



VRF (variable refrigerant flow) Installation manual

VPC/VRC****4M**

- 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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SAMSUNG



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Safety Information

California Proposition 65 Warning (US)

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

Please follow the following safety information for safety of the installer and the user.

- VRF uses R-410A refrigerant.
 - When using R-410A, moisture or foreign substances may affect the performance and reliability of the product. Safety precautions must be obeyed when installing the refrigerant pipe.
 - The designed maximum pressure of the system is 4.1MPa (594.6psi) and therefore select appropriate material and thickness according to the regulations.
 - R-410A is a quasi-azeotrope of two refrigerants and it has to be charged in liquid phase when filling the refrigerant. (If you charge vapor refrigerant, it may change the blend of the refrigerant and cause product malfunction.)
- You must connect the indoor units for R-410A 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-410A, it cannot operated normally.)
- 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, VRF should not be relocated after installation. But when it has to be relocated for inevitable reasons, please contact Lennox's qualified dealers for VRF.

⚠ 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.

General information

⚠ WARNING

- Consult qualified installer or dealer for installation.
 - When installation is done by unqualified person, problems such as water leakage, electric shock or fire may occur.
 - Installation work must be done properly according to this installation manual.
 - When installation is not done properly, it may cause water leakage, electric shock or fire.
 - When installing the unit in a small room, take measure to keep the refrigerant concentration from exceeding allowable safety limits in case of refrigerant leakage. Consult the dealer for precautionary measure before the installation.
 - When refrigerant leaks and exceed dangerous concentration level, it may cause suffocation accidents.
 - If any gas or impurities, except R-410A refrigerant, come into the refrigerant pipe, serious problem may occur and it may cause injury.
- Use the supplied accessories, specified components and tools for the installation.
 - Do not use the pipe and the installation product used for refrigerants except R-410A.
 - Failure to use the specified components can cause product fall down, water leakage, electrical shock, and fire. (The pipe and flare components used for refrigerants except R-410A must not be used)
 - Install the outdoor unit on a hard and even place that can support its weight.
 - If the place cannot support its weight, the outdoor unit may fall down and it may cause injury.
 - Check the following before installation and service work.
 - Before welding, remove dangerous and inflammable things that may cause an explosion and fire around the work.
 - Before welding, remove the refrigerant from inside the pipe or the product.
 - If you perform welding while refrigerant is in the pipe, it may increase the pressure of the refrigerant and cause the pipe to burst. If the pipe bursts or explodes, it may cause severe injury to the installer.
 - When welding, use the nitrogen gas to eliminate oxidation inside the pipe.
 - Do not modify the product on your own.
 - Potential risk of electric shock, fire, product failure or injury.
 - Fix the outdoor unit securely on foundation to resist strong wind or earthquake.
 - If the outdoor unit is not properly fixed, it turns over and accidents may occur.
 - 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.
 - 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.
 - Wiring must be connected with the designated wires and it must be fixed securely so that it does not apply any external force to the connection part of the terminals.
 - If connection for fixation is not properly done, it may cause heat generation or 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 generate on the electrical terminal and cause electric shock or fire.
 - Exclusive circuit breaker (MCCB, ELB) must be installed to the power supply.
 - When overcurrent or current leakage occurs with no circuit breaker installed, power will not be cut-off and it may cause electric shock or fire.
 - Do not use damaged parts. It may cause fire or electric shock.
 - You must cut-off the power before you work on, or adjust any power supply part for product installation, maintenance, repair or any other services.
 - There is risk of electric shock.
 - Even when the power is off, it is dangerous when you come in contact with inverter PCB, fan PCB since high pressure DC voltage is charged to those parts.

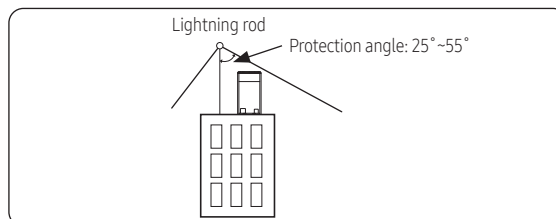
Safety Information

- When replacing/repairing the PCB, cut-off the power and wait until the DC voltage is discharged before replacing/repairing them. (Wait for more than 15 minutes to allow it to discharge naturally.)
- If the refrigerant gas leaks during the installation, you should ventilate the room.
 - When the refrigerant gas gets in contact with flammable substance, it may generate toxic gas.
- Gas leakage must be checked after installation is completed.
 - When the refrigerant gas gets in contact with flammable substance, it may generate toxic gas.
- You can get frostbite if you get in contact with the leaked refrigerant gas.
- Supply power to the product during winter time since the product will operate in protection mode when the temperature decrease below 0°C (32°F).
 - If power is removed, compressor protection mode cannot operate and may cause damage to the product.
- 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.

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

⚠ CAUTION

- Do not install the drain pipe directly to the bottom part of the outdoor unit and built a proper drainage so that water drains out smoothly. If not, pipe may freeze or bursts during winter time and cause damage to the product or water leakage.
 - When the draining work is not done properly, water leak may occur and cause property damage.
- Install the power cable and communication cable of the indoor and outdoor unit at least 1.5m (4.92ft) away from the electric appliances and install it at least 2m (6.56ft) away from the lightning conductor.
 - Noise may be generated from the electronic devices, depending on the status of the electric wave.
- Install the outdoor unit within the angle stated in the table, according to the height of the building.
 - Do not leave the refrigerant container under the hot sunlight. (There is risk of explosion.)
 - You must use the appropriate pipes according to the standard since the pressure of the refrigerant is high.
 - Make sure that the pipes does not get any weaker by welding it too much.
 - Make sure to install the product away from children's' reach. (Sharp parts of the heat exchanger may cause personal injury and when parts of the product gets damage, it may decrease product's performance.)



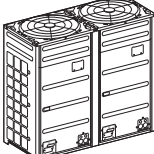


Height of the building	Protection angle
20m(65.6 ft) or less	55°
40m(131.2 ft) or less	35°
60m(196.9 ft) or less	25°

- Install the indoor unit away from lighting apparatus that uses ballast stabilizer.
 - If you use the wireless remote control, it may not operate normally due to ballast stabilizer.
- Do not install the product in following places.
 - Place where outdoor unit's noise and warm air may disturb neighbors.
 - Do not leave any obstacles around the inlet and outlet of the product. (It may cause damage or accidents.)
 - The place where there is mineral oil or arsenic acid.
 - Those parts may get damaged due to burned resin and cause water leakage or product may fall.
 - The efficiency of the heat exchanger may reduce or product may break.
 - The place where corrosive gas such as sulfurous acid gas generates from the vent pipe or air outlet.
 - The copper pipe or connection pipe may corrode and refrigerant may leak.
 - The place where there is a machine that generates electromagnetic waves.
 - The VRF may not operate normally due to problems in control system.
 - The place where there is a danger of combustible gas leakage or place where thinner or gasoline is handled.
 - (There is risk of fire or explosion.)
 - The place with carbon fiber or flammable dust.
 - The place near seashore or hot spring where there is risk of outdoor unit corrosion.
- Changes in VRF compare to conventional models that has to noted when installing
 - For optimal distribution of the refrigerant, you must use Y-joint as branch joint for connecting outdoor units. (Do not use T-joint)
 - You cannot operate normally if you do not complete the trial operation through outdoor unit key mode. You must use KEY MODE to run trial operation.
 - Check the compatibility of other products such as indoor unit, EEV kits etc. which will be connected to VRF.
 - The length of maximum piping, level difference, the quantity of connectable indoor units, the installation at the outdoor joints and the outdoor unit combinations are different from the conventional models.
 - If the pipe length is over 2m (6.56ft) between outdoor units, make traps to prevent oil stagnation. Oil stagnation may occur when outdoor unit at the end of module stops while other outdoor units are still in operation.

Preparations for Outdoor Unit

Outdoor unit classification

Classification	VRF Small type	VRF Large type	VRF X-Large type
Appearance			



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 them to suffocation.

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.
- When transporting VRF outdoor, be aware of the center of gravity of the outdoor (Please refer to the center of gravity label attached on the front panel, and remove it after installation.)

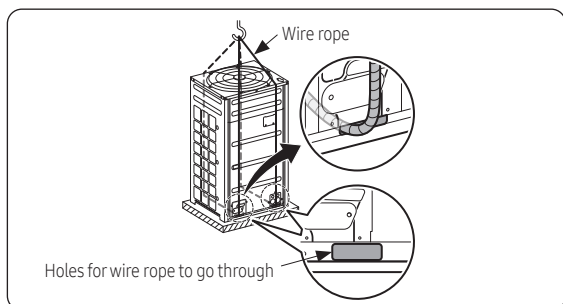


CAUTION

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

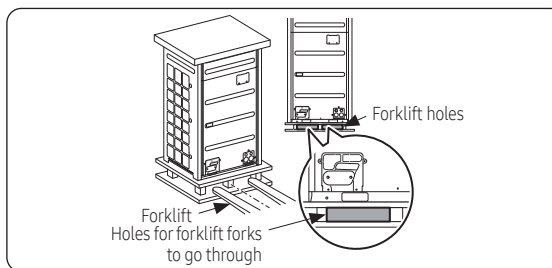
When moving with a crane

- 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.



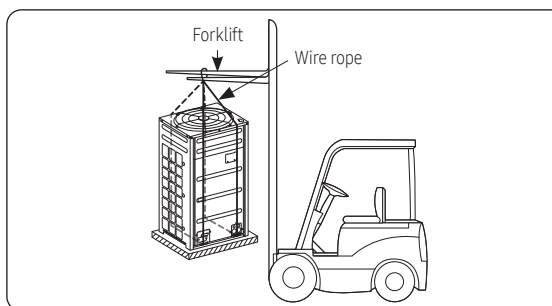
When moving with a forklift

- 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.



Outdoor unit combination

- Make sure to use an indoor unit that is compatible with 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. $0.5 \times \Sigma(\text{Outdoor unit capacity}) \leq \text{Total capacity of the connected indoor units} \leq 1.3 \times \Sigma(\text{Outdoor unit capacity})$
- Please contact your local Lennox representative or refer to the Technical Data Book for further details if the project requires you to design the project with a connection ratio greater than 130 %.
- 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 can be connected.



CAUTION

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

Preparations for Outdoor Unit

Module combination for V*C***S4M*** series

Model name for combination	Number of individual outdoor units	Nominal Capacity		Rated Capacity		Total cooling capacity of the connected indoor units		Maximum number of connectable indoor units	Combined outdoor units							
									V*C***S4M***							
		Cooling (Btu/h)	Heating (Btu/h)	Cooling (Btu/h)	Heating (Btu/h)	Minimum (Btu/h)	Maximum (Btu/h)		072 (6Ton)	096 (8Ton)	120 (10Ton)	144 (12Ton)	168 (14Ton)	192 (16Ton)	216 (18Ton)	240 (20Ton)
V*C072S4M-4*	1	72000	81000	69000	77000	36000	93600	12	1							
V*C096S4M-4*	1	96000	108000	92000	103000	48000	124800	16		1						
V*C120S4M-4*	1	120000	135000	114000	129000	60000	156000	20			1					
V*C144S4M-4*	1	144000	162000	138000	154000	72000	187200	25				1				
V*C168S4M-4*	1	168000	189000	160000	180000	84000	218400	29					1			
V*C192S4M-4*	1	192000	216000	184000	206000	96000	249600	33						1		
V*C216S4M-4*	1	216000	243000	206000	232000	108000	280800	37							1	
V*C240S4M-4*	1	240000	270000	228000	258000	120000	312000	41								1
V*C264S4M-4*	2	264000	297000	252000	282000	132000	343200	45		1			1			
V*C288S4M-4*	2	288000	324000	274000	308000	144000	374400	49		1				1		
V*C312S4M-4*	2	312000	351000	298000	334000	156000	405600	54		1					1	
V*C336S4M-4*	2	336000	378000	320000	360000	168000	436800	58		1						1
V*C360S4M-4*	2	360000	405000	342000	386000	180000	468000	62			1					1
V*C384S4M-4*	2	384000	432000	366000	412000	192000	499200	64						2		
V*C408S4M-4*	2	408000	459000	388000	438000	204000	530400	64						1	1	
V*C432S4M-4*	3	432000	486000	412000	462000	216000	561600	64		2			1			
V*C456S4M-4*	3	456000	513000	436000	488000	228000	592800	64			1	1		1		

Module combination for V*C***L4M*** series

Model name for combination	Number of individual outdoor units	Nominal Capacity		Rated Capacity		Total cooling capacity of the connected indoor units		Maximum number of connectable indoor units	Combined outdoor units		
									V*C***L4M***		
		Cooling (Btu/h)	Heating (Btu/h)	Cooling (Btu/h)	Heating (Btu/h)	Minimum (Btu/h)	Maximum (Btu/h)		072 (6Ton)	096 (8Ton)	120 (10Ton)
V*C072L4M-4*	1	72000	81000	69000	77000	36000	93600	12	1		
V*C096L4M-4*	1	96000	108000	92000	103000	48000	124800	16		1	
V*C120L4M-4*	1	120000	135000	114000	129000	60000	156000	20			1
V*C144L4M-4*	2	144000	162000	138000	154000	72000	187200	25	2		
V*C168L4M-4*	2	168000	189000	161000	180000	84000	218400	29	1	1	
V*C192L4M-4*	2	192000	216000	184000	206000	96000	249600	33		2	
V*C216L4M-4*	3	216000	243000	206000	232000	108000	280800	37	3		
V*C240L4M-4*	3	240000	270000	228000	258000	120000	312000	41	2	1	
V*C264L4M-4*	3	264000	297000	252000	283000	132000	343200	45	2		1
V*C288L4M-4*	3	288000	324000	275000	309000	144000	374400	49	1	1	1

Module combination for V*C***S4M-4J series

Model name for combination	Number of individual outdoor units	Nominal Capacity		Rated Capacity		Total cooling capacity of the connected indoor units		Maximum number of connectable indoor units	Combined outdoor units							
									V*C***S4M-4J							
		Cooling (Btu/h)	Heating (Btu/h)	Cooling (Btu/h)	Heating (Btu/h)	Minimum (Btu/h)	Maximum (Btu/h)		72 (6Ton)	96 (8Ton)	120 (10Ton)	144 (12Ton)	168 (14Ton)	192 (16Ton)	216 (18Ton)	240 (20Ton)
V*C072S4M-4J	1	72000	81000	69000	77000	36000	93600	12	1							
V*C096S4M-4J	1	96000	108000	92000	103000	48000	124800	16		1						
V*C120S4M-4J	1	120000	135000	114000	129000	60000	156000	20			1					
V*C144S4M-4J	1	144000	162000	138000	154000	72000	187200	25				1				
V*C168S4M-4J	1	168000	189000	160000	180000	84000	218400	29					1			
V*C192S4M-4J	1	192000	216000	184000	206000	96000	249600	33						1		
V*C216S4M-4J	1	216000	243000	206000	232000	108000	280800	37							1	
V*C240S4M-4J	1	240000	270000	228000	258000	120000	312000	41								1
V*C264S4M-4J	2	264000	297000	252000	282000	132000	343200	45		1			1			
V*C288S4M-4J	2	288000	324000	274000	308000	144000	374400	49		1				1		
V*C312S4M-4J	2	312000	351000	298000	334000	156000	405600	54		1					1	
V*C336S4M-4J	2	336000	378000	320000	360000	168000	436800	58		1						1
V*C360S4M-4J	2	360000	405000	342000	386000	180000	468000	62			1					1
V*C384S4M-4J	2	384000	432000	366000	412000	192000	499200	64						2		
V*C408S4M-4J	2	408000	459000	388000	438000	204000	530400	64						1	1	
V*C432S4M-4J	3	432000	486000	412000	462000	216000	561600	64		2			1			
V*C456S4M-4J	3	456000	513000	436000	488000	228000	592800	64			1	1		1		

Choosing the installation location

Outdoor unit location requirements

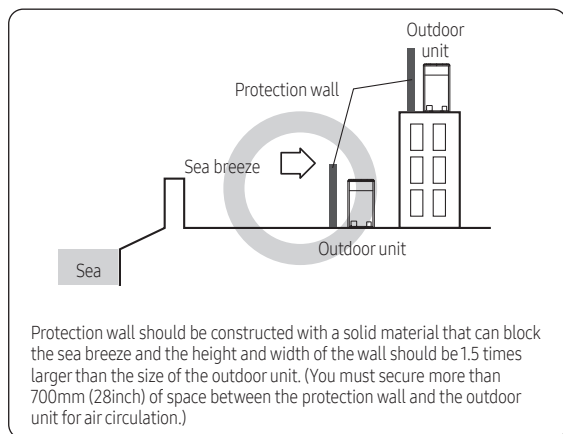
Decide the installation location, with the consideration of the following conditions, under user's approval.

- Place where hot discharge air or noise from the outdoor unit may not disturb the neighbor.
- Place where structure can bear the weight and vibration of the outdoor unit.
- Place with flat surface where rainwater does not settle or leak.
- Place where it is not exposed to strong wind.
- Place in a well ventilated place with sufficient service place for repairs and maintenance. A discharge duct may be required (field provided).
- Place where you can connect the refrigerant pipes between indoor and outdoor units within allowable distance.
- Place where it allows easy waterproofing and draining work for the condensation water generated from the outdoor unit during heating operation.
- Place where there is no risk of inflammable gas leakage.
- Place where there is no direct influence of snow or rain.
- Place where a large amount of water generated by external environment does not directly affect the top of the outdoor unit.

Installation Guide at the seashore

Make sure to follow below guides when installing at the seashore.

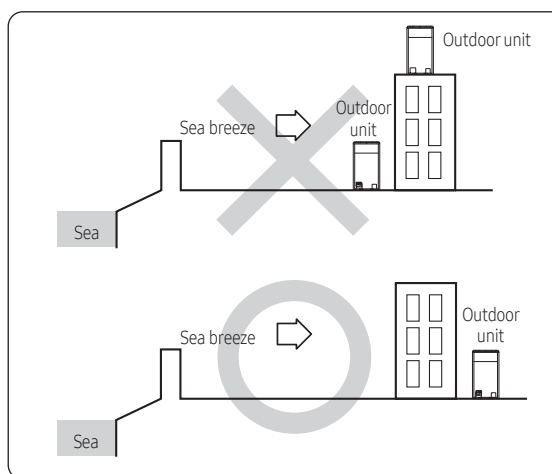
- 1 Do not install the product in a place where it is directly exposed to sea water and sea breeze.
 - Make sure to install the product behind a structure (such as building) that can block sea breeze.
 - Even when it is inevitable to install the product in seashore, make sure that product is not directly exposed to sea breeze by installing a protection wall.



- 2 Consider that the salinity particles clinging to the external panels should be sufficiently washed out.
- 3 Because the residual water at the bottom of the outdoor unit significantly promotes corrosion, make sure that the slope does not disturb drainage.
 - Keep the floor level so that rain does not accumulate.
 - Be careful not to block the drain hole due to foreign substance
- 4 When product is installed in seashore, periodically clean it with water to remove attached salinity.

- 5 Make sure to install the product in a place that provides smooth water drainage. Especially, ensure that the base part has good drainage.
- 6 If the product is damaged during the installation or maintenance, make sure to repair it.
- 7 Check the condition of the product periodically.
 - When the product is to be shut down for a long period of time, such as off-peak hours, take appropriate measures like covering the product.
- 8 If the product installed within 500m (1640ft) of seashore, special anti-corrosion treatment is required.
 - ※ Please contact your local Lennox representative for further details.

If you cannot find a proper location to install the outdoor unit, consult with an expert or specialty store.



CAUTION

- VRF may cause static noise when listening to AM stations. Therefore, select an installation location for indoor unit where electrical wiring can be done while keeping certain distance from a radio, computer and stereo equipment.
 - Especially, keep the unit at least 3m (9.84ft) away from the electrical equipment in an area with weak electromagnetic waves and put the main power cable and communication cables in a separately installed protection tube.
 - 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 VRF malfunction. (Example: Remote control sensor of the indoor unit may not receive the signal very well, due to ballast stabilizer of the lighting equipment.)
- In regions with heavy snowfall, make sure to install the outdoor unit where there is no concerns of direct snowfall on the outdoor unit. Also, build higher base support so that accumulated snow does not block the air inlet or the heat exchanger.
- R-410A refrigerant is a safe, nontoxic and nonflammable refrigerant. However, if the place holds any concerns for exceeding dangerous level of refrigerant concentration in case of refrigerant leakage, extra ventilation system is required.

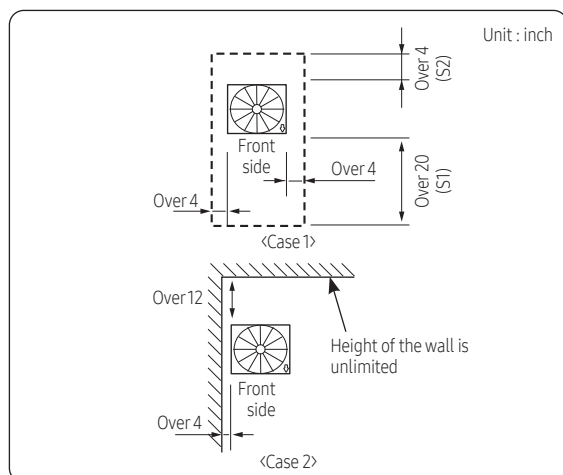
Choosing the installation location

- When you install the outdoor unit in high places such as a roof, install fence or guardrail around it. When there is no fence or guardrail, service person could fall.
- Do not install the product in places where corrosive gases such as sulfur oxides, ammonia, and sulfurous gas are produced. (e.g. Toilet outlet, ventilation opening, sewage works, dyeing complex, cattle shed, sulfuric hot spring, nuclear power plant, ship etc.) When installing the product in those places, contact an installation specialty store as the copper pipe and brazing part will need additional corrosion proof or anti-rust additive to prevent corrosion.
- Make sure not to keep any inflammable materials (such as wooden materials, oil etc.) around the outdoor unit. When there's fire, those inflammable material will easily catch the fire and may pass it on to the product.
- Depending on the condition of power supply, unstable power or voltage may cause malfunction of the parts or control system. (At the ship or places using power supply from electric generator...etc)
- Heat Recovery systems require installation of MSB(s).
- During operation, MSBs may create noise. When selecting the MSB installation location, make sure to install in an area where potential noise will not be an issue.

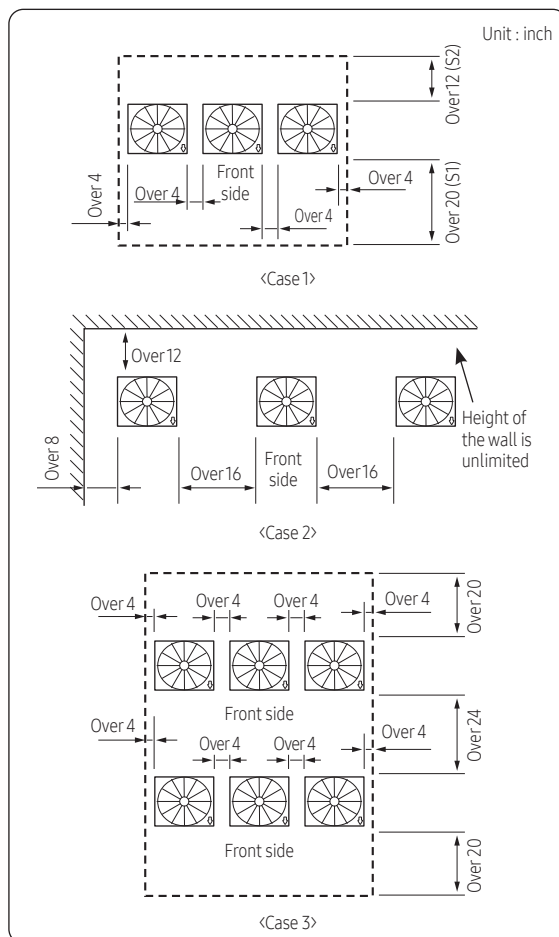
Outdoor unit space requirements

- Space requirement was decided based on following conditions; Cooling mode, outdoor temperature of 35°C (95°F). Larger space is required if the outdoor temperature is higher than 35°C (95°F) or if the place is heated easily by quantity of solar radiation.
- When you secure installation space, consider path for people and the direction of the wind.
- Secure installation space as shown in the below illustration, considering ventilation and the service space.
- If the installation space is narrow, installer or other worker may get injured during work and may also cause problem to the product.
- If you install multiple number of outdoor units in one space, make sure to secure enough ventilation space if there's any walls around the product that may disturb the air flow. If enough ventilation space is not secured, product may malfunction.
- You may install the outdoor units with 20mm (0.78inch) of space between the product, but product's performance may decrease depending on the installation environment.

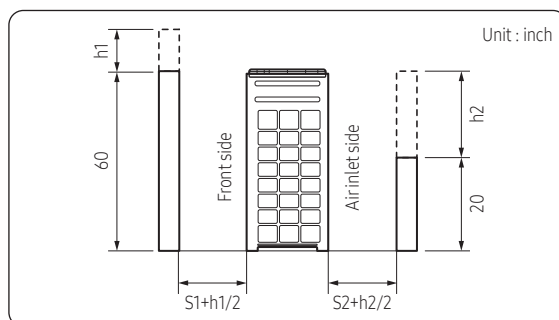
Single installation



Module installation

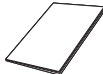



- For <Case 1> or <Case 3>
 - Height of the wall on the front side should not be higher than 1500mm (60inch).
 - Height of the wall on the air inlet side should not be higher than 500mm (20inch).
 - Height of the wall on the side is not limited.
 - If the height of the wall exceeds by certain value (h_1 , h_2), additional clearance $[(h_1)/2, (h_2)/2]$: Half of the exceeded height] should be added to the service space (S_1 , S_2).



Preparing materials and tools

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

Installation manual (1)	Packing socket (1)
	

- ※ Certain models are supplied with a packing socket. The socket type may differ, depending on the model.

Optional accessories

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

Classification	Model Name	Specification	
		MBH	kW
Y-Joint	V1IDBP01PR	51 and below	15.0 and below
	V1IDBP02PR	52~136	15.1 ~40.0
	V1IDBP03PR	137~154	40.1 ~45.0
	V1IDBP04PR	155~240	45.1 ~70.3
	V1IDBP05PR	241~336	70.4 ~98.4
	V1IDBP06PR	337~461	98.5 ~135.2
	V1IDBP07PR	Over 461	Over135.2

Classification	Model Name	Specification	
		MBH	kW
Y-Joint (Only H/R)	V1IDBP08HR	76 and below	22.4 and below
	V1IDBP09HR	77~240	22.5 ~70.3
	V1IDBP10HR	241~461	70.4 ~135.2
	V1IDBP07HR	Over 461	Over135.2
Distribution header	V1HDRK11PR	154 and below (for 4 rooms)	45.0 and below (for 4 rooms)
	V1HDRK12PR	240 and below (for 8 rooms)	70.3 and below (for 8 rooms)
	V1HDRK13PR	241 ~ 461 (for 8 rooms)	70.4 ~ 135.2 (for 8 rooms)
Y-Joint - Outdoor unit	V1ODBP14HP	461 and below	135.2 and below
	V1ODBP15HP	Over 461	Over 135.2
Y-Joint (Only H/R) - Outdoor unit	V1ODBP14HR	461 and below	135.2 and below
	V1ODBP15PR	Over 461	Over 135.2

- ※ If you use an indoor unit with no internal EEV(Electronic Expansion Valve), you will need an EEV kit.
- ※ Only use the genuine accessories listed in above table and do not use imitated accessories.

Outdoor unit installation

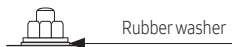
WARNING

- 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 palette 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.
- Make sure that the height of the base ground is 200mm (8inch) 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.
 - 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.
 - Base ground should be 1.5 times larger than the bottom of the outdoor unit.
 - Outdoor unit must be fixed firmly so that it can withstand the wind speed of 30m/s. If you cannot fix the outdoor unit on the base ground, fix it by side or use extra structure.

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

⚠ CAUTION

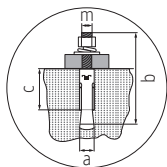
- Cautions regarding on connecting the anchor bolt
 - Tighten the rubber washer to prevent the bolt connection part of the outdoor unit from corroding.



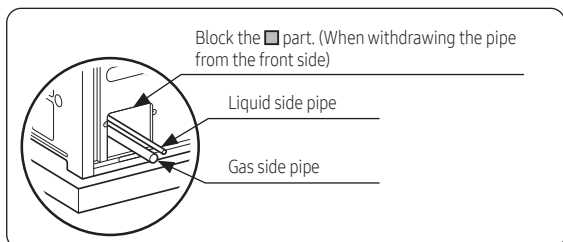
- Anchor specification

Size	Diameter of drill bit (a)	Anchor length (b)	Sleeve length (c)	Insert depth	Fastening torque
Ø 10	14mm (1/2")	75mm (3")	40mm (1-1/2")	50mm (2")	30 N·m

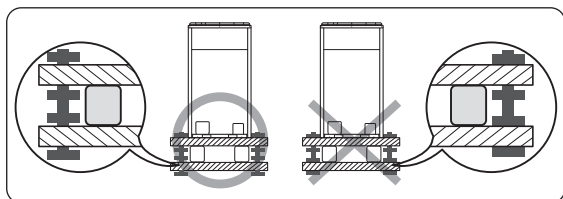
- ※ Use the anchor bolts and nuts that is zinc plated or made of STS material. Regular anchor bolts or nuts may get damaged by corrosion.



- Cautions regarding on connecting the pipe
 - If you install the outdoor unit on the rooftop, check the strength and make sure to waterproof the rooftop.
 - Construct draining pit around the base construction and pay attention to the drainage around the outdoor unit. (Condensation or defrost water may form during outdoor unit operation.)
 - If there's any possibility of small animals from entering the pipe outlet, block the outlet as shown in the illustration.

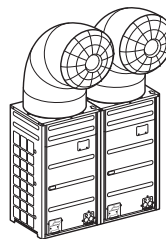


- Cautions regarding on anti-vibration frame installation
 - During installation, make sure there is no gap between the base ground and the supporting structures such as anti-vibration frame or H beam.
 - Base ground must be constructed strongly to support the bottom part of the anti-vibration mount.



- After installing the anti-vibration frame, untighten the fixing part on the top and bottom part of the frame.

- Caution for installing discharge duct
 - Static pressure of the discharge duct should be within the standard specification when installing the duct.
 - If you remove the fan guard to install the discharge duct, make sure to install a safety net on the duct outlet. Foreign substance may enter into the product and there could be a risk of personal injury.
 - Wear protection equipment at all times when making galvanized sheet metal duct, since the worker may get injured by the sharp parts.
 - When installing the outdoor unit under the tree or near forest, leaves may get into the product and cause problems on the product. Therefore, install a discharge duct to prevent foreign substance infiltration.

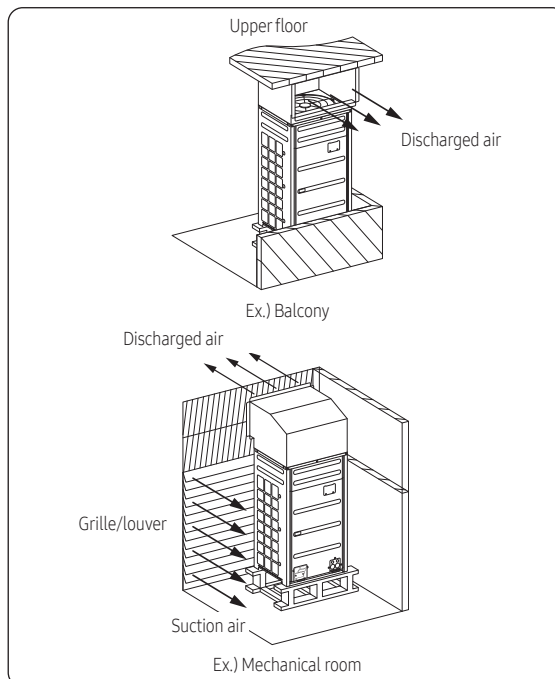


〈Preventing foreign substance infiltration〉

Installing the outdoor unit in various environments

Installing the outdoor unit around the obstacles

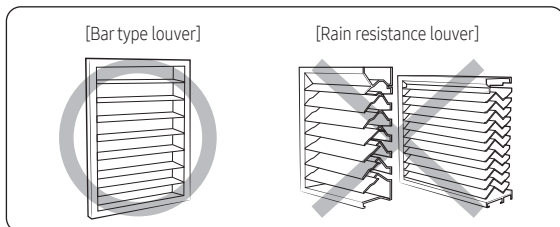
- It is necessary to install a discharge guide duct(field supply) to direct exhaust from the fan horizontally, when it is difficult to provide a minimum space of 2m (6.56ft) between the air outlet and a nearby obstacle.



Outdoor unit installation

⚠ WARNING

- Should adopt bar type louver. Don't use a type of rain resistance louver.



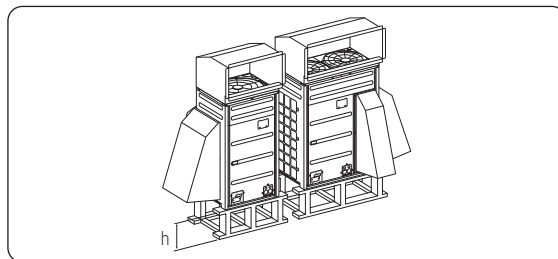
- Louver specifications.
 - Angle criteria : less than 20°
 - Opening ratio criteria : greater than 80%

Installing the outdoor unit in cold region

- In cold regions with lots of snowfall, install a snow prevention duct, as a sufficient countermeasure, to prevent snow from accumulating on the outdoor unit. When the snow prevention duct is not installed, frost may accumulate on the heat exchanger and heating operation may not work normally.
- Air outlet of the duct should not be directed to the enclosed space.

⚠ CAUTION

- Cautions regarding on installing the frame and selecting the base ground
 - Height (h) of the frame and the base ground should be higher than the "heaviest expected snowfall".
 - Area of the frame and the base ground should not be larger than the area of the outdoor unit. Snow may accumulate if the area of the frame or the base ground is larger.



Installing the outdoor unit in windy region

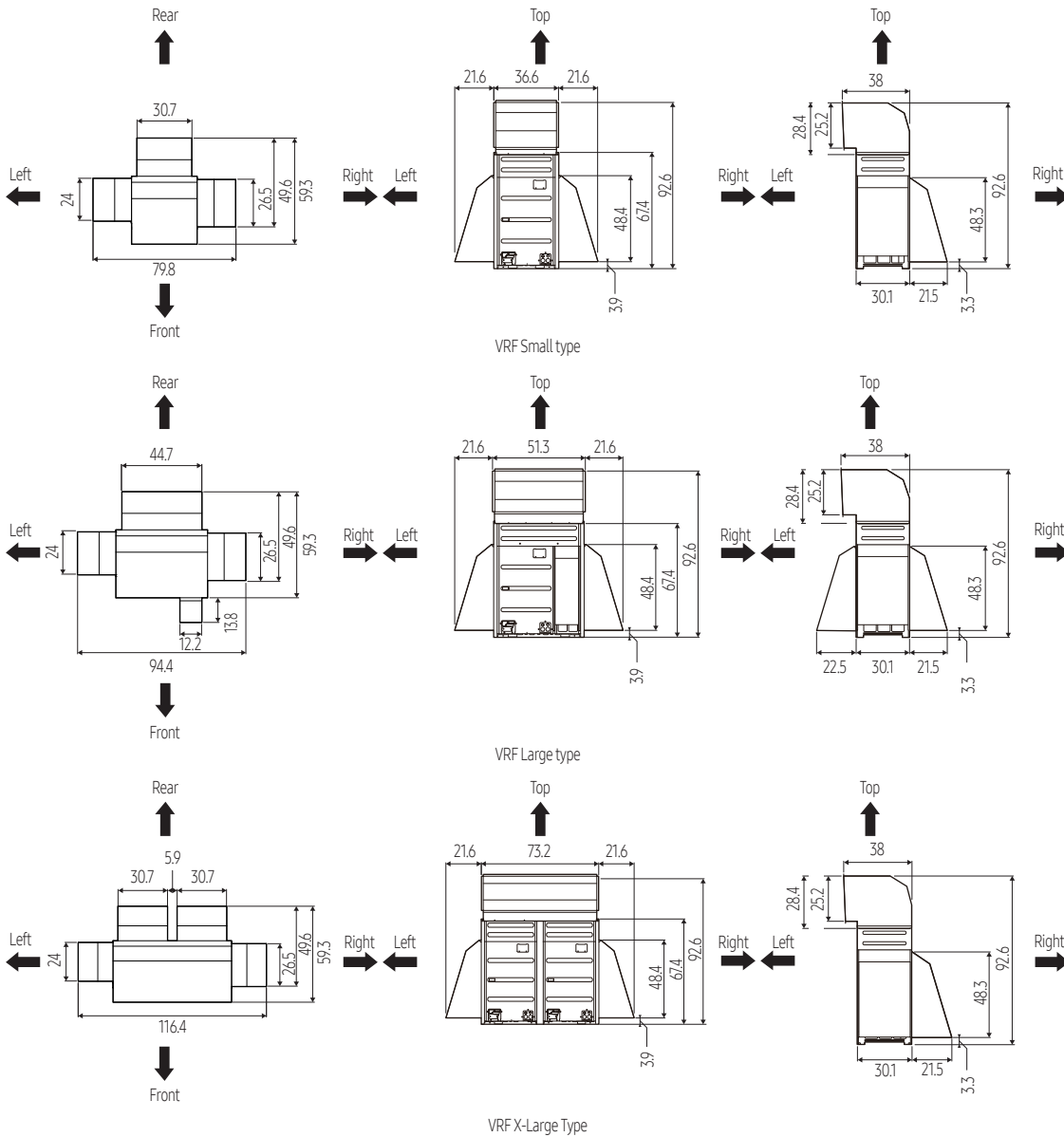
- In windy regions such as near sea shores, protection wall or wind protection duct must be installed for normal operation of the outdoor unit. (Refer to the illustration of the snow prevention duct, for installing the wind protection duct.)
- Install the wind prevention duct with the consideration of major wind direction. If the direction of the discharge part is same as major direction of the wind, it could cause product's performance decrease.

⚠ CAUTION

- Cautions regarding on installing the frame and selecting the base ground
 - The base ground must be solid and the outdoor unit must be fixed with anchor bolts.
 - Make sure to install outdoor unit in a place strong enough to withstand its weight. If the place cannot withstand the weight of the outdoor unit, outdoor unit may fall and cause personal injury.
 - When installing on a rooftop subject to strong wind, countermeasures must be taken to prevent the unit from falling down.
 - Use a frame that is resistant to corrosion.



Unit : inch



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 works with the service valve open, the pipe inhales the air and it makes the pressure inside of the refrigerant cycle abnormally high which may lead to explosion and injury.

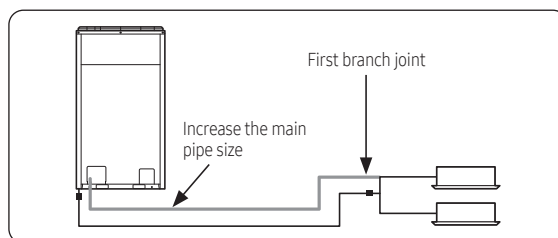
Refrigerant pipe work

- 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-410A 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-410A refrigerant.
- Use clean refrigerant pipe and there shouldn't be any harmful ion, oxide, dust, iron content or moisture inside pipe.
- Use tools and accessories that fit on R-410A only.

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	
Manifold gauge	Air tightness test ~ additional refrigerant charging	Vacuuming, charging refrigerant and checking operation	Compatible
Refrigerant charging hose			Need exclusive one since there is risk of refrigerant leakage or inflow of impurities

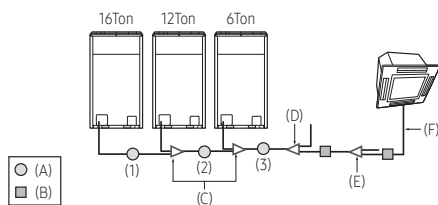
Tool	Installation process/ purpose	Compatibility with conventional tool
Vacuum pump	Pipe drying	Compatible (Use products which contain the check valve to prevent the oil from flowing backward into the outdoor unit.) Use the one that can be vacuumed up to 0.5 Torr (500 microns).
Scale for refrigerant charging	Refrigerant charging	Compatible
Gas leak detector	Gas leak test	Need exclusive one
Flare nut	Must use the flare nut equipped with the product.	

Selecting refrigerant pipe



- Install the refrigerant pipe according to main pipe size of each outdoor unit capacity.
- When the pipe length (including elbow) between an outdoor unit and the farthest indoor unit exceeds 90 m (295.3 ft), you must increase the size of the pipe (main pipe) by one grade which connects between the outdoor unit to the first branch joint.
- For H/R model, When the pipe length (including elbow) between an outdoor unit and the farthest indoor unit exceeds 90 m (295.3 ft), you must increase the size of the liquid pipe by one grade among the pipes(main pipe) which connects between the outdoor unit to the first branch joint.

H/P (Heat pump)



Ex.) 34 Ton

Ton	No.	Pipe size (O.D)			
		Liquid pipe		Gas pipe	
		mm	inch	mm	inch
16	(1)	15.88	5/8	28.58	1 1/8
28	(2)	19.05	3/4	34.92	1 3/8
34	(3)	19.05	3/4	41.28	1 5/8

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 295ft (90m)				*Maximum pipe length over 295ft (90m)			
		Liquid		Gas		Liquid		Gas	
		inch	mm	inch	mm	inch	mm	inch	mm
Capacity ≤ 85	Capacity ≤ 25	03/8	09.52	03/4	019.05	01/2	012.70	07/8	022.22
85 < Capacity ≤ 99	25 < Capacity ≤ 29	03/8	09.52	07/8	022.22	01/2	012.70	01 note1)	025.40 note1)
99 < Capacity ≤ 120	29 < Capacity ≤ 35	01/2	012.70	01 1/8	028.58	05/8	015.88	01 1/8	028.58
120 < Capacity ≤ 140	35 < Capacity ≤ 41	01/2	012.70	01 1/8	028.58	05/8	015.88	01 1/4 note2)	031.75 note2)
140 < Capacity ≤ 160	41 < Capacity ≤ 47	05/8	015.88	01 1/8	028.58	03/4	019.05	01 3/8	034.92
160 < Capacity ≤ 181	47 < Capacity ≤ 53	05/8	015.88	01 1/8	028.58	03/4	019.05	01 1/2	038.10
181 < Capacity ≤ 222	53 < Capacity ≤ 65	05/8	015.88	01 1/8	028.58	03/4	019.05	01 1/2	038.10
222 < Capacity ≤ 240	65 < Capacity ≤ 70	05/8	015.88	01 1/8	028.58	03/4	019.05	01 1/2	038.10
240 < Capacity ≤ 336	70 < Capacity ≤ 98	03/4	019.05	01 1/8	028.58	07/8	022.22	01 5/8	041.28
336 < Capacity ≤ 467	98 < Capacity ≤ 137	03/4	019.05	01 1/8	028.58	07/8	022.22	01 5/8	041.28
467 < Capacity ≤ 583	137 < Capacity ≤ 171	03/4	019.05	01 1/8	028.58	07/8	022.22	01 5/8	041.28

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

Note1) If 01" (25.40mm) pipe is not available on site, use 01 1/8" (28.58mm) pipe.

Note2) If 01 1/4" (31.75mm) pipe is not available on site, use 01 3/8" (34.92mm) pipe.

Note3) If 01 1/2" (38.10mm) pipe is not available on site, use 01 5/8" (41.28mm) 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 148ft (45m)				Branch pipe length between 148ft-295ft (45-90m)			
		Liquid		Gas		Liquid		Gas	
		inch	mm	inch	mm	inch	mm	inch	mm
Capacity < 19	Capacity < 5.7	01/4	06.35	01/2	012.70	03/8	09.52	05/8	015.88
19 ≤ Capacity < 55	5.7 ≤ Capacity < 16	01/4	06.35	05/8	015.88	03/8	09.52	03/4	019.05
55 ≤ Capacity < 79	16 ≤ Capacity < 23.2	03/8	09.52	03/4	019.05	01/2	012.70	07/8	022.22
79 ≤ Capacity < 115	23.2 ≤ Capacity < 33.6	03/8	09.52	07/8	022.22	01/2	012.70	01 note1)	025.40 note1)
115 ≤ Capacity < 133	33.6 ≤ Capacity < 39	01/2	012.70	01 1/8	028.58	05/8	015.88	01 1/8	028.58
133 ≤ Capacity < 150	39 ≤ Capacity < 44	01/2	012.70	01 1/8	028.58	05/8	015.88	01 1/4 note2)	031.75 note2)
150 ≤ Capacity < 172	44 ≤ Capacity < 50.4	05/8	015.88	01 1/8	028.58	03/4	019.05	01 3/8	034.92
172 ≤ Capacity < 229	50.4 ≤ Capacity < 67.2	05/8	015.88	01 1/8	028.58	03/4	019.05	01 1/2	038.10
230 ≤ Capacity < 248	67.2 ≤ Capacity < 72.8	05/8	015.88	01 1/8	028.58	03/4	019.05	01 1/2	038.10
248 ≤ Capacity < 344	72.8 ≤ Capacity < 100.8	03/4	019.05	01 1/8	028.58	07/8	022.22	01 5/8	041.28
344 ≤ Capacity < 392	100.8 ≤ Capacity < 115	03/4	019.05	01 1/8	028.58	07/8	022.22	01 5/8	041.28
392 ≤ Capacity < 592	115 ≤ Capacity < 173.6	07/8	022.22	01 3/4	044.45	07/8	022.22	01 3/4	044.45
592 ≤ Capacity < 676	173.6 ≤ Capacity < 198	07/8	022.22	01 3/4	044.45	07/8	022.22	01 3/4	044.45
676 ≤ Capacity < 860	198 ≤ Capacity < 252	07/8	022.22	01 3/4	044.45	07/8	022.22	01 3/4	044.45
860 ≤ Capacity	252 ≤ Capacity	07/8	022.22	01 3/4	044.45	07/8	022.22	01 3/4	044.45

Note1) If 01" (25.40mm) pipe is not available on site, use 01 1/8" (28.58mm) pipe.

Note2) If 01 1/4" (31.75mm) pipe is not available on site, use 01 3/8" (34.92mm) pipe.

Note3) If 01 1/2" (38.10mm) pipe is not available on site, use 01 5/8" (41.28mm) pipe.

Note4) If 01 3/4" (44.45mm) pipe is not available on site, use 02 1/8" (53.98mm) 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	
	Capacity ≤ 467	Capacity ≤ 137	
Y-joint for outdoor unit (C)	467 < Capacity	137 < Capacity	V10DBP15HP

First branch joint (D)

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

Classification	Outdoor unit capacity		Model name
	MBH	kW	
	Capacity ≤ 140	Capacity ≤ 41	
Y-joint (D)	Capacity ≤ 160	Capacity ≤ 47	V11DBP03PR
	Capacity ≤ 239	Capacity ≤ 70	V11DBP04PR
	Capacity ≤ 336	Capacity ≤ 98	V11DBP05PR
	Capacity ≤ 467	Capacity ≤ 137	V11DBP06PR
	467 < Capacity	137 < Capacity	V11DBP07PR

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	
	Capacity < 55	Capacity < 16	
Y-joint (E)	55 ≤ Capacity < 133	16 ≤ Capacity < 39	V11DBP02PR
	133 ≤ Capacity < 172	39 ≤ Capacity < 50.4	V11DBP03PR
	172 ≤ Capacity < 248	50.4 ≤ Capacity < 72.8	V11DBP04PR
	248 ≤ Capacity < 344	72.8 ≤ Capacity < 100.8	V11DBP05PR
	344 ≤ Capacity < 478	100.8 ≤ Capacity < 140	V11DBP06PR
	478 < Capacity	140 < Capacity	V11DBP07PR
Distribution header (E)	Capacity < 172 (for 4 rooms)	Capacity < 50.4 (for 4 rooms)	V1HDK11PR
	Capacity < 248 (for 8 rooms)	Capacity < 72.8 (for 8 rooms)	V1HDK12PR
	Capacity < 478 (for 8 rooms)	Capacity < 140 (for 8 rooms)	V1HDK13PR

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	01/4	06.35	01/2	012.7
20 < Capacity ≤ 54	6 < Capacity ≤ 16	03/8	09.52	05/8	015.88
54 < Capacity ≤ 78	16 < Capacity ≤ 23	03/8	09.52	03/4	019.05
78 < Capacity	23 < Capacity	03/8	09.52	07/8	022.22

※ 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.

Refrigerant pipe installation

H/P (Heat pump)

When all the following conditions are met, install the main liquid pipe that is one step smaller to reduce piping load and the amount of refrigerant.

Note that the refrigerant for the main liquid pipe must be added by the specified amount upon reduction.

Condition 1: The vertical piping length is less than 131 ft (40 m)

Condition 2: For BG units, allowable length A (ft) \geq max. piping length (ft) / { 1 - (vertical piping length (ft) * 0.0046) }

※ Max. piping length: The equivalent length (ft) of piping from the outdoor unit to the farthest indoor unit

For SI units, allowable length A (m) \geq max. piping length (m) / { 1 - (vertical piping length (m) * 0.015) }

※ Max. piping length: The equivalent length (m) of piping from the outdoor unit to the farthest indoor unit

※ If the conditions above are satisfied and one-size smaller piping has been installed, set the "liquid pipe (main pipe) size reduction" option.

- Length allowed to reduce the diameter of liquid pipe, A (equivalent length)

Outdoor unit capacity (Ton)	Maximum pipe length within 90m (295.3ft)				Maximum pipe length over 90m (295.3ft)			
	Pipe diameter		Allowable length		Pipe diameter		Allowable length	
	mm	inch	m	ft	mm	inch	m	ft
6	This capacity is not supported.							
8	This capacity is not supported.							
10	9.52	3/8	50	164	12.7	1/2	200	656
12	9.52	3/8	30	98	12.7	1/2	160	525
14	12.7	1/2	90	295	15.88	5/8	200	656
16	12.7	1/2	90	295	15.88	5/8	200	656
18	12.7	1/2	80	262	15.88	5/8	200	656
20	12.7	1/2	60	197	15.88	5/8	190	623
22	15.88	5/8	90	295	19.05	3/4	200	656
24	15.88	5/8	90	295	19.05	3/4	200	656
26	15.88	5/8	90	295	19.05	3/4	200	656
28	15.88	5/8	90	295	19.05	3/4	200	656
30	15.88	5/8	90	295	19.05	3/4	200	656
32	15.88	5/8	80	262	19.05	3/4	200	656
34	15.88	5/8	70	230	19.05	3/4	200	656
36	15.88	5/8	60	197	19.05	3/4	190	623
38	15.88	5/8	60	197	19.05	3/4	170	558
40	15.88	5/8	50	164	19.05	3/4	150	492

E.g. 1: For a site with 18 tons (BG units), max. piping length of 460 ft (395 ft-long horizontal piping and 65 ft-long vertical piping) condition, allowable length A \geq max. piping length / { 1 - (vertical piping length * 0.0046) }

$$656\text{ft} \geq 460\text{ft} / \{ 1 - (65 * 0.0046) \} = 460\text{ft} / 0.701 = 656\text{ft}$$

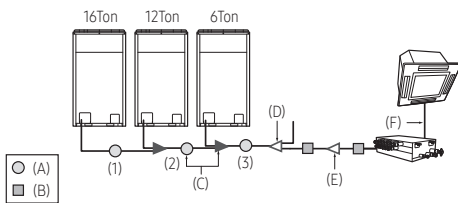
Accordingly, the max. piping length of 460 ft (395 ft-long horizontal piping and 65 ft-long vertical piping) is allowable.

E.g. 2: For a site with 18 tons (SI units), max. piping length of 140 m (120 m-long horizontal piping and 20 m-long vertical piping) condition, allowable length A \geq max. piping length / { 1 - (vertical piping length * 0.015) }

$$200\text{m} \geq 140\text{m} / \{ 1 - (20 * 0.015) \} = 140\text{m} / 0.7 = 200\text{m}$$

Accordingly, the max. piping length of 140m (120m-long horizontal piping and 20m-long vertical piping) is allowable.

H/R (Heat recovery)



Ex.) 34 Ton

Ton	No.	Pipe size (O.D.)					
		Liquid		Gas		High pressure Gas	
		mm	inch	mm	inch	mm	inch
10	(1)	15.88	5/8	28.58	11/8	28.58	11/8
28	(2)	19.05	3/4	34.92	13/8	28.58	11/8
34	(3)	19.05	3/4	41.28	15/8	34.92	13/8

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 295ft (90m)						*Maximum pipe length over 295ft (90m)					
		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	03/8	09.52	03/4	09.05	05/8	015.88	01/2	012.70	03/4	09.05	05/8	015.88
85 < Capacity ≤ 99	25 < Capacity ≤ 29	03/8	09.52	07/8	022.22	03/4	09.05	01/2	012.70	07/8	022.22	03/4	09.05
99 < Capacity ≤ 120	29 < Capacity ≤ 35	01/2	012.70			03/4	09.05	05/8	015.88	011/8	028.58	07/8	022.22
120 < Capacity ≤ 140	35 < Capacity ≤ 41			011/8	028.58	07/8	022.22			011/8	028.58	07/8	022.22
140 < Capacity ≤ 160	41 < Capacity ≤ 47												
160 < Capacity ≤ 181	47 < Capacity ≤ 53	05/8	015.88					03/4	09.05			011/8	028.58
181 < Capacity ≤ 222	53 < Capacity ≤ 65			013/8	034.92	011/8	028.58			013/8	034.92	011/8	028.58
222 < Capacity ≤ 240	65 < Capacity ≤ 70												
240 < Capacity ≤ 336	70 < Capacity ≤ 98	03/4	09.05	015/8	041.28	013/8	034.92	07/8	022.22	015/8	041.28	013/8	034.92
336 < Capacity ≤ 467	98 < Capacity ≤ 137												
467 < Capacity ≤ 583	137 < Capacity ≤ 171												

*Maximum pipe length : The pipe length between an outdoor unit and the farthest indoor unit.
 ※ For HR model, only increase the size of the liquid pipe if pipe length exceeds 295ft (90m).
 ※ 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 148ft (45m)						Branch pipe length between 148ft-295ft (45-90m)					
		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	01/4	06.35	01/2	012.70	03/8	09.52	03/8	09.52	01/2	012.70	03/8	09.52
19 ≤ Capacity < 55	5.7 ≤ Capacity < 16			05/8	015.88	01/2	012.70			05/8	015.88	01/2	012.70
55 ≤ Capacity < 79	16 ≤ Capacity < 23.2	03/8	09.52	03/4	09.05	05/8	015.88	01/2	012.70	03/4	09.05	05/8	015.88
79 ≤ Capacity < 115	23.2 ≤ Capacity < 33.6			07/8	022.22			07/8	022.22			07/8	022.22
115 ≤ Capacity < 133	33.6 ≤ Capacity < 39					03/4	09.05					03/4	09.05
133 ≤ Capacity < 150	39 ≤ Capacity < 44	01/2	012.70					05/8	015.88				
150 ≤ Capacity < 172	44 ≤ Capacity < 50.4			011/8	028.58	07/8	022.22	011/8	028.58	07/8	022.22		
172 ≤ Capacity < 229	50.4 ≤ Capacity < 67.2	05/8	015.88					03/4	09.05				
229 ≤ Capacity < 248	67.2 ≤ Capacity < 72.8			013/8	034.92	011/8	028.58			013/8	034.92	011/8	028.58
248 ≤ Capacity < 344	72.8 ≤ Capacity < 100.8	03/4	09.05					07/8	022.22				
344 ≤ Capacity < 392	100.8 ≤ Capacity < 115			015/8	041.28	013/8	034.92			015/8	041.28	013/8	034.92
392 ≤ Capacity < 592	115 ≤ Capacity < 173.6												
592 ≤ Capacity < 676	173.6 ≤ Capacity < 198	07/8	022.22	013/4	044.45	015/8	041.28	013/4	044.45	015/8	041.28		
676 ≤ Capacity < 860	198 ≤ Capacity < 252			021/8	053.98	013/4	044.45	011/8	028.58	021/8	053.98	013/4	044.45
860 ≤ Capacity	252 ≤ Capacity	01	025.40	021/8	053.98	013/4	044.45	011/8	028.58	021/8	053.98	013/4	044.45

Note1) If 01 1/4" (25.40mm) pipe is not available on site, use 01 1/8" (28.58mm) pipe.
 Note2) If 01 1/4" (31.75mm) pipe is not available on site, use 01 3/8" (34.92mm) pipe.
 Note3) If 01 1/2" (38.10mm) pipe is not available on site, use 01 5/8" (41.28mm) pipe.
 Note4) If 01 3/4" (44.45mm) pipe is not available on site, use 02 1/8" (53.98mm) 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 ≤ 467	Capacity ≤ 137	V10DBP16HR
	467 < Capacity	137 < Capacity	V10DBP17HR
Y-joint for high pressure gas pipe (C)	Capacity ≤ 467	Capacity ≤ 137	V10DBP14HR
	467 < Capacity	137 < Capacity	V10DBP15HP

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 ≤ 140	Capacity ≤ 41	V11DBP02PR
	Capacity ≤ 160	Capacity ≤ 47	V11DBP03PR
	Capacity ≤ 239	Capacity ≤ 70	V11DBP04PR
	Capacity ≤ 336	Capacity ≤ 98	V11DBP05PR
	Capacity ≤ 467	Capacity ≤ 137	V11DBP06PR
	467 < Capacity	137 < Capacity	V11DBP07PR
Y-joint for high pressure gas pipe (D)	Capacity ≤ 85	Capacity ≤ 25	V11DBP08HR
	Capacity ≤ 239	Capacity ≤ 70	V11DBP09HR
	Capacity ≤ 467	Capacity ≤ 137	V11DBP10HR
	467 < Capacity	137 < Capacity	V11DBP07HR

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	V11DBP01PR
	55 ≤ Capacity < 133	16 ≤ Capacity < 39	V11DBP02PR
	133 ≤ Capacity < 172	39 ≤ Capacity < 50.4	V11DBP03PR
	172 ≤ Capacity < 248	50.4 ≤ Capacity < 72.8	V11DBP04PR
	248 ≤ Capacity < 344	72.8 ≤ Capacity < 100.8	V11DBP05PR
	344 ≤ Capacity < 478	100.8 ≤ Capacity < 140	V11DBP06PR
Y-joint for high pressure gas pipe (E)	478 < Capacity	140 < Capacity	V11DBP07PR
	Capacity < 79	Capacity < 23.2	V11DBP08HR
	79 ≤ Capacity < 248	23.2 ≤ Capacity < 72.8	V11DBP09HR
	248 ≤ Capacity < 478	72.8 ≤ Capacity < 140	V11DBP10HR

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	01/4	06.35	01/2	012.7
20 < Capacity ≤ 54	6 < Capacity ≤ 16	03/8	09.52	05/8	015.88
54 < Capacity ≤ 78	16 < Capacity ≤ 23	03/8	09.52	03/4	019.05
78 < Capacity	23 < Capacity	03/8	09.52	07/8	022.22

※ 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.

Refrigerant pipe installation

H/R (Heat recovery)

When all the following conditions are met, install the main liquid pipe that is one step smaller to reduce piping load and the amount of refrigerant.

Note that the refrigerant for the main liquid pipe must be added by the specified amount upon reduction.

Condition 1: The vertical piping length is less than 131 ft (40 m)

Condition 2: For Imperial units, allowable length A (ft) \geq max. piping length (ft) / { 1 - (vertical piping length (ft) * 0.0046) }

※ Max. piping length: The equivalent length (ft) of piping from the outdoor unit to the farthest indoor unit

For SI units, allowable length A (m) \geq max. piping length (m) / { 1 - (vertical piping length (m) * 0.015) }

※ Max. piping length: The equivalent length (m) of piping from the outdoor unit to the farthest indoor unit

※ If the conditions above are satisfied and one-size smaller piping has been installed, set the "liquid pipe (main pipe) size reduction" option.

- Length allowed to reduce the diameter of liquid pipe, A (equivalent length)

Outdoor unit capacity (Ton)	Maximum pipe length within 90m (295.3ft)				Maximum pipe length over 90m (295.3ft)			
	Pipe diameter		Allowable length		Pipe diameter		Allowable length	
	mm	inch	m	ft	mm	inch	m	ft
6	This capacity is not supported.							
8	This capacity is not supported.							
10	9.52	3/8	50	164	12.7	1/2	200	656
12	9.52	3/8	30	98	12.7	1/2	160	525
14	12.7	1/2	90	295	15.88	5/8	200	656
16	12.7	1/2	90	295	15.88	5/8	200	656
18	12.7	1/2	80	262	15.88	5/8	200	656
20	12.7	1/2	60	197	15.88	5/8	190	623
22	15.88	5/8	90	295	19.05	3/4	200	656
24	15.88	5/8	90	295	19.05	3/4	200	656
26	15.88	5/8	90	295	19.05	3/4	200	656
28	15.88	5/8	90	295	19.05	3/4	200	656
30	15.88	5/8	90	295	19.05	3/4	200	656
32	15.88	5/8	80	262	19.05	3/4	200	656
34	15.88	5/8	70	230	19.05	3/4	200	656
36	15.88	5/8	60	197	19.05	3/4	190	623
38	15.88	5/8	60	197	19.05	3/4	170	558
40	15.88	5/8	50	164	19.05	3/4	150	492

E.g. 1: For a site with 18 tons (BG units), max. piping length of 460 ft (395 ft-long horizontal piping and 65 ft-long vertical piping) condition, allowable length A \geq max. piping length / { 1 - (vertical piping length * 0.0046) }

$$656\text{ft} \geq 460\text{ft} / \{ 1 - (65 * 0.0046) \} = 460\text{ft} / 0.701 = 656\text{ft}$$

Accordingly, the max. piping length of 460 ft (395 ft-long horizontal piping and 65 ft-long vertical piping) is allowable.

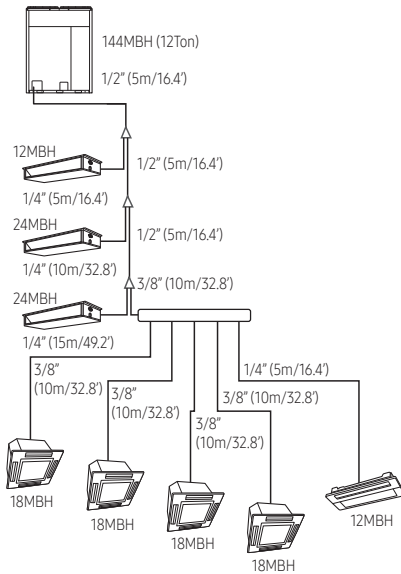
E.g. 2: For a site with 18 tons (SI units), max. piping length of 140 m (120 m-long horizontal piping and 20 m-long vertical piping) condition, allowable length A \geq max. piping length / { 1 - (vertical piping length * 0.015) }

$$200\text{m} \geq 140\text{m} / \{ 1 - (20 * 0.015) \} = 140\text{m} / 0.7 = 200\text{m}$$

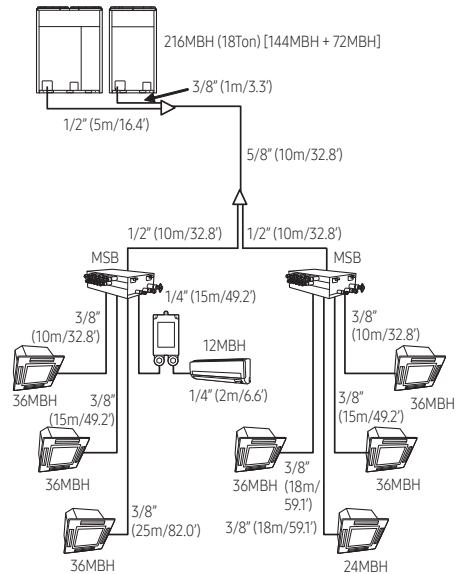
Accordingly, the max. piping length of 140m (120m-long horizontal piping and 20m-long vertical piping) is allowable.

Additional refrigerant

H/P (Heat pump)



H/R (Heat recovery)



Refrigerant pipe installation

- Basic amount of refrigerant within the outdoor unit [lb(kg)]
 - Amount of additional refrigerant has to be calculated based on the sum of all liquid pipe length.

Classification	V*C072S4M-4*	V*D096S4M-4*	V*D120S4M-4*	V*D144S4M-4*
Basic amount [lb(kg)]	13.7 (6.2)	17.6 (8)	17.6 (8)	23.1 (10.5)
Classification	V*C168S4M-4*	V*C192S4M-4*	V*C216S4M-4*	V*D240S4M-4*
Basic amount [lb(kg)]	23.1 (10.5)	27.6 (12.5)	34.2 (15.5)	34.2 (15.5)
Classification	V*C072L4M-4*	V*C096L4M-4*	V*C120L4M-4*	
Basic amount [lb(kg)]	17.6 (8)	23.1 (10.5)	23.1 (10.5)	

- Amount of additional refrigerant depending on the pipe size (㉑)
 - Amount of additional refrigerant has to be calculated based on the sum of all liquid pipe length.

Size of liquid pipe [mm (inch)]	Φ1/4 (Φ6.35)	Φ3/8 (Φ9.52)	Φ1/2 (Φ12.7)	Φ5/8 (Φ15.88)	Φ3/4 (Φ19.05)	Φ7/8 (Φ22.22)	Φ1 (Φ25.4)	Φ1 1/8 (Φ28.58)
Additional amount [lb/ft (kg/m)]	0.013 (0.02)	0.04 (0.06)	0.084 (0.125)	0.121 (0.18)	0.181 (0.27)	0.235 (0.35)	0.356 (0.53)	0.437 (0.65)
Amount of refrigerant added when the diameter of liquid pipe is reduced [lb/ft(kg/m)]	-	0.054 (0.08)	0.087 (0.13)	0.131 (0.195)	0.188 (0.28)	0.282 (0.42)	0.356 (0.53)	-

- For the indoor unit already connected to EEV kit, the additional refrigerant charging is 0.0067lb/ft (0.01kg/m) regardless of the pipe size.

Refrigerant pipe installation

- 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
1way cassette (VOWC***S4-4P)	0.33 (0.15)		0.33 (0.15)	0.55 (0.25)	0.55 (0.25)	0.71 (0.32)	0.71 (0.32)		0.71 (0.32)													
4way cassette S (600x600) (V22C***S4-4P)	0.64 (0.29)		0.64 (0.29)	0.64 (0.29)	0.64 (0.29)		0.82 (0.37)	0.82 (0.37)														
4way cassette S (V33C***S4-4P)		1.61 (0.73)		1.61 (0.73)	1.61 (0.73)		1.61 (0.73)	1.61 (0.73)				1.94 (0.88)		1.94 (0.88)		1.94 (0.88)						
360 cassette (V36C***S4-4P)				0.99 (0.45)	0.99 (0.45)		0.99 (0.45)	0.99 (0.45)				1.52 (0.69)		1.52 (0.69)		1.52 (0.69)						
LSP duct (VLOC***S4-4P)			0.77 (0.35)	0.77 (0.35)	0.77 (0.35)		0.99 (0.45)	0.99 (0.45)														
MSP duct (VMDC***S4-4P)		0.99 (0.45)	0.99 (0.45)	0.99 (0.45)	0.99 (0.45)	0.99 (0.45)	1.50 (0.68)															
HSP duct (VHIC***S4-4P)								1.50 (0.68)	1.50 (0.68)			1.50 (0.68)		1.85 (0.84)		1.85 (0.84)	2.01 (0.91)			2.60 (1.18)	2.60 (1.18)	
OAP duct (VOSC***S4-4P)																			2.60 (1.18)		2.60 (1.18)	
Floor Standing (VSCC***S4-4P, VSEC***S4-4P)		0.26 (0.12)		0.49 (0.22)	0.49 (0.22)		0.71 (0.32)	0.71 (0.32)														
Ceiling (VUCC***S4-4P, VBCC***S4-4P)							0.86 (0.39)	0.86 (0.39)						1.23 (0.56)		2.09 (0.95)						
MPAHU(V-AHU) (VVCC***S4-4P)					0.73 (0.33)		1.10 (0.50)	1.10 (0.50)				1.83 (0.83)		1.94 (0.88)		2.60 (1.18)	2.80 (1.27)	3.73 (1.69)	3.73 (1.69)			
Wall mounted (with EEV) (VWMC***S4-4P)	0.51 (0.23)		0.51 (0.23)	0.71 (0.32)	0.71 (0.32)	1.06 (0.48)	1.06 (0.48)	1.06 (0.48)		1.41 (0.64)		1.50 (0.68)										
Hydro unit HE (VHEC***S4-4P)														1.32 (0.6)		1.32 (0.6)					1.54 (0.7)	2.65 (1.2)
Hydro unit HT (VHTC***S4-4P)																1.32 (0.6)			1.32 (0.6)			
MSB (V1MSBB**HR)	1.10 (0.50)																					

※ If there is no additional refrigerant value for the indoor unit in the above table, refer to the indoor unit installation manual.

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

- Method to calculate total amount of additional refrigerant
 - Amount of additional refrigerant depending on the pipe length (㉑)
 - Amount of additional refrigerant for each indoor unit (㉔) = Σ (Amount of additional refrigerant for each connected indoor unit)
※ Refer to the table
 - Total amount of additional refrigerant = ㉑+㉔
- Sum of total amount of additional refrigerant and the basic amount of refrigerant should not exceed 100kg (220lb). If the refrigerant exceeds 100kg (220lb), separate the module so that weight of the refrigerant doesn't exceed 100kg (220lb).
Ex) If the outdoor unit's basic refrigerant amount is 8.7kg (19.1lb), the total amount of additional refrigerant(㉑+㉔) should not exceed 91.3kg (200.9lb).



- Example of refrigerant calculation for H/P models

Classification	Size of liquid pipe [mm (inch)]	Length [m (ft)]	Unit amount of refrigerant [kg/m (lb/ft)]	Amount of additional refrigerant [kg (lb)]	Total amount of additional refrigerant [kg (lb)]
		①	②	①×②	Σ(①×②)
Liquid pipe (a)	Ø6.35 (Ø1/4)	35 (114.8)	0.02 (0.013)	0.7 (1.54)	a 5.575 (12.23)
	Ø9.52 (Ø3/8)	50 (164.0)	0.06 (0.040)	3.0 (6.56)	
	Ø12.70 (Ø1/2)	15 (49.2)	0.125 (0.084)	1.875 (4.13)	

Classification	Model name of indoor unit	Number of indoor units	Unit amount of refrigerant [kg/EA (lb/EA)]	Amount of additional refrigerant [kg (lb)]	Total amount of additional refrigerant [kg (lb)]
		①	②	①×②	Σ(①×②)
Indoor unit (b)	4way cassette (V33C018S4-4P)	4	0.57 (1.26)	2.28 (5.02)	b 3.78 (8.32)
	LSP duct (VLOC024S4-4P)	2	0.45 (0.99)	0.90 (1.98)	
	LSP duct (VLOC012S4-4P)	1	0.35 (0.77)	0.35 (0.77)	
	1way cassette (VOWC012S4-4P)	1	0.25 (0.55)	0.25 (0.55)	

- Total amount of refrigerant ((a)+(b)) = 5.575 + 3.78 = 9.355 (kg)
= 12.23 + 8.32 = 20.55 (lb)

- Example of refrigerant calculation for H/R models

Classification	Size of liquid pipe [mm (inch)]	Length [m (ft)]	Unit amount of refrigerant [kg/m (lb/ft)]	Amount of additional refrigerant [kg (lb)]	Total amount of additional refrigerant [kg (lb)]
		①	②	①×②	Σ(①×②)
Liquid pipe (a)	Ø6.35 (Ø1/4)	15 (49.2)	0.02 (0.013)	0.3 (0.66)	a 11.965 (26.37)
	Ø9.52 (Ø3/8)	112 (367.5)	0.06 (0.040)	6.72 (14.81)	
	Ø12.70 (Ø1/2)	25 (82.0)	0.125 (0.084)	3.125 (6.89)	
	Ø15.88 (Ø 5/8)	10 (32.8)	0.18 (0.121)	1.8 (3.97)	
	Ø 6.35 (Ø 1/4) (EEV Kit ~ indoor unit)	2 (6.6)	0.01 (0.0067)	0.02 (0.04)	

Classification	Model name of indoor unit	Number of indoor units	Unit amount of refrigerant [kg/EA (lb/EA)]	Amount of additional refrigerant [kg (lb)]	Total amount of additional refrigerant [kg (lb)]
		①	②	①×②	Σ(①×②)
Indoor unit (b)	4way cassette (V33C024S4-4P)	4	0.73 (1.61)	2.92 (6.54)	b 5.88 (13.07)
	4way cassette (V33C036S4-4P)	3	0.88 (1.94)	2.64 (5.82)	
	Wall mounted (VWMC012S4-4P)	1	0.32 (0.71)	0.32 (0.71)	
	MSB	2	0.50 (1.10)	1 (2.20)	

- Total amount of refrigerant ((a)+(b)) = 11.965 + 5.88 = 17.845 (kg)
= 26.37 + 13.07 = 39.44 (lb)

Refrigerant pipe installation

Temper grade and minimum thickness of the refrigerant pipe

Outer diameter		Minimum thickness		Temper grade
mm	inch	mm	inch	
6.35	1/4	0.70	0.028	Annealed
9.52	3/8	0.70	0.028	
12.70	1/2	0.80	0.031	
15.88	5/8	1.00	0.039	
19.05	3/4	0.90	0.035	Drawn
22.22	7/8	0.90	0.035	
25.40	1	1.00	0.039	
28.58	1 1/8	1.10	0.043	
31.75	1 1/4	1.10	0.043	
34.92	1 3/8	1.21	0.048	
38.10	1 1/2	1.35	0.053	
41.28	1 5/8	1.43	0.056	
44.45	1 3/4	1.60	0.063	
50.80	2	2.00	0.079	
53.98	2 1/8	2.10	0.083	

CAUTION

- For pipes larger than Ø 3/4" (Ø 19.05mm), drawn type (C1220T-1/2H or C1220T-H) type copper pipe must be used. If a 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

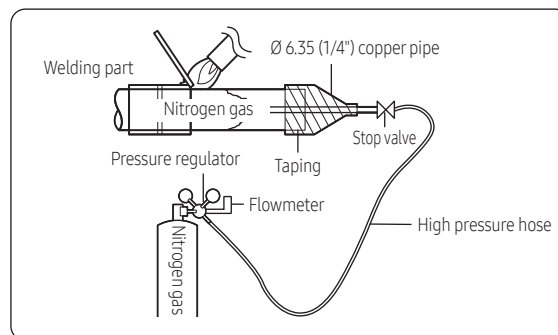
Refrigerant pipe welding and safety information

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 0.05 m³/h (0.54ft³/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.

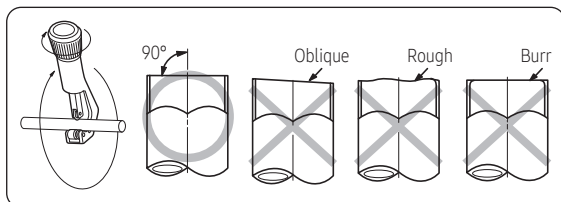
CAUTION

- 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.



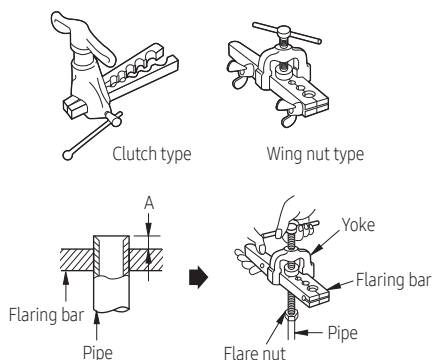
Cutting or flaring the pipes

- 1 Make sure that you prepared the required tools.
 - Pipe cutter, Deburring tool, flaring tool and pipe holder, etc.
- 2 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.



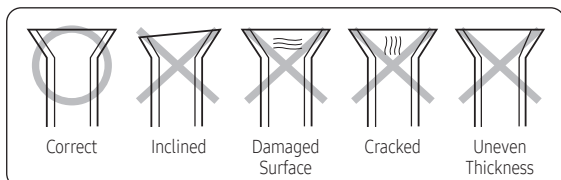
- 3 To prevent a gas leak, remove all burrs at the cut edge of the pipe using a Deburring tool.
- 4 Carry out flaring work using flaring tool as shown below.

[Flaring tools]



	Pipe diameter [D, mm (inch)]	Depth of flaring part [A, mm (inch)]		
		Using flaring tool for R-410A	Using conventional flaring tool	
			Clutch type	Wing nut type
	ø6.35(ø1/4)	0~0.5 (0~0.02)	1.0~1.5 (0.04~0.06)	1.5~2.0 (0.06~0.08)
	ø9.52(ø3/8)			
	ø12.70(ø1/2)			
	ø15.88(ø5/8)			

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

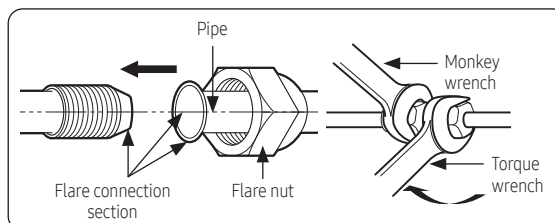


CAUTION

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

CAUTION

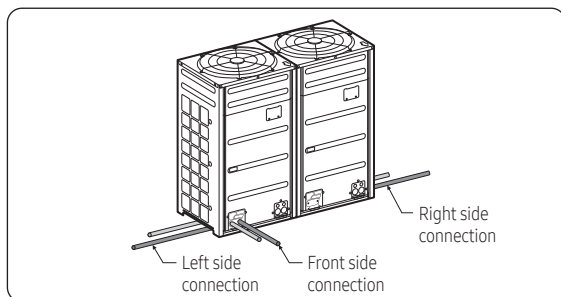
- Blowing Nitrogen gas should be done when welding the pipe.
- Make sure to use the provided flare nut.
- Make sure that there are no cracks or twisted part when you need to bend the pipe.
- Do not fasten the flare nut with excessive strength.
- R-410A is a high pressure refrigerant and there is a risk 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

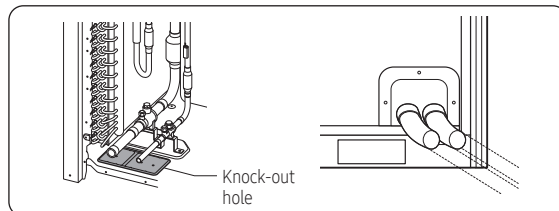
1 Direction of the pipe

Refrigerant pipe can be withdrawn from the front, left and right side. Take necessary method to install the pipes according to the condition of the installation site.



CAUTION

- Caution for using knock-out hole



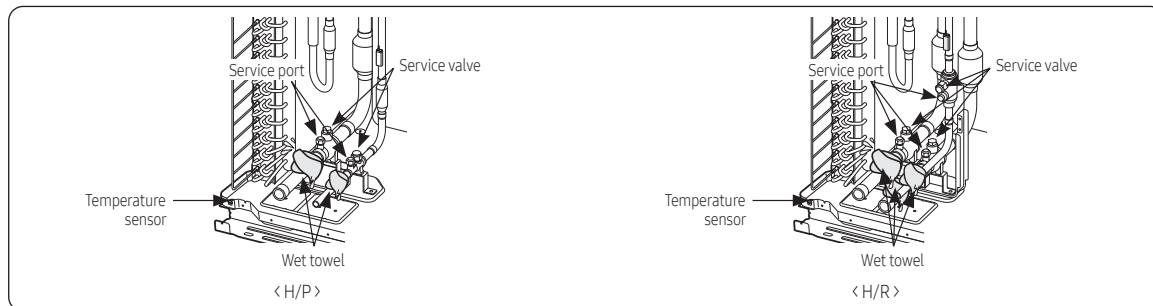
- Make sure to prevent any damages on the exterior of the outdoor unit.
- Remove all burrs around the knock-out hole and apply varnish on the cross section and edges of the knock-out hole to prevent rust.
- Use a cable protection tube and bushing to prevent a cable from being damaged when passing through a knock-out hole.

2 Connecting refrigerant pipe for outdoor unit

Classification	Front side connection	Right/left (and bottom) side connection
Working process	<ul style="list-style-type: none"> First, remove the piping cover from the outdoor unit. Separate the knock-out hole that you are going to use. If you separate the knock-out hole that is going to be unused, small animals such as squirrels and rats may get into the unit through the hole. Fix the bottom side of the piping cover first and then fix the top part of it. 	<ul style="list-style-type: none"> Separate the knock-out hole at the bottom side of the unit and install the pipe. After installing and insulating the pipe, close up the remaining holes. If not, small animals such as rats and squirrels may get inside the unit.
H/P		
H/R		

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 welding fire or flame. Sensor for detecting outside temperature is located on the left side of the welding part so be extra careful not to damage the sensor when welding.
 - 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 as shown in the illustration. 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. (Vibration 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.



3 Pipe installation between the outdoor units

- You will need branch joints, which is an optional accessory, for connecting in between outdoor units in order to combine outdoor units in module.
- ※ For optimal distribution of the refrigerant, you must use Y-joint as branch joint for connecting outdoor units. (Do not use T-joint)
- When you install the outdoor units in module, there is no restriction of installation order among outdoor units.
- Height of the connection pipe should be same or lower than the ones connected to the outdoor units.

Caution	Correct installation	Incorrect installation
Refrigerant pipes should be connected at the same or lower level than the ones connected to the outdoor unit.		
Refrigerant pipes must be connected by the side of the product.		
Branch joint between outdoor units must be installed horizontally.		
Install a vertical trap in following cases as shown in the figure : Case1. Pipe length between outdoor unit branches exceeds 2.5m(8.20ft). Case2. Pipe length between outdoor unit and its branch exceeds 2.5m(8.20ft).		

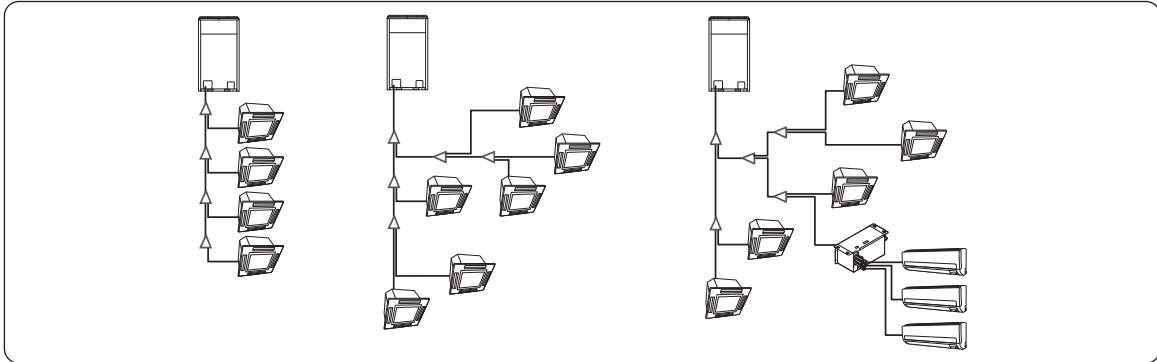


Refrigerant pipe installation

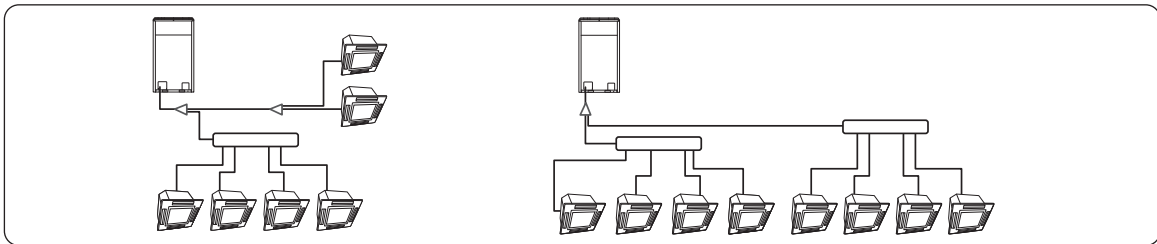
Examples of refrigerant pipe installation

H/P (Heat pump)

1 Using Y-joint

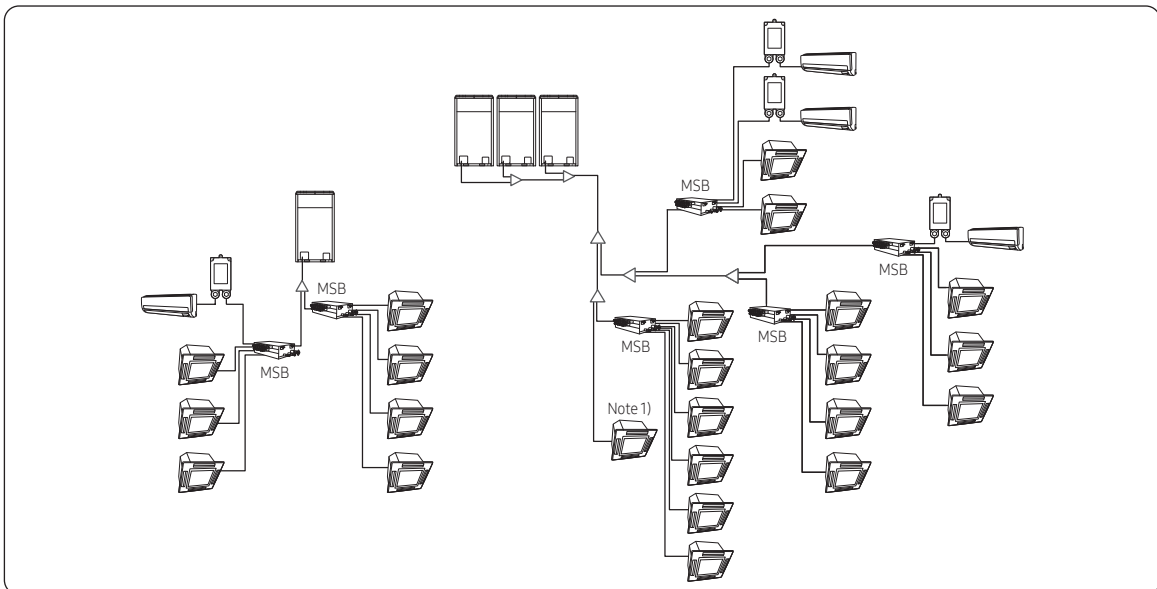


2 Using distribution header



H/R (Heat recovery)

Using Y-joint

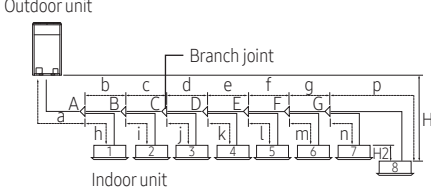
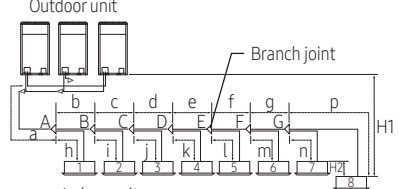
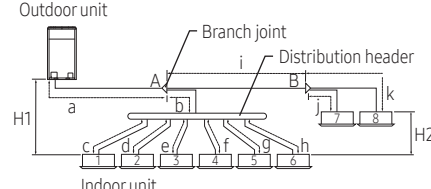
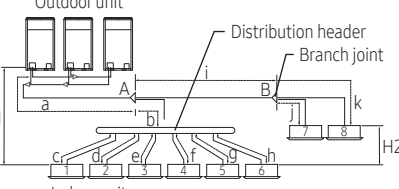
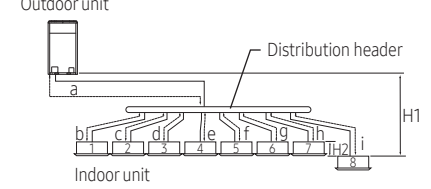
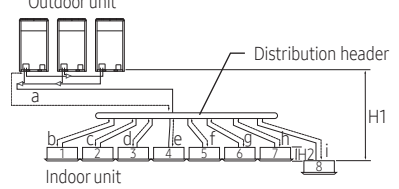


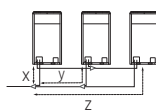
Note 1) Direct-connected indoor unit without MSB (for H/R only)

- This indoor unit can only be used for cooling operation. (Heating operation is not possible.)
- Connect indoor unit to liquid and low pressure gas pipe.
- Change the installation option for direct-connected indoor unit without MSB. (refer to the indoor unit installation manual)

Allowable length of the refrigerant pipe and the installation examples

H/P (Heat pump)

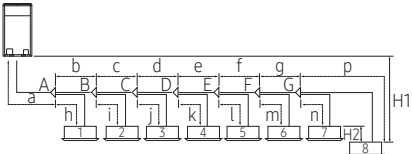
Classification	Single Installation	Module installation
Installing only with Y-joint		
Installing with Y-joint and distribution header		
Installing only with distribution header		

Classification				Example		Remarks
Maximum allowable length of pipe	Outdoor unit ~ Indoor unit	Actual length (Equivalent length)	200 m(656') and below [220 m(722') and below]	Installing only with Y-joint	$a+b+c+d+e+f+g+p \leq 200 \text{ m}(220 \text{ m})/656'(722')$	Equivalent length Y-joint: 0.5 m (1.64'), Distribution header: 1 m(3.28')
				Installing with Y-joint and distribution header	$a+b+h \leq 200 \text{ m}(220 \text{ m})$, $a+i+k \leq 200 \text{ m}(220 \text{ m})/656'(722')$	
				Installing only with distribution header	$a+i \leq 200 \text{ m}(220 \text{ m})/656'(722')$	
		Total length of pipe (m)	1000 m(3281') or less	Installing only with Y-joint	$a+b+c+d+e+f+g+h+i+j+k+l+m+n+p \leq 1000 \text{ m}(3281')$	-
				Installing with Y-joint and distribution header	$a+b+c+d+e+f+g+h+i+j+k \leq 1000 \text{ m}(3281')$	-
				Installing only with distribution header	$a+b+c+d+e+f+g+h+i \leq 1000 \text{ m}(3281')$	-
	Outdoor unit ~ Outdoor unit (Module installation)	Pipe length	10 m (33') or less	$x \leq 10 \text{ m}(33')$, $y \leq 10 \text{ m}(33')$, $z \leq 10 \text{ m}(33')$		
		Equivalent length	13 m (43') or less	$x \leq 13 \text{ m}(43')$, $y \leq 13 \text{ m}(43')$, $z \leq 13 \text{ m}(43')$		
Maximum allowable height difference of pipe	Outdoor unit ~ Indoor unit	110/110 m(361'/361') <small>Note 2)</small>		$H1 \leq 110/110 \text{ m}(361'/361')$		
	Indoor unit ~ Indoor unit	50 m (164') or less		$H2 \leq 50 \text{ m}(164')$		
		But, when wall-mount type indoor units with EEV (AM****NQD* / AM****NVD*) is installed, H2 is 15 m(49') or less.				

Refrigerant pipe installation

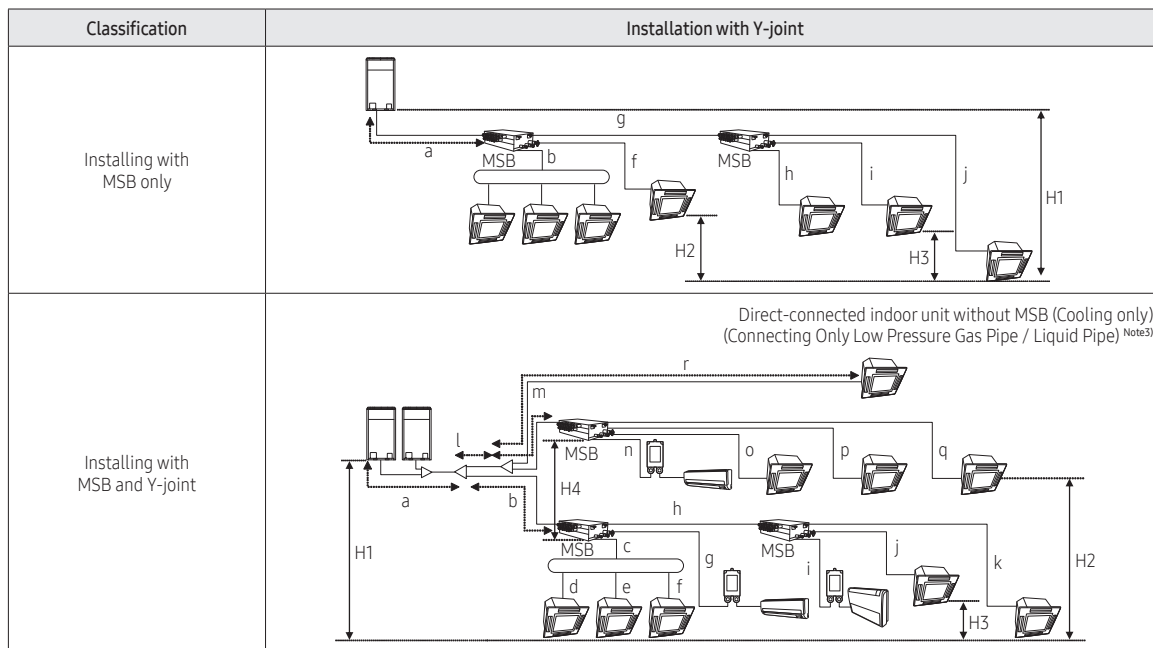
Classification				Example		Remarks
Maximum allowable length after branch joint	First branch joint ~ Farthest Indoor unit	Pipe length	45 m (148') or less	Installing only with Y-joint	$b+c+d+e+f+g+p \leq 45 \text{ m (148')}$	-
				Installing with Y-joint and distribution header	$i+k \leq 45 \text{ m (148')}$	
				Installing only with distribution header	$i \leq 45 \text{ m (148')}$	
		45 m~90 m (148'~295') <small>Note 1)</small>	Required conditions must be satisfied			-

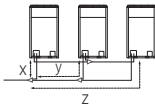
Note 1) Required condition

Classification	Condition	Example
First branch joint ~ Farthest Indoor unit	45m(148') ≤ b+c+d+e+f+g+p ≤ 90m (295'): branch pipes (b, c, d, e, f, g) size 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+c+d+e+f+g)×2 +h+i+j+k+l+m+n+p ≤ 1000 m (3281')	
	If the size of pipe (main pipe), between the first branch joint and the outdoor unit, is increased by 1 grade, (a+b+c+d+e+f+g)×2 +h+i+j+k+l+m+n+p ≤ 1000 m (3281')	
Each Y-joint ~ Each indoor unit	h, i, j, ... p ≤ 45 m (148')	
Difference between the distance of the outdoor unit to the farthest indoor unit and nearest indoor unit ≤ 45m(148'), (a+b+c+d+e+f+g+p)-(a+h) ≤ 45m (148')		

Note 2) When indoor unit is located at higher level than outdoor unit, allowable height difference is 110m(361'), (If the height difference is over 40m(131'), contact your local dealer for more information.)
 but when the indoor unit is located at lower level than outdoor unit, allowable height difference is 110m(361') (If the height difference is over 50m(164'), need to decide whether to install PDM kit or not.)
 Model name of the PDM kit : V1PDMK03PR, V1PDMK01PR, V1PDMK02PR

H/R (Heat recovery)



Classification				Example		Remarks
Maximum allowable pipe length	Outdoor unit ~ Indoor unit	Actual pipe length (Equivalent length)	200 m or less (220 m or less)/656'(722')	Installing only with MSB	$a+g+j \leq 200 \text{ m (220 m)}/656'(722')$	Equivalent length Y-joint: 0.5 m(1.64') Distribution header: 1 m(3.28') MSB: 1 m(3.28')
				Installing with MSB and Y-joint	$a+b+h+k \leq 200 \text{ m (220 m)}/656'(722')$	
		Total length of pipe	1000 m (3281') or less	Installing only with MSB	$a+b+c+d+e+f+g+h+i+j \leq 1000 \text{ m (3281')}$	
				Installing with MSB and Y-joint	$a+b+c+\dots+r \leq 1000 \text{ m (3281')}$	
	Outdoor unit	Pipe length	10 m(33') or less	$x \leq 10 \text{ m (33')}, y \leq 10 \text{ m (33')}, z \leq 10 \text{ m (33')}$		
	~ Outdoor unit (Module installation)	Equivalent length	13 m(43') or less	$x \leq 13 \text{ m (43')}, y \leq 13 \text{ m (43')}, z \leq 13 \text{ m (43')}$		
	MSB ~ Indoor unit	Pipe length	45 m(148') or less	Installing only with MSB	$b+c \leq 45 \text{ m (148')}, b+d \leq 45 \text{ m (148')}, b+e \leq 45 \text{ m (148')}, f \leq 45 \text{ m (148')}, g+h \leq 45 \text{ m (148')}, g+i \leq 45 \text{ m (148')}, g+j \leq 45 \text{ m (148')}$	
Installing with MSB and Y-joint				$c+d, c+e, c+f, g, h+i, h+j, h+k, n, o, p, q, r \leq 45 \text{ m (148')}$		
Maximum allowable height difference	Outdoor unit ~ Indoor unit	Pipe length	110 m / 110 m(361'/361') <small>Note 1)</small>	$H1 \leq 110 \text{ m / 110 m (361'/361')}$		
	Indoor unit ~ Indoor unit		40 m(131') or less	$H2 \leq 40 \text{ m (131')}$		
			But, when VVMC***S4-4P is installed, H2 is 15 m(49') or less.			
	Indoor unit ~ Indoor unit (in one MSB)		15 m(49') or less	$H3 \leq 15 \text{ m (49')}$		
	MSB ~ MSB		30 m(98') or less	$H4 \leq 30 \text{ m (98')}$		
Maximum allowable length after branch joint	First branch joint ~ Farthest Indoor unit	Pipe length	45 m(148') or less	Installing only with MSB	$g+j \leq 45 \text{ m (148')}$	
				Installing with MSB and Y-joint	$b+h+k \leq 45 \text{ m (148')}, l+m+q \leq 45 \text{ m (148')}, l+r \leq 45 \text{ m (148')}$	
			45 ~ 90 m (148'~295') <small>Note 2)</small>	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 110m(361'), (If the height difference is over 40m(131'), contact your local dealer for more information.) but when the indoor unit is located at lower level than outdoor unit, allowable height difference is 110m(361') (If the height difference is over 50m(164'), need to decide whether to install PDM kit or not.)
Model name of the PDM kit : V1PDMK03PR, V1PDMK01PR, V1PDMK02PR

Note 2) Required condition

Classification	Condition	Example
First branch joint ~ Farthest Indoor unit	$45\text{m}(148') \leq b+h+k, l+m+q, l+r \leq 90\text{m}(295')$: Size of the branch liquid and low pressure gas pipes (b, l, m) must be increased by 1 grade.	
Total length of extended pipe	<p>If the size of pipe (main pipe), between the first branch joint and the outdoor unit, is not increased by 1 grade, $a+(b+l+m) \times 2+c+d+e+f+g+h+i+j+k+n+o+p+q+r \leq 1000\text{m}(3281')$</p> <p>If the size of pipe (main pipe), between the first branch joint and the outdoor unit, is increased by 1 grade, $(a+b+l+m) \times 2+c+d+e+f+g+h+i+j+k+n+o+p+q+r \leq 1000\text{m}(3281')$</p>	
MSB ~ Each indoor unit	$c+d, c+e, c+f, g, h+i, h+j, h+k, n, o, p, q, r \leq 45\text{m}(148')$	
Difference between the distance of the outdoor unit to the farthest indoor unit and nearest indoor unit $\leq 45\text{m}(148')$ $(a+b+h+k) - (a+b+c+d) \leq 45\text{m}(148')$		

Note 3) For indoor units to which no MSB is connected, be sure to set their options to "Cooling only indoor unit," and then connect them to a low pressure gas pipe and a liquid pipe. Be sure to combine the cooling only indoor units so that their total capacity becomes 50% or less of the total capacity of all indoor units.

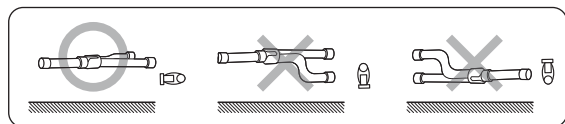
Note 4) In case of connecting more than one indoor unit in one MSB Port, the below indoor units cannot be combined.
OAP duct (VOSC***S4-4P), Hydro Unit HE (VHEC***S4-4P), Hydro Unit HT (VHTC***S4-4P)

Note 5) In case of connecting two MSB ports with Y-joint, the indoor units cannot be combined to more than one.

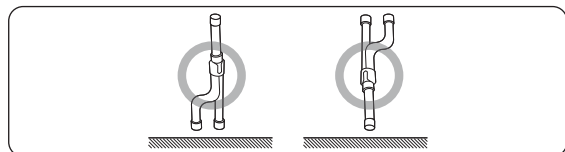
Installing the branch joints

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

Horizontal installation

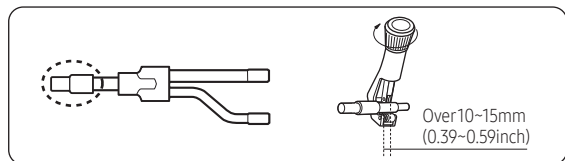


Vertical installation



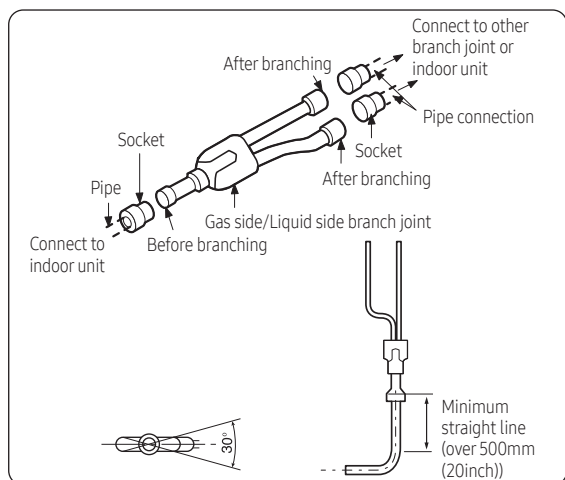
NOTE

- For A~J type branch joints : Connect the branch joint to the connection pipe with the provided reducer.
- For K~Z type branch joints : Cut the connection part of the branch joint or the provided socket, according to the diameter of the connection pipe, before connecting them.



CAUTION

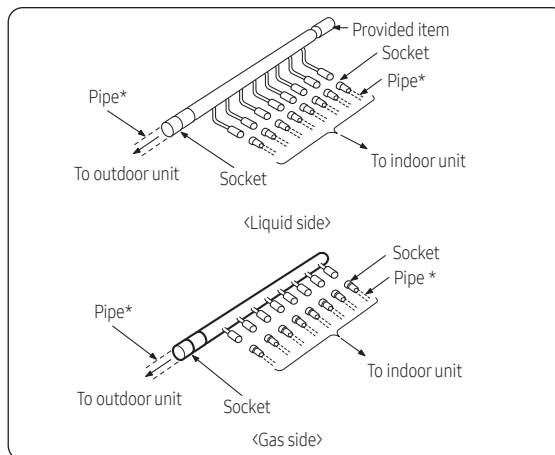
- Install the branch joint within $\pm 15^\circ$ of the horizon or vertical line.
- Make sure that the pipe is not bent at where it is connected to the branch joint.
- Keep a minimum straight line distance of 500mm (20inch) or more before connecting branch joint.



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

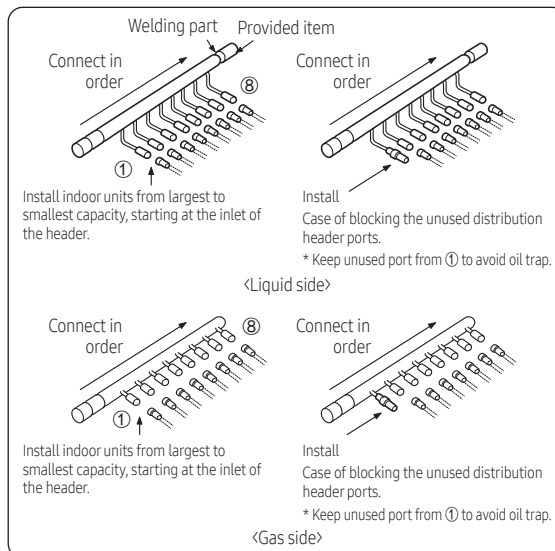
Installing the distribution header

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



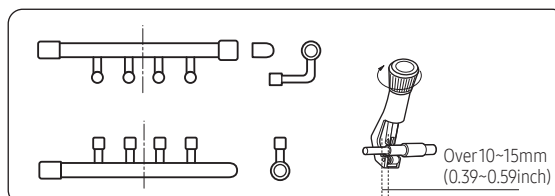
※ Pipe : Separately purchased item

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



NOTE

- For A~J type distribution header : Connect the distribution header to the connection pipe with the provided reducer.
- For K~Z type distribution headers : Cut the provided socket, according to the diameter of the connection pipe, before connecting it.



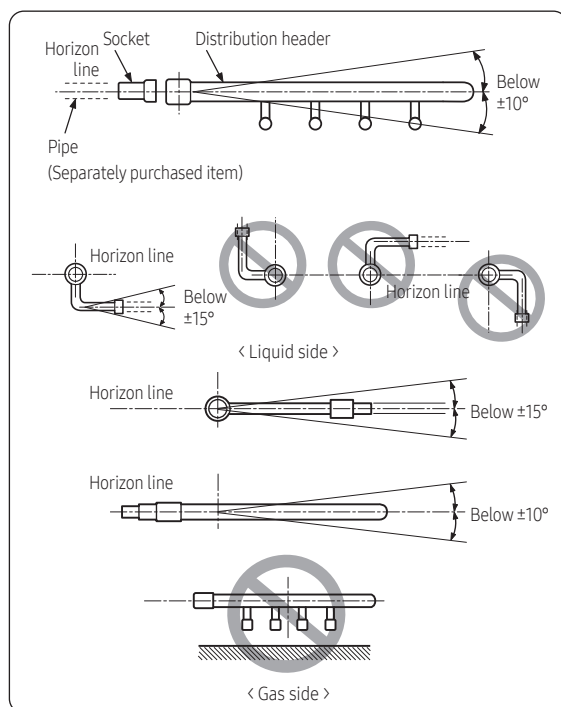
Refrigerant pipe installation

⚠ CAUTION

- Connect the indoor units in order, while respecting 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.
- Keep unused port from ① to avoid oil trap.

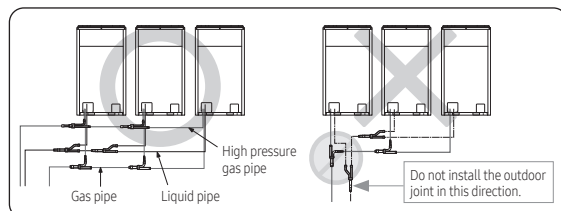
3 Install the distribution header horizontally.

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

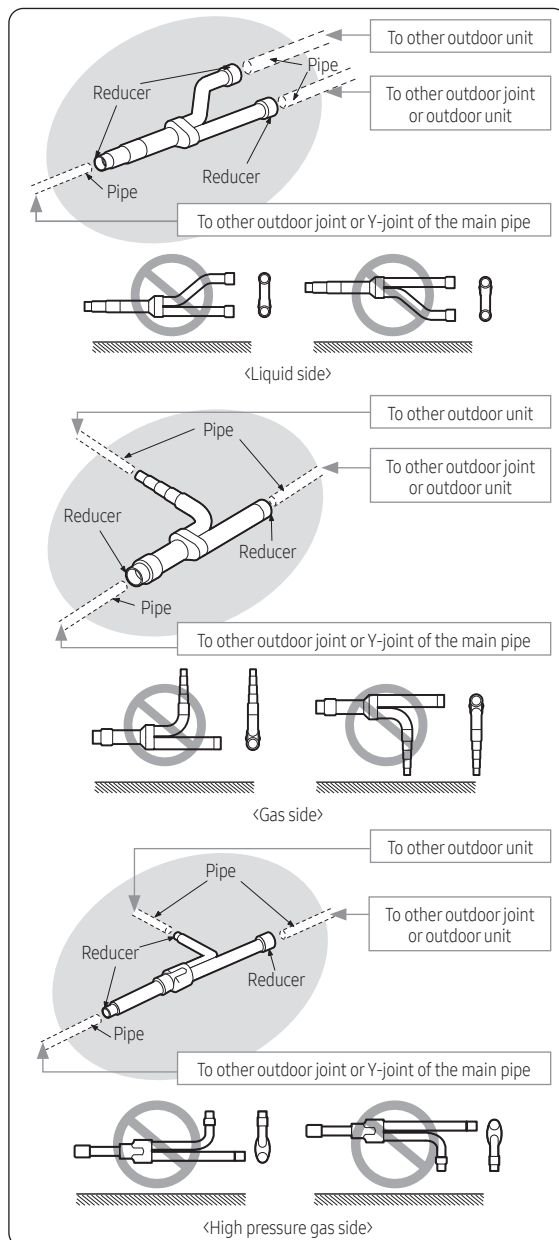


Installing the branch joint between outdoor units

Installation of outdoor joints



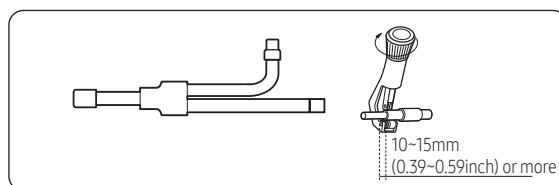
※ High pressure gas pipe only applies to the H/R product.



※ Use the attached reducer according to the selected pipe size.

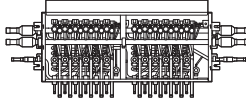
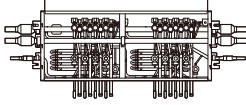
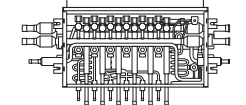
NOTE

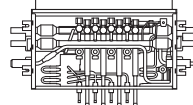
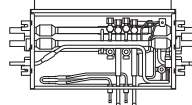
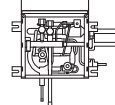
- Connect the Outdoor joint to the pipe by cutting the outlet of the Outdoor joint or provided reducer properly.



Installing the MSB

MSB specification

Model	V1MSBB12HR	V1MSBB08HR	V1MSBB06HR
Exterior of MSB			
Number of connectable indoor units at one port	Up to 8 units	Up to 8 units	Up to 8 units
Maximum number of indoor units (Total)	64	64	32
The maximum capacity of the connectable indoor units at one port	16 kW (54MBH)	16 kW (54MBH)	16 kW (54MBH)
The maximum capacity of the connectable indoor units at one port (with Y-JOINT)	32.0 kW (108 MBH)	32.0 kW (108 MBH)	32.0 kW (108 MBH)
The maximum capacity of the connectable indoor units	85.0 kW (290MBH)	85.0 kW (290MBH)	61.6 kW (216MBH)
Internal EEV	Not included Cannot connect indoor unit without internal EEV		

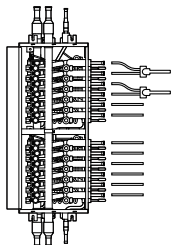
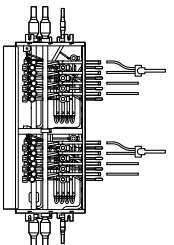
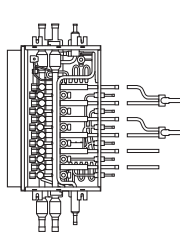
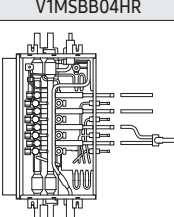
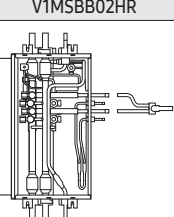
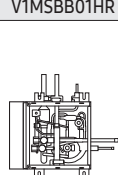
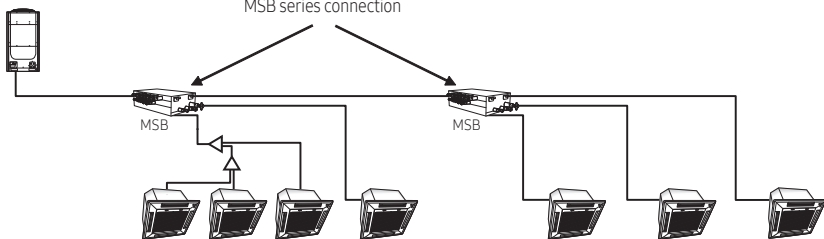




Model	V1MSBB04HR	V1MSBB02HR	V1MSBB01HR
Exterior of MSB			
Number of connectable indoor units at one port	Up to 8 units	Up to 8 units	Up to 8 units
Maximum number of indoor units (Total)	32	16	8
The maximum capacity of the connectable indoor units at one port	16 kW (54MBH)	16 kW (54MBH)	16 kW (54MBH)
The maximum capacity of the connectable indoor units at one port (with Y-JOINT)	32.0 kW (108 MBH)	32.0 kW (108 MBH)	-
The maximum capacity of the connectable indoor units	61.6 kW (216MBH)	32.0 kW (108MBH)	16 kW (54MBH)
Internal EEV	Not included Cannot connect indoor unit without internal EEV		

CAUTION

- If the sum of the connected indoor unit capacity connected to the MSB is greater than 67.2kW (228MBH), performance may vary depending on operating conditions.
- The incoming pipe diameters supplying refrigerant to the MSB are determined based on the sum of the connected indoor units. If these pipe diameters are different than the MSB pipe diameters, use the provided reducers to connect to the MSB. If the provided reducers are not the correct size, field supplied reducers must be used.

Refrigerant pipe installation

Installing the indoor units

Model	V1MSBB12HR	V1MSBB08HR	V1MSBB06HR
Example installing (Each port connection)			
			
Example installing (MSB series connection)			
Installing indoor units	<p>Under 16.0 kW (54 MBH) indoor unit : Don't use Y-connector 16.0 ~ 32.0 kW (54 ~ 108 MBH) indoor unit : Use Y-connector at the Gas & Liquid line If you want to continuous cooling operation under -5 °C (23 °F), set outdoor 'Expand operational temperature range for cooling operation (HR only)', and use Y-connector on 5.0 ~ 16.0 kW (17 ~ 54 MBH) indoor unit In case of MSB connection in series, the maximum capacity of indoor units in MSB series connection is the larger value of MSB which are connected in series. (Example> V1MSBB12HR + V1MSBB06HR → 85.0 kW (290 MBH))</p>		
Using Y-connector	<p>[V1MSBB06HR, V1MSBB04HR, V1MSBB02HR, V1MSBB01HR] In case of using Y-connector, it is only connectable for port combination at below connectable port combination for Y-connector : A + B port, C + D port, E + F port Non-connectable port combination for Y-connector : B + C port, D + E port, non-continuous port Set Dip Switch option for using Y-connector</p> <div> <div>  <p>Default</p> </div> <div>  <p>Combination of A+B port</p> </div> <div>  <p>Combination of C+D port</p> </div> <div>  <p>Combination of E+F port</p> </div> </div>		



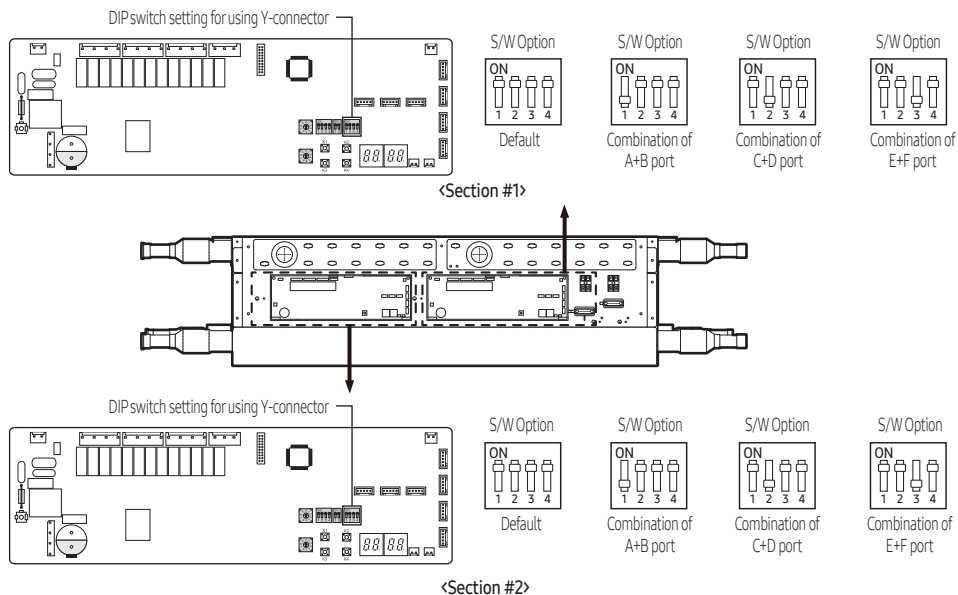
Using
Y-connector

[V1MSBB12HR, V1MSBB08HR]

In case of using Y-connector, it is only connectable for port combination at below connectable port combination for Y-connector : [#1-A] + [#1-B] port, [#1-C] + [#1-D] port, [#1-E] + [#1-F] port
[#2-A] + [#2-B] port, [#2-C] + [#2-D] port, [#2-E] + [#2-F] port

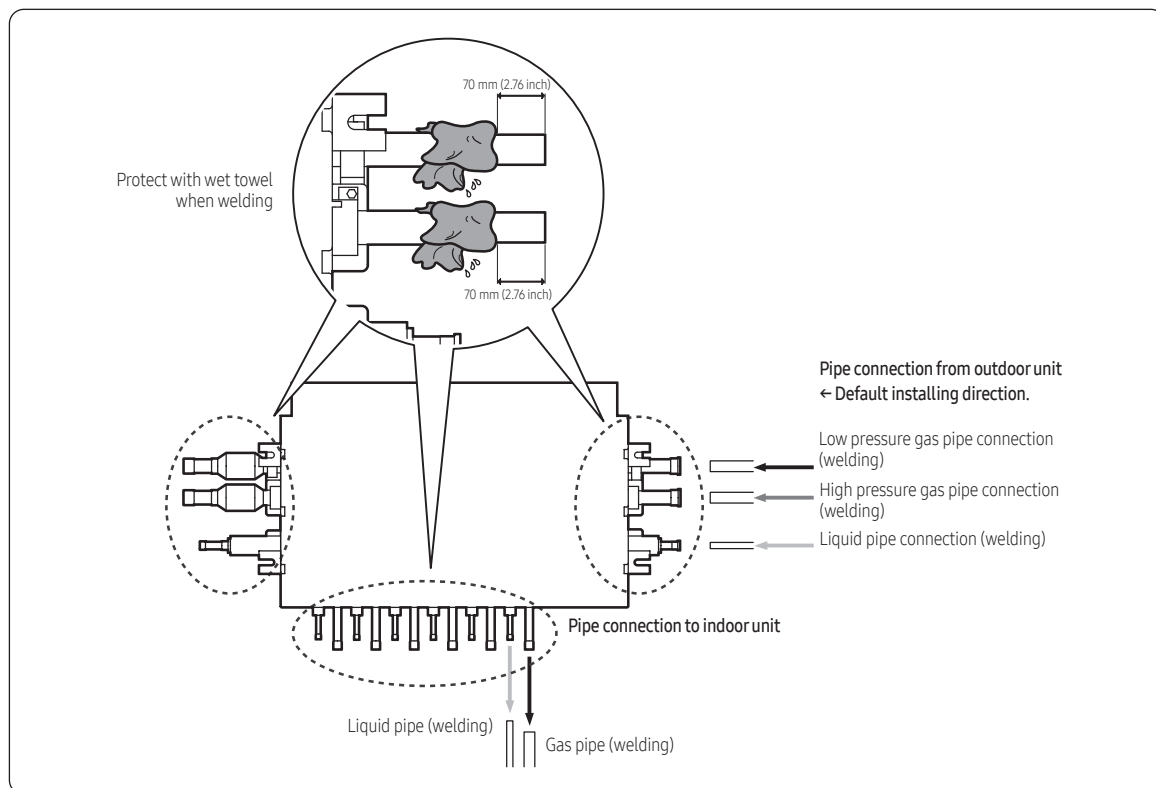
Non-connectable port combination for Y-connector : [#1-B] + [#1-C] port, [#1-D] + [#1-E] port, non-continuous port
[#2-B] + [#2-C] port, [#2-D] + [#2-E] port, non-continuous port

Set Dip Switch option for using Y-connector



Refrigerant pipe installation

How to connect the pipes



- ※ When installing MSB, use the pattern sheet for installation that is provided with the product.
- ※ When welding the gas pipes, protect the product with the flame-proof sheet.
- ※ When connecting the MSB with outdoor units, default direction is set in the MSB.
If installing opposite direction, weld the enclosed copper cap in each high pressure, low pressure and liquid pipes.

Electrical wiring work

Electric Characteristics

1 [V*C***S4M-4Y series] Heat Pump / Heat Recovery (208~230V)

Nom. Ton	Model	Units		Module #1						Module #2						Module #3					
				RLA		FLA		Power Supply		RLA		FLA		Power Supply		RLA		FLA		Power Supply	
		Hz	Volts	Comp1	Comp2	FAN1	FAN2	MCA	MOP	Comp1	Comp2	FAN1	FAN2	MCA	MOP	Comp1	Comp2	FAN1	FAN2	MCA	MOP
6Ton	V*C072S4M-4Y	60	208-230	18.7	-	4.6	-	28.0	35.0	-	-	-	-	-	-	-	-	-	-	-	-
8Ton	V*C096S4M-4Y	60	208-230	12.2	12.2	4.2	4.2	36.0	40.0	-	-	-	-	-	-	-	-	-	-	-	-
10Ton	V*C120S4M-4Y	60	208-230	14.4	14.4	4.2	4.2	40.8	45.0	-	-	-	-	-	-	-	-	-	-	-	-
12Ton	V*C144S4M-4Y	60	208-230	19.6	19.6	4.2	4.2	52.6	60.0	-	-	-	-	-	-	-	-	-	-	-	-
14Ton	V*C168S4M-4Y	60	208-230	20.4	20.4	4.2	4.2	54.4	60.0	-	-	-	-	-	-	-	-	-	-	-	-
16Ton	V*C192S4M-4Y	60	208-230	22.5	22.5	4.6	4.6	60.0	70.0	-	-	-	-	-	-	-	-	-	-	-	-
18Ton	V*C216S4M-4Y	60	208-230	24.3	24.3	4.6	4.6	64.0	80.0	-	-	-	-	-	-	-	-	-	-	-	-
20Ton	V*C240S4M-4Y	60	208-230	26.1	26.1	4.6	4.6	68.0	80.0	-	-	-	-	-	-	-	-	-	-	-	-
22Ton	V*C264S4M-4Y	60	208-230	12.2	12.2	4.2	4.2	36.0	40.0	20.4	20.4	4.2	4.2	54.4	60.0	-	-	-	-	-	-
24Ton	V*C288S4M-4Y	60	208-230	12.2	12.2	4.2	4.2	36.0	40.0	22.5	22.5	4.6	4.6	60.0	70.0	-	-	-	-	-	-
26Ton	V*C312S4M-4Y	60	208-230	12.2	12.2	4.2	4.2	36.0	40.0	24.3	24.3	4.6	4.6	64.0	80.0	-	-	-	-	-	-
28Ton	V*C336S4M-4Y	60	208-230	12.2	12.2	4.2	4.2	36.0	40.0	26.1	26.1	4.6	4.6	68.0	80.0	-	-	-	-	-	-
30Ton	V*C360S4M-4Y	60	208-230	14.4	14.4	4.2	4.2	40.8	45.0	26.1	26.1	4.6	4.6	68.0	80.0	-	-	-	-	-	-
32Ton	V*C384S4M-4Y	60	208-230	22.5	22.5	4.6	4.6	60.0	70.0	22.5	22.5	4.6	4.6	60.0	70.0	-	-	-	-	-	-
34Ton	V*C408S4M-4Y	60	208-230	22.5	22.5	4.6	4.6	60.0	70.0	24.3	24.3	4.6	4.6	64.0	80.0	-	-	-	-	-	-
36Ton	V*C432S4M-4Y	60	208-230	14.4	14.4	4.2	4.2	40.8	45.0	14.4	14.4	4.2	4.2	40.8	45.0	22.5	22.5	4.6	4.6	60.0	70.0
38Ton	V*C456S4M-4Y	60	208-230	14.4	14.4	4.2	4.2	40.8	45.0	19.6	19.6	4.2	4.2	52.6	60.0	22.5	22.5	4.6	4.6	60.0	70.0

2 [V*C***S4M-4G series] Heat Pump / Heat Recovery (460V)

Nom. Ton	Model	Units		Module #1						Module #2						Module #3					
				RLA		FLA		Power Supply		RLA		FLA		Power Supply		RLA		FLA		Power Supply	
		Hz	Volts	Comp1	Comp2	FAN1	FAN2	MCA	MOP	Comp1	Comp2	FAN1	FAN2	MCA	MOP	Comp1	Comp2	FAN1	FAN2	MCA	MOP
6Ton	VPC072S4M-4G	60	460	10.0	-	2.3	-	15.0	20.0	-	-	-	-	-	-	-	-	-	-	-	-
8Ton	VPC096S4M-4G	60	460	6.0	6.0	2.1	2.1	18.0	20.0	-	-	-	-	-	-	-	-	-	-	-	-
10Ton	VPC120S4M-4G	60	460	6.6	6.6	2.1	2.1	19.4	25.0	-	-	-	-	-	-	-	-	-	-	-	-
12Ton	VPC144S4M-4G	60	460	9.6	9.6	2.1	2.1	26.2	35.0	-	-	-	-	-	-	-	-	-	-	-	-
14Ton	VPC168S4M-4G	60	460	11.0	11.0	2.1	2.1	29.0	35.0	-	-	-	-	-	-	-	-	-	-	-	-
16Ton	VPC192S4M-4G	60	460	13.0	13.0	2.3	2.3	34.0	40.0	-	-	-	-	-	-	-	-	-	-	-	-
18Ton	VPC216S4M-4G	60	460	14.8	14.8	2.3	2.3	38.0	50.0	-	-	-	-	-	-	-	-	-	-	-	-
20Ton	VPC240S4M-4G	60	460	15.6	15.6	2.3	2.3	40.0	50.0	-	-	-	-	-	-	-	-	-	-	-	-
22Ton	V*C264S4M-4G	60	460	6.0	6.0	2.1	2.1	18.0	20.0	11.0	11.0	2.1	2.1	29.0	35.0	-	-	-	-	-	-
24Ton	V*C288S4M-4G	60	460	6.0	6.0	2.1	2.1	18.0	20.0	13.0	13.0	2.3	2.3	34.0	40.0	-	-	-	-	-	-
26Ton	V*C312S4M-4G	60	460	6.0	6.0	2.1	2.1	18.0	20.0	14.8	14.8	2.3	2.3	38.0	50.0	-	-	-	-	-	-
28Ton	V*C336S4M-4G	60	460	6.0	6.0	2.1	2.1	18.0	20.0	15.6	15.6	2.3	2.3	40.0	50.0	-	-	-	-	-	-
30Ton	V*C360S4M-4G	60	460	6.6	6.6	2.1	2.1	19.4	25.0	15.6	15.6	2.3	2.3	40.0	50.0	-	-	-	-	-	-
32Ton	V*C384S4M-4G	60	460	13.0	13.0	2.3	2.3	34.0	40.0	13.0	13.0	2.3	2.3	34.0	40.0	-	-	-	-	-	-
34Ton	V*C408S4M-4G	60	460	13.0	13.0	2.3	2.3	34.0	40.0	14.8	14.8	2.3	2.3	38.0	50.0	-	-	-	-	-	-
36Ton	V*C432S4M-4G	60	460	6.6	6.6	2.1	2.1	19.4	25.0	6.6	6.6	2.1	2.1	19.4	25.0	13.0	13.0	2.3	2.3	34.0	40.0
38Ton	V*C456S4M-4G	60	460	6.6	6.6	2.1	2.1	19.4	25.0	9.6	9.6	2.1	2.1	26.2	35.0	13.0	13.0	2.3	2.3	34.0	40.0

Electrical wiring work

3 [V*C***S4M-4J series] Heat Pump / Heat Recovery (575V)

Non. Ton	Model	Units		Module #1						Module #2						Module #3					
				RLA		FLA		Power Supply		RLA		FLA		Power Supply		RLA		FLA		Power Supply	
		Hz	Volts	Comp1	Comp2	FAN1	FAN2	MCA	MOP	Comp1	Comp2	FAN1	FAN2	MCA	MOP	Comp1	Comp2	FAN1	FAN2	MCA	MOP
6Ton	V*C072S4M-4J	60	575	8.5	-	2.3	-	13.4	20	-	-	-	-	-	-	-	-	-	-	-	-
8Ton	V*C096S4M-4J	60	575	5.0	5.0	2.3	2.3	16.1	20	-	-	-	-	-	-	-	-	-	-	-	-
10Ton	V*C120S4M-4J	60	575	5.5	5.5	2.3	2.3	17.4	20	-	-	-	-	-	-	-	-	-	-	-	-
12Ton	V*C144S4M-4J	60	575	7.6	7.6	2.3	2.3	22.2	25	-	-	-	-	-	-	-	-	-	-	-	-
14Ton	V*C168S4M-4J	60	575	8.8	8.8	2.3	2.3	24.8	30	-	-	-	-	-	-	-	-	-	-	-	-
16Ton	V*C192S4M-4J	60	575	11.2	11.2	2.3	2.3	30.5	40	-	-	-	-	-	-	-	-	-	-	-	-
18Ton	V*C216S4M-4J	60	575	12.8	12.8	2.3	2.3	34.0	45	-	-	-	-	-	-	-	-	-	-	-	-
20Ton	V*C240S4M-4J	60	575	13.5	13.5	2.3	2.3	35.8	45	-	-	-	-	-	-	-	-	-	-	-	-
22Ton	V*C264S4M-4J	60	575	5.0	5.0	2.3	2.3	16.1	20	8.8	8.8	2.3	2.3	24.8	30	-	-	-	-	-	-
24Ton	V*C288S4M-4J	60	575	5.0	5.0	2.3	2.3	16.1	20	11.2	11.2	2.3	2.3	30.5	40	-	-	-	-	-	-
26Ton	V*C312S4M-4J	60	575	5.0	5.0	2.3	2.3	16.1	20	12.8	12.8	2.3	2.3	34.0	45	-	-	-	-	-	-
28Ton	V*C336S4M-4J	60	575	5.0	5.0	2.3	2.3	16.1	20	13.5	13.5	2.3	2.3	35.8	45	-	-	-	-	-	-
30Ton	V*C360S4M-4J	60	575	5.5	5.5	2.3	2.3	17.4	20	13.5	13.5	2.3	2.3	35.8	45	-	-	-	-	-	-
32Ton	V*C384S4M-4J	60	575	11.2	11.2	2.3	2.3	30.5	40	11.2	11.2	2.3	2.3	30.5	40	-	-	-	-	-	-
34Ton	V*C408S4M-4J	60	575	11.2	11.2	2.3	2.3	30.5	40	12.8	12.8	2.3	2.3	34.0	45	-	-	-	-	-	-
36Ton	V*C432S4M-4J	60	575	5.5	5.5	2.3	2.3	17.4	20	5.5	5.5	2.3	2.3	17.4	20	11.2	11.2	2.3	2.3	30.5	40
38Ton	V*C456S4M-4J	60	575	5.5	5.5	2.3	2.3	17.4	20	7.6	7.6	2.3	2.3	22.2	25	11.2	11.2	2.3	2.3	30.5	40

4 [V*C***L4M-4Y series] Heat Pump / Heat Recovery (208~230V)

Nom. Ton	Model	Units		Module #1						Module #2						Module #3					
				RLA		FLA		Power Supply		RLA		FLA		Power Supply		RLA		FLA		Power Supply	
		Hz	Volts	Comp1	Comp2	FAN1	FAN2	MCA	MOP	Comp1	Comp2	FAN1	FAN2	MCA	MOP	Comp1	Comp2	FAN1	FAN2	MCA	MOP
6Ton	V*C072L4M-4Y	60	208-230	18	18	4.2	4.2	50	60	-	-	-	-	-	-	-	-	-	-	-	-
8Ton	V*C096L4M-4Y	60	208-230	22	22	4.2	4.2	62	70	-	-	-	-	-	-	-	-	-	-	-	-
10Ton	V*C120L4M-4Y	60	208-230	28	28	4.2	4.2	76	90	-	-	-	-	-	-	-	-	-	-	-	-
12Ton	V*C144L4M-4Y	60	208-230	18	18	4.2	4.2	50	60	18	18	4.2	4.2	50	60	-	-	-	-	-	-
14Ton	V*C168L4M-4Y	60	208-230	18	18	4.2	4.2	50	60	22	22	4.2	4.2	62	70	-	-	-	-	-	-
16Ton	V*C192L4M-4Y	60	208-230	22	22	4.2	4.2	62	70	22	22	4.2	4.2	62	70	-	-	-	-	-	-
18Ton	V*C216L4M-4Y	60	208-230	18	18	4.2	4.2	50	60	18	18	4.2	4.2	50	60	18	18	4.2	4.2	50	60
20Ton	V*C240L4M-4Y	60	208-230	18	18	4.2	4.2	50	60	18	18	4.2	4.2	50	60	22	22	4.2	4.2	62	70
22Ton	V*C264L4M-4Y	60	208-230	18	18	4.2	4.2	50	60	18	18	4.2	4.2	50	60	28	28	4.2	4.2	76	90
24Ton	V*C288L4M-4Y	60	208-230	18	18	4.2	4.2	50	60	22	22	4.2	4.2	62	70	28	28	4.2	4.2	76	90

5 [V*C***L4M-4G series] Heat Pump / Heat Recovery (460V)

Nom. Ton	Model	Units		Module #1						Module #2						Module #3					
				RLA		FLA		Power Supply		RLA		FLA		Power Supply		RLA		FLA		Power Supply	
		Hz	Volts	Comp1	Comp2	FAN1	FAN2	MCA	MOP	Comp1	Comp2	FAN1	FAN2	MCA	MOP	Comp1	Comp2	FAN1	FAN2	MCA	MOP
6Ton	V*C072L4M-4G	60	460	9.2	9.2	2.1	2.1	25	30	-	-	-	-	-	-	-	-	-	-	-	-
8Ton	V*C096L4M-4G	60	460	11	11	2.1	2.1	31	35	-	-	-	-	-	-	-	-	-	-	-	-
10Ton	V*C120L4M-4G	60	460	14	14	2.1	2.1	38	45	-	-	-	-	-	-	-	-	-	-	-	-
12Ton	V*C144L4M-4G	60	460	9.2	9.2	2.1	2.1	25	30	9.2	9.2	2.1	2.1	25	30	-	-	-	-	-	-
14Ton	V*C168L4M-4G	60	460	9.2	9.2	2.1	2.1	25	30	11	11	2.1	2.1	31	35	-	-	-	-	-	-
16Ton	V*C192L4M-4G	60	460	11	11	2.1	2.1	31	35	11	11	2.1	2.1	31	35	-	-	-	-	-	-
18Ton	V*C216L4M-4G	60	460	9.2	9.2	2.1	2.1	25	30	9.2	9.2	2.1	2.1	25	30	9.2	9.2	2.1	2.1	25	30
20Ton	V*C240L4M-4G	60	460	9.2	9.2	2.1	2.1	25	30	9.2	9.2	2.1	2.1	25	30	11	11	2.1	2.1	31	35
22Ton	V*C264L4M-4G	60	460	9.2	9.2	2.1	2.1	25	30	9.2	9.2	2.1	2.1	25	30	14	14	2.1	2.1	38	45
24Ton	V*C288L4M-4G	60	460	9.2	9.2	2.1	2.1	25	30	11	11	2.1	2.1	31	35	14	14	2.1	2.1	38	45

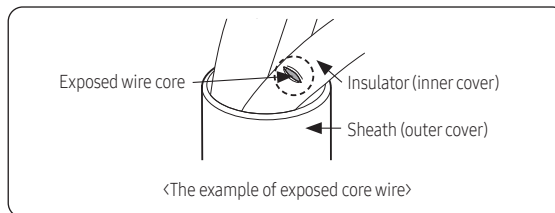
NOTE

- RLA is based on AHRI 1230 Cooling Standard Condition (Indoor Temp : 26.7°C/80°F(DB) / 19.46°C/67°F(WB), Outdoor Temp : 35°C/95°F(DB))
- Voltage Tolerance is ± 10%
- Maxium allowable voltage between phases is 2%
- Refer to module combination table for independent units information
- Symbols:
 - RLA : Rated Load Ampere
 - FLA : Full Load Ampere
 - MCA : Minimum Circuit Ampere (A)
 - MOP : Maxium Overcurrent Protective Device(A)''

⚠ CAUTION

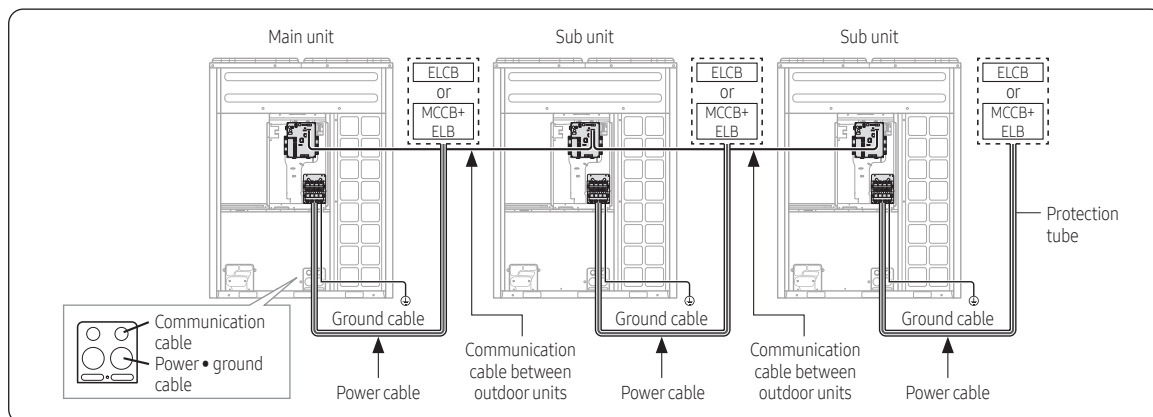
- Caution for electrical work
 - You must install ELCB or MCCB + ELB
 - ELCB: Earth leakage breaker
 - MCCB: Molded case circuit breaker
 - ELB: Earth leakage breaker
 - Do not operate the outdoor unit before completing the refrigerant pipe work.
 - Do not disconnect or change the cable inside the product. It may cause damage to the product.
 - Specification of the power cable is selected based on following installation condition; culvert installation/ ambient temperature 30°C (86°F)/ 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 50m (164.04ft), 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.



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.



Electrical wiring work

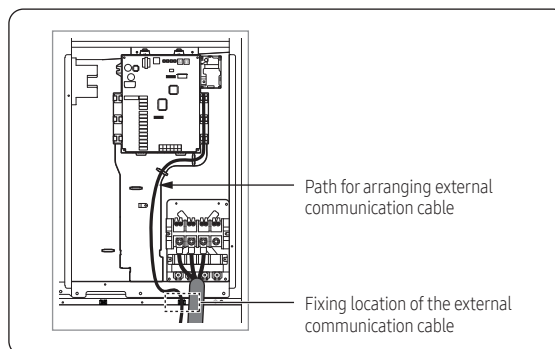
Specification of the protection tube

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 1 PVC coated 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

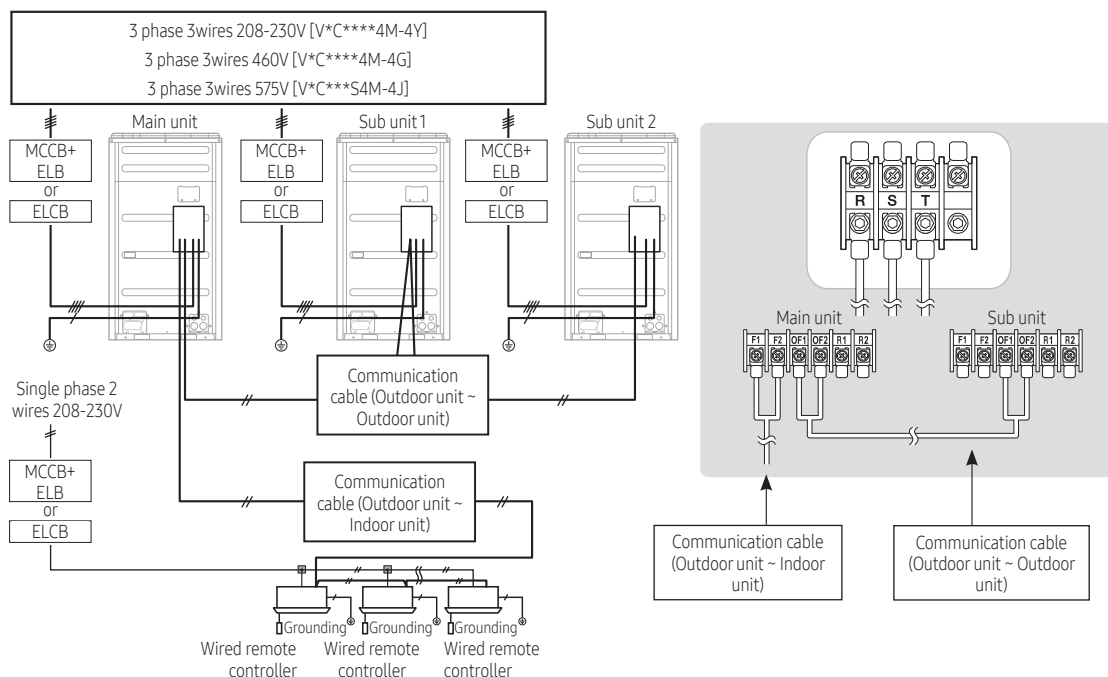
CAUTION

- 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.
- Caution for installing communication cable
- When you connect the cable, it may sag and pressed by other parts. Therefore cables should be fixed to a clamp highlighted with a box on the illustration.



Power wiring diagram

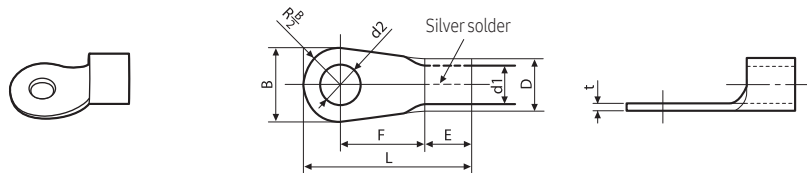


- Connect a power cable of the outdoor unit after checking that R-S-T (3 phase 3 wire) is properly connected.
- Malfunction may occur if one or more of the wires among R-S-T phases (3 Phases-3 Wires) are not connected properly.
(*Malfunction: Turning on/off, occurrence of error, consecutive reset)
- 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.

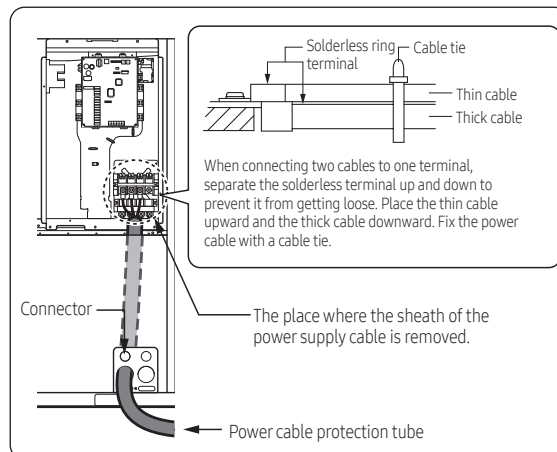


Nominal dimensions for cable [mm ² (inch ²)]		4/6 (0.006/0.009)		10 (0.01)	16 (0.02)	25 (0.03)		35 (0.05)		50 (0.07)	70 (0.10)
Nominal dimensions for screw [mm (inch)]		4 (3/8)	8 (3/16)	8 (3/16)	8 (3/16)	8 (3/16)	8 (3/16)	8 (3/16)	8 (3/16)	8 (3/16)	8 (3/16)
B	Standard dimension [mm (inch)]	9.5 (3/8)	15 (9/16)	15 (9/16)	16 (10/16)	12 (1/2)	16.5 (10/16)	16 (10/16)	22 (7/8)	22 (7/8)	24 (1)
	Allowance [mm (inch)]	±0.2 (±0.007)		±0.2 (±0.007)	±0.2 (±0.007)	±0.3 (±0.011)		±0.3 (±0.011)		±0.3 (±0.011)	±0.4 (±0.015)
D	Standard dimension [mm (inch)]	5.6 (1/4)		7.1 (1/4)	9 (3/8)	11.5 (7/16)		13.3 (1/2)		13.5 (1/2)	17.5 (1/2)
	Allowance [mm (inch)]	+0.3 (+0.011) -0.2 (-0.007)		+0.3 (+0.011) -0.2 (-0.007)	+0.3 (+0.011) -0.2 (-0.007)	+0.5 (+0.019) -0.2 (-0.007)		+0.5 (+0.019) -0.2 (-0.007)		+0.5 (+0.019) -0.2 (-0.007)	+0.5 (+0.019) -0.4 (-0.015)
d1	Standard dimension [mm (inch)]	3.4 (1/8)		4.5 (3/16)	5.8 (1/4)	7.7 (5/16)		9.4 (3/8)		11.4 (7/16)	13.3 (1/2)
	Allowance [mm (inch)]	±0.2 (±0.007)		±0.2 (±0.007)	±0.2 (±0.007)	±0.2 (±0.007)		±0.2 (±0.007)		±0.3 (±0.011)	±0.4 (±0.015)
E	Min. [mm (inch)]	6 (1/4)		7.9 (5/16)	9.5 (5/16)	11 (3/8)		12.5 (1/2)		17.5 (11/16)	18.5 (3/4)
F	Min. [mm (inch)]	5 (3/16)	9 (3/8)	9 (3/8)	13 (1/2)	15 (5/8)	13 (1/2)	13 (1/2)	13 (1/2)	14 (9/16)	20 (3/4)
L	Max. [mm (inch)]	20 (3/4)	28.5 (1-1/8)	30 (1-3/16)	33 (1-5/16)	34 (1-3/8)		38 (1-1/2)	43 (1-11/16)	50 (2)	51 (2)
d2	Standard dimension [mm (inch)]	4.3 (3/16)	8.4 (1-3/16)	8.4 (1-3/16)	8.4 (1-3/16)	8.4 (1-3/16)	8.4 (1-3/16)	8.4 (1-3/16)	8.4 (1-3/16)	8.4 (1-3/16)	8.4 (1-3/16)
	Allowance [mm (inch)]	+0.2 (+0.007) 0 (0)	+0.4 (+0.015) 0 (0)	+0.4 (+0.015) 0 (0)	+0.4 (+0.015) 0 (0)	+0.4 (+0.015) 0 (0)		+0.4 (+0.015) 0 (0)		+0.4 (+0.015) 0 (0)	+0.4 (+0.015) 0 (0)
t	Min. [mm (inch)]	0.9 (0.03)		1.15 (0.04)	1.45 (0.05)	1.7 (0.06)		1.8 (0.07)		1.8 (0.07)	2.0 (0.078)

Connecting the power terminal

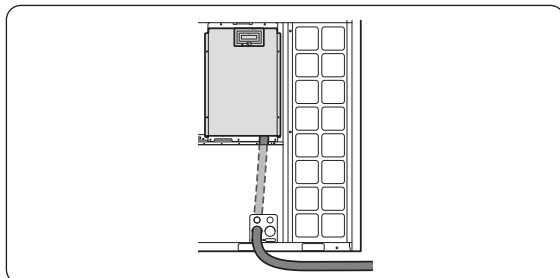
- Connect the cables to the terminal board with solderless ring terminals.
- Properly connect the cables by using certified and rated cables and make sure to fix them properly so that external force is not applied to the terminal.
- Use a driver and wrench that can apply the rated torque when tightening 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.

1 Front connection



Electrical wiring work

2 Closing the cover

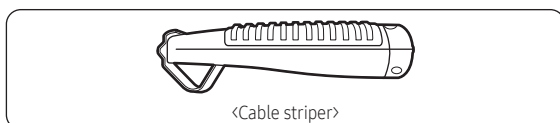


Screw	Tightening torque for terminal		Remarks
	N·m	lbf·ft	
M3.5	0.78~1.18	0.6~0.9	communication cable
M4	1.2~1.8	0.9~1.3	Single phase 208~230V power cable
M8	5.5~7.3	4.1~5.4	3 phase 208~230V/460V/ 575V power cable

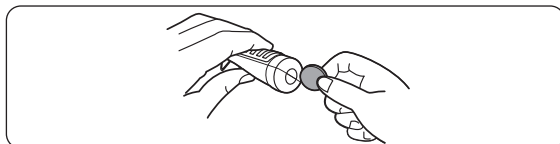
CAUTION

- 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 20mm (0.79 inch) 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.
- There is a risk of electric shock when power is applied. Close the cover of the control box before proceeding to work.
- To inspect the compressor or PBA, first make sure to turn off the system. Electricity may flow even in a compressor that has not been used recently. Exercise caution to protect yourself from an electric shock.

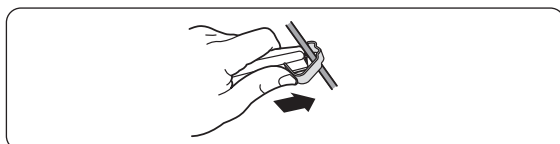
Examples of how to use the cable stripper



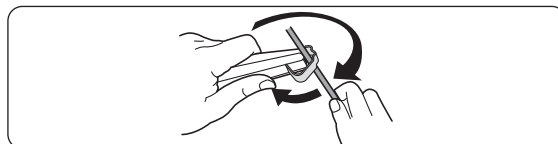
- Adjust the blade position by coin. (Controller is at the bottom side of the tool.) Fix the blade position according to the outer sheath thickness of the power cable.



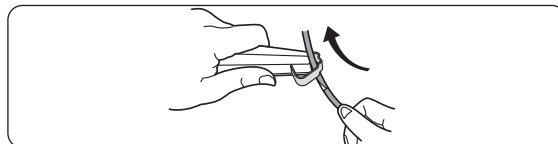
- Fix the power cable and tool by using the hook at the top side of the tool.



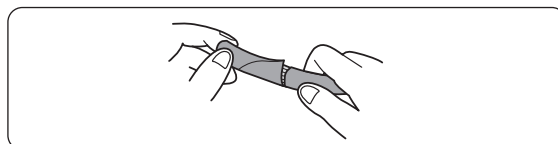
- Cut out the outer sheath of the power cable by revolving the tool in the direction of the arrow, two or three times.



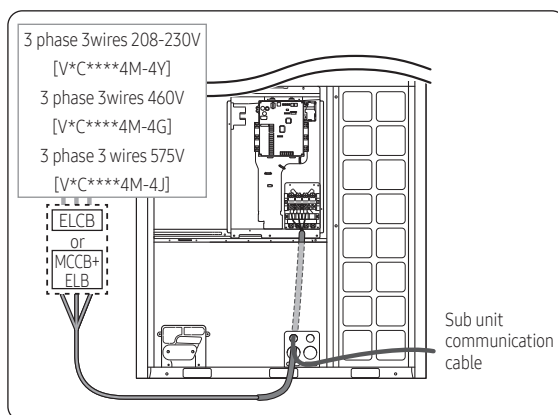
- At this situation, cut out the outer sheath of the power cable by moving the tool toward the direction of the arrow.



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



Fixing the power cable



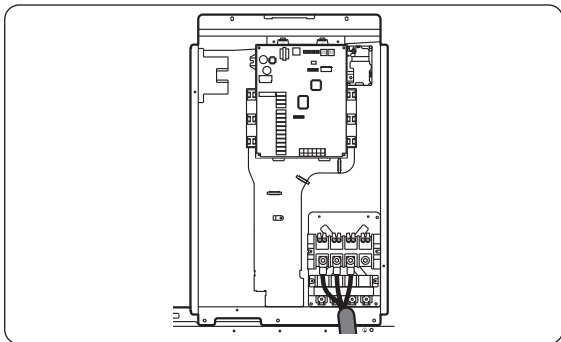
CAUTION

- 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.



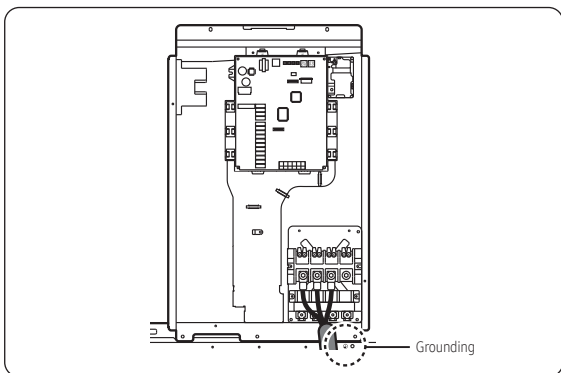
Connect the ring terminal of 3 phase cable

- 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.



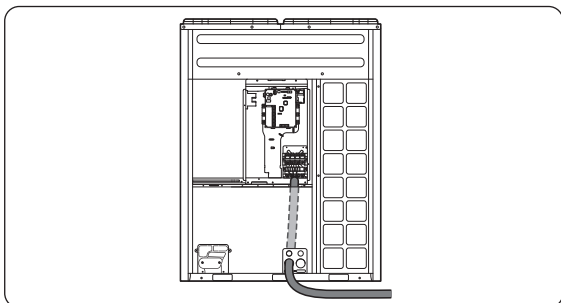
Fixing the ground cable

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



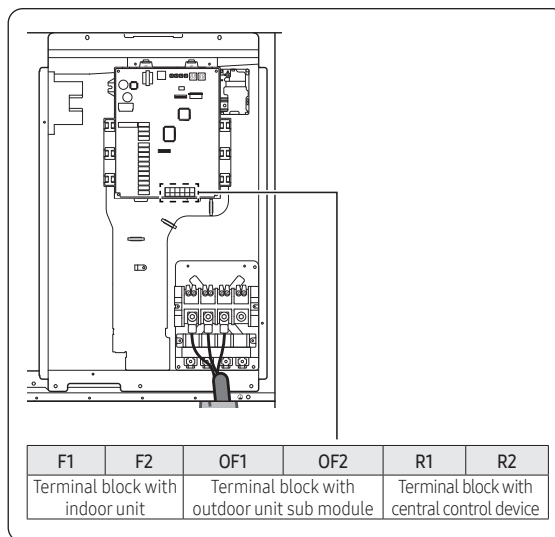
Withdrawing the power cable

- Withdrawing from the front side
 - Connect the power cable protection tube into the power supply box as shown picture.
 - Be sure that the power supply cable is not damaged by burr on the knock-out hole.

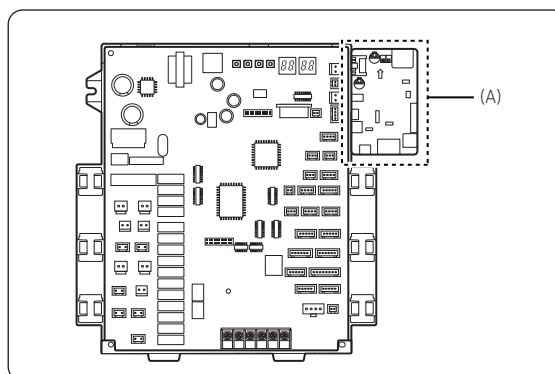


Connecting Central Controls

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



Where to install the interface module

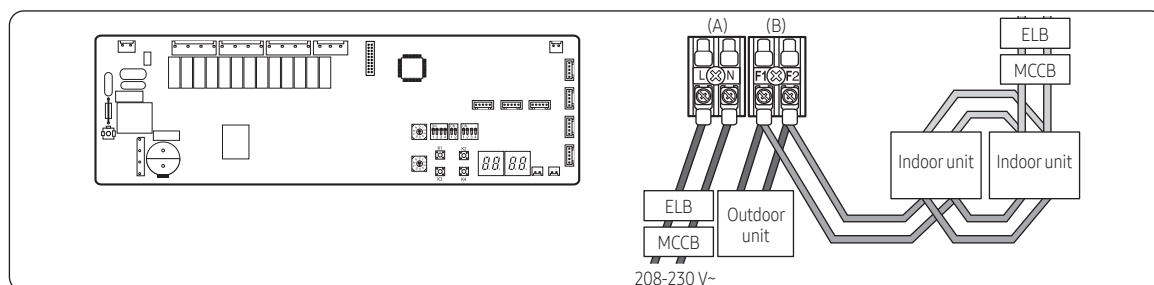


- Install the interface module in location (A), considering the installation conditions.
 - For details on how to install, refer to the interface module installation manual.

Electrical wiring work

Connecting the MSB (V1MSBB06HR, V1MSBB04HR, V1MSBB02HR, V1MSBB01HR, V1MSBB08HR, V1MSBB12HR)

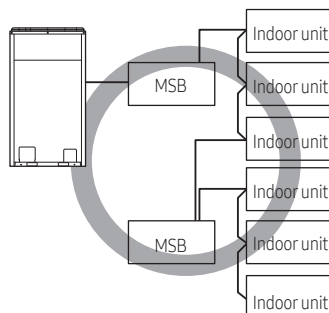
Example



- (A) Power must be supplied to the MSB separately from the outdoor unit.
- (B) Connect the communication cable of the outdoor unit (F1, F2) to the communication cable of the MSB (F1, F2)

CAUTION

- Power cable connection should be done with the solderless ring terminal.



- When installing the MSB, communication cable can be connected as shown above.

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 VRF.
- Ground the power cable according to the following table.

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

Note 1) About grounding work 3.

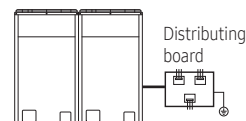
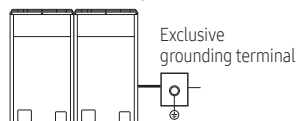
- Grounding work must be done by an expert (with qualification).
- Check if the grounding resistance is lower than 100Ω. When installing an earth leakage breaker (that can cut the electric circuit within 0.5 second in case of a short circuit), allowable grounding resistance should be 30~500Ω.

Note 2) Grounding at dry place

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

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



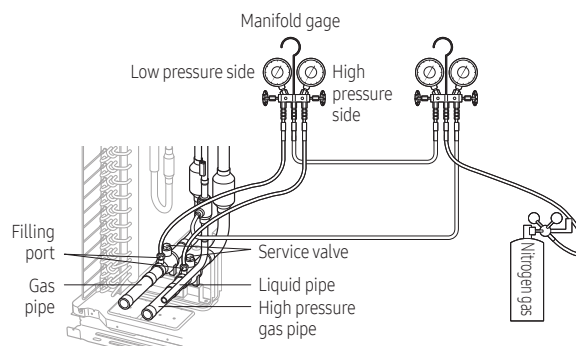
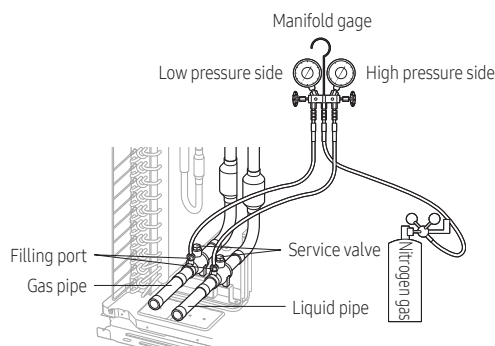
Air tightness test and vacuum drying

Air tightness test

- Use tools for R-410A to prevent the inflow of foreign substances and resist against the internal pressure.
- Do not remove the core of filling port.
- Use dry nitrogen gas for air tightness test as shown in the illustration.

H/P

H/R



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

If you apply pressure at more than 4.1MPa (594.6psi), 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 1.0MPa (145psi) of the pressure before performing vacuum drying and check for further gas leakage.

After checking the first gas leakage, maintain 1.0MPa (145psi) 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 4.1MPa (594.6psi), from entering into the pipe.

Air tightness test and vacuum drying

Vacuum drying pipes and indoor units

- Use tools for R-410A to prevent the inflow of foreign substances and resist against the internal pressure.
- Use vacuum pump that allows vacuuming under 0.5 Torr (500 microns).
- 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.

Connect the manifold gauge to the liquid side pipe and gas side pipe (when installing outdoor units in module).

When installing outdoor units in module, connect the manifold gauge to liquid side pipe and the gas side pipe.

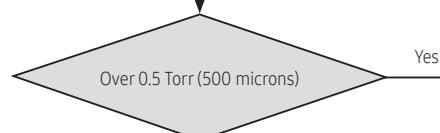
Perform vacuum drying of the liquid side pipe and gas side pipe (when installing outdoor units in module) using a vacuum pump.

Make sure that check valve is installed to prevent pump oil from flowing into the pipe.

While the vacuum gauge pressure is less than 0.5 Torr (500 microns), perform the vacuum drying for more than 1 hour and close the valve.

Vacuum pressure must be checked with the vacuum gauge.

After vacuum pump stops, check whether the pressure is maintained within 0.5 Torr (500 microns) for an hour.



Charge additional refrigerant to the pipe

Check for gas leakage

Vacuum destruction

- Apply dry nitrogen gas to the pipe at pressure of 0.05MPa (7.25psi).

Perform vacuum drying again

Pressure increase

Yes

No

- ※ 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 0°C (32°F)), 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 30°C (89.6°F), humidity less than 85%. If case if the humidity is higher, you must increase the size by one grade as stated in below table.

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

¹⁾ To install in any of the following places or environments, use the same insulating material used in general conditions.

- An air-conditioned place where humidity is high inside the ceiling tiles
- A space where temperature/humidity difference is large between the upper and lower air due to a high ceiling (e.g., a large chapel/church, cinema, split-level open lobby, lecture hall with theatre seating)
- A corridor or passageway with no air conditioning system
- An old building with poor insulation

[Under the following conditions, a gas pipe of Ø9.52 to Ø25.40 mm(3/8inch to 1inch) and plumbing of thickness 13mm(1/2) can be used]

- A general town centre building (e.g., an apartment building, dwelling house, lecture hall, educational institute building, office, shopping complex)
- A structure with an exposed ceiling
- A structure with ceiling tiles and a ventilation system
- A structure where there is no inflow of air from the outside due to plumbing laid inside a wall

※ Even in the above conditions, if humidity is very high or condensation is expected to occur, change the installation thickness for high humidity.

²⁾ To install in any of the following places or environments, use the same insulating material used in a place with high humidity.

<Geographical conditions>

- A location with high humidity, such as a seaside area, a hot spring area, an area near a pond/river or a ridge (a building that is partially covered in earth and sand)
- A location where morning dew occurs frequently (e.g., once every three days)

<Purpose of the building>

- Sauna, swimming pool or restaurant

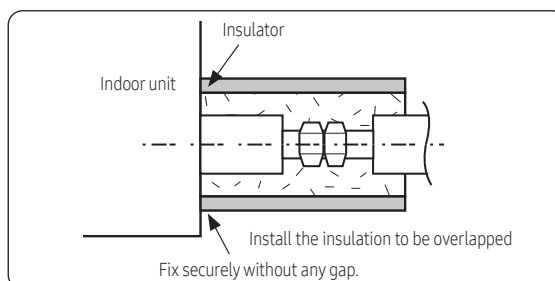
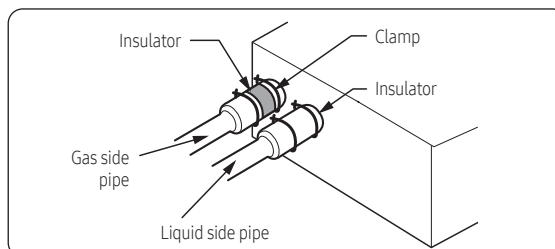
<Structural conditions of the building>

- Installation inside a ceiling that is not air-conditioned where there is inflow of a large amount of moisture (plumbing installed along a corridor or near the entrance of a hall of residence or studio flat)
- A place where humidity is high due to an insufficient ventilation system in the space where plumbing is installed
- A room on a semi-basement floor

- If you are not sure which insulating material to use, choose material used in a place with high humidity.
- If the purpose of the room is subject to change, reconsider the thickness of insulating material.
- Use the specified insulating material only.

Insulate the refrigerant pipe

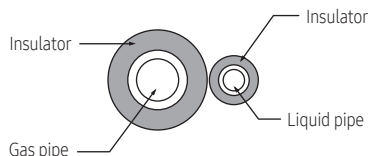
- Make sure to insulate the refrigerant pipe, branch joint, distribution header, and the connection part of the pipes.
- If you insulate the pipes, condensed water will not fall from the pipes.
- Check if there are any cracks on the insulation at the bent part of the pipe.



Pipe insulation

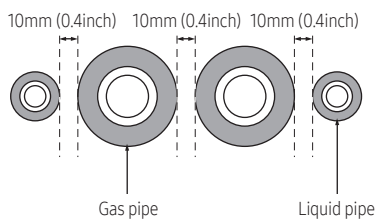
Insulating pipes

- 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 one grade.



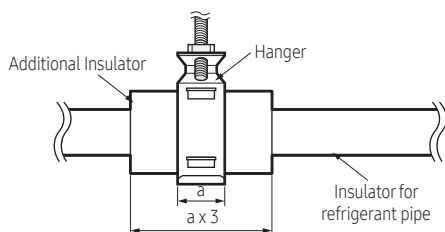
Insulating pipes connected behind the EEV kit

- When installing the gas side and liquid side pipes, leave at least 10mm (0.4 inch) of space.
- When the gas side and liquid side pipes are contacting each other, increase the thickness of the insulation by one grade.



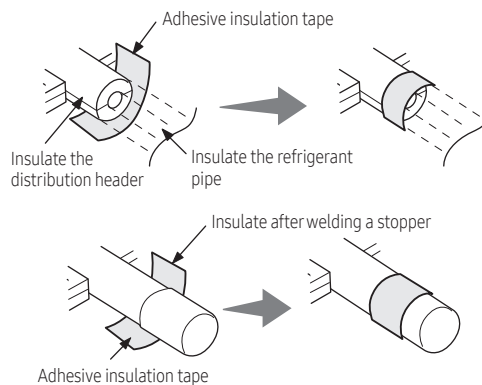
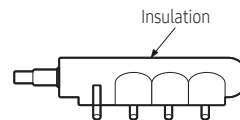
CAUTION

- 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.

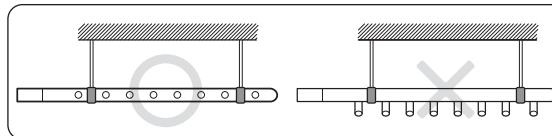


Insulate the distribution header

- 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.

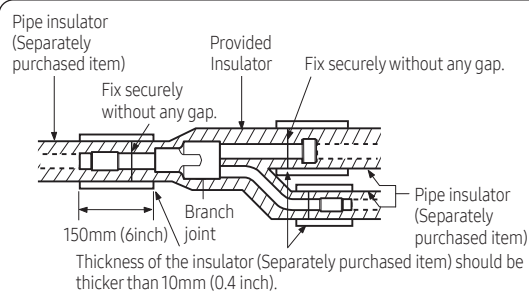


- Fix the distribution header with a hanger after insulating it.

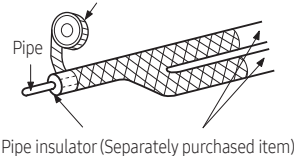


Insulating the branch joint

- 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 10mm (0.4inch).
- Use an insulator that resist heat up to 120°C (248°F). Wrap the branch joint with an insulation that has thickness of at least 10mm (0.4inch).



Insulation tape (Separately purchased item)

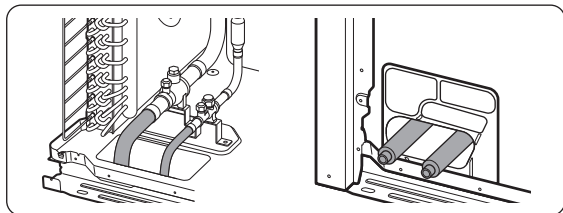


- Attach the adhesive insulation tape to the pipe, as shown in the picture, after insulating the pipe.

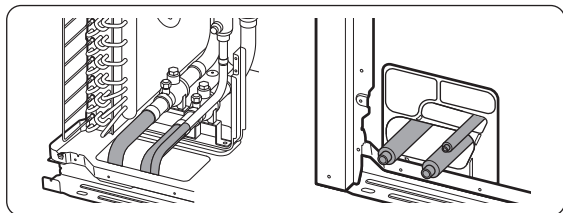
Insulating the pipe located inside of the outdoor unit

- 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



H/R

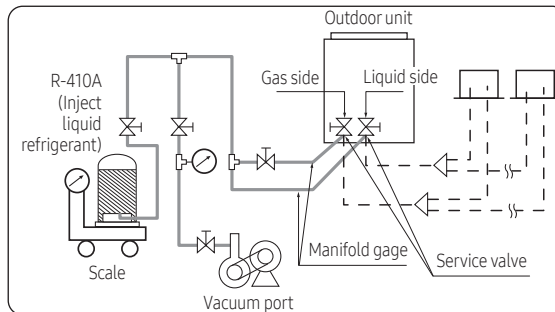


CAUTION

- The filled-out label must be adhered in the proximity of the product charging port.
(ex. onto the inside of the stop valve cover.)

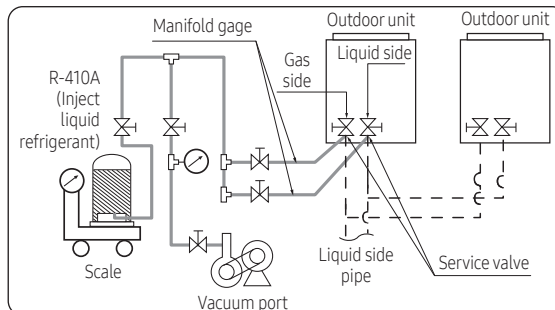
Single installation

- 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.



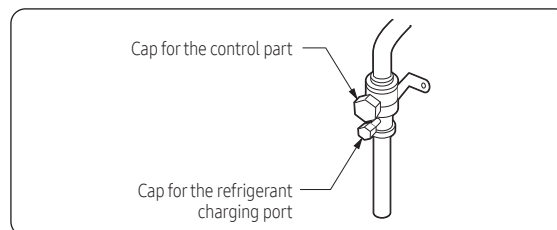
Pipe insulation

⚠ CAUTION

- Open the gas side and liquid side service valve completely after charging the refrigerant. (If you operate the 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 or EEV kits.
- 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
10~12N·m (7.4 ~ 8.9 lbf·ft)
- Tightening torque for the cap of control part
20~25N·m (14.8 ~ 18.4lbf·ft)
- Opening/closing torque for the valve
– Ø19.05mm (Ø3/4inch) : 10 N·m (7.4 lbf·ft)



Basic segment display

Step	Display content	Display			
At initial power input	Checking segment display	SEG 1	SEG 2	SEG 3	SEG 4
		"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)	MSB, Indoor unit address	SEG 1	SEG 2	SEG 3	SEG 4
		I/U: "A" MSB: "C"	I/U: "0" MSB: "1"	Reception address (in decimal number)	

※ I/U : Indoor unit

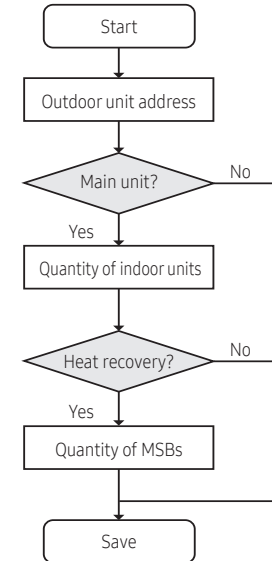
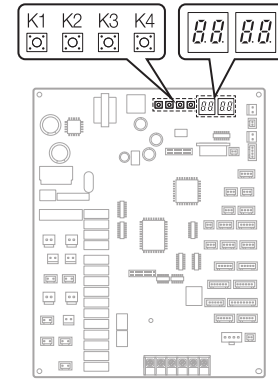
Setting outdoor unit option switch and key function

Setting outdoor unit option switches

- 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 it is heat recovery model, go to step 7. Otherwise, press K2 button for 2 seconds to save & exit (system will be reset)			
Quantity of MSBs * Heat recovery model only				
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' quantity			
Step9	K2: long	00 00	Save	Restart
* Press K1 for 2 seconds to exit without save regardless of setting step.				

- ※ When counting the quantity of MSBs, one MSB is one.
However, in the case of V1MSBB12HR and V1MSBB08HR, even one MSB must be counted as two MSBs.
- Example 1> V1MSBB06HR + V1MSBB12HR → 3ea
 - Example 2> V1MSBB06HR + V1MSBB12HR + V1MSBB08HR → 5ea

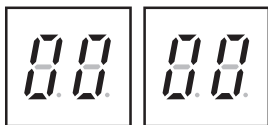


Setting outdoor unit option switch and key function

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.

Example)



- 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.

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	
Capacity correction for cooling	Main	0	1	0	0	7-9	Targeted evaporation temperature [°C]. (When low temperature value is set, discharged air temperature of the indoor unit will decrease)
				0	1	5-7 (Factory default)	
				0	2	9-11	
				0	3	10-12	
				0	4	11-13	
				0	5	12-14	
				0	6	13-15	
Capacity correction for heating	Main	0	2	0	0	3.0 (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	2.8	
				0	5	2.9	
				0	6	3.1	
				0	7	3.2	
				0	8	3.3	
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	
Temperature to trigger defrost operation	Main	0	5	0	0	Factory default	
				0	1	Apply setting when the product is being installed in humid area such as near river or lake	
Fan speed correction for outdoor unit	Individual	0	6	0	0	Factory default	Increase the outdoor unit's fan speed to maximum value
				0	1	Increase fan speed	

Setting outdoor unit option switch and key function

Optional item	Input unit	SEG1	SEG2	SEG3	SEG4	Function of the option	Remarks
Silent mode	Main	0	7	0	0	Disabled (Factory default)	Enables the silent mode for night-time in cooling mode (It operates automatically depending on the temperature.) However, if the external contact interface module (VSTAT10P-1) is used, entering the silent mode is available with contact signal in cooling and heating mode.
				0	1	LEVEL 1 / Auto	
				0	2	LEVEL 2 / Auto	
				0	3	LEVEL 3 / Auto	
				0	4	LEVEL 1 / External contact	
				0	5	LEVEL 2 / External contact	
				0	6	LEVEL 3 / External contact	
				0	7	LEVEL 1	
				0	8	LEVEL 2	
				0	9	LEVEL 3	
High-head condition setting	Main	0	8	0	0	Disabled (Factory default)	
				0	1	Level 1 of height difference type 1 (Indoor unit is lower than outdoor unit)	When outdoor unit is located 40~80m(131.2~262.5ft) above the indoor unit
				0	2	Level 2 of height difference type 1 (Indoor unit is lower than outdoor unit)	When outdoor unit is located over 80m(262.5ft) above the indoor unit
				0	3	Height difference type 2 (Outdoor unit is lower than indoor unit)	When indoor unit is over 30m(98.4ft) above the outdoor unit
Long-piping condition setting	Main	0	9	0	0	Disabled (Factory default)	
				0	1	LEVEL 1	When equivalent length of farthest indoor unit from the outdoor unit is between 100~170m(328.1~557.7ft)
				0	2	LEVEL 2	When equivalent length of farthest indoor unit from the outdoor unit is over 170m(557.7ft)
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	
Rotation defrost (HR only)	Main	1	1	0	0	Disabled (Factory default)	
				0	1	Enabled	When enabled, continuous heating operation is possible but heating performance will decrease during rotation defrost operation
Expand operational temperature range for cooling operation (HR only)	Main	1	2	0	0	Disabled (Factory default)	
				0	1	Enabled	When enabled, continuous cooling operation is possible even in low temperature condition up to -15°C, but noise of the MSB will increase
Channel address	Main	1	3	A	U	Automatic setting (Factory default)	Address for classifying the product from upper level controller (DMS, etc.)
				0 ~ 15		Manual setting for channel 0~15	
Snow accumulation prevention control	Main	1	4	0	0	Enabled (Factory default)	During snow accumulation, the fan may spin even when the unit is not in operation
				0	1	Disabled	
Unused option	Main	1	5	0	0	Unused option	Unused option by this model
Unused option	Main	1	6	0	0	Unused option	Unused option by this model

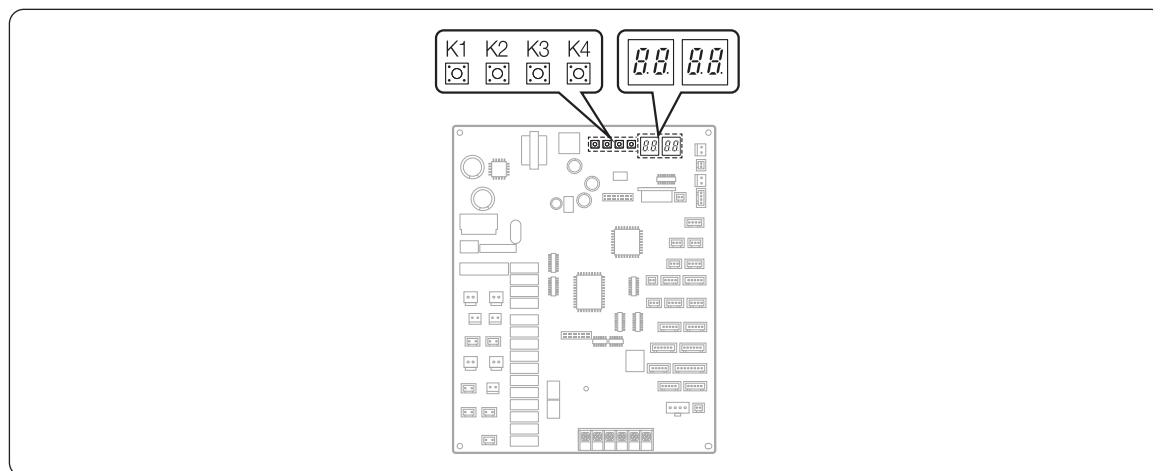


Optional item	Input unit	SEG1	SEG2	SEG3	SEG4	Function of the option	Remarks
Speed operation	Main	1	7	0	0	Disabled (Factory default)	Enabling this setting will command the VRF to cool/heat faster at initial start-up. However, this function will not work when High-head condition setting or Long-piping condition setting is enabled.
				0	1	Enabled	
Max. capacity restriction	Main	1	8	0	0	Enabled (Factory default)	Restrict excessive capacity increase when operating indoor units with small capacity
				0	1	Disabled	
Unused option	Main	1	9	0	0	Unused option	Unused option by this model
Unused option	Main	2	0	0	0	Unused option	Unused option by this model
Low ambient cooling kit (LA Kit) option	Main	2	1	0	0	Disabled (Factory default)	Set when LA KIT is installed. In case of using LA KIT option, AI High Pressure Control is restricted.
				0	1	Enabled	
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)	
Base Heater	Main	2	3	0	0	Disabled (Factory default)	Set when Base Heater is installed.
				0	1	Enabled	
Inverter Carrier Frequency	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	
Auto Change Over	Main	2	6	0	0	Not applied	When Thermo off for all running indoor units, change the operation mode. ※ Unused by the cooling only models
				0	1	Applied	
Emergency defrost operation	Main	2	7	0	0	Disable (default)	You can enable this function, 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	Disable (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	

※ 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 key operation and checking the view mode with tact switch



K1 control	KEY operation	Display on segment
Press and hold 1 time	Auto trial operation	"K" "K" "BLANK" "BLANK" Display can be changed into "K" "9" "X" "X" (Last two digits display the progress.)

K1 (Number of press)	KEY operation	Display on 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	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" "1" "1"
13 times	Inverter Fault Detection (Comp#2)	"K" "5" "1" "2"
14 times	Inverter Fault Detection (Fan#1)	"K" "5" "F" "1"
15 times	Inverter Fault Detection (Fan#2)	"K" "5" "F" "2"
16 times	End Key operation	-

⚠ WARNING

- After installing the product, be sure to perform leak tests on the piping connections. After pumping down refrigerant to inspect or relocate the outdoor unit, be sure to stop the compressor and then remove the connected pipes.
 - Do not operate the compressor while a valve is open due to refrigerant leakage from a pipe or an unconnected or incorrectly connected pipe. Failure to do so may cause air to flow into the compressor and too a high pressure to develop inside the refrigerant circuit, leading to an explosion or product malfunction.



K2 (Number of press)	KEY operation	Display on 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	H/R: Checking the pipe connection H/P: Automatic setting of operation mode (Cooling/Heating) for trial operation	"K" "8" "BLANK" "BLANK"
5 times	Checking the amount of refrigerant	"K" "9" X X (Display of last two digits may differ depending on the progress)
6 times	Discharge mode of DC link voltage	"K" "A" "BLANK" "BLANK"
7 times	Forced defrost operation	"K" "B" "BLANK" "BLANK"
8 times	Forced oil collection	"K" "C" "BLANK" "BLANK"
9 times	Inverter compressor 1 check	"K" "D" "BLANK" "BLANK"
10 times	Inverter compressor 2 check	"K" "E" "BLANK" "BLANK"
11 times	Fan 1 check	"K" "F" "BLANK" "BLANK"
12 times	Fan 2 check	"K" "G" "BLANK" "BLANK"
13 times	H/R : Auto pipe pairing H/P : Unused	"K" "H" X X (Display of last two digits may differ depending on the progress)
14 times	Baseheater testing mode	"K" "I" "BLANK" "BLANK"
15 times	Unused	"K" "J" X X (Display of last two digits may differ depending on the progress)
16 times	End Key operation	-

- ※ 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 replacing/repairing the PCB, cut-off the power and wait until the DC voltage is discharged before replacing/repairing them. (Wait for more than 15 minutes to allow it to discharge naturally.)
- ※ 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'.
- ※ During "Discharge mode of DC link voltage", voltage of INV1 and INV2 will be displayed alternately.
After discharging of DC link voltage, "K" "A" "0" "K" is displayed.
- ※ If "K" "A" "n" "A" is displayed or 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.
- ※ When pressing K2 key 9 to 12 times without inverter checker, error code can be displayed on segment even though the outdoor unit is normal.
- ※ If error have been occurred, do not use the key operation.
- ※ KEY operation of K2 15 times(Automatic refrigerant charging fuction) is an unused function.
It can be available with Automatic refrigerant charging option KIT.

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	Capacity of Outdoor unit Model	1	(a) Capacity → Off, 1, 6
2 times	Order frequency of the compressor 1	2	120 Hz → 1, 2, 0
3 times	Order frequency of the compressor 2	3	120 Hz → 1, 2, 0
4 times	High pressure (MPa)	4	1.52 MPa → 1, 5, 2
5 times	Low pressure (MPa)	5	0.43 MPa → 0, 4, 3
6 times	Discharge temperature (Compressor 1)	6	87 °C → 0, 8, 7
7 times	Discharge temperature (Compressor 2)	7	87 °C → 0, 8, 7
8 times	IPM temperature (Compressor 1)	8	87 °C → 0, 8, 7
9 times	IPM temperature (Compressor 2)	9	87 °C → 0, 8, 7
10 times	CT sensor value (Compressor 1)	A	2 A → 0, 2, 0
11 times	CT sensor value (Compressor 2)	B	2 A → 0, 2, 0



Setting outdoor unit option switch and key function

K4 (Number of press)	KEY operation	Display on segment	
		SEG1	SEG2, 3, 4
12 times	Suction temperature	C	-42 °C → -, 4, 2
13 times	COND OUT temperature	D	-42 °C → -, 4, 2
14 times	Temperature of liquid pipe	E	-42 °C → -, 4, 2
15 times	TOP temperature (Compressor1)	F	-42 °C → -, 4, 2
16 times	TOP temperature (Compressor 2)	G	-42 °C → -, 4, 2
17 times	Outdoor temperature	H	-42 °C → -, 4, 2
18 times	EVI inlet temperature	I	-42 °C → -, 4, 2
19 times	EVI outlet temperature	J	-42 °C → -, 4, 2
20 times	Main EEV1 step	K	2000 steps → 2, 0, 0
21 times	Main EEV2 step	L	2000 steps → 2, 0, 0
22 times	EVI EEV step	M	300 steps → 3, 0, 0
23 times	HR EEV step	N	300 steps → 3, 0, 0
24 times	Fan step (SSR or BLDC)	O	13 steps → 0, 1, 3
25 times	Current frequency (Compressor1)	P	120 Hz → 1,2,0
26 times	Current frequency (Compressor 2)	Q	120 Hz → 1,2,0
27 times	Suction 2 temperature	R	-42 °C → -, 4, 2
28 times	Main indoor unit address	S	Main indoor unit not selected → BLANK, N, D If indoor unit No.1 is selected as the main unit → 0, 0, 1
29 times	unused	T	-
30 times	Suction 3 temperature	U	-42°C → -, 4, 2
31 times	COND OUT 2 temperature	V	-42°C → -, 4, 2
32 times	End key operation		

※ Suction2 temperature is displayed on Heat Recovery or X-Large models.

※ Suction3 temperature & Cond out2 temperature are displayed on X-Large models.

(a) When pressing K4 key 1 time, below number is displayed on segment depending on model.

Model	Display on segment
V*C072***	Off, 0, 8
V*C096***	Off, 1, 0
V*C120***	Off, 1, 2
V*C144***	Off, 1, 4
V*C168***	Off, 1, 8
V*C192***	Off, 2, 0
V*C216***	Off, 2, 2
V*C240***	Off, 2, 4

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	Inverter1 version	INV1	Version (ex. 1412)		
4 times	Inverter 2 version	INV2	Version (ex. 1412)		
5 times	Fan1 version	FAN1	Version (ex. 1412)		
6 times	Fan 2 version	FAN2	Version (ex. 1412)		
7 times	EEP version	EEP	Version (ex. 1412)		
8 times	Automatically assigned address of the units	AUTO	SEG1	SEG2	SEG3, 4
			Indoor unit: "A" MSB: "C"	Indoor unit: "0" MSB: "1"	Address (ex: 07)
9 times	Manually assigned address of the units	MANU	SEG1	SEG2	SEG3, 4
			Indoor unit: "A"	Indoor unit: "0"	Address (ex: 15)

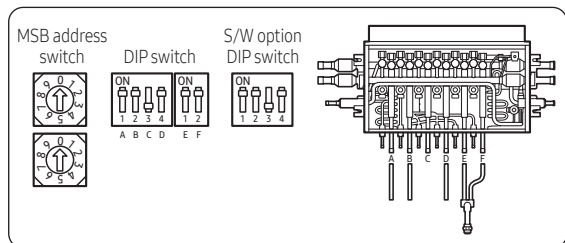
※ I/U : Indoor unit

Optional: Setting the MSB and Pipe Addresses (for HR Only)

You can set the MSB address, the MSB ports to use, and the address for each MSB port connected to each indoor unit.

Setting the MSB address and the MSB ports to use

You can set the MSB address and the MSB ports on the MSB PBA.



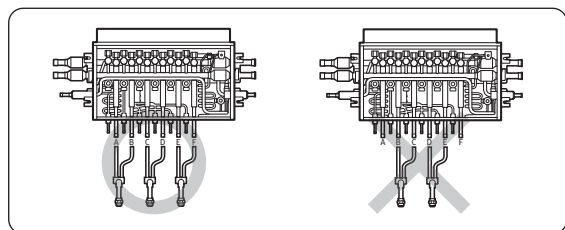
- 1 Set the MSB address switch to a value. If two or more MSBs are installed, be sure to set a unique value for each MSB. For the MSB address, you can set a value from 0 to 15.

* When counting the quantity of MSBs, one MSB is one. However, in the case of V1MSBB12HR and V1MSBB08HR, even one MSB must be counted as two MSBs.

- 2 For each MSB ports that are connected to an indoor unit through piping, set their DIP switch to ON. For other MSB ports, set their DIP switches to OFF. You can find the address (A to F) of an MSB port on the indoor unit piping connection.
- 3 If two MSB ports are connected to an indoor unit through a Y-joint, set the relevant S/W option DIP switch to the settings given in the following table:

S/W option DIP switch No.	ON (Individual connection)	OFF (Shared connection)
1	Each of ports A and B	Both ports A and B
2	Each of ports C and D	Both ports C and D
3	Each of ports E and F	Both ports E and F

- You cannot make a shared connection for the two ports B and C, and D and E at the same time.



- 4 Set the address of each MSB port that is connected to an indoor unit by taking the procedures in Setting the Pipe Addresses Manually or Setting the Pipe Addresses Automatically. (Auto pipe pairing operation)

CAUTION

- If the following models are connected, set the pipe addresses manually by referring to Setting the Pipe Addresses Manually.
 - OAP duct (VOSC***S4-4P), Hydro Unit(VHEC***S4-4P, VHTC***S4-4P)

Setting the Pipe Addresses Manually

You can use the wired or wireless remote control or the Lennox Service Software to set the pipe addresses for each indoor unit.

Setting by using the wired or wireless remote control (For how to operate the remote control buttons, see the remote control user manual.)

- 1 Turn on both the indoor unit and the remote control.
- 2 Enter the "Option setting mode" on the remote control.
- 3 Set the address of each MSB port that is connected to an indoor unit by referring to the following table. (You can also set the address of each indoor unit.)

Option	SEG1	SEG2	SEG3	SEG4	SEG5	SEG6
Value	0	A: Address setting mode	0: The address of the indoor unit will not be set. 1: The address of the indoor unit will be set.	0 to 9: Hundreds digit of the indoor unit address	0 to 9: Tens digit of the indoor unit address	0 to 9: Units digit of the indoor unit address
Option	SEG7	SEG8	SEG9	SEG10	SEG11	SEG12
Value	1	0	0: The RMC address will not be set. 1: The RMC address will be set.	0	0 to F: RMC group channel	0 to F: RMC group address
Option	SEG13	SEG14	SEG15	SEG16	SEG17	SEG18
Value	2	0	0: The MSB address will not be set. 1: The MSB address will be set.	0 to 1: Tens digit of the MSB address	0 to 9: Units digit of the MSB address	A to F: MSB port address
Option	SEG19	SEG20	SEG21	SEG22	SEG23	SEG24
Value	3	0	0	0	0	0

Examples> If the indoor unit whose address is not yet set is connected to port A on the MSB 1, set 0A0000-100000-20101A-300000.

If the indoor unit whose address is set to 9 is connected to port B on the MSB 2, set 0A1009-100000-20102B-300000.

Setting by using Lennox Service Software

- Set the pipe addresses by using Add-on > Change address on Lennox Service Software. (For more information, see the Lennox Service Software Help.)

Optional: Setting the MSB and Pipe Addresses (for HR Only)

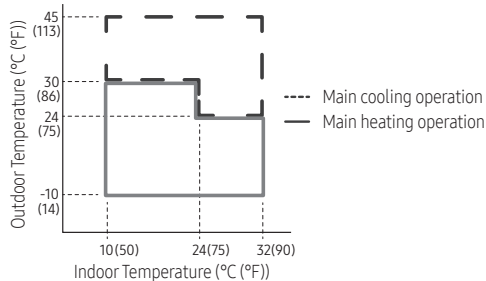
Setting the Pipe Addresses Automatically (Auto pipe pairing operation)

You can use the Automatic pipe-address setting operation to automatically set the address of each MSB port that is connected to an indoor unit.

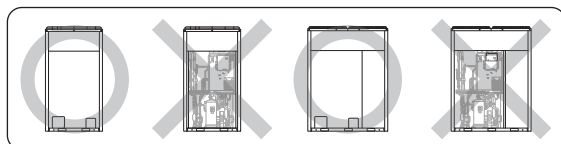
If an MSB port is set incorrectly or a pipe between an MSB and an indoor unit is connected incorrectly, that indoor unit is indicated.

Check items before running the Auto pipe pairing operation

- 1 Ensure that the service valve of the outdoor unit is open.
- 2 Ensure that the power cables and communication cables of the indoor and outdoor units are correctly connected.
- 3 Turn on the indoor and outdoor units 6 hours before running the Automatic pipe-address setting operation to warm up both units sufficiently.
- 4 Before turning on the power, check whether the voltages and phases are correct by using a voltmeter and a phase tester.
 - Check for the R, S, T, and N terminals: ensure that 380-415V is read between lines (R-S, S-T, T-R) and 200-240V (R-N, S-N, T-N) between phases.
- 5 After the power is turn on, set the devices (indoor unit, MSB, and others) that are connected to the outdoor unit, and set the options. Note that, before the MSB port addresses are set, MSB port setting errors (E216, 217, 218) may occur. You can run the Automatic pipe-address setting operation regardless of MSB port setting errors.
- 6 If the OAP(Outdoor Air Processing) Duct or Hydro unit is connected, set the pipe addresses manually referring to [Setting the Pipe Addresses Manually].
- 7 Check the operating temperature for the Automatic pipe-address setting operation:
If this operation is run at a temperature out of the operating temperature range, the addresses set automatically may be incorrect. Set the pipe addresses manually by referring to Setting the Pipe Addresses Manually.
- 8 Auto pipe-pairing operation does not work within 3 minutes after power on and reset due to communication check.



- Before running the Auto pipe pairing operation, be sure to close the front cabinet. If this operation is run with the front cabinet open, the product may be damaged and the pipe addresses cannot be correctly recognized.



To run the Auto pipe pairing operation, take the following steps:

- 1 Press the K2 button 13 times on the main PBA of the outdoor unit to start the Auto pipe pairing operation. (Display : **FH** **00**)

	Outdoor temperature < 24°C (75°F)	24°C (75°F) ≤ Outdoor temperature < 30°C (86°F)	30°C (86°F) ≤ Outdoor temperature
Indoor temperature < 24°C (75°F)	Main heating operation	Main heating operation	Main cooling operation
Indoor temperature ≥ 24°C (75°F)	Main heating operation	Main cooling operation	Main cooling operation

Each step is indicated on the outdoor unit display. (The whole operation takes about 25 to 55minutes normally, depending on the number of indoor units connected. However, it can be operated for up to 2 hours to protect the compressor.)

- Step 1 (Start **FH** **00**) → Steps 2 to 8 (Setup **FH** **08**) → Step 9 (Check **FH** **09**) → Step 10 (Confirmation **FH** **10**)

- 2 When the Auto pipe pairing operation finishes, the following data is shown on the outdoor unit display.

Result	Outdoor unit display	Description
Setting completed	End	
Setting error	E191 ↔ Indoor unit data (displayed alternately)	<p>Indoor unit data</p> <ul style="list-style-type: none"> • SEG 1,2 = indoor unit address / SEG 3,4 = error status 00: An MSB port is not disabled, or a pipe is not connected. 01: Cooling only indoor unit is connected to MSB. 02: The shared setting for two ports is incorrect. <p>Example) When the MSB port connected to the indoor unit 12 is disabled, E191 and 1200 are displayed alternately</p> <ul style="list-style-type: none"> • If two or more indoor units have setting errors, the data about the next indoor unit is displayed each time you press the K2 switch.

CAUTION

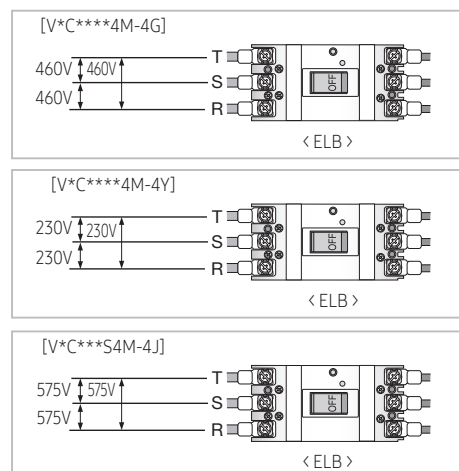
- If the MSB ports to use are set incorrectly, the Auto pipe pairing operation may stop due to high-pressure or low-pressure protection control or the data about the indoor unit that has a MSB port setting error may be incorrect. Ensure that the MSB ports to use are set correctly.
- Depending on the indoor and outdoor temperatures, the Auto pipe pairing operation may stop due to protection control.
- If an error occurs while the Auto pipe pairing operation is running, check the error code and take actions.
- If you cannot finish the Auto pipe pairing operation because of the previous reasons, set the pipe addresses manually by referring to Setting the Pipe Addresses Manually.

Performing final checks and trial operation

- Before supplying the power, use DC 500V (V*C****4M-4G) or DC 600 V (V*C****4M-4Y) insulation resistance tester to measure the power (3 phase: R, S, T/ 1 phase: L, N) terminal and the outdoor unit grounding.
 - Measurement should be over 30MΩ.
- Before supplying the power, use a voltmeter and phase tester to check the voltage and the phase.
 - R, S, T terminal: Check the 460V(V*C****4M-4G) or 230V (V*C****4M-4Y) or 575V(V*C***S4M-4J) 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.



- Check if the R-410A indoor units are connected.
- When N phase is not correctly connected to R, S and T phase, over-voltage protection control will be in effect and it will cut-off the power of the PCB. Check the power cable connection of the N phase if the PCB is not turned on.
- Check the following after the installation is completed.

Installation work	Outdoor unit	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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		<ul style="list-style-type: none"> 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		<ul style="list-style-type: none"> 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		<ul style="list-style-type: none"> 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		<ul style="list-style-type: none"> 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		<ul style="list-style-type: none"> If there is a possibility of the outdoor unit from vibrating, check whether the anti-vibration frame is correctly installed.

Performing final checks and trial operation

⚠ CAUTION

Precautions before test 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 in 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.
- Do not operate the product with its panel or protection nets off.
 - There is risk of personal injury from the parts rotating, heated or with the high voltage.
- Do not turn off the main power immediately 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.

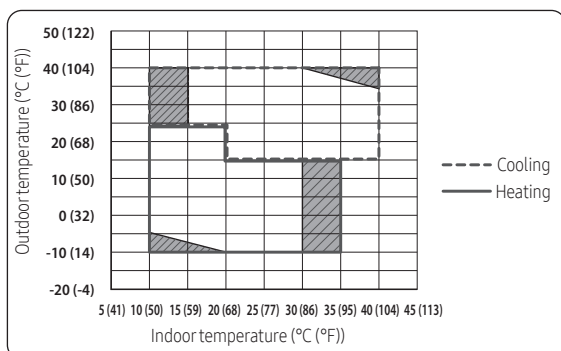
- In Auto trial operation, product will automatically select either cooling or heating mode and operate in selected mode.
- In the temperature range marked with slashed pattern, system protection control may trigger during operation. (If the system protection control is enabled, it can be hard to get 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.
- If all indoor units are connected with only hydro unit, it is operated by heating mode. If outdoor temperature is above 35°C (95°F), auto trial operation is skipped and UP mode will be cleared.

Auto trial operation

- 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)
- 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.
- When auto trial operation ends, use Lennox Service Software to issue a result report.
 - Refer to service manual if you have any items with "NG" on the result report.
 - After taking appropriate measure for the items with "NG", run the auto trial operation again.
- 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.
- Explain to the user how to use the VRF according to the user's manual.
- Hand over the installation manual to the customer so they can keep it with them.

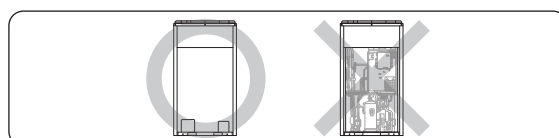
⚠ CAUTION

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



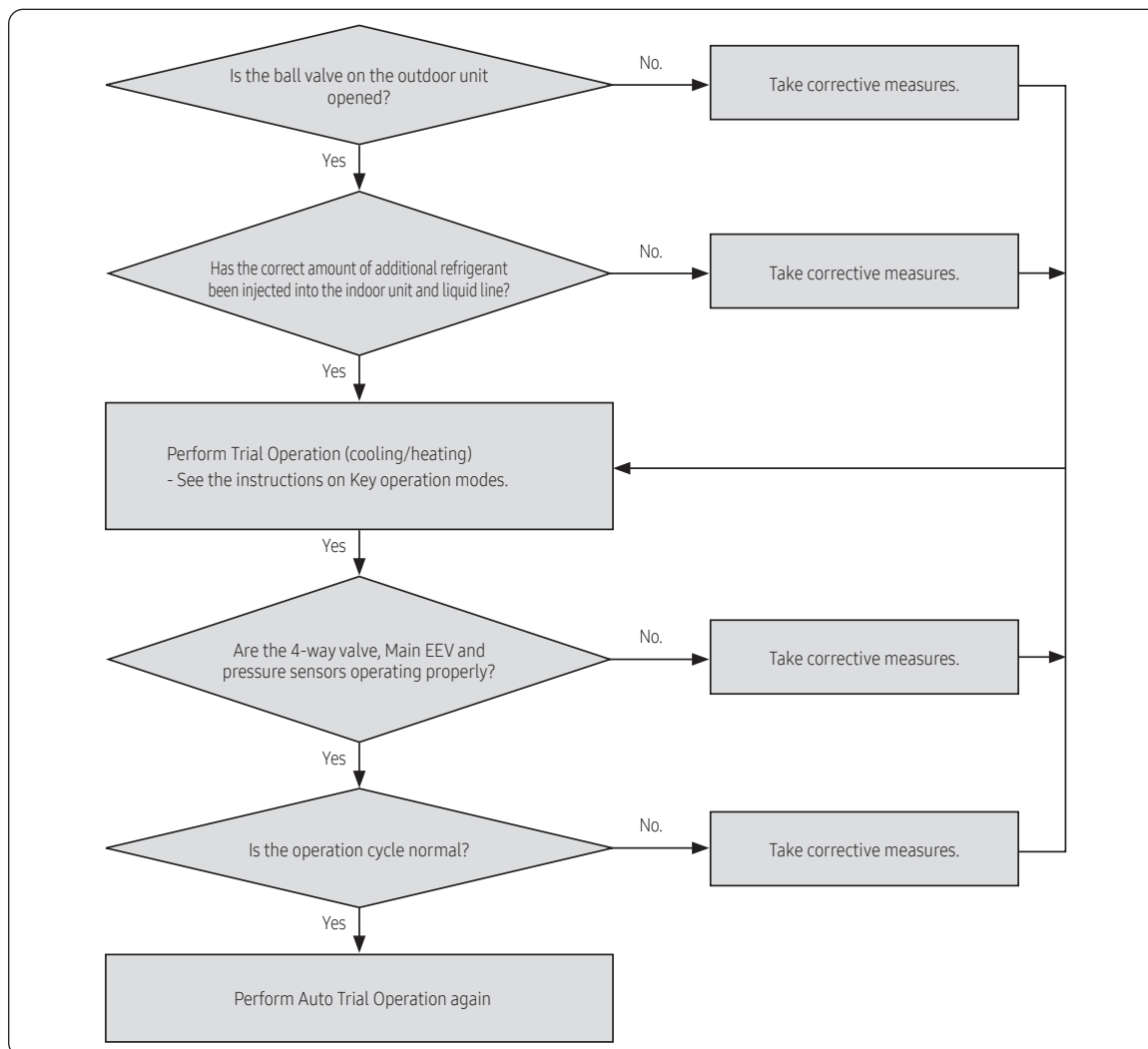
⚠ CAUTION

- Make sure to close the top and bottom 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.



Inspection and trial operation

Measure to take when E503 error occurs



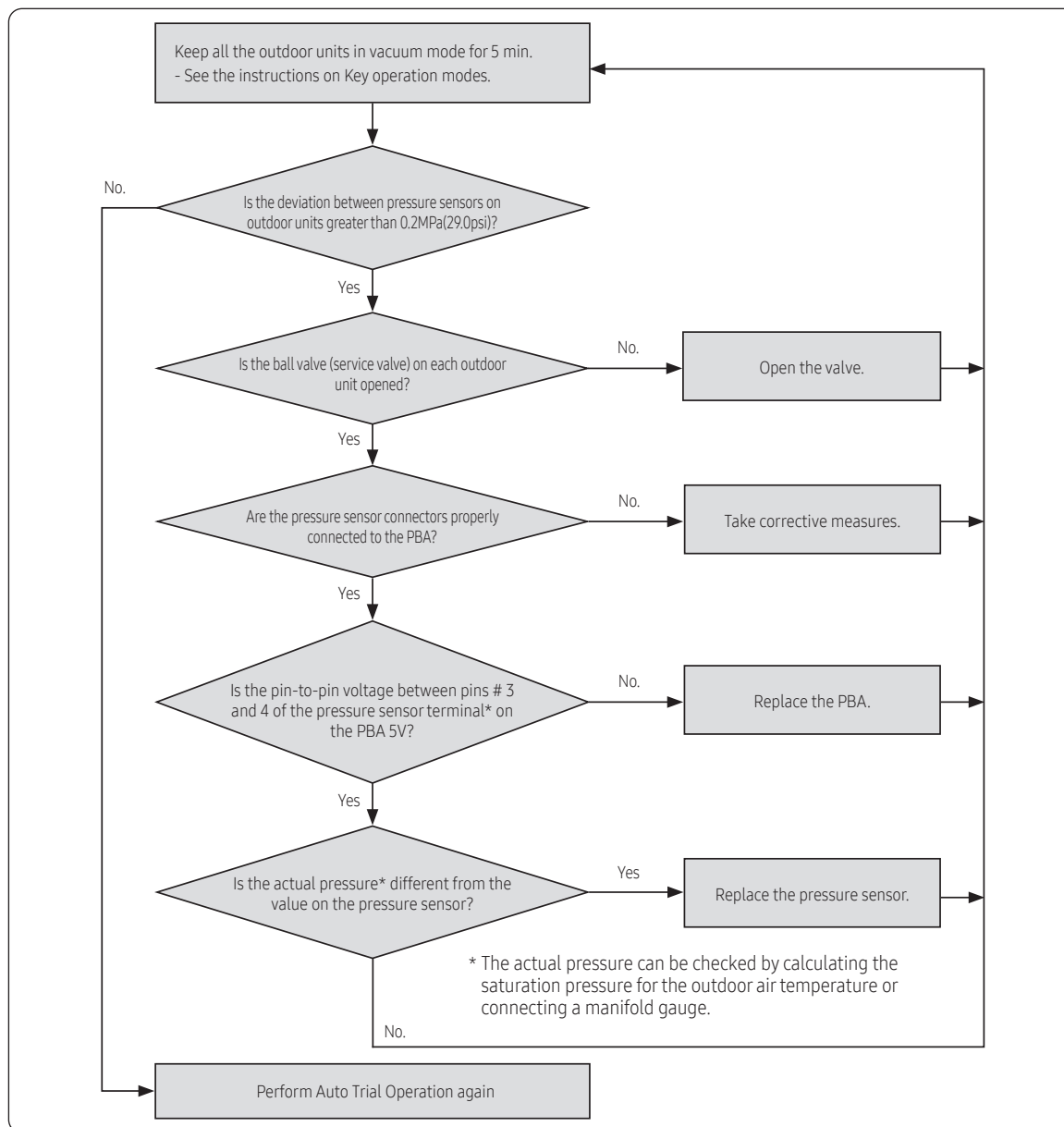
- ※ Symptoms for abnormal operation of the 4way valve
 - Abnormal noise during compressor operation, Increase in the suction temperature.
- ※ Symptoms for abnormal operation of the Main EEV
 - It is not possible to control the superheat (SH)
 - It is not possible to secure a Discharge superheat(DSH) of higher than 20K
- ※ For more information, see the troubleshooting in the service manual.

⚠ CAUTION

- If service valve (ball valve) check is required, corresponding outdoor unit will display the error.
- If service valve (ball valve) check is required, auto detection mode will be terminated. Check service valve (ball valve) of gas pipe and liquid pipe at the same time when checking service valve (ball valve).
- When 4way 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 there's frost formed in outdoor unit or the outdoor unit is operating in defrost operation, it may be hard to detect problem normally. In this case, perform Trial operation or Forced defrost operation to eliminate the frost, and then perform Auto Trial Operation again.
- If the operation range is not within guaranteed range, error may occur even though the product is normal.
- To replace a component or inspect the PBA, be sure to cut off the power supply first. If inspection must be performed with the power supply on, exercise extra care to prevent electric shock.

Inspection and trial operation

Measure to take when E505 or E506 error occurs



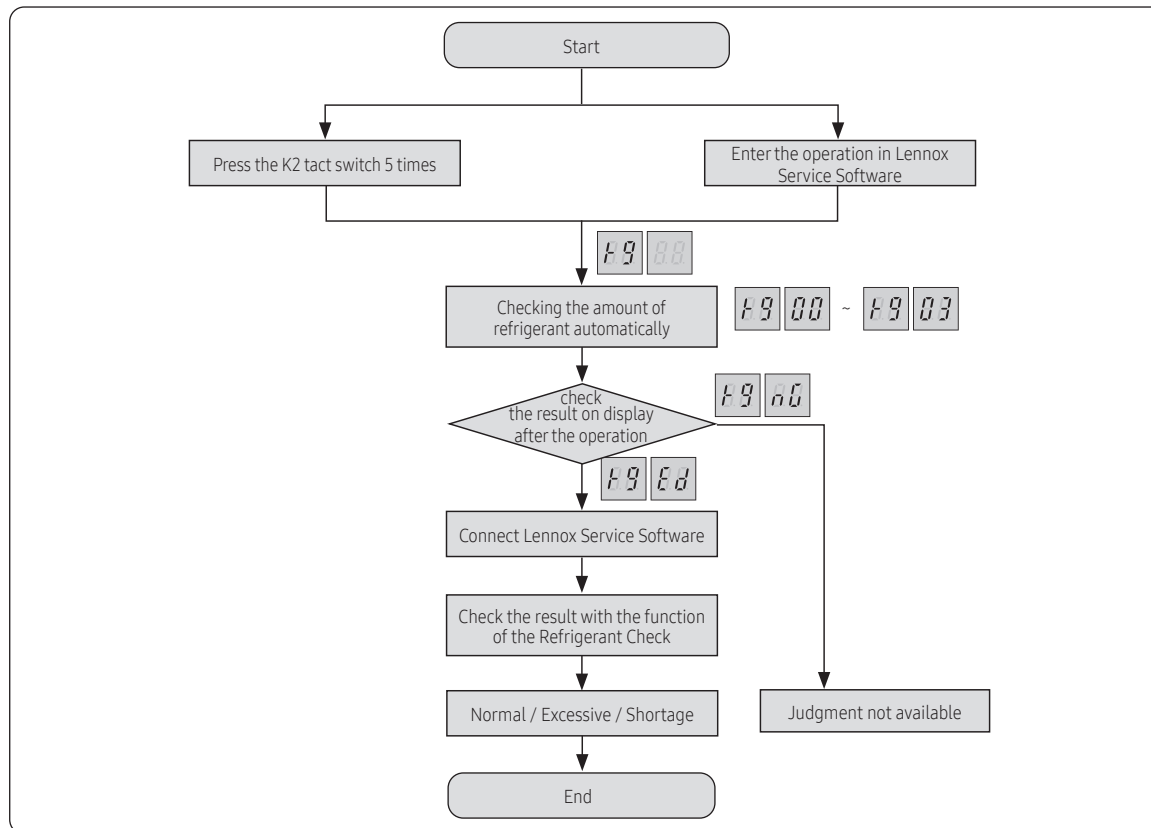
※ For more information, see the troubleshooting in the service manual.

⚠ CAUTION

- When the auto trial operation for pressure sensor was executed before the pressure of the outdoor unit is equalized (when there's close to no difference between high and low pressure), error may occur even though the product is normal.
- If pressure sensor check is required, error will be displayed on all installed outdoor units.
- If pressure sensor check is required, outdoor units will terminate auto trial operation mode automatically.
- 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.
- To replace a component or inspect the PBA, be sure to cut off the power supply first. If inspection must be performed with the power supply on, exercise extra care to prevent electric shock.

Automatic refrigerant amount detection function

This function checks amount of refrigerant in the system through refrigerant amount detection operation



※ After refrigerant amount detection is finished, if you see "K9 Ed" on the display and cannot check the refrigerant amount from the Lennox Service Software, it means insufficient degree of supercooling.

⚠ CAUTION

- If the temperature is out of the guaranteed range below, exact result will not be obtained.
 - Indoor: 20~32 °C (68~89.6 °F)
 - Outdoor: 5~43 °C (41~109.4°F)
- If the operation cycle is not stable, the operation of refrigerant amount check may be forcibly finished.
- Accuracy of the result may decrease if the product has not been operated for a long period of time or **Heat** mode has been operated before running the function of refrigerant amount check. Therefore, use the function of refrigerant amount check after operating the product in **Cool** mode for at least 30 minutes.
- Product may trigger system protection operation depending on the installation environment. In this case, the result of refrigerant amount check may not be accurate.

Actions to take for the check result

- Excessive amount of refrigerant
 - Discharge 10% of total amount of refrigerant and restart the refrigerant amount check.
- Insufficient amount of refrigerant
 - Add 10% of the total amount of refrigerant and restart the refrigerant amount check.
- Judgment not available
 - Check if the function of refrigerant amount check is executed within the guaranteed temperature range. Run trial operation to check if there are other problems on the system.

