

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

LG SPLIT ROOFTOP UNIT(RTU)



MFL71810404
Rev.01_091324

www.lghvac.com
www.lg.com

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Do not throw away, destroy, or lose this manual.
Please read carefully and store in a safe place for future reference.
Content familiarity required for proper installation.

The instructions included in this manual must be followed to prevent product malfunction, property damage, injury, or death to the user or other people. Incorrect operation due to ignoring any instructions will cause harm or damage. A summary of safety precautions begins on page 4.

For more technical materials such as submittals, engineering databooks, and catalogs, visit www.lghvac.com.

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SAFTY PRECAUTION

The instructions below must be followed to prevent product malfunction, property damage, injury or death to the user or other people. Incorrect operation due to ignoring any instructions will cause harm or damage. The level of seriousness is classified by the symbols below

INSTALLATION

TABLE OF SYMBOLS

 DANGER	This symbol indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury
 WARNING	This symbol indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	This symbol indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
 NOTE	This symbol indicates situations that may result in equipment or property damage accidents only.
	This symbol indicates an action that should not be performed.

DANGER

-  **Do not store or use flammable gas or combustibles near the unit.**
There is risk of fire, explosion, physical injury or death
-  **Do not supply power to the unit until all wiring and piping are completed or reconnected and checked.**
There is risk of physical injury or death due to electric shock.

WARNING

-  **Do not install or remove the unit by yourself (end-user). Ask the dealer or an LG trained technician to install the unit**
Improper installation by the user may result in water leakage, fire, explosion, electric shock, physical injury or death.
- **Installation, startup, and service must be performed by a qualified installer or a service agency.**
Improper installation, adjustment, service, maintenance, or alteration can cause personal injury or loss of life.
- **For replacement of an installed unit, always contact a trained service provider.**
There is risk of fire, electric shock, explosion, and physical injury or death.
- **Periodically check that the outdoor unit is not damaged.**
There is risk of explosion, physical injury, or death.
- **Replace all control box and panel covers.**
If cover panels are not installed securely, dust, water and animals may enter the unit, causing fire, electric shock, and physical injury or death.
- **Do not install the unit in potentially explosive atmospheres.**
- **Always check for system refrigerant leaks after the unit has been installed or serviced.**
Exposure to high concentration levels of refrigerant gas may lead to illness or death.
-  **Do not install the unit using defective hanging, attaching, or mounting hardware.**
There is risk of physical injury or death.
- **Pipes and wires should be purchased separately for installation of the product.**
- **Wear protective gloves when handling equipment.**
Sharp edges may cause personal injury.
- **Dispose of the packing materials safely.**
 - Packing materials, such as nails and other metal or wooden parts may cause puncture wounds or other injuries.
 - Tear apart and throw away plastic packaging bags so that children may not play with them and risk suffocation and death.
-  **Do not install the unit in any location exposed to open flame or extreme heat. Do not touch the unit with wet hands.**
There is risk of fire, electric shock, explosion, and physical injury or death.
- **Install the unit considering the potential for earthquakes.**
Improper installation may cause the unit to fall, resulting in physical injury or death.
-  **Do not change the settings of the protection devices.**
If the pressure switch, thermal switch, or other protection device is shorted and forced to operate improperly, or parts other than those specified by LG are used, there is risk of fire, electric shock, explosion, and physical injury or death.
- **If the unit is installed in a small space, take measures to prevent the refrigerant concentration from exceeding safety limits in the event of a refrigerant leak.**
Consult the latest edition of ASHRAE (American Society of Heating, Refrigerating, and Air Conditioning Engineers) Standard 15. If the refrigerant leaks and safety limits are exceeded, it could result in personal injuries or death from oxygen depletion

! CAUTION

- Be very careful when transporting the product.
 - ⓧ Do not attempt to carry the product without assistance.
 - Some products use polypropylene bands for packaging. Do not use polypropylene bands to lift the unit.
 - Suspend the unit from the base at specified positions.
 - Support the unit at a minimum of four points to avoid slippage from rigging apparatus.
 - Failure to follow these directions may result in minor or moderate physical injury.

! NOTE

- **Properly insulate all cold surfaces to prevent "sweating."**
Cold surfaces such as uninsulated pipe can generate condensate that may drip and cause a slippery floor condition and/or water damage to walls.
- **Installation, startup, and service must be performed by a qualified installer, service agency, or gas supplier.**
Improper installation, adjustment, service, maintenance, or alteration can cause property damage
- **When installing the unit in a hospital, mechanical room, or similar electromagnetic field (EMF) sensitive environment, provide sufficient protection against electrical noise.**
Inverter equipment, power generators, high-frequency medical equipment, or radio communication equipment may cause the air conditioner to operate improperly. The unit may also affect such equipment by creating electrical noise that disturbs medical treatment or image broadcasting.
- ⓧ **Do not use the product for special purposes such as preserving foods, works of art, wine coolers, or other precision air conditioning applications.**
There is risk of property damage.
- ⓧ **Do not make refrigerant substitutions. Use R410A only.**
If a different refrigerant is used, or air mixes with original refrigerant, the unit will malfunction and become damaged.
- ⓧ **Do not install the unit in a noise sensitive area.**
- **When connecting refrigerant tubing, remember to allow for pipe expansion.** Improper piping may cause refrigerant leaks and system malfunction
- **Take appropriate actions at the end of HVAC equipment life to recover, recycle, reclaim or destroy R410A refrigerant according to applicable U.S. Environmental Protection Agency (EPA) rules.**
- **Periodically check that the outdoor unit is not damaged.**
There is a risk of equipment damage.
- **Install the unit in a safe location where no one can step on or fall onto it. Do not install the unit with defective hanging, attaching, or mounting hardware.**
There is risk of unit and property damage.
- **Install the drain trap to ensure adequate drainage.**
There is a risk of water leakage and property damage.
- ⓧ **Don't store or use flammable gas/combustibles near the unit.**
There is risk of product failure.
- **Always check for system refrigerant leaks after the unit has been installed or serviced.**
Low refrigerant levels may cause product failure.
- **Ductwork and other installed airflow restriction devices such as filters shall not exceed the rated maximum static pressure limits of the RTU fan assembly.**
Doing so may cause product malfunction
- **OA Inlet (duct) should not be placed in an environment where may be exposed to harmful volatile organic compounds (VOCs), or in environments where there is improper air make up or supply or inadequate ventilation.**

WIRING

⚠ DANGER

- **High voltage electricity is required to operate this system. Adhere to the National Electrical Codes and these instructions when wiring.**
Improper connections and inadequate grounding can cause accidental injury or death.
- **Always ground the unit following local, state, and National Electrical Codes.**
- **Turn the power off at the nearest disconnect before servicing the equipment.**
Electric shock can cause physical injury or death.
- **Properly size all circuit breakers or fuses.**
There is risk of fire, electric shock, explosion, physical injury or death.

⚠ WARNING

- **The information contained in this manual is intended for use by an experienced, trained electrician familiar with the U.S. National Electric Code (NEC) who is equipped with the proper tools and test instruments.**
Failure to carefully read and follow all instructions in this manual can result in injury or death.
- **Ensure the unit is connected to a dedicated power source that provides adequate power.**
If the power source capacity is inadequate or the electric work is not performed properly, it may result in fire, electric shock, physical injury or death.
- **Refer to local, state, and federal codes, and use power wires of sufficient current capacity and rating.**
Wires that are too small may generate heat and cause a fire and physical injury or death.
- **Secure all field wiring connections with appropriate wire strain relief.**
Improperly securing wires will create undue stress on equipment power lugs. Inadequate connections may generate heat, cause a fire and physical injury or death.
- **Properly tighten all power connections.**
Loose wiring may overheat at connection points, causing a fire, physical injury or death.

ⓘ NOTE

- **⊘ Do not supply power to the unit until all electrical wiring, controls wiring, piping, installation, and refrigerant system evacuation are completed.**
The system will malfunction.
- **The information contained in this manual is intended for use by an experienced, trained electrician familiar with the U.S. National Electric Code (NEC) who is equipped with the proper tools and test instruments.**
Failure to carefully read and follow all instructions in this manual can result in equipment malfunction or property damage.

OPERATION

DANGER

-  Do not provide power to or operate the unit if it is flooded or submerged.
There is risk of fire, electric shock, physical injury or death.
- Use a dedicated power source for this product.
There is risk of fire, electric shock, physical injury or death.
-  Do not operate the disconnect switch with wet hands.
There is risk of fire, electric shock, physical injury or death.
- Periodically verify the hanging bolts and other hardware securing the unit have not deteriorated.
If the unit falls from its installed location, it can cause property damage, product failure, physical injury or death.
- If refrigerant gas leaks out, ventilate the area before operating the unit.
If the unit is mounted in an enclosed, low-lying, or poorly ventilated area and the system develops a refrigerant leak, it may cause fire, electric shock, explosion, physical injury or death.

WARNING

-  Do not allow water, dirt, or animals to enter the unit.
There is risk of fire, electric shock, physical injury or death.
-  Do not touch refrigerant piping during or after operation.
It can cause burns or frostbite.
-  Do not operate the unit with the panel(s) or protective cover(s) removed; keep fingers and clothing away from moving parts.
The rotating, hot, cold, and high-voltage parts of the unit can cause physical injury or death.
- Periodically check power cable and connection for damage.
Cable must be replaced by the manufacturer, its service agent, or similar qualified persons in order to avoid physical injury and / or electric shock.
- Securely attach the electrical cover to the unit.
Non-secured electrical covers can result in burns or electric shock due to dust or water in the service panel.
- Ensure no power is connected to the unit other than as directed in this manual. Remove power from the unit before removing or servicing the unit.
There is risk of unit failure, fire, electric shock, physical injury or death.

NOTE

- Clean up the site after installation is finished, and check that no metal scraps, screws, or bits of wiring have been left inside or surrounding the unit.
-  Do not use this equipment in mission critical or special purpose applications such as preserving foods, works of art, wine coolers or refrigeration.
-  Do not allow water, dirt, or animals to enter the unit.
There is risk of unit failure
-  Do not block the inlet or outlet.
Unit may malfunction.
-  Do not operate the unit with the panel(s) opened or removed; keep fingers and clothing away from moving parts
Non-secured covers can result in malfunction due to dust or water
- Periodically verify the equipment mounting hardware has not deteriorated.
If the base collapses, the unit could fall and cause property damage or product failure.
-  Do not turn off the main power switch after operation has been stopped.
Wait at least five (5) minutes before turning off the main power switch, otherwise it will result in product malfunction.

R410A REFRIGERANT

R410A refrigerant has a higher operating pressure in comparison to R22 refrigerant and, therefore, all piping system materials installed must have a higher resisting pressure than the materials traditionally used in R22 systems. R410A refrigerant is an azeotrope of R32 and R125, mixed at 50:50, so the ozone depletion potential (ODP) is 0.

WARNING

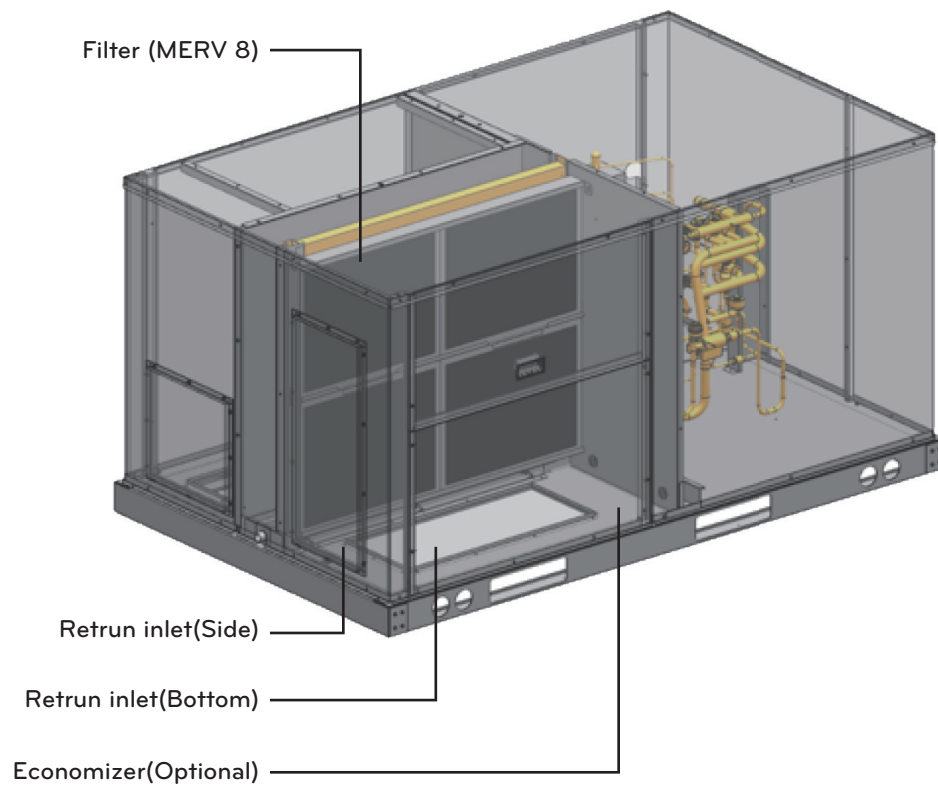
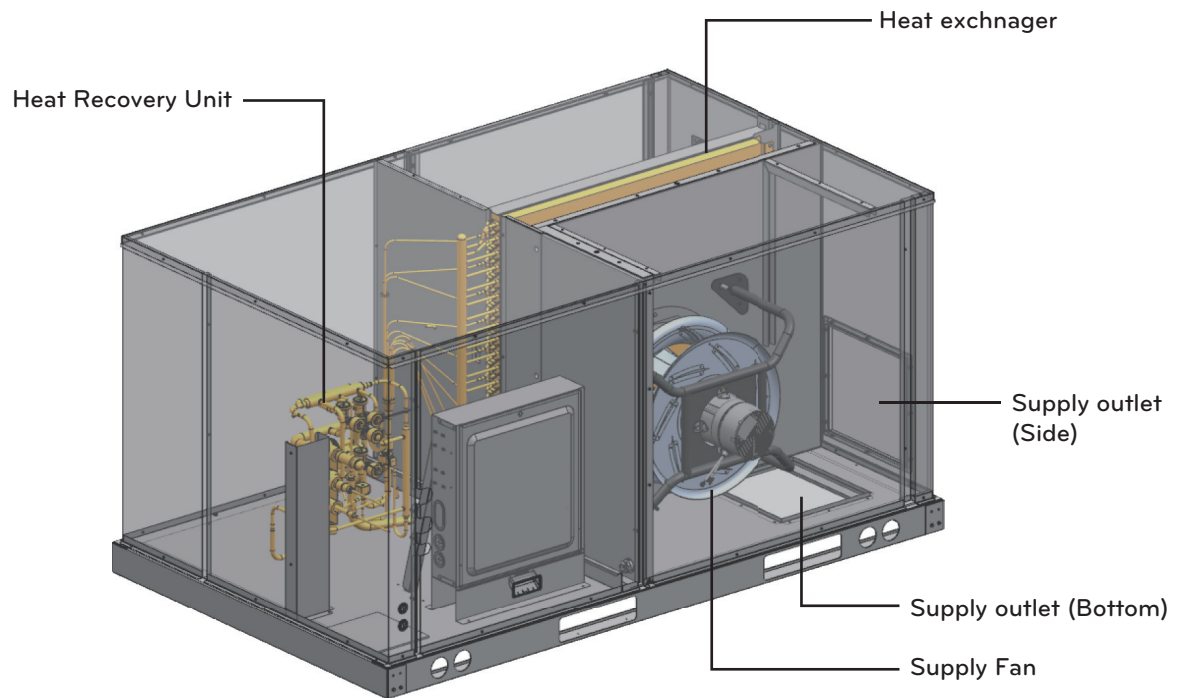
-  Do not place the refrigerant cylinder in direct sunlight. Refrigerant cylinder may explode causing severe injury or death.

NOTE

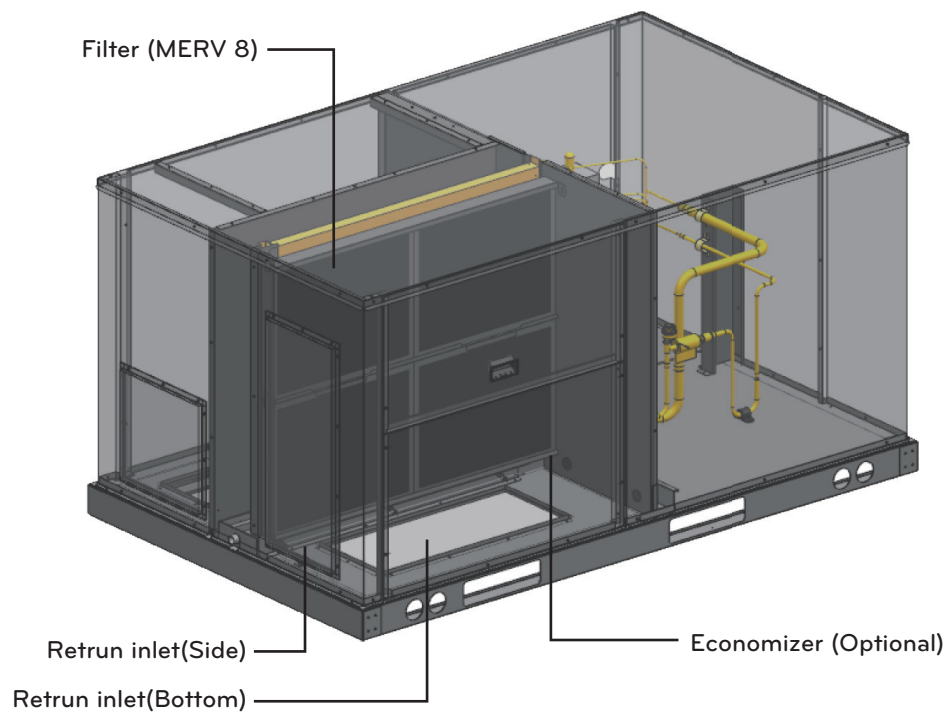
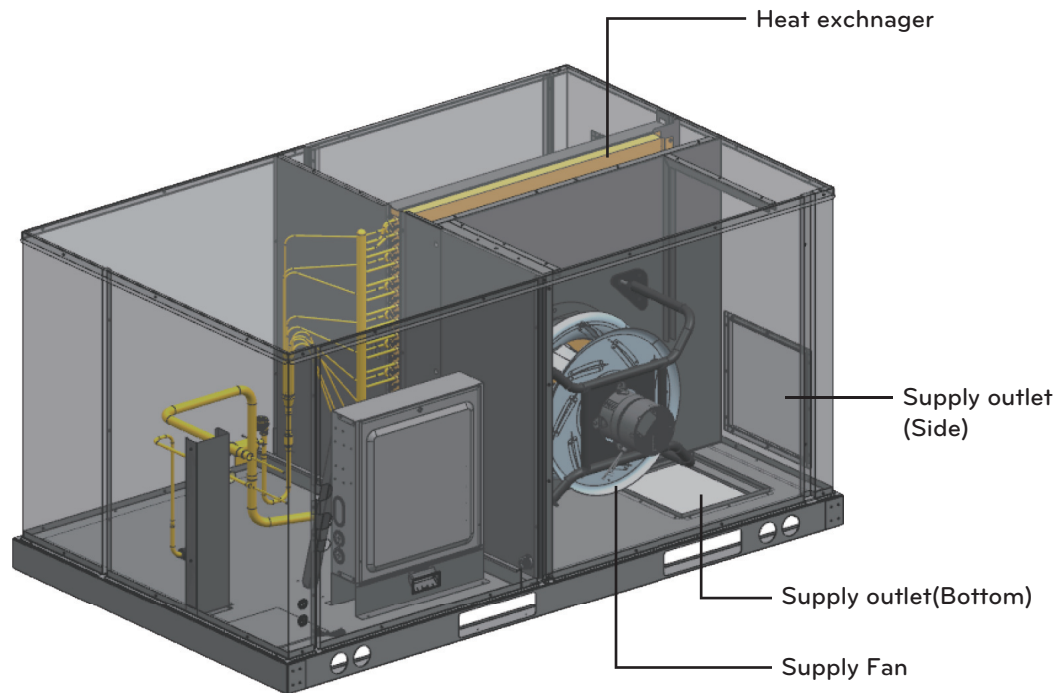
- Because R410A is a combination of R32 and R125, the required additional refrigerant must be charged in its liquid state. If the refrigerant is charged in its gaseous state, its composition changes and the system will not work properly.
-  Do not heat piping more than necessary during installation. Piping may become soft and fail when pressurized.
-  Do not use any piping that has not been approved for use in high-pressure refrigerant systems. Piping wall thickness must comply with the applicable local, state, and federal codes for the 551 psi design pressure of R410A. Inadequate piping may fail when pressurized.

PRODUCT OVERVIEW

Split RTU Interior Components (HR Model)



Split RTU Interior Components.(H/P Model)



DIMENSION

Service Area

Removing from Storage

As units are removed from storage to be installed in their final location, they should be protected and maintained in a similar fashion until the equipment goes into operation.

Prior to installing the unit and system components, inspect the unit assembly to make sure it is in working order.

- 1. Check all fasteners, set screws on the fan, wheel, bearings, drive, motor base, and accessories for tightness
- 2. Rotate the fan wheel(s) by hand and assure no parts are rubbing.

Assemblies

Blower - one plenum-type fans (LG 3D Plug). All units are equipped with a plenum fan for Supply Air

Coils - Evaporator coil

Filters - 2 inch thick pleated paper MERV 8(standard) or MERV 13 filters in the supply air stream

Split DX system - Unit ordered with either Multi V 5 outdoor unit or Multi V S outdoor unit.

Airflow Arrangement

The unit is capable of Constant Air volume (CAV) with two different mode. One is “Air Volume (CFM) Control” which follow automatically the target CFM value. It can be used between 0.8 and maximum ESP. The other is “Constant Volume” control; this is manual set up of the Air volume with RPM setting. It can be used between 0.2 to 0.8 in.wg.

Service Clearance

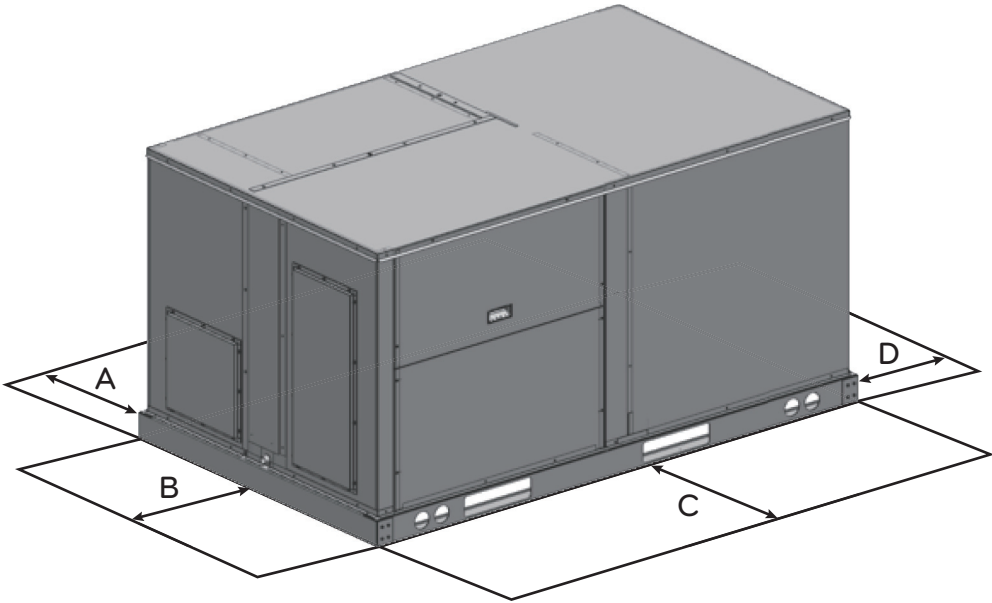
Allow service clearances as indicated in Figure below. Also, it is recommended to provide a roof walkway to the RTU, as well as along each side of the unit in order to provide access to most controls and serviceable components.

Refer to NEC and local for minimum clearances around the unit and control panel.

Table. Service Clearance [Unit : Inch]

Dimensions			
A	B	C	D
42	48	42	36

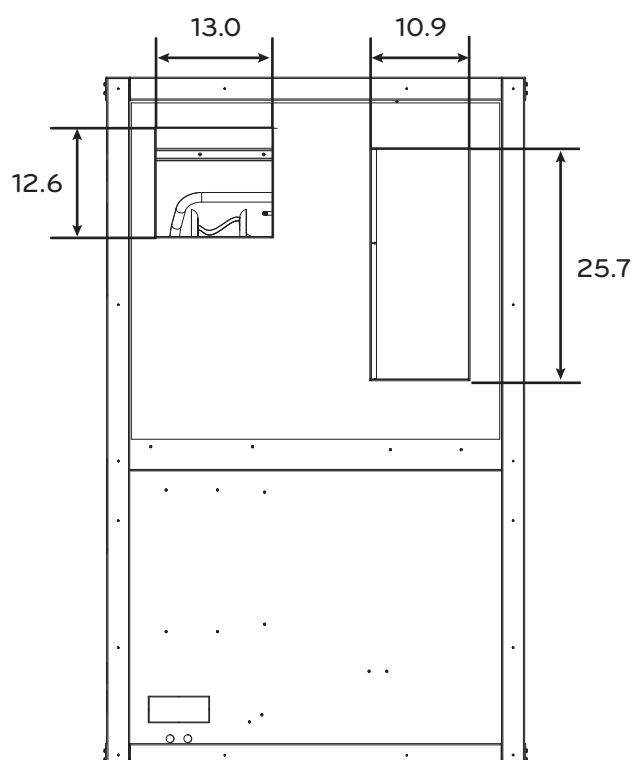
Figure. Clearance Requirements for Split Rooftop Unit.



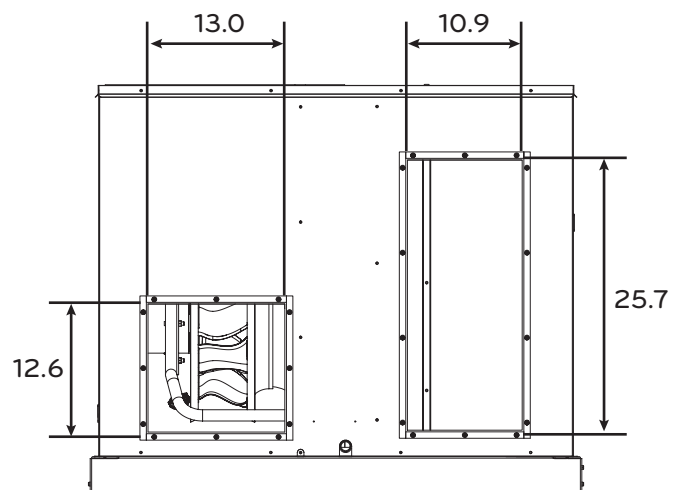
Product Dimension

[Unit : Inch]

ENGLISH



Vertical Discharge



Side Discharge

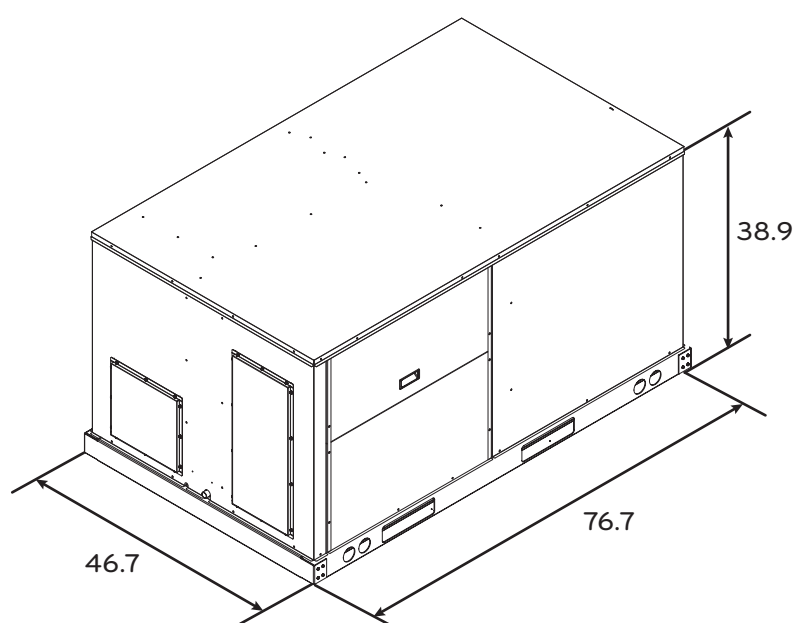


Table. Air Flow Size

[Unit : Inch]

	Supply Air	Return Air
Horizontal	13.0 x 12.6	10.9 x 25.7
Vertical	13.0 x 12.6	10.9 x 25.7

Piping Connection

Split RTU Piping Connecton Dimensions

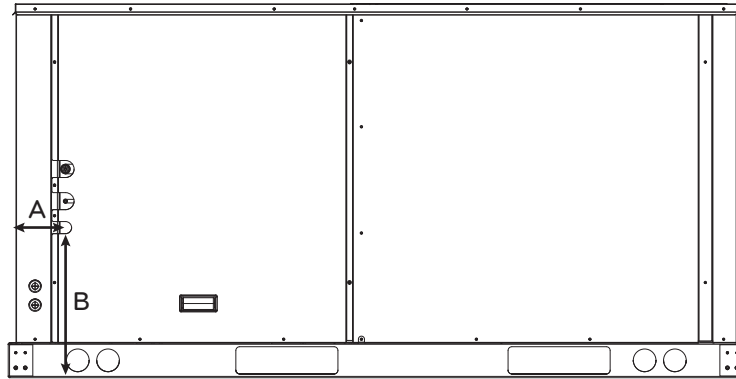


Table. Piping Connection Dimension (HR Model)

[Unit : Inch]

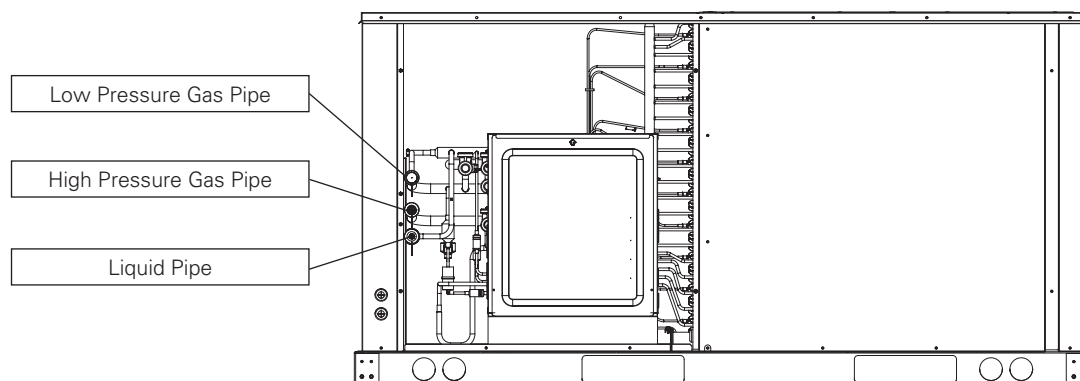
Nominal Tons	Liquid Line				High Pressure Gas Line				Low Pressure Gas Line			
	Dia.	connection	A	B	Dia.	connection	A	B	Dia.	connection	A	B
3	3/8	Brazed	5-1/32	17-1/8	1/2	Brazed	5-1/32	19-7/8	5/8	Brazed	5-1/32	23-7/32
4	3/8	Brazed	5-1/32	17-1/8	1/2	Brazed	5-1/32	19-7/8	5/8	Brazed	5-1/32	23-7/32
5	3/8	Brazed	5-1/32	17-1/8	5/8	Brazed	5-1/32	19-7/8	3/4	Brazed	5-1/32	23-7/32
6	3/8	Brazed	5-1/32	17-1/8	5/8	Brazed	5-1/32	19-7/8	3/4	Brazed	5-1/32	23-7/32

Table. Piping Connection Dimension (H/P Model)

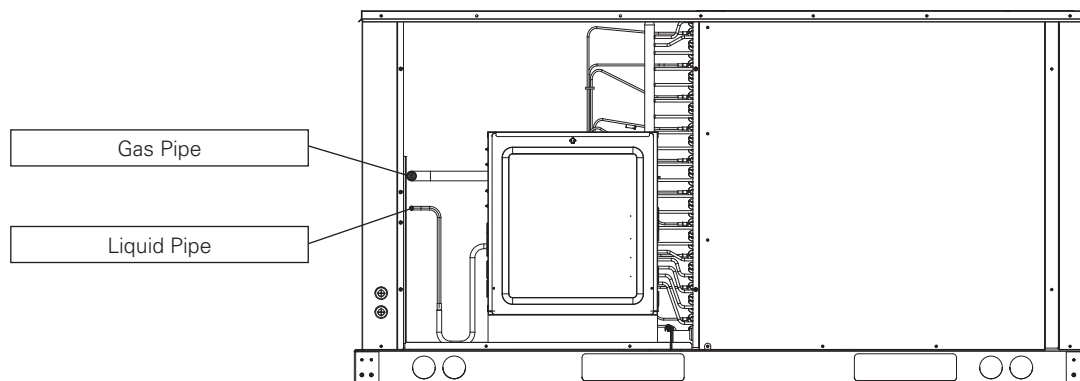
Nominal Tons	Liquid Line				Gas Line			
	Dia.	connection	A	B	Dia.	connection	A	B
3	3/8	Brazed	5-1/32	17-1/8	5/8	Brazed	5-1/32	23-7/32
4	3/8	Brazed	5-1/32	17-1/8	5/8	Brazed	5-1/32	23-7/32
5	3/8	Brazed	5-1/32	17-1/8	3/4	Brazed	5-1/32	23-7/32
6	3/8	Brazed	5-1/32	17-1/8	3/4	Brazed	5-1/32	23-7/32

Pipe Location

Pipe Location (HR Model)



Pipe Location (H/P Model)



Electrical Data

Table. RTU Electrical DATA

Ton	MCA	MOP	Rated Amps (A)	Power Supply			Power Input ¹⁾ (W)		
				Hz	Volts	Phase	Max Cooling	Max Heating	L / M H at Factory Default
6	8.4	15	6.7	60	208/230	1	770	770	140 / 260 / 350
5							760	760	130 / 250 / 330
4							700	700	120 / 150 / 260
3							640	640	110 / 130 / 150

MCA : Minimum Circuit Ampacity.

MOP : Maximum Overcurrent Protection.

Units are suitable for use on an electrical system where voltage supplied to unit terminals is within the listed range limits.

Select wire size based on the larger MCA value. Instead of fuse, use the circuit breaker.

1) Max. power input is rated at maximum setting value.

INSTALLATION

Receiving and Inspection

Upon receiving the product, verify that all pieces listed on the bill of lading, delivery receipt, or packing list have been received.

Inspect each crate or carton for shipping damage before accepting delivery. Alert the carrier if any damage is detected; do not refuse shipment. The customer must note any damage (or shortage of items) on the delivery receipt and all copies of the bill of lading, which then should be signed by the delivery carrier. Photograph the damage if possible. If damaged, immediately contact your manufacturer's representative.

Handling

Handle in such a manner as to keep from scratching or chipping the unit.

Storage

Units are protected against damage during shipment. If the unit cannot be installed and operated immediately, precautions need to be taken to prevent deterioration of the unit during storage. The user assumes responsibility of the unit and accessories while in storage. The manufacturer will not be responsible for damage during storage. These suggestions are provided solely as a convenience to the user.

The ideal environment for the storage of units and accessories is indoors, above grade, in a low humidity atmosphere which is sealed to prevent the entry of blowing dust, rain, or snow. All accessories must be stored indoors in a clean, dry atmosphere.

Removing from Storage

As units are removed from storage to be installed in their final location, they should be protected and maintained in a similar fashion until the equipment goes into operation.

Prior to installing the unit and system components, inspect the unit assembly to make sure it is in working order.

1. Check all fasteners, set screws on the fan, wheel, bearings, drive, motor base, and accessories for tightness
2. Rotate the fan wheel(s) by hand and assure no parts are rubbing.

Assemblies

Blower - One plenum-type fan(LG 3D Plug). All units are equipped with a plenum fan for Supply Air

Coils - Evaporator coil

Filters - 2 Inch thick pleated paper MERV 8(standard) or 2 Inch thick pleated paper MERV 13 filters in the supply air stream.

Split DX system - Unit ordered with a MultiV 5 outdoor unit

Airflow Arrangement

The unit is capable of Constant Air volume (CAV) with two different mode. One is "Air Volume (CFM) Control" which follow automatically the target CFM value, other is "Constant Volume" control which is manually set up using the Air volume with RPM (%) setting.

Location Selection

To avoid the possibility of fire, do not install the unit in an area where combustible gas may generate, flow, stagnate, or leak. Failure to do so will cause serious bodily injury or death. Before beginning installation, read the safety summary at the beginning of this manual.

! NOTE

Select a location for installing the unit that meets the following conditions:

1. Where there is enough structural strength to bear the weight of the unit.
2. Operating sound from the unit will not disturb occupants.
3. Include enough space for service access.
4. Include space for drainage to ensure condensate flows properly out of the unit when it is in cooling mode.
5. Use a level indicator to ensure the unit is installed on a level plane.

! NOTE

The unit may be damaged, may malfunction, and/or will not operate as designed if installed in any of these conditions.

1. Do not install the unit near a heat or steam source or where considerable amounts of oil iron powder, or flour are used. These materials may generate condensate, cause a reduction in heat exchanger efficiency, or malfunction of the condensate drain. If this is a potential problem, install a ventilation fan large enough to vent out these materials.
2. Do not install the unit where it will be subjected to direct thermal radiation from other heat sources.
3. Do not install the unit in an area where combustible gas may generate, flow, stagnate, or leak. There is the possibility of fire.
4. Do not install the unit in a location where acidic solution and spray (sulfur) are often used.

Rigging

Rigging holes for shackles are integral on the unit base. Use four independent lines, securing one end of a line to a unit base lifting point and the other end of the line to an associated spreader bar lifting point. See Figure below.

Use spreader bars to prevent damage to the unit cabinet. Avoid twisting or uneven lifting of the unit. The cable length from the bracket to the hook should always be longer than the distance between the outer lifting points.

Lifting

⚠ WARNING

1. Only trained and qualified personnel should be allowed to rig loads or operate load rated cranes and/or hoist assemblies. Do not use a forklift to lift or maneuver the unit. Failure to use a load rated crane or hoist assembly to lift or maneuver the unit can cause severe personal injury and property damage.
2. Use all lifting points. Improper lifting can cause property damage, severe personal injury or death.

! NOTE

Lifting points may not be symmetrical to the center of gravity of the unit. Ballast or unequal cable lengths may be required.

1. Before lifting, be sure that all shipping materials have been removed from unit.
2. To assist in determining rigging requirements, see the General Data section of this manual.
3. Spreader bars must span the unit to prevent damage to the cabinet by the lift cables
4. Always test-lift the unit to check for proper balance and rigging before hoisting to desired location.
5. Do not lift unit by weatherhood.
6. Do not lift units in windy conditions.
7. Preparation of curb and roof openings should be completed prior to lifting unit to the roof.
8. Heck to make sure that gasket (supplied by others) has been applied to the top of the curb prior to lifting the unit and setting on the curb.
9. Do not use fork lifts for handling unit.

Figure. Split RTU Rigging

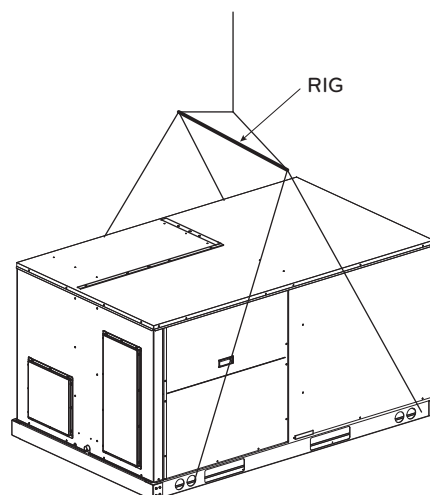


Table. RTU Weight

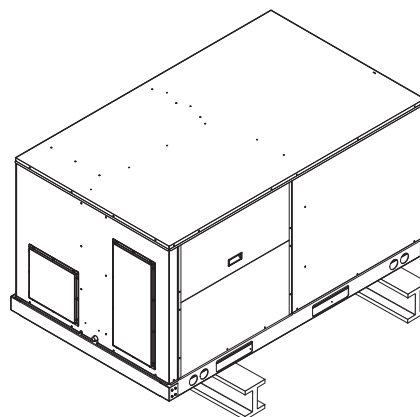
Model	Weight(lbs.)
HR Model Unit(3,4,5,6 Ton)	472
H/P Model(3,4,5,6 Ton)	461

Rail Mounting

The units may be installed on rails provided and installed by others. Ensure that rails are designed to handle the weight of the unit and provide proper load distribution on building supports.

1. Make sure that rail positioning does not interfere with the openings on the unit.
2. Rails should run the width of the unit and extend beyond the unit a minimum of 12 inches on each side.
3. Set unit on rails.
See Figure below for example of a typical RTU installed on rails supplied by others.

Figure. Split RTU – Installed on Rails.



Typical Unit Installed on Rails Supplied by Others

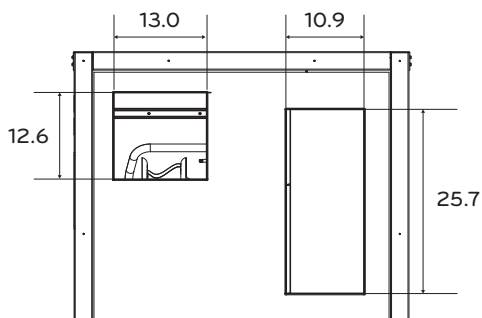
Duct Connections

The unit is shipped in the vertical (bottom) duct configuration. To convert to horizontal ducted configuration, remove screws from the side duct opening covers and remove the covers.

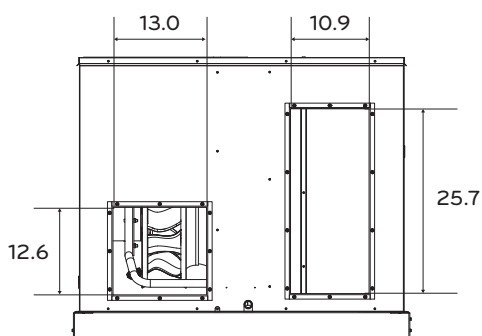
Using the same screws, install the covers on the vertical duct openings. Seals around duct openings must be tight.

Vertical Discharge

[Unit : inch]



Horizontal Discharge



General Mounting - Curb

Roof curb details, including duct locations and dimensions are to be found in the roof curb assembly instructions.

Rooftop units require curbs to be mounted first. The duct connections must be located so they will be clear of structural members of the building.

1. Factory-Supplied Roof Curbs

Roof curbs are model GKD which are shipped in a knockdown kit (includes duct adapters) and require field assembly (by others). Assembly instructions are included with the curb kit.

2. Install Curb

Locate curb over roof opening and fasten in place. Check that the diagonal dimensions are within $\pm 1/8$ inch of each other and adjust as necessary. For proper coil drainage and unit operation, it is important that the installation be level. Shim the curb as required to level. Install gasket on top surface of curb (provided by others). Assembly of a typical roof curb is shown in "Figure. Split RTU Roof Curb"

3. Install Duct Work

Installation of all ducts should be done in accordance with SMACNA and AMCA guidelines. Duct adapters are provided to support ducts prior to setting the unit.

4. Set the Unit

Lift unit to a point directly above the curb and duct openings. Guide unit while lowering to align with duct.

NOTE

- The bottom of the unit must be field-insulated if outdoor air can contact the bottom of the unit. To avoid leakage.
- Do not drill or punch holes in the floor of the unit.
- Gasket material must be applied to all surfaces of the curb which contact the unit to create proper seal between the unit and the curb.

Roof Ductwork Configuration

When the supply air discharge opening and/or the return air intake opening are located on the bottom of a unit, the ductwork must be connected to the curb directly. The actual opening sizes in the floor of the unit are not specified as they are slightly undersized from the duct dimensions shown on the following curb drawings.

Figure. Split RTU Roof Curb

Roof Curb drawing

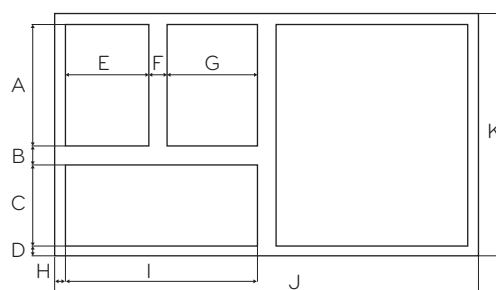


Table. Roof Curb

[Unit : inch]

A	20.4	E	14	I	32.19
B	3	F	3	J	70.87
C	13.78	G	15.19	K	40.69
D	1.75	H	1.75		

UNIT PIPING

Refrigerant Safety

WARNING

- Verify the maximum refrigerant concentration in the space where the indoor unit will be mounted meets the concentration limit allowed by ASHRAE Standards 15-2010 and 34-2010. There is danger of asphyxiation from oxygen displacement.

ASHRAE Standards 15-2010 and 34-2010 offer guidelines that address refrigerant safety and the maximum allowable concentration of refrigerant in an occupied space. Refrigerant will dissipate into the atmosphere, but a certain volume of air is required for this to occur safely. For R410A refrigerant, the maximum allowable concentration of refrigerant is twenty-six (26) lbs. per 1,000 cubic feet of an occupied space. Buildings with twenty-four (24) hour occupancy allow half of that concentration.¹

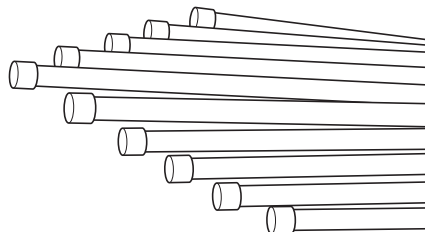
ASHRAE Standards 15 and 34 assume that if a system develops a leak, its entire refrigerant charge will dump into the area where the leak occurs. To meet ASHRAE Standards 15 and 34, calculate the refrigerant concentration that may occur in the smallest room volume on the system, and compare the results to the maximum allowable concentration number.¹ Also consult state and local codes in regards to refrigerant safety.

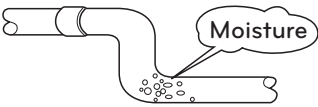
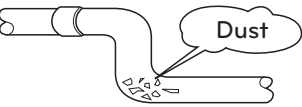
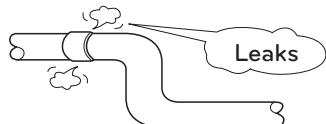
¹ Information about ASHRAE Standard 15-2010 / 34-2010 and addenda current as of the date of this publication

Piping Materials and Handling

Pipes used for the refrigerant piping system must include the specified thickness, and the interior must be clean. While handling and storing, do not bend or damage the pipes, and take care not to contaminate the interior with dust, moisture, etc. Keep refrigerant pipe dry, clean, and airtight

Keep Pipes Capped While Storing



	Drying	Cleanliness	Airtight
	Should be no moisture inside	No dust inside.	There is no refrigerant leakage
Items			
Cause failure	- Significant hydrolysis of refrigerant oil - Degradation of refrigerant oil - Poor insulation of the compressor - Do not cold and warm - Clogging of EEV, Capillary	- Degradation of refrigerant oil - Poor insulation of the compressor - Do not cold and warm - Clogging of EEV, Capillary	- Gas shortages - Degradation of refrigerant oil - Poor insulation of the compressor - Do not cold and warm
Countermeasure	- No moisture in the pipe - Until the connection is completed, the plumbing pipe entrance should be strictly controlled. - Stop plumbing at rainy day. - Pipe entrance should be taken side or bottom. - When removal burr after cutting pipe, pipe entrance should be taken down. - Pipe entrance should be fitted cap when pass through the walls.	- No dust in the pipe. - Until the connection is completed, the plumbing pipe entrance should be strictly controlled. - Pipe entrance should be taken side or bottom. - When removal burr after cutting pipe, pipe entrance should be taken down. - Pipe entrance should be fitted cap when pass through the walls.	- Airtightness test should be. - Brazing operations to comply with standards. - Flare to comply with standards. - Flange connections to comply with standards.

Piping Size		Torque		
mm	inch	kgf-cm	N-m	lbf-ft
Ø 6.35	Ø 1/4	180 ~ 250	17.6 ~ 24.5	13 ~ 18
Ø 9.52	Ø 3/8	340 ~ 420	33.3 ~ 41.2	25 ~ 30
Ø 15.88	Ø 5/8	630 ~ 820	61.7 ~ 80.4	45 ~ 59
Ø 12.7	Ø 1/2	550 ~ 660	53.9 ~ 64.7	40 ~ 48
Ø 19.05	Ø 3/4	990 ~ 1210	97.0 ~ 118.7	71 ~ 87

Refrigerant Pipe Connections

Units come with brazed connections only

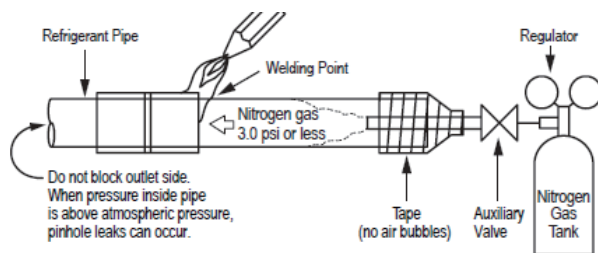
Brazing

NOTE

- It is imperative to keep the piping system free of contaminants and debris such as copper burrs, slag, or carbon dust during installation.

- All joints are brazed in the field. Multi V refrigeration system components contain very small capillary tubes, small orifices, electronic expansion valves, oil separators, and heat exchangers that can easily become blocked. Proper system operation depends on the installer using best practices and utmost care while assembling the piping system.
 - Store pipe stock in a dry place and keep stored pipe capped and clean.
 - Purge all pipe sections clean with dry nitrogen prior to assembly.
- Proper system operation depends on the installer using best practices and the utmost care while assembling the piping system.
 - Use adapters to assemble different sizes of pipe.
 - Always use a non-oxidizing material for brazing. Do not use flux, soft solder, or anti-oxidant agents. If the proper material is not used, oxidized film may accumulate and clog or damage the compressors. Flux can harm the copper piping or refrigerant oil.
 - Use a tubing cutter; do not use a saw to cut pipe. De-bur and clean all cuts before assembly.
- Brazing joints: Use a dry nitrogen purge operating at a maximum pressure of three (3) psig and maintain a steady flow.
 - Use a 15% silver phosphorous copper brazing alloy to avoid overheating and produce good flow.
 - Protect isolation valves, electronic expansion valves, and other heat-sensitive control components from excessive heat with a wet rag or heat barrier spray.

Figure. Using Nitrogen Gas during Brazing



Pipe Support Location

A properly installed pipe system will have sufficient support so that pipes will not sag during the life of the system. As necessary, place supports closer for segments where potential sagging could occur. Maximum spacing of pipe supports must meet local codes.

Figure. Pipe Support at Split RTU Unit

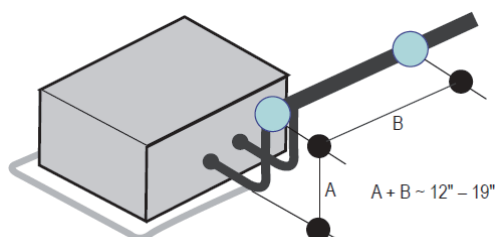


Figure. Typical Pipe Support Location Change in Pipe Direction

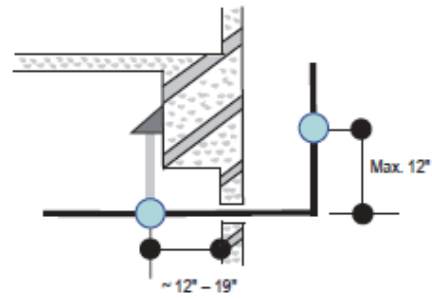
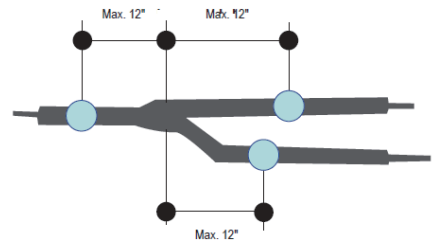
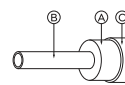


Figure. Pipe Support at Y branch Fitting



Insulate Refrigerant Pipes

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



① Heat insulation material

② Pipe

③ Outer covering (Wind the connection part and cutting part of heat insulation material with a finishing tape.)

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

NOTE

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

Bad example	Do not insulate gas or low pressure pipe and liquid or high pressure pipe together. ① Liquid pipe ② Gas pipe ③ Power cables ④ Finishing tape ⑤ Insulating material ⑥ Communication cables	Be sure to fully insulate connecting portion. ① These parts are not insulated.
	① Liquid pipe ② Gas pipe ③ Power cables ④ Insulating material ⑤ Communication cables Power Communication cables	

CAUTION

- Cutting line of insulation must look upper direction. Thickness of insulation is 15mm (Gas pipe) and 19mm (Liquid pipe) or over

Condensate Drain Connection

! NOTE

- All condensate drain connections must be properly trapped and primed before operating the unit. Failure to properly trap a drain will result in flooding the drain pan and potential water damage to the unit or building.

Slope the piping from the trap downward in direction of flow. The trap must be primed before startup by filling the "U" portion of the trap with water. Drains that are not properly trapped and primed will not operate correctly. Each drain connection must be individually trapped.

Figure shows the layout of the condensate drain connection. The distance from the drain pan outlet to the horizontal run of the P-trap should be a distance of twice the static pressure in the drain pan.

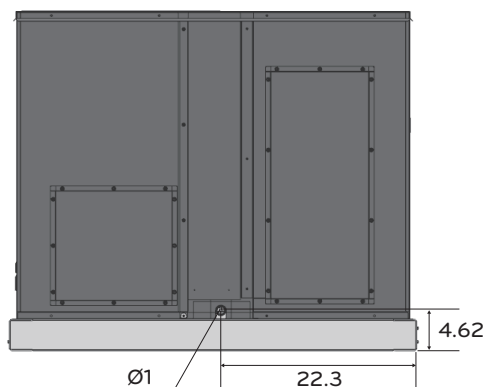
If local and area codes permit, the condensate may be drained back onto the roof, but a drip pad should be provided beneath the outlet. If local and area codes require a permanent drain line, it should be fabricated and installed in accordance with Best Practices and all codes.

In some climates, it will be necessary to provide freeze protection for the P trap and drain line. The P trap should be kept filled with water or glycol solution at all times and it should be protected from freezing to protect the P trap

from damage. If severe weather conditions occur, it may be necessary to fabricate a P trap and drain line of metal and install a heat tape to prevent freezing.

Split RTU Drain

Figure. Split RTU Drain



[Unit : inch]

Condensate drain trapping and piping must conform to all applicable codes. A U-trap and drain line must be installed. The U-trap cannot exceed 6 inches from the drain connection. The lines need to be the same pipe size or larger than the drain connection. Include a U-trap, and pitch downward toward the drain. An air break should be used with long condensate line runs.

! NOTE

- Failure to install U-traps can result in an overflow of condensate water. This can lead to product damage or property damage. Draw-through cooling coils will have a negative static pressure in the drain pan area. This can cause an un-trapped drain to back up due to the air being pulled up through the condensate drain piping.
- The value of pressure in the drain pipe should be at least equal to the absolute value of the negative static pressure in the drain pan plus one inch.
- ⊗ Do not use a pipe size smaller than the unit connection(1 inch).

Figure. U-Trap Specifications.

- Install the U-Trap to prevent leaks caused by blocking the intake air filter.

Applied U-Trap Dimension

$$A \geq 4 \text{ inch}$$

$$B \geq 2C$$

$$C \geq 2 \times SP$$

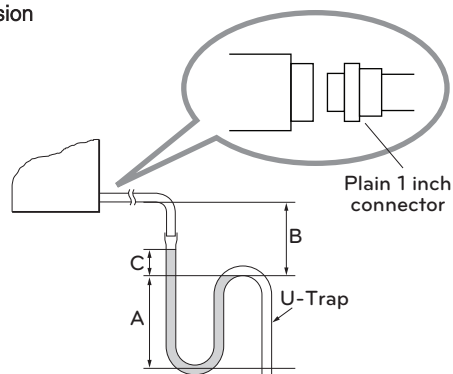
SP = External Pressure (in.wc)

Ex) External Pressure = 0.4in.wc

$$A \geq 2\text{-}9/16 \text{ inch}$$

$$B \geq 1\text{-}7/12 \text{ inch}$$

$$C \geq 19/24 \text{ inch}$$



Refrigerant Piping Installation

This product is designed to work with refrigerant R410A. Always follow these instructions to perform installation procedures.

- Be sure to use the specified refrigerant during refrigerant circulation and prevent air from contaminating the refrigerant
- If the refrigerant leaks during the installation process, make sure to ventilate any enclosed

Selection of Field-Supplied Piping Material

WARNING

- Always follow local codes when selecting and installing copper pipe and piping system components. Approved piping for use with Multi V products will be marked "R410 RATED" along the length of the pipe. Piping wall thickness must meet local code requirements and be approved for a maximum operating pressure of 551 psi. When bending piping, try to keep the number of bends to a minimum, and use the largest radii possible to reduce the equivalent length of installed piping; also, bending radii greater than ten (10) piping diameters can minimize pressure drop. Be sure no traps or sags are present.
- LG prefers the use of hard drawn copper in pipe segments connecting a Split Roof Top Unit(RTU) product and an outdoor unit

Selection of Piping Size

NOTE

- Always reference the LATS HVAC software report (latest version)
- Larger-capacity outdoor units must be the master in a multiframe system
- Master outdoor unit capacity must be greater than or equal to the slave1 outdoor unit capacity, and, where applicable, slave1 outdoor unit capacity must be greater than or equal to the slave2 outdoor unit capacity.
- Connection piping from branch to branch cannot exceed the main pipe diameter (A) used by the outdoor unit.
- Other Indoor units cannot be connected with RTU units.
- Header Branch is not allowed to install in RTU Application.

Refrigerant System Engineering and Allowable Pipe Length

Proper system operation depends on the installer using utmost care while assembling the piping system.

NOTE

- LG Electronics U.S.A.,Inc. is not responsible for any piping calculations, refrigerant leaks, degradation of performance, any other potential problems or damages caused by the interconnecting piping, their joint connections, isolation valves, or introduced debris inside the piping system

WARNING

- Combining Multi V RTU units and Multi V indoor units on the same system is prohibited.

One of the most critical elements of a Multi V system is the refrigerant piping. Below Table lists pipe length limits that must be followed in the design of a Multi V refrigerant pipe system

Table. Multi V 5 Refrigerant Piping System Limitations.

Pipe Length (ELF = Equivalent Length of pipe in Feet)	Longest total equivalent piping length	3,280 feet
	Longest distance from outdoor unit to RTU unit	656 feet (Actual) 738 feet (Equivalent)
	Distance between fittings and RTU unit	≥ 20 inches
	Distance between fittings and Y-branches	≥ 20 inches
	Distance between two Y-branches	≥ 20 inches
	Minimum distance between RTU unit to any Y-branch	3 feet from RTU unit to Y-branch
	Maximum distance between first Y-branch to farthest RTU unit	131 feet (295 feet for conditional applications)
Elevation (All Elevation Limitations are Measured in Actual Feet)	If outdoor unit is above or below RTU unit	164 feet
	Between RTU Units	98 feet

Table. Equivalent Piping Length for Y-branches, Headers, and Other Piping Components.

Components	Size (inches)													
Long Radius Elbow(ft.)	1/4	3/8	1/2	5/8	3/4	7/8	1	1-1/8	1-1/4	1-3/8	1-1/2	1-5/8	1-3/4	2-1/8
Y-branch (ft.) ¹	0.5	0.6	0.7	0.8	1.2	1.3	1.5	1.6	1.8	2.0	2.1	2.3	2.5	2.8

*1: Kit contains two Y-branches: one for liquid and one for vapor.

Pipe Handling

Pipes used for the refrigerant piping system must include the specified thickness, and the interior must be clean. While handling and storing, do not bend or damage the pipes, and take care not to contaminate the interior with dust, moisture, etc.

Refrigerant System Engineering

Proper system operation depends on the installer using utmost care while assembling the piping system.

WARNING

LG Electronics U.S.A., Inc., is not responsible for any piping calculations, refrigerant leaks, degradation of performance, any other potential problems or damages caused by the interconnecting piping, their joint connections, isolation valves, or introduced debris inside the piping system.

Selection of Piping Size

WARNING

For piping work, follow the maximum tolerated length, difference in height, and length after a branch

- Use only the pipe size selected by the LATS HVAC pipe system design software. Using a different size is prohibited and will result in a system malfunction or failure to work at all.
- Larger-capacity outdoor units must be the master in a multiframe system
- Master outdoor unit capacity must be greater than or equal to the slave1 outdoor unit capacity, and, where applicable, slave1 outdoor unit capacity must be greater than or equal to the slave2 outdoor unit capacity.
- Connection piping from branch to branch cannot exceed the main pipe diameter (A) used by the outdoor unit.
- Install the header branches or heat recovery units so that the pipe distances between the connected indoor units are minimized. Large differences in pipe distances can cause indoor unit performances to fluctuate.
- Y-branches and other header branches cannot be installed downstream of the initial header branch

Determine the proper size referring to following tables and reference figure (only for indication)

Figure. Piping Sizing

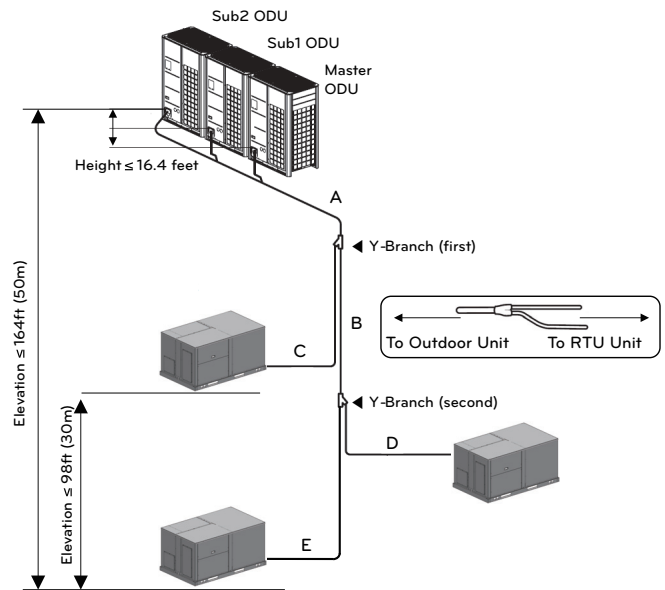


Table. Piping Outer Diameter size

ODU Capacity Ton (kBtu/h)	Liquid Pipe OD Inches(mm)	Low Pressure Pipe OD Inches(mm)	High Pressure Pipe OD Inches(mm)
10(119.7)	1/2 (12.7)	1-1/8(28.58)	3/4 (19.05)
12(144)			7/8(22.22)
14(168)			
16-18(192-206)	5/8(15.88)	1-3/8(34.9)	1-1/8n(28.58)
20(233.1)			
22-28 (264-336)			
30-42(360-504)	3/8(9.52)	1-5/8 (41.3)	

Table. Main Pipe (A)

ODU Capacity Ton (kBtu/h)	Liquid Pipe OD Inches (mm)	Low Pressure Pipe OD Inches (mm)	High Pressure Pipe OD Inches (mm)
10(119.7)	1/2 (12.7)	No Increase	No Increase
12(144)			
14(168)			
16-18(192-206)	5/8 (15.88)	No Increase	No Increase
20(233.1)			
22-28 (264-336)	7/8 (22.22)	No Increase	No Increase
30-42 (360-504)			

Table. Pipe B/C/D/E between Y-branch and Y-branch /RTU

Downstream RTU Capacity(kBtu/h)	Liquid Pipe OD Inches (mm)	Low Pressure Pipe OD Inches (mm)	High Pressure Pipe OD Inches (mm)
<114,700	3/8 (9.52)	7/8 (22.22)	3/4 (19.05)
<172,000	1/2 (12.7)	1-1/8 (28.58)	7/8 (22.22)
<229,400			
<248,500	5/8 (15.88)	1-3/8 (34.9)	1-1/8 (28.58)
<344,000			
<592,000	3/4 (19.05)	1-5/8 (41.3)	1-3/8 (34.9)

ELECTRICAL INFORMATION

! WARNING

- All power wiring and communication cable installation must be performed by authorized service providers working in accordance with local, state, and National Electrical Code (NEC) regulations related to electrical equipment and wiring, and following the instructions in this manual. Failure to do so will lead to electric shock and bodily injury or death.
- Be sure that main power to the unit is completely off before proceeding. Follow all safety and warning information outlined at the beginning of this manual. Failure to do so will cause electric shock and bodily injury.
- Familiarize yourself with the location of the circuit breaker. Be sure that a circuit breaker or some other emergency power cutoff device is in place before any power wiring is done to the system. Failure to do so will cause bodily injury or death.
- ⚡ Never touch any power lines or live cables before all power is cutoff to the system. To do so, will cause bodily injury or death.
- Undersized wiring will lead to unacceptable voltage at the unit and will cause a fire, which will cause bodily injury or death.
- Properly ground all outdoor units and RTU units. Ground wiring must always be installed by a qualified technician. Ground wiring is required to prevent accidental electrical shock during current leakage, which will cause bodily injury or death.
- Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and NEC regulations related to electrical equipment and wiring, and following the instructions in this manual. Generated overcurrent could include some amount of direct current. Using an oversized breaker or fuse will result in electric shock, physical injury or death.
- ⚡ Do not connect ground wire to refrigerant, gas, or water piping; to lightning rods; to telephone ground wiring; or to the building plumbing system. Failure to properly provide a NEC-approved earth ground can result in electric shock, physical injury or death.

! NOTE

- Consider ambient conditions (temperature, direct sunlight, inclement weather, etc.) when selecting, installing, and connecting the power wiring.
- Properly ground all RTU units. Ground wiring must always be installed by a qualified technician. Improperly ground wire can cause communication problems from electrical noise, and motor current leakage.
- If there is a possibility of reversed phase, phase loss, momentary blackout, or the power goes on and off while the system is operating, install a field-supplied phase loss protection circuit. If the system operates in reversed phase, etc., it will damage the compressors and other components.
- Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and NEC regulations related to electrical equipment and wiring, and following the instructions in this manual. Generated overcurrent will include some amount of direct current. Using an oversized breaker or fuse will result in equipment malfunction and property damage.
- ⚡ Do not connect ground wire to refrigerant, gas, or water piping; to lightning rods; to telephone ground wiring; or to the building plumbing system. Failure to properly provide a NEC-approved earth ground can result in property damage and equipment malfunction.
- Verify the power imbalance is no greater than 2% between phases at each outdoor unit frame. Power imbalances will damage the components.

Separating Power Wiring and Communication Cables

- Avoid running the power wiring and communication cable alongside each other; there is a strong likelihood of operation malfunction due to electrostatic and electromagnetic interference. Do not run both in the same conduit.
- If running the power wiring and communication cable alongside each other cannot be avoided, see the table below for minimum required distances.

Table. Power Wire and Communication Cable Minimum Required Separation Allowable Distance

Capacity of Power Supply Wiring(Current)		Minimum Distance ^{1,2}
100V or more	10A	12 inches
	50A	20 inches
	100A	40 inches
	Exceeding 100A	60 inches

* 1 : The figures above are based on parallel lengths up to 328 feet long. For lengths in excess of 328 feet, the distances will have to be recalculated in direct proportion to the additional line lengths involved.

* 2 : If the power supply waveform continues to exhibit some distortion, the space between the power wiring and communication cable must be increased.

! NOTE

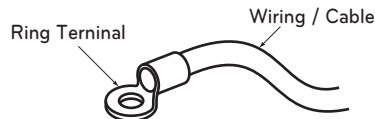
- ⚡ Do not secure the power wiring and communication cables together. It will result in equipment malfunction.
- ⚡ Do not run the power wiring and the communication cable in the same conduit. It will result in equipment malfunction

Power Wiring / Communication Cable Connection

Best practice dictates using solderless ring or fork terminals at all power wiring and communication cable terminations. Use copper bearing ring or fork terminals; ⓧ Do not use galvanized or nickel plate over steel. Use appropriate crimping tool to attach the ring or fork terminals at all power wiring and control cable terminations. To install:

- Firmly attach the wire; secure in a way to prevent external forces from being imparted to the terminal block.
- Use an appropriately sized screwdriver for tightening the terminals.
- ⓧ Do not overtighten the connections; over tightening will damage the terminal

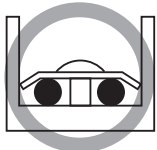
Figure. Typical Ring Terminal



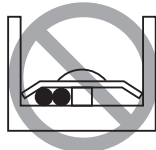
If ring terminals or fork terminals are not available, then:

- ⓧ Do not terminate different gauge wires to the power terminal block. (Slack in the wiring will generate heat.)
- When terminating wires of the same thickness, follow the instructions demonstrated in the figures below.

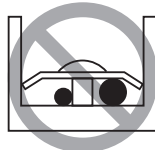
Figure. Proper & Improper Power Wiring Connections



Terminate multiple power wires of the same gauge to both sides.



ⓧ Do not terminate two wires on one side



ⓧ Do not terminate different gauge wires to a terminal block

⚠ WARNING

- If power wires are not properly terminated and firmly attached, there is risk of fire, electric shock, and physical injury or death

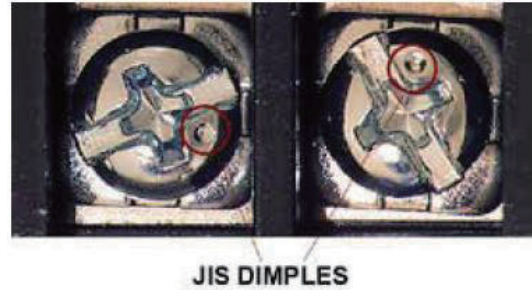
! NOTE

- ⓧ Never apply line voltage power to the communications cable terminal block. If contact is made, the PCBs will be damaged.
- Always include some allowance in the wiring length when terminating. Firmly attach the wiring or cable, but provide some slack to facilitate removing the electrical panels while servicing, and to prevent external forces from damaging the terminal block

Terminal Connections

LG uses a "JIS" type of screw for all terminals; us a JIS screwdriver to tighten and loosen these screws and void damaging the terminal Do not overtighten the connections overtightening will damage the terminals – but firmly and securely attach the wiring in a way to prevent external forces from being imparted to the terminal block

Figure. JIS screw



! NOTE

- All wiring to the unit must be drawn through one of the prepunched holes in the bottom of the floor pan immediately underneath the control center or through a field-cut hole in the side of the unit casing
- The terminals labeled "GND" are NOT ground terminals. The terminals labeled ⓧ ARE ground terminals.
- Polarity matters. Always connect "A" to "A" and "B" to "B."
- Always create a wiring diagram that contains the exact sequence in which all the indoor units and heat recovery units are wired in relation to the outdoor unit.
- ⓧ Do not include splices or wire nuts in the communication cable

Power Supply / Power Wiring Specifications

Outdoor unit(s) and RTU units must be provided power from separate breakers. For detailed information, see the Multi V Outdoor Unit Engineering and Installation Manuals on www.lghvac.com.

RTU units

- RTU units require 1Ø, 208/230V, 60Hz power, but each unit draws minimal power.
- Where permitted by NEC and local codes, multiple RTU units can be powered from a single breaker.
- Service switches typically must be installed for each RTU unit
- Ground each RTU unit separately to a solid earth ground source per NEC and local code requirements.

WARNING

- All power wiring installation must be performed by trained service providers working in accordance with local, state, and NEC regulations related to electrical equipment and wiring, and following the instructions in this manual. Failure to do so will lead to electric shock and bodily injury or death.
- Use specified wiring for connections, and ensure that external force is not imparted to terminal connections. If connections are too firmly attached, it will generate heat and / or cause a fire, resulting in physical injury or death.
- Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and NEC regulations related to electrical equipment and wiring, and following the instructions in this manual. Generated overcurrent will include some amount of direct current. Using an oversized breaker or fuse will result in electric shock, physical injury or death.
- Use the appropriate type of overcurrent protection. Generated overcurrent will include some amount of direct current, and if the appropriate type of overcurrent protection is not installed, there is a risk of fire, electric shock, and physical injury or death.
- Ground wiring is required to prevent accidental electrical shock during current leakage, communication problems from electrical noise, and motor current leakage. Do not connect the ground line to the pipes. There is risk of fire, electric shock, explosion, physical injury or death.
- Install a main shutoff switch that interrupts all power sources simultaneously. There is risk of fire, electric shock, explosion, physical injury or death.

NOTE

- Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and NEC regulations related to electrical equipment and wiring, and following the instructions in this manual. Generated overcurrent could include some amount of direct current. Using an oversized breaker or fuse will result in equipment malfunction and property damage.
-  Do not connect ground wire to refrigerant, gas, or water piping to lightning rods; to telephone ground wiring; or to the building plumbing system. Failure to properly provide a National Electrical Code-approved earth ground can result in property damage and equipment malfunction

Communication Cable Specifications From Outdoor Unit to RTU Units

- Communication cable from Main Outdoor Unit to RTU Units is to be LG supplied or field supplied 18 AWG, 4-conductor, twisted, stranded, shielded. Never splice communications cable. Ensure the communication cable shield is properly grounded to the Main Outdoor Unit chassis only. Do not ground the Outdoor Unit to RTU Units communication cable at any other point. Wiring must comply with all applicable local and national codes.
- Cable shields between the connected devices must be tied together and continuous from the main outdoor unit to the last component connected and insulated to prevent grounding against the RTU Unit electrical enclosures.
- Start the communication cable at the main outdoor unit and route to the RTU units in a daisy chain configuration. Do not install in a starburst configuration.
- Insulation as required by NEC and local codes.
- Rated for continuous exposure of temperatures up to 140°F.
- Maximum allowable communication cable length is 3,281 feet

WARNING

- Ground wiring is required to prevent accidental electrical shock during current leakage, communication problems from electrical noise, and motor current leakage. Do not connect the ground line to the pipes. There is risk of fire, electric shock, explosion, physical injury or death.
-  Never ground the shield of the communications cable to the indoor unit frame or other grounded entities of the building. In adequate connections will generate heat, cause a fire, and physical injury or death

NOTE

- Always verify the communication cable is connected to a communications terminal on the outdoor unit(s). Never apply line voltage power to the communication cable connection. If contact is made, the PCBs will be damaged.
-  Never use a common multiple-core communications cable. Each communications bus shall be provided a separate cable (i.e., between outdoor unit(s) and RTU unit(s), outdoor units and central controller(s)). If communications cables of separate systems are wired using a common multiple-core cable, it will result in a poor communications signal and unacceptable system operation

Communication Cable Connection

! NOTE

- When connecting the communications bus between the outdoor unit and RTU unit(s), it does not matter what physical path or route the wire takes. The installer may use discretion when choosing the order the components are connected to the communications bus, but must maintain the daisy chain and polarity configuration.

1. Access hole of Communication and power cable are located at the bottom of Unit. Remember the communications cable and the power cable must enter the control box through different knockouts.
2. Rubber grommet in the knockout hole to prevent wire chaffing.
3. If using conduit, connect the conduit to the control box using field-provided fittings and industry best-practice procedures.
4. Provide at least three (3) to four (4) inches of slack cable at each RTU unit.
5. Secure the communications cable to the inside surface of the control box using a field provided nylon wire clamp.
6. Strip approximately quarter of an inch of insulation from each communications cable conductor. At each RTU unit, insert the conductors under the terminal screw.
7. Securely tighten the terminal screws to prevent the communications conductors from coming loose from the terminal block
8. Secure the communications cable in appropriate locations outside the indoor unit to prevent damage to the cable or injury to maintenance personnel.

Connecting the Power Wiring

High voltage electricity is required to operate this system. Adhere to the National Electrical Codes and these instructions when wiring. Always ground the unit following local, state, and National Electrical Codes. Read the safety summary at the beginning of this manual.

- Secure all field wiring connections with appropriate wire strain relief. Improperly securing wires will create undue stress on equipment power lugs. Inadequate connections will generate heat, cause a fire and physical injury or death.
- Properly tighten all power connections. Loose wiring will overheat at connection points, causing a fire, physical injury or death.

! NOTE

- Connect the RTU unit input power cable but do not apply power to the RTU unit until authorized to do so by the system commissioning agent. Inappropriate power connection can result in equipment damage and will void the LG limited liability warranty.
- When connecting the communications bus between the outdoor unit and RTU unit(s), it does not matter what physical path or route the wire takes. The installer can use discretion when choosing the order the components are connected to the communications bus, but must maintain the daisy chain and polarity configuration.
- Failure to follow any of these power and communications wiring guidelines or instructions will cause communications errors and unit malfunction.

Don'ts

Never use wire caps and never splice communications cables.

- Never connect central controllers or LG building management system gateways to the RTU unit / outdoor unit communications cable.

Connection Procedure

RTU unit installation best practices are to connect control wiring (low voltage) and then connect power wiring (high voltage). Do not apply power to the RTU unit or any Multi V system component until authorized to do so by the system commissioning agent.

1. Ensure the input power is disconnected and there is no power on the power input cable.
2. Remove the knockout plugs from the control box. Remember the communications cable and the power cable must enter the control box through different knockouts.
3. Install a field provided plastic or rubber grommet in the knockout holes to prevent wire chaffing.
4. If using conduit, connect the conduit to the control box using field provided fittings and industry best-practice procedures.
5. Ensure the power wiring is routed separately from the communications cable to the unit's terminal block. Do not route the communications cable near the power cable. Provide at least three (3) to four (4) inches of slack cable at each RTU unit.

! NOTE

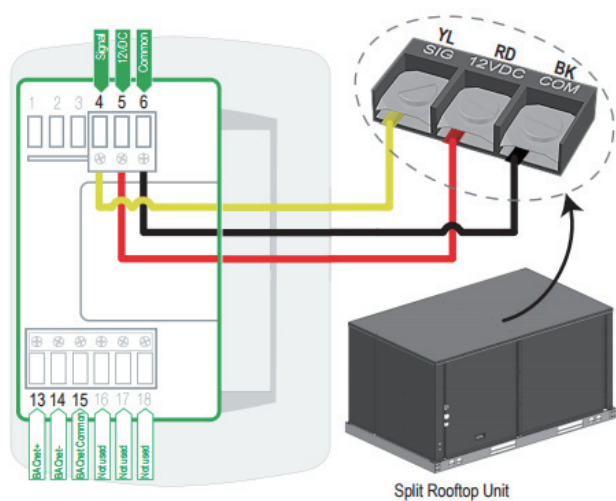
- Power wiring is field supplied. Wire size is selected based on the larger MCA value, and must comply with the applicable local and national codes.

6. Connect the power wiring to the terminal block connections. Ensure the screws securely connect the wire to the terminals and are not loose.
7. Polarity matters on the outdoor unit to RTU unit communications bus, and must be maintained throughout the entire system. Be sure to connect:
 - IDU-A terminals (outdoor unit) to ODU(IDU)-A (RTU unit) terminals and connect IDU-B terminals (outdoor unit) terminals to ODU(IDU)-B (RTU unit) terminals.
 - Central-A terminals (outdoor unit) to ODU(CEN)-A (RTU unit) terminals and connect Central-B terminals (outdoor unit) to ODU(CEN)-B (RTU unit) terminals.
 Refer to the preceeding pages for RTU unit wiring connections.

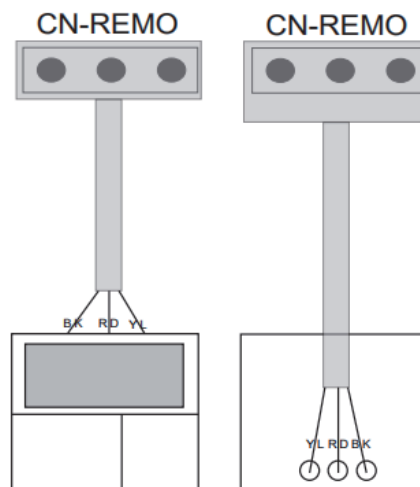
Communication Cable Specification from RTUs to Remote Controllers

- Communication cable from RTU to Remote Controller(s) is to be LG supplied or field supplied 22 AWG, 3-conductor, twisted, stranded, unshielded. Wiring must comply with all applicable local and national codes.
- If using LG supplied cable and the length needs to be extended, the LG Extension Kit (sold separately) must be used. A maximum of four (4) kits (up to 165 feet) can be used.
- Remote Controllers have hardwired connections: SIG - 12V - GND (Comm.) terminals.
- See diagrams below for two options: terminal block connections and Molex connections. Refer to the wiring diagram schematic found in the RTU itself, or to the wiring diagram in this Manual.
- NEVER splice, cut, or extend cable length with field provided cable. Always include enough cable to cover distance between the RTU and the remote controller.
- Set the RTU operating parameters using DIP switches, or by setting up the remote controller. Refer to the remote controller installation manuals for more details.

One example of RTU to Zone Controller Connection.



Another example of RTU to Zone Controller Connection.



NOTE

- Cable connected to Zone Controller is the factory default connection.

Communication Cable Specification between Multiple RTUs Operating as a Group(Group Control)

If any RTUs were specified to operate in unison:

- Before running cable, decide which indoor unit will be the "Main." The other indoor units in that group will be designated as "Sub(s)." The zone controller will be connected to the "Main."
- Set the pertinent DIP switch at each indoor unit to identify the Main and Sub(s).
- Use a daisy chain configuration and connect all of the group's indoor units together starting at the "Main" unit.
- NEVER splice, cut, or extend cable length with field provided cable. Always include enough cable to cover distance between all components.
- Perform group control settings and connect the group control wiring after the system auto address and auto pipe procedures have been completed.

For indoor units with hardwired connections SIG - 12V - GND (Comm.) terminals:

- From the controller to the main indoor unit, use 22 AWG, 3-conductor, twisted, stranded, unshielded. All wiring must comply with all applicable local and national codes.
- From the main indoor unit to the sub indoor unit(s), daisy chain using 22 AWG, 3-conductor, twisted, stranded, unshielded. (Do not attach wire to 12VDC terminal to the slave indoor units). All wiring must comply with all applicable local and national codes.

For indoor units with CN-REMO connections:

Use Group Control Kit (sold separately) containing extension and Y-splitter cables. Use one (1) group control cable kit for each indoor unit in the group except for the last indoor unit.

NOTE

- Cable connected to zone controller is the factory default connection.
- Indoor unit connections depend on indoor unit type.

Figure. Example of Indoor Unit Group to Zone Controller Connections.(Sig-12V-GND [Comm.]Terminal)

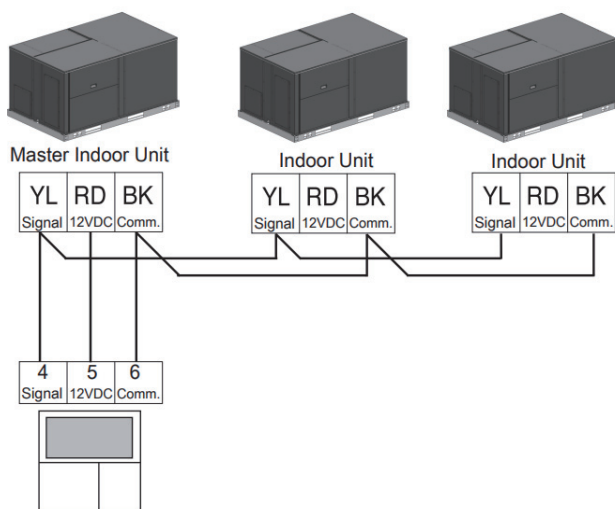
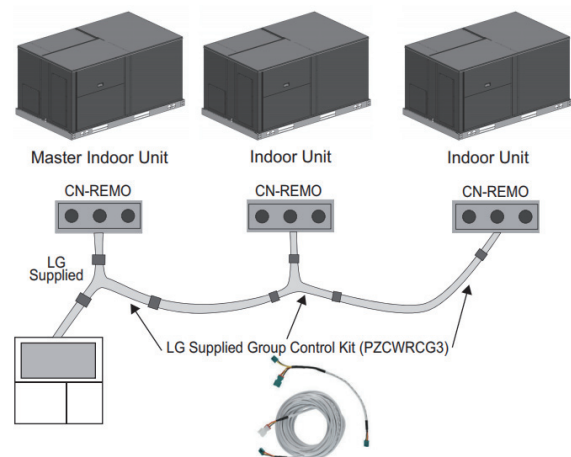


Figure. Example of Indoor Unit Group to Zone Controller Connections.(CN-REMO)



Communication Cable Connections

NOTE

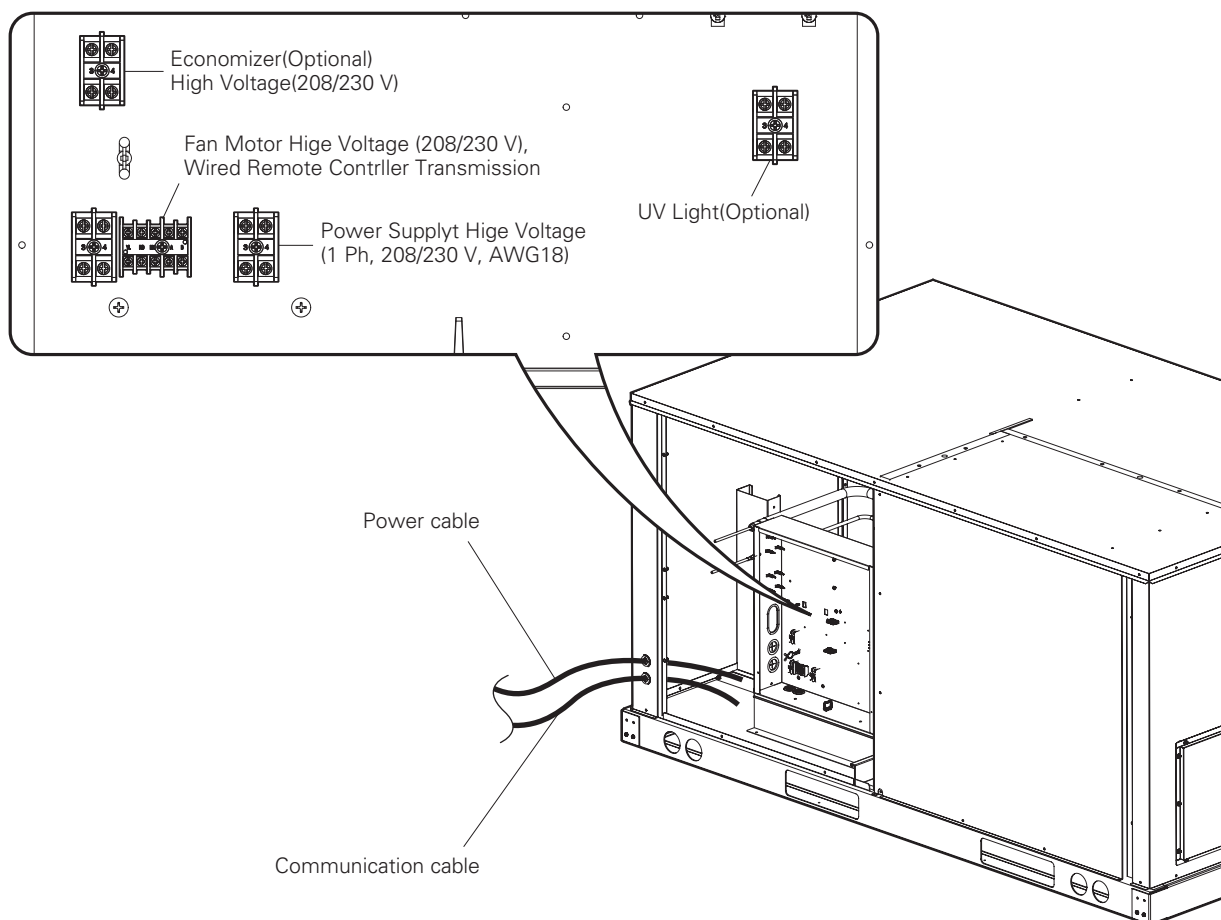
When connecting the communications bus between the outdoor unit, indoor unit(s), and heat recovery unit(s), it does not matter what physical path or route the wire takes. The installer may use discretion when choosing the order the components are connected to the communications bus, but must maintain the daisy chain and polarity configuration.

1. Remove a knock-out plug from the control box. Remember the communications cable and the power cable must enter the control box through different knockouts.
2. Field-install a plastic or rubber grommet in the knockout hole to prevent wire chaffing.
3. If using conduit, connect the conduit to the control box using field-provided fittings and industry best-practice procedures.
4. Provide at least three (3) to four (4) inches of slack cable at each indoor unit.
5. Secure the communications cable to the inside surface of the control box using a field provided nylon wire clamp.
6. Strip approximately quarter of an inch of insulation from each communications cable conductor. At each indoor unit, insert the conductors under the terminal screw.
7. Securely tighten the terminal screws to prevent the communications conductors from coming loose from the terminal block.
8. Secure the communications cable in appropriate locations outside the indoor unit.

Recommended Electrical Entry Location

It is recommended by the Manufacturer that electrical service be brought into the unit through the end wall, as shown below. There are three penetrations into the cabinet that are required. See Figure below.

Figure. Location of Power/Communications Cable in the RoofTop Unit.



Wired remote controller installation

- Since the room temperature sensor is in the remote controller, the remote controller box should be installed in a place away from direct sunlight, high humidity and direct supply of cold air to maintain proper space temperature.
Install the remote controller about 1.2~1.5 m(4~5 ft) above the floor in an area with good air circulation at an average temperature.

Do not install the remote controller where it can be affected by:

- Drafts, or dead spots behind doors and in corners.
- Hot or cold air from ducts.
- Radiant heat from sun or appliances.
- Concealed pipes and chimneys.
- Uncontrolled areas such as an outside wall behind the remote controller.
- This remote controller is equipped with a seven segment LED. display. For proper display of the remote controller LED's, the remote controller should be installed properly as shown in Fig 7.
(The standard height is 1.2~1.5 m(4~5 ft) from floor level.)

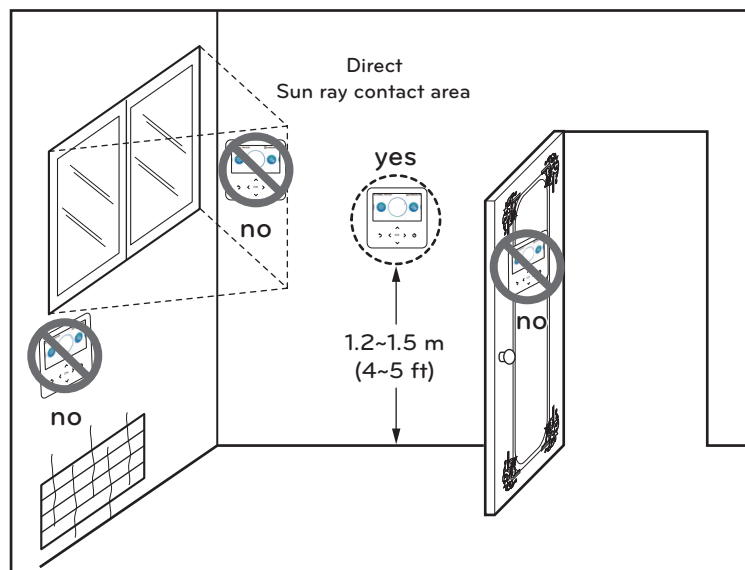


Figure. Typical locations for remote controller

Electronic Wiring

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

⚠ WARNING

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

LEAK / PRESSURE CHECK AND EVACUATION

Leak / Pressure Check

After the refrigerant piping installation is complete, perform a triple leak / pressure test to check for leaks at any joints or connections within the piping system.

! DANGER

- Using combustible gases, including oxygen, will result in fire or explosion and result in severe personal injury or death. Use inert gas (medical-grade dry nitrogen) when checking leaks, cleaning, installing/repairing pipes, etc. The use of a 600psig nitrogen regulator is required for safety.

! NOTE

- ⚠ Do not apply power to the units before performing a system leak test. There is a possibility that the EEV valves will close and isolate sections of the piping system, making the leak test inconclusive. Contact your LG Applied Rep or service technician for the procedure to reopen the EEV valves before the leak test ONLY if the power has been applied
- For multi-frame outdoor units, connect the nitrogen cylinder regulator to the gauge manifold, then connect the gauge manifold to the Schrader port on the service port of only one outdoor unit, preferably the slave outdoor unit that is farthest away from the refrigerant piping system and connected indoor units / heat recovery units.
- ⚠ Never perform the leak test using refrigerant
- ⚠ To avoid nitrogen entering the refrigerant system in a liquid state, the top of the cylinder must be higher than its bottom (used in a vertical standing position) when the system is pressurized
- Use only a leak-free gauge manifold set

Leak / Pressure Check Procedure Steps.

1. After the refrigerant piping installation is complete, open the isolation ball valves, if any that will have been included in the piping system.
2. Verify that all outdoor unit service ports are closed. For multi-frame outdoor units, verify the service valves on all master and slave outdoor units are closed and the stem head access caps are tight. The leak / pressure check is to be performed to only the refrigerant piping system and connected RTU units
3. Remove the caps on the Schrader ports. Connect the (medical-grade dry) nitrogen cylinder regulator to a gauge manifold, then connect the gauge manifold to the Schrader ports on the hot gas line (high pressure vapor), liquid line, and suction (low pressure vapor) service ports..

! NOTE

- For multi-frame outdoor units, connect the gauge manifold to the Schrader ports on only one outdoor unit, preferably the slave outdoor unit that is farthest away from the refrigerant piping system and connected indoor units / heat recovery units

4. Perform the leak / pressure check at 150 psig for five (5) minutes (standing pressure check).
5. Perform the leak / pressure check at 300 psig for fifteen (15) minutes (standing pressure check).
6. Perform the leak / pressure check at 550 psig for 24 hours to make sure the piping system is leak-free. After the gauge reading reaches 550 psig, isolate the system by first closing the gauge manifold, then close the nitrogen cylinder valve. Check the flared and brazed connections for leaks by applying a bubble solution to all joints.

! NOTE

- The bubble solution must be a solution designed for refrigerant leak testing. Common soap solution must never be used on refrigerant piping as those contain chemicals that could corrode copper and brass, and cause product malfunction

7. If the pressure does NOT drop for 24 hours, the system passes the test. See how ambient conditions will affect the pressure test below.

Ambient Conditions and the Leak / Pressure Check

If the ambient temperature changed between the times when pressure was applied and when the pressure drop was checked, adjust results by factoring in approximately 0.79 psi for each 1°F of temperature difference.

Correction formula:

(°F Temperature when pressure was applied - °F Temperature when pressure drop was checked) x 0.79.

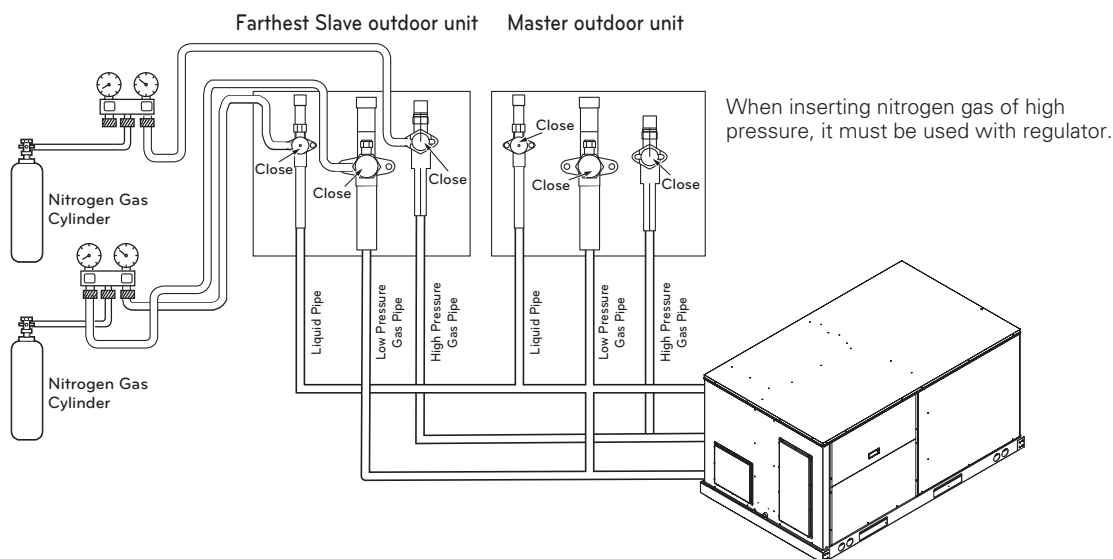
Example: When pressure (550 psig) was applied, temperature was 80°F; 24 hours later when pressure drop (540 psig) was checked, temperature was 68°F.

Thus, $(80^{\circ}\text{F} - 68^{\circ}\text{F}) \times 0.79 = 9.5 \text{ psig}$.

In this case, the pressure drop of 9.5 psig was due to temperature differences, therefore, there is no leak in the refrigerant piping system.

8. If the pressure drops and it is not due to ambient conditions, there is a leak and it must be found. Remove the bubble solution with a clean cloth, repair the leak(s), and perform the leak / pressure check again.
9. After the system has been thoroughly tested and no leaks are found, depressurize by loosening the charging hose connector at the nitrogen cylinder regulator. When system pressure returns to normal, completely disconnect the charging hose from the cylinder, and release the nitrogen charge from all refrigerant piping. Wipe off any remaining bubble solution with a clean cloth.

Figure. Leak / Pressure Test for system designed for RTU HR Model

**NOTE**

- Farthest slave outdoor unit is the slave outdoor unit installed farthest away from the refrigerant piping system / RTU unit

Evacuation

After the leak / pressure check is complete, perform a Triple Evacuation with the entire system. Evacuation must be performed through the Schrader ports on the outdoor unit service ports.

NOTE

- For faster evacuation, the Schrader core can be removed, and an auxiliary service port can be used. Make sure to re-install the original Schrader core before operating the system.

For Heat Recovery systems, evacuate through all three (3) hot gas line (high pressure vapor), liquid line, and suction (low pressure vapor) refrigerant lines.

The outdoor unit service valves must remain closed and the stem head access caps tight. Do not open the outdoor unit service valves and release the factory refrigerant charge until the LG trained commissioner authorizes to do so. The system must be left in vacuum until the LG trained commissioner verifies the quality of the evacuation.

Any field-installed ball valves in the refrigerant system (if used) must be open to ensure all piping is free and clear for evacuation on all piping and connected indoor units / heat recovery units.

NOTE

- Do not apply power to the units before performing a system leak test. There is a possibility that the EEV valves will close and isolate sections of the piping system, making the leak test inconclusive. Contact your LG Applied Rep or service technician for the procedure to reopen the EEV valves before the leak test ONLY if the power has been applied
- For multi-frame outdoor units, connect the vacuum pump / manifold to the service port Schrader ports (or core) to only one outdoor unit, preferably the slave outdoor unit that is installed farthest away from the refrigerant piping system and connected indoor units / heat recovery units.
- Use only a vacuum pump that can reach 500 microns, vacuum rated hoses or copper tubing, and a leak-free gauge manifold set
- Use only new vacuum pump oil from a properly sealed (unopened) container, and change oil in pump before **EVERY** use.
- Subsequent oil changes will be necessary after several hours of continuous operation; have extra oil on hand.
- Use a quality micron gauge in good operating order and install as far away from pump as possible

Evacuation Procedure Steps

1. If this procedure is performed shortly after the leak / pressure test, the caps and cores on the Schrader ports must have already been removed, and the manifold must already be connected. If the procedure was not performed shortly after the leak / pressure test, make sure to remove the caps and cores on the Schrader ports. Verify that the service valves on the outdoor unit are closed, and the stem head access caps are tight.

NOTE

- Connect the vacuum pump to the gauge manifold and hoses. Once the vacuum pump is first operated, if hoses, manifold, and vacuum valves are leak free (and oil is no moisture laden), the gauge must read <100 microns within on (1) minute.

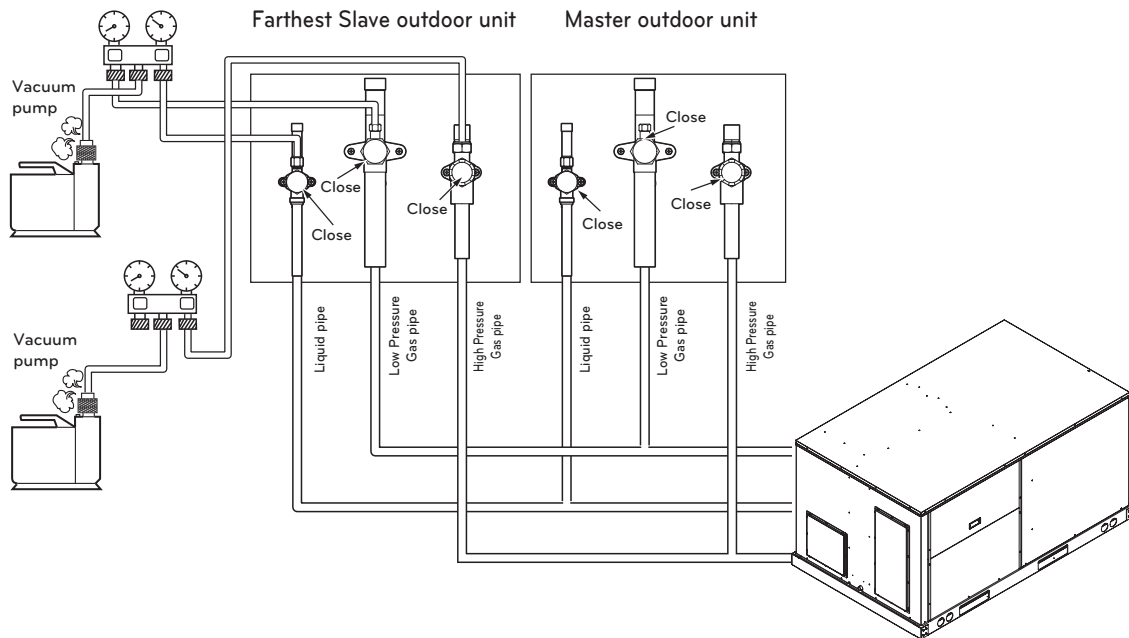
2. Connect the gauge manifold along with the vacuum pump to the Schrader ports (with core removed) using vacuum hoses. Open the gauge manifold and the vacuum pump valves
3. Operate the vacuum pump and evacuate the system to the 2,000 micron level. Isolate the pump by closing the manifold gauges and the vacuum pump valve, and then watch the micron level. Micron level could rise a bit, but **MUST** eventually stop rising for fifteen (15) minutes.
 - If the micron level **DOES NOT** stop rising, there is a leak, and the leak test must be performed again.
 - If the micron level **DOES** rise above 2,000 micron, re-open the manifold gauges and the vacuum pump valve and continue evacuation back down to 2,000 micron level.
 - If the micron level holds at 2,000 micron, continue to step 4.

4. Break vacuum with 50 psig nitrogen purge for an appropriate amount of time (this is to "sweep" moisture from piping).
5. Purge nitrogen from the system until the pressure drops down to 1 to 3 psig.
6. Evacuate to 1,000 micron level. Isolate the pump by closing the manifold gauges and the vacuum pump valve, and then watch the micron level. Micron level could rise a bit, but **MUST** eventually stop rising for fifteen (15) minutes.
 - If the micron level **DOES NOT** stop rising, there is a leak, and the leak test must be performed again.
 - If the micron level **DOES** rise above 1,000 micron, re-open the manifold gauges and the vacuum pump valve, and continue evacuation back down to 1,000 micron level.
 - If the micron level holds at 1,000 micron, continue to step 7.
7. Break vacuum with 50 psig nitrogen purge for an appropriate amount of time
8. Purge nitrogen from the system until the pressure drops down to 1 to 3 psig.
9. Evacuate to static micron level ≤ 500
10. Micron level must remain ≤ 500 for 24 hours. If the vacuum gauge rises and stops, the system could contain moisture, therefore, it will be necessary to repeat the steps of vacuum break and drying.
11. After maintaining the system in vacuum for 24 hours, check if the vacuum gauge rises or not. If it doesn't rise, then the system is properly evacuated.
12. Close manifold gauges.
13. Shut the valve before turning off the vacuum pump.

! NOTE

- If the outdoor unit is moved to and installed in another site, only charge with new refrigerant after successful leak test and triple evacuation procedures have been performed. If different refrigerant or air is mixed with the original refrigerant, the refrigerant cycle will malfunction and the unit will be damaged.

Figure. Evacuation Diagram for Heat Recovery Systems



! NOTE

- Farthest slave outdoor unit is the slave outdoor unit installed farthest away from the refrigerant piping system / RTU unit

CHARGING REFRIGERANT

DANGER

- Refrigerant gas is heavier than air and replaces oxygen. A massive leak will result in oxygen depletion, especially in basements, and an asphyxiation hazard will result in serious injury or death.
- If refrigerant gas leaks during installation, ventilate the area immediately. Refrigerant gas will result in producing toxic gas if it comes into contact with fire. Exposure to this gas will result in severe injury or death.

WARNING

- Refrigerant cannot be charged until field wiring has been completed.
- Refrigerant may only be charged after performing the leak test and the vacuum drying.
- When charging a system, care shall be taken that its maximum permissible charge is never exceeded, in view of the danger of liquid hammer.
- Charging with an unsuitable substance may cause explosions and accidents, so always ensure that the appropriate refrigerant R410A is charged.
- Refrigerant containers shall be opened slowly.
- Always use protective gloves and protect your eyes when charging refrigerant.
- When the refrigerant system is to be opened, refrigerant must be treated according to the applicable legislation.
- To avoid compressor breakdown. Do not charge the refrigerant more than the specified amount.

Refrigerant Charge Worksheet

The calculation of the additional charge should take into account the length of pipe and CF (Correction Factor) value of RTU unit.

System Tag or ID		Job Name : _____		Date : _____		
		Project Manager : _____				
Line #	Description	Chassis I.D	Size(Btu/h)	Quantity	CF(Rcf.) ¹ /(lbs.)	Total(lbs.)
1	Linear feet of 1/4" liquid line tubing ²	-	-		0.015	
2	Linear feet of 3/8" liquid line tubing ²	-	-		0.041	
3	Linear feet of 1/2" liquid line tubing ²	-	-		0.079	
4	Linear feet of 5/8" liquid line tubing ²	-	-		0.116	
5	Linear feet of 3/4" liquid line tubing ²	-	-		0.179	
6	Linear feet of 7/8" liquid line tubing ²	-	-		0.238	
7	Linear feet of 1" liquid line tubing ²	-	-		0.323	
8	Split Rooftop Unit(RTU) HR Model	DD	-		4.19	
9	Split Rooftop Unit(RTU) HP Model	DD	-		3.55	
10	ADDITIOINAL Refrigerant Charge Required (Sum of lines 1-9)					
11	Outdoor Unit Factory Refrigerant Charge	11A	ARUM072*TE5	72k		14.3
		11B	ARUM096*TE5	96k		23.2
		11C	ARUM121*TE5	121k		23.2
		11D	ARUM144*TE5	144k		26.5
		11E	ARUM168*TE5	168k		26.5
		11F	ARUM192*TE5	192k		30.9
		11G	ARUM216*TE5	216k		37.5
		11H	ARUM241*TE5	241k		37.5
12	Total ODU FACTORY Refrigerant Charge (sum of factory refrigerant charges for all ODUs in the system, line 10A – 10H)					

* 1: CF (Ref.) = Correction Factor for Refrigerant Charge.

* 2: For refrigerant charge purposes, consider only the liquid line; ignore the vapor line(s).

RTU Combination

No.	Connection Condition	Cobination
1	Only RTU installation	1) The total capacity of RTU should be 50~110% of outdoor unit.
2	Mixture Installation with standard indoor units and RTUs.	1) The total capacity of indoor units(Standard Indoor Unit + RTU) should be 50~100% of outdoor unit. 2) The total capacity of RTUs should be less than 60% the total capacity of Indoor units.

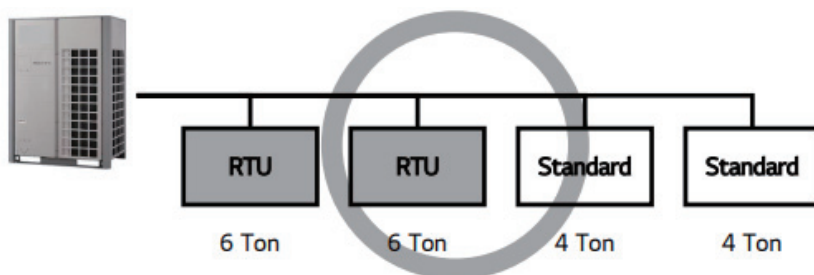
⚠ CAUTION

Failure to comply with the above connection conditions for installation, it can cause colling&heating capacity down.

Connection of the Outdoor Unit

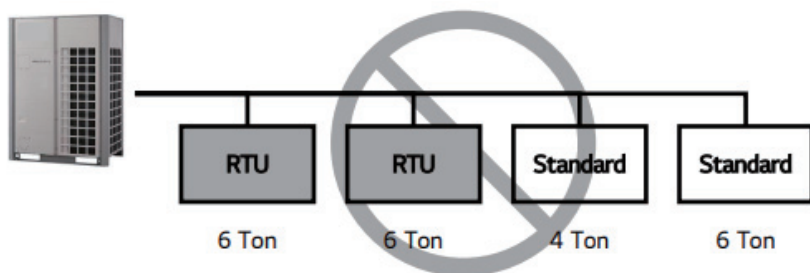
<Mixture Install>

Outdoor : 20 Ton



<Wrong Install>

Outdoor : 20 Ton



※ The total capacity of indoor units exceed 100% of Outdoor unit.

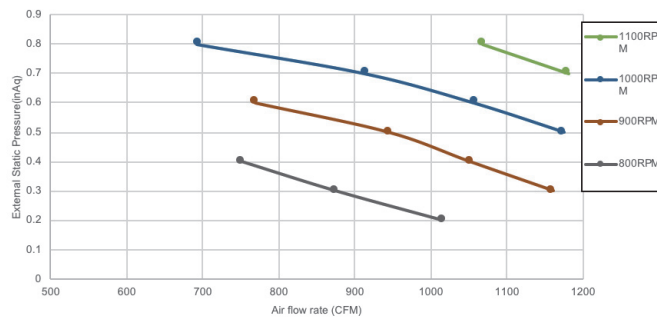
External Static Pressure

External Static Pressure(ESP) - 36k

36k ESP Table

ESP (InAq)	RPM			
	800	900	1000	1100
0.2	1014			
0.3	874	1161		
0.4	750	1051		
0.5		944	1175	
0.6		769	1056	
0.7			913	1181
0.8			693	1068

36k ESP Chart

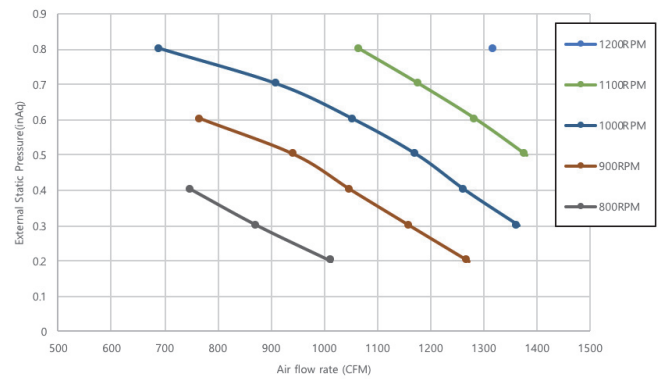


External Static Pressure(ESP) - 48k

48k ESP Table

ESP (InAq)	RPM				
	800	900	1000	1100	1200
0.2	1014	1272			
0.3	874	1161	1367		
0.4	750	1051	1266		
0.5		944	1175	1380	
0.6		769	1056	1287	
0.7			913	1181	
0.8			693	1068	1322

48k ESP Chart

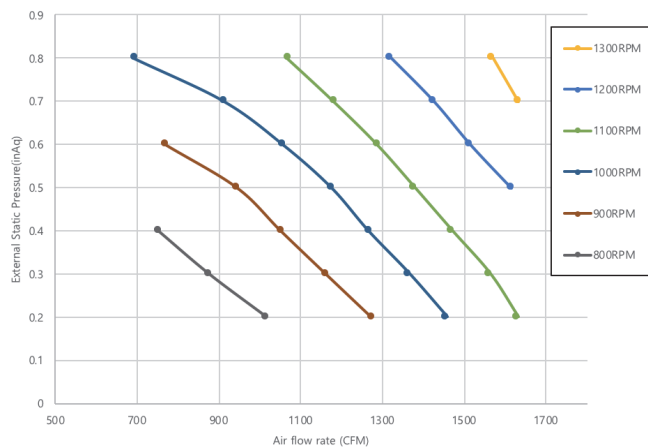


External Static Pressure(ESP) - 60k

60k ESP Table

ESP (InAq)	RPM					
	800	900	1000	1100	1200	1300
0.2	1014	1272	1458	1632		
0.3	874	1161	1367	1564		
0.4	750	1051	1266	1471		
0.5		944	1175	1380	1616	
0.6		769	1056	1287	1516	
0.7			913	1181	1426	1634
0.8			693	1068	1322	1571

60k ESP Chart

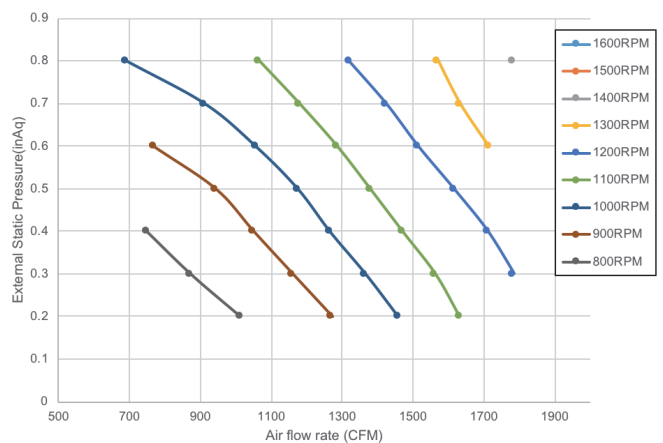


External Static Pressure(ESP) - 72k

72k ESP Table

ESP (InAq)	RPM						
	800	900	1000	1100	1200	1300	1400
0.2	1014	1272	1458	1632			
0.3	874	1161	1367	1564	1785		
0.4	750	1051	1266	1471	1711		
0.5		944	1175	1380	1616		
0.6		769	1056	1287	1516	1715	
0.7			913	1181	1426	1634	
0.8			693	1068	1322	1571	1784

72k ESP Chart





US	Please call the installing contractor of your product, as warranty service will be provided by them.
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