



**LG**

Life's Good

ENGLISH

# INSTALLATION MANUAL

# AIR CONDITIONER

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

***GHP* SUPER**

Model : GPUW\*\*\*BSS

GP\*W\*\*\*B6\*

GP\*W\*\*\*B2\*



P/NO : MFL67737304

[www.lg.com](http://www.lg.com)

## TIPS FOR SAVING ENERGY

Here are some tips that will help you minimize the power consumption when you use the air conditioner. You can use your air conditioner more efficiently by referring to the instructions below:

- Do not cool excessively indoors. This may be harmful for your health and may consume more electricity.
- Block sunlight with blinds or curtains while you are operating the air conditioner.
- Keep doors or windows closed tightly while you are operating the air conditioner.
- Adjust the direction of the air flow vertically or horizontally to circulate indoor air.
- Speed up the fan to cool or warm indoor air quickly, in a short period of time.
- Open windows regularly for ventilation as the indoor air quality may deteriorate if the air conditioner is used for many hours.
- Clean the air filter once every 2 weeks. Dust and impurities collected in the air filter may block the air flow or weaken the cooling / dehumidifying functions.

### *For your records*

Staple your receipt to this page in case you need it to prove the date of purchase or for warranty purposes. Write the model number and the serial number here:

Model number : \_\_\_\_\_

Serial number : \_\_\_\_\_

You can find them on a label on the side of each unit.

Dealer's name : \_\_\_\_\_

Date of purchase : \_\_\_\_\_

# IMPORTANT SAFETY INSTRUCTIONS

## **READ ALL INSTRUCTIONS BEFORE USING THE APPLIANCE.**

Always comply with the following precautions to avoid dangerous situations and ensure peak performance of your product

### **WARNING**

It can result in serious injury or death when the directions are ignored

### **CAUTION**

It can result in minor injury or product damage when the directions are ignored

### **WARNING**

- Installation or repairs made by unqualified persons can result in hazards to you and others.
- Installation of all field wiring and components **MUST** conform with local building codes or, in the absence of local codes, with the National Electrical Code 70 and the National Building Construction and Safety Code or Canadian Electrical Code and National Building Code of Canada.
- The information contained in the manual is intended for use by a qualified service technician familiar with safety procedures and equipped with the proper tools and test instruments.
- Failure to carefully read and follow all instructions in this manual can result in equipment malfunction, property damage, personal injury and/or death.

## Installation

- Only licensed electricians should do all electrical work according to “Electric Facility Engineering Standard” and “Interior Wire Regulations” and the instructions given in this manual and always use a specific circuit.
  - If the power supply capacity is inadequate or electrical work is performed improperly, electric shock or fire may result.
- Only licensed technicians should install the fuel gas pipes and do the piping work.
  - Improper installation may cause fire or explosion.
- Always ground the product
  - There is a risk of fire or electric shock if not grounded.
- Always install a circuit breaker and dedicated switch.
  - If not installed, it may cause fire or electric shock.
- Do not use a damaged circuit breaker or dedicated switch.
  - It may cause fire or electric shock.
- For the installation of gas heat pump, always contact an authorized service center.
  - Improper installation may result leak, fire or electric shock.
- For the re-installation, always contact the **GHP SUPER** service center.
  - Improper installation may result leak, fire and electric shock.
- Do not disassemble, repair, or modify the air conditioner on your own.
  - It may cause fire or electric shock.
- Do not store or use flammable gas or combustibles near the air conditioner.
  - There is a risk of fire or failure of product.

#### 4 IMPORTANT SAFETY INSTRUCTIONS

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- Always use the correctly rated breaker or fuse.
  - Use of overrated breaker or fuse, or metal copper wires may cause fire or failure of the air conditioner.
- Prepare for strong wind or earthquake and install the unit fixed in the ground at the specified place.
  - There is a risk of death, property damage, or injury.
- When installing and moving the air conditioner to another site, do not charge it with a different refrigerant from the refrigerant R410A specified on the unit.
  - If a different refrigerant is mixed with the original refrigerant, the refrigerant cycle may malfunction and the unit may be damaged.
- Do not use the R22 manifold gauge.
  - Always use the high-pressure R410A manifold gauge for a stable charging.
- Do not use the R22 pipes and installation materials for the R410A installation. (do not mix them up)
  - Mixing the R22 refrigerant oil with the R410A oil will cause a hydrolysis, and may lead to fire or failure of the air conditioner.
- Install the air conditioner onto a sturdy place where it can sustain the weight.
  - Improper location may cause the air conditioner to fall and get damaged.
- Do not reconstruct to change the settings of the protection devices.
  - If the protection device is shorted and modified, and operated forcibly, fire or explosion may result.
- Always use a vacuum pump or Inert (nitrogen)gas when doing leakage test or air purge.
  - Use of oxygen, compressed air and flammable gases may cause fire and explosion. There is risk of death, property damage, or explosion.
- Check what kind of fuel gas is used.
  - Using an incorrect type of gas may cause the operation failure of the engine and the malfunction of the engine combustion, and result a carbon monoxide poisoning and the breakdown of the engine.
- Do not combine the exhaust drain hose of the indoor unit and the outdoor unit.
  - Combining the exhaust drain hose will make the exhaust flow backward in and increase the risk of carbon monoxide poisoning.
- Install the outdoor unit properly to prevent a reversed flow of the exhaust gas.
  - Exhaust gas flowing backward into a building may cause carbon dioxide poisoning.
- If the air conditioner is installed in a small room, measures must be taken to prevent to refrigerant concentration from exceeding the safety limit when the refrigerant leaks.
  - If the refrigerant leaks and exceeds the safety limit, hazards due to lack of oxygen in the room could result.
- Ventilate before operating air conditioner when refrigerant gas leaks.
  - If the refrigerant contacts inflammables such as welding flame, hazardous gas may result.
- The power of indoor and outdoor units must be separated when installing.

## Operation

- Do not extend or modify a power cord on your own.
  - It may cause fire or electric shock.
- Use a dedicated power cord.
  - It may cause fire or electric shock.
- Keep the air conditioner (control panel) from getting wet. Do not wash the air conditioner with water.
  - There is a risk of electric shock or failure of the air conditioner.
- Do not touch the main power switch with wet hands.
  - It may cause fire or electric shock
- When the air conditioner is soaked (flooded or submerged), contact service center.
  - It may cause fire or electric shock
- Do not touch the heat exchanger fins.
  - The sharp fins may cause injury.
- Do not change the reconstruction and the setting of the protection devices.
  - If the pressure switch, thermal switch, or other protection device is shorted or operated forcibly, or unspecified parts are used, fire and explosion may result.
- Do not operate the air conditioner with the shutoff valve closed when gas leaks.
  - Operating the air conditioner during gas leaks may result fire or explosion.
- Do not block the inlet or outlet of indoor/outdoor units.
  - Since the fan rotates at high speed during operation, it may cause injury or failure of the air conditioner.

## CAUTION

### Installation

- Always check for gas leakage after installation or repair of the air conditioner.
  - It may cause failure of the air conditioner.
- Do not install the product where the noise or hot air from the outdoor unit could disturb your neighbors.
  - It may cause a conflict with your neighbors.
- Keep level even when installing the product.
  - Uneven height of the air conditioner may result a shaking and leakage.
- Do not install the air conditioner in an area where the gas leaks.
  - If the gas leaks around the unit, property damage may result.
- Do not use the air conditioner for special purposes, such as storing works of art, animals and plants, or sensitive devices.
  - If the air conditioner is used for these purposes, property damage may result.
- Keep the unit away from children.
  - The heat exchanger fins are very sharp. It can cause the injury, such as cutting the finger. The damaged fins may result in degradation of capacity.
- When installing the unit in a hospital, communication station, or similar places, provide sufficient protection against noise.
  - The inverter equipment, private power generator, high-frequency medical equipment, or radio communication equipment may cause the air conditioner to operate erroneously, or fail to operate. On the other hand, the air conditioner may affect such equipment by creating noise that disturbs medical treatment or image broadcasting.

## 6 IMPORTANT SAFETY INSTRUCTIONS

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- Do not install the product where it is exposed to sea wind (salt spray) directly. Build a fence around the unit, if necessary.
  - Corrosion caused by the sea wind (salt spray) may result a product malfunction or inefficient operation.
- Keep animals and plants from the direct air of the outdoor unit inlet/outlet or exhaust gas.
  - It may harm animals and plants.

### Operation

- Do not obstruct the air passage of the outdoor unit inlet/outlet/drain hose.
  - It may cause failure of the unit or carbon monoxide poisoning.
- Do not climb on the outdoor unit or place any objects on it.
  - It may cause property damage or injury if falling or electric shocked.
- Do not touch the exhaust gas outlet of the outdoor unit.
  - It may cause burns.
- When the oil or coolant leaks from the outdoor unit, contact service center.
  - Such leakages may damage the outdoor unit and the other accessories (waterproof sheet) as well.

### Precautions during electrical work and transportation

- Do not put a tension force on the power cables when installing.
  - The cables may cut off and generate heat due to a high tension, and it may cause fire. Do not replace the damaged power cables on your own. Instead, contact A/S center for replacement.
- Always use a dedicated power cables.
  - Use power cables of sufficient current carrying capacity and rating. It may cause fire or electric shock.
- Beware of the damage to the stand from long-term use.
  - It may cause injury or property damage.
- Be careful when transporting the air conditioner.
  - Do not carry a product weighing more than 20kg on your own.
  - Some products use PP bands for packaging. Do not use any PP bands for the transportation purpose.
  - Do not touch the heat exchanger fins. You may cut your fingers.
  - When transporting the air conditioner, make sure to suspend it at the specified positions on the unit base. In addition, be sure to support the unit at four points to prevent it from slipping sideways.
- Safely discard the packing materials.
  - Some packing materials, such as nails and other metal or wooden parts, may cause stabs or other injuries.
  - Tear apart and throw away plastic packaging bags so that children will not play with them. Children playing with plastic bags face the danger of suffocation.

### Precautions before a test run

- Turn on the main power at least 5 hours before starting operation in case of low outdoor temperature.
  - Starting operation immediately after turning on the main power may result in severe damage to internal parts. Keep the power switch turned on during operation. Keep the power switch turned on during operation.
- Do not touch any of refrigerant pipes during or right after operation.
  - The refrigerant pipes during or right after operation can get very hot or cold depending on the refrigerant condition which flows through the pipes, compressor, and refrigerant cycle parts. If you touch the pipes with the refrigerant passing through, you may get burned or frostbite.
- Do not operate the air conditioner with the product panels or guards removed.
  - Rotating, hot, or high-voltage parts can cause injury.
- Do not turn off the main power immediately after stopping the operation.
  - Wait at least for 5 minutes before turning off the main power. Otherwise, it may result in water leakage or other problems.
- Auto-addressing should be done with the power of all indoor and outdoor units connected. Auto-addressing should also be done after replacing the indoor unit PCB.



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# COMBINATION OF OUTDOOR UNIT

## GHP Model

Chassis	Name	Capacity [kW (btu/h)]	Chassis Combinations
UPB	GPUW160B2C/B6C/B6S GPUW200B2C/B6C/B6S GPUW250B2C/B6C/B6S/BSS	45 (153 600) 56 (191 100) 71 (242 300)	
UPB UPB	GP-W320B2C/B6C GP-W360B2C/B6C GP-W400B2C/B6C GP-W450B2C/B6C GP-W500B2C/B6C	90 (307 100) 101 (344 600) 112 (382 100) 127 (433 300) 142 (484 500)	

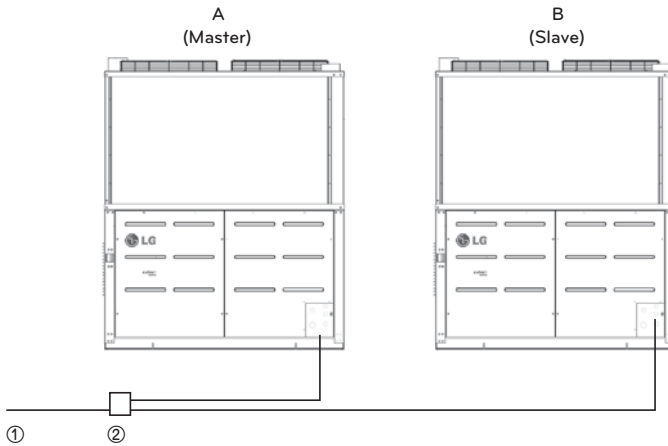
## Combination of Outdoor Unit

System Capacity [kW (btu/h)]	Number of Indi- vidual Outdoor Units	Individual Outdoor Unit Capacity [kW (btu/h)]					
		45 (153 600)		56 (191 100)		71 (242 300)	
		Master	Slave	Master	Slave	Master	Slave
45 (153 600)	1	1					
56 (191 100)	1			1			
71 (242 300)	1					1	
90 (307 100)	2	1	1				
101 (344 600)	2		1	1			
112 (382 100)	2			1	1		
127 (433 300)	2				1	1	
142 (484 500)	2					1	1

## Precautions to take when installing in a series

### ⚠ CAUTION

- When an indoor unit is connected to more than 100% of outdoor unit capacity, the cooling and heating performance of the indoor unit running may be reduced.
- When installing indoor units in a series, install in descending order of outdoor unit capacity as follows.



$A \geq B$

① Connecting pipe on the indoor unit

② Connecting branch duct between outdoor units

# ACCESSORIES

## Separately purchased accessories

The flow distribution(branch) as described below should be purchased separately for installation.

The Y-branch flow distribution joint pipes to connect the outdoor and indoor units

[unit:mm]

Models	Gas pipe	Liquid pipe
ARBLN 01621		
ARBLN 03321		
ARBLN 07121		
ARBLN 14521		
ARBLN 23220		

The header flow distribution joint pipes to connect the outdoor and indoor units

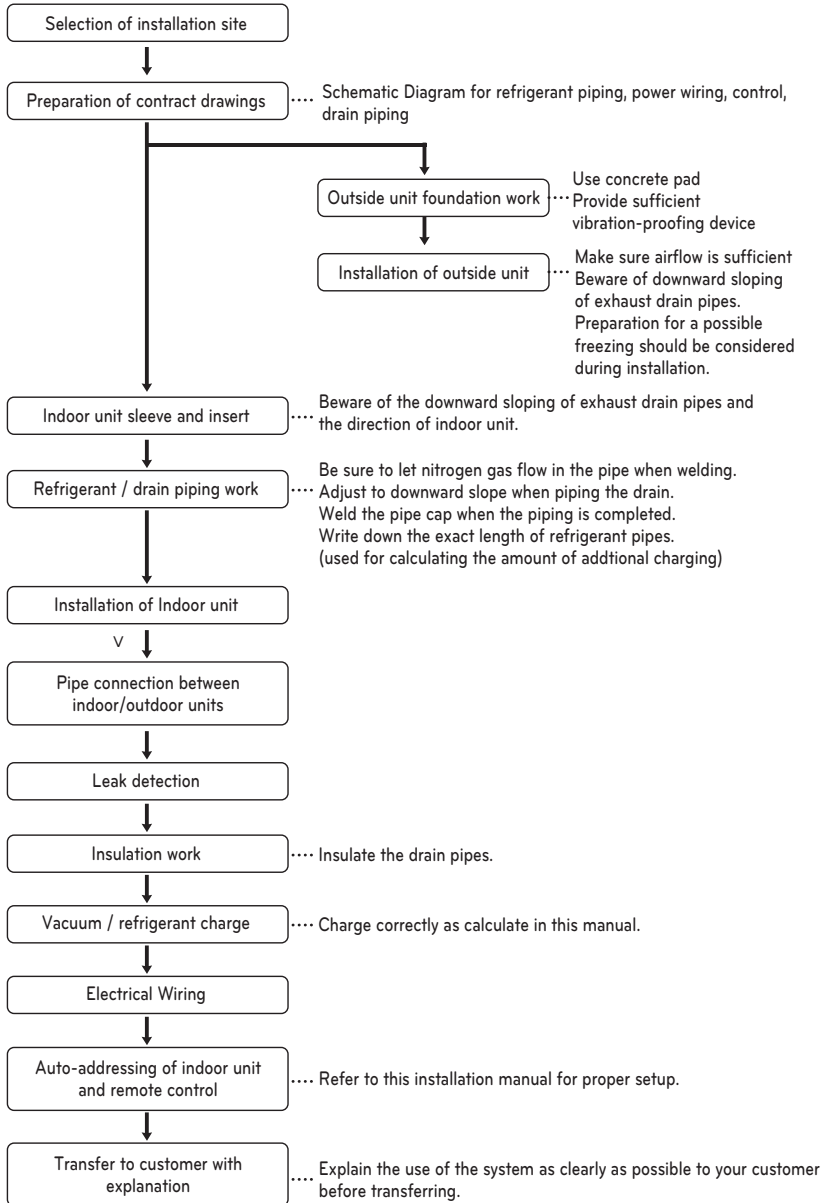
[unit:mm]

Models	Gas pipe	Liquid pipe
4 branch ARBL054		
7 branch ARBL057		
4 branch ARBL104		
7 branch ARBL107		
10 branch ARBL1010		
10 branch ARBL2010		

The connecting Y branch joint pipes between outdoor units (in a series)

Unit	Combination Specifications	Model name	Gas pipe	Liquid pipe
Unit		ARCNN41		

# INSTALLATION PROCESS



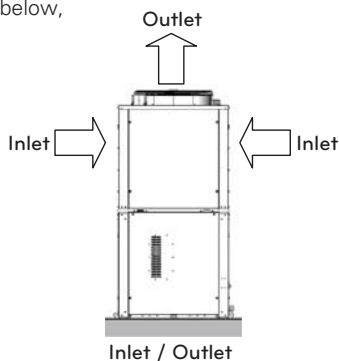
The order of the above list may vary depending on the different conditions of installation sites. Read the installation manual thoroughly before installation.

## SELECTION OF INSTALLATION SITE

### Considerations when selecting an outdoor unit installation site

- You need to select adequate installation location considering the following conditions, and make sure to acquire the consent of the user.
- A place where exhaust gas does not flow back into a building or does not remain
- Beware that exhaust gas and air flowing out of the outdoor unit fan may cause harm to the animals and plants.
- A place without direct thermal radiation from other heat sources
- A place where the noise from the outdoor unit will not disturb the neighbors
- A place not exposed to a strong wind
- Place that can sufficiently endure the weight and vibration of the outdoor unit and where even installation is possible.
- A place where the drain flows out of the unit well
- A place with space for air passage and service work. Avoid the unit installation in a place where generation, inflow, stagnation, and leakage of exhaust gas is expected in order to prevent fire.
- Avoid the unit installation in a place where corrosive gas such as acidic and alkaline gas is existed.
- In order to operate the unit more stable below the outdoor temperature 10°C, avoid a place exposed to snow or rain directly. Otherwise, install a duct for air suction/discharge.
- Do not use the unit under any special environment where oil, steam and sulfuric gas exist.
- When the outdoor temperature is below -5°C, installing the outdoor unit for air conditioning is restricted.
- It is recommended to fence round the outdoor unit in order to prevent any person or animal from accessing the outdoor unit.
- If necessary, install a warning signs indicating a danger.
- If installation site is an area of high humidity in winter (seaside, lakeside), make sure to install the outdoor unit in a place where it has good ventilation with a plenty of sunshine (e.g: rooftop).
- If it is installed at a place with a lot of snowfall, install with the frame and base height higher than the most extreme snowfall amount standard, and mount the snowfall hood (separately sold).
- The noise from the unit may cause disturb the other devices. Electrical wiring should be done at least more than 5 m from computer, radio, TV, phone, other cables, antenna, and so on.
- Do not install the inlet/outlet of the outdoor unit facing a seasonal wind.
- If the outdoor unit for winter is installed in such places as below, it may delay the preheat time of the indoor unit and cause a poor heating operation.

- ① In the shade of small space
- ② On the wet and damp ground
- ③ In the humid area
- ④ In a place with poor ventilation



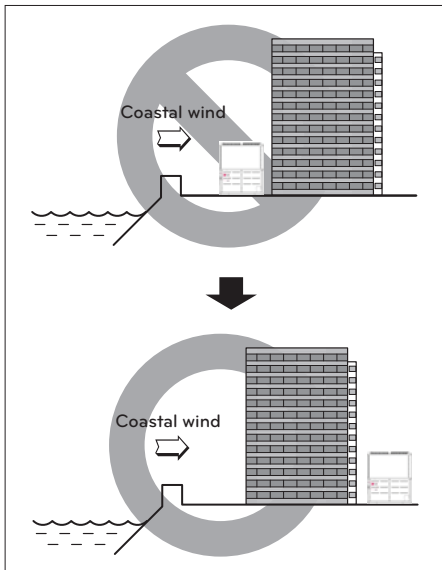
## Seaside Installation Instructions

### ! CAUTION

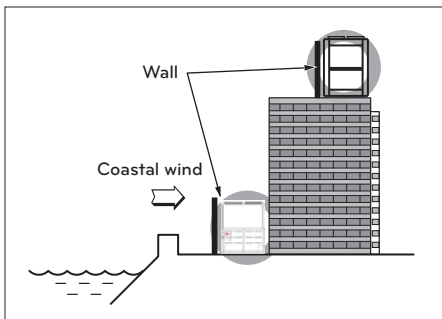
- Do not install the air conditioner where it could be exposed to sea wind directly.
- If the outdoor unit is installed close to the seaside, it needs additional anticorrosion treatment on the heat exchanger.

\* Selecting the site (outdoor unit)

- Install the outdoor unit where the sea wind can be avoided.



- If the outdoor unit should be installed facing the sea wind, build a windbreak around the unit to protect it from the wind.



The materials of windbreak, such as concrete, should be strong enough to protect the outdoor unit from the sea wind. The height and width should be more than 150% of the size of outdoor unit.

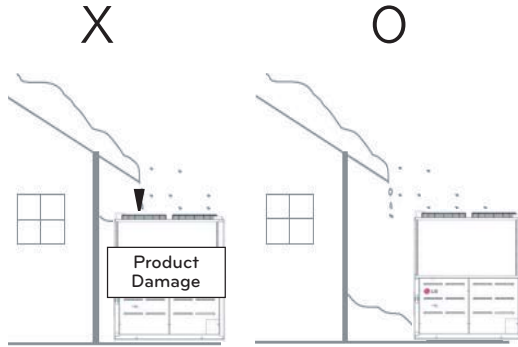
The distance between the windbreak and the outdoor unit should be more than 700mm for easy air flow.

- Place with fluent water draining
  - Install at a place with fluent water draining to prevent damage from localized heavy rain and avoid frequent flooded area.

\* Periodic (more than once a year) cleaning of the dust or salt particles stuck on the heat exchanger by using water.

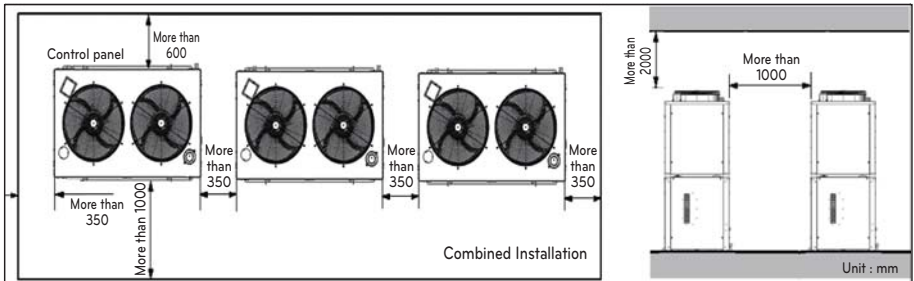
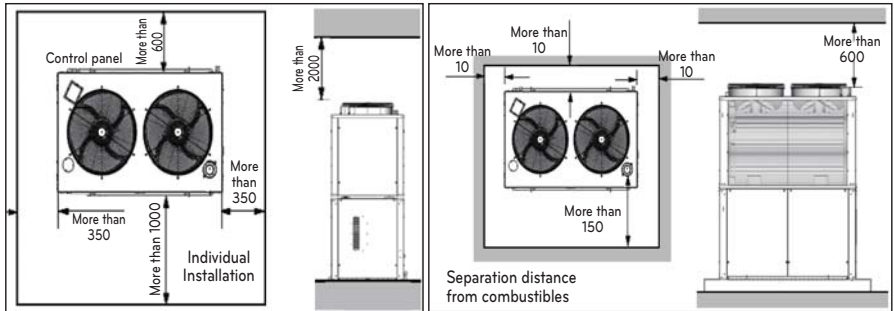
## Precautions for seasonal wind and wintertime

- Sufficient measures are required for a normal operation in the areas where a heavy snow and harsh weather conditions are expected.
- Install the unit considering seasonal wind or snow in winter for other areas as well.
- Attach a hood to the inlet/outlet to prevent snow or rain from entering the unit directly when the unit is operated at the outdoor temperature below 10.
- Install the outdoor unit not to come in contact with snow directly. If snow piles up and freezes on the inlet, the system may malfunction.
- Make sure to clear away the snow before operating when snow piles up more than 100mm on top of the outdoor unit.
- Install the outdoor unit where it can be protected from heavy snow.
- Do not install the outdoor unit on weak ground such as a dilapidated part of building or an area prone to snow accumulation.
- Do not install the outdoor unit under any eaves or any area where an icicle or snow may fall, because this may cause damage.
- Place that has no direct influence of snow or rain.
- Place with no danger of snowfall or icicle drop.
- Place without weak floor or base such as decrepit part of the building or with a lot of snow accumulation.



### Installation Space

During the installation of the unit, secure the minimum space considering service, inlet, and outlet as shown in the figures below.



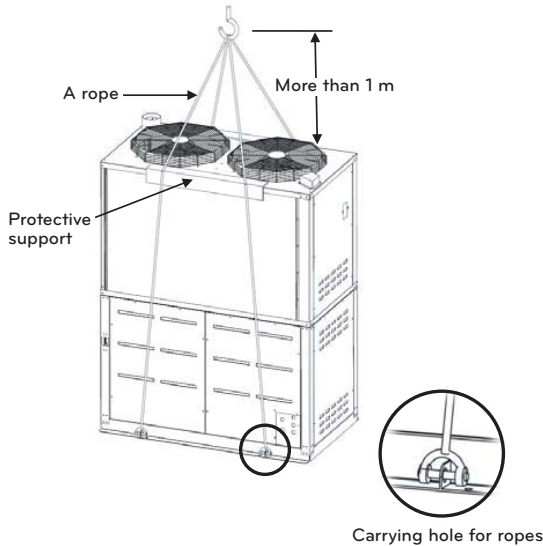
Securing the installation space (installation space)



# OUTDOOR UNIT INSTALLATION

## Outdoor Unit Transportation

- Lift the unit by using a crane rope to the carrying hole in the bottom base of the outdoor unit.
- Avoid scratches or distortion on the external panel with protective support when suspending.
- There is a risk of dropping when the unit is hoisted by a forklift. Do not hoist the unit forcibly when it is off balance.
- Make sure to use a rope long enough so that the distance between the top of the outdoor unit and the hook can be more than 1 m.
- Make sure to use the proper ropes strong enough to support the weight of the outdoor unit.
- The use of improper ropes may result in dropping.
- Always transport the outdoor unit upright (vertically). It is dangerous to transport the outdoor unit flat (horizontally) and it may also cause a malfunction.
- When carrying, place the forks of the forklift into the carrying hole for forklift.



### CAUTION

Pay special attention when carrying the unit.

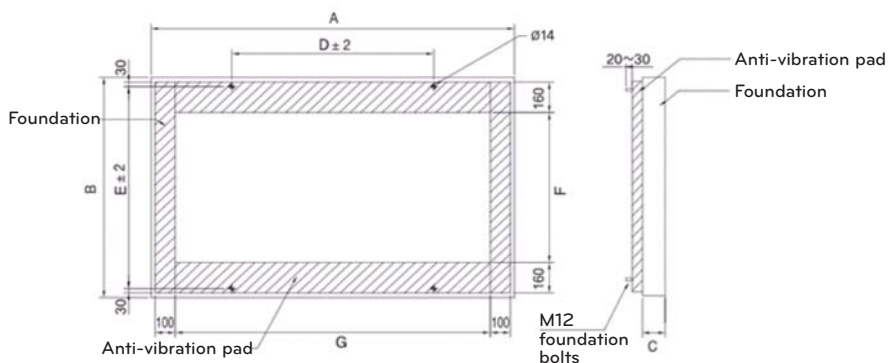
- The PP bands (PET bands) are used for packing. It is dangerous to use the PP bands to transport the unit.
- Do not touch the heat exchanger fins with your bare hands. You can get a cut in your hands.
- Tear apart and throw away plastic packaging bags so that children will not play with them. Children playing with plastic bags face the danger of suffocation.
- When carrying the outdoor unit, be sure to support it at four points. Carrying it with 3-point support may make the outdoor unit unstable and fall.
- Hoist the unit making sure it is being lifted at its center of gravity.

## Foundation Installation

### ! CAUTION

- Make sure to level a concrete foundation and to have good drainage.
- When installing the outdoor unit, always use a dedicated anchor bolts.
- Make sure to use anti-vibration materials (cushion pad) so that the bottom surface of the outdoor unit can get the evenly distributed weight.
- When installing the outdoor unit at the rooftop of a building, use an anti-vibration stand.
- For ground-level installation, install an anti-vibration stand if the area is sensitive to vibration or noise.
- Insert the rubber pad of over 10 t between the concrete foundation and the anti-vibration pad.

\* Refer to the foundation diagram of the approved plan(drawing) when installing.

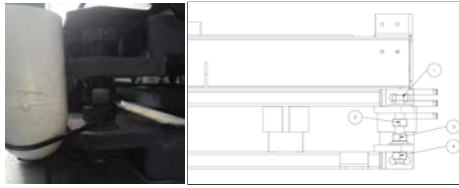


Unit: mm

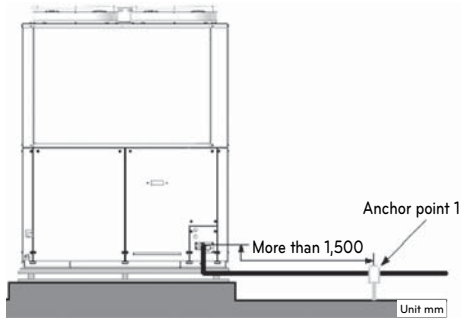
Model	Installation Type		A	B	C	D	E	F	G
GP* W*** B**	Ground installation	Anti-vibration stand X	More than 1,900	More than 1,300	More than 200	968	1,030	770	1,650
		Anti-Vibration stand O	More than 1,900	More than 1,300	More than 200	1,590	1,134	874	1,610
	Rooftop installation	Anti-Vibration stand O	More than 2,000	More than 1,600	More than 200	1,590	1,134	874	1,610

## Precautions to take when installing the anti-vibration stand

When installing the anti-vibration stand, inspect the following:



- The nuts #3 and #4 are fixed onto the side of the anti-vibration stand.
- There is an appropriate distance (10 mm) from the bolt #1 and nut #2 to the ODU, as seen in the picture on the left.
- The bolt should not be touching a concrete floor.
- Non-compliance with the above may cause the outdoor unit to vibrate.



- When using an anti-vibration stand, keep the outdoor unit at least more than 1,500mm from the first anchor point of the refrigerant pipe.

### **!** WARNING

- Install where it can sufficiently support the weight of the outdoor unit. If the support strength is not enough, the outdoor unit may drop and hurt people.
- Install where the outdoor unit may not fall in strong wind or earthquake. If there is a fault in the supporting conditions, the outdoor unit may fall and hurt people.
- Please take extra cautions on the supporting strength of the ground, water outlet treatment (treatment of the water flowing out of the outdoor unit in operation), and the passages of the pipe and wiring, when making the ground support.

### **!** CAUTION

- Be sure to remove the pallet (wooden support) of the bottom of the outdoor unit base pan before using an anchor bolt. It can make the foundation of the outdoor unit unstable, and may cause freezing of the heat exchanger resulting in abnormal operations.
- Be sure to remove the pallet (wooden support) of the bottom of the outdoor unit before welding. Not removing the pallet causes hazard of fire during welding.

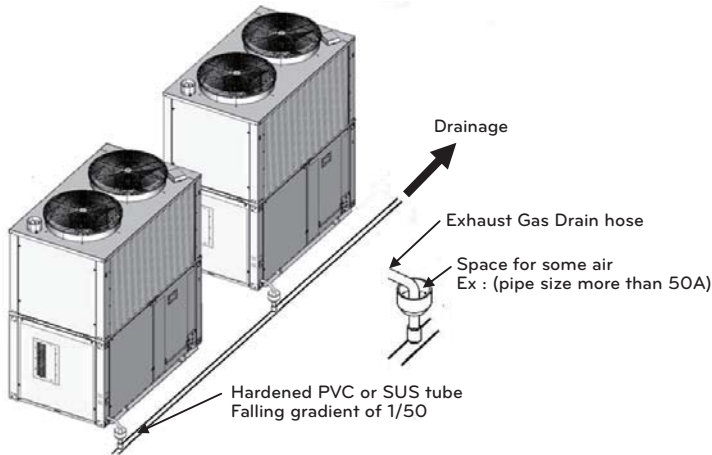
## Outdoor Unit Drainage Piping

### ! WARNING

- When connecting the rubber drain hose of the outdoor unit to the pipe for drainage, make sure to lay pipes exposed(released) to the air. If the exhaust gas flows backward inside a building, it causes a carbon dioxide poisoning.
- Do not use the indoor unit drain pipes mixed with the outdoor unit drain pipes. If the exhaust gas flows backward inside a building through the indoor unit drain pipes, it causes a carbon dioxide poisoning.

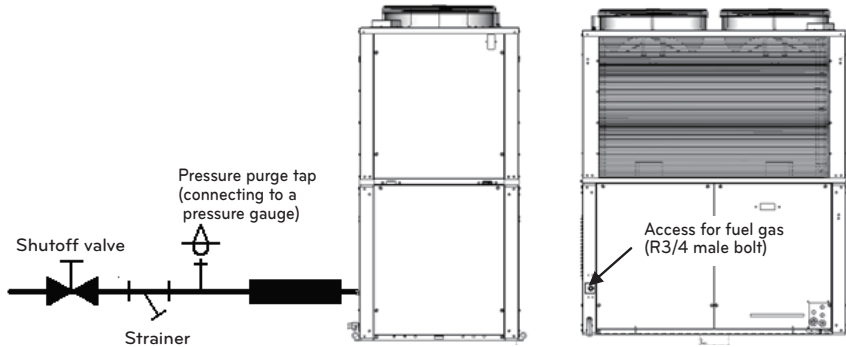
### ! CAUTION

- Extend the drain pipes to a gutter(water outlet) for drainage. A direct drainage to the surface of waterproof sheets or concrete causes contamination or damage.
  - Take preventive measures to protect the drain pipes from freezing in winter.
- The drain piping work should be done with a falling gradient of more than  $1/50$  for better drainage. Do not add any shaft tubes to the drain pipes. Do not add any traps to the drain pipes. If the multiple indoor units share the same drain pipe, keep the each rubber hose open to the air. Otherwise, the exhaust gas from the outdoor unit in operation could flow backward into the indoor unit (not in operation) and cause an engine malfunction.
  - Use the corrosion-free hardened Polyvinyl Chloride (PVC) or stainless tubes for the drain piping.



## Fuel Gas Piping

Install the fuel gas pipes of the outdoor unit as pictured below.



### ! WARNING

Only licensed installers and service technicians should perform the fuel gas piping. Improper installation causes fire and explosion.

### ! CAUTION

- A fuel gas port is fastened with an appropriate torque and shipped in a way that ensures it will remain leak free. When connecting the gas piping, secure the connecting port in order not to have excessive torque. Applying an excessive force when fastening can damage to the gasket and cause a gas leak.
- Check for gas leaks from the fuel gas pipes after completing the installation. Gas leaks cause hazards such as fire.
- Use a flexible hose when connecting to the outdoor unit. There is a risk of gas leaks from a vibration of steel pipes.

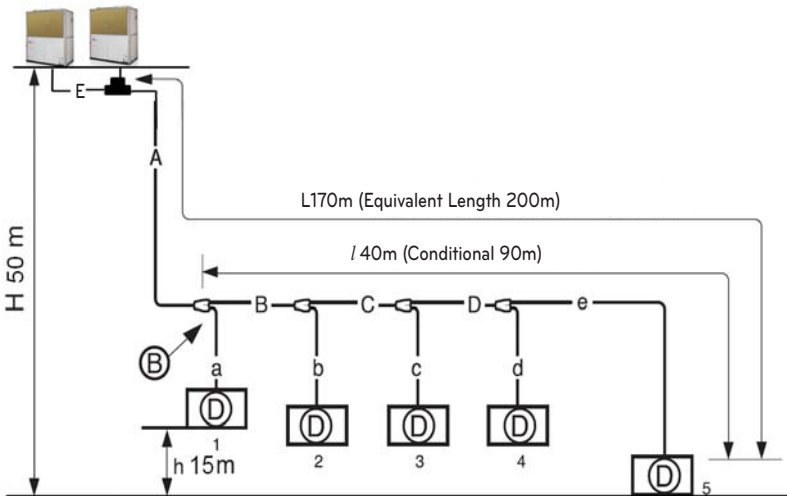
## Outline of the piping plan

### System Limitations

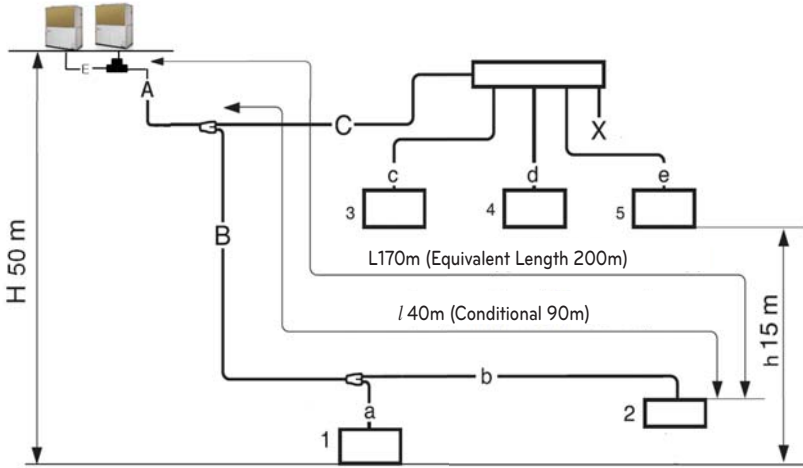
Item	Range
Capacity ratio of indoor unit to outdoor unit	50 ~ 130 %
Minimum capacity of accessible indoor unit	2.3 kW
Maximum number of accessible indoor unit (by mode)	25units(45 kW) / 31units(56 kW) / 39units (71 kW) / 50units(90 kW) / 56units(101 kW) / 62units (112 kW) / 70units(127 kW) / 78units(142 kW)

### Length of Refrigerant Piping and Permissible Differences in Elevation (Applicable to Individual or Series Installation)

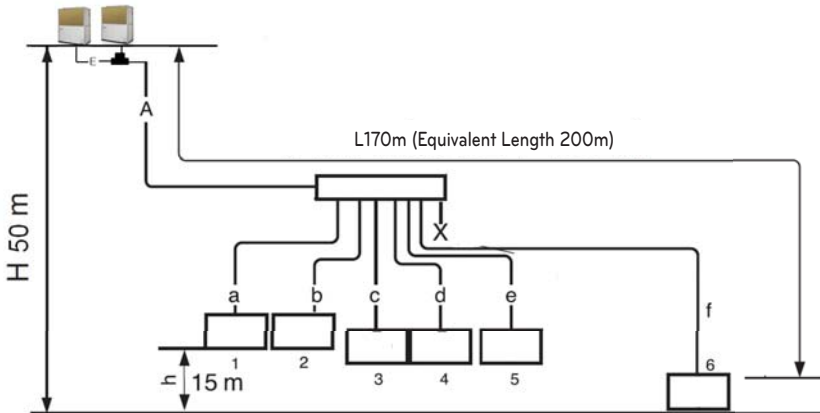
Y-branch method



Y/Header Method



Header Method



Item	Symbol	Contents		The actual length (m)
Allow the pipe length	L	Allow the pipe length		$7 \leq L \leq 170$ (Equivalent length 200)
	l	The maximum of pipe length after first branch		$\leq 40$ ( $\leq 90^*$ )
	a, b, c, d, e	Length of pipe from each branch		$\leq 30$
	Total pipe length from ODU to IDU			$\leq 640$
Permitted height difference	H	Height between the ODU, IDU	Outdoor unit installation (top)	$\leq 50$
			Outdoor unit installation (bottom)	$\leq 35$ ( $\leq 30^{**}$ )
	h	Between the indoor unit		$\leq 15$

\* : To apply Conditional Application

\*\* : When the outdoor air temp. is below 10 °C, it is limited by 30m.



# REFRIGERANT PIPING

To meet the below requirements to make 40m above~90m or under of pipe length after the first branch.

	Requirements	Examples	
1	The diameter of the pipes between the first branch and the last branch should be one size bigger than normal. It is not necessary to do so if the diameter is identical with the one of the main pipe.	$40\text{ m} < B+C+D+e \leq 90\text{ m} \rightarrow$ B, C, D diameter change	$\varnothing 6.35 \rightarrow \varnothing 9.52, \varnothing 9.52 \rightarrow \varnothing 12.7,$ $\varnothing 12.7 \rightarrow \varnothing 15.88, \varnothing 15.88 \rightarrow \varnothing 19.05,$ $\varnothing 19.05 \rightarrow \varnothing 22.2, \varnothing 22.2 \rightarrow \varnothing 25.4,$ $\varnothing 25.4 \rightarrow \varnothing 28.58, \varnothing 28.58 \rightarrow \varnothing 31.8,$ $\varnothing 31.8 \rightarrow \varnothing 34.9, \varnothing 34.9 \rightarrow \varnothing 38.1$
2	[Length of the pipe from outdoor unit to the farthest indoor unit] - [Length of the pipe from outdoor unit to the closest indoor unit] $\leq 40\text{ m}$	$(A+B+C+D+e)-(A+a) \leq 40\text{ m}$	
3	The length of the pipes described above should be doubled when calculating the total length of the refrigerant piping.	$A+B \times 2 + C \times 2 + D \times 2 + a + b + c + d + e \leq 640\text{ m}$	
4	The length from each indoor unit to the closest branch piping $\leq 40\text{ m}$	$a, b, c, d, e \leq 40\text{ m}$	

## ! WARNING

### Precautions during header branch piping

- It is recommended that the difference between the piping length(a~f) connected to the indoor unit and the piping length after header branch be minimized.
- Performance difference between indoor units may occur.
- The Y branch and header branch cannot be used after header branch.

## ! WARNING

### Y Piping Precautions

- When the diameter of piping (B) (which is connected behind the first branch) is bigger than the diameter of main piping (A), install B in the same way as A.

## ! CAUTION

- If overall equivalent pipe length is more than 90m from outdoor unit to the farthest indoor unit, the diameter of the main pipe must be increased.
- After first branch, If the diameter of the pipe(B) is greater than the diameter of the main pipe(A), the diameter of the pipe(B) is the same size as the diameter of the main pipe(A) to the installation.

## 26 REFRIGERANT PIPING

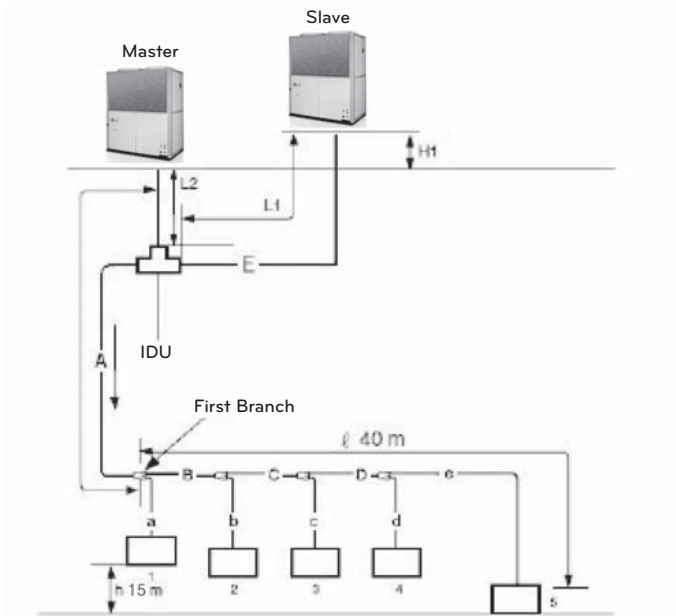
- Refrigerant pipe diameter from outdoor unit to first branch. (A)
- Refrigerant pipe diameter from outdoor unit to outdoor unit (E)

Outdoor unit Total capacity [kW (btu/h)]	Standard Pipe Diameter		When pipe length is 90m or more from ODU to the farthest IDU	
	Gas pipe [mm(inch)]	Liquid pipe [mm(inch)]	Gas pipe [mm(inch)]	Liquid pipe [mm(inch)]
45 (153 600)	Ø 28.58(1-1/8 )	Ø 15.88(5/8)	Ø 28.58(1-1/8 )	Ø 15.88(5/8)
56 (191 100)	Ø 28.58(1-1/8 )	Ø 15.88(5/8)	Ø 31.8(1-1/4)	Ø 19.05(3/4)
71 (242 300)	Ø 31.8(1-1/4)	Ø 15.88(5/8)	Ø 34.9(1-3/8)	Ø 19.05(3/4)
90 (307 100)	Ø 34.9(1-3/8)	Ø 19.05(3/4)	Ø 38.1(1-1/2)	Ø 22.2(7/8)
101 (344 600)	Ø 34.9(1-3/8)	Ø 19.05(3/4)	Ø 38.1(1-1/2)	Ø 22.2(7/8)
112 (382 100)	Ø 41.3(1-5/8)	Ø 19.05(3/4)	Ø 41.3(1-5/8)	Ø 22.2(7/8)
127 (433 300)	Ø 41.3(1-5/8)	Ø 19.05(3/4)	Ø 41.3(1-5/8)	Ø 22.2(7/8)
142 (484 500)	Ø 41.3(1-5/8)	Ø 19.05(3/4)	Ø 41.3(1-5/8)	Ø 22.2(7/8)

- Diameter of Refrigerant Piping (B, C and D) from Branch to Branch

Gross Capacity (kW) of Indoor Unit Connected behind the Branch	Gas pipe [mm(inch)]	Liquid pipe [mm(inch)]
5.6 (19 100)	Ø 12.7(1/2)	Ø 6.35(1/4)
16 (54 600)	Ø 15.88(5/8)	Ø 9.52(3/8)
23 (78 500)	Ø 19.05(3/4)	Ø 9.52(3/8)
33 (112 600)	Ø 22.2(7/8)	Ø 9.52(3/8)
47 (160 400)	Ø 28.58(1-1/8 )	Ø 12.7(1/2)
71 (242 300)	Ø 28.58(1-1/8 )	Ø 15.88(5/8)
104 (354 800)	Ø 34.9(1-3/8)	Ø 19.05(3/4)
174 (593 700)	Ø 41.3(1-5/8)	Ø 19.05(3/4)

## Refrigerant Piping Work for Series Installation



### \* Selecting the Diameters of A and E

A: Piping from the indoor unit to the first branch. The diameter that can handle the capacity of the master and slave combined.

E: The diameter that can handle the capacity of the slave

Permissible difference of elevation for outdoor units (H1)	Less than or equal to 0.5 m
Permissible length of piping for outdoor units (L1 + L2)	Less than or equal to 7 m

\* For the piping length and diameter standards other than those in the above table, refer to the standards in pp. 22-26.

### ⚠ CAUTION

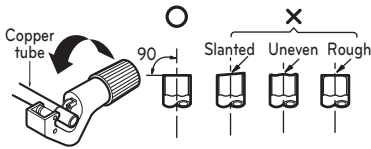
- An additional Y branch joint is required to connect outdoor units in a series.
- When connecting piping in outdoor units, piping must level off or be on a gradient towards a slave outdoor unit in order to prevent oil from accumulating in the slave outdoor unit. Otherwise, the product may not work properly.
- When connecting piping among outdoor units, the main piping must be positioned lower than the connecting ports on the outdoor units in order to prevent oil from accumulating in the outdoor unit. Otherwise, the product may not work properly.

## Piping Work

Main cause of gas leaks is a bad (poor) flaring work. Perform the flaring work properly in the following instructions.

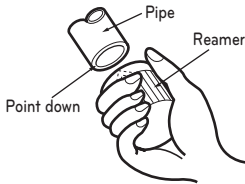
### Cut the pipes and the cables

- Use the authentic parts/tools purchased in the market or the piping tools included in the product as accessories.
- Measure the distance between the indoor and the outdoor unit.
- Cut the pipes a little longer than the measured distance.
- Cut the cable 1.5m longer than the pipe length.



### Burrs removal

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



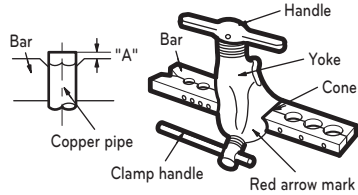
### Flaring work

- Perform the flaring work using flaring tools as shown below.

Total capacity of indoor unit	Pipes(mm)		" A "	
	Gas pipe	Liquid pipe	Gas pipe	Liquid pipe
Less than 6kW	Ø 12.7	Ø 6.35	1.6~1.8	1.1~1.3
Less than 16kW	Ø 15.88	Ø 9.52	1.6~1.8	1.5~1.7

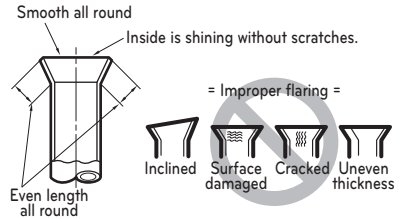
※ Use a welding type for indoor units with capacity of more than 16kW

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



### Check

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



### Piping connection

- Lay pipes following the piping passage. Do not bend more than 3 times in the same spot. Do not bend reversely.
- Fit the union of the indoor unit into the center of the pipe after pipe modification, and tighten them with a spanner.
- Connect the pipe into the service valve of outdoor unit.
- Check for gas leaks in the connecting area between the outdoor unit and indoor unit after piping.

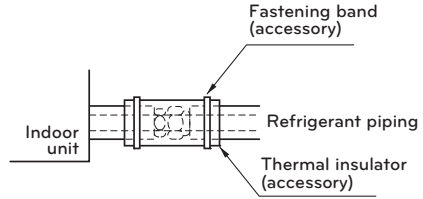
Diameter (mm)	Flare nut tightening torque (N·m)
Ø 6.35	16 ± 2
Ø 9.52	38 ± 4
Ø 12.7	55 ± 5
Ø 15.88	75 ± 7
Ø 19.05	110 ± 10

### CAUTION

When tightening, use two torque wrenches.

## Insulation

- Use the heat insulation material which has an excellent heat-resistance (over 120C) for the refrigerant piping.
- If installing the unit in a high humid area, use a thicker insulation material than standard.



Rubber thermal insulation for refrigerant piping (EPDM, NBR) standard thickness

(Unit: mm)

Classification		Air conditioned location		Non-air conditioned location	
		Note1) General location	Note2) Special location	Note3) General location	Note4) Negative condition
Liquid pipe	Ø 6.35(1/4)	Above t9	Above t9	Above t9	Above t9
	Ø 9.52(3/8)				
	Above Ø12.7	Above t13	Above t13	Above t13	Above t13
Gas pipe	Ø 9.52(3/8)	Above t13	Above t19	Above t19	Above t25
	Ø 12.7(1/2)				
	Ø 15.88(5/8)				
	Ø 19.05(3/4)				
	Ø 22.2(7/8)				
	Ø 25.4(1)				
	Ø 28.58(1-1/8)	Above t19	Above t25	Above t25	
	Ø 31.75(1-1/4)				
	Ø 34.9(1-3/8)				
	Ø 38.1(1-1/2)				
	Ø 41.3(1-5/8)				
	Ø 44.45(1-3/4)				
	Ø 50.8(2)				
Ø 53.98(2-1/8)				Above t32	

Note 1) General location: When the pipe passes through indoors in which the indoor unit is operated

- Apartment, classroom, office, mall, hospital, office-tel etc.

Note 2) Special location

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

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

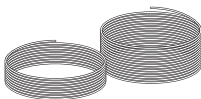
Note 4) Negative condition: When below conditions 1 and 2 are met.

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

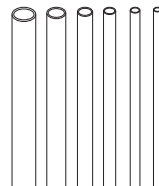
Pipe thickness standard for R410A piping

(Unit: mm)

Diameter	R410A		
	Soft	Hard	Tolerance (permissible difference)
Ø 6.35(1/4)	0.7	0.8	±0.06
Ø 9.52(3/8)	0.8	0.8	±0.06
Ø 12.7(1/2)	0.8	0.8	±0.06
Ø 15.88(5/8)	1	1	±0.09
Ø 19.05(3/4)		1	±0.09
Ø 22.2(7/8)		1	±0.09
Ø 25.4(1)		1	±0.09
Ø 28.58(1-1/8)		1	±0.09
Ø 31.8(1-1/4)		1.1	±0.09
Ø 34.9(1-3/8)		1.2	±0.09
Ø 38.1(1-1/2)		1.35	±0.09
Ø 41.3(1-5/8)		1.45	±0.09
Ø 44.45(1-3/4)		1.55	±0.09
Ø 53.98(2-1/8)		2.1	±0.09



▲ Soft (Pan Cake)



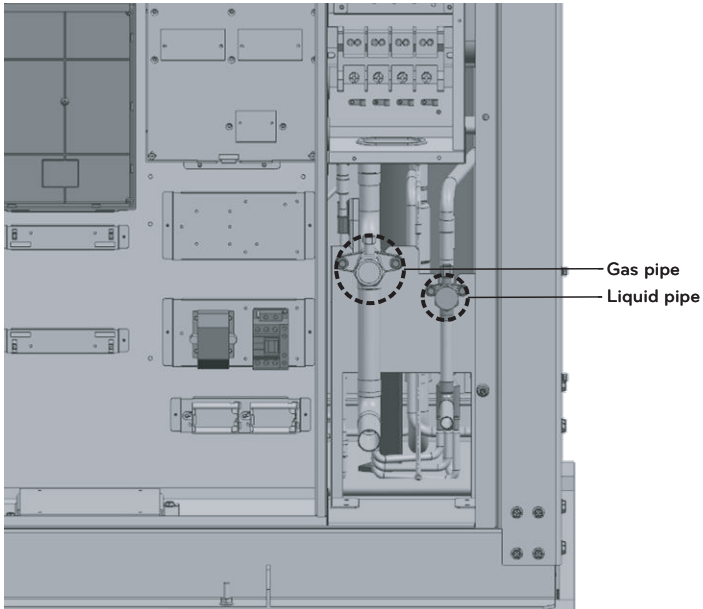
▲ Hard (straight tubes)

## Precautions on pipe connection/valve operation

Piping is connecting the end of a pipe to a branching pipe. The refrigerant pipe of the outdoor unit is divided at the end to connect to each indoor unit.

Flare connection for the indoor unit piping, and welding connection for the outdoor unit piping and branching is used.

- Open/close the valve using a wrench.

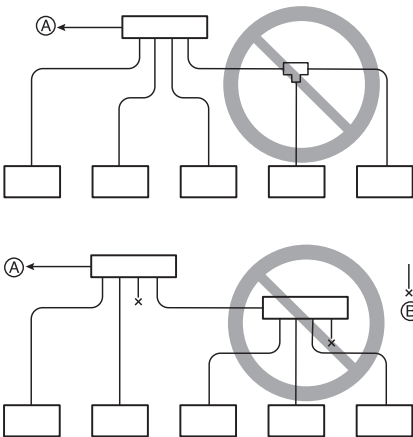


### WARNING

- Always be careful not to leak the refrigerant during welding.
- The refrigerant generates poisonous gas which is harmful to human body if combusted.
- Do not perform welding in a closed space.
- Be sure to close the cap of the service port to prevent gas leakage after the work.

## Precautions

- Use the standardized products for the refrigerant piping.
- Unstandardized pipes often contain dust or other impurities.
- Make sure to clear inside the pipe by blowing a dehumidified nitrogen gas into the pipe.
- Be careful not to let dust, water, or other contaminants enter inside the pipe during installation.
- Reduce the number of bending areas as much as possible, and make bending radius as big as possible
- Always use the branch piping set developed (invented) by LG.
- If the diameters of the branch piping of the designed refrigerant pipes are not identical, cut the connecting section with a pipe cutter and connect the pipes with a pipe expander for connecting different diameters.
- Always observe the restrictions on the refrigerant piping.  
(such as rated length, difference in pressure, and diameters of the pipes) Failure to do so may result in equipment failure or a decline in heating/cooling performance.
- A second branch cannot be made after a header branch.



Ⓐ Direction of the outdoor unit (to outdoor unit)

Ⓑ Sealed piping (with a cap)

- Be sure to meet standard requirements when welding.
- Beware that **GHP<sup>SUPER</sup>** series will not operate properly when the amount of refrigerant is excessive or insufficient.
- Check the records of the piping length and the amount of additional refrigerant when servicing the unit.
- Be sure to vacuum using a vacuum pump.
- Always insulate the piping. Insufficient insulation will result in a decline in heating/cooling performance, water dripping from condenser and other problems.
- When connecting the refrigerant pipes, make sure the service valve of the outdoor unit is completely closed (the factor default setting).
- Do not open the service valve until all refrigerant pipes for the outdoor and indoor units have been connected, and a refrigerant leakage test and the evacuation process have been completed.
- Be sure to let nitrogen flow in the pipe when welding. Otherwise, excess sludge may form inside the pipe and disturb the normal operations of compressor and cause damages.
- Weld after wrapping the service valve with wet towel when connecting the valve with the pipes. Otherwise, it may cause a refrigerant leakage and the deterioration of system as well.
- Consult with the service center about the sound absorber installation when the length of outdoor/indoor unit piping is short or noise is possibly passed onto the indoor unit.

### ⚠ CAUTION

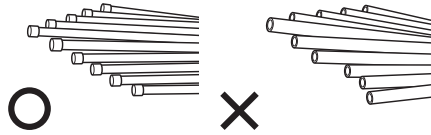
- Make the unit vacuum-treated completely before **GHP<sup>SUPER</sup>** initial installation or reinstallation to another place.  
- If a different refrigerant is mixed with the original refrigerant, the refrigerant cycle may malfunction and the unit may be damaged.
- After selecting a diameter of the refrigerant pipe to suit the total capacity of the indoor unit connected after branching, use an appropriate branch pipe set according to the pipe diameter of the indoor unit and the installation pipe drawing.






# PIPE CONNECTIONS BETWEEN INDOOR/OUTDOOR UNITS

## Plumbing materials and storage methods

- Pipe must be able to obtain the specified thickness and should be used with low impurities.
- Also when handling storage, pipe must be careful to prevent a fracture, deformity and wound.
- Should not be mixed with contaminations such as dust, moisture.



## Refrigerant piping on three principles

	Drying	Cleanliness	Airtight
	Should be no moisture inside	No dust inside.	There is no refrigerant leakage
Items			
Cause failure	<ul style="list-style-type: none"> <li>- Significant hydrolysis of refrigerant oil</li> <li>- Degradation of refrigerant oil</li> <li>- Poor insulation of the compressor</li> <li>- Do not cold and warm</li> <li>- Clogging of EEV, Capillary</li> </ul>	<ul style="list-style-type: none"> <li>- Degradation of refrigerant oil</li> <li>- Poor insulation of the compressor</li> <li>- Do not cold and warm</li> <li>- Clogging of EEV, Capillary</li> </ul>	<ul style="list-style-type: none"> <li>- Gas shortages</li> <li>- Degradation of refrigerant oil</li> <li>- Poor insulation of the compressor</li> <li>- Do not cold and warm</li> </ul>
Counter-measure	<ul style="list-style-type: none"> <li>- No moisture in the pipe</li> <li>- Until the connection is completed, the plumbing pipe entrance should be strictly controlled.</li> <li>- Stop plumbing at rainy day.</li> <li>- Pipe entrance should be taken side or bottom.</li> <li>- When removal burr after cutting pipe, pipe entrance should be taken down.</li> <li>- Pipe entrance should be fitted cap when pass through the walls.</li> </ul>	<ul style="list-style-type: none"> <li>- No dust in the pipe.</li> <li>- Until the connection is completed, the plumbing pipe entrance should be strictly controlled.</li> <li>- Pipe entrance should be taken side or bottom.</li> <li>- When removal burr after cutting pipe, pipe entrance should be taken down.</li> <li>- Pipe entrance should be fitted cap when pass through the walls.</li> </ul>	<ul style="list-style-type: none"> <li>- Airtightness test should be.</li> <li>- Brazing operations to comply with standards.</li> <li>- Flare to comply with standards.</li> <li>- Flange connections to comply with standards.</li> </ul>

### Nitrogen substitution method

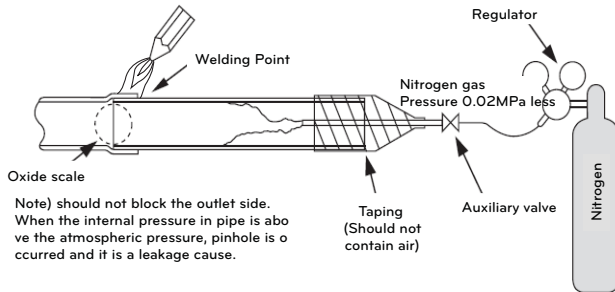
Welding, as when heating without nitrogen substitution a large amount of the oxide film is formed on the internal piping.

The oxide film is caused by clogging EEV, Capillary, oil hole of accumulator and suction hole of oil pump in compressor.

It prevents normal operation of the compressor.

In order to avoid this problem, Welding should be done after replacing air by nitrogen gas.

When welding plumbing pipe, the work is required.



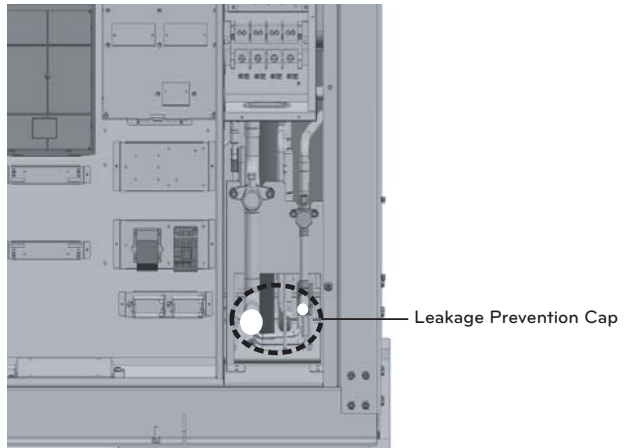
### CAUTION

- 1 Always use the nitrogen.(not use oxygen, carbon dioxide, and a Chevron gas):  
Please use the following nitrogen pressure 0.02MPa  
Oxygen - Promotes oxidative degradation of refrigerant oil.  
Because it is flammable, it is strictly prohibited to use  
Carbon dioxide - Degrade the drying characteristics of gas  
Chevron Gas - Toxic gas occurs when exposed to direct flame.
- 2 Always use a pressure reducing valve.
- 3 Please do not use commercially available antioxidant.  
The residual material seems to be the oxide scale is observed.  
In fact, due to the organic acids generated by oxidation of the alcohol contained in the anti-oxidants, ants nest corrosion occurs.  
(causes of organic acid → alcohol + copper + water + temperature)

## Preparation Work for Outdoor Unit

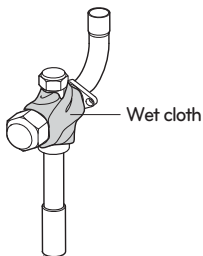
### Remove leakage prevention cap

- Remove the leakage prevention cap attached to the outdoor unit service valve before piping work.
- Proceed the leakage prevention cap removal as follows.
  1. Verify whether the liquid/gas pipes are locked.
  2. Extract (discharge) any remaining refrigerant or air inside using the service port.
  3. Remove the leakage prevention cap.



Perform the gas pipe/liquid pipe connection as follows.

- Gas pipe/liquid pipe and common pipes should be purchased locally.
- Wrap wet towel when welding. Otherwise, it may result in internal damages.
- After welding the elbow and the straight pipe, insert the panel into the pipe and keep welding the connected pipes. Insert the pipe in the center of the panel hole.
- You must run nitrogen at 20 kPa through the inside piping while welding.
- Otherwise, a large amount of oxide coating will form inside the piping, which may affect the functioning of a valve or a compressor etc.

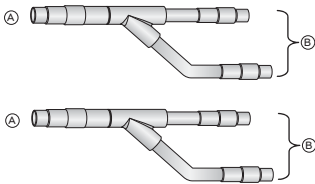


Outdoor unit pipe connection

## Branch Installation Method

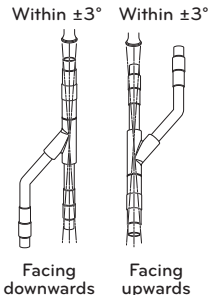
### Y branch

- Make sure that the two outlet pipes of Y branch are attached horizontally. (see the diagram below)
- Horizontal installation is recommended for Y branch.  
However, if there is no other way but vertical installation, then install the branch up straight. (If the branch is not installed horizontally, it may cause refrigerant drift and result in deterioration of cooling/heating performance.)
- If the diameter of the selected refrigerant pipe is different from the one of the joint, cut a modified joint to adjust in the Y branch before using. (When cutting the modified joint section, remove the burr on the cut surface completely. Be extra careful not to let the burr into the Y branch.)
- Be sure to let nitrogen gas flow in the pipe when welding.  
Otherwise, the excessive sludge formed inside the pipe may cause a malfunction of the unit.

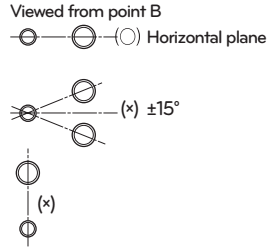


(A) To Branch Piping or Indoor Unit  
(B) To Outside Unit

<Vertical installation>

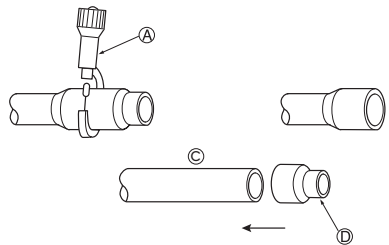
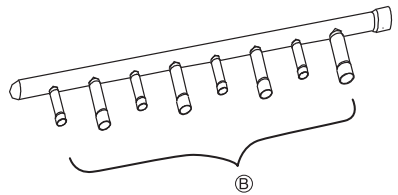


<Horizontal installation>



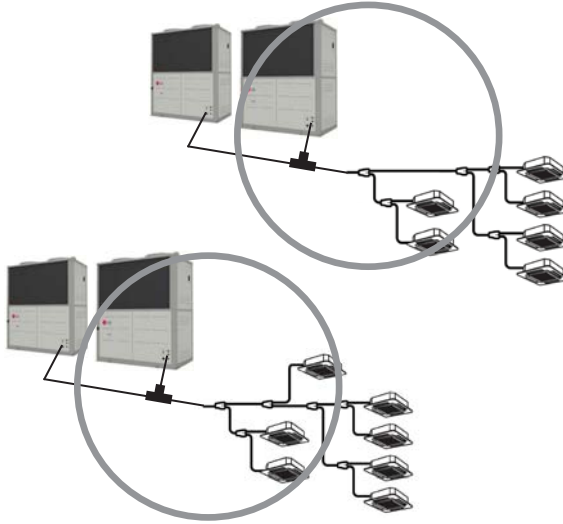
### Header Branch

- The indoor unit with larger capacity must be installed closer to A than the smaller one.
- If the diameter of the refrigerant pipe selected by the procedures described earlier is different from the one of the joint section, the connecting joint section should be adjusted using a modified joint. A modified joint is included in the branch pipe.
  - (A) A pipe cutter
  - (B) To indoor unit
  - (C) Connecting to pipe
  - (D) Modified joint
- If the number of pipes to be connected is smaller than the number of header branch pipes, seal the unconnected branch pipes.



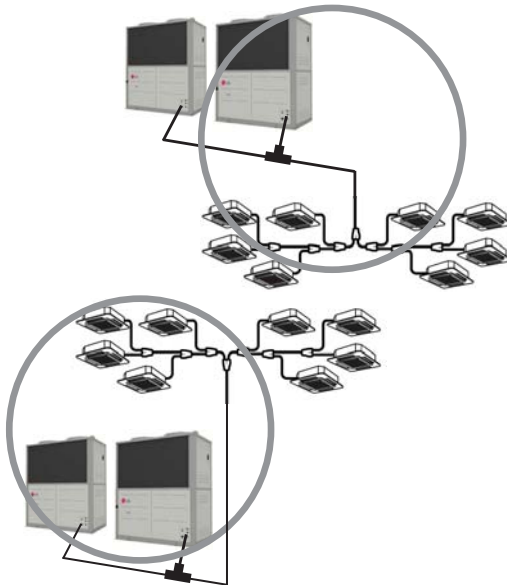
## Distribution Method (Branch Method)

- The case where only branch pipes are connected to one another



- Vertical Distribution

※ Be sure that the branch pipes are attached vertically.

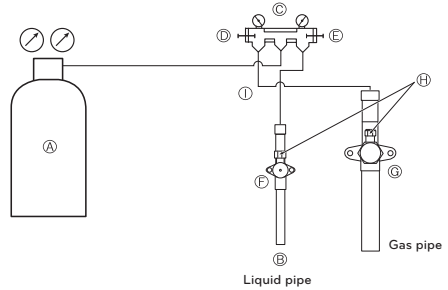


# LEAK DETECTION

Leak detection should be made by pressurizing nitrogen gas to 3.8 MPa(38.7 kgf/cm<sup>2</sup>). Refer to the diagram as follows. (Make a detection test with the service valve closed. Be sure to pressurize the liquid pipe and the gas pipe.)

The test result can be judged good if the pressure has not been reduced for 24 hours after the nitrogen gas pressurization.

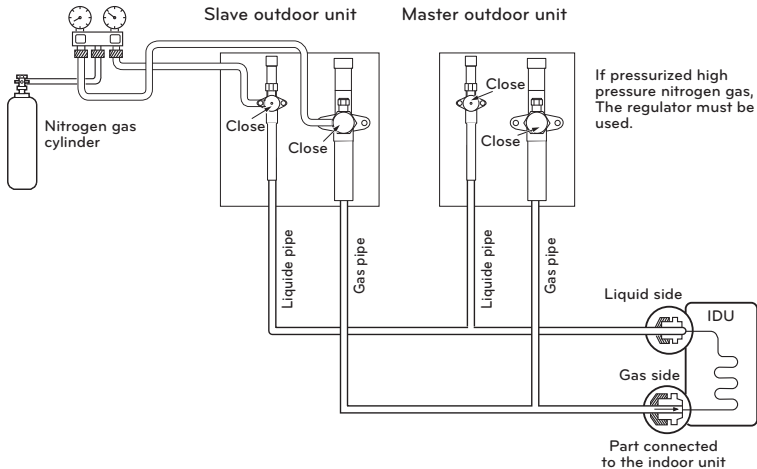
- (A) Nitrogen gas
- (B) To indoor unit
- (C) Manifold gauge
- (D) Low pressure side handle
- (E) High pressure side handle
- (F) Liquid pipe
- (G) Gas pipe
- (H) Service port
- (I) To outdoor unit



## ! WARNING

- Use a vacuum pump or Inert (nitrogen) gas when performing leak detection or air purge. Do not use compressed air or oxygen, or inflammable gas. There is a risk of fire or explosion. There is a risk of death, injury, fire, or explosion.

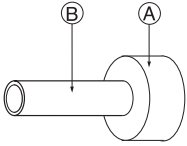
## Precautions to take during series installation



# PIPE INSULATION

## Refrigerant Pipe Insulation

For the refrigerant pipe insulation, cover the liquid pipe and the gas pipe with a rubber insulating material thick enough to completely fill the gap between the insulator and the pipe. Insufficient insulation may cause drip of condensate water. Be extra care to the ceiling insulation.



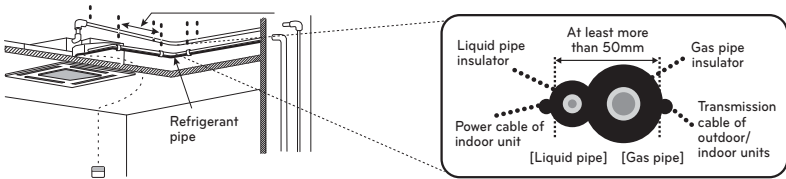
- Ⓐ A thermal insulation material
- Ⓑ Pipe

A	Adhesive + rubber foam insulation material (heat-resistant polyethylene foam) + adhesive tape
B	Pipe

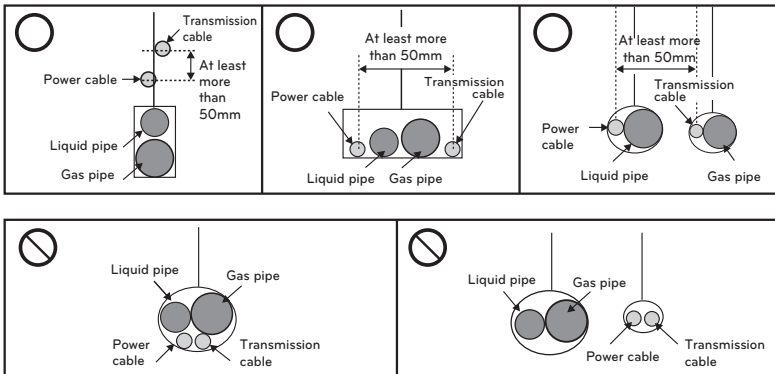
### ! CAUTION

Any insulation materials exposed to UV rays should be covered by a pipe cover to protect the pipe and the insulator.

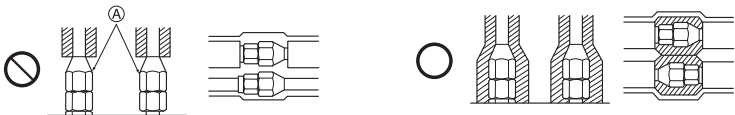
### - Horizontal pipe support method



### - Clamp hanger support



Insulate the joint area completely.



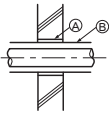
Ⓐ This part is not insulated.

## Insulation of the part where pipes penetrate walls and others

When filling a gap with mortar, cover the penetrating part with steel plate to prevent the insulation material from being caved in. For the bottom part, use incombustible materials for both insulation and covering. (Vinyl covering should not be used.)

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

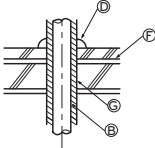
Inner wall (concealed)



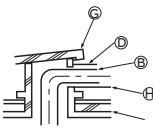
Outer wall



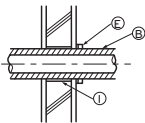
Floor (fireproofing)



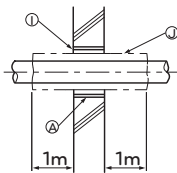
Roof pipe shaft



Outer wall (exposed)

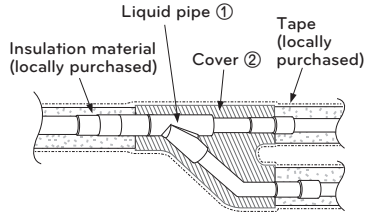


Penetrating portion on fire limit and boundary wall



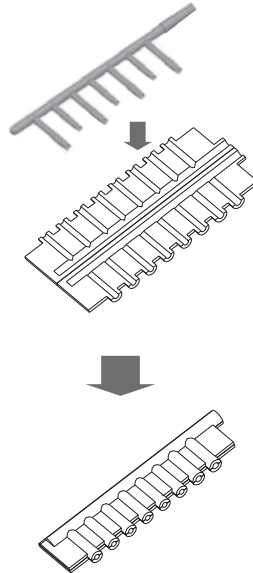
## Insulation of Branch Piping

### Y Branch Insulation



- Install properly for the liquid pipe and the cover. Seal the joint area of the cover (2) using a heat sealing tape (locally purchased).
- Insulate the gas pipe in the same way as above.

### Header branch insulation



- Insulate the header branch with the insulation material as shown in the figure.



# VACUUM AND REFRIGERANT CHARGE

## Vacuum

Vacuum drying should be made from the service port to the connected pipes and the indoor unit using a vacuum pump with the service valve of the outdoor unit closed.

(Make sure to vacuum from the service port of the liquid pipe and the gas pipe.)

When the vacuum capacity reaches 5 torr, there should be no change in the vacuum gauge (remained at 5 torr) for one hour.

(Any changes mean a leakage or moisture detected inside the pipe.)

If there is a possibility of moisture remaining inside the pipe, vacuum the system for 2 hours and give pressure to the system to 0.05 MPa(0.5 kgf/cm<sup>2</sup>) with nitrogen.

And then vacuum it again more than one hour until it reaches 5 torr. Maintain the 5 torr level for one hour and check whether the vacuum gauge does not rise or not.

### ! WARNING

Use a vacuum pump or Inert (nitrogen) gas when performing leakage detection or air purge.

Use of oxygen, compressed air, or flammable gas causes fire or explosion.

There is a risk of death, injury, fire, or explosion.

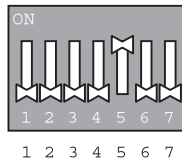
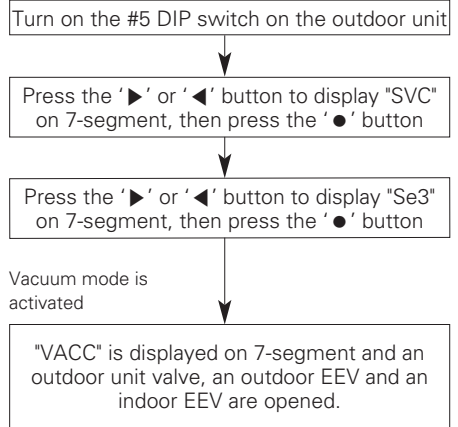
### ! CAUTION

Do not perform the air purge with refrigerant. Make sure to use a vacuum pump with a vacuum gauge attached.

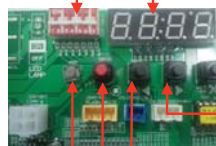
## Setting the Vacuum Mode

This mode is used for a vacuum operation after removing the refrigerant at the work site to, for example, replace parts of a compressor or an outdoor unit or to add or replace an outdoor unit.

## How to Set Vacuum Mode



DIP SWITCH 7-Segment



- ← SW04C ( X : cancel)
- SW03C (▶ : forward)
- ← SW02C (◀ : backward)
- SW01C (● : confirm)
- SW01D (reset)

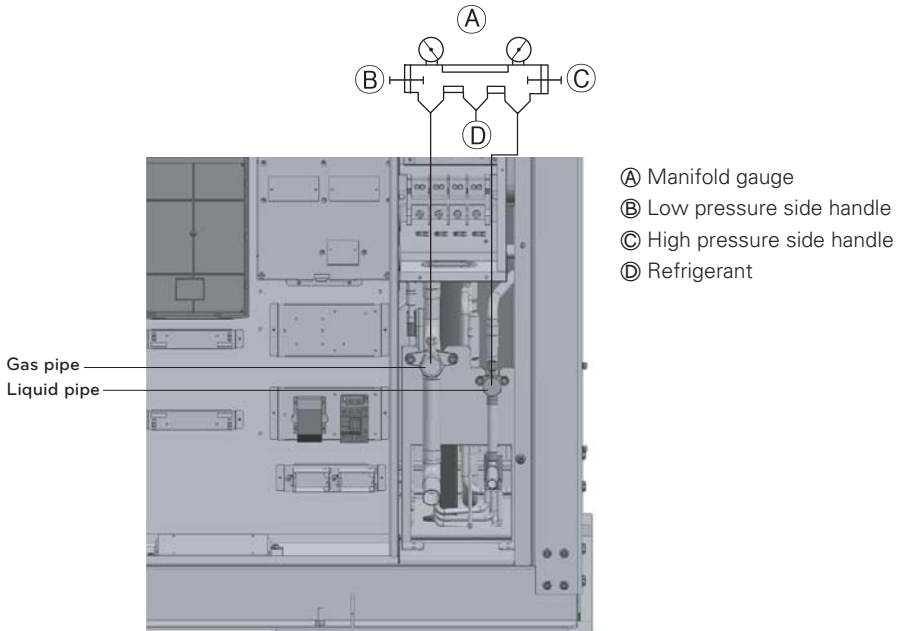
## How to Unset Vacuum Mode

Turn all DIP switches off, then press the reset button (SW01D) for 2 seconds.

### ! WARNING

While in vacuum mode, the outdoor operation is stopped and the compressor is not run.

## Refrigerant Charge



- Add exact amount of refrigerant calculated by the combination of the installation pipe diameter length and the indoor unit.
- Incorrect amount of refrigerant may cause malfunction of the unit.
- If the additional amount of refrigerant exceeds the range of  $\pm 10\%$ , the compressor burning or insufficient indoor unit performance may result.

### **!** WARNING

- Pipe to be vacuumed: gas pipe, liquid pipe
- Do not charge with any other refrigerants than the designated refrigerant (R410A) when transporting or reinstalling the unit.
- If a different refrigerant or air is mixed with the original refrigerant, the refrigerant cycle may malfunction causing damages.

## The Additional Amount of Refrigerant Charge

The calculation of the additional charge should take into account the length of pipe and correction factor (CF) value of indoor unit.

Additional amount of refrigerant charge (kg)	+	Total liquid pipe(m) : Ø25.4 mm	x 0.480(kg/m)
	+	Total liquid pipe(m) : Ø22.2 mm	x 0.354(kg/m)
	+	Total liquid pipe(m) : Ø19.05 mm	x 0.266(kg/m)
	+	Total liquid pipe(m) : Ø15.88 mm	x 0.173(kg/m)
	+	Total liquid pipe(m) : Ø12.7 mm	x 0.118(kg/m)
	+	Total liquid pipe(m) : Ø9.52 mm	x 0.061(kg/m)
	+	Total liquid pipe(m) : Ø6.35 mm	x 0.022(kg/m)
	+	CF value of indoor unit (see below)	

Calculation of CF value (indoor unit)

Example) 4Way Cassette 14.5KW-1ea, High static duct 7.3KW-2ea,  
 1Way Cassette 2.3KW-4ea  
 $CF = 0.64 \times 1 + 0.26 \times 2 + 0.2 \times 4 = 1.96$

CF value of indoor unit

(unit : kg)

Capacity(Btu/h(kW)) Type	9k	12k	15k	18k	24k	28k	36k	42k	48k	76k	96k
	(2.8)	(3.6)	(4.5)	(5.6)	(7.1)	(8.2)	(10.6)	(12.3)	(14.1)	(22.4)	(28.0)
Ceiling Concealed Duct (Low Static)	0.17	0.17	0.17	0.37	0.37	-	-	-	-	-	-
Ceiling Concealed Duct (High Static)	0.26	0.26	0.26	0.26	0.26	0.44	0.44	0.44	0.62	1.00	1.00
Wall Mounted	0.24	0.24	0.24	0.28	0.28	-	-	-	-	-	-
1Way Ceiling Cassette	0.20	0.20	-	0.29	0.29	-	-	-	-	-	-
2Way Ceiling Cassette	-	-	-	0.16	0.16	-	-	-	-	-	-
4Way Ceiling Cassette	0.25	0.25	0.32	0.32	0.48	0.48	0.64	0.64	0.64	-	-
ARTCOOL Gallery	0.10	0.10	-	-	-	-	-	-	-	-	-
Floor Standing	0.17	0.17	0.17	0.37	0.37	-	-	-	-	-	-
Ceiling & Floor	0.10	0.10	-	-	-	-	-	-	-	-	-
Ceiling Suspended	-	-	-	0.35	0.35	-	0.54	-	0.75	-	-
Comm. Stand	-	-	-	-	-	-	-	-	0.59	-	-

# ELECTRICAL WIRING

## Precaution

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

### WARNING

- Only licensed electricians should do the electrical work using special circuits in accordance with regulations and this installation manual. Insufficient capacity or any defects of the power supply circuit may cause fire or electric shock.

- 2 Install the outdoor unit transmission cable away from the power source wiring so that it is not affected by electric noise from the power source. (Do not run it through the same conduit.)
- 3 Follow ordinance of your governmental organization for technical standard related to electrical equipment, wiring regulations and guidance of each electric power company.

### WARNING

- Be sure to ground the outdoor unit. Do not connect the ground wire to any gas pipes, liquid pipes, lightning rod or telephone ground wire. Incomplete grounding may cause electric shock.

- 4 Give some allowance to wiring for electrical part box of the indoor and outdoor units. The box is sometimes removed at the time of service work.
- 5 Never connect the main power source to the terminal block of transmission cable. If connected, electrical parts will be burnt out.
- 6 Use 2-core shield cable for transmission cable.  
If transmission cables of different systems are wired with the same multiple core cable, the poor transmitting and receiving will cause erroneous operation.

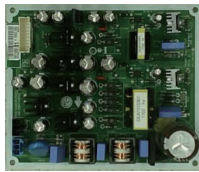
### WARNING

- Use round pressure terminals for connections to the power cable. It may cause fire or flame damages on the electrical parts.
- Make sure that the power unbalance ratio is not greater than 5%. If it is greater the unit's lifespan will be reduced.
- Use the 2-core shield cables.
- Do not use them together with power cables.
- Do not use the multi-core cables.

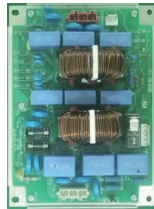
- 7 Only the specified transmission cable should be used in the terminal block for the outdoor unit transmission.
- 8 For the grounding power cables for the indoor unit, use the cables as below.
  - A corrosive-resistant metal cable with equivalent or higher strength/size of annealed copper wire with 1.6mm in diameter
  - A single cord or a single cap-tire cable with more than 1.25mm<sup>2</sup> cross section
  - A double-conductor cable with more than 0.75mm<sup>2</sup> cross section which is a cable compressed or twisted by two conductors from each side.

## Control Box and Connecting Position of Wiring

- Remove all of the screws from the right front panel, and remove the panel by pulling it forward.
- Connect the transmission cable between the main and the sub outdoor unit through the terminal block. When the central control system is connected to the outdoor unit, a dedicated PCB must be connected between them.
- When connecting the transmission cable between the outdoor and indoor units with shielded wire, make sure to connect the shield ground to the grounding screw.
- When connecting to the central control system with shielded wire, make sure to connect the shield ground to the grounding screw.



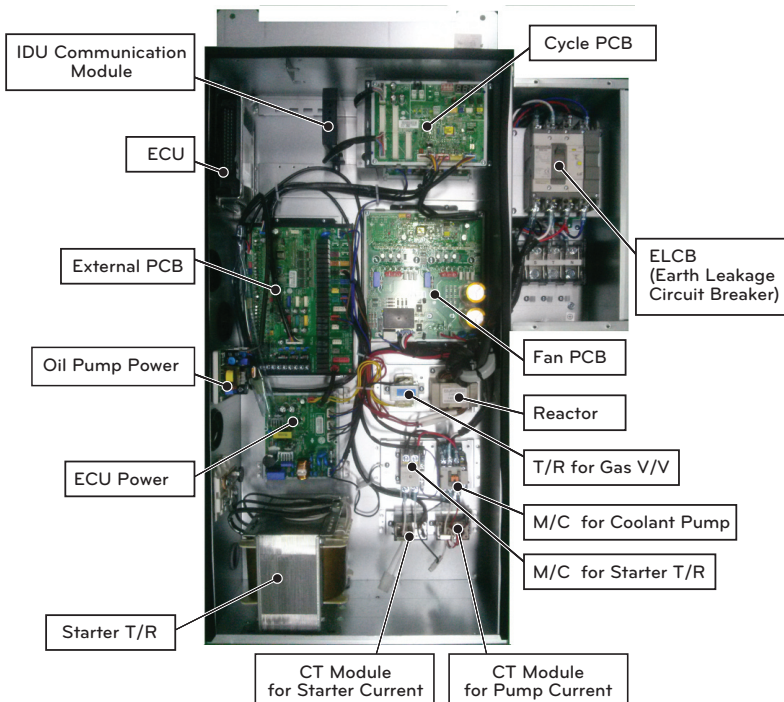
Cycle POWER



Noise Filter



Control panel



## Transmission and Power Cables

- 1 Transmission cable (between outdoor and indoor units)
  - Type: shielding wire      Cross section: 1.0 ~ 1.5mm<sup>2</sup>
  - Insulation material: PVC    Maximum allowable temperature: 60°C
  - Maximum allowable length: under 640m
- 2 Remote control cable
  - Type: 3-core cable
- 3 Central control system

Category	Wire types	Cross section
ACP & AC Manager(256 chambers)	2-core wire (2-shielding wire)	1.0 ~ 1.5 mm <sup>2</sup>
AC Smart(64 chambers)	2-core wire (2-shielding wire)	1.0 ~ 1.5 mm <sup>2</sup>
Simple/regular central control (16)	4-core wire (4-shielding wire)	1.0 ~ 1.5 mm <sup>2</sup>

- 4 Separation distance of transmission and power cables
  - If the transmission and power cables are run alongside each other, then there is a strong likelihood of operational failure developing due to the interference in the signal wiring caused by electrostatic and electromagnetic coupling.  
If the transmission and power cables are running alongside, keep the distance of more than 50mm between them.
  - Separation distance from the power cables of other equipment

	Power cable current capacity	Separation distance
More than 100V	10 A	300 mm
	50 A	500 mm
	100 A	1,000 mm
	More than 100A	1,500 mm

- 1 The figures are based on the assumed length of parallel cabling up to 100m. For the length in excess of 100m the figures will have to be recalculated in direct proportion to the additional length of cable involved.
- 2 If the power supply waveform continues to exhibit some distortion, the recommended separation distance in the table should be increased.
  - If the cables are laid inside the conduits or tied up to one bundle, then the following considerations must be given to the issue.
    - Do not lay the power cable and the transmission cable in the same conduit.
    - Do not bind the transmission cable and the power cable together.

### WARNING

- Did you ground the both outdoor and indoor units?
- Insufficient grounding may cause electric shock. Only licensed electricians should do the grounding work.
- ✳ For the indoor unit grounding, the earth wire is needed to prevent the electric shock in case of a short circuit, the communication problems due to noise, and the motor leakage current.

## 5 Outdoor Unit Power Cable Specifications and Switch Capacity

Type of Outdoor Unit	Power Specifications	Wire Thickness (mm <sup>2</sup> )			Earth Leakage Circuit Breaker (ELCB)
		Main power cable wire	Branch wire	Ground wire	
1Unit	3 Ø, 380 V3N~, 60 Hz	2.5	-	2.5	30A
	1 Ø, 220 V~, 60 Hz	2.5	-	2.5	30A
2Unit	3 Ø, 380 V3N~, 60 Hz	4.0	-	2.5 ~ 4.0	60A
	1 Ø, 220 V~, 60 Hz	6.0	-	2.5 ~ 6.0	60A

**Branch wire**

Power cable wire between a master and a slave1 outdoor unit — minimum of 2.5 mm<sup>2</sup>

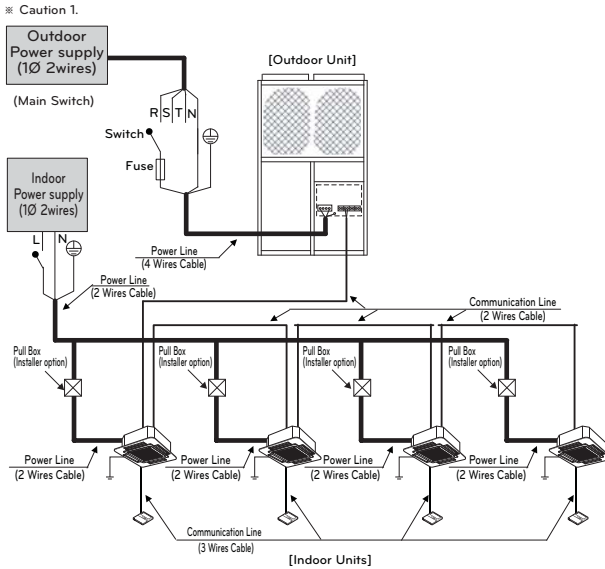
- \* The above standards are based on CV wires.
- \* For detailed wire specifications, contact the head office.
- \* For 3-phase products, use 3-phase, 4-wire and 4-pole ELCB.
- \* For single-phase products, use 2-pole or 3-pole ELCB.

- Do not install any 'individual switch or electrical outlet' to disconnect each of indoor unit separately from the power supply.
- Bear in mind the ambient conditions (ambient temperature, direct sunlight, rain water, etc.) when proceeding with the wiring and connections.
- The cable size is the minimum value for metal conduit wiring.  
The power cable size should be 1 rank thicker than normal, taking into account the cable voltage drops.
- For the specific wiring work, comply with the requirements of the wiring regulations of the region.
- For the power cable of the outdoor unit parts, use a standardized products.
- Do not connect the ground wire to any gas pipes, liquid pipes, lightning rod or telephone ground wire.
- Make sure to use the leakage circuit breaker.

**! WARNING**

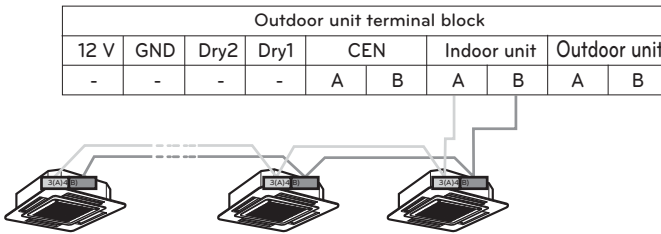
- Make sure to use specified cables for connections so that no external force is imparted to terminal connections. If connections are not fixed firmly, it may cause heating or fire.
- Make sure to use the appropriate type of overcurrent protection switch. Note that the generated overcurrent may include some amount of direct current.
- The earth leakage circuit breaker should be installed. Otherwise, there is a risk of electric shock.
- Do not use anything other than the breaker and the fuse with correct capacity.  
Using the fuse, cable, or cooper wire with too large capacity may cause a malfunction or fire.
- Be sure not to make the 3-phase 4-wire system of the indoor unit connection as a reversed phase or open phase when connecting.
- Use round pressure terminals for connections to the power cable. It may cause fire or flame damages on the electrical parts.
- When installing the main power, make sure to have N phase. If the voltage of R.S.T. phase is impressed in the "N" phase, it causes fire damage on the valuable electric components.

## Examples of Transmission Cable



※ Caution 1. It may be different according to specification of a voltage.

### Between outdoor and indoor units

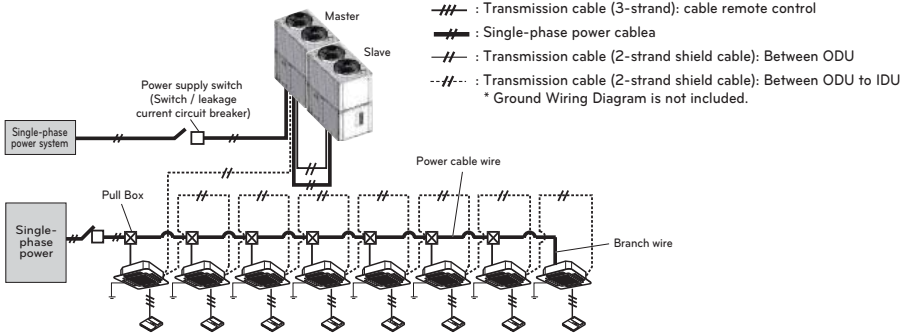


※ Caution 1. It may be different according to specification of a voltage.

### ! WARNING

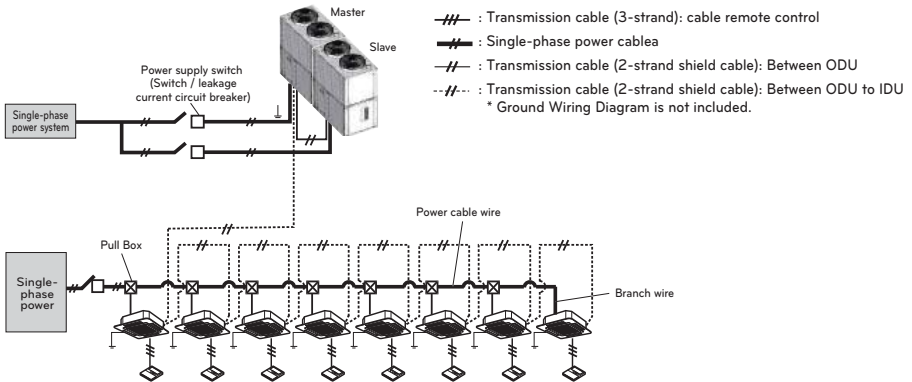
- Install the earth leakage circuit breaker.
- For the indoor unit grounding, the earth wire is needed to prevent the electric shock in case of a short circuit, the communication problems due to noise, and the motor leakage current. (It is not connected to piping.)
- Only one point grounding in the outdoor unit should be done for the transmission cable grounding.
- Do not install any 'individual switch or electrical outlet' to disconnect each of indoor unit separately from the power supply.





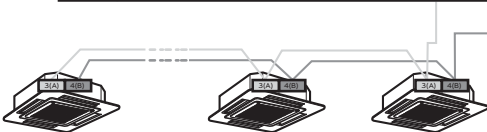
**! WARNING**

- The indoor unit grounding needs the ground wire to prevent the indoor unit short circuiting, to prevent a communication failure due to noise and to prevent a motor current leakage. (Not connected to piping)
- For communication cables, grounding should be a single point ground on the outdoor unit.
- Do not install an individual switch or an individual wall outlet which can block the power supply to each indoor unit connected to the outdoor unit.



Between the IDU to Master ODU

CN06-COMM-TB									
12 V	GND	Dry2	Dry1	CEN	IDU		ODU		
-	-	-	-	A	B	A	B	A	B

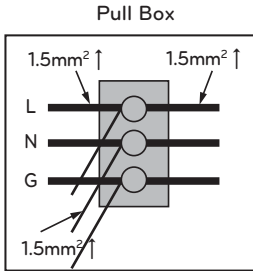


## Between the Slave IDU To Master ODU

CNO6-COMM-TB									
12 V	GND	Dry2	Dry1	CEN		IDU		ODU	
-	-	-	-	A	B	A	B	A	B

CNO6-COMM-TB									
12 V	GND	Dry2	Dry1	CEN		IDU		ODU	
-	-	-	-	A	B	A	B	A	B

- \* GND is a "-" terminal for dry contact of the outdoor unit. GND does not mean ground.
- \* Check if the terminals of the master and slave outdoor units are compatible (for example, A-A and B-B).



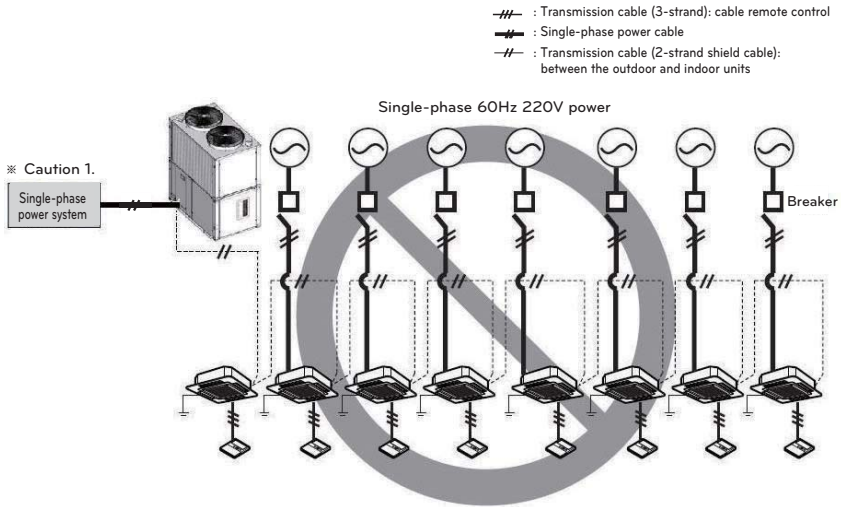
- \* Consider the capacity of all indoor units that are connected

### ⚠ WARNING

- Install the ELCB.
- The indoor unit grounding needs the ground wire to prevent the indoor unit short circuiting, to prevent a communication failure due to noise and to prevent a motor current leakage. (Not connected to piping)
- For communication cables, grounding should be done only to Single point ground of the outdoor unit.
- Do not install an individual switch or an individual wall outlet which can block the power supply to each indoor unit connected to the outdoor unit.

## Examples of Bad Power Cable Connections

Do not connect the power of each indoor unit separately as below.



※ Caution 1. It may be different according to specification of a voltage.

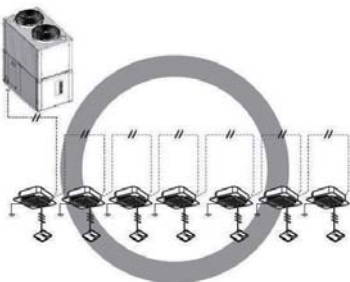
### ! WARNING

Do not install any 'individual switch or electrical outlet' to disconnect each of indoor unit separately from the power supply.

## Transmission cable connection between the outdoor and indoor units

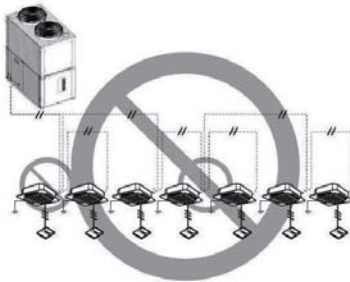
[BUS type]

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

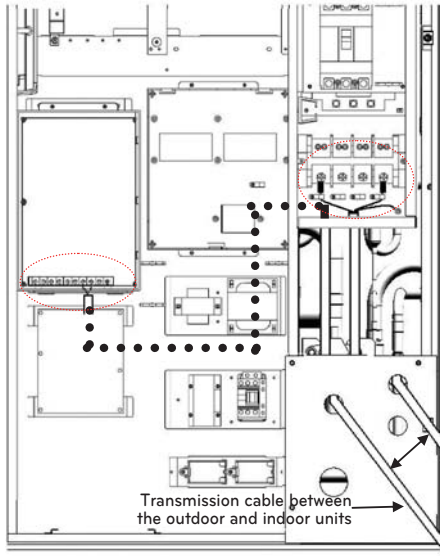


[STAR type]

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

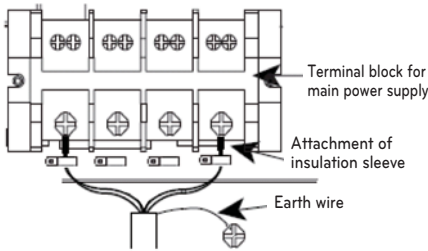


## Outdoor Unit Wiring Connection



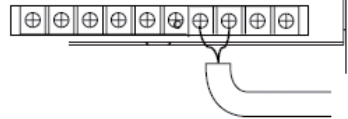
- Main Power Cable Connection**
1. Fix it firmly so that it does not slip.
  2. Attach the insulation sleeve.
  3. Make sure to do grounding work.

Keep the separation distance of more than 50mm between the main power cable and the transmission cable.



Main power cable/earth wire connection

Outdoor unit terminal block									
12 V	GND	Dry2	Dry1	CEN		Indoor unit		Outdoor unit	
-	-	-	-	A	B	A	B	A	B



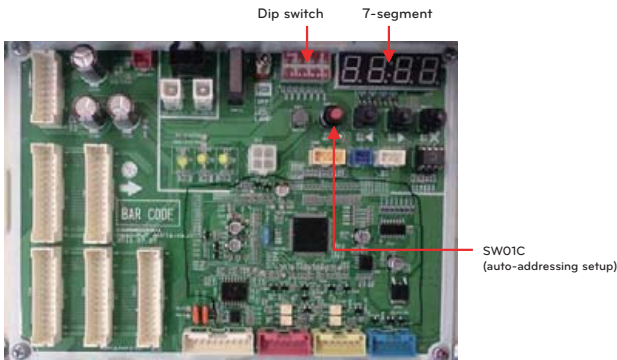
Transmission cable connection

## Automatic Addressing for Indoor Unit

The address of indoor unit will be set by auto addressing.

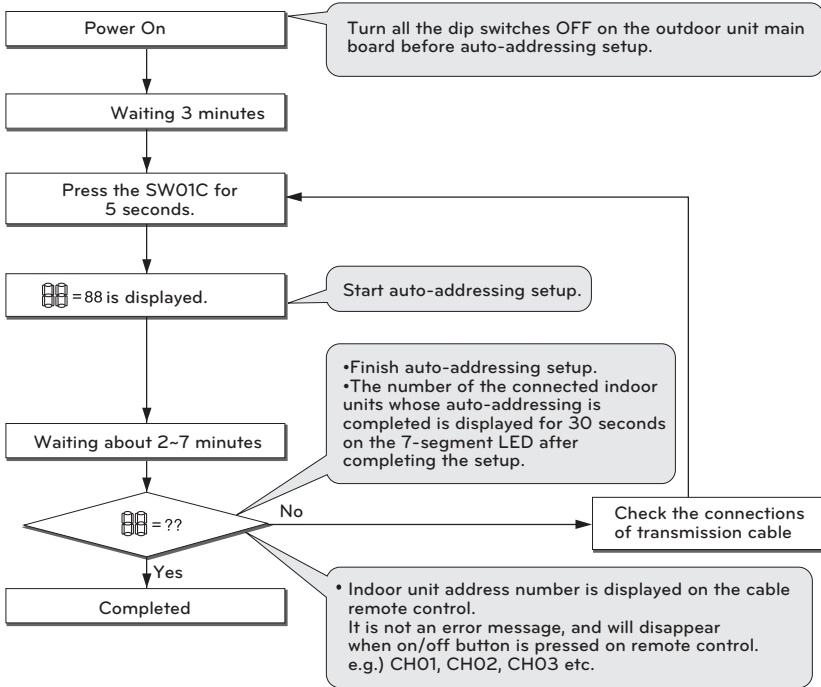
- Wait for 3 minutes after supplying power (outdoor unit, indoor unit)
- Press the switch (SW01C) of the indoor unit for 5 seconds.
- "88" will be displayed on the 7-segment LED of the outdoor unit main board.
- It will take 2~7 minutes to complete the auto addressing depending on the number of indoor units connected.
- After the completion of auto-addressing, the number of the connected indoor units whose addressing is completed is displayed for 30 seconds on the 7-segment LED of the outdoor unit main board.
- After the completion of auto-addressing, address of each indoor unit is displayed on the cable remote control. (CH01, CH02, CH03, .....CH06 : displayed as the number of connected indoor units)

### Main board



### ! WARNING

- In replacement of the indoor unit PCB, always perform the Auto-addressing settings again. Make sure to perform the reset with the power of all the outdoor and indoor units connected. If power supply is not applied to the indoor unit, an operation error will occur. (Auto-addressing setup cannot be done while the indoor unit is operating.)
- Auto-addressing for **GHP SUPER** has to be performed in 3 minutes after the initial power supply to improve the transmission.  
Turn all the dip switches OFF on the outdoor unit main board before auto-addressing setup.



## DIP Switch Setup

The number is sequentially appeared on the 7-segment. (The farthest dip switch from the 7-segment is granted the first number 1.)

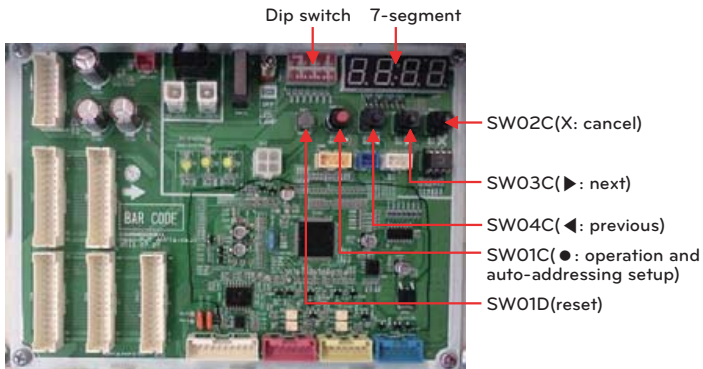
Check the settings after the dip switch setup

- After the dip switch setup, turn ON the outdoor unit power then you can check the setting values of the outdoor unit on the 7-segment LED.
- The display will last only 2 seconds after applying the power.
- It checks whether the input is properly performed without the bad contact of the dip switch.

### CAUTION

Improper setup of the dip switch will cause a malfunction of the unit.

## Main board



For the master ODU

DIP switch settings	Remark
	Factory settings Normal mode

For the slave ODU (if there is only one ODU, only apply the settings to the master ODU).

DIP switch settings	Remark
	The slave outdoor unit must be configured.

## Master Outdoor Unit Settings Check

The numbers should display one by one on 7-segment after the power is turned on.

The numbers correspond to each setting.

<Display Order>

① Master model capacity → ② Slave model capacity → ③ Total capacity → ④ System type →  
⑤ Power type → ⑥ Product type

<Example>

When the series model is 127 kW (45 HP) (380 V) which is a two-unit (R410A refrigerant) (380 V) combination of 56 kW (20 HP) and 71kW (25 HP)

① 25 → ② 20 → ③ 45 → ④ 1 → ⑤ 38 → ⑥ 1

E.g. Meaning of Symbols

Symbol	Number	Meaning
①	16 ~ 25	Master model capacity
②	16 ~ 25	Slave model capacity
③	16 ~ 50	Total capacity
④	1	Heat Pump
⑤	38	380 V model
	125	220 V 50 Hz model
	126	220 V 60 Hz model
⑥	1	High efficiency model

Capacity by Models

Number	Capacity (kW)	Capacity (HP)	Remark	Refrigerant
16	45	16	Same for master and slave	R410A
20	56	20		
25	71	25		



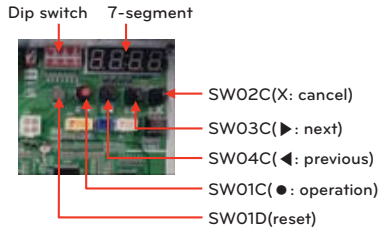
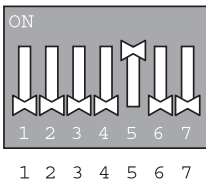
# ADDITIONAL FUNCTIONS

## Additional Functions Setup

Lift the dip switch #5 up to set up the additional functions you desire by using the buttons.

### CAUTION

You will be able to set the switch functions only when the power (all of the indoor units) is OFF.



Mode		Function		Option		Value		Action		Remarks (save)	
Contents	Display	Contents	Display	Contents	Display	Contents	Display	Contents	Display		
Installer setup function	Func	COOL & HEAT selector	Fn1	OFF	pp1~op2	Selected value display	-	-	Setup application	N/A	EEPROM save
		Static pressure mode	Fn2	OFF	pp1~op3	Selected value display	-	-	Setup application	N/A	EEPROM save
		Night low noise mode	Fn3	OFF	pp1~op12	Selected value display	-	-	Setup application	N/A	EEPROM save
		Outdoor unit address	Fn5	-	-	-	0~255	Selected value	Setup application	N/A	EEPROM save
		Snow removal + forced defrost	Fn6	OFF	Op1 (snow removal / defrost)	Selected value display	-	-	Setup application	N/A	EEPROM save
		Target pressure modification	Fn8	OFF	pp1~op4	Selected value display	-	-	Setup application	N/A	EEPROM save

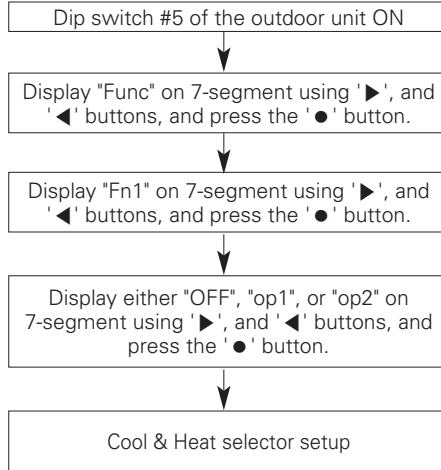
### CAUTION

The functions saved in EEPROM remain even after resetting. Setting it OFF is needed to cancel the function completely.

## Cool & Heat selector

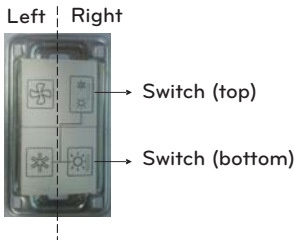
It controls the cooling/heating through a mode setup from the outdoor unit and the Cool & Heat selector switch.

### Mode Setup



### Function setting

Switch control		Function Setup		
Switch (top)	Switch(Bottom)	OFF	op1(ventilation function)	op2(indoor unit oFF function)
Right	Left	Not operate	Cooling	Cooling
Right	Right	Not operate	Heating	Heating
Left	N/A	Not operate	Fan mode	Off



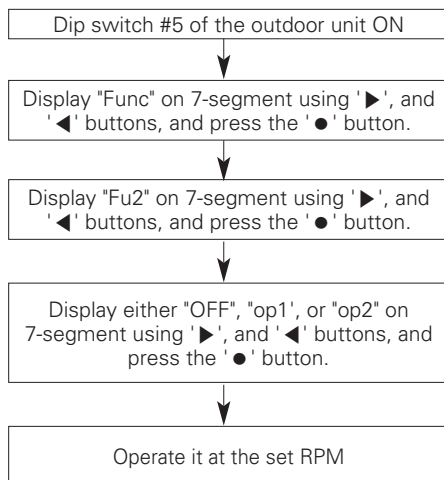
### CAUTION

- Ask the licensed installer for the function setup when installing the outdoor unit.
- Set it OFF if you do not use the function.
- It will operate only with the Cool & Heat selector installed.

## Static pressure compensation mode

Lift the dip switch #5 up to set up the additional functions as you desire by using the buttons. This function secures the air flow rate of outdoor unit, in case static pressure has been applied like using duct at fan discharge of the outdoor unit.

### Mode Setup



### Fan Rotation Setup

Volume	3Phase 380V 50Hz		1Phase 220V 50Hz	
	Cooling MAX. fan RPM	Heating MAX. fan RPM	Cooling MAX. fan RPM	Heating MAX. fan RPM
oFF	950	950	920	920
op1	1000	1000		
op2	1020	1000		
op3	1050	1000		



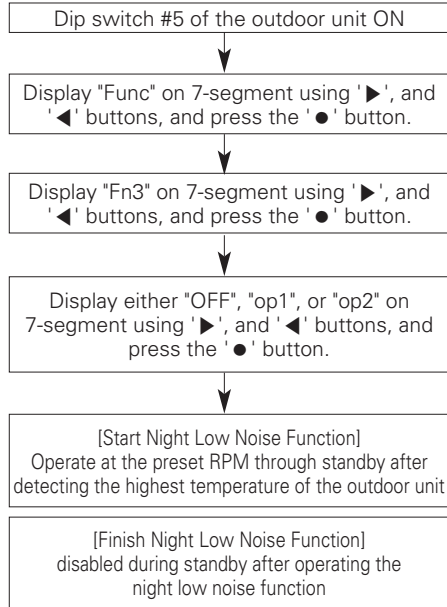
### CAUTION

- Ask the licensed installer for the function setup when installing the outdoor unit.
- Set it OFF if you do not use the function.

## Night Low Noise Mode

It allows the outdoor unit fan to rotate slower with a low fan RPM in order to reduce noise from the outdoor unit fan during nighttime when the cooling load is low.

### Mode Setup



### Time Setup

Step	Standby (Hr)	Operation (Hr)
op1	8	9
op2	6.5	10.5
op3	5	12
op4	8	9
op5	6.5	10.5
op6	5	12
op7	8	9
op8	6.5	10
op9	5	12
op10	Continuous operation	
op11	Continuous operation	
op12	Continuous operation	

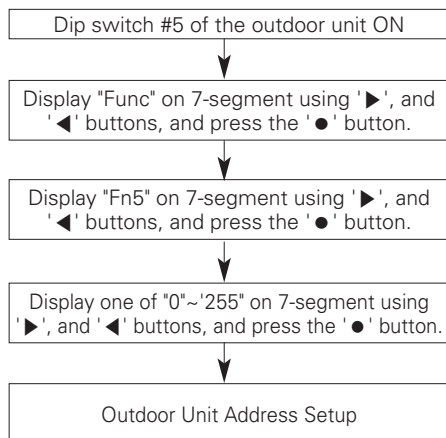
### ⚠ CAUTION

- Ask the licensed installer for the function setup when installing the outdoor unit.
- Set it OFF if you do not use the function.
- Changes in the outdoor unit RPM may reduce the cooling performance.

## Outdoor Unit Address Setup

It is an address setup function for the outdoor unit in order to distinguish the outdoor units from each other when installing the central control system.

### Mode Setup



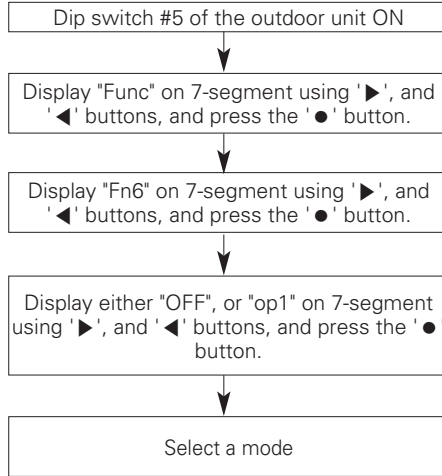
### CAUTION

- Ask the licensed installer for the function setup when installing the outdoor unit.
- If the central control system is not installed, there will be no change even after the mode setup.

## Snow Removal Function

It operates a fan to prevent snow from piling up in the area of heavy snow.

### Mode Setup



### Mode Setup

Settings	Modes
OFF	None (N/A)
op1	Start forced defrost/snow removal

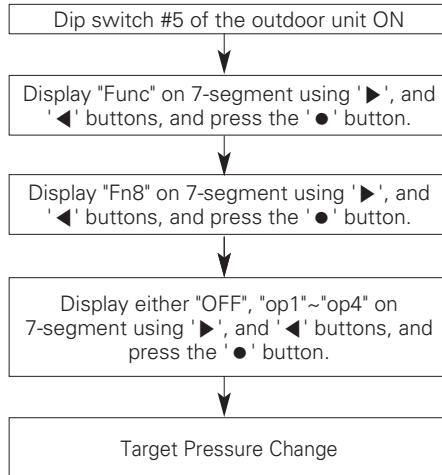
### CAUTION

- Ask the licensed installer for the function setup when installing the outdoor unit.
- Set it OFF if you do not use the function.

## Target Static Pressure Setup

It is used to change the target value of the outdoor unit and adjust it to the purpose of use.

### Mode Setup



### Target Pressure Setup

mode	Purpose	Condensing temperature variation	Evaporating temperature variation
op1	Capacity Improvement Stage 1	-3 °C	+2 °C
op2	Capacity Improvement Stage 2	-1.5 °C	-2 °C
op3	Energy Saving Stage 1	+2.5 °C	-4 °C
op4	Energy Saving Stage 2	-4.5 °C	-6 °C



### CAUTION

- Ask the licensed installer for the function setup when installing the outdoor unit.
- Set it OFF if you do not use the function.
- The capacity may decline or the power consumption may increase.

# SELF-DIAGNOSIS FUNCTION

## Self-Diagnosis Function

### Error Indicator

- This function indicates types of failure in self-diagnosis and occurrence of failure for air conditioner.
- Each error mark is displayed on the cable remote control, the 7-segment LED of the outdoor unit control board as shown in the table.
- If more than two troubles occur simultaneously, lower number of the error code is first displayed.
- The error code displayed will disappear after the error is corrected.

### Error Display

- 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> LED of 7-segment indicate the error code number, and the 4th LED indicates the unit number.
- e.g.) 1131: error number 113 of the 1st outdoor unit (No.113 error)
- For the indoor unit errors, it does not display on the 7-segment but only on the indoor unit remote control.
- e.g.) CH→ 01: error number 1 (No.1 error)



Display	Error types	Cause of error	
Indoor unit related error	1	Air temperature sensor error of indoor unit	Air temperature sensor of indoor unit disconnection or short circuit
	2	Inlet pipe temperature sensor error of indoor unit	Inlet pipe temperature sensor disconnection or short circuit
	3	Communication error between cable remote control and indoor unit	The cable remote control fails to receive the signals from indoor unit
	4	Indoor drain error	Malfunction of drain pump or float switch
	5	Communication error between outdoor and indoor units	Indoor unit fails to receive the signals from indoor unit for more than 5 minutes in a row
	6	Outlet pipe temperature sensor error of indoor unit	Inlet pipe temperature sensor of indoor unit disconnection or short circuit
	9	Indoor unit EEPROM error	Communication error between MICOM and EEPROM or omission of EEPROM data (indoor unit)
	10	Indoor unit BLDC Motor Feedback signal error	Motor connector removed or motor error
	11	Communication error between outdoor and indoor units	Indoor unit fails to receive the auto-addressing calling signal for a certain amount of time



Display	Error types	Cause of error	
Outdoor unit related error	22	Inverter Board Input Over Current(RMS) of Master Outdoor Unit	Master Outdoor Unit Inverter Board Input Current excess (RMS)
	24	High-pressure switch operation	Discharge pressure increase due to compressor discharge pressure error or clogged pipe
	25	High/low-pressure of input voltage	Unstable input voltage
	32	Excessive increase of compressor discharge temperature	Insufficient refrigerant or hot gas bypass error/EEV error
	34	Excessive increase of high-pressure	Discharge pressure increase due to compressor discharge pressure error or clogged pipe
	35	Excessive decrease of low-pressure	Inlet pipe is clogged or refrigerant is insufficient
	36	Low compression ratio error	Compressor capacity control valve error or compressor error/valve tension error
	41	Compressor discharge temperature sensor error	Compressor discharge temperature sensor disconnection or short circuit
	42	Low-pressure sensor error	Low-pressure sensor disconnection or short circuit
	43	High-pressure sensor error	High-pressure sensor disconnection or short circuit
	44	Air temperature sensor error of indoor unit	Outdoor unit air temperature sensor disconnection or short circuit
	46	Inlet temperature sensor error	Compressor inlet temperature sensor disconnection or short circuit
	50	Open phase of outdoor unit 3-phase power	One or more phase of the FAN inverter PCB TST phases is open
	51	Hyperconnected capacity error	Capacity of the connected indoor unit exceeds the limit capacity
	52	Fan Board communication error	Communication error with the Fan PCB
	53	Communication error between outdoor and indoor units	Data of the indoor unit connected to the outdoor unit fails to receive the signals for more than 3 minutes after successfully communicating more than one time.
	54	Reversed phase of outdoor unit 3-phase power	RST phase is reversed connected to the inverter PCB
	60	Inverter PCB EEPROM Error of Master Outdoor Unit	Access Error of Inverter PCB of Master Outdoor Unit
	67	Fan Lock	FAN motor's burnt damage and electric breakdown/other impurities
71	Converter CT Sensor Error of Master Outdoor Unit	Converter CT Sensor open or short of Master Outdoor Unit	
75	Fan CT Sensor error	CT sensor disconnection or short circuit	
76	Fan DC Link high-voltage error	Fan PCB detects the DC Link voltage exceeds the limit voltage	
77	Fan overvoltage error	Fan PCB detects the DC Link voltage exceeds the limit voltage	

Display	Error types	Cause of error
79	Fan operation failure error	Fan operation error
86	Main PCB EEPROM error	Main PCB EEPROM Access error
87	Fan PCB EEPROM error	Fan PCB EEPROM Access error
104	Communication Error Between Master Outdoor Unit and Other Outdoor Unit	Failing to receive Slave Unit signal at main PCB of Master Outdoor Unit
105	Fan board communication error	Communication error with the Fan PCB in the Inv PCB
106	Fan PCB IPM Fault error	H/W excess current of Fan PCB
107	Fan DC Link low-voltage error	Fan PCB detects the DC Link voltage drops below the limit voltage
108	Fan PCB communication error	Communication error with the Main PCB in the Fan PCB
113	Liquid pipe temperature sensor error	Liquid pipe temperature sensor disconnection or short circuit
115	Supercooling outlet temperature sensor error	Supercooling outlet temperature sensor disconnection or short circuit
145	External PCB communication error	Communication error between the Main and the External PCB
151	4Way valve transfer failure	4Way valve transfer failure
152	Operation failure	It occurs in case of fuel gas error/starter error/ignition plug error/inlet air blocked
153	Engine RPM low error	It occurs in case of fuel gas error/starter error/ignition plug error/inlet air blocked
154	Engine RPM high error	ECU/throttle fuel control valve error
155	Coolant temperature high error	Coolant flow error (coolant pump/engine 3-phase valve/plate 3-phase valve error)
156	Hydraulic pressure switch error during operation	Insufficient engine oil
157	Engine oil change warning	1. It indicates the need for regular maintenance (warning before 10,000 hours) 2. after 10,500 hours from the warning, the engine will go out of operation
158	Coolant pump electric current error	Bubbles in coolant/sludge in the pump and fire damage
159	Starter Motor electric current error	Sludge built up in the engine or combustion damage on the motor
160	Coolant temperature low error	Temperature sensor error
161	RPM difference error	ECU data error/engine tracking error

Outdoor unit related error

Display	Error types	Cause of error	
Outdoor unit related error	162	Exhaust gas high error	Coolant system error
	163	No.1_Comp error	Compressor No.1 liquid compress and combustion damage/ engine tracking error
	164	No2._Comp error	Compressor No.2 liquid compress and combustion damage/ engine tracking error
	165	High compression ratio error	Compression ratio error
	166	Water sensor error	Engine water sensor is disconnected/ contact error
	167	Throttle sensor error	Throttle sensor is disconnected/ contact error
	168	Map sensor error	Map sensor is disconnected/ contact error
	170	Air sensor error	Ari sensor error
	172	Oil hydraulic pressure switch error during suspended operation	Oil hydraulic pressure switch error
	173	Controlled shutdown	It occurs when the switch is set to ON
	174	Coolant level error	No coolant left in the coolant supplemental(backup) tank
	175	Pump CT sensor error	Combustion damage on the CT sensor
	176	Oil level low error	Engine oil replenishment is needed
	177	Engine room temperature sensor error	Engine room temperature sensor disconnection or short circuit
	178	Exhaust gas temperature sensor error	Exhaust gas temperature sensor disconnection or short circuit
	180	ECU communication error	Poor communication/ unstable voltage
	181	Compressor 1 oil temperature sensor error	Compressor No.1 temperature sensor disconnection or short circuit
	182	Compressor 2 oil temperature sensor error	Compressor No.2 temperature sensor disconnection or short circuit
	183	Oil separator oil temperature sensor error	Oil separator oil temperature sensor disconnection or short circuit
	187	Hydro-Kit PHEX bursting error	Inlet water temperature is below 5 degree
193	Master Outdoor Unit Fan Heatsink High Temperature	System is turned off by Master Outdoor Unit Fan Heatsink High Temperature	
194	Master Outdoor Unit Fan Heatsink Temperature Sensor Fault	Master Outdoor Unit Fan Heatsink Temperature Sensor open or short	

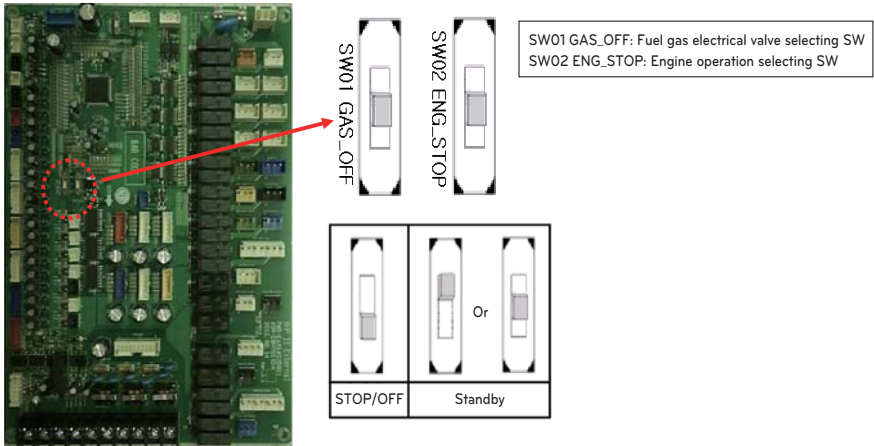
## ! CAUTION

### Error message 157

If the "oil check" displays in the indoor unit remote control, it indicates that it is time to replace the oil which has to be done every 10,000 hours.

If you do not get a maintenance check within 500 hours after the sign displayed, the indoor unit will not be able to operate.

## Operation restriction of the outdoor unit prior to maintenance



Move the fuel gas electrical valve selecting switch(SW01) to 「STOP/OFF」position.

→ It is a switch designed to restrict the motion of the fuel gas valve. In order to cancel it, move the switch to 「STANDBY」position.

If the engine operation selecting switch(SW02) is positioned in 「STOP/OFF」, it will restrict the engine operation and stop it.

→ It is a switch designed to restrict the operation of the engine. In order to cancel it, move the switch to 「STANDBY」position.

## ! WARNING

Make sure that both fuel gas electrical valve selecting switch and the engine operation selecting switch are positioned in 「STOP/OFF」before an engine checkup.

# REGULAR MAINTENANCE

## Regular Maintenance

Performing a maintenance on a regular basis is important requirement to maintain the engine's best condition.

Give special attention to the safety matters when replacing parts or during the maintenance.

### - Warranty Period

This product has full one-year warranty from the day when the test run is completed.

- Regular maintenance service is provided by the company even after the warranty period is over because the extended maintenance in a regular basis is needed for the safety and convenience of the customers. The regular maintenance contract is made about the items as follows. Contact the retail store/AS team for more details.

Regular maintenance/ regular parts replacement period and the parts list					
Maintenance checklist			Maintenance period		
Maintenance checklist	System condition checkup	Operation data records/diagnosis		Every year or every 2,000 hours	
		Refrigerant leakage detection			
	Engine and other equipment checkup	Main engine checkup	Start performance checkup		Every year or every 2,000 hours
			Noise/vibration checkup		
			Harness system checkup		
			Mixer cleansing		
			Valve clearance checkup/(adjust if necessary)		
		Coolant system checkup	Leakage detection		
			Gravity measurement supplement/supplement		
			Oil leak detection/change/refill		
Engine oil system checkup	Oil leak detection/change/refill				
Exhaust gas system checkup	Exhaust gas line leakage detection				
Fuel gas system checkup	Safety device operation checkup/leakage detection				
Parts to be regularly replaced	Engine oil & Oil filter	Replacement	Every 5 years or every 10,000 hours		
	Air cleaner element				
	Ignition plug				
	Compressor drive belt				
	Drain filter refill/cleaning				
	Coolant checkup/refill				

Regular maintenance means a general maintenance every year including the replacement of regular parts. Each maintenance should be given every 10,000 hours or 5 years after the previous maintenance. (whichever comes first)

- The heat exchanger fins cleansing is usually performed every 3~4 years, depending on the operational conditions. If dust or impurities stick to the heat exchanger fins of the outdoor/indoor units, it may cause a poor performance or malfunction. Thus, cleansing the fins is needed to extend the lifespan of the unit. This service involves extra charges.

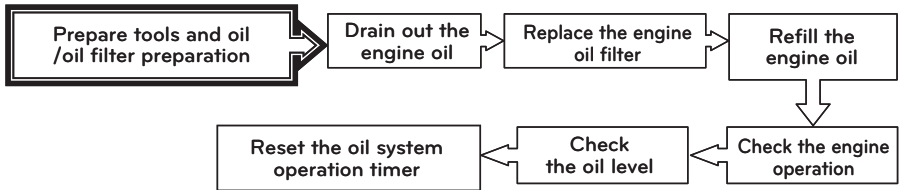
## Engine oil and oil filter replacement/refill

### ! CAUTION

- In order to cool down completely, stop the unit 1~2 hours prior to maintenance/replacement. If you touch a heated area of the outdoor unit parts which was in operation, it may cause burns.
- Make sure to shut off the power breaker of the outdoor control panel when performing internal work on the outdoor unit. If the indoor unit is operated by the customer's remote control during internal work, it may cause injury or equipment damage.
- Use authentic products from LG electronics for the parts replacement. Use of inauthentic parts or oil can cause malfunction of the unit and the customer will be responsible for any damages involved.

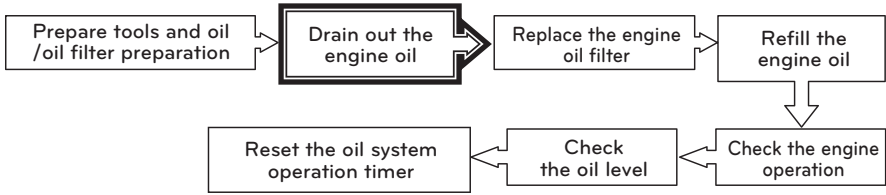
### \* Maintenance/replacement of engine oil system

- Replacement of engine oil and oil filter should be performed every 10,000 hours or every 5 years. (whichever comes first)
- Be sure to replace the engine oil and oil filter together.
- Use the authentic product of the company for the engine oil/oil filter replacement. For the engine oil replacement, be sure to replace the engine oil pan of engine room and the oil of oil tank together.



Refer to the following table to prepare the tools and parts necessary for the replacement/maintenance.

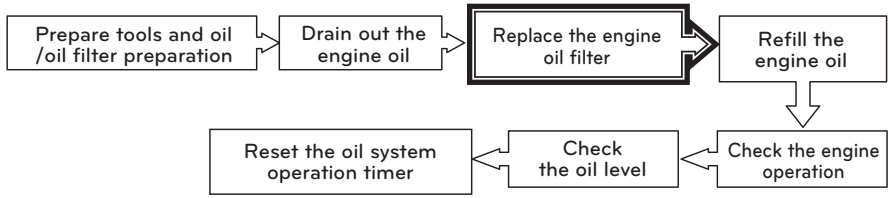
Required tools and parts	Specifications and Stock No.	Quantity	Remarks
LG electronics authentic oil	Dedicated (exclusive)	45 L	10 W ~ 40
Oil filter	Dedicated (exclusive)	1	
Spanner	Size 10mm	1	
Oil filter wrench		1	
Oil filter pump		1	Engine oil exclusive (no moisture/dust)
Measuring container	5 ~ 10 L	1	For measuring when pumping the oil
Oil tray		1	
Waste oil container	30 ~ 40 L	1	
Oil cleaner cloth	Dry cloth	1	



### Drain the engine oil out of the sub oil pan and inside the engine

- Stop the engine by controlled shutdown before the maintenance. (refer to 'Operation restriction of the outdoor unit prior to maintenance' in the 'Self-diagnosis')
- Remove the cap from the top of the oil tank and drain out the oil with an oil filter pump as shown in the picture. Perform the same for the level sensing tank.
- Dispose of the waste oil into a waste oil container.
- Dispose of the waste oil from inside the engine into the waste oil container after removing a hose on the bottom.
- Be sure to take a time to drain out the waste oil completely.
- If you operate the engine for about 15 minutes before the drainage in winter, it will make the work easier. (be careful of the heated area)





### Drain the engine oil out of the sub oil pan and inside the engine

#### - Oil filter removal

Place an oil tray under the filter to prevent the remaining oil from running off during the oil filter removal.

Remove the oil filter by turning it with an oil filter wrench. (Figure 1)

#### - Oil filter installation

Apply a thin coat of oil to the O ring of the new oil filter. (Figure 2)

Put the oil filter in the oil filter frame located in the lower part of the engine side and tighten it up according to the designated tightening force. (Figure 3)

Tightening force: 21.6~24.5 N·m (2.2~2.5 kgf·m)

Wipe the dropping oil with a dry cloth.

### CAUTION

Avoid using an oil filter wrench when installing an oil filter.

Tightening excessively may cause a damage on the O ring and result in oil leakage.

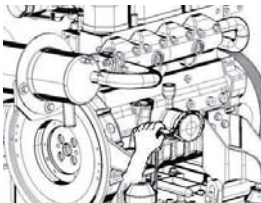


Figure 1 Oil filter removal

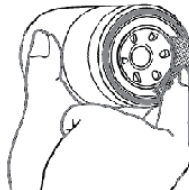


Figure 2 Apply oil

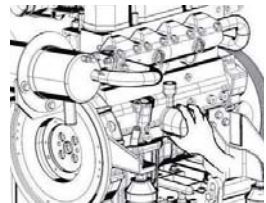


Figure 3 Install the oil filter replacement

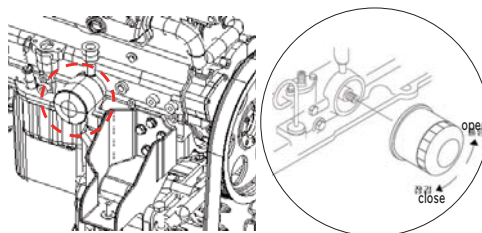
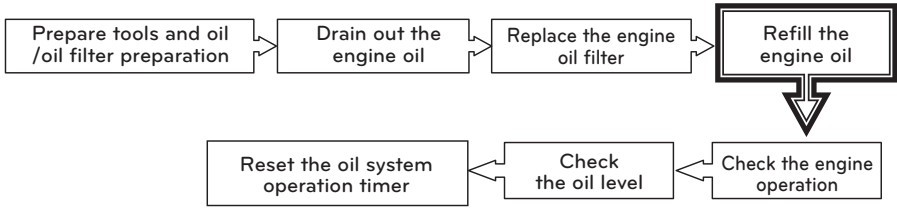


Figure 4 Oil filter location





### Refill the engine oil

Replenish the main oil tank, the level sensing tank, and the engine with new engine oil. Make sure to measure the amount of oil during the refill. (Figure 5)

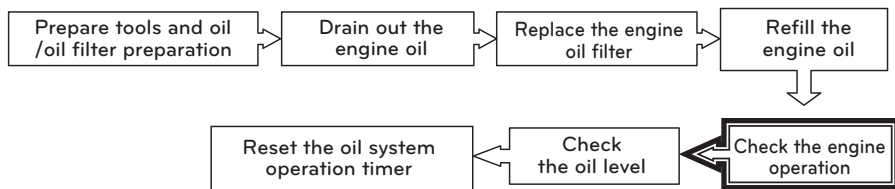


Figure 5 Engine oil refill

### ! CAUTION

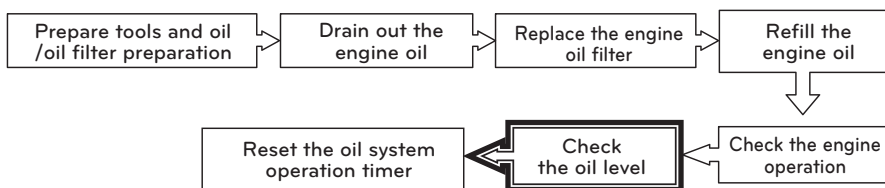
Make sure to draw off any excessive amount to maintain the designated/appropriate level. Overfilling can cause a problem for the engine and result in malfunction.

Wipe the spilled oil with a dry cloth.



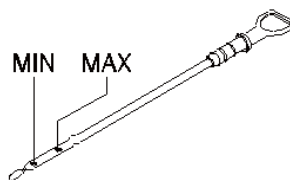
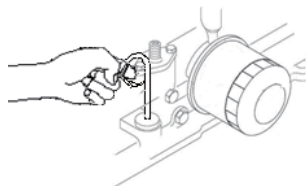
### Check the engine operation

- Flip on the ENG\_STOP switch(SW02) and the GAS OFF selecting switch(SW01) located in the external board of the outdoor unit control panel towards the 「Upward」 to turn ON. If the indoor user is selecting the operation mode, the outdoor unit can be operated by only flipping the ENG\_STOP switch(SW02) and the GAS OFF selecting switch(SW01). But if all the indoor units are turned off, the outdoor unit can be operated by connecting the MCS exclusive program.
- Run the system for about 15~20 minutes to check the oil filter and any oil leakage from other hoses.



### Check the oil level

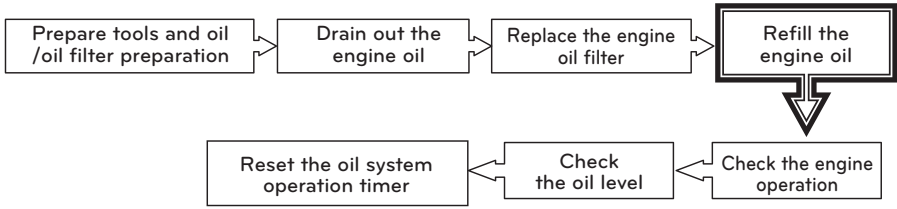
- Stop the engine and wait for 10 minutes  
In order to stop the engine, refer to ['Operation restriction of the outdoor unit prior to maintenance' in the 'Self-diagnosis'].
- Pull out the oil level gauge from the side of the engine and clean the gauge with a dry cloth. Insert the gauge all the way in and pull it out to check the oil level.  
Check the oil level if it is between the maximum level (MAX) and the minimum level (MIN).
- If the oil level is above MAX, draw some oil off.



Engine oil level gauge

### CAUTION

Be careful not to exceed the MAX level when supplying the oil.

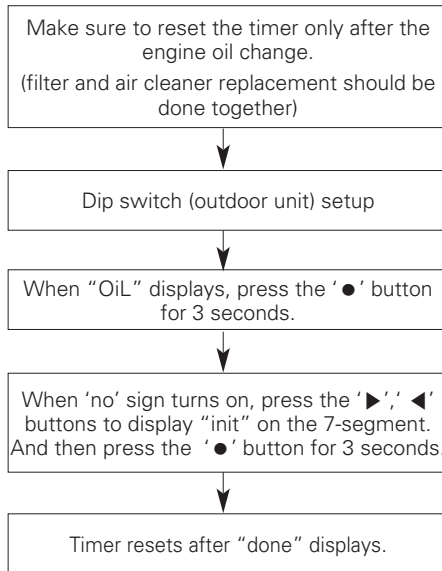


### Reset the oil system operation timer

- It resets a timer after the engine oil change.

Be sure to reset only after the engine oil change during the regular maintenance.

- Reset the engine oil change timer



### ! CAUTION

This function must be performed only after the engine oil replacement.

## Engine ignition plug replacement

### ⚠ CAUTION

- In order to cool down completely, stop the unit 1~2 hours prior to maintenance/replacement. If you touch a heated area of the outdoor unit parts which was in operation, it may cause burns.
- Make sure to shut off the power breaker of the outdoor control panel when performing internal work on the outdoor unit. If the indoor unit is operated by the customer's remote control during internal work, it may cause injury or equipment damage.
- Use authentic products from LG electronics for the parts replacement. Use of inauthentic parts or oil can cause malfunction of the unit and the customer will be responsible for any damages involved.

### \* Engine ignition plug replacement

Engine ignition plug should be replaced every 10,000 hours or 5 years. (whichever comes first)

Use the authentic products from LG electronics for the ignition plug replacement.

Replacement procedure is as follows.

Refer to the table below when preparing the tools and part required for the replacement/maintenance.

Necessary parts and tools	Specifications and Stock No.	Quantity	Remarks
Ignition plug		4	LG electronics authentic products
Screwdriver	+, -	1ea	
Plug wrench	Size 16mm	1	
Wire brush		1	
Torque wrench	6.4~29.4N·m	1	

### Outdoor unit panel removal

- Stop the engine by controlled shutdown before the maintenance. (refer to 'Operation restriction of the outdoor unit prior to maintenance' in the 'Self-diagnosis')

- Open the outdoor unit panel.

### Old ignition plug separation

- Separate the ignition plug from high-tension wire.

- Remove the ignition plug coil.

- Remove the ignition plug by loosening with a wrench(16mm size).

### New ignition plug replacement / installation

- Replace the old ignition plug with a new one and install it in reverse order as described above.



Figure 1. Ignition plug

## ⚠ CAUTION

- When removing a high-tension wire, be sure to hold the cap area. (refer to Figure 2)
- Be careful not to let any impurities inside the cylinder during the replacement.
- Use the 16mm ignition plug wrench socket. Using the wrong size tool (bigger size) may cause damages on the engine.
- Install the high-tension wire in the same spot as before the removal.

### Tightening torque

Joint parts	Tightening torque N·m (kgf·m)
Ignition plug	24.5~34.3 (2.5 ~ 3.5)

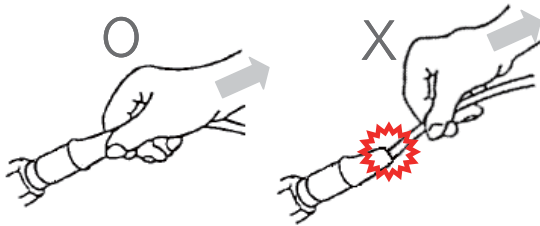


Figure 2. Ignition plug separation

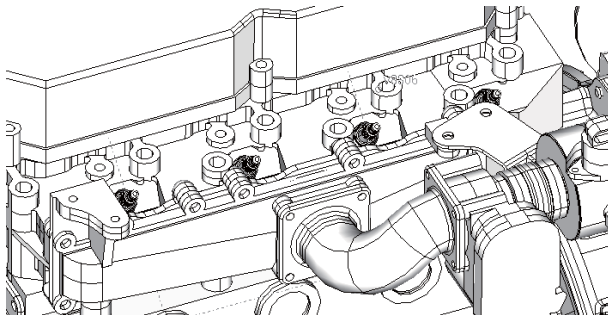


Figure 3. Tightening an ignition plug

### Check the engine operation

- Flip on the ENG\_STOP switch(SW02) and the GAS OFF selecting switch(SW01) located in the external board of the outdoor unit control panel towards the 「Upward」 to turn ON.
- If the indoor user is selecting the operation mode, the outdoor unit can be operated by only flipping the ENG\_STOP switch(SW02) and the GAS OFF selecting switch(SW01). But if all the indoor units are turned off, the outdoor unit can be operated by connecting the MCS exclusive program.

## Engine ignition plug replacement

### CAUTION

- In order to cool down completely, stop the unit 1~2 hours prior to maintenance/replacement. If you touch a heated area of the outdoor unit parts which was in operation, it may cause burns.
- Make sure to shut off the power breaker of the outdoor control panel when performing internal work on the outdoor unit. If the indoor unit is operated by the customer's remote control during internal work, it may cause injury or equipment damage.
- Use authentic products from LG electronics for the parts replacement. Use of inauthentic parts or oil can cause malfunction of the unit and the customer will be responsible for any damages involved.

### ※ Valve clearance checkup/adjustment

The valve clearance should be checked every 2,000 hours or one year and perform the adjustment if necessary.

When the rocker arm shaft(spindle) is removed due to a parts replacement, valve clearance should be adjusted as well.

Valve clearance checkup/adjustment proceeds as follows.

**Refer to the table below when preparing the tools and part required for the replacement/maintenance.**

Necessary parts and tools	Specifications and Stock No.	Quantity	Remarks
THICKNESS GAUGE	0.3 ~ 0.25mm	1	0.25mm (in cold)
Socket wrench	10 ~ 19mm	1ea	
Screwdriver		1SET	
Torque wrench	2.9~9.8 N·m 9.8~44.1 N·m	1ea	

### Valve clearance adjustment

Stop the engine by controlled shutdown before the maintenance. (refer to 'Operation restriction of the outdoor unit prior to maintenance' in the 'Self-diagnosis')

#### 1) Rocker cover removal/ top dead center checking

- Remove the high-tension wires of all cylinders and the blow-by hose, and then open the engine rocker cover. (size 12mm)
- Rotate the crank shaft pulley clockwise in order to position a far left groove from the crank pulley grooves (F) inside a timing gear (E) of a front case. (Figure 1)
- When there is a gap between an air intake & the exhaust rocker arm (G) of #1 cylinder and a valve cap, cylinder #1 is the compression top dead center. When there is a gap between the air intake & exhaust rocker arm (H) of cylinder #4 and the valve cap, cylinder #4 is the compression top dead center. Therefore, make sure to have the cylinder #1 be the compression top dead center by rotating the crank pulley 1 full revolution.

## 2) Valve clearance adjustment

- Adjust the air intake valve and the exhaust valve of the cylinder 1.
- Adjust the air intake valve of the cylinder 2.
- Adjust the exhaust valve of the cylinder 3.
- Rotate the engine crank shaft one time (360°) and adjust it to "0" marked on the crank shaft pulley. (top dead center of cylinder 4)
- Adjust the air intake valve and the exhaust valve of the cylinder 4.
- Adjust the air intake valve of the cylinder 3.
- Adjust the exhaust valve of the cylinder 2.

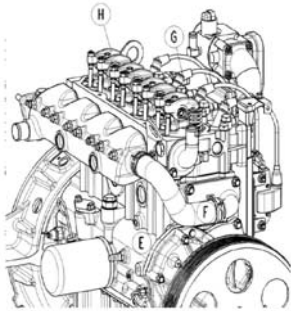


Figure 1. Check the top dead center (1)

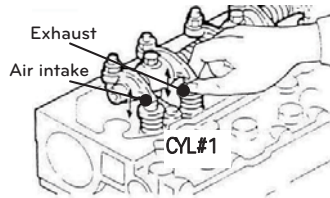


Figure 2. Check the top dead center (1)

※ The valve clearance adjustment proceeds as follows.

- Check if the push rod is easily moved by hand, and unfasten the check nut. Loosen the jack bolt a little bit using a screwdriver and insert the THICKNESS GAUGE. Turn the jack bolt to adjust the valve clearance. After completing the adjustment, fasten the jack bolt and the check nut. (Figure 3)

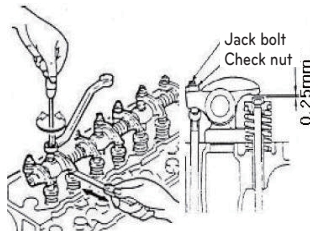


Figure 3. Valve clearance adjustment

- The valve clearance should be adjusted in cold. (air intake/exhaust clearance cold 0.25mm)
- Check nut tightening torque: 27~34 N·m

Cylinder number	1		2		3		4	
Valve	Air intake	Exhaust	Air intake	Exhaust	Air intake	Exhaust	Air intake	Exhaust
Top dead center of cylinder 1	●	●	●			●		
Top dead center of cylinder 1				○	○			○

### 3) After adjustment

Put the engine rocker cover and the high-tension wire back together.

(Rocker cover tightening torque: 10.8~12.8N·m / 1.1~1.3 kg·m)

### Check the engine operation

Flip on the ENG\_STOP switch(SW02) and the GAS OFF selecting switch(SW01) located in the external board of the outdoor unit control panel towards the 「Upward」to turn ON. Check for any abnormal sound during the operation.

If there is an abnormal sound, check the engine operation again.



## Air cleaner filter replacement

### CAUTION

- In order to cool down completely, stop the unit 1~2 hours prior to maintenance/replacement. If you touch a heated area of the outdoor unit parts which was in operation, it may cause burns.
- Make sure to shut off the power breaker of the outdoor control panel when performing internal work on the outdoor unit. If the indoor unit is operated by the customer's remote control during internal work, it may cause injury or equipment damage.
- Use authentic products from LG electronics for the parts replacement. Use of inauthentic parts or oil can cause malfunction of the unit and the customer will be responsible for any damages involved.

### \* Air cleaner filter replacement

- The clogged air cleaner reduces the amount of air intake and causes malfunction of the engine.  
Thus, the air cleaner should be replaced regularly. If the unit is installed in the area of heavy dust or oil, replace the air cleaner in advance.
- The air cleaner should be replaced every 10,000 hours or 5 years. (whichever comes first)
- Use the authentic products from LG electronics for the air cleaner replacement.
- The air cleaner replacement proceeds as follows.

Refer to the table below when preparing the tools and part required for the replacement/maintenance.

Necessary parts and tools	Specifications and Stock No.	Quantity	Remarks
Air cleaner element		1	LG electronics authentic products (FPG)
Spanner	Size 10mm	1	

### Air cleaner element replacement and cover maintenance

- Stop the engine by controlled shutdown before the maintenance. (refer to 'Operation restriction of the outdoor unit prior to maintenance' in the 'Self-diagnosis')
- Remove the right side panel on the bottom front of the outdoor unit.
- Loosen the clamps(3 spots) of the air cleaner cover and check for the Vacuator valve V/V located at the end of the cover.  
Replace the valve if damaged.
- \* What is a Vacuator valve? It is a device to automatically discharge any dust particles inside the air cleaner.
- Replace the used filter element with a new one. (Figure2, Figure3)
- Wipe off the dust insider the air cleaner before replacing.
- Put the cover back together and tighten the clamp. When installing the cover, always keep the Vacuator valve facing downward. (Figure 4)



Vacuator Valve

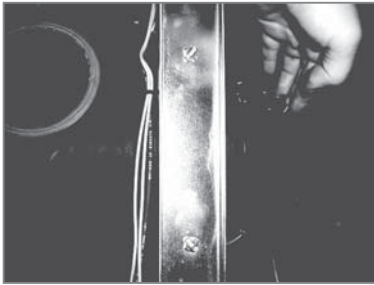


Figure 1 Loosening a clamp

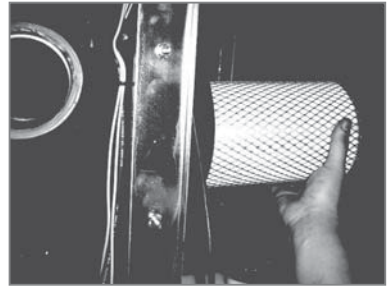


Figure 2 Removal of the used element/cleaning inside

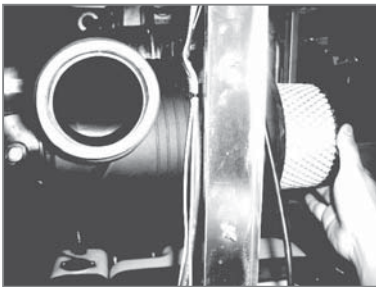


Figure 3 Element replacement

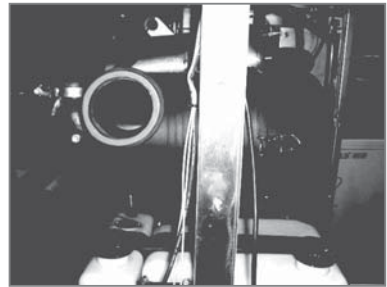


Figure 4 tightening a clamp

**! CAUTION**

- The element has a drying system. Do not use oil.
- If the unit is installed in the area of heavy dust or oil, replace the air cleaner more frequently.

## Compressor drive belt replacement

### ⚠ CAUTION

- In order to cool down completely, stop the unit 1~2 hours prior to maintenance/replacement. If you touch a heated area of the outdoor unit parts which was in operation, it may cause burns.
- Make sure to shut off the power breaker of the outdoor control panel when performing internal work on the outdoor unit. If the indoor unit is operated by the customer's remote control during internal work, it may cause injury or equipment damage.
- Use authentic products from LG electronics for the parts replacement. Use of inauthentic parts or oil can cause malfunction of the unit and the customer will be responsible for any damages involved.

### \* Compressor drive belt replacement

- The drive belt should be replaced every 10,000 hours or 5 years. (whichever comes first)
- Use authentic products from LG electronics for the drive belt replacement.
- (caution) Stop the engine by controlled shutdown before the maintenance. (refer to 'Operation restriction of the outdoor unit prior to maintenance' in the 'Self-diagnosis')

Refer to the table below when preparing the tools and part required for the replacement/maintenance.

Necessary parts and tools	Specifications and Stock No.	Quantity	Remarks
Drive belt	10 RIB	1	LG electronics authentic products
Torque wrench	8~200 N·m	1	
Socket wrench	10,19,22 mm	1st	
Spanner	19 mm	1	
Tension Meter		1	U-507

### Compressor drive belt replacement

- Loosen the compressor bracket fixing bolt. (refer to Figure1)

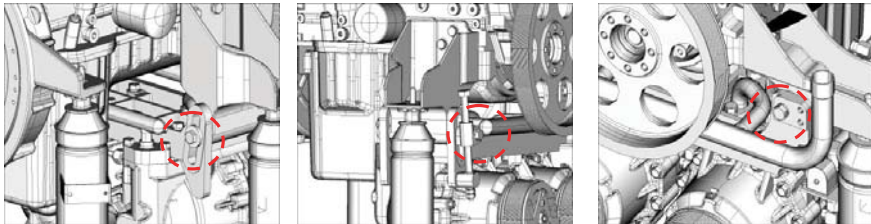


Figure 1 Location of the compressor bracket fixing bolt

- Remove a clip for fixing pipes. (Figure 2)

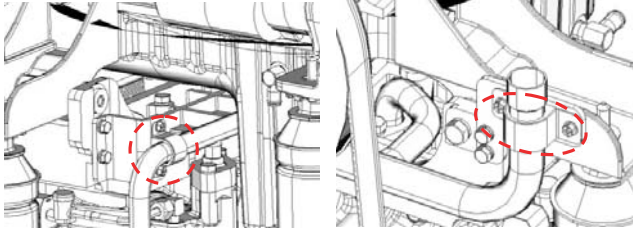


Figure 2 Removal of a pipe fixing bolt

### ⚠ CAUTION

Make sure to remove the clip for fixing pipes.

- Turn the tension balancer bolt counter clockwise to remove the belt. (Figure 3)
  - Counter clockwise: decrease in tension
  - Clockwise: increase in tension
- Adjust the belt tension after replacing with a new belt.

### \* Tension adjustment

- 1) Position a new belt onto pulley properly and screw the tension balancer bolt clockwise. Tension will apply onto the belt as a bracket declines. Check if the belt is out of the pulley. Adjust the tension, preventing the belt from slipping out of the pulley.
- 2) Adjust the tension until the proper tension (tension limit) is achieved. Belt tension: 1,400~1,500N (initial) You can measure the current tension more easily if you use ultrasound tension meter.
- 3) Belt tensioning is not adjusted to 1. First, adjust the tension and rotate the engine pulley one or two times by hands. Then, check the tension again. You will see the tension drops. And then, adjust the tension again by turning the tension balancer bolt. When the proper tension is achieved, rotate the engine pulley again to check the tension. Repeat it several times to achieve the tension limit.

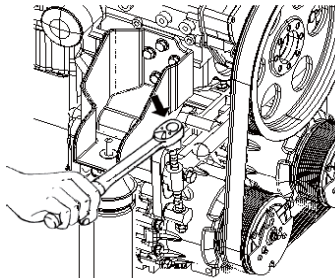


Figure 3 Tension balancer bolt/tensioning

- After completing the tensioning, tighten the compressor bracket fixing bolt. (tightening torque: 78~90 N·m)
- Put the pipe fixing clip back together to fix the compressor inlet/outlet pipes.

### Check the engine operation

Flip on the ENG\_STOP switch(SW02) and the GAS OFF selecting switch(SW01) located in the external board of the outdoor unit control panel towards the 「Upward」to turn ON. Check for any abnormal sound during the operation.

Check for an abnormal sound or wobbling belt during engine operation.

Readjust the tension if any problems appear.



### CAUTION

- During the belt replacement, be careful not to get your fingers caught in between the belt and the pulley. Do not grab the belt and perform the replacement work at the same time.
- Be sure to check for any misplaced/slipped belts after tensioning. Be sure to perform a test run.



Ultrasound tension meter

## Coolant checkup/refill

### CAUTION

- In order to cool down completely, stop the unit 1~2 hours prior to maintenance/replacement. If you touch a heated area of the outdoor unit parts which was in operation, it may cause burns.
- Make sure to shut off the power breaker of the outdoor control panel when performing internal work on the outdoor unit. If the indoor unit is operated by the customer's remote control during internal work, it may cause injury or equipment damage.
- Use authentic products from LG electronics for the parts replacement. Use of inauthentic parts or oil can cause malfunction of the unit and the customer will be responsible for any damages involved.

### \* Compressor drive belt replacement

- The drive belt should be replaced every 10,000 hours or 5 years. (whichever comes first)
- Use authentic products from LG electronics for the drive belt replacement.
- (caution) Stop the engine by controlled shutdown before the maintenance. (refer to 'Operation restriction of the outdoor unit prior to maintenance' in the 'Self-diagnosis')

Refer to the table below when preparing the tools and part required for the replacement/maintenance.

Necessary parts and tools	Specifications and Stock No.	Quantity	Remarks
Coolant/antifreeze solution	Ethylene glycol 100%	Moderate amount	
Distilled water	100% distilled water	Moderate amount	
Dry cloth		Some /a few	
Measuring container	1.5 ~ 2 L	1	Coolant exclusive
Concentration gauge	Optical	1	Ethylene glycol exclusive

### Coolant checkup/refill

- Remove the upper side panel of the outdoor unit.
- If the coolant level of supplementary tank is between L and H about 10 minutes after the unit stops operating, it indicates a normal coolant level. If the level is close to L, refill the coolant.
- If there is a substantial change in the coolant level few days after refilling, check for any leakages.
- For the coolant refill, dilute the ethylene glycol 100% with distilled water by 50:50. Open the cap on the top of the tank to refill the coolant up to the MAX limit (for about 4 liters) and close the cap. (concentration: 50%, freezing point: above -35 °C)
- After completing the maintenance, clean the spilled coolant with a dry cloth and close the top panel.

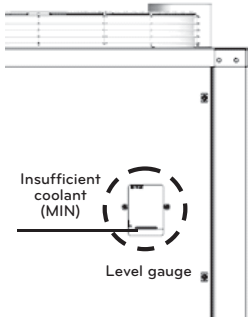


Figure 1 Coolant level check

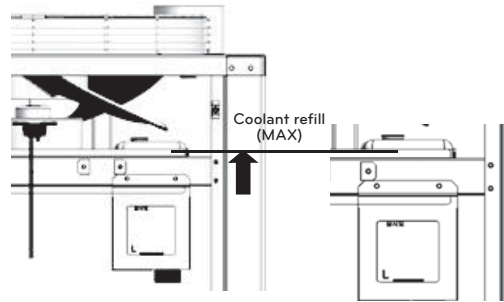
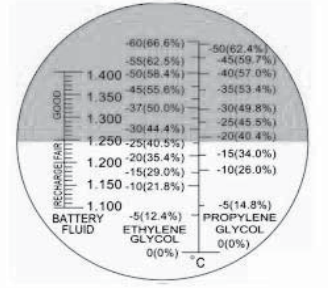


Figure 2 Coolant refill



Coolant concentration meter



Tester gradation/markings (40.5%)

### ⚠ CAUTION

- Be careful not to let any coolant in the mouth or eyes during the coolant refill.
- Refill the coolant while the outdoor unit is stopped by controlled shutdown.
- Operating the unit while refilling a coolant may cause injury.

## Drain filter stones maintenance/refill

### CAUTION

- In order to cool down completely, stop the unit 1~2 hours prior to maintenance/replacement. If you touch a heated area of the outdoor unit parts which was in operation, it may cause burns.
- Make sure to shut off the power breaker of the outdoor control panel when performing internal work on the outdoor unit. If the indoor unit is operated by the customer's remote control during internal work, it may cause injury or equipment damage.
- Use authentic products from LG electronics for the parts replacement. Use of inauthentic parts or oil can cause malfunction of the unit and the customer will be responsible for any damages involved.

### \* Drain filter stones maintenance/refill

- Drain filter stones should be checked and refilled every 10,000 hours or 5 years. (whichever comes first)
- (Caution) Stop the engine by controlled shutdown before the maintenance. (refer to 'Operation restriction of the outdoor unit prior to maintenance' in the 'Self-diagnosis')

Refer to the table below when preparing the tools and part required for the replacement/maintenance.

Necessary parts and tools	Specifications and Stock No.	Quantity	Remarks
Drain filter stones replacement		Moderate amount	Calcite 4Kg
Cleansing liquid		Moderate amount	500 cc
Packing system	Large/small	1ea	
Container 1			
Long metal rod (iron rod)	Length 30 cm	1	
Socket wrench	Size 10 mm	1	
Dry cloth		Some/a few	

### Drain filter stones maintenance/refill

- Remove the drain filter from the outdoor unit.
- Loosen a bolt on the drain filter cover by using a socket wrench(10mm). (Figure1)
- Clean the used stones with cleansing liquid. When cleaning the stones, dilute 10cc of cleansing liquid with 1 liter of water. (Figure 2)
- Clean the stones thoroughly using a long iron rod. (Figure 3)
- After cleansing the stones, refill the stones (calcite). Fill the container with stones(calcite) completely up to the top. For the drain outlet, fill it only up to below the hole. (Figure 4)
- Clean the flange connecting to a cover in order to tighten them together more easily.
- Check the condition of the O ring (2 of them) as well and replace it if necessary.
- Close the cover and tighten the bolt. Be careful not to tighten too hard. A proper tightening torque is 4.0 Nm.



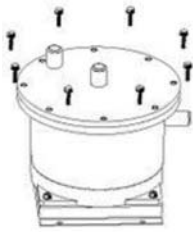


Figure 1 Remove the bolts

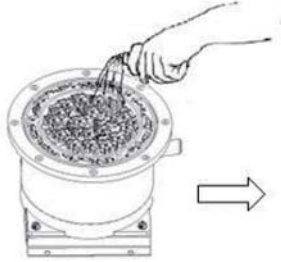


Figure 2 Cleansing liquid



Figure 3 Clean the stones

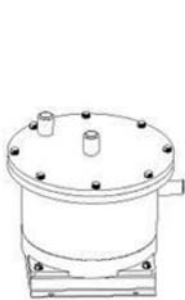


Figure 6 Tighten the bolts

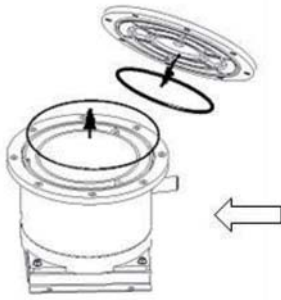


Figure 5 Check for the O ring

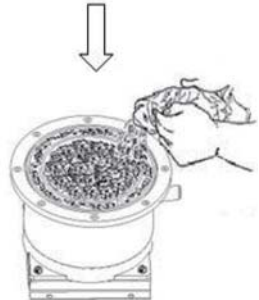


Figure 4 Refill the stones

Drain filter stones maintenance/refill



