



Water-Cooled VRF Installation manual

V*D***W6M-5*

- Thank you for purchasing this Lennox Product.
- Before operating this unit, please read this manual carefully and retain it for future reference.



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Safety precautions

California Proposition 65 Warning (US)

⚠ WARNING : Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Before installing Water-cooled VRF, please read this manual thoroughly to ensure that you know how to safely and efficiently install a new appliance.

- Water-cooled VRF uses R-32 refrigerant.
 - When using R-32, moisture or foreign substances may affect the capacity and reliability of the product. Safety precautions must be taken when installing the refrigerant pipe.
 - The designed maximum pressure of the system is 4.1 MPa (594.6 psi). Select appropriate material and thickness according to the regulations.
 - Make sure to charge with liquid phase when filling refrigerant. (If you charge vapor refrigerant, it may affect the capacity and reliability of the product.)
- You must connect the indoor units for R-32 refrigerant. Refer to product catalog to find out the models names for connectable indoor units. (If you connect the indoor units that are not designed for R-32, it cannot operate normally.)
- Water-cooled VRF uses plate type heat exchanger, and extra concern must be taken regarding on selecting the installation location since it requires water pipe installation.
- For product protection, it is recommended to adopt closed circuit cooling tower or indirect water pipe circuit structure for Water-cooled VRF.

Before the installation, read the 'Severe warning signs' and the 'Caution signs' thoroughly.

- After completing the installation and trial operation, explain to the user how to use and maintain the product. Also, hand over this installation manual so that it can be stored by the user.
- Manufacturer is not responsible for the incidents occurred by improper installation. Installer is responsible for any installation related claims from the user occurred by neglecting warnings and cautions stated in this manual. (Installer will be responsible for any service charges that may occur)
- Generally, Water-cooled VRFs should not be relocated after installation. But when it has to be relocated for inevitable reasons, please contact Lennox qualified dealers for Water-Cooled VRFs.

Product is irrelevant to any installation or performance problem of the cooling tower and water pipes.

Anti-freeze must be used when temperature of water inlet for heating is below 50 °F (10 °C) or ground heat source is used.

⚠ WARNING

- Hazards or unsafe practices that may result in severe personal injury or death.

⚠ CAUTION

- Hazards or unsafe practices that may result in minor personal injury (to installer/user) or property damage.

Symbol	Meaning
	Flammable gas
	Flammable materials
	Refrigerant safety group
	Read installation manual
	Refer to installation manual
	Read service manual

Safety precautions

SEVERE WARNING SIGNS

Installation must be requested to a qualified installer.

- If the user installs a product improperly on their own, it may cause water leakage, electric shock or fire.

Install the unit in a place where it is strong enough to hold the product weight.

- When installed in place where it is not strong enough to withhold the product weight, the unit could fall and cause injury.

Electric work must be done by qualified persons, complying the national wiring regulations and installed according to the instruction stated in the installation manual with leased circuit.

- Capacity shortage on the leased circuit and improper installation may cause electric shock or fire.

Use specified wires to connect indoor and outdoor units, and make sure the wire is firmly fixed.

- Improper connection may cause fire.

Neatly arrange the wires in the electrical parts to make sure that electrical cover is closed securely without any gaps.

- If the cover is not properly closed, heat may be generated on the electrical terminal and cause electric shock or fire.

Make sure to use the provided or specified parts with the specified tools for installation.

- Failing to do so may cause product falling, water leakage, fire or electric shock.

In any case of refrigerant leakage, make sure to ventilate.

- If the refrigerant gas comes in contact with fire, harmful gas will be generated.
- Make sure that the refrigerant gas does not leak after completing the installation. If the refrigerant gas of the indoor unit leaks and comes into contact with the fan heater, space heater or stove, harmful gas will be generated.

Make sure to perform grounding work.

- Do not connect the ground wire to a gas pipe, water pipe, lightning rod or telephone grounding. Improper grounding could cause electric shock.

Do not install the product in a place where it is or might be exposed to inflammable gas leakage.

- When the gas leaks and gets accumulated around the product, it may cause fire.

Installation work must be done according to the instruction in this installation manual.

- Improper installation may cause water leakage, electric shock or fire.

When inserting the power plug, make sure to insert it fully and check that power plug and an outlet does not have any dust, blockage or loosened part.

- If there is dust, blockage or loosened part on a power plug or outlet, it can cause electric shock or fire. Also, replace the outlet if it is loosened.

When installation is in progress, check the following before operating the product.

- Make sure pipes are properly connected without any leakage.
- Service valve should remain open. If the compressor operates with service valve closed, compressor or other parts may get damaged due to overpressure. Also, if there is leakage on the connection part, air inflow and other matter may make the status even more overpressured, which can cause personal injury due to explosion.

Stop the compressor before disconnecting the refrigerant pipe for pump-down operation.

- If you disconnect the refrigerant pipe while compressor is operating with service valve open, air inflow will cause excessive pressure in the refrigerant cycle that could lead to explosion and personal injury.

Do not assemble the power cord on your own, use two cables together to extend the cable length or connect the power to a multi outlet connected with other products.

- Bad connection, isolation and over voltage may cause fire or electric shock.

Cut-off the main power supply before indoor unit electrical installation.

- Potential risk or electric shock.

You may need to install an ELB (earth leakage breaker) depending on the installation location.

- Not installing an ELB (earth leakage breaker) may cause electric shock.
- Wear protective equipment (such as safety gloves, goggles, and headgear) during installation and maintenance works. Installation/ repair technicians may be injured if protective equipment is not properly equipped.
- This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.
- Do not use means to accelerate the defrosting process or to clean, other than those recommended by Lennox.
- Do not pierce or burn.
- Be aware that refrigerants may not contain an odour.



CAUTION SIGNS

Perform the drainage/piping work securely according to the installation manual.

- If not, water could drop from the unit and household goods could get wet and damaged.

Fasten a flare nut with a torque wrench as specified in this installation manual.

- When fastened too tight, a flare nut may break after a long period of time and cause refrigerant leakage.

Wear thick gloves during the installation process.

- If not, personal injury may occur due to the Water-cooled VRF parts.

Do not install the outdoor unit in a place where animals could live.

- If an animal gets contact with the electric parts, damage or fire may occur. In addition ask the customer to maintain a clean installation place around it.

Upon receipt, inspect the product to verify that it has not been damaged during transport.

If the product appears damaged, DO NOT INSTALL it, and immediately report the damage to the carrier or retailer (if the installer or the authorized technician has collected the material from the retailer.)

Refrigerant used in this product must be added or disposed in an appropriate way by qualified personnel.

- At the end of the life cycle, take it to a proper recycling or disposal center or return it to the dealer so that it can be disposed correctly.
- If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.
- This unit is equipped with electrically powered safety measures. To be effective, the unit must be electrically powered at all times after installation, other than when servicing.
- LEAK DETECTION SYSTEM installed. Unit must be powered except for service.
- The installer must be careful not to cover any labels or markings related to flammable refrigerants that are attached to the exterior of the product.

Preparation of fire extinguisher

- If flammable work is to be done, appropriate fire extinguishing equipment should be available.
- Have a dry CO₂ fire extinguisher adjacent to the charging area and workspace.

Ignition source safety

- Make sure to store the units in a place without continuously operating ignition sources (for example, open flames, an operating gas appliance or an operating electric heater).
- The service technician shall not use any ignition sources with the risk of fire or explosion.
- Potential ignition sources shall be kept away from the work area where the flammable refrigerant can be released into the surrounding area.
- The work area should be checked to ensure that there are no flammable hazards or ignition risks. The "No Smoking" sign shall be attached.
- Under no circumstances shall potential sources of ignition be used while detecting refrigerant leaks.
- Make sure that the seals or sealing materials have not degraded.
- Safe parts are the ones with which the worker can work in a flammable atmosphere. Other parts may result in ignition due to leakage.
- Replace components only with parts specified by Lennox. Other parts may result in the ignition of refrigerant in the atmosphere from a leak.

Area ventilation

- Make sure that the work area is well ventilated before performing hot work.
- Ventilation shall be made even during work.
- The ventilation should safely disperse any released gases and preferably expel them into the atmosphere.

Leakage detection methods

- The leakage detector shall be calibrated in a refrigerant-free area.
- Make sure that the detector is not a potential source of ignition.
- The leakage detector shall be set to the LFL (lower flammability limit).
- The use of detergents containing chlorine shall be avoided for cleaning because the chlorine may react with the refrigerant and corrode the piping.
- If leakage is suspected, naked flames shall be removed.





Safety precautions

- If a leakage is found while brazing, the entire refrigerant charge shall be recovered from the product or isolated (e.g. using shut-off valves). It shall not be directly released into the environment. Oxygen free nitrogen (OFN) shall be used for purging the system before and during the brazing process.
- The work area shall be checked with an appropriate refrigerant detector before and during work.
- Ensure that the leakage detector is appropriate for use with flammable refrigerants.

Labeling

- The parts shall be labeled to ensure that they have been decommissioned and emptied of refrigerant.
- The labels shall note the date of application.
- Make sure that the labels are affixed on the system to notify it contains flammable refrigerant.

Recovery

- When removing refrigerant from the system for servicing or decommissioning, it is recommended to remove the entire refrigerant charge.
- When transferring refrigerant into cylinders, make sure that only refrigerant recovery cylinders are used.
- All cylinders used for the recovered refrigerant shall be labeled.
- Cylinders shall be equipped with pressure relief valves and shut-off valves in a proper order.
- Empty recovery cylinders shall be evacuated and cooled before recovery.
- The recovery system shall operate normally according to the specified instructions and shall be suitable for refrigerant recovery.
- In addition, the calibration scales shall operate normally.
- Hoses shall be equipped with leak-free disconnect couplings.
- Before starting the recovery, check for the status of the recovery system and sealing state. Consult with the manufacturer if suspected.
- The recovered refrigerant shall be returned to the supplier in the correct recovery cylinders with the Waste Transfer Note attached.
- Do not mix refrigerants in the recovery units or cylinders.

- If compressors or compressor oils are to be removed, make sure that they have been evacuated to an acceptable level to ensure that flammable refrigerant does not remain in the lubricant.
- The evacuation process shall be performed before sending the compressor to the suppliers.
- Only the electrical heating of the compressor body is allowed to accelerate the process.
- Oil shall be drained safely from the system.
- For installation with handling the refrigerant (R-32), use dedicated tools and piping materials. Because the pressure of the refrigerant, R-32, is approximately 1.6 times higher than that of R-22, failure to use the dedicated tools and piping materials may cause rupture or injury. Furthermore, it may cause serious accidents such as water leakage, electric shock, or fire.
- Never install motor-driven equipment to prevent ignition.

Precautions for using R-32 refrigerant

General

- This product is pre-charged with mildly flammable gas classified as A2L by ASHRAE. The following precautions and instruction manuals must be followed during installation, operation, servicing and decommissioning of the product.
- The appliance shall be stored in a room without continuously operating ignition sources, like open flames or a gas appliance or an electric heater.
- All national and local regulations shall be observed at all times.
- All pipe-work including piping material, pipe routing and installation shall include protection from physical damage in operation and service, and be in compliance with national and local codes and standards, such as ASHRAE 15, ASHRAE 15.2, IAPMO Uniform Mechanical Code, ICC International Mechanical Code, or CSA B52. All field joints shall be accessible for inspection prior to being covered or enclosed.
- All field piping and joints shall be pressure tested with an inert gas according to prevalent industry standards prior to refrigerant charging and system commissioning.
- Where additional field charging is required. The installer shall write with a permanent marker the field charge added on the ODU label provided, such that the Total Charge = Factory 'Pre-charge' + field charge.





- For ducted systems, any auxiliary systems that are potential ignition sources shall not be installed in the duct work. Examples of ignition sources are hot surfaces with temperatures exceeding 1292 °F (700 °C) and electric switching devices.
- Any auxiliary device installed must be approved by Lennox and must be suitable for operating with the refrigerant marked on the label.
- Where mechanical ventilation is used, the lower edge of the air extraction opening shall not be more than 3.94 inch (100 mm) above the floor. The exhaust location outside the building must be at least 9.84 ft (3 m) away from the building opening and mechanical air intake openings.
- To handle, purge, and dispose of the refrigerant, or break into the refrigerant circuit, the worker should have a certificate from an industry-accredited authority.
- Non-ducted systems may be installed in areas such as false ceilings not being used as return air plenum if the conditioned air does not mix with the air in the false ceilings.
- For ducted appliances false ceiling or drop ceilings may be used as return air plenum if a refrigerant leak detection system is provided in the system and any external connections are also provided with a sensor immediately below the return air plenum duct joint.
- Installation, servicing and any type of maintenance or repair must be performed by certified personnel that are competent to carry out such activity in accordance with national and local regulations.

General Information on Servicing

- Do not work in a confined space. Ensure adequate ventilation is provided at the workspace during the entirety of the duration of the work to safely disperse any released refrigerant.
- All maintenance staff and others working in the local area shall be instructed on the nature of the work being performed and instructed to follow all instructions provided by Lennox, national and local authorities.
- The area shall be checked with an approved refrigerant detector before and during any work on the system.

The following checks shall be applied to installations and maintenance operations.

- The actual total refrigerant charge is in accordance with the room size in accordance with Table 1.
- The ventilation machinery and outlets are operating adequately and are not obstructed.
- Markings on the equipment are visible and legible.
- Refrigerant pipes or components are installed in a position where they are unlikely to be exposed to any substance that may corrode refrigerant-containing components.

Initial checks of electrical devices shall include the following.

- that capacitors are discharged in a safe manner to avoid sparking.
- that no live electrical components and wiring are exposed while charging, recovering or purging the system.
- That there is continuity to earth bonding.
- Check that the cabling is not worn, corroded or damaged in any manner.

Electrical repair safety measures

- All electrical components used or replaced must be to Lennox's specifications.
- If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with.
- Sealed electrical components and intrinsically safe components shall be replaced and not repaired.
- Cabling should be protected from excessive vibration, pressure, sharp edges, and other adverse environmental factors.

Detection of flammable refrigerants

- Electronic leak detectors shall be used to detect flammable refrigerants, but the sensitivity may not be adequate or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.)
- Make sure that the detector is not a potential source of ignition.



Safety precautions

- Leak detection equipment shall be set at a percentage of the LFL (Lower flammable limit) of the refrigerant and shall be calibrated to the refrigerant employed and the appropriate percentage of gas (25% maximum) is confirmed.
- The use of detergents containing chlorine shall be avoided for cleaning because the chlorine may react with the refrigerant and corrode the piping.
- If leakage is suspected, naked flames shall be removed.
- If a leakage is found while brazing, the entire refrigerant shall be recovered from the product or isolated (e.g. using shut-off valves). It shall not be directly released into the environment. Oxygen-free nitrogen (OFN) shall be used for purging the system before and during the brazing process.
- The work area shall be checked with an appropriate refrigerant detector before and during work.
- Ensure that the leakage detector is appropriate for use with flammable refrigerants.

Removal and Evacuation

- When removing refrigerant for servicing it is recommended to remove the entire quantity.
- When removing refrigerant follow local and national regulations and follow best practices including;
 - evacuate;
 - purge the circuit with inert gas (optional for A2L);
 - evacuate (optional for A2L);
 - continuously flush or purge with inert gas when using a flame to open the circuit; and
 - open the circuit.
- Use proper recovery cylinders appropriate for the type of refrigerant.
- Follow prescribed industry best practices for purging and evacuation.
- Oxygen free nitrogen shall be used for purging the system.

Charging procedure

- Follow industry standard refrigerant charging best practices.
- Before recharging the system, it shall be pressure tested with oxygen-free nitrogen gas.
- Ensure that contamination of different refrigerants does not occur when charging.
- Cylinders shall be kept in the appropriate position as per instructions.
- The refrigerant system should be grounded before charging the system.
- Label the system when charging is completed.
- Take extreme care not to overfill the refrigeration system.
- The system shall be leak tested on completion of charging before commissioning.

Decommissioning

- Only qualified licensed professionals shall perform refrigerant recovery and decommissioning.
- Isolate the system electrically.
- All recovery equipment and cylinders shall conform to appropriate standards. Only approved cylinders, with pressure relief valves, for the type of refrigerant shall be used.
- Recover refrigerant following industry standard procedure for flammable refrigerants.
- When draining compressors oil care must be taken that there is no flammable refrigerant in the compressor and that the compressor is not hot. Oil should be handled according to local and federal regulations.
- After decommissioning, the system shall be labeled stating that it has been decommissioned. The label shall be dated and signed. The label should state that it "contains flammable refrigerant".
- Ensure that there are labels on the equipment indicating the equipment contains flammable refrigerant.
- Recovered refrigerant shall not be mixed or reused. It shall be processed according to national, state and local regulations.



R-32 General Guidelines for Compliance

DISCLAIMER: This section is provided as a general guideline to assist with compliance for Water-cooled VRF system installations. It is not intended to serve as a substitute for a comprehensive code compliance document. The responsibility for ensuring that all designs, installations, and operations meet applicable regulations, codes, and standards rests solely with the project's licensed engineer or other qualified design professional.

The Water-cooled VRF model uses R-32 refrigerant, a mildly flammable gas classified as A2L by ASHRAE.

The system allows for connection with shut off valve box and remote-control alarm to alert the users and limit the refrigerant leakage in case of a leak.

And the indoor units of system is certified as Enhanced Tightness Refrigeration System (ETRS).

Follow the installation requirement presented in this manual, and ensure system is compliant with relevance regulations and codes.

Outdoor Unit

Safety measures should be determined based on the size of the room where the outdoor unit is installed and the total R-32 refrigerant charge of the system.

Use the instructions in this manual as a guideline to help assess the necessary safety measures.

The outdoor unit includes an output signal for external devices, which is activated if the R-32 sensor detects a refrigerant leak or if the sensor malfunctions or short-circuits.

This signal can be used to activate additional safety devices, such as a ventilation system or alarm. For detailed information on using this function, refer to the safety measures section of this manual.

Indoor Unit

Safety measures should be determined based on the size of the room where the indoor unit is installed and the total R-32 refrigerant charge of the system. Use the instructions in this manual as a guideline to help assess the necessary safety measures. The indoor unit includes an output signal for external devices, which is activated if the R-32 sensor detects a refrigerant leak or if the sensor malfunctions or short-circuits. This signal can be used to activate additional safety devices, such as a ventilation system or alarm. For detailed information on using this function, refer to the indoor unit installation manual.



NOTE

- When installing the indoor unit, connect at least one wired remote control.



R-32 General Guidelines for Compliance

Deciding on the required Safety Measures for Outdoor unit

- Step 1: Determine the system's total refrigerant charge.
The total refrigerant charge of the system is determined by the sum of the refrigerant charged in the outdoor unit and the additional refrigerant required based on the piping length and indoor unit combination. Depending on the determined refrigerant charge, it can be divided into three cases:
 - Case.1: If the total refrigerant charge is 4.06lb(1.84kg) or less, no additional measures are necessary.
 - Case.2: If the total refrigerant charge exceeds 4.06lb(1.84kg) but is 35.08lb(15.91kg) or less, go to step2.
 - Case.3: If the total refrigerant charge exceeds 35.08lb(15.91kg) but is 175.40lb(79.56kg) or less, go to step5.
- Step 2: Determine area of the room the outdoor units are installed in.
Calculate the area of the room with walls, doors, and partitions excluded.
Spaces connected by false ceilings, ducts, or similar connections are not considered a single space.
- Step 3: Referring to the total refrigerant charge determined in Step 1, determine the minimum required room area from the Table 1.
(Note: Set the installation height of the Water-cooled VRF model to 2.0ft (0.6m))
- Step 4: If the area of the room determined in step 2 is larger than the minimum required room area determined in step 3, no additional measures are necessary. However, if the area of the room determined in step 2 is smaller than that minimum required room area, go to Step 5.
- Step 5: One of the following additional ventilation measures must be applied.
 - Ventilated Enclosure: Equip the outdoor unit with a ventilation duct system.
 - Room Ventilation: Install the outdoor unit in a room that meets the specified ventilation conditions.
 - Machinery room: Install the outdoor unit in a machinery room as defined in ASHRAE 15.

Deciding on the required Safety Measures for indoor unit

- Step 1: Determine the system's total refrigerant charge.
The total refrigerant charge of the system is determined by the sum of the refrigerant charged in the outdoor unit and the additional refrigerant required based on the piping length and indoor unit combination.
- Step 2: Determine the smallest area of the room the indoor units are installed in.
It includes the room where the indoor unit is directly installed and the room served by the ducted indoor unit.
Calculate the area of the room with walls, doors, and partitions excluded.
Spaces connected by false ceilings, ducts, or similar connections are not considered a single space.
- Step 3: Referring to the total refrigerant charge determined in Step 1, determine the minimum required room area from the table below.
- Step 4: If the smallest area of the room determined in step 2 is larger than the minimum required room area determined in step 3, no additional measures are necessary. However, if the smallest area of the room determined in step 2 is smaller than that minimum required room area, additional safety measures must be taken (e.g., changing installation conditions, ventilation, shut-off valves).





<Table 1>

m[lbs(kg)] Installation Height[ft(m)]	Minimum required room area [A, ft²(m²)]			
	2.0(0.6)	5.9(1.8)	7.2(2.2)	8.2(2.5)
11.02(5)	586(54.47)	195(18.16)	160(14.85)	141(13.07)
13.23(6)	704(65.36)	235(21.79)	192(17.83)	169(15.69)
15.43(7)	821(76.25)	274(25.42)	224(20.8)	197(18.3)
17.64(8)	938(87.15)	313(29.05)	256(23.77)	225(20.92)
19.84(9)	1055(98.04)	352(32.68)	288(26.74)	253(23.53)
22.05(10)	1173(108.93)	391(36.31)	320(29.71)	281(26.14)
24.25(11)	1290(119.83)	430(39.94)	352(32.68)	310(28.76)
26.46(12)	1407(130.72)	469(43.57)	384(35.65)	338(31.37)
28.66(13)	1524(141.61)	508(47.2)	416(38.62)	366(33.99)
30.86(14)	1642(152.51)	547(50.84)	448(41.59)	394(36.6)
33.07(15)	1759(163.4)	586(54.47)	480(44.56)	422(39.22)
35.27(16)	1876(174.29)	625(58.1)	512(47.53)	450(41.83)
37.48(17)	1993(185.19)	664(61.73)	544(50.51)	478(44.44)
39.68(18)	2111(196.08)	704(65.36)	576(53.48)	507(47.06)
41.89(19)	2228(206.97)	743(68.99)	608(56.45)	535(49.67)
44.09(20)	2345(217.86)	782(72.62)	640(59.42)	563(52.29)
46.3(21)	2462(228.76)	821(76.25)	672(62.39)	591(54.9)
48.5(22)	2580(239.65)	860(79.88)	704(65.36)	619(57.52)
50.71(23)	2697(250.54)	899(83.51)	736(68.33)	647(60.13)
52.91(24)	2814(261.44)	938(87.15)	767(71.3)	675(62.75)
55.12(25)	2931(272.33)	977(90.78)	799(74.27)	704(65.36)
57.32(26)	3049(283.22)	1016(94.41)	831(77.24)	732(67.97)
59.52(27)	3166(294.12)	1055(98.04)	863(80.21)	760(70.59)
61.73(28)	3283(305.01)	1094(101.67)	895(83.18)	788(73.2)
63.93(29)	3400(315.9)	1133(105.3)	927(86.16)	816(75.82)
66.14(30)	3518(326.8)	1173(108.93)	959(89.13)	844(78.43)
68.34(31)	3635(337.69)	1212(112.56)	991(92.1)	872(81.05)
70.55(32)	3752(348.58)	1251(116.19)	1023(95.07)	901(83.66)
72.75(33)	3869(359.48)	1290(119.83)	1055(98.04)	929(86.27)
74.96(34)	3987(370.37)	1329(123.46)	1087(101.01)	957(88.89)
77.16(35)	4104(381.26)	1368(127.09)	1119(103.98)	985(91.5)
79.37(36)	4221(392.16)	1407(130.72)	1151(106.95)	1013(94.12)
81.57(37)	4338(403.05)	1446(134.35)	1183(109.92)	1041(96.73)
83.78(38)	4456(413.94)	1485(137.98)	1215(112.89)	1069(99.35)
85.98(39)	4573(424.84)	1524(141.61)	1247(115.86)	1097(101.96)
88.18(40)	4690(435.73)	1563(145.24)	1279(118.84)	1126(104.58)
90.39(41)	4807(446.62)	1602(148.87)	1311(121.81)	1154(107.19)
92.59(42)	4925(457.52)	1642(152.51)	1343(124.78)	1182(109.8)
94.8(43)	5042(468.41)	1681(156.14)	1375(127.75)	1210(112.42)
97(44)	5159(479.3)	1720(159.77)	1407(130.72)	1238(115.03)
99.21(45)	5276(490.2)	1759(163.4)	1439(133.69)	1266(117.65)
101.41(46)	5394(501.09)	1798(167.03)	1471(136.66)	1294(120.26)
103.62(47)	5511(511.98)	1837(170.66)	1503(139.63)	1323(122.88)
105.82(48)	5628(522.88)	1876(174.29)	1535(142.6)	1351(125.49)

m[lbs(kg)] Installation Height[ft(m)]	Minimum required room area [A, ft²(m²)]			
	2.0(0.6)	5.9(1.8)	7.2(2.2)	8.2(2.5)
108.03(49)	5745(533.77)	1915(177.92)	1567(145.57)	1379(128.1)
110.23(50)	5863(544.66)	1954(181.55)	1599(148.54)	1407(130.72)
112.44(51)	5980(555.56)	1993(185.19)	1631(151.52)	1435(133.33)
114.64(52)	6097(566.45)	2032(188.82)	1663(154.49)	1463(135.95)
116.85(53)	6214(577.34)	2071(192.45)	1695(157.46)	1491(138.56)
119.05(54)	6332(588.24)	2111(196.08)	1727(160.43)	1520(141.18)
121.25(55)	6449(599.13)	2150(199.71)	1759(163.4)	1548(143.79)
123.46(56)	6566(610.02)	2189(203.34)	1791(166.37)	1576(146.41)
125.66(57)	6683(620.92)	2228(206.97)	1823(169.34)	1604(149.02)
127.87(58)	6801(631.81)	2267(210.6)	1855(172.31)	1632(151.63)
130.07(59)	6918(642.7)	2306(214.23)	1887(175.28)	1660(154.25)
132.28(60)	7035(653.59)	2345(217.86)	1919(178.25)	1688(156.86)
134.48(61)	7152(664.49)	2384(221.5)	1951(181.22)	1717(159.48)
136.69(62)	7270(675.38)	2423(225.13)	1983(184.19)	1745(162.09)
138.89(63)	7387(686.27)	2462(228.76)	2015(187.17)	1773(164.71)
141.1(64)	7504(697.17)	2501(232.39)	2047(190.14)	1801(167.32)
143.3(65)	7622(708.06)	2541(236.02)	2079(193.11)	1829(169.93)
145.51(66)	7739(718.95)	2580(239.65)	2111(196.08)	1857(172.55)
147.71(67)	7856(729.85)	2619(243.28)	2143(199.05)	1885(175.16)
149.91(68)	7973(740.74)	2658(246.91)	2175(202.02)	1914(177.78)
152.12(69)	8091(751.63)	2697(250.54)	2207(204.99)	1942(180.39)
154.32(70)	8208(762.53)	2736(254.18)	2238(207.96)	1970(183.01)
156.53(71)	8325(773.42)	2775(257.81)	2270(210.93)	1998(185.62)
158.73(72)	8442(784.31)	2814(261.44)	2302(213.9)	2026(188.24)
160.94(73)	8560(795.21)	2853(265.07)	2334(216.87)	2054(190.85)
163.14(74)	8677(806.1)	2892(268.7)	2366(219.85)	2082(193.46)
165.35(75)	8794(816.99)	2931(272.33)	2398(222.82)	2111(196.08)
167.55(76)	8911(827.89)	2970(275.96)	2430(225.79)	2139(198.69)
169.76(77)	9029(838.78)	3010(279.59)	2462(228.76)	2167(201.31)
171.96(78)	9146(849.67)	3049(283.22)	2494(231.73)	2195(203.92)
174.17(79)	9263(860.57)	3088(286.86)	2526(234.7)	2223(206.54)
175.4(79.56)	9329(866.67)	3110(288.89)	2544(236.36)	2239(208)

※ If the total refrigerant charge for your system is not shown, use linear interpolation to calculate it using the closest smallest and largest area values in the table.
And if the height for your installation is not shown, use the closest lower height value in the table.
To get a more accurate confirmation, consult the appropriate experts.

m Total refrigerant charge in the system [kg]

A_{min} Minimum room area [m²]

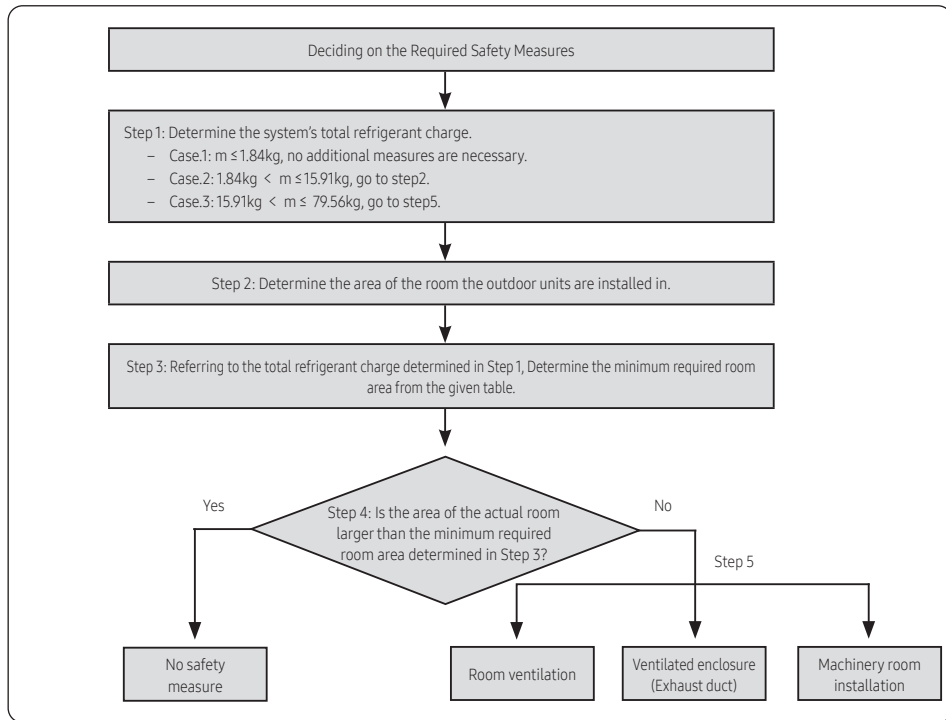


R-32 General Guidelines for Compliance

Flowchart

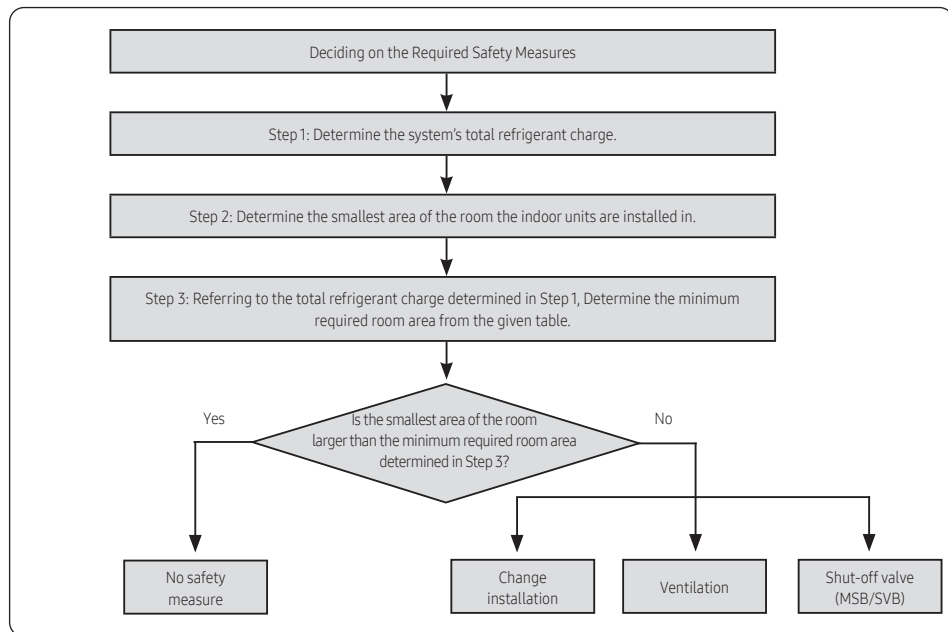
Outdoor unit

Before Installation





Indoor unit



R-32 General Guidelines for Compliance

Safety measures

Alarm

The R-32 wired remote controller (VSTAT04P-1) is equipped with a refrigerant leakage alarm.

For details on R-32 wired remote controller with alarm functionality, please refer to the installation and user manual provided with the remote controller.

Change Installation

By changing the installation conditions, the safety measure decision step can be re-executed.

Re-execute the decision step after the following actions:

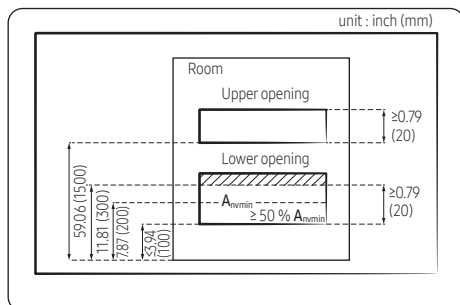
- 1 Increase the area of the smallest room where the units are installed.
- 2 Reduce the length of the piping to decrease the total refrigerant charge of system.
- 3 Increase the installation height of the product.

Natural ventilation

Natural ventilation is a safety measure involving ventilation through a large space with enough air to dilute leaked refrigerant.

If natural ventilation to indoors is implemented, the installation area can be determined by the sum of the area of the room where the unit is installed and the area of the ventilated room.

If natural ventilation is applied, the following conditions must be met:



$A_{\min}$ Minimal natural ventilation area

Lower opening:

- Not an opening leading to the outside.
- Not an opening that can be closed.
- Area of the opening is $\geq 0.13 \text{ ft}^2$ (0.012 m^2) ($A_{\min}$).
- Area of an opening from the floor that is 12 inch (300 mm) or greater is not included in the calculation of $A_{\min}$.
- A minimum of 50 % of $A_{\min}$ must be located below 8 inch (200 mm) from the floor.
- The bottom of the lower opening must be located at ≤ 4 inch (100 mm) from the floor.
- The height of the opening is ≥ 0.78 inch (20 mm).

Upper opening:

- Not an opening leading to the outside.
- Not an opening that can be closed.
- The area of the opening is $\geq 0.065 \text{ ft}^2$ (0.006 m^2) (50 % of $A_{\min}$).
- The bottom of the lower opening must be located at ≥ 59 inch (1500 mm) from the floor.
- The height of the opening is ≥ 0.78 inch (20 mm).

✱ Upper opening requirements can be satisfied through false ceilings, ventilation ducts, or similar arrangements for airflow between connected rooms.

CAUTION

- Natural ventilation to outdoors is not allowed below ground level.
- Natural ventilation from an occupied space shall not be made to outdoors.

Mechanical ventilation

The outdoor unit and indoor unit provide an additional output signal for external devices.

This output signal occurs if the R-32 sensor detects a refrigerant leak, or the R-32 sensor has a malfunction or short circuit.

Based on this signal, a mechanical ventilation system can be activated.

If mechanical ventilation is applied, the following conditions must be met:

- The upper edge of the air outlet must be located at the same level as or below the refrigerant release point.
- The mechanical ventilation air extracted from the space must be positioned relative to the mechanical ventilation air intake openings to ensure that the supplementary air mixes with the leaked refrigerant.
- Required airflow (Please refer to the technical data for the exact required airflow value.)



Shut-off valves

R-32 MSB/SVB with built in shut-off valve can be used as a safety device section off pipes and reduce releasable charge.

- ※ For the small chassis (VPD038/048/055W6M-5P), the shut-off valve is built into the outdoor unit, so there is no need to install the MSB/SVB.

As the M_{rel} , which is releasable charge that can be released per port, is used, the total refrigerant charge in the system is no longer used for the minimum required room area calculation.

The maximum possible refrigerant leakage is determined by the length of the piping and the size of the indoor heat exchanger, which are related to the capacity of the indoor units connected to each port.

If a leak is detected from an indoor unit, the shut-off valve within the MSB/SVB for the corresponding port will close. This isolates the leaking section of the piping from the rest of the system, significantly reducing the amount of refrigerant that could leak.

The maximum allowable indoor unit capacity is determined according to the following procedure.

- Step 1: Determine the smallest area among the following:
 - Each room where indoor units connected to the MSB/SVB unit branch piping port are installed.
 - Each room served by duct-type indoor units installed in other rooms.

Calculate the area of the room with walls, doors, and partitions excluded. Spaces connected by false ceilings, ducts, or similar connections are not considered a single space.

Using the calculated area of the smallest room from above, determine the maximum allowable indoor unit capacity for the corresponding port in the next step.

- Step 2: Use the table to determine the maximum allowable indoor unit capacity (the sum of the capacities of all connected indoor units) for each branch piping port.

(* Round down the calculated value.)

Area of installed/ conditioned room [ft ² (m ²)]	Maximum total indoor unit capacity[Btu/ h(kW)]	
	1 indoor unit per 1 port or 1 indoor unit per 2 port	2~8 indoor unit per 1 port
<53.82(5)	-	-
53.82(5)	5118(1.5)	-
64.58(6)	5118(1.5)	-
75.35(7)	5118(1.5)	-
86.11(8)	5118(1.5)	-
96.88(9)	5118(1.5)	-
107.64(10)	19108(5.6)	-
118.4(11)	19108(5.6)	10236(3)
129.17(12)	19108(5.6)	10236(3)
139.93(13)	19108(5.6)	10236(3)
150.69(14)	19108(5.6)	10236(3)
161.46(15)	24226(7.1)	10236(3)
215.28(20)	47770(14)	10236(3)
269.1(25)	95540(28)	20473(6)
322.92(30)	95540(28)	25591(7.5)
376.74(35)	95540(28)	30709(9)
430.56(40)	95540(28)	35827(10.5)
484.38(45)	95540(28)	40946(12)
≥538.2(50)	95540(28)	54594(16)

- Step 3: The total indoor unit capacity connected to each branch piping port must be equal to or less than the capacity limit derived from the table. If not, the installation must be adjusted, and all the steps above should be repeated.

Possible measures:

- Increase the area of the smallest room connected to the same branch piping port.
- Reduce the capacity of the indoor units connected to the same branch piping port.
- Split the indoor unit capacity into two separate branch piping ports.
- Consult with appropriate experts to adjust the system through more detailed calculations.

For details on the installation of the MSB/SVB, please refer to the installation manual provided with the MSB/SVB.



R-32 General Guidelines for Compliance

Ventilated enclosure (Outdoor)

The ventilated enclosure can be achieved by equipping the product with an exhaust duct system. The Water-cooled VRF features a contact signal for connecting an external exhaust fan and a connection point for the duct passage.

To select the fan of the appropriate specifications, consider the legal requirements and the total pressure drop in the duct system.

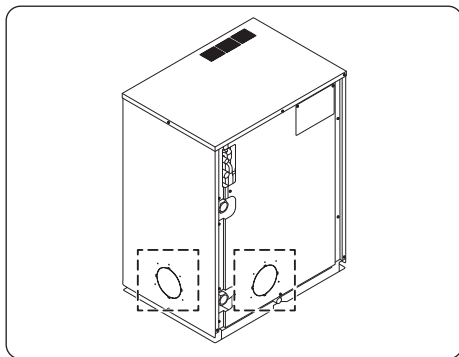
The minimum airflow rate required of ductwork by law is 11.1 CFM (18.8 m³/h). The resulting pressure drop must lower the pressure inside the outdoor unit to at least 0.0029 psi (20 Pa) lower than the ambient pressure.

(* The internal pressure of the outdoor unit must not be lower than the ambient pressure by more than 0.0508 psi (350 Pa).)

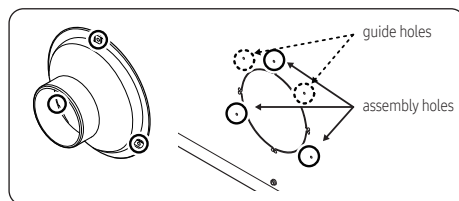
When treating the total pressure drop in the duct system, calculate the sum of the pressure drops induced by all components of the exhaust channel (e.g. ducts, bends, reducers). If an accurate calculation of pressure drops is required, consult the appropriate experts.

Duct connection

The Water-cooled VRF provides an accessory that serves as a connector for duct passages. This connector can be attached to a 4-inch duct passage. According to your installation environment, remove one of the two panels marked in the image below, create a hole, and assemble the duct connector.

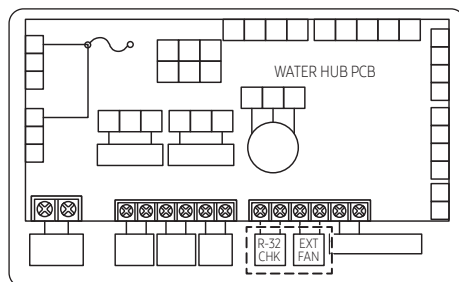


There are 2 guide holes and 3 assembly holes. Secure it in place by fastening screws into the 3 assembly holes.



External output(Exhaust fan & R-32 check)

The external output is a dry contact that closes when a leak is detected or when there is a fault or short-circuit in the R-32 sensor. The EXT FAN output is used to connect to an exhaust fan when a ventilated enclosure is required. The R-32 CHECK output is used when an external alarm is needed.



The selection of wiring should be determined in accordance with applicable legislation based on the specifications provided below.

Output connection requirements	
Voltage	198 ~ 242V (220V±10%)
Maximum current	2.25V



Machinery room (Outdoor)

If the releasable charge of the installed outdoor unit is very large and it is difficult to apply room ventilation or ventilated enclosure, installing the outdoor unit in a machinery room that complies with ASHRAE 15 standards can achieve a fullproof safety measure.

Systems containing A2L in a machinery room must meet the following requirements

General & A2L Specials

- Dimensioned for service access to parts
- 7.25 ft (2.2 m) head room
- Other equipment may be housed within.
- Tight fitting door(s)
- No openings that permit escaping refrigerants
- No airflow to/from occupied space(s)
- Access doors in ductwork & AHUs must be gasketed and tight fitting
- Access restricted to authorized personnel
- Marked, permanent signs at each entrance
- No flame producing devices over 1290 °F (700 °C) except for maintenance/repair
- Doors shall be approved , self-closing, tight-fitting fire doors.
- Noncombustible construction
- One-hour fire-resistive if separating occupied space(s)
- Any exterior openings not under fire escape or open stairway
- Pipe penetrations shall be tightly sealed

Detection Requirements

- Detection of concentration > 25% LFL** shall:
 - De-energize compressors
 - De-energize normally closed automatic refrigerant valves
 - De-energize other unclassified electrical sources with apparent power > 1 kVA

Ventilation Requirements

- Continuous or Activated (by RDS)
 - If continuous, failure of system activates an alarm
- Vented to outdoors
- Via one or more powered fans
 - Single or multi speed
 - Electric motors NOT in ductwork
 - Fan rotating elements shall be nonferrous or nonsparking or Casing shall consist of or be lined with such material
- Makeup air shall serve no other areas
- Inlet location specifics
- Level I Ventilation rate at minimum
- Level II Ventilation rate

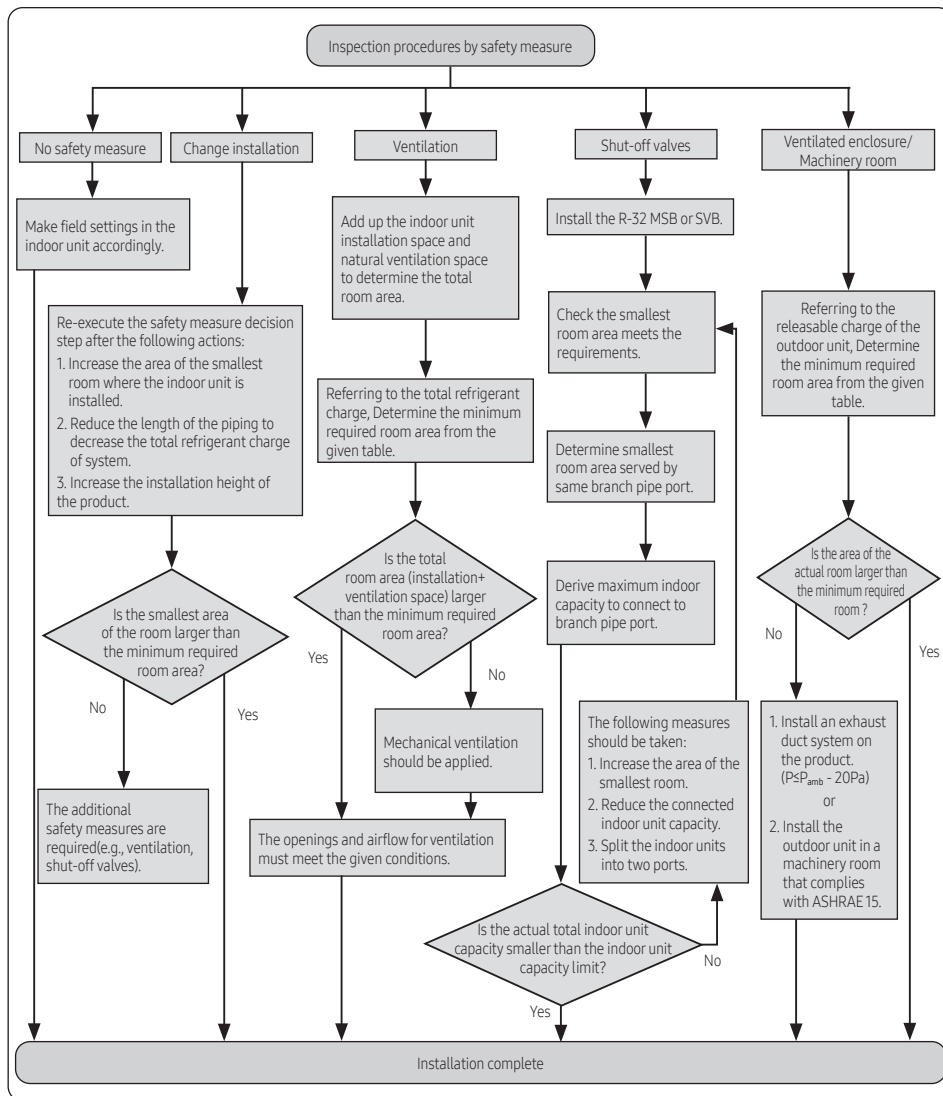
For more detailed conditions, refer to the relevant specification.



R-32 General Guidelines for Compliance

Flowchart

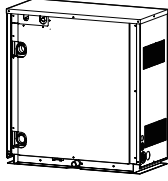
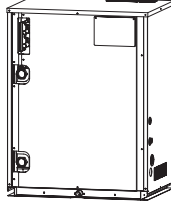
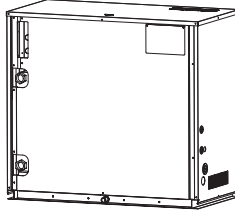
Before Installation





Preparing for installation

Outdoor unit classification

Classification	Small chassis	Medium chassis	Large chassis
Appearance			
Models	VPD038/048/055W6M-5P	VRD072/096/120W6M-5*	VRD192/240W6M-5*

CAUTION

Packaging material disposition

- Safely store or dispose the packaging materials.
 - Sharp metals such as nails or wooden material packaging that may break into pieces become a cause for personal injury.
 - Make sure to store or dispose the vinyl type packaging material to keep it out of reach of children. Children may put them over their face, which is very dangerous since it may lead to suffocation.

Outdoor unit combination

- Make sure to use an indoor unit that is compatible with Water-cooled VRF.
- Indoor units can be connected within the range indicated in following table.
- If the total capacity of the connected indoor units exceeds the indicated maximum capacity, cooling and heating capacity of the indoor unit may decrease.
- Total capacity of the connected indoor units can be allowed from 50% to 130% of the total outdoor unit capacity. $0.5 \times \Sigma(\text{Outdoor unit capacity}) \leq \text{Total capacity of the connected indoor units} \leq 1.3 \times \Sigma(\text{Outdoor unit capacity})$
- You can connect maximum 64 indoor units to the outdoor unit. Maximum quantity of connectable indoor unit is set to 64 since outdoor unit only support up to 64 communication address. Indoor unit address can be assigned from 0~63. If the indoor unit address was assigned from 64~79, E201 error will occur.
- Maximum 32 Wall-mount type indoor units with EEV (VWMD***S6-5P) can be connected.
- Do not install MSB for R-410A refrigerant. It is not compatible with R-32 products.
 - MSB for R-410A refrigerant: V1MSBB**HR
 - MSB for R-32 refrigerant: V2MSBB**HR

CAUTION

- Use the following table to determine the size and number of outdoor units needed to achieve the capacity requirements.



Preparing for installation

Outdoor unit combination

Model name for combination		Used only for heat pump system (1 phase)		
		3 ton	4 ton	5 ton
		VPD038W6M-5P	VPD048W6M-5P	VPD055W6M-5P
Number of individual outdoor units		1	1	1
Combined outdoor unit	VPD038W6M-5P	1		
	VPD048W6M-5P		1	
	VPD055W6M-5P			1
Nominal Capacity	Cooling (Btu/h)	38,200	47,800	54,600
	Heating (Btu/h)	42,600	54,600	61,400
Rated Capacity	Cooling (Btu/h)	38,000	48,000	54,500
	Heating (Btu/h)	42,000	54,000	61,000
Total capacity of the connected indoor units (cooling)	Minimum (Btu/h)	19,100	23,900	27,300
	Maximum (Btu/h)	49,700	62,100	71,000
Maximum number of connectable indoor units		6	8	9

Premium energy efficiency type

Model name for combination		Used for both heat pump and heat recovery systems (3 phase)			
		6 ton	8 ton	10 ton	12 ton
		VRD072W6M-5*	VRD096W6M-5*	VRD120W6M-5*	VRD144W6M-5*2
Number of individual outdoor units		1	1	1	2
Combined outdoor unit	VRD072W6M-5*	1			2
	VRD096W6M-5*		1		
	VRD120W6M-5*			1	
	VRD192W6M-5*				
Nominal Capacity	Cooling (Btu/h)	72,000	96,000	120,000	144,000
	Heating (Btu/h)	81,000	108,000	135,000	162,000
Rated Capacity	Cooling (Btu/h)	69,000	92,000	114,000	138,000
	Heating (Btu/h)	77,000	103,000	129,000	154,000
Total capacity of the connected indoor units (cooling)	Minimum (Btu/h)	36,000	48,000	60,000	72,000
	Maximum (Btu/h)	93,600	124,800	156,000	187,200
Maximum number of connectable indoor units		12	16	20	25



Model name for combination		Used for both heat pump and heat recovery systems (3 phase)			
		14 ton	16 ton	18 ton	22 ton
		VRD168W6M-5*2	VRD192W6M-5*	VRD216W6M-5*2	VRD264W6M-5*2
Number of individual outdoor units		2	1	2	2
Combined outdoor unit	VRD072W6M-5*	1			1
	VRD096W6M-5*	1		1	
	VRD120W6M-5*			1	
	VRD192W6M-5*		1		1
Nominal Capacity	Cooling (Btu/h)	168,000	192,000	216,000	264,000
	Heating (Btu/h)	189,000	216,000	243,000	297,000
Rated Capacity	Cooling (Btu/h)	160,000	184,000	206,000	252,000
	Heating (Btu/h)	180,000	206,000	232,000	282,000
Total capacity of the connected indoor units (cooling)	Minimum (Btu/h)	84,000	96,000	108,000	132,000
	Maximum (Btu/h)	218,400	249,600	280,800	343,200
Maximum number of connectable indoor units		29	33	37	45

Model name for combination		Used for both heat pump and heat recovery systems (3 phase)			
		24 ton	28 ton	30 ton	32 ton
		VRD288W6M-5*2	VRD336W6M-5*3	VRD360W6M-5*3	VRD384W6M-5*3
Number of individual outdoor units		2	3	3	3
Combined outdoor unit	VRD072W6M-5*		2	1	
	VRD096W6M-5*	1		1	2
	VRD120W6M-5*				
	VRD192W6M-5*	1	1	1	1
Nominal Capacity	Cooling (Btu/h)	288,000	336,000	360,000	384,000
	Heating (Btu/h)	324,000	378,000	405,000	432,000
Rated Capacity	Cooling (Btu/h)	276,000	322,000	344,000	368,000
	Heating (Btu/h)	308,000	360,000	386,000	412,000
Total capacity of the connected indoor units (cooling)	Minimum (Btu/h)	144,000	168,000	180,000	192,000
	Maximum (Btu/h)	374,400	436,800	468,000	499,200
Maximum number of connectable indoor units		49	58	62	64



Preparing for installation

Premium compact type

Before Installation

Model name for combination		Used for both heat pump and heat recovery systems (3 phase)		
		20 ton	26 ton	28 ton
		VRD240W6M-5*	VRD312W6M-5*2	VRD336W6M-5*2
Number of individual outdoor units		1	2	2
Combined outdoor unit	VRD072W6M-5*		1	
	VRD096W6M-5*			1
	VRD120W6M-5*			
	VRD192W6M-5*			
	VRD240W6M-5*	1	1	1
Nominal Capacity	Cooling (Btu/h)	240,000	312,000	336,000
	Heating (Btu/h)	270,000	351,000	378,000
Rated Capacity	Cooling (Btu/h)	228,000	298,000	320,000
	Heating (Btu/h)	256,000	334,000	360,000
Total capacity of the connected indoor units (cooling)	Minimum (Btu/h)	120,000	156,000	168,000
	Maximum (Btu/h)	312,000	405,600	436,800
Maximum number of connectable indoor units		51	54	58

Model name for combination		Used for both heat pump and heat recovery systems (3 phase)	
		30 ton	34 ton
		VRD360W6M-5*2	VRD408W6M-5*3
Number of individual outdoor units		2	3
Combined outdoor unit	VRD072W6M-5*		1
	VRD096W6M-5*		1
	VRD120W6M-5*	1	
	VRD192W6M-5*		
	VRD240W6M-5*	1	1
Nominal Capacity	Cooling (Btu/h)	360,000	408,000
	Heating (Btu/h)	405,000	459,000
Rated Capacity	Cooling (Btu/h)	342,000	390,000
	Heating (Btu/h)	386,000	436,000
Total capacity of the connected indoor units (cooling)	Minimum (Btu/h)	180,000	204,000
	Maximum (Btu/h)	468,000	530,400
Maximum number of connectable indoor units		62	64

※ Minimum capacity of the indoor unit is 7.5 MBH.

CAUTION

- Installation combination must be complied when composing outdoor unit combination.





Moving the outdoor unit

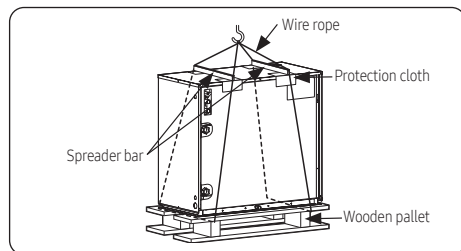
- Select the moving path in advance.
- Be sure that moving path can support weight of the outdoor unit.
- Do not slant the product more than 30° when carrying it. (Do not lay the product down in sideways.)
- Surface of the heat exchanger is sharp. Be careful not to get injured while moving the product.

CAUTION

- You must use certain part of the product when moving the product.

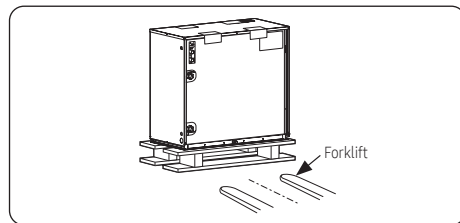
When moving with a crane

- Fasten the wire rope as shown in the figure.
- To protect damage or scratches, insert a piece of cloth between the outdoor unit and the wire rope.



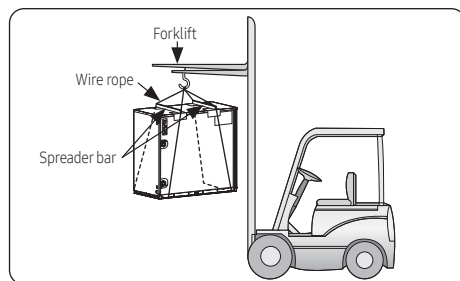
When moving with a forklift

- Carefully insert the forklift forks into the forklift holes at the bottom of the outdoor unit.
- Be careful with the forklift from damaging the product.



When moving the product without wooden pallet and the crane is not available for use

- Connect a wire rope to the outdoor unit as you would move it with a crane.
- Hang the wire rope to the forklift fork to move the outdoor unit.





Selecting installation location

Decide the installation location regarding the following condition and obtain user's approval.

Standard installation condition

- Heat source water containing foreign substances can cause condenser and pipe corrosion as well as water scale. Therefore, make sure that water source meets the standard of cooling water quality for refrigerating and air conditioning equipment. (Refer to 'Cooling water management' on page 116.)
- Closed circuit cooling tower must be used, but when open cooling tower is in use, select indirect water pipe installation method which water pipe of the building is not directly connected to the water pipe of the product.
- Strainer (which needs to be purchased separately) must be installed to the 'Water IN' pipes of the heat source water. If sand, dust or rust debris enter to water system, it may cause corrosion on metallic materials or blockage of the water heat exchanger and damage the heat exchanger.
- Water-cooled VRF is not designed to be installed outdoor. There are risk of burst and frozen water pipes when the outdoor unit is installed outdoor, therefore it must be installed indoor (machine room etc.)

Installation location condition

- Choose a place with ventilation duct or opening to cool down the heat generated from the product and maintain the surrounding temperature within 32~104 °F (0~40 °C) and the humidity below 80 %.
- Choose a place where structure can bear the weight and vibration of the outdoor unit.
- Choose a flat place that rainwater does not settle or leak.
- Choose a well ventilated place with sufficient space for repair and other services.
- Choose a place where you can easily connect the refrigerant pipes between indoor and outdoor units within allowable distance.
- This product is not salt tolerant, therefore do not install it near the sea or hot springs where outdoor unit may corrode.

⚠ CAUTION

- R-32 refrigerant is a safe, nontoxic and mildly flammable(A2L) refrigerant. If the place holds any concerns for exceeding dangerous level of refrigerant concentration in case of refrigerant leakage, extra ventilation system is required.
- Do not install the product in a place with corrosive gas such as sulfur oxides, ammonia gas, sulfurous gases. Example: near washroom exhaust pipe, ventilation duct outlet, or surface near hot spring etc. (Copper pipes and soldered parts may corrode and cause refrigerant leakage.)
- Install the product in a place without any risk of inflammable gas leakage.
- Water-cooled VRF can be interfered with static noise when listening to AM radio. Therefore, select a location where indoor unit can be installed while keeping optimal distance from the radio, computer, stereo equipment. Furthermore, select a location where electrical wiring work is possible and put those wires in a individual protection tubes and ground those protection tube.
 - Especially, keep the unit at least 9.84 ft (3 m) away from the electrical equipment in an area with weak electromagnetic waves and put the main power cable and communication cables in separately installed protection tubes, and ground each protection tubes.
 - Make sure that there is no equipment that generates electromagnetic waves. If not electromagnetic waves may cause problem to the control systems which may lead to Water-cooled VRF malfunction. (Example: Remote control sensor of the indoor unit may not be received well, due to ballast stabilizer of the lighting equipment.)





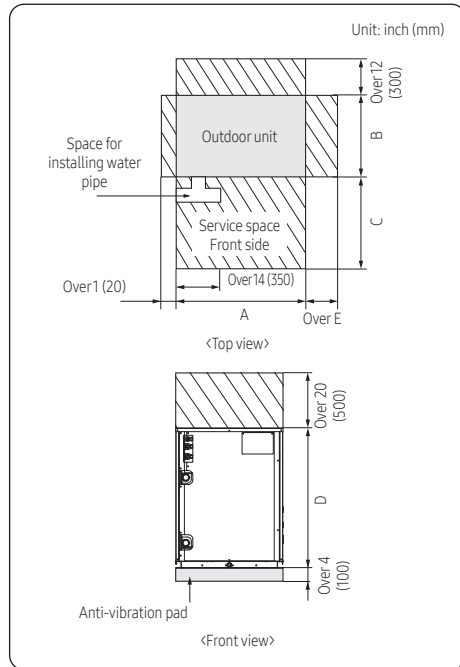
Space requirement for installation

Minimum space requirement for installation

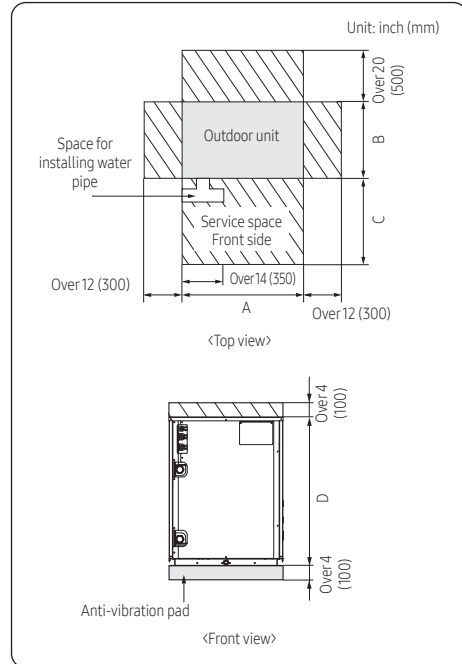
- Secure minimum installation space as shown in the following figures, considering service area and path for people etc.
 - If the installation space is narrow, installer or other worker may get injured during work and may also cause problem to the product.
- If the conditions does not meet the space requirement in this manual, please contact qualified installation agent.
- You must check the required service clearance since it is different for each model.

Single installation

When the water pipe passes through top of the product



When the water pipe passes through back of the product



Before Installation

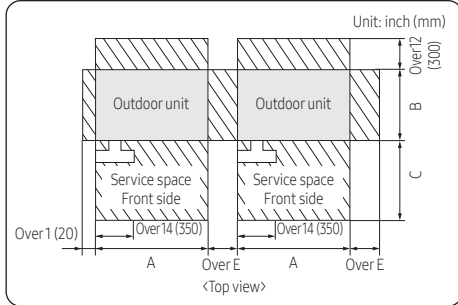




Space requirement for installation

Before Installation

Module or continuous installation



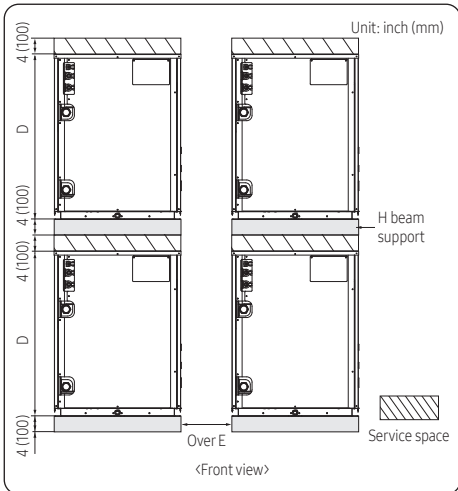
Unit: inch (mm)

Model name of outdoor unit	A	B	C	D	E
VPD038/048/055W6M-5P	29.5 (750)	13 (330)	19.7 (500)	31.5 (800)	4 (100)
VRD072/096/120W6M-5Y	30.3 (770)	21.5 (545)	23.6 (600)	39.4 (1000)	4 (100)
VRD192/240W6M-5Y	43.3 (1100)	21.5 (545)	23.6 (600)	39.4 (1000)	4 (100)
VRD072/096/120W6M-5G	31.1 (790)	21.5 (545)	23.6 (600)	39.4 (1000)	12 (300)
VRD192/240W6M-5G	44.1 (1120)	21.5 (545)	23.6 (600)	39.4 (1000)	12 (300)

CAUTION

- If the outdoor unit is needed to be installed close to the walls unavoidably, prevent the vibration from being transferred to the walls with cushioning materials etc.

Double installation



- For the double installation, service space is required for the front, rear, and sides of the product. For the size of the service space, refer to the service space size of single, module or continuous installation.
- Clear enough space for E (space between outdoor units), so that water pipes connected to outdoor units does not block the front side of the outdoor units next to it.





Accessories

Accessories

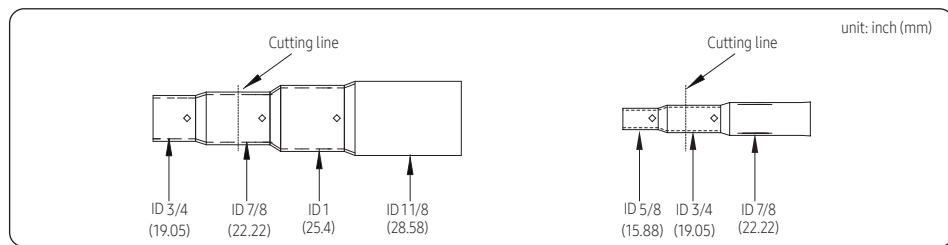
- You must keep following accessories until the installation is finished.
- Hand over the installation manual to the customer after finishing the installation.

Installation manual	*Installation socket

- ※ Models with packing socket: VRD072/096/120W6M-5*.
- ※ Socket can be different depending on the models.

Model number	Connection type	Heat recovery [inch (mm)]				Heat pump [inch (mm)]		
		Gas	Liquid	High-pressure gas	Socket needed	Gas	Liquid	Socket needed
VRD072W6M-5* (6 ton) (a)	Unit connection	7/8 (22.22)	3/8 (9.52)	3/4 (19.05)	Yes	3/4 (19.05)	3/8 (9.52)	No
	Field connection	3/4 (19.05)	3/8 (9.52)	5/8 (15.88)		3/4 (19.05)	3/8 (9.52)	
VRD096W6M-5* (8 ton) (a)	Unit connection	7/8 (22.22)	3/8 (9.52)	3/4 (19.05)	No	3/4 (19.05)	3/8 (9.52)	Yes
	Field connection	7/8 (22.22)	3/8 (9.52)	3/4 (19.05)		7/8 (22.22)	3/8 (9.52)	
VRD120W6M-5* (10 ton) (a)	Unit connection	1-1/8 (28.58)	3/8 (9.52)	7/8 (22.22)	No	7/8 (22.22)	3/8 (9.52)	Yes
	Field connection	1-1/8 (28.58)	1/2 (12.7)	7/8 (22.22)		1-1/8 (28.58)	1/2 (12.7)	
VRD192W6M-5* (16 ton)	Unit connection	1-1/8 (28.58)	5/8 (15.88)	1-1/8 (28.58)	No	1-1/8 (28.58)	5/8 (15.88)	No
	Field connection	1-1/8 (28.58)	5/8 (15.88)	1-1/8 (28.58)		1-1/8 (28.58)	5/8 (15.88)	
VRD240W6M-5* (20 ton)	Unit connection	1-1/8 (28.58)	5/8 (15.88)	1-1/8 (28.58)	No	1-1/8 (28.58)	5/8 (15.88)	No
	Field connection	1-1/8 (28.58)	5/8 (15.88)	1-1/8 (28.58)		1-1/8 (28.58)	5/8 (15.88)	

(a) Cut socket as needed for 6, 8, and 10 ton units.



Before Installation



Accessories

Optional accessories

- Following optional accessories are needed for connecting pipes between the indoor and outdoor units.

Classification	Model Name
Y-Joint	V1IDBP01PR
	V1IDBP02PR
	V1IDBP03PR
	V1IDBP04PR
	V1IDBP05PR
	V1IDBP06PR
Y-Joint (Only H/R)	V1IDBP08HR
	V1IDBP09HR
	V1IDBP10HR
Distribution header	V1HDRK11PR
	V1HDRK12PR
	V1HDRK13PR
Y-Joint - Outdoor unit	V1ODBP14HP
Y-Joint (Only H/R) - Outdoor unit	V1ODBP14HR

- ※ Only use the genuine accessories listed in above table and do not use imitated accessories.
- ※ Please refer to the "Refrigerant pipe installation" section on the back page for the criteria for accessory selection.
- ※ Recommended specification of the strainer

Max. working pressure	Water pipe connection		Mesh size	Material(strainer/Mesh)
	VPD038/048/055* VRD072/096/120/192*	VRD240*		
1.96 MPa (284 psi)	NPT 1 1/4 (NPT internal thread)	NPT 2 (NPT internal thread)	50 Mesh	AISI316/SUS304





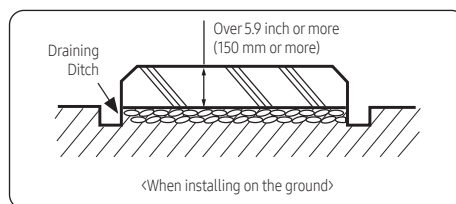
Base construction and installation of the outdoor unit

⚠ WARNING

- Make sure to remove the wooden pallet before installing the outdoor unit. If you do not remove the wooden pallet, there is risk of fire during welding the pipes. If the outdoor unit is installed with wooden pallet on, and it was used for long period time, wooden pallet may break and cause electrical hazard or high pressure may damage the pipes.
 - ※ Fix an outdoor unit firmly on the base ground with anchor bolts.
 - ※ Manufacturer is not responsible for the damage occurred by not following the installation standards.
- 1 Make sure that the height of the base ground is 5.9 inch (150 mm) or higher to protect the outdoor unit from rain water or other external conditions. Also, install a draining pit around the base ground and connect the drain pipe to the drainage.
 - 2 Considering the vibration and weight of the outdoor unit, strength of the base ground must be strong to prevent noise and the top surface of it should be flat.
 - 3 Base ground should be 1.5 times larger than the bottom of the outdoor unit.
 - 4 Outdoor unit must be fixed firmly so that it can withstand the wind speed of 98.4 ft/s (30 m/s). If you cannot fix the outdoor unit on the base ground, fix it by side or use extra structure.
 - 5 In heating operation, defrost water may form so you must really care about the drainage and waterproofing the floor. To prevent defrost water from stagnating or freezing, construct a drainage with over 1/50 slope. (Ice may form on the floor in winter time.)
 - 6 It is necessary to add wire mesh or steel bar during concrete construction for the base ground to prevent damages or cracks.

- 7 When installing multiple outdoor units at the same place, construct a H beam or an anti-vibration frame on the base ground to install the outdoor unit.
- 8 After installing a H beam or an anti-vibration frame, apply corrosion protection and other necessary coating.
- 9 When concrete construction for outdoor unit installation is completed, install an anti-vibration pad ($t=0.78$ inch / 20 mm or more) or an anti-vibration frame to prevent vibration of the outdoor unit from transferring to the base ground.
- 10 Place the outdoor unit on a H beam or an anti-vibration frame and fix it with the bolt, nut and washer. (The bearing force has to be over 3.5 kN)

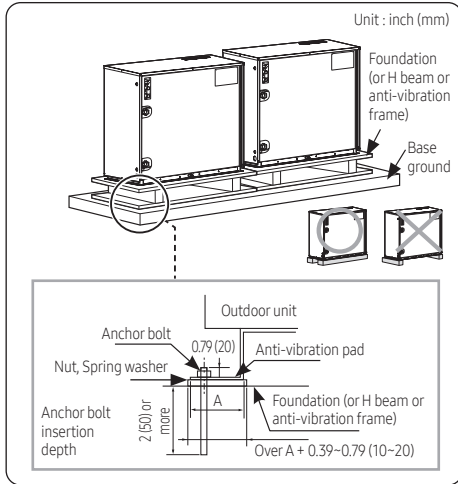
Foundation



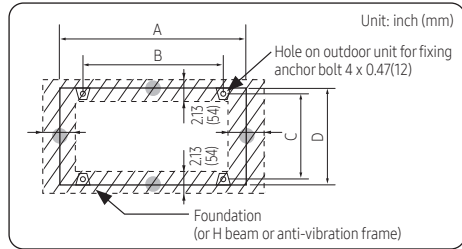


Base construction and installation of the outdoor unit

Outdoor unit installation



Fixing the outdoor unit



Unit: inch (mm)

Classification	Small chassis	Medium chassis		Large chassis	
Models	VPD038/048/055W6M-5P	VRD072/096/120W6M-5Y	VRD072/096/120W6M-5G	VRD192/240W6M-5Y	VRD192/240W6M-5G
A	29.5 (750)	30.3 (770)	31.3 (790)	43.3 (1100)	44.1 (1120)
B	25.0 (636)	25.5 (648)		38.4 (976)	
C	12.3 (313)	20.8 (527)		20.8 (528)	
D	13.0 (330)	21.5 (545)		21.5 (545)	

※ For adding the anti-vibration frame on the base ground, the specification for the fixing hole depends on the specification of the anti-vibration frame.

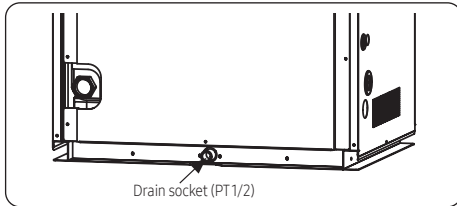




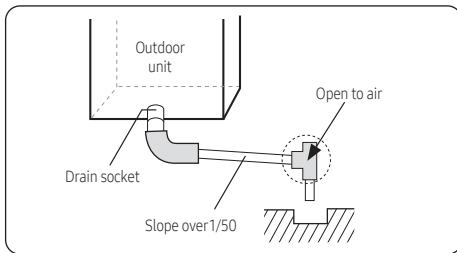
Drain pipe installation

Installing the drain pipe

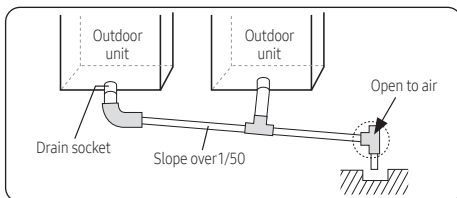
- Attach the drain pipe to the drain socket (PT1/2) located on the bottom of the product.



Single installation



Module installation



- Do not install trap and ensure the slope of the drain pipe is more than 1/50.
- Insulate the drain pipe and drain plug with insulation over 0.4 inch (10 mm) thick.
- Install self-regulating heating cable on the drain pipe to prevent it from freezing.
- If you have installed a heater to prevent drain pipe from freezing, install a safety equipment for a heating appliance.

CAUTION

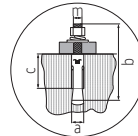
- Cautions regarding connecting the anchor bolt
 - Use the rubber washer to prevent the anchor bolt from corroding.



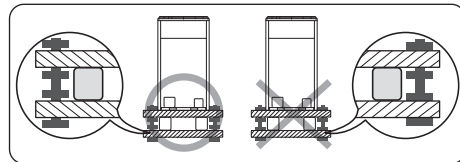
- Anchor bolt specifications

Size (m)	Drill bit diameter (a)	Anchor length (b)	Sleeve length (c)	Insertion depth	Fastening torque
Ø10	1/2" (14 mm)	3" (75 mm)	11/2" (40 mm)	2" (50 mm)	30 N·m

- ※ Use anchor bolts and nuts made of plated zinc or STS material. Regular anchor bolts or nuts may get damaged by corrosion.



- Cautions regarding anti-vibration frame installation
 - During installation, make sure there is no gap between the base ground and the supporting structures such as anti-vibration frame or H beam.
 - Base ground must be constructed firmly to support the bottom part of the anti-vibration mount.
 - After installing the anti-vibration frame, unscrew the fixing part on the top and bottom part of the frame.



- If the anti-vibration frame or H beam is fixed to the base ground with anchor bolts, make sure that waterproofed surface is not damaged by anchor bolts and apply additional waterproof solution if necessary.





Refrigerant pipe installation

⚠ WARNING

- When installing, make sure there is no leakage. When collecting the refrigerant, stop the compressor first before removing the connection pipe. If the refrigerant pipe is not properly connected and the compressor is working with the service valve open, the pipe sucks the air in which makes the pressure inside of the refrigerant cycle abnormally high which may lead to explosion and injury.

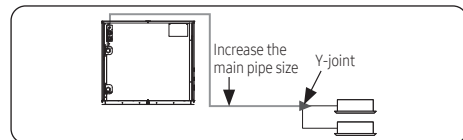
Refrigerant pipe work

- The length of refrigerant pipe should be as short as possible and the height difference between an indoor and outdoor unit should be minimized.
- Piping work must be done within allowable piping length, height difference, and the allowable length after branching.
- The pressure of the R-32 is high. Use only certified refrigerant pipe and follow the installation method.
- After installing the pipes, calculate the total length of the pipe to check if additional refrigerant is needed. When you need to charge the additional refrigerant, make sure to use R-32 refrigerant.
- The inside of the refrigerant pipe must be clean and contain no harmful ions, oxides, dust, iron particles or moisture.
- Use tools and accessories compatible with R-32 refrigerant gas.

Tool	Installation process/purpose		Compatibility with conventional tool
Pipe cutter	Refrigerant pipe installation	Pipe cutting	Compatible
Flaring tool		Pipe flaring	
Refrigerant machine oil		Apply refrigerant oil on flared part	Exclusive ether oil, ester oil, alkali benzene oil or synthetic oil
Torque wrench		Connect flare nut with pipe	Compatible
Pipe bender	Air tightness test	Pipe bending	
Nitrogen gas		Prevent oxidation within the pipe	
Welder		Pipe welding	

Tool	Installation process/purpose		Compatibility with conventional tool
Manifold gage	Air tightness test ~ additional refrigerant charging	Vacuuming, charging refrigerant and checking operation	Need exclusive one to prevent mixture of R-22 refrigerant oil use and also the measurement is not available due to high pressure
Refrigerant charging hose			Need exclusive one since there is risk of refrigerant leakage or contamination
Vacuum pump	Pipe drying		Compatible (Use products which contain the check valve to prevent the oil from flowing backward into the outdoor unit.) Use the one that can be vacuumed up to -100.7 kpa(5 Torr).
Scale for refrigerant charging			Compatible
Gas leak detector	Gas leak test		Need exclusive one for R-32 (Ones used for R-134a or R-410A are not compatible)
Flare nut	Must use the flare nut supplied with the product. Refrigerant leakage may occur when the conventional flare nut for R-22 or R-410A is used.		

Selecting refrigerant pipe

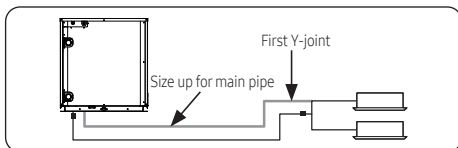


- Install the refrigerant pipe according to main pipe size of each outdoor unit capacity.
- When the pipe length (including elbow) between the outdoor unit and the farthest indoor unit exceeds 295.28 ft (90 m), the size of the pipe (main pipe) connecting the outdoor unit to the first branch joint must be increased by 1 grade.
- For H/R System, when the pipe length (including elbow) between an outdoor unit and the farthest indoor unit exceeds 295.28 ft (90 m), you must increase the size of the liquid pipe by 1 grade among the pipes(main pipe) which connects between the outdoor unit to the first branch joint



Choosing refrigerant pipe

H/P (VPD038/048/055W6M-5P)



Pipe installation between an outdoor unit and the first Y-joint

Outdoor unit capacity (Ton)	Liquid pipe [inch (mm)]	Gas pipe [inch (mm)]
3	Ø3/8 (9.52)	Ø5/8 (15.88)
4	Ø3/8 (9.52)	Ø3/4 (19.05)
5	Ø3/8 (9.52)	Ø3/4 (19.05)

- Install the refrigerant pipe according to main pipe size of each outdoor unit capacity.

Pipe installation between Y-joints

Indoor unit total capacity [kW (Btu/h)]	Pipe diameter (O•D•mm)	
	Liquid pipe [inch (mm)]	Gas pipe [inch (mm)]
$X \leq 15.0$ (51000)	Ø3/8 (9.52)	Ø5/8 (15.88)
15.0 (51000) < $X \leq 23.2$ (79000)		Ø3/4 (19.05)

Selecting Y-joint

- Select the first Y-joint according to main pipe size of each outdoor unit capacity.
- Select the other Y-joints according to the total indoor unit capacity under the selected Y-joint.

Selecting the first Y-joint	
Outdoor unit capacity (Ton)	Y-joint model
3	V1IDBP01PR
4	V1IDBP02PR
5	V1IDBP02PR

Other Y-joints	
Total indoor unit capacity under the selected Y-joint [kW (Btu/h)]	Y-joint model
$X \leq 15.0$ (51000)	V1IDBP01PR
15.0 (51000) < $X \leq 40.6$ (138000)	V1IDBP02PR

Selecting additional refrigerant charging

- Basic refrigerant
The basic amount of additional refrigerant charged at a factory

Model	Refrigerant	Factory charge	
		lbs	kg
VPD038W6M-5P	R-32	2.0	0.9
VPD048W6M-5P		2.9	1.3
VPD055W6M-5P		2.9	1.3





Refrigerant pipe installation

- Charging additional refrigerant

The amount of additional refrigerant charging	=	The amount of refrigerant charging for pipe + the amount of refrigerant correction charging for an indoor unit.
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- The amount of additional refrigerant depending on the pipe size (㉓)
 - Amount of additional refrigerant has to be calculated based on the sum of all liquid pipe length.

Size of liquid pipe [inch (mm)]	1/4 (6.35)	3/8 (9.52)	1/2 (12.7)	5/8 (15.88)
Additional amount [lb/ft (kg/m)]	0.013 (0.02)	0.037 (0.055)	0.077 (0.115)	0.111 (0.165)

Additional refrigerant charging calculation = The sum of total length of Ø 3/8 liquid pipe(ft) x 0.040 lb + the sum of total length of Ø 1/4 liquid pipe(ft) x 0.013 lb

Ex) a(Ø 3/8) = 120 ft, b+c+d(Ø 3/8) = 50 ft, e+f+g(Ø 1/4) = 50 ft Refer to 'Connection by header joint' on page 52.

The amount of additional refrigerant = 170 ft x 0.040 lb + 50 ft x 0.013 lb = 7.45 lb

- Amount of additional refrigerant for each indoor unit (㉔)

Unit : lb (kg)

Capacity Index (MBH)	5	6	7	9	12	15	18	20	24	27	28	30	32	36	42	48	54	60	72	76	96	144
1-Way cassette (VOWD***S6-5P)	0.31 (0.14)		0.31 (0.14)	0.51 (0.23)	0.51 (0.23)	0.64 (0.29)	0.64 (0.29)		0.64 (0.29)													
Mini 4-Way cassette S (600x600) (V22D***S6-5P)	0.57 (0.26)		0.57 (0.26)	0.57 (0.26)	0.73 (0.33)		0.73 (0.33)	0.73 (0.33)														
4-Way cassette (V33D***S6-5P)		1.46 (0.66)		1.46 (0.66)	1.46 (0.66)		1.46 (0.66)	1.46 (0.66)				1.74 (0.79)		1.74 (0.79)		1.74 (0.79)						
360 cassette (V36D***S6-5P)				0.90 (0.41)	0.90 (0.41)		0.90 (0.41)	0.90 (0.41)				1.37 (0.62)		1.37 (0.62)		1.37 (0.62)						
LSPduct (VL0D***S6-5P)			0.62 (0.28)	0.62 (0.28)	0.62 (0.28)		0.62 (0.28)	0.62 (0.28)														
MSPduct (VMD***S6-5P)		0.90 (0.41)	0.90 (0.41)	0.90 (0.41)	0.90 (0.41)	0.90 (0.41)	1.34 (0.61)															
HSPduct (VHD***S6-5P)									1.34 (0.61)	1.34 (0.61)		1.34 (0.61)		1.68 (0.76)		1.68 (0.76)	1.68 (0.76)			2.34 (1.06)	2.34 (1.06)	
OAPduct (VOSD***S6-5P)																			2.34 (1.06)		2.34 (1.06)	
Floor Standing (VSCD***S6-5P) (VSED***S6-5P)		0.24 (0.11)		0.44 (0.20)	0.44 (0.20)		0.64 (0.29)	0.64 (0.29)														
Ceiling (VUCD***S6-5P)							0.95 (0.43)	0.95 (0.43)						0.95 (0.43)		1.19 (0.54)						
MPAHU(V-AHU) (VVC***S6-5P)					0.66 (0.30)		1.00 (0.45)	1.00 (0.45)				1.65 (0.75)		1.74 (0.79)		2.34 (1.06)	2.51 (1.14)	3.35 (1.52)	3.35 (1.52)			
Wall mounted (VWM***S6-5P)	0.46 (0.21)		0.46 (0.21)	0.64 (0.29)	0.64 (0.29)	0.95 (0.43)	0.95 (0.43)		0.95 (0.43)	0.95 (0.43)			1.34 (0.61)									
Hydro unit HE ^(Note1) (VHD***S6-5P)														1.19 (0.54)		1.19 (0.54)					1.39 (0.63)	2.38 (1.08)





Capacity Index (MBH)	5	6	7	9	12	15	18	20	24	27	28	30	32	36	42	48	54	60	72	76	96	144
Hydro unit HT ^{Note1)} (VHTD***S6-5P)																1.19 (0.54)			1.19 (0.54)			
MSB/SVB (**; 01/02/04) (V2MSBB**HR) (VZSOB**HP)	0.66 (0.30)																					
MSB/SVB (**; 06/08) (V3MSBB06HR, VZMSBB08HR) (VZSOB**HP)	1.43 (0.65)																					
MSB/SVB (**; 12) (V2MSBB**HR) (VZSOB**HP)	2.20 (1.00)																					
AHU SVB (VZSOB**AH)	0.66 (0.30)																					

- If there is no additional refrigerant value for the indoor unit in the above table, refer to the indoor unit installation manual.
- Additional refrigerant charging of MSB is 1.1 lb (0.5 kg) for every MSB kit.
- If AHU kit is included among the indoor units, add 0.04 lb (0.018 kg) of refrigerant for every 1 MBH of AHU capacity.

^{Note1)} In case the capacity conjunction of the Hydro Unit HT/HE exceeds 50 % among the total indoor unit, please don't put the additional refrigerant.

Ex) Indoor1(VOWD007S6-5P) x 4 ea, Indoor 2(V33D009S6-5P) x 2 ea

The amount of additional refrigerant = 0.31 lb x 4 ea + 1.46 lb x 2 ea = 4.16 lb

- 3 The total amount of additional refrigerant charging = the amount of refrigerant charging for pipe + the amount of refrigerant for each indoor unit.

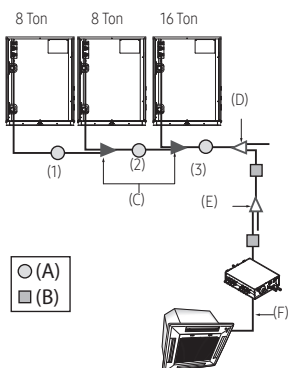
Ex) The amount of additional refrigerant charging((a)+(b)) = 7.45 lb + 4.16 lb = 11.61 lb

- ※ Sum of total amount of additional refrigerant and the basic amount of refrigerant should not exceed 175.40 lb (79.56 kg).

If the refrigerant exceeds 175.40 lb (79.56 kg), it goes beyond the scope of the UL standards, rendering the safety measures we provide ineffective.

Ex) If the outdoor unit's basic refrigerant amount is 23.15 lb (10.5 kg), the total amount of additional refrigerant((a)+(b)) should not exceed 152.35 lb (69.10 kg).

H/P (VRD072/096/120/192/240W6M-5*)



Ex.) 32 Ton

Outdoor unit capacity (Ton)	No.	Pipe size (O.D)			
		Liquid pipe		Gas pipe	
		inch	mm	inch	mm
8	(1)	3/8	9.52	7/8	22.22
16	(2)	1/2	12.70	1 1/8	28.58
32	(3)	5/8	15.88	1 3/8	34.92





Refrigerant pipe installation

Size of the pipe connected to the outdoor unit (A)

Select the size of the main pipe according to the below table.

Outdoor unit capacity (MBH) (Cooling)	Outdoor unit capacity (kW) (Cooling)	* Maximum pipe length within 295 ft (90 m)				* Maximum pipe length over 295 ft (90 m)			
		Liquid		Gas		Liquid		Gas	
		inch	mm	inch	mm	inch	mm	inch	mm
Capacity ≤ 85	Capacity ≤ 25	Ø3/8	Ø9.52	Ø3/4	Ø19.05	Ø1/2	Ø12.70	Ø7/8	Ø22.22
85 < Capacity ≤ 99	25 < Capacity ≤ 29	Ø1/2	Ø12.70	Ø7/8	Ø22.22	Ø5/8	Ø15.88	Ø1 Note1)	Ø25.40 Note1)
99 < Capacity ≤ 120	29 < Capacity ≤ 35							Ø1 1/8	Ø28.58
120 < Capacity ≤ 140	35 < Capacity ≤ 41							Ø1 1/4 Note2)	Ø31.75 Note2)
140 < Capacity ≤ 181	41 < Capacity ≤ 53			Ø1 1/8	Ø28.58	Ø3/4	Ø19.05	Ø1 3/8	Ø34.92
181 < Capacity ≤ 222	53 < Capacity ≤ 65							Ø1 1/2 Note3)	Ø38.10 Note3)
222 < Capacity ≤ 240	65 < Capacity ≤ 70	Ø5/8	Ø15.88	Ø1 3/8	Ø34.92	Ø7/8	Ø22.22	Ø1 5/8	Ø41.28
240 < Capacity ≤ 273	70 < Capacity ≤ 80							Ø1 3/4 Note4)	Ø44.45 Note4)
273 < Capacity ≤ 314	80 < Capacity ≤ 92								
314 < Capacity ≤ 369	92 < Capacity ≤ 108	Ø3/4	Ø19.05	Ø1 5/8	Ø41.28	Ø7/8	Ø22.22		
369 < Capacity ≤ 409	108 < Capacity ≤ 120								
409 < Capacity ≤ 467	120 < Capacity ≤ 137								
467 < Capacity ≤ 583	137 < Capacity ≤ 171								

*Maximum pipe length : The pipe length between an outdoor unit and the farthest indoor unit.

Note1) If Ø1" (25.40 mm) pipe is not available on site, use Ø1 1/8" (28.58 mm) pipe.

Note2) If Ø1 1/4" (31.75 mm) pipe is not available on site, use Ø1 3/8" (34.92 mm) pipe.

Note3) If Ø1 1/2" (38.10 mm) pipe is not available on site, use Ø1 5/8" (41.28 mm) pipe.

Note4) If Ø1 3/4" (44.45 mm) pipe is not available on site, use Ø2 1/8" (53.98 mm) pipe.

※ For the case that the diameter of the default pipe of an outdoor unit does not match that of the pipe installed on the site, a socket is provided by default together with the outdoor unit.



Size of the pipe between branch joints (B)

Select the pipe size according to the sum of indoor unit capacity which will be connected after the branch.

※ However, if the size of the pipe between branch joints (B) is bigger than the size of the pipe connected to the outdoor unit (A), apply the pipe size (A).

Indoor unit capacity (MBH)	Indoor unit capacity (kW)	Branch pipe length within 148 ft (45 m)				Branch pipe length between 148 ft~295 ft (45~90 m)			
		Liquid		Gas		Liquid		Gas	
		inch	mm	inch	mm	inch	mm	inch	mm
Capacity < 19	Capacity < 5.7	Ø1/4	Ø6.35	Ø1/2	Ø12.7	Ø3/8	Ø9.52	Ø5/8	Ø15.88
19 ≤ Capacity < 55	5.7 ≤ Capacity < 16	Ø3/8	Ø9.52	Ø5/8	Ø15.88	Ø1/2	Ø12.7	Ø3/4	Ø19.05
55 ≤ Capacity < 79	16 ≤ Capacity < 23.2			Ø3/4	Ø19.05			Ø7/8	Ø22.22
79 ≤ Capacity < 115	23.2 ≤ Capacity < 33.6			Ø7/8	Ø22.22			Ø1 Note1)	Ø25.40 Note1)
115 ≤ Capacity < 134	33.6 ≤ Capacity < 39.2	Ø1/2	Ø12.7	Ø11/8	Ø28.58	Ø5/8	Ø15.88	Ø11/8	Ø28.58
134 ≤ Capacity < 153	39.2 ≤ Capacity < 44.8							Ø11/4 Note2)	Ø31.75 Note2)
153 ≤ Capacity < 191	44.8 ≤ Capacity < 56							Ø1 3/8	Ø34.92
191 ≤ Capacity < 229	56 ≤ Capacity < 67.2			Ø1 3/8	Ø34.92			Ø1 1/2 Note3)	Ø38.10 Note3)
229 ≤ Capacity < 248	67.2 ≤ Capacity < 72.8	Ø5/8	Ø15.88	Ø1 5/8	Ø41.28	Ø3/4	Ø19.05	Ø1 5/8	Ø41.28
248 ≤ Capacity < 287	72.8 ≤ Capacity < 84							Ø1 3/4 Note4)	Ø44.45 Note4)
287 ≤ Capacity < 325	84 ≤ Capacity < 95.2							Ø1 1/2	Ø38.10
325 ≤ Capacity < 382	95.2 ≤ Capacity < 112							Ø1 3/8	Ø34.92
382 ≤ Capacity < 420	112 ≤ Capacity < 123.2	Ø3/4	Ø19.05	Ø1 3/4 Note4)	Ø44.45 Note4)	Ø7/8	Ø22.22	Ø2 1/8	Ø53.98
420 ≤ Capacity < 478	123.2 ≤ Capacity < 140							Ø2 1/8	Ø53.98
478 ≤ Capacity < 592	140 ≤ Capacity < 173.6							Ø2 1/8	Ø53.98
592 ≤ Capacity < 669	173.6 ≤ Capacity < 196	Ø7/8	Ø22.22	Ø2 1/8	Ø53.98	Ø1 Note1)	Ø25.40 Note1)	Ø2 1/8	Ø53.98
669 ≤ Capacity < 726	196 ≤ Capacity < 212.8							Ø2 1/8	Ø53.98
726 ≤ Capacity < 822	212.8 ≤ Capacity < 240.8							Ø2 1/8	Ø53.98
822 ≤ Capacity	240.8 ≤ Capacity	Ø7/8	Ø22.22	Ø2 1/8	Ø53.98	Ø1 Note1)	Ø25.40 Note1)	Ø2 1/8	Ø53.98

Note1) If Ø1" (25.40 mm) pipe is not available on site, use Ø1 1/8" (28.58 mm) pipe.

Note2) If Ø1 1/4" (31.75 mm) pipe is not available on site, use Ø1 3/8" (34.92 mm) pipe.

Note3) If Ø1 1/2" (38.10 mm) pipe is not available on site, use Ø1 5/8" (41.28 mm) pipe.

Note4) If Ø1 3/4" (44.45 mm) pipe is not available on site, use Ø2 1/8" (53.98 mm) pipe.

Installing the product



Refrigerant pipe installation

Branch joint (C-E)

Branch joint between outdoor units (C)

Select a branch joint according to the sum of the capacity of outdoor units connected to the branch joint.

Classification	Outdoor unit capacity		Model name
	MBH	kW	
Y-joint for outdoor unit (C)	Capacity ≤ 546	Capacity ≤ 160	V10DBP14HP

First branch joint (D)

Select according to the sum of the capacity of the outdoor unit.

Classification	Outdoor unit capacity		Model name
	MBH	kW	
Y-joint (D)	Capacity ≤ 172	Capacity ≤ 50.4	V1IDBP02PR
	Capacity ≤ 229	Capacity ≤ 67.2	V1IDBP03PR
	Capacity ≤ 268	Capacity ≤ 78.4	V1IDBP04PR
	Capacity ≤ 420	Capacity ≤ 123.2	V1IDBP05PR
	Capacity ≤ 650	Capacity ≤ 190.4	V1IDBP06PR

Branch joint (E)

Select a branch joint according to the sum of indoor unit capacity which will be connected after the branch.

※ However, if the branch joints (E) is bigger than the first branch joint (D), apply the branch joint of the same size as the first branch joint (D).

Classification	Indoor unit capacity		Model name
	MBH	kW	
Y-joint (E)	Capacity < 55	Capacity < 16	V1IDBP01HR
	55 ≤ Capacity < 191	16 ≤ Capacity < 56	V1IDBP02HR
	191 ≤ Capacity < 248	56 ≤ Capacity < 72.8	V1IDBP03HR
	248 ≤ Capacity < 287	72.8 ≤ Capacity < 84	V1IDBP04HR
	287 ≤ Capacity < 420	84 ≤ Capacity < 123.2	V1IDBP05HR
	420 ≤ Capacity < 669	123.2 ≤ Capacity < 196	V1IDBP06HR
Distribution header (E)	Capacity < 191 (for 4 rooms)	Capacity < 56 (for 4 rooms)	V1HDRK11PR
	Capacity < 344 (for 8 rooms)	Capacity < 100.8 (for 8 rooms)	V1HDRK12PR
	Capacity < 554 (for 8 rooms)	Capacity < 162.4 (for 8 rooms)	V1HDRK13PR

Size of the pipe between the branch joint and the indoor unit (F)

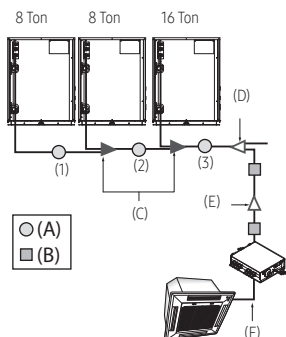
Select according to the capacity of the indoor unit.

Indoor unit capacity		Liquid		Gas	
MBH	kW	inch	mm	inch	mm
Capacity ≤ 20	Capacity ≤ 6	Ø1/4	Ø6.35	Ø1/2	Ø12.7
20 < Capacity ≤ 54	6 < Capacity ≤ 16	Ø3/8	Ø9.52	Ø5/8	Ø15.88
54 < Capacity ≤ 78	16 < Capacity ≤ 23	Ø3/8	Ø9.52	Ø3/4	Ø19.05
78 < Capacity	23 < Capacity	Ø3/8	Ø9.52	Ø7/8	Ø22.22

※ If the criteria for selecting the branch in the outdoor installation manual and the branch installation manual are different, please select the branch in accordance with the outdoor installation manual.



H/R (VRD072/096/120/192/240W6M-5*)



Ex.) 32 Ton

Outdoor unit capacity (Ton)	No.	Pipe size (O.D)					
		Liquid pipe		Low pressure gas pipe		High pressure gas pipe	
		inch	mm	inch	mm	inch	mm
8	(1)	3/8	9.52	7/8	22.22	3/4	19.05
16	(2)	1/2	12.70	1 1/8	28.58	7/8	22.22
32	(3)	5/8	15.88	1 3/8	34.92	1 3/8	34.92

Size of the pipe connected to the outdoor unit (A)

Select the size of the main pipe according to the below table.

Outdoor unit capacity (MBH) (Cooling)	Outdoor unit capacity (kW) (Cooling)	*Maximum pipe length within 295 ft (90 m)						*Maximum pipe length over 295 ft (90 m)					
		Liquid		Low pressure gas		High pressure gas		Liquid		Low pressure gas		High pressure gas	
		inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
Capacity ≤ 85	Capacity ≤ 25	Ø3/8	Ø9.52	Ø3/4	Ø19.05	Ø5/8	Ø15.88	Ø1/2	Ø12.70	Ø3/4	Ø19.05	Ø5/8	Ø15.88
85 < Capacity ≤ 99	25 < Capacity ≤ 29			Ø7/8	Ø22.22	Ø3/4	Ø19.05			Ø7/8	Ø22.22	Ø3/4	Ø19.05
99 < Capacity ≤ 120	29 < Capacity ≤ 35			Ø1/2	Ø12.70	Ø7/8	Ø22.22			Ø5/8	Ø15.88	Ø7/8	Ø22.22
119 < Capacity ≤ 140	35 < Capacity ≤ 41												
140 < Capacity ≤ 181	41 < Capacity ≤ 53												
181 < Capacity ≤ 222	53 < Capacity ≤ 65	Ø5/8	Ø15.88	Ø1 1/8	Ø28.58	Ø1 1/8	Ø28.58	Ø3/4	Ø19.05	Ø1 1/8	Ø28.58	Ø1 3/8	Ø34.92
222 < Capacity ≤ 240	65 < Capacity ≤ 70			Ø1 3/8	Ø34.92					Ø1 3/8	Ø34.92		
239 < Capacity ≤ 273	70 < Capacity ≤ 80												
273 < Capacity ≤ 314	80 < Capacity ≤ 92												
314 < Capacity ≤ 369	92 < Capacity ≤ 108	Ø3/4	Ø19.05	Ø1 5/8	Ø41.28	Ø1 3/8	Ø34.92	Ø7/8	Ø22.22	Ø1 5/8	Ø41.28	Ø1 3/8	Ø34.92
369 < Capacity ≤ 409	108 < Capacity ≤ 120												
409 < Capacity ≤ 467	120 < Capacity ≤ 137												
467 < Capacity ≤ 583	137 < Capacity ≤ 171												

*Maximum pipe length : The pipe length between an outdoor unit and the farthest indoor unit.

※ For H/R model, only increase the size of the liquid pipe if pipe length exceeds 295 ft (90 m).

※ For the case that the diameter of the default pipe of an outdoor unit does not match that of the pipe installed on the site, a socket is provided by default together with the outdoor unit

Installing the product



Refrigerant pipe installation

Size of the pipe between branch joints (B)

Select the pipe size according to the sum of indoor unit capacity which will be connected after the branch.

※ However, if the size of the pipe between branch joints (B) is bigger than the size of the pipe connected to the outdoor unit (A), apply the pipe size (A).

Indoor unit capacity (MBH)	Indoor unit capacity (kW)	Branch pipe length within 148 ft (45 m)						Branch pipe length between 148 ft~295 ft (45~90 m)					
		Liquid		Low pressure gas		High pressure gas		Liquid		Low pressure gas		High pressure gas	
		inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
Capacity < 19	Capacity < 5.7	Ø1/4	Ø6.35	Ø1/2	Ø12.7	Ø3/8	Ø9.52	Ø3/8	Ø9.52	Ø1/2	Ø12.7	Ø3/8	Ø9.52
19 ≤ Capacity < 55	5.7 ≤ Capacity < 16	Ø3/8	Ø9.52	Ø5/8	Ø15.88	Ø1/2	Ø12.7	Ø1/2	Ø12.7	Ø5/8	Ø15.88	Ø1/2	Ø12.7
55 ≤ Capacity < 79	16 ≤ Capacity < 23.2			Ø3/4	Ø19.05	Ø5/8	Ø15.88			Ø3/4	Ø19.05	Ø5/8	Ø15.88
79 ≤ Capacity < 115	23.2 ≤ Capacity < 33.6			Ø7/8	Ø22.22	Ø3/4	Ø19.05			Ø7/8	Ø22.22	Ø3/4	Ø19.05
115 ≤ Capacity < 134	33.6 ≤ Capacity < 39.2	Ø1/2	Ø12.7	Ø11/8	Ø28.58	Ø7/8	Ø22.22	Ø5/8	Ø15.88	Ø11/8	Ø28.58	Ø7/8	Ø22.22
134 ≤ Capacity < 153	39.2 ≤ Capacity < 44.8					Ø11/8	Ø28.58					Ø11/8	Ø28.58
153 ≤ Capacity < 191	44.8 ≤ Capacity < 56					Ø11/8	Ø28.58					Ø11/8	Ø28.58
191 ≤ Capacity < 229	56 ≤ Capacity < 67.2	Ø5/8	Ø15.88	Ø1 3/8	Ø34.92	Ø1 3/8	Ø34.92	Ø3/4	Ø19.05	Ø1 3/8	Ø34.92	Ø1 3/8	Ø34.92
229 ≤ Capacity < 248	67.2 ≤ Capacity < 72.8												
248 ≤ Capacity < 287	72.8 ≤ Capacity < 84												
287 ≤ Capacity < 325	84 ≤ Capacity < 95.2	Ø3/4	Ø19.05	Ø1 5/8	Ø41.28	Ø1 5/8	Ø41.28	Ø7/8	Ø22.22	Ø1 5/8	Ø41.28	Ø1 3/8	Ø34.92
325 ≤ Capacity < 382	95.2 ≤ Capacity < 112												
382 ≤ Capacity < 420	112 ≤ Capacity < 123.2												
420 ≤ Capacity < 478	123.2 ≤ Capacity < 140	Ø7/8	Ø22.22	Ø1 3/4	Ø44.45 Note3)	Ø1 1/2	Ø38.10 Note2)	Ø1 1/2	Ø38.10 Note2)	Ø1 3/4	Ø44.45 Note3)	Ø1 1/2	Ø38.10 Note2)
478 ≤ Capacity < 592	140 ≤ Capacity < 173.6												
592 ≤ Capacity < 669	173.6 ≤ Capacity < 196												
669 ≤ Capacity < 726	196 ≤ Capacity < 212.8	Ø7/8	Ø22.22	Ø2 1/8	Ø53.98	Ø1 5/8	Ø41.28	Ø1	Ø25.40 Note1)	Ø21/8	Ø53.98	Ø1 5/8	Ø41.28
726 ≤ Capacity < 822	212.8 ≤ Capacity < 240.8												
822 ≤ Capacity	240.8 ≤ Capacity												

Note1) If Ø1" (25.40 mm) pipe is not available on site, use Ø1 1/8" (28.58 mm) pipe.

Note2) If Ø1 1/2" (38.10 mm) pipe is not available on site, use Ø1 5/8" (41.28 mm) pipe.

Note3) If Ø1 3/4" (44.45 mm) pipe is not available on site, use Ø2 1/8" (53.98 mm) pipe.

**Branch joint (C~E)**

Branch joint between outdoor units (C)

Select a branch joint according to the sum of the capacity of outdoor units connected to the branch joint.

Classification	Outdoor unit capacity		Model name
	MBH	kW	
Y-joint for liquid/low pressure gas pipe (C)	Capacity ≤ 546	Capacity ≤ 160	V1IDBP14HP
Y-joint for high pressure gas pipe (C)	Capacity ≤ 546	Capacity ≤ 160	V1IDBP14HR

First branch joint (D)

Select according to the sum of the capacity of the outdoor unit.

Classification	Outdoor unit capacity		Model name
	MBH	kW	
Y-joint for liquid/low pressure gas pipe (D)	Capacity ≤ 172	Capacity ≤ 50.4	V1IDBP02PR
	Capacity ≤ 229	Capacity ≤ 67.2	V1IDBP03PR
	Capacity ≤ 268	Capacity ≤ 78.4	V1IDBP04PR
	Capacity ≤ 420	Capacity ≤ 123.2	V1IDBP05PR
	Capacity ≤ 650	Capacity ≤ 190.4	V1IDBP06PR
Y-joint for high pressure gas pipe (D)	Capacity ≤ 85	Capacity ≤ 25	V1IDBP08HR
	Capacity ≤ 273	Capacity ≤ 80	V1IDBP09HR
	Capacity ≤ 546	Capacity ≤ 160	V1IDBP10HR

Branch joint (E)

Select a branch joint according to the sum of indoor unit capacity which will be connected after the branch.

※ However, if the branch joints (E) is bigger than the first branch joint (D), apply the branch joint of the same size as the first branch joint (D).

Classification	Indoor unit capacity		Model name
	MBH	kW	
Y-joint for liquid/low pressure gas pipe (E)	Capacity < 55	Capacity < 16	V1IDBP01PR
	55 ≤ Capacity < 191	16 ≤ Capacity < 56	V1IDBP02PR
	191 ≤ Capacity < 248	56 ≤ Capacity < 72.8	V1IDBP03PR
	248 ≤ Capacity < 287	72.8 ≤ Capacity < 84	V1IDBP04PR
	287 ≤ Capacity < 420	84 ≤ Capacity < 123.2	V1IDBP05PR
	420 ≤ Capacity < 669	123.2 ≤ Capacity < 196	V1IDBP06PR
Y-joint for high pressure gas pipe (E)	Capacity < 79	Capacity < 23.2	V1IDBP08HR
	79 ≤ Capacity < 287	23.2 ≤ Capacity < 84	V1IDBP09HR
	287 ≤ Capacity < 554	84 ≤ Capacity < 162.4	V1IDBP10HR
	554 < Capacity	162.4 ≤ Capacity	V1IDBP07HR

Size of the pipe between the branch joint and the indoor unit (F)

Select according to the capacity of the indoor unit.

Indoor unit capacity		Liquid		Gas	
MBH	kW	inch	mm	inch	mm
Capacity ≤ 20	Capacity ≤ 6	Ø1/4	Ø6.35	Ø1/2	Ø12.7
20 < Capacity ≤ 54	6 < Capacity ≤ 16	Ø3/8	Ø9.52	Ø5/8	Ø15.88
54 < Capacity ≤ 78	16 < Capacity ≤ 23	Ø3/8	Ø9.52	Ø3/4	Ø19.05
78 < Capacity	23 < Capacity	Ø3/8	Ø9.52	Ø7/8	Ø22.22

※ If the criteria for selecting the branch in the outdoor installation manual and the branch installation manual are different, please select the branch in accordance with the outdoor installation manual.







- Amount of additional refrigerant for each indoor unit (b)

Unit : lb (kg)

Capacity Index (MBH)	5	6	7	9	12	15	18	20	24	27	28	30	32	36	42	48	54	60	72	76	96	144
1-Way cassette (VOWD***S6-5P)	0.31 (0.14)		0.31 (0.14)	0.51 (0.23)	0.51 (0.23)	0.64 (0.29)	0.64 (0.29)		0.64 (0.29)													
Mini 4-Way cassette S (600x600) (V22D***S6-5P)	0.57 (0.26)		0.57 (0.26)	0.57 (0.26)	0.73 (0.33)		0.73 (0.33)	0.73 (0.33)														
4-Way cassette (V33D***S6-5P)		1.46 (0.66)		1.46 (0.66)	1.46 (0.66)		1.46 (0.66)		1.46 (0.66)			1.74 (0.79)		1.74 (0.79)		1.74 (0.79)						
360 cassette (V36D***S6-5P)				0.90 (0.41)	0.90 (0.41)		0.90 (0.41)		0.90 (0.41)			1.37 (0.62)		1.37 (0.62)		1.37 (0.62)						
LSP duct (VL0D***S6-5P)			0.62 (0.28)	0.62 (0.28)	0.62 (0.28)		0.62 (0.28)		0.62 (0.28)													
MSP duct (VM0D***S6-5P)		0.90 (0.41)	0.90 (0.41)	0.90 (0.41)	0.90 (0.41)	0.90 (0.41)	1.34 (0.61)															
HSP duct (VH1D***S6-5P)									1.34 (0.61)	1.34 (0.61)		1.34 (0.61)		1.68 (0.76)		1.68 (0.76)	1.68 (0.76)			2.34 (1.06)	2.34 (1.06)	
OAP duct (VO0D***S6-5P)																			2.34 (1.06)		2.34 (1.06)	
Floor Standing (VSCD***S6-5P) (VSED***S6-5P)		0.24 (0.11)		0.44 (0.20)	0.44 (0.20)		0.64 (0.29)		0.64 (0.29)													
Ceiling (VUCD***S6-5P)							0.95 (0.43)		0.95 (0.43)					0.95 (0.43)		1.9 (0.86)						
MPAHU(V-AHU) (VVCD***S6-5P)					0.66 (0.30)		1.00 (0.45)		1.00 (0.45)			1.65 (0.75)		1.74 (0.79)		2.34 (1.06)	2.51 (1.14)	3.35 (1.52)	3.35 (1.52)			
Wall mounted (VWMD***S6-5P)	0.46 (0.21)		0.46 (0.21)	0.64 (0.29)	0.64 (0.29)	0.95 (0.43)	0.95 (0.43)		0.95 (0.43)		0.95 (0.43)		1.34 (0.61)									
Hydro unit HE ^(Note1) (VHED***S6-5P)														1.19 (0.54)		1.19 (0.54)					1.39 (0.63)	2.38 (1.08)
Hydro unit HT ^(Note1) (VHTD***S6-5P)																1.19 (0.54)			1.19 (0.54)			
MSB/SVB (**; 01/02/04) (V2MSBB**HR) (VZSOB**HP)	0.66(0.30)																					
MSB/SVB (**; 06/08) (V3MSBB06HR, VZMSBB08HR) (VZSOB**HP)	1.43(0.65)																					
MSB/SVB (**; 12) (V2MSBB**HR) (VZSOB**HP)	2.20(1.00)																					
AHU SVB (VZSOB**AH)	0.66(0.30)																					

- If there is no additional refrigerant value for the indoor unit in the above table, refer to the indoor unit installation manual.
- Additional refrigerant charging of MSB is 1.1 lb (0.5 kg) for every MSB kit.
- If AHU kit is included among the indoor units, add 0.04 lb (0.018 kg) of refrigerant for every 1 MBH of AHU capacity.

^(Note1) In case the capacity conjunction of the Hydro Unit HT/HE exceeds 50 % among the total indoor unit, please don't put the additional refrigerant.





Refrigerant pipe installation

- Method to calculate the total amount of additional refrigerant
 - Amount of additional refrigerant depends on the pipe length (a)
 - Amount of additional refrigerant for each indoor unit (b) = Σ (Amount of additional refrigerant for each connected indoor unit)
 - ※ Refer to the table
 - Total amount of additional refrigerant = a + b
- ※ Sum of total amount of additional refrigerant and the basic amount of refrigerant should not exceed 175.40 lb (79.56 kg).
If the refrigerant exceeds 175.40 lb (79.56 kg), it goes beyond the scope of the UL standards, rendering the safety measures we provide ineffective.
Ex) If the outdoor unit's basic refrigerant amount is 23.15 lb (10.5 kg), the total amount of additional refrigerant(a+b) should not exceed 152.35 lb (69.10 kg).
- Example of refrigerant calculation for H/P and H/R System

Classification	Size of liquid pipe [inch (mm)]	Length [ft (m)]	Unit amount of refrigerant [lb/ft (kg/m)]	Amount of additional refrigerant [lb (kg)]	Total amount of additional refrigerant [lb (kg)]
		①	②	①×②	Σ(①×②)
Liquid pipe (a)	Ø1/4 (Ø6.35)	49.2(15)	0.013 (0.02)	0.64(0.30)	24.19(10.99)
	Ø3/8 (Ø9.52)	367.5(112)	0.037 (0.055)	13.60(6.16)	
	Ø1/2 (Ø12.70)	82.0(25)	0.077 (0.115)	6.31(2.88)	
	Ø5/8 (Ø15.88)	32.8(10)	0.111 (0.165)	3.64(1.65)	

Classification	Model name of indoor unit	Number of indoor units	Unit amount of refrigerant [lb/EA (kg/EA)]	Amount of additional refrigerant [lb (kg)]	Total amount of additional refrigerant [lb (kg)]
		①	②	①×②	Σ(①×②)
Indoor unit (b)	4way cassette (V33D024S6-5P)	4	1.46 (0.66)	5.84 (2.64)	14.56 (6.60)
	4way cassette (V33D036S6-5P)	3	1.74 (0.79)	5.22 (2.37)	
	Wall mounted (VWMD012S6-5P)	1	0.64 (0.29)	0.64 (0.29)	
	MSB/SVB (V3MSBB06HR) / (V2SOB06HP)	2	1.43 (0.65)	2.86 (1.30)	

- Total amount of refrigerant (a+b) = 24.19 + 14.56 = 38.75 (lb)
= 10.99 + 6.60 = 17.59 (kg)





Temper grade and minimum thickness of the refrigerant pipe

Outer diameter		Minimum thickness		Temper grade
inch	mm	inch	mm	
1/4	6.35	0.028	0.70	Annealed
3/8	9.52	0.028	0.70	
1/2	12.70	0.031	0.80	
5/8	15.88	0.039	1.00	
3/4	19.05	0.035	0.90	Drawn
7/8	22.22	0.035	0.90	
1	25.40	0.039	1.00	
1 1/8	28.58	0.043	1.10	
1 1/4	31.75	0.043	1.10	
1 3/8	34.92	0.048	1.20	
1 1/2	38.10	0.053	1.35	
1 5/8	41.28	0.056	1.43	
1 3/4	44.45	0.063	1.60	
2	50.80	0.079	2.00	
2 1/8	53.98	0.083	2.10	



Refrigerant pipe installation

⚠ CAUTION

- For pipes larger than 3/4" (19.05 mm), drawn type (C1220T-1/2H or C1220T-H) type copper pipe must be used. If an annealed type (C1220T-O) copper pipe is used, pipe may break due to its low pressure resistance and cause personal injury.

Keeping refrigerant pipe

To prevent foreign materials or water from entering the pipe, storing method and sealing method (especially during installation) is very important. Apply correct sealing method depending on the environment.

Exposure place	Exposure time	Sealing type
Outdoor	Longer than one month	Pipe pinch
	Shorter than one month	Taping
Indoor	-	Taping

Refrigerant pipe welding and safety information

⚠ CAUTION

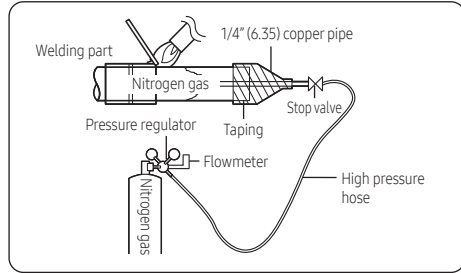
Important information for refrigerant pipe work

- Make sure there is no moisture inside the pipe.
- Make sure there are no foreign substances and impurities in the pipe.
- Make sure there is no leakage.
- Make sure to follow the instruction when welding or storing the pipe.

Nitrogen flushing welding

- When welding the refrigerant pipes, flush them with nitrogen gas as shown in the picture.
- If you do not perform nitrogen flushing when welding the pipes, oxide may form inside the pipe. It can cause the damage of the important parts such as compressor and valves etc.

- Adjust the flow rate of the nitrogen flushing with a pressure regulator to maintain 0.54 ft³/h (0.05 m³/h) or less.



Direction of the pipe when welding

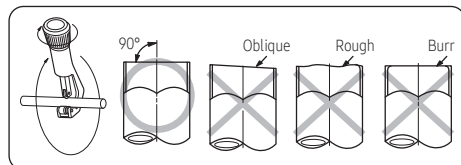
- Direction of the pipe should be headed downward or in a sideways when welding.
- Avoid welding the pipe with pipe direction heading upward.

⚠ CAUTION

- When you test gas leakage after welding the pipes, use a designated solution for gas leakage detection. If you use the detection solution that includes sulfuric ingredient, it may cause corrosion to the pipes.

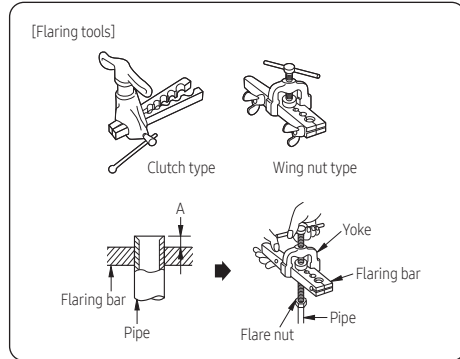
Cutting or flaring the pipes

- Make sure that you prepared the required tools.
 - Pipe cutter, Deburring tool, flaring tool and pipe holder, etc.
- If you want to shorten the pipe, cut it with a pipe cutter ensuring that the cut edge remains at 90° with the side of the pipe.
 - Refer to below illustrations for correct and incorrect examples of cut edges.



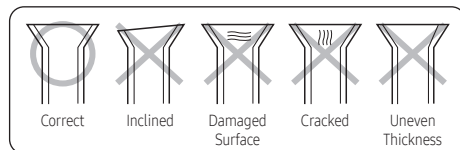


- 3 To prevent a gas leak, remove all burrs at the cut edge of the pipe using a Deburring tool.
- 4 Carry out flaring work using flaring tool as shown below.



	Pipe diameter [D, inch (mm)]	Depth of flaring part [A, inch (mm)]		
		Using flaring tool for R-32	Using conventional flaring tool	
			Clutch type	Wing nut type
	1/4 (6.35)	0 ~ 0.02 (0 ~ 0.5)	0.04 ~ 0.06 (1.0 ~ 1.5)	0.06 ~ 0.08 (1.5 ~ 2.0)
	3/8 (9.52)	0 ~ 0.02 (0 ~ 0.5)	0.04 ~ 0.06 (1.0 ~ 1.5)	0.06 ~ 0.08 (1.5 ~ 2.0)
	1/2 (12.70)	0 ~ 0.02 (0 ~ 0.5)	0.04 ~ 0.06 (1.0 ~ 1.5)	0.06 ~ 0.08 (1.5 ~ 2.0)
	5/8 (15.88)	0 ~ 0.02 (0 ~ 0.5)	0.04 ~ 0.06 (1.0 ~ 1.5)	0.06 ~ 0.08 (1.5 ~ 2.0)

- 5 Check that you flared the pipe correctly.
 - Refer to below illustrations for correct and incorrect examples of flared pipe.



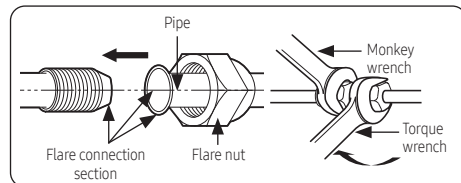
CAUTION

- If foreign matters or burrs are not removed after cutting pipe, refrigerant gas may leak.

- If foreign matters enter inside the pipe, important interior parts of the unit may get damaged or product efficiency will be reduced. So, the direction of pipe should be downward during pipe cutting or flaring.

Connecting the flared pipes

- Check if the flaring is properly done according to the standard size.
- Align the center of the piping and tighten the flare nut with your hands. Then, tighten the flare nut with torque wrench in a direction of the arrow indicated in below illustration.
- Make sure to use ester oil to coat the flare connection section.



Outer diameter (L)		Torque (D)		Flare dimension		Flare shape [inch (mm)]
inch	mm	N·m	lbf·ft	inch	mm	
1/4	6.35	14 ~ 18	10.3 ~ 13.3	0.34 ~ 0.36	8.7 ~ 9.1	
3/8	9.52	34 ~ 42	25.1 ~ 31.0	0.50 ~ 0.52	12.8 ~ 13.2	
1/2	12.7	49 ~ 61	36.1 ~ 45.0	0.64 ~ 0.65	16.2 ~ 16.6	
5/8	15.88	68 ~ 82	50.2 ~ 60.5	0.76 ~ 0.78	19.3 ~ 19.7	

CAUTION

- Blowing Nitrogen gas should be done when welding the pipe.
- Make sure to use the provided flare nut.
- Make sure that there are no cracks or twisted part when you need to bend the pipe.
- Do not fasten the flare nut with excessive strength.
- R-32 is a high pressure refrigerant and there is a risk of refrigerant leakage if the flare connection is not coated with ester oil. Therefore, apply ester oil to coat the flare connection area.

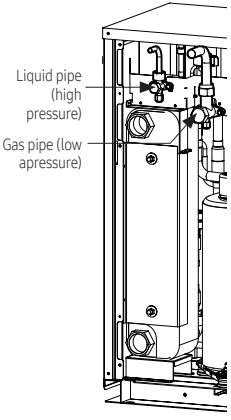
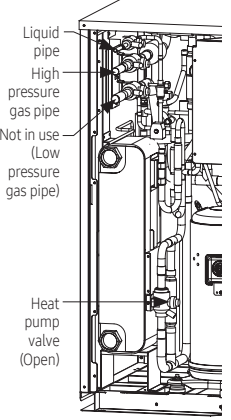
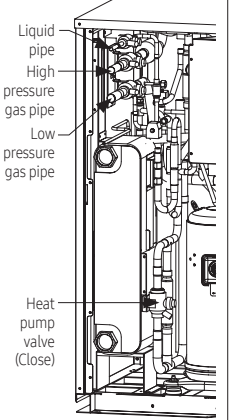




Refrigerant pipe installation

Pipe installation for an outdoor unit

- 1 The outdoor unit of VPD***W6M-5P is the non-modular H/P exclusive system.
- 2 The outdoor unit of VRD***W6M-5* is used for both modular H/P and H/R systems. Connect the liquid and gas pipes to the outdoor unit as shown in the figure.
 - For H/P System, connect liquid and gas pipes. Set the following option switch.
 - For H/R System, connect liquid and high/low pressure gas pipes. Close the internal heat pump valve.
 - For module installation, make sure that each heat pump valve and the following option switch setting is adjusted according to each purpose. (When installing outdoor units in module, E573 error may occur when settings are different between outdoor units.)

Classification	VPD038/048/055*	VRD072/096/120/192/240*	
	H/P system	H/P system	H/R system
Service valve			
Heat pump valve	-	Open (Factory default)	Close (Set during installation)
Option switch	-	Set as "ht 00" (Set during installation)	Set as "ht 01" (Factory default)

※ Refer to "Setting outdoor unit option switches" on page 90 for setting option switches.

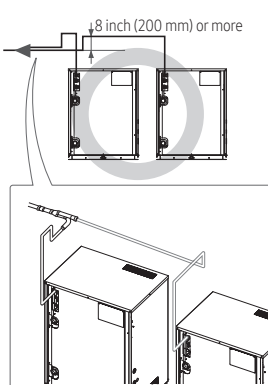
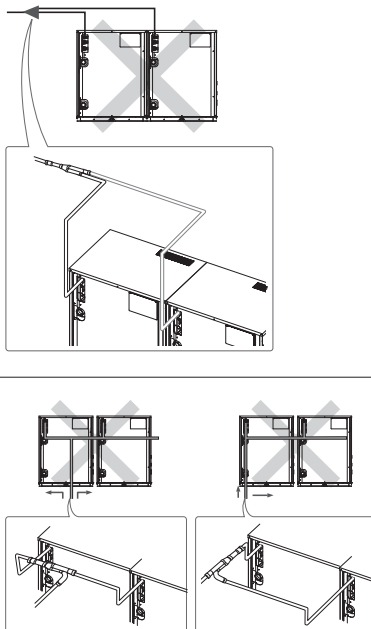




⚠ CAUTION

Caution for welding the pipe to an outdoor unit

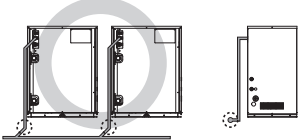
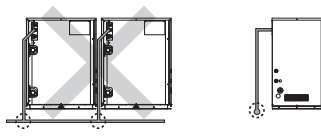
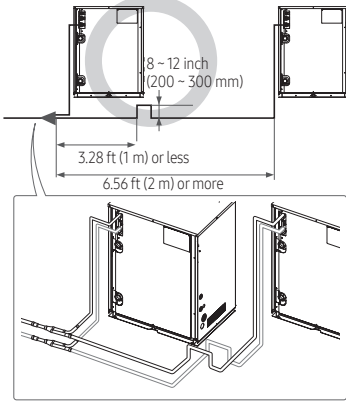
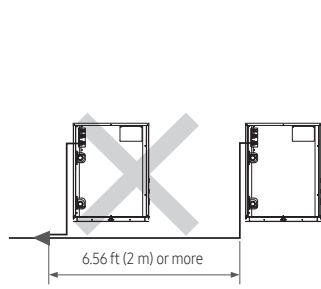
- When welding the pipe, the unit may get damaged by the heat and flame from welding. Use a flame proofing cloth to protect the unit from a brazing fire or flame.
- The O-ring and Teflon packing inside service valve may get damaged by the heat from welding. Wrap the bottom side of the service valve with a wet cloth and weld it. Also, water dripping from the wet cloth may interrupt the welding. Make sure the water does not drip from the wet cloth.
- Make sure that connected pipes does not interrupt each other or make contact with the product. If they contact each other or contact with the outdoor unit, vibration will occur and it may cause damage to the pipes.
- When removing the sealed pipe on the bottom side of the service valve, cut it with a pipe cutter first and then start the welding. When the sealed pipe is welded without cutting, you may get injured by the refrigerant within the pipe.
- The outdoor unit of VRD***W6M-5* is a modular product. Connect the refrigerant pipes between outdoor units as shown in the figure.
- Connect refrigerant pipes between outdoor units.
- To connect pipes between outdoor units, branch joints (that needs to be purchased separate) must be installed.
- ※ For optimal distribution of the refrigerant, you must use Y-joint for connecting outdoor units. (Do not use T-joint)
- When outdoor units are installed in module, there are no restrictions on the order of installation.

Caution	Correct installation	Incorrect installation
When refrigerant pipe is installed at higher level than the pipe connection part of the outdoor unit, you must install a trap at the gas pipe.		





Refrigerant pipe installation

Caution	Correct installation	Incorrect installation
Branch joint between outdoor units must be installed horizontally.		
When the piping length between outdoor unit and the branch joint exceeds 6.56 ft (2 m), install a vertical trap as show in the figure.		

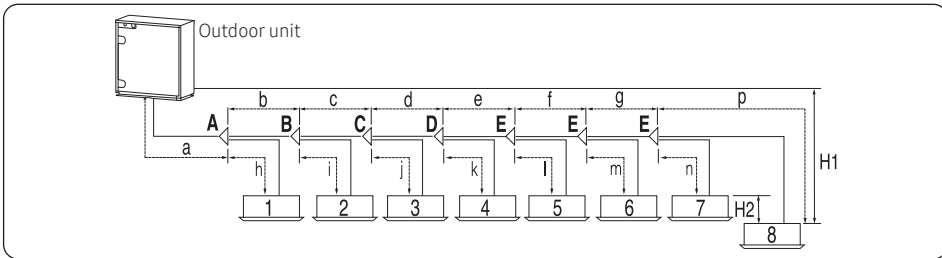




Allowable length of the refrigerant pipe and the installation examples

H/P (VPD038/048/055W6M-5P)

1 Connection by Y-joint



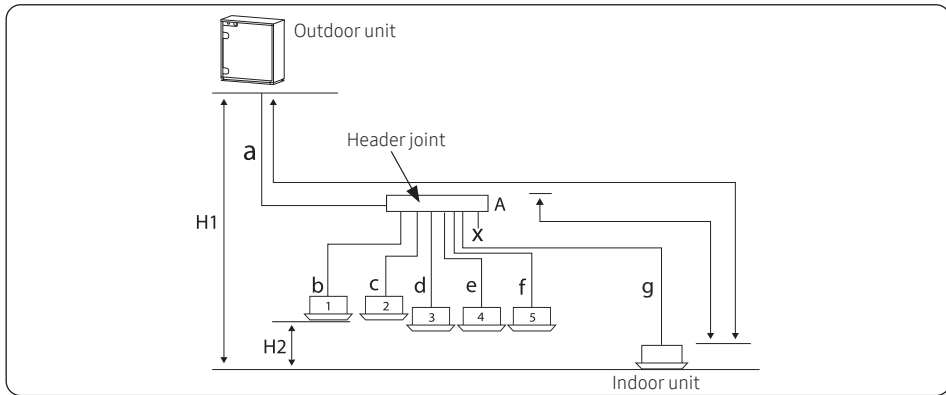
Classification			Y-joint connection	
Maximum allowable length of pipe	Outdoor unit ~ Indoor units	Actual Length	The distance between the outdoor unit and the farthest indoor unit ≤ 246' (75 m) Ex) 8 indoor units a+b+c+d+e+f+g+p≤ 246' (75 m)	
			Equivalent length	The distance between an outdoor unit and the farthest indoor unit ≤ 295' (90 m) The equivalent length between Y-joint and EEV kit: 1.64' (0.5 m)
				Main pipe length
		Total length	The sum of the total length of pipes should be less then 656' (200 m)	
		Maximum allowable height	Outdoor unit ~ Indoor units	Height
Height	H2: The difference of height between indoor units ≤ 49' (15 m)			
Maximum allowable length after Y-joint		Actual Length	The distance between the first Y-joint and the farthest indoor unit ≤ 131' (40 m) Ex) 8 indoor units b+c+d+e+f+g+p≤ 131' (40 m)	

Installing the product

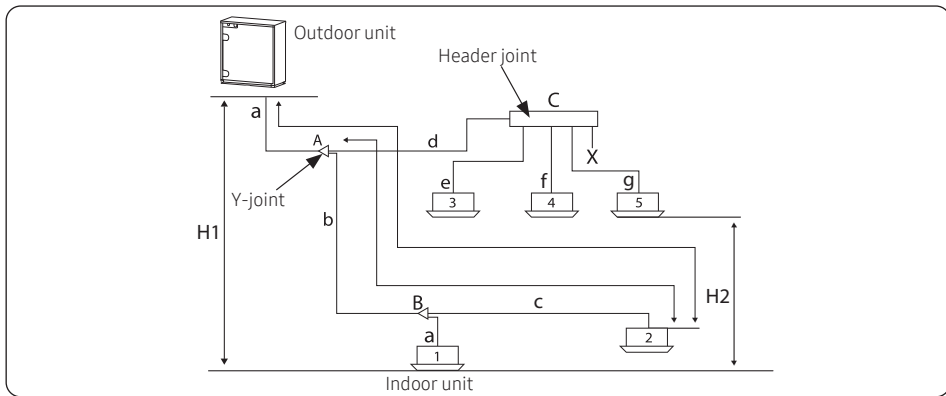


Refrigerant pipe installation

2 Connection by header joint



3 Connection by Y-joint/header joint



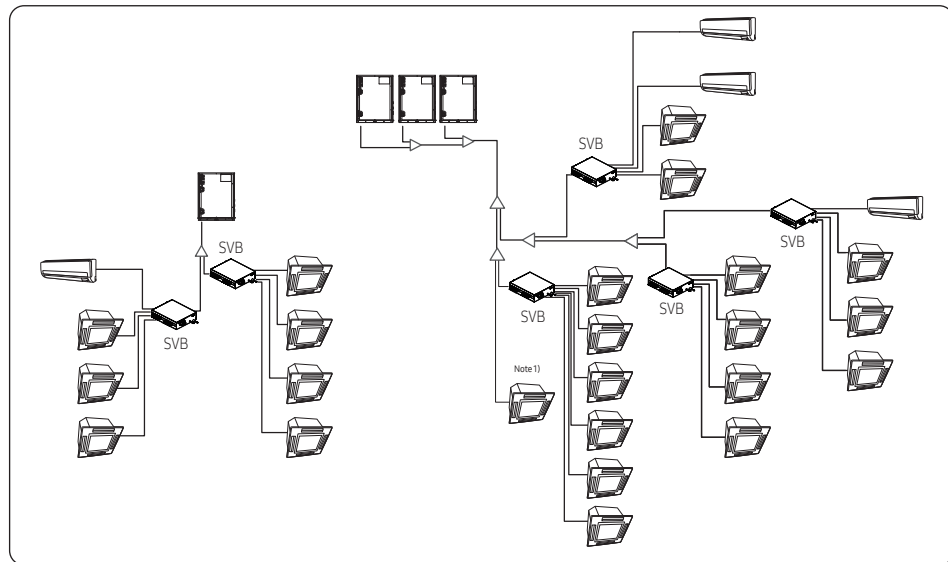


Classification			Header joint connection		Y-joint / header joint connection	
Maximum allowable length of pipe	Outdoor unit ~ Indoor units	Actual Length	The distance between an outdoor unit and the farthest indoor unit ≤ 246' (75 m)			
			Ex) 8 indoor units a+g≤ 246' (75 m)		Ex) 8 indoor units a+b+c ≤ 246' (75 m)	
		Equivalent length	The distance between an outdoor unit and the farthest indoor unit ≤ 295' (90 m)			
		Main pipe length	The main pipe(a) from the outdoor unit to the first Y-joint should be less than 164' (50 m).			
		Total length	The sum of total length of pipes should be less then 656' (200 m).			
Maximum allowable height	Outdoor unit ~ Indoor units	Height	H1: The difference in height between an outdoor unit and indoor unit ≤ 98' (30 m)			
		Height	H2: The difference in height between indoor units ≤ 49' (15 m)			
Maximum allowable length after Y-joint		Actual Length	The distance between the header joint and the indoor unit ≤ 131' (40 m) Ex) b, c ~ f, g ≤ 131' (40 m)		The distance between the first Y-joint and the farthest indoor unit ≤ 131' (40 m) Ex) 8 indoor units b+c, d+g ≤ 131' (40 m)	

Examples of refrigerant pipe installation

H/P (VRD072/096/120/192/240W6M-5*)

Using Y-joint



Note 1) Indoor unit without SVB (for H/P only)

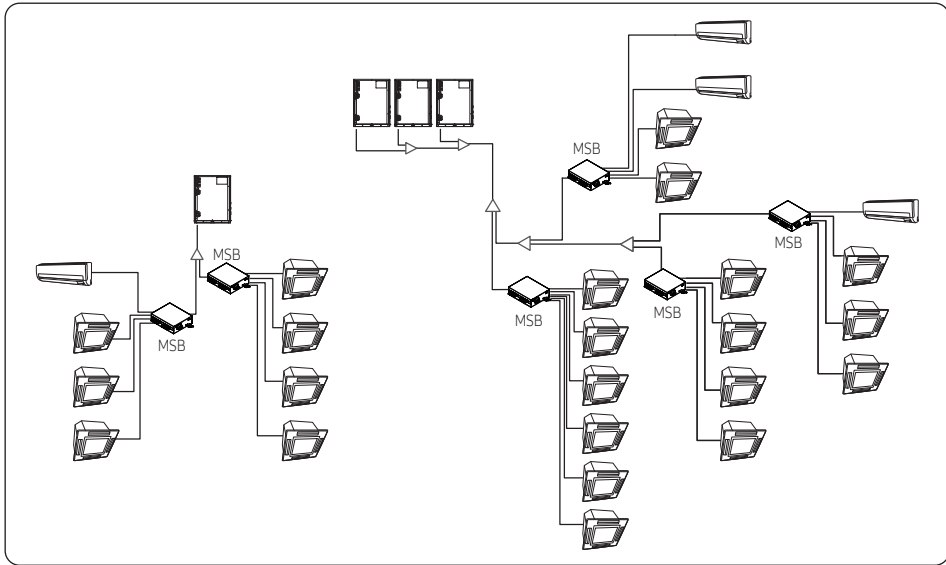
- Consult a qualified installer to ensure compliance with all safety standards related to refrigerant leakage and to determine whether an SVB connection is required.



Refrigerant pipe installation

H/R (VRD072/096/120/192/240W6M-5*)

Using Y-joint



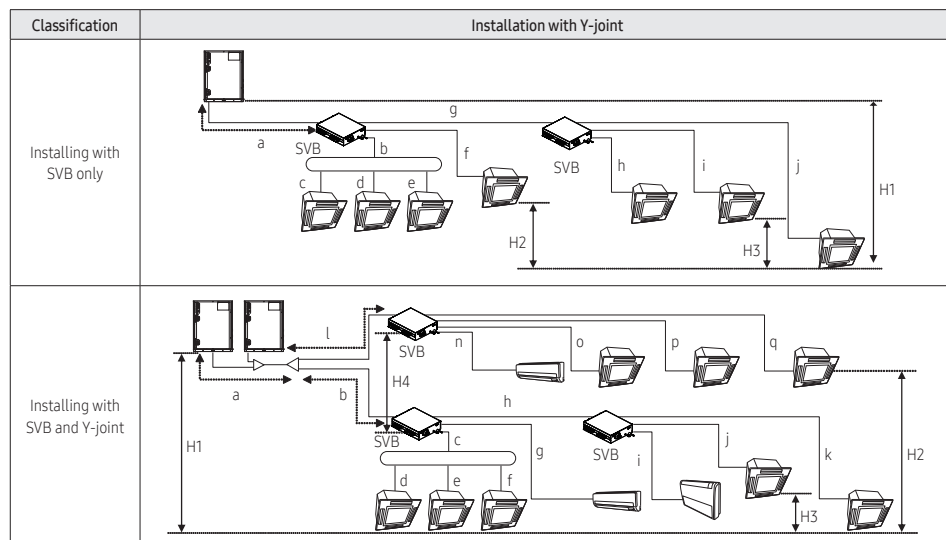
Installing the product





Allowable length of the refrigerant pipe and the installation examples

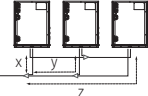
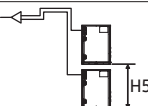
H/P (VRD072/096/120/192/240W6M-5*)



Installing the product



Refrigerant pipe installation

Classification				Example		Remarks	
Maximum allowable pipe length	Outdoor unit ~ Indoor unit	Actual pipe length (Equivalent length)	558' (170 m) or less	Installing only with SVB	$a+g+j \leq 558' (623') / 170 \text{ m} (190 \text{ m})$	Equivalent length Y-joint: 1.64' (0.5 m) Distribution header: 1 m SVB: 3.28' (1 m)	
			[623' (190 m) or less]	Installing with SVB and Y-joint	$a+b+h+k \leq 558' (623') / 170 \text{ m} (190 \text{ m})$		
		Total length of pipe	1640' (500 m) or less	Installing only with SVB	$a+b+c+d+e+f+g+h+i+j \leq 1640' (500 \text{ m})$		
				Installing with SVB and Y-joint	$a+b+c+d+e+f+g+p+h+i+j+k+m+n+o+p+q \leq 1640' (500 \text{ m})$		
	Outdoor unit ~ Outdoor unit (Module installation)	Pipe length	33' (10 m) or less	$x \leq 33' (10 \text{ m}), y \leq 33' (10 \text{ m}), z \leq 33' (10 \text{ m})$			
		Equivalent length	43' (13 m) or less	$x \leq 43' (13 \text{ m}), y \leq 43' (13 \text{ m}), z \leq 43' (13 \text{ m})$			
		Height difference	4.9' (1.5 m) or less	$H5 \leq 4.9' (1.5 \text{ m})$			
	SVB ~ Indoor unit	Pipe length	148' (45 m) or less	Installing only with SVB	$b+c \leq 148' (45 \text{ m}), b+d \leq 148' (45 \text{ m}), b+e \leq 148' (45 \text{ m}), f \leq 148' (45 \text{ m}), g+h \leq 148' (45 \text{ m}), g+i \leq 148' (45 \text{ m}), g+j \leq 148' (45 \text{ m})$		
				Installing with SVB and Y-joint	$c+d, c+e, c+f, g, h+i, h+j, h+k, n, o, p, q \leq 148' (45 \text{ m})$		
Maximum allowable height difference	Outdoor unit ~ Indoor unit	Pipe length	164'/131' (50 m/40 m) Note 1)	$H1 \leq 164'/131' (50 \text{ m}/40 \text{ m})$			
	Indoor unit ~ Indoor unit		131' (40 m) or less	$H2 \leq 131' (40 \text{ m})$			
			But, when VWMD***S6-5P is installed, H2 is 49' (15 m) or less.				
	Indoor unit ~ Indoor unit (in one SVB)		49' (15 m) or less	$H3 \leq 49' (15 \text{ m})$			
	SVB ~ SVB		98' (30 m) or less	$H4 \leq 98' (30 \text{ m})$			
Maximum allowable length after branch joint	First branch joint ~ Farthest Indoor unit	Pipe length	148' (45 m) or less	Installing only with SVB	$g+j \leq 148' (45 \text{ m})$		
				Installing with SVB and Y-joint	$b+h+k \leq 148' (45 \text{ m}), l+q \leq 148' (45 \text{ m})$		
			148' ~ 295' (45 m ~ 90 m) Note 2)	Required conditions must be satisfied			



Note 1) When indoor unit is located at higher level than outdoor unit, allowable height difference is 361 ft (110 m), (If the height difference is over 131 ft (40 m), contact your local dealer for more information.) but when the indoor unit is located at lower level than outdoor unit, allowable height difference is 361 ft (110 m) (If the height difference is over 164 ft (50 m), need to decide whether to install PDM kit or not.)

Model name of the PDM kit : MXD-A38K2A, MXD-A12K2A, MXD-A58K2A

Note 2) Required condition

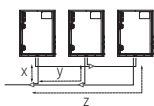
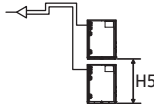
Classification	Condition	Example
First branch joint ~ Farthest Indoor unit	$148' (45 \text{ m}) \leq b+h+k, l+q \leq 295' (90 \text{ m})$: Size of the branch liquid and low pressure gas pipes (b, l) must be increased by 1 grade.	
Total length of extended pipe	If the size of pipe (main pipe), between the first branch joint and the outdoor unit, is not increased by 1 grade, $a+(b+l) \times 2+c+d+e+f+g+h+i+j+k+n+o+p+q \leq 1640' (500 \text{ m})$ If the size of pipe (main pipe), between the first branch joint and the outdoor unit, is increased by 1 grade, $(a+b+l) \times 2+c+d+e+f+g+h+i+j+k+n+o+p+q \leq 1640' (500 \text{ m})$	
SVB ~ Each indoor unit	$c+d, c+e, c+f, g, h+i, h+j, h+k, n, o, p, q \leq 148' (45 \text{ m})$	
Difference between the distance of the outdoor unit to the farthest indoor unit and nearest indoor unit $\leq 148' (45 \text{ m})$ $(a+b+h+k) - (a+b+c+d) \leq 148' (45 \text{ m})$		

※ In case of connecting more than one indoor unit in one SVB Port, the below indoor units cannot be combined. OAP duct(VOSD***S6-5P), Hydro Unit(VH*D***S6-5P)

※ In case of connecting two SVB ports with Y-joint, the indoor units cannot be combined to more than one.





Classification				Example		Remarks
Maximum allowable pipe length	Outdoor unit ~ Indoor unit	Actual pipe length (Equivalent length)	558' (170 m) or less [623' (190 m) or less]	Installing only with MSB	$a+g+j \leq 558'(623') / 170 \text{ m} (190 \text{ m})$	Equivalent length Y-joint: 1.64' (0.5 m) Distribution header: 1 m MSB: 3.28' (1 m)
				Installing with MSB and Y-joint	$a+b+h+k \leq 558'(623') / 170 \text{ m} (190 \text{ m})$	
		Total length of pipe	1640' (500 m) or less	Installing only with MSB	$a+b+c+d+e+f+g+h+i+j \leq 1640' (500 \text{ m})$	
				Installing with MSB and Y-joint	$a+b+c+d+e+f+g+p+h+i+j+k+m+n+o+p+q \leq 1640' (500 \text{ m})$	
	Outdoor unit ~ Outdoor unit (Module installation)	Pipe length	33' (10 m) or less	$x \leq 33' (10 \text{ m}), y \leq 33' (10 \text{ m}), z \leq 33' (10 \text{ m})$		
		Equivalent length	43' (13 m) or less	$x \leq 43' (13 \text{ m}), y \leq 43' (13 \text{ m}), z \leq 43' (13 \text{ m})$		
		Height difference	4.9' (1.5 m) or less	$H5 \leq 4.9' (1.5 \text{ m})$		
	MSB ~ Indoor unit	Pipe length	148' (45 m) or less	Installing only with MSB	$b+c \leq 148' (45 \text{ m}), b+d \leq 148' (45 \text{ m}), b+e \leq 148' (45 \text{ m}), f \leq 148' (45 \text{ m}), g+h \leq 148' (45 \text{ m}), g+i \leq 148' (45 \text{ m}), g+j \leq 148' (45 \text{ m})$	
				Installing with MSB and Y-joint	$c+d, c+e, c+f, g, h+i, h+j, h+k, n, o, p, q \leq 148' (45 \text{ m})$	
	Maximum allowable height difference	Outdoor unit ~ Indoor unit	Pipe length	164'/131' (50 m/40 m) Note 1)	$H1 \leq 164'/131' (50 \text{ m}/40 \text{ m})$	
Indoor unit ~ Indoor unit		131' (40 m) or less		$H2 \leq 131' (40 \text{ m})$		
		But, when VWMD***S6-5P is installed, H2 is 49' (15 m) or less.				
Indoor unit ~ Indoor unit (in one MSB)		49' (15 m) or less		$H3 \leq 49' (15 \text{ m})$		
MSB ~ MSB		98' (30 m) or less		$H4 \leq 98' (30 \text{ m})$		
Maximum allowable length after branch joint	First branch joint ~ Farthest Indoor unit	Pipe length	148' (45 m) or less	Installing only with MSB	$g+j \leq 148' (45 \text{ m})$	
				Installing with MSB and Y-joint	$b+h+k \leq 148' (45 \text{ m}), l+q \leq 148' (45 \text{ m})$	
			148' ~ 295' (45 m ~ 90 m) Note 2)	Required conditions must be satisfied		

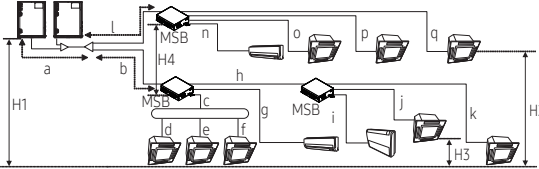


Refrigerant pipe installation

Note 1) When indoor unit is located at higher level than outdoor unit, allowable height difference is 361 ft (110 m), (If the height difference is over 131 ft (40 m), contact your local dealer for more information.) but when the indoor unit is located at lower level than outdoor unit, allowable height difference is 361 ft (110 m) (If the height difference is over 164 ft (50 m), need to decide whether to install PDM kit or not.)

Model name of the PDM kit : MXD-A38K2A, MXD-A12K2A, MXD-A58K2A

Note 2) Required condition

Classification	Condition	Example
First branch joint ~ Farthest Indoor unit	$148' (45 \text{ m}) \leq b+h+k, l+q \leq 295' (90 \text{ m})$: Size of the branch liquid and low pressure gas pipes (b, l) must be increased by 1 grade.	
Total length of extended pipe	If the size of pipe (main pipe), between the first branch joint and the outdoor unit, is not increased by 1 grade, $a+(b+l) \times 2+c+d+e+f+g+h+i+j+k+n+o+p+q \leq 1640' (500 \text{ m})$	
	If the size of pipe (main pipe), between the first branch joint and the outdoor unit, is increased by 1 grade, $(a+b+l) \times 2+c+d+e+f+g+h+i+j+k+n+o+p+q \leq 1640' (500 \text{ m})$	
MSB ~ Each indoor unit	$c+d, c+e, c+f, g, h+i, h+j, h+k, n, o, p, q \leq 148' (45 \text{ m})$	
Difference between the distance of the outdoor unit to the farthest indoor unit and nearest indoor unit $\leq 148' (45 \text{ m})$ $(a+b+h+k) - (a+b+c+d) \leq 148' (45 \text{ m})$		

※ In case of connecting more than one indoor unit in one MSB Port, the below indoor units cannot be combined. OAP duct(VOSD***S6-5P), Hydro Unit(VH*D***S6-5P)

※ In case of connecting two MSB ports with Y-joint, the indoor units cannot be combined to more than one.

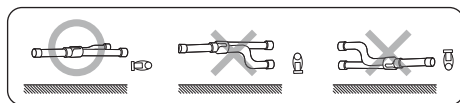




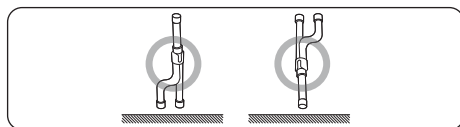
Installing the branch joints

Branch joints must be installed 'horizontally' or 'vertically'.

Horizontal installation

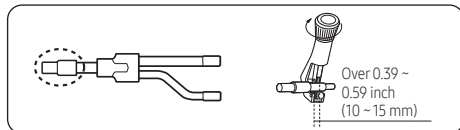


Vertical installation



NOTE

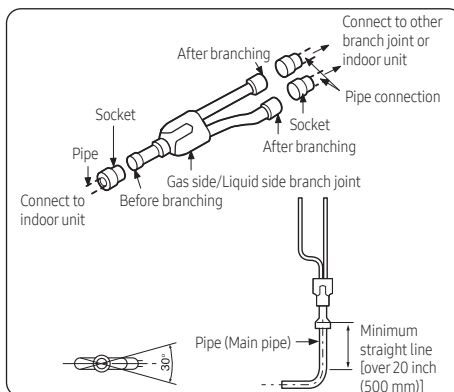
- Cut the connection part of the branch joint or the provided socket, according to the diameter of the connection pipe, before connecting them.



CAUTION

- Install the branch joint within $\pm 15^\circ$ of the horizon or vertical line.
- Make sure that the pipe is not bent at where it is connected to the branch joint.

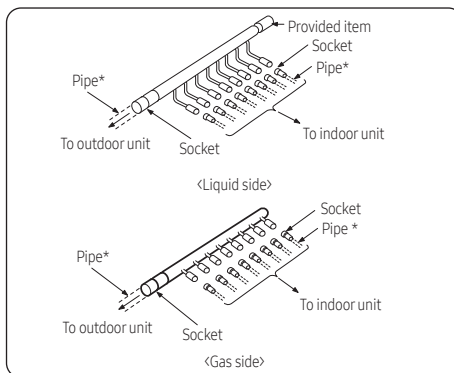
- Keep a minimum straight line distance of 20 inch (500 mm) or more before connecting branch joint.



※ Install within $\pm 15^\circ$ of the horizon or vertical line.

Installing the distribution header

- 1 Select the reducer that fits the diameter of the pipe.



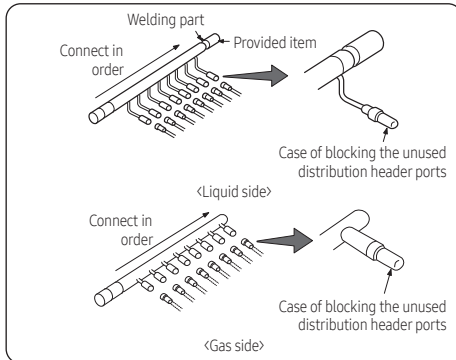
※ Pipe : Separately purchased item





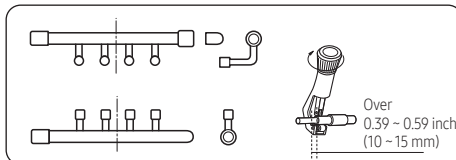
Refrigerant pipe installation

- 2 If the number of connected indoor unit is fewer than ports on the distribution header, block the unused ports with caps.



NOTE

- Cut the provided socket, according to the diameter of the connection pipe, before connecting it.

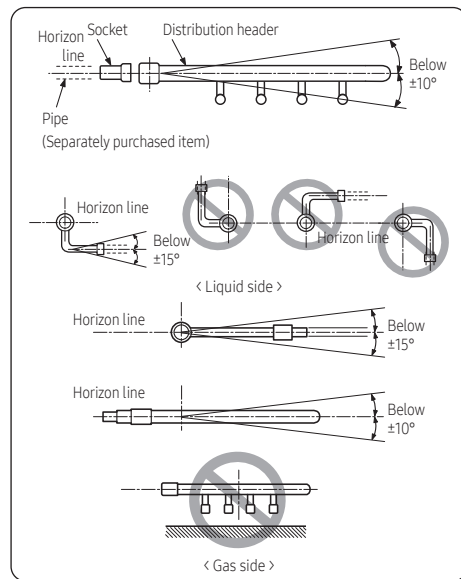


CAUTION

- Connect the indoor units in order, while following the direction of the arrow shown in the illustration.
- When indoor units are connected to same distribution head, indoor unit must be connected in order of their capacity, from largest to smallest.

- 3 Install the distribution header horizontally.

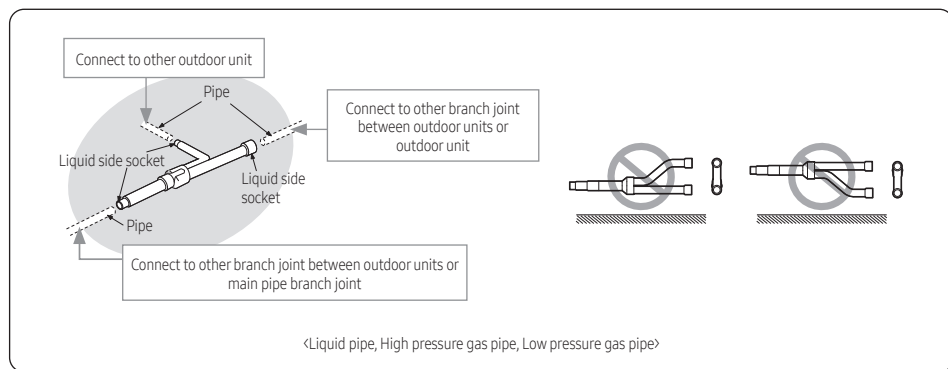
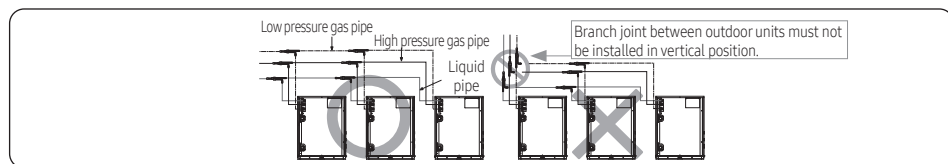
- Install the distribution header horizontally so that its ports do not face down.





Installing the branch joint between outdoor units

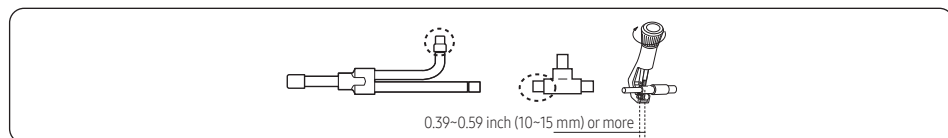
Installation of outdoor joints (VRD072/096/120/192/240W6M-5*)



※ Use a provided liquid side socket according to the size of the selected pipe.

NOTE

- Cut the connection part of the outdoor unit connection pipe or the provided socket, according to the diameter of the connection pipe, before connecting them.





Electrical wiring work

Specification of the circuit breaker and power cable

Electric Characteristics

1 Heat Pump (1 phase 208 ~ 230V)

Nominal Capacity (Ton)	Model name	Module1		
		RLA		Power Supply
		Comp 1	MCA	
3	VPD038W6M-5P	15.9	20	35
4	VPD048W6M-5P	18.9	24	40
5	VPD055W6M-5P	20.7	26	45

2 Heat Pump (3 phase 208~230V) - Premium Energy Efficiency Type

Nominal Capacity (Ton)	Model name	Module 1				Module 2				Module 3			
		RLA		Power Supply		RLA		Power Supply		RLA		Power Supply	
		Comp1	Comp 2	MCA	MOP	Comp1	Comp 2	MCA	MOP	Comp1	Comp 2	MCA	MOP
6	VRD072W6M-5Y	12.7	-	16	25	-	-	-	-	-	-	-	-
8	VRD096W6M-5Y	18.3	-	23	40	-	-	-	-	-	-	-	-
10	VRD120W6M-5Y	23.9	-	30	50	-	-	-	-	-	-	-	-
12	VRD144W6M-5Y2	12.7	-	16	25	12.7	-	16	25	-	-	-	-
14	VRD168W6M-5Y2	12.7	-	16	25	18.3	-	23	40	-	-	-	-
16	VRD192W6M-5Y	17.5	17.5	39.6	50	-	-	-	-	-	-	-	-
18	VRD216W6M-5Y2	18.3	-	23	40	23.9	-	30	50	-	-	-	-
22	VRD264W6M-5Y2	12.7	-	16	25	17.5	17.5	39.6	50	-	-	-	-
24	VRD288W6M-5Y2	18.3	-	23	40	17.5	17.5	39.6	50	-	-	-	-
28	VRD336W6M-5Y3	12.7	-	16	25	12.7	-	16	25	17.5	17.5	39.6	50
30	VRD360W6M-5Y3	12.7	-	16	25	18.3	-	23	40	17.5	17.5	39.6	50
32	VRD384W6M-5Y3	18.3	-	23	40	18.3	-	23	40	17.5	17.5	39.6	50

3 Heat Pump (3 phase 208~230V) - Premium Compact Type

Nominal Capacity (Ton)	Model name	Module 1				Module 2				Module 3			
		RLA		Power Supply		RLA		Power Supply		RLA		Power Supply	
		Comp1	Comp 2	MCA	MOP	Comp1	Comp 2	MCA	MOP	Comp1	Comp 2	MCA	MOP
20	VRD240W6M-5Y	29.3	29.3	66	90	-	-	-	-	-	-	-	-
26	VRD312W6M-5Y2	12.7	-	16	25	29.3	29.3	66	90	-	-	-	-
28	VRD336W6M-5Y2	18.3	-	23	40	29.3	29.3	66	90	-	-	-	-
30	VRD360W6M-5Y2	23.9	-	30	50	29.3	29.3	66	90	-	-	-	-
34	VRD408W6M-5Y3	12.7	-	16	25	18.3	-	23	40	29.3	29.3	66	90





4 Heat Pump (3 phase 460V) - Premium Energy Efficiency Type

Nominal Capacity (Ton)	Model name	Module 1				Module 2				Module 3			
		RLA		Power Supply		RLA		Power Supply		RLA		Power Supply	
		Comp 1	Comp 2	MCA	MOP	Comp 1	Comp 2	MCA	MOP	Comp 1	Comp 2	MCA	MOP
6	VRD072W6M-5G	7.9	-	10	15	-	-	-	-	-	-	-	-
8	VRD096W6M-5G	8.7	-	11	15	-	-	-	-	-	-	-	-
10	VRD120W6M-5G	12.4	-	15.6	25	-	-	-	-	-	-	-	-
12	VRD144W6M-5G2	7.9	-	10	15	7.9	-	10	15	-	-	-	-
14	VRD168W6M-5G2	7.9	-	10	15	8.7	-	11	15	-	-	-	-
16	VRD192W6M-5G	11.5	11.5	26.2	35	-	-	-	-	-	-	-	-
18	VRD216W6M-5G2	8.7	-	11	15	12.4	-	15.6	25	-	-	-	-
22	VRD264W6M-5G2	7.9	-	10	15	11.5	11.5	26.2	35	-	-	-	-
24	VRD288W6M-5G2	8.7	-	11	15	11.5	11.5	26.2	35	-	-	-	-
28	VRD336W6M-5G3	7.9	-	10	15	7.9	-	10	15	11.5	11.5	26.2	35
30	VRD360W6M-5G3	7.9	-	10	15	8.7	-	11	15	11.5	11.5	26.2	35
32	VRD384W6M-5G3	8.7	-	11	15	8.7	-	11	15	11.5	11.5	26.2	35

5 Heat Pump (3 phase 460V) - Premium Compact Type

Nominal Capacity (Ton)	Model name	Module 1				Module 2				Module 3			
		RLA		Power Supply		RLA		Power Supply		RLA		Power Supply	
		Comp 1	Comp 2	MCA	MOP	Comp 1	Comp 2	MCA	MOP	Comp 1	Comp 2	MCA	MOP
20	VRD240W6M-5G	14.6	14.6	33	45	-	-	-	-	-	-	-	-
26	VRD312W6M-5G2	7.9	-	10	15	14.6	14.6	33	45	-	-	-	-
28	VRD336W6M-5G2	8.7	-	11	15	14.6	14.6	33	45	-	-	-	-
30	VRD360W6M-5G2	12.4	-	15.6	25	14.6	14.6	33	45	-	-	-	-
34	VRD408W6M-5G3	7.9	-	10	15	8.7	-	11	15	14.6	14.6	33	45



NOTE

- RLA is based on AHRI 1230 Cooling Standard Condition [Indoor Temp : 80 °F/26.7 °C / 67 °F/19.46 °C(WB), Inlet Water Temp : 86 °F (30 °C)]
- Voltage Tolerance is ±10 %
- Maximum allowable voltage between phases is 2 %
- Refer to module combination table for independent units information
- Symbols
 - RLA : Rated Load Ampere
 - MCA : Minimum Circuit Ampere (A)
 - MOP : Maximum Overcurrent Protective Device (A)

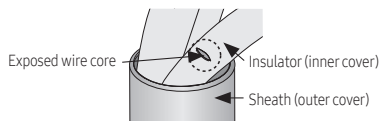


Electrical wiring work

⚠ CAUTION

Caution for electrical work

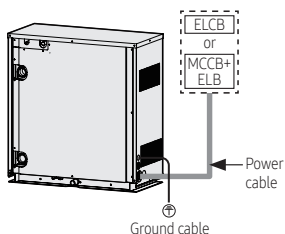
- You must install ELCB or MCCB + ELB
 - ELCB: Earth leakage breaker
 - MCCB: Molded case circuit breaker
 - ELB: Earth leakage breaker
- Do not operate the outdoor unit before completing the refrigerant pipe work.
- Do not disconnect or change the cable inside the product. It may cause damage to the product.
- Specification of the power cable is selected based on following installation condition; culvert installation/ ambient temperature 86 °F (30 °C)/ single multi conductor cables. If the condition is different from the ones stated, please consult an electrical installation expert and re-select the power cable.
 - If the length of power cable exceed 164.04 ft (50 m), re-select the power cable considering the voltage drop.
- Use a power cable made out of incombustible material for the insulator (inner cover) and the sheath (outer cover).
- Do not use the power cable with the core wire exposed due to insulator damage occurred during removal of the sheath. When the core wire is exposed, it may cause fire.



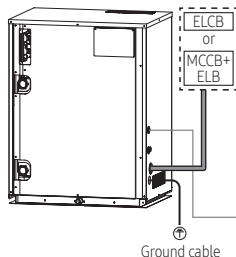
〈The example of exposed core wire〉

Power and communication cable configuration

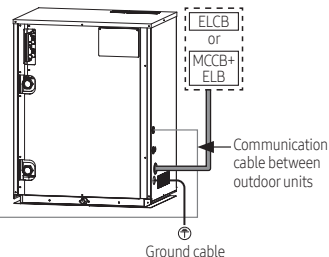
- Main power and the ground cable must be withdrawn through the knock-out hole on the bottom-right or right side of the cabinet.
- Withdraw the communication cable from the designated knock-out hole on the bottom-right side of the front part.
- Install the power and communication cable using separate cable protection tube.
- Fix a protection tube to the knock-out hole on the outdoor unit by using a CD connector or bushing. Make sure to use insulating bushing.
- Make sure that power and communication cables do not block the front panel.



〈VPD038/048/055W6M-5P〉



〈VRD072/096/120/192/240W6M-5*〉





Specification of the protection tube

Name	Temper grade	Applicable conditions
Flexible PVC conduit	PVC	When the protection tube is installed indoor and not exposed to outside, because it is embedded in concrete structure
Class 1 flexible conduit	Galvanized steel sheet	When the protection tube is installed indoor but exposed to outside so there are risk of damage to the protection tube
Class 2 flexible conduit	Galvanized steel sheet and Soft PVC compound	When the protection tube is installed outdoor and exposed to outside so there are risk of damage to the protection tube and extra waterproof is needed

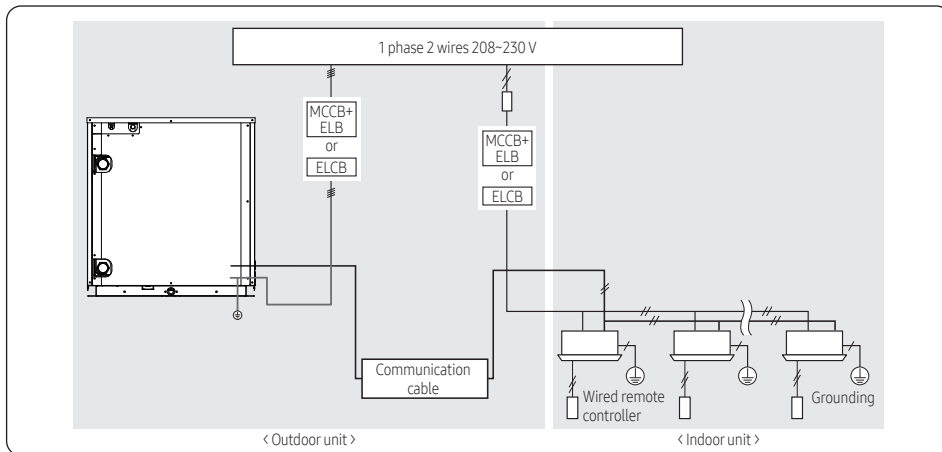
⚠ CAUTION

Caution for perforating the knock-out hole

- Perforate a knock-out hole by punching it with a hammer.
- After perforating the knock-out hole, apply rust resisting paint around the hole.
- When you need to pass the cables through the knock-out hole, remove burrs on the hole and protection the cable with a protection tape or bushing etc.

Power wiring diagram

1 phase 2 wires 208~230 V (VPD***W6M-5P)



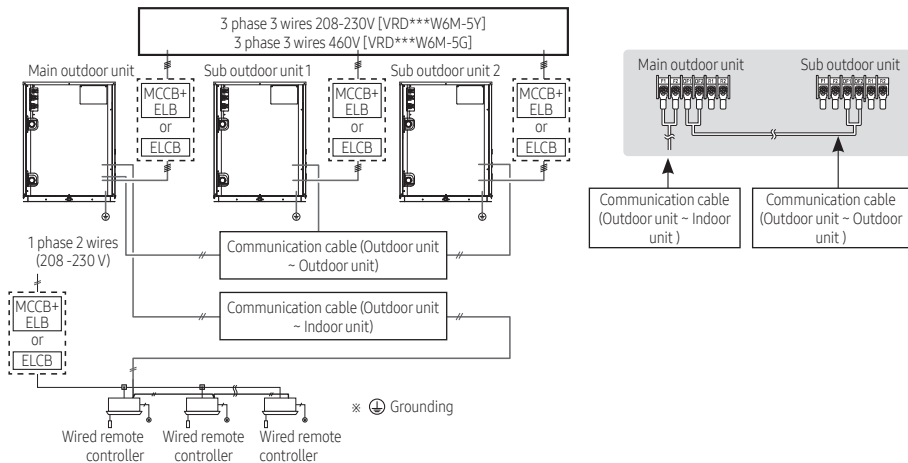
- Connect a power cable of the outdoor unit after checking that L-N (1 phase 2 wires) is properly connected. (If the power of 208 ~ 230 V is supplied to the N phase, PCB and other electrical parts will be damaged.)
 - Communication cable between indoor units has no polarity.
 - Arrange the cables with a cable tie.
- ※ ELCB and ELB must be installed since there is risk of electric shock or fire when they are not installed.





Electrical wiring work

3 phase 3 wires 208~230 V [VRD***W6M-5Y] / 3 phase 3 wires 460 V [VRD***W6M-5G]



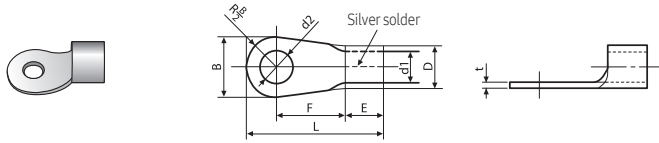
- Connect a power cable of the outdoor unit after checking that R-S-T (3 phase 3 wire) is properly connected.
 - Communication cable between indoor and outdoor units and communication cable between outdoor units has no polarity.
 - Arrange the cables with a cable tie.
- ※ ELCB and ELB must be installed since there is risk of electric shock or fire when they are not installed.





Selecting solderless ring terminal

- Select a solderless ring terminal for a power cable according to the nominal dimensions for cable.
- Apply insulation coating to the connection part of the solderless ring terminal and the power cable.



[Unit : lb (kg)]

Nominal dimensions for cable [inch ² (mm ²)]		0.006/0.009 (4/6)		0.016 (10)	0.025 (16)		0.039 (25)		0.054 (35)		0.078 (50)	0.109 (70)
Nominal dimensions for screw [inch (mm)]		0.157 (4)	0.315 (8)	0.315 (8)	0.315 (8)	0.315 (8)	0.315 (8)	0.315 (8)	0.315 (8)	0.315 (8)	0.315 (8)	0.315 (8)
B	Standard dimension [inch (mm)]	0.374 (9.5)	0.591 (15)	0.591 (15)	0.630 (16)	0.472 (12)	0.650 (16.5)	0.630 (16)	0.866 (22)	0.866 (22)	0.945 (24)	
	Allowance [inch (mm)]	±0.008 (±0.2)		±0.008 (±0.2)		±0.012 (±0.3)		±0.012 (±0.3)		±0.012 (±0.3)	±0.016 (±0.4)	
D	Standard dimension [inch (mm)]	0.220 (5.6)		0.280 (7.1)	0.354 (9)	0.453 (11.5)		0.524 (13.3)		0.531 (13.5)	0.689 (17.5)	
	Allowance [inch (mm)]	+0.012 (+0.3) -0.008 (-0.2)		+0.012 (+0.3) -0.008 (-0.2)	+0.012 (+0.3) -0.008 (-0.2)	+0.020 (+0.5) -0.008 (-0.2)		+0.020 (+0.5) -0.008 (-0.2)		+0.020 (+0.5) -0.008 (-0.2)	+0.020 (+0.5) -0.016 (-0.4)	
d1	Standard dimension [inch (mm)]	0.134 (3.4)		0.177 (4.5)	0.228 (5.8)	0.303 (7.7)		0.370 (9.4)		0.449 (11.4)	0.524 (13.3)	
	Allowance [inch (mm)]	±0.008 (±0.2)		±0.008 (±0.2)	±0.008 (±0.2)	±0.008 (±0.2)		±0.008 (±0.2)		±0.012 (±0.3)	±0.016 (±0.4)	
E	Min. [inch (mm)]	0.236 (6)		0.311 (7.9)	0.374 (9.5)	0.433 (11)		0.492 (12.5)		0.689 (17.5)	0.728 (18.5)	
F	Min. [inch (mm)]	0.197 (5)	0.354 (9)	0.354 (9)	0.512 (13)	0.591 (15)	0.512 (13)	0.512 (13)	0.512 (13)	0.551 (14)	0.787 (20)	
L	Max. [inch (mm)]	0.787 (20)	1.122 (28.5)	1.181 (30)	1.299 (33)	1.339 (34)		1.496 (38)	1.693 (43)	1.969 (50)	2.008 (51)	
d2	Standard dimension [inch (mm)]	0.169 (4.3)	0.331 (8.4)	0.331 (8.4)	0.331 (8.4)	0.331 (8.4)	0.331 (8.4)	0.331 (8.4)	0.331 (8.4)	0.331 (8.4)	0.331 (8.4)	
	Allowance [inch (mm)]	+0.008 (+0.2) 0 (0)	+0.016 (+0.4) 0 (0)	+0.016 (+0.4) 0 (0)	+0.016 (+0.4) 0 (0)	+0.016 (+0.4) 0 (0)		+0.016 (+0.4) 0 (0)		+0.016 (+0.4) 0 (0)	+0.016 (+0.4) 0 (0)	
t	Min. [inch (mm)]	0.035 (0.9)		0.045 (1.15)	0.057 (1.45)	0.067 (1.7)		0.071 (1.8)		0.071 (1.8)	0.079 (2.0)	

Installing the product

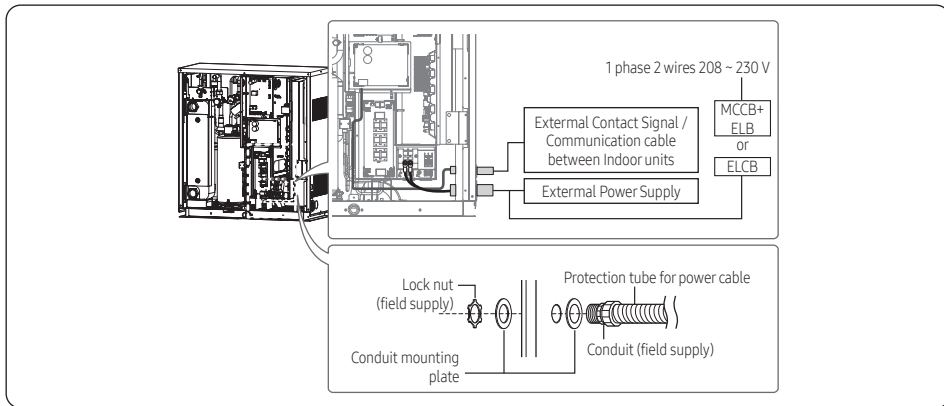


Electrical wiring work

Connecting the power terminal

- Connect the cables to the terminal board with solderless ring terminals.
- Properly connect the cables by using certified and rated cables and make sure to fix them properly so that external force is not applied to the terminal.
- Use a driver and wrench that can apply the rated torque when tightening the screws on the terminal board.
- Tighten the terminal screws by complying rated torque value. If the terminal is loose, fire can occur due to arc heat generation and if the terminal is too tight, terminal board could get damaged.

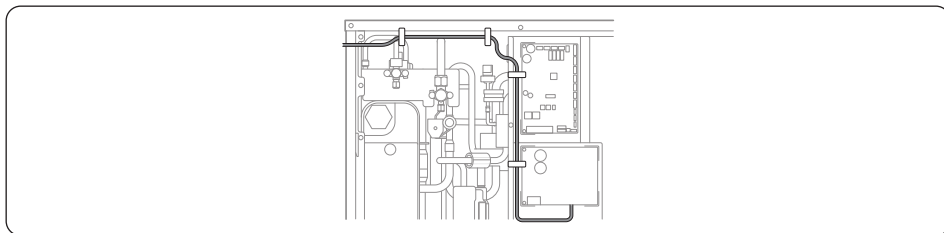
VPD038/048/055W6M-5P



Screw	Tightening torque for terminal		Remarks
	N·m	lbf·ft	
M4	1.2~1.8	0.9~1.3	Communication : F1, F2
M5	2.0~3.0	1.5~2.2	1 phase AC power supply : 1(L), 2(N), L, N

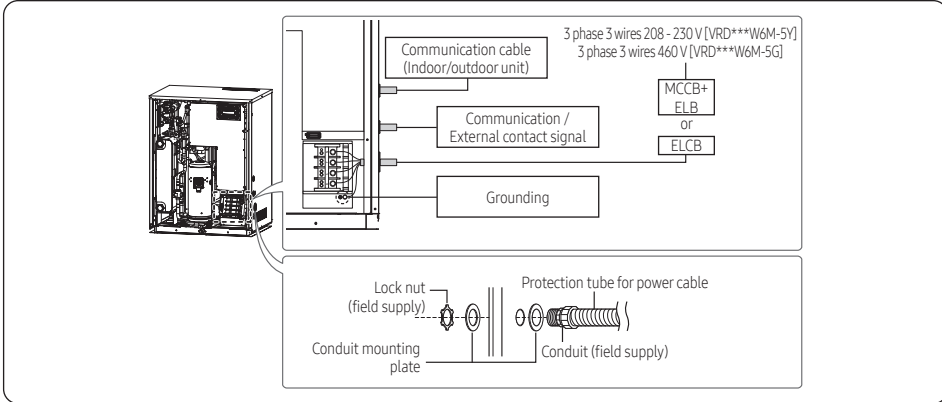
See the following figure when connecting the communication or external contact through the knock-out hole on the top left corner of the cabinet.

(Field installation range for the power cable protection tube)





VRD***W6M-5Y / VRD***W6M-5G



CAUTION

- When removing the outer sheath of the power supply cable, be careful not to scratch the inner sheath of the cable.
- Make sure that more than 1 inch (20 mm) of the outer sheath of the indoor unit power and communication cable are inside the electrical component box.
- Install the communication cable separately from power cable and other communication cables.

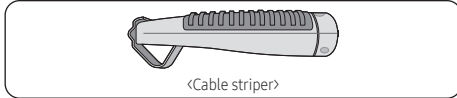
Screw	Tightening torque for terminal		Remarks
	N·m	lbf·ft	
M4	1.2~1.8	0.9~1.3	1 phase 208~230 V power cable
M8	5.5~7.3	4.1~5.4	3 phase 208~230 V / 460 V power cable



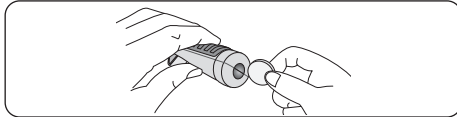


Electrical wiring work

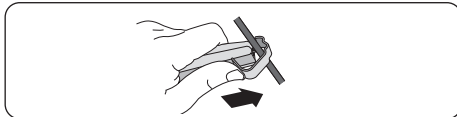
Examples of how to use the cable stripper



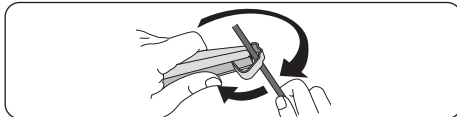
- 1 Adjust the blade position by coin. (Controller is at the bottom side of the tool.) Fix the blade position according to the outer sheath thickness of the power cable.



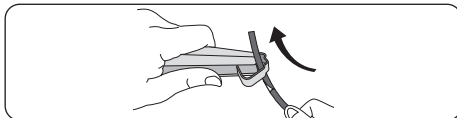
- 2 Fix the power cable and tool by using the hook at the top side of the tool.



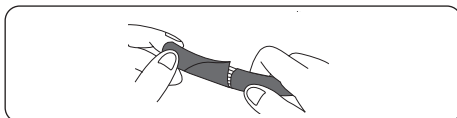
- 3 Cut out the outer sheath of the power cable by revolving the tool in the direction of the arrow, two or three times.



- 4 At this situation, cut out the outer sheath of the power cable by moving the tool toward the direction of the arrow.



- 5 Slightly bend the wire and pull out the cut part of the outer sheath.



Fixing the power cable

⚠ CAUTION

- Do not let the power cable come into contact with the pipes inside the outdoor unit. If the power supply cable touches the pipes, the vibration of the compressor is transferred to the pipes and can damage the power supply cables or pipes, creating the danger of fire or explosion.
- Make sure that the place where the sheath of power supply cable is removed is inside the power supply box. If it is impossible, you should connect the protection tube for power cable to the power supply box.
- After arranging the power cable into the power supply box, tighten the cover.

Connect the ring terminal of 3 phase cable

- 1 Cut the power cable to an appropriate length and connect it with the solderless terminal.
- 2 After connecting the power cable to the terminal as seen in the illustration, fix it with cable tie.
- 3 Fix the housing, which has an insulator, to the terminal board.

Fixing the ground cable

- Connect the ground cable to the grounding hole inside the power supply box.

Withdrawing the power cable

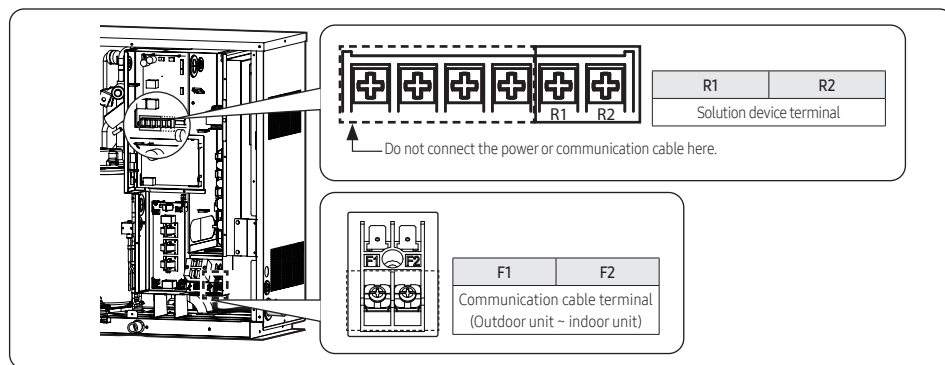
- Through the cable withdrawing hole, penetrate the knock out hole on the side and connect the protection tube (for power cable) up to the power box.
- ※ When penetrating knock out hole, be careful not to damage the heat exchanger pipe or temperature sensor.
- ※ Be sure that the power supply cable is not damaged by burr on the knock-out hole.





Installing the Solution device

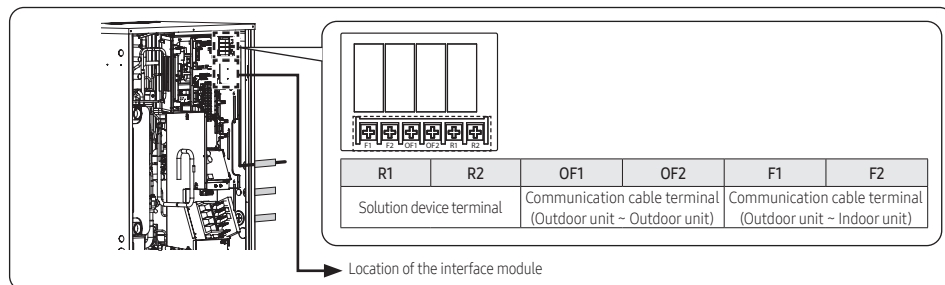
VPD***W6M-5P



- ※ When connecting the communication cable, use a terminal block to fix it.

VRD***W6M-5Y / VRD***W6M-5G

- When the number of indoor units installed with the outdoor unit is 16 or less



- ※ When connecting the communication cable, use a wire holder to fix it.
- ※ To connect old communication type upper level controller, interface module must be installed. For detail instruction of installation, refer to the installation manual of corresponding interface module.





Electrical wiring work

Grounding work

Grounding must be done by a qualified installer for your safety.

Grounding the power cable

- The standard of grounding may vary according to the rated voltage and installation place of the Water-cooled VRF.
- Ground the power cable according to the following table.

Power condition Installation place	Voltage to ground is lower than 150 V	Voltage to ground is over 150 V
High humidity	Must perform the grounding work 3. ^{Note 1)} (Including the case where earth leakage breaker is installed)	
Average humidity	Perform grounding work 3. ^{Note 1)}	Must perform the grounding work 3. ^{Note 1)} (Including the case where earth leakage breaker is installed)
Low humidity	Perform grounding work 3, if possible, for your safety. ^{Note 2)}	

Note 1) About grounding work 3.

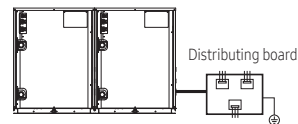
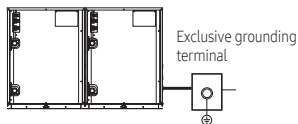
- Grounding work must be done by an expert (with qualification).
- Check if the grounding resistance is lower than 100 Ω . When installing a earth leakage breaker (that can cut the electric circuit within 0.5 second in case of a short circuit), allowable grounding resistance should be 30~500 Ω .

Note 2) Grounding at dry place

- The grounding resistance should be lower than 100 Ω . Even in worst case, grounding resistance should be lower than 250 Ω .

Performing the grounding work

- Use a rated grounding cable by referring to the specification of the electric cable for the outdoor unit.
 - ※ When using the exclusive grounding terminal
(When the grounding terminal is already built on the house)
 - ※ When using grounding of the switch board



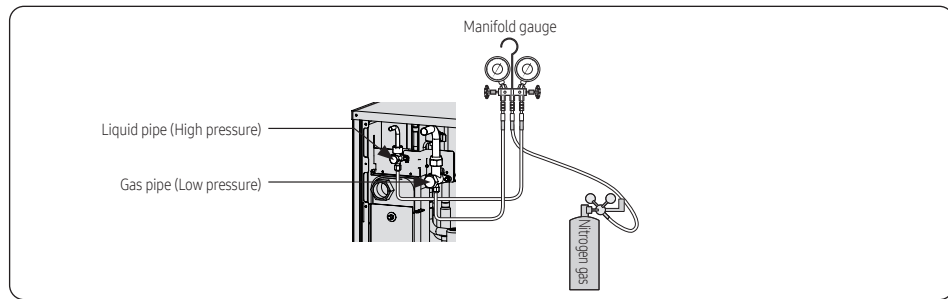


Air tightness test and vacuum drying

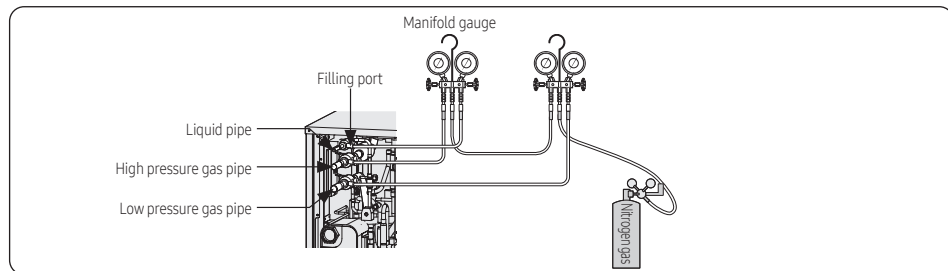
Air tightness test

- Use tools for R-32 to prevent the inflow of foreign substances and resist against the internal pressure.
- Do not remove the core of filling port.
- Use Nitrogen gas for air tightness test as shown in the illustration.

VPD038/048/055W6M-5P



VRD072/096/120/192/240W6M-5*



Installing the product





Air tightness test and vacuum drying

Apply pressure to the liquid side pipe and gas side pipe (when installing outdoor units in module) with Nitrogen gas at 4.1 MPa (594.6 psi).

If you apply pressure at more than 4.1 MPa (594.6 psi), pipes may get damaged. Apply pressure with pressure regulator and pay attention to the pressure of the nitrogen.

Keep it for minimum 24 hours to check if pressure drops.

After applying Nitrogen gas, check there's any change of pressure, using a pressure regulator.

If the pressure drops, check for gas leakage.

If the pressure is changed, apply soap water to check for leakage and check the pressure of the nitrogen gas again.

Maintain 1.0 MPa (145 psi) of the pressure before performing vacuum drying and check for further gas leakage.

After checking the first gas leakage, maintain 1.0 MPa (145 psi) to check for further gas leakage.

⚠ CAUTION

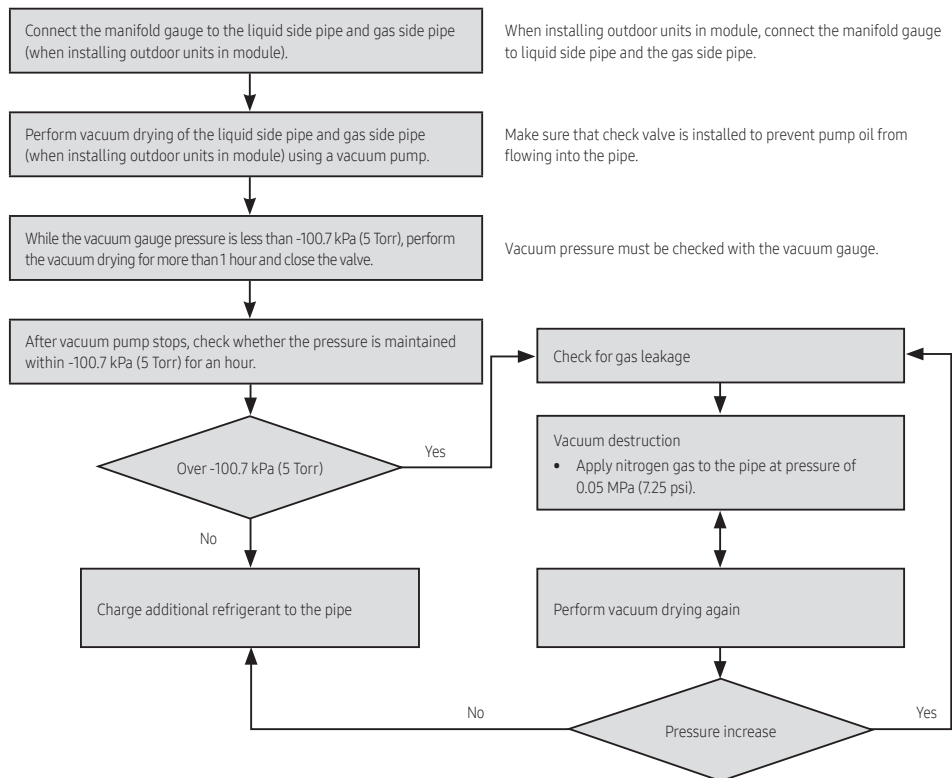
- Perform a Nitrogen gas leak test with the service valve of the outdoor unit closed.
- When charging the nitrogen gas, charge it from the both (high•low pressure) sides.
- If the pipe is filled in a short time with a highly excessive pressure of Nitrogen gas, the pipes may get damaged. Make sure to use a regulator to prevent the high pressure Nitrogen gas, over 4.1 MPa (594.6 psi), from entering into the pipe.





Vacuum drying pipes and indoor units

- Use tools for R-32 to prevent the inflow of foreign substances and resist against the internal pressure.
- Use vacuum pump that allows vacuuming under -100.7 kPa (5 Torr).
- Use the vacuum pump with the check valve to prevent pump oil from flowing backward while the vacuum pump is stopped.
- Completely close the liquid/gas side service valve of the outdoor unit.



- ※ If the pressure rises in an hour, either water is remaining inside the pipe or there is a leakage.
- ※ When the ambient temperature of vacuuming pipe is low (less than 32 °F/0 °C), moisture might remain within the pipe. Therefore, pay special attention to the pipe sealing in the winter.





Pipe insulation

Insulating the refrigerant pipes and branch joints

- Check for gas leakage before completing (the hose and pipe insulation) and if there is no sign of leakage, make sure to insulate the pipes and hoses.
- Use EPDM material insulator that meets the following conditions.

Test item	Unit	Standard
Density	g/cm ³	0.048~0.096
Dimensional change rate by heat	%	Below -5
Absorption rate	g/cm ³	Below 0.005
Thermal conduction rate	W/m·K	Below 0.037
Moisture transpiration factor	ng/(m ² ·s·Pa)	Below 15
Moisture transpiration grade	g/(m ² ·24h)	Below 15
Formaldehyde dispersion	mg/L	There should be none
Oxygen rate	%	Over 25

Selecting the refrigerant pipe insulator

- Insulate the gas pipe and liquid pipe by referring to the thickness of insulator for each pipe size.
- The standard condition is; temperature at 86 °F (30 °C), humidity less than 85%. If case if the humidity is higher, you must increase the size by 1 grade as stated in below table.

Pipe	Outer diameter		Insulator (Cooling, Heating)				Remarks
			General [86 °F (30 °C), 85%]		High humidity [86 °F (30 °C), over 85%]		
			EPDM, NBR				
	inch	mm	inch	mm			
Liquid pipe	1/4 ~ 3/8	6.35 ~ 9.52	3/8	9	3/8	9	Heating resisting temperature over 248 °F (120 °C)
	1/2 ~ 2	12.7 ~ 50.8	1/2	13	1/2	13	
Gas pipe	1/4	6.35	1/2	13	3/4	19	
	3/8-1	9.52 ~ 25.4	3/4	19	1	25	
	1 1/8 ~ 1 3/4	28.58 ~ 44.45	3/4	19	1 1/4	32	
	2	50.8	1	25	1 1/2	38	

- ※ When installing insulation in places and conditions below, use the same insulation that is used for high humidity conditions.

<Geological condition>

- High humidity places such as shoreline, hot spring, near lake or river, and ridge (when the part of the building is covered by earth and sand.)

<Operation purpose condition>

- Restaurant ceiling, sauna, swimming pool etc.

<Building construction condition>

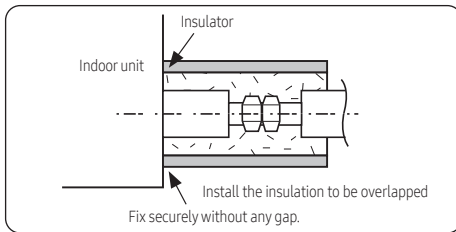
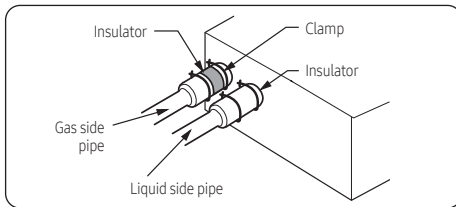
- The ceiling frequently exposed to moisture and cooling is not covered. (e.g. The pipe installed at a corridor of a dormitory and studio or near an exit that opens and closes frequently.)
- The place where the pipe is installed is highly humid due to the lack of ventilation system.





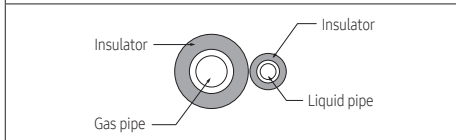
Insulate the refrigerant pipe

- Make sure to insulate the refrigerant pipe, branch joint, distribution header, and the connection part of the pipes.
- If you insulate the pipes, condensed water will not fall from the pipes.
- Check if there are any cracks on the insulation at the bent part of the pipe.



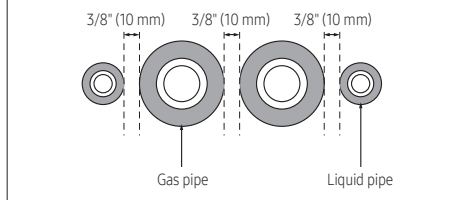
Insulating pipes

- The insulation of the gas and liquid pipes can be in contact with each other but they should not press excessively against each other.
- When the gas side and liquid side pipes are contacting each other, increase the thickness of the insulation by 1 grade.



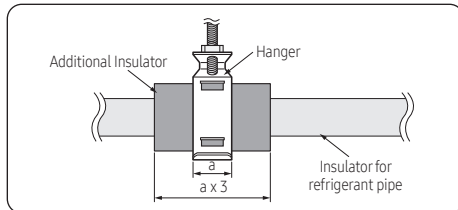
Insulating pipes after MSB or SVB.

- When installing the gas side and liquid side pipes, leave at least 3/8" (10 mm) of space.
- When the gas side and liquid side pipes are contacting each other, increase the thickness of the insulation by 1 grade.



CAUTION

- Install the insulation without any gaps or cracks and use adhesive on the connection part of it to prevent moisture from entering.
- Bind the refrigerant pipe with insulation tape if it is exposed to outside sunlight. (When binding the pipe with finishing tape, be careful not to reduce the thickness of the insulation.)
- Install the refrigerant pipe respecting that the insulation does not get thinner on the bent part or hanger of pipe.
- When the thickness of insulation is reduced, reinforce the reduced thickness with additional insulation.

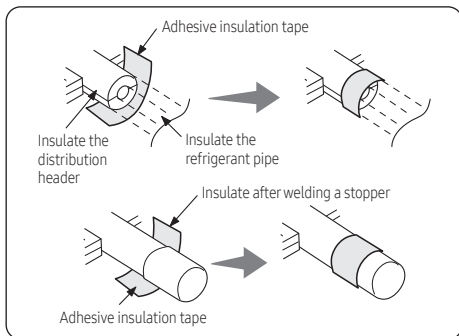
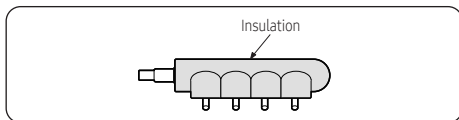




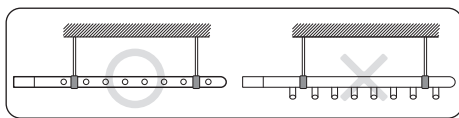
Pipe insulation

Insulate the distribution header

- Fix the distribution header with a cable tie and cover the connected part.
- Insulate the distribution header and the welded part and wrap the connected part with an adhesive insulation tape to prevent dew formation.

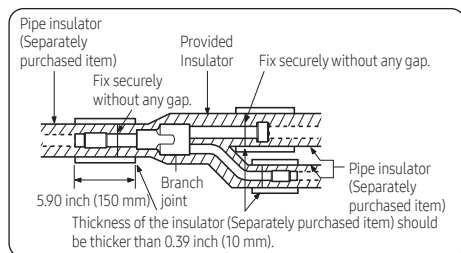


- Fix the distribution header with a hanger after insulating it.



Insulating the branch joint

- Tightly attach the insulator, provided with the branch joint, to the separately purchased insulator. Wrap the connected part with an insulator (separately purchased item) that has thickness of at least 0.39 inch (10 mm).
- Use an insulator that resist heat up to 248 °F (120 °C). Wrap the branch joint with an insulation that has thickness of at least 0.39 inch (10 mm).

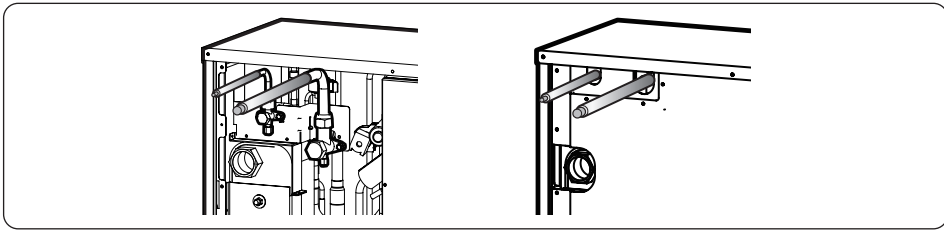




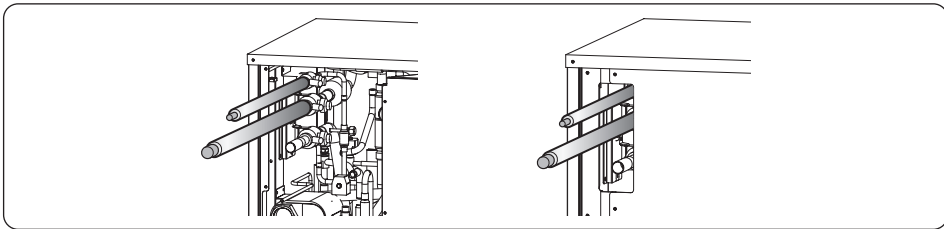
Insulating the pipe located inside of the outdoor unit

- With a pipe insulator, insulate the pipe up to whole service valve located inside of the outdoor unit.
- Seal the gap between the outdoor unit pipe and the insulator. Rainwater and dewdrops may soak through the gap between the pipe and the insulation of the outdoor unit installed on the outside.
- Separate the cover of the pipe and close it after insulation work. Only remove a knock-out hole cover where the pipe will be installed. If the knock-out hole is open unnecessarily, it must be closed. If not, small animals such as squirrels and rats may get into the unit through the hole and the unit may be damaged.

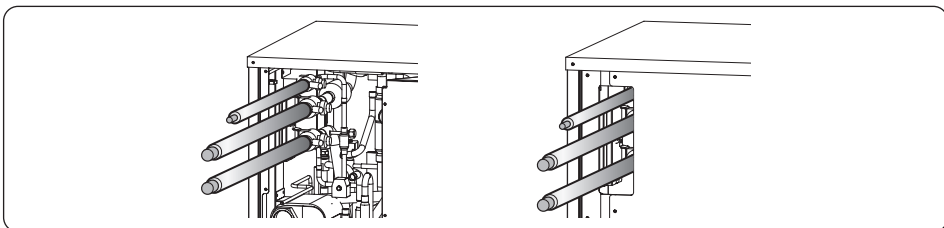
H/P (VPD038/048/055W6M-5P)



H/P (VRD072/096/120/192/240W6M-5*)



H/R (VRD072/096/120/192/240W6M-5*)

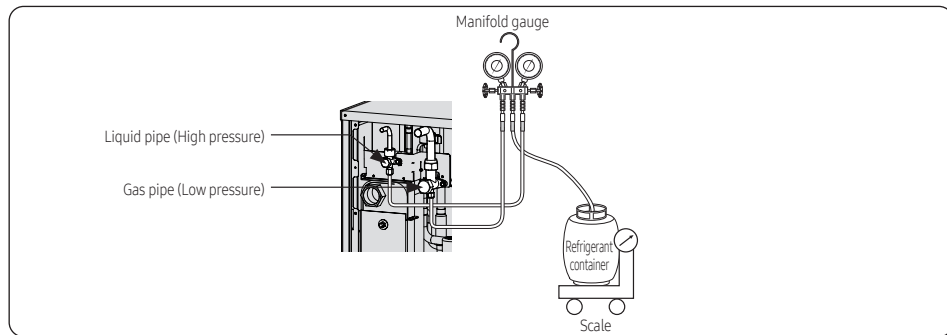




Refrigerant collection

Collecting refrigerant (to a refrigerant container)

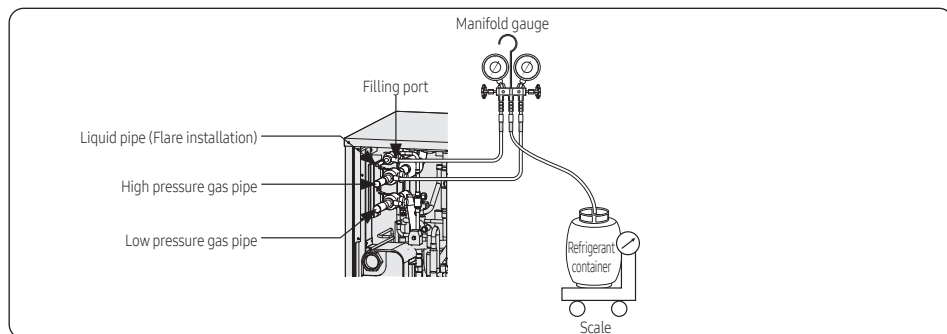
VPD038/048/055W6M-5P



VRD072/096/120/192/240W6M-5*

You cannot collect the entire refrigerant in the system at once during pump down operation. Therefore you must collect additional refrigerant into the empty refrigerant container prior to pump down operation.

- 1 Connect a refrigerant container to an outdoor unit as shown in the illustration and operate about 50 % of the indoor units in cooling mode.
- 2 When the pressure on the high pressure side is over 2.94 MPa (426 psi), decrease the number of operating indoor unit.
- 3 Open the manifold gauge (that is connected to the liquid side service valve) and the valve on the refrigerant container to collect refrigerant.



CAUTION

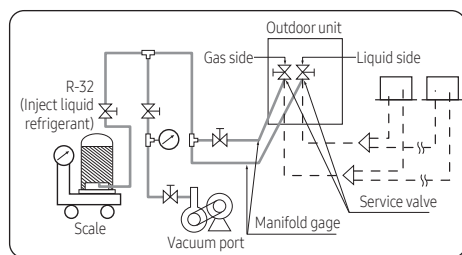
- Refrigerant must be collected prior to pump down operation.
- Make sure that amount of collecting refrigerant does not exceed capacity of the refrigerant container.
- Refer to service manual for detail instruction.



Charging refrigerant

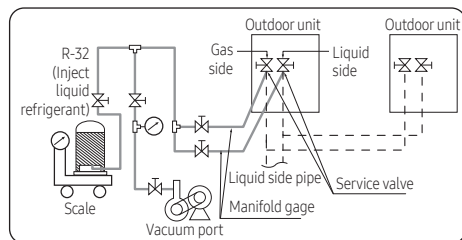
Single installation

- Open the manifold gauge valve connected to the liquid side service valve and add the liquid refrigerant.
- If you cannot add the whole quantity of the refrigerant while the outdoor unit is stopped, open the gas side and liquid side service valve. Then, add remaining refrigerant by pressing the refrigerant adding button of the outdoor PCB.



Module installation

- Open the manifold gauge valve connected to the liquid side service valve and add the liquid refrigerant.
- If you cannot add the whole quantity of the refrigerant while the outdoor unit is stopped, open the gas side and liquid side service valve. Then, add remaining refrigerant by pressing the refrigerant adding button of the outdoor PCB.
- If you use the refrigerant charging function from the PCB, outdoor unit will operate and charge the refrigerant. At this time, you must use gas side manifold gauge for cooling operation and use charging port for heating at the manifold gauge for heating operation.



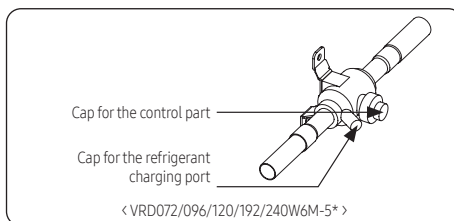
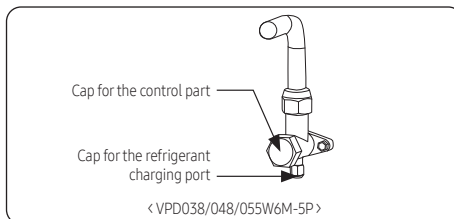
⚠ CAUTION

- Open the gas side and liquid side service valve completely after charging the refrigerant. (If you operate the Water-cooled VRF with the service valve closed, the important parts may be damaged.)

- Put on safety equipment when charging refrigerant.
- Do not charge the refrigerant when you adjust or control other product such as indoor units.
- If you charge the refrigerant with the front cabinet open, be very careful with the fan on the top of the product to prevent personal injury.
- When the ambient temperature is low in winter time, do not heat the refrigerant container to speed up the charging process. There is risk of explosion.
- Beware for possibility of refrigerant leakage when you connect the manifold gauge to the charging port for heating.
- Close the valve of the refrigerant container immediately after charging the refrigerant. If not, there might be a change in entire amount of refrigerant.

Using service valve for gas

- After charging the refrigerant, close all caps as shown in the illustration.
- Tightening torque for the cap of refrigerant charging port 10~12 N·m (7.4 ~ 8.9 lbf·ft)
- Tightening torque for the cap of control part 20~25 N·m (14.8 ~ 18.4 lbf·ft)
- Opening/closing torque for the valve
 - Over 3/4 inch (19.05 mm) : 10 N·m (7.4 lbf·ft)





Basic segment display

Step	Display content	Display			
		SEG 1	SEG 2	SEG 3	SEG 4
At initial power input	Checking segment display	"8"	"8"	"8"	"8"
While setting communication between indoor and outdoor unit (Addressing)	Number of connected indoor units	SEG 1	SEG 2	SEG 3	SEG 4
		"A"	"d"	Number of communicated units • Refer to "View Mode" for communication address	
After communication setting (usual occasion)	Transmit/Reception address	SEG 1	SEG 2	SEG 3	SEG 4
		I/U: "A" MSB/SVB: "C"	I/U: "0" MSB/SVB: "1"	Reception address (in decimal number)	

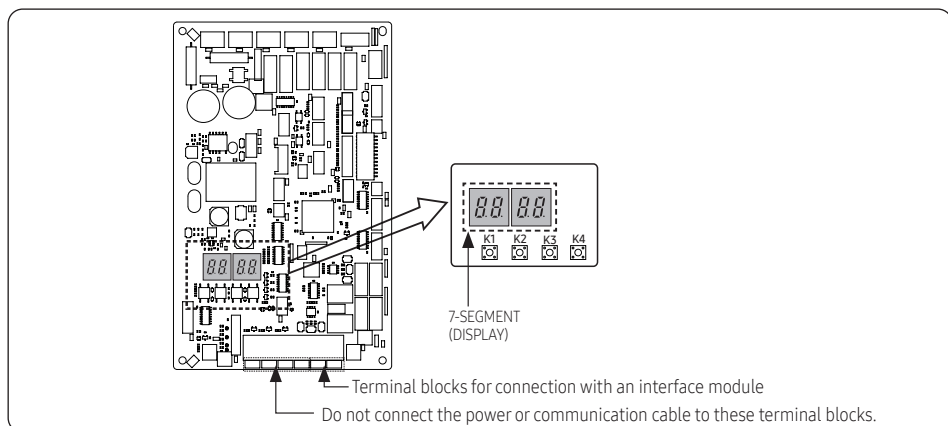
※ I/U : Indoor unit

Setting outdoor unit option switch and key function

Setting outdoor unit option switches

Small chassis (VPD038/048/055W6M-5P)

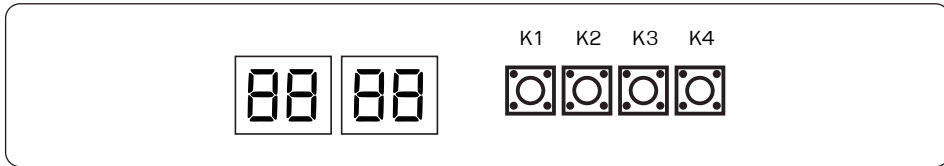
1 PBA shape





Setting outdoor unit option switch and key function

2 Setting the number of connecting indoor units



Step	Button	Display	Description	Remarks
The number of indoor units				
Step1	Display of outdoor unit	7d nd	Required to set	-
Step2	Press the K1 and K2 buttons for 2 seconds simultaneously.	7d 00	Ready to set	Example) 03: 3 units 64: 64 units
	Press the K2 button n times.	7d x0	Tens digit (0 ~ 6)	
	Press the K4 button n times.	7d 0x	Units digit (0 ~ 9)	
	Press the K4 button for 2 seconds - the number of connected indoor units is automatically detected.			
Step3	Press the K2 button for 2 seconds to save the option and exit from menu. (System reset)			

3 Tact Switch Key Operation

KEY setting		
K1 (Number of press)	KEY operation	Display on 7-Segment
1 time	Refrigerant charging in Heating mode	"K" "1" "BLANK" "BLANK"
2 times	Trial operation in Heating mode	"K" "2" "BLANK" "BLANK"
3 times	Refrigerant discharging (Outdoor unit address 1)	"K" "3" "BLANK" "1"
4 times	Vacuum (Outdoor unit address 1)	"K" "4" "BLANK" "1"
5 times	Inverter Fault Detection(Comp#1)	"K" "5" "1" "1"
6 times	End KEY operation	-
Press and hold	Auto trial operation	"K" "K" "BLANK" "BLANK"

KEY setting		
K2 (Number of press)	KEY operation	Display on 7-Segment
1 time	Refrigerant charging in Cooling mode	"K" "5" "BLANK" "BLANK"
2 times	Trial operation in Cooling mode	"K" "6" "BLANK" "BLANK"
3 times	Pump down all units in Cooling mode	"K" "7" "BLANK" "BLANK"
4 times	Auto trial operation	"K" "8" "BLANK" "BLANK"
5 times	Checking the amount of refrigerant	"K" "9" "X" "X" (Last two digits display the progress.)
6 times	Discharge mode of DC link voltage	"K" "A" "BLANK" "BLANK"
7 times	Forced oil collection	"K" "B" "BLANK" "BLANK"
8 times	Inverter compressor 1 check	"K" "C" "BLANK" "BLANK"
9 times	Water pipe connection inspection operation	"K" "D" "BLANK" "BLANK"
10 times	Load inspection operation	"K" "E" "BLANK" "BLANK"
11 times	Refrigerant leak inspection mode	"K" "L" "BLANK" "BLANK"
12 times	End KEY operation	-



Setting outdoor unit option switch and key function

※ If the voltage does not drop during 'Discharge mode of DC link voltage', please cut-off the power and wait for 15 minutes until voltage discharges naturally. Due to the characteristics of the inverter PCB, 'Discharge mode of DC link voltage' may not be supported.

KEY setting		
K3 (Number of press)	KEY operation	Display on 7-Segment
1 time	Initialize (Reset) operation	Same as initial state

View Mode			
Table. View mode 1			
K4 (Number of press)	Display content	Display	
		SEG1	SEG2, 3, 4
1 time	Outdoor Capacity	1	16 Horse Power → 0,1,6
2 times	Target frequency (Compressor)	2	120 Hz → 1,2,0
3 times	High pressure (MPa)	3	1.52 MPa → 1,5,2 / 216 psi → 2,1,6
4 times	Low pressure (MPa) (Value of 1 second)	4	0.43 MPa → 0,4,3 / 216 psi → 2,1,6
5 times	Discharge temperature (Compressor)	5	87 °C → 0,8,7 / 188 °F → 1,8,8
6 times	IPM temperature (Compressor)	6	87 °C → 0,8,7 / 188 °F → 1,8,8
7 times	CT sensor value (Compressor)	7	2A → 0,2,0
8 times	Suction temperature	8	-42 °C → -4,2 / -44 °F → -4,4
9 times	COND OUT temperature	9	-42 °C → -4,2 / -44 °F → -4,4
10 times	Temperature of liquid pipe	A	87 °C → 0,8,7 / 188 °F → 1,8,8
11 times	TOP temperature (Compressor)	B	87 °C → 0,8,7 / 188 °F → 1,8,8
12 times	Water temperature	C	-42 °C → -4,2 / -44 °F → -4,4
13 times	Main EEV step	D	2000 → 2,0,0
14 times	ESC EEV step	E	300 → 3,0,0
15 times	Current frequency of the compressor	F	120 Hz → 1,2,0
16 times	Address of main indoor unit	G	When main indoor unit is not set → BLANK, N, D
			When indoor unit No.1 is set as main indoor unit → 0,0,1
17 times	Temperature of control box	H	-42 °C → -4,2 / -44 °F → -4,4
18 times	Refrigerant leak detection sensor operational duration	I	1000 days → 1,0,0





Press K4 for 3 seconds to use View mode 2				
Table. View mode2				
K4 (Number of press)	Displayed content	Display		
		page1	page2	
1 time	Main version	MAIN	Version (Example: 1412)	
2 times	Water hub version	HUB2	Version (Example: 1412)	
3 times	Inverter 1 version	INV1	Version (Example: 1412)	
4 times	EEP version	EEP	Version (Example: 1412)	
5 times	Shut-off version	SHOF	Version (Example: 1412) ※ If there is no Shutoff PBA, "----"	
6 times	Received units	AUTO	SEG1, 2	
	SEG3, 4			
	Indoor unit: "A", "0"			
	Automatically assigned address		Address (Example: 07)	
			SVB : "C","1"	
7 times	Received units	MANU	SEG1, 2	
	SEG3, 4			
	Indoor unit: "A", "0"			
	Manually assigned address of the units		Address (Example: 15)	

Installing and setting the option with tact switch

Refer to page 94 for the information about setting the option KEY.

Option item	Input unit	SEG1	SEG2	SEG3	SEG4	Function of the option	Remarks
Emergency operation for compressor malfunction	Individual	0	0	0	0	Disabled (Factory default)	E560 will occur when all the compressors are set as malfunction state.
				0	1	Set compressor 1 as malfunction state	
				0	2	Set compressor 2 as malfunction state	
Cooling capacity correction	Main	0	1	0	0	7-9 (Factory default)	Targeted evaporation temperature [°F (°C)]. (When low temperature value is set, discharged air temperature of the indoor unit will decrease)
				0	1	5-7	
				0	2	9-11	
				0	3	10-12	
				0	4	11-13	
				0	5	12-14	
				0	6	13-15	
Heating capacity correction	Main	0	2	0	0	2.8 (Factory default)	Targeted high pressure [MPa]. (When low pressure value is set, discharged air temperature of the indoor unit will decrease)
				0	1	2.5	
				0	2	2.6	
				0	3	2.7	
				0	4	2.9	
				0	5	3.0	
				0	6	3.1	
				0	7	3.2	
				0	8	3.3	



Setting outdoor unit option switch and key function

Option item	Input unit	SEG1	SEG2	SEG3	SEG4	Function of the option	Remarks
Current restriction rate	Individual	0	3	0	0	100 % (Factory default)	When restriction option is set, cooling and heating performance may decrease.
				0	1	95 %	
				0	2	90 %	
				0	3	85 %	
				0	4	80 %	
				0	5	75 %	
				0	6	70 %	
				0	7	65 %	
				0	8	60 %	
				0	9	55 %	
				1	0	50 %	
				1	1	Disable	
Oil collection interval	Main	0	4	0	0	Factory default	
				0	1	Shorten the interval by 1/2	
Disable	Main	0	5	0	0	Disable	
				0	1	Disable	
Disable	Individual	0	6	0	0	Disable	
				0	1	Disable	
Disable	Main	0	7	0	0	Disable	
				0	1	Disable	
				0	2	Disable	
				0	3	Disable	
Setting high-head condition	Main	0	8	0	0	Disable (Factory default)	
				0	1	Level 1 of height difference type 1 (Indoor unit is lower than outdoor unit)	When outdoor unit is over 131'~ 263' (40 ~ 80 m) above the indoor unit
				0	2	Level 2 of height difference type 1 (Indoor unit is lower than outdoor unit)	When outdoor unit is over 263' (80 m) above the indoor unit
				0	3	Height difference type 2 (Outdoor unit is lower than indoor unit)	When indoor unit is over 98' (30 m) above the outdoor unit
Setting long piping condition (Setting is unnecessary if high-head condition is set.)	Main	0	9	0	0	Disable (Factory default)	
				0	1	Long piping level 1	When equivalent length of farthest indoor unit from the outdoor unit is between 328'~558' (100~170 m)
				0	2	Long piping level 2	When equivalent length of farthest indoor unit from the outdoor unit is over 558' (170 m)
Energy saving setting	Main	1	0	0	0	Disable (Factory default)	The energy saving mode starts when the room temperature reaches desired temperature while operating in heating mode.
				0	1	Enable	



Option item	Input unit	SEG1	SEG2	SEG3	SEG4	Function of the option	Remarks
Disable	Main	1	1	0	0	Disable	This function is not applicable for this model.
				0	1	Enable	
Expand operational temperature range for cooling operation	Main	1	2	0	0	Disable	
				0	1	Enable	
Channel address	Main	1	3	A	U	Automatic setting (Factory default)	Address for classifying the product from upper level controller (DMS, Lennox Service Software, etc.)
				0 ~ 15		Manual setting for channel 0~15	
Disable	Main	1	4	0	0	Disable	This function is not applicable for this model.
				0	1	Disable	
Circulation water flow control	Main	1	5	0	0	Disable (Factory default)	When variable flow control valve is applied
				0	1	7-10 V	
				0	2	5-10 V	
				0	3	3-10 V	
Disable	Main	1	6	0	0	Disable	
Disable	Main	1	7	0	0	Disable (Factory default)	Options for high-speed operation
				0	1	Enable	
Maximum cooling capacity restriction	Main	1	8	0	0	Enable	Maximum cooling capacity restriction
				0	1	Disable	
Disable	Main	1	9	0	0	Disable	Leaked refrigerant collection
				0	1	Disable	
Circulation fluid flow setting	Individual	2	0	0	0	Water	Circulation fluid flow setting
				0	1	Antifreeze solution 1	
				0	2	Antifreeze solution 2	
				0	3	Water	
Aux Heater's interworking control for cycle heating (cooling priority control)	Main	2	1	0	0	Not applied	When using the Aux Heating, set the delay time for Switching from cooling to heating. ※ Unused by the cooling only models
				0	1	Switching delay to heating (30 mins.)	
				0	2	Switching delay to heating (15 mins.)	
				0	3	Switching delay to heating (10 mins.)	
				0	4	Switching delay to heating (5 mins.)	
Auto Change Over	Main	2	2	0	0	Not applied	When Thermo off for all running indoor units, change the operation mode.
				0	1	Applied	
Reduction of the diameter of liquid pipe	Main	2	3	0	0	Disabled (Factory default)	Set when piping is installed with Reduction of the diameter of liquid pipe.
				0	1	Enable	
View Mode Unit Option	Main	2	4	0	0	Temperature : °C Pressure : Mpa	Converts the temperature, pressure units in the view mode(K4 switch)
				0	1	Temperature : °F Pressure : psi	
Emergency Heat	Main	2	5	0	0	Disable	While configured, in case of the system errors, emergency heating operation is possible using an external heater.
				0	1	Enable	





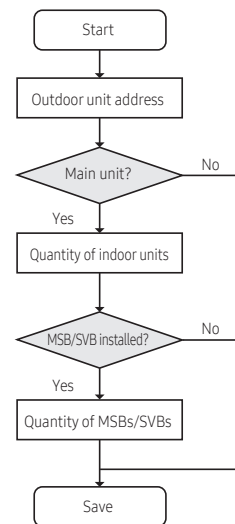
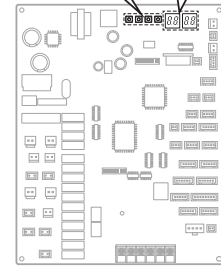
Setting outdoor unit option switch and key function

Setting outdoor unit option switches

Medium / Large chassis (VRD072/096/120/192/240W6M-5*)

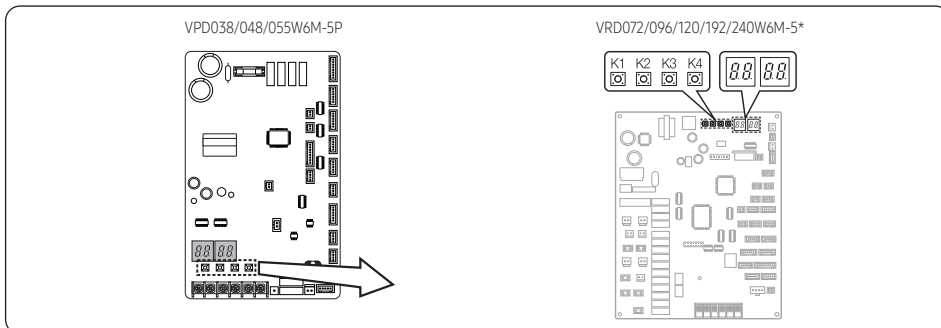
- Setting outdoor install option

Step	Button	Display	Description	Note
Outdoor unit address				
Step1	Outdoor unit display	00 00	Setting required	-
Step2	Press (K1+K2) for 2 seconds	00 00	Unit address for module combination	00: Main unit
	K4 x 1 time	00 01		01: Sub1 unit
	K4 x 2 times	00 02		02: Sub2 unit
	K4 x 3 times	00 03		03: Sub3 unit
Step3	If it is main unit, go to step4. Otherwise, press K2 button for 2 seconds to save & exit (system will be reset)			
Quantity of indoor units				
Step4	Press K1	00 00	Ready to set	-
Step5	K2 x n times	00 x0	Tens digit (0 ~ 6)	Ex) 03: 3 units 64: 64 units
	K4 x n times	00 0x	Ones digit (0 ~ 9)	
	* K4: Press for 2 seconds - automatic detection of indoor units' quantity			
Step6	If MSB/SVB is installed, go to step 7. Otherwise, press K2 button for 2 seconds to save & exit (system will be reset)			
Quantity of MSBs/SVBs				
Step7	Press K1	00 00	Ready to set	-
Step8	K2 x n times	00 x0	Tens digit (0 ~ 1)	Ex) 03: 3 units 16: 16 units
	K4 x n times	00 0x	Ones digit (0 ~ 9)	
	* K4: Press for 2 seconds - automatic detection of MSBs/SVBs' quantity			
Step9	Press K1	ht 01	Ready to set	00 : Heat pump system
Step10	Press K4	ht 00	Ones digit(0~1)	01 : Heat recovery system
Step11	K2: long	88 00	Save	Restart
* Press K1 for 2 seconds to exit without save regardless of setting step.				





Setting outdoor unit key function



Installing and setting the option with tact switch and explanation of the functions

Setting the option

- 1 Press and hold K2 to enter the option setting. (Only available when the operation is stopped)
 - If you enter the option setting, display will show the following. (If you have set the 'Emergency operation for compressor malfunction', 1 or 2 will be displayed on SEG 4.)



- SEG 1 and SEG 2 will display the number for selected option.
- SEG 3 and SEG 4 will display the number for set value of the selected option.

- 2 If you have entered option setting, you can shortly press the K1 switch to adjust the value of the SEG 1, SEG 2 and select the desired option. (Refer to pages 96 ~ 98 for the SEG number of the function for each option)

Example)

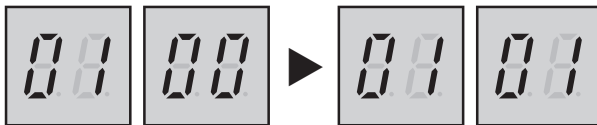




Setting outdoor unit option switch and key function

- 3 If you have selected desired option, you can shortly press the K2 switch to adjust the value of the SEG 3, SEG 4 and change the function for the selected option. (Refer to pages 96 ~ 98 for the SEG number of the function for each option)

Example)



- 4 After selecting the function for options, press and hold the K2 switch for 2 seconds. Edited value of the option will be saved when entire segments blink and tracking mode begins.

CAUTION

- Edited option will not be saved if you do not end the option setting as explained in above instruction.
- ※ While you are setting the option, you may press and hold the K1 button to reset the value to previous setting.
- ※ If you want to restore the setting to factory default, press and hold the K4 button while you are in the option setting mode.
 - If you press and hold the K4 button, setting will be restored to factory default but it doesn't mean that restored setting is saved. Press and hold the K2 button. When the segments shows that tracking mode is in progress, setting will be saved.

Optional item	Input unit	SEG1	SEG2	SEG3	SEG4	Function of the option	Remarks
Emergency operation for compressor malfunction	Individual	0	0	0	0	Disabled (Factory default)	E560 will occur when all the compressors are set as malfunction state.
				0	1	Set compressor 1 as malfunction state	
				0	2	Set compressor 2 as malfunction state	
Cooling capacity correction	Main	0	1	0	0	7-9 (Factory default)	Targeted evaporation temperature [°F (°C)]. (When low temperature value is set, discharged air temperature of the indoor unit will decrease)
				0	1	5-7	
				0	2	9-11	
				0	3	10-12	
				0	4	11-13	
				0	5	12-14	
				0	6	13-15	
Heating capacity correction	Main	0	2	0	0	2.8 (Factory default)	Targeted high pressure [MPa]. (When low pressure value is set, discharged air temperature of the indoor unit will decrease)
				0	1	2.5	
				0	2	2.6	
				0	3	2.7	
				0	4	2.9	
				0	5	3.0	
				0	6	3.1	
				0	7	3.2	
				0	8	3.3	



Optional item	Input unit	SEG1	SEG2	SEG3	SEG4	Function of the option	Remarks
Current restriction rate	Individual	0	3	0	0	100% (Factory default)	When restriction option is set, cooling and heating performance may decrease.
				0	1	95 %	
				0	2	90 %	
				0	3	85 %	
				0	4	80 %	
				0	5	75 %	
				0	6	70 %	
				0	7	65 %	
				0	8	60 %	
				0	9	55 %	
				1	0	50 %	
				1	1	No restriction	
Oil collection interval	Main	0	4	0	0	Factory default	
				0	1	Shorten the interval by 1/2	
Disable	Main	0	5	0	0	Disable	This function is not applicable for this model
				0	1	Disable	
Disable	Individual	0	6	0	0	Disable	This function is not applicable for this model
				0	1	Disable	
Disable	Main	0	7	0	0	Disable	This function is not applicable for this model
				0	1	Disable	
				0	2	Disable	
				0	3	Disable	
Setting high-head condition	Main	0	8	0	0	Disable (Factory default)	When outdoor unit is over 131'~263' (40 ~ 80 m) above the indoor unit
				0	1	Level 1 of height difference type 1 (Indoor unit is lower than outdoor unit)	
				0	2	Level 2 of height difference type 1 (Indoor unit is lower than outdoor unit)	
				0	3	Height difference type 2 (Outdoor unit is lower than indoor unit)	
Setting long-piping condition (Setting is unnecessary if high-head condition is set.)	Main	0	9	0	0	Disable (Factory default)	When equivalent length of farthest indoor unit from the outdoor unit is between 328'~558' (100~170 m)
				0	1	Long piping level 1	
				0	2	Long piping level 2	
Energy control operation	Main	1	0	0	0	Basic (Factory default)	Energy control option of designated operation sequence Operating in energy saving mode, capacity might decrease compared to normal operation mode
				0	1	Energy saving	
				0	2	Power	



Setting outdoor unit option switch and key function

Optional item	Input unit	SEG1	SEG2	SEG3	SEG4	Function of the option	Remarks
Disable	Main	1	1	0	0	Disable	This function is not applicable for this model
				0	1	Disable	
Expand operational temperature range for cooling operation	Main	1	2	0	0	Disable	
				0	1	Enable	
Channel address	Main	1	3	A	U	Automatic setting (Factory default)	Address for classifying the product from upper level controller (DMS, Lennox Service Software, etc.)
				0 ~ 15		Manual setting for channel 0~15	
Disable	Main	1	4	0	0	Disable	This function is not applicable for this model
				0	1	Disable	
Circulation water flow control	Individual	1	5	0	0	Disable (Factory default)	When variable flow control valve is applied.
				0	1	7-10 V	
				0	2	5-10 V	
				0	3	3-10 V	
Disable	Main	1	6	0	0	Disused option	
High-speed operation	Main	1	7	0	0	Disable (Factory default)	High-speed operation
				0	1	Enable	
Max. capacity restriction	Main	1	8	0	0	Enable	Maximum cooling capacity restriction
				0	1	Disable	
Gasleak Pumpdown	Main	1	9	0	0	Disable	Leaked refrigerant collection
				0	1	Enable	
Note 1) Circulation fluid flow setting	Individual	2	0	0	0	Water	Circulation fluid flow setting
				0	1	Anti-freeze solution 1	
				0	2	Anti-freeze solution 2	
Disable	Main	2	1	0	0	Disable	This function is not applicable for this model
				0	1	Disable	
Emergency operation for indoor unit communication error	Main	2	2	0	0	Disabled (Factory default)	When set, emergency operation is possible even if an indoor communication error occurs.
				0	1	Indoor high humidity condition (operating for up to 12hours)	
				0	2	Indoor low humidity condition (operating for up to 24hours)	
Disable	Main	2	3	0	0	Disabled (Factory default)	Set when Base Heater is installed.
				0	1	Enabled	
Disable	Main	2	4	0	0	Disabled (default)	Set inverter carrier frequency
				0	1	8kHz	
Aux Heater's interworking control for cycle heating (cooling priority control)	Main	2	5	0	0	Not applied	When using the Aux Heating, set the delay time for Switching from cooling to heating. ※ Unused by the cooling only models
				0	1	Switching delay to heating (30 mins.)	
				0	2	Switching delay to heating (15 mins.)	
				0	3	Switching delay to heating (10 mins.)	
				0	4	Switching delay to heating (5 mins.)	
				0	5	Not switching delay	



Optional item	Input unit	SEG1	SEG2	SEG3	SEG4	Function of the option	Remarks
Auto Change Over	Main	2	6	0	0	Not applied	When Thermo off for all running indoor units, change the operation mode.
				0	1	Applied	
Disable	Main	2	7	0	0	Disable (default)	You can enable this fuction, if the ice on the outdoor Heat exchanger is not removed even after continuous defrost operation, emergency defrosting operation is performed, but defrost operation can take a long time.
				0	1	Enable	
Reduction of the diameter of liquid pipe	Main	2	8	0	0	Disabled (Factory default)	Set when piping is installed with Reduction of the diameter of liquid pipe.
				0	1	Enable	
View Mode Unit Option	Main	2	9	0	0	Temperature : °C Pressure : Mpa	Converts the temperature, pressure units in the view mode(K4 switch)
				0	1	Temperature : °F Pressure : psi	
Emergency Heat	Main	3	0	0	0	Disable	While configured, in case of the system errors, emergency heating operation is possible using an external heater.
				0	1	Enable	
Disable	Main	3	1	0	0	Disable	AI function activation setting (AI Board installation required)
				0	1	Enable	

Note 1) Anti-freeze solution 1: Freezing point of anti-freeze must be below 17.6 °F (-8 °C).
(Minimum temperature of entering water: 23 °F (-5 °C))
Anti-freeze solution 2: Freezing point of anti-freeze must be below 5 °F (-15 °C).
(Minimum temperature of entering water: 14 °F (-10 °C))

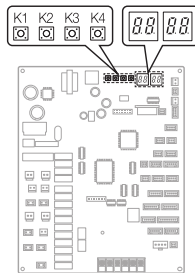
- ※ There is a risk of water leakage during emergency operation for indoor unit communication error. Please be careful when using it.





Setting outdoor unit option switch and key function

Setting outdoor unit key function



K1 (Number of press)	KEY operation	Display on segment
Press and hold 1 time	Auto trial operation	"K" "K" "BLANK" "BLANK"
1 time	Refrigerant charging in Heating mode	"K" "1" "BLANK" "BLANK"
2 times	Trial operation in Heating mode	"K" "2" "BLANK" "BLANK"
3 times	Pump out in Heating mode (Outdoor unit address 1)	"K" "3" "BLANK" "1"
4 times	Pump out in Heating mode (Outdoor unit address 2)	"K" "3" "BLANK" "2"
5 times	Pump out in Heating mode (Outdoor unit address 3)	"K" "3" "BLANK" "3"
6 times	Pump out in Heating mode (Outdoor unit address 4)	"K" "3" "BLANK" "4"
7 times	Vacuuming (Outdoor unit address 1)	"K" "4" "BLANK" "1"
8 times	Vacuuming (Outdoor unit address 2)	"K" "4" "BLANK" "2"
9 times	Vacuuming (Outdoor unit address 3)	"K" "4" "BLANK" "3"
10 times	Vacuuming (Outdoor unit address 4)	"K" "4" "BLANK" "4"
11 times	Vacuuming (All outdoor units)	"K" "4" "BLANK" "A"
12 times	Inverter Fault Detection(Comp#1)	"K" "5" "i" "1"
13 times	Inverter Fault Detection(Comp#2)	"K" "5" "i" "2"
14 times	End Key operation	-





K2 (Number of press)	KEY operation	Display on segment
1	Refrigerant charging in Cooling mode	"K" "5" "BLANK" "BLANK"
2	Trial operation in Cooling mode	"K" "6" "BLANK" "BLANK"
3	Pump down all units in Cooling mode	"K" "7" "BLANK" "BLANK"
4	H/R: Pipe connection inspection H/P: Auto trial operation	"K" "8" "BLANK" "BLANK"
5	Checking the amount of refrigerant	"K" "9" "X" "X" (Display of last two digits may differ depending on the status)
6	Discharge mode of DC link voltage	"K" "A" "BLANK" "BLANK"
7	Forced oil collection	"K" "C" "BLANK" "BLANK"
8	Inspect inverter compressor 1	"K" "D" "BLANK" "BLANK"
9	Inspect inverter compressor 2	"K" "E" "BLANK" "BLANK"
10	Water pipe valve/Pump check	"K" "F" "BLANK" "BLANK"
11	Cooling fan/Flow control valve check	"K" "G" "BLANK" "BLANK"
12	Auto pipe pairing	"K" "H" "X" "X" ※ Only H/R mode
13	Refrigerant leak inspection mode	"K" "L" "BLANK" "BLANK"
14	End Key operation	-

- ※ During "Discharge mode of DC link voltage", voltage of INV1 and INV2 will be displayed alternately.
- ※ Even when the outdoor unit power is off, it is dangerous when you come in contact with inverter PCB and fan PCB since they are charged with high DC voltage.
- ※ When there were error, 'Discharge mode of DC link voltage' may not have been effective. Especially if error E464 and E364 have been occurred, power element might be damaged by fire and therefore, do not use the 'Discharge mode of DC link voltage'.

K3 (Number of press)	KEY operation	Display on segment
1 time	Initialize (Reset) setting	Same as initial state

K4 (Number of press)	KEY operation	Display on segment	
		SEG1	SEG2, 3, 4
1 time	Outdoor Capacity	1	16 Horse Power → 0,1,6
2 times	Target frequency (Compressor 1)	2	120 Hz → 1, 2, 0
3 times	Target frequency (Compressor 2)	3	120 Hz → 1, 2, 0
4 times	High pressure (MPa)	4	1.52 MPa → 1,5,2 / 216 psi → 2,1,6
5 times	Low pressure (MPa)	5	0.43 MPa → 0,4,3 / 216 psi → 2,1,6
6 times	Discharge temperature (Compressor 1)	6	87°C → 0,8,7 / 188°F → 1,8,8
7 times	Discharge temperature (Compressor 2)	7	87°C → 0,8,7 / 188°F → 1,8,8
8 times	IPM temperature (Compressor 1)	8	87°C → 0,8,7 / 188°F → 1,8,8
9 times	IPM temperature (Compressor 2)	9	87°C → 0,8,7 / 188°F → 1,8,8
10 times	CT sensor value (Compressor 1)	A	2A → 0,2,0
11 times	CT sensor value (Compressor 2)	B	2A → 0,2,0
12 times	Suction temperature	C	-42°C → -,4,2 / -44°F → -,4,4
13 times	COND OUT temperature	D	-42°C → -,4,2 / -44°F → -,4,4
14 times	Temperature of liquid pipe	E	-42°C → -,4,2 / -44°F → -,4,4





Setting outdoor unit option switch and key function

K4 (Number of press)	KEY operation	Display on segment	
		SEG1	SEG2, 3, 4
15 times	TOP temperature (Compressor 1)	F	-42°C → -4,2 / -44°F → -4,4
16 times	TOP temperature (Compressor 2)	G	-42°C → -4,2 / -44°F → -4,4
17 times	Water temperature	H	-42°C → -4,2 / -44°F → -4,4
18 times	EVI inlet temperature	I	-42°C → -4,2 / -44°F → -4,4
19 times	EVI outlet temperature	J	-42°C → -4,2 / -44°F → -4,4
20 times	Main EEV 1 step	K	2000 steps → 2, 0, 0
21 times	Main EEV 2 step	L	2000 steps → 2, 0, 0
22 times	EVI EEV step	M	300 steps → 3, 0, 0
23 times	H/R EEV step	N	2000 steps → 2, 0, 0
24 times	Current frequency of the compressor 1	O	120 Hz → 1,2,0
25 times	Current frequency of the compressor 2	P	120 Hz → 1,2,0
26 times	Temperature of suction 2 (For H/R only)	Q	-42°C → -4,2 / -44°F → -4,4
27 times	Address of master indoor unit	R	When a master indoor unit is not set → BLANK, N, D When indoor unit address No.1 is set as master indoor unit → 0, 0, 1
28 times	Temperature of control box	S	-42°C → -4,2 / -44°F → -4,4
29 times	Refrigerant leak detection sensor operational duration	T	1000 days → 1, 0, 0

K4 (Number of press) Press and hold the K4 to enter the setting	Displayed content	Display on segment		
		page1	page2	
1 time	Main version	MAIN	Version (ex. 1412)	
2 times	Hub version	HUB	Version (ex. 1412)	
3 times	Water hub version	HUB2	Version (ex. 1412)	
4 times	Inverter 1 version	INV1	Version (ex. 1412)	
5 times	Inverter 2 version	INV2	Version (ex. 1412)	
6 times	EEP version	EEP	Version (ex. 1412)	
7 times	Automatically assigned address of the units	AUTO	SEG1 Indoor unit: "A" MSB/SVB: "C"	SEG2 Indoor unit: "0" MSB/SVB: "I" SEG3, 4 Address (ex: 07)
8 times	Manually assigned address of the units	MANU	SEG1 Indoor unit: "A"	SEG2 Indoor unit: "0" SEG3, 4 Address

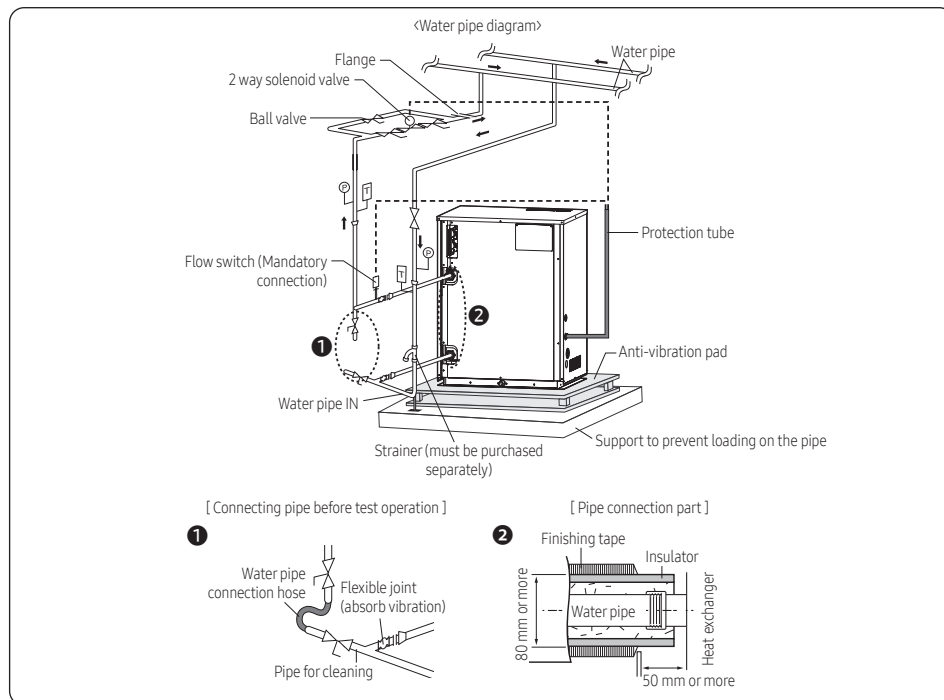




Water pipe installation

It is recommended to use closed circuit cooling tower. If open cooling tower is applied, use intermediate heat exchanger and make sure that supplied heat source water system is closed circuit.

Water pipe installation



- ✕ From above illustration, flow switch (mandatory) and 2 way solenoid valve (optional) must be at least equivalent to the specification recommended by our company and they should be installed horizontally.
- ✕ The FPT of the water pipe inlet and outlet is NPT internal thread.

⚠ CAUTION

When water pipe circuit freezes, it will cause damage to the plate type heat exchanger and therefore preventive measure must be taken according to the situation.

- Drain remaining water in the water pipe when it will not be used for long period of time
- Constantly operate the water pump to circulate the water within the water pipe
- Install self-regulating heat cable on the water pipes

Water pipe installation

- Design condition

Type	Circulating water	Operation	Inlet water temperature		Remarks
			Main usage range	Usage range limit (Note 3)	
Heat source water	Water loop	Cooling	68 ~ 95 °F (20 ~ 35 °C)	50 ~ 113 °F (10 ~ 45 °C)	Refer to 'Cooling water management' on page 116
		Heating			
Ground heat source (Note 1)	Ground loop	Cooling	59 ~ 95 °F (15 ~ 35 °C)	50 ~ 113 °F (10 ~ 45 °C)	
		Heating	41 ~ 77 °F (5 ~ 25 °C)	23 ~ 113 °F (-5 ~ 45 °C) 14 ~ 113 °F (-10 ~ 45 °C) (Note 2)	

Note 1) Anti-freeze must be used when temperature of water inlet for heating is below 50 °F (10 °C) or ground heat source is used. Maintain appropriate concentration level of anti-freeze according to temperature of water inlet.

Note 2) Strict management of anti-freeze concentration level is required. Consult Lennox before application.

Note 3) When inlet water temperature is outside of limit, consult Lennox before application.

- Refer to following table, for diameter of the outdoor unit connection part where water pipe will be connected. If you install outdoor units with different capacities, install a flow control valve to secure rated flow for each outdoor unit. Socket must be connected within below tightening torque. If the tightening torque exceeds below value, it may cause product breakage.

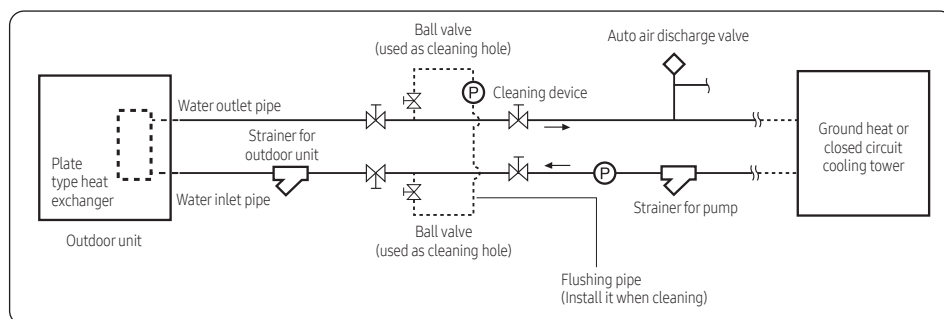
VPD038/048/055W6M-5P VRD072/096/120W6M-5*	VRD192/240W6M-5*
NPT1-1/4 (NPT Internal thread)	NPT 2 (NPT Internal thread)

Outer diameter of water pipe		Tightening torque
inch	mm	N·m
0.39 ~ 0.79	10 ~ 20	25
0.83 ~ 1.18	21 ~ 30	50
1.22 ~ 1.97	31 ~ 50	100
2.0 ~ 3.15	51 ~ 80	220
3.19 ~ 4.53	81 ~ 115	600

- Use certified parts for water pipe system and the water pressure of the water pipe system connected to outdoor unit must remain under 1.96 MPa (285 psi).
- Outdoor unit water pipes must be equipped with valves and other instrumentations as shown in the figure on the previous page. Strainer and flow switch must be installed within 3.3 ~ 6.6 ft (1 ~ 2 m) from the entrance pipe of the outdoor unit. (Strainer must be installed on entrance side)
 - When strainer is not installed, sand, dust or rust debris may cause product breakage.
 - Make sure to install a flow switch that works at minimum discharge. When optimal discharge level is not reached, heat exchanger within the outdoor unit may break.
- Water inlet pipe is located at the bottom part of the heat exchanger and the water outlet pipe is at the top part of the heat exchanger.
- Outdoor unit must be installed indoor at room temperature and the water inlet and outlet of the outdoor unit must be insulated with the heat exchanger as shown in the illustration.
- Damp-proof, cold reserving and insulation work must be done thoroughly to prevent condensation from forming on the surface of the product and drain pipes of indoor/outdoor units. When the necessary work is not done thoroughly, you will waste energy caused by thermal loss and may get property damage during cold seasons when water pipe freezes and bursts.
- If you stop the product for long time or in night time, water pipe circuit may freeze naturally when the temperature around the outdoor unit is under 32 °F (0 °C). When water pipe circuit freezes, it will cause damage to the plate type heat exchanger and therefore preventive measure must be taken according to the situation.
 - Drain remaining water in the water pipe
 - Operate continuous water circulation pump during outdoor unit operation, 1~5 minutes before the operation and 1~5 minutes after operation stops
 - Install self-regulating heat cable on the water pipes



- 8 When inlet water temperature is lower than 50 °F (10 °C), appropriate anti-freeze must be used according to the temperature. (Set the outdoor unit option switch (Key option) according to the usage temperature.)
 - When lowest inlet water temperature is 23 °F (-5 °C), freezing point of anti-freeze must be lower than 17.6 °F (-8 °C)
 - When lowest inlet water temperature is 14 °F (-10 °C), freezing point of anti-freeze must be lower than 5 °F (-15 °C)
- 9 Install number of auto air vent valve at a point where air may remain within the pipe (such as vertical water pipe). If the air within the pipe is not vented, it may cause performance decrease or corrosion on the product or pipes.
- 10 Keep the inlet water temperature within 'Main usage range'. If not, product may not work continuously.
- 11 Water scale may occur on the plate type heat exchanger depending on the water quality and the type of plate heat exchanger so regular chemical cleaning is necessary. When installing water pipes, install a heat source water shut-off valve and also install the flushing pipe with a ball valves (for chemical cleaning) on the pipe installed between the shut-off valve and the outdoor unit.



- 12 Before trial operation, connect the flushing pipes installed on inlet and outlet as shown in above illustration. Then, take appropriate measures (such as blind flange etc) to stop the circulation water from entering the outdoor unit plate type heat exchanger, and use circulating pump to remove foreign substance within the water pipes and clean the strainer. When foreign substances accumulates on outdoor unit plate type heat exchanger, it may break the heat exchanger or cause problem to it.
- 13 For legal facilities, install digital sensor and flow meter on the water pipe for monitoring.

CAUTION

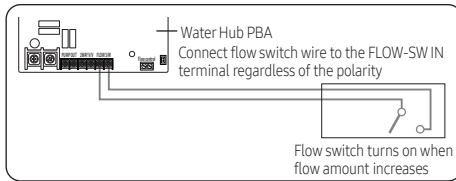
- Open the valve of the water pipe connected to the outdoor unit after flushing (cleaning foreign substances in water pipe) is completed.
- Check that air is vented from the water pipe and circulation amount is secured before opening the service valve on the refrigerant side of the outdoor unit.
- When circulating water stops during outdoor unit operation, it may cause breakage on plate type heat exchanger. Check the flow of circulation with flow switch or other devices.



External contact connection

Flow switch connection (Mandatory connection)

- When flow switch is used, it will receive signal of the heat source water circulation and detects if there is any problem on water circulation before operating the outdoor unit.
- When there is no contact signal input to the flow switch, it will be diagnosed as 'Problem with the heat source water circulation' and outdoor unit will stop operating to protect outdoor unit.

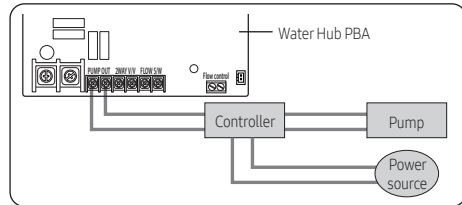


CAUTION

- Pump out, 2 way solenoid valve, flow switch can be used individually or together.
- For installation location of the 2 way solenoid valve and flow switch, Refer to 'Water pipe diagram' on page 99.

Pump out connection

- When the main pump is installed to common water pipe, powerless contact signal will be provided. (Refer to 'Installation example of extra controller such as 2 way solenoid valve and pump etc' in page 104 ~ 105.)



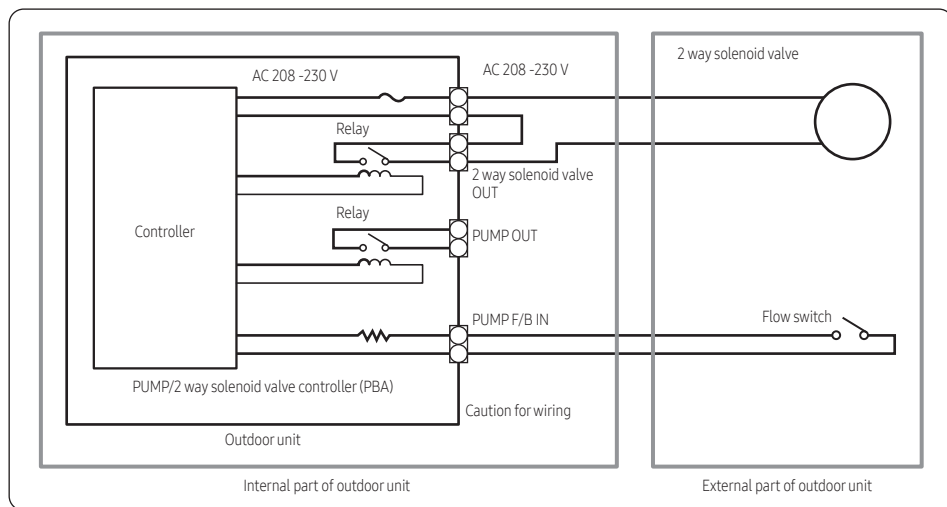


Explanation of optional functions

Wiring method for optional functions

Installation example of AC 208~230 V, direct operation type 2 way solenoid valve

208 ~ 230 V (VPD***W6M-5P, VRD***W6M-5Y) Models

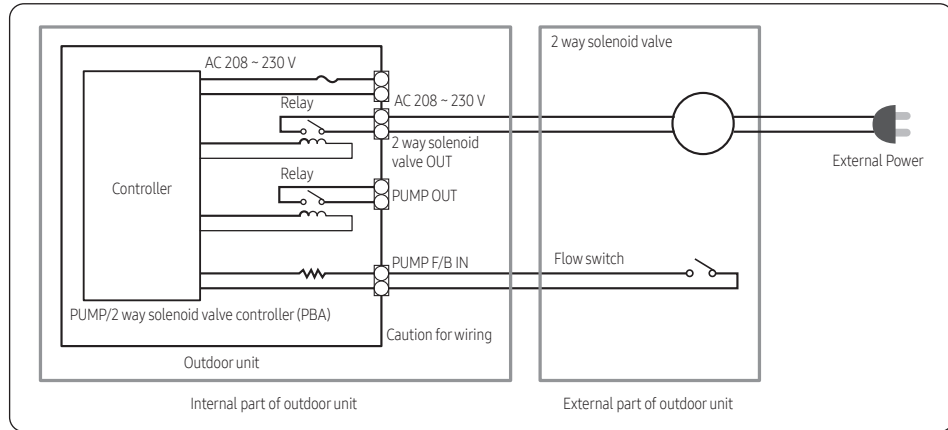


- 2 way solenoid valve is a type that works at AC 208 - 230 V 50/60 Hz and supports product with 0.2 A or low.
 - For 2 way solenoid valve with over 0.2 A, connect external power.
 - For external power cable for 2 way solenoid valve must use 600 V flame-resisting double layered cable.
- Product will not operate when flow switch is not installed.



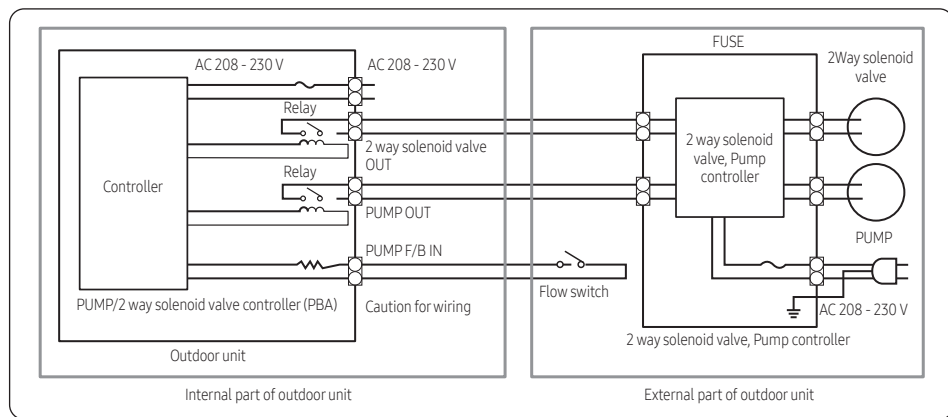
Installation example of AC 460 V, direct operation type 2 way solenoid valve

460 V (VRD***W6M-5G) Models



- 2 way solenoid valve is a type that works at AC 208 - 230 V 50/60 Hz and supports product with 0.2 A or low.
 - For external power cable for 2 way solenoid valve must use 600 V flame-resisting double layered cable.
- Product will not operate when flow switch is not installed.
- 460 V (VRD***W6M-5G) must use external power.

Installation example of extra controller such as 2 way solenoid valve and pump etc.

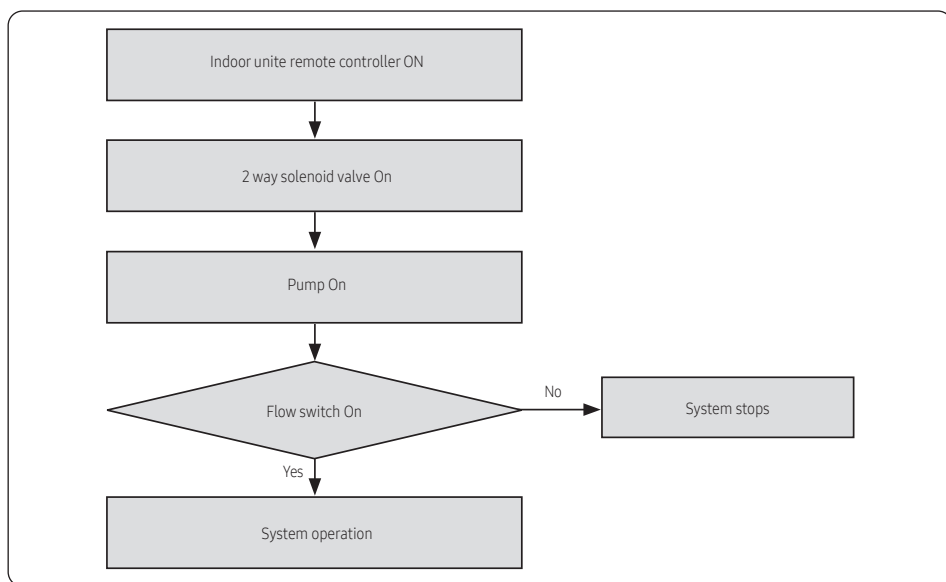




Explanation of optional functions

- If the operation type of 2 way solenoid valve is different, use extra controller.
 - Also use external controller for pump.
 - Outdoor unit only provides contact signal needed for 2 way solenoid valve and pump operation. Therefore, do not use the contact signal from the Water-cooled VRF directly.
- Product will not operate when flow switch is not installed.

Flow chart of outdoor unit external contact controller

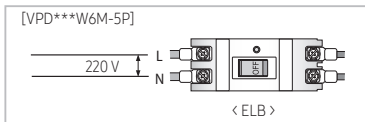


- Flow switch detector circuit must be detected for more than 30 seconds within 3 minutes after first operation signal output of the pump. (Outdoor unit will not operate when there is no detection.)
- Outdoor unit will stop if the contact of flow switch becomes 'Off' even during the operation.
- When outdoor unit stops, cooling water pump will also stop.
- Even when you are not using the external contact control from VRF outdoor unit, you may use other external control methods such as DDC, PLC or BMS and apply above flow chart. Also apply control for freezing prevention of the water circulation during winter season.
- If you control pump/2 way solenoid valve with extra controller, make sure to apply in control so that pump/2 way solenoid valve operates for 3 minutes after the outdoor unit stops operating.

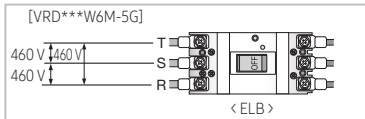
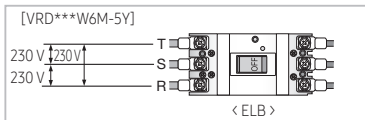


Things to check after completing the installation

- 1 Before supplying the power, use DC 500 V (VRD***W6M-5Y) or DC 600 V (VRD***W6M-5G) insulation resistance tester to measure the power (3 phase: R, S, T) terminal and insulation resistance between the outdoor unit grounds.
 - Measurement should be over 30 MΩ.
- 2 Before supplying the power, use a voltmeter and phase tester to check the voltage and the phase.
 - Single phase 2 wired power supply
L and N terminals: Check the 220 V (VPD***W6M-5P) between wires.



- R, S, T terminal: Check the 230 V (VRD***W6M-5Y) or 460 V (VRD***W6M-5G) between wires (R-S, S-T, T-R)



⚠ CAUTION

- Never measure the communication terminal since communication circuit may get damaged.
- Check for short-circuit of the communication terminal with a general circuit tester.

- 3 Check if the R-32 indoor units are connected.



Things to check after completing the installation

4 Check the following after the installation is completed.

Installation work	Outdoor unit	- Have you checked the external surface and the inside of the outdoor unit? - Is there any possibility of short-circuit caused by the heat of an outdoor unit? - Is the place well-ventilated and ensures space for service? - Is the outdoor unit fixed securely to withstand any external force?
	Indoor unit	- Have you checked the external surface and the inside of the indoor unit? - Is there enough space for service? - Have you checked if the center of the indoor unit is ensured and it is installed horizontally?
Refrigerant pipe work		- Have you selected correct pipes? - Are the liquid and gas valve open? - Is the total number of connected indoor units within the allowable range? - Are the length and the height difference between the refrigerant pipes within the allowable range? - Are the branch joints properly installed? - Did you check the connection of liquid and gas pipes? - Have you selected correct insulator for pipes and insulated them correctly? - Did you insulate the pipes and connection part correctly? - Is the quantity of the additional refrigerant correctly weighed in? (You must record the amount of additional refrigerant on the service record paper placed inside of the outdoor unit.)
Drain pipe work		- Have you checked if the drain pipes of the indoor and outdoor unit are connected together? - Have you completed the drain test? - Is the drain pipe properly insulated?
Electrical wiring work		- Are the power cable and communication cable tightened firmly on the terminal board within the range of rated tightening torque? - Have you checked for cross-connection of the power and communication cables? - Have you performed the earthing work 3 to the outdoor unit? - Did you make sure to use 2-core cable (not multi-core cable) for the communication cable? - Is the length of the wire within allowed range? - Is the wiring route correct?
Setting address		- Did you set the address of the indoor and outdoor units properly? - Did you set the address of the indoor and outdoor units properly? (When using multiple remote controllers)
Option		If there is a possibility of the outdoor unit from vibrating, check whether the anti-vibration frame is correctly installed.



Inspection and test operation

⚠ CAUTION

Precautions before trial operation

- When the outdoor temperature is low, turn on the main power 6 hours before beginning the operation.
 - If you start the operation immediately after turning on the main power, it may cause serious damage to the part within the product.
- Do not touch the refrigerant pipe during or right after the operation.
 - Refrigerant pipe may be hot or cold during or right after the operation depending on the status of the refrigerant which flows through the refrigerant pipe, compressor and other parts of the refrigerant cycle. If you touch the refrigerant during or right after the operation, you may get burns or frostbite.
- Do not operate the product with its panel or protection nets off.
 - There is risk of personal injury from the parts that rotates, heated or with the high voltage.
- Do not cut off the main power right after stopping the operation.
 - Wait for at least 5 minutes before turning off the main power. If not, water leakage or other problems may occur.
- Connect all the indoor units and the power supply for the outdoor unit and run auto address setting. Run auto address setting even after changing the indoor unit PCB.

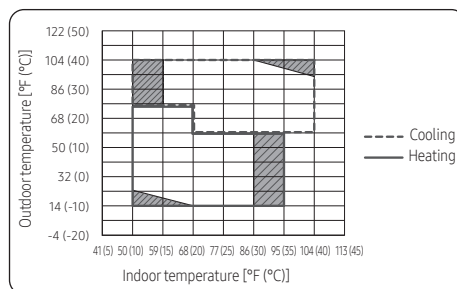
Checklist before auto trial operation

- 1 Check the power cable and communication cable of the indoor and outdoor unit.
- 2 Supply power to the outdoor unit 6 hours before trial operation to pre-heat the crank case heater.
- 3 Before supplying the power, use a voltmeter and phase tester to check the voltage and the phase.
 - Single phase 2 wires (VPD***W6M-5P)
L and N terminals: Check the 220 V (VPD***W6M-5P) between wires.
 - R,S,T terminal: Check the 230 V between wires (R-S, S-T, T-R) (VRD***W6M-5Y Model only). / 460 V between wires (R-S, S-T, T-R) (VRD***W6M-5G Model only)

- 4 When the power is supplied, outdoor unit will execute tracking to check the indoor unit connection and other optional functions.
- 5 Write down the installation report on the service history report paper attached on the front part of the control box.

⚠ CAUTION

- Supply power to the outdoor unit 6 hours before auto trial operation to pre-heat the crank case heater.
- 6 Guaranteed range of auto trial operation
For precise judgment, you must perform auto trial operation in below indoor/outdoor temperature condition.



- In Auto trial operation, product will automatically select either cooling or heating mode and operate in selected mode.
- In the temperature range marked with slashed pattern, system protection control may trigger during operation. (If the system protection control is enabled, it can be hard to get the precise judgment after the auto trial operation.)
- When the temperature is outside of guaranteed range, accuracy of judgment on auto trial operation may decrease near boarder line area.

Inspection and test operation

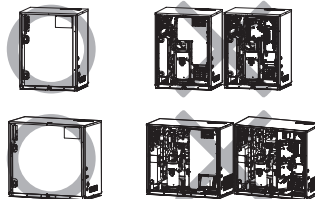
Auto trial operation

- 1 If the Auto Trial Operation is not completed, normal operation will be prohibited.
 - When the auto trial operation is not completed, UP (UnPrepared) will appear on the segment after the communication check and restrict compressor from operating. (UP Mode will be cleared automatically when auto trial mode is completed.)
 - Auto trial operation may take 20 minutes to maximum 2 hours depending on the operation status.
 - During auto trial operation, noise can be generated due to valve inspection. (Check the product if abnormal noise occurs continuously.)
- 2 When error occurs during auto trial operation, check the error code and take appropriate measures.
 - Refer to next couple of pages when E503, E505 or E506 error occurs.
 - Refer to service manual if you need inspection or when other errors occur.
- 3 When auto trial operation ends, use Lennox Service Software to issue a result report.
 - Refer to service manual for further actions if you have any items with "inspection required" sign on the result report.
 - After taking appropriate measure for the items with "inspection required" sign, run the auto trial operation again.

- 4 Check the following items by running trial operation (cooling/heating).
 - Check if cooling/heating operation performs normally.
 - Individual indoor unit control: Check for air flow direction and fan speed.
 - Check for abnormal operation noise from the indoor and outdoor unit.
 - Check for proper draining from the indoor unit during cooling operation.
 - Use Lennox Service Software to check the detail operation status.
- 5 Explain to the user how to use the Water-cooled VRF according to the user's manual and provide this installation manual to the user.

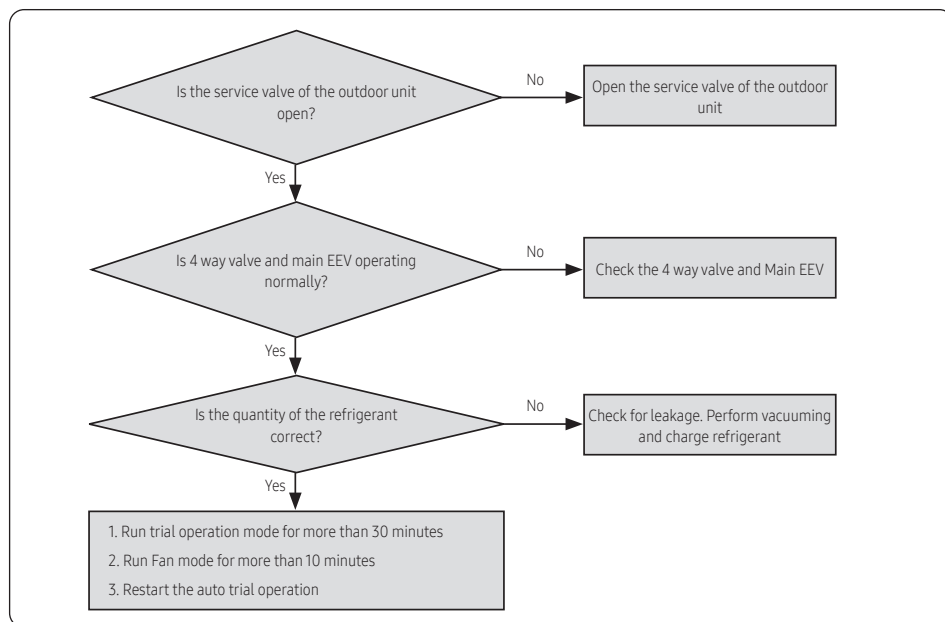
CAUTION

- Make sure to close the front part of the outdoor unit cabinet during operation. If you operate the unit with the front cabinet open, it may cause damage to the product and you may not get the precise data from Lennox Service Software.





Measures to take when an E503 error occurs (When the “inspection required” message appears on the Lennox Service Software report)



※ 4 way valve abnormal operation symptoms:

- Refrigerant noise increases when the compressor is in operation and the inlet pipe temperature (H/P: Suction, H/R: Suction 2) remains over 50 °F (10 °C) when compared to the low pressure saturation temperature.
- During heating operation, the temperature of the EVa. in/out maintains a value of less than 32 °F (0 °C).

※ Main EEV abnormal operation symptoms:

- During heating operation, an error occurs when controlling the degree of the superheat on the compressor inlet.
: If there is an operation error whilst the EEV is fully open, the target degree of superheat [33.8 °F (1 °C)] cannot be achieved [below 32 °F (0 °C)] and the discharge temperature of the compressor is low.
: If there is an operation error whilst the EEV is fully closed, the low pressure will decrease and the degree of superheat on the compressor inlet increases excessively.



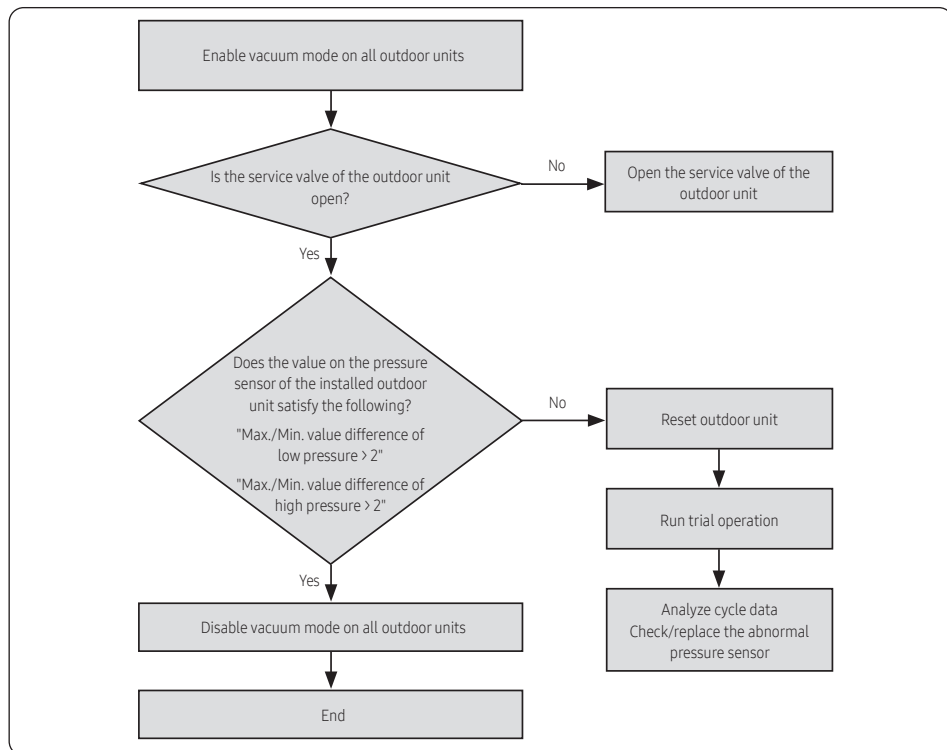
CAUTION

- If the service valve needs to be detected, corresponding outdoor unit will display the error.
- If the service valve needs to be detected, auto detection mode will end. Check both gas pipe and liquid pipe service valves when detecting service valve.
- When 4 way valve, Main EEV detection is needed, run heating trial operation for more than 1 hour and analyze the data to check for a problem.
- If the operation range is not within guaranteed range, error may occur even though the product is normal.



Inspection and test operation

Measure to take when E505 or E506 error occurs



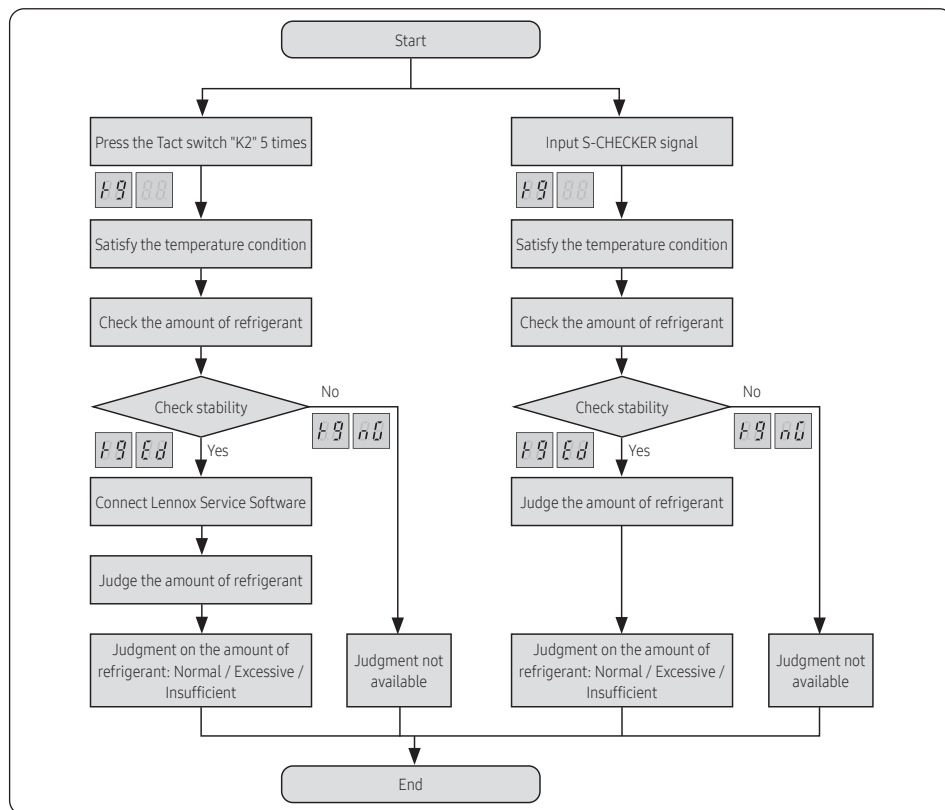
CAUTION

- When the auto trial operation for pressure sensor is executed before the pressure of the outdoor unit is equalized (when there is little difference between high and low pressure), error may occur even though the product is normal.
- If the pressure sensor needs to be detected, all outdoor units will display the error.
- If the pressure sensor needs to be detected, auto trial operation mode will end.
- To check for the pressure sensor with the problem, run trial operation for more than 1 hour and analyze the data to check for a problem.



Automatic refrigerant amount checking function

This function detects the amount of refrigerant in the system



⚠ CAUTION

- When the temperature is outside of guaranteed range, you can not obtain an accurate result.
 - Indoor : 68 ~ 89.6 °F (20 ~ 32 °C)
 - Water temperature : 59 ~ 104 °F (15 ~ 40 °C)
- If the operation cycle is not stable, refrigerant amount detection operation may end.
- Accuracy of the results may decrease if the product is not operated for a long period time before the refrigerant amount detection function operation is activated. Use the refrigerant amount detection operation function after operating the product in cooling mode for at least 30 minutes.
- Depending upon the operational environment, a system protection operation may be triggered. As a result, the refrigerant amount detection result may be inaccurate.



Automatic refrigerant amount checking function

Actions to take after the detection result

- Excessive amount of refrigerant : Discharge 5 % of the detected amount of refrigerant and restart the refrigerant amount detection operation.
- Insufficient amount of refrigerant : Charge 5 % of the detected amount of refrigerant and restart the refrigerant amount detection operation.
- Insufficient degree of supercooling : Charge 10 % of the detected amount of refrigerant and restart the refrigerant amount detection operation.
- Judgment not available : Check if the refrigerant amount detection operation was executed within guaranteed temperature range. Execute trial operation to check if there's any other problems on the system.

Precaution before trial operation

- 1 Water quality management
 - It is not possible to disassemble the plate heat exchanger for cleaning or part replacement. Therefore, to prevent corrosion or water scale on the plate type heat exchanger, you must manage the cooling water quality in compliance with standard of cooling water. (Refer to 'Cooling water management' on page 116.)
 - If the temperature of water is higher than room temperature, make sure to keep the concentration of chloride ion below 100 ppm to prevent corrosion and the water hardness should be below 150 mg CaCO₃/L to prevent water scale. When a scale inhibitor is used, make sure to use the type that is corrosion-free to the stainless steel and copper.
- 2 Water flow management
 - Insufficient water flow will lead to accidents related to frozen plate type heat exchanger. Check to make sure if there is any decrease in amount of water flow due to blocked strainer, problem on air ventilation or circulation pump after checking the temperature/pressure difference between the inlet and outlet of the plate type heat exchanger. If the temperature/pressure difference exceeds optimal range, stop the operation until remedial action is taken before the operation is restarted.
- 3 Counter-measures after E436 error (anti-freeze control) display
 - If E436 is displayed during operation, make sure to take care of the cause of problem before re-starting the operation. Water may freeze partially from the point when E436 is displayed. If you re-start the operation before the problem has been taken care of, plate type heat exchanger will shutdown and it will be impossible to melt the ice. If the water remains frozen, plate type heat exchanger will break and cause refrigerant leakage or water may enter into the refrigerant cycle.



Maintenance

Precautions on plate type heat exchanger maintenance

- ※ Make sure to tell the user to keep this installation manual.
- When the product was not operated for long period of time, check the followings:
 - Check the water to see if the water quality is meets the standard.
 - Clean the strainer.
 - Check to see if there is enough amount of water flow
 - Check to see if there is any problems on the water pressure, amount of water and the water temperature at inlet/outlet.
 - If you are using ground heat source, make sure to check the concentration level of the anti-freeze before the operation to maintain the freezing point at below 17.6 °F (-8 °C) (Refer to 'Ground heat exchanger circulation water (anti-freeze) usage standard (mandatory checklist)' on page 118)
 - It is not possible to disassemble the plate heat exchanger for cleaning or part replacement. Therefore it has to be cleaned by following methods.
 - Check if there is any cleaning hole for chemical cleaning at the inlet water pipe. For water scale cleaning use diluted (down to 5 %) citric acid, oxalic acid, acetic acid, phosphoric acid. However, do not use a cleaning solution containing hydrochloric acid, sulfuric acid or nitric acid since they are highly corrosive.
 - Check if there is valve on the inlet/outlet of the plate type heat exchanger.
 - Connect a exclusive pipe for cleaning to the inlet/outlet pipe of the plate type heat exchanger and fill the detergent at the temperature of 122 ~ 140 °F (50 ~ 60 °C) and circulate the detergent for about 2~5 hours. Cleaning time can be different depending on the temperature of detergent or degree of water scale. Judge the degree of water scale removal by the color of water detergent.
 - After cleaning, discharge the detergent within the plate type heat exchanger and fill the plate type heat exchanger with a water mixed with 1~2 % of sodium hydroxide or sodium bicarbonate. Circulate the water mixture for 15~20 minutes to neutralize.
 - After neutralizing the pipes, rinse the plate type heat exchanger with distilled water.
 - If you are using the detergent sold at local retail stores, make sure that it doesn't cause any corrosion to the stainless steel or copper.
 - For detail information on cleaning method (and proper use of detergent), contact the detergent manufacturer.
 - After cleaning, check to see if it is possible to operate normally.

Recommended number of inspection for normal operation

Inspection list	Inspection standard	Number of inspection	Side effects when inadequate
Forced drainage	Have you set the electric conductivity value properly?	Once a week	Corrosion, water scale or slime may occur
	Is electric conductivity sensor working properly?		
	Is auto valve working properly?		
Cooling water and water quality inspection	Is cooling water corrupted or have floating particles?	Once a month	Corrosion, water scale or slime may occur
	Is there rust water?		
	Is there any red tides?		
	Is the concentration of the antifreeze being maintained?	Once a year (before winter season)	-
Internal/external part of the cooling tower	Is there any water scale or slime?	Once a month	Corrosion, water scale or slime may occur
	Is there any signs of corrosion on the metal part?		
	Is there any water plant?		
Heat source water device	Have you set the make-up water supply value properly?	Daily	Operation problem at the cooling tower or intensified water concentration
	Is there any excess or deficiency of the make-up water?		
	Is the water level within the tank normal for operation?		



Cooling water management

1 Standard of cooling water quality for air conditioning and the number of water quality inspection

※ Make sure to comply the standard for water quality management.

• Cooling water with high level of foreign substances can cause pipe corrosion or creation of water scale which effects the product's performance and lifespan. (Use the appropriate heat source water according to the below table) If the system water is sourced from anything other than the local water supply, make sure to check the quality of water.

※ For water quality management on the heat source water of closed circuit water cooling must be done according to the below table. If the water quality is not managed according to the below table, it may decrease the performance of Water-cooled VRF and cause serious problem on the product.

Classification	Item	Closed type system		Effects		Recommended number for water quality inspection
		Circulating water	Supplemented water	Corrosion	Scale	
Standard value	pH [77 °F (25 °C)]	7.0 ~ 8.0	7.0 ~ 8.0	●	●	Twice a month
	Electric conductivity [77 °F (25 °C)](mS/m)	30 or below	30 or below	●	●	
	Chloride ion (mg Cl ⁻ /L)	50 or below	50 or below	●		Once a month
	Sulfate ion (mg SO ₄ ²⁻ /L)	50 or below	50 or below	●	●	
	M alkali level [pH 4.8] (mg CaCO ₃ /L)	50 or below	50 or below		●	
	Total hardness (mg CaCO ₃ /L)	70 or below	70 or below		●	
	Calcium hardness (mg CaCO ₃ /L)	50 or below	50 or below		●	
	Ionized silica (mg SiO ₂ /L)	30 or below	30 or below		●	
Reference	Iron (mg Fe/L)	1.0 or below	0.3 or below	●	●	Once a month
	Copper (mg Cu/L)	1.0 or below	1.0 or below	●		
	Sulfate ion (mg S ²⁻ /L)	Not to be detected	Not to be detected	●		
	Ammonium ion (mg NH ₄ ⁺ /L)	0.3 or below	0.1 or below	●		
	Residual chlorine (mg Cl/L)	0.25 or below	0.3 or below	●		
	Free carbon dioxide (mg CO ₂ /L)	0.4 or below	0.4 or below	●		
	Stability index	-	-	●	●	

⚠ CAUTION

- Circle (O) denotes the factor relevant to corrosion or water scale.
- When the water temperature is over 104 °F (40 °C), steel without protective coating may corrode when exposed to water. Applying corrosion prevention material or degassing can be an effective measure to prevent corrosion.
- For the cooling water and the make-up water, used under closed circuit water system with closed circuit cooling tower, should satisfy the standard shown in above table.
- Supplied water or make-up water should be tap water, industrial water or groundwater. Purified water, neutralized water and softened water should not be supplied.
- 15 items in the above table is a typical factor for corrosion and/or water scale.

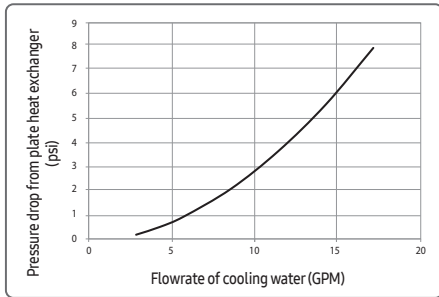
2 Operation range of water

- When the amount of cooling water is out of the operation range, stop the outdoor unit and take care of the cause before re-start the operation (Operation range : 60~120 % of the standard amount of water flow)

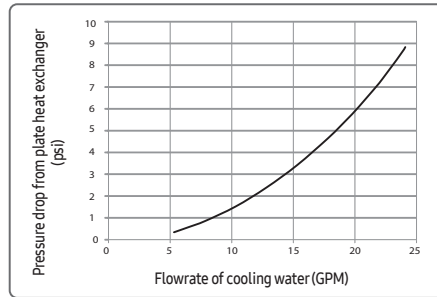


Flowrate of cooling water (GPM)				
Model name		VPD038W6M-5P	VPD048W6M-5P	VPD055W6M-5P
Standard condition	Cooling/Heating	10.5	13.2	15.9
Operation range	Cooling/Heating	6.3~12.7	7.9~15.9	9.5~19.0

- VPD038W6M-5P

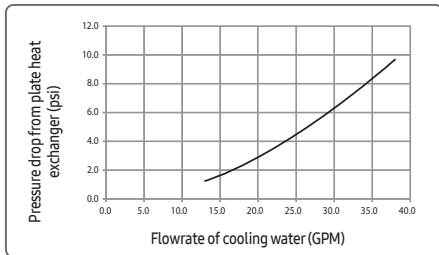


- VPD048/055W6M-5P

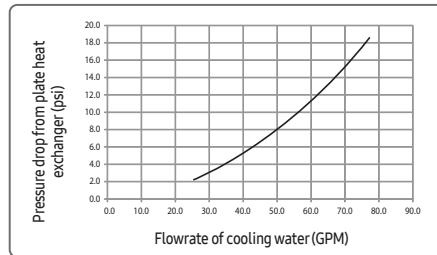


Flowrate of cooling water (GPM)						
Model name		VRD072W6M-5*	VRD096W6M-5*	VRD120W6M-5*	VRD192W6M-5*	VRD240W6M-5*
Standard condition	Cooling/Heating	21.1	25.4	30.1	50.2	60.2
Operation range	Cooling/Heating	12.7 ~ 25.4	15.3 ~ 30.4	18 ~ 36.2	30.1 ~ 60.2	35.9 ~ 72.4

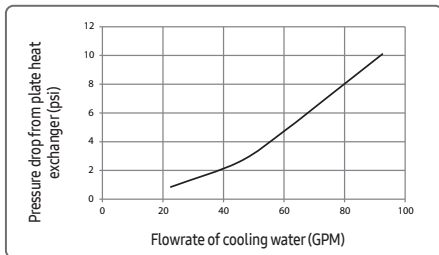
- VRD072/096/120W6M-5*



- VRD192W6M-5*



- VRD240W6M-5*





Cooling water management

3 Ground heat exchanger circulation water (anti-freeze) usage standard (mandatory checklist)

When using ground heat source, use anti-freeze to manage the freezing point. If you do not use anti-freeze, it will cause the pipes to freeze and burst. Note that the manufacturer does not take responsibility for any damage caused.

- All the circulating water (anti-freeze) and additives (corrosion inhibitor, bacteria inhibitor, foam inhibitors) must be used after consulting with the business ordering party or supervisor for its impact on environment, toxicity, corrosiveness, harmfulness to human and management plan.
- Contractor must take extra care regarding on handling, packaging and transporting regulations and procedure of the anti-freeze.
- Do not use the anti-freeze that is harmful to humans or equipment. In addition, anti-freeze must be injected to the pipe according to specification and concentration level that is actually required by system. (Do not directly inject undiluted solution, consult business ordering party or supervisor when undiluted solution was brought to the site)
- Before injecting the anti-freeze, evacuate any air that may remain in the system and apply pressure to check for leakage.
- User must monitor and manage periodically to maintain initially designed concentration level of the anti-freeze. If the concentration level decrease due to leakage or over certain period of time, it may cause due to pipe to freeze and burst.
- Usage condition of the anti-freeze when ground heat exchanger is installed (mandatory)
 - Flash point: Flash point of the anti-freeze must be over 194 °F (90 °C).
 - Biochemical oxygen demand: Amount of oxygen in 1 g of anti-freeze at 50 °F (10 °C) must be within 0.1 ~ 0.2 g and this value must be maintained for 5 days.
 - Freezing point: Concentration level of the anti-freeze must be maintained above freezing temperature.
 - Toxicity: LD50 per each 1 kg of anti-freeze must be less than 5 g.
 - Storage stability: It must not be separate when heated or cooled, and also turbidity should not be increased.
 - Corrosion resistance: It must be corrosion resistant to all the metallic material used for ground heat pumps and pipes.
 - Scale: Scale that has been accumulated on the plate type heat exchanger for one year of performance should not cause performance decrease over 15 %.

4 Standard data for status of Anti-freeze [Based on temperature of anti-freeze at 59 °F (15 °C)]

Type of anti-freeze [Based on 59 °F (15 °C)]	Concentration [% Wt.]	Freezing temperature		Density	
		°F	°C	lb/ft ³	kg/m ³
Ethylene glycol	10	26.2	-3.2	63.4	1014.87
	20	18.0	-7.8	64.4	1031.39
	30	6.6	-14.1	65.4	1047.07
	40	-8.1	-22.3	66.3	1061.65
Propylene glycol	10	26.1	-3.3	63.0	1009.75
	20	19.2	-7.1	63.7	1020.91
	30	9.1	-12.7	64.3	1030.51
	40	-6.0	-21.1	64.8	1038.65



Installation check card

Calculation of Additional Charging Weight of the Refrigerant		
High Pressure Pipe	Total Pipe Length [ft (m)]	Additional Refrigerant [lbs (kg)]
Ø 1/4" (6.35)		
Ø 3/8" (9.52)		
Ø 1/2" (12.70)		
Ø 5/8" (15.88)		
Ø 3/4" (19.05)		
Ø 7/8" (22.23)		
Ø 1" (25.40)		

Installation condition for a water pipe

Date of Installation	DD	MM	YY
Date of Test Run	DD	MM	YY

Water Pipe Installation Company	Company Name	
	Contact	
Cooling Water	Type and Capacity	
Boiler	Type and Capacity	
Anti-Freeze Specification	Type	
	Concentration	%
Flow switch (Compulsory)	Type	Manufacturer: Model Name:
	Installed Direction	Horizontal installation ()
2Way Valve (Optional)	Type	Manufacturer: Model Name:
	Installed Direction	Horizontal installation ()
Variable Flow Control Valve (Optional)	Type	Manufacturer: Model Name:
	Installed Direction	Horizontal installation ()

- ※ This product is irrelevant to any installation or performance problem of the cooling tower and boiler.
- ※ This installation specification of the Lennox products will be managed as a reference for follow-up management.

- ※ This product must be installed by the installation experts. Installing on your own or by unauthorized installer will be cause of product failure.
- ※ Installer and inspector must fill in the installation check card after completing the product installation and test run.
- ※ User must request the installer/inspector's to write down their real name since it will be convenient when receiving follow-up services or moving and re-installing the product.





Self-checklist for installer

Preparation	Item	Checklist	Check standard	Check result
	Distribution board	Did you install the separate circuit breakers to cut the power of each indoor unit?	Separate circuit breaker must be used to install indoor unit power	
	Outdoor unit power	Did you connect the outdoor unit power cable in correct order of RST power?	Visual check	
		Did you connect the outdoor unit power cable with solderless ring terminal by applying rated torque?	Use solderless ring terminal and follow rated torque for connection	
	Outdoor unit communication	Did you set the number of indoor units connected to the outdoor unit?	Check S/W combination of the outdoor unit PCB with the actual diagram	
		Did you connect the communication cable (F1, F2) between the indoor and outdoor units without dividing it multiple times from one indoor unit?	Check the connection status of communication cable	
	Outdoor unit	Is there enough space around the outdoor unit?	Check the standards in the installation manual	
		Did you select the appropriate location for installation?	Surrounding temperature within 32~104 °F (0~40 °C), and humidity within 80 %	
		Did you apply anti-vibration frame or pad according to the standards stated in the installation manual?	Visual check	
		Did you install drain pipe for outdoor unit?	Visual check	
		Did you remove the stopper nut and washer used to fix the compressor?	Visually check that the compressor is fixed only with the nut washer	
	Water supply system	Is there any leakage on the pipe?	Visual check	
		Check if the temperature and pressure sensor is installed on the inlet/outlet of the outdoor unit.	Visual check. (4 in total) Notify the water pipe installer if they are not installed.	
		Check if the shut-off valve and flexible joint is installed on the inlet/outlet of the outdoor unit.	Visual check. (4 in total) Notify the water pipe installer if they are not installed.	
		Check if foreign substances and welding slugs in the pipe were cleaned.	Check whether or not flushing work has been performed and check the water quality. Notify the water pipe installer if flushing work has not been done.	
		Check if the strainer on the inlet water pipe were cleaned.	Clean the strainer. Notify the water pipe installer if the strainer was not cleaned.	
		Check if the flow switch is installed on the outlet water pipe and connected to the product. (Installed in a vertical position on horizontal water pipe.)	Visual check. Notify the water pipe installer if it is not installed.	
		Check if the drain valve (for discharging water) is installed.	Visual check. Notify the water pipe installer if it is not installed.	
		Is there countermeasure for maintaining the amount of water flow between the outdoor units?	Visual check. Notify the water pipe installer if they are not installed.	



Self-checklist for installer

	Item		Checklist	Check standard	Check result
Preparation	Water supply system	Ground heat	Is the internal pressure of the pipe at 14.2~56.9 psi(1~4 kg/cm ²), when the ground water circulation pump is stopped?	Visually check the pressure gauge	
			What is the value of ground thermal conductivity?	Check the value of ground thermal conductivity on ground heat usage review	
			Did you check the concentration level of the anti-freeze among the circulation water?	Check the Brine concentration measurement (Based on the installation manual)	
Trial Operation	Outdoor unit		Is the inlet water temperature appropriate?	Check the temperature gauge (Based on the installation manual)	() °F
			Is the supplied amount of water flow within the maximum/minimum range?	Check the standards in the installation manual	() LPM
			Is the contact signal input for flow switch normal?	Check with clamp meter (Check for on/off contact when water pipe is on/off)	
			Is there error display on outdoor unit PCB?	Check error	
			Is there abnormal vibration or noise on outdoor unit cabinet?	Visual check	
	Indoor unit		Is there abnormal operation noise on indoor unit?	Check for abnormal noise	
			Is the cooling/heating discharge temperature of indoor unit appropriate?	Check for abnormal temperature	
			Is the blade movement of cassette type indoor unit appropriate?	Visual check	
			Is the discharged air volume for duct and indoor unit appropriate?	Check the temperature	
			Is there any water leakage on the drain pipe near the indoor unit?	Visual check	
			Is there any error display on indoor unit panel?	Check for error	
			Do you see any gaps or bent part on the panel of the cassette type indoor unit?	Visual check	
	Controller		Can you turn on/off the power with the controller?	Visual check	

Others



Memo

Others

