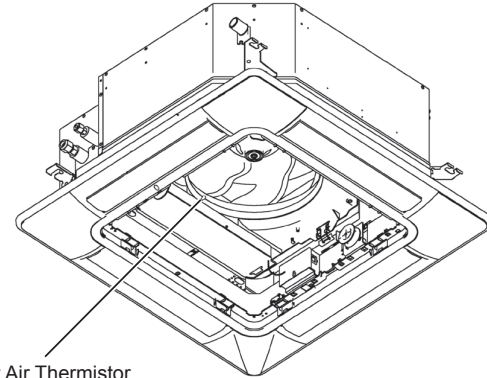
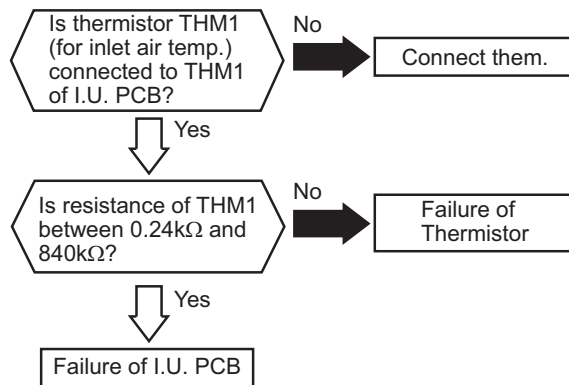
Alarm
Code

11

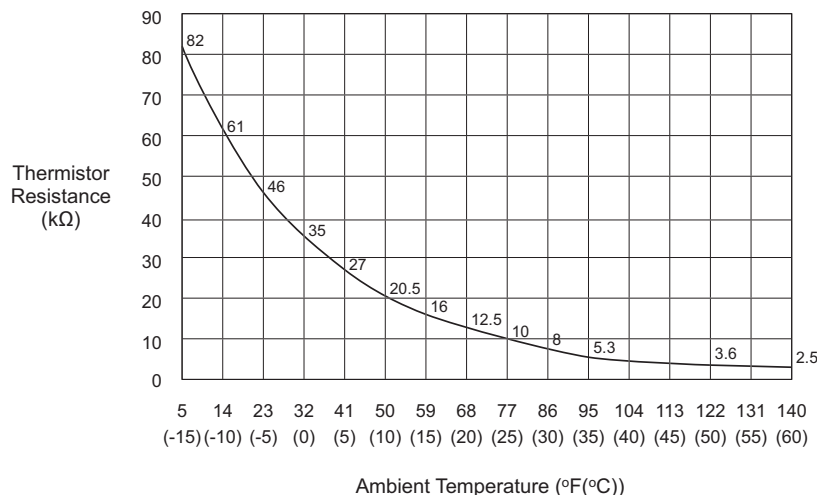
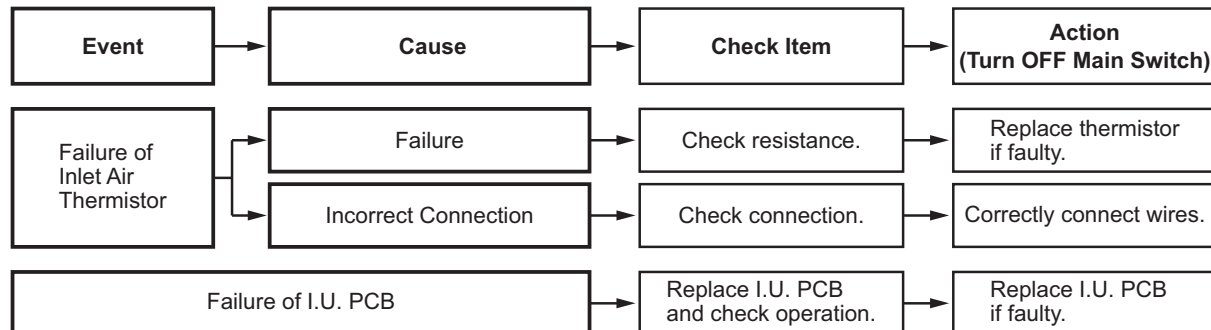
Abnormality of Thermistor for Indoor Unit Inlet Air Temperature
(Inlet Air Thermistor)

- 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.
- *1) Except for some models.

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



Example of 4-way Cassette Type



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

23 11

Alarm Code
(11 ~ 19)

Unit No. of
Malfunctioning Indoor Unit

NOTE:

This figure is applicable to the following thermistors.

1. Inlet Air Thermistor (THM1), 2. Liquid Pipe Thermistor (Freeze Protection) (THM3), 3. Gas Pipe Thermistor (THM5), 4. Outlet Air Thermistor (THM2), 5. Outside Air Thermistor or Remote Thermistor (THM4)

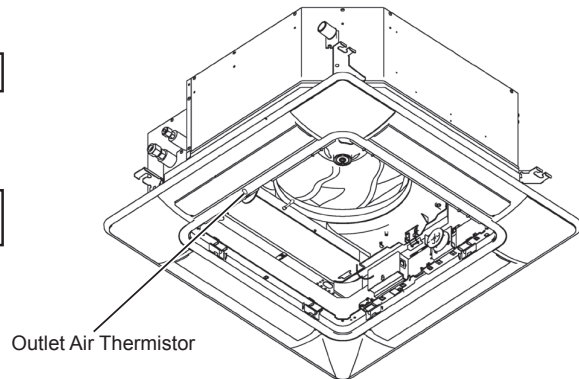
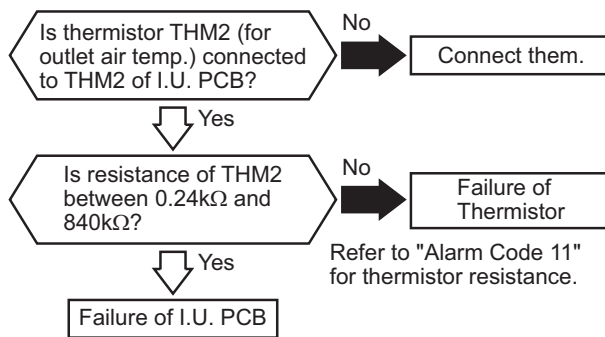
Alarm
Code

12

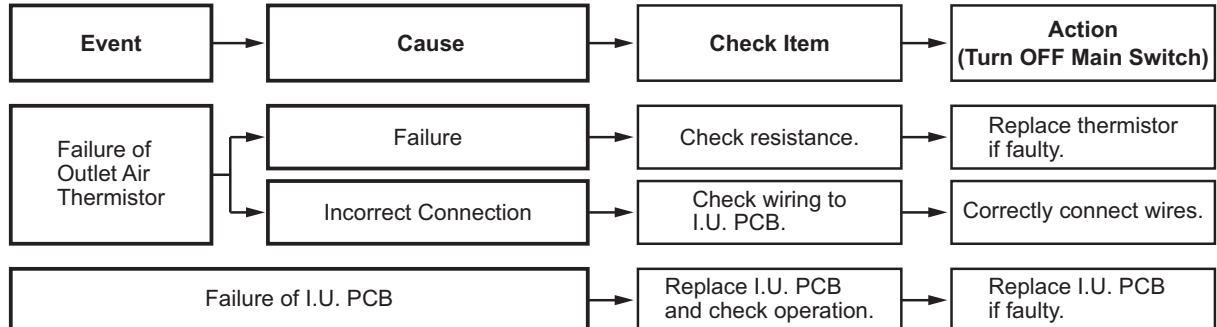
Abnormality of Thermistor for Indoor Unit Outlet Air Temperature
(Outlet Air Thermistor)

- 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.
- *1) Except for some models.

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

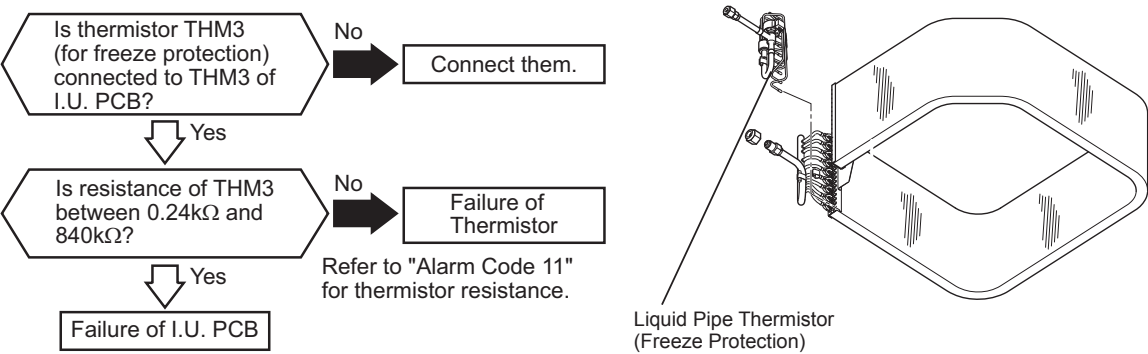


Example of 4-way Cassette Type



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

- The RUN indicator (red) flashes.
 - The indoor unit number (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.
- *1) Except for some models.
- ★ This alarm code is displayed when a short circuit (0.24kΩ or less) or disconnection (840kΩ or more) of the thermistor is detected during a heating or cooling operation. The operation automatically restarts when the malfunction is removed.



Example of 4-way Cassette Type

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

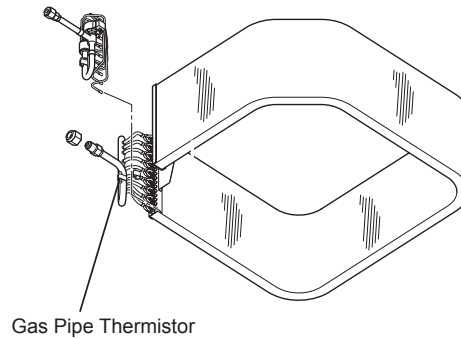
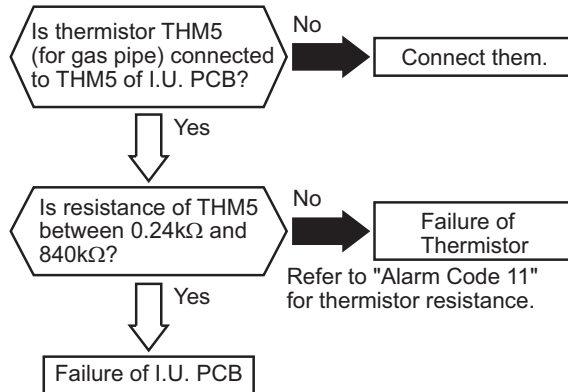
Alarm
Code

14

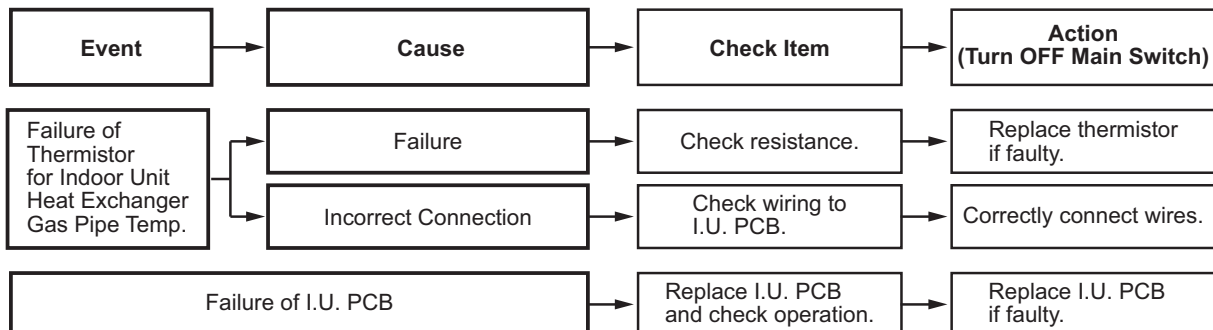
Abnormality of Thermistor for Gas Refrigerant Pipe Temperature
at Indoor Unit Heat Exchanger (Gas Pipe Thermistor)

- The RUN indicator (red) flashes.
 - The indoor unit number (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.
- ^{*1)} Except for some models.

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



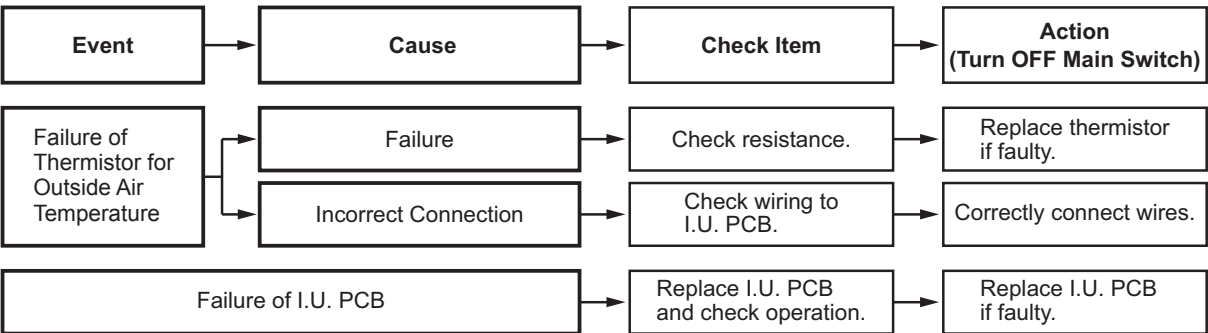
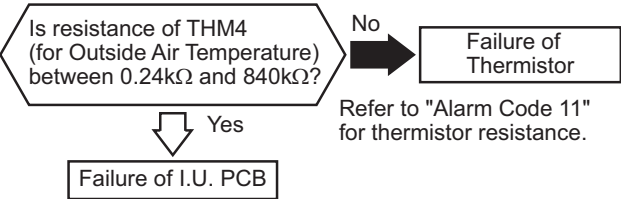
Example of 4-way Cassette Type



^{*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 circuit ($0.24\text{k}\Omega$ or less) or disconnection ($840\text{k}\Omega$ or more) of the thermistor is detected during a heating or cooling operation.

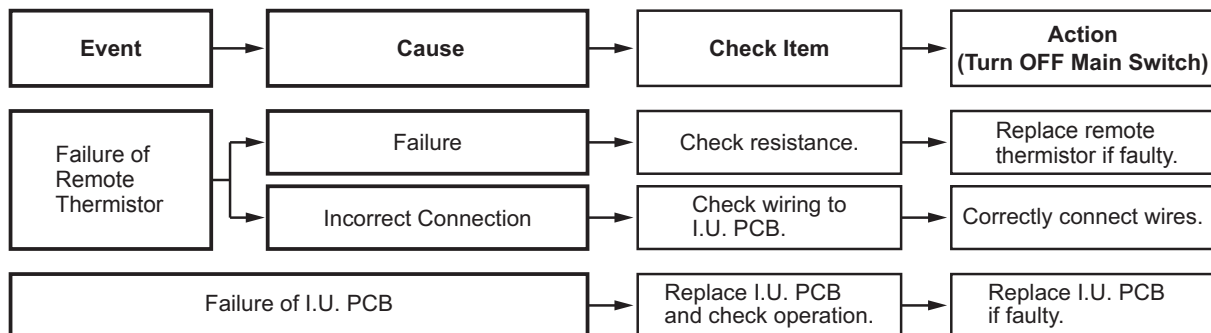
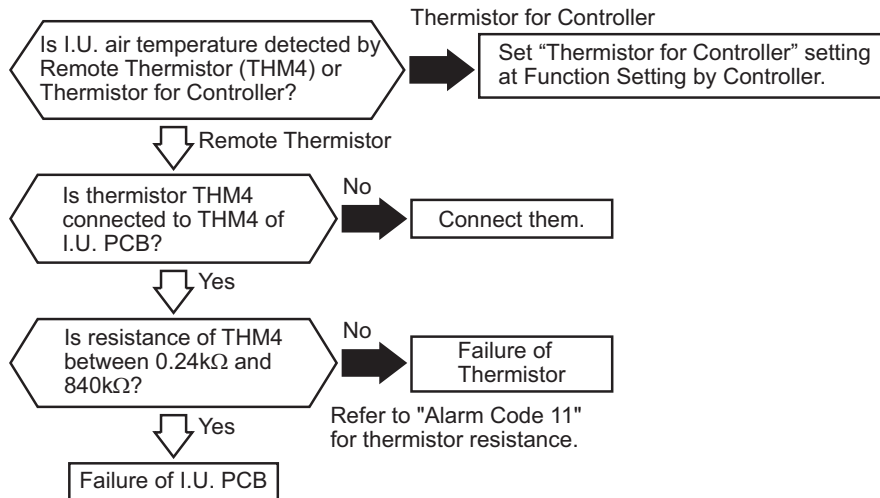


Alarm
Code

16

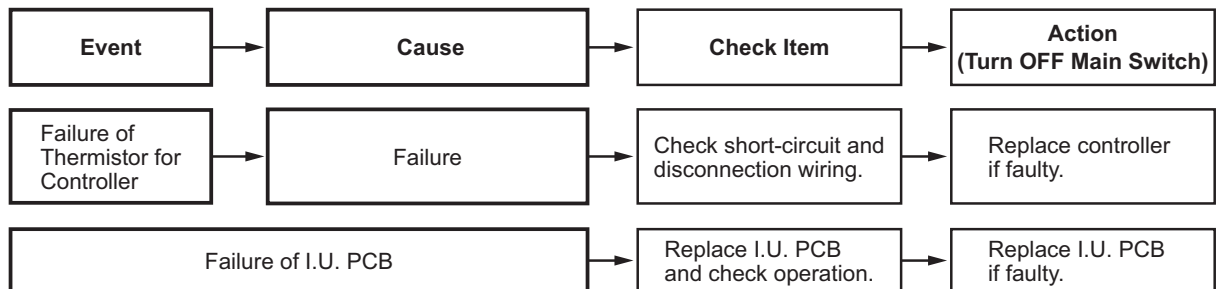
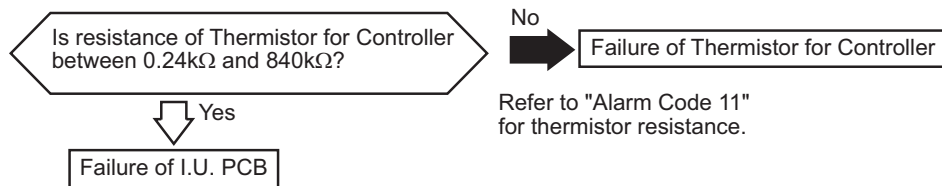
Abnormality of Remote Thermistor
(for DOAS Unit)

- 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 circuit ($0.24\text{k}\Omega$ or less) or disconnection ($840\text{k}\Omega$ or more) of the thermistor is detected during a heating, cooling or fan operation.



Alarm Code	17	Abnormality of Thermistor for Controller (for DOAS Unit)
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- 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 circuit ($0.24\text{k}\Omega$ or less) or disconnection ($840\text{k}\Omega$ or more) of the thermistor is detected during a heating or cooling operation.



NOTE:

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.

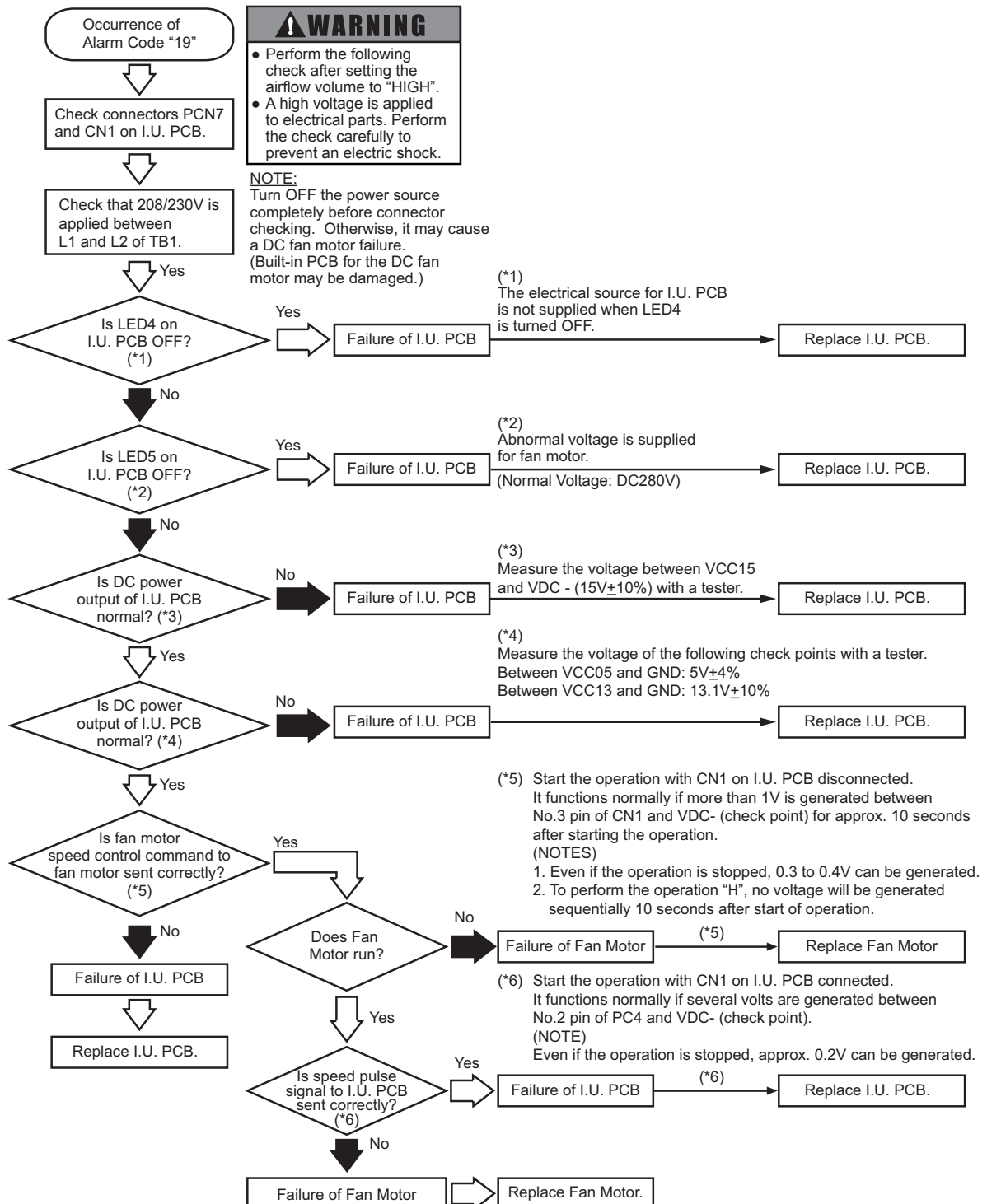
Alarm
Code

19

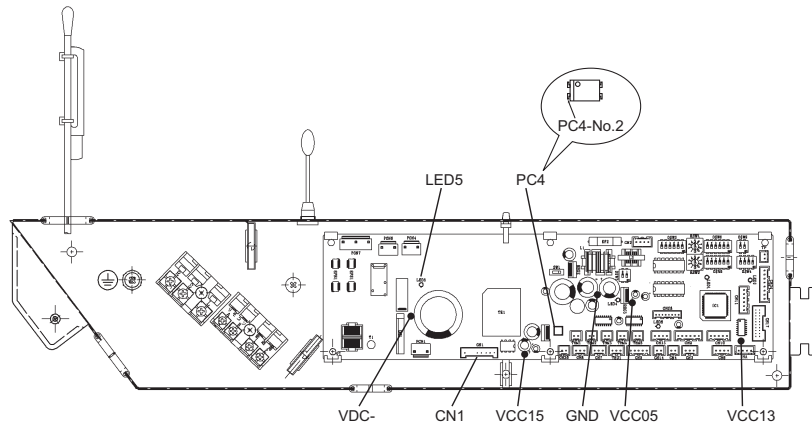
Activation of Protection Device for Indoor Fan Motor
(Indoor Unit with DC Motor)

- 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.
- ^{*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.

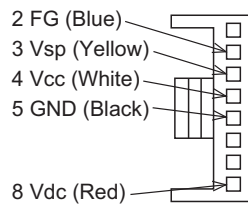


● Example of 4-Way Cassette Type



< Checking for Fan Motor >

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



1st			2nd		
Tester		Resistance Value	Tester		Resistance Value
Red	Black	Ω	Red	Black	Ω
FG	GND		GND	FG	
Vsp	GND		GND	Vsp	
Vcc	GND		GND	Vcc	
Vdc	GND		GND	Vdc	

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

NOTE:

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

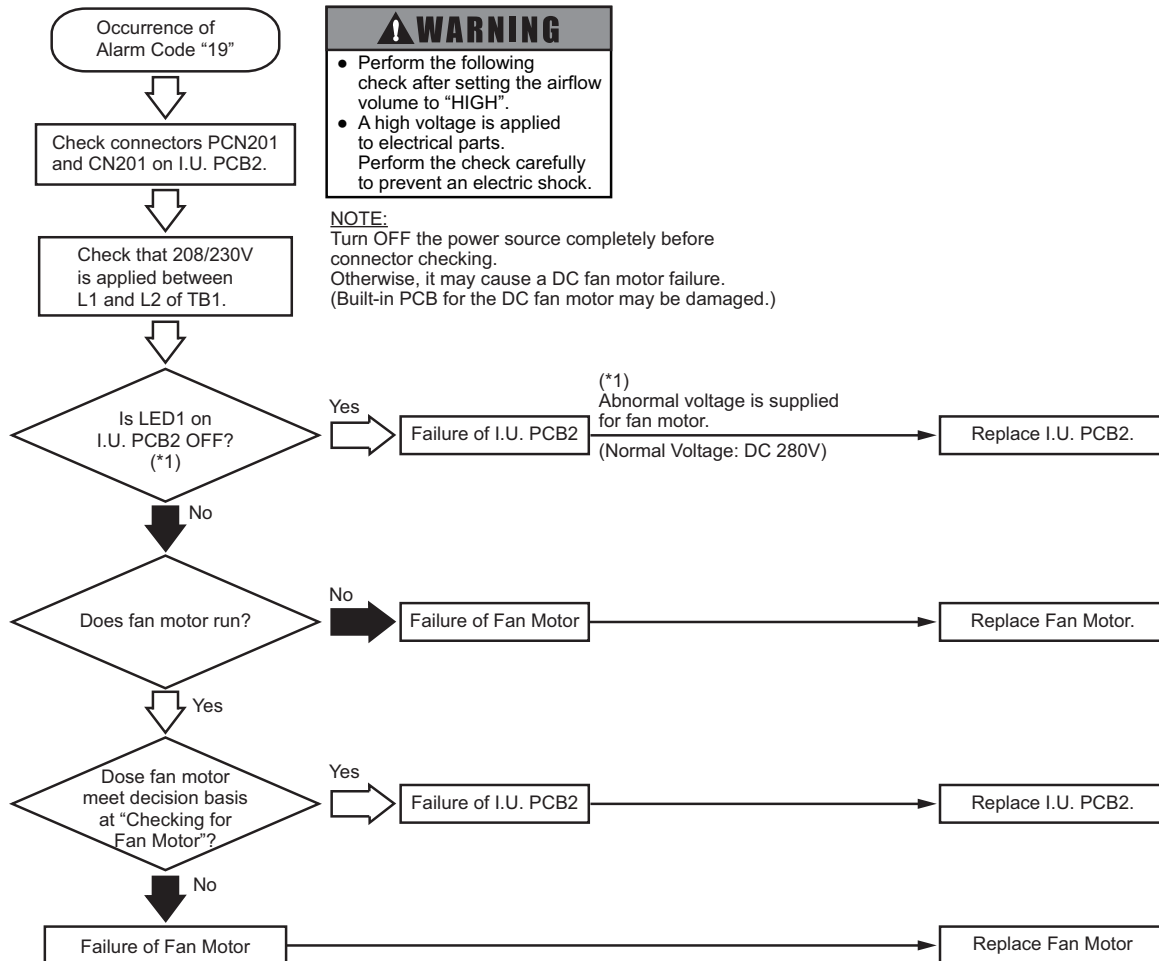
Alarm
Code

19

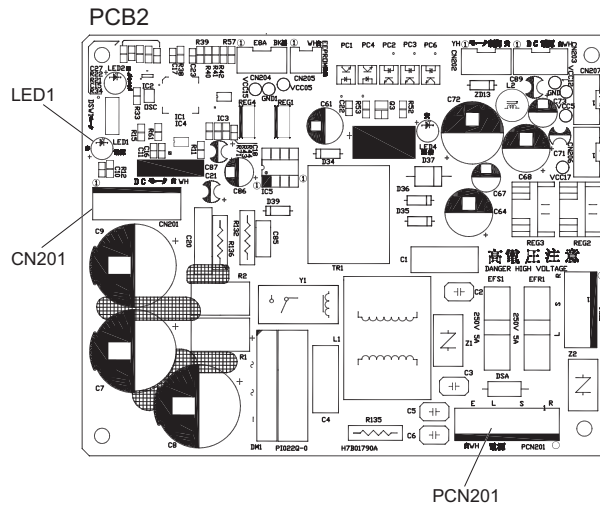
Activation of Protection Device for Indoor Fan Motor
(Ducted (Medium Static and Slim) Type)

- 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.
- ^{*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.

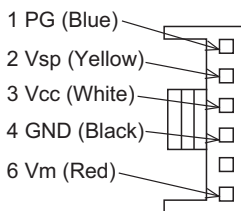


• Ducted Medium Static Type



< Checking for Fan Motor >

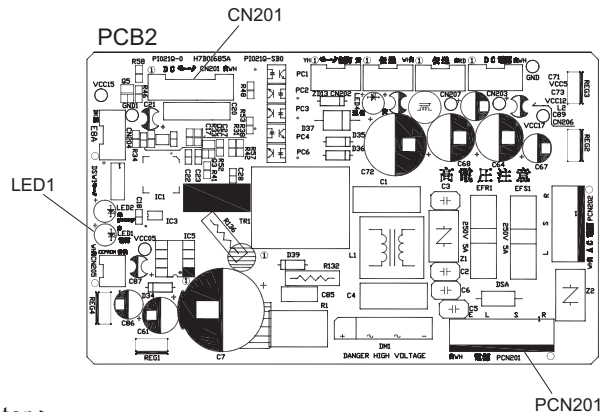
Remove the connector of the fan motor and measure the resistance value between each of the pins (twice). Check whether the resistance value is over or not according to the table shown below. When performing the second measuring, make sure to change the tester (Red/ Black).



1st			2nd		
Tester		Resistance Value	Tester		Resistance Value
Red	Black	Ω	Red	Black	Ω
PG	GND		GND	PG	
Vsp	GND		GND	Vsp	
Vcc	GND		GND	Vcc	
Vm	GND		GND	Vm	

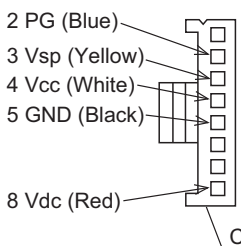
Decision Basis
Resistance values of both 1st and 2nd measurings are over 10

• Ducted Slim Type



< Checking for Fan Motor >

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



1st			2nd		
Tester		Resistance Value	Tester		Resistance Value
Red	Black	Ω	Red	Black	Ω
PG	GND		GND	PG	
Vsp	GND		GND	Vsp	
Vcc	GND		GND	Vcc	
Vdc	GND		GND	Vdc	

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

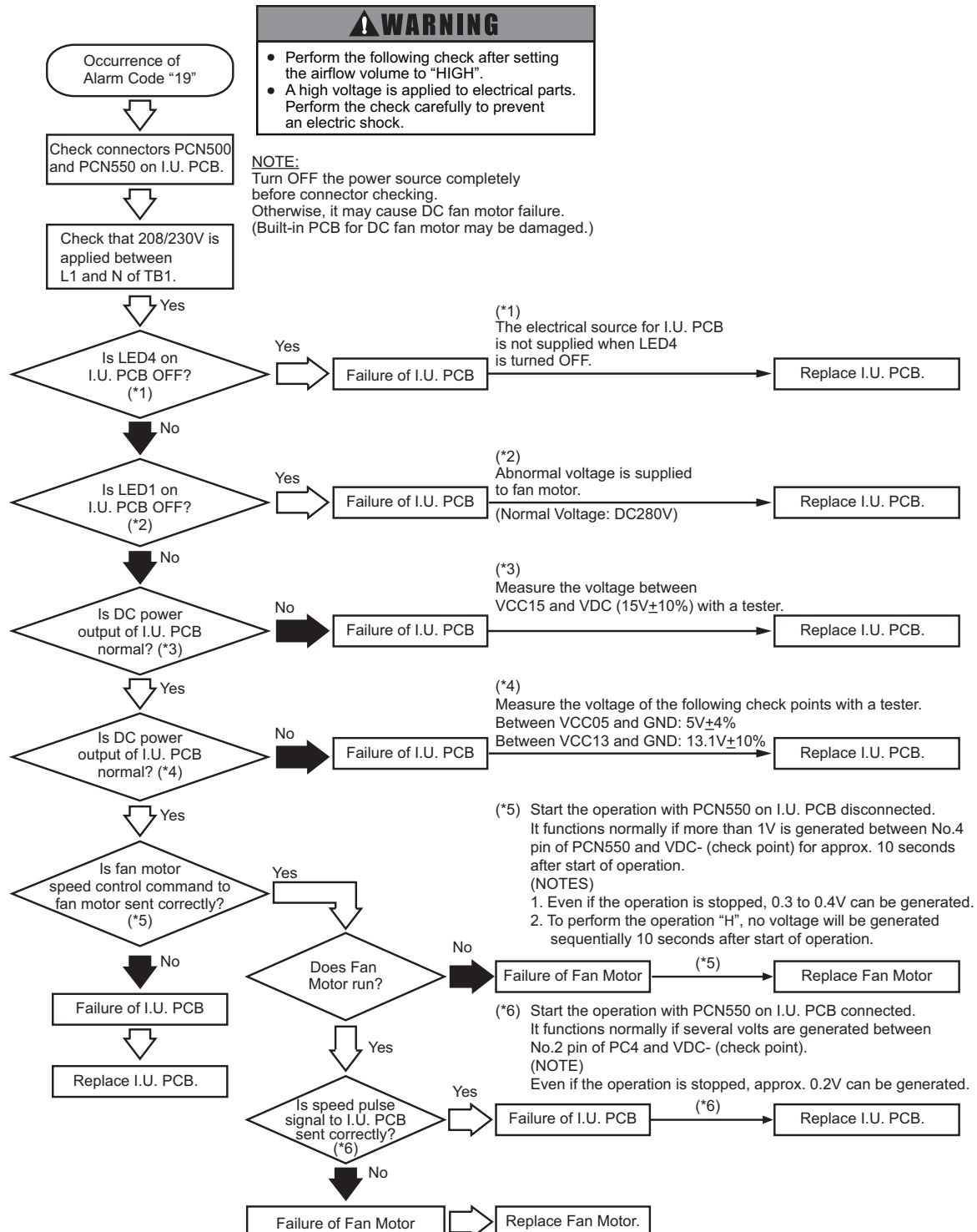
Alarm
Code

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.
- ^{*1)} Except for some models.

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



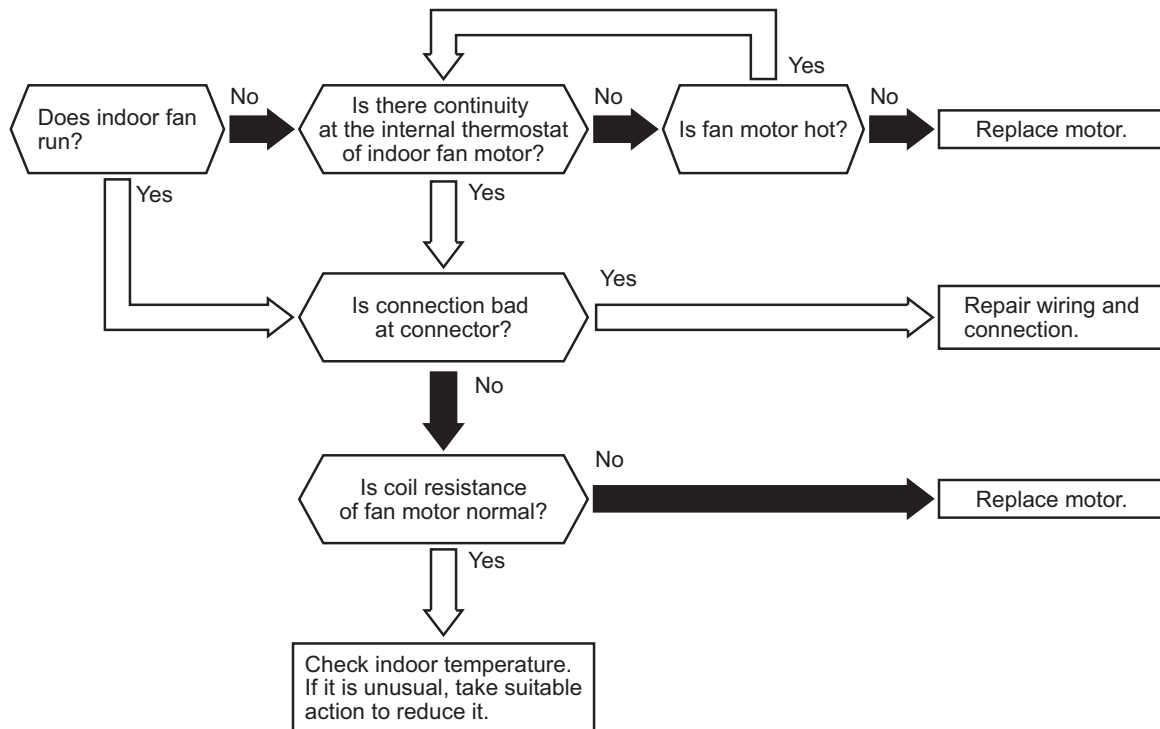
Alarm
Code

19

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

- The RUN indicator (red) 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.
- ^{*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.
		Contact Failure	Measure resistance with a tester.
		Incorrect Connection	Check connection.
			Repair connection.

Alarm
Code

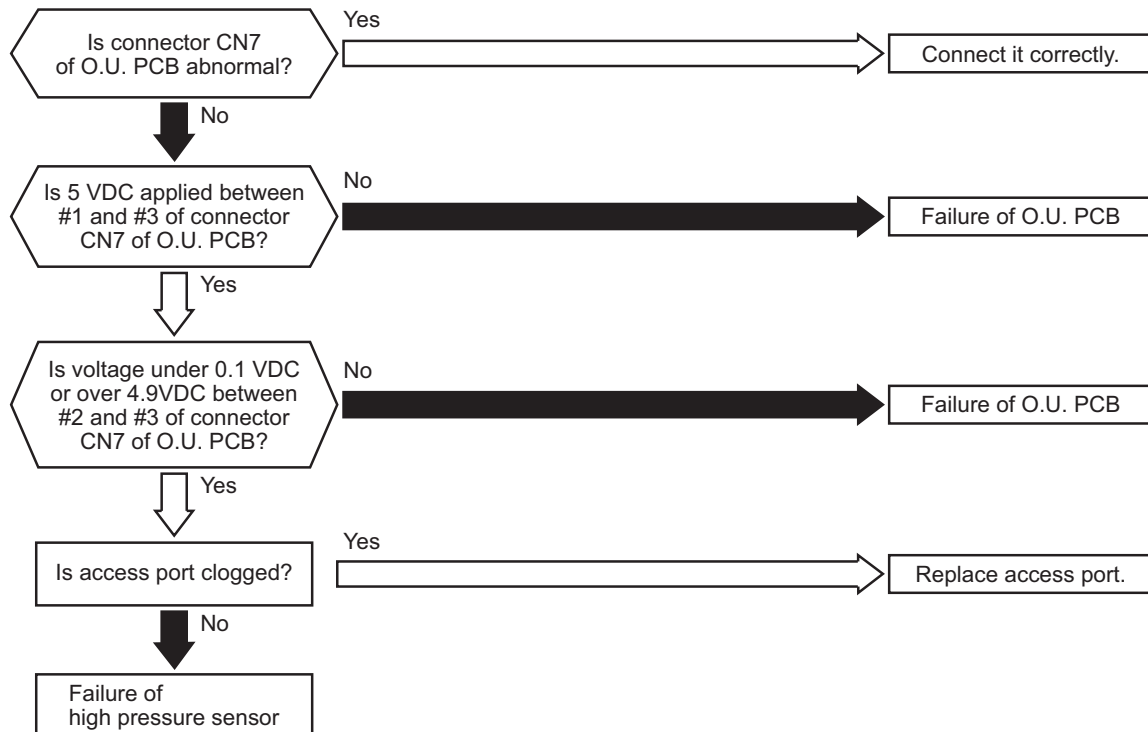
21

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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
- *1) Except for some models.

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

O.U. PCB: Outdoor Unit PCB

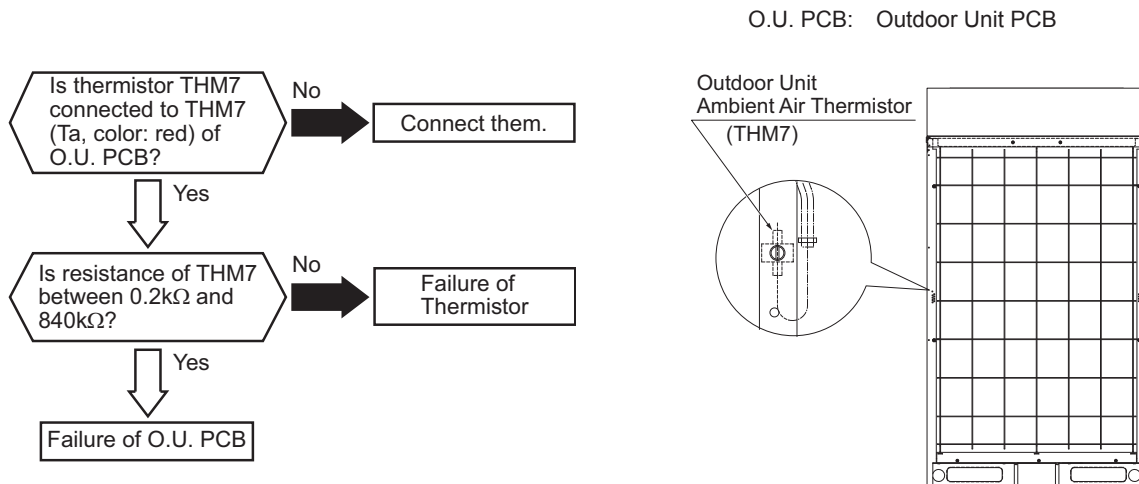


Event	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Thermistor on Top of Compressor	Failure	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to O.U. PCB.	Repair wiring and connection.
Failure of O.U. PCB		Replace O.U. PCB and check operation.	Replace O.U. 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	22	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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
- *1) Except for some models.

★ This alarm code is displayed when a short circuit ($0.2\text{k}\Omega$ or less) or disconnection ($840\text{k}\Omega$ or more) of the thermistor is detected during operation.

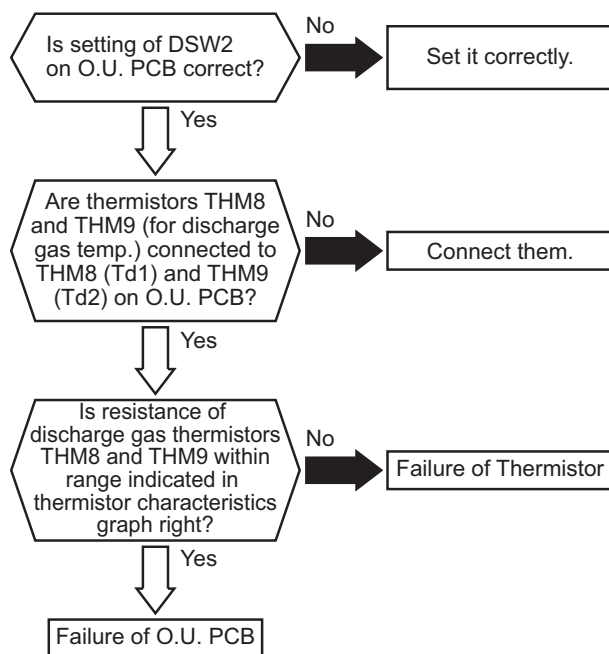


Event	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Thermistor for Outdoor Air Temp.	Failure	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to O.U. PCB.	Repair wiring and connection.
Failure of O.U. PCB		Replace O.U. PCB and check operation.	Replace O.U.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

Alarm Code **23**

Abnormality of Thermistor for Discharge Gas Temperature on the Top of Compressor

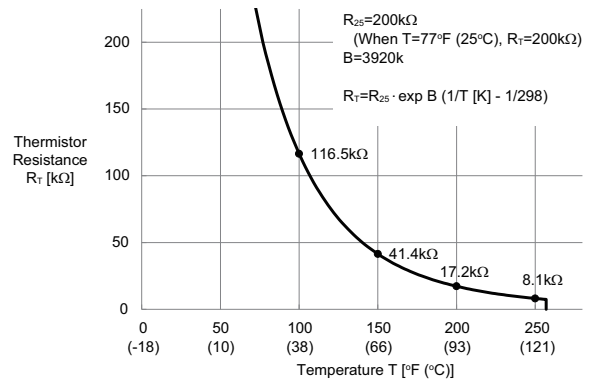
- The RUN indicator (red) flashes.
 - The indoor unit number (refrigerant cycle number - address number), the alarm code, the model code*¹⁾, the model name*¹⁾ and the number of connected indoor units are displayed on the LCD. The indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB. (For the combination of outdoor units, the alarm code is displayed on the PCB of outdoor Unit A.) Additionally for the outdoor unit number and compressor number with an abnormal thermistor, check the alarm code history.
- *1) Except for some models.
- ★ This alarm code is displayed when a short circuit for one minute (0.9kΩ or less) or disconnection (5946kΩ or more) of the thermistor is detected for a second time during operation.



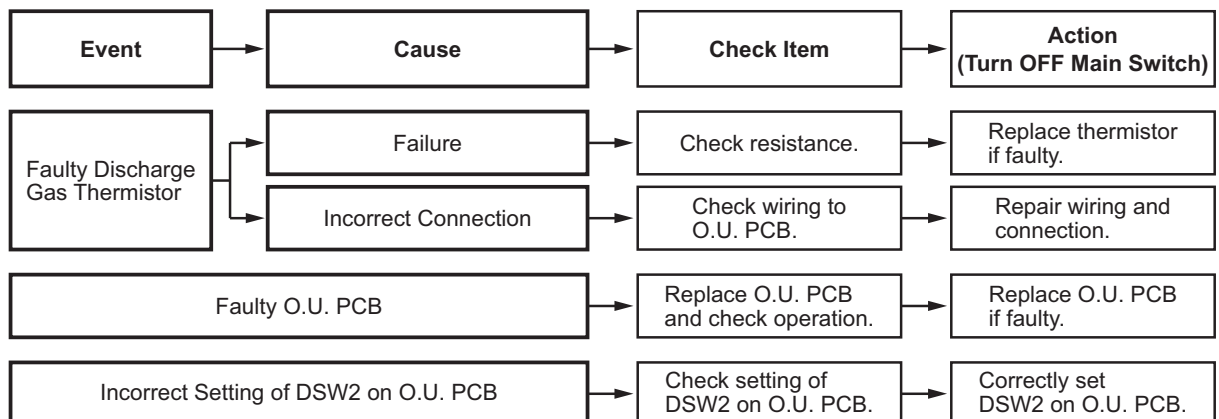
O.U. PCB: Outdoor Unit PCB

Model	Thermistor	
	Td1 (THM8)	Td2 (THM9)
(H,Y)VAHP072B(3,4)1CW (H,Y)VAHP096B(3,4)1CW	○	○

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



Thermistor Characteristics



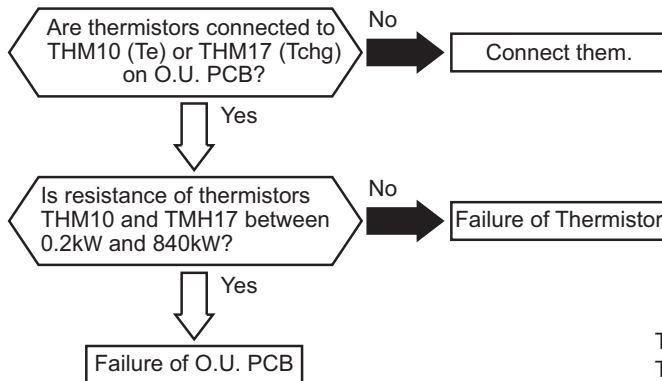
Alarm
Code

24

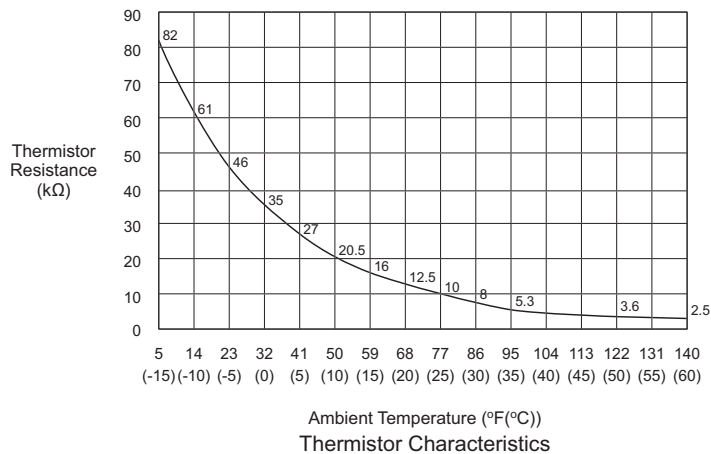
Abnormality of Thermistor for Evaporating Temperature
during Heating Operation (Outdoor Unit Evaporating Thermistor)

- The RUN indicator (red) flashes.
 - The indoor unit number (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. (For a combination of outdoor units, the alarm code is displayed on the PCB of outdoor Unit A.) Additionally, for the outdoor unit number and compressor number with an abnormal thermistor, check the alarm code history.
- ^{*1)} Except for some models.

- ★ This alarm is displayed when a short circuit ($0.2\text{k}\Omega$ or less) or disconnection ($840\text{k}\Omega$ or more) of the thermistor is detected for eight minutes during operation.

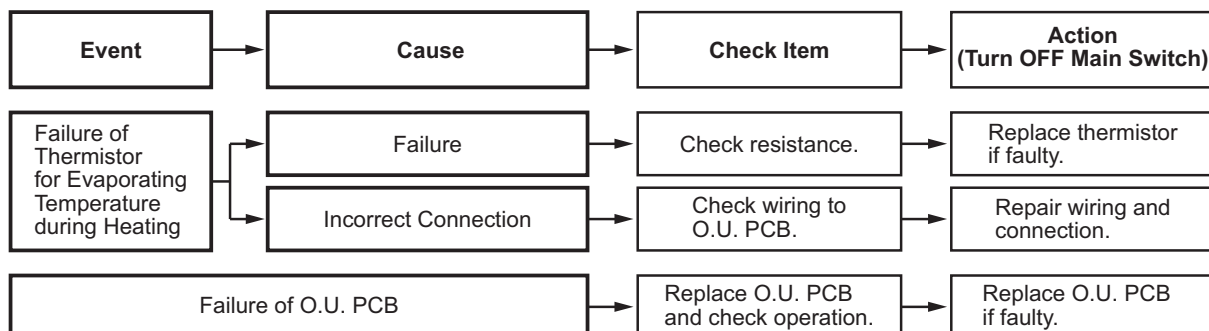


Te: Thermistor for Outdoor Liquid Pipe
 Tchg: Thermistor for Super Cooling Main Line
 O.U. PCB: Outdoor Unit PCB

**NOTE:**

This data is applicable to the following thermistors.

1. Ambient Temperature Thermistor (THM7)
2. Evaporation Liquid Line Thermistor (THM10)
3. Evaporation Gas Line Thermistor (THM11)
4. Supercooling Main Line Thermistor (THM17)
5. Supercooling Bypass Line Thermistor (THM23)



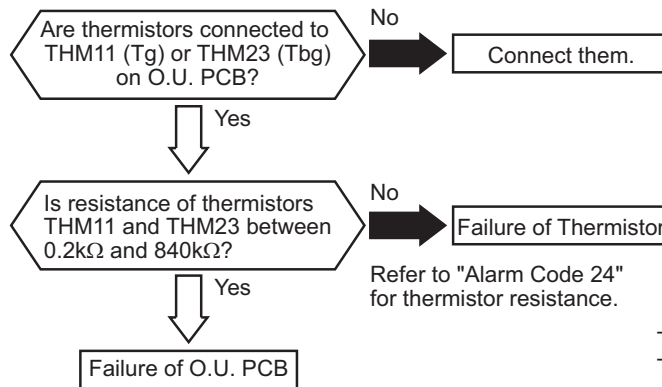
Alarm
Code

25

Abnormality of Thermistor for Outdoor Unit Heat Exchanger Gas Pipe (Tg/Tbg)

- 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. (For a combination of outdoor units, the alarm code is displayed on the PCB of outdoor Unit A.) Additionally for the outdoor unit number and compressor number with an abnormal thermistor, check the alarm code history.
- *1) Except for some models.

- ★ This alarm is displayed when a short circuit ($0.2\text{k}\Omega$ or less) or disconnection ($840\text{k}\Omega$ or more) of the thermistor is detected for eight minutes during operation.



Tg: Thermistor for Outdoor Gas Pipe
Tbg: Thermistor for Super Cooling Bypass Line
O.U. PCB: Outdoor Unit PCB

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

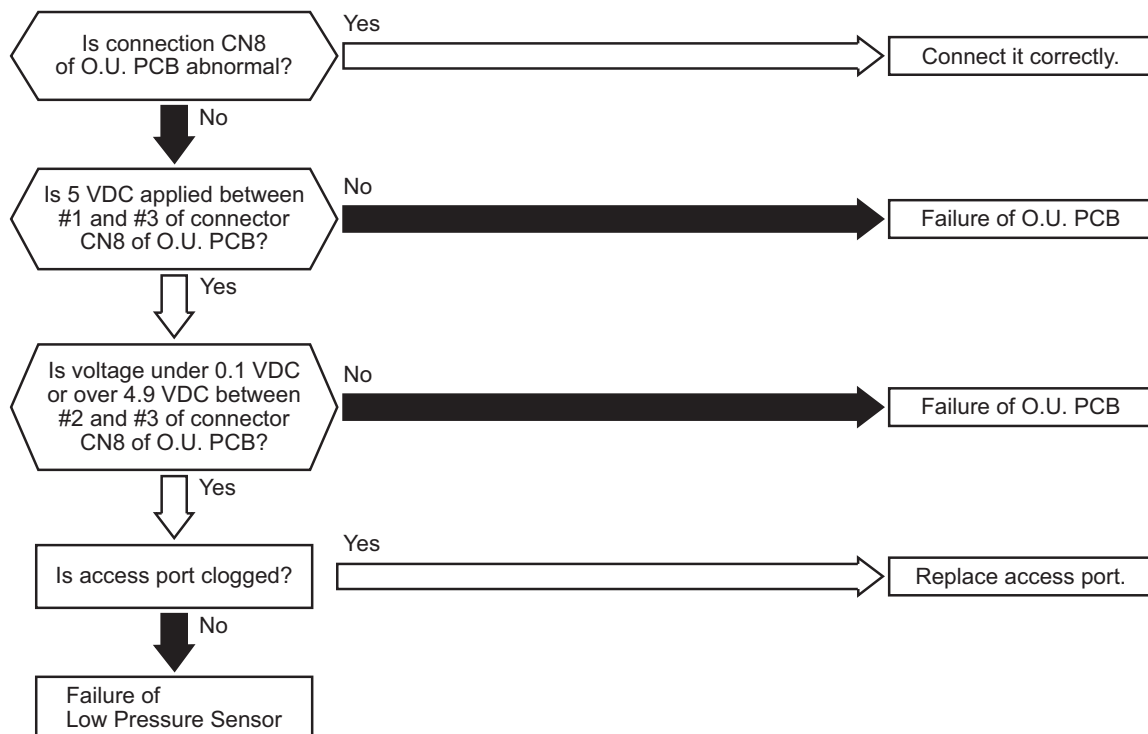
29

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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
- *1) Except for some models.

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

O.U. PCB: Outdoor Unit PCB



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

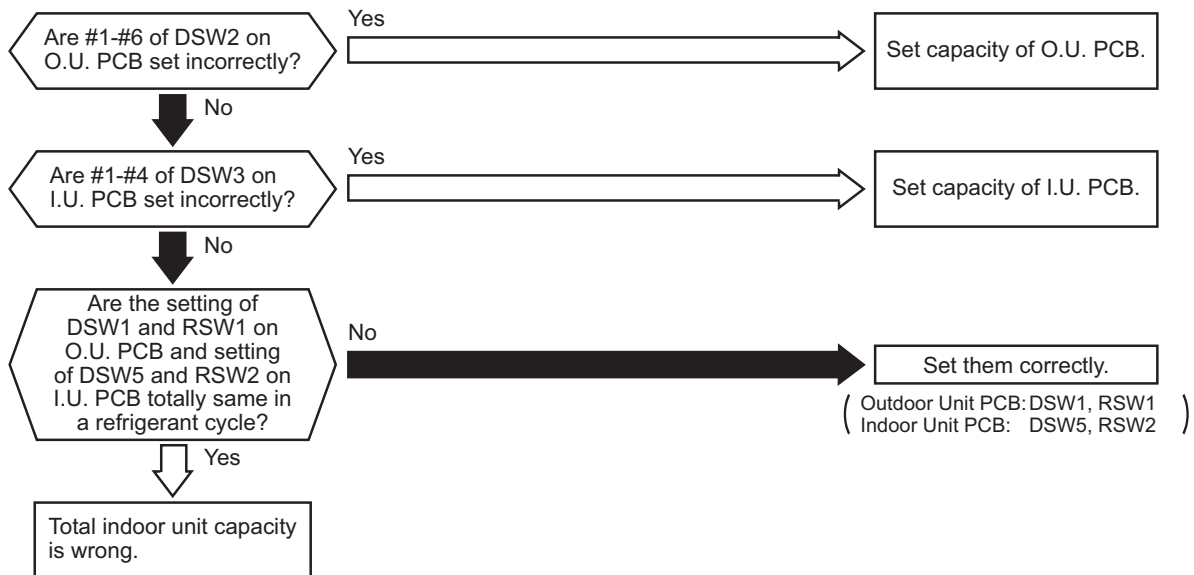
31

Incorrect Capacity Setting of Indoor Unit and 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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
- *1) Except for some models.

- ★ This alarm code is indicated 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
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 50% to 130%.
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



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

Alarm
Code

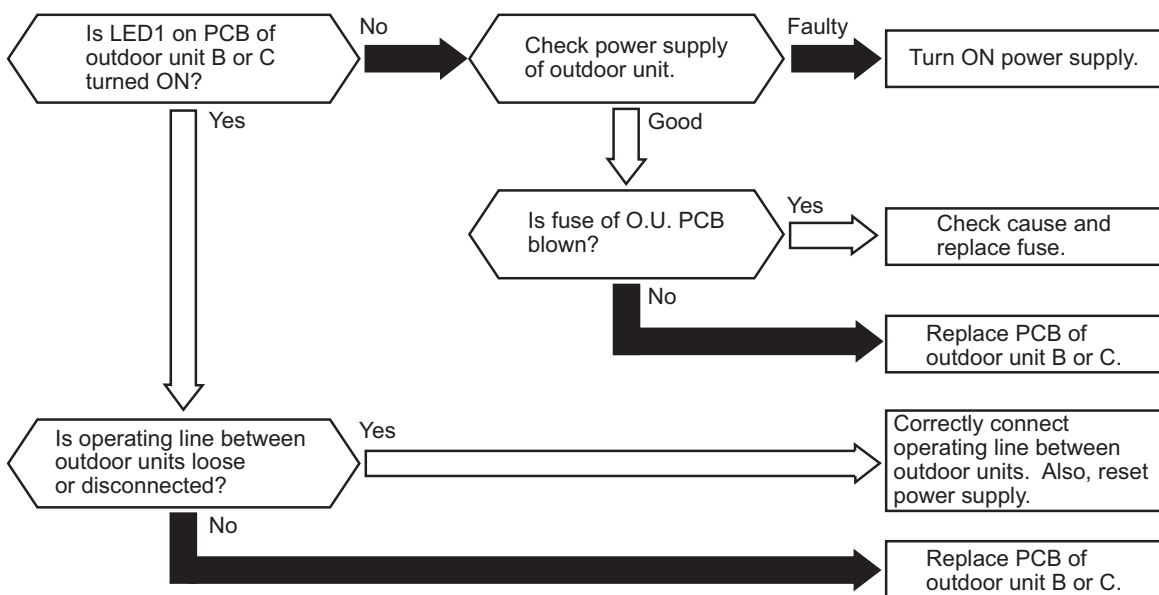
31

Abnormal Communication between Outdoor Units

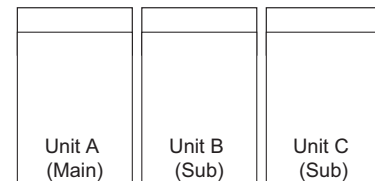
- The RUN indicator (red) flashes.
 - The indoor unit number (refrigerant cycle number - address number), the alarm code, the model code^{*1)}, the model name^{*1)} and the number of connected indoor units are displayed on the LCD. The indoor unit number and the alarm code are displayed on the 7-segment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

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

O.U. PCB: Outdoor Unit PCB



Outdoor Unit



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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
- ^{*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	36	Incorrect Indoor Unit Combination
------------	----	-----------------------------------

- 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.
- ^{*1)} Except for some models.

Alarm
Code

38

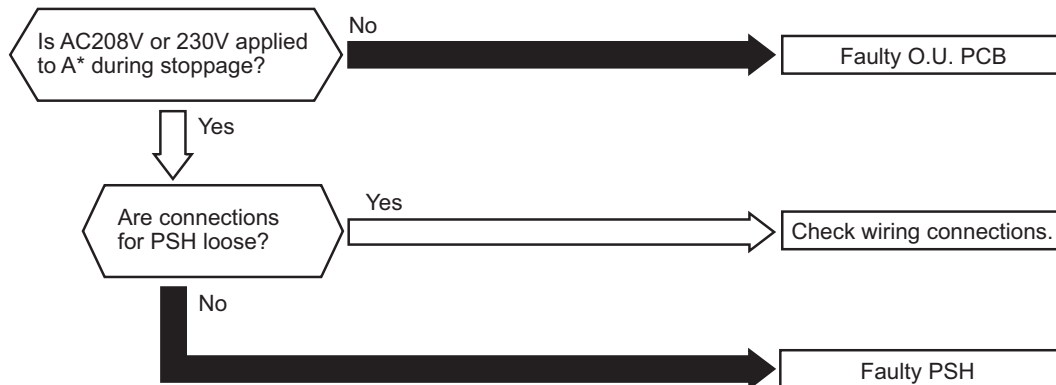
Abnormality of Picking up Circuit for Protection in Outdoor Unit

- 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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
- *1) Except for some models.

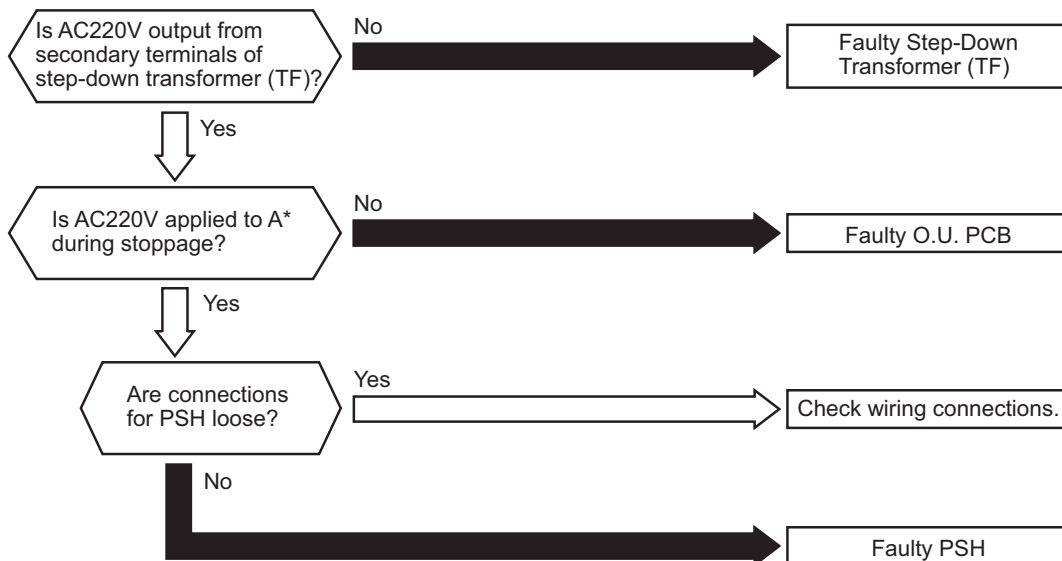
★ This alarm code is displayed when AC 208/230V or 220V is not detected in A* during inverter compressor stoppage.

O.U. PCB: Outdoor Unit PCB

• (H,Y)VAHP***B31CW

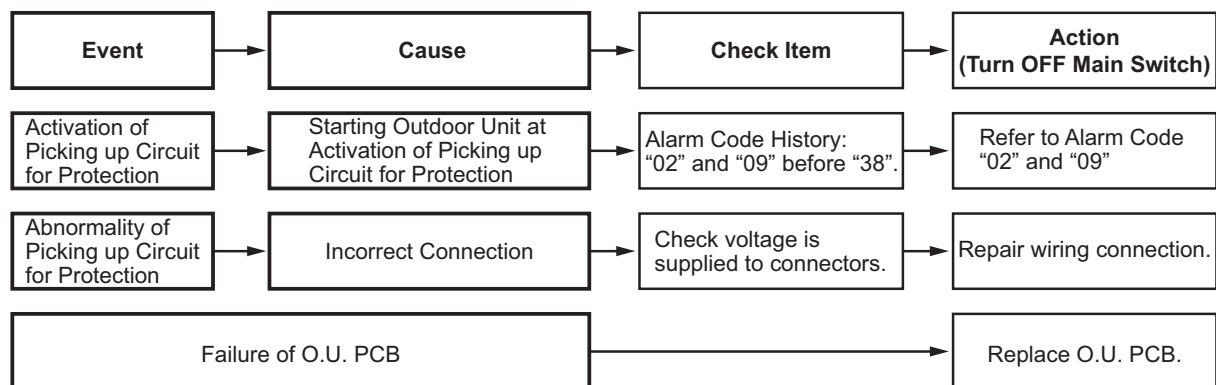


• (H,Y)VAHP***B41CW



A*: Between Terminals 3# of PCN2 (or 3# of PCN16) and "S1" on O.U. PCB

TROUBLESHOOTING



- 1): This alarm code may be indicated when the high pressure switch (PSH) is connected incorrectly or fails (open fault). The item for alarm code 02 should be checked as well.
- 2): Especially, check the wiring connection for PCN2 and PCN16 on O.U. PCB.

Alarm
Code

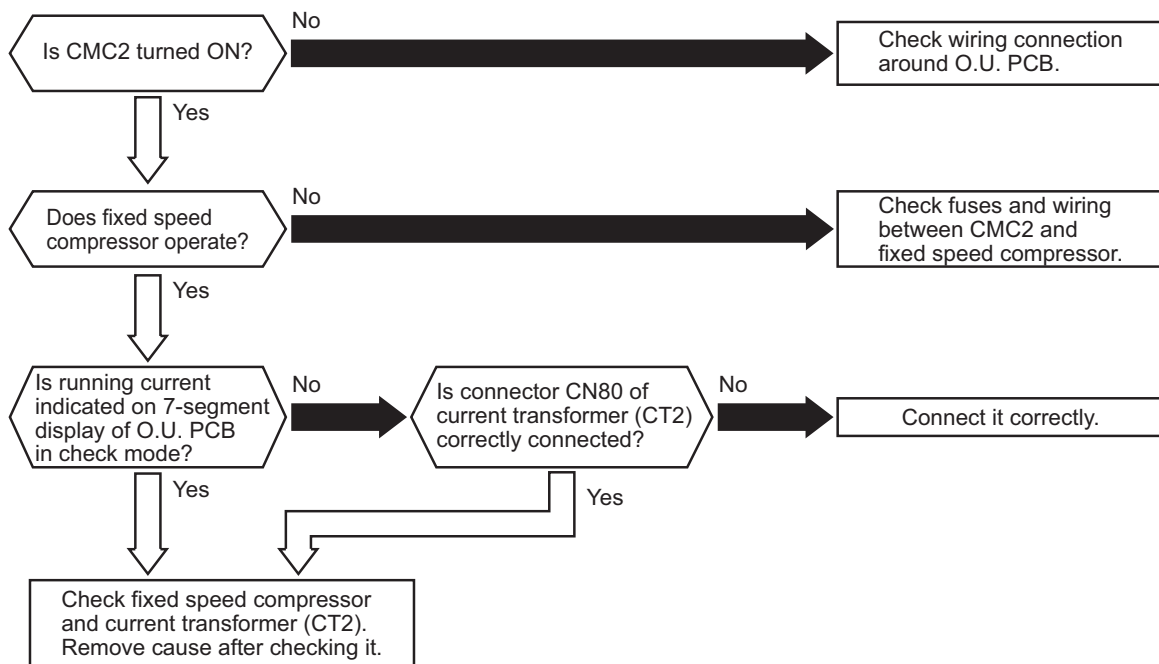
39

Abnormality of Running Current at Fixed Speed Compressor

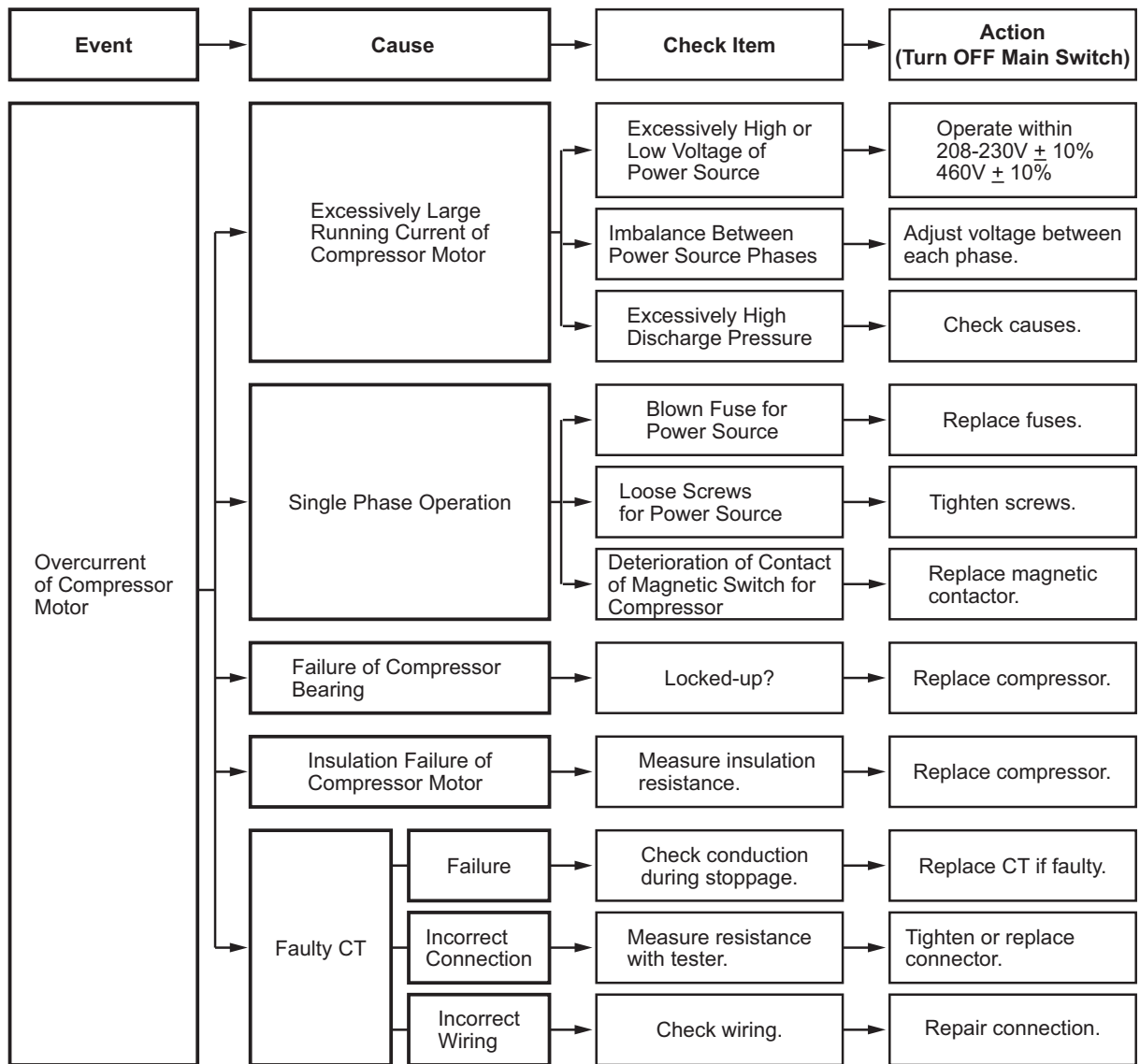
- The RUN indicator (red) flashes.
 - The indoor unit number (refrigerant cycle number - address number), the alarm code, the model code^{*1)}, the model name^{*1)} and the number of connected indoor units are displayed on the LCD. The indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB. (For a combination of outdoor units, the alarm code is displayed on the PCB of outdoor Unit A.) Additionally for the outdoor unit number and compressor number with an abnormal thermistor, check the alarm code history.
- ^{*1)} Except for some models.

- ★ When the running current of the fixed speed compressor is 0A or exceeds the overcurrent limit during the operation, all the compressors stop. The operation automatically restarts after three minutes. If this occurs again in the same compressor twice in the next 30 minutes, this alarm code is displayed.

O.U. PCB: Outdoor Unit PCB



TROUBLESHOOTING



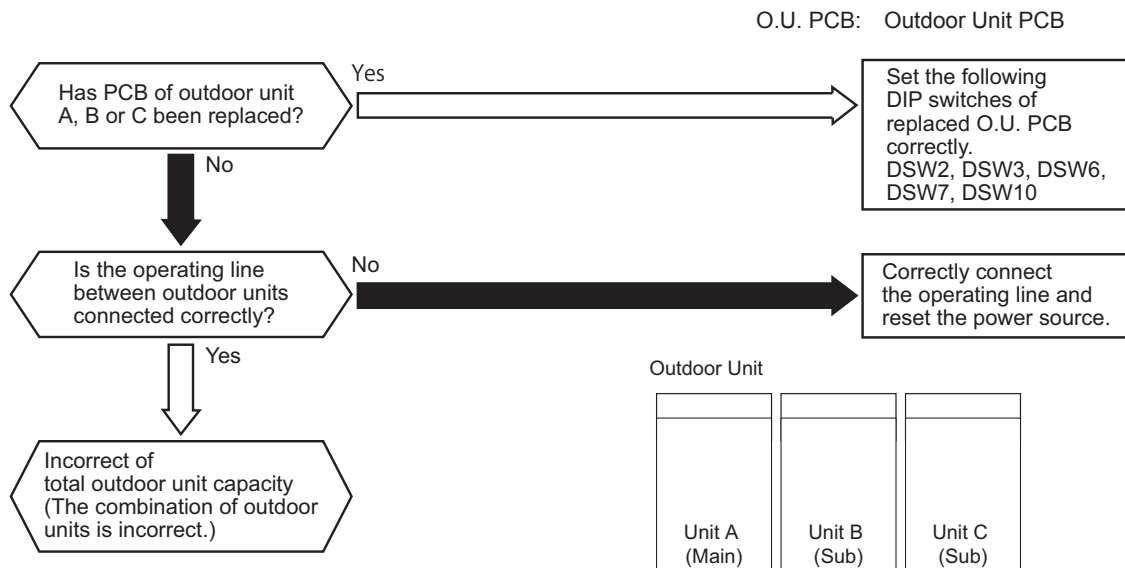
Alarm
Code

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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
- ^{*1)} Except for some models.

★ This alarm code is indicated when the total capacity of the outdoor unit connected to the communication terminal between outdoor units exceeds 360 MBH.

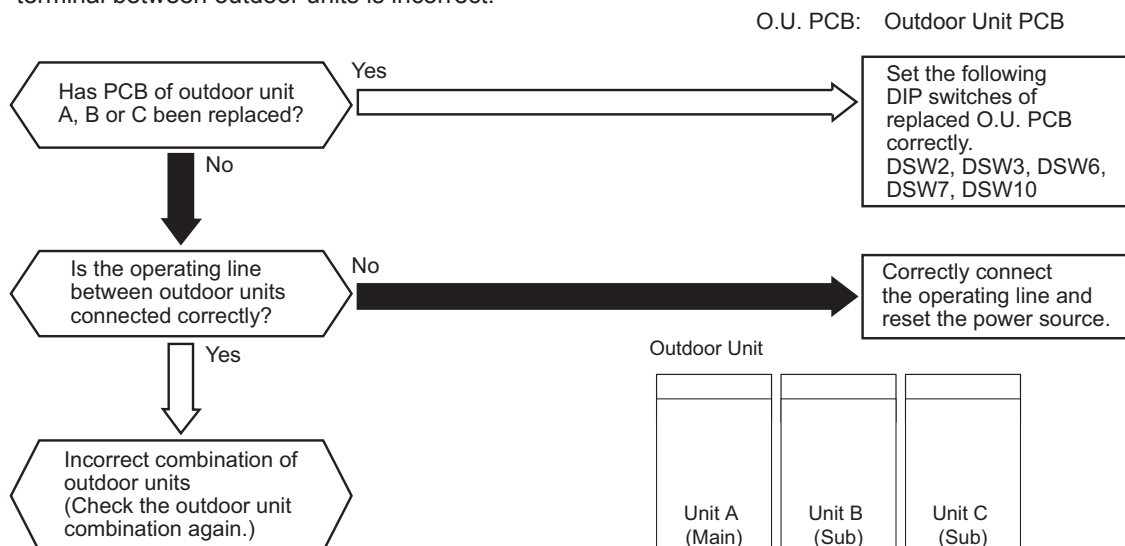
Alarm
Code

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, and the indoor unit number and the alarm code are displayed on the 7-segment of outdoor unit PCB.
- ^{*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.



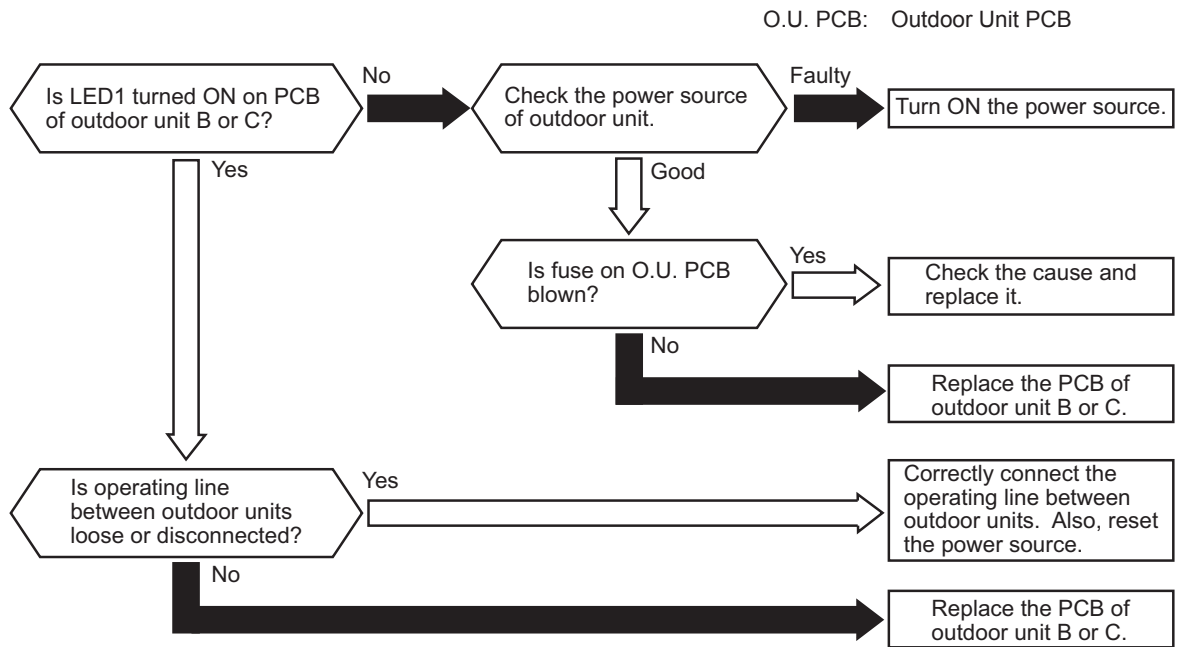
Alarm
Code

3d

Communication Failure 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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
- *1) Except for some models.

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



Outdoor Unit

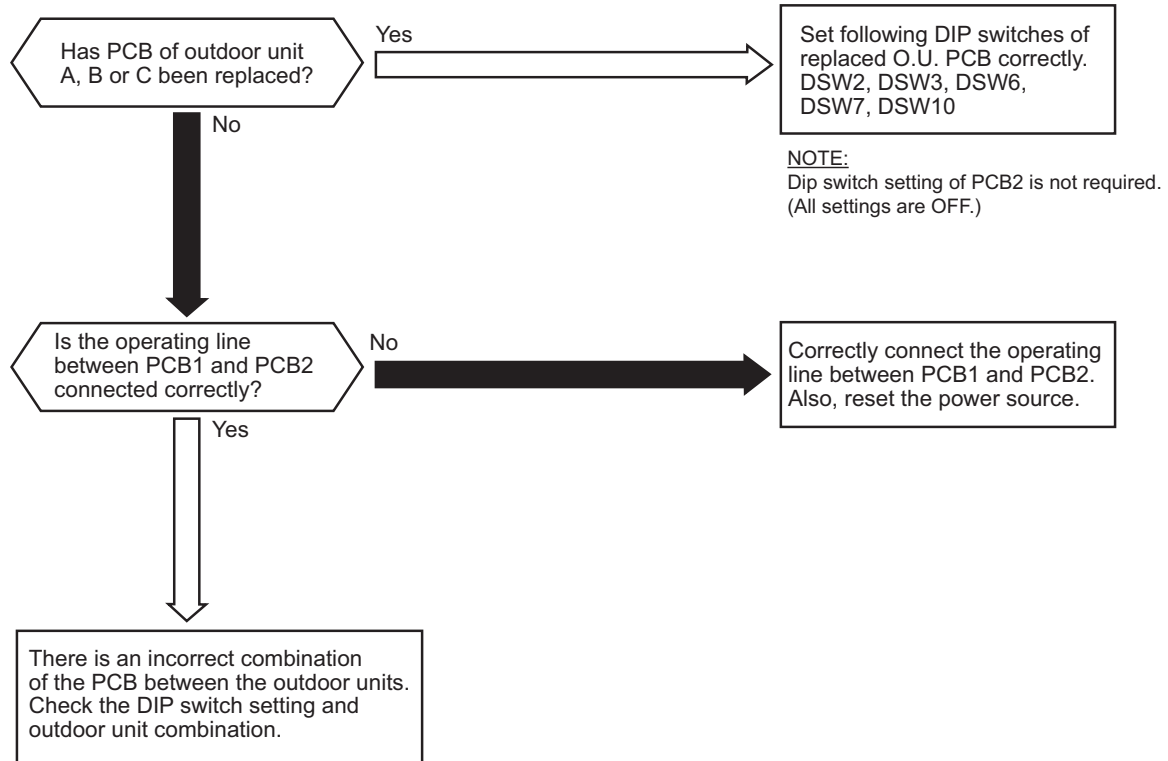
Unit A (Main)	Unit B (Sub)	Unit C (Sub)

Alarm
Code

Abnormality of Inverter PCBs Combination of 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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
- ^{*1)} Except for some models.

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



Alarm
Code

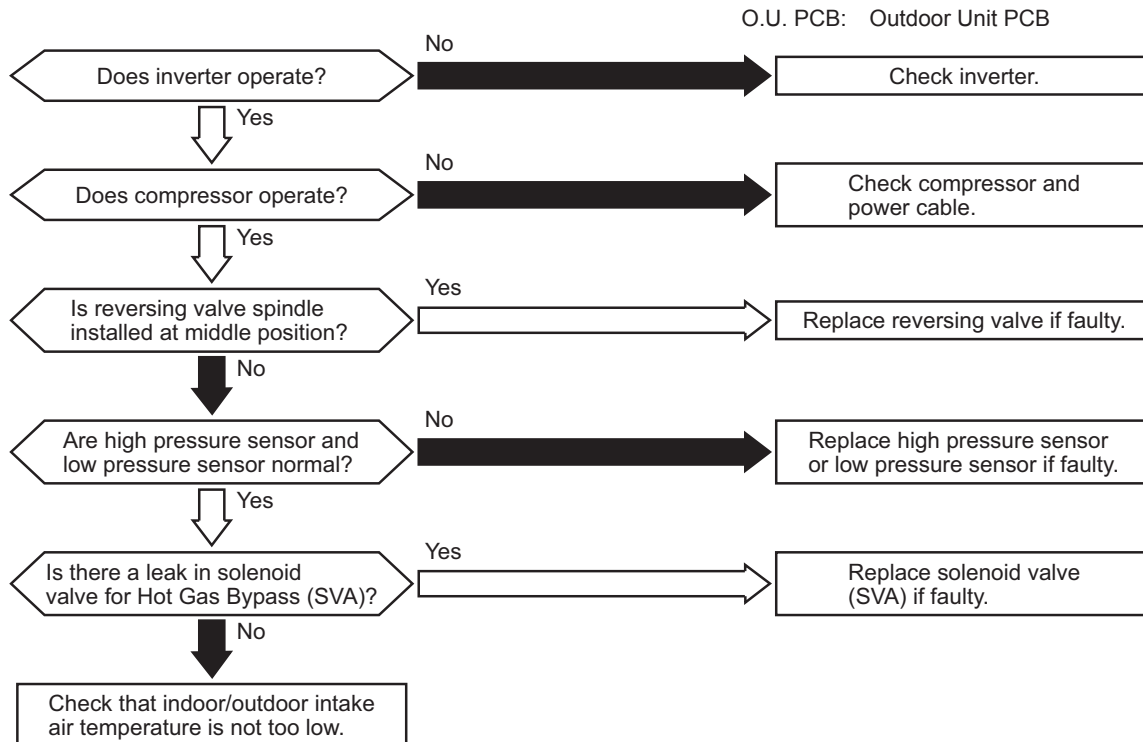
43

Activation of Low Compression Ratio Protection Device

- 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.
- *1) Except for some models.

- ★ This alarm code is displayed when the following condition occurs more than twice in an hour.

Compression ratio $\varepsilon = \{(Pd + 14.5 \text{ psi (0.1 MPa)}) / (Ps + (8.7 \text{ psi (0.06 MPa)}))\}$, calculated from a discharge pressure (Pd) and suction pressure (Ps) is lower than 1.8.



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 source and pressure indication.	Replace sensor if faulty.
	Excessively Low Indoor Intake Air Temperature	Check indoor unit and outdoor unit air temp. thermistor.	Replace thermistor if faulty.
	Leakage from Solenoid Valve (SVA)	Check Solenoid Valve.	Replace SVA if there is leakage.

Alarm
Code

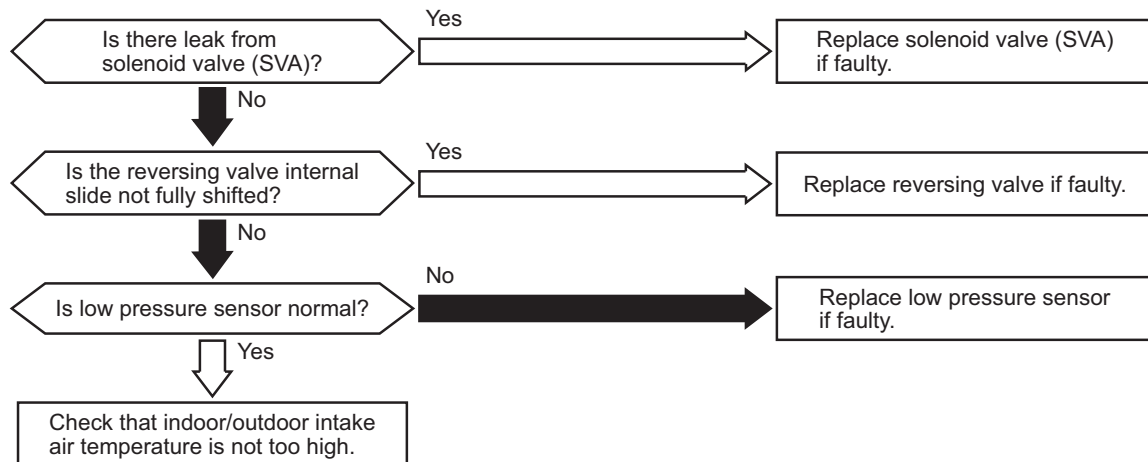
44

Activation of Low Pressure Increase Protection Device

- 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.
- *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



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 source.	Replace sensor if faulty.
	Excessively High Indoor Unit and Outdoor Unit Suction Air Temperature	Check indoor unit and outdoor unit suction air temp. thermistor.	Replace thermistor if faulty.

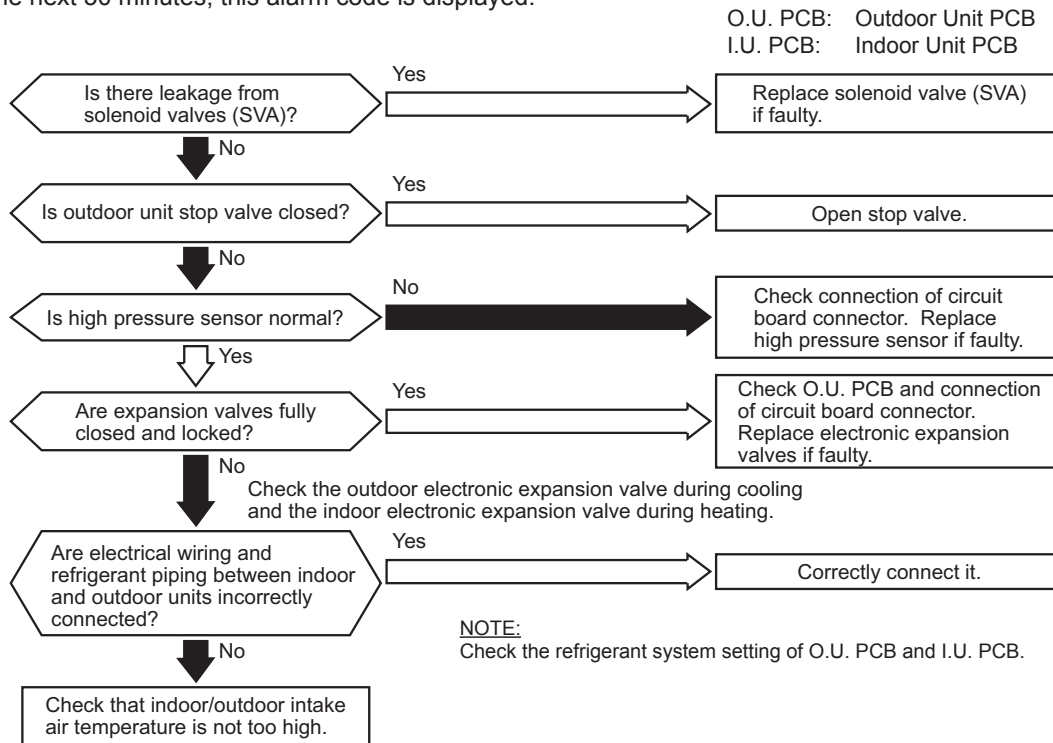
Alarm
Code

45

Activation of High Pressure Increase Protection Device

- 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.
- *1) Except for some models.

- ★ If the discharge pressure (Pd) of the compressor is more than 551 psi (3.8 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.



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.	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.

Alarm
Code

47

Activation of Low Pressure Decrease Protection Device
(Vacuum Operation Protection)

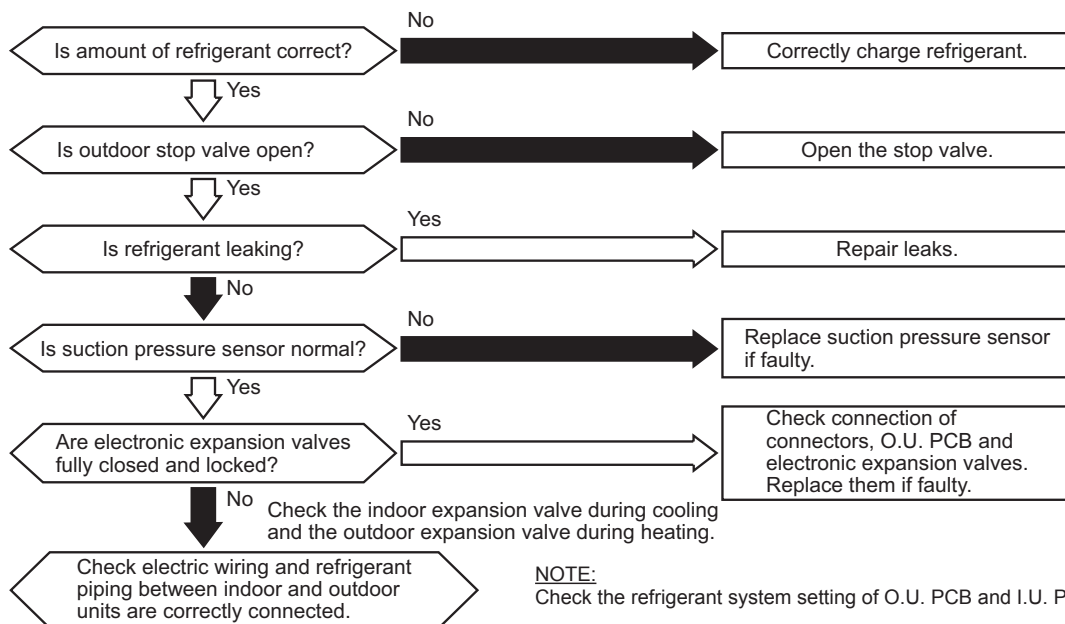
- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address number), the alarm code, the model code^{*1)}, the model name^{*1)} and the number of connected indoor units are displayed on the LCD. The indoor unit number and the alarm code are displayed on the 7-segment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

*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.

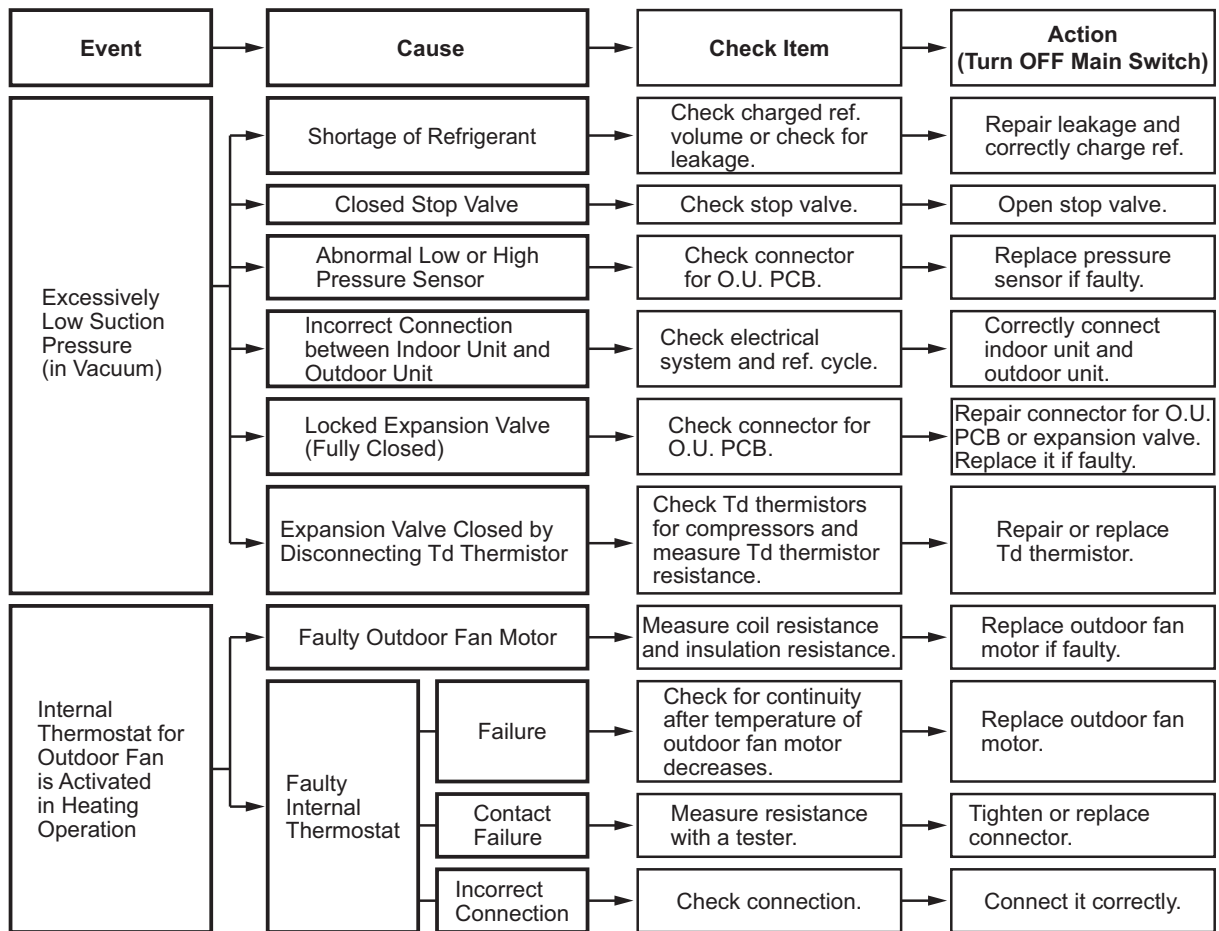
O.U. PCB: Outdoor Unit PCB

I.U. PCB: Indoor Unit PCB

**NOTE:**

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

TROUBLESHOOTING



Alarm
Code

48

Activation of Inverter Overcurrent Protection Device (1)

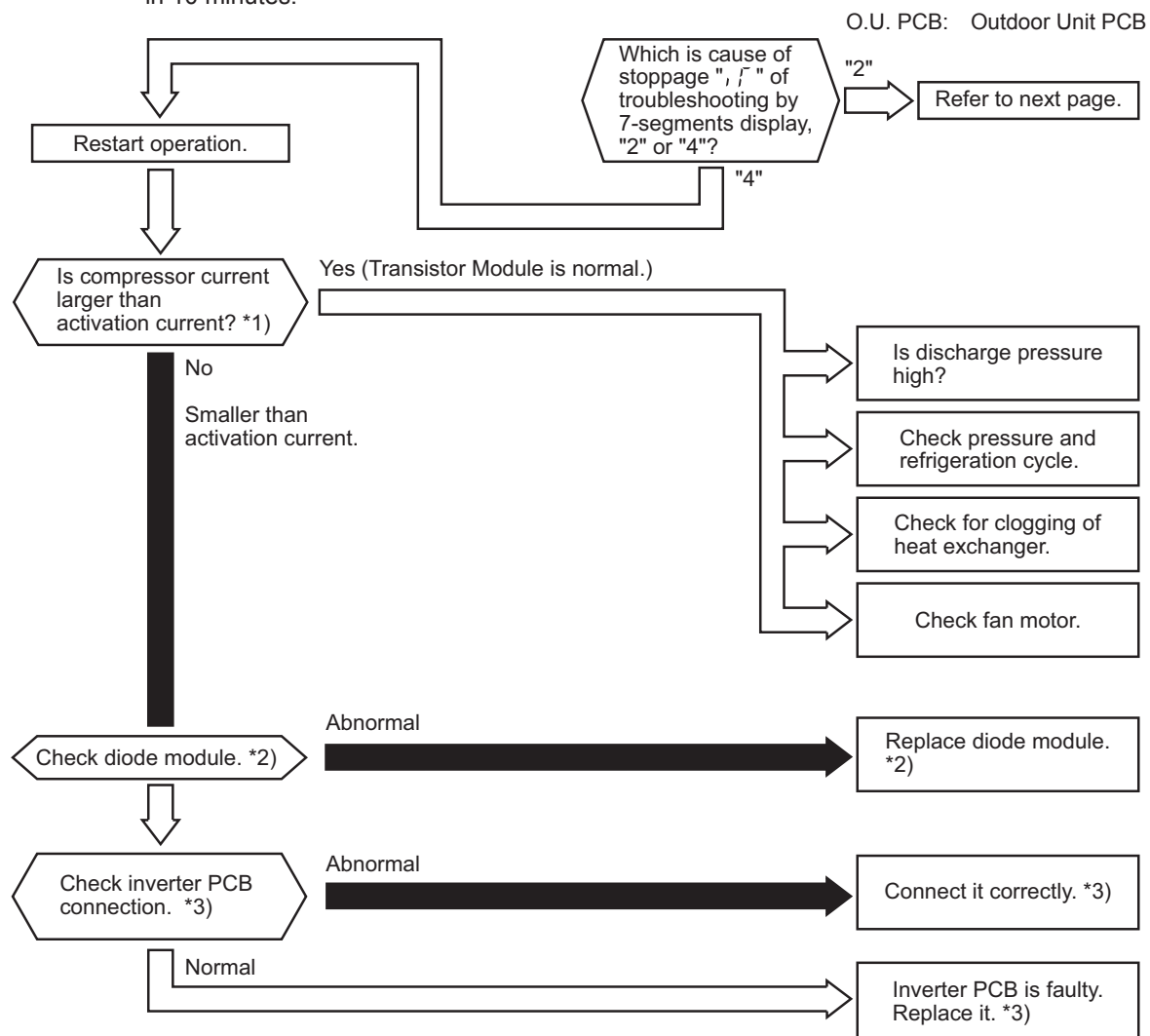
- The RUN indicator (red) flashes.
- The indoor unit number (refrigerant cycle number - address number), the alarm code, the model code^{*1)}, the model name^{*1)} and the number of connected indoor units are displayed on the LCD. The indoor unit number and the alarm code are displayed on the 7-segment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

^{*1)} Except for some models.

- ★ 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.



^{*1)}: Regarding the setting value of activation current, refer to Section 4.2.1.1.

^{*2)}: Regarding replacing or checking diode module, refer to Section 4.2.1.1.

^{*3)}: Regarding replacing or checking method for inverter parts, refer to Section 4.2.1.1.

Inverter Stoppage Code

itc	Cause of Inverter Stoppage
2	Instantaneous Overcurrent
4	Inverter Overcurrent

Alarm
Code

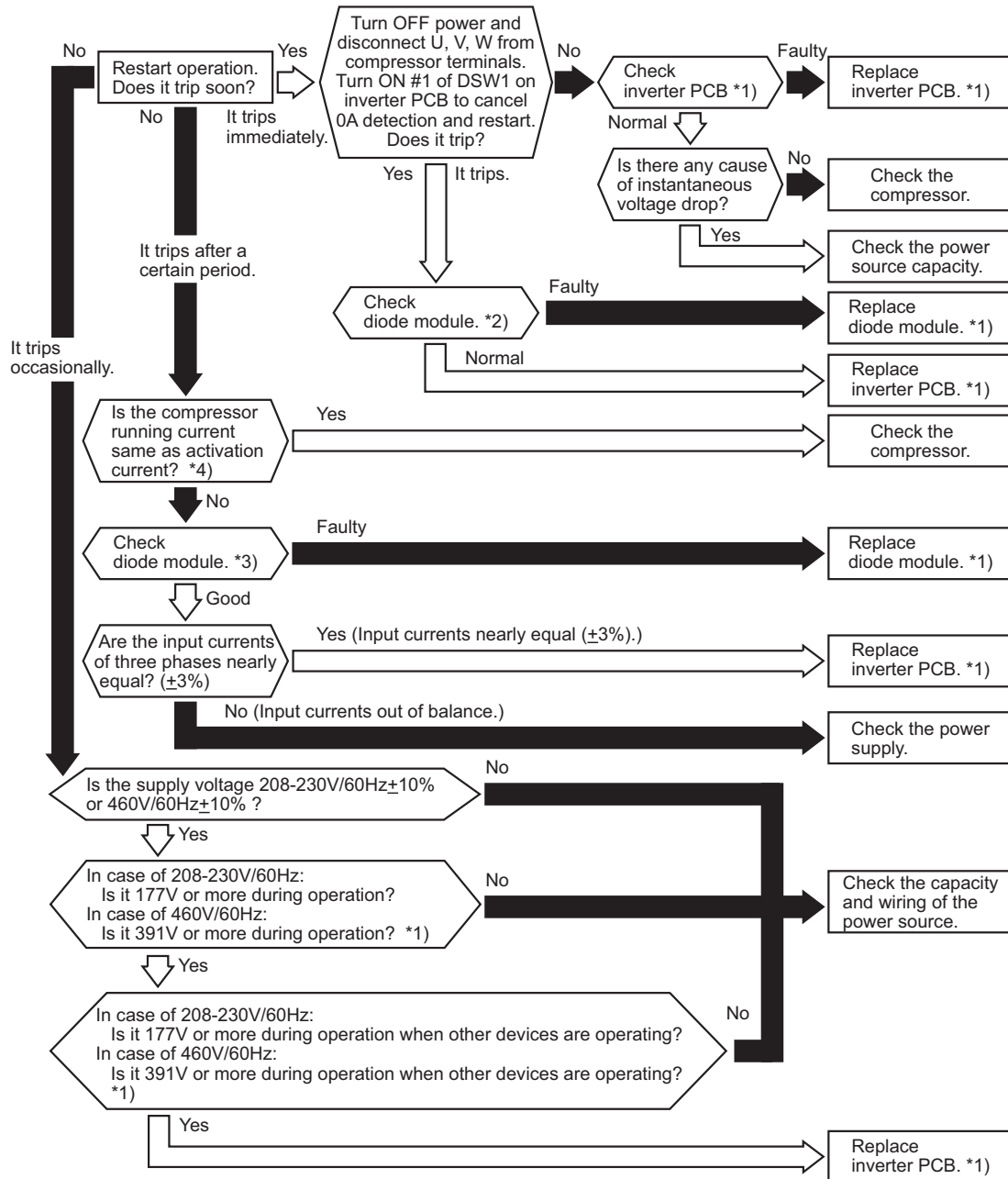
48

Activation of Inverter Overcurrent Protection Device (2)

- The RUN indicator (red) 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.
- ^{*1)} Except for some models.

★ This alarm code is displayed when instantaneous overcurrent occurs six times within 30 minutes. If this occurs less than six times in 30 minutes, the operation automatically restarts.

Conditions of Activation: Inverter current with 150% of the rated current



^{*1)}: For the maintenance and replacement of inverter PCB, perform the high voltage discharge work according to Section 4.2.1.1.

^{*2)}: Refer to Section 4.2.1.1 for details of checking procedures of transistor module.

^{*3)}: Refer to Section 4.2.1.1 for details of checking procedures of diode module.

^{*4)}: Regarding the setting value of activation current, refer to Section 4.2.1.1.

Alarm
Code

51

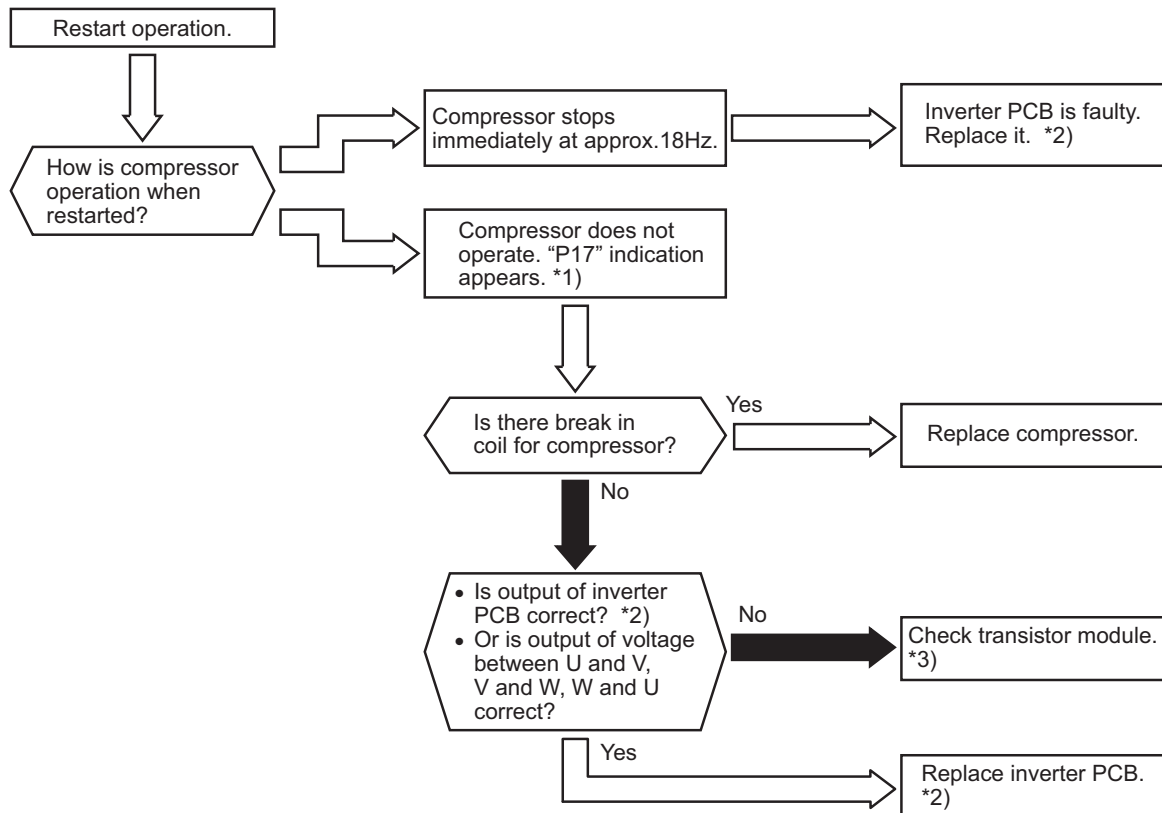
Abnormality of Current Sensor

- 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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
- *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) When the compressor's operating frequency reaches 15 to 18Hz after the compressor starts, the effective value of running current at each phase (U+, U-, V+ and V-) is 1.5A or less.
- (2) The wave height value of running current for the phase positioning is less than 5A before the compressor starts (at the end of the phase positioning).



*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.

*3): Refer to Section 4.2.1.1 for details of checking procedures of transistor module.

Inverter Stoppage Code

itc	Cause of Inverter Stoppage
8	Abnormal Current Sensor

Alarm
Code

53

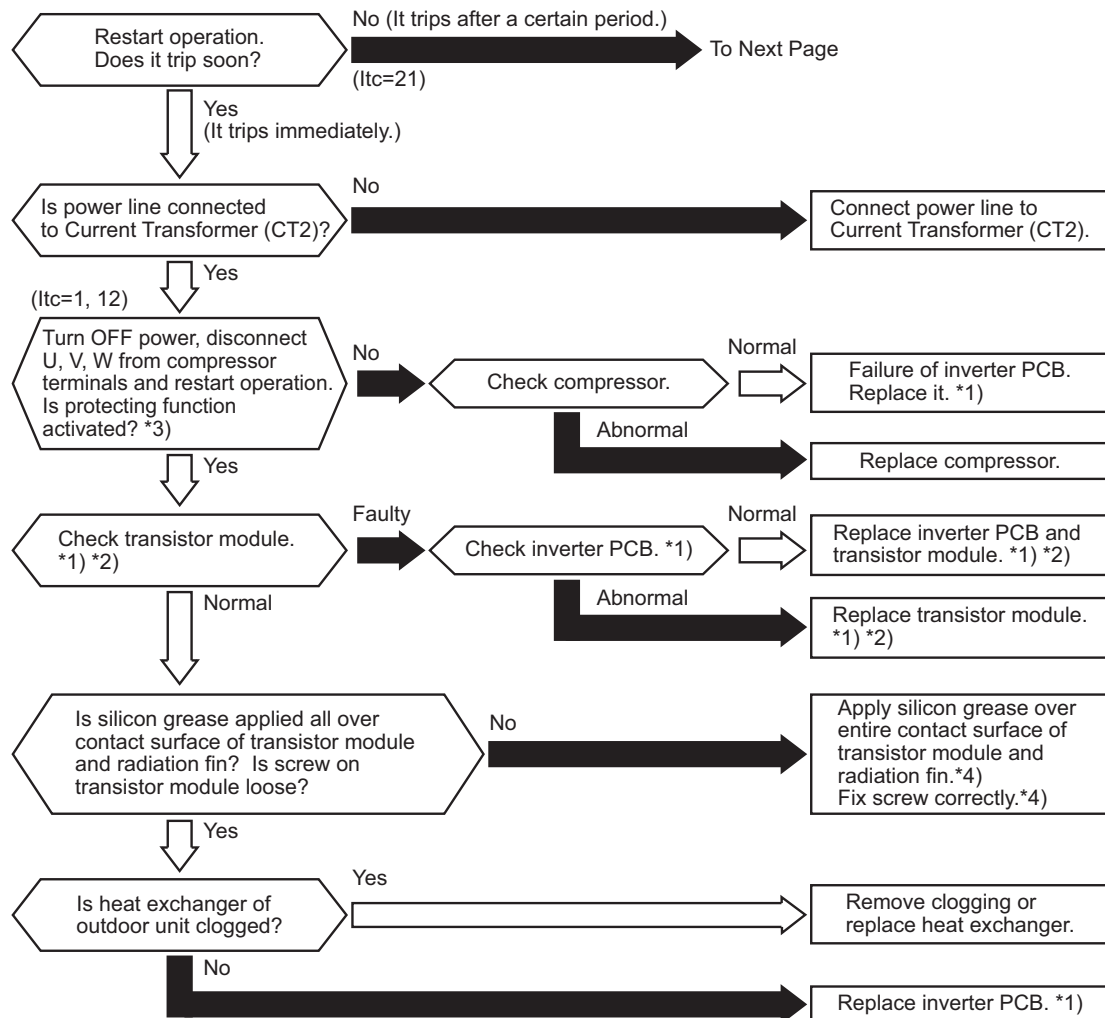
Inverter Error Signal Detection

- 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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
- ^{*1)} Except for some models.

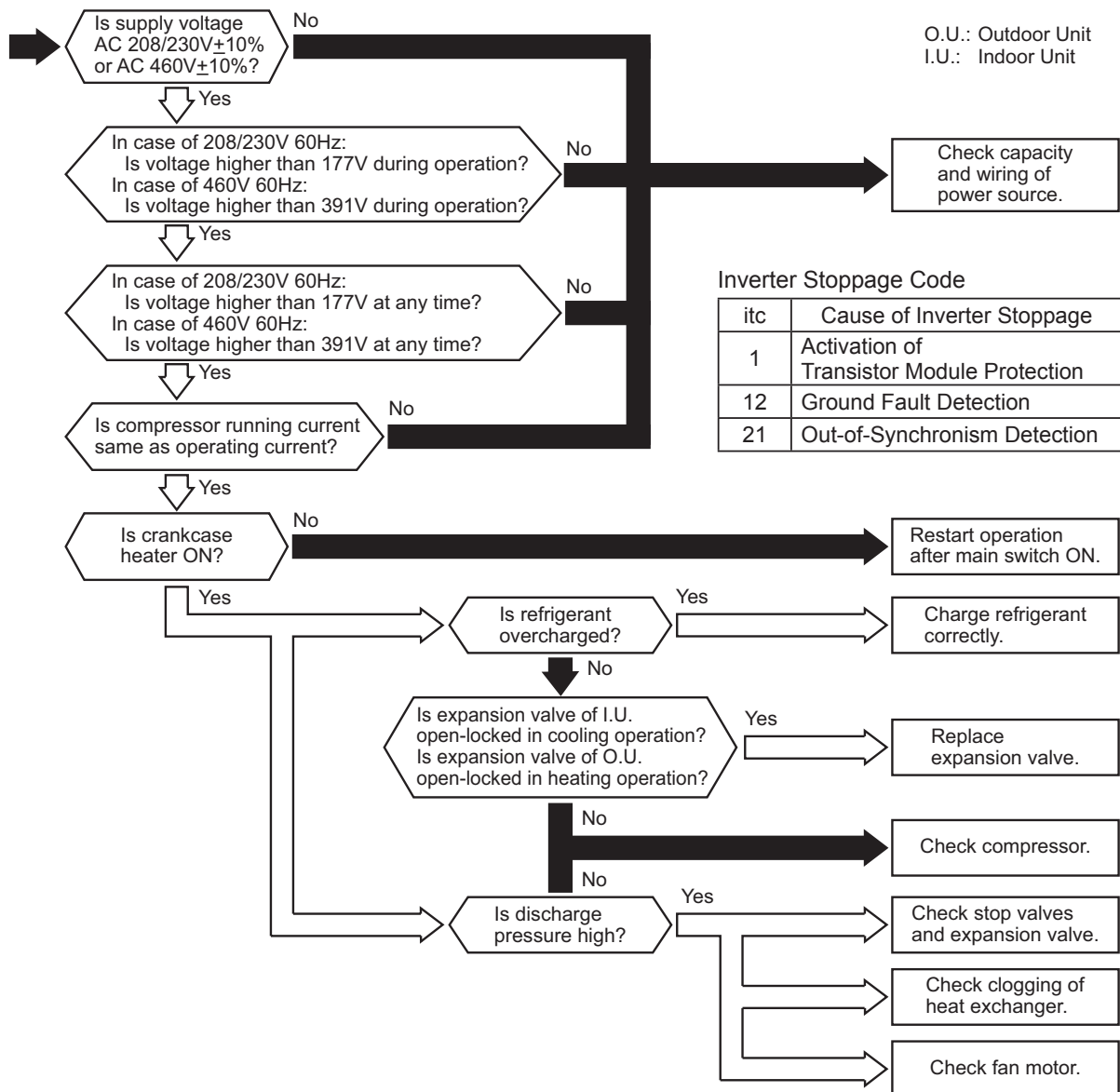
- ★ IPM (Transistor Module) of the inverter PCB has the abnormality detection function. This alarm is displayed when any of the following conditions is met seven times in 30 minutes. If this occurs less than seven times in 30 minutes, the operation automatically restarts.

Condition of Activation:

- (1) An abnormal current is applied to the transistor module due to a short circuit, a ground fault or overcurrent.
- (2) The temperature at transistor module increases abnormally.
- (3) The control voltage decreases.



References to *1), *2), *3) and *4) here are on the next page.



These references are from previous page:

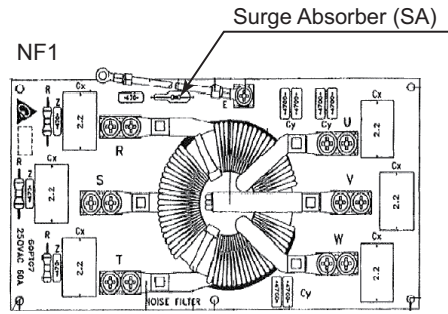
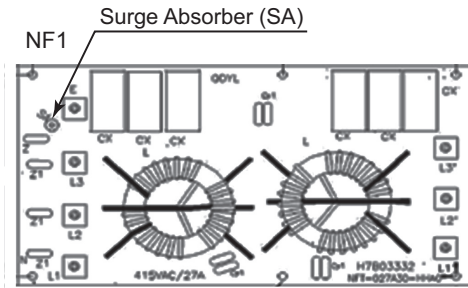
- *1): For the maintenance and replacement of the inverter PCB, perform the high voltage discharge work according to Section 4.2.1.1.
- *2): Refer to Section 4.2.1.1 for details of checking procedures of transistor module.
- *3): Turn ON the No.1 switch of DSW1 on the inverter PCB when restarting the operation with the terminals of the compressor disconnected. After troubleshooting, turn OFF the No.1 switch of DSW1 on inverter PCB.
- *4): Use the silicon grease provided as an accessory (Service Parts No.: P22760).

NOTE:

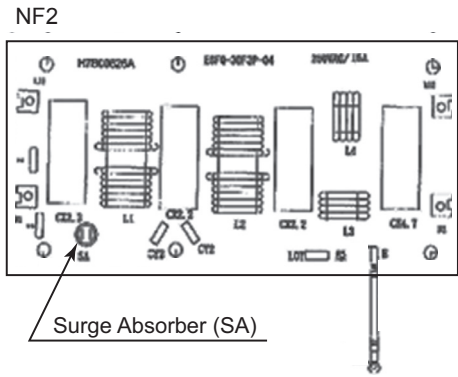
When an excessive surge current is applied to the unit due to lightning or other causes, this alarm code "53" or the inverter stoppage code (IT) "11" will be indicated and the unit cannot be operated. In this case, check the surge absorber/surge arrester (SA) on the noise filter (NF1, NF2). The surge absorber may be damaged if the inner surface of the surge absorber is black. In that case, replace the surge absorber.
If the inside of the surge absorber is normal, turn OFF the power once and wait for LED201 on the inverter PCB (red) OFF (approximately five minutes) and turn it ON again.

TROUBLESHOOTING

< Position of Surge Absorber >



(208/230V)



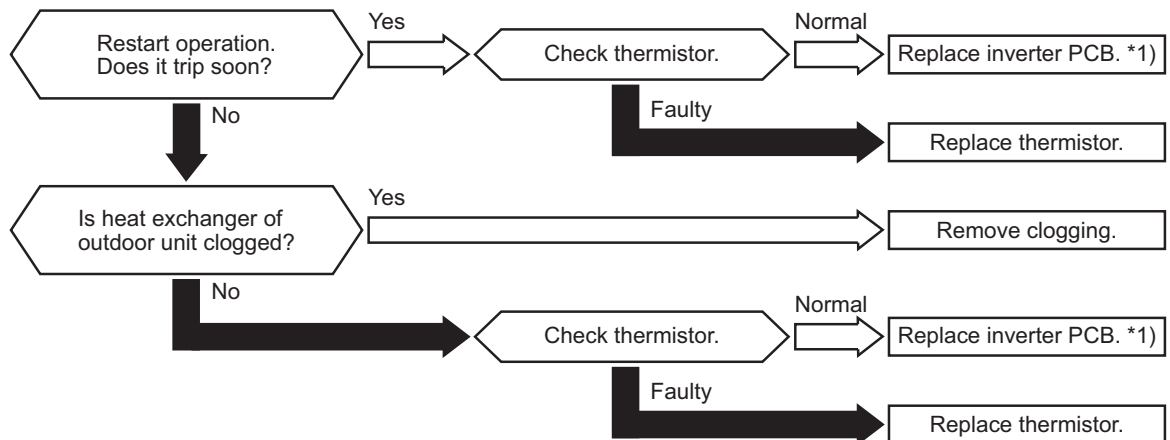
(460V)

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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
- ^{*1)} Except for some models.

- ★ If the temperature of the radiation fin thermistor exceeds 194°F (90°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.

Inverter Stoppage Code

itc	Cause of Inverter Stoppage
3	Abnormal Inverter Fin Temperature

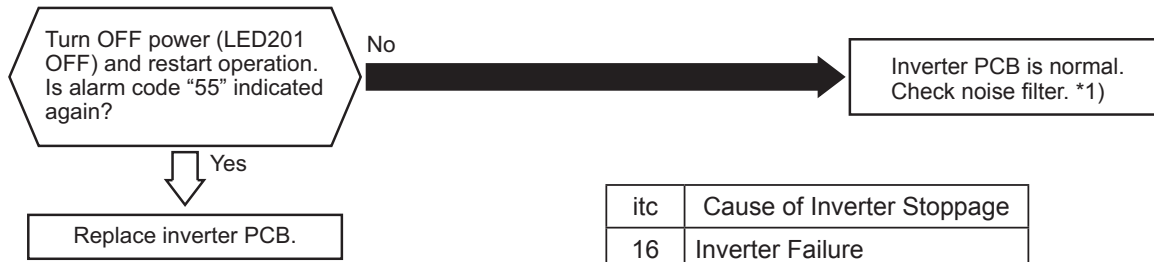
Alarm Code **55**

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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
- *1) Except for some models.

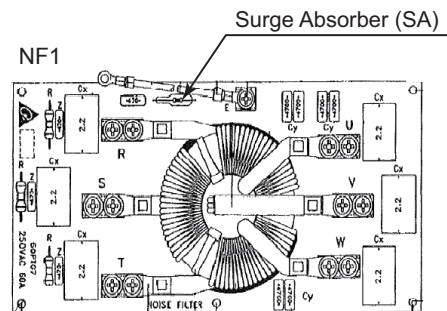
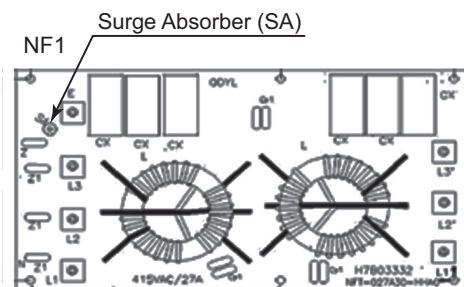
- ★ An abnormality is detected when the actual frequency from the inverter PCB is less than 10Hz after the inverter frequency is output from the outdoor unit PCB to the inverter PCB. This alarm code is displayed when this occurs three times in 30 minutes. If it occurs less than three times in 30 minutes,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

Conditions of Activation: Inverter PCB does not operate normally.

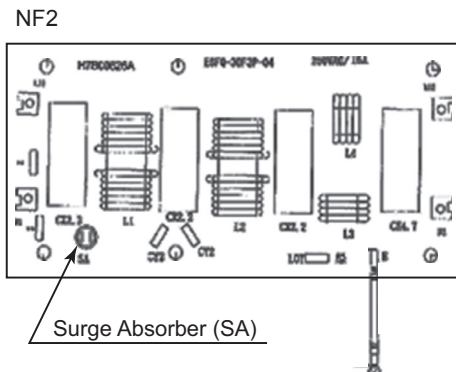


- *1): When an excessive surge current is applied to the unit due to lightning or other causes, this alarm code "55" or the inverter stoppage code (IT) "11" will be indicated and the unit cannot be operated. In this case, check the surge absorber/surge arrester (SA) on the noise filter (NF1, NF2). The surge absorber may be damaged if the inner surface of the surge absorber is black. In that case, replace the surge absorber. If the inside of the surge absorber is normal, turn OFF the power once and wait for LED201 on the inverter PCB (red) OFF (approximately five minutes) and turn it ON again.

< Position of Surge Absorber >



(208/230V)



(460V)

Alarm Code **57**

Activation of Fan Controller Protection

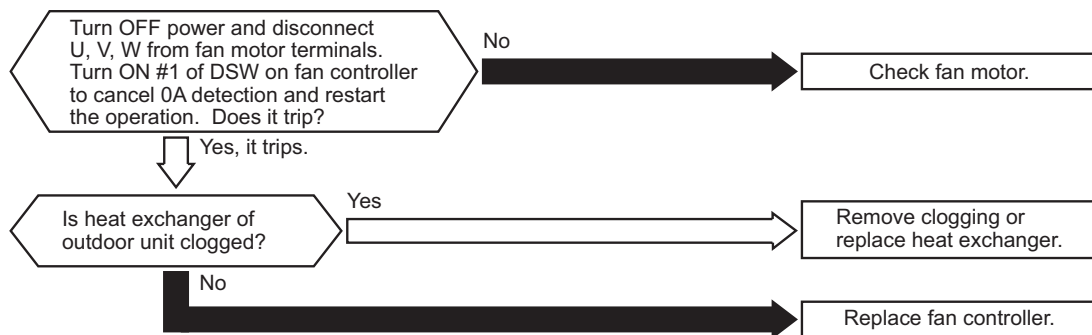
- The RUN indicator (red) flashes.
 - The indoor unit number (refrigerant cycle number - address number), the alarm code, the model code*¹⁾, the model name*¹⁾ and the number of connected indoor units are displayed on the LCD. The indoor unit number and the alarm code are displayed on the 7-segment display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

★ IPM (Transistor Module) 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) The abnormal current such as a short-circuit current, a ground-fault current or the overcurrent occurs at the transistor module.
- (2) The control voltage decreases.

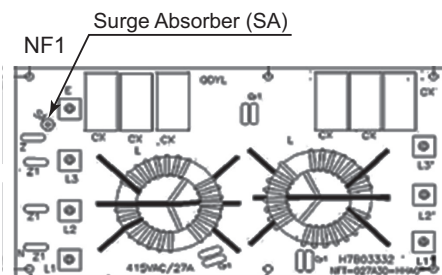


NOTE:

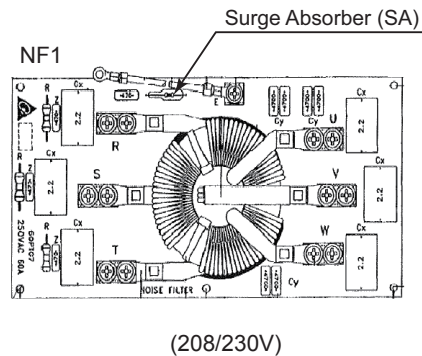
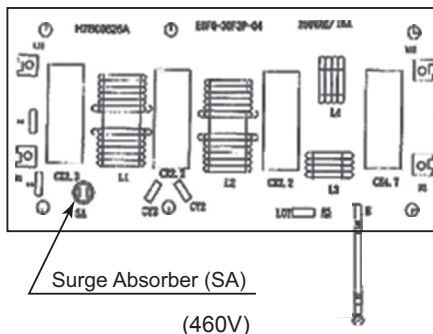
When an excessive surge current is applied to the unit due to lightning or other causes, this alarm code "57" or the inverter stoppage code (IT) "11" will be indicated and the unit cannot be operated. In this case, check to ensure the surge absorber/surge arrester (SA) on the noise filter (NF1, NF2).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

If the inside of the surge absorber is normal, turn OFF the power once and wait for LED201 on the inverter PCB (red) OFF (approximately five minutes) and turn it ON again.

< Position of Surge Absorber >



NF2



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

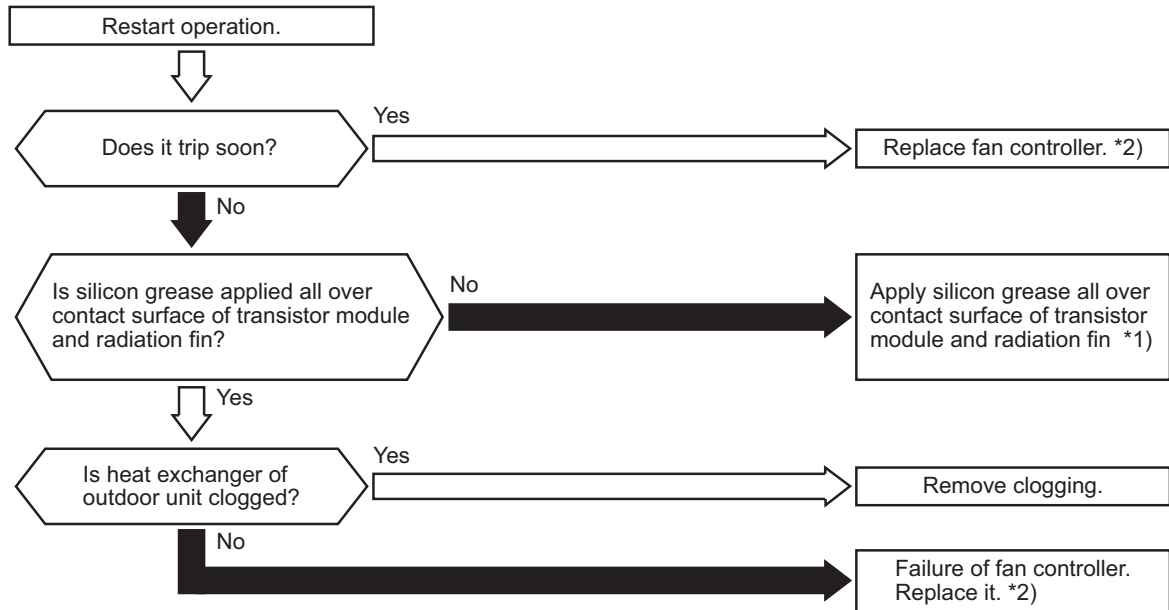
Alarm
Code

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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
- *1) Except for some models.

- ★ If the temperature of the thermistor inside the transistor module exceeds 212°F(100°C) 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.



*1): Use the silicon grease provided as an accessory (Service Parts No.: P22760) when replacing components.
Do Not re-use old silicon grease.

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

Alarm
Code

56

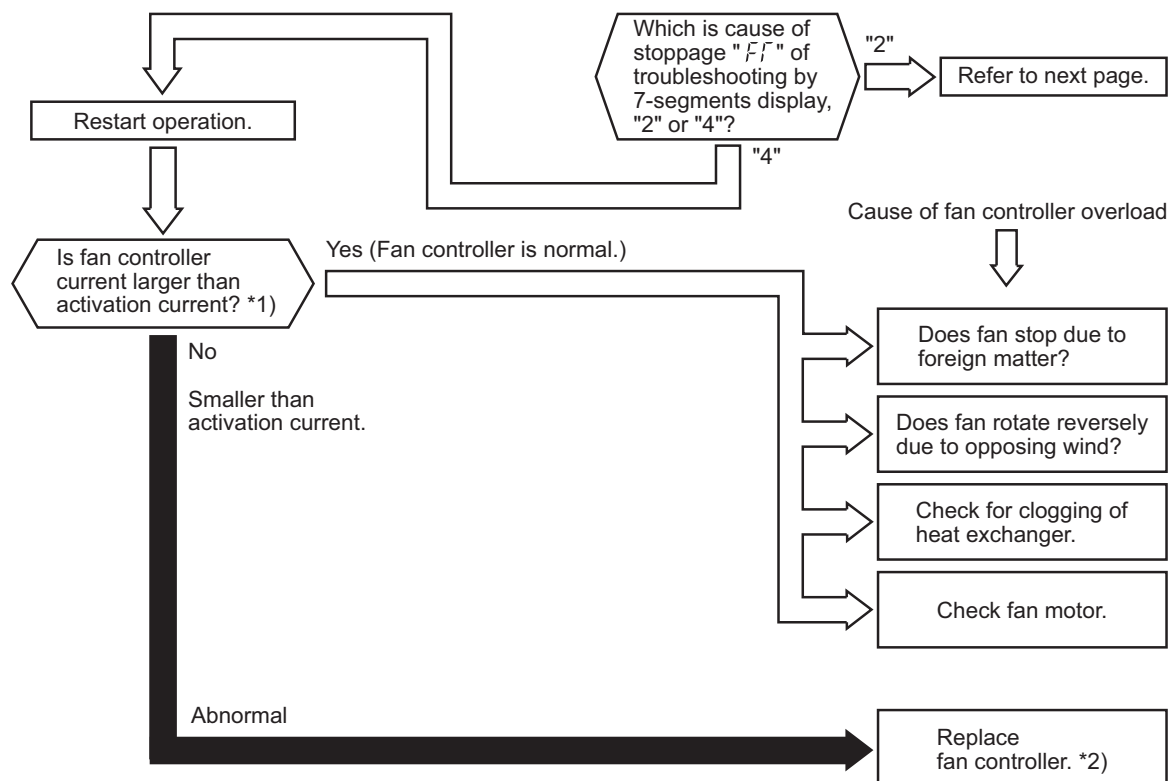
Activation of Fan Controller Overcurrent Protection Device (1)

- 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 indoor unit number and the alarm code are displayed on the 7-segment display of the outdoor unit PCB.
- *1) Except for some models.

- ★ 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.



*1): Regarding the setting value of activation current, refer to Section 4.2.1.1.

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

Alarm
Code

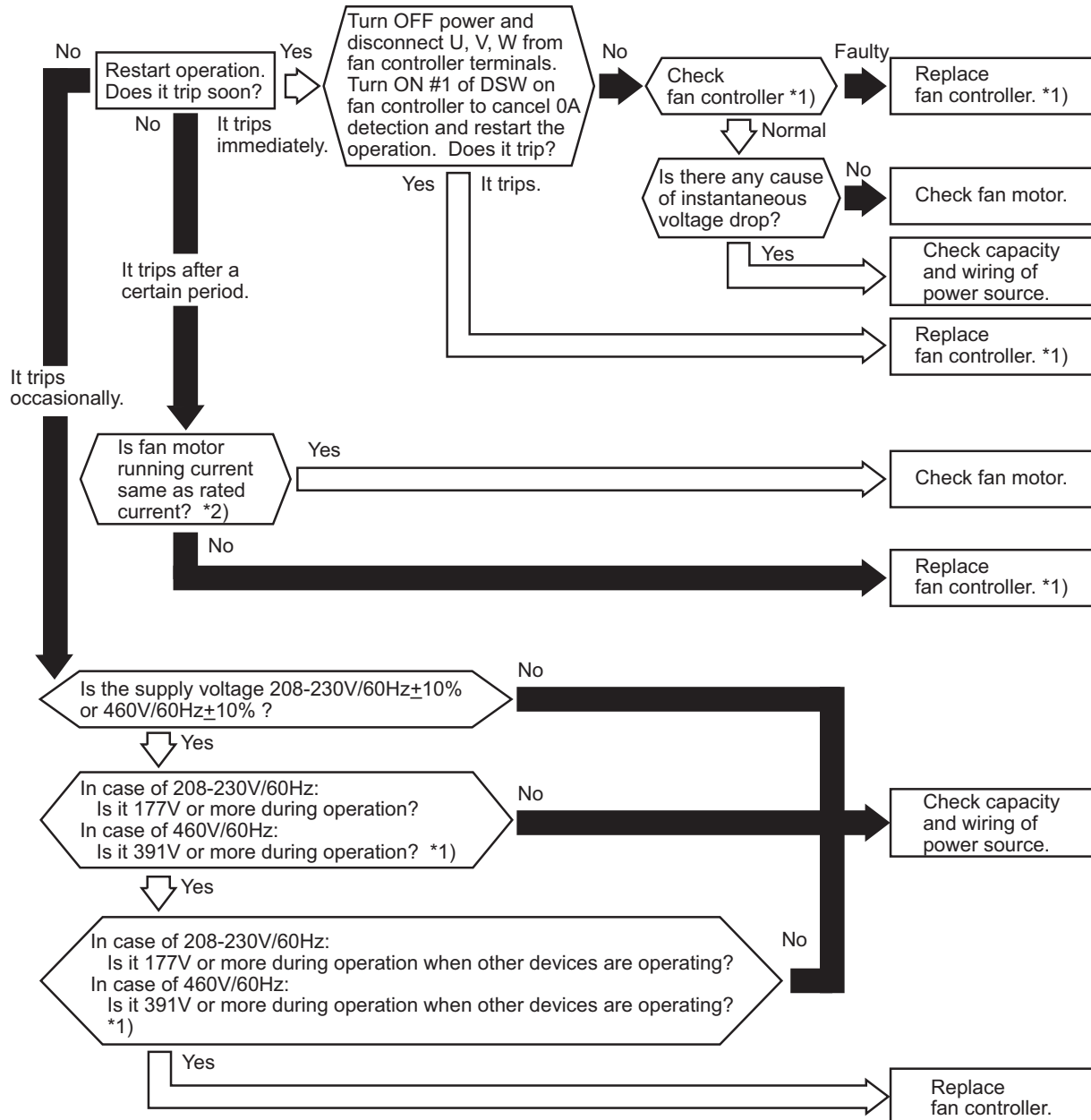
56

Activation of Fan Controller Overcurrent Protection Device (2)

- 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.
- ^{*1)} Except for some models.

★ This alarm code is displayed when instantaneous overcurrent occurs 10 times within 30 minutes. If this occurs less than 10 times in 30 minutes, the operation is automatically retried.

Conditions of Activation: The running current exceeds the rated current of the transistor module.



^{*1)}: For the maintenance and replacement of a fan controller, perform the high voltage discharge work according to Section 4.2.1.1.

^{*2)}: Regarding the setting value of activation current, refer to Section 4.2.1.1.

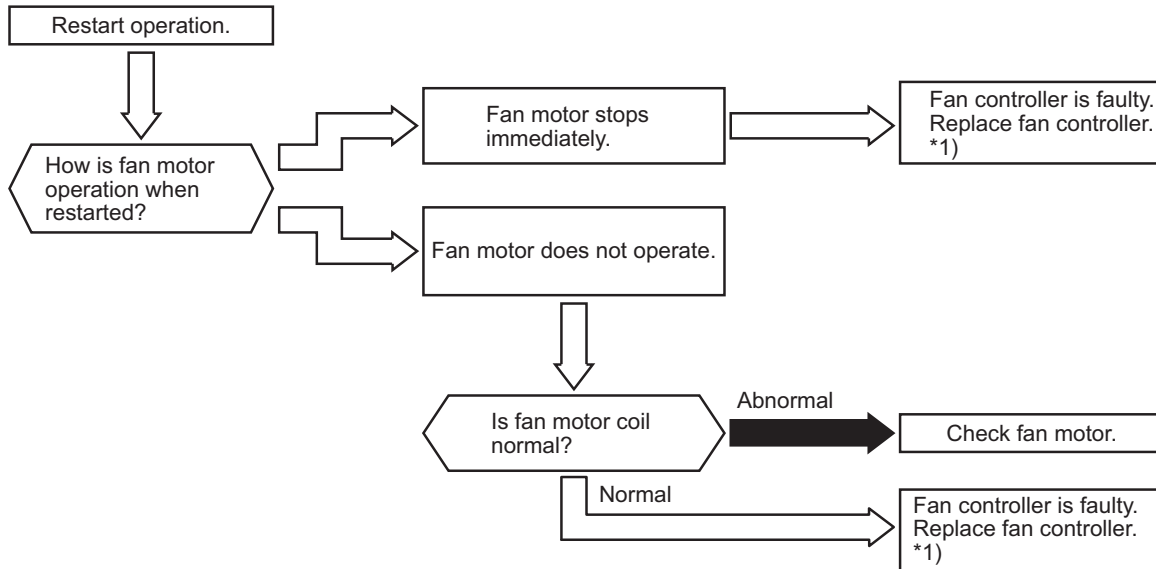
Alarm
Code **5E**

Abnormality of Fan Controller Sensor

★ Conditions of Activation:

This alarm code is displayed when the following conditions occur.

- (1) After the fan motor operation is started, the fan controller current does NOT exceed 1.5A.
- (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 4A.



*1): For the maintenance and replacement of the fan controller, perform the high voltage discharge work according to Section 4.2.1.1.

Alarm
Code **EE**

Compressor Protection

★ This alarm code is displayed when any of the following alarms causing serious compressor damages 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.**

3.2.3 Abnormalities of Devices

Other Abnormalities	Abnormalities of Devices
---------------------	--------------------------

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

Event	Cause	Check Item	Action (Turn OFF Main Switch)
"RUN" Indicator and LCD are ON. However, the system does not operate. (example) Indoor/outdoor fans or compressor do not operate.	Failure of Indoor Unit Fan Motor	Disconnected Coil	Measure coil resistance with tester.
		Burned-Out Coil	Measure insulation resistance.
	Failure of Outdoor Unit Fan Motor	Disconnected Coil	Measure coil resistance with tester.
		Burned-Out Coil	Measure insulation resistance.
	Failure of Comp. Motor	Measure resistance between wires.	Replace compressor.
	Failure of Comp.	Check for abnormal sound from comp.	Replace compressor.
	Failure of Magnetic Switch for Comp.	Contact Failure	Check whether magnetic switch is activated correctly.
The Comp. does not Stop or Start even if the temperature setpoint on the LCD is Changed *3)	Failure of One of PCBs (for outdoor unit, indoor unit, wired controller)	Disconnected Wire to PCB	Check connection.
		Failure of PCB	Check PCB in self-checking mode *1).
	Failure of Air Inlet Thermistor	Failure of Thermistor	Check it in Check Mode *2).
		Disconnection of Thermistor	Check it in Check Mode *2).
	Abnormality of Wired Controller Cord	Check it in Test Run.	Replace or correctly connect wires if abnormal.
	Failure of Indoor Unit PCB	Check it in self-checking mode *1).	Replace PCB if faulty.

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

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

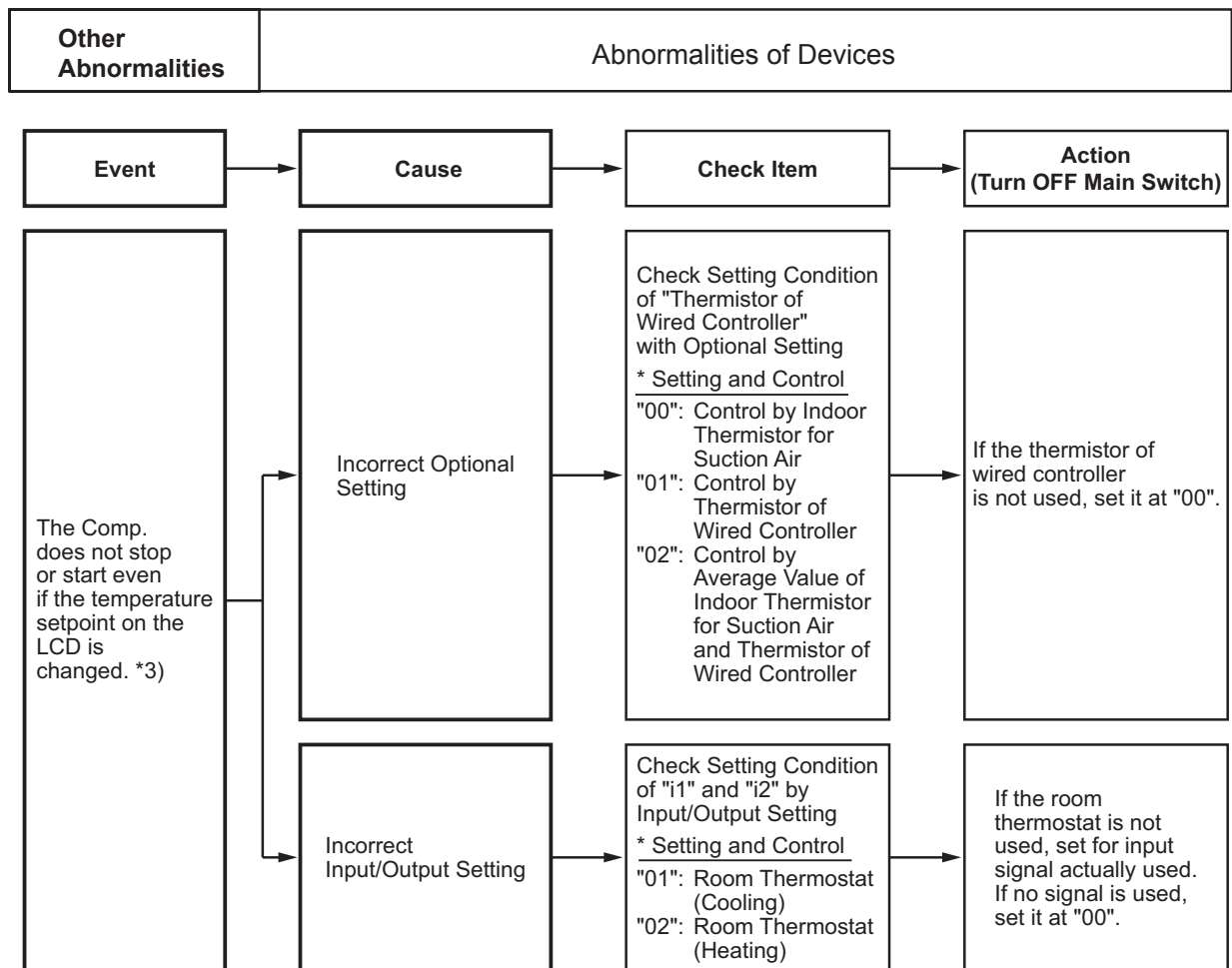
*3): Even if controllers are normal, the compressor does not operate under the following conditions.

* 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.



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

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

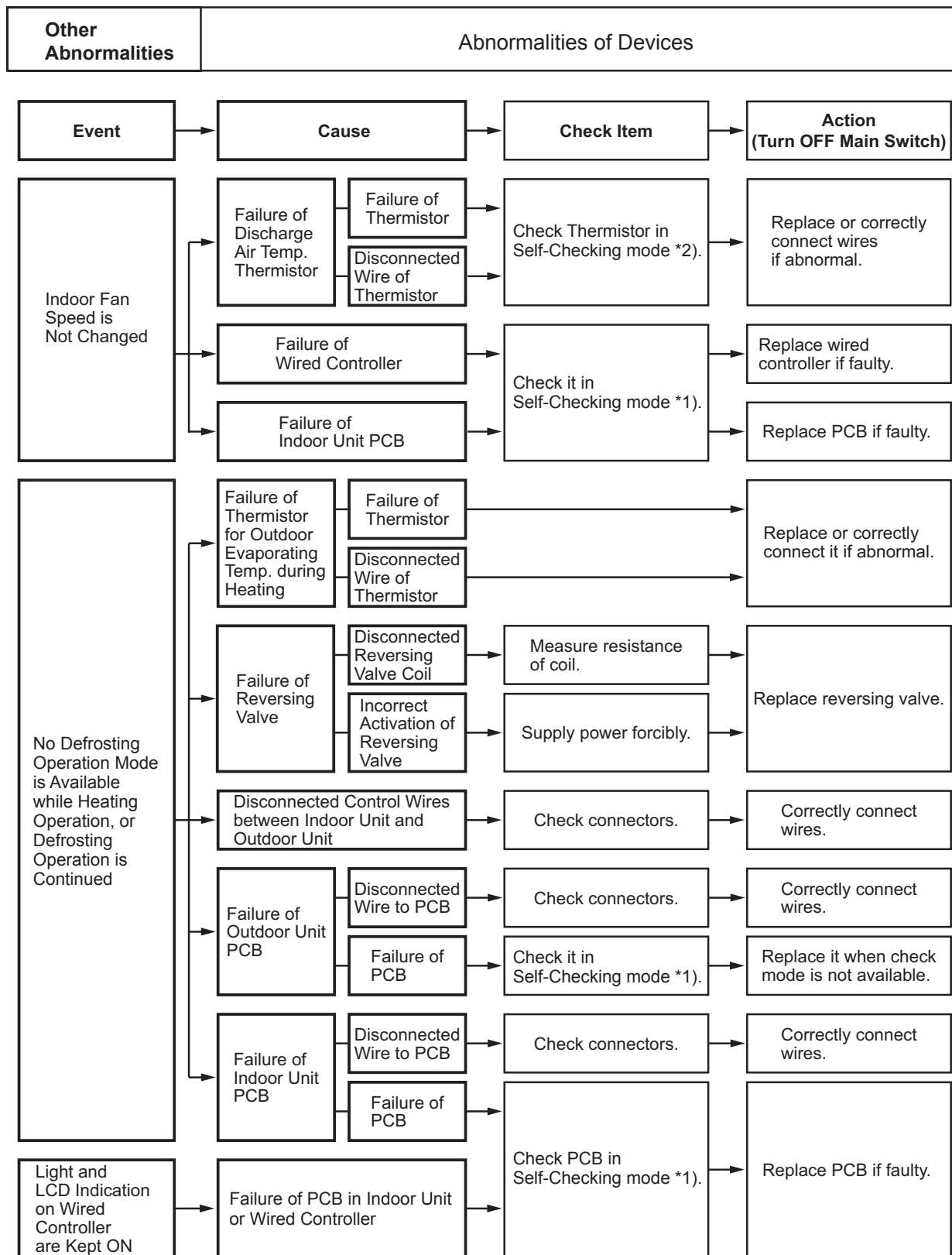
*3): Even if controllers are normal, the compressor does not operate under the following conditions.

* 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.



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

Before the test run, check that the unit is appropriately installed according to the Installation and Maintenance Manual. After that, inspect the following items.

Check Item		Contents
1	Damage	Are the unit appearance and inside of the unit damaged?
2	Fan Motor	Is the fan motor runner installed in the center of the casing? Is the fan motor installed away from the casing? (The fan motor should NOT be touched by the casing.)
3	Fasteners	Are the screws loose due to vibration during transportation? Check that the fasteners are secured firmly during installation, <u>especially for electrical wiring.</u>
4	Refrigerant Leaks	<u>Check that there are NO refrigerant leaks.</u> The tightening part of the pipe (flare part) may be loose because of vibration during 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. <u>Do NOT apply electricity to the terminal board of operating line. (Control PCB may be damaged.)</u>
7	Stop Valve Fully Open	Prior to test run, check that the stop valve of the outdoor unit is completely open.
8	Power Source Phase	The operation is NOT possible with the incorrect power phase order or lacking phase. • Alarm "05" will be indicated on the LCD of the wired controller. • "05" will be indicated on the 7-segment display of the outdoor unit. Check the power source 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 operated due to the activation of the overload operation prevention under the ambient temperature of 66°F (19°C) or over.) To perform the test run, set the test run mode with the wired controller.

***1): Insulation Resistance**

- If the unit has been turned OFF for long periods, insulation resistance may decrease to 1MΩ or less because the refrigerant is retained in the compressor. Check the following points.
 - (a) Disconnect the cables of the compressor and measure the insulation resistance of the compressor itself. If the resistance is 1MΩ or less, an insulation failure of another electrical charge part has occurred.
 - (b) If the resistance is 1MΩ or less, reconnect the compressor and turn ON the main power supply. The compressor 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 leakage breaker 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) will be cancelled and the compressor operation will be 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

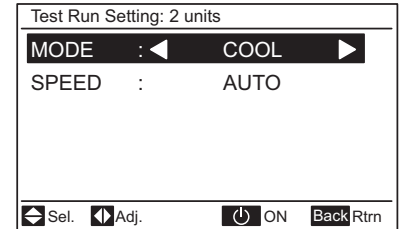
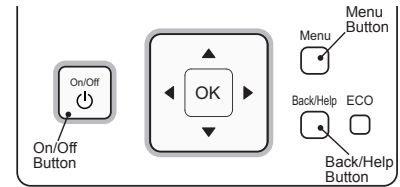
(1) Wired Controller (CIW01)

- (1) Turn ON the power source 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 "Δ∇" and press "OK".
The Test Run screen will be displayed.

NOTE:

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



NOTE:

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

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

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

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

(3) Checking Procedures for Abnormalities

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

Back to (1) after checking

Move to (4) on the next page. ←

(4) Press "On/Off" button.

Normal → The test run operation will be started. The operation mode, the airflow volume, the airflow direction and the test run time can be set on the Test Run screen.
Select the item by pressing " $\Delta \nabla < \triangleright$ ".
The test run will be 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

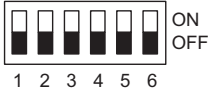
Wired Controller Indication	Unit Condition	Fault	Inspection Points when the Power Source is OFF
The operation light flashes. (1 time/1 sec.) And the Unit No. and Alarm Code "03" flash.	The unit does not start.	The power source is not turned ON.	1. Connecting Order of each Terminal Block. The fuse on 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. <div> <p>The diagram shows two PCBs: Indoor Unit PCB and Outdoor Unit PCB. Each has two switches, DSW7 and DSW10. For the Indoor Unit PCB, DSW7 is set to position 1 (ON) and DSW10 is set to position 2 (OFF). For the Outdoor Unit PCB, DSW7 is set to position 1 (ON) and DSW10 is set to position 2 (OFF). Arrows indicate the correct positions for each switch.</p> </div> 2. Screw Fastening of each Terminal Block. 3. Connecting Order of Power Line Between Indoor Units and Outdoor Unit.
		The connecting wires of operating line are incorrect or loose.	
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




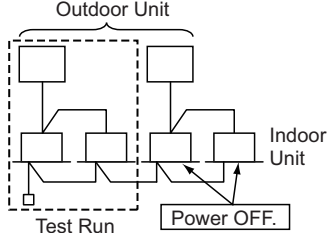
The procedures for the test run from the outdoor unit side are indicated below. Setting of this DIP switch is possible with the power source ON.

Setting of DIP Switch (Factory Setting)

DSW4					
Switch for Setting of Service Operation and Function					
					
1	2	3	4	5	6
ON	OFF	OFF	OFF	OFF	OFF

! WARNING

- Do not touch any other electrical part when operating switches on the PCB.
- Do not attach or detach the service cover when the power source for the outdoor unit is supplied and the outdoor unit is operated.
- Turn all the DIP switches of DSW4 OFF when the test run operation is completed.

	DIP Switch Setting	Operation	Remarks
Test Run	<p>1. Setting of Operation Mode</p> <p>Cooling: Set DSW4-2 OFF.</p>  <p>Heating: Set DSW4-2 ON.</p> 	<p>1. The indoor unit automatically starts operating when the test run of the outdoor unit is set.</p> <p>2. The ON/OFF operation can be performed from the wired controller or DSW4-1 of the outdoor unit.</p> <p>3. The operation continues for two hours without Thermo-OFF.</p>	<p>* Note that the indoor units operate in conjunction with the test run operation of the outdoor unit.</p> <p>* If the test run is started from the outdoor unit and stopped from the 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.</p> <p>* 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 source OFF for the indoor units in other refrigerant systems not included in the test run.</p>
	<p>2. Starting Test Run</p> <p>Set DSW4-1 ON and the operation is started after a few to 20 seconds.</p>  <p>If heating operation leave DSW4-2 at ON.</p>		 <p>* The setting of DSW4 is not required for the test run from the wired controller.</p>

NOTE:

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

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

	DIP Switch Setting	Operation	Remarks
Manual OFF of Comp.	<p>1. Setting *Compressor Manual OFF: Set DSW4-4 ON.</p> <p>1 2 3 4 5 6</p> <p>ON OFF</p> <p>2. Canceling *Compressor ON: Set DSW4-4 OFF.</p> <p>1 2 3 4 5 6</p> <p>ON OFF</p>	<p>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.</p> <p>2. When DSW4-4 is OFF, the compressor starts operating after the cancellation of three-minutes guard.</p>	<p>* Do not repeat compressor ON/OFF frequently.</p>
Manual Defrost	<p>1. Manual Defrost Operation Press 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.</p> <p>2. Manual Defrost Operation Completion Defrosting operation automatically ends and the heating operation restarts.</p>	<p>1. Defrosting operation is available regardless of frost condition and total time of heating operation.</p> <p>2. Defrosting operation is not performed when the temperature of outdoor heat exchanger is higher than 50°F(10°C), high pressure is higher than 3.3MPa or the unit is Thermo-OFF.</p>	<p>* Do not continuously repeat defrosting operation.</p> <p>* 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.</p> <p>Time Left (Every Four Seconds)</p>

NOTE:

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

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

When the test run operation is complete, turn all switches of 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 will be changed or the test run will end.
If necessary, control them after the test run is complete.
- (2) If an alarm code is indicated during the test run, reset the system by turning the main power supply OFF, then back ON. The system should then operate.

3.4.3 Checking the Test Run

(1) Indoor and Outdoor Fan

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

(2) Power Supply Voltage

Check the power supply.

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

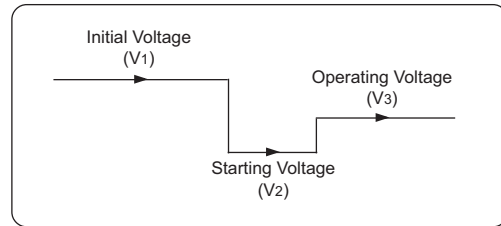
Usually, voltage drop will occur when starting the operation as shown in the figure (V_2).

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

<Normal Range of Power Supply Voltage>

- Supply Voltage: Rated Voltage $\leq \pm 10\%$
- Starting Voltage (V_2): Rated Voltage $\geq -15\%$

< Voltage Change >



Operating Voltage (V_3): Rated Voltage $\leq \pm 10\%$

Voltage Imbalance between Phase: $\leq 3\%$

(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)

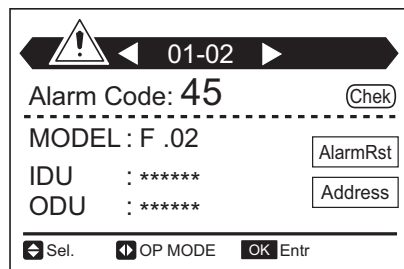
(5) High Pressure Increase Retry (Protection Control)

(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 "P13" will be indicated 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" will be indicated on the LCD of the wired controller or the 7-segment display of the outdoor unit PCB.

< For CIW01 >



NOTE:

High pressure may not increase until the high pressure 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 system tester.

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 source 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.	
3	In an instance where the constant compressor is turned ON and OFF repeatedly, switch off an indoor unit with a small capacity.	

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

No.	Check Item	Result
1	Check the operating data after 20-minute operation.	
2	Check <u>Pd</u> and <u>Td</u> . Is Td-SH 59 to 113°F (15 to 45°C) ?	
3	Is <u>Ps</u> 22 to 189 psi (0.15 to 1.3 MPa) ?	
4	Is <u>Pd</u> 145 to 522 psi (1.0 to 3.6 MPa) ? (If the outdoor temperature is high, <u>Pd</u> becomes high.)	

NOTE:

The symbol with an underline indicates an item to check.

(3) Check Item after Sampling Data

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

No.	Check Item	Standard	Causes	Result
1	Is fan actually running when <u>Fo</u> (Airflow Rate of O.U. Fan) is not "0"?	-	<ul style="list-style-type: none"> Fan Motor Failure O.U. PCB Failure Condenser Failure 	
2	Is the total of <u>iE</u> (I.U. Ex. Valves Opening) abnormally low or high?	-	<ul style="list-style-type: none"> Low → Excessive Refrigerant High → Insufficient Refrigerant or Excessive Pipe Pressure Loss 	
3	Is <u>TL</u> (Liquid Pipe Temp. of I.U. Heat Exchanger) lower than <u>Ti</u> (Intake Air Temp. of I.U.)?	It is normal when $TL - Ti < -9^{\circ}F (-5^{\circ}C)$.	<ul style="list-style-type: none"> TL Thermistor Failure I.U. Ex. Valve; Fully Closed Short-Circuit 	
4	Is <u>TG</u> (Gas Pipe Temp. of I.U. Heat Exchanger) lower than <u>Ti</u> (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 $TG - Ti < -9^{\circ}F (-5^{\circ}C)$.	<ul style="list-style-type: none"> TG Thermistor Failure I.U. Ex. Valve; Fully Closed or Slightly Open Short-Circuit 	
5	Is there any excessive difference in SH (<u>TG-TL</u>) of I.U. heat exchanger among I.U.s? (It is applicable when 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).	<ul style="list-style-type: none"> TL/TG Thermistor Failure I.U. Ex. Valve; Fully Open, Slightly Open or Fully Closed 	
6	Is there any I.U. with the I.U. heat exchanger SH (<u>TG-TL</u>) excessively lower than the other units' value and is <u>iE</u> (I.U. Ex. Valves Opening) lower than "5"?	It is normal if SH of the unit is up to -5°F (-3°C) lower than the other units.	<ul style="list-style-type: none"> I.U. Ex. Valve; Locked and Fully Open Mismatched Wiring and Piping 	
7	Is there any I.U. with the I.U. heat exchanger SH (<u>TG-TL</u>) excessively lower than the other units' value and is <u>iE</u> (I.U. Ex. Valves Opening) lower than "100"?	It is normal if SH of the unit is up to 5°F (3°C) higher than the other units.	<ul style="list-style-type: none"> I.U. Ex. Valve; Locked and Slightly Open or Closed Mismatched between Wiring and Piping 	
8	Is the temperature difference between I.U.s* more than 13°F (7°C)? * The temperature difference between I.U.s means the following; <u>b3</u> (Discharge Air Temp.) - <u>b2</u> (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 <u>oE1</u> and <u>oE2</u> (O.U. Ex. Valves Opening) abnormally low or high when TdSH is 59°F to 113°F (15°C to 45°C)?	-	<ul style="list-style-type: none"> Low → Excessive Refrigerant High → Insufficient Refrigerant 	
2	Is <u>Pd</u> "232" to "522" psi ("1.6" to "3.6" MPa)?	232 - 522 psi (Pd is high when the indoor temperature is high.)	<ul style="list-style-type: none"> Low → Solenoid Valve SVA Leakage High → Excessive Gas Pipe Pressure Loss 	
3	Is <u>Ps</u> "22" to "189" psi ("0.15" to "1.3" MPa)?	22 - 189 psi	<ul style="list-style-type: none"> Low → O.U. Short-circuit Low/High → O.U. Fan Motor Failure, Fan Module Failure or Outdoor Ambient Thermistor Failure 	
4	Is the temperature difference between I.U.s* more than 18°F (10°C) when <u>iE</u> (I.U. Ex. Valve) is "100"? * The temperature difference between I.U. means the following; <u>b3</u> (Discharge Air Temp.) - <u>b2</u> (Intake Air Temp.) indicated on the wired controller by check mode. However, this is applicable only when <u>b2</u> (Intake Air Temp.) - <u>b1</u> (Setting Temp.) is higher than 5°F (3°C).	18°F (10°C) and over	<ul style="list-style-type: none"> Failure in PCB, Wiring, I.U. Ex. Valve and Coil Excessive Pipe Pressure Loss Thermistor Failure for Discharge Air 	

NOTE:

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

3.4.5 Reset for Accumulated Operation Time of Compressor 1-2 (cUJ1-cUJ2)

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 Compressor 1>



Press PSW2 to display the accumulated operation time of the compressor.
(Press PSW4 to return to the indication "cUJ1".)

PSW2 ↑↓ PSW4



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



The indication will be changed to "0".

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



NOTE:

In an instance of 144 to 360 MBH, it is required to reset the accumulated operation time for each outdoor unit.

4. Maintenance

4.1 Maintenance of Outdoor Unit

⚠ DANGER

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

⚠ WARNING

TURN OFF all power source switches.

4.1.1 Removing Front Service Cover

(1) Removing Service Cover

- Remove six screws from the service cover.
- Put your hands on the groove at the bottom of the service cover. Then, lift the cover up slightly and draw it forward. Remove the 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

- Remove five screws from the front cover.
- Hold the upper side of the front cover and lift it upward. 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

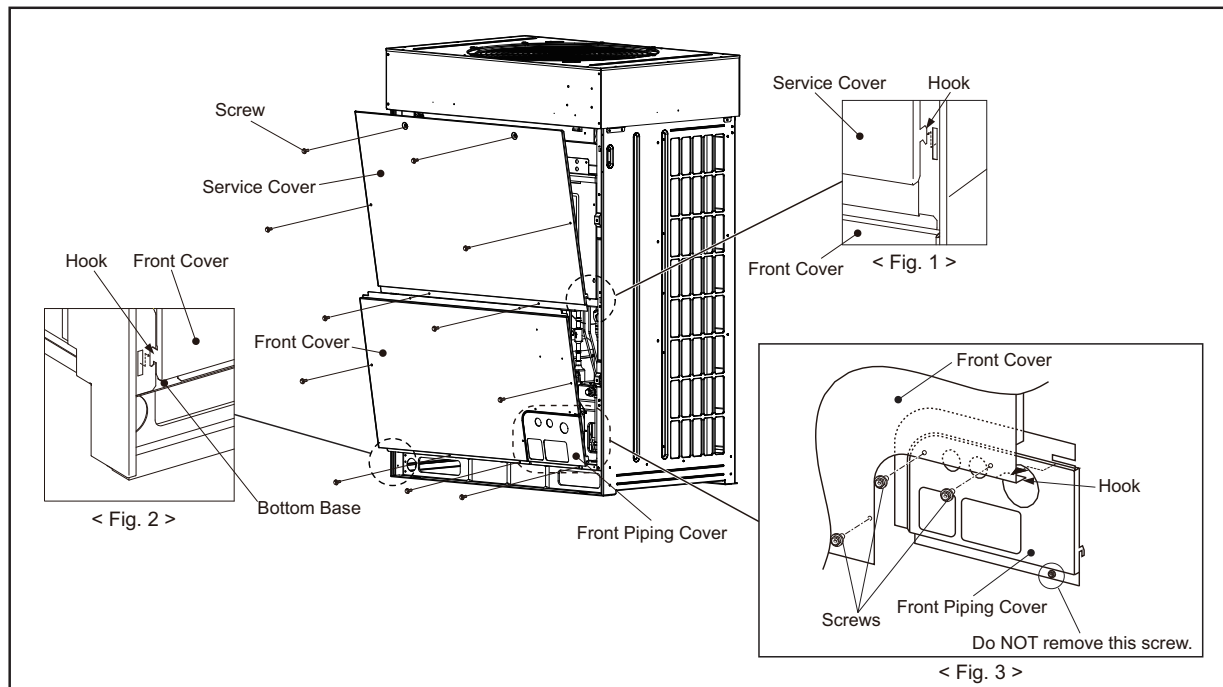
- Remove the screws fixing the front cover. Then, remove the screws fixing the piping cover. Do not remove the screws circled in the figure.
- Hold the upper side of the front cover and lift it upward. Remove the front cover from the insertion part into the piping cover on the left. Then, draw the front cover forward. (Refer to Fig. 3)

NOTES:

- When attaching / removing the front service cover, take special care not to be injured with the plate edges.
- 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.

Tool

Phillips Screwdriver



WARNING

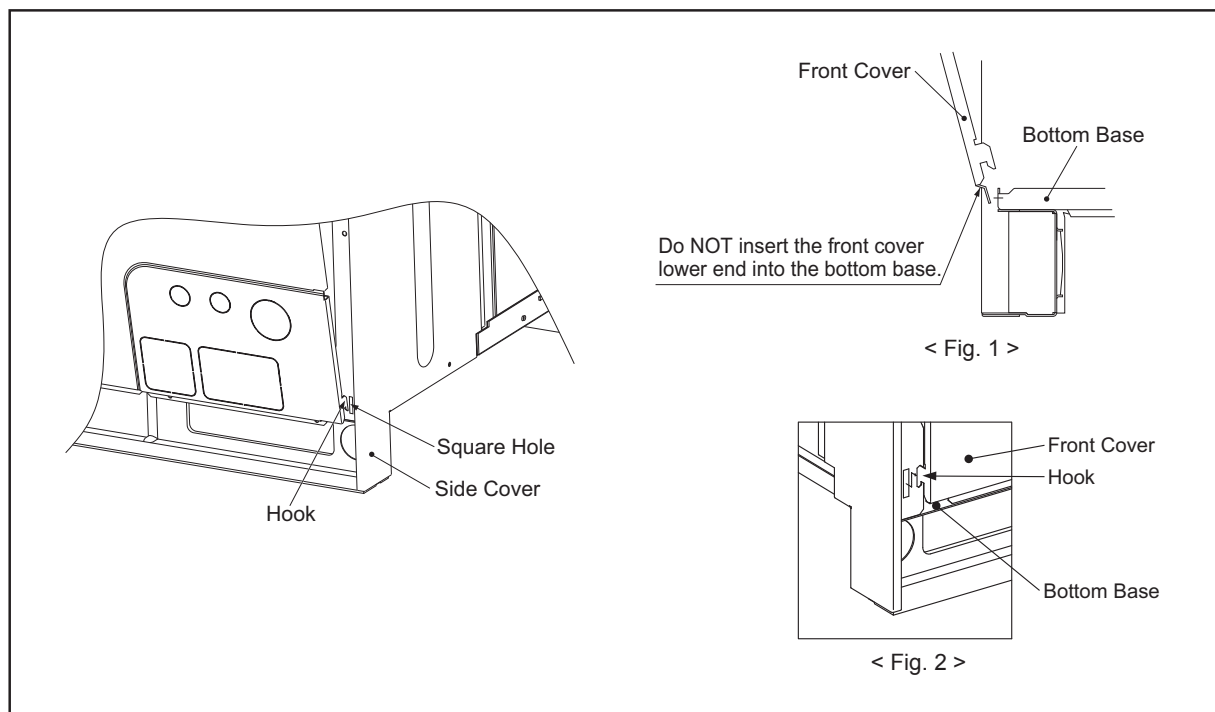
TURN OFF all power source switches.

4.1.2 Attaching Front Service Cover

(1) Attaching Front Cover

- (a) Insert the hooks of the front cover into the square holes of the side cover. (Refer to Fig. 1)
DO NOT insert the lower end of the front cover into the inside of the bottom base.
- (b) Fix the front cover with the screws.

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



(2) Attaching Service Cover

- (a) Service cover shall be attached after attaching the front cover. Insert the hooks of the service cover into the square holes of the side cover. (Refer to Fig. 2)
- (b) Fix the front cover with the screws.

! WARNING

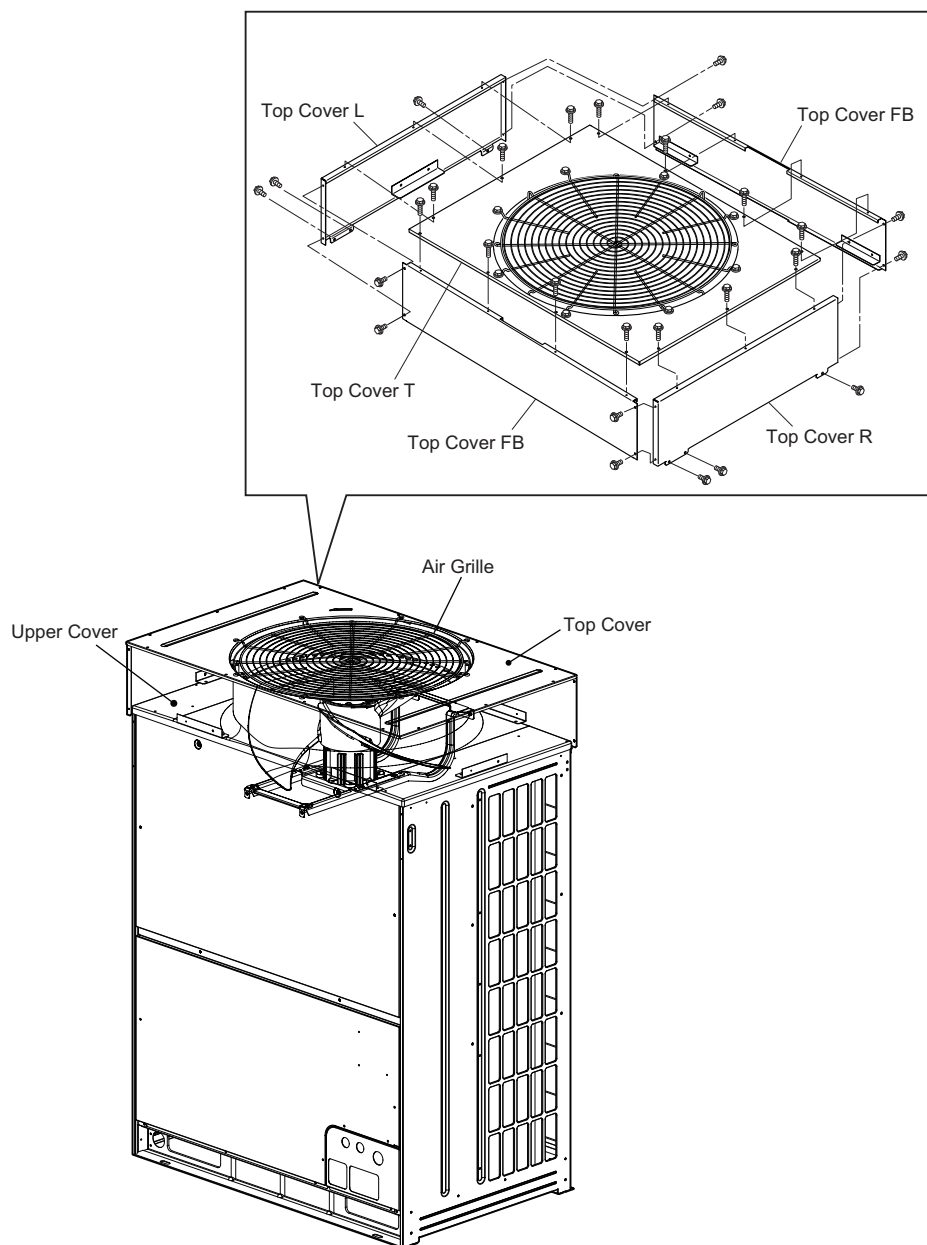
TURN OFF all power source switches.

4.1.3 Removing Top Cover and Upper Cover

- (1) Remove the 28 screws securing the top cover T, R, L, and FB.

Tool

Phillips Screwdriver

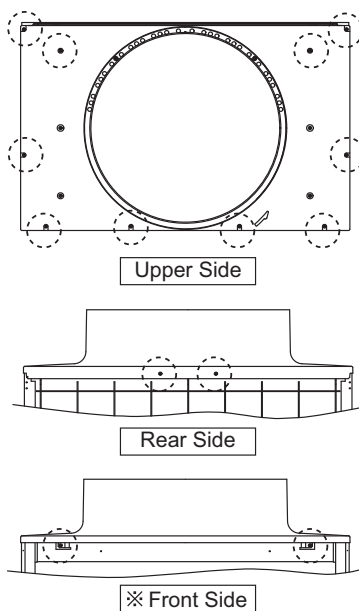


! WARNING**TURN OFF all power source switches.**

- (2) Remove fourteen screws securing the upper cover.
- (3) Lift up the upper cover. When removing the upper cover, make sure that it does not come in contact with the propeller fan.

Tool

Phillips Screwdriver



* When removing two screws on the front side, remove the service cover according to Section 4.1.1 "Removing Front Service Cover".

! WARNING

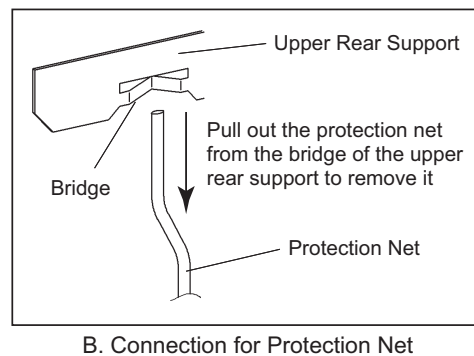
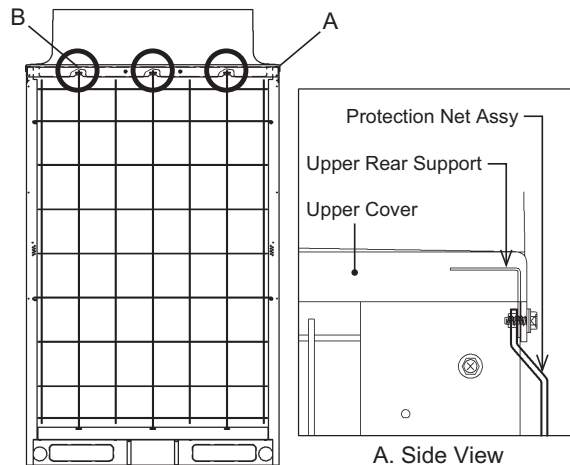
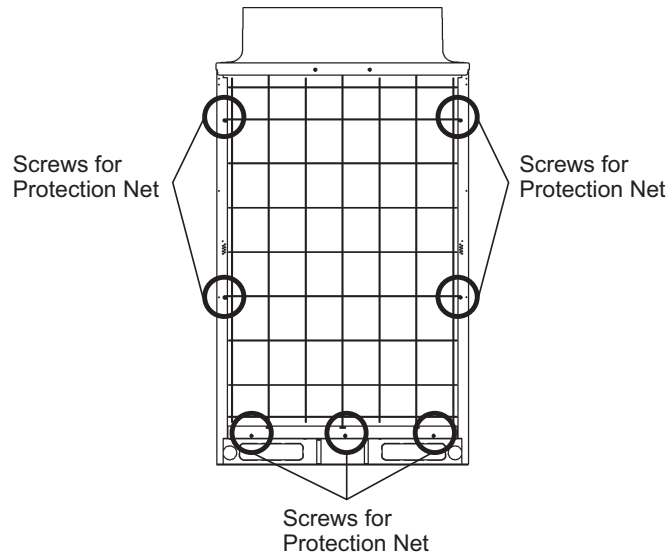
TURN OFF all power source switches.

4.1.4 Removing Protection Net

- (1) Remove seven screws securing the protection net.
- (2) Pull out the protection net from the bridge of the upper rear support to remove it.

Tool

Phillips Screwdriver



! WARNING

TURN OFF all power source switches.

4.1.5 Removing Electrical Box Cover

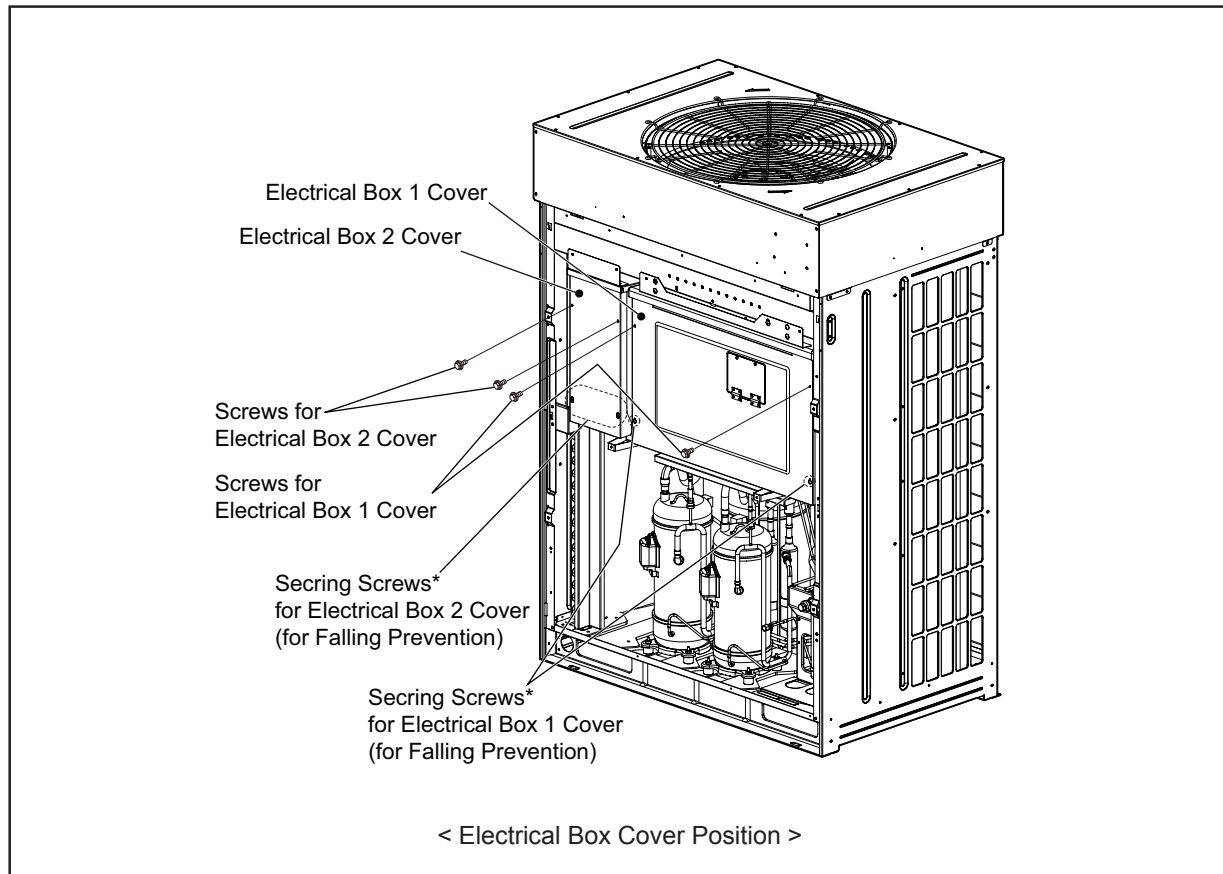
- (1) Remove the front service cover according to Section 4.1.1 "Removing Front Service Cover".
 - (2) Remove two screws for the electrical box 1 cover and loosen two securing screws*.
 - (3) Push the electrical box 1 cover up and remove the electrical box cover by drawing it forward from the securing screws*.
 - (4) Remove two screws for electrical box 2 cover and loosen two securing screws*.
 - (5) Push the electrical box 2 cover up.
- Remove the electrical box 2 cover by drawing it forward from the securing screws*.

NOTES:

1. Before removing the screws securing the electrical box 1 cover and electrical box 2 cover, ensure that the securing screws* are attached to the cover so that the cover will not fall.
2. Be careful not to get injured by the front cover edge when removing the electrical box cover.

Tool

Phillips Screwdriver



! WARNING

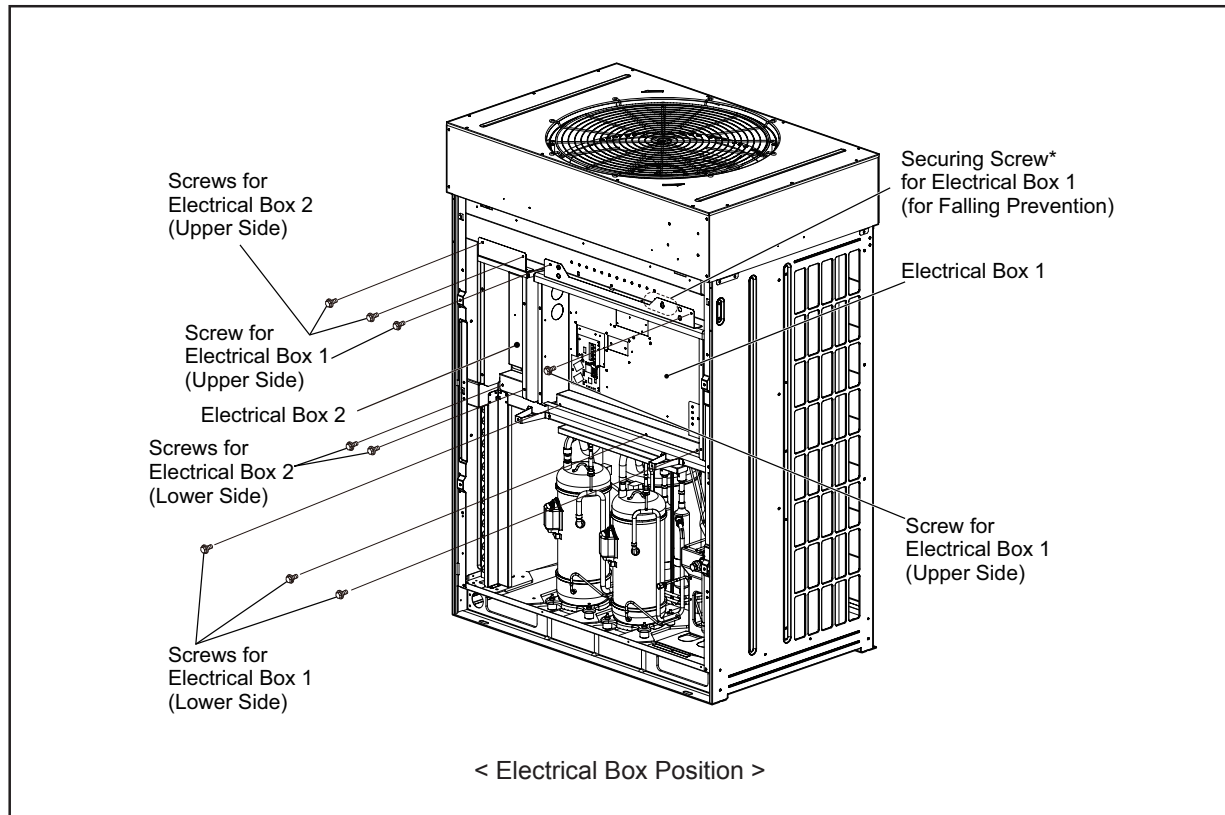
TURN OFF all power source switches.

4.1.6 Removing Electrical Box

- (1) Remove the front service cover according to Section 4.1.1 "Removing Front Service Cover".
- (2) Remove the electrical box 1 cover and electrical box 2 cover according to Section 4.1.5 "Removing Electrical Box Cover".
- (3) Remove the screws securing the power source wiring, compressor wires, operating line, and ground wire.
- (4) Disconnect the connector for the fan motor, solenoid valve, crankcase heater, and high pressure switch.
- (5) Disconnect the connector for the thermistor, electronic expansion valve, and pressure sensor on PCB1.
- (6) Remove three screws securing the lower side of electrical box 1.
- (7) Install the electrical box 1 cover.
- (8) Remove two screws securing the upper side of electrical box 1 and loosen the securing screw*.
- (9) Push the electrical box 1 up and draw it forward from the securing screw*.
- (10) Remove two screws securing the lower side of electrical box 2.
- (11) Install the electrical box 2 cover.
- (12) Remove two screws securing the upper side of electrical box 2. Then, remove electrical box 2.

Tool

Phillips Screwdriver



! WARNING

TURN OFF all power source switches.

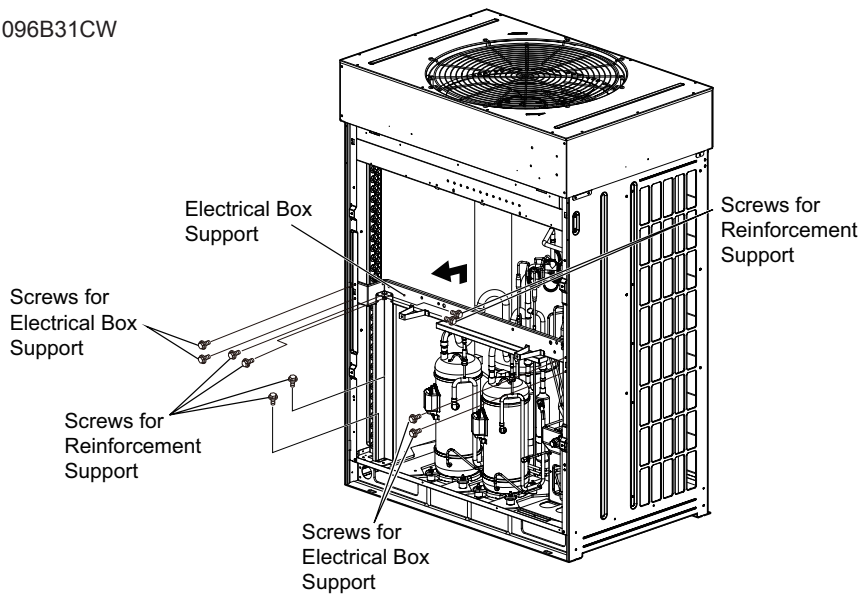
4.1.7 Removing Electrical Box Support and Reinforcement Support

- (1) Remove the front service cover according to Section 4.1.1 "Removing Front Service Cover".
- (2) Remove the electrical box according to Section 4.1.6 "Removing Electrical Box".
- (3) Remove the screws securing the reinforcement support.
 - [208/230V] (H,Y)VAHP072, 096B31CW: 6 screws
 - [460V] (H,Y)VAHP072, 096B41CW: 4 screws
- (4) Remove four screws securing the electrical box support.
- (5) Lift up the electrical box support. Remove the electrical box support from the hooks on the right and left sides and draw it forward in the direction of the arrow.

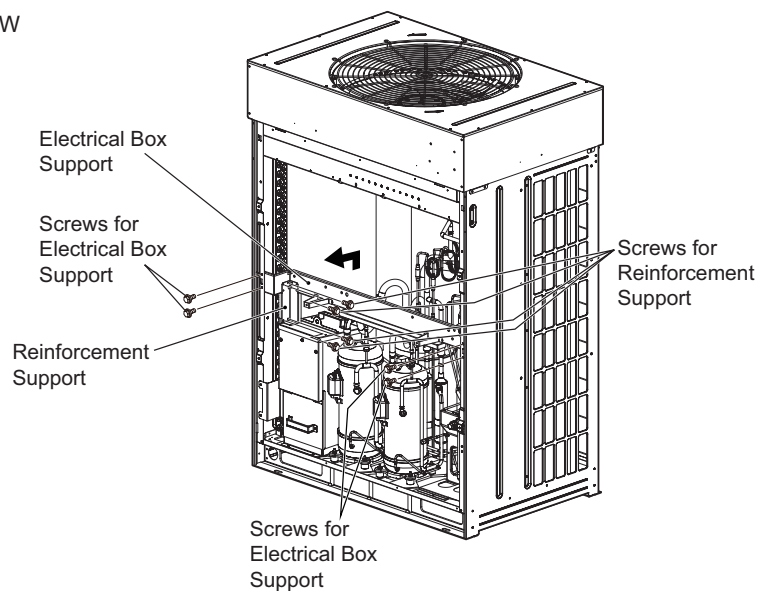
Tool

Phillips Screwdriver

- [208/230V]
(H,Y)VAHP072, 096B31CW



- [460V]
(H,Y)VAHP072, 096B41CW

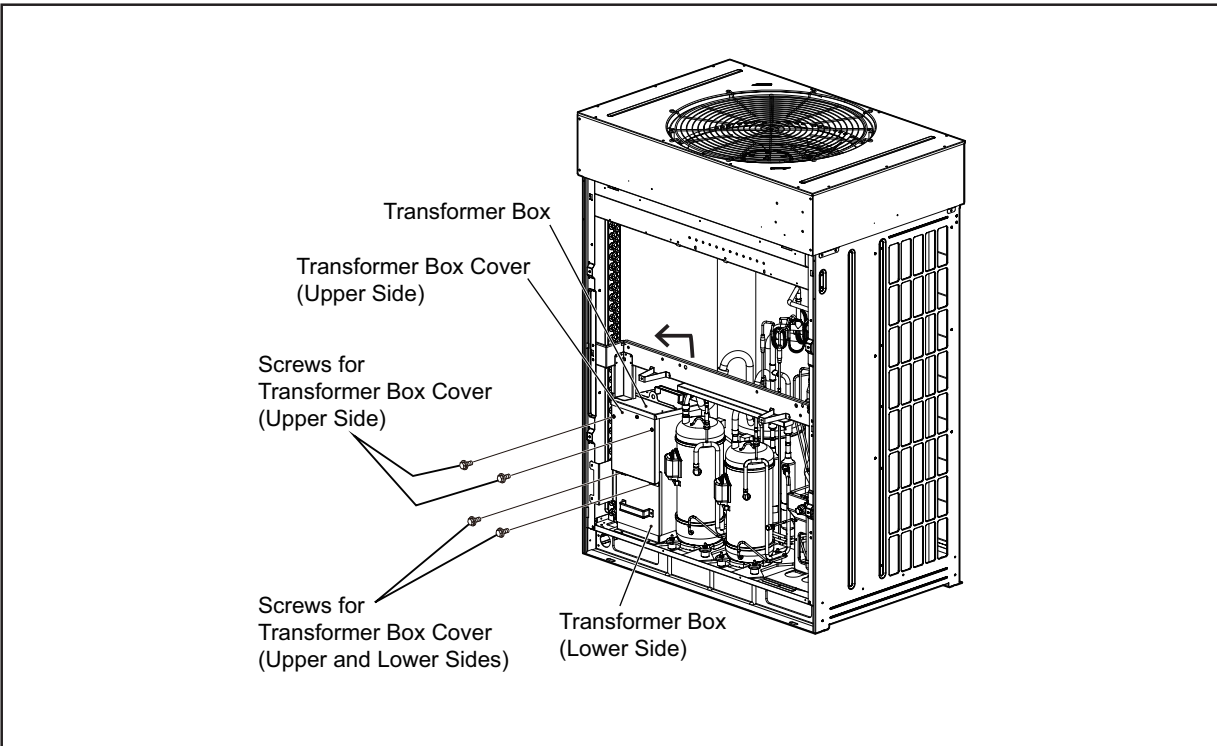


! WARNING**TURN OFF all power source switches.****4.1.8 Removing Transformer Box Cover****[460V] (H,Y)VAHP072, 096B41CW Only**

- (1) Remove the front service cover according to Section 4.1.1 "Removing Front Service Cover".
- (2) Remove four screws from the transformer box cover (upper side) and remove the transformer box cover (upper side).
- (3) Remove four screws from the transformer box cover (lower side) and remove the transformer box cover (lower side).

Tool

Phillips Screwdriver

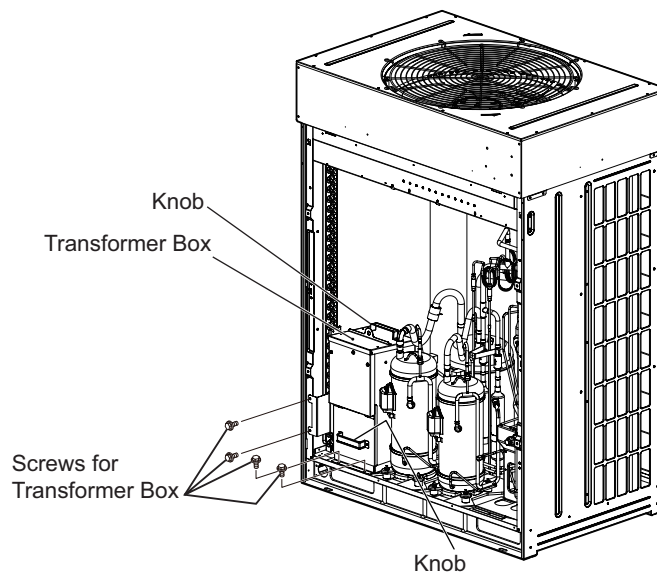


! WARNING**TURN OFF all power source switches.****4.1.9 Removing Transformer Box****[460V] (H,Y)VAHP072, 096B41CW Only**

- (1) Remove the front service cover according to Section 4.1.1 "Removing Front Service Cover".
- (2) Remove the reinforcement support according to Section 4.1.7 "Removing Electrical Box Support and Reinforcement Support".
- (3) Remove four screws securing the transformer box.
- (4) Remove the transformer box by pulling the knobs of the front and upper sides of the transformer box and slide forward.

Tool

Phillips Screwdriver



! WARNING

TURN OFF all power source switches.

4.1.10 Removing Air Grille

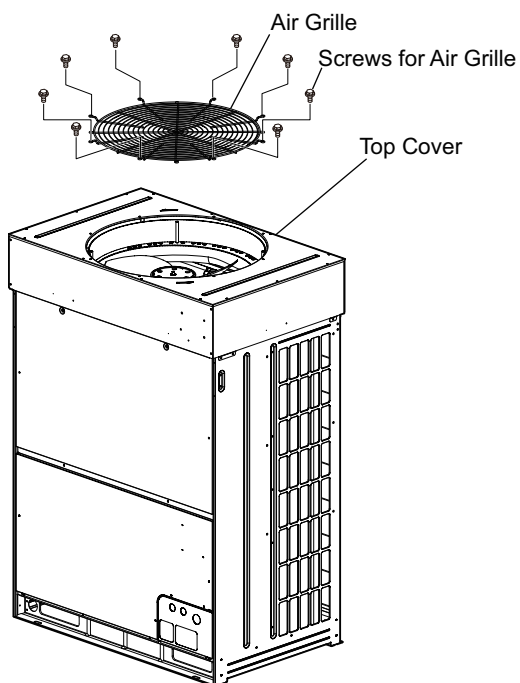
Remove eight screws securing the air grille.
Remove the air grille.

NOTE:

DO NOT apply excessive force to the top cover to avoid damage.

Tool

Phillips Screwdriver



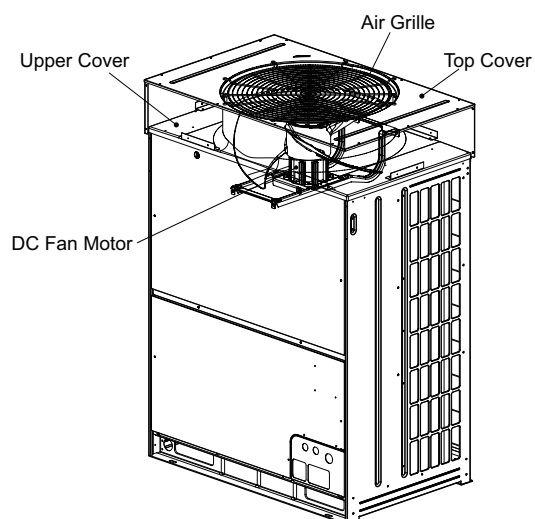
! WARNING

TURN OFF all power source switches.

4.1.11 Removing Outdoor Fan Motor

- (1) Remove the top cover with the air grille according to Section 4.1.3 "Removing Top Cover and Upper Cover".

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



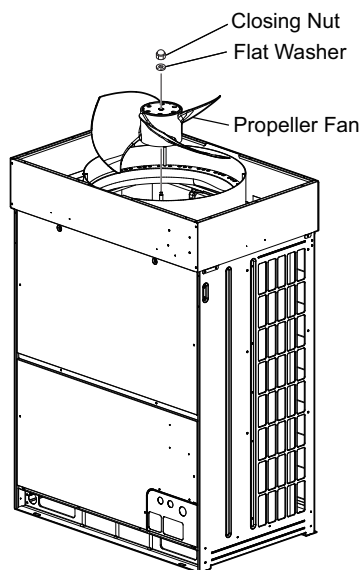
< Fan Motor Position >

- (2) Remove the closing nut and the flat washer securing the propeller fan onto the motor shaft using a box wrench. Remove the propeller fan from the motor shaft. If it is difficult to remove the fan, use a puller.

NOTE:

DO NOT apply excessive force to the upper cover (plastic part) to avoid damage.

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



! WARNING

TURN OFF all power source switches.

(3) Removing Wire

- (a) Remove the service cover and the electrical box 1 cover according to Section 4.1.1 "Removing Front Service Cover" and Section 4.1.5 "Removing Electrical Box Cover".
- (b) Disconnect the connector for the motor in the electrical box 1.

(4) Remove four screws securing the motor, and remove the motor.

(H,Y)VAHP072, 096B(3,4)1CW: M5

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

NOTES:

1. Fix the motor wire onto the motor clamp with the plastic tie to avoid contact with the propeller fan.
2. When mounting the propeller fan, place and push the propeller fan with matching the mark (\ominus with the cut out part of the motor shaft). Firmly install the propeller fan with a 22.1 lbf·ft (30N·m) torque after the head of the fan shaft comes up.

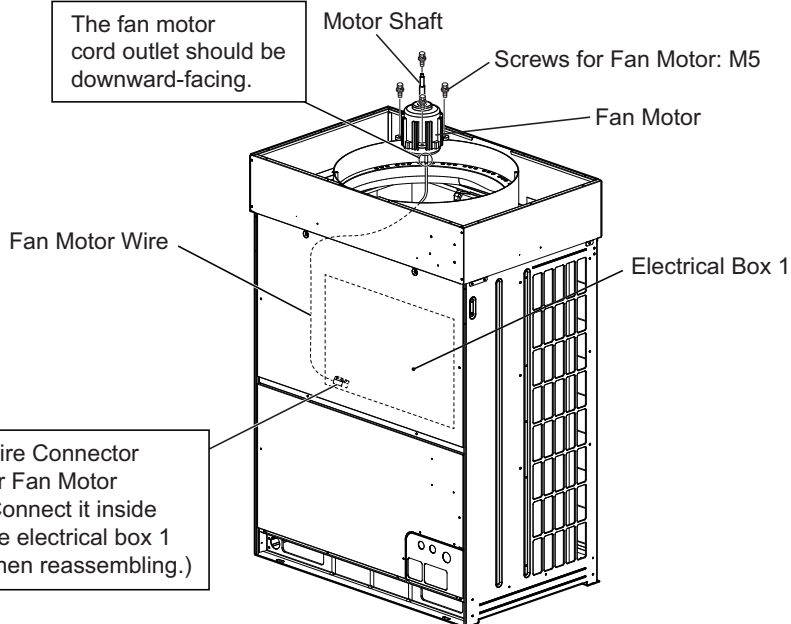
Torque for Mounting Propeller Fan

22.1 lbf·ft (30N·m)

3. Connect the motor wire connector with the wire connector in electrical box 1.

- (6) Check that the gap between the propeller fan and the upper cover is even by observing from the upper cover top. Also check that there is no noise caused by the propeller fan coming in contact with the upper cover during the propeller fan operation.

Tool	Adjustable Wrench, Wire Cutter, Phillips Screwdriver, Puller
------	--



! WARNING

TURN OFF all power source switches.

4.1.12 Removing Compressor

Recover the refrigerant using standard EPA procedures and external equipment.
In other instances, recover the refrigerant before starting the work, and turn OFF the power source of the unit.

NOTE:

Do NOT touch the compressor or the high pressure refrigerant piping during operation or when immediately stopping the unit because of the high temperature.

When removing the wiring or reassembling the compressor, be aware not to let the wiring come in contact with the compressor or the refrigerant piping.

- (1) Remove the front service cover according to Section 4.1.1 "Removing Front Service Cover".
If the outdoor unit is installed close to the wall, remove the refrigerant piping and move the outdoor unit away from the wall.
- (2) Release the tack for the soundproof cover of the compressor and remove the soundproof cover.
- (3) Remove the Td thermistor on top of the compressor.

NOTE:

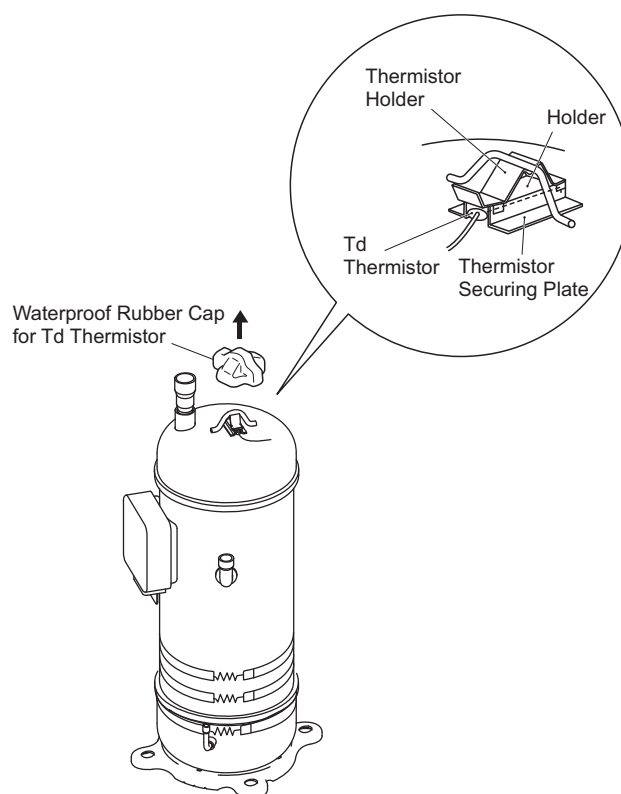
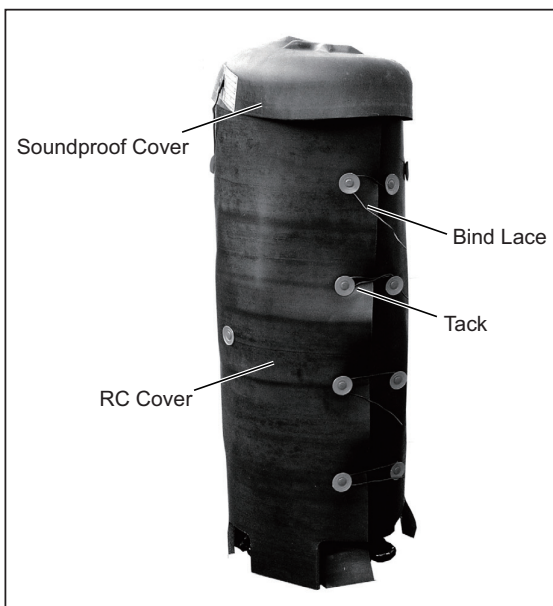
The thermistor holder, thermistor securing plate, and the RC cover are used again when reassembling.
Keep them in a container so that the parts are stored correctly.

Tool

Long-nose Pliers

NOTE:

When removing the compressor, the electrical box located above the compressor may be disturbed when removing the RC cover. So the electrical box should be removed before starting work.
If not, the inner aluminum sheet may be damaged when removing the RC cover.

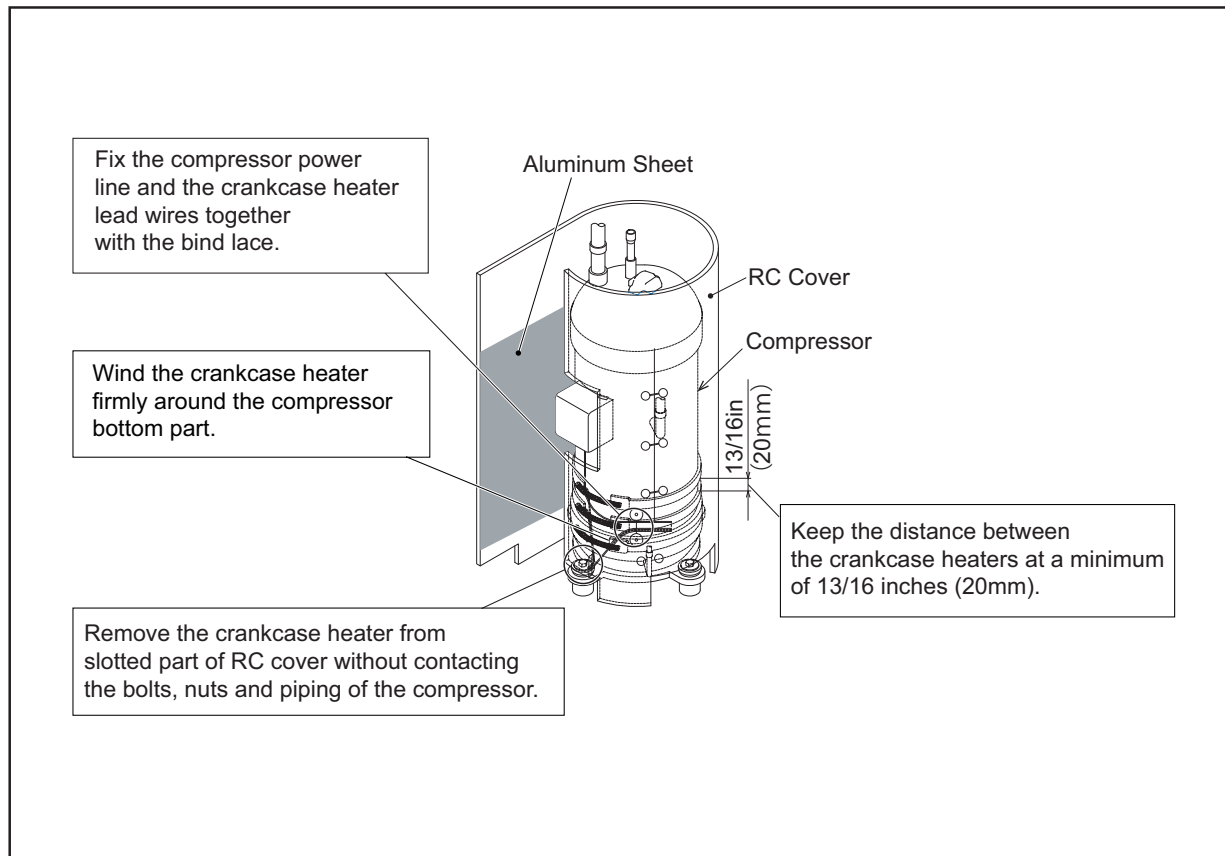


! WARNING**TURN OFF all power source switches.**

- (4) Release the bind lace of the RC cover for removal.

NOTES:

1. When removing the RC cover, be careful not to deform the piping around the cover. The braze joint may become damaged due to pipe deformation.
2. When removing the compressor, be careful not to be injured by the sheet metal edge or the heat exchanger fins.
3. The aluminum sheet is conductive. If the aluminum sheet is damaged, it may lead to a malfunction because of contact with electrical wiring. To avoid such a failure, check the RC cover conditions when repair is complete.



! WARNING

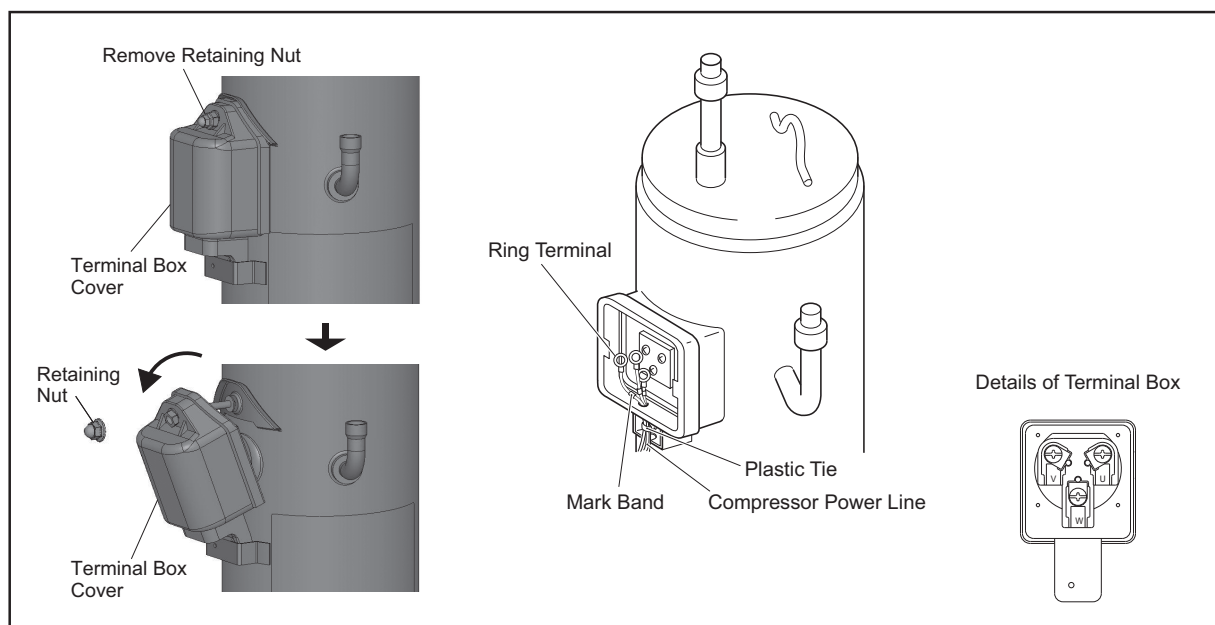
TURN OFF all power source switches.

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

NOTES:

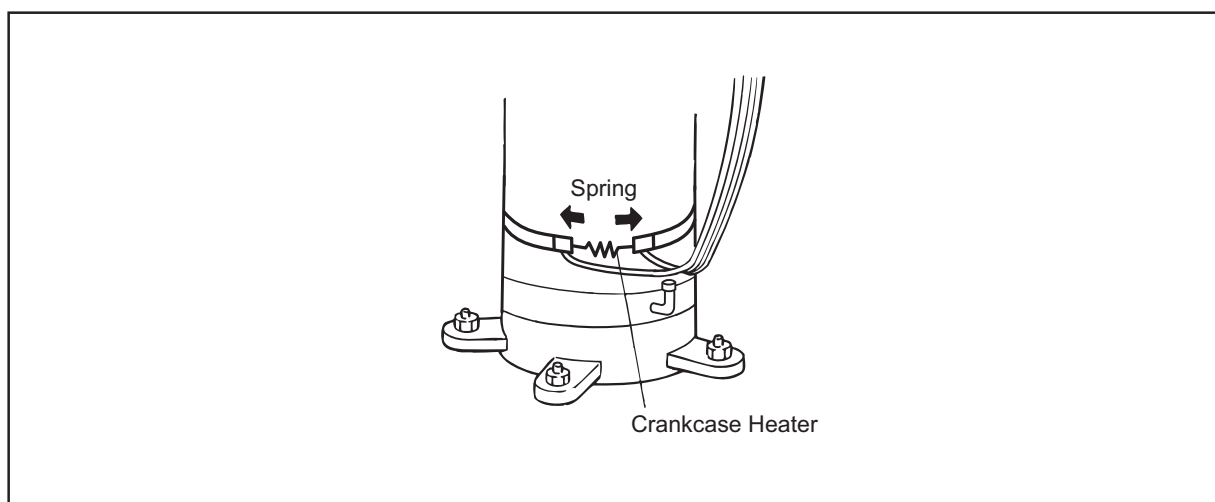
1. When replacing the compressor, check for the ring terminal condition. If the ring terminal is damaged or something appears wrong with it, replace it with a new one.
2. Secure the lead wire firmly with plastic ties.
3. Retighten the compressor screws after replacing.

Tool	Phillips Screwdriver, Adjustable Wrench
------	---



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

Tool	Long-nose Pliers
------	------------------



! WARNING

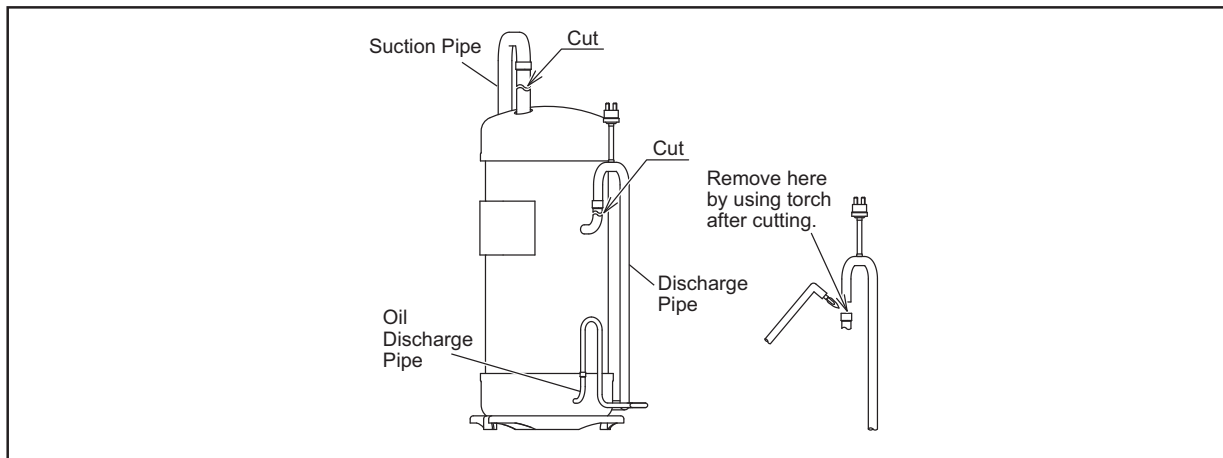
TURN OFF all power source switches.

- (7) Disconnect the discharge and suction pipes from the compressor. Check that the pressure inside the pipe is equal to the atmospheric pressure. Cut the pipe at the closer position to the compressor from the braze joint. After cutting, remove the pipe from the brazing part of the compressor.

NOTES:

1. All the pipes are connected by brazing. When applying the torch flame to the pipe connections, the oil adhered inside the pipe may burn. When brazing, clear the flammable materials from around the compressor.
2. Torch work while system is under pressure is very dangerous. Make sure to cut the pipes first before applying heat from a torch.

Tool	Torch, Pipe Cutter
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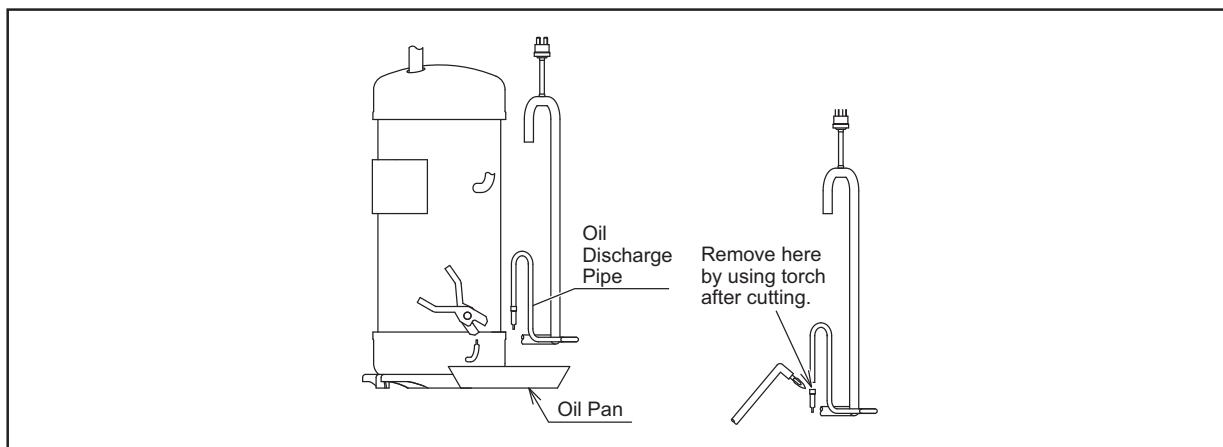


- (8) Disconnect the oil discharge pipe from the compressor. When disconnecting, pinch and cut the pipe at the closer position to the compressor from the braze joint, so that the refrigerant oil remaining inside the compressor does not spill from the oil discharge pipe. Before disconnecting the oil discharge pipe at the system piping side, check that the oil at the brazing part is completely removed.

NOTES:

1. If the oil discharge pipe is disconnected without performing the above procedure (for example, applying the torch directly to the braze joint), the refrigerant oil will spill from the oil discharge pipe can catch fire. Make sure to follow the procedures for safety.
2. When disconnecting the oil discharge pipe, use an oil pan in case the remaining refrigerant oil spills.
3. DO NOT throw out the oil that is collected in the oil pan.
Oil quantity is measured afterward.

Tool	Pincher, Torch, Oil Pan
------	-------------------------



! WARNING

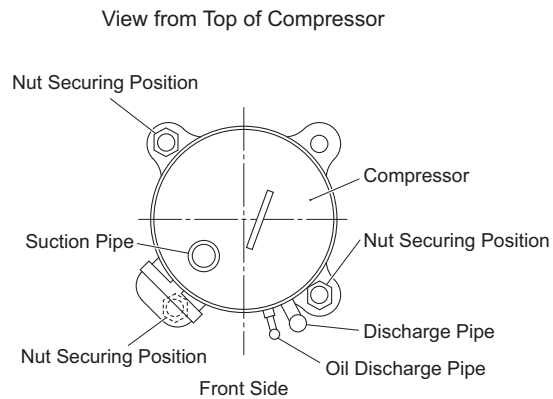
TURN OFF all power source switches.

- (9) Remove three nuts securing the compressor and remove the compressor.

NOTES:

1. When removing the compressor, be aware that it does not come in contact with surrounding pipes. If contacted, pipes may become deformed.
2. Be aware of potential injuries from sheet metal edges when working with sheet metal.
3. When removing the compressor secured with the oil discharge pipe, seal the pipe ends with tape to avoid spilling any remaining refrigerant oil spill.
4. Do not expose the refrigerant cycle to the environment for a long period in order to avoid introduction of foreign particles and moisture to system.
After removing the compressor, mount the new one quickly.
5. When removing the compressor, remove the electrical box and transformer box (460V only) located above the compressor to make the work easier. The box wrench (13/32 inch (10mm)) is required to remove the nuts securing the compressor.

Tool	Adjustable Wrench, Box Wrench, Phillips Screwdriver,
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! WARNING

TURN OFF all power source switches.

- (10) Take out the remaining refrigerant oil in the compressor from the discharge pipe, and measure the oil quantity. This procedure should be performed for the constant speed compressor or the inverter compressor replacement.

NOTES:

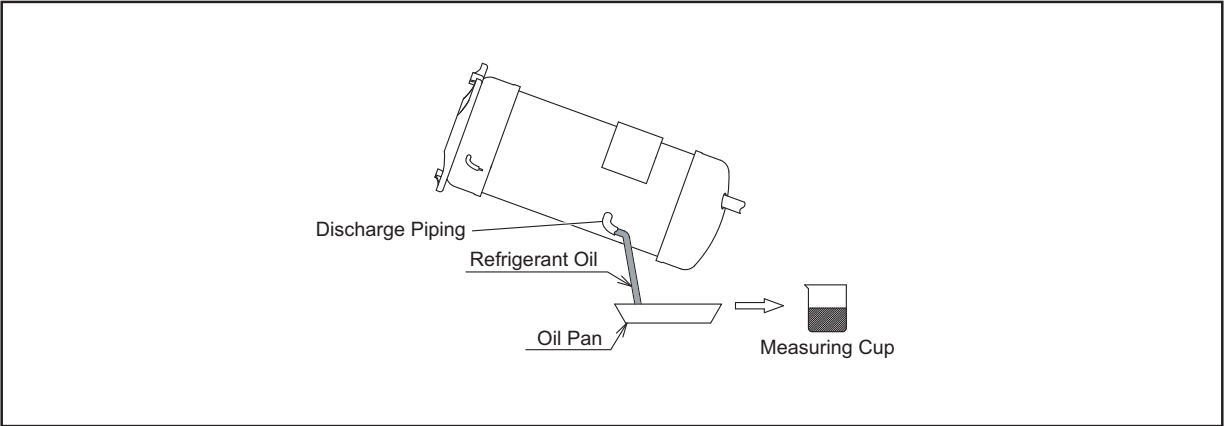
- 1. Additional refrigerant oil charge is required if:
remaining refrigerant oil quantity in the old compressor is more than the pre-charged refrigerant oil in the new compressor
- 2. No additional refrigerant oil charge is required if:
remaining refrigerant oil quantity in the old compressor is less than the pre-charged refrigerant oil in the new compressor
- 3. The recharged quantity of the refrigerant oil to the cycle is calculated as follows:
(Remaining quantity in the old compressor + Collected quantity in Section 4.1.12 (8) + 0.05 gal. (200cc)*) - (Initial charged quantity in the compressor for each model)

Compressor	Initial Charged Refrigerant Oil
For Inverter (EK655DHD)	0.29 gal. (1100cc)
For Constant Speed (EK655DH)	0.13 gal. (500cc)

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

- 4. If the refrigerant oil is contaminated, exchange all with new refrigerant oil.

Tool	Oil Pan, Measuring Cup
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! WARNING

TURN OFF all power source switches.

- (11) Mount the new compressor. When attaching the nut at the front side, pay attention not to deform the discharge piping.

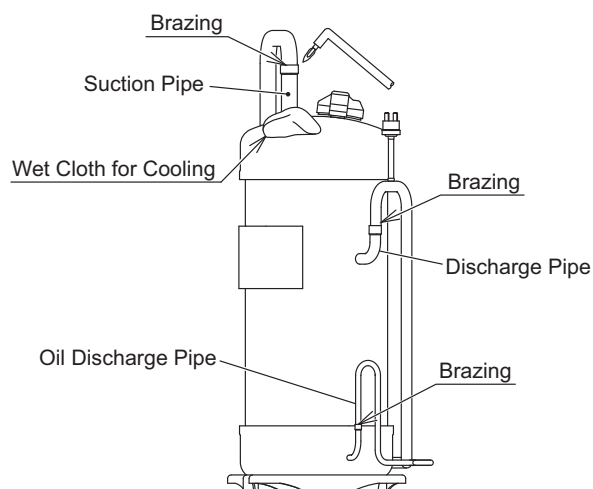
Perform the brazing according to the following order:

- (a) Oil Discharge Pipe
- (b) Discharge Pipe
- (c) Suction Pipe

NOTES:

- 1. When mounting the new compressor on the base, pay attention not to come in contact with piping. If contacted, piping may become deformed.
- 2. The new compressor should be mounted with the cap. Remove the cap just before starting the brazing work.
- 3. Connect the charging hose with the access port at the low pressure side to release pressure.
- 4. When brazing the suction pipe, make sure that the connecting part is firmly inserted into the compressor. Keep compressor piping cool using a wet cloth in order to avoid bringing the brazing material into the compressor.

Tool	Torch, Wet Cloth, Plier
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! WARNING

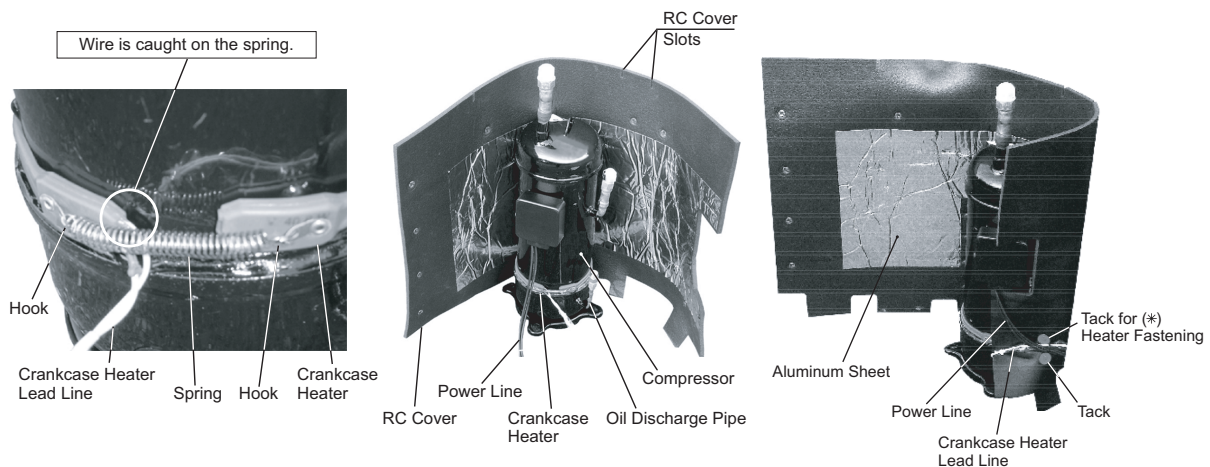
TURN OFF all power source switches.

- (12) Wind the crankcase heater around the compressor.
Crankcase heater mounting position: Back to the original setting (Refer to Section 4.1.12 (6))
- (13) Attach the RC cover.
- (14) Reconnect all wires in the original positions.
 - (a) The crankcase heater lead wire is fixed inside the RC cover with the tack(*) without coming in contact with the power line and the piping.
 - (b) Draw the lead wire for the high pressure switch (PSH) and attach the Td thermistor. Pull out the wires from the slotted part at the top of the RC cover.

NOTES:

1. If the power line or the crankcase heater lead line comes in contact with a high temperature part such as oil discharge pipe or compressor chamber, the wire may be cut or fired. Protect the wire from overheating and protect the edge with the RC cover.
2. Check that the high pressure switch (PSH) does not contact with the RC cover aluminum sheet.

(Example)

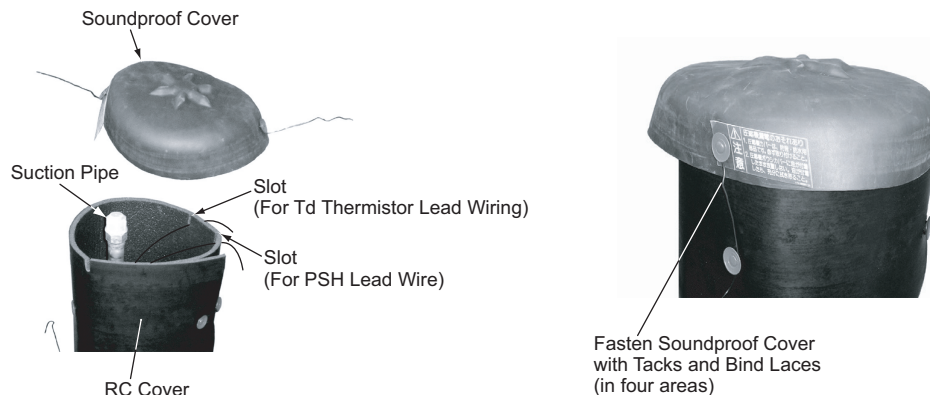


NOTES:

1. Attach the crankcase heater firmly to the compressor and secure it with a spring as shown in the figure.
2. If there is a clearance between the crankcase heater and the compressor due to wire overlapping, excessive heat is generated there. Then the crankcase heater fails due to overheating. When mounting the reassembled crankcase heater, this should be taken into account.
3. If the crankcase heater lead wire is caught on the spring, the lead wire may be cut due to vibration. When reassembling, attention should be paid to the lead wire.

- (c) Fasten the cover firmly with two tacks to keep water from entering the clearance between the RC cover and the soundproof cover.

(Example)



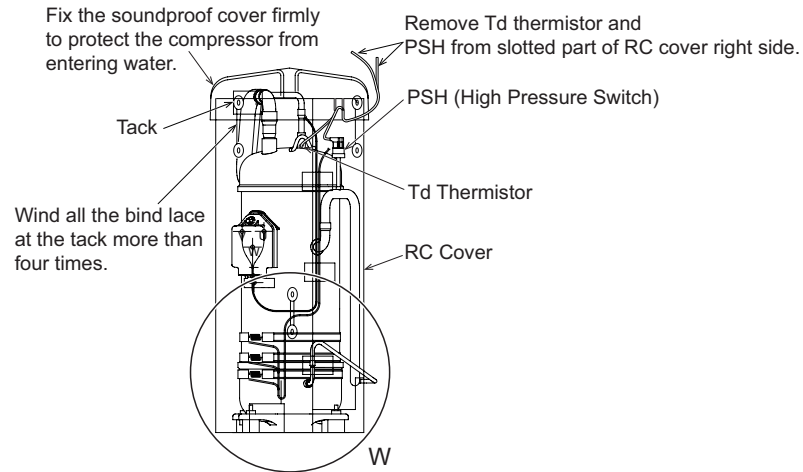
WARNING

TURN OFF all power source switches.

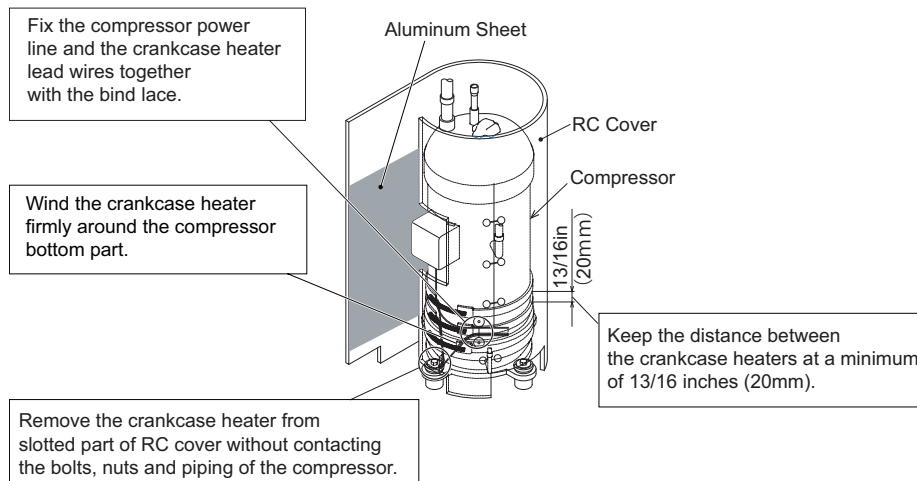
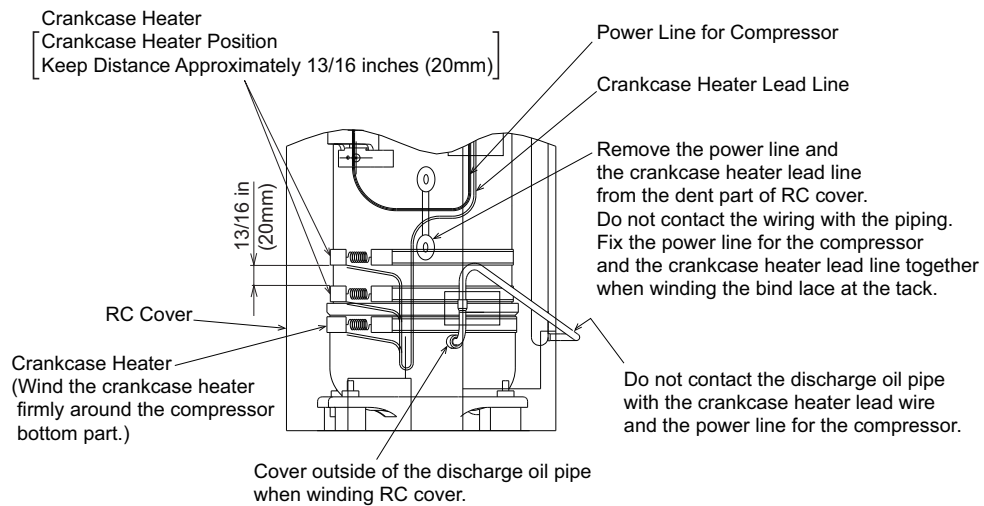
(15) Perform the final check for wiring conditions referring to the drawing below.

NOTE:

Ensure that all wires do not come in contact with the compressor, piping or plate edges. If there are contacts, broken wires or a fire can occur.



Detailed View from W



! WARNING

TURN OFF all power source switches.

4.1.13 Replacing Refrigerant Oil

4.1.13.1 Replacing Refrigerant Oil (No Blockage in Return Oil Circuit)

- (1) Remove the front service cover according to Section 4.1.1 "Removing Front Service Cover".
- (2) Close (A) high/low pressure gas stop valve and (B) liquid stop valve.
- (3) Recover the refrigerant in the outdoor unit from (D) low pressure access port and (E) high pressure access port. Ensure that the pressure does not increase at this time.

NOTE:

If the pressure increases, recover all the refrigerant in the system.

- (4) Connect the charge hose (for R410A) to (C) access port for recovering refrigerant oil.
- (5) Charge nitrogen (22 psi (0.15 MPa)) from (D) low pressure access port and recover the refrigerant oil in the accumulator by applying pressure. (approx. 20 minutes)

NOTE:

Ensure that the pressure for (E) high pressure access port is NOT abnormal when nitrogen is charged.

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

NOTE:

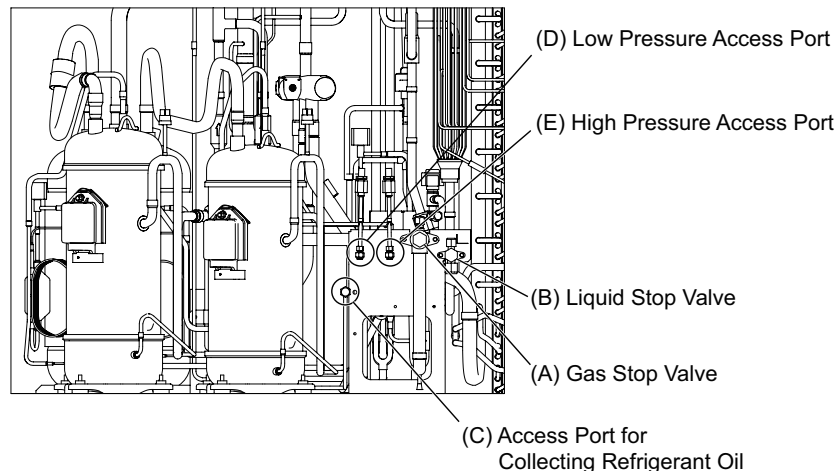
When the collected refrigerant oil is 0.79 gal. (3L) or less, a blockage may exist in the return oil circuit. In that case, replace the return oil circuit according to Section 4.1.13.2 "Replacing Refrigerant Oil (Blockage in Return Oil Circuit) and Replacing Return Oil Circuit".

- (7) When the procedures above are completed, perform the vacuuming again from (D) low pressure access port and recharge the refrigerant. After recharging, open the stop valves.

NOTE:

1. Use a clean charging hose.
2. Charge the refrigerant oil in a short amount of time (within approximately 20 minutes). Use a container with a small opening so that the refrigerant oil does not absorb the moisture from the atmosphere.

Tool	Adjustable Wrench
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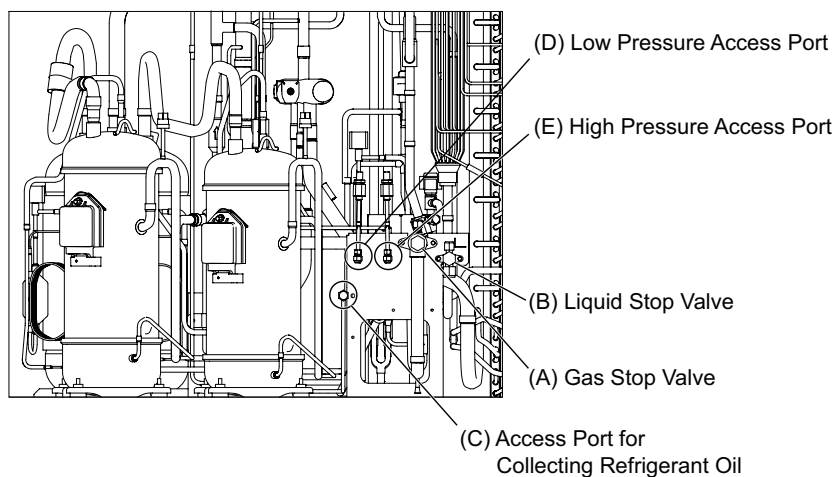
! WARNING**TURN OFF all power source switches.****4.1.13.2 Replacing Refrigerant Oil (Blockage in Return Oil Circuit) and Replacing Return Oil Circuit**

- (1) Remove the front service cover according to Section 4.1.1 "Removing Front Service Cover".
- (2) Remove the electrical box, wirings, electrical box support and transformer box (460V only) according to Section 4.1.6, 4.1.7 and 4.1.9.
- (3) Close (A) gas stop valve and (B) liquid stop valve.
- (4) Recover the refrigerant in the outdoor unit from (D) low pressure access port and (E) high pressure access port. Ensure that the pressure will not increase at this time.

NOTE:

If the pressure increases, recover all the refrigerant in the refrigerant cycle.

Tool	Adjustable Wrench
------	-------------------



 **WARNING**

TURN OFF all power source switches.

- (5) Remove (G) solenoid valve coil connected to (H) solenoid valve body of the return oil circuit according to Section 4.1.14.2 "Removing Solenoid Valve Coil".
- (6) Cut off (I) return oil circuit connecting with (J) accumulator pipe at the cutting position indicated in the figure below.
After that, remove remaining return oil circuit inside of (L) brazing for return oil circuit.
- (7) Cut (I) return oil circuit off from (K) oil separator outlet port at the point indicated in the figure. Remove (I) return oil circuit from the unit. Then, remove (M) brazing for oil separator outlet.

NOTES:

1. When cutting (I) return oil circuit off, cut the closer part to (I) return oil circuit to prevent the refrigerant oil remaining in (I) return oil circuit from spilling out.
2. When cutting (I) return oil circuit off, do not use a saw.
3. After cutting (I) return oil circuit off, remove the cut-off piping from (M) brazing for oil separator outlet.
4. When removing (L) brazing for return oil circuit at the upper part of the return oil circuit and (M) brazing for oil separator outlet, refrigerant oil may come out. Prepare the oil pan before the work to receive the refrigerant oil.

! WARNING

TURN OFF all power source switches.

- (8) Cover the hole of (L) brazing for return oil circuit using tape. Connect a charging hose to (M) brazing for oil separator outlet. Then, charge nitrogen (22 psi (0.15 MPa)) from the upper union of (D) low pressure access port, and recover refrigerant oil in the (K) oil separator, applying pressure.

NOTE:

In an instance where the unit has two return oil circuits and two oil separators, collect the refrigerant oil from one oil separator and then from the other.

- (9) Stop charging nitrogen after the refrigerant oil has completely been collected and connect the return oil pipe. After connecting the pipe, perform the nitrogen pressurization from (D) low pressure access port. During the work, check that the oil does not spill out from the flare nut connection and braze joint.
- (10) Perform vacuuming from (D) low pressure access port and add the same quantity of oil that was collected from (C) access port for recovering refrigerant oil.

NOTE:

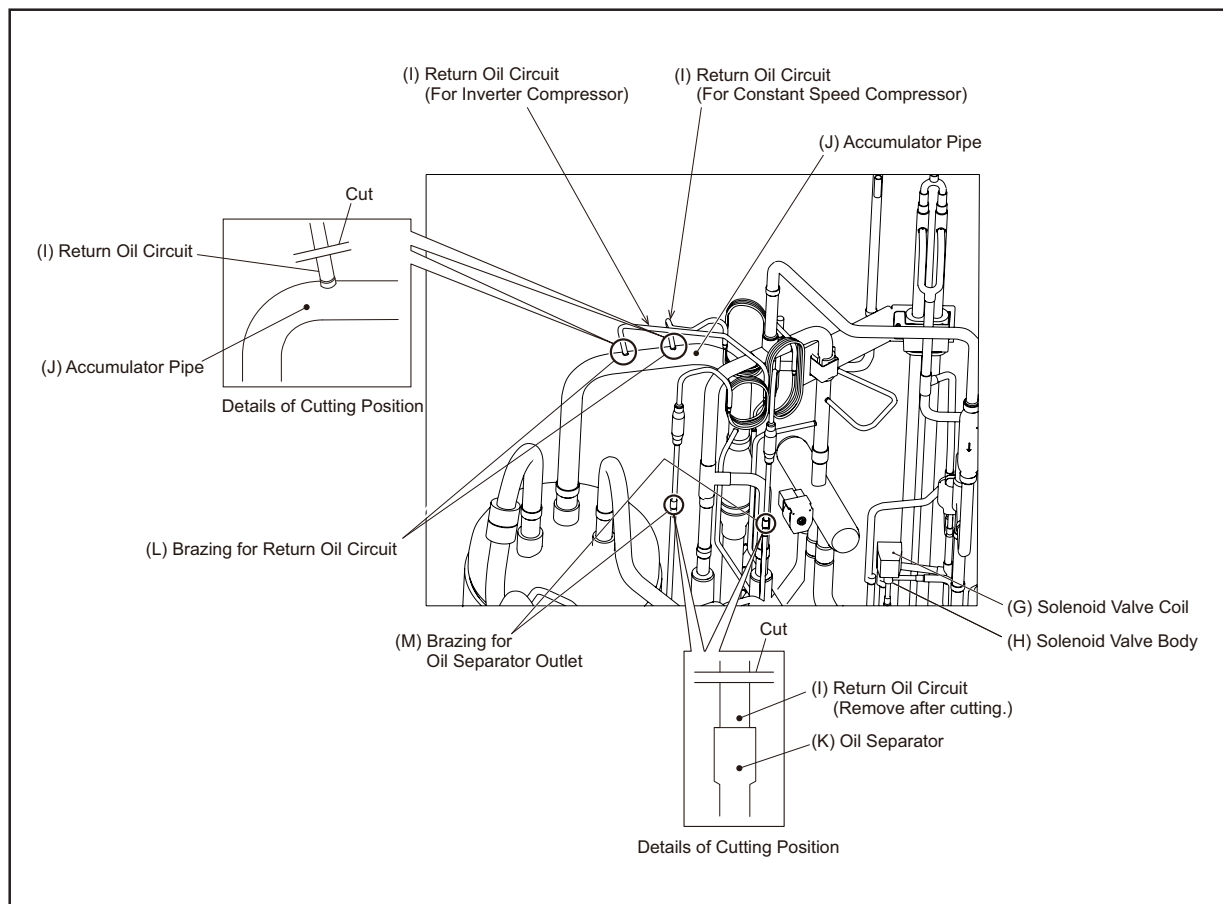
If replacing the return oil circuit only, procedures (8) and (9) are not required.

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

NOTES:

1. Use a clean charging hose.
2. Charge the refrigerant oil in a short amount of time (within approximately 20 minutes). Use a container with a small opening so that the refrigerant oil will not absorb moisture from the atmosphere.

Tool	Adjustable Wrench
------	-------------------

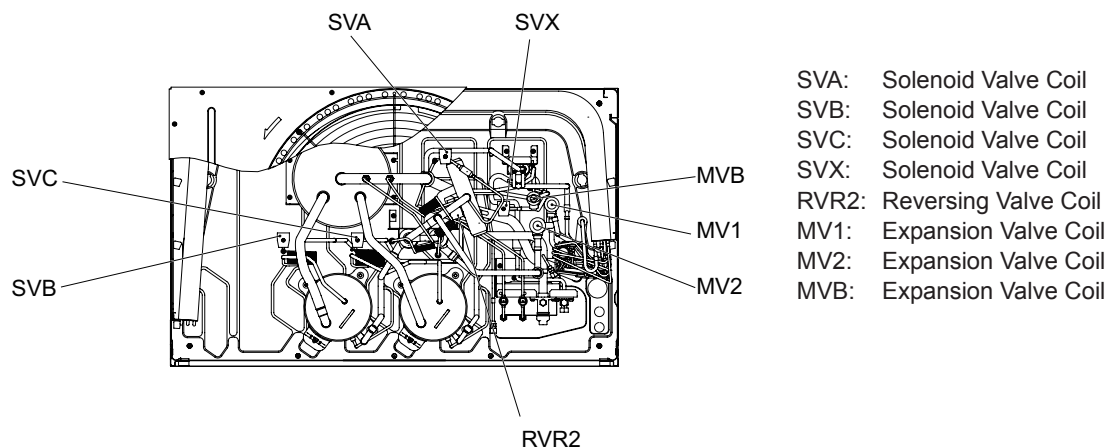


! WARNING

TURN OFF all power source switches.

4.1.14 Removing Coils

The following figures indicate positions of coils.



< Coil Position >

! WARNING

TURN OFF all power source switches.

4.1.14.1 Removing Expansion Valve Coil (MV1, MV2, MVB)

- (1) Remove the front service cover according to Section 4.1.1 "Removing Front Service Cover".
- (2) Turn the expansion valve coil in a counterclockwise direction as shown in the figure. 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 coil.

NOTE:

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

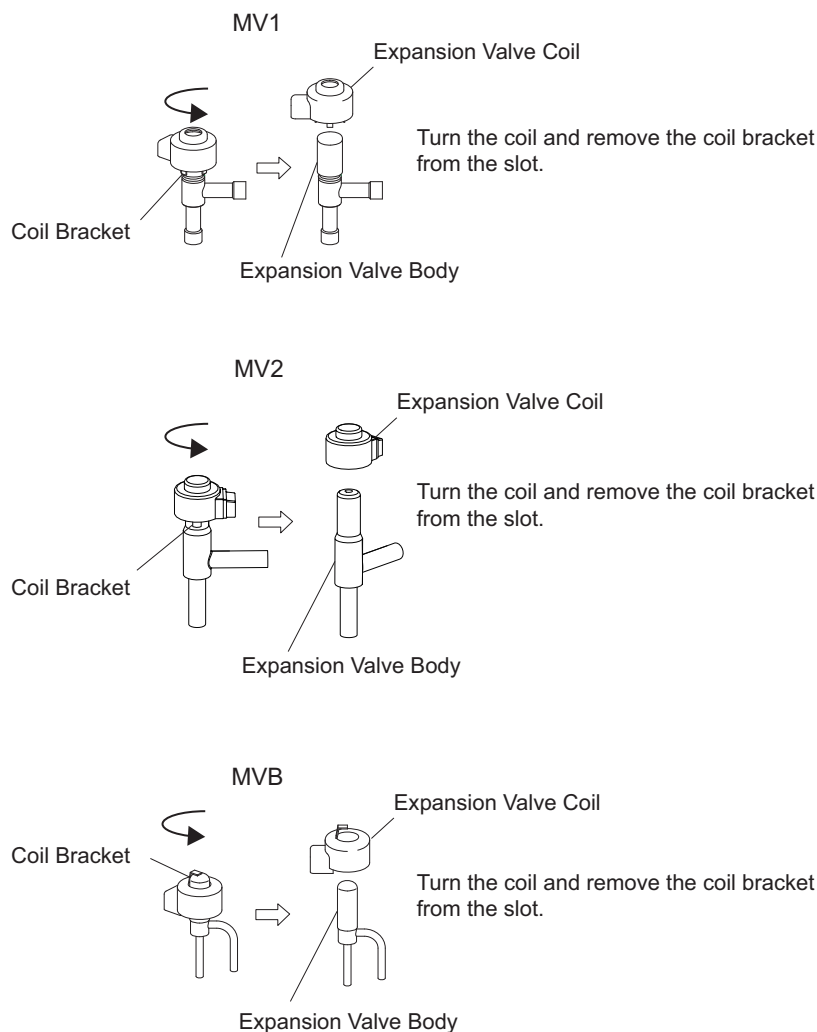
- (3) For replacing the expansion valve coil, press the coil into the expansion valve slot by turning the coil. If an excessive force is applied to the coil, the coil bracket may become damaged. As a result, the coil cannot be fixed at the correct position as shown in the figure.
 - Any slots on the expansion valve inner surface are acceptable to fix.

NOTE:

The expansion valve coil should be tightened to 44.3 lbf-ft (60 N·m) or less. After securing, check the expansion valve coil position.

Tool

Pliers



! WARNING

TURN OFF all power source switches.

- (3) For replacing the expansion valve coil, 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 become damaged. As a result, the coil cannot be fixed at the correct position as shown in the figure.

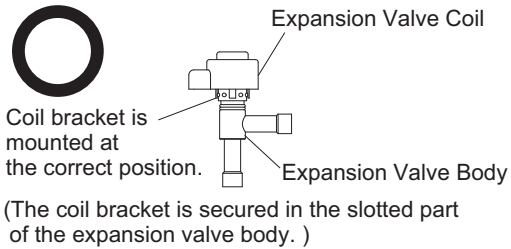
- Any slots on the expansion valve inner surface are acceptable to fix.

NOTE:

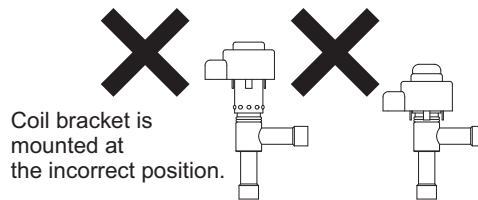
The expansion valve coil should be tightened to 44.3 lbf·ft (60 N·m) or less. After securing, check the expansion valve coil position.

Tool	Pliers
------	--------

Correct



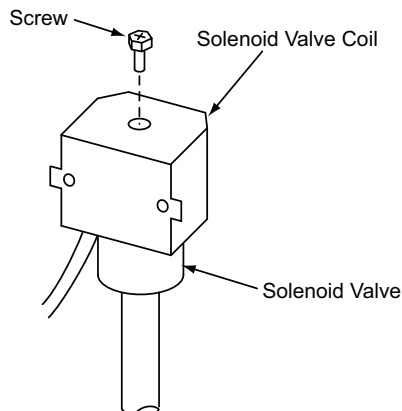
Incorrect



4.1.14.2 Removing Solenoid Valve Coil (SVA, SVB, SVC, SVX)

- Remove one screw securing the solenoid valve coil with a Phillips screwdriver. If the screw is difficult to remove, use an adjustable wrench.
- Remove the solenoid valve coil.

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



! WARNING

TURN OFF all power source switches.

4.1.14.3 Removing Solenoid Valve (SVA, SVB, SVC, SVX)

- (1) Remove the front service cover according to Section 4.1.1 "Removing Front Service Cover".
- (2) Close gas stop valve and liquid stop valve.
- (3) Recover refrigerant in the outdoor unit from low pressure access port and high pressure access port. Ensure that the pressure does not increase at this time.

NOTE:

If the pressure increases, collect all the refrigerant in the system.

- (4) Remove the solenoid valve coils according to Section 4.1.14.2 "Removing Solenoid Valve Coil".
- (5) Unbraid at the following segments:

Solenoid Valve Coil (SVA): Two brazing segments

Solenoid Valve Coil (SVB): Two brazing segments

Solenoid Valve Coil (SVC): Two brazing segments

Solenoid Valve Coil (SVX): Two brazing segments

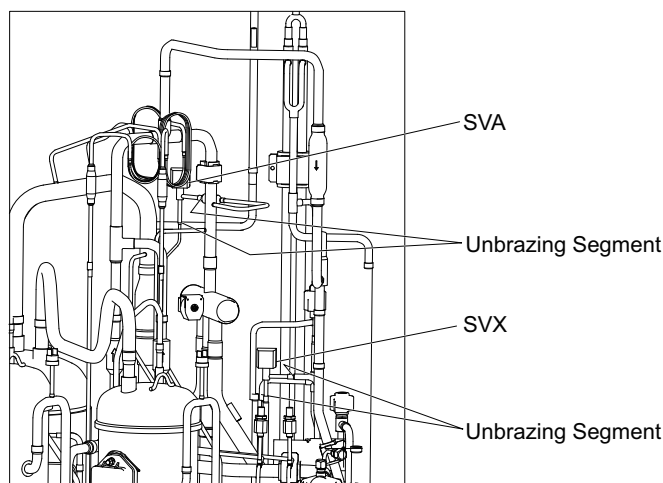
NOTE:

1. When performing brazing work, cover the solenoid valve with a wet cloth for cooling.

2. Pay attention not to burn the connecting wiring and piping insulation while brazing.

- (6) For reassembly, perform the removal procedure in reverse order.

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



< Solenoid Valve >

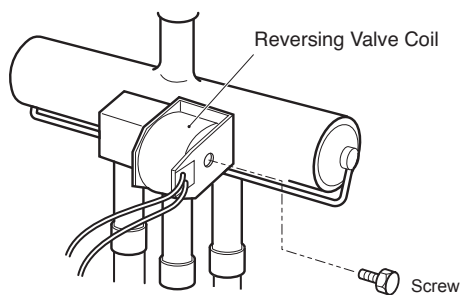
! WARNING**TURN OFF all power source switches.**

4.1.14.4 Removing Reversing Valve Coil (RVR2)

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

Tool

Phillips Screwdriver



This is the unit front view.

! WARNING

TURN OFF all power source switches.

4.1.14.5 Removing Reversing Valve

- (1) Remove the front service cover according to Section 4.1.1 "Removing Front Service Cover".
- (2) Remove the electrical box, wirings and electrical box support according to Section 4.1.6 "Removing Electrical Box."
- (3) Before starting this work, recover the refrigerant into a recovery cylinder from the system, and turn OFF the power source of the unit.
- (4) The reversing valve securing position is as shown in the figure.
- (5) Disconnect the wiring for the reversing valve coil.
- (6) Remove the reversing valve coils according to Section 4.1.14.4 "Removing Reversing Valve Coil".
- (7) Unbraid as shown in the figure by covering the reversing valve with a wet cloth for cooling.

NOTE:

1. Unbraid only at the indicated segment in the figure. If not, leakage may occur when reassembling.
2. Connect the charging hose to the access port for the low pressure gas stop valve before unbrazing.

- (8) Remove the reversing valve assembly.

Unbraid as shown in the figure by covering the reversing valve with a wet cloth for cooling.

Unbraid in the following order:

- (a) Brazing at right and left branch pipes of three pipes from the reversing valve.
- (b) Brazing at the center branch pipe of three pipes from the reversing valve.

NOTE:

When unbrazing, cover the reversing valve with a wet cloth for cooling.

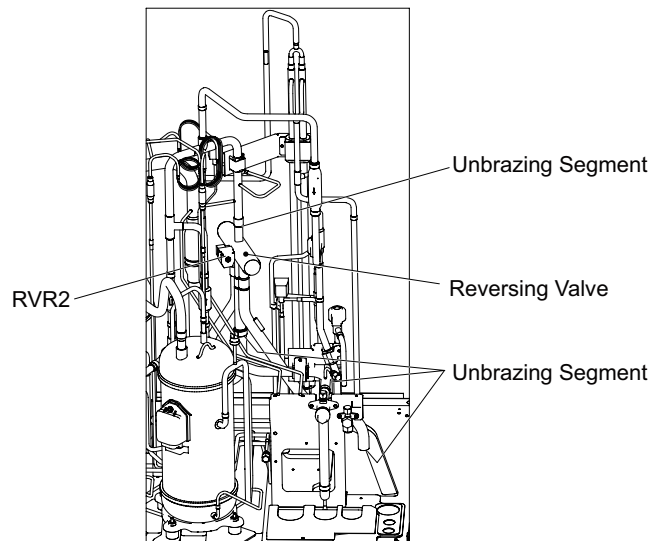
- (9) For reassembly, perform the removal procedure in a reverse order.

NOTE:

When performing brazing work, cover the reversing valve with a wet cloth for cooling.

Tool

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



! WARNING

TURN OFF all power source switches.

4.1.15 Removing Stop Valve

Before starting this work, recover the refrigerant into a recovery cylinder from the system, and turn OFF the power source of the unit.

- (1) Remove the front service cover according to Section 4.1.1 "Removing Front Service Cover".
 - (2) When removing the (A) gas stop valve, cover the stop valves with a wet cloth for cooling and then unbraid.
- When removing the (B) liquid stop valve, unbraid the pipe for the stop valve as shown in the figure.

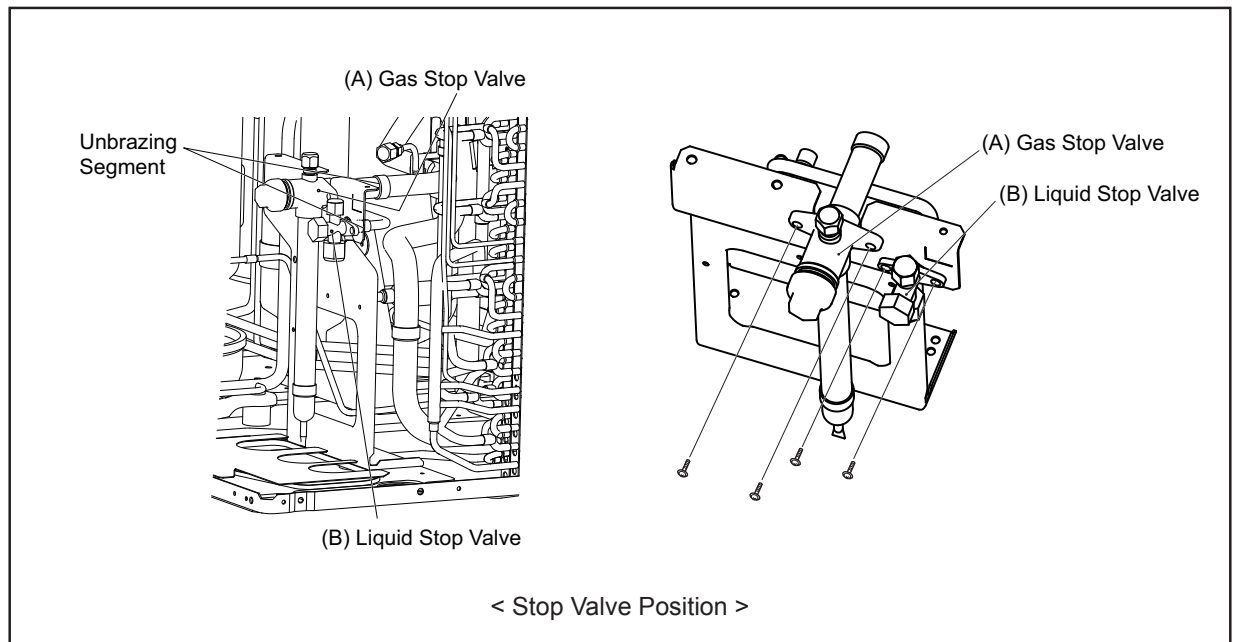
NOTE:

1. Connect the charging hose to the access port for the low pressure gas stop valve.
2. To unbraid for the (A) gas stop valve, the RC cover should be removed or protected with a metal plate.
- (3) After unbrazing for the stop valves, remove the screws securing the plates as shown in the figure and pull out the stop valves and the plates.
- (4) Set the stop valves using a reverse procedure.

NOTE:

When brazing the stop valves or unbrazing, cover the stop valves with a wet cloth for cooling.

Tool	Wet Cloth, Torch, Pliers, Phillips Screwdriver
------	---



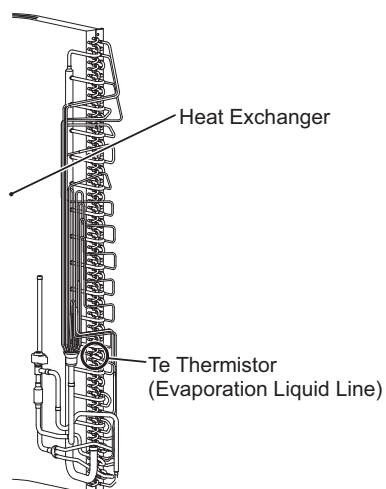
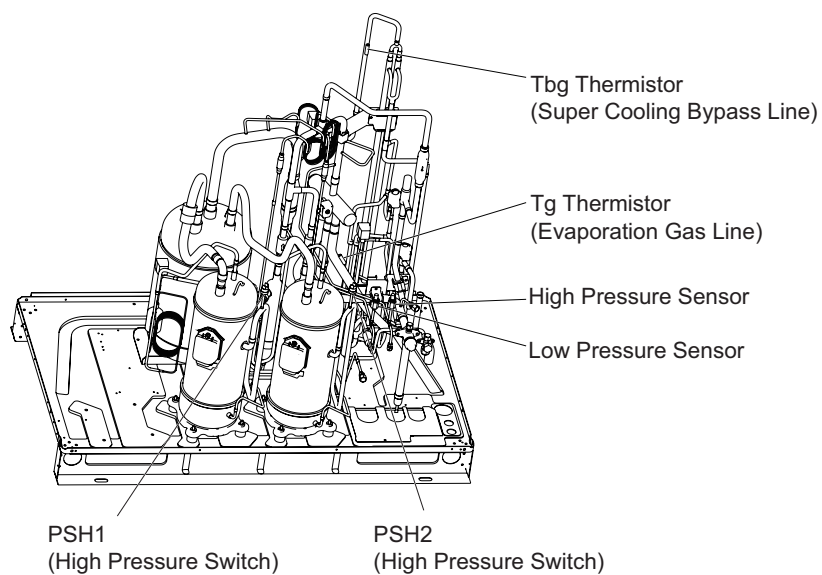
! WARNING

TURN OFF all power source switches.

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

- (1) Remove the front service cover according to Section 4.1.1 "Removing Front Service Cover".
- (2) High Pressure Switch (PSH1 and PSH2), High Pressure Sensor, Low Pressure Sensor and Thermistor (Tg, Tchg, Tbg and Te) are secured as shown in the figure below.

Tool	Adjustable Wrench
------	-------------------



< High Pressure Switch, High/Low Pressure Sensor Position >

! WARNING

TURN OFF all power source switches.

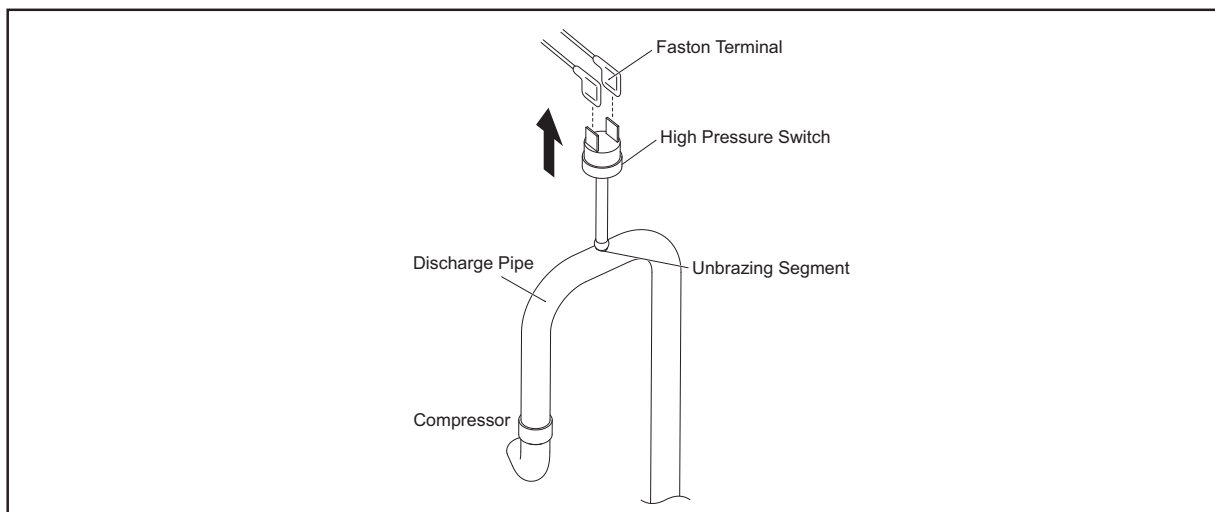
4.1.16.1 Removing High Pressure Switch (PSH1, PSH2)

- (1) Recover refrigerant into proper refrigerant recovery cylinder.
- (2) Disconnect the faston terminals.
- (3) Remove the high pressure switch from the unbrazing segment of the discharge pipe using a torch.

NOTES:

1. When the high pressure switch is removed, do not expose the refrigerant cycle to the environment for a long period in order to avoid introduction of foreign particles and moisture to system. Install a replacement high pressure switch immediately after removing. If it is not possible to do this immediately, seal the hole with tape.
2. Check that the RC cover inner side (aluminum sheet) does not come in contact with the terminals of the high pressure switch.
3. Make sure to secure the insulating sleeve of the faston terminals as shown in the figure. If the terminals of the high pressure switch are exposed and come in contact with the RC cover, the electrical components may be damaged.

Tool	Torch, Adjustable Wrench, Phillips Screwdriver, Pliers
------	--



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

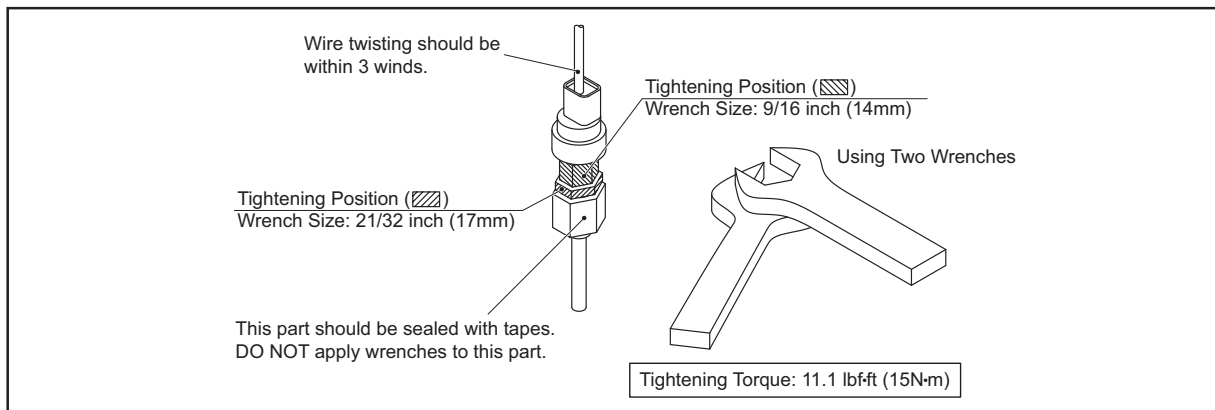
- (1) Remove the connector for the pressure sensor wiring from PCB1.

NOTE:

First, remove the connector or the wiring can be damaged.

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

Tool	Adjustable Wrench, Phillips Screwdriver, Pliers
------	---



! WARNING**TURN OFF all power source switches.****4.1.17 Removing Thermistor for Liquid Pipe**

- (1) Remove the front service cover according to Section 4.1.1 "Removing Front Service Cover".
- (2) Remove the electrical box cover according to Section 4.1.5 "Removing Electrical Box Cover".
- (3) Remove the CORK TAPE. (CORK TAPE is also used during reassembly.) Then, remove the thermistor for the liquid pipe by pulling out the thermo clip from the pipe.

NOTE:

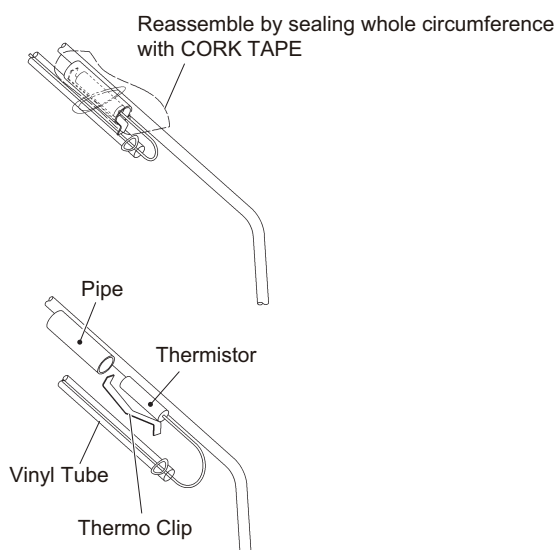
When removing the thermistor for the liquid pipe, take special care not to cause damage to your hands or the thermistor with the valve support securing the stop valve.

- (4) Reassemble the thermistor for the liquid pipe using reverse procedures.

NOTE:

When reassembling the thermistor, secure the thermistor with the vinyl pipe end downward to prevent condensate from entering the pipe.

Tool

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

! WARNING**TURN OFF all power source switches.****4.1.18 Removing Thermistor for Ambient Temperature**

- (1) Remove the front service cover according to Section 4.1.1 "Removing Front Service Cover".
- (2) Remove the electrical box cover according to Section 4.1.5 "Removing Electrical Box Cover".
- (3) Remove the top cover and upper cover according to Section 4.1.3 "Removing Top Cover and Upper Cover".

NOTE:

When removing the top cover and upper cover, be careful not to damage the shroud.

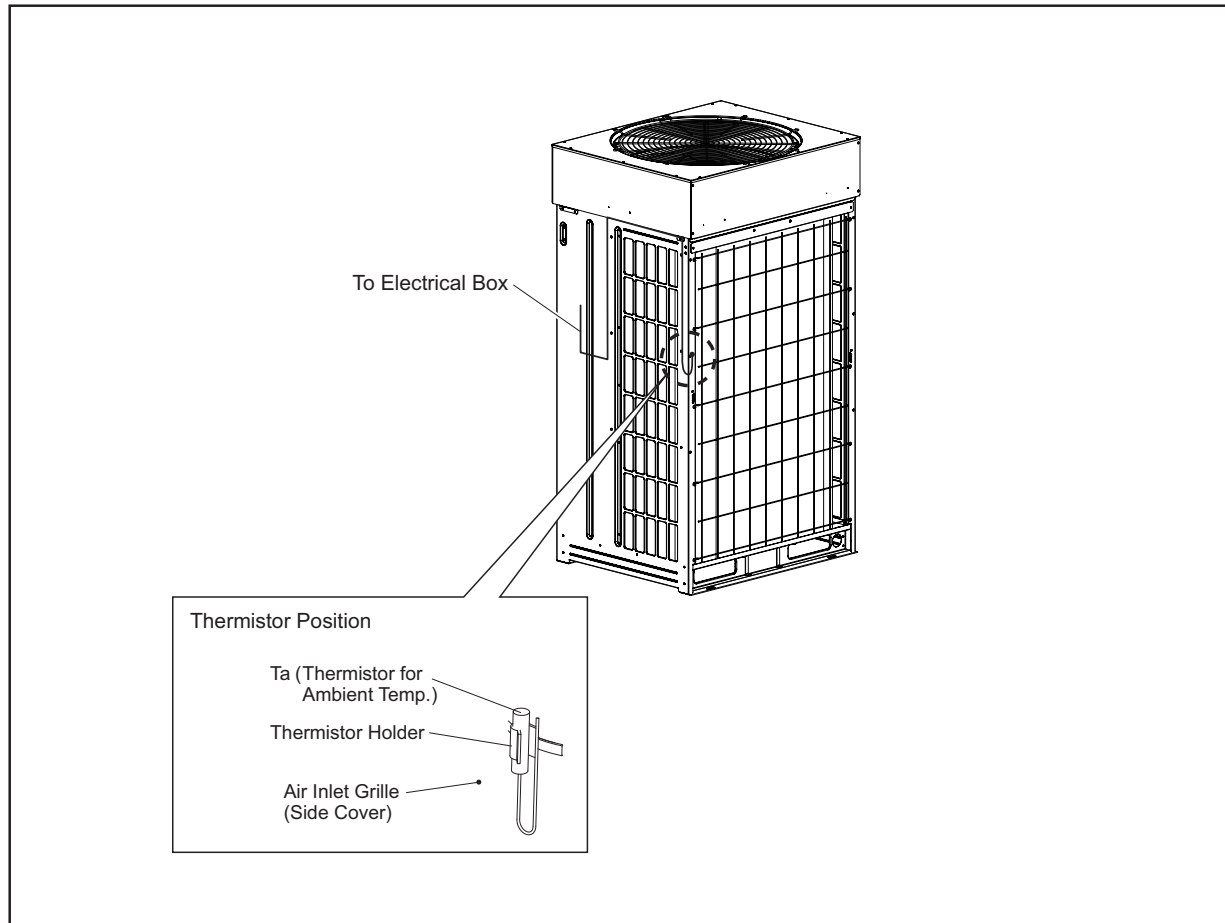
- (4) Remove the securing clamps for wiring.
- (5) Reassemble the thermistor for ambient temperature using reverse procedures for removal.

NOTE:

If the upper cover is not secured properly, it may cause upper cover vibration during the outdoor fan operation. Check the upper cover carefully after reassembling.

Tool

Phillips Screwdriver, Wire Cutter



 **WARNING**

TURN OFF all power source switches.

4.1.19 Removing Other Electrical Components

NOTES:

1. Apply conductive heat transfer paste or silicon grease (Service Part No.: P22760) slightly over the contact surface of the fin when replacing the components of the radiation fin such as transistor module (IPM), diode module (DM) and fan controller (FANM).
2. Match the terminal numbers with the mark band numbers when reassembling. If incorrectly connected, malfunction may occur or the electrical components may be damaged.
3. The U and V-Phases of the power source cables for inverter compressor (MC1) should be passed through the current sensor (CTU and CTV) of the inverter module (PCB2) completely.
Connect the U-Phase of the power source cable with the U-Phase side (CTU), and the V-Phase with the V-Phase side (CTV) of the current sensor. Not doing so may cause equipment malfunction or failure.
4. When securing PCBs or sheet metal for PCBs, protect the electric wiring from being caught on the sheet metal or the electrical components.
5. Make sure to use screws, bushes and collars when securing PCBs for the inverter compressor.
Not doing so may cause equipment malfunction.
6. When replacing the PCB for communication, set the DIP switches the same as before replacing the PCB.
An incorrect setting will cause a malfunction. Refer to the instruction manual attached with servicing the PCB.
7. Do not apply excessive force to the electrical components on the PCB or the PCB itself. It may lead to PCB malfunction.
8. When replacing the fan controller, set the DIP switches the same as before replacing the fan controller.
An incorrect setting will cause a malfunction.



TURN OFF all power source switches.

4.1.19.1 Removing PCB1 and Electrical Components for Electrical Box

< Removing PCB1 >

- (1) Remove all the connectors for wiring at PCB1.
- (2) Hold the middle part of the holder securing PCB1 (Part A in the figure, 11 parts) with a long-nose plier and pull it out to remove.

< Opening PCB1 Securing Plate >

- (1) Remove all the wirings connected with the electrical components.
- (2) Remove two screws at Part B in the figure. Check or replace electrical components through the opening.
- (3) If the securing plate for PCB1 is removed, all the connectors connected with PCB1 should be removed.

< Removing Electrical Components >

- (1) Remove all the wirings connected with the electrical components.
- (2) Remove the screws securing electrical components.

NOTES:

1. The open angle for the PCBs' securing plate should be within 120 degrees. If trying to open wider than 120 degrees, the securing plate will not open due to insufficient electrical wiring length.
2. Do not touch the electrical components on the PCBs.
Do not bend or apply excessive force to a PCB. It will cause a PCB failure.

NOTES:

1. Match the terminal numbers with the mark band numbers when reassembling. If incorrectly connected, a malfunction may occur or the electrical components may be damaged.
2. Protect the cables from being caught on the plate edge or electrical components when closing the PCB securing plate when reassembling.
3. The capacitor is charged with electricity even if the power source is turned OFF.
DO NOT come in contact with the terminals so as to avoid electrical shock. (*)

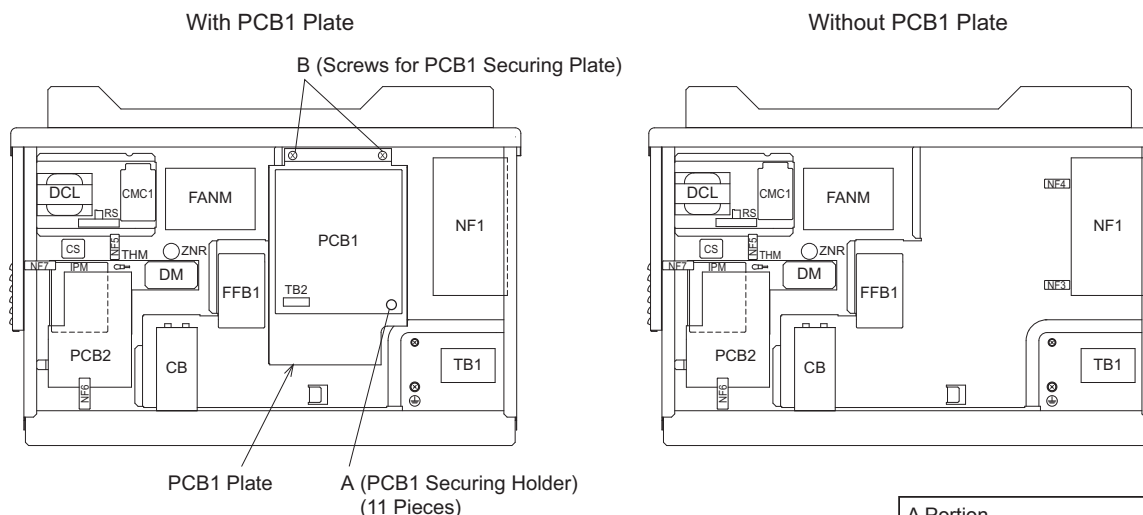
! WARNING

TURN OFF all power source switches.

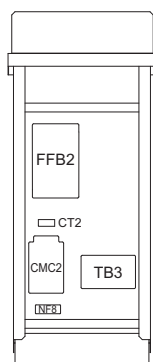
Tool Phillips Screwdriver,
Long-Nose Pliers, Pliers

- [208/230V] (H,Y)VAHP***B31CW

Interior of Electrical Box 1



Interior of Electrical Box 2



Item	Part Name	Item	Part Name
CB	Capacitor	MOF1	Motor for Outdoor Fan
CMC1, 2	Contact for Compressor Motor	NF1, 3~8	Noise Reduction Filter
CS	Capacitor	PCB1	Outdoor Unit PCB (Printed Circuit Board)
CT2	Current Transformer	PCB2	Inverter PCB (Printed Circuit Board)
DCL	Reactor	PSH1, 2	Pressure Switch for Protection
DM	Diode Module	RS	Resistor for Starting
FANM	Fan Module	TB1, 2	Terminal Block
FFB1, 2	Fuse-Free Breaker	THM	Thermistor for Fin Temperature
IPM	Transistor Module	ZNR	Surge Absorber
MC1, 2	Motor for Compressor		

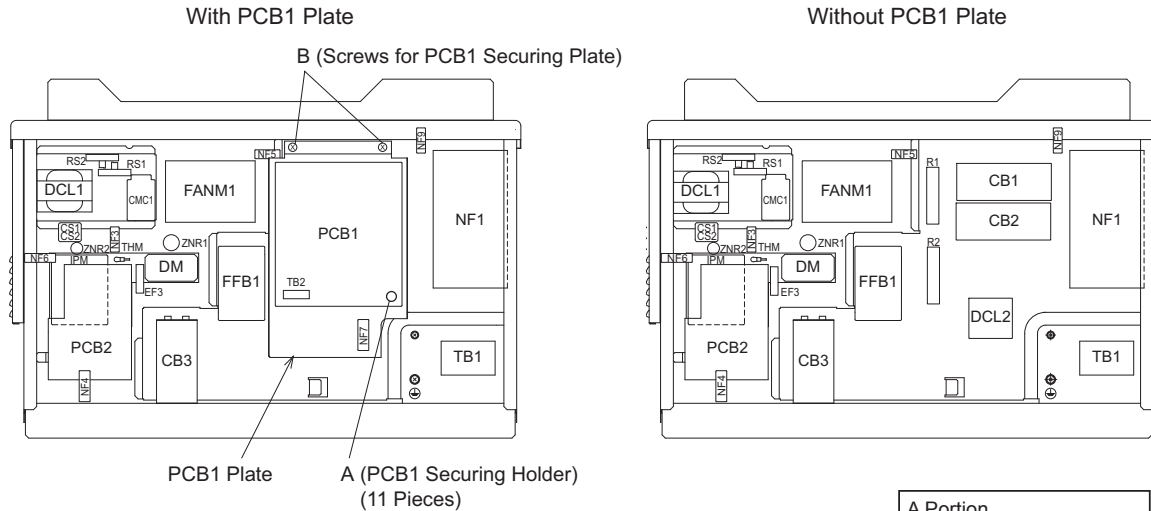
! WARNING

TURN OFF all power source switches.

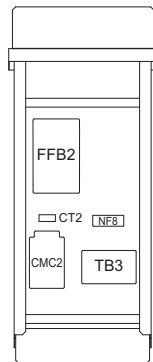
Tool Phillips Screwdriver,
Long-Nose Pliers, Pliers

- [460V] (H,Y)VAHP***B41CW

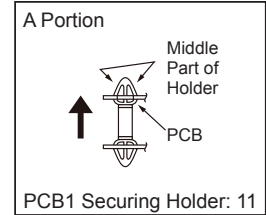
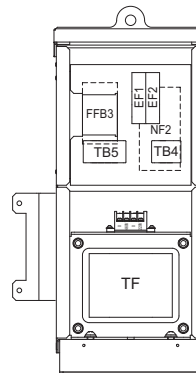
Interior of Electrical Box 1



Interior of Electrical Box 2



Interior of Transformer Box



Item	Part Name	Item	Part Name
CB1~3	Capacitor	MC1, 2	Motor for Compressor
CMC1, 2	Contactora for Compressor Motor	MOF1	Motor for Outdoor Fan
CS1, 2	Capacitor	NF1~9	Noise Reduction Filter
CT2	Current Transformer	PCB1	Outdoor Unit PCB (Printed Circuit Board)
DCL1, 2	Reactor	PCB2	Inverter PCB (Printed Circuit Board)
DM	Diode Module	RS1, 2	Resistor for Starting
EF1~3	Fuse	TB1~5	Terminal Block
FANM	Fan Module	TF	Transformer
FFB1~3	Fuse-Free Breaker	THM	Thermistor for Fin Temperature
IPM	Transistor Module	ZNR1, 2	Surge Absorber

! WARNING

Turn OFF all power source switches.

Do not touch any electrical components while LED201 (red) on the Inverter PCB (PCB2) is ON. Otherwise, an electric shock will occur.

4.1.19.2 Removing Inverter PCB (PCB2)

- (1) Disconnect all the wirings to the CN2, CN206, PCN301.
- (2) Disconnect the wirings for the transistor module (U, V, W) and C on the Inverter PCB (PCB2). Then, disconnect the wirings for U and V from the current sensor.
- (3) After removing three M3 screws, remove the bushes and collars from the inverter PCB (PCB2). When reassembling the inverter PCB (PCB2), the bushes and collars should be secured correctly.

NOTE:

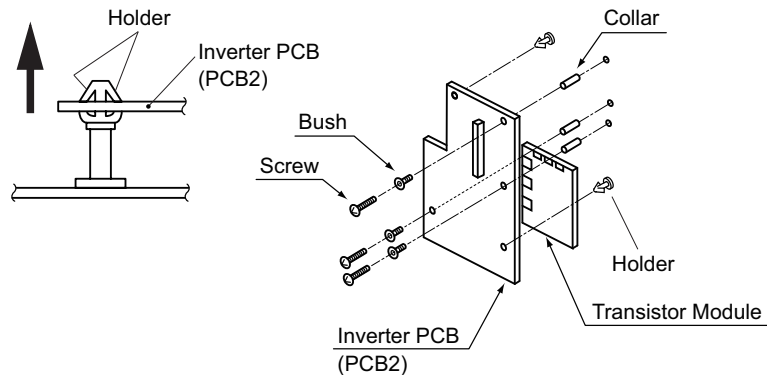
Do not touch any electrical components while the LED201 (red) of the inverter PCB (PCB2) is ON. Otherwise, it may lead to an electrical shock.

NOTES:

1. When reassembling the electrical components, match the terminal numbers with the mark band numbers. If they are incorrectly connected, a malfunction may occur or the electrical components may become damaged.
2. When closing the outdoor unit PCB (PCB1) for reassembly, protect the cables from catching on the plate edges or electrical components.

Tool

Phillips Screwdriver



! WARNING

Turn OFF all power source switches.

Do not touch any electrical components while the LED201 (red) on the Inverter PCB (PCB2) is ON. Otherwise, an electric shock will occur.

4.1.19.3 Removing Diode Module and Transistor Module

- (1) Disconnect the wirings to the terminals (1) to (5) on the diode module and to terminals P, N, U, V, and W on the transistor module.
- (2) Remove six screws securing the diode module and transistor module. Then, remove the diode module and transistor module.

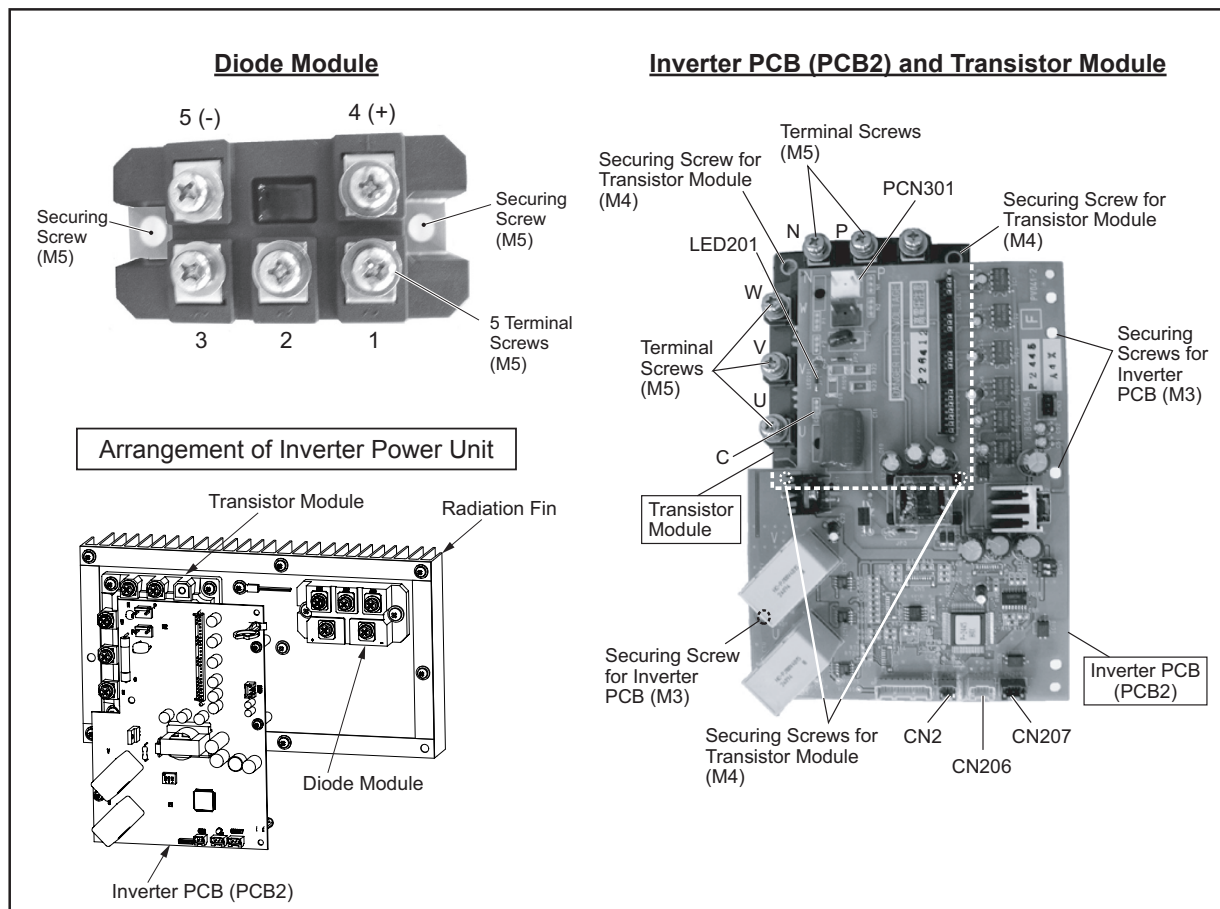
NOTE:

As for the inverter PCB and the transistor module, the figure below indicates the correct installation positions, with the letters on the inverter PCB on the side.

NOTES:

1. When reassembling the electrical components, match terminal numbers with the mark band numbers. If they are incorrectly connected, a malfunction may occur or the electrical components may be damaged.
2. When closing the outdoor unit PCB (PCB1) securing plate for reassembly, protect the cables from catching on the plate edges or electrical components.
3. 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 (Service Part No.: P22760) provided as an accessory.

Tool Phillips Screwdriver, Long-Nose Pliers



! WARNING

Turn OFF all power source switches.

Do not touch any electrical components while LED201 (red) on the Inverter PCB (PCB2) is ON. Otherwise, an electric shock will occur.

4.1.19.4 Removing Fan Controller

Before this work, remove the service cover according to Section 4.1.1 "Removing Front Service Cover". Check to ensure that LED501 (red) of the FANM1 is OFF.

Disconnect all the wirings to the fan controller as shown below.

(1) Disconnect the wirings from the fan controller.

[208/230V] CN206, CN207, R, S, T, U, V, W

[460V] CN206, CN207, R, S, U, V, W, P2, N, DCL1, DCL2

(2) Remove nine screws securing the fan controller so that the fan controller can be removed.

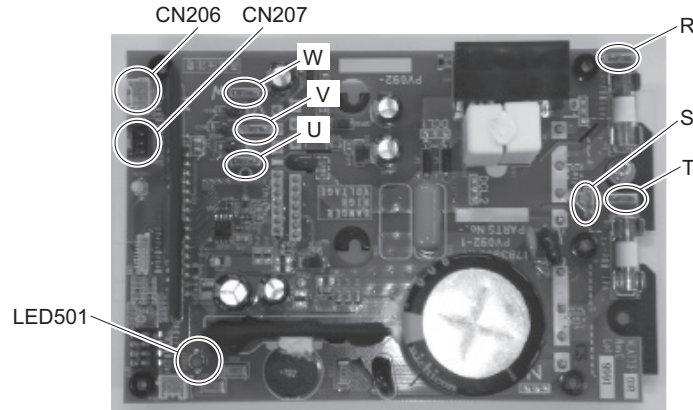
NOTES:

1. Do not apply great force when removing the fan controller, or the soldering may become loosened and a malfunction of the fan controller may occur.
2. Identify and match the terminal numbers with the mark band numbers when reassembling. If incorrectly connected, a malfunction or damage will occur.
3. Check to ensure that the electrical wires will not be caught between the mounting electrical components and the mounting plates when the inverter PCB (PCB2) is re-installed.
4. Apply silicon grease evenly on the whole rear side of the fan controller when installing. Use silicon grease (Service Part No.: P22760) provided as an accessory.

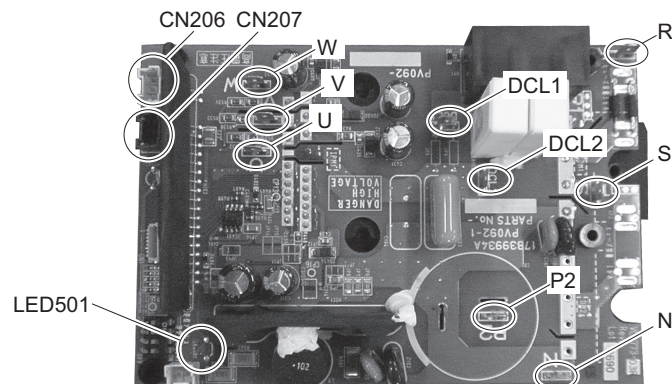
Tool

Phillips Screwdriver, Long-Nose Pliers

• [208/230V] (H,Y)VAHP***B31CW



• [460V] (H,Y)VAHP***B41CW



! WARNING

TURN OFF all power source switches.

- (3) Install the electrical box using reverse procedures.

NOTES:

1. Check to ensure that the tube end of the waterproof vinyl pipe and the connectors are in the electrical box. Secure them firmly with a cable clamp when wiring as shown in the figure below.
2. Secure the wiring connecting each electrical part and the electrical box with a plastic band to avoid direct contact with the compressor, piping, and plate edges.
3. Secure the wiring neatly with a cable clamp and make sure that the wiring is not be held down by the electrical box cover. Otherwise, the wiring may be damaged when the cover is closed.
4. Secure the fan motor wiring with a cable clamp as shown in the figure.

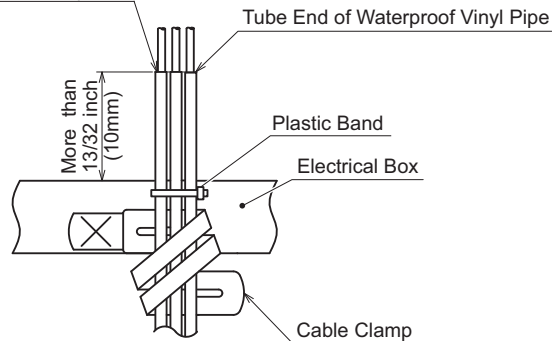
NOTES:

1. When reassembling the electrical component, match the terminal numbers with the mark band numbers . If they are incorrectly connected, malfunction may occur or the electrical components may be damaged.
2. Settings of DIP switches differ according to the model. When replacing the outdoor unit PCB, refer to "Field Work Instructions."

Tool	Phillips Screwdriver, Pincher Tool
------	------------------------------------

Details for Securing the Vinyl Pipe Edge

More than 13/32 inch (10mm) of waterproof vinyl pipe should be in the electrical box.



! WARNING**TURN OFF all power source switches.**

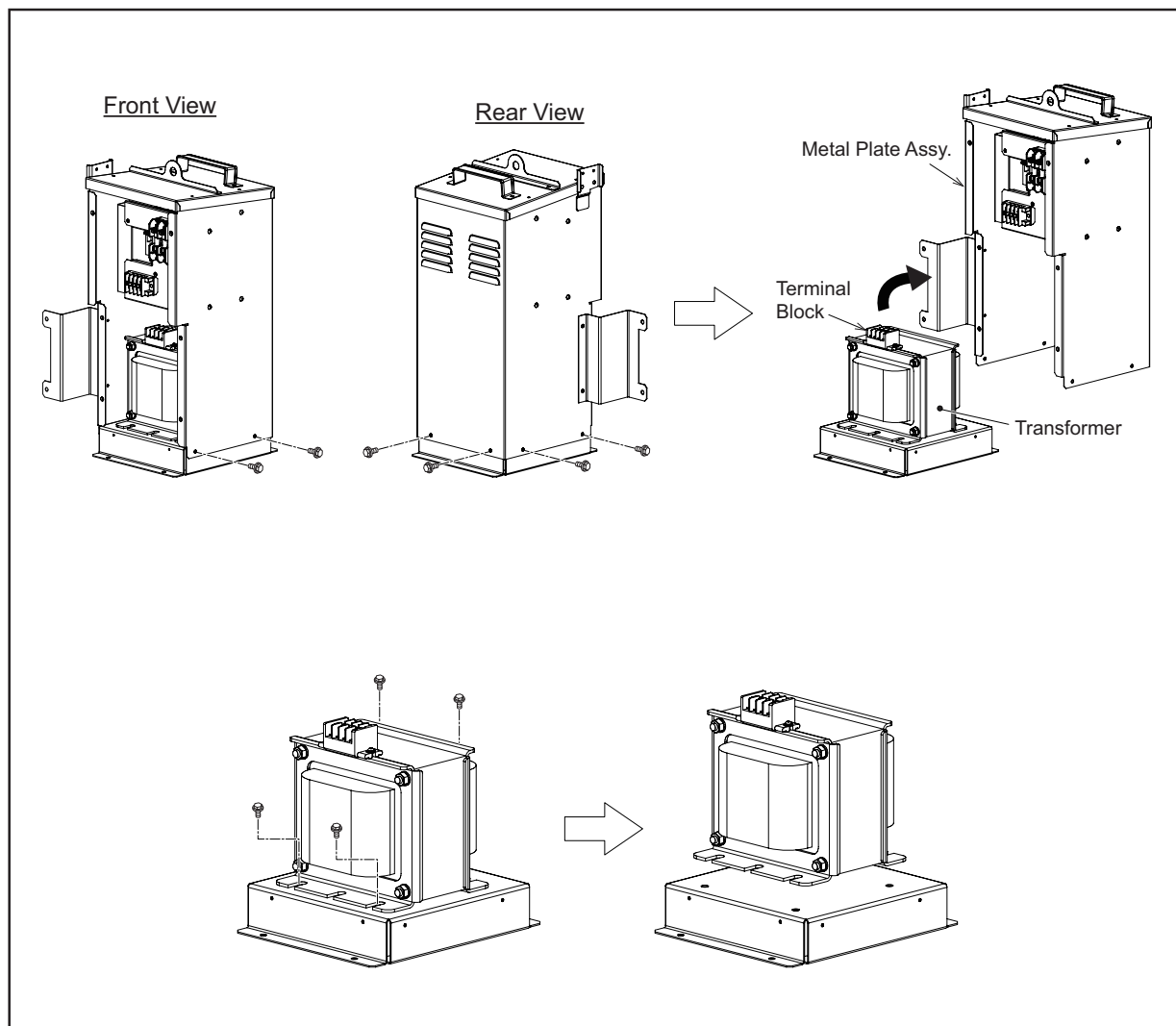
4.1.20 Removing Transformer [460V] (H,Y)VAHP***B41CW Only

Before this work, remove the transformer box according to Section 4.1.9 "Removing Transformer Box".
Remove the transformer box cover according to Section 4.1.8 "Removing Transformer Box Cover".

- (1) Disconnect all wiring to the terminal block of transformer.
- (2) During the transformer box assembly, remove six screws that secure the metal plates.
- (3) Remove the metal plate assembly from the transformer.
- (4) Remove four screws securing the transformer so the transformer can be removed.

Tool

Phillips Screwdriver



4.2 Main Parts

4.2.1 for Outdoor Unit

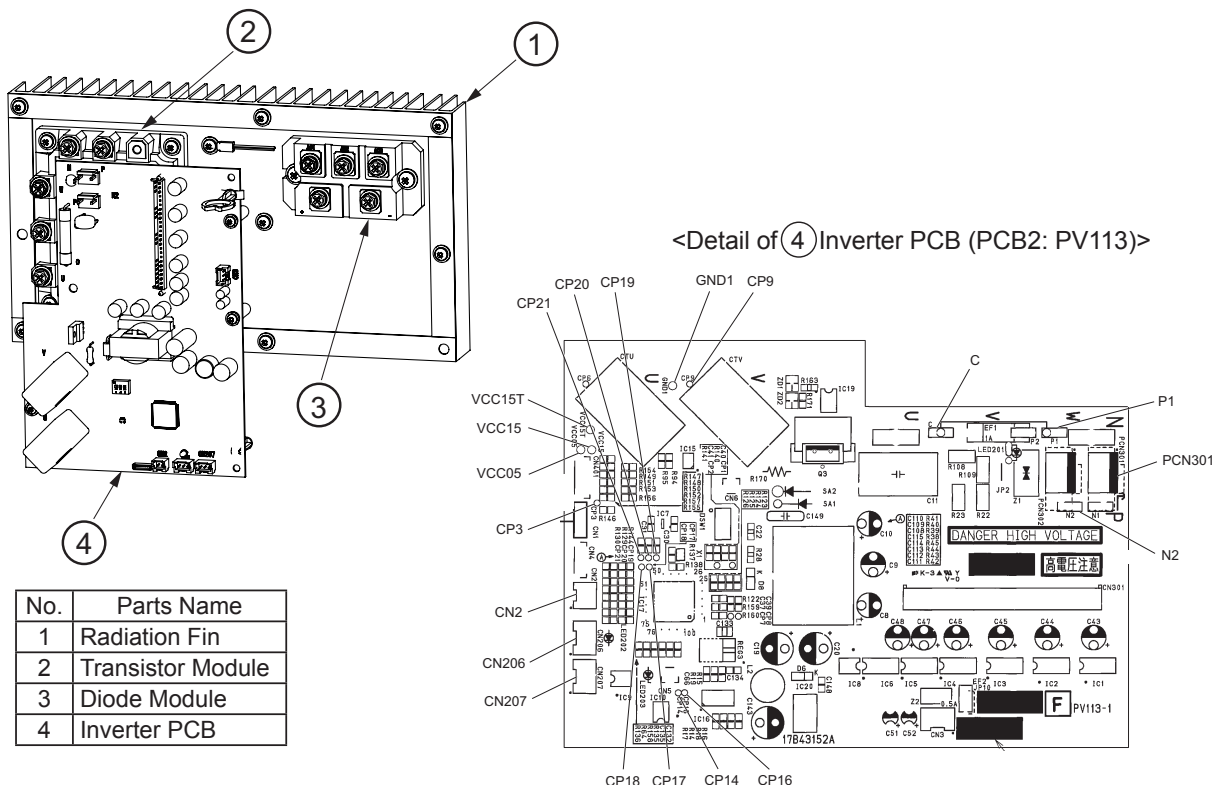
4.2.1.1 Inverter

• Specifications of Inverter

Applicable Model	(H,Y)VAHP072B31CW (H,Y)VAHP096B31CW	(H,Y)VAHP072B41CW (H,Y)VAHP096B41CW
Applicable Power Source	208-230V, 3PH, 60Hz	460V, 3PH, 60Hz
Output Voltage (Maximum)	208/230V	460V
Output Current (Maximum)	45A	23.5A
Inverter PCB		
Fan Controller	7A	7A
Control Method	Vector PWM Control	
Range Output Frequency	15 - 100Hz	
Inverter PCB		
Fan Controller	0 - 70Hz	
Accuracy of Frequency	0.01Hz	
Output / Characteristics	<p>Conditions:</p> <ol style="list-style-type: none"> Power Source Voltage AC 208V, 460V Non-Loading (Free Output) <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>(208V)</p> </div> <div style="text-align: center;"> <p>(460V)</p> </div> </div> <p>NOTE: Characteristics are fluctuated by the current minimize control.</p>	
Soft Start Stop	0.125Hz/S, 0.25Hz/S, 0.5Hz/S, 1Hz/S, 3Hz/S (5 Steps)	
Protection Function	<p>Excessive High or Low Voltage for Inverter</p> <p>In Case of 208-230V Excessive Low Voltage at a DC Voltage is Lower than 196V Excessive High Voltage at a DC Voltage is Higher than 376V</p> <p>In Case of 460V Excessive Low Voltage at a DC Voltage is Lower than 456V Excessive High Voltage at a DC Voltage is Higher than 752V</p>	
Abnormality of Current Sensor	<p>Stoppage at a current of compressor smaller than 1.5A</p> <p>Cause of Abnormality: Failure of Current Sensor Failure of Transistor Module Failure of Compressor Disconnected Wiring</p>	

Protection Function Overcurrent Protection for Inverter	<p>(1) Short-Circuit Trip of Arm (2) Instantaneous Overcurrent Trip (3) Instantaneous Overcurrent Trip (4) Electronic Thermal Trip</p> <p>When detecting current is more than rated current of Transistor Module, overcurrent is detected.</p> <p>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.</p>
Protection of Transistor Module (IPM)	<p>Transistor module (IPM) has four protection functions for self-protection.</p> <p>(1) Some of the output terminals between "U" and "V", "V" and "W", "W" and "U" have a short-circuit.</p> <p>(2) Running current reaches the maximum rated current.</p> <p>(3) Abnormal temperature is measured by internal thermistor.</p> <p>(4) Control voltage decreases abnormally.</p>
Overload Control	<p>Overload control at a current greater than (Rated Current x 105%).</p> <p>Overload control release at a current smaller than (Rated Current x 88%).</p>
Fin Temperature Increase	<p>The unit is stopped when the IPM temperature is higher than 90°C.</p>
Earth Detection	<p>The unit is stopped when the compressor is earthing.</p>

● Arrangement of Inverter Power Unit



(Main Parts)

● Protective Function

(1) Excessive High or Low Voltage for Inverter

(a) Level of Detection

① In case of 280-230V, 60Hz.

When the voltage of direct current is greater than 376V, 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 752V, abnormalities are detected.

When the voltage of direct current is smaller than 456V, abnormalities are detected.

(b) Function

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

(c) Cancellation of Protection Function

Transmission signal about stoppage cause is canceled when remote control switch is off or main power source is cut off.

(2) Abnormality of Current Sensor

(a) Level of Detection

① When the compressor operating frequency is between 15Hz and 18Hz after compressor is started, one of the effective value of running current at each phase is less than 1.5A (including 1.5A).

② The wave height value of running current for the phase positioning is less than 5A before the compressor is started (at completing the phase positioning).

(b) Function

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

(c) Cancellation of Protection Function

Transmission signal about stoppage cause is canceled when remote control switch is off or main power source is cut off.

(3) Overcurrent Protection for Inverter

(a) Level of Detection

① When the compressor current detected by current sensor exceeds the rated current of transistor module (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 of stoppage cause to outdoor unit PCB.

(c) Cancellation of Protection Function

Transmission signal about stoppage cause is canceled when remote control switch is off or main power source is cut off.

(4) Protection of Transistor Module (IPM)

(a) Level of Detection

① When some of the output terminals between "U" and "V", "V" and "W", "W" and "U" of transistor module (IPM) are short-circuited, an abnormality is detected.

② When the running current of transistor module (IPM) reaches the maximum rated current, an abnormality is detected.

③ When abnormal increase in temperature is measured by thermistor with internal transistor module (IPM), an abnormality is detected.

④ When the control voltage of transistor module (IPM) abnormally decreases, an abnormality is detected.

(b) Function

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

(c) Cancellation of Protection Function

Transmission signal about stoppage cause is canceled when remote control switch is off or main power source is cut off.

(5) Fin Temperature Increase

- (a) Level of Detection
When the temperature of internal thermistor exceeds 90°C, an abnormality is detected.
- (b) Function
When abnormalities are detected, the inverter compressor is stopped and the signal code of stoppage cause is transmitted to outdoor unit PCB.
- (c) Cancellation of Protection Function
Transmission signal about stoppage cause is canceled when remote control switch is off or main power source is cut off.

(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 transistor module (IPM) are short-circuited, abnormalities are detected.
- (b) Function
When abnormalities are detected, the inverter compressor is stopped and the signal code of stoppage cause is transmitted to outdoor unit PCB.
- (c) Cancellation of Protection Function
Transmission signal about stoppage cause is canceled when remote control switch is off or main power source is cut off.

● 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 frequency order is smaller than the maximum value, the operation is performed according to the order.
- (c) Cancellation of Protection Function
After the operation described in the above item (b) is performed for 10 seconds, this control is canceled.

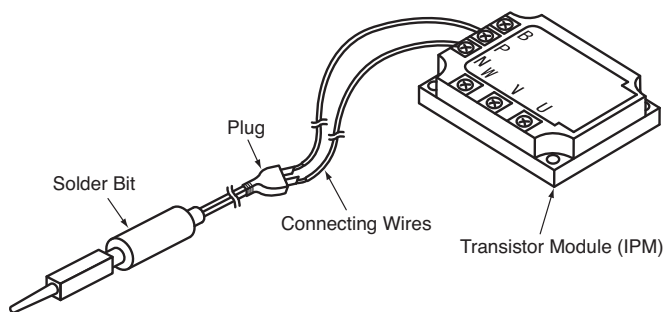
- High Voltage Discharge Work for Replacing Parts

⚠ CAUTION

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

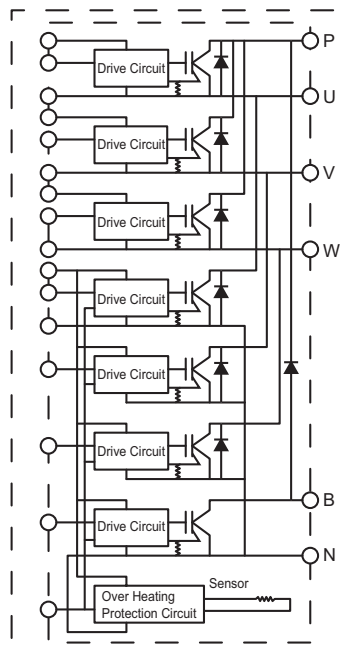
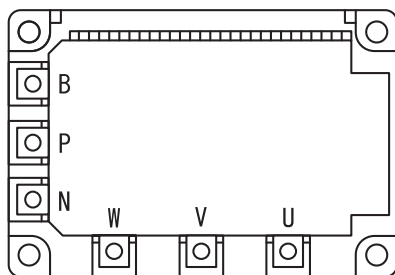
< Procedures >

- Turn OFF the main switches and wait for three minutes. Check to ensure that no high voltage exists. If LED201 is ON after start-up and LED201 is OFF after turning OFF power source, the voltage will decrease to DC50V or less.
- Connect connecting wires to an electrical solder bit.
- Connect the wires to terminals, P and N on IPM. ⇒ Discharging is started, resulting in hot solder bit. Take special care to avoid short circuit between terminal P and N.
- Wait for two or three minutes and measure the voltage again. Check to ensure that no voltage is charged.



(1) Checking Method of Transistor Module (IPM)

Outer Appearance and Internal Circuit of Transistor Module

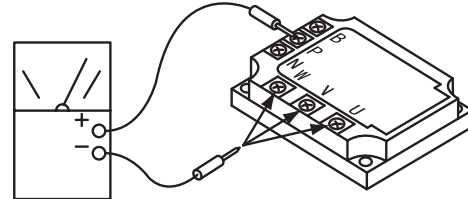


Remove all the terminals of the transistor module before checking. If procedures (a) to (d) are performed and the results are satisfactory, the transistor module is normal. Measure it under 1k Ω range of a tester.

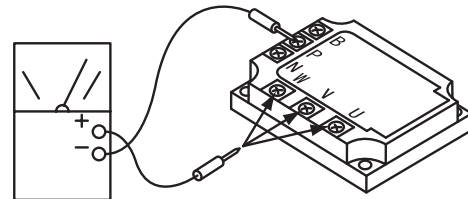
NOTICE

Do not use a digital tester.

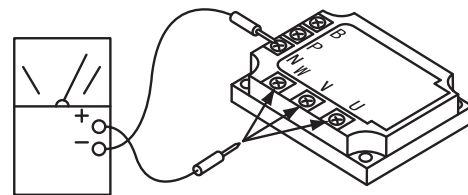
- (a) By touching the + side of the tester to the P terminal of transistor module and the - side of tester to U, V, and W of the transistor module, measure the resistance. If all the resistances are from 1 to 5k Ω , it is normal.



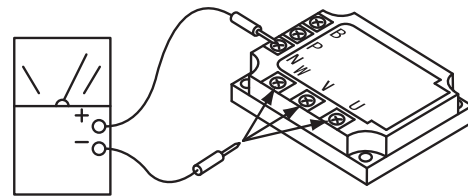
- (b) By touching the - side of the tester to the P terminal of transistor module and the + side of tester to U, V, and W of the transistor module, measure the resistance. If all the resistances are greater than 100k Ω , it is normal.



- (c) By touching the - side of the tester to the N terminal of transistor module and the + side of tester to U, V, and W of the transistor module, measure the resistance. If all the resistances are from 1 to 5k Ω , it is normal.

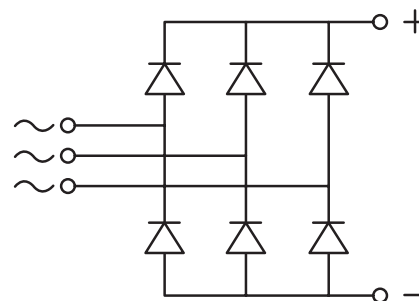
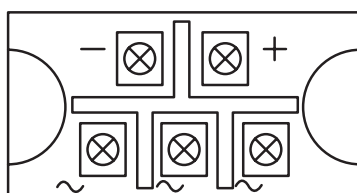


- (d) By touching the + side of the tester to the N terminal of transistor module and the - side of tester to U, V, and W of the transistor module, measure the resistance. If all the resistances are greater than 100k Ω , it is normal.



(2) Checking Method of Diode Module (DM)

Outer Appearance and Internal Circuit of Diode Module

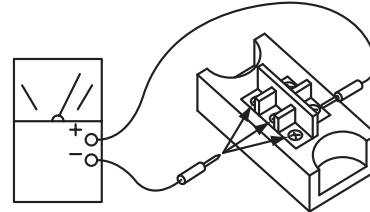


If procedures (a) to (d) are performed and the results are satisfactory, the diode module is normal. Measure it under 1k Ω range of a tester.

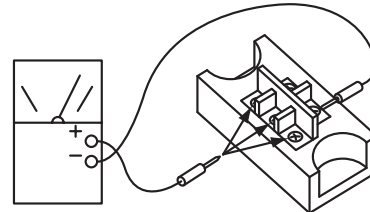
NOTICE

Do not use a digital tester.

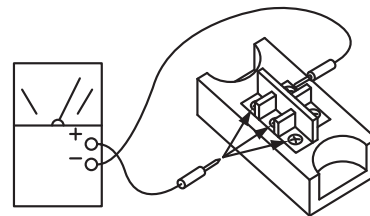
- (a) By touching the + side of the tester to the + terminal of diode module and the - side of tester to the ~ terminals (3 NOs.) of the diode module, measure the resistance. If all the resistances are from 5 to 50k Ω , it is normal.



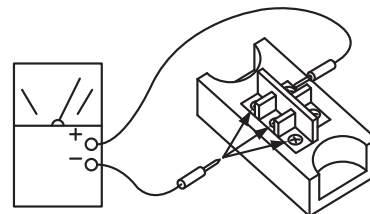
- (b) By touching the - side of the tester to the + terminal of diode module and the + side of tester to the ~ terminals (3 NOs.) of the diode module, measure the resistance. If all the resistances are greater than 500k Ω , it is normal.



- (c) By touching the - side of the tester to the - terminal of diode module and the + side of tester to the ~ terminals (3 NOs.) of the diode module, measure the resistance. If all the resistances are from 5 to 50k Ω , it is normal.



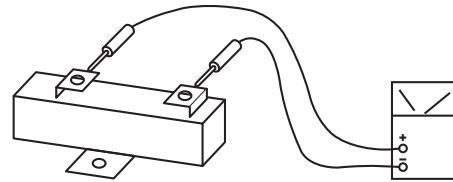
- (d) By touching the + side of the tester to the - terminal of diode module and the - side of tester to the ~ terminals (3 NOs.) of the diode module, measure the resistance. If all the resistances are greater than 500k Ω , it is normal.



(3) Checking Method of Resistor

Measure the resistance of both ends of resistor as shown in the figure.
If the resistance is $\infty\Omega$, it is abnormal.

Resistance		208/230V	460V
For Inverter	RS	0.5k Ω	-
	RS1	-	0.5k Ω
	RS2	-	0.5k Ω
	R1	-	9.7k Ω
	R2	-	12.0k Ω

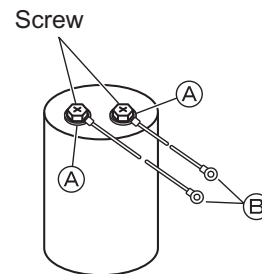


(4) Checking Method of Capacitor

- (a) Check that the screws are connected tightly.
- (b) Check that the capacitor is not tarnished or expanded.

* When checking the capacitor, disconnect the terminals (B).
Do not disconnect the terminals (A).

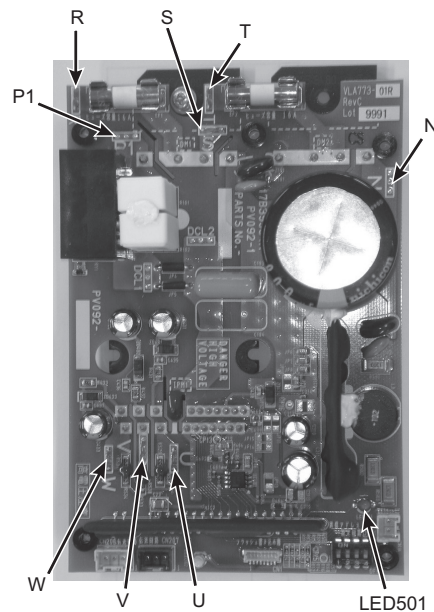
Capacitance	208/230V/60Hz	460V/60Hz
For Inverter	4700 μ F	4700 μ F
For Fan Controller	-	2700 μ F



(5) Checking of Fan Controller

- (a) Turn OFF the power source before this work.
Also ensure that LED501 (red) on the fan controller is turned OFF.
If LED501 is turned ON, an electrical shock may occur because of residual voltage over DC 50V
- (b) Disconnect all the wirings connected to the fan controller.
Measure the resistance between terminals using a tester. (Do not use a digital tester.)
When measuring the resistance, check the color of the tester probe and the terminals to be measured as shown in the table below.

Tester Probe Red (+) - Black (-)	Resistance Range
P1 - R P1 - S P1 - T R - N S - N T - N P1 - U P1 - V P1 - W U - N V - N W - N	1 k Ω and over
R - P1 S - P1 T - P1 N - R N - S N - T U - P1 V - P1 W - P1 N - U N - V N - W	Resistance will gradually increase once after it is between 1700 k Ω to 1900 k Ω . (*)



(*) Measure the resistance of each terminal at intervals of 30 seconds or longer.

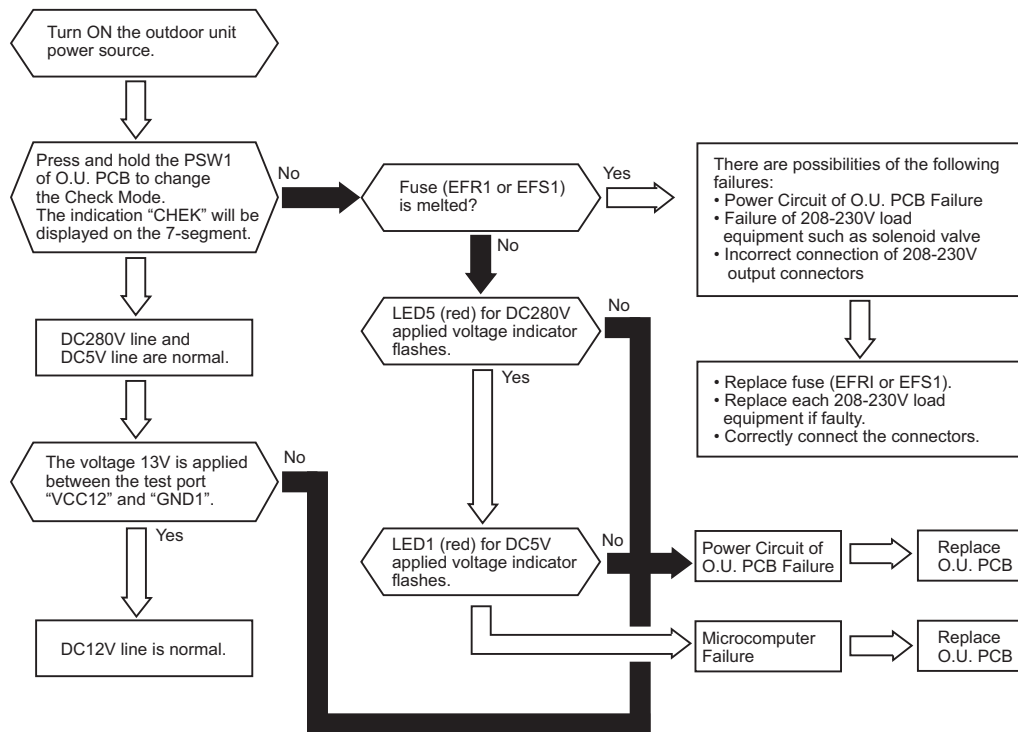
< DSW Initial Setting >

DSW1			
1	2	3	4
OFF	OFF	OFF	OFF

Do not change the DSW setting from the original setting. Abnormal communication and fan controller failure may occur if the setting is changed.

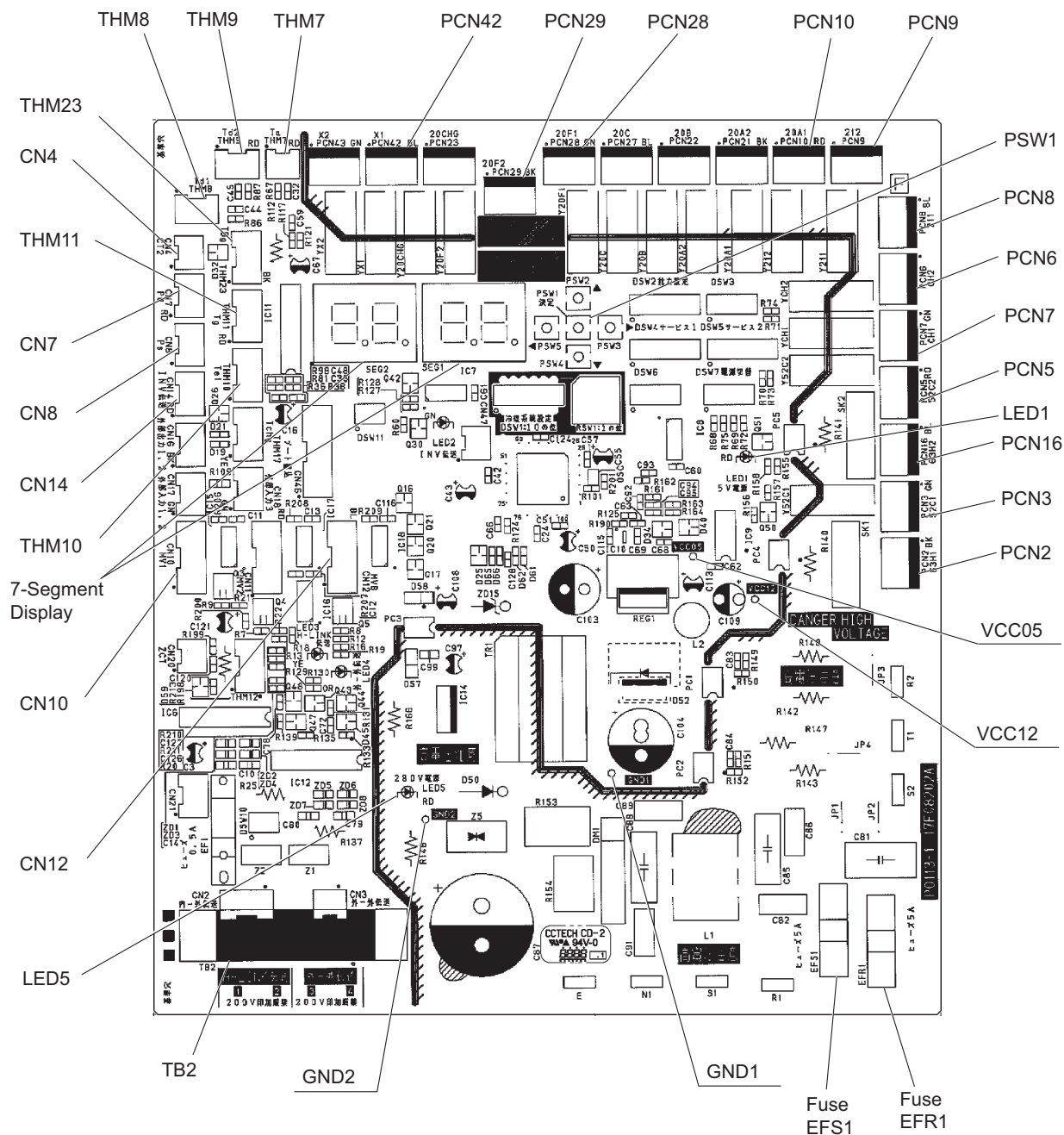
4.2.1.2 Printed Circuit Board

• Checking Procedures for Outdoor Unit PCB



● PCB1 (PO113)

Arrangement of Connectors and Check Points.



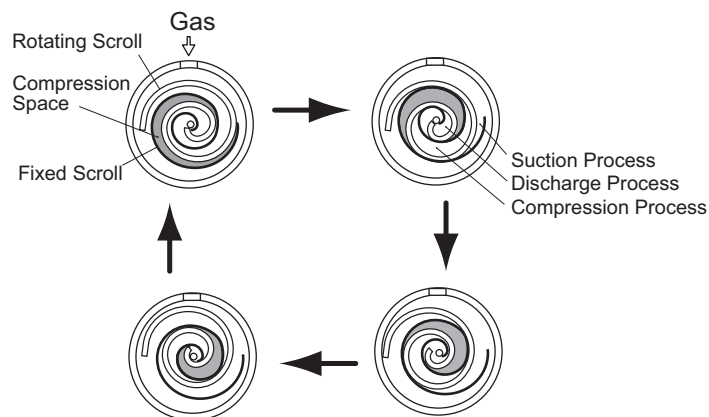
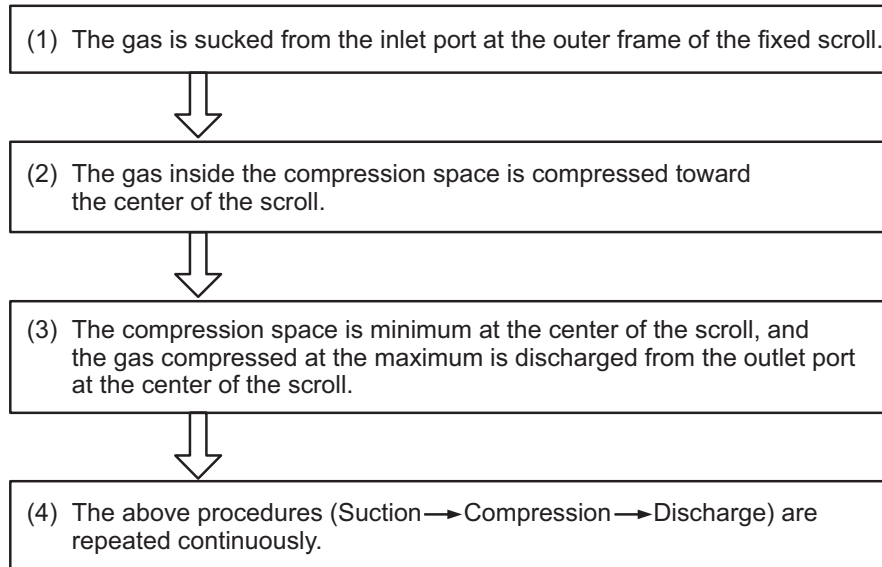
(Main Parts)

4.2.1.3 Scroll Compressor

- Reliable Mechanism for Low Vibration and Low Sound

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

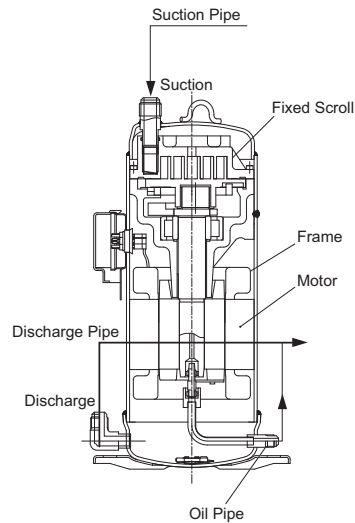
- Principle of Compression



● 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	Inverter Compressor	Fixed Speed Compressor	Total
(H,Y)VAHP072B31CW (H,Y)VAHP096B31CW (H,Y)VAHP072B41CW (H,Y)VAHP096B41CW	EK655DHD x1	EK655DH x1	2

NOTE:

Seen from the front side of the unit, the one compressor at the left is the inverter compressor and the other compressor is the constant speed type.

● Checking of Compressor Motor

Name of Parts	Model	Resistance (Ω)
Compressor Motor (for Inverter Compressor)	EK655DHD	0.199 (208-230V/60Hz) at 167°F(75°C) 0.839 (460V/60Hz) at 167°F(75°C)
Compressor Motor (for Fixed Speed Compressor)	EK655DH	0.707 (208-230V/60Hz) at 167°F(75°C) 2.907 (460V/60Hz) at 167°F(75°C)

MAINTENANCE

(Main Parts)

- 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. are greatly different from the indication (Td1, Td2) during check mode.		
3	Are connectors for current sensor correctly connected?	(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	Is current sensor faulty?			
5	Is current sensing part on inverter PCB faulty?			
6	Is the direction of current sensor (CTU, CTV) reverse?	Check the direction ⇒ by viewing.		
7	Are power source wires, U and V inserted correctly into current sensor?	Check to ensure that wires are correctly inserted.		
8	Are expansion valves (MV1 and MVB) correctly connected?	Check to ensure that MV1 to CN10 and MVB to CN12 are correctly connected.		
9	Are expansion valve coils (MV1 and MVB) correctly installed?	Check to ensure that each coil is correctly installed on the valve.		
10	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.		
11	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		
12	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.		
13	Are the contacts for comp. magnetic switch CMC1 and CMC2 faulty?	Check the surface of each contact.		
14	Is there any voltage abnormality among L1-L2, L2-L3 and L3-L1?	Check to ensure that voltage imbalance is smaller than 3%. Please note that power source voltage must be within 208/230V or 460V±10%.		
15	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.

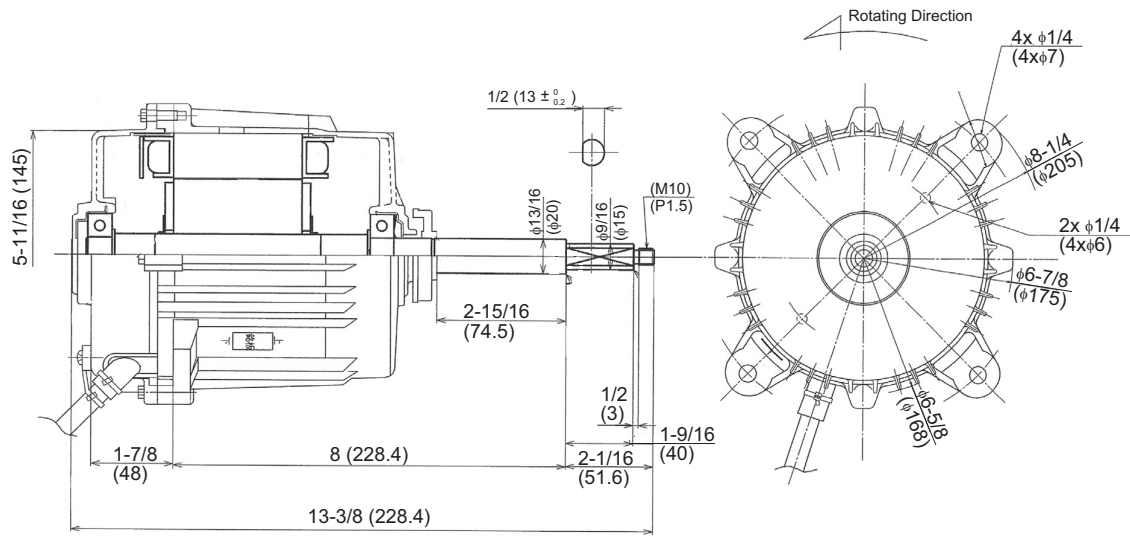
Additional Information for “CHECK LIST ON COMPRESSOR”

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, 4, 5	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.
6, 7	The current sensor checks phase and adjusts output electrical wave in addition to the above mentioned items. If fault occurs, the output electrical wave becomes unstable giving stress to the motor winding, resulting in winding insulation failure.
8, 9	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. If expansion valves are incorrectly connected, correct control is not available, resulting in compressor seizure depending on liquid refrigerant returning conditions or motor winding insulation failure depending on overheating conditions.
10	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.
11	For additional information, refer to page 4-67 in this document.
12	The compressor may be locked due to the liquid return operation during the cooling operation.
13	If the contacting resistance increases, voltage imbalance among each phase will cause abnormal overcurrent.
14	In this case, overcurrent will occur, efficiency will decrease or the motor winding will be excessively heated.
15	In this case, it will result in motor burning or compressor seizure.

MAINTENANCE

(Main Parts)

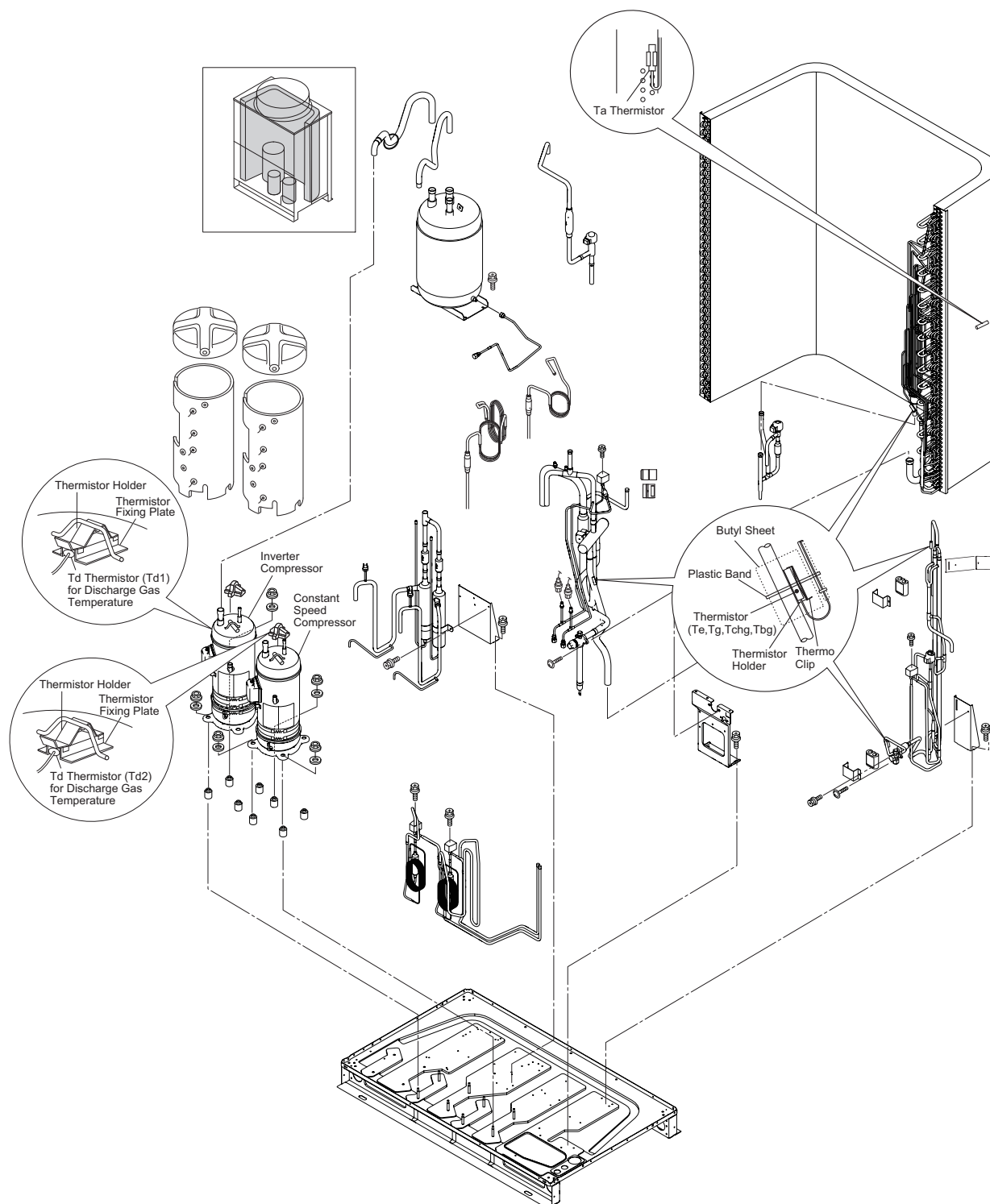
4.2.1.4 Fan Motor



Name of Parts	Model	Electrical Wiring Diagram	Wiring No.	Resistance (Ω)
DC Fan Motor for Outdoor Unit (H,Y)VAHP072B(3,4)1CW (H,Y)VAHP096B(3,4)1CW	ECW8802AHS 1200W	<p>U: Red V: White W: Black</p>	White-Black Black-Red Red-White	0.794±5% at 68°F(20°C)

4.2.1.5 Thermistor

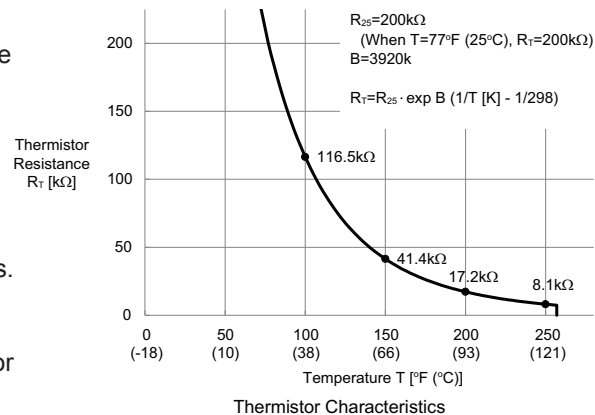
(1) Position of Thermistor



(Main Parts)

(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 and lubricating properties deteriorate, resulting in short compressor life.
- b. If discharge gas temperature increases excessively, compressor temperature increases. At the worst, compressor motor winding will be burnt out.
- c. When the upper part temperature of compressor increases during heating operation, the unit is controlled according to the following method.
 - An electronic expansion valve of outdoor units is (are) opened to return the liquid refrigerant to the compressor through the accumulator, decreasing compressor temperature.
 - If the compressor upper part temperature increases exceeding 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

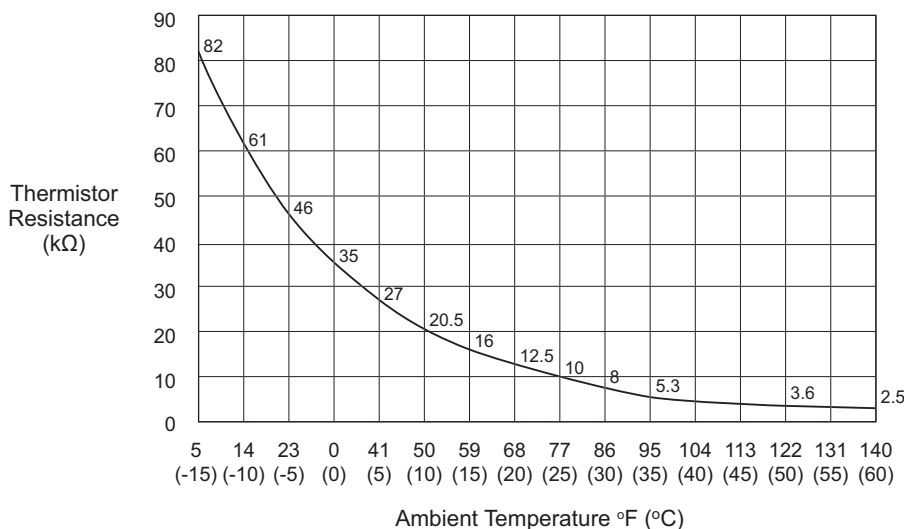
The thermistor resistance characteristics are shown in the figure below.

(4) Thermistor for Evaporating Temperature of Outdoor Unit in Heating Operation (For Defrosting)

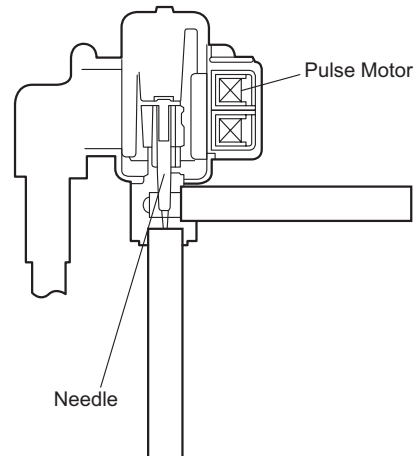
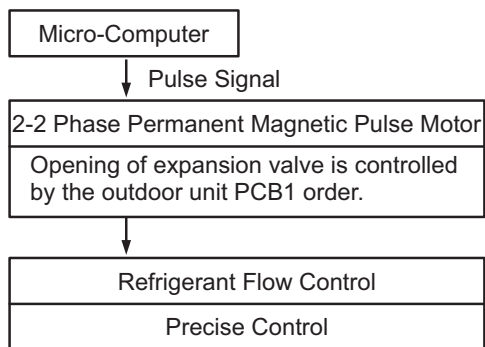
The characteristics for the thermistor are the same as those of outdoor ambient temperature thermistor shown in the figure below.

(5) Thermistor for Super Cooling Bypass and Main Line Temperature of Outdoor Unit

The characteristics for the thermistor are the same as those of outdoor ambient temperature thermistor shown in the figure below.



4.2.1.6 Electronic Expansion Valve



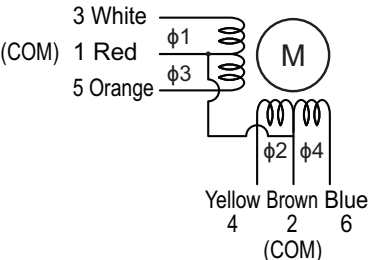
• Specifications for MV1

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	<div style="display: flex; align-items: flex-start;"> <div style="flex: 1;"> </div> <div style="flex: 1;"> <table border="1"> <thead> <tr> <th>Phase</th><th>1</th><th>2</th><th>3</th><th>4</th></tr> </thead> <tbody> <tr> <td>φ1</td><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td></tr> <tr> <td>φ2</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td></tr> <tr> <td>φ3</td><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td></tr> <tr> <td>φ4</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td></tr> </tbody> </table> <p>OPEN: 4 → 3 → 2 → 1 → 4 CLOSE: 1 → 2 → 3 → 4 → 1</p> </div> </div> <p>< 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))</p>				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
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																									

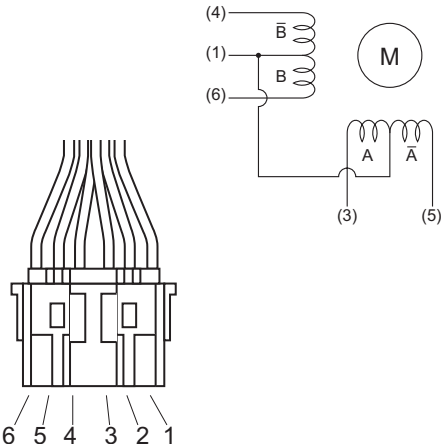
MAINTENANCE

(Main Parts)

• Specifications for MV2

Model	HDM-BD120HS-1																																													
Working Temperature Range	-13°F to 140°F (-25°C to 60°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	30 - 90 PPS 1-2 Phase Excitation																																													
Coil Resistance	46Ω (at 68°F (20°C))																																													
Insulation Class	Class E																																													
Wiring Diagram, Drive Circuit and Activation Mode	<div><div><div>3 White (COM) 1 Red 5 Orange</div><div></div><div>Yellow Brown Blue 4 2 6 (COM)</div></div><div><table><tr><th>Phase</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th></tr><tr><td>φ1</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td></tr><tr><td>φ2</td><td>OFF</td><td>ON</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td></tr><tr><td>φ3</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td></tr><tr><td>φ4</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>ON</td></tr></table><div>OPEN: 8 → 7 → 6 → 5 → 4 → 3 → 2 → 1 CLOSE: 1 → 2 → 3 → 4 → 5 → 6 → 7 → 8</div></div></div> <div><p>< Checking Method ></p><p>Measure the coil resistances between Red (common) and each phase. The measured resistance value is normal if approximately 100Ω *).</p><p>(*): Ambient Temperature 68°F (20°C))</p></div>	Phase	1	2	3	4	5	6	7	8	φ1	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	φ2	OFF	ON	ON	ON	OFF	OFF	OFF	OFF	φ3	OFF	OFF	OFF	ON	ON	ON	OFF	OFF	φ4	OFF	OFF	OFF	OFF	OFF	ON	ON	ON
Phase	1	2	3	4	5	6	7	8																																						
φ1	ON	ON	OFF	OFF	OFF	OFF	OFF	ON																																						
φ2	OFF	ON	ON	ON	OFF	OFF	OFF	OFF																																						
φ3	OFF	OFF	OFF	ON	ON	ON	OFF	OFF																																						
φ4	OFF	OFF	OFF	OFF	OFF	ON	ON	ON																																						

• Specifications for MVB

Model	Body: UKV25-D26, Motor for EXPV: UKV-A035																																																																		
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	<div><p>Phase (Connection No.)</p><table><tr><th>Phase (Connection No.)</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th></tr><tr><td>A (3)</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td></tr><tr><td>\bar{B} (4)</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td></tr><tr><td>\bar{A} (5)</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td></tr><tr><td>B (6)</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td></tr></table><p>Valve Operation Direction → Open ← Close</p><p>Order of Excitation (1-2 Phase Excitation)</p><table><tr><th>Connector No.</th><th>Color of Lead Wire</th><th>Phase</th></tr><tr><td>1</td><td>Gray</td><td>Common (+)</td></tr><tr><td>2</td><td>-</td><td>-</td></tr><tr><td>3</td><td>Orange</td><td>A</td></tr><tr><td>4</td><td>Black</td><td>B</td></tr><tr><td>5</td><td>Yellow</td><td>\bar{A}</td></tr><tr><td>6</td><td>Red</td><td>\bar{B}</td></tr></table><p>< Checking Method > Measure the coil resistances between connector No.1 (common) and each phase. The measured resistance value is normal if approximately 46Ω *). (*): Ambient Temperature 68°F (20°C))</p></div>	Phase (Connection No.)	1	2	3	4	5	6	7	8	A (3)	ON	OFF	ON	OFF	ON	OFF	ON	OFF	\bar{B} (4)	OFF	ON	OFF	ON	OFF	ON	OFF	ON	\bar{A} (5)	ON	OFF	ON	OFF	ON	OFF	ON	OFF	B (6)	OFF	ON	OFF	ON	OFF	ON	OFF	ON	Connector No.	Color of Lead Wire	Phase	1	Gray	Common (+)	2	-	-	3	Orange	A	4	Black	B	5	Yellow	\bar{A}	6	Red	\bar{B}
Phase (Connection No.)	1	2	3	4	5	6	7	8																																																											
A (3)	ON	OFF	ON	OFF	ON	OFF	ON	OFF																																																											
\bar{B} (4)	OFF	ON	OFF	ON	OFF	ON	OFF	ON																																																											
\bar{A} (5)	ON	OFF	ON	OFF	ON	OFF	ON	OFF																																																											
B (6)	OFF	ON	OFF	ON	OFF	ON	OFF	ON																																																											
Connector No.	Color of Lead Wire	Phase																																																																	
1	Gray	Common (+)																																																																	
2	-	-																																																																	
3	Orange	A																																																																	
4	Black	B																																																																	
5	Yellow	\bar{A}																																																																	
6	Red	\bar{B}																																																																	

• Checking Method of Electronic Expansion Valve

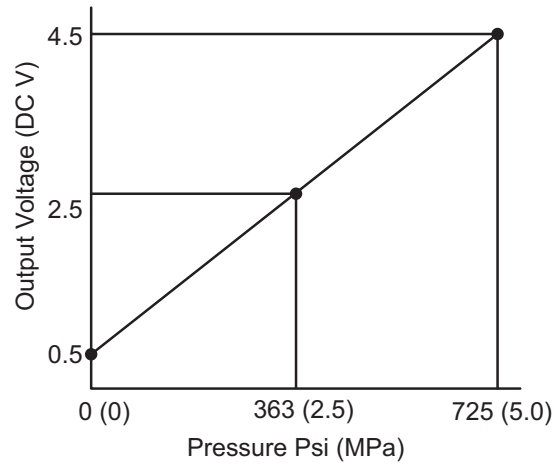
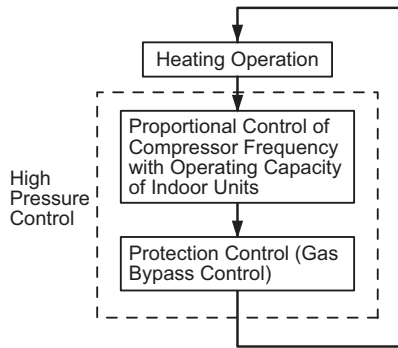
Outdoor Unit Electronic Expansion Valve	
Locked (Fully Closed)	It is abnormal if the liquid pipe pressure does not increase during cooling operation
Locked (Slightly Open)	It is abnormal if the liquid pipe pressure does not increase and the outlet temperature of the expansion valve decreases after the 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 and there is no other fault such as excessive charge of refrigerant.

(Main Parts)

4.2.1.7 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; gas by-pass control.

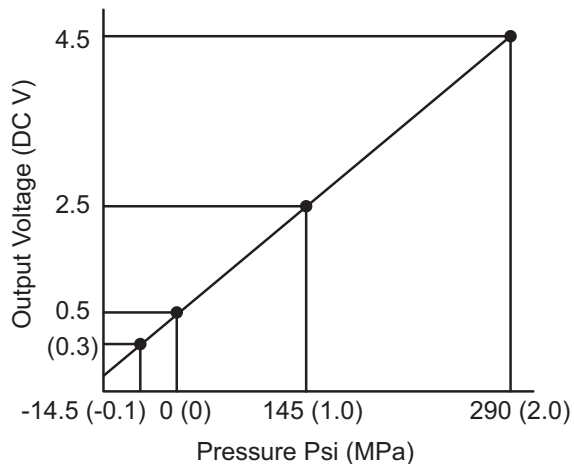
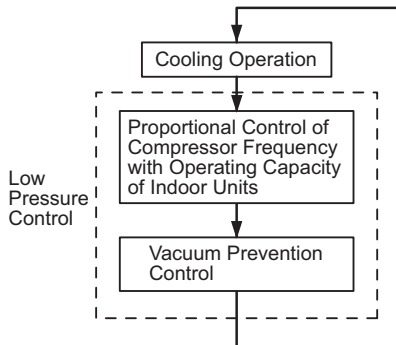


Output Characteristics of High Pressure Sensor

(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.

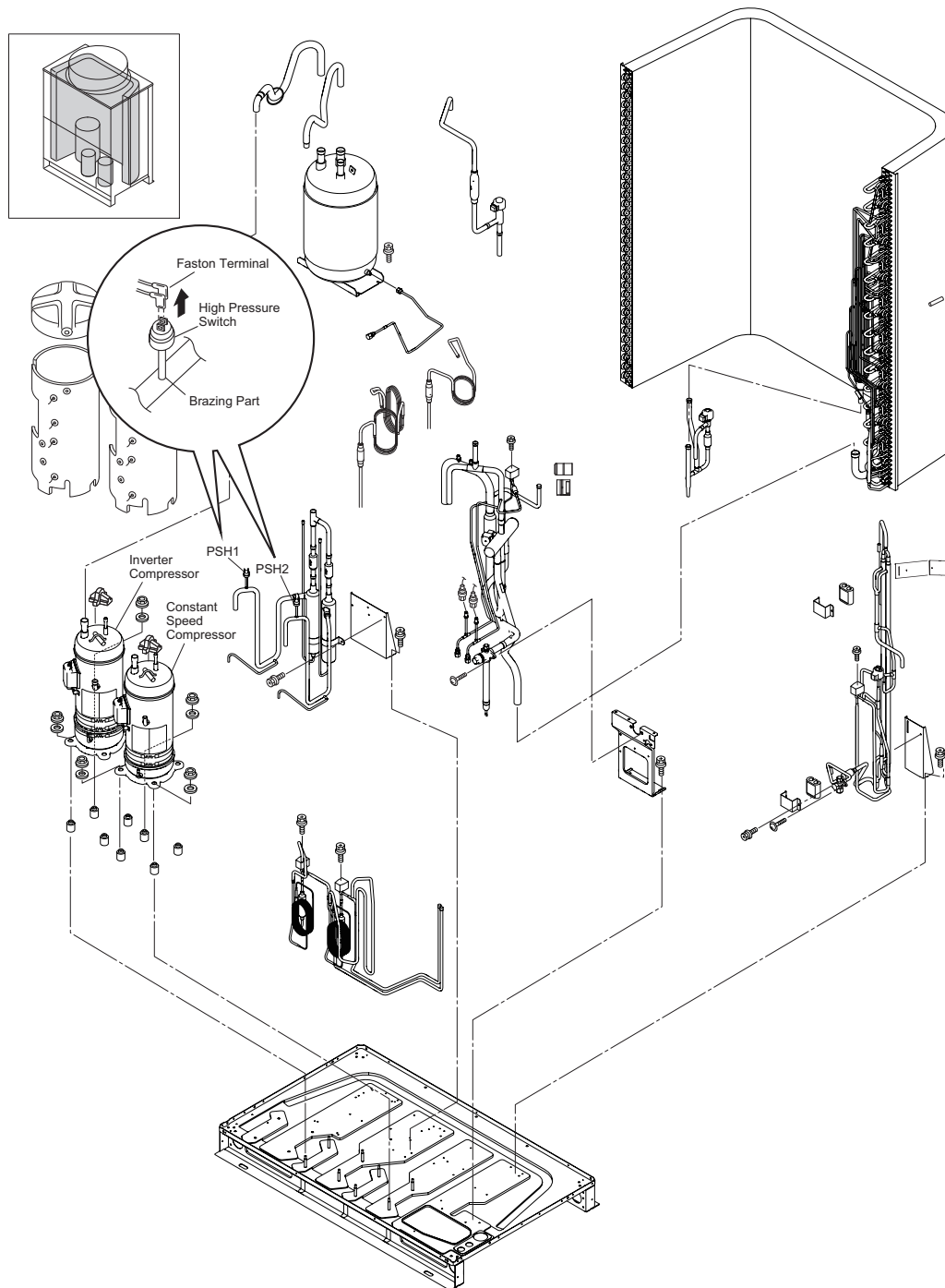
If the suction pressure is excessively low, the cooling can be insufficient and parts composing the refrigeration cycle can be damaged. For this reason, if the output of the low pressure sensor indicates vacuum and the value is maintained for 12 minutes or longer, the compressor is stopped for the purpose of protection.



Output Characteristics of Low Pressure Sensor

4.2.1.8 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, in case that the discharge pressure is higher than 601psi (4.15MPa) (R410A), the protection control is activated, and the compressor is stopped.



MAINTENANCE

(Main Parts)

4.2.1.9 Electrical Coil Parts

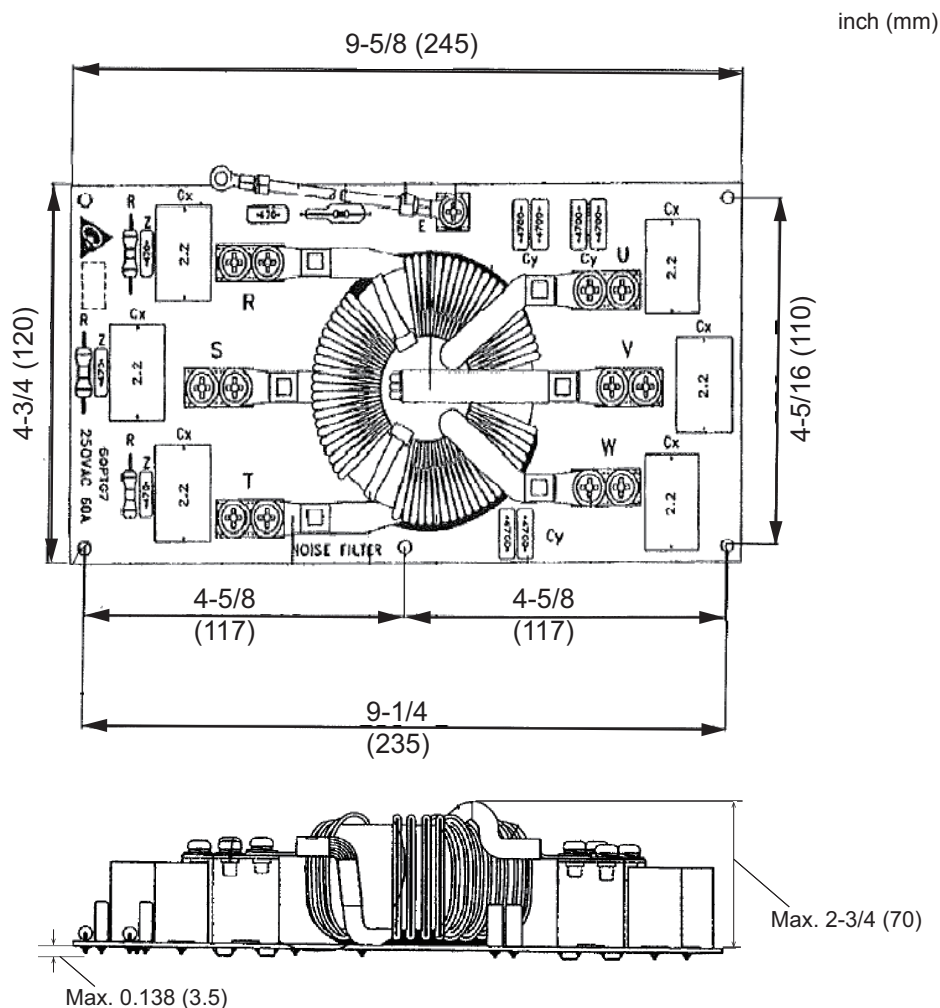
Name of Parts	Model		Resistance (Ω)
Solenoid Valve for Gas Bypass	Coil	SR10PA (Coil + Body Set Model)	1,250 at 68°F (20°C)
	Body		
Reversing Valve	Coil	STF-H01AQ3004UAA1	-
	Body	STF-H07U12	

4.2.1.10 Noise Filter (NF1, NF2)

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

(1) Noise Filter (208/230V 60Hz; NF1)

Items	Specifications
Model	EFFQ-60TT-01
Rated Current	AC250V 60A
Permissible Temperature Range	-13°F (-25°C) to 185°F (85°C)
Circuit Diagram	

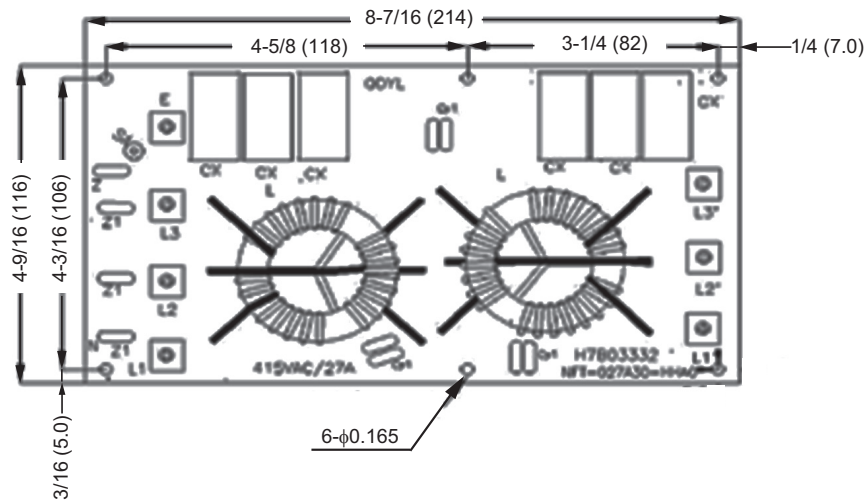


MAINTENANCE

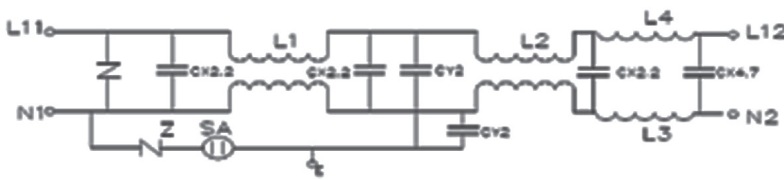
(Main Parts)

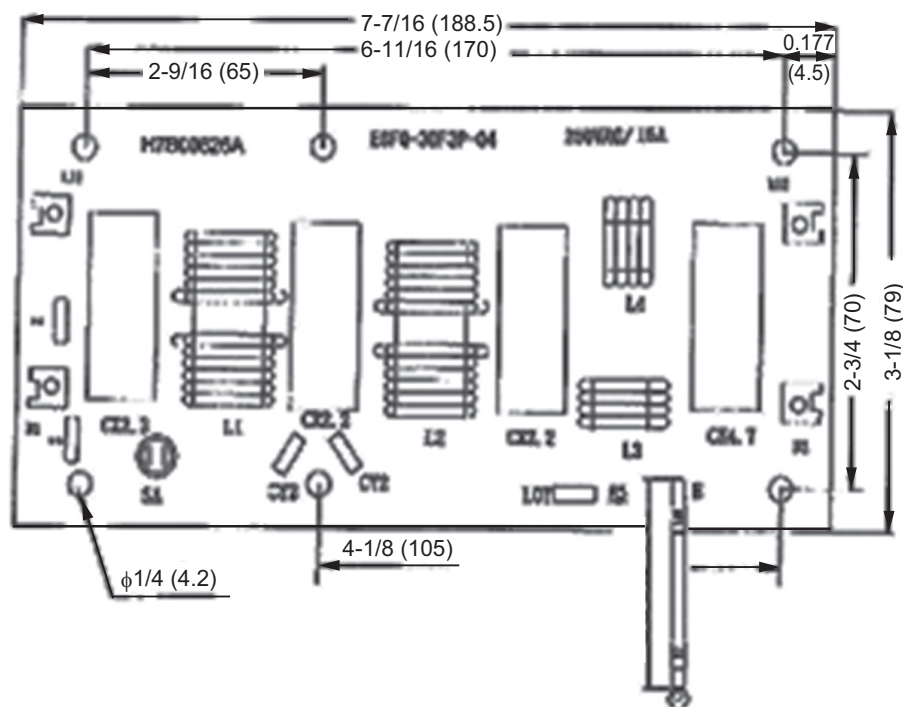
(2) Noise Filter (460V 60Hz; NF1)

Items	Specifications
Model	NFT-027A30-HHAO
Rated Current	AC 460V 27A
Permissible Temperature Range	-13°F (-25°C) to 149°F (65°C)
Circuit Diagram	



(3) Noise Filter (460V 60Hz; NF2)

Items	Specifications
Model	ESFQ-30F3P-04
Rated Current	AC220V 15A
Permissible Temperature Range	-13°F (-25°C) to 140°F (60°C)
Circuit Diagram	



MAINTENANCE

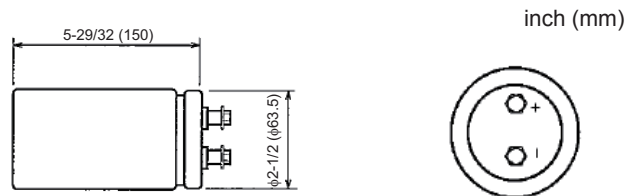
(Main Parts)

4.2.1.11 Capacitor (CB, CB1, CB2, CB3)

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

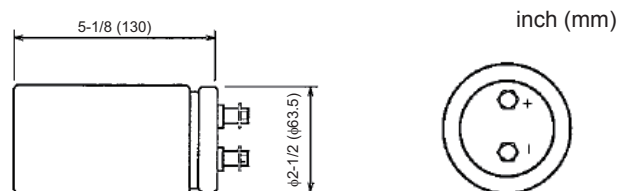
(1) Capacitor for Inverter (208/230V 60Hz; CB) (460V 60Hz; CB1, CB2)

Items	Specifications
Model	LNx2W472MSEaHE
Capacity of Static Electricity	4700 μ F
Rated Voltage	450V
Permissible Temperature Range	-13°F (-25°C) to 185°F (85°C)



(2) Capacitor for Fan Controller (460V 60Hz; CB3)

Items	Specifications
Model	ELXR451LGC272MDD0M, LNT2W272MSEaHE
Capacity of Static Electricity	2700 μ F
Rated Voltage	450V
Permissible Temperature Range	-13°F (-25°C) to 221°F (105°C)



(3) Checking Method of Capacitor

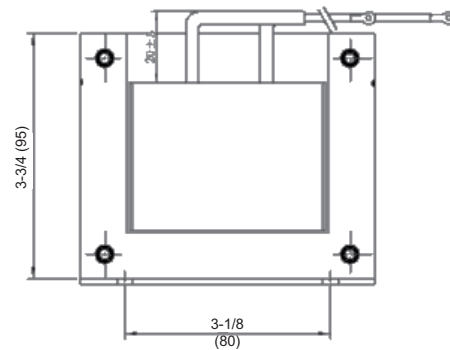
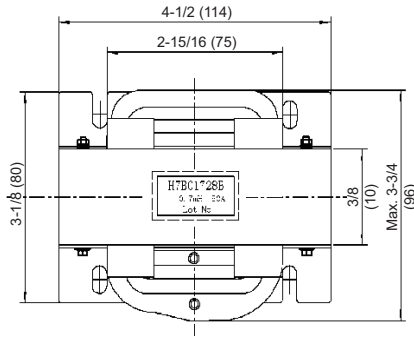
Refer to Section 4.2.1.1 "Inverter / • High Voltage Discharge Work for Replacing Parts (4)"

4.2.1.12 Reactor (DCL, DCL1, DCL2)

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

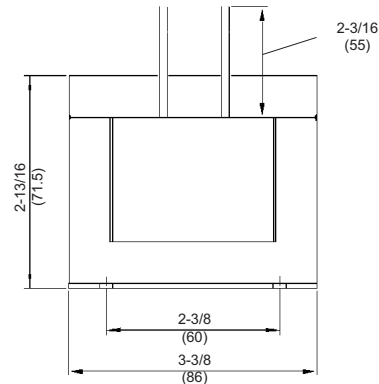
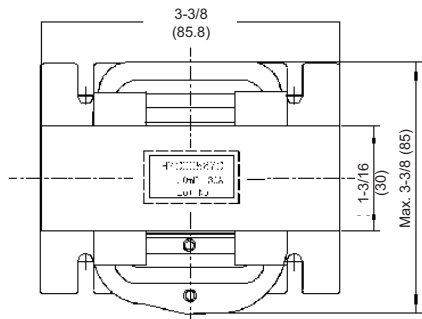
(1) Reactor for Inverter (208/230V 60Hz; DCL)

Items	Specifications
Character	0.7mH \pm 10% (1KHz)
Rated Current	50A
Direct Current Resistance	11.2m Ω \pm 20% (77°F (25°C))
Permissible Temperature Range	Max. 230°F (110°C)



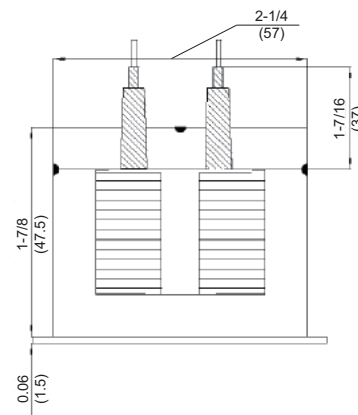
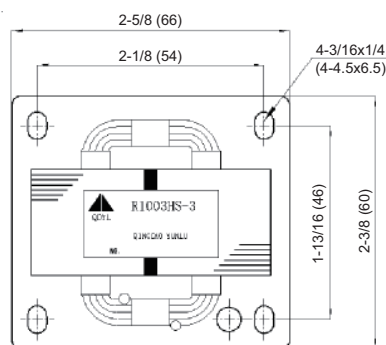
(2) Reactor for Inverter (460V 60Hz; DCL1)

Items	Specifications
Character	1.0mH \pm 10% (1KHz)
Rated Current	30A
Direct Current Resistance	22.8m Ω \pm 20% (77°F (25°C))
Permissible Temperature Range	Max. 230°F (110°C)



(3) Reactor for Fan Controller

Items	Specifications
Character	3.0mH \pm 10% (1KHz)
Rated Current	10A
Direct Current Resistance	Max. 104m Ω (68°F (20°C))
Permissible Temperature Range	Max. 158°F (70°C)



5. External Input/Output and Function Setting

5.1 DIP Switch Settings of Outdoor Unit

TURN OFF all power sources before setting.

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

(However, DSW4-No.1, 2, 4, 6, DSW7-No.4 and push switches can be operated when the power source is ON.)

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

• Initial Setting

Arrangement of Dip Switches		Push Switches																					
DSW1 Ref. Cycle No. Setting Setting is required. Setting Before Shipment Tens Digit Last Digit Set the unit number of outdoor unit at each refrigerant cycle. (Setting before shipment is unit 0.)		DSW2 Capacity Setting No setting is required. <table border="1"> <thead> <tr> <th>Capacity [x 1000 Btu/h]</th> <th>72</th> <th>96</th> </tr> </thead> <tbody> <tr> <td>DSW2 Setting</td> <td> </td> <td> </td> </tr> </tbody> </table>		Capacity [x 1000 Btu/h]	72	96	DSW2 Setting																
Capacity [x 1000 Btu/h]	72	96																					
DSW2 Setting																							
DSW4 Test Run and Service Setting Setting is required. For Test Run, Function Setting and External Input/Output Setting Setting Before Shipment <table border="1"> <thead> <tr> <th>Setting Item</th> <th>Pin No.</th> </tr> </thead> <tbody> <tr> <td>Test Cooling Operation</td> <td>1</td> </tr> <tr> <td>Test Heating Operation</td> <td>1, 2</td> </tr> <tr> <td>Compressor Forced Stop and Function Setting</td> <td>4</td> </tr> <tr> <td>External Input/Output Setting</td> <td>4, 6</td> </tr> </tbody> </table>		Setting Item	Pin No.	Test Cooling Operation	1	Test Heating Operation	1, 2	Compressor Forced Stop and Function Setting	4	External Input/Output Setting	4, 6	DSW5 Emergency Operation / Test Run and Service / High Static Pressure Mode Setting No setting is required. Turn ON the dip switch when use the below functions. Setting Before Shipment <table border="1"> <thead> <tr> <th>Setting Item</th> <th>Pin No.</th> </tr> </thead> <tbody> <tr> <td>Except No.1 Comp. Operation</td> <td>1</td> </tr> <tr> <td>Except No.2 Comp. Operation</td> <td>2</td> </tr> <tr> <td>Refrigerant Amount Judgement</td> <td>4</td> </tr> <tr> <td>High Static Pressure Mode ※</td> <td>5</td> </tr> </tbody> </table> <p>※ IMPORTANT NOTICE In case of installing the air outlet duct kit (field-supplied), make sure to turn ON DSW5-No.5.</p>		Setting Item	Pin No.	Except No.1 Comp. Operation	1	Except No.2 Comp. Operation	2	Refrigerant Amount Judgement	4	High Static Pressure Mode ※	5
Setting Item	Pin No.																						
Test Cooling Operation	1																						
Test Heating Operation	1, 2																						
Compressor Forced Stop and Function Setting	4																						
External Input/Output Setting	4, 6																						
Setting Item	Pin No.																						
Except No.1 Comp. Operation	1																						
Except No.2 Comp. Operation	2																						
Refrigerant Amount Judgement	4																						
High Static Pressure Mode ※	5																						
DSW6 Outdoor Unit No. Setting Setting is required. <p>IMPORTANT NOTICE The outdoor unit is not single, the combination setting is necessary. Be sure to do this setting.</p> Single Setting (Setting Before Shipment) Combination Setting <table border="1"> <thead> <tr> <th>Unit A (No.0 Unit)</th> <th>Unit B (No.1 Unit)</th> <th>Unit C (No.2 Unit)</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>				Unit A (No.0 Unit)	Unit B (No.1 Unit)	Unit C (No.2 Unit)																	
Unit A (No.0 Unit)	Unit B (No.1 Unit)	Unit C (No.2 Unit)																					
DSW7 Power Supply Setting and Service Setting 208V Unit: Setting is required. 230V, 460V Unit: No setting is required. 208V, 230V Unit: 230V Setting Before Shipment 460V Unit: 460V Setting Before Shipment <table border="1"> <thead> <tr> <th>Setting Item</th> <th>Pin No.</th> </tr> </thead> <tbody> <tr> <td>Except Hot Gas Defrost Operation</td> <td>3</td> </tr> <tr> <td>Function Setting</td> <td>4</td> </tr> </tbody> </table>		Setting Item	Pin No.	Except Hot Gas Defrost Operation	3	Function Setting	4	DSW10 Transmission Setting Setting is required. For End Resistance Cancellation Set DSW10-No.1 correctly in the same H-LINK system. Otherwise, it may cause abnormal transmission. <table border="1"> <thead> <tr> <th>Setting Before Shipment</th> <th>End Resistance Cancellation</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> </tr> </tbody> </table>		Setting Before Shipment	End Resistance Cancellation												
Setting Item	Pin No.																						
Except Hot Gas Defrost Operation	3																						
Function Setting	4																						
Setting Before Shipment	End Resistance Cancellation																						

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 (DSW5-No.5: ON)

Turn ON the DSW5-No.5 pin for the high static pressure setting.

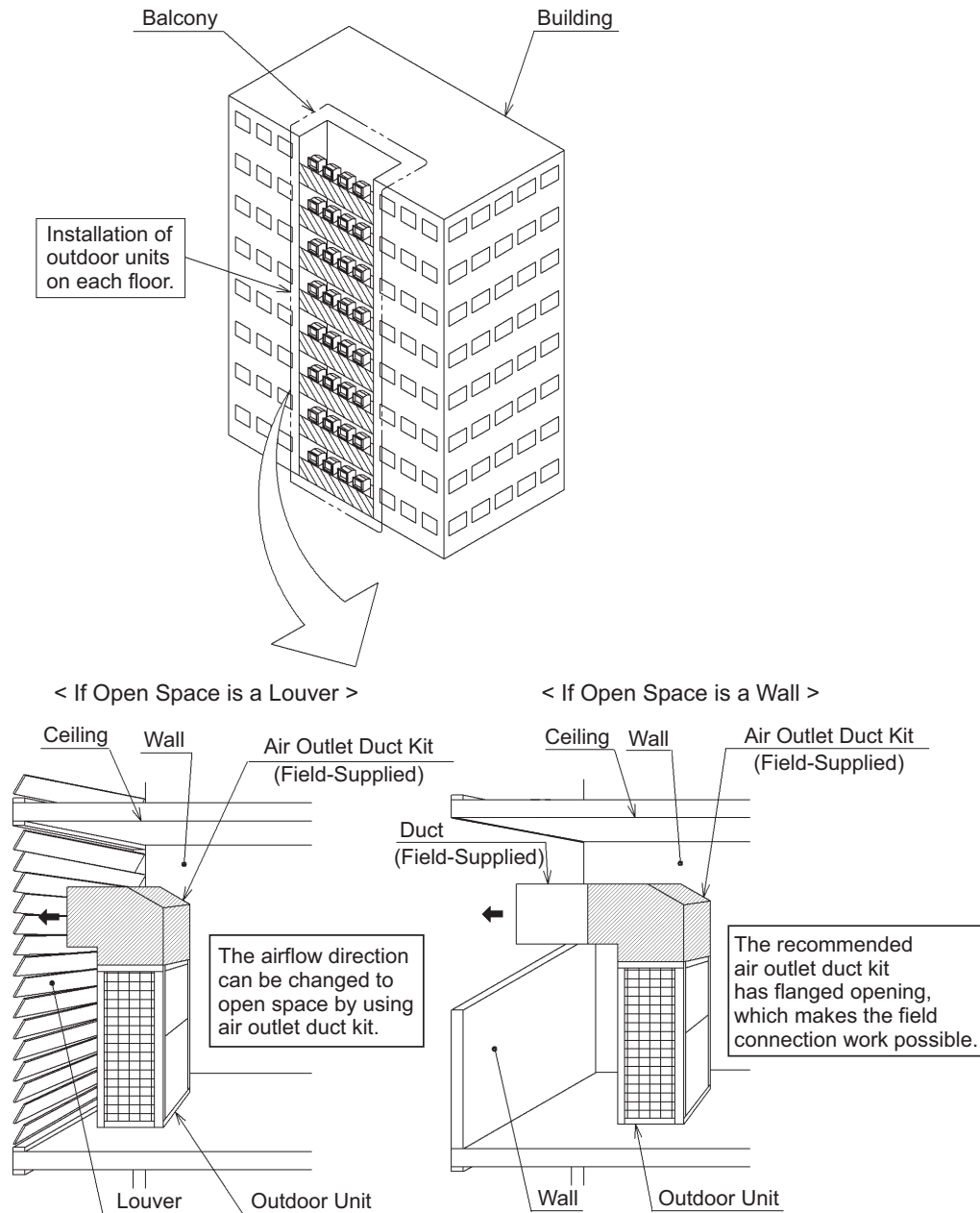
This setting is required when adopting the field-supplied outlet duct in the field.

This setting enables high static pressure operation up to a maximum of 0.24 in.W.G. (60Pa).

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.



NOTE:

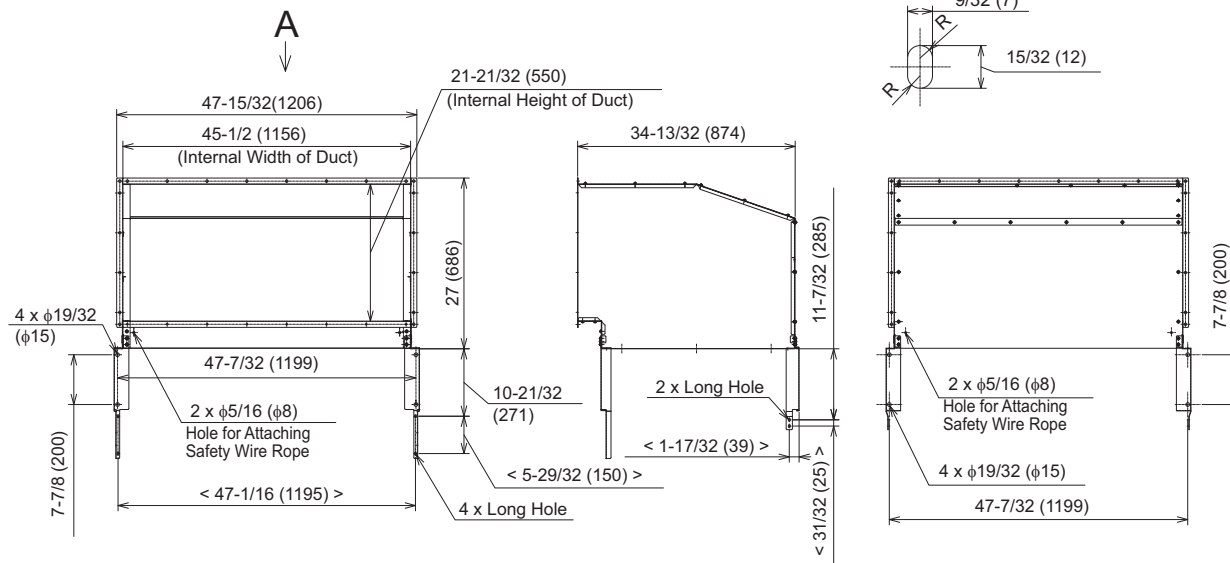
When installing the duct (field-supplied), make sure not to flow the outlet airflow of the outdoor unit into the air inlet of the outdoor unit. If not, the operation range will be limited due to increasing high pressure in the cooling operation or decreasing low pressure in the heating operation resulting in a malfunction of the unit.

EXTERNAL INPUT/OUTPUT AND FUNCTION SETTING

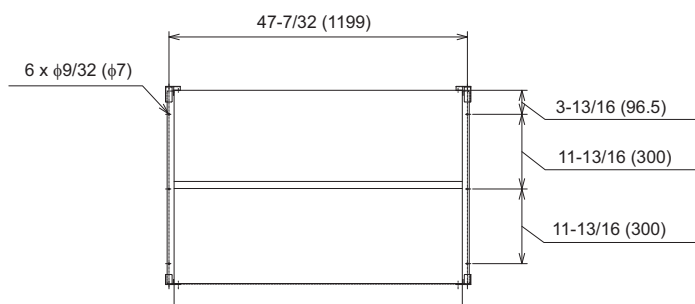
- Example of field-supplied outlet duct

- (H,Y)VAHP072B(3,4)1CW and (H,Y)VAHP096B(3,4)1CW

Dimensional Drawing

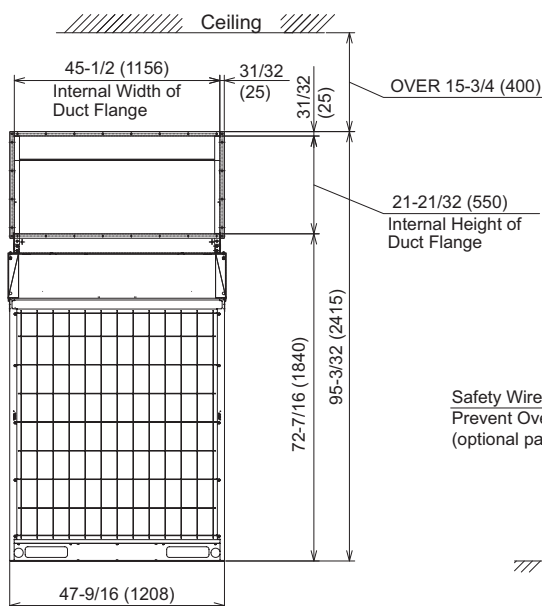


< A View >

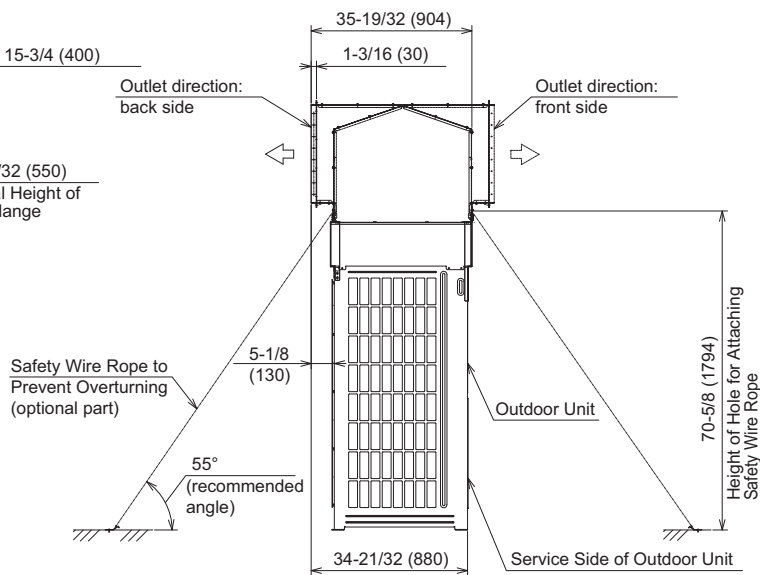


Installation Appearance

< Back Side View >



< Left Side View >



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.
Turn ON DSW4-No.6.



External Input/ Output Setting Mode
"io Sf"



■ Exit Setting Mode

Turn OFF DSW4-No.6 during indicated
External Input/ Output Setting Mode.
Turn OFF DSW4-No.4.

[Function Setting]

■ Start of Setting

Turn ON DSW4-No.4.
Turn ON DSW7-No.4.

Function Setting Mode
"Func"



■ Exit Setting Mode

Turn OFF DSW7-No.4 during indicated
Function Setting Mode.
Turn OFF DSW4-No.4.

Press PSW1 once.

After setting, confirm DSW4 setting is the same as the factory setting,
and DSW7 setting is correct.

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 Operation Mode
3	Demand Stoppage
4	Outdoor Fan Motor Start/Stop
5	Forced Stoppage
6	Demand Current Control 40%
7	Demand Current Control 60%
8	Demand Current Control 70%
9	Demand Current Control 80%
10	Demand Current Control 100%
11	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

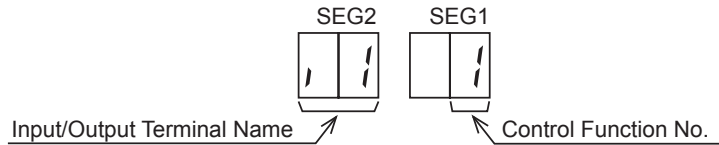
<Output Terminal>

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

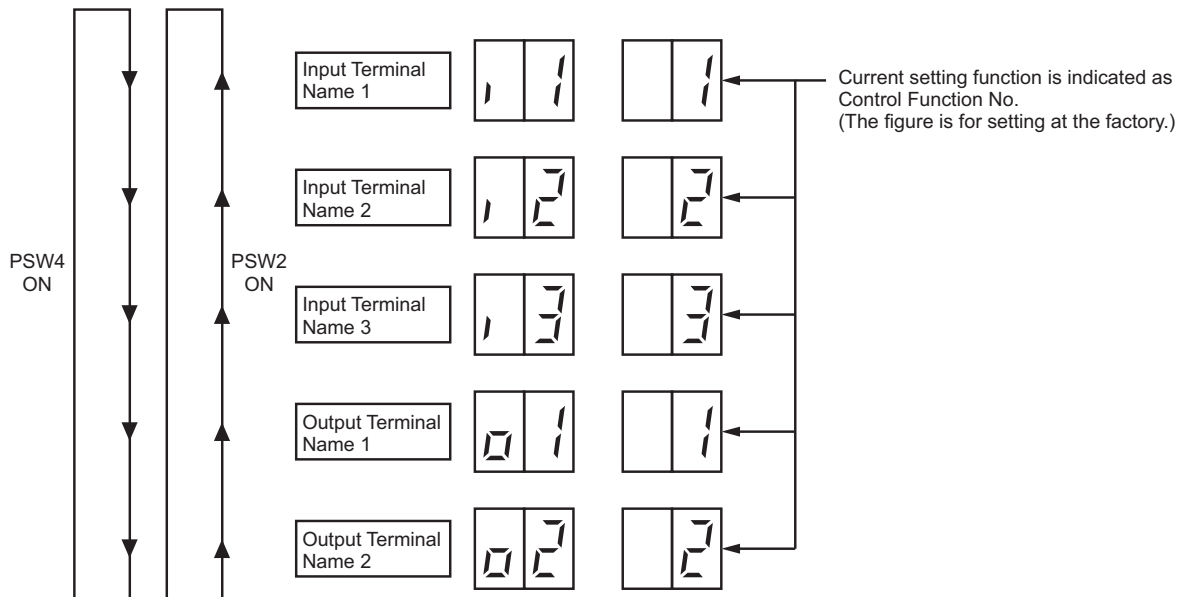
If an alternative setting is required at a site, perform the following procedures.
For a combination of outdoor units, perform the setting for outdoor unit A.

- 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.)

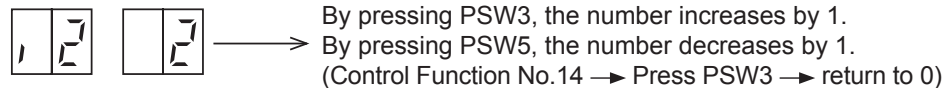


This display indicates Control Function No. 1 (Fixed Heating Operation Mode) is set at input 1.

- By pressing PSW2 or PSW4, the input/output terminal name is changed.
The following shows the display changes when PSW2 or PSW4 is pushed.



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



- 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 and DSW7 are 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 source 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

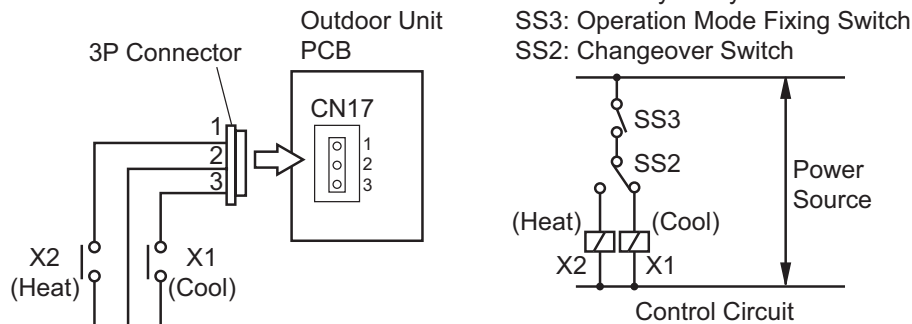
Short Circuit between Terminals 2 and 3 of CN17: Fixed Cooling Operation Mode

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)

When the input terminals for Demand Stoppage on the outdoor unit PCB are short-circuited while running, the compressor(s) is stopped. (In this case, the indoor unit(s) is put under Thermo-OFF condition. Cooling operation: Air-flow setting, Heating operation: Lo setting)

The stoppage code No. "10" is given. In this case, if the input terminals are opened, operation is resumed.

NOTE:

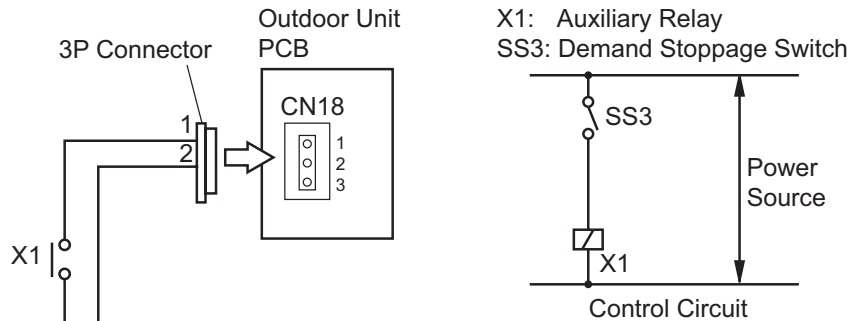
When demand control (ON/OFF) is performed, it is recommended that the control (ON/OFF) time is set appropriately according to the heat load. Also, set the demand control time approximately once in 15 minutes at the minimum in consideration for saving energy.

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

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

- Setting Example

Demand Stoppage at Input 3 (between 1 and 2 pins of CN18)

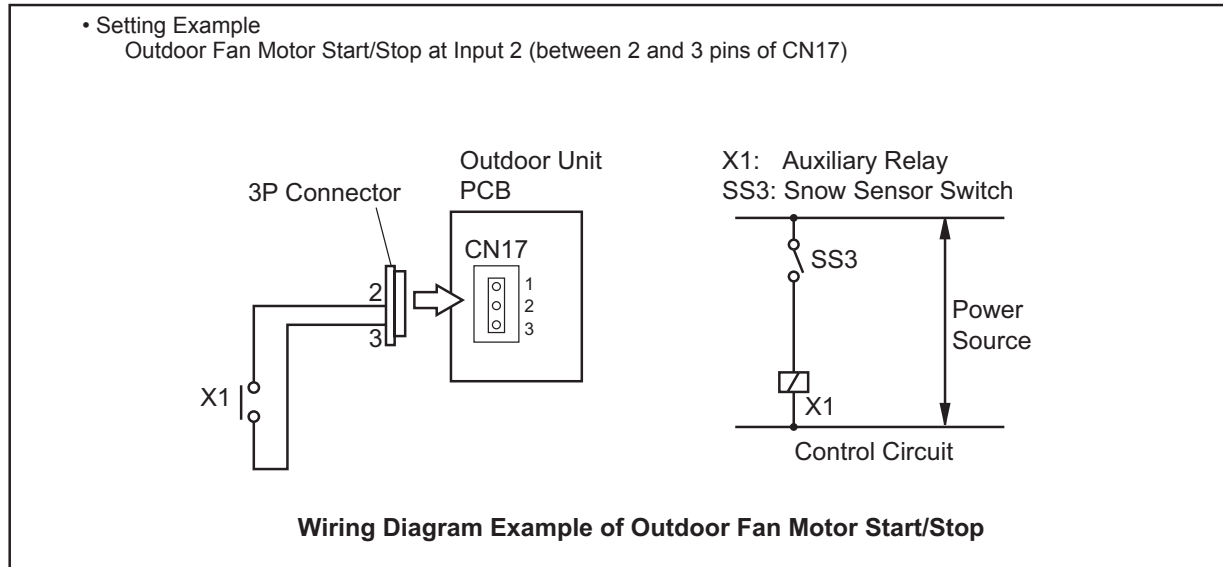


Wiring Diagram Example of Demand Stoppage

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

This is an auxiliary function to protect the outdoor unit from snow. When the input terminals for Outdoor Fan Motor Start/Stop on the outdoor unit PCB are short-circuited during the compressor stoppage, all the outdoor fan motors start operating. If the compressor restarts operating, the outdoor fan motors will be restored to normal operation. If the input terminals of Outdoor Fan Motor Start/Stop are opened during the outdoor fan motor operation following the short circuit of these terminals, the outdoor fan motor will stop. This function is possible only during the compressor stoppage (during Switch-OFF or Thermo-OFF of the Switch-ON). Therefore, this function will not be possible even if the input signal is sent during the normal cooling or heating operation.

An example of 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.

**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.

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

(4) **Input** Forced Stoppage (Control Function No.5)

When the input terminals for Forced Stoppage on the outdoor unit PCB are short-circuited while running, the compressors and the indoor fan motors are stopped. The stoppage code No. "10" is given. In this case, if the input terminals are opened, operation is resumed.

NOTE:

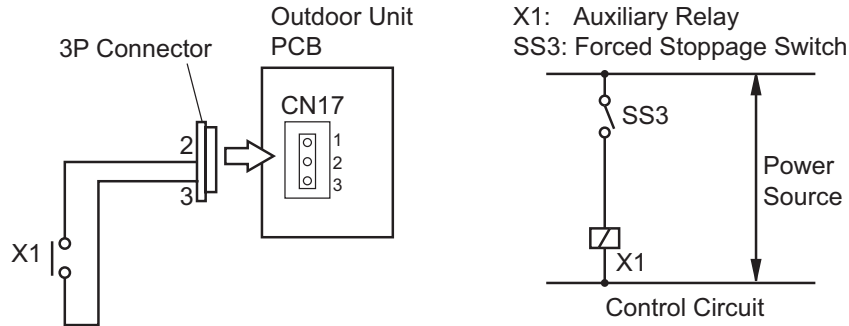
When demand control (ON/OFF) is performed, it is recommended that the control (ON/OFF) time is set appropriately according to the heat load. Also, set the demand control time approximately once in 15 minutes at the minimum in consideration for saving energy.

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

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

• Setting Example

Forced Stoppage at Input 2 (between 2 and 3 pins of CN17)



Wiring Diagram Example of Forced Stoppage

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

When the input terminals for Demand Current Control on the outdoor unit PCB are short-circuited, the compressor frequency is controlled so that the maximum limit of the outdoor running current is set to 100%, 80%, 70%, 60% or 40% of the reference power consumption.

If the outdoor unit running current exceeds the maximum limit for twenty minutes, the indoor unit is put under Thermo-OFF condition. In this case, the stoppage code No. "10" is given. When the input terminal is opened during the demand current control, its control is released.

NOTE:

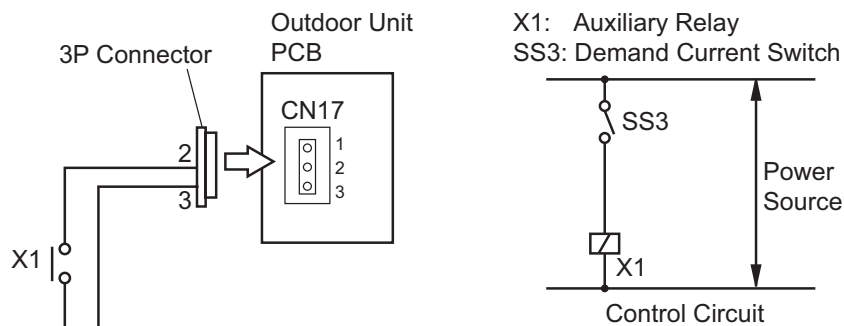
Thermo-ON: The outdoor unit and some indoor units are running.

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

Outdoor Unit Capacity [MBH]	Reference Power Consumption [KW]
072, 096	9.6

• 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

< NOTE >

1. The Demand Current Control (%) is value criterion. The value used for this control is calculated from the current, and therefore is different from the value indicated by a wattmeter. If it is required that the maximum power consumption is managed precisely, a field-supplied demand controller should be used.
2. The actual value may temporarily be higher than the indicated value (by 40% to 100%) depending on the operating control conditions such as protection control.

(6) [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:

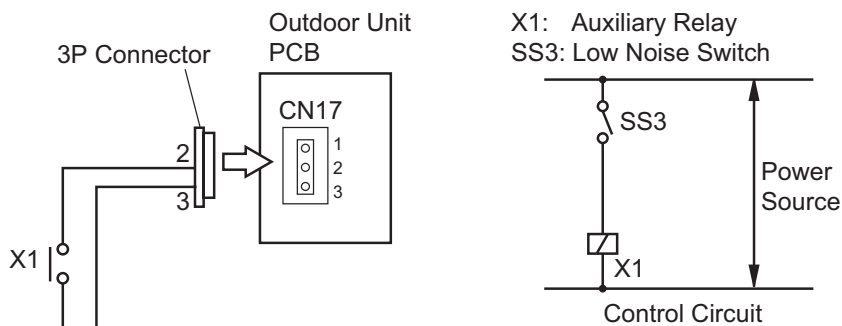
- (a) The outdoor unit capacity will decrease because the compressor frequency and outdoor fan motor frequency forcibly decrease. The operating range will also be restricted.
- (b) The value on the table below indicate the operating sound (targeted value) of single unit. In some cases, the operating 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 (6) “Low Noise Setting”

< Control Function No. for Low Noise Setting and Operating Sound/Outdoor Unit Capacity >

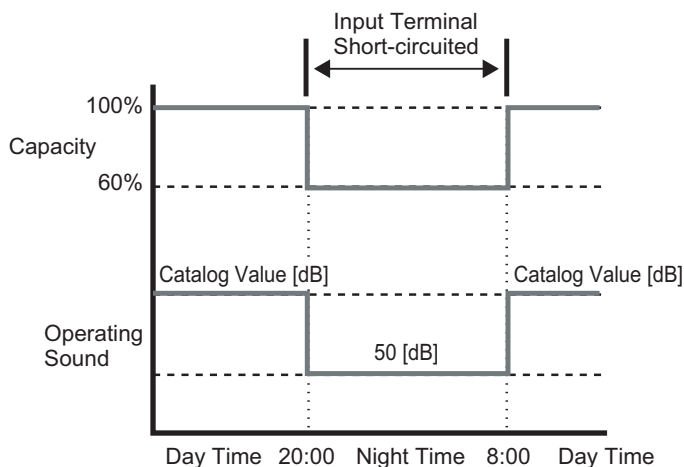
Control Function No.	Operating Sound (Targeted Value)	Outdoor Unit Capacity (Specification Ratio)
No Setting	Catalog Value	100%
11 (Low Noise Setting 1)	55	80%
12 (Low Noise Setting 2)	50	60%
13 (Low Noise Setting 3)	45	40%

• 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

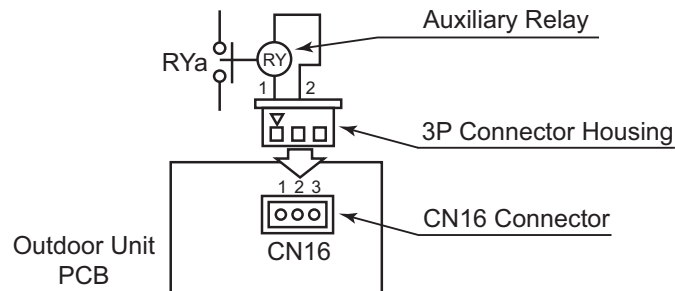
The following signals can be picked up from the outdoor unit PCB.
Refer to Table 5.2 for the required auxiliary relay.

(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)



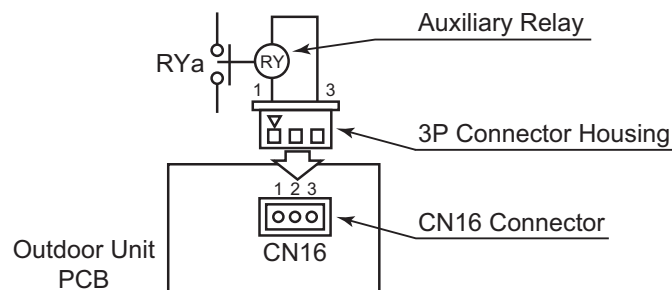
Wiring Diagram Example of Operation Signal

(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)

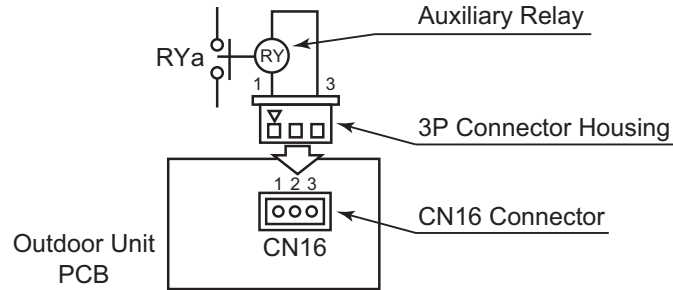


Wiring Diagram Example of Alarm Signal

(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)

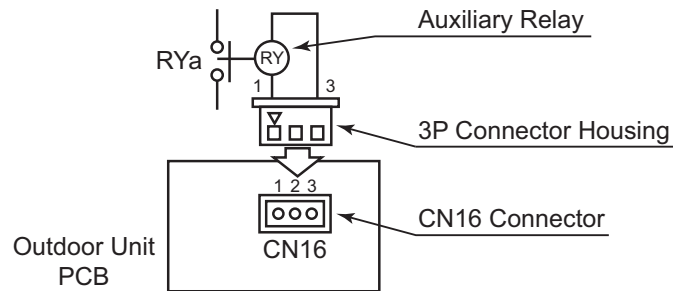


Wiring Diagram Example of Compressor ON Signal

(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

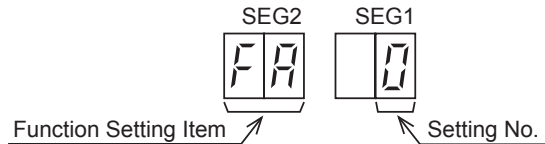
- Refer to Section 5.3 “• Setting Method” for mode transition functions.

NOTE:

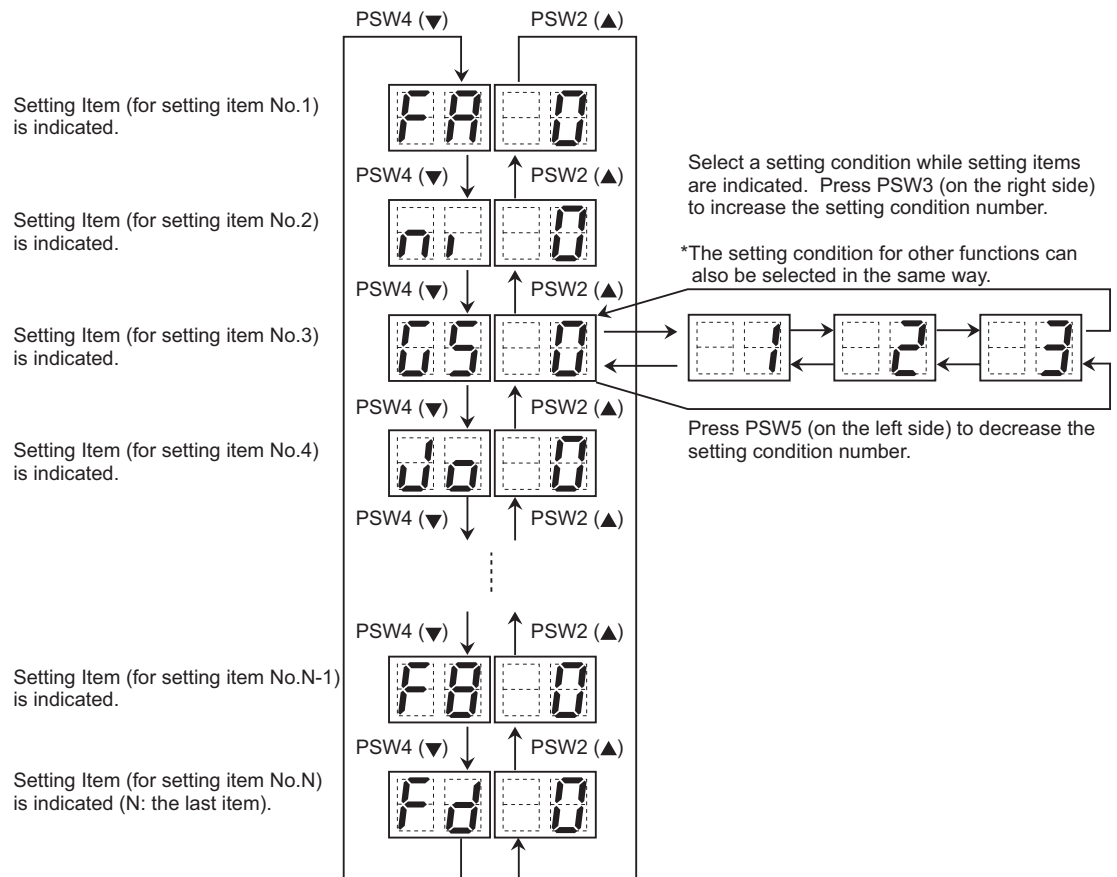
The setting should be performed during the outdoor unit stoppage.

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 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 DSW7-No.4. The display will be back to the normal operation. Then turn OFF DSW4-No.4. Confirm if DSW4 and DSW7 are 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 source is cut OFF.

EXTERNAL INPUT/OUTPUT AND FUNCTION SETTING

5.3.2.1 Function Setting Item

No.	Setting Item	7-Segment Display		Contents
		SEG2	SEG1	
1	Circulator Function at Heating Thermo-OFF	FR	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	GS	00	No setting
			01	For heating
			02	For cooling
			03	For cooling/heating
4	Not Prepared	Jo	00	-
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)
			05	Indoor fan intermittent operation during hot gas bypass defrosting
6	Cancellation of Hot Start	Hr	00	Hot start control is available
			01	Cancellation of hot start
7	Priority Capacity Mode	nU	00	No setting
			01	Change of frequency maximum limit value
			02	Change of current limit value
			03	Change of frequency maximum limit value and current limit value
8	Compressor Frequency Control Target Value for Cooling	Hc	00	Initial setting (Ps evaporation temperature targeted value 46°F (8°C))
			01	Targeted value 36°F (2°C)
			02	Targeted value 38°F (3°C)
			03	Targeted value 40°F (4°C)
			04	Targeted value 41°F (5°C)
			05	Targeted value 42°F (6°C)
			06	Targeted value 44°F (7°C)
			07	Targeted value 48°F (9°C)
			08	Targeted value 50°F (10°C)
			09	Targeted value 52°F (11°C)
			10	Targeted value 54°F (12°C)
			11	Targeted value 56°F (13°C)
			12	Targeted value 58°F (14°C)
9	Compressor Frequency Control Target Value for Heating	Hh	00	Initial setting (Pd targeted value 413psi (2.85MPa))
			01	Targeted value 392psi (2.70MPa)
			02	Targeted value 399psi (2.75MPa)
			03	Targeted value 406psi (2.80MPa)
			04	Targeted value 409psi (2.82MPa)
			05	Targeted value 418psi (2.88MPa)
			06	Targeted value 421psi (2.90MPa)
10	Indoor Expansion Valve Control Target Value for Cooling	Sc	00	Initial setting (SH targeted value +9°F (+5°C))
			01	SH Targeted value +13°F (+7°C)
			02	SH Targeted value +11°F (+6°C)
			03	SH Targeted value +7°F (+4°C)
			04	SH Targeted value +5°F (+3°C)
11	Indoor Expansion Valve Control Target Value for Heating	SH	00	Initial setting (SC targeted value +9°F (+5°C))
			01	SC Targeted value +20°F (+11°C)
			02	SC Targeted value +15°F (+8°C)
			03	SC Targeted value +3°F (+2°C)
			04	SC Targeted value -2°F (-1°C)

No.	Setting Item	7-Segment Display		Contents
		SEG2	SEG1	
12	Indoor Expansion Valve Opening Change for Stoppage Indoor Unit in Heating Mode	5 ₁	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 Change for Thermo-OFF Indoor Unit in Heating Mode	5 ₀	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 of Thermo-ON Indoor Unit in Heating Mode	c ₁	00	Initial setting (600~1300 pulse)
			01	Expansion valve opening: 300~650 pulse
			02	Expansion valve opening 006-015MBH: 650 pulse, 018MBH or over: 1000 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	c _b	00	Initial setting
			01	Cooling operation initial opening -5%
			02	Cooling operation initial opening +3%
			03	Cooling operation initial opening +5%
			04	Cooling operation initial opening +10%
16	Indoor Expansion Valve Initial Opening for Heating	c _h	00	Initial setting
			01	Heating operation initial opening -5%
			02	Heating operation initial opening +3%
			03	Heating operation initial opening +5%
			04	Heating operation initial opening +10%
17	Low Noise Setting (Sound Reduction Function, cooling/heating operation range will be restricted.)	d _b	00	Initial setting
			01	Reduction Outdoor Fan Rotation 65%
			02	Reduction Outdoor Fan Rotation 50%
			03	Reduction Outdoor Fan Rotation 40%
			04	Reduction Compressor Frequency 80%
			05	Reduction Compressor Frequency 60%
			06	Reduction Compressor Frequency 40%
			07	Reduction Outdoor Fan Rotation 65%/ Compressor Frequency 80%
			08	Reduction Outdoor Fan Rotation 50%/ Compressor Frequency 60%
			09	Reduction Outdoor Fan Rotation 40%/ Compressor Frequency 40%
18	Demand Function Setting	d _E	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	U _E	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	F _b	00	Initial setting
			01	Outlet temperature ≤ 50°F (10°C)
			02	Outlet temperature ≤ 54°F (12°C)
			03	Outlet temperature ≤ 58°F (14°C)
21	Outlet Air Temperature Control for DOAS	F _Γ	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.)	F _α	00	Initial setting
			01	Change of fan rotation -12rpm
			02	Change of fan rotation -24rpm

EXTERNAL INPUT/OUTPUT AND FUNCTION SETTING

No.	Setting Item	7-Segment Display		Contents
		SEG2	SEG1	
23	Not Prepared	L7	00	-
24	Thermo-OFF Setting for Outdoor Unit After Defrosting Operation	d5	00	No setting
			01	Thermo-OFF stoppage setting for outdoor unit after defrosting operation
25	Energy Saving Mode	F1	00	Not Available
			01	Available
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	Change of Indoor fan OFF operation hour when heating operation is activated	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
28	Intermittent Operation of Outdoor Fan Motor	F4	00	No intermittent operation
			01	Set outdoor temperature $\leq 38^{\circ}\text{F}$ (3°C)
			02	Set outdoor temperature $\leq 32^{\circ}\text{F}$ (0°C)
			03	Set outdoor temperature $\leq 34^{\circ}\text{F}$ (1°C)
			04	Set outdoor temperature $\leq 36^{\circ}\text{F}$ (2°C)
			05	Set outdoor temperature $\leq 40^{\circ}\text{F}$ (4°C)
29	Indoor Heat Exchanger SH Target Value Control for Cooling (Only for 4-Way Cassette Type)	F5	00	Initial setting (SH target value $+9^{\circ}\text{F}$ ($+5^{\circ}\text{C}$))
			01	SH target value $+7^{\circ}\text{F}$ ($+4^{\circ}\text{C}$)
			02	SH target value $+5^{\circ}\text{F}$ ($+3^{\circ}\text{C}$)
			03	SH target value $+3^{\circ}\text{F}$ ($+2^{\circ}\text{C}$)
			04	SH target value $+2^{\circ}\text{F}$ ($+1^{\circ}\text{C}$)
30	Indoor Expansion Valve Opening 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
31	Invalid Capacity Control by Compressor for Cooling	F7	00	Initial setting (valid)
			01	Invalid
32	Forced Defrosting after Enforced Stoppage during Defrosting Cycle	F8	00	Initial setting (valid)
			01	Invalid
33	Change of Hot Gas Defrosting Operation Range	F9	00	Initial setting (Hot gas defrosting operation range available: Temperature Difference 3)
			01	Hot gas defrosting operation range available: Temperature Difference 6
			02	Hot gas defrosting operation range available: Temperature Difference 5
			03	Hot gas defrosting operation range available: Temperature Difference 4
			04	Hot gas defrosting operation range available: Temperature Difference 2
			05	Hot gas defrosting operation range available: Temperature Difference 1
34	Change of Demand Control Valid Range	Fc	00	Initial setting (Available at normal operation)
			01	Available at start up and normal operation
35	Change of Temperature Unit and Pressure Unit	Fd	00	Initial Setting (Temp: $^{\circ}\text{F}$, Pressure: psi)
			01	Temp: $^{\circ}\text{C}$, Pressure: MPa

NOTE:

Contact your distributor or contractor for details on items "8" to "16", "24", "26", "27", "29", "30", "32" and "33".

5.3.2.2 Description of Function Setting Item

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

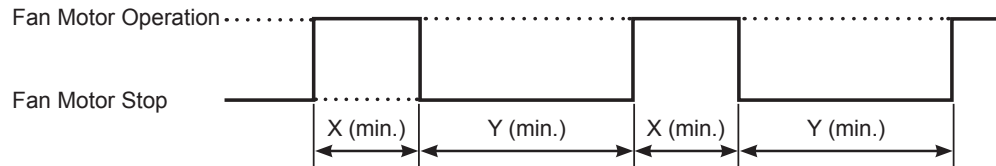
Press "PSW3" and select the setting conditions "0 to 4" in Circulator Function at Heating Thermo-OFF "FA".

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”)

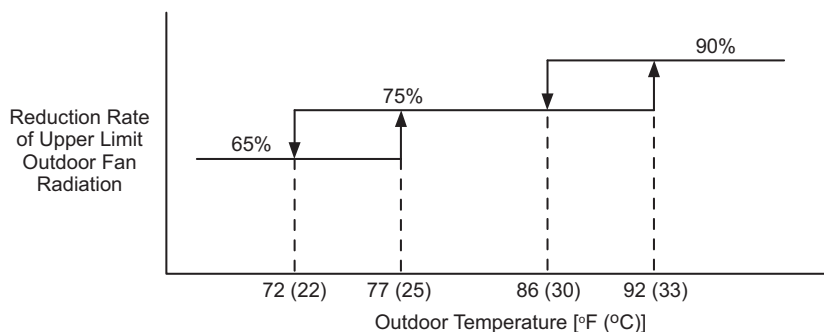
Press “PSW3” and select the setting condition “1” or “2” for the Night Shift (Low Noise) “ni”. Then, this function can be set. “ni”=1 reduces the upper limit of the outdoor fan rotation and the compressor frequency as shown below in any operation. “ni”=2 is adapted only for cooling operation. In heating 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.

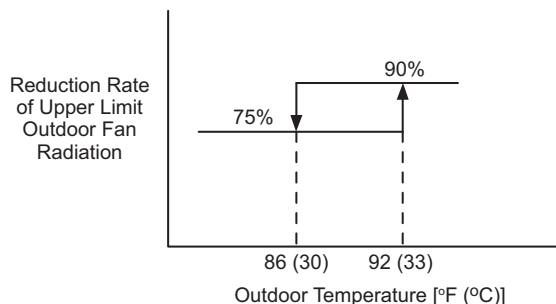
< Night Shift >

“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



NOTE:

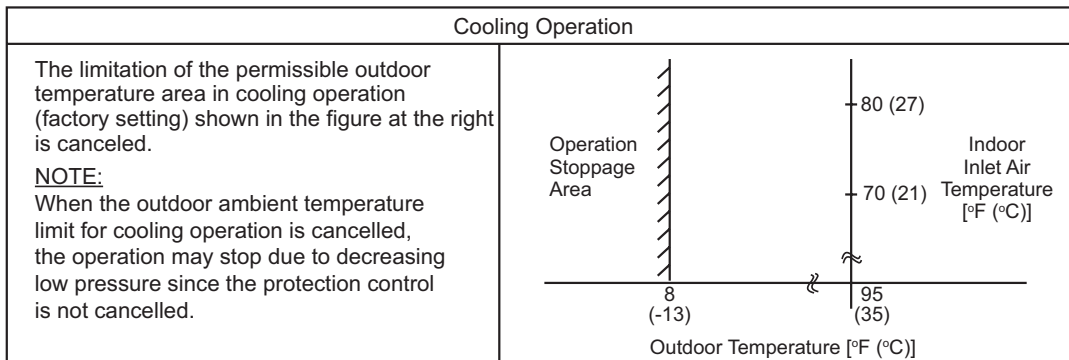
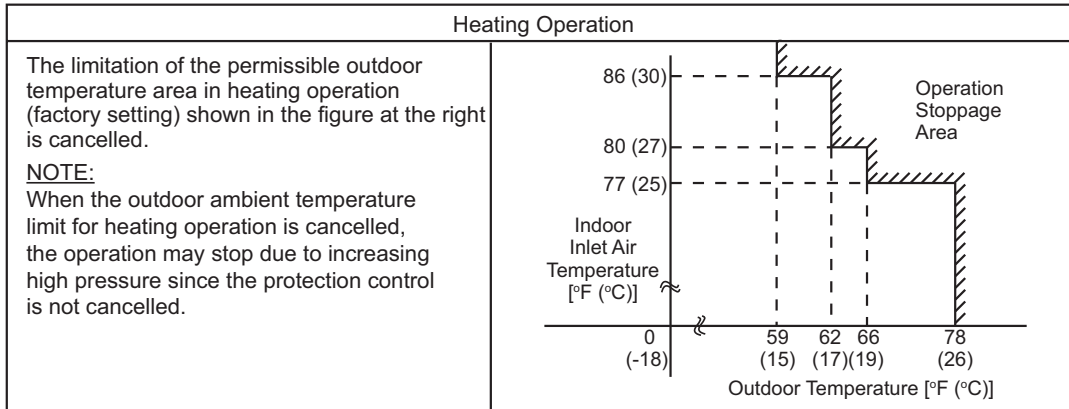
Reduction rates are approximate, these may change slightly depending on the outdoor unit model.

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

Press "PSW3" and select the setting condition "0" to "3" for Cancellation of Outdoor Ambient Temperature limit "LS". Then, this function can be set.

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

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



NOTE:

If this function is set and the outdoor unit operates in the operation stoppage area shown in the above figure for a long time, some alarm codes by abnormal operation may occur and the outdoor unit may be damaged since outdoor ambient temperature limit control is cancelled.

If the alarm codes occur frequently, contact your distributor or contractor.

(4) SLo Defrost Setting (Function Setting “bJ”)

Press “PSW3” and select the setting condition “0” to “4” at SLo Defrost Setting “ $\frac{b}{J}$ ”.

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
5	STOP	SLo Speed (Intermittent) (During Hot Gas Bypass Defrost)	SLo Speed (Intermittent) (During Hot Gas Bypass Defrost)

NOTE:

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

(5) 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 “ $\frac{n}{U}$ ”. By setting this function, the target frequency and current limit of the compressor 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	Current Limit is Set Higher
3	Compressor Frequency Limit and Current Limit are Set Higher

(6) Low Noise Setting (Function Setting “db”)

Press “PSW3” and select the setting condition “0” to “9” at the Low Noise Setting “ $\frac{d}{b}$ ” 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 Rotation
0	Not Changed (100%)	Not Changed (100%)
1	Not Changed	65%
2	Not Changed	50%
3	Not Changed	40%
4	80%	Not Changed
5	60%	Not Changed
6	40%	Not Changed
7	80%	65%
8	60%	50%
9	40%	40%

(7) 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:

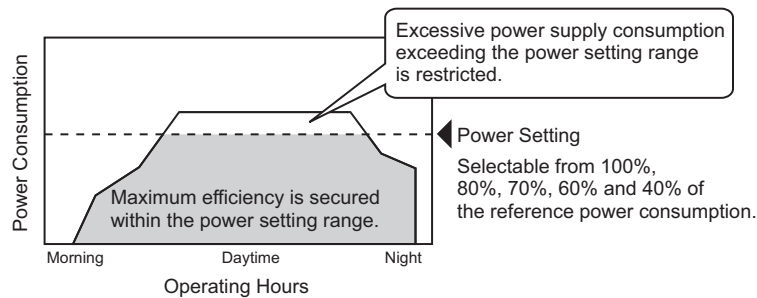
If the outdoor unit running current exceeds the maximum limit for twenty minutes, the indoor unit is put under Thermo-OFF condition. In this case, the stoppage code No. “10” is given.

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, 096	9.6

< 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.

EXTERNAL INPUT/OUTPUT AND FUNCTION SETTING

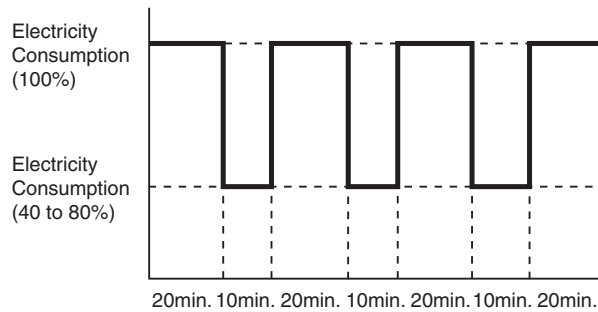
(8) Wave Function Setting (Function Setting "UE")

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 Setting)
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.

(9) 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)

(10) Adjustment of Fan Rotation (Function Setting "Fo")

Press "PSW3" and select the setting condition "0" to "2" at Adjustment of Fan Rotation "F_Q", 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.

(11) Energy Saving Mode (Function Setting "F1")

Press "PSW3" and select the setting condition "0" to "1", so that Energy Saving Mode "F₁" can be set. This function is available by setting to "1" to lower the compressor frequency upper limit and reduce energy consumption. The heating capacity will be reduced during Energy Saving Mode is set, so utilize this mode only when the extra capacity to the load is available. Energy Saving Mode can be set during heating operation.

"F1" Setting Condition	Energy Saving
0	Initial Setting (Not Available)
1	Available (Compressor Frequency 80%)

EXTERNAL INPUT/OUTPUT AND FUNCTION SETTING

(12) Intermittent Operation of Outdoor Fan Motor (Function Setting "F4")

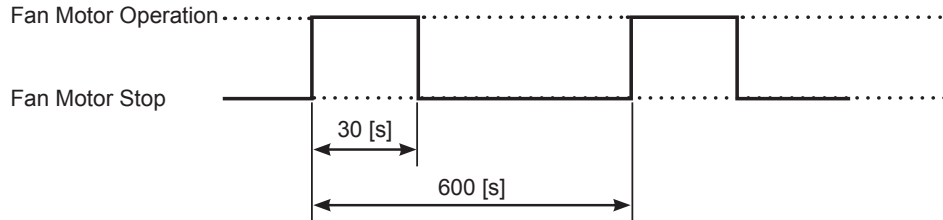
Press "PSW3" and set Intermittent Operation of Outdoor Fan Motor "F4" (auxiliary function) to protect the outdoor fan motor from snow.

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

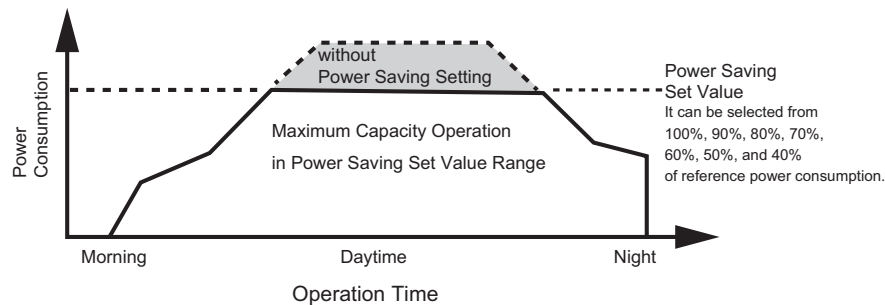
Press “ECO” button then the power saving guide will be displayed to support the setting. Easy access to the confirmation and setting screen from the current setting status screen.

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.



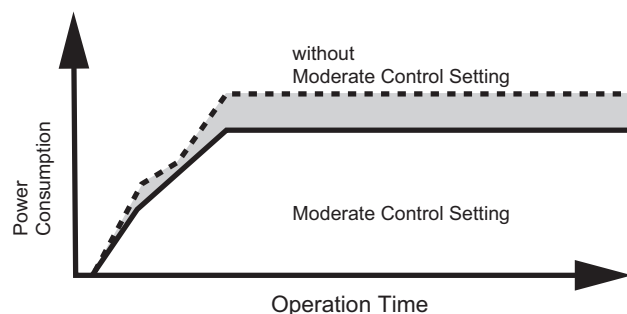
Outdoor Unit Capacity [MBH]	Reference Power Consumption [KW]
072, 096	9.6

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 source 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.

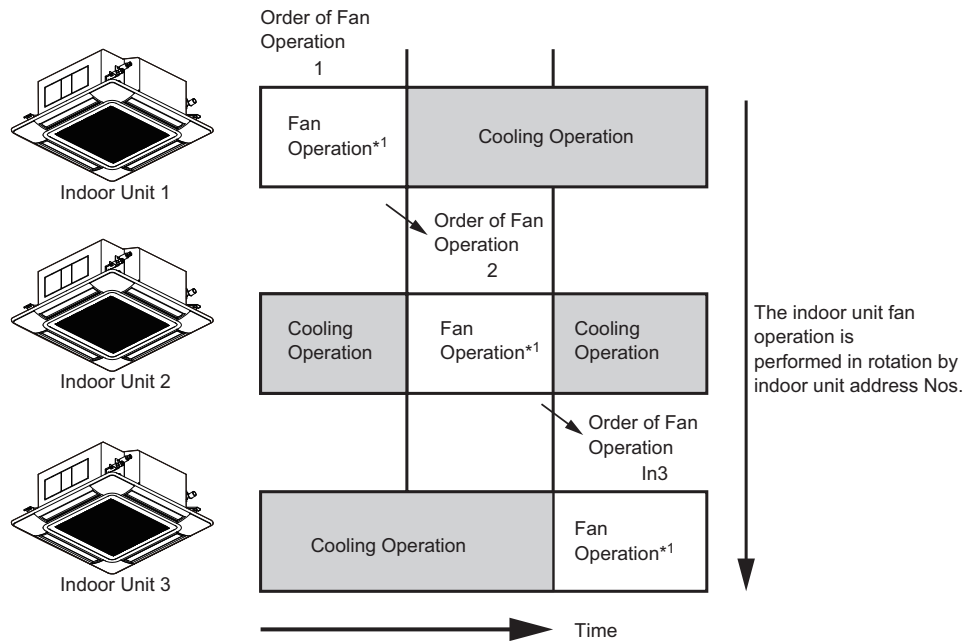


NOTES:

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.

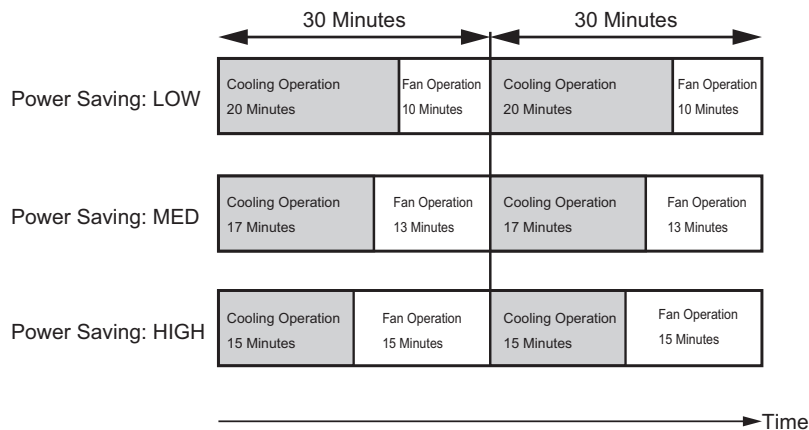


NOTES:

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.

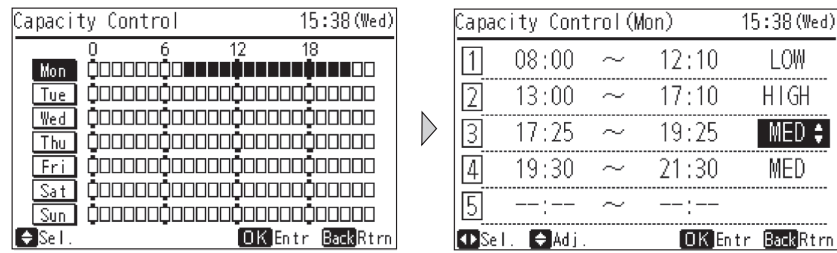


NOTE:

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

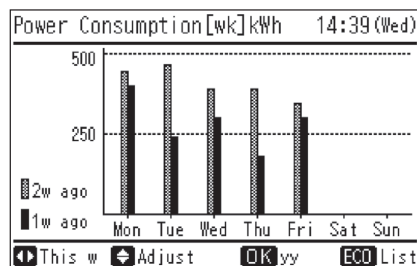
The operation noise reduction schedule function is utilized to set the operation noise reduction schedule up to five settings a day each day of the week.

NOTE:

The operation noise reduction setting may decrease 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 15-2013 provides safeguards for life, limb, health, 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



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) Drain Pan, Condensate Mechanism and Condensate Pipe

- Drain Line - Inspect and clean the condensate line at least twice a year.
- Drain-Up Mechanism - Inspect for activation of drain-up mechanism.

(c) Float Switch

- Activation - Inspect for activation of float switch.

6.4 Service and Maintenance Record by 7-Segment Display

Customer's Name _____

DATE: _____ - _____ - _____

Outdoor Unit Model (Serial No. _____)			(Serial No. _____)						(Serial No. _____)						
(1) Operation Mode															
(2) Test Run Start Time															
(3) Data Collect Start Time															
(4) Read Out Data from 7-Segment in Outdoor Unit															
Protection Control Code															
Checking Mode	Input/Output State of Outdoor Micro-Computer	SC	Y20A	Y21	Y52C	Fan2	Fan1	YCH	Y20A	Y21	Y52C	Fan2	Fan1	YCH	
	Total Capacity of Operating Indoor Unit	oP													
	Control Software No.	SP													
	Inverter Software No.	iP													
	Inverter Order Frequency to Compressor	H1													
	Outdoor Fan Step	Fo													
	Outdoor Expansion Valve Opening	Eo													
	High Pressure (Discharge Pressure)	Pd.													
	Low Pressure (Suction Pressure)	Ps.													
	Discharge Temperature	Td													
	Evaporating Temperature	TE													
	Ambient Air Temperature	To													
	Inverter Fin Temperature	TF													
	Inverter Primary Current	A1													
	Inverter Secondary Current	A2													
	Checking for Indoor Unit	Indoor Unit Address	n-												
		Indoor Expansion Valve Opening	E-												
		Liquid Pipe Temperature of Indoor Unit	L-												
		Gas Pipe Temperature of Indoor Unit	u-												
		Indoor Unit Inlet Air Temperature	i-												
		Indoor Unit Outlet Air Temperature	o-												
		Cause Code of Indoor Unit Stoppage	d-												
	Accumulated Operating Time of Compressor	UJ													
		cJ													
	Outdoor Unit Alarm Code	AC													
	Cause Code of Inverter Stoppage	IT													
	Cause Code of Fan Stoppage (Lower)	FT													
Cause Code of Fan Stoppage (Upper)	FT.														
Total Capacity of Indoor Unit Connected	CP														
Connected Indoor Unit Number	AA														
Refrigerant Address	GA														

NOTE:

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

6.5 Service and Maintenance Record by Wired Controller

Data Sheet for Checking by Wired Controller

Time				:	:	:	:	:
I.U. Model								
I.U. Serial No.								
I.U. No. / Alarm Code								
	Check Mode 1	Check Mode 2		1 • 2	1 • 2	1 • 2	1 • 2	1 • 2
B Temp. Indication								
	Set Temp.	b1	--					
	Inlet Air Temp.	b2	g1					
	Discharge Air Temp.	b3	g2					
	Liquid Pipe Temp.	b4	g3					
	Remote Thermistor Temp.	b5	--					
	Outdoor Air Temp.	b6	g4					
	Gas Pipe Temp.	b7	g5					
	Evaporating Temp. at Heating	b8	g6					
	Condensing Temp. at Cooling	b9	g7					
	Comp. Top Temp.	bA	g8					
	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	g9					
	Suction Pressure	H2	gA					
	Control Information	H3	gb					
	Operating Frequency	H4	gC					
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	gd					
	O.U. Expansion Valve 1	L2	gE					
	O.U. Expansion Valve 2	L3	--					
	O.U. Expansion Valve B	L4	--					

NOTE:

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

P Compressor Condition Indication (Reference)								
	Comp. Current	P1	gF					
	Accumulated Operation Time of Comp.	P2	--					
g Sensor Condition Indication								
	Motion Sensor Response Rate	g1	--					
	Radiation Sensor Temp.	g2	--					
	Motion Sensor1 Response Rate	g3	--					
	Motion Sensor2 Response Rate	g4	--					
	Motion Sensor3 Response Rate	g5	--					
	Motion Sensor4 Response Rate	g6	--					
	Setting Temp. Collected Value	g7	--					

Client: _____
 Installation Date: _____
 System No.: _____
 Date Checked: _____
 Checked by: _____

Result	

NOTE:

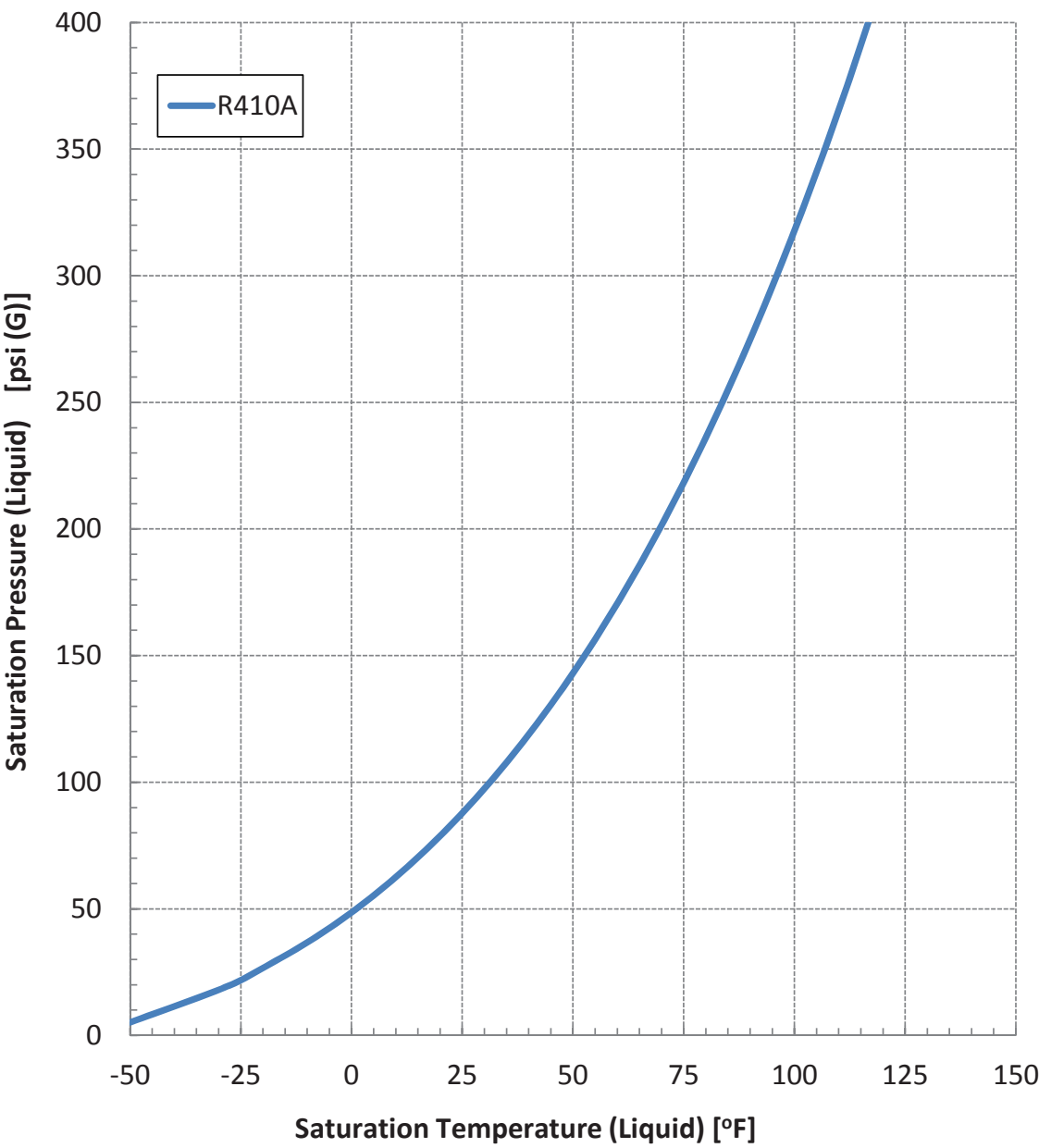
Refer to Section 3.1.4 "Checking Wired Controller" for items of check mode.

6.6 Service and Maintenance Record

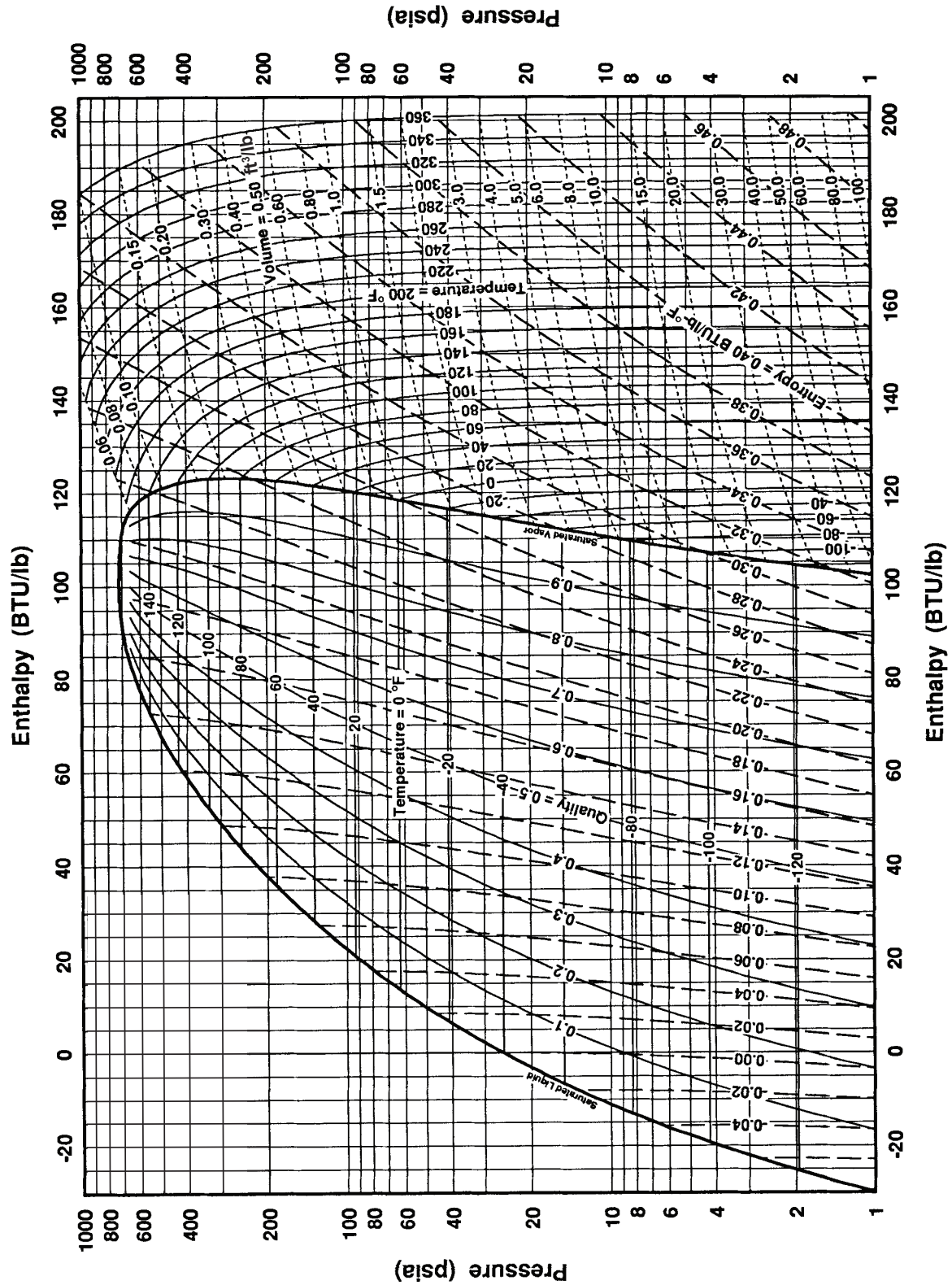
Service and Maintenance Record

No.	Check Item	Action	Judgment
1	Is service space sufficient?		YES or NO
2	Short Circuit of Discharged Air?		YES or NO
3	Any Heat Influence?		YES or NO
4	Is ground wiring connected?		YES or NO
5	Refrigeration Piping		GOOD or NOT GOOD
6	Fixing of Units		GOOD or NOT GOOD
7	Any Damage on External or Internal Surface?		YES or NO
8	Checking of Screws and Bolts	Tighten them if they are loosened.	TIGHTENED or NOT TIGHTENED
9	Tightening of Terminal Screws	Tighten all terminal screws with a Phillips screwdriver.	TIGHTENED or NOT TIGHTENED
10	Are compressor terminals tightly fixed?	Check all compressor terminals are tightly fixed.	GOOD or NOT GOOD
11	Insulation Resistance	Measure insulation resistance with insulation resistance-meter. Comp. and Fan Motor: greater than 3MΩ Others: greater than 3MΩ	GOOD or NOT GOOD
12	Does drain 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.	ditto	GOOD or NOT GOOD
15	Check for leakage at indoor heat exchanger.	ditto	GOOD or NOT GOOD
16	Check for leakage at reversing valve.	ditto	GOOD or NOT GOOD
17	Check for leakage at check valve.	ditto	GOOD or NOT GOOD
18	Check for leakage at accumulator.	ditto	GOOD or NOT GOOD
19	Check for leakage at strainer.	ditto	GOOD or NOT GOOD
20	Check for leakage at electronic expansion valve.	ditto	GOOD or NOT GOOD
21	Check for leakage at piping.	ditto	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 Switch		psi(G)
33	Low Pressure Switch		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

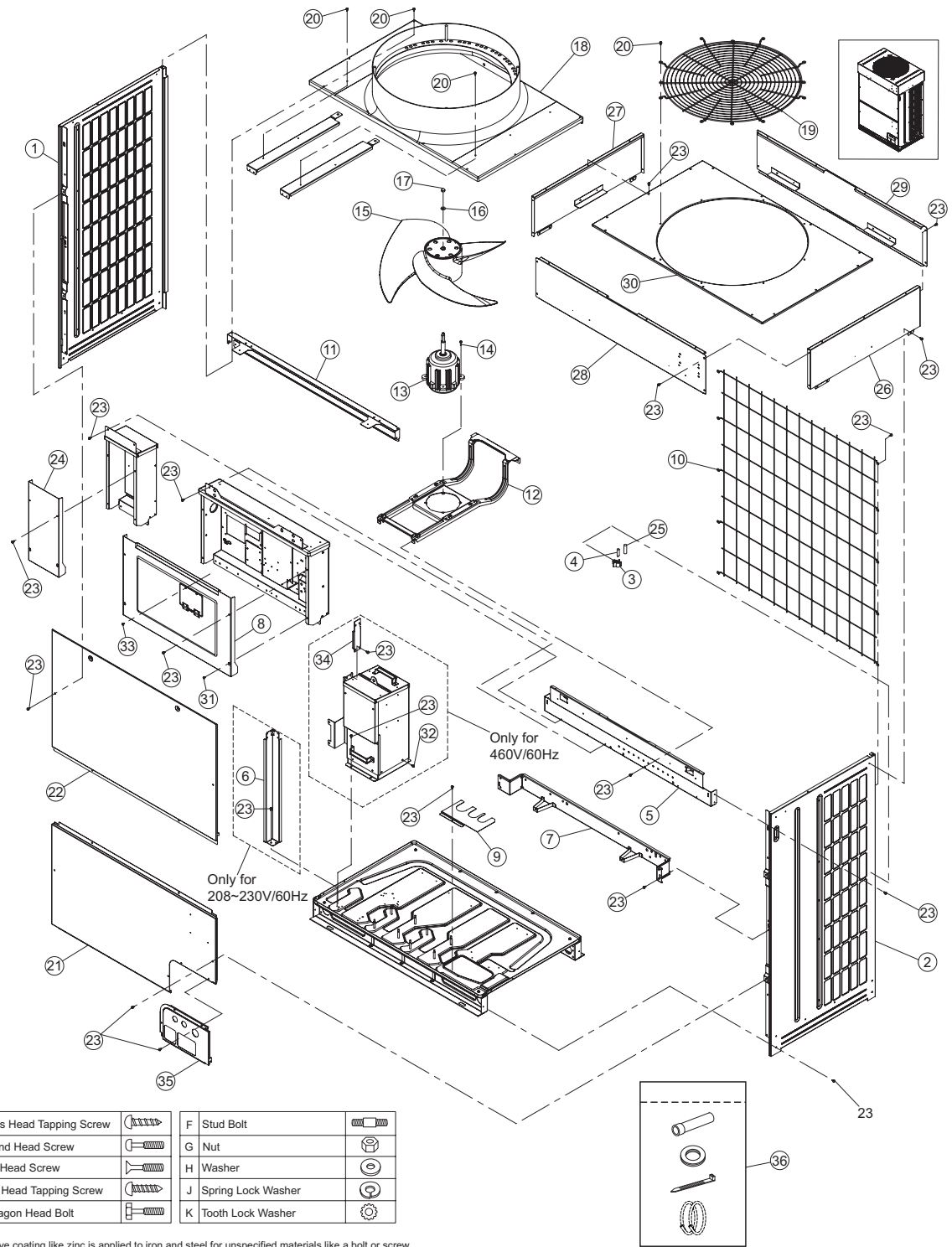
SERVICE PARTS LIST

[illegible]

LOCATION OF SERVICE PARTS IN THE UNIT

< Cabinet and Fan >

MODEL: (H,Y)VAHP072B31CW
(H,Y)VAHP096B31CW
(H,Y)VAHP072B41CW
(H,Y)VAHP096B41CW



A	Truss Head Tapping Screw		F	Stud Bolt	
B	Round Head Screw		G	Nut	
C	Flat Head Screw		H	Washer	
D	Pan Head Tapping Screw		J	Spring Lock Washer	
E	Hexagon Head Bolt		K	Tooth Lock Washer	

NOTE:
A protective coating like zinc is applied to iron and steel for unspecified materials like a bolt or screw.

SERVICE PARTS LIST

					(P0165x-02)	
					Voltage	
					208/230V 60Hz	460V 60Hz
No.	Part Name	Replacement Part		Remarks	Q'ty Per Unit	
		Draw. No.	Part No.		(H,Y)VAHP072B31CW (H,Y)VAHP096B31CW	(H,Y)VAHP072B41CW (H,Y)VAHP096B41CW
1	Compressor	17F18776A	06954296	MC1: EK655DHD-65A2Y	1	
		17F19108A	06954167	MC1: EK655DHD-65D2Y		1
2	Compressor	17F18584A	06954166	MC2: EK655DH-65H2Y	1	
		17F19087A	06954157	MC2: EK655DH-65E2Y		1
3	Vibration Absorber	H17D21147B	-		4	4
4	Vibration Absorber	H17D49474A	-		4	4
5	Vibration Absorber	H17D21207A	-		6	6
6	Nut	H17D49475A	-		6	6
7	Crankcase Heater	H7D07781B	QU078010	CH1: 120W (40W x 3), Belt Heater	1	1
8	Crankcase Heater	H7D02452B	QU078002	CH2: 80W (40W x 2), Belt Heater	1	1
9	Rubber Cap	H17B29767A	QU032001		2	2
10	Accumulator	H7B03605A	QU089009		1	1
11	Stopper	H7D07780A	-		1	1
12	Valve Stay	H17F09346A	-		1	1
13	Oil Separator	H7C03052A	QU055001		2	2
14	Check Valve	H7C01709A	QU042001		2	2
15	Pressure Switch	H7C03969A	QU001001	PSH1: Shanghai Junle, H20PS	2	2
16	Oil Separator Stay	H17H06170A	-		1	1
17	Saddle	H7D02638A	-		2	2
18	Double Tube	H17F05849A	QU041001		1	1
19	Silencer	H7E00415A	QU302002		2	2
20	Expansion Valve	17C78465A	P26007	MVB: Saginomiya, UKV-25D26	1	1
21	EXPV. Coil	17C78180C	P27606	MVB: Saginomiya, UKV-A035	1	1
22	Stop Valve	H7C00434A	QU027003	3/8 (Liquid)	1	1
23	Plate Stay	H17H06172A	-		1	1
24	Stopper	H17E25685A	-		2	2
25	Rubber Seat	H17H10681A	-		2	2
26	Reversing Valve	H7C03986A	QU081003	RVR1, 2: Saginomiya, STF-H07U12	1	1
27	Coil	H7C03987B	QU081001	RVR1, 2: Saginomiya, STF-H01AQ3004UAA1	1	1
28	Strainer	H17G15764B	QU030003		1	1
29	Strainer	H17G62701A	QU030005		1	1
30	Check Joint	H7C00441A	QU028001		3	3
31	Solenoid Valve	17C64849A	P24511	SVA, SVX: Nichiden Kougyou, SR10PA	4	4
32	Check Joint	17E08728B	QU028003		2	2
33	Coil	17C76434B	P30572	SVA, SVX:Nichiden Kougyou, SR10PA	4	4
34	Stop Valve	H17F09233A	QU027001	7/8 (Gas)	1	1
35	Strainer	H17D55178A	QU030001		2	2
36	Strainer	H17G62700A	QU030004		2	2
37	Expansion Valve	17F07288B	P29262	MV1: PAM-BB0YGHS-101	1	1
38	EXPV. Coil	17F07287A	P29263	MV1: Saginomiya, PAM-MD12HS-7	1	1
39	Pressure Sensor	17B46255A	P26013	PD: Saginomiya, NSK-BH050F	1	1
40	Pressure Sensor	17B46256A	P26014	PS: Saginomiya, NSK-BH020F	1	1
41	Sound Proof Cover	H7C02480A	QU032003		1	1
42	Sound Proof Cover	H17C59825B	QU032002		2	2
43	Sound Proof Cover	H7C02481A	QU032012		1	1

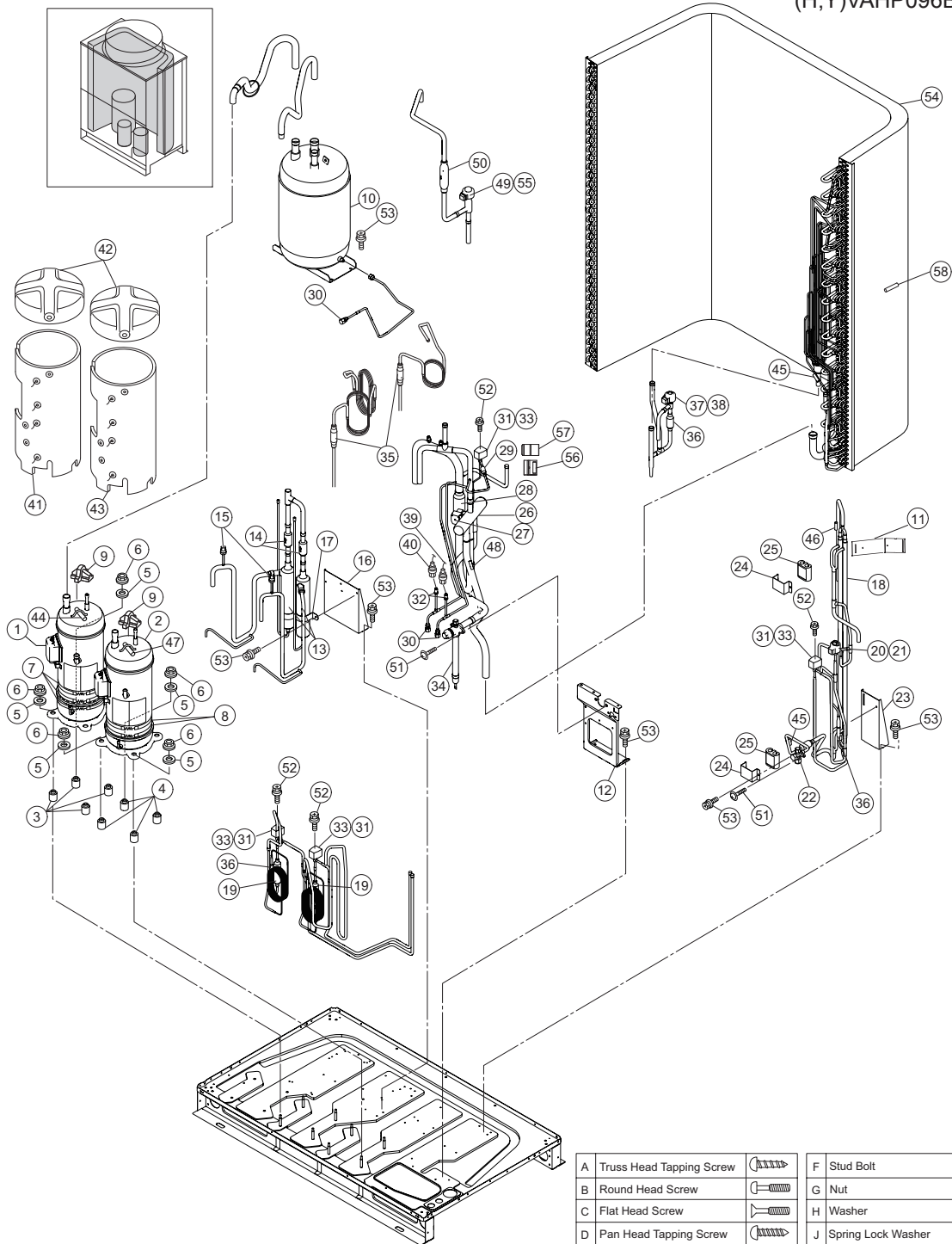
SERVICE PARTS LIST

[illegible]

LOCATION OF SERVICE PARTS IN THE UNIT

< Refrigerant Cycle >

MODEL: (H,Y)VAHP072B31CW
(H,Y)VAHP096B31CW
(H,Y)VAHP072B41CW
(H,Y)VAHP096B41CW



A	Truss Head Tapping Screw		F	Stud Bolt	
B	Round Head Screw		G	Nut	
C	Flat Head Screw		H	Washer	
D	Pan Head Tapping Screw		J	Spring Lock Washer	
E	Hexagon Head Bolt		K	Tooth Lock Washer	

NOTE:

A protective coating like zinc is applied to iron and steel for unspecified materials like a bolt or screw.

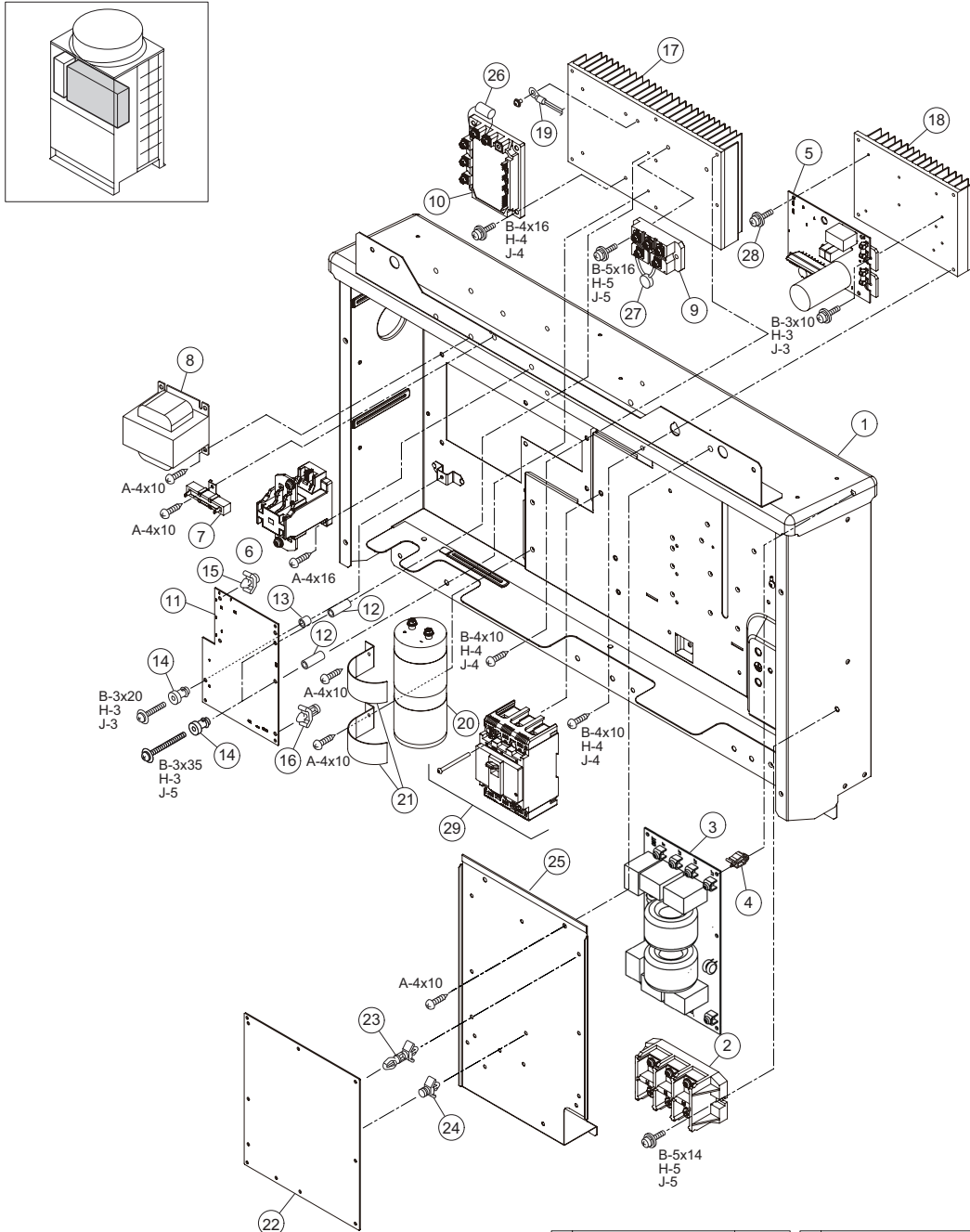
SERVICE PARTS LIST

[illegible]

LOCATION OF SERVICE PARTS IN THE UNIT

< Electrical Parts > (208/230V 60Hz)

MODEL: (H,Y)VAHP072B31CW
(H,Y)VAHP096B31CW



A	Truss Head Tapping Screw		F	Stud Bolt	
B	Round Head Screw		G	Nut	
C	Flat Head Screw		H	Washer	
D	Pan Head Tapping Screw		J	Spring Lock Washer	
E	Hexagon Head Bolt		K	Tooth Lock Washer	

NOTE:
A protective coating like zinc is applied to iron and steel for unspecified materials like a bolt or screw.

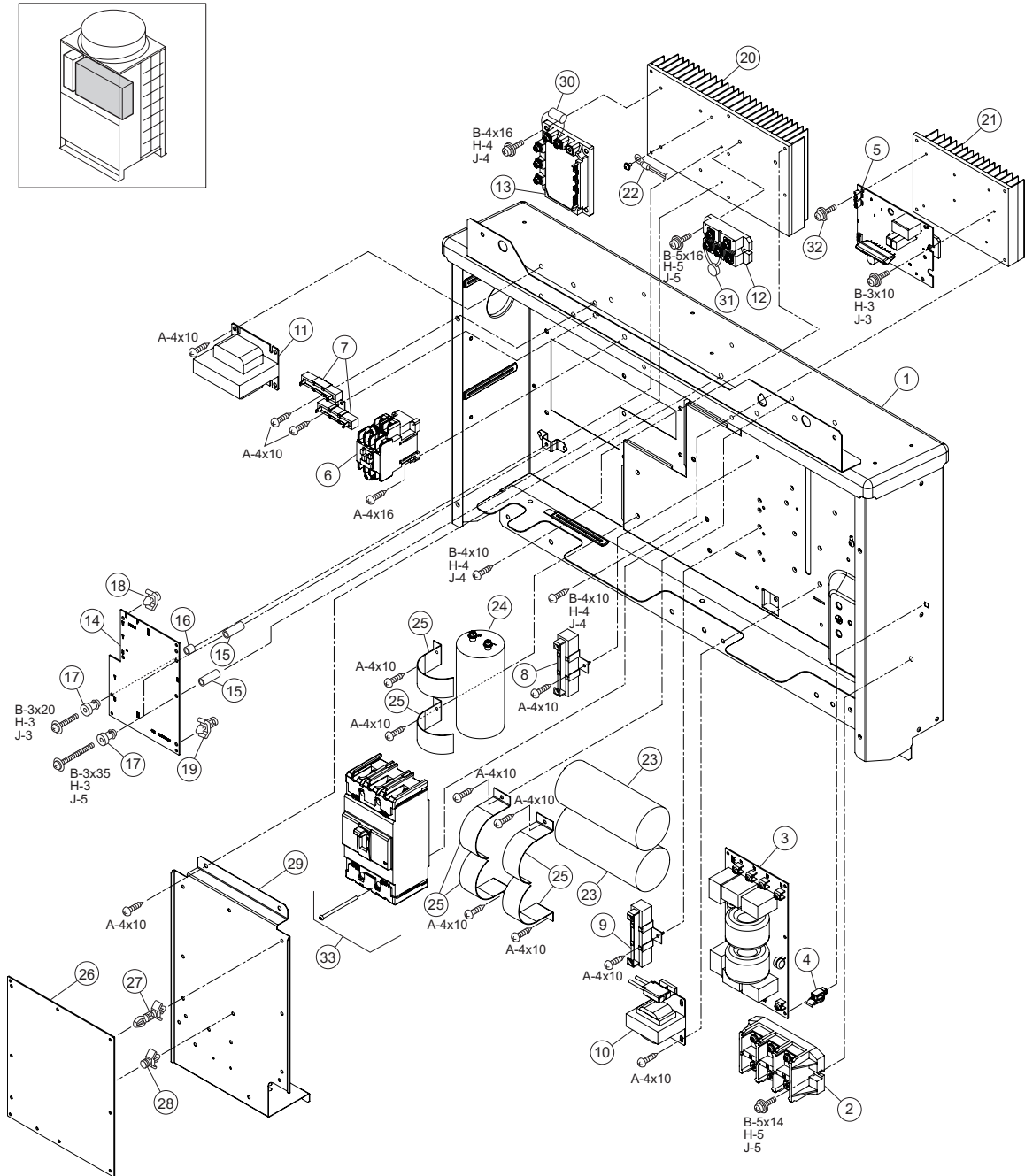
SERVICE PARTS LIST

[illegible]

LOCATION OF SERVICE PARTS IN THE UNIT

< Electrical Parts > (460V 60Hz)

MODEL: (H,Y)VAHP072B41CW
(H,Y)VAHP096B41CW



A	Truss Head Tapping Screw		F	Stud Bolt	
B	Round Head Screw		G	Nut	
C	Flat Head Screw		H	Washer	
D	Pan Head Tapping Screw		J	Spring Lock Washer	
E	Hexagon Head Bolt		K	Tooth Lock Washer	

NOTE:

A protective coating like zinc is applied to iron and steel for unspecified materials like a bolt or screw.

SERVICE PARTS LIST

[illegible]

SERVICE PARTS LIST

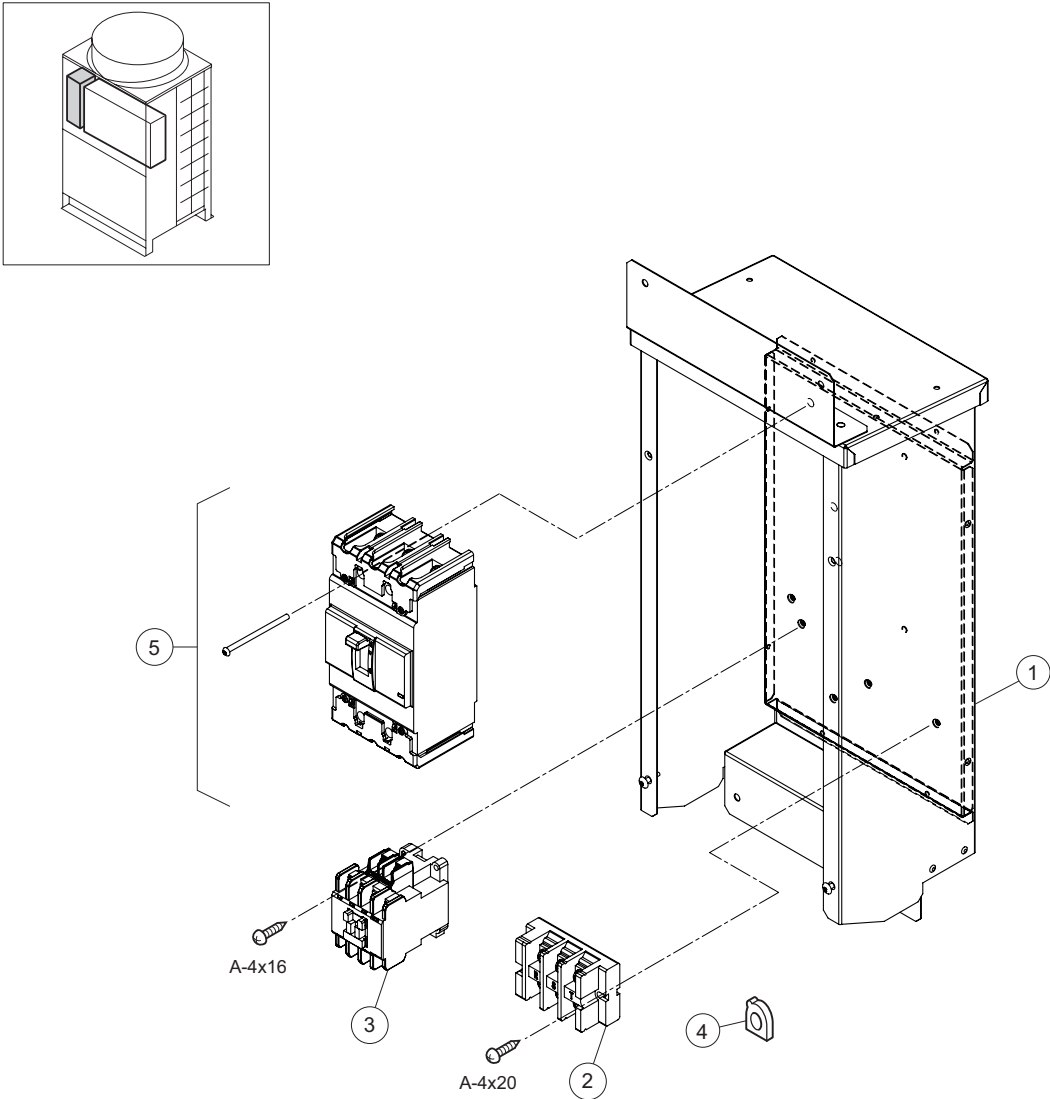
SERVICE PARTS LIST

[illegible]

LOCATION OF SERVICE PARTS IN THE UNIT

< Sub Electrical Box >

MODEL: (H,Y)VAHP072B31CW
(H,Y)VAHP096B31CW
(H,Y)VAHP072B41CW
(H,Y)VAHP096B41CW



A	Truss Head Tapping Screw		F	Stud Bolt	
B	Round Head Screw		G	Nut	
C	Flat Head Screw		H	Washer	
D	Pan Head Tapping Screw		J	Spring Lock Washer	
E	Hexagon Head Bolt		K	Tooth Lock Washer	

NOTE:
A protective coating like zinc is applied to iron and steel for unspecified materials like a bolt or screw.

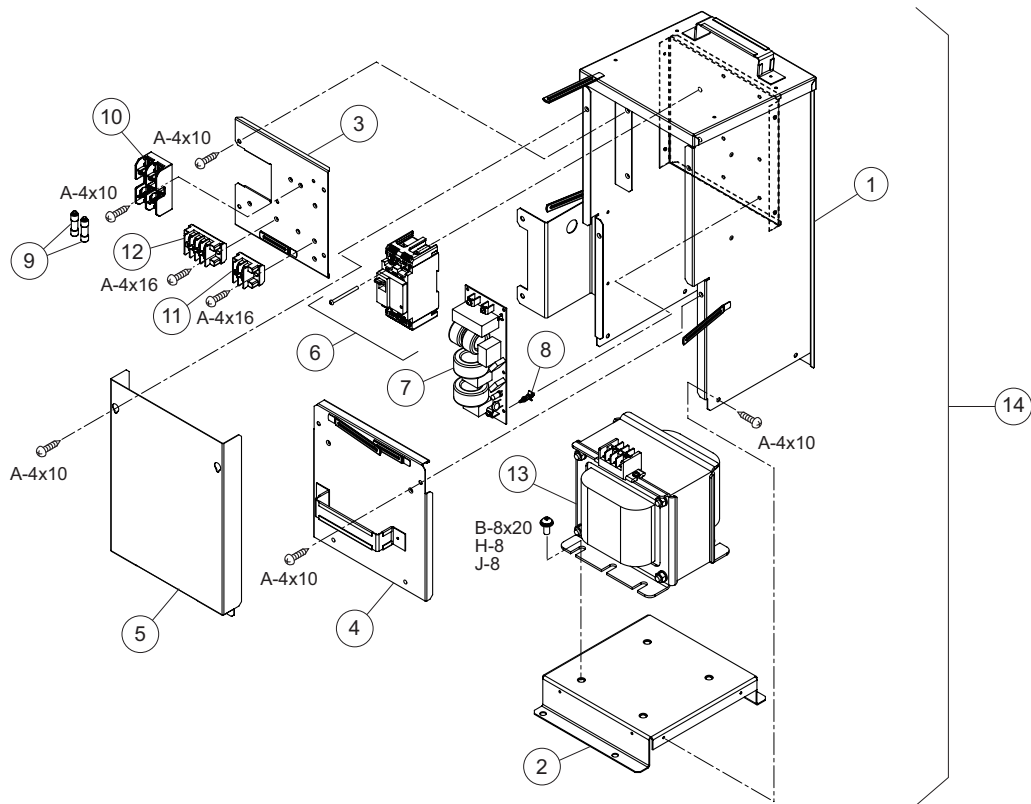
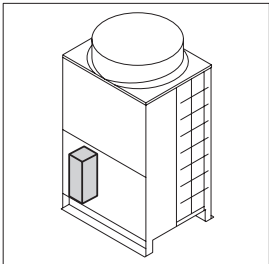
SERVICE PARTS LIST

[illegible]

LOCATION OF SERVICE PARTS IN THE UNIT

< TF Box >

MODEL: (H,Y)VAHP072B41CW
(H,Y)VAHP096B41CW



A	Truss Head Tapping Screw		F	Stud Bolt	
B	Round Head Screw		G	Nut	
C	Flat Head Screw		H	Washer	
D	Pan Head Tapping Screw		J	Spring Lock Washer	
E	Hexagon Head Bolt		K	Tooth Lock Washer	

NOTE:
A protective coating like zinc is applied to iron and steel for unspecified materials like a bolt or screw.

