Multi F / Multi F MAX Air-Source System Install Tips

The following pages present an overview of Multi F / Multi F MAX air-source system installation concepts, and is intended to supplement the technical and installation information provided with each product and through www.lghvac.com. The review of basic operation and maintenance skills must reinforce industry established practices and provide helpful tips to make equipment operation successful.

Note:

⃠ ***The installation guide is NOT intended to be a replacement for LG installation manuals, nor is it intended to cover ALL the logistics of operating and maintenance of LG systems. For detailed information on the procedures mentioned here, refer to the installation manual specific to your product. Always comply with applicable local, state, and federal codes.***

Safety Instructions - Installation

⚠DANGER

⃠ Do not store or use flammable gas or combustibles near the unit.
There is risk of fire, explosion, and physical injury or death.

⚠CAUTION

Be very careful when transporting the product. There is a risk of the product falling and causing physical injury.
Use appropriate moving equipment to transport each frame; ensure the equipment is capable of supporting the weight of the equipment.

⚠WARNING

An authorized, trained technician licensed locally and at the state level must install the unit.
Improper installation by the user may result in fire, explosion, electric shock, physical injury or death.

Wear protective gloves when handling equipment. Sharp edges may cause personal injury.

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.

Dispose 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.

Install the unit considering the potential for strong winds or earthquakes.
Improper installation may cause the unit to fall over, resulting in physical injury or death.

Install the unit in a safe location where nobody can step on or fall onto it. ⃠ Do not install the unit on a defective stand.
It may result in an accident that causes physical injury or death.

Properly insulate all cold surfaces to prevent "sweating."
Cold surfaces such as uninsulated piping can generate condensate that could drip, causing a slippery surface that creates a risk of slipping, falling, and personal injury.

Note:

⃠ Do not install the product where it is exposed directly to ocean winds.
Sea salt in the air may cause the product to corrode. Corrosion, particularly on the condenser and evaporator fins, could cause product malfunction or inefficient operation.

Properly insulate all cold surfaces to prevent "sweating."
Cold surfaces such as uninsulated piping can generate condensate that may drip and cause a slippery surface condition and / or water damage to interior surfaces.

Always check for system refrigerant leaks after the unit has been installed.
Low refrigerant levels may cause product failure.

⃠ Do not make refrigerant substitutions. Use R-410A only.
If a different refrigerant is used, or air mixes with original refrigerant, the unit will malfunction and be damaged.

Keep the unit upright during installation to avoid vibration or water leakage.

When connecting refrigerant tubing, remember to allow for pipe expansion.
Improper piping may cause refrigerant leaks and system malfunction.

⃠ Do not install the outdoor unit in a noise-sensitive area. Periodically check that the outdoor frame is not damaged.
There is a risk of equipment damage.

Install the unit in a safe location where nobody can step on or fall onto it. ⃠ Do not install the unit on a defective stand.
There is a risk of unit and property damage.

Install the drain hose to ensure adequate drainage.
There is a risk of water leakage and property damage.

⃠ Do not store or use flammable gas / combustibles near the unit.
There is a risk of product failure.

Safety Instructions - Wiring

⚠DANGER

High voltage electricity is required to operate this system. Adhere to the U.S. National Electric Code (NEC) and these instructions when wiring.
Improper connections and inadequate grounding can cause accidental injury or death.

Always ground the unit following local, state, and NEC codes.
There is risk of fire, electric shock, and 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 industry-qualified, experienced, certified electrician familiar with the 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, property damage, personal 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.

All electric work must be performed by a licensed electrician and conform to local building codes or, in the absence of local codes, with the NEC, and the instructions given in this manual.
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.

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 lugs.
Loose wiring may overheat at connection points, causing a fire, physical injury or death.

⃠ Do not change the settings of the protection devices.
If the pressure switch, thermal switch, or other protection devices are bypassed or forced to work improperly, or parts other than those specified by LG are used, there is risk of fire, electric shock, explosion, and 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.

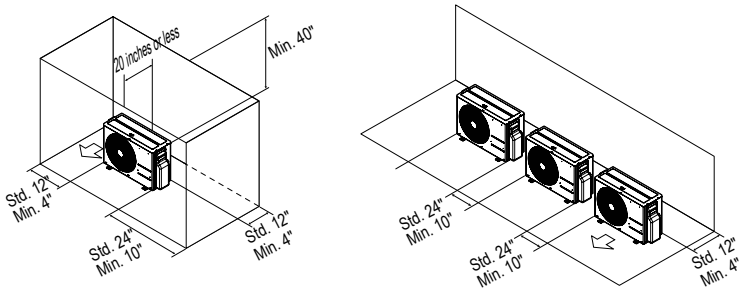
Clearances

LG Multi F / Multi F MAX air-source units are engineered to be installed outdoors. These outdoor units require sufficient space to ensure proper airflow, operation, and maintenance / service access. When installing outdoor units, allowable service, inlet, outlet, and space requirements MUST be considered. If the installation space is too tight around the outdoor units, then the system will not operate properly and it will be difficult to service. Figures below illustrate clearance requirements for various installation scenarios for Multi F and Multi F MAX outdoor units.

Other Outdoor Unit Placement Considerations:

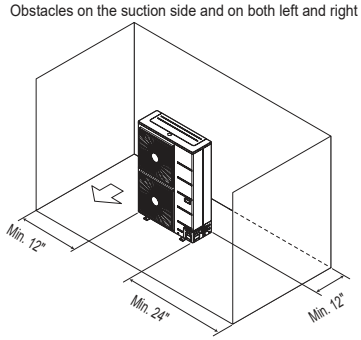
- Noise (Operational and Electrical)
- Site Occupants
- Good Drainage for Condensate, etc.
- Account for Snow Fall Levels
- Prevailing Winds
- Oceanside Applications (Install the outdoor unit on the side of the building opposite from direct ocean winds. If such an installation is not possible, then install a concrete windbreaker.)

Multi F Outdoor Unit Service Access and Allowable Clearances.

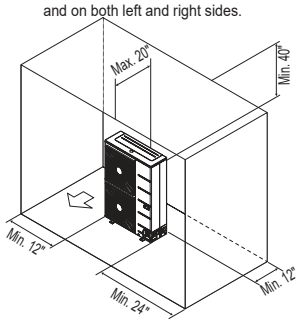


Multi F MAX Outdoor Unit Service Access and Allowable Clearances.

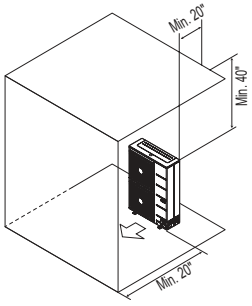
Obstacles on the suction side and on both left and right sides.



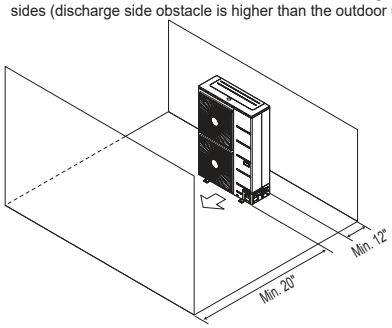
Obstacles above, on the air intake side, and on both left and right sides.



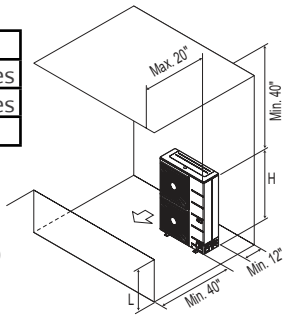
Obstacles above and on the air discharge side.



Where there are obstacles on both suction and discharge sides (discharge side obstacle is higher than the outdoor unit).



Where there are obstacles above, and on both suction and discharge sides (discharge side obstacle is lower than the outdoor unit).



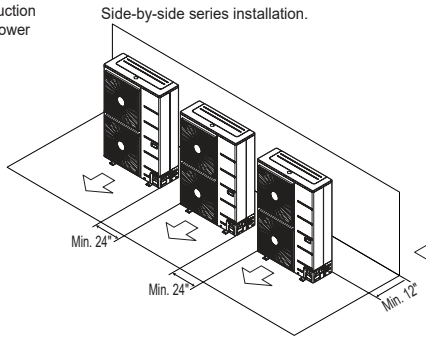
Ratio among H, A, and L.

	L	A
L ≤ H	0 < L ≤ 1/2 H	30 inches
	1/2 H < L	40 inches
H < L	Set Stand as: L ≤ H	

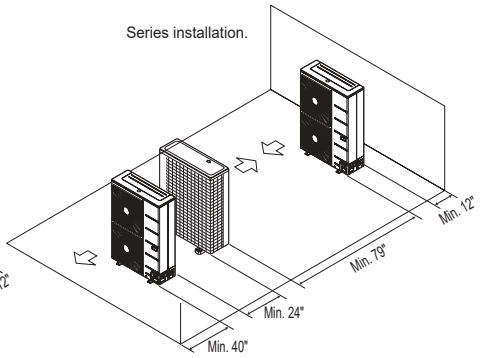
Note:

"L" must be lower than "H". If a stand is necessary, it must be contained (not open frame) to prevent the discharge air from short cycling.

Side-by-side series installation.



Series installation.



Note:

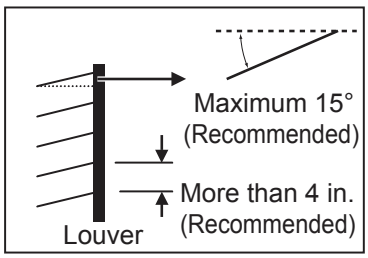
If the outdoor unit is installed between standard and minimum clearances, capacity decreases approximately 10%.

If placement options are limited because of a lack of ground space, roof space, a location that meets design requirements, on retrofit projects where an equipment / mechanical room already exists, then the outdoor unit MAY be installed in an interior space ONLY IF specific conditions are fulfilled. For example, if the Multi F / Multi F MAX outdoor unit is to be installed in an enclosure, it must have certain design specifications:

Louver Recommendations for Outdoor Unit Enclosures

- Enclosure is a Manual Door Open Type.
- Louver Angle: No More Than 15° Horizontally.
- Space Between Louvers : More than 4 inches (Recommend).
- Louver Shape: Wing or Plane Type. ⃠ Do not use "S" type louvers.
- Open Rate, Inlet, Outlet, Air Flow Rate, and Total Opening Rate must be taken into consideration. See the complete Multi F / Multi F MAX Outdoor Unit Installation Manual for information.

Louver Recommendations.



Note:

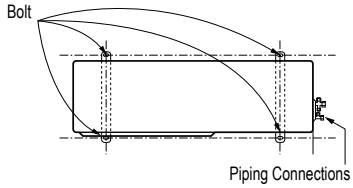
- ***If the rules for installing Multi F / Multi F MAX outdoor units (either outside or inside) are not followed correctly, a drop in outdoor unit fan performance and / or noise can occur, or if there is insufficient air flow exchange, the system could stop operating.***
- ***All dimensions are minimum clearances considering airflow only. Increase as necessary for NEC or other code compliance.***
- ***If the installation scenario varies in any way from the samples provided here or in the complete installation manual, contact an LG representative for guidance.***

Mounting Options

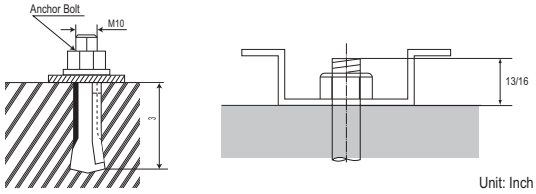
After an installation area for the outdoor unit(s) is chosen, verify:

- The floor surface / chosen location has enough strength to support the weight of the unit(s) and base.
- There is enough space for piping and wiring (when installed through the bottom of the unit [Multi F MAX outdoor units only).
- The area has sufficient slope for drainage around the foundation to ensure condensate thoroughly flows away from the outdoor unit condensate drain connection(s) to a drain (if present).
- Run-off from defrost mode will not accumulate and freeze on sidewalks or driveways.
- ⃠ Avoid placing the unit(s) in a low-lying area where water may accumulate.
- If installing the outdoor unit on a roof, check the strength of the roof.
- When installing on a wall (with field-supplied brackets), roof, or rooftop, securely anchor the mounting platform with nails and / or wiring, taking into consideration the possibility of strong winds or earthquakes.

Bolting the Outdoor Unit to the Platform (Piping Location May Differ Depending on Outdoor Unit Model).



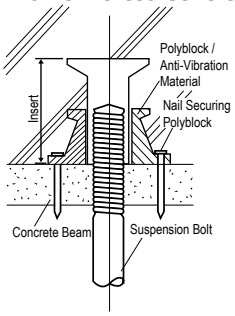
Close up of a Bolt Attachment.



Outdoor Unit Platform Concrete Specifications

- Concrete foundations must be made of one part cement, two parts sand, and four parts gravel.
- The surface of the foundation must be finished with mortar with rounded edges, and weatherproofed.
- Ensure that the concrete platform will not degrade easily, and has enough strength to bear the weight of the unit.
- Concrete height must be a minimum of four (4) to eight (8) inches high, depending on the outdoor unit. See the complete Multi F / Multi F MAX Installation Manual to review height, width, etc., platform requirements for each specific outdoor unit.

Example of Using an Insert for a Hole in a Reinforced Concrete Beam.



Bolting the Outdoor Unit

- All four corners of the outdoor unit must be supported properly, and securely fastened.
- Include an H-beam support. Attach the corners firmly, otherwise the support will bend.
- If not otherwise directed by a structural engineer or local codes, use a M10J bolt inserted at least three (3) inches deep into the supports. Tightly anchor the outdoor unit with the bolt and a hexagon nut.
- If there is a possibility of vibration from the outdoor unit transmitting to the building, add an anti-vibration material to the platform.
- Seal all wiring and piping access holes with field-supplied sealing material to prevent animals and bugs from entering the unit.

Tools

Verify the tools listed below are available for use at the installation site:

- Screw Drivers (JIS for terminal screws, Flat, Phillips)
- Pliers
- Wire Strippers, Cutters, and Crimpers
- Hammer
- Adjustable Wrenches
- Drill and Bits
- Hole Saw
- Utility Knife
- Drop Cloth
- Pipe Cutter / Reamer
- Acetylene Brazing Outfit
- Brazing Material —15% silver only
- Digital Multimeter and Amp Clamp
- R-410A Flaring Tool
- Torque Wrench Set
- Dedicated R-410A Refrigerant Manifold Gauge
- Dedicated 5/16" Premium Hoses
- Nitrogen regulator (for 550# test)
- 1/4" to 5/16" Hose Adapters (if needed)
- Nitrogen Tank
- Electronic Leak Detector
- 5/16" Schrader Core Removal Tool
- Vacuum Micron Gauge
- Good Quality Digital Charging Scale
- Vacuum Pump and Fresh Oil
- Refrigerant Recovery Unit and Tank

Piping

Multi F System Piping

Multi F outdoor units have two (2), three (3), or four (4) sets (one vapor and one liquid) of flare-type piping connections. Number of connections will differ depending on outdoor unit. Field-installed piping directly links one set of outdoor unit connections to one indoor unit.

Depending on the indoor unit piping size, connection sockets (included as factory-supplied accessories with the indoor units) may need to be used. See the complete Multi F / Multi F MAX Outdoor Unit Installation Manual for specific information.

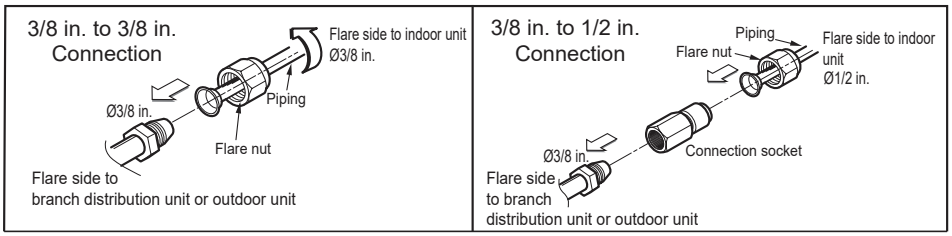
Multi F MAX System Piping

Field piping for Multi F MAX outdoor units can be installed in one of four directions: front, rear, right, and bottom. Whatever direction is chosen, plug the access holes with field-provided putty or insulation to fill all gaps. If the piping is installed in the bottom direction, the access hole of the base pan must be knocked out before piping work begins.

Multi F MAX outdoor units have one set (one vapor and one liquid) of flare-type connections. Field-installed piping links the outdoor unit connections to a branch distribution unit. If installing two (2) branch distribution units in parallel on one (1) Multi F MAX outdoor unit, an LG-supplied Y-Branch kit PMBL5620 MUST be used.

Connection sockets may need to be used when piping the branch distribution unit to indoor unit, depending on indoor unit pipe connections. See the complete Multi F / Multi F MAX Outdoor Unit Installation Manual for specific information. Connection sockets are factory-supplied as an accessory with the indoor unit, or in the case of 36k indoor units, supplied as an accessory with the branch distribution unit

Examples of Outdoor Unit / Branch Distribution Unit to Indoor Unit Connections (With and Without Connection Socket).



Piping Selection

ACR-rated, seamless phosphorous deoxidized copper (UNS C12200 DHP class) rated at the system working pressure is the only approved refrigerant pipe material for LG Multi F / Multi F MAX products. Approved piping will be marked "R-410A rated" along the length of the tube.

Note:

- ***Wall thickness must meet local code requirements and be approved for a maximum operating pressure of 551 psi.***
- ***LG recommends soft copper use to be limited to 1/2 inches. Use hard drawn for larger sizes to avoid sags and kinks that lead to oil trapping.***

Handling the Piping

To avoid operation failure, a Multi F / Multi F MAX system CANNOT have contaminants or moisture in the piping network. Piping must be kept clean, dry, and air tight. Commercially available piping, however, often contains dust and other materials. Clean it with a dry inert gas, and keep it capped until ready for installation. While installing, prevent dust, water, or other contaminants from entering the piping. When cutting the piping, hold it so copper shavings do not fall into it, and properly remove all burrs with a de-burring tool. Ream all piping to its full inside diameter, correctly reamed piping will provide an excellent surface for a tight seal.

When bending piping, try to keep the number of bends to a minimum, and use the largest radius possible to reduce the equivalent length of installed pipe. If an obstacle is in the path of the planned refrigerant pipe run, it is preferable to route the pipe over the obstacle, with the length of the horizontal section of pipe above or below the obstacle be a minimum of three (3) times the longest vertical rise (or fall) at either end of the segment.

Piping Expansion

Under normal operating conditions, the vapor pipe temperature of a Multi F / Multi F MAX system can vary as much as 180°F. With this large variance in pipe temperature, the designer must consider pipe expansion and contraction to avoid pipe and fitting fatigue failures. When a segment of pipe is mounted between two fixed points, provisions must be provided to allow pipe expansion to naturally occur, generally by expansion Loops or U-bends.

Flaring the Piping

When flaring the piping, use a dedicated R-410A flaring tool; use only synthetic oil between the nut and the flare (not inside the piping) to achieve correct torque and prevent leaks. Flares must be deeper to handle the higher pressures of R-410A.

When brazing the piping, always use 15% silver braze and a nitrogen purge. Similar to piping medical gas, flow the nitrogen through the piping at 1to 3 psig to prevent oxidation.

Proper R-410A Flare.

Piping Components

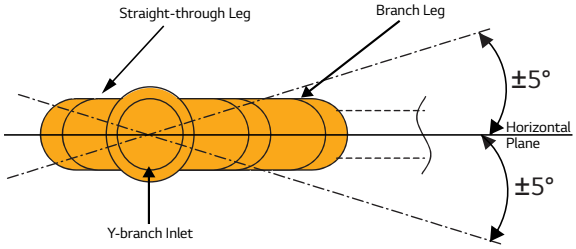
Only LG supplied Y-branch fittings can be used to join one pipe segment to two (2) or more segments. ⃠ Third-party or field-fabricated components such as Tee's, Y-fittings, or other branch fittings are not permitted. The only field-provided fittings allowed in a Multi F / Multi F MAX piping system are 45° and 90° long radius elbows and full port ball valves (if applicable).

Multi F MAX Y-Branch Kit

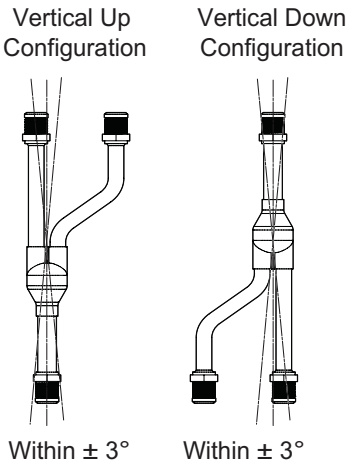
The LG-supplied Y-Branch kit PMBL5620 MUST be used when installing two (2) branch distribution units in parallel on one (1) Multi F MAX system. Each Y-Branch kit includes two (2) Y-branches (one for the liquid line and one for the vapor line) and insulation covers.

Y-branches may be installed in horizontal or vertical configurations. When installed vertically, the straight-through leg must be within ±3° of plumb. When installed horizontally, the straight-through leg must be within ±5° rotation.

Indoor Unit Y-Branch Horizontal Configuration.



Y-branch Installation Alignment Specification.



Y-branches must be properly installed following instructions in the applicable LG manual. Y-branches must always be installed with the single port facing the outdoor unit and the two-port end facing the branch distribution units. ⃠ Do not install Y-branches backwards as refrigerant flow cannot make U-turns. The Y-branch kit must be located at least three (3) feet from the outdoor unit. Provide a minimum of 20 inches between a Y-branch and the branch distribution unit.

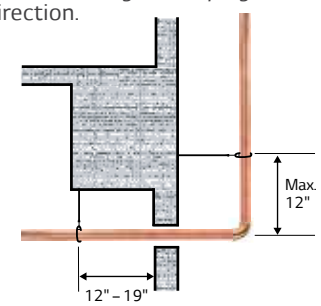
Piping Supports

A properly installed piping system is adequately supported to avoid piping sags (sagging pipes become oil traps that lead to equipment malfunction). Field-provided piping supports must be designed to meet local codes. As necessary, place supports closer for segments where sagging could potentially occur. Maximum spacing of pipe supports must meet local codes, but if there are no specifications in the local codes, then the piping must be supported:

- Minimum of 20 inches recommended between long radius 90 degree elbows, and between the Y-branch and the branch distribution unit.
- Maximum 5 feet on center for straight segments of pipe up to 3/4 inches outside dia. size.
- Maximum of 6 feet on center for pipe up to 1 inch outside diameter size.
- Wherever the pipe changes direction, place a hanger within 12 inches on one side and within 12 to 19 inches of the bend on the other side.

Examples of Piping Supports.

Rule for Changes in Piping Direction.



Piping, continued.

Piping Insulation

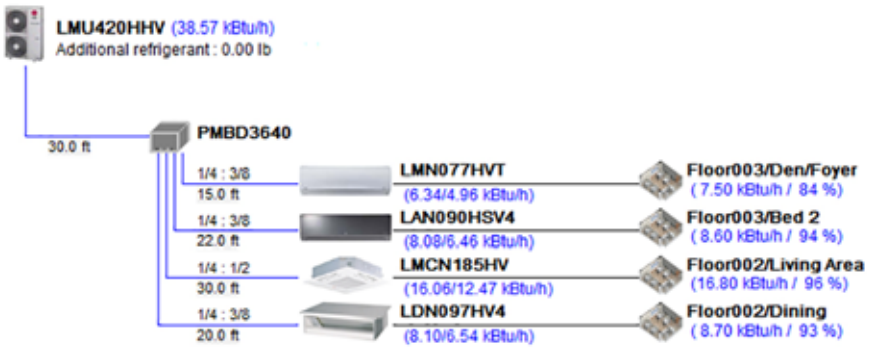
ALL piping and piping connections in a Multi F / Multi F MAX system must be insulated; a minimum 1/2 inch wall, closed cell with vapor barrier insulation is recommended (follow all local, sate, and national requirements). Insulate all piping separately. If improperly insulated, condensate may form on the outside of the piping and water damage within building may occur, the Multi F / Multi F MAX system will lose capacity, or heat may move from the Multi F / Multi F MAX system to the surrounding air.

LATS

Indoor / outdoor unit locations and piping routes MUST be finalized prior to piping work to determine actual lengths. After piping installation starts, all changes in proposed lengths must be forwarded to the designer for re-calculation in LATS and a NEW Field Drawing produced before pipe is installed.

Note:

Pay attention to a possible change in unit capacities as piping lengths change! If piping lengths to be installed are not those as specified in LATS, a new LATS file MUST be produced BEFORE pipe work begins!



Wiring

⚠WARNING

- ***All power wiring and communication cable installation must be performed by authorized service providers working in accordance with local, state, and NEC regulations.***
- ***Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and NEC regulations. Using inappropriately sized electrical components may result in electric shock, physical injury, or death.***
- ***Properly ground the outdoor units. ⃠ 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 an NEC approved earth ground can result in electric shock, physical injury or death.***
- ***Properly terminate all wiring. If wires are not properly terminated and attached, there is risk of fire, electric shock, and physical injury or death.***

Power Wiring and Communication / Connection (Power) Cable Specifications

Multi F / Multi F MAX outdoor units operate at 1Ø, 208-230V, 60Hz, and power is wired to the outdoor unit only. The outdoor unit supplies power to the indoor units and the branch distribution units through the communication / connection (power) cable.

Power supply to the outdoor unit must be selected based on NEC and local codes. Maximum allowable voltage fluctuation ±10% or nameplate rated value. Wiring must be solid or stranded, and must comply with all local and national electrical codes. Properly ground the outdoor unit per NEC and local codes.

Multi F communication / connection (power) cable from the outdoor unit to the indoor unit must be a minimum of 18 AWG, four (4) conductor, stranded, shielded or unshielded.

Multi F MAX communication / connection (power) cable from the outdoor unit to the branch distribution unit(s) must be a minimum of 16 AWG, four (4) conductor, stranded, shielded or unshielded.

Multi F MAX communication / connection (power) cable from the branch distribution unit(s) to the indoor units must be a minimum of 18 AWG, four (4) conductor, stranded, shielded or unshielded.

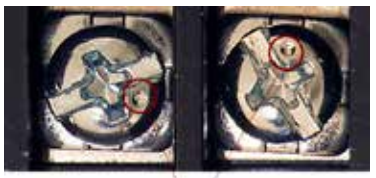
Note:

- ***Ensure the power wiring / communication cable shield (if shielded) from the outdoor unit to the indoor units / branch distribution units is properly grounded to the outdoor unit chassis only. ⃠ Do not ground at any other point. Wiring must comply with all applicable local and national codes.***
- ***Use a conduit for the communications / connection (power) cable from the outdoor unit to the indoor units and branch distribution unit(s). Electrical interference my cause product malfunction.***
- ***The communications / connection (power) cable from the outdoor unit to the indoor units / branch distribution unit(s) must be separated and isolated from power wiring to the outdoor unit, computers, radio and television broadcasting facilities, as well as medical imaging equipment. Electrical interference my cause product malfunction.***

Wiring Connections

LG uses a "JIS" type of screw for all terminals; use a JIS screwdriver to tighten and loosen these screws and avoid damaging the terminal. Use a solderless ring or fork connection when possible. ⃠ Do not over tighten the connections — over tightening may damage the terminals — but firmly and securely attach the wiring in a way to prevent external forces from being imparted on the terminal block.

JIS Screws.



Note:

- ***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 branch distribution units (Multi F MAX systems onlyare wired in relation to the outdoor unit.***
- ***⃠ Do not include splices or wire nuts in the communication cable.***

Final Installation Procedures

Perform Triple Leak / Pressure Check (Multi F and Multi F MAX)

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. Perform the Triple / Leak Pressure Check with only the piping system and indoor units / branch distribution units. Use medical grade dry nitrogen.

Triple Leak / Pressure Procedure

Step 1: Perform the leak / pressure check at 150 psig for fifteen (15) minutes (standing pressure check).
Step 2: Perform the leak / pressure check at 300 psig for thirty (30) minutes (standing pressure check).
Step 3: Perform the leak / pressure check at 550 psig for one (1) hour 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 any brazed connections) for leaks by applying a bubble solution to all joints.
Step 4: If the pressure does NOT drop for one (1) hour, the system passes the test.
Step 5: If the pressure drops, 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.

Perform Deep Evacuation (Multi F)

On Multi F systems, after the leak / pressure check is complete, the deep evacuation procedure must be performed to the refrigerant piping and all connected indoor units.

Deep Evacuation Procedure

Step 1: Evacuate to static micron level ≤500 for at least one (1) hour.
Step 2: Micron level must remain ≤500 for two (2) hours. If the vacuum gauge rises and stops, the system may contain moisture; therefore, it will be necessary to repeat the steps of vacuum break and drying.
Step 3: After maintaining the system in vacuum for two (2) hours, check if the vacuum gauge rises or not. If it doesn't rise, then the system is properly evacuated.

Triple Evacuation Procedure (Multi F MAX)

On Multi F MAX systems, after the leak / pressure check is complete, the triple evacuation procedure must be performed to the refrigerant piping and all connected indoor units / branch distribution units. ⃠ Do not just perform the deep evacuation procedure on Multi F MAX systems. The deep evacuation procedure is insufficient to fully evacuate the extensive piping systems on Multi F MAX products.

Triple Evacuation Procedure Steps

Step 1: Operate the vacuum pump and evacuate the system to the 2,000 micron level. Isolate the pump, and then watch the micron level.
- If the micron level DOES NOT stop rising, there is a leak.
- 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 the next step.

Step 2: Break vacuum with 50 psig nitrogen purge for an appropriate amount of time (this is to "sweep" moisture from piping).
Step 3: Purge nitrogen from the system until the pressure drops down to 1 to 3 psig.
Step 4: Evacuate to 1,000 micron level. Isolate the pump and then watch the micron level.
- If the micron level DOES NOT stop rising, there is a leak.
- 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 the next step.

Step 5: Break vacuum with 50 psig nitrogen purge for an appropriate amount of time.
Step 6: Purge nitrogen from the system until the pressure drops down to 1 to 3 psig.
Step 7: Evacuate to static micron level ≤500 for at least one (1) hour.
Step 8: Micron level must remain ≤500 for two (2) hours. If the vacuum gauge rises and stops, the system may contain moisture; therefore, it will be necessary to repeat the steps of vacuum break and drying.

Note:

The triple evacuation procedure is a best practices recommendation for Multi F systems, but mandatory for Multi F MAX systems.

Test Run

After the triple leak / pressure and evacuation procedures are complete, perform a test run.

Before the Test Run

1. Check that all condensate tubing, refrigerant piping and power wiring, and communication / connection (power) cables are properly connected.
2. Make sure that the gas and liquid service valves are fully open.

Test Run Procedure

3. Operate the system in cooling mode for 15 to 20 minutes.
4. Evaluate performance as the system runs, verifying the outdoor unit, and all indoor units and branch distribution units (Multi F MAX systems only) are working properly. Make notes as needed to address any issues that might be found.

- Check the system refrigerant charge:
  - Measure the pressure from the gas side service valve.
  - Measure the indoor unit inlet and outlet air temperatures. Verify the difference between the intake temperature and the discharge is more than 15°F.
  - See table below for the optimum condition of the gas side pressure (again, system is in cooling mode).

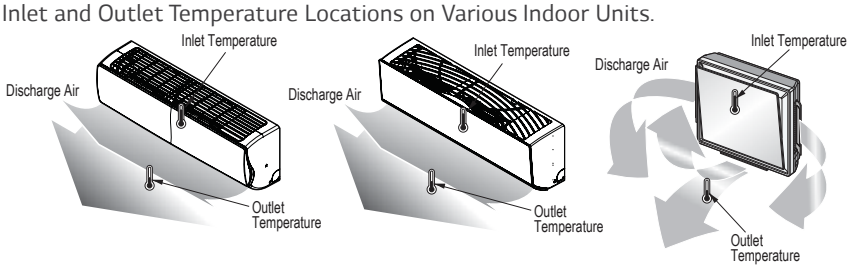
Optimum Conditions of the Gas Side Pressure.

Refrigerant Type	Outside Ambient Temperature	Gas Side Service Valve Pressure
R410A	95°F	120~135 psig

Note:

If the pressure is > 135 psig, the system is most likely overcharged, and refrigerant must be removed. If the pressure is < 120 psig, the system is most likely undercharged and refrigerant must be added.

Inlet and Outlet Temperature Locations on Various Indoor Units.



Final Installation Procedures

Installing the Remote Controller Batteries

As part of the test run, two (2) AAA (1.5V) batteries need to be inserted into the remote controller, and the remote controller may need to be powered on to operate the indoor units (depending on the indoor units included in the system). To insert the batteries follow the steps below. For information on using the remote controller, refer to its owner's manual.

Refrigerant Charge

LG Multi F and Multi F MAX outdoor units ship from the factory with a charge of R410A refrigerant. A trim charge may need to be added to take into account additional piping length. To find the R410A factory charge of each outdoor unit, see the Multi F / Multi F MAX Outdoor Unit Installation Manuals.

To determine the additional refrigerant that is needed, apply the formulas below, and record the results. If the total additional refrigerant charge value is a negative number, then an additional trim charge does not need to be added to the system.

Multi F Systems

Additional charge (oz.) = (Installed Length of Branch [A] – Chargeless Pipe Length [L]) x a
+ (Installed Length of Branch [B] – Chargeless Pipe Length [L]) x a
+ (Installed Length of Branch [C] – Chargeless Pipe Length [L]) x a
+ (Installed Length of Branch [D] – Chargeless Pipe Length [L]) x a
- CF (Correction Factor) x 5.29

Multi F MAX Systems

Additional charge (oz.) = (Total Main Piping Length [A] - Chargeless Pipe Length of Main Pipe [L]) x a
+ (Installed Length of Branch [B1] – Chargeless Pipe Length [B]) x b
+ (Installed Length of Branch [B2] – Chargeless Pipe Length [B]) x b
+ (Installed Length of Branch [B3] – Chargeless Pipe Length [B]) x b ...
- CF (Correction Factor) x 3.53

Note:

• Number of installed length of branches depends on system specifications.
• CF = Maximum number of connectible indoor units – Total number of connected indoor units

Optional Modes

Multi F and Multi F MAX outdoor units include optional functions such as mode locks for cooling and heating, night quiet modes, and others. The modes are set by powering off the system, setting the applicable DIP switches on the PCB of the outdoor unit, and then turning the power back on. These modes must only be set by an authorized, trained and licensed technician during the installation process. For a complete list of optional modes that are available for specific outdoor units, and the detailed procedures necessary to properly set the modes, see the complete Multi F / Multi F MAX Installation Manual.

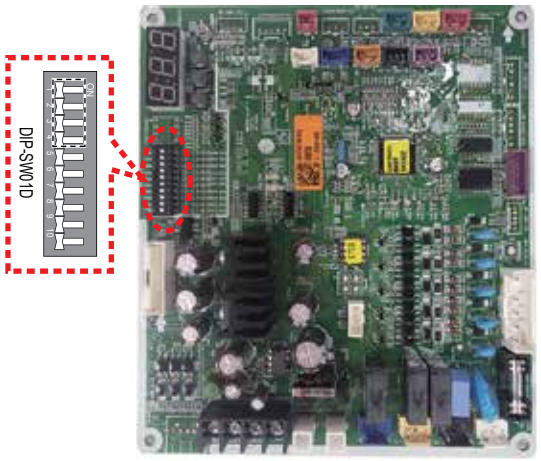
⚠WARNING

The circuit breaker must be turned off or the power source of the product must be shut off before setting the DIP switch. There is risk of physical injury or death due to electric shock.

Note:

• Unless the applicable DIP switch is set properly, the system may not work.
• If a specific function is desired, request that the installer set the appropriate DIP switch during installation.

Location of the Outdoor Unit DIP Switch Example. (Appearances May Differ Depending on Model).



Note:

LGMV monitoring software is encouraged for use in future diagnostic and maintenance related checks.

Installation Checklist

Major Component Rough-In

Description	Check
Multi F / Multi F MAX outdoor unit was connected properly per local code and the product installation procedures.	
All literature and bagged accessories have been removed from the fan discharge (ducted and cassette model indoor units).	
All indoor units and branch distribution unit(s) (Multi F MAX only) are installed, properly supported, and located indoors in a non-corrosive environment.	
Duct work installation completed (ducted indoor units only).	

Piping Material, Components, and Insulation

Description	Check
Multi-zone duct-free split systems: ACR copper piping rated at the system working pressure was used.	
LG Y-branch fitting was used per manufacturer's recommendations.	
All refrigerant pipes and valves were insulated separately. Insulation is positioned up against the walls of the indoor units and branch distribution units (Multi F MAX only). No gaps shown. Insulation was not compressed at clamps and hangers.	

Brazing Practices

Description	Check
Use medical grade dry nitrogen for purging during brazing (constant 3 psig while brazing).	
15% silver brazing material only.	

Refrigerant Piping Design and System

Description	Check
You must have in your possession a copy of the "As-Designed" LATS piping tree diagram. BEFORE ANY FIELD PIPE SIZE OR LENGTH CHANGES ARE MADE, PROPOSED CHANGES MUST BE FORWARDED TO THE DESIGN ENGINEER SO THAT THEY CAN INPUT THE CHANGES INTO LATS and RE-ISSUE A NEW LATS MULTI V PIPING TREE DIAGRAM. Installer must receive change authorization from the design engineer, because any change made requires the review of the entire tree diagram and verification that the change did not impact the size of piping segments in other parts of the system.	
All pipe materials were properly stored, capped, and clean. All burrs were removed after cutting and pipe ends were reamed before brazing.	
During refrigerant pipe installation, for each segment of pipe, a record was made of the pipe length (including expansion loops, offsets, double-back sections), and sizes, as well as the quantity and type of elbows used.	
Expansion loops, coils or other acceptable measures are provided where necessary to absorb temperature-change based pipe movement.	
A torque wrench and backup wrench were used to tighten all flare connections.	
The back side of all flares were lubricated with a small drop of PVE refrigeration oil before tightening flare fittings.	
Ensure all field made flares are 45°. Use factory-supplied flare nuts only.	
Pipe segments and Y-branch fittings are secured to the structure using a combination of fixed and floating clamps, and all wall penetrations were sleeved.	
Pipe insulation was not compressed at any point.	
Y-branch fittings were properly INSTALLED per details provided in the Multi F / Multi F MAX Outdoor Unit Installation Manual.	
Y-branch fittings were properly SUPPORTED per details provided in the Multi F / Multi F MAX Outdoor Unit Installation Manual.	
No oil traps, solenoid valves, sight glasses, filter driers, or any other unauthorized refrigerant specialties were present.	
(Optional) High quality R-410A rated full port ball valves (Schrader between the valve body and the indoor units) used at all indoor units and at will in the refrigerant piping network.	
Best practice includes a minimum of 20 inches of straight pipe was installed between long radius 90 degree elbows, and between the Y-branch fitting and branch distribution unit.	

Condensate Pump / Drain Installation

Description	Check
Condensate piping installed correctly on indoor units. Material used is acceptable under local code. Insulated as necessary to prevent condensation.	
All condensate vertical risers are equal to or less than 27-1/2 inches from the bottom of the indoor unit.	
Indoor units with condensate pumps were level. Units with gravity drains were level or slightly canted toward the drain connection and are supported properly.	
Pumped condensate drain lines were properly connected (do not have traps, and connect to the top surface of the main drain line).	
All condensate lines were properly insulated to prevent condensation.	
Multi F / Multi F MAX gravity condensate drain line was connected and routed where it properly drains away or, if installed in a mechanical room, was connected and properly routed to a drain terminal.	

Installation Checklist, continued

Power Wire and Communications Cables

Description	Check
Ground wire was installed and properly terminated at the outdoor unit.	
Power wiring was connected to a single phase 208-230V source.	
The power supplied was clean with voltage fluctuations within specifications (±10% of nameplate).	
Power wiring to the Multi F / Multi F MAX outdoor unit was field supplied, solid or stranded, and installed per all local, state, and NEC requirements.	
All communications / connection (power) cable from the Multi F outdoor unit to the indoor units is to be minimum four conductor, 18 AWG stranded, shielded or unshielded (if shielded, it must be grounded to the chassis of the outdoor unit only), and must comply with applicable local and national codes.	
All power wiring / communication cable to be minimum 16 AWG from the Multi F MAX outdoor unit to the BD unit, and 18 AWG from the branch distribution unit to the indoor units, stranded, shielded or unshielded (if shielded, it must be grounded to the chassis of the outdoor unit only), and must comply with applicable local and national codes.	
Power wiring to the outdoor unit and communication / connection (power) cable from the outdoor unit to the indoor units or branch distribution units (Multi F MAX only) were separated per manufacturer's guidelines. These cannot be run in the same conduit.	
Communications / connection (power) cable were run in the same conduit (outdoor unit to indoor unit or branch distribution unit [Multi F MAX only] as provided in the product installation manual.	
Proper communications cable was used between each indoor unit and its zone controller where applicable. No cables were spliced and no wire nuts are present.	
Communication type RS-485–BUS type.	
Used appropriate crimping tool to attach ring or fork terminals at all power wiring and control cable terminations.	
Only LG-supplied Y-cables were used between grouped indoor units, if applicable.	

To access the complete Multi F / Multi F MAX Installation Manuals, visit www.lghvac.com/resources.

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