



Multi V™ 5 Air-Source System Install Tips

The following pages present an overview of Multi V 5 air-source Variable Refrigerant Flow (VRF) 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 VRF 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.

⚠ 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.

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.

⚠ 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.

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.

⊘ 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.
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.

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.

⚠ 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.

Note:

⊘ Do not supply power to the unit until all electrical wiring, controls wiring, piping, installation, and refrigerant system evacuation are completed.

Always ground the unit following local, state, and NEC codes.
There is risk of fire, electric shock, and physical injury or death.

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 size all circuit breakers or fuses.
There is risk of fire, electric shock, explosion, 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.

Clearances

LG Multi V 5 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 and between the outdoor units, then the system will not operate properly and it will be difficult to service. See diagrams for installation guidelines when the outdoor unit(s) are surrounded by walls on two or four sides (wall height restrictions are present if the outdoor unit[s] are surrounded by walls on four sides; see information below).

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.)

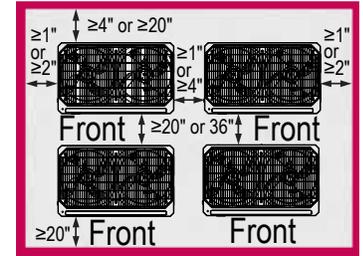
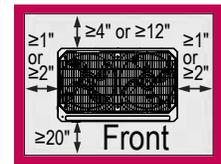
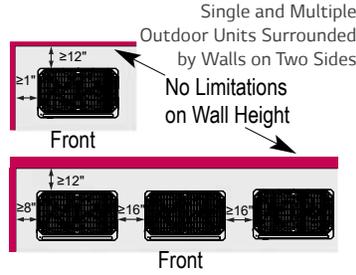
If placement options are limited because of a lack of ground space, roof space, a location that meets design requirements, on retrofit projects where an equipment / mechanical room already exists, then the outdoor unit **MAY** be installed in a more confined space **ONLY IF** specific conditions are fulfilled. For detailed information on installing air-source units indoors, see the Multi V 5 Engineering Manual, or contact your LG sales representative.

Wall Height Restrictions (When the Outdoor Unit[s] Are Surrounded by Walls on All Four Sides.)

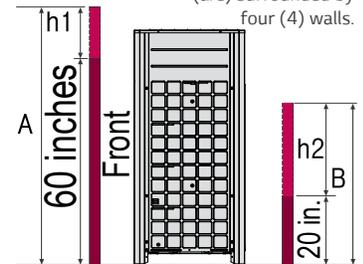
- Wall height at the front of the unit must be ≤ 60 inches.
- Wall height at the inlet side of the unit must be ≤ 20 inches.
- There are no height limitations for the walls at the sides of the unit.
- If the wall height at the front and inlet sides of the unit are higher than allowable limits, additional space must be included.
 - Additional Space on the inlet side by $1/2$ of h_1 .
 - Additional space on the front by $1/2$ of h_2 .
 - $h_1 = A$ (Actual height) - 60 inches.
 - $h_2 = B$ (Actual height) - 20 inches.

Note:

- **All dimensions are minimum clearances considering airflow only. Increase as necessary for NEC or other code compliance.**
- **If your installation scenario varies in any way from the samples provided here, contact your LG representative for guidance.**
- **In a multi-frame system, arrange the outdoor units so that the master outdoor unit (largest capacity) is closest to piping network going to the indoor units. The slave outdoor unit(s) (smaller capacities) must be positioned farthest away from the piping network. Single compressor frames cannot be the master if a dual compressor frame is present.**



Wall height limitations when the unit(s) is (are) surrounded by four (4) walls.



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).
- There is sufficient slope for proper drainage away and between the units from the condensate drain connection(s) to the floor drain (if present).
- When deciding on a location to place the outdoor unit, be sure to choose an area where runoff 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.

⚠ WARNING

If the floor surface / chosen location is not strong enough to support the weight, the unit will fall and cause physical injury or death. Also, install the outdoor unit to protect against extremely high winds and earthquakes. Any deficiency in installation may cause unit to fall, resulting in physical injury or death.

All four corners, as well as the center of the outdoor unit, must be supported properly. All four corners of the outdoor unit must be securely fastened to a:

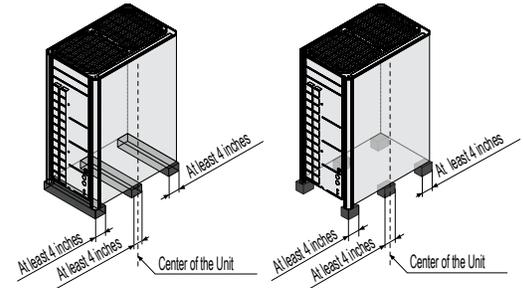
- Supporting base.
- Concrete pad.
- Base rails.
- Mounting platform that is anchored to the building.
- Any acceptable support structure that is designed by a structural engineer.

Anchoring the Outdoor Unit

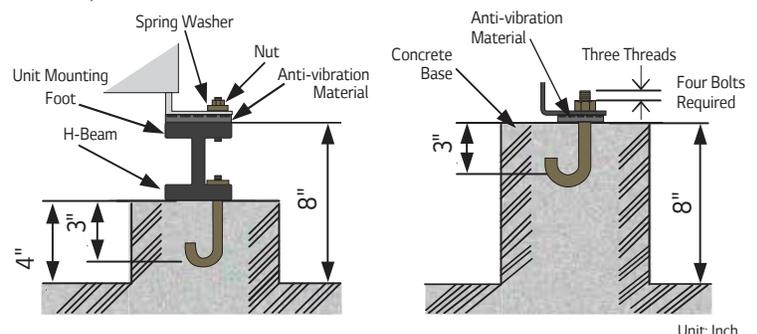
- Outdoor unit support(s) must be at least ≥ 4 inches wide and ≥ 8 inches high.
- Include anti-vibration material chosen by the acoustics engineer.
- If not otherwise directed by the structural engineer or local codes, use a $7/8$ inch or $1/2$ inch diameter J-bolts inserted at least 3 inches deep into the supports.
- Use a hexagon nut with a spring washer.

Refer to the dimensional drawings of the unit(s), and always follow the applicable local and state codes for clearances, mounting, anchor, and vibration attenuation requirements.

Mounting Requirements and Options.



Close Up of Outdoor Unit Anchor Bolts.



Unit: Inch

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

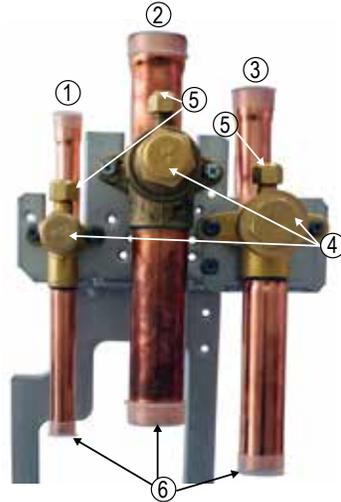
Multi V 5 Piping and Service Ports

LG Multi V 5 Variable Refrigerant Flow (VRF) outdoor units can be configured to operate as either a heat pump or a heat recovery system. The piping MUST be installed to the correct outdoor unit service ports according to project specifications or the system will not operate properly. See below for the piping installation differences between heat pump and heat recovery systems.

Heat Pump Outdoor Unit Service Port Detail

1. Liquid piping service port (back seated type with right hand thread).
2. Service port NOT used for heat pump systems. Keep closed and capped.
3. Vapor piping service port (back seated type with right hand thread).
4. Stem head access with factory-provided cap.
5. Schrader ports with factory-provided cap.
6. Service port piping to connect to field piping.

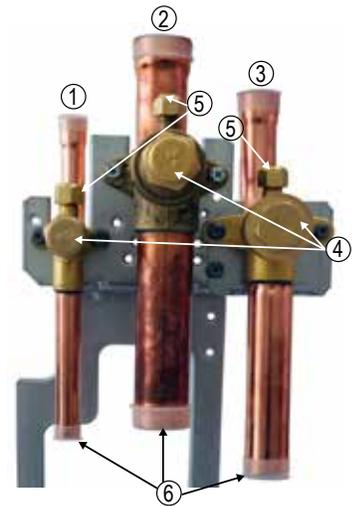
Heat Pump Outdoor Unit Service Port Diagram.



Heat Recovery Outdoor Unit Service Port Detail

1. Liquid piping service port (back seated type with right hand thread).
2. Low pressure vapor piping service port (back seated type with right hand thread).
3. High pressure vapor piping service port (back seated type with right hand thread).
4. Stem head access with factory-provided cap.
5. Schrader ports with factory-provided cap.
6. Service port piping to connect to field piping.

Heat Recovery Outdoor Unit Service Port Diagram.



Piping Selection

ACR-rated, seamless phosphorous deoxidized copper (UNS C12200 DHP class) is the only approved refrigerant pipe material for LG Multi V 5 products. Approved piping will be marked "R-410A rated" along the length of the tube.

- Drawn temper (rigid) ACR copper tubing is available in sizes 3/8 through 2-1/8 inches (ASTM B 280, clean, dry and capped).
- Annealed temper (soft) ACR copper tubing is available in sizes 1/4 through 2-1/8 inches (ASTM B 280, clean, dry, and capped).

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 VRF 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

Expansion and contraction must be allowed in the design to avoid fitting and piping fatigue failures. A vapor line in a Multi V 5 system can change from 50° to 170° when switching from cooling to heating. This can cause up to 1-3/8 inches expansion / contraction per 100 feet of pipe, or about 0.001 inch / °F per 10 feet of pipe. When a segment of pipe is mounted between 2 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 1 to 3 psig to prevent oxidation.

Proper R-410A Flare.



Piping Components

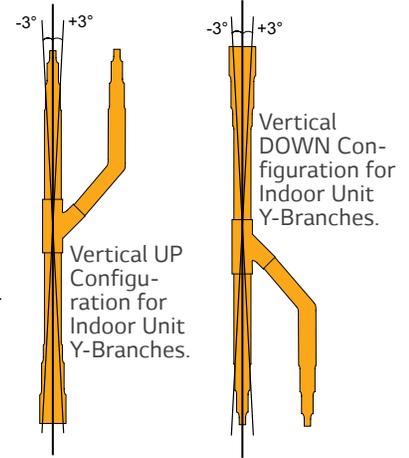
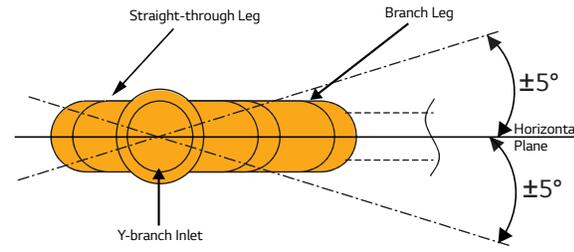
Only LG supplied Y-branch and Header fittings can be used to join one pipe segment to 2 or more segments. Ⓣ Third-party or field-fabricated components such as Tee's, Y-fittings, Headers, or other branch fittings are not permitted. The only field-provided fittings allowed in a Multi V 5 piping system are 45° and 90° long radius elbows and full port ball valves (if applicable).

Indoor Unit Y-Branch Orientation

Indoor unit long radius 90 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-branches must always be installed with the single port end towards the outdoor unit, the two-port end towards the indoor units. Provide a minimum of 20 inches between a Y-branch and any other fittings or indoor units. There must be a minimum of 20 inches between heat recovery units piped in series.

Indoor Unit Y-Branch Horizontal Configuration.



Outdoor Unit Y-Branch Orientation

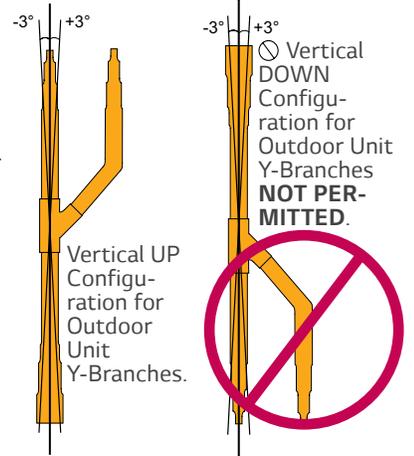
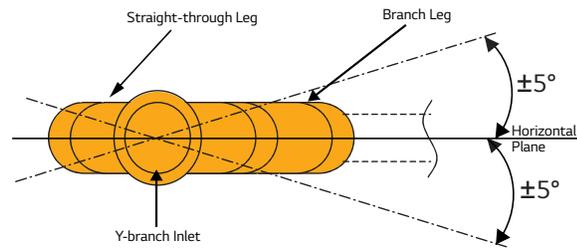
Outdoor unit Y-branches can only be installed in a horizontal or vertical UP configuration.

Ⓣ The vertical DOWN configuration is not permitted.

When installed vertically, position the Y-branch at a level lower than the outdoor unit it serves, so the straight-through leg is within ±3° of plumb. When installed horizontally, position the Y-branch so the take-off leg is level and shares the same horizontal plane as the straight-through leg within ±5° rotation.

Outdoor unit Y-branches must always be installed with the 2-port ends connected to the piping coming from the outdoor units, and the single port end towards the refrigerant piping system supporting the indoor units.

Outdoor Unit Y-Branch Horizontal Configuration.



Piping Supports

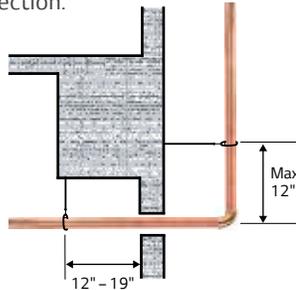
A properly installed piping system is adequately supported to avoid piping sags (sagging pipes become oil traps that lead to equipment malfunction). Field-provided piping supports must be designed to meet local codes. As necessary, place supports closer for segments where sagging could potentially occur. 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 all Y-branches and Headers.
- 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.
- Maximum 8 feet on center for pipe up to 2 inches 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.

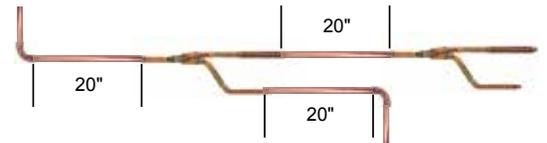
Examples of Piping Supports.



Rule for Changes in Piping Direction.



20 Inch Rule Between Y-Branches and Headers.



Piping Insulation

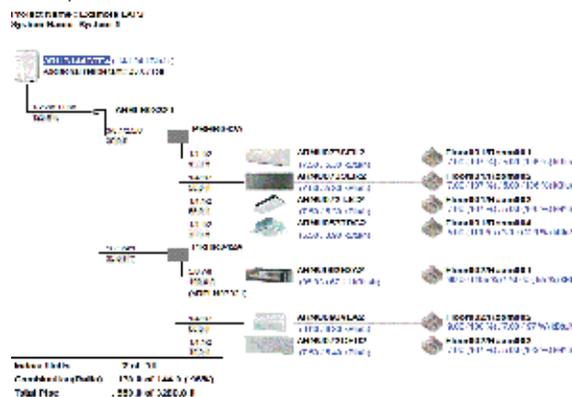
ALL piping and piping connections in a VRF system must be insulated; a minimum 1/2 inch wall, closed cell with vapor barrier insulation is recommended (follow all local, state, and national requirements). Insulate the liquid, suction, and hot gas piping separately. If improperly insulated, condensate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

Example of LATS File.



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 all outdoor units and indoor 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 Specifications

Outdoor unit(s) and indoor units must be provided power from separate breakers. Each outdoor unit frame in a multi-frame configuration must be provided a dedicated fused disconnect or breaker. Heat pump and heat recovery outdoor units are available in both 3Ø, 208-230V, 60Hz, and 3Ø, 460V, 60Hz. No matter which system is installed, power supply must not decrease or increase more than 10% of the rated voltage. Power imbalance between phases cannot be greater than 2% (if it is, the lifespan of the units will be reduced).

Power wiring to the outdoor unit(s) is to be field-provided, solid or stranded, and complies with all applicable local and national electrical codes. Position the power wiring a minimum of 2 inches away from the communication cables to avoid operation problems caused by electrical interference.

Ⓣ Do not run both in the same conduit.

Indoor units and heat recovery units require 1Ø, 208-230V, 60Hz power, but each unit draws minimal power. Where permitted by NEC and local codes, multiple indoor units and heat recovery units may be powered from a single breaker. Service switches typically must be installed for each indoor unit and heat recovery unit.

Communication Cable Specifications

- Communication cable between master outdoor unit to slave outdoor unit(s), and master outdoor unit to indoor unit(s) / heat recovery unit(s) is to be 18 AWG, 2-conductor, twisted, stranded, shielded. Indoor unit / heat recovery unit comm. bus: IDU A and B terminals on outdoor unit to A and B terminals on indoor units and heat recovery units.
 - Master / slave comm. bus: SODU A and B terminals on master outdoor unit to SODU A and B terminals on slave outdoor unit(s).
- Communication cable from master outdoor unit to central controllers must be 18 gauge, 2-conductor, twisted, stranded, shielded.
 - Control comm. bus: CEN A and B terminals on master outdoor unit to terminals A and B on central controllers.
- Communication cable from master outdoor unit to mode selector switch is to be 18 AWG, 3-conductor, twisted or non-twisted, stranded, shielded.
- Communication cable from indoor units to remote controllers is to be 22 AWG, 3-conductor, twisted, stranded, unshielded.
 - Remote Controllers have hardwired connections: SIG - 12V - GND (Comm.) terminals.
 - Indoor unit controller connections depend on type of indoor unit being installed. Some indoor units use terminal block connections; other indoor units use Molex connections. See the specific indoor unit wiring diagrams for more information.

Note:

Ensure the communication cable shield from the master outdoor unit to the slave outdoor unit(s), the indoor units / heat recovery unit(s), the central controller, and / or the mode selector switch is properly grounded to the master outdoor unit chassis only. Ⓣ Do not ground the communication cable at any other point. Wiring must comply with all applicable local and national codes.

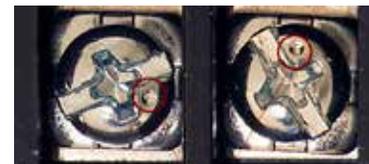
Wiring Connections

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 overtighten the connections — overtightening 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.

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 heat recovery units are wired in relation to the outdoor unit.
- Ⓣ Do not include splices or wire nuts in the communication cable.

JIS Screws.



JIS DIMPLES

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

Triple Leak / Pressure Procedure

Step 1: Perform the leak / pressure check at 150 psig for 5 minutes (standing pressure check).

Step 2: Perform the leak / pressure check at 300 psig for 15 minutes (standing pressure check).

Step 3: 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:

If the ambient temperature changed between the time 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 system.

Perform Triple Evacuation

After the leak / pressure check is complete, perform a Triple Evacuation with the entire system. Set the (master) outdoor unit to vacuum mode (limit vacuum mode to less than 48 hours of continuous operation). For Heat Pump systems, evacuate through both the liquid and vapor refrigerant lines. For Heat Recovery systems, evacuate through all 3 hot gas line (high pressure vapor), liquid line, and suction (low pressure vapor) refrigerant lines.

Triple Evacuation Procedure

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 psi 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.

Step 4: If the pressure does NOT drop for 24 hours, the system passes the test. See how ambient conditions may affect the pressure test below.

Step 5: 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.

- 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 psi 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 .

Step 8: Micron level must remain ≤ 500 for 24 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:

• **Do not apply power to any Multi V system device prior to performing the triple leak or triple evacuation. There is a possibility that EEV valves may close and isolate sections of the pipe system, Contact your LG Applied Rep or service technician for the procedure to reopen the EEV valves before triple leak and triple evacuation ONLY if the power has been applied.**

- **Triple leak and triple evacuation must be performed through the Schrader ports on the outdoor unit service ports.**
- **For triple leak and triple evacuation purposes in a multi-frame system, connect to the farthest slave outdoor unit.**
- **Do not open the outdoor unit service valves and release the factory refrigerant charge until the LG trained commissioner authorizes to do so.**

Auto Addressing

Multi V 5 systems include an automatic process - auto addressing - that has to be completed for the system to function as a whole. In auto addressing, the (master) outdoor unit sends out a communications signal to each indoor unit and heat recovery unit. Addressing enables the (master) outdoor unit to identify which indoor unit and heat recovery unit the data is coming from and going to. Before initiating the auto addressing procedure, verify that the compressors are disabled.

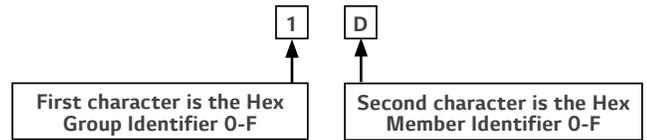
Auto Addressing Procedure

- Supply power to each indoor unit and heat recovery unit - if applicable - but **do not** turn the power buttons on.
- Turn power to the (master) outdoor unit on. After 3 full minutes, the outdoor unit display will be blank.
- Press and hold the red SW01C button on the outdoor unit main PCB for about 5 seconds. Release the red SW01C button when the display changes to "88."
- After about 3 to 7 minutes, the display will flash the number of indoor units found, and then the number of heat recovery units found (if applicable).

- Wired remote controllers and indoor LEDs will indicate the auto address numbers assigned to them by the outdoor unit.
- If all indoor units and heat recovery units are found and no errors codes have appeared, then auto addressing was successful.
- If all indoor units and heat recovery units are not found and / or errors codes have appeared, check the indoor unit to outdoor unit communications cable for improper connections.

Central Controller Addressing

If the Multi V 5 system includes a central controller / BMS gateway, the installer must manually set (through the remote controller) each indoor unit with a two-character hexadecimal address: 0-9 and A-F (but do not use Address "00"). This allows the indoor units to be recognized by the central controller / BMS gateway. Write up an addressing schedule before initiating the procedure. Power the indoor unit on to address, then power off when complete.



DIP Switches and Rotary Dial Settings

Installer may need to manually set DIP switches and rotary dials because of installation or application requirements. See below for an overview of the most common settings. Power must be cycled after changing the switch settings.

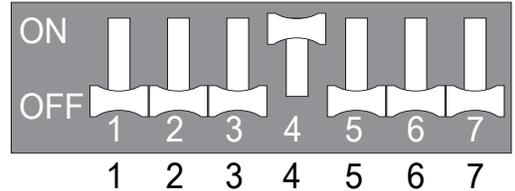
Outdoor Units - DIP Switches

Setting Outdoor Units to Heat Pump or Heat Recovery Systems

Outdoor units are factory set to heat recovery operation. If the system is a heat pump application, ALL outdoor unit(s) (master and slave[s]) MUST be manually set: Flip switch No. 4 on the DIP-SW01 bank to ON. Display will show "HR" (heat recovery).

- Push the SW03C button to change "HR" (heat recovery) to "HP" (heat pump), then press the confirm SW01C button.
- Flip switch No. 4 on the DIP-SW01 bank to OFF, and push the reset (SW01D) button to restart the system. If No. 4 on the DIP-SW01 bank is switched to ON again, "HR" (heat recovery) or "HP" (heat pump) can be verified by reading the display later.

Heat Pump System DIP Switch Setting on Outdoor Units (Manually Set).



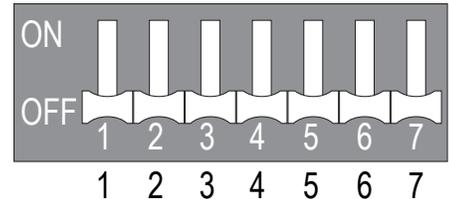
Setting Outdoor Units in Dual / Triple Frame Systems

In a dual / triple frame system, one (1) outdoor unit must be set to Master and the others set to Slave(s) or an error code will be generated.

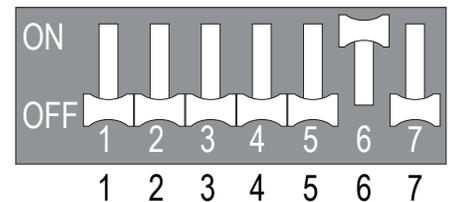
- For the DIP-SW01 bank on the master unit, all DIP switches must be set to off.
- For the DIP-SW01 bank on the slave 1 unit, set only DIP switch 6 to ON.
- For the DIP-SW01 bank on the slave 2 unit, set only DIP switch 7 to ON.

Master, Slave1, and Slave2 DIP Switch Settings.

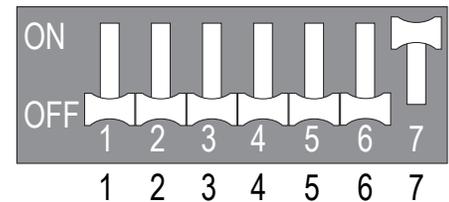
Master Outdoor Unit



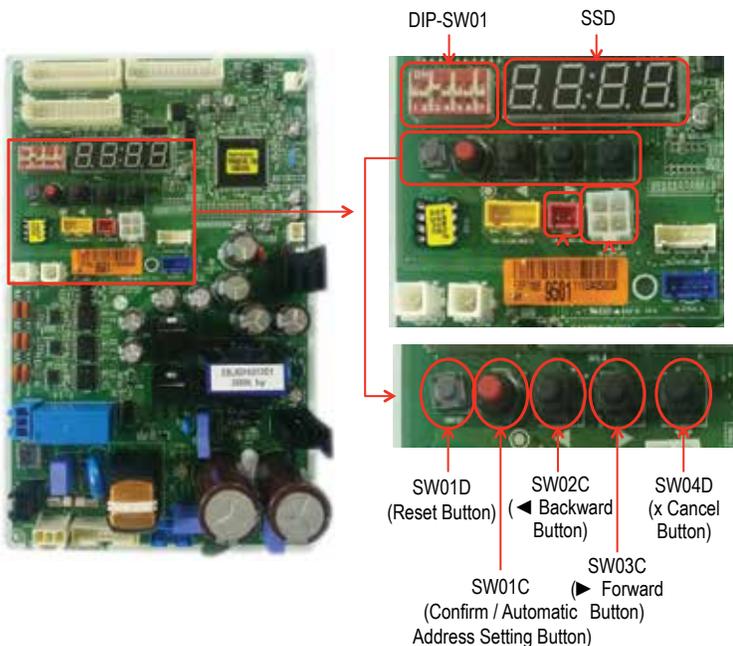
Slave1 Outdoor Unit



Slave2 Outdoor Unit



Location of Outdoor Unit DIP-SW01 DIP Switch Bank and SW01D Reset Button.



Example of Indoor Unit DIP Switches.



Indoor Units - DIP Switches

Installer may need to adjust DIP switches on some types of indoor units if the project calls for certain functions. See the Engineering and Installation Manuals at www.lghvac.com for information on specific indoor units.

Note:

- Before setting options, ensure the input power to all indoor units is OFF. Ensure the outdoor unit is ON but the compressor is not operating. Restore power to the indoor units after this procedure is complete.
- LG's indoor units are designated Generation 4 (Gen 4). For Gen 4 indoor units to operate with Gen 4 indoor unit features, Air-source unit DIP switch 3 must be set to ON (factory default setting is OFF).

Heat Recovery Units - Rotary Switch

Every heat recovery unit on each system must be addressed with a unique character (0-F) set by the rotary switch on its PCB. Start with 0 (assign 0 to the heat recovery unit that has the largest capacity indoor unit connected to port number one [1]), and count up (1, 2, etc.) for additional heat recovery units.

Heat Recovery Units - DIP Switches

Depending on the application, not all heat recovery unit ports have to be used (unused ports must be capped off). Certain switches are used to designate how many ports are being used.

- Large capacity (6 and 8 ton) indoor units require two ports on a heat recovery unit that are twinned together with a Y-branch kit. Certain switches identify which ports are being used for this application (valve group setting).
- Heat recovery units can support up to 8 indoor units on one port (zone setting for auto pipe detection).

Note:

For detailed heat recovery unit setting information, see the Installation Manual for your model.

Other Field Set Up Options

- Installing and setting all wired remote controllers. Access the field installer settings to display functions (information displayed depends on product features).
- Choose and set the controlling room temperature sensors.
- Airflow for ducted indoor units should be adjusted to deliver the require airflow at the external static pressure of the duct system.

Pre-Commissioning Summary

By this point, the following procedures must be complete:

- Successful triple leak / pressure and triple evacuation procedures have been performed.
- All ball valves, if applicable, must be open. Manifold gauge set valves must be closed to isolate the system.
- Auto Addressing has been successfully completed.
- If the system includes a central controller / BMS gateway, applicable components have been assigned a two-character hexadecimal address.
- All necessary DIP switches and rotary dials have been set properly.
- Outdoor unit service valves remain closed. (If the valves were opened, the factory refrigerant charge has been released.)

Prepare Pre-Commissioning Package Documents

Gather the following documents:

- Refrigerant piping system(s) shop drawing(s) generated by LATS Multi V pipe design software.
- Pipe fitter's pipe changes and field notes.
- Verified "As-Built" LATS Multi V Project file (*.mtv) that includes all changes noted by the pipe fitter(s). The tree diagram notes must include changes to the line lengths used for each liquid line segment. Verify that the sum of the indoor unit nominal capacity connected to the piping system is between 50% and 130% of the nominal capacity of the outdoor unit(s). If this rule is violated, the system will not start.
- Air balance report showing proper airflow at all indoor units.

*BACnet is a trademark of ASHRAE; LonWorks is a trademark of Echelon Corporation.

The system is now ready for commissioning procedures and additional trim charge. Send all Pre-Commissioning Package Documents to your LG Applied Representative and request commissioning assistance.

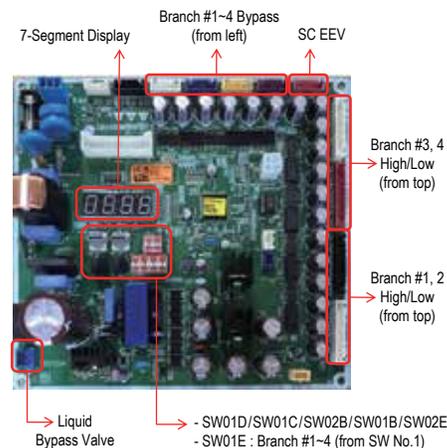
The contractor must ONLY request commissioning when everything is completed and all components tested / addressed (if a component is not operating within the usual parameters at the time of commissioning, then adjustments must be made that may prevent the Commissioner from signing off and approving the system). Before commissioning, the Commissioner may contact you to discuss specific job points, scheduled day(s) and expected duration. It is the contractor's responsibility to provide all of the necessary start-up labor, refrigerant, tools and test equipment needed to complete the process in the expected time frame.

⊗ Do not attempt to start the outdoor unit(s), charge refrigerant, or open service valves until directed by your Commissioner. After commissioning, the contractor will be notified if there are any corrections needed to allow warranty activation. The Distributor or LG Rep / Controls Contractor may provide assistance with controls setup, final device programming, BMS integration, air balance adjustments, etc.; and proceed with any owner training (if included).

Note:

LGMV monitoring software is encouraged for ease of future diagnostic and maintenance related checks.

Location of Heat Recovery Unit DIP and Rotary Switches (Appearances May Differ Depending on Model).



- If the project calls for group control of indoor units:
- For systems without central control, turn power off at all indoor units designed as a group. Determine which indoor unit is master, then, using optional group control kits, connect subsequent slave indoor units.
- For systems with central control, address the master unit and turn DIP switch No. 3 to on for all slave indoor units. Use a wireless remote to set wall mounted indoor units to slave.

- All indoor units have been checked for power at the unit disconnect and power is present at the indoor unit PCB board. (LED is lit.) ⊗ Do not turn on the unit using the on / off button.
- The communications cable to the indoor units has been disconnected from the IDU (A) and IDU (B) terminals at the outdoor unit(s).
- Install checklist points have been followed, verified, and any needed corrections have been made.
- Power has been energized to the outdoor unit(s) to power the compressor crankcase heater(s) at least 6 hours before commissioning.

- Completed and verified Installation Checklist for all the components in the system (see Installation Checklist, or see the Installation Manual on www.lghvac.com). Correct any procedures needing attention before initiating a request for commissioning.
- Completed Pre-Commissioning Device Configuration Worksheet with the models and serial numbers of all equipment to assist in full Warranty activation; completed Pre-Commissioning Checklist (see Installation Manual at www.lghvac.com for copies).
- If available, a list of IP addresses obtained from the building owners IT department for each ACP, BACnet®, LonWorks®, and AC Smart devices.*

Installation Checklist

Major Component Rough-In

Description	Check
All Multi V 5 outdoor units are 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 heat recovery units (for Heat Recovery systems 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
Heat recovery systems: LG prefers the use of ACR hard drawn copper on pipe segments located between heat recovery units and outdoor units, between heat recovery units piped in series, and between heat recovery units and multiple indoor units sharing a heat recovery unit port.	
Heat pump systems: LG prefers the use of ACR hard drawn copper for all pipe segments in the piping system except segments located between Y-branch fittings (or header fittings) and indoor units.	
DOAS Units: LG prefers the use of hard drawn copper in pipe segments connecting a DOAS products and an outdoor unit.	
LG Y-branch fittings or headers were used as per LATS Multi V report.	
All refrigerant pipes and valves were insulated separately. Insulation is positioned up against the walls of the indoor units and heat recovery units (for Heat Recovery systems 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 psi while brazing).	
15% silver brazing material only.	

Refrigerant Piping

Description	Check
You must have in your possession a copy of the "As-Designed" LATS Multi V 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, off-sets, 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, Y-branches, and/or header fittings are secured to the structure using a combination of fixed and floating clamps, and all wall penetrations were sleeved.	
All pipe insulation is not compressed at any point.	
Y-branch and header fittings were properly INSTALLED per details provided in the Multi V Outdoor Unit Installation Manual.	
Y-branch and header fittings were properly SUPPORTED per details provided in the Multi V Outdoor Unit Installation Manual.	
No oil traps, solenoid valves, sight glasses, filter driers, or any other unauthorized refrigerant specialties are present.	
(Optional) High quality R-410A rated full port ball valves (Schradar 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 each elbow, and Y-branch or header fitting, and between two Y-branch fittings.	
Inverted traps on vapor lines installed if required per installation manual.	

Heat Recovery Unit

Description	Check
Heat recovery unit is installed properly: Cannot be installed upside down or at any angle. It must be installed indoors, top-side up, level.	
Piping is insulated properly per the design engineer's specifications. Insulation is snug against the housing of the heat recovery unit.	
DIP switches and rotary dial settings are correct.	
If large capacity indoor unit, a Y-branch is installed properly.	

Condensate Pump / Drain Installation

Description	Check
Indoor unit condensate drain pipes were installed correctly.	
Minimum 3/4 inch, maximum 1 inch condensate piping installed on indoor units - material used is acceptable under local code. Insulated 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).	
Condensate lines are properly insulated to prevent condensation.	
Outdoor unit's gravity condensate drain line is connected and routed where it properly drained away or, if installed in a mechanical room, is connected and properly routed to a drain terminal.	

Installation Checklist, continued

Power Wire and Communications Cables

Description	Check										
Record power three phase 208-230V source or three phase 460V (verify system electrical requirements).											
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">R (L1) to Ground _____</td> <td style="width: 50%;">R - S _____</td> </tr> <tr> <td>S (L2) to Ground _____</td> <td>R - T _____</td> </tr> <tr> <td>T (L3) to Ground _____</td> <td>S - T _____</td> </tr> <tr> <td></td> <td>Sum of the Above _____</td> </tr> <tr> <td></td> <td>Divided by 3 _____ = Average Voltage</td> </tr> </table>	R (L1) to Ground _____	R - S _____	S (L2) to Ground _____	R - T _____	T (L3) to Ground _____	S - T _____		Sum of the Above _____		Divided by 3 _____ = Average Voltage	
R (L1) to Ground _____	R - S _____										
S (L2) to Ground _____	R - T _____										
T (L3) to Ground _____	S - T _____										
	Sum of the Above _____										
	Divided by 3 _____ = Average Voltage										
Ground wire was installed and properly terminated at the outdoor unit(s).											
The power supplied was clean with voltage fluctuations within specifications ($\pm 10\%$ of nameplate for 208-230V units, 414-528V for 460V units).											
Power wiring to the outdoor unit(s) was installed per all local, state, and NEC requirements.											
Power wiring to each indoor unit was installed per all local, state, and NEC requirements.											
Communications cable between the outdoor unit(s) and indoor units was connected in a daisy chain configuration (i.e., single parallel chain). No "star" or multiple parallel circuits. No cable splices or wire nuts were used to connect communications cables.											
Record Communication Voltage Range											
<table style="width: 100%; border: none;"> <tr> <td style="width: 30%;">High _____ VDC</td> <td style="width: 40%;"></td> <td style="width: 30%;">Low _____ VDC</td> </tr> </table>	High _____ VDC		Low _____ VDC								
High _____ VDC		Low _____ VDC									
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.											
Communication cable between Master ODU to Slave ODU(s), and Master ODU to IDUs / HRUs to be 18 AWG, 2-conductor, twisted, stranded, shielded. Ensure the communication cable shield is properly grounded to the Master ODU chassis only. Cable segment shields are tied together.											
Use appropriate crimping tool to attach ring or fork terminals at all power wiring and control cable terminations.											
All power and control wires were properly separated using the recommended distance provided in the product installation manual.											
Only LG-supplied Y-cables were used between indoor units.											

To access the complete Multi V 5 Installation Manual, see:
https://files.lghvac.com/resources//IM_MultiV_5_OutdoorUnits.pdf,
or visit www.lghvac.com.

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