

INSTALLATION MANUAL

AIR CONDITIONER

- Please read this installation manual completely before installing the product.
- Installation work must be performed in accordance with the national wiring standards by authorized personnel only.
- Please retain this installation manual for future reference after reading it thoroughly.your set and retain it for future reference.

MULTI V™
WATER IV

MODEL : ARWV100DAL4



P/NO : MFL67705804

www.lg.com

TABLE OF CONTENTS

Safety Precautions	3
Installation Process	7
Outside units Information.....	8
Environment-friendly Alternative Refrigerant R410A	9
Select the Best Location.....	9
Installation space	10
Water control	11
Lifting method	13
Installation	14
Refrigerant piping installation	18
Device protection unit.....	21
Refrigerant piping system	22
Y branch pipe and header branch pipe type	32
Leakage test and vacuum	34
Electrical Wiring	36
Test Run	47
Maintenance.....	53
Cooling tower applied method	55
Caution For Refrigerant Leak.....	56
Water Solenoid Valve Control	58

Safety Precautions



To prevent injury to the user or other people and property damage, the following instructions must be followed.

- Incorrect operation due to ignoring instruction will cause harm or damage. The seriousness is classified by the following indications.

⚠ WARNING This symbol indicates the possibility of death or serious injury.

⚠ CAUTION This symbol indicates the possibility of injury or damage to properties only.

- Meanings of symbols used in this manual are as shown below.

	Be sure not to do.
	Be sure to follow the instruction.

⚠ WARNING

■ Installation

Have all electric work done by a licensed electrician according to "Electric Facility Engineering Standard" and "Interior Wire Regulations" and the instructions given in this manual and always use a special circuit.

- If the power source capacity is inadequate or electric work is performed improperly, electric shock or fire may result.

Ask the dealer or an authorized technician to install the air conditioner.

- Improper installation by the user may result in water leakage, electric shock, or fire.

Always ground the product.

- There is risk of fire or electric shock.

Always install a dedicated circuit and breaker.

- Improper wiring or installation may cause fire or electric shock.

For re-installation of the installed product, always contact a dealer or an Authorized Service Center.

- There is risk of fire, electric shock, explosion, or injury.

Do not install, remove, or re-install the unit by yourself (customer).

- There is risk of fire, electric shock, explosion, or injury.

Do not store or use flammable gas or combustibles near the air conditioner.

- There is risk of fire or failure of product.

Use the correctly rated breaker or fuse.

- There is risk of fire or electric shock.

Do not install the unit at the outdoor.

- Otherwise it may cause fire, electric shock and trouble.

Do not install the product on a defective installation stand.

- It may cause injury, accident, or damage to the product.

Safety Precautions

When installing and moving the air conditioner to another site, do not charge it with a different refrigerant from the refrigerant specified on the unit.

- If a different refrigerant or air is mixed with the original refrigerant, the refrigerant cycle may malfunction and the unit may be damaged.

Ventilate before operating air conditioner when gas leaked out.

- It may cause explosion, fire, and burn.

Do not reconstruct to change the settings of the protection devices.

- If the pressure switch, thermal switch, or other protection device is shorted and operated forcibly, or parts other than those specified by LGE are used, fire or explosion may result.

Securely install the cover of control box and the panel.

- If the cover and panel are not installed securely, dust or water may enter the outside unit and fire or electric shock may result.

If the air conditioner is installed in a small room, measures must be taken to prevent the refrigerant concentration from exceeding the safety limit when the refrigerant leaks.

- Consult the dealer regarding the appropriate measures to prevent the safety limit from being exceeded. Should the refrigerant leak and cause the safety limit to be exceeded, hazards due to lack of oxygen in the room could result.

Use a vacuum pump or Inert (nitrogen) gas when doing leakage test or air purge. Do not compress air or Oxygen and Do not use Flammable gases. Otherwise, it may cause fire or explosion.

- There is the risk of death, injury, fire or explosion.

■ Operation

Do not damage or use an unspecified power cable.

- There is risk of fire, electric shock, explosion, or injury.

Use a dedicated outlet for this appliance.

- There is risk of fire or electrical shock.

Be cautious that water could not enter the product.

- There is risk of fire, electric shock, or product damage.

Do not touch the power switch with wet hands.

- There is risk of fire, electric shock, explosion, or injury.

When the product is soaked (flooded or submerged), contact an Authorized Service Center.

- There is risk of fire or electric shock.

Be cautious not to touch the sharp edges when installing.

- It may cause injury.

Take care to ensure that nobody could step on or fall onto the outside unit.

- This could result in personal injury and product damage.

Do not open the inlet grille of the product during operation. (Do not touch the electrostatic filter, if the unit is so equipped.)

- There is risk of physical injury, electric shock, or product failure.

⚠ CAUTION

■ Installation

Always check for gas (refrigerant) leakage after installation or repair of product.

- Low refrigerant levels may cause failure of product.

Keep level even when installing the product.

- To avoid vibration or water leakage.

Use power cables of sufficient current carrying capacity and rating.

- Cables that are too small may leak, generate heat, and cause a fire.

Keep the unit away from children. The heat exchanger is very sharp.

- It can cause the injury, such as cutting the finger. Also the damaged fin may result in degradation of capacity.

Do not install the product where the noise or hot air from the outside unit could damage the neighborhoods.

- It may cause a problem for your neighbors.

Do not install the unit where combustible gas may leak.

- If the gas leaks and accumulates around the unit, an explosion may result.

Do not use the product for special purposes, such as preserving foods, works of art, etc. It is a consumer air conditioner, not a precision refrigeration system.

- There is risk of damage or loss of property.

When installing the unit in a hospital, communication station, or similar place, provide sufficient protection against noise.

- The inverter equipment, private power generator, high-frequency medical equipment, or radio communication equipment may cause the air conditioner to operate erroneously, or fail to operate. On the other hand, the air conditioner may affect such equipment by creating noise that disturbs medical treatment or image broadcasting.

■ Operation

Do not use the air conditioner in special environments.

- Oil, steam, sulfuric smoke, etc. can significantly reduce the performance of the air conditioner or damage its parts.

Make the connections securely so that the outside force of the cable may not be applied to the terminals.

- Inadequate connection and fastening may generate heat and cause a fire.

Do not block the inlet or outlet.

- It may cause failure of appliance or accident.

Be sure the installation area does not deteriorate with age.

- If the base collapses, the air conditioner could fall with it, causing property damage, product failure, or personal injury.

Install and insulate the drain hose to ensure that water is drained away properly based on the installation manual.

- A bad connection may cause water leakage.

Safety Precautions

Be very careful about product transportation.

- Only one person should not carry the product if it weighs more than 20 kg.
- Some products use PP bands for packaging. Do not use any PP bands for a means of transportation. It is dangerous.
- Do not touch the heat exchanger fins. Doing so may cut your fingers.
- When transporting the outside unit, suspending it at the specified positions on the unit base. Also support the outside unit at four points so that it cannot slip sideways.

Safely dispose of the packing materials.

- Packing materials, such as nails and other metal or wooden parts, may cause stabs or other injuries.
- Tear apart and throw away plastic packaging bags so that children may not play with them. If children play with a plastic bag which was not torn apart, they face the risk of suffocation.

Do not touch any of the refrigerant piping during and after operation.

- It can cause a burn or frostbite.

Do not directly turn off the main power switch after stopping operation.

- Wait at least 5 minutes before turning off the main power switch. Otherwise it may result in water leakage or other problems.

Use a firm stool or ladder when cleaning or maintaining the air conditioner.

- Be careful and avoid personal injury.

Turn on the power at least 6 hours before starting operation.

- Starting operation immediately after turning on the main power switch can result in severe damage to internal parts. Keep the power switch turned on during the operational season.

Do not operate the air conditioner with the panels or guards removed.

- Rotating, hot, or high-voltage parts can cause injuries.

Auto-addressing should be done in condition of connecting the power of all indoor and outdoor units. Auto-addressing should also be done in case of changing the indoor unit PCB.

ENVIRONMENTAL INFORMATION

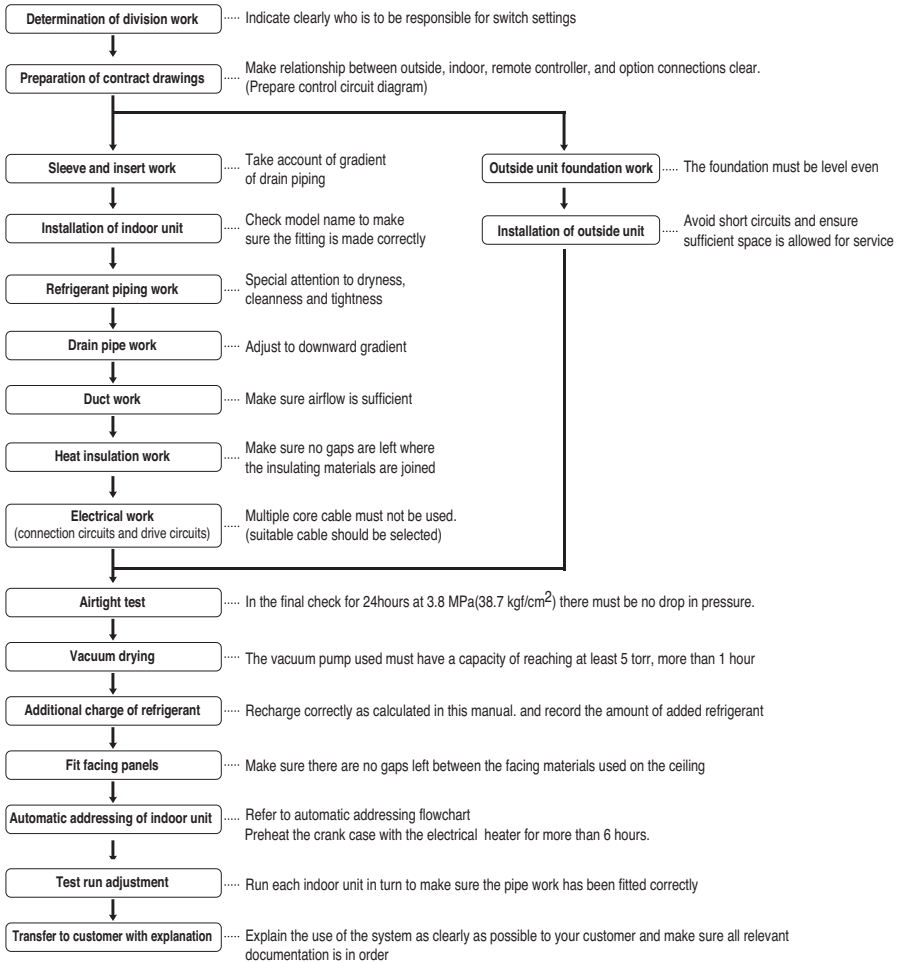
WEEE



Disposal of your old appliance

1. When this crossed-out wheeled bin symbol is attached to a product it means the product is covered by the e-waste (Management and Handling) Rules, 2011.
2. All electrical and electronic products should be disposed of separately from the municipal waste stream via designated collection facilities appointed by the government or the local authorities.
3. The correct disposal of your old appliance will help prevent potential negative consequences for the environment and human health.
4. For more detailed information about disposal of your old appliance, please contact your city office, waste disposal service or the shop where you purchased the product.
5. This product does not contain any of the hazardous substances as specified in the rule 13 (1) and (2) of the e-waste (Management and Handling) Rules, 2011.

Installation Process



⚠ CAUTION

- The above list indicates the order in which the individual work operations are normally carried out but this order may be varied where local conditions warrants such change.
- The wall thickness of the piping should comply with the relevant local and national regulations for the designed pressure 3.8MPa.
- Since R410A is a mixed refrigerant, the required additional refrigerant must be charged in its liquid state.(If the refrigerant is charged in its gaseous state, its composition changes and the system will not work properly.)

Outside units Information

CAUTION

- Ratio of the running Indoor Units to the Outside: Within 10 ~ 100%
- A combination operation over 100% cause to reduce each indoor unit capacity.

■ Combination Ration(50~200%)

Outside Number	Connection Capacity
Single outside units	130%

Notes:

* We can guarantee the operation only within 130% Combination. If you want to connect more than 130% combination, please contact us and discuss the requirement like below.

- 1) If the operation of indoor unit is more than 130%, low airflow operation is recommended in all the indoor units.
- 2) If the operation of indoor unit is more than 130%, additional refrigerant is needed according to the Aheadquarter guidance.
- 3) Over 130%, capacity is same as capacity of 130%, Same remark is valid for power input.

Power Supply: Outside Unit (3Ø, 460V, 60Hz)

■ Cooling Only

Unit			1 Unit
System Capacity (HP)			10
Model	Combination Unit		ARWV100DAL4
	Independent Unit		ARWV100DAL4
Refrigerant Precharged Amount	kg		2.0
Maximum Connectable Number of Indoor Units			16
Net Weight	kg		127
	lbs		279
Dimensions(WxHxD)	mm		755 x 997 x 500
	inch		29-23/32 x 39-1/4 x 19-11/16
Refrigerant Connecting Pipes	Liquid	mm(inch)	9.52(3/8)
	Gas	mm(inch)	22.2(7/8)
Water Connecting Pipes	Inlet		PT25
	Outlet		PT25
	Drain Outlet		PT20
Temp. range of Circulation water	Cooling		10°C ~ 45°C(50°F ~ 113°F)

Environment-friendly Alternative Refrigerant R410A

- The refrigerant R410A has the property of higher operating pressure in comparison with R22. Therefore, all materials have the characteristics of higher resisting pressure than R22 ones and this characteristic should be also considered during the installation.
- R410A is an azeotrope of R32 and R125 mixed at 50:50, so the ozone depletion potential (ODP) of R410A is 0. These days the developed countries have approved it as the environment-friendly refrigerant and encouraged to use it widely to prevent environment pollution.

CAUTION

- The wall thickness of the piping should comply with the relevant local and national regulations for the designed pressure 3.8MPa
- Since R410A is a mixed refrigerant, the required additional refrigerant must be charged in its liquid state. If the refrigerant is charged in its gaseous state, its composition changes and the system will not work properly.
- Do not place the refrigerant container under the direct rays of the sun to prevent it from exploding.
- For high-pressure refrigerant, any unapproved pipe must not be used.
- Do not heat pipes more than necessary to prevent them from softening.
- Be careful not to install wrongly to minimize economic loss because it is expensive in comparison with R22.

Select the Best Location

Precaution when selecting the installation location

- Select space for installation outside unit, which will meet the following conditions.
- With strength which bears weight of unit
- With space for air passage and service work
- Don't install the unit at the space where generation, inflow, stagnation, and leak of combustible gas is expected.
- Avoid unit installation in a place where acidic solution and spray (sulfur) are often used.
- Location with no leakage of combustible gas
- Recommend the outside unit to be installed within 0~40°C.
- Location with installation or service work space (Refer to required space)
- Do not use the outside unit under any special environment where oil, steam and sulfuric gas exist.
- Install in a separate machine room not exposed to external air
 - Establish an anti-freeze plan for the water supply when the product is stopped during the winter.
 - Install the product so that the noise from the machine room is not transferred outside
- The floor of the machine room must be water proof.
- Drainage must be installed in the machine room to process the water drainage.
- Install a floor slope to make the drainage smooth.
- Avoid installing the outside unit in the location with following conditions.
- Location where corrosive gas such as acidic gas is generated. (It may cause the refrigerant leakage by corrosion of the pipe.)
- Location where electromagnetic waves happen. (It may cause the abnormal operation by control parts disorder.)
- Location to be able to leak the combustible gas
- Location with carbon fiber or combustible dust.
- Location with the combustible material like thinner or gasoline. (It may cause a fire by leaking the gas near the product.)

CAUTION

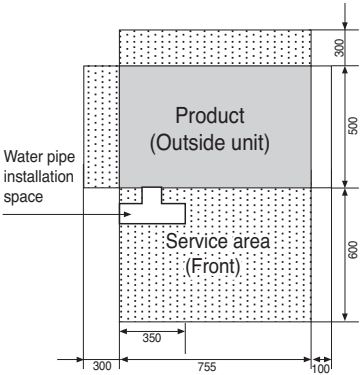
1. Do not install Multi V water outside. Always install indoor like machine room.
2. Inverter product may generate electric noise. Keep the body from computer, stereo etc. at enough distance. Specially leave space from indoor remote controller to shoes electric devices at the above 3m in weak electric wave area. Insert the power cable and other wire into separate conduit.

Installation space

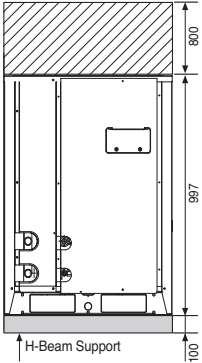
Individual Installation

Required the minimum space as shown below for installation and check.
If the space is not fit on this drawing, consult with LG.

: Service area



<Top View>



<Front View>

Water control

Water control

- Keep the water temperature between 10~45°C. Other it may cause the breakdown.
 - Standard water supply temperature is 30°C for Cooling and 20°C for heating.
- Properly control the water velocity. Otherwise it may cause the noise, pipe vibration or pipe contraction, expansion according to the temperature. Use the same water pipe size connected with the product or more.
- Refer to the water source pipe diameter and water velocity table below. As the water velocity is fast, air bubble will increase.

Diameter (mm)	Velocity range (m/s)
< 50	0.6 ~ 1.2
50 ~ 100	1.2 ~ 2.1
100 <	2.1 ~ 2.7

- Be careful of the water purity control. Otherwise it may cause the breakdown due to water pipe corrosion. (Refer to 'Standard Table for Water Purity Control')
- In case the water temperature is above 40°C, it is good to prevent the corrosion by adding the anticorrosive agent.
- Install the pipe, valve and gauge sensor in the space where it is easy to maintain. Install the water valve in the low position for drain, if required.
- Be careful not to let air in. If so, the water velocity will be unstable in the circulation, pump efficiency will also decrease and may cause the piping vibration. Therefore, install the air purge where it may generate the air.
- Choose the following anti freezing methods. Otherwise, it will be dangerous for the pipe to break in the winter.
 - Circulate the water with the pump before dropping the temperature.
 - Keep the normal temperature by boiler.
 - When the cooling tower is not operated for a long time, drain the water in the cooling tower.
 - Use an anti-freeze. (For using an anti freeze, change the DIP switch on main PCB in outside unit.)
 - Refer to the additive amount about freezing temperature as in the table given below.

Anti freeze type	Minimum temperature for anti freezing (°C)					
	0	-5	-10	-15	-20	-25
Ethylene glycol (%)	0	12	20	30	-	-
Propylene glycol (%)	0	17	25	33	-	-
Methanol (%)	0	6	12	16	24	30

- In addition to anti freeze, it may cause the change of the pressure in the water system and the low performance of the product.
- It can use to both the open cooling type and closed cooling type tower.

Standard table for water purity control

The water may contain many foreign substances and hence may influence the performance and lifetime of the product due to the corrosion of the condenser and water pipe. (Use water source that complies with the below standard table for water purity control.)

If you use water supply other than the tap water to supply the water for the cooling tower, you must do a water quality inspection.

- If you use the closed cooling tower, the water quality must be controlled in accordance with the following standard table.

If you do not control the water quality in accordance with the following standard water quality table, it can cause performance deterioration to the air conditioner and severe problem to the product

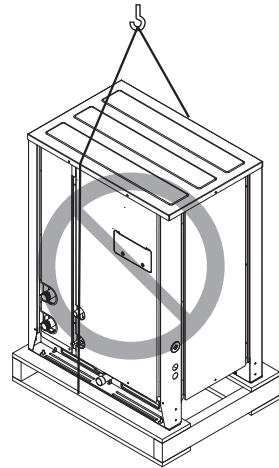
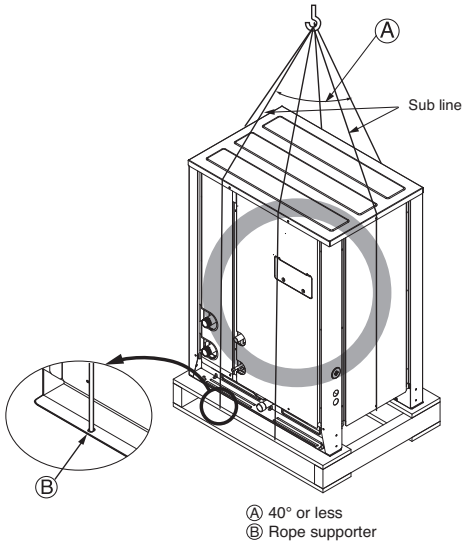
Items	Closed type		Effect	
	Circulating water	Supplemented water	Corrosion	Scale
Basic Item				
pH(25C)	7.0~8.0	7.0~8.0	O	O
Conductivity[25C](mS/m)	Below 30	Below 30	O	O
Chlorine ion(mg Cl ⁻ /l)	Below 50	Below 50	O	-
Sulfuric acid ion(mg SO ₄ ²⁻ /l)	Below 50	Below 50	O	O
Acid demand[pH 4.8] (mg SiO ₂ /l)	Below 50	Below 50	-	O
Total hardness(mg SiO ₂ /l)	Below 70	Below 70	-	O
Ca hardness(mg CaCO ₃ /l)	Below 50	Below 50	-	O
Ion silica(mg SiO ₂ /l)	Below 30	Below 30	-	O
Reference Item				
Fe(mg Fe/l)	Below 1.0	Below 0.3	O	O
Copper(mg Cu/l)	Below 1.0	Below 0.1	O	-
Sulfuric acid ion(mg S ²⁻ /l)	Must not be detected	Must not be detected	O	-
Ammonium ion(mg NH ₄ ⁺ /l)	Below 0.3	Below 0.1	O	-
Residual chlorine(mg Cl/l)	Below 0.25	Below 0.3	O	-
Free carbon dioxide(mg CO ₂ /l)	Below 0.4	Below 4.0	O	-
Stability index	-	-	O	O

[Reference]

- (1) The "O" mark for corrosion and scale means that there is possibility of occurrence.
- (2) When the water temperature is 40°C or above or when uncoated iron is exposed to the water, it can result in corrosion. Therefore adding anti-corrosion agent or removing the air can be very effective.
- (3) In case of using the closed type cooling tower, the cooling water and supplementing water must satisfy the water quality criteria of closed type system in the table.
- (4) Supplementing water and supplied water must be supplied with tap water, industrial water and underground water excluding filtered water, neutral water, soft water etc.
- (5) 15 items in the table are general causes of corrosion and scale.

Lifting method

- When carrying the unit suspended, pass the ropes under the unit and use the two suspension points each at the front and rear.
- Always lift the unit with ropes attached at four points so that impact is not applied to the unit.
- Attach the ropes to the unit at an angle of 40° or less



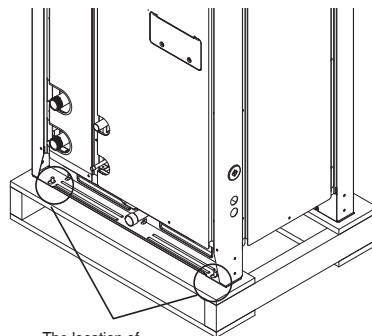
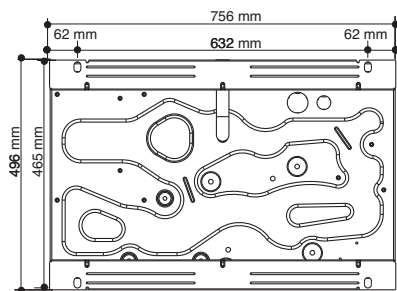
! WARNING

! CAUTION

- Do not have only one person carry product if it is more than 20kg.
- PP bands are used to pack some products.
Do not use them as a means for transportation because they are dangerous.
- Tear the plastic packaging bag and scrap it so that children cannot play with it.
Otherwise plastic packaging bag may suffocate children.
- When carrying in outside unit, be sure to support it at four points.
Carrying in and lifting with 3-point support may make outside unit unstable, resulting in a fall of it.
- When carrying with the forklift, be careful not to drop the product.

Installation

Location of anchor bolt



The location of anchor bolt

⚠ CAUTION

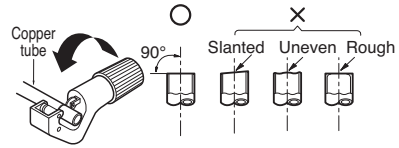
- Be sure to install unit in a place strong enough to withstand its weight. Any lack of strength may cause unit to fall down, resulting in a personal injury.
- Have installation work in order to protect against a strong wind and earthquake. Any installation deficiency may cause unit to fall down, resulting in a personal injury.
- Especially take care for support strength of the floor surface, water drain processing (processing of water flown out from the outside unit during operation) and paths of the pipe and wiring when making a base support.

Preparation of Piping

Main cause of gas leakage is defect in flaring work. Carry out correct flaring work in the following procedure.

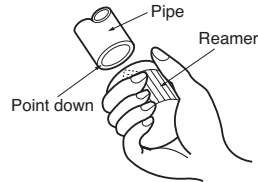
1) Cut the pipes and the cable.

- Use the accessory piping kit or the pipes purchased locally.
- Measure the distance between the indoor and the outside unit.
- Cut the pipes a little longer than measured distance.
- Cut the cable 1.5m longer than the pipe length.



2) Burrs removal

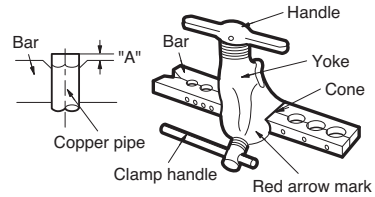
- Completely remove all burrs from the cut cross section of pipe/tube.
- Put the end of the copper tube/pipe to downward direction as you remove burrs in order to avoid to let burrs drop in the tubing.



3) Flaring work

- Carry out flaring work using flaring tool as shown below.

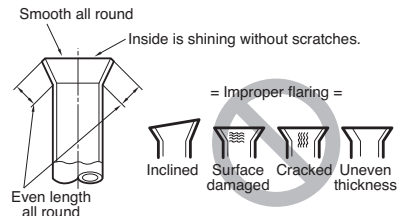
Indoor unit [kW(Btu/h)]	Pipe		"A"	
	Gas	Liquid	Gas	Liquid
<5.6(19,100)	1/2"	1/4"	0.5~0.8	0~0.5
<16.0(54,600)	5/8"	3/8"	0.8~1.0	0.5~0.8
<22.4(76,400)	3/4"	3/8"	1.0~1.3	0.5~0.8



Firmly hold copper tube in a bar(or die) as indicated dimension in the table above.

4) Check

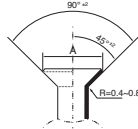
- Compare the flared work with figure below.
- If flare is noted to be defective, cut off the flared section and do flaring work again.



FLARE SHAPE and FLARE NUT TIGHTENING TORQUE

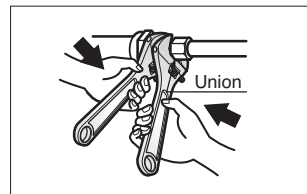
Precautions when connecting pipes

- See the following table for flare part machining dimensions.
- When connecting the flare nuts, apply refrigerant oil to the inside and outside of the flares and turn them three or four times at first. (Use ester oil or ether oil.)
- See the following table for tightening torque. (Applying too much torque may cause the flares to crack.)
- After all the piping has been connected, use nitrogen to perform a gas leak check.

pipe size	tightening torque(Ncm)	A(mm)	flare shape
Ø9.5	3270-3990	12.8-13.2	
Ø12.7	4950-6030	16.2-16.6	
Ø15.9	6180-7540	19.3-19.7	

CAUTION

- Always use a charge hose for service port connection.
- After tightening the cap, check that no refrigerant leaks are present.
- When loosening a flare nut, always use two wrenches in combination. When connecting the piping, always use a spanner and torque wrench in combination to tighten the flare nut.
- When connecting a flare nut, coat the flare(inner and outer faces) with oil for R410A(PVE) and hand tighten the nut 3 to 4 turns as the initial tightening.



Opening shutoff valve

1. Remove the cap and turn the valve counter clockwise with the hexagon wrench.
2. Turn it until the shaft stops.
Do not apply excessive force to the shutoff valve. Doing so may break the valve body, as the valve is not a backseat type. Always use the special tool.
3. Make sure to tighten the cap securely.

Closing shutoff valve

1. Remove the cap and turn the valve clockwise with the hexagon wrench.
2. Securely tighten the valve until the shaft contacts the main body seal.
3. Make sure to tighten the cap securely.

* For the tightening torque, refer to the table on the below.

Tightening torque

Shut off Valve size	Flare nut	Cap (valve Lid)	Valve Core	Service port	Heagonal wrench
Ø6.35(1/4") (7/16-20UNF)	16.0±2.0	17.6±2.0	3.0	12.7±2.0	6.0±0.6
Ø9.52(3/8") (5/8-18UNF)	38.0±4.0	17.6±2.0	3.0	12.7±2.0	6.0±0.6
Ø12.7(1/2") (3/4-16UNF)	55.0±6.0	20.0±2.0	3.0	12.7±2.0	9.0±0.9
Ø15.88(5/8") (7/8-14UNF)	75.0±7.0	25.0±2.5	3.0	12.7±2.0	15.0±1.5
Ø19.05(3/4") (1/16-UNS)	110.0±10.0	25.0±2.5	3.0	12.7±2.0	30.0±3.0
Ø22.2(7/8")	-	25.0±2.5	3.0	12.7±2.0	30.0±3.0
Ø25.4(1")	-	25.0±2.5	3.0	12.7±2.0	30.0±3.0

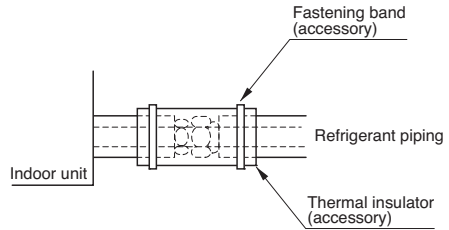
HEAT INSULATION

1. Use the heat insulation material for the refrigerant piping which has an excellent heat-resistance (over 120°C).

2. Precautions in high humidity circumstance:

This air conditioner has been tested according to the "ISO Conditions with Mist" and confirmed that there is not any default. However, if it is operated for a long time in high humid atmosphere (dew point temperature: more than 23°C), water drops are liable to fall. In this case, add heat insulation material according to the following procedure:

- Heat insulation material to be prepared... EPDM (Ethylene Propylene Diene Methylene)-over 120°C the heat-resistance temperature.
- Add the insulation over 10mm thickness at high humidity environment.



3. Standard refrigerant pipe EPDM heat insulation material thickness

[Unit:mm]

Classification		Air conditioned location		Non-air conditioned location	
		Note1) General location	Note2) Special location	Note3) General location	Note4) Negative condition
Liquid pipe	Ø6.35	Above t9	Above t9	Above t9	Above t9
	Ø9.52				
	Above Ø12.7				
Gas pipe	Ø9.52	Above t13	Above t13	Above t13	Above t25
	Ø12.7				
	Ø15.88				
	Ø19.05				
	Ø22.22				
	Ø25.4				
	Ø28.58	Above t19	Above t25	Above t25	
	Ø31.75				
	Ø34.9				
	Ø38.1				
	Ø44.45				

Note 1) General location: When the pipe passes through indoors in which the indoor unit is operated
 - Apartment, classroom, office, mall, hospital, office-tel etc.

Note 2) Special location

1. When the location is air conditioned but has severe temperature/humidity difference due to high ceiling
 - Church, auditorium, theater, lobby etc.
2. When the location is air conditioned but the internal temperature/humidity of the ceiling finishing is high
 - Bathroom/swimming pool locker room etc. (Building with roof ceiling of sandwich assembly type)

Note 3) General location: When the pipe passes indoors where the indoor unit is not operated
 - Hall way etc. (Dormitory, school, office-tel)

Note 4) Negative condition: When below conditions 1 and 2 are met.

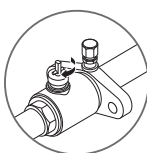
1. When the pipe passes indoors where the indoor unit is not operated
2. When the humidity is high, regionally, and there is no air flow in the pipe passing area
 - When installing the outside unit within the outside pipe tray or at a location where it is ok to have freezes, apply 13t.
 - If you are not sure with the selection of heat insulation material, coordinate with the supervision or HQ.
 - The thickness of the above heat insulation material is based on the heat conductivity of 0.088W/m°C.

Refrigerant piping installation

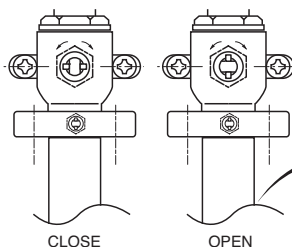
⚠ WARNING

Always use extreme care to prevent the refrigerant gas (R410A) from leakage while using fire or flame. If the refrigerant gas comes in contact with the flame from any source, such as a gas stove, it breaks down and generates a poisonous gas which can cause gas poisoning. Never perform brazing in an unventilated room. Always conduct an inspection for gas leakage after installation of the refrigerant piping has been completed.

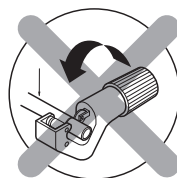
Cautions in pipe connection/valve operation



Open status when both the pipe and the valve are in a straight line.



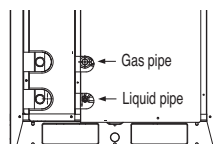
Do not cutting.



⚠ WARNING

After completing work, securely tighten both service ports and caps so that gas does not leak.

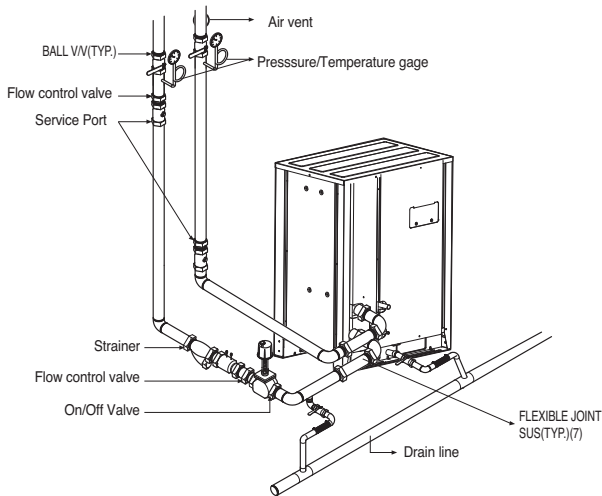
- * Remove the front panel before pipe connection
- * Must check the pipe (liquid pipe, gas pipe, high/low pressure common pipe) before pipe connection



Installation of water pipe

1) Water pipe system diagram

- The water pressure resistance of the water pipe system of this product is 1.98MPa
- When the water pipe passes indoors, make sure to execute heat insulation on the pipe so that water drops do not form on the outer side of the water pipe.
- The size of the drain pipe must be equal to or larger than the diameter of the connecting product.
 - Always install a trap so that the drained water does not back flush.
- Always install a strainer (20 Mesh or above) at the entrance of the water pipe. (When sand, trash, rusted pieces get mixed into the water supply, it can cause problems to the product due to blocking)
 - If On/Off valve is applied, by interlocking with outside unit, it can save the energy consumption of pump by blocking the water supply to the outside unit not operating. Select appropriate valve and install on site if necessary.
- Install a pressure gauge and temperature gauge at the inlet and outlet of the water pipe.
- Flexible joints must be installed not to cause any leakage from the vibration of pipes.
- Install a service port to clean the heat exchanger at the each end of the water inlet and outlet.
- For the components of the water pipe system, always use components above the designed water pressure.



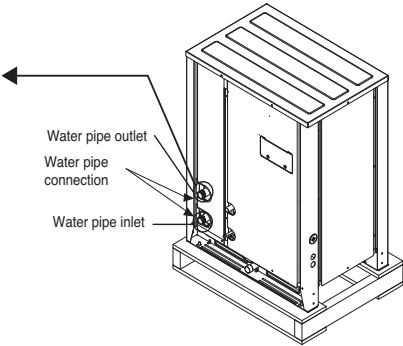
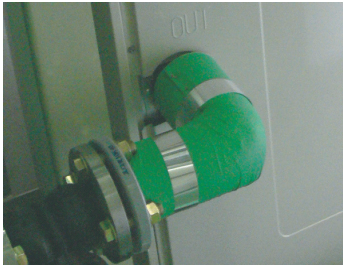
CAUTION

**Do not directly connect the drain outlet to the water pipe outlet.
(It can cause problems to the product.)**

2) Water pipe connection

- The water pipe should be the same size of the connection on the product or more.
- If necessary install the insulation material in the water pipe inlet/outlet to prevent water drop, freeze and to save energy. (Use the above 20mm thickness PE insulation material.)
- Tightly connect the socket to the water pipe refer to below table for recommended specification. (Too much torque may cause the damage of the facility.)

Pipe thickness		Shear stress		Tensile stress		Bending moment		Torque	
mm	inch	(kN)	(kgf)	(kN)	(kgf)	(N·m)	(kgf·m)	(N·m)	(kgf·m)
12.7	1/2	3.5	350	2.5	250	20	23	5	3.5
19.05	3/4	12	1200	2.5	250	20	2	115	11.5
25.4	1	11.2	1120	4	400	45	4.5	155	15.5
31.8	1 1/4	14.5	1450	6.5	650	87.5	8.75	265	26.5
38.1	1 1/2	16.5	1.7	9.5	0.95	155	16	350	35.5
50.8	2	21.5	2.2	13.5	1.4	255	26	600	61



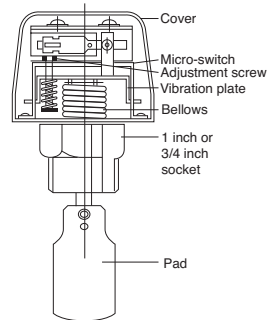
Device protection unit

Strainer on water pipe

To protect the water cooling type product, you must install a strainer with 20 Mesh or more on the heat water supply pipe. If not installed, it can result in damage of heat exchanger by the following situation.
If you do not use a strainer with 50 mesh or more, alien particles can partially block the water paths.

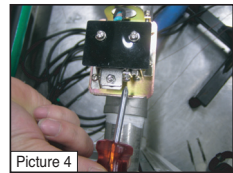
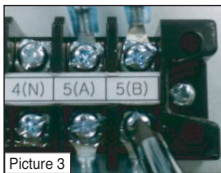
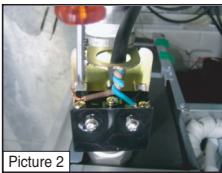
Flow switch work

- It is recommended to install the flow switch to the water collection pipe system connecting to the outside unit.
(Flow switch acts as the 1st protection device when the heat water is not supplied. If a certain level of water does not flow after installing the flow switch, an error sign of CH24 error will be displayed on the product and the product will stop operating.)
- When setting the flow switch, it is recommended to use the product with default set value to satisfy the minimum flow rate of this product. (The minimum flow rate range of this product is 50%. Reference flow rate : 10HP – 96LPM)
- Select the flow switch with the permitted pressure specification considering the pressure specification of the heat water supply system. (Control signal from outside unit is AC 220V.)



Installation of flow switch

- The flow switch must be installed at the horizontal pipe of the heat water supply outlet of the product and check the direction of the heat water flow before the installation. (Picture 1)
 - When connecting the flow switch to the product, remove the jump wire to connect to the communication terminal (5(A) and 5(B)) of the outside unit control box. (Picture 2, 3) (Open the cover of the flow switch and check the wiring diagram before connecting the wires. The wiring method can differ by the manufacturer of the flow switch.)
 - If necessary, adjust the flow rate detection screw after consulting with an expert and adjust to the minimum flow rate range. (Picture 4) (Minimum flow rate range of this product is 50%. Adjust the flow switch to touch the contact point when the flow rate reaches 50% of the flow rate.)
- Reference flow rate : 10HP – 96LPM



⚠ CAUTION

- If the set value does not satisfy the minimum flow rate or if the set value is changed by the user arbitrarily, it can result in product performance deterioration or serious product problem.
- If the product is operated with the heat water supply not flowing smoothly, it can damage the heat exchanger or cause serious product problems.
- When the product operates while the flow switch touches the contact point at the flow rate range out of the permitted range, it can cause product performance deterioration or serious product problem.
- Must use the normal closed type flow switch
 - Circuit of outside unit is normal closed type

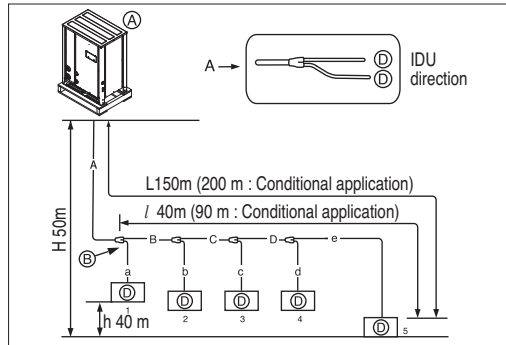
Refrigerant piping system

Y branch method

Single outside unit system

Example : 5 Indoor Units connected

- Ⓐ : Outdoor Unit
- Ⓑ : 1st branch
- Ⓒ : Y branch
- Ⓓ : Indoor Unit
- Ⓔ : Header branch
- Ⓕ : Suture



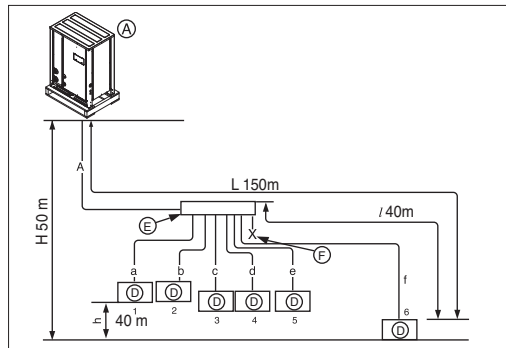
* If it is conditionally installed, refer to (table 1).

Headerv branch Method

Single outside unit system

Example : 6 Indoor Units connected

- Ⓐ : Outdoor Unit
- Ⓑ : 1st branch
- Ⓒ : Y branch
- Ⓓ : Indoor Unit
- Ⓔ : Header branch
- Ⓕ : Suture

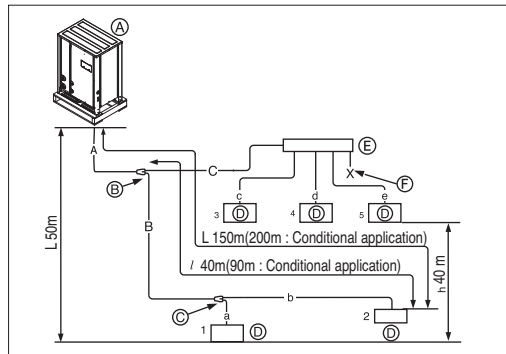


Y/Header branch method

Single outside unit system

Example : 5 Indoor Units connected

- Ⓐ : Outdoor Unit
- Ⓑ : 1st branch
- Ⓒ : Y branch
- Ⓓ : Indoor Unit
- Ⓔ : Header branch
- Ⓕ : Suture



* If it is conditionally installed, refer to (table 1).

▷ Refrigerant pipe diameter from branch to branch (B,C,D)

Downward Indoor Unit total capacity(kW)	Liquid pipe(mm)	Gas pipe(mm)
≤ 5.6	Ø 6.35	Ø 12.7
< 16.0	Ø 9.52	Ø 15.88
≤ 23.0	Ø 9.52	Ø 19.05
< 33.0	Ø 9.52	Ø 22.2
< 47.0	Ø 12.7	Ø 28.58
< 71.0	Ø 15.88	Ø 28.58
< 104.0	Ø 19.05	Ø 34.9
< 174.0	Ø 19.05	Ø 41.3

▷ Total pipe length limited

Classification	Section	Type	Y branch	Y/header branch	Header branch
Maximum permitted length	Outdoor unit ↔ indoor unit	Maximum pipe length(L)	A+B+C+D+e ≤ 150 m (Conditionally 200 m)*	A+B+b ≤ 150 m A+C+e ≤ 150 m (Conditionally 200m)*	A+f ≤ 150 m
		Corresponding pipe length	175 m (Conditionally 225 m)*	175 m (Conditionally 225 m)*	175 m
		Total pipe length (Outdoor unit ↔ total indoor unit)	300 m (Conditionally 500 m)*	300 m (Conditionally 500 m)*	300 m (Conditionally 500 m)*
Permitted height	Outdoor unit ↔ indoor unit	height difference(H)	50 m	50 m	50 m
	Indoor unit ↔ indoor unit	height difference(h)	40 m	40 m	40 m
Maximum pipe length after 1st branch		Actual pipe length(l)	40 m (Conditionally 90m)*	40 m (Conditionally 90m)*	40 m

⚠ WARNING

- It is recommended that difference of piping length for pipes connected to the Indoor Unit is minimized. Performance difference between Indoor Units may occur.
- When the any one (or both) of below conditions are satisfied, the diameter of main pipe (A) must be increased according to below table.
 - The equivalent length between outdoor unit and the farthest indoor unit is 90m or more (Liquid and Gas pipes are increased)

➤ Refrigerant pipe diameter from outdoor unit to first branch. (A, E, F, G)

Upward Outdoor unit total capacity	Standard Pipe Diameter		Increased Pipe Diameter	
			When pipe length is 90m or more from ODU to 1st branch	
kW	Liquid pipe(mm)	Gas pipe(mm)	Liquid pipe(mm)	Gas pipe(mm)
23	Ø 9.52	Ø 19.05	Ø 12.7	Ø 22.2
29	Ø 9.52	Ø 22.2	Ø 12.7	Ø 22.2
35	Ø 12.7	Ø 22.2	Ø 15.88	Ø 25.4
41	Ø 12.7	Ø 25.4	Ø 15.88	Ø 28.58

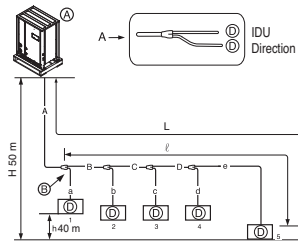
5* If the step up size is not available, you can not select the next higher size available.

◆ (Table 1) Cautions during the installation of Maximum pipe length 90m after the 1st branch

⚠ WARNING

To install maximum pipe length after the 1st branch exceeding 40 m and 90 m or less, the following conditions must be satisfied.

	Required	Example
1	Select the diameter of the pipe between the 1st branch and the last branch to be 1 level larger. Provided that, it is not necessary if the pipe diameter is the same as the main pipe.	$40\text{ m} < B+C+D+e \leq 90\text{ m}$ → Change B, C, and D pipe diameter. Ø6.35 → Ø9.52, Ø9.52 → Ø12.7, Ø12.7 → Ø15.88, Ø15.88 → Ø19.05, Ø19.05 → Ø22.2, Ø22.2 → Ø25.4, Ø25.4 → Ø28.58, Ø28.58 → Ø31.8, Ø31.8 → Ø34.9, Ø34.9 → Ø38.1
2	During the calculation of the total refrigerant pipe length, the above pipe length shall be calculated as twice.	$A+Bx2+Cx2+Dx2+a+b+c+d+e \leq 500\text{ m}$
3	The length from each indoor unit to the nearest branch pipe $\leq 40\text{ m}$	$a,b,c,d,e \leq 40\text{ m}$
4	Length from outdoor unit to the farthest indoor unit] – [Length from outdoor unit to the nearest indoor unit] $\leq 40\text{ m}$	$(A+B+C+D+e)-(A+a) \leq 40\text{ m}$



◆ Cautions for Y branch pipe

⚠ WARNING

If the pipe diameter(B, C) connected after the 1st branch is larger than the main pipe diameter(A), install the pipe diameter(B, C) connected after the 1st branch to be the same as the main pipe diameter(A).

Example) If indoor units are connected 120 % to 29 kW

- Outdoor unit main pipe diameter(A): (Gas pipe) (Fluid pipe)
 - Pipe diameter(B, C) after the 1st branch according to 120% indoor unit combination(34.8kW):
(Gas pipe) (Fluid pipe)
- Therefore, select the pipe diameter(B, C) after the 1st branch to be main pipe diameter(A) (Gas pipe) (Fluid pipe)

◆ Cautions for header branch pipe

⚠ WARNING

- It is recommended to install the difference between the length of the pipe after header branch(a~f) and the length of the pipe connected to indoor unit to be the minimum.
- As the pipe length difference increases, there may be performance differences between indoor units.
- Y branch and header branch cannot be used after header branch.

Indoor unit connection

→ Indoor unit connecting pipe from branch (a~f)

Indoor unit capacity [kW(Btu/h)]	Liquid pipe [mm(inch)]	Gas pipe [mm(inch)]
≤ 5.6(19,100)	Ø6.35(1/4)	Ø12.7(1/2)
< 16.0(54,600)	Ø9.52(3/8)	Ø15.88(5/8)
≤ 22.4(76,400)	Ø9.52(3/8)	Ø19.05(3/4)
< 33(112,600)	Ø9.52(3/8)	Ø22.2(7/8)

Oil trap application method between outside units

- Because of the possibility of oil being accumulated in the outside unit that has stopped, when there is a height difference between outside unit pipes or if the pipe distance between the outside units is over 2m, you must always apply an oil trap. (But, the oil trap between outside units is limited to 1 time and is only applied to the gas pipe.)
- If the pipe distance between the outside units is 2m or below, and if the location of the main pipe is lower than that of the outside unit and if the location of the main pipe is lower than that of the outside unit, the oil trap does not have to be applied.
- If the location of the main pipe is higher than the location of the outside unit, be careful since the oil can be accumulated in the stopped outside unit.
- If there is high/low difference between the outside unit pipes, oil can be accumulated to the outside unit on the lower location until the unit stops.

Calculation of amount of refrigerant

The calculation of the additional charge should take account of the diameter and length of the pipe.

(A)	Product Charge(kg)	
(B)	Additional charge (kg)	
=	Total liquid pipe (m): Ø25.4 mm	x 0.480(kg/m)
+	Total liquid pipe (m): Ø22.2mm	x 0.354(kg/m)
+	Total liquid pipe (m): Ø19.05mm	x 0.266(kg/m)
+	Total liquid pipe (m): Ø15.88mm	x 0.173(kg/m)
+	Total liquid pipe (m): Ø12.7mm	x 0.118(kg/m)
+	Total liquid pipe (m): Ø9.52mm	x 0.061(kg/m)
+	Total liquid pipe (m): Ø6.35mm	x 0.022(kg/m)
+	CF(kg) (Correction Factor)	
	Total amount(kg)	= (A) + (B)

CAUTION If a negative result is obtained from the calculation, no refrigerant needs to be added.

Ex) 10HP

- (A) Outside unit
(B) Header branch
(C) Indoor unit



A : Ø9.52, 50m
B : Ø9.52, 10m
C : Ø9.52, 10m
D : Ø9.52, 10m
E : Ø6.35, 10m

$$\begin{aligned}
 \text{Additional Charge} &= A \times 0.061 + B \times 0.061 + C \times 0.061 \\
 &\quad + D \times 0.061 + E \times 0.022 + CF \\
 &= 50 \times 0.061 + 10 \times 0.061 + 10 \times 0.061 \\
 &\quad + 10 \times 0.061 + 10 \times 0.022 + 0(CF) \\
 &= 5.1\text{kg}
 \end{aligned}$$

CF value of indoor unit

(unit : kg)

Capacity(Btu/h(kW))	5k (1.6)	7k (2.2)	9k (2.8)	12k (3.6)	15k (4.5)	18k (5.6)	21k (6.2)	24k (7.1)	28k (8.2)	36k (10.6)	42k (12.3)	48k (14.1)
Type												
Ceiling Concealed Duct (Low Static)	- 0.14*	0.17 0.14*	0.17 0.14*	0.17 0.19*	0.17 0.19*	0.37 0.19*	- 0.25*	0.37 0.25*	-	-	-	-
Ceiling Concealed Duct (High Static / Built in)	-	0.26	0.26	0.26	0.26	0.26	-	0.26	0.44	0.44	0.44	0.62
Wall Mounted / ARTCOOL Mirror	-	0.24	0.24	0.24	0.24	0.28	-	0.28	-	-	-	-
1Way Ceiling Cassette	-	0.20	0.20	0.20	-	0.29	-	0.29	-	-	-	-
2Way Ceiling Cassette	-	-	-	-	-	0.16	-	0.16	-	-	-	-
4Way Ceiling Cassette	0.18	0.18	0.25	0.25	0.32	0.32	-	0.48	0.48	0.64	0.64	0.64
ARTCOOL Gallery	-	0.10	0.10	0.10	-	-	-	-	-	-	-	-
Floor Standing	-	0.17	0.17	0.17	0.17	0.37	-	0.37	-	-	-	-
Ceiling & Floor	-	-	0.10	0.10	-	-	-	-	-	-	-	-
Ceiling Suspended	-	-	-	-	-	0.35	-	0.35	-	0.54	-	0.75
Console	-	0.17	0.17	0.17	0.17	-	-	-	-	-	-	-
Heat recovery ventilator(DX)	-	-	-	0.20	-	0.20	-	0.20	-	-	-	-

CAUTION

Use only 2-series of indoor unit. Ex) ARNU***2

* Ceiling Concealed Duct (Low Static) L1, L2, L3 Chassis models only

Do not combine for indoor unit of Fresh Air Intake Unit.

Do not combine for 54k or more indoor unit of ceiling concealed duct (high static) type.

Note:

Fill in the f-gas Label attached on outside about the quantity of the fluorinated greenhouse gases

- ① Manufacturing site (See Model Name label)
- ② Installation site (If possible being placed adjacent to the service points for the addition or removal of refrigerant)
- ③ The total Charge (①+②)

⚠ WARNING**► Regulation for refrigerant leakage**

: the amount of refrigerant leakage should satisfy the following equation for human safety.

$\frac{\text{Total amount of refrigerant in the system}}{\text{Volume of the room at which indoor unit of the least capacity is installed}} \leq 0.44 \text{ (kg / m}^3\text{)}$

If the above equation cannot be satisfied, the following steps must be followed.

- Selection of air conditioning system: Select one of the following
 1. Installation of effective opening part: At the top and bottom of the door connecting the room to the outside, create an opening with or without the door of with 0.15% of floor space or above.
 2. Recheck of outside unit capacity and piping length
 3. Reduction of the amount of refrigerant
 4. Installation of 2 or more security devices (Alarm for gas leakage)
- Change indoor unit type
 - : Installation position should be over 2m from the floor (Wall mounted type → cassette type)
- Adoption of ventilation system

Ventilation system prevents the refrigerant density from increasing when the refrigerant is leaked by the installation. Ventilation system comes in two types; external air inflow type or exhaust type. External air inflow type is recommended due to the characteristics of the refrigerant.

Always operate the ventilation system irrelevant from whether the air conditioner is used or not and whether the indoor or not. When it is impossible to operate this and in case of a refrigerant leakage by the sensor, the ventilation system is automatically operated.
- Limitation in piping work
 - : Prepare for earthquake and thermal stress
- Reduction of all refrigerant charge amount of the refrigerant facility (When calculated value exceeds 0.44kg/m³)
 1. Shorten the refrigerant pipe length.
 - Change the location of the outside unit and shorten the length of the refrigerant pipe to reduce all refrigerant charge amount.

Caution

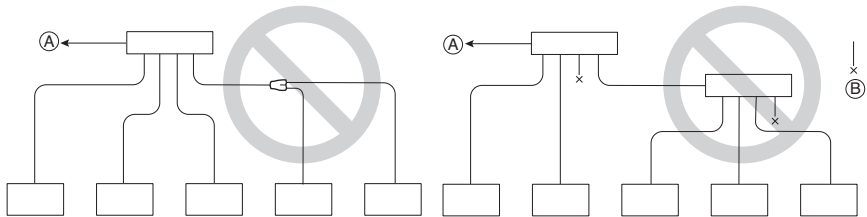
- Use the following materials for refrigerant piping.
 - Material: Seamless phosphorous deoxidized copper pipe
 - Wall thickness : Comply with the relevant local and national regulations for the designed pressure 3.8MPa. We recommend the following table as the minimum wall thickness.

Outer diameter [mm]	6.35	9.52	12.7	15.88	19.05	22.2	25.4	28.58	31.8	34.9	38.1	41.3
Minimum thickness [mm]	0.8	0.8	0.8	0.99	0.99	0.99	0.99	0.99	1.1	1.21	1.35	1.43

- Commercially available piping often contains dust and other materials. Always blow it clean with a dry inert gas.
- Use care to prevent dust, water or other contaminants from entering the piping during installation.
- Reduce the number of bending portions as much as possible, and make bending radius as big as possible.
- Always use the branch piping set shown below, which are sold separately.

Y branch		Header		
		4 branch	7 branch	10 branch
ARBLN01621	ARBLN03321	ARBL054	ARBL057	ARBL1010
ARBLN07121		ARBL104	ARBL107	

- If the diameters of the branch piping of the designated refrigerant piping differs, use a pipe cutter to cut the connecting section and then use an adapter for connecting different diameters to connect the piping.
- Always observe the restrictions on the refrigerant piping (such as rated length, difference in height, and piping diameter).
Failure to do so can result in equipment failure or a decline in heating/cooling performance.
- A second branch cannot be made after a header. (These are shown by ⊗.)

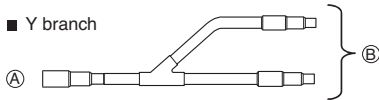


- (A) To Outside Unit
(B) Sealed Piping

- The Multi V will stop due to an abnormality like excessive or insufficient refrigerant. At such a time, always properly charge the unit. When servicing, always check the notes concerning both the piping length and the amount of additional refrigerant.
- Never perform a pump down. This will not only damage the compressor but also deteriorate the performance.**
- Never use refrigerant to perform an air purge. Always evacuate using a vacuum pump.**

Branch pipe Fitting

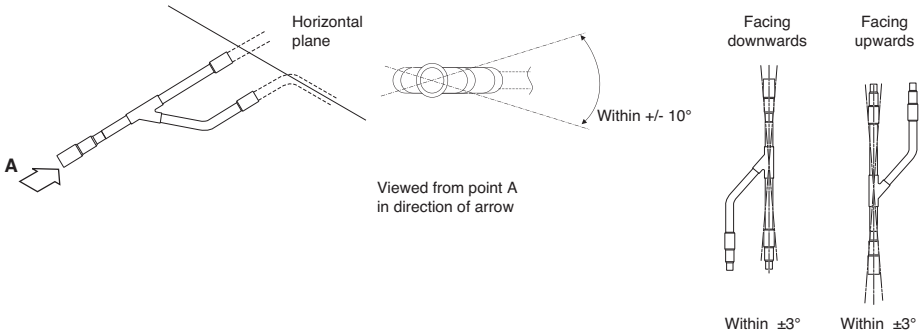
■ Y branch



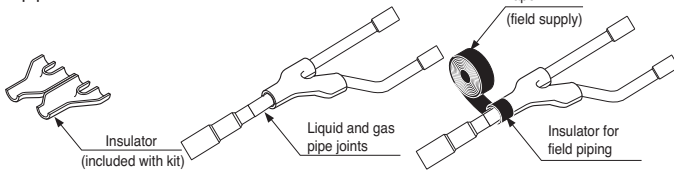
(A) To Outside Unit

(B) To Branch Piping or Indoor Unit

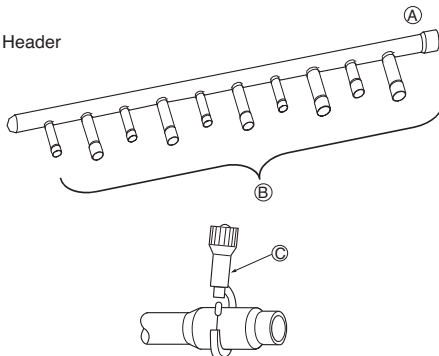
- Ensure that the branch pipes are attached horizontally or vertically (see the diagram below.)



- There is no limitation on the joint mounting configuration.
- If the diameter of the refrigerant piping selected by the procedures described is different from the size of the joint, the connecting section should be cut with a pipe cutter.
- Branch pipe should be insulated with the insulator in each kit.



■ Header



(A) To outside unit

(B) To indoor unit

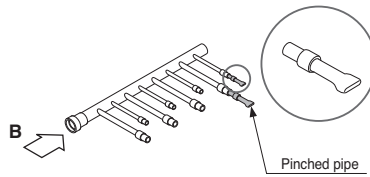
- The indoor unit having larger capacity must be installed closer to (A) than smaller one.
- If the diameter of the refrigerant piping selected by the procedures described is different from the size of the joint, the connecting section should be cut with a pipe cutter.

© Pipe cutter

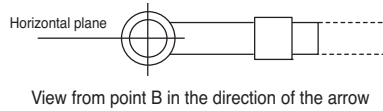
- When the number of pipes to be connected is smaller than the number of header branches, install a cap to the unconnected branches.

Refrigerant piping system

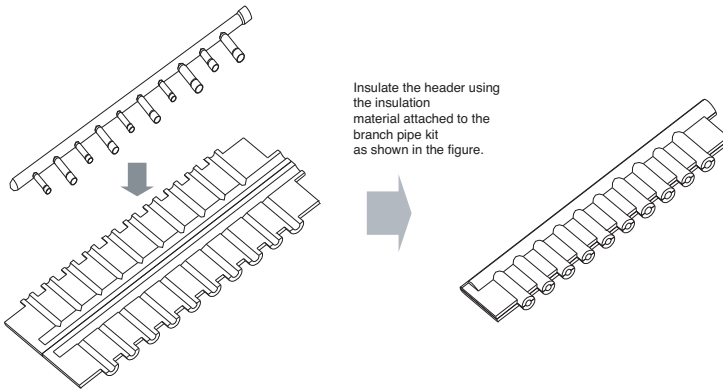
- When the number of indoor units to be connected to the branch pipes is less than the number of branch pipes available for connection then cap pipes should be fitted to the surplus branches.



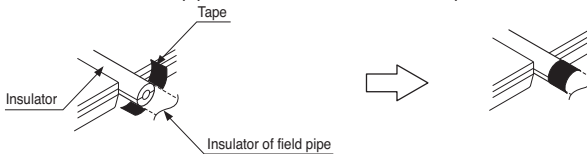
- Fit branch pipe lie in a horizontal plane.



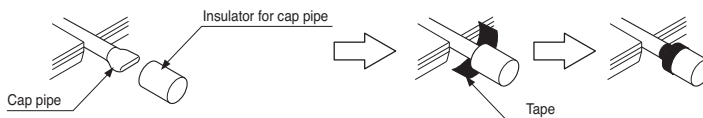
- Header should be insulated with the insulator in each kit.



- Joints between branch and pipe should be sealed with the tape included in each kit.

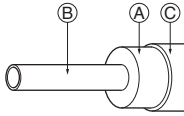


- Any cap pipe should be insulated using the insulator provided with each kit and then taped as described above.



Thermal insulation of refrigerant piping

Be sure to give insulation work to refrigerant piping by covering liquid pipe and gas pipe separately with enough thickness heat-resistant polyethylene, so that no gap is observed in the joint between indoor unit and insulating material, and insulating materials themselves. When insulation work is insufficient, there is a possibility of condensation drip, etc. Pay special attention to insulation work to ceiling plenum.



(A) Heat insulation material

(B) Pipe

(C) Outer covering

(Wind the connection part and cutting part of heat insulation material with a finishing tape.)

Heat insulation material	Adhesive + Heat - resistant polyethylene foam + Adhesive tape	
Outer covering	Indoor	Vinyl tape
	Floor exposed	Water-proof hemp cloth + Bronze asphalt
	Outside	Water-proof hemp cloth + Zinc plate + Oily paint

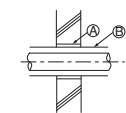
Note:

When using polyethylene cover as covering material, asphalt roofing shall not be required.

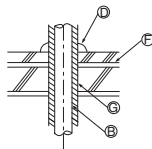
Bad example	<ul style="list-style-type: none"> Do not insulate gas or low pressure pipe and liquid or high pressure pipe together. <p>(A) Liquid pipe (B) Gas pipe (C) Power lines (D) Finishing tape (E) Insulating material (F) Transmission lines</p>	<ul style="list-style-type: none"> Be sure to fully insulate connecting portion. <p>(A) These parts are not insulated.</p>
Good example	<p>(A) Liquid pipe (B) Gas pipe (C) Power lines (D) Insulating material (E) Transmission lines</p> <p>Power lines Transmission lines</p> <p>Separation</p>	

Penetrations

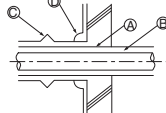
Inner wall (concealed)



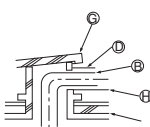
Floor (fireproofing)



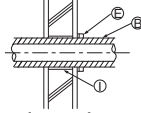
Outer wall



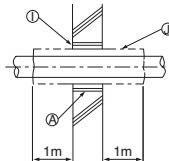
Roof pipe shaft



Outer wall (exposed)



Penetrating portion on fire limit and boundary wall



- (A) Sleeve
- (B) Heat insulating material
- (C) Lagging
- (D) Caulking material
- (E) Band
- (F) Waterproofing layer
- (G) Sleeve with edge
- (H) Lagging material
- (I) Mortar or other incombustible caulking
- (J) Incombustible heat insulation material

When filling a gap with mortar, cover the penetration part with steel plate so that the insulation material will not be caved in. For this part, use incombustible materials for both insulation and covering. (Vinyl covering should not be used.)

[unit:mm]

Models	Gas pipe	Liquid pipe
ARBLN01621		
ARBLN03321		
ARBLN07121		

Header

[unit:mm]

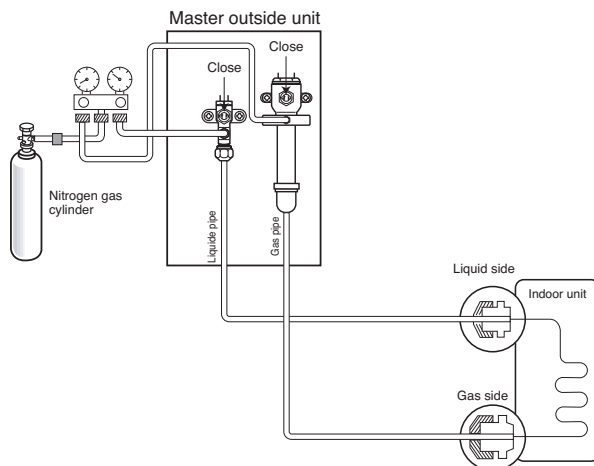
Models	Gas pipe	Liquid pipe
4 branch ARBL054		
7 branch ARBL057		
4 branch ARBL104		
7 branch ARBL107		
10 branch ARBL1010		

Leakage test and vacuum

Leak test

Leak test should be made by pressurizing nitrogen gas to 3.8 MPa(38.7kgf/cm²). If the pressure does not drop for 24 hours, the system passes the test. If the pressure drops, check where the nitrogen leaks. For the test method, refer to the following figure. (Make a test with the service valves closed. Be also sure to pressurize liquid pipe, gas pipe and high/low pressure common pipe)

The test result can be judged good if the pressure has not be reduced after leaving for about one day after completion of nitrogen gas pressurization.



Note:

If the ambient temperature differs between the time when pressure is applied and when the pressure drop is checked, apply the following correction factor

There is a pressure change of approximately 0.1 kg/cm² (0.01 MPa) for each 1°C of temperature difference.

Correction= (Temp. at the time of pressurization – Temp. at the time of check) X 0.1

For example: Temperature at the time of pressurization (3.8 MPa) is 27 °C

24 hour later: 3.73 MPa, 20°C

In this case the pressure drop of 0.07 is because of temperature drop

And hence there is no leakage in pipe occurred.

CAUTION

To prevent the nitrogen from entering the refrigeration system in the liquid state, the top of the cylinder must be at higher position than the bottom when you pressurize the system.
Usually the cylinder is used in a vertical standing position.

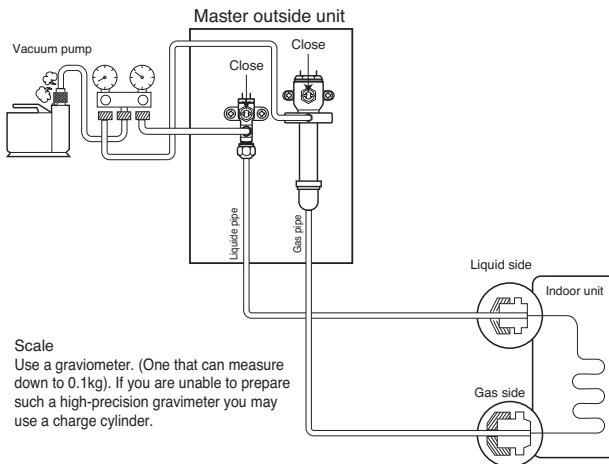
Vacuum

Vacuum drying should be made from the service port provided on the outside unit's service valve to the vacuum pump commonly used for liquid pipe, gas pipe and high/low pressure common pipe. (Make Vacuum from liquid pipe, gas pipe and high/low pressure common pipe with the service valve closed.)

* Never perform air purging using refrigerant.

• Vacuum drying: Use a vacuum pump that can evacuate to -100.7kPa (5 Torr, -755mmHg).

1. Evacuate the system from the liquid and gas pipes with a vacuum pump for over 2 hrs and bring the system to -100.7kPa .
After maintaining system under that condition for over 1 hr, confirm the vacuum gauge rises. The system may contain moisture or leak.
2. Following should be executed if there is a possibility of moisture remaining inside the pipe.
(Rainwater may enter the pipe during work in the rainy season or over a long period of time)
After evacuating the system for 2 hrs, give pressure to the system to 0.05MPa (vacuum break) with nitrogen gas and then evacuate it again with the vacuum pump for 1hr to -100.7kPa (vacuum drying). If the system cannot be evacuated to -100.7kPa within 2 hrs, repeat the steps of vacuum break and its drying.
Finally, check if the vacuum gauge does not rise or not, after maintaining the system in vacuum for 1 hr.



Scale
Use a gravimeter. (One that can measure down to 0.1kg). If you are unable to prepare such a high-precision gravimeter you may use a charge cylinder.

• Vacuum should be done for 3 hours or more after the pressure is under 0.5 torr .

Note : Always add an appropriate amount of refrigerant. (For the refrigerant additional charge)

Too much or too little refrigerant will cause trouble.

To use the Vacuum Mode

(If the Vacuum mode is set, all valves of Indoor units and Outside units will be opened.)

WARNING

When installing and moving the air conditioner to another site, recharge after perfect evacuation.

- If a different refrigerant or air is mixed with the original refrigerant, the refrigerant cycle may malfunction and the unit may be damaged.

Electrical Wiring

Areas of Caution

1. Follow ordinance of your governmental organization for technical standard related to electrical equipment, wiring regulations and guidance of each electric power company.

⚠ WARNING

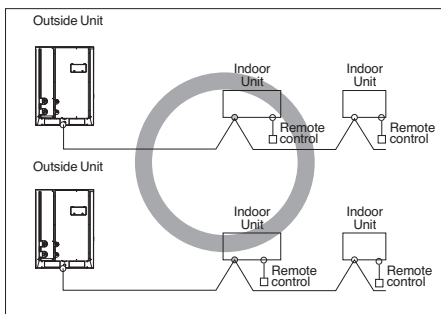
Be sure to have authorized Electrical engineers do electric work using special circuits in accordance with regulations and this installation manual. If power supply circuit has a lack of capacity or electric work deficiency, it may cause an electric shock or fire.

2. Install the outside unit transmission line away from the power source wiring so that it may not be affected by electric noise from the power source. (Do not run it through the same conduit.)
3. Be sure to provide designated grounding work to outside unit.

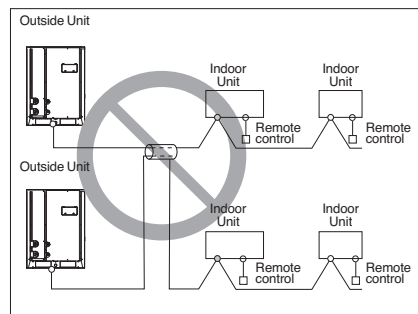
⚠ CAUTION

Be sure to correct the outside unit to earth. Do not connect earth line to any gas pipe, water pipe, lightning rod or telephone earth line. If earth is incomplete, it may cause an electric shock.

4. Give some allowance to wiring for electrical part box of indoor and outside units, because the box is sometimes removed at the time of service work.
5. Never connect the main power source to terminal block of transmission line. If connected, electrical parts will be burnt out.
6. Use 2-core shield cable for transmission line. (O mark in the figure below) If transmission lines of different systems are wired with the same multicore cable, the resultant poor transmission and receiving will cause erroneous operations. (⊗ mark in the figure below)
7. Only the transmission line specified should be connected to the terminal block for outside unit transmission.



2-core shield cable



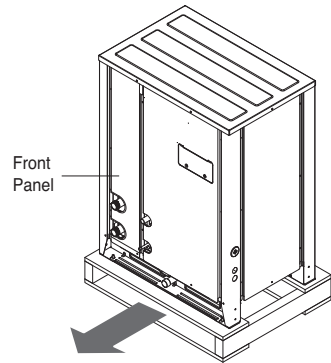
Multi-core cable

⚠ WARNING

- Use the 2-core shield cables for transmission lines. Never use them together with power cables.
- The conductive shielding layer of cable should be grounded to the metal part of both units.
- Never use multi-core cable
- As this unit is equipped with an inverter, to install a phase leading capacitor not only will deteriorate power factor improvement effect, but also may cause capacitor abnormal heating. Therefore, never install a phase leading capacitor.
- Keep power imbalance within 2% of the supply rating. Large imbalance will shorten the life of the smoothing capacitor.
- Introducing with a missing N-phase or with a mistaken N-phase will break the equipment.

Control Box and Wiring Location

- Unscrew all the screw, pull out the panel.
- Connect the transmission wire between outside unit and indoor unit, the connection between outside unit and central controller system pass through the sub PCB for central control.
- When connecting indoor unit with the shield cable, ground at the grounding screw.
When connecting central controller with the shield cable, ground at the grounding screw.
- Refer to next page about the distance between main power cable and communication cable.
- Refer to 106 page about Auto-Addressing and Test Run.



Transmission and Power Lines

1) Transmission cable

- Types : shielding wire CVVS or CPEVS
- Diameter : 1.0 ~ 1.5 mm²
- Insulation material : PVC
- Maximum allowable temperature: 60°C
- Maximum allowable line length: under 300m

2) Remote control cable

- Types : 3-core cable

3) Simple central control cable

- Types : 4-core cable (Shielding wire)
- Use wires of size : 1.0 ~ 1.5 mm²
- Insulation material : PVC

4) Separation of transmission and power lines

- If transmission and power lines are run alongside each other then here is a strong likelihood of operational faults developing due to interference in the signal wiring caused by electrostatic and electromagnetic coupling.

Current capacity of power line		Spacing
100V or more	10A	300mm
	50A	500mm
	100A	1,000mm
	Exceed 100A	1,500mm

Note:

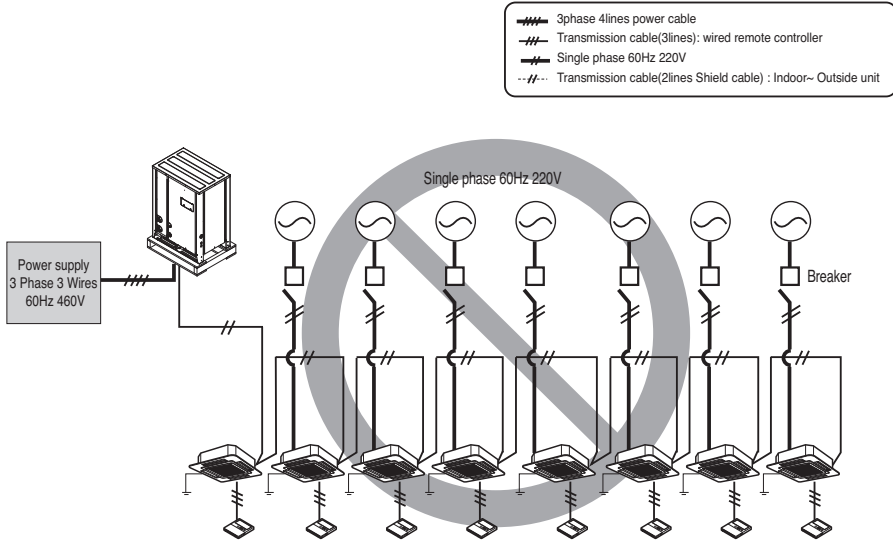
1. The figures are based on assumed length of parallel cabling up to 100m. For length in excess of 100m the figures will have to be recalculated in direct proportion to the additional length of line involved.
 2. If the power supply waveform continues to exhibit some distortion the recommended spacing in the table should be increased.
- If the lines are laid inside conduits then the following point must also be taken into account when grouping various lines together for introduction into the conduits.
 - Power lines(including power supply to air conditioner) and signal lines must not be laid inside the same conduit.
 - In the same way, when grouping the power lines and signal lines should not be bunched together.

CAUTION

- If apparatus is not properly earthed then there is always a risk of electric shocks, the earthing of the apparatus must be carried out by a qualified person.
- Use a power wire pipe for the power wiring.

◆ Example for mistake of wiring

- Do not separately connect the power of the indoor unit.



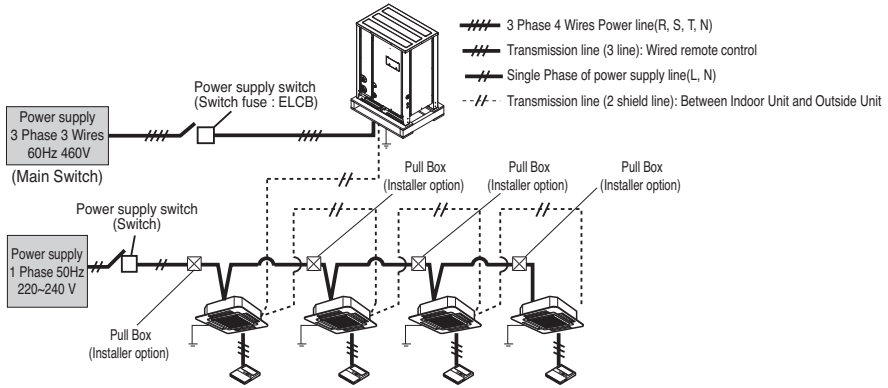
⚠ CAUTION

Never install individual switch or individual outlet to cut the power connecting the indoor unit.

1. 60Hz

◆ Example Connection of Transmission Cable

1 Outside Unit



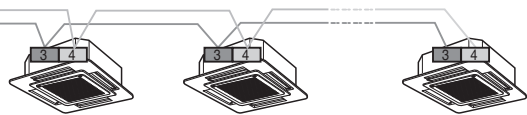
WARNING

- Indoor Unit ground Lines are required for preventing electrical shock accident during current leakage, Transmission disorder by noise effect and motor current leakage (without connection to pipe).
- Don't install an individual switch or electrical outlet to disconnect each of indoor unit separately from the power supply.
- Install the main switch that can interrupt all the power sources in an integrated manner because this system consists of the equipment utilizing the multiple power sources.
- If there exists the possibility of reversed phase, lose phase, momentary blackout or the power goes on and off while the product is operating, attach a reversed phase protection circuit locally. Running the product in reversed phase may break the compressor and other parts.

Between Indoor and Master Outside unit

SODU	IDU	CEN	DRY1	DRY2	GND	12V
B	A		B	A		

Master
Outside unit

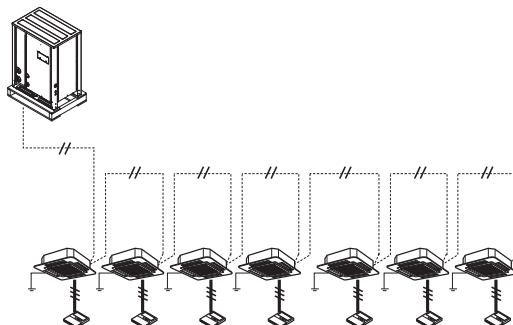


The GND terminal is a 'L' terminal for the central controller, not Ground Line

◆ Example Connection of Communication Cable

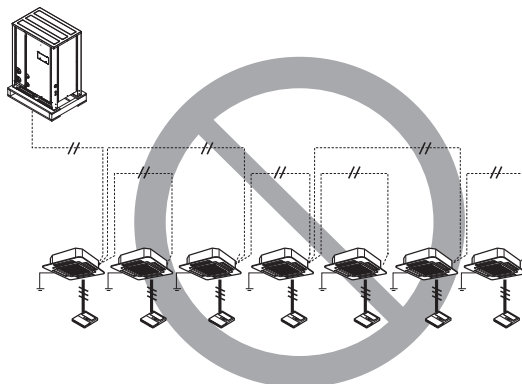
[BUS type]

- Connection of communication cable must be installed like below figure between indoor unit to outside unit.



[STAR type]

- Abnormal operation can be caused by communication defect, when connection of communication cable is installed like below figure(STAR type).



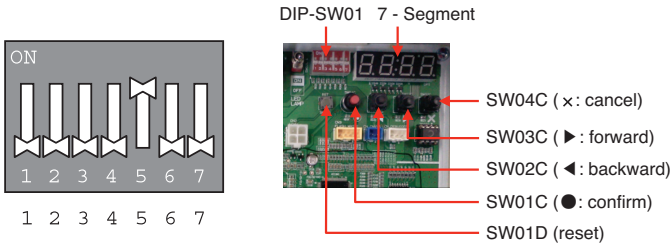
Dip switch setting

Setting the function

Select the mode/function/option/value using '▶', '◀' Button and confirm that using the '●' button after dip switch No.5 is turned on.

CAUTION

- It is only executed when all indoor units are off.



Mode		Function		Option			Value		Action		Remarks
Content	Display1	Content	Display2	Content	Display3	Content	Display4	Implement	Display5		
Installation	Func	Cool & Heat Selector	F01	OFF	op1~op2	Selected the option	-	-	Change the set value	Blank	Save in EEPROM
		Geothermal mode setting	F02	OFF	ON	Selected the option	-	-	Change the set value	Blank	Save in EEPROM
		Sol. Valve 200 V output	F03	OFF	ON	Selected the option	-	-	Change the set value	Blank	Save in EEPROM
		Variable water flow control	F04	OFF	ON	Selected the option	-	-	Change the set value	Blank	Save in EEPROM
		ODU address	F05	-		-	0~255	Set the value	Change the set value	Blank	Save in EEPROM
		Target pressure adjusting	F07	OFF	op1~op3	Selected the option	-	-	Change the set value	Blank	Save in EEPROM
		Use Sump Heater	F08	OFF	ON	Selected the option	-	-	Change the set value	Blank	Save in EEPROM
		IDU capacity adjusting	F09	OFF	ON	Selected the option	-	-	Change the set value	Blank	Save in EEPROM

* Functions save in EEPROM will be kept continuously, though the system power was reset.
To cancel the function you need to set OFF.

Dip switch setting

1. Set the dip switch and turn on the power of the outside unit to check whether the set value is correctly entered in the 7 segment.
2. This function is shown for only 2 seconds after the power is connected.

■ Checking according to dip switch setting

- You can check the setting values of the Master outdoor unit from the 7 segment LED.
The dip switch setting should be changed when the power is OFF.
- It checks whether the input is properly performed without the bad contact of the dip switch or not

■ Checking the initial display

The number is sequentially appeared at the 7 segment in 5 seconds after applying the power.
This number represents the setting condition.

Master model capacity → Slave1 model capacity → Slave2 model capacity → Slave3 model capacity
→ Total capacity → System type → Power type → Product type

Example) 178 kW(62HP) 4Unit R410A combination (Cooling/heating switching type, 380V general type)
16 → 16 → 16 → 14 → 62 → 2 → 38 → 1

⚠ CAUTION

Product may not properly operate if the relevant DIP switch is not properly setup.

EX) Details of each symbol

Symbol	Number	Contents
①	8~20	Master model capacity
②	10~20	Slave 1 capacity
③	10~20	Slave 2 capacity
④	10~20	Slave 3 capacity
⑤	8~80	Total capacity
⑥	1	Cooling only
	2	Cooling/Heating switching type
	3	Simultaneous Cooling/Heating type
⑦	38	380 V
	46	460 V
	22	220 V
⑧	1	General type
	2	Tropical type
	3	Factory type

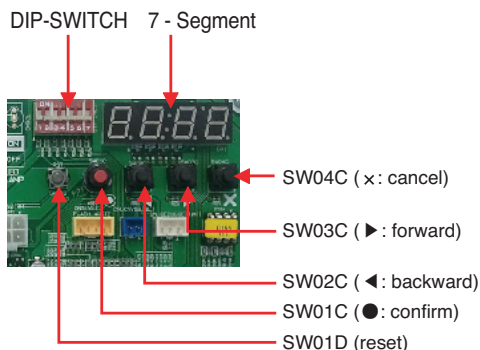
Model capacity

Capacity(kW)	Capacity(HP)	Remark	Refrigerant
23	8	Same for master /slave	R410A
29	10		
35	12		
41	14		
46	16		
52	18		
57	20		

Indoor unit auto addressing

- The address of the indoor units would be set by auto addressing.
 - 1) Wait for 3 minutes after applying power supply (master and slave outside unit, indoor unit)
 - 2) Press the switch of the outside unit (SW02V) for 5 seconds.
 - 3) A "88" is indicated on 7-segment LED of the outside unit PCB.
 - 4) For completing addressing, 2~7 minutes are required depending on numbers of indoor unit connection set.
 - 5) Numbers of indoor unit connection set whose addressing is completed are indicated for 30 seconds on 7-segment LED of the outside unit PCB.
 - 6) After completing addressing, address of each indoor unit is indicated on the wired remote controller display window. (CH01, CH02, CH03, CH06 : Indicated as number of indoor unit connection set.)

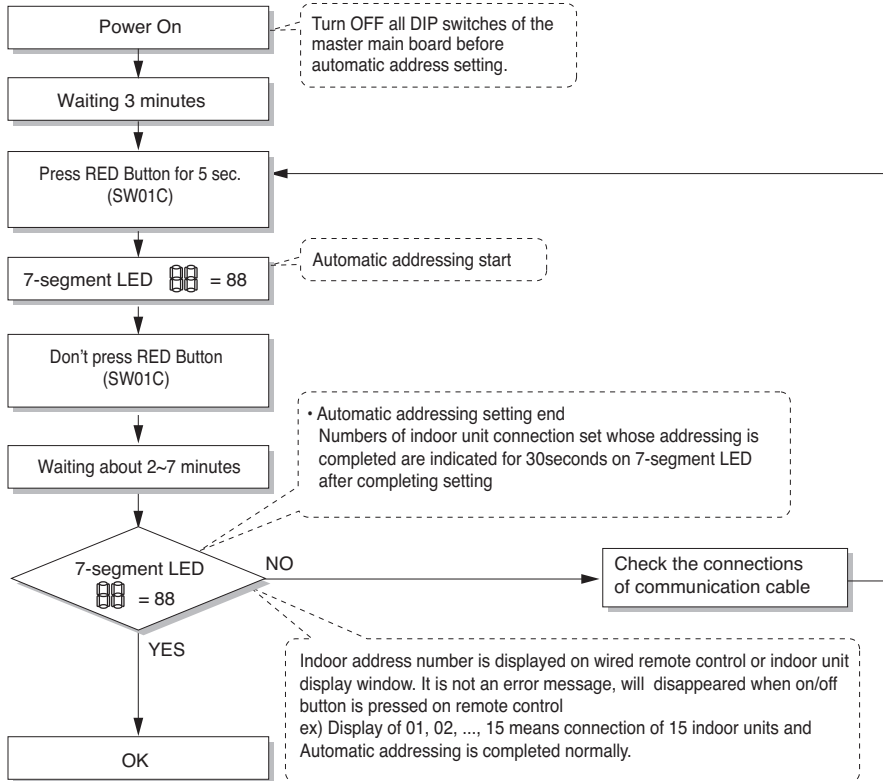
[MAIN PCB]



⚠ WARNING

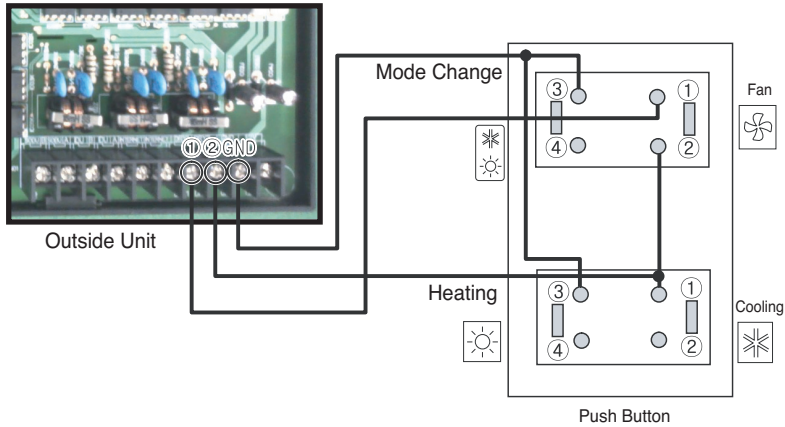
- When replacing the indoor unit PCB, you must execute the auto addressing again. Always execute this with all the power of indoor units and outside units connected. If the power is not connected to the indoor unit, it can generate an operation error.
- When power is connected to the Multi V Water II for the first time, it will standby for more than 3 minutes to improve the indoor unit communication, and then the address must be set.

◆ The Procedure of Automatic Addressing



Outside unit Dry Contact installation and connection

- Connect wires as below figure at the hole of backside of Outside Unit Dry Contact.
- Insert the wire in the connection hole pushing the "Push" button.
- Setting Main PCB Dip SW of Master Outside Unit.



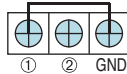
Mode setting without Cool/Heat Selector

In case of no Cool/Heat Selector, connect signal terminal block as below figure And description.
Connect signal terminal block as below figure and description.

- How to set mode without Cool/Heat Selector

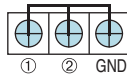
• Cooling Mode Setting

- ① → GND Connection
- ② → Off (Open)



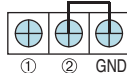
• Heating Mode Setting

- ① → GND Connection
- ② → GND Connection



• Fan Mode Setting

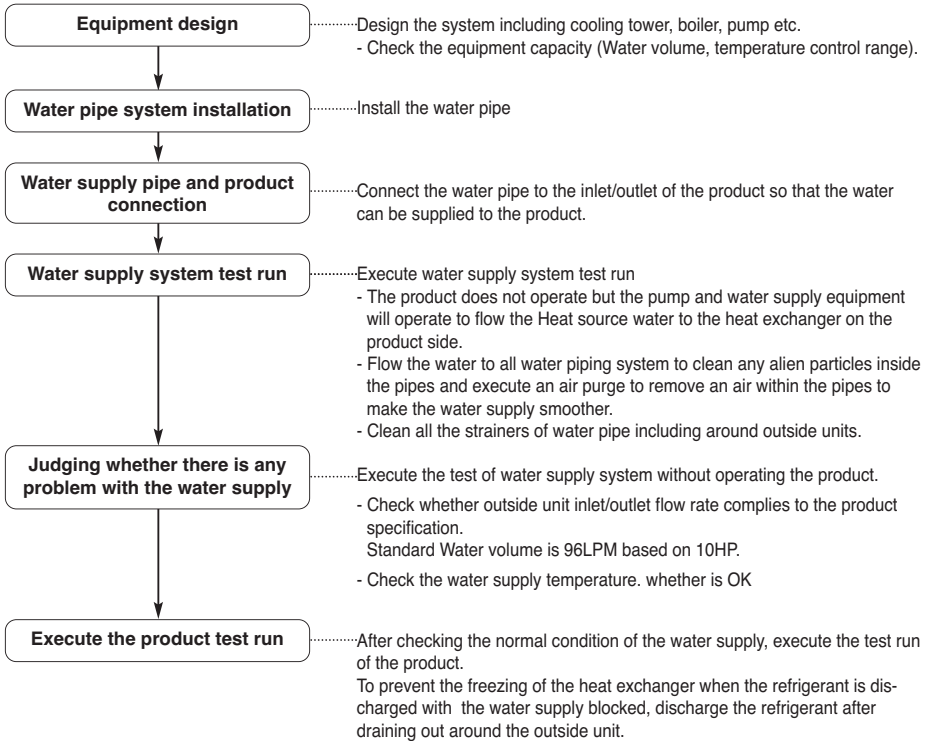
- ① → Off (Open)
- ② → GND Connection



Test Run

Water supply system test run

- Before executing the test run for the product, you must first test the heat source water system.
The test run for the product must be executed after checking the flow rate and temperature of the heat source water supplied.



Precaution before test run

1	Check whether the air is completely removed and the water supply is flowing smoothly.
2	Check whether there is any refrigerant leakage of any disconnected or loose communication or power wire, or use the electric wiring diagram to check the wiring connection condition. Check whether the power and communication wire are connected.
3	Check whether the power cable R, S, T and N are correctly connected. Check the insulation resistance with the DB mega tester device (DC 500V) between the power terminal block and grounding, and check whether it is 2.0MΩ or above when measured. If the resistance is 2.0MΩ or less, do not operate the product. Precaution: - Never check the insulation resistance for the terminal control board. (The control board can be damaged.) - If you leave the system turned off right after the installation or for a long period of time, the refrigerant gets accumulated within the compressor and the insulation resistance reduces to less than 2 MΩ. When the insulation resistance is 2 MΩ or less, turn on the power and let the electricity be supplied to the crank case heater of the compressor and let the refrigerant including the oil inside the compressor to evaporate. Then the insulation resistance value will increase to more than 2.0 MΩ.
4	Check whether the liquid and gas pipes are open.
5	Precaution when blocking the water cooling type Multi V main power - While using the product (Air conditioning season/Heating season), always connect the main power of the outside unit. - During the test run operation after installing the product or during the operation after blocking the outside unit main power (Power outage etc.), you must always connect the power 6 hours prior to heating the crank case heater. If the crank case is not preheated for more than 6 hours with the electric heater, it can cause a burn on the compressor. (Heating the bottom part of the compressor with the crank case heater is to evaporate the refrigerant included in the oil inside the compressor.)

WARNING

- Always check whether the water supply is flowing smoothly before the test run. (If sufficient amount of water is not flowing, it can burn the product.)
- During the initial test run after installing the product, leaving the product for more than 3 days or after replacing the compressor, power must be connected 6 hours prior to the operation to heat the compressor heater. (If the product is not heated sufficiently, it can burn the product.)

How to Cope with Abnormal Test Run

Item	Phenomenon	Cause	Checkpoint and resolution
Whether heat water is supplied	CH24	When connecting the flow switch, heat-sourced water doesn't flow or the amount of its flow lacks due to the checked error related to heat-sourced water.	Check whether the heat source water supply pump is operating.
			Check whether the heat source water supply pipe is clogged. (Clean strainer, valve locked, valve issue, air trapped etc.)
			Check whether the flow switch is normal condition. (Flow switch problem, arbitrary control, disconnection etc.)
	CH32	Heat water not supplied or flow rate is insufficient	Check whether heat source water supply pump is operating.
			Check whether the heat source water supply pipe is clogged. (Clean strainer, valve locked, valve issue, air trapped etc.)
	CH34	Heat water not supplied or flow rate is insufficient(During Cool-ing)	Check whether heat source water supply pump is operating.
			Check whether the heat source water supply pipe is clogged. (Clean strainer, valve locked, valve issue, air trapped etc.)

Daily check/management

1. Flow rate control

Check whether the strainer is clogged or whether the pipe is filled with air and then check the temperature and pressure difference of the inlet and outlet pipe to check whether the flow rate is insufficient.

If the temperature and pressure difference is above the appropriate level, it means that the flow rate is reduced. In this case, the operation must immediately be stopped and re-operated when the root cause is resolved. (*If air is trapped in the pipe, the air must be purged. Air inside the water pipe interferes with the circulation of the heat water supply and can cause insufficient flow rate or freezing.)

2. Brine density management

When using the brine (Anti-freeze) in the heat water supply, designated type and density must be used. Calcium chloride brine can cause corrosion on the Shell & Coil heat exchanger and must not be used.

If the anti-freeze liquid is left as is, it absorbs the moisture from the air to cause a drop in the density, leading to freezing of Shell & Coil heat exchanger. Therefore minimize the contact surface with the atmosphere and periodically measure the density of the brine to supplement the brine as needed to maintain the density.

Maintenance/Repair checklist

Checkpoint \ Period (Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Product operating condition	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Heat exchanger cleaning (Wash)					●					●					●
Strainer cleaning	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Water quality check	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Refrigerant leakage check	●														●
Indoor unit filter cleaning	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

(● : Check mark)

⚠ CAUTION

- The above checklist is set based on the minimum period and more frequent checking can be required depending on the operating condition/water quality condition.
- When cleaning the heat exchanger, make sure to take parts out or lock the valve so that chemical detergent does not penetrate into the pressure gauge etc.
- When cleaning the heat exchanger, check the connecting part of the water pipes prior to cleaning so that the chemical detergent does not leak.
- After sufficiently mixing the chemical detergent with water, start cleaning.
- Cleaning the heat exchanger is easier at the initial stage and becomes difficult after the scaling has accumulated.
- In areas where the water quality is poor, cleaning is required periodically.
Because chemical detergent has strong acidity, it must be washed off thoroughly with water.
- To check whether it is cleaned well inside, remove the hose and check the inside.
- Purge the air to remove any air inside the water pipe.
- After checking, always check whether the heat water supply is flowing normally flowing before operating the product.

Self-Diagnosis Function

Error Indicator

- This function indicates types of failure in self-diagnosis and occurrence of failure for air condition.
- Error mark is displayed on display window of indoor units and wired remote controller, and 7-segment LED of outside unit control board as shown in the table.
- If more than two troubles occur simultaneously, lower number of error code is first displayed.
- After error occurrence, if error is released, error LED is also released simultaneously.

Error Display

1st,2nd LED of 7-segment indicates error number, 3rd LED indicates unit number.

Ex) 211 : No.21 error of master unit

213 : No.21 error of slave2

011 → 051 : No.105 error of master unit

	Display		Title	Cause of Error
Indoor Unit related Error	0	1	- Air temperature sensor of indoor unit	Air temperature sensor of indoor unit is open or short
	0	2	- Inlet pipe temperature sensor of indoor unit	Inlet pipe temperature sensor of indoor unit is open or short
	0	3	- Communication error : wired remote controller ↔ indoor unit	Failing to receive wired remote controller signal in indoor unit PCB
	0	4	- Drain pump	Malfunction of drain pump
	0	5	- Communication error : outdoor unit ↔ indoor unit	Failing to receive outdoor unit signal in indoor unit PCB
	0	6	- Outlet pipe temperature sensor of indoor unit	Outlet pipe temperature sensor of indoor unit is open or short
	0	9	- Indoor EEPROM Error	In case when the serial number marked on EEPROM of Indoor unit is 0 or FFFFFFFF
	1	0	- Poor fan motor operation	Disconnecting the fan motor connector/Failure of indoor fan motor lock
	1	7	- Inlet Air temperature sensor of FAU	Air temperature sensor of indoor unit is open or short
Outside Unit related Error	2	1	* Master outside unit inverter compressor IPM Fault	Master outside unit inverter compressor drive IPM error
	2	2	* Inverter Board Input Over Current(RMS) of Master outside Unit	Master Outside Unit Inverter Board Input Current excess (RMS)
	2	3	* Master outside unit inverter compressor DC link under-voltage	DC voltage is not charged after master outside unit operating relay is turned on
	2	4	* Master outside unit high pressure switch	Compressor maintenance by master outside unit high pressure switch Flow rate insufficiency or flow switch trouble of master outside unit
	2	5	* Master outside unit input voltage over-voltage/under-voltage	Master outside unit input voltage over-voltage or under-voltage
	2	6	* Master outside unit inverter compressor operation failure error	Initial operation failure due to master outside unit inverter compressor error
	2	8	* Master outside unit inverter DC link over-voltage error	Compressor turned Off due to master outside unit inverter DC voltage over-charge
	2	9	* Master outside unit inverter compressor overcurrent	Master outside unit inverter compressor error or operating component (IPM) error operation
	3	2	* Master outside unit inverter compressor discharge temperature over-rise	Compressor turned off due to master outside unit inverter compressor discharge temperature over-rise Flow rate insufficiency or flow switch trouble of master outside unit
	3	4	* Master outside unit high pressure over-rise	Compressor turned off due to master outside unit high pressure over-rise Flow rate insufficiency or flow switch trouble of master outside unit
	3	5	* Master outside unit low pressure over-drop.	Compressor turned off due to master outside unit low pressure overdrop.
	3	6	* Master Outside Unit Low Compression Ratio Limited	Master Outside Unit stayed under low Compression limit for 3 minutes
	3	9	* Master Outside unit Communication error between Master outside unit PFC and inverter board	Master Outside unit inverter compressor current detection (CT) sensor disconnection or short circuit

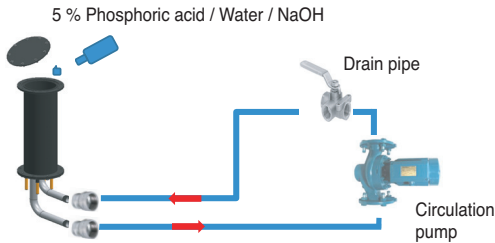
Test Run

Display				Title	Cause of Error	
Outside Unit related Error	4	0	*	Master outside unit inverter compressor CT sensor error	Master outside unit inverter compressor current detection (CT) sensor disconnection or short circuit	
	4	1	*	Master outside unit inverter compressor discharge temperature sensor error	Master outside unit inverter compressor discharge temperature sensor disconnection or short circuit	
	4	2	*	Master Outdoor Unit Low Pressure Sensor Fault	Master Outdoor Unit Low Pressure Sensor open or short	
	4	3	*	Master Outdoor Unit High Pressure Sensor Fault	Master Outside Unit High Pressure Sensor open or short	
	4	4	*	Master Outside unit air temperature sensor error	Master Outside unit air temperature sensor disconnection or short circuit	
	4	6	*	Master outside unit suction temperature sensor error	Master outside unit suction temperature sensor disconnection or short circuit	
	4	9	*	Master outside unit IGBT temperature sensor error	Master out side unit IGBT temperature sensor disconnection or short circuit	
	5	0	*	Master outside unit 3 phase power missing	Master outside unit power line phase missing	
	5	1	*	Over-capacity (Indoor unit capacity sum is excessive) connection	Excessive connection of indoor unit connection display value (Different from outside unit)	
	5	2	*	Communication error with master outside unit inverter controller	When the inverter controller signal is not received from the master outside unit inverter controller	
	5	3	*	Communication error with master Outside unit controller and indoor unit	When the indoor unit control signal is not received from the master Outside unit controller	
	5	7	*	Communication error between Master outside unit inverter controller	Failing to receive inverter controller signal at Master Outdoor Unit controller	
	5	9	*	Mixing Installation of Sub Outdoor Unit	Mixing Installation of Old Sub Outdoor Unit and New Slave Outdoor Unit	
	6	0	*	Master outside unit inverter PCB EEPROM error	Master outside unit inverter PCB EEPROM ACCESS error	
	6	2	*	Master outside unit inverter IGBT over-rise error	Master outside unit inverter IGBT when the temperature rises above 110 °C	
	6	5	*	Master outside unit inverter IGBT temperature sensor error	Master outside unit inverter IGBT temperature sensor disconnection or short circuit	
	7	1	*	PFC CT Sensor Error of Master Outdoor Unit	Master Outdoor Unit PFC CT Sensor open or short	
	8	6	*	Master outside unit master PCB EEPROM error	Communication error between master outside unit master MICOM and EEPROM or EEPROM missing	
	8	8	*	PFC PCB EEPROM error	Communication error between master outside unit master PFC and EEPROM or EEPROM missing	
	1	0	4	*	Communication Error Between Master Outdoor Unit and Other Outdoor Unit	Failing to receive Slave Unit signal at main PCB of Master Outdoor Unit
	1	1	3	*	Master Outdoor Unit Liquid pipe Temperature Sensor Error	Liquid pipe temperature sensor of Master Outdoor Unit is open or short
	1	1	5	*	Master Outdoor Unit Subcooling Outlet Temperature Sensor Error	Master Outdoor Unit Subcooling Outlet Temperature Sensor open or short
	1	1	6	*	Master Outdoor Unit Oil Level Sensor Error	Oil Level Sensor of Master Outdoor Unit is open or short
	1	4	5	*	Master outdoor unit Main Board - External Board communication Error	Master outdoor unit Main Board - External Board communication Error
	1	5	1	*	Failure of operation mode conversion at Master Outside Unit	Failure of operation mode conversion at Master Outside Unit
	1	8	1	*	Water temperature sensor error	Water temperature sensor open/short
	1	8	2	*	Communication error between MICOMs	Communication error between main MICOM and sub MICOM

Maintenance

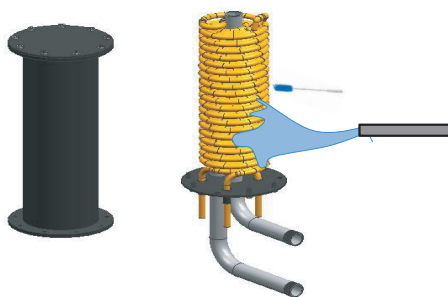
Maintenance of Shell & coil heat exchanger

1) Chemical Washing



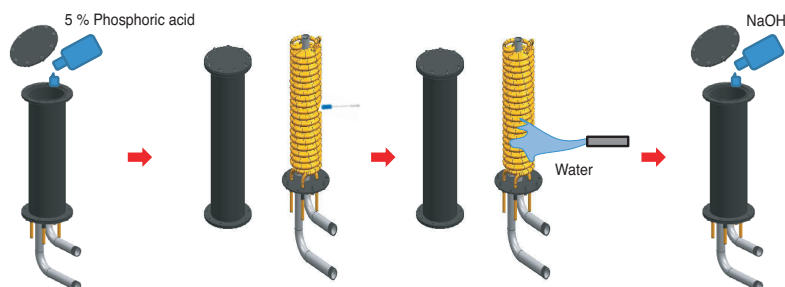
- 1) Connect water piping in sizes 25A to 32A expansion pipe fitting.
- 2) Connect the SCHEX and circulation pump through the 32A water piping.
- 3) Install the drain pipe to the other pipe line.
- 4) After open upper plate of SCHEX, put 5 % Phosphoric acid aqueous solution in the case. And close the upper plate.
- 5) Circulation washing for 30 minutes, using a circulation pump. After repeat 3 or 4 times this operation, discharge the solution through the drain pipe.
- 6) 4),5) in the same way, circulation cleaning 3~4 times with clean water once every 30 minutes. And discharge the water through the drain pipe.
- 7) Finally, In order to neutralize the acidic conditions of the coil, after circulates the water intermixed with NaOH, discharge the water through the drain pipe.

2) Mechanical Washing



- 1) Using the Socket Wrench, divide the case and bolt fixed on the lower plate of SCHEX.
- 2) Spray the Water to the horizontal direction for washing of the entire coil.
- 3) Brush the coil to the rotating direction and with spraying water.
- 4) Remove the scale divide from coil with spraying.
- 5) Assemble the case of SCHEX with Socket Wrench.
- 6) Operate the system after assembly.

3) Chemical / Mechanical Washing

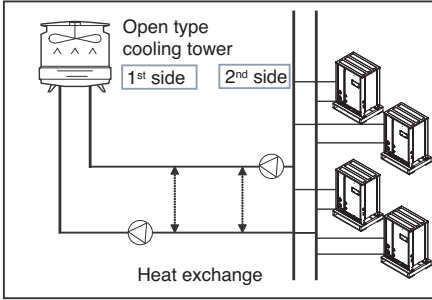


- 1) After open upper plate of SCHEX, put 5% Phosphoric acid aqueous solution in the case. And close the upper plate.
- 2) After about 1 hour, discharge 5% Phosphoric acid aqueous solution through the drain pipe.
- 3) Using the Socket Wrench, divide the case and bolt fixed on the lower plate of SCHEX.
- 4) Scrub the Coil to the direction from row 4 to row 1 with size \varnothing 6~8 mm brush.
- 5) Spray the Water to the horizontal direction for washing of the entire coil.
- 6) Assemble the case of SCHEX with Socket Wrench.
- 7) Open the upper plate then circulates the water intermixed with NaOH, discharge the water through the drain pipe.
- 8) Operate the system after assembly.

⚠ WARNING

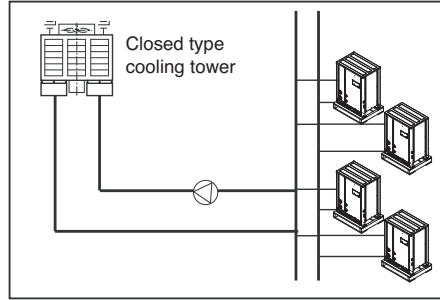
- Frequently and at regular intervals, observe interior and exterior condition of all tubes and keep them clean. Neglect in keeping all tubes clean may result in complete stoppage of flow. At least recommend to check heat exchanger annually.
- Do not make wet the internals of outside unit, when washing the heat exchanger.

Cooling tower applied method



[Open type cooling tower + Middle heat exchanger]

Heat exchanger is installed between the cooling tower and outside unit system piping, and the temperature difference between 1st side and 2nd side is maintained constantly



[Closed type cooling tower]

Heat source water of the cooling tower is supplied directly to the outside unit system.

⚠ CAUTION

When the open type cooling tower is used and the water supply is directly connected to the 2nd heat exchanger, product damage by alien particle cannot be repaired for free.

- Always use the 2nd heat exchanger.

Caution For Refrigerant Leak

The installer and system specialist shall secure safety against leakage according to local regulations or standards. The following standards may be applicable if local regulations are not available.

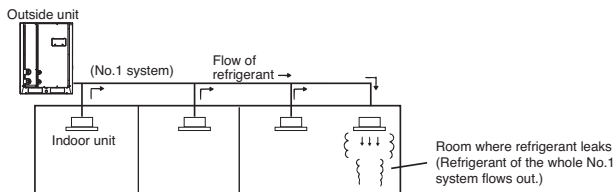
Introduction

Though the R410A refrigerant is harmless and incombustible itself, the room to equip the air conditioner should be large to such an extent that the refrigerant gas will not exceed the limiting concentration even if the refrigerant gas leaks in the room.

Limiting concentration

Limiting concentration is the limit of Freon gas concentration where immediate measures can be taken without hurting human body when refrigerant leaks in the air. The limiting concentration shall be described in the unit of kg/m^3 (Freon gas weight per unit air volume) for facilitating calculation.

Limiting concentration: $0.44\text{kg/m}^3(\text{R410A})$



Checking procedure of limiting concentration

Check limiting concentration along following steps and take appropriate measure depending on the situation.

Calculate amount of all the replenished refrigerant (kg) per each refrigerant system.

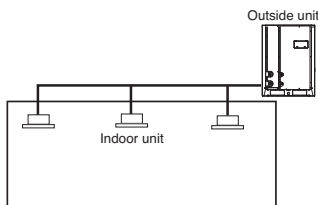
Amount of replenished refrigerant per one outside unit system	+	Amount of additional replenished refrigerant	=	Total amount of replenished refrigerant in refrigerant facility (kg)
↓		↓		
Amount of replenished refrigerant at factory shipment		Amount of additionally replenished refrigerant depending on piping length or piping diameter at customer		

Note : In case one refrigerant facility is divided into 2 or more refrigerant systems and each system is independent, amount of replenished refrigerant of each system shall be adopted.

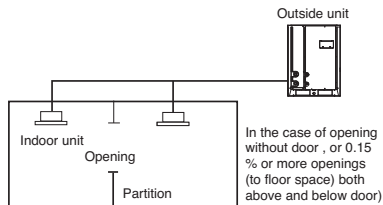
Calculate minimum room capacity

Calculate room capacity by regarding a portion as one room or the smaller room.

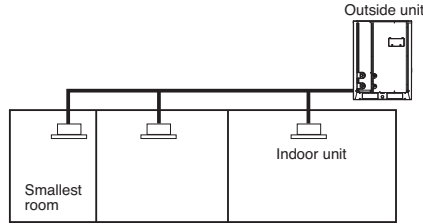
(1) Without partition



(2) With partition and with opening which serve as passage of air to adjoining room



(3) With partition and without opening which serve as passage of air to adjoining room



■ Calculate refrigerant concentration

$$\frac{\text{Total amount of replenished refrigerant in refrigerant facility (kg)}}{\text{Capacity of smallest room where indoor unit is installed (m}^3\text{)}} = \text{Refrigerant concentration (kg/m}^3\text{)} \quad \text{(R410A)}$$

In case the result of calculation exceeds the limiting concentration, perform the same calculations by shifting to the second smallest, and the third smallest rooms until at last the result is below the limiting concentration.

■ In case the concentration exceeds the limit

When the concentration exceeds the limit, change original plan or take one of the countermeasures shown below:

• Countermeasure 1

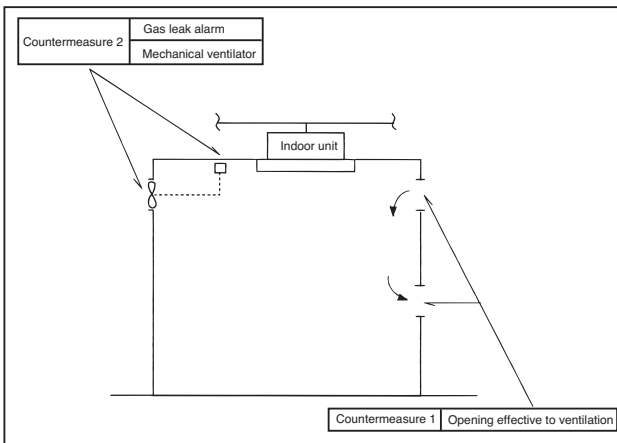
Provide opening for ventilation.

Provide 0.15% or more opening to floor space both above and below door, or provide opening without door.

• Countermeasure 2

Provide gas leak alarm linked with mechanical ventilator.

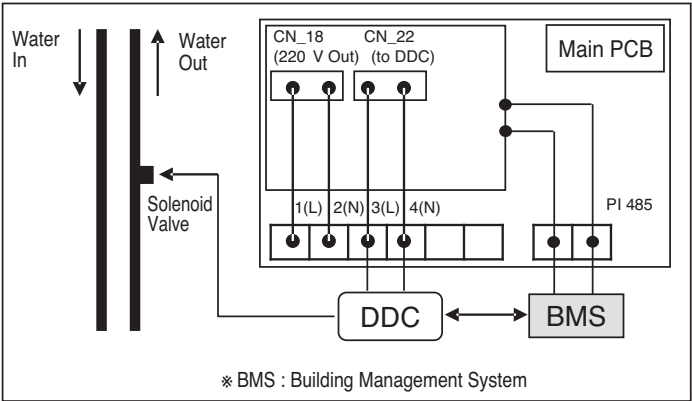
Reducing the outside refrigerant qty.



Pay a special attention to the place, such as a basement, etc. where refrigerant can stay, since refrigerant is heavier than air.

Water Solenoid Valve Control

Central Control(Use DDC Port)



Individual Control(Use 220V Output Port)

