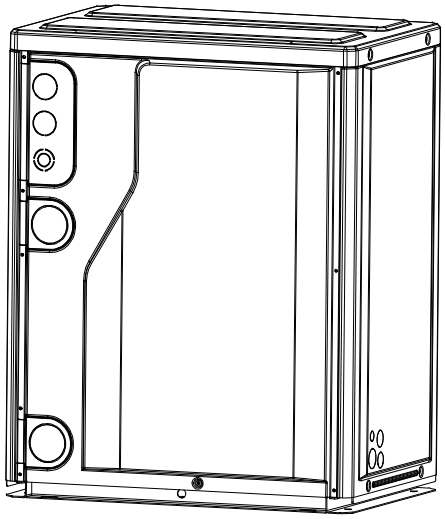
Installation and Maintenance Manual

INVERTER-DRIVEN
MULTI-SPLIT SYSTEM
HEAT PUMP AND
HEAT RECOVERY
AIR CONDITIONERS



Models:

Water Source Units;

AVWW-76FKFW
AVWW-96FKFW
AVWW-114FKFW
AVWW-136FKFW
AVWW-154FKFW
AVWW-170FKFW
AVWW-190FKFW
AVWW-210FKFW
AVWW-228FKFW
AVWW-250FKFW
AVWW-268FKFW
AVWW-286FKFW
AVWW-304FKFW
AVWW-326FKFW
AVWW-344FKFW
AVWW-360FKFW
AVWW-380FKFW
AVWW-400FKFW
AVWW-418FKFW
AVWW-440FKFW
AVWW-456FKFW
AVWW-476FKFW
AVWW-494FKFW
AVWW-516FKFW
AVWW-534FKFW
AVWW-550FKFW
AVWW-570FKFW

IMPORTANT:

READ AND UNDERSTAND THIS MANUAL BEFORE INSTALLING THIS HEAT PUMP AND HEAT RECOVERY AIR CONDITIONER. KEEP THIS MANUAL FOR FUTURE REFERENCE.

M00261Q

ORIGINAL INSTRUCTIONS

Declaration of Conformity
(Manufacturer's Declaration)

Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd.
Add: 218, Qianwangang Road, Economic & Technical Development Zone, Qingdao, P.R. China
declares under its sole responsibility that the air conditioning models to
which this declaration relates:

AVWW-76~570FKFW

are in conformity with the following standard(s) or other normative document(s), provided that these are used in accordance with our instructions:

EN 60335-1
EN 60335-2-40
EN 62233
EN 378-2 EN
61000-6-1
EN 61000-6-3

following the provisions of:

2006/42/EC
2014/30/EU
2012/19/EU
2011/65/EU
2014/35/EU
2014/68/EU
2014/517/EU
2009/125/EC
2010/30/EU
2006/1907/EC

Directives, as amended.
Manufacturing number and manufacturing year: refer to model Nameplate.
Notes:

This declaration becomes invalid, if technical or operational modifications are introduced without the manufacturers consent.

Hisense Italia S.r.l. is authorised to Compile the Technical Construction File.
Ad. : Via Montefeltro 6A, 20156 Milano.

Hisense

Name, Surname : Li Hu

Position/ Title : Director

Date : September 7, 2018

Important Notice

- Hisense pursues a policy of continuing improvement in design and performance in its products. As such, Hisense reserves the right to make changes at any time without prior notice.
- Hisense cannot anticipate every possible circumstance that might involve a potential hazard.
- This heatpump and heat recovery air conditioning unit is designed for standard air conditioning applications only.
  Do not use this unit for anything other than the purposes for which it was intended for.
- The installer and system specialist shall safeguard against leakage in accordance with local codes.
  No part of this manual may be reproduced in any way without the expressed written consent of Hisense.
- This heat pump and heat recovery 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 contractor.
- This manual provides common descriptions, basic and advanced information to maintain and service this heat pump and heat recovery air conditioning unit which you operate as well for other models.
- This heat pump and heat recovery air conditioning unit is 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

Indoor Unit Inlet Air Temperature	Cooling Operation Range	°C WB	15~23
	Heating Operation Range	°C DB	15~27
Water Source Unit Entering Water Temperature		°C	10~45

DB: Dry Bulb, WB: Wet Bulb

Refer to the Engineering Manual for details of operation limitations.

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

  This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.

Product Inspection upon Arrival

1. Upon receiving this product, inspect it for any damage 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 use 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 Hisense. Performing any mechanical alterations on this product without the consent of the manufacturer will render your warranty null and void.

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1. Introduction

This manual concentrates on the Water Source Heat Pump and Heat Recovery Unit. Read this manual carefully before installation. Read over the installation manual for the Indoor Unit also.

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

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

2. Important Safety Instructions

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

General Precautions

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

- This system should be installed by personnel certified by Hisense. Personnel must be qualified according to local codes and regulations. Incorrect installation could cause leaks, electric shock, fire or explosion. In areas where Seismic Performance requirements are specified, the appropriate measures should be taken during installation to guard against possible damage or injury that might occur in an earthquake. If the unit is not installed correctly, injuries may occur due to a falling unit.
- Use appropriate Personal Protective Equipment (PPE), such as gloves and protective goggles and where appropriate, have a gas mask nearby. Also use electrical protection equipment and tools suited for electrical operation purposes. Keep heat shields, fire blankets, 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 water source 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.
- Hisense will not assume any liability for injuries or damage caused by not following steps outlined or described in this manual. Unauthorized modifications to Hisense products are prohibited as they…
  - May create hazards which could result in death, serious injury, equipment damage, or property damage;
  - Will void product warranties;
  - May invalidate product regulatory certifications;
  - May violate OSHA standards;

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

- Be careful that moisture, dust, or variant refrigerant compounds not enter the refrigerant cycle during installation work. Foreign matter could damage internal components or cause blockages.
- If air filters are required on this unit, do not operate the unit without the air filter set in place. If the air filter is not installed, dust may accumulate and breakdown may result.
- 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 approximately 3m away from such devices.
- When a wireless controller is used, locate at a distance of at least approximately 1m between the indoor unit and electric lighting. If not, the receiver part of the unit may have difficulty receiving operation commands.
- Do not install the unit 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 overflow.
- 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.
- Do not install the unit where water can seep into the unit or where there is high humidity that can affect the unit.

Installation Precautions

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

- When installing the unit into…
  - A wall: Make sure the wall is strong enough to hold the unit's weight. It may be necessary to construct a strong wood or metal frame to provide added support.
  - A room: Properly insulate any refrigerant tubing run inside a room to prevent "sweating" that can cause dripping and water damage to walls, floors, or property within the space.
  - Damp or uneven areas: Use a raised concrete pad or concrete blocks to provide a solid, level foundation for the unit to prevent water damage and abnormal vibration.
- Do not install the unit outdoor, 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, hot spring or swimming pool.
  - Where dense, salt-laden airflow is heavy, such as in coastal regions.
  - Where the air quality is of high acidity.
  - Where harmful gases can be generated from decomposition.
- Do not install the unit in the place where water may enter the unit.
- 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 property 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 flame nearby.
- Perform a test run to ensure normal operation. Safety guards, shields, barriers, covers, and protective devices must be in place while the compressor/unit is operating. During the test run, keep fingers and clothing away from any moving parts.
- Clean up the site when finished, remembering to check that no tools, metal scraps, or bits of wiring have been left inside the unit being installed.
- During transportation, do not allow the backrest of the forklift make contact with the unit, otherwise, it may cause damage to the unit and also may cause injury when stopped or started suddenly.
- Remove gas inside the closing pipe (piping cap) 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.

Water Piping Precautions

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

- Select the water piping according to local or national regulation.
  Supply water must be clean tap water or industrial water. (Refer to Section 6.4 “Water Quality Requirements” for details.)
- Do not connect the drain outlet to the water piping.
  Install drain piping to proper drainage. Improper drain piping may result in water leakage and property damage.
- Perform piping work in such a way no water may drop on the service panels of the water source unit. Securely fasten the service panels. Otherwise, dust or water may enter the unit causing fire or electric shock.
- Water source unit must be used with closed type cooling tower. Open type cooling tower can not be used.
  Be sure to check the water pipeline construction, water quality monitoring, and water treatment.
- This product is equipped with plate type heat exchangers. In the plate type heat exchanger, water flows through a narrow space between the plates.
  Water strainer must be installed at the water inlet side of water piping near the product.
  Otherwise, impurities and water scales will damage heat exchanger. Be sure to regularly clean the strainer according to the clogging degree.
- Perform thermal insulation up to the water inlet/outlet of heat exchanger and the water piping to prevent sweating and freezing.
  Otherwise, damage may be caused by freezing during low ambient temperature and thermal loss.
  Amount of insulation depends on pipe temperature, air temperature, and humidity.
- Be sure to check the position of connection pipe. Do not connect inlet and outlet pipe reversely.
  Connection pipe and pipe joint on heat exchanger should be removal to make operation and clean work more convenient.
- There must be an extra bracer to support piping and piping joints. Use a sleeve to protect the pipes at the point where they go through a wall.
- Perform a thorough inspection of the unit to check for leaks both inside and outside of the system.
  Open fully the water inlet and outlet valves to the unit. Ensure valve flow to the inlet and outlet piping.
  Ensure air purge and drain valves are functioning on the water piping.
  Remove the valve handle to prevent the valve from being opened. If this valve is opened during operation, water blow-off can cause disruption.
  Set the drain valve at lower points in the water system to allow thorough discharge of water to the heat exchanger and system.
- When shutting down the unit for a long period, drain the water from the water piping by opening the drain plug or the air purge plug.

- In winter, when the ambient temperature is low, equipment and piping can be damaged during the shutdown periods at night, because the water in the pump or piping will be frozen. To prevent the water from freezing operate the pumps even during the shutdown periods. In case there is still a danger of freezing, completely drain the water from the piping. After a long stoppage, be sure to check and clean the unit in the water system thoroughly before initial startup.

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 Hisense. Hisense uses only refrigerants that have been approved for use in the unit's intended home country or market. Hisense 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 Hisense distributors. Use of any non-approved refrigerant substitutes will void the warranty and will increase the potential risk of equipment damage, property damage, personal injury, or death.

- Take measures to ensure that the refrigerant limitations in ASHRAE Standard 15 (Canada: B52), or other local codes, are followed. If refrigerant gas has leaked during the installation work, ventilate the room immediately.
- Check the design pressure for this product is 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 must be thicker than that for R22. Be sure to use the specified refrigerant piping. If not, the refrigerant piping may rupture due to an excessive refrigerant pressure. 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 other non-condensables. Perform the installation work with care to prevent moisture, dust, or different refrigerant from entering the refrigerant cycle. Foreign matter can be introduced into the cycle from such parts as expansion valve and the operation may be unavailable.
- To avoid the possibility of different refrigerant or refrigerant oil being introduced into the cycle, the sizes of the charging connections have been changed from R407C type and R22 type. It is necessary to prepare the tools listed in Section 3.2 before performing the installation work.
- Use refrigerant pipes and joints which are approved for use with R410A.
- A compressor/unit comprises a pressurized system. Never loosen threaded joints while the system is under pressure and never open pressurized system parts.
- Before installation is complete, make sure that the refrigerant leak test has been performed. If refrigerant gases escape into the air, turn OFF the main switch, extinguish any open flames and contact your service contractor. Refrigerant (Fluorocarbon) for this unit is odorless. If the refrigerant should leak and come into contact with open flames, toxic gas could be generated. Also, because the fluorocarbons are heavier than air, they settle to the floor, which could cause asphyxiation.
- When installing the unit, and connecting refrigerant piping, keep all piping runs as short as possible, and make sure to securely connect the refrigerant piping before the compressor starts operating. If the refrigerant piping is not connected and the compressor activates with the stop valve opened, the refrigerant cycle will become subjected to extremely high pressure, which can cause an explosion or fire.
- Tighten the flare nut in the indoor unit 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 excessive force to the stop valve at the end of opening. Otherwise, the stop valve flies out due to refrigerant pressure. At the test run, fully open the gas and liquid valves, otherwise, these devices will be damaged. (It is closed before shipment.)
- If the arrangement for water source units is incorrect, it may cause flowback of the refrigerant and result in failure of the water source unit.
- The refrigerant system may be damaged if the slope of the piping connection kit exceeds $\pm 15^{o}$.

Electrical Precautions

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

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

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

    Regarding the cases mentioned above, surge voltage may be inducted into the power supply cables for the packaged air conditioner due to a rapid change in power consumption of the device and an activation of a switch.
    Check field regulations and standards before performing electrical work in order to protect the power supply for the new air conditioner unit.
- Communication cable shall be a minimum of AWG18 ($0.82mm^2$), 2-Conductor, Stranded Copper. Shielded cable must be considered for applications and routing in areas of high EMI and other sources of potentially excessive electrical noise to reduce the potential for communication errors. When shielded cable is applied, secure properly and terminate cable shield as required per Hisense 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.
- Make sure that the terminals do not come into contact with the surface of the electrical box. If the terminals are too close to the surface, it may lead to failures at the terminal connection.
- Turn OFF and disconnect the unit from the power supply when handling the service connector. Do not open the service cover or access panel to the indoor or water source units without turning OFF the main power supply.

- After ceasing operation, be sure to wait at least five minutes before turning of the main power switch. Otherwise, water leakage or electrical breakdown may result. Disconnect the power supply completely before attempting any maintenance for electrical parts. Check to ensure that no residual voltage is present after disconnecting the power supply.
- Do not clean with, or pour water into, the controller as it could cause electric shock and/or damage the unit. Do not use strong detergent such as a solvent. Clean with a soft cloth.
- Check that the ground wire is securely connected. Do not connect ground wiring to gas piping, water piping, lighting conductor, or telephone ground wiring.
- If a circuit breaker or fuse is frequently tripped, shut down the system and contact your service contractor.
- Perform all electrical work in accordance with this manual and in compliance with all regulations and safety standards.
- Do not open a service access cover or panel of an indoor or water source unit without first turning OFF the power at the main power supply.
- Residual voltage can cause electric shock. At all times, check for residual voltage after disconnecting from the power supply before starting work on the unit.
- This equipment can be installed with a Ground Fault Circuit Breaker (GFCI), which is a recognized measure for added protection to a properly grounded unit. Install appropriate sized breakers / fuses / overcurrent protection switches, and wiring in accordance with local codes and requirements. The equipment installer is responsible for understanding and abiding by applicable codes and requirements.

3. Before Installation

3.1 Factory-Supplied Accessories

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

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Accessories			76	96	114	136	154	170	190
Pipe Accessories	(A)	Adapters at HP gas side	 Φ19.05→Φ15.88						
	(B)	Adapters at LP gas side		 Φ19.05→Φ22.2			 Φ25.4→Φ28.6	 Φ25.4→Φ28.6	 Φ25.4→Φ28.6
	(C)	Adapter at liquid side					 Φ15.88→Φ12.7		

ID: Inner Diameter OD: Outer Diameter

NOTICE

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

3.2 Line-Up of Water Source Units

This water source unit series consists of models 76-190. The water source unit can be used as either heat pump system or heat recovery system.

3.2.1 Heat Pump System

Capacity	76	96	114	136
Model	AVWW-76FKFW	AVWW-96FKFW	AVWW-114FKFW	AVWW-136FKFW
Capacity	154	170	190	210
Model	AVWW-154FKFW	AVWW-170FKFW	AVWW-190FKFW	AVWW-210FKFW
Capacity	154	170	190	210=96+114
Model	AVWW-154FKFW	AVWW-170FKFW	AVWW-190FKFW	AVWW-210FKFW
Capacity	228=114+114	250=114+136	268=114+154	286=96+190
Model	AVWW-228FKFW	AVWW-250FKFW	AVWW-268FKFW	AVWW-286FKFW
Capacity	304=114+190	326=136+190	344=154+190	360=170+190
Model	AVWW-304FKFW	AVWW-326FKFW	AVWW-344FKFW	AVWW-360FKFW
Capacity	380=190+190	400=96+114+190	418=114+114+190	440=96+154+190
Model	AVWW-380FKFW	AVWW-400FKFW	AVWW-418FKFW	AVWW-440FKFW
Capacity	456=96+170+190	476=96+190+190	494=114+190+190	516=136+190+190
Model	AVWW-456FKFW	AVWW-476FKFW	AVWW-494FKFW	AVWW-516FKFW
Capacity	534=154+190+190	550=170+190+190	570=190+190+190	
Model	AVWW-534FKFW	AVWW-550FKFW	AVWW-570FKFW	

3.2.2 Heat Recovery System

Capacity	76	96	114	136
Model	AVWW-76FKFW	AVWW-96FKFW	AVWW-114FKFW	AVWW-136FKFW
Capacity	154	170	190	210
Model	AVWW-154FKFW	AVWW-170FKFW	AVWW-190FKFW	AVWW-210FKFW
Capacity	154	170	190	210=96+114
Model	AVWW-154FKFW	AVWW-170FKFW	AVWW-190FKFW	AVWW-210FKFW
Capacity	228=114+114	250=114+136	268=114+154	286=96+190
Model	AVWW-228FKFW	AVWW-250FKFW	AVWW-268FKFW	AVWW-286FKFW
Capacity	304=114+190	326=136+190	344=154+190	360=170+190
Model	AVWW-304FKFW	AVWW-326FKFW	AVWW-344FKFW	AVWW-360FKFW
Capacity	380=190+190	400=96+114+190	418=114+114+190	440=96+154+190
Model	AVWW-380FKFW	AVWW-400FKFW	AVWW-418FKFW	AVWW-440FKFW
Capacity	456=96+170+190	476=96+190+190	494=114+190+190	516=136+190+190
Model	AVWW-456FKFW	AVWW-476FKFW	AVWW-494FKFW	AVWW-516FKFW
Capacity	534=154+190+190	550=170+190+190	570=190+190+190	
Model	AVWW-534FKFW	AVWW-550FKFW	AVWW-570FKFW	

4. Water Source Unit Installation

4.1 Installation Location and Precautions

⚠ WARNING

Install the water source unit to indoors. It is recommended that the water source unit be installed in a mechanical room, to prevent weather damage. To reduce the risk of serious injury or death, the following installation precautions must be followed.

- When installing the unit into…
  - A room: Properly insulate any refrigerant pipe run inside a room to prevent "sweating" that can cause dripping and water damage to walls, floors, equipment, and property.
  - 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.
  - Install the unit indoor. Do not install the unit in a place where water can enter the unit.
  - Install the water source unit in the shade, not exposed to direct sunshine or direct radiation from any high temperature heat sources.
  - Install the water source unit in a space with limited access to general public.
  - Install the water source in a space where ambient temperature is 1.7~40°C DB and relative humidity is lower than 80%.
  - When installed in an enclosed space, the space should be vented accordingly.
- Do not install the unit outdoor. 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, hot spring or swimming pool.
  - Where dense, self-laden airflow may be present.
  - Where the air quality is of high acidity.
  - Where other harmful gases may be present.
- During heating operation, condensate is discharged. Provide adequate condensate hose (field supplied).
- Before performing any brazing work, be sure that there are no flammable materials or open flame nearby.
- Perform a test run to ensure normal operation. Safety guards, shields, barriers, covers, and protective devices must be in place while the compressor/unit is operating. During the test run, keep fingers and clothing away from any moving parts.
- Clean up the site when finished, remembering to check that no tools, metal scraps, or bits of wiring have been left behind inside the unit being installed.

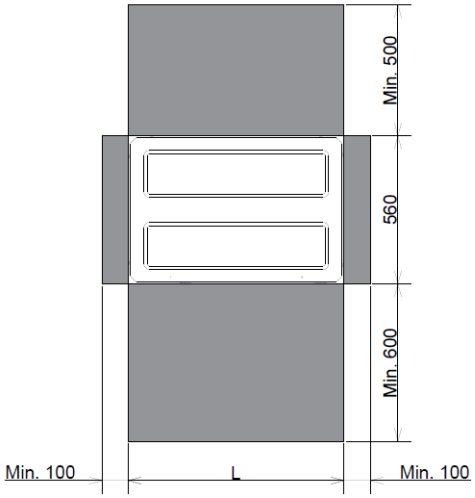
After installation work for the system has been completed, explain the "Safety Precautions," the proper use and maintenance of the unit to the customer according to the information in all manuals that came with the system. All manuals and warranty information must be given to the user or left near the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

4.2 Service and Installation Space

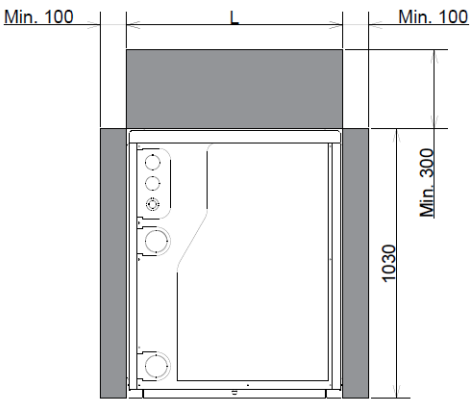
Install the water source unit with sufficient space around it for operation and maintenance access as shown in the following figures.

- Service and Installation Spaces
  Secure the service space when replacing parts or service maintenance access.
  Single installation with refrigerant pipes from front side piping cover and drain pipe from front side of unit.

Unit: mm



Top View

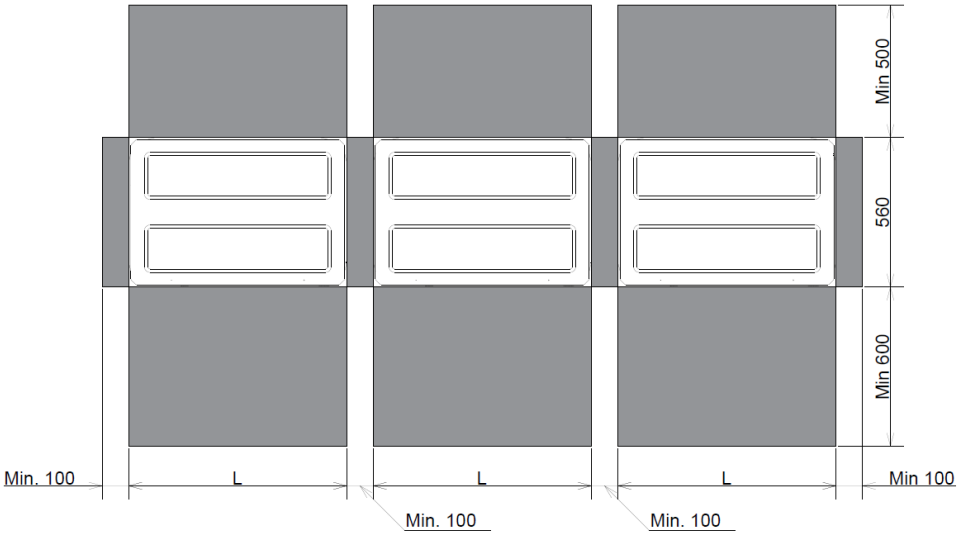


Front View

* Provide minimum of 500mm space for drain pipe from rear side of unit.

Multiple installation with drain pipe from front side of unit.

Unit: mm



Top View

* Provide minimum of 500mm space for drain pipe from rear side of unit.

Unit: mm

Model	L
76, 96, 114 and 136	820
154, 170 and 190	1040

Suspending 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 to prevent the unit from tipping over.

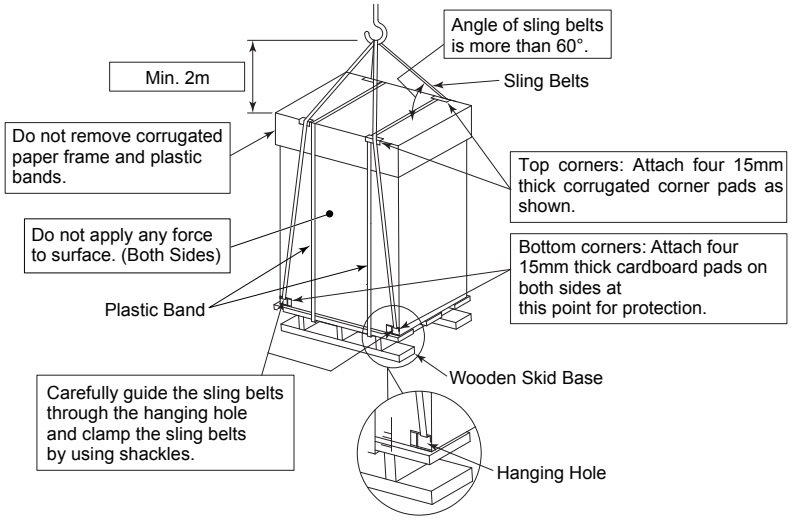


Figure 5.1 Suspending Unit on Wooden Skid Base for Transportation

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

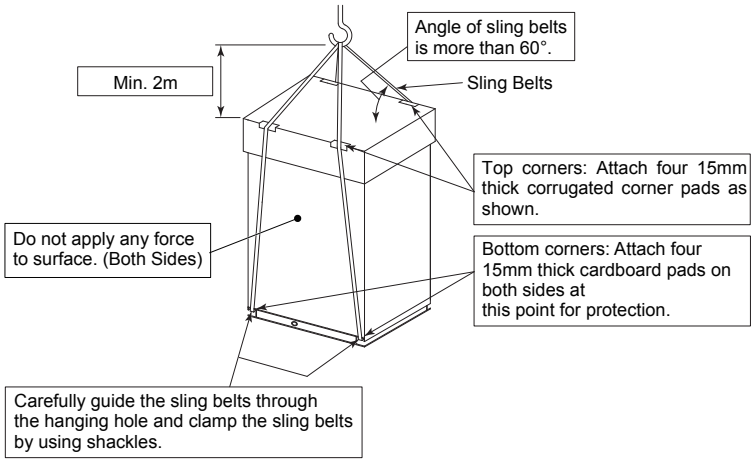


Figure 5.2 Suspending Unit without Wooden Skid Base

5. Transportation and Installation Work

5.1 Handling of Water Source Unit

⚠ WARNING

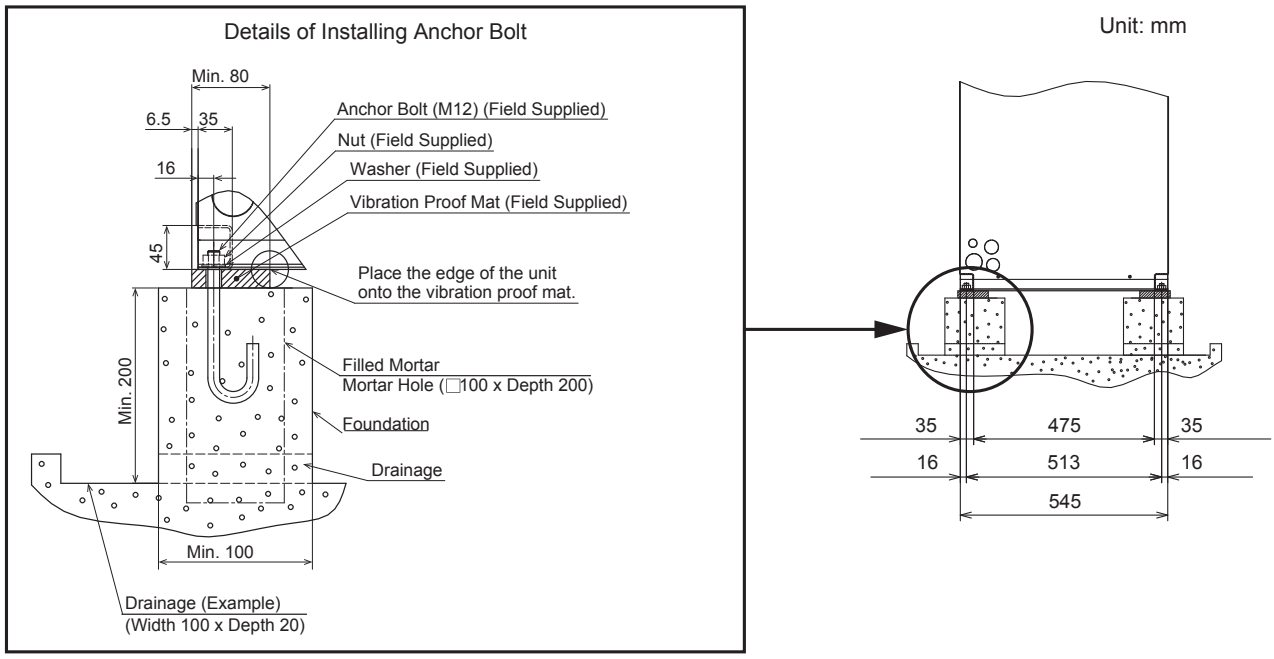
Do not place or leave any foreign objects: (cables, tools), inside the water source unit or control module and verify that nothing remains there prior to installation and test run. Damage and fire can result due to carelessness.

5.2 Installation Work

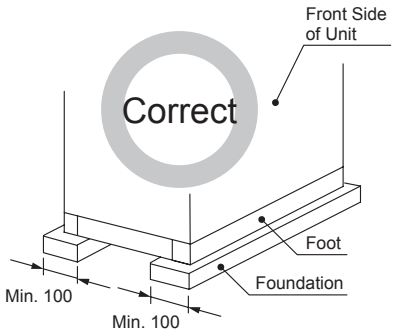
5.2.1 Concrete Foundations

(1) The height of the foundation should be more than 150mm above the ground.

(2) Provide adequate drainage around the foundation.

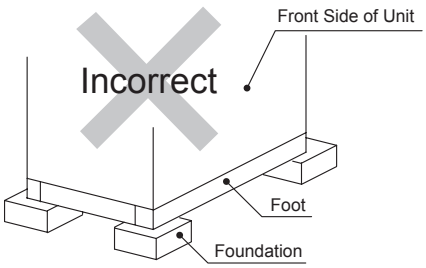


* Provide a concrete foundation as shown below.

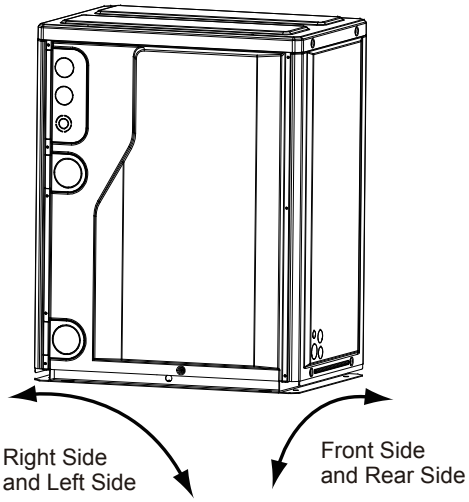


The concrete foundations are installed along the water source unit width direction.

* Do not use a concrete foundation such as seen here. The base of the water source unit can become deformed.



(3) Install the water source 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 10mm. The unit should be installed so that the front (or back) side of the unit is slightly (0 to 5mm) lower than the back (or front) side to allow and promote condensate drainage.

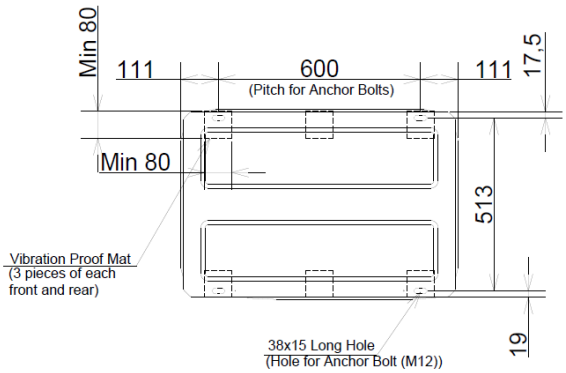


(4) Provide a strong, level, and stable foundation so that:
   a. The water source unit does not lean to one side.
   b. Sound from inside unit are minimal.
   c. The water source unit always remains stable and upright.

(5) When installing the water source unit, secure the unit with anchor bolts and field-supplied vibration proof mats. Refer to Figure 5.4 for the location of holes for anchor bolts.

Unit: mm

Models 76, 96, 114 and 136



Models 154, 170 and 190

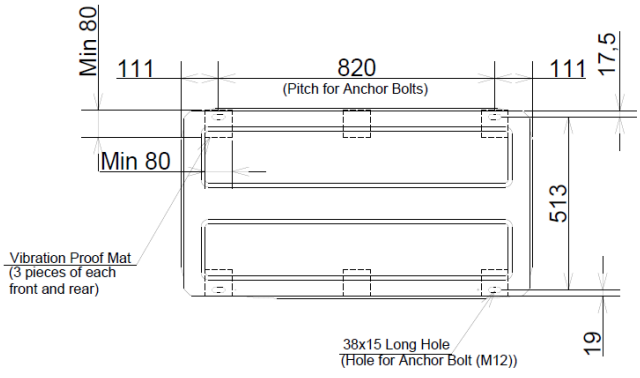
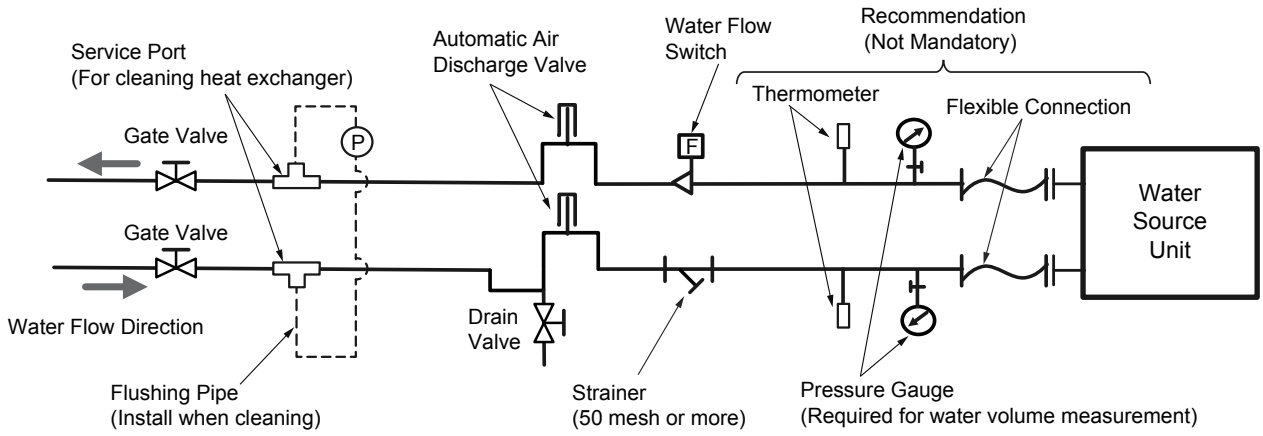


Figure 5.4 Positions of Anchor Bolts

6. Water Piping Work

6.1 Piping Connection

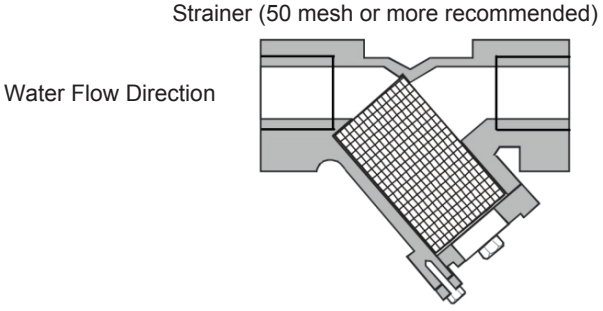
Example of basic water piping connection to the water source unit is shown below.



Basic Water Piping Connection

Perform the piping connection work for the water source unit while paying attention to the following.

- Make sure to select appropriate water pump (field-supplied) depending on water source unit model and number of units. Refer to Section 6.2 for water flow rate and pressure drop for each water source unit.
- Install gate valves at the inlet and outlet piping to isolate from other water circuit and allow service of the water source unit.
- It is recommended to install service ports at an easy position to handle for chemical cleaning of plate heat exchanger.
- Equip drain valve and automatic air discharge valves on the water piping.
  The drain valve handle should be removed so that the valve can not be opened under normal circumstances.
  If this valve is opened during operation, trouble will occur due to water blow-off.
  Drain valve should be set on lower points in water system, so as to discharge water in the plate heat exchanger and system thoroughly.
  Install automatic air discharge valves at the higher position where air is likely collect and in order to discharge air in piping.
  If air remains inside the water piping then it may decrease the operating performance and cause corrosion.
- Provide a 50 mesh or more water strainer at the water inlet side of water piping within approximately 1~2m from the water source unit. Otherwise, plate heat exchanger may damage. In the plate heat exchanger, water flows through a narrow space between the plates.
  Therefore, there is a possibility that freezing or corrosion may occur if foreign particles or dusts are clogged. Also, install a cleanable water strainer at the portion close to the water inlet side of water pump.



NOTE:

Be sure to install horizontally on the water inlet side. In case the water flow downwards, vertical installation is allowed.

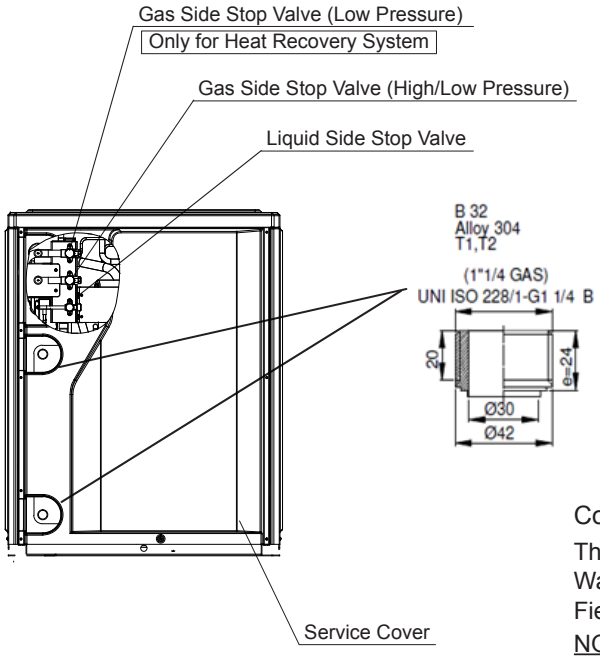
- It is recommended to install thermometer and pressure gauge at the water inlet and outlet side of water source unit for easy service.
- It is recommended to utilize flexible connections to the water inlet and outlet side of water piping, so that vibration is not transmitted and prevent piping crack.
- Provide water flow switch (field-supplied) at the water outlet side of water piping within approximately 1~2m from the water source unit to check the water flow. Refer to Section 6.3 for details.
- Connect water piping to water inlet and outlet of the water source unit. Be sure to check the position of connection piping. Do not connect inlet and outlet piping reversely. Tighten securely the connection of water piping and socket with tightening torque not exceeding the upper limit value in the following table.

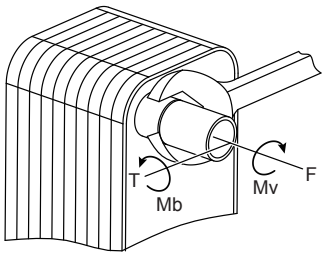
Maximum Tightening Torque

T [kN]	F [kN]	Mb [N·m]	Mv [N·m]
24.7	9.6	300	500

Position of Piping Connection
The water piping connection is located in the front side of unit.

Unit: mm



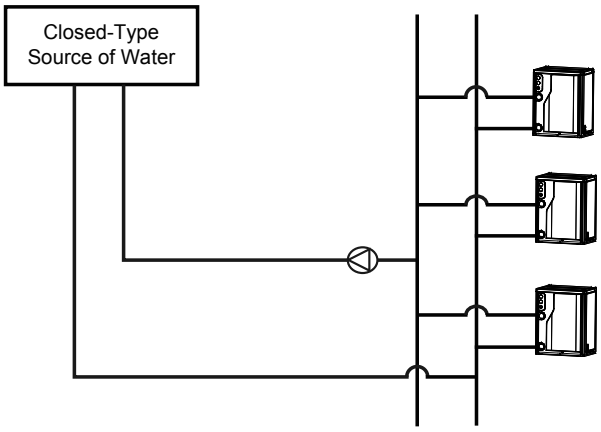


Connection Size

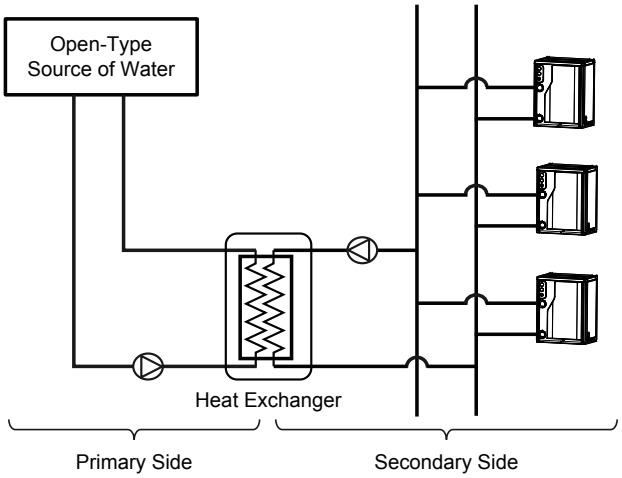
Thread size: 1-1/4” NPT (Threads per inch :11-1/2 pcs)
Water source unit side: Male thread (outside thread)
Field water piping side: Female thread (inside thread)
NOTE:
Water piping size should be designed with consideration for pump size and overall length of piping.

Water Piping Connection and Socket of Heat Exchanger

- Water pressure resistance of the water piping of this water source unit is 1.96 MPa.
- Water piping size to the unit should not be less than that of pipe joint on the unit.
- Select the water piping according to local or national regulation.
- Before installation, flush a l water piping thoroughly to ensure no foreign particle from entering. Be careful not to flush any foreign particle into plate heat exchange .
- Make sure the water circuit supply to the water source unit is closed loop water circuit and water is not exposed to the atmosphere. In case open-type cooling tower is used, provide heat exchanger between the cooling tower and water source unit system piping. Make sure the water circuit supply to the water source unit is closed loop water circuit. Otherwise, corrosion may occur.



Closed-Type Water Circuit



Open-Type Water Circuit with Heat Exchanger

- Sufficiently perform insula ion to keep the water piping cool and to prevent sweating of the piping. Thermal loss may also occur.
- If the water is frozen, the plate heat exchanger of the water source unit may be busted. Prepare freeze protection while paying attention to the following.

Examples of freeze protection:

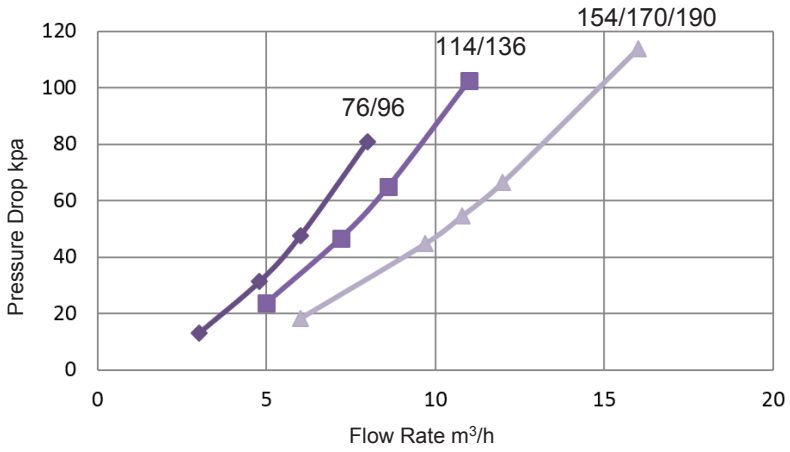
- Use heater or boiler to prevent water from freezing.
- Install water source unit in an environment with an ambient temperature above 1.7°C DB.
- When water piping temperature or water temperature is low, operate the water pump to prevent freezing during the water source unit is stopped.
- When the water source unit will not be used for long periods in low ambient conditions, completely drain the water from the water source system. Be sure to check and clean the water source unit in water system thoroughly before initial startup after a long stoppage.

6.2 Water Flow Rate and Pressure Drop

Water Flow Rate and Pressure Drop
Select the water pump (field-supplied) according to the following table

Model		76	96	114	136	154	170	190
Rated Water Flow Rate [m^3/h]		4.60	5.76	6.90	8.30	9.20	10.00	11.60
Allowable Water Flow Rate [m^3/h]	Maximum	3.04	3.80	4.55	5.48	6.07	6.60	7.66
	Minimum	2.53	3.15	3.80	4.57	5.06	5.50	6.38

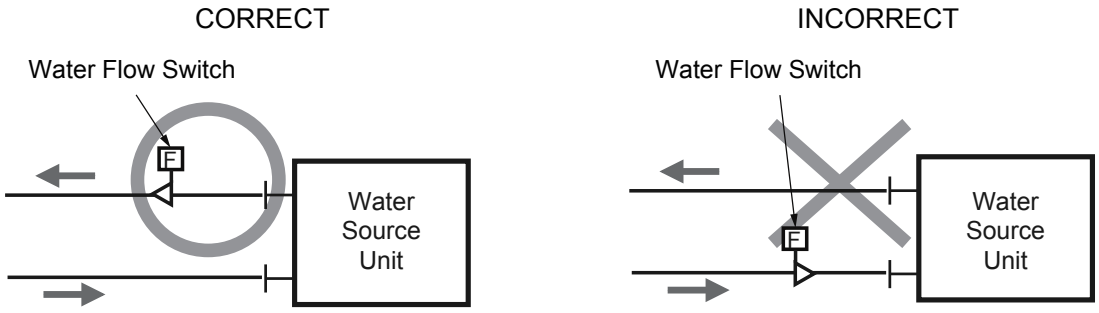
Relation of water flow rate and pressure drop of each water source unit model is shown in the chart below.



In case the water source unit operate above the rated water flow rate, the water pump power consumption is increased. It is recommended to operate below the rated water flow rate

6.3 Water Flow Control

Water source unit is damaged if it is operated with no water circulating through the water piping.
It is necessary to provide the water flow switch (field-supplied) on water outlet side of water piping within approximately 1~2m from each water source unit to realize stop protection.
If water flow switch is open while the water source unit is operating, “A2” alarm occurs.
Water flow switch should be turned ON in 240sec. or less after water source unit starts operation
Refer to Section 8.3 for the details of wiring to electrical box.



NOTICE:

- Select water flow switch (field-supplied) which output close signal when minimum flow rate is satisfied for each water source unit. Refer to the table at Section 6.2.
- Install water flow switch by following their installation procedure.
- If water flow switch is NOT proper (non-detectable), plate heat exchanger may burst due to water freeze or compressor may damage due to increased pressure. On the other hand, if the water flow switch detection is easy, then the water source unit is forced to stop frequently.
- Water flow switch is not required to detect overflow rate.
  However overflow rate may cause refrigerant cycle trouble

6.4 Water Quality Requirements

⚠ CAUTION

- **Water source unit must be used with closed type cooling tower. Open type cooling tower will face poor quality-water, corrosion and sediment. Be sure to check the water pipeline construction, water quality monitoring and water treatment.**
- **Make sure to use anti-corrosion agent or deterioration treatment agent when the steel piping is not protected by protection layers. Corrosion may occur when the water temperature is above 104°F(40°C).**
- **Do not use once-through cooling water. Otherwise, corrosion may occur.**
- **Make sure that any water scales inhibitor or water treatment won't damage stainless steel or copper piping associated with the local water treatment facility.**
- **When treated water is used, it rarely causes scale deposits or other damage to equipment. However, well water or river water will in most cases contain suspended solid matter, organic matter, and scale in great quantities.**
  Therefore, such water should be subjected to filtration or softening treatment with chemicals before application. It is also necessary to analyze the quality of water by checking pH, electrical conductivity, ammonia ion content, sulfur content, and others, and to utilize treated water only if problem is encountered through these checks.

For circulating water and make-up water, used in a closed-type water circuit such as a closed-type cooling tower, the standards shown in the table below should be followed.

Table 6.1 Water Quality Requirement (Reference)

Items Based on Guideline of Water Quality for Refrigeration and Air Conditioning Equipment (JRA GL02E-1994)			Circulating Water (20~60°C)	Make-up Water	Tendency	
					Corrosion	Scale
Standard Items	pH (25°C)		7.0~8.0		○	○
	Electrical conductivity (25°C)	[mS/m]	< 9.1 (30)		○	○
	Chloride ions	[mg Cl^-/ℓ]	< 50		○	
	Sulfate ions	[mg SO_4^{2-}/ℓ]	< 50		○	
	Acid consumption (pH 4.8)	[mg $CaCO_3$/ℓ]	< 50			○
	Total hardness	[mg $CaCO_3$/ℓ]	< 70			○
	Calcium hardness	[mg $CaCO_3$/ℓ]	< 50			○
	Ionic silica	[mg SiO_2/ℓ]	< 30			○
Reference Items	Iron	[mg Fe/ℓ]	< 1.0	< 0.3	○	○
	Copper	[mg Cu/ℓ]	< 1.0	< 0.1	○	
	Sulfate ions	[mg S^{2-}/ℓ]	—		○	
	Ammonium ions	[mg NH_4^+/ℓ]	< 0.3	< 0.1	○	
	Residual chlorine	[mg Cl/ℓ]	< 0.25	< 0.3	○	
	Free carbon dioxide	[mg CO_2/ℓ]	< 0.4	< 4.0	○	
	Stability Index		—		○	○

NOTE:
- These items represent typical causes of corrosion and scale.
  The circle marks "○" in the columns "Tendency" indicate a tendency for corrosion or scale to develop.
- Do not use antifreeze solution.

6.5 Maintenance of Water Circuit

If the water pressure difference at the water inlet and outlet sides of the plate heat exchanger is higher compared to during Test Run, the water strainer may be clogged.
Be sure to regularly clean the water strainer according to the clogging degree and check the water flow rate (or pressure drop).

- If clogging in the plate heat exchanger occurs seriously, this will cause insufficient cooling performance o freezing in the heat exchanger. It is strongly recommended that the plate heat exchanger be cleaned at the same time when the water strainer is cleaned.
- In case of removing the scale formed on the plate heat exchanger, it is recommended to use 5% diluted solutions which contains formic acid, citric acid, oxalic acid, acetic acid or phosphoric acid.
  Do not use corrosive solutions with hydrochloric acid or nitrate.
- Circulate the cleaning solution of 50~62^{o}C by using a water pump for 2 to 5 hours.
  Cleaning time depends on the change of the dirtiness (color) of cleaning solution.
  After circulating the cleaning solution, remove the solution from the plate heat exchanger.
  Then circulate the neutralization solution such as 1~2% sodium hydroxide (NaOH) or sodium bicarbonate ($NaHCO_3$) for 15~20 minutes.
- When using any cleaning detergent sold in the market, make sure that it does not cause corrosion to stainless steel and copper. For details of cleaning method, contact the manufacturer of cleaning detergent.
- Cleaning of plate heat exchangers shall be performed by specialists. Contact your contractor or distributor.
- After cleaning has been completed, make sure that the unit can be operated normally.
  When the freeze protection is activated during operation, make sure to remove the cause before restarting the operation. In case the freezing is repeated, the heat exchanger is damaged and refrigerant leakage or water enter the refrigerant pipe may occur.
- When the water pressure difference during operation is over the allowable range, make sure to stop the water source unit and remove the cause.

7. Refrigerant Piping Work

⚠ WARNING

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

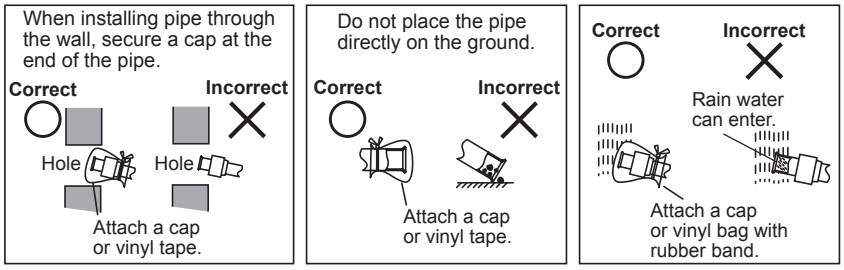
⚠ CAUTION

- **Ensure that the corresponding pipe connections for the liquid, low pressure gas and high/low pressure 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.**

7.1 Piping Materials

(1) Obtain locally-supplied copper pipes.
(2) Use 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.
Do not use any tools which produce a lot of metal shavings such as a saw or a grinder.
(5) Take special care to prevent contamination or moisture settling on interior pipe surfaces during piping work.

Cautions for Refrigerant Pipe Ends

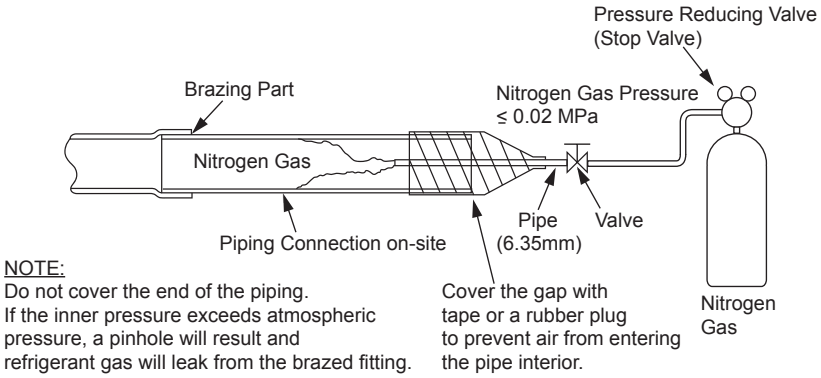


Brazing Work

(1) Brazing work must be performed by an authorized installer.

(2) For refrigerant pipe connections, perform non-oxidation brazing with a nitrogen purge. If refrigerant piping is brazed without nitrogen, a large amount of oxidized scaling is generated in the piping. This oxidized scaling will cause clogging inside the expansion valve, solenoid valve, accumulator, and compressor, which will prevent the unit from operating properly.
Do not use the field-supplied antioxidant which can corrode pipes and degrade the refrigerant oil.

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

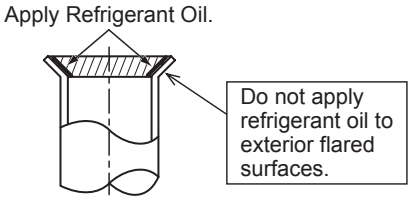


NOTICE:
To avoid oxidation and scaling, perform brazing at the appropriate brazing temperature.

Cautions for Piping Connection Work

(1) Verify that there are no scratches, metal shavings, gaps, or deformations at the flared end before connecting pipe to the system.

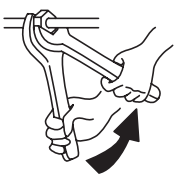
(2) Before tightening the flare nut, apply a small amount of oil (field-supplied) to the outside of the flare (Do not apply any oil to the threads.) Tighten the liquid pipe flare nut to the specified torque while using a back-up wrench to prevent damage to the unit. Ensure that the flare connections are leak-free upon completion of the work with a proper pressure/leak test.
NOTE:
Refrigerant oil is field-supplied
[Polyvinyl Ether Oil: FVC68D (Idemitsu Lubricants America)]



(3) Be sure to use the accessory flare nuts for indoor unit connections.
To tighten the torque for liquid stop valve, refer to Section 7.2.1 “Stop Valve” of the tightening torque table.

Required Tightening Torque

Pipe Size	Tightening Torque
6.35 mm	14 - 18 N·m
9.52 mm	34 - 42 N·m
12.7 mm	49 - 61 N·m
15.88 mm	68 - 82 N·m
19.05 mm	100 - 120 N·m

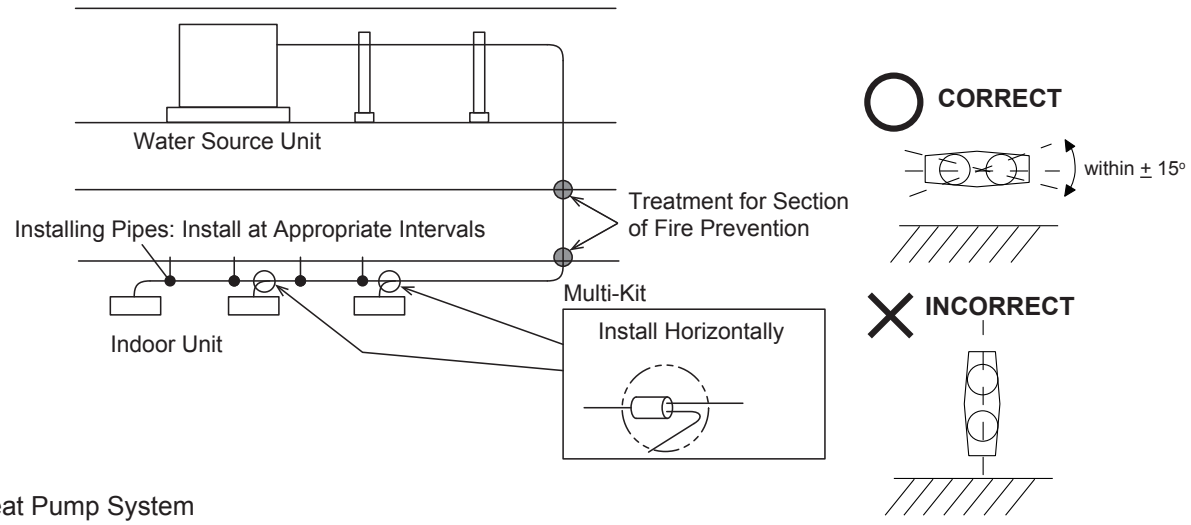

Use two wrenches as shown.

(4) When the temperature and humidity inside the ceiling exceed 27°C/RH80%, apply additional insulation of approximately 10mm in thickness to the existing insulation. The insulation prevents the formation of condensation on the surface of the insulation (refrigerant pipe only).
(5) Perform a leak test at 4.15MPa.
(6) Perform cold insulation work by wrapping tape around flared and reducer connections. Also, insulate all the refrigerant pipes.
(7) Connect the indoor/water source units with refrigerant pipe. Secure the pipe to prevent it from coming into contact with structures such as a wall or ceiling. Otherwise, noise will occur due to vibration of the pipe.

Precaution for Installing and Securing Piping

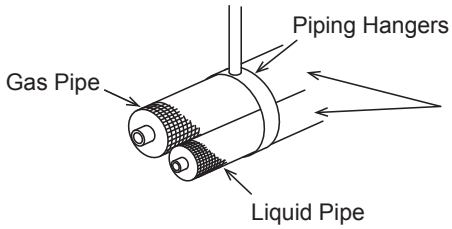
When assembling pipes onsite with hidden elbow or socket joints, provide a service access door to facilitate close-up examination of interconnecting components.

Example for Pipe Support



For Heat Pump System

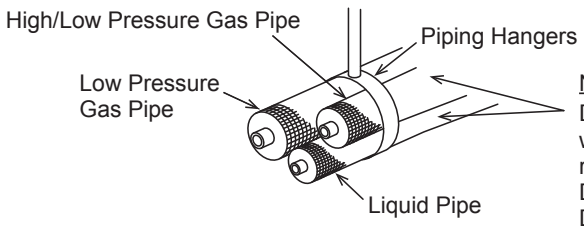
Secure Liquid Pipes and Gas Pipes



NOTICE:
Due to varying chemical properties, gas and liquid pipes will expand or contract at different rates due to changing refrigerant temperatures.
Do not fasten gas and liquid pipes together with tape. Distortion and deformation of the pipes can occur when improperly supported.

For Heat Recovery System

Secure Liquid Pipes, Low Pressure Gas Pipes and High/Low Pressure Gas Pipes



NOTICE:
Due to varying chemical properties, gas and liquid pipes will expand or contract at different rates due to changing refrigerant temperatures.
Do not fasten gas and liquid pipes together with tape. Distortion and deformation of the pipes can occur when improperly supported.

Table 7.1 Piping Sizes of Water Source

Unit Model: AVWW-FKFW (2 Pipes)

mm

Model	Gas	Liquid
76/96	19.05	9.53
114/136	22.20	12.70
154-190	22.20	15.88

Model: AVWW-FKFW (3 Pipes)

mm

Model	Gas		Liquid
	Low Pressure	High/Low Pressure	
76/96	19.05	19.05	9.53
114/136	25.40	22.20	12.70
154 - 190	25.40	22.20	15.88

Table 7.2 Piping Sizes of Indoor Unit

mm

Model	Gas	Liquid
6 - 15	12.7	6.35
18 - 54	15.88	9.52
60 - 72	19.05	9.52
96	22.2	9.52

7.2 Piping Connection Work

Comply with the restrictions for refrigerant piping (permissible length, height difference) in “Piping Work Conditions” and “Piping Branch Restriction” under Section 7.4 or the water source unit can become damaged or fail. The stop valves are closed (factory-setting) when refrigerant piping connections are performed. Do not open these stop valves until all the refrigerant pipes are connected, pressure tested, and evacuated.

7.2.1 Stop Valve

(1) Make sure that all the stop valves are closed.
(2) Connect a manifold to the service port and release any gas inside the pipe.
(3) Cut the end of the closing pipe (piping cap) and ensure that no residual gas or oil exists inside the gas pipe.
(4) Remove any combustible material from unit before using a torch. (Please see close pipe (piping cap) diagram below.)
(5) Remove the closing pipe (piping cap) from the brazing portion with a torch. The stop valve will be damaged unless protected by a wet cloth or other means.

⚠ WARNING

When installing a Heat Pump System, do <u>not</u> cut the end of the closing pipe (piping cap) of the low pressure gas pipe. If the end of the closing pipe (piping cap) for the low pressure gas pipe is cut by mistake, reseal it completely to prevent refrigerant leakage.

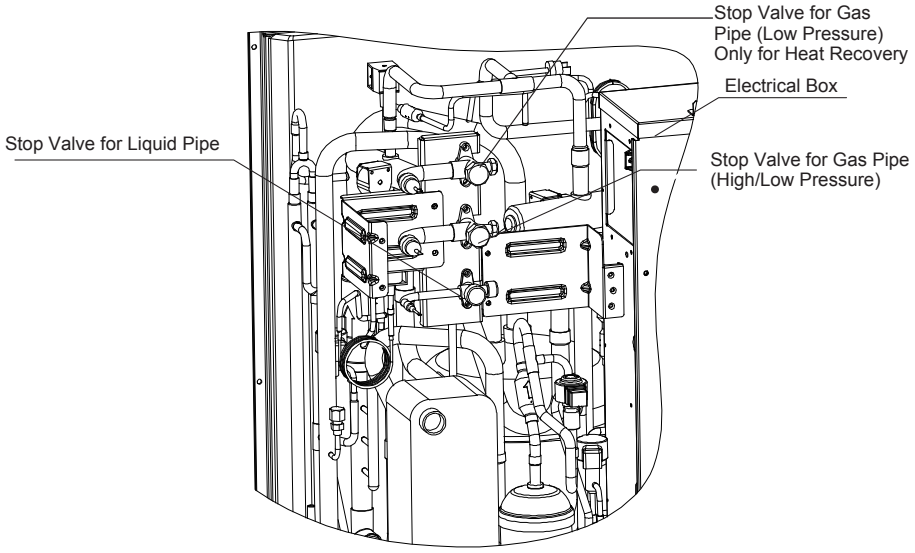


Figure 7.1

⚠ WARNING

- **Release the gas inside the closing pipe (piping cap) before brazing work is performed. If the brazing filler material melts with residual gas inside, the pipe will explode and injuries can result.**
- **Do not expose surrounding parts and the oil return pipe of the compressor to flame when a torch is used. If the oil return pipe is exposed to excessive heat, high temperature oil will escape and cause a fire or injury.**

7.2.2 Piping Connection Method

Perform the refrigerant piping connection work for each water source unit.

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

- Firmly secure the pipe in order to avoid vibration, excessive force on the valve and noise.

(1) Piping can be installed from the front side cover.
For vibration protection, properly secure pipe connections and check that no excessive force is applied to the stop valve.
(2) Follow the installation procedures in Section 7.2.1.
(3) Connect the piping in accordance with Figures 7.1 and 7.2 on the following page.
(4) Seal the gaps between the front side cover and pipes with insulation.

For Pipes from Front Side Piping Cover

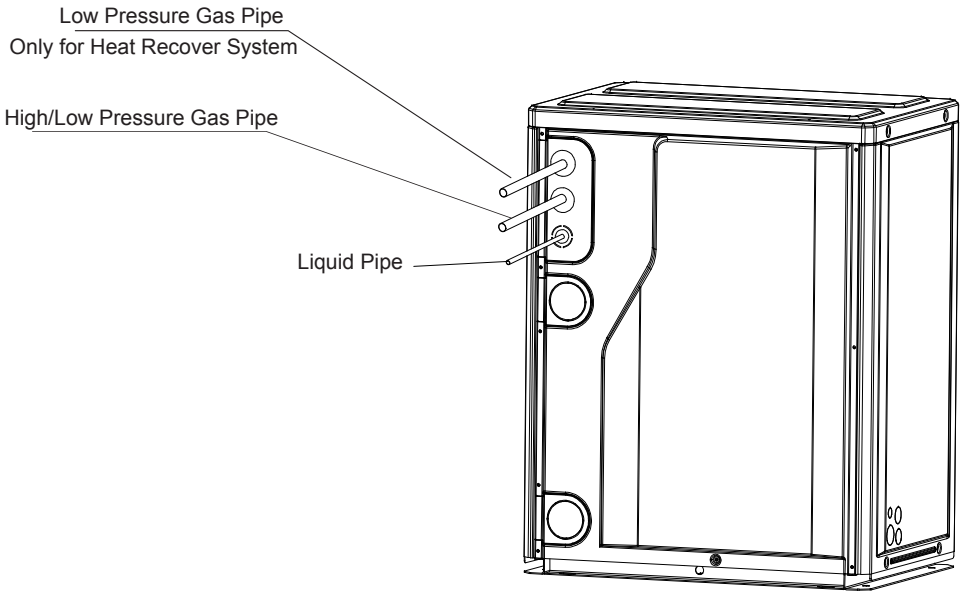
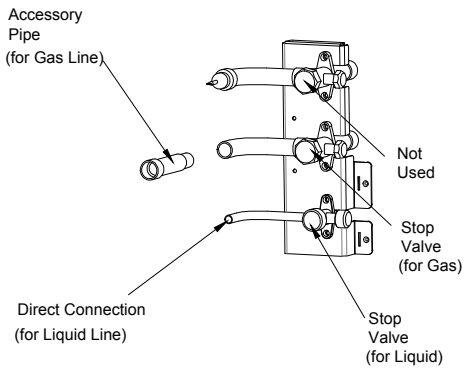


Figure 7.2

- Details of Stop Valve Piping Connections
  Be sure to remove first the closing pipe (piping cap) of the gas and liquid stop valves. Refer to Section 3. “Factory-Supplied Accessories” for the details of the accessory pipes.

  Heat Pump System with refrigerant pipes from front side

76



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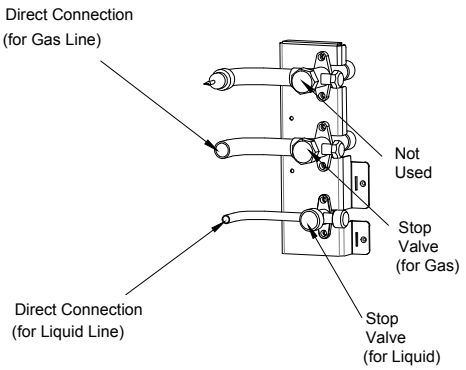
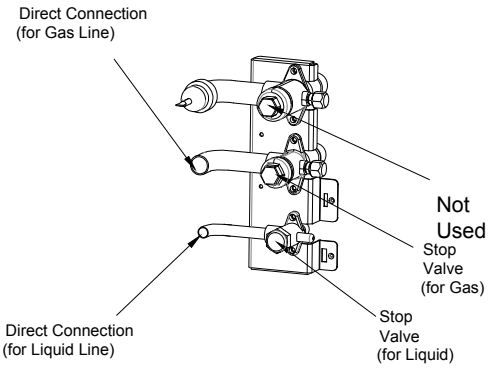


114/136



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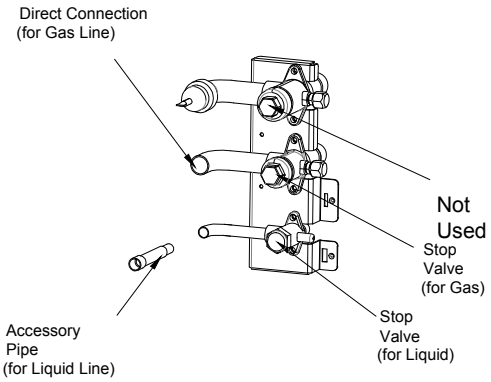
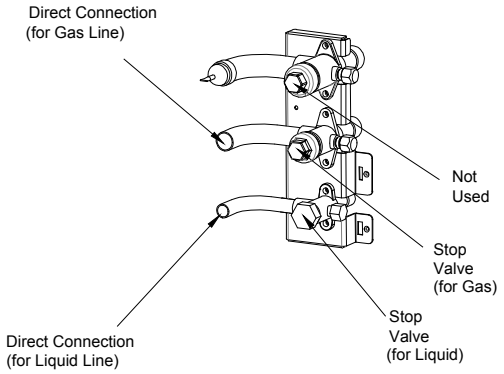
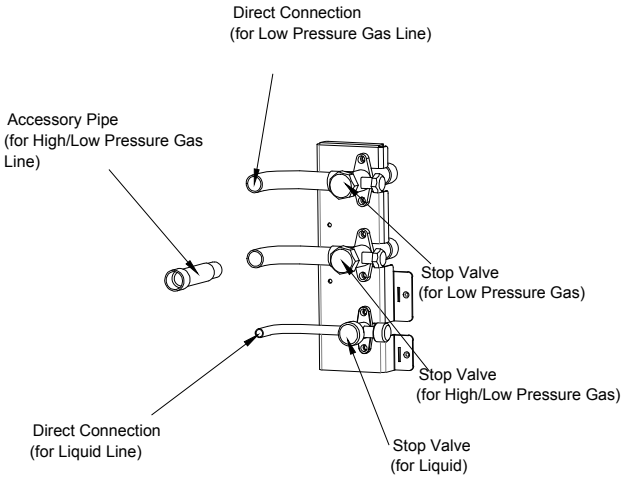


170/190



Heat Recovery System with refrigerant pipes from front side

76



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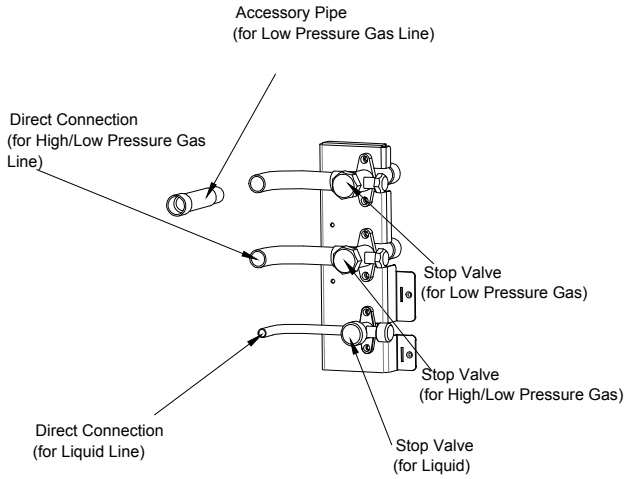
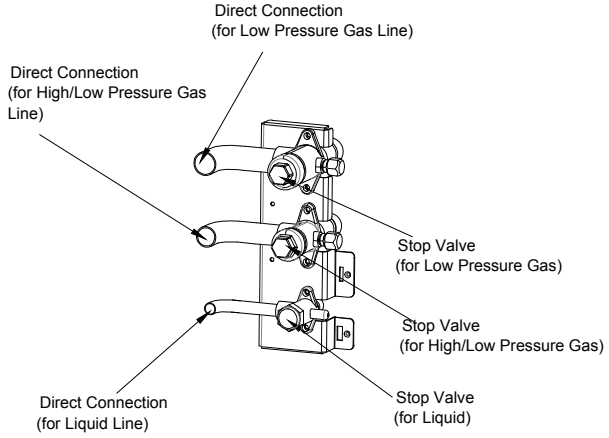


114/136



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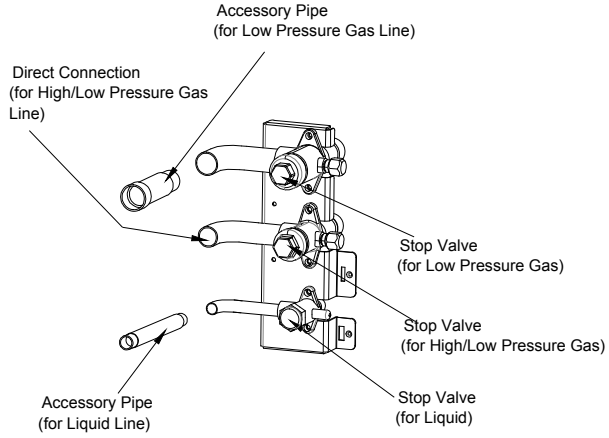

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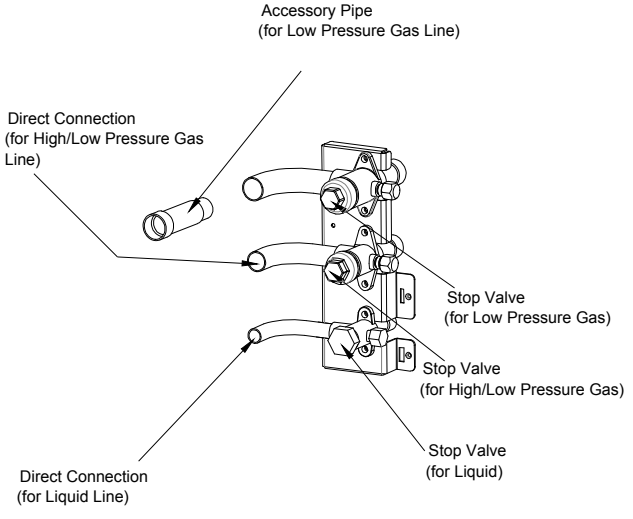
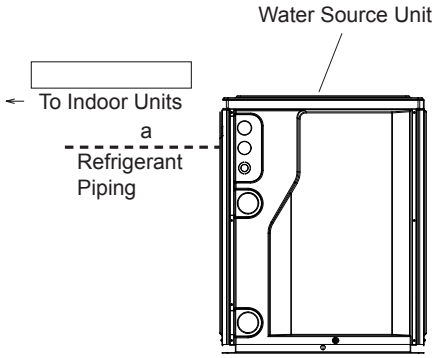


7.3 Piping Sizes from Water Source Units

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

7.3.1 Heat Pump System

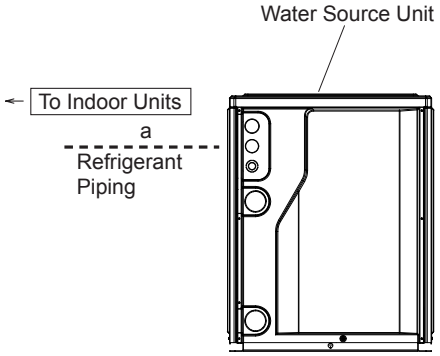


(mm)

Model			76	96	114/136	154	170/190
Piping Size	a	Gas	15.88	19.05	22.2	22.2	22.2
		Liquid	9.53	9.53	12.7	12.7	15.88

Model			210/228	250~344	268~344	360~516	534~570
Piping Size	a	Gas	25.4	25.4	28.6	31.75	38.1
		Liquid	15.88	19.05	19.05	19.05	22.2

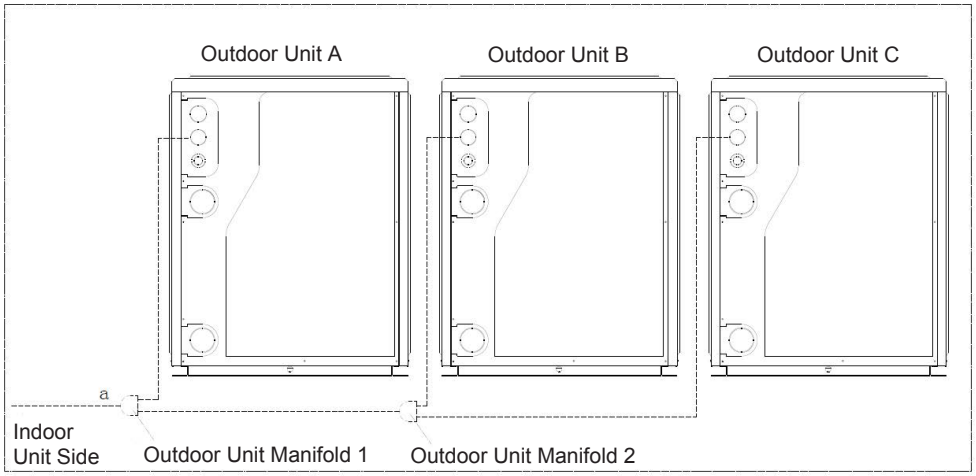
7.3.2 Heat Recovery System



(mm)

Model			76	96	114/136	154	170/190
Piping Size	a	Low Pressure Gas	19.05	22.2	25.4	28.6	28.6
		High/Low Pressure Gas	15.88	19.05	22.2	22.2	22.2
		Liquid	9.53	9.53	12.7	12.7	15.88

Model			210/228	250	268~344	360~516	534~570
Piping Size	a	Low Pressure Gas	28.6	31.75	31.75	38.1	38.1
		High/Low Pressure Gas	25.4	25.4	28.6	31.75	38.1
		Liquid	15.88	19.05	19.05	19.05	22.2



8. 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 water source unit 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.**
- **ELB may be recommended depending on the application; 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.**
  M3.5: 0.7 to 0.9 N·m
  M4: 1.0 to 1.3 N·m
  M5: 2.0 to 2.4 N·m
  M6: 4.0 to 5.0 N·m
  M8: 9.0 to 11.0 N·m
  M10: 18.0 to 23.0 N·m

- **Use the specified cables for wiring between the water source unit and indoor units. Selecting incorrect cables will cause an electric shock or a fire. Communication cable shall be a minimum of AWG18 (0.82mm^2), 2-Conductor, Stranded Copper. Shielded cable must be considered for applications and routing in areas of high EMI and other sources of potentially excessive electrical noise to reduce the potential for communication errors. When shielded cable is applied, secure properly and terminate cable shield as required per Hisense 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.**

8.1 General Check

(1) Make sure that the field-supplied electrical components (main power switches, circuit breakers, wires, conduit connectors, and wire terminals) are properly selected according to the electrical characteristics indicated in Table 8.1. Make sure that the components comply with local codes.

- Supply electrical power to each water source unit. This equipment can be installed with an ELB, which is a recognized measure for added protection to a properly grounded unit. Install appropriate sized breakers / fuses / overcurrent protection switches and wiring in accordance with local codes. The equipment installer is responsible for understanding and abiding by applicable codes and requirements.
- Supply power supplies for the indoor unit and water source unit respectively.
  Connect the power supply wiring to each indoor unit group and its respective water source unit. This equipment can be installed with an ELB, 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 codes. The equipment installer is responsible for understanding and abiding by applicable codes.
- As for the heat recovery system, the power supply for the Switch Box and Indoor Unit in the same refrigerant system can be supplied with one main switch.

(2) Check to ensure that the power supply voltage is within ±10% of the rated voltage.
If the power supply voltage is too low, the system cannot start due to the voltage drop.

(3) Check the size of the electrical wires.

(4) Communication cable must be a minimum of AWG18 (0.82mm^2), 2-Conductor, Stranded Copper. Shielded cable must be considered for applications and routing in areas of high EMI and other sources of potentially excessive electrical noise to reduce the potential for communication errors. When shielded cable is applied, secure properly and terminate cable shield as required per Hisense guidelines. Plenum and riser ratings for communication cables must be considered per application and local codes where:

- The power supply for the packaged air conditioner is supplied from the same power transformer as the device with high electricity consumption*
- 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 local codes before performing electrical work in order to protect the power supply wiring of the packaged air conditioner.

(5) Check to ensure that the ground wiring for the water source unit and indoor unit are connected.

8.2 Electrical Wiring Connection

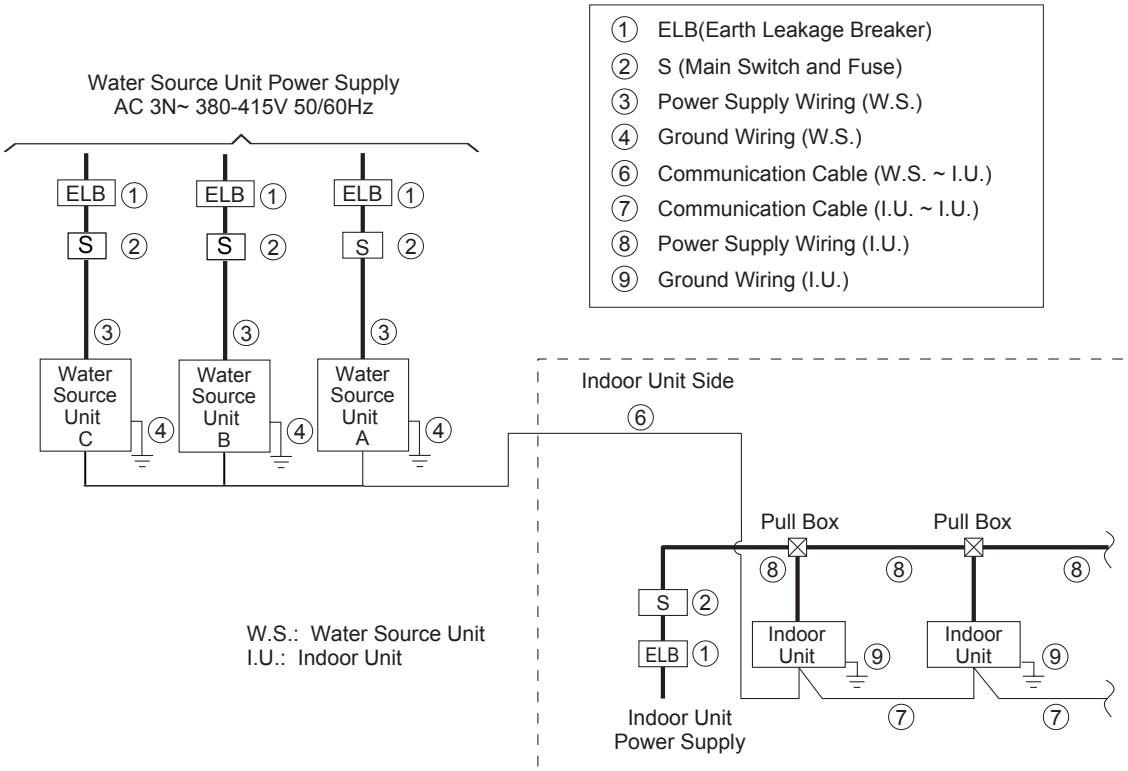
⚠ WARNING

- **This equipment can be installed with an ELB, 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 codes and requirements. The equipment installer is responsible for understanding and abiding by applicable codes and requirements.**
- **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.

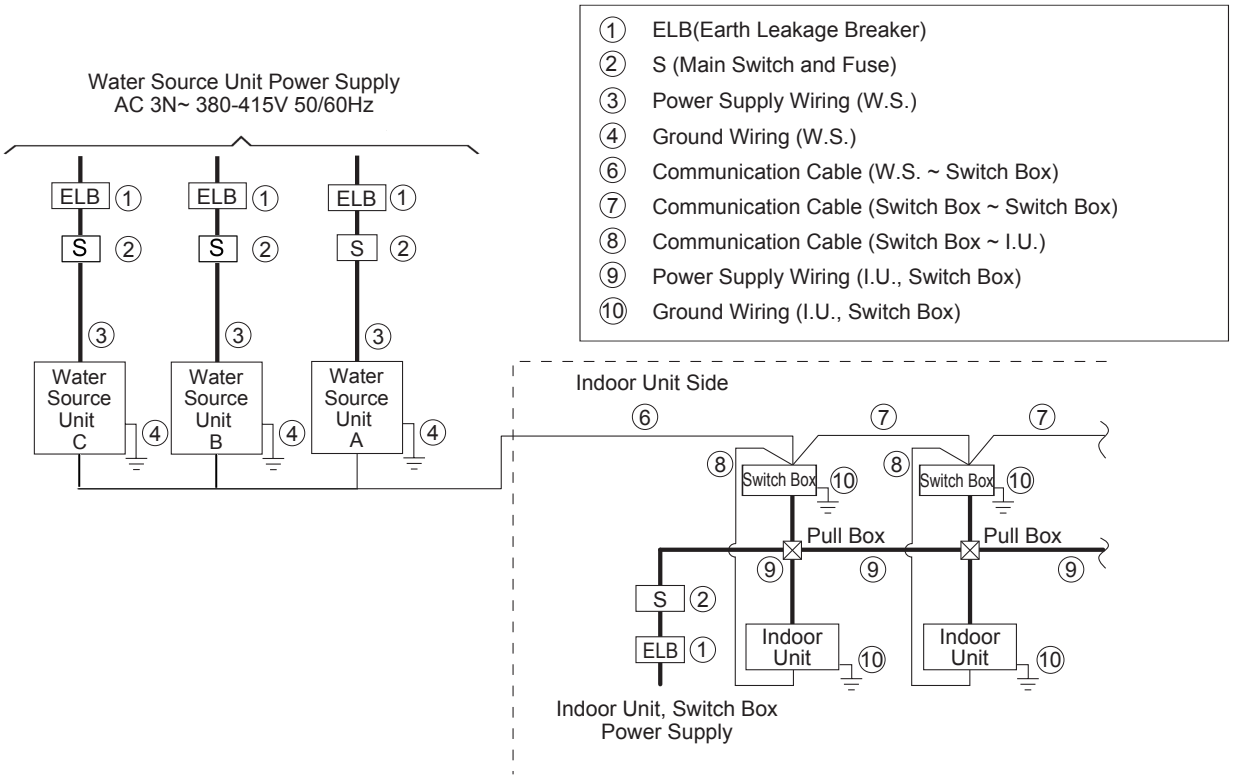
(1) Power Supply Wiring

Supply power supplies to each water source unit and indoor unit group respectively.
Using this method is a basic principle of power supply wiring.

Heat Pump System



Heat Recovery System



(2) Electrical Characteristics

Note the following when selecting wiring:

- Use the charts below to select appropriate earth leakage breaker / fuses and wiring in accordance with local codes.
- Ensure communication cable is 2-Conductor, Stranded Copper. Shielded cable must be considered for applications and routing in areas of high EMI and other sources of potentially excessive electrical noise to reduce the potential for communication errors. When shielded cable is applied, secure properly and terminate cable shield as required per Hisense guidelines. Plenum and riser ratings for communication cables must be considered per application and local code requirements.

Table 8.1 Electrical Characteristics and Recommended Wiring Size

Model	Water Source Unit			Fuse (A)	ELB		Power Source Cable Size (mm^2)	Transmitting Source Cable Size(mm^2)
	Hz (Hz)	Voltage (V)	Max.Runing Current (A)		Nominal Current (A)	Nominal Sensitive Current (mA)		
AVWW-76FKFW	50/60	380-415	16.1	20	20	30	$4mm^2$	$0.75mm^2$
AVWW-96FKFW	50/60	380-415	18.7	25	25	30	$4mm^2$	$0.75mm^2$
AVWW-114FKFW	50/60	380-415	22.5	32	32	30	$4mm^2$	$0.75mm^2$
AVWW-136FKFW	50/60	380-415	28.1	40	40	30	$6mm^2$	$0.75mm^2$
AVWW-154FKFW	50/60	380-415	28.6	40	40	30	$6mm^2$	$0.75mm^2$
AVWW-170FKFW	50/60	380-415	30.1	40	40	30	$6mm^2$	$0.75mm^2$
AVWW-190FKFW	50/60	380-415	31.9	40	40	30	$6mm^2$	$0.75mm^2$

NOTE:

(1) Follow local codes and regulations when selecting field wires.

(2) The wire sizes in the table of page are selected at the maximum current of the unit according to the European Standard, En60335. Use the wires which are not lighter than the ordinary polychloroprene sheathed flexible cord(cord designation H05RN-F)

(3) Use a Shielded cable for the transmitting circuit and connect it to ground.

(4) In the case that power cables are connected in series, add each unit maximum current and select wires below.

Rated current of appliance A	Nominal cross-sectional area mm^2
≤3	1 to 2,5
>3 and ≤6	1 to 2,5
>6 and ≤10	1 to 2,5
>10 and ≤16	1,5 to 4
>16 and ≤25	2,5 to 6
>25 and ≤32	4 to 10
>32 and ≤50	6 to 16
>50 and ≤63	10 to 25

* In the case that current exceeds 63A, do not connect cables in series.

⚠ WARNING

Install a multi–pole main switch with a space of 3.5mm or more between each phase.

⚠ CAUTION

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

ATTENTION:

1. When the power supply wiring is longer, select the minimum wiring size that has a voltage drop within 2%.
2. Power supply voltage should be satisfied with the followings.
   Supply Voltage: Rated Voltage within ±10%
   Starting Voltage: Rated Voltage within -15%
   Operating Voltage: Rated Voltage within ±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 if hard vinyl piping is used.
   Lightning Conductor: The electrical potential of the earth increases when a lightening conductor is used.

8.3 Electrical Wiring for Water Flow Control

8.3.1 External Input/Output Signal

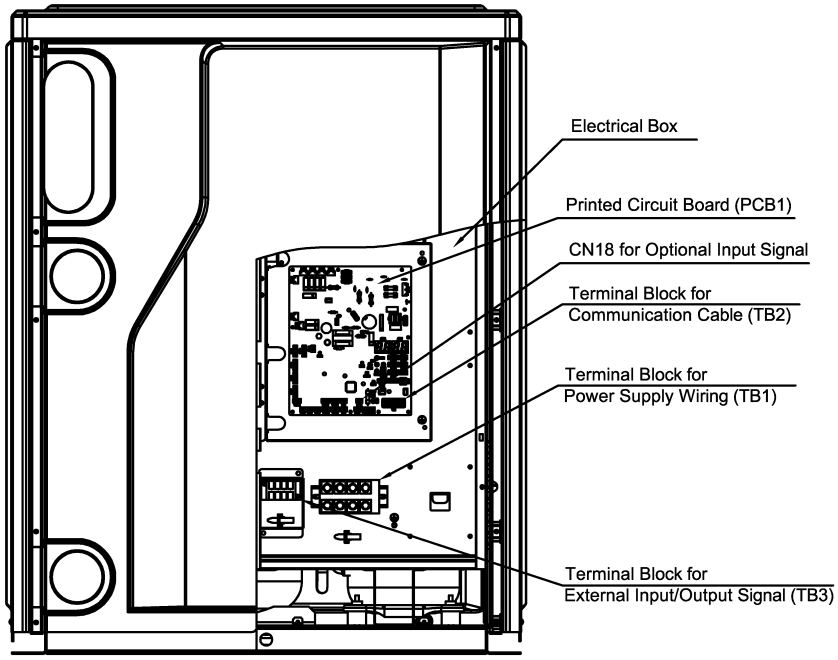


Figure 8.1

NOTES:

- Relay of AC contactor should be connected to terminal block TB3 #5 and #6. Water pump cannot directly operate from terminal block TB3 #5 and #6.
- Water flow switch must be connected to terminal block TB3 #7 and #8 when operating this unit.
- Do not reverse the connections on terminal block TB3 #5 and #6, and terminal block TB3 #7 and #8. Incorrect wiring will short circuit and printed circuit board (PCB) is burned and destroyed.

8.3.2 Connection for Water Pump

If “Valve/Pump Operation Request” output signal is used for water pump, separate external power supply to operate water pump is required.

NOTE:
Do not use terminal block 3 (TB3) terminals No.5-6 to supply power for the water pump.
Otherwise, serious accident and malfunction of the water source unit may result.

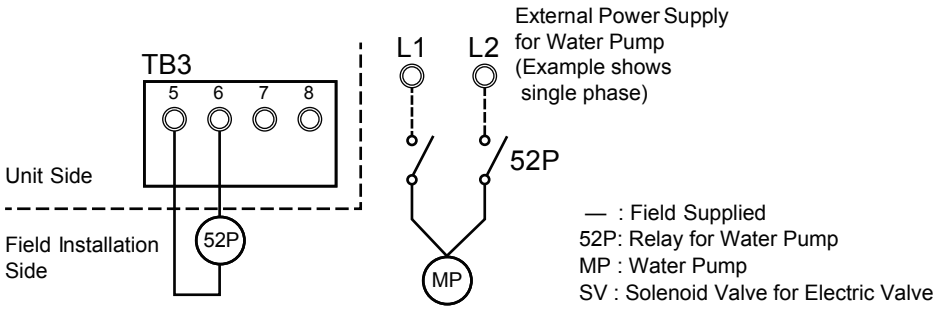


Figure 8.2 Water Pump Wiring

Connection for Solenoid Valve of Electric Valve
Solenoid valve can be connected to terminal block 3 (TB3) terminals No.5-6 directly.
If output is 0.1A or more, be sure to use relay and external power supply same connection as water pump.

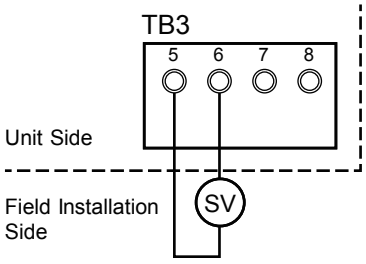


Figure 8.3 Solenoid Valve Wiring

8.3.3 Connection for Water Flow Switch

Connect water flow switch with shielded cable to the terminal block TB3 of the unit.
Terminal of water flow switch should be placed in proper position for easy wiring
It must be interlocked with the unit. Wire the circuit as shown below.

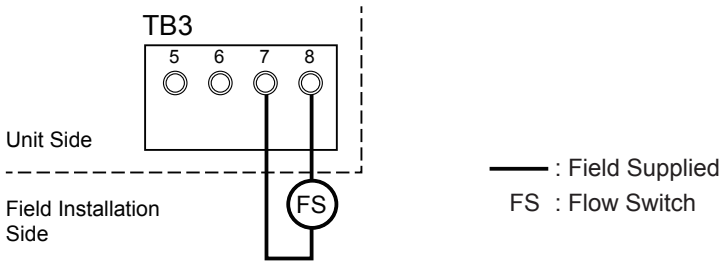


Figure 8.4 Water Flow Switch Wiring

8.4 Electrical Wiring for Water Source Unit

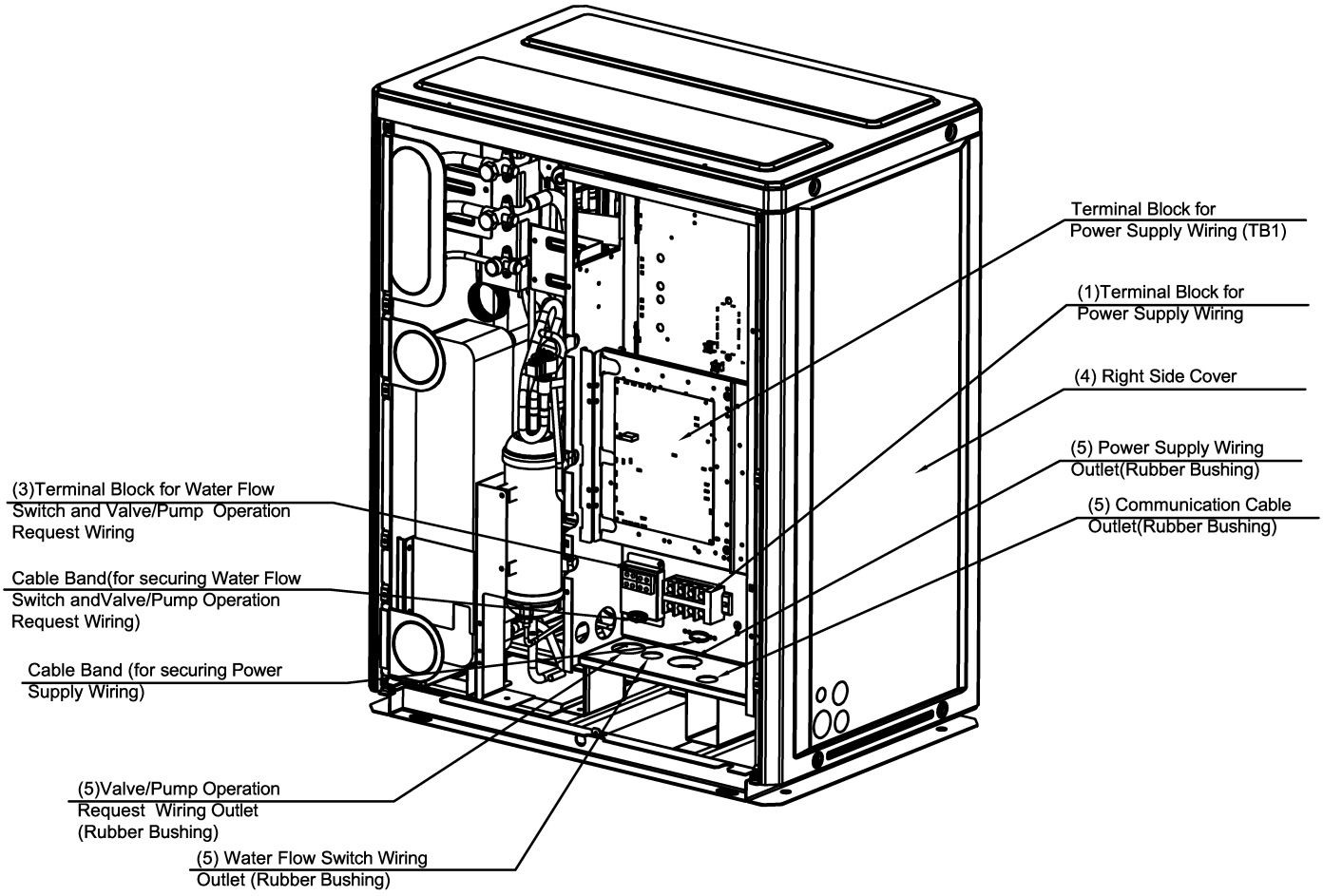
Connect the electrical wiring according to the following figure

(1) Connect the power supply wires to L1, L2, L3 and N for the three-phase power supply on the terminal block TB1 and ground wiring to the terminal in the electrical control box.

(2) Connect the communication cables between the water source unit and indoor units to the TB2 terminals 1 and 2 on the PCB1. As for the communication cables between water source units in the same refrigerant system, connect them to the TB2 terminals 3 and 4 on the PCB1. When shielded cable is applied (M4), secure properly and terminate cable shield as required per Hisense guidelines. Plenum and riser ratings for communication cables must be considered per application and local code. Communication cable must be a minimum of AWG18 (0.82mm^2), 2-Conductor, Stranded Copper.

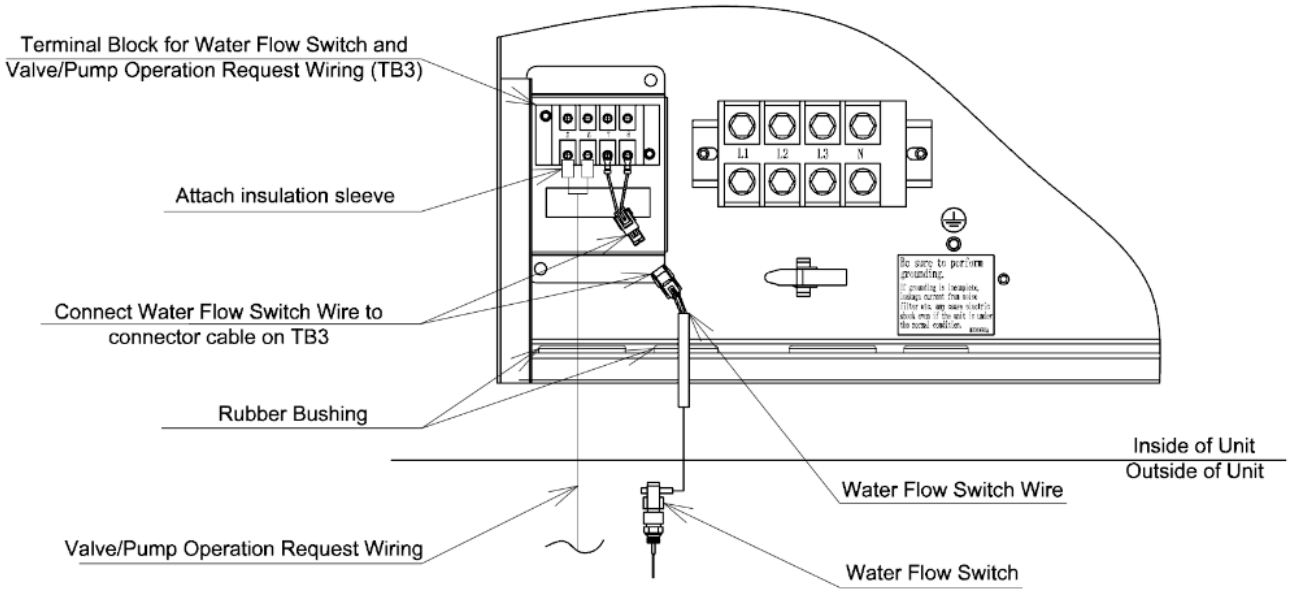
(3) The communication cable and water flow switch cable need to separated from the power supply wirings in the water source unit. Local codes need to be followed.

(4) Tighten screws for the terminal block according to IEC.



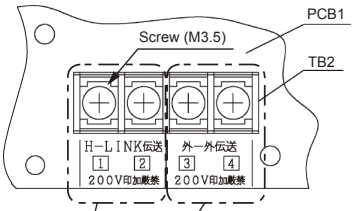
Above figure illustrate the example of a small cabinet.

(1) Detail of Terminal Block for Power Supply Wiring (TB1)



(2) Detail of Terminal Block for Communication Cable (TB2)

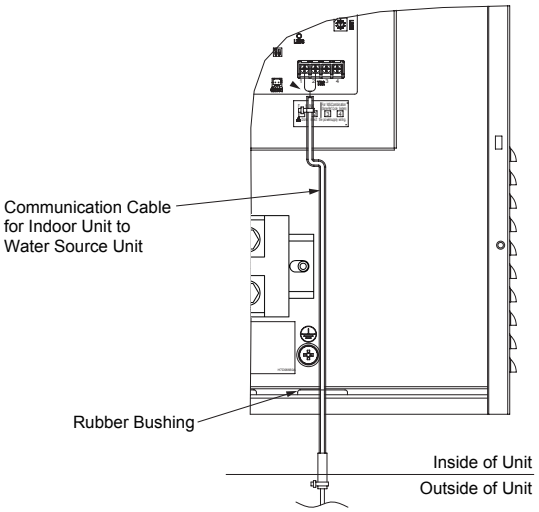
˜ Do not connect the main power supply wiring to the communication line (Terminals 1, 2, 3 and 4 of TB2). If these are connected, the PCB1 will be destroyed.



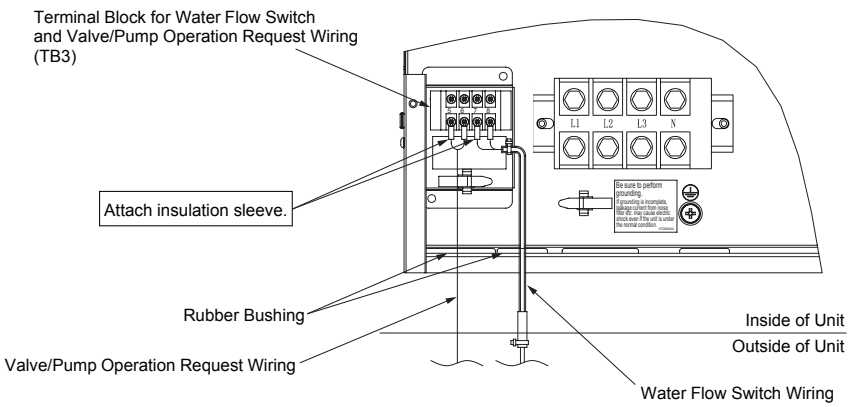
Not Used

* This terminal is used only for combination water source units and not used for single units.

HI-NET Terminal
(Communication cable between the water source unit and indoor unit, or between the water source unit and water source unit of other refrigerant system.)



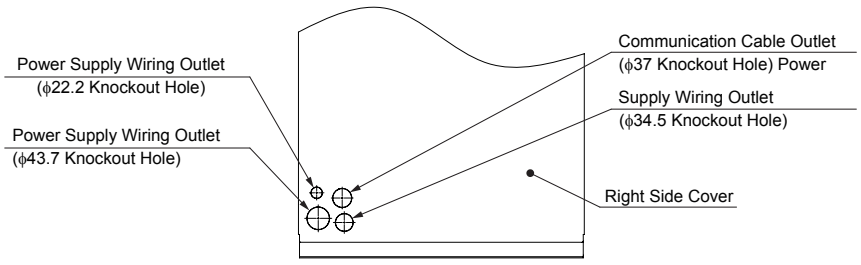
(3) Detail of Terminal Block for Water Flow Switch and Valve/Pump Operation Request Wiring (TB3)



(4) Details of Right Side Cover Wiring Outlet

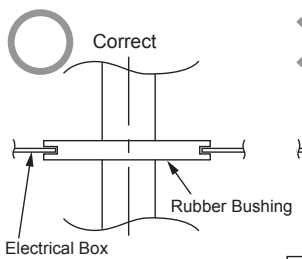
˜ Be sure to install accessory rubber bushing to the wiring outlet for communication cable.
˜ Hermetically seal the end of conduit tubing by using putty to seal against moisture.

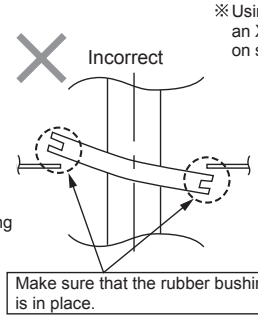
Unit: mm



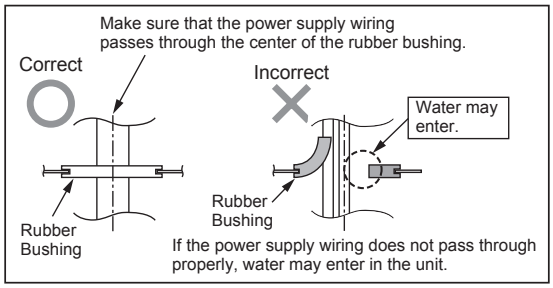
(5) Details of Wiring Outlets inside the Electrical Box (Rubber Bushing Section)

Rubber Bushing (Wiring Outlet)





※ Using a cutter knife, and cut an X in the rubber bushing on site as shown below.

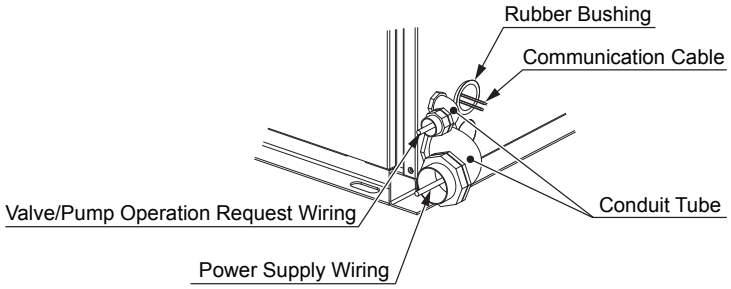


⚠ CAUTION

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.)

NOTICE:

- When installing the power supply wiring and valve/pump operation request wiring, use the field-supplied conduit tube as shown below.
- When installing the communication cables, run them through the rubber bushing attached to the unit.
- Maintain at least 127mm between the power supply wiring or valve/pump operation request wiring and communication cables.
- Prevent cables from touching or rubbing up against refrigerant piping, plate edges, and electrical components inside the unit.



⚠ CAUTION

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

8.5 Electrical Wiring Connections of Indoor Unit, Water Source Unit and Switch Box

(1) Connect a power supply wiring to each water source unit. Connect an optional ELB, fuse, and main switch (S) to each water source unit.

(2) Connect a power supply wiring to each indoor unit group and change-over box group connected to the same water source unit. (Total operating current be less than 12A.)
Connect an optional ELB, fuse, and main switch (S) to each indoor unit group.

(3) Connect the communication cable between indoor units, change-over boxes and water source units, as shown in Figure 8.5 and 8.6.

(4) Connect the communication cables in the same refrigerant system unit. (If the refrigerant piping of indoor unit is connected to the water source 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 (0.82mm^2), 2-Conductor, Stranded Copper. Shielded cable must be considered for applications and routing in areas of high EMI and other sources of potentially excessive electrical noise to reduce the potential for communication errors. When shielded cabling is applied, secure properly and terminate cable shield as required per Hisense 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 HI-NET system.

(7) Maintain at least 27mm between the communication cables and the power supply wiring, and also min. 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 water source unit A (main unit).
- between water source unit and indoor unit
- between water source unit and switch box
- between water source unit and water source unit in other refrigerant systems

(9) Do not connect the power supply wiring to the terminal block for communication cable (TB2). All the printed circuit boards in the same refrigerant system will be damaged.

(10) For a Heat Recovery System, connect the communication cables from indoor unit exclusively used for cooling to the terminals 1 and 2 on TB2 in the switch box.

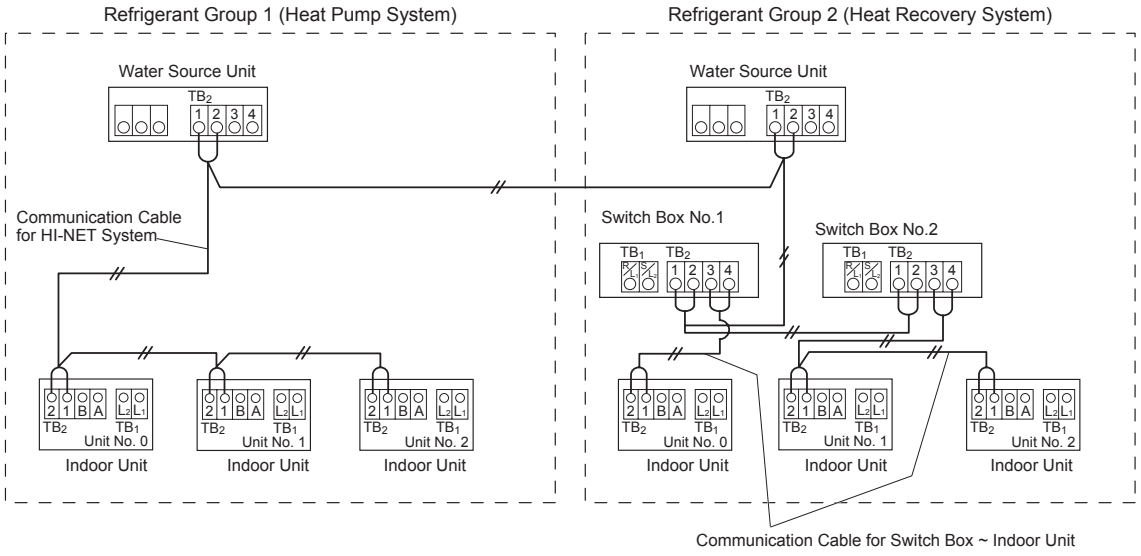
(11) Connect the ground wiring to the water source unit/indoor units and switch box. The ground wiring work under the condition of 100Ω (max.) ground resistance must be performed by an authorized personnel.

Communication Cable

Install communication cable while paying attention to the following.

For the combination units, DSW settings of Main and Sub.

- An alarm occurs if the communication cables between main water source unit and sub water source units are connected to the terminals 1 and 2 for HI-NET system.
- If an alarm is triggered on the LCD of main water source unit, follow the "7-segment" display at the main water source unit for verification purposes
- Perform a function setting at the main water source unit.
- Maximum number of refrigerant groups with one central controller is 64 (for HI-NET II). Maximum number of indoor units to be connected is 160 (for HI-NET II).



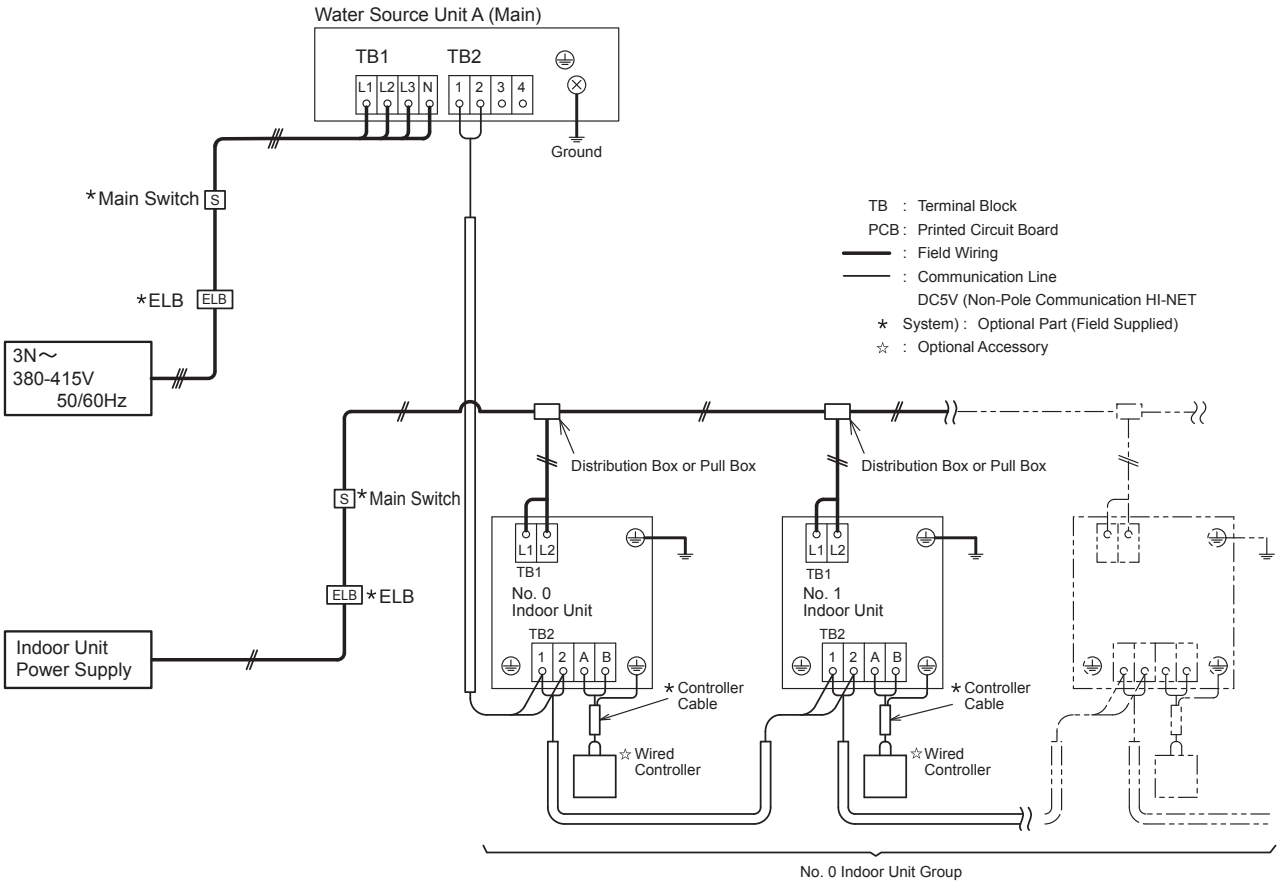


Figure 8.5 Layout for Electrical Wiring Connection (Heat Pump System)

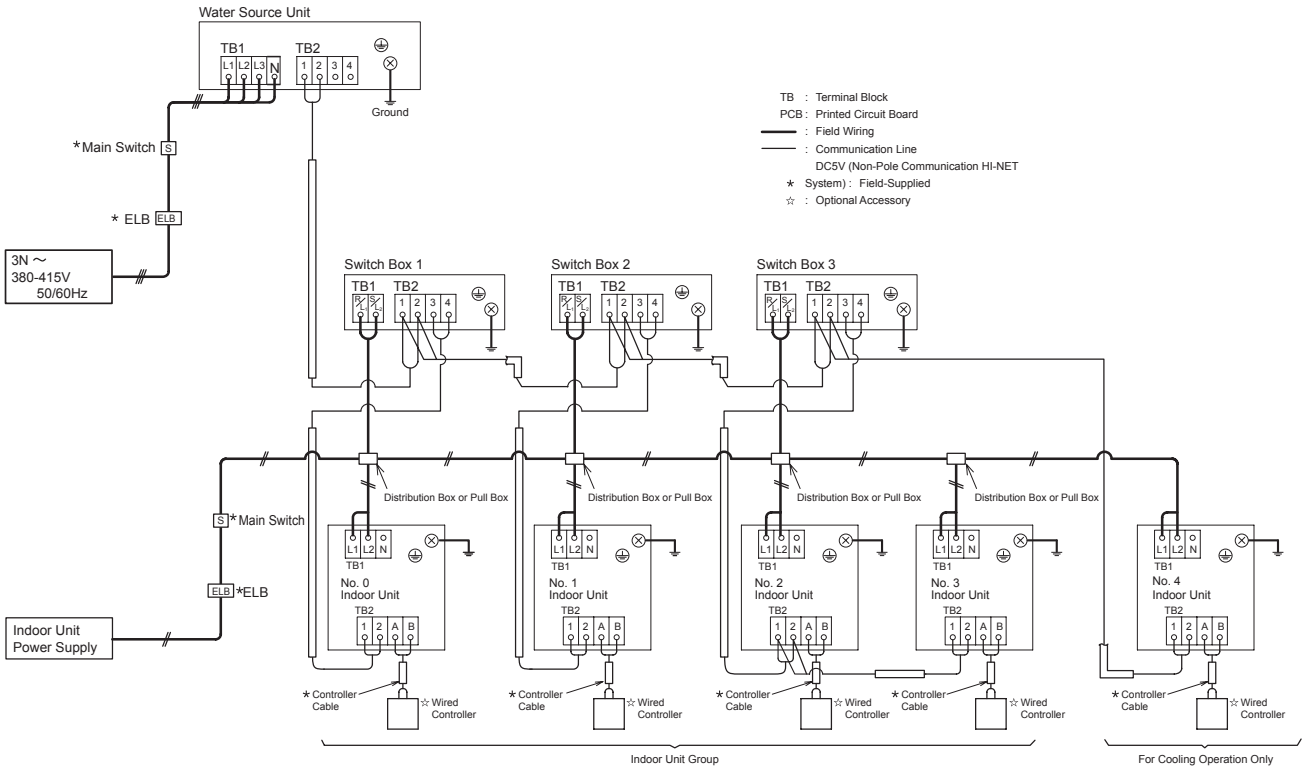


Figure 8.6 Layout for Electrical Wiring Connection (Heat Recovery System)

8.6 Function Setting

External Input/Output and Function Setting

Make sure to perform external input/output and function setting while Water Source Unit is stopped.
It cannot be set while Water Source Unit is operating or check mode.

[External Input/Output Setting]

■ Start of Setting

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

▼

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.

[Function Setting]

■ Start of Setting

Turn ON DSW4-No.4.
Turn ON DSW4-No.5.

▼

For the setting mode, refer to ② below.

■ Exit Setting Mode

Turn OFF DSW4-No.5 during indicated Function Setting Mode.
Turn OFF DSW4-No.4.

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

After setting, confirm DSW4 setting is same as setting before shipment.

① [External Input/Output Setting]

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

< Example >

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

	Item	SEG2	SEG1	SET
1	Input Setting 1 CN17 [1-2 pin]	i1	4	4
2	Input Setting 2 CN17 [2-3 pin]	i2	2	
3	Input Setting 3 CN18 [1-2 pin]	i3	3	
4	Output Setting 1 CN16 [1-2 pin]	o1	1	
5	Output Setting 2 CN16 [1-3 pin]	o2	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.
Input Setting 1 can NOT be set to other than Function No.4.
CN17 is connected with cable only for Input Setting 1.
Input Setting 2 (CN17 [2-2 pin]) also can be set.
But if it is used, modification of connector is required.

Setting of External Input and 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	Flow Switch Signal	Defrost Signal (No Need for Water Source Unit)
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	-
14	External Abnormality Detection	-
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.

Function No.14 is valid only when applied to Input Setting 3.

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.

< Example >

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

	Item	SEG2	SEG1	SET
1	Circulator Function at Heating Thermo-OFF	FA	0	
2	Night-Shift	ni	0	
3	Cancellation of Outdoor Ambient Temperature Limit	C5	0	
4	Defrost for Cold Area (Change of Defrost Condition)	dA	0	
5	Heating Start Up Fan Setting	bU	0	
6	Cancellation of Water Source Unit Hot Start	HT	0	
7	Priority Capacity Mode	nU	0	
8	Compressor Frequency Control Target Value for Cooling	Hc	0	
9	Compressor Frequency Control Target Value for Heating	Hh	0	
10	Indoor Expansion Valve Control Target Value for Cooling	SC	0	
11	Indoor Expansion Valve Control Target Value for Heating	SH	0	
12	Indoor Expansion Valve Opening Change for Stoppage Indoor Unit in Heating Mode	S1	0	
13	Indoor Expansion Valve Opening Change for Thermo-OFF Indoor Unit in Heating Mode	So	0	
14	Indoor Expansion Valve Initial Opening of Thermo-ON Indoor Unit in Heating Mode	c1	0	
15	Fine Adjustment of Indoor Expansion Valve Initial Opening in Cooling Mode	cb	0	
16	Fine Adjustment of Indoor Expansion Valve Initial Opening in Heating Mode	ch	0	
17	Low Noise Setting	db	0	
18	Demand Current Setting	dE	0	
19	Wave Function Setting	UE	0	
20	Protection of Decrease in Outlet Temperature for Cooling	Fb	0	
21	When used as special-purpose air conditioner	FT	0	
22	Low water temperature setting for heating (Setup not available without anti-freeze solution)	Fo	0	
23	Not Prepared	LT	0	
24	Not Prepared	dS	0	
25	Not Prepared	F1	0	
26	Crankcase Heater Control during Stoppage	F2	0	
27	Setting of OFF Time for Indoor Unit Fan OFF for Heating	F3	0	
28	Not Prepared	F4	0	
29	4-way Indoor Unit Refrigeration Capacity Compensation Setting	F5	0	
30	Not Prepared	F6	0	
31	Not Prepared	F7	0	
32	Not Prepared	F8	0	
33	Not Prepared	F9	0	
34	Not Prepared	FC	0	
35	Convert Unit in Checking Mode	Fd	0	
36	Permit Indoor Fan Operation during Forced Stoppage	FE	0	
37	Not Prepared	FF	0	
38	Not Prepared	FG	0	
39	Not Prepared	FH	0	
40	Not Prepared	F1	0	
41	Not Prepared	FJ	0	
42	Not Prepared	FL	0	
43	Not Prepared	Fn	0	
44	Not Prepared	FP	0	
45	Not Prepared	Fr	0	
46	Not Prepared	FU	0	
47	Not Prepared	FY	0	

9. Additional Refrigerant Charge

9.1 Leak Test

(1) Check to ensure that the stop valves for high/low pressure gas, low pressure gas and liquid pipes are closed completely before leak testing.

(2) The refrigerant used for this water source 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 high/low pressure gas, low pressure gas (for heat recovery system only) and liquid. Tighten the open-close stop valve in the closing direction according to the following tightening torque.

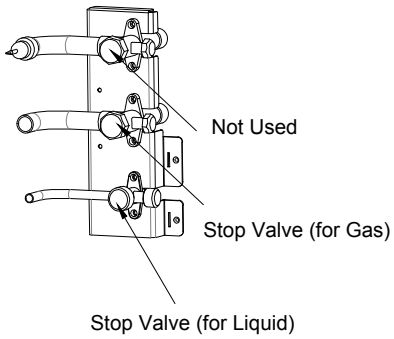
Operation of Stop Valves Caution

(a) Remove the stop valve caps before performing the airtight test after connecting the refrigerant piping. Tighten the stop valve in clockwise direction.

(b) Perform the work after warming the stop valve with a hair dryer etc. when controlling the stop valve in a cold area. (The stop valve O-ring will harden at low temperature, causing the O-ring material to contract by volume, and refrigerant leakage can occur.)

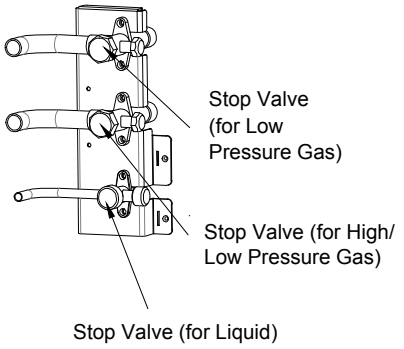
(c) Do not apply excessive force after fully opening the stop valve (Tightening Torque: < 5.0 N·m). (A back seat (hard stop), is not provided, allowing complete removal of the valve stem.)

(d) Securely tighten the caps according to the torque specifications in Section 7.2.1 after each stop valve is opened.



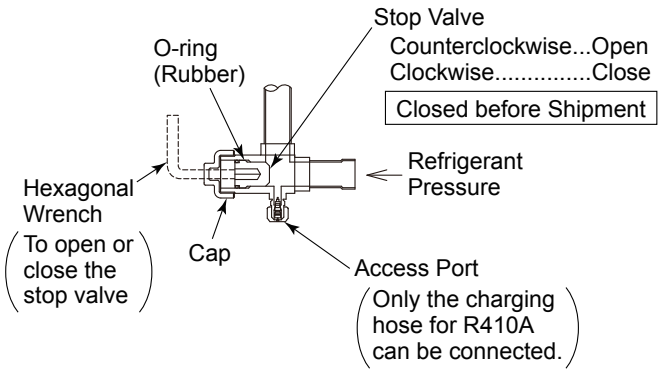
Heat Pump System

Fig. 9.1



Heat Recovery System

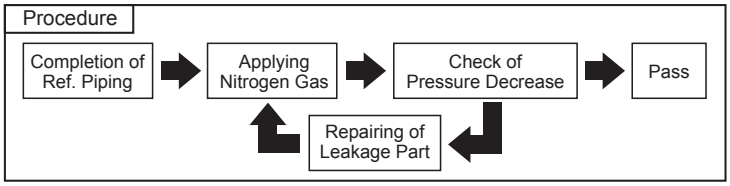
Fig. 9.2



Airtight Test Method

(1) Connect the manifold gauge to the access port 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 4.15MPa.
For checking gas leakage, use the leak detector or foaming agent. If there is any leakage, fix the leaking part.

(2) Caution for checking gas leakage, do not use a foaming agent which generates ammonia.
Additionally, do NOT use any household detergent as foaming agent with potentially unknown or harmful ingredients.
Use the recommended foaming agent to detect leaking refrigerant gas is shown below.



Recommended Foaming Agent	Manufacturer
Güprofle	Yokogawa & CO.,Ltd

CAUTION:
Nitrogen Gas should be sufficiently charged for each access port (high/low pressure gas line side, low pressure gas line side (for heat recovery system only), and for liquid line side). If not performed in this manner, the expansion valve for the water source unit, indoor unit, or switch box (for heat recovery system only) can close up, making any airtight test impossible.

⚠ WARNING

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

Insulation Work for Water Piping

Sufficiently perform thermal insulation up to the water inlet/outlet root part of heat exchange and the water piping to prevent sweating and freezing.
Otherwise, damage may be caused by freezing during low ambient temperature and thermal loss.
Insulation should also be performed in the following places:

- Water piping becomes significantly lower than ambient temperature
- Indoor piping becomes frozen
- Drainage piping

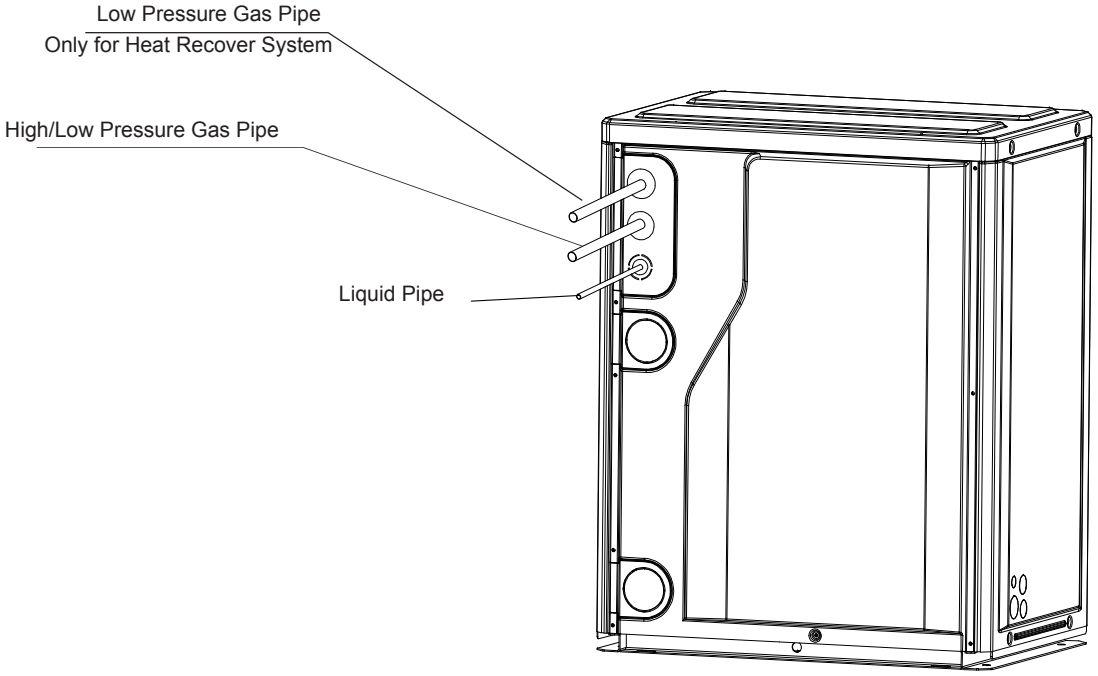
Under the condition where the ambient temperature is low in winter and at night, there is a case where equipment and piping will become damaged during the unit stoppage, because the water in the pump or piping will be frozen.
This will cause damage to the heat exchanger. Be sure to take measure for prevent freezing.

Insulation Work for Refrigerant Piping

(1) Securely insulate the high/low pressure and low pressure (for heat recovery system only) 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.

CAUTION:
If the gap is not sealed, damage can occur from water, animals or insects that can gain entry.



9.2 Vacuuming

Connecting

Connect a manifold gauge, vacuum gauge and vacuum pump to the following access ports.

Heat Pump System	High/Low Pressure Gas Stop Valve Liquid Stop Valve
Heat Recovery System	High/Low Pressure Gas Stop Valve Low Pressure Gas Stop Valve Liquid Stop Valve

Triple Evacuation Method

According to the following < Step 1 > < Step 2 > < Step 3 > in order, conduct vacuum drying work.

< Step 1 >

(1) Vacuum until the pressure reaches 2 mmHg.
(2) Pressurize with nitrogen up to 0.3 MPaG for 15 minutes.
(3) Release pressure to atmosphere level as less than 0.03 MPaG.

< Step 2 >

(1) Vacuum until the pressure reaches 1 mmHg.
(2) Pressurize with nitrogen up to 0.3 MPaG for 15 minutes.
(3) Release pressure to atmosphere level as less than 0.03 MPaG.

< Step 3 >

(1) Vacuum until the pressure reaches 0.5 mmHg.
(2) Stop vacuum pump.
(3) Check that the vacuum 0.5 mmHg can maintain for one hour.

NOTICE

1. If tool or measuring instruments come into contact with the refrigerant, use the tools or the measuring instruments exclusively for R410A.
2. Do not perform vacuum pumping work with valves of the water source units open.
   Otherwise, the refrigerant charged before shipment may leak and it may result in failure.
   If moisture remains inside the pipes, the compressor may be damaged.

9.3 Charging Work

(1) An additional refrigerant charge is required according to total piping length. Refer to Table 9.1.

(2) After vacuum pumping work, check that the high/low pressure gas valve (low pressure gas valve is for heat recovery system only), and liquid stop valve are fully closed.
Charge the additional refrigerant from the access port of liquid stop valve (acceptable error must be within 0.5 kg).

(3) After refrigerant has been charged, fully open the liquid stop valve and gas stop valves.
Gas remaining at the O-ring or screw component may emit a hissing sound when removing the stop valve cap. However, this is not leaking gas.

(4) If it proves impossible to dispense the specified (charged) quantity of refrigerant, follow the procedure below.

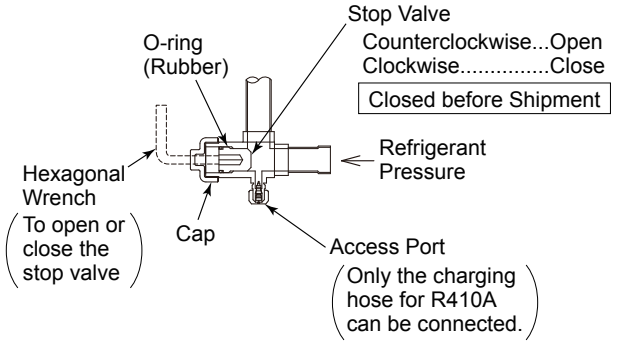
(a) Fully open the stop valve at the gas line side (for heat recovery system, both stop valves of high/low pressure and low pressure side).

NOTICE

Do not apply excessive force to the stop valve after fully opening. Otherwise, the stop valve will blow out due to refrigerant pressure. At the test run, fully open the stop 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 stop valve (Tightening Torque: < 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 specifications in Section 7.2.1 after each stop valve is opened.



Hexagonal Wrench Size [mm]

Model	Gas Valve	Liquid Valve
76, 96	5	5
114, 136, 154	10	
170 - 190		

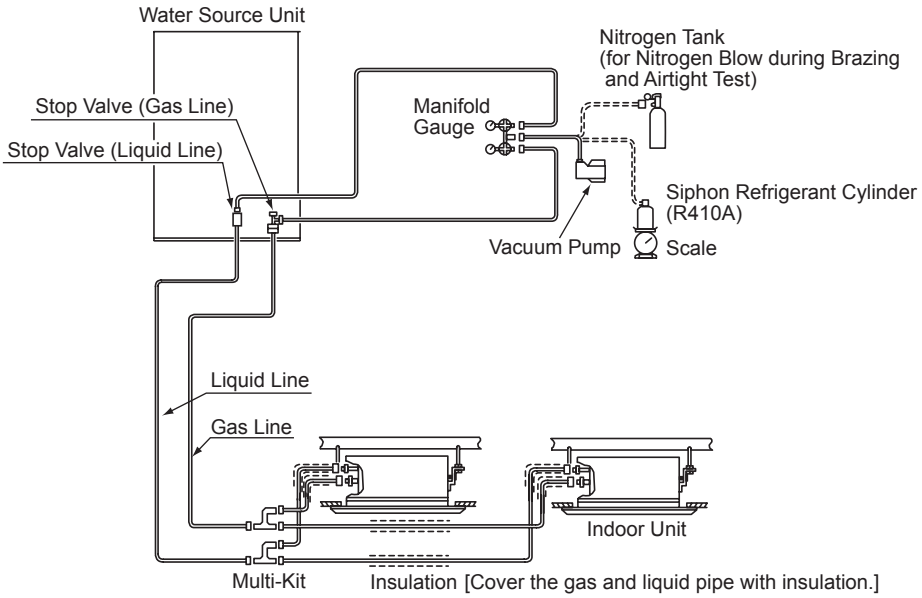
(b) Operate the compressor in the cooling mode and charge the additional refrigerant from the access port of the liquid stop valve. An acceptable error must fall within 0.5 kg. At this time, keep the liquid stop valve slightly open.

(c) After the refrigerant is charged, fully open the liquid stop valve and the gas stop valve.

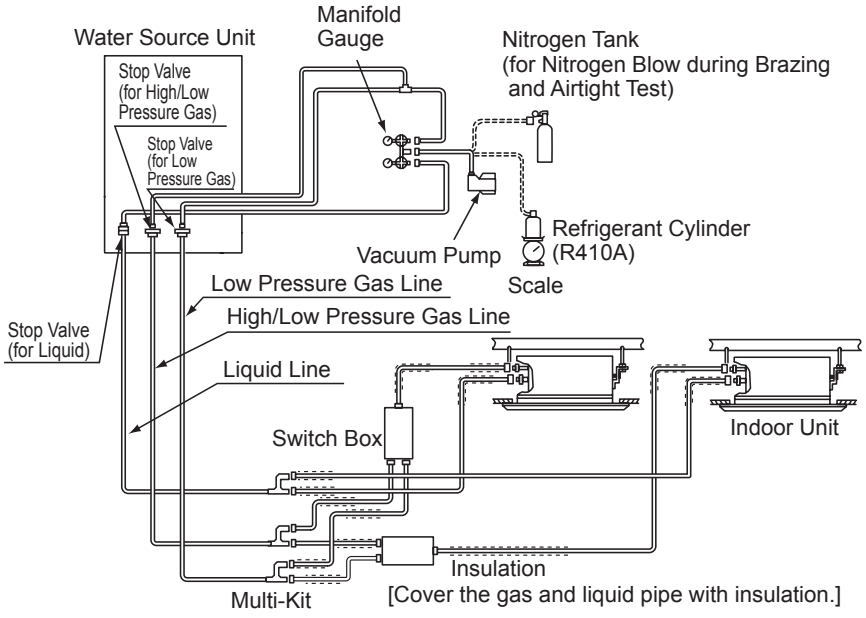
(d) Carefully calculate any additional refrigerant quantity for charging. If the quantity of additional refrigerant is not correct, it might cause a compressor failure. The additional refrigerant must be charged in a liquid condition.

(e) Refrigerant charge from the access port on the gas stop valve can lead to compressor failure. Be sure to charge refrigerant from the access port on the liquid stop valve.

Heat Pump System



Heat Recovery System



Charge the correct refrigerant quantity according to Table 9.1. If not, a compressor may be damaged due to an excess or insufficient refrigerant charge.

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

Insulate the liquid piping and gas piping completely to avoid decreasing of performance and condensation 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

9.4 Additional Refrigerant Charge Calculation

Table 9.1 Additional Refrigerant Charge Calculation

Although this unit has been charged with refrigerant, an additional refrigerant charge is required.

Determine what additional charge of refrigerant according to the following procedures, and charge it into the system. Record the additional refrigerant charge on the refrigerant label attached to the back surface of the service cover to facilitate maintenance and servicing activities thereafter.

(1) Calculating Method of Additional Refrigerant Charge WT [kg]

<table>
<tr><th>No.</th><th>Symbol</th><th>Content</th><th>Additional Charge</th></tr>
<tr><td>1</td><td>W1</td><td>This system's total additional charge W_1 =
<table>
<tr><th>Pipe diameter</th><th>Total Piping Length</th><th>In piping chilled refrigerant</th><th>Additional Charge (kg)</th></tr>
<tr><td>Φ22.2</td><td>m</td><td>×0.30=</td><td></td></tr>
<tr><td>Φ19.05</td><td>m</td><td>×0.24=</td><td></td></tr>
<tr><td>Φ15.88</td><td>m</td><td>×0.15=</td><td></td></tr>
<tr><td>Φ12.7</td><td>m</td><td>×0.09=</td><td></td></tr>
<tr><td>Φ9.53</td><td>m</td><td>×0.04=</td><td></td></tr>
<tr><td>Φ6.35</td><td>m</td><td>×0.02=</td><td></td></tr>
<tr><td colspan="3">This Example's Total Additional Charge =</td><td></td></tr>
</table></td><td>kg</td></tr>
<tr><td>2</td><td>W2</td><td>Indoor Additional Charge Computing Method (W2 kg)
Model 05~12 addition of each indoor machine 0.3kg
Model 14~54 addition of each indoor machine 0.5kg
Model 76/96 addition of each indoor unit 1.0kg

☐ ×0.30kg + ☐ ×0.5kg + ☐ ×1.0kg + ☐ kg</td><td>kg</td></tr>
<tr><td>3</td><td>W3</td><td>CH Device Additional Charge Computing Method (W3 kg)
1 Differences CH Device Don't Need Additional Refrigerant
2/3/4 Differences CH Device Each Machine Added 0.1kg
8 Differences CH Device Each Machine Added 0.2kg

☐ ×0.1kg + ☐ ×0.2kg + ☐ kg</td><td>kg</td></tr>
<tr><td>4</td><td>W4</td><td>Indoor unit connection ratio (the total capacity of indoor machine/the total capacity of the outdoor machine) Additional refrigerant charge (W4 kg)
The whole system capacity ratio is less than 100% 0.0kg
The whole system capacity ratio is between 100% and 115% 0.3kg
The whole system capacity ratio is between 116% and 130% 0.5kg</td><td>kg</td></tr>
<tr><td></td><td>W</td><td>The Total Additional Charge (W kg) = W1 + W2 + W3 + W4</td><td>kg</td></tr>
</table>

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

Maximum Additional Refrigerant Charge Quantity Allowed [kg]

Water Source Unit Capacity	76, 96	114	136, 154, 170	190
Maximum Additional Refrigerant Charge [kg]	28.0	36.0	40.0	48.0

Initial Refrigerant Charge Amount of W.S. (Before Shipment) W0 [kg]

Water Source Unit Capacity	76, 96	114, 136	154	170, 190
W0 Water Source Unit Refrigerant Charge [kg]	3.5	4.7	6.2	7.0

W0 is the water source unit refrigerant charge prior to shipment.

(2) Record of Additional Charge
Total refrigerant charge of this system is calculated in the following formula.

Total Refrigerant Charge = WT [kg] + W0 [kg] = ☐ kg

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

- 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 as follows so that a complete discharge due to a leak into a small, occupied, and enclosed room can never exceed the allowable limit for the room.

10. Test Run

Test Run should be performed in accordance with Sections 10.2 and 10.3. Use Table 10.1 for recording the Test Run.

⚠ WARNING

An electrical shock will occur if there is residual voltage.
Turn OFF power at the power supply completely before attempting any electrical maintenance work.
Verify that no residual voltage exists after turning OFF the power at the power supply.

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 and switch box.

10.1 Before Test Run

(1) Check to ensure that the refrigerant piping and communication lines between indoor and water source 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 for water source unit and DSW5 and RSW2 for indoor unit) and the unit number (DSW6 and RSW1) for indoor units are applicable to the system.
Depending on the indoor unit type RSW is different. Refer to the installation manual attached to each indoor unit. Confirm that all DIP switch settings on the printed circuit board for indoor and water source units are correct. Pay special attention to the setting for water source unit number, the refrigerant system number, and end terminal resistance. Refer to Section 8, "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 megaohm, 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 (Water Source Unit: TB2 1, 2, 3, 4 / Indoor Unit: TB2 A, B, 1, 2 / Switch Box: TB2 1, 2, 3, 4). Otherwise, failure can result.

(3) Verify that each wire, L1, L2, and L3, is correctly connected at the power supply.
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 supply according to the spec sheet attached to the inside back surface of the service cover.

(4) Apply power to water source unit(s) at least 12 hours prior to operation of the system to allow for adequate pre-heating of the compressor oil.
The water source 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 water source unit.
2. Wait for 30 seconds.
3. Push PSW5 on the water source 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 is displayed.
* Press "△" or "▽" to select "Cancel Preheating Control". Press "OK" and cancel the pre-heating control.

For other controllers, refer to the manual attached to each controller.

(5) Be sure to close the service cover at the front upper 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 is activated, check the recommended size shown in Table 8.1.

NOTICE

Confirm that field-supplied electrical components (main switch fuse, fuse-free break , GFCI breakers, wires, conduit connectors and wire terminals) have been properly selected according to the electrical data shown in Table 8.1, and ensure that these components comply with national and local electrical codes.

10.2 Test Run for Water Piping

Before Test Run, make sure that the water piping work has been carried out in a proper manner. Especially, make sure that the water strainer, automatic air discharge valve and water flow switch are positioned at their correct places.

(1) Close the gate valves to cut off water flow to the water source unit and circulate water within the common water piping.
After removing any foreign particles and substances from the water piping, clean the water strainer near the water inlet side of water source unit.
For better cleaning of the water strainer, provide short-circuit by using the flexible connection to circulate water to the point just before the water source unit.

(2) Open the gate valves to circulate water to the water source unit.
Be sure that no air has been caught in the water system.

(3) Measure the water pressure drop of before and after the water source unit and make sure the water flow rate is according to design.
Be sure that entering water temperature is within the operation range and then perform Test Run.
Check the entering water temperature is within the operation range during Test Run.
If any air has been caught or the water flow rate is not enough in the water piping the plate heat exchanger may freeze.
In case of any abnormality, stop the test run immediately and carry out troubleshooting and resolve the trouble.

(4) When the water flow switch is installed incorrectly, “A2” alarm occurs.
Check the contact signal is closed when the water pump is operating.

(5) When the water flow switch is selected incorrectly, “0d” alarm occurs.
Check the water flow switch does not operate when the water flow rate drop below minimum.

(6) Proper inspection should be performed to check for water leaking parts of water piping.

(7) After the Test Run has been completed, inspect the water strainer at the water inlet side of water source unit. Remove any foreign particles and substances from the water strainer.

10.3 Test Run for Water Source Unit

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

(1) For heat pump system, check to ensure that stop valves for high/low pressure gas and liquid of the water source units are fully opened.
For heat recovery system, check to ensure that stop valves for high/low pressure gas, low pressure gas (only for heat recovery system) and liquid of the water source unit 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.

(3) Perform the test run according to the following procedure. Ensure that the unit operates without any problem.

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

Test Run by Wired Controller

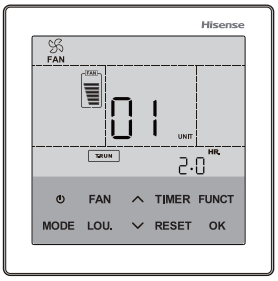
(a) Press and hold “Menu” and “Back/Help” simultaneously for at least 3 seconds. The test run menu will be displayed.

(b) Select “Test Run” by pressing “△▽” 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”.

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

Test Run Screen



- 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 “△▽” and set the detail by pressing “◁▷”.
  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 in Section “Important Notice” for the working range.

  Example
  The cooling operation is not performed if the entering water temperature is below 50°F (10°C).

(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 10.2, 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 water source 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 result in loose or disconnected wires, components, and incorrect wiring.
- A small sound may be heard from the water source unit after turning ON at the power supply 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 water source unit for a few seconds after running or stopping the compressor, 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 Water Source Unit Side

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

Setting of DIP Switch (Factory Setting)

Note that the darkened squares here denote that the switch is in the "OFF" position.

DSW4
Switch for Setting of Service Operation and Function

1. Test Run
2. COOL/HEAT Setting (ON: Heating Operation)
3. Not Used
4. Manual Compressor OFF
5. Function Setting
6. External Input/Output Setting

⚠ WARNING

- **Do not touch any other electrical part when operating switches on the PCB.**
- **Do not attach or detach a service cover when the power supply for the water source unit is supplied and the water source unit is operated.**
- **Turn all DIP switches of No.1 to 4 pins of DSW4 OFF when the test run operation is completed.**

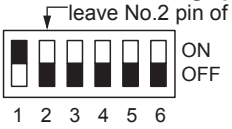
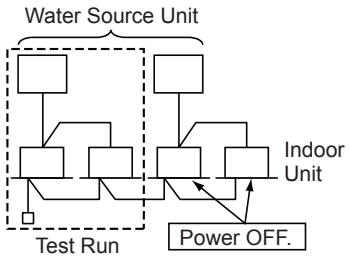
	DIP Switch Setting	Operation	Remarks
Test Run	1. Setting of Operation Mode Cooling: Set No.2 pin of DSW4 OFF.  Heating: Set No.2 pin of DSW4 ON.  2. Starting Test Run Set No.1 pin of DSW4 ON and the operation is started after a few ~ 20 seconds. When **heating operation**, leave No.2 pin of DSW4 at ON.  	1. The indoor unit automatically starts operating when the test run of the water source unit is set. 2. The ON/OFF operation can be performed from the wired controller or No.1 pin of DSW4 of the water source unit. 3. The operation continues for two hours without Thermo-OFF.	* Note that indoor units operate in conjunction with the test run operation for the water source unit. * If the test run is started from the water source unit and stopped from the wired controller, the test run function of the wired controller is canceled. However, the test run function of the water source unit is not canceled. Check to ensure that the No.1 pin of DSW4 of the water source unit PCB is turned OFF. * If multiple indoor units are connected with one wired controller, perform the test run operation individually for each refrigerant system, one by one. Then, make sure to turn the power supply OFF for the indoor units in other refrigerant systems not selected for the test run operation.  * A setting of DSW4 is not required for the test run from the wired controller.
Manual OFF of Comp.	1. Setting *Compressor Manual OFF: Set No.4 pin of DSW4 ON.  2. Canceling *Compressor ON: Set No.4 pin of DSW4 OFF.  	1. When No.4 pin of DSW4 is ON during compressor operation, the compressor shuts down immediately and the indoor unit is assumes the condition of Thermo-OFF. 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.	* Do not repeat compressor ON/OFF frequently.

Table 10.1 Test Run and Maintenance Record

MODEL: SERIAL. No. COMPRESSOR MFG. No.

CUSTOMER'S NAME AND ADDRESS: DATE:

THE RESULT OF ALL PERIODIC ROUTINE TESTS:

1. Is the rotation direction of the indoor fan correct? ☐
2. Is the water source unit inlet and outlet water pipe connection 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	°C,	No. 2	DB	/WB	°C,	No. 3	DB	/WB	°C,	No. 4	DB	/WB	°C
Outlet:		DB	/WB	°C,		DB	/WB	°C,		DB	/WB	°C,		DB	/WB	°C
Inlet:	No. 5	DB	/WB	°C,	No. 6	DB	/WB	°C,	No. 7	DB	/WB	°C,	No. 8	DB	/WB	°C
Outlet:		DB	/WB	°C,		DB	/WB	°C,		DB	/WB	°C,		DB	/WB	°C

6. Check Water Source Unit Entering and Leaving Water Temperature and Pressure.
   - Entering Water: _____ °C, _____ MPa
   - Leaving Water: _____ °C, _____ MPa
7. Check Refrigerant Temperature
   - Liquid Temperature: _____ °C
   - Discharge Gas Temperature: _____ °C
8. Check Pressure
   - Discharge Pressure: _____ MPa
   - Suction Pressure: _____ MPa
9. Check Voltage
   - Rated Voltage: _____ V
   - Operating Voltage: L_1-L_2 _____ V, L_1-L_3 _____ V, L_2-L_3 _____ V
   - Starting Voltage: _____ V
   - Phase Imbalance: $1-\frac{V}{Vm}=$ _____
10. Check Compressor Input Running Current
    - Input: _____ kW
    - Running Current: Comp. No.1 _____ A Comp. No.2 _____ A
11. Is the water flow adequate? ☐
12. Is the refrigerant charge adequate? ☐
13. Do the water flow switch operate correctly? ☐
14. Do the operation control devices operate correctly? ☐
15. Do the safety devices operate correctly? ☐
16. Has the unit been checked for refrigerant leakage? ☐
17. Is the unit clean inside and outside? ☐
18. Are all cabinet panels securely closed? ☐
19. Are all cabinet panels free from rattles? ☐
20. Is the filter clean? ☐
21. Is the heat exchanger clean? ☐
22. Are the stop valves open? ☐
23. Does the condensate water flow smoothly from the condensate pipe? ☐
24. Are the components of the system changed and replaced?

Table 10.2 Alarm Code

Code	Category	Content of Abnormality	Leading Cause
01	Indoor Unit	Activation of Protection Device (Float Switch)	Activation of Float Switch (High Water Level in Drain Pan, Abnormality of Drain Pipe, Float Switch, or Drain Pan)
02	Water Source Unit	Activation of Protection Device (High Pressure Cut)	Activation of PSH (Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing)
03	Communication	Abnormal Communication between Indoor and Water Source Unit	Incorrect Wiring, Loose Terminals, Disconnected Communication Cable, Blowout of Fuse, Indoor Unit Power OFF
04		Abnormal Communication between Inverter PCB and Water Source Unit PCB	Inverter PCB - Water Source PCB Communication Failure (Loose Connector, Wire Breaking, Blowout of Fuse)
05	Supply Phase	Abnormality of Power Supply Phases	Incorrect Power Supply, Connection to Reversed Phase, Open-Phase
06	Voltage	Abnormal Inverter Voltage	Water Source Unit Voltage Decrease, Insufficient Power Capacity
07	Cycle	Decrease in Discharge Gas Superheat	Excessive Refrigerant Charge, Failure of Thermistor, Incorrect Wiring, Incorrect Piping Connection, Expansion Valve Locking at Opened Position (Disconnect Connector)
08		Increase in Discharge Gas Temperature	Insufficient Refrigerant Charge, Pipe Clogging, Failure of Thermistor, Incorrect Wiring, Incorrect Piping Connection, Expansion Valve Locking at Closed Position (Disconnect Connector)
0A	Water Source Unit	Abnormal transmission between outdoor units	Outdoor-outdoor communication cable (break, incorrect connection, etc.)
0b		Incorrect outdoor unit address setting	Outdoor-outdoor communication cable (break, incorrect connection, etc.)
0C		Incorrect Water Source Unit Main Unit Setting	Two sub units employing identical settings existing in a system
0d		Water Temperature Abnormality	Insufficient water Flow Rate, Abnormally Low Entering Water Temperature, Insufficient Refrigerant, Piping Clogging, Expansion Valve Locking at Close Position
11	Sensor on Indoor Unit	Abnormality of Inlet Air Thermistor	Incorrect Wiring, Disconnecting Wiring, Breaking Wire, Short Circuit
12		Abnormality of Outlet Air Thermistor	
13		Abnormality of Freeze Protection Thermistor	
14		Abnormality of Gas Piping Thermistor	
15		Abnormality of Outdoor Air Thermistor (EconoFresh)	
16		Abnormality of Remote Sensor (DOAS)	
17		Abnormality of Thermistor Built-in Remote Controller (DOAS)	
18	Indoor Fan Motor	Abnormality of Indoor Fan System	Abnormality of Indoor Fan Motor (Step-Out), Indoor Fan Controller Failure
19		Activation of Protection Device for Indoor Fan	Fan Motor Overheat, Lockup
1A	Indoor Fan Controller	Abnormality of Fan Controller Fin Temperature	Abnormality of Fin Thermistor or Fan Controller, Heat Exchanger Clogging, Abnormality of Fan Motor
1b		Activation of Overcurrent Protection	Abnormality of Fan Motor
1C		Problem with Current Sensor	Abnormality of Fan Controller Current Sensor
1d		Activation Fan Controller Protection	Driver IC Error Signal Detection, Instantaneous Overcurrent
1E		Abnormality of Indoor Fan Controller Voltage	Indoor Voltage Decrease, Insufficient Capacity of Power Supply Wiring
21	Sensor on Water Source Unit	Abnormality of High Pressure Sensor	Incorrect Wiring, Disconnecting Wiring, Breaking Wire, Short Circuit
23		Abnormality of Discharge Gas Thermistor on Top of Compressor	
24		Abnormality of Heat Exchanger Liquid Pipe Thermistor	
25		Abnormality of Heat Exchanger Gas Pipe Thermistor	
29		Abnormality of Low Pressure Sensor	
2A		Abnormality of Entering Water Thermistor	
2b		Abnormality of Electrical Box Thermistor	
30	System	Incorrect Connection of Switch Box	Connection of Generation 1 Switch Box to Water Source Unit
31		Incorrect Capacity Setting of Water Source Unit and Indoor Unit	Incorrect Capacity Setting of Water Source Unit and Indoor Unit, Excessive or Insufficient Indoor Unit Total Capacity Code
35		Incorrect Setting of Indoor Unit No.	Duplication of Indoor Unit No. In same Refrigerant Cycle Number
36		Incorrect of Indoor Unit Combination	Indoor Unit is Designed for R22
38		Abnormality of Picking up Circuit for Protection in Water Source Unit	Failure of Protection Detecting Device (Incorrect Wiring of Water Source Unit PCB)

Code	Category	Content of Abnormality	Leading Cause
3A	Water Source Unit	Abnormality of Water Source Unit Capacity	Water Source Unit Capacity > 190
3b		Incorrect setting of outdoor unit (model combination or voltage)	Difference of voltage setting between master unit and slave unit
3d		Abnormal transmission between main unit and sub unit(s)	In the case where the communication with sub unit is unavailable for 30 consecutive seconds
3E		Abnormal Combination between Inverter PCB and Water Source Unit PCB	Incorrect Combination between Inverter PCB and Water Source Unit PCB
43	Protection Device	Activation of Pressure Ratio Decrease Protection	Defective Compression (Failure of Compressor or Inverter, Loose Power Supply Connection)
44		Activation of Low Pressure Increase Protection	Overload at Cooling, High Temperature at Heating, Expansion Valve Locking at Open Position (Loose Connector)
45		Activation of High Pressure Increase Protection	Overload Operation (Heat Exchanger Clogging), Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing
-		Excessively low high Pressure	Shortage of refrigerant
47		Activation of Low Pressure Decrease Protection	Insufficient Refrigerant, Piping Clogging, Expansion valve Locking at Close Position (Loosen Connector)
48		Activation of Inverter Overcurrent Protection	Overload Operation, Compressor Failure
51	Sensor	Abnormal Inverter Current Sensor	Current Sensor Failure
53	Inverter	Inverter Error Signal Detection	Driver IC Error Signal Detection (Protection for Overcurrent, Voltage Decrease, Short Circuit), Instantaneous Overcurrent
54		Abnormality of Inverter Temperature	Abnormal Inverter Thermistor, Heat Exchanger Clogging, Cooling Fan Failure
55		Inverter Failure	Inverter PCB Failure
A1	External Input	Detection of External Abnormality	Input Signal by External Abnormality Detection Setting
A2		Flow Switch Abnormality	Insufficient water Flow Rate, Flow Switch Failure, Incorrect Wiring of Flow Switch
b0	Indoor Unit	Incorrect Setting of Unit Model Code	Incorrect Setting of Indoor Unit Model
b1		Incorrect Setting of Unit and Refrigerant Cycle Number	64 or More Number is Set for Address or Refrigerant Cycle
b2		Abnormality of EEPROM	EEPROM failure, Incorrect Data of EEPROM
b5		Incorrect Indoor Unit No. Setting	There are 17 or More Non-Corresponding to HI-NET II Units are Connected to One System.
b6		Abnormal Communication between Indoor PCB and Indoor Fan Controller	Communication Failure, Disconnected Communication Cable, Abnormal Connection
C1	Switch Box	Incorrect Switch Box Connection	2 or More Change-Over Boxes are Connected between Water Source Unit and Indoor Unit
C2		Incorrect Indoor Unit Connection Number	9 or More Indoor Units Connected to Single Branch Type Switch Box, 7 or More Indoor Units Connected per a branch of Multiple Branch Type Switch Box
C3		Incorrect Indoor Unit Refrigerant Number Setting	Indoor Units of Different Refrigerant Cycle Number are Connected to Switch Box
C5		Incorrect Connection Port Setting	Indoor Unit is connected to a port that is set to not used for Multiple Branch Type Switch Box
E4	Water Source Unit	Cooling Fan Abnormality	Cooling Fan Failure, Blowout of Fuse for Cooling Fan, Abnormally High Ambient Temperature
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

11. 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.

Model		AVWW-76FKFW	AVWW-96FKFW	AVWW-114FKFW	AVWW-136FKFW	AVWW-154FKFW	AVWW-170FKFW	AVWW-190FKFW
High Pressure Increase Protection		Automatic Reset, Non-Adjustable						
High Pressure Increase Protection Control	(MPa)	3.80	3.80	3.80	3.80	3.80	3.80	3.80
Pressure Switch		(for each compressor)						
Cut-Out	(MPa)	$(4.15\ ^{-0.05}_{-0.15})$	$(4.15\ ^{-0.05}_{-0.15})$	$(4.15\ ^{-0.05}_{-0.15})$	$(4.15\ ^{-0.05}_{-0.15})$	$(4.15\ ^{-0.05}_{-0.15})$	$(4.15\ ^{-0.05}_{-0.15})$	$(4.15\ ^{-0.05}_{-0.15})$
Cut-In	(MPa)	(3.20 ±0.15)	(3.20 ±0.15)	(3.20 ±0.15)	(3.20 ±0.15)	(3.20 ±0.15)	(3.20 ±0.15)	(3.20 ±0.15)
For Inverter Compressor		Automatic Reset, Non-Adjustable						
Over Current Inverter Current Protection Control	A	26	26	26	26	26	26	26
Fuse	A	40	40	50	50	40	40	40
Over Heat		Automatic Reset, Non-Adjustable						
Discharge Temperature Increase Protection Control for 5sec	(°C)	140	140	140	140	140	140	140
for 10min	(°C)	132	132	132	132	132	132	132
For Fan Motor (Electrical Box)		Automatic Reset, Non-Adjustable						
Fuse	A	3.15	3.15	3.15	3.15	3.15	3.15	3.15

Technical Parameters

Model(s): AVWW-76FKFW

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

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

Type: compressor driven vapour compression

Driver of compressor: electric motor

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

Parameters shall be declared for the average heating season

Cooling

Item		Symbol	Value	Unit	Item	Symbol	Value	Unit
Rated cooling capacity		$P_{rated,c}$	22.4	kW	Seasonal space cooling energy efficiency	$\eta_{s,c}$	239	%
Declared cooling capacity (*) for part loadat given outdoor temperatures Tj and indoor 27(19) ℃					Declared energy efficiency ratio (*) for part load at given outdoor temperatures Tj			
Outdoor temperature Tj	water loop inlet / outlet temperature							
Tj=+35 ℃	30/35	P_{dc}	22.4	kW	Tj=+35 ℃	EER_d	5.82	—
Tj=+30 ℃	26/*	P_{dc}	16.6	kW	Tj=+30 ℃	EER_d	11.0378	—
Tj=+25 ℃	22/*	P_{dc}	10.5	kW	Tj=+25 ℃	EER_d	15.3297	—
Tj=+20 ℃	18/*	P_{dc}	4.7	kW	Tj=+20 ℃	EER_d	10.0649	—
Degradation co-efficient for air conditioners (**)		C_{dc}	0.25	—				
Power consumption in modes other than 'active mode'								
Off mode		P_{OFF}	0.048	kW	Crankcase heater mode	P_{CX}	0.048	kW
Thermostat-off mode		P_{TO}	0.048	kW	Standby mode	P_{SB}	0.048	kW

Heating

Item		Symbol	Value	Unit	Item	Symbol	Value	Unit
Rated cooling capacity		$P_{rated,h}$	25	kW	Seasonal space cooling energy efficiency	$\eta_{s,h}$	223	%
Declared capacity (*) for cooling, at indoor temperature 20 ℃ and outdoor temperature Tj					Declared coefficiency of performance (*) /Average season, at indoor temperature 20 ℃ and outdoor temperature Tj			
Outdoor temperature Tj	water loop inlet / outlet temperature							
Tj=-7 ℃	10/*	P_{dh}	15.4	kW	Tj=-7 ℃	COP_d	5.57	—
Tj=+2 ℃	10/*	P_{dh}	9.5	kW	Tj=+2 ℃	COP_d	6.24	—
Tj=+7 ℃	10/*	P_{dh}	6.1	kW	Tj=+7 ℃	COP_d	6.17	—
Tj=+12 ℃	10/*	P_{dh}	2.6	kW	Tj=+12 ℃	COP_d	3.92	—
Tj=bivalent temperature		P_{dh}	15.4	kW	Tj=bivalent temperature	COP_d	5.57	—
Tj=operating limit		P_{dh}	17.5	kW	Tj=operating limit	COP_d	5.21	—
Bivalent temperature					Operating limit temperature			
heating/Average		T_{biv}	-7	℃	heating/Average	T_{ol}	-10	℃
heating/Wamer		T_{biv}	—	℃	heating/Wamer	T_{ol}	—	℃
heating/Colder		T_{biv}	—	℃	heating/Colder	T_{ol}	—	℃
Degradation co-efficient heat pumps (**)		C_{dc}	0.25					
Power consumption in modes other than 'active mode'								
off mode		P_{OFF}	0.048	kW	Back-up heating capacity (*)	elbu	0	kW
thermostat-off mode (heating)		P_{TO}	0.048	kW	Type of energy input			
crankcase heater mode		P_{CK}	0.048	kW	standby mode	P_{SB}	0.048	kW
Other items								
capacity control		variable			Rated water flow rate	—	4.6	m3/h
Sound power level, indoor/outdoor measured		LWA	49/51	dB(A)				
Global warming potential		GWP	2088	kg CO2 eq. (100 years)				
Note		The above performance data is obtained on the basis of the performance of this outdoor unit, with a 100%-combination of ceiling ducted type indoor units.						
Contact details		Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd. 218,Qianwangang Road, Economic and Technological Development Zone, Qingdao, P.R. China						

Packing List

Details		Remarks
Outdoor Unit:	1 Set	
Pipe Accessories Bag:	1 pc	
Water Flow Switch:	1 pc	
Operation Installation & Maintenance Manual:	1 pc	

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