LG
Life's Good

MULTI F
MULTI F MAX

OUTDOOR UNIT
INSTALLATION MANUAL

Multi-Zone Heat Pump Systems

1.5 to 5 Tons

Dual and Tri-Zone
Multi F

Quad-Zone
Multi F

Eight-Zone
Multi F MAX

PROPRIETARY DATA NOTICE

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Please read carefully and store in a safe place for future reference.
Content familiarity is required for proper installation.

The instructions included in this manual must be followed to prevent product malfunction, property damage, injury, or death to the user or other people. Incorrect operation due to ignoring any instructions will cause harm or damage. The level of seriousness is classified by the symbols described by the summary list of safety precautions on page 4.

For more technical materials such as submittals, catalogs, engineering, owner's, best practices, building ventilation guide, and service manuals, visit www.lghvac.com.

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SAFETY INSTRUCTIONS

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

TABLE OF SYMBOLS

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

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.

⃠ Do not supply power to the unit until all wiring and piping are completed or reconnected and checked.
There is risk of physical injury or death due to electric shock.

⚠WARNING

⃠ Do not install or remove the unit by yourself (end user). Ask the dealer or an trained technician to install the unit.
Improper installation by the user will result in fire, explosion, electric shock, physical injury or death.

For replacement of an installed unit, always contact an LG trained service provider.
There is risk of fire, electric shock, explosion, and physical injury or death.

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

⃠ Do not change the settings of the protection devices.
If the protection devices have been bypassed or is forced to operate improperly, or parts other than those specified by LG are used, there is risk of fire, electric shock, explosion, and physical injury or death.

Replace all control box and panel covers.
If cover panels are not installed securely, dust, water and animals will enter the outdoor unit, causing fire, electric shock, and physical injury or death.

Always check for system refrigerant leaks after the unit has been installed or serviced.
Exposure to high concentration levels of refrigerant gas will lead to illness or death.

Periodically check that the outdoor frame is not damaged.
There is a risk of explosion, physical injury, or death.

If the air conditioner is installed in a small space, take measures to prevent the refrigerant concentration from exceeding safety limits in the event of a refrigerant leak.
Consult the latest edition of ASHRAE (American Society of Heating, Refrigerating, and Air Conditioning Engineers) Standard 15. If the refrigerant leaks and safety limits are exceeded, it could result in personal injuries or death from oxygen depletion.

The branch distribution (BD) unit must be installed indoors; ⃠ do not install the BD unit in a highly humid environment.
There is risk of physical injury or death due to electric shock.

Dispose the packing materials safely.
- *Packing materials, such as nails and other metal or wooden parts, will cause puncture wounds or other injuries.*
- *Tear apart and throw away plastic packaging bags so that children will not play with them and risk suffocation and death.*

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

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

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Installation, continued

⚠WARNING

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.

⚠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 weights listed.*
- *Some products use polypropylene bands for packaging.* ⃠ *Do not use polypropylene bands to lift the unit.*
- *Support the outdoor unit a minimum of four points to avoid slippage from rigging apparatus.*

Note:

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

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

When installing the outdoor unit in a low-lying area, or a location that is not level, use a raised concrete pad or concrete blocks to provide a solid, level foundation.
This prevents water damage and abnormal vibration.

Properly insulate all cold surfaces to prevent "sweating."
Cold surfaces such as uninsulated piping can generate condensate that will drip and cause water damage to walls.

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

The branch distribution (BD) unit must be installed indoors; ⃠ **Do not install the BD box in a highly humid environment.**
There is risk of product failure and property damage.

⃠ **Do not make refrigerant substitutions. Use R410A only.**
If a different refrigerant is used, or air mixes with original refrigerant, the unit will malfunction and be damaged.

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

⃠ **Do not use the product for mission critical or special purpose applications such as preserving foods, works of art, or other precision air conditioning applications. The equipment is designed to provide comfort cooling and heating.**
There is risk of property damage.

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

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

⃠ **Do not install the outdoor unit or BD unit in a noise-sensitive area.**

Take appropriate actions at the end of HVAC equipment life to recover, recycle, reclaim or destroy R410A refrigerant according to applicable U.S. Environmental Protection Agency (EPA) rules.

Periodically check that the outdoor 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.

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SAFETY INSTRUCTIONS

Wiring

⚠DANGER

High voltage electricity is required to operate this system. Adhere to the NEC code 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.

Turn the power off at the nearest disconnect before servicing the equipment.
Electrical shock can cause physical injury or death.

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

⃠ Do not share the electrical circuit with other appliances.
There is risk of fire, electric shock, and physical injury or death due to heat generation.

⃠ Do not use damaged or loose power wiring. ⃠ Do not randomly modify or extend the outdoor unit's power wiring. Ensure that the power wiring will not be pulled nor weight be placed on the power wiring during operation.
There is risk of fire, electric shock, and 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 U.S. National Electric Code (NEC) who is equipped with the proper tools and test instruments.
Failure to carefully read and follow all instructions in this manual can result in personal 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 National Electrical Code, and the instructions given in this manual.
If the power source capacity is inadequate or the electric work is not performed properly, it will result in fire, electric shock, physical injury or death.

Refer to local, state, and federal codes, and use power wires of sufficient current capacity and rating.
Wires that are too small will generate heat and cause a fire.

Secure all field wiring connections with appropriate wire strain relief.
Improperly securing wires will create undue stress on equipment power lugs. Inadequate connections will generate heat, cause a fire and physical injury or death.

Ensure the system is connected to a dedicated power source that provides adequate power.
If the power source capacity is inadequate or the electric work is not performed properly, it will result in fire, electric shock, physical injury or death.

Properly tighten all power connections.
Loose wiring will overheat at connection points, causing a fire, physical injury or death.

⃠ Do not change the settings of the protection devices.
If the protection devices have been bypassed or are forced to operate improperly, or parts other than those specified by LG are used, there is risk of fire, electric shock, explosion, and physical injury or death.

Note:

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

The information contained in this manual is intended for use by an industry-qualified, experienced, certified electrician familiar with the U.S. National Electric Code (NEC) who is equipped with the proper tools and test instruments.
Failure to carefully read and follow all instructions in this manual can result in equipment malfunction and / or property damage.

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Operation

⚠DANGER

⃠ Do not provide power to or operate the unit if it is flooded or submerged.
There is risk of fire, electric shock, physical injury or death.

Use a dedicated breaker for this product.
There is risk of fire, electric shock, physical injury or death.

⃠ Do not operate the disconnect switch with wet hands.
There is risk of fire, electric shock, physical injury or death.

Periodically verify the equipment mounts have not deteriorated.
If the base collapses, the unit could fall and cause physical injury or death.

Use inert (nitrogen) gas when performing leak tests or air purges. ⃠ Do not use compressed air, oxygen, or flammable gases.
Using these substances will cause fire, explosion, and physical injury or death.

If refrigerant leaks out, ventilate the area before operating the unit.
If the unit is mounted in an enclosed, low-lying, or poorly ventilated area, and the system develops a refrigerant leak, it will cause a fire, electric shock, explosion, physical injury or death.

⚠WARNING

⃠ Do not allow water, dirt, or animals to enter the unit.
There is risk of fire, electric shock, physical injury or death.

⃠ Do not operate the unit with the panel(s) or protective cover(s) removed; keep fingers and clothing away from moving parts.
The rotating, hot, cold, and high-voltage parts of the unit can cause physical injury or death.

⃠ Do not touch the refrigerant piping during or after operation.
It can cause burns or frostbite.

⃠ Do not open the inlet during operation.
There is risk of electric shock, physical injury or death.

⚠CAUTION

To avoid physical injury, use caution when cleaning or servicing the air conditioner.
There is risk of electric shock, physical injury or death.

Note:

Clean up the site after servicing is finished, and check that no metal scraps, screws, or bits of wiring have been left inside or surrounding the unit.

⃠ Do not use the product for mission critical or special purpose applications such as preserving foods, works of art, or other precision air conditioning applications. The equipment is designed to provide comfort cooling and heating.
Oil, steam, sulfuric smoke, etc., can significantly reduce the performance of the unit, or damage its parts.

⃠ Do not block the inlet or outlet.
Unit will malfunction.

⃠ Do not allow water, dirt, or animals to enter the unit.
There is risk of unit failure.

⃠ Do not open the inlet during operation.
There is risk of unit failure.

⃠ Do not operate the unit when the panel(s) or protective cover(s) are removed.
Non-secured covers can result in product malfunction due to dust or water in the service panel.

Periodically verify the equipment mounts have not deteriorated.
If the base collapses, the unit could fall and cause property damage or product failure.

Use a only soft cloth to clean the air conditioner. ⃠ Do not use wax, thinner, or strong detergents.
Strong cleaning products will damage the surface of the air conditioner, or will cause its appearance to deteriorate.

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NOMENCLATURE

Multi-Zone Systems — Indoor Units and Outdoor Units

L	M	DN	12	6	HV

L = LG

Type: M = Multi-Zone

Component:
AN: Art Cool™ Wall-Mounted Indoor Unit
N: Standard Wall-Mounted Indoor Unit
CN: Four-Way Ceiling-Cassette Indoor Unit
DN: Ceiling-Concealed Duct (Low Static) Indoor Unit
HN: Ceiling-Concealed Duct (High Static) Indoor Unit
QN: Low-Wall Console Indoor Unit
VN: Vertical-Horizontal Air Handling Indoor Unit
U: Outdoor Unit

Nominal Capacity
(Nominal cooling capacity in Btu/h):

07 = 7,000	15 = 15,000	30 = 30,000	54 = 54,000
09 = 9,000	18 = 18,000	36 = 36,000	
12 = 12,000	24 = 24,000	48 = 48,000	

Generation

Features:
H = Heat Pump
V = Inverter
T = High Wall-Mounted Indoor Unit
P = Art Cool Gallery Indoor Unit

Branch Distribution Units

P	M	BD	36	2	0

P = Part (Accessory)

Type: M = Multi-Zone

BD: Branch Distribution Unit

Family

Number of Port Connections
(Maximum Number of Connectible Indoor Units): 2, 3, 4

Generation: 0, 1

Note:

- *Voltage for all equipment is 208-230V, 60 Hz, 1-phase.*
- *All indoor units are compatible with wired controllers.*
- *All outdoor units are LGAP control network compatible with PI-485 V-net Control Integration Board (PMNFP14A1, sold separately).*
- *Compatible single zone IDU nomenclature is listed in the Single Zone Wall-Mounted IDU Engineering Manual.*

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GENERAL DATA

Multi F Outdoor Unit Specifications

Table 1: Multi F Outdoor Unit Specifications.

Model Number	LMU18CHV	LMU24CHV	LMU30CHV	LMU36CHV
Cooling Capacity (Btu/h)[1] (Min.~Rated~ Max.)	8,400~17,000~19,000	8,400~20,000~25,000	8,400~30,000~36,000	8,400~32,000~38,400
Heating Capacity (Btu/h)[1] (Min.~Rated~ Max.)	10,248~22,000~24,000	9,240~24,000~28,800	9,240~32,000~38,400	9,240~36,000~41,600
Operating Range				
Cooling (°F DB)	14[7] - 118	14[7] - 118	14[7] - 118	14[7] - 118
Heating (°F WB)	-4 - 64	-4 - 64	-4 - 64	-4 - 64
Compressor				
Inverter Quantity	Twin Rotary x 1	Twin Rotary x 1	Twin Rotary x 1	Twin Rotary x 1
Oil Type	FVC68D	FVC68D	FVC68D	FVC68D
Fan (Side Discharge)				
Type	Propeller	Propeller	Propeller	Propeller
Motor Output (W) x Qty.	85.4 x 1	85.4 x 1	124.2 x 1	124.2 x 1
Motor/Drive	Brushless Digitally Controlled / Direct			
Maximum Air Volume (CFM)	1,766	1,766	2,119	2,119
Unit Data				
Refrigerant Type	R410A	R410A	R410A	R410A
Refrigerant Control/Location	EEV/Outdoor Unit	EEV/Outdoor Unit	EEV/Outdoor Unit	EEV/Outdoor Unit
Min. Number Indoor Units/System[2]	2	2	2	2
Max. Number Indoor Units/System[2]	2	3	4	4
Maximum Allowable Total Indoor Unit Connected Capacity (Btu/h)	24,000	33,000	40,000	48,000
Sound Pressure (Cooling / Heating) dB(A)[3]	49 / 52	49 / 52	52 / 55	52 / 55
Net Unit Weight (lbs.)	100	100	137	137
Shipping Weight (lbs.)	108	108	148	148
Power Wiring / Communications Cable (No. x AWG)[4,5]	4C x 14	4C x 14	4C x 14	4C x 14
Heat Exchanger				
Material and Fin Coating	Copper Tube/Aluminum Fin and GoldFin™/Hydrophilic			
Rows/Columns/Fins per inch x Qty.	(2 x 28 x 14) x 1	(2 x 28 x 14) x 1	(2 x 38 x 14) x 1	(2 x 38 x 14) x 1
Piping				
Liquid Line Connection (in., OD) x Qty.	1/4 x 2	1/4 x 3	1/4 x 4	1/4 x 4
Vapor Line Connection (in., OD) x Qty.	3/8 x 2	3/8 x 3	3/8 x 4	3/8 x 4
Factory Charge lbs. of R410A	3.96	3.96	6.18	6.18
Piping Lengths				
Maximum Total Piping (ft.)[6]	164.0	246.1	246.1	246.1
Maximum Outdoor Unit to Indoor Unit Piping (ft)	82.0	82.0	82.0	82.0
Piping Length (No Additional Refrigerant [ft])	49.2	73.8	98.4	98.4
Maximum Elevation between Outdoor Unit and Indoor Unit (ft.)	49.2	49.2	49.2	49.2
Maximum Elevation between Indoor Unit and Indoor Unit (ft.)	24.6	24.6	24.6	24.6

[1]Rated capacity applied with non-ducted indoor units, and is rated 0 ft. above sea level with 25 ft. of refrigerant line per indoor unit and a 0 ft. level difference between outdoor and indoor units. All capacities are net with a combination ratio between 95 – 105%.

Rated cooling capacity obtained with air entering the indoor unit at 80ºF dry bulb (DB) and 67ºF wet bulb (WB) and outdoor ambient conditions of 95ºF dry bulb (DB) and 75ºF wet bulb (WB).
Rated heating capacity obtained with air entering the indoor unit at 70ºF dry bulb (DB) and 60ºF wet bulb (WB) and outdoor ambient conditions of 47ºF dry bulb (DB) and 43ºF wet bulb (WB).

[2]At least two indoor units must be connected. For allocated capacity information, see the combination tables in the "Multi F / Multi F MAX Combination Data Manual" on www.lghvac.com. For performance data, see "Multi F / Multi F MAX Performance Data Manual" on www.lghvac.com.

[3]Sound pressure levels are tested in an anechoic chamber under ISO Standard 3745 and are the same in both cooling and heating mode. These values can increase due to ambient conditions during operation.

[4]Power wiring to the outdoor unit is field supplied, solid or stranded, and must comply with the applicable local and national codes. For detailed information, please refer to electrical characteristics on page 10.

[5]Power wiring / communication cable to be minimum 14 AWG, 4-conductor from the outdoor unit to the indoor unit, 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. For detailed electrical information, please refer to electric characteristics on page 10.

[6]Piping lengths are equivalent.

[7]Installation of an optional Low Ambient Wind Baffle Kit will allow operation down to -4°F in cooling mode.

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GENERAL DATA

Multi F Outdoor Unit Electrical Data

Table 2: Multi F Outdoor Unit Electrical Data.

Nominal Tons	Unit Model No.	Hertz	Voltage	Phase	Voltage Range (Min. to Max.)	MCA	MOP	Compressor Quantity	Compressor Motor RLA	Outdoor Fan Motor		Indoor Fan Motor
										kW	FLA	FLA
1.5	LMU18CHV	60	208 - 230	1	187 - 253	13.3	20	1	8.9	0.09	0.59	1.60
2	LMU24CHV					14.3	20	1	9.4	0.09	0.59	2.00
2.5	LMU30CHV					16.6	25	1	10.8	0.12	0.73	2.40
3	LMU36CHV					17.9	25	1	11.2	0.12	0.73	3.20

Voltage tolerance is ±10%.

Maximum allowable voltage unbalance is 2%.

RLA = Rated Load Amps.

MCA = Minimum Circuit Ampacity.

Maximum Overcurrent Protection (MOP) is calculated as follows: (Largest motor FLA x 2.25) + (Sum of other motor FLA) rounded down to the nearest standard fuse size.

Indoor Fan Motor (FLA) is based on the maximum combination of indoor units.

The max combination for each outdoor unit is:

- 18,000 ODU (LMU18CHV): 12,000 IDU x 2
- 24,000 ODU (LMU24CHV): 12,000 IDU x 2 + 9,000 IDU x 1
- 30,000 ODU (LMU30CHV): 12,000 IDU x 3
- 36,000 ODU (LMU36CHV): 12,000 IDU x 4

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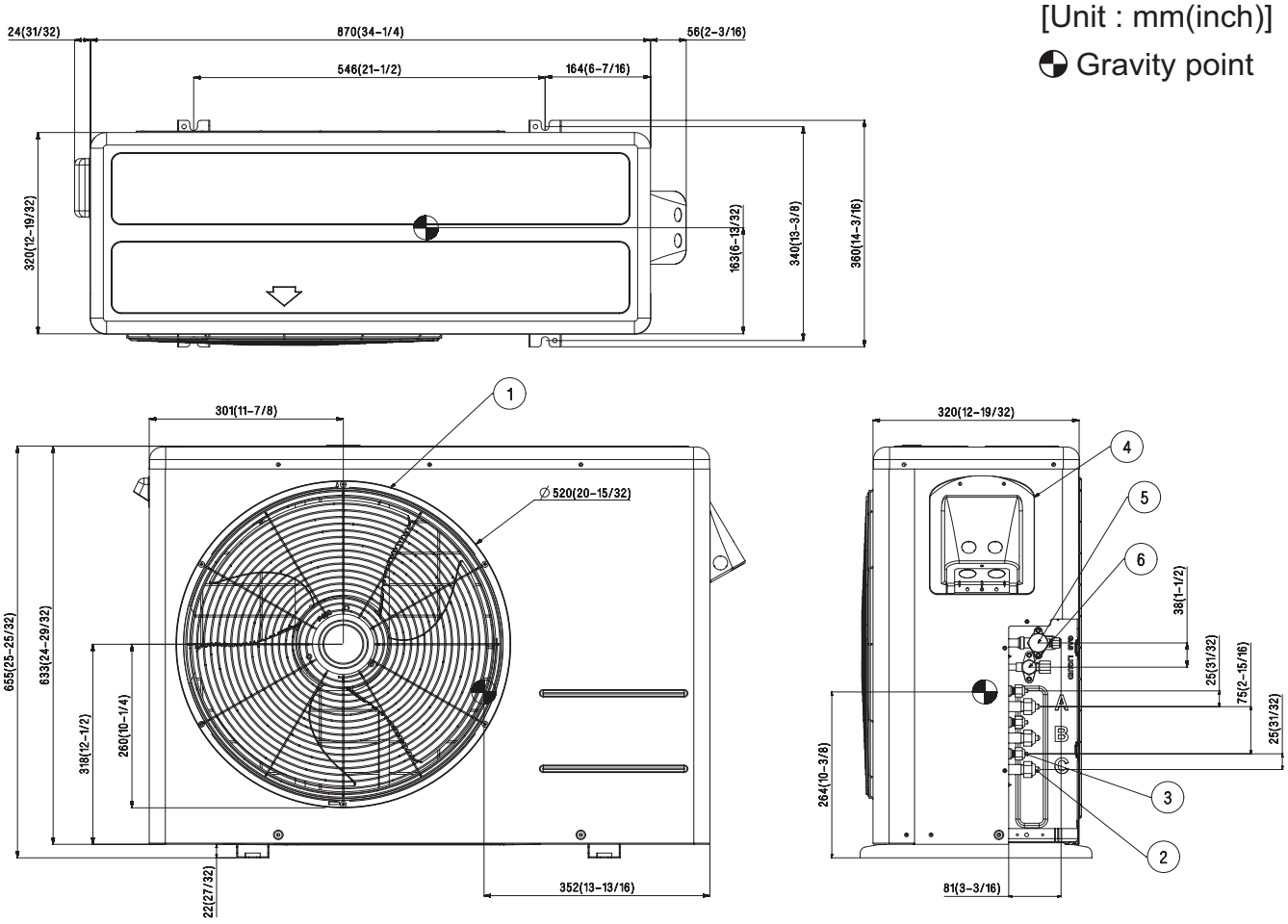
GENERAL DATA

Multi F Outdoor Unit Dimensions

Figure 1: LMU18CHV Multi F Outdoor Unit External Dimensions.

[Unit : mm(inch)]

◒ Gravity point



No.	Part Name
1	Air discharge grille
2	Gas pipe connection
3	Liquid pipe connection
4	Power & transmission connection
5	Main service valve(Gas)
6	Main service valve(Liquid)

▣ Note

1. Unit should be installed in compliance with the installation manual in the product box.
2. Unit should be grounded in accordance with the local regulations or applicable national codes.
3. All electrical components and materials to be supplied on the site must comply with the local regulations or international codes.
4. Electrical characteristics chapter should be considered for electrical work and design. Especially the capacity of power cable and circuit breaker for outdoor unit should be more than that of electrical characteristics chapter.

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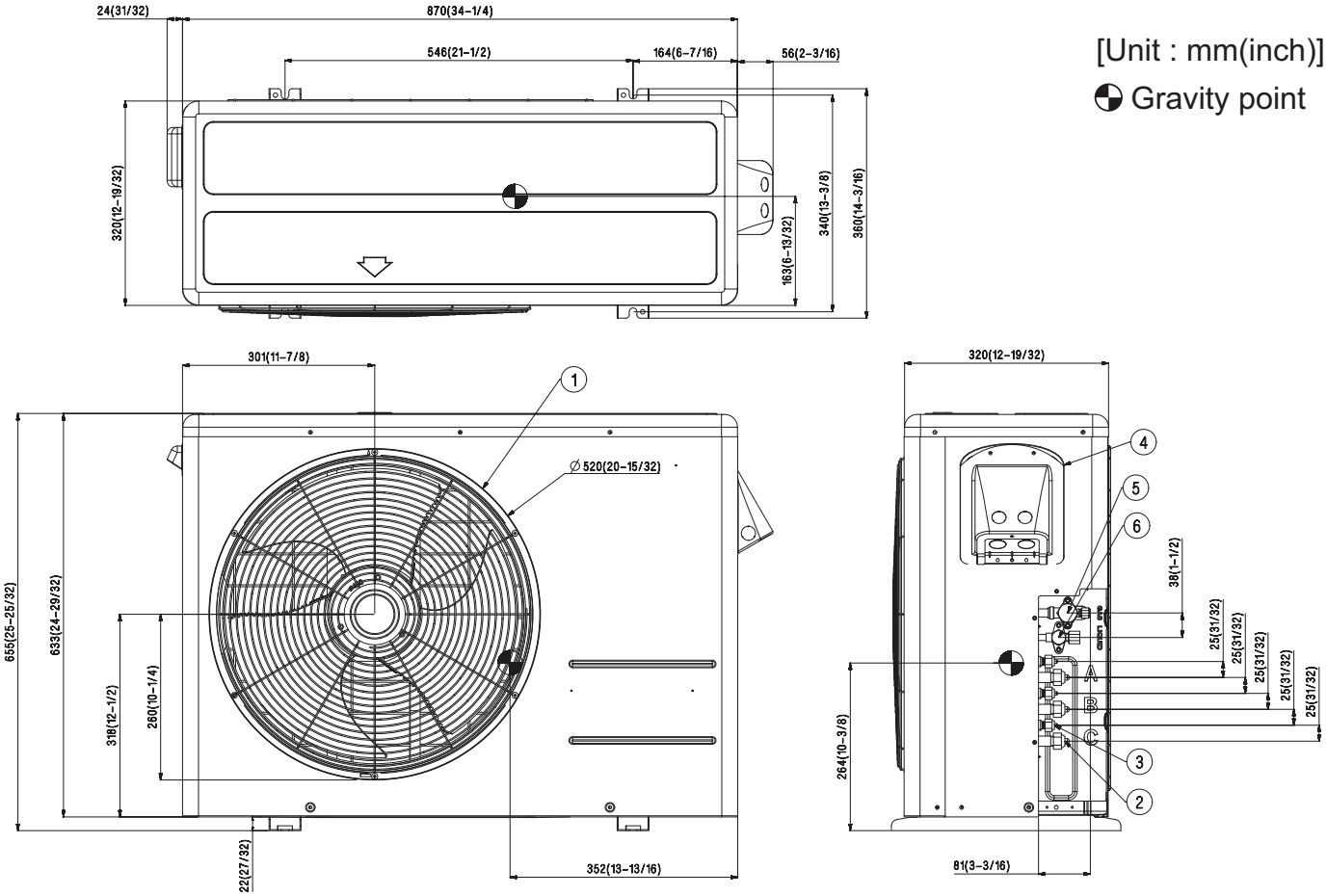
GENERAL DATA

Multi F Outdoor Unit Dimensions

Figure 2: LMU24CHV Multi F Outdoor Unit External Dimensions.



No.	Part Name
1	Air discharge grille
2	Gas pipe connection
3	Liquid pipe connection
4	Power & transmission connection
5	Main service valve(Gas)
6	Main service valve(Liquid)

■ Note

1. Unit should be installed in compliance with the installation manual in the product box.
2. Unit should be grounded in accordance with the local regulations or applicable national codes.
3. All electrical components and materials to be supplied on the site must comply with the local regulations or international codes.
4. Electrical characteristics chapter should be considered for electrical work and design. Especially the capacity of power cable and circuit breaker for outdoor unit should be more than that of electrical characteristics chapter.

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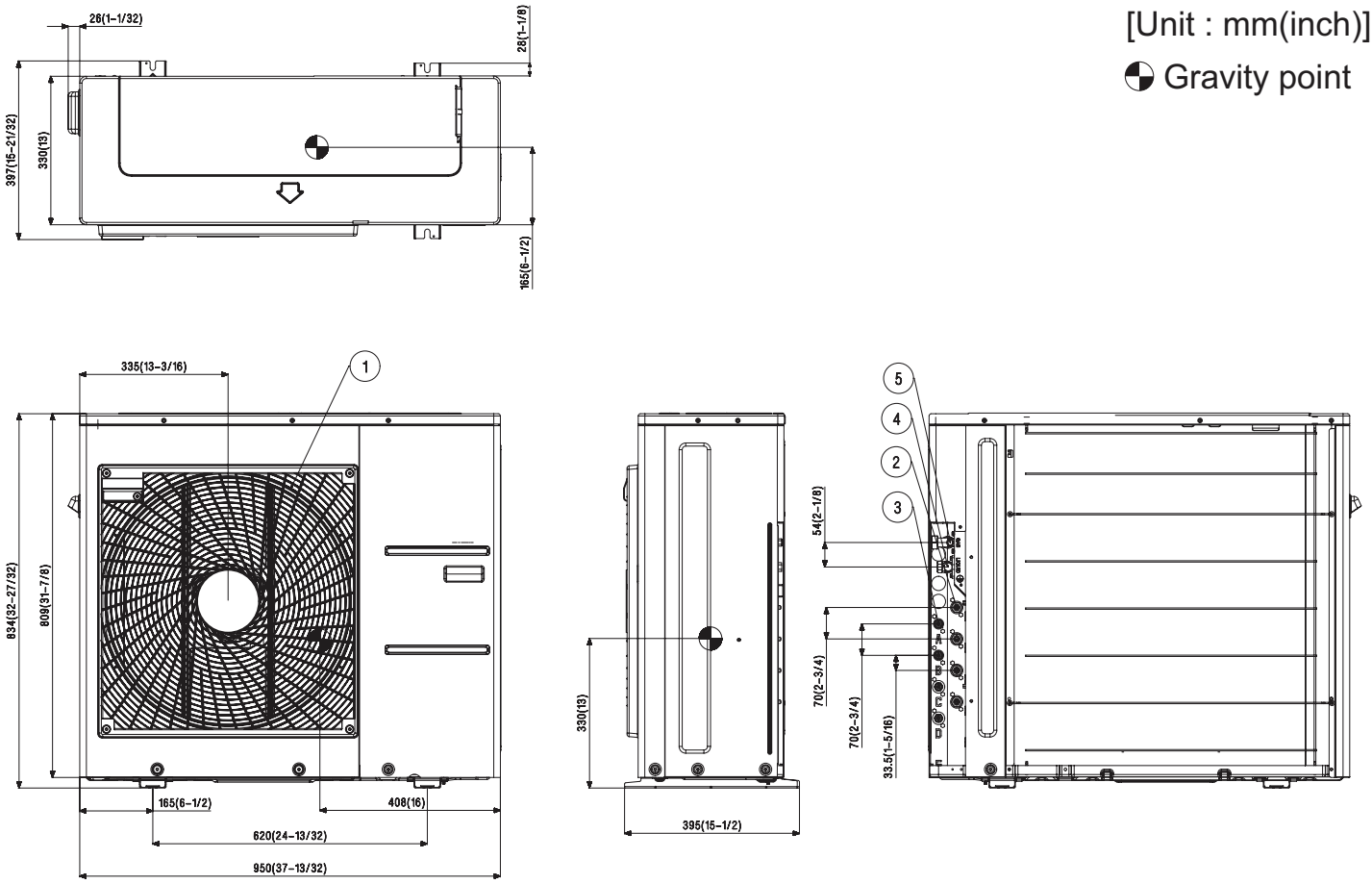
GENERAL DATA

Multi F Outdoor Unit Dimensions

Figure 3: LMU30CHV and LMU36CHV Multi F Outdoor Unit External Dimensions.

[Unit : mm(inch)]

Gravity point



No.	Part Name
1	Air discharge grille
2	Gas pipe connection
3	Liquid pipe connection
4	Main service valve(Liquid)
5	Main service valve(Gas)

■ Note

1. Unit should be installed in compliance with the installation manual in the product box.
2. Unit should be grounded in accordance with the local regulations or applicable national codes.
3. All electrical components and materials to be supplied on the site must comply with the local regulations or international codes.
4. Electrical characteristics chapter should be considered for electrical work and design. Especially the capacity of power cable and circuit breaker for outdoor unit should be more than that of electrical characteristics chapter.

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GENERAL DATA

Multi F MAX Outdoor Unit Specifications

Table 3: Multi F MAX Outdoor Unit General Data.

Model Number	LMU480HV	LMU540HV	LMU600HV
Cooling Capacity (Btu/h) (Minimum ~ Rated ~ Maximum)[1]	14,400~48,000~58,000	14,400~52,500~63,200	15,600~60,000~68,000
Heating Capacity (Btu/h) (Minimum ~ Rated ~ Maximum)[1]	15,840~54,000~61,000	16,272~58,000~64,000	17,940~64,000~70,000
Operating Range			
Cooling (°F DB)	14[7] - 118	14[7] - 118	14[7] - 118
Heating (°F WB)	-4 - 64	-4 - 64	-4 - 64
Compressor			
Inverter Quantity	Twin Rotary x 1	Twin Rotary x 1	Twin Rotary x 1
Oil Type	FVC68D	FVC68D	FVC68D
Fan (Side Discharge)			
Type	Propeller	Propeller	Propeller
Motor Output (W) x Qty.	124.2 x 2	124.2 x 2	124.2 x 2
Motor/Drive	Brushless Digitally Controlled/Direct		
Maximum Air Volume (CFM)	2,119 x 2	2,119 x 2	2,119 x 2
Unit Data			
Refrigerant Type	R410A	R410A	R410A
Refrigerant Control/Location	EEV / Outdoor Unit, Branch Distribution Unit		
Min. Number Indoor Units/System[2]	2	2	2
Max. Number Indoor Units/System[2]	8	8	8
Maximum Allowable Total Indoor Unit Connected Capacity (Btu/h)	65,000	73,000	81,000
Sound Pressure ±3 dB(A)[3] (Cooling / Heating)	54 / 56	54 / 56	56 / 58
Net Unit Weight (lbs.)	214	214	223
Shipping Weight (lbs.)	236	236	249
Power/Communications Wiring Between ODU and BD Unit (No. X AWG)[4,5]	4C X 14	4C X 14	4C x 14
Heat Exchanger			
Material and Fin Coating	Copper Tube / Aluminum Fin and GoldFin™/Hydrophilic		
Rows/Columns/Fins per inch x Qty.	(2 x 32 x 14) x 2	(2 x 32 x 14) x 2	(3 x 32 x 14) x 2
Piping			
Liquid Line Connection (in., OD) x Qty.	3/8 x 1	3/8 x 1	3/8 x 1
Vapor Line Connection (in., OD) x Qty.	3/4 x 1	3/4 x 1	3/4 x 1
Factory Charge lbs. of R410A	9.7	9.7	12.3
Piping Lengths			
Maximum Total System Piping (ft.)[6]	475.7	475.7	475.7
Maximum Main Pipe Length (Outdoor Unit to BD Unit [ft.])	180.4	180.4	180.4
Total Branch Piping (BD Units to all Indoor Units [ft.])	295.3	295.3	295.3
Maximum Branch Pipe Length (Length between each BDU and IDU [ft.])	49.2	49.2	49.2
Maximum Outdoor Unit to Indoor Unit Pipe Length (ft.)	229.6	229.6	229.6
Max. Main Piping Length (No Additional Refrigerant (ft.)	16	16	16
Max. Branch Piping Length (No Additional Refrigerant (ft.)	131	131	147.6
Maximum Elevation between Outdoor Unit and Indoor Unit (ft.)	98.4	98.4	98.4
Maximum Elevation between Indoor Unit and Indoor Unit (ft.)	49.2	49.2	49.2
Maximum Elevation between BD Unit and Indoor Unit (ft.)	32.8	32.8	32.8
Maximum Elevation between BD Unit and BD Unit (ft.)	49.2	49.2	49.2

[1]Rated capacity applied with non-ducted indoor units, and is rated 0 ft. above sea level with a 0 ft. level difference between outdoor and indoor units. All capacities are net with a combination ratio between 95 – 105%.

Rated cooling capacity obtained with air entering the indoor unit at 80ºF dry bulb (DB) and 67ºF wet bulb (WB) and outdoor ambient conditions of 95ºF dry bulb (DB) and 75ºF wet bulb (WB). Rated heating capacity obtained with air entering the indoor unit at 70ºF dry bulb (DB) and 60ºF wet bulb (WB) and outdoor ambient conditions of 47ºF dry bulb (DB) and 43ºF wet bulb (WB).

[2]At least one Branch Distribution Unit is required for system operation; a maximum of two can be installed per outdoor unit with use of Y-branch accessory (PMBL5620). At least two indoor units must be connected. For allocated capacity information, see the combination tables in the "Multi F / Multi F MAX Combination Data Manual" on www.lghvac.com. For performance data, see "Multi F / Multi F MAX Performance Data Manual" on www.lghvac.com.

[3]Sound pressure levels are tested in an anechoic chamber under ISO Standard 3745. These values can increase due to ambient conditions during operation.

[4]Power wiring to the outdoor unit is field supplied, solid or stranded, and must comply with the applicable local and national codes. For detailed information, please refer to electrical characteristics on page 15.

[5]Power wiring / communication cable to be minimum 14 AWG, 4-conductor from the outdoor unit to the BD unit (Multi F MAX systems only), and 14 AWG, 4-conductor from the BD unit to the indoor unit, 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. For detailed electrical information, please refer to electric characteristics on page 15.

[6]Piping lengths are equivalent.

[7]Installation of an optional Low Ambient Wind Baffle Kit will allow operation down to -4°F in cooling mode.

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GENERAL DATA

Multi F MAX Outdoor Unit Electrical Data

Table 4: Multi F MAX Electrical Data.

Nominal Tons	Unit Model No.	Hertz	Voltage	Phase	Voltage Range (Min. to Max.)	MCA	MOP	Compressor Quantity	Compressor Motor RLA	Condenser Fan Motor(s)		Indoor Fan Motor
										Condenser Fan Quantity x kW	Condenser Fan Motor FLA	
4.0	LMU480HV	60	208 - 230	1	187 - 253	27.3	40	1	17.5	2 x 0.12	0.73 x 2	4.0
4.5	LMU540HV	60	208 - 230		187 - 253	29.4	40	1	18.5	2 x 0.12	0.73 x 2	4.8
5.0	LMU600HV	60	208 - 230		187 - 253	32.2	45	1	20.4	2 x 0.12	0.73 x 2	5.2

Voltage tolerance is ±10%.

Maximum allowable voltage unbalance is 2%.

RLA = Rated Load Amps.

MCA = Minimum Circuit Ampacity.

Maximum Overcurrent Protection (MOP) is calculated as follows: (Largest motor FLA x 2.25) + (Sum of other motor FLA) rounded down to the nearest standard fuse size.

Indoor Fan Motor (FLA) is based on the maximum combination of indoor units.

The max combination for each outdoor unit is:

- 48,000 ODU (LMU480HV): 12,000 IDU x 5
- 54,000 ODU (LMU540HV): 12,000 IDU x 6
- 60,000 ODU (LMU6000HV): 12,000 IDU x 6 + 9,000 IDU x 1

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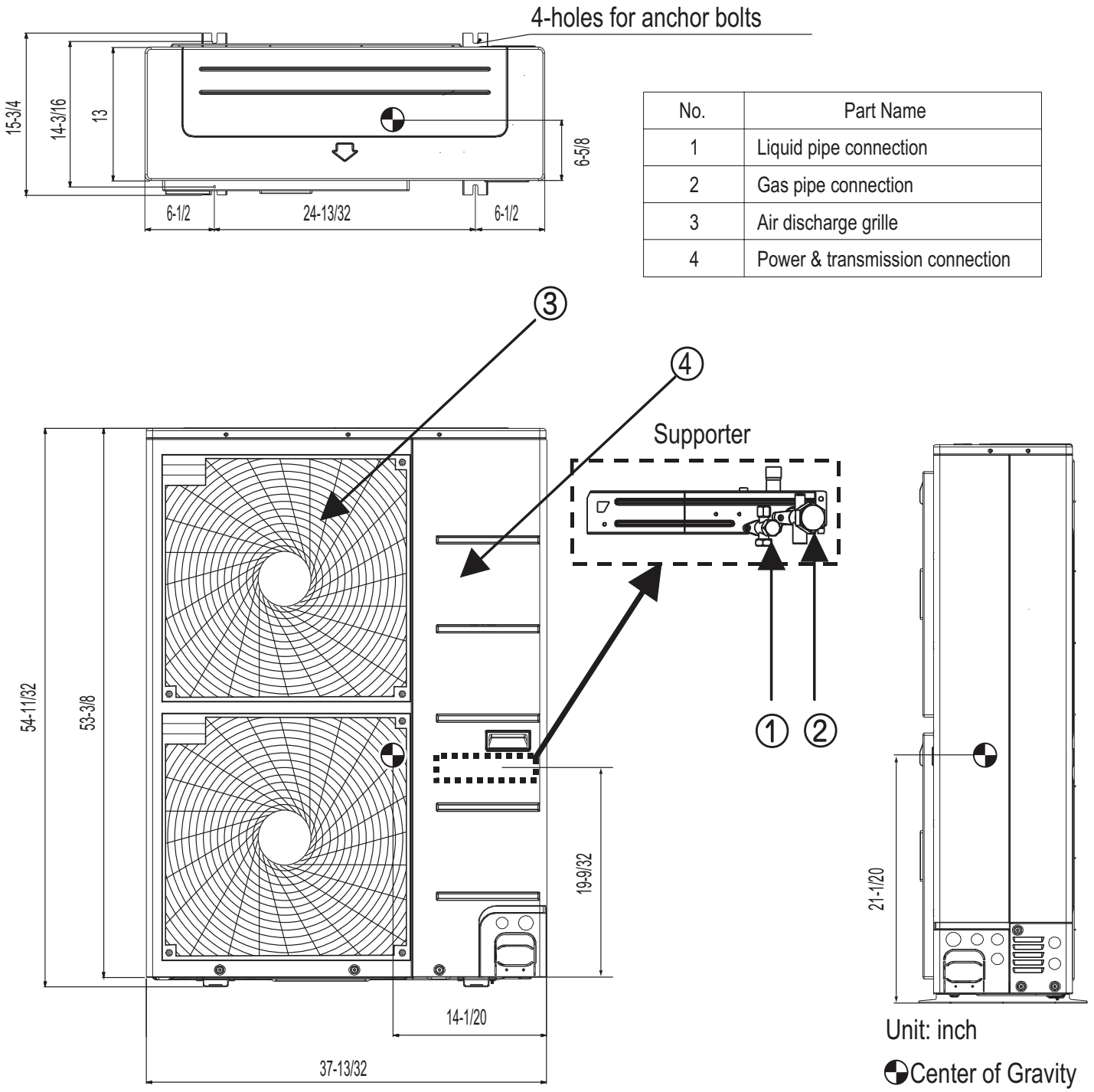
Figure 4: LMU480HV, LMU540HV, and LMU600HV Multi F MAX Outdoor Unit External Dimensions.



No.	Part Name
1	Liquid pipe connection
2	Gas pipe connection
3	Air discharge grille
4	Power & transmission connection

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GENERAL DATA

Branch Distribution Unit Specification / Electrical Data

Table 5: Branch Distribution Unit General Data.

Model Number		PMBD3620	PMBD3630	PMBD3640	PMBD3641
No. of Connectible Indoor Units[1]		1-2	1-3	1-4	1-4
Max. Nominal Capacity / Port (Btu/h)[2]		24,000	24,000	24,000	24,000 for A,B,C Ports; 36,000 for D Port
Max. Nominal Capacity / Branch Distribution Unit (Btu/h)		48,000	72,000	73,000	73,000
Operation Temperature Range (°F DB)		0 ~ 150	0 ~ 150	0 ~ 150	0 ~ 150
Unit Data					
Refrigerant Type		R410A	R410A	R410A	R410A
Power Supply V, Ø, Hz		208-230, 1, 60	208-230, 1, 60	208-230, 1, 60	208-230, 1, 60
Power Input (W)		16	24	32	32
Rated Amps (A)		0.08	0.12	0.16	0.16
Dimensions W x H x D (in.)		17-3/32 x 6-13/32 x 10-23/32	17-3/32 x 6-13/32 x 10-23/32	17-3/32 x 6-13/32 x 10-23/32	17-3/32 x 6-13/32 x 10-23/32
Net Unit Weight (lbs.)		13	14.3	15.7	15.7
Shipping Weight (lbs.)		15	17	18	18
Communication / Connection (Power) Cables[3]					
From Outdoor Unit to Branch Distribution Unit (Qty. x AWG)[3]		4C x 14	4C x 14	4C x 14	4C x 14
From Branch Distribution Unit to Indoor Unit (Qty. x AWG)[3]		4C x 14	4C x 14	4C x 14	4C x 14
Piping Connections					
Outdoor Unit to Branch Distribution Unit	Liquid (in., OD)	Ø3/8	Ø3/8	Ø3/8	Ø3/8
	Vapor (in., OD)	Ø3/4	Ø3/4	Ø3/4	Ø3/4
Branch Distribution Unit to Indoor Units	Liquid (in., OD) x Qty.	Ø1/4 x 2	Ø1/4 x 3	Ø1/4 x 4	Ø1/4 x 4
	Vapor (in., OD) x Qty.	Ø3/8 x 2	Ø3/8 x 3	Ø3/8 x 4	Ø3/8 x 3; Ø1/2 x 1
Piping Lengths					
Maximum Total System Piping (ft.)[4]		475.7	475.7	475.7	475.7
Maximum Main Pipe Length (Outdoor Unit to Branch Distribution Units [ft.])		180.4	180.4	180.4	180.4
Total Branch Piping (Branch Distribution Units to Indoor Units [ft.])		295.3	295.3	295.3	295.3
Maximum Branch Pipe Length Between Branch Distribution Unit and Each Indoor Unit [ft.])		49.2	49.2	49.2	49.2
Maximum Outdoor Unit to Indoor Unit Pipe Length (ft.)		229.6	229.6	229.6	229.6
Piping Length (No Additional Refrigerant [ft.]; approx. 16 ft. of Main Piping + 131 ft. of Branch Piping)		147.6	147.6	147.6	147.6
Maximum Elevation between Branch Distribution Unit and Indoor Unit (ft.)		32.8	32.8	32.8	32.8
Maximum Elevation between Branch Distribution Unit and Branch Distribution Unit (ft.)		49.2	49.2	49.2	49.2

[1]At least one branch distribution Unit is required for system operation; a maximum of two can be installed per outdoor unit with use of Y-branch accessory (PMBL5620) To connect only one (1) indoor unit to a branch distribution unit, the system must include another branch distribution unit with at least one (1) connected indoor unit.

[2] Branch distribution Unit can accommodate from one (1) indoor unit up to four (4) indoor units depending on the ports available on the branch distribution Unit.

[3]Communication / power (connection) cable must be a minimum of 14 AWG, 4-conductor from the outdoor unit to the branch distribution unit (Multi F MAX systems only), and 14 AWG, 4-conductor from the branch distribution unit to the indoor unit, 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.

[4]Piping lengths are equivalent.

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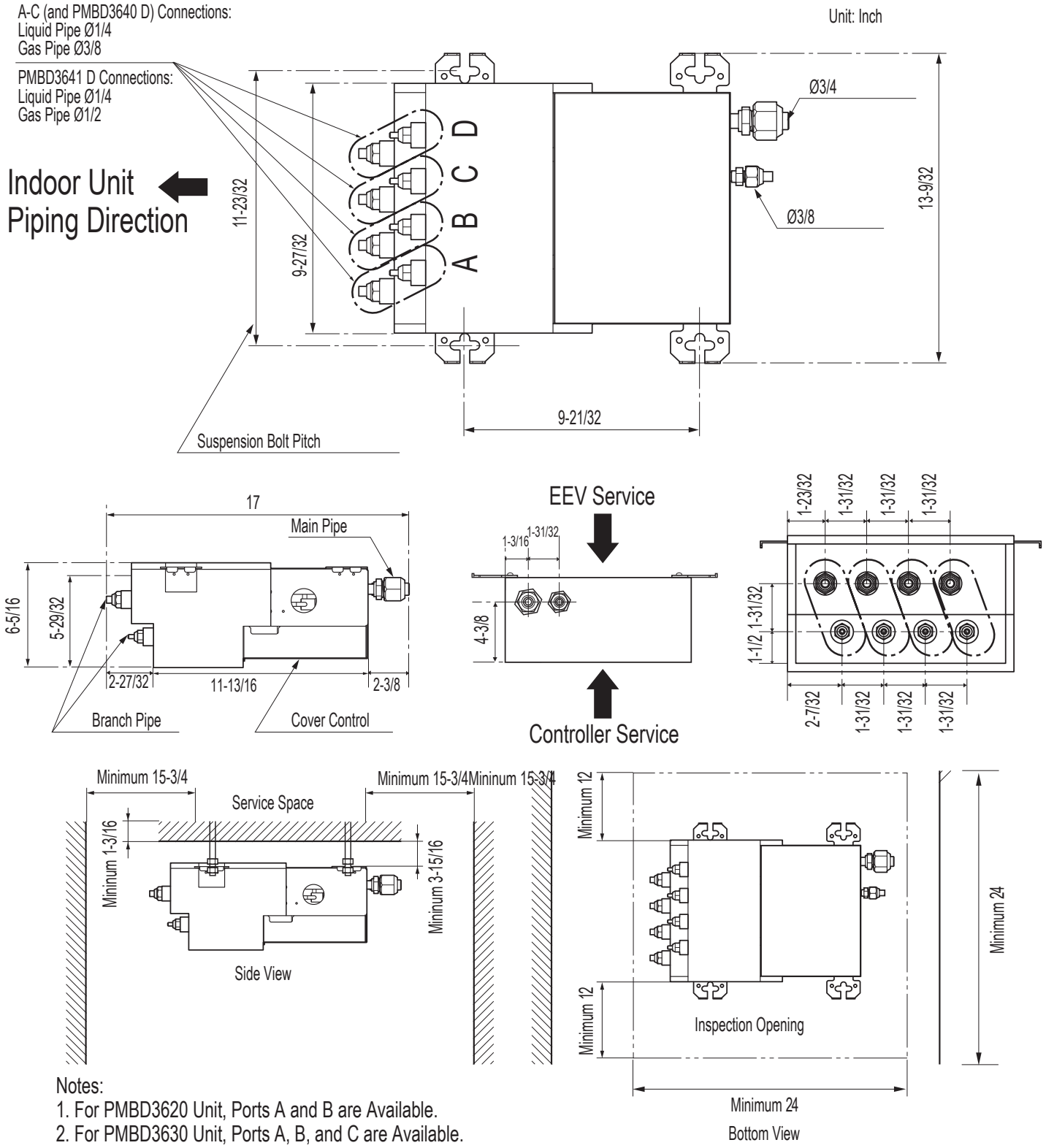
GENERAL DATA

Branch Distribution Unit Dimensions

Figure 5: PMBD3620, PMBD3630, PMBD3640, and PMBD3641 External Dimensions.



Notes:
1. For PMBD3620 Unit, Ports A and B are Available.
2. For PMBD3630 Unit, Ports A, B, and C are Available.
3. For PMBD3640 and PMBD3641 Units, Ports A, B, C, and D are Available.

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TRANSPORTING / LIFTING

Transporting / Lifting the Outdoor Unit

- At the time of delivery, the package must be checked for any damage (exterior and interior). Report any damage to the carrier claims agent immediately.
- When lifting the unit, use lifting straps and place properly around the unit.
- Always lift the unit using properly sized lifting straps rated to carry the unit weight.
- Ensure the straps are long enough to maintain a maximum of a 40° angle.

Table 6: Multi F / Multi F MAX Shipping and Net Weights.

Capacity (ton)	Shipping Weight (lbs.)	Net Weight (lbs.)
1.5	108	100
2		
2.5	148	137
3		
4	236	214
4.5		
5	249	223

⚠ WARNING

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 weights listed above. If the equipment is not properly secured, it will result in an accident that causes physical injury or death.*
- *Wear protective gloves when handling equipment. Sharp edges will cause personal injury.*
- *Dispose the packing materials safely. Packing materials, such as nails and other metal or wooden parts, will cause puncture wounds or other injuries.*
- *Tear apart and throw away plastic packaging bags so that children will not play with them and risk suffocation and death.*
- *Use caution when using a forklift to transport an unpackaged unit. The forklift arms must pass through the openings at the bottom. ⃠ Do not drop the unit when carrying it with a forklift. There is a risk of the product falling and causing physical injury.*
- *Consider the unit's center of gravity before lifting. Hoist the unit with the center of gravity centered among the lifting straps. There is a risk of the product falling and causing physical injury.*
- *Some products include polypropylene bands around the unit for packaging. ⃠ Do not use polypropylene bands to lift the unit. There is a risk of the product falling and causing physical injury.*
- *Lift the outdoor unit from the base at specified locations. Support the outdoor unit at a minimum of four (4) points to avoid slippage from the rigging apparatus. There is a risk of the product falling and causing physical injury.*
- *If a crane is to suspend the outdoor unit, it is recommended that two (2) ropes at least twenty-three (23) feet in length be used.*
- *Pass the ropes under the unit. Pass the rope through the two (2) forklift slots each at the front and rear of the outdoor unit.*
- *To prevent damage to the outdoor unit, always lift the unit with the ropes attached at four (4) points at an angle of ≤40°.*

Note:

- *Make sure the outdoor unit is in its original packaging to avoid damage during local transport.*
- *Handle the outdoor unit with care. Keep the outdoor unit upright to avoid damaging inside components.*
- *When lifting, always include padding to protect the outdoor unit from rope damage.*

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PLACEMENT CONSIDERATIONS

Selecting the Best Location for the Outdoor Unit

MULTI F
MULTI F MAX

Selecting the Best Location for the Outdoor Unit

⚠DANGER

- ⃠ *Do not install the unit in an area where combustible gas will generate, flow, stagnate, or leak. These conditions can cause a fire, resulting in bodily injury or death.*
- ⃠ *Do not install the unit in a location where acidic solution and spray (sulfur) are often used as it can cause bodily injury or death.*
- ⃠ *Do not use the unit in environments where oil, steam, or sulfuric gas are present as it can cause bodily injury or death.*

⚠CAUTION

When deciding on a location to place the outdoor unit, be sure to choose an area where run-off from defrost will not accumulate and freeze on sidewalks or driveways, which will create unsafe conditions. Properly install and insulate any drain hoses to prevent the hose from freezing, cracking, leaking, and causing unsafe conditions from frozen condensate.

⚠WARNING

Install a fence to prevent vermin from crawling into the unit or unauthorized individuals from accessing it. Vermin and unauthorized individuals will cause a fire, electric shock, physical injury or death. Follow the placement guidelines set forth in "Clearance Requirements".

Note:

Install a fence to prevent vermin from crawling into the unit or unauthorized individuals from accessing it. Vermin and unauthorized individuals will damage the unit. Follow the placement guidelines set forth in "Clearance Requirements".

Select a location for installing the outdoor unit that will meet the following conditions:

- Where there is enough strength to bear the weight of the unit.
- A location that allows for optimum air flow and is easily accessible for inspection, maintenance, and service.
- Where piping between the outdoor unit and indoor unit (and branch distribution unit[s], if Multi F MAX) is within allowable limits.
- Include space for drainage to ensure condensate flows properly out of the unit when it is in heating mode. ⃠ Avoid placing the outdoor unit in a low-lying area where water could accumulate.
- If the outdoor unit is installed in a highly humid environment (near an ocean, lake, etc.), ensure that the site is well-ventilated and has a lot of natural light (Example: Install on a rooftop).

⃠ Do Not's

- *Where it will be subjected to direct thermal radiation from other heat sources, or an area that would expose the outdoor unit to heat or steam like discharge from boiler stacks, chimneys, steam relief ports, other air conditioning units, kitchen vents, plumbing vents, and other sources of extreme temperatures.*
- *Where high-frequency electrical noise / electromagnetic waves will affect operation.*
- *Where operating sound from the unit will disturb inhabitants of surrounding buildings.*
- *Where the unit will be exposed to direct, strong winds.*
- *Where the discharge of one outdoor unit will blow into the inlet side of an adjacent unit (when installing multiple outdoor units).*

Outdoor Unit Condensate Drain Piping

Outdoor unit requires condensate drain piping. Condensate drain pipe is constructed with materials approved by local code. See pages 22 to 24 for information in reference to outdoor unit placement.

Planning for Snow and Ice

To ensure the outdoor unit operates properly, certain measures are required in locations where there is a possibility of heavy snowfall or severe windchill or cold:

1. Prepare for severe winter wind chills and heavy snowfall, even in areas of the country where these are unusual phenomena.
2. Position the outdoor unit so that its airflow fans are not buried by direct, heavy snowfall. If snow piles up and blocks the airflow, the system will malfunction.
3. Remove any snow that has accumulated four (4) inches or more on the top of the outdoor unit.
4. In climates that will experience significant snow buildup, mount the outdoor unit on a raised, field-provided platform or stand. The raised support platform must be high enough to allow the unit to remain above possible snow drifts, and must be higher than the maximum anticipated snowfall for the location.
5. Design the mounting base to prevent snow accumulation on the platform in front or back of the unit frame.
6. Provide a field fabricated snow protection hood to keep snow and ice and/or drifting snow from accumulating on the coil surfaces.
7. To prevent snow and heavy rain from entering the outdoor unit, install the condenser air inlets and outlets facing away from direct winds.
8. Consider tie-down requirements in case of high winds or where required by local codes.

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PLACEMENT CONSIDERATIONS

Selecting the Best Location for the Outdoor Unit

Planning for Snow and Ice, continued.

⚠CAUTION

When deciding on a location to place the outdoor unit, be sure to choose an area where run-off from defrost will not accumulate and freeze on sidewalks or driveways, which will create unsafe conditions. Properly install and insulate any drain hoses to prevent the hose from freezing, cracking, leaking, and causing unsafe conditions from frozen condensate.

Rooftop Installations

If the outdoor unit is installed on a roof structure, be sure to level the unit. Ensure the roof structure and anchoring method are adequate for the unit location. Consult local codes regarding rooftop mounting.

Oceanside Installation Precautions

- Install the outdoor unit on the side of the building opposite from direct ocean winds.
- Select a location with good drainage.
- Periodically clean dust or salt particles off of the heat exchanger with water.

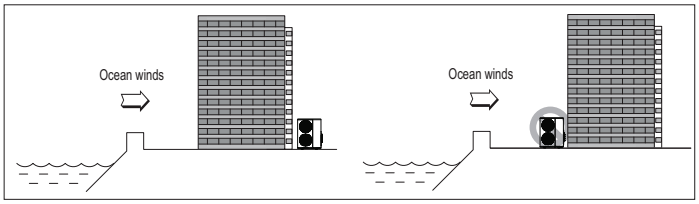
Avoid installing the outdoor unit where it would be directly exposed to ocean winds.

Note:

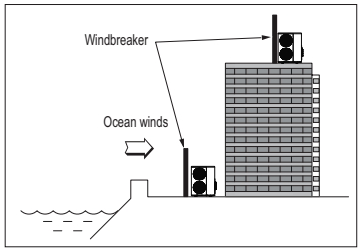
Additional anti-corrosion treatment will need to be applied to the outdoor unit at oceanside locations.

Note:

Ocean winds will cause corrosion, particularly on the condenser and evaporator fins, which, in turn could cause product malfunction or inefficient performance.



If the outdoor unit must be placed in a location where it would be subjected to direct ocean winds, install a concrete windbreaker strong enough to block any winds. Windbreaker height and width must be more than 150% of the outdoor unit, and be installed at least 27-1/2 inches away from the outdoor unit to allow for airflow.



Tie-Downs and Lightning Protection

Tie-Downs

- The strength of the roof must be checked before installing the outdoor units.
- If the installation site is prone to high winds or earthquakes, when installing on the wall or roof, securely anchor the mounting base using a field-provided tie-down configuration approved by a local professional engineer.
- The overall tie-down configuration must be approved by a local professional engineer. Always refer to local code when using a wind restraint system.

Lightning Protection

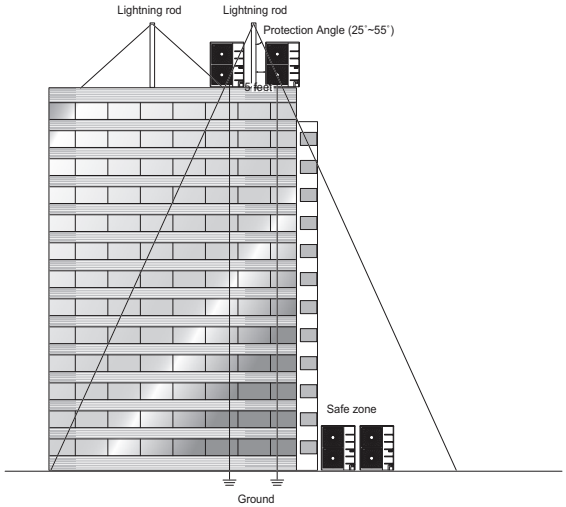
- To protect the outdoor unit from lightning, it must be placed within the specified lightning safety zone.

Table 7: Safety Zone Specifications.

Building Height (feet)	66	98	148	197
Protection Angle (˚)	55	45	35	25

- Power cable and communication cable must be installed five (5) feet away from lightning rod.
- A high-resistance ground system must be included to protect against induced lightning or indirect strike.

Figure 6: Lightning Protection Diagram.



Note:

If the building does not include lightning protection, the outdoor unit will be damaged from a lightning strike. Inform the customer of this possibility in advance.

Installation

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PLACEMENT CONSIDERATIONS

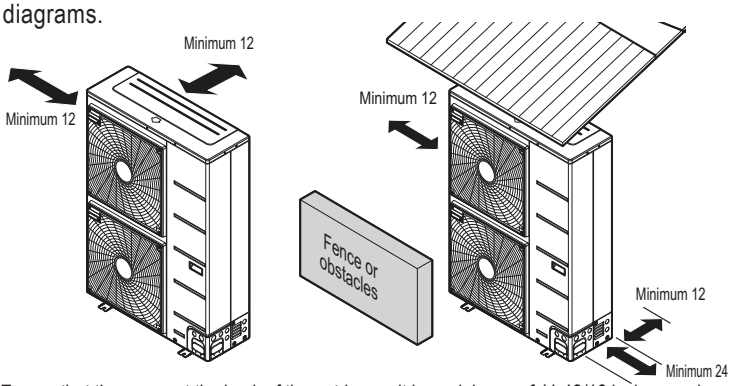
Selecting the Best Location for the Outdoor Unit

Outdoor Unit Service Access and Allowable Clearances

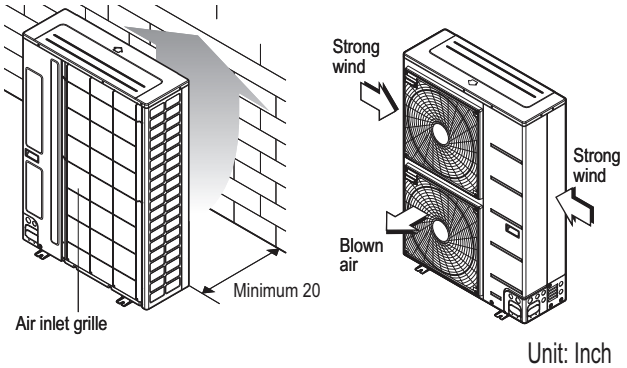
Appropriate airflow through the outdoor unit coil is critical for proper unit operation.

- Include enough space for airflow and for service access. If installing multiple outdoor units, ⃠ avoid placing the units where the discharge of one unit will blow into the inlet side of an adjacent unit.
- No obstacles to air circulation around the unit; keep proper distances from ceilings, fences, floor, walls, etc. (Install a fence to prevent pests from damaging the unit or unauthorized individuals from accessing it.)
- If an awning is built over the unit to prevent direct sunlight or rain exposure, make sure that the discharge air of the outdoor unit isn't restricted.

When installing the outdoor unit, consider service, inlet, and outlet, and minimum allowable space requirements as illustrated in the following diagrams.



Ensure that the space at the back of the outdoor unit is a minimum of 11-13/16 inches, and include a minimum of 23-5/8 inches at the right side of the unit for service.

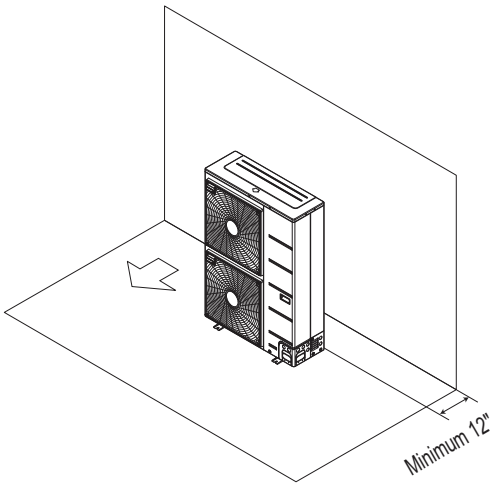


If the outdoor unit discharge side faces a wall, include a minimum of 19-11/16 inches between the outdoor unit and the wall. Install the outdoor unit so that the discharge port is set at a right angle to the wind direction.

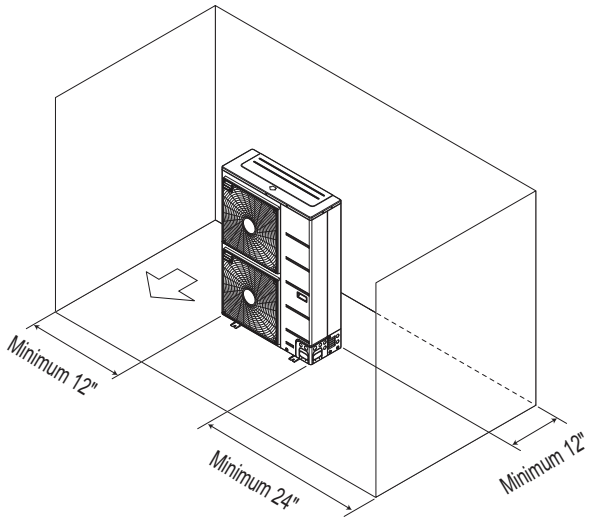
Unit: Inch

Clearance Requirements when Different Obstacles are Present (Unit: Inch)

Obstacle on the suction side only.



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



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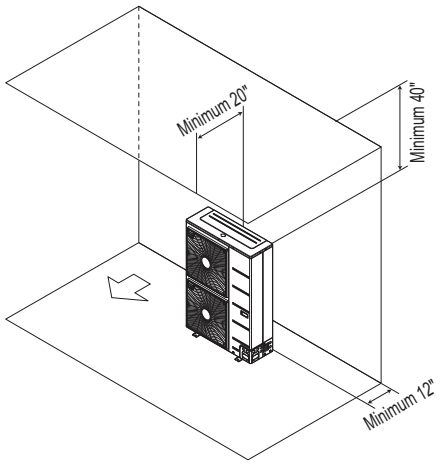
PLACEMENT CONSIDERATIONS

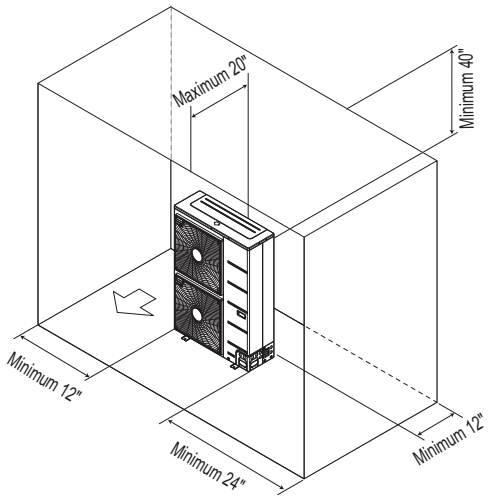
Selecting the Best Location for the Outdoor Unit

Clearance Requirements when Different Obstacles are Present, continued. (Unit: Inch)

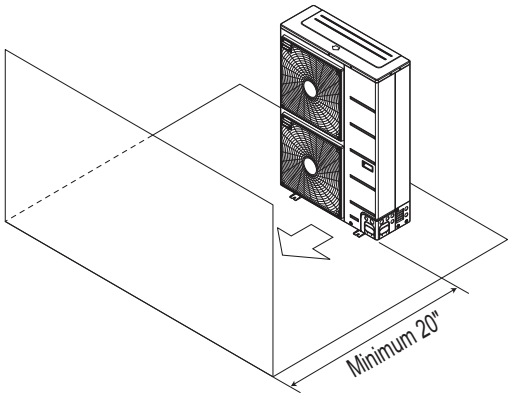
Obstacles above and on the air intake side.



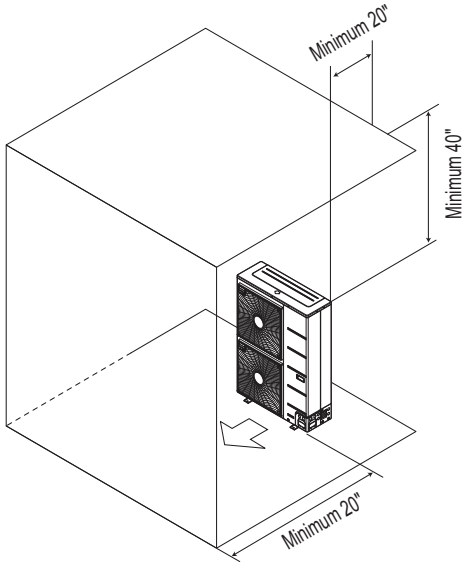
Obstacles above, on the air intake side, and on both left and right sides



Obstacle just on the air discharge side.



Obstacles above and on the air discharge side.



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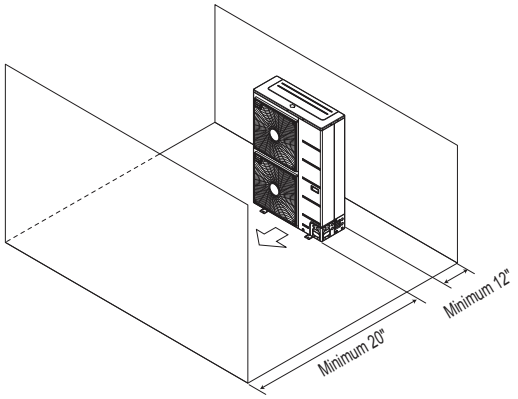
PLACEMENT CONSIDERATIONS

Selecting the Best Location for the Outdoor Unit

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 higher than the outdoor unit).

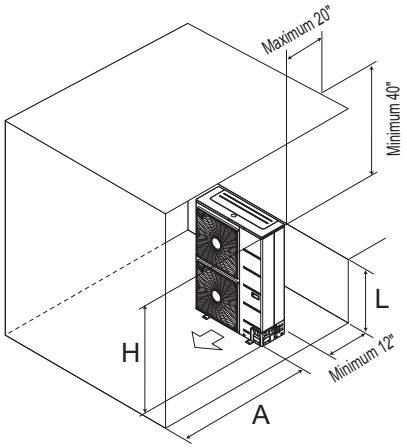
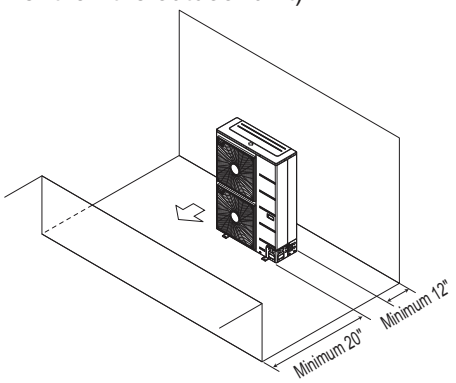


Table 8: Ratio among H, A, and L.

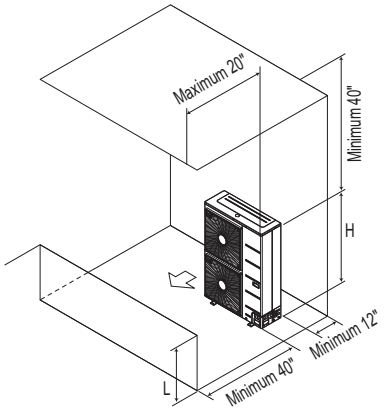
	L	A
L ≤ H	0 < L ≤ 1/2 H	30 inches
	1/2 H < L	40 inches
H < L	Set Stand as: L ≤ H	

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

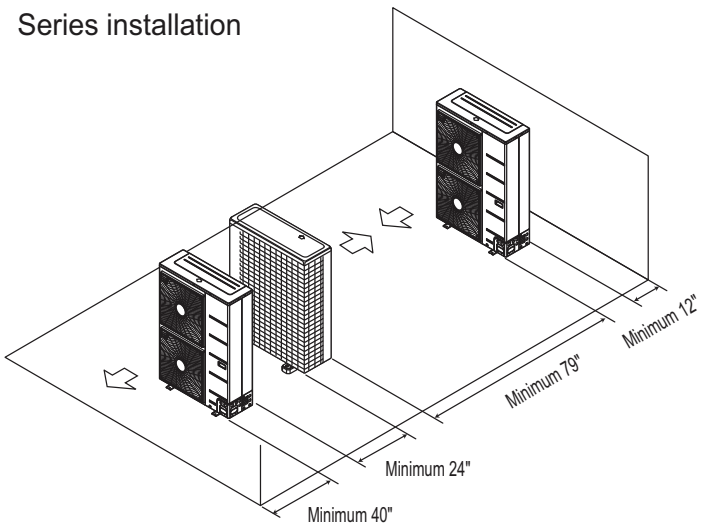
Where there are obstacles on both suction and discharge sides (discharge side obstacle is lower than the outdoor unit).



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



Series installation



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.

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PLACEMENT CONSIDERATIONS

Selecting the Best Location for the Outdoor Unit

Installing Outdoor Units Indoors

LG Multi F / Multi F MAX outdoor units are engineered to be mounted outdoors and include technology designed to minimize the negative effects of winter weather's freezing rain, sleet, and snow. Some building projects, however, necessitate placing the HVAC outdoor units indoors:

- Lack of ground space.
- Lack of an appropriate outdoor location that meets system design requirements.
- When mounting on the roof is not an option due to a lack of roof space.
- Roof warranty will be voided if mechanical equipment is placed on the membrane.
- On retrofit projects, a former chiller / boiler / air handler equipment room, mechanical area, or penthouse already exists.
- To curtail the potential need for redundant zone heating devices such as wall-fin radiators or duct heaters.
- In extremely cold environments where there is a significant amount of run-time at temperatures well below freezing outside the outdoor unit ambient air temperature range published in this engineering manual.

Benefits of Installing Outdoor Units Indoors

- Shelters the outdoor unit from direct exposure to prevailing winds that decrease the heating capability of the outdoor unit.
- Protects equipment from freezing precipitation and/or potential ice build-up that could hinder unit operation.
- Maintains coil heat transfer efficiency by reducing the number of and shortening the cycle time for defrost operation.
- Easier maintenance and servicing during inclement weather.
- When mounted in a fully enclosed space, limiting the ambient air temperature will allow the Multi F / Multi F MAX system designer to eliminate oversizing.
- The outdoor unit to compensate for loss of capacity at low ambient temperatures.
- Will also curtail the need to provide inefficient redundant zone heating devices such as wall-fin radiators and second-stage ancillary heating devices.

Design Considerations Include:

- Enclosure types and elements such as louvers (see next page), rain hoods, dampers and controls, heating methods and sizing of heating devices.
- Heating strategies.
- Duct design.
- Condensate handling.

General Guidelines

- Follow ASHRAE 62.1 design guidelines.
- Depending on the project / application, a roof over the outdoor units in combination with a wind break will be all that is necessary.
- Consider the potential for snow accumulation near louvers / roof openings. Outside air intakes and discharge ducts/louvers must be engineered to clear anticipated snow accumulation levels by at least one (1) foot.
- In situations where operation is anticipated at temperatures of -13°F and lower, ancillary heat must be provided to heat the outdoor unit coils to assure continuous compressor operation and heating.

It will be necessary to use a field-fabricated air guide to prevent discharge air from short-cycling back to the coil inlet.

- Consider the direction of prevailing winds and opening placement. If possible, locate inlet openings upwind of discharge openings and other exhaust outlets.
- When inlet and outlet openings are placed on the same wall, minimum distance between the two openings must be approximately three (3) feet (minimum distance varies significantly with variations in outlet opening face velocity).
- If roof-mounted ventilation openings are used, strategically locate the inlet ventilation opening(s) upwind of the outlet opening(s).
- Discharge and supply ductwork must be designed to avoid weather related long periods of water entrainment and the potential for microbial growth.

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PLACEMENT CONSIDERATIONS

Selecting the Best Location for the Outdoor Unit

Provide a means to drain the condensate generated during heating mode and defrost cycle in addition to rainwater that infiltrates the inlet louver enclosed area.

- Install a field-provided drain pan under the outdoor units and provide a path to a nearby floor drain.
- If the ambient air temperature is expected to drop below 32°F in the enclosure, heat the bottom surface of the pan, drain line, and floor drain so that the condensate does not freeze before reaching the drain.

⚠ CAUTION

When deciding on a location to place the outdoor unit, be sure to choose an area where run-off from defrost will not accumulate and freeze on sidewalks or driveways which will create unsafe conditions.

Allow for ventilation intake and exhaust air based on maximum outdoor unit fan capacity.

- Select the size, type and orientation of architectural louvers with adequate "net free area" face velocity to ensure the total external static pressure from the outdoor unit fan does not exceed design limitations (see specification data tables).
- No obstructions must be placed in front of the louver that could hamper the free flow (throw) of air.
- Roof top openings and / or discharge and supply louvers must be equipped with screens to prevent bird and insect infiltration.

Note:

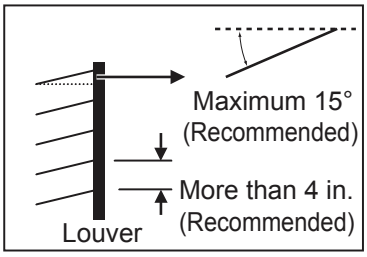
For louver recommendations, see below and on the next page.

As always, the best solution for each project balances acceptable heating performance (considering local weather conditions), capital costs, life cycle energy consumption, and limitations set forth by local building codes.

Louver Recommendations for Outdoor Unit Enclosure

1. Outdoor Unit Enclosure: Manual Door Open Type.
2. Louver Angle: No More Than 15° Horizontally.
3. Space Between Louvers: More than 4 inches (Recommend).
4. Louver Shape: Wing or Plane Type.

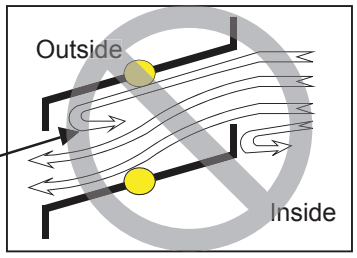
Figure 7: Louver Recommendations.



Note:

- *Open Rate and Inlet must be taken into consideration when designing the louvered outdoor unit enclosure.*
- ⃠ *Do not use "S" type louvers.*

Figure 8: Using "S" Type Louvers.



Note:

If the Louver Open Rate is Too Small

1. *Noise can occur because of the increased air velocity passing through the louver blade.*
2. *Noise can occur from louver blade vibrations.*
3. *A drop in outdoor unit fan performance (excess static pressure can cause a drop in outdoor unit performance and heat exchanger efficiency).*
4. *If the louver open rate is too small or there is insufficient air flow exchange, the air conditioner might stop operating.*

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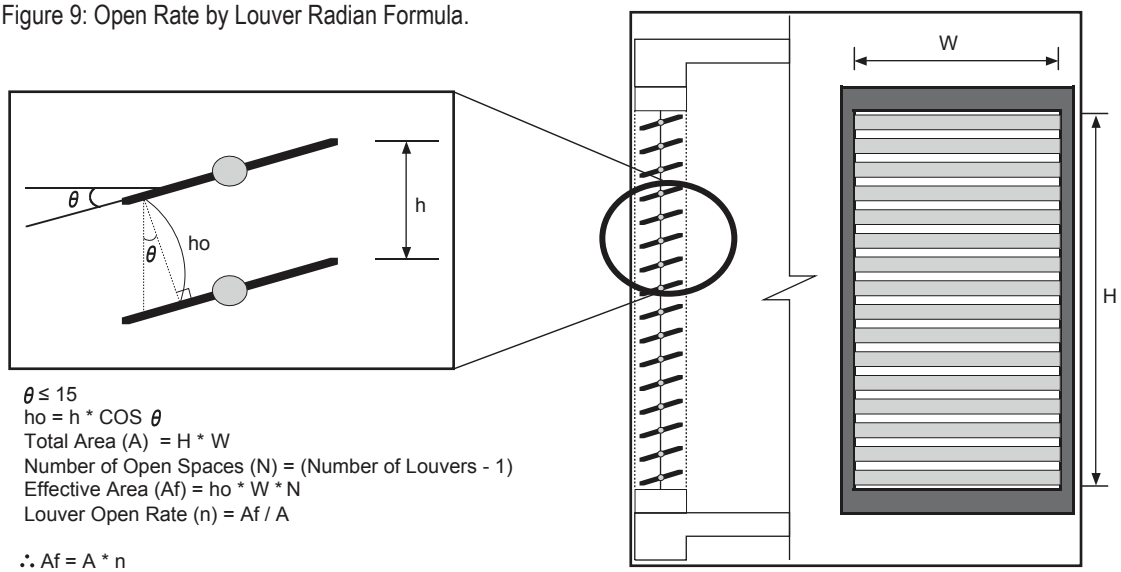
PLACEMENT CONSIDERATIONS

Selecting the Best Location for the Outdoor Unit

Open Rate by Louver Radian

Figure 9: Open Rate by Louver Radian Formula.



$\theta \leq 15$
ho = h * COS θ
Total Area (A) = H * W
Number of Open Spaces (N) = (Number of Louvers - 1)
Effective Area (Af) = ho * W * N
Louver Open Rate (n) = Af / A

$\therefore$ Af = A * n

Effective Cross Section Area

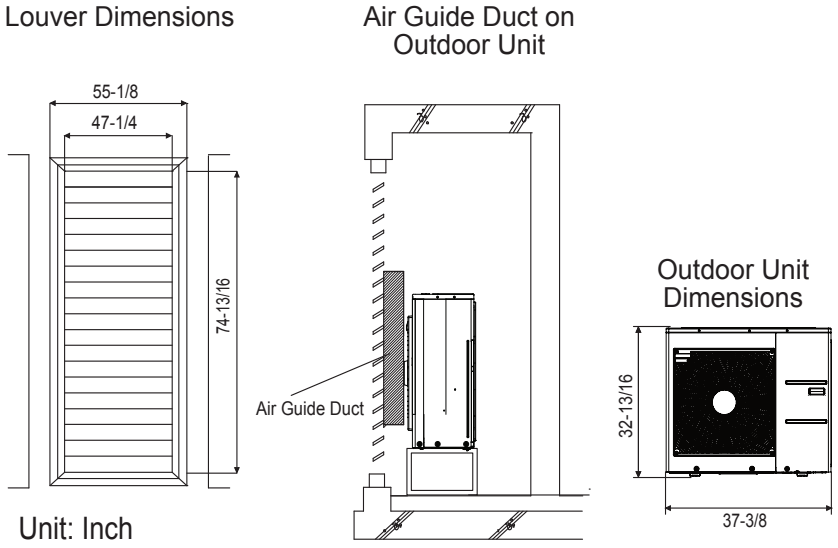
Confirming Air Flow Rate / Total Opening Rate

Figure 10: Example of Installing Outdoor Unit Indoors.

- Example: LMU36CHV
- Airflow Rate: 2,119 ft.^{3}/min.
- Velocity of Outlet Air: 16.4 ft./s
- Velocity of Inlet Air: 8.2 ft./s
- Open Rate = 80% or More

$$\text{Open Rate} = \frac{\text{Effective Face Area (Af)}}{\text{Total Face Area (A)}}$$

- Discharge Air Guide must be installed.



Formula

- Total Louver Dimension (Excluding Frame) (A) = 3.9 feet x 6.2 feet = 24.2 ft.^{2}
- Louver Shield Dimension by Product (B) = 3.12 feet x 2.74 feet = 8.55 ft.^{2}
- Inlet Louver Dimension (A - B) = 15.7 ft.^{2}
- Equivalent Inlet Dimension (Open Rate 80%) = 15.7 ft^2 x 0.8 = 12.56 ft.^{2}
- Equivalent Inlet Air Volume = 12.56 ft.^{2} x 8.2 ft./s x 60 sec./min. = 6,179.5 ft.^{3}/min.
- Required Air Volume / Equivalent Volume = 6,179.5 ft.^{3}/min. / 2,119 ft.^{3}/min. = 291% (Within Allowable Limits)

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PLACEMENT CONSIDERATIONS

Selecting the Best Location for the Indoor Units / Branch Distribution Units

Selecting the Best Location for the Indoor Units

Note:

Select a location for installing the indoor units that will meet the following conditions:

- Within allowable parameters for proper connection to the outdoor unit (and branch distribution unit, if a Multi F MAX system).
- So that condensation drainage can be conveniently routed away.
- Include enough space around the indoor unit so that it is accessible for maintenance and service purposes.
- Where electrical noise / electromagnetic waves will not affect indoor unit operation. Maintain proper distances between the indoor units and electric wires, audio and visual appliances, breaker / circuit panels, etc. If the frequency signal of the appliance is unstable, then install the indoor unit a minimum of ten (10) feet away, and run the power and transmission cables through a conduit.
- An area that is level and with enough strength to bear the weight of the indoor unit(s).

⃠ Do Not's

- *Install in an area with obstacles to air circulation around the unit; keep proper distances from ceilings, doorways, floor, walls, etc.*
- *Install in an area where operation sound will disturb occupants.*
- *Install in an area that exposes the indoor unit(s) to heat, water, steam, oil splattering or spray.*

Note:

⃠ *Indoor units (IDUs) must not be placed in an environment where the IDUs will be exposed to harmful volatile organic compounds (VOCs) or in environments where there is improper air make up or supply or inadequate ventilation. If there are concerns about VOCs in the environment where the IDUs are installed, proper air make up or supply and / or adequate ventilation must be provided. Additionally, in buildings where IDUs will be exposed to VOCs consider a factory-applied epoxy coating to the fan coils for each IDU.*

For detailed placement considerations and installation requirements for indoor units, refer to its Indoor Unit Engineering and / or Installation Manuals.

Selecting the Best Location for the Branch Distribution (BD) Units

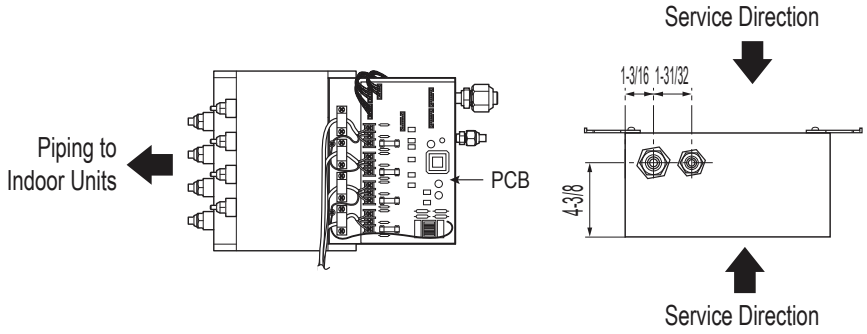
Note:

Branch distribution (BD) units are used only with Multi F MAX systems to distribute the refrigerant from the outdoor unit up to eight (8) indoor units.

Select a location indoors that will meet the following conditions:

- Within allowable parameters for proper connection to the Multi F MAX outdoor unit and indoor unit(s); refrigerant piping and wire lengths must not exceed amounts specified by LG Electronics, U.S.A., Inc.
- Condensate drain piping is not required.
- Ensure there is enough space in the installation area for service purposes (minimum 24 inches); install the refrigerant piping and electrical wiring system in an easily accessible location.

Figure 11: Branch Distribution Unit Key Components.



- Level where there is enough strength to bear the weight of the branch distribution unit.

⃠ Do Not's

- *Install the branch distribution unit in a location where it would be subjected to strong radiation heat from heat sources.*
- *Install in an installation environment where the branch distribution unit would be exposed to heat, water, steam, oil splattering or spray.*
- *Install the unit in a location where any sound it generates will disturb occupants in the surrounding rooms.*
- *Install in a location where there are obstacles to air circulation around the unit; keep proper distances from ceilings, doorways, floor, walls, etc.*
- *Install in an area where high-frequency electrical noise / electromagnetic waves will affect operation. Maintain proper distances between the branch distribution unit(s) and electric wires, audio and visual appliances, breaker / circuit panels, etc.*

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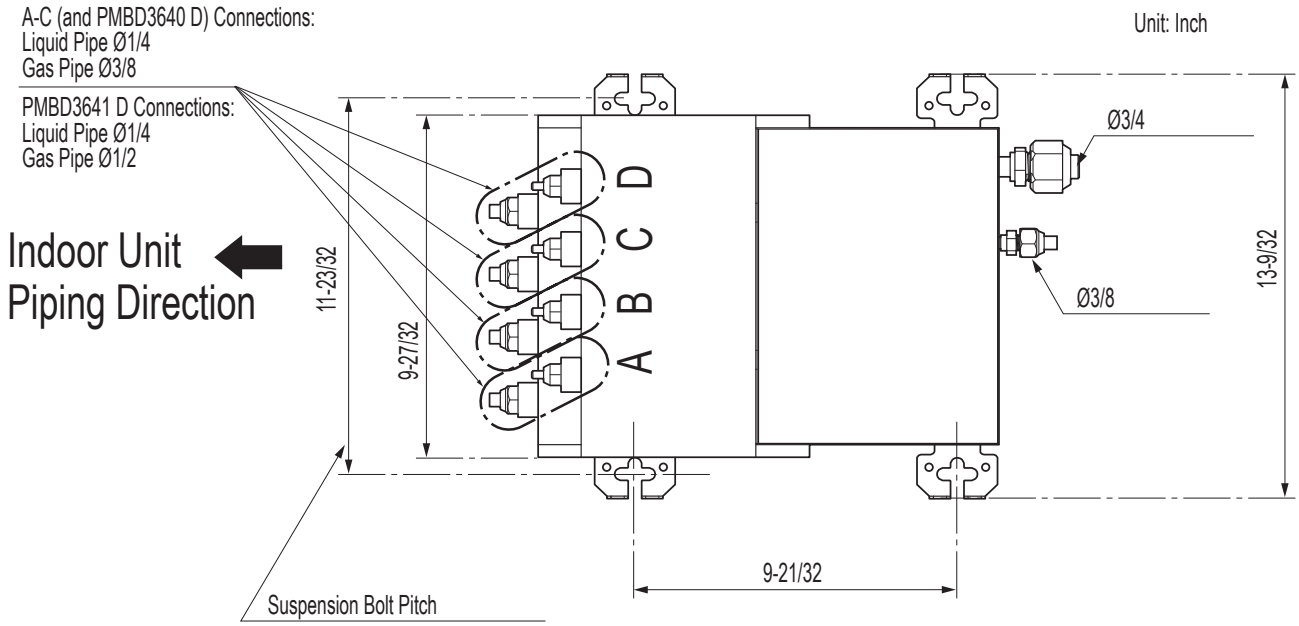
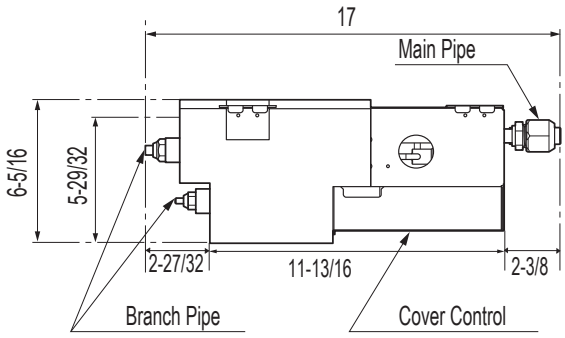
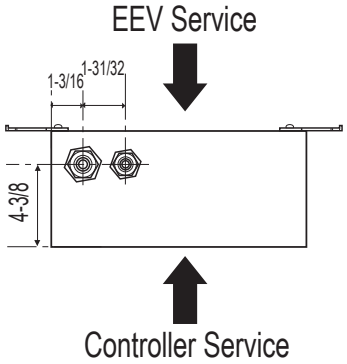
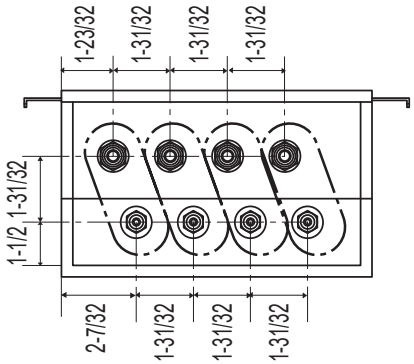
PLACEMENT CONSIDERATIONS

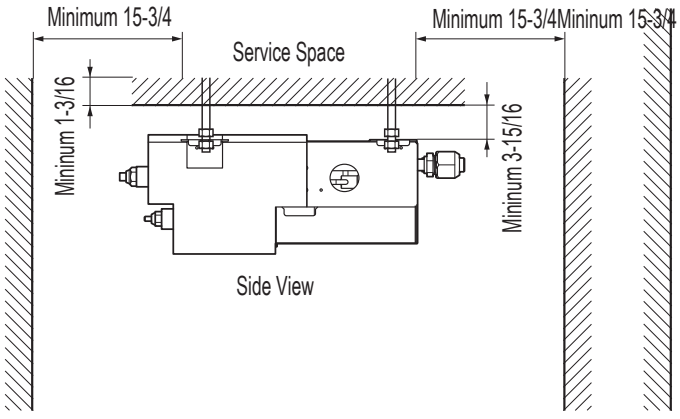
Selecting the Best Location for the Branch Distribution Units

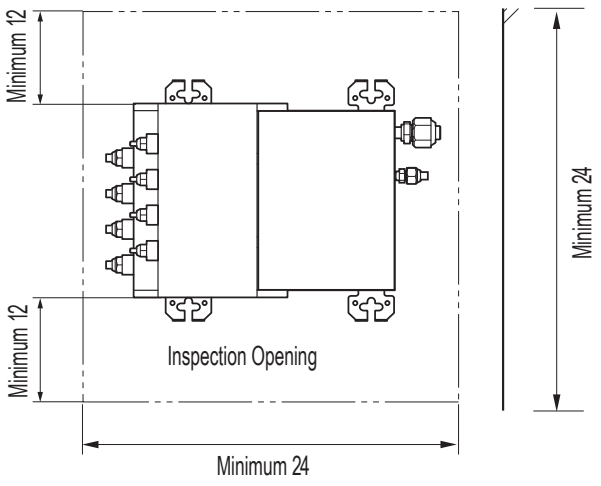












Notes:
1. For PMBD3620 Unit, Ports A and B are Available.
2. For PMBD3630 Unit, Ports A, B, and C are Available.
3. For PMBD3640 and PMBD3641 Units, Ports A, B, C, and D are Available.

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MOUNTING / ANCHORING THE OUTDOOR UNITS

Mounting / Anchoring the Outdoor Unit General Specifications

- Tightly anchor the outdoor unit with a bolt and nut to a concrete or rigid platform.
- 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.
- If installing the outdoor unit on the roof, check the strength of the roof.

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.
- See table and figures for height, width, etc., requirements.
- Include an area for drainage around the foundation to ensure condensate thoroughly drains away from the outdoor unit.

Figure 12: Example of Using an Insert for a Hole in a Reinforced Concrete Beam.

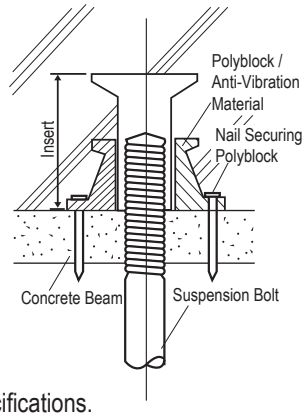


Figure 13: Close up of Bolt Attachment.

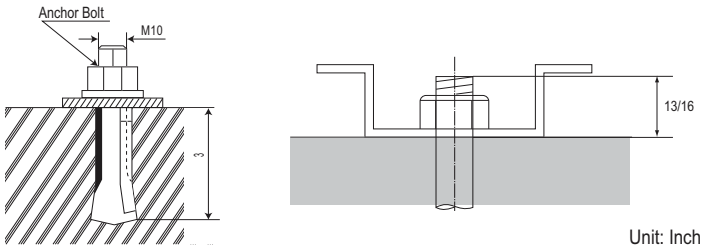


Table 9: Outdoor Unit Foundation Specifications.

Outdoor Unit	Bolt Type	Concrete Height	Bolt Depth
LMU18CHV, LMU24CHV, LMU30CHV, LMU36CHV	M10-J	Minimum Four (4) Inches	Minimum Three (3) Inches
LMU480HV, LMU540HV, LMU600HV	M10-J	Minimum Eight (8) Inches	Minimum Three (3) Inches

Figure 14: LMU18CHV and LMU24CHV Outdoor Units.

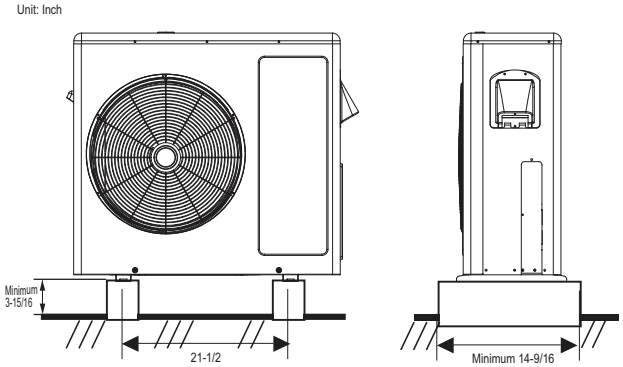


Figure 15: LMU30CHV and LMU36CHV Outdoor Units.

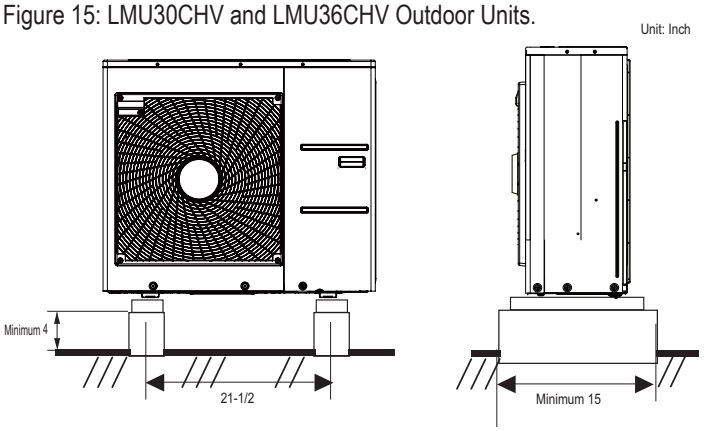
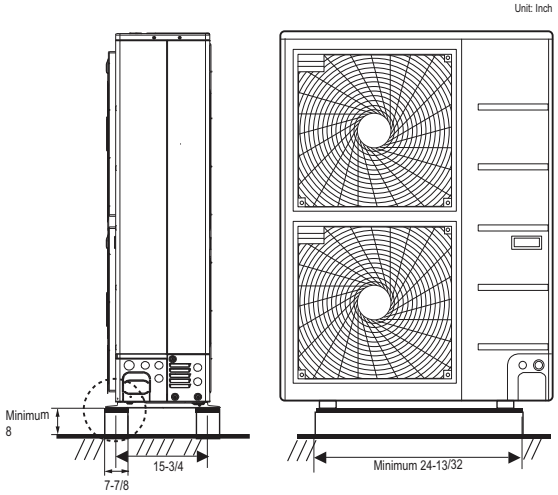


Figure 16: LMU480HV, LMU540HV, LMU600HV Outdoor Units.



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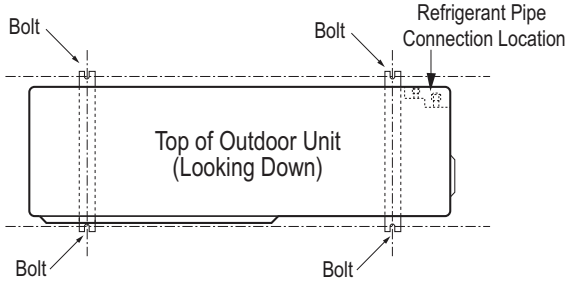
MOUNTING / ANCHORING THE OUTDOOR / BRANCH DISTRIBUTION UNITS

Mounting / Anchoring the Outdoor Unit General Specifications, continued.

Bolting the Outdoor Unit to the Platform Procedure

1. Ensure that the concrete platform will not degrade easily, and has enough strength to bear the weight of the unit.
2. Include an H-beam support. Firmly attach the corners, otherwise the support will bend.
3. Use a hexagon nut.
4. If there is a possibility of vibration from the outdoor unit transmitting to the building, add an anti-vibration material to the platform.
5. Include enough space around the concrete foundation for condensate drainage.
6. Seal all wiring and piping access holes with field-supplied sealing material to prevent animals and bugs from entering the unit.

Figure 18: Bolting the Outdoor Unit to the Platform (Piping Location Will Differ Depending on Outdoor Unit Model).



Branch Distribution Unit Orientation

Multi F MAX branch distribution (BD) units can be installed in a multitude of options to fit various building configurations and job or application requirements (suspended from the ceiling or mounted on the wall). The installation location of the PCB within the branch distribution unit can be changed for easier service access, depending on the branch distribution unit installation itself (see the wiring section for information). Branch distribution units include electronic expansion valves that properly seat only if the branch distribution unit is installed in an acceptable orientation. Installations with improper branch distribution unit orientation risk incomplete valve seating and system performance degradation from potential refrigerant leakage through the electronic expansion valve.

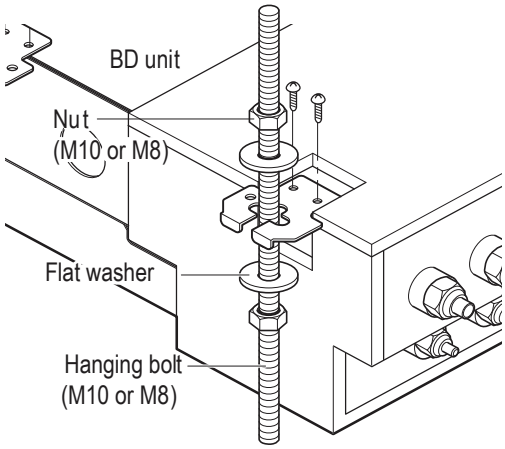
Note:

This material is for informational or educational purposes only. It is not intended to be a substitute for professional advice. Consult with your engineer or design professionals for specific applications to your system.

Ceiling Mount Installation - Hangers with Hanging Bolt

1. Drill four (4) holes in the ceiling, following the dimensions on the previous page.
2. Attach the factory-supplied hangers with two (2) screws each at the designated four (4) areas on the frame of the branch distribution unit.
3. Install an anchor in the ceiling, and attach the hanging bolts to the ceiling.
4. Add nuts and washers to the hanging bolt as shown at right.
5. Hang the branch distribution unit on the hanging bolts (ceiling side up), and after checking for level (±5 degrees), securely tighten all nuts.

Figure 17: Branch Distribution Ceiling Mount Installation.



Ceiling Mount Installation - Hangers Only

1. Attach the factory-supplied hangers with two (2) screws each at the designated four (4) areas on the frame of the branch distribution unit.
2. Install the branch distribution unit to the ceiling using two screws on each of the hangers as shown below. Unit must be ±5 degrees of level.
3. Cover parts of the hanger holes with polyethylene foam insulation (to prevent condensation).

Note:

If a screw has been installed on the frame of the branch distribution unit and the screw has been removed, to prevent condensation, either re-install the screw or cover the open hole with aluminum tape.

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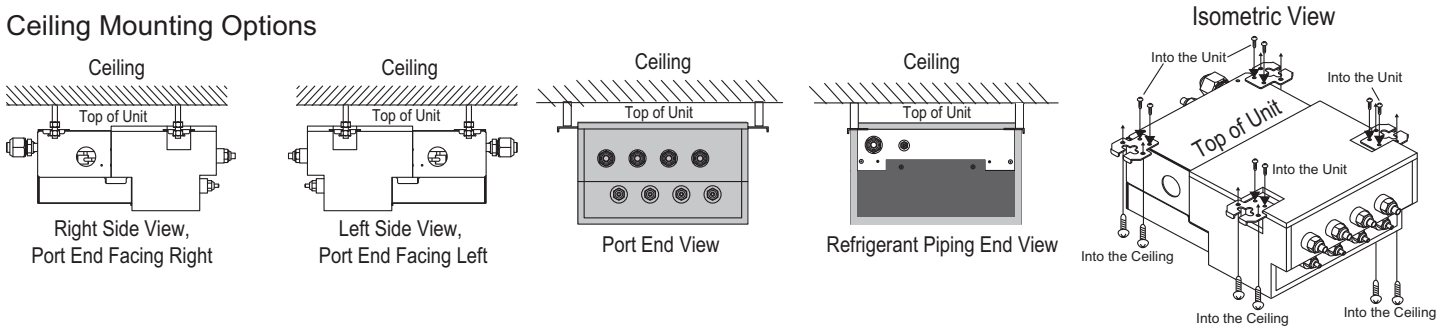
MOUNTING / ANCHORING THE BRANCH DISTRIBUTION UNITS

Ceiling Mount Installation, continued.

Figure 19: Acceptable Branch Distribution Unit Ceiling Mount Orientations.



Wall Mount Installation - Hangers Only

1. Attach the factory-supplied hangers with two (2) screws each at the designated four (4) areas on the frame of the branch distribution unit.
2. Install the branch distribution unit to the wall using two screws on each of the hangers. Unit must be ±5 degrees of level.
3. Cover parts of the hanger holes with polyethylene foam insulation (to prevent condensation).

Figure 20: Acceptable Branch Distribution Unit Orientation.

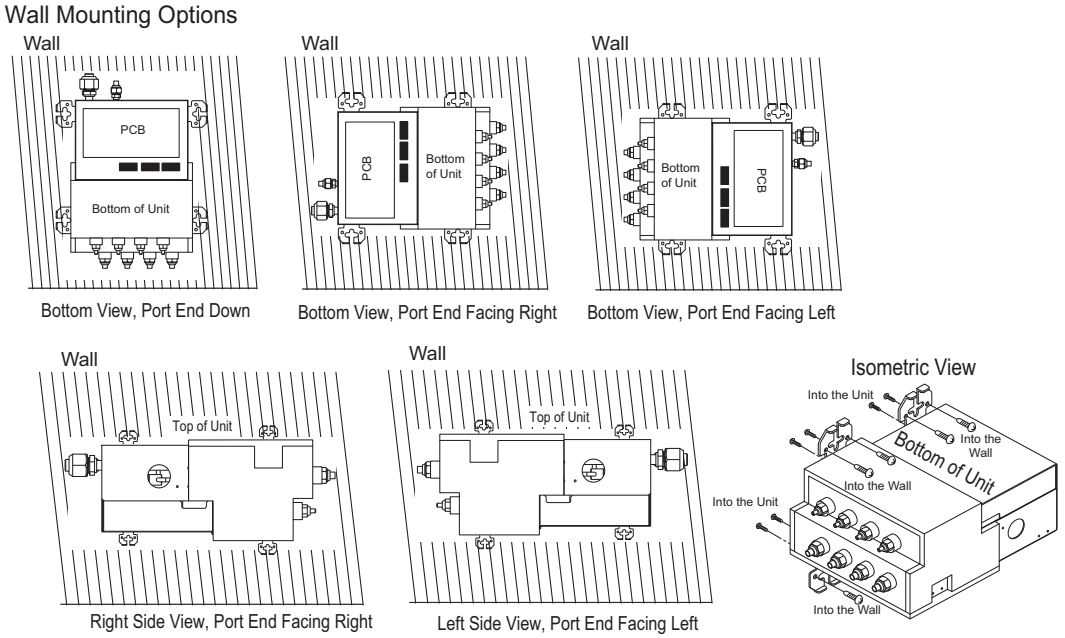
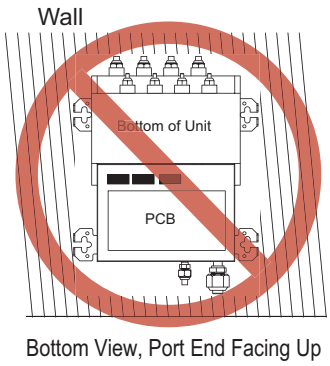


Figure 21: Unacceptable Branch Distribution Unit Wall Mount Orientations.



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LG AIR CONDITIONER TECHNICAL SOLUTION (LATS)

LG Air Conditioner Technical Solution (LATS) Software

A properly designed and installed refrigerant piping system is critical to the optimal performance of LG air-conditioning systems. To assist engineers, LG offers, free of charge, LG Air Conditioner Technical Solution (LATS) software—a total design solution for LG air conditioning systems.

Note:

To reduce the risk of designing an improper applied system or one that will not operate correctly, LG prefers that LATS software be used on all projects.

Formats

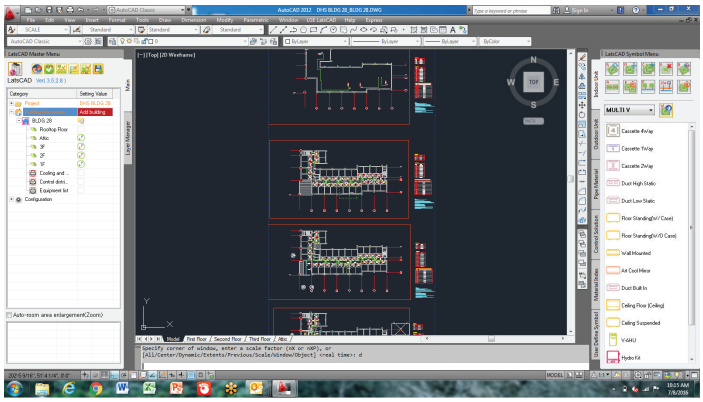
LATS is available to LG customers in three user interfaces: LATS HVAC, LATS CAD2, and LATS Revit. All three LATS formats are available through www.myLGHVAC.com, or contact an LG Sales Representative.

LATS HVAC is a Windows®-based application that aids engineers in designing LG Variable Refrigerant Flow (VRF), Multi F / Multi F MAX, Multi F / Multi F MAX with LGRED, Single-Zone, and Energy Recovery Ventilator (ERV) systems.
**Windows® is a registered mark of Microsoft® Corporation.*

LATS CAD2 combines the LG LATS program with AutoCAD® software**. It permits engineers to layout and validate LG Multi V Variable Refrigerant Flow (VRF), Multi F / Multi F MAX, Multi F / Multi F MAX with LGRED, Single-Zone, and Energy Recovery Ventilator (ERV) systems directly into CAD drawings.

LATS Revit integrates the LG LATS program with Revit® software**. It permits engineers to layout and validate Multi V VRF systems directly into Revit drawings.
***AutoCAD® and Revit® are both registered marks of Autodesk, Inc.*

Figure 22: Example of LATS CAD2.



Features

All LG product design criteria have been loaded into the program, making LATS simple to use: double click or drag and drop the component choices. Build systems in Tree Mode where the refrigerant system can be viewed. Switch to a Schematic diagram to see the electrical and communications wiring.

LATS software permits the user to input region data, indoor and outdoor design temperatures, modify humidity default values, zoning, specify type and size of outdoor units and indoor units, and input air flow and external static pressure (ESP) for ducted indoor units.

The program can also:

- Import building loads from a separate Excel file.
- Present options for outdoor unit auto selection.
- Automatically calculate component capacity based on design conditions for the chosen region.
- Verify if the height differences between the various system components are within system limits.
- Provide the correct size of each refrigerant piping segment and LG Y-Branches and Headers.
- Adjust overall piping system length when elbows are added.
- Check for component piping limitations and flag if any parameters are broken.
- Factor operation and capacity for defrost operation.
- Calculate refrigerant charge, noting any additional trim charge.
- Suggest accessories for indoor units and outdoor units.
- Run system simulation.

Note:

Features depend on which LATS program is being used, and the type of system being designed.

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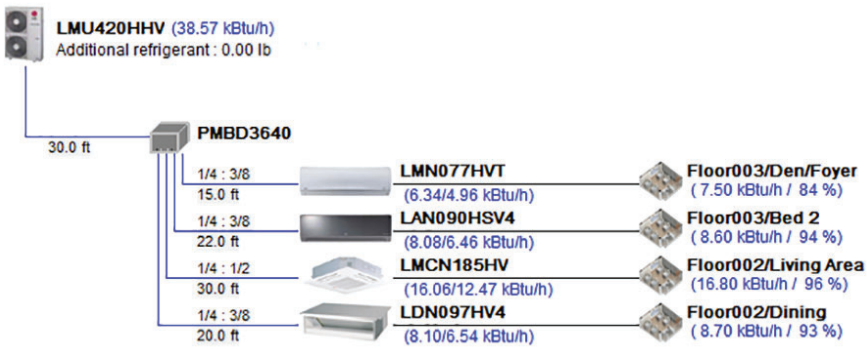
LATS Generates a Complete Project Report

LATS software also generates a report containing project design parameters, cooling and heating design data, system component performance, and capacity data. The report includes system combination ratio and refrigerant charge calculations; and provides detailed bill of material, including outdoor units, indoor units, control devices, accessories, refrigerant pipe sizes segregated by building, by system, by pipe size, and by pipe segments. LATS can generate an Excel GERP report that can imported into the LG SOPS pricing and ordering system.

Proper Design to Install Procedure

LG encourages a two report design-to-install-procedure. After the design engineer determines building / zone loads and other details, the engineer opens the LATS program and inputs the project's information. When the design is complete, the "Auto Piping" and "System Check" functions must be used to verify piping sizes, limitations, and if any design errors are present. If errors are found, engineers must adjust the design, and run Auto Piping and System Check again. When the design passes the checks, then the engineer prints out a project "Shop Drawing" (LATS Tree Diagram) and provides it to the installing contractor. The contractor must follow the LATS Tree Diagram when building the piping system, but oftentimes the design changes on the building site:

Figure 23: Example of a LATS Tree Diagram.



- Architect has changed location and/or purpose of room(s).
- Outdoor unit cannot be placed where originally intended.
- Structural elements prevent routing the piping as planned.
- Air conditioning system conflicts with other building systems (plumbing, gas lines, etc.).

The contractor must mark any deviation from the design on the Shop Drawing, including as-built straight lines and elbows. This "Mark Up" drawing must be returned to the design engineer or Rep, who must input contractor changes into the LATS file. (Copy the original LATS software file, save and rename as a separate file, and modify all piping lengths by double-clicking on each length and editing information.) Like the shop drawing, the Auto Piping and System Check must also be run on this new "As Built" drawing. The design engineer or Rep must then provide the final As Built file to the contractor. The Mark Up version must be compared to the As Built version for:

- Differences in pipe diameter(s). If incorrect diameters have been installed, the piping must be changed out. If pipe diameters have changed, check to see if Y-Branches will also need to be changed.
- Changes to outdoor unit and indoor unit capacities. Capacities changes will impact line length changes.
- Additional refrigerant charge quantity ("Trim Charge"). Trim charge will change if piping lengths and diameters change. The As Built version must reflect installed piping lengths to ensure correct trim charge.

All documents submitted by the contractor, as well as the Shop Drawing and the As Built Drawing files must be provided for commissioning purposes. Model and serial numbers for all system components must also be submitted. If the steps previously detailed are not followed, and all documents are not provided to the commissioning agent, the project runs the risk of not being commissioned and voiding any limited warranty LG offers on the equipment.

Note:

Contact your LG representative for the vest software program for your application.

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REFRIGERANT SAFETY STANDARDS / DEVICE CONNECTION LIMITATIONS

Refrigerant Safety Standards

ASHRAE Standards 15-2010 and 34-2010 address refrigerant safety and the maximum allowable concentration of refrigerant in an occupied space. Refrigerant will dissipate into the atmosphere, but a certain volume of air is required to safely dissipate the refrigerant. For R410A refrigerant, the maximum allowable concentration of refrigerant is 26 lbs./1,000 cubic feet (Addendum L modified the RCL to 26) of occupied spaces. Buildings with 24-hour occupancy allow half of that concentration.

If a VRF system develops a refrigerant leak, the entire refrigerant charge of the system will dump into the area where the leak occurs. To meet ASHRAE Standards 15 and 34, the smallest room volume on the system must be calculated and compared to the maximum allowable concentration. If the concentration level is higher than allowed, the following are some design suggestions to eliminate the problem:

- Split dual-frame and triple-frame systems into single-frame systems that have lower refrigerant charges.
- Add transfer grilles in the ceiling or walls of the smaller rooms to increase the volume of the room.
- Remove the smallest space from the system and serve it with a smaller mini-split system.

Device Connection Limitations

- The minimum number of connected and operating indoor units to Multi F / Multi F MAX systems is two, taking into consideration the minimum combination ratio.
- The maximum number of indoor units for each Multi F / Multi F MAX heat pump systems is:

LMU18CHV = 2 LMU24CHV = 3 LMU30CHV = 4 LMU36CHV = 4 LMU480HV = 8 LMU540HV = 8 LMU600HV = 8

Note:

For allocated capacity information, see the combination tables in the "Multi F / Multi F MAX Combination Data Manual" on www.lghvac.com. For performance data, see "Multi F / Multi F MAX Performance Data Manual" on www.lghvac.com.

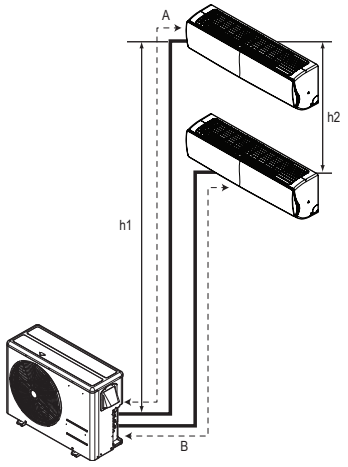
One of the most critical elements of Multi F and Multi F MAX systems is the refrigerant piping. See below and the following pages for pipe length limits that must be followed in the design of Multi F and Multi F MAX refrigerant pipe systems.

Multi F Outdoor Unit Piping Length and Elevation Limitations

Table 10: Multi F Refrigerant Piping System Limitations.

Outdoor Unit Model (Btu/h)	LMU18CHV / 18,000	LMU24CHV / 24,000	LMU30CHV / 30,000	LMU36CHV / 36,000
Max. Total System Piping Length (ft.)	164 A+B	246.1 A+B+C	246.1 A+B+C+D	246.1 A+B+C+D
Min. Length for One Branch (ft.)	9.8	9.8	9.8	9.8
Max. Length for One Branch (ft.)	82	82	82	82
Max. Elevation Between Each Indoor Unit and Outdoor Unit (h1)	49.2	49.2	49.2	49.2
Max. Elevation Between Indoor Units (h2)	24.6	24.6	24.6	24.6
Max. Combination of Indoor Units	24,000	33,000	40,000	48,000

Figure 24: Multi F Refrigerant Piping System Limitations (LMU18CHV Example).



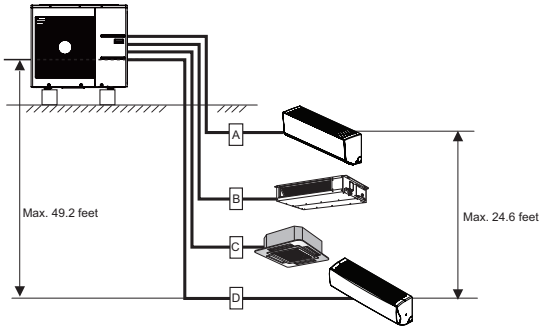
Multi F System Example

Example: LMU36CHV outdoor unit with four (4) indoor units connected.

ODU: Outdoor Unit.

IDU: Indoor Unit.

A, B, C, D: Pipes from Outdoor Unit to Indoor Unit.



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REFRIGERANT SAFETY STANDARDS / DEVICE CONNECTION LIMITATIONS

Multi F MAX Outdoor Unit Piping Length and Elevation Limitations

Table 12: Multi F MAX Refrigerant Piping System Limitations.

Pipe Length (ELF = Equivalent Length of pipe in Feet)	**Total piping length (ΣA + ΣB)**		≤475.7 feet
	Main pipe (Outdoor Unit to Branch Distribution Units: ΣA)	**Minimum**	9.8 feet
		Maximum	≤180.4 feet
	Total branch piping length (ΣB)		≤295.3 feet
	Branch pipe (Branch Distribution Units to Indoor Units: B)	**Minimum**	10 feet
		Maximum	≤49.2 feet
Elevation Differential (All Elevation Limitations are Measured in Actual Feet)	**If outdoor unit is above or below indoor unit (h1)**		≤98.4 feet
	Between the farthest two indoor units (h2)		≤49.2 feet
	Between branch distribution unit and farthest connected indoor unit(s) (h3)		≤32.8 feet
	Between branch distribution units (h4)		≤49.2 feet
Max. Combination of IDUs	LMU480HV = 65,000	LMU540HV = 73,000	LMU600HV = 81,000

Figure 25: Multi F MAX Refrigerant Piping System Limitations.

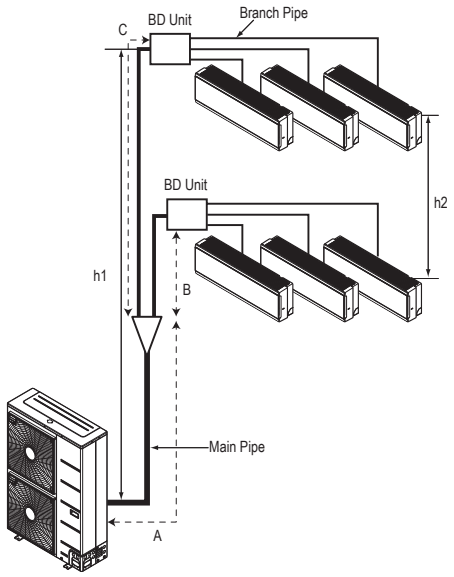


Table 13: Multi F MAX Piping Sizes.

Piping	Main Pipe A (inch)	Branch Pipe B
Liquid	Ø3/8	Depends on the size of the indoor unit piping
Gas	Ø3/4	

Multi F MAX System Example with Two Branch Distribution Units

Example: LMU540HV outdoor unit with seven (7) indoor units, and two (2) branch distribution units connected.

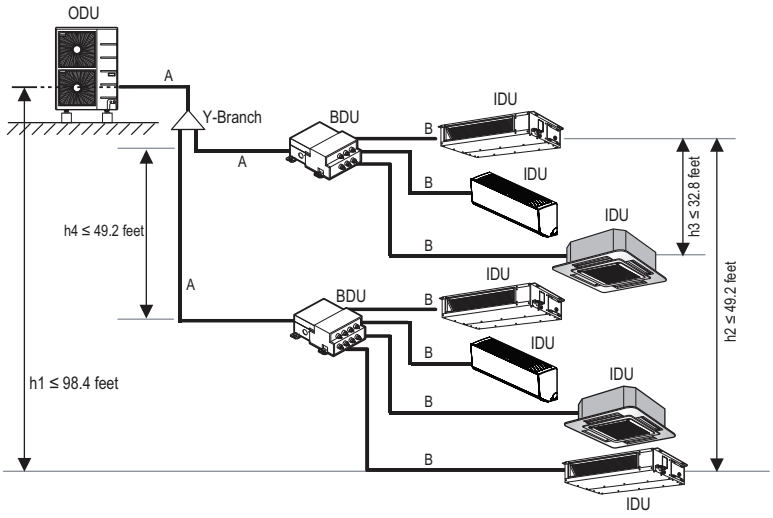
ODU: Outdoor Unit.

IDU: Indoor Unit.

BD: Branch Distribution Unit(s).

ΣA: Main Pipe.

ΣB: Branch Pipe (Branch Distribution Unit[s] to Indoor Unit[s]).



Using Refrigerant Components

Field-supplied elbows are allowed as long as they are designed for use with R410A refrigerant. The designer, however, must be cautious with the quantity and size of fittings used, and must account for the additional pressure losses in equivalent pipe length calculation for each branch. The equivalent pipe length of each elbow must be added to each pipe segment.

Table 11: Equivalent Piping Length for Elbows, Y-branches, and Branch Distribution Units.

Component	Size (Inches)				
	1/4	3/8	1/2	5/8	3/4
Elbow (ft.)	0.5	0.6	0.7	0.8	1.2
Y-Branch Kit (ft., Multi F MAX systems only)[1]	1.6				
Branch Distribution Unit (ft., Multi F MAX systems only)	8.2				

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

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Selecting Field-Supplied Copper Piping

Note:

Always follow local codes when selecting and installing copper pipe and piping system components.

Approved piping for use with LG HVAC products will be marked "R410 RATED" along the length of the pipe. Piping wall thickness must meet local code requirements and be approved for a maximum operating pressure of 551 psi. When bending piping, try to keep the number of bends to a minimum, and use the largest radii possible to reduce the equivalent length of installed piping; also, bending radii greater than ten (10) piping diameters can minimize pressure drop. Be sure no traps or sags are present.

For Multi-Zone Split Systems

Use ACR copper piping rated at the system working pressure (rated for R410A refrigerant).

Note:

Always properly support the piping as per the instructions on page 43.

Table 14: ACR Rated Copper Tubing Material.

Type	Seamless Phosphorous Deoxidized
Class	UNS C12200 DHP
Straight Lengths	H58 Temper
Coils	O60 Temper

Table 15: ACR Rated Piping Wall Thicknesses.

OD (in)	1/4	3/8	1/2	5/8	3/4	7/8	1-1/8	1-3/8	1-5/8
Material	Rigid or Soft ACR Rated for R410A			Rigid or Solid ACR Rated for R410A					
Min. Bend Radius (in)	0.563	0.9375	1.5	2.25	3.0	3.0	3.5	4.0	4.5
Min. Wall Thickness (in)	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.050

Table 16: ACR Copper Tubing Dimensions and Physical Characteristics[1-3].

Nominal Pipe Outside Diameter (in)	**Actual Outside Diameter (in)**	**Tempered (Hard Drawn)**			**Annealed (Soft)**		
		Nominal Wall Thickness (in)	**Weight (lb/ft)**	**Cubic ft per Linear ft**	**Nominal Wall Thickness (in)**	**Weight (lb/ft)**	**Cubic ft per Linear ft**
1/4	0.250	--	--	--	0.030	0.081	0.00020
3/8	0.375	0.030	0.126	0.00054	0.032	0.134	0.00053
1/2	0.500	0.035	0.198	0.00101	0.032	0.182	0.00103
5/8	0.625	0.040	0.285	0.00162	0.035	0.251	0.00168
3/4	0.750	0.042	0.362	0.00242	0.042	0.362	0.00242
7/8	0.875	0.045	0.455	0.00336	0.045	0.455	0.00336
1-1/8	1.125	0.050	0.655	0.00573	0.050	0.655	0.00573
1-3/8	1.375	0.055	0.884	0.00875	0.055	0.884	0.00875
1-5/8	1.625	0.060	1.14	0.0124	0.060	1.14	0.0124

[1]All dimensions provided are in accordance with ASTM B280 – Standard.
[2]Design pressure = 551 psig.
[3]The Copper Tube Handbook, 2016, Copper Development Association Inc., 260 Madison Avenue, New York, NY 10016.

Note:

- *Commercially available piping often contains dust and other materials. Always blow it clean with a dry nitrogen.*
- *Prevent dust, water or other contaminants from entering the piping during installation.*

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COPPER EXPANSION AND CONTRACTION

Copper Expansion and Contraction

Under normal operating conditions, the vapor pipe temperature of a Multi F 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.

Refrigerant pipe along with the insulation jacket form a cohesive unit that expands and contracts together. During system operation, thermal heat transfer occurs between the pipe and the surrounding insulation.

If the pipe is mounted in free air space, no natural restriction to movement is present if mounting clamps are properly spaced and installed. When the refrigerant pipe is mounted underground in a utility duct stacked among other pipes, natural restriction to linear movement is present. In extreme cases, the restrictive force of surface friction between insulating jackets could become so great that natural expansion ceases and the pipe is "fixed" in place. In this situation, opposing force caused by change in refrigerant fluid/vapor temperature can lead to pipe/fitting stress failure.

The refrigerant pipe support system must be engineered to allow free expansion to occur. When a segment of pipe is mounted between two fixed points, provisions must be provided to allow pipe expansion to naturally occur. The most common method is the inclusion of expansion Loop or U-bends mounted in the horizontal plane. When expansion loops are placed in a vertical riser, the loop is to be formed in a horizontal fashion resulting in a torsional movement during expansion and contraction. Each segment of pipe has a natural fixed point where no movement occurs. This fixed point is located at the center point of the segment assuming the entire pipe is insulated in a similar fashion. The natural fixed point of the pipe segment is typically where the expansion Loop or U-bend must be. Linear pipe expansion can be calculated using the following formula:

$$LE = C \times L \times (T_r - T_a) \times 12$$

LE	=	Anticipated linear tubing expansion (in.)
C	=	Constant (For copper = 9.2 x 10-6 in./in.°F)
L	=	Length of pipe (ft.)
T_r	=	Refrigerant pipe temperature (°F)
T_a	=	Ambient air temperature (°F)
12	=	Inches to feet conversion (12 in./ft.)

1. From the table "Linear Thermal Expansion of Copper Tubing in Inches," find the row corresponding with the actual length of the straight pipe segment.

2. Estimate the minimum and maximum temperature of the pipe. Typical pipe temperature change ranges: High Pressure Vapor: ambient temperature to 215°F; Low Pressure Vapor: ambient to 35°F; Liquid pipe: ambient, 80°F, 110°F. Choose the two most extreme. In the column showing the minimum pipe temperature, look up the anticipated expansion distance. Do the same for the maximum pipe temperature.

3. Calculate the difference in the two expansion distance values. The result will be the anticipated change in pipe length.

General Example:

A system is installed and the design shows that there is a 100 foot straight segment of tubing between a Y-branch and a branch distribution unit. The system operates 24 hours per day. In heating, this pipe transports hot gas vapor to the indoor units at 120°F. In cooling, the same tube is a suction line returning refrigerant vapor to the outdoor unit at 40°F. Look up the copper tubing expansion at each temperature and calculate the difference.

Vapor Line

Transporting Hot Vapor: 100 ft. pipe at 120°F = 1.40 in.
Transporting Suction Vapor: 100 ft. pipe at 40°F = 0.40 in.
Anticipated Change in Length: 1.40 in. – 0.40 in. = 1.00 in.

Liquid Line

The liquid temperature remains relatively the same temperature; only the direction of flow will reverse. Therefore, no significant change in length of the liquid line is anticipated.

When creating an expansion joint, the joint depth must be a minimum of two times the joint width. Although different types of expansion arrangements are available, the data for correctly sizing an expansion loop is provided in the table "Coiled Expansion Loops and Offsets (Plan View)." Use soft copper with long radius bends on longer runs or long radius elbows for shorter pipe segments. Using the anticipated linear expansion (LE) distance calculated, look up the Expansion Loop or U-bend minimum design dimensions. If other types of expansion joints are chosen, design per ASTM B-88 Standards.

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COPPER EXPANSION AND CONTRACTION

To find the anticipated expansion value:

1. From the table below, find the row corresponding with the actual feet of the straight pipe segment.
2. Estimate the minimum and maximum temperature of the pipe.
3. In the column showing the minimum pipe temperature, look up the anticipated expansion distance corresponding to the segment length. Do the same for the maximum pipe temperature.
4. Calculate the difference in the two expansion distance values. The result will be the change in pipe length.

Table 17: Linear Thermal Expansion of Copper Tubing in Inches.

Pipe Length[1]	Fluid Temperature °F																			
	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	100°	105°	110°	115°	120°	125°	130°
10	0.04	0.04	0.05	0.06	0.06	0.07	0.08	0.08	0.09	0.09	0.10	0.10	0.11	0.11	0.11	0.12	0.13	0.14	0.15	0.15
20	0.08	0.08	0.10	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.22	0.23	0.26	0.28	0.29	0.30
30	0.12	0.12	0.15	0.18	0.20	0.21	0.23	0.24	0.26	0.27	0.29	0.30	0.32	0.33	0.32	0.35	0.39	0.42	0.44	0.45
40	0.16	0.16	0.20	0.24	0.26	0.28	0.30	0.32	0.34	0.36	0.38	0.40	0.42	0.44	0.43	0.46	0.52	0.56	0.58	0.60
50	0.20	0.20	0.25	0.30	0.33	0.35	0.38	0.40	0.43	0.45	0.48	0.50	0.53	0.55	0.54	0.58	0.65	0.70	0.73	0.75
60	0.24	0.24	0.30	0.36	0.39	0.42	0.45	0.48	0.51	0.54	0.57	0.60	0.63	0.66	0.65	0.69	0.78	0.84	0.87	0.90
70	0.28	0.28	0.35	0.42	0.46	0.49	0.53	0.56	0.60	0.63	0.67	0.70	0.74	0.77	0.76	0.81	0.91	0.98	1.02	1.05
80	0.32	0.32	0.40	0.48	0.52	0.56	0.60	0.64	0.68	0.72	0.76	0.80	0.84	0.88	0.86	0.92	1.04	1.12	1.16	1.20
90	0.36	0.36	0.45	0.54	0.59	0.63	0.68	0.72	0.77	0.81	0.86	0.90	0.95	0.99	0.97	1.04	1.17	1.26	1.31	1.35
100	0.40	0.40	0.50	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00	1.05	1.10	1.08	1.15	1.30	1.40	1.45	1.50
120	0.48	0.48	0.60	0.72	0.78	0.84	0.90	0.96	1.02	1.08	1.14	1.20	1.26	1.32	1.30	1.38	1.56	1.68	1.74	1.80
140	0.56	0.56	0.70	0.84	0.91	0.98	1.05	1.12	1.19	1.26	1.33	1.40	1.47	1.54	1.51	1.61	1.82	1.96	2.03	2.10
160	0.64	0.64	0.80	0.96	1.04	1.12	1.20	1.28	1.36	1.44	1.52	1.60	1.68	1.76	1.73	1.84	2.08	2.24	2.32	2.40
180	0.72	0.72	0.90	1.08	1.17	1.26	1.35	1.44	1.53	1.62	1.71	1.80	1.89	1.98	1.94	2.07	2.34	2.52	2.61	2.70
200	0.80	0.80	1.00	1.20	1.30	1.40	1.50	1.60	1.70	1.80	1.90	2.00	2.10	2.20	2.16	2.30	2.60	2.80	2.90	3.00
220	0.88	0.88	1.10	1.32	1.43	1.54	1.65	1.76	1.87	1.98	2.09	2.20	2.31	2.42	2.38	2.53	2.86	3.08	3.19	3.30
240	0.96	0.96	1.20	1.44	1.56	1.68	1.80	1.92	2.04	2.16	2.28	2.40	2.52	2.64	2.59	2.76	3.12	3.36	3.48	3.60
260	1.04	1.04	1.30	1.56	1.69	1.82	1.95	2.08	2.21	2.34	2.47	2.60	2.73	2.86	2.81	2.99	3.38	3.64	3.77	3.90
280	1.12	1.12	1.40	1.68	1.82	1.96	2.10	2.24	2.38	2.52	2.66	2.80	2.94	3.08	3.02	3.22	3.64	3.92	4.06	4.20
300	1.20	1.20	1.50	1.80	1.95	2.10	2.25	2.40	2.55	2.70	2.85	3.00	3.15	3.30	3.24	3.45	3.90	4.20	4.35	4.50
320	1.28	1.28	1.60	1.92	2.08	2.24	2.40	2.56	2.72	2.88	3.04	3.20	3.36	3.52	3.46	3.68	4.16	4.48	4.64	4.80
340	1.36	1.36	1.70	2.04	2.21	2.38	2.55	2.72	2.89	3.06	3.23	3.40	3.57	3.74	3.67	3.91	4.42	4.76	4.93	5.10
360	1.44	1.44	1.80	2.16	2.34	2.52	2.70	2.88	3.06	3.24	3.42	3.60	3.78	3.96	3.89	4.14	4.68	5.04	5.22	5.40
380	1.52	1.52	1.90	2.28	2.47	2.66	2.85	3.04	3.23	3.42	3.61	3.80	3.99	4.18	4.10	4.37	4.94	5.32	5.51	5.70
400	1.60	1.60	2.00	2.40	2.60	2.80	3.00	3.20	3.40	3.60	3.80	4.00	4.20	4.40	4.32	4.60	5.20	5.60	5.80	6.00
420	1.68	1.68	2.10	2.52	2.73	2.94	3.15	3.36	3.57	3.78	3.99	4.20	4.41	4.62	4.54	4.83	5.46	5.88	6.09	6.30
440	1.76	1.76	2.20	2.64	2.86	3.08	3.30	3.52	3.74	3.96	4.18	4.40	4.62	4.84	4.75	5.06	5.72	6.16	6.38	6.60
460	1.84	1.84	2.30	2.76	2.99	3.22	3.45	3.68	3.91	4.14	4.37	4.60	4.83	5.06	4.97	5.29	5.98	6.44	6.67	6.90
480	1.92	1.92	2.40	2.88	3.12	3.36	3.60	3.84	4.08	4.32	4.56	4.80	5.04	5.28	5.18	5.52	6.24	6.72	6.96	7.20
500	2.00	2.00	2.50	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.40	5.75	6.50	7.00	7.25	7.50

[1]Pipe length baseline temperature = 0°F. "Expansion of Carbon, Copper and Stainless Steel Pipe," The Engineers' Toolbox, www.engineeringtoolbox.com.

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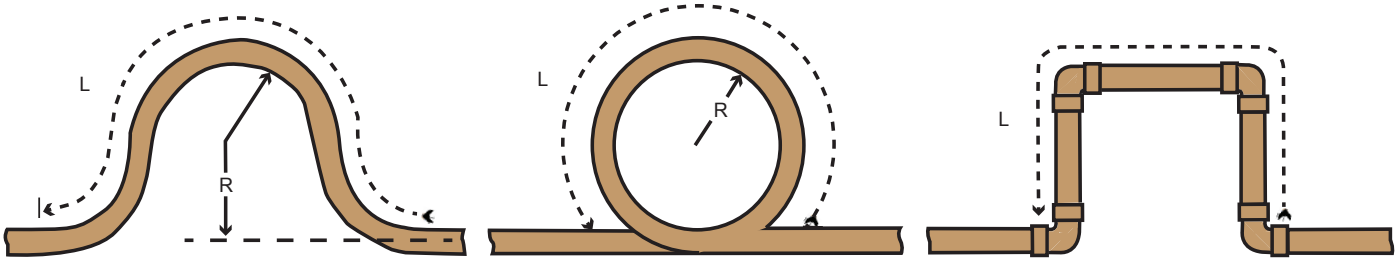
COPPER EXPANSION AND CONTRACTION

Figure 26: Coiled Expansion Loops and Offsets (Plan View).



Large Tubing U-bend (>3/4 in.) | Loop | Small Tubing U-bend (<3/4 in.)

Note:

All expansion loops and offsets must be installed in the horizontal plane to prevent the possibility of trapping oil. Loops and offsets in vertical risers must also be installed in a horizontal plane.

Table 18: Radii of Coiled Expansion Loops and Developed Lengths of Expansion Offsets.

Anticipated Linear Expansion (LE) (in.)		Nominal Tube Size (OD) inches						
		1/4	3/8	1/2	3/4	1	1-1/4	1-1/2
1/2	R[1]	6	7	8	9	11	12	13
	L[2]	38	44	50	59	67	74	80
1	R[1]	9	10	11	13	15	17	18
	L[2]	54	63	70	83	94	104	113
1-1/2	R[1]	11	12	14	16	18	20	22
	L[2]	66	77	86	101	115	127	138
2	R[1]	12	14	16	19	21	23	25
	L[2]	77	89	99	117	133	147	160
2-1/2	R[1]	14	16	18	21	24	26	29
	L[2]	86	99	111	131	149	165	179
3	R[1]	15	17	19	23	26	29	31
	L[2]	94	109	122	143	163	180	196
3-1/2	R[1]	16	19	21	25	28	31	34
	L[2]	102	117	131	155	176	195	212
4	R[1]	17	20	22	26	30	33	36
	L[2]	109	126	140	166	188	208	226

[1]R = Centerline Length of Pipe.
[2]L = Centerline Minimum Radius (inches).

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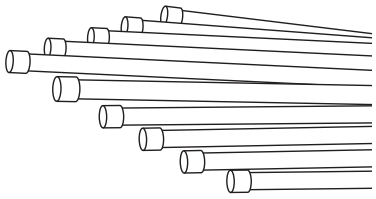
Piping Handling

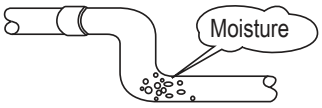
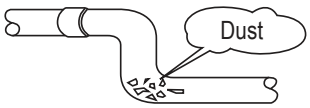
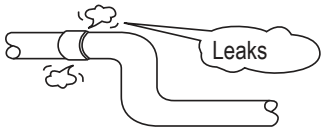
Pipes used for the refrigerant piping system must include the specified thickness, and the interior must be clean.

While handling and storing, ⃠ do not bend or damage the pipes, and take care not to contaminate the interior with dust, moisture, etc.

Keep Pipes Capped While Storing.



Keep refrigerant pipe dry, clean, and airtight.

	Dry	Clean	Airtight
	No moisture should be inside the piping.	No dust should be inside the piping.	No leaks should occur.
			
Possible Problems	- Significant hydrolysis of refrigerant oil. - Refrigerant oil degradation. - Poor insulation of the compressor. - System does not operate properly. - EEVs, capillary tubes are clogged.	- Refrigerant oil degradation. - Poor insulation of the compressor. - System does not operate properly. - EEVs and capillary tubes become clogged.	- Refrigerant gas leaks / shortages. - Refrigerant oil degradation. - Poor insulation of the compressor. - System does not operate properly.
Solutions	- Remove moisture from the piping. - Piping ends should remain capped until connections are complete. - ⃠ Do not install piping on a rainy day. - Connect piping properly at the unit's side. - Remove caps only after the piping is cut, the burrs are removed, and after passing the piping through the walls. - Evacuate system to a minimum of 500 microns and insure the vacuum holds at that level for 1 hour.	- Remove dust from the piping. - Piping ends should remain capped until connections are complete. - Connect piping properly at the side of the unit. - Remove caps only after the piping is cut and burrs are removed. - Retain the cap on the piping when passing it through walls, etc.	- Test system for air tightness. - Perform brazing procedures that comply with all applicable standards. - Perform flaring procedures that comply with all applicable standards. - Perform flanging procedures that comply with all applicable standards. - Ensure that refrigerant lines are pressure tested to 550 psig and hold for 24 hours.

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REFRIGERANT SYSTEM ENGINEERING

Proper system operation depends on the installer using utmost care while assembling the piping system. The following pages are an overview of best practices when installing the refrigerant piping system.

Note:

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

⃠ No Pipe Size Substitutions

Use only the pipe size selected by the LATS HVAC pipe system design software. Using a different size is prohibited and will result in a system malfunction or failure to work at all.

⃠ No In-line Refrigeration Components

Components such as oil traps, solenoid valves, filter-driers, sight glasses, tee fittings, and other after-market accessories are ⃠ not permitted on the refrigerant piping system between the outdoor units and the indoor / heat recovery units. LG HVAC systems are provided with redundant systems that make sure oil is properly returned to the compressor. Sight-glasses and solenoid valves will cause vapor to form in the liquid stream. Over time, driers will deteriorate and introduce debris into the system. The designer and installer must verify the refrigerant piping system is free of traps, sagging pipes, sight glasses, filter driers, etc.

Field-Provided Isolation Ball Valves

LG maintains a neutral position on using isolation valves in LG HVAC refrigerant piping systems. LG does not endorse any manufacturer of isolation valves. It is recognized that installing isolation valves will simplify future maintenance requirements, and, if used, considerations must be taken including, but not limited to, the following:

- Pressure drops for any component used, including isolation valves, must be known in equivalent pipe length and calculated into the total and segment equivalent piping lengths and compared to product design limitations.
- In all cases, materials must be suitable for the application and any applicable codes, including, but not limited to, diameter and wall thickness continuity per ACR standards.

Failure to do so will cause significant performance degradation. Proper leak checks must be performed. Using isolation valves does not automatically void any LG product warranty, however, a limited warranty will be voided in whole or part must any field supplied accessory fail in any way that causes product failure.

Using Elbows

Field-supplied elbows are allowed if they are long radius and designed for use with R410A refrigerant. The designer and installer, however, must be cautious with the quantity and size of fittings used, and must account for the additional pressure losses in equivalent pipe length calculation for each branch. The equivalent pipe length of each elbow must be added to each pipe segment in the LATS program.

Pipe Bends

When bending soft copper, use long radius bends. Refer to the “Radii of Coiled Expansion Loops and Developed Lengths of Expansion Offsets” table for minimum radius specifications.

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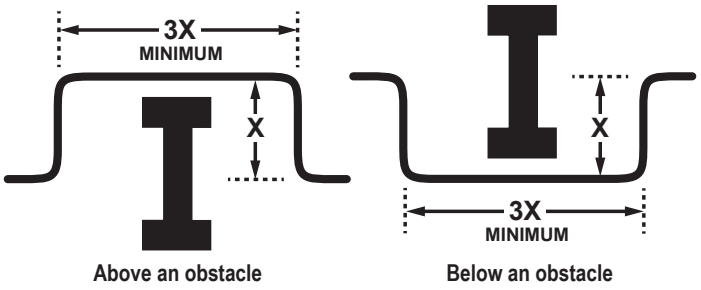
Obstacles

When an obstacle, such as an I-beam or concrete T, is in the path of the planned refrigerant pipe run, it is best practice to route the pipe over the obstacle. If adequate space is not available to route the insulated pipe over the obstacle, then route the pipe under the obstacle. In either case, it is imperative 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.

Figure 27: Installing Piping Above and Below an Obstacle.



Pipe Supports

A properly installed pipe system must be adequately supported to avoid pipe sagging. Sagging pipes become oil traps that lead to equipment malfunction.

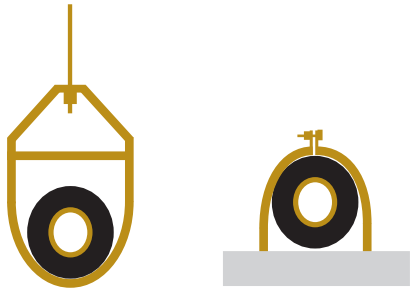
Pipe supports must ⃠ never touch the pipe wall; supports must be installed outside (around) the primary pipe insulation jacket. Insulate the pipe first because pipe supports must be installed outside (around) the primary pipe insulation jacket. Clevis hangers must be used with shields between the hangers and insulation. Field provided pipe supports must be designed to meet local codes. If allowed by code, use fiber straps or split-ring hangers suspended from the ceiling on all-thread rods (fiber straps or split ring hangers can be used as long as they do not compress the pipe insulation). Place a second layer of insulation over the pipe insulation jacket to prevent chafing and compression of the primary insulation in the confines of the support clamp.

A properly installed pipe system will have sufficient supports to avoid pipes from sagging during the life of the system. As necessary, place supports closer for segments where potential sagging could occur. Maximum spacing of pipe supports must meet local codes. If local codes do not specify pipe support spacing, pipe must be supported:

- Maximum of five (5) feet on center for straight segments of pipe up to 3/4 inches outside diameter size.
- Maximum of six (6) feet on center for pipe up to one (1) inch outside diameter size.
- Maximum of eight (8) feet on center for pipe up to two (2) inches outside diameter size.

Wherever the pipe changes direction, place a hanger within twelve (12) inches on one side and within twelve (12) to nineteen (19) inches of the bend on the other side. Support piping at indoor units, Y-branch, and Header fittings as shown.

Figure 28: Pipe Hanger Details.



Note:

Use a 4" + long sheet curved sheet metal saddles between hanger bracket and insulation to promote linear expansion/contraction.

Figure 29: Typical Pipe Support Location—Change in Pipe Direction.

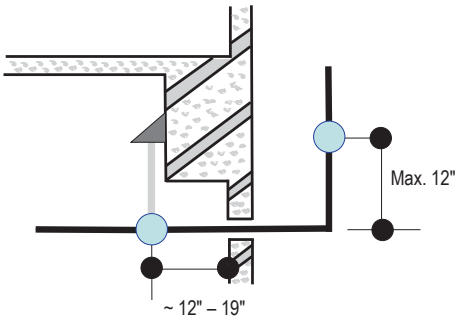


Figure 30: Pipe Support at Indoor Unit.

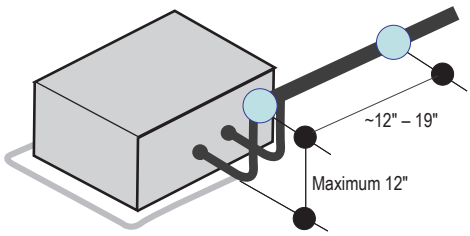


Figure 31: Pipe Support at Y-branch Fitting.

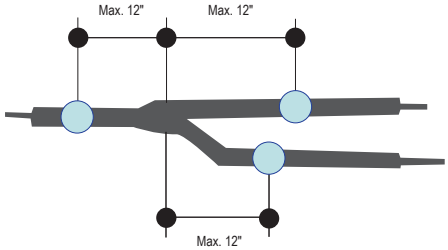
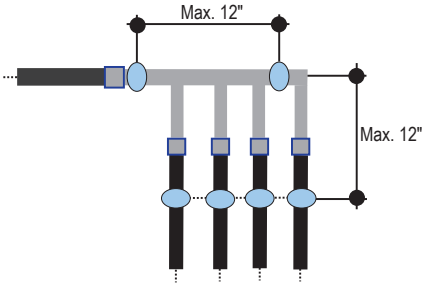


Figure 32: Pipe Support at Header Fitting.



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Examples of Supports

Figure 33: U-Bolt Support with Insulation.

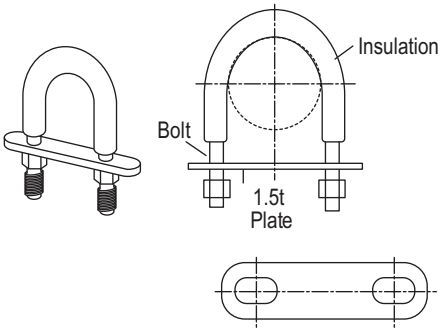


Figure 34: O-Ring Support with Insulation.

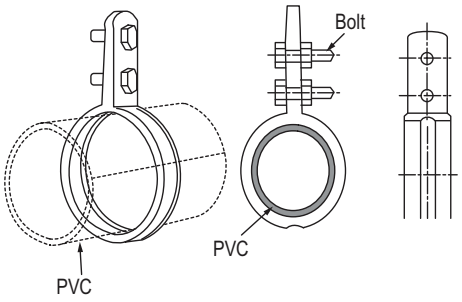
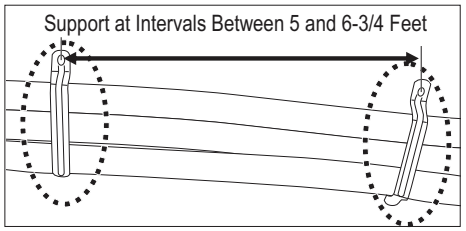


Figure 35: Saddle-Type Support.



Do not compress the insulation with the saddle-type support. If the insulation is compressed, it will tear open and allow condensation to generate during product operation.

Figure 36: U-Bolt Support with an Insulated Pipe.

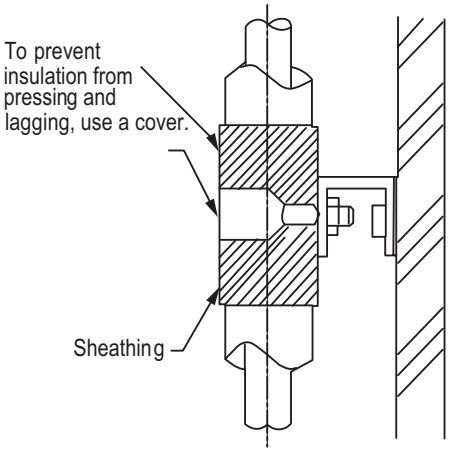


Figure 37: O-Ring Band Support with an Insulated Pipe.

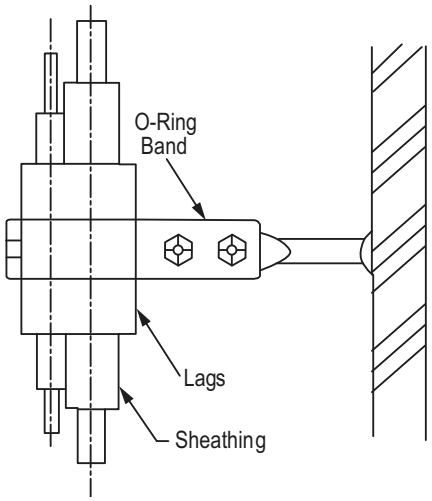


Figure 38: One-Point Down-Stop Support (>441 lbs.).

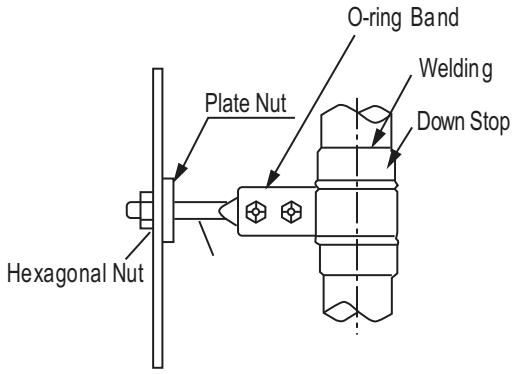
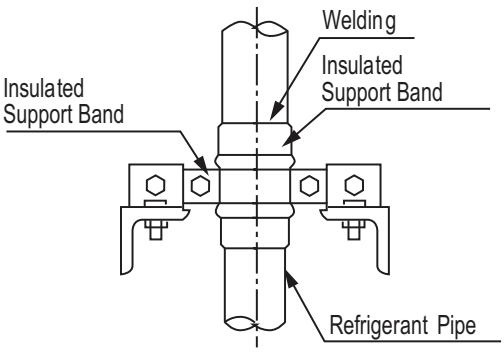


Figure 39: Two-Point Down-Stop Support.



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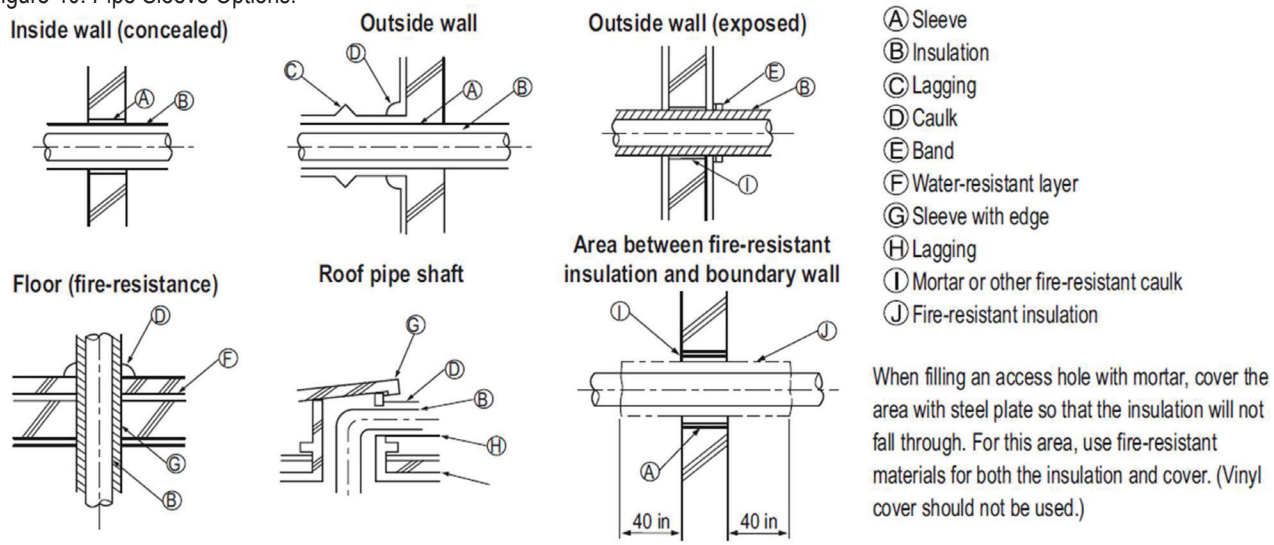
Pipe Sleeves at Penetrations

LG recommends that all pipe penetrations through walls, floors, and pipes buried underground be properly insulated and routed through an appropriate wall sleeve of sufficient size to prevent compression of refrigerant pipe insulation and promote free movement of the pipe within the sleeve. Use 4"+ curved sheet metal saddles between the bottom surface of the pipe and the bottom surface of the penetration.

Figure 40: Pipe Sleeve Options.



Note:

Diameter of penetrations must be determined by pipe diameter plus the thickness of the insulation.

Underground Refrigerant Piping

Refrigerant pipe installed underground must be routed inside a vapor tight protective sleeve to prevent insulation deterioration and water infiltration. Refrigerant pipe installed inside underground casing must be continuous without any joints. Underground refrigerant pipe must be located at a level **below the frost line**.

Table 19: Utility Conduit Sizes.

Liquid Pipe[1]	Vapor Pipe[1]			
	3/8 (2.0[2,5])	1/2 (2.0[2,5])	5/8 (2-1/8[2,5])	3/4 (2-1/4[2,5])
1/4 (1.0)[3]	4	4	4	4
3/8 (1-1/8)[3]	4	4	4	5
1/2 (1-1/2)[4]	5	5	5	5
5/8 (1-5/8)[4]	5	5	5	5
3/4 (1-3/4)[4]	5	5	5	5

[1]OD pipe diameter in inches; Values in parenthesis () indicate OD of pipe with insulation jacket.

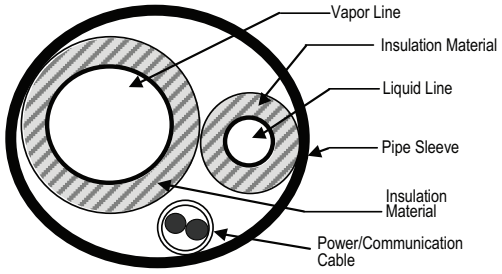
[2]Diameter of pipe with insulation. Thickness of pipe insulation is typical. Actual required thickness will vary based on surrounding ambient conditions and must be calculated and specified by the design engineer.

[3]Insulation thickness (value in parenthesis) = 3/8 inch.

[4]Insulation thickness (value in parenthesis) = 1 inch.

[5]Insulation thickness (value in parenthesis) = 3/4 inch.

Figure 41: Typical Arrangement of Refrigerant Pipe and Cable(s) in a Utility Conduit.



Note:

Provide expansion joints in long pipe segments and place in an accessible conduit box for inspection. Use galvanized curved sheet metal saddles at all mounting points. Pipe must be allowed to move freely linearly.

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Flaring and Brazing Procedures

One of the main causes of refrigerant leaks is a defective connection. For LG HVAC systems, the installer needs to know how perform both flared and brazed connections successfully.

Note:

• During installation, it is imperative to keep the piping system free of contaminants and debris such as copper burrs, slag, or carbon dust.

• ⃠ Do not use kinked pipe caused by excessive bending in one specific area on its length.

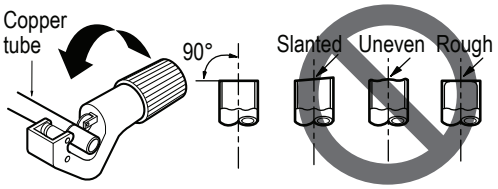
Flaring Procedure

Note:

When selecting flare fittings, always use a 45° fitting rated for use with high pressure refrigerant R410A. Selected fittings must also comply with local, state, or federal standards.

1. Cut the pipe to length.
   - Measure the distance between the indoor unit and the outdoor unit.
   - Cut the pipes a little longer than measured distance.

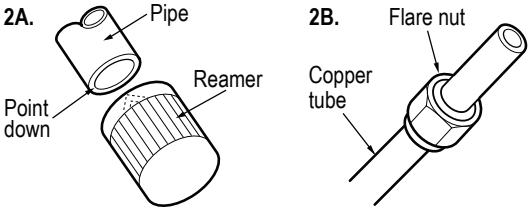
1.



2A. Remove the burrs.
   - Completely remove all burrs from pipe ends.
   - When removing burrs, point the end of the copper pipe down to avoid introducing foreign materials in the pipe.

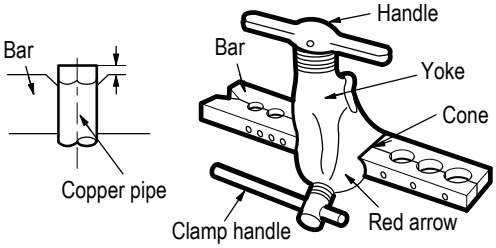
2B. Slide the flare nut onto the copper tube.

2A. **2B.**



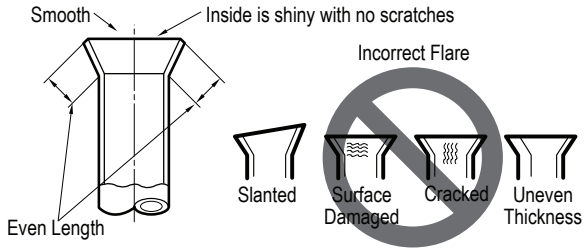
3. Flaring the pipe end.
   - Use the proper size flaring tool to finish flared connections as shown.
   - ALWAYS create a 45° flare when working with R410A.

3.

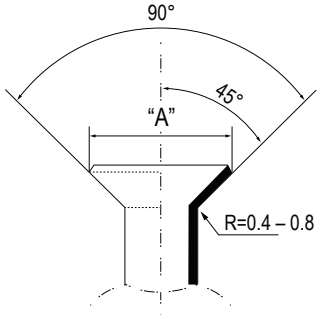


4. Carefully inspect the flared pipe end.
   - Compare the geometry with the figure to the right
   - If the flare is defective, cut it off and re-do procedure.
   - If flare looks good, blow the pipe clean with dry nitrogen.

4.



Dimensions of the Flare.



Flared Connection Dimensions / Tightening Torque.

Pipe Size (in. O.D.)	Outside Diameter (mm)	"A" Dimension (mm [in.])
1/4	6.35	~ 9.1 (11/32 - 23/64)
3/8	9.52	~ 13.2 (1/2 - 33/64)
1/2	12.7	~ 16.6 (41/64 - 21/32)
5/8	15.88	~ 19.7 (49/64 - 25/32)
3/4	19.05	-

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FLARING AND BRAZING PROCEDURES

Tightening the Flare Nuts

Tightening Torque for Flare Nuts.

Pipe Size (in. O.D.)	Outside Diameter (mm)	Tightening Torque (ft-lbs.)
1/4	6.35	13.0 - 18.0
3/8	9.52	24.6 - 30.4
1/2	12.7	39.8 - 47.7
5/8	15.88	45.4 - 59.3
3/4	19.05	71.5 - 87.5

1. When connecting the flare nuts, coat the flare (outside only) with polyvinyl ether (PVE) refrigeration oil only.

Note:

⃠ *Do not use polyolyester (POE) or any other type of mineral oil as a thread lubricant. These lubricants are not compatible with the PVE oil used in this system and create oil sludge leading to equipment damage and system malfunction.*

⃠ *Do not add any contaminants inside the refrigerant piping.*

2. Initially hand tighten the flare nuts using three (3) or four (4) turns.
3. To finish tightening the flare nuts, use both a torque wrench and a backup wrench.
4. After all the piping has been connected and the caps have been tightened, check for refrigerant gas leaks.

Loosening the Flare Nuts

Always use two (2) wrenches to loosen the flare nuts.

Brazing Procedure

⚠WARNING

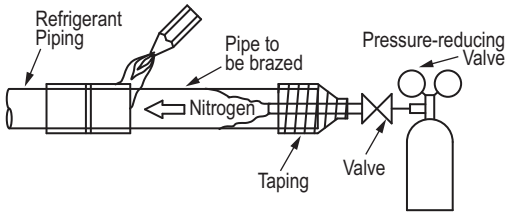
⃠ *Do not braze in an enclosed location.* ⃠ *Do not allow the refrigerant to leak during brazing. Always test for gas leaks before and after brazing. If the refrigerant combusts, it generates a toxic gas the will cause physical injury or death.*

Note:

Braze the pipes to the service valve pipe stub of the outdoor unit.

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

Figure 42: Refrigerant Pipe Brazing.



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Multi F Outdoor Unit to Indoor Unit Piping Connections

Note:

⃠ **Avoid Pipe Damage**

- *When routing field-provided piping, ⃠ avoid damaging the outdoor unit from excessive vibration.*
- *Properly insulate the liquid and gas lines separately up to the point of connection at the unit frame.*
- *See table below for Multi F outdoor unit connection types.*

⃠ *Correctly route the piping so it does not make contact with mounting bolts. Allow room for field installation.*

Figure 43: Multi F Refrigerant Pipe Connections (LMU36CHV shown as example).

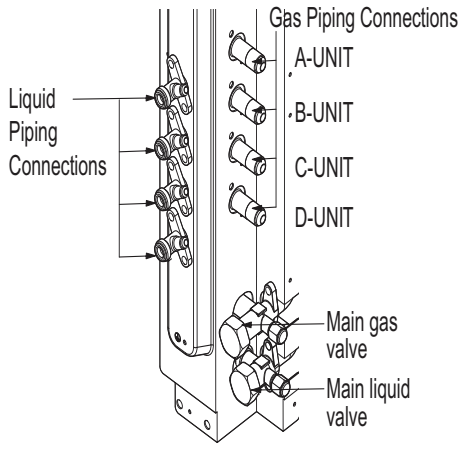

Table 20: Outdoor Unit Piping Connections.

Outdoor Unit Piping Connections	LMU18CHV	LMU24CHV	LMU30CHV	LMU36CHV
Liquid Line Connection (in., OD) x Qty.	1/4 x 2	1/4 x 3	1/4 x 4	1/4 x 4
Vapor Line Connection (in., OD) x Qty.	3/8 x 2	3/8 x 3	3/8 x 4	3/8 x 4

Table 21: Indoor Unit Pipe Sizes.

Indoor Unit Capacity	Vapor Line Piping Size (in., OD)	Liquid Line Piping Size (in., OD)
7,000 Btu/h	Ø3/8	Ø1/4
9,000 Btu/h		
12,000 Btu/h		
15,000 Btu/h		
15,000 Btu/h: Console; 18,000 Btu/h	Ø1/2	
24,000 Btu/h		

Note:

Connection sockets (included as a factory-supplied accessory with the indoor units) will need to be used when piping the indoor units to the outdoor unit. See tables above and below for indoor unit piping connection and connection socket dimensions. If a 36K indoor unit is included, the connection sockets are included with the Branch Distribution unit.

Table 22: Indoor Unit Piping Connections.

Indoor Unit Capacity	Vapor Line Conn. (in., OD)	Liquid Line Conn. (in., OD)
7,000 Btu/h	Ø3/8	Ø1/4
9,000 Btu/h		
12,000 Btu/h		
15,000 Btu/h		
18,000 Btu/h: Wall-Mounted	Ø5/8	Ø3/8
15,000 Btu/h: Console; 18,000 Btu/h: Low Static Duct, Four-Way Cassette	Ø1/2	Ø1/4
24,000 Btu/h	Ø1/2	Ø1/4

Table 23: Connection Socket Dimensions.

Indoor Unit Capacity	Vapor (in., OD)		Liquid (in., OD)	
	A	B	A	B
18,000 Btu/h: Wall-Mounted	Ø3/8 → Ø1/2, Ø1/2 → Ø5/8		Ø1/4 → Ø3/8	
15,000 Btu/h: Console; 18,000 Btu/h: Low Static Duct, Four-Way Cassette	Ø3/8 → Ø1/2		N/A	
24,000 Btu/h	Ø3/8 → Ø1/2		N/A	

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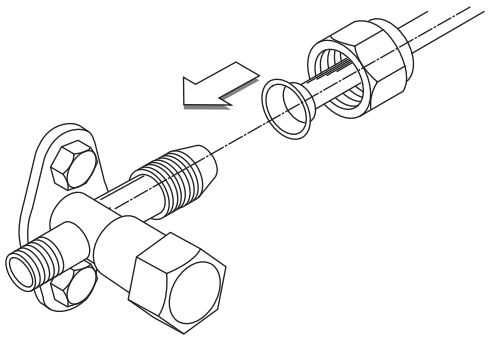
Installing Field Piping to the Outdoor Unit Piping Connections

1. Verify the outdoor unit service ports are closed.
2. Remove the caps on the outdoor unit piping connections.
3. Connect the gas piping first to ROOM A, then to ROOM B, then to ROOM C, in that order. Number of connections will differ depending on outdoor unit.
4. Tighten each gas piping connection individually following the "Tightening the Flare Nuts" procedure below.
5. Connect the liquid piping first to ROOM A, then to ROOM B, then to ROOM C, in that order. Number of connections will differ depending on outdoor unit.
6. Tighten each liquid piping connection individually following the "Tightening the Flare Nuts" procedure below.

Figure 44: Close Up of the Field Piping to the Outdoor Unit Piping Connection.



Tightening the Flare Nuts

Tightening Torque for Flare Nuts.

Pipe Size (in. O.D.)	Outside Diameter (mm)	Tightening Torque (ft-lbs.)
1/4	6.35	13.0 - 18.0
3/8	9.52	24.6 - 30.4
1/2	12.7	39.8 - 47.7
5/8	15.88	45.4 - 59.3
3/4	19.05	71.5 - 87.5

1. When connecting the flare nuts, coat the flare (outside only) with polyvinyl ether (PVE) refrigeration oil only.

Note:

⃠ *Do not use polyolyester (POE) or any other type of mineral oil as a thread lubricant. These lubricants are not compatible with the PVE oil used in this system and create oil sludge leading to equipment damage and system malfunction.*

⃠ *Do not add any contaminants inside the refrigerant piping.*

2. Initially hand tighten the flare nuts using three (3) or four (4) turns.
3. To finish tightening the flare nuts, use both a torque wrench and a backup wrench.
4. After all the piping has been connected and the caps have been tightened, check for refrigerant gas leaks.

Using the Connection Socket

Some indoor units require the use of a connection socket when piping the indoor units to the outdoor unit. (See previous page for information.) The connection sockets are included as a factory-supplied accessory with the indoor units. To install:

1. Align the center of the piping sections as seen in the diagrams at right and below.
2. Follow the "Tightening the Flare Nuts" procedure above.

Figure 45: Connection Socket Diagram, External View.

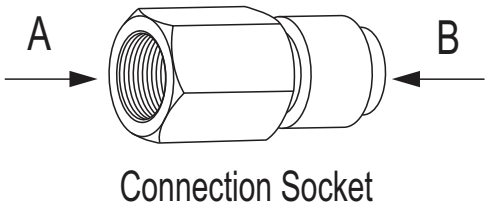


Figure 46: Connection Socket Diagram.

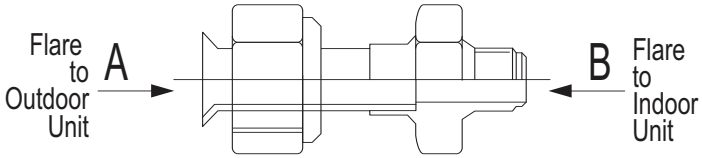
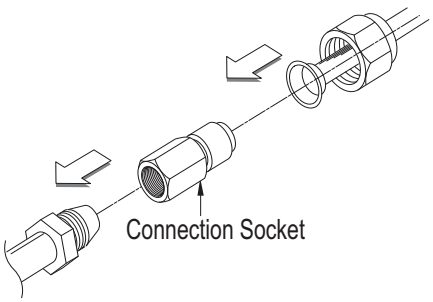


Figure 47: Performing Connections.



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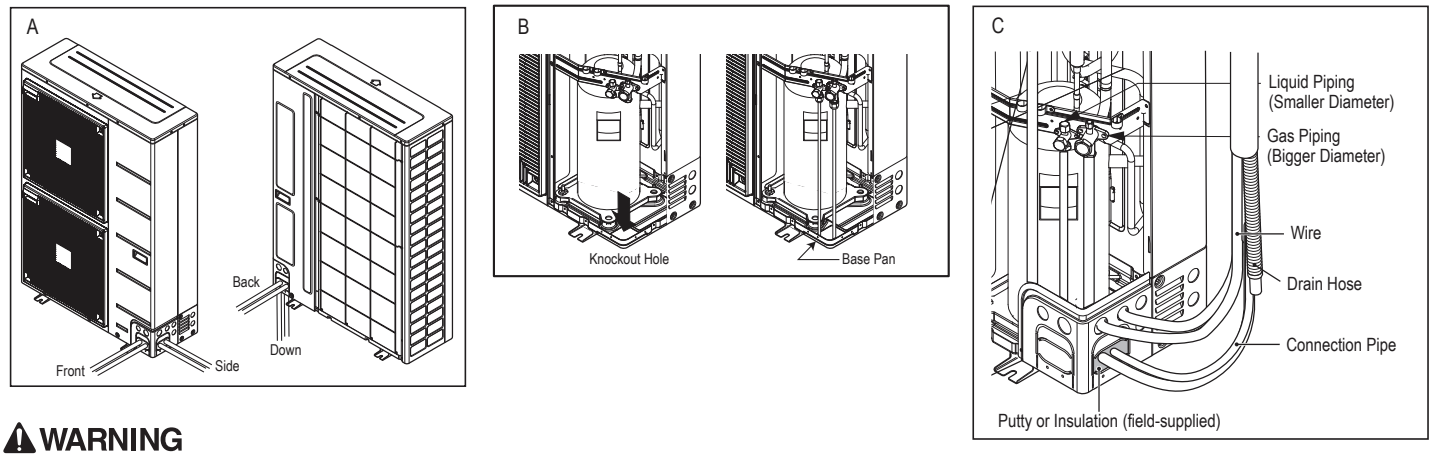
Multi F MAX Refrigerant Piping Connections / Piping Routes

For Multi F MAX outdoor units, piping can be installed in one of four directions: front, side, back, and down (A). If the downward installation is chosen, the knockout hole in the base pan must be accessed (B).

Whatever direction is chosen, plug the access holes with field-provided putty or insulation to fill all gaps (C).

Figure 48: Multi F MAX Piping Installation.



⚠WARNING

Insects or small animals entering the outdoor unit will cause a short circuit in the electrical box, which will lead to fire, electric shock, physical injury, or death.

Note:

Insects or small animals entering the outdoor unit will cause a short circuit in the electrical box, which will lead to unit failure.

Multi F MAX Outdoor Unit System Piping Connections

Note:

⃠ **Avoid Pipe Damage**

- *When routing field-provided piping, ⃠ avoid damaging the outdoor unit from excessive vibration.*
- *Properly insulate the liquid and gas lines separately up to the point of connection at the unit frame.*
- *See table below for Multi F MAX outdoor unit connection types.*

⃠ *Correctly route the piping so it does not make contact with mounting bolts. Allow room for field installation.*

Figure 49: Multi F MAX Outdoor Unit Refrigerant Pipe Connections.

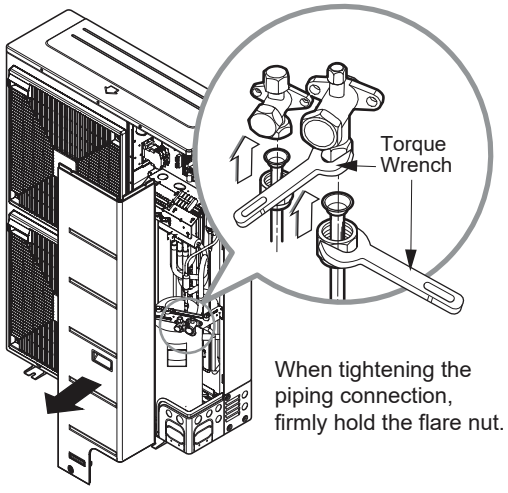


Table 24: Multi F MAX Outdoor Unit Piping Connections.

Outdoor Unit Piping Connections	LMU480HV, LMU540HV, LMU600HV
Liquid Line Connection (in., OD) x Qty.	Ø3/8 x 1
Vapor Line Connection (in., OD) x Qty.	Ø3/4 x 1

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Multi F MAX Outdoor Unit System Piping Connections

Note:

⃠ **Avoid Pipe Damage**

- *When routing field-provided piping, ⃠ avoid damaging the outdoor unit from excessive vibration.*
- *Properly insulate the liquid and gas lines separately up to the point of connection at the unit frame.*
- *See table below for Multi F MAX outdoor unit connection types.*

⃠ *Correctly route the piping so it does not make contact with mounting bolts. Allow room for field installation.*

Branch Distribution to Indoor Unit Piping Connections

- Install indoor unit liquid and vapor refrigerant pipes (and connection wiring) to the appropriate branch distribution ports.
- Clearly note on the indoor unit's refrigerant piping (liquid, vapor) which branch distribution port it is connected to (A, B, C, D).

Table 25: Outdoor Unit Piping Connections.

Outdoor Unit Piping Connections	LMU480HV, LMU540HV, LMU600HV
Liquid Line Connection (in., OD) x Qty.	3/8 x 1
Vapor Line Connection (in., OD) x Qty.	3/4 x 1

Figure 50: Branch Distribution Ports to Indoor Units -- Side View.

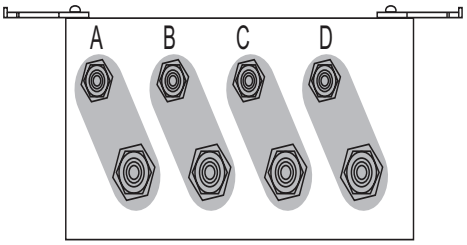

Table 26: Branch Distribution Unit Piping Connections.

Branch Distribution Unit	Refrigerant Connections Pipe Size (in.)		Connectible Indoor Unit Capacity (Btu/h)
	Liquid	Vapor	
PMBD3620	Ø1/4 x 2	Ø3/8 x 2	7,000, 9,000, 12,000, 15,000, 18,000, 24,000
PMBD3630	Ø1/4 x 3	Ø3/8 x 3	7,000, 9,000, 12,000, 15,000, 18,000, 24,000
PMBD3640	Ø1/4 x 4	Ø3/8 x 4	7,000, 9,000, 12,000, 15,000, 18,000, 24,000
PMBD3641	Ø1/4 x 4	Ø3/8 x 3	7,000, 9,000, 12,000, 15,000, 18,000, 24,000 (A, B, C)
		Ø1/2 x 1	24,000, 36,000 (D)

Table 27: Indoor Unit Pipe Sizes.

Indoor Unit Capacity	Vapor Line Piping Size (in., OD)	Liquid Line Piping Size (in., OD)
7,000 Btu/h	Ø3/8	Ø1/4
9,000 Btu/h		
12,000 Btu/h		
15,000 Btu/h		
15,000 Btu/h: Console; 18,000 Btu/h	Ø1/2	
24,000 Btu/h		
36,000 Btu/h	Ø5/8	Ø3/8

Table 28: Indoor Unit Piping Connections.

Indoor Unit Capacity	Vapor Line Conn. (in., OD)	Liquid Line Conn. (in., OD)
7,000 Btu/h	Ø3/8	Ø1/4
9,000 Btu/h		
12,000 Btu/h		
15,000 Btu/h		
18,000 Btu/h: Wall-Mounted	Ø5/8	Ø3/8
15,000 Btu/h: Console; 18,000 Btu/h: Low Static Duct, Four-Way Cassette	Ø1/2	Ø1/4
24,000 Btu/h	Ø1/2	Ø1/4
36,000 Btu/h	Ø5/8	Ø3/8

Note:

Connection sockets (included as a factory-supplied accessory with the indoor units) will need to be used when piping the indoor units to the branch distribution unit. The connection sockets for 36k indoor units are factory supplied with the branch distribution units. See tables above and below for indoor unit piping connection and connection socket dimensions. See the follow page for the connection socket installation procedure.

Table 29: Connection Socket Dimensions.

Indoor Unit Capacity	Vapor (in., OD)		Liquid (in., OD)	
	A	B	A	B
18,000 Btu/h: Wall-Mounted	Ø3/8 → Ø1/2, Ø1/2 → Ø5/8		Ø1/4 → Ø3/8	
15,000 Btu/h: Console; 18,000 Btu/h: Low Static Duct, Four-Way Cassette	Ø3/8 → Ø1/2		N/A	
24,000 Btu/h	Ø3/8 → Ø1/2		N/A	
36,000 Btu/h	Ø1/2 → Ø5/8		Ø1/4 → Ø3/8	

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Installing Field Piping to the Branch Distribution Unit Piping Connections

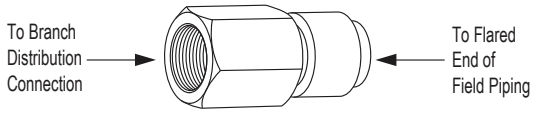
1. Remove any caps, etc., that could be on the branch distribution unit.
2. Tighten each piping connection individually following the “Tightening the Flare Nuts” procedure below.
3. When all piping installation has been completed, perform the triple leak / pressure and evacuation tests (see the Final Installation Procedures Section), verify that the system does not have any leaks, and then fully insulate all joints / connections.

Using the Connection Socket

Some indoor units require the use of a connection socket when piping the indoor units to the branch distribution unit. (See previous page and below for information.) The connection sockets are included as a factory-supplied accessory with the indoor units, or in the case of the 36k indoor unit, it is factory supplied with the branch distribution units. To install:

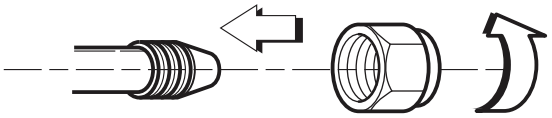
1. Remove any caps, etc., that could be on the branch distribution unit.
2. Align the center of the piping sections as seen in the diagram at right.
3. Tighten each piping connection individually following the “Tightening the Flare Nuts” procedure below.
4. When all piping installation has been completed, perform the triple leak / pressure and evacuation tests (see the Final Installation Procedures Section), verify that the system does not have any leaks, and then fully insulate all joints / connections.

Figure 51: Connection Socket Diagram, External View.



Connection Socket

Figure 52: Socket Connection.



Tightening the Flare Nuts

Tightening Torque for Flare Nuts.

Pipe Size (in. O.D.)	Outside Diameter (mm)	Tightening Torque (ft-lbs.)
1/4	6.35	13.0 - 18.0
3/8	9.52	24.6 - 30.4
1/2	12.7	39.8 - 47.7
5/8	15.88	45.4 - 59.3
3/4	19.05	71.5 - 87.5

1. When connecting the flare nuts, coat the flare (outside only) with polyvinyl ether (PVE) refrigeration oil only.

Note:

⃠ *Do not use polyolyester (POE) or any other type of mineral oil as a thread lubricant. These lubricants are not compatible with the PVE oil used in this system and create oil sludge leading to equipment damage and system malfunction.*

⃠ *Do not add any contaminants inside the refrigerant piping.*

2. Initially hand tighten the flare nuts using three (3) or four (4) turns.
3. To finish tightening the flare nuts, use both a torque wrench and a backup wrench.
4. After all the piping has been connected and the caps have been tightened, check for refrigerant gas leaks.

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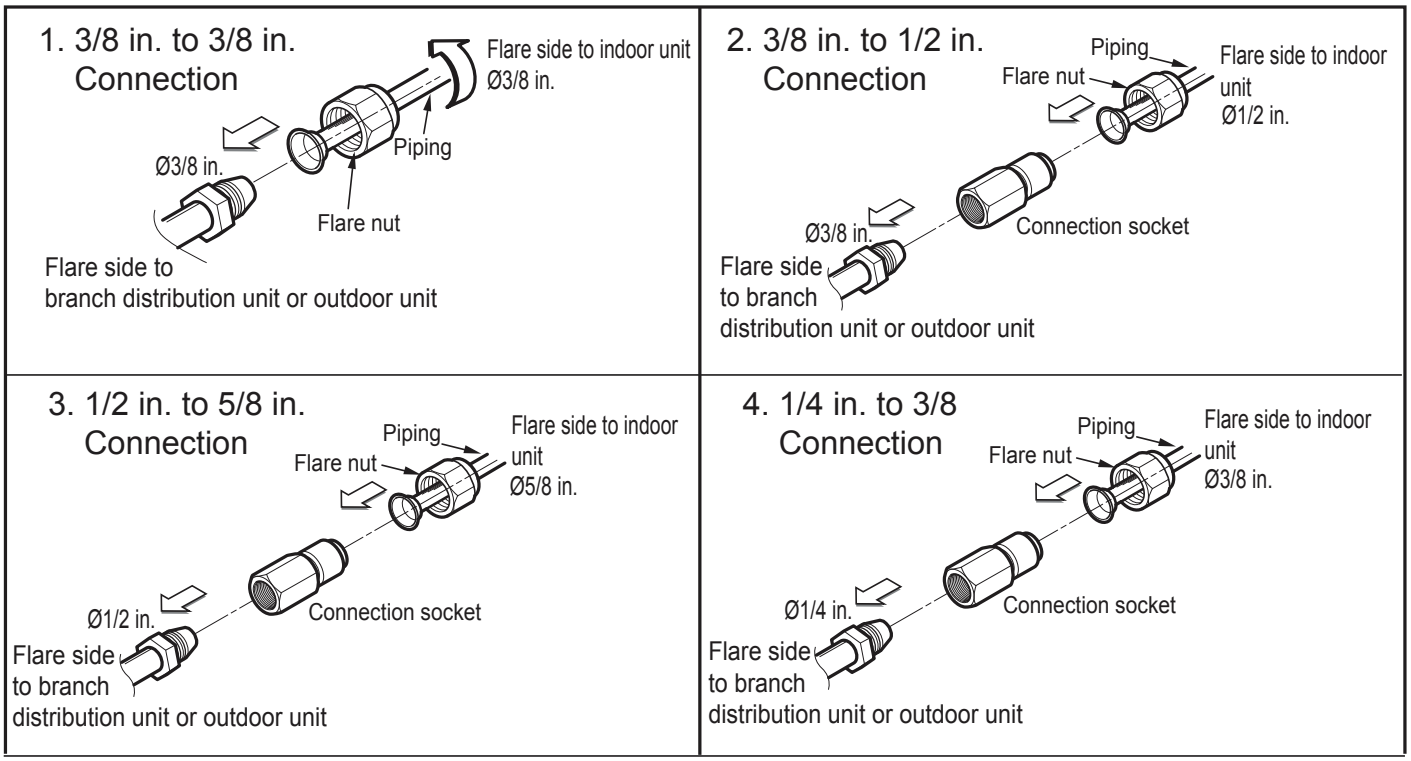
Figure 53: Possible Outdoor Unit or Branch Distribution Unit to Indoor Unit Connections.



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Multi F MAX Y-Branch Kit PMBL5620

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. ⃠ Field-supplied fittings are not permitted. 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 can be installed in horizontal or vertical configurations. When installed vertically, position the Y-branch so the straight through leg is ±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 ±5° rotation.

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.

When a Y-branch is located in a pipe chase or other concealed space, access doors must be provided for inspection access.

The equivalent pipe length of each Y-branch (1.6') must be added to the main pipe segment entered into LATS piping design software.

Note:

- *Design pressure is 551 psig.*
- *All dimensions in inches. Tolerance ±1/4 inch.*
- *Images are not to scale.*

Figure 54: Y-Branch Port Identifier Diagram.

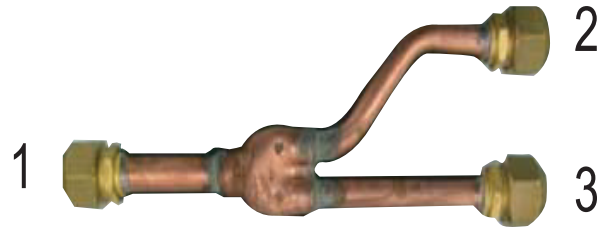
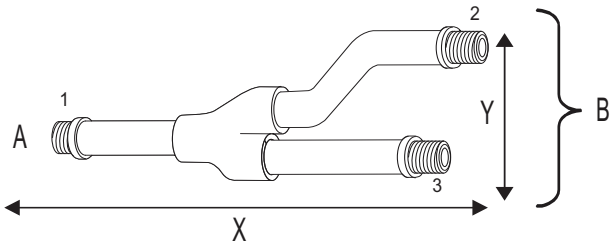


Figure 55: Y-Branch Dimensions Diagram.



A = To Outdoor Unit B = To Branch Distribution Unit

Table 30: Y-Branch Connection Diameters.

Model	Y-Branch Type	Port Identifier (inch)			Dimensions	
		1	2	3	X	Y
PMBL5620	Liquid	3/8	3/8	3/8	13.80	3.24
	Vapor	3/4	3/4	3/4	12.48	3.02

Figure 56: Horizontal Configuration End View.

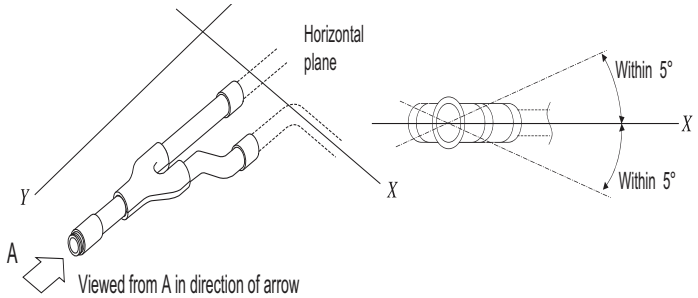
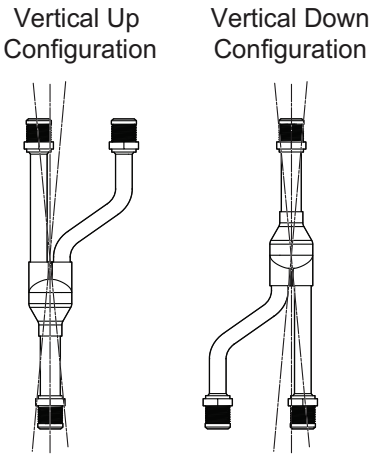


Figure 57: Y-branch Installation Alignment Specification.



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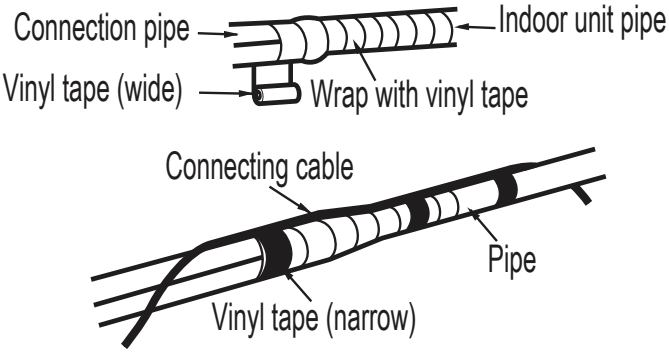
BUNDLING AND SPECIAL APPLICATIONS

Bundling

If a conduit or piping set cover is not used on the connection from the outdoor unit to the interior, bundle both insulated refrigerant pipes, the drain hose, and outdoor unit to indoor unit / branch distribution unit communication / connection (power) cable together with wide vinyl tape.

1. Piping must be fully encased in insulation material: Overlap the field installation piping insulation material and the indoor unit piping insulation material.
2. Bind together the two pipes, using vinyl tape. Make sure there are no gaps during the binding.
3. Be sure the cutting line is placed upward.
4. Wrap the rear piping section with narrow vinyl tape.
5. Continue to wrap the indoor unit pipe as connected to the outdoor connection pipe.
6. Using a wider vinyl tape, bundle the piping and drain hose together.
   - Tape must be sufficient to cover the piping in order to fit into the rear piping housing area at the back of the indoor unit.

Figure 58: Bundling the Connection Components (From Outdoor Unit to Indoor Unit / Branch Distribution Unit [Multi F MAX systems only]).



Special Applications

If an additional drain hose is necessary, the end of drain outlet must be routed above the ground. Secure the drain hose appropriately.

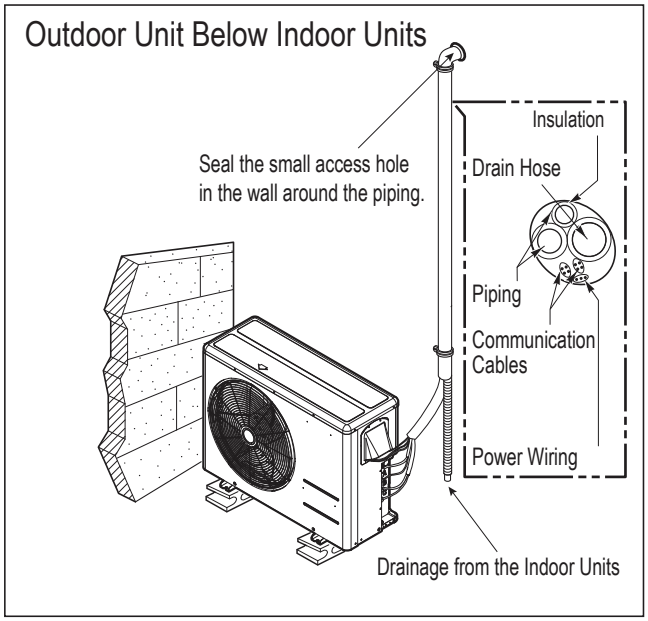
When the Outdoor Unit is Installed Below the Indoor Unit:

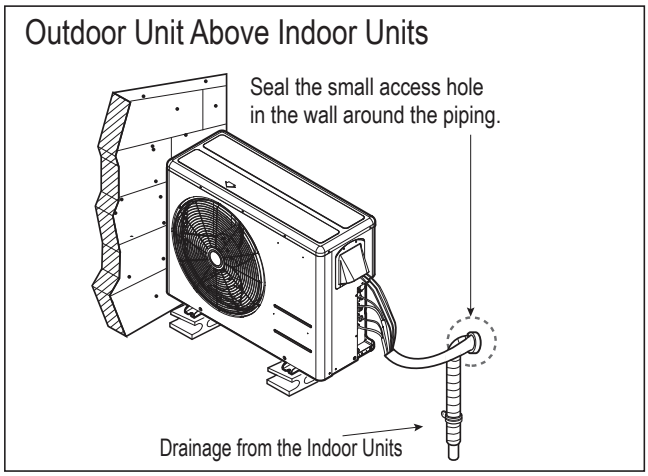
1. Use a conduit, piping set cover, or bundle the (separately) insulated refrigerant piping, the drain hose, and the communications / connection (power) cable together.
2. Make sure to include some slack in the wiring. Wiring must be installed in an upwards direction to prevent water from accessing into the control box.
3. Secure the conduit, piping set cover, or bundle along the outside wall using saddles or a similar type of piping support.
4. Seal any openings in the wall that are around the piping.

When the Outdoor Unit is Installed Above the Indoor Unit:

1. Use a conduit, piping set cover, or bundle the (separately) insulated refrigerant piping and the communications / connection (power) cable together up to the outdoor unit service valves.
2. Make sure to include some slack in the wiring. Wiring must be installed in upwards direction to prevent water from traveling into the control box.
3. If necessary, secure the conduit, piping set cover, or bundle along the outside wall using saddles or a similar type of piping support.
4. Ensure the insulated drain hose from the indoor unit is installed away from the outdoor unit, and in a downwards direction. If necessary, secure along the outside wall using saddles or a similar type of support.
5. Seal any openings in the wall that are around the piping.

Figure 59: Special Applications.





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Condensate Drain Piping

Outdoor unit requires condensate drain piping. Condensate drain pipe must be constructed with materials approved by local code. See pages 22 to 24 for information in reference to outdoor unit placement and condensate drainage.

Drain Leak Test

A leak test must be performed 24 hours after the drainage system has been installed.

Note:

For indoor unit condensate drain piping information, see the Multi F / Multi F MAX Indoor Unit Engineering Manual, or the installation manual specific to the indoor unit type.

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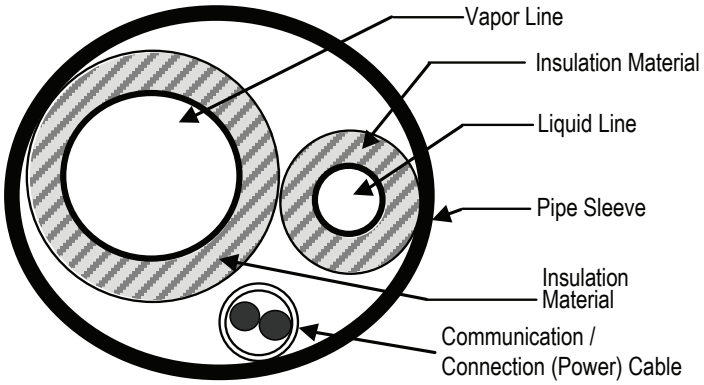
Note:

For information regarding insulation for underground or penetration situations, see the "General Refrigerant Piping System Information" section.

General Piping System Insulation

All refrigerant piping from the outdoor unit to the indoor units / branch distribution units (Multi F MAX systems only) must be insulated correctly for safety and usage. Y-branch connections, refrigerant piping, field-provided isolation ball valves (if present), service valves, and elbows must be properly and completely insulated using closed cell pipe insulation (up to the indoor unit piping connections). To prevent heat loss / heat gain through the refrigerant piping, all refrigerant piping including liquid lines and vapor lines must be insulated separately. Insulation must be a minimum 1/2 inches thick, and thickness will need to be increased based on ambient conditions and local codes. Table on the next page lists minimum wall thickness requirements for Ethylene Propylene Diene Methylene (EPDM) insulation.

Figure 60: Typical Pipe Insulation, Power Wire and Communications Cable Arrangement



Inside the outdoor unit, maximum pipe temperature is 248°F and minimum pipe temperature is -40°F. For field insulation of refrigerant piping between outdoor units and indoor units, consider the following pipe temperature ranges for an operating heat pump system:

- Heating mode refrigerant temperature ranges: Liquid, 75-118°F; High Pressure Vapor, 95-220°F.
- Cooling mode refrigerant temperature ranges: Liquid, 75-118°F; Low Pressure Vapor, 40-90°F.

All insulation joints must be glued with no air gaps. Insulation material must fit snugly against the refrigeration pipe with no air space between it and the pipe. Insulation passing through pipe hangers, inside conduit, and/or sleeves must not be compressed. Protect insulation inside hangers and supports with a second layer. All pipe insulation exposed to the sun and outdoor elements must be properly protected with PVC, aluminum vapor barrier, or alternatively placed in a weather-resistant enclosure such as a pipe rack with a top cover; and meet local codes. LG-provided Y-branches are shipped from the factory with pre-formed peel-and-stick foam insulation jackets, with a 1.84 lb./ft.^{3} density, 1/2 inch thickness, and meet UL94 MF-1 flammability.

The design engineer must perform calculations to determine if the factory-supplied insulation jackets are sufficient to meet local codes and avoid sweating. Add additional insulation if necessary. Check the fit of the insulation jacket after the Y-branch fitting and all run-out pipes are installed.

Figure 61: Typical Insulation Butt-Joint at Indoor Unit Casing.

Figure 62: Typical Refrigerant Flare Fitting Insulation Detail.

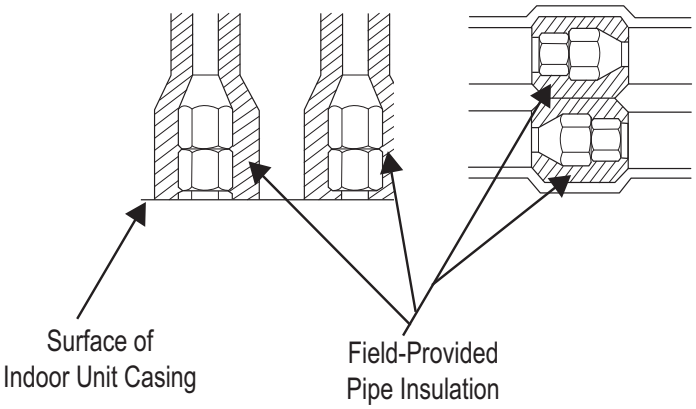
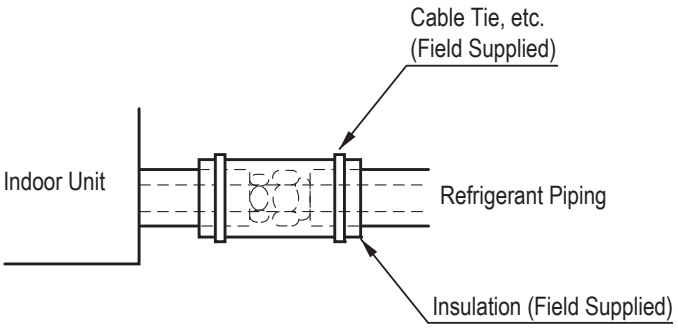


Figure 63: Insulating the Shut Off / Isolation Ball Valve (If Present).



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Minimum Refrigerant Pipe Ethylene Propylene Diene Methylene (EPDM) Insulation Wall Thickness Requirements

Note:

- ⃠ *Do not insulate gas and liquid pipes together as this can result in pipe leakage and malfunction due to extreme temperature fluctuations.*
- *Always properly insulate the piping. Insufficient insulation will result in condensation, reduced heating/cooling performance, etc. Also, if the pipes aren't insulated properly, condensation could potentially cause damage to building finishes. Pay special attention to insulating the pipes installed in the ceiling plenum.*
- *Fully insulate the piping connections.*
- *Follow local codes and the designer's instructions when selecting ethylene propylene diene methylene (EPDM) insulation wall thickness.*

Table 31: Minimum Refrigerant Pipe EPDM Insulation Wall Thickness Requirements.[1]

<table>
<tr><th colspan="2" rowspan="2">Classification</th><th colspan="2">Air-conditioned location</th><th colspan="2">Non-air conditioned location</th></tr>
<tr><th>1. Typical Conditioned Location</th><th>2. Special Conditioned Location</th><th>3. Typical Unconditioned Location</th><th>4. Special Unconditioned Location</th></tr>
<tr><td rowspan="3">Liquid pipe</td><td>ø1/4 inch</td><td rowspan="2">>1/2 inch</td><td rowspan="2">>1/2 inch</td><td rowspan="2">>1/2 inch</td><td rowspan="2">>1/2 inch</td></tr>
<tr><td>ø3/8 inch</td></tr>
<tr><td>≥ø1/2 inch</td><td>>1/2 inch</td><td>>1/2 inch</td><td>>1/2 inch</td><td>>1/2 inch</td></tr>
<tr><td rowspan="12">Vapor pipe</td><td>ø3/8 inch</td><td rowspan="6">>1/2 inch</td><td rowspan="7">>3/4 inch</td><td rowspan="7">>3/4 inch</td><td rowspan="12">>1 inch</td></tr>
<tr><td>ø1/2 inch</td></tr>
<tr><td>ø5/8 inch</td></tr>
<tr><td>ø3/4 inch</td></tr>
<tr><td>ø7/8 inch</td></tr>
<tr><td>ø1 inch</td></tr>
<tr><td>ø1-1/8 inches</td><td rowspan="5">>3/4 inch</td></tr>
<tr><td>ø1-1/4 inches</td><td rowspan="5">>1 inch</td><td rowspan="5">>1 inch</td></tr>
<tr><td>ø1-3/8 inches</td></tr>
<tr><td>ø1-1/2 inches</td></tr>
<tr><td>ø1-3/4 inches</td></tr>
</table>

[1]The thickness of the above insulation material is based on heat conductivity of 0.61 Btu/in/h/ft²/°F.

1. Typical Conditioned Location

A building plenum or space that contains conditioned air that does not exceed 80°F DB.

2. Special Conditioned Location

1. When the location is air conditioned, but there is severe temperature/humidity difference due to high ceilings.

• Church, auditorium, theater, lobby, etc.

2. When the location is air conditioned, but internal temperature/humidity are high.

• Bathroom, swimming pool, locker room, etc.

3. Typical Unconditioned Location

An unconditioned space inside a building.

4. Special Unconditioned Location: If conditions 1 and 2 below are present.

1. An unconditioned space or plenum of a building.
2. An area where there is an elevated humidity level.

5. Additional Insulation for Indoor Units Will be Required in Humid Environments.

The air conditioner factory insulation has been tested according to "ISO Conditions with Mist," and it satisfies the requirements. If the system has been operating for a long time in a high humidity environment (dew point temperature: more than 73°F), condensate is likely to form. If this happens, install 3/8 inch thick EPDM insulation that is plenum-rated with a heat-resistance factor of more than 248°F.

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Note:

- ⃠ *Do not insulate gas and liquid pipes together as this can result in pipe leakage and malfunction due to extreme temperature fluctuations.*
- *Be sure to fully insulate the piping connections.*

Installing the Insulation

1. Insulation material must be longer than the refrigerant piping. Each vapor and liquid piping must be insulated separately.
2. Place the closed-cell ethylene propylene diene methylene (EPDM) insulation material carefully around each refrigerant pipe so as not to damage it. Be sure the insulation material cutting line is placed upward.
3. Apply adhesive to both cut surfaces of the insulation and press together. Allow adhesive to dry so that the bond is secure and does not come apart.

Insulating Piping Joints

1. Push the EPDM insulation from the straight piping surrounding the joint (elbow, outdoor unit to indoor unit piping connection point, etc.) as close together as possible.
2. Cut a piece of insulation to fit the joint, overlapping the insulation on the surrounding piping by at least one (1) inch.
3. Apply adhesive to bond all the ends.
4. Secure by completely wrapping narrow vinyl tape around the insulation / joint so that there are no gaps.
5. Tape must be sufficient to cover the piping so it can fit into the rear piping housing area at the back of the indoor unit or branch distribution unit (Multi F MAX systems only).

Figure 64: Correct Cutting Line Placement.

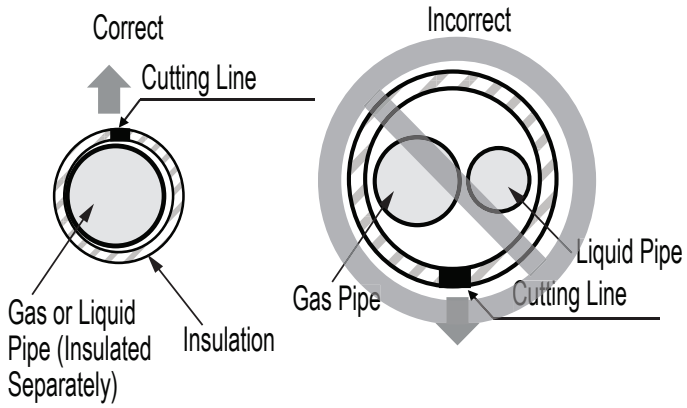
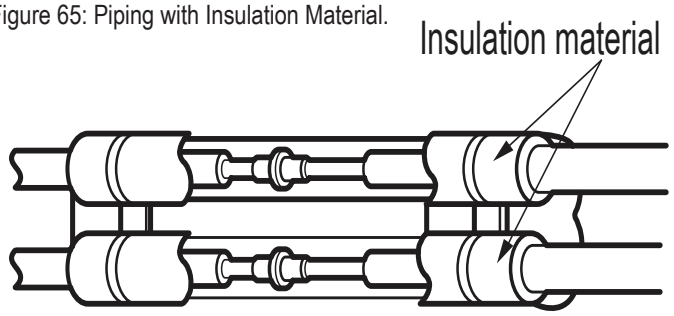


Figure 65: Piping with Insulation Material.

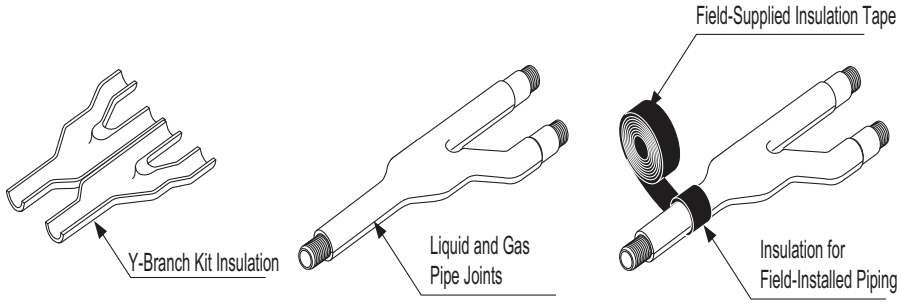


Y-Branch Kit Insulation

Each Y-branch kit comes with clam-shell type peel-and-stick insulation jackets molded to fit the Y-branch fittings—one for the liquid line, one for the vapor line.

- Check the fit of the Y-branch clam-shell insulation jacket after the Y-branch is installed.
- Mark all the pipes at the points where the insulation jacket ends.
- Remove the jacket.
- Install field-provided insulation on the run-out and main pipes first.
- Peel the adhesive glue protector slip from the insulation jacket, and install the clam-shell jacket over the fitting.

Figure 66: Y-branch Insulation Detail.



Note:

Additional Insulation for Y-Branches Will be Required in Humid Environments.

If the system has been operating for a long time in a high humidity environment (dew point temperature: more than 73°F), condensate is likely to form. If this happens, install 3/8 inch thick ethylene propylene diene methylene (EPDM) insulation that is plenum-rated with a heat-resistance factor that follows applicable local, state, and federal codes.

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ELECTRICAL

General Information

⚠ WARNING

- *All power (line voltage) wiring and communication cable installation must be performed by trained service providers working in accordance with all local, state, and National Electrical Code (NEC) / UL / ETL federal regulations related to electrical equipment and wiring, and following the manufacturer product diagrams, requirements, and instructions in this manual. Electric shock can cause physical injury or death.*
- *Be sure that main power to the unit is completely off before proceeding. Follow all safety and warning information outlined at the beginning of this manual. Failure to do so will cause electric shock and bodily injury.*
- *Install a main shutoff switch or circuit breaker that interrupts all power sources simultaneously (circuit breaker must be resistant to electromagnetic currents). Be sure that the circuit breaker or some other emergency power cutoff device is in place before any power wiring is done to the system. Failure to do so will cause bodily injury or death.*
- ⃠ *Never touch any power lines or live cables before all power is cutoff to the system. To do so will cause bodily injury or death.*
- *Power wiring and communication cable sizes must comply with all applicable federal, state, and local codes. Undersized wiring will lead to unacceptable voltage at the unit and will cause a fire, which will cause bodily injury or death.*
- *Properly ground the outdoor unit, indoor units, and branch distribution units. Ground wiring must always be installed by a trained technician. Ground wiring is required to prevent accidental electrical shock during current leakage, which will cause bodily injury or death.*
- *Verify that the circuit breaker is set to OFF before installing the wiring system. Electric shock can cause physical injury or death.*
- *Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and NEC regulations related to electrical equipment and wiring, and following the instructions in this manual. Generated overcurrent will include some amount of direct current. Using an oversized breaker or fuse will result in electric shock, physical injury or death.*
- ⃠ *Do not connect ground wire to refrigerant, gas, sewage, or water piping; to lightning rods; to telephone ground wiring; or to the building plumbing system. Failure to properly provide a NEC-approved earth ground can result in electric shock, fire, physical injury or death.*

Note:

- *Consider ambient conditions (temperature, direct sunlight, inclement weather, etc.) when selecting, installing, and connecting the power wiring.*
- *Properly ground the outdoor unit, indoor units, and branch distribution units. Ground wiring must always be installed by a trained technician. Improperly grounded wire can cause communication problems from electrical noise, and motor current leakage.*
- *Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and NEC regulations related to electrical equipment and wiring, and following the instructions in this manual. Generated overcurrent will include some amount of direct current. Using an oversized breaker or fuse will result in equipment malfunction and property damage.*
- ⃠ *Do not connect ground wire to refrigerant, gas, or water piping; to lightning rods; to telephone ground wiring; or to the building plumbing system. Failure to properly provide a NEC-approved earth ground can result in property damage and equipment malfunction.*
- ⃠ *Do not operate the air conditioning system until the refrigerant piping installation is complete. Operating the system before refrigerant piping is finalized will damage the compressor.*

Location / Accessing the Power Wiring and Communications Cable Connections

1. Detach the outdoor unit panel by loosening the screws.
2. Remove the control cover (if applicable) by loosening the screws.
3. When all connections are complete, re-attach the cover control to its original position using the screws, then re-attach the outdoor unit panel.

Figure 67: Power Wiring and Communication / Connection (Power) Cable Paths (LMU18~36CHV; LMU480, 540HV Example).

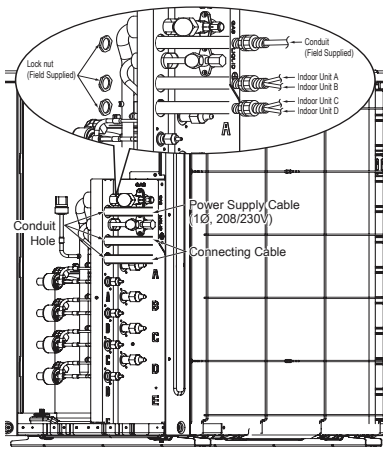
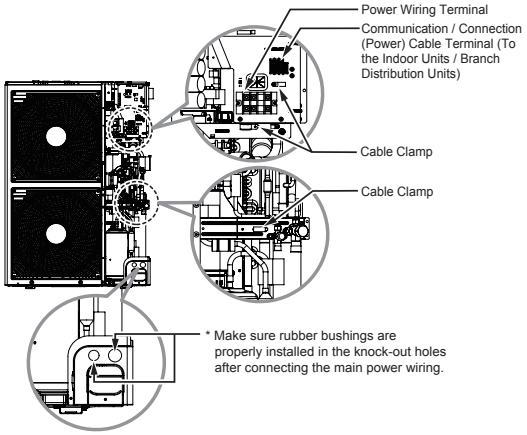


Figure 68: Location of the Power Wiring and Communication Cable Terminals LMU600HV).



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Power Wiring / Communication Cable Connections

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

To Install a Ring or Fork Terminal:

1. Trim the wiring with wire cutters or pliers, then strip the insulation to expose the strand wiring to about 3/8 inches.
2. Using a ring terminal fastener or pliers, securely clamp a ring terminal to each stripped wire end.

To Connect the Wiring to the Terminals:

1. Remove the JIS terminal screws from the (outdoor unit, branch distribution unit, or indoor unit) terminal plate with a JIS screwdriver. (See information about LG terminal connections on the next page.)
2. Position the ring terminal around the terminal, place the terminal screw in the ring, and tighten to the terminal plate using a JIS screwdriver.
   - Firmly attach the wire; secure in a way to prevent external forces from being imparted to the terminal block.
   - Use an appropriately sized JIS screwdriver for tightening the terminals.
   - ⃠ Do not over tighten the connections; over tightening will damage the terminals.

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

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

Figure 69: Close up of a Typical Ring Terminal.

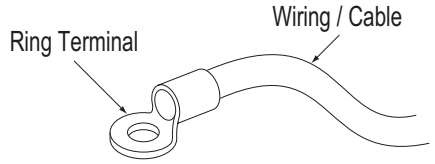


Figure 70: Adding a Ring Terminal to the Wiring.

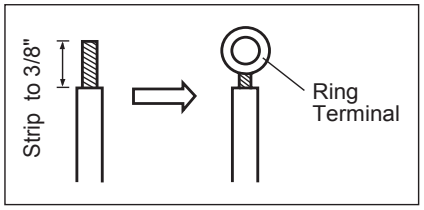


Figure 71: Tightening the Ring Terminal to the Terminal Plate.

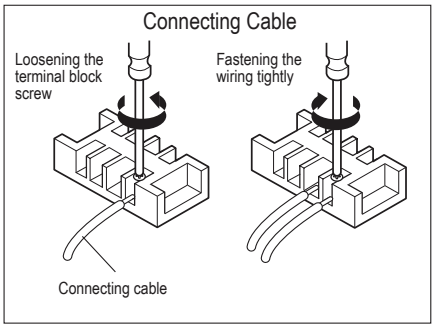
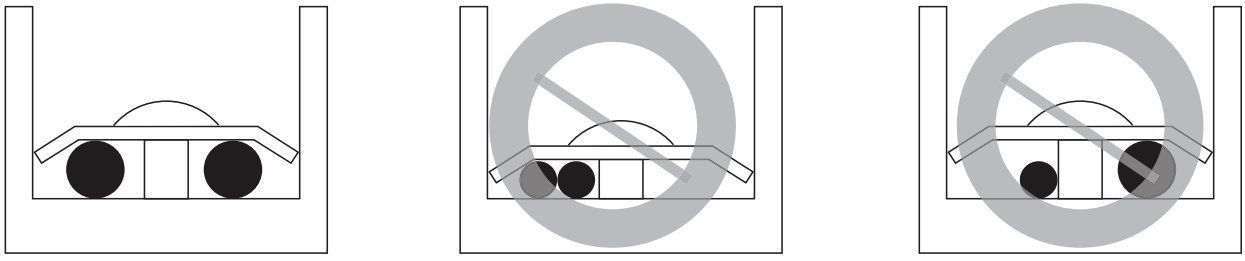


Figure 72: Proper and Improper Power Wiring Connections.

● :Copper Wire



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

⃠ Do not terminate two wires on one side.

⃠ Do not terminate different gauge wires to a terminal block.

⚠WARNING

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

Note:

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

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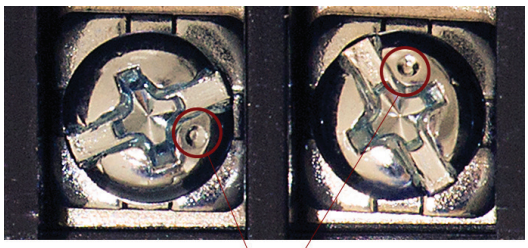
ELECTRICAL

Connections and Specifications

LG Terminal 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. ⃠ Do not over tighten the connections — over tightening will damage the terminals — but firmly and securely attach the wiring in a way to prevent external forces from being imparted to the terminal block.

Figure 73: 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 only) are wired in relation to the outdoor unit.*
- ⃠ *Do not include splices or wire nuts in the communication cable.*

Power Supply / Power Wiring Specifications

- Multi F and Multi F MAX systems operate at 1Ø, 208-230V, 60Hz, and power is wired to the outdoor unit only. The outdoor unit will supply power to the indoor units and the branch distribution units (Multi F MAX systems only) 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.
- Power wiring to the outdoor unit(s) must be solid or stranded, and must comply with all local and national electrical codes.
- Properly ground the outdoor unit and indoor unit per NEC and local codes.
- Ground wire must be longer than the common power / communication wires.
- Connect the wiring firmly so the wires cannot be easily pulled out.
- Refer to the inside of the chassis cover or control cover for circuit and terminal block diagrams.
- Always match color codes of each wire and follow wiring diagram.
- ⃠ Do not install power wiring to the outdoor unit and the communication / connection (power) cable to the indoor unit in the same conduit. Use separate conduits.

Figure 75: Multi F / Multi F MAX Outdoor Unit Power Wiring.

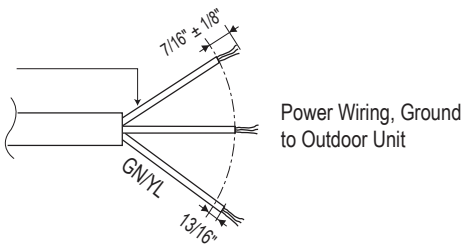
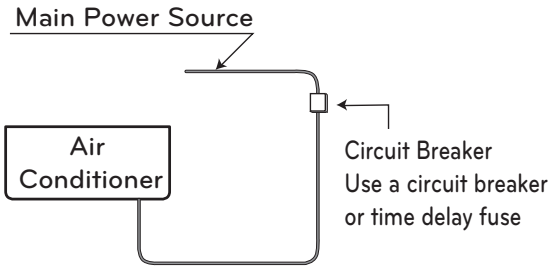


Table 32: Circuit Breaker / Fuse Size.

Outdoor Unit Model	Power Source	Fuse or Breaker Capacity
LMU18CHV, LMU24CHV	1Ø, 208-230V	20A
LMU30CHV, LMU36CHV	1Ø, 208-230V	25A
LMU480HV, LMU540HV	1Ø,208-230V	40A
LMU600HV	1Ø, 208-230V	45A

Figure 74: Circuit Breaker



⚠ WARNING

- *Always have a trained service provider properly ground the outdoor unit. If the outdoor unit is not properly grounded, there is a risk of electric shock, physical injury, or death.*
- *Provide a circuit breaker between the power source and the outdoor unit. Failure to do so will cause bodily injury or death.*

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Communication / Connection (Power) Cable Specifications

- Multi F Systems:
  - Communication / connection (power) cable from the outdoor unit to the indoor unit for lengths up to 130 feet must use a minimum of 14 AWG, four (4) conductor, 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.
  - When the communication / connection (power) wires between the indoor unit and outdoor unit is GREATER THAN 130 feet, use:
    - A two (2) conductor wire for power (for each indoor unit).
    - A two (2) conductor wire for communication / ground (for each indoor unit).
    - Separate the power AT LEAST two (2) inches away from the communication / ground wire (for each indoor unit).
    - All wiring is still minimum 14 gauge, stranded, shielded, or unshielded as cited above (for each indoor unit).
- Multi F MAX Systems:
  - All communication / connection (power) cable from the outdoor unit to the branch distribution unit(s) must be a minimum of 14 AWG, four (4) conductor, 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.
  - Communication / connection (power) cable from the branch distribution unit(s) to the indoor units for lengths up to 130 feet must use a minimum of 14 AWG, four (4) conductor, 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.
  - When the communication / connection (power) wires between the branch distribution unit and indoor unit is GREATER THAN 130 feet, use:
    - A two (2) conductor wire for power (for each indoor unit).
    - A two (2) conductor wire for communication / ground (for each indoor unit).
    - Separate the power AT LEAST two (2) inches away from the communication / ground wire (for each indoor unit).
    - All wiring is still minimum 14 gauge, stranded, shielded, or unshielded as cited above (for each indoor unit).
- Insulation material as required by local code.
- Rated for continuous exposure of temperatures up to 140°F.
- Firmly attach the cable; provide slack but secure in a way to prevent external forces from being imparted on the terminal block.
- Wiring must be completed without splices.

Figure 76: Typical Multi F / Multi F MAX Outdoor and Indoor / Branch Distribution Unit Wiring and Communications Cable Diagram For Wiring Lengths Up to 130 Feet.

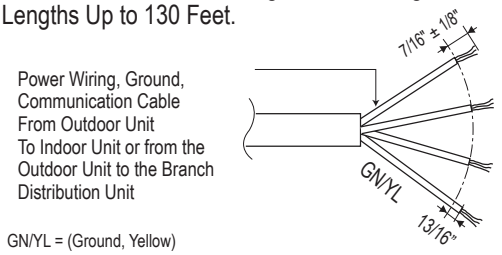
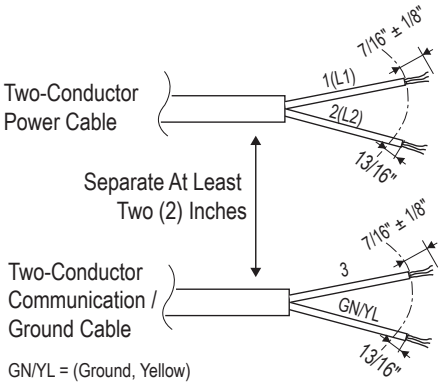


Figure 77: Multi F Outdoor Unit to Indoor Unit, and Multi F MAX Branch Distribution Unit to Indoor Unit Wiring Diagram for Wiring Lengths GREATER THAN 130 Feet.



Note:

- *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.*
- ⃠ *Never ground the shield of the communications cable to the indoor unit frame or other grounded entities of the building. Ground the communications cable shield only at the outdoor unit. Improperly grounding this cable can cause communications errors.*
- *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.*

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Connections and Specifications

Figure 78: Typical Multi F System General Power / Communications System Schematic When Wiring is Less Than 130 Feet.

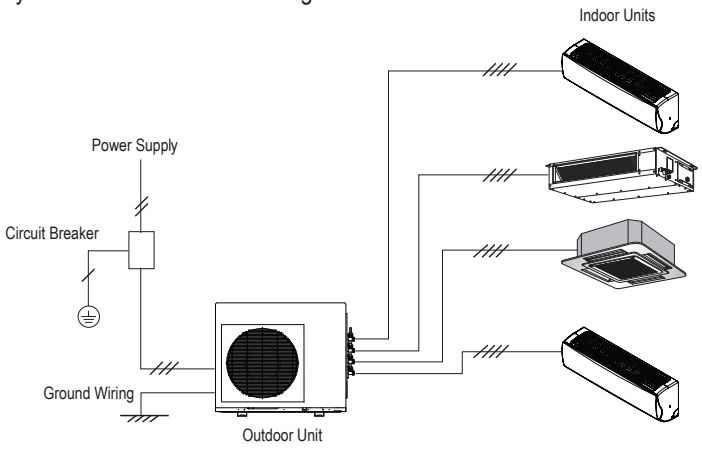


Figure 79: Typical Multi F MAX System General Power / Communications System Schematic When Wiring is Less Than 130 Feet.

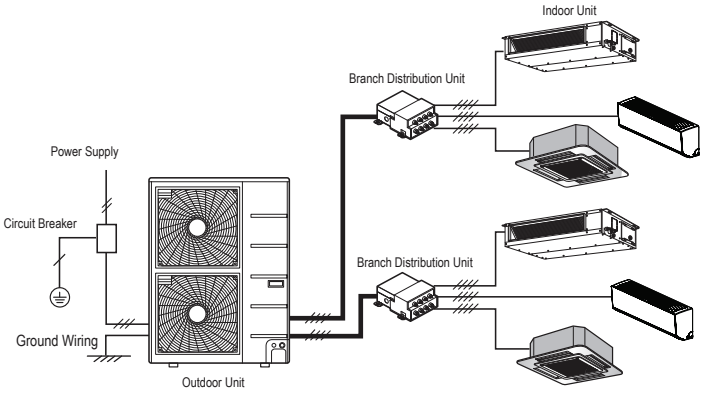
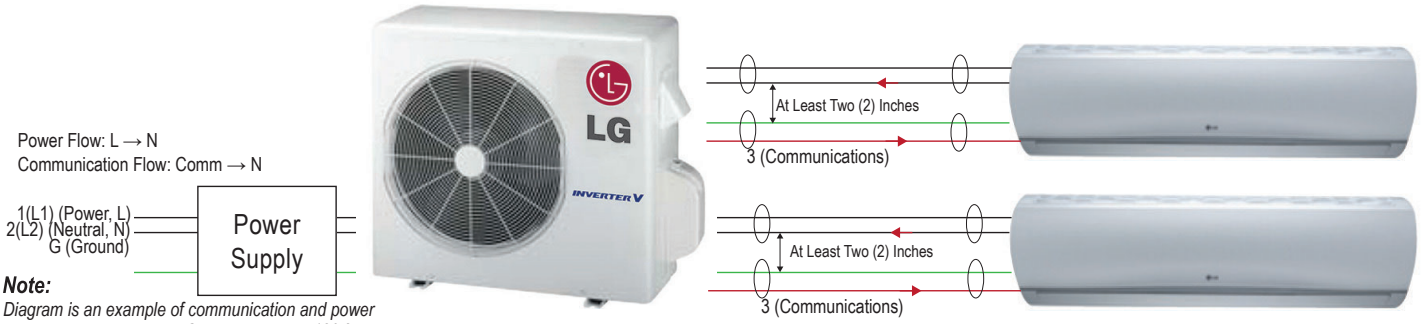


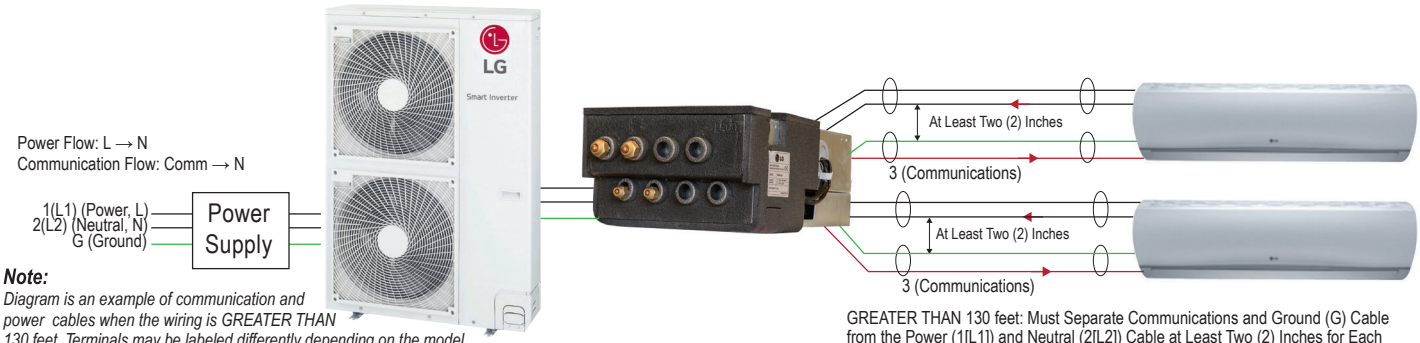
Figure 80: Schematic of a Multi F System When the Wiring is GREATER THAN 130 Feet.



Note:
Diagram is an example of communication and power cables when the wiring is GREATER THAN 130 feet. Terminals may be labeled differently depending on the model. Outdoor and Indoor Unit appearances may vary depending on the model.

GREATER THAN 130 feet: Must Separate Communications and Ground (G) Cable from the Power (1[L1]) and Neutral (2[L2]) Cable at Least Two (2) Inches for Each Indoor Unit

Figure 81: Schematic of a Multi F MAX System When the Wiring is GREATER THAN 130 Feet.



Note:
Diagram is an example of communication and power cables when the wiring is GREATER THAN 130 feet. Terminals may be labeled differently depending on the model. Outdoor and Indoor Unit appearances may vary depending on the model.

GREATER THAN 130 feet: Must Separate Communications and Ground (G) Cable from the Power (1[L1]) and Neutral (2[L2]) Cable at Least Two (2) Inches for Each Indoor Unit.

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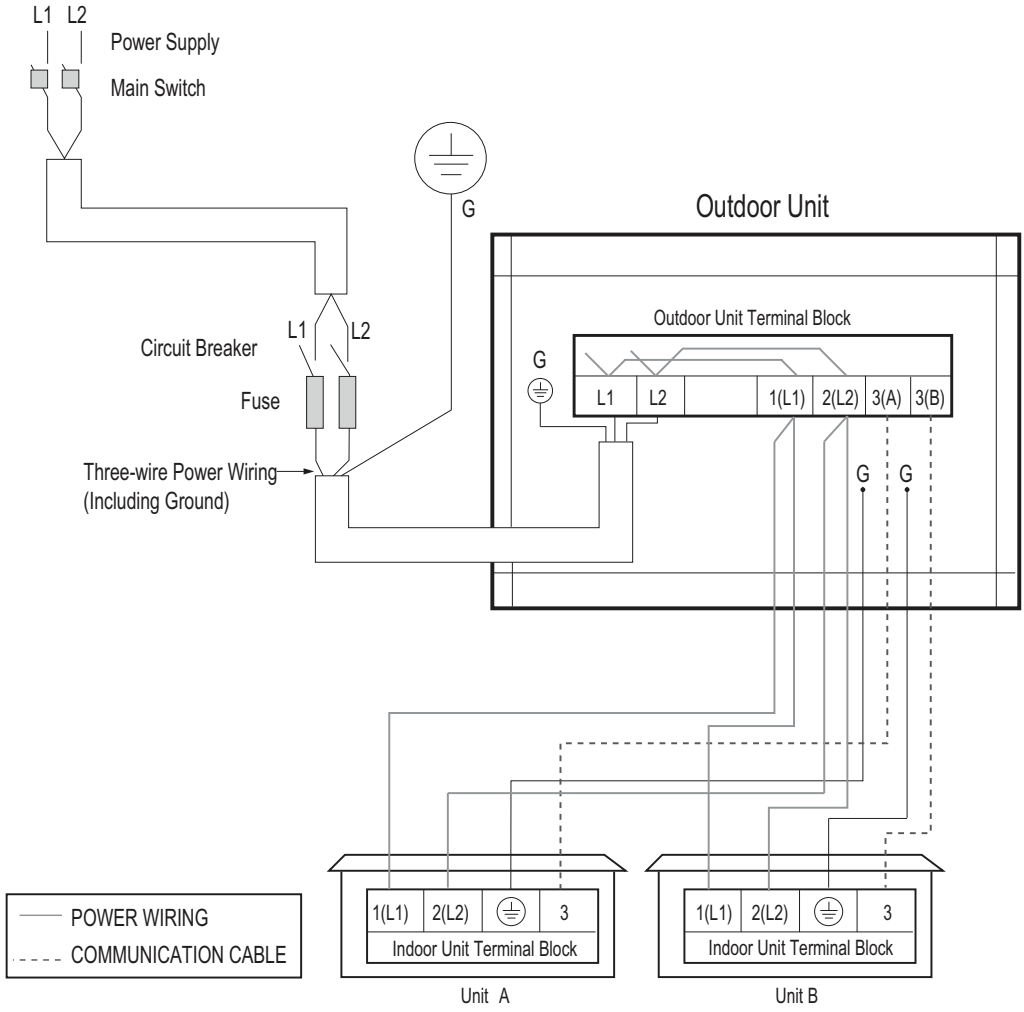
Figure 82: Multi F LMU18CHV System Power Wiring and Communications Cable.



⚠ WARNING

- *All field-supplied wiring, components, and materials must comply with all applicable national, state, and local codes and requirements. Improper wiring will result in fire, electric shock, physical injury or death.*
- *Ground wiring is required to prevent accidental electrical shock during current leakage, communication problems from electrical noise, and motor current leakage. ⃠ Do not connect the ground line to the pipes. There is a risk of fire, electric shock, explosion, physical injury or death.*
- *Install a main shutoff switch or circuit breaker that interrupts all power sources simultaneously. There is a risk of fire, electric shock, explosion, physical injury or death.*

Note:

- *All field-supplied wiring, components, and materials must comply with all applicable national, state, and local codes and requirements. Failure to install proper electrical components can result in property damage and equipment malfunction.*
- *Ground wiring is required to prevent communication problems from electrical noise, and motor current leakage. Failure to provide proper ground wiring can result in property damage and equipment malfunction.*
- *Install a main shutoff switch or circuit breaker that interrupts all power sources simultaneously. Failure to install proper electric components can result in property damage and equipment malfunction.*
- *Maintain polarity throughout the communication network. The system will malfunction if not properly wired.*

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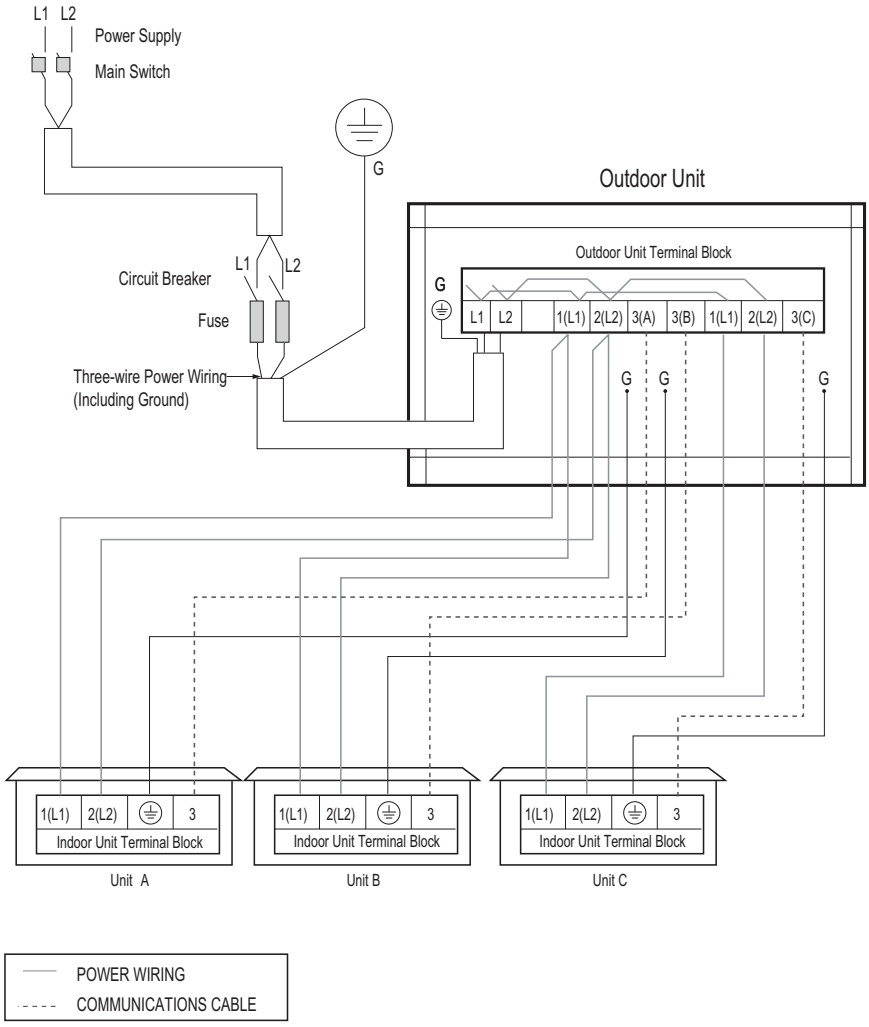
Figure 83: Multi F LMU24CHV System Power Wiring and Communications Cable.



⚠ WARNING

- *All field-supplied wiring, components, and materials must comply with all applicable national, state, and local codes and requirements. Improper wiring will result in fire, electric shock, physical injury or death.*
- *Ground wiring is required to prevent accidental electrical shock during current leakage, communication problems from electrical noise, and motor current leakage. ⃠ Do not connect the ground line to the pipes. There is a risk of fire, electric shock, explosion, physical injury or death.*
- *Install a main shutoff switch or circuit breaker that interrupts all power sources simultaneously. There is a risk of fire, electric shock, explosion, physical injury or death.*

Note:

- *All field-supplied wiring, components, and materials must comply with all applicable national, state, and local codes and requirements. Failure to install proper electrical components can result in property damage and equipment malfunction.*
- *Ground wiring is required to prevent communication problems from electrical noise, and motor current leakage. Failure to provide proper ground wiring can result in property damage and equipment malfunction.*
- *Install a main shutoff switch or circuit breaker that interrupts all power sources simultaneously. Failure to install proper electric components can result in property damage and equipment malfunction.*
- *Maintain polarity throughout the communication network. The system will malfunction if not properly wired.*

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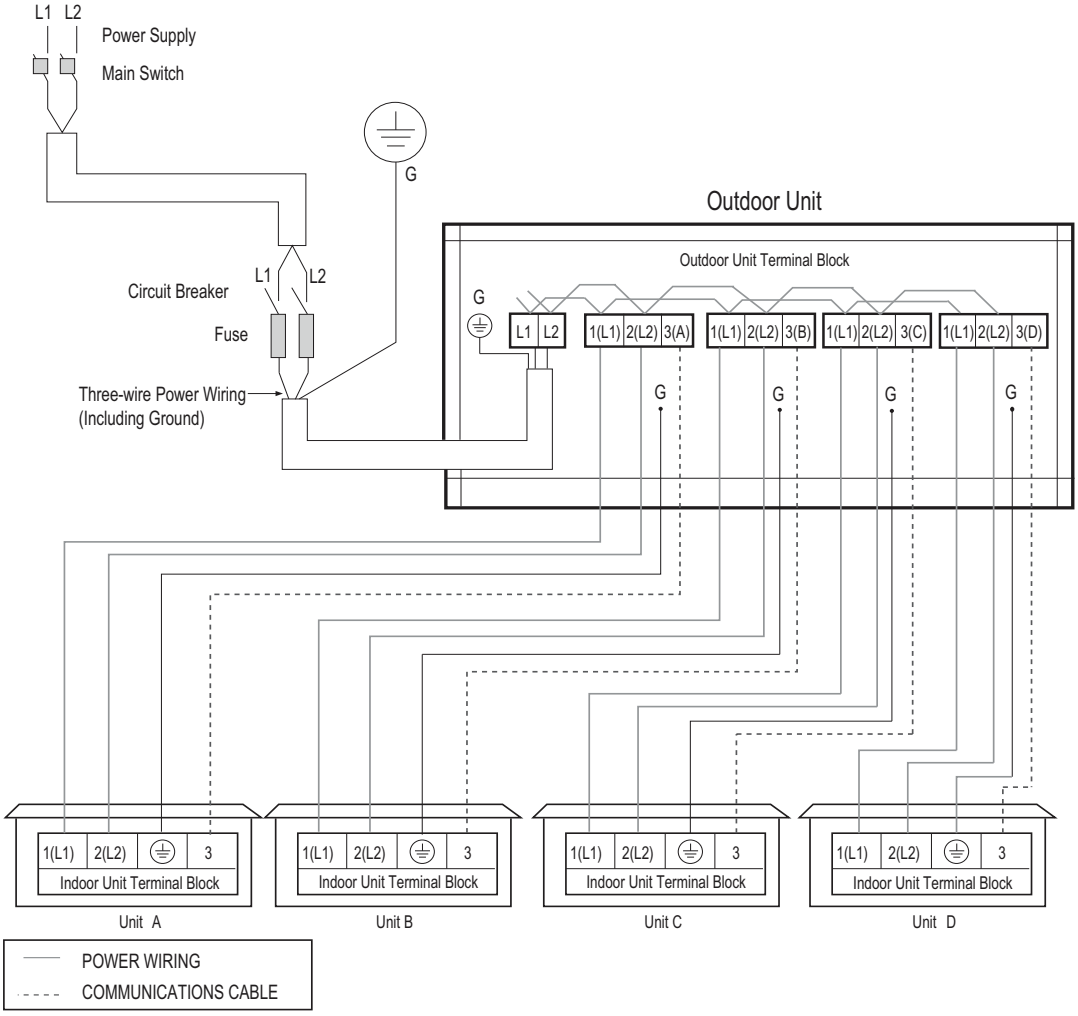
Figure 84: Multi F LMU30CHV and LMU36CHV System Power Wiring and Communications Cable.



⚠ WARNING

- *All field-supplied wiring, components, and materials must comply with all applicable national, state, and local codes and requirements. Improper wiring will result in fire, electric shock, physical injury or death.*
- *Ground wiring is required to prevent accidental electrical shock during current leakage, communication problems from electrical noise, and motor current leakage. ⃠ Do not connect the ground line to the pipes. There is a risk of fire, electric shock, explosion, physical injury or death.*
- *Install a main shutoff switch or circuit breaker that interrupts all power sources simultaneously. There is a risk of fire, electric shock, explosion, physical injury or death.*

Note:

- *All field-supplied wiring, components, and materials must comply with all applicable national, state, and local codes and requirements. Failure to install proper electrical components can result in property damage and equipment malfunction.*
- *Ground wiring is required to prevent communication problems from electrical noise, and motor current leakage. Failure to provide proper ground wiring can result in property damage and equipment malfunction.*
- *Install a main shutoff switch or circuit breaker that interrupts all power sources simultaneously. Failure to install proper electric components can result in property damage and equipment malfunction.*
- *Maintain polarity throughout the communication network. The system will malfunction if not properly wired.*

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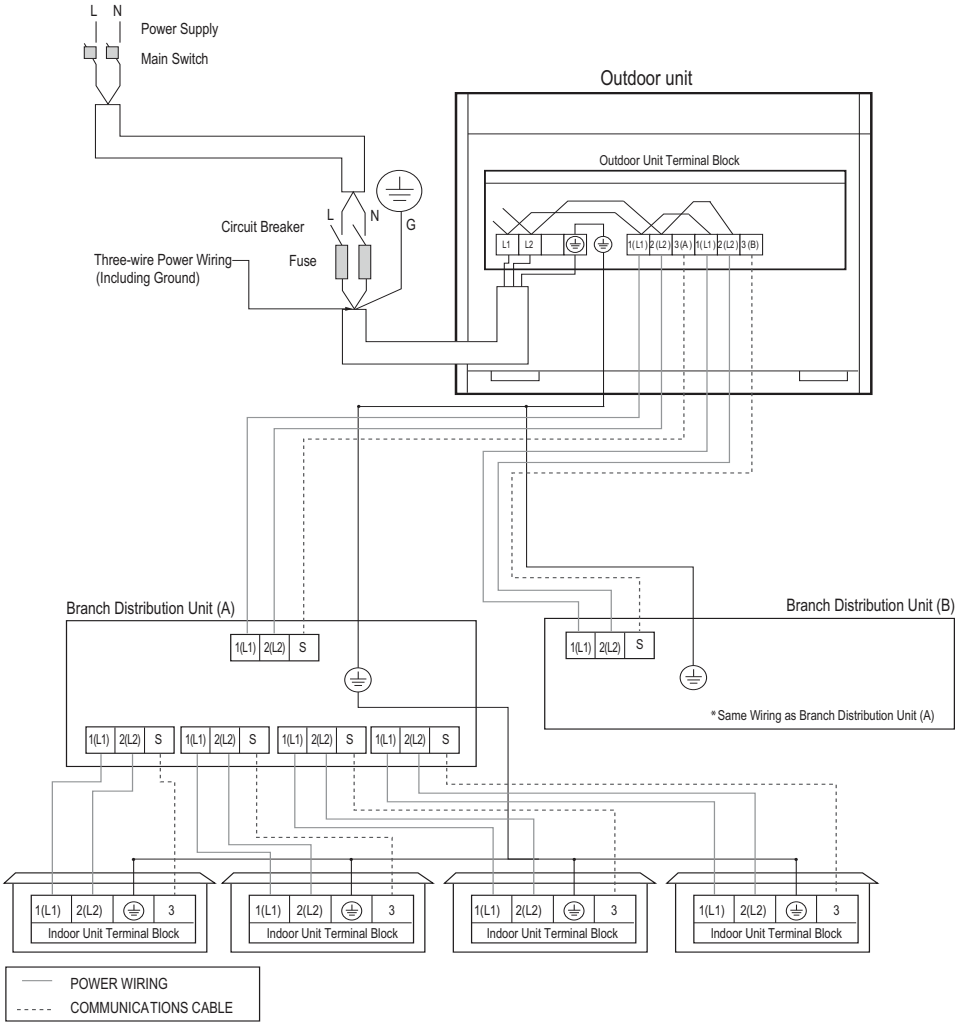
Installation

Figure 85: Multi F MAX LMU480HV and LMU540HV System Power Wiring and Communications Cable.



⚠ WARNING

- *All field-supplied wiring, components, and materials must comply with all applicable national, state, and local codes and requirements. Improper wiring will result in fire, electric shock, physical injury or death.*
- *Ground wiring is required to prevent accidental electrical shock during current leakage, communication problems from electrical noise, and motor current leakage. ⃠ Do not connect the ground line to the pipes. There is a risk of fire, electric shock, explosion, physical injury or death.*
- *Install a main shutoff switch or circuit breaker that interrupts all power sources simultaneously. There is a risk of fire, electric shock, explosion, physical injury or death.*

Note:

- *All field-supplied wiring, components, and materials must comply with all applicable national, state, and local codes and requirements. Failure to install proper electrical components can result in property damage and equipment malfunction.*
- *Ground wiring is required to prevent communication problems from electrical noise, and motor current leakage. Failure to provide proper ground wiring can result in property damage and equipment malfunction.*
- *Install a main shutoff switch or circuit breaker that interrupts all power sources simultaneously. Failure to install proper electric components can result in property damage and equipment malfunction.*
- *Maintain polarity throughout the communication network. The system will malfunction if not properly wired.*

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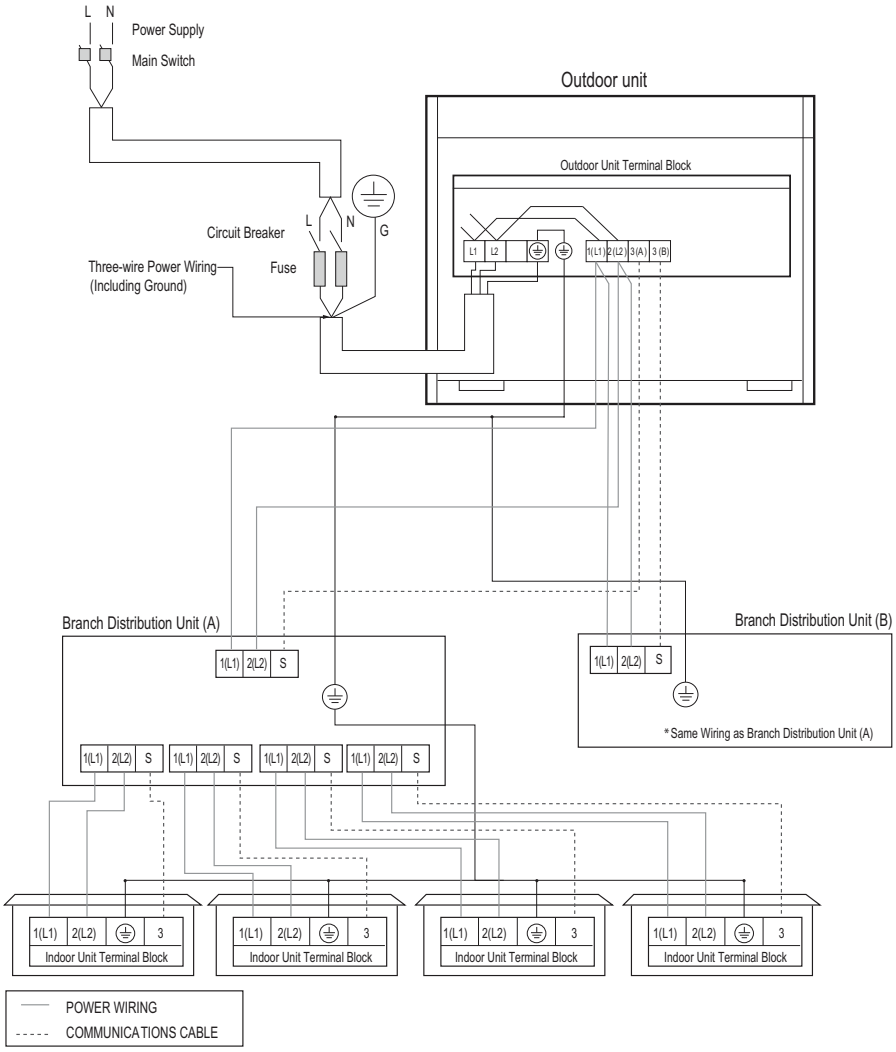
Figure 86: Multi F MAX LMU600HV System Power Wiring and Communications Cable.



⚠ WARNING

- *All field-supplied wiring, components, and materials must comply with all applicable national, state, and local codes and requirements. Improper wiring will result in fire, electric shock, physical injury or death.*
- *Ground wiring is required to prevent accidental electrical shock during current leakage, communication problems from electrical noise, and motor current leakage. ⃠ Do not connect the ground line to the pipes. There is a risk of fire, electric shock, explosion, physical injury or death.*
- *Install a main shutoff switch or circuit breaker that interrupts all power sources simultaneously. There is a risk of fire, electric shock, explosion, physical injury or death.*

Note:

- *All field-supplied wiring, components, and materials must comply with all applicable national, state, and local codes and requirements. Failure to install proper electrical components can result in property damage and equipment malfunction.*
- *Ground wiring is required to prevent communication problems from electrical noise, and motor current leakage. Failure to provide proper ground wiring can result in property damage and equipment malfunction.*
- *Install a main shutoff switch or circuit breaker that interrupts all power sources simultaneously. Failure to install proper electric components can result in property damage and equipment malfunction.*
- *Maintain polarity throughout the communication network. The system will malfunction if not properly wired.*

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Connecting the Communications / Connection (Power) Cables

1. Detach the outdoor unit panels by loosening the screws.
2. Remove the control cover (if applicable) by loosening the screws.
3. Remove the conduit knock outs or access holes.
4. Pull the power wiring, and the communications / connection (power) cable into the outdoor unit (through the conduits, if applicable). Ensure there is enough length to connect to the terminals on the outdoor unit. Secure any conduits with field-supplied lock nuts.
5. Connect the power wiring, and the communications / connection (power) cable to the correct terminals on the outdoor unit.
6. Connect communications / connection (power) cable to the correct control board terminals on the indoor unit (or branch distribution unit[s] if Multi F MAX system).
7. Follow the wiring diagrams on the outdoor unit and indoor units (or branch distribution unit[s]) control covers. Ensure that the terminal board numbers and wiring color on the outdoor unit matches the terminal number and wiring color on the indoor unit or branch distribution unit(s).
8. Provide strain relief and help protect the connections by (separately) securing the wiring / cable to the outdoor unit with the factory-supplied clamps (up to 35 lbs.). Clamps are included near the terminal block. Zip ties can also be used to hold all cables in place.
9. For more installation information for specific indoor units, refer to the separate indoor unit installation manuals on www.lghvac.com.
10. When all connections are complete, reattach the control cover to its original position using the screws, then reinstall the outdoor unit panel.
11. After installation is complete, seal any gaps around the wiring in the panel access holes or the conduits.

Figure 87: Connecting the Power Wiring / Communications Cables to the Outdoor Unit (LMU18~36CHV; LMU480, 540HV).

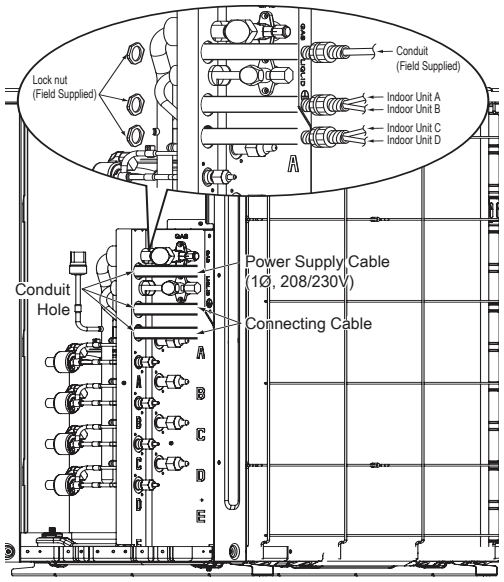
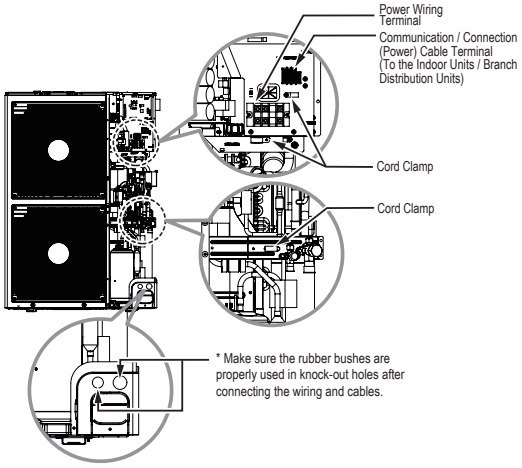


Figure 88: Connecting the Power Wiring / Communications Cables to the Outdoor Unit (LMU600HV).



⚠ WARNING

- *Always have a trained technician properly ground the outdoor unit. If the outdoor unit is not properly grounded, there is a risk of electric shock, physical injury, or death.*
- *Failure to properly install wiring can result in electric shock, fire, physical injury or death.*
- *Failure to properly provide a NEC-approved earth ground can result in electric shock, fire, physical injury or death.*
- *Comply with local and national codes while running the wire from the indoor unit (and branch distribution units if Multi F MAX system) to the outdoor unit (size of wire and wiring method, etc). Incorrectly sized wiring will cause the terminal to overheat, generate a fire, and risk physical injury or death.*
- *All wiring / cable must be firmly connected to its terminal. Loose wiring will cause the terminal to overheat, generate a fire, and risk physical injury or death.*
- ⃠ *Do not allow the wiring / cable to touch refrigerant tubing, the compressor, or any moving parts. It can result in electric shock, fire, physical injury or death.*
- *Replace all control box and panel covers. If cover panels are not installed securely, dust, water and animals will enter the outdoor unit, causing fire, electric shock, and physical injury or death.*

Note:

- *Ensure the communications / connection (power) cable from the outdoor units to the indoor / branch distribution units, and the power wiring to the outdoor unit are separate; otherwise, the outdoor unit operation will be affected by electrical noise and will malfunction or fail.*
- *The communications / connection (power) cable from the outdoor unit to the indoor / branch distribution units must be separated and isolated from power wiring to the outdoor unit, computers, elevators, radio and television broadcasting facilities, as well as medical imaging equipment; otherwise, the outdoor unit operation will be affected by electrical noise and will malfunction or fail.*
- *All wiring / cable must be firmly connected to its terminals. Loose wiring will result in unit malfunction.*

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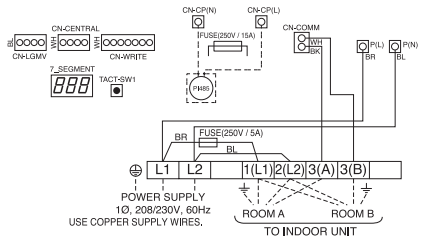
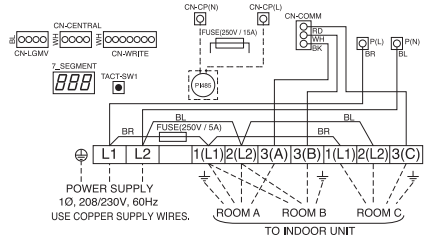
Figure 89: Detailed Diagrams of Outdoor Unit PCB Terminal Connections.

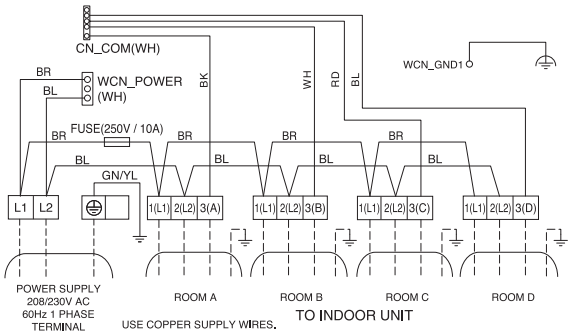
Multi F LMU18CHV



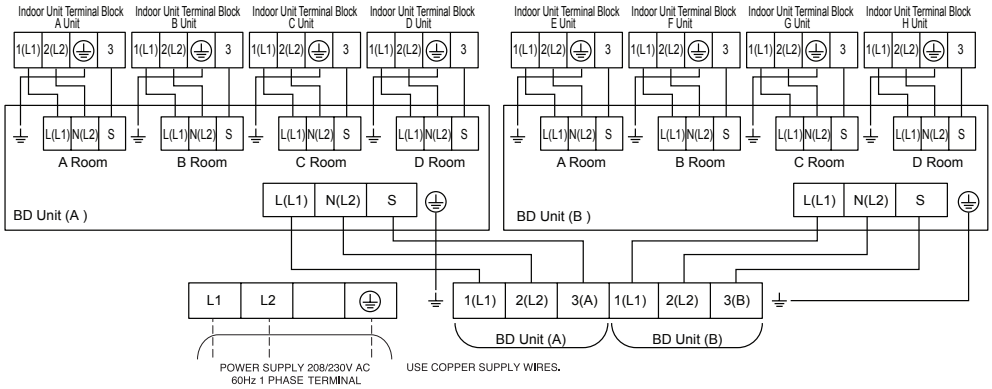
Multi F LMU24CHV



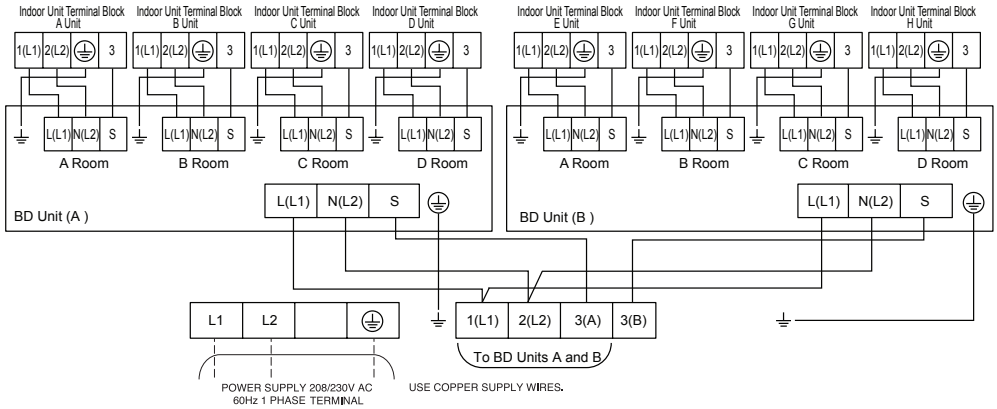
Multi F LMU30CHV and LMU36CHV



Multi F MAX LMU480HV and LMU540HV



Multi F MAX LMU600HV



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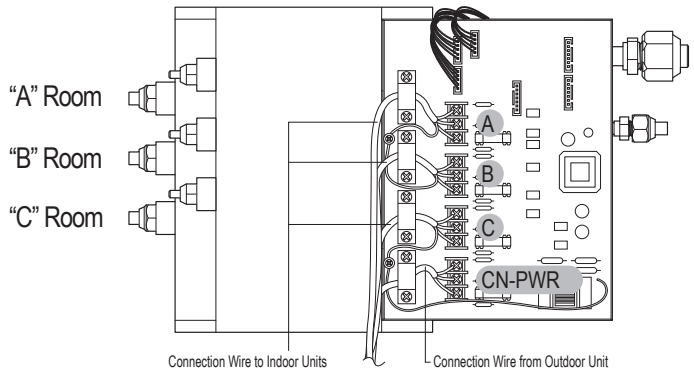
Connecting the Communications / Connection (Power) Cable to the Branch Distributor Unit (Multi F MAX Systems Only)

General Instructions

- Always connect power wiring / communications cable matching the branch distribution unit terminals to their respective indoor units (Example for three-port branch distribution unit PMBD3630: A, B, and C).
- Follow the instructions on the nameplates and connect wiring / cables of the outdoor unit and indoor units to the correct terminals. Always attach each ground wire separately to a grounding screw.
- After completion, secure wiring with wire clamps. Secure wiring firmly to the indoor unit.

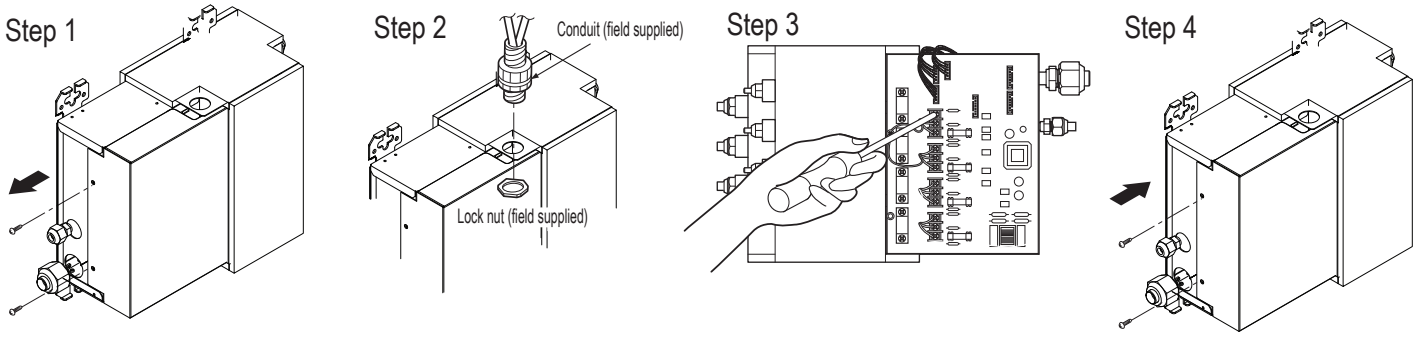
Figure 90: Interior View of a Branch Distribution Unit (Three-Port PMBD3630 Example Shown).



Branch Distribution Unit Wiring Connection Procedure

1. Remove the branch distribution unit control cover. Unscrew the two (2) screws, and slide the cover off the branch distribution frame following the arrows in the diagram (Step 1).
2. Draw the communications / connection (power) cable from the outdoor unit so there is enough length to connect to the terminals on the branch distribution unit. Secure a field -supplied conduit to the branch distribution unit using a field-supplied lock nut on the interior of the branch distribution unit frame (Step 2). Pull the communication / connection (power) cable through the conduit into the branch distribution unit.
3. Connect communications / connection (power) cable from the outdoor unit to the branch distribution unit terminals, and from the branch distribution unit terminals to the indoor unit terminals following the wiring diagram on the outdoor unit control cover (Step 3). Allow 11-13/16 inches of slack in the wire harness. Attach communications / connection (power) cable to the branch distribution unit with clamps at four (4) locations.
4. Replace the branch distribution unit control cover following the arrows in the diagram. Tighten the two (2) screws to finish (Step 4).

Figure 91: Branch Distribution Unit Wiring Steps.



⚠ WARNING

⃠ *Do not use tapped wires, stand wires, extension cords, or starburst-type connections as they will cause overheating, fire, electric shock, physical injury or death.*

Note:

Always refer to the circuit diagram on the inside of the outdoor unit control cover.

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PI-485

PI-485 V-net Control Integration Board for Outdoor Units adapt Multi F / Multi F MAX systems to a LG VRF system central protocol for integration with LG central controllers. The PI-485 is installed in the Multi F / Multi F MAX outdoor unit. For more information on PI-485 installation, see the PI-485 installation manual.

Figure 92: PI-485 Board (Appearance will differ depending on model).

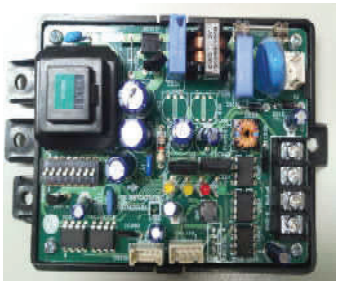
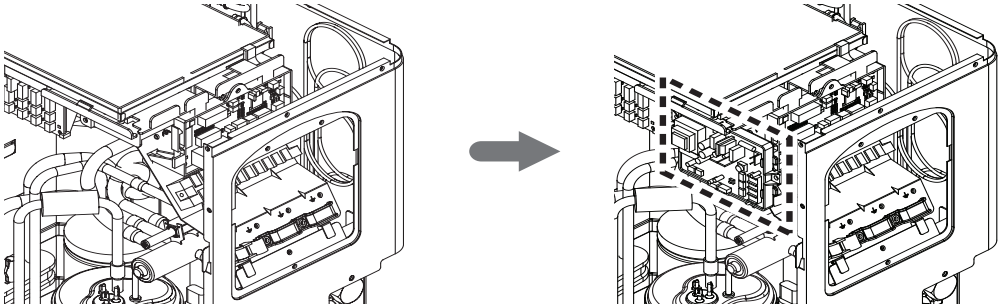
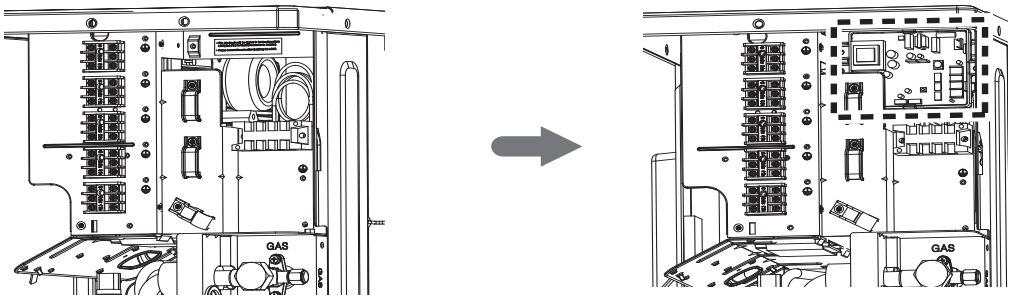


Figure 93: PI-485 Installation Area in Multi F and Multi F MAX Outdoor Units.

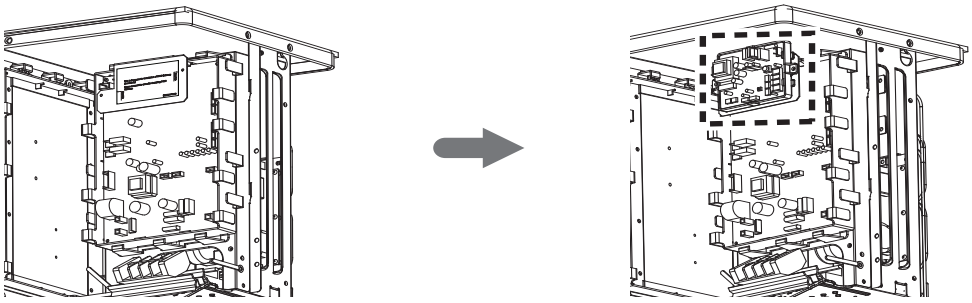
Multi F LMU18CHV, LMU24CHV



Multi F LMU30CHV, LMU36CHV



Multi F MAX LMU480HV, LMU540HV



Multi F MAX LMU600HV

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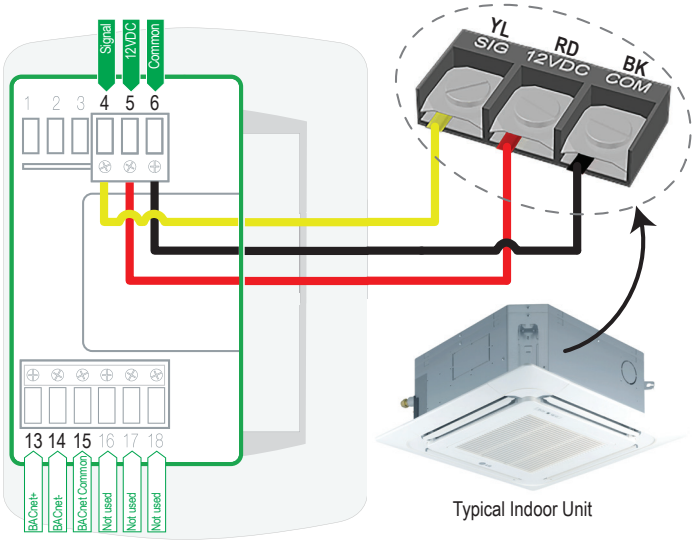
ELECTRICAL

Installation

From Indoor Units to Remote Controllers

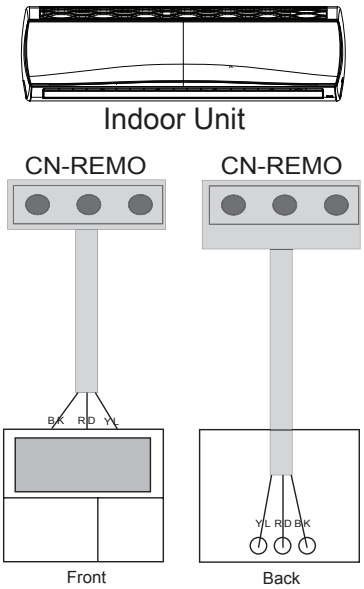
- Communication cable from indoor unit to remote controller(s) is to be LG supplied or field supplied 22 AWG, 3-conductor, twisted, stranded, unshielded. Wiring must comply with all applicable local and national codes.
- If using the LG supplied cable and the length needs to be extended, the LG Extension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

Figure 94: One Example of Indoor Unit to Zone Controller Connection.



Typical Indoor Unit

Figure 95: Another Example of Indoor Unit to Zone Controller Connection.



Note:

Cable connected to Zone Controller is the factory default connection.

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Between Multiple Indoor Units Operating as a Group (Group Control)

If any indoor units were specified to operate in unison:

- Before running cable, decide which indoor unit will be the "Master." The other indoor units in that group will be designated as "Slave(s)." The zone controller will be connected to the "Master."
- Set the pertinent DIP switch at each indoor unit to identify the Master and Slave(s). On wall mounted indoor unit models, set the assignment using the handheld remote controller.
- Use a daisy chain configuration and connect all of the group's indoor units together starting at the "Master" unit.
- ⃠ NEVER splice, cut, or extend cable length with field provided cable. Always include enough cable to cover distance between all components.

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

- From the controller to the master indoor unit, use 22 AWG, 3-conductor, twisted, stranded, unshielded. All wiring must comply with all applicable local / national codes.
- From the master indoor unit to the slave indoor unit(s), daisy chain using 22 AWG, 3-conductor, twisted, stranded, unshielded. All wiring must comply with all applicable local / national codes.
- (⃠ Do not attach wire to 12VDC terminal to the slave indoor units). All wiring must comply with all applicable local and national codes.
- ⃠ NEVER splice, cut, or extend cable length; always include enough cable to cover distance between all components.

For indoor units with CN-REMO connections:

Use one (or multiple) Group Control Kit(s) (sold separately) containing extension and Y-splitter cables. Use one (1) group control cable kit for each indoor unit in the group except for the last indoor unit. ⃠ NEVER splice, cut, or extend cable length with field provided cable.

Figure 96: Example of Indoor Unit Group to Zone Controller Connections (Sig-12V-GND [Comm.] Terminal).

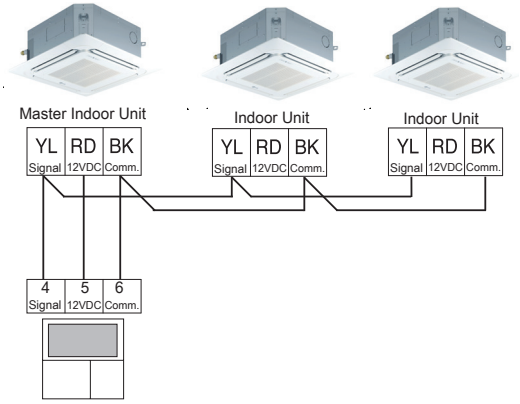

Figure 97: Example of Indoor Unit Group to Zone Controller Connections (CN-REMO).

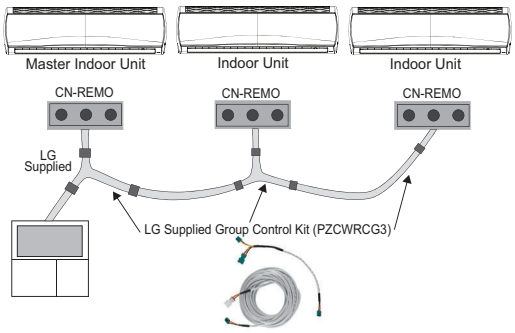

Table 33: Accessories for Some Group Control Applications.

Accessory	Model Number	Image
Wired Remote Group Control Cable Assembly, Required for connecting multiple indoor units to a control group	PZCWRCG3	
Wired Remote/Wired Remote Extension Cable, Required for extending the distance between indoor units or remote controllers in a control group	PZCWRC1	

Note:

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

General Specifications

- Wired remote controllers can be connected to all indoor unit types.
- Wireless controllers can be used in conjunction with wired remote controllers.
- A dry contact unit can be connected with a central controller simultaneously.
  - The master indoor unit is recognized by the dry contact unit and the central controller.
  - Group Control only available for indoor units manufactured after February 2009.
  - The central controller can control indoor units after setting the address of the master indoor unit only.
  - Slave indoor unit cannot be individually controlled by central controller.
  - Slave indoor unit will operate like master indoor unit.
- If an error occurs with the indoor unit, the error will be displayed on the wired remote controller.
- The following functions are available with group control:
- Selection of operation options (operation/mode/set temperature)
- Control of air flow rate (High/Medium/Low)

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FINAL INSTALLATION PROCEDURES

Triple Leak / Pressure Test

Triple Leak / Pressure Test

After the refrigerant piping installation is complete, perform a triple leak / pressure test. Triple leak / pressure test is performed between the outdoor unit and indoor units (and branch distribution units [Multi F MAX only]) to verify that refrigerant can flow through the system without danger of leaks or pressure losses. Air and moisture that is left in the piping can lead to undesirable results and can cause damage to the system. It is important to go through a complete leak / pressure cycle to be sure that the refrigerant piping is cleared out. This process will have to be repeated if any air or moisture be is found to remain in the piping.

Note:

Insufficient or incorrectly done air purging will lead to the following:

- *Pressure in the system can rise.*
- *Operating current can rise.*
- *Inefficient cooling or heating mode capability.*
- *Moisture in the refrigerant circuit will freeze and block capillary tubing.*
- *Water can lead to corrosion of parts in the system.*

⚠DANGER

Using combustible gases, including oxygen will result in fire or explosion, resulting in personal injury or death. Use inert gas (medical-grade dry nitrogen) when checking leaks, cleaning, installing/repairing pipes, etc. The use of at least 800 psig nitrogen regulator is required for safety.

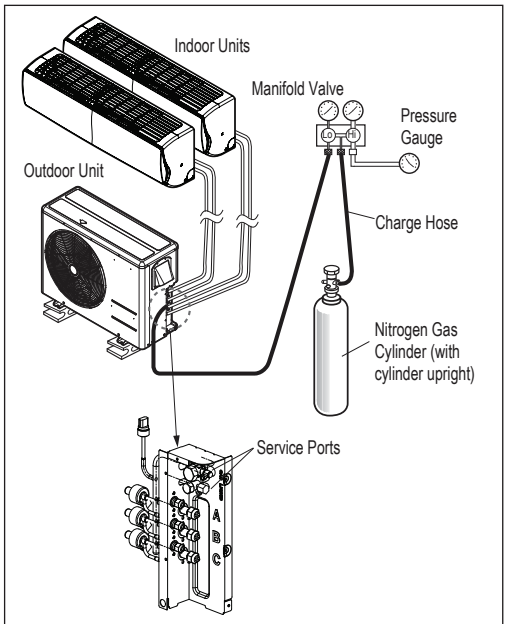
Note:

- *⃠ Do not apply power to the system before performing a system leak test. There is a possibility that the EEV valve will close and isolate sections of the piping system, making the leak test inconclusive.*
- *⃠ Never perform the leak test using refrigerant.*
- *To avoid nitrogen entering the refrigerant system in a liquid state, the top of the cylinder must be higher than its bottom (used in a vertical standing position) when the system is pressurized.*
- *Use only a leak-free gauge manifold set.*
- *Piping system must not be pressured to more than 550 psi. Pressures greater than 550 psi will damage the piping system and cause unit malfunction.*

Triple Leak / Pressure Check Procedure

1. After the refrigerant piping installation is complete, open the isolation ball valves, if any, that could have been included in the piping system.
2. Verify that both the liquid and gas (vapor) suction line outdoor unit service ports are closed, and the stem head access caps are tight. The leak / pressure check is to be performed only to the refrigerant piping system, and all connected indoor units and branch distribution units (Multi F MAX units only).
3. Remove the caps on both the liquid and gas (vapor) suction Schrader ports. Connect the (medical-grade dry) nitrogen cylinder regulator to a gauge manifold, then connect the gauge manifold to the Schrader ports on the service ports.
4. Perform the leak / pressure check at 150 psig for fifteen (15) minutes (standing pressure check).
5. Perform the leak / pressure check at 300 psig for thirty (30) minutes (standing pressure check).
6. 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. Also test for leaks at both service valves.

Figure 98: Triple Leak / Pressure Test Diagram.



Appearances will vary depending on model.

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FINAL INSTALLATION PROCEDURES

Triple Leak / Pressure and Deep Evacuation Tests

Triple Leak / Pressure Check Procedure, continued.

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

7. If the pressure does NOT drop for one (1) hour, the system passes the test.

8. 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.

9. After the system has been thoroughly tested and no leaks are found, depressurize by loosening the charging hose connector at the nitrogen cylinder regulator. When system pressure returns to normal, completely disconnect the charging hose from the cylinder, and release the nitrogen charge from all refrigerant piping. Wipe off any remaining bubble solution with a clean cloth.

Deep Evacuation Procedure

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. On Multi F MAX systems, the triple evacuation procedure (seen on page 78) must be performed. Deep evacuation must be performed through the Schrader ports on the outdoor unit service ports.

Note:
The triple evacuation procedure seen on page 78 is a best practices recommendation for Multi F systems, but mandatory for Multi F MAX systems.

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

- Deep evacuate through both the liquid and gas (vapor) suction Schrader ports on the outdoor unit service ports.
- The outdoor unit service valves must remain closed and the stem head access caps tight. ⃠ Do not open the outdoor unit service valves and release the factory refrigerant charge until trim charge is complete, and the system is ready to operate.
- Any field-installed ball valves in the refrigerant system (if used) must be open to ensure all piping is free and clear for deep evacuation on all piping and connected indoor units.

Note:
- ⃠ *Do not apply power to the system before performing the deep evacuation procedure. There is a possibility that the EEV valve will close and isolate sections of the piping system, making the deep evacuation procedure inconclusive.*
- ⃠ *Never perform evacuation using refrigerant.*
- *Use only a vacuum pump that can reach 500 microns, vacuum rated hoses or copper tubing, and a leak-free gauge manifold set.*
- *Use only new vacuum pump oil from a properly sealed (unopened) container, and change oil in pump before EVERY use.*
- *Subsequent oil changes will be necessary after several hours of continuous operation; have extra oil on hand.*
- *Use a quality micron gauge in good operating order and install as far away from pump as possible.*

Deep Evacuation Procedure Steps

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

2. Connect the gauge manifold along with the vacuum pump to the liquid and gas (vapor) suction Schrader ports (with core removed) using a vacuum hose. Open the gauge manifold and the vacuum pump valves.

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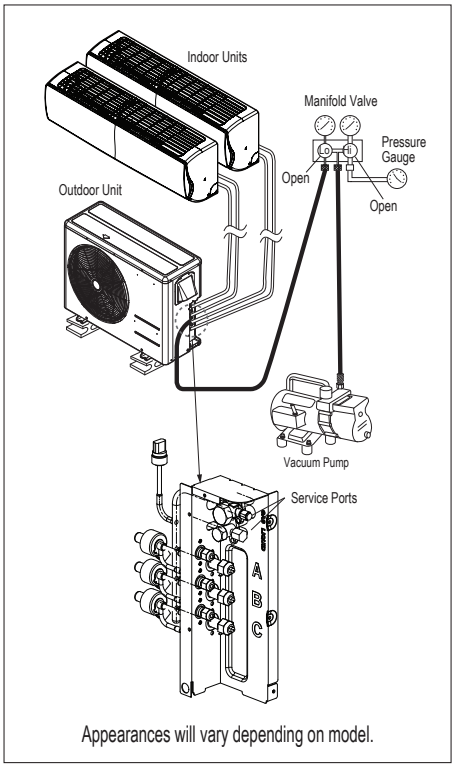
FINAL INSTALLATION PROCEDURES

Deep Evacuation / Triple Evacuation Tests

Deep Evacuation Procedure, continued.

3. Evacuate to static micron level ≤500 for at least one (1) hour.
4. Micron level must remain ≤500 for two (2) hours. If the vacuum gauge rises and stops, the system could contain moisture; therefore, it will be necessary to repeat the steps of vacuum break and drying.
5. 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.
6. Close manifold gauges.
7. Shut the valves before turning off and disconnecting the vacuum pump.

Figure 99: Evacuation Procedure Diagram.



Appearances will vary depending on model.

Triple Evacuation Procedure

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 must be performed through the Schrader ports on the outdoor unit service ports.

Note:

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

Note:

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

- Evacuate through both the liquid and gas (vapor) suction Schrader ports on the outdoor unit service ports.
- The outdoor unit service valves must remain closed and the stem head access caps tight. ⃠ Do not open the outdoor unit service valves and release the factory refrigerant charge until trim charge is complete, and the system is ready to operate.
- Any field-installed ball valves in the refrigerant system (if used) must be open to ensure all piping is free and clear for evacuation on all piping and connected indoor units / branch distribution units.

Note:

- ⃠ *Do not apply power to the system before performing the evacuation procedure. There is a possibility that the EEV valve will close and isolate sections of the piping system, making the evacuation procedure inconclusive.*
- ⃠ *Never perform evacuation using refrigerant.*
- *Use only a vacuum pump that can reach 500 microns, vacuum rated hoses or copper tubing, and a leak-free gauge manifold set.*
- *Use only new vacuum pump oil from a properly sealed (unopened) container, and change oil in pump before EVERY use.*
- *Subsequent oil changes will be necessary after several hours of continuous operation; have extra oil on hand.*
- *Use a quality micron gauge in good operating order and install as far away from pump as possible.*

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FINAL INSTALLATION PROCEDURES

Triple Evacuation Test

Triple Evacuation Procedure Steps

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

2. Connect the gauge manifold along with the vacuum pump to the liquid and gas (vapor) suction Schrader ports (with core removed) using a vacuum hose. Open the gauge manifold and the vacuum pump valves.

Note:

- *After the vacuum pump is first operated, if hoses, manifold, and vacuum valves are leak free (and oil is not moisture laden), the gauge must read <100 microns within one (1) minute.*
- ⃠ *Do not proceed if the gauge does not read <100 microns within one (1) minute. There is a leak in the hose, gauge manifold, or vacuum valve, and the equipment must be replaced.*

3. Operate the vacuum pump and evacuate the system to the 2,000 micron level. Isolate the pump by closing the manifold gauges and the vacuum pump valve, and then watch the micron level. Micron level will rise a bit, but MUST eventually stop rising for fifteen (15) minutes.

- If the micron level DOES NOT stop rising, there is a leak, and the leak test must be performed again.
- If the micron level DOES rise above 2,000 micron, re-open the manifold gauges and the vacuum pump valve and continue evacuation back down to 2,000 micron level.
- If the micron level holds at 2,000 micron, continue to step 4.

4. Break vacuum with 50 psig nitrogen purge for an appropriate amount of time (this is to “sweep” moisture from piping).

5. Purge nitrogen from the system until the pressure drops down to 1 to 3 psig.

6. Evacuate to 1,000 micron level. Isolate the pump by closing the manifold gauges and the vacuum pump valve, and then watch the micron level. Micron level will rise a bit, but MUST eventually stop rising for fifteen (15) minutes.

- If the micron level DOES NOT stop rising, there is a leak, and the leak test must be performed again.
- If the micron level DOES rise above 1,000 micron, re-open the manifold gauges and the vacuum pump valve, and continue evacuation back down to 1,000 micron level.
- If the micron level holds at 1,000 micron, continue to step 7.

7. Break vacuum with 50 psig nitrogen purge for an appropriate amount of time.

8. Purge nitrogen from the system until the pressure drops down to 1 to 3 psig.

9. Evacuate to static micron level ≤500 for at least one (1) hour.

10. Micron level must remain ≤500 for one (1) hour. If the vacuum gauge rises and stops, the system could contain moisture; therefore, it will be necessary to repeat the steps of vacuum break and drying.

11. After maintaining the system in vacuum for one (1) hour, check if the vacuum gauge rises or not. If it doesn’t rise, then the system is properly evacuated.

12. Close manifold gauges.

13. Shut the valves before turning off and disconnecting the vacuum pump.

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FINAL INSTALLATION PROCEDURES

Refrigerant Charge

LG Multi F and Multi F MAX outdoor units ship from the factory with a charge of R410A refrigerant. A trim charge will need to be added to take into account additional piping length.

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.

Table 34: Outdoor Unit Factory Charge.

Outdoor Unit	Factory Charge lbs. of R410A
LMU18CHV	3.96
LMU24CHV	3.96
LMU30CHV	6.18
LMU36CHV	6.18
LMU480HV	9.7
LMU540HV	9.7
LMU600HV	12.3

Multi F Systems

Additional charge (lbs.) = (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

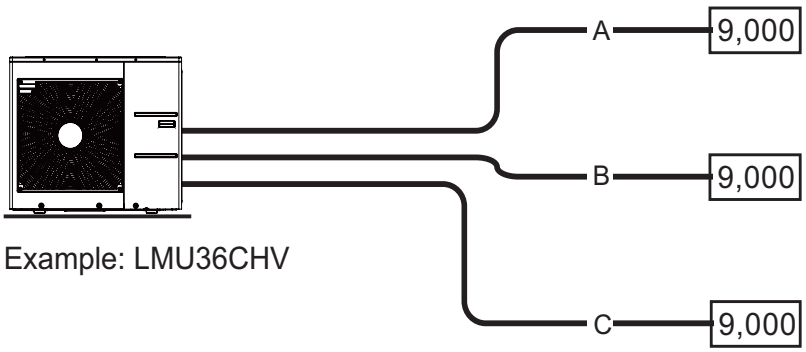
Note:

- *Number of installed length of branches depends on the specifications of the outdoor unit model.*
- *CF = Maximum number of connectible indoor units – Total number of connected indoor units.*

Table 35: Multi F Outdoor Unit Piping Specifications.

Outdoor Unit Model	Min. to Max. Piping Length for One Branch (ft.)	Max. Total System Piping Length (ft.)	Chargeless Pipe Length per Branch (L) (ft.)	Piping Length (No Additional Refrigerant [ft])	Additional Charge Needed (a) (oz./ft.)
LMU18CHV	9.8 to 82	164	24.6	49.2	0.22
LMU24CHV	9.8 to 82	246.1	24.6	73.8	0.22
LMU30CHV	9.8 to 82	246.1	24.6	98.4	0.22
LMU36CHV	9.8 to 82	246.1	24.6	98.4	0.22

Figure 100: Multi F Additional Refrigerant Charge Example.



Example: LMU36CHV

Each branch pipe
A = 82 ft.
B = 16 ft.
C = 49 ft.

Additional Charge
= (82 - 24.6) x 0.22
+ (16 - 24.6) x 0.22
+ (49 - 24.6) x 0.22
- (4 - 3) x 5.29
= 10.82 oz.

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FINAL INSTALLATION PROCEDURES

Refrigerant Charge

Multi F MAX Systems

Additional charge (lbs.) = (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

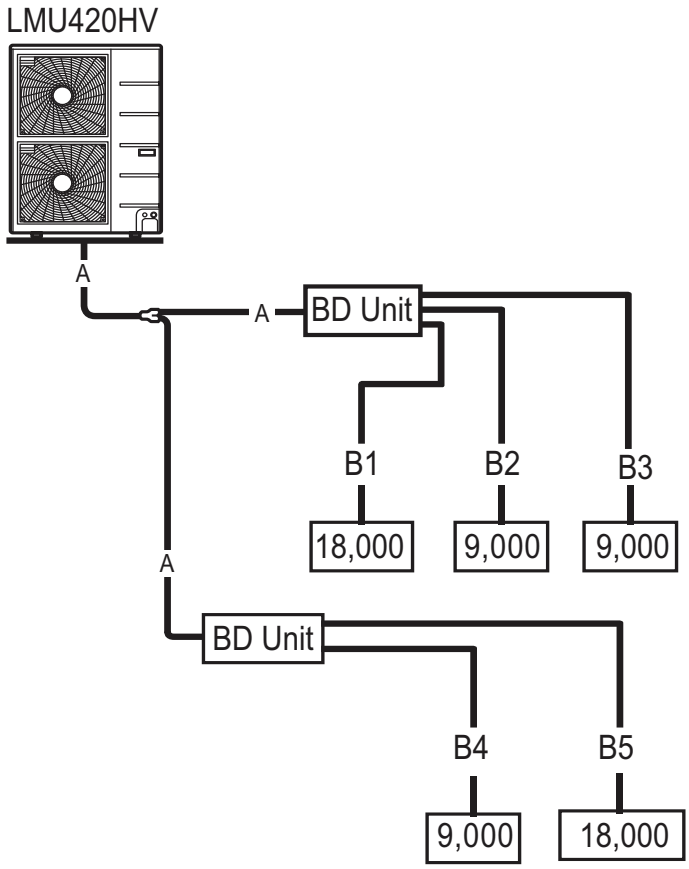
Note:

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

Table 36: Multi F MAX Outdoor Unit Piping Specifications.

Outdoor Unit Model	Main Piping Length		Branch Piping Length	
	Chargeless Pipe Length of Main Pipe (L) (ft.)	Additional Charge Needed (a) (oz./ft.)	Chargeless Pipe Length per Branch Pipe (B) (ft.)	Additional Charge Needed (b) (oz./ft.)
LMU480HV	16.4	0.54	16.4	0.22
LMU540HV	16.4	0.54	16.4	0.22
LMU600HV	16.4	0.54	16.4	0.22

Figure 101: Multi F MAX Additional Refrigerant Charge Example.



- Total main pipe (A) = 60 ft.
- Each branch pipe
  B1 = 49 ft.
  B2 = 17 ft.
  B3 = 17 ft.
  B4 = 10 ft.
  B5 = 23 ft.

Additional Charge
= (60 - 16.4) x 0.54
+ (49 - 16.4) x 0.22
+ (17 - 16.4) x 0.22
+ (17 - 16.4) x 0.22
+ (10 - 16.4) x 0.22
+ (23 - 16.4) x 0.22
– (8 - 5) x 3.53
= 20.43 oz.

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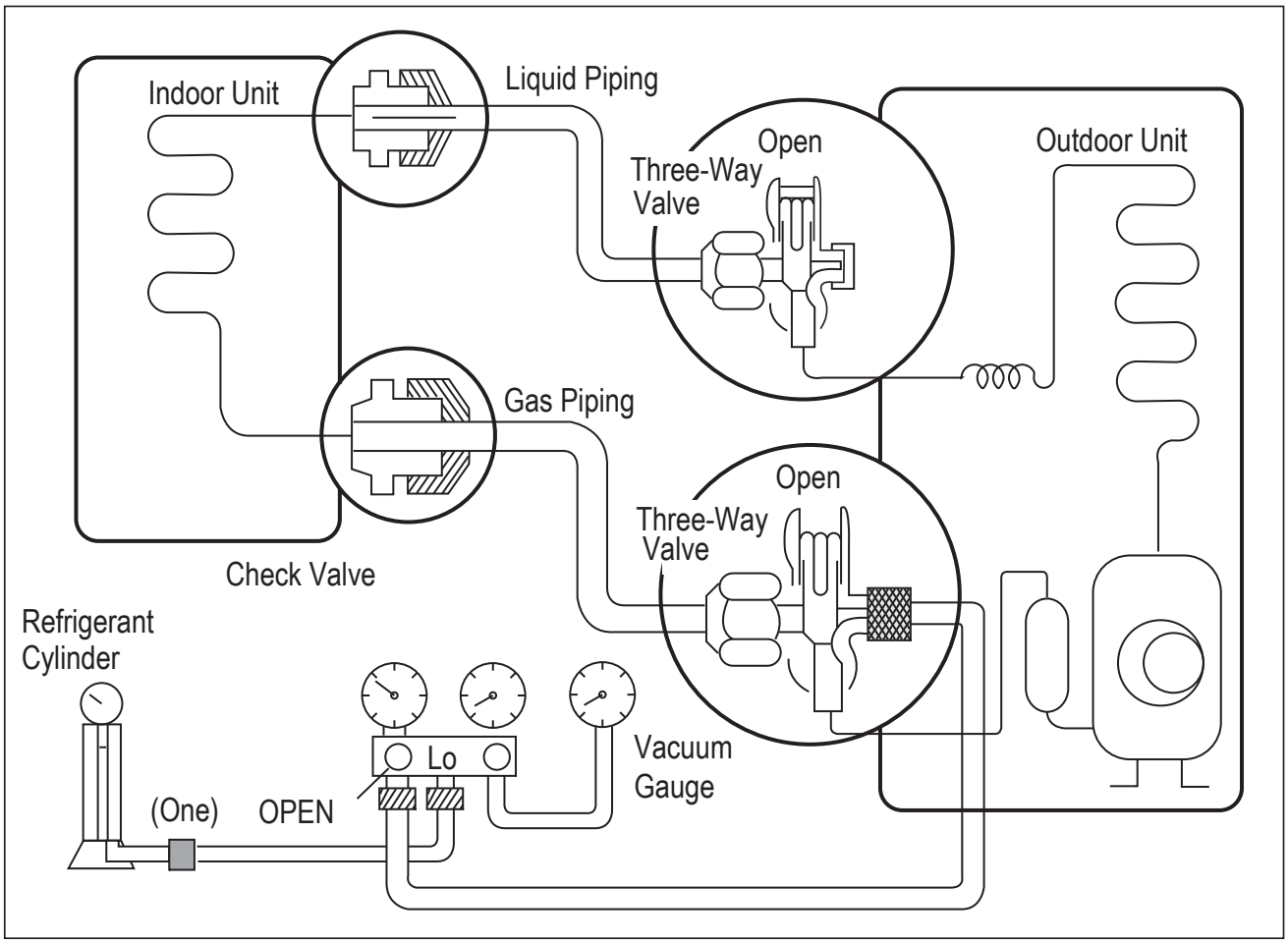
Refrigerant Charge

1. Determine the refrigerant that is needed, applying the necessary formulas as outlined in the previous pages.
2. Connect the charging cylinder to the charge hose on the manifold valve.
3. Purge air from the charge hose by opening the valve at the bottom of the cylinder, and press the check valve on the manifold valve.
4. Confirm that the “Lo” knob of the manifold valve is open and charge the system with liquid refrigerant. (Because R-410A is a non-azeotrope refrigerant, it must be charged in the liquid state.)
   - If the required amount of refrigerant cannot be charged all at once, the refrigerant can be charged a little at a time (approximately 5.29 ounces) while the system operates in cooling. This procedure must be repeated until the entire amount of refrigerant gets charged into the system; perform once, then wait approximately one [1] minute before resuming.
5. Immediately disconnect the charge hose from the service port on the three-way valve. Stopping halfway allows the refrigerant to discharge.
   - If the system has been charged with liquid refrigerant while it operates, turn the system off before disconnecting the hose.
6. Mount the valve stem nuts and the service port nut. Use torque wrench to tighten the service port nut to a torque of 1.8 kg.m and check for leaks.

⚠ WARNING

When installing or relocating the outdoor unit, make sure that no substance other than the specified refrigerant (R410A) enters the refrigerant circuit. The presence of foreign substances such as air can cause an abnormal pressure rise and will result in explosion and physical injury.

Figure 102: Charging the Refrigerant.



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Cautions for Refrigerant Leaks / Introduction

ASHRAE Standards 15 and 34 offer guidelines that address refrigerant safety and the maximum allowable concentration of refrigerant in an occupied space. Refrigerant will dissipate into the atmosphere, but a certain volume of air is required for this to occur safely. For R410A refrigerant, the maximum allowable concentration is 0.026 lbs./ft^3 per 1,000 ft^3 of air in an occupied space. Buildings with twenty-four (24) hour occupancy allow half of that concentration.[1]

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

⚠ WARNING

Verify the maximum refrigerant concentration level in the space where the indoor unit will be mounted meets the concentration limit for the application. If the refrigerant leaks and safety limits are exceeded, it could result in personal injuries or death from oxygen depletion.

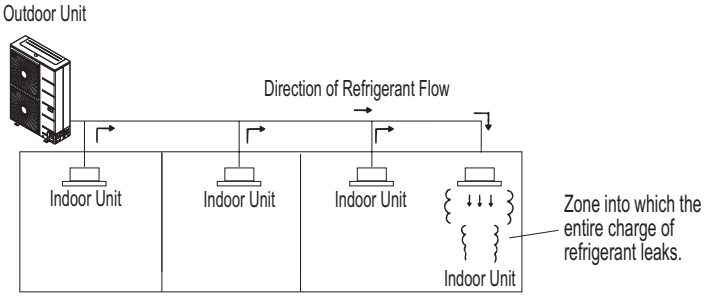
Note:

Take appropriate actions at the end of HVAC equipment life to recover, recycle, reclaim or destroy R410A refrigerant according to applicable US EPA rules.

To calculate the potential refrigerant concentration level (RCL):

1. Measure the occupied space dimensions (in feet).
2. Calculate the cubic foot volume of air in the smallest occupied space. (To obtain a detailed overview of the RCL, perform the same calculations to the second smallest zone, the third smallest zone until the RCL is obtained for all zones. Also, pay special attention to areas such as basements, etc., where refrigerant cannot dissipate easily.)
3. Divide the refrigerant charge of the Multi Zone system serving the area in pounds by the results of step 1.
4. If the calculation indicates that the potential refrigerant concentration level is higher than the allowed RCL, increase the cubic volume of the smallest occupied space or modify the piping system design.
5. The allowable RCL limit for most applications must be equal to or less than 0.026 lbs./ft^3. However, in special occupied spaces, such as hospitals and nursing homes, where occupants will have limited mobility, the allowable RCL limit is cut in half. See ASHRAE Standard 34 and local codes for detailed information.[1]

Figure 103: Example of R410A Refrigerant Leak Location.



Refrigerant Concentration Limit (RCL) Calculations

To calculate total refrigerant amount per system:

Amount of Factory-Charged Refrigerant per Outdoor Unit + **Amount of Additional Refrigerant Trim Charge** = **Total System Refrigerant Charge**

$$\text{RCL (lbs./ft}^3\text{)} = \frac{\text{Total System Refrigerant Charge (lbs.)}}{\text{Volume of Smallest Occupied Space (ft}^3\text{)}}$$

[1] American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc. (ASHRAE). Atlanta, GA. ASHRAE, Inc. Information about ASHRAE Standard 15 / 34 and addenda current as of the date of this publication.

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FINAL INSTALLATION PROCEDURES

Cautions for Refrigerant Leaks

To determine the volume of an occupied space, the designer must also determine which ones are connected, not connected, or ventilated (refer to Standard 34).

If the calculated RCL is above the allowable limit, there are two primary methods used to lower the RCL:

1. Increase the volume of the occupied space.
2. Decrease the size of the refrigerant charge.

Per Standard 34-2007, acceptable methods used to increase the volume of an occupied space include:

- Install transfer ducts between rooms.
- Undercut and overcut doors (partitions ≤0.15% of cubic volume of space within a zone).
- Add an opening without a door (partitions ≤0.15% of cubic volume of space within a zone).
- Include ventilation grilles in doors; include ventilation inlets / outlets (partitions ≤0.15% of cubic volume of space within a zone).
- Include the area above the ceiling as part of the return or supply air path (partitions ≤0.15% of cubic volume of space within a zone).
- Install a mechanical ventilator linked to a gas leak detector.
- Change the indoor unit type (wall mounted to ceiling cassette) / position.

Figure 104: Examples of Zones.

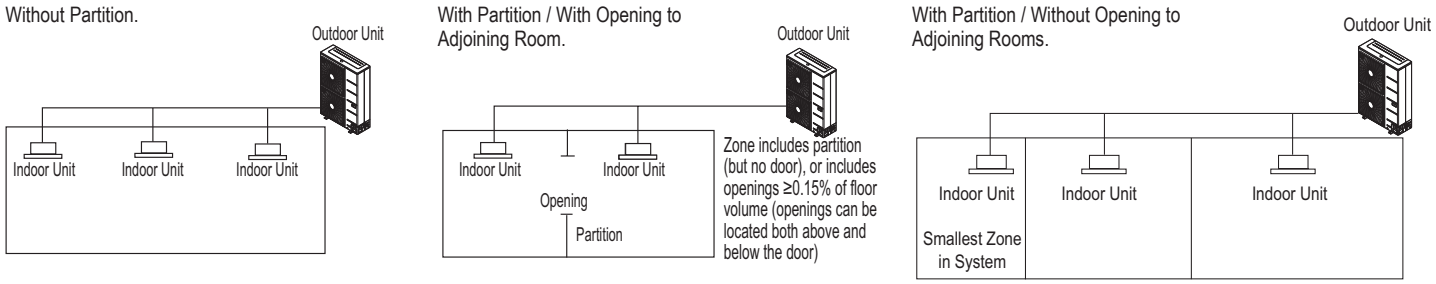
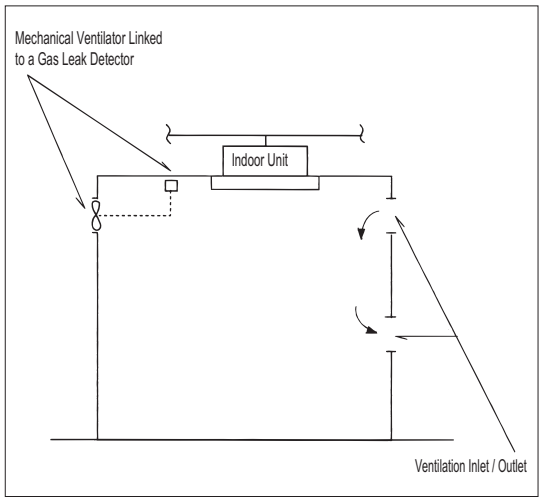


Figure 105: Example of Acceptable Ventilation Methods.



Note:

See also the LG HVAC Building Ventilation Guide on www.lghvac.com.

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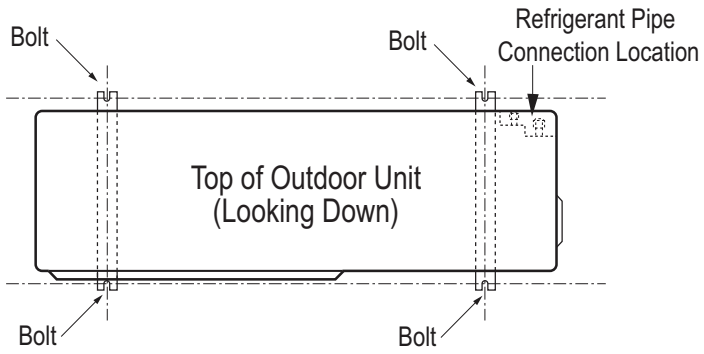
Test Run

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.

Figure 106: Piping Connection on the Outdoor Unit (Will Differ Depending on Outdoor Unit Model).



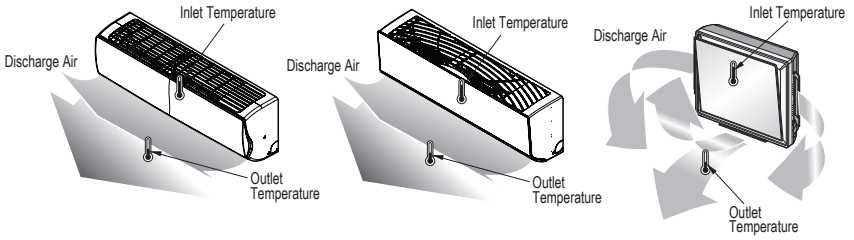
Test Run Procedure

1. Operate the system in cooling mode for 15 to 20 minutes.
2. 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).

Table 37: Optimum Conditions of the Gas Side Pressure.

Refrigerant Type	Outside Ambient Temperature	Gas Side Service Valve Pressure
R410A	95°F	113~142 psig

Figure 107: Inlet and Outlet Temperature Locations on Various Indoor Units.



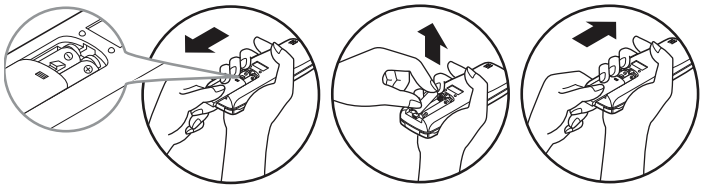
Note:

If the pressure is >142 psig, the system is most likely overcharged, and refrigerant must be removed. If the pressure is <113 psig, the system is most likely undercharged and refrigerant must be added.

Installing the Remote Controller Batteries

As part of the test run, the batteries need to be inserted into the remote controller, and the remote controller will 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.

Figure 108: Installing the Remote Controller Batteries.



1. The remote controller needs two (2) AAA (1.5V) batteries for operation. ⃠ Do not use rechargeable batteries. Remove the battery cover from the back of the remote controller by pushing downward on the tab at the top of the battery cover and then lift up to remove.
2. Insert the two new batteries. Align batteries by the (+) and (-) sides (the interior battery compartment of the remote controller will have clear markings for the (+) and (-) placement).
3. Verify that the batteries have "clicked" into the compartment and are firmly engaged with the contacts on either side.
4. Reattach the back cover of the remote controller.
5. Proceed with powering on the remote controller and usage as needed.

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Outdoor Unit DIP Switch Settings

System must be powered off, and then turned back on to apply DIP switch settings.

⚠ WARNING

Turn off the circuit breaker or shut off the power source of the product 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 will not work.*
- *If a specific function is desired, request that the installer set the appropriate DIP switch during installation.*
- *Only the first four DIP switches are functional on the LMU480, 540, and 600HV.*

Figure 109: LMU18~36CHV Outdoor Unit DIP Switches (in Normal Operation Setting).

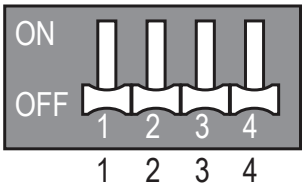


Figure 110: LMU480-540HV Outdoor Unit DIP Switches (in Normal Operation Setting).

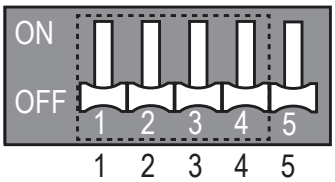


Figure 111: LMU600HV Outdoor Unit DIP Switches (in Normal Operation Setting).

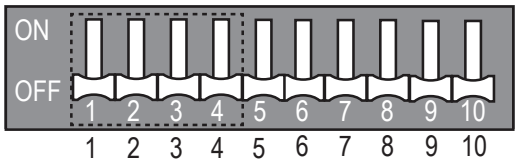
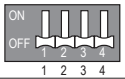
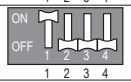
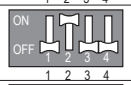
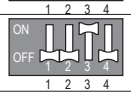
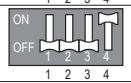
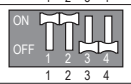
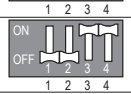
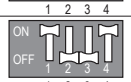
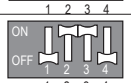
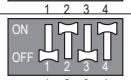
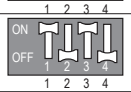
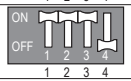
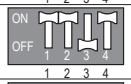
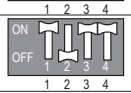
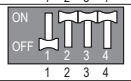


Table 38: DIP Switch Settings and Functionalities.

DIP Switch Setting	Function
	Normal Operation (No Function)
	Forced Cooling Operation
	Wiring Error Check
	Reducing Power Consumption (Step 1)
	Reducing Power Consumption (Step 2)
	Mode Lock (Cooling)
	Mode Lock (Heating)
	Night Quiet Mode (Step 1)
	Night Quiet Mode (Step 2)
	Mode Lock (Cooling) + Night Quiet Mode (Step 1)
	Mode Lock (Cooling) + Night Quiet Mode (Step 2)
	Reducing Power Consumption (Step 1) with Mode Lock (Cooling)
	Reducing Power Consumption (Step 2) with Mode Lock (Cooling)
	Reducing Power Consumption (Step 1) with Mode Lock (Heating)
	Reducing Power Consumption (Step 2) with Mode Lock (Heating)

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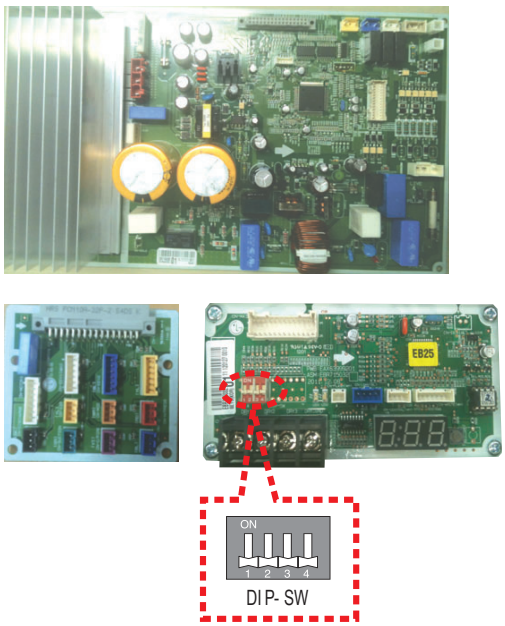
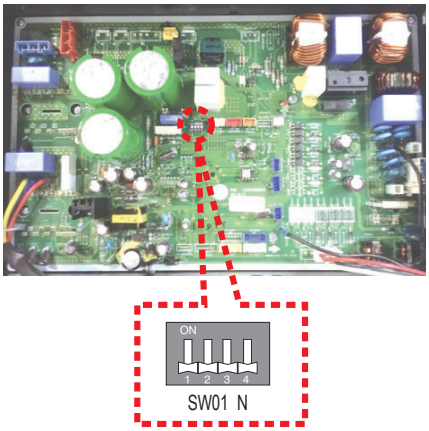
Location of DIP Switches on Multi F and Multi F MAX Outdoor Units

Figure 112: Multi F / Multi F MAX Outdoor Unit DIP Switch Locations.

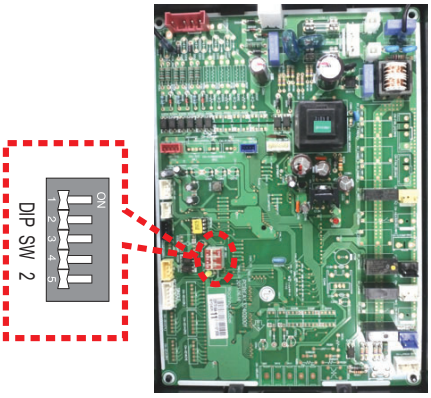
Multi F LMU18CHV and LMU24CHV



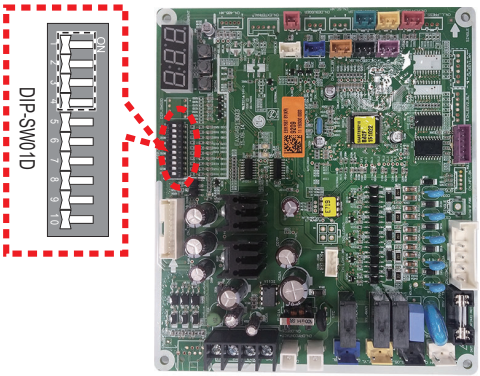
Multi F LMU30CHV and LMU36CHV



Multi F MAX LMU480HV and LMU540HV



Multi F MAX LMU600HV

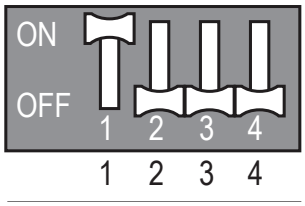


Forced Cooling Operation Function

Use to add refrigerant to the system when outside ambient temperatures are cool (ex.: winter).

1. Shut power down to the system.
2. Set DIP Switch 1 to ON.
3. Turn power on to the system.
4. Verify that the Red LED on the outdoor unit PCB is ON (indicates indoor units are in forced cooling operation).
5. Add refrigerant.

Figure 113: Forced Cooling DIP Switch Setting.



Note:

• If the green LED light on the outdoor unit PCB is ON, it indicates the compressor is OFF due to low pressure in the system.
• Turn DIP Switch 1 to OFF after finishing (Normal Operation setting).
• Only the first four DIP switches are functional on the LMU480, 540, 600HV.

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FINAL INSTALLATION PROCEDURES

DIP Switch Settings for Optional Modes

Wiring Error Check

Use to verify if wiring is properly installed.

1. Shut power down to the system.
2. Set DIP Switch 2 to ON.
3. Turn power on to the system.
4. Check if the Red and Green LEDs on the outdoor unit PCB are ON (indicate indoor units are in forced operation mode).
5. If the wiring is correctly installed, the Green LED will light up. If the wiring is incorrectly installed, the Red and Green LEDs will blink, indicating which part of the system is in error.
   - Red LED = Piping Number
   - Green LED = Wiring Number (Room)

Example: If the Red LED blinks twice and the Green LED blinks three times, the second piping to the third room is in error (see at right).

Figure 114: Wiring Error Check DIP Switch Setting.

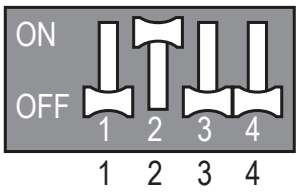
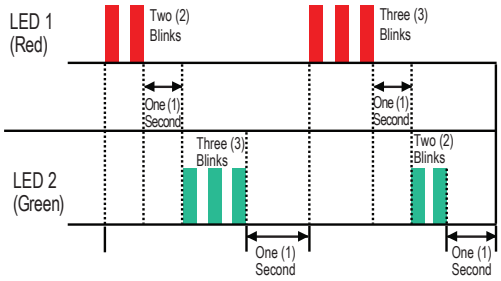


Figure 115: Wiring Error Check Example.



Note:

- *If the indoor unit(s) are not communicating properly to the outdoor unit, the Wiring Error Check cannot operate correctly.*
- *Only the part of the system in error will be displayed. System will operate correctly after the error is fixed.*
- *If outdoor and indoor temperatures are too low (ex.: winter), the wiring error check function will not operate (Red LED is ON).*
- *Turn DIP Switch 2 to OFF after finishing (Normal Operation setting).*
- *Only the first four DIP switches are functional on the LMU480, 540, 600HV.*

Reducing Power Consumption

Enables more efficient system operation by reducing the maximum power consumption value (reducing the MCA).

1. Shut power down to the system.
2. For Step 1, set only DIP Switch 3 to ON. For Step 2, set only DIP Switch 4 to ON.
3. Turn power on to the system.

Figure 116: Reducing Power Consumption Chart.

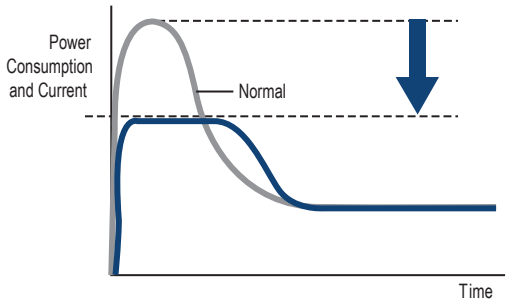
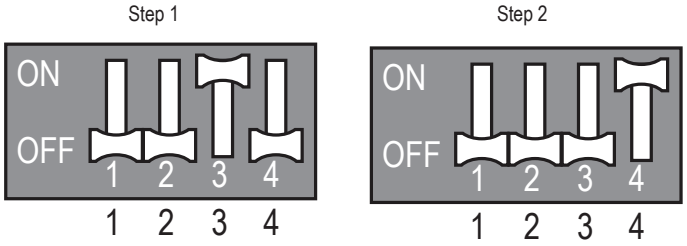


Table 39: Reducing Power Consumption Current Levels.

Phase	1Ø		
Model	Multi F LMU18CHV, LMU24CHV	Multi F LMU30CHV, LMU36CHV	Multi F MAX LMU480HV, LMU540HV, LMU600HV
Step 1 (A)	9	13	22
Step 2 (A)	8	11	21

Figure 117: Reducing Power Consumption DIP Switch Settings.



Note:

- *Reduced Power Consumption reduces outdoor unit capacity.*
- *Only the first four DIP switches are functional on the LMU480, 540, 600HV.*

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FINAL INSTALLATION PROCEDURES

DIP Switch Settings for Optional Modes

Reducing Power Consumption with Mode Lock

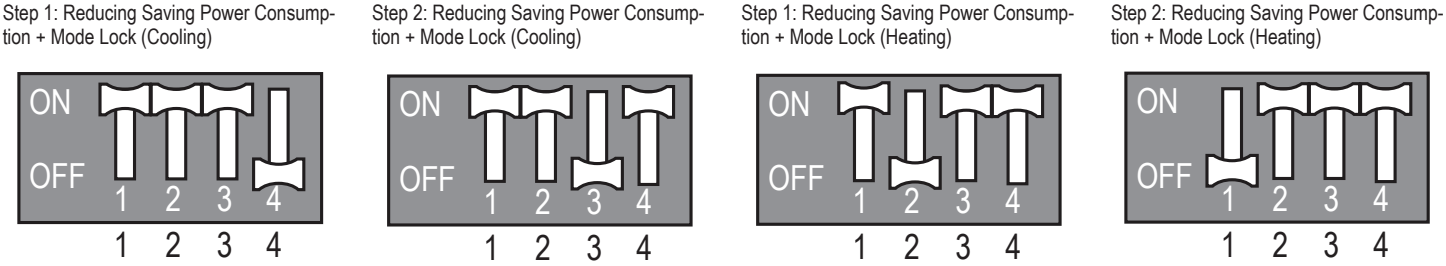
Enables more efficient system operation by lowering the maximum power consumption value, as well as locks the mode of operation (Example: In a cooling-only server room application where permission to adjust the system mode is highly limited). Changing modes can cause a change in compressor frequency, which would cause problems with the setting. As such, if this mode is used, it is locked in either cooling or heating. The function is rarely, if ever, used.

1. Shut power down to the system.
2. Set DIP Switches as indicated below, following the steps and chosen mode.
3. Turn power on to the system.

Note:

Only the first four DIP switches are functional on the LMU480, 540, 600HV.

Figure 118: Saving Power Consumption with Mode Lock DIP Switch Settings.

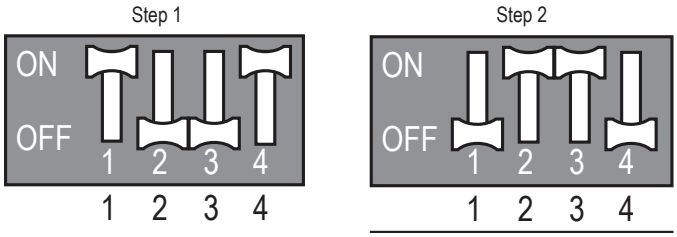


Night Quiet Mode

Lowers the operation sound of the outdoor unit by changing the compressor frequency and fan speeds. Night quiet mode initiates eight (8) hours after the highest outdoor air temperature is measured, then is active for nine (9) hours.

1. Shut power down to the system.
2. For Step 1, set only DIP Switches 2 and 3 to ON. For Step 2, set only DIP Switches 1 and 4 to ON.
3. Turn power on to the system.

Figure 119: Night Quiet Mode DIP Switch Settings.

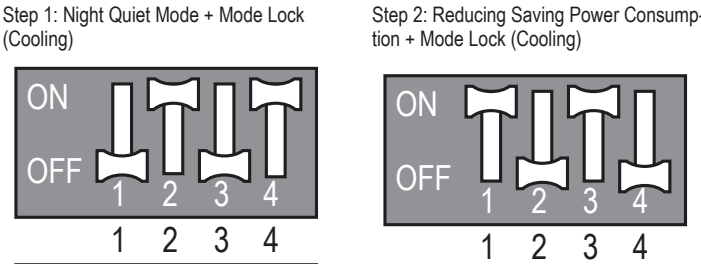


Night Quiet Mode with Mode Lock

Lowers the operation sound of the outdoor unit by changing the compressor frequency and fan speeds, as well as locks the mode of operation. Changing modes can cause a change in compressor frequency, which would cause problems with the setting. As such, if this mode is used, it is locked in either cooling or heating. The function is rarely, if ever, used. Night quiet mode initiates eight (8) hours after the highest outdoor air temperature is measured, then is active for nine (9) hours.

1. Shut power down to the system.
2. For Step 1, set only DIP Switches 2 and 4 to ON. For Step 2, set DIP Switches 1 and 3 to ON.
3. Turn power on to the system.

Figure 120: Night Quiet Mode with Mode Lock DIP Switch Settings.



Note:

- *If compressor frequency and fan speed are decreased, cooling capacity also will decrease accordingly.*
- *Night Quiet Mode can only be used when system is in cooling operation.*
- *Change the DIP switches if Night Quiet Mode is no longer desired.*
- *If indoor unit operation is set by the fan speed "Power", Night Quiet Mode will not function until fan speed "Power" is changed.*
- *Only the first four DIP switches are functional on the LMU480, 540, 600HV.*

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FINAL INSTALLATION PROCEDURES

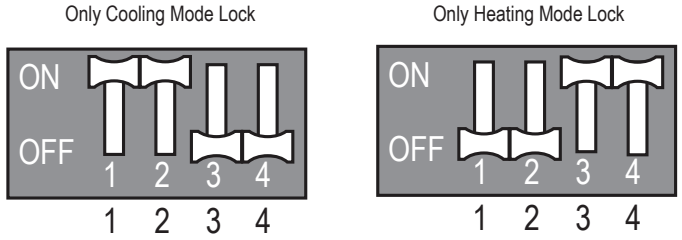
DIP Switch Settings for Optional Modes

Mode Lock

Prevents mixed mode operation (mode change) in applications where only one mode is necessary.

1. Shut power down to the system.
2. For Only Cooling Mode Lock, set only DIP Switches 1 and 2 to ON. For Only Heating Mode Lock, set only DIP Switches 3 and 4 to ON.
3. Turn power on to the system.

Figure 121: Mode Lock DIP Switch Settings.



Note:

Only the first four DIP switches are functional on the LMU480, 540, 600HV.

PCB Display (Multi F LMU18-24CHV and LMU600HV Models Only)

For Multi F LMU18CHV, LMU24CHV, and LMU600HV outdoor units, the cycle data can be checked without using LG Monitoring View (LGMV) Diagnostic Software by pushing TACT-SW1. See below for the types of cycle information that will be displayed in LGMV. After first page is displayed, the second page will be subsequently displayed.

⚠WARNING

Protect fingers / hands with a non-conducting material before pushing TACT-SW1. There is risk of physical injury or death due to electric shock.

Figure 122: Location of TACT-SW1 (LMU18-24CHV).

Figure 123: Location of TACT-SW1 (LMU600HV).

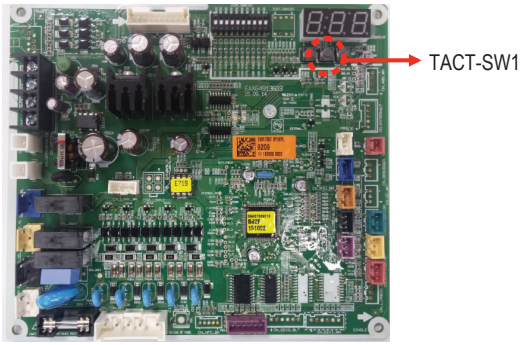


Table 40: PCB Display Information.

TACT-SW1 No. of Pushes	Description	Display		
		Example	First Page	Second Page
One (1) Time	Low Pressure	890kpa	"LP"	"89"
Two (2) Times	High Pressure	2,900kpa	"HP"	"290"
Three (3) Times	Discharge Temperature	85°C	"DS"	"85"
Four (4) Times	Condenser Outlet Temperature	-10°C	"CS"	"-10"
Five (5) Times	Suction Temperature	-10°C	"SS"	"-10"
Six (6) Times	Outdoor Unit Air Temperature	-10°C	"AS"	"-10"
Seven (7) Times	Current	15A	"A"	"15"
Eight (8) Times	Voltage	230V	"V"	"230"
Nine (9) Times	Compressor Hz	100Hz	"F"	"100"
Ten (10) Times	DC Link Voltage	230V	"dc"	"230"

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ERROR CODE TABLES

⚠WARNING *Please refer to the Safety Precautions on pages 4-7 for more detail to prevent injury or death regarding the operation and service troubleshooting of the Multi F / Multi F MAX product.*

Troubleshooting Using Error Codes

Refer to the tables below and on the next page for error codes that are generated from the indoor and outdoor units. These codes indicate different types of unit failures, assist in self-diagnosis, are the most common that will manifest through these units. Error codes are displayed on indoor unit LEDs, wired remote controllers, the outdoor unit PCB, and through LG Monitoring View (LGMV) diagnostic software.

Systems could generate additional codes not listed here. Contact LG Support if these types of errors are seen and a simple power down and boot up has not corrected the issue. ⃠ Do not attempt to fix the system yourself.

- If two or more errors occur simultaneously, the highest error code number is displayed first.
- After error is resolved, the error code does not display.

Decoding the Error Display

See images and table below for indoor unit error codes, location of LEDs, and operation status.

The first and second number on the LED indicates error number. Example: 21 = LED1 (Red light) 2x blink, LED2 (Green light) 1x blink.

Error Code Nomenclature Definitions

- MICOM: Non-volatile memory chip where unit setup information is stored.
- EEPROM: Non-volatile memory chip where device identification, size, and factory defined default component operating parameters are stored.

Figure 124: Example of Standard Wall-Mounted Indoor Unit LEDs.

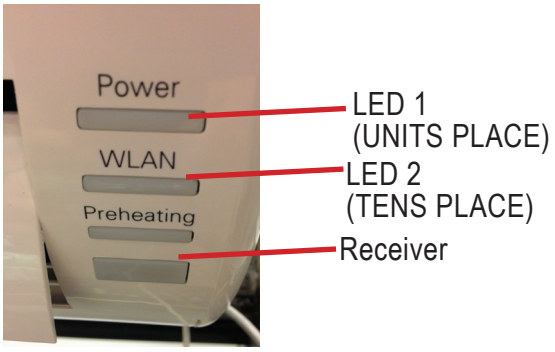


Figure 125: Example of Art Cool Mirror Wall-Mounted Indoor Unit LEDs.

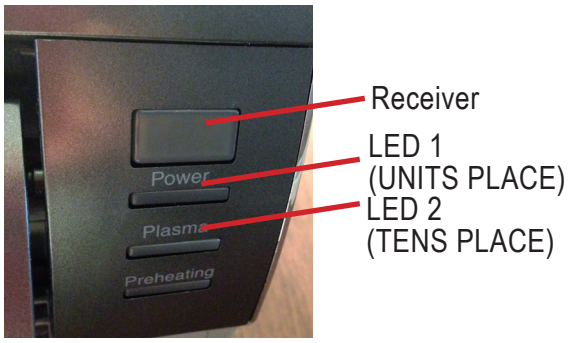
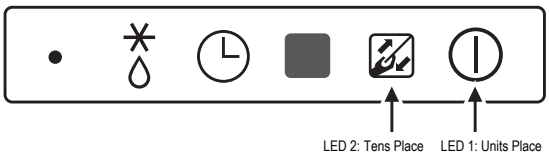


Figure 126: Example of Ceiling Cassette Indoor Unit LEDs.



Number of Blinks = Error Code

Note:

Appearances will vary depending on model.

Table 41: Indoor Unit Error Codes.

Error Code	Description	Indoor Unit Operation Status
00	No error	ON
01	Indoor unit room temperature sensor error	OFF
02	Indoor unit inlet pipe sensor error	OFF
03	Controller error	OFF
04	Drain pump error (optional)	OFF
05	Communication error between indoor unit and outdoor units	OFF
06	Indoor unit outlet pipe sensor error	OFF
07	Different mode operation error	OFF
09	Indoor unit EEPROM error	OFF
10	Indoor unit BLDC motor fan lock	OFF

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ERROR CODE TABLES

⚠ WARNING *Please refer to the Safety Precautions on pages 4-7 for more detail to prevent injury or death regarding the operation and service troubleshooting of the Multi F / Multi F MAX product.*

Table 42: Outdoor Unit Error Codes.

Error Code	Description	No. of Times Outdoor Unit LEDs Blink		Outdoor Operation Status
		LED01 (Red)	LED02 (Green)	
21	DC Peak (IPM Fault); Compressor DC voltage was too high	2X	1X	OFF
22	Current Transformer2 (CT2) error; Alternating current (AC) input too high	2X	2X	OFF
23	DC Link Low Voltage (DC Link Voltage is <140VDC)	2X	3X	OFF
	DC Link High Voltage (DC Link Voltage is >420VDC)			
25	AC Low / High Voltage	2X	5X	OFF
26	DC Compressor Position Error (Compressor failed to start properly)	2X	6X	OFF
27	PSC / PFC Fault; Input current to inverter compressor PCB is too high	2X	7X	OFF
29	Current to inverter compressor is too high	2X	9X	OFF
32	Inverter compressor discharge pipe (D-Pipe) temperature is too high	3X	2X	OFF
35	Low Pressure Error; Pressure dropped below recommended limits	3X	5X	OFF
39	Communication Error between PFC MICOM and Inverter MICOM	3X	9X	OFF
40	CT Sensor Error; Thermistor is disconnected or has shorted out	4X	-	OFF
41	Inverter compressor discharge pipe (D-Pipe) sensor is disconnected or has shorted out	4X	1X	OFF
43	High pressure sensor is disconnected or has shorted out	4X	3X	OFF
44	Outdoor air sensor is disconnected or has shorted out	4X	4X	OFF
45	Mid-pipe thermistor of outdoor unit condenser is disconnected or has shorted out	4X	5X	OFF
46	Outdoor unit suction piping thermistor is disconnected or has shorted out	4X	6X	OFF
48	Outlet piping (liquid) of condenser is disconnected or has shorted out	4X	8X	OFF
51	Combination ratio (capacity) is out of range; Total nominal indoor unit capacity is<50% or >130% of the outdoor unit capacity	5X	1X	OFF
53	Communication failure between outdoor unit and indoor unit(s)	5X	3X	OFF
54	Outdoor unit is not wired properly (ex: reversed phase)	5X	4X	OFF
60	Outdoor unit printed circuit board (PCB) EEPROM check sum error	6X	-	OFF
61	Condenser coil thermistor temperature is too high	6X	1X	OFF
62	Outdoor unit inverter compressor PCB heat sink temperature is too high	6X	2X	OFF
65	Heat sink thermistor is disconnected or has shorted out	6X	5X	OFF
67	Outdoor unit brushless direct current (BLDC) fan motor lock error	6X	7X	OFF
73	Outdoor unit PFC overcurrent (peak) error	7X	3X	OFF

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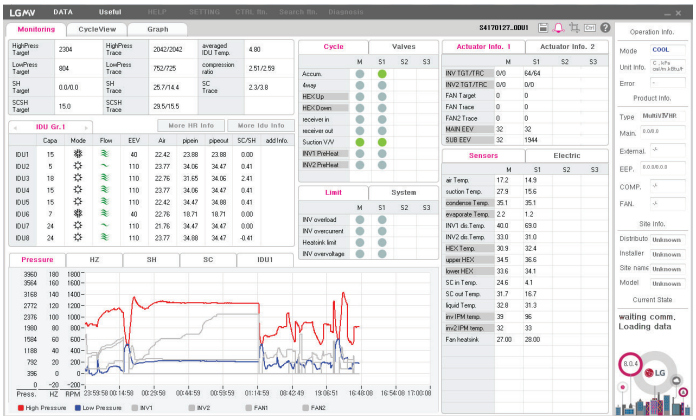
LG MONITORING VIEW (LGMV) DIAGNOSTIC SOFTWARE

LG Monitoring View (LGMV) Diagnostic Software

LG Monitoring View (LGMV) software allows the service technician or commissioning agent to connect a computer USB port to the Multi F / Multi F MAX system's main printed circuit board (PCB) using an accessory cable without the need for a separate interface device.

LGMV is available in different formats, including Mobile LGMV, which is an app for use on wireless devices. Contact your LG Sales Representative for more information, including recommended PC or mobile device configurations.

Figure 127: LGMV Monitoring Screen.



Note:

- *Images on these pages are examples of LGMV screenshots. Actual images will differ depending on the version of the software and the units installed.*
- *Information displayed also depends on which unit is installed.*

LGMV Display

LGMV displays the following real-time data:

- Actual inverter compressor speed
- Target inverter compressor speed
- Actual outdoor fan speed
- Target outdoor unit fan speed
- Actual superheat
- Target superheat
- Actual subcooler circuit superheat
- Target subcooler circuit superheat
- Main EEV position
- Subcooling EEV position
- Inverter compressor current transducer value
- Outdoor air temperature
- Actual high pressure/saturation temperature
- Actual low pressure/saturation temperature
- Suction temperature
- Inverter compressor discharge temperature
- Constant speed compressor discharge temperature
- Front outdoor coil pipe temperature
- Back outdoor coil pipe temperature
- Liquid line pipe temperature
- Subcooler inlet temperature
- Subcooler outlet temperature
- Average indoor unit (IDU) pipe temperature
- Inverter compressor operation indicator light
- Four-way reversing valve operation indicator light
- Pressure graph showing actual low pressure and actual high pressure levels
- Error code display
- Operating mode indicator
- Target high pressure
- Target low pressure
- PCB (printed circuit board) version
- Software version
- Installer name
- Model no. of outdoor units
- Site name
- Total number of connected indoor units
- Communication indicator lights
- Indoor unit capacity
- Indoor unit operating mode
- Indoor unit fan speed
- Indoor unit EEV position
- Indoor unit room temperature
- Indoor unit inlet pipe temperature
- Indoor unit outlet pipe temperature
- Indoor unit error code

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LG MONITORING VIEW (LGMV) DIAGNOSTIC SOFTWARE

Additional screens can be accessed by tabs on the main screen. Additional screens include:

1. Cycleview: Graphic of internal components including:
   - Compressors showing actual speeds
   - EEVs
   - Indoor units
   - Liquid injection valves
   - Temperature and pressure sensors
   - Four-way reversing valve
   - Outdoor fans showing status and speeds

2. Graph: Full screen graph of actual high and low pressures and high and low pressure limits. A sliding bar allows viewing of previously recorded data.

3. Control IDU: Enables user to turn on IDU's default setpoints of 86°F in heat mode or 64°F in cool mode.

4. Setting: Converts metric values to imperial values.

5. Making Data: Recording of real time data to a separate file created to be stored on the user's computer.

6. Loading Data: Recorded data from a saved ".CSV" file can be loaded to create an LGMV session.

7. Electrical Data: The Electric tab on the main screen is changed to show the following:
   - Inverter compressor
     - Amps
     - Volts
     - Power Hz
     - Inverter control board fan Hz
   - Constant compressor
     - Current transducer value
     - Phase

Figure 129: LGMV Cycleview Screen.

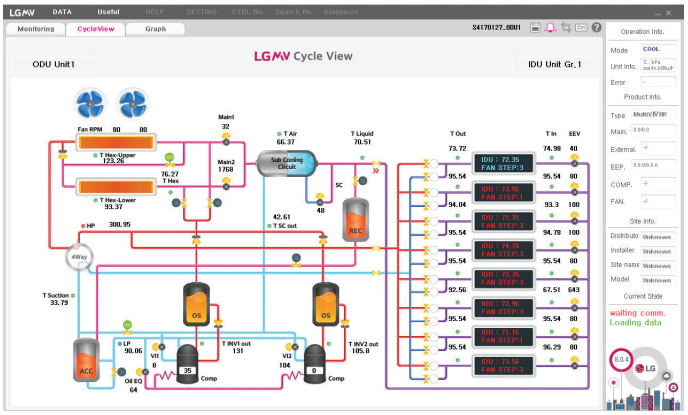
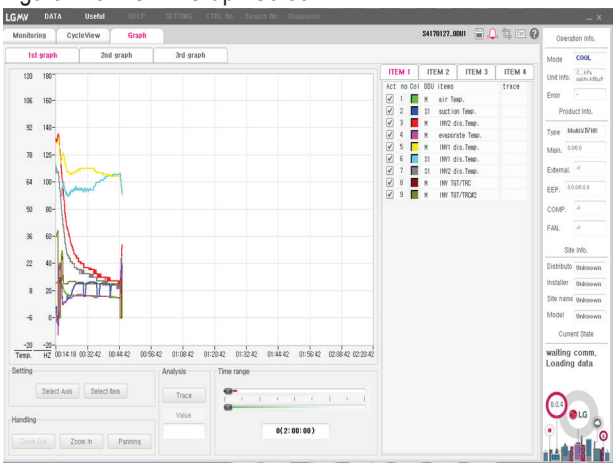


Figure 128: LGMV Graph Screen.



Note:

- *Images on these pages are examples of LGMV screenshots. Actual images will differ depending on the version of the software and the units installed.*
- *Information displayed also depends on which unit is installed.*

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LG SIMS

The LG Smart Inverter Monitoring System (SIMS) WLAN module and the smart phone app together provide monitoring and troubleshooting capability for LG Multi F / Multi F MAX systems. SIMS functions only with LG Duct Free products, and can also be used with Single Zone one-to-one configurations such as the Single Zone Wall Mount systems.

SIMS can display and graph operational data for the air conditioner system including the indoor unit and the outdoor unit. SIMS also displays error codes and a troubleshooting guide. A full copy of the LG SIMS User's Manual is available on the www.lghvac.com website.

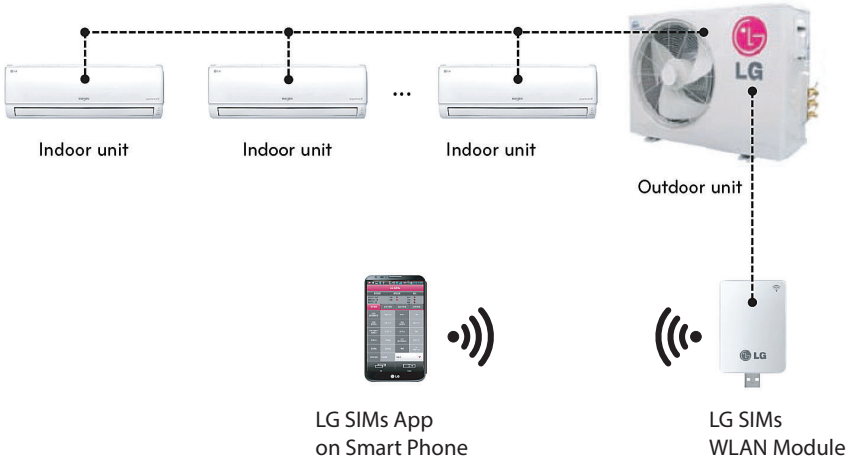
To use SIMS you must be a trained HVAC service technician familiar with LG's Duct Free Systems. You must understand the inverter air conditioning operation cycle, the meaning of the data displayed by SIMs, and how to use the data to troubleshoot the system.

Figure 130: LG SIMS App and WLAN Module.

Note:

- *Images on these pages are examples of SIMS screenshots. Actual images will differ depending on the version of the software and the units installed.*
- *Information displayed also depends on which unit is installed.*

Figure 131: Example of a SIMS WLAN Module Used with a Typical DFS System.



⚠WARNING

High voltages capable of causing death are used in this equipment. Outdoor unit power remains connected during this procedure. Take extreme caution not to touch electrical components or connections. Failure to observe this warning can result in death or severe injury.

Note:

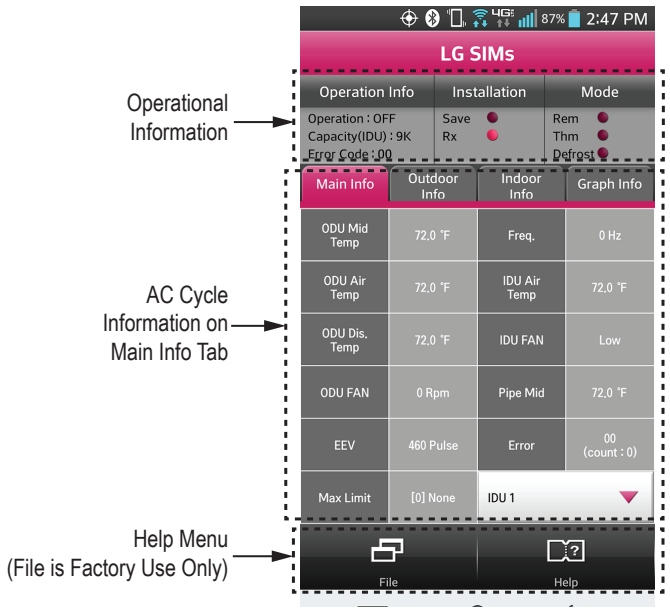
- *The Duct Free System air conditioning system must run for at least 15–20 minutes before data collected by SIMS 2.0 is valid for troubleshooting.*
- *The free SIMS app must be correctly installed on a smart phone before using SIMS.*
- *Some outdoor units have an LGMV extension cable accessed by removing the side handle cover. If the outdoor unit does not have this extension cable, access the LGMV connector by removing the top cover of the outdoor unit.*

SIMs App Main Info Screen

The main screen is the first screen displayed after wireless connection is established. Tap the Main Info tab to display current readings regarding your indoor and outdoor unit(s). The Operational Info area of the screen will show active functions or modes by illuminating the light to the right of the function.

Additional Help information can be accessed by tapping the Help Menu buttons at the bottom of this screen.

Figure 132: SIMs App Main Info Screen.



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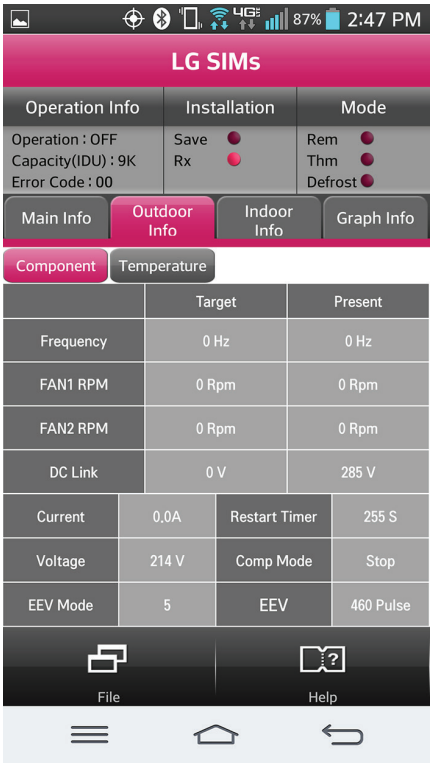
LG SMART INVERTER MONITORING SYSTEM (SIMS)

MULTI F
MULTI F MAX

SIMS App Screens



Outdoor Info / Component Screen

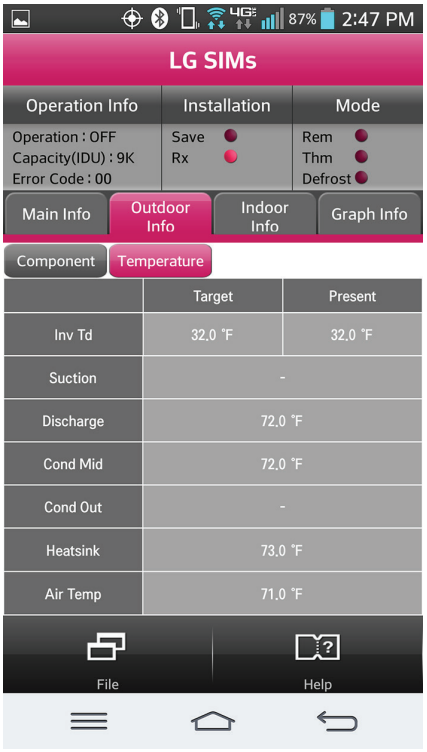
Displays the following information:

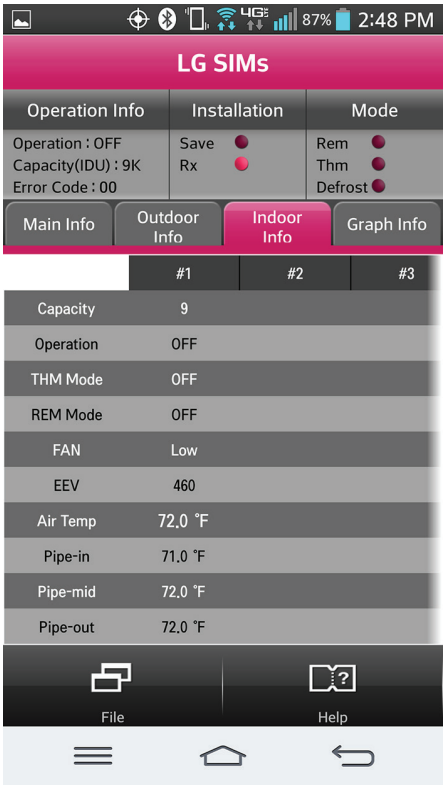
- Frequency
- FAN1 RPM
- FAN2 RPM
- DC Link
- Current
- Voltage
- EEV Mode
- Restart Timer
- Comp Mode
- EEV

Outdoor Info/ Temperature Screen

Displays the following information:

- Inv TD
- Suction
- Discharge
- Cond Mid
- Cond Out
- Heatsink
- Air Temp





Indoor Info Tab

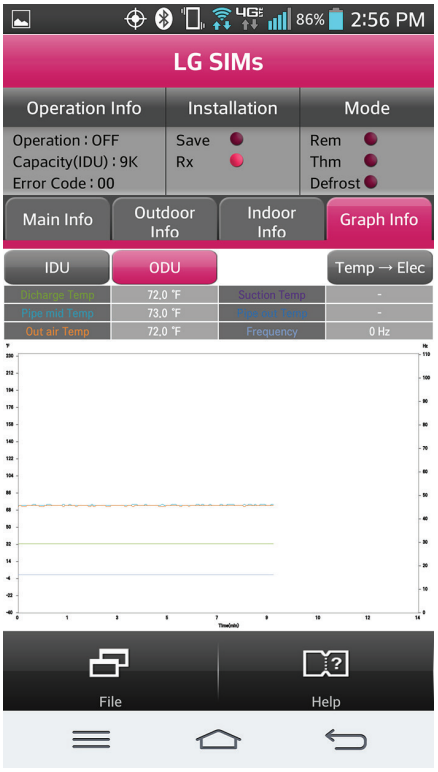
Displays the following information:

- Frequency
- Operation
- THM Mode
- REM Mode
- FAN
- EEV
- Air Temp
- Pipe-in
- Pipe-mid
- Pipe-out

Graph Info Tab

This tab, has three sub sections:

- IDU - Indoor Unit Temperature graph. Displays IDU information in graph format. Information displayed is for the IDU # selected on the Main screen.
- ODU - Outdoor Unit Temperature and Frequency graph. Displays ODU information in graph format.
- ODU Electric - Outdoor Unit Electric data graph is displayed.



Note:

- *Images on these pages are examples of SIMS screenshots. Actual images will differ depending on the version of the software and the units installed.*
- *Information displayed also depends on which unit is installed.*

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MAINTENANCE RECOMMENDATIONS

Table 43: Maintenance Recommendations.

Component	Maintenance	Occurrence (Minimum)
Indoor Units	Wash filters	On a regular basis / as needed
	Clean coils	Once a year
	Clean / check unit base pan	Once a year
Outdoor Unit(s)	Clean coils	Once or twice a year
Communications Cable and Power Wiring	Verify that all cables and wiring are properly connected	Once or twice a year

Note:

It is also recommended to monitor system operation using LGMV and / or SIMS Software at least once a year.

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MULTI F
MULTI F MAX

INSTALLATION CHECKLIST

PAGE 1

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 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, 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.	

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INSTALLATION CHECKLIST

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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).	
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.	
All condensate lines were properly insulated to prevent condensation.	

Power Wire and Communications Cables

Description	Check
Ground wire was installed and properly terminated at the 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.	
For Multi F Systems • When the wiring length is up to 130 feet, communication / connection (power) wiring from the outdoor unit to the indoor unit is minimum 14 gauge, four-conductor, stranded, shielded or unshielded. If shielded, must be grounded to chassis at the outdoor unit only. • When the wiring length is GREATER THAN 130 feet, communication / connection (power) wiring from the outdoor unit to the indoor unit is minimum 14 gauge, stranded, shielded or unshielded. If shielded, must be grounded to chassis at the outdoor unit only. Use a two (2) conductor wire for power; use a two (2) conductor wire for communication / ground. Separate the power AT LEAST two (2) inches away from the communication / ground wire.	
For Multi F MAX Systems All power wiring / communication cable to be minimum 14 AWG from the Multi F MAX outdoor unit to the BD unit 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. • When the wiring length is up to 130 feet, communication / connection (power) wiring from the BD unit to the indoor unit is minimum 14 gauge, four-conductor, stranded, shielded or unshielded. If shielded, must be grounded to chassis at the outdoor unit only. • When the wiring length is GREATER THAN 130 feet, communication / connection (power) wiring from the BD unit to the indoor unit is minimum 14 gauge, stranded, shielded or unshielded. If shielded, must be grounded to chassis at the outdoor unit only. Use a two (2) conductor wire for power; use a two (2) conductor wire for communication / ground. Separate the power AT LEAST two (2) inches away from the communication / ground wire.	
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.	

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INSTALLATION CHECKLIST

PAGE 3

Major Component Rough-In

Piping and Insulation

Brazing Practices

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INSTALLATION CHECKLIST

Installation—Refrigerant Piping

Installation—Branch Distribution Unit (Multi F MAX Systems Only)

Installation—Condensate Pump / Drain Installation

Installation—Power Wire and Communications Cables

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MULTI F
MULTI F MAX

MULTI F REFRIGERANT CHARGE WORKSHEET

LG Multi F outdoor units ship from the factory with a charge of R410A refrigerant. A trim charge will need to be added to take into account additional piping length.

To determine the additional refrigerant that is needed, apply the formula 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 Outdoor Unit Factory Charge

Outdoor Unit	Factory Charge lbs. of R410A
LMU18CHV	3.96
LMU24CHV	3.96
LMU30CHV	6.18
LMU36CHV	6.18

Multi F Outdoor Unit Additional Refrigerant Charge Formula

Additional charge (lbs.) = (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

Note:

• Number of installed length of branches depends on the specifications of the outdoor unit model.

• CF = Maximum number of connectible indoor units – Total number of connected indoor units.

Multi F Outdoor Unit Piping Specifications

Multi F Outdoor Unit Model	Min. to Max. Piping Length for One Branch (ft.)	Max. Total System Piping Length (ft.)	Chargeless Pipe Length per Branch (L) (ft.)	Additional Charge Needed (a) (oz./ft.)
LMU18CHV	10 to 82	164	24.6	0.22
LMU24CHV	10 to 82	246.1	24.6	0.22
LMU30CHV	10 to 82	246.1	24.6	0.22
LMU36CHV	10 to 82	246.1	24.6	0.22

Multi F Refrigerant Charge Calculations

(_____[A] – 24.6) x 0.22 (_____)

+ (_____[B] – 24.6) x 0.22 + (_____)

+ (_____[C] – 24.6) x 0.22 + (_____)

+ (_____[D] – 24.6) x 0.22 + (_____)

- _____CF x 5.29 - (_____)

= _____ Additional Charge (oz.)

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MULTI F
MULTI F MAX

MULTI F MAX REFRIGERANT CHARGE WORKSHEET

LG Multi F MAX outdoor units ship from the factory with a charge of R410A refrigerant. A trim charge will need to be added to take into account additional piping length.

To determine the additional refrigerant that is needed, apply the formula 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 MAX Outdoor Unit Factory Charge

Outdoor Unit	Factory Charge lbs. of R410A
LMU480HV	9.7
LMU540HV	9.7
LMU600HV	12.3

Additional charge (lbs.) = (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

Multi F MAX Outdoor Unit Piping Specifications

Outdoor Unit Model	Main Piping Length		Branch Piping Length	
	Chargeless Pipe Length of Main Pipe (L) (ft.)	Additional Charge Needed (a) (oz./ft.)	Chargeless Pipe Length per Branch Pipe (B) (ft.)	Additional Charge Needed (b) (oz./ft.)
LMU480HV	16.4	0.54	16.4	0.22
LMU540HV	16.4	0.54	16.4	0.22
LMU600HV	16.4	0.54	16.4	0.22

Multi F MAX Refrigerant Charge Calculations

(_____[A] – 16.4) x 0.54	(_____)
+ (_____[B1] – 16.4) x 0.22	+ (_____)
+ (_____[B2] – 16.4) x 0.22	+ (_____)
+ (_____[B3] – 16.4) x 0.22	+ (_____)
+ (_____[B4] – 16.4) x 0.22	+ (_____)
+ (_____[B5] – 16.4) x 0.22	+ (_____)
+ (_____[B6] – 16.4) x 0.22	+ (_____)
+ (_____[B7] – 16.4) x 0.22	+ (_____)
+ (_____[B8] – 16.4) x 0.22	+ (_____)
- _____CF x 3.53	- (_____)

= _____ Additional Charge (oz.)

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Inverter

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LG Electronics, U.S.A., Inc.
Air Conditioning Technologies
4300 North Point Parkway
Alpharetta, Georgia 30022
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IM_MultiF_ODU_04_20
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IM_MultiF_ODU_11_16
IM_MultiF_ODU_4_16
IM_MultiF_ODU_11_15

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MULTI F
MULTI F MAX

OUTDOOR UNIT
INSTALLATION MANUAL

Multi-Zone Heat Pump Systems

1.5 to 5 Tons

Dual and Tri-Zone
Multi F

Quad-Zone
Multi F

Eight-Zone
Multi F MAX

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Please read carefully and store in a safe place for future reference.
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The instructions included in this manual must be followed to prevent product malfunction, property damage, injury, or death to the user or other people. Incorrect operation due to ignoring any instructions will cause harm or damage. The level of seriousness is classified by the symbols described by the summary list of safety precautions on page 4.

For more materials such as submittals, catalogs, engineering, installation, owner's, and service manuals, visit www.lghvac.com.

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SAFETY INSTRUCTIONS

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

TABLE OF SYMBOLS

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

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.

⃠ **Do not supply power to the unit until all wiring and piping are completed or reconnected and checked.**
There is risk of physical injury or death due to electric shock.

⚠WARNING

⃠ **Do not install, remove, or re-install the unit by yourself (end user). Ask the dealer or an trained technician to install the unit.**
Improper installation by the user may result in fire, explosion, electric shock, physical injury or death.

For replacement of an installed unit, always contact an LG trained service provider.
There is risk of fire, electric shock, explosion, and physical injury or death.

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

⃠ **Do not change the settings of the protection devices.**
If the protection devices have been bypassed or is forced to operate improperly, or parts other than those specified by LG are used, there is risk of fire, electric shock, explosion, and physical injury or death.

Replace all control box and panel covers.
If cover panels are not installed securely, dust, water and animals may enter the outdoor unit, causing fire, electric shock, and physical injury or death.

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.

Periodically check that the outdoor frame is not damaged.
There is a risk of explosion, physical injury, or death.

If the air conditioner is installed in a small space, take measures to prevent the refrigerant concentration from exceeding safety limits in the event of a refrigerant leak.
Consult the latest edition of ASHRAE (American Society of Heating, Refrigerating, and Air Conditioning Engineers) Standard 15. If the refrigerant leaks and safety limits are exceeded, it could result in personal injuries or death from oxygen depletion.

The branch distribution (BD) unit must be installed indoors; ⃠ **do not install the BD unit in a highly humid environment.**
There is risk of physical injury or death due to electric shock.

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, fall onto it, or place objects on it. ⃠ **Do not install the unit on a defective stand.**
It may result in an accident that causes physical injury or death.

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Installation, continued

⚠ WARNING

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.

⚠ 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 weights listed.*
- *Some products use polypropylene bands for packaging.* ⃠ *Do not use polypropylene bands to lift the unit.*
- *Support the outdoor unit a minimum of four points to avoid slippage from rigging apparatus.*

Note

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

⃠ **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.

When installing the outdoor unit in a low-lying area, or a location that is not level, use a raised concrete pad or concrete blocks to provide a solid, level foundation.
This prevents water damage and abnormal vibration.

Properly insulate all cold surfaces to prevent "sweating."
Cold surfaces such as uninsulated piping can generate condensate that may drip and cause water damage to walls.

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

The branch distribution (BD) unit must be installed indoors; ⃠ **Do not install the BD box in a highly humid environment.**
There is risk of product failure and property damage.

⃠ **Do not make refrigerant substitutions. Use R410A only.**
If a different refrigerant is used, or air mixes with original refrigerant, the unit will malfunction and be damaged.

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

⃠ **Do not use the product for mission critical or special purpose applications such as preserving foods, works of art, or other precision air conditioning applications. The equipment is designed to provide comfort cooling and heating.**
There is risk of property damage.

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 or BD unit in a noise-sensitive area.**

Take appropriate actions at the end of HVAC equipment life to recover, recycle, reclaim or destroy R410A refrigerant according to applicable U.S. Environmental Protection Agency (EPA) rules.

Periodically check that the outdoor 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.

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Wiring

⚠DANGER

High voltage electricity is required to operate this system. Adhere to the NEC code 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.

Turn the power off at the nearest disconnect before servicing the equipment.
Electrical shock can cause physical injury or death.

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

⃠ Do not share the electrical circuit with other appliances.
There is risk of fire, electric shock, and physical injury or death due to heat generation.

⃠ Do not use damaged or loose power wiring. ⃠ Do not modify or extend the outdoor unit's power wiring randomly. Ensure that the power wiring will not be pulled nor weight be placed on the power wiring during operation.
There is risk of fire, electric shock, and 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 U.S. National Electric Code (NEC) who is equipped with the proper tools and test instruments.
Failure to carefully read and follow all instructions in this manual can result in equipment malfunction, property damage, personal 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 National Electrical Code, 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.

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.

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.

Ensure the system is connected to a dedicated power source that provides adequate power.
If the power source capacity is inadequate or the electric work is not performed properly, it may result in fire, electric shock, physical injury or death.

Properly tighten all power connections.
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 protection devices have been bypassed or are forced to operate improperly, or parts other than those specified by LG are used, there is risk of fire, electric shock, explosion, and physical injury or death.

Note

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

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Operation

⚠DANGER

⃠ Do not provide power to or operate the unit if it is flooded or submerged.
There is risk of fire, electric shock, physical injury or death.

Use a dedicated breaker for this product.
There is risk of fire, electric shock, physical injury or death.

⃠ Do not operate the disconnect switch with wet hands.
There is risk of fire, electric shock, physical injury or death.

Periodically verify the equipment mounts have not deteriorated.
If the base collapses, the unit could fall and cause physical injury or death.

Use inert (nitrogen) gas when performing leak tests or air purges. ⃠ Do not use compressed air, oxygen, or flammable gases.
Using these substances may cause fire, explosion, and physical injury or death.

If refrigerant leaks out, ventilate the area before operating the unit.
If the unit is mounted in an enclosed, low-lying, or poorly ventilated area, and the system develops a refrigerant leak, it may cause a fire, electric shock, explosion, physical injury or death.

⚠WARNING

⃠ Do not allow water, dirt, or animals to enter the unit.
There is risk of fire, electric shock, physical injury or death.

⃠ Do not operate the unit with the panel(s) or protective cover(s) removed; keep fingers and clothing away from moving parts.
The rotating, hot, cold, and high-voltage parts of the unit can cause physical injury or death.

⃠ Do not touch the refrigerant piping during or after operation.
It can cause burns or frostbite.

⃠ Do not open the inlet during operation.
There is risk of electric shock, physical injury or death.

⚠CAUTION

To avoid physical injury, use caution when cleaning or servicing the air conditioner.

Note

Clean up the site after servicing is finished, and check that no metal scraps, screws, or bits of wiring have been left inside or surrounding the unit.

⃠ Do not use the product for mission critical or special purpose applications such as preserving foods, works of art, or other precision air conditioning applications. The equipment is designed to provide comfort cooling and heating.
Oil, steam, sulfuric smoke, etc., can significantly reduce the performance of the unit, or damage its parts.

⃠ Do not block the inlet or outlet.
Unit may malfunction.

⃠ Do not allow water, dirt, or animals to enter the unit.
There is risk of unit failure.

⃠ Do not open the inlet during operation.
There is risk of unit failure.

⃠ Do not operate the unit when the panel(s) or protective cover(s) are removed; keep fingers and clothing away from moving parts.
Non-secured covers can result in malfunction due to dust or water in the service panel.

Periodically verify the equipment mounts have not deteriorated.
If the base collapses, the unit could fall and cause property damage or product failure.

Use a only soft cloth to clean the air conditioner. ⃠ Do not use wax, thinner, or strong detergents.
Strong cleaning products may damage the surface of the air conditioner, or may cause its appearance to deteriorate.

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SPECIFICATIONS

Multi F Outdoor Units

MULTI F
MULTI F MAX

Table 1: Multi F Outdoor Unit Specifications.

Model Number	LMU18CHV	LMU24CHV	LMU30CHV	LMU36CHV
Cooling Capacity (Btu/h)[1] (Min.~Rated~ Max.)	8,400~17,000~19,000	8,400~20,000~25,000	8,400~30,000~36,000	8,400~32,000~38,400
Heating Capacity (Btu/h)[1] (Min.~Rated~ Max.)	10,248~22,000~24,000	9,240~24,000~28,800	9,240~32,000~38,400	9,240~36,000~41,600
Operating Range				
Cooling (°F DB)	14[7] - 118	14[7] - 118	14[7] - 118	14[7] - 118
Heating (°F WB)	-4 - 64	-4 - 64	-4 - 64	-4 - 64
Compressor				
Inverter Quantity	Twin Rotary x 1	Twin Rotary x 1	Twin Rotary x 1	Twin Rotary x 1
Oil Type	FVC68D	FVC68D	FVC68D	FVC68D
Fan (Side Discharge)				
Type	Propeller	Propeller	Propeller	Propeller
Motor Output (W) x Qty.	85.4 x 1	85.4 x 1	124.2 x 1	124.2 x 1
Motor/Drive	Brushless Digitally Controlled / Direct			
Maximum Air Volume (CFM)	1,766	1,766	2,119	2,119
Unit Data				
Refrigerant Type	R410A	R410A	R410A	R410A
Refrigerant Control/Location	EEV/Outdoor Unit	EEV/Outdoor Unit	EEV/Outdoor Unit	EEV/Outdoor Unit
Min. Number Indoor Units/System[2]	2	2	2	2
Max. Number Indoor Units/System[2]	2	3	4	4
Maximum Allowable Total Indoor Unit Connected Capacity (Btu/h)	24,000	33,000	40,000	48,000
Sound Pressure (Cooling / Heating) dB(A)[3]	49 / 52	49 / 52	52 / 55	52 / 55
Net Unit Weight (lbs.)	100	100	137	137
Shipping Weight (lbs.)	108	108	148	148
Power Wiring / Communications Cable (No. x AWG)[4,5]	4C x 18	4C x 18	4C x 18	4C x 18
Heat Exchanger				
Material and Fin Coating	Copper Tube/Aluminum Fin and GoldFin™/Hydrophilic			
Rows/Columns/Fins per inch x Qty.	(2 x 28 x 14) x 1	(2 x 28 x 14) x 1	(2 x 38 x 14) x 1	(2 x 38 x 14) x 1
Piping				
Liquid Line Connection (in., OD) x Qty.	1/4 x 2	1/4 x 3	1/4 x 4	1/4 x 4
Vapor Line Connection (in., OD) x Qty.	3/8 x 2	3/8 x 3	3/8 x 4	3/8 x 4
Factory Charge lbs. of R410A	3.96	3.96	6.18	6.18
Piping Lengths				
Maximum Total Piping (ft.)[6]	164.0	246.1	246.1	246.1
Maximum Outdoor Unit to Indoor Unit Piping (ft)	82.0	82.0	82.0	82.0
Piping Length (No Additional Refrigerant [ft])	49.2	73.8	98.4	98.4
Maximum Elevation between Outdoor Unit and Indoor Unit (ft.)	49.2	49.2	49.2	49.2
Maximum Elevation between Indoor Unit and Indoor Unit (ft.)	24.6	24.6	24.6	24.6

[1]Rated capacity applied with non-ducted indoor units, and is rated 0 ft. above sea level with 25 ft. of refrigerant line per indoor unit and a 0 ft. level difference between outdoor and indoor units. All capacities are net with a combination ratio between 95 – 105%.

Rated cooling capacity obtained with air entering the indoor unit at 80ºF dry bulb (DB) and 67ºF wet bulb (WB) and outdoor ambient conditions of 95ºF dry bulb (DB) and 75ºF wet bulb (WB).
Rated heating capacity obtained with air entering the indoor unit at 70ºF dry bulb (DB) and 60ºF wet bulb (WB) and outdoor ambient conditions of 47ºF dry bulb (DB) and 43ºF wet bulb (WB).

[2]At least two indoor units should be connected. For allocated capacity information, see the combination tables in the "Multi F / Multi F MAX Combination Data Manual" on www.lg-dfs.com. For performance data, see "Multi F / Multi F MAX Performance Data Manual" on www.lg-dfs.com.

[3]Sound pressure levels are tested in an anechoic chamber under ISO Standard 3745 and are the same in both cooling and heating mode. These values can increase due to ambient conditions during operation.

[4]Power wiring to the outdoor unit is field supplied, solid or stranded, and must comply with the applicable local and national codes. For detailed information, please refer to electrical characteristics on page 11.

[5]All power wiring / communication cable to be minimum 18 AWG from the outdoor unit to the indoor unit, 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. For detailed electrical information, please refer to electric characteristics on page 11.

[6]Piping lengths are equivalent.

[7]Installation of an optional Low Ambient Wind Baffle Kit will allow operation down to -4°F in cooling mode.

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SPECIFICATIONS

Multi F MAX Outdoor Units

Table 2: Multi F MAX Outdoor Unit General Data.

Model Number	LMU480HV	LMU540HV	LMU600HV
Cooling Capacity (Btu/h) (Minimum ~ Rated ~ Maximum)[1]	14,400~48,000~58,000	14,400~52,500~63,200	15,600~60,000~68,000
Heating Capacity (Btu/h) (Minimum ~ Rated ~ Maximum)[1]	15,840~54,000~61,000	16,272~58,000~64,000	17,940~64,000~70,000
Operating Range			
Cooling (°F DB)	14[7] - 118	14[7] - 118	14[7] - 118
Heating (°F WB)	-4 - 64	-4 - 64	-4 - 64
Compressor			
Inverter Quantity	Twin Rotary x 1	Twin Rotary x 1	Twin Rotary x 1
Oil Type	FVC68D	FVC68D	FVC68D
Fan (Side Discharge)			
Type	Propeller	Propeller	Propeller
Motor Output (W) x Qty.	124.2 x 2	124.2 x 2	124.2 x 2
Motor/Drive	Brushless Digitally Controlled/Direct		
Maximum Air Volume (CFM)	2,119 x 2	2,119 x 2	2,119 x 2
Unit Data			
Refrigerant Type	R410A	R410A	R410A
Refrigerant Control/Location	EEV / Outdoor Unit, Branch Distribution Unit		
Min. Number Indoor Units/System[2]	2	2	2
Max. Number Indoor Units/System[2]	8	8	8
Maximum Allowable Total Indoor Unit Connected Capacity (Btu/h)	65,000	73,000	81,000
Sound Pressure ±3 dB(A)[3] (Cooling / Heating)	54 / 56	54 / 56	56 / 58
Net Unit Weight (lbs.)	214	214	223
Shipping Weight (lbs.)	236	236	249
Power/Communications Wiring Between ODU and BD Unit (No. X AWG)[4,5]	4C X 16	4C X 16	4C x 16
Heat Exchanger			
Material and Fin Coating	Copper Tube / Aluminum Fin and GoldFin™/Hydrophilic		
Rows/Columns/Fins per inch x Qty.	(2 x 32 x 14) x 2	(2 x 32 x 14) x 2	(3 x 32 x 14) x 2
Piping			
Liquid Line Connection (in., OD) x Qty.	3/8 x 1	3/8 x 1	3/8 x 1
Vapor Line Connection (in., OD) x Qty.	3/4 x 1	3/4 x 1	3/4 x 1
Factory Charge lbs. of R410A	9.7	9.7	12.3
Piping Lengths			
Maximum Total System Piping (ft.)[6]	475.7	475.7	475.7
Maximum Main Pipe Length (Outdoor Unit to BD Unit [ft.])	180.4	180.4	180.4
Total Branch Piping (BD Units to all Indoor Units [ft.])	295.3	295.3	295.3
Maximum Branch Pipe Length (Length between each BDU and IDU [ft.])	49.2	49.2	49.2
Maximum Outdoor Unit to Indoor Unit Pipe Length (ft.)	229.6	229.6	229.6
Max. Main Piping Length (No Additional Refrigerant (ft.)	16	16	16
Max. Branch Piping Length (No Additional Refrigerant (ft.)	131	131	147.6
Maximum Elevation between Outdoor Unit and Indoor Unit (ft.)	98.4	98.4	98.4
Maximum Elevation between Indoor Unit and Indoor Unit (ft.)	49.2	49.2	49.2
Maximum Elevation between BD Unit and Indoor Unit (ft.)	32.8	32.8	32.8
Maximum Elevation between BD Unit and BD Unit (ft.)	49.2	49.2	49.2

[1]Rated capacity applied with non-ducted indoor units, and is rated 0 ft. above sea level with a 0 ft. level difference between outdoor and indoor units. All capacities are net with a combination ratio between 95 – 105%.

Rated cooling capacity obtained with air entering the indoor unit at 80ºF dry bulb (DB) and 67ºF wet bulb (WB) and outdoor ambient conditions of 95ºF dry bulb (DB) and 75ºF wet bulb (WB). Rated heating capacity obtained with air entering the indoor unit at 70ºF dry bulb (DB) and 60ºF wet bulb (WB) and outdoor ambient conditions of 47ºF dry bulb (DB) and 43ºF wet bulb (WB).

[2]At least one Branch Distribution Unit is required for system operation; a maximum of two can be installed per outdoor unit with use of Y-branch accessory (PMBL5620). At least two indoor units should be connected. For allocated capacity information, see the combination tables in the "Multi F / Multi F MAX Combination Data Manual" on www.lg-dfs.com. For performance data, see "Multi F / Multi F MAX Performance Data Manual" on www.lg-dfs.com.

[3]Sound pressure levels are tested in an anechoic chamber under ISO Standard 3745. These values can increase due to ambient conditions during operation.

[4]Power wiring to the outdoor unit is field supplied, solid or stranded, and must comply with the applicable local and national codes. For detailed information, please refer to electrical characteristics on page 11.

[5]All power wiring / communication cable to be minimum 16 AWG from the outdoor unit to the BD unit (Multi F MAX systems only), and 18 AWG from the BD unit to the indoor unit, 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. For detailed electrical information, please refer to electric characteristics on page 11.

[6]Piping lengths are equivalent.

[7]Installation of an optional Low Ambient Wind Baffle Kit will allow operation down to -4°F in cooling mode.

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SPECIFICATIONS

Multi F MAX Branch Distribution Units

MULTI F
MULTI F MAX

Table 3: Multi F MAX BD Unit General Data.

Model Number		PMBD3620	PMBD3630	PMBD3640	PMBD3641
No. of Connectible Indoor Units[1]		1-2	1-3	1-4	1-4
Max. Nominal Capacity / Port (Btu/h)[2]		24,000	24,000	24,000	24,000 for A,B,C Ports; 36,000 for D Port
Max. Nominal Capacity / BD Unit (Btu/h)		48,000	72,000	73,000	73,000
Operation Temperature Range (°F DB)		0 ~ 150	0 ~ 150	0 ~ 150	0 ~ 150
Unit Data					
Refrigerant Type		R410A	R410A	R410A	R410A
Power Supply V, Ø, Hz		208-230, 1, 60	208-230, 1, 60	208-230, 1, 60	208-230, 1, 60
Power Input (W)		16	24	32	32
Rated Amps (A)		0.08	0.12	0.16	0.16
Dimensions W x H x D (in.)		17-3/32 x 6-13/32 x 10-23/32	17-3/32 x 6-13/32 x 10-23/32	17-3/32 x 6-13/32 x 10-23/32	17-3/32 x 6-13/32 x 10-23/32
Net Unit Weight (lbs.)		13	14.3	15.7	15.7
Shipping Weight (lbs.)		15	17	18	18
Power Wiring / Communication Cables[3]					
From Outdoor Unit to BD Unit (Qty. x AWG)[3]		4 x 16	4 x 16	4 x 16	4 x 16
From BD Unit to Indoor Unit (Qty. x AWG)[3]		4 x 18	4 x 18	4 x 18	4 x 18
Piping Connections					
Outdoor Unit to BD Unit	Liquid (in., OD)	Ø3/8	Ø3/8	Ø3/8	Ø3/8
	Vapor (in., OD)	Ø3/4	Ø3/4	Ø3/4	Ø3/4
BD Unit to Indoor Units	Liquid (in., OD) x Qty.	Ø1/4 x 2	Ø1/4 x 3	Ø1/4 x 4	Ø1/4 x 4
	Vapor (in., OD) x Qty.	Ø3/8 x 2	Ø3/8 x 3	Ø3/8 x 4	Ø3/8 x 3 Ø1/2 x 1
Piping Lengths					
Maximum Total System Piping (ft.)[4]		475.7	475.7	475.7	475.7
Maximum Main Pipe Length (Outdoor Unit to BD Units [ft.])		180.4	180.4	180.4	180.4
Maximum Total Branch Piping (BD Units to Indoor Units [ft.])		295.3	295.3	295.3	295.3
Maximum Branch Pipe Length Between BD Unit and Each Indoor Unit [ft.])		49.2	49.2	49.2	49.2
Maximum Outdoor Unit to Indoor Unit Pipe Length (ft.)		229.6	229.6	229.6	229.6
Main Piping Length (No Additional Refrigerant (ft.)		16	16	16	16
Branch Piping Length (No Additional Refrigerant (ft.)		131	131	131	131
Maximum Elevation between BD Unit and Indoor Unit (ft.)		32.8	32.8	32.8	32.8
Maximum Elevation between BD Unit and BD Unit (ft.)		49.2	49.2	49.2	49.2

[1]At least one Branch Distribution Unit is required for system operation; a maximum of two can be installed per outdoor unit with use of Y-branch accessory (PMBL5620) To connect only one (1) indoor unit to a branch distribution unit, the system must include another branch distribution unit with at least one (1) connected indoor unit.

[2] Branch Distribution Unit can accommodate from one (1) indoor unit up to four (4) indoor units depending on the ports available on the Branch Distribution Unit.

[3]All power wiring / communication cable to be minimum 16 AWG from the outdoor unit to the BD unit (Multi F MAX systems only), and 18 AWG from the BD unit to the indoor unit, 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. For detailed electrical information, please refer to electric characteristics on page 11.

[4]Piping lengths are equivalent.

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ELECTRICAL DATA

Multi F and Multi F MAX Outdoor Units

Table 4: Multi F Outdoor Unit Electrical Data.

Nominal Tons	Unit Model No.	Hertz	Voltage	Phase	Voltage Range (Min. to Max.)	MCA	MOP	Compressor Quantity	Compressor Motor RLA	Outdoor Fan Motor		Indoor Fan Motor
										kW	FLA	FLA
1.5	LMU18CHV	60	208 - 230	1	187 - 253	13.3	20	1	8.9	0.09	0.59	1.60
2	LMU24CHV					14.3	20	1	9.4	0.09	0.59	2.00
2.5	LMU30CHV					16.6	25	1	10.8	0.12	0.73	2.40
3	LMU36CHV					17.9	25	1	11.2	0.12	0.73	3.20

Voltage tolerance is ±10%.

Maximum allowable voltage unbalance is 2%.

RLA = Rated Load Amps.

MCA = Minimum Circuit Ampacity.

Maximum Overcurrent Protection (MOP) is calculated as follows: (Largest motor FLA x 2.25) + (Sum of other motor FLA) rounded down to the nearest standard fuse size.

Indoor Fan Motor (FLA) is based on the maximum combination of indoor units.

The max combination for each outdoor unit is:

- 18,000 ODU (LMU18CHV): 12,000 IDU x 2
- 24,000 ODU (LMU24CHV): 12,000 IDU x 2 + 9,000 IDU x 1
- 30,000 ODU (LMU30CHV): 12,000 IDU x 3
- 36,000 ODU (LMU36CHV): 12,000 IDU x 4

Table 5: Multi F MAX Electrical Data.

Nominal Tons	Unit Model No.	Hertz	Voltage	Phase	Voltage Range (Min. to Max.)	MCA	MOP	Compressor Quantity	Compressor Motor RLA	Condenser Fan Motor(s)		Indoor Fan Motor
										Condenser Fan Quantity x kW	Condenser Fan Motor FLA	
4.0	LMU480HV	60	208 - 230	1	187 - 253	27.3	40	1	17.5	2 x 0.12	0.73 x 2	4.0
4.5	LMU540HV	60	208 - 230		187 - 253	29.4	40	1	18.5	2 x 0.12	0.73 x 2	4.8
5.0	LMU600HV	60	208 - 230		187 - 253	32.2	45	1	20.4	2 x 0.12	0.73 x 2	5.2

Voltage tolerance is ±10%.

Maximum allowable voltage unbalance is 2%.

RLA = Rated Load Amps.

MCA = Minimum Circuit Ampacity.

Maximum Overcurrent Protection (MOP) is calculated as follows: (Largest motor FLA x 2.25) + (Sum of other motor FLA) rounded down to the nearest standard fuse size.

Indoor Fan Motor (FLA) is based on the maximum combination of indoor units.

The max combination for each outdoor unit is:

- 48,000 ODU (LMU480HV): 12,000 IDU x 5
- 54,000 ODU (LMU540HV): 12,000 IDU x 6
- 60,000 ODU (LMU6000HV): 12,000 IDU x 6 + 9,000 IDU x 1

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R410A Refrigerant

R410A refrigerant has a higher operating pressure in comparison to R22 refrigerant and, therefore, all piping system materials installed must have a higher resisting pressure than the materials traditionally used in R22 systems.

R410A refrigerant is an azeotrope of R32 and R125, mixed at 50:50, so the ozone depletion potential (ODP) is 0.

⚠WARNING

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

Note

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

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GENERAL INSTALLATION GUIDELINES

Location for Outdoor Unit

Selecting the Best Location for the Outdoor Unit

⚠DANGER

To avoid the possibility of fire, do not install the unit in an area where combustible gas may generate, flow, stagnate, or leak. Failure to do so will cause serious bodily injury or death.

Note:

Before beginning installation, read the safety summary at the beginning of this manual.

⚠WARNING

⃠ Do not install the unit in a location where acidic solution and spray (sulfur) are often used as this may cause serious bodily injury or death. ⃠ Do not use the unit in environments where oil, steam, or sulfuric gas are present as this may cause serious bodily injury or death.

⚠CAUTION

When deciding on a location to place the outdoor unit, be sure to choose an area where run-off from defrost will not accumulate and freeze on sidewalks or driveways which may create unsafe conditions.

Note:

Select a location for installing the outdoor unit that will meet the following general conditions:

- *A location strong enough to bear the weight of the outdoor unit.*
- *A location that allows for optimum air flow and is easily accessible for inspection, maintenance, and service.*
- *Where piping between the outdoor unit, indoor unit(s), and BD units (Multi F MAX systems only) are within allowable limits.*
- *Include space for drainage to ensure condensate flows properly out of the unit when it is in heating mode. Avoid placing the outdoor unit in a low-lying area where water could accumulate.*

⃠

- *Where it will not be subjected to direct thermal radiation from other heat sources, nor an area that would not expose the outdoor unit to heat or steam like discharge from boiler stacks, chimneys, steam relief ports, other air conditioning units, kitchen vents, plumbing vents, and other sources of extreme temperatures.*
- *Where high-frequency electrical noise / electromagnetic waves will not affect operation.*
- *Where operating sound from the unit will not disturb inhabitants of surrounding buildings.*
- *Where the unit will not be exposed to direct, strong winds.*

Oceanside Installation Precautions

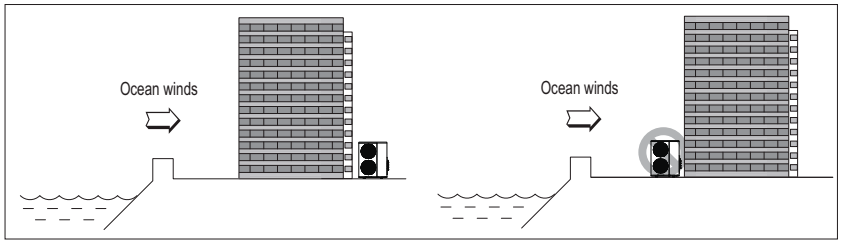
- Avoid installing the outdoor unit where it would be directly exposed to ocean winds.
- Install the outdoor unit on the side of the building opposite from direct ocean winds.
- Select a location with good drainage.
- Periodically clean dust or salt particles off of the heat exchanger with water.

Note:

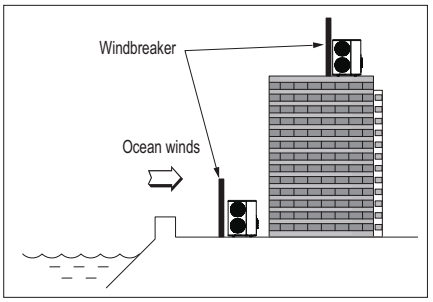
Additional anti-corrosion treatment may need to be applied to the outdoor unit at oceanside locations.

Note:

Ocean winds may cause corrosion, particularly on the condenser and evaporator fins, which, in turn could cause product malfunction or inefficient performance.



If the outdoor unit must be placed in a location where it would be subjected to direct ocean winds, install a concrete windbreaker strong enough to block any winds. Windbreaker height and width should be more than 150% of the outdoor unit, and be installed at least 27-1/2 inches away from the outdoor unit to allow for airflow.



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GENERAL INSTALLATION GUIDELINES

Location for Outdoor Unit

Rooftop Installations

If the outdoor unit is installed on a roof structure, be sure to level the unit. Ensure the roof structure and anchoring method are adequate for the unit location. Consult local codes regarding rooftop mounting.

Planning for Snow and Ice

In climates that experience snow buildup, place the unit on a raised platform to ensure proper condenser airflow. The raised support platform must be high enough to allow the unit to remain above possible snow drifts. Mount the unit on a field-provided stand that is higher than the maximum anticipated snowfall for the location. Design the mounting base to prevent snow accumulation on the platform in front or back of the unit case. If necessary, provide a field fabricated hood to keep snow and ice and/or drifting snow from accumulating on the coil surfaces. Use inlet and discharge duct or hoods to prevent snow or rain from accumulating on the fan inlet and outlet guards. Best practice prevents snow from accumulating on top of the unit. Consider tie-down requirements in case of high winds or where required by local codes.

⚠CAUTION

When deciding on a location to place the outdoor unit, be sure to choose an area where run-off from defrost will not accumulate and freeze on sidewalks or driveways which may create unsafe conditions.

Tie-Downs and Lightning Protection

Tie-Downs

- The strength of the roof must be checked before installing the outdoor units.
- If the installation site is prone to high winds or earthquakes, when installing on the wall or roof, securely anchor the mounting base using a field-provided tie-down configuration approved by a local professional engineer.
- The overall tie-down configuration must be approved by a local professional engineer. Always refer to local code when using a wind restraint system.

Lightening Protection

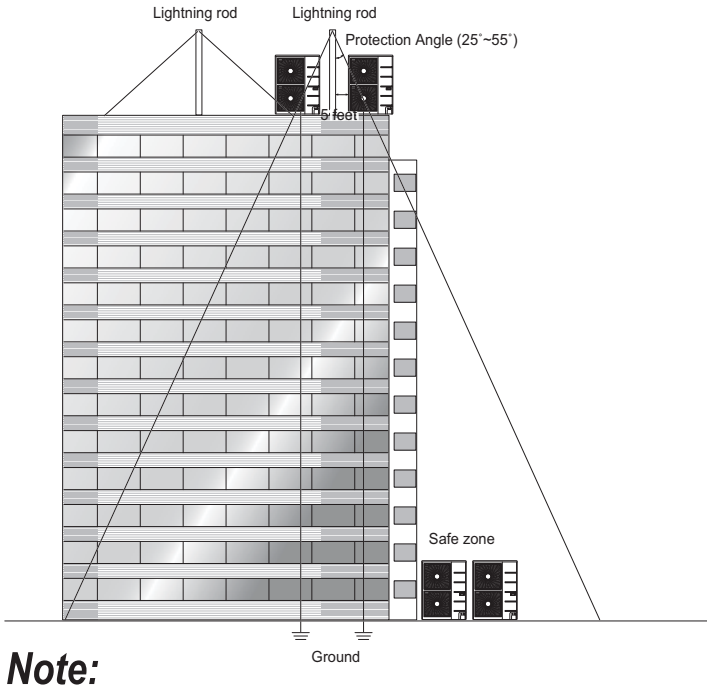
- To protect the outdoor unit from lightning, it should be placed within the specified lightning safety zone.

Table 6: Safety Zone Specifications.

Building Height (feet)	66	98	148	197
Protection Angle (˚)	55	45	35	25

- Power cable and communication cable should be installed five (5) feet away from lightning rod.
- A high-resistance ground system should be included to protect against induced lightning or indirect strike.

Figure 1: Lightening Protection Diagram.



Note:

If the building does not include lightning protection, the outdoor unit may be damaged from a lightening strike. Inform the customer of this possibility in advance.

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GENERAL INSTALLATION GUIDELINES

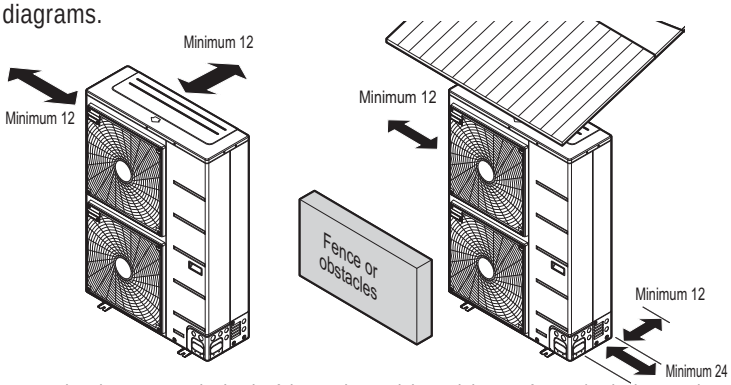
Service Access and Allowable Clearances for Outdoor Unit

Outdoor Unit Service Access and Allowable Clearances

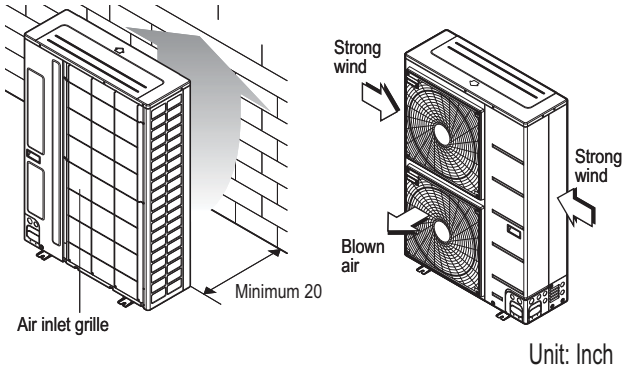
Appropriate airflow through the outdoor unit coil is critical for proper unit operation.

- Include enough space for airflow and for service access. If installing multiple outdoor units, avoid placing the units where the discharge of one unit will blow into the inlet side of an adjacent unit.
- No obstacles to air circulation around the unit; keep proper distances from ceilings, fences, floor, walls, etc. (Install a fence to prevent pests from damaging the unit or unauthorized individuals from accessing it.)
- If an awning is built over the unit to prevent direct sunlight or rain exposure, make sure that the discharge air of the outdoor unit isn't restricted.

When installing the outdoor unit, consider service, inlet, and outlet, and minimum allowable space requirements as illustrated in the following diagrams.



Ensure that the space at the back of the outdoor unit is a minimum of 11-13/16 inches, and include a minimum of 23-5/8 inches at the right side of the unit for service.

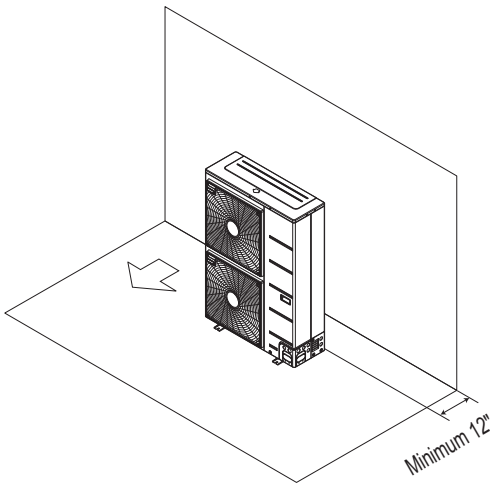


Unit: Inch

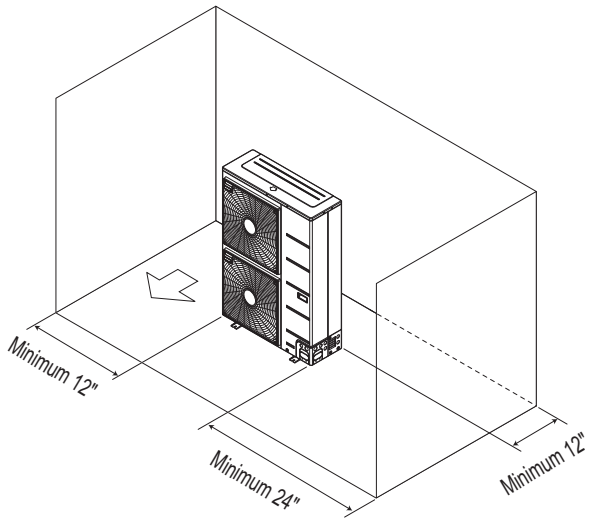
If the outdoor unit discharge side faces a wall, include a minimum of 19-11/16 inches between the outdoor unit and the wall. Install the outdoor unit so that the discharge port is set at a right angle to the wind direction.

Clearance Requirements when Different Obstacles are Present (Unit: Inch)

Obstacle on the suction side only.



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



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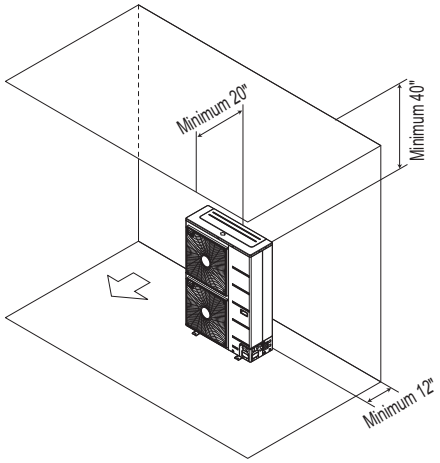
GENERAL INSTALLATION GUIDELINES

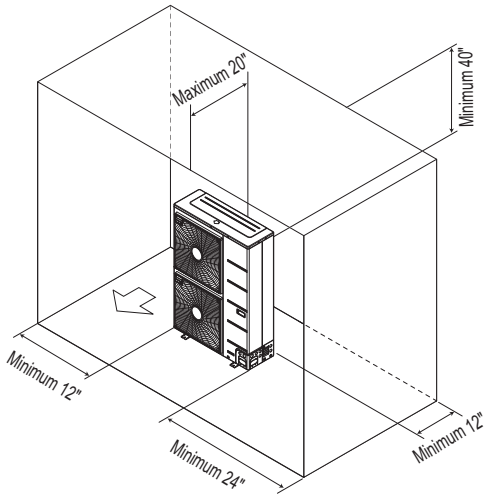
Allowable Clearances for Outdoor Unit

Clearance Requirements when Different Obstacles are Present, continued. (Unit: Inch)

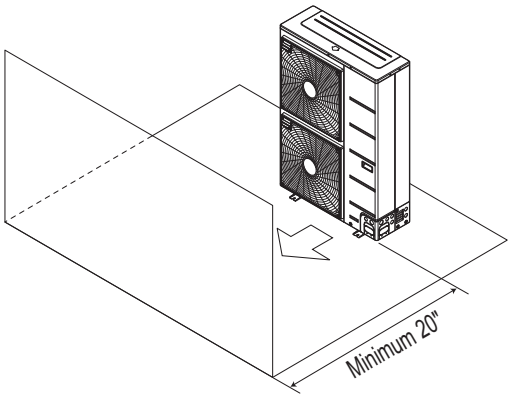
Obstacles above and on the air intake side.



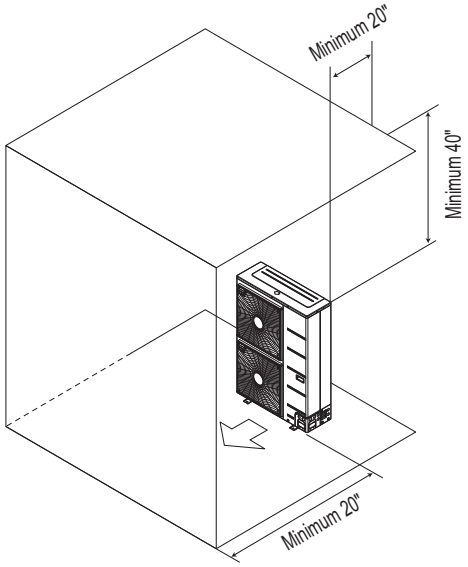
Obstacles above, on the air intake side, and on both left and right sides



Obstacle just on the air discharge side.



Obstacles above and on the air discharge side.



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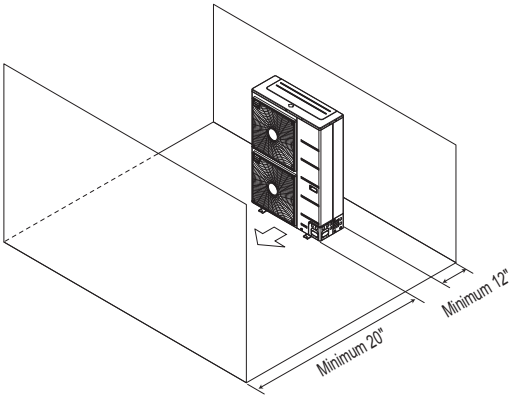
GENERAL INSTALLATION GUIDELINES

Allowable Clearances for Outdoor Unit

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 higher than the outdoor unit).

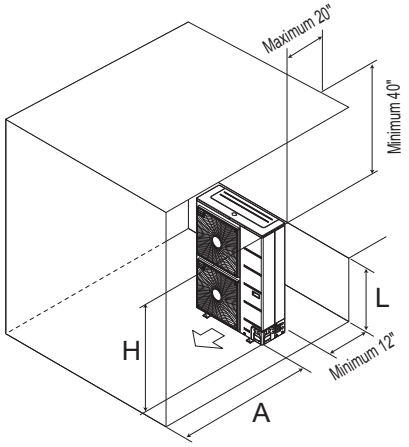
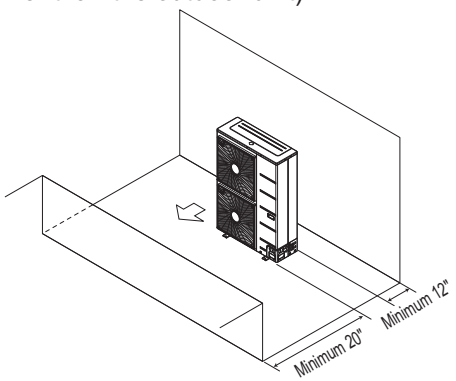


Table 7: Ratio among H, A, and L.

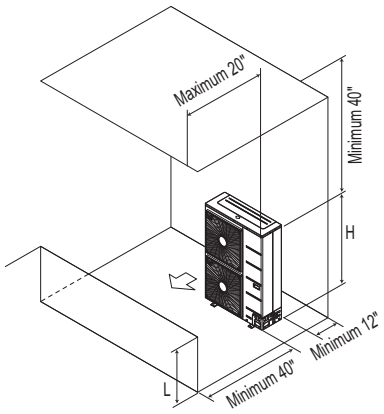
	L	A
L ≤ H	0 < L ≤ 1/2 H	30 inches
	1/2 H < L	40 inches
H < L	Set Stand as: L ≤ H	

If a stand is necessary, it should be contained (not open frame) to prevent the discharge air from short cycling.

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



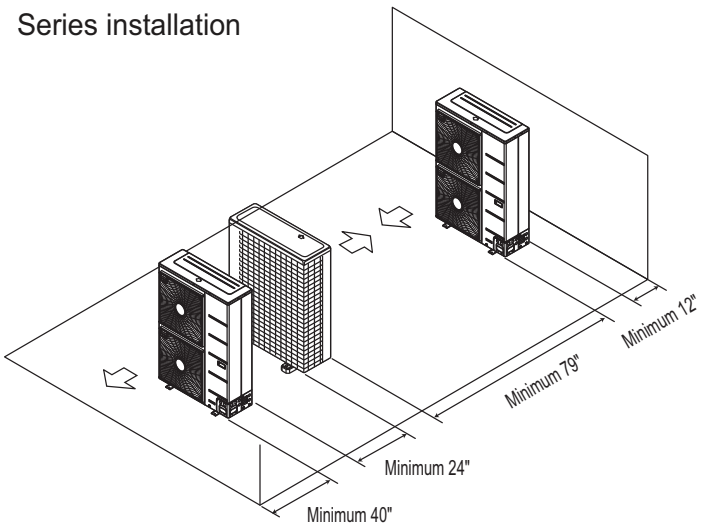
Where there are obstacles above, and on both suction and discharge sides (discharge side obstacle is lower than the outdoor unit).



Note:

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

Series installation



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GENERAL INSTALLATION GUIDELINES

Rigging Instructions / Platform Instructions for Outdoor Unit

Rigging and Lifting Instructions

⚠ WARNING

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

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.*

⚠ 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 weights listed.*
- *Some products use polypropylene bands for packaging. ⃠ Do not use polypropylene bands to lift the unit.*
- *Support the outdoor unit a minimum of four points to avoid slippage from rigging apparatus.*

Note:

- *Make sure the outdoor unit is in its original packaging to avoid damage during local transport.*
- *At the time of delivery, the package should be checked for any damage (exterior and interior). Report any damage to the carrier claims agent immediately.*
- *Handle the outdoor unit with care. Keep the outdoor unit upright to avoid damaging inside components.*
- *If a forklift is to transport the outdoor unit, the forklift arms should pass through the openings at the bottom.*
- *If a crane is to suspend the outdoor unit, it is recommended that two (2) ropes at least twenty-three (23) feet in length be used.*
- *Pass the ropes under the unit. Pass the rope through the two (2) forklift slots each at the front and rear of the outdoor unit.*
- *To prevent damage to the outdoor unit, always lift the unit with the ropes attached at four (4) points at an angle of ≤40°.*
- *Always include padding to protect the outdoor unit from rope damage, and take into consideration the outdoor unit's center of gravity.*

Concrete Platform Specifications

- Concrete foundations should be made of one part cement, two parts sand, and four parts gravel.
- The surface of the foundation should be finished with mortar with rounded edges, and weather-proofed.

Anchoring the Outdoor Unit

- Tightly anchor the outdoor unit with a bolt and nut to a concrete or rigid platform.
- When installing on a wall (with field-supplied brackets), roof, or rooftop, securely anchor the mounting platform with nails, taking into consideration the possibility of strong winds or earth-quakes.
- If there is a possibility of vibration from the outdoor unit transmitting to the building, add an anti-vibration material to the platform.

Figure 2: Example of Using an Insert for a Hole in a Reinforced Concrete Beam.

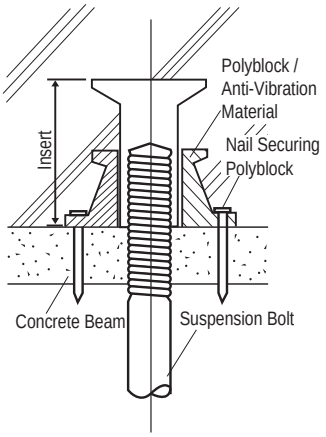
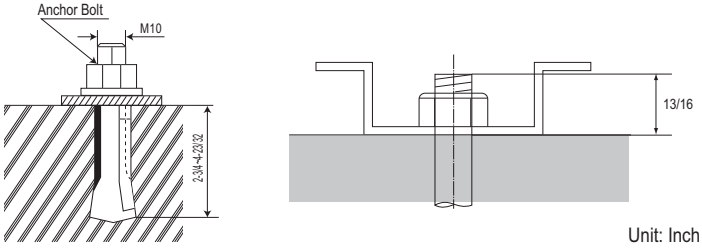


Figure 3: Close up of Bolt Attachment.



Unit: Inch

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GENERAL INSTALLATION GUIDELINES

Platform Instructions for Outdoor Unit

Outdoor Unit Platform Requirements

Outdoor Unit Foundation Requirements.

Figure 4: LMU18CHV and LMU24CHV Outdoor Units.

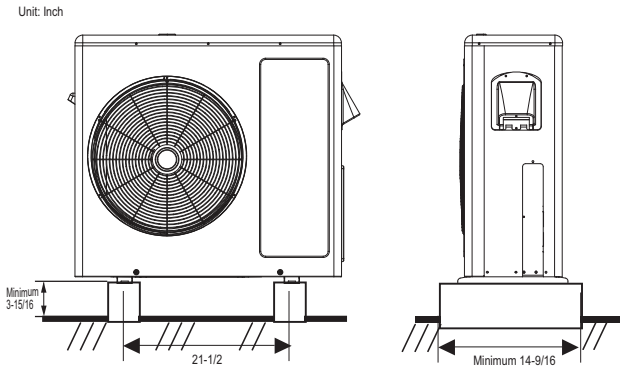


Figure 5: LMU30CHV and LMU36CHV Outdoor Units.

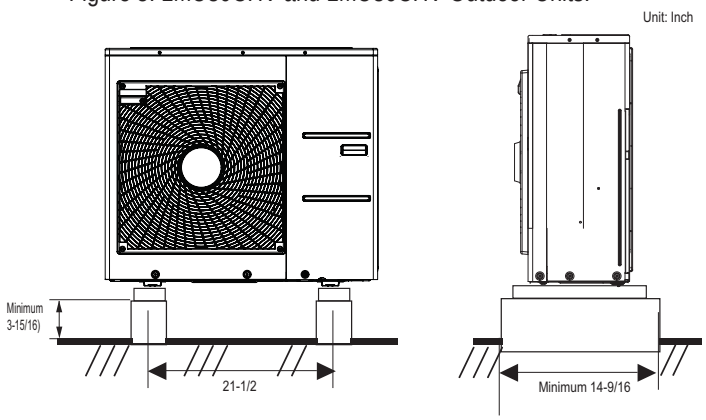
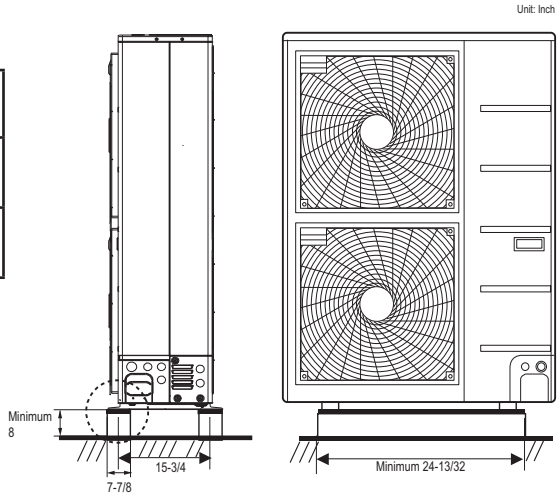


Table 8: Outdoor Unit Foundation Specifications.

Outdoor Unit Type	Bolt Type	Concrete Height	Bolt Depth
LMU18CHV, LMU24CHV, LMU30CHV, LMU36CHV	M10-J	Minimum 4 inches	Minimum 3 inches
LMU480HV, LMU540HV, LMU600HV	M10-J	Minimum 8 inches	Minimum 3 inches

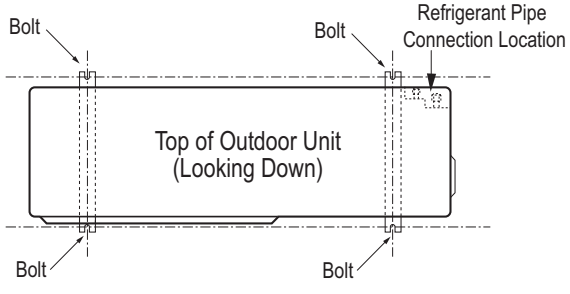
Figure 6: LMU480HV, LMU540HV, LMU600HV Outdoor Units.



Bolting the Outdoor Unit to the Platform

1. Ensure that the concrete platform will not degrade easily, and has enough strength to bear the weight of the unit.
2. Include an H-beam support. Firmly attach the corners, otherwise the support will bend.
3. Use a hexagon nut.
4. Use anti-vibration material.
5. Include enough space around the concrete foundation for condensate drainage.
6. Seal all wiring and piping access holes to prevent bugs from entering the unit.

Figure 7: Bolting the Outdoor Unit to the Platform (Piping Location May Differ Depending on Outdoor Unit Model).



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GENERAL INSTALLATION GUIDELINES

Location for Multi F MAX Branch Distribution Units

Selecting the Best Location for the Branch Distribution (BD) Unit

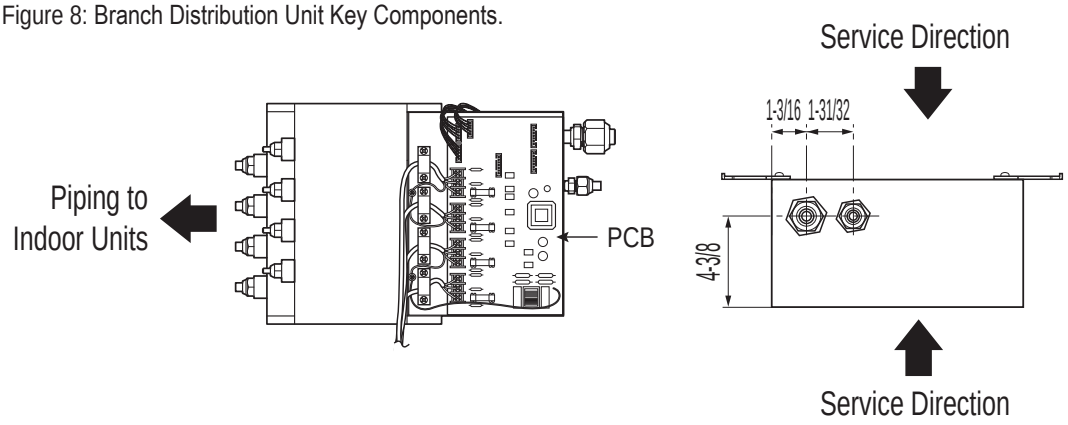
Note:

Branch Distribution (BD) units are used only with Multi F MAX systems to distribute the refrigerant from the outdoor unit to up to eight indoor units. Select location indoors that will meet the following conditions:

- Within allowable parameters for proper connection to the Multi F MAX outdoor unit and indoor unit(s); refrigerant piping and wire lengths must not exceed amounts specified by LG Electronics, U.S.A., Inc.
- Condensate drain piping is not required.
- Ensure there is enough space in the installation area for service and inspection purposes (23-5/8 inch square opening).
- Install the refrigerant piping and electrical wiring system in an easily accessible location.
- Level where there is enough strength to bear the weight of the BD unit.
- Interior installation is highly recommended.
- Allowable operating temperature range: 0 ~ 150°F; Allowable maximum operating humidity range: 80%.
- Unit can be installed no more than ±5 degrees of level.

- ⃠ Do not install the BD unit in a location where it would be subjected to strong radiation heat from heat sources.
- Avoid an installation environment where the BD unit would be exposed to heat, water, steam, oil splattering, spray or other factors that may damage the PCB.
- Install the unit in a location where any sound it generates will not disturb occupants in the surrounding rooms.
- No obstacles to air circulation around the unit; keep proper distances from ceilings, doorways, floor, walls, etc.
- Where high-frequency electrical noise / electromagnetic waves will not affect operation. Maintain proper distances between the BD unit(s) and electric wires, audio and visual appliances, breaker / circuit panels, etc.

Figure 8: Branch Distribution Unit Key Components.



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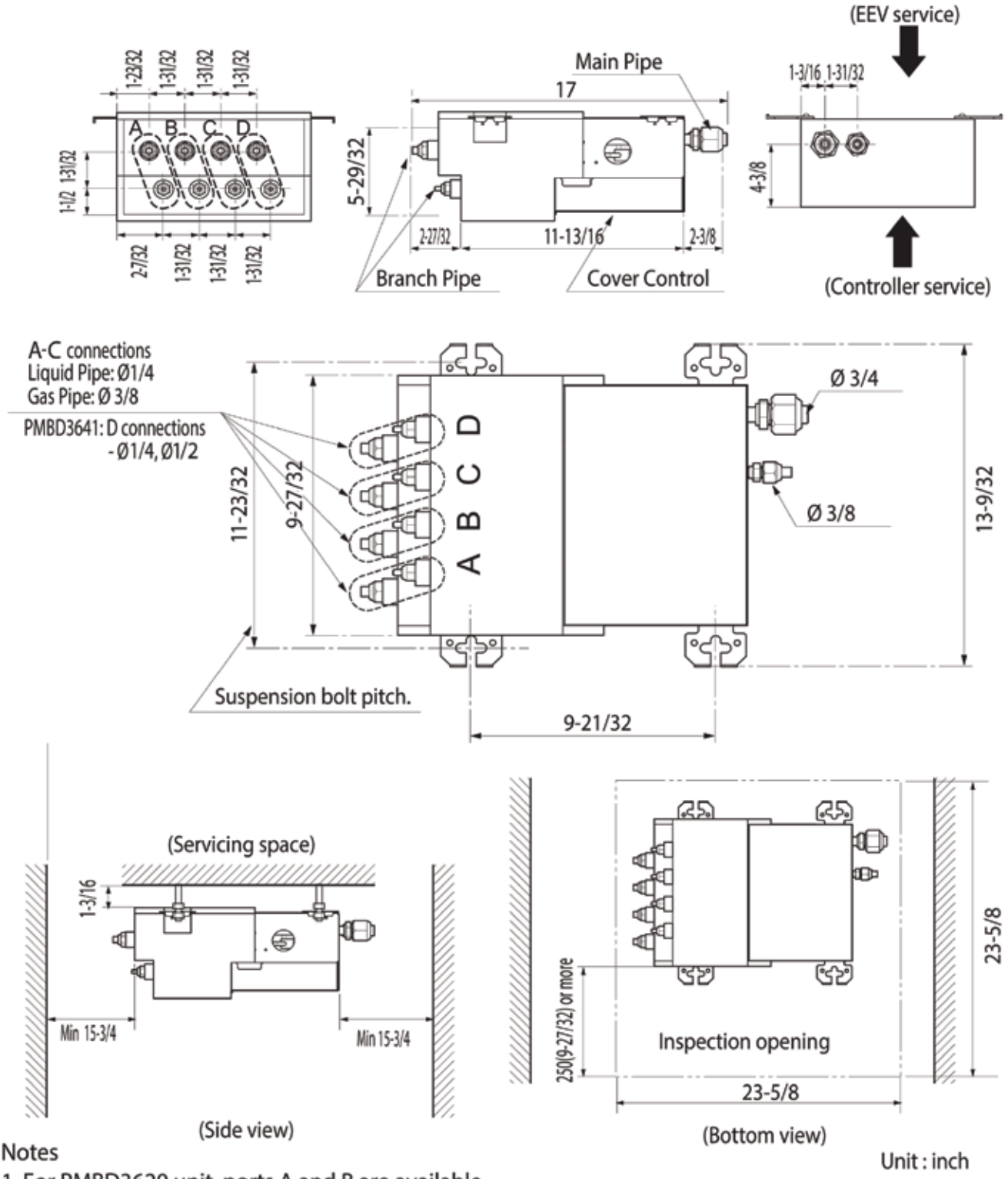
GENERAL INSTALLATION GUIDELINES

Location for Multi F MAX Branch Distribution Units

Figure 9: PMBD3620, PMBD3630, PMBD3640, and PMBD3641 External Dimensions.



Notes

1. For PMBD3620 unit, ports A and B are available.
2. For PMBD3630 unit, ports A, B and C are available.
3. For PMBD3640 and PMBD3641 units, ports A, B, C and D are available.

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GENERAL INSTALLATION GUIDELINES

Multi F MAX Branch Distribution Unit Installation

Branch Distribution Unit Orientation

Multi F MAX Branch Distribution (BD) Units can be installed in a multitude of options to fit various building configurations and job or application requirements. The installation location of the PCB within the BD unit can be changed for easier service access, depending on the BD unit installation itself (see the wiring section for information). Multi F MAX BD Units include electronic expansion valves that properly seat only if the BD Unit is installed in an acceptable orientation. Installations with improper BD Unit orientation risk incomplete valve seating and system performance degradation from potential refrigerant leakage through the electronic expansion valve.

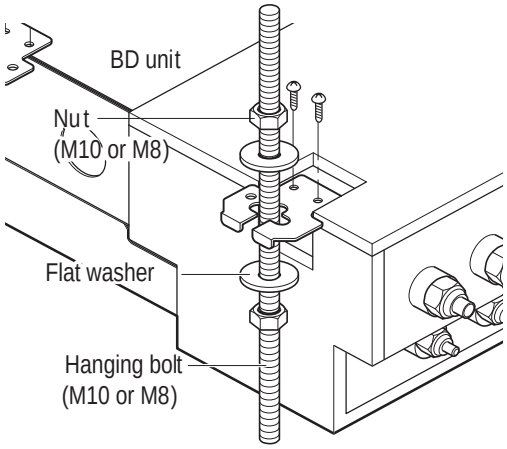
Note:

This material is for informational or educational purposes only. It is not intended to be a substitute for professional advice. Consult with your engineer or design professionals for specific applications to your system.

Ceiling Mount Installation - Hangers with Hanging Bolt

1. Drill four (4) holes in the ceiling, following the dimensions on the previous page.
2. Attach the factory-supplied hangers with two (2) screws each at the designated four (4) areas on the frame of the BD unit.
3. Install an anchor in the ceiling, and attach the hanging bolts to the ceiling.
4. Add nuts and washers to the hanging bolt as shown at right.
5. Hang the BD unit on the hanging bolts (ceiling side up), and after checking for level (±5 degrees), securely tighten all nuts.

Figure 11: BD Ceiling Mount Installation.



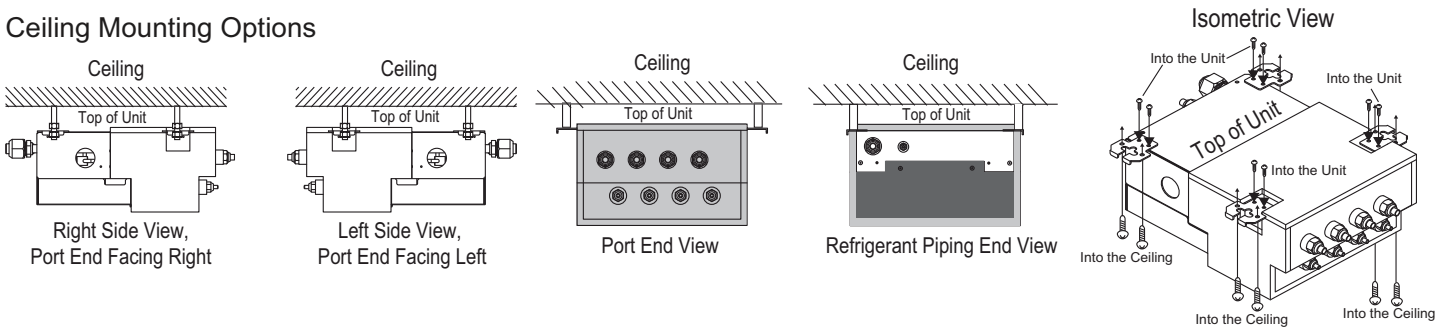
Ceiling Mount Installation - Hangers Only

1. Attach the factory-supplied hangers with two (2) screws each at the designated four (4) areas on the frame of the BD unit.
2. Install the BD unit to the ceiling using two screws on each of the hangers as shown below. Unit should be ±5 degrees of level.
3. Cover parts of the hanger holes with polyethylene foam insulation (to prevent condensation).

Note:

If a screw has been installed on the frame of the BD unit and the screw has been removed, to prevent condensation, either re-install the screw or cover the open hole with aluminum tape.

Figure 10: Acceptable BD Unit Ceiling Mount Orientations.



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Wall Mount Installation - Hangers Only

1. Attach the factory-supplied hangers with two (2) screws each at the designated four (4) areas on the frame of the BD unit.
2. Install the BD unit to the wall using two screws on each of the hangers. Unit should be ±5 degrees of level.
3. Cover parts of the hanger holes with polyethylene foam insulation (to prevent condensation).

Figure 12: Acceptable BD Unit Wall Mount Orientations.

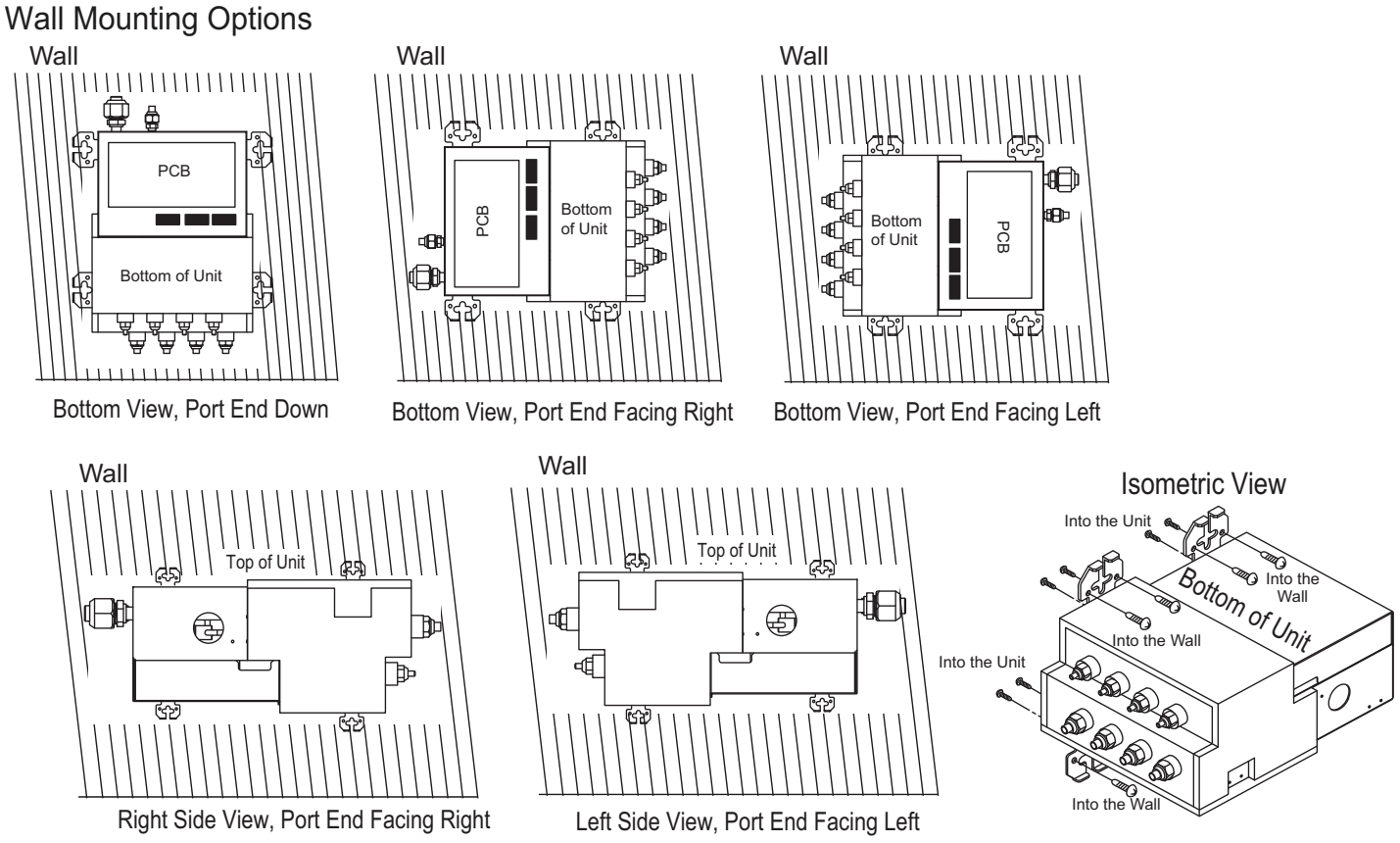
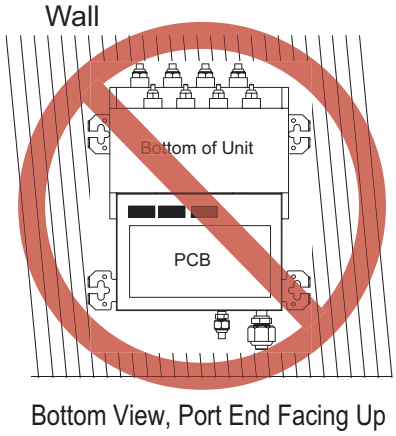


Figure 13: Unacceptable BD Unit Orientation.



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GENERAL INSTALLATION GUIDELINES

Piping Preparation

⚠ WARNING

- ⃠ *Do not allow the refrigerant to leak during brazing; if the refrigerant combusts, it generates a toxic gas.*
- ⃠ *Do not braze in an enclosed location, and always test for gas leaks before / after brazing.*
- *There is risk of fire, explosion, and physical injury or death.*

Outdoor Unit Pipe Connections

1. ⃠ Do not use kinked pipe caused by excessive bending in one specific area on its length.
2. Braze the pipes to the service valve pipe stub of the outdoor unit.
3. After brazing, check for refrigerant gas leaks.
4. When selecting flare fittings, always use a 45° fitting rated for use with high pressure refrigerant R410A. Selected fittings must also comply with local, state, or federal standards.

Creating a Flare Fitting

One of the main causes of refrigerant leaks is defective flared connections. Create flared connections using the procedure below.

1. Cut the pipe to length.
- Measure the distance between the indoor unit and the outdoor unit.
- Cut the pipes a little longer than measured distance.

2A. Remove the burrs
- Completely remove all burrs from pipe ends.
- When removing burrs, point the end of the copper pipe down to avoid introducing foreign materials in the pipe.

2B. Remove the flare nuts attached to the indoor and outdoor units. Slide the flare nut onto the copper tube.

3. Flaring the pipe end.
- Use the proper size flaring tool to finish flared connections as shown.
- ALWAYS create a 45° flare when working with R410A.
- Firmly hold copper tube in a bar with a dimension as indicated in the table below.

4. Carefully inspect the flared pipe end.
- Compare the geometry with the figures and dimensions as detailed.
- If the flare is defective, cut it off and re-do procedure.
- If flare looks good, blow clean the pipe with dry nitrogen.

Figure 14: Dimensions of the Flare.

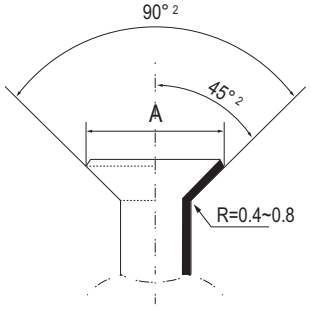
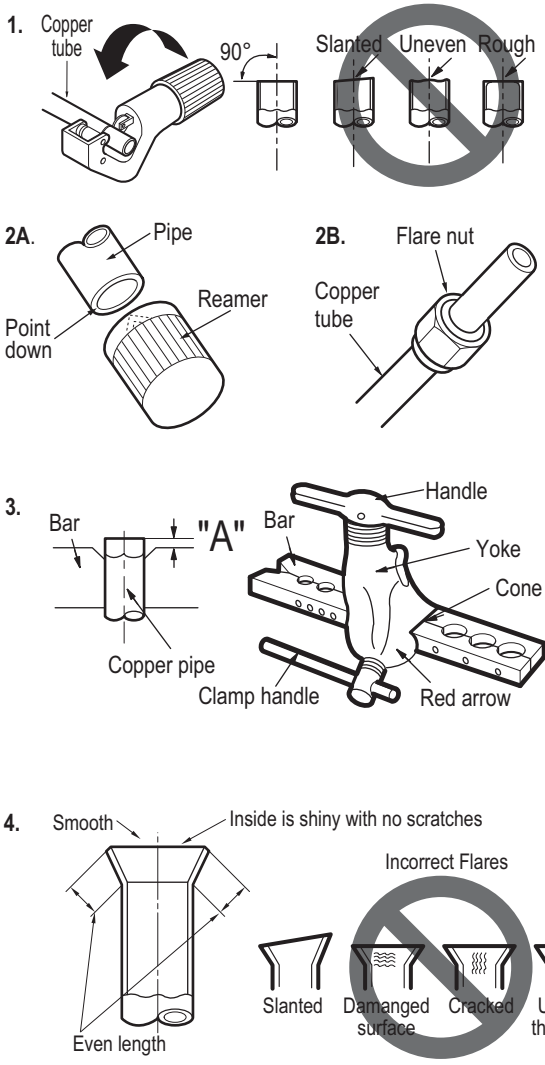


Table 9: Flared Connection Dimensions.

Outside Diameter	A
Inch	Inch
Ø1/4	0.04 ~ 0.05
Ø3/8	0.06 ~ 0.07
Ø1/2	0.06 ~ 0.07
Ø5/8	0.06 ~ 0.07
Ø3/4	0.07 ~ 0.08



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GENERAL INSTALLATION GUIDELINES

Piping Preparation

Tightening the Flare Connections

When connecting the flare nuts, coat the flare (outside only) with polyvinyl ether (PVE) refrigeration oil only.

Note:

⃠ Do not use polyolyester (POE) or any other type of mineral oil as a thread lubricant. These lubricants are not compatible with PVE oil used in this system and create oil sludge leading to equipment damage and system malfunction.

Table 10: Tightening Torque for Flare Nuts.

Pipe size (Inches O.D.)	Tightening torque (ft-lbs)
1/4Ø	13 ~ 18
3/8Ø	24.6 ~ 30.4
1/2Ø	39.8 ~ 47.7
5/8Ø	45.6 ~ 59.3
3/4Ø	71.6 ~ 87.5

Align the center of the piping, and initially hand tighten the flare nuts using three (3) or four (4) turns. For Multi F Outdoor Units, install the flare nuts by:

1. Connecting the Gas Piping for Connections A through D first.
2. Connecting the Liquid Piping for Connections A through D last.

Then, to finish tighten the flare nut using the torque wrench and a backup wrench, following the direction arrows on the wrench and using the appropriate tightening torque, until the wrench clicks. After all the piping has been connected, check for refrigerant gas leaks.

Figure 15: Flare Connection.

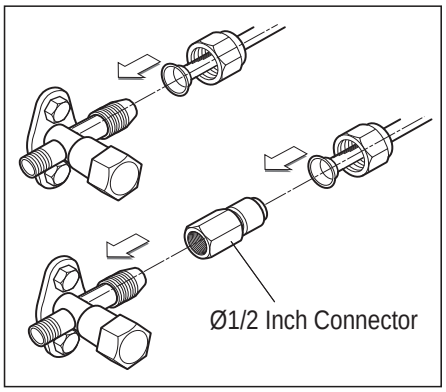


Figure 16: Example of Multi F Piping Connections.

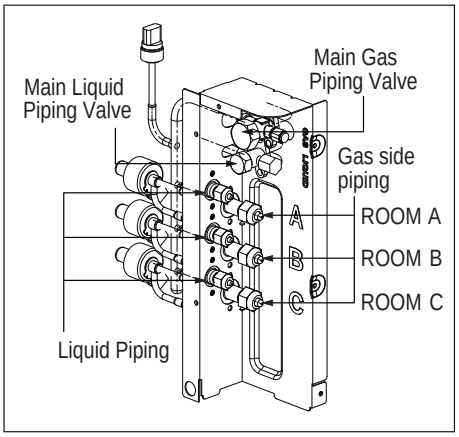
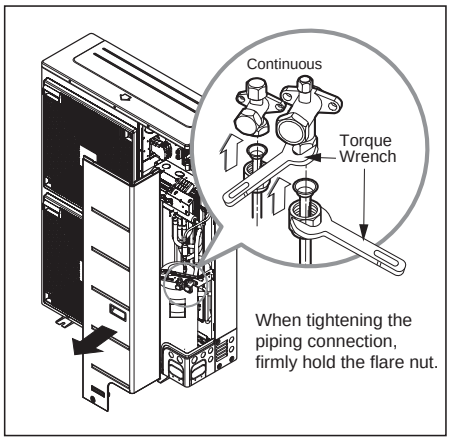


Figure 17: Multi F MAX Piping Connection.



For Multi F MAX outdoor units, piping can be installed in one of four directions: front, side, back, and down (A). If the downward installation is chosen, the knockout hole in the base pan must be accessed (B).

Whatever direction is chosen, plug the access holes with field-provided putty or insulation to fill all gaps (C).

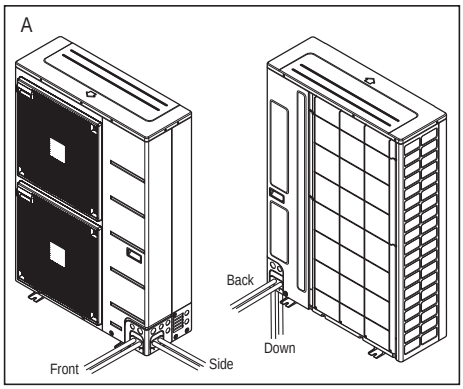
⚠WARNING

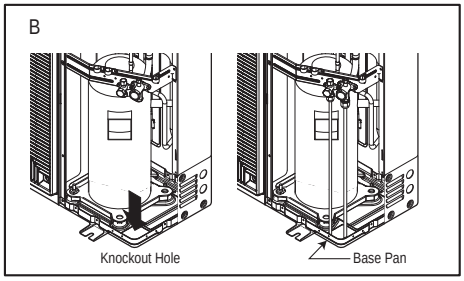
Insects or small animals entering the outdoor unit may cause a short circuit in the electrical box, which may lead to fire, electric shock, physical injury, or death.

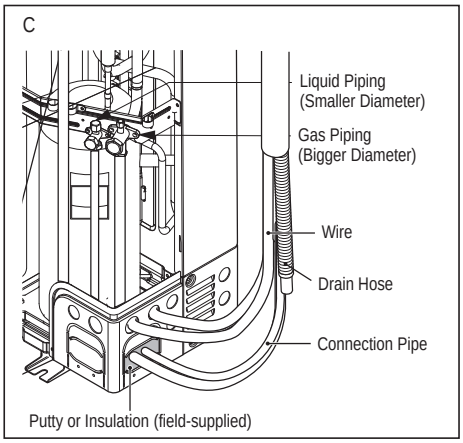
Note:

Insects or small animals entering the outdoor unit may cause a short circuit in the electrical box, which may lead to unit failure.

Figure 18: Multi F MAX Piping Installation.







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Loosening the Flare Nuts

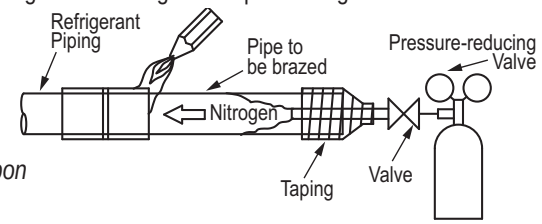
Always use two (2) wrenches to loosen the flare nuts.

Brazing Practices

Note:

Keep the piping system free of contaminants and debris such as copper burrs, slag, or carbon dust during installation. Contaminants can result in mechanical failure of the system.

Figure 20: Refrigerant Pipe Brazing.



All joints are brazed in the field. Multi F / Multi F MAX refrigeration system components contain very small capillary tubes, small orifices, electronic expansion valves, oil separators, and heat exchangers that can easily become blocked. Proper system operation depends on the installer using best practices and utmost care while assembling the piping system.

- While brazing, use a dry nitrogen purge operating at a minimum pressure of three (3) psig and maintain a steady flow.
- Blow clean all pipe sections with dry nitrogen prior to assembly.
- Use a tubing cutter. De-burr and clean all cuts before assembly.
- Store pipe stock in a dry place. Keep pipe capped and clean.
- Use adapters to assemble different sizes of pipe. Use a 15% silver phosphorous copper brazing alloy to avoid overheating and produce good flow.
- Protect isolation valves, electronic expansion valves, and other heat-sensitive control components from excessive heat with a wet rag or a heat barrier spray product.

- ⃠ Do not use flux, soft solder, or anti-oxidant agents.
- ⃠ Do not use a saw to cut pipe.

Piping Materials and Handling

Pipes used for the refrigerant piping system must include the specified thickness, and the interior must be clean.

⃠ Do not bend or damage the pipes while handling and storing, and take care not to contaminate the interior with dust, moisture, etc. See Table 11 for care of piping.

Figure 19: Keep Piping Capped While Storing

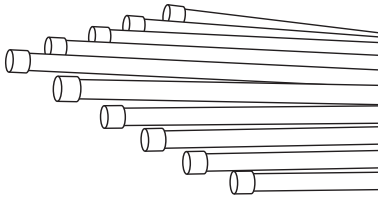
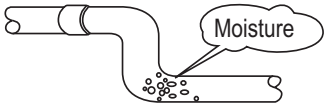
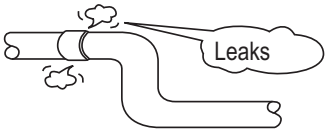


Table 11: Three Principles of Refrigerant Piping

	Dry	Clean	Airtight
Principles	No moisture should be inside the piping.	No dust should be inside the piping.	No leaks should occur.
			
Problems Caused	- Significant hydrolysis of refrigerant oil. - Refrigerant oil degradation. - Poor insulation of the compressor. - System does not operate properly. - EEVs, capillary tubes are clogged.	- Refrigerant oil degradation. - Poor insulation of the compressor. - System does not operate properly. - EEVs and capillary tubes become clogged.	- Refrigerant gas leaks / shortages. - Refrigerant oil degradation. - Poor insulation of the compressor. - System does not operate properly.
Solutions	- Remove moisture from the piping. - Piping ends should remain capped until connections are complete. - ⃠ Do not install piping on a rainy day. - Connect piping properly at the unit's side. - Remove caps only after the piping is cut, the burrs are removed, and after passing the piping through the walls. - Evacuate system to a minimum of 500 microns and insure the vacuum holds at that level for 24 hours	- Remove dust from the piping. - Piping ends should remain capped until connections are complete. - Connect piping properly at the side of the unit. - Remove caps only after the piping is cut and burrs are removed. - Retain the cap on the piping when passing it through walls, etc.	- Test system for air tightness. - Perform brazing procedures that comply with all applicable standards. - Perform flaring procedures that comply with all applicable standards. - Perform flanging procedures that comply with all applicable standards. - Ensure that refrigerant lines are pressure tested to 550 psig.

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Selecting Field-Supplied Copper Tubing

Type ACR copper is the only approved refrigerant pipe material for use with LG Multi F air conditioning products. ACR rated tubing is the only type that ships with yellow caps. Approved tubing for use with Multi F products will be marked "R410 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:

Tube wall thickness should meet local code requirements and be approved for an operating pressure of 551 psi. If local code does not specify wall thickness, LG suggests using tube thickness per table below. When bending tubing, try to keep the number of bends to a minimum, and use the largest radii possible to reduce the equivalent length of installed pipe; also, bending radii greater than ten (10) pipe diameters can minimize pressure drop. Be sure no traps or sags are present when rolling out soft copper tubing coils.

Table 14: ACR Copper Tubing Material

Type	Seamless Phosphorous Deoxidized
Class	UNS C12200 DHP
Straight Lengths	H58 Temper
Coils	O60 Temper

Table 12: Piping Tube Thicknesses

OD (in)	1/4	3/8	1/2	5/8	3/4	7/8	1-1/8	1-3/8	1-5/8
Material	Rigid Type "K" or "L" and Soft ACR Acceptable			Rigid Type "K" or "L" Only					
Min. Bend Radius (in)	.563	.9375	1.5	3.0	3.0	3.0	3.5	4.0	4.5
Min. Wall Thickness (in)	.031	.031	.031	.039	.042	.045	.050	.050	.050

Table 13: ACR Copper Tubing Dimensions and Physical Characteristics[1-4]

Nominal Pipe Outside Diameter (in)	Actual Outside Diameter (in)	Drawn Temper			Annealed Temper		
		Nominal Wall Thickness (in)	Weight (lb/ft)	Cubic ft per Linear ft	Nominal Wall Thickness (in)	Weight (lb/ft)	Cubic ft per Linear ft
1/4	0.250	--	--	--	0.030	0.081	.00020
3/8	0.375	0.030	0.126	.00054	0.032	0.134	.00053
1/2	0.500	0.035	0.198	.00101	0.032	0.182	.00103
5/8	0.625	0.040	0.285	.00162	0.035	0.251	.00168
3/4	0.750	0.042	0.362	.00242	0.042	0.362	.00242
7/8	0.875	0.045	0.455	.00336	0.045	0.455	.00336
1-1/8	1.125	0.050	0.655	.00573	0.050	0.655	.00573

[1]All dimensions provided are in accordance with ASTM B280 – Standard.
[2]Design pressure = 551 psig.
[3]ACR Tubing is available as hard drawn or annealed (soft) and are suitable for use with R410A refrigerant.
[4]The Copper Tube Handbook, 2010, Copper Development Association Inc., 260 Madison Avenue, New York, NY 10016.

Note:

• Commercially available piping often contains dust and other materials. Always blow it clean with a dry inert gas.
• Prevent dust, water or other contaminants from entering the piping during installation. Contaminants can cause mechanical failure.

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Multi F MAX Y-Branch Kit PMBL5620

The LG supplied Y-Branch Kit PMBL5620 MUST be used when two branch distribution units are connected on one Multi F MAX system. Field-supplied fittings are not permitted. Each Y-Branch kit comes with 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, position the Y-branch so the straight-through leg is ±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 ±5° rotation.

Y-branches must be properly installed following instructions in the applicable LG manual. Y-branches should 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.

It is recommended that when a Y-branch is located in a pipe chase or other concealed space, access doors should be provided for inspection access.

The equivalent pipe length of each Y-branch (1.6') must be added to the main pipe segment entered into LATS Multi F piping design software.

Note:

- *Design pressure is 551 psig.*
- *All dimensions in inches. Tolerance ±1/4 inch.*
- *Images are not to scale.*

Figure 24: Horizontal Configuration End View.

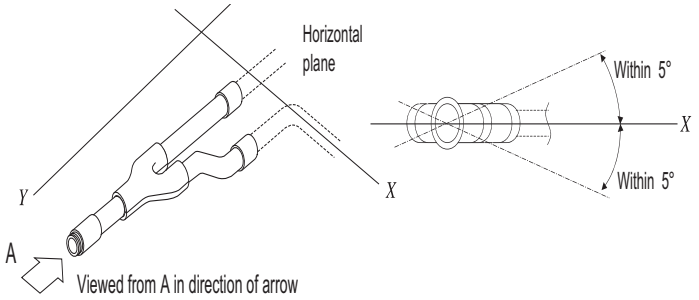


Figure 21: Y-Branch Connections.

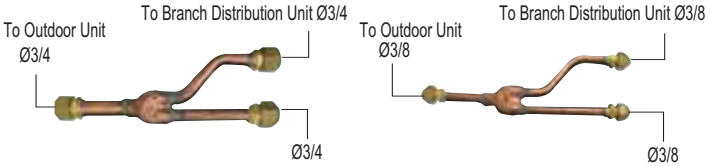


Table 15: Y-Branch Connection Diameters.

Model	Y-Branch Type	Port Identifier (inch)			Dimensions	
		1	2	3	X	Y
PMBL5620	Liquid	3/8	3/8	3/8	13.80	3.24
	Vapor	3/4	3/4	3/4	12.48	3.02

Figure 22: Y-Branch Port Identifier Diagram.

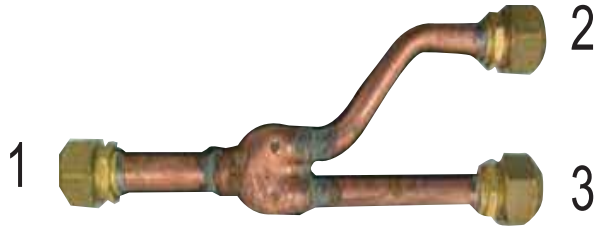
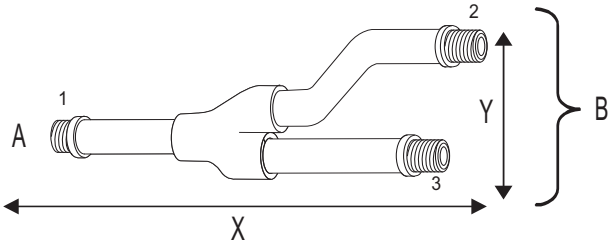
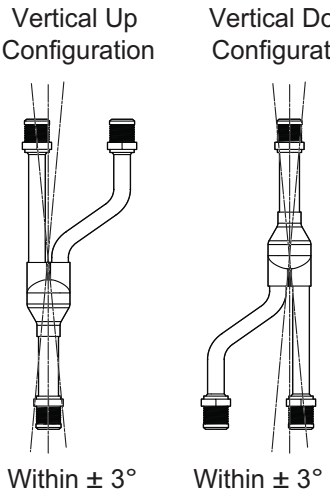


Figure 23: Y-Branch Dimensions Diagram.



A = To Outdoor Unit B = To Branch Distribution Unit

Figure 25: Y-branch Installation Alignment Specification.



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Y-Branch Kit Insulation

Each Y-branch kit comes with clam-shell type peel-and-stick insulation jackets molded to fit the Y-branch fittings—one for the liquid line, one for the vapor line.

- Check the fit of the Y-branch clam-shell insulation jacket after the Y-branch is installed.
- Mark the pipe where the insulation jacket ends.
- Remove the jacket.
- Install field-provided insulation on the pipes first.
- Peel the adhesive glue protector slip and install the clam-shell jacket over the fitting

Figure 26: Y-branch Insulation Detail.

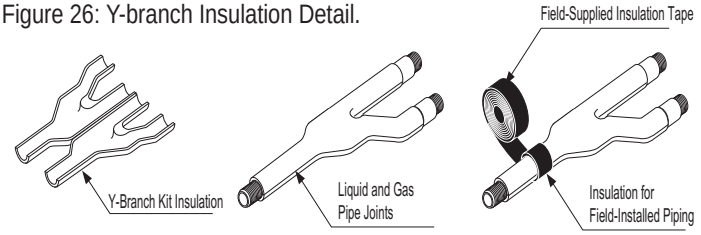


Table 16: Insulation Jacket Properties.

Material	Polyolefin Foam
UL94 Flame Classification	HF-1
Density	1.84 lbs./ft.^{3}
Thermal Conductivity	.0208 Btu/h/ft. ^oR
Thickness	1/2 inch

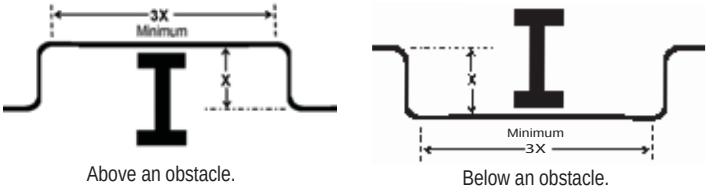
No Pipe Size Substitutions

Use only the pipe size selected by the LATS Multi F pipe system design software or as conveyed in the product installation instructions. Using a different size is prohibited and may result in a system malfunction or failure to work at all.

Obstacles

When an obstacle, such as an I-beam or concrete T, is in the path of the planned refrigerant pipe run, it is best practice to route the pipe over the obstacle. If adequate space is not available to route the insulated pipe over the obstacle, then route the pipe under the obstacle. In either case, it is imperative the horizontal section of pipe above or below the obstacle be a minimum of three (3) times greater than the longest vertical rise (or fall) distance.

Figure 27: Installing Piping Above and Below an Obstacle.



Above an obstacle. Below an obstacle.

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Copper Expansion and Contraction

Under normal operating conditions, the vapor pipe temperature of a Multi F 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.

Refrigerant pipe, along with the insulation jacket, form a cohesive unit that expands and contracts together. During system operation, thermal heat transfer occurs between the pipe and the surrounding insulation.

If the pipe is mounted in free air space, no natural restriction to movement is present if mounting clamps are properly spaced and installed. When the refrigerant pipe is mounted underground in a utility duct stacked among other pipes, natural restriction to linear movement is present. In extreme cases, the restrictive force of surface friction between insulating jackets could become so great that natural expansion ceases and the pipe is "fixed" in place. In this situation, opposing force caused by change in refrigerant fluid/vapor temperature can lead to pipe/fitting stress failure.

The refrigerant pipe support system must be engineered to allow free expansion to occur. When a segment of pipe is mounted between two fixed points, provisions must be provided to allow pipe expansion to naturally occur. The most common method is the inclusion of expansion Loop or U-bends mounted in the horizontal plane. When expansion loops are placed in a vertical riser, the loop is to be formed in a horizontal fashion resulting in a torsional movement during expansion and contraction. Each segment of pipe has a natural fixed point where no movement occurs. This fixed point is located at the center point of the segment assuming the entire pipe is insulated in a similar fashion. The natural fixed point of the pipe segment is typically where the expansion Loop or U-bend should be. Linear pipe expansion can be calculated using the following formula:

$$LE = C \times L \times (T_r - T_a) \times 12$$

LE	=	Anticipated linear tubing expansion (in.)
C	=	Constant (For copper = 9.2×10^{-6} in./in.°F)
L	=	Length of pipe (ft.)
T_R	=	Refrigerant pipe temperature (°F)
T_a	=	Ambient air temperature (°F)
12	=	Inches to feet conversion (12 in./ft.)

1. From Table 17, find the row corresponding with the actual length of the straight pipe segment.
2. Estimate the minimum and maximum temperature of the pipe. Typical pipe temperature change range: High Pressure Vapor: ambient temperature to 215°F; Low Pressure Vapor: ambient to 35°F; Liquid pipe: ambient, 80°F, 110°F. Choose the two most extreme. In the column showing the minimum pipe temperature, look up the anticipated expansion distance. Do the same for the maximum pipe temperature.
3. Calculate the difference in the two expansion distance values. The result will be the anticipated change in pipe length.

Example:

A Multi F MAX system is installed and the design shows that there is a 100 foot straight segment of tubing between a Y-branch and a branch distribution unit. The system operates 24 hours per day. In heating, this pipe transports hot gas vapor to the indoor units at 120°F. In cooling, the same tube is a suction line returning refrigerant vapor to the outdoor unit at 40°F. Look up the copper tubing expansion at each temperature and calculate the difference.

Vapor Line

Transporting Hot Vapor: 100 ft. pipe at 120°F = 1.40 in.
Transporting Suction Vapor: 100 ft. pipe at 40°F = 0.40 in.
Anticipated Change in Length: 1.40 in. – 0.40 in. = 1.00 in.

Liquid Line

The liquid temperature remains the same temperature; only the direction of flow will reverse. Therefore, no significant change in length of the liquid line is anticipated.

When creating an expansion joint, the joint depth should be a minimum of two times the joint width. Although different types of expansion arrangements are available, the data for correctly sizing an expansion loop is provided in Table 18. Use soft copper with long radius bends on longer runs or long radius elbows for shorter pipe segments. Using the anticipated linear expansion (LE) distance calculated, look up the Expansion Loop or U-bend minimum design dimensions. If other types of expansion joints are chosen, design per ASTM B-88 Standards.

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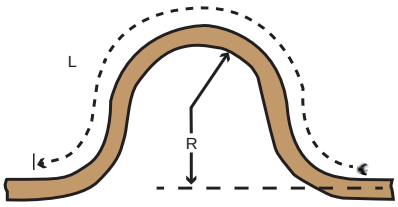
Table 17: Linear Thermal Expansion of Copper Tubing in Inches.

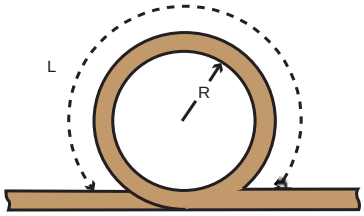
Pipe Length[1]	Fluid Temperature °F																			
	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	100°	105°	110°	115°	120°	125°	130°
10	0.04	0.04	0.05	0.06	0.06	0.07	0.08	0.08	0.09	0.09	0.10	0.10	0.11	0.11	0.11	0.12	0.13	0.14	0.15	0.15
20	0.08	0.08	0.10	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.22	0.23	0.26	0.28	0.29	0.30
30	0.12	0.12	0.15	0.18	0.20	0.21	0.23	0.24	0.26	0.27	0.29	0.30	0.32	0.33	0.32	0.35	0.39	0.42	0.44	0.45
40	0.16	0.16	0.20	0.24	0.26	0.28	0.30	0.32	0.34	0.36	0.38	0.40	0.42	0.44	0.43	0.46	0.52	0.56	0.58	0.60
50	0.20	0.20	0.25	0.30	0.33	0.35	0.38	0.40	0.43	0.45	0.48	0.50	0.53	0.55	0.54	0.58	0.65	0.70	0.73	0.75
60	0.24	0.24	0.30	0.36	0.39	0.42	0.45	0.48	0.51	0.54	0.57	0.60	0.63	0.66	0.65	0.69	0.78	0.84	0.87	0.90
70	0.28	0.28	0.35	0.42	0.46	0.49	0.53	0.56	0.60	0.63	0.67	0.70	0.74	0.77	0.76	0.81	0.91	0.98	1.02	1.05
80	0.32	0.32	0.40	0.48	0.52	0.56	0.60	0.64	0.68	0.72	0.76	0.80	0.84	0.88	0.86	0.92	1.04	1.12	1.16	1.20
90	0.36	0.36	0.45	0.54	0.59	0.63	0.68	0.72	0.77	0.81	0.86	0.90	0.95	0.99	0.97	1.04	1.17	1.26	1.31	1.35
100	0.40	0.40	0.50	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00	1.05	1.10	1.08	1.15	1.30	1.40	1.45	1.50
120	0.48	0.48	0.60	0.72	0.78	0.84	0.90	0.96	1.02	1.08	1.14	1.20	1.26	1.32	1.30	1.38	1.56	1.68	1.74	1.80
140	0.56	0.56	0.70	0.84	0.91	0.98	1.05	1.12	1.19	1.26	1.33	1.40	1.47	1.54	1.51	1.61	1.82	1.96	2.03	2.10
160	0.64	0.64	0.80	0.96	1.04	1.12	1.20	1.28	1.36	1.44	1.52	1.60	1.68	1.76	1.73	1.84	2.08	2.24	2.32	2.40
180	0.72	0.72	0.90	1.08	1.17	1.26	1.35	1.44	1.53	1.62	1.71	1.80	1.89	1.98	1.94	2.07	2.34	2.52	2.61	2.70

[1]Pipe length baseline temperature = 0°F. "Expansion of Carbon, Copper and Stainless Steel Pipe," *The Engineers' Toolbox*, www.engineeringtoolbox.com.

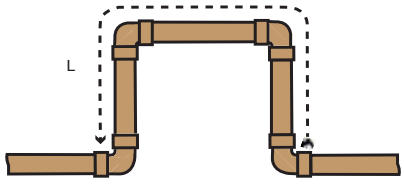
Figure 28: Coiled Expansion Loops and Offsets (Plan View shown).



Large Tubing U-bend (>3/4 in.)



Loop



Small Tubing U-bend (<3/4 in.)

Table 18: Radii of Coiled Expansion Loops and Developed Lengths of Expansion Offsets.

Anticipated Linear Expansion (LE) (inches)		Nominal Tube Size (OD) inches			
		1/4	3/8	1/2	3/4
1/2	R[1]	6	7	8	9
	L[2]	38	44	50	59
1	R[1]	9	10	11	13
	L[2]	54	63	70	83
1-1/2	R[1]	11	12	14	16
	L[2]	66	77	86	101
2	R[1]	12	14	16	19
	L[2]	77	89	99	117
2-1/2	R[1]	14	16	18	21
	L[2]	86	99	111	131
3	R[1]	15	17	19	23
	L[2]	94	109	122	143
3-1/2	R[1]	16	19	21	25
	L[2]	102	117	131	155
4	R[1]	17	20	22	26
	L[2]	109	126	140	166

[1]R = Centerline Length of Pipe.

[2]L = Centerline Minimum Radius (inches).

Note:

All expansion Loops and Offsets should be installed in the horizontal plane to prevent the possibility of trapping oil. Loops and Offsets in vertical risers should also be installed in a horizontal plane.

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GENERAL INSTALLATION GUIDELINES

Piping Materials and Handling

Note:

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

Pipe Bends

When bending soft copper, use long radius bends. Refer to the “Radii of Coiled Expansion Loops and Developed Lengths of Expansion Offsets” table for minimum radius specifications, page 18.

In-line Refrigeration Components

Components such as oil traps, solenoid valves, filter-dryers, sight glasses, tee fittings, and other after-market accessories are not permitted on the refrigerant piping system between the outdoor units and the indoor / branch distribution units. Multi F and Multi F MAX systems are provided with redundant systems that assure oil is properly returned to the compressor. Sight-glasses and solenoid valves may cause vapor to form in the liquid stream. Over time, dryers may deteriorate and introduce debris into the system. The designer and installer should verify the refrigerant piping system is free of traps, sagging pipes, sight glasses, filter dryers, etc.

Field-Provided Isolation Ball Valves

LG maintains a neutral position on using isolation valves in VRF refrigerant piping systems. LG does not endorse any manufacturer of isolation valves. It is recognized that installing isolation valves may simplify future maintenance requirements, and, if used, considerations should be taken including, but not limited to, the following:

- Pressure drops for any component used, including isolation valves, must be known in equivalent pipe length and calculated into the total and segment equivalent piping lengths and compared to product design limitations.
- In all cases, materials must be suitable for the application and any applicable codes, including, but not limited to, diameter and wall thickness continuity per ACR standards.

Failure to do so may cause significant performance degradation. Proper leak checks must be performed. Using isolation valves does not automatically void any LG product warranty; however, a limited warranty may be voided in whole or part should any field supplied accessory fail in any way that causes product failure.

Using Elbows

Field supplied elbows are allowed as long as they are designed for use with R410A refrigerant. The designer and installer, however, should be cautious with the quantity and size of fittings used, and must account for the additional pressure losses in equivalent pipe length calculation for each branch. The equivalent pipe length of each elbow must be added to each pipe segment in the LATS program. See page 35 for equivalent lengths.

Pipe Slope

The horizontal pipe slope cannot exceed 10° up or down.

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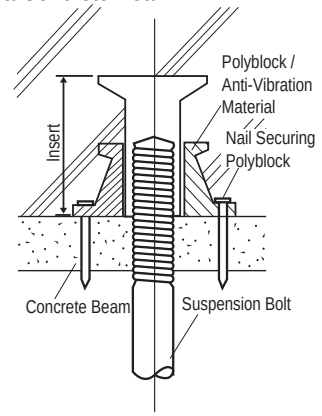
Inserts and Pipe Supports

Inserts

An insert can be installed into a floor or beam before the concrete sets so that fittings such as ducts, pipes, or suspension bolts can be added at a later time. Decide where the inserts should be placed before support installation.

Figure 29: Installing an Insert Into a Concrete Beam.



Pipe Supports

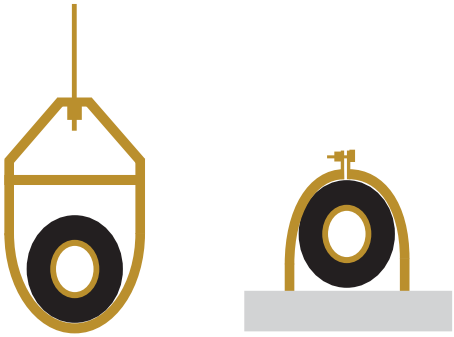
Note:

A properly installed pipe system should be adequately supported to avoid pipe sagging. Sagging pipes become oil traps that lead to equipment malfunction.

⃠ Pipe supports should never touch the pipe wall; supports shall be installed outside (around) the primary pipe insulation jacket.

Insulate the pipe first because pipe supports shall be installed outside (around) the primary pipe insulation jacket. Clevis hangers should be used with shields between the hangers and insulation.

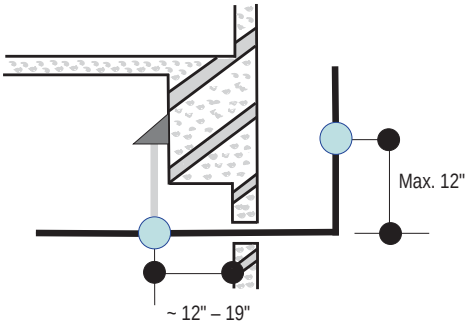
Figure 30: Pipe Hanger Details.



Field provided pipe supports should be designed to meet local codes. If allowed by code, use fiber straps or split-ring hangers suspended from the ceiling on all-thread rods (fiber straps or split ring hangers can be used as long as they do not compress the pipe insulation). Place a second layer of insulation over the pipe insulation jacket to prevent chafing and compression of the primary insulation within the confines of the support pipe clamp.

A properly installed pipe system will have sufficient supports to avoid pipes from sagging during the life of the system. As necessary, place supports closer for segments where potential sagging could occur. Maximum spacing of pipe supports shall meet local codes. If local codes do not specify pipe support spacing, pipe shall be supported a maximum of five (5) feet on center for straight segments of pipe up to 3/4" outside diameter size.

Figure 31: Typical Pipe Support Location—Change in Pipe Direction.



Wherever the pipe changes direction, place a hanger within twelve (12) inches on one side and within twelve to nineteen (12 to 19) inches of the bend on the other side. Support piping at indoor units as shown. Support Y-Branch fittings as shown.

Figure 32: Pipe Support at Indoor Unit.

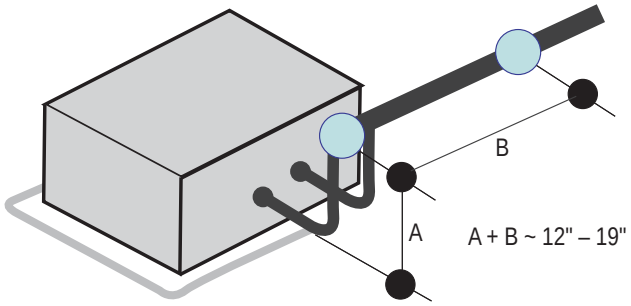
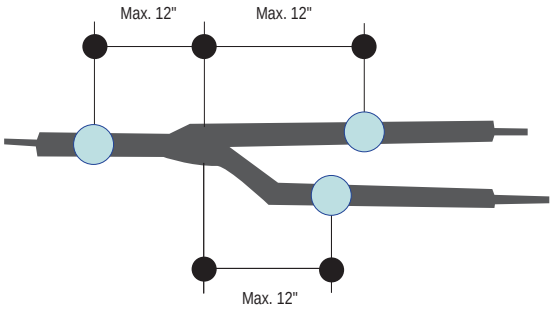


Figure 33: Pipe Support at Y-branch Fitting.



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Examples of Supports

Figure 34: U-Bolt Support with Insulation.

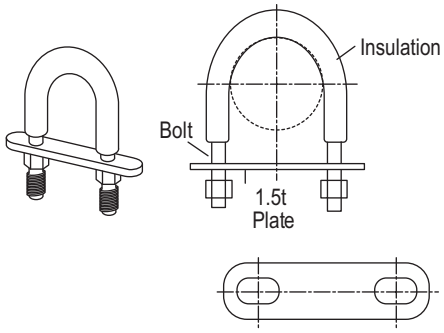


Figure 35: O-Ring Support with Insulation.

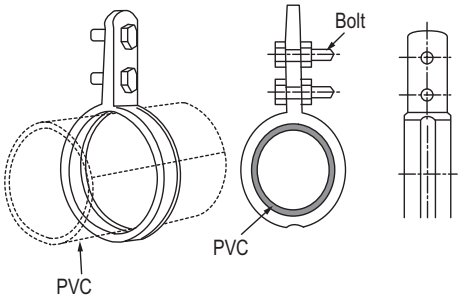
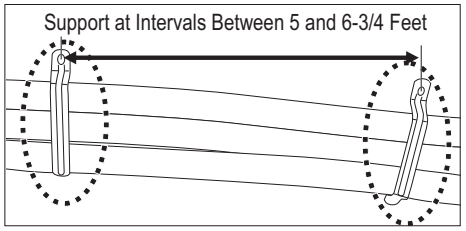


Figure 36: Saddle-Type Support.



Do not compress the insulation with the saddle-type support. If the insulation is compressed, it may tear open and allow condensation to generate during product operation.

Figure 37: U-Bolt Support with an Insulated Pipe.

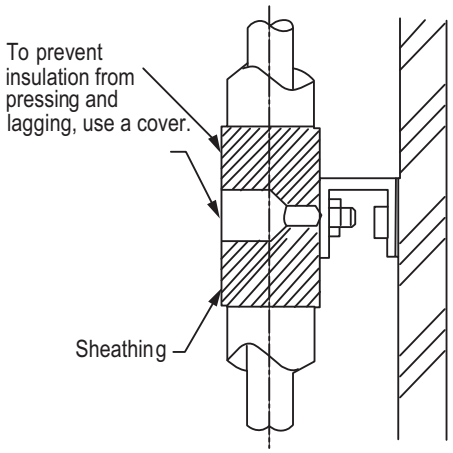


Figure 38: O-Ring Band Support with an Insulated Pipe.

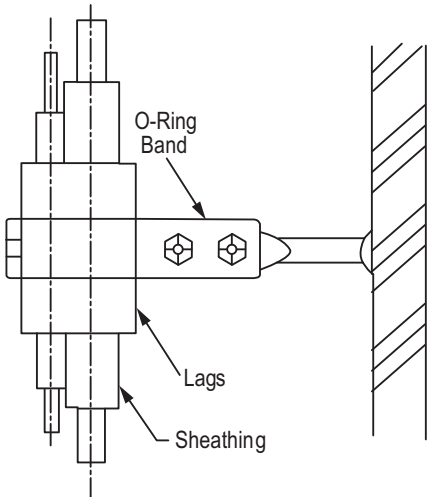


Figure 39: One-Point Down-Stop Support (>441 lbs.).

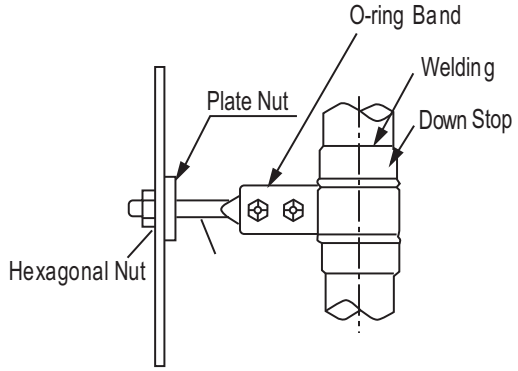
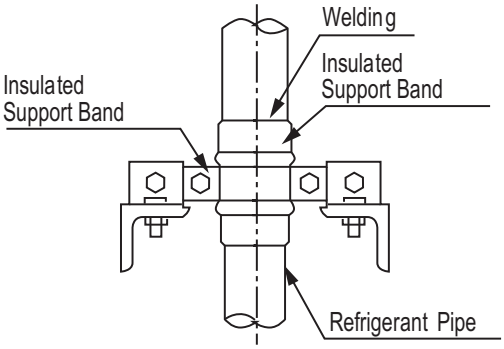


Figure 40: Two-Point Down-Stop Support.



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REFRIGERANT PIPING CONNECTIONS

The following are examples of manual pipe size calculations. Designers are highly encouraged to use LATS for Multi F systems.

Device Connection Limitations

- The minimum number of connected and operating indoor units to Multi F / Multi F MAX systems is two, taking into consideration the minimum combination ratio.
- The maximum number of indoor units for each Multi F / Multi F MAX heat pump systems is:

LMU18CHV = 2 LMU24CHV = 3 LMU30CHV = 4 LMU36CHV = 4 LMU480HV = 8 LMU540HV = 8 LMU600HV = 8

Note:

For allocated capacity information, see the combination tables in the "Multi F / Multi F MAX Combination Data Manual" on www.lg-dfs.com. For performance data, see "Multi F / Multi F MAX Performance Data Manual" on www.lg-dfs.com.

Piping Length and Elevation Limitations

One of the most critical elements of Multi F and Multi F MAX systems is the refrigerant piping. The tables on the next few pages list pipe length limits that must be followed in the design of Multi F and Multi F MAX refrigerant pipe systems.

Using Refrigerant Components

Field-supplied elbows are allowed as long as they are designed for use with R410A refrigerant. The designer, however, should be cautious with the quantity and size of fittings used, and must account for the additional pressure losses in equivalent pipe length calculation for each branch. The equivalent pipe length of each elbow must be added to each pipe segment.

Table 20: Equivalent Piping Length for Elbows, Y-branches, and Branch Distribution Units.

Component	Size (Inches)				
	1/4	3/8	1/2	5/8	3/4
Elbow (ft.)	0.5	0.6	0.7	0.8	1.2
Y-Branch Kit (ft., Multi F MAX systems only)[1]	1.6				
Branch Distribution Unit (ft., Multi F MAX systems only)	8.2				

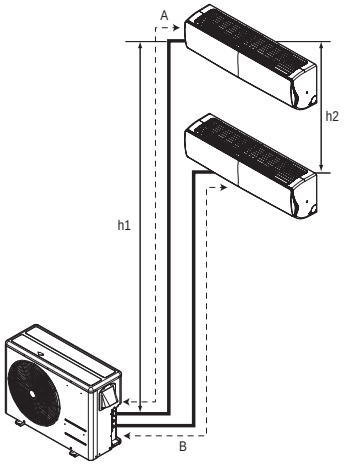
[1]Kit contains two Y-branches: one for liquid and one for vapor.

Multi F Outdoor Unit Piping Length and Elevation Limitations

Table 19: Multi F Refrigerant Piping System Limitations.

Outdoor Unit Model (Btu/h)	LMU18CHV / 18,000	LMU24CHV / 24,000	LMU30CHV / 30,000	LMU36CHV / 36,000
Max. Total System Piping Length (ft.)	164 A+B	246.1 A+B+C	246.1 A+B+C+D	246.1 A+B+C+D
Min. Length for One Branch (ft.)	9.8	9.8	9.8	9.8
Max. Length for One Branch (ft.)	82	82	82	82
Max. Elevation Between Each Indoor Unit and Outdoor Unit (h1)	49.2	49.2	49.2	49.2
Max. Elevation Between Indoor Units (h2)	24.6	24.6	24.6	24.6
Max. Combination of Indoor Units	24,000	33,000	40,000	48,000

Figure 41: Multi F Refrigerant Piping System Limitations (LMU18CHV Example).



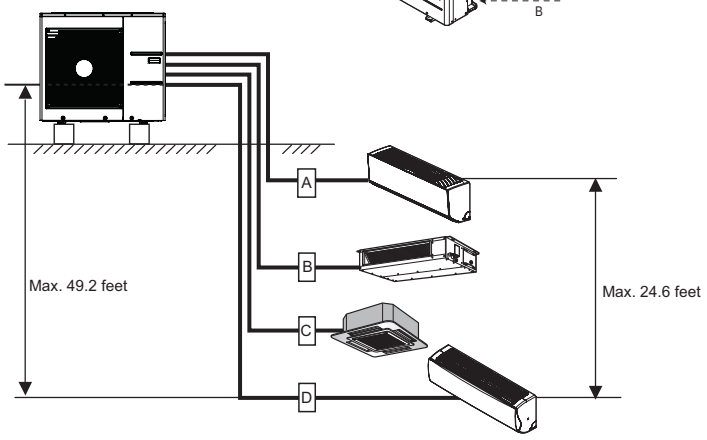
Multi F System Example

Example: LMU36CHV outdoor unit with four (4) indoor units connected.

ODU: Outdoor Unit.

IDU: Indoor Unit.

A, B, C, D: Pipes from Outdoor Unit to Indoor Unit.



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REFRIGERANT PIPING CONNECTIONS

The following are examples of manual pipe size calculations. Designers are highly encouraged to use LATS for Multi F systems.

Multi F MAX Outdoor Unit Piping Length and Elevation Limitations

Table 22: Multi F MAX Refrigerant Piping System Limitations.

Pipe Length (ELF = Equivalent Length of pipe in Feet)	**Total piping length (ΣA + ΣB)**		≤475.7 feet
	Main pipe (Outdoor Unit to Branch Distribution Units: **ΣA)**	Minimum	9.8 feet
		Maximum	≤180.4 feet
	Total branch piping length (ΣB)		≤295.3 feet
	Branch pipe (Branch Distribution Units to Indoor Units: B)	Minimum	10 feet
		Maximum	≤49.2 feet
Elevation Differential (All Elevation Limitations are Measured in Actual Feet)	If outdoor unit is above or below indoor unit (h1)		≤98.4 feet
	Between the farthest two indoor units (h2)		≤49.2 feet
	Between branch distribution unit and farthest connected indoor unit(s) (h3)		≤32.8 feet
	Between branch distribution units (h4)		≤49.2 feet
Max. Combination of IDUs	LMU480HV = 65,000	LMU540HV = 73,000	LMU600HV = 81,000

Figure 42: Multi F MAX Refrigerant Piping System Limitations.

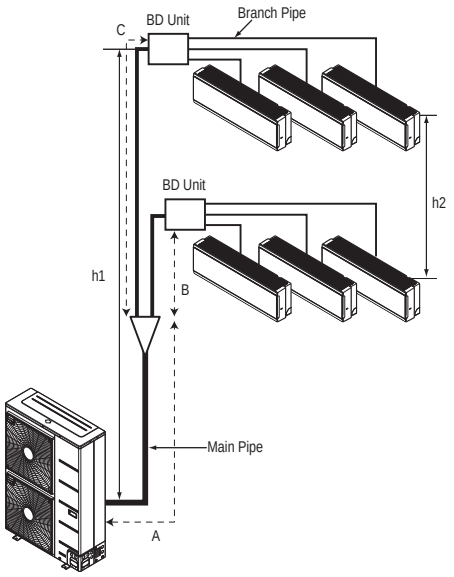


Table 23: Multi F MAX Piping Sizes.

Piping	Main Pipe A (inch)	Branch Pipe B
Liquid	Ø3/8	Depends on the size of the indoor unit piping
Gas	Ø3/4	

Multi F MAX System Example with One Branch Distribution Unit

Example: LMU540HV outdoor unit with four (4) indoor units, and one (1) branch distribution unit connected.

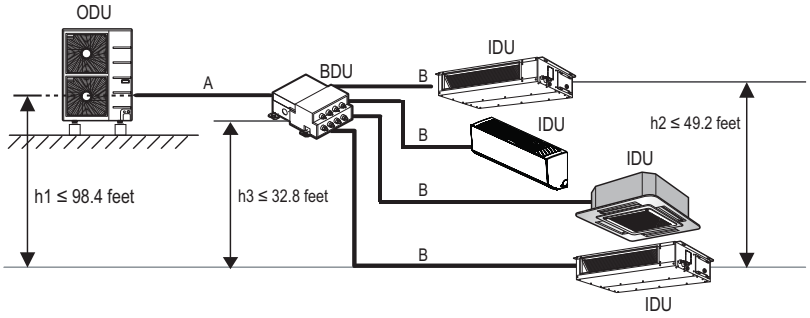
ODU: Outdoor Unit.

IDU: Indoor Unit.

BDU: Branch Distribution Unit.

A: Main Pipe.

B: Branch Pipe (Branch Distribution Unit to Indoor Unit[s]).



Multi F MAX System Example with Two Branch Distribution Units

Example: LMU540HV outdoor unit with seven (7) indoor units, and two (2) branch distribution units connected.

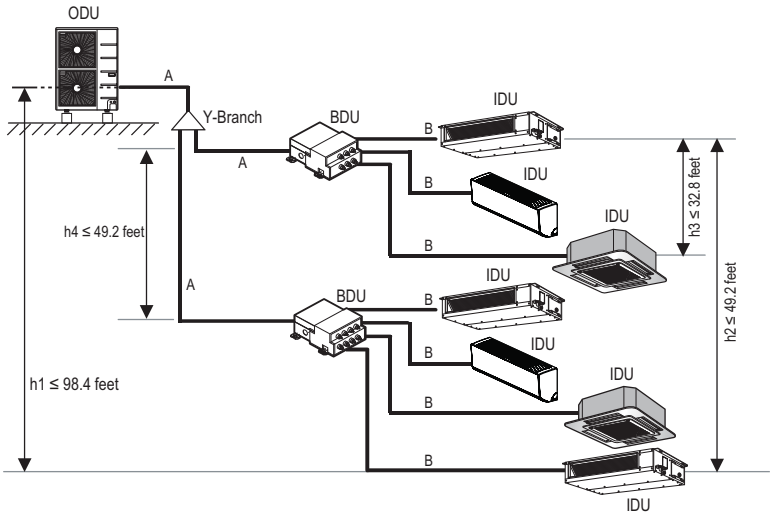
ODU: Outdoor Unit.

IDU: Indoor Unit.

BD: Branch Distribution Unit(s).

ΣA: Main Pipe.

ΣB: Branch Pipe (Branch Distribution Unit[s] to Indoor Unit[s]).



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Multi F Outdoor Unit to Indoor Unit Piping Connections

Note:

Avoid Pipe Damage

- *When routing field-provided piping, avoid damaging the outdoor unit from excessive vibration.*
- *Properly insulate the liquid and gas lines separately up to the point of connection at the unit frame.*
- *See table below for Multi F outdoor unit connection types.*

⃠ *Correctly route the piping so it does not make contact with mounting bolts. Allow room for field installation.*

Figure 43: Multi F Refrigerant Pipe Connections (LMU36CHV shown as example).

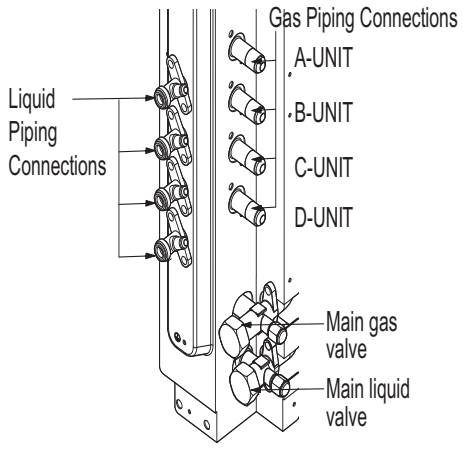


Table 24: Outdoor Unit Piping Connections.

Outdoor Unit Piping Connections	LMU18CHV	LMU24CHV	LMU30CHV	LMU36CHV
Liquid Line Connection (in., OD) x Qty.	1/4 x 2	1/4 x 3	1/4 x 4	1/4 x 4
Vapor Line Connection (in., OD) x Qty.	3/8 x 2	3/8 x 3	3/8 x 4	3/8 x 4

Table 25: Indoor Unit Pipe Sizes.

Indoor Unit Capacity	Vapor Line Piping Size (in., OD)	Liquid Line Piping Size (in., OD)
7,000 Btu/h	Ø3/8	Ø1/4
9,000 Btu/h		
12,000 Btu/h		
15,000 Btu/h		
18,000 Btu/h	Ø1/2	
24,000 Btu/h		

Connection sockets (included as a factory-supplied accessory with the indoor units) may need to be used when piping the indoor units to the outdoor unit. If a 36K indoor unit is included, the connection sockets are included with the Branch Distribution unit.

Table 26: Connection Socket Dimensions.

Indoor Unit Capacity	Vapor (in., OD)		Liquid (in., OD)	
	A	B	A	B
18,000 Btu/h: Wall-Mounted	Ø3/8 → Ø1/2, Ø1/2 → Ø5/8		Ø1/4 → Ø3/8	
18,000 Btu/h: Low Static Duct, Four-Way Cassette	Ø3/8 → Ø1/2		N/A	
24,000 Btu/h	Ø3/8 → Ø1/2		N/A	

Using the Connection Socket

1. Align the center of the piping sections and tighten the flare nut by hand.

2. Tighten the flare nut with a torque wrench, using the arrows on the wrench as a guide, until a click is heard.

Table 27: Indoor Unit Piping Connections.

Indoor Unit Capacity	Vapor Line Conn. (in., OD)	Liquid Line Conn. (in., OD)
7,000 Btu/h	Ø3/8	Ø1/4
9,000 Btu/h		
12,000 Btu/h		
15,000 Btu/h		
18,000 Btu/h: Wall-Mounted	Ø5/8	Ø3/8
18,000 Btu/h: Low Static Duct, Four-Way Cassette	Ø1/2	Ø1/4
24,000 Btu/h	Ø1/2	Ø1/4

Figure 44: Connection Socket Diagram.

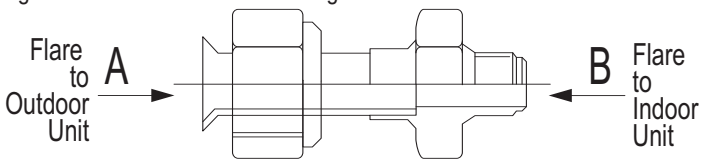
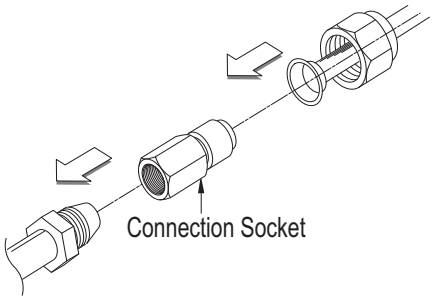


Figure 45: Performing Connections.



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Multi F MAX Outdoor Unit System Piping Connections

Note:

Avoid Pipe Damage

- *When routing field-provided piping, avoid damaging the outdoor unit from excessive vibration.*
- *Properly insulate the liquid and gas lines separately up to the point of connection at the unit frame.*
- *See table below for Multi F MAX outdoor unit connection types.*

⃠ *Correctly route the piping so it does not make contact with mounting bolts. Allow room for field installation.*

Table 28: Outdoor Unit Piping Connections.

Outdoor Unit Piping Connections	LMU480HV, LMU540HV, LMU600HV
Liquid Line Connection (in., OD) x Qty.	3/8 x 1
Vapor Line Connection (in., OD) x Qty.	3/4 x 1

Branch Distribution to Indoor Unit Piping Connections

- Install indoor unit liquid and vapor refrigerant pipes (and connection wiring) to the appropriate branch distribution ports.
- Clearly note on the indoor unit's refrigerant piping (liquid, vapor) which branch distribution port it is connected to (A, B, C, D).

Table 29: Branch Distribution Unit Piping Connections.

Branch Distribution Unit	PMBD3620	PMBD3630	PMBD3640	PMBD3641
Piping Connections to Outdoor Unit				
Liquid (in., OD) x Qty.	Ø3/8 x 1			
Vapor (in., OD) x Qty.	Ø3/4 x 1			
Piping Connections to Indoor Units				
Liquid (in., OD) x Qty.	Ø1/4 x 2	Ø1/4 x 3	Ø1/4 x 4	Ø1/4 x 4
Vapor (in., OD) x Qty.	Ø3/8 x 2	Ø3/8 x 3	Ø3/8 x 4	Ø3/8 x 3, Ø1/2 x 1

Figure 46: Branch Distribution Ports to Indoor Units.

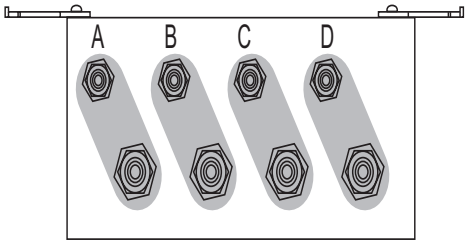


Table 30: Indoor Unit Pipe Sizes.

Indoor Unit Capacity	Vapor Line Piping Size (in., OD)	Liquid Line Piping Size (in., OD)
7,000 Btu/h	Ø3/8	Ø1/4
9,000 Btu/h		
12,000 Btu/h		
15,000 Btu/h		
18,000 Btu/h	Ø1/2	
24,000 Btu/h		
36,000 Btu/h	Ø5/8	Ø3/8

Table 31: Indoor Unit Piping Connections.

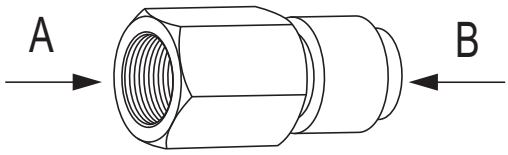
Indoor Unit Capacity	Vapor Line Conn. (in., OD)	Liquid Line Conn. (in., OD)
7,000 Btu/h	Ø3/8	Ø1/4
9,000 Btu/h		
12,000 Btu/h		
15,000 Btu/h		
18,000 Btu/h: Wall-Mounted	Ø5/8	Ø3/8
18,000 Btu/h: Low Static Duct, Four-Way Cassette	Ø1/2	Ø1/4
24,000 Btu/h	Ø1/2	Ø1/4
36,000 Btu/h	Ø5/8	Ø3/8

Connection sockets (included as a factory-supplied accessory with the indoor units) may need to be used when piping the indoor units to the branch distribution unit. If a 36K indoor unit is included, the connection sockets are included with the Branch Distribution unit.

Table 32: Connection Socket Dimensions.

Indoor Unit Capacity	Vapor (in., OD)		Liquid (in., OD)	
	A	B	A	B
18,000 Btu/h: Wall-Mounted	Ø3/8 → Ø1/2, Ø1/2 → Ø5/8		Ø1/4 → Ø3/8	
18,000 Btu/h: Low Static Duct, Four-Way Cassette	Ø3/8 → Ø1/2		N/A	
24,000 Btu/h	Ø3/8 → Ø1/2		N/A	
36,000 Btu/h	Ø1/2 → Ø5/8		Ø1/4 → Ø3/8	

Figure 47: Connection Socket Diagram.



Connection Socket

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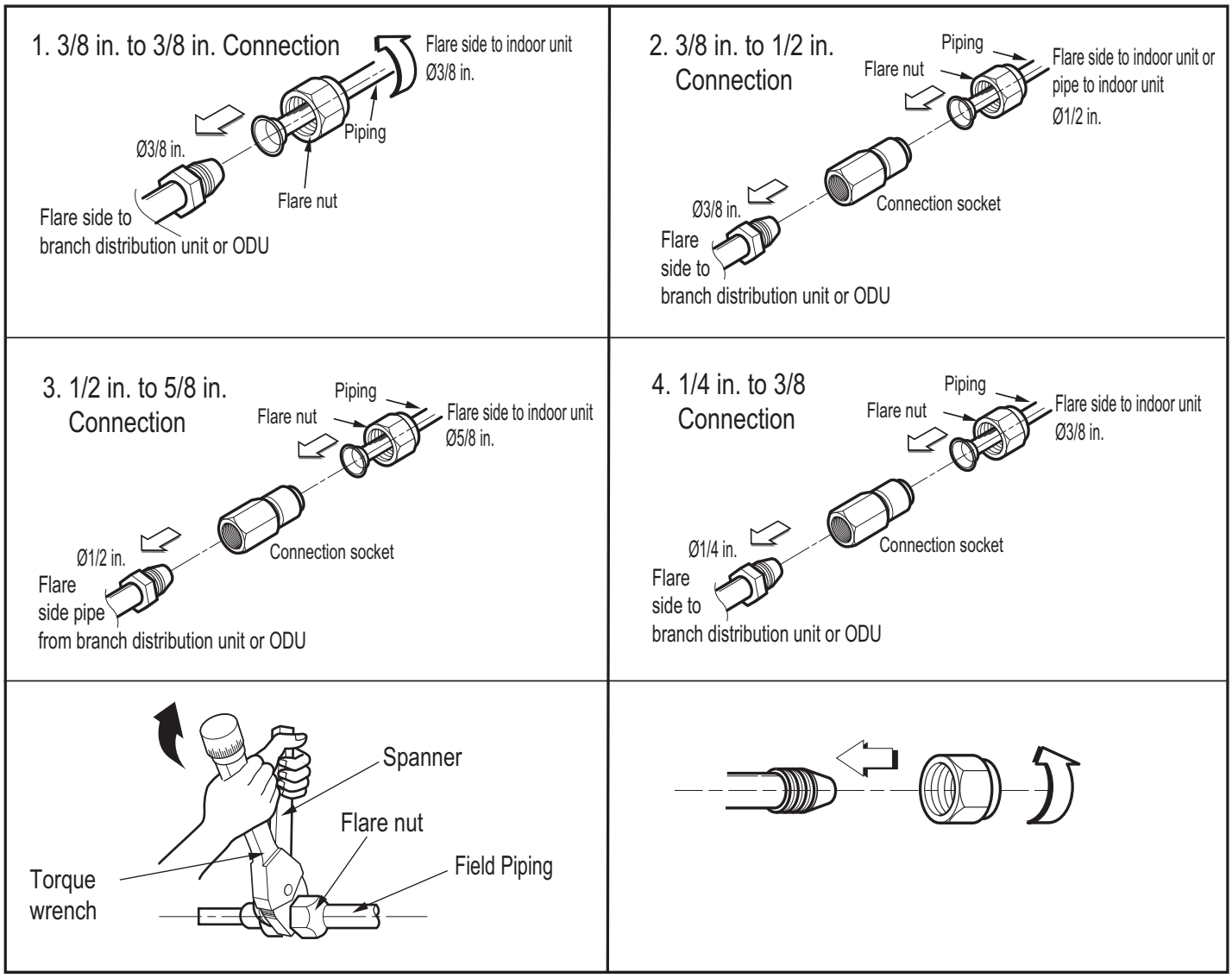
Multi F MAX Outdoor Unit System Piping Connections, continued.

1. Align the center of the piping sections and tighten the flare nut by hand.
2. Tighten the flare nut with a torque wrench, using the arrows on the wrench as a guide, until a click is heard.
3. Wrap insulation around the connection.

Figure 48: Possible Outdoor Unit or Branch Distribution Unit to Indoor Unit Connections.



Outdoor Unit Condensate Drain Piping

Outdoor unit requires condensate drain piping. Condensate drain pipe is constructed with materials approved by local code. See pages 13 to 17 for information in reference to outdoor unit placement and condensate drainage.

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Multi F MAX Y-Branch Kit PMBL5620

Y-branches may be installed in horizontal or vertical configurations. When installed vertically, position the Y-branch so the straight-through leg is ±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 ±5° rotation.

Y-branches should always be installed with the single port facing the outdoor unit and the two-port end facing the branch distribution units.

The equivalent pipe length of each Y-branch (1.6') must be added to the main pipe segment entered into LATS Multi F piping design software.

Figure 50: Horizontal Configuration End View.

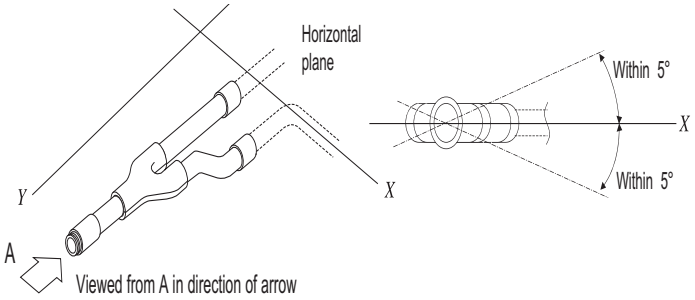


Table 33: Y-Branch Connection Diameters.

Model	Y-Branch Type	Port Identifier (inch)			Dimensions	
		1	2	3	X	Y
PMBL5620	Liquid	3/8	3/8	3/8	13.80	3.24
	Vapor	3/4	3/4	3/4	12.48	3.02

Figure 49: Y-Branch Port Identifier Diagram.

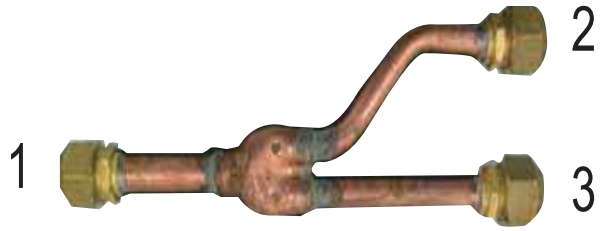
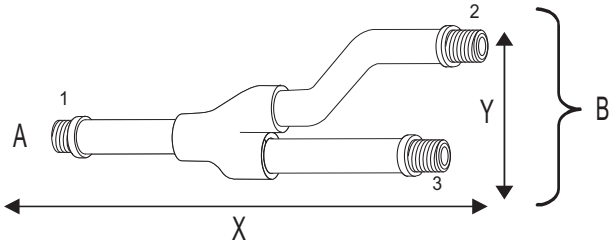
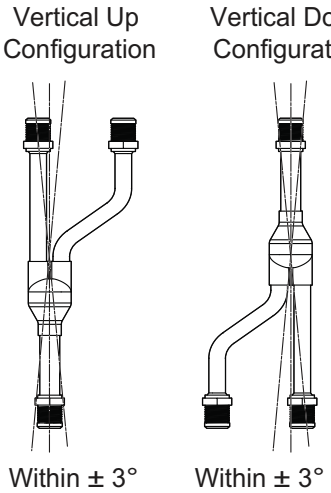


Figure 51: Y-Branch Dimensions Diagram.



A = To Outdoor Unit B = To Branch Distribution Unit

Figure 52: Y-branch Installation Alignment Specification.



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Flushing the Refrigerant Piping

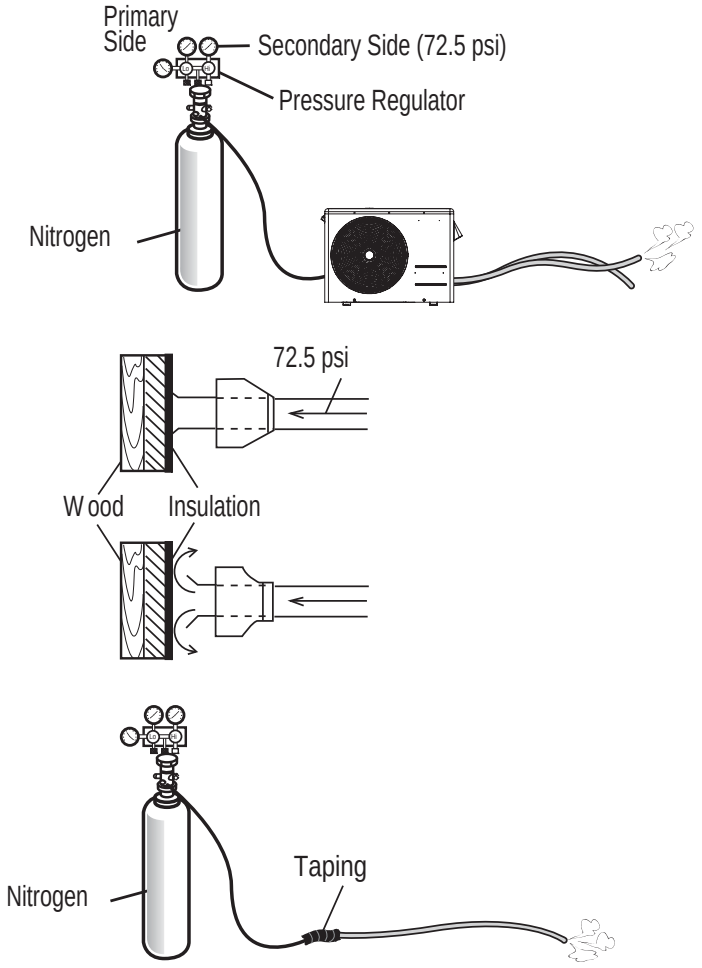
Flushing is a method of cleaning the refrigerant piping using pressurized nitrogen gas. Flushing:

1. Removes oxidation bubbles that may have formed inside the copper piping if nitrogen replacement was insufficient during soldering.
2. Removes foreign material and moisture from piping if the piping wasn't stored properly.
3. Checks connections in pipes linking outdoor and indoor units (both liquid and gas pipes).

Flushing the Refrigerant Piping Procedure

1. Attach a pressure regulator on a nitrogen cylinder.
2. Connect the charge hose from the pressure regulator to the outdoor unit liquid piping side service port before its connection to the indoor or BD (Multi F MAX systems only) unit piping.
3. Open the main valve on the nitrogen cylinder and set the pressure regulator to 0.5 MPa (72.5 psi).
4. Verify that the nitrogen is flowing through the piping correctly.
5. When flushing, block the open end of the piping with a wood insulation block. When the pressure becomes too high, quickly remove the block.
6. Repeat steps 4 and 5 until the piping is completely flushed and clean.
7. Connect the charge hose from the pressure regulator to the outdoor unit gas piping side service port before its connection to the indoor or BD (Multi F MAX systems only) unit piping.
8. Follow steps 3, 4, 5, and 6.
9. For systems with BD unit(s) (Multi F MAX only), each piping run should be flushed individually before connecting the indoor units (follow steps 3, 4, 5, and 6).

Figure 53: Flushing the Refrigerant Piping.



Note:

Nitrogen flushing is strongly recommended after soldering. Foreign materials in the piping will cause system malfunction.

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REFRIGERANT PIPING PREPARATION

Leak Test

Leak Test and Vacuum Procedures

Before performing the test run, Multi F and Multi F MAX refrigerant piping and the piping connections to the outdoor unit, the indoor units, and the BD units (Multi F MAX systems only) must be evacuated to remove any non-condensible gases and moisture that may be present in the system, and checked for leaks. Air and moisture that is left in the piping can lead to undesirable results and can cause damage to the working unit. It is important to go through a complete air purging cycle to be sure that the lines are cleared out. Note that this process may have to be repeated should any air or moisture be found to remain in the piping. After air purging and evacuating the lines, be sure to take a leak test for all piping and tubing. If any air and moisture remain in the refrigerant system:

1. Pressure in the system rises.
2. Operating current rises.
3. Cooling or heating efficiency drops.
4. Moisture in the refrigerant circuit may freeze and block capillary tubing.
5. Water may corrode parts of the refrigeration system.

Leak Test

Note:

Perform the leak test by pressurizing nitrogen gas to 550 psi on both the liquid and gas pipes. Test with the piping service valves closed. If the pressure does not drop for twenty-four (24) hours, the system passes the test. If the pressure drops, there is a nitrogen leak in the system. Find the leak, repair, and then test again.

Before the Leak Test

1. Check that all refrigerant piping, the drain pipe, and power wiring / communications cables are properly connected.
2. Remove the caps from both the gas and the liquid service valves on the outdoor unit. Verify that both service valves are closed.

Pressure Gauge Hookup

3. Connect the manifold valve (which includes the pressure gauges), along with the dry nitrogen gas cylinder, to the service valves using the charge hoses.

Note:

Use a manifold valve for leak testing. The high side manifold valve must always be kept closed.

Leak Test Procedure

4. Pressurize the system to maximum 550 psig with the dry nitrogen gas.

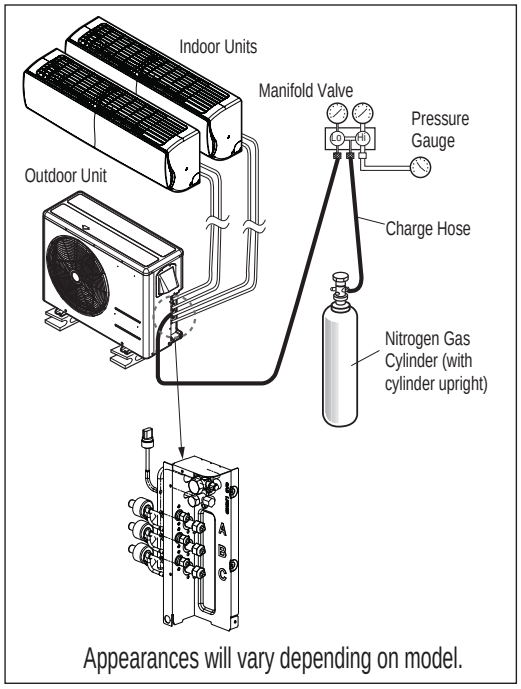
⚠DANGER

Use of combustible gases including oxygen, may result in fire or explosion, resulting in personal injury or death.

⚠WARNING

Use of combustible gases including oxygen runs the risk of fire and explosion, resulting in personal injury or death. Inert gas (nitrogen) should be used when checking leaks, cleaning or repairs of pipes, etc.

Figure 54: Leak Test Diagram.



Appearances will vary depending on model.

Note:

- *To avoid nitrogen entering the refrigerant system in a liquid state, the top of the cylinder must be higher than its bottom when the system is pressurized.*
- *The cylinder should be used in a vertical standing position.*

5. Close the cylinder valve when the gauge reading reaches 550 psig, and then test for leaks using the liquid soap method.
6. While running the nitrogen gas tank hookup, apply a soap water or a liquid neutral detergent to all indoor, BD, outdoor unit connection(s), and all refrigerant piping joints with a soft brush. Also test for leaks at both of the gas and liquid side service valves.

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REFRIGERANT PIPING PREPARATION

Leak Test

Leak Test Procedure, continued.

7. While operating the pressure gauge system, observe the connections for any leaks. If bubbles appear at any of the connections (indoor, BD, and outdoor units) or refrigerant piping joints, a leak is present.
8. Make a note of where the leaks are, and remove the soap with a clean cloth.
9. Disengage the nitrogen pressure by loosening the charge hose connector at the nitrogen cylinder. After the system pressure is back to normal range, disconnect hose from the cylinder.
10. Repair the connections and piping where bubbles / leaks were observed. When finished, repeat leak testing using the liquid soap method and nitrogen cylinder.
11. After system is leak free, depressurize by loosening the charge hose connector at the nitrogen cylinder. When system pressure returns to normal, disconnect the hose from the cylinder.

Essential Points for Leak Testing

The key to successful testing is strict adherence to the leak testing procedure.

1. The liquid and gas piping in each refrigerant system should be pressurized with nitrogen gas in accordance with the steps listed below.

   Step 1: Pressurize to 43.5 psi for three (3) minutes or more. (Will identify if major leaks are present in the system.)

   Step 2: Pressurize to 217.6 psi for three (3) minutes or more. (Will identify if major leaks are present in the system.)

   Step 3: Pressurize to 551.1 psi for approximate twenty-four (24) hours. (Will identify if minor leaks are present in the system.)

Pressurizing the system to 551.1 psi does not guarantee the identification of minor leaks if the pressure is maintained for only a short time. It is recommended that the system remain pressurized for at least 24 hours.

Note:

Piping system should not be pressured to more than 551.1 psi. Pressures greater than 551.1 psi may damage the piping system and cause unit malfunction.

2. Check for pressure drop. If there is no drop in pressure, the test is successful. If the pressure drops, there is a leak in the piping system. If, however, there was a change in the ambient temperature between when pressure was initialized and when pressure drop is checked, then calculations must be adjusted accordingly. A difference of 1.8°F can account for a pressure change of 1.45 psi.

Compensation Value: Temperature at Pressure Initialization – Temperature at Pressure Check × 1.45

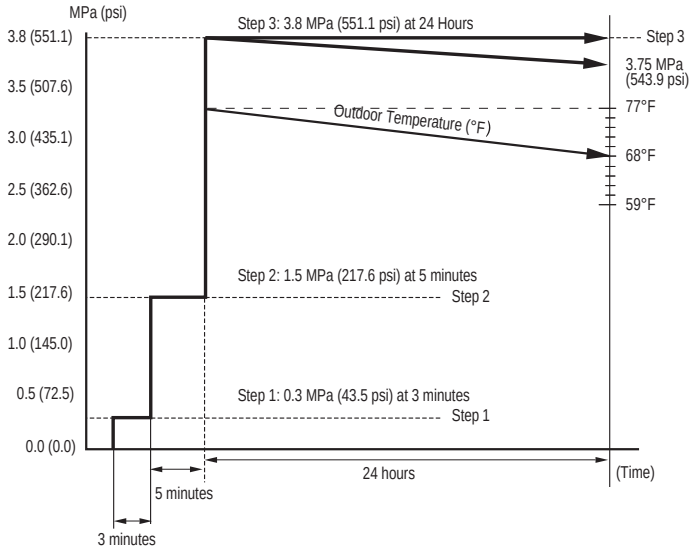
Example:

During Leak Test: 551.1 psi at 77°F

Twenty-four (24) Hours Later: 543.9 psi at 68°F

Although the pressure dropped from 551.1 psi to 543.9 psi, it can be assumed that there are no leaks because pressure can also drop due to the change in outdoor temperature.

Figure 55: Leak Test Time Diagram.



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Vacuum Procedure

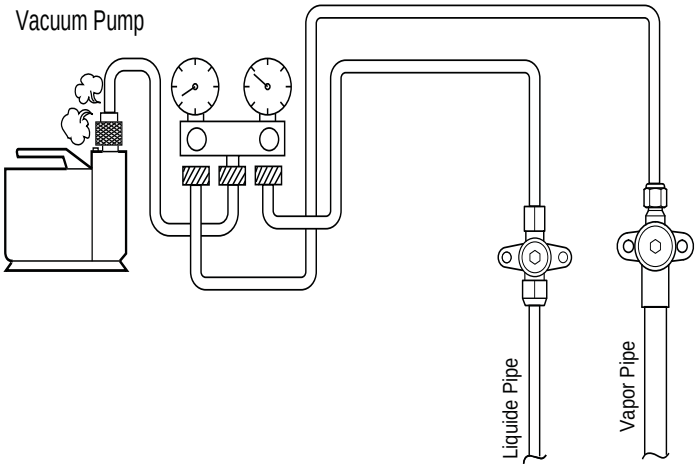
Vacuum drying should be performed from the service port provided on the outdoor unit's service valve to the vacuum pump commonly used for liquid pipe and the vapor pipe. Vacuum of the pipe and the indoor units should be made from the port of the outdoor unit's service valve with the service valve closed.

Note:

- ⃠ *Never perform air purging using refrigerant; it will damage the outdoor unit.*
- *Use a vacuum pump that can evacuate to 500 microns.*

1. Evacuate the system from the liquid and vapor pipes with a vacuum pump for over two (2) hours and bring the system to 500 microns.
2. Maintain system under that condition for over one (1) hour; if the vacuum gauge rises, the system may contain moisture or a leak.
3. If there is a possibility of moisture in the piping (rainwater may have entered the piping if work was performed during a rainy season or over an extended period), then:
   - Evacuate the system for two (2) hours to 7.3 psi (vacuum break) with nitrogen gas.
   - Evacuate it again with the vacuum pump for one (1) hour to 500 microns (vacuum drying).
4. If the system cannot be evacuated to 500 microns, repeat the steps of vacuum break and drying.
5. Finally, after maintaining the system in vacuum for one (1) hour, check if the vacuum gauge rises or not.

Figure 56: Vacuum Procedure Diagram.



Note:

- *If the primary refrigerant charge is not performed in a reasonable time after the vacuum procedure is complete, wet air may infiltrate the outdoor unit. If wet air is mixed with refrigerant, the refrigerant cycle may malfunction and the unit may be damaged.*
- ⃠ *Do not perform refrigerant charge while the compressor is operating, otherwise, liquid may leak and subsequently damage the compressor.*
- *Use a micron gauge to measure vacuum.*
- *Obtain the precise amount of refrigerant needed using calculations outlined in the following pages. Too much or too little refrigerant may cause the system to malfunction.*
- *If other refrigerants are mixed in the original refrigerant, the refrigerant piping system may be damaged or malfunction.*
- *Because R410A is a mixed refrigerant, the required additional refrigerant must be charged in its liquid state. If the refrigerant is charged in its gaseous state, its composition changes and the system will not work properly.*

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REFRIGERANT PIPING PREPARATION

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 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.

Table 34: Outdoor Unit Factory Charge.

Outdoor Unit	Factory Charge lbs. of R410A
LMU18CHV	3.96
LMU24CHV	3.96
LMU30CHV	6.18
LMU36CHV	6.18
LMU480HV	9.7
LMU540HV	9.7
LMU600HV	12.3

Multi F Systems

Additional charge (lbs.) = (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

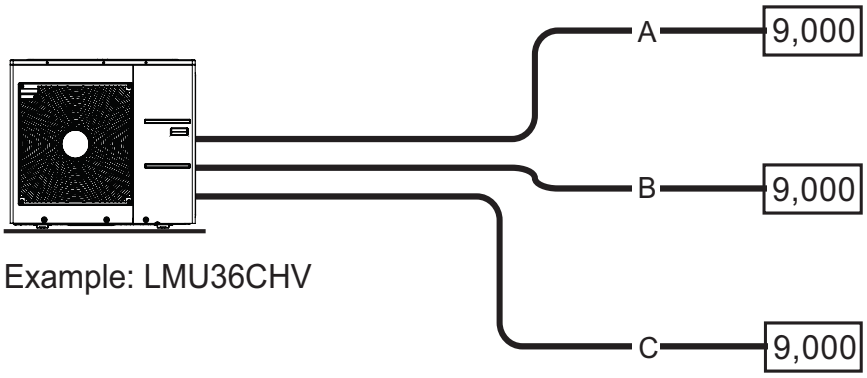
Note:

- *Number of installed length of branches depends on the specifications of the outdoor unit model.*
- *CF = Maximum number of connectible indoor units – Total number of connected indoor units.*

Table 35: Multi F Outdoor Unit Piping Specifications.

Outdoor Unit Model	Min. to Max. Piping Length for One Branch (ft.)	Max. Total System Piping Length (ft.)	Chargeless Pipe Length per Branch (L) (ft.)	Piping Length (No Additional Refrigerant [ft])	Additional Charge Needed (a) (oz./ft.)
LMU18CHV	9.8 to 82	164	24.6	49.2	0.22
LMU24CHV	9.8 to 82	246.1	24.6	73.8	0.22
LMU30CHV	9.8 to 82	246.1	24.6	98.4	0.22
LMU36CHV	9.8 to 82	246.1	24.6	98.4	0.22

Figure 57: Multi F Additional Refrigerant Charge Example.



Example: LMU36CHV

Each branch pipe
A = 82 ft.
B = 16 ft.
C = 49 ft.

Additional Charge
= (82 - 24.6) x 0.22
+ (16 - 24.6) x 0.22
+ (49 - 24.6) x 0.22
- (4 - 3) x 5.29
= 10.82 oz.

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REFRIGERANT PIPING PREPARATION

Refrigerant Charge

Multi F MAX Systems

Additional charge (lbs.) = (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

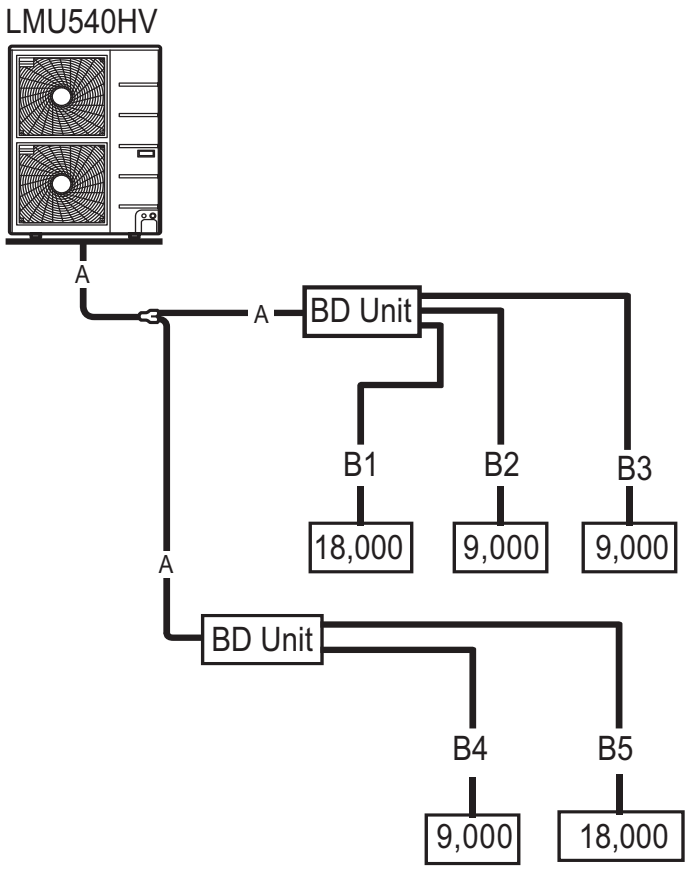
Note:

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

Table 36: Multi F MAX Outdoor Unit Piping Specifications.

Outdoor Unit Model	Main Piping Length		Branch Piping Length	
	Chargeless Pipe Length of Main Pipe (L) (ft.)	Additional Charge Needed (a) (oz./ft.)	Chargeless Pipe Length per Branch Pipe (B) (ft.)	Additional Charge Needed (b) (oz./ft.)
LMU480HV	16.4	0.54	16.4	0.22
LMU540HV	16.4	0.54	16.4	0.22
LMU600HV	16.4	0.54	16.4	0.22

Figure 58: Multi F MAX Additional Refrigerant Charge Example.



- Total main pipe (A) = 60 ft.
- Each branch pipe
  B1 = 49 ft.
  B2 = 17 ft.
  B3 = 17 ft.
  B4 = 10 ft.
  B5 = 23 ft.

Additional Charge
= (60 - 16.4) x 0.54
+ (49 - 16.4) x 0.22
+ (17 - 16.4) x 0.22
+ (17 - 16.4) x 0.22
+ (10 - 16.4) x 0.22
+ (23 - 16.4) x 0.22
– (8 - 5) x 3.53
= 20.43 oz.

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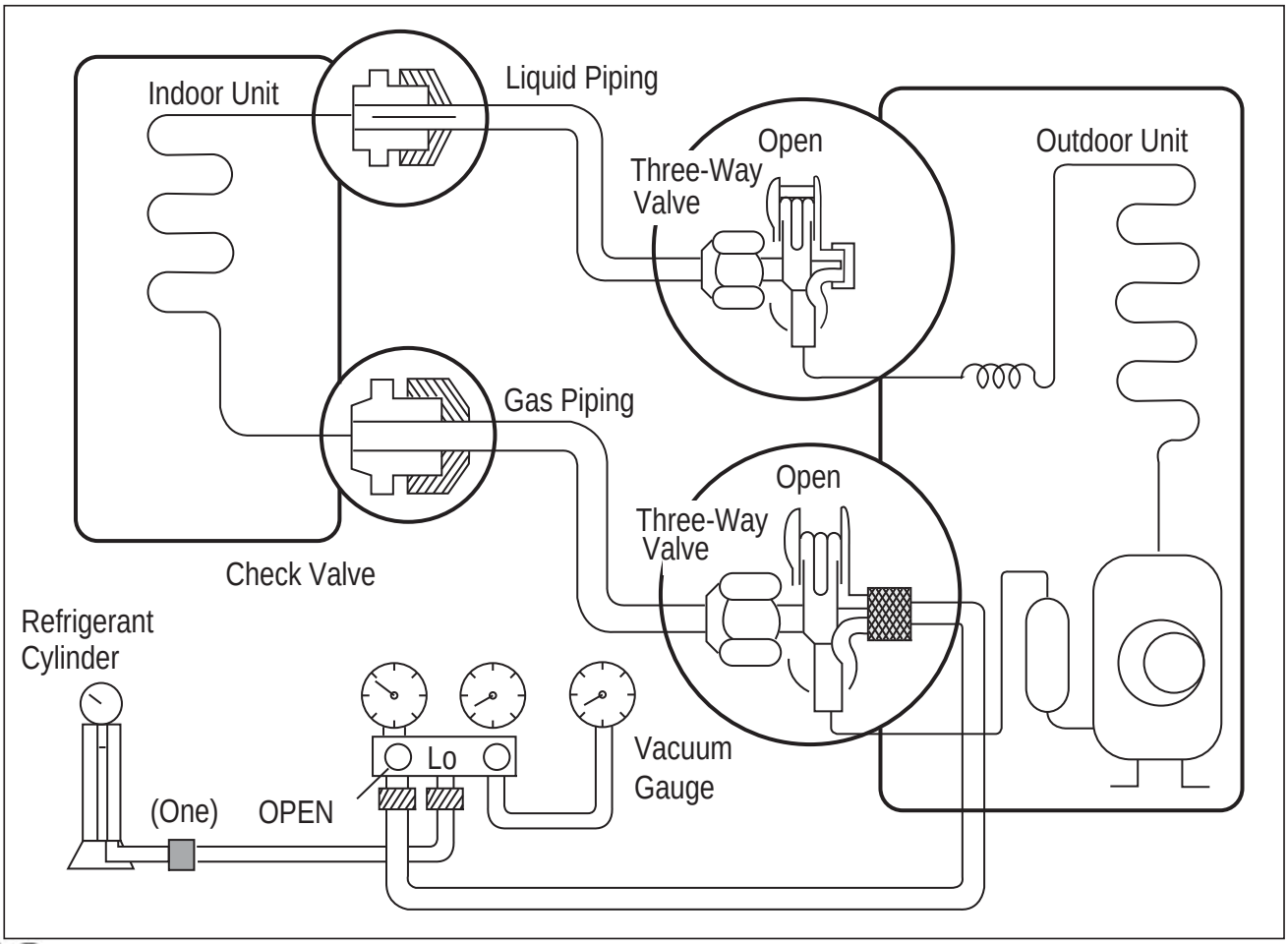
Charging the Refrigerant

1. Determine the refrigerant that is needed, applying the necessary formulas as outlined in the previous pages.
2. Connect the charging cylinder to the charge hose on the manifold valve.
3. Purge air from the charge hose by opening the valve at the bottom of the cylinder, and press the check valve on the manifold valve.
4. Confirm that the “Lo” knob of the manifold valve is open and charge the system with liquid refrigerant. (Because R-410A is a non-azeotrope refrigerant, it must be charged in the liquid state.)
   - If the required amount of refrigerant cannot be charged all at once, the refrigerant can be charged a little at a time (approximately 5.29 ounces) while the system operates in cooling. This procedure must be repeated until the entire amount of refrigerant gets charged into the system; perform once, then wait approximately one [1] minute before resuming.
5. Immediately disconnect the charge hose from the service port on the three-way valve. Stopping halfway allows the refrigerant to discharge.
   - If the system has been charged with liquid refrigerant while it operates, turn the system off before disconnecting the hose.
6. Mount the valve stem nuts and the service port nut. Use torque wrench to tighten the service port nut to a torque of 1.8 kg.m and check for leaks.

⚠ WARNING

When installing or relocating the outdoor unit, make sure that no substance other than the specified refrigerant (R410A) enters the refrigerant circuit. Any presences of foreign substances such as air can cause an abnormal pressure rise and may result in explosion and physical injury.

Figure 59: Charging the Refrigerant.



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Refrigerant Piping System Insulation

All refrigerant piping from the outdoor unit to the indoor units / BD units (Multi F MAX systems only) must be insulated correctly for safety and usage. Y-branch connections, refrigerant piping, field-provided isolation ball valves (if present), service valves, and elbows must be properly and completely insulated using closed cell pipe insulation (up to the indoor unit piping connections). To prevent heat loss / heat gain through the refrigerant piping, all refrigerant piping including liquid lines and vapor lines shall be insulated separately. Insulation shall be a minimum 1/2" thick, and thickness may need to be increased based on ambient conditions and local codes. Table below lists minimum wall thickness requirements for Ethylene Propylene Diene Methylene (EPDM) insulation.

Inside the outdoor unit, maximum pipe temperature is 248°F and minimum pipe temperature is -40°F. For field insulation of refrigerant piping between outdoor units and indoor units, consider the following pipe temperature ranges for an operating heat pump system:

- Heating mode refrigerant temperature ranges: Liquid 75-118°F; High Pressure Vapor 95-220°F
- Cooling mode refrigerant temperature ranges: Liquid 75-118°F; Low Pressure Vapor 40-90°F

Figure 60: Typical Pipe Insulation, Power Wire and Communications Cable Arrangement

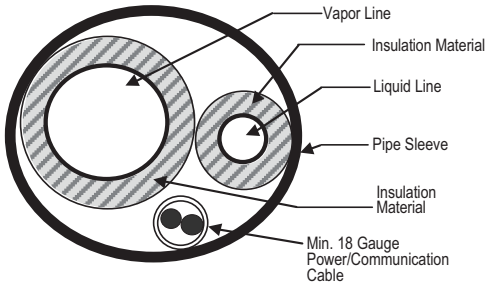


Figure 61: Typical Insulation Butt-Joint at Indoor Unit Casing

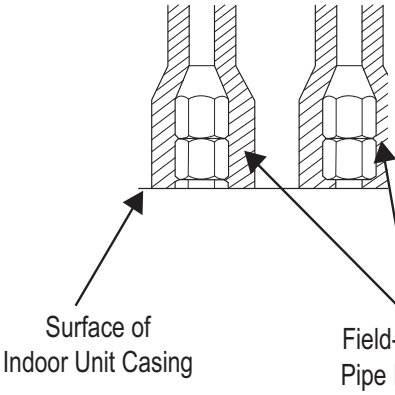
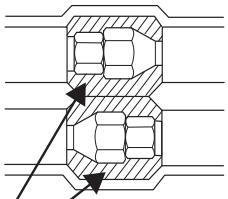


Figure 62: Typical Refrigerant Flare Fitting Insulation Detail



Note:

- ⃠ *Do not insulate gas and liquid pipes together as this can result in pipe leakage and malfunction due to extreme temperature fluctuations.*
- *Be sure to fully insulate the piping connections.*

Minimum Refrigerant Pipe Ethylene Propylene Diene Methylene (EPDM) Insulation Wall Thickness Requirements

Note:
Follow locals codes when selecting EPDM insulation wall thickness.

Table 37: Insulation Guidelines for Typical and Special Circumstances

Classification		Air-conditioned location		Non-air conditioned location	
		1. Typical location	2. Special location	3. Typical location	4. Special location
Liquid pipe	ø1/4 inch	1/2 inch	1/2 inch	1/2 inch	1/2 inch
	ø3/8 inch				
	≥ø1/2 inch	1/2 inch	1/2 inch	1/2 inch	1/2 inch
Vapor pipe	ø3/8 inch	1/2 inch	3/4 inch	3/4 inch	1 inch
	ø1/2 inch				
	ø5/8 inch				
	ø3/4 inch				
	ø7/8 inch				
	ø1 inch				
	ø1-1/8 inches	3/4 inch	1 inch	1 inch	
	ø1-1/4 inches				
	ø1-3/8 inches				
	ø1-1/2 inches				
	ø1-3/4 inches				

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REFRIGERANT PIPING PREPARATION

Refrigerant Piping Insulation

1. Typical location (Air-conditioned location): When the piping passes through an indoor area where the indoor unit operates.
• Apartment, classroom, office, mall, hospital, etc.

2. Special location (Air-conditioned location):
1. When the location is air conditioned, but there is severe temperature/humidity difference due to high ceilings
• Church, auditorium, theater, lobby, etc.
2. When the location is air conditioned, but internal temperature/humidity are high
• Bathroom, swimming pool, locker room, etc.

3. Typical location (Non-Air conditioned location): When the piping passes through an indoor area where the indoor unit does not operate.
• Hallway or a dormitory or school, etc.

4. Special location (Non-Air conditioned location): If conditions 1 and 2 below are present.
1. When the piping passes through an indoor area where the indoor unit does not operate.
2. When the humidity is high and there is no air flow in the location where the piping is installed.
• The thickness of the above insulation material is based on heat conductivity of 0.61 Btu/in/h/ft^2/°F.

Pipe Sleeves at Penetrations

LG requires that all pipe penetrations through walls, floors, and pipes buried underground be routed through a properly insulated sleeve that is sufficiently sized to provide free movement of the pipe and does not compress the insulation. Underground refrigerant pipe shall be routed inside a protective sleeve to prevent insulation deterioration. Also follow federal, state, and local regulations and codes when choosing a sleeve type.

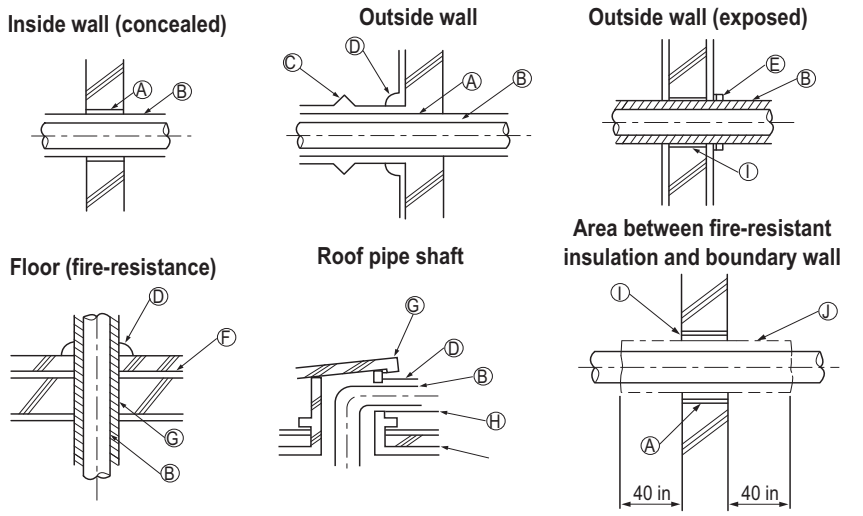
Note:

Diameter of penetrations shall be determined by pipe diameter plus the thickness of the insulation.

For example:

Diameter of Gas Piping:	1/2"
Diameter of Liquid Piping:	1/4"
Thickness of Gas Piping Insulation:	0.4" x 2
Thickness of Liquid Piping Insulation:	0.4" x 2
Surplus:	0.8"
Sleeve diameter (total):	3.1" minimum

Figure 63: Pipe Sleeve Options.



Ⓐ Sleeve
Ⓑ Insulation
Ⓒ Lagging
Ⓓ Caulk
Ⓔ Band
Ⓕ Water-resistant layer
Ⓖ Sleeve with edge
Ⓗ Lagging
Ⓘ Mortar or other fire-resistant caulk
Ⓙ Fire-resistant insulation

When filling an access hole with mortar, cover the area with steel plate so that the insulation will not fall through. For this area, use fire-resistant materials for both the insulation and cover.
⃠ Vinyl cover should not be used.

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Underground Refrigerant Piping

Refrigerant pipe installed underground should be routed inside a vapor tight protective sleeve to prevent insulation deterioration and water infiltration. Refrigerant pipe installed inside underground casing must be continuous without any joints. Underground refrigerant pipe must be located at a level below the frost line.

Table 38: Utility Conduit Sizes.

Liquid Pipe[1]	Vapor Pipe[1]		
	1/2 (2.0[2,5])	5/8 (2-1/8[2,5])	3/4 (2-1/4[2,5])
1/4 (1.0)[3]	4	4	4
3/8 (1-1/8)[3]	4	4	5
1/2 (1-1/2)[4]	5	5	5
5/8 (1-5/8)[4]	5	5	5
3/4 (1-3/4)[4]	5	5	5

[1]OD pipe diameter in inches; Values in parenthesis () indicate OD of pipe with insulation jacket.

[2]Diameter of pipe with insulation. Thickness of pipe insulation is typical. Actual required thickness may vary based on surrounding ambient conditions and should be calculated and specified by the design engineer.

[3]Insulation thickness (value in parenthesis) = 3/8 inch.

[4]Insulation thickness (value in parenthesis) = 1 inch.

[5]Insulation thickness (value in parenthesis) = 3/4 inch.

Figure 64: Typical Arrangement of Refrigerant Pipe and Cable(s) in a Utility Conduit.

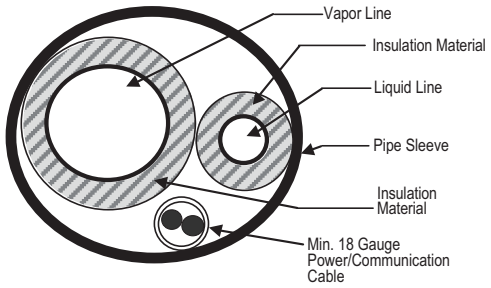
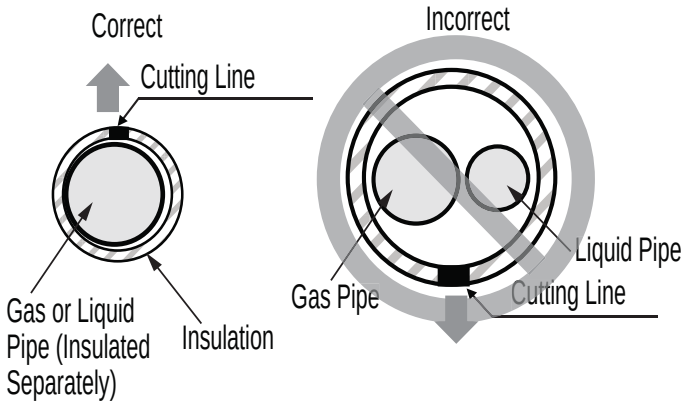


Figure 65: Underground Refrigerant Piping.

Installing the Insulation

1. Insulation material should be longer than the refrigerant piping. Each vapor and liquid piping must be insulated separately.
2. Place the closed-cell ethylene propylene diene methylene (EPDM) insulation material carefully around each refrigerant pipe so as not to damage it. Be sure the insulation material cutting line is place upward.
3. Apply adhesive to both cut surfaces of the insulation and press together. Allow adhesive to dry so that the bond is secure and does not come apart.

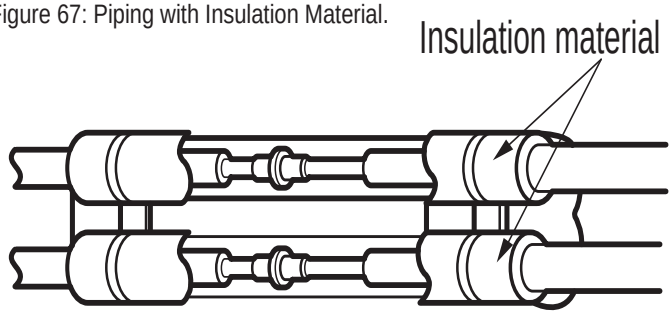
Figure 66: Correct Cutting Line Placement.



Insulating Piping Joints

1. Push the EPDM insulation from the straight piping surrounding the joint (elbow, outdoor unit to indoor unit piping connection point, etc.) as close together as possible.
2. Cut a piece of insulation to fit the joint, overlapping the insulation on the surrounding piping by at least one (1) inch.
3. Apply adhesive to bond all the ends.
4. Secure by completely wrapping narrow vinyl tape around the insulation / joint so that there are no gaps.
5. Tape should be sufficient to cover the piping so it can fit into the rear piping housing area at the back of the indoor unit or BD unit (Multi F MAX systems only).

Figure 67: Piping with Insulation Material.



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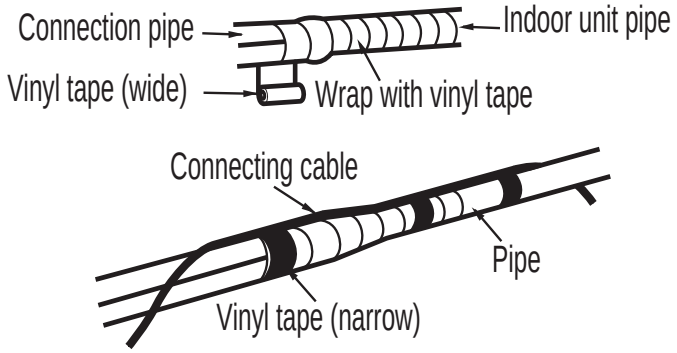
REFRIGERANT PIPING PREPARATION

Refrigerant Piping Insulation

Bundling

If a conduit is not used on the connection from the outdoor unit to the interior, bundle both insulated refrigerant pipes, the drain hose, and outdoor unit to indoor unit / BD unit communication cable / power wiring together with wide vinyl tape.

Figure 68: Bundling the Connection Components (From Outdoor Unit to Indoor Unit / BD Unit [Multi F MAX systems]).



Special Applications

If an additional drain hose is necessary, the end of drain outlet should be routed above the ground. Secure and the drain hose appropriately.

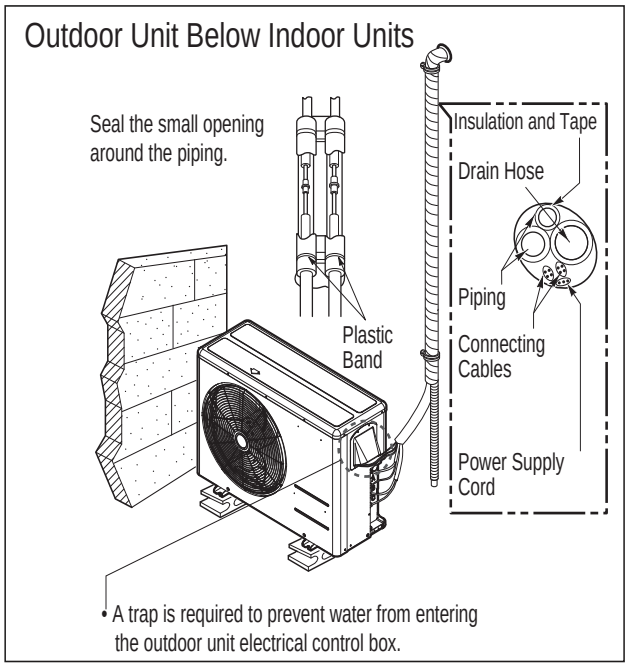
When the Outdoor Unit is Installed Below the Indoor Unit:

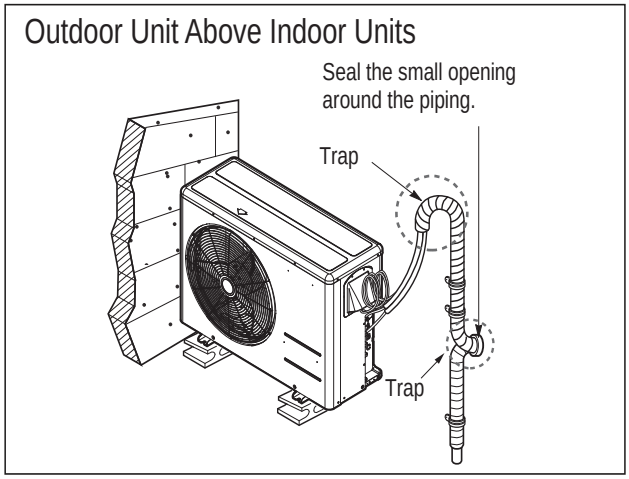
1. Wrap the vinyl tape around the separately insulated refrigerant piping, the drain hose, and the communications cable / power wiring together from the bottom to top.
2. Secure the bundle along the outside wall using saddles or a similar type of piping support.
3. Seal any openings in the wall.

When the Outdoor Unit is Installed Above the Indoor Unit:

1. Wrap the vinyl tape around the separately insulated refrigerant piping, the drain hose, and the communications cable / power wiring together from the bottom to top.
2. Secure a portion of the bundle along the outside wall using saddles or a similar type of piping support.
3. At the appropriate location, form a trap with the bundle to prevent water from entering interior spaces or the electrical control box of the outdoor unit.
4. Secure the rest of the bundle along the outside wall using saddles or a similar type of piping support.
5. Seal any openings in the wall.

Figure 69: Special Applications.





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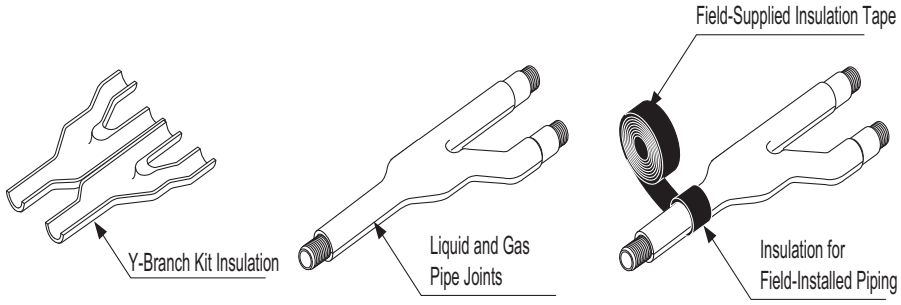
Y-Branch Kit Insulation

Each Y-branch kit comes with clam-shell type peel-and-stick insulation jackets molded to fit the Y-branch fittings—one for the liquid line, one for the vapor line.

- Check the fit of the Y-branch clam-shell insulation jacket after the Y-branch is installed.
- Mark the pipe where the insulation jacket ends.
- Remove the jacket.
- Install field-provided insulation on the pipes first.
- Peel the adhesive glue protector slip and install the clam-shell jacket over the fitting

Figure 70: Y-branch Insulation Detail.



Note:

Additional Insulation for Y-Branches May be Required in Humid Environments.

If the system has been operating for a long time in a high humidity environment (dew point temperature: more than 73°F), condensate is likely to form. If this happens, install 3/8 inch thick ethylene propylene diene methylene (EPDM) insulation that is plenum-rated with a heat-resistance factor that follows applicable local, state, and federal codes.

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⚠ WARNING

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

Note:

- *Consider ambient conditions (temperature, direct sunlight, inclement weather, etc.) when selecting, installing, and connecting the power wiring.*
- *Properly ground the outdoor units. Improperly ground wire can cause communication problems from electrical noise and motor current leakage. Ground wiring must always be installed by a qualified technician.*
- *If the system operates in reversed phase, it may damage the compressors and other components.*
- *If there is a possibility of reversed phase, phase loss, momentary blackout, or the power goes on and off while the system is operating, install a field-supplied phase loss protection circuit.*
- *Undersized wiring may lead to unacceptable voltage at the unit and may cause unit malfunction.*
- *Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and National Electrical Code regulations related to electrical equipment and wiring, and following the instructions in this manual. Using an oversized breaker or fuse may result in equipment malfunction and property damage.*
- ⃠ *Do not connect ground wire to refrigerant, gas, or water piping; to lightning rods; to telephone ground wiring; or to the building plumbing system. Failure to properly provide a National Electrical Code-approved earth ground can result in property damage and equipment malfunction.*

Power Supply / Power Wiring Specifications

Note:

- *Multi F and Multi F MAX systems operate at 1Ø, 208-230V, 60Hz.*
- *Power supply, wire type and size should be selected based on National Electrical Code and local codes. Maximum allowable voltage fluctuation ±10% or nameplate rated value.*
- *Properly ground the outdoor units per National Electrical Code and local codes.*
- *For power to the outdoor units, use field-supplied copper wiring that is solid or stranded, and shielded with the wires separately insulated.*
- *Ground wire should be longer than the common power / communication wires.*
- *Connect the wiring firmly so the wires cannot be easily pulled out.*
- *Refer to the inside of the chassis cover for circuit and terminal block diagrams for your model unit.*
- *Always match color codes of each wire and follow wiring diagram.*
- *Outdoor unit wiring can be found on the inside of the outdoor unit control cover.*

Note:
It is highly recommended to provide a circuit breaker between the power source and the outdoor unit as shown.

Figure 71: Circuit Breaker

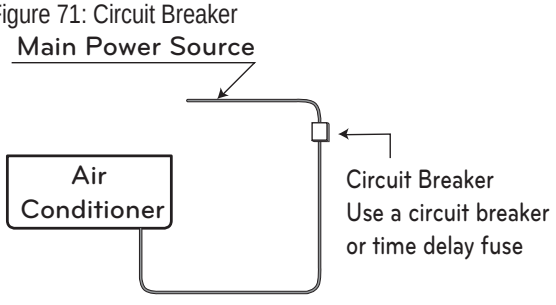

Table 39: Circuit Breaker / Fuse Size.

Outdoor Unit Model	Power Source	Fuse or Breaker Capacity
LMU18CHV, LMU24CHV	1Ø, 208-230V	20A
LMU30CHV, LMU36CHV	1Ø, 208-230V	25A
LMU480HV, LMU540HV	1Ø,208-230V	40A
LMU600HV	1Ø,208-230V	45A

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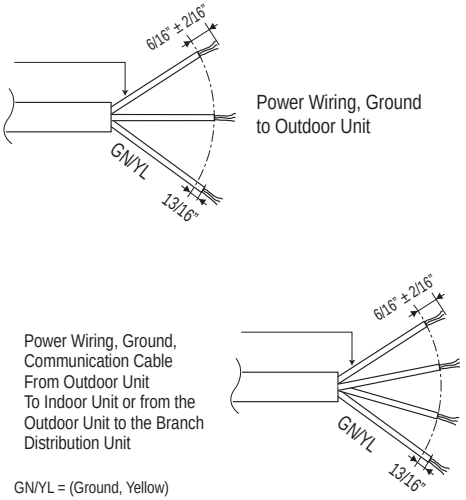
General Communication Cable Specifications

- Multi F Systems: All power wiring / communication cable to be minimum 18 AWG from the outdoor unit to the indoor unit, 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.
- Multi F MAX Systems: All power wiring / communication cable to be minimum 16 AWG from the outdoor unit to the BD unit, and 18 AWG from the BD unit to the indoor unit, 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.
- For power / communication wires between the Multi F and Multi F MAX outdoor units and the indoor units / BD units (Multi F MAX systems only), use a four (4) conductor, stranded, shielded or unshielded wire. If shielded, the wire must be grounded to the chassis at the outdoor unit only.
- Insulation material as required by local code.
- Rated for continuous exposure of temperatures up to 140°F.
- Firmly attach the cable; provide slack but secure in a way to prevent external forces from being imparted on the terminal block.
- Wiring should be completed without splices.

Figure 72: Multi F / Multi F MAX Outdoor and Indoor / Branch Distribution Unit Wiring and Communications Cable Diagram.



Note:

- *Always verify the communication cable is connected to a communications terminal. Never apply line voltage power to the communication cable connection. If contact is made, the PCBs may be damaged.*
- *The shield of the communications cable connecting the outdoor unit to the indoor units should be grounded only to the outdoor unit frame.*
- *Tie the shield of each cable segment together using a wire nut at the indoor unit. Maintain polarity throughout the communication network.*
- *Position the incoming power to the outdoor unit away from the power / communications cables from the outdoor unit to the indoor unit / branch distribution unit (Multi F MAX systems only).*
- ⃠ *Never use a common multiple-core communications cable. Each communications bus shall be provided a separate cable (i.e., between outdoor unit and indoor unit).*

Outdoor Unit Wiring Connection Guidelines

Best practice dictates using ring or spade terminals to terminate power wiring at the power terminal block

To Install a Ring Terminal:

1. Trim the strand wiring with wire cutters or pliers, then strip the insulation to expose the strand wiring to about 3/8 inch.
2. Using a ring terminal fastener or pliers, securely clamp a ring terminal to each stripped wire end.

To Connect the Wiring to the Terminals:

1. Remove the terminal screws from the (outdoor unit, BD unit, or indoor unit) terminal plate with a screwdriver.
2. Position the ring terminal around the terminal, place the terminal screw in the ring, and tighten to the terminal plate using a screwdriver.

Figure 73: Close up of a Typical Ring Terminal

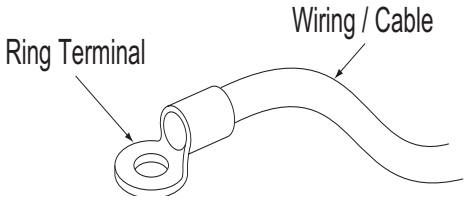
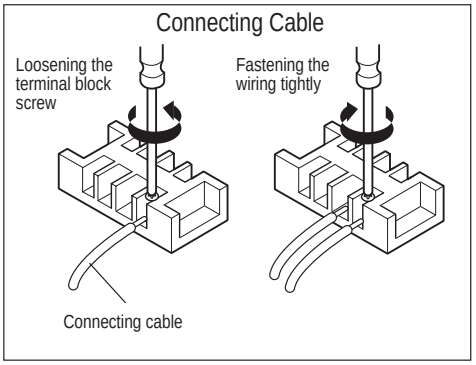


Figure 74: Tightening the Ring Terminal to the Terminal Plate.



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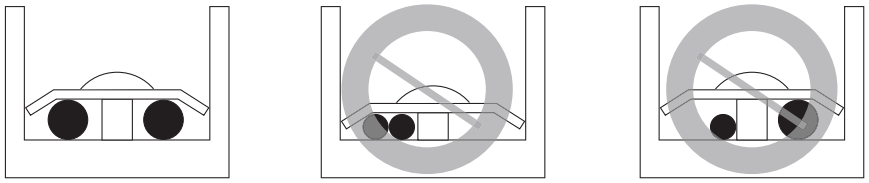
Outdoor Unit Wiring Connection Guidelines, continued.
If ring terminals or spade clips are not available, then:

Note:

- ⃠ *Do not terminate different gauge wires to the power terminal block. Slack in the wiring may generate heat and fire.*
- ⃠ *Do not over tighten the connections; overtightening may damage the terminals.*
- *When terminating wires of the same thickness, follow the instructions demonstrated in the illustrations below.*
- *Firmly attach the wire; secure in a way to prevent external forces from being imparted on the terminal block.*
- *Use an appropriately sized screwdriver for tightening the terminals.*

Figure 75: Proper and Improper Power Wiring Connections

● :Copper Wire



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

⃠ Do not terminate two wires on one side.

⃠ Do not terminate different gauge wires to a terminal block.

Note:

- ⃠ *Never apply line voltage power to the communications cable terminal block. If contact is made, the PCBs may be damaged.*
- *Always include some allowance in the wiring length when terminating. Provide some slack to facilitate removing the electrical panels while servicing.*

⚠WARNING

- *If power wires are not properly terminated and firmly attached, there is risk of fire, electric shock, and physical injury or death.*
- ⃠ *Never ground the shield of the communications cable to the indoor unit frame or other grounded entities of the building. Failure to properly provide a National Electrical Code-approved earth ground can result in electric shock, physical injury or death.*

Connecting the Power Wiring / Communications Cable to the Outdoor Unit

1. Remove the side panel and the conduit panel knockouts.
2. Detach the control cover by loosening and removing the screws.
3. Draw the power wiring to the outdoor unit, and the power wiring / communications cable (connecting cable) to the indoor units or BD unit (Multi F MAX systems only), through field-supplied conduits. Ensure there is enough length to connect the wiring / cables to the terminals on the outdoor unit. Secure the conduit to the outdoor unit using a field-supplied lock nut on the interior of the outdoor unit frame.
4. Properly connect the power wiring, and the power wiring / communications cable (connecting cable) to the correct terminals. Refer to the outdoor unit wiring
   diagram.
5. To provide strain relief, (separately) secure the power wiring and the power wiring / communications cable (connecting cable) to the outdoor unit with the factory-supplied clamps (up to 35 lbs.). Zip ties can also be used to hold all wiring / cables in place.
6. Re-attach the outdoor unit cover control and side panel to the original position with the screws.

⚠DANGER

⃠ *Do not use damaged or loose power wiring.* ⃠ *Do not modify or extend the outdoor unit's power wiring randomly. Ensure that the power wiring will not be pulled nor weight be placed on the power wiring during operation. There is risk of fire, electric shock, and physical injury or death.*

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Connecting the Power Wiring / Communications Cable to the Outdoor Unit, continued.

Figure 76: Connecting the Power Wiring / Communications Cables to the Outdoor Unit (LMU18~36CHV; LMU480, 540HV).

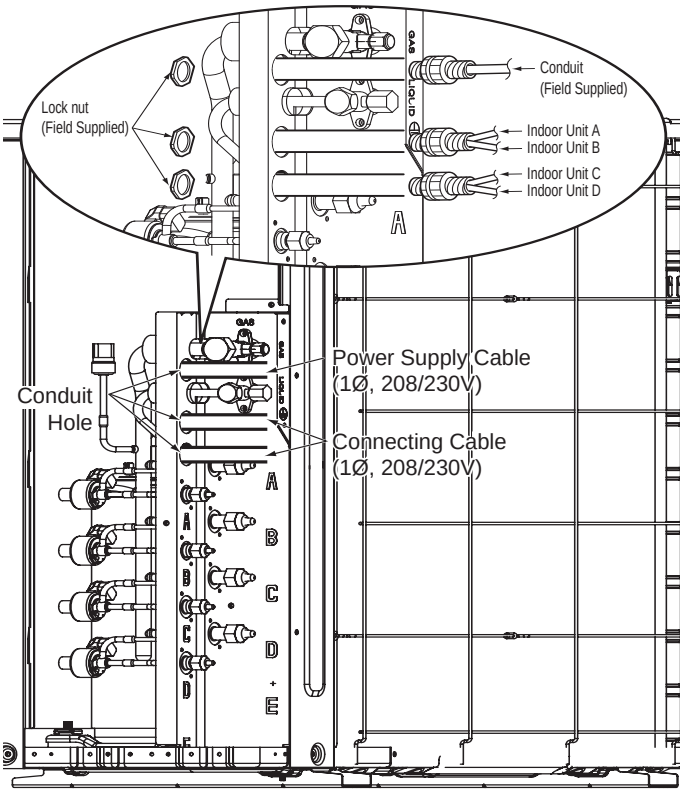
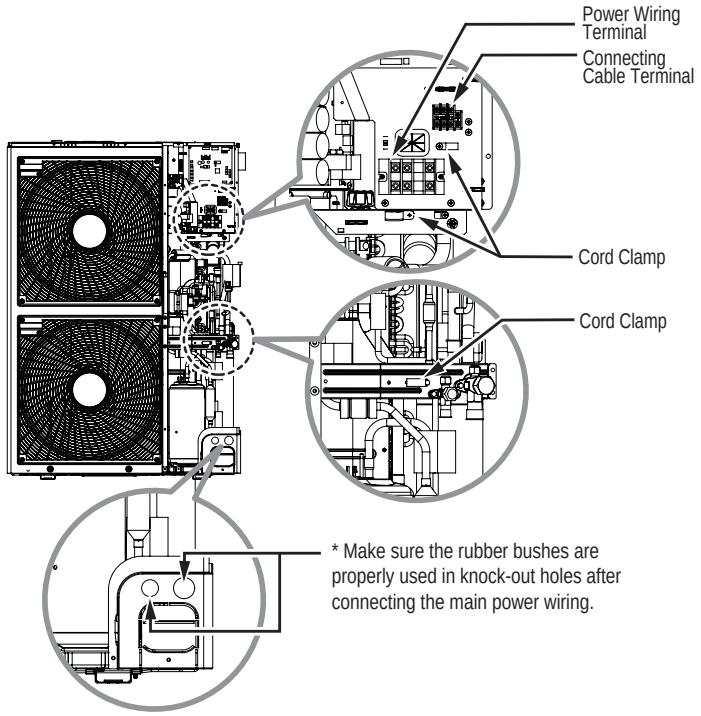


Figure 77: Connecting the Power Wiring / Communications Cables to the Outdoor Unit (LMU600HV).



⚠ WARNING

- *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.*
- *Replace all control box and panel covers. If cover panels are not installed securely, dust, water and animals may enter the outdoor unit, causing fire, electric shock, and physical injury or death.*

Note:

- *The communications cable (connecting cable) from the outdoor unit to the indoor unit should be isolated from the electrical wiring of external devices such as computers, elevators, radio and television broadcasting facilities, and medical imaging offices. Communication problems can arise from electrical noise.*
- ⃠ *Do not install the power wiring to the outdoor unit and the power wiring / communications cable (connecting cable) to the indoor units in the same conduit. These wiring / cables should have separate conduits that are placed a reasonable distance apart. Communication problems can arise from electrical noise.*

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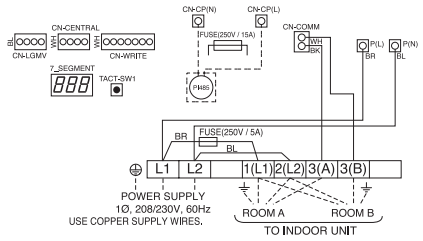
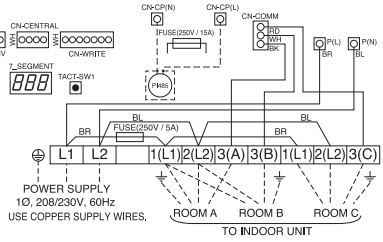
Connecting the Power Wiring / Communications Cable to the Outdoor Unit, continued.

Figure 78: Detailed View of Outdoor Unit Terminal Blocks / Connections.

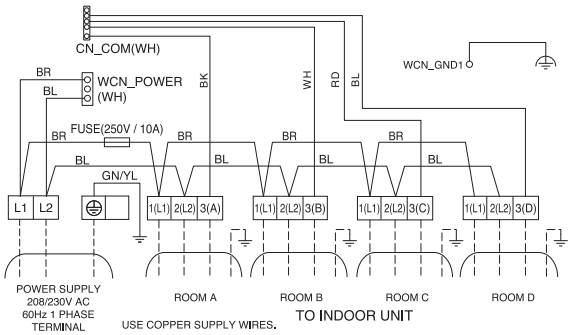
Multi F LMU18CHV



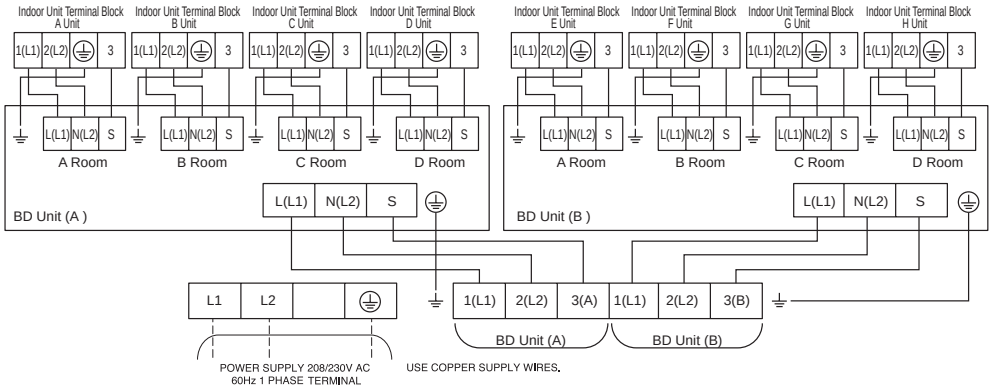
Multi F LMU24CHV



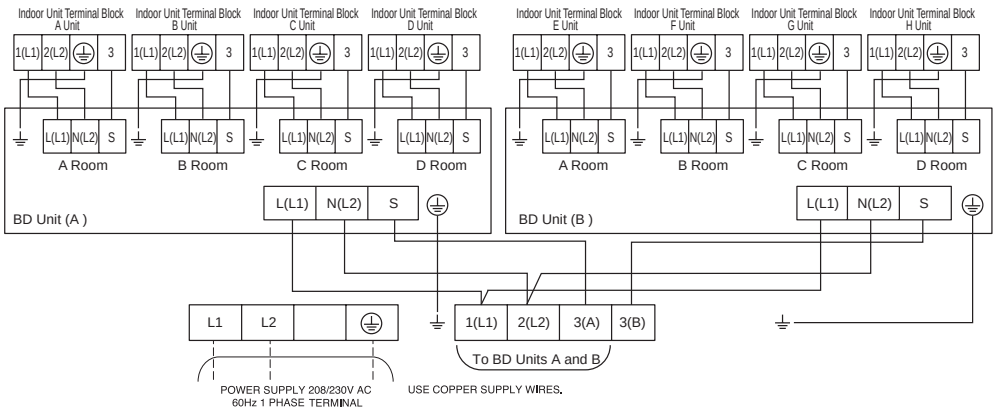
Multi F LMU30CHV and LMU36CHV



Multi F MAX LMU480HV and LMU540HV



Multi F MAX LMU600HV



Wiring

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Connecting the Power Wiring / Communications Cable to Indoor Units

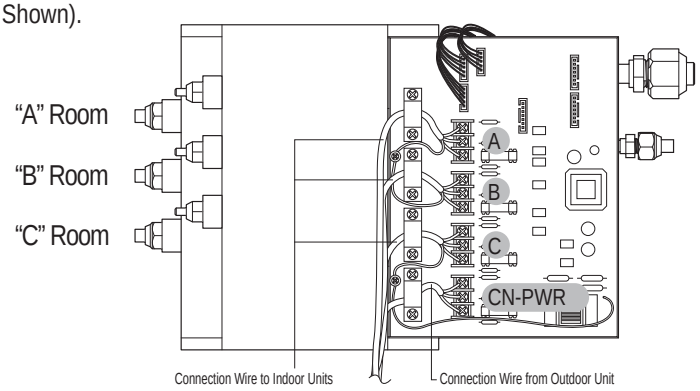
1. Connect power wiring / communications cable (connecting cable) from the outdoor unit to the individual indoor unit terminals following the wiring diagrams on the outdoor unit and indoor unit control covers.
2. Ensure that the terminal board numbers (A, B, C; 1, 2, 3) and wiring color on the outdoor unit matches the terminal number and wiring color on the indoor unit. (Terminal board numbers are arranged from top to bottom in order from 1 to 3.)
3. Provide strain relief by securing the wiring / cable to the indoor unit with the factory-supplied clamps.
4. For more installation information for specific indoor units, refer to the separate indoor unit installation manuals on www.lg-dfs.com.

Connecting the Power Wiring / Communications Cable to the Branch Distributor (BD) Unit (Multi F MAX Systems Only)

General Instructions

- Always connect power wiring / communications cable matching the BD unit terminals to their respective indoor units (Example for three-port BD Unit PMBD3630: A, B, and C).
- Follow the instructions on the nameplates and connect wiring / cables of the outdoor unit and indoor units to the correct terminals (1, 2, 3). Always attach each ground wire separately to a grounding screw.
- After completion, secure wiring with wire clamps. Secure wiring firmly to the indoor unit.

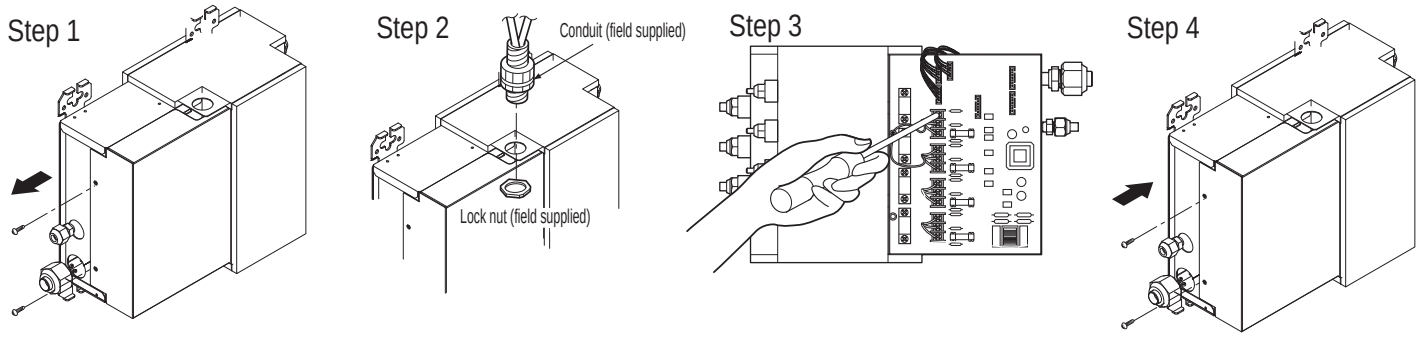
Figure 79: Interior View of a BD Unit (Three-Port PMBD3630 Example Shown).



BD Unit Wiring Connection Procedure

1. Remove the BD unit control cover. Unscrew the two (2) screws, and slide the cover off the BD frame following the arrows in the diagram (Step 1).
2. Draw the power wiring / communications cable through the field-supplied conduit so there is enough length to connect wiring / cable to the terminals on the BD unit. Secure conduit to the BD unit using a field-supplied lock nut on the interior of the BD unit frame (Step 2).
3. Connect wiring / cable from the outdoor unit to the BD unit terminals, and from the BD unit terminals to the indoor unit terminals following the wiring diagram on the outdoor unit control cover (Step 3). Allow 11-13/16 inches of slack in the wire harness. Attach wiring / cable to the BD unit with clamps at four (4) locations.
4. Replace the BD unit control cover following the arrows in the diagram. Tighten the two (2) screws to finish (Step 4).

Figure 80: BD Unit Wiring Steps.



⚠WARNING

⃠ *Do not use tapped wires, extension cords, or starburst-type connections as they may cause overheating, fire, electric shock, physical injury or death.*

Note:

Always refer to the circuit diagram on the inside of the outdoor unit control cover.

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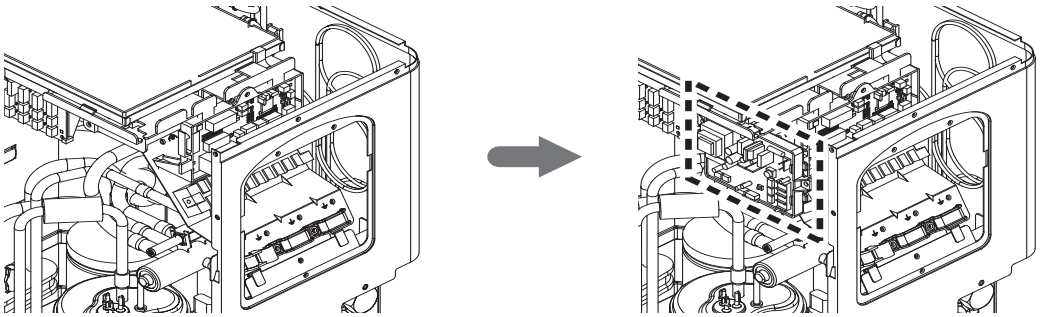
PI485

PI485 V-net Control Integration Board for Outdoor Units adapt Multi F, Multi F MAX systems to a LG VRF system central protocol for integration with LG central controllers. The PI485 is installed in the Multi F / Multi F MAX outdoor unit. For more information on PI485 installation, see the PI485 installation manual.

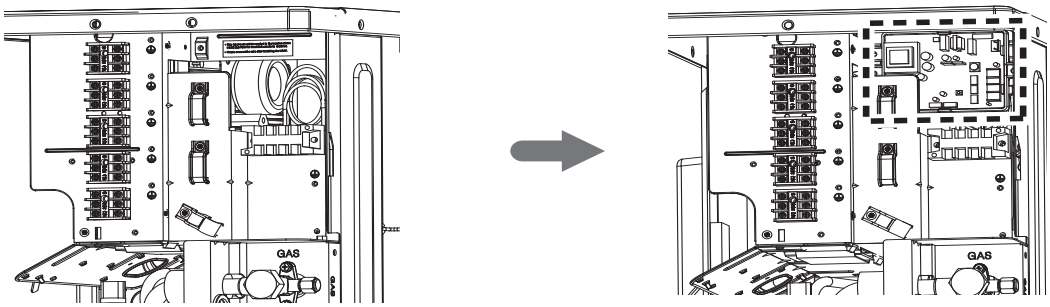
Figure 81: PI485 Board (Appearance may differ depending on model).

Figure 82: PI485 Installation Area in Multi F and Multi F MAX Outdoor Units.

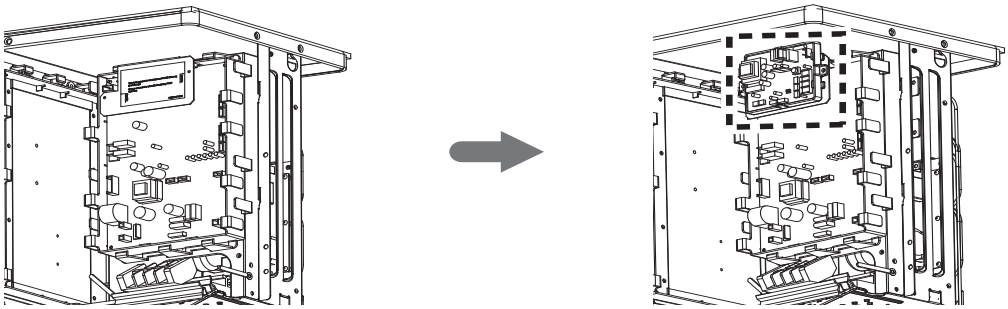
Multi F LMU18CHV, LMU24CHV



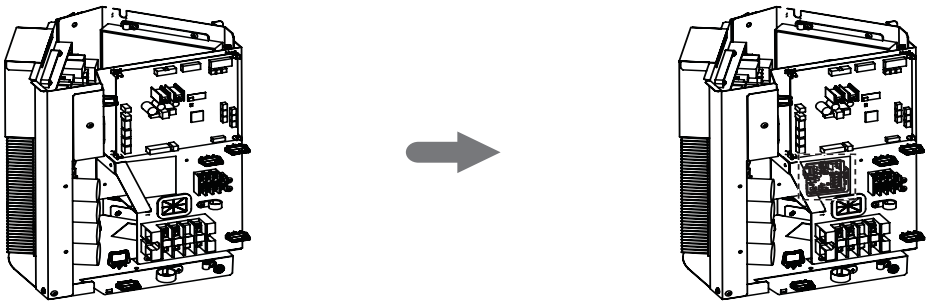
Multi F LMU30CHV, LMU36CHV



Multi F MAX LMU480HV, LMU540HV



Multi F MAX LMU600HV



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Test Run

After checking the system for leaks and performing the evacuation procedure, perform a test run. Follow the guidelines below for proper procedure.

Before the Test Run

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

Installing the Remote Controller Batteries

As part of the test run, the batteries need to be inserted into the remote controller, and the remote controller needs to be powered on to operate the indoor units. To insert the batteries follow the steps below. For information on using the remote controller, refer to its owner's manual.

1. The remote controller needs two AAA (1.5V) batteries for operation. Remove the battery cover from the back of the remote controller by pushing downward on the tab at the top of the battery cover and then lift up to remove.
2. Insert the two new batteries. Align batteries by the (+) and (-) sides (the interior battery compartment of the remote controller will have clear markings for the (+) and (-) placement).
3. Verify that the batteries have "clicked" into the compartment and are firmly engaged with the contacts on either side of them.
4. Reattach the back cover of the remote controller.
5. Proceed with powering on the remote controller and usage as needed.

Figure 83: Piping Connection on the Outdoor Unit (May Differ Depending on Outdoor Unit Model).

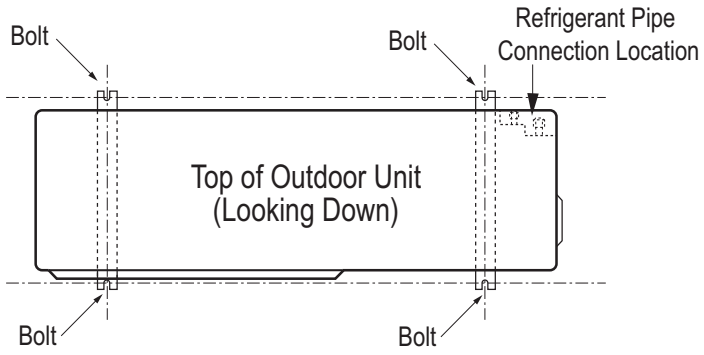
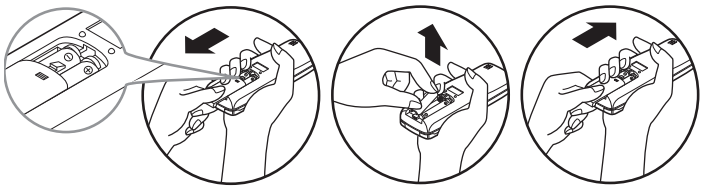


Figure 84: Installing the Remote Controller Batteries.



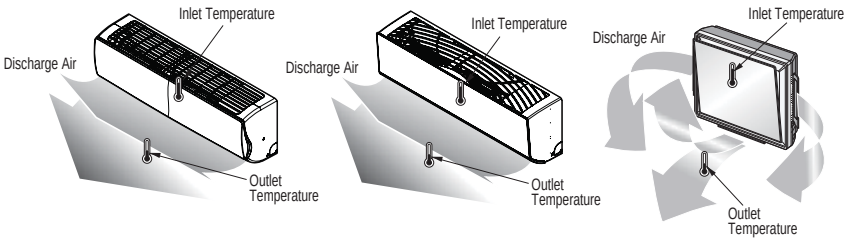
Test Run Procedure

1. Start up the system and perform a test run. Operate the system in cooling mode for 15 to 20 minutes.
2. Evaluate performance as the system runs, verifying the outdoor unit and all indoor units and BD 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. See table below for the optimum condition of the gas side pressure (system is in cooling mode).

Table 40: Optimum Conditions of the Gas Side Pressure.

Refrigerant Type	Outside Ambient Temperature	Gas Side Service Valve Pressure
R410A	95°F	113~142 psig

Figure 85: Inlet and Outlet Temperature Locations on Various Indoor Units.



Note:

If the pressure is >142psig, the system is most likely overcharged, and refrigerant should be removed. If the pressure is <113 psig, the system is most likely undercharged and refrigerant should be added.

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Outdoor Unit DIP Switch Settings

System must be powered off, and then turned back on to apply DIP switch settings.

⚠WARNING

Turn off the circuit breaker or shut the power source of the product down 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.*
- *Only the first four DIP switches are functional on the LMU480, 540, 600HV.*

Figure 86: LMU18~36CHV Outdoor Unit DIP Switches (in Normal Operation Setting).

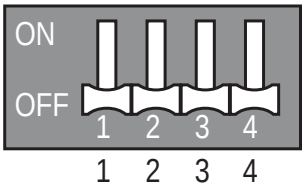


Figure 87: LMU480-540HV Outdoor Unit DIP Switches (in Normal Operation Setting).

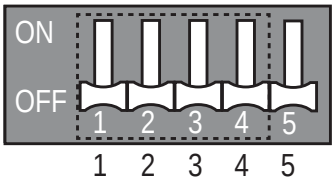


Figure 88: LMU600HV Outdoor Unit DIP Switches (in Normal Operation Setting).

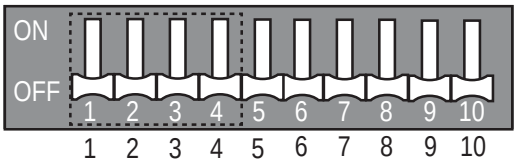
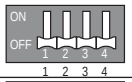
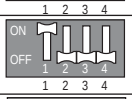
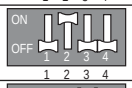
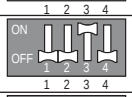
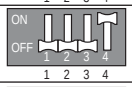
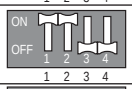
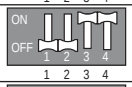
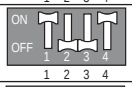
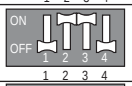
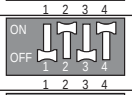
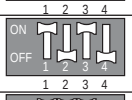
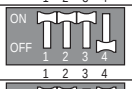
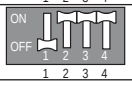


Table 41: DIP Switch Settings and Functionalities.

DIP Switch Setting	Function
	Normal Operation (No Function)
	Forced Cooling Operation
	Wiring Error Check
	Reducing Power Consumption (Step 1)
	Reducing Power Consumption (Step 2)
	Mode Lock (Cooling)
	Mode Lock (Heating)
	Night Quiet Mode (Step 1)
	Night Quiet Mode (Step 2)
	Mode Lock (Cooling) + Night Quiet Mode (Step 1)
	Mode Lock (Cooling) + Night Quiet Mode (Step 2)
	Reducing Power Consumption (Step 1) with Mode Lock (Cooling)
	Reducing Power Consumption (Step 2) with Mode Lock (Cooling)
	Reducing Power Consumption (Step 1) with Mode Lock (Heating)
	Reducing Power Consumption (Step 2) with Mode Lock (Heating)

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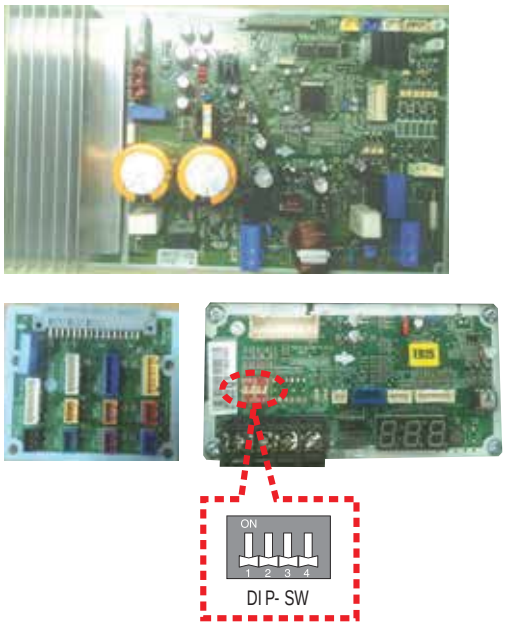
DIP SWITCH SETTINGS

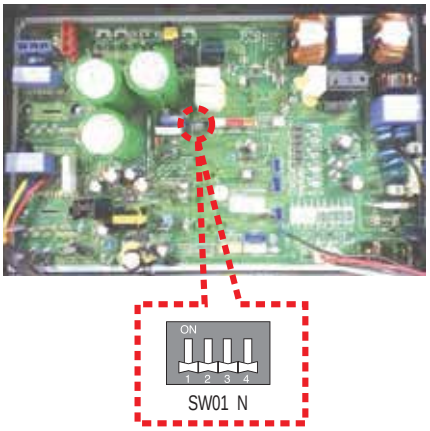
Location of DIP Switches on Multi F and Multi F MAX Outdoor Units

Figure 89: Multi F / Multi F MAX Outdoor Unit DIP Switch Locations.

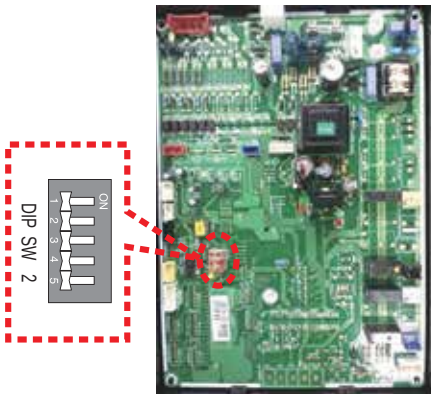
Multi F LMU18CHV and LMU24CHV



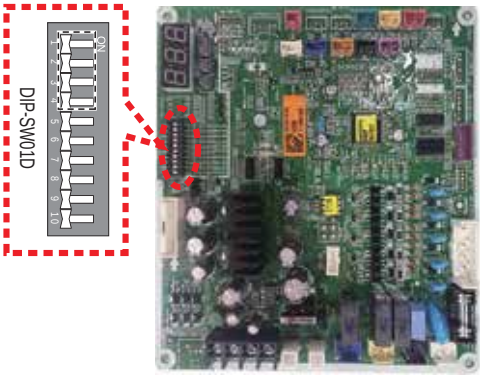
Multi F LMU30CHV and LMU36CHV



Multi F MAX LMU480HV and LMU540HV



Multi F MAX LMU600HV

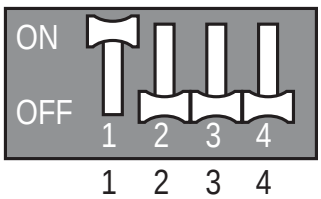


Forced Cooling Operation Function

Use to add refrigerant to the system when outside ambient temperatures are cool (ex.: winter).

1. Shut power down to the system.
2. Set DIP Switch 1 to ON.
3. Turn power on to the system.
4. Verify that the Red LED on the outdoor unit PCB is ON (indicates indoor units are in forced cooling operation).
5. Add refrigerant.

Figure 90: Forced Cooling DIP Switch Setting.



Note:

• If the green LED light on the outdoor unit PCB is ON, it indicates the compressor is OFF due to low pressure in the system.

• Turn DIP Switch 1 to OFF after finishing (Normal Operation setting).

• Only the first four DIP switches are functional on the LMU480, 540, 600HV.

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DIP SWITCH SETTINGS

Wiring Error Check

Use to verify if wiring is properly installed.

1. Shut power down to the system.
2. Set DIP Switch 2 to ON.
3. Turn power on to the system.
4. Check if the Red and Green LEDs on the outdoor unit PCB are ON (indicate indoor units are in forced operation mode).
5. If the wiring is correctly installed, the Green LED will light up. If the wiring is incorrectly installed, the Red and Green LEDs will blink, indicating which part of the system is in error.
   - Red LED = Piping Number
   - Green LED = Wiring Number (Room)

Example: If the Red LED blinks twice and the Green LED blinks three times, the second piping to the third room is in error (see at right).

Figure 91: Wiring Error Check DIP Switch Setting.

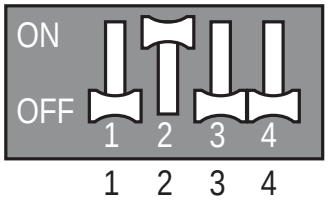
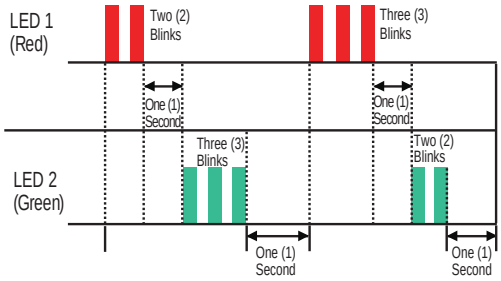


Figure 92: Wiring Error Check Example.



Note:

- *If the indoor unit(s) are not communicating properly to the outdoor unit, the Wiring Error Check cannot operate correctly.*
- *Only the part of the system in error will be displayed. System will operate correctly after the error is fixed.*
- *If outdoor and indoor temperatures are too low (ex.: winter), the wiring error check function will not operate (Red LED is ON).*
- *Turn DIP Switch 2 to OFF after finishing (Normal Operation setting).*
- *Only the first four DIP switches are functional on the LMU480, 540, 600HV.*

Reducing Power Consumption

Enables more efficient system operation by reducing the maximum power consumption value (reducing the MCA).

1. Shut power down to the system.
2. For Step 1, set only DIP Switch 3 to ON. For Step 2, set only DIP Switch 4 to ON.
3. Turn power on to the system.

Figure 93: Reducing Power Consumption Chart.

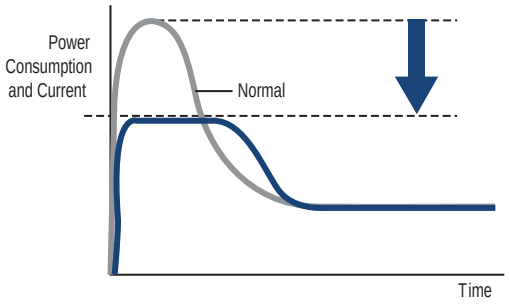
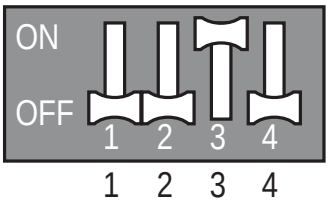


Table 42: Reducing Power Consumption Current Levels.

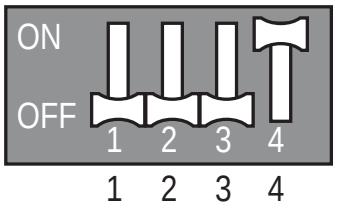
Phase	1Ø		
Model	Multi F LMU18CHV, LMU24CHV	Multi F LMU30CHV, LMU36CHV	Multi F MAX LMU480HV, LMU540HV, LMU600HV
Step 1 (A)	9	13	22
Step 2 (A)	8	11	21

Figure 94: Reducing Power Consumption DIP Switch Settings.

Step 1



Step 2



Note:

- *Reduced Power Consumption reduces outdoor unit capacity.*
- *Only the first four DIP switches are functional on the LMU480, 540, 600HV.*

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Reducing Power Consumption with Mode Lock

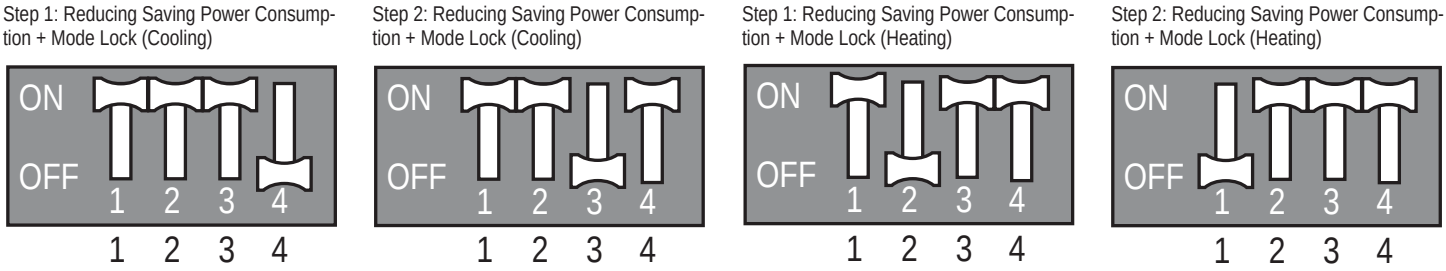
Enables more efficient system operation by lowering the maximum power consumption value, as well as locks the mode of operation (Example: In a cooling-only server room application where permission to adjust the system mode is highly limited). Changing modes can cause a change in compressor frequency, which would cause problems with the setting. As such, if this mode is used, it is locked in either cooling or heating. The function is rarely, if ever, used.

1. Shut power down to the system.
2. Set DIP Switches as indicated below, following the steps and chosen mode.
3. Turn power on to the system.

Note:

Only the first four DIP switches are functional on the LMU480, 540, 600HV.

Figure 95: Saving Power Consumption with Mode Lock DIP Switch Settings.

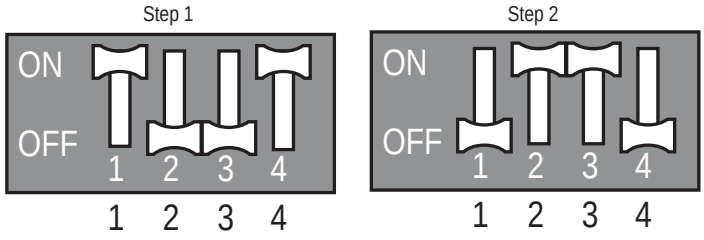


Night Quiet Mode

Lowers the operation sound of the outdoor unit by changing the compressor frequency and fan speeds. Night quiet mode initiates eight (8) hours after the highest outdoor air temperature is measured, then is active for nine (9) hours.

1. Shut power down to the system.
2. For Step 1, set only DIP Switches 2 and 3 to ON. For Step 2, set only DIP Switches 1 and 4 to ON.
3. Turn power on to the system.

Figure 96: Night Quiet Mode DIP Switch Settings.

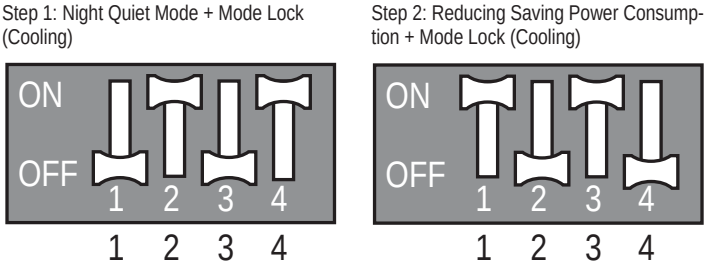


Night Quiet Mode with Mode Lock

Lowers the operation sound of the outdoor unit by changing the compressor frequency and fan speeds, as well as locks the mode of operation. Changing modes can cause a change in compressor frequency, which would cause problems with the setting. As such, if this mode is used, it is locked in either cooling or heating. The function is rarely, if ever, used. Night quiet mode initiates eight (8) hours after the highest outdoor air temperature is measured, then is active for nine (9) hours.

1. Shut power down to the system.
2. For Step 1, set only DIP Switches 2 and 4 to ON. For Step 2, set DIP Switches 1 and 3 to ON.
3. Turn power on to the system.

Figure 97: Night Quiet Mode with Mode Lock DIP Switch Settings.



Note:

- *If compressor frequency and fan speed are decreased, cooling capacity also may decrease accordingly.*
- *Night Quiet Mode can only be used when system is in cooling operation.*
- *Change the DIP switches if Night Quiet Mode is no longer desired.*
- *If indoor unit operation is set by the fan speed "Power", Night Quiet Mode will not function until fan speed "Power" is changed.*
- *Only the first four DIP switches are functional on the LMU480, 540, 600HV.*

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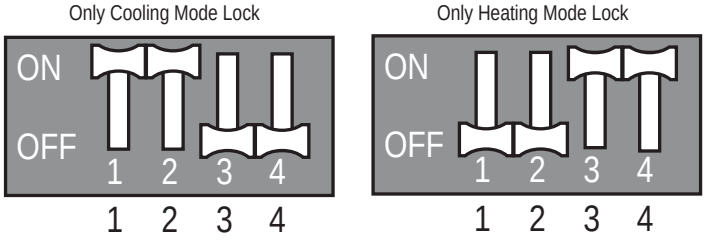
Mode Lock

Prevents mixed mode operation (mode change) in applications where only one mode is necessary.

1. Shut power down to the system.
2. For Only Cooling Mode Lock, set only DIP Switches 1 and 2 to ON. For Only Heating Mode Lock, set only DIP Switches 3 and 4 to ON.
3. Turn power on to the system.

Figure 98: Mode Lock DIP Switch Settings.



Note:

Only the first four DIP switches are functional on the LMU480, 540, 600HV.

PCB Display (Multi F LMU18-24CHV and LMU600HV Models Only)

For Multi F LMU18CHV, LMU24CHV, and LMU600HV outdoor units, the cycle data can be checked without using LG Monitoring View (LGMV) Diagnostic Software by pushing TACT-SW1. See below for the types of cycle information that will be displayed in LGMV. After first page is displayed, the second page will be subsequently displayed.

⚠WARNING

Protect fingers / hands with a non-conducting material before pushing TACT-SW1. There is risk of physical injury or death due to electric shock.

Figure 99: Location of TACT-SW1 (LMU18-24CHV).

Figure 100: Location of TACT-SW1 (LMU600HV).

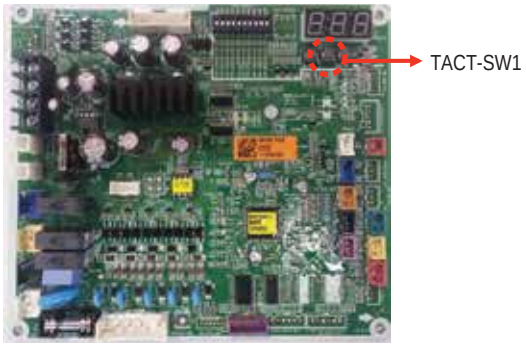


Table 43: PCB Display Information.

TACT-SW1 No. of Pushes	Description	Display		
		Example	First Page	Second Page
One (1) Time	Low Pressure	890kpa	“LP”	“89”
Two (2) Times	High Pressure	2,900kpa	“HP”	“290”
Three (3) Times	Discharge Temperature	85°C	“DS”	“85”
Four (4) Times	Condenser Outlet Temperature	-10°C	“CS”	“-10”
Five (5) Times	Suction Temperature	-10°C	“SS”	“-10”
Six (6) Times	Outdoor Unit Air Temperature	-10°C	“AS”	“-10”
Seven (7) Times	Current	15A	“A”	“15”
Eight (8) Times	Voltage	230V	“V”	“230”
Nine (9) Times	Compressor Hz	100Hz	“F”	“100”
Ten (10) Times	DC Link Voltage	230V	“dc”	“230”

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LG Monitoring View (LGMV) Diagnostic Software

LGMV software (PRCTSL1 and PRCTFE1) allows the service technician or commissioning agent to connect a computer USB port to the Multi F / Multi F MAX system's main printed circuit board (PCB) using an accessory cable without the need for a separate interface device. The monitoring screen for LGMV allows the user to view the following real time data on one screen:

- Actual inverter compressor speed
- Target inverter compressor speed
- Actual outdoor fan speed
- Target outdoor unit fan speed
- Actual superheat
- Target superheat
- Actual subcooler circuit superheat
- Target subcooler circuit superheat
- Main EEV position
- Subcooling EEV position
- Inverter compressor current transducer value
- Outdoor air temperature
- Actual high pressure/saturation temperature
- Actual low pressure/saturation temperature
- Suction temperature
- Inverter compressor discharge temperature
- Front outdoor coil pipe temperature
- Back outdoor coil pipe temperature
- Liquid line pipe temperature
- Subcooler inlet temperature
- Subcooler outlet temperature
- Average indoor unit (IDU) pipe temperature
- Inverter compressor operation indicator light
- Liquid injection valves' operation indicator lights
- Hot gas bypass valve operation indicator light
- Four-way reversing valve operation indicator light
- Pressure graph showing actual low pressure and high pressure levels
- Error code display
- Operating mode indicator
- Target high pressure
- Target low pressure
- PCB (printed circuit board) version
- Software version
- Installer name
- Model number of IDUs
- Site name
- Total number of connected IDUs

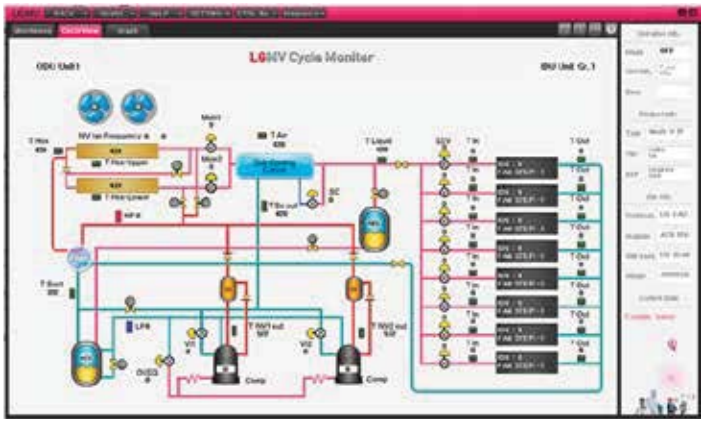
Figure 101: MV Real-time Data Screen

- Communication indicators
- IDU capacity
- IDU operating mode
- IDU fan speed
- IDU EEV position
- IDU room temperature
- IDU inlet pipe temperature
- IDU outlet pipe temperature
- IDU error code

Additional screens can be accessed by tabs on the main screen. Additional screens include the following:

1. Cycleview: Graphic of internal components including:
   - Compressors showing actual speeds
   - EEVs
   - IDUs
   - Temperature and pressure sensors
   - Four-way reversing valve
2. Graph: Full screen graph of actual high and low pressures and high and low pressure limits. A sliding bar enables user to go back in time and view data.
3. Control FTN: Enables user to turn on IDUs in 1.8 °F increments.
4. Useful Tab
   - Unit Conversion: Converts metric values to imperial values.

Figure 102: MV Cycleview



Note:
Images on these pages are examples of LGMV screenshots. Actual images may differ depending on the version of the software and the unit installed.

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LG Monitoring View (LGMV) Diagnostic Software and Cable - Continued

5. Data
   - Data Saving Start: Recording of real time data to a separate file created to be stored on the user's computer.
   - Data Loading Start: Recorded data from a saved ".CSV" file can be loaded to create an LGMV session.

6. Monitoring
   - Electrical: The lower half of main screen is changed to show Inverter Compressor Amps, Volts, Power Hz, Inverter control board fan Hz.

Figure 103: MV Control Indoor Units Screen

Error Codes

LGMV software helps the service technician or commissioning agent to troubleshoot system operation issues by displaying malfunction codes. These error codes can be seen on the main screen of the LGMV software program. For an overview of Multi F / Multi F MAX system error codes, see Error Codes section. For detailed information on how to troubleshoot individual error codes, see the Multi F / Multi F MAX Service Manual.

Figure 104: Error Code Screen

The software is available in a high version with all of the features listed above. The low version has all features as the high version without Target High Pressure and Target Low Pressure values shown on main screen.

In lieu of connecting to the outdoor unit, user has the option to connect to IDU with the use of a USB to RS-485 connector kit. When connected through IDU, user will not be able to record data.

This software can be used to both commission new systems and troubleshoot existing systems. LGMV data can be recorded to a ".CSV" file and emailed to an LG representative to assist with diagnostic evaluations.

Recommended Minimum PC Configuration:

- CPU: Pentium® IV 1.6 GHz
- Main Memory: 1G
- Operating System: Windows® XP/Vista/7 32 bit (recommended), 64 bit
- Hard Disk: 600 MB when operating
- MS Office 2003, 2007 (recommended) for select reporting functions

Note:
Images on these pages are examples of LGMV screenshots. Actual images may differ depending on the version of the software and the units installed.

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LG SIMS

The SIMs WLAN module and the smart phone app together provide monitoring and trouble-shooting capability for LG Multi F / Multi F MAX systems. SIMs functions only with LG Duct Free products.

SIMs can display and graph operational data for the air conditioner system including the indoor unit and the outdoor unit. SIMs also displays error codes and a troubleshooting guide. A full copy of the LG SIMs Smart Inverter Monitoring System User's Manual is available on the www.lghvac.com website.

To use SIMs you must be a trained HVAC service technician familiar with variable refrigerant flow (VRF) systems in general and with LG's Duct Free System products. You should understand the inverter air conditioning operation cycle, the meaning of the data displayed by SIMs, and how to use the data to troubleshoot the system.

Figure 106 shows a Multi F configuration used with the SIMs module and app. LG SIMs can also be used with Single Zone one-to-one configurations such as the Single Zone Wall Mount systems.

Figure 105: LG SIMs App and WLAN Module

Figure 106: SIMs WLAN Module to Typical DFS System

⚠WARNING

High voltages capable of causing death are used in this equipment. Outdoor unit power remains connected during this procedure. Take extreme caution not to touch electrical components or connections. Failure to observe this warning can result in death or severe injury.

Note:

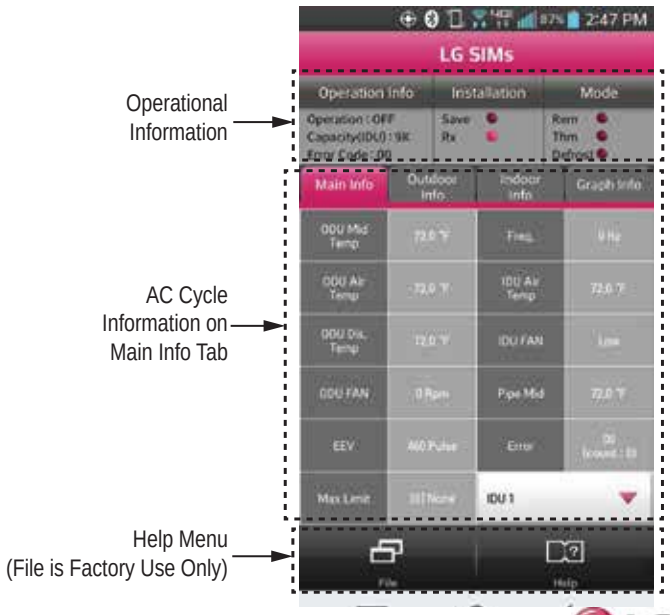
- *The Duct Free System air conditioning system must run for at least 15–20 minutes before data collected by SIMs 2.0 is valid for troubleshooting.*
- *The free SIMs app must be correctly installed on your smart phone before using SIMs.*
- *Some ODUs have an LGMV extension cable accessed by removing the side handle cover. If the ODU does not have this extension cable, access the LGMV connector by removing the top cover of the ODU.*

SIMs App Main Info Screen

The main screen is the first screen displayed after wireless connection is established. Tap the Main Info tab to display current readings regarding your indoor and outdoor unit(s). The Operational Info area of the screen will show active functions or modes by illuminating the light to the right of the function.

Additional Help information can be accessed by tapping the Help Menu buttons at the bottom of this screen.

Figure 107: SIMs App Main Info Screen



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SIMs App Screens

Outdoor Info/ Component Screen

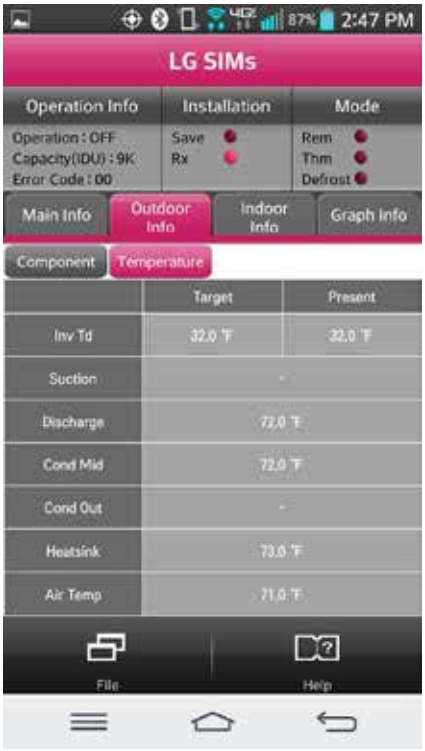
Displays the following information:

- Frequency
- FAN1 RPM
- FAN2 RPM
- DC Link
- Current
- Voltage
- EEV Mode
- Restart Timer
- Comp Mode
- EEV

Outdoor Info/ Temperature Screen

Displays the following information:

- Inv TD
- Suction
- Discharge
- Cond Mid
- Cond Out
- Heatsink
- Air Temp



Indoor Info Tab

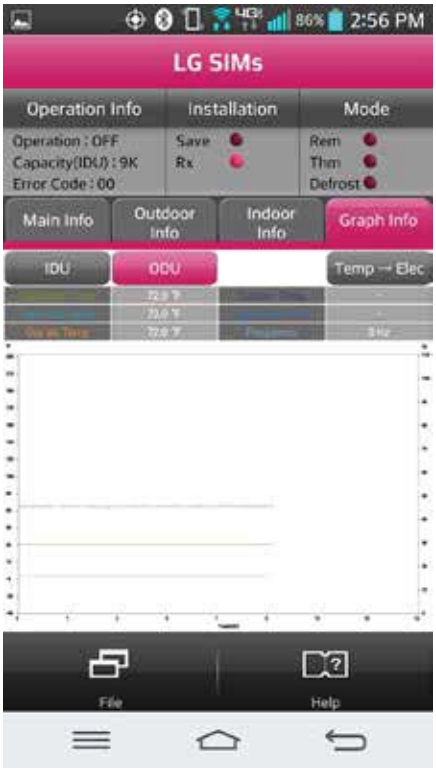
Displays the following information:

- Frequency
- Operation
- THM Mode
- REM Mode
- FAN
- EEV
- Air Temp
- Pipe-in
- Pipe-mid
- Pipe-out

Graph Info Tab

This tab, has three sub sections:

- IDU - Indoor Unit Temperature graph. Displays IDU information in graph format. Information displayed is for the IDU # selected on the Main screen.
- ODU - Outdoor Unit Temperature and Frequency graph. Displays ODU information in graph format.
- ODU Electric - Outdoor Unit Electric data graph is displayed.



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Troubleshooting Using Error Codes

Refer to Tables 44 and 45 for error codes that are generated from the indoor and outdoor units. These codes indicate different types of unit failures, assist in self-diagnosis, are the most common that will manifest through these units. Error codes are displayed on indoor unit LEDs, wired remote controllers, the outdoor unit PCB, and through LG Monitoring View (LGMV) diagnostic software.

Systems may generate additional codes not listed here. Contact LG Support if these types of errors are seen and a simple power down and boot up has not corrected the issue. Do not attempt to fix the system yourself.

- If two or more errors occur simultaneously, the highest error code number is displayed first.
- After error is resolved, the error code does not display.

Decoding the Error Display

See images and table below for indoor unit error codes, location of LEDs, and operation status.

The first and second number on the LED indicates error number. Example: 21 = LED1 (Red light) 2x blink, LED2 (Green light) 1x blink.

Error Code Nomenclature Definitions

- MICOM: Non-volatile memory chip where unit setup information is stored.
- EPROM: Non-volatile memory chip where device identification, size, and factory defined default component operating parameters are stored.

Figure 108: Standard Wall-Mounted Indoor Unit LEDs.

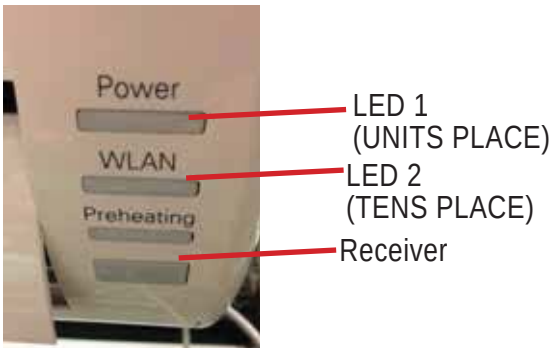


Figure 109: Art Cool Mirror Wall-Mounted Indoor Unit LEDs.

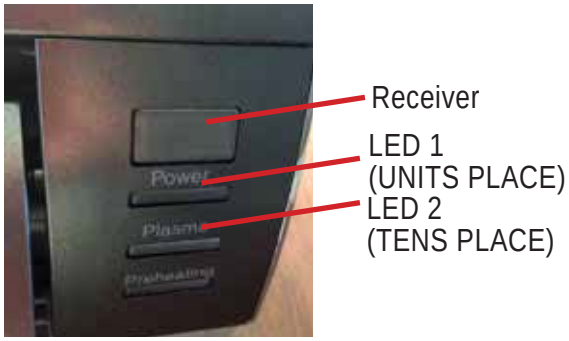
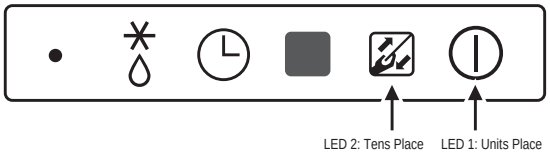


Figure 110: Ceiling Cassette Indoor Unit LEDs.



Number of Blinks = Error Code

Table 44: Indoor Unit Error Codes.

Error Code	Description	Indoor Unit Operation Status
00	No error	ON
01	Indoor unit room temperature sensor error	OFF
02	Indoor unit inlet pipe sensor error	OFF
03	Controller error	OFF
04	Drain pump error (optional)	OFF
05	Communication error between indoor unit and outdoor units	OFF
06	Indoor unit outlet pipe sensor error	OFF
07	Different mode operation error	OFF
09	Indoor unit EPROM error	OFF
10	Indoor unit BLDC motor fan lock	OFF

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Table 45: Outdoor Unit Error Codes.

Error Code	Description	No. of Times Outdoor Unit LEDs Blink		Outdoor Operation Status
		LED01 (Red)	LED02 (Green)	
21	DC Peak (IPM Fault); Compressor DC voltage was too high	2X	1X	OFF
22	Current Transformer2 (CT2) error; Alternating current (AC) input too high	2X	2X	OFF
23	DC Link Low Voltage (DC Link Voltage is <140VDC)	2X	3X	OFF
	DC Link High Voltage (DC Link Voltage is >420VDC)			
25	AC Low / High Voltage	2X	5X	OFF
26	DC Compressor Position Error (Compressor failed to start properly)	2X	6X	OFF
27	PSC / PFC Fault; Input current to inverter compressor PCB is too high	2X	7X	OFF
29	Current to inverter compressor is too high	2X	9X	OFF
32	Inverter compressor discharge pipe (D-Pipe) temperature is too high	3X	2X	OFF
35	Low Pressure Error; Pressure dropped below recommended limits	3X	5X	OFF
39	Communication Error between PFC MICOM and Inverter MICOM	3X	9X	OFF
40	CT Sensor Error; Thermistor is disconnected or has shorted out	4X	-	OFF
41	Inverter compressor discharge pipe (D-Pipe) sensor is disconnected or has shorted out	4X	1X	OFF
43	High pressure sensor is disconnected or has shorted out	4X	3X	OFF
44	Outdoor air sensor is disconnected or has shorted out	4X	4X	OFF
45	Mid-pipe thermistor of outdoor unit condenser is disconnected or has shorted out	4X	5X	OFF
46	Outdoor unit suction piping thermistor is disconnected or has shorted out	4X	6X	OFF
48	Outlet piping (liquid) of condenser is disconnected or has shorted out	4X	8X	OFF
51	Combination ratio (capacity) is out of range; Total nominal indoor unit capacity is<50% or >130% of the outdoor unit capacity	5X	1X	OFF
53	Communication failure between outdoor unit and indoor unit(s)	5X	3X	OFF
54	Outdoor unit is not wired properly (ex: reversed phase)	5X	4X	OFF
60	Outdoor unit printed circuit board (PCB) EPROM check sum error	6X	-	OFF
61	Condenser coil thermistor temperature is too high	6X	1X	OFF
62	Outdoor unit inverter compressor PCB heat sink temperature is too high	6X	2X	OFF
65	Heat sink thermistor is disconnected or has shorted out	6X	5X	OFF
67	Outdoor unit brushless direct current (BLDC) fan motor lock error	6X	7X	OFF
73	Outdoor unit PFC overcurrent (peak) error	7X	3X	OFF

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Cautions for Refrigerant Leaks / Introduction

ASHRAE Standards 15 and 34 offer guidelines that address refrigerant safety and the maximum allowable concentration of refrigerant in an occupied space. Refrigerant will dissipate into the atmosphere, but a certain volume of air is required for this to occur safely. For R410A refrigerant, the maximum allowable concentration is 0.026 lbs./ft^3 per 1,000 ft^3 of air in an occupied space. Buildings with twenty-four (24) hour occupancy allow half of that concentration.[1]

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

⚠ WARNING

Verify the maximum refrigerant concentration level in the space where the indoor unit will be mounted meets the concentration limit for the application. If the refrigerant leaks and safety limits are exceeded, it could result in personal injuries or death from oxygen depletion.

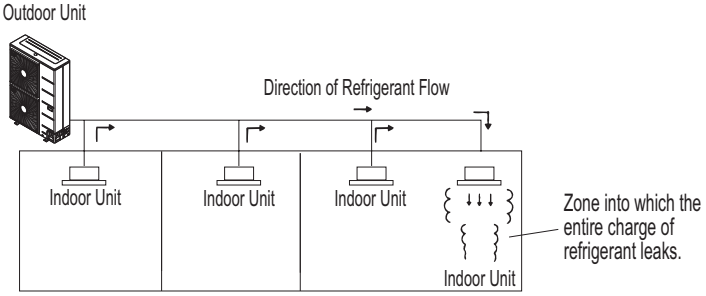
Note:

Take appropriate actions at the end of HVAC equipment life to recover, recycle, reclaim or destroy R410A refrigerant according to applicable US EPA rules.

To calculate the potential refrigerant concentration level (RCL):

1. Measure the occupied space dimensions (in feet).
2. Calculate the cubic foot volume of air in the smallest occupied space. (To obtain a detailed overview of the RCL, perform the same calculations to the second smallest zone, the third smallest zone until the RCL is obtained for all zones. Also, pay special attention to areas such as basements, etc., where refrigerant cannot dissipate easily.)
3. Divide the refrigerant charge of the Multi Zone system serving the area in pounds by the results of step 1.
4. If the calculation indicates that the potential refrigerant concentration level is higher than the allowed RCL, increase the cubic volume of the smallest occupied space or modify the piping system design.
5. The allowable RCL limit for most applications must be equal to or less than 0.026 lbs./ft^3. However, in special occupied spaces, such as hospitals and nursing homes, where occupants may have limited mobility, the allowable RCL limit is cut in half. See ASHRAE Standard 34 and local codes for detailed information.[1]

Figure 111: Example of R410A Refrigerant Leak Location.



Refrigerant Concentration Limit (RCL) Calculations

To calculate total refrigerant amount per system:

Amount of Factory-Charged Refrigerant per Outdoor Unit + Amount of Additional Refrigerant Trim Charge = Total System Refrigerant Charge

$$\text{RCL (lbs./ft}^3\text{)} = \frac{\text{Total System Refrigerant Charge (lbs.)}}{\text{Volume of Smallest Occupied Space (ft}^3\text{)}}$$

[1] American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc. (ASHRAE). Atlanta, GA. ASHRAE, Inc. Information about ASHRAE Standard 15 / 34 and addenda current as of the date of this publication.

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CAUTIONS FOR REFRIGERANT LEAKS

To determine the volume of an occupied space, the designer must also determine which ones are connected, not connected, or ventilated (refer to Standard 34).

If the calculated RCL is above the allowable limit, there are two primary methods used to lower the RCL:

1. Increase the volume of the occupied space.
2. Decrease the size of the refrigerant charge.

Per Standard 34-2007, acceptable methods used to increase the volume of an occupied space include:

- Install transfer ducts between rooms.
- Undercut and overcut doors (partitions ≤0.15% of cubic volume o f space within a zone).
- Add an opening without a door (partitions ≤0.15% of cubic volume of space within a zone).
- Include ventilation grilles in doors; include ventilation inlets / outlets (partitions ≤0.15% of cubic volume of space within a zone).
- Include the area above the ceiling as part of the return or supply air path (partitions ≤0.15% of cubic volume of space within a zone).
- Install a mechanical ventilator linked to a gas leak detector.
- Change the indoor unit type (wall mounted to ceiling cassette) / position.

Figure 112: Examples of Zones.

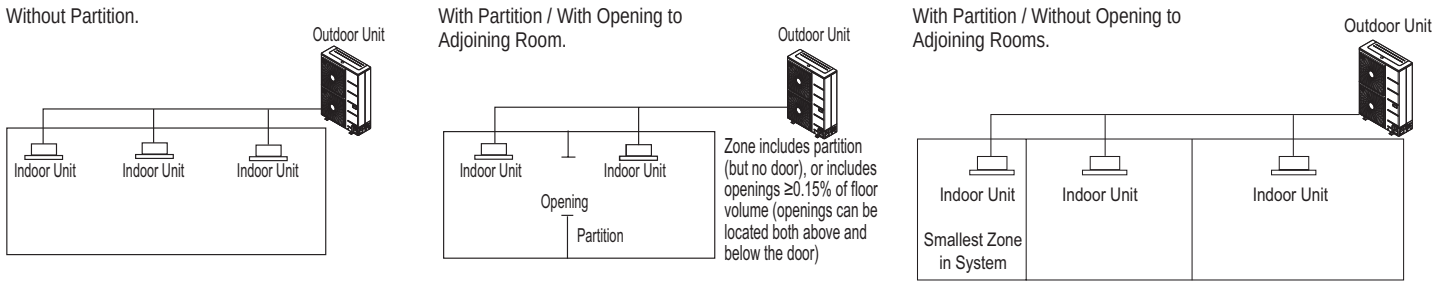
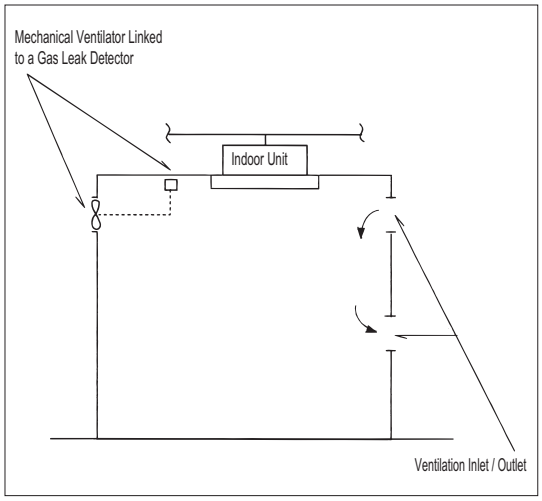


Figure 113: Examples of Acceptable Ventilation Methods.



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MULTI F
MULTI F MAX

INSTALLATION CHECKLIST

Major Component Rough-In

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

Piping and Insulation

Description	Check
Copper	
Over 5/8 inches—Rigid ACR only.	
5/8 inches and under—Can use soft ACR.	
15% silver brazing material only.	
All refrigerant pipes and valves were insulated separately. Insulation butts up against the walls of the indoor units. No gaps or cracks. Insulation was not compressed at clamps and hangers.	
LG Y-branches were used per manufacturer's recommendations.	
(Optional) Full port ball valves for all indoor units. (Schrader between the valve body and the indoor units.)	
Condensate piping installed on indoor units–material used is acceptable under local code. Insulated as necessary to prevent condensation.	

Brazing Practices

Description	Check
Medical grade (there are 4 available) dry nitrogen for purging during brazing was used (constant 3 psi while brazing).	

Installation

(For more information on any procedure, refer to the detail provided in the Indoor Unit Installation Manuals.)

Refrigerant Piping

Description	Check
Have in possession a copy of the "As-Designed" LATS Multi F 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 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.	
All long runs of straight pipe were provided with expansion loops.	
Ensure Y-branches are installed with no more than ±5° of horizontal.	
Ensure Y-branches are installed with no more than ±3° of vertical.	
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 were properly supported and all wall penetrations were sleeved.	
Pipe insulation was not compressed at any point.	
Y-branches were properly supported per details provided in the installation manual.	
Ensure Y-branches are installed in the correct direction. Flow is always from the single end to the double end.	
No oil traps, solenoid valves, sight glasses, filter driers, or any other unauthorized refrigerant specialties were present.	
(Optional) R410A rated full port ball valves were used at all indoor units and wherever appropriate in the refrigerant piping network.	
Best practice including a minimum of 20" of straight pipe was installed between each elbow.	

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INSTALLATION CHECKLIST

Condensate Pump / Drain Installation

Description	Check
Indoor unit condensate drain pipes were installed correctly.	
All condensate vertical risers are equal to or less than 27-1/2" 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).	

Power Wire and Communications Cables

Description	Check
Power wiring was connected to a single phase 208-230V source.	
Ground wire was installed and properly terminated at the unit.	
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 installed per all local electrical code requirements.	
Power wiring to the indoor units and branch distribution unit(s) (Multi F MAX only) was installed per all local electrical code requirements.	
LG-supplied cable was used between each indoor unit and its zone controller. No cables were spliced and no wire caps are present.	
Communication type RS-485–BUS type.	
Communications/power were a minimum of 18-AWG, four (4) conductor, stranded, shielded or unshielded, with insulation material per local code. If shielded, must be ground to outdoor unit only. Cable segment shields were tied together.	
Used appropriate crimping tool to attach ring or spade terminals at all power wiring and control cable terminations.	
Power and control wires were run in the same conduit (ODU to IDU only) as provided in the product installation manual. Power to ODU and power/communications to IDU cannot be run in the same conduit and must be separated per manufacturer's guidelines.	

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INSTALLATION CHECKLIST

Major Component Rough-In

Piping and Insulation

Brazing Practices

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INSTALLATION CHECKLIST

Installation—Refrigerant Piping

Installation—Branch Distribution Unit (Multi F MAX Systems Only)

Installation—Condensate Pump / Drain Installation

Installation—Power Wire and Communications Cables

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MULTI F
MULTI F MAX

MULTI F REFRIGERANT CHARGE WORKSHEET

LG Multi F 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 determine the additional refrigerant that is needed, apply the formula 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 Outdoor Unit Factory Charge

Outdoor Unit	Factory Charge lbs. of R410A
LMU18CHV	3.96
LMU24CHV	3.96
LMU30CHV	6.18
LMU36CHV	6.18

Multi F Outdoor Unit Additional Refrigerant Charge Formula

Additional charge (lbs.) = (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

Note:

• Number of installed length of branches depends on the specifications of the outdoor unit model.

• CF = Maximum number of connectible indoor units – Total number of connected indoor units.

Multi F Outdoor Unit Piping Specifications

Multi F Outdoor Unit Model	Min. to Max. Piping Length for One Branch (ft.)	Max. Total System Piping Length (ft.)	Chargeless Pipe Length per Branch (L) (ft.)	Additional Charge Needed (a) (oz./ft.)
LMU18CHV	10 to 82	164	24.6	0.22
LMU24CHV	10 to 82	246.1	24.6	0.22
LMU30CHV	10 to 82	246.1	24.6	0.22
LMU36CHV	10 to 82	246.1	24.6	0.22

Multi F Refrigerant Charge Calculations

(_____[A] – 24.6) x 0.22 (_____)

+ (_____[B] – 24.6) x 0.22 + (_____)

+ (_____[C] – 24.6) x 0.22 + (_____)

+ (_____[D] – 24.6) x 0.22 + (_____)

- _____CF x 5.29 - (_____)

= _____ Additional Charge (lbs.)

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MULTI F
MULTI F MAX

MULTI F MAX REFRIGERANT CHARGE WORKSHEET

LG 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 determine the additional refrigerant that is needed, apply the formula 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 MAX Outdoor Unit Factory Charge

Outdoor Unit	Factory Charge lbs. of R410A
LMU480HV	9.7
LMU540HV	9.7
LMU600HV	12.3

Additional charge (lbs.) = (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

Multi F MAX Outdoor Unit Piping Specifications

Outdoor Unit Model	Main Piping Length		Branch Piping Length	
	Chargeless Pipe Length of Main Pipe (L) (ft.)	Additional Charge Needed (a) (oz./ft.)	Chargeless Pipe Length per Branch Pipe (B) (ft.)	Additional Charge Needed (b) (oz./ft.)
LMU480HV	16.4	0.54	16.4	0.22
LMU540HV	16.4	0.54	16.4	0.22
LMU600HV	16.4	0.54	16.4	0.22

Multi F MAX Refrigerant Charge Calculations

(_____[A] – 16.4) x 0.54	(_____)
+ (_____[B1] – 16.4) x 0.22	+ (_____)
+ (_____[B2] – 16.4) x 0.22	+ (_____)
+ (_____[B3] – 16.4) x 0.22	+ (_____)
+ (_____[B4] – 16.4) x 0.22	+ (_____)
+ (_____[B5] – 16.4) x 0.22	+ (_____)
+ (_____[B6] – 16.4) x 0.22	+ (_____)
+ (_____[B7] – 16.4) x 0.22	+ (_____)
+ (_____[B8] – 16.4) x 0.22	+ (_____)
- _____CF x 3.53	- (_____)

= _____ Additional Charge (lbs.)

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Refer to Service Manuals posted on www.lghvac.com for a full description of all error codes and work-arounds.

LG Electronics, U.S.A., Inc.
Commercial Air Conditioning Division
4300 North Point Parkway
Alpharetta, Georgia 30022
www.lg-vrf.com

LG Electronics Products Support
1-888-865-3026 USA
Follow the prompts for HVAC products.

IM_MultiF_ODU_03_17
Supersedes: IM_MultiF_ODU_11_16
IM_MultiF_ODU_4_16
IM_MultiF_ODU_11_15

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MULTI F
MULTI F MAX

OUTDOOR UNIT
INSTALLATION MANUAL

Multi-Zone Heat Pump Systems

1.5 to 5 Tons

Dual and Tri-Zone
Multi F

Quad-Zone
Multi F

Eight-Zone
Multi F MAX

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Content familiarity required for proper installation.

The instructions included in this manual must be followed to prevent product malfunction, property damage, injury, or death to the user or other people. Incorrect operation due to ignoring any instructions will cause harm or damage. The level of seriousness is classified by the symbols described by the summary list of safety precautions on page 4.

For more materials such as submittals, catalogs, engineering, installation, owner's, and service manuals, visit www.lghvac.com.

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SAFETY INSTRUCTIONS

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

TABLE OF SYMBOLS

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

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.

⃠ **Do not supply power to the unit until all wiring and piping are completed or reconnected and checked.**
There is risk of physical injury or death due to electric shock.

⚠WARNING

⃠ **Do not install, remove, or re-install the unit by yourself (end user). Ask the dealer or an trained technician to install the unit.**
Improper installation by the user may result in fire, explosion, electric shock, physical injury or death.

For replacement of an installed unit, always contact an LG trained service provider.
There is risk of fire, electric shock, explosion, and physical injury or death.

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

⃠ **Do not change the settings of the protection devices.**
If the protection devices have been bypassed or is forced to operate improperly, or parts other than those specified by LG are used, there is risk of fire, electric shock, explosion, and physical injury or death.

Replace all control box and panel covers.
If cover panels are not installed securely, dust, water and animals may enter the outdoor unit, causing fire, electric shock, and physical injury or death.

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.

Periodically check that the outdoor frame is not damaged.
There is a risk of explosion, physical injury, or death.

If the air conditioner is installed in a small space, take measures to prevent the refrigerant concentration from exceeding safety limits in the event of a refrigerant leak.
Consult the latest edition of ASHRAE (American Society of Heating, Refrigerating, and Air Conditioning Engineers) Standard 15. If the refrigerant leaks and safety limits are exceeded, it could result in personal injuries or death from oxygen depletion.

The branch distribution (BD) unit must be installed indoors; ⃠ **do not install the BD unit in a highly humid environment.**
There is risk of physical injury or death due to electric shock.

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, fall onto it, or place objects on it. ⃠ **Do not install the unit on a defective stand.**
It may result in an accident that causes physical injury or death.

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Installation, continued

⚠ WARNING

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.

⚠ 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 weights listed.*
- *Some products use polypropylene bands for packaging.* ⃠ *Do not use polypropylene bands to lift the unit.*
- *Support the outdoor unit a minimum of four points to avoid slippage from rigging apparatus.*

Note

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

⃠ **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.

When installing the outdoor unit in a low-lying area, or a location that is not level, use a raised concrete pad or concrete blocks to provide a solid, level foundation.
This prevents water damage and abnormal vibration.

Properly insulate all cold surfaces to prevent "sweating."
Cold surfaces such as uninsulated piping can generate condensate that may drip and cause water damage to walls.

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

The branch distribution (BD) unit must be installed indoors; ⃠ **Do not install the BD box in a highly humid environment.**
There is risk of product failure and property damage.

⃠ **Do not make refrigerant substitutions. Use R410A only.**
If a different refrigerant is used, or air mixes with original refrigerant, the unit will malfunction and be damaged.

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

⃠ **Do not use the product for mission critical or special purpose applications such as preserving foods, works of art, or other precision air conditioning applications. The equipment is designed to provide comfort cooling and heating.**
There is risk of property damage.

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 or BD unit in a noise-sensitive area.**

Take appropriate actions at the end of HVAC equipment life to recover, recycle, reclaim or destroy R410A refrigerant according to applicable U.S. Environmental Protection Agency (EPA) rules.

Periodically check that the outdoor 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.

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Wiring

⚠DANGER

High voltage electricity is required to operate this system. Adhere to the NEC code 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.

Turn the power off at the nearest disconnect before servicing the equipment.
Electrical shock can cause physical injury or death.

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

⃠ Do not share the electrical circuit with other appliances.
There is risk of fire, electric shock, and physical injury or death due to heat generation.

⃠ Do not use damaged or loose power wiring. ⃠ Do not modify or extend the outdoor unit's power wiring randomly. Ensure that the power wiring will not be pulled nor weight be placed on the power wiring during operation.
There is risk of fire, electric shock, and 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 U.S. National Electric Code (NEC) who is equipped with the proper tools and test instruments.
Failure to carefully read and follow all instructions in this manual can result in equipment malfunction, property damage, personal 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 National Electrical Code, 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.

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.

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.

Ensure the system is connected to a dedicated power source that provides adequate power.
If the power source capacity is inadequate or the electric work is not performed properly, it may result in fire, electric shock, physical injury or death.

Properly tighten all power connections.
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 protection devices have been bypassed or are forced to operate improperly, or parts other than those specified by LG are used, there is risk of fire, electric shock, explosion, and physical injury or death.

Note

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

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Operation

⚠DANGER

⃠ Do not provide power to or operate the unit if it is flooded or submerged.
There is risk of fire, electric shock, physical injury or death.

Use a dedicated breaker for this product.
There is risk of fire, electric shock, physical injury or death.

⃠ Do not operate the disconnect switch with wet hands.
There is risk of fire, electric shock, physical injury or death.

Periodically verify the equipment mounts have not deteriorated.
If the base collapses, the unit could fall and cause physical injury or death.

Use inert (nitrogen) gas when performing leak tests or air purges. ⃠ Do not use compressed air, oxygen, or flammable gases.
Using these substances may cause fire, explosion, and physical injury or death.

If refrigerant leaks out, ventilate the area before operating the unit.
If the unit is mounted in an enclosed, low-lying, or poorly ventilated area, and the system develops a refrigerant leak, it may cause a fire, electric shock, explosion, physical injury or death.

⚠WARNING

⃠ Do not allow water, dirt, or animals to enter the unit.
There is risk of fire, electric shock, physical injury or death.

⃠ Do not operate the unit with the panel(s) or protective cover(s) removed; keep fingers and clothing away from moving parts.
The rotating, hot, cold, and high-voltage parts of the unit can cause physical injury or death.

⃠ Do not touch the refrigerant piping during or after operation.
It can cause burns or frostbite.

⃠ Do not open the inlet during operation.
There is risk of electric shock, physical injury or death.

⚠CAUTION

To avoid physical injury, use caution when cleaning or servicing the air conditioner.

Note

Clean up the site after servicing is finished, and check that no metal scraps, screws, or bits of wiring have been left inside or surrounding the unit.

⃠ Do not use the product for mission critical or special purpose applications such as preserving foods, works of art, or other precision air conditioning applications. The equipment is designed to provide comfort cooling and heating.
Oil, steam, sulfuric smoke, etc., can significantly reduce the performance of the unit, or damage its parts.

⃠ Do not block the inlet or outlet.
Unit may malfunction.

⃠ Do not allow water, dirt, or animals to enter the unit.
There is risk of unit failure.

⃠ Do not open the inlet during operation.
There is risk of unit failure.

⃠ Do not operate the unit when the panel(s) or protective cover(s) are removed; keep fingers and clothing away from moving parts.
Non-secured covers can result in malfunction due to dust or water in the service panel.

Periodically verify the equipment mounts have not deteriorated.
If the base collapses, the unit could fall and cause property damage or product failure.

Use a only soft cloth to clean the air conditioner. ⃠ Do not use wax, thinner, or strong detergents.
Strong cleaning products may damage the surface of the air conditioner, or may cause its appearance to deteriorate.

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SPECIFICATIONS

Multi F Outdoor Units

MULTI F
MULTI F MAX

Table 1: Multi F Outdoor Unit Specifications.

Model Number	LMU18CHV	LMU24CHV	LMU30CHV	LMU36CHV
Cooling Capacity (Btu/h)[1] (Min.~Rated~ Max.)	8,400~17,000~19,000	8,400~20,000~25,000	8,400~30,000~36,000	8,400~32,000~38,400
Heating Capacity (Btu/h)[1] (Min.~Rated~ Max.)	10,248~22,000~24,000	9,240~24,000~28,800	9,240~32,000~38,400	9,240~36,000~41,600
Operating Range				
Cooling (°F DB)	14[7] - 118	14[7] - 118	14[7] - 118	14[7] - 118
Heating (°F WB)	-4 - 64	-4 - 64	-4 - 64	-4 - 64
Compressor				
Inverter Quantity	Twin Rotary x 1	Twin Rotary x 1	Twin Rotary x 1	Twin Rotary x 1
Oil Type	FVC68D	FVC68D	FVC68D	FVC68D
Fan (Side Discharge)				
Type	Propeller	Propeller	Propeller	Propeller
Motor Output (W) x Qty.	85.4 x 1	85.4 x 1	124.2 x 1	124.2 x 1
Motor/Drive	Brushless Digitally Controlled / Direct			
Maximum Air Volume (CFM)	1,766	1,766	2,119	2,119
Unit Data				
Refrigerant Type	R410A	R410A	R410A	R410A
Refrigerant Control/Location	EEV/Outdoor Unit	EEV/Outdoor Unit	EEV/Outdoor Unit	EEV/Outdoor Unit
Min. Number Indoor Units/System[2]	2	2	2	2
Max. Number Indoor Units/System[2]	2	3	4	4
Maximum Allowable Total Indoor Unit Connected Capacity (Btu/h)	24,000	33,000	40,000	48,000
Sound Pressure (Cooling / Heating) dB(A)[3]	49 / 52	49 / 52	52 / 55	52 / 55
Net Unit Weight (lbs.)	100	100	137	137
Shipping Weight (lbs.)	108	108	148	148
Power Wiring / Communications Cable (No. x AWG)[4,5]	4C x 18	4C x 18	4C x 18	4C x 18
Heat Exchanger				
Material and Fin Coating	Copper Tube/Aluminum Fin and GoldFin™/Hydrophilic			
Rows/Columns/Fins per inch x Qty.	(2 x 28 x 14) x 1	(2 x 28 x 14) x 1	(2 x 38 x 14) x 1	(2 x 38 x 14) x 1
Piping				
Liquid Line Connection (in., OD) x Qty.	1/4 x 2	1/4 x 3	1/4 x 4	1/4 x 4
Vapor Line Connection (in., OD) x Qty.	3/8 x 2	3/8 x 3	3/8 x 4	3/8 x 4
Factory Charge lbs. of R410A	3.96	3.96	6.18	6.18
Piping Lengths				
Maximum Total Piping (ft.)[6]	164.0	246.1	246.1	246.1
Maximum Outdoor Unit to Indoor Unit Piping (ft)	82.0	82.0	82.0	82.0
Piping Length (No Additional Refrigerant [ft])	49.2	73.8	98.4	98.4
Maximum Elevation between Outdoor Unit and Indoor Unit (ft.)	49.2	49.2	49.2	49.2
Maximum Elevation between Indoor Unit and Indoor Unit (ft.)	24.6	24.6	24.6	24.6

[1]Rated capacity applied with non-ducted indoor units, and is rated 0 ft. above sea level with 25 ft. of refrigerant line per indoor unit and a 0 ft. level difference between outdoor and indoor units. All capacities are net with a combination ratio between 95 – 105%.

Rated cooling capacity obtained with air entering the indoor unit at 80ºF dry bulb (DB) and 67ºF wet bulb (WB) and outdoor ambient conditions of 95ºF dry bulb (DB) and 75ºF wet bulb (WB).
Rated heating capacity obtained with air entering the indoor unit at 70ºF dry bulb (DB) and 60ºF wet bulb (WB) and outdoor ambient conditions of 47ºF dry bulb (DB) and 43ºF wet bulb (WB).

[2]At least two indoor units should be connected. For allocated capacity information, see the combination tables in the "Multi F / Multi F MAX Combination Data Manual" on www.lg-dfs.com. For performance data, see "Multi F / Multi F MAX Performance Data Manual" on www.lg-dfs.com.

[3]Sound pressure levels are tested in an anechoic chamber under ISO Standard 3745 and are the same in both cooling and heating mode. These values can increase due to ambient conditions during operation.

[4]Power wiring to the outdoor unit is field supplied, solid or stranded, and must comply with the applicable local and national codes. For detailed information, please refer to electrical characteristics on page 11.

[5]All power wiring / communication cable to be minimum 18 AWG from the outdoor unit to the indoor unit, 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. For detailed electrical information, please refer to electric characteristics on page 11.

[6]Piping lengths are equivalent.

[7]Installation of an optional Low Ambient Wind Baffle Kit will allow operation down to -4°F in cooling mode.

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SPECIFICATIONS

Multi F MAX Outdoor Units

Table 2: Multi F MAX Outdoor Unit General Data.

Model Number	LMU480HV	LMU540HV	LMU600HV
Cooling Capacity (Btu/h) (Minimum ~ Rated ~ Maximum)[1]	14,400~48,000~58,000	14,400~52,500~63,200	15,600~60,000~68,000
Heating Capacity (Btu/h) (Minimum ~ Rated ~ Maximum)[1]	15,840~54,000~61,000	16,272~58,000~64,000	17,940~64,000~70,000
Operating Range			
Cooling (°F DB)	14[7] - 118	14[7] - 118	14[7] - 118
Heating (°F WB)	-4 - 64	-4 - 64	-4 - 64
Compressor			
Inverter Quantity	Twin Rotary x 1	Twin Rotary x 1	Twin Rotary x 1
Oil Type	FVC68D	FVC68D	FVC68D
Fan (Side Discharge)			
Type	Propeller	Propeller	Propeller
Motor Output (W) x Qty.	124.2 x 2	124.2 x 2	124.2 x 2
Motor/Drive	Brushless Digitally Controlled/Direct		
Maximum Air Volume (CFM)	2,119 x 2	2,119 x 2	2,119 x 2
Unit Data			
Refrigerant Type	R410A	R410A	R410A
Refrigerant Control/Location	EEV / Outdoor Unit, Branch Distribution Unit		
Min. Number Indoor Units/System[2]	2	2	2
Max. Number Indoor Units/System[2]	8	8	8
Maximum Allowable Total Indoor Unit Connected Capacity (Btu/h)	65,000	73,000	81,000
Sound Pressure ±3 dB(A)[3] (Cooling / Heating)	54 / 56	54 / 56	56 / 58
Net Unit Weight (lbs.)	214	214	223
Shipping Weight (lbs.)	236	236	249
Power/Communications Wiring Between ODU and BD Unit (No. X AWG)[4,5]	4C X 16	4C X 16	4C x 16
Heat Exchanger			
Material and Fin Coating	Copper Tube / Aluminum Fin and GoldFin™/Hydrophilic		
Rows/Columns/Fins per inch x Qty.	(2 x 32 x 14) x 2	(2 x 32 x 14) x 2	(3 x 32 x 14) x 2
Piping			
Liquid Line Connection (in., OD) x Qty.	3/8 x 1	3/8 x 1	3/8 x 1
Vapor Line Connection (in., OD) x Qty.	3/4 x 1	3/4 x 1	3/4 x 1
Factory Charge lbs. of R410A	9.7	9.7	12.3
Piping Lengths			
Maximum Total System Piping (ft.)[6]	475.7	475.7	475.7
Maximum Main Pipe Length (Outdoor Unit to BD Unit [ft.])	180.4	180.4	180.4
Total Branch Piping (BD Units to all Indoor Units [ft.])	295.3	295.3	295.3
Maximum Branch Pipe Length (Length between each BDU and IDU [ft.])	49.2	49.2	49.2
Maximum Outdoor Unit to Indoor Unit Pipe Length (ft.)	229.6	229.6	229.6
Max. Main Piping Length (No Additional Refrigerant (ft.)	16	16	16
Max. Branch Piping Length (No Additional Refrigerant (ft.)	131	131	147.6
Maximum Elevation between Outdoor Unit and Indoor Unit (ft.)	98.4	98.4	98.4
Maximum Elevation between Indoor Unit and Indoor Unit (ft.)	49.2	49.2	49.2
Maximum Elevation between BD Unit and Indoor Unit (ft.)	32.8	32.8	32.8
Maximum Elevation between BD Unit and BD Unit (ft.)	49.2	49.2	49.2

[1]Rated capacity applied with non-ducted indoor units, and is rated 0 ft. above sea level with a 0 ft. level difference between outdoor and indoor units. All capacities are net with a combination ratio between 95 – 105%.

Rated cooling capacity obtained with air entering the indoor unit at 80ºF dry bulb (DB) and 67ºF wet bulb (WB) and outdoor ambient conditions of 95ºF dry bulb (DB) and 75ºF wet bulb (WB). Rated heating capacity obtained with air entering the indoor unit at 70ºF dry bulb (DB) and 60ºF wet bulb (WB) and outdoor ambient conditions of 47ºF dry bulb (DB) and 43ºF wet bulb (WB).

[2]At least one Branch Distribution Unit is required for system operation; a maximum of two can be installed per outdoor unit with use of Y-branch accessory (PMBL5620). At least two indoor units should be connected. For allocated capacity information, see the combination tables in the "Multi F / Multi F MAX Combination Data Manual" on www.lg-dfs.com. For performance data, see "Multi F / Multi F MAX Performance Data Manual" on www.lg-dfs.com.

[3]Sound pressure levels are tested in an anechoic chamber under ISO Standard 3745. These values can increase due to ambient conditions during operation.

[4]Power wiring to the outdoor unit is field supplied, solid or stranded, and must comply with the applicable local and national codes. For detailed information, please refer to electrical characteristics on page 11.

[5]All power wiring / communication cable to be minimum 16 AWG from the outdoor unit to the BD unit (Multi F MAX systems only), and 18 AWG from the BD unit to the indoor unit, 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. For detailed electrical information, please refer to electric characteristics on page 11.

[6]Piping lengths are equivalent.

[7]Installation of an optional Low Ambient Wind Baffle Kit will allow operation down to -4°F in cooling mode.

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SPECIFICATIONS

Multi F MAX Branch Distribution Units

MULTI F
MULTI F MAX

Table 3: Multi F MAX BD Unit General Data.

Model Number		PMBD3620	PMBD3630	PMBD3640	PMBD3641
No. of Connectible Indoor Units[1]		1-2	1-3	1-4	1-4
Max. Nominal Capacity / Port (Btu/h)[2]		24,000	24,000	24,000	24,000 for A,B,C Ports; 36,000 for D Port
Max. Nominal Capacity / BD Unit (Btu/h)		48,000	72,000	73,000	73,000
Operation Temperature Range (°F DB)		0 ~ 150	0 ~ 150	0 ~ 150	0 ~ 150
Unit Data					
Refrigerant Type		R410A	R410A	R410A	R410A
Power Supply V, Ø, Hz		208-230, 1, 60	208-230, 1, 60	208-230, 1, 60	208-230, 1, 60
Power Input (W)		16	24	32	32
Rated Amps (A)		0.08	0.12	0.16	0.16
Dimensions W x H x D (in.)		17-3/32 x 6-13/32 x 10-23/32	17-3/32 x 6-13/32 x 10-23/32	17-3/32 x 6-13/32 x 10-23/32	17-3/32 x 6-13/32 x 10-23/32
Net Unit Weight (lbs.)		13	14.3	15.7	15.7
Shipping Weight (lbs.)		15	17	18	18
Power Wiring / Communication Cables[3]					
From Outdoor Unit to BD Unit (Qty. x AWG)[3]		4 x 16	4 x 16	4 x 16	4 x 16
From BD Unit to Indoor Unit (Qty. x AWG)[3]		4 x 18	4 x 18	4 x 18	4 x 18
Piping Connections					
Outdoor Unit to BD Unit	Liquid (in., OD)	Ø3/8	Ø3/8	Ø3/8	Ø3/8
	Vapor (in., OD)	Ø3/4	Ø3/4	Ø3/4	Ø3/4
BD Unit to Indoor Units	Liquid (in., OD) x Qty.	Ø1/4 x 2	Ø1/4 x 3	Ø1/4 x 4	Ø1/4 x 4
	Vapor (in., OD) x Qty.	Ø3/8 x 2	Ø3/8 x 3	Ø3/8 x 4	Ø3/8 x 3 Ø1/2 x 1
Piping Lengths					
Maximum Total System Piping (ft.)[4]		475.7	475.7	475.7	475.7
Maximum Main Pipe Length (Outdoor Unit to BD Units [ft.])		180.4	180.4	180.4	180.4
Maximum Total Branch Piping (BD Units to Indoor Units [ft.])		295.3	295.3	295.3	295.3
Maximum Branch Pipe Length Between BD Unit and Each Indoor Unit [ft.])		49.2	49.2	49.2	49.2
Maximum Outdoor Unit to Indoor Unit Pipe Length (ft.)		229.6	229.6	229.6	229.6
Main Piping Length (No Additional Refrigerant (ft.)		16	16	16	16
Branch Piping Length (No Additional Refrigerant (ft.)		131	131	131	131
Maximum Elevation between BD Unit and Indoor Unit (ft.)		32.8	32.8	32.8	32.8
Maximum Elevation between BD Unit and BD Unit (ft.)		49.2	49.2	49.2	49.2

[1]At least one Branch Distribution Unit is required for system operation; a maximum of two can be installed per outdoor unit with use of Y-branch accessory (PMBL5620) To connect only one (1) indoor unit to a branch distribution unit, the system must include another branch distribution unit with at least one (1) connected indoor unit.

[2] Branch Distribution Unit can accommodate from one (1) indoor unit up to four (4) indoor units depending on the ports available on the Branch Distribution Unit.

[3]All power wiring / communication cable to be minimum 16 AWG from the outdoor unit to the BD unit (Multi F MAX systems only), and 18 AWG from the BD unit to the indoor unit, 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. For detailed electrical information, please refer to electric characteristics on page 11.

[4]Piping lengths are equivalent.

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ELECTRICAL DATA

Multi F and Multi F MAX Outdoor Units

Table 4: Multi F Outdoor Unit Electrical Data.

Nominal Tons	Unit Model No.	Hertz	Voltage	Phase	Voltage Range (Min. to Max.)	MCA	MOP	Compressor Quantity	Compressor Motor RLA	Outdoor Fan Motor		Indoor Fan Motor
										kW	FLA	FLA
1.5	LMU18CHV	60	208 - 230	1	187 - 253	13.3	20	1	8.9	0.09	0.59	1.60
2	LMU24CHV					14.3	20	1	9.4	0.09	0.59	2.00
2.5	LMU30CHV					16.6	25	1	10.8	0.12	0.73	2.40
3	LMU36CHV					17.9	25	1	11.2	0.12	0.73	3.20

Voltage tolerance is ±10%.

Maximum allowable voltage unbalance is 2%.

RLA = Rated Load Amps.

MCA = Minimum Circuit Ampacity.

Maximum Overcurrent Protection (MOP) is calculated as follows: (Largest motor FLA x 2.25) + (Sum of other motor FLA) rounded down to the nearest standard fuse size.

Indoor Fan Motor (FLA) is based on the maximum combination of indoor units.

The max combination for each outdoor unit is:

- 18,000 ODU (LMU18CHV): 12,000 IDU x 2
- 24,000 ODU (LMU24CHV): 12,000 IDU x 2 + 9,000 IDU x 1
- 30,000 ODU (LMU30CHV): 12,000 IDU x 3
- 36,000 ODU (LMU36CHV): 12,000 IDU x 4

Table 5: Multi F MAX Electrical Data.

Nominal Tons	Unit Model No.	Hertz	Voltage	Phase	Voltage Range (Min. to Max.)	MCA	MOP	Compressor Quantity	Compressor Motor RLA	Condenser Fan Motor(s)		Indoor Fan Motor
										Condenser Fan Quantity x kW	Condenser Fan Motor FLA	
4.0	LMU480HV	60	208 - 230	1	187 - 253	27.3	40	1	17.5	2 x 0.12	0.73 x 2	4.0
4.5	LMU540HV	60	208 - 230		187 - 253	29.4	40	1	18.5	2 x 0.12	0.73 x 2	4.8
5.0	LMU600HV	60	208 - 230		187 - 253	32.2	45	1	20.4	2 x 0.12	0.73 x 2	5.2

Voltage tolerance is ±10%.

Maximum allowable voltage unbalance is 2%.

RLA = Rated Load Amps.

MCA = Minimum Circuit Ampacity.

Maximum Overcurrent Protection (MOP) is calculated as follows: (Largest motor FLA x 2.25) + (Sum of other motor FLA) rounded down to the nearest standard fuse size.

Indoor Fan Motor (FLA) is based on the maximum combination of indoor units.

The max combination for each outdoor unit is:

- 48,000 ODU (LMU480HV): 12,000 IDU x 5
- 54,000 ODU (LMU540HV): 12,000 IDU x 6
- 60,000 ODU (LMU6000HV): 12,000 IDU x 6 + 9,000 IDU x 1

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R410A Refrigerant

R410A refrigerant has a higher operating pressure in comparison to R22 refrigerant and, therefore, all piping system materials installed must have a higher resisting pressure than the materials traditionally used in R22 systems.

R410A refrigerant is an azeotrope of R32 and R125, mixed at 50:50, so the ozone depletion potential (ODP) is 0.

⚠WARNING

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

Note

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

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GENERAL INSTALLATION GUIDELINES

Location for Outdoor Unit

Selecting the Best Location for the Outdoor Unit

⚠DANGER

To avoid the possibility of fire, do not install the unit in an area where combustible gas may generate, flow, stagnate, or leak. Failure to do so will cause serious bodily injury or death.

Note:

Before beginning installation, read the safety summary at the beginning of this manual.

⚠WARNING

⃠ Do not install the unit in a location where acidic solution and spray (sulfur) are often used as this may cause serious bodily injury or death. ⃠ Do not use the unit in environments where oil, steam, or sulfuric gas are present as this may cause serious bodily injury or death.

⚠CAUTION

When deciding on a location to place the outdoor unit, be sure to choose an area where run-off from defrost will not accumulate and freeze on sidewalks or driveways which may create unsafe conditions.

Note:

Select a location for installing the outdoor unit that will meet the following general conditions:

- *A location strong enough to bear the weight of the outdoor unit.*
- *A location that allows for optimum air flow and is easily accessible for inspection, maintenance, and service.*
- *Where piping between the outdoor unit, indoor unit(s), and BD units (Multi F MAX systems only) are within allowable limits.*
- *Include space for drainage to ensure condensate flows properly out of the unit when it is in heating mode. Avoid placing the outdoor unit in a low-lying area where water could accumulate.*

⃠

- *Where it will not be subjected to direct thermal radiation from other heat sources, nor an area that would not expose the outdoor unit to heat or steam like discharge from boiler stacks, chimneys, steam relief ports, other air conditioning units, kitchen vents, plumbing vents, and other sources of extreme temperatures.*
- *Where high-frequency electrical noise / electromagnetic waves will not affect operation.*
- *Where operating sound from the unit will not disturb inhabitants of surrounding buildings.*
- *Where the unit will not be exposed to direct, strong winds.*

Oceanside Installation Precautions

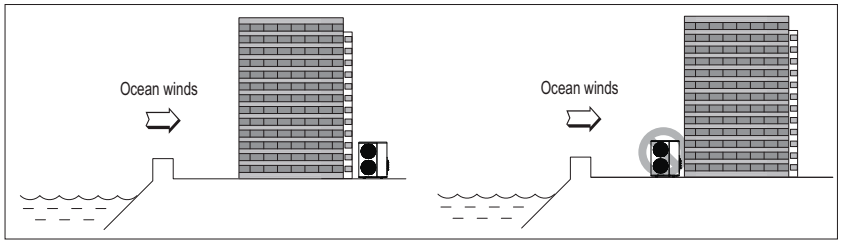
- Avoid installing the outdoor unit where it would be directly exposed to ocean winds.
- Install the outdoor unit on the side of the building opposite from direct ocean winds.
- Select a location with good drainage.
- Periodically clean dust or salt particles off of the heat exchanger with water.

Note:

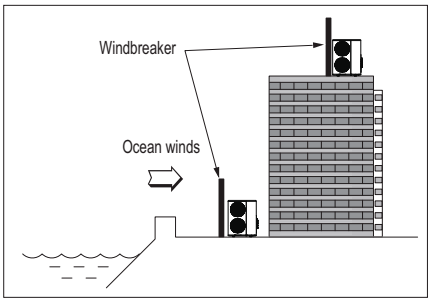
Additional anti-corrosion treatment may need to be applied to the outdoor unit at oceanside locations.

Note:

Ocean winds may cause corrosion, particularly on the condenser and evaporator fins, which, in turn could cause product malfunction or inefficient performance.



If the outdoor unit must be placed in a location where it would be subjected to direct ocean winds, install a concrete windbreaker strong enough to block any winds. Windbreaker height and width should be more than 150% of the outdoor unit, and be installed at least 27-1/2 inches away from the outdoor unit to allow for airflow.



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GENERAL INSTALLATION GUIDELINES

Location for Outdoor Unit

Rooftop Installations

If the outdoor unit is installed on a roof structure, be sure to level the unit. Ensure the roof structure and anchoring method are adequate for the unit location. Consult local codes regarding rooftop mounting.

Planning for Snow and Ice

In climates that experience snow buildup, place the unit on a raised platform to ensure proper condenser airflow. The raised support platform must be high enough to allow the unit to remain above possible snow drifts. Mount the unit on a field-provided stand that is higher than the maximum anticipated snowfall for the location. Design the mounting base to prevent snow accumulation on the platform in front or back of the unit case. If necessary, provide a field fabricated hood to keep snow and ice and/or drifting snow from accumulating on the coil surfaces. Use inlet and discharge duct or hoods to prevent snow or rain from accumulating on the fan inlet and outlet guards. Best practice prevents snow from accumulating on top of the unit. Consider tie-down requirements in case of high winds or where required by local codes.

⚠CAUTION

When deciding on a location to place the outdoor unit, be sure to choose an area where run-off from defrost will not accumulate and freeze on sidewalks or driveways which may create unsafe conditions.

Tie-Downs and Lightning Protection

Tie-Downs

- The strength of the roof must be checked before installing the outdoor units.
- If the installation site is prone to high winds or earthquakes, when installing on the wall or roof, securely anchor the mounting base using a field-provided tie-down configuration approved by a local professional engineer.
- The overall tie-down configuration must be approved by a local professional engineer. Always refer to local code when using a wind restraint system.

Lightening Protection

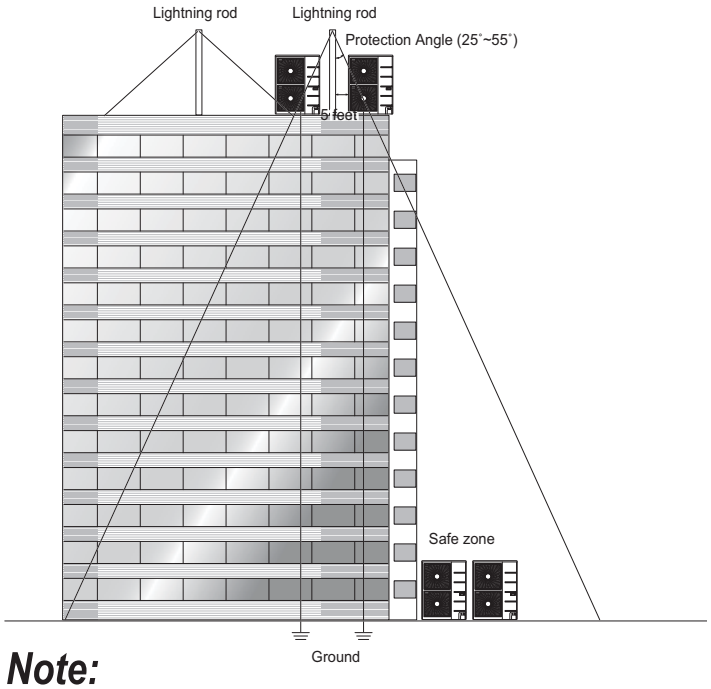
- To protect the outdoor unit from lightning, it should be placed within the specified lightning safety zone.

Table 6: Safety Zone Specifications.

Building Height (feet)	66	98	148	197
Protection Angle (˚)	55	45	35	25

- Power cable and communication cable should be installed five (5) feet away from lightning rod.
- A high-resistance ground system should be included to protect against induced lightning or indirect strike.

Figure 1: Lightening Protection Diagram.



Note:

If the building does not include lightning protection, the outdoor unit may be damaged from a lightening strike. Inform the customer of this possibility in advance.

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GENERAL INSTALLATION GUIDELINES

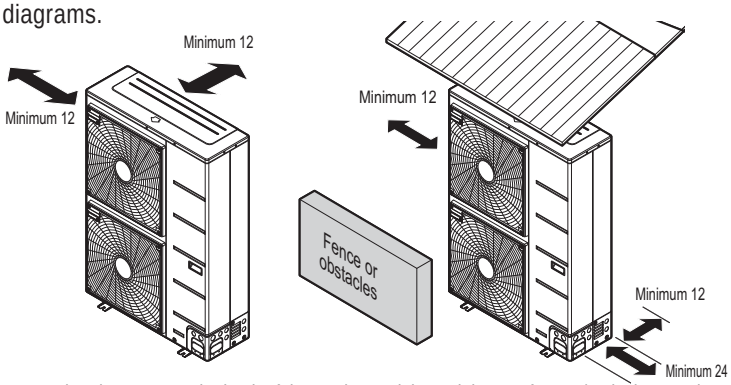
Service Access and Allowable Clearances for Outdoor Unit

Outdoor Unit Service Access and Allowable Clearances

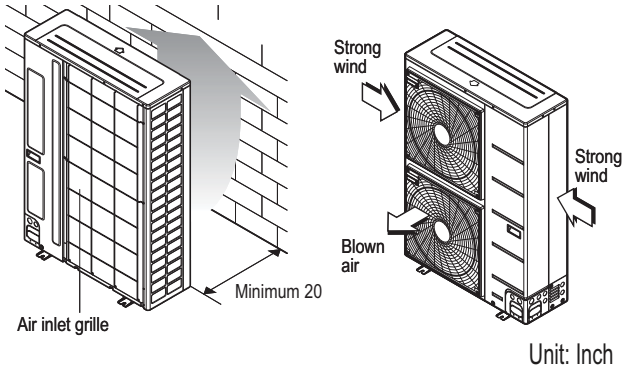
Appropriate airflow through the outdoor unit coil is critical for proper unit operation.

- Include enough space for airflow and for service access. If installing multiple outdoor units, avoid placing the units where the discharge of one unit will blow into the inlet side of an adjacent unit.
- No obstacles to air circulation around the unit; keep proper distances from ceilings, fences, floor, walls, etc. (Install a fence to prevent pests from damaging the unit or unauthorized individuals from accessing it.)
- If an awning is built over the unit to prevent direct sunlight or rain exposure, make sure that the discharge air of the outdoor unit isn't restricted.

When installing the outdoor unit, consider service, inlet, and outlet, and minimum allowable space requirements as illustrated in the following diagrams.



Ensure that the space at the back of the outdoor unit is a minimum of 11-13/16 inches, and include a minimum of 23-5/8 inches at the right side of the unit for service.

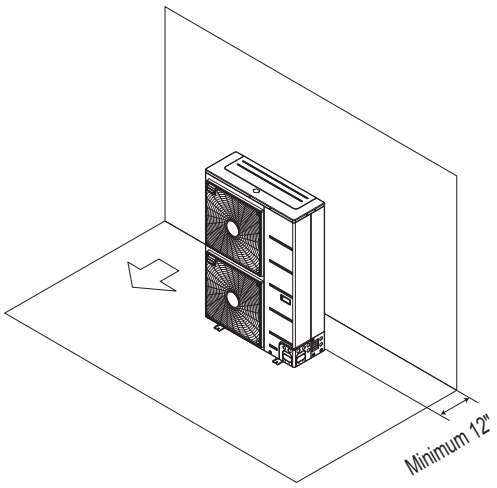


Unit: Inch

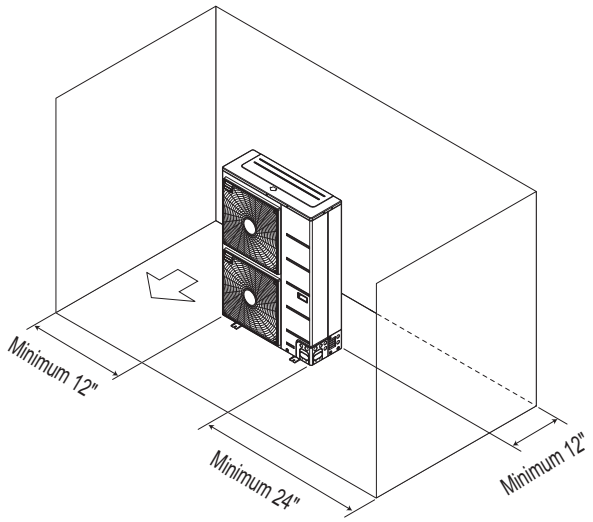
If the outdoor unit discharge side faces a wall, include a minimum of 19-11/16 inches between the outdoor unit and the wall. Install the outdoor unit so that the discharge port is set at a right angle to the wind direction.

Clearance Requirements when Different Obstacles are Present (Unit: Inch)

Obstacle on the suction side only.



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



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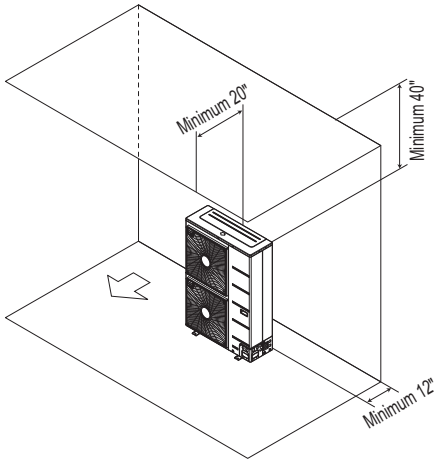
GENERAL INSTALLATION GUIDELINES

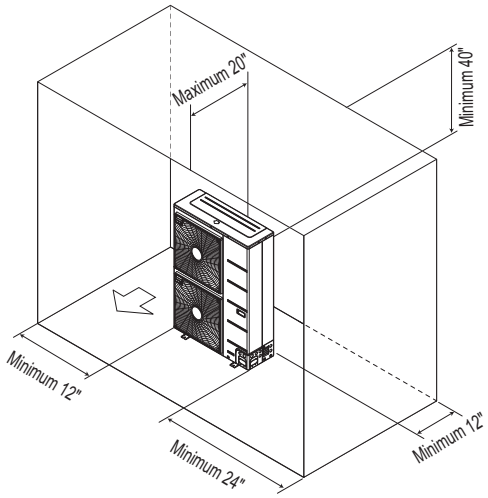
Allowable Clearances for Outdoor Unit

Clearance Requirements when Different Obstacles are Present, continued. (Unit: Inch)

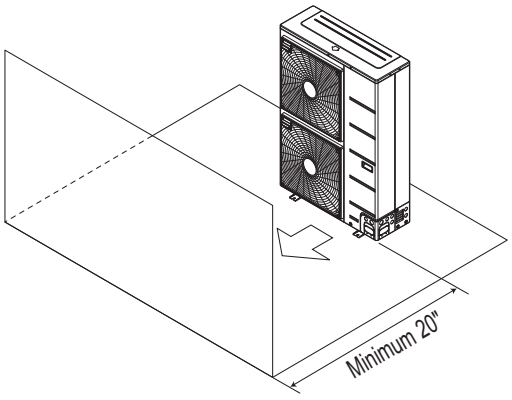
Obstacles above and on the air intake side.



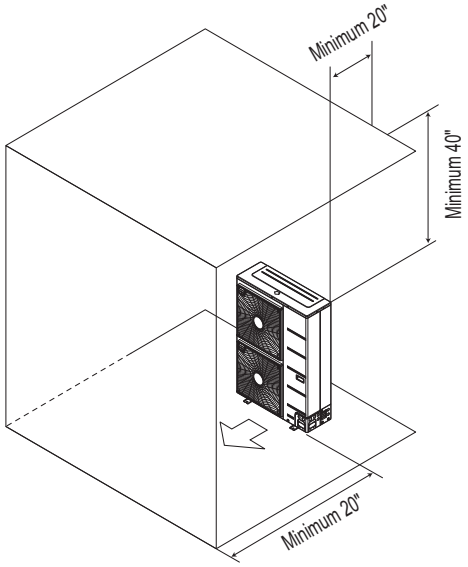
Obstacles above, on the air intake side, and on both left and right sides



Obstacle just on the air discharge side.



Obstacles above and on the air discharge side.



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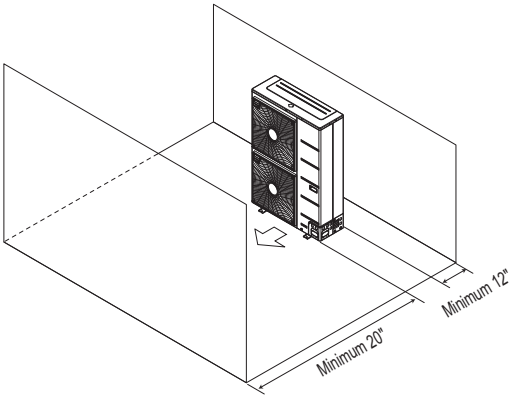
GENERAL INSTALLATION GUIDELINES

Allowable Clearances for Outdoor Unit

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 higher than the outdoor unit).

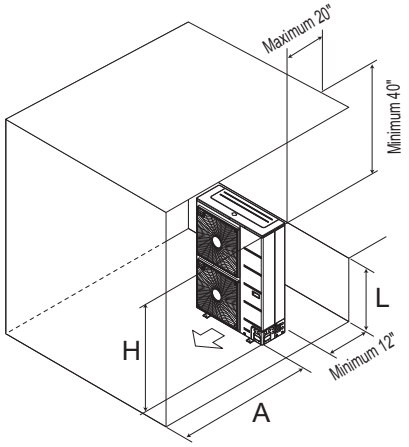
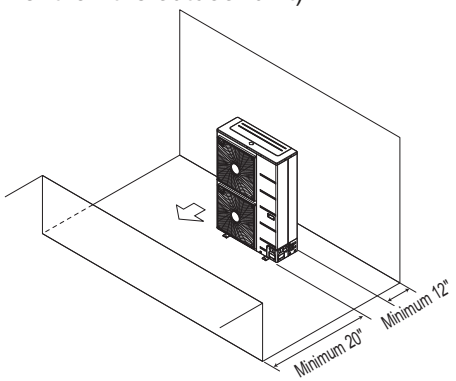


Table 7: Ratio among H, A, and L.

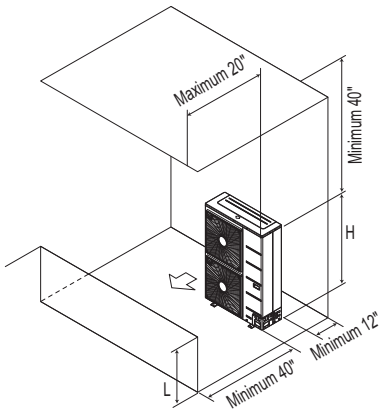
	L	A
L ≤ H	0 < L ≤ 1/2 H	30 inches
	1/2 H < L	40 inches
H < L	Set Stand as: L ≤ H	

If a stand is necessary, it should be contained (not open frame) to prevent the discharge air from short cycling.

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



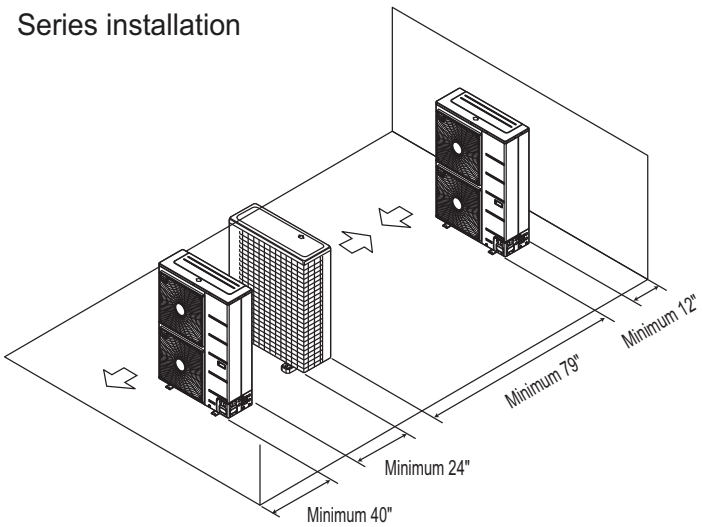
Where there are obstacles above, and on both suction and discharge sides (discharge side obstacle is lower than the outdoor unit).



Note:

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

Series installation



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GENERAL INSTALLATION GUIDELINES

Rigging Instructions / Platform Instructions for Outdoor Unit

Rigging and Lifting Instructions

⚠ WARNING

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

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.*

⚠ 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 weights listed.*
- *Some products use polypropylene bands for packaging. ⃠ Do not use polypropylene bands to lift the unit.*
- *Support the outdoor unit a minimum of four points to avoid slippage from rigging apparatus.*

Note:

- *Make sure the outdoor unit is in its original packaging to avoid damage during local transport.*
- *At the time of delivery, the package should be checked for any damage (exterior and interior). Report any damage to the carrier claims agent immediately.*
- *Handle the outdoor unit with care. Keep the outdoor unit upright to avoid damaging inside components.*
- *If a forklift is to transport the outdoor unit, the forklift arms should pass through the openings at the bottom.*
- *If a crane is to suspend the outdoor unit, it is recommended that two (2) ropes at least twenty-three (23) feet in length be used.*
- *Pass the ropes under the unit. Pass the rope through the two (2) forklift slots each at the front and rear of the outdoor unit.*
- *To prevent damage to the outdoor unit, always lift the unit with the ropes attached at four (4) points at an angle of ≤40°.*
- *Always include padding to protect the outdoor unit from rope damage, and take into consideration the outdoor unit's center of gravity.*

Concrete Platform Specifications

- Concrete foundations should be made of one part cement, two parts sand, and four parts gravel.
- The surface of the foundation should be finished with mortar with rounded edges, and weather-proofed.

Anchoring the Outdoor Unit

- Tightly anchor the outdoor unit with a bolt and nut to a concrete or rigid platform.
- When installing on a wall (with field-supplied brackets), roof, or rooftop, securely anchor the mounting platform with nails, taking into consideration the possibility of strong winds or earth-quakes.
- If there is a possibility of vibration from the outdoor unit transmitting to the building, add an anti-vibration material to the platform.

Figure 2: Example of Using an Insert for a Hole in a Reinforced Concrete Beam.

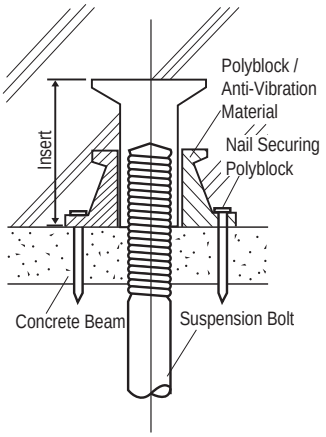
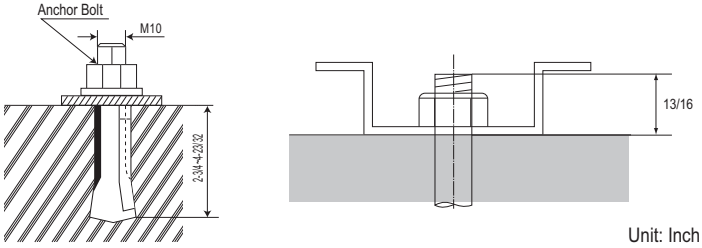


Figure 3: Close up of Bolt Attachment.



Unit: Inch

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GENERAL INSTALLATION GUIDELINES

Platform Instructions for Outdoor Unit

Outdoor Unit Platform Requirements

Outdoor Unit Foundation Requirements.

Figure 4: LMU18CHV and LMU24CHV Outdoor Units.

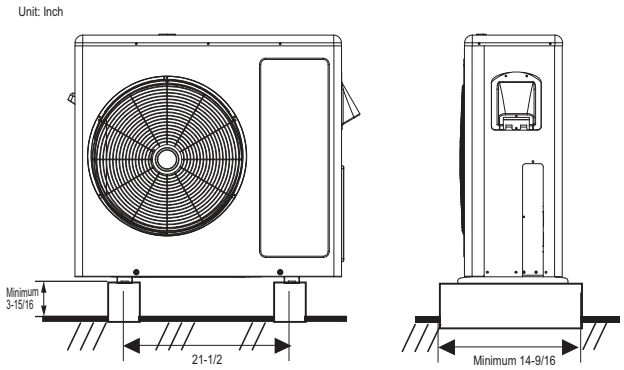


Figure 5: LMU30CHV and LMU36CHV Outdoor Units.

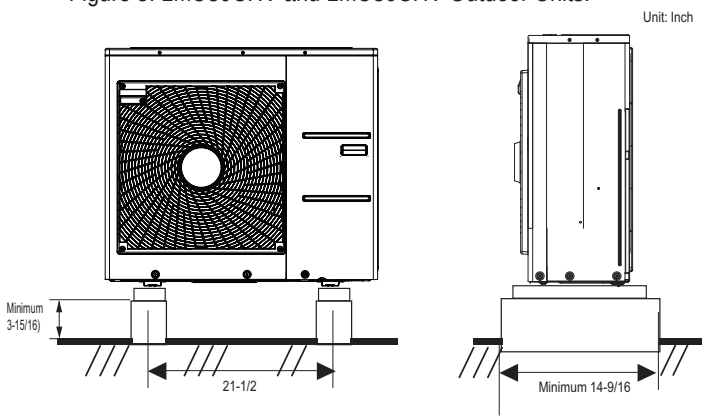
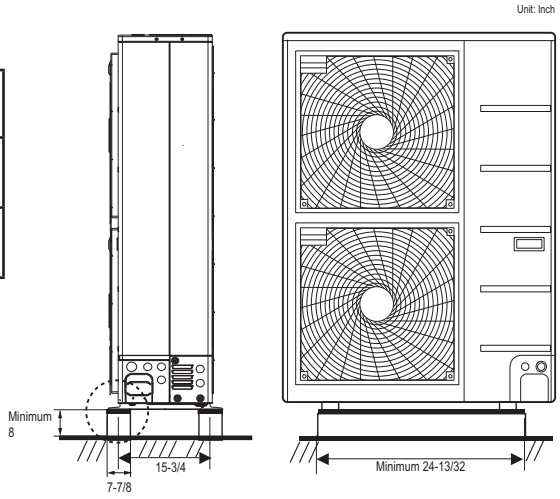


Table 8: Outdoor Unit Foundation Specifications.

Outdoor Unit Type	Bolt Type	Concrete Height	Bolt Depth
LMU18CHV, LMU24CHV, LMU30CHV, LMU36CHV	M10-J	Minimum 4 inches	Minimum 3 inches
LMU480HV, LMU540HV, LMU600HV	M10-J	Minimum 8 inches	Minimum 3 inches

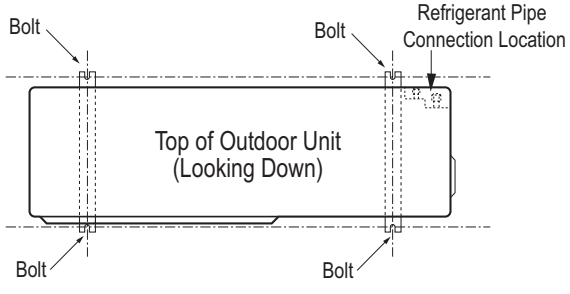
Figure 6: LMU480HV, LMU540HV, LMU600HV Outdoor Units.



Bolting the Outdoor Unit to the Platform

1. Ensure that the concrete platform will not degrade easily, and has enough strength to bear the weight of the unit.
2. Include an H-beam support. Firmly attach the corners, otherwise the support will bend.
3. Use a hexagon nut.
4. Use anti-vibration material.
5. Include enough space around the concrete foundation for condensate drainage.
6. Seal all wiring and piping access holes to prevent bugs from entering the unit.

Figure 7: Bolting the Outdoor Unit to the Platform (Piping Location May Differ Depending on Outdoor Unit Model).



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GENERAL INSTALLATION GUIDELINES

Location for Multi F MAX Branch Distribution Units

Selecting the Best Location for the Branch Distribution (BD) Unit

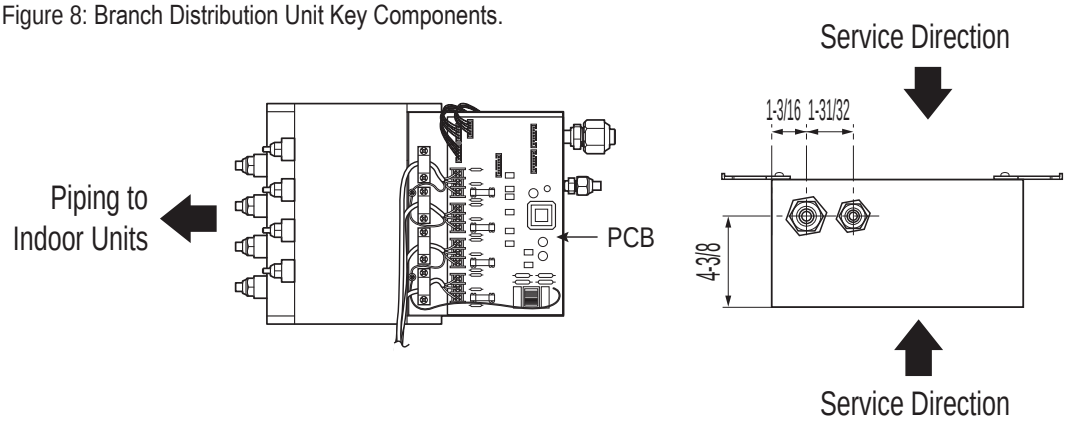
Note:

Branch Distribution (BD) units are used only with Multi F MAX systems to distribute the refrigerant from the outdoor unit to up to eight indoor units. Select location indoors that will meet the following conditions:

- Within allowable parameters for proper connection to the Multi F MAX outdoor unit and indoor unit(s); refrigerant piping and wire lengths must not exceed amounts specified by LG Electronics, U.S.A., Inc.
- Condensate drain piping is not required.
- Ensure there is enough space in the installation area for service and inspection purposes (23-5/8 inch square opening).
- Install the refrigerant piping and electrical wiring system in an easily accessible location.
- Level where there is enough strength to bear the weight of the BD unit.
- Interior installation is highly recommended.
- Allowable operating temperature range: 0 ~ 150°F; Allowable maximum operating humidity range: 80%.
- Unit can be installed no more than ±5 degrees of level.

- ⃠ Do not install the BD unit in a location where it would be subjected to strong radiation heat from heat sources.
- Avoid an installation environment where the BD unit would be exposed to heat, water, steam, oil splattering, spray or other factors that may damage the PCB.
- Install the unit in a location where any sound it generates will not disturb occupants in the surrounding rooms.
- No obstacles to air circulation around the unit; keep proper distances from ceilings, doorways, floor, walls, etc.
- Where high-frequency electrical noise / electromagnetic waves will not affect operation. Maintain proper distances between the BD unit(s) and electric wires, audio and visual appliances, breaker / circuit panels, etc.

Figure 8: Branch Distribution Unit Key Components.



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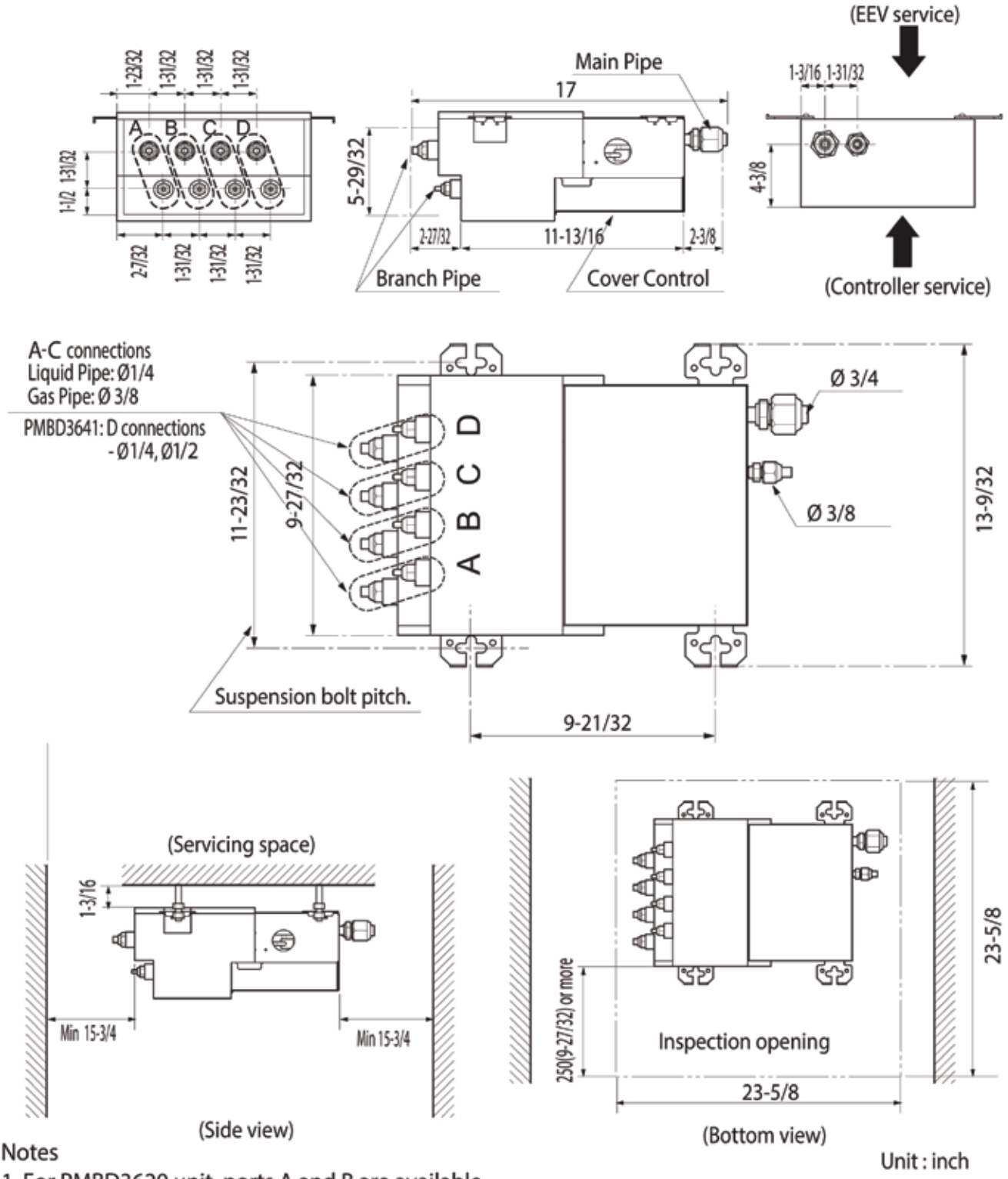
GENERAL INSTALLATION GUIDELINES

Location for Multi F MAX Branch Distribution Units

Figure 9: PMBD3620, PMBD3630, PMBD3640, and PMBD3641 External Dimensions.



Notes

1. For PMBD3620 unit, ports A and B are available.
2. For PMBD3630 unit, ports A, B and C are available.
3. For PMBD3640 and PMBD3641 units, ports A, B, C and D are available.

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GENERAL INSTALLATION GUIDELINES

Multi F MAX Branch Distribution Unit Installation

Branch Distribution Unit Orientation

Multi F MAX Branch Distribution (BD) Units can be installed in a multitude of options to fit various building configurations and job or application requirements. The installation location of the PCB within the BD unit can be changed for easier service access, depending on the BD unit installation itself (see the wiring section for information). Multi F MAX BD Units include electronic expansion valves that properly seat only if the BD Unit is installed in an acceptable orientation. Installations with improper BD Unit orientation risk incomplete valve seating and system performance degradation from potential refrigerant leakage through the electronic expansion valve.

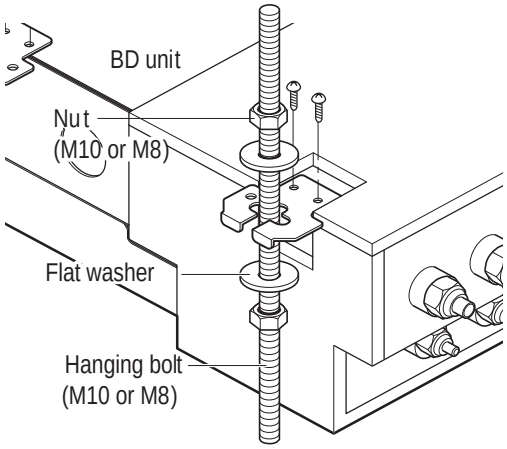
Note:

This material is for informational or educational purposes only. It is not intended to be a substitute for professional advice. Consult with your engineer or design professionals for specific applications to your system.

Ceiling Mount Installation - Hangers with Hanging Bolt

1. Drill four (4) holes in the ceiling, following the dimensions on the previous page.
2. Attach the factory-supplied hangers with two (2) screws each at the designated four (4) areas on the frame of the BD unit.
3. Install an anchor in the ceiling, and attach the hanging bolts to the ceiling.
4. Add nuts and washers to the hanging bolt as shown at right.
5. Hang the BD unit on the hanging bolts (ceiling side up), and after checking for level (±5 degrees), securely tighten all nuts.

Figure 11: BD Ceiling Mount Installation.



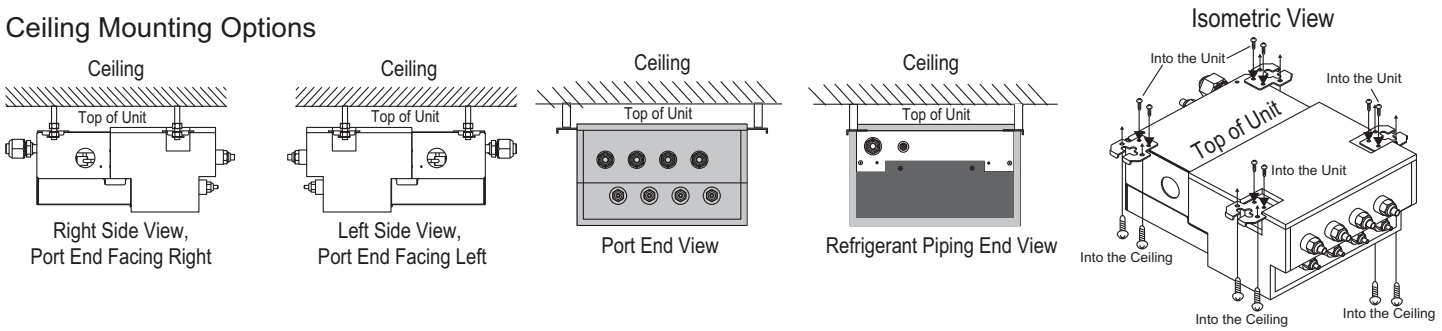
Ceiling Mount Installation - Hangers Only

1. Attach the factory-supplied hangers with two (2) screws each at the designated four (4) areas on the frame of the BD unit.
2. Install the BD unit to the ceiling using two screws on each of the hangers as shown below. Unit should be ±5 degrees of level.
3. Cover parts of the hanger holes with polyethylene foam insulation (to prevent condensation).

Note:

If a screw has been installed on the frame of the BD unit and the screw has been removed, to prevent condensation, either re-install the screw or cover the open hole with aluminum tape.

Figure 10: Acceptable BD Unit Ceiling Mount Orientations.



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Wall Mount Installation - Hangers Only

1. Attach the factory-supplied hangers with two (2) screws each at the designated four (4) areas on the frame of the BD unit.
2. Install the BD unit to the wall using two screws on each of the hangers. Unit should be ±5 degrees of level.
3. Cover parts of the hanger holes with polyethylene foam insulation (to prevent condensation).

Figure 12: Acceptable BD Unit Wall Mount Orientations.

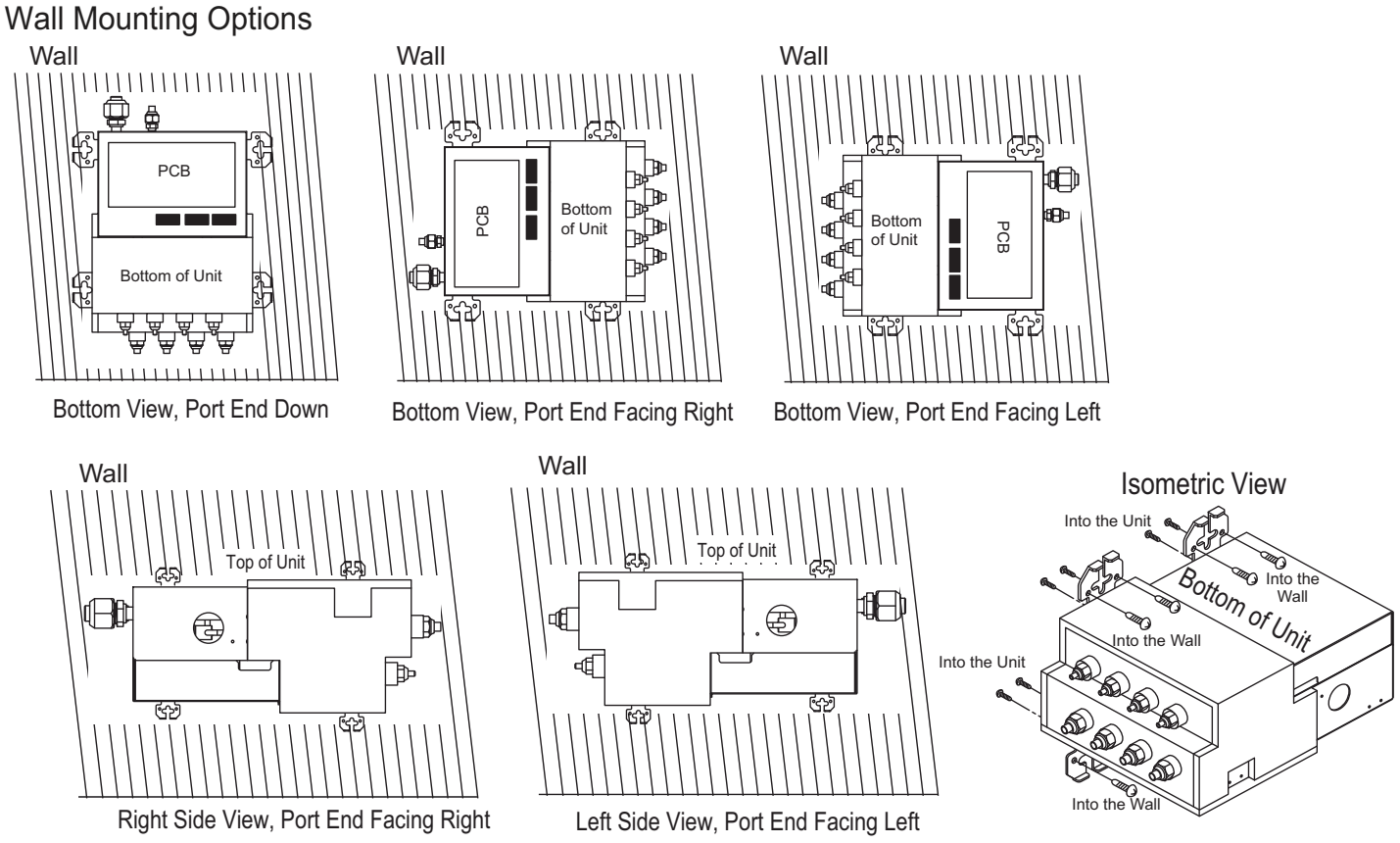
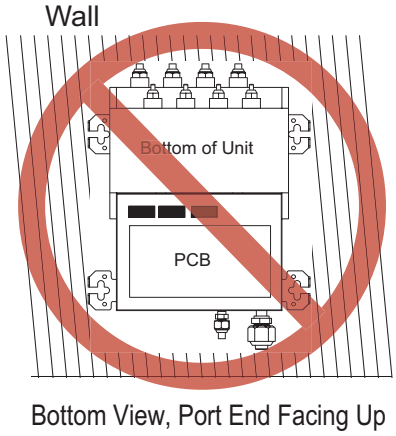


Figure 13: Unacceptable BD Unit Orientation.



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GENERAL INSTALLATION GUIDELINES

Piping Preparation

⚠ WARNING

- ⃠ *Do not allow the refrigerant to leak during brazing; if the refrigerant combusts, it generates a toxic gas.*
- ⃠ *Do not braze in an enclosed location, and always test for gas leaks before / after brazing.*
- *There is risk of fire, explosion, and physical injury or death.*

Outdoor Unit Pipe Connections

1. ⃠ Do not use kinked pipe caused by excessive bending in one specific area on its length.
2. Braze the pipes to the service valve pipe stub of the outdoor unit.
3. After brazing, check for refrigerant gas leaks.
4. When selecting flare fittings, always use a 45° fitting rated for use with high pressure refrigerant R410A. Selected fittings must also comply with local, state, or federal standards.

Creating a Flare Fitting

One of the main causes of refrigerant leaks is defective flared connections. Create flared connections using the procedure below.

1. Cut the pipe to length.
- Measure the distance between the indoor unit and the outdoor unit.
- Cut the pipes a little longer than measured distance.

2A. Remove the burrs
- Completely remove all burrs from pipe ends.
- When removing burrs, point the end of the copper pipe down to avoid introducing foreign materials in the pipe.

2B. Remove the flare nuts attached to the indoor and outdoor units. Slide the flare nut onto the copper tube.

3. Flaring the pipe end.
- Use the proper size flaring tool to finish flared connections as shown.
- ALWAYS create a 45° flare when working with R410A.
- Firmly hold copper tube in a bar with a dimension as indicated in the table below.

4. Carefully inspect the flared pipe end.
- Compare the geometry with the figures and dimensions as detailed.
- If the flare is defective, cut it off and re-do procedure.
- If flare looks good, blow clean the pipe with dry nitrogen.

Figure 14: Dimensions of the Flare.

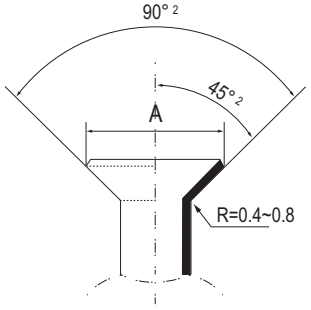
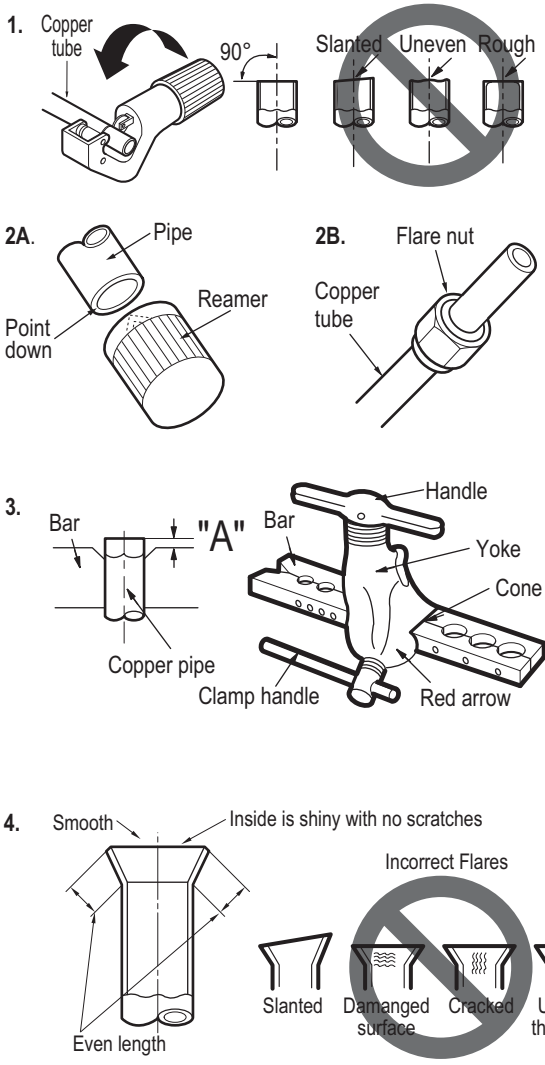


Table 9: Flared Connection Dimensions.

Outside Diameter	A
Inch	Inch
Ø1/4	0.04 ~ 0.05
Ø3/8	0.06 ~ 0.07
Ø1/2	0.06 ~ 0.07
Ø5/8	0.06 ~ 0.07
Ø3/4	0.07 ~ 0.08



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GENERAL INSTALLATION GUIDELINES

Piping Preparation

Tightening the Flare Connections

When connecting the flare nuts, coat the flare (outside only) with polyvinyl ether (PVE) refrigeration oil only.

Note:

⃠ Do not use polyolyester (POE) or any other type of mineral oil as a thread lubricant. These lubricants are not compatible with PVE oil used in this system and create oil sludge leading to equipment damage and system malfunction.

Table 10: Tightening Torque for Flare Nuts.

Pipe size (Inches O.D.)	Tightening torque (ft-lbs)
1/4Ø	13 ~ 18
3/8Ø	24.6 ~ 30.4
1/2Ø	39.8 ~ 47.7
5/8Ø	45.6 ~ 59.3
3/4Ø	71.6 ~ 87.5

Align the center of the piping, and initially hand tighten the flare nuts using three (3) or four (4) turns. For Multi F Outdoor Units, install the flare nuts by:

1. Connecting the Gas Piping for Connections A through D first.
2. Connecting the Liquid Piping for Connections A through D last.

Then, to finish tighten the flare nut using the torque wrench and a backup wrench, following the direction arrows on the wrench and using the appropriate tightening torque, until the wrench clicks. After all the piping has been connected, check for refrigerant gas leaks.

Figure 15: Flare Connection.

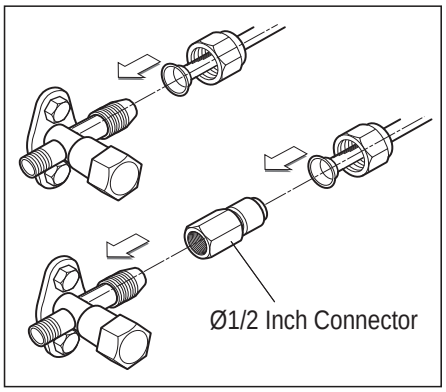


Figure 16: Example of Multi F Piping Connections.

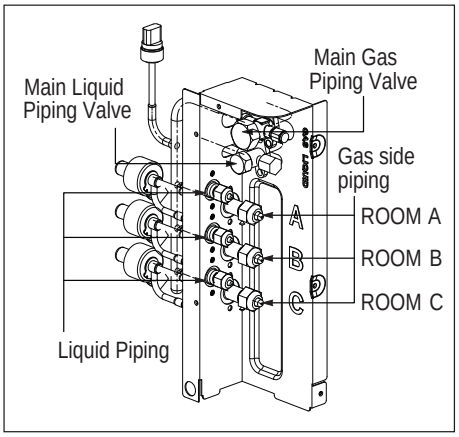
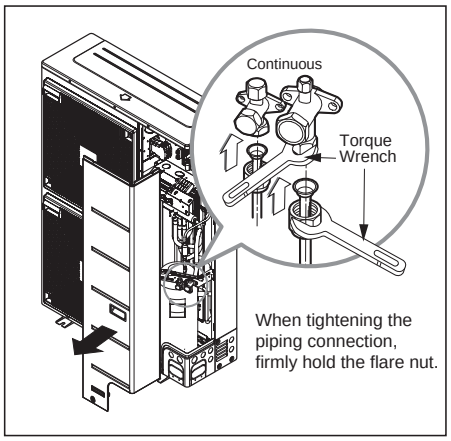


Figure 17: Multi F MAX Piping Connection.



For Multi F MAX outdoor units, piping can be installed in one of four directions: front, side, back, and down (A). If the downward installation is chosen, the knockout hole in the base pan must be accessed (B).

Whatever direction is chosen, plug the access holes with field-provided putty or insulation to fill all gaps (C).

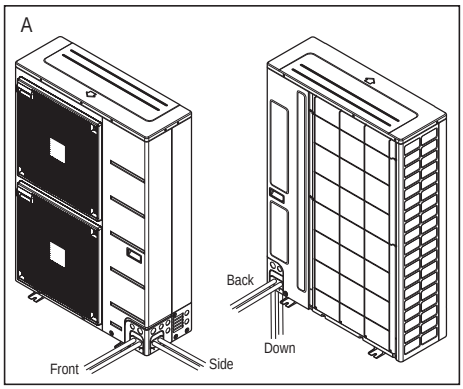
⚠WARNING

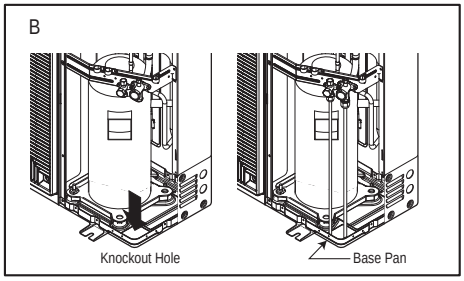
Insects or small animals entering the outdoor unit may cause a short circuit in the electrical box, which may lead to fire, electric shock, physical injury, or death.

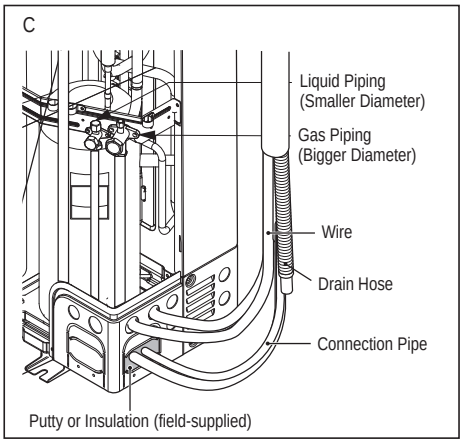
Note:

Insects or small animals entering the outdoor unit may cause a short circuit in the electrical box, which may lead to unit failure.

Figure 18: Multi F MAX Piping Installation.







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Loosening the Flare Nuts

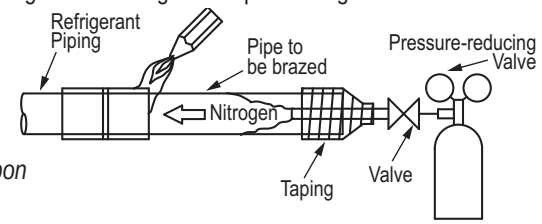
Always use two (2) wrenches to loosen the flare nuts.

Brazing Practices

Note:

Keep the piping system free of contaminants and debris such as copper burrs, slag, or carbon dust during installation. Contaminants can result in mechanical failure of the system.

Figure 20: Refrigerant Pipe Brazing.



All joints are brazed in the field. Multi F / Multi F MAX refrigeration system components contain very small capillary tubes, small orifices, electronic expansion valves, oil separators, and heat exchangers that can easily become blocked. Proper system operation depends on the installer using best practices and utmost care while assembling the piping system.

- While brazing, use a dry nitrogen purge operating at a minimum pressure of three (3) psig and maintain a steady flow.
- Blow clean all pipe sections with dry nitrogen prior to assembly.
- Use a tubing cutter. De-burr and clean all cuts before assembly.
- Store pipe stock in a dry place. Keep pipe capped and clean.
- Use adapters to assemble different sizes of pipe. Use a 15% silver phosphorous copper brazing alloy to avoid overheating and produce good flow.
- Protect isolation valves, electronic expansion valves, and other heat-sensitive control components from excessive heat with a wet rag or a heat barrier spray product.

- ⃠ Do not use flux, soft solder, or anti-oxidant agents.
- ⃠ Do not use a saw to cut pipe.

Piping Materials and Handling

Pipes used for the refrigerant piping system must include the specified thickness, and the interior must be clean.

⃠ Do not bend or damage the pipes while handling and storing, and take care not to contaminate the interior with dust, moisture, etc. See Table 11 for care of piping.

Figure 19: Keep Piping Capped While Storing

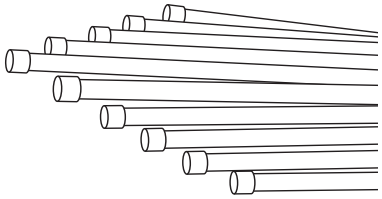
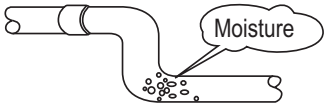
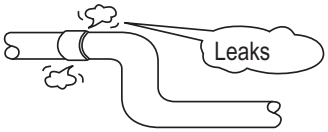


Table 11: Three Principles of Refrigerant Piping

	Dry	Clean	Airtight
Principles	No moisture should be inside the piping.	No dust should be inside the piping.	No leaks should occur.
			
Problems Caused	- Significant hydrolysis of refrigerant oil. - Refrigerant oil degradation. - Poor insulation of the compressor. - System does not operate properly. - EEVs, capillary tubes are clogged.	- Refrigerant oil degradation. - Poor insulation of the compressor. - System does not operate properly. - EEVs and capillary tubes become clogged.	- Refrigerant gas leaks / shortages. - Refrigerant oil degradation. - Poor insulation of the compressor. - System does not operate properly.
Solutions	- Remove moisture from the piping. - Piping ends should remain capped until connections are complete. - ⃠ Do not install piping on a rainy day. - Connect piping properly at the unit's side. - Remove caps only after the piping is cut, the burrs are removed, and after passing the piping through the walls. - Evacuate system to a minimum of 500 microns and insure the vacuum holds at that level for 24 hours	- Remove dust from the piping. - Piping ends should remain capped until connections are complete. - Connect piping properly at the side of the unit. - Remove caps only after the piping is cut and burrs are removed. - Retain the cap on the piping when passing it through walls, etc.	- Test system for air tightness. - Perform brazing procedures that comply with all applicable standards. - Perform flaring procedures that comply with all applicable standards. - Perform flanging procedures that comply with all applicable standards. - Ensure that refrigerant lines are pressure tested to 550 psig.

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Selecting Field-Supplied Copper Tubing

Type ACR copper is the only approved refrigerant pipe material for use with LG Multi F air conditioning products. ACR rated tubing is the only type that ships with yellow caps. Approved tubing for use with Multi F products will be marked "R410 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:

Tube wall thickness should meet local code requirements and be approved for an operating pressure of 551 psi. If local code does not specify wall thickness, LG suggests using tube thickness per table below. When bending tubing, try to keep the number of bends to a minimum, and use the largest radii possible to reduce the equivalent length of installed pipe; also, bending radii greater than ten (10) pipe diameters can minimize pressure drop. Be sure no traps or sags are present when rolling out soft copper tubing coils.

Table 14: ACR Copper Tubing Material

Type	Seamless Phosphorous Deoxidized
Class	UNS C12200 DHP
Straight Lengths	H58 Temper
Coils	O60 Temper

Table 12: Piping Tube Thicknesses

OD (in)	1/4	3/8	1/2	5/8	3/4	7/8	1-1/8	1-3/8	1-5/8
Material	Rigid Type "K" or "L" and Soft ACR Acceptable			Rigid Type "K" or "L" Only					
Min. Bend Radius (in)	.563	.9375	1.5	3.0	3.0	3.0	3.5	4.0	4.5
Min. Wall Thickness (in)	.031	.031	.031	.039	.042	.045	.050	.050	.050

Table 13: ACR Copper Tubing Dimensions and Physical Characteristics[1-4]

Nominal Pipe Outside Diameter (in)	Actual Outside Diameter (in)	Drawn Temper			Annealed Temper		
		Nominal Wall Thickness (in)	Weight (lb/ft)	Cubic ft per Linear ft	Nominal Wall Thickness (in)	Weight (lb/ft)	Cubic ft per Linear ft
1/4	0.250	--	--	--	0.030	0.081	.00020
3/8	0.375	0.030	0.126	.00054	0.032	0.134	.00053
1/2	0.500	0.035	0.198	.00101	0.032	0.182	.00103
5/8	0.625	0.040	0.285	.00162	0.035	0.251	.00168
3/4	0.750	0.042	0.362	.00242	0.042	0.362	.00242
7/8	0.875	0.045	0.455	.00336	0.045	0.455	.00336
1-1/8	1.125	0.050	0.655	.00573	0.050	0.655	.00573

[1]All dimensions provided are in accordance with ASTM B280 – Standard.
[2]Design pressure = 551 psig.
[3]ACR Tubing is available as hard drawn or annealed (soft) and are suitable for use with R410A refrigerant.
[4]The Copper Tube Handbook, 2010, Copper Development Association Inc., 260 Madison Avenue, New York, NY 10016.

Note:

• Commercially available piping often contains dust and other materials. Always blow it clean with a dry inert gas.
• Prevent dust, water or other contaminants from entering the piping during installation. Contaminants can cause mechanical failure.

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Multi F MAX Y-Branch Kit PMBL5620

The LG supplied Y-Branch Kit PMBL5620 MUST be used when two branch distribution units are connected on one Multi F MAX system. Field-supplied fittings are not permitted. Each Y-Branch kit comes with 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, position the Y-branch so the straight-through leg is ±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 ±5° rotation.

Y-branches must be properly installed following instructions in the applicable LG manual. Y-branches should 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.

It is recommended that when a Y-branch is located in a pipe chase or other concealed space, access doors should be provided for inspection access.

The equivalent pipe length of each Y-branch (1.6') must be added to the main pipe segment entered into LATS Multi F piping design software.

Note:

- *Design pressure is 551 psig.*
- *All dimensions in inches. Tolerance ±1/4 inch.*
- *Images are not to scale.*

Figure 24: Horizontal Configuration End View.

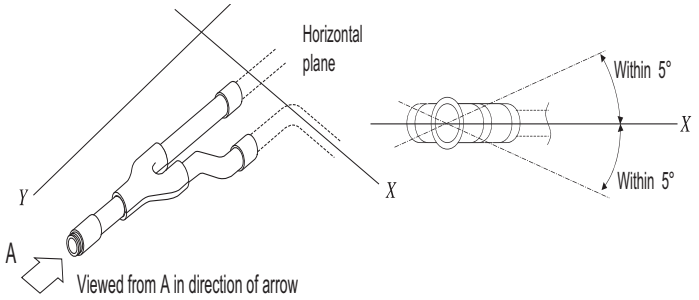


Figure 21: Y-Branch Connections.

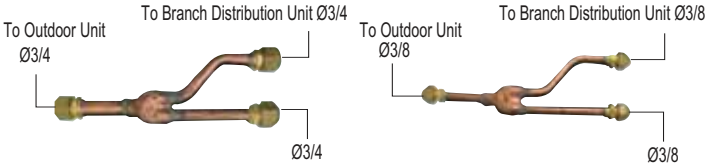


Table 15: Y-Branch Connection Diameters.

Model	Y-Branch Type	Port Identifier (inch)			Dimensions	
		1	2	3	X	Y
PMBL5620	Liquid	3/8	3/8	3/8	13.80	3.24
	Vapor	3/4	3/4	3/4	12.48	3.02

Figure 22: Y-Branch Port Identifier Diagram.

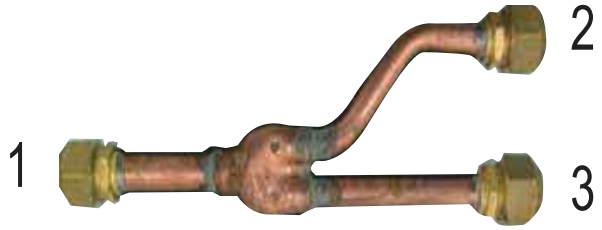
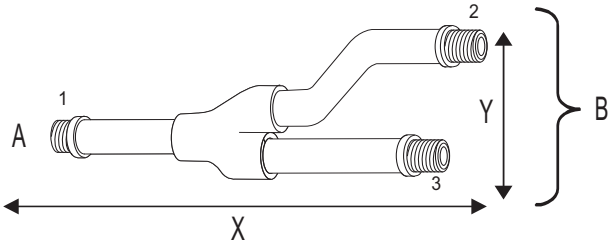
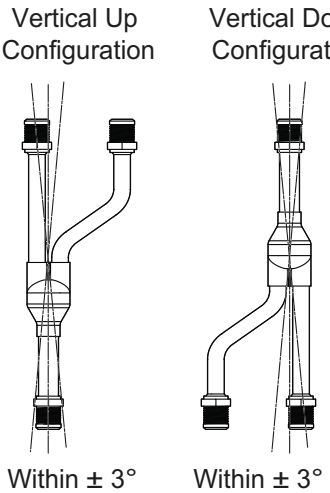


Figure 23: Y-Branch Dimensions Diagram.



A = To Outdoor Unit B = To Branch Distribution Unit

Figure 25: Y-branch Installation Alignment Specification.



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Y-Branch Kit Insulation

Each Y-branch kit comes with clam-shell type peel-and-stick insulation jackets molded to fit the Y-branch fittings—one for the liquid line, one for the vapor line.

- Check the fit of the Y-branch clam-shell insulation jacket after the Y-branch is installed.
- Mark the pipe where the insulation jacket ends.
- Remove the jacket.
- Install field-provided insulation on the pipes first.
- Peel the adhesive glue protector slip and install the clam-shell jacket over the fitting

Figure 26: Y-branch Insulation Detail.

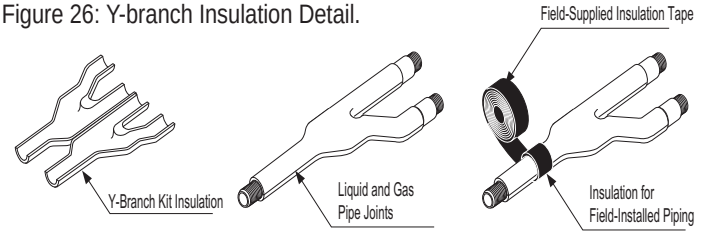


Table 16: Insulation Jacket Properties.

Material	Polyolefin Foam
UL94 Flame Classification	HF-1
Density	1.84 lbs./ft.^{3}
Thermal Conductivity	.0208 Btu/h/ft. ^oR
Thickness	1/2 inch

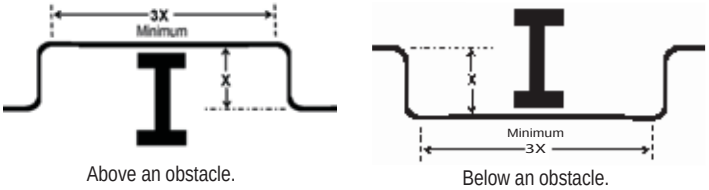
No Pipe Size Substitutions

Use only the pipe size selected by the LATS Multi F pipe system design software or as conveyed in the product installation instructions. Using a different size is prohibited and may result in a system malfunction or failure to work at all.

Obstacles

When an obstacle, such as an I-beam or concrete T, is in the path of the planned refrigerant pipe run, it is best practice to route the pipe over the obstacle. If adequate space is not available to route the insulated pipe over the obstacle, then route the pipe under the obstacle. In either case, it is imperative the horizontal section of pipe above or below the obstacle be a minimum of three (3) times greater than the longest vertical rise (or fall) distance.

Figure 27: Installing Piping Above and Below an Obstacle.



Above an obstacle. Below an obstacle.

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Copper Expansion and Contraction

Under normal operating conditions, the vapor pipe temperature of a Multi F 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.

Refrigerant pipe, along with the insulation jacket, form a cohesive unit that expands and contracts together. During system operation, thermal heat transfer occurs between the pipe and the surrounding insulation.

If the pipe is mounted in free air space, no natural restriction to movement is present if mounting clamps are properly spaced and installed. When the refrigerant pipe is mounted underground in a utility duct stacked among other pipes, natural restriction to linear movement is present. In extreme cases, the restrictive force of surface friction between insulating jackets could become so great that natural expansion ceases and the pipe is "fixed" in place. In this situation, opposing force caused by change in refrigerant fluid/vapor temperature can lead to pipe/fitting stress failure.

The refrigerant pipe support system must be engineered to allow free expansion to occur. When a segment of pipe is mounted between two fixed points, provisions must be provided to allow pipe expansion to naturally occur. The most common method is the inclusion of expansion Loop or U-bends mounted in the horizontal plane. When expansion loops are placed in a vertical riser, the loop is to be formed in a horizontal fashion resulting in a torsional movement during expansion and contraction. Each segment of pipe has a natural fixed point where no movement occurs. This fixed point is located at the center point of the segment assuming the entire pipe is insulated in a similar fashion. The natural fixed point of the pipe segment is typically where the expansion Loop or U-bend should be. Linear pipe expansion can be calculated using the following formula:

$$LE = C \times L \times (T_r - T_a) \times 12$$

LE	=	Anticipated linear tubing expansion (in.)
C	=	Constant (For copper = 9.2×10^{-6} in./in.°F)
L	=	Length of pipe (ft.)
T_R	=	Refrigerant pipe temperature (°F)
T_a	=	Ambient air temperature (°F)
12	=	Inches to feet conversion (12 in./ft.)

1. From Table 17, find the row corresponding with the actual length of the straight pipe segment.
2. Estimate the minimum and maximum temperature of the pipe. Typical pipe temperature change range: High Pressure Vapor: ambient temperature to 215°F; Low Pressure Vapor: ambient to 35°F; Liquid pipe: ambient, 80°F, 110°F. Choose the two most extreme. In the column showing the minimum pipe temperature, look up the anticipated expansion distance. Do the same for the maximum pipe temperature.
3. Calculate the difference in the two expansion distance values. The result will be the anticipated change in pipe length.

Example:

A Multi F MAX system is installed and the design shows that there is a 100 foot straight segment of tubing between a Y-branch and a branch distribution unit. The system operates 24 hours per day. In heating, this pipe transports hot gas vapor to the indoor units at 120°F. In cooling, the same tube is a suction line returning refrigerant vapor to the outdoor unit at 40°F. Look up the copper tubing expansion at each temperature and calculate the difference.

Vapor Line

Transporting Hot Vapor: 100 ft. pipe at 120°F = 1.40 in.
Transporting Suction Vapor: 100 ft. pipe at 40°F = 0.40 in.
Anticipated Change in Length: 1.40 in. – 0.40 in. = 1.00 in.

Liquid Line

The liquid temperature remains the same temperature; only the direction of flow will reverse. Therefore, no significant change in length of the liquid line is anticipated.

When creating an expansion joint, the joint depth should be a minimum of two times the joint width. Although different types of expansion arrangements are available, the data for correctly sizing an expansion loop is provided in Table 18. Use soft copper with long radius bends on longer runs or long radius elbows for shorter pipe segments. Using the anticipated linear expansion (LE) distance calculated, look up the Expansion Loop or U-bend minimum design dimensions. If other types of expansion joints are chosen, design per ASTM B-88 Standards.

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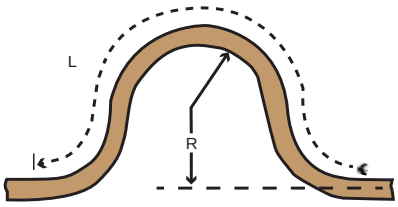
Table 17: Linear Thermal Expansion of Copper Tubing in Inches.

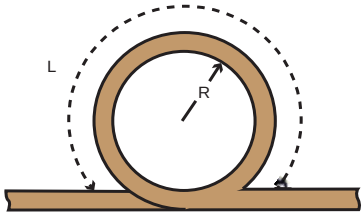
Pipe Length[1]	Fluid Temperature °F																			
	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	100°	105°	110°	115°	120°	125°	130°
10	0.04	0.04	0.05	0.06	0.06	0.07	0.08	0.08	0.09	0.09	0.10	0.10	0.11	0.11	0.11	0.12	0.13	0.14	0.15	0.15
20	0.08	0.08	0.10	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.22	0.23	0.26	0.28	0.29	0.30
30	0.12	0.12	0.15	0.18	0.20	0.21	0.23	0.24	0.26	0.27	0.29	0.30	0.32	0.33	0.32	0.35	0.39	0.42	0.44	0.45
40	0.16	0.16	0.20	0.24	0.26	0.28	0.30	0.32	0.34	0.36	0.38	0.40	0.42	0.44	0.43	0.46	0.52	0.56	0.58	0.60
50	0.20	0.20	0.25	0.30	0.33	0.35	0.38	0.40	0.43	0.45	0.48	0.50	0.53	0.55	0.54	0.58	0.65	0.70	0.73	0.75
60	0.24	0.24	0.30	0.36	0.39	0.42	0.45	0.48	0.51	0.54	0.57	0.60	0.63	0.66	0.65	0.69	0.78	0.84	0.87	0.90
70	0.28	0.28	0.35	0.42	0.46	0.49	0.53	0.56	0.60	0.63	0.67	0.70	0.74	0.77	0.76	0.81	0.91	0.98	1.02	1.05
80	0.32	0.32	0.40	0.48	0.52	0.56	0.60	0.64	0.68	0.72	0.76	0.80	0.84	0.88	0.86	0.92	1.04	1.12	1.16	1.20
90	0.36	0.36	0.45	0.54	0.59	0.63	0.68	0.72	0.77	0.81	0.86	0.90	0.95	0.99	0.97	1.04	1.17	1.26	1.31	1.35
100	0.40	0.40	0.50	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00	1.05	1.10	1.08	1.15	1.30	1.40	1.45	1.50
120	0.48	0.48	0.60	0.72	0.78	0.84	0.90	0.96	1.02	1.08	1.14	1.20	1.26	1.32	1.30	1.38	1.56	1.68	1.74	1.80
140	0.56	0.56	0.70	0.84	0.91	0.98	1.05	1.12	1.19	1.26	1.33	1.40	1.47	1.54	1.51	1.61	1.82	1.96	2.03	2.10
160	0.64	0.64	0.80	0.96	1.04	1.12	1.20	1.28	1.36	1.44	1.52	1.60	1.68	1.76	1.73	1.84	2.08	2.24	2.32	2.40
180	0.72	0.72	0.90	1.08	1.17	1.26	1.35	1.44	1.53	1.62	1.71	1.80	1.89	1.98	1.94	2.07	2.34	2.52	2.61	2.70

[1]Pipe length baseline temperature = 0°F. "Expansion of Carbon, Copper and Stainless Steel Pipe," *The Engineers' Toolbox*, www.engineeringtoolbox.com.

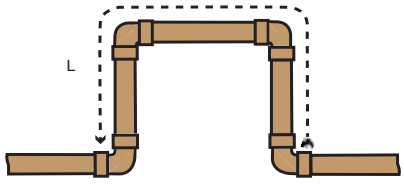
Figure 28: Coiled Expansion Loops and Offsets (Plan View shown).



Large Tubing U-bend (>3/4 in.)



Loop



Small Tubing U-bend (<3/4 in.)

Table 18: Radii of Coiled Expansion Loops and Developed Lengths of Expansion Offsets.

Anticipated Linear Expansion (LE) (inches)		Nominal Tube Size (OD) inches			
		1/4	3/8	1/2	3/4
1/2	R[1]	6	7	8	9
	L[2]	38	44	50	59
1	R[1]	9	10	11	13
	L[2]	54	63	70	83
1-1/2	R[1]	11	12	14	16
	L[2]	66	77	86	101
2	R[1]	12	14	16	19
	L[2]	77	89	99	117
2-1/2	R[1]	14	16	18	21
	L[2]	86	99	111	131
3	R[1]	15	17	19	23
	L[2]	94	109	122	143
3-1/2	R[1]	16	19	21	25
	L[2]	102	117	131	155
4	R[1]	17	20	22	26
	L[2]	109	126	140	166

[1]R = Centerline Length of Pipe.

[2]L = Centerline Minimum Radius (inches).

Note:

All expansion Loops and Offsets should be installed in the horizontal plane to prevent the possibility of trapping oil. Loops and Offsets in vertical risers should also be installed in a horizontal plane.

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GENERAL INSTALLATION GUIDELINES

Piping Materials and Handling

Note:

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

Pipe Bends

When bending soft copper, use long radius bends. Refer to the “Radii of Coiled Expansion Loops and Developed Lengths of Expansion Offsets” table for minimum radius specifications, page 18.

In-line Refrigeration Components

Components such as oil traps, solenoid valves, filter-dryers, sight glasses, tee fittings, and other after-market accessories are not permitted on the refrigerant piping system between the outdoor units and the indoor / branch distribution units. Multi F and Multi F MAX systems are provided with redundant systems that assure oil is properly returned to the compressor. Sight-glasses and solenoid valves may cause vapor to form in the liquid stream. Over time, dryers may deteriorate and introduce debris into the system. The designer and installer should verify the refrigerant piping system is free of traps, sagging pipes, sight glasses, filter dryers, etc.

Field-Provided Isolation Ball Valves

LG maintains a neutral position on using isolation valves in VRF refrigerant piping systems. LG does not endorse any manufacturer of isolation valves. It is recognized that installing isolation valves may simplify future maintenance requirements, and, if used, considerations should be taken including, but not limited to, the following:

- Pressure drops for any component used, including isolation valves, must be known in equivalent pipe length and calculated into the total and segment equivalent piping lengths and compared to product design limitations.
- In all cases, materials must be suitable for the application and any applicable codes, including, but not limited to, diameter and wall thickness continuity per ACR standards.

Failure to do so may cause significant performance degradation. Proper leak checks must be performed. Using isolation valves does not automatically void any LG product warranty; however, a limited warranty may be voided in whole or part should any field supplied accessory fail in any way that causes product failure.

Using Elbows

Field supplied elbows are allowed as long as they are designed for use with R410A refrigerant. The designer and installer, however, should be cautious with the quantity and size of fittings used, and must account for the additional pressure losses in equivalent pipe length calculation for each branch. The equivalent pipe length of each elbow must be added to each pipe segment in the LATS program. See page 35 for equivalent lengths.

Pipe Slope

The horizontal pipe slope cannot exceed 10° up or down.

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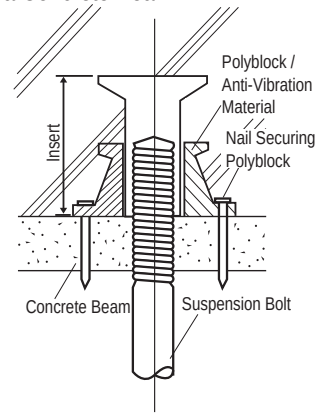
Inserts and Pipe Supports

Inserts

An insert can be installed into a floor or beam before the concrete sets so that fittings such as ducts, pipes, or suspension bolts can be added at a later time. Decide where the inserts should be placed before support installation.

Figure 29: Installing an Insert Into a Concrete Beam.



Pipe Supports

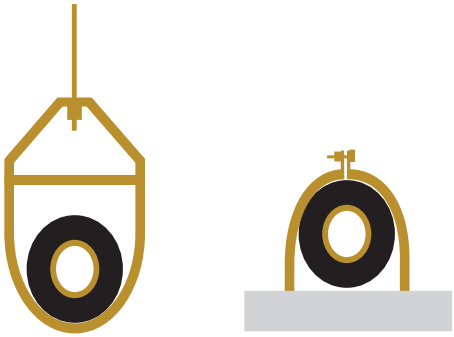
Note:

A properly installed pipe system should be adequately supported to avoid pipe sagging. Sagging pipes become oil traps that lead to equipment malfunction.

⃠ Pipe supports should never touch the pipe wall; supports shall be installed outside (around) the primary pipe insulation jacket.

Insulate the pipe first because pipe supports shall be installed outside (around) the primary pipe insulation jacket. Clevis hangers should be used with shields between the hangers and insulation.

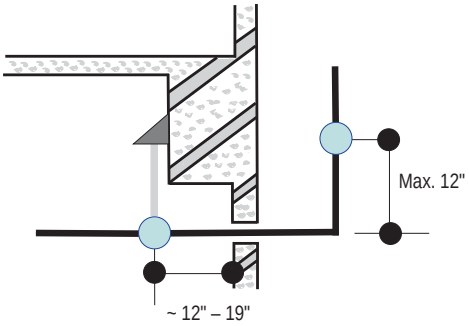
Figure 30: Pipe Hanger Details.



Field provided pipe supports should be designed to meet local codes. If allowed by code, use fiber straps or split-ring hangers suspended from the ceiling on all-thread rods (fiber straps or split ring hangers can be used as long as they do not compress the pipe insulation). Place a second layer of insulation over the pipe insulation jacket to prevent chafing and compression of the primary insulation within the confines of the support pipe clamp.

A properly installed pipe system will have sufficient supports to avoid pipes from sagging during the life of the system. As necessary, place supports closer for segments where potential sagging could occur. Maximum spacing of pipe supports shall meet local codes. If local codes do not specify pipe support spacing, pipe shall be supported a maximum of five (5) feet on center for straight segments of pipe up to 3/4" outside diameter size.

Figure 31: Typical Pipe Support Location—Change in Pipe Direction.



Wherever the pipe changes direction, place a hanger within twelve (12) inches on one side and within twelve to nineteen (12 to 19) inches of the bend on the other side. Support piping at indoor units as shown. Support Y-Branch fittings as shown.

Figure 32: Pipe Support at Indoor Unit.

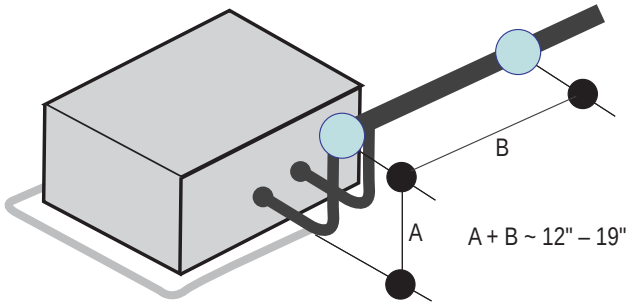
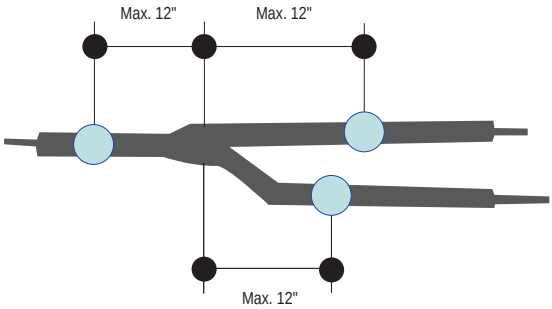


Figure 33: Pipe Support at Y-branch Fitting.



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Examples of Supports

Figure 34: U-Bolt Support with Insulation.

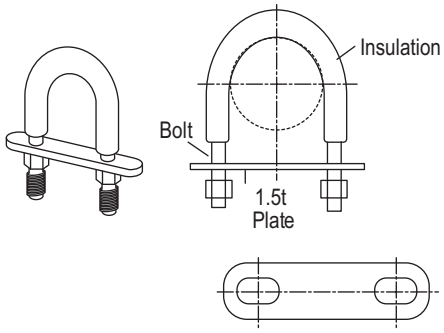


Figure 35: O-Ring Support with Insulation.

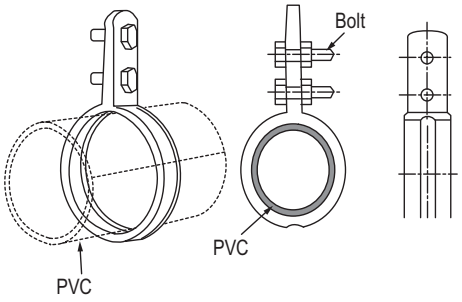
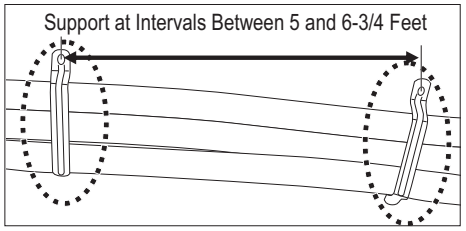


Figure 36: Saddle-Type Support.



Do not compress the insulation with the saddle-type support. If the insulation is compressed, it may tear open and allow condensation to generate during product operation.

Figure 37: U-Bolt Support with an Insulated Pipe.

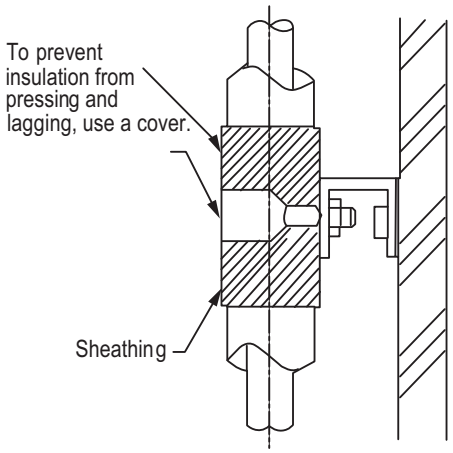


Figure 38: O-Ring Band Support with an Insulated Pipe.

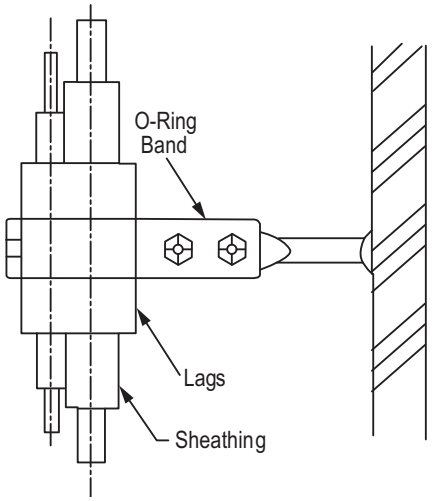


Figure 39: One-Point Down-Stop Support (>441 lbs.).

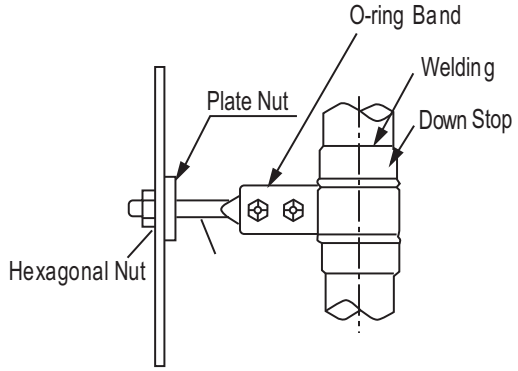
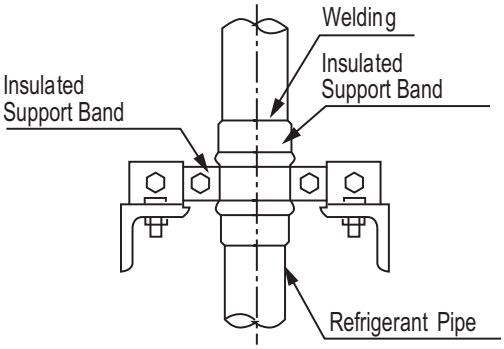


Figure 40: Two-Point Down-Stop Support.



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REFRIGERANT PIPING CONNECTIONS

The following are examples of manual pipe size calculations. Designers are highly encouraged to use LATS for Multi F systems.

Device Connection Limitations

- The minimum number of connected and operating indoor units to Multi F / Multi F MAX systems is two, taking into consideration the minimum combination ratio.
- The maximum number of indoor units for each Multi F / Multi F MAX heat pump systems is:

LMU18CHV = 2 LMU24CHV = 3 LMU30CHV = 4 LMU36CHV = 4 LMU480HV = 8 LMU540HV = 8 LMU600HV = 8

Note:

For allocated capacity information, see the combination tables in the "Multi F / Multi F MAX Combination Data Manual" on www.lg-dfs.com. For performance data, see "Multi F / Multi F MAX Performance Data Manual" on www.lg-dfs.com.

Piping Length and Elevation Limitations

One of the most critical elements of Multi F and Multi F MAX systems is the refrigerant piping. The tables on the next few pages list pipe length limits that must be followed in the design of Multi F and Multi F MAX refrigerant pipe systems.

Using Refrigerant Components

Field-supplied elbows are allowed as long as they are designed for use with R410A refrigerant. The designer, however, should be cautious with the quantity and size of fittings used, and must account for the additional pressure losses in equivalent pipe length calculation for each branch. The equivalent pipe length of each elbow must be added to each pipe segment.

Table 20: Equivalent Piping Length for Elbows, Y-branches, and Branch Distribution Units.

Component	Size (Inches)				
	1/4	3/8	1/2	5/8	3/4
Elbow (ft.)	0.5	0.6	0.7	0.8	1.2
Y-Branch Kit (ft., Multi F MAX systems only)[1]	1.6				
Branch Distribution Unit (ft., Multi F MAX systems only)	8.2				

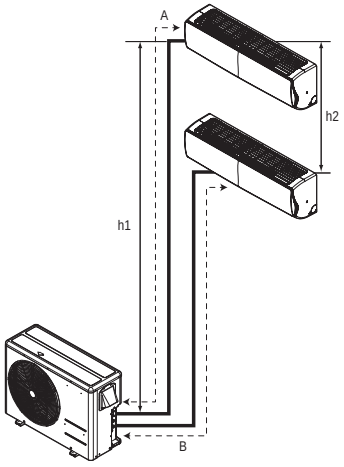
[1]Kit contains two Y-branches: one for liquid and one for vapor.

Multi F Outdoor Unit Piping Length and Elevation Limitations

Table 19: Multi F Refrigerant Piping System Limitations.

Outdoor Unit Model (Btu/h)	LMU18CHV / 18,000	LMU24CHV / 24,000	LMU30CHV / 30,000	LMU36CHV / 36,000
Max. Total System Piping Length (ft.)	164 A+B	246.1 A+B+C	246.1 A+B+C+D	246.1 A+B+C+D
Min. Length for One Branch (ft.)	9.8	9.8	9.8	9.8
Max. Length for One Branch (ft.)	82	82	82	82
Max. Elevation Between Each Indoor Unit and Outdoor Unit (h1)	49.2	49.2	49.2	49.2
Max. Elevation Between Indoor Units (h2)	24.6	24.6	24.6	24.6
Max. Combination of Indoor Units	24,000	33,000	40,000	48,000

Figure 41: Multi F Refrigerant Piping System Limitations (LMU18CHV Example).



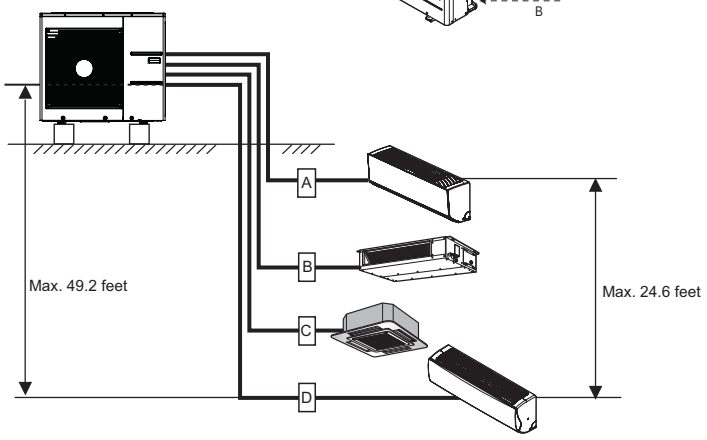
Multi F System Example

Example: LMU36CHV outdoor unit with four (4) indoor units connected.

ODU: Outdoor Unit.

IDU: Indoor Unit.

A, B, C, D: Pipes from Outdoor Unit to Indoor Unit.



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REFRIGERANT PIPING CONNECTIONS

The following are examples of manual pipe size calculations. Designers are highly encouraged to use LATS for Multi F systems.

Multi F MAX Outdoor Unit Piping Length and Elevation Limitations

Table 22: Multi F MAX Refrigerant Piping System Limitations.

Pipe Length (ELF = Equivalent Length of pipe in Feet)	**Total piping length (ΣA + ΣB)**		≤475.7 feet
	Main pipe (Outdoor Unit to Branch Distribution Units: **ΣA)**	Minimum	9.8 feet
		Maximum	≤180.4 feet
	Total branch piping length (ΣB)		≤295.3 feet
	Branch pipe (Branch Distribution Units to Indoor Units: B)	Minimum	10 feet
		Maximum	≤49.2 feet
Elevation Differential (All Elevation Limitations are Measured in Actual Feet)	If outdoor unit is above or below indoor unit (h1)		≤98.4 feet
	Between the farthest two indoor units (h2)		≤49.2 feet
	Between branch distribution unit and farthest connected indoor unit(s) (h3)		≤32.8 feet
	Between branch distribution units (h4)		≤49.2 feet
Max. Combination of IDUs	LMU480HV = 65,000	LMU540HV = 73,000	LMU600HV = 81,000

Figure 42: Multi F MAX Refrigerant Piping System Limitations.

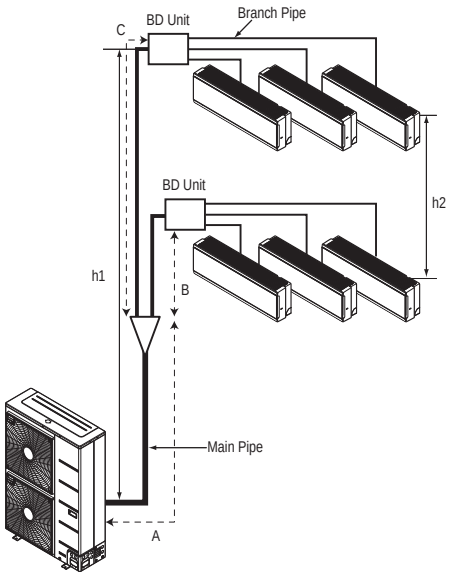


Table 23: Multi F MAX Piping Sizes.

Piping	Main Pipe A (inch)	Branch Pipe B
Liquid	Ø3/8	Depends on the size of the indoor unit piping
Gas	Ø3/4	

Multi F MAX System Example with One Branch Distribution Unit

Example: LMU540HV outdoor unit with four (4) indoor units, and one (1) branch distribution unit connected.

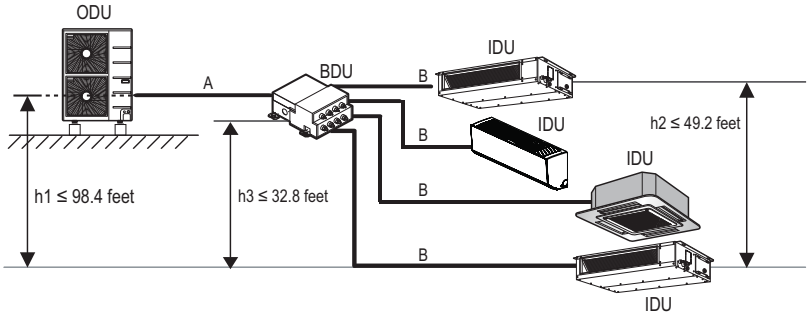
ODU: Outdoor Unit.

IDU: Indoor Unit.

BDU: Branch Distribution Unit.

A: Main Pipe.

B: Branch Pipe (Branch Distribution Unit to Indoor Unit[s]).



Multi F MAX System Example with Two Branch Distribution Units

Example: LMU540HV outdoor unit with seven (7) indoor units, and two (2) branch distribution units connected.

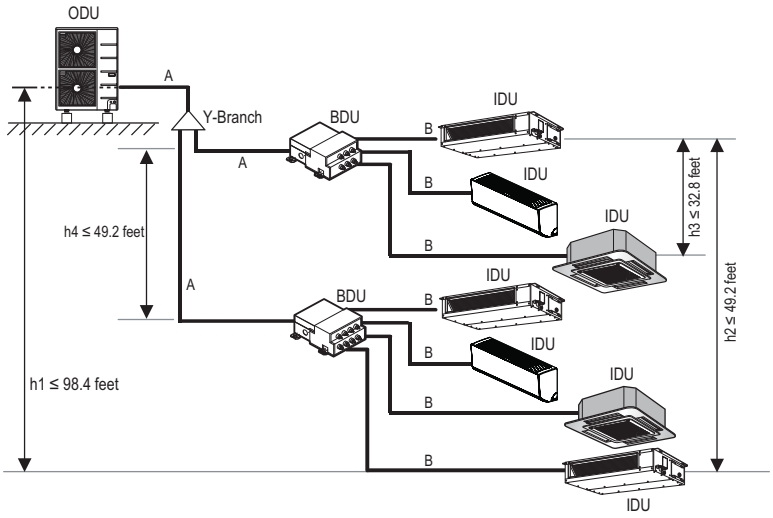
ODU: Outdoor Unit.

IDU: Indoor Unit.

BD: Branch Distribution Unit(s).

ΣA: Main Pipe.

ΣB: Branch Pipe (Branch Distribution Unit[s] to Indoor Unit[s]).



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Multi F Outdoor Unit to Indoor Unit Piping Connections

Note:

Avoid Pipe Damage

- *When routing field-provided piping, avoid damaging the outdoor unit from excessive vibration.*
- *Properly insulate the liquid and gas lines separately up to the point of connection at the unit frame.*
- *See table below for Multi F outdoor unit connection types.*

⃠ *Correctly route the piping so it does not make contact with mounting bolts. Allow room for field installation.*

Figure 43: Multi F Refrigerant Pipe Connections (LMU36CHV shown as example).

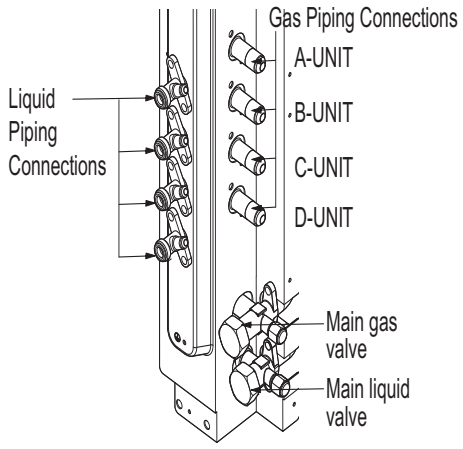


Table 24: Outdoor Unit Piping Connections.

Outdoor Unit Piping Connections	LMU18CHV	LMU24CHV	LMU30CHV	LMU36CHV
Liquid Line Connection (in., OD) x Qty.	1/4 x 2	1/4 x 3	1/4 x 4	1/4 x 4
Vapor Line Connection (in., OD) x Qty.	3/8 x 2	3/8 x 3	3/8 x 4	3/8 x 4

Table 25: Indoor Unit Pipe Sizes.

Indoor Unit Capacity	Vapor Line Piping Size (in., OD)	Liquid Line Piping Size (in., OD)
7,000 Btu/h	Ø3/8	Ø1/4
9,000 Btu/h		
12,000 Btu/h		
15,000 Btu/h		
18,000 Btu/h	Ø1/2	
24,000 Btu/h		

Connection sockets (included as a factory-supplied accessory with the indoor units) may need to be used when piping the indoor units to the outdoor unit. If a 36K indoor unit is included, the connection sockets are included with the Branch Distribution unit.

Table 26: Connection Socket Dimensions.

Indoor Unit Capacity	Vapor (in., OD)		Liquid (in., OD)	
	A	B	A	B
18,000 Btu/h: Wall-Mounted	Ø3/8 → Ø1/2, Ø1/2 → Ø5/8		Ø1/4 → Ø3/8	
18,000 Btu/h: Low Static Duct, Four-Way Cassette	Ø3/8 → Ø1/2		N/A	
24,000 Btu/h	Ø3/8 → Ø1/2		N/A	

Using the Connection Socket

1. Align the center of the piping sections and tighten the flare nut by hand.

2. Tighten the flare nut with a torque wrench, using the arrows on the wrench as a guide, until a click is heard.

Table 27: Indoor Unit Piping Connections.

Indoor Unit Capacity	Vapor Line Conn. (in., OD)	Liquid Line Conn. (in., OD)
7,000 Btu/h	Ø3/8	Ø1/4
9,000 Btu/h		
12,000 Btu/h		
15,000 Btu/h		
18,000 Btu/h: Wall-Mounted	Ø5/8	Ø3/8
18,000 Btu/h: Low Static Duct, Four-Way Cassette	Ø1/2	Ø1/4
24,000 Btu/h	Ø1/2	Ø1/4

Figure 44: Connection Socket Diagram.

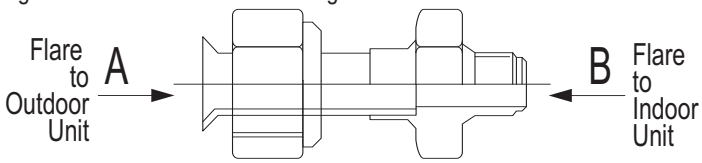
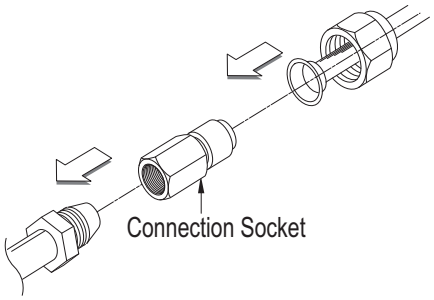


Figure 45: Performing Connections.



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Multi F MAX Outdoor Unit System Piping Connections

Note:

Avoid Pipe Damage

- *When routing field-provided piping, avoid damaging the outdoor unit from excessive vibration.*
- *Properly insulate the liquid and gas lines separately up to the point of connection at the unit frame.*
- *See table below for Multi F MAX outdoor unit connection types.*

⃠ *Correctly route the piping so it does not make contact with mounting bolts. Allow room for field installation.*

Table 28: Outdoor Unit Piping Connections.

Outdoor Unit Piping Connections	LMU480HV, LMU540HV, LMU600HV
Liquid Line Connection (in., OD) x Qty.	3/8 x 1
Vapor Line Connection (in., OD) x Qty.	3/4 x 1

Branch Distribution to Indoor Unit Piping Connections

- Install indoor unit liquid and vapor refrigerant pipes (and connection wiring) to the appropriate branch distribution ports.
- Clearly note on the indoor unit's refrigerant piping (liquid, vapor) which branch distribution port it is connected to (A, B, C, D).

Table 29: Branch Distribution Unit Piping Connections.

Branch Distribution Unit	PMBD3620	PMBD3630	PMBD3640	PMBD3641
Piping Connections to Outdoor Unit				
Liquid (in., OD) x Qty.	Ø3/8 x 1			
Vapor (in., OD) x Qty.	Ø3/4 x 1			
Piping Connections to Indoor Units				
Liquid (in., OD) x Qty.	Ø1/4 x 2	Ø1/4 x 3	Ø1/4 x 4	Ø1/4 x 4
Vapor (in., OD) x Qty.	Ø3/8 x 2	Ø3/8 x 3	Ø3/8 x 4	Ø3/8 x 3, Ø1/2 x 1

Figure 46: Branch Distribution Ports to Indoor Units.

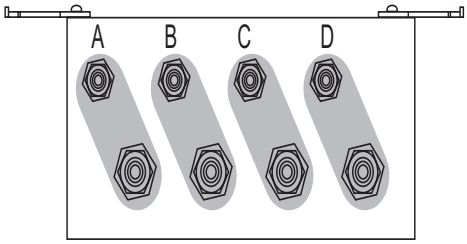


Table 30: Indoor Unit Pipe Sizes.

Indoor Unit Capacity	Vapor Line Piping Size (in., OD)	Liquid Line Piping Size (in., OD)
7,000 Btu/h	Ø3/8	Ø1/4
9,000 Btu/h		
12,000 Btu/h		
15,000 Btu/h		
18,000 Btu/h	Ø1/2	
24,000 Btu/h		
36,000 Btu/h	Ø5/8	Ø3/8

Table 31: Indoor Unit Piping Connections.

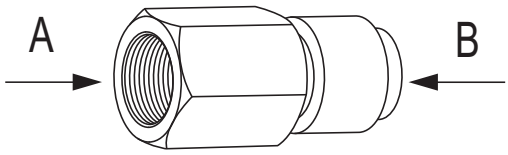
Indoor Unit Capacity	Vapor Line Conn. (in., OD)	Liquid Line Conn. (in., OD)
7,000 Btu/h	Ø3/8	Ø1/4
9,000 Btu/h		
12,000 Btu/h		
15,000 Btu/h		
18,000 Btu/h: Wall-Mounted	Ø5/8	Ø3/8
18,000 Btu/h: Low Static Duct, Four-Way Cassette	Ø1/2	Ø1/4
24,000 Btu/h	Ø1/2	Ø1/4
36,000 Btu/h	Ø5/8	Ø3/8

Connection sockets (included as a factory-supplied accessory with the indoor units) may need to be used when piping the indoor units to the branch distribution unit. If a 36K indoor unit is included, the connection sockets are included with the Branch Distribution unit.

Table 32: Connection Socket Dimensions.

Indoor Unit Capacity	Vapor (in., OD)		Liquid (in., OD)	
	A	B	A	B
18,000 Btu/h: Wall-Mounted	Ø3/8 → Ø1/2, Ø1/2 → Ø5/8		Ø1/4 → Ø3/8	
18,000 Btu/h: Low Static Duct, Four-Way Cassette	Ø3/8 → Ø1/2		N/A	
24,000 Btu/h	Ø3/8 → Ø1/2		N/A	
36,000 Btu/h	Ø1/2 → Ø5/8		Ø1/4 → Ø3/8	

Figure 47: Connection Socket Diagram.



Connection Socket

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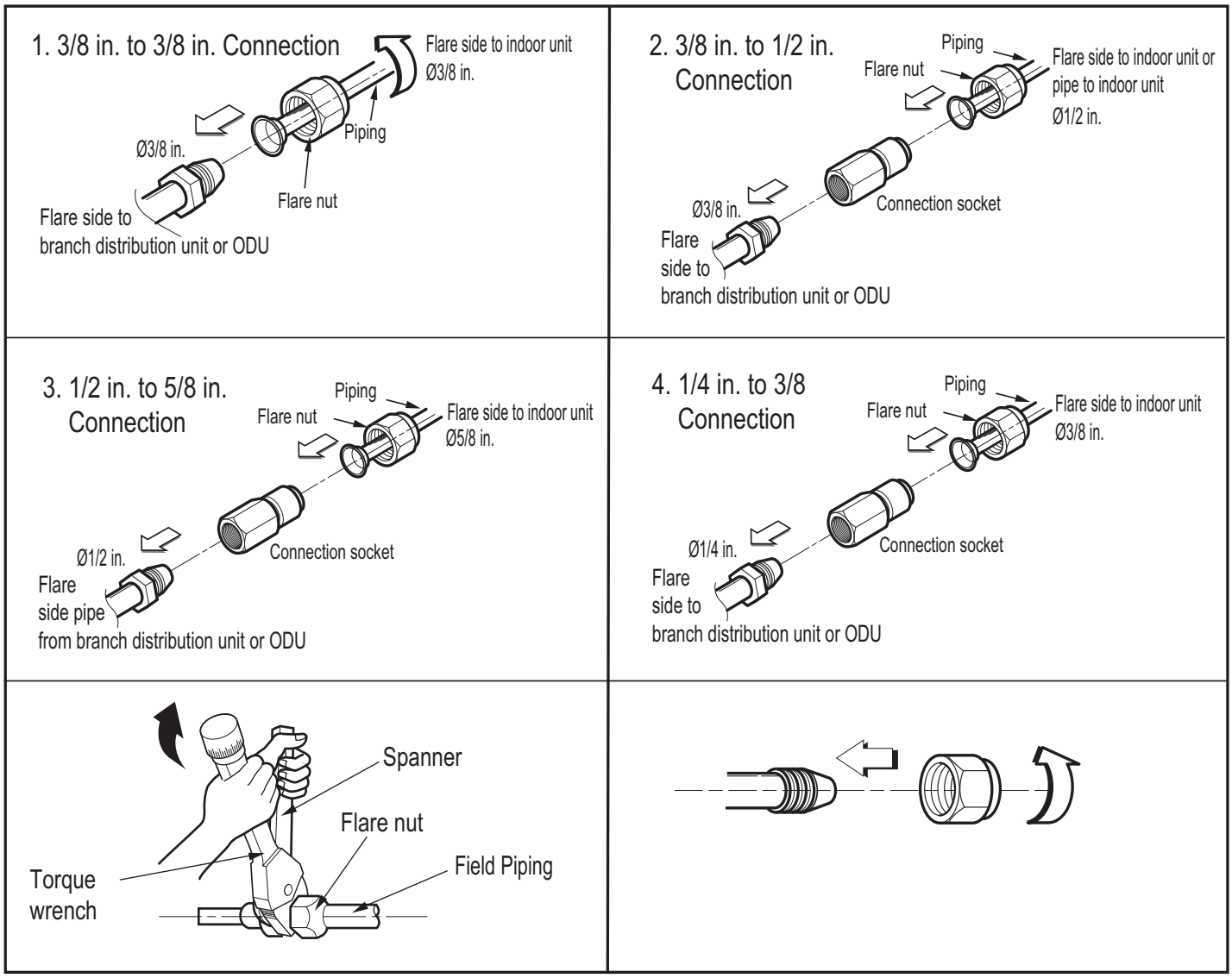
Multi F MAX Outdoor Unit System Piping Connections, continued.

1. Align the center of the piping sections and tighten the flare nut by hand.
2. Tighten the flare nut with a torque wrench, using the arrows on the wrench as a guide, until a click is heard.
3. Wrap insulation around the connection.

Figure 48: Possible Outdoor Unit or Branch Distribution Unit to Indoor Unit Connections.



Outdoor Unit Condensate Drain Piping

Outdoor unit requires condensate drain piping. Condensate drain pipe is constructed with materials approved by local code. See pages 13 to 17 for information in reference to outdoor unit placement and condensate drainage.

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Multi F MAX Y-Branch Kit PMBL5620

Y-branches may be installed in horizontal or vertical configurations. When installed vertically, position the Y-branch so the straight-through leg is ±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 ±5° rotation.

Y-branches should always be installed with the single port facing the outdoor unit and the two-port end facing the branch distribution units.

The equivalent pipe length of each Y-branch (1.6') must be added to the main pipe segment entered into LATS Multi F piping design software.

Figure 50: Horizontal Configuration End View.

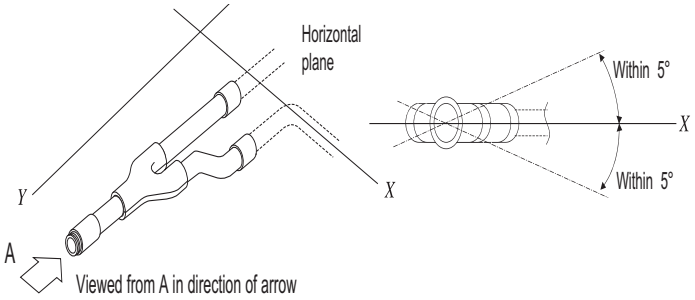


Table 33: Y-Branch Connection Diameters.

Model	Y-Branch Type	Port Identifier (inch)			Dimensions	
		1	2	3	X	Y
PMBL5620	Liquid	3/8	3/8	3/8	13.80	3.24
	Vapor	3/4	3/4	3/4	12.48	3.02

Figure 49: Y-Branch Port Identifier Diagram.

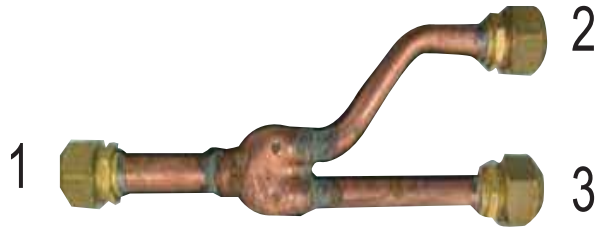
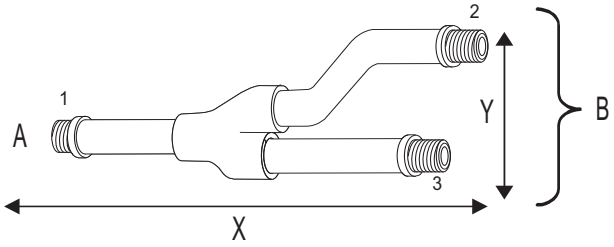
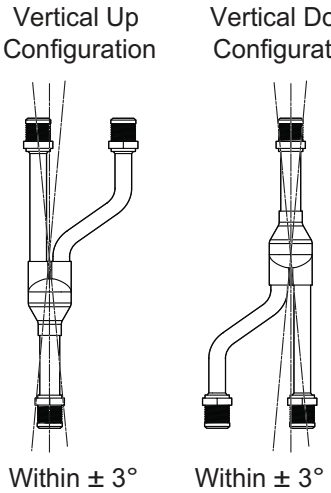


Figure 51: Y-Branch Dimensions Diagram.



A = To Outdoor Unit B = To Branch Distribution Unit

Figure 52: Y-branch Installation Alignment Specification.



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Flushing the Refrigerant Piping

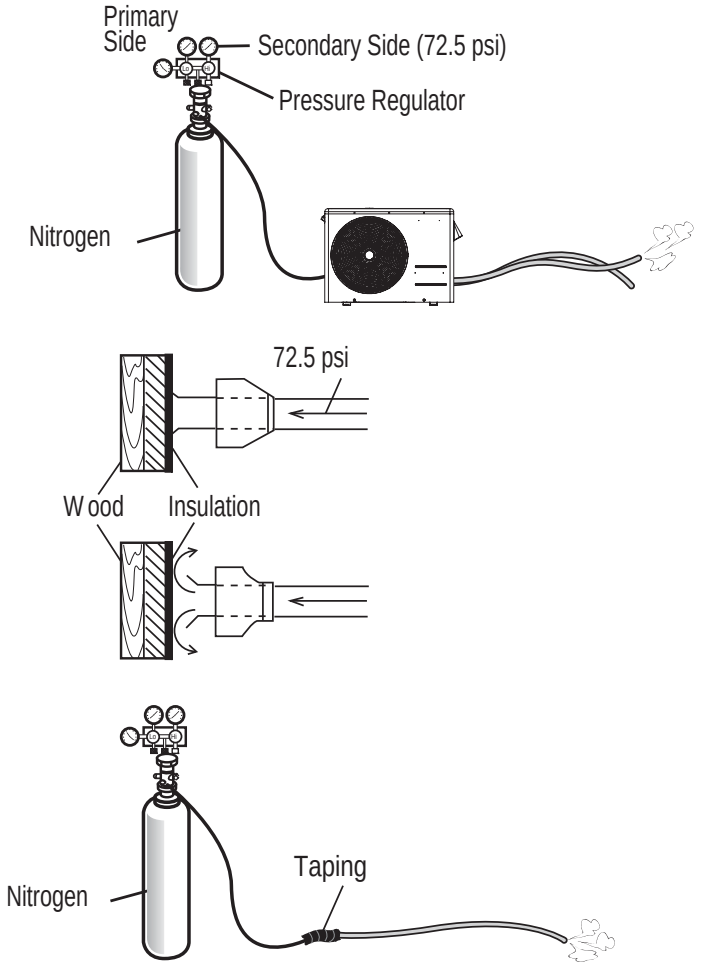
Flushing is a method of cleaning the refrigerant piping using pressurized nitrogen gas. Flushing:

1. Removes oxidation bubbles that may have formed inside the copper piping if nitrogen replacement was insufficient during soldering.
2. Removes foreign material and moisture from piping if the piping wasn't stored properly.
3. Checks connections in pipes linking outdoor and indoor units (both liquid and gas pipes).

Flushing the Refrigerant Piping Procedure

1. Attach a pressure regulator on a nitrogen cylinder.
2. Connect the charge hose from the pressure regulator to the outdoor unit liquid piping side service port before its connection to the indoor or BD (Multi F MAX systems only) unit piping.
3. Open the main valve on the nitrogen cylinder and set the pressure regulator to 0.5 MPa (72.5 psi).
4. Verify that the nitrogen is flowing through the piping correctly.
5. When flushing, block the open end of the piping with a wood insulation block. When the pressure becomes too high, quickly remove the block.
6. Repeat steps 4 and 5 until the piping is completely flushed and clean.
7. Connect the charge hose from the pressure regulator to the outdoor unit gas piping side service port before its connection to the indoor or BD (Multi F MAX systems only) unit piping.
8. Follow steps 3, 4, 5, and 6.
9. For systems with BD unit(s) (Multi F MAX only), each piping run should be flushed individually before connecting the indoor units (follow steps 3, 4, 5, and 6).

Figure 53: Flushing the Refrigerant Piping.



Note:

Nitrogen flushing is strongly recommended after soldering. Foreign materials in the piping will cause system malfunction.

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REFRIGERANT PIPING PREPARATION

Leak Test

Leak Test and Vacuum Procedures

Before performing the test run, Multi F and Multi F MAX refrigerant piping and the piping connections to the outdoor unit, the indoor units, and the BD units (Multi F MAX systems only) must be evacuated to remove any non-condensible gases and moisture that may be present in the system, and checked for leaks. Air and moisture that is left in the piping can lead to undesirable results and can cause damage to the working unit. It is important to go through a complete air purging cycle to be sure that the lines are cleared out. Note that this process may have to be repeated should any air or moisture be found to remain in the piping. After air purging and evacuating the lines, be sure to take a leak test for all piping and tubing. If any air and moisture remain in the refrigerant system:

1. Pressure in the system rises.
2. Operating current rises.
3. Cooling or heating efficiency drops.
4. Moisture in the refrigerant circuit may freeze and block capillary tubing.
5. Water may corrode parts of the refrigeration system.

Leak Test

Note:

Perform the leak test by pressurizing nitrogen gas to 550 psi on both the liquid and gas pipes. Test with the piping service valves closed. If the pressure does not drop for twenty-four (24) hours, the system passes the test. If the pressure drops, there is a nitrogen leak in the system. Find the leak, repair, and then test again.

Before the Leak Test

1. Check that all refrigerant piping, the drain pipe, and power wiring / communications cables are properly connected.
2. Remove the caps from both the gas and the liquid service valves on the outdoor unit. Verify that both service valves are closed.

Pressure Gauge Hookup

3. Connect the manifold valve (which includes the pressure gauges), along with the dry nitrogen gas cylinder, to the service valves using the charge hoses.

Note:

Use a manifold valve for leak testing. The high side manifold valve must always be kept closed.

Leak Test Procedure

4. Pressurize the system to maximum 550 psig with the dry nitrogen gas.

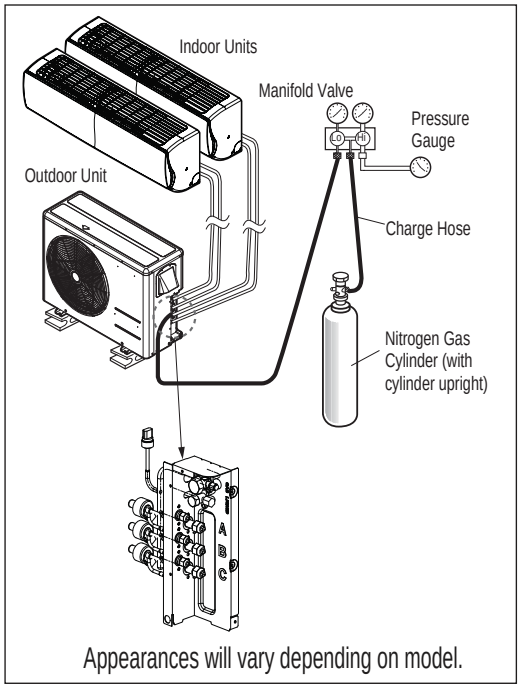
⚠DANGER

Use of combustible gases including oxygen, may result in fire or explosion, resulting in personal injury or death.

⚠WARNING

Use of combustible gases including oxygen runs the risk of fire and explosion, resulting in personal injury or death. Inert gas (nitrogen) should be used when checking leaks, cleaning or repairs of pipes, etc.

Figure 54: Leak Test Diagram.



Appearances will vary depending on model.

Note:

- *To avoid nitrogen entering the refrigerant system in a liquid state, the top of the cylinder must be higher than its bottom when the system is pressurized.*
- *The cylinder should be used in a vertical standing position.*

5. Close the cylinder valve when the gauge reading reaches 550 psig, and then test for leaks using the liquid soap method.
6. While running the nitrogen gas tank hookup, apply a soap water or a liquid neutral detergent to all indoor, BD, outdoor unit connection(s), and all refrigerant piping joints with a soft brush. Also test for leaks at both of the gas and liquid side service valves.

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REFRIGERANT PIPING PREPARATION

Leak Test

Leak Test Procedure, continued.

7. While operating the pressure gauge system, observe the connections for any leaks. If bubbles appear at any of the connections (indoor, BD, and outdoor units) or refrigerant piping joints, a leak is present.
8. Make a note of where the leaks are, and remove the soap with a clean cloth.
9. Disengage the nitrogen pressure by loosening the charge hose connector at the nitrogen cylinder. After the system pressure is back to normal range, disconnect hose from the cylinder.
10. Repair the connections and piping where bubbles / leaks were observed. When finished, repeat leak testing using the liquid soap method and nitrogen cylinder.
11. After system is leak free, depressurize by loosening the charge hose connector at the nitrogen cylinder. When system pressure returns to normal, disconnect the hose from the cylinder.

Essential Points for Leak Testing

The key to successful testing is strict adherence to the leak testing procedure.

1. The liquid and gas piping in each refrigerant system should be pressurized with nitrogen gas in accordance with the steps listed below.

   Step 1: Pressurize to 43.5 psi for three (3) minutes or more. (Will identify if major leaks are present in the system.)

   Step 2: Pressurize to 217.6 psi for three (3) minutes or more. (Will identify if major leaks are present in the system.)

   Step 3: Pressurize to 551.1 psi for approximate twenty-four (24) hours. (Will identify if minor leaks are present in the system.)

Pressurizing the system to 551.1 psi does not guarantee the identification of minor leaks if the pressure is maintained for only a short time. It is recommended that the system remain pressurized for at least 24 hours.

Note:

Piping system should not be pressured to more than 551.1 psi. Pressures greater than 551.1 psi may damage the piping system and cause unit malfunction.

2. Check for pressure drop. If there is no drop in pressure, the test is successful. If the pressure drops, there is a leak in the piping system. If, however, there was a change in the ambient temperature between when pressure was initialized and when pressure drop is checked, then calculations must be adjusted accordingly. A difference of 1.8°F can account for a pressure change of 1.45 psi.

Compensation Value: Temperature at Pressure Initialization – Temperature at Pressure Check × 1.45

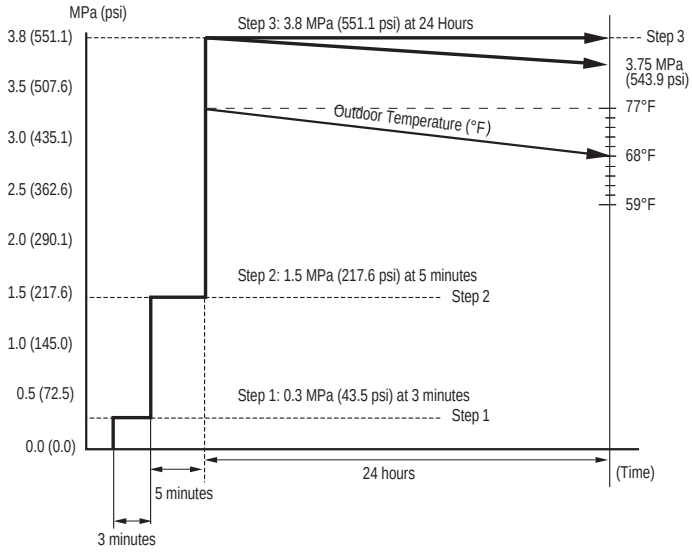
Example:

During Leak Test: 551.1 psi at 77°F

Twenty-four (24) Hours Later: 543.9 psi at 68°F

Although the pressure dropped from 551.1 psi to 543.9 psi, it can be assumed that there are no leaks because pressure can also drop due to the change in outdoor temperature.

Figure 55: Leak Test Time Diagram.



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Vacuum Procedure

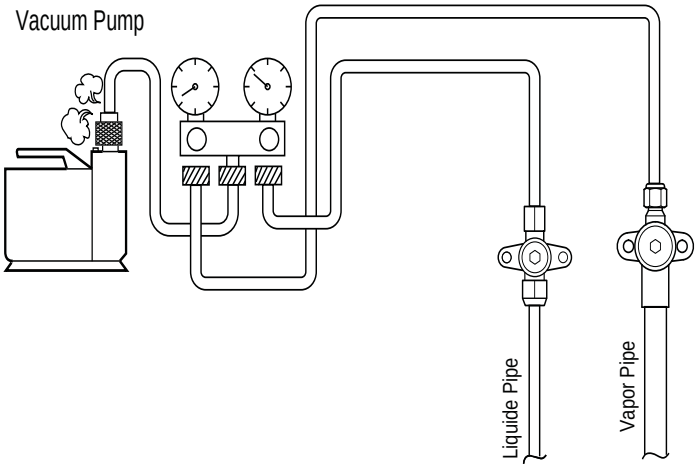
Vacuum drying should be performed from the service port provided on the outdoor unit's service valve to the vacuum pump commonly used for liquid pipe and the vapor pipe. Vacuum of the pipe and the indoor units should be made from the port of the outdoor unit's service valve with the service valve closed.

Note:

- ⃠ *Never perform air purging using refrigerant; it will damage the outdoor unit.*
- *Use a vacuum pump that can evacuate to 500 microns.*

1. Evacuate the system from the liquid and vapor pipes with a vacuum pump for over two (2) hours and bring the system to 500 microns.
2. Maintain system under that condition for over one (1) hour; if the vacuum gauge rises, the system may contain moisture or a leak.
3. If there is a possibility of moisture in the piping (rainwater may have entered the piping if work was performed during a rainy season or over an extended period), then:
   - Evacuate the system for two (2) hours to 7.3 psi (vacuum break) with nitrogen gas.
   - Evacuate it again with the vacuum pump for one (1) hour to 500 microns (vacuum drying).
4. If the system cannot be evacuated to 500 microns, repeat the steps of vacuum break and drying.
5. Finally, after maintaining the system in vacuum for one (1) hour, check if the vacuum gauge rises or not.

Figure 56: Vacuum Procedure Diagram.



Note:

- *If the primary refrigerant charge is not performed in a reasonable time after the vacuum procedure is complete, wet air may infiltrate the outdoor unit. If wet air is mixed with refrigerant, the refrigerant cycle may malfunction and the unit may be damaged.*
- ⃠ *Do not perform refrigerant charge while the compressor is operating, otherwise, liquid may leak and subsequently damage the compressor.*
- *Use a micron gauge to measure vacuum.*
- *Obtain the precise amount of refrigerant needed using calculations outlined in the following pages. Too much or too little refrigerant may cause the system to malfunction.*
- *If other refrigerants are mixed in the original refrigerant, the refrigerant piping system may be damaged or malfunction.*
- *Because R410A is a mixed refrigerant, the required additional refrigerant must be charged in its liquid state. If the refrigerant is charged in its gaseous state, its composition changes and the system will not work properly.*

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REFRIGERANT PIPING PREPARATION

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 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.

Table 34: Outdoor Unit Factory Charge.

Outdoor Unit	Factory Charge lbs. of R410A
LMU18CHV	3.96
LMU24CHV	3.96
LMU30CHV	6.18
LMU36CHV	6.18
LMU480HV	9.7
LMU540HV	9.7
LMU600HV	12.3

Multi F Systems

Additional charge (lbs.) = (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

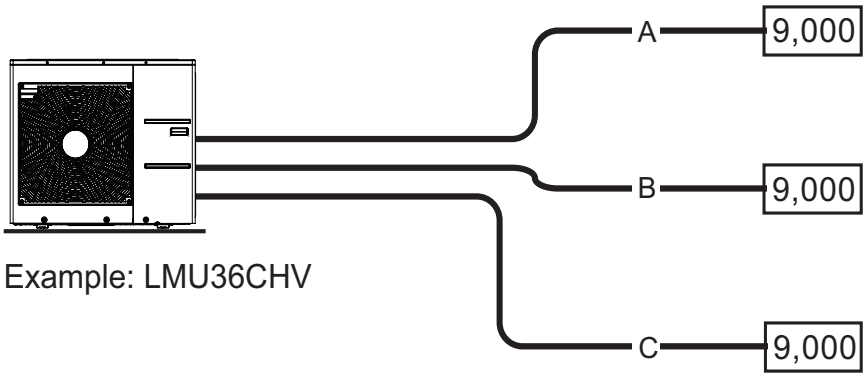
Note:

- *Number of installed length of branches depends on the specifications of the outdoor unit model.*
- *CF = Maximum number of connectible indoor units – Total number of connected indoor units.*

Table 35: Multi F Outdoor Unit Piping Specifications.

Outdoor Unit Model	Min. to Max. Piping Length for One Branch (ft.)	Max. Total System Piping Length (ft.)	Chargeless Pipe Length per Branch (L) (ft.)	Piping Length (No Additional Refrigerant [ft])	Additional Charge Needed (a) (oz./ft.)
LMU18CHV	9.8 to 82	164	24.6	49.2	0.22
LMU24CHV	9.8 to 82	246.1	24.6	73.8	0.22
LMU30CHV	9.8 to 82	246.1	24.6	98.4	0.22
LMU36CHV	9.8 to 82	246.1	24.6	98.4	0.22

Figure 57: Multi F Additional Refrigerant Charge Example.



Example: LMU36CHV

Each branch pipe
A = 82 ft.
B = 16 ft.
C = 49 ft.

Additional Charge
= (82 - 24.6) x 0.22
+ (16 - 24.6) x 0.22
+ (49 - 24.6) x 0.22
- (4 - 3) x 5.29
= 10.82 oz.

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REFRIGERANT PIPING PREPARATION

Refrigerant Charge

Multi F MAX Systems

Additional charge (lbs.) = (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

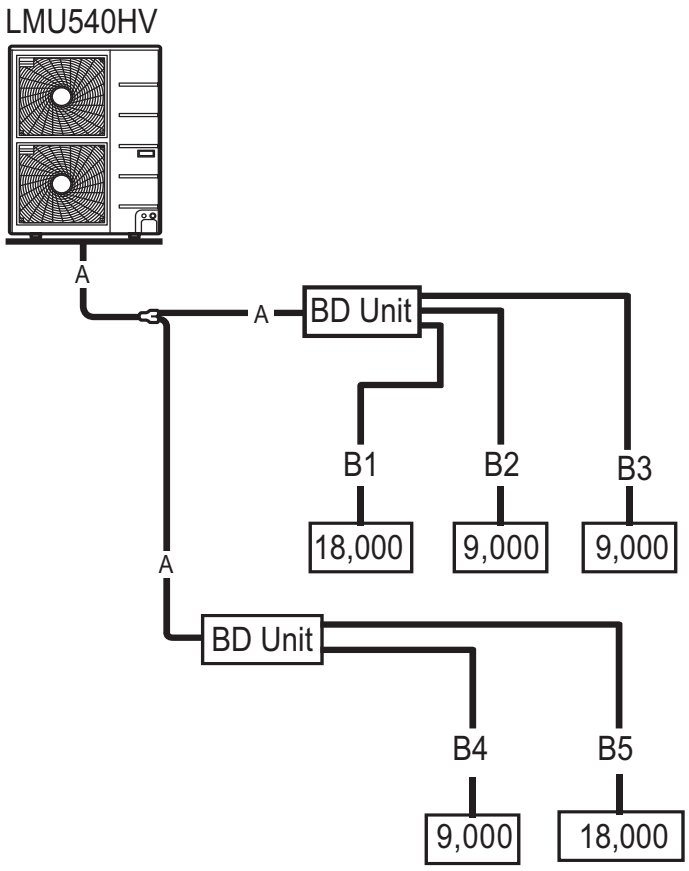
Note:

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

Table 36: Multi F MAX Outdoor Unit Piping Specifications.

Outdoor Unit Model	Main Piping Length		Branch Piping Length	
	Chargeless Pipe Length of Main Pipe (L) (ft.)	Additional Charge Needed (a) (oz./ft.)	Chargeless Pipe Length per Branch Pipe (B) (ft.)	Additional Charge Needed (b) (oz./ft.)
LMU480HV	16.4	0.54	16.4	0.22
LMU540HV	16.4	0.54	16.4	0.22
LMU600HV	16.4	0.54	16.4	0.22

Figure 58: Multi F MAX Additional Refrigerant Charge Example.



- Total main pipe (A) = 60 ft.
- Each branch pipe
  B1 = 49 ft.
  B2 = 17 ft.
  B3 = 17 ft.
  B4 = 10 ft.
  B5 = 23 ft.

Additional Charge
= (60 - 16.4) x 0.54
+ (49 - 16.4) x 0.22
+ (17 - 16.4) x 0.22
+ (17 - 16.4) x 0.22
+ (10 - 16.4) x 0.22
+ (23 - 16.4) x 0.22
– (8 - 5) x 3.53
= 20.43 oz.

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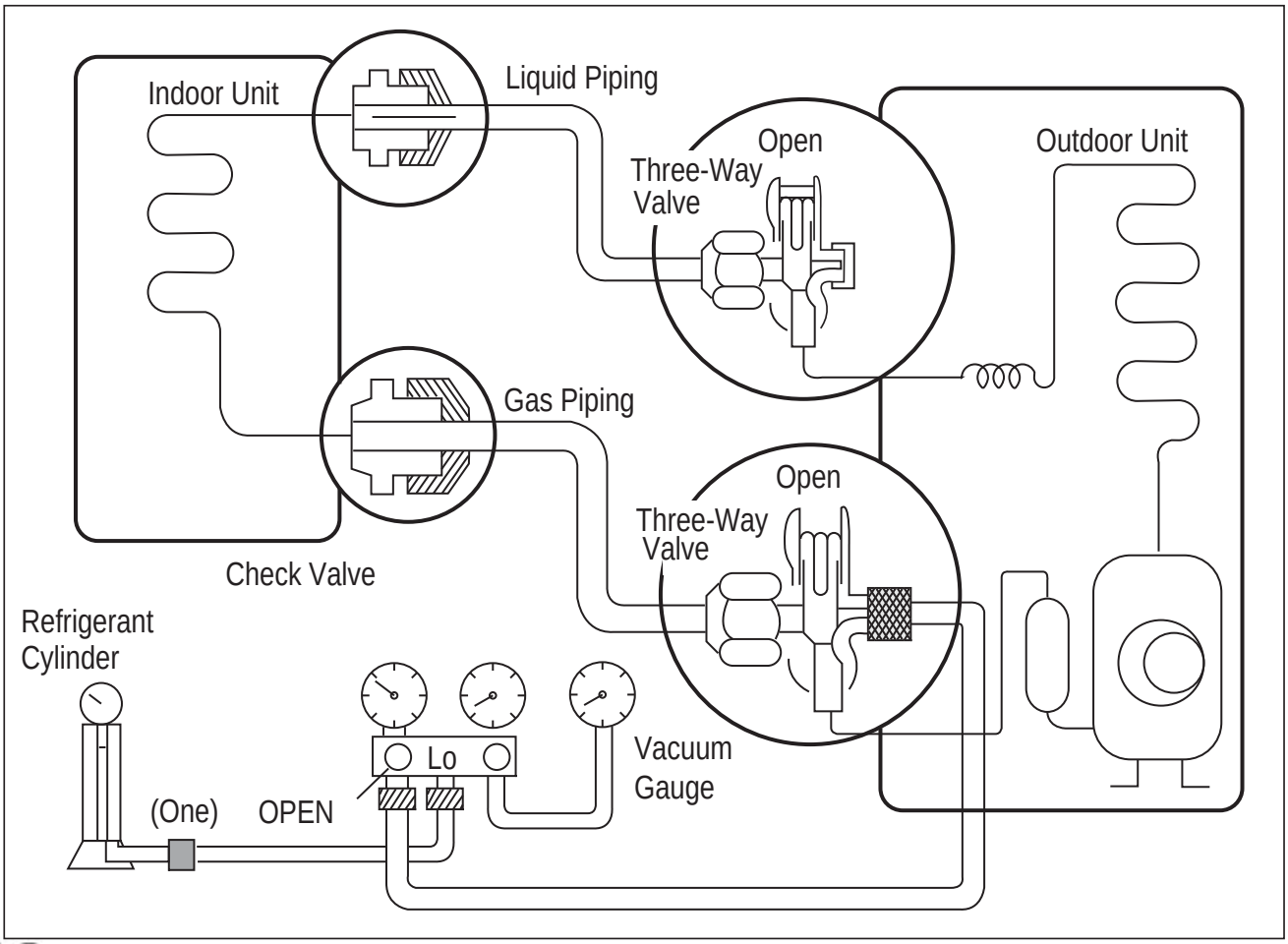
Charging the Refrigerant

1. Determine the refrigerant that is needed, applying the necessary formulas as outlined in the previous pages.
2. Connect the charging cylinder to the charge hose on the manifold valve.
3. Purge air from the charge hose by opening the valve at the bottom of the cylinder, and press the check valve on the manifold valve.
4. Confirm that the “Lo” knob of the manifold valve is open and charge the system with liquid refrigerant. (Because R-410A is a non-azeotrope refrigerant, it must be charged in the liquid state.)
   - If the required amount of refrigerant cannot be charged all at once, the refrigerant can be charged a little at a time (approximately 5.29 ounces) while the system operates in cooling. This procedure must be repeated until the entire amount of refrigerant gets charged into the system; perform once, then wait approximately one [1] minute before resuming.
5. Immediately disconnect the charge hose from the service port on the three-way valve. Stopping halfway allows the refrigerant to discharge.
   - If the system has been charged with liquid refrigerant while it operates, turn the system off before disconnecting the hose.
6. Mount the valve stem nuts and the service port nut. Use torque wrench to tighten the service port nut to a torque of 1.8 kg.m and check for leaks.

⚠ WARNING

When installing or relocating the outdoor unit, make sure that no substance other than the specified refrigerant (R410A) enters the refrigerant circuit. Any presences of foreign substances such as air can cause an abnormal pressure rise and may result in explosion and physical injury.

Figure 59: Charging the Refrigerant.



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Refrigerant Piping System Insulation

All refrigerant piping from the outdoor unit to the indoor units / BD units (Multi F MAX systems only) must be insulated correctly for safety and usage. Y-branch connections, refrigerant piping, field-provided isolation ball valves (if present), service valves, and elbows must be properly and completely insulated using closed cell pipe insulation (up to the indoor unit piping connections). To prevent heat loss / heat gain through the refrigerant piping, all refrigerant piping including liquid lines and vapor lines shall be insulated separately. Insulation shall be a minimum 1/2" thick, and thickness may need to be increased based on ambient conditions and local codes. Table below lists minimum wall thickness requirements for Ethylene Propylene Diene Methylene (EPDM) insulation.

Inside the outdoor unit, maximum pipe temperature is 248°F and minimum pipe temperature is -40°F. For field insulation of refrigerant piping between outdoor units and indoor units, consider the following pipe temperature ranges for an operating heat pump system:

- Heating mode refrigerant temperature ranges: Liquid 75-118°F; High Pressure Vapor 95-220°F
- Cooling mode refrigerant temperature ranges: Liquid 75-118°F; Low Pressure Vapor 40-90°F

Figure 60: Typical Pipe Insulation, Power Wire and Communications Cable Arrangement

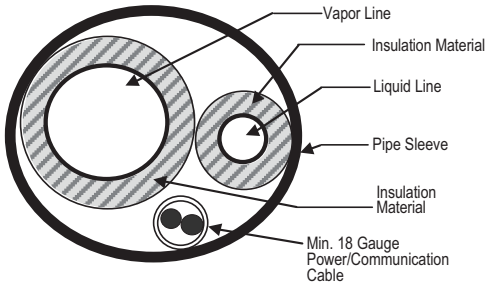


Figure 61: Typical Insulation Butt-Joint at Indoor Unit Casing

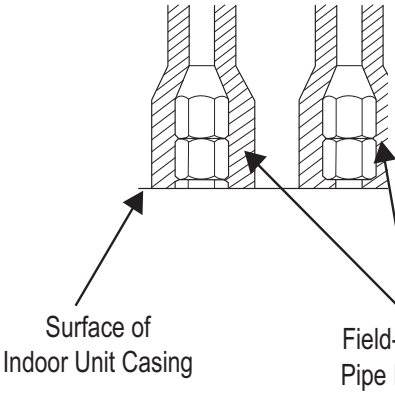
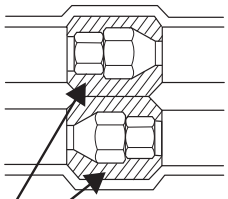


Figure 62: Typical Refrigerant Flare Fitting Insulation Detail



Note:

- ⃠ *Do not insulate gas and liquid pipes together as this can result in pipe leakage and malfunction due to extreme temperature fluctuations.*
- *Be sure to fully insulate the piping connections.*

Minimum Refrigerant Pipe Ethylene Propylene Diene Methylene (EPDM) Insulation Wall Thickness Requirements

Note:
Follow locals codes when selecting EPDM insulation wall thickness.

Table 37: Insulation Guidelines for Typical and Special Circumstances

Classification		Air-conditioned location		Non-air conditioned location	
		1. Typical location	2. Special location	3. Typical location	4. Special location
Liquid pipe	ø1/4 inch	1/2 inch	1/2 inch	1/2 inch	1/2 inch
	ø3/8 inch				
	≥ø1/2 inch	1/2 inch	1/2 inch	1/2 inch	1/2 inch
Vapor pipe	ø3/8 inch	1/2 inch	3/4 inch	3/4 inch	1 inch
	ø1/2 inch				
	ø5/8 inch				
	ø3/4 inch				
	ø7/8 inch				
	ø1 inch				
	ø1-1/8 inches	3/4 inch	1 inch	1 inch	
	ø1-1/4 inches				
	ø1-3/8 inches				
	ø1-1/2 inches				
	ø1-3/4 inches				

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REFRIGERANT PIPING PREPARATION

Refrigerant Piping Insulation

1. Typical location (Air-conditioned location): When the piping passes through an indoor area where the indoor unit operates.
• Apartment, classroom, office, mall, hospital, etc.

2. Special location (Air-conditioned location):
1. When the location is air conditioned, but there is severe temperature/humidity difference due to high ceilings
• Church, auditorium, theater, lobby, etc.
2. When the location is air conditioned, but internal temperature/humidity are high
• Bathroom, swimming pool, locker room, etc.

3. Typical location (Non-Air conditioned location): When the piping passes through an indoor area where the indoor unit does not operate.
• Hallway or a dormitory or school, etc.

4. Special location (Non-Air conditioned location): If conditions 1 and 2 below are present.
1. When the piping passes through an indoor area where the indoor unit does not operate.
2. When the humidity is high and there is no air flow in the location where the piping is installed.
• The thickness of the above insulation material is based on heat conductivity of 0.61 Btu/in/h/ft^2/°F.

Pipe Sleeves at Penetrations

LG requires that all pipe penetrations through walls, floors, and pipes buried underground be routed through a properly insulated sleeve that is sufficiently sized to provide free movement of the pipe and does not compress the insulation. Underground refrigerant pipe shall be routed inside a protective sleeve to prevent insulation deterioration. Also follow federal, state, and local regulations and codes when choosing a sleeve type.

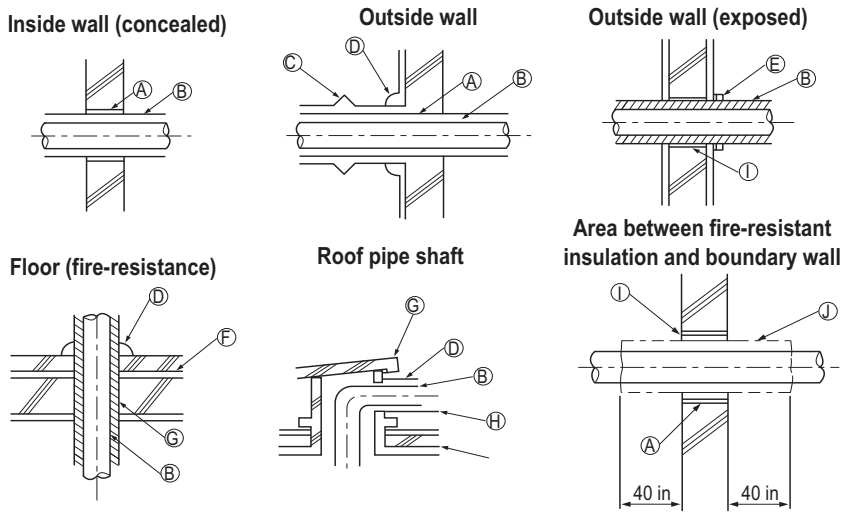
Note:

Diameter of penetrations shall be determined by pipe diameter plus the thickness of the insulation.

For example:

Diameter of Gas Piping:	1/2"
Diameter of Liquid Piping:	1/4"
Thickness of Gas Piping Insulation:	0.4" x 2
Thickness of Liquid Piping Insulation:	0.4" x 2
Surplus:	0.8"
Sleeve diameter (total):	3.1" minimum

Figure 63: Pipe Sleeve Options.



Ⓐ Sleeve
Ⓑ Insulation
Ⓒ Lagging
Ⓓ Caulk
Ⓔ Band
Ⓕ Water-resistant layer
Ⓖ Sleeve with edge
Ⓗ Lagging
Ⓘ Mortar or other fire-resistant caulk
Ⓙ Fire-resistant insulation

When filling an access hole with mortar, cover the area with steel plate so that the insulation will not fall through. For this area, use fire-resistant materials for both the insulation and cover.
⃠ Vinyl cover should not be used.

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Underground Refrigerant Piping

Refrigerant pipe installed underground should be routed inside a vapor tight protective sleeve to prevent insulation deterioration and water infiltration. Refrigerant pipe installed inside underground casing must be continuous without any joints. Underground refrigerant pipe must be located at a level below the frost line.

Table 38: Utility Conduit Sizes.

Liquid Pipe[1]	Vapor Pipe[1]		
	1/2 (2.0[2,5])	5/8 (2-1/8[2,5])	3/4 (2-1/4[2,5])
1/4 (1.0)[3]	4	4	4
3/8 (1-1/8)[3]	4	4	5
1/2 (1-1/2)[4]	5	5	5
5/8 (1-5/8)[4]	5	5	5
3/4 (1-3/4)[4]	5	5	5

[1]OD pipe diameter in inches; Values in parenthesis () indicate OD of pipe with insulation jacket.

[2]Diameter of pipe with insulation. Thickness of pipe insulation is typical. Actual required thickness may vary based on surrounding ambient conditions and should be calculated and specified by the design engineer.

[3]Insulation thickness (value in parenthesis) = 3/8 inch.

[4]Insulation thickness (value in parenthesis) = 1 inch.

[5]Insulation thickness (value in parenthesis) = 3/4 inch.

Figure 64: Typical Arrangement of Refrigerant Pipe and Cable(s) in a Utility Conduit.

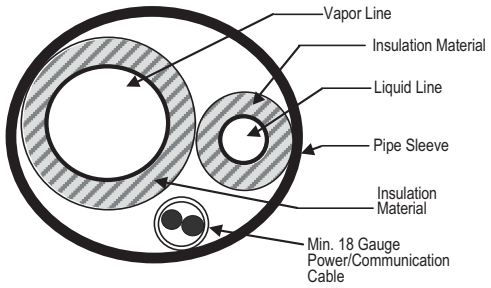
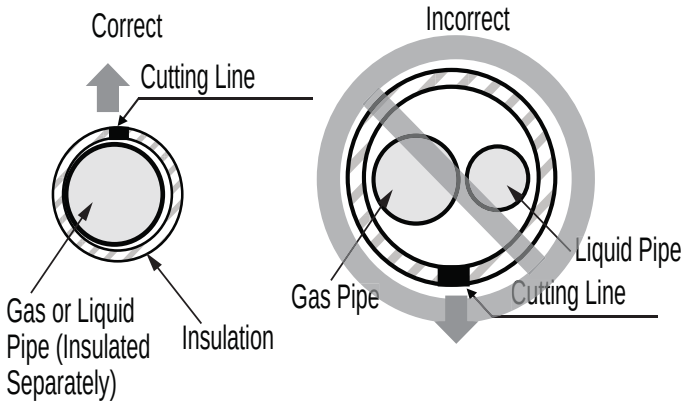


Figure 65: Underground Refrigerant Piping.

Installing the Insulation

1. Insulation material should be longer than the refrigerant piping. Each vapor and liquid piping must be insulated separately.
2. Place the closed-cell ethylene propylene diene methylene (EPDM) insulation material carefully around each refrigerant pipe so as not to damage it. Be sure the insulation material cutting line is place upward.
3. Apply adhesive to both cut surfaces of the insulation and press together. Allow adhesive to dry so that the bond is secure and does not come apart.

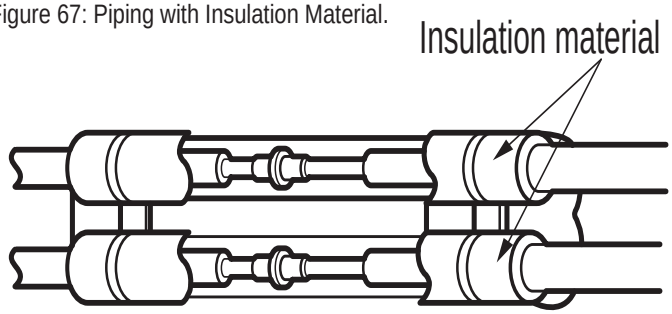
Figure 66: Correct Cutting Line Placement.



Insulating Piping Joints

1. Push the EPDM insulation from the straight piping surrounding the joint (elbow, outdoor unit to indoor unit piping connection point, etc.) as close together as possible.
2. Cut a piece of insulation to fit the joint, overlapping the insulation on the surrounding piping by at least one (1) inch.
3. Apply adhesive to bond all the ends.
4. Secure by completely wrapping narrow vinyl tape around the insulation / joint so that there are no gaps.
5. Tape should be sufficient to cover the piping so it can fit into the rear piping housing area at the back of the indoor unit or BD unit (Multi F MAX systems only).

Figure 67: Piping with Insulation Material.



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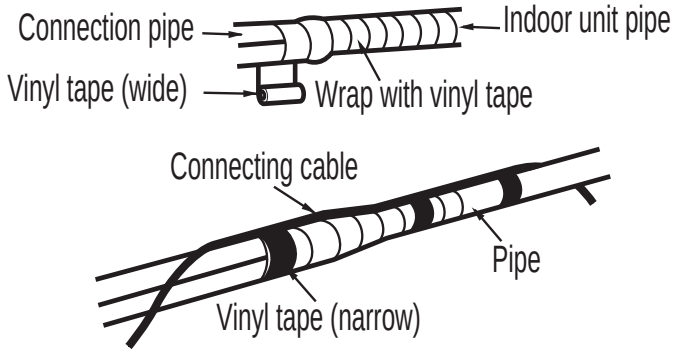
REFRIGERANT PIPING PREPARATION

Refrigerant Piping Insulation

Bundling

If a conduit is not used on the connection from the outdoor unit to the interior, bundle both insulated refrigerant pipes, the drain hose, and outdoor unit to indoor unit / BD unit communication cable / power wiring together with wide vinyl tape.

Figure 68: Bundling the Connection Components (From Outdoor Unit to Indoor Unit / BD Unit [Multi F MAX systems]).



Special Applications

If an additional drain hose is necessary, the end of drain outlet should be routed above the ground. Secure and the drain hose appropriately.

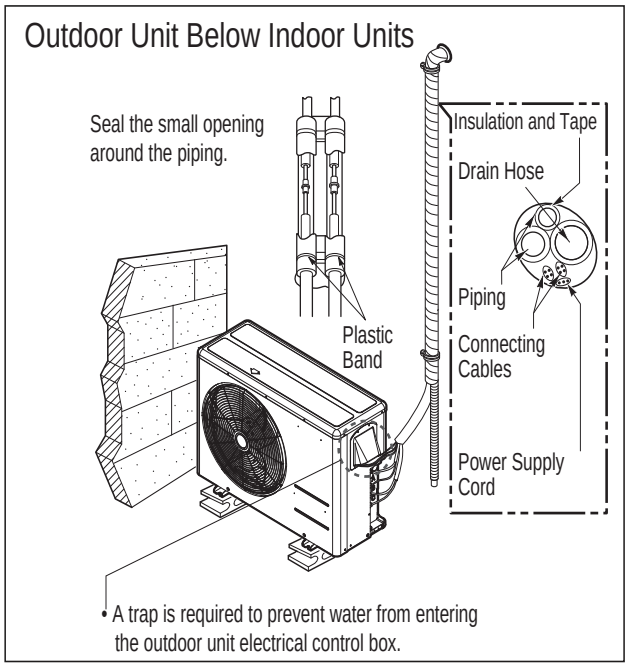
When the Outdoor Unit is Installed Below the Indoor Unit:

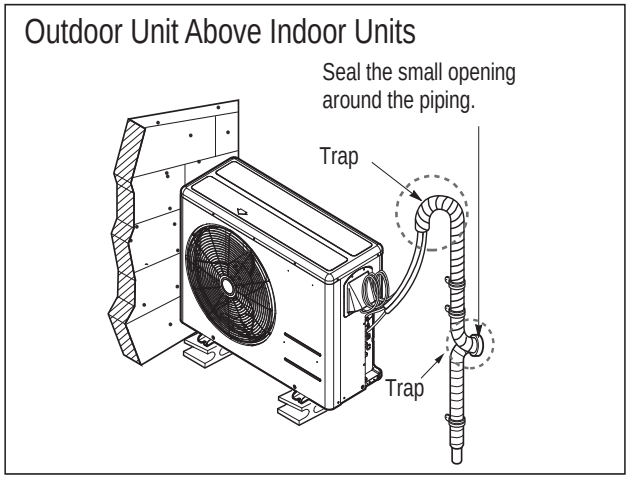
1. Wrap the vinyl tape around the separately insulated refrigerant piping, the drain hose, and the communications cable / power wiring together from the bottom to top.
2. Secure the bundle along the outside wall using saddles or a similar type of piping support.
3. Seal any openings in the wall.

When the Outdoor Unit is Installed Above the Indoor Unit:

1. Wrap the vinyl tape around the separately insulated refrigerant piping, the drain hose, and the communications cable / power wiring together from the bottom to top.
2. Secure a portion of the bundle along the outside wall using saddles or a similar type of piping support.
3. At the appropriate location, form a trap with the bundle to prevent water from entering interior spaces or the electrical control box of the outdoor unit.
4. Secure the rest of the bundle along the outside wall using saddles or a similar type of piping support.
5. Seal any openings in the wall.

Figure 69: Special Applications.





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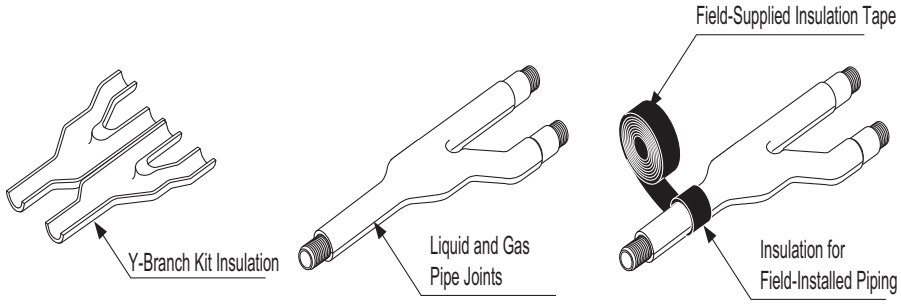
Y-Branch Kit Insulation

Each Y-branch kit comes with clam-shell type peel-and-stick insulation jackets molded to fit the Y-branch fittings—one for the liquid line, one for the vapor line.

- Check the fit of the Y-branch clam-shell insulation jacket after the Y-branch is installed.
- Mark the pipe where the insulation jacket ends.
- Remove the jacket.
- Install field-provided insulation on the pipes first.
- Peel the adhesive glue protector slip and install the clam-shell jacket over the fitting

Figure 70: Y-branch Insulation Detail.



Note:

Additional Insulation for Y-Branches May be Required in Humid Environments.

If the system has been operating for a long time in a high humidity environment (dew point temperature: more than 73°F), condensate is likely to form. If this happens, install 3/8 inch thick ethylene propylene diene methylene (EPDM) insulation that is plenum-rated with a heat-resistance factor that follows applicable local, state, and federal codes.

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⚠ WARNING

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

Note:

- *Consider ambient conditions (temperature, direct sunlight, inclement weather, etc.) when selecting, installing, and connecting the power wiring.*
- *Properly ground the outdoor units. Improperly ground wire can cause communication problems from electrical noise and motor current leakage. Ground wiring must always be installed by a qualified technician.*
- *If the system operates in reversed phase, it may damage the compressors and other components.*
- *If there is a possibility of reversed phase, phase loss, momentary blackout, or the power goes on and off while the system is operating, install a field-supplied phase loss protection circuit.*
- *Undersized wiring may lead to unacceptable voltage at the unit and may cause unit malfunction.*
- *Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and National Electrical Code regulations related to electrical equipment and wiring, and following the instructions in this manual. Using an oversized breaker or fuse may result in equipment malfunction and property damage.*
- ⃠ *Do not connect ground wire to refrigerant, gas, or water piping; to lightning rods; to telephone ground wiring; or to the building plumbing system. Failure to properly provide a National Electrical Code-approved earth ground can result in property damage and equipment malfunction.*

Power Supply / Power Wiring Specifications

Note:

- *Multi F and Multi F MAX systems operate at 1Ø, 208-230V, 60Hz.*
- *Power supply, wire type and size should be selected based on National Electrical Code and local codes. Maximum allowable voltage fluctuation ±10% or nameplate rated value.*
- *Properly ground the outdoor units per National Electrical Code and local codes.*
- *For power to the outdoor units, use field-supplied copper wiring that is solid or stranded, and shielded with the wires separately insulated.*
- *Ground wire should be longer than the common power / communication wires.*
- *Connect the wiring firmly so the wires cannot be easily pulled out.*
- *Refer to the inside of the chassis cover for circuit and terminal block diagrams for your model unit.*
- *Always match color codes of each wire and follow wiring diagram.*
- *Outdoor unit wiring can be found on the inside of the outdoor unit control cover.*

Note:
It is highly recommended to provide a circuit breaker between the power source and the outdoor unit as shown.

Figure 71: Circuit Breaker

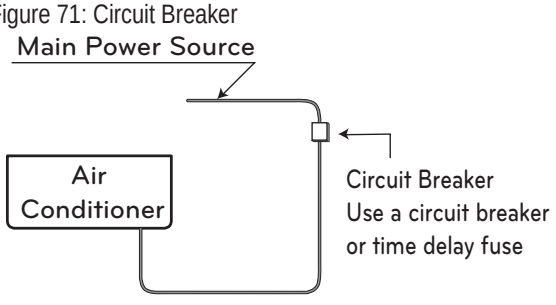

Table 39: Circuit Breaker / Fuse Size.

Outdoor Unit Model	Power Source	Fuse or Breaker Capacity
LMU18CHV, LMU24CHV	1Ø, 208-230V	20A
LMU30CHV, LMU36CHV	1Ø, 208-230V	25A
LMU480HV, LMU540HV	1Ø,208-230V	40A
LMU600HV	1Ø,208-230V	45A

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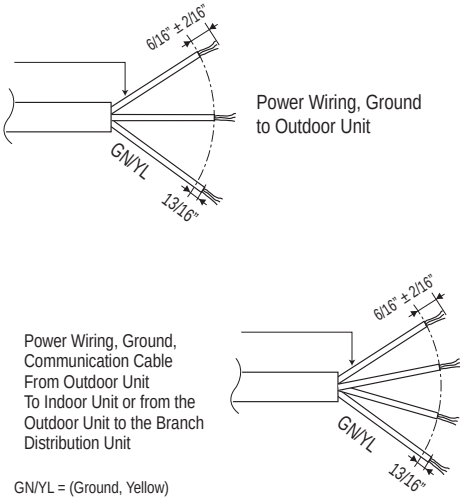
General Communication Cable Specifications

- Multi F Systems: All power wiring / communication cable to be minimum 18 AWG from the outdoor unit to the indoor unit, 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.
- Multi F MAX Systems: All power wiring / communication cable to be minimum 16 AWG from the outdoor unit to the BD unit, and 18 AWG from the BD unit to the indoor unit, 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.
- For power / communication wires between the Multi F and Multi F MAX outdoor units and the indoor units / BD units (Multi F MAX systems only), use a four (4) conductor, stranded, shielded or unshielded wire. If shielded, the wire must be grounded to the chassis at the outdoor unit only.
- Insulation material as required by local code.
- Rated for continuous exposure of temperatures up to 140°F.
- Firmly attach the cable; provide slack but secure in a way to prevent external forces from being imparted on the terminal block.
- Wiring should be completed without splices.

Figure 72: Multi F / Multi F MAX Outdoor and Indoor / Branch Distribution Unit Wiring and Communications Cable Diagram.



Note:

- *Always verify the communication cable is connected to a communications terminal. Never apply line voltage power to the communication cable connection. If contact is made, the PCBs may be damaged.*
- *The shield of the communications cable connecting the outdoor unit to the indoor units should be grounded only to the outdoor unit frame.*
- *Tie the shield of each cable segment together using a wire nut at the indoor unit. Maintain polarity throughout the communication network.*
- *Position the incoming power to the outdoor unit away from the power / communications cables from the outdoor unit to the indoor unit / branch distribution unit (Multi F MAX systems only).*
- ⃠ *Never use a common multiple-core communications cable. Each communications bus shall be provided a separate cable (i.e., between outdoor unit and indoor unit).*

Outdoor Unit Wiring Connection Guidelines

Best practice dictates using ring or spade terminals to terminate power wiring at the power terminal block

To Install a Ring Terminal:

1. Trim the strand wiring with wire cutters or pliers, then strip the insulation to expose the strand wiring to about 3/8 inch.
2. Using a ring terminal fastener or pliers, securely clamp a ring terminal to each stripped wire end.

To Connect the Wiring to the Terminals:

1. Remove the terminal screws from the (outdoor unit, BD unit, or indoor unit) terminal plate with a screwdriver.
2. Position the ring terminal around the terminal, place the terminal screw in the ring, and tighten to the terminal plate using a screwdriver.

Figure 73: Close up of a Typical Ring Terminal

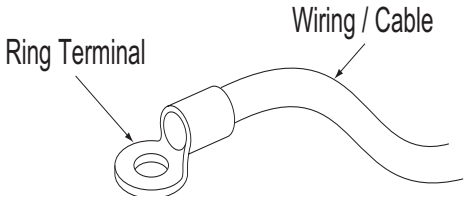
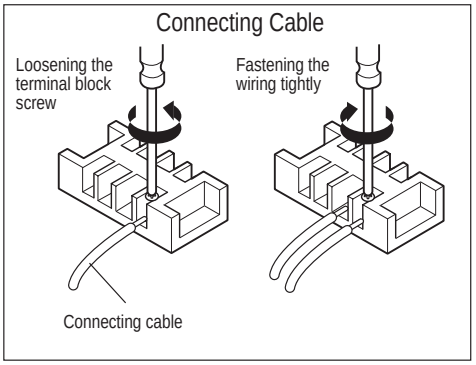


Figure 74: Tightening the Ring Terminal to the Terminal Plate.



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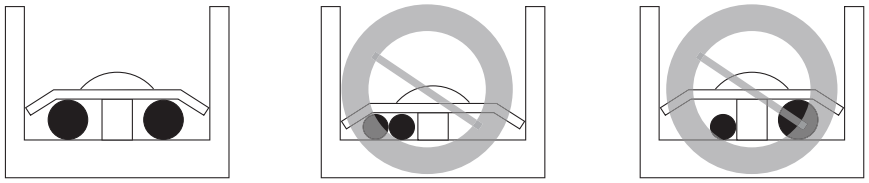
Outdoor Unit Wiring Connection Guidelines, continued.
If ring terminals or spade clips are not available, then:

Note:

- ⃠ *Do not terminate different gauge wires to the power terminal block. Slack in the wiring may generate heat and fire.*
- ⃠ *Do not over tighten the connections; overtightening may damage the terminals.*
- *When terminating wires of the same thickness, follow the instructions demonstrated in the illustrations below.*
- *Firmly attach the wire; secure in a way to prevent external forces from being imparted on the terminal block.*
- *Use an appropriately sized screwdriver for tightening the terminals.*

Figure 75: Proper and Improper Power Wiring Connections

● :Copper Wire



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

⃠ Do not terminate two wires on one side.

⃠ Do not terminate different gauge wires to a terminal block.

Note:

- ⃠ *Never apply line voltage power to the communications cable terminal block. If contact is made, the PCBs may be damaged.*
- *Always include some allowance in the wiring length when terminating. Provide some slack to facilitate removing the electrical panels while servicing.*

⚠WARNING

- *If power wires are not properly terminated and firmly attached, there is risk of fire, electric shock, and physical injury or death.*
- ⃠ *Never ground the shield of the communications cable to the indoor unit frame or other grounded entities of the building. Failure to properly provide a National Electrical Code-approved earth ground can result in electric shock, physical injury or death.*

Connecting the Power Wiring / Communications Cable to the Outdoor Unit

1. Remove the side panel and the conduit panel knockouts.
2. Detach the control cover by loosening and removing the screws.
3. Draw the power wiring to the outdoor unit, and the power wiring / communications cable (connecting cable) to the indoor units or BD unit (Multi F MAX systems only), through field-supplied conduits. Ensure there is enough length to connect the wiring / cables to the terminals on the outdoor unit. Secure the conduit to the outdoor unit using a field-supplied lock nut on the interior of the outdoor unit frame.
4. Properly connect the power wiring, and the power wiring / communications cable (connecting cable) to the correct terminals. Refer to the outdoor unit wiring
   diagram.
5. To provide strain relief, (separately) secure the power wiring and the power wiring / communications cable (connecting cable) to the outdoor unit with the factory-supplied clamps (up to 35 lbs.). Zip ties can also be used to hold all wiring / cables in place.
6. Re-attach the outdoor unit cover control and side panel to the original position with the screws.

⚠DANGER

⃠ *Do not use damaged or loose power wiring.* ⃠ *Do not modify or extend the outdoor unit's power wiring randomly. Ensure that the power wiring will not be pulled nor weight be placed on the power wiring during operation. There is risk of fire, electric shock, and physical injury or death.*

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Connecting the Power Wiring / Communications Cable to the Outdoor Unit, continued.

Figure 76: Connecting the Power Wiring / Communications Cables to the Outdoor Unit (LMU18~36CHV; LMU480, 540HV).

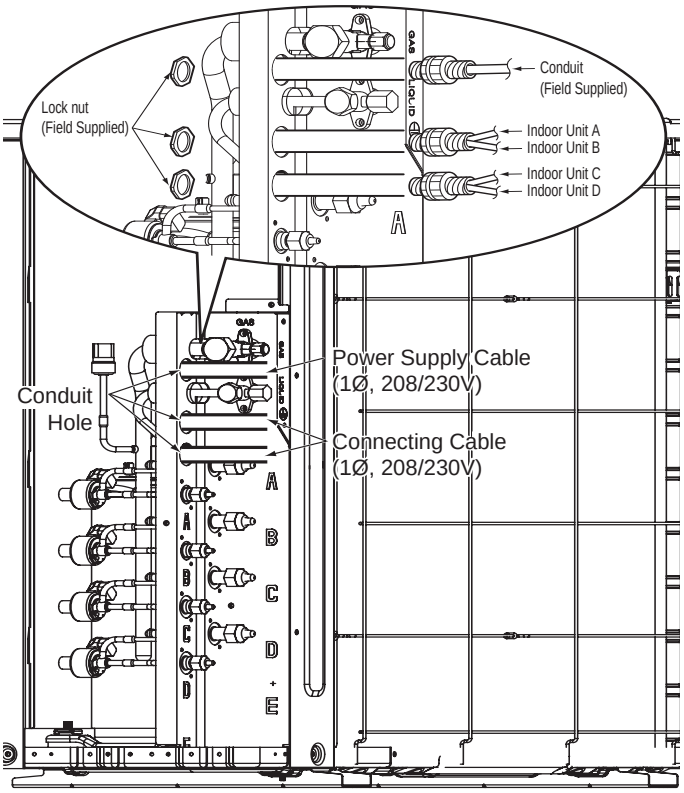
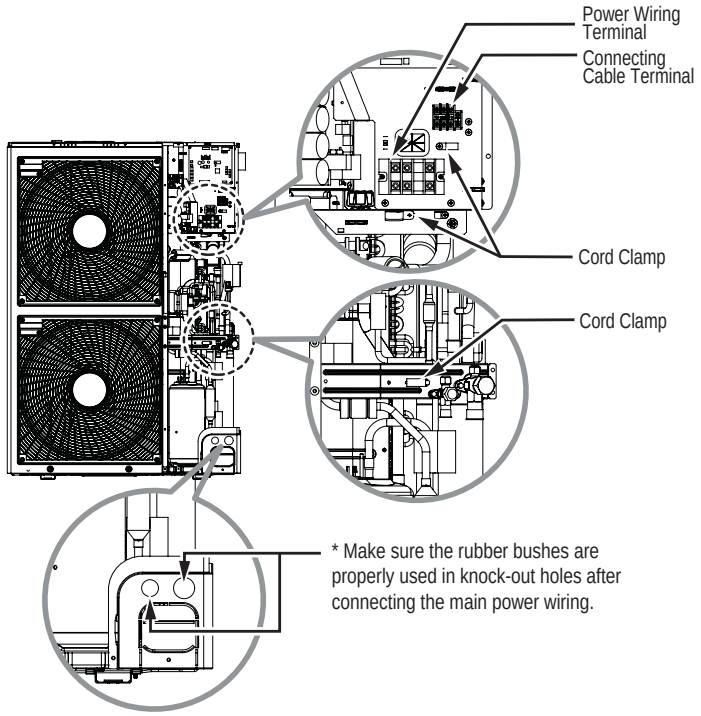


Figure 77: Connecting the Power Wiring / Communications Cables to the Outdoor Unit (LMU600HV).



⚠ WARNING

- *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.*
- *Replace all control box and panel covers. If cover panels are not installed securely, dust, water and animals may enter the outdoor unit, causing fire, electric shock, and physical injury or death.*

Note:

- *The communications cable (connecting cable) from the outdoor unit to the indoor unit should be isolated from the electrical wiring of external devices such as computers, elevators, radio and television broadcasting facilities, and medical imaging offices. Communication problems can arise from electrical noise.*
- ⃠ *Do not install the power wiring to the outdoor unit and the power wiring / communications cable (connecting cable) to the indoor units in the same conduit. These wiring / cables should have separate conduits that are placed a reasonable distance apart. Communication problems can arise from electrical noise.*

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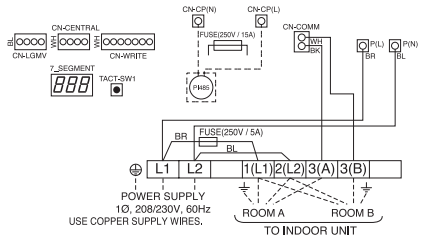
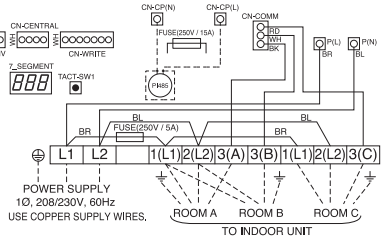
Connecting the Power Wiring / Communications Cable to the Outdoor Unit, continued.

Figure 78: Detailed View of Outdoor Unit Terminal Blocks / Connections.

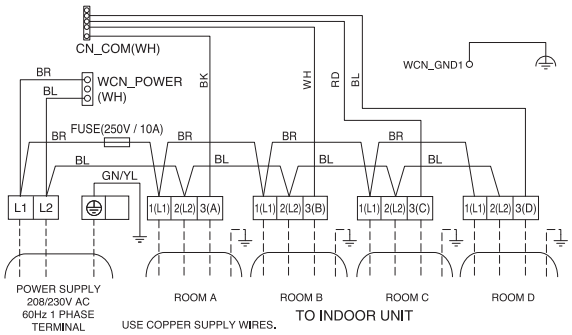
Multi F LMU18CHV



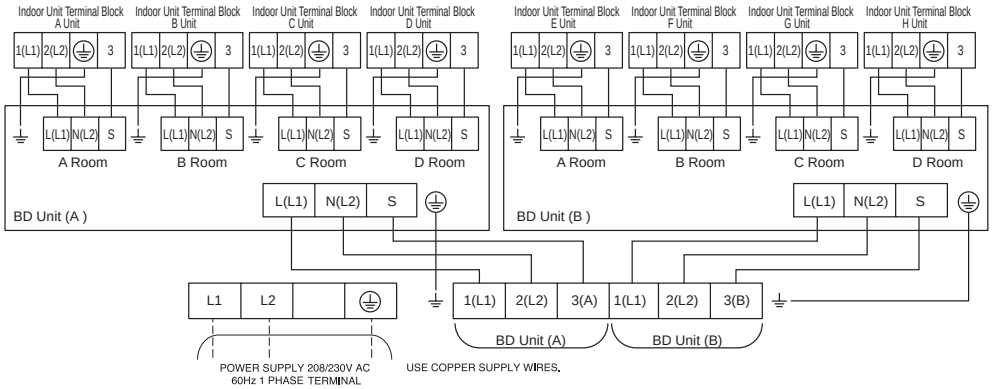
Multi F LMU24CHV



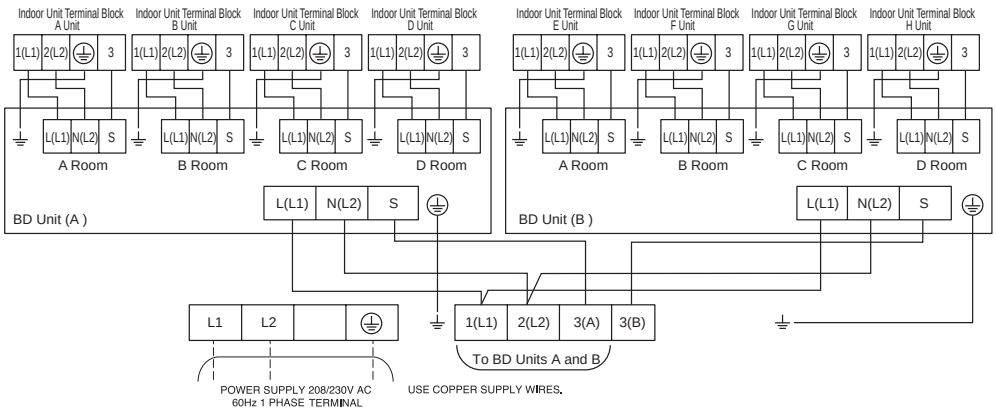
Multi F LMU30CHV and LMU36CHV



Multi F MAX LMU480HV and LMU540HV



Multi F MAX LMU600HV



Wiring

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Connecting the Power Wiring / Communications Cable to Indoor Units

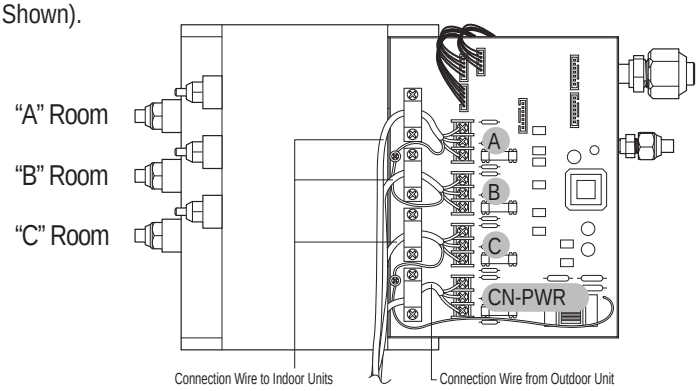
1. Connect power wiring / communications cable (connecting cable) from the outdoor unit to the individual indoor unit terminals following the wiring diagrams on the outdoor unit and indoor unit control covers.
2. Ensure that the terminal board numbers (A, B, C; 1, 2, 3) and wiring color on the outdoor unit matches the terminal number and wiring color on the indoor unit. (Terminal board numbers are arranged from top to bottom in order from 1 to 3.)
3. Provide strain relief by securing the wiring / cable to the indoor unit with the factory-supplied clamps.
4. For more installation information for specific indoor units, refer to the separate indoor unit installation manuals on www.lg-dfs.com.

Connecting the Power Wiring / Communications Cable to the Branch Distributor (BD) Unit (Multi F MAX Systems Only)

General Instructions

- Always connect power wiring / communications cable matching the BD unit terminals to their respective indoor units (Example for three-port BD Unit PMBD3630: A, B, and C).
- Follow the instructions on the nameplates and connect wiring / cables of the outdoor unit and indoor units to the correct terminals (1, 2, 3). Always attach each ground wire separately to a grounding screw.
- After completion, secure wiring with wire clamps. Secure wiring firmly to the indoor unit.

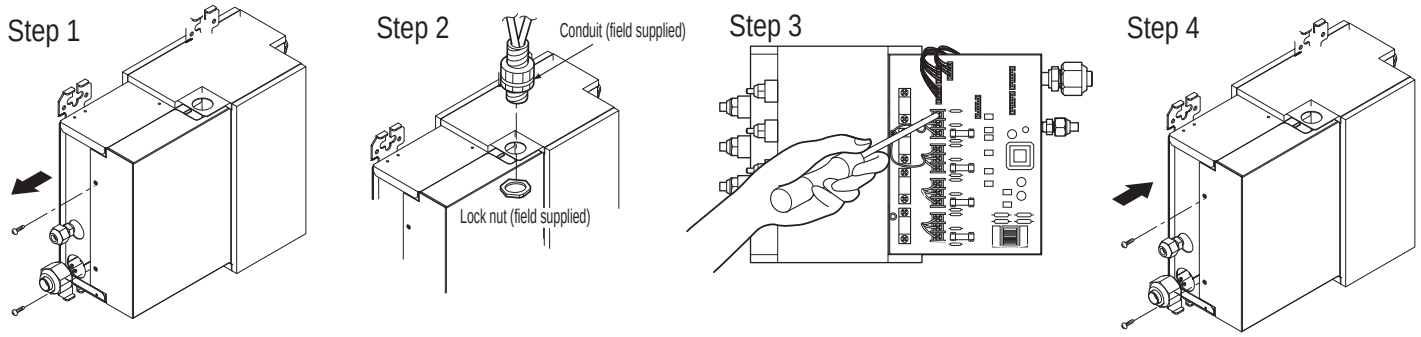
Figure 79: Interior View of a BD Unit (Three-Port PMBD3630 Example Shown).



BD Unit Wiring Connection Procedure

1. Remove the BD unit control cover. Unscrew the two (2) screws, and slide the cover off the BD frame following the arrows in the diagram (Step 1).
2. Draw the power wiring / communications cable through the field-supplied conduit so there is enough length to connect wiring / cable to the terminals on the BD unit. Secure conduit to the BD unit using a field-supplied lock nut on the interior of the BD unit frame (Step 2).
3. Connect wiring / cable from the outdoor unit to the BD unit terminals, and from the BD unit terminals to the indoor unit terminals following the wiring diagram on the outdoor unit control cover (Step 3). Allow 11-13/16 inches of slack in the wire harness. Attach wiring / cable to the BD unit with clamps at four (4) locations.
4. Replace the BD unit control cover following the arrows in the diagram. Tighten the two (2) screws to finish (Step 4).

Figure 80: BD Unit Wiring Steps.



⚠WARNING

⃠ *Do not use tapped wires, extension cords, or starburst-type connections as they may cause overheating, fire, electric shock, physical injury or death.*

Note:

Always refer to the circuit diagram on the inside of the outdoor unit control cover.

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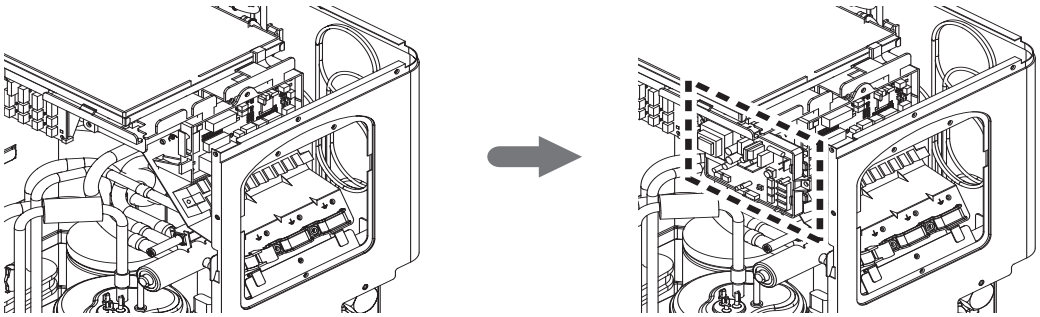
PI485

PI485 V-net Control Integration Board for Outdoor Units adapt Multi F, Multi F MAX systems to a LG VRF system central protocol for integration with LG central controllers. The PI485 is installed in the Multi F / Multi F MAX outdoor unit. For more information on PI485 installation, see the PI485 installation manual.

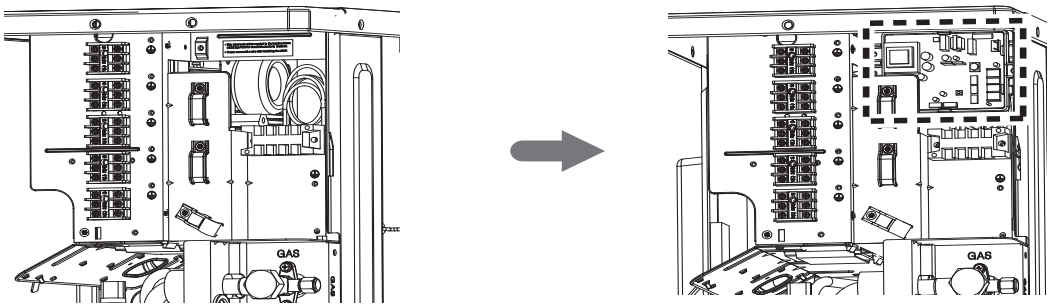
Figure 81: PI485 Board (Appearance may differ depending on model).

Figure 82: PI485 Installation Area in Multi F and Multi F MAX Outdoor Units.

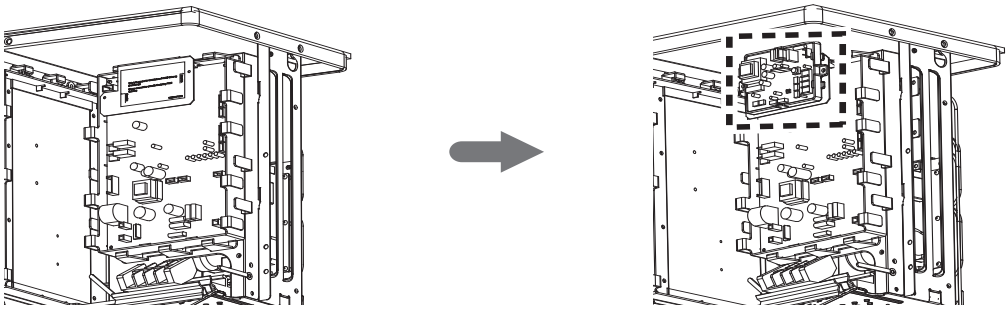
Multi F LMU18CHV, LMU24CHV



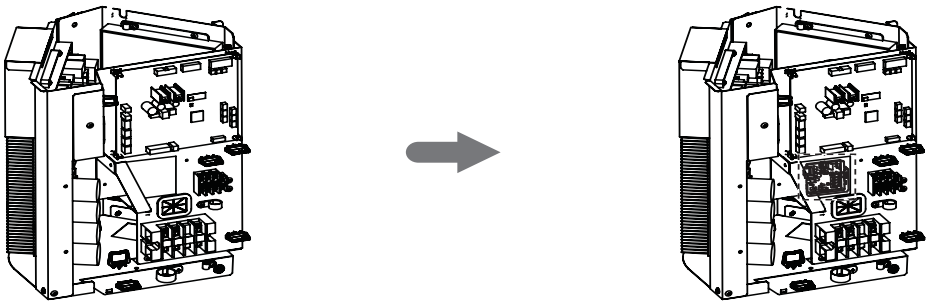
Multi F LMU30CHV, LMU36CHV



Multi F MAX LMU480HV, LMU540HV



Multi F MAX LMU600HV



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Test Run

After checking the system for leaks and performing the evacuation procedure, perform a test run. Follow the guidelines below for proper procedure.

Before the Test Run

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

Installing the Remote Controller Batteries

As part of the test run, the batteries need to be inserted into the remote controller, and the remote controller needs to be powered on to operate the indoor units. To insert the batteries follow the steps below. For information on using the remote controller, refer to its owner's manual.

1. The remote controller needs two AAA (1.5V) batteries for operation. Remove the battery cover from the back of the remote controller by pushing downward on the tab at the top of the battery cover and then lift up to remove.
2. Insert the two new batteries. Align batteries by the (+) and (-) sides (the interior battery compartment of the remote controller will have clear markings for the (+) and (-) placement).
3. Verify that the batteries have "clicked" into the compartment and are firmly engaged with the contacts on either side of them.
4. Reattach the back cover of the remote controller.
5. Proceed with powering on the remote controller and usage as needed.

Figure 83: Piping Connection on the Outdoor Unit (May Differ Depending on Outdoor Unit Model).

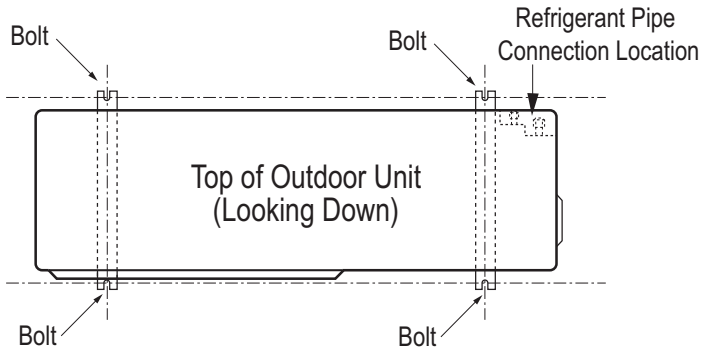
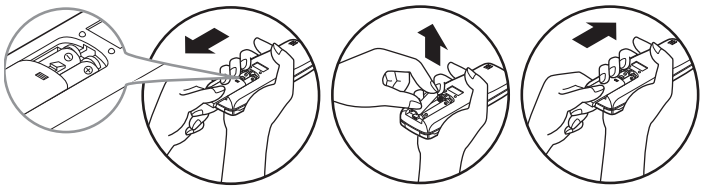


Figure 84: Installing the Remote Controller Batteries.



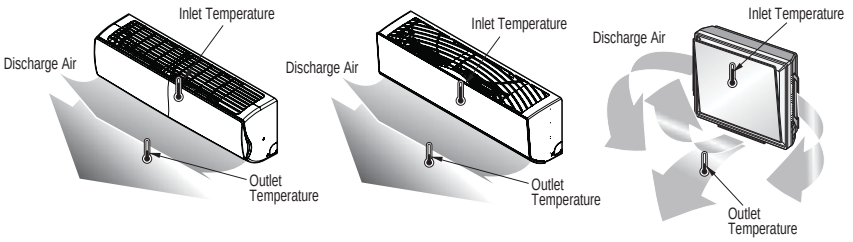
Test Run Procedure

1. Start up the system and perform a test run. Operate the system in cooling mode for 15 to 20 minutes.
2. Evaluate performance as the system runs, verifying the outdoor unit and all indoor units and BD 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. See table below for the optimum condition of the gas side pressure (system is in cooling mode).

Table 40: Optimum Conditions of the Gas Side Pressure.

Refrigerant Type	Outside Ambient Temperature	Gas Side Service Valve Pressure
R410A	95°F	113~142 psig

Figure 85: Inlet and Outlet Temperature Locations on Various Indoor Units.



Note:

If the pressure is >142psig, the system is most likely overcharged, and refrigerant should be removed. If the pressure is <113 psig, the system is most likely undercharged and refrigerant should be added.

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Outdoor Unit DIP Switch Settings

System must be powered off, and then turned back on to apply DIP switch settings.

⚠WARNING

Turn off the circuit breaker or shut the power source of the product down 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.*
- *Only the first four DIP switches are functional on the LMU480, 540, 600HV.*

Figure 86: LMU18~36CHV Outdoor Unit DIP Switches (in Normal Operation Setting).

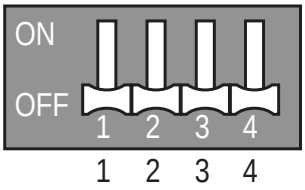


Figure 87: LMU480-540HV Outdoor Unit DIP Switches (in Normal Operation Setting).

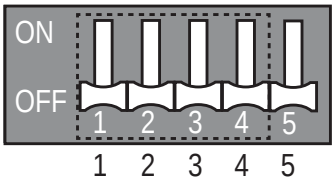


Figure 88: LMU600HV Outdoor Unit DIP Switches (in Normal Operation Setting).

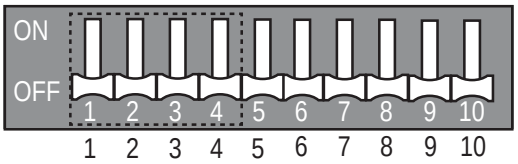
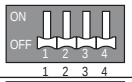
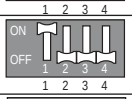
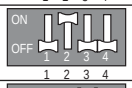
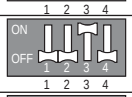
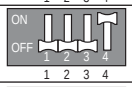
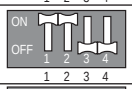
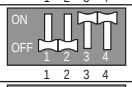
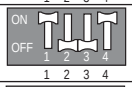
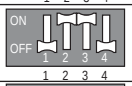
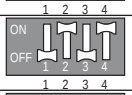
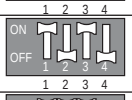
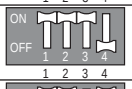
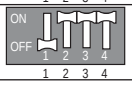


Table 41: DIP Switch Settings and Functionalities.

DIP Switch Setting	Function
	Normal Operation (No Function)
	Forced Cooling Operation
	Wiring Error Check
	Reducing Power Consumption (Step 1)
	Reducing Power Consumption (Step 2)
	Mode Lock (Cooling)
	Mode Lock (Heating)
	Night Quiet Mode (Step 1)
	Night Quiet Mode (Step 2)
	Mode Lock (Cooling) + Night Quiet Mode (Step 1)
	Mode Lock (Cooling) + Night Quiet Mode (Step 2)
	Reducing Power Consumption (Step 1) with Mode Lock (Cooling)
	Reducing Power Consumption (Step 2) with Mode Lock (Cooling)
	Reducing Power Consumption (Step 1) with Mode Lock (Heating)
	Reducing Power Consumption (Step 2) with Mode Lock (Heating)

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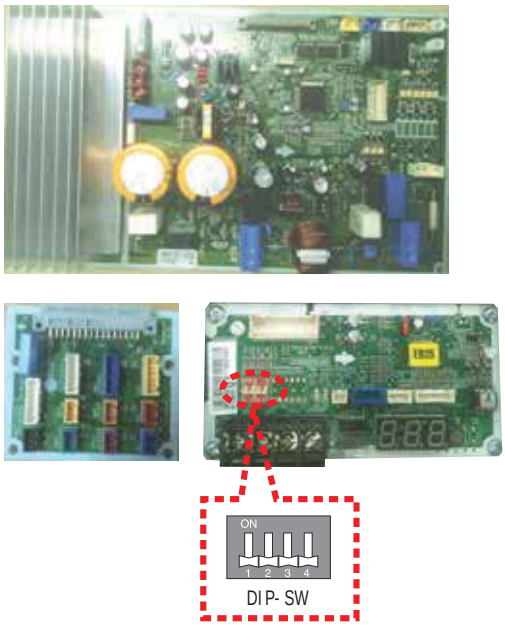
DIP SWITCH SETTINGS

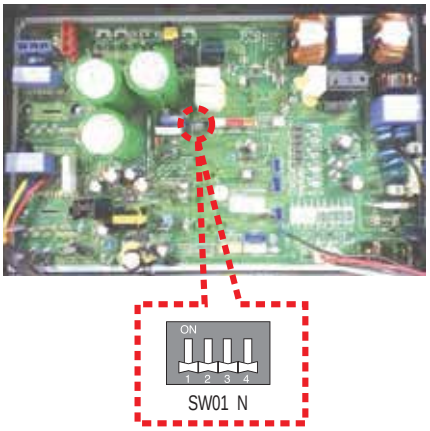
Location of DIP Switches on Multi F and Multi F MAX Outdoor Units

Figure 89: Multi F / Multi F MAX Outdoor Unit DIP Switch Locations.

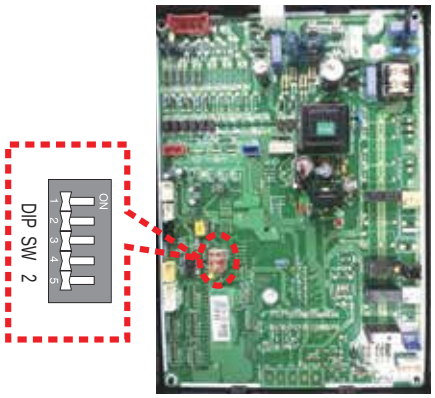
Multi F LMU18CHV and LMU24CHV



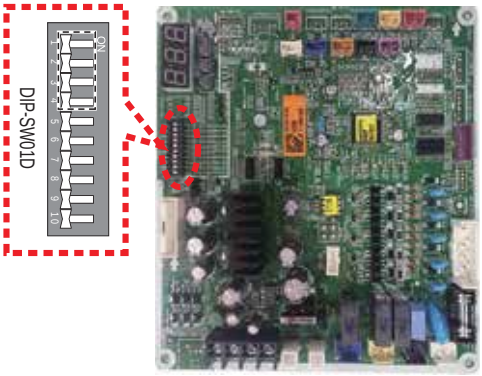
Multi F LMU30CHV and LMU36CHV



Multi F MAX LMU480HV and LMU540HV



Multi F MAX LMU600HV

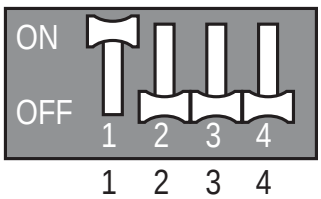


Forced Cooling Operation Function

Use to add refrigerant to the system when outside ambient temperatures are cool (ex.: winter).

1. Shut power down to the system.
2. Set DIP Switch 1 to ON.
3. Turn power on to the system.
4. Verify that the Red LED on the outdoor unit PCB is ON (indicates indoor units are in forced cooling operation).
5. Add refrigerant.

Figure 90: Forced Cooling DIP Switch Setting.



Note:

• If the green LED light on the outdoor unit PCB is ON, it indicates the compressor is OFF due to low pressure in the system.

• Turn DIP Switch 1 to OFF after finishing (Normal Operation setting).

• Only the first four DIP switches are functional on the LMU480, 540, 600HV.

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DIP SWITCH SETTINGS

Wiring Error Check

Use to verify if wiring is properly installed.

1. Shut power down to the system.
2. Set DIP Switch 2 to ON.
3. Turn power on to the system.
4. Check if the Red and Green LEDs on the outdoor unit PCB are ON (indicate indoor units are in forced operation mode).
5. If the wiring is correctly installed, the Green LED will light up. If the wiring is incorrectly installed, the Red and Green LEDs will blink, indicating which part of the system is in error.
   - Red LED = Piping Number
   - Green LED = Wiring Number (Room)

Example: If the Red LED blinks twice and the Green LED blinks three times, the second piping to the third room is in error (see at right).

Figure 91: Wiring Error Check DIP Switch Setting.

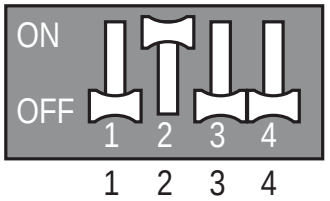
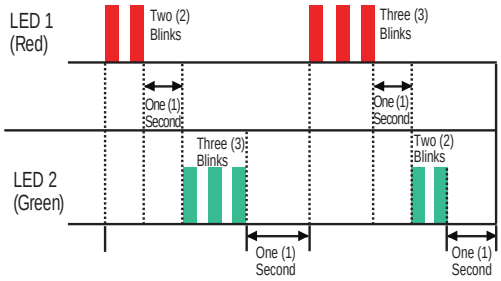


Figure 92: Wiring Error Check Example.



Note:

- *If the indoor unit(s) are not communicating properly to the outdoor unit, the Wiring Error Check cannot operate correctly.*
- *Only the part of the system in error will be displayed. System will operate correctly after the error is fixed.*
- *If outdoor and indoor temperatures are too low (ex.: winter), the wiring error check function will not operate (Red LED is ON).*
- *Turn DIP Switch 2 to OFF after finishing (Normal Operation setting).*
- *Only the first four DIP switches are functional on the LMU480, 540, 600HV.*

Reducing Power Consumption

Enables more efficient system operation by reducing the maximum power consumption value (reducing the MCA).

1. Shut power down to the system.
2. For Step 1, set only DIP Switch 3 to ON. For Step 2, set only DIP Switch 4 to ON.
3. Turn power on to the system.

Figure 93: Reducing Power Consumption Chart.

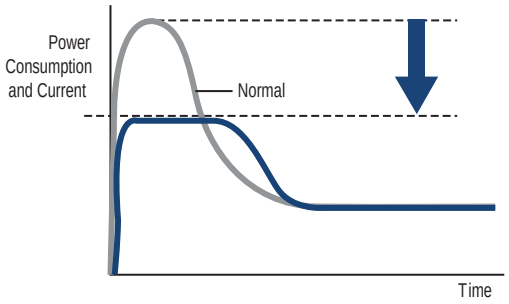
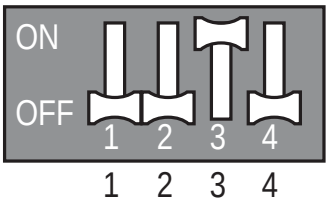


Table 42: Reducing Power Consumption Current Levels.

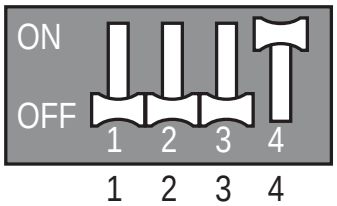
Phase	1Ø		
Model	Multi F LMU18CHV, LMU24CHV	Multi F LMU30CHV, LMU36CHV	Multi F MAX LMU480HV, LMU540HV, LMU600HV
Step 1 (A)	9	13	22
Step 2 (A)	8	11	21

Figure 94: Reducing Power Consumption DIP Switch Settings.

Step 1



Step 2



Note:

- *Reduced Power Consumption reduces outdoor unit capacity.*
- *Only the first four DIP switches are functional on the LMU480, 540, 600HV.*

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Reducing Power Consumption with Mode Lock

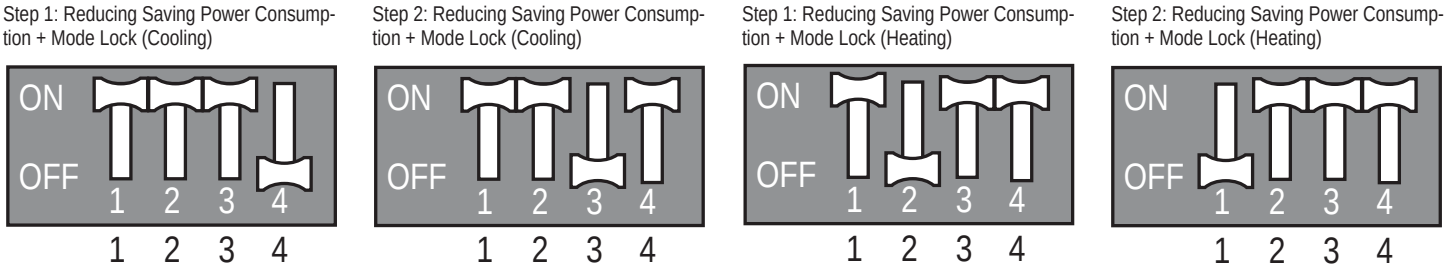
Enables more efficient system operation by lowering the maximum power consumption value, as well as locks the mode of operation (Example: In a cooling-only server room application where permission to adjust the system mode is highly limited). Changing modes can cause a change in compressor frequency, which would cause problems with the setting. As such, if this mode is used, it is locked in either cooling or heating. The function is rarely, if ever, used.

1. Shut power down to the system.
2. Set DIP Switches as indicated below, following the steps and chosen mode.
3. Turn power on to the system.

Note:

Only the first four DIP switches are functional on the LMU480, 540, 600HV.

Figure 95: Saving Power Consumption with Mode Lock DIP Switch Settings.

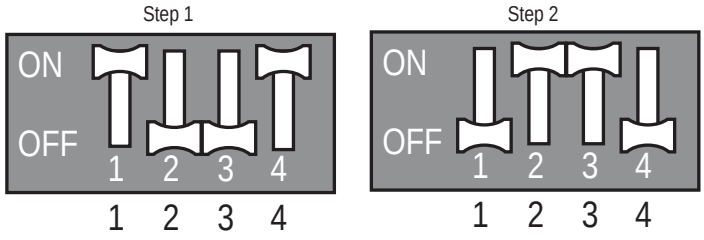


Night Quiet Mode

Lowers the operation sound of the outdoor unit by changing the compressor frequency and fan speeds. Night quiet mode initiates eight (8) hours after the highest outdoor air temperature is measured, then is active for nine (9) hours.

1. Shut power down to the system.
2. For Step 1, set only DIP Switches 2 and 3 to ON. For Step 2, set only DIP Switches 1 and 4 to ON.
3. Turn power on to the system.

Figure 96: Night Quiet Mode DIP Switch Settings.

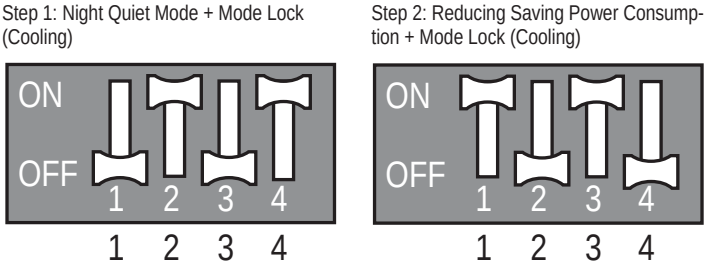


Night Quiet Mode with Mode Lock

Lowers the operation sound of the outdoor unit by changing the compressor frequency and fan speeds, as well as locks the mode of operation. Changing modes can cause a change in compressor frequency, which would cause problems with the setting. As such, if this mode is used, it is locked in either cooling or heating. The function is rarely, if ever, used. Night quiet mode initiates eight (8) hours after the highest outdoor air temperature is measured, then is active for nine (9) hours.

1. Shut power down to the system.
2. For Step 1, set only DIP Switches 2 and 4 to ON. For Step 2, set DIP Switches 1 and 3 to ON.
3. Turn power on to the system.

Figure 97: Night Quiet Mode with Mode Lock DIP Switch Settings.



Note:

- *If compressor frequency and fan speed are decreased, cooling capacity also may decrease accordingly.*
- *Night Quiet Mode can only be used when system is in cooling operation.*
- *Change the DIP switches if Night Quiet Mode is no longer desired.*
- *If indoor unit operation is set by the fan speed "Power", Night Quiet Mode will not function until fan speed "Power" is changed.*
- *Only the first four DIP switches are functional on the LMU480, 540, 600HV.*

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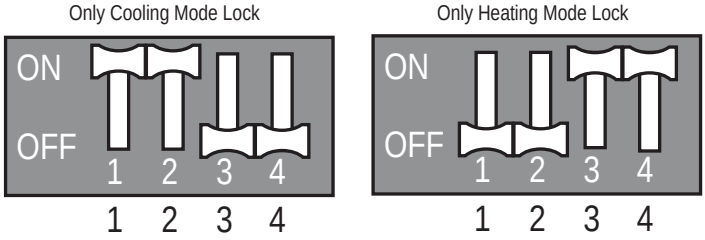
Mode Lock

Prevents mixed mode operation (mode change) in applications where only one mode is necessary.

1. Shut power down to the system.
2. For Only Cooling Mode Lock, set only DIP Switches 1 and 2 to ON. For Only Heating Mode Lock, set only DIP Switches 3 and 4 to ON.
3. Turn power on to the system.

Figure 98: Mode Lock DIP Switch Settings.



Note:

Only the first four DIP switches are functional on the LMU480, 540, 600HV.

PCB Display (Multi F LMU18-24CHV and LMU600HV Models Only)

For Multi F LMU18CHV, LMU24CHV, and LMU600HV outdoor units, the cycle data can be checked without using LG Monitoring View (LGMV) Diagnostic Software by pushing TACT-SW1. See below for the types of cycle information that will be displayed in LGMV. After first page is displayed, the second page will be subsequently displayed.

⚠WARNING

Protect fingers / hands with a non-conducting material before pushing TACT-SW1. There is risk of physical injury or death due to electric shock.

Figure 99: Location of TACT-SW1 (LMU18-24CHV).

Figure 100: Location of TACT-SW1 (LMU600HV).

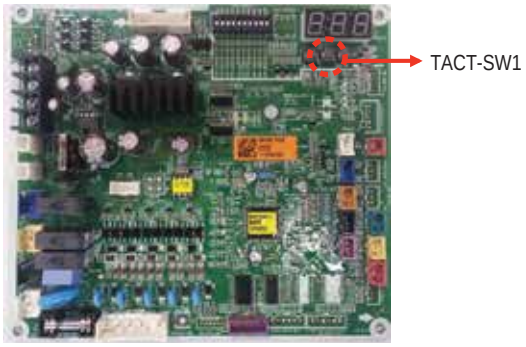


Table 43: PCB Display Information.

TACT-SW1 No. of Pushes	Description	Display		
		Example	First Page	Second Page
One (1) Time	Low Pressure	890kpa	“LP”	“89”
Two (2) Times	High Pressure	2,900kpa	“HP”	“290”
Three (3) Times	Discharge Temperature	85°C	“DS”	“85”
Four (4) Times	Condenser Outlet Temperature	-10°C	“CS”	“-10”
Five (5) Times	Suction Temperature	-10°C	“SS”	“-10”
Six (6) Times	Outdoor Unit Air Temperature	-10°C	“AS”	“-10”
Seven (7) Times	Current	15A	“A”	“15”
Eight (8) Times	Voltage	230V	“V”	“230”
Nine (9) Times	Compressor Hz	100Hz	“F”	“100”
Ten (10) Times	DC Link Voltage	230V	“dc”	“230”

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LG Monitoring View (LGMV) Diagnostic Software

LGMV software (PRCTSL1 and PRCTFE1) allows the service technician or commissioning agent to connect a computer USB port to the Multi F / Multi F MAX system's main printed circuit board (PCB) using an accessory cable without the need for a separate interface device. The monitoring screen for LGMV allows the user to view the following real time data on one screen:

- Actual inverter compressor speed
- Target inverter compressor speed
- Actual outdoor fan speed
- Target outdoor unit fan speed
- Actual superheat
- Target superheat
- Actual subcooler circuit superheat
- Target subcooler circuit superheat
- Main EEV position
- Subcooling EEV position
- Inverter compressor current transducer value
- Outdoor air temperature
- Actual high pressure/saturation temperature
- Actual low pressure/saturation temperature
- Suction temperature
- Inverter compressor discharge temperature
- Front outdoor coil pipe temperature
- Back outdoor coil pipe temperature
- Liquid line pipe temperature
- Subcooler inlet temperature
- Subcooler outlet temperature
- Average indoor unit (IDU) pipe temperature
- Inverter compressor operation indicator light
- Liquid injection valves' operation indicator lights
- Hot gas bypass valve operation indicator light
- Four-way reversing valve operation indicator light
- Pressure graph showing actual low pressure and high pressure levels
- Error code display
- Operating mode indicator
- Target high pressure
- Target low pressure
- PCB (printed circuit board) version
- Software version
- Installer name
- Model number of IDUs
- Site name
- Total number of connected IDUs

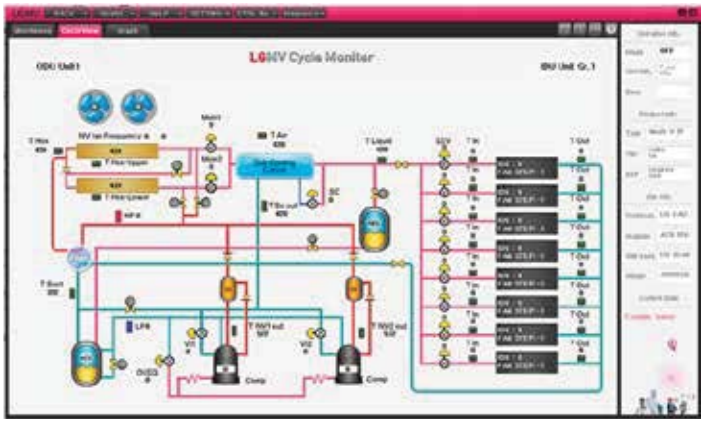
Figure 101: MV Real-time Data Screen

- Communication indicators
- IDU capacity
- IDU operating mode
- IDU fan speed
- IDU EEV position
- IDU room temperature
- IDU inlet pipe temperature
- IDU outlet pipe temperature
- IDU error code

Additional screens can be accessed by tabs on the main screen. Additional screens include the following:

1. Cycleview: Graphic of internal components including:
   - Compressors showing actual speeds
   - EEVs
   - IDUs
   - Temperature and pressure sensors
   - Four-way reversing valve
2. Graph: Full screen graph of actual high and low pressures and high and low pressure limits. A sliding bar enables user to go back in time and view data.
3. Control FTN: Enables user to turn on IDUs in 1.8 °F increments.
4. Useful Tab
   - Unit Conversion: Converts metric values to imperial values.

Figure 102: MV Cycleview



Note:
Images on these pages are examples of LGMV screenshots. Actual images may differ depending on the version of the software and the unit installed.

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LG Monitoring View (LGMV) Diagnostic Software and Cable - Continued

5. Data
   - Data Saving Start: Recording of real time data to a separate file created to be stored on the user's computer.
   - Data Loading Start: Recorded data from a saved ".CSV" file can be loaded to create an LGMV session.

6. Monitoring
   - Electrical: The lower half of main screen is changed to show Inverter Compressor Amps, Volts, Power Hz, Inverter control board fan Hz.

Figure 103: MV Control Indoor Units Screen

Error Codes

LGMV software helps the service technician or commissioning agent to troubleshoot system operation issues by displaying malfunction codes. These error codes can be seen on the main screen of the LGMV software program. For an overview of Multi F / Multi F MAX system error codes, see Error Codes section. For detailed information on how to troubleshoot individual error codes, see the Multi F / Multi F MAX Service Manual.

Figure 104: Error Code Screen

The software is available in a high version with all of the features listed above. The low version has all features as the high version without Target High Pressure and Target Low Pressure values shown on main screen.

In lieu of connecting to the outdoor unit, user has the option to connect to IDU with the use of a USB to RS-485 connector kit. When connected through IDU, user will not be able to record data.

This software can be used to both commission new systems and troubleshoot existing systems. LGMV data can be recorded to a ".CSV" file and emailed to an LG representative to assist with diagnostic evaluations.

Recommended Minimum PC Configuration:

- CPU: Pentium® IV 1.6 GHz
- Main Memory: 1G
- Operating System: Windows® XP/Vista/7 32 bit (recommended), 64 bit
- Hard Disk: 600 MB when operating
- MS Office 2003, 2007 (recommended) for select reporting functions

Note:
Images on these pages are examples of LGMV screenshots. Actual images may differ depending on the version of the software and the units installed.

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LG SIMS

The SIMs WLAN module and the smart phone app together provide monitoring and trouble-shooting capability for LG Multi F / Multi F MAX systems. SIMs functions only with LG Duct Free products.

SIMs can display and graph operational data for the air conditioner system including the indoor unit and the outdoor unit. SIMs also displays error codes and a troubleshooting guide. A full copy of the LG SIMs Smart Inverter Monitoring System User's Manual is available on the www.lghvac.com website.

To use SIMs you must be a trained HVAC service technician familiar with variable refrigerant flow (VRF) systems in general and with LG's Duct Free System products. You should understand the inverter air conditioning operation cycle, the meaning of the data displayed by SIMs, and how to use the data to troubleshoot the system.

Figure 106 shows a Multi F configuration used with the SIMs module and app. LG SIMs can also be used with Single Zone one-to-one configurations such as the Single Zone Wall Mount systems.

Figure 105: LG SIMs App and WLAN Module

Figure 106: SIMs WLAN Module to Typical DFS System

⚠WARNING

High voltages capable of causing death are used in this equipment. Outdoor unit power remains connected during this procedure. Take extreme caution not to touch electrical components or connections. Failure to observe this warning can result in death or severe injury.

Note:

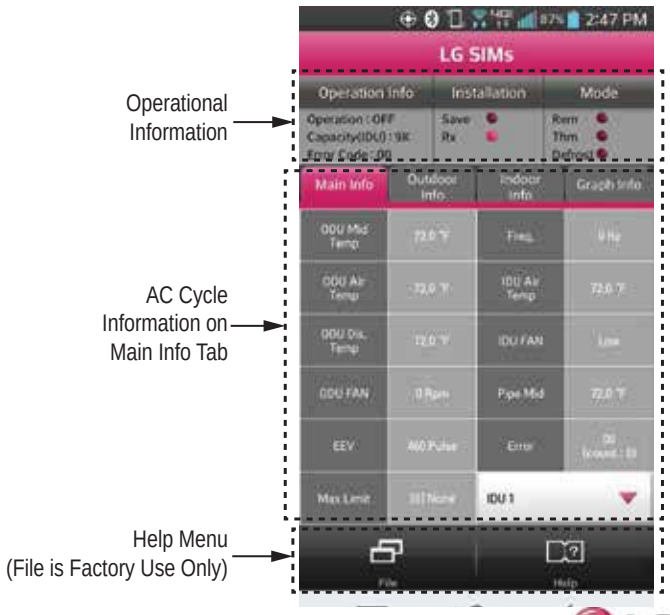
- *The Duct Free System air conditioning system must run for at least 15–20 minutes before data collected by SIMs 2.0 is valid for troubleshooting.*
- *The free SIMs app must be correctly installed on your smart phone before using SIMs.*
- *Some ODUs have an LGMV extension cable accessed by removing the side handle cover. If the ODU does not have this extension cable, access the LGMV connector by removing the top cover of the ODU.*

SIMs App Main Info Screen

The main screen is the first screen displayed after wireless connection is established. Tap the Main Info tab to display current readings regarding your indoor and outdoor unit(s). The Operational Info area of the screen will show active functions or modes by illuminating the light to the right of the function.

Additional Help information can be accessed by tapping the Help Menu buttons at the bottom of this screen.

Figure 107: SIMs App Main Info Screen



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SIMs App Screens

Outdoor Info/ Component Screen

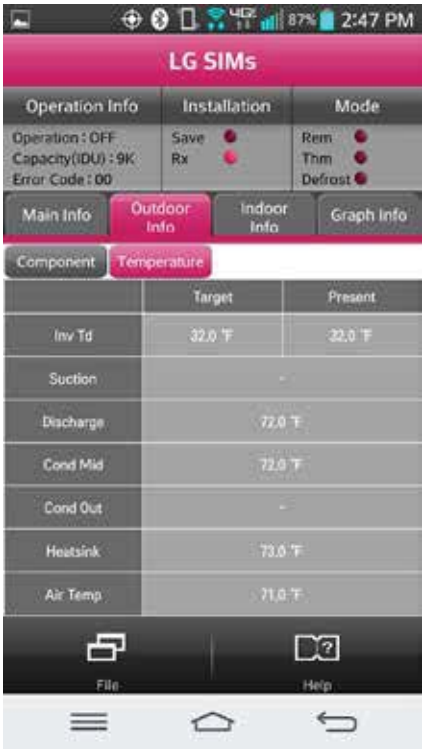
Displays the following information:

- Frequency
- FAN1 RPM
- FAN2 RPM
- DC Link
- Current
- Voltage
- EEV Mode
- Restart Timer
- Comp Mode
- EEV

Outdoor Info/ Temperature Screen

Displays the following information:

- Inv TD
- Suction
- Discharge
- Cond Mid
- Cond Out
- Heatsink
- Air Temp



Indoor Info Tab

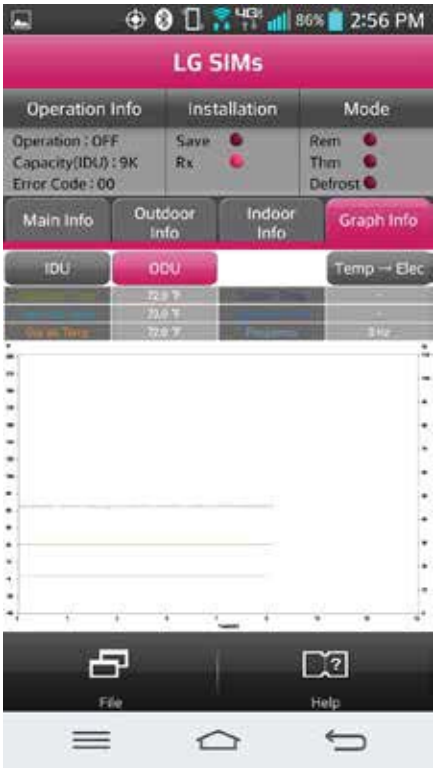
Displays the following information:

- Frequency
- Operation
- THM Mode
- REM Mode
- FAN
- EEV
- Air Temp
- Pipe-in
- Pipe-mid
- Pipe-out

Graph Info Tab

This tab, has three sub sections:

- IDU - Indoor Unit Temperature graph. Displays IDU information in graph format. Information displayed is for the IDU # selected on the Main screen.
- ODU - Outdoor Unit Temperature and Frequency graph. Displays ODU information in graph format.
- ODU Electric - Outdoor Unit Electric data graph is displayed.



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Troubleshooting Using Error Codes

Refer to Tables 44 and 45 for error codes that are generated from the indoor and outdoor units. These codes indicate different types of unit failures, assist in self-diagnosis, are the most common that will manifest through these units. Error codes are displayed on indoor unit LEDs, wired remote controllers, the outdoor unit PCB, and through LG Monitoring View (LGMV) diagnostic software.

Systems may generate additional codes not listed here. Contact LG Support if these types of errors are seen and a simple power down and boot up has not corrected the issue. Do not attempt to fix the system yourself.

- If two or more errors occur simultaneously, the highest error code number is displayed first.
- After error is resolved, the error code does not display.

Decoding the Error Display

See images and table below for indoor unit error codes, location of LEDs, and operation status.

The first and second number on the LED indicates error number. Example: 21 = LED1 (Red light) 2x blink, LED2 (Green light) 1x blink.

Error Code Nomenclature Definitions

- MICOM: Non-volatile memory chip where unit setup information is stored.
- EPROM: Non-volatile memory chip where device identification, size, and factory defined default component operating parameters are stored.

Figure 108: Standard Wall-Mounted Indoor Unit LEDs.

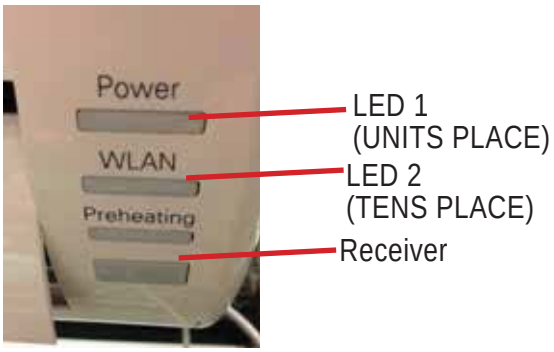


Figure 109: Art Cool Mirror Wall-Mounted Indoor Unit LEDs.

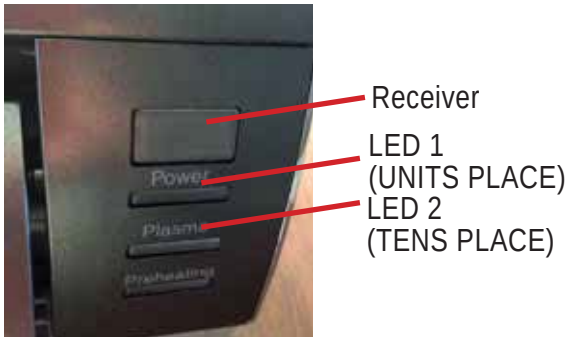
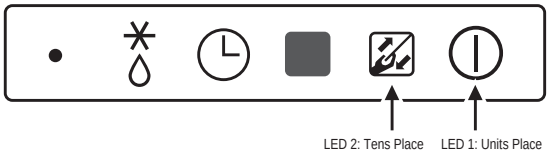


Figure 110: Ceiling Cassette Indoor Unit LEDs.



Number of Blinks = Error Code

Table 44: Indoor Unit Error Codes.

Error Code	Description	Indoor Unit Operation Status
00	No error	ON
01	Indoor unit room temperature sensor error	OFF
02	Indoor unit inlet pipe sensor error	OFF
03	Controller error	OFF
04	Drain pump error (optional)	OFF
05	Communication error between indoor unit and outdoor units	OFF
06	Indoor unit outlet pipe sensor error	OFF
07	Different mode operation error	OFF
09	Indoor unit EPROM error	OFF
10	Indoor unit BLDC motor fan lock	OFF

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Table 45: Outdoor Unit Error Codes.

Error Code	Description	No. of Times Outdoor Unit LEDs Blink		Outdoor Operation Status
		LED01 (Red)	LED02 (Green)	
21	DC Peak (IPM Fault); Compressor DC voltage was too high	2X	1X	OFF
22	Current Transformer2 (CT2) error; Alternating current (AC) input too high	2X	2X	OFF
23	DC Link Low Voltage (DC Link Voltage is <140VDC)	2X	3X	OFF
	DC Link High Voltage (DC Link Voltage is >420VDC)			
25	AC Low / High Voltage	2X	5X	OFF
26	DC Compressor Position Error (Compressor failed to start properly)	2X	6X	OFF
27	PSC / PFC Fault; Input current to inverter compressor PCB is too high	2X	7X	OFF
29	Current to inverter compressor is too high	2X	9X	OFF
32	Inverter compressor discharge pipe (D-Pipe) temperature is too high	3X	2X	OFF
35	Low Pressure Error; Pressure dropped below recommended limits	3X	5X	OFF
39	Communication Error between PFC MICOM and Inverter MICOM	3X	9X	OFF
40	CT Sensor Error; Thermistor is disconnected or has shorted out	4X	-	OFF
41	Inverter compressor discharge pipe (D-Pipe) sensor is disconnected or has shorted out	4X	1X	OFF
43	High pressure sensor is disconnected or has shorted out	4X	3X	OFF
44	Outdoor air sensor is disconnected or has shorted out	4X	4X	OFF
45	Mid-pipe thermistor of outdoor unit condenser is disconnected or has shorted out	4X	5X	OFF
46	Outdoor unit suction piping thermistor is disconnected or has shorted out	4X	6X	OFF
48	Outlet piping (liquid) of condenser is disconnected or has shorted out	4X	8X	OFF
51	Combination ratio (capacity) is out of range; Total nominal indoor unit capacity is<50% or >130% of the outdoor unit capacity	5X	1X	OFF
53	Communication failure between outdoor unit and indoor unit(s)	5X	3X	OFF
54	Outdoor unit is not wired properly (ex: reversed phase)	5X	4X	OFF
60	Outdoor unit printed circuit board (PCB) EPROM check sum error	6X	-	OFF
61	Condenser coil thermistor temperature is too high	6X	1X	OFF
62	Outdoor unit inverter compressor PCB heat sink temperature is too high	6X	2X	OFF
65	Heat sink thermistor is disconnected or has shorted out	6X	5X	OFF
67	Outdoor unit brushless direct current (BLDC) fan motor lock error	6X	7X	OFF
73	Outdoor unit PFC overcurrent (peak) error	7X	3X	OFF

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Cautions for Refrigerant Leaks / Introduction

ASHRAE Standards 15 and 34 offer guidelines that address refrigerant safety and the maximum allowable concentration of refrigerant in an occupied space. Refrigerant will dissipate into the atmosphere, but a certain volume of air is required for this to occur safely. For R410A refrigerant, the maximum allowable concentration is 0.026 lbs./ft^3 per 1,000 ft^3 of air in an occupied space. Buildings with twenty-four (24) hour occupancy allow half of that concentration.[1]

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

⚠ WARNING

Verify the maximum refrigerant concentration level in the space where the indoor unit will be mounted meets the concentration limit for the application. If the refrigerant leaks and safety limits are exceeded, it could result in personal injuries or death from oxygen depletion.

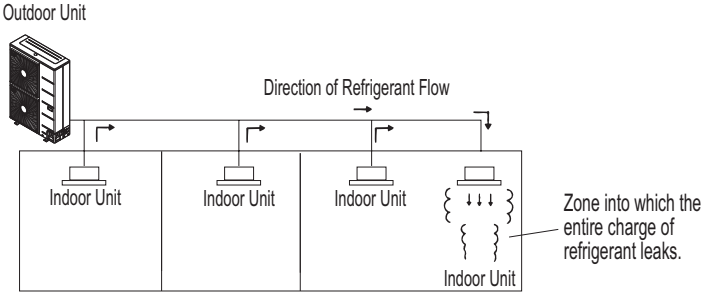
Note:

Take appropriate actions at the end of HVAC equipment life to recover, recycle, reclaim or destroy R410A refrigerant according to applicable US EPA rules.

To calculate the potential refrigerant concentration level (RCL):

1. Measure the occupied space dimensions (in feet).
2. Calculate the cubic foot volume of air in the smallest occupied space. (To obtain a detailed overview of the RCL, perform the same calculations to the second smallest zone, the third smallest zone until the RCL is obtained for all zones. Also, pay special attention to areas such as basements, etc., where refrigerant cannot dissipate easily.)
3. Divide the refrigerant charge of the Multi Zone system serving the area in pounds by the results of step 1.
4. If the calculation indicates that the potential refrigerant concentration level is higher than the allowed RCL, increase the cubic volume of the smallest occupied space or modify the piping system design.
5. The allowable RCL limit for most applications must be equal to or less than 0.026 lbs./ft^3. However, in special occupied spaces, such as hospitals and nursing homes, where occupants may have limited mobility, the allowable RCL limit is cut in half. See ASHRAE Standard 34 and local codes for detailed information.[1]

Figure 111: Example of R410A Refrigerant Leak Location.



Refrigerant Concentration Limit (RCL) Calculations

To calculate total refrigerant amount per system:

Amount of Factory-Charged Refrigerant per Outdoor Unit + Amount of Additional Refrigerant Trim Charge = Total System Refrigerant Charge

$$\text{RCL (lbs./ft}^3\text{)} = \frac{\text{Total System Refrigerant Charge (lbs.)}}{\text{Volume of Smallest Occupied Space (ft}^3\text{)}}$$

[1] American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc. (ASHRAE). Atlanta, GA. ASHRAE, Inc. Information about ASHRAE Standard 15 / 34 and addenda current as of the date of this publication.

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CAUTIONS FOR REFRIGERANT LEAKS

To determine the volume of an occupied space, the designer must also determine which ones are connected, not connected, or ventilated (refer to Standard 34).

If the calculated RCL is above the allowable limit, there are two primary methods used to lower the RCL:

1. Increase the volume of the occupied space.
2. Decrease the size of the refrigerant charge.

Per Standard 34-2007, acceptable methods used to increase the volume of an occupied space include:

- Install transfer ducts between rooms.
- Undercut and overcut doors (partitions ≤0.15% of cubic volume o f space within a zone).
- Add an opening without a door (partitions ≤0.15% of cubic volume of space within a zone).
- Include ventilation grilles in doors; include ventilation inlets / outlets (partitions ≤0.15% of cubic volume of space within a zone).
- Include the area above the ceiling as part of the return or supply air path (partitions ≤0.15% of cubic volume of space within a zone).
- Install a mechanical ventilator linked to a gas leak detector.
- Change the indoor unit type (wall mounted to ceiling cassette) / position.

Figure 112: Examples of Zones.

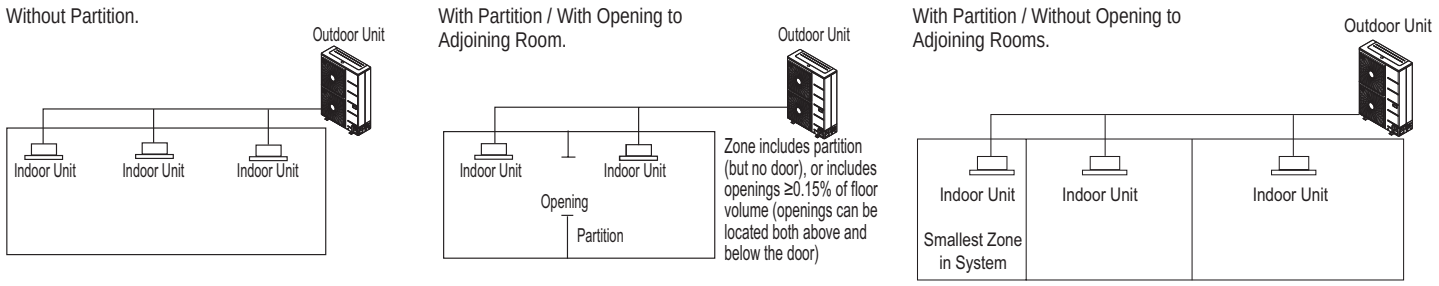
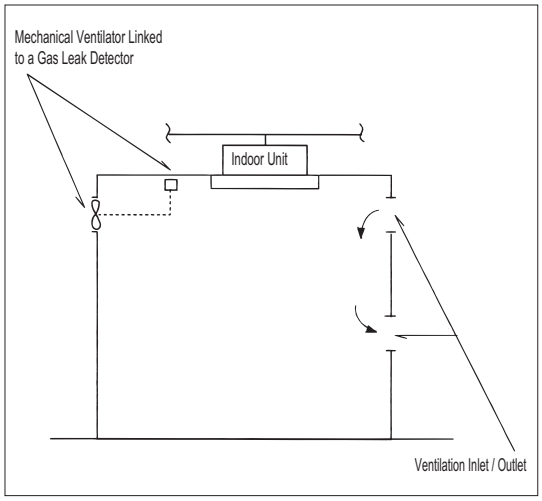


Figure 113: Examples of Acceptable Ventilation Methods.



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MULTI F
MULTI F MAX

INSTALLATION CHECKLIST

Major Component Rough-In

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

Piping and Insulation

Description	Check
Copper	
Over 5/8 inches—Rigid ACR only.	
5/8 inches and under—Can use soft ACR.	
15% silver brazing material only.	
All refrigerant pipes and valves were insulated separately. Insulation butts up against the walls of the indoor units. No gaps or cracks. Insulation was not compressed at clamps and hangers.	
LG Y-branches were used per manufacturer's recommendations.	
(Optional) Full port ball valves for all indoor units. (Schrader between the valve body and the indoor units.)	
Condensate piping installed on indoor units–material used is acceptable under local code. Insulated as necessary to prevent condensation.	

Brazing Practices

Description	Check
Medical grade (there are 4 available) dry nitrogen for purging during brazing was used (constant 3 psi while brazing).	

Installation

(For more information on any procedure, refer to the detail provided in the Indoor Unit Installation Manuals.)

Refrigerant Piping

Description	Check
Have in possession a copy of the "As-Designed" LATS Multi F 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 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.	
All long runs of straight pipe were provided with expansion loops.	
Ensure Y-branches are installed with no more than ±5° of horizontal.	
Ensure Y-branches are installed with no more than ±3° of vertical.	
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 were properly supported and all wall penetrations were sleeved.	
Pipe insulation was not compressed at any point.	
Y-branches were properly supported per details provided in the installation manual.	
Ensure Y-branches are installed in the correct direction. Flow is always from the single end to the double end.	
No oil traps, solenoid valves, sight glasses, filter driers, or any other unauthorized refrigerant specialties were present.	
(Optional) R410A rated full port ball valves were used at all indoor units and wherever appropriate in the refrigerant piping network.	
Best practice including a minimum of 20" of straight pipe was installed between each elbow.	

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INSTALLATION CHECKLIST

Condensate Pump / Drain Installation

Description	Check
Indoor unit condensate drain pipes were installed correctly.	
All condensate vertical risers are equal to or less than 27-1/2" 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).	

Power Wire and Communications Cables

Description	Check
Power wiring was connected to a single phase 208-230V source.	
Ground wire was installed and properly terminated at the unit.	
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 installed per all local electrical code requirements.	
Power wiring to the indoor units and branch distribution unit(s) (Multi F MAX only) was installed per all local electrical code requirements.	
LG-supplied cable was used between each indoor unit and its zone controller. No cables were spliced and no wire caps are present.	
Communication type RS-485–BUS type.	
Communications/power were a minimum of 18-AWG, four (4) conductor, stranded, shielded or unshielded, with insulation material per local code. If shielded, must be ground to outdoor unit only. Cable segment shields were tied together.	
Used appropriate crimping tool to attach ring or spade terminals at all power wiring and control cable terminations.	
Power and control wires were run in the same conduit (ODU to IDU only) as provided in the product installation manual. Power to ODU and power/communications to IDU cannot be run in the same conduit and must be separated per manufacturer's guidelines.	

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INSTALLATION CHECKLIST

Major Component Rough-In

Piping and Insulation

Brazing Practices

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INSTALLATION CHECKLIST

Installation—Refrigerant Piping

Installation—Branch Distribution Unit (Multi F MAX Systems Only)

Installation—Condensate Pump / Drain Installation

Installation—Power Wire and Communications Cables

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MULTI F
MULTI F MAX

MULTI F REFRIGERANT CHARGE WORKSHEET

LG Multi F 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 determine the additional refrigerant that is needed, apply the formula 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 Outdoor Unit Factory Charge

Outdoor Unit	Factory Charge lbs. of R410A
LMU18CHV	3.96
LMU24CHV	3.96
LMU30CHV	6.18
LMU36CHV	6.18

Multi F Outdoor Unit Additional Refrigerant Charge Formula

Additional charge (lbs.) = (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

Note:

• Number of installed length of branches depends on the specifications of the outdoor unit model.

• CF = Maximum number of connectible indoor units – Total number of connected indoor units.

Multi F Outdoor Unit Piping Specifications

Multi F Outdoor Unit Model	Min. to Max. Piping Length for One Branch (ft.)	Max. Total System Piping Length (ft.)	Chargeless Pipe Length per Branch (L) (ft.)	Additional Charge Needed (a) (oz./ft.)
LMU18CHV	10 to 82	164	24.6	0.22
LMU24CHV	10 to 82	246.1	24.6	0.22
LMU30CHV	10 to 82	246.1	24.6	0.22
LMU36CHV	10 to 82	246.1	24.6	0.22

Multi F Refrigerant Charge Calculations

(_____[A] – 24.6) x 0.22 (_____)

+ (_____[B] – 24.6) x 0.22 + (_____)

+ (_____[C] – 24.6) x 0.22 + (_____)

+ (_____[D] – 24.6) x 0.22 + (_____)

- _____CF x 5.29 - (_____)

= _____ Additional Charge (lbs.)

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MULTI F
MULTI F MAX

MULTI F MAX REFRIGERANT CHARGE WORKSHEET

LG 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 determine the additional refrigerant that is needed, apply the formula 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 MAX Outdoor Unit Factory Charge

Outdoor Unit	Factory Charge lbs. of R410A
LMU480HV	9.7
LMU540HV	9.7
LMU600HV	12.3

Additional charge (lbs.) = (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

Multi F MAX Outdoor Unit Piping Specifications

Outdoor Unit Model	Main Piping Length		Branch Piping Length	
	Chargeless Pipe Length of Main Pipe (L) (ft.)	Additional Charge Needed (a) (oz./ft.)	Chargeless Pipe Length per Branch Pipe (B) (ft.)	Additional Charge Needed (b) (oz./ft.)
LMU480HV	16.4	0.54	16.4	0.22
LMU540HV	16.4	0.54	16.4	0.22
LMU600HV	16.4	0.54	16.4	0.22

Multi F MAX Refrigerant Charge Calculations

(_____[A] – 16.4) x 0.54	(_____)
+ (_____[B1] – 16.4) x 0.22	+ (_____)
+ (_____[B2] – 16.4) x 0.22	+ (_____)
+ (_____[B3] – 16.4) x 0.22	+ (_____)
+ (_____[B4] – 16.4) x 0.22	+ (_____)
+ (_____[B5] – 16.4) x 0.22	+ (_____)
+ (_____[B6] – 16.4) x 0.22	+ (_____)
+ (_____[B7] – 16.4) x 0.22	+ (_____)
+ (_____[B8] – 16.4) x 0.22	+ (_____)
- _____CF x 3.53	- (_____)

= _____ Additional Charge (lbs.)

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Refer to Service Manuals posted on www.lghvac.com for a full description of all error codes and work-arounds.

LG Electronics, U.S.A., Inc.
Commercial Air Conditioning Division
4300 North Point Parkway
Alpharetta, Georgia 30022
www.lg-vrf.com

LG Electronics Products Support
1-888-865-3026 USA
Follow the prompts for HVAC products.

IM_MultiF_ODU_03_17
Supersedes: IM_MultiF_ODU_11_16
IM_MultiF_ODU_4_16
IM_MultiF_ODU_11_15

LG
Life's Good

ENGLISH
FRANÇAIS
ESPAÑOL

INSTALLATION MANUAL
AIR CONDITIONER

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

TYPE : Multi Type

http://www.lghvac.com
www.lg.com

P/NO : MFL67206502

FLEX MULTI SPLIT INSTALLATION INSTRUCTIONS

IMPORTANT!

Please read this instruction sheet completely before installing the product.

This air conditioning system meets strict safety and operating standards. As the installer or service person, it is an important part of your job to install or service the system so it operates safely and efficiently.

⚠ WARNING

- Installation or repairs made by unqualified persons can result in hazards to you and others. Installation MUST comply with local building codes or, in the absence of local codes, with the National Electrical Code NFPA 70/ANSI C1-1993 or current edition and Canadian Electrical Code Part1 CSA C.22.1.
- The information contained in this manual is intended for use by a qualified service technician familiar with safety procedures and equipped with the proper tools and test instruments.
- Failure to carefully read and follow all instructions in this manual can result in equipment malfunction, property damage, personal injury and/or death.

CAUTION: Improper installation, adjustment, alteration, service or maintenance can void the warranty. The weight of the condensing unit requires caution and proper handling procedures when lifting or moving to avoid personal injury. Use care to avoid contact with sharp or pointed edges.

Safety Precautions

- Always wear safety glasses and work gloves when installing equipment.
- Never assume electrical power is disconnected. Check with meter and equipment.
- Keep hands out of fan areas when power is connected to equipment.
- R410A causes frostbite burns.
- R410A is toxic when burned.

NOTE TO INSTALLING DEALER : The Owners Instructions and Warranty are to be given to the owner or prominently displayed near the indoor Air Handler Unit.

⚠ Special warnings

When wiring:

Electrical shock can cause severe personal injury or death. Only a qualified, experienced electrician should attempt to wire this system.

- Do not supply power to the unit until all wiring and tubing are completed or reconnected and checked.
- Highly dangerous electrical voltages are used in this system. Carefully refer to the wiring diagram and these instructions when wiring. Improper connections and inadequate grounding can cause accidental injury or death.
- Ground the unit following local electrical codes.
- Connect all wiring tightly. Loose wiring may cause overheating at connection points and a possible fire hazard.

When transporting:

Be careful when picking up and moving the indoor and outdoor units. Get a partner to help, and bend your knees when lifting to reduce strain on your back. Sharp edges or thin aluminum fins on the air conditioner can cut your fingers.

When installing...

... in a wall: Make sure the wall is strong enough to hold the unit's weight. It may be necessary to construct a strong wood or metal frame to provide added support.

... in a room: Properly insulate any tubing run inside a room to prevent "sweating" that can cause dripping and water damage to wall and floors.

... in moist or uneven locations: Use a raised concrete pad or concrete blocks provide a solid, level foundation for the outdoor unit. This prevents water damage and abnormal vibration.

... in an area with high winds: Securely anchor the outdoor unit down with bolts and a metal frame. Provide a suitable air baffle.

... in a snowy area(for Heat Pump Model): Install the outdoor unit on a raised platform that is higher than drifting snow. Provide snow vents.

When connecting refrigerant tubing

- Keep all tubing runs as short as possible.
- Use the flare method for connecting tubing.
- Check carefully for leaks before starting the test run.

When servicing

- Turn the power OFF at the main power box(mains) before opening the unit to check or repair electrical parts and wiring.
- Keep your fingers and clothing away from any moving parts.
- Clean up the site after you finish, remembering to check that no metal scraps or bits of wiring have been left inside the unit being serviced.

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Required Tools

- ❑ Level gauge
- ❑ Screw driver
- ❑ Electric drill
- ❑ Hole core drill (ø50mm)

- ❑ Flaring tool set
- ❑ Specified torque wrenches
  1.8kg.m, 4.2kg.m, 5.5kg.m, 6.6kg.m
  (different depending on model No.)
- ❑ Adjustable wrench

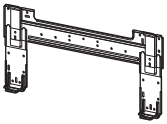
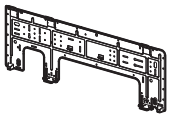
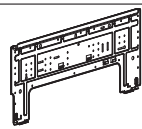
- ❑ A glass of water
- ❑ Screw driver

- ❑ Hexagonal wrench(4mm)
- ❑ Refrigerant Gas Leak Detector
- ❑ Vacuum pump
- ❑ Gauge manifold

- ❑ Owner's manual
- ❑ Thermometer
- ❑ Remote Control Holder

Installation Parts Provided

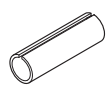
[Standard / Standard Libero / Artcool Mirror]

Type 1	Type 2	Type 3	Type 4
Installation plate	Installation plate	Installation plate	Installation plate
			
Type "B" screw	Type "B" screw	Type "B" screw / Type "C" screw	Type "B" screw / Type "C" screw
Type "A" screw	Type "A" screw	Type “A” screw	Type “A” screw
Remote control holder	Remote control holder	Remote control holder	Remote control holder

[Ceiling Concealed Duct Type]

Name	Clamp metal	Insulation for fitting	Screws for duct flanges	Clamp	Conduit Bracket
Quantity	1 EA	1 set	1 set	8 EA	1 EA
Shape		for gas pipe for liquid pipe			Conduit Bracket Screw(M4) 2EA

[Ceiling Cassette Type]

Name	Drain hose	Clamp metal	Washer for hanging backet	Clamp	Conduit Bracket	Insulation for fitting	Remote control holder
Quantity	1 EA	1 EA	8 EA	8 EA	1 EA	1 SET	1 EA
Shape					Conduit Bracket Screw(M4) 2EA	 for gas pipe for liquid pipe	

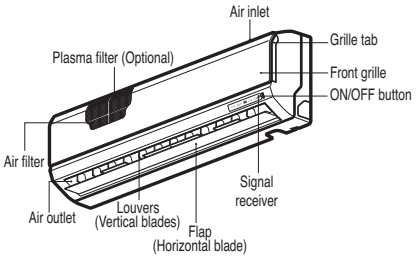
ENGLISH

Product Introduction

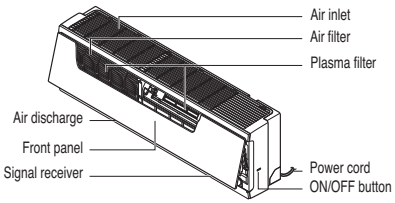
Here is a brief introduction of the indoor and outdoor units. Please see the information specific to your indoor unit type.

Indoor Unit

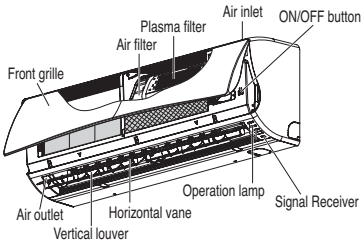
[Standard Type]



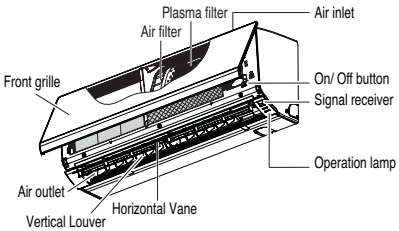
[Artcool Mirror Type]



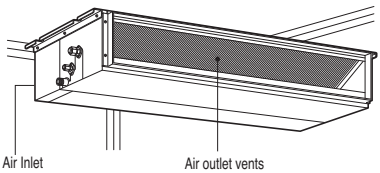
[Standard Libero Type]



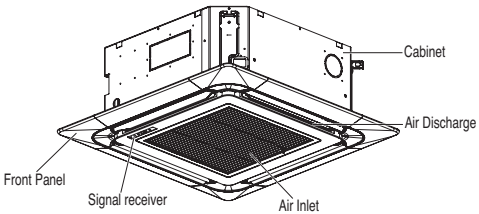
[Artcool Libero Type]



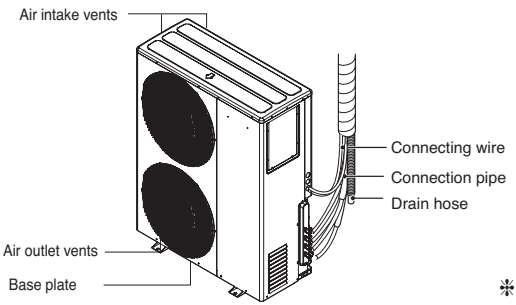
[Ceiling Concealed Duct Type]



[Ceiling Cassette Type]



Outdoor Unit



❉ The figure can be changed according to model.

Safety Precautions

To prevent the injury of the user or other people and property damage, the following instructions must be followed.

- Be sure to read before installing the air conditioner.
- Be sure to observe the cautions specified here as they include important items related to safety.
- Incorrect operation due to ignoring instruction will cause harm or damage. The seriousness is classified by the following indications.

⚠WARNING	This symbol indicates the possibility of death or serious injury.
⚠CAUTION	This symbol indicates the possibility of injury or damage to properties only.

- The meanings of the symbols used in this manual are as shown below.

	Be sure not to do.
	Be sure to follow the instruction.

⚠WARNING

■ Installation

Always perform grounding.

- Otherwise, it may cause electrical shock.

Don't use a power cord, a plug or a loose socket which is damaged.

- Otherwise, it may cause a fire or electrical shock.

For installation of the product, always contact the service center or a professional installation agency.

- Otherwise, it may cause a fire, electrical shock, explosion or injury.

Securely attach the electrical part cover to the indoor unit and the service panel to the outdoor unit.

- If the electrical part cover of the indoor unit and the service panel of the outdoor unit are not attached securely, it could result in a fire or electric shock due to dust, water, etc.

Always install an air leakage breaker and a dedicated switching board.

- No installation may cause a fire and electrical shock.

Do not keep or use flammable gases or combustibles near the air conditioner.

- Otherwise, it may cause a fire or the failure of product.

Ensure that an installation frame of the outdoor unit is not damaged due to use for a long time.

- It may cause injury or an accident.

Do not disassemble or repair the product randomly.

- It will cause a fire or electrical shock.

Do not install the product at a place that there is concern of falling down.

• Otherwise, it may result in personal injury.

Use caution when unpacking and installing.

• Sharp edges may cause injury.

Use a vacuum pump or Inert (nitrogen) gas when doing leakage test or air purge. Do not compress air or Oxygen and Do not use Flammable gases. Otherwise, it may cause fire or explosion.

• There is the risk of death, injury, fire or explosion.

■ Operation

Do not share the outlet with other appliances.

• It will cause an electric shock or a fire due to heat generation.

Do not use the damaged power cord.

• Otherwise, it may cause a fire or electrical shock.

Do not modify or extend the power cord randomly.

• Otherwise, it may cause a fire or electrical shock.

Take care so that the power cord may not be pulled during operation.

• Otherwise, it may cause a fire or electrical shock.

Unplug the unit if strange sounds, smell, or smoke comes from it.

• Otherwise, it may cause electrical shock or a fire.

Keep the flames away.

• Otherwise, it may cause a fire.

Take the power plug out if necessary, holding the head of the plug and do not touch it with wet hands.

• Otherwise, it may cause a fire or electrical shock.

Do not use the power cord near the heating tools.

• Otherwise, it may cause a fire and electrical shock.

Do not open the suction inlet of the indoor/outdoor unit during operation.

• Otherwise, it may electrical shock and failure.

Do not allow water to run into electrical parts.

• Otherwise, it may cause the failure of machine or electrical shock.

Hold the plug by the head when taking it out.

• It may cause electric shock and damage.

Never touch the metal parts of the unit when removing the filter.

• They are sharp and may cause injury.

Do not step on the indoor/outdoor unit and do not put anything on it.

• It may cause an injury through dropping of the unit or falling down.

Do not place a heavy object on the power cord.

• Otherwise, it may cause a fire or electrical shock.

When the product is submerged into water, always contact the service center.

• Otherwise, it may cause a fire or electrical shock.

Take care so that children may not step on the outdoor unit.

• Otherwise, children may be seriously injured due to falling down.

⚠CAUTION

■ Installation

Install the drain hose to ensure that drain can be securely done.

• Otherwise, it may cause water leakage.

Install the product so that the noise or hot wind from the outdoor unit may not cause any damage to the neighbors.

• Otherwise, it may cause dispute with the neighbors.

Always inspect gas leakage after the installation and repair of product.

• Otherwise, it may cause the failure of product.

Keep level parallel in installing the product.

• Otherwise, it may cause vibration or water leakage.

■ Operation

Avoid excessive cooling and perform ventilation sometimes.

• Otherwise, it may do harm to your health.

Use a soft cloth to clean. Do not use wax, thinner, or a strong detergent.

• The appearance of the air conditioner may deteriorate, change color, or develop surface flaws.

Do not use an appliance for special purposes such as preserving animals vegetables, precision machine, or art articles.

• Otherwise, it may damage your properties.

Do not place obstacles around the flow inlet or outlet.

• Otherwise, it may cause the failure of appliance or an accident.

Installation of Indoor, Outdoor Unit

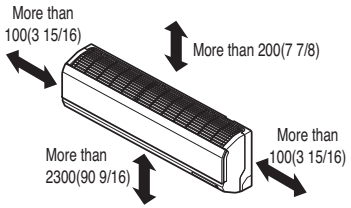
Read completely, then follow step by step.

Select the best location

Indoor unit

1. Do not have any heat or steam near the unit.
2. Select a place where there are no obstacles in front of the unit.
3. Make sure that condensation drainage can be conveniently routed away.
4. Do not install near a doorway.
5. Ensure the unit is unobstructed, allow proper space on all sides according to the arrows and distance measurements in the figures.
6. Use a Metal Detector or Metal Scanner to locate studs to prevent unnecessary damage to the wall.

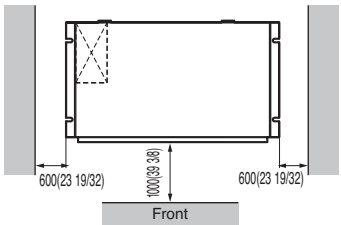
[Standard/Standard Libero/Artcool Mirror/Artcool Libero Type]



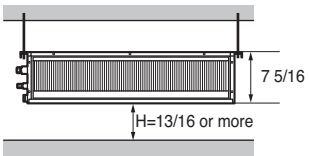
Unit:mm(inch)

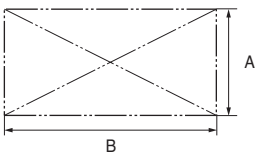
[Ceiling Concealed Duct Type]

Top view



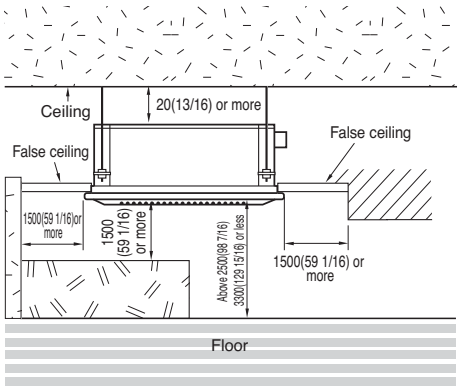
Front view





Capacity(Btu/h class)	A	B
9/12k	600(23 5/8)	900(35 15/32)
18k	600(23 5/8)	1100(43 5/16)

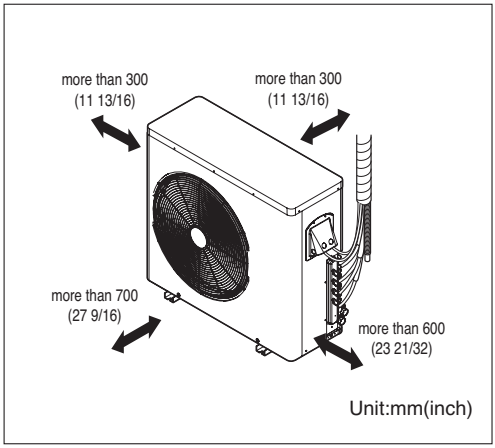
[Ceiling Cassette Type]



Unit:mm(inch)

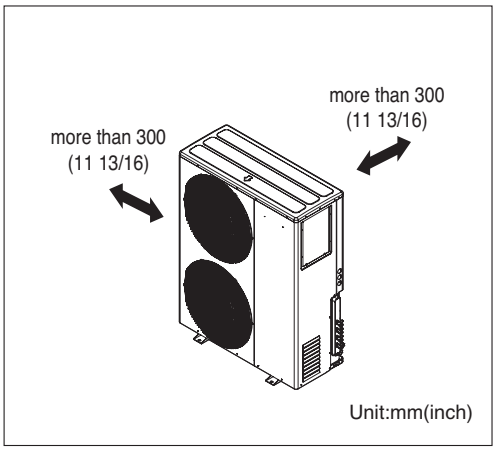
Outdoor unit

1. If an awning is built over the unit to prevent direct sunlight or rain exposure, make sure that heat radiation from the condenser is not restricted.
2. Ensure the unit is unobstructed, allow proper space on all sides according to the arrows and distance measurements in the figures.
3. Do not place animals and plants in the path of the warm air.
4. Take the air conditioner weight into account and select a place where noise and vibration are minimum.
5. Select a place so that the warm air and sound from the air conditioner does not disturb neighbors.



Rooftop Installations:

If the outdoor unit is installed on a roof structure, be sure to level the unit. Ensure the roof structure and anchoring method are adequate for the unit location. Consult local codes regarding rooftop mounting.



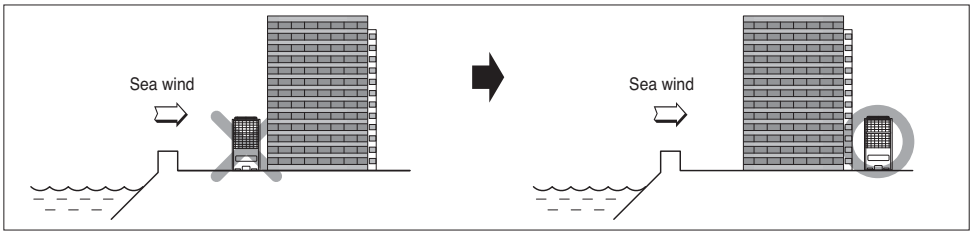
Seaside Applications and Installation

⚠ CAUTION

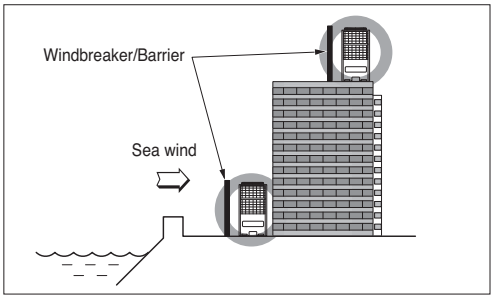
1. Air conditioners should not be installed in areas where corrosive gases, such as acid or alkaline gas, are produced.
2. Do not install the product where it could be exposed to sea wind (salty wind) directly. It can result corrosion on the product. Corrosion, particularly on the condenser and evaporator fins, could cause product malfunction or inefficient performance.
3. If outdoor unit is installed close to the seaside, it should avoid direct exposure to the sea wind.

1. Selecting the location(Outdoor Unit)

1) If the outdoor unit is to be installed close to the seaside, direct exposure to the sea wind should be avoided. Install the outdoor unit on the opposite side of the sea wind direction.



2) In case, to install the outdoor unit on the seaside, set up a windbreaker/barrier, to lessen the unit's exposure to sea air



- It should be strong enough (like concrete) to obstruct the wind from the sea.
- The height and width should be more than 150% of the outdoor unit.
- A minimum of 70cm (27 1/16 inches) of space between outdoor unit and the windbreak for easy air flow.

3) Select a well-drained place.

Periodic (more than once/year) cleaning of the dust or salt particles stuck on the heat exchanger using water is recommended.

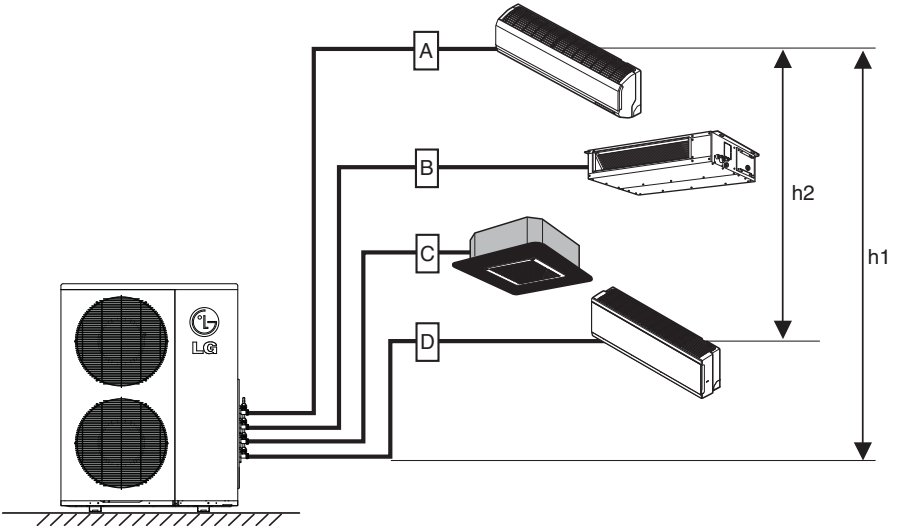
Piping length and elevation

Multi Piping Type

Unit : m(ft)

Outdoor Unit Capacity (Btu/h class)	Max total length of all pipes (A+B)/(A+B+C)/ (A+B+C+D)	Max length of each pipe (A/B/C/D)	Min length of each pipe (A/B/C/D)	Max Elevation between each indoor unit and outdoor unit (h1)	Max elevation between indoor units (h2)	Max.Combination of Indoor unit (Btu/h class)
18k	50(164)	25(82)	3(10)	15(49)	7.5(25)	24k
24k	75(246)	25(82)	3(10)	15(49)	7.5(25)	33k
36k	75(246)	25(82)	3(10)	15(49)	7.5(25)	48k

Indoor unit Capacity (Btu/h class)	Pipe Diameter Unit : mm(inch)	
	Gas	Liquid
9k	9.52(3/8)	6.35(1/4)
12k	9.52(3/8)	6.35(1/4)
18k	12.7(1/2)	6.35(1/4)



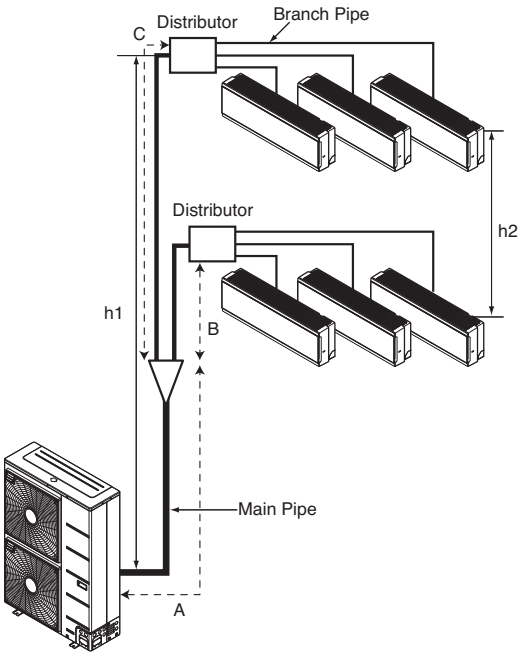
CAUTION: Capacity is based on standard length and maximum allowance length is on the basis of reliability.

Distributor Piping Type

Unit : m(ft)

Outdoor Unit Capacity (Btu/h class)	Max total length of all pipes (Main + Branch pipes)	Max length of Main pipe (A+B+C)	Max length of Branch pipes	Max length of each Branch pipe	Min length of each pipe (Main / Branch pipes)	Max Elevation Between each indoor unit and outdoor unit (h1)	Max Elevation Between indoor (h2)	Max Combination of indoor unit
54k	145(476)	55(180)	90(295)	15(49)	3(10)	30(98)	15(49)	73k

Indoor unit Capacity (Btu/h class)	Pipe Diameter Unit : mm(inch)	
	Gas	Liquid
9k	9.52(3/8)	6.35(1/4)
12k	9.52(3/8)	6.35(1/4)
18k	12.7(1/2)	6.35(1/4)



CAUTION: Capacity is based on standard length and maximum allowance length is on the basis of reliability.

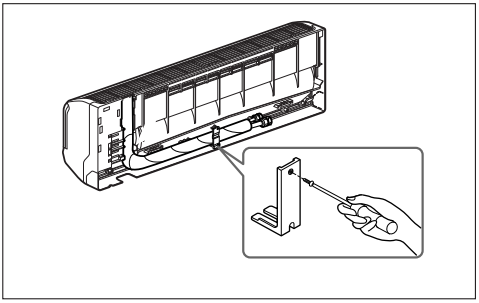
Installation

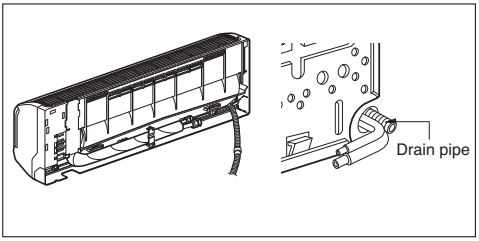
[Standard / Standard Libero / Artcool Mirror Type]

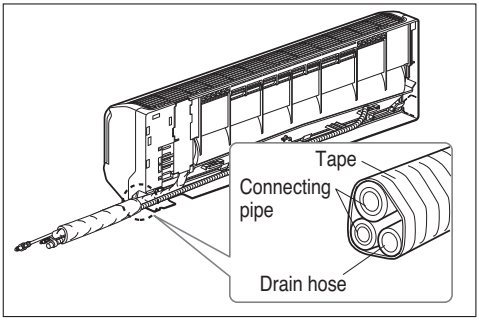
Connecting the piping

Standard / Artcool Mirror Type

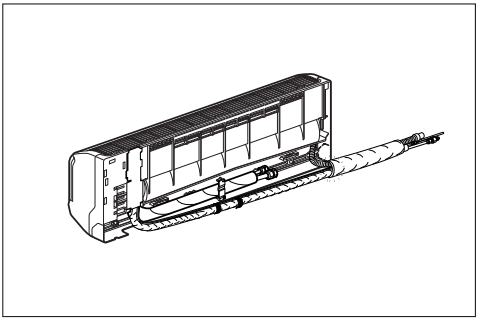
1. Prepare the indoor unit's piping and drain hose for installation through the wall.
2. Remove the plastic tubing retainer(see the illustration on the right) and pull the tubing and drain hose away from chassis.
3. Route the indoor tubing and the drain hose to the required piping hole position.
4. Insert the piping, drain hose, and the connecting cable into the piping hole.
5. Insert the connecting cable into the indoor unit.
   - Don't connect the cable to the indoor unit.
   - Make a small loop with the cable for easy connection later.
6. Tape the tubing and drain hose.





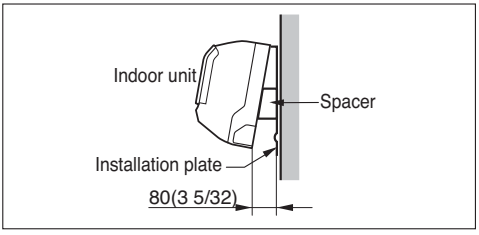


For right rear piping



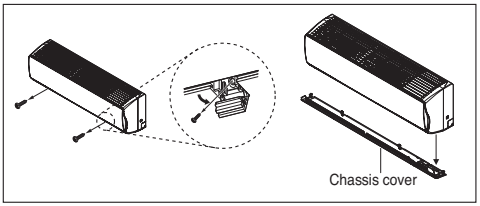
For left rear piping

7. Indoor unit installation
   - Hang the indoor unit from the hooks at the top of the installation plate.
   - Insert the spacer etc. between the indoor unit and the installation plate and separate the bottom of the indoor unit from the wall.



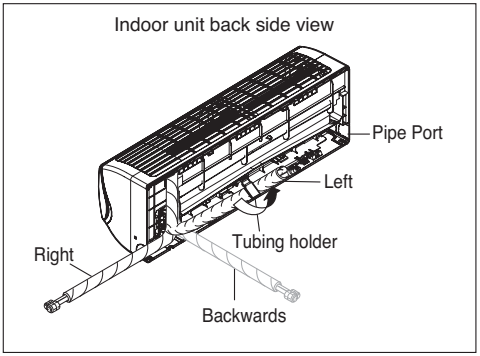
 # Standard Libero / Artcool Libero Type

1. Pull the screw cap at the bottom of the indoor unit
2. Remove the chassis cover from the unit by loosing screws

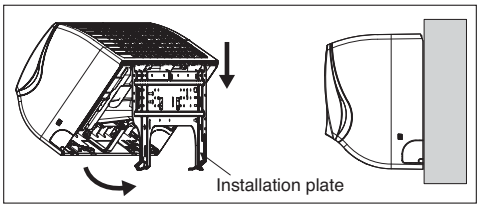


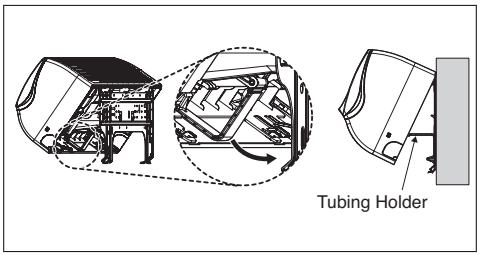
3. Pull back the tubing holder.

4. Remove pipe port cover and positioning the tubing



5. Indoor unit installation
   1) Hook the indoor unit onto the upper portion of the installation plate.(engage the three hooks at the top of the indoor unit with the upper edge of the installation plate) Ensure that the hooks are properly seated on the installation plate by moving it left and right
   2) Unlock the tubing holder from the chassis and mount between the chassis and installation plate in order to separate the bottom side of the indoor unit from the wall



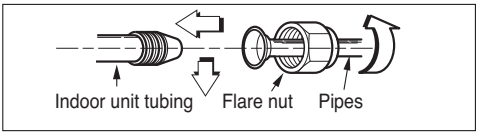


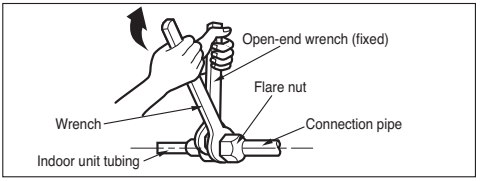
Connecting the piping to the indoor unit and drain hose to drain pipe.

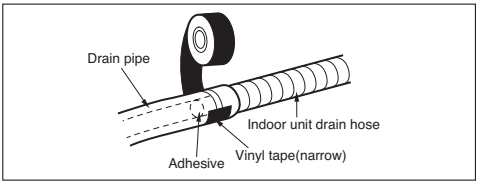
1. Align the center of the pipes and sufficiently tighten the flare nut by hand.
2. Tighten the flare nut with a wrench.

Outside diameter		Torque		
mm	inch	N. m	kgf.m	lbf.ft
Ø6.35	1/4	14~18	1.4~1.8	10~13
Ø9.52	3/8	34~42	3.5~4.3	25~31
Ø12.7	1/2	49~61	5.0~6.2	36~45
Ø15.88	5/8	69~82	7.0~8.4	51~60
Ø19.05	3/4	100~120	10.0~12.2	73~88

3. Next, extend the indoor unit's drain hose. Then attach the drain pipe.





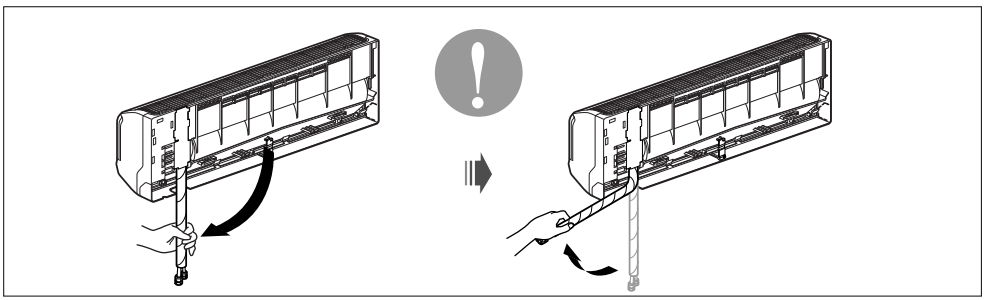


⚠ CAUTION

Installation Information. For left piping. Follow the instruction below.

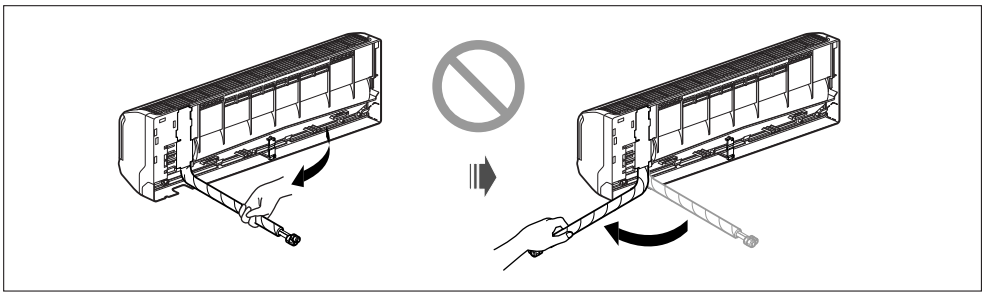
Good case

• Press on the upper side of clamp and unfold the tubing to slowly downward.



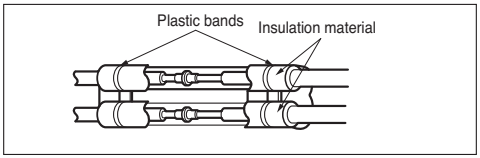
Bad case

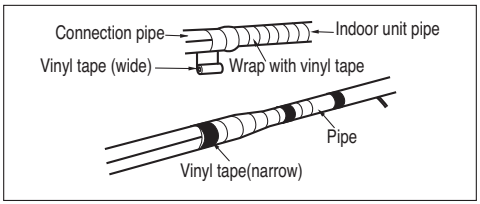
• Bending the pipe from right to left may cause damage to the tubing.



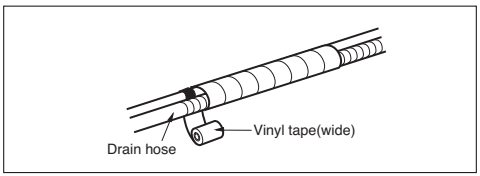
Wrap the insulation material around the connecting portion.

1. Overlap the connection pipe insulation and the indoor unit pipe heat insulation material. Bind them together with vinyl tape so that there is no gap.
2. Wrap the area which accommodates the rear piping housing section with vinyl tape.

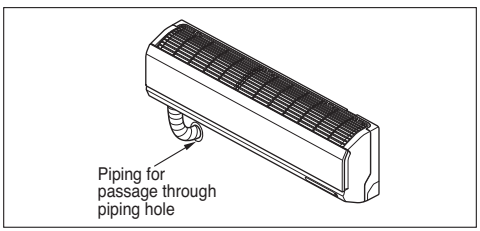




3. Bundle the piping and drain hose together by wrapping them with vinyl tape over the range within which they fit into the rear piping housing section.



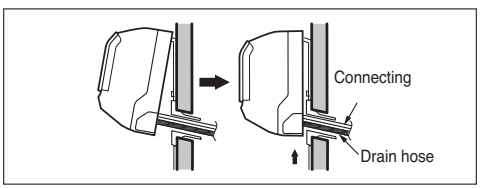
Reroute the pipings and the drain hose across the back of the chassis.



Finishing the indoor unit installation

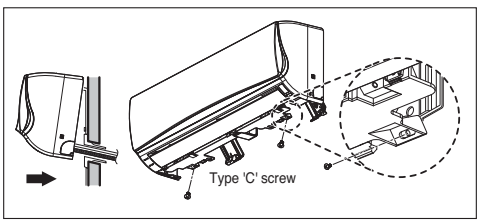
 # Standard / Artcool Mirror Type

1. Remove the spacer.
2. Ensure that the hooks are properly seated on the installation plate by moving it left and right.
3. Press the lower left and right sides of the unit against the installation plate until the hooks engage into their slots(clicking sound).



 # Standard Libero / Artcool Libero Type

1. Mount the tubing holder in the original positon.
2. Ensure that the hooks are properly seated on the installation plate by moving it left and right.
3. Press the lower left and right sides of the unit against the installation plate until the hooks engage into their slots (clicking sound).
4. Finish the assembly by screwing the unit to the installation plate by using two pieces of type "C" screws. And assemble a chassis cover.

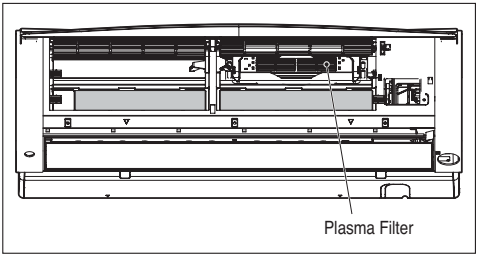


⚠ CAUTION

If the split type Indoor unit is installed in a wall having hole or opening near by or back side of the unit, then the air from other side of the wall can come inside the condition space through that hole / opening. That air can cause unwanted dew / water droplet formation when it comes in contact with body of the indoor unit. So all hole or opening on the wall must be blocked very well to avoid water dropping from the body of the unit.

Installation of filters

1) Detach two attached tapes from the plasma filter.



How To Fix

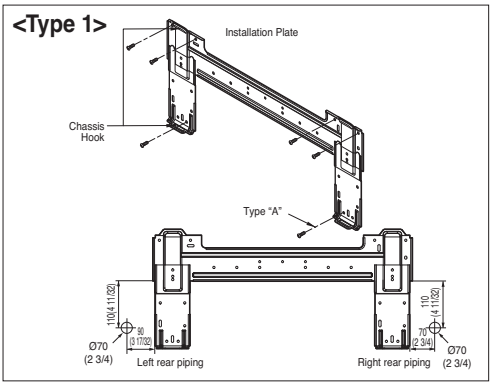
The wall you select should be strong and solid enough to prevent vibration

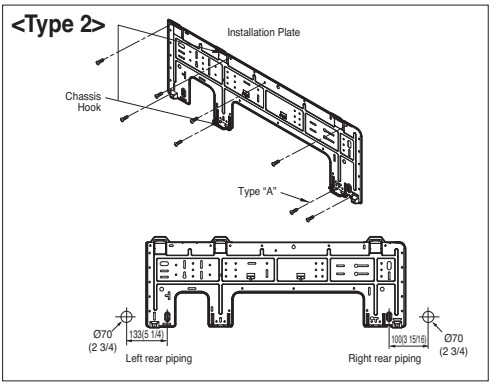
1. Mount the installation plate on the wall with type "A" screws. If mounting the unit on a concrete wall, use anchor bolts.

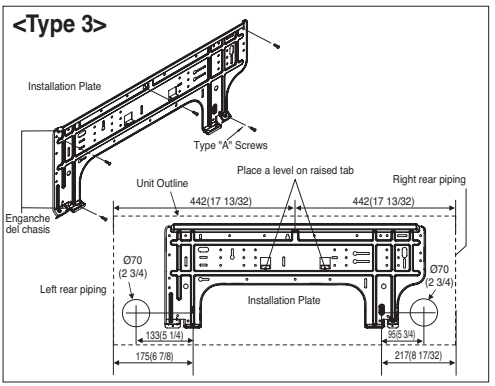
• Mount the installation plate horizontally by aligning the centerline using a level.

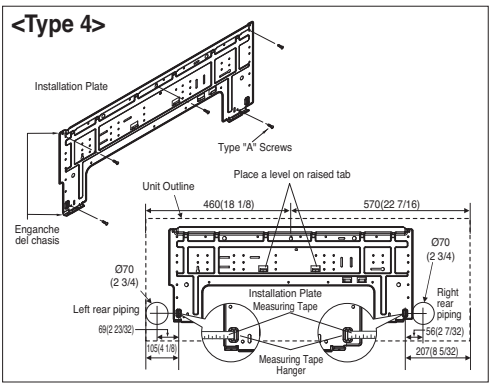
2. Measure the wall and mark the centerline. It is also important to use caution concerning the location of the installation plate-routing of the wiring to power outlets is through the walls typically. Drilling the hole through the wall for piping connections must be done safely.

Indoor Type	Capacity (kBtu/h)	Type
Standard / Standard Libero / Artcool Mirror / Artcool Libero	9/12	Type 1 / Type 3
	18	Type 2 / Type 4







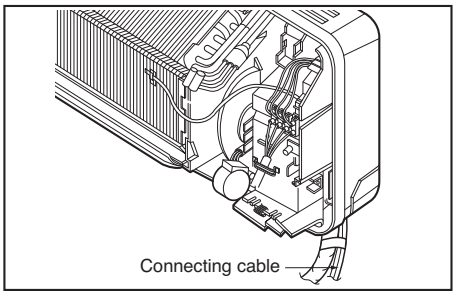


Wiring Connection

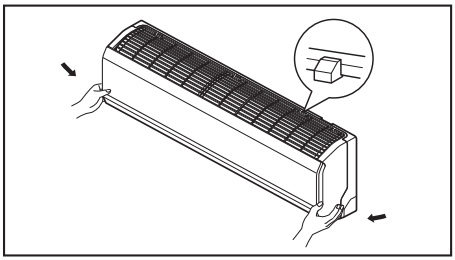
1. Connect the wires to the terminals on the control board individually according to the outdoor unit connection.
   - Ensure that the color of the wires of outdoor unit and the terminal No. are the same as those of indoor unit respectively.

Terminal Block in Indoor				
1(L1)	2(L2)	⏚	3	4

Connected to Outdoor Unit



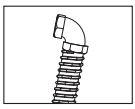
2. Attach the Grille onto the cabinet.
   - Grasp the lower left and right side of the Grille and engage four tabs on the top inside edge of the chassis.
   - Press the Grille toward the chassis until it goes back into place.

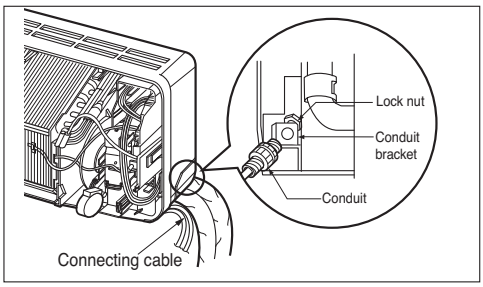


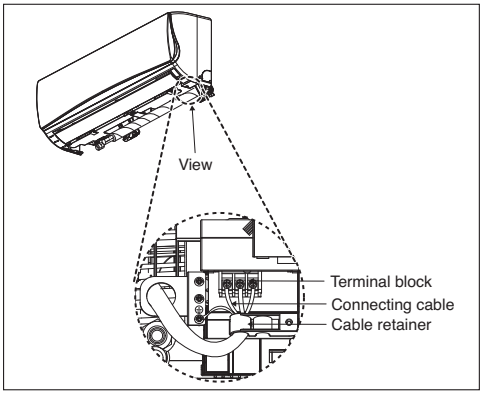
Conduit connection

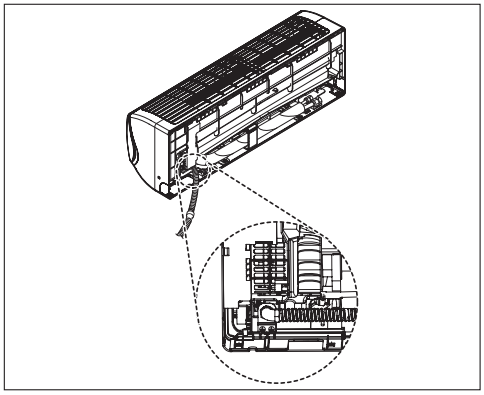
1. Set the connecting cable into the terminal block of indoor unit, and tighten set screw to lock the conduit bracket to the indoor unit.
2. Join the conduit and the conduit bracket together.

CAUTION : Must use the elbow type (L-Type) conduit.







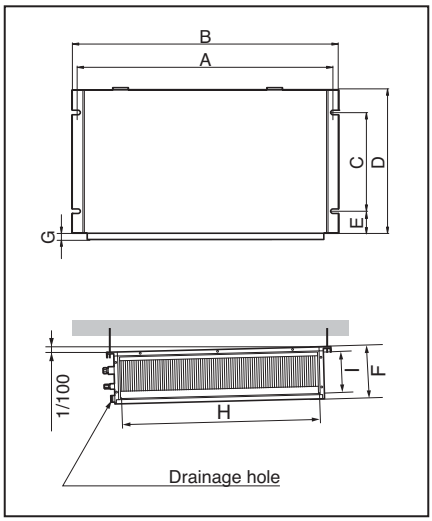


[Ceiling Concealed Duct Type]

Ceiling dimension and hanging bolt location

Installation of Unit

Install the unit above the ceiling correctly.



CASE 1

POSITION OF SUSPENSION BOLT

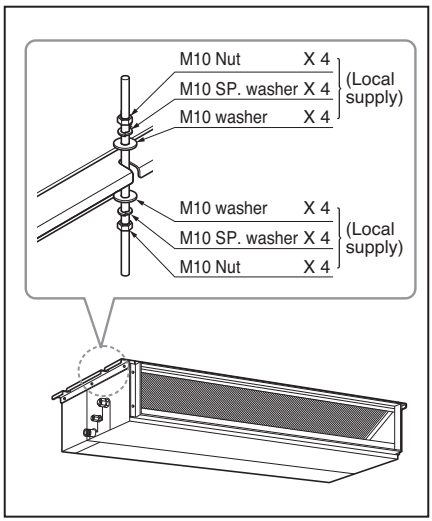
- Apply a joint-canvas between the unit and duct to absorb unnecessary vibration.
- Apply a filter Accessory at air return hole.

Unit:mm(inch)

Dimension / Capacity Btu/h class	A	B	C	D	E	F	G	H	I
9/12k	850 (33 15/32)	900 (35 15/32)	383 (15 3/32)	570 (22 7/16)	93.5 (3 11/16)	190 (7 1/2)	20.6 (13/16)	795 (31 5/16)	163 (6 13/32)
18k	1130 (44 1/2)	1180 (46 1/2)	383 (15 3/32)	570 (22 7/16)	93.5 (3 11/16)	190 (7 1/2)	20.6 (13/16)	1065 (41 15/16)	163 (6 13/32)

CASE 2

- Install the unit leaning to a drainage hole side as a figure for easy water drainage.

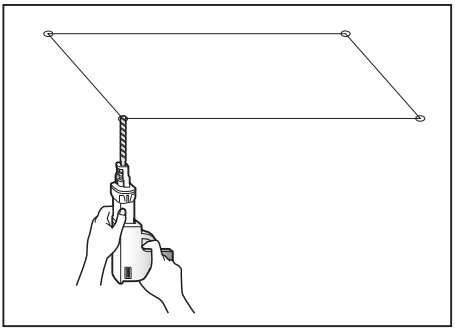


POSITION OF CONSOLE BOLT

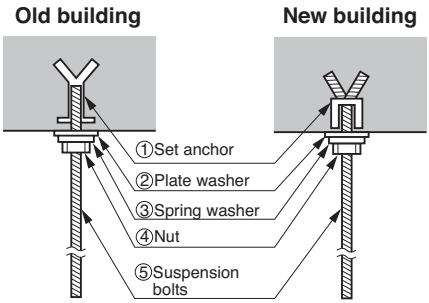
- A place where the unit will be leveled and that can support the weight of the unit.
- A place where the unit can withstand its vibration.
- A place where service can be easily performed.

How to Fix

- Select and mark the position for fixing bolts.
- Drill the hole for set anchor on the face of ceiling.



- Insert the set anchor and washer onto the suspension bolts for locking the suspension bolts on the ceiling.
- Mount the suspension bolts to the set anchor firmly.
- Secure the installation plates onto the suspension bolts (adjust level roughly) using nuts, washers and spring washers.



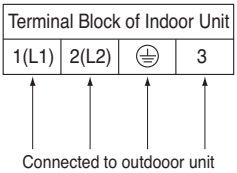
CAUTION : Tighten the nut and bolt to prevent unit falling.

Wiring Connection

Connect the wires to the terminals on the control board individually according to the outdoor unit connection.

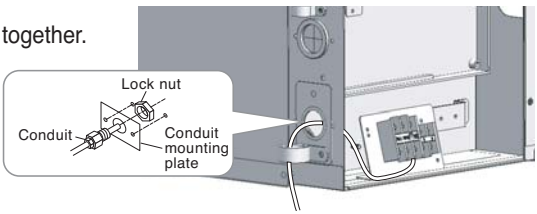
- Ensure that the color of the wires of outdoor unit and the terminal No. are the same as those of indoor unit respectively.

B1/B2 Series



Conduit connection

1. Remove the busing rubber product attached on the indoor unit.
2. Set the connecting cable into the terminal block of indoor unit, and tighten set screw to lock the conduit bracket to the indoor unit.
3. Join the conduit and the conduit bracket together.

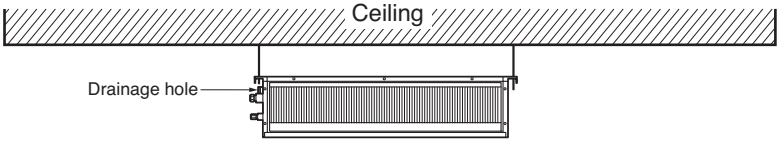


CAUTION

1. Install declination of the indoor unit is very important for the drain of the duct type air conditioner.
2. Minimum thickness of the insulation for the connecting pipe shall be 19mm(1/32 inch).

Front of view

• The unit must be horizontal or declined to the drain hose connected when finished installation.



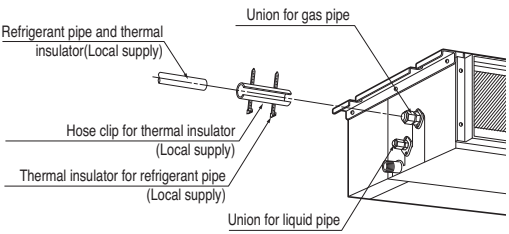
Drain Pump use

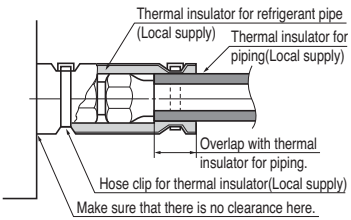
INSULATION, OTHERS

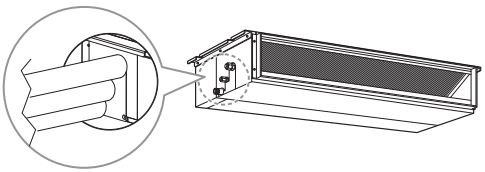
Insulate the joint and tubes completely.

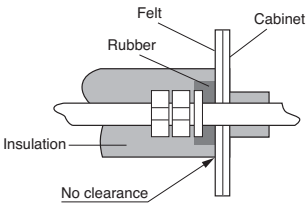
THERMAL INSULATION All thermal insulation must comply with local requirement.

INDOOR UNIT









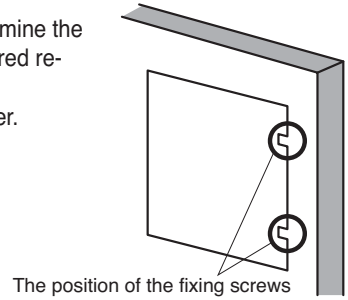
TEST AND CHECK

■ ***After all workings are finished, check the working and operation.***

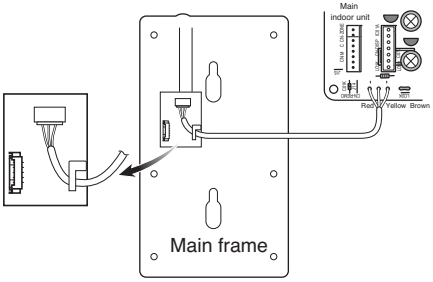
- Air distribution ..... Is the air circulation good?
- Drain ..... Is the drainage smoothly and no sweating?
- Gas leakage ..... Is the piping connection correctly?
- Wiring ..... Is the wiring connection correctly?
- Lock-bolt ..... Is the lock-bolt of compressor loosened?
- Insulation..... Is the unit fully insulated?
- Ground ..... Is the unit safely grounded?

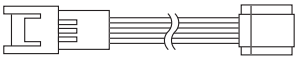
Installation of wired Remote Controller

1 Put the installation paper on the place and determine the position and height of the fixing screws of the wired remote controller.
- Refer to the printed side of the installation paper.



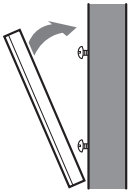
2 Plug the connecting cable into the indoor unit.
- The product is being shipped with the cable connected only to the remote controller. Fix the connecting cable with the cable rack.

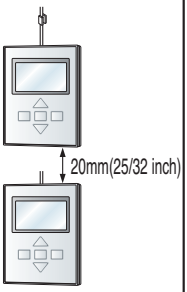




3 Remove the installation paper before installing the remote controller so that it can fit at the right place.

Fixing the remote controller

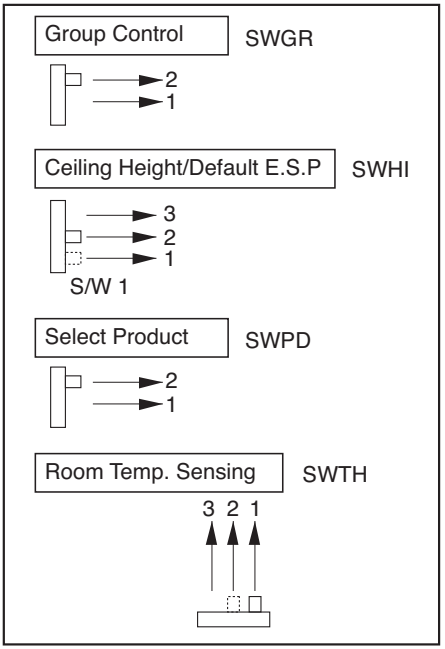




* Do not embed the remote controller into the wall. (It may cause the breakdown of the temperature sensor.)
* If you want to install a number of remote controller at the same place in a vertical line, install them at regular intervals of 20mm(25/32 inch). (It may cause the breakdown of the temperature sensor.)
* Do not install the cable with a distance of 50m(164ft) or longer. (This can cause communication error.)
* When installing the cable, check whether the connector between the remote controller and the product is installed properly. The connector will not be connected when installed in opposite sides.

❏ Supply the power after connecting wired remote controller.
When you need to change wired remote controller, switch off the main power and change it.
If the wired remote controller is changed before switching off the main power, the option function of the indoor unit can't be used. (option function like "slo" fan speed selection)

Wired remote controller switch information



Group control switch

1. For individual control/Master use
2. For group control/Slave use

Ceiling height selection switch

1. Low ceiling
2. Standard ceiling
3. High ceiling

Product selection switch

1. Cooling Only product
2. Heat Pump product

Indoor temperature sensor selection switch

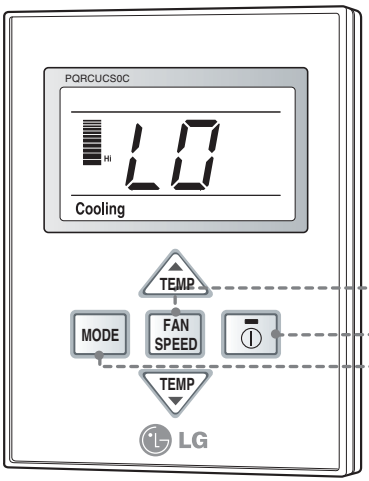
1. Use the temperature sensor on the remote controller.
2. Use the temperature sensor on the product.
3. Use the sensors on the product and remote controller.

- When changing the product selection switch and group control switch, the power must be reconnected to reflect the changes.
- The central control could operate inappropriately depends on indoor unit type, when the remote controller is set as slave.

■ **Necessary functions before using**

Trial Operation

The trial operation is to check the installation status of the product. The temperature will not be controlled during trial operation. Instead the product will operate in several modes such as cooling, strong wind, comp-on.



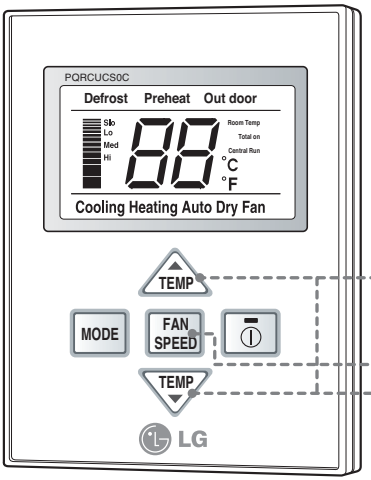
1 If you want to set the trial operation mode, press the mode button and the Fan speed button same time for three seconds.

2 Then the product will begin the trial operation and the display will be like as shown on left side picture.

3 If you want to cancel the trial operation mode, just press the On/Off button.

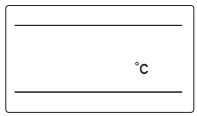
4 The trail operation will be shut down automatically after 18 minutes and system will go to the standby mode.

Celsius/Fahrenheit Switching

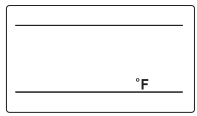


1 If you want to change the temperature unit as the Celsius or Fahrenheit, press the Temperature control button(▼) and the Fan speed button same time for three seconds to enter the setting Mode.

2 Press the temperature control button to change the unit.
Ex) Setting unit as Fahrenheit.



<Setting as Celsius>



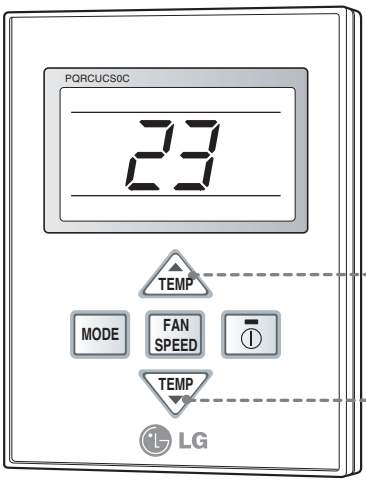
<Setting as Fahrenheit>

3 After setting, press the Temperature control button(▼) and the Fan speed button same time for three seconds to exit the setting Mode.
The system will automatically release without input after 30 seconds.

Setting the Central-Control Address

Please set the address while using the central controller.

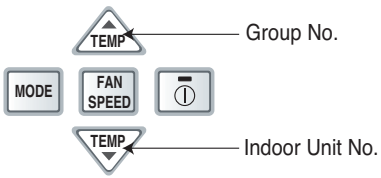
You don't need to set address if you don't use central controller.



1 If you want to set the address on the display panel, press both temperature control buttons (▲/▼) same time for three seconds.

2 Press the temperature-increasing button to change the group number. Press the temperature-decreasing button to change the indoor unit number.
e.g. As shown on the left side panel, it displays 23.
Group No. : 2
Indoor Unit No. : 3

3 Set the address by pressing both temperature control buttons again(s/t) at the same time for three seconds.

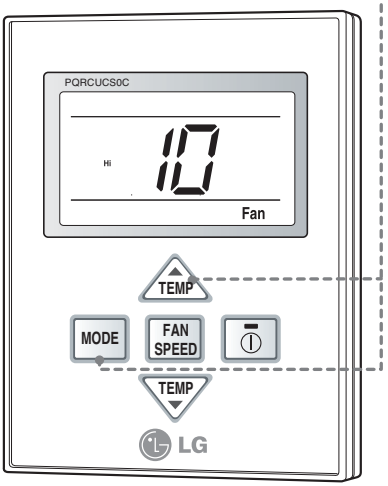


- **If you connect the indoor unit to the central controller, you should set the network address of the indoor unit so that the central controller could recognize it.**
- **The center-control address is composed of the group number and the indoor-unit number.**

Note : The remote controller displays 'HL' if central controller has locked the remote controller .

ESP Function

E.S.P function is setting the volume of each fan speed. It is for the convenience of installation. It is recommended that you should not use this function while using the remote controller.

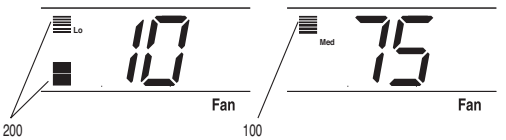


1 Press the mode button and the temperature increasing button(▲) same time for three seconds.

2 Set the volume of each fan speed(Low, Medium, Hi) by using the temperature control button. Press the fan speed button to select the fan speed.
The value of E.S.P can be adjusted from 1 to 255.

3 If you press the On/Off button while setting the ESP function, it will be canceled. (The picture on the left side is the example of setting the Hi wind to ESP 10.)

4 Press the mode button and the temperature increasing button (▲) same time for three seconds. Then the ESP setting will be activated after the temperature display flashes three times.
EX)



Setting the Low wind to 210 | Setting the Medium wind to 175

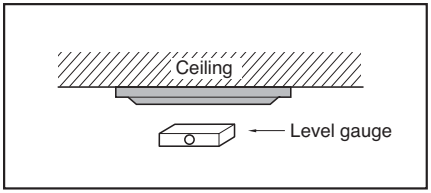
※ The E.S.P value is set at the proper value at the factory. So it is highly recommended that you should not change the E.S.P value at your discretion.

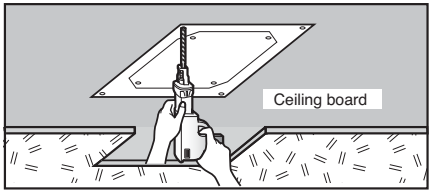
Static pressure(mmAq)		0	1	2	3	4
Model name	Step(H/M/L)	Setting value				
AMNW09GB1A0 [LMDN095HV]	8.5 CMM(300cfm)	75	84	94	104	114
	7.5 CMM(265cfm)	69	77	88	99	110
	6.5 CMM(230cfm)	62	71	83	95	106
AMNW12GB1A0 [LMDN125HV]	9.5 CMM(335cfm)	82	90	99	109	118
	8.5 CMM(300cfm)	75	84	94	104	114
	7.5 CMM(265cfm)	69	77	88	99	110
AMNW18GB2A0 [LMDN185HV]	15 CMM(530cfm)	90	97	105	114	122
	13.5 CMM(477cfm)	82	90	99	109	119
	11.5 CMM(406cfm)	75	84	93	103	114

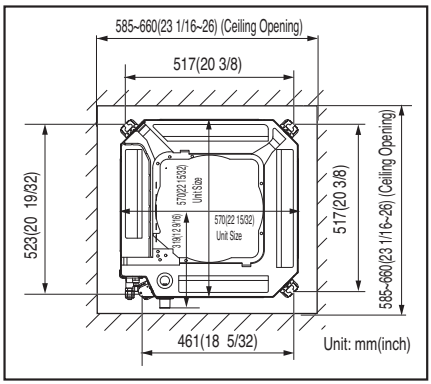
[Ceiling Cassette Type]

Ceiling dimension and hanging bolt location

• The dimensions of the paper model for installation are the same as those of the ceiling opening dimensions.







- Select and mark the position for fixing bolts and piping hole.
- Decide the position for fixing bolts slightly tilted to the drain direction after considering the direction of drain hose.
- Drill the hole for anchor bolt on the wall.

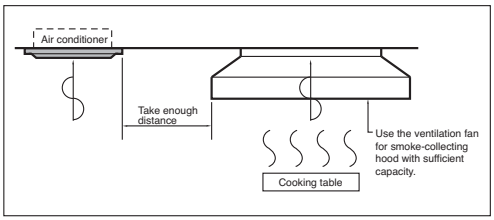
CAUTION :

- **This air-conditioner uses a drain pump.**
- **Install the unit horizontally using a level gauge.**
- **During the installation, care should be taken not to damage electric wires.**

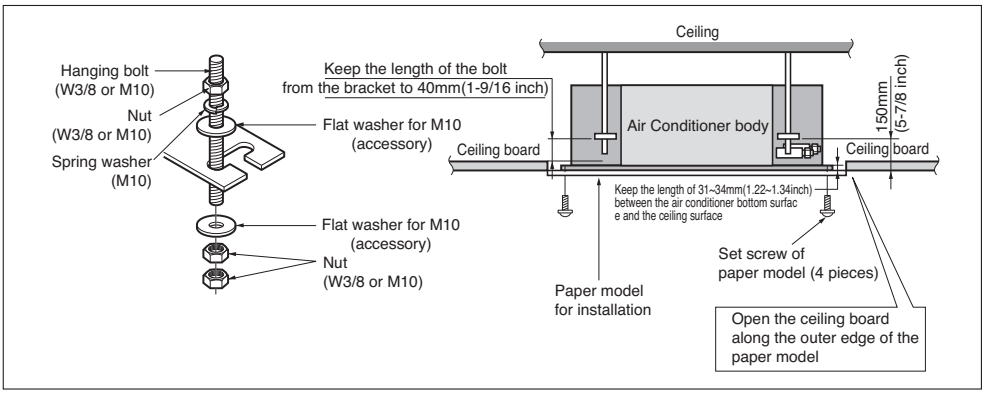
NOTICE

• Avoid the following installation location.

1. Such places as restaurants and kitchen where considerable amount of oil steam and flour is generated.
   These may cause heat exchange efficiency reduction, or water drops, drain pump mal-function.
   In these cases, take the following actions;
   - Make sure that ventilation fan is enough to cover all noxious gases from this place.
   - Ensure enough distance from the cooking room to install the air conditioner in such a place where it may not suck oily steam.
2. Avoid installng air conditioner in such places where cooking oil or iron powder is generated.
3. Avoid places where inflammable gas is generated.
4. Avoid place where noxious gas is generated.
5. Avoid places near high frequency generators.



How to Fix



• The following parts are local purchasing.

① Hanging Bolt - W 3/8 or M10

② Nut - W 3/8 or M10

③ Spring Washer - M10

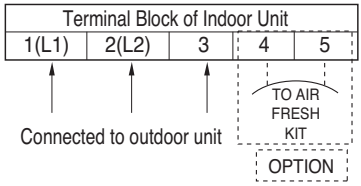
④ Plate Washer - M10

CAUTION : Tighten the nut and bolt to prevent unit from falling off.

Wiring Connection

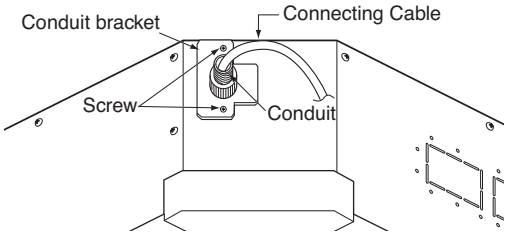
• Open the control box cover and connect the remote control cord and indoor power wires.

TQ/TR series



Conduit connection

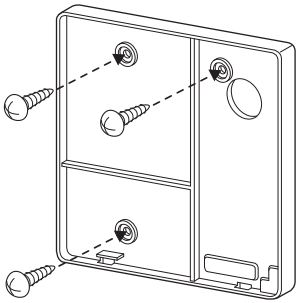
• Remove the busing rubber product attached on the indoor unit.
• Join the conduit and the conduit bracket together using nut.
• Set the connecting cable into the terminal block of indoor unit, and tighten set screw to lock the conduit bracket to the indoor unit.



Installation of Wired Remote Controller(Optional)

1. Please fix tightly using provided screw after placing remote controller setup board on the place where you like to setup.

- Please set it up not to bend because poor setup could take place if setup board bends. Please set up remote controller board fit to the reclamation box if there is a reclamation box.
- Install the product so as not to make a gap with the wall side and to prevent shaking after the installation.

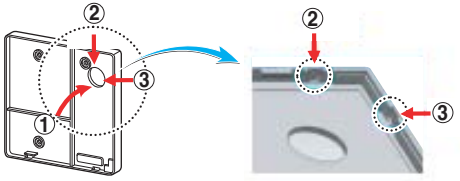


2. Can set up Wired remote controller cable into three directions.

- Setup direction: the surface of wall reclamation, upper, right
- If setting up remote controller cable into upper and right side, please set up after removing remote controller cable guide groove.

❉ Remove guide groove with long nose.

① Reclamation to the surface of the wall
② Upper part guide groove
③ Right part guide groove

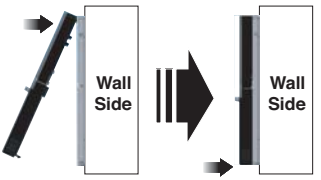


<Wire guide grooves>

3. Please fix remote controller upper part into the setup board attached to the surface of the wall, as the picture below, and then, connect with setup board by pressing lower part.

- Please connect not to make a gap at the remote controller and setup board's upper and lower, right and left part.
- Before assembly with the installation board, arrange the Cable not to interfere with circuit parts.

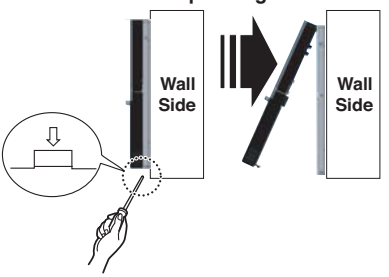
<Connecting order>



When separating remote controller from setup board, as the picture below, after inserting into the lower separating hole using screw driver and then, spinning clockwise, remote controller is separated.

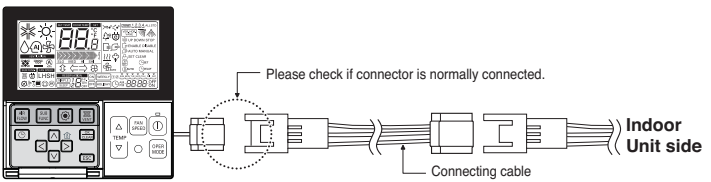
- There are two separating holes. Please individually separate one at a time.
- Please be careful not to damage the inside components when separating.

<Separating order>



4. Please connect indoor unit and remote controller using connection cable.

12V	Red
Signal	Yellow
GND	Black



5. Please use extension cable if the distance between wired remote controller and indoor unit is more than 10m(32.8ft).

⚠CAUTION

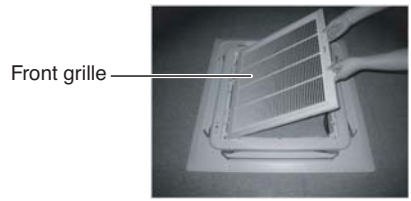
When installing the wired remote controller, do not bury it in the wall.
(It can cause damage in the temperature sensor.)
Do not install the cable to be 50m(164ft) or above.
(It can cause communication error.)

- When installing the extension cable, check the connecting direction of the connector of the remote controller side and the product side for correct installation.
- If you install the extension cable in the opposite direction, the connector will not be connected.
- Specification of extension cable: 2547 1007 22# 2 core 3 shield 5 or above.

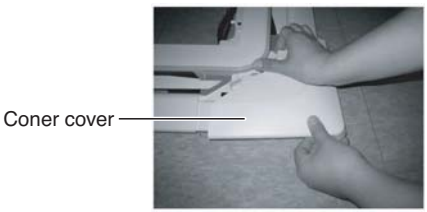
Installation of Decorative Panel

The decorative panel has its installation direction.
Before installing the decorative panel, always remove the paper template.

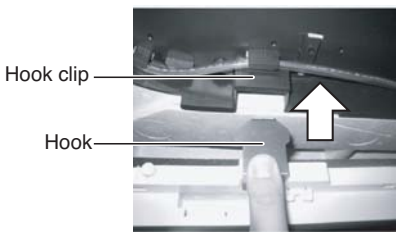
1. Remove the packing and take out air inlet grille from front panel.



2. Remove the Corner covers of the panel.

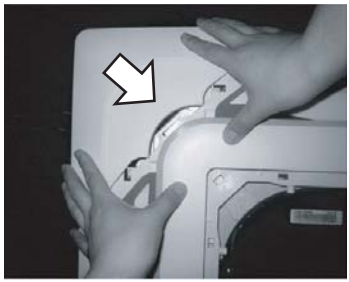


3. Fit the panel on the unit by inserting hooks as shown in picture.

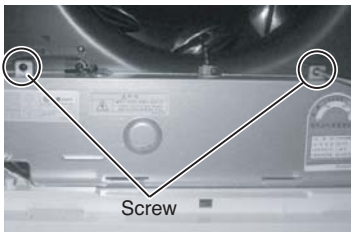


4. Insert two screws on diagonal corners of panel. Do not tighten the bolts completely. (The fixing screws are included in the in-door unit box.)
   Check the alignment of panel with the ceiling. Height can be adjusted using hanging bolts as shown in picture. Insert the other two screws and tighten all screws completely.

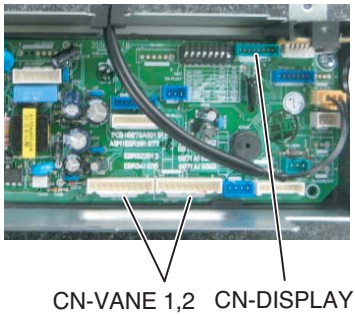
5. Fit the corner covers.



6. Open two screws of control panel cover.

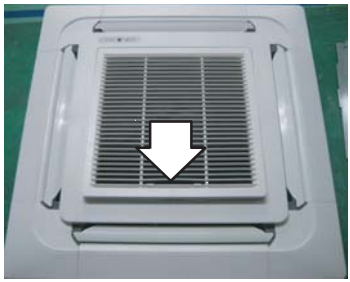


7. Connect one display connector and two vane control connectors of front panel to indoor unit PCB.
   The position marking on PCB is as:
   Display connector : CN-DISPLAY
   Vane control connector: CN-VANE 1,2

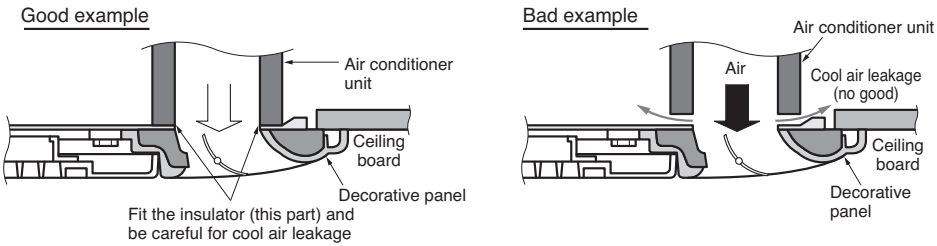


8. Close the cover for control box.

9. Install the air inlet grille and Filter on the panel.



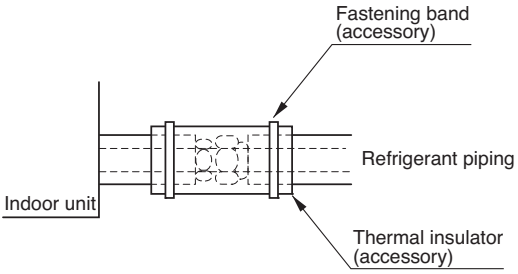
CAUTION: Install certainly the decorative panel.
Cool air leakage causes sweating. ⇨ Water drops fall.



HEAT INSULATION

1. Use the heat insulation material for the refrigerant piping which has an excellent heat-resistance [over 120°C(248°F)].

2. Precautions in high humidity circumstance:
   This air conditioner has been tested according to the "KS Standard Conditions with Mist" and confirmed that there is not any default. However, if it is operated for a long time in high humid atmosphere [dew point temperature: more than 23°C(73.4°F)], water drops are liable to fall. In this case, add heat insulation material according to the following procedure:

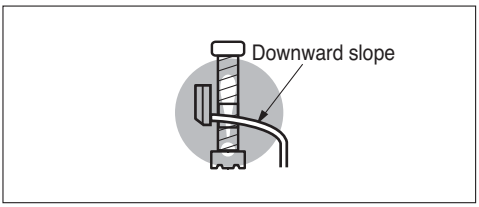


- Heat insulation material to be prepared... Adiabatic glass wool with thickness 10 to 20mm.
- Stick glass wool on all air conditioners that are located in ceiling atmosphere.

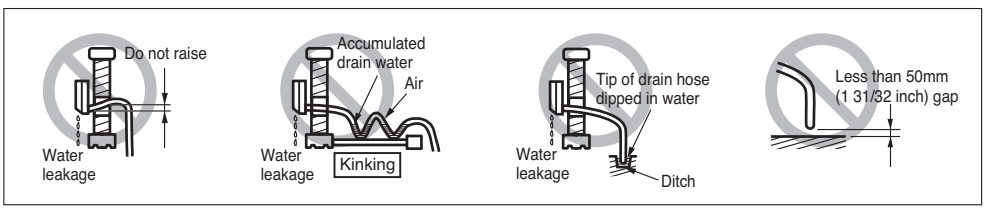
Drain Piping

[Standard / Standard Libero / Artcool Mirror Type]

1. The drain hose should point downward for optimum drainage.



2. Incorrect Installation Examples:



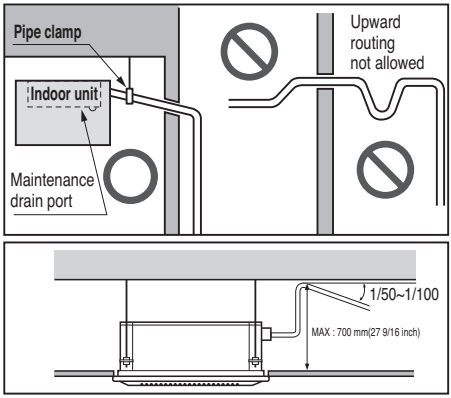
[Ceiling Concealed Duct/Ceiling Cassette Type]

- Drain piping must have down-slope (1/50 to 1/100): be sure not to provide up-and-down slope to prevent reversal flow.
- During drain piping connection, be careful not to exert extra force on the drain port on the indoor unit.
- The outside diameter of the drain connection on the indoor unit is 32mm(1 1/4 inch).

Piping material: Polyvinyl chloride pipe inner diometes Ø 25mm(1 inch) and pipe fittings

- Be sure to install heat insulation on the drain piping.

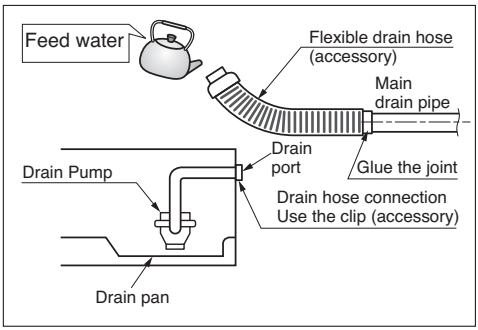
Heat insulation material: Polyethylene foam with thickness more than 8mm(5/16 inch).



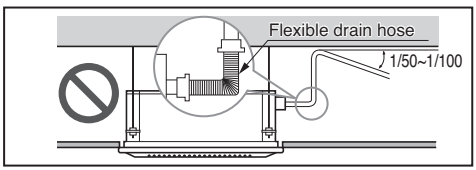
Drain test

The air conditioner uses a drain pump to drain water.
Use the following procedure to test the drain pump operation:

- Connect the main drain pipe to the exterior and leave it provisionally until the test comes to an end.
- Feed water to the flexible drain hose and check the piping for leakage.
- Be sure to check the drain pump for normal operating and noise when electrical wiring is complete.
- When the test is complete, connect the flexible drain hose to the drain port on the indoor unit.



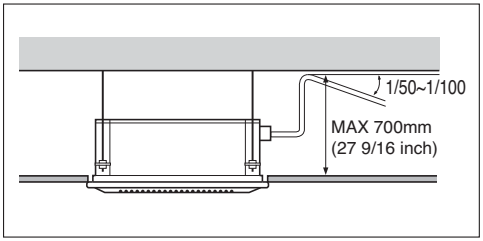
CAUTION : The supplied flexible drain hose should not be curved, neither screwed. The curved or screwed hose may cause a leakage of water.



❊ The figure can be changed according to model.

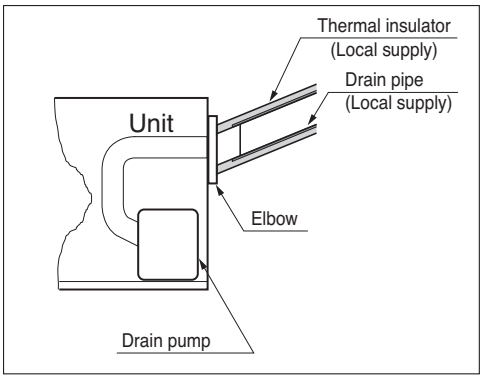
Attention

1. Possible drain-head height is up to 700mm(27 9/16 inch). So, it must be installed below 700mm(27 9/16 inch).



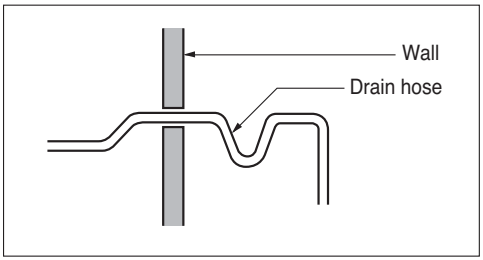
2. Keep the drain hose downward up to 1/50~1/100 inclination.
   Prevent any upward flow or reverse flow in any part.

3. 5mm(3/16 inch) or thicker formed thermal insulator is provided for the drain pipe.



4. Upward routing is not allowed.

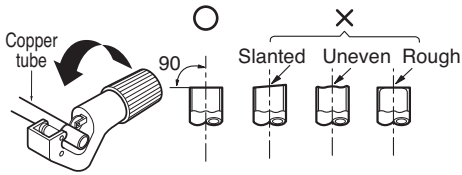
5. Be sure to check the drain pump for normal operation and abnormal noise when electrical wiring is complete.



Flaring Work and Connection of Piping

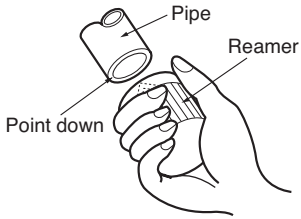
Flaring work

Main cause of gas leakage is defect in flaring work. Carry out correct flaring work in the following procedure.



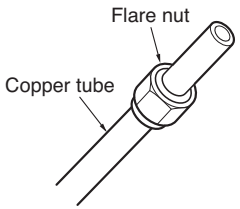
1) Cut the pipes and the cable.

- Use the accessory piping kit or the pipes purchased locally.
- Measure the distance between the indoor and the outdoor unit.
- Cut the pipes a little longer than measured distance.
- Cut the cable 1.5m(4.9ft) longer than the pipe length.



2) Burrs removal

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



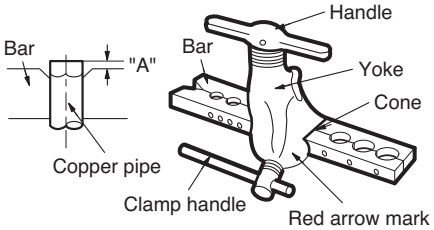
3) Putting nut on

- Remove flare nuts attached to indoor and outdoor units, than put them on pipe/tube having completed burr removal.
  (Not possible to put them on after flaring work)

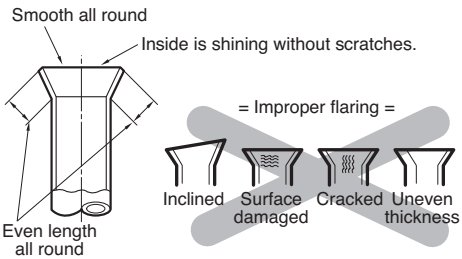
4) Flaring work

- Carry out flaring work using flaring tool as shown below.

Outside diameter		A	
mm	inch	mm	inch
Ø6.35	1/4	1.1~1.3	0.04~0.05
Ø9.52	3/8	1.5~1.7	0.06~0.07
Ø12.7	1/2	1.6~1.8	0.06~0.07
Ø15.88	5/8	1.6~1.8	0.06~0.07
Ø19.05	3/4	1.9~2.1	0.07~0.08



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



5) Check

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

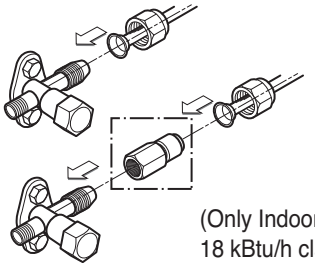
Connection of piping - Outdoor

Align the center of the piping and sufficiently tighten the flare nut by hand.

Connecting pipe order

1) A~D-UNIT gas side pipe

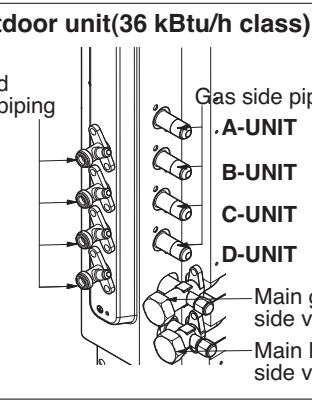
2) A~D-UNIT liquid side pipe



Finally, tighten the flare nut with torque wrench until the wrench clicks.

- When tightening the flare nut with torque wrench ensure the direction for tightening follows the arrow on the wrench.

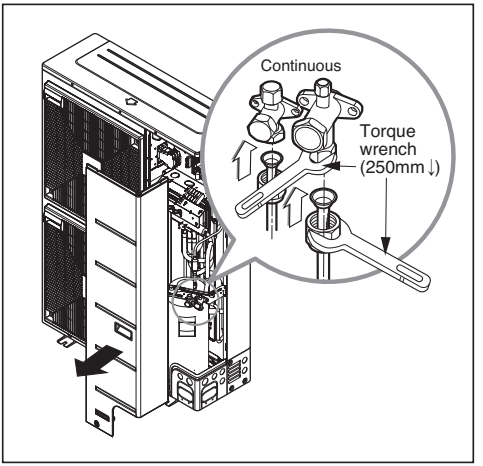
Outside diameter		Torque		
mm	inch	N. m	kgf.m	lbf.ft
Ø6.35	1/4	14~18	1.4~1.8	10~13
Ø9.52	3/8	34~42	3.5~4.3	25~31
Ø12.7	1/2	49~61	5.0~6.2	36~45
Ø15.88	5/8	69~82	7.0~8.4	51~60
Ø19.05	3/4	100~120	10.0~12.2	73~88



- For the units with capacity more than 48 kBtu/h, the installation piping is connectable in four directions.(refer to figure 1)
- When connecting in a downward direction, knock out the knockout hole of the base pan. (refer to figure 2)

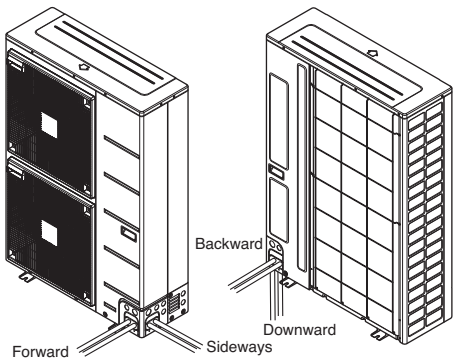
Preventing foreign objects from entering (Figure3)

- Plug the pipe through-holes with putty or insulation material(procured locally)to stop up all gaps,as shown in the figure 3.
- Insects or small animals entering the outdoor unit may cause a short circuit in the electrical box.

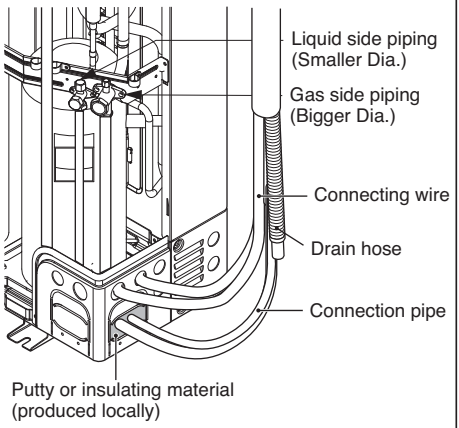


❊ When tighten the pipe, hold the haxagonal body.

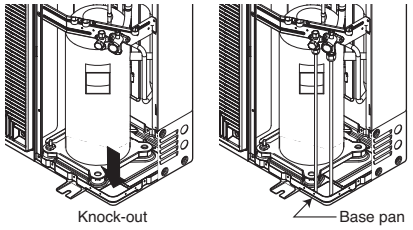
<Figure 1>



<Figure 3>

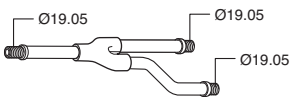
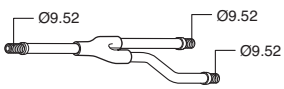


<Figure 2>

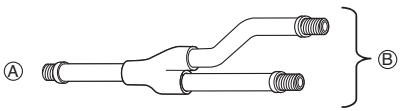


Branch

[unit:mm]

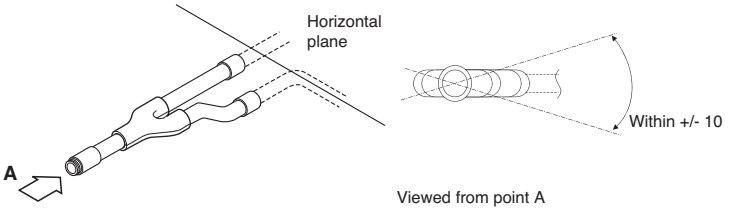
Model	Gas Pipe	Liquid Pipe
PMBL5620		

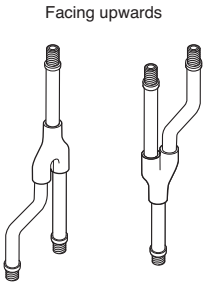
■ Y branch



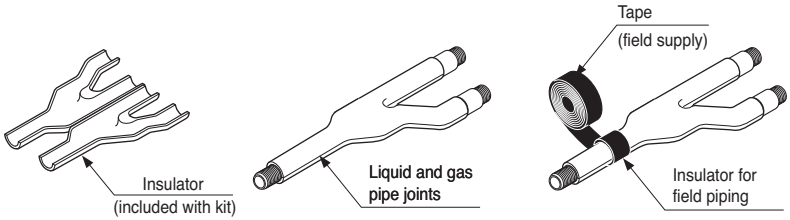
Ⓐ To Outdoor Unit
Ⓑ To BD Unit

• Ensure that the branch pipes are attached horizontally or vertically (see the diagram below.)



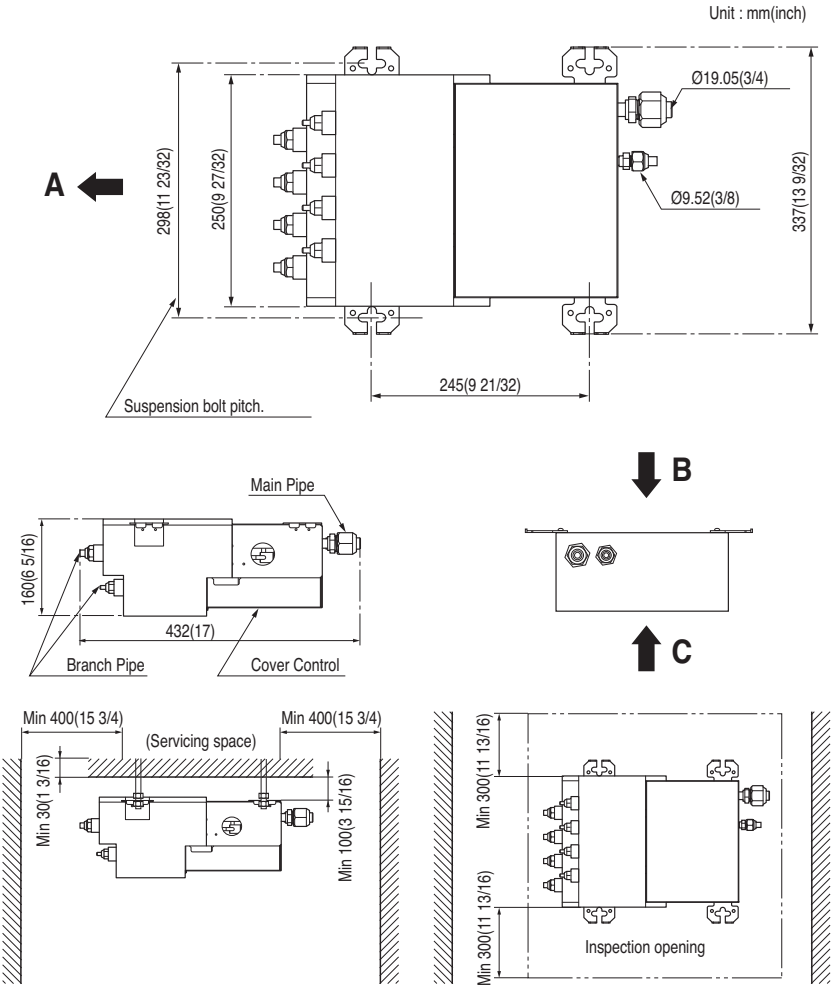


• Branch pipe should be insulated with the insulator in each kit.



Installation

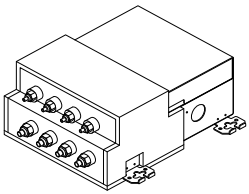
- This unit may be installed suspended from the ceiling or mounted on the wall.
- This unit may only be installed horizontally , as shown in the diagram below.(Side B is facing up) However, it may be freely installed in any direction forward or back, and to the sides.
- Be sure to leave a 600mm square opening for service and inspection as shown in the diagram below, for both ceiling - suspended installation and wall-mounted installation.
- This unit "does not require drain treatment" as it uses internal foam treatment as low-pressure piping insulation.
- Service direction is the side B and C
- The piping for the indoor unit may be led around in direction A
- The inclination of side B must be within ±5 degrees forward or back or to the sides.



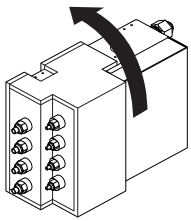
Installation of The Main Unit

NOTICE :

- This unit has two different installation types: (1) Ceiling-suspended type and (2) wall-mounted type.
- Choose the proper installation pattern according to the location of installation.
- The installation location for printed wiring board can be changed.
  Follow the procedure specified in the "CONNECTING THE WIRING" section to change the location.

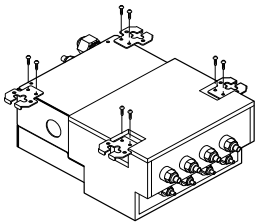


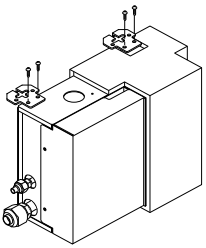
(1) Ceiling-suspended type



(2) Wall-mountde type

(1) Ceiling-suspended type





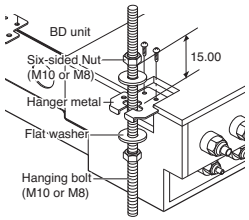
Procedure

(1) Fix the furnished hanger metal with two screws.(4 locations in total).

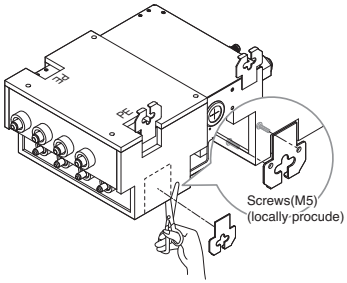
(2) Using an insert-hole-in- anchor, hang the hanging bolt.

(3) Install a hexagon nut and a flat washer (locally-procured)to the hanging bolt as shown in the figure in the left, and lift the main unit to hang on the hanger metal.

(4) After checking with a level that the unit is level, tighten the hexagon nut.
  * The tilt of the unit should be within ±5° in front/back and left/right.



(2) Wall-mounted type



Procedure

(1) Fix the furnished hanger metal with two screws. (3 locations in total).

(2) After checking with a level that the unit is level, fix the unit with the furnished wood screws.
  * The tilt of the unit should be within ±5° in front/back and left/right.

* Block up the parts of hanger holes (2 places) by using insulation PE after installing the hanger.

CAUTIONS

- **Once a screw-hole on the main unit has had a screw hammered in, make sure to either hammer it again or cover it with alumium tape.(This is to prevent condensation)**
- **Be sure to install the unit with the ceiling-side up.**
- **Do not install near bedrooms. the sound of refrigerant flowing through the piping may sometimes be audible.**

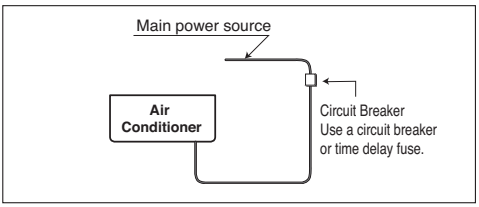
Connecting the Cable between Indoor Unit, Distributor Unit and Outdoor Unit

Connect the cable to the Indoor unit.

Connect the cable to the indoor unit by connecting the wires to the terminals on the control board individually according to the outdoor unit connection. (Ensure that the color of the wires of the outdoor unit and the terminal No. are the same as those of the indoor unit.)
The ground wire should be longer than the common wires.
The circuit diagram is not subject to change without notice.
When installing, refer to the electrical diagram behind the front panel of Indoor Unit.
The wiring for the outdoor unit can be found on the inside of the Outdoor Unit control cover.

RECOMMENDATION:
- **The circuit diagram is subject to change without notice.**
- **Be sure to connect wires according to the wiring diagram.**
- **Connect the wires firmly, so that they can not be pulled out easily.**
- **Connect the wires according to color codes by referring to the wiring diagram.**

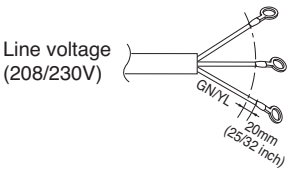
RECOMMENDATION: Provide a circuit breaker between power source and the outdoor unit as shown below.



Outdoor Unit Capacity (Btu/h class)	Power source	Fuse or breaker Capacity
18k	1ø,208/230V	15A
24/36k	1ø,208/230V	25A
54k	1ø,208/230V	40A

RECOMMENDATION: The power cord connected to the outdoor unit should comply with the following specifications: NRTL Recognized(for example, UL or ETL recognized and CSA certified).

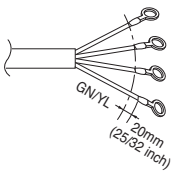
■ Power supply cable



As always, final wire selection is governed by local codes and should be installed by a licensed professional contractor.

	The minimum recommended wire size
18kBtu/h	AWG 14-3
24/36kBtu/h	AWG 12-3
54kBtu/h	AWG 8-3

■ Connecting cable



The power connecting cable between the outdoor and indoor units must comply with the following specifications: NRTL Recognized (for example, UL or ETL recognized and CSA certified).
AWG 18-4 is the minimum recommended wire size, however, the selected conductors must comply with local codes and be suitable for installation in wet locations.

RECOMMENDATION: When using separate wires as the power cord, please secure separate wires in the control box panel using tie wraps to hold all wires in place.

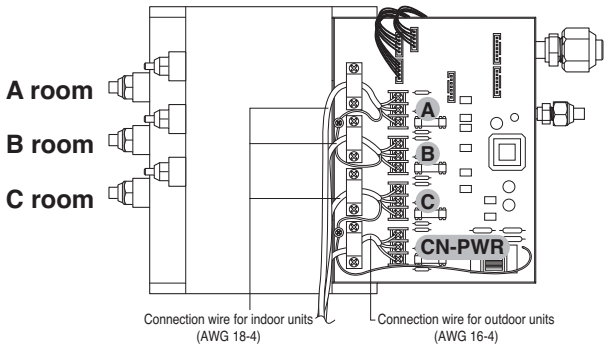
Connect the cable to the Distributor unit.

- Connect refrigerant pipes and connection wires to the appropriate ports maked with matching alphabets (A, B and C) on this unit.
- Follow the instructions on the wiring nameplate to connect the connection wires of indoor/outdoor units to terminal board numbers.(1, 2 and 3) Always fix each ground wire separately with a ground screw.(See the figure below.)
- After completing the wiring, fix the outer coating of wires securely with wire clamps. The wire clamp on indoor unit side is furnished. Follow the procedure below to install.
- Refer to the circuit diagram on the control cover inside outdoor unit.

NOTICE :

The terminal board numbers are arranged from top to bottom in order of 1, 2 and 3.

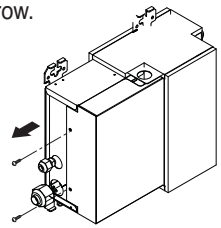
In Case of 3 rooms



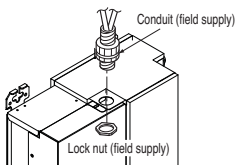
Warning

Do not use tapped wires, stand wires, extensioncords, or starbust connections, as they may cause overtheating, electrical shock, or fire.

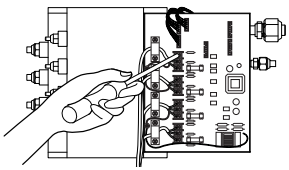
(1) Remove the control cover. Loosen the two screws, and slide the cover in the direction of the arrow.



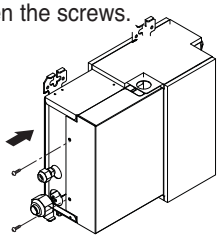
(2) Pull out connection cable through conduit. After conduit to the panel, fix nut to the opposite side of panel. Pass the connection cabel through the hole.



(3) Perform wiring with reference the wiring diagram on a control cover of outdoor unit. Allow 300 mm(11 13/16 inch) for the pulling-out section of harness. Fix the wires completely with wire clamps(4 locations).

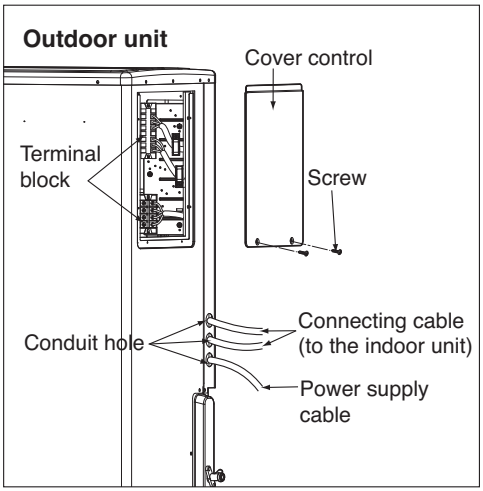


(4) Put in the cover in the direction of the arrow then tighten the screws.

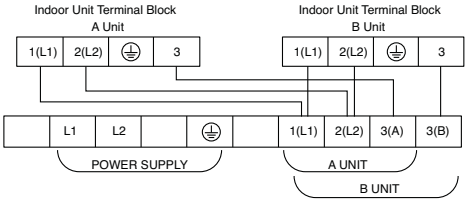


Connect the cable to the Outdoor unit.

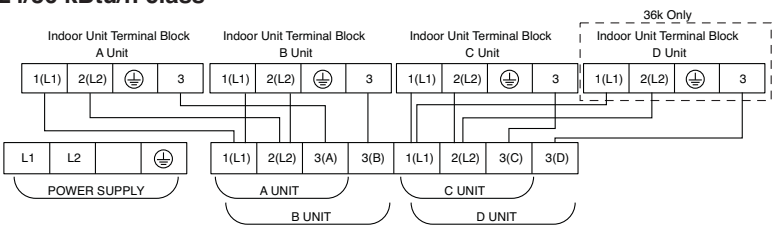
1. Remove the control cover from the unit by loosening the screw.
   Connect the wires to the terminals on the control board individually as the following.
2. Secure the cable onto the control board with the holder (clamper).
3. Re-attach the cover control to the original position using the screws.



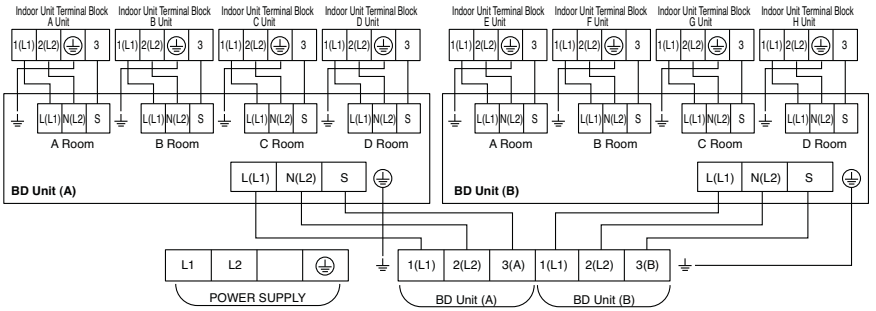
18kBtu/h class



24/36 kBtu/h class



54 kBtu/h class



NOTICE :

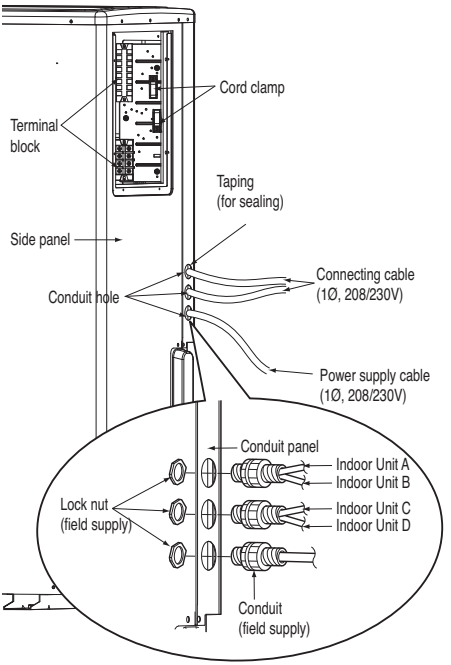
1. Use connection cable NRTL(UL, ETL, CAS…) listed and stranded copper(4) THHN conductors, sunlight (UV) resistant ROHS compliant PVC jacket 600V direct burial listed, approved for wet conditions. Temperature rated for –20°C(-4°F) to 90°C(194°F). And this cable should be enclosed in conduit.

WARNING:

- **Be sure to comply with local and national codes while running the wire from the indoor unit to the outdoor unit(size of wire and wiring method, etc).**
- **Every wire must be connected firmly.**
- **No wire should be allowed to touch refrigerant tubing, the compressor or any moving parts.**
- **The communication wirings of air conditioner should be separate and isolated from external device's electric wiring such as computers, elevator, radio & Television broadcasting facilities, as well as medical imaging offices.**

Connection method of the connecting cable(Example)

(1) Remove the side panel and knockouts of conduit panel. (for low voltage line)
(2) Pull out connection cable through conduit.
(3) After conduit to the panel, fix nut to the opposite side of panel.
(4) Pass the connection cabel through the hole.
(5) Properly connect the cable on the terminal block.
(6) Fix the connection cable with cord clamp provided on the unit not to have strain at the terminal when the connection cable is pulled outside up to a 35 pound weight



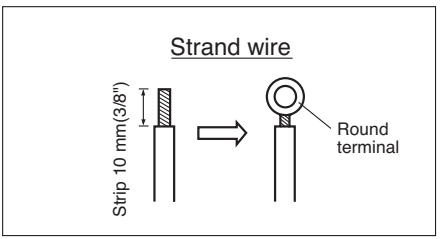
WARNING: Loose wiring may cause the terminal to overheat or result in unit malfunction. A fire hazard may also exist. Therefore, be sure all wiring is tightly connected.

When connecting each power wire to the corresponding terminal, follow instructions "How to connect wiring to the terminals" and fasten the wire tightly with the fixing screw of the terminal plate.

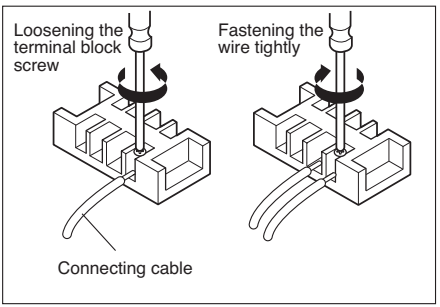
How to connect wiring to the terminals

▼ For strand wiring
(1) Cut the wire end with a wire cutter or wire-cutting pliers, then strip the insulation to expose the strand wiring about 10 mm(3/8").
(2) Using a screwdriver, remove the terminal screw(s) on the terminal plate.
(3) Using a round terminal fastener or pliers, securely clamp each stripped wire end with a round terminal.
(4) Position the round terminal wire, and replace and tighten the terminal screw using a screwdriver.

Power supply cable



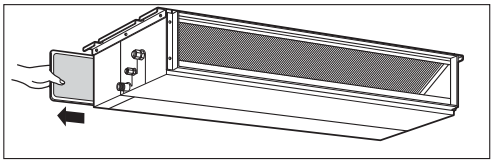
Connecting Cable



Checking the Drainage, Insulating the Pipe and Special Piping Applications

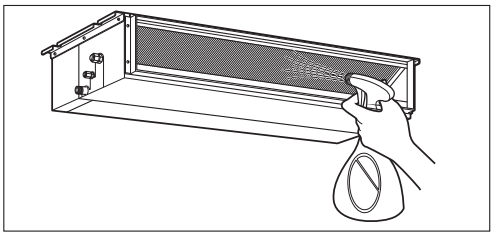
Checking the drainage

1. Remove the Air Filter.



2. Check the drainage.

- Spray one or two glasses of water upon the evaporator.
- Ensure that water flows drain hose of indoor unit without any leakage.

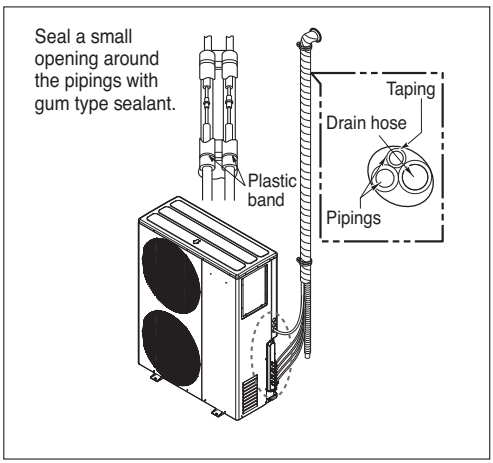


❉ The figure can be changed according to model.

Insulating the Pipe and Special Piping Applications

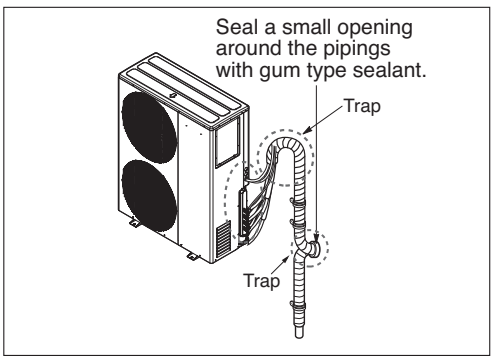
Insulate the piping by wrapping the connecting portion of the indoor unit with insulation material and secure it with two kinds of vinyl tape.

- If you want to connect an additional drain hose, the end of the drain outlet should be routed above the ground. Secure the drain hose appropriately.



In cases where the outdoor unit is installed below the indoor unit perform the following:

1. Tape the piping, drain hose and connecting cable from down to up.
2. Secure the taped piping along the exterior wall using saddle or equivalent.



In cases where the Outdoor unit is installed above the Indoor unit perform the following.

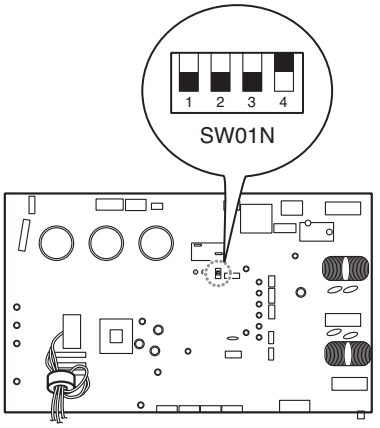
1. Tape the piping and connecting cable from down to up.
2. Secure the taped piping along the exterior wall. Form a trap to prevent water entering the room.
3. Secure the piping onto the wall using a saddle or equivalent.

Long Pipe Setting

1. Open the top cover of outdoor unit.
2. Select one of the two selectable modes as follows.
3. Set the Zone as shown in Fig.
4. Close the top cover and check whether the product works normally.

WARNING: Do not open the top cover or Set the pipe length when operating the product.

18/24/36 kBtu/h class



Air Purging and Evacuation

Air and moisture remaining in the refrigerant system have undesirable effects as indicated below.

1. Pressure in the system rises.
2. Operating current rises.
3. Cooling(or heating) efficiency drops.
4. Moisture in the refrigerant circuit may freeze and block capillary tubing.
5. Water may lead to corrosion of parts in the refrigeration system.

Therefore, the indoor/outdoor unit and connecting tube must be checked for leaks, and vacuumed to remove incondensible gas and moisture in the system.

Leak Checking

Preparation

- Check that each tube(both liquid and gas side tubes) between the indoor and outdoor units have been properly connected and all wiring for the test run has been completed. Remove the service valve caps from both the gas and the liquid sides on the outdoor unit. Check that both the liquid and the gas side service valves on the outdoor unit are kept closed at this stage.

Leakage test

- Connect the manifold valve(with pressure gauges) and dry nitrogen gas cylinder to this service port with charge hoses.

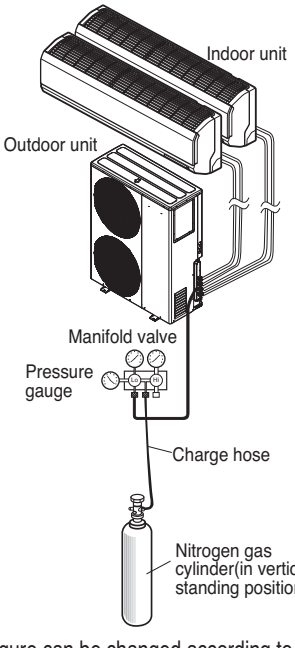
⚠ CAUTION: Be sure to use a manifold valve for leak testing. The high side manifold valve must always be kept closed.

- Pressurize the system to no more than 150 P.S.I.G. with dry nitrogen gas and close the cylinder valve when the gauge reading reached 150 P.S.I.G. Next, test for leaks with liquid soap.

⚠ CAUTION: To avoid nitrogen entering the refrigerant system in a liquid state, the top of the cylinder must be higher than its bottom when you pressurize the system. Usually, the cylinder is used in a vertical standing position.

NOTICE : Leakage testing shoud be done for each indoor unit connection set, separately.

1. Do a leakage test of all joints of the tubing(both indoor and outdoor) and both gas and liquid side service valves with soap bubbles.
   Bubbles indicate a leak. Be sure to wipe off the soap with a clean cloth.
2. After the system is found to be free of leaks, relieve the nitrogen pressure by loosening the charge hose connector at the nitrogen cylinder. When the system pressure is reduced to normal, disconnect the hose from the cylinder.



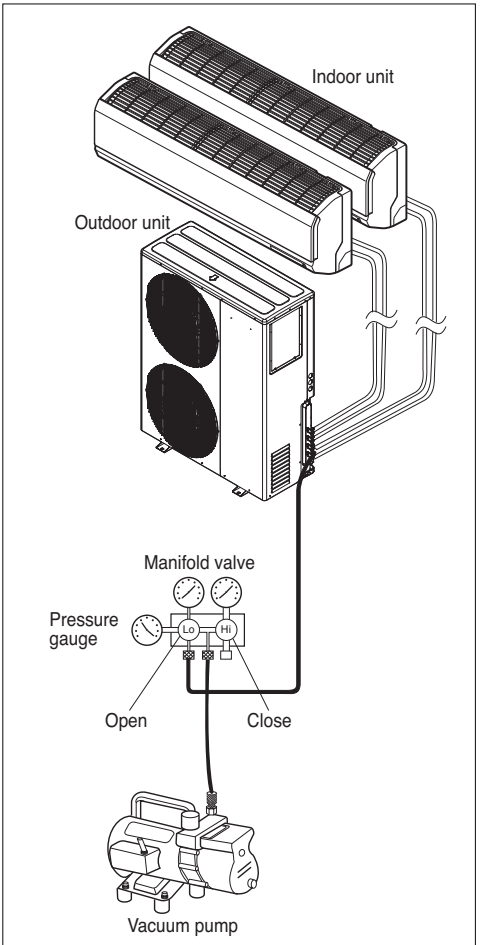
❊ The figure can be changed according to model.

Evacuation

1. Connect the charge hose end described in the preceding steps to the vacuum pump to evacuate the tubing and indoor unit.
   Confirm the "Lo" knob of the manifold valve is open. Then, run the vacuum pump.
   The operation time for evacuation varies with tubing length and capacity of the pump.

   [Each Room] The vacuum pump must be operated less than 0.8torr of the gage pressure.

2. When the desired vacuum is reached, close the "Lo" knob of the manifold valve and stop the vacuum pump.



❊ The figure can be changed according to model.

Finishing the job

1. With a service valve wrench, turn the valve stem of liquid side valve counter-clockwise to fully open the valve.
2. Turn the valve stem of gas side valve counter-clockwise to fully open the valve.
3. Loosen the charge hose connected to the gas side service port slightly to release the pressure, then remove the hose.
4. Replace the flare nut and its bonnet on the gas side service port and fasten the flare nut securely with an adjustable wrench. This process is very important to prevent leakage from the system.
5. Replace the valve caps at both gas and liquid side service valves and fasten them tight.

This completes air purging with a vacuum pump.

The air conditioner is now ready for test running.

NOTICE

: Repeat evacuation procedure for each indoor unit.

Charging

■ If installed total piping length is more than standard total length, additional refrigerant charging is necessary.
Below standard total piping length, additional refrigerant charging is not required.

Multiple Piping Models

Unit:m(ft)

Outdoor Unit Capacity (Btu/h class)	Max total length of all pipes (A+B)/(A+B+C)/(A+B+C+D)	Max length of each pipe (A/B/C/D)	Min length of each pipe (A/B/C/D)	Additional Refrigerant Unit : g/m (oz/ft)	Standard Total Piping Length (No Add`l refrigerant)
18k	50(164)	25(82)	3(9.8)	20(0.22)	15(49.2)
24k	75(246)	25(82)	3(9.8)	20(0.22)	22.5(74)
36k	75(246)	25(82)	3(9.8)	20(0.22)	30(98.4)

Distributor Type Model

Unit:m(ft)

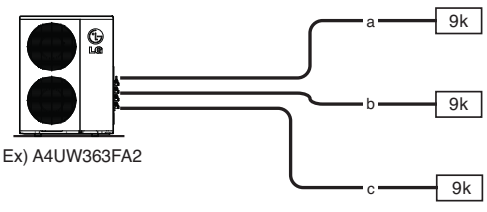
Outdoor Unit Capacity (Btu/h class)	Main Piping Length		Branch Piping Length	
	Standard Length	Additional Refrigerant Unit : g/m (oz/ft)	Standard Length	Additional Refrigerant Unit : g/m (oz/ft)
54k	5(16.4)	50(0.55)	5(16.4)	20(0.22)

✎ *Important:*

If you are ever uncertain of the unit charge, reclaim, evacuate and weigh in the correct charge using the charge amount specified on the Unit`s specification label.

Multiple Piping Models

Additional charge(oz) = (Total Installation Piping Length-Standard Total Piping Length) x 0.22



Ex) A4UW363FA2

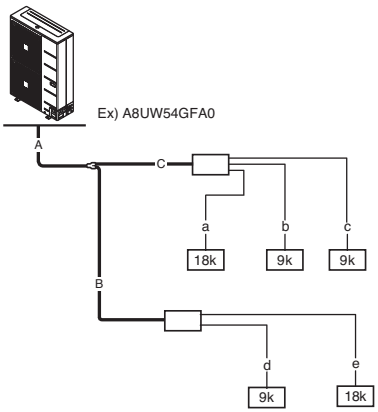
Each branch pipe
a=82ft
b=16ft
c=49ft

Additional Charge
= {(82+16+49)-98.4} x 0.22 = 10.69 oz

Distributor type Models

Additional charge (oz) = ((Total Main piping Length - Main Standard Length) x 0.55
+ (A Room Branch Length – Standard Length) x 0.22
+ (B Room Branch Length – Standard Length) x 0.22
+ (C Room Branch Length – Standard Length) x 0.22 +..)
- CF(Correction Factor) x 3.53

❊ CF = Max. number of connectable indoor unit – Total number of connected indoor unit



- Total main pipe(A+B+C)=98ft
- Each branch pipe
  a=33ft
  b=26ft
  c=16.4ft
  d=10ft
  e=33ft

❖ Additional Charge
= ((98-16.4)×0.55 + (33-16.4)×0.22
+ (26-16.4)×0.22 + (16.4-16.4)×0.22
+ (10-16.4)×0.22 + (33-16.4)×0.22)
- (8-5)×3.53 = 42.3oz

❊ If the total additional charge value after calculation comes out to be negative, then do not consider additional charge.

Combination indoor units

The indoor units connectable to the outdoor unit are shown below

Type	Chassis Name	Indoor Unit Capacity (Btu/h class)			Outdoor Unit Capacity (Btu/h class)			
		9k	12k	18k	18 k	24 k	36 k	54 k
		Model Name			Connectable Combination			
Standard Type	SE	AMNW09GDEL1 [LMN095HV(T)]	AMNW12GDEL1 [LMN125HV(T)]		O	O	O	O
	S5			AMNW18GD5L1 [LMN185HV(T)]		O	O	O
Standard Libero Type	SB	AMNW09GDBL0 [LMN096HVT] AMNW09GEBA0 [LMEN096HVT]	AMNW12GDBL0 [LMN126HVT] AMNW12GEBA0 [LMEN126HVT]		O	O	O	O
	SC			AMNW18GDCL0 [LMN186HVT] AMNW18GECA0 [LMEN186HVT]		O	O	O
Artcool Mirror Type	SE	AMNW09GDER1 [LMAN095HV(T)]	AMNW12GDER1 [LMAN125HV(T)]		O	O	O	O
	S8			AMNW18GD8R1 [LMAN185HV(T)]		O	O	O
Artcool Libero Type	SB	AMNW09GDBR0 [LMAN096HVT]	AMNW12GDBR0 [LMAN126HVT]		O	O	O	O
	SC			AMNW18GDCR0 [LMAN186HVT]		O	O	O
Ceiling Concealed Duct Type	B1	AMNW09GB1A0 [LMDN095HV]	AMNW12GB1A0 [LMDN125HV]		O	O	O	O
	B2			AMNW18GB2A0 [LMDN185HV]		O	O	O
Ceiling Cassette Type	TR		AMNW12GTRA0 [LMCN125HV]		O	O	O	O
	TQ			AMNW18GTQA0 [LMCN185HV]		O	O	O

NOTICE : 1. The total capacity(in Btu/h unit) of connected indoor unit models represents the total sum of the figures expressed in the indoor model name.

2. Combinations in which the total capacity of the connected indoor units exceeds the capacity of the outdoor unit will reduce the capacity of each indoor unit below the rated capacity during simultaneous operation. Therefore, if circumstances allows, combine indoor units within the capacity of the outdoor unit

US	1. Please call the installing contractor of your product, as warranty service will be provided by them. 2. If you have service issues that have not been addressed by the contractor, please call 1-888-865-3026.
CANADA	Service call Number # : (888) LG Canada, (888) 542-2623

LG
Life's Good

MULTI F
MULTI F MAX

STANDARD WALL-MOUNTED INDOOR UNIT INSTALLATION MANUAL

Models:

LMN079HVT	7 kBtu
LSN090HSV5	9 kBtu
LSN120HSV5	12 kBtu
LMN159HVT	15 kBtu
LSN180HSV5	18 kBtu
LMN249HVT	24 kBtu

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This document is for design purposes only.

⃠ Do not throw away, destroy, or lose this manual.

Please read carefully and store in a safe place for future reference.
Content familiarity required for proper installation.

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

A summary list of safety precautions begins on page 3.

IM_MultiF_StdWallMount_HVT_HSV5_11_18

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

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SAFETY INSTRUCTIONS

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

TABLE OF SYMBOLS

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

INSTALLATION

⚠DANGER

⃠ Don't store or use flammable gas / combustibles near the unit.

There is risk of fire, explosion, and physical injury or death.

⚠WARNING

⃠ Do not install or remove the unit by yourself (end-user). Ask the dealer or an LG trained technician to install the unit.

Improper installation by the user will result in water leakage, fire, explosion, electric shock, physical injury or death.

For replacement of an installed unit, always contact an LG trained service provider.

There is risk of fire, electric shock, explosion, and physical injury or death.

The outdoor unit is shipped with refrigerant and the service valves closed. ⃠ Do not open service valves on the unit until all non-condensibles have been removed from the piping system and authorization has been obtained from the commissioning agent.

There is a risk of physical injury or death.

⃠ Do not run the compressor with the service valves closed.

There is risk of explosion, physical injury, or death.

Periodically check that the outdoor unit is not damaged.

There is risk of explosion, physical injury, or death.

Replace all control box and panel covers.

If cover panels are not installed securely, dust, water and animals will enter the unit, causing fire, electric shock, and physical injury or death.

Wear protective gloves when handling equipment. Sharp edges will 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 will lead to illness or death.

⃠ Do not install the unit using defective hanging, attaching, or mounting hardware.

There is risk of physical injury or death.

Dispose the packing materials safely.

- *Packing materials, such as nails and other metal or wooden parts will cause puncture wounds or other injuries.*
- *Tear apart and throw away plastic packaging bags so that children will not play with them and risk suffocation and death.*

⃠ Do not install the unit in any location exposed to open flame or extreme heat. ⃠ Do not touch the unit with wet hands.

There is risk of fire, electric shock, explosion, and physical injury or death

Install the unit considering the potential for strong winds or earthquakes.

Improper installation will cause the unit to fall, resulting in physical injury or death.

⃠ Do not change the settings of the protection devices.

If the pressure switch, thermal switch, or other protection device is shorted and forced to operate improperly, or parts other than those specified by LG are used, there is risk of fire, electric shock, explosion, and physical injury or death.

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INSTALLATION - CONTINUED

⚠WARNING

If the air conditioner is installed in a small space, take measures to prevent the refrigerant concentration from exceeding safety limits in the event of a refrigerant leak.
Consult the latest edition of ASHRAE (American Society of Heating, Refrigerating, and Air Conditioning Engineers) Standard 15. If the refrigerant leaks and safety limits are exceeded, it could result in personal injuries or death from oxygen depletion.

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

⚠CAUTION

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

Note:

Properly insulate all cold surfaces to prevent "sweating."
Cold surfaces such as un-insulated piping can generate condensate that will drip and cause a slippery surface condition and/or water damage to walls.

When installing the unit in a hospital, mechanical room, or similar electromagnetic field (EMF) sensitive environment, provide sufficient protection against electrical noise.
Inverter equipment, power generators, high-frequency medical equipment, or radio communication equipment will cause the air conditioner to operate improperly. The unit will also affect such equipment by creating electrical noise that disturbs medical treatment or image broadcasting.

⃠ **Do not use the product for special purposes such as preserving foods, works of art, wine coolers, or other precision air conditioning applications. This equipment is designed to provide comfort cooling and heating.**
There is risk of property damage.

⃠ **Do not make refrigerant substitutions. Use R410A only.**
If a different refrigerant is used, or air mixes with original refrigerant, the unit will malfunction and become damaged.

⃠ **Do not install the unit in a noise sensitive area.**

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

⃠ **Don't store or use flammable gas / combustibles near the unit.**
There is risk of product failure.

Take appropriate actions at the end of HVAC equipment life to recover, recycle, reclaim or destroy R410A refrigerant according to applicable U.S. Environmental Protection Agency (EPA) rules.

Periodically check that the outdoor unit is not damaged.
There is a risk of equipment damage.

Install the unit in a safe location where no one can step on or fall onto it. ⃠ **Do not install the unit with defective hanging, attaching, or mounting hardware.**
There is risk of unit and property damage.

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

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

The unit is shipped with refrigerant and the service valves closed. ⃠ **Do not open service valves on the unit until all non-condensibles have been removed from the piping system and authorization to do so has been obtained from the commissioning agent.**
There is a risk of refrigerant contamination, refrigerant loss and equipment damage.

⃠ **Do not run the compressor with the service valves closed.**
There is a risk of equipment damage.

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WIRING

⚠DANGER

High voltage electricity is required to operate this system. Adhere to the National Electrical Codes and these instructions when wiring.

Improper connections and inadequate grounding can cause accidental injury or death.

Always ground the unit following local, state, and National Electrical Codes.

Turn the power off at the nearest disconnect before servicing the equipment.

Electric shock can cause physical injury or death.

Properly size all circuit breakers or fuses.

There is risk of fire, electric shock, explosion, physical injury or death.

⚠WARNING

The information contained in this manual is intended for use by an industry-qualified, experienced, certified electrician familiar with the U.S. National Electric Code (NEC) who is equipped with the proper tools and test instruments.

Failure to carefully read and follow all instructions in this manual can result in personal 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 National Electrical Code, and the instructions given in this manual.

If the power source capacity is inadequate or the electric work is not performed properly, it will result in fire, electric shock, physical injury or death.

Properly tighten all power connections.

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

Ensure the unit is connected to a dedicated power source that provides adequate power.

If the power source capacity is inadequate or the electric work is not performed properly, it will result in fire, electric shock, physical injury or death.

Refer to local, state, and federal codes, and use power wires of sufficient current capacity and rating.

Wires that are too small will generate heat and cause a fire.

Secure all field wiring connections with appropriate wire strain relief.

Improperly securing wires will create undue stress on equipment power lugs. Inadequate connections will generate heat, cause a fire and physical injury or death.

Note:

⃠ Do not cut, lengthen or shorten the communications and power cable between any dry contact unit and its connected indoor unit. ⃠ Do not install the unit in a location where the communications and power cable cannot be safely and easily connected between the two units. ⃠ Do not allow strain on this cable.

Poor cable connections can cause equipment malfunction.

The information contained in this manual is intended for use by an industry-qualified, experienced, certified electrician familiar with the U.S. National Electric Code (NEC) who is equipped with the proper tools and test instruments.

Failure to carefully read and follow all instructions in this manual can result in equipment malfunction and property damage.

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OPERATION

⚠DANGER

⃠ Do not provide power to or operate the unit if it is flooded or submerged.
There is risk of fire, electric shock, physical injury or death.

Use a dedicated power source for this product.
There is risk of fire, electric shock, physical injury or death.

⃠ Do not operate the disconnect switch with wet hands.
There is risk of fire, electric shock, physical injury or death.

Periodically verify that the hardware securing the unit has not deteriorated.
If the unit falls from its installed location, it can cause property damage, product failure, physical injury or death.

If refrigerant gas leaks out, ventilate the area before operating the unit.
If the unit is mounted in an enclosed, low-lying, or poorly ventilated area and the system develops a refrigerant leak, it will cause fire, electric shock, explosion, physical injury or death.

⚠WARNING

⃠ Do not allow water, dirt, or animals to enter the unit.
There is risk of unit failure, fire, electric shock, physical injury or death.

⃠ Avoid excessive cooling and periodically perform ventilation to the unit.
Inadequate ventilation is a health hazard.

⃠ Do not touch refrigerant piping during or after operation.
It can cause burns or frostbite.

⃠ Do not operate the unit with the panel(s) or protective cover(s) removed; keep fingers and clothing away from moving parts.
The rotating, hot, cold, and high-voltage parts of the unit can cause physical injury or death.

Periodically verify the equipment mounts have not deteriorated.
If the base collapses, the unit could fall and cause physical injury or death.

Periodically check power cable and connection for damage.
Cable must be replaced by the manufacturer, its service agent, or similar qualified persons in order to avoid physical injury and/or electric shock.

Securely attach the electrical cover to the unit.
Non-secured electrical covers can result in burns or electric shock due to dust or water in the service panel.

⃠ Do not open the inlet grille of the unit during operation. ⃠ Do not operate the unit with the panels or guards removed. ⃠ Do not insert hands or other objects through the inlet or outlet when the unit is powered. ⃠ Do not touch the electrostatic filter, if the unit includes one.
The unit contains sharp, rotating, hot, and high voltage parts that can cause personal injury and/or electric shock.

Ensure no power is connected to the unit other than as directed in this manual. Remove power from the unit before removing or servicing the unit.
There is risk of unit failure, fire, electric shock, physical injury or death.

⚠CAUTION

⃠ To avoid physical injury, use caution when cleaning or servicing the air conditioner.

Note:

Clean up the site after installation is finished, and check that no metal scraps, screws, or bits of wiring have been left inside or surrounding the unit.

⃠ Do not use this equipment in mission critical or special-purpose applications such as preserving foods, works of art, wine coolers or refrigeration. This equipment is designed to provide comfort cooling and heating.

Provide power to the compressor crankcase heaters at least six (6) hours before operation begins.
Starting operation with a cold compressor sump(s) will result in severe bearing damage to the compressor(s). Keep the power switch on during the operational season.

⃠ Do not block the inlet or outlet.
Unit will malfunction.

Securely attach the electrical cover to the indoor unit.
Non-secured covers can result in fire due to dust or water in the service panel.

Periodically verify the equipment mounts have not deteriorated.
If the base collapses, the unit could fall and cause property damage or product failure.

⃠ Do not allow water, dirt, or animals to enter the unit.
There is risk of unit failure.

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UNIT NOMENCLATURE

Multi F Multi-Zone Systems — Indoor Units

L = LG

Frame Type:
M = Multi-Zone
A/S = Single Zone (Gen 4, 5 Single Zone units also compatible with Multi Zone)

Component:
AN: Art Cool™ Wall-Mounted Indoor Unit
N: Standard Wall-Mounted Indoor Unit
CN: Four-Way Ceiling-Cassette Indoor Unit
DN: Ceiling-Concealed Duct (Low Static) Indoor Unit
HN: Ceiling-Concealed Duct (High Static) Indoor Unit
VN: Vertical-Horizontal Air Handling Indoor Unit

Nominal Capacity
(Nominal cooling capacity in Btu/h):

079 = 7,000	159 = 15,000
090 = 9,000	180 = 18,000
120 = 12,000	249 = 24,000

Features:
H = Heat Pump
V = Inverter
T = High Wall-Mounted Indoor Unit
P = Art Cool Gallery Indoor Unit

Generation:
3 = Third (also Third Gen if no number in this position)
4 = Fourth
5 = Fifth

- *Voltage for all equipment is 208-230V, 60 Hz, 1-phase.*
- *All indoor units are compatible with wired controllers*

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Multi F and Multi F MAX Standard Wall-Mounted Units

This manual describes how to install the LG Multi F and Multi F MAX (Multi Zone) Standard Wall-Mounted Indoor Units (IDU) for Multi F heat pump systems. The table on the next page lists the available models. Refer to LG's Multi F Indoor Unit Engineering Manual for complete detailed engineering data and selection procedures.

Figure 1: Multi F Standard Wall-Mounted HVT Indoor Unit.

Safety

Safety of personnel is the primary concern during all procedures. Read and understand the safety summary at the front of this manual. Read and understand this installation procedure before beginning installation. Use the appropriate tools and accessories during installation. Plan the work and ⃠ do not work alone, if possible. Know how to obtain emergency medical and fire fighting assistance.

Figure 2: Multi F Standard Wall-Mounted HSV5 Indoor Unit.

Installation Personnel

This equipment is intended for installation by personnel trained in the required construction, mechanical, electrical, and/or other disciplines.

⚠WARNING

Installation work must be performed by trained personnel and in accordance with national wiring standards and all local or other applicable codes. Improper installation can result in fire, electric shock, physical injury, or death.

Note:

Please read all instructions before installing this product. Become familiar with the unit's components and connections, and the order of installation. Incorrect installation can degrade or prevent proper operation.

Required Tools (field provided)

- Level
- Screwdriver
- Electrical lineman pliers
- Electric drill
- Hole saw
- Drill
- Flaring tool set
- Tubing cutter
- Tube/pipe reamer
- Torque wrenches
- Allen wrench
- Gas-leak detector
- Thermometer

Required Parts (field provided)

- Connecting cable (power and control)
- Pipes - vapor line and liquid line, with insulation
- Insulated drain hose
- Additional drain hose

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Included Parts

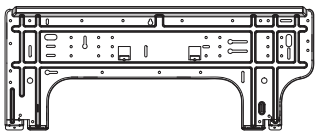
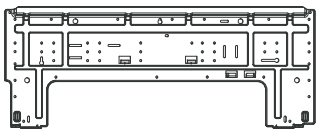
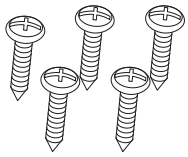
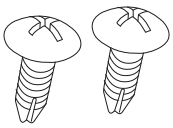
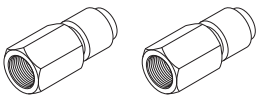
Part	Quantity	Image
Installation Plate	One (1)	 7,000 ~ 15,000 Btu/h Indoor Units  18,000 and 24,000 Btu/h Indoor Units
Type “A” Screws	Five (5)	
Type “B”, “C”, and “D” Screws (Example image; appearances will vary)	Two (2) Each Type	
Wireless Controller with Holder AKB74955602	One (1)	
Connectors (For use with Multi F Systems)	One (1) Each for Ø3/8 inch → Ø 1/2 inch One (1) Each for Ø5/8 inch → Ø 1/2 inch One (1) Each for Ø1/4 inch → Ø 3/8 inch (All three connectors listed above are included with the 18,000 Btu/h indoor unit; the Ø3/8 inch → Ø 1/2 is the only one required for the 24,000 Btu/h indoor unit.)	

Table 1: Multi F Standard Wall-Mounted Indoor Units.

Unit	Model Number	Nominal Capacity	
		Cooling (Btu)	Heating (Btu)
	LMN079HVT	7,000	8,100
	LMN159HVT	14,300	15,600
	LMN249HVT	24,000	25,600
	LSN090HSV5	9,000	10,900
	LSN120HSV5	12,000	13,600
	LSN180HSV5	18,000	21,600

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R410A Refrigerant

R410A refrigerant has a higher operating pressure in comparison to R22 refrigerant. All piping system materials installed must have a higher resisting pressure than the materials traditionally used in R22 systems.

R410A refrigerant is an azeotrope of R32 and R125, mixed at 50:50. The ozone depletion potential (ODP) is 0.

⚠WARNING

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

Note

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

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Table 2: Multi F Multi Zone Standard Wall-Mounted Indoor Unit Specifications.

Model Name	LMN079HVT	LSN090HSV5	LSN120HSV5	LMN159HVT	LSN180HSV5	LMN249HVT
Nominal Cooling Capacity (Btu/h)[1]	7,000	9,000	12,000	14,300	18,000	24,000
Nominal Heating Capacity (Btu/h)[1]	8,100	10,900	13,600	15,600	21,600	25,600
Operating Range						
Cooling (°F WB)	57-77					
Heating (°F DB)	59-81					
Fan						
Type	Cross Flow					
Motor Output (W) x Qty.	30 x 1				60 x 1	
Motor/Drive	Brushless Digitally Controlled / Direct					
Airflow Rate CFM (H/M/L)	254 / 204 / 148	268 / 218 / 169	282 / 233 / 177	314 / 268 / 184	558 / 438 / 353	597 / 452 / 367
Unit Data						
Refrigerant Type[2]	R410A					
Refrigerant Control	Electronic Expansion Valve (EEV)					
Power Supply V, Ø, Hz[3]	208-230, 1, 60					
Rated Amps (A)	0.4					
Sound Pressure Level ±3 dB(A) (H/M/L)[4]	35 / 31 / 26	36 / 32 / 27	38 / 34 / 29	42 / 38 / 32	44 / 38 / 34	46 / 41 / 36
Dimensions (W x H x D, in.)	32-15/16 x 12-1/8 x 7-7/16				39-9/32 x 13-19/32 x 8-9/32	
Net Unit Weight (lbs.)	18.3				25.6	
Shipping Weight (lbs.)	23.4				32.2	
Power Wiring / Communications Cable (No. x AWG)[5]	4 x 18					
Heat Exchanger (Row x Column x Fin / inch) x Number	(2 x 23 x 22) x 1				(2 x 16 x 20) x 1	
Pipe Size						
Liquid (in.)	1/4					
Vapor (in.)	3/8				1/2	
Connection Size						
Liquid (in.)	1/4				3/8	1/4
Vapor (in.)	3/8				5/8	1/2
Drain O.D. / I.D. (in.)	27/32, 5/8					

[1]Nominal capacity is rated 0 ft. above sea level with corresponding refrigerant piping length in accordance with standard length of each outdoor unit and a 0 ft. level difference between outdoor and indoor units. All capacities are net with a combination ratio between 95 – 105%.

Nominal cooling capacity rating obtained with air entering the indoor unit at 80ºF dry bulb (DB) and 67ºF wet bulb (WB) and outdoor ambient conditions of 95ºF dry bulb (DB) and 75ºF wet bulb (WB).

Nominal heating capacity rating obtained with air entering the indoor unit at 70ºF dry bulb (DB) and 60ºF wet bulb (WB) and outdoor ambient conditions of 47ºF dry bulb (DB) and 43ºF wet bulb (WB).

[2]This unit comes with a dry helium charge.

[3]Acceptable operating voltage: 187V-253V.

[4]Sound pressure levels are tested in an anechoic chamber under ISO Standard 3745 and are the same in both cooling and heating mode. These values can increase due to ambient conditions during operation.

[5]All power wiring / communications cable to the IDUs be minimum 18 AWG, 4-conductor, stranded, shielded or unshielded (if shielded, must be grounded to chassis at ODU only) and must comply with applicable local and national codes.

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Figure 3: LMN079HVT, LSN090HSV5, LSN120HSV5, and LMN159HVT Dimensions.

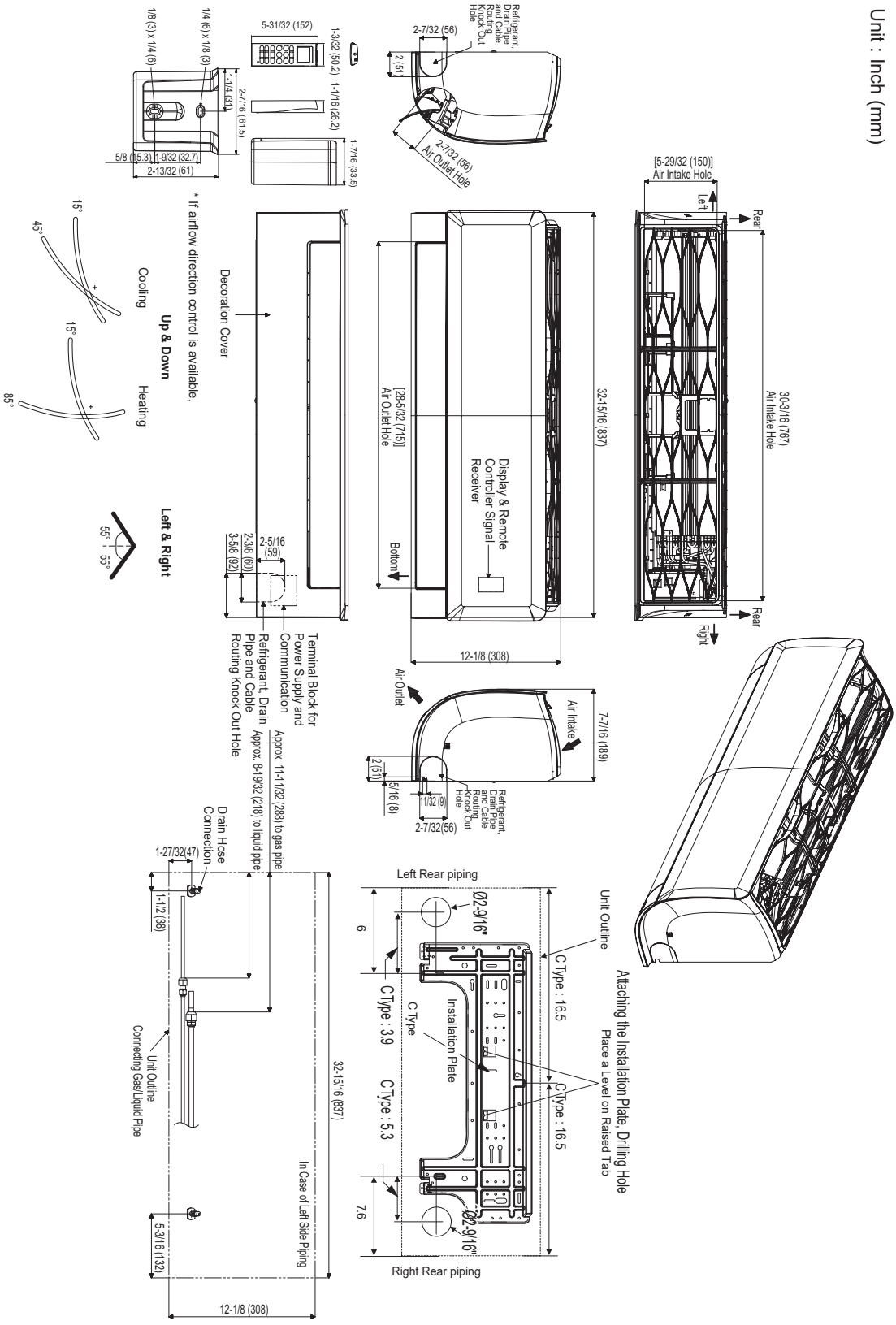

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Figure 4: LSN180HSV5 and LMN249HVT Dimensions.

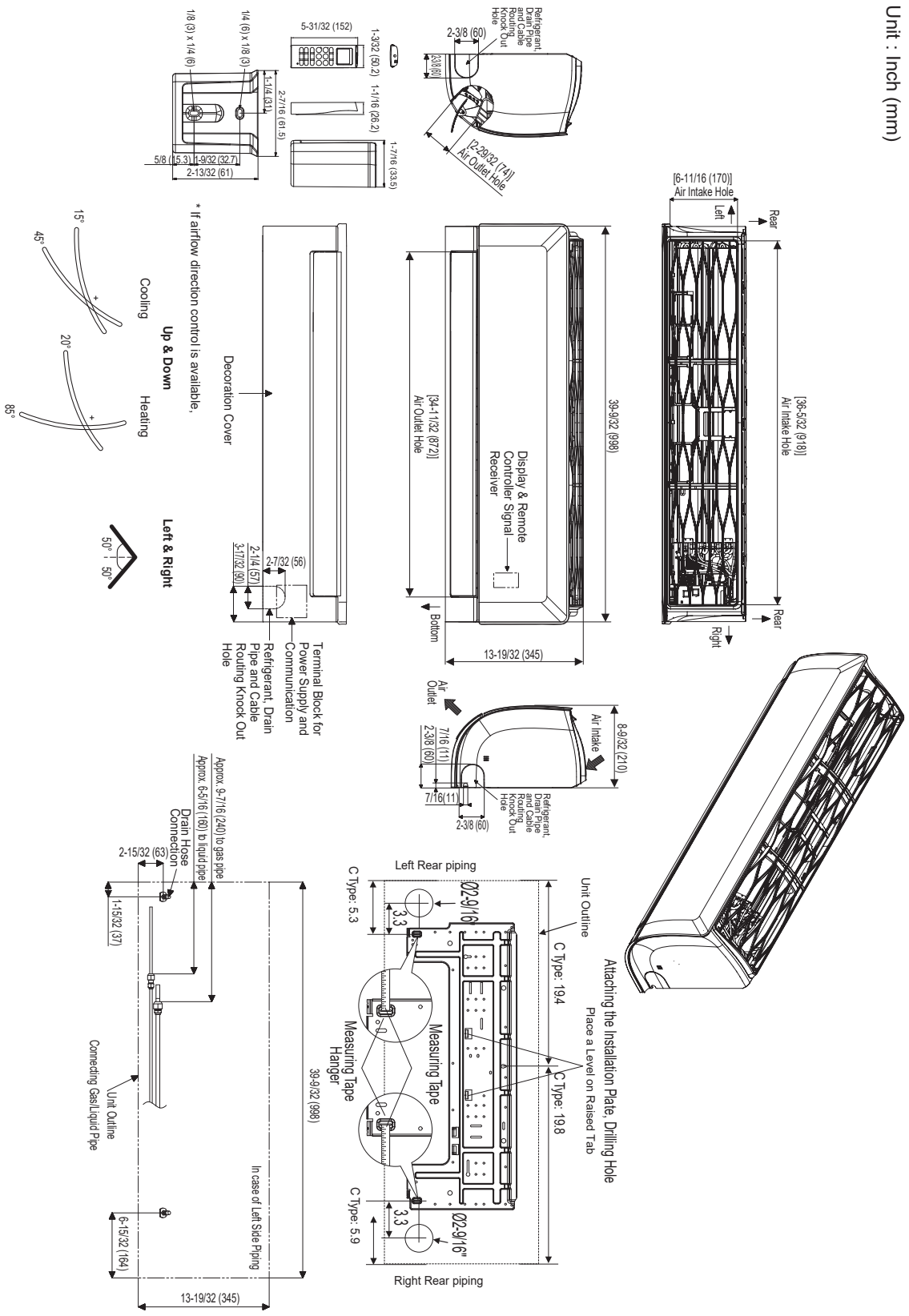

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Figure 5: Multi F Standard Wall-Mounted Indoor Unit Refrigerant Flow Diagram (9HVT and HSV5).

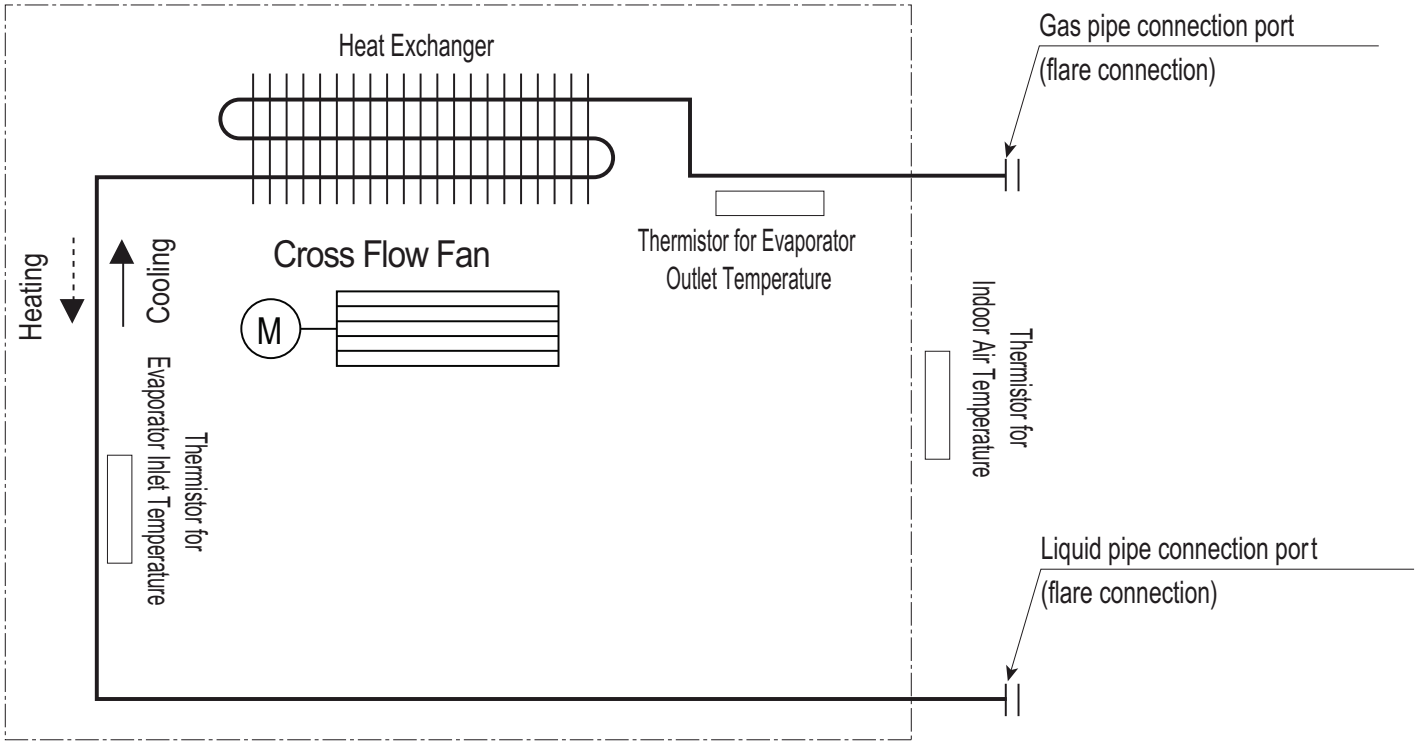

Table 3: Multi F Standard Wall-Mounted Indoor Unit Refrigerant Pipe Sizes.

Model No.	Vapor (inch)	Liquid (inch)
LMN079HVT	Ø3/8	Ø1/4
LSN090HSV5		
LSN120HSV5		
LMN159HVT		
LSN180HSV5	Ø1/2	
LMN249HVT		

Table 4: Multi F Standard Wall-Mounted Indoor Unit Refrigerant Pipe Connections.

Model No.	Vapor (inch)	Liquid (inch)
LMN079HVT	Ø3/8	Ø1/4
LSN090HSV5		
LSN120HSV5		
LMN159HVT		
LSN180HSV5	Ø5/8	Ø3/8
LMN249HVT	Ø1/2	Ø1/4

Table 5: Multi F LSNxxxHSV5 Standard Wall-Mounted Indoor Unit Thermistor Details.

Description	PCB Connector
Indoor Air Temperature Thermistor	CN-TH1
Evaporator Inlet Temperature Thermistor	
Evaporator Middle Temperature Thermistor	CN-TH2
Evaporator Outlet Temperature Thermistor	
Water Level Sensor (Optional)	CN-TH3

Table 6: Multi F LMNxxxHVT Standard Wall-Mounted Indoor Unit Thermistor Details.

Description	PCB Connector
Indoor Air Temperature Thermistor	CN-TH1
Evaporator Inlet Temperature Thermistor	
Evaporator Outlet Temperature Thermistor	CN-TH2
Water Level Sensor (Optional)	CN-TH3

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Unpack and Inspect for Freight Damage

⚠CAUTION

Shipping and net weights of the wall-mounted units are listed in the specifications table. To help avoid injury to personnel and damage to the unit, use two people when carrying a unit by hand.

Note:

- *Shipping and net weights of the ceiling cassette units are listed in the specification tables in the beginning of this manual. To help avoid damage to the unit, use at least two people when carrying a unit by hand.*
- *Before opening the shipping container, check the container labeling to verify the unit received is the correct unit. Verify the unit capacity, type, and voltage. Refer to the "Unit Nomenclature" chart in the beginning of this manual.*
- *After opening, if the unit is damaged, repack the unit as it was shipped to you. RETAIN ALL PACKING MATERIALS. In general, freight damage claims will be denied if the original packing materials are not retained for the claims adjustor to inspect. Contact your supervisor on how to proceed with filing a freight claim and to order a replacement unit.*
- *To avoid damaging the indoor unit, ⃠ do not unpack the unit and remove the protective materials until it is ready to install. Before unpacking, carefully move the packaged unit to a work area near the installation location.*

1. Before opening the shipping container, verify that the correct unit is present as described in the Note above.
2. Place the box on a solid surface right side up.
3. Cut the white reinforced nylon straps.
4. Open the top of the box and fold back all four flaps.
5. Remove the protective cardboard / Styrofoam® top sheet and place to the side.
6. The walls and top panels are not attached to the bottom of the box. Lift the cardboard carton by the flaps and remove the box walls and top and place it to the side.
7. Remove the moisture barrier plastic bonnet.
8. Check the unit nameplate data and model number. Verify the unit voltage and capacities are correct before proceeding.
9. Locate and retain the included parts located in the box.
10. Using two people, carefully lift the unit and inspect for freight damage. ⃠ DO NOT lift by the refrigerant piping or drain pipe stub. Lift by the frame only. If damage is found, repack the unit as it was received in the original container.

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Location Selection

Note:

Follow required best practices when choosing a location for the Standard Wall-Mounted Indoor Units (IDU).

⚠DANGER

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

Select a location for installing the wall-mounted indoor unit (IDU) that meets the following conditions:

Do's

- Ensure that the wall is solid and has enough structural strength to bear the weight of the installation plate and indoor unit.
- Include enough space for service access.
- Place the unit in a location where drainage can be obtained easily and to minimize the length of the condensate drain piping; include space for drainage to ensure condensate flows properly out of the unit when it is in cooling mode.
- Place the unit in a location where air circulation will not be blocked; keep proper distances from ceilings, doorways, floor, walls, etc.
- Place the unit in a location where operating sound from the unit will not disturb occupants--place the unit where noise prevention is taken into consideration
- Ensure there is sufficient space from the ceiling and floor.
- Use a level indicator to ensure the unit is installed on a level plane.
- Use a stud finder to locate studs easily, preventing unnecessary damage to the wall.
- Locate the indoor unit in a location where it can be easily connected to the outdoor unit / branch distribution unit.

⃠ Don'ts

- ⃠ *Do not install the unit where it will be subjected to direct thermal radiation from other heat sources.*
- ⃠ *Do not install the unit in a location where acidic solution and spray (sulfur) are often used.*
- ⃠ *Do not use the unit in environments where oil, steam, or sulfuric gas are present.*
- ⃠ *Do not install additional ventilation products on the chassis of the unit.*
- ⃠ *Avoid installing the unit near high-frequency generator sources.*
- ⃠ *Do not install the unit near a doorway.*
- ⃠ *Do not install the unit near a heat or steam source, or where considerable amounts of oil, iron powder, or flour are used. These materials will generate condensate, cause a reduction in heat exchanger efficiency, or malfunction of the condensate drain. If this is a potential problem, install a ventilation fan large enough to vent out these materials.*

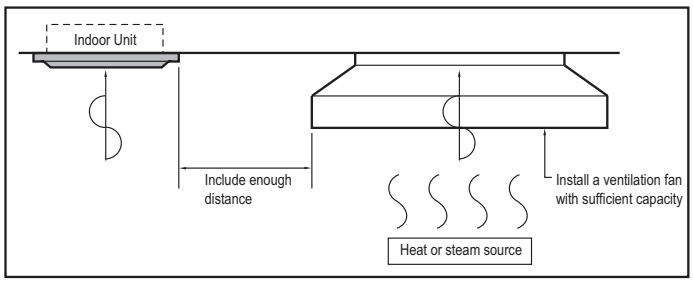
⚠WARNING

The unit must not be installed where sulfuric acid and flammable or corrosive gases are generated, vented into, or stored. There is risk of fire, explosion, and physical injury or death.

Note:

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

Figure 6: Installing Near a Heat or Steam Source.



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Note:

- *Indoor units (IDUs) must not be placed in an environment where the IDUs will be exposed to harmful volatile organic compounds (VOCs) or in environments where there is improper air make up or supply or inadequate ventilation. If there are concerns about VOCs in the environment where the IDUs are installed, proper air make up or supply and/or adequate ventilation must be provided. Additionally, in buildings where IDUs will be exposed to VOCs, consider a third party factory-applied epoxy coating to the fan coils for each IDU where the entire coil is dipped, not sprayed.*
- *If the unit is installed near a body of water, the installation parts are at risk of corroding. Appropriate anti-corrosion methods must be taken for the unit and all installation parts.*

Installing in an Area Exposed to Unconditioned Air

In some installation applications, areas (floors, walls) in some rooms will be exposed to unconditioned air (room will be above or next to an unheated garage or storeroom). To countermeasure:

- Verify that carpet is or will be installed (carpet will increase the temperature by three degrees).
- Add insulation between the floor joists.
- Install radiant heat or another type of heating system to the floor.

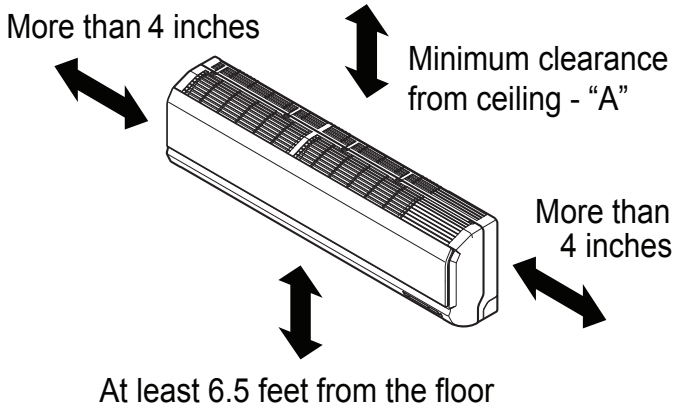
Required Clearances

The figure at right and table below list required clearance distances around a typical installed wall-mounted unit.

Table 7: Standard Wall Mount Indoor Unit Ceiling Clearances.

"A" Ceiling Clearance (inches)	Indoor Unit Model(s)
5	LMN079HVT, LMN159HVT, LSN090HSV5, LSN120HSV5
8	LSN180HSV5, LMN249HVT

Figure 7: Standard Wall Mount Indoor Unit Clearance Requirements.



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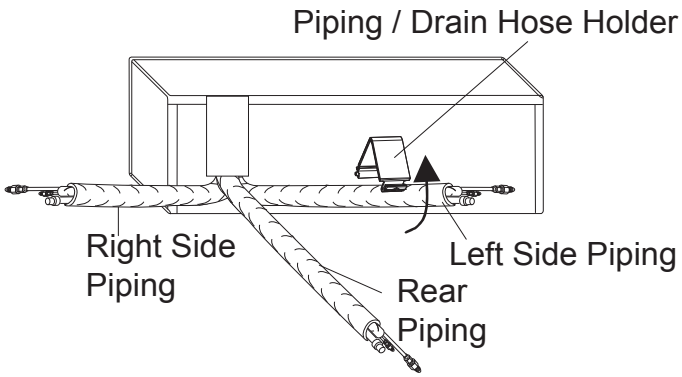
General Guidelines — HVT and HSV5 Wall-Mounted Indoor Units

Wall-mounted indoor units have several options on how the piping and wiring can be routed (see figure at right). Whichever way the piping and wiring are routed out of the indoor units, the mounting wall on which the indoor unit is installed must be strong and solid enough to protect it from vibration.

- Mount the installation plate on the wall using the Type “A” screws. If mounting the unit on concrete, consider using anchor bolts.
- Always mount the installation plate horizontally. Measure the wall and mark the center line using thread and a level.

Figure 8: Choice of Piping / Wiring Routes.



⚠WARNING

- *Mounting hardware must be securely installed to prevent the chassis falling from its installation location. There is risk of injury or property damage from falling equipment.*
- *When choosing a location for the wall mount plate, be sure to take into consideration routing of wiring for power outlets within the wall. Touching wiring can cause serious bodily injury or death.*
- *Installation work must be performed by trained personnel and in accordance with all local or other applicable codes. There is risk of injury to personnel from incorrect installation.*

Note:

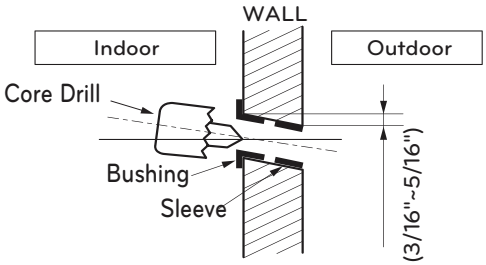
- *Ensure the unit is properly installed. Incorrectly installed units can result in degraded performance or an inoperative unit / system.*
- *Mounting hardware must be securely installed to prevent the chassis falling from its installation location. There is risk of property damage from falling equipment.*
- *Use a level indicator to ensure the installation plate and chassis are installed on a level plane.*
- *If the unit is installed near a body of water, certain components are at risk of being corroded. Appropriate anti-corrosion methods must be taken for the unit and all components.*

Drilling the Piping Hole in the Wall

Follow all piping clearance recommendations.

1. Using a 2-9/16 to 2-5/8 inch hole core drill bit (depending on indoor model type), drill a hole at either the right or left side of the wall mounting, pre-chosen following installation guidelines and application needs.
   - The slant of the hole must be 3/16” to 5/16” from level with the slant being upward on the indoor unit side and downward on the outdoor unit side.
2. Finish off the newly drilled hole as shown with bushing and sleeve covering to prevent damage to the insulation and piping.

Figure 9: Drilling Piping Hole.



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Mounting the Installation Plate to the Wall

⚠ WARNING

- *Mounting hardware must be securely installed to prevent the frame falling from its installation location. There is risk of personnel injury from falling equipment.*
- *When choosing a location for the wall mount plate, take into consideration routing of wiring for power outlets within the wall. Contacting wiring can cause serious bodily injury or death.*
- *Use caution when drilling holes through the walls for the purposes of piping connections. Power wiring can cause serious bodily injury or death.*
- *Installation work must be performed by trained personnel and in accordance with all local or other applicable codes. There is risk of injury to personnel from incorrect installation.*

Note:

- *Mounting hardware must be securely installed to prevent the frame falling from its installation location. There is risk of property damage from falling equipment.*
- *Select the location carefully. Unit must be anchored to a strong and solid wall to prevent unnecessary vibration, and to securely hold the installation place and the weight of the frame.*
- *Ensure the unit is properly installed. Incorrectly installed units can result in degraded performance or an inoperative unit/system.*
- *Use a level indicator to ensure the installation plate and chassis are installed on a level plane.*
- *If the unit is installed near a body of water, certain components are at risk of being corroded. Appropriate anti-corrosion methods must be taken for the unit and all components.*

Follow the procedure below and general best practices when mounting the indoor unit's installation plate to a wall.

1. The wall mounted indoor unit is shipped with the installation plate attached to its back. To remove, unscrew the one (1) screw that holds the installation plate to the back of the indoor unit. See the installation plate diagrams below.
2. Always mount the installation plate horizontally. Align the centerline using a leveling tool. Measure the wall and mark the centerline.
3. Attach the installation plate to the wall following the measurements and marks. Mount the installation plate on the wall using the factory-supplied Type "A" screws. If mounting the unit on a concrete wall, use field-supplied anchor bolts. Use a level to ensure the plate is level.
4. Observe all rear piping clearances when drilling into the wall.

Figure 10: General Wall Mount Indoor Unit Installation Plate—Side View (Example Only. Appearances Will Vary Depending on Model).

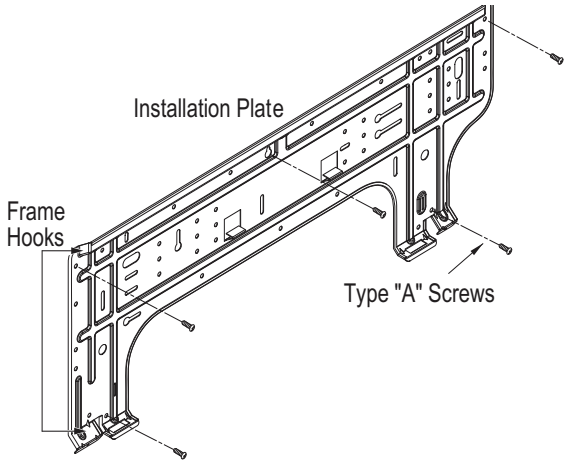


Figure 11: Installation Plate Attaching Screw Placement (Example Only. Appearances and Placement Will Vary Depending on Model).

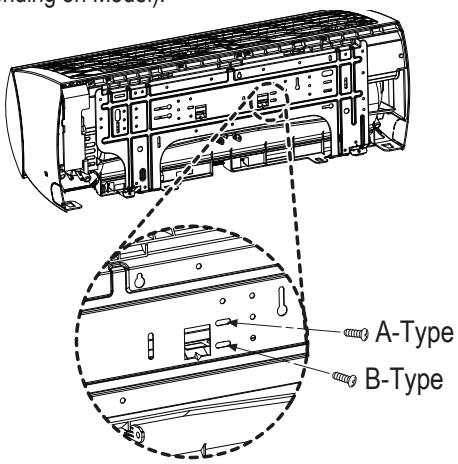
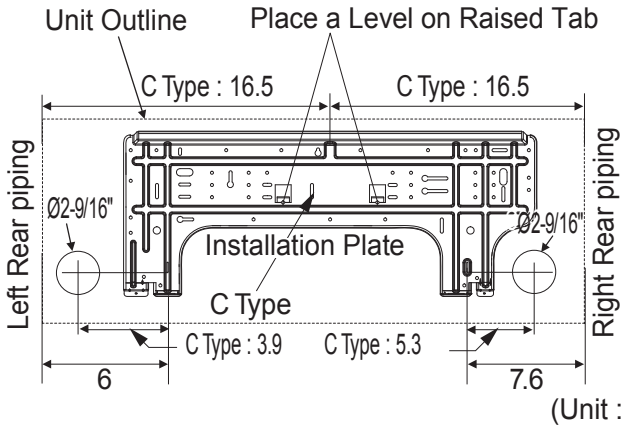
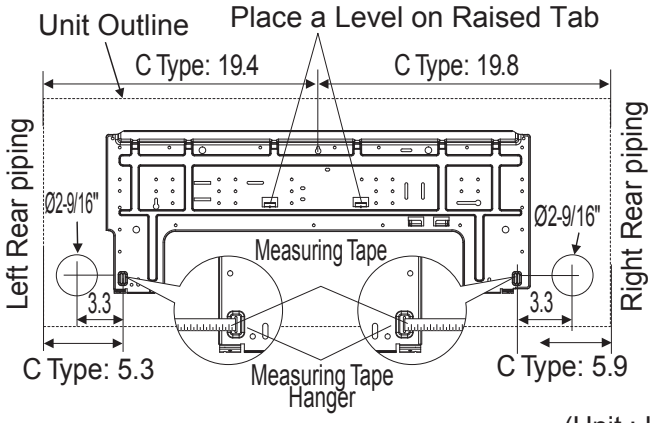


Figure 12: Installation Plate for LMN079HVT, LMN159HVT, and LSN090-120HSV5 Indoor Units.



(Unit : Inch)

Figure 13: Installation Plate for LSN180HSV5 and LMN249HVT Indoor Units.



(Unit : Inch)

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Removing the Indoor Unit Bottom Cover — HVT Wall-Mounted Indoor Units

To access the indoor unit piping port connections, terminal block, and to make the indoor unit installation procedure easier, it is recommended that the bottom cover be removed first.

1. Fully open the front panel.

2. At the bottom panel of the indoor unit, unsnap the latches that cover the screws. Number of screws on the panel will differ by indoor unit model.

3. Using a Phillips head screwdriver, remove the screws from the bottom panel of the indoor unit and set aside for re-installation.

4. Remove the bottom panel, being careful not to scratch the main horizontal vane. Set aside the bottom panel to re-install after all procedures are complete.

Figure 14: Latch over Screws on Indoor Unit Bottom Panel.

Figure 15: Remove Screws from Bottom Panel.

Figure 16: Remove Bottom Panel.

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Removing the Indoor Unit Bottom Cover — HSV5 Wall-Mounted Indoor Units

To access the indoor unit piping port connections, terminal block, and to make the indoor unit installation procedure easier, it is recommended that the bottom cover be removed first.

1. Unsnap the bottom cover at its top left and right sides (Location 1).

2. Unsnap each of the three (3) or four (4) small C-hooks located in the middle of the bottom cover (Location 2). Number of C-hooks present depends on model of indoor unit.

3. Lift the three (3) to four (4) hinges on the bottom cover up and out of the channels molded to the left, right, and middle of the indoor unit (Location 3). Number of hinges present depends on model of indoor unit.

4. Set aside the bottom cover to re-install after all procedures are complete.

Figure 17: Removing the HSV5 Bottom Cover.

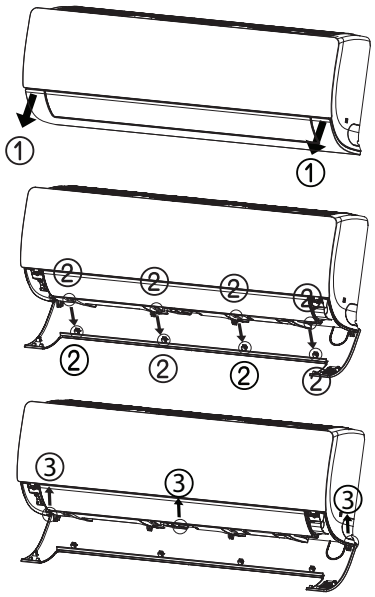


Figure 18: Removing the HSV5 Bottom Cover (Appearances Will Vary Depending on Indoor Unit Model).

Figure 20: Bottom Cover with Top and Middle Unsnapped, Front View (Appearances Will Vary Depending on Indoor Unit Model).

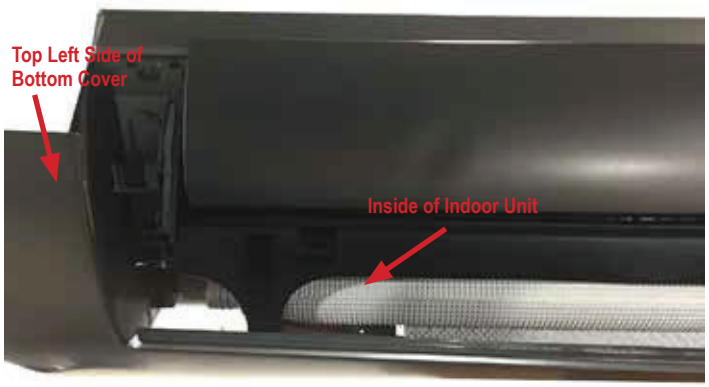
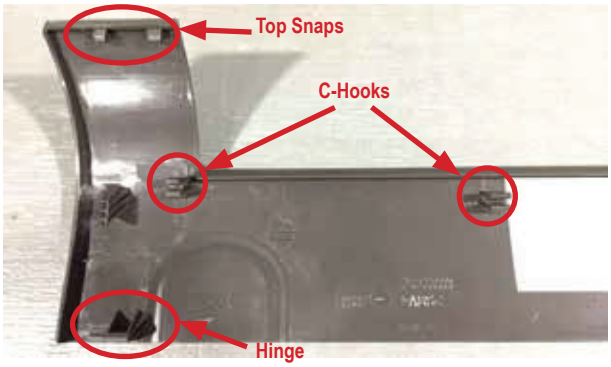


Figure 19: Back of Bottom Cover Completely Removed from Indoor Unit (Appearances Will Vary Depending on Indoor Unit Model).

Figure 21: Close Up of Bottom Cover Connections (Appearances Will Vary Depending on Indoor Unit Model).



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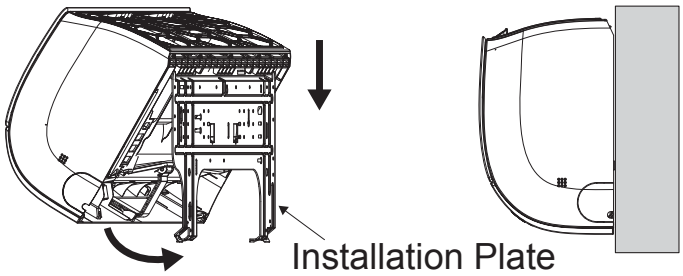
Mounting the Indoor Unit to the Installation Plate — HVT and HSV5 Wall-Mounted Indoor Units

1. Position the indoor unit onto the upper portion of the installation plate.

2. Engage the hooks at the top of the indoor unit with the upper edge of the installation plate (number of hooks depends on model type).

3. Ensure the hooks are properly seated on the installation plate by shaking the indoor unit left and right.

Figure 22: Attaching the Indoor Unit to the Installation Plate.



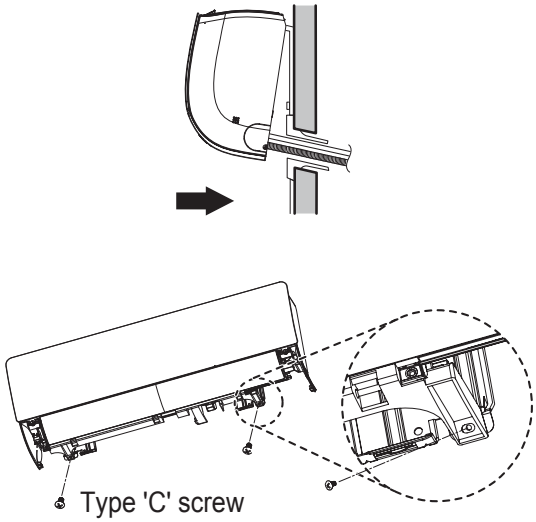
Note:

Permanently secure the indoor unit to the wall ONLY AFTER all other tasks such as Refrigerant Piping Connections, Drain Piping Connections, Electrical Connections, and Final Installation Procedures are complete. See next page for steps on how to prepare for piping and electrical connections.

4. Carefully guide the refrigerant piping and drain piping through the access hole.

5. Push the bottom of indoor unit towards the installation plate to anchor to the wall.
   - Press the lower left and right sides of the unit against the installation plate until the hooks engage into their slots.
   - A clicking sound will be heard as the bottom of the indoor unit attaches to the installation plate successfully.
   - Pay attention to the positioning of the piping through the wall.

Figure 23: Finishing Indoor Unit Installation to the Wall Plate (Example).



6. Finish the installation by completely securing the indoor unit to the installation plate using the factory-supplied screws (screw placement will vary depending on indoor unit model).

⚠WARNING

The indoor unit can fall from the wall if it is not properly installed and secured to the installation plate. Falling indoor units can cause bodily injury or death.

Note:

- *To avoid a gap between the indoor unit and the wall, ensure the screws are correctly and fully secured to the installation plate.*
- *To prevent condensate from forming due to an inflow of outdoor air, before indoor unit installation is finished, completely seal the piping access hole in the wall.*

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Preparing for Piping / Electrical Connections

1. To prepare the indoor unit for piping and electrical installation, disengage bottom on indoor unit from installation plate by reversing Steps 6, 5, and 4 from the previous procedure, if those procedures have been performed.

2. Unsnap the piping / drain hose holder (L-bracket) out from the indoor unit frame. Prop it open between the indoor unit frame and installation plate to separate the bottom of the indoor unit from the wall. This will allow for more working space.

Figure 24: L-bracket Closed (Appearances Will Vary Depending on Indoor Unit Model).

Figure 25: Mounting the Indoor Unit on Installation Plate.

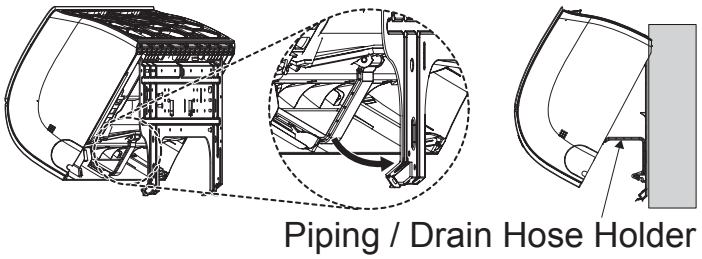


Figure 26: L-bracket Open (Appearances Will Vary Depending on Indoor Unit Model).

Note:

- *Go to the Electrical Installation section of this manual for information on electrical wiring to the indoor unit.*
- *After all Refrigerant Piping and Electrical Connection procedures are complete, snap the L-bracket closed, and secure the indoor unit to the installation plate as detailed in Steps 5 and 6 in "Mounting the Indoor Unit to the Installation Plate".*

Positioning the Indoor Unit Piping / Electrical Connections

Wall-mounted indoor units have several options on how the piping and wiring can be routed (see figure at right). Installation is pre-chosen following installation guidelines and application needs.

1. Unsnap the piping / drain hose holder (L-bracket) out from the indoor unit as described above.

2. Remove the piping port cover.

3. Position the piping by unfolding and bending the piping slowly downward first as shown, then to the left or right as shown.

4. Secure piping with the piping holder if appropriate.

Figure 27: Choice of Piping / Wiring Routes.

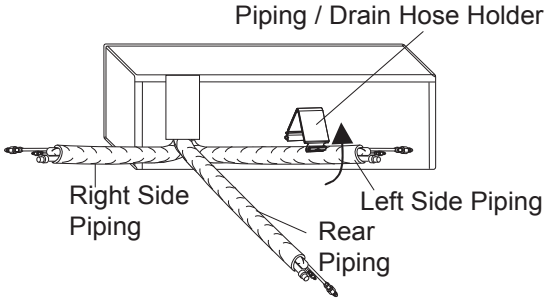
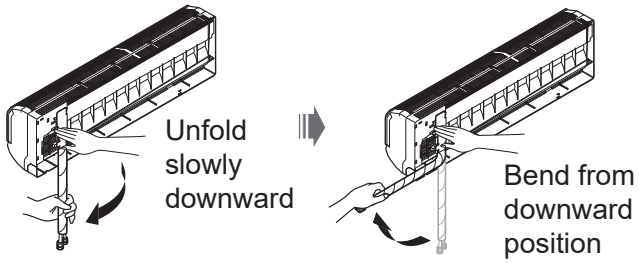


Figure 28: Bending Piping at Rear of Indoor Unit.



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Note:

- ⃠ *Do not bend the piping directly backwards or to the left or right sides without bending it downward first; this will damage the indoor unit piping.*
- ⃠ *Do not forcibly press the refrigerant piping onto the bottom frame or the front grille; this will damage the indoor unit piping and / or indoor unit frame.*
- *Ensure the piping is straight.* ⃠ *Do not kink the piping; this will damage the indoor unit and piping.*

Figure 29: Improper Piping Bending.

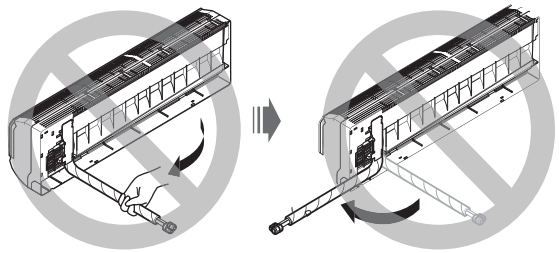
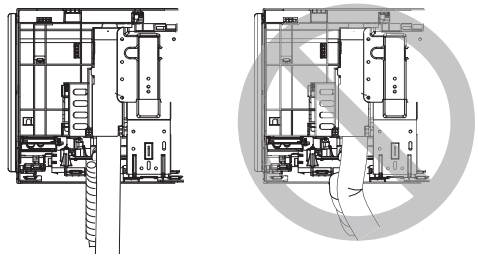


Figure 30: Keep Piping Straight; Avoid Kinks.



Piping Installation When Piping is on the Left Side

Note:

- *See the Electrical System Installation section for information on how to connect the communication / connection (power) cable from the outdoor unit.*
- *For left-side piping, it is recommended that the communication / power connections are complete before starting the piping connections.*

1. Insert drain hose on left (feature will differ depending on model of indoor unit).
2. Align the center of the refrigerant piping and corresponding connection as shown on the next page.
3. Place a couple of drops of refrigerant oil on outside of the flare before assembling. ⃠ Do not add any contaminants. Tighten the flare nut initially by hand.
4. Finish tightening the flare nut with a torque wrench until the wrench clicks. Follow torque guidelines in the“Tightening the Flare Nuts” procedure later in this section.

Note:

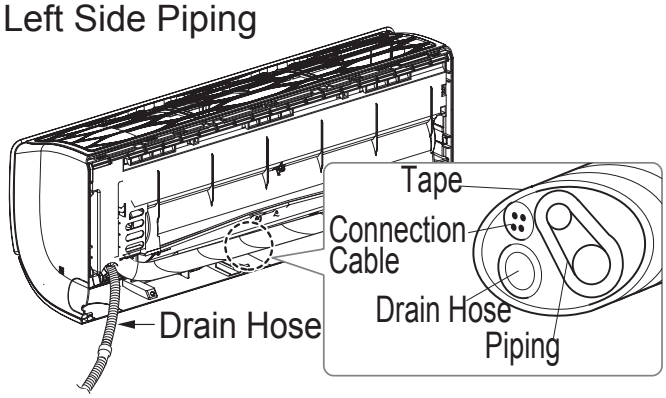
When tightening the flare nut with a torque wrench, ensure the direction for tightening follows the arrow on the wrench.

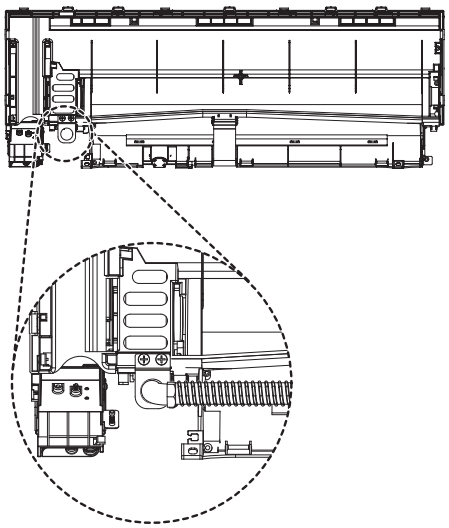
5. Bundle the refrigerant piping, drain hose, and communication / connection (power) cable together. Ensure that the drain hose is located at the bottom of the bundle.
   - If using a conduit for the power wiring / communications cable, see the next page.

Note:

Positioning the drain hose at the top of the bundle can cause condensate to overflow from the drain pan in the inside of the indoor unit.

Figure 31: Piping Installation When Piping is on the Left Side.





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Piping Installation When Piping is on the Right Side

Note:

See the Electrical System Installation section for information on how to connect the communication / connection (power) wiring from the outdoor unit.

1. Align the center of the refrigerant piping and corresponding connection as shown.
2. Place a couple of drops of refrigerant oil on outside of the flare before assembling. ⃠ Do not add any contaminants. Tighten the flare nut initially by hand.
3. Finish tightening the flare nut with a torque wrench until the wrench clicks. Follow torque guidelines in the"Tightening the Flare Nuts" procedure later in this section.

Note:

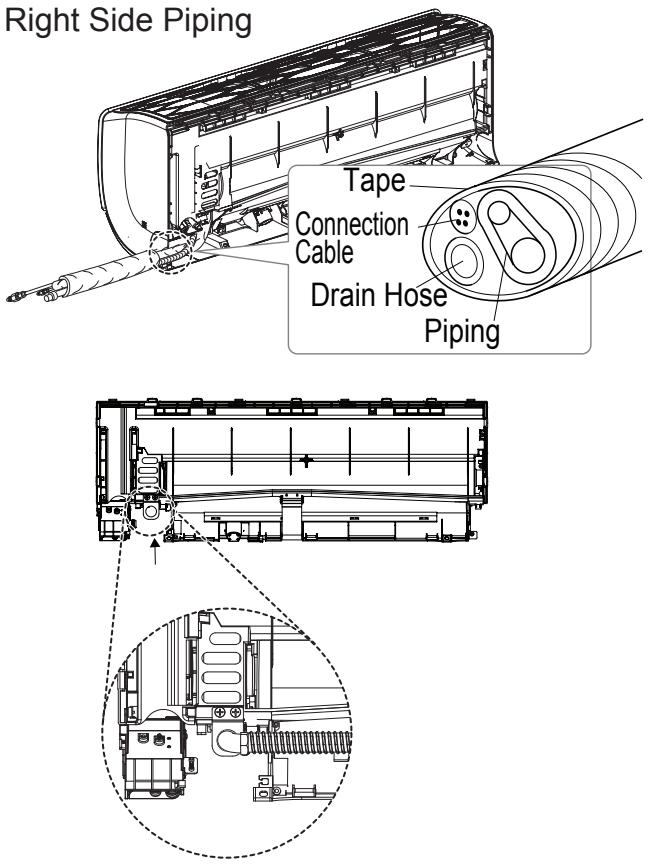
When tightening the flare nut with a torque wrench, ensure the direction for tightening follows the arrow on the wrench.

4. Bundle the refrigerant piping, drain hose, and communication / connection (power) cable together. Ensure that the drain hose is located at the bottom of the bundle.
   - If using a conduit for the power wiring / communications cable, see below.

Note:

Positioning the drain hose at the top of the bundle can cause condensate to overflow from the drain pan in the inside of the indoor unit.

Figure 32: Piping Installation When Piping is on the Right Side.



Using a Conduit for Indoor Unit Wiring / Cable Installation

Note:

Use a liquidtight 3/4 inch elbow connector for flexible conduit.

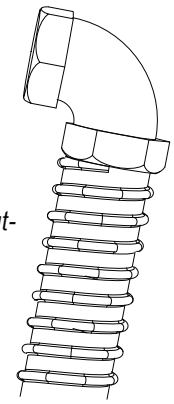
1. Prop indoor unit away from wall bracket.
2. Guide communication / connection (power) cable insulation into the conduit.

Note:

- *Check local, state, and federal codes when choosing a conduit size.*
- *For systems with wiring greater than 130 feet, see the "Communication / Connection (Power) Cable Specifications from Outdoor Unit to Indoor Unit" in the Electrical System Installation section for information.*

3. Attach conduit using the liquidtight 3/4 inch elbow connector.
4. Reassemble the indoor unit properly onto the wall bracket.
5. If conduit is not used, see pages in this section for refrigerant piping, condensate drain, power wiring / communication cable bundling information.
6. To protect the piping, condensate drain, and conduit from the elements, add a lineset cover from the indoor access hole to the outdoor unit.

Figure 33: Liquidtight 3/4 Inch Elbow Connector Attached to Flexible Conduit.



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Bundling

If a conduit or piping set cover is not used on the connection from the outdoor unit to the interior, bundle both separately insulated refrigerant pipes, the drain hose, and outdoor unit to indoor unit communication / connection (power) cable together with wide vinyl tape.

1. Both piping must be fully and separately encased in insulation material: Overlap the field installation piping insulation material and the indoor unit piping insulation material.
2. Bind together the two pipes, using vinyl tape. Make sure there are no gaps during the binding.
3. Be sure the cutting line is placed upward.
4. Wrap the rear piping section with narrow vinyl tape.
5. Continue to wrap the indoor unit pipe as connected to the outdoor connection pipe.
6. Using a wider vinyl tape, bundle the piping and drain hose together.
   - Tape must be sufficient to cover the piping in order to fit into the rear piping housing area at the back of the indoor unit.

Note:

- *Always include insulation on all refrigerant and drain piping to ensure condensate does not form and cause damage to walls, floors, etc.*
- *For systems with wiring greater than 130 feet, see the "Communication / Connection (Power) Cable Specifications from Outdoor Unit to Indoor Unit" in the Electrical System Installation section for information.*

Figure 34: Bundling the Connection Components (From Outdoor Unit to Indoor Unit).

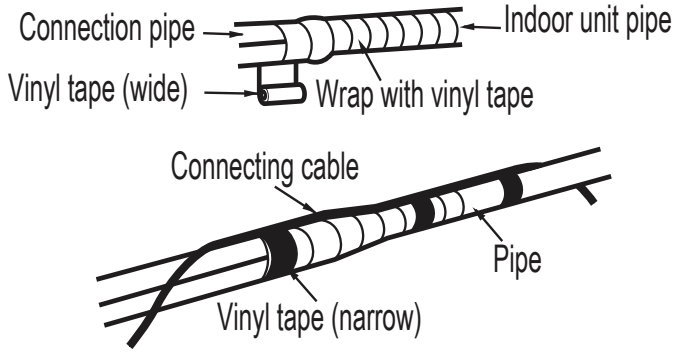
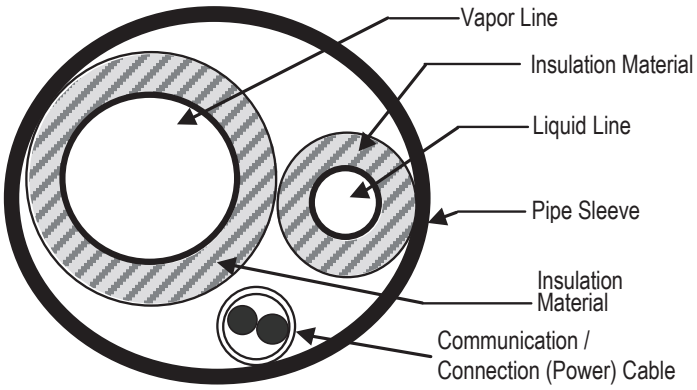


Figure 35: Cutaway of Proper Pipe and Cable Bundling.



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Flaring Procedure

One of the main causes of refrigerant leaks is a defective connection. For LG HVAC systems, the installer needs to know how perform flared connections successfully.

Note:

• During installation, it is imperative to keep the piping system free of contaminants and debris such as copper burrs, slag, or carbon dust.

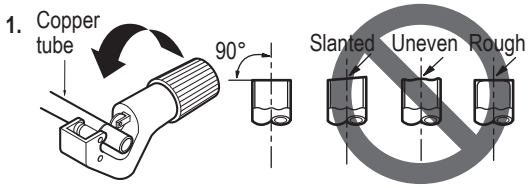
• ⃠ Do not use kinked pipe caused by excessive bending in one specific area on its length.

Flaring Procedure

Note:

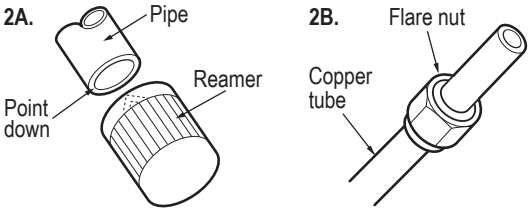
When selecting flare fittings, always use a 45° fitting rated for use with high pressure refrigerant R410A. Selected fittings must also comply with local, state, or federal standards.

1. Cut the pipe to length.
   - Measure the distance between the indoor unit and the outdoor unit.
   - Cut the pipes a little longer than measured distance.

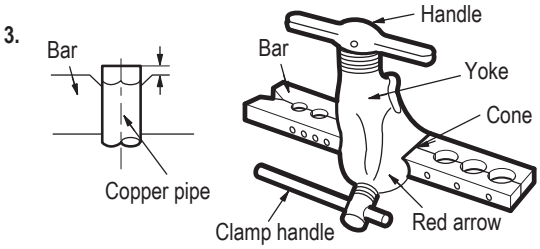


2A. Remove the burrs.
   - Completely remove all burrs from pipe ends.
   - When removing burrs, point the end of the copper pipe down to avoid introducing foreign materials in the pipe.

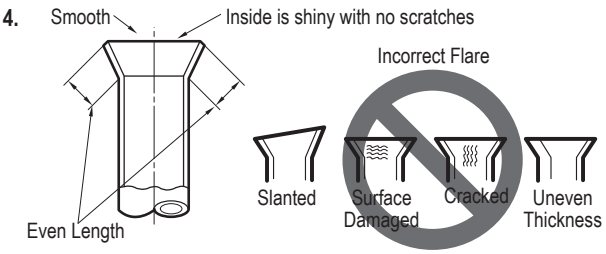
2B. Slide the flare nut onto the copper tube.



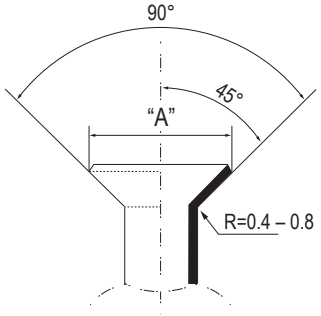
3. Flaring the pipe end.
   - Use the proper size flaring tool to finish flared connections as shown.
   - ALWAYS create a 45° flare when working with R410A.



4. Carefully inspect the flared pipe end.
   - Compare the geometry with the figure to the right
   - If the flare is defective, cut it off and re-do procedure.
   - If flare looks good, blow the pipe clean with dry nitrogen.



Dimensions of the Flare.



Flared Connection Dimensions / Tightening Torque.

Pipe Size (in. O.D.)	Outside Diameter (mm)	"A" Dimension (mm [in.])
1/4	6.35	~ 9.1 (11/32 - 23/64)
3/8	9.52	~ 13.2 (1/2 - 33/64)
1/2	12.7	~ 16.6 (41/64 - 21/32)
5/8	15.88	~ 19.7 (49/64 - 25/32)
3/4	19.05	-

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Tightening the Flare Nuts

Tightening Torque for Flare Nuts.

Pipe Size (in. O.D.)	Outside Diameter (mm)	Tightening Torque (ft-lbs.)
1/4	6.35	13.0 - 18.0
3/8	9.52	24.6 - 30.4
1/2	12.7	39.8 - 47.7
5/8	15.88	45.4 - 59.3
3/4	19.05	71.5 - 87.5

1. When connecting the flare nuts, coat the flare (outside only) with polyvinyl ether (PVE) refrigeration oil only.

Note:

⃠ *Do not use polyolyester (POE) or any other type of mineral oil as a thread lubricant. These lubricants are not compatible with the PVE oil used in this system and create oil sludge leading to equipment damage and system malfunction.*

⃠ *Do not add any contaminants inside the refrigerant piping.*

2. Initially hand tighten the flare nuts using three (3) or four (4) turns.
3. To finish tightening the flare nuts, use both a torque wrench and a backup wrench.
4. After all the piping has been connected and the caps have been tightened, check for refrigerant gas leaks.

Loosening the Flare Nuts

Always use two (2) wrenches to loosen the flare nuts.

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Multi F with LGRED Outdoor Unit to Indoor Unit Piping Connections

Note:

Avoid Pipe Damage

- *When routing field-provided piping, avoid damaging the outdoor unit from excessive vibration.*
- *Properly insulate the liquid and gas lines separately up to the point of connection at the unit frame.*
- *See table below for Multi F with LGRED outdoor unit connection types.*

⃠ *Correctly route the piping so it does not make contact with mounting bolts. Allow room for field installation.*

Table 8: Multi F with LGRED Outdoor Unit Piping Connections.

Outdoor Unit Piping Connections	LMU180HHV	LMU240HHV	LMU300HHV
Liquid Line Connection (in., OD) x Qty.	Ø1/4 x 2	Ø1/4 x 3	Ø1/4 x 4
Vapor Line Connection (in., OD) x Qty.	Ø3/8 x 2	Ø3/8 x 3	Ø3/8 x 4

Figure 36: Multi F with LGRED Outdoor Unit Refrigerant Pipe Connections (LMU360HHV shown as example).

Multi F with LGRED Outdoor Unit
(18, 24, 30kBtu/h)

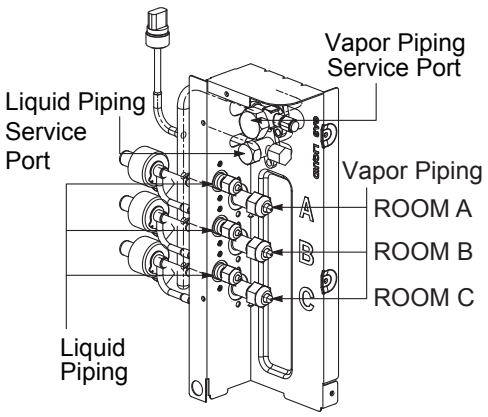

Table 9: Indoor Unit Pipe Sizes.

Indoor Unit Capacity	Vapor Line Piping Size (in., OD)	Liquid Line Piping Size (in., OD)
7,000 Btu/h	Ø3/8	Ø1/4
9,000 Btu/h		
12,000 Btu/h		
15,000 Btu/h		
18,000 Btu/h	Ø1/2	
24,000 Btu/h		

Table 11: Indoor Unit Piping Connections.

Indoor Unit Capacity	Vapor Line Conn. (in., OD)	Liquid Line Conn. (in., OD)
7,000 Btu/h	Ø3/8	Ø1/4
9,000 Btu/h		
12,000 Btu/h		
15,000 Btu/h		
18,000 Btu/h Wall-Mounted and Vertical Air Handling Units	Ø5/8	Ø3/8
18,000 Btu/h Low Static Duct and Four-Way Cassette Units	Ø1/2	Ø1/4
24,000 Btu/h	Ø1/2	Ø1/4

Note:

Connection sockets (included as a factory-supplied accessory with the indoor units) will need to be used when piping the indoor units to the outdoor unit. See tables above and below for indoor unit piping connection and connection socket dimensions. See the follow page for the connection socket installation procedure.

Table 10: Connection Socket Dimensions.

Indoor Unit Capacity	Vapor (in., OD)		Liquid (in., OD)	
	A	B	A	B
18,000 Btu/h Wall-Mounted and Vertical Air Handling Units	Ø3/8 → Ø1/2, Ø1/2 → Ø5/8		Ø1/4 → Ø3/8	
18,000 Btu/h Low Static Duct and Four-Way Cassette Units	Ø3/8 → Ø1/2		N/A	
24,000 Btu/h	Ø3/8 → Ø1/2		N/A	

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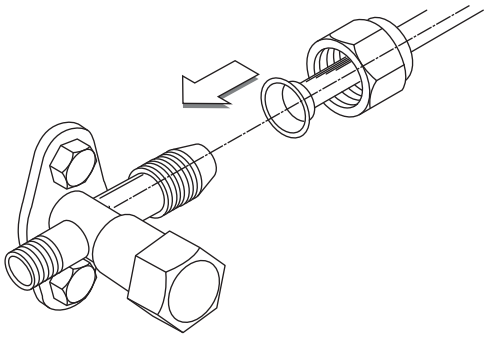
Installing Field Piping to the Outdoor Unit Piping Connections

1. Verify the outdoor unit service ports are closed.
2. Remove the caps on the outdoor unit piping connections.
3. Connect the gas piping first to ROOM A, then to ROOM B, then to ROOM C, in that order. Number of connections will differ depending on outdoor unit.
4. Tighten each gas piping connection individually following the “Tightening the Flare Nuts” procedure earlier in this section.
5. Connect the liquid piping first to ROOM A, then to ROOM B, then to ROOM C, in that order. Number of connections will differ depending on outdoor unit.
6. Tighten each liquid piping connection individually following the “Tightening the Flare Nuts” procedure earlier in this section.

Figure 38: Close Up of the Field Piping to the Outdoor Unit Piping Connection.



Using the Connection Socket

Some indoor units require the use of a connection socket when piping the indoor units to the outdoor unit. (See previous page for information.) The connection sockets are included as a factory-supplied accessory with the indoor units. To install:

1. Align the center of the piping sections as seen in the diagrams at right and below.
2. Follow the “Tightening the Flare Nuts”procedure earlier in this section.
3. When all piping installation has been completed, perform the triple leak / pressure and evacuation tests (see the Final Installation Procedures Section in the Multi F / Multi F MAX Outdoor Unit Installation Manual), verify that the system does not have any leaks, and then fully insulate all joints / connections.

Figure 37: Connection Socket Installation.

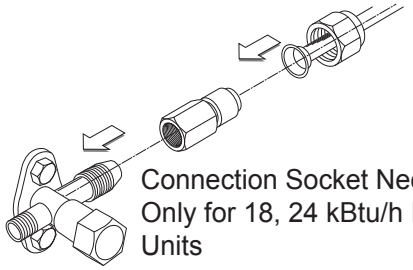


Figure 39: Connection Socket Diagram, External View.

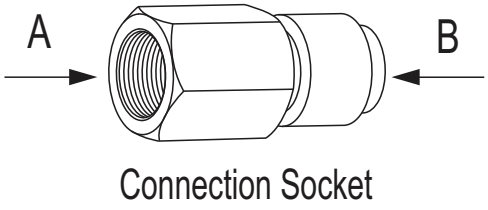
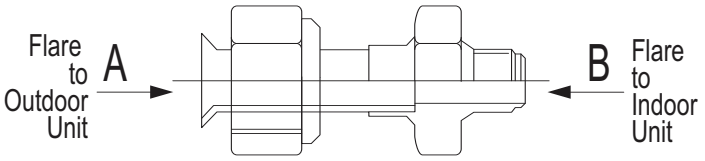


Figure 40: Connection Socket Diagram, Internal View.



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Multi F MAX with LGRED Outdoor Unit System Piping Connections

Note:

Avoid Pipe Damage

- *When routing field-provided piping, avoid damaging the outdoor unit from excessive vibration.*
- *Properly insulate the liquid and gas lines separately up to the point of connection at the unit frame.*
- *See table below for Multi F MAX outdoor unit connection types.*

⃠ *Correctly route the piping so it does not make contact with mounting bolts. Allow room for field installation.*

Figure 41: Multi F MAX with LGRED Outdoor Unit Refrigerant Pipe Connections.

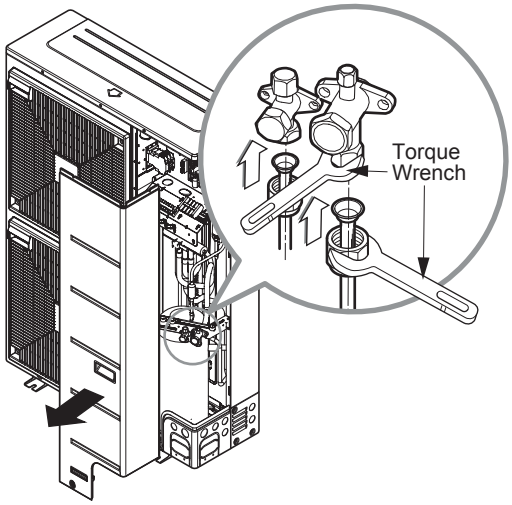


Table 12: Multi F MAX with LGRED Outdoor Unit Piping Connections.

Outdoor Unit Piping Connections	LMU360HHV, LMU420HHV
Liquid Line Connection (in., OD) x Qty.	Ø3/8 x 1
Vapor Line Connection (in., OD) x Qty.	Ø3/4 x 1

Branch Distribution to Indoor Unit Piping Connections

- Install indoor unit liquid and vapor refrigerant pipes (and connection wiring) to the appropriate branch distribution ports.
- Clearly note on the indoor unit's refrigerant piping (liquid, vapor) which branch distribution port it is connected to (A, B, C, D).

Table 13: Branch Distribution Unit Piping Connections.

Branch Distribution Unit	Refrigerant Connections Pipe Size (in.)		Connectable Indoor Unit Capacity (Btu/h)
	Liquid	Vapor	
PMBD3620	Ø1/4 x 2	Ø3/8 x 2	7,000, 9,000, 12,000, 15,000, 18,000, 24,000
PMBD3630	Ø1/4 x 3	Ø3/8 x 3	7,000, 9,000, 12,000, 15,000, 18,000, 24,000
PMBD3640	Ø1/4 x 4	Ø3/8 x 4	7,000, 9,000, 12,000, 15,000, 18,000, 24,000
PMBD3641	Ø1/4 x 4	Ø3/8 x 3	7,000, 9,000, 12,000, 15,000, 18,000, 24,000 (A, B, C)
		Ø1/2 x 1	36,000 (D)

Figure 42: Branch Distribution Ports to Indoor Units -- Side View.

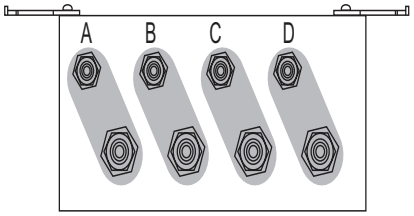
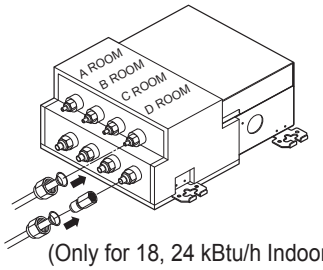


Figure 43: Branch Distribution Piping Connections.

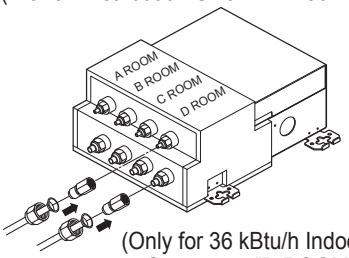
Multi F MAX with LGRED Outdoor Units (36, 42 kBtu/h)

(Branch Distribution Unit: PMBD3640)



(Only for 18, 24 kBtu/h Indoor Units)

(Branch Distribution Unit: PMBD3641)



(Only for 36 kBtu/h Indoor Units to Connect to "D ROOM")

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Table 14: Indoor Unit Pipe Sizes.

Indoor Unit Capacity	Vapor Line Piping Size (in., OD)	Liquid Line Piping Size (in., OD)
7,000 Btu/h	Ø3/8	Ø1/4
9,000 Btu/h		
12,000 Btu/h		
15,000 Btu/h		
18,000 Btu/h	Ø1/2	
24,000 Btu/h		

Table 15: Indoor Unit Piping Connections.

Indoor Unit Capacity	Vapor Line Conn. (in., OD)	Liquid Line Conn. (in., OD)
7,000 Btu/h	Ø3/8	Ø1/4
9,000 Btu/h		
12,000 Btu/h		
15,000 Btu/h		
18,000 Btu/h Wall-Mounted and Vertical Air Handling Units	Ø5/8	Ø3/8
18,000 Btu/h Low Static Duct and Four-Way Cassette Units	Ø1/2	Ø1/4
24,000 Btu/h	Ø1/2	Ø1/4

Note:

Connection sockets (included as a factory-supplied accessory with the indoor units) will need to be used when piping the indoor units to the branch distribution unit. The connection sockets for 36k indoor units are factory supplied with the branch distribution units. See tables above and below for indoor unit piping connection and connection socket dimensions. See below and the follow page for the connection socket installation procedure.

Table 16: Connection Socket Dimensions.

Indoor Unit Capacity	Vapor (in., OD)		Liquid (in., OD)	
	A	B	A	B
18,000 Btu/h Wall-Mounted and Vertical Air Handling Units	Ø3/8 → Ø1/2, Ø1/2 → Ø5/8		Ø1/4 → Ø3/8	
18,000 Btu/h Low Static Duct and Four-Way Cassette Units	Ø3/8 → Ø1/2		N/A	
24,000 Btu/h	Ø3/8 → Ø1/2		N/A	

Installing Field Piping to the Branch Distribution Unit Piping Connections

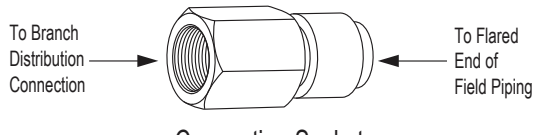
1. Remove any caps, etc., that will be on the branch distribution unit.
2. Tighten each piping connection individually following the “Tightening the Flare Nuts” procedure later in this section.
3. When all piping installation has been completed, perform the triple leak / pressure and evacuation tests (see the Final Installation Procedures Section in the Multi F / Multi F MAX Outdoor Unit Installation Manual), verify that the system does not have any leaks, and then fully insulate all joints / connections.

Using the Connection Socket

Some indoor units require the use of a connection socket when piping the indoor units to the branch distribution unit. (See previous page and below for information.) The connection sockets are included as a factory-supplied accessory with the indoor units, or in the case of the 36k indoor unit, it is factory supplied with the branch distribution units. To install:

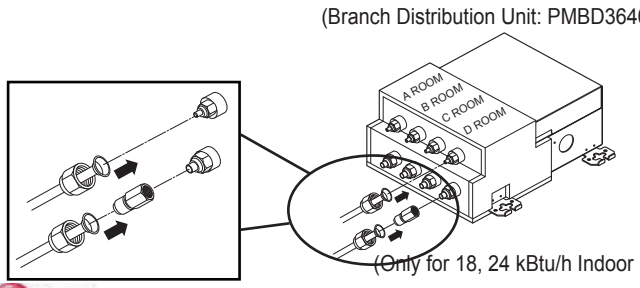
1. Remove any caps, etc., that will be on the branch distribution unit.
2. Align the center of the piping sections as seen in the diagram at right.
3. Tighten each piping connection individually following the “Tightening the Flare Nuts” procedure earlier in this section.
4. When all piping installation has been completed, perform the triple leak / pressure and evacuation tests (see the Final Installation Procedures Section in the Multi F / Multi F MAX Outdoor Unit Installation Manual), verify that the system does not have any leaks, and then fully insulate all joints / connections.

Figure 45: Connection Socket Diagram, External View.



Connection Socket

Figure 44: Close Up of Branch Distribution to Indoor Unit Piping Connections.



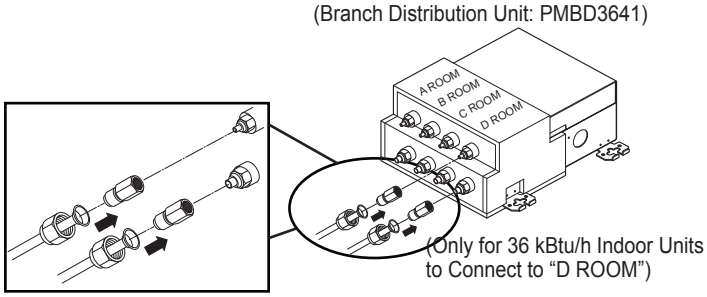


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Figure 46: Socket Connection.

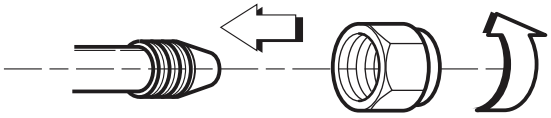
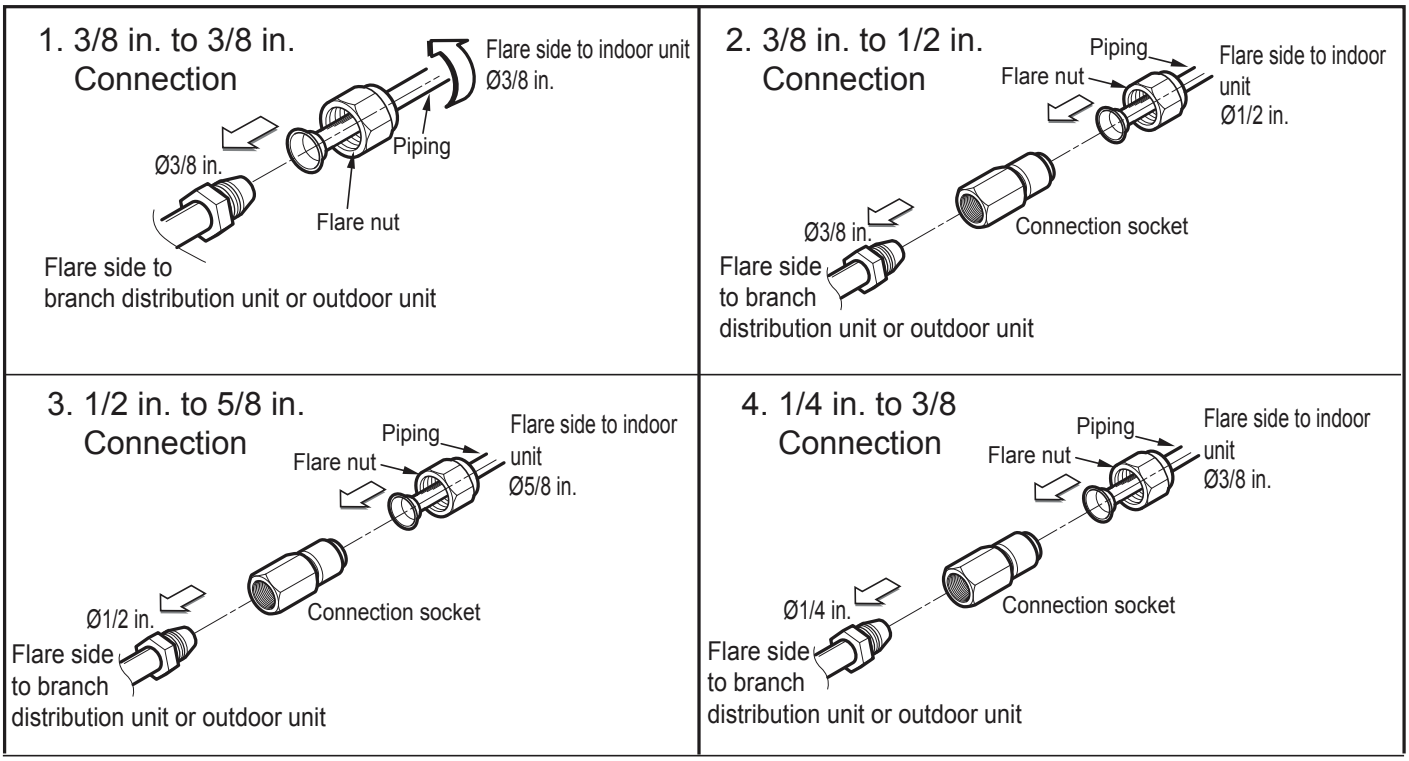


Figure 47: Possible Outdoor Unit or Branch Distribution Unit to Indoor Unit Connections.



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Indoor Unit Condensate Drain Hose Installation

Note:

Refer to the diagrams below and follow proper installation and the position of the drain hose along the refrigerant piping installation path to avoid leaks. After the drain hose is set in place, always follow with leak / pressure testing and deep evacuation procedures of the refrigerant piping to be sure all refrigerant piping is properly installed. Re-check and retest as necessary.

- Wall-mounted indoor units have a factory-provided flexible pipe (27/32" O.D./ 5/8" I.D.) to drain condensate water. The flexible pipe connects to field-provided drain pipe. Use materials that comply with local codes for drain pipe and insulation.
- Remove the drain plug on left or right side depending on the piping installation. Insert the drain hose on the left side when left side piping is used; install the drain hose on the right side when right side piping is used.
- Drain hose is routed from the indoor unit through the structure (wall) to the outdoor. It must slope at an angle where it is higher at the indoor unit and lower toward the outdoor area, thereby letting gravity push any condensation down and out.
- The drain hose might need to be extended so that condensate can be properly routed away. Connect the flexible drain pipe with a round clamp. If the flexible drain pipe is not installed properly, water will leak from the connection.
- Install the flexible drain pipe as straight as possible; sharp angles will cause the pipe to deteriorate and will crack over time.
- Insert the drain hose >2 inches so it won't pull out of the field-supplied drain pipe.
- ⃠ Avoid piping the drain hose as shown in the diagrams in the figure on the next page. These methods are incorrect and can cause leaks at the indoor unit site.

Figure 48: Flexible Drain Hose Connection.

Clamp the Flexible Drain Hose Connection

Figure 49: Correct Slope Angle for Drain Hose.

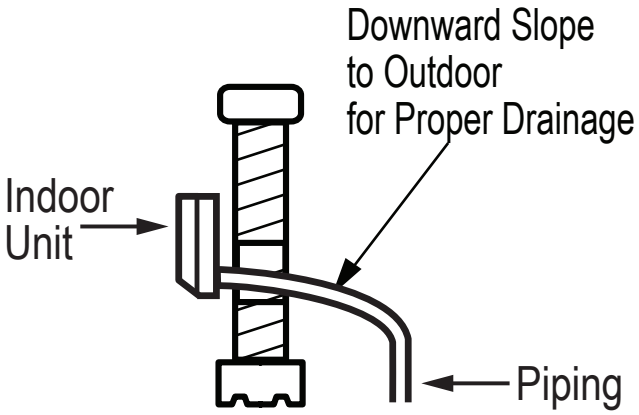

Figure 50: HVT and HSV5 Outdoor Unit Drain Hose Extension.

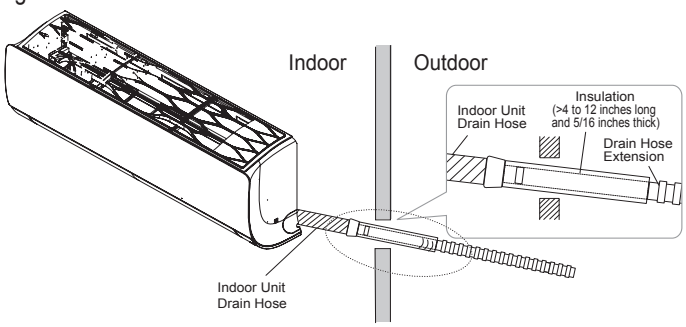

Figure 51: Inserting the Drain Hose >2 inches Into the Field-Supplied Drain Pipe.

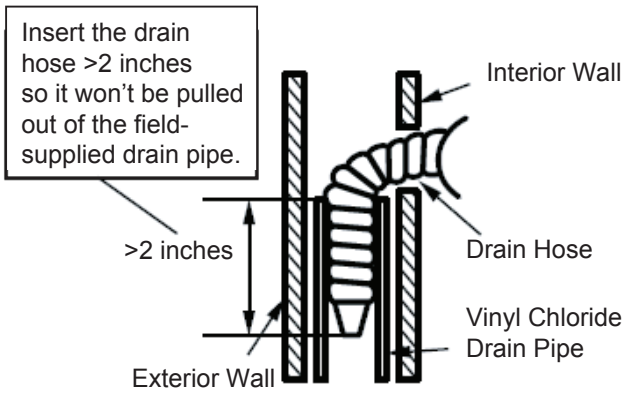

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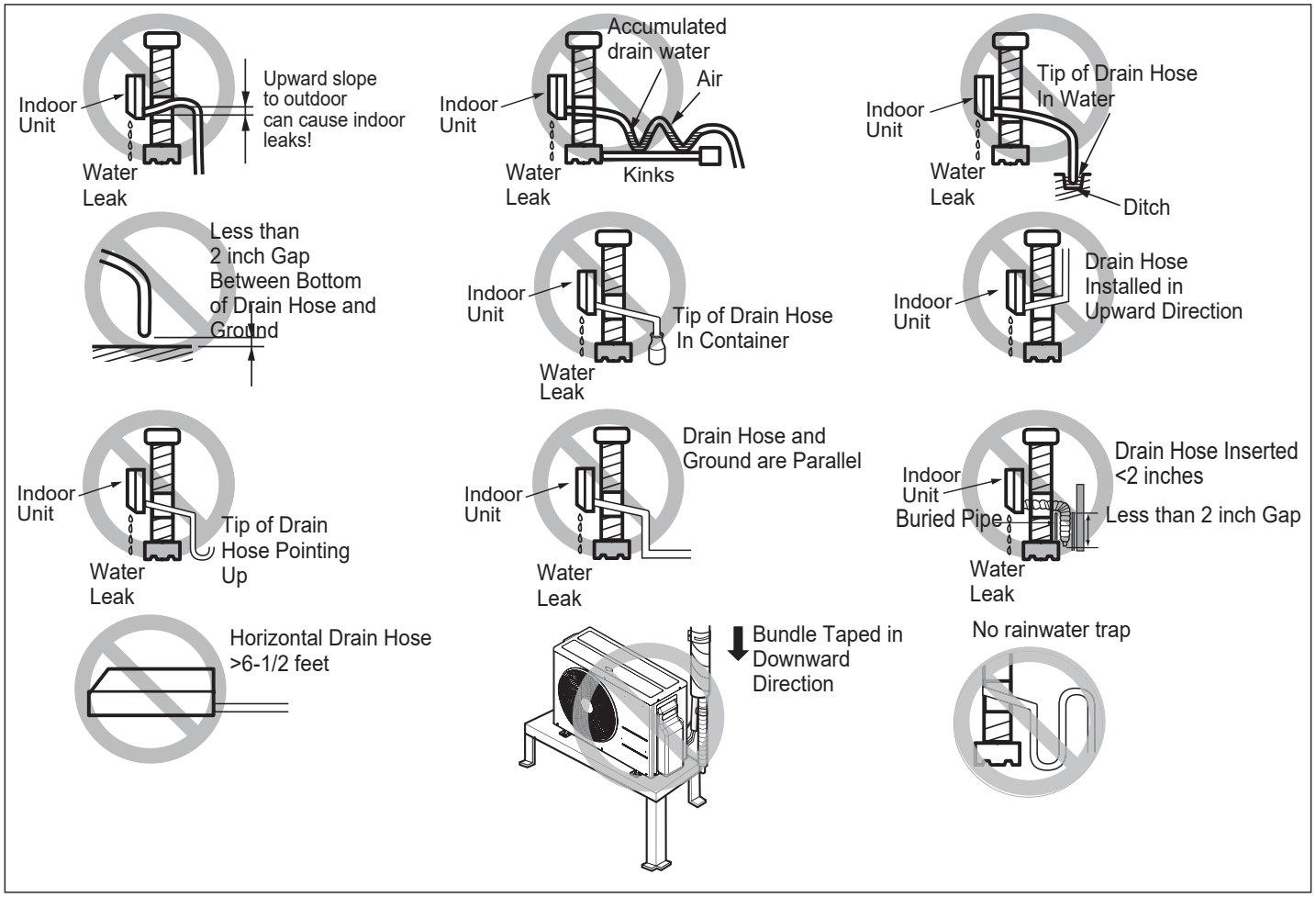
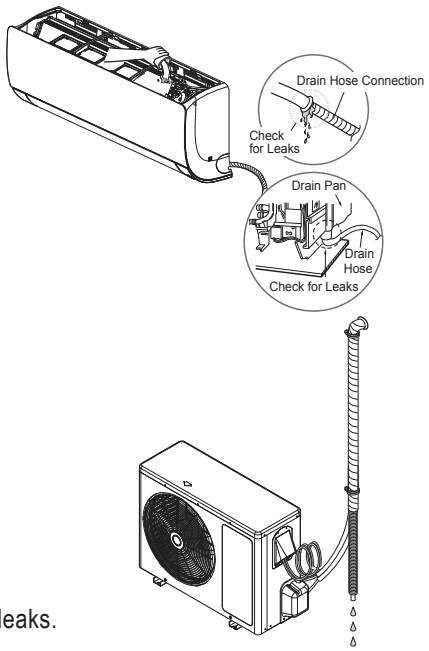
Figure 52: Incorrect Slope Angles for the Drain Hose.



Drain Hose Insulation

1. The drain hose and extension must be properly insulated to ensure condensation will not damage walls, floors, etc. Foamed polyethylene or equivalent of at least 5/16 inches thick is required.
2. Overlap the insulation at the connection of the field-installed piping and the indoor unit piping. Tape together so that no gaps exist.
3. Secure insulation to the rear piping housing section with vinyl tape.
4. Bundle the piping and drain hose with tape where they meet at the back of the indoor unit frame. Position the drain hose at the bottom of the bundle (positioning the drain hose at the top of the bundle will cause the drain pan to overflow inside the indoor unit).

Figure 53: Checking for Leaks at the Indoor Unit. Example Only; Systems Will Vary.



Checking the Indoor Unit Drain Hose for Leaks

1. Pour a glass of water on the evaporator.
2. Verify that the water flows appropriately through and out of the drain hose without any leaks.

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Refrigerant Piping System Insulation

All refrigerant piping from the outdoor unit to the indoor units / branch distribution units must be insulated correctly for safety and usage. Refrigerant piping, Y-branch connections, field-provided isolation ball valves (if present), service valves, and elbows must be properly and completely insulated using closed cell pipe insulation (up to the indoor unit piping connections). To prevent heat loss / heat gain through the refrigerant piping, all refrigerant piping including liquid lines and vapor lines must be insulated separately. Insulation must be a minimum 1/2 inches thick, and thickness will need to be increased based on ambient conditions and local codes. Table on next page lists minimum wall thickness requirements for Ethylene Propylene Diene Methylene (EPDM) insulation.

Inside the outdoor unit, maximum pipe temperature is 248°F and minimum pipe temperature is -40°F. For field insulation of refrigerant piping between outdoor units and indoor units, consider the following pipe temperature ranges for an operating heat pump system:

- Heating mode refrigerant temperature ranges: Liquid = 75-118°F; High Pressure Vapor = 95-220°F
- Cooling mode refrigerant temperature ranges: Liquid = 75-118°F; Low Pressure Vapor = 40-90°F

All insulation joints must be glued with no air gaps. Insulation material must fit snugly against the refrigeration pipe with no air space between it and the pipe. ⃠ Do not allow insulation passing through pipe hangers, inside conduit, and/or sleeves to be compressed. Protect insulation inside hangers and supports with a second layer. All pipe insulation exposed to the sun and outdoor elements must be properly protected with PVC, aluminum vapor barrier, or alternatively placed in a weather-resistant enclosure such as a pipe rack with a top cover; and meet local codes.

Note:

Follow locals codes when selecting EPDM insulation wall thickness. Thickness in the table is based on heat conductivity of 0.61 Btu/in/h/ft²/°F.

Minimum Refrigerant Pipe Ethylene Propylene Diene Methylene (EPDM) Insulation Wall Thickness Requirements

Table 17: Insulation Guidelines for Typical and Special Circumstances.

Classification / Piping O.D.		Air-conditioned location		Non-air conditioned location	
		1. Typical Conditioned Location	2. Special Conditioned Location	3. Typical Unconditioned Location	4. Special Unconditioned Location
Liquid pipe	ø1/4 inches	1/2 inches	1/2 inches	1/2 inches	1/2 inches
	ø3/8 inches				
	≥ø1/2 inches	1/2 inches	1/2 inches	1/2 inches	1/2 inches
Vapor pipe	ø3/8 inches	1/2 inches	3/4 inches	3/4 inches	1 inch
	ø1/2 inches				
	ø5/8 inches				
	ø3/4 inches				

1. Typical Air-Conditioned Location

A building plenum or space that contains conditioned air that does not exceed 80°F DB. When piping passes through an indoor area where the indoor unit operates, such as an apartment, classroom, office, mall, hospital, etc.

2. Special Air-Conditioned Location

1. When the location is air conditioned, but there is severe temperature/humidity difference due to high ceilings.
- Church, auditorium, theater, lobby, etc.
2. When the location is air conditioned, but internal temperature/humidity are high.
- Bathroom, swimming pool, locker room, etc.

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3. Typical Unconditioned Location

When piping passes through an indoor area where the indoor unit does not operate, such as a hallway, dormitory, or school, etc. An unconditioned space inside a building.

4. Special Unconditioned Location: If conditions 1 and 2 below are present.

1. An unconditioned space or plenum of a building.
2. An area where there is an elevated humidity level.

5. Additional Insulation for Indoor Units Will be Required in Humid Environments.

The air conditioner factory insulation has been tested according to "ISO Conditions with Mist," and it satisfies the requirements. If the system has been operating for a long time in a high humidity environment (dew point temperature: more than 73°F), condensate is likely to form. If this happens, install 3/8 inch thick EPDM insulation that is plenum-rated with a heat-resistance factor of more than 248°F.

Installing Refrigerant Piping Insulation

⚠WARNING

Ensure all refrigerant piping is insulated. Exposed refrigerant piping will cause burns if touched.

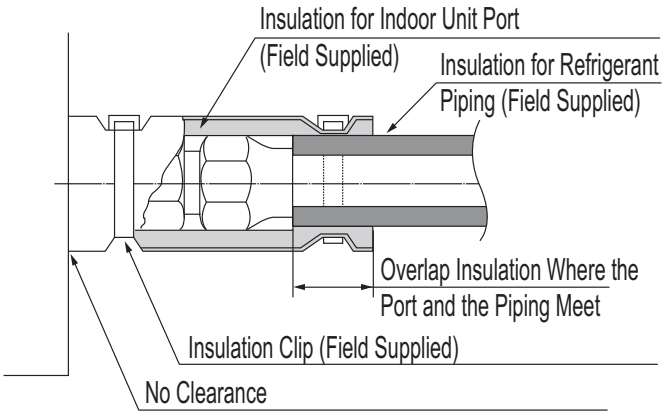
Wrap all refrigerant and condensate piping including field-provided isolation ball valves and flexible pipe connection kits provided by LG. All pipes must be insulated and each pipe must be separately wrapped. Any exposed piping will generate condensate or will cause burns if touched. Sufficiently insulate all cold surfaces to prevent moisture forming.

Ensure insulation material fits snugly against the refrigeration pipe with no air space between the pipe surface and the surrounding insulation.

Protect insulation inside hangers and supports with a second insulation layer. Ensure insulation on all pipe passing through pipe hangers, inside conduit, and/or sleeves is not compressed.

Glue all insulation joints with no air gaps between insulation segments, and between insulation segments and the unit case. Ensure insulation material fits snugly against the refrigeration pipe with no air space between it and the pipe. All pipe insulation exposed to the sun and outdoor elements must be properly protected with PVC, aluminum vapor barrier, or alternatively placed in a weather-resistant enclosure such as a pipe rack with a top cover; and must meet local codes. Pay special attention to insulating the pipes installed in a ceiling plenum.

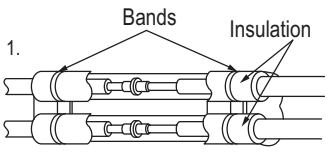
Figure 54: Typical Refrigerant Line Flare Fitting Insulation Detail



Note:

- ⃠ *Do not insulate gas and liquid pipes together as this can result in pipe leakage and malfunction due to extreme temperature fluctuations.*
- *Always properly insulate the piping. Insufficient insulation will result in condensation, reduced heating/cooling performance, etc. Also, if the pipes aren't insulated properly, condensation could potentially cause damage to building finishes. Pay special attention to insulating the pipes installed in the ceiling plenum.*
- *Fully insulate the piping connections.*

Figure 55: Insulating the Piping.



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⚠ WARNING

- *All power wiring (line voltage) and communication cable installation must be performed by trained service providers working in accordance with all local, state, and National Electrical Code (NEC) / UL / ETL federal regulations related to electrical equipment and wiring, and following the manufacturer product diagrams, requirements, and instructions in this manual. Electric shock can cause physical injury or death.*
- *Be sure that main power to the unit is completely off before proceeding. Follow all safety and warning information outlined at the beginning of this manual. Failure to do so will cause electric shock and bodily injury.*
- *Install a main shutoff switch or circuit breaker that interrupts all power sources simultaneously (circuit breaker must be resistant to electromagnetic currents). Be sure that the circuit breaker or some other emergency power cutoff device is in place before any power wiring is done to the system. Failure to do so will cause bodily injury or death.*
- ⃠ *Never touch any power lines or live cables before all power is cutoff to the system. To do so will cause bodily injury or death.*
- *Power wiring and communication cable sizes must comply with all applicable federal, state, and local codes. Undersized wiring will lead to unacceptable voltage at the unit and will cause a fire, which will cause bodily injury or death.*
- *Properly ground the outdoor unit, indoor units, and branch distribution units. Ground wiring must always be installed by a trained technician. Ground wiring is required to prevent accidental electrical shock during current leakage, which will cause bodily injury or death.*
- *Verify that the circuit breaker is set to OFF before installing the wiring system. Electric shock can cause physical injury or death.*
- *Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and National Electrical Code regulations related to electrical equipment and wiring, and following the instructions in this manual. Using an oversized breaker or fuse will result in electric shock, physical injury or death.*
- ⃠ *Do not connect ground wire to refrigerant, gas, or water piping; to lightning rods; to telephone ground wiring; or to the building plumbing system. Failure to properly provide a NEC-approved earth ground can result in electric shock, fire, physical injury or death.*

Note:

- *Consider ambient conditions (temperature, direct sunlight, inclement weather, etc.) when selecting, installing, and connecting the power wiring.*
- *Properly ground the outdoor unit, indoor units, and branch distribution units. Ground wiring must always be installed by a trained technician. Improperly grounded wire can cause communication problems from electrical noise, and motor current leakage.*
- *Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and NEC regulations related to electrical equipment and wiring, and following the instructions in this manual. Generated overcurrent will include some amount of direct current. Using an oversized breaker or fuse will result in equipment malfunction and property damage.*
- ⃠ *Do not connect ground wire to refrigerant, gas, or water piping; to lightning rods; to telephone ground wiring; or to the building plumbing system. Failure to properly provide a NEC-approved earth ground can result in property damage and equipment malfunction.*
- ⃠ *Do not operate the air conditioning system until the refrigerant piping installation is complete. Operating the system before refrigerant piping is finalized will damage the compressor.*

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Power Wiring / Communication Cable Connections

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

To Install a Ring or Fork Terminal:

1. Trim the wiring with wire cutters or pliers, then strip the insulation to expose the strand wiring to about 3/8 inches.
2. Using a ring terminal fastener or pliers, securely clamp a ring terminal to each stripped wire end.

To Connect the Wiring to the Terminals:

1. Remove the JIS terminal screws from the (outdoor unit, branch distribution unit, or indoor unit) terminal plate with a JIS screwdriver. (See information about LG terminal connections on the next page.)
2. Position the ring terminal around the terminal, place the terminal screw in the ring, and tighten to the terminal plate using a JIS screwdriver.
   - Firmly attach the wire; secure in a way to prevent external forces from being imparted to the terminal block.
   - Use an appropriately sized JIS screwdriver for tightening the terminals.
   - ⃠ Do not over tighten the connections; over tightening will damage the terminals.

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

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

Figure 57: Close up of a Typical Ring Terminal.

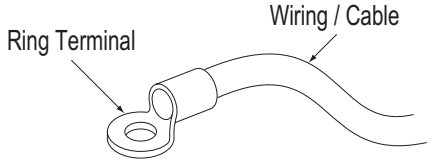


Figure 58: Adding a Ring Terminal to the Wiring.

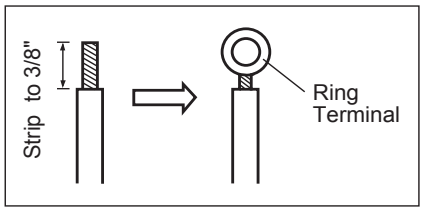


Figure 56: Tightening the Ring Terminal to the Terminal Plate.

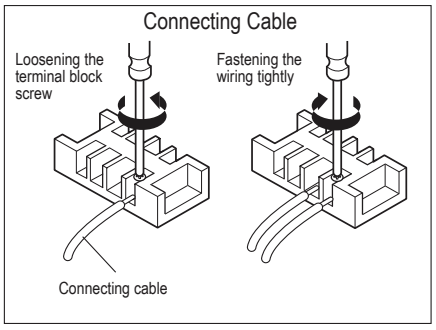
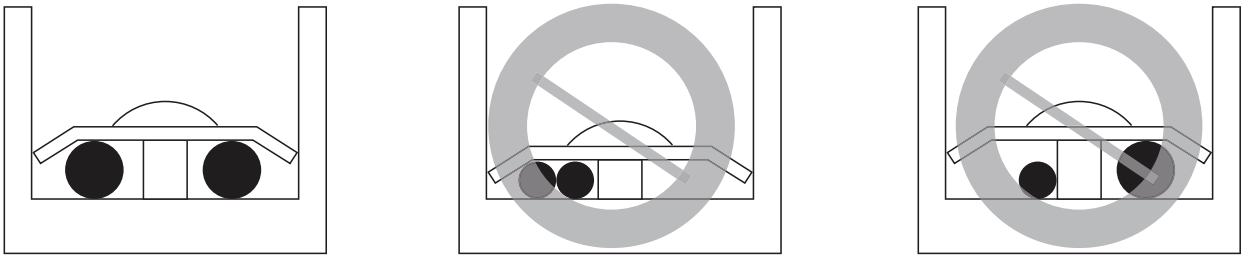


Figure 59: Proper and Improper Power Wiring Connections.

● :Copper Wire



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

⃠ Do not terminate two wires on one side.

⃠ Do not terminate different gauge wires to a terminal block.

⚠ WARNING

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

Note:

- ⃠ *Never apply line voltage power to the communications cable terminal block. If contact is made, the PCBs will be damaged.*
- *Always include some allowance in the wiring length when terminating. Firmly attach the wiring or cable, but provide some slack to facilitate removing the electrical panels while servicing, and to prevent external forces from damaging the terminal block.*
- ⃠ *Never ground the shield of the communications cable to the indoor unit frame or other grounded entities of the building. Ground the communications cable shield only at the outdoor unit. Improperly grounding this cable can cause communications errors.*

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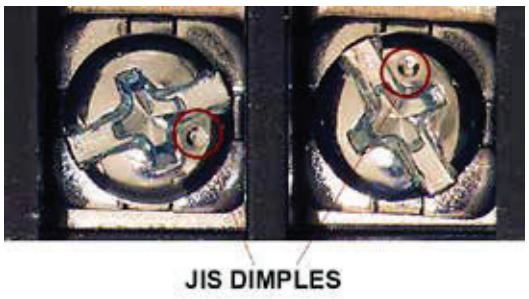
LG Terminal Connections

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. ⃠ Do not over tighten the connections — over tightening will damage the terminals — but firmly and securely attach the wiring in a way to prevent external forces from being imparted to the terminal block.

Figure 60: 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 with LGRED systems only) are wired in relation to the outdoor unit.*
- ⃠ *Do not include splices or wire nuts in the communication cable.*

Power Supply / Power Wiring Specifications

- Multi F and Multi F MAX with LGRED systems operate at 1Ø, 208-230V, 60Hz, and power is wired to the outdoor unit only. The outdoor unit will supply power to the indoor units and the branch distribution units (Multi F MAX with LGRED systems only) through the communication / connection (power) cable (indoor units and branch distribution units draw minimum power). See the Multi F Outdoor Unit Installation Manual for information.
- Select power supply wire type and size based on NEC and local codes. Maximum voltage fluctuation ±10% of the nameplate rated value.
- Properly ground the outdoor unit / indoor units / branch distribution units per NEC and local codes.
- Ground wire must be longer than the common power / communication wires.
- Connect the wiring firmly so the wires cannot be easily pulled out.
- Refer to the inside of the chassis cover or control cover for circuit and terminal block diagrams.
- Always match color codes of each wire and follow wiring diagram.
- ⃠ Do not install power wiring to the outdoor unit and the communication / connection (power) cable to the indoor unit in the same conduit. Use separate conduits.

⚠ WARNING

- *Always have a trained service provider properly ground the outdoor unit. If the outdoor unit is not properly grounded, there is a risk of electric shock, physical injury, or death.*
- *Provide a circuit breaker between the power source and the outdoor unit. Failure to do so will cause bodily injury or death.*

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Communication / Connection (Power) Cable Specifications

- Multi F with LGRED Systems:
  - Communication / connection (power) cable from the outdoor unit to the indoor unit for lengths up to 130 feet must use a minimum of 18 AWG, four (4) conductor, 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.
  - When the communication / connection (power) wires between the indoor unit and outdoor unit is GREATER THAN 130 feet, use:
    - A two (2) conductor wire for power (for each indoor unit).
    - A two (2) conductor wire for communication / ground (for each indoor unit).
    - Separate the power AT LEAST two (2) inches away from the communication / ground wire (for each indoor unit).
    - All wiring is still minimum 18 gauge, stranded, shielded, or unshielded as cited above (for each indoor unit).
- Multi F MAX with LGRED Systems:
  - All 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 (if shielded, it must be grounded to the chassis of the outdoor unit only), and must comply with applicable local and national codes.
  - Communication / connection (power) cable from the branch distribution unit(s) to the indoor units for lengths up to 130 feet must use a minimum of 18 AWG, four (4) conductor, 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.
  - When the communication / connection (power) wires between the branch distribution unit and indoor unit is GREATER THAN 130 feet, use:
    - A two (2) conductor wire for power (for each indoor unit).
    - A two (2) conductor wire for communication / ground (for each indoor unit).
    - Separate the power AT LEAST two (2) inches away from the communication / ground wire (for each indoor unit).
    - All wiring is still minimum 18 gauge, stranded, shielded, or unshielded as cited above (for each indoor unit).
- Insulation material as required by local code.
- Rated for continuous exposure of temperatures up to 140°F.
- Firmly attach the cable; provide slack but secure in a way to prevent external forces from being imparted on the terminal block.
- Wiring must be completed without splices.

Figure 61: Typical Multi F / Multi F MAX with LGRED Outdoor and Indoor / Branch Distribution Unit Wiring and Communications Cable Diagram For Wiring Lengths Up to 130 Feet.

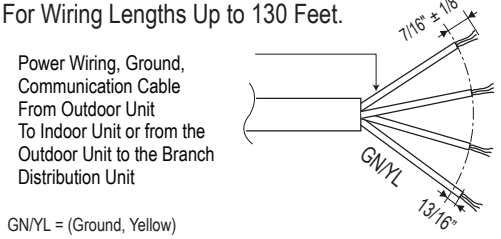
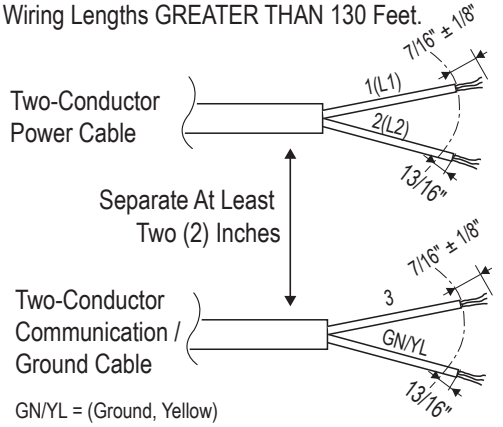


Figure 62: Multi F with LGRED Outdoor Unit to Indoor Unit, and Multi F MAX with LGRED Branch Distribution Unit to Indoor Unit Wiring Diagram for Wiring Lengths GREATER THAN 130 Feet.



Note:

- *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.*
- ⃠ *Never ground the shield of the communications cable to the indoor unit frame or other grounded entities of the building. Ground the communications cable shield only at the outdoor unit. Improperly grounding this cable can cause communications errors.*
- *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.*

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Figure 63: Typical Multi F with LGRED System General Power / Communications System Schematic When Wiring is Less Than 130 Feet.

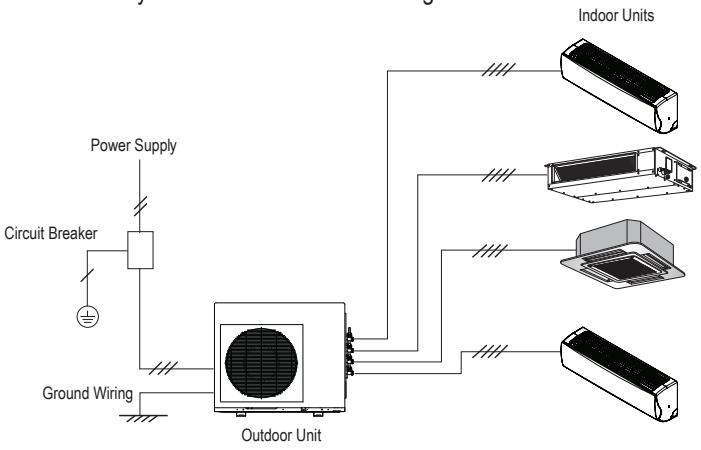


Figure 64: Typical Multi F MAX with LGRED System General Power / Communications System Schematic When Wiring is Less Than 130 Feet.

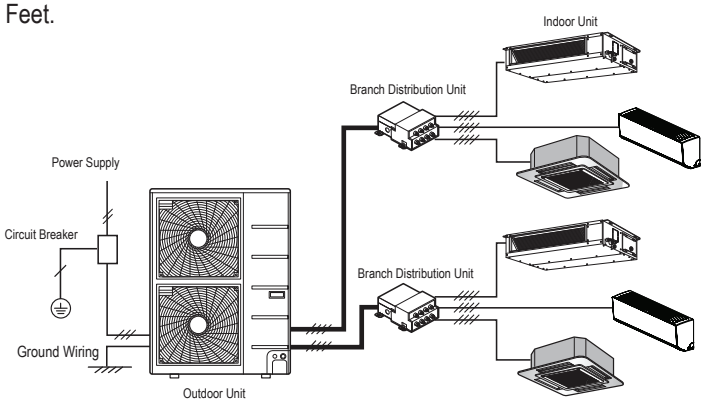
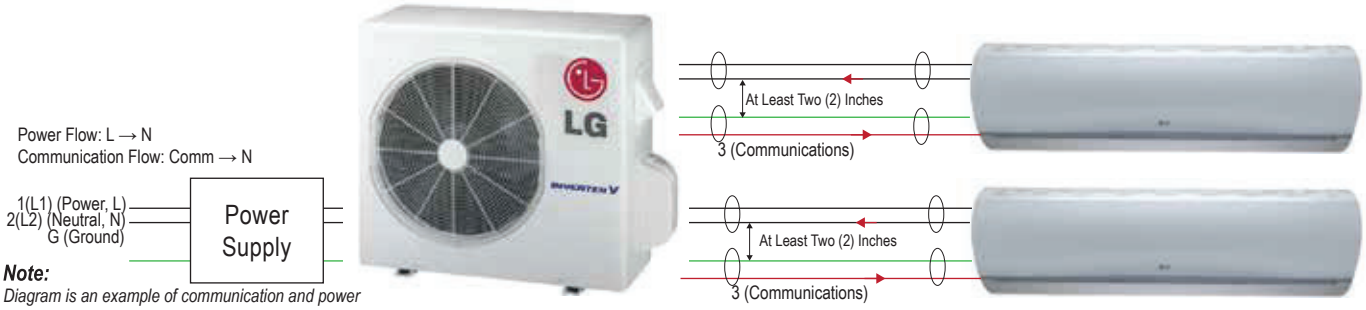


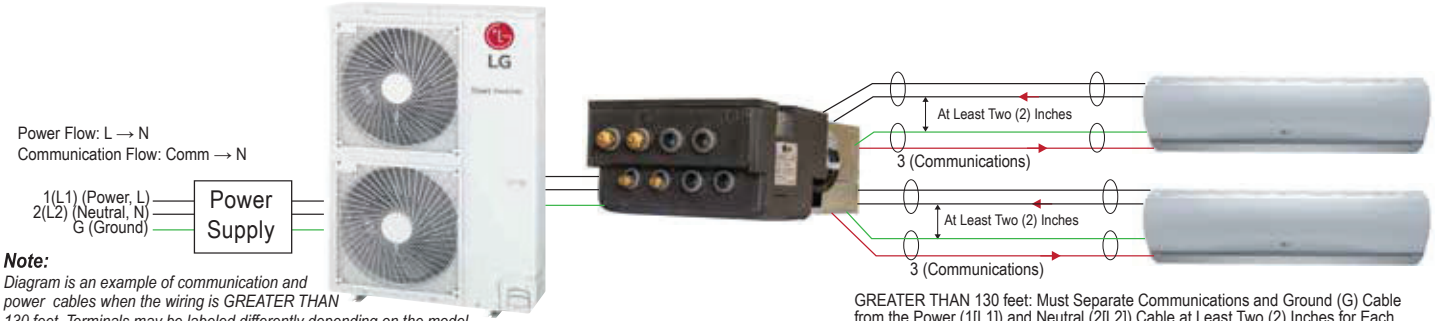
Figure 65: Schematic of a Multi F with LGRED System When the Wiring is GREATER THAN 130 Feet.



Note:
Diagram is an example of communication and power cables when the wiring is GREATER THAN 130 feet. Terminals may be labeled differently depending on the model. Outdoor and Indoor Unit appearances may vary depending on the model.

GREATER THAN 130 feet: Must Separate Communications and Ground (G) Cable from the Power (1[L1]) and Neutral (2[L2]) Cable at Least Two (2) Inches for Each Indoor Unit.

Figure 66: Schematic of a Multi F MAX with LGRED System When the Wiring is GREATER THAN 130 Feet.



Note:
Diagram is an example of communication and power cables when the wiring is GREATER THAN 130 feet. Terminals may be labeled differently depending on the model. Outdoor and Indoor Unit appearances may vary depending on the model.

GREATER THAN 130 feet: Must Separate Communications and Ground (G) Cable from the Power (1[L1]) and Neutral (2[L2]) Cable at Least Two (2) Inches for Each Indoor Unit.

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Controller Options

Wall-mounted indoor units include a wireless handheld remote controller (Model No. AKB74955602), but optional LG-supplied wired controllers are available. After all wiring is connected to the indoor and outdoor units, test the accompanying remote controllers for performance. As always, follow all safety warnings and notes when operating the units using the remote controller. Additionally, all of the Multi F / Multi F MAX outdoor units can use the following controllers when accompanied with the PI 485 VNet Accessory:

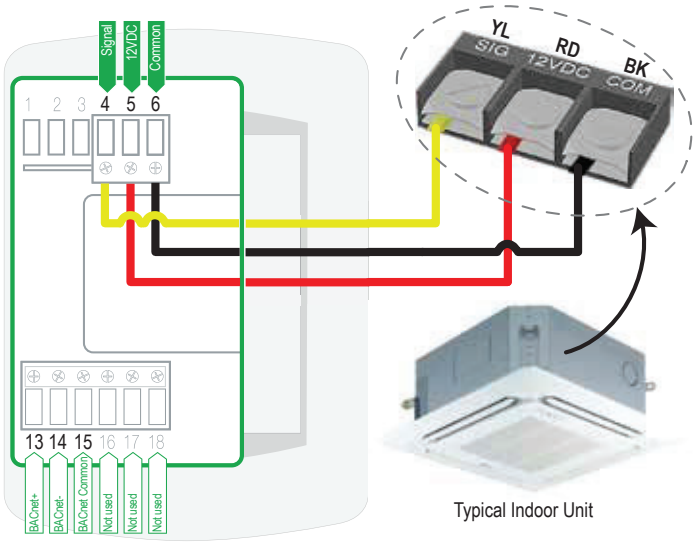
- AC Smart
- ACP
- BACnet®
- LonWorks®

BACnet® is a registered trademark of ASHRAE
LonWorks® is a registered trademark of Echelon Corporation.

Communication Cables From Indoor Units to Remote Controllers

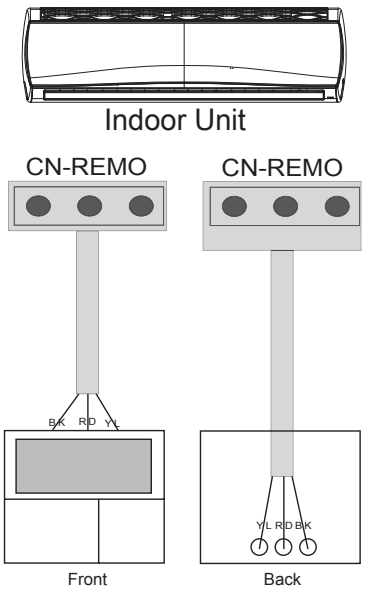
- Communication cable from indoor unit to remote controller(s) is to be 22 AWG, 3-conductor, twisted, stranded, unshielded. Wiring must comply with all applicable local and national codes.
- If using the LG Controller / Extension cable and the length needs to be further extended, the LG Extension Kit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

Figure 67: One Example of Indoor Unit to Zone Controller Connection.



Typical Indoor Unit

Figure 68: Another Example of Indoor Unit to Zone Controller Connection.



Note:

Cable connected to Zone Controller is the factory default connection.

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Communication Cables Between Multiple Indoor Units Operating as a Group (Group Control)

If any indoor units were specified to operate in unison:

- Before running cable, decide which indoor unit will be the "Master." The other indoor units in that group will be designated as "Slave(s)." The zone controller will be connected to the "Master."
- Set the pertinent DIP switch at each indoor unit to identify the Master and Slave(s). On wall mounted indoor unit models, set the assignment using the handheld remote controller.
- Use a daisy chain configuration and connect all of the group's indoor units together starting at the "Master" unit.
- ⃠ NEVER splice, cut, or extend cable length with field provided cable. Always include enough cable to cover distance between all components.

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

- From the controller to the master indoor unit, use 22 AWG, 3-conductor, twisted, stranded, unshielded. All wiring must comply with all applicable local / national codes.
- From the master indoor unit to the slave indoor unit(s), daisy chain using 22 AWG, 3-conductor, twisted, stranded, unshielded. All wiring must comply with all applicable local / national codes.
- (⃠ Do not attach wire to 12VDC terminal to the slave indoor units). All wiring must comply with all applicable local and national codes.
- ⃠ NEVER splice, cut, or extend cable length; always include enough cable to cover distance between all components.

For indoor units with CN-REMO connections:

Use one (or multiple) Group Control Kit(s) (sold separately) containing extension and Y-splitter cables. Use one (1) group control cable kit for each indoor unit in the group except for the last indoor unit. ⃠ NEVER splice, cut, or extend cable length with field provided cable.

Figure 69: Example of Indoor Unit Group to Zone Controller Connections (Sig-12V-GND [Comm.] Terminal).

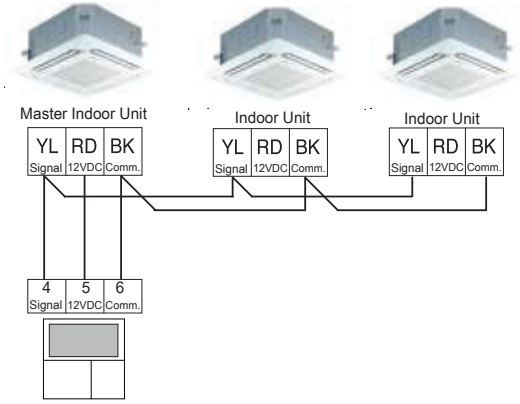

Figure 70: Example of Indoor Unit Group to Zone Controller Connections (CN-REMO).

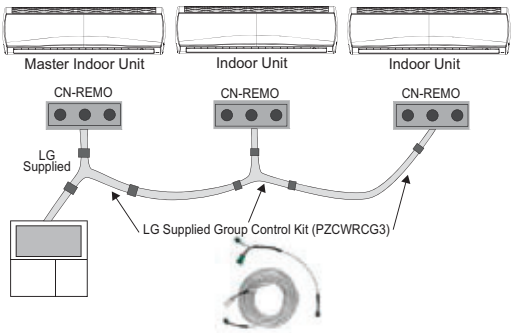

Table 18: Accessories for Some Group Control Applications.

Accessory	Model Number	Image
Wired Remote Group Control Cable Assembly, Required for connecting multiple indoor units to a control group	PZCWRCG3	
Wired Remote/Wired Remote Extension Cable, Required for extending the distance between indoor units or remote controllers in a control group	PZCWRC1	

Note:

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

General Specifications

- Wired remote controllers can be connected to all indoor unit types.
- Wireless controllers can be used in conjunction with wired remote controllers.
- A dry contact unit can be connected with a central controller simultaneously.
  - The master indoor unit is recognized by the dry contact unit and the central controller.
  - Group Control only available for indoor units manufactured after February 2009.
  - The central controller can control indoor units after setting the address of the master indoor unit only.
  - Slave indoor unit cannot be individually controlled by central controller.
  - Slave indoor unit will operate like master indoor unit.
- If an error occurs with the indoor unit, the error will be displayed on the wired remote controller.
- The following functions are available with group control:
- Selection of operation options (operation/mode/set temperature)
- Control of air flow rate (High/Medium/Low)

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Connecting the Power Wiring / Communication Cable - HVT Indoor Units

⚠WARNING

- *Verify that main power to the unit is completely off before proceeding with these steps as there is a risk of electrical shock, bodily injury, and / or death.*
- *Follow all safety and warning information outlined at the beginning and throughout this manual. Failure to do so will cause electrical shock, bodily injury, and / or death.*

Note:

- *Follow all safety and warning information outlined at the beginning and throughout this manual. Failure to do so will cause unit failure.*
- *Connect the communication / connection (power) cable to the indoor unit by matching the terminals on the outdoor unit control board. Verify the color of the wires at the outdoor unit, along with the terminal numbers, match those for the indoor unit.*
- *Images are representative; actual appearance will vary.*
- *Refer to the circuit diagram on the indoor unit bottom cover.*

HVT Indoor Unit Wiring Installation Procedure

1. The front panel must already be opened, and the bottom panel must already be removed. If not, fully open the front panel. The control cover can be accessed on the bottom right side of the front of the indoor unit.

2. At the bottom panel of the indoor unit, unsnap the latches that cover the screws. Number of screws on the panel will differ by indoor unit model.

3. Using a Phillips head screwdriver, remove the screws from the bottom panel of the indoor unit and set aside for re-installation.

4. Remove the bottom panel, being careful not to scratch the main horizontal vane. Set aside the bottom panel to re-install after all procedures are complete.

Figure 71: Latch over Screws on Indoor Unit Bottom Panel.

5. Remove the control cover on the bottom right side of the front of the indoor unit by detaching the screw. Set the screw and the control cover aside for re-installation.

Figure 72: Remove Screws from Bottom Panel.

Figure 73: Remove Bottom Panel.

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6. Route the power wiring / communications (connection) cable through the bottom of the indoor unit (through a knockout panel) to the terminal block.

7. Using a JIS screwdriver, connect the cable terminals to the terminal block. Ensure wire color and terminal number of the indoor unit matches those of the outdoor unit. Refer to the wiring diagram on the inside of the cover.

8. Choice of the cable path out of the indoor unit and to the outdoor unit depends on refrigerant piping / drain hose installation: left side piping, following back of indoor unit; right side piping, through the knockout hole; or rear piping.

Figure 74: Indoor Unit Knockout.

Figure 75: Indoor Unit Terminal Block with Ground Cable (Example Only).

Note:

- *Each wire must be securely attached to the terminal block.*
- *Ground cable must be longer than the other wires.*
- *Secure the cable onto the control board using a cable tie.*
- *Use a conduit to protect the cable / refrigerant piping from the indoor unit to the outdoor unit.*

Cable Installation When Piping is on the Left Side:

- Insert the communication / connection (power) cable through the bottom of the indoor unit.
- Connect the terminals to the terminal block.
- Secure the cable onto the terminal block with the cable retainer.
- Secure the refrigerant piping, drain hose, and communication / connection (power) cable together using cable ties and conduit, or by the bundling method.

Note:

Position the drain hose at the bottom. Positioning the drain hose at the top of the bundle can cause condensate to overflow from the drain pan in the inside of the indoor unit.

Cable Installation When Piping is on the Right Side:

- Connect the terminals to the terminal block.
- Secure the cable onto the terminal block with the cable retainer.
- Secure the refrigerant piping, drain hose, and communication / connection (power) cable together using cable ties and conduit, or by the bundling method.

Note:

- *Position the drain hose at the bottom. Positioning the drain hose at the top of the bundle can cause condensate to overflow from the drain pan in the inside of the indoor unit.*
- *For more information on conduits or the bundling method, see the Refrigerant Piping Connection section.*

9. Reattach the control cover using the screw.

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Figure 76: LMN079HVT, LMN159HVT, LMN249HVT Indoor Unit Wiring Diagram.

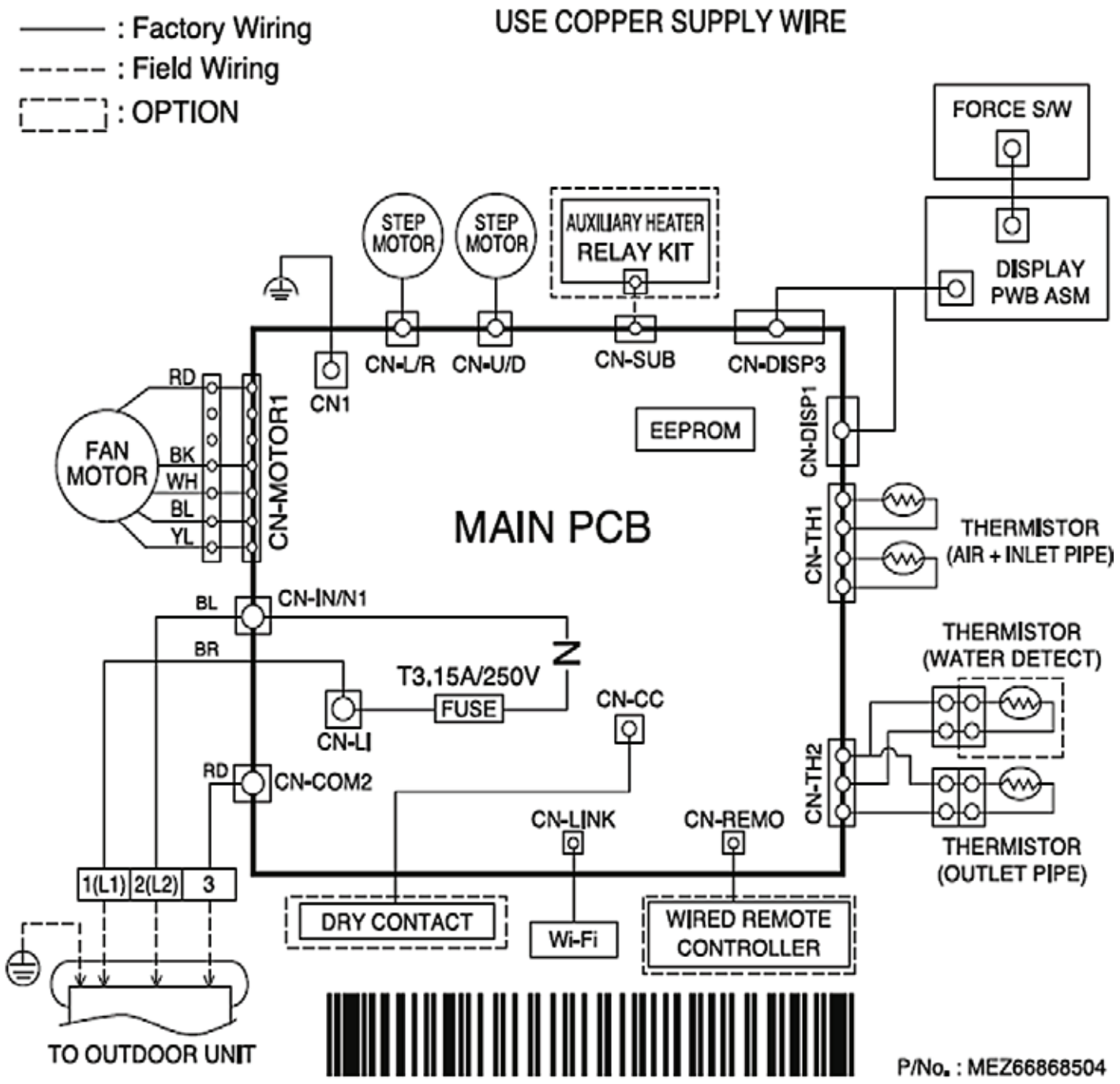

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Figure 77: Connecting the Power Wiring / Communication Cable to the HVT Indoor Unit Terminal Block - Front View.

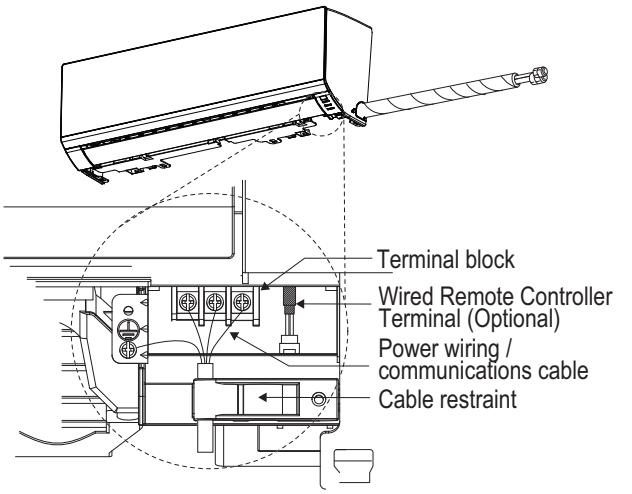


Figure 78: Connecting the Power Wiring / Communication Cable to the HVT Indoor Unit Terminal Block - Back View.

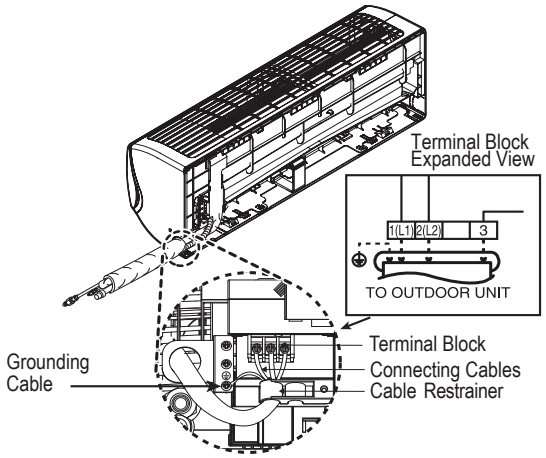


Figure 79: Indoor Unit to Outdoor Unit / Branch Distribution Unit Terminal Connections—LMN079HVT and LMN159HVT.

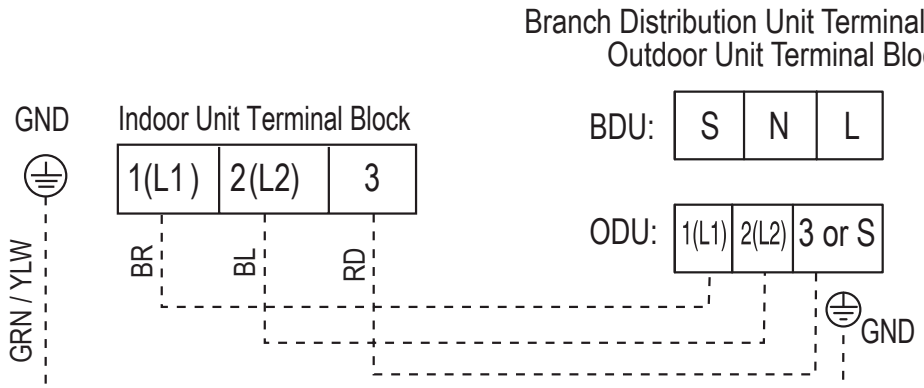
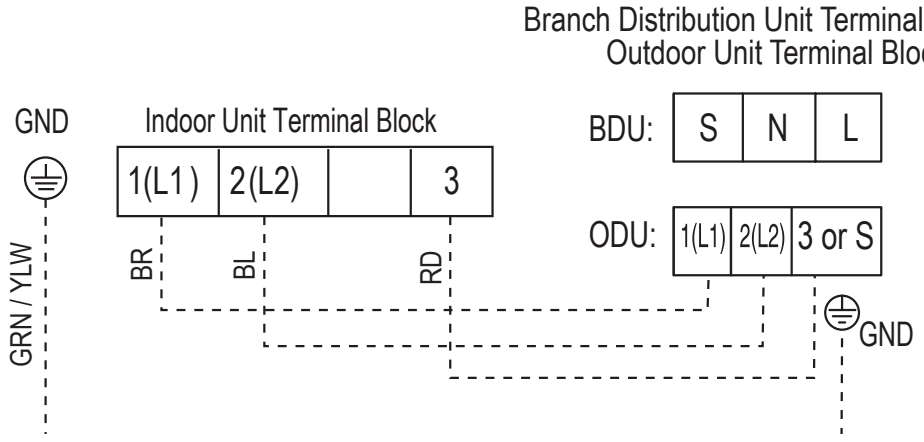


Figure 80: Indoor Unit to Outdoor Unit / Branch Distribution Unit Terminal Connections—LMN249HVT.



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Connecting the Power Wiring / Communication Cable - HSV5 Indoor Units

⚠WARNING

- *Verify that main power to the unit is completely off before proceeding with these steps as there is a risk of electrical shock, bodily injury, and / or death.*
- *Follow all safety and warning information outlined at the beginning and throughout this manual. Failure to do so will cause electrical shock, bodily injury, and / or death.*

Note:

- *Follow all safety and warning information outlined at the beginning and throughout this manual. Failure to do so will cause unit failure.*
- *Connect the communication / connection (power) cable to the indoor unit by matching the terminals on the outdoor unit control board. Verify the color of the wires at the outdoor unit, along with the terminal numbers, match those for the indoor unit.*
- *Images are representative; actual appearance will vary.*
- *Refer to the circuit diagram on the indoor unit bottom cover.*

HSV5 Indoor Unit Wiring Installation Procedure

1. The bottom panel must have already been removed. If it hasn't been removed, unsnap the bottom cover at its top left and right sides (Location 1).

2. Unsnap each of the three (3) or four (4) small C-hooks located in the middle of the bottom cover (Location 2). Number of C-hooks present depends on model of indoor unit.

3. Lift the three (3) to four (4) hinges on the bottom cover up and out of the channels molded to the left, right, and middle of the indoor unit (Location 3). Number of hinges present depends on model of indoor unit.

4. Set aside the bottom cover to re-install after all procedures are complete.

5. Terminal block is located at the front bottom-right—hand side of the indoor unit. To access the terminals, unscrew the metal control cover screw (if applicable), and raise the metal control cover.

6. Using a JIS screwdriver, connect the cable terminals to the terminal block. Ensure wire color and terminal number of the indoor unit matches those of the outdoor unit. Refer to the wiring diagram on the inside of the bottom cover.

Note:

- *Each wire must be securely attached to the terminal block.*
- *Ground cable must be longer than the other wires.*
- *Secure the cable onto the control board using a cable tie.*
- *Use a conduit to protect the cable / refrigerant piping from the indoor unit to the outdoor unit.*

Figure 81: Steps to Removing the Bottom Cover.

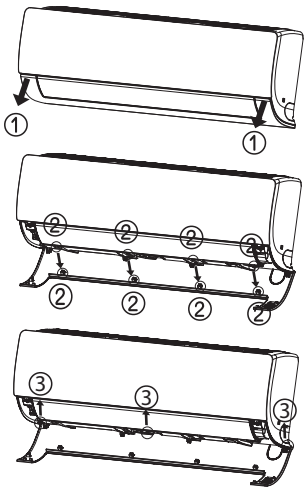

Figure 82: Removing the Bottom Cover (Appearances Will Vary Depending on Indoor Unit Model).

Figure 83: Location of the Indoor Unit Terminal Block.

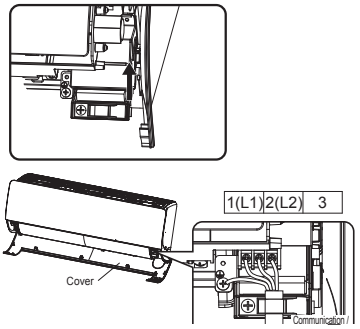

Figure 84: Terminal Cover Down.

Figure 85: Terminal Cover Up.

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Connecting Indoor Unit Electrical Wiring, continued.

7. Choice of the cable path out of the indoor unit and to the outdoor unit depends on refrigerant piping / drain hose installation: left side piping, following back of indoor unit; right side piping, through the knockout hole; or rear piping.

Cable Installation When Piping is on the Left Side:

- Insert the communication / connection (power) cable through the bottom of the indoor unit,
- Connect the terminals to the terminal block.
- Secure the cable onto the terminal block with the cable retainer.
- Secure the refrigerant piping, drain hose, and communication / connection (power) cable together using cable ties and conduit, or by the bundling method.

Note:

Position the drain hose at the bottom. Positioning the drain hose at the top of the bundle can cause condensate to overflow from the drain pan in the inside of the indoor unit.

Cable Installation When Piping is on the Right Side:

- Connect the terminals to the terminal block.
- Secure the cable onto the terminal block with the cable retainer.
- Secure the refrigerant piping, drain hose, and communication / connection (power) cable together using cable ties and conduit, or by the bundling method.

Note:

Position the drain hose at the bottom. Positioning the drain hose at the top of the bundle can cause condensate to overflow from the drain pan in the inside of the indoor unit.

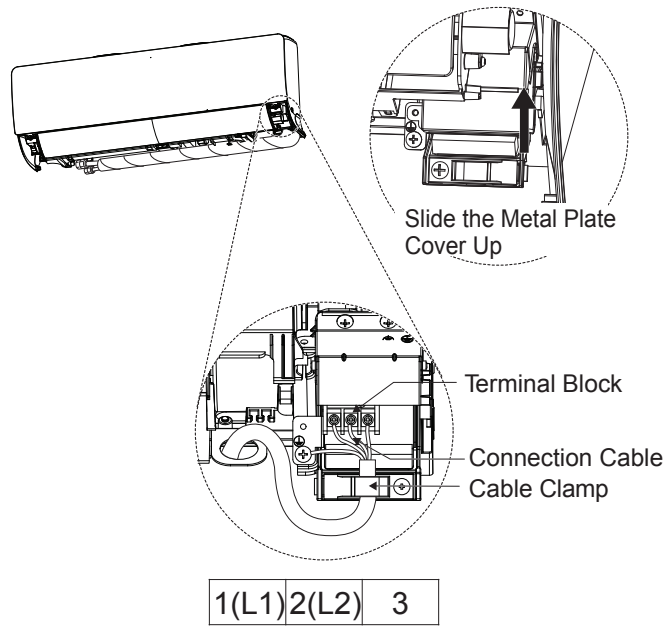
Note:

For more information on conduits or the bundling method, see the Refrigerant Piping Connection section.

8. Reattach the metal control cover using the screw (if applicable).

Figure 86: Cable / Refrigerant Piping / Drain Hose Installation Options.

Wiring When Piping is on the Left Side



Wiring When Piping is on the Right Side

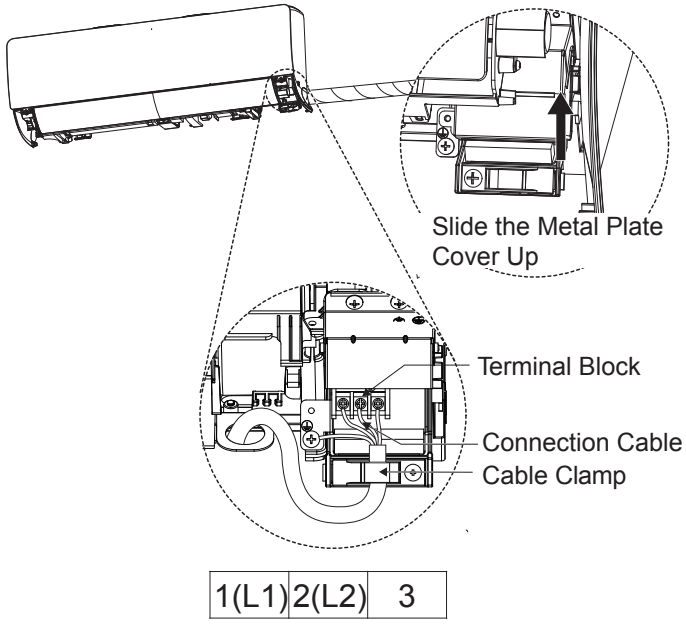


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Figure 87: LSN090HSV5, LSN120HSV5, LSN180HSV5 Indoor Units Wiring Diagram.

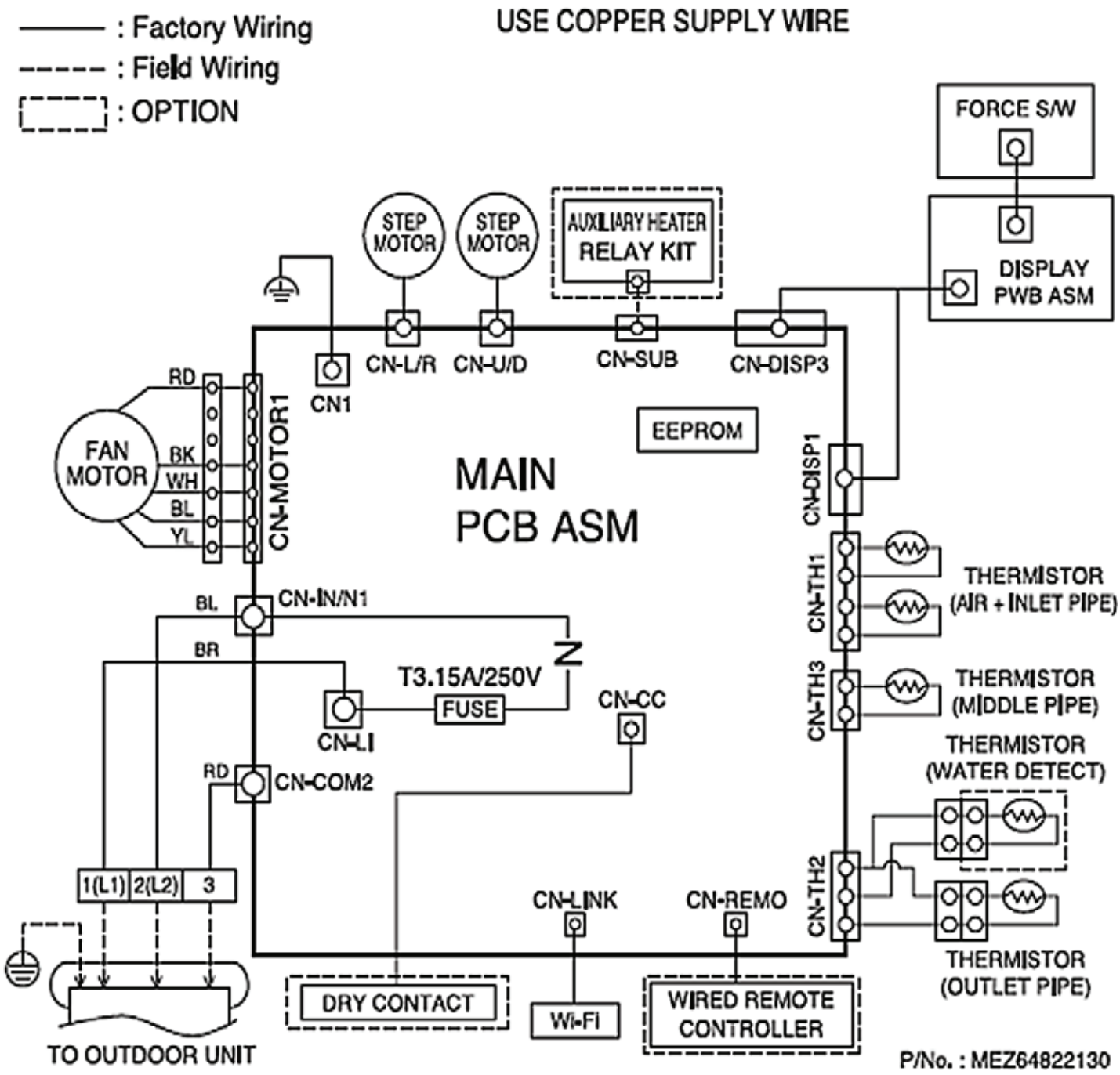

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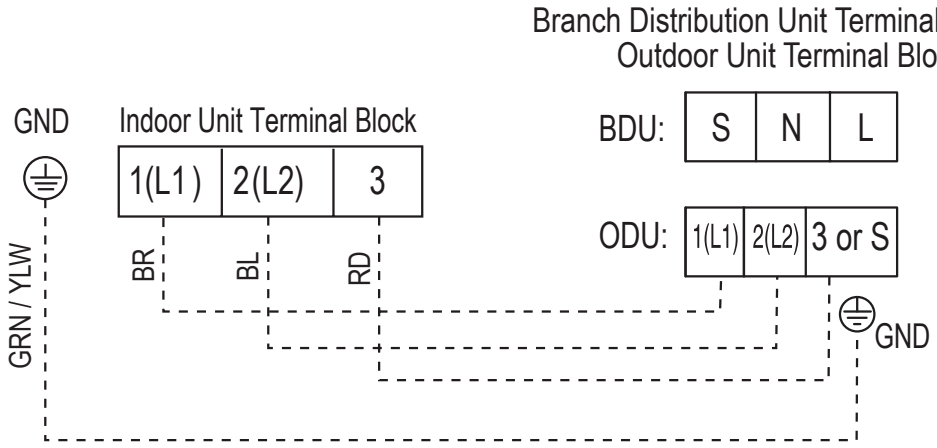
Figure 88: Indoor Unit to Outdoor Unit / Branch Distribution Unit Terminal Connections—LSN090HSV5, LSN120HSV5 and LSN180HSV5.



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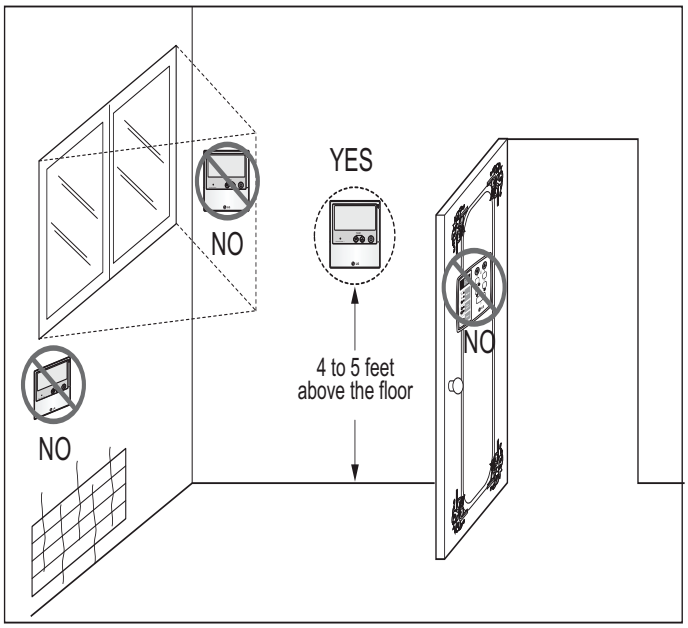
Wired Controller Installation

Wall indoor units can be used with various wired controllers (optional; sold separately). Wired controllers include a sensor to detect room temperature. To maintain comfort levels in the conditioned space, the wired controller must be installed in a location away from direct sunlight, high humidity, and where it could be directly exposed to cold air. Controller must be installed four (4) to five (5) feet above the floor where its display can be read easily, in an area with good air circulation, and where it can detect an average room temperature.



⃠ *Do not install the remote controller where it can be impacted by the following:*

- *Drafts or dead spots behind doors and in corners*
- *Hot or cold air from ducts*
- *Radiant heat from sun or appliances*
- *Concealed pipes and chimneys*
- *Uncontrolled areas such as an outside wall behind the remote controller*

1. Pull communications cable between the controller handy box (if used) and the indoor unit.

2. Store a minimal amount of cable in the handy box. Any additional cable must be coiled and stored near the indoor unit control panel.

3. If additional cable length is needed, communication cable from the indoor unit to the remote controller(s) is to be 22 AWG, 3-conductor, twisted, stranded, unshielded. Wiring must comply with all applicable local and national codes. If using the LG Controller / Extension cable and the length needs to be further extended, the LG Extension Kit (sold separately) must be used. A maximum of four (4) kits (up to 165 feet) can be used.

4. If the cable between a zone controller and the indoor unit is too long, ⃠ do not cut. Coil any spare communications cable, tie-wrap it, and leave it next to the indoor unit location.

Wall-Mounted Sensor Installation

Proper indoor unit operation depends on the location of the room sensor, if a room sensor is installed in addition to, or to use in place of a controller. A good location will protect the sensor from direct sunlight and external local sources of water vapor, and air flow. If no mounting height was specified by the building designer, place the handy box approximately four (4) to five (5) feet above the finished floor.

- It could be necessary to use a handy box that is sized in metric units, depending on the sensor model. Check with your LG representative to verify which size of handy box is needed for the sensor in question.
- Communication cable from the indoor unit to the controller(s) is to be 22 AWG, 3-conductor, twisted, stranded, unshielded. Wiring must comply with all applicable local and national codes. If using the LG Controller / Extension cable and the length needs to be further extended, the LG Extension Kit (sold separately) must be used. A maximum of four (4) kits (up to 165 feet) can be used.
- Maintain at least the minimum distance required between the communications cable and power wiring. The minimum required space between the two depends on the voltage of the power wiring.

Note:

- ⃠ *Do not route power wiring and communications cables in the same conduit. Routing power wiring and communications cables together will cause communication errors and unit malfunction.*
- ⃠ *Do not cut the quick-connect plugs off or adjust the length of the cable. Keep the communications cable away from high voltage wires and electromagnetic field (EMF) producing equipment. Performing these actions will cause communication errors and unit malfunction.*

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Reattaching the Indoor Unit Panels - HVT

Reattach the indoor unit front and bottom panel after all other installation procedures are complete.

1. If ON, shut power OFF to the system. If it hasn't already, reattach the control cover with its screw.
2. Reattach the bottom panel to the indoor unit, carefully aligning the panel using the rear tabs. Tap the panel gently to verify it engages at the bottom.
3. Using a Phillips screwdriver, reattach the screws to the bottom panel.
4. After the screws are in place, re-snap the latches over the screws.
5. Shut the front panel. Tap the panel gently to verify it is fully shut.

Figure 89: Reattaching the Bottom Panel.

Figure 90: Reattaching the Screws on the Bottom Panel.

Figure 91: Reattaching the Screws on the Bottom Panel.

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Reattaching the Indoor Unit Bottom Cover - HSV5

Reattach the indoor unit bottom cover after all other installation procedures are complete.

1. If ON, shut power OFF to the system.

2. At the bottom of the bottom cover, insert the three (3) to four (4) hinges into the channels molded to the left, right, and middle of the indoor unit (Location 1). Number of hinges present depends on model of indoor unit.

3. After all hinges are secure, match the three (3) or four (4) small C-hooks located in the middle of the bottom cover (Location 2) to their sockets on the indoor unit. (Number of C-hooks present depends on model of indoor unit.) On the outside of the bottom cover, securely snap the C-hooks in place at each location using the heel of the palm.

4. Match the snaps at the top left and right sides of the bottom cover to their sockets, and push to lock the bottom cover to the indoor unit (Location 3).

5. Verify the bottom cover is securely installed by pushing the bottom cover to the indoor unit at all attachment locations.

Note:

To prevent bending the bottom cover (and subsequent damage), assemble the bottom cover correctly.

Figure 92: Close Up of Bottom Cover Connections (Appearances Will Vary Depending on Indoor Unit Model).

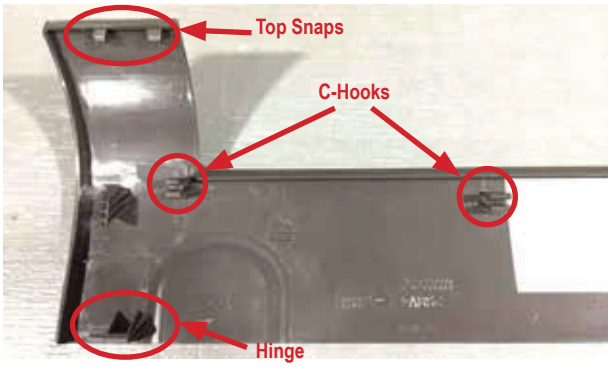


Figure 93: Inserting the Bottom Cover Hinges into the Indoor Unit Channels (Step 2).

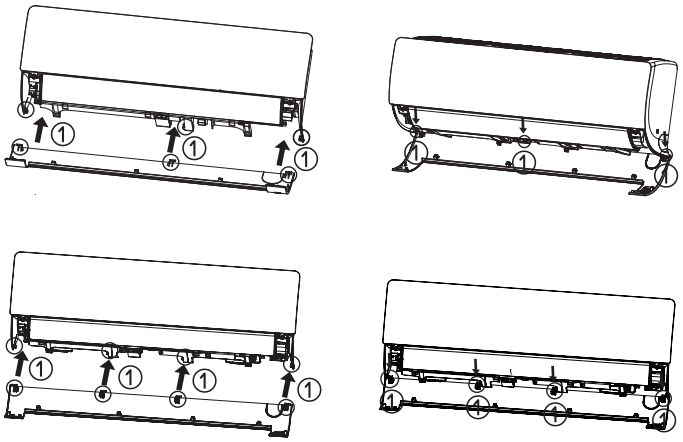


Figure 94: Securing the Bottom Cover C-hooks to the Indoor Unit Sockets (Step 3).

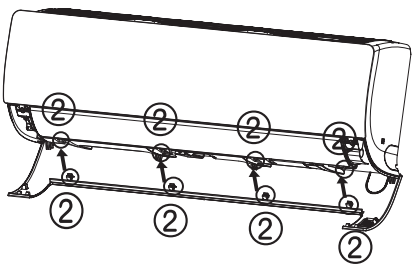
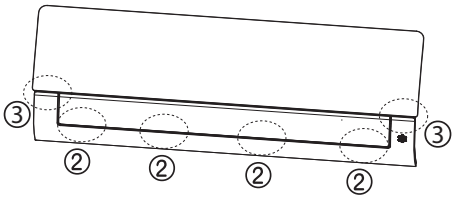


Figure 95: Snapping the Top Left and Right Sides (Step 4).

Figure 96: Checking that All Attachment Locations Are Secure (Step 5).



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Air Filter Disassembly and Assembly - HSV5

Air Filter Disassembly

1. Turn power off to the system.
2. Find the handles located at the top-front of the air filter molded into the plastic frame support.
3. Lift handles slightly up and out to remove the air filter.

Figure 97: Disassembling the Air Filter (Appearances Will Vary Depending on Indoor Unit Model).

2. Lifting the Air Filter by the Handles.

3. Disassembling the Air Filter.

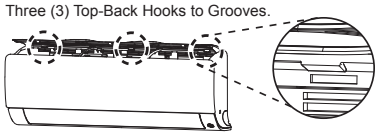
Air Filter Assembly

1. Turn power OFF to the system.
2. Holding the air filter by its handles, match the hooks and grooves on the air filter to the hooks and grooves at the top-back of the indoor unit. (Number of hooks and grooves present depends on model of indoor unit.)
3. Match the air filter bars and grooves to the grooves and hooks at the top-front of the indoor unit.
4. Use thumbs to gently snap the air filter to the indoor unit where the top-front bars, grooves, and hooks are located.
5. Check the sides of the front grille to verify the air filter is assembled correctly.
6. Turn power back on to the system.

Figure 98: Assembling the Air Filter (Appearances Will Vary Depending on Indoor Unit Model).

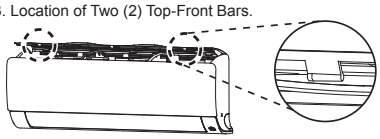
2. Matching Hooks to Top-Back Grooves.

Three (3) Top-Back Hooks to Grooves.

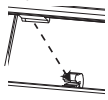


Four (4) Top-Back Hooks to Grooves.

3. Location of Two (2) Top-Front Bars.



Example of Indoor Unit Hook to Air Filter Groove.



4. Securing the Air Filter on the Indoor Unit.

5. Checking the Sides for Correct Air Filter Assembly.

Note:

- *It is easier to assemble and disassemble the air filter if standing on a ladder looking down at the top of the indoor unit.*
- ⃠ *Do not bend the air filter; this damages it.*
- *If the air filter is not assembled correctly, dust and other substances will enter the indoor unit.*

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Installing Batteries into the Handheld Remote Controller

For information on using the handheld remote controller, refer to its owner's manual.

1. The remote controller needs two AAA (1.5V) batteries for operation. Remove the battery cover from the back of the remote controller by pushing downward on the tab at the top of the battery cover, and then lift up to remove.

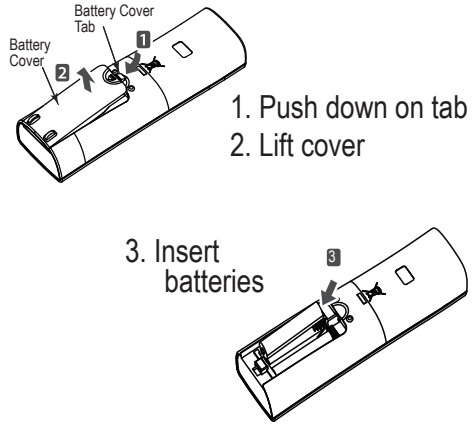
2. Insert the two new batteries.
   - Align batteries by the (+) and (-) sides.
   - The interior battery compartment of the remote controller will have clear markings for the (+) and (-) placement.

3. Verify that the batteries have clicked into the compartment and are firmly engaged with the contacts on either side of them.

4. Reattach the back cover of the remote controller.

5. Proceed with powering on the remote controller and use as needed. Remove the batteries if system won't be used for an extended time.

Figure 99: Installing the Remote Controller Batteries.



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Troubleshooting Using Error Codes

Refer to the table below for error codes that are generated from the indoor units (see the Multi F / Multi F MAX Outdoor Unit Installation Manual for outdoor unit error codes). These codes are the most common. Your particular system might generate additional codes not listed here. Please contact LG Support if you see these types of errors and a simple power cycle has not corrected the issue.

Error Codes

- Indicate different types of unit failures, assists in self-diagnosis and to track the frequency of occurrence.
- Error codes are displayed on indoor unit LEDs, wired remote controllers, the outdoor unit PCB, and through the SIMS app and LG Monitoring View (LGMV) diagnostic software. Also, check the wired remote controller display first for error codes if present.
- If two or more errors occur simultaneously, the lower error code number is displayed first.
- After the error is resolved, the error code does not display.

Decoding the Error Display

The first and second number on the LED indicates error number. Example: 21 = LED1 (Green light) 2x blink, LED2 (Red light) 1x blink.

Error Code Nomenclature Definitions

- MICOM: Non-volatile memory chip where unit setup information is stored.
- EEPROM: Non-volatile memory chip where device identification, size, and factory defined default component operating parameters are stored.

Table 19: Multi Zone Wall-Mounted Indoor Unit Error Codes

Error Code	Description	Number of Times Indoor Unit LEDs Blink	
		LED 2	LED 1
1	Indoor unit room temperature sensor error	-	1X
2	Indoor unit inlet pipe sensor error	-	2X
4	Float switch error (optional)	-	4X
5	Communication error between indoor unit and outdoor units	-	5X
6	Indoor unit outlet pipe sensor error	-	6X
9	Indoor unit EEPROM error	-	9X
10	Indoor unit BLDC motor fan lock	1X	-
12	Indoor unit middle pipe sensor error	1X	2X

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Troubleshooting Using Error Codes - Continued

Table 20: Multi F / Multi F MAX with LGRED Outdoor Unit Error Codes

Error Code	Description	No. of Times Outdoor Unit LEDs Blink	
		LED 1 = Green	LED 2 = Red
21	DC Peak (IPM Fault); Compressor DC voltage was too high	1X	2X
22	Current Transformer2 (CT2) error; Alternating current (AC) input too high	2X	2X
23	DC Link Low Volt	3X	2X
25	AC Low/High Volt	5X	2X
26	DC Comp Position Error (not providing rotation), Locking	6X	2X
27	PSC Fault; Current to inverter compressor between AC and DC converter circuit too high	7X	2X
28	Inverter compressor DC voltage is too high	8X	2X
29	Inverter compressor amperage is too high	9X	2X
31	Current-to-current transformer (CT) thermistor is too low	1X	3X
32	Inverter Compressor Discharge Pipe (D-Pipe) Overheat	2X	3X
40	CT Sensor Error; Thermistor is disconnected or shorted out	-	4X
41	D-Pipe Sensor INV is disconnected or shorted out	1X	4X
44	Outdoor Air Sensor is disconnected or shorted out	4X	4X
45	Middle thermistor of outdoor unit condenser coil is disconnected or shorted out	5X	4X
46	Outdoor unit suction line thermistor is disconnected or shorted out	6X	4X
48	Outdoor unit coil outlet (liquid line) thermistor is disconnected or shorted out	8X	4X
53	Communication failure from outdoor unit to indoor unit	3X	5X
60	Outdoor unit printed circuit board (PCB) EEPROM check sum error	-	6X
61	Outdoor unit condenser coil temperature is too high	1X	6X
62	Outdoor unit inverter compressor PCB heat sink temperature is too high	2X	6X
63	Condenser coil pipe thermistor temperature is too low	3X	6X
65	Heat sink thermistor has disconnected or has shorted out	5X	6X
67	Outdoor brushless direct current (BLDC) fan motor lock error	7X	6X

Refer to Service Manuals posted on www.lghvac.com for a full description of all error codes and workarounds.

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INSTALLATION CHECKLIST

System ID No.: _____ Indoor Unit ID.: _____

Checked by: _____ Date:_____ Signature:_____

Major Component Rough-In

Description	Check
The 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 with LGRED only) are installed, properly supported, and located indoors in a non-corrosive environment.	

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 with LGRED 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

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, 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 with LGRED Outdoor Unit Installation Manual.	
Y-branch fittings were properly SUPPORTED per details provided in the Multi F / Multi F MAX with LGRED Outdoor Unit Installation Manual.	
No oil traps, solenoid valves, sight glasses, filter driers, or any other unauthorized refrigerant specialties were present.	
(Optional) High quality R410A rated full port ball valves with a Schrader port were used at all indoor units and at will in the refrigerant piping network. (Recommended for serviceability.)	

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INSTALLATION CHECKLIST

MULTI F
MULTI F MAX

System ID No.: _____ Indoor Unit ID.: _____

Checked by: _____ Date:_____ Signature:_____

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" 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 (no traps, and connect to the top surface of the main drain line).	
Multi F / Multi F MAX with LGRED outdoor unit 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.	
All condensate lines were properly insulated to prevent condensation.	

Power Wire and Communications Cables

Description	Check
Ground wire was installed and properly terminated at the 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 with LGRED outdoor unit was field supplied, solid or stranded, and installed per all local, state, and NEC requirements.	
For Multi F with LGRED Systems • When the wiring length is up to 130 feet, communication / connection (power) wiring from the outdoor unit to the indoor unit is minimum 18 gauge, four-conductor, stranded, shielded or unshielded. If shielded, must be grounded to chassis at the outdoor unit only. • When the wiring length is GREATER THAN 130 feet, communication / connection (power) wiring from the outdoor unit to the indoor unit is minimum 18 gauge, stranded, shielded or unshielded. If shielded, must be grounded to chassis at the outdoor unit only. Use a two (2) conductor wire for power; use a two (2) conductor wire for communication / ground. Separate the power AT LEAST two (2) inches away from the communication / ground wire.	
For Multi F MAX with LGRED Systems All power wiring / communication cable to be minimum 16 AWG from the Multi F MAX with LGRED outdoor unit to the BD unit 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. • When the wiring length is up to 130 feet, communication / connection (power) wiring from the BD unit to the indoor unit is minimum 18 gauge, four-conductor, stranded, shielded or unshielded. If shielded, must be grounded to chassis at the outdoor unit only. • When the wiring length is GREATER THAN 130 feet, communication / connection (power) wiring from the BD unit to the indoor unit is minimum 18 gauge, stranded, shielded or unshielded. If shielded, must be grounded to chassis at the outdoor unit only. Use a two (2) conductor wire for power; use a two (2) conductor wire for communication / ground. Separate the power AT LEAST two (2) inches away from the communication / ground wire.	
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 with LGRED 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 with LGRED 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.	

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For further technical materials such as submittals, engineering manuals, service manuals, and catalogs, visit www.lghvac.com.

Who to call for assistance

Freight Damage and Unit Replacements	Your LG Manufacturer Representative
Missing Parts	Your LG Manufacturer Representative
Freight Damage and Unit Replacements	Your LG Manufacturer Representative
Received Wrong Indoor Unit Model	Your LG Manufacturer Representative
Installation, Startup, and Commissioning Technical Assistance	1-888-865-3026

For warranty information, visit www.lghvac.com.

LG Electronics, U.S.A., Inc.
Air Conditioning Technologies
4300 North Point Parkway
Alpharetta, Georgia 30022
www.lghvac.com

LG Customer Information Center, Commercial Products
1-888-865-3026 USA
Follow the prompts for commercial A/C products and parts.

IM_MultiF_StdWallMount_9HVT_HSV5_11_18
Supersedes: IM_MultiF_StdWallMount_11_15
IM-Multi-F_StdWallMount-03-15

LG
Life's Good

MULTI F
MULTI F MAX

STANDARD WALL-MOUNTED INDOOR UNIT INSTALLATION MANUAL

Models:

LMN079HVT	7 kBtu
LSN090HSV5	9 kBtu
LSN120HSV5	12 kBtu
LMN159HVT	15 kBtu
LSN180HSV5	18 kBtu
LMN249HVT	24 kBtu

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⃠ Do not throw away, destroy, or lose this manual.

Please read carefully and store in a safe place for future reference.
Content familiarity required for proper installation.

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

A summary list of safety precautions begins on page 3.

IM_MultiF_StdWallMount_HVT_HSV5_11_18

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

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SAFETY INSTRUCTIONS

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

TABLE OF SYMBOLS

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

INSTALLATION

⚠DANGER

⃠ Don't store or use flammable gas / combustibles near the unit.

There is risk of fire, explosion, and physical injury or death.

⚠WARNING

⃠ Do not install or remove the unit by yourself (end-user). Ask the dealer or an LG trained technician to install the unit.

Improper installation by the user will result in water leakage, fire, explosion, electric shock, physical injury or death.

For replacement of an installed unit, always contact an LG trained service provider.

There is risk of fire, electric shock, explosion, and physical injury or death.

The outdoor unit is shipped with refrigerant and the service valves closed. ⃠ Do not open service valves on the unit until all non-condensibles have been removed from the piping system and authorization has been obtained from the commissioning agent.

There is a risk of physical injury or death.

⃠ Do not run the compressor with the service valves closed.

There is risk of explosion, physical injury, or death.

Periodically check that the outdoor unit is not damaged.

There is risk of explosion, physical injury, or death.

Replace all control box and panel covers.

If cover panels are not installed securely, dust, water and animals will enter the unit, causing fire, electric shock, and physical injury or death.

Wear protective gloves when handling equipment. Sharp edges will 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 will lead to illness or death.

⃠ Do not install the unit using defective hanging, attaching, or mounting hardware.

There is risk of physical injury or death.

Dispose the packing materials safely.

- *Packing materials, such as nails and other metal or wooden parts will cause puncture wounds or other injuries.*
- *Tear apart and throw away plastic packaging bags so that children will not play with them and risk suffocation and death.*

⃠ Do not install the unit in any location exposed to open flame or extreme heat. ⃠ Do not touch the unit with wet hands.

There is risk of fire, electric shock, explosion, and physical injury or death

Install the unit considering the potential for strong winds or earthquakes.

Improper installation will cause the unit to fall, resulting in physical injury or death.

⃠ Do not change the settings of the protection devices.

If the pressure switch, thermal switch, or other protection device is shorted and forced to operate improperly, or parts other than those specified by LG are used, there is risk of fire, electric shock, explosion, and physical injury or death.

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INSTALLATION - CONTINUED

⚠WARNING

If the air conditioner is installed in a small space, take measures to prevent the refrigerant concentration from exceeding safety limits in the event of a refrigerant leak.
Consult the latest edition of ASHRAE (American Society of Heating, Refrigerating, and Air Conditioning Engineers) Standard 15. If the refrigerant leaks and safety limits are exceeded, it could result in personal injuries or death from oxygen depletion.

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

⚠CAUTION

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

Note:

Properly insulate all cold surfaces to prevent "sweating."
Cold surfaces such as un-insulated piping can generate condensate that will drip and cause a slippery surface condition and/or water damage to walls.

When installing the unit in a hospital, mechanical room, or similar electromagnetic field (EMF) sensitive environment, provide sufficient protection against electrical noise.
Inverter equipment, power generators, high-frequency medical equipment, or radio communication equipment will cause the air conditioner to operate improperly. The unit will also affect such equipment by creating electrical noise that disturbs medical treatment or image broadcasting.

⃠ **Do not use the product for special purposes such as preserving foods, works of art, wine coolers, or other precision air conditioning applications. This equipment is designed to provide comfort cooling and heating.**
There is risk of property damage.

⃠ **Do not make refrigerant substitutions. Use R410A only.**
If a different refrigerant is used, or air mixes with original refrigerant, the unit will malfunction and become damaged.

⃠ **Do not install the unit in a noise sensitive area.**

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

⃠ **Don't store or use flammable gas / combustibles near the unit.**
There is risk of product failure.

Take appropriate actions at the end of HVAC equipment life to recover, recycle, reclaim or destroy R410A refrigerant according to applicable U.S. Environmental Protection Agency (EPA) rules.

Periodically check that the outdoor unit is not damaged.
There is a risk of equipment damage.

Install the unit in a safe location where no one can step on or fall onto it. ⃠ **Do not install the unit with defective hanging, attaching, or mounting hardware.**
There is risk of unit and property damage.

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

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

The unit is shipped with refrigerant and the service valves closed. ⃠ **Do not open service valves on the unit until all non-condensibles have been removed from the piping system and authorization to do so has been obtained from the commissioning agent.**
There is a risk of refrigerant contamination, refrigerant loss and equipment damage.

⃠ **Do not run the compressor with the service valves closed.**
There is a risk of equipment damage.

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WIRING

⚠DANGER

High voltage electricity is required to operate this system. Adhere to the National Electrical Codes and these instructions when wiring.

Improper connections and inadequate grounding can cause accidental injury or death.

Always ground the unit following local, state, and National Electrical Codes.

Turn the power off at the nearest disconnect before servicing the equipment.

Electric shock can cause physical injury or death.

Properly size all circuit breakers or fuses.

There is risk of fire, electric shock, explosion, physical injury or death.

⚠WARNING

The information contained in this manual is intended for use by an industry-qualified, experienced, certified electrician familiar with the U.S. National Electric Code (NEC) who is equipped with the proper tools and test instruments.

Failure to carefully read and follow all instructions in this manual can result in personal 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 National Electrical Code, and the instructions given in this manual.

If the power source capacity is inadequate or the electric work is not performed properly, it will result in fire, electric shock, physical injury or death.

Properly tighten all power connections.

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

Ensure the unit is connected to a dedicated power source that provides adequate power.

If the power source capacity is inadequate or the electric work is not performed properly, it will result in fire, electric shock, physical injury or death.

Refer to local, state, and federal codes, and use power wires of sufficient current capacity and rating.

Wires that are too small will generate heat and cause a fire.

Secure all field wiring connections with appropriate wire strain relief.

Improperly securing wires will create undue stress on equipment power lugs. Inadequate connections will generate heat, cause a fire and physical injury or death.

Note:

⃠ Do not cut, lengthen or shorten the communications and power cable between any dry contact unit and its connected indoor unit. ⃠ Do not install the unit in a location where the communications and power cable cannot be safely and easily connected between the two units. ⃠ Do not allow strain on this cable.

Poor cable connections can cause equipment malfunction.

The information contained in this manual is intended for use by an industry-qualified, experienced, certified electrician familiar with the U.S. National Electric Code (NEC) who is equipped with the proper tools and test instruments.

Failure to carefully read and follow all instructions in this manual can result in equipment malfunction and property damage.

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OPERATION

⚠DANGER

⃠ Do not provide power to or operate the unit if it is flooded or submerged.
There is risk of fire, electric shock, physical injury or death.

Use a dedicated power source for this product.
There is risk of fire, electric shock, physical injury or death.

⃠ Do not operate the disconnect switch with wet hands.
There is risk of fire, electric shock, physical injury or death.

Periodically verify that the hardware securing the unit has not deteriorated.
If the unit falls from its installed location, it can cause property damage, product failure, physical injury or death.

If refrigerant gas leaks out, ventilate the area before operating the unit.
If the unit is mounted in an enclosed, low-lying, or poorly ventilated area and the system develops a refrigerant leak, it will cause fire, electric shock, explosion, physical injury or death.

⚠WARNING

⃠ Do not allow water, dirt, or animals to enter the unit.
There is risk of unit failure, fire, electric shock, physical injury or death.

⃠ Avoid excessive cooling and periodically perform ventilation to the unit.
Inadequate ventilation is a health hazard.

⃠ Do not touch refrigerant piping during or after operation.
It can cause burns or frostbite.

⃠ Do not operate the unit with the panel(s) or protective cover(s) removed; keep fingers and clothing away from moving parts.
The rotating, hot, cold, and high-voltage parts of the unit can cause physical injury or death.

Periodically verify the equipment mounts have not deteriorated.
If the base collapses, the unit could fall and cause physical injury or death.

Periodically check power cable and connection for damage.
Cable must be replaced by the manufacturer, its service agent, or similar qualified persons in order to avoid physical injury and/or electric shock.

Securely attach the electrical cover to the unit.
Non-secured electrical covers can result in burns or electric shock due to dust or water in the service panel.

⃠ Do not open the inlet grille of the unit during operation. ⃠ Do not operate the unit with the panels or guards removed. ⃠ Do not insert hands or other objects through the inlet or outlet when the unit is powered. ⃠ Do not touch the electrostatic filter, if the unit includes one.
The unit contains sharp, rotating, hot, and high voltage parts that can cause personal injury and/or electric shock.

Ensure no power is connected to the unit other than as directed in this manual. Remove power from the unit before removing or servicing the unit.
There is risk of unit failure, fire, electric shock, physical injury or death.

⚠CAUTION

⃠ To avoid physical injury, use caution when cleaning or servicing the air conditioner.

Note:

Clean up the site after installation is finished, and check that no metal scraps, screws, or bits of wiring have been left inside or surrounding the unit.

⃠ Do not use this equipment in mission critical or special-purpose applications such as preserving foods, works of art, wine coolers or refrigeration. This equipment is designed to provide comfort cooling and heating.

Provide power to the compressor crankcase heaters at least six (6) hours before operation begins.
Starting operation with a cold compressor sump(s) will result in severe bearing damage to the compressor(s). Keep the power switch on during the operational season.

⃠ Do not block the inlet or outlet.
Unit will malfunction.

Securely attach the electrical cover to the indoor unit.
Non-secured covers can result in fire due to dust or water in the service panel.

Periodically verify the equipment mounts have not deteriorated.
If the base collapses, the unit could fall and cause property damage or product failure.

⃠ Do not allow water, dirt, or animals to enter the unit.
There is risk of unit failure.

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UNIT NOMENCLATURE

Multi F Multi-Zone Systems — Indoor Units

L = LG

Frame Type:
M = Multi-Zone
A/S = Single Zone (Gen 4, 5 Single Zone units also compatible with Multi Zone)

Component:
AN: Art Cool™ Wall-Mounted Indoor Unit
N: Standard Wall-Mounted Indoor Unit
CN: Four-Way Ceiling-Cassette Indoor Unit
DN: Ceiling-Concealed Duct (Low Static) Indoor Unit
HN: Ceiling-Concealed Duct (High Static) Indoor Unit
VN: Vertical-Horizontal Air Handling Indoor Unit

Nominal Capacity
(Nominal cooling capacity in Btu/h):

079 = 7,000	159 = 15,000
090 = 9,000	180 = 18,000
120 = 12,000	249 = 24,000

Features:
H = Heat Pump
V = Inverter
T = High Wall-Mounted Indoor Unit
P = Art Cool Gallery Indoor Unit

Generation:
3 = Third (also Third Gen if no number in this position)
4 = Fourth
5 = Fifth

- *Voltage for all equipment is 208-230V, 60 Hz, 1-phase.*
- *All indoor units are compatible with wired controllers*

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Multi F and Multi F MAX Standard Wall-Mounted Units

This manual describes how to install the LG Multi F and Multi F MAX (Multi Zone) Standard Wall-Mounted Indoor Units (IDU) for Multi F heat pump systems. The table on the next page lists the available models. Refer to LG's Multi F Indoor Unit Engineering Manual for complete detailed engineering data and selection procedures.

Figure 1: Multi F Standard Wall-Mounted HVT Indoor Unit.

Safety

Safety of personnel is the primary concern during all procedures. Read and understand the safety summary at the front of this manual. Read and understand this installation procedure before beginning installation. Use the appropriate tools and accessories during installation. Plan the work and ⃠ do not work alone, if possible. Know how to obtain emergency medical and fire fighting assistance.

Figure 2: Multi F Standard Wall-Mounted HSV5 Indoor Unit.

Installation Personnel

This equipment is intended for installation by personnel trained in the required construction, mechanical, electrical, and/or other disciplines.

⚠WARNING

Installation work must be performed by trained personnel and in accordance with national wiring standards and all local or other applicable codes. Improper installation can result in fire, electric shock, physical injury, or death.

Note:

Please read all instructions before installing this product. Become familiar with the unit's components and connections, and the order of installation. Incorrect installation can degrade or prevent proper operation.

Required Tools (field provided)

- Level
- Screwdriver
- Electrical lineman pliers
- Electric drill
- Hole saw
- Drill
- Flaring tool set
- Tubing cutter
- Tube/pipe reamer
- Torque wrenches
- Allen wrench
- Gas-leak detector
- Thermometer

Required Parts (field provided)

- Connecting cable (power and control)
- Pipes - vapor line and liquid line, with insulation
- Insulated drain hose
- Additional drain hose

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Included Parts

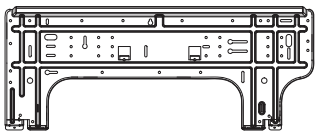
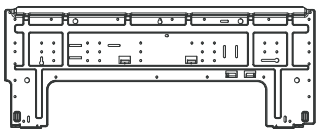
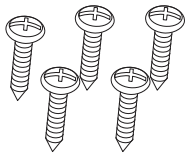
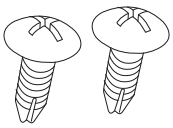
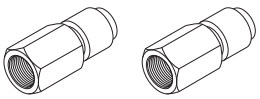
Part	Quantity	Image
Installation Plate	One (1)	 7,000 ~ 15,000 Btu/h Indoor Units  18,000 and 24,000 Btu/h Indoor Units
Type “A” Screws	Five (5)	
Type “B”, “C”, and “D” Screws (Example image; appearances will vary)	Two (2) Each Type	
Wireless Controller with Holder AKB74955602	One (1)	
Connectors (For use with Multi F Systems)	One (1) Each for Ø3/8 inch → Ø 1/2 inch One (1) Each for Ø5/8 inch → Ø 1/2 inch One (1) Each for Ø1/4 inch → Ø 3/8 inch (All three connectors listed above are included with the 18,000 Btu/h indoor unit; the Ø3/8 inch → Ø 1/2 is the only one required for the 24,000 Btu/h indoor unit.)	

Table 1: Multi F Standard Wall-Mounted Indoor Units.

Unit	Model Number	Nominal Capacity	
		Cooling (Btu)	Heating (Btu)
	LMN079HVT	7,000	8,100
	LMN159HVT	14,300	15,600
	LMN249HVT	24,000	25,600
	LSN090HSV5	9,000	10,900
	LSN120HSV5	12,000	13,600
	LSN180HSV5	18,000	21,600

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R410A Refrigerant

R410A refrigerant has a higher operating pressure in comparison to R22 refrigerant. All piping system materials installed must have a higher resisting pressure than the materials traditionally used in R22 systems.

R410A refrigerant is an azeotrope of R32 and R125, mixed at 50:50. The ozone depletion potential (ODP) is 0.

⚠WARNING

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

Note

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

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Table 2: Multi F Multi Zone Standard Wall-Mounted Indoor Unit Specifications.

Model Name	LMN079HVT	LSN090HSV5	LSN120HSV5	LMN159HVT	LSN180HSV5	LMN249HVT
Nominal Cooling Capacity (Btu/h)[1]	7,000	9,000	12,000	14,300	18,000	24,000
Nominal Heating Capacity (Btu/h)[1]	8,100	10,900	13,600	15,600	21,600	25,600
Operating Range						
Cooling (°F WB)	57-77					
Heating (°F DB)	59-81					
Fan						
Type	Cross Flow					
Motor Output (W) x Qty.	30 x 1				60 x 1	
Motor/Drive	Brushless Digitally Controlled / Direct					
Airflow Rate CFM (H/M/L)	254 / 204 / 148	268 / 218 / 169	282 / 233 / 177	314 / 268 / 184	558 / 438 / 353	597 / 452 / 367
Unit Data						
Refrigerant Type[2]	R410A					
Refrigerant Control	Electronic Expansion Valve (EEV)					
Power Supply V, Ø, Hz[3]	208-230, 1, 60					
Rated Amps (A)	0.4					
Sound Pressure Level ±3 dB(A) (H/M/L)[4]	35 / 31 / 26	36 / 32 / 27	38 / 34 / 29	42 / 38 / 32	44 / 38 / 34	46 / 41 / 36
Dimensions (W x H x D, in.)	32-15/16 x 12-1/8 x 7-7/16				39-9/32 x 13-19/32 x 8-9/32	
Net Unit Weight (lbs.)	18.3				25.6	
Shipping Weight (lbs.)	23.4				32.2	
Power Wiring / Communications Cable (No. x AWG)[5]	4 x 18					
Heat Exchanger (Row x Column x Fin / inch) x Number	(2 x 23 x 22) x 1				(2 x 16 x 20) x 1	
Pipe Size						
Liquid (in.)	1/4					
Vapor (in.)	3/8				1/2	
Connection Size						
Liquid (in.)	1/4				3/8	1/4
Vapor (in.)	3/8				5/8	1/2
Drain O.D. / I.D. (in.)	27/32, 5/8					

[1]Nominal capacity is rated 0 ft. above sea level with corresponding refrigerant piping length in accordance with standard length of each outdoor unit and a 0 ft. level difference between outdoor and indoor units. All capacities are net with a combination ratio between 95 – 105%.

Nominal cooling capacity rating obtained with air entering the indoor unit at 80ºF dry bulb (DB) and 67ºF wet bulb (WB) and outdoor ambient conditions of 95ºF dry bulb (DB) and 75ºF wet bulb (WB).

Nominal heating capacity rating obtained with air entering the indoor unit at 70ºF dry bulb (DB) and 60ºF wet bulb (WB) and outdoor ambient conditions of 47ºF dry bulb (DB) and 43ºF wet bulb (WB).

[2]This unit comes with a dry helium charge.

[3]Acceptable operating voltage: 187V-253V.

[4]Sound pressure levels are tested in an anechoic chamber under ISO Standard 3745 and are the same in both cooling and heating mode. These values can increase due to ambient conditions during operation.

[5]All power wiring / communications cable to the IDUs be minimum 18 AWG, 4-conductor, stranded, shielded or unshielded (if shielded, must be grounded to chassis at ODU only) and must comply with applicable local and national codes.

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Figure 3: LMN079HVT, LSN090HSV5, LSN120HSV5, and LMN159HVT Dimensions.

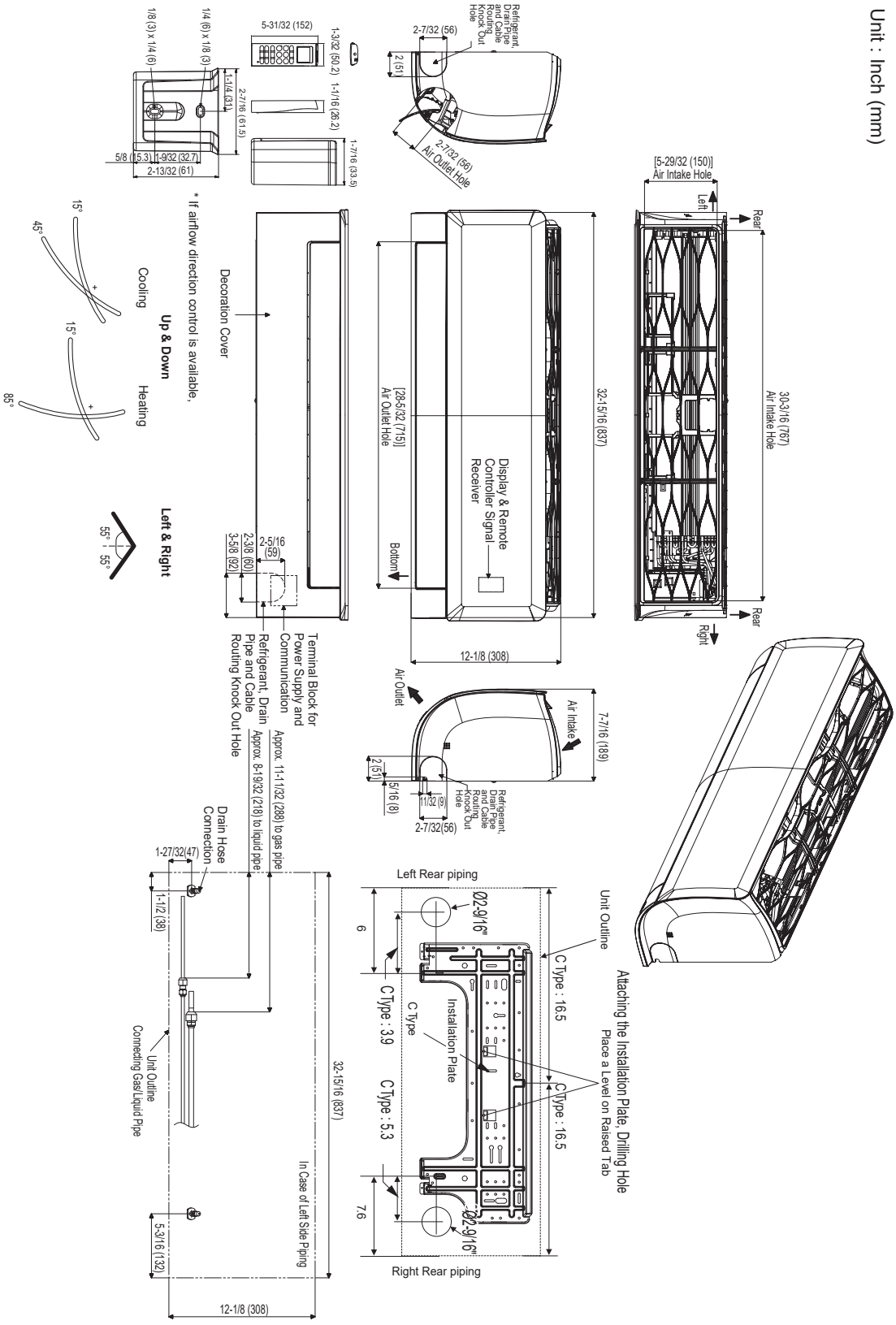

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Figure 4: LSN180HSV5 and LMN249HVT Dimensions.

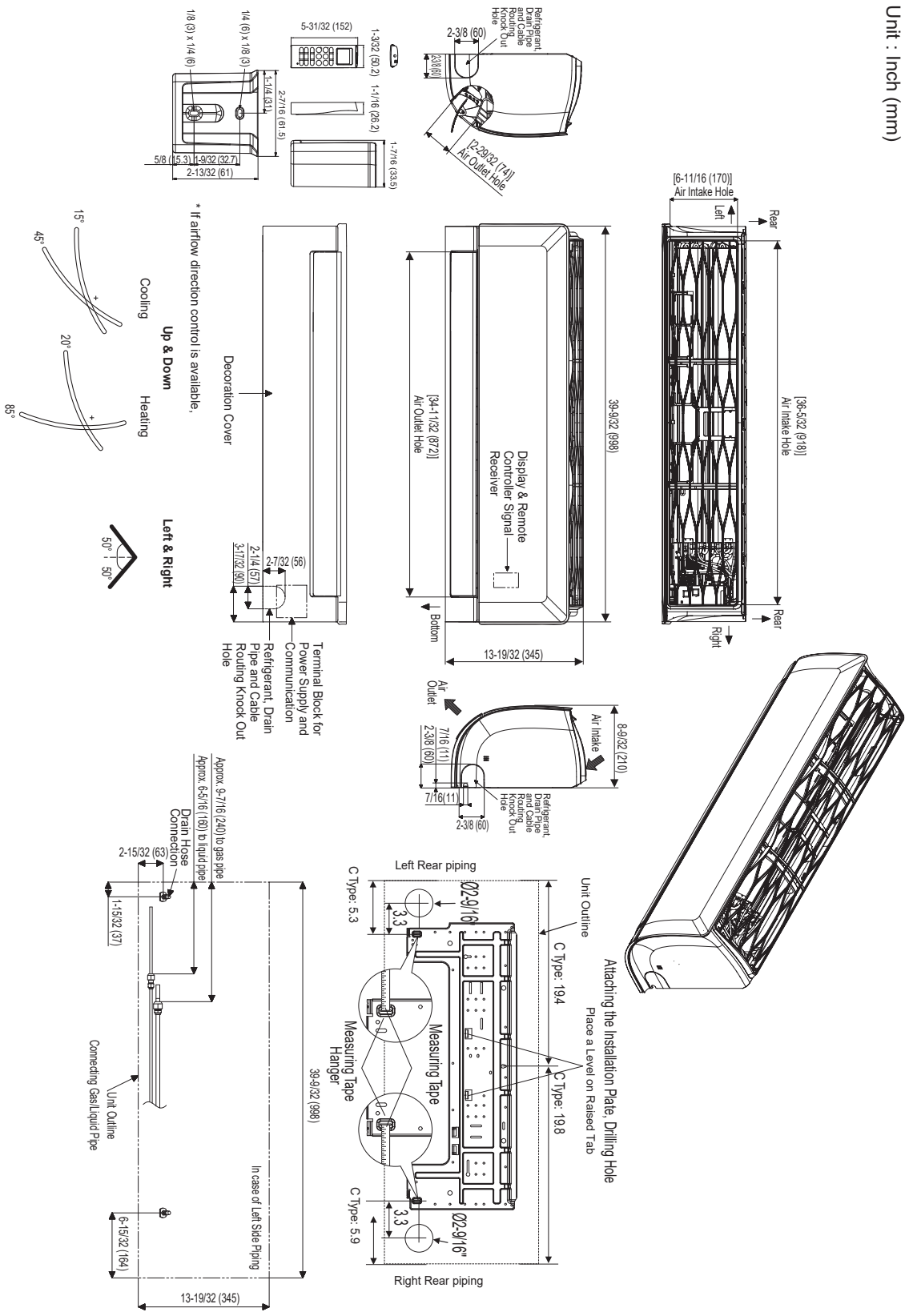

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Figure 5: Multi F Standard Wall-Mounted Indoor Unit Refrigerant Flow Diagram (9HVT and HSV5).

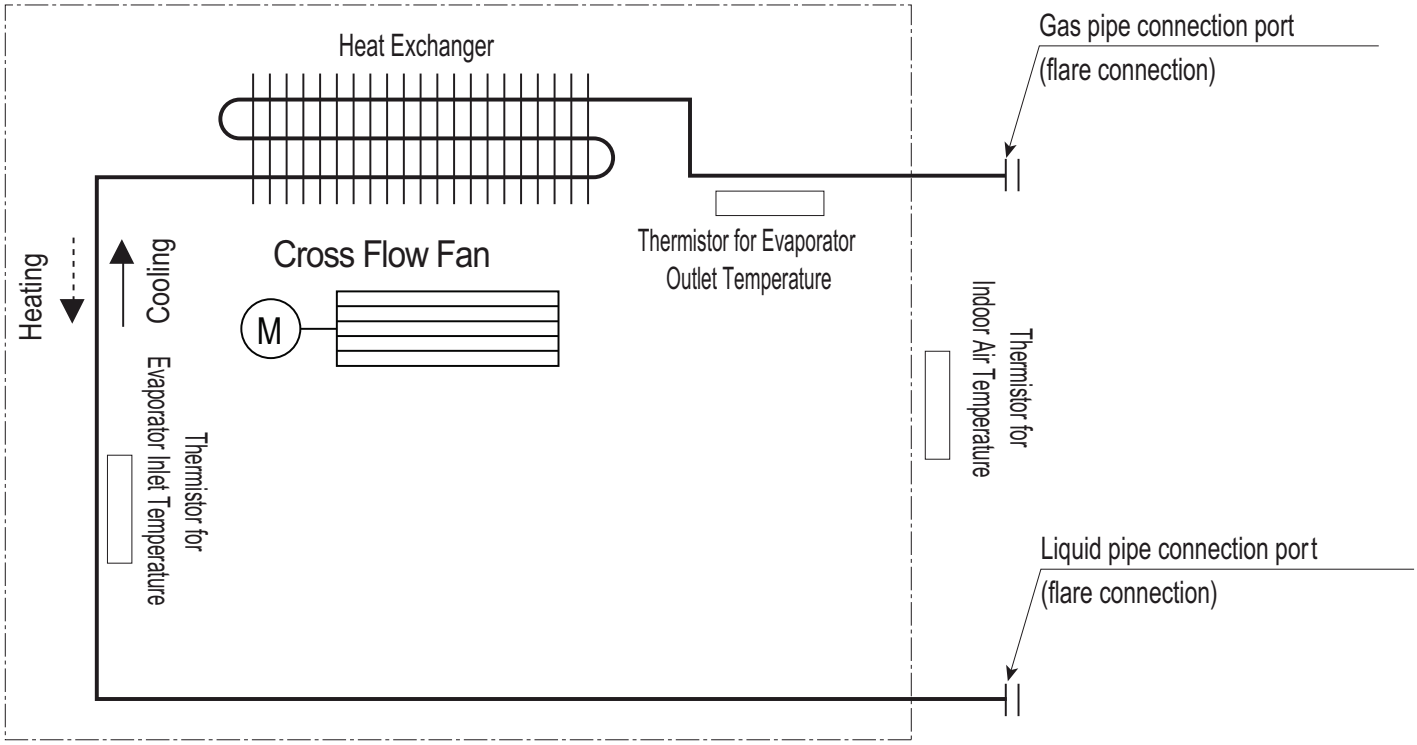

Table 3: Multi F Standard Wall-Mounted Indoor Unit Refrigerant Pipe Sizes.

Model No.	Vapor (inch)	Liquid (inch)
LMN079HVT	Ø3/8	Ø1/4
LSN090HSV5		
LSN120HSV5		
LMN159HVT		
LSN180HSV5	Ø1/2	
LMN249HVT		

Table 4: Multi F Standard Wall-Mounted Indoor Unit Refrigerant Pipe Connections.

Model No.	Vapor (inch)	Liquid (inch)
LMN079HVT	Ø3/8	Ø1/4
LSN090HSV5		
LSN120HSV5		
LMN159HVT		
LSN180HSV5	Ø5/8	Ø3/8
LMN249HVT	Ø1/2	Ø1/4

Table 5: Multi F LSNxxxHSV5 Standard Wall-Mounted Indoor Unit Thermistor Details.

Description	PCB Connector
Indoor Air Temperature Thermistor	CN-TH1
Evaporator Inlet Temperature Thermistor	
Evaporator Middle Temperature Thermistor	CN-TH2
Evaporator Outlet Temperature Thermistor	
Water Level Sensor (Optional)	CN-TH3

Table 6: Multi F LMNxxxHVT Standard Wall-Mounted Indoor Unit Thermistor Details.

Description	PCB Connector
Indoor Air Temperature Thermistor	CN-TH1
Evaporator Inlet Temperature Thermistor	
Evaporator Outlet Temperature Thermistor	CN-TH2
Water Level Sensor (Optional)	CN-TH3

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Unpack and Inspect for Freight Damage

⚠CAUTION

Shipping and net weights of the wall-mounted units are listed in the specifications table. To help avoid injury to personnel and damage to the unit, use two people when carrying a unit by hand.

Note:

- *Shipping and net weights of the ceiling cassette units are listed in the specification tables in the beginning of this manual. To help avoid damage to the unit, use at least two people when carrying a unit by hand.*
- *Before opening the shipping container, check the container labeling to verify the unit received is the correct unit. Verify the unit capacity, type, and voltage. Refer to the "Unit Nomenclature" chart in the beginning of this manual.*
- *After opening, if the unit is damaged, repack the unit as it was shipped to you. RETAIN ALL PACKING MATERIALS. In general, freight damage claims will be denied if the original packing materials are not retained for the claims adjustor to inspect. Contact your supervisor on how to proceed with filing a freight claim and to order a replacement unit.*
- *To avoid damaging the indoor unit, ⃠ do not unpack the unit and remove the protective materials until it is ready to install. Before unpacking, carefully move the packaged unit to a work area near the installation location.*

1. Before opening the shipping container, verify that the correct unit is present as described in the Note above.
2. Place the box on a solid surface right side up.
3. Cut the white reinforced nylon straps.
4. Open the top of the box and fold back all four flaps.
5. Remove the protective cardboard / Styrofoam® top sheet and place to the side.
6. The walls and top panels are not attached to the bottom of the box. Lift the cardboard carton by the flaps and remove the box walls and top and place it to the side.
7. Remove the moisture barrier plastic bonnet.
8. Check the unit nameplate data and model number. Verify the unit voltage and capacities are correct before proceeding.
9. Locate and retain the included parts located in the box.
10. Using two people, carefully lift the unit and inspect for freight damage. ⃠ DO NOT lift by the refrigerant piping or drain pipe stub. Lift by the frame only. If damage is found, repack the unit as it was received in the original container.

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Location Selection

Note:

Follow required best practices when choosing a location for the Standard Wall-Mounted Indoor Units (IDU).

⚠DANGER

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

Select a location for installing the wall-mounted indoor unit (IDU) that meets the following conditions:

Do's

- Ensure that the wall is solid and has enough structural strength to bear the weight of the installation plate and indoor unit.
- Include enough space for service access.
- Place the unit in a location where drainage can be obtained easily and to minimize the length of the condensate drain piping; include space for drainage to ensure condensate flows properly out of the unit when it is in cooling mode.
- Place the unit in a location where air circulation will not be blocked; keep proper distances from ceilings, doorways, floor, walls, etc.
- Place the unit in a location where operating sound from the unit will not disturb occupants--place the unit where noise prevention is taken into consideration
- Ensure there is sufficient space from the ceiling and floor.
- Use a level indicator to ensure the unit is installed on a level plane.
- Use a stud finder to locate studs easily, preventing unnecessary damage to the wall.
- Locate the indoor unit in a location where it can be easily connected to the outdoor unit / branch distribution unit.

⃠ Don'ts

- ⃠ *Do not install the unit where it will be subjected to direct thermal radiation from other heat sources.*
- ⃠ *Do not install the unit in a location where acidic solution and spray (sulfur) are often used.*
- ⃠ *Do not use the unit in environments where oil, steam, or sulfuric gas are present.*
- ⃠ *Do not install additional ventilation products on the chassis of the unit.*
- ⃠ *Avoid installing the unit near high-frequency generator sources.*
- ⃠ *Do not install the unit near a doorway.*
- ⃠ *Do not install the unit near a heat or steam source, or where considerable amounts of oil, iron powder, or flour are used. These materials will generate condensate, cause a reduction in heat exchanger efficiency, or malfunction of the condensate drain. If this is a potential problem, install a ventilation fan large enough to vent out these materials.*

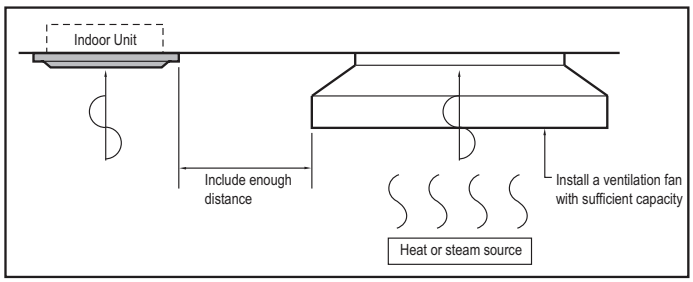
⚠WARNING

The unit must not be installed where sulfuric acid and flammable or corrosive gases are generated, vented into, or stored. There is risk of fire, explosion, and physical injury or death.

Note:

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

Figure 6: Installing Near a Heat or Steam Source.



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Note:

- *Indoor units (IDUs) must not be placed in an environment where the IDUs will be exposed to harmful volatile organic compounds (VOCs) or in environments where there is improper air make up or supply or inadequate ventilation. If there are concerns about VOCs in the environment where the IDUs are installed, proper air make up or supply and/or adequate ventilation must be provided. Additionally, in buildings where IDUs will be exposed to VOCs, consider a third party factory-applied epoxy coating to the fan coils for each IDU where the entire coil is dipped, not sprayed.*
- *If the unit is installed near a body of water, the installation parts are at risk of corroding. Appropriate anti-corrosion methods must be taken for the unit and all installation parts.*

Installing in an Area Exposed to Unconditioned Air

In some installation applications, areas (floors, walls) in some rooms will be exposed to unconditioned air (room will be above or next to an unheated garage or storeroom). To countermeasure:

- Verify that carpet is or will be installed (carpet will increase the temperature by three degrees).
- Add insulation between the floor joists.
- Install radiant heat or another type of heating system to the floor.

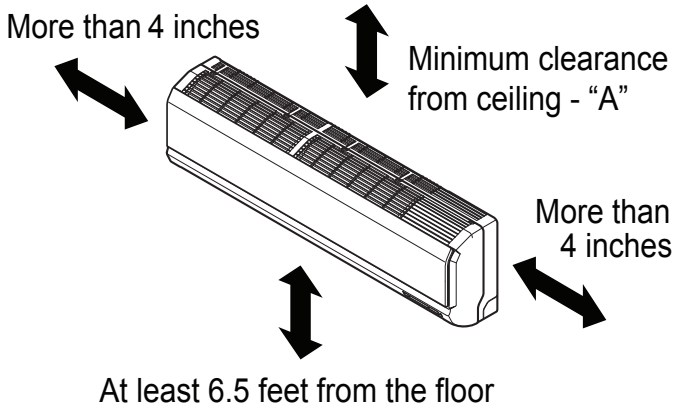
Required Clearances

The figure at right and table below list required clearance distances around a typical installed wall-mounted unit.

Table 7: Standard Wall Mount Indoor Unit Ceiling Clearances.

"A" Ceiling Clearance (inches)	Indoor Unit Model(s)
5	LMN079HVT, LMN159HVT, LSN090HSV5, LSN120HSV5
8	LSN180HSV5, LMN249HVT

Figure 7: Standard Wall Mount Indoor Unit Clearance Requirements.



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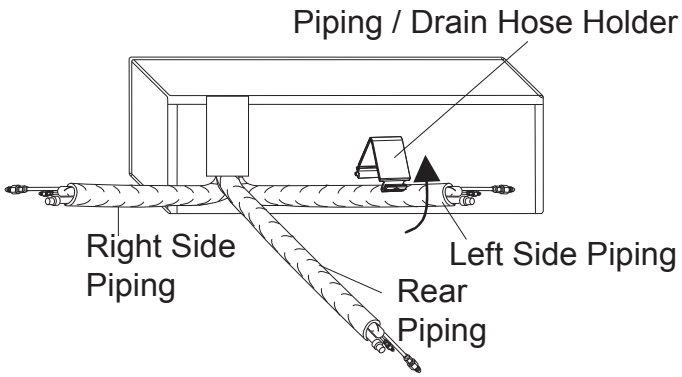
General Guidelines — HVT and HSV5 Wall-Mounted Indoor Units

Wall-mounted indoor units have several options on how the piping and wiring can be routed (see figure at right). Whichever way the piping and wiring are routed out of the indoor units, the mounting wall on which the indoor unit is installed must be strong and solid enough to protect it from vibration.

- Mount the installation plate on the wall using the Type “A” screws. If mounting the unit on concrete, consider using anchor bolts.
- Always mount the installation plate horizontally. Measure the wall and mark the center line using thread and a level.

Figure 8: Choice of Piping / Wiring Routes.



⚠WARNING

- *Mounting hardware must be securely installed to prevent the chassis falling from its installation location. There is risk of injury or property damage from falling equipment.*
- *When choosing a location for the wall mount plate, be sure to take into consideration routing of wiring for power outlets within the wall. Touching wiring can cause serious bodily injury or death.*
- *Installation work must be performed by trained personnel and in accordance with all local or other applicable codes. There is risk of injury to personnel from incorrect installation.*

Note:

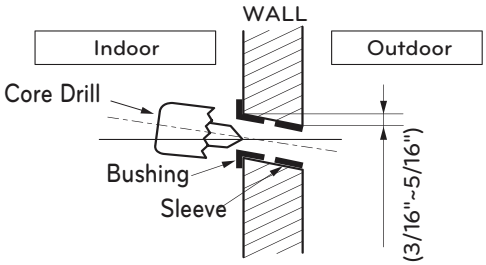
- *Ensure the unit is properly installed. Incorrectly installed units can result in degraded performance or an inoperative unit / system.*
- *Mounting hardware must be securely installed to prevent the chassis falling from its installation location. There is risk of property damage from falling equipment.*
- *Use a level indicator to ensure the installation plate and chassis are installed on a level plane.*
- *If the unit is installed near a body of water, certain components are at risk of being corroded. Appropriate anti-corrosion methods must be taken for the unit and all components.*

Drilling the Piping Hole in the Wall

Follow all piping clearance recommendations.

1. Using a 2-9/16 to 2-5/8 inch hole core drill bit (depending on indoor model type), drill a hole at either the right or left side of the wall mounting, pre-chosen following installation guidelines and application needs.
   - The slant of the hole must be 3/16” to 5/16” from level with the slant being upward on the indoor unit side and downward on the outdoor unit side.
2. Finish off the newly drilled hole as shown with bushing and sleeve covering to prevent damage to the insulation and piping.

Figure 9: Drilling Piping Hole.



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Mounting the Installation Plate to the Wall

⚠ WARNING

- *Mounting hardware must be securely installed to prevent the frame falling from its installation location. There is risk of personnel injury from falling equipment.*
- *When choosing a location for the wall mount plate, take into consideration routing of wiring for power outlets within the wall. Contacting wiring can cause serious bodily injury or death.*
- *Use caution when drilling holes through the walls for the purposes of piping connections. Power wiring can cause serious bodily injury or death.*
- *Installation work must be performed by trained personnel and in accordance with all local or other applicable codes. There is risk of injury to personnel from incorrect installation.*

Note:

- *Mounting hardware must be securely installed to prevent the frame falling from its installation location. There is risk of property damage from falling equipment.*
- *Select the location carefully. Unit must be anchored to a strong and solid wall to prevent unnecessary vibration, and to securely hold the installation place and the weight of the frame.*
- *Ensure the unit is properly installed. Incorrectly installed units can result in degraded performance or an inoperative unit/system.*
- *Use a level indicator to ensure the installation plate and chassis are installed on a level plane.*
- *If the unit is installed near a body of water, certain components are at risk of being corroded. Appropriate anti-corrosion methods must be taken for the unit and all components.*

Follow the procedure below and general best practices when mounting the indoor unit's installation plate to a wall.

1. The wall mounted indoor unit is shipped with the installation plate attached to its back. To remove, unscrew the one (1) screw that holds the installation plate to the back of the indoor unit. See the installation plate diagrams below.
2. Always mount the installation plate horizontally. Align the centerline using a leveling tool. Measure the wall and mark the centerline.
3. Attach the installation plate to the wall following the measurements and marks. Mount the installation plate on the wall using the factory-supplied Type "A" screws. If mounting the unit on a concrete wall, use field-supplied anchor bolts. Use a level to ensure the plate is level.
4. Observe all rear piping clearances when drilling into the wall.

Figure 10: General Wall Mount Indoor Unit Installation Plate—Side View (Example Only. Appearances Will Vary Depending on Model).

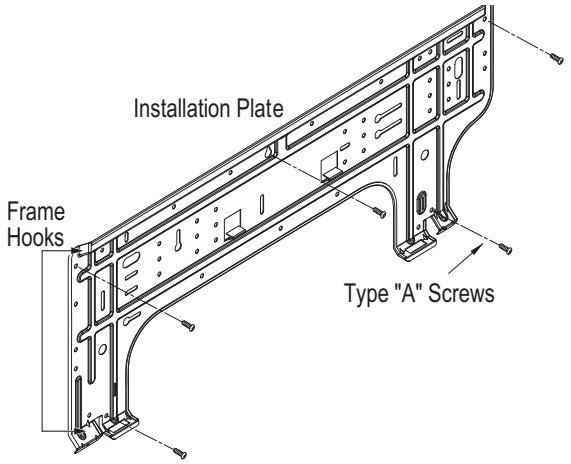


Figure 11: Installation Plate Attaching Screw Placement (Example Only. Appearances and Placement Will Vary Depending on Model).

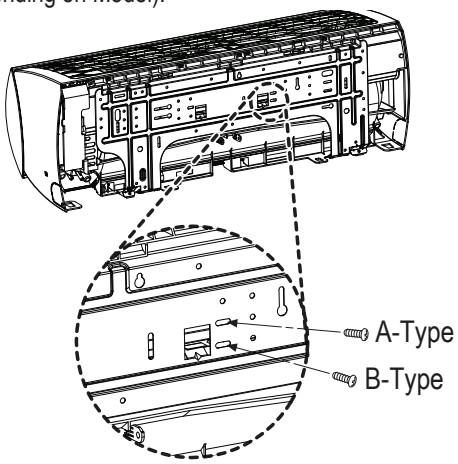
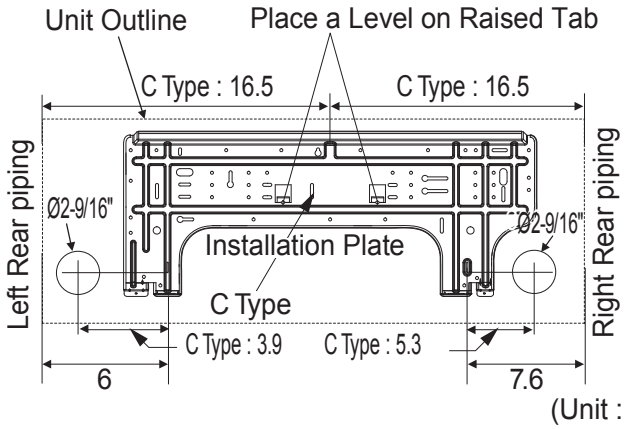
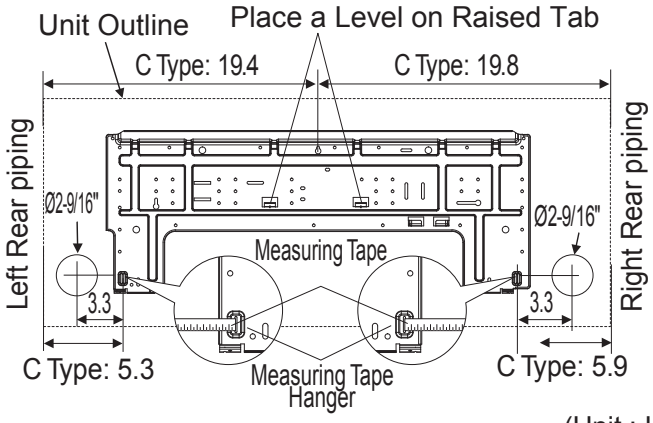


Figure 12: Installation Plate for LMN079HVT, LMN159HVT, and LSN090-120HSV5 Indoor Units.



(Unit : Inch)

Figure 13: Installation Plate for LSN180HSV5 and LMN249HVT Indoor Units.



(Unit : Inch)

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Removing the Indoor Unit Bottom Cover — HVT Wall-Mounted Indoor Units

To access the indoor unit piping port connections, terminal block, and to make the indoor unit installation procedure easier, it is recommended that the bottom cover be removed first.

1. Fully open the front panel.

2. At the bottom panel of the indoor unit, unsnap the latches that cover the screws. Number of screws on the panel will differ by indoor unit model.

3. Using a Phillips head screwdriver, remove the screws from the bottom panel of the indoor unit and set aside for re-installation.

4. Remove the bottom panel, being careful not to scratch the main horizontal vane. Set aside the bottom panel to re-install after all procedures are complete.

Figure 14: Latch over Screws on Indoor Unit Bottom Panel.

Figure 15: Remove Screws from Bottom Panel.

Figure 16: Remove Bottom Panel.

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Removing the Indoor Unit Bottom Cover — HSV5 Wall-Mounted Indoor Units

To access the indoor unit piping port connections, terminal block, and to make the indoor unit installation procedure easier, it is recommended that the bottom cover be removed first.

1. Unsnap the bottom cover at its top left and right sides (Location 1).

2. Unsnap each of the three (3) or four (4) small C-hooks located in the middle of the bottom cover (Location 2). Number of C-hooks present depends on model of indoor unit.

3. Lift the three (3) to four (4) hinges on the bottom cover up and out of the channels molded to the left, right, and middle of the indoor unit (Location 3). Number of hinges present depends on model of indoor unit.

4. Set aside the bottom cover to re-install after all procedures are complete.

Figure 17: Removing the HSV5 Bottom Cover.

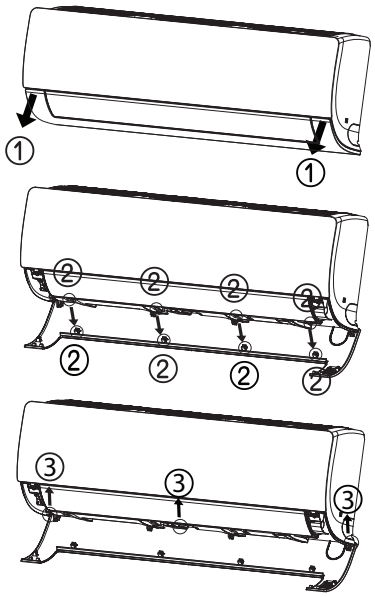


Figure 18: Removing the HSV5 Bottom Cover (Appearances Will Vary Depending on Indoor Unit Model).

Figure 20: Bottom Cover with Top and Middle Unsnapped, Front View (Appearances Will Vary Depending on Indoor Unit Model).

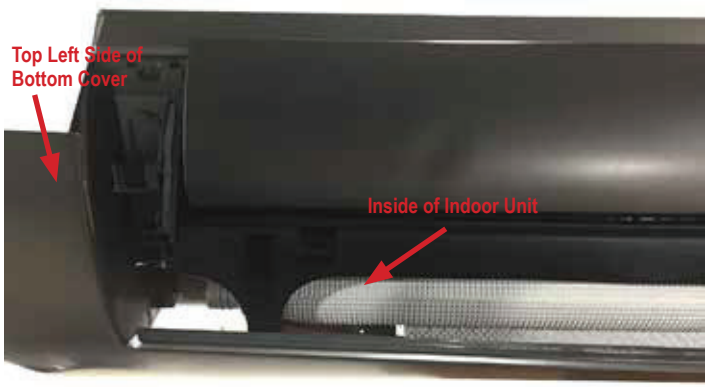
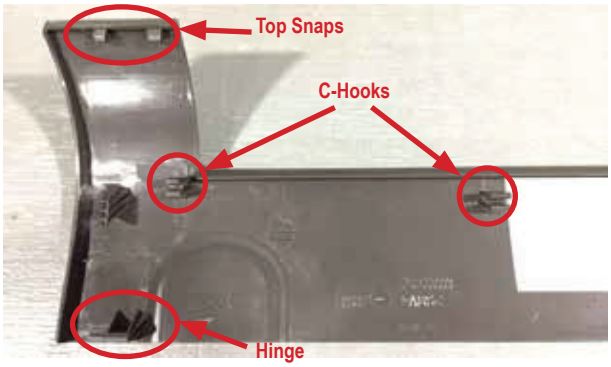


Figure 19: Back of Bottom Cover Completely Removed from Indoor Unit (Appearances Will Vary Depending on Indoor Unit Model).

Figure 21: Close Up of Bottom Cover Connections (Appearances Will Vary Depending on Indoor Unit Model).



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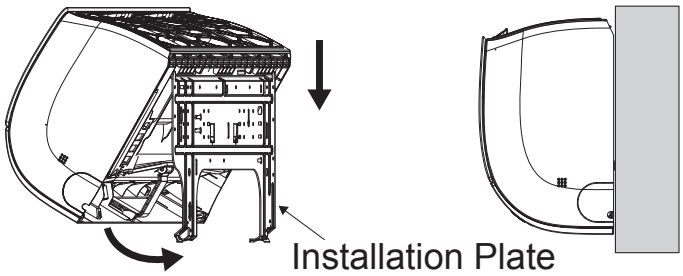
Mounting the Indoor Unit to the Installation Plate — HVT and HSV5 Wall-Mounted Indoor Units

1. Position the indoor unit onto the upper portion of the installation plate.

2. Engage the hooks at the top of the indoor unit with the upper edge of the installation plate (number of hooks depends on model type).

3. Ensure the hooks are properly seated on the installation plate by shaking the indoor unit left and right.

Figure 22: Attaching the Indoor Unit to the Installation Plate.



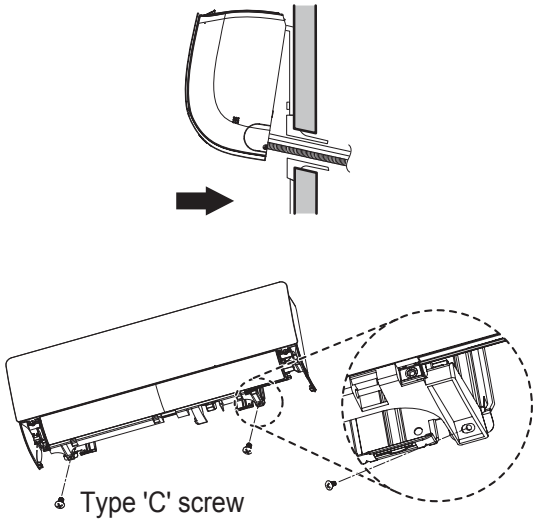
Note:

Permanently secure the indoor unit to the wall ONLY AFTER all other tasks such as Refrigerant Piping Connections, Drain Piping Connections, Electrical Connections, and Final Installation Procedures are complete. See next page for steps on how to prepare for piping and electrical connections.

4. Carefully guide the refrigerant piping and drain piping through the access hole.

5. Push the bottom of indoor unit towards the installation plate to anchor to the wall.
   - Press the lower left and right sides of the unit against the installation plate until the hooks engage into their slots.
   - A clicking sound will be heard as the bottom of the indoor unit attaches to the installation plate successfully.
   - Pay attention to the positioning of the piping through the wall.

Figure 23: Finishing Indoor Unit Installation to the Wall Plate (Example).



6. Finish the installation by completely securing the indoor unit to the installation plate using the factory-supplied screws (screw placement will vary depending on indoor unit model).

⚠WARNING

The indoor unit can fall from the wall if it is not properly installed and secured to the installation plate. Falling indoor units can cause bodily injury or death.

Note:

- *To avoid a gap between the indoor unit and the wall, ensure the screws are correctly and fully secured to the installation plate.*
- *To prevent condensate from forming due to an inflow of outdoor air, before indoor unit installation is finished, completely seal the piping access hole in the wall.*

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Preparing for Piping / Electrical Connections

1. To prepare the indoor unit for piping and electrical installation, disengage bottom on indoor unit from installation plate by reversing Steps 6, 5, and 4 from the previous procedure, if those procedures have been performed.

2. Unsnap the piping / drain hose holder (L-bracket) out from the indoor unit frame. Prop it open between the indoor unit frame and installation plate to separate the bottom of the indoor unit from the wall. This will allow for more working space.

Figure 24: L-bracket Closed (Appearances Will Vary Depending on Indoor Unit Model).

Figure 25: Mounting the Indoor Unit on Installation Plate.

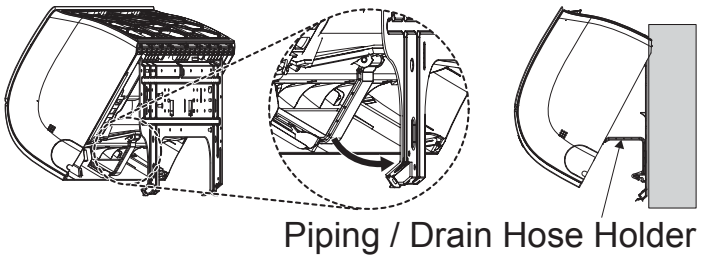


Figure 26: L-bracket Open (Appearances Will Vary Depending on Indoor Unit Model).

Note:

- *Go to the Electrical Installation section of this manual for information on electrical wiring to the indoor unit.*
- *After all Refrigerant Piping and Electrical Connection procedures are complete, snap the L-bracket closed, and secure the indoor unit to the installation plate as detailed in Steps 5 and 6 in "Mounting the Indoor Unit to the Installation Plate".*

Positioning the Indoor Unit Piping / Electrical Connections

Wall-mounted indoor units have several options on how the piping and wiring can be routed (see figure at right). Installation is pre-chosen following installation guidelines and application needs.

1. Unsnap the piping / drain hose holder (L-bracket) out from the indoor unit as described above.

2. Remove the piping port cover.

3. Position the piping by unfolding and bending the piping slowly downward first as shown, then to the left or right as shown.

4. Secure piping with the piping holder if appropriate.

Figure 27: Choice of Piping / Wiring Routes.

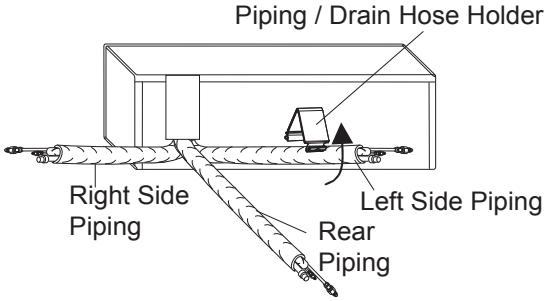
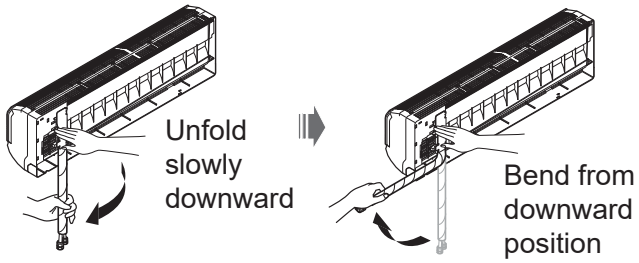


Figure 28: Bending Piping at Rear of Indoor Unit.



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Note:

- ⃠ *Do not bend the piping directly backwards or to the left or right sides without bending it downward first; this will damage the indoor unit piping.*
- ⃠ *Do not forcibly press the refrigerant piping onto the bottom frame or the front grille; this will damage the indoor unit piping and / or indoor unit frame.*
- *Ensure the piping is straight.* ⃠ *Do not kink the piping; this will damage the indoor unit and piping.*

Figure 29: Improper Piping Bending.

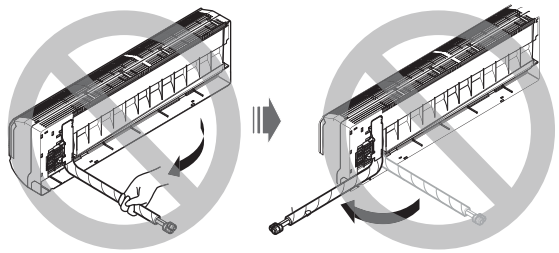
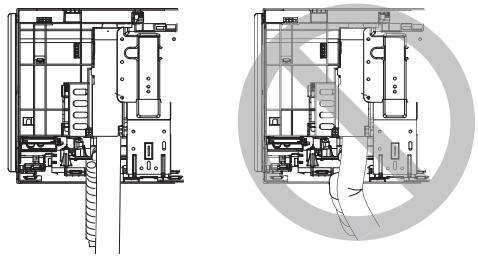


Figure 30: Keep Piping Straight; Avoid Kinks.



Piping Installation When Piping is on the Left Side

Note:

- *See the Electrical System Installation section for information on how to connect the communication / connection (power) cable from the outdoor unit.*
- *For left-side piping, it is recommended that the communication / power connections are complete before starting the piping connections.*

1. Insert drain hose on left (feature will differ depending on model of indoor unit).
2. Align the center of the refrigerant piping and corresponding connection as shown on the next page.
3. Place a couple of drops of refrigerant oil on outside of the flare before assembling. ⃠ Do not add any contaminants. Tighten the flare nut initially by hand.
4. Finish tightening the flare nut with a torque wrench until the wrench clicks. Follow torque guidelines in the“Tightening the Flare Nuts” procedure later in this section.

Note:

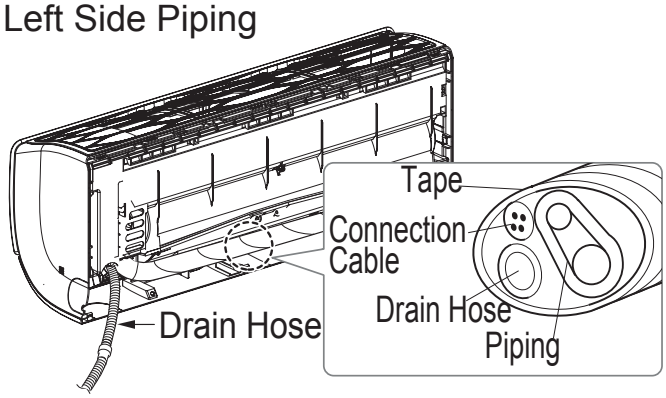
When tightening the flare nut with a torque wrench, ensure the direction for tightening follows the arrow on the wrench.

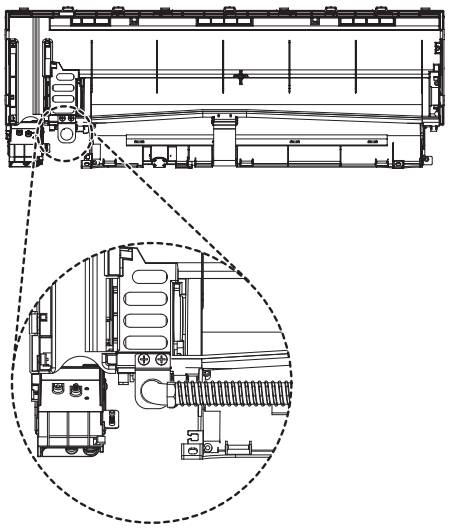
5. Bundle the refrigerant piping, drain hose, and communication / connection (power) cable together. Ensure that the drain hose is located at the bottom of the bundle.
   - If using a conduit for the power wiring / communications cable, see the next page.

Note:

Positioning the drain hose at the top of the bundle can cause condensate to overflow from the drain pan in the inside of the indoor unit.

Figure 31: Piping Installation When Piping is on the Left Side.





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Piping Installation When Piping is on the Right Side

Note:

See the Electrical System Installation section for information on how to connect the communication / connection (power) wiring from the outdoor unit.

1. Align the center of the refrigerant piping and corresponding connection as shown.
2. Place a couple of drops of refrigerant oil on outside of the flare before assembling. ⃠ Do not add any contaminants. Tighten the flare nut initially by hand.
3. Finish tightening the flare nut with a torque wrench until the wrench clicks. Follow torque guidelines in the"Tightening the Flare Nuts" procedure later in this section.

Note:

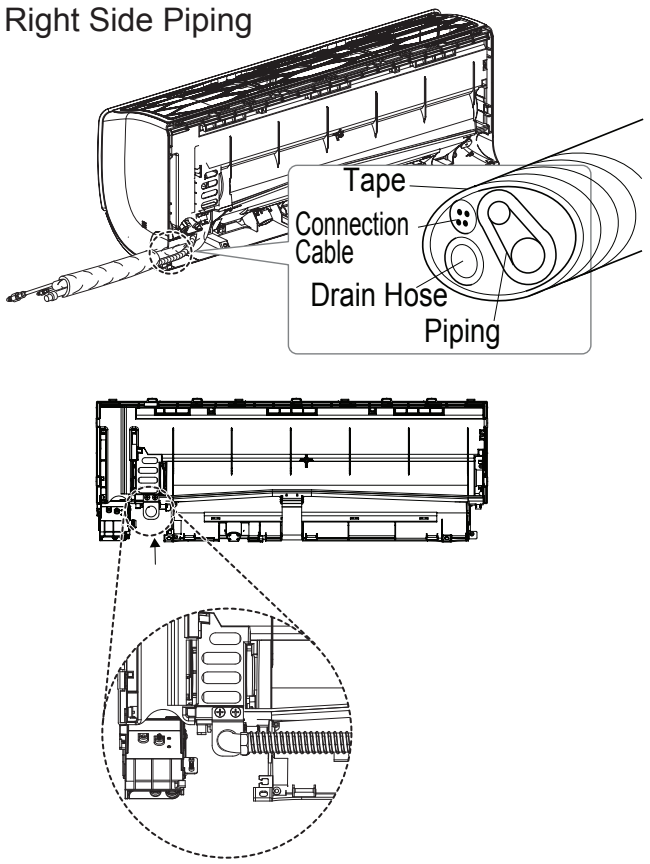
When tightening the flare nut with a torque wrench, ensure the direction for tightening follows the arrow on the wrench.

4. Bundle the refrigerant piping, drain hose, and communication / connection (power) cable together. Ensure that the drain hose is located at the bottom of the bundle.
   - If using a conduit for the power wiring / communications cable, see below.

Note:

Positioning the drain hose at the top of the bundle can cause condensate to overflow from the drain pan in the inside of the indoor unit.

Figure 32: Piping Installation When Piping is on the Right Side.



Using a Conduit for Indoor Unit Wiring / Cable Installation

Note:

Use a liquidtight 3/4 inch elbow connector for flexible conduit.

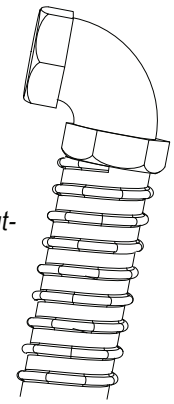
1. Prop indoor unit away from wall bracket.
2. Guide communication / connection (power) cable insulation into the conduit.

Note:

- *Check local, state, and federal codes when choosing a conduit size.*
- *For systems with wiring greater than 130 feet, see the "Communication / Connection (Power) Cable Specifications from Outdoor Unit to Indoor Unit" in the Electrical System Installation section for information.*

3. Attach conduit using the liquidtight 3/4 inch elbow connector.
4. Reassemble the indoor unit properly onto the wall bracket.
5. If conduit is not used, see pages in this section for refrigerant piping, condensate drain, power wiring / communication cable bundling information.
6. To protect the piping, condensate drain, and conduit from the elements, add a lineset cover from the indoor access hole to the outdoor unit.

Figure 33: Liquidtight 3/4 Inch Elbow Connector Attached to Flexible Conduit.



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Bundling

If a conduit or piping set cover is not used on the connection from the outdoor unit to the interior, bundle both separately insulated refrigerant pipes, the drain hose, and outdoor unit to indoor unit communication / connection (power) cable together with wide vinyl tape.

1. Both piping must be fully and separately encased in insulation material: Overlap the field installation piping insulation material and the indoor unit piping insulation material.
2. Bind together the two pipes, using vinyl tape. Make sure there are no gaps during the binding.
3. Be sure the cutting line is placed upward.
4. Wrap the rear piping section with narrow vinyl tape.
5. Continue to wrap the indoor unit pipe as connected to the outdoor connection pipe.
6. Using a wider vinyl tape, bundle the piping and drain hose together.
   - Tape must be sufficient to cover the piping in order to fit into the rear piping housing area at the back of the indoor unit.

Note:

- *Always include insulation on all refrigerant and drain piping to ensure condensate does not form and cause damage to walls, floors, etc.*
- *For systems with wiring greater than 130 feet, see the "Communication / Connection (Power) Cable Specifications from Outdoor Unit to Indoor Unit" in the Electrical System Installation section for information.*

Figure 34: Bundling the Connection Components (From Outdoor Unit to Indoor Unit).

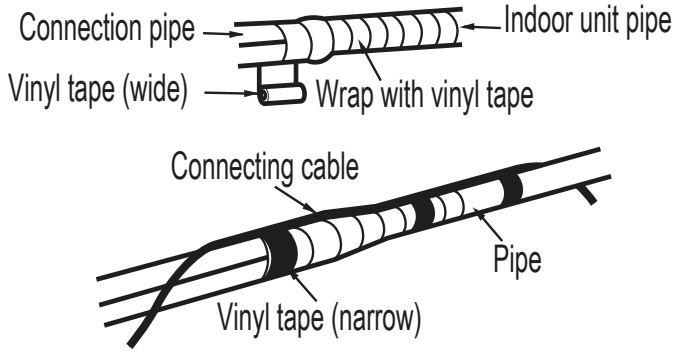
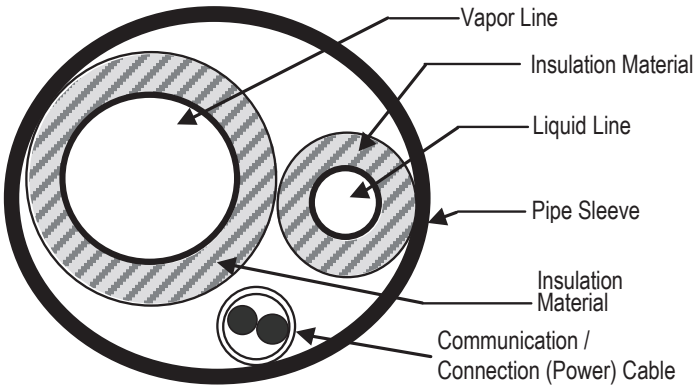


Figure 35: Cutaway of Proper Pipe and Cable Bundling.



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Flaring Procedure

One of the main causes of refrigerant leaks is a defective connection. For LG HVAC systems, the installer needs to know how perform flared connections successfully.

Note:

• During installation, it is imperative to keep the piping system free of contaminants and debris such as copper burrs, slag, or carbon dust.

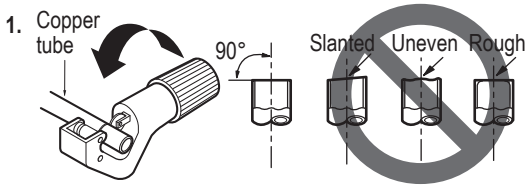
• ⃠ Do not use kinked pipe caused by excessive bending in one specific area on its length.

Flaring Procedure

Note:

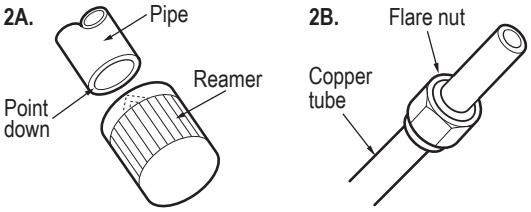
When selecting flare fittings, always use a 45° fitting rated for use with high pressure refrigerant R410A. Selected fittings must also comply with local, state, or federal standards.

1. Cut the pipe to length.
   - Measure the distance between the indoor unit and the outdoor unit.
   - Cut the pipes a little longer than measured distance.

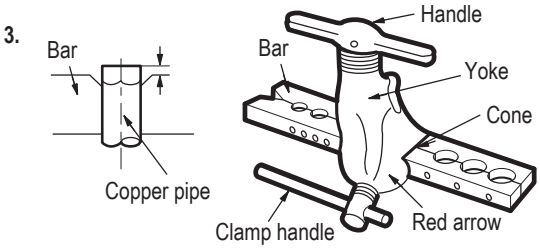


2A. Remove the burrs.
   - Completely remove all burrs from pipe ends.
   - When removing burrs, point the end of the copper pipe down to avoid introducing foreign materials in the pipe.

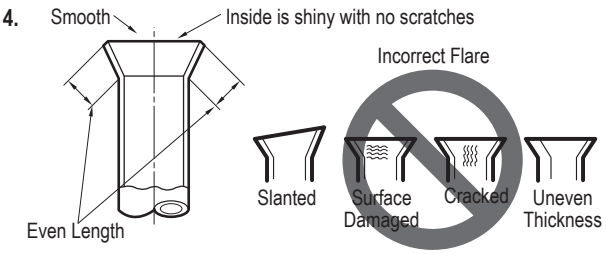
2B. Slide the flare nut onto the copper tube.



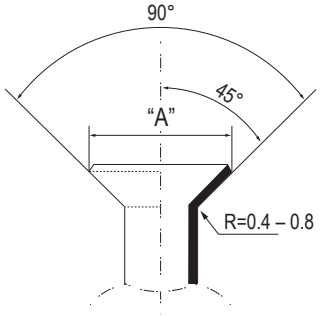
3. Flaring the pipe end.
   - Use the proper size flaring tool to finish flared connections as shown.
   - ALWAYS create a 45° flare when working with R410A.



4. Carefully inspect the flared pipe end.
   - Compare the geometry with the figure to the right
   - If the flare is defective, cut it off and re-do procedure.
   - If flare looks good, blow the pipe clean with dry nitrogen.



Dimensions of the Flare.



Flared Connection Dimensions / Tightening Torque.

Pipe Size (in. O.D.)	Outside Diameter (mm)	"A" Dimension (mm [in.])
1/4	6.35	~ 9.1 (11/32 - 23/64)
3/8	9.52	~ 13.2 (1/2 - 33/64)
1/2	12.7	~ 16.6 (41/64 - 21/32)
5/8	15.88	~ 19.7 (49/64 - 25/32)
3/4	19.05	-

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Tightening the Flare Nuts

Tightening Torque for Flare Nuts.

Pipe Size (in. O.D.)	Outside Diameter (mm)	Tightening Torque (ft-lbs.)
1/4	6.35	13.0 - 18.0
3/8	9.52	24.6 - 30.4
1/2	12.7	39.8 - 47.7
5/8	15.88	45.4 - 59.3
3/4	19.05	71.5 - 87.5

1. When connecting the flare nuts, coat the flare (outside only) with polyvinyl ether (PVE) refrigeration oil only.

Note:

⃠ *Do not use polyolyester (POE) or any other type of mineral oil as a thread lubricant. These lubricants are not compatible with the PVE oil used in this system and create oil sludge leading to equipment damage and system malfunction.*

⃠ *Do not add any contaminants inside the refrigerant piping.*

2. Initially hand tighten the flare nuts using three (3) or four (4) turns.
3. To finish tightening the flare nuts, use both a torque wrench and a backup wrench.
4. After all the piping has been connected and the caps have been tightened, check for refrigerant gas leaks.

Loosening the Flare Nuts

Always use two (2) wrenches to loosen the flare nuts.

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Multi F with LGRED Outdoor Unit to Indoor Unit Piping Connections

Note:

Avoid Pipe Damage

- *When routing field-provided piping, avoid damaging the outdoor unit from excessive vibration.*
- *Properly insulate the liquid and gas lines separately up to the point of connection at the unit frame.*
- *See table below for Multi F with LGRED outdoor unit connection types.*

⃠ *Correctly route the piping so it does not make contact with mounting bolts. Allow room for field installation.*

Table 8: Multi F with LGRED Outdoor Unit Piping Connections.

Outdoor Unit Piping Connections	LMU180HHV	LMU240HHV	LMU300HHV
Liquid Line Connection (in., OD) x Qty.	Ø1/4 x 2	Ø1/4 x 3	Ø1/4 x 4
Vapor Line Connection (in., OD) x Qty.	Ø3/8 x 2	Ø3/8 x 3	Ø3/8 x 4

Figure 36: Multi F with LGRED Outdoor Unit Refrigerant Pipe Connections (LMU360HHV shown as example).

Multi F with LGRED Outdoor Unit
(18, 24, 30kBtu/h)

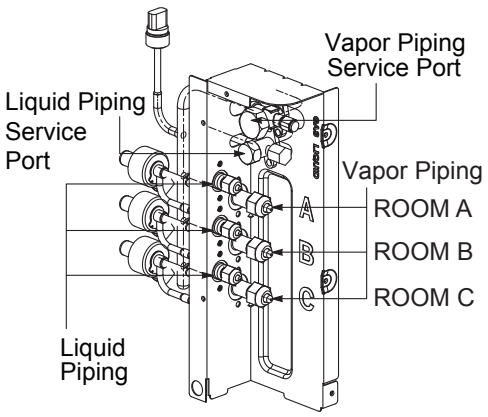

Table 9: Indoor Unit Pipe Sizes.

Indoor Unit Capacity	Vapor Line Piping Size (in., OD)	Liquid Line Piping Size (in., OD)
7,000 Btu/h	Ø3/8	Ø1/4
9,000 Btu/h		
12,000 Btu/h		
15,000 Btu/h		
18,000 Btu/h	Ø1/2	
24,000 Btu/h		

Table 11: Indoor Unit Piping Connections.

Indoor Unit Capacity	Vapor Line Conn. (in., OD)	Liquid Line Conn. (in., OD)
7,000 Btu/h	Ø3/8	Ø1/4
9,000 Btu/h		
12,000 Btu/h		
15,000 Btu/h		
18,000 Btu/h Wall-Mounted and Vertical Air Handling Units	Ø5/8	Ø3/8
18,000 Btu/h Low Static Duct and Four-Way Cassette Units	Ø1/2	Ø1/4
24,000 Btu/h	Ø1/2	Ø1/4

Note:

Connection sockets (included as a factory-supplied accessory with the indoor units) will need to be used when piping the indoor units to the outdoor unit. See tables above and below for indoor unit piping connection and connection socket dimensions. See the follow page for the connection socket installation procedure.

Table 10: Connection Socket Dimensions.

Indoor Unit Capacity	Vapor (in., OD)		Liquid (in., OD)	
	A	B	A	B
18,000 Btu/h Wall-Mounted and Vertical Air Handling Units	Ø3/8 → Ø1/2, Ø1/2 → Ø5/8		Ø1/4 → Ø3/8	
18,000 Btu/h Low Static Duct and Four-Way Cassette Units	Ø3/8 → Ø1/2		N/A	
24,000 Btu/h	Ø3/8 → Ø1/2		N/A	

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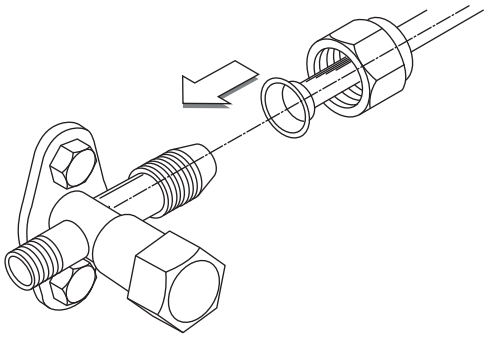
Installing Field Piping to the Outdoor Unit Piping Connections

1. Verify the outdoor unit service ports are closed.
2. Remove the caps on the outdoor unit piping connections.
3. Connect the gas piping first to ROOM A, then to ROOM B, then to ROOM C, in that order. Number of connections will differ depending on outdoor unit.
4. Tighten each gas piping connection individually following the “Tightening the Flare Nuts” procedure earlier in this section.
5. Connect the liquid piping first to ROOM A, then to ROOM B, then to ROOM C, in that order. Number of connections will differ depending on outdoor unit.
6. Tighten each liquid piping connection individually following the “Tightening the Flare Nuts” procedure earlier in this section.

Figure 38: Close Up of the Field Piping to the Outdoor Unit Piping Connection.



Using the Connection Socket

Some indoor units require the use of a connection socket when piping the indoor units to the outdoor unit. (See previous page for information.) The connection sockets are included as a factory-supplied accessory with the indoor units. To install:

1. Align the center of the piping sections as seen in the diagrams at right and below.
2. Follow the “Tightening the Flare Nuts”procedure earlier in this section.
3. When all piping installation has been completed, perform the triple leak / pressure and evacuation tests (see the Final Installation Procedures Section in the Multi F / Multi F MAX Outdoor Unit Installation Manual), verify that the system does not have any leaks, and then fully insulate all joints / connections.

Figure 37: Connection Socket Installation.

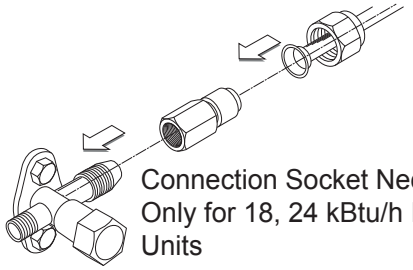


Figure 39: Connection Socket Diagram, External View.

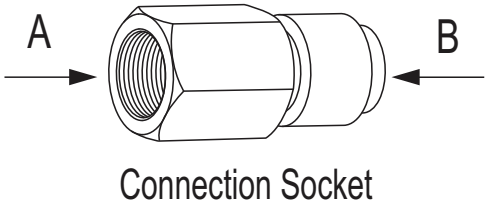
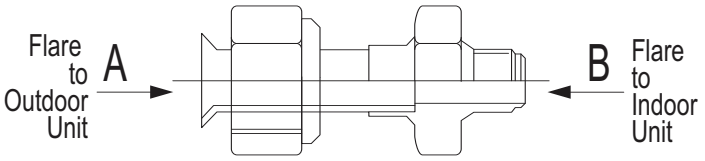


Figure 40: Connection Socket Diagram, Internal View.



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Multi F MAX with LGRED Outdoor Unit System Piping Connections

Note:

Avoid Pipe Damage

- *When routing field-provided piping, avoid damaging the outdoor unit from excessive vibration.*
- *Properly insulate the liquid and gas lines separately up to the point of connection at the unit frame.*
- *See table below for Multi F MAX outdoor unit connection types.*

⃠ *Correctly route the piping so it does not make contact with mounting bolts. Allow room for field installation.*

Figure 41: Multi F MAX with LGRED Outdoor Unit Refrigerant Pipe Connections.

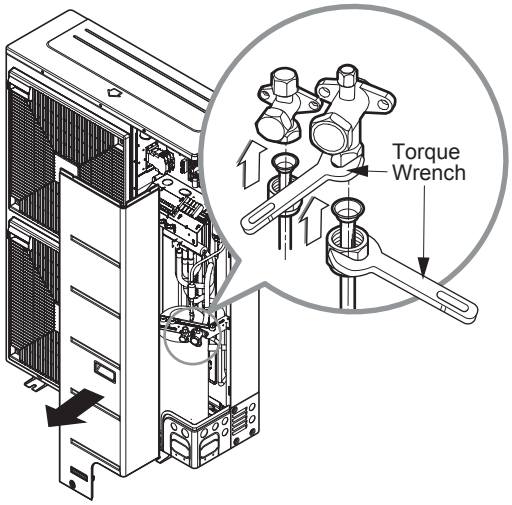


Table 12: Multi F MAX with LGRED Outdoor Unit Piping Connections.

Outdoor Unit Piping Connections	LMU360HHV, LMU420HHV
Liquid Line Connection (in., OD) x Qty.	Ø3/8 x 1
Vapor Line Connection (in., OD) x Qty.	Ø3/4 x 1

Branch Distribution to Indoor Unit Piping Connections

- Install indoor unit liquid and vapor refrigerant pipes (and connection wiring) to the appropriate branch distribution ports.
- Clearly note on the indoor unit's refrigerant piping (liquid, vapor) which branch distribution port it is connected to (A, B, C, D).

Table 13: Branch Distribution Unit Piping Connections.

Branch Distribution Unit	Refrigerant Connections Pipe Size (in.)		Connectable Indoor Unit Capacity (Btu/h)
	Liquid	Vapor	
PMBD3620	Ø1/4 x 2	Ø3/8 x 2	7,000, 9,000, 12,000, 15,000, 18,000, 24,000
PMBD3630	Ø1/4 x 3	Ø3/8 x 3	7,000, 9,000, 12,000, 15,000, 18,000, 24,000
PMBD3640	Ø1/4 x 4	Ø3/8 x 4	7,000, 9,000, 12,000, 15,000, 18,000, 24,000
PMBD3641	Ø1/4 x 4	Ø3/8 x 3	7,000, 9,000, 12,000, 15,000, 18,000, 24,000 (A, B, C)
		Ø1/2 x 1	36,000 (D)

Figure 42: Branch Distribution Ports to Indoor Units -- Side View.

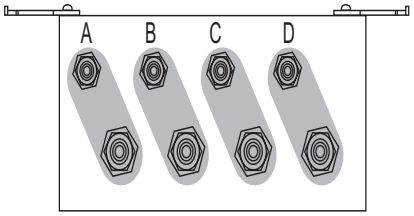
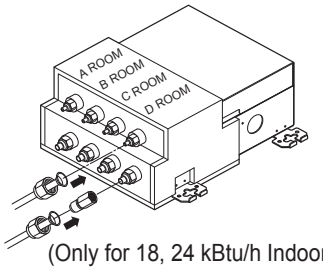


Figure 43: Branch Distribution Piping Connections.

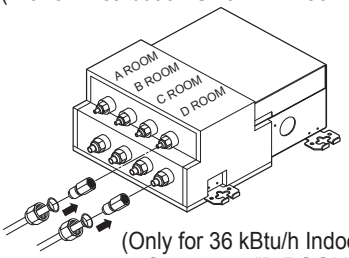
Multi F MAX with LGRED Outdoor Units (36, 42 kBtu/h)

(Branch Distribution Unit: PMBD3640)



(Only for 18, 24 kBtu/h Indoor Units)

(Branch Distribution Unit: PMBD3641)



(Only for 36 kBtu/h Indoor Units to Connect to "D ROOM")

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Table 14: Indoor Unit Pipe Sizes.

Indoor Unit Capacity	Vapor Line Piping Size (in., OD)	Liquid Line Piping Size (in., OD)
7,000 Btu/h	Ø3/8	Ø1/4
9,000 Btu/h		
12,000 Btu/h		
15,000 Btu/h		
18,000 Btu/h	Ø1/2	
24,000 Btu/h		

Table 15: Indoor Unit Piping Connections.

Indoor Unit Capacity	Vapor Line Conn. (in., OD)	Liquid Line Conn. (in., OD)
7,000 Btu/h	Ø3/8	Ø1/4
9,000 Btu/h		
12,000 Btu/h		
15,000 Btu/h		
18,000 Btu/h Wall-Mounted and Vertical Air Handling Units	Ø5/8	Ø3/8
18,000 Btu/h Low Static Duct and Four-Way Cassette Units	Ø1/2	Ø1/4
24,000 Btu/h	Ø1/2	Ø1/4

Note:

Connection sockets (included as a factory-supplied accessory with the indoor units) will need to be used when piping the indoor units to the branch distribution unit. The connection sockets for 36k indoor units are factory supplied with the branch distribution units. See tables above and below for indoor unit piping connection and connection socket dimensions. See below and the follow page for the connection socket installation procedure.

Table 16: Connection Socket Dimensions.

Indoor Unit Capacity	Vapor (in., OD)		Liquid (in., OD)	
	A	B	A	B
18,000 Btu/h Wall-Mounted and Vertical Air Handling Units	Ø3/8 → Ø1/2, Ø1/2 → Ø5/8		Ø1/4 → Ø3/8	
18,000 Btu/h Low Static Duct and Four-Way Cassette Units	Ø3/8 → Ø1/2		N/A	
24,000 Btu/h	Ø3/8 → Ø1/2		N/A	

Installing Field Piping to the Branch Distribution Unit Piping Connections

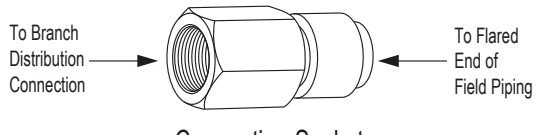
1. Remove any caps, etc., that will be on the branch distribution unit.
2. Tighten each piping connection individually following the “Tightening the Flare Nuts” procedure later in this section.
3. When all piping installation has been completed, perform the triple leak / pressure and evacuation tests (see the Final Installation Procedures Section in the Multi F / Multi F MAX Outdoor Unit Installation Manual), verify that the system does not have any leaks, and then fully insulate all joints / connections.

Using the Connection Socket

Some indoor units require the use of a connection socket when piping the indoor units to the branch distribution unit. (See previous page and below for information.) The connection sockets are included as a factory-supplied accessory with the indoor units, or in the case of the 36k indoor unit, it is factory supplied with the branch distribution units. To install:

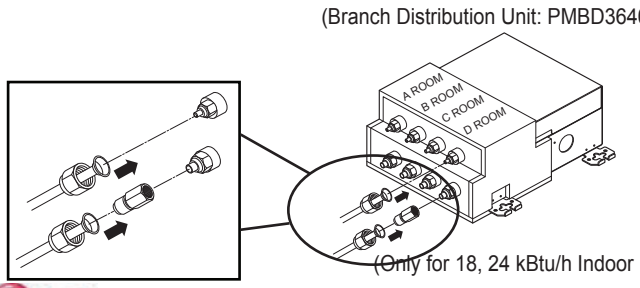
1. Remove any caps, etc., that will be on the branch distribution unit.
2. Align the center of the piping sections as seen in the diagram at right.
3. Tighten each piping connection individually following the “Tightening the Flare Nuts” procedure earlier in this section.
4. When all piping installation has been completed, perform the triple leak / pressure and evacuation tests (see the Final Installation Procedures Section in the Multi F / Multi F MAX Outdoor Unit Installation Manual), verify that the system does not have any leaks, and then fully insulate all joints / connections.

Figure 45: Connection Socket Diagram, External View.



Connection Socket

Figure 44: Close Up of Branch Distribution to Indoor Unit Piping Connections.



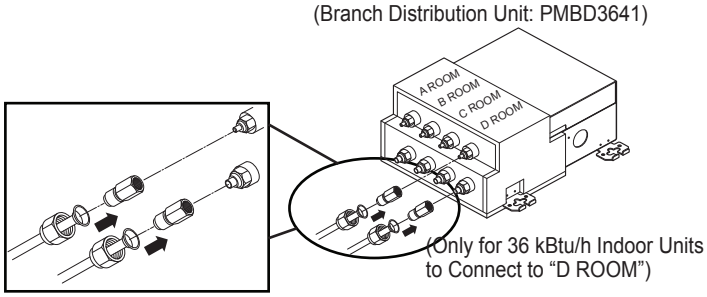


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Figure 46: Socket Connection.

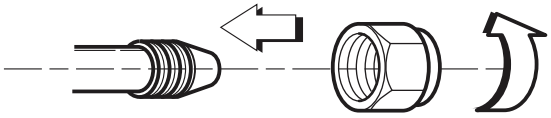
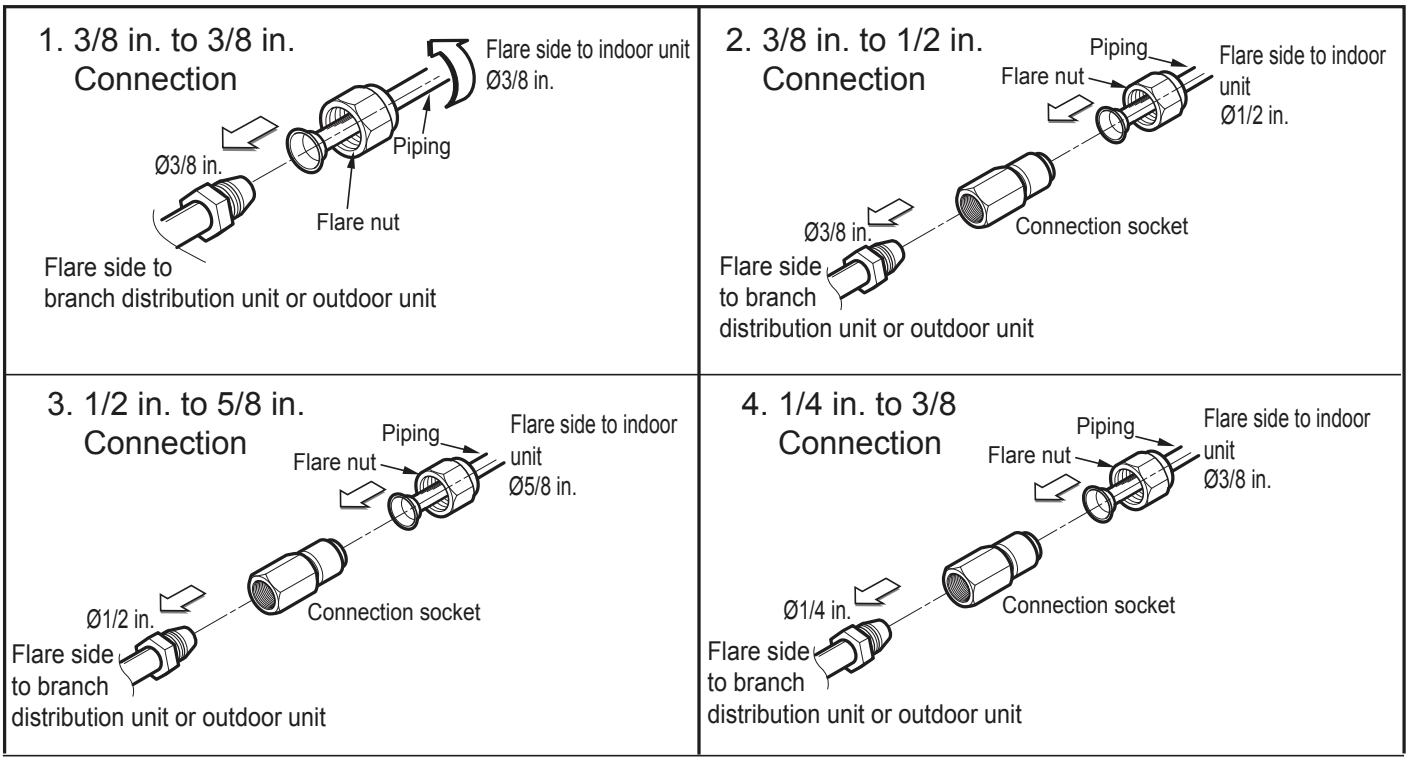


Figure 47: Possible Outdoor Unit or Branch Distribution Unit to Indoor Unit Connections.



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Indoor Unit Condensate Drain Hose Installation

Note:

Refer to the diagrams below and follow proper installation and the position of the drain hose along the refrigerant piping installation path to avoid leaks. After the drain hose is set in place, always follow with leak / pressure testing and deep evacuation procedures of the refrigerant piping to be sure all refrigerant piping is properly installed. Re-check and retest as necessary.

- Wall-mounted indoor units have a factory-provided flexible pipe (27/32" O.D./ 5/8" I.D.) to drain condensate water. The flexible pipe connects to field-provided drain pipe. Use materials that comply with local codes for drain pipe and insulation.
- Remove the drain plug on left or right side depending on the piping installation. Insert the drain hose on the left side when left side piping is used; install the drain hose on the right side when right side piping is used.
- Drain hose is routed from the indoor unit through the structure (wall) to the outdoor. It must slope at an angle where it is higher at the indoor unit and lower toward the outdoor area, thereby letting gravity push any condensation down and out.
- The drain hose might need to be extended so that condensate can be properly routed away. Connect the flexible drain pipe with a round clamp. If the flexible drain pipe is not installed properly, water will leak from the connection.
- Install the flexible drain pipe as straight as possible; sharp angles will cause the pipe to deteriorate and will crack over time.
- Insert the drain hose >2 inches so it won't pull out of the field-supplied drain pipe.
- ⃠ Avoid piping the drain hose as shown in the diagrams in the figure on the next page. These methods are incorrect and can cause leaks at the indoor unit site.

Figure 48: Flexible Drain Hose Connection.

Clamp the Flexible Drain Hose Connection

Figure 49: Correct Slope Angle for Drain Hose.

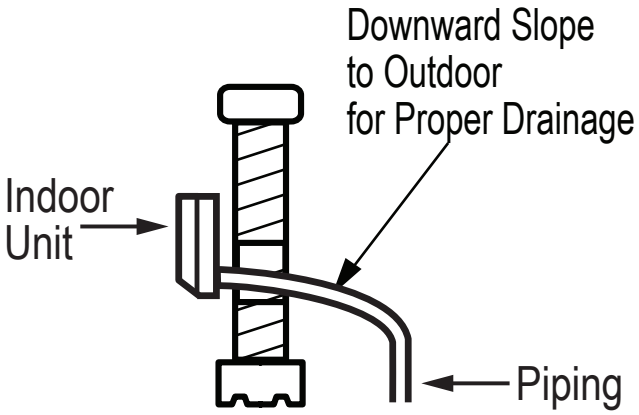

Figure 50: HVT and HSV5 Outdoor Unit Drain Hose Extension.

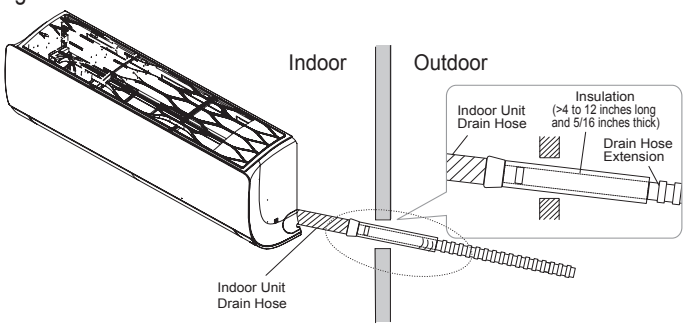

Figure 51: Inserting the Drain Hose >2 inches Into the Field-Supplied Drain Pipe.

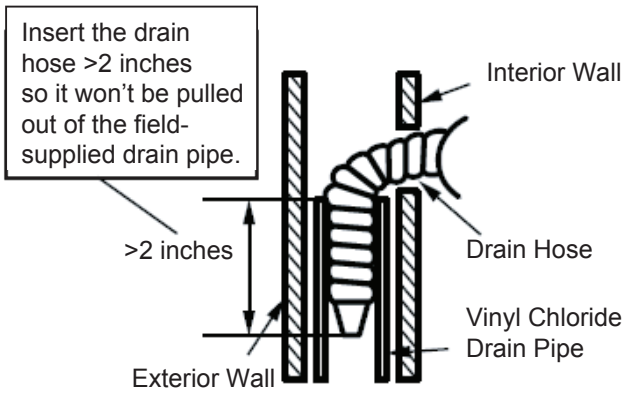

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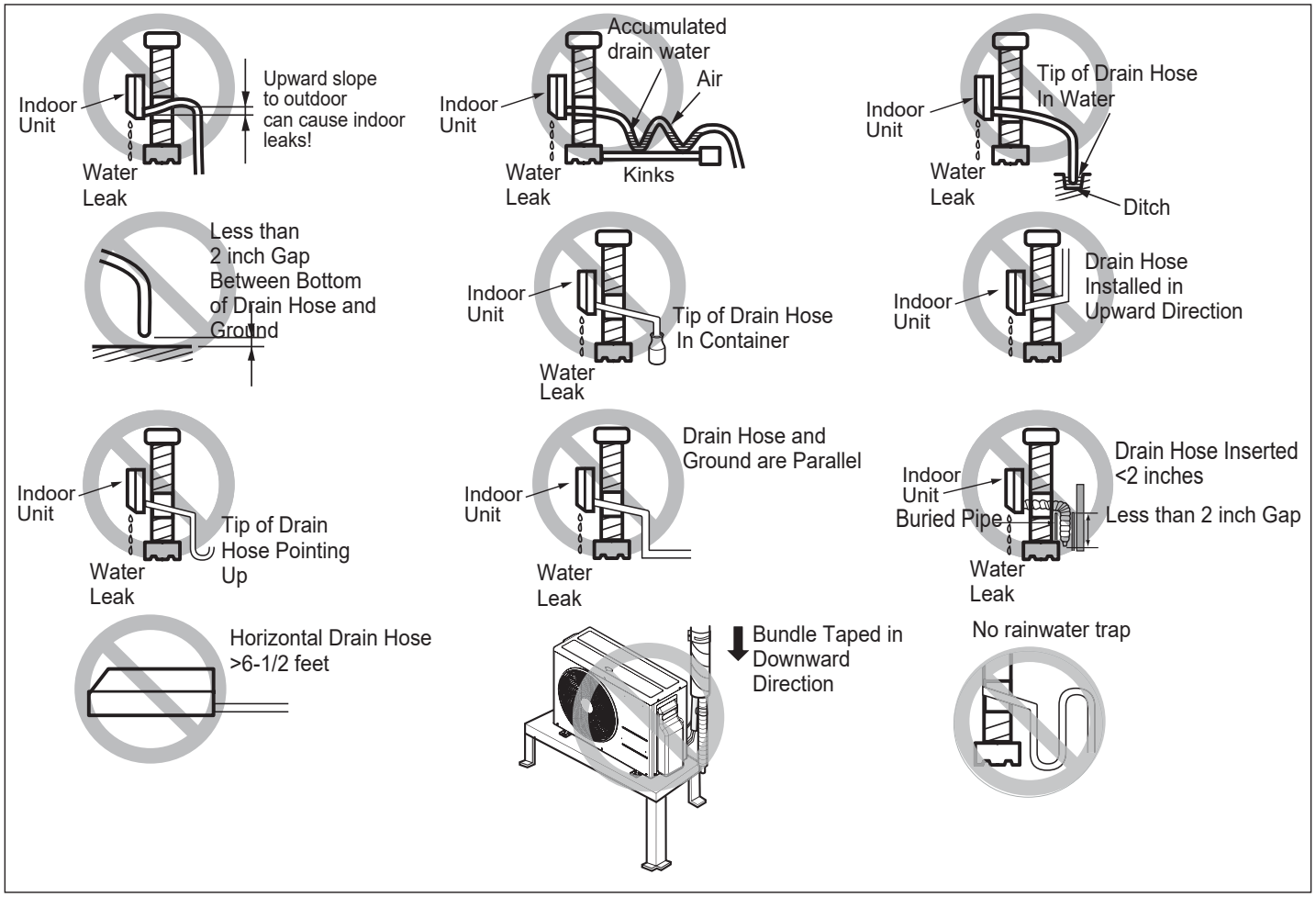
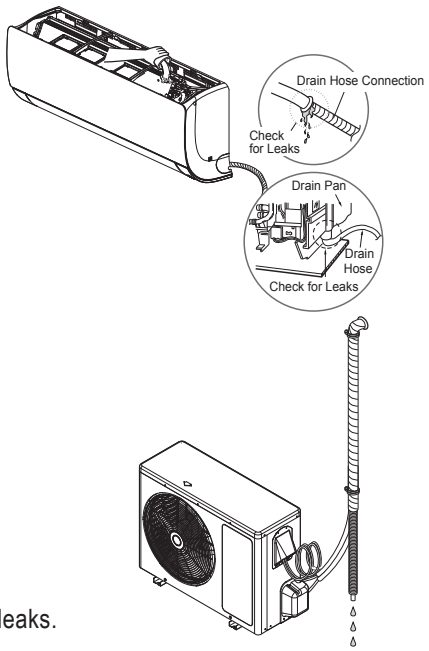
Figure 52: Incorrect Slope Angles for the Drain Hose.



Drain Hose Insulation

1. The drain hose and extension must be properly insulated to ensure condensation will not damage walls, floors, etc. Foamed polyethylene or equivalent of at least 5/16 inches thick is required.
2. Overlap the insulation at the connection of the field-installed piping and the indoor unit piping. Tape together so that no gaps exist.
3. Secure insulation to the rear piping housing section with vinyl tape.
4. Bundle the piping and drain hose with tape where they meet at the back of the indoor unit frame. Position the drain hose at the bottom of the bundle (positioning the drain hose at the top of the bundle will cause the drain pan to overflow inside the indoor unit).

Figure 53: Checking for Leaks at the Indoor Unit. Example Only; Systems Will Vary.



Checking the Indoor Unit Drain Hose for Leaks

1. Pour a glass of water on the evaporator.
2. Verify that the water flows appropriately through and out of the drain hose without any leaks.

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Refrigerant Piping System Insulation

All refrigerant piping from the outdoor unit to the indoor units / branch distribution units must be insulated correctly for safety and usage. Refrigerant piping, Y-branch connections, field-provided isolation ball valves (if present), service valves, and elbows must be properly and completely insulated using closed cell pipe insulation (up to the indoor unit piping connections). To prevent heat loss / heat gain through the refrigerant piping, all refrigerant piping including liquid lines and vapor lines must be insulated separately. Insulation must be a minimum 1/2 inches thick, and thickness will need to be increased based on ambient conditions and local codes. Table on next page lists minimum wall thickness requirements for Ethylene Propylene Diene Methylene (EPDM) insulation.

Inside the outdoor unit, maximum pipe temperature is 248°F and minimum pipe temperature is -40°F. For field insulation of refrigerant piping between outdoor units and indoor units, consider the following pipe temperature ranges for an operating heat pump system:

- Heating mode refrigerant temperature ranges: Liquid = 75-118°F; High Pressure Vapor = 95-220°F
- Cooling mode refrigerant temperature ranges: Liquid = 75-118°F; Low Pressure Vapor = 40-90°F

All insulation joints must be glued with no air gaps. Insulation material must fit snugly against the refrigeration pipe with no air space between it and the pipe. ⃠ Do not allow insulation passing through pipe hangers, inside conduit, and/or sleeves to be compressed. Protect insulation inside hangers and supports with a second layer. All pipe insulation exposed to the sun and outdoor elements must be properly protected with PVC, aluminum vapor barrier, or alternatively placed in a weather-resistant enclosure such as a pipe rack with a top cover; and meet local codes.

Note:

Follow locals codes when selecting EPDM insulation wall thickness. Thickness in the table is based on heat conductivity of 0.61 Btu/in/h/ft²/°F.

Minimum Refrigerant Pipe Ethylene Propylene Diene Methylene (EPDM) Insulation Wall Thickness Requirements

Table 17: Insulation Guidelines for Typical and Special Circumstances.

Classification / Piping O.D.		Air-conditioned location		Non-air conditioned location	
		1. Typical Conditioned Location	2. Special Conditioned Location	3. Typical Unconditioned Location	4. Special Unconditioned Location
Liquid pipe	ø1/4 inches	1/2 inches	1/2 inches	1/2 inches	1/2 inches
	ø3/8 inches				
	≥ø1/2 inches	1/2 inches	1/2 inches	1/2 inches	1/2 inches
Vapor pipe	ø3/8 inches	1/2 inches	3/4 inches	3/4 inches	1 inch
	ø1/2 inches				
	ø5/8 inches				
	ø3/4 inches				

1. Typical Air-Conditioned Location

A building plenum or space that contains conditioned air that does not exceed 80°F DB. When piping passes through an indoor area where the indoor unit operates, such as an apartment, classroom, office, mall, hospital, etc.

2. Special Air-Conditioned Location

1. When the location is air conditioned, but there is severe temperature/humidity difference due to high ceilings.
- Church, auditorium, theater, lobby, etc.
2. When the location is air conditioned, but internal temperature/humidity are high.
- Bathroom, swimming pool, locker room, etc.

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3. Typical Unconditioned Location

When piping passes through an indoor area where the indoor unit does not operate, such as a hallway, dormitory, or school, etc. An unconditioned space inside a building.

4. Special Unconditioned Location: If conditions 1 and 2 below are present.

1. An unconditioned space or plenum of a building.
2. An area where there is an elevated humidity level.

5. Additional Insulation for Indoor Units Will be Required in Humid Environments.

The air conditioner factory insulation has been tested according to "ISO Conditions with Mist," and it satisfies the requirements. If the system has been operating for a long time in a high humidity environment (dew point temperature: more than 73°F), condensate is likely to form. If this happens, install 3/8 inch thick EPDM insulation that is plenum-rated with a heat-resistance factor of more than 248°F.

Installing Refrigerant Piping Insulation

⚠WARNING

Ensure all refrigerant piping is insulated. Exposed refrigerant piping will cause burns if touched.

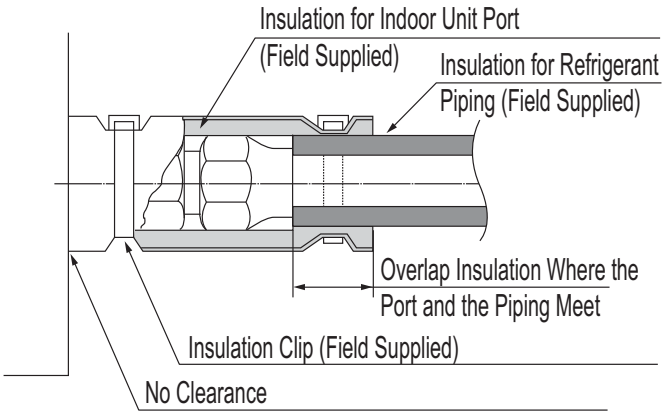
Wrap all refrigerant and condensate piping including field-provided isolation ball valves and flexible pipe connection kits provided by LG. All pipes must be insulated and each pipe must be separately wrapped. Any exposed piping will generate condensate or will cause burns if touched. Sufficiently insulate all cold surfaces to prevent moisture forming.

Ensure insulation material fits snugly against the refrigeration pipe with no air space between the pipe surface and the surrounding insulation.

Protect insulation inside hangers and supports with a second insulation layer. Ensure insulation on all pipe passing through pipe hangers, inside conduit, and/or sleeves is not compressed.

Glue all insulation joints with no air gaps between insulation segments, and between insulation segments and the unit case. Ensure insulation material fits snugly against the refrigeration pipe with no air space between it and the pipe. All pipe insulation exposed to the sun and outdoor elements must be properly protected with PVC, aluminum vapor barrier, or alternatively placed in a weather-resistant enclosure such as a pipe rack with a top cover; and must meet local codes. Pay special attention to insulating the pipes installed in a ceiling plenum.

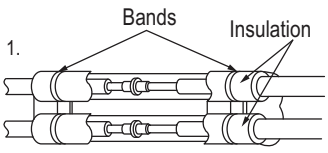
Figure 54: Typical Refrigerant Line Flare Fitting Insulation Detail



Note:

- ⃠ *Do not insulate gas and liquid pipes together as this can result in pipe leakage and malfunction due to extreme temperature fluctuations.*
- *Always properly insulate the piping. Insufficient insulation will result in condensation, reduced heating/cooling performance, etc. Also, if the pipes aren't insulated properly, condensation could potentially cause damage to building finishes. Pay special attention to insulating the pipes installed in the ceiling plenum.*
- *Fully insulate the piping connections.*

Figure 55: Insulating the Piping.



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⚠ WARNING

- *All power wiring (line voltage) and communication cable installation must be performed by trained service providers working in accordance with all local, state, and National Electrical Code (NEC) / UL / ETL federal regulations related to electrical equipment and wiring, and following the manufacturer product diagrams, requirements, and instructions in this manual. Electric shock can cause physical injury or death.*
- *Be sure that main power to the unit is completely off before proceeding. Follow all safety and warning information outlined at the beginning of this manual. Failure to do so will cause electric shock and bodily injury.*
- *Install a main shutoff switch or circuit breaker that interrupts all power sources simultaneously (circuit breaker must be resistant to electromagnetic currents). Be sure that the circuit breaker or some other emergency power cutoff device is in place before any power wiring is done to the system. Failure to do so will cause bodily injury or death.*
- ⃠ *Never touch any power lines or live cables before all power is cutoff to the system. To do so will cause bodily injury or death.*
- *Power wiring and communication cable sizes must comply with all applicable federal, state, and local codes. Undersized wiring will lead to unacceptable voltage at the unit and will cause a fire, which will cause bodily injury or death.*
- *Properly ground the outdoor unit, indoor units, and branch distribution units. Ground wiring must always be installed by a trained technician. Ground wiring is required to prevent accidental electrical shock during current leakage, which will cause bodily injury or death.*
- *Verify that the circuit breaker is set to OFF before installing the wiring system. Electric shock can cause physical injury or death.*
- *Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and National Electrical Code regulations related to electrical equipment and wiring, and following the instructions in this manual. Using an oversized breaker or fuse will result in electric shock, physical injury or death.*
- ⃠ *Do not connect ground wire to refrigerant, gas, or water piping; to lightning rods; to telephone ground wiring; or to the building plumbing system. Failure to properly provide a NEC-approved earth ground can result in electric shock, fire, physical injury or death.*

Note:

- *Consider ambient conditions (temperature, direct sunlight, inclement weather, etc.) when selecting, installing, and connecting the power wiring.*
- *Properly ground the outdoor unit, indoor units, and branch distribution units. Ground wiring must always be installed by a trained technician. Improperly grounded wire can cause communication problems from electrical noise, and motor current leakage.*
- *Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and NEC regulations related to electrical equipment and wiring, and following the instructions in this manual. Generated overcurrent will include some amount of direct current. Using an oversized breaker or fuse will result in equipment malfunction and property damage.*
- ⃠ *Do not connect ground wire to refrigerant, gas, or water piping; to lightning rods; to telephone ground wiring; or to the building plumbing system. Failure to properly provide a NEC-approved earth ground can result in property damage and equipment malfunction.*
- ⃠ *Do not operate the air conditioning system until the refrigerant piping installation is complete. Operating the system before refrigerant piping is finalized will damage the compressor.*

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Power Wiring / Communication Cable Connections

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

To Install a Ring or Fork Terminal:

1. Trim the wiring with wire cutters or pliers, then strip the insulation to expose the strand wiring to about 3/8 inches.
2. Using a ring terminal fastener or pliers, securely clamp a ring terminal to each stripped wire end.

To Connect the Wiring to the Terminals:

1. Remove the JIS terminal screws from the (outdoor unit, branch distribution unit, or indoor unit) terminal plate with a JIS screwdriver. (See information about LG terminal connections on the next page.)
2. Position the ring terminal around the terminal, place the terminal screw in the ring, and tighten to the terminal plate using a JIS screwdriver.
   - Firmly attach the wire; secure in a way to prevent external forces from being imparted to the terminal block.
   - Use an appropriately sized JIS screwdriver for tightening the terminals.
   - ⃠ Do not over tighten the connections; over tightening will damage the terminals.

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

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

Figure 57: Close up of a Typical Ring Terminal.

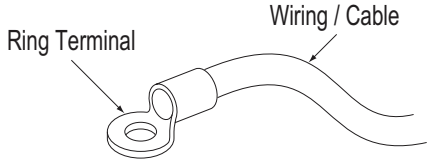


Figure 58: Adding a Ring Terminal to the Wiring.

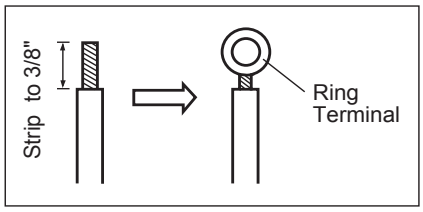


Figure 56: Tightening the Ring Terminal to the Terminal Plate.

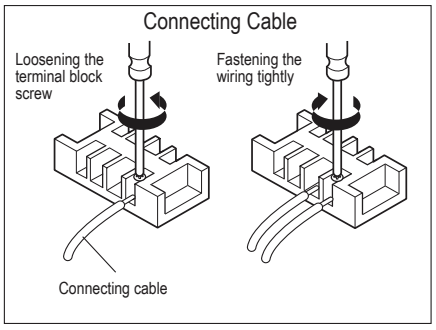
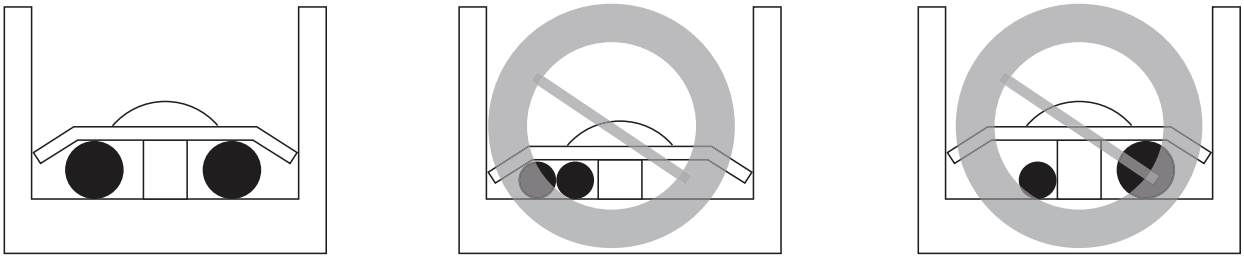


Figure 59: Proper and Improper Power Wiring Connections.

● :Copper Wire



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

⃠ Do not terminate two wires on one side.

⃠ Do not terminate different gauge wires to a terminal block.

⚠ WARNING

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

Note:

- ⃠ *Never apply line voltage power to the communications cable terminal block. If contact is made, the PCBs will be damaged.*
- *Always include some allowance in the wiring length when terminating. Firmly attach the wiring or cable, but provide some slack to facilitate removing the electrical panels while servicing, and to prevent external forces from damaging the terminal block.*
- ⃠ *Never ground the shield of the communications cable to the indoor unit frame or other grounded entities of the building. Ground the communications cable shield only at the outdoor unit. Improperly grounding this cable can cause communications errors.*

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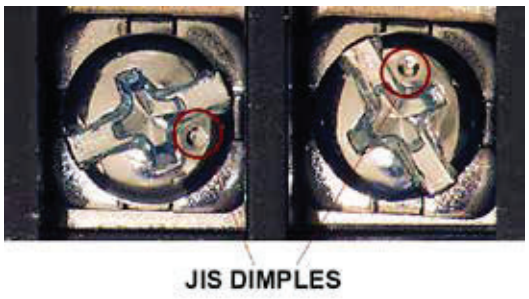
LG Terminal Connections

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. ⃠ Do not over tighten the connections — over tightening will damage the terminals — but firmly and securely attach the wiring in a way to prevent external forces from being imparted to the terminal block.

Figure 60: 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 with LGRED systems only) are wired in relation to the outdoor unit.*
- ⃠ *Do not include splices or wire nuts in the communication cable.*

Power Supply / Power Wiring Specifications

- Multi F and Multi F MAX with LGRED systems operate at 1Ø, 208-230V, 60Hz, and power is wired to the outdoor unit only. The outdoor unit will supply power to the indoor units and the branch distribution units (Multi F MAX with LGRED systems only) through the communication / connection (power) cable (indoor units and branch distribution units draw minimum power). See the Multi F Outdoor Unit Installation Manual for information.
- Select power supply wire type and size based on NEC and local codes. Maximum voltage fluctuation ±10% of the nameplate rated value.
- Properly ground the outdoor unit / indoor units / branch distribution units per NEC and local codes.
- Ground wire must be longer than the common power / communication wires.
- Connect the wiring firmly so the wires cannot be easily pulled out.
- Refer to the inside of the chassis cover or control cover for circuit and terminal block diagrams.
- Always match color codes of each wire and follow wiring diagram.
- ⃠ Do not install power wiring to the outdoor unit and the communication / connection (power) cable to the indoor unit in the same conduit. Use separate conduits.

⚠ WARNING

- *Always have a trained service provider properly ground the outdoor unit. If the outdoor unit is not properly grounded, there is a risk of electric shock, physical injury, or death.*
- *Provide a circuit breaker between the power source and the outdoor unit. Failure to do so will cause bodily injury or death.*

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Communication / Connection (Power) Cable Specifications

- Multi F with LGRED Systems:
  - Communication / connection (power) cable from the outdoor unit to the indoor unit for lengths up to 130 feet must use a minimum of 18 AWG, four (4) conductor, 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.
  - When the communication / connection (power) wires between the indoor unit and outdoor unit is GREATER THAN 130 feet, use:
    - A two (2) conductor wire for power (for each indoor unit).
    - A two (2) conductor wire for communication / ground (for each indoor unit).
    - Separate the power AT LEAST two (2) inches away from the communication / ground wire (for each indoor unit).
    - All wiring is still minimum 18 gauge, stranded, shielded, or unshielded as cited above (for each indoor unit).
- Multi F MAX with LGRED Systems:
  - All 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 (if shielded, it must be grounded to the chassis of the outdoor unit only), and must comply with applicable local and national codes.
  - Communication / connection (power) cable from the branch distribution unit(s) to the indoor units for lengths up to 130 feet must use a minimum of 18 AWG, four (4) conductor, 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.
  - When the communication / connection (power) wires between the branch distribution unit and indoor unit is GREATER THAN 130 feet, use:
    - A two (2) conductor wire for power (for each indoor unit).
    - A two (2) conductor wire for communication / ground (for each indoor unit).
    - Separate the power AT LEAST two (2) inches away from the communication / ground wire (for each indoor unit).
    - All wiring is still minimum 18 gauge, stranded, shielded, or unshielded as cited above (for each indoor unit).
- Insulation material as required by local code.
- Rated for continuous exposure of temperatures up to 140°F.
- Firmly attach the cable; provide slack but secure in a way to prevent external forces from being imparted on the terminal block.
- Wiring must be completed without splices.

Figure 61: Typical Multi F / Multi F MAX with LGRED Outdoor and Indoor / Branch Distribution Unit Wiring and Communications Cable Diagram For Wiring Lengths Up to 130 Feet.

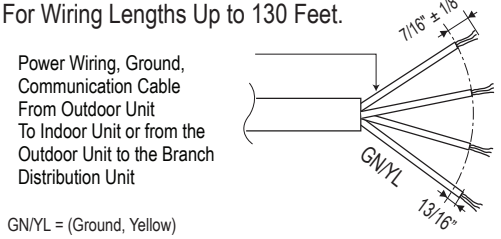
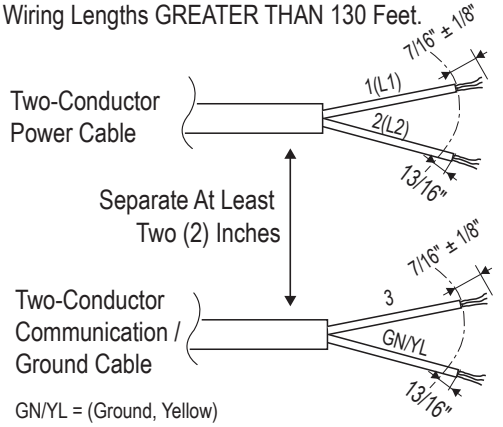


Figure 62: Multi F with LGRED Outdoor Unit to Indoor Unit, and Multi F MAX with LGRED Branch Distribution Unit to Indoor Unit Wiring Diagram for Wiring Lengths GREATER THAN 130 Feet.



Note:

- *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.*
- ⃠ *Never ground the shield of the communications cable to the indoor unit frame or other grounded entities of the building. Ground the communications cable shield only at the outdoor unit. Improperly grounding this cable can cause communications errors.*
- *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.*

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Figure 63: Typical Multi F with LGRED System General Power / Communications System Schematic When Wiring is Less Than 130 Feet.

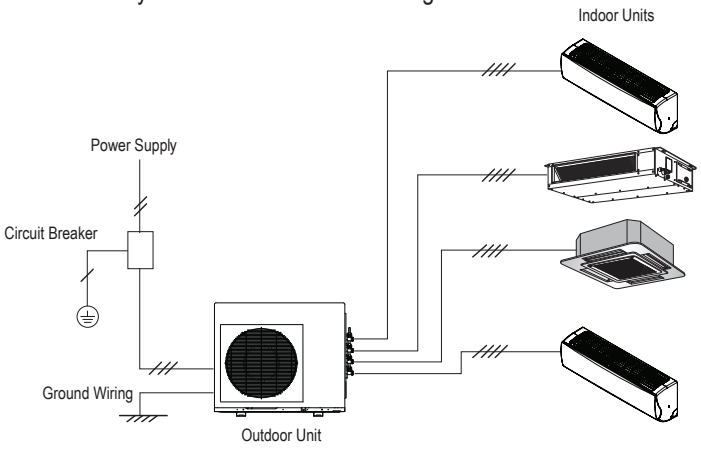


Figure 64: Typical Multi F MAX with LGRED System General Power / Communications System Schematic When Wiring is Less Than 130 Feet.

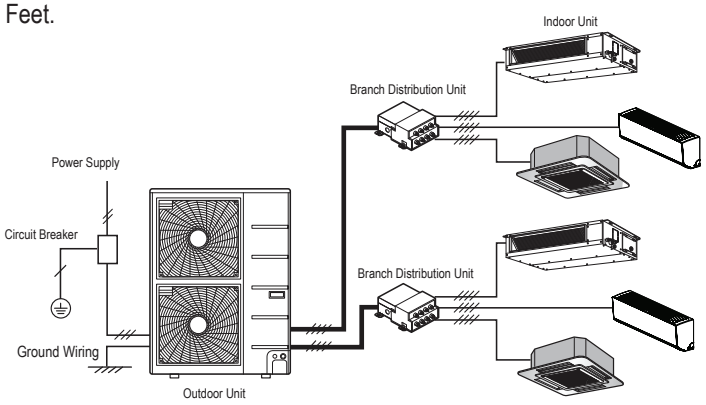
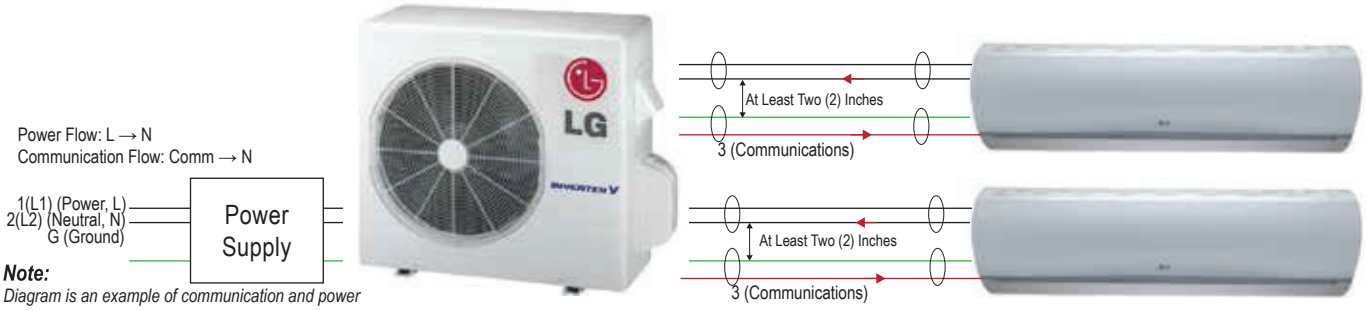


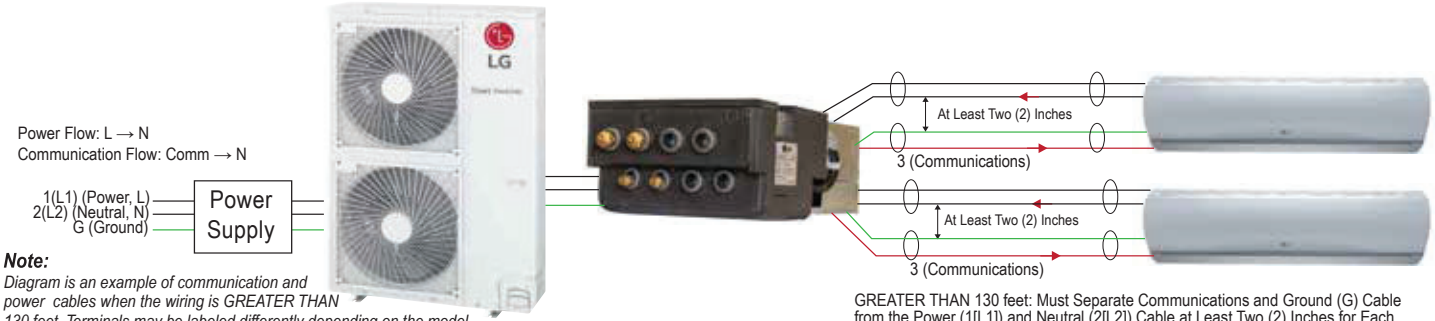
Figure 65: Schematic of a Multi F with LGRED System When the Wiring is GREATER THAN 130 Feet.



Note:
Diagram is an example of communication and power cables when the wiring is GREATER THAN 130 feet. Terminals may be labeled differently depending on the model. Outdoor and Indoor Unit appearances may vary depending on the model.

GREATER THAN 130 feet: Must Separate Communications and Ground (G) Cable from the Power (1[L1]) and Neutral (2[L2]) Cable at Least Two (2) Inches for Each Indoor Unit.

Figure 66: Schematic of a Multi F MAX with LGRED System When the Wiring is GREATER THAN 130 Feet.



Note:
Diagram is an example of communication and power cables when the wiring is GREATER THAN 130 feet. Terminals may be labeled differently depending on the model. Outdoor and Indoor Unit appearances may vary depending on the model.

GREATER THAN 130 feet: Must Separate Communications and Ground (G) Cable from the Power (1[L1]) and Neutral (2[L2]) Cable at Least Two (2) Inches for Each Indoor Unit.

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Controller Options

Wall-mounted indoor units include a wireless handheld remote controller (Model No. AKB74955602), but optional LG-supplied wired controllers are available. After all wiring is connected to the indoor and outdoor units, test the accompanying remote controllers for performance. As always, follow all safety warnings and notes when operating the units using the remote controller. Additionally, all of the Multi F / Multi F MAX outdoor units can use the following controllers when accompanied with the PI 485 VNet Accessory:

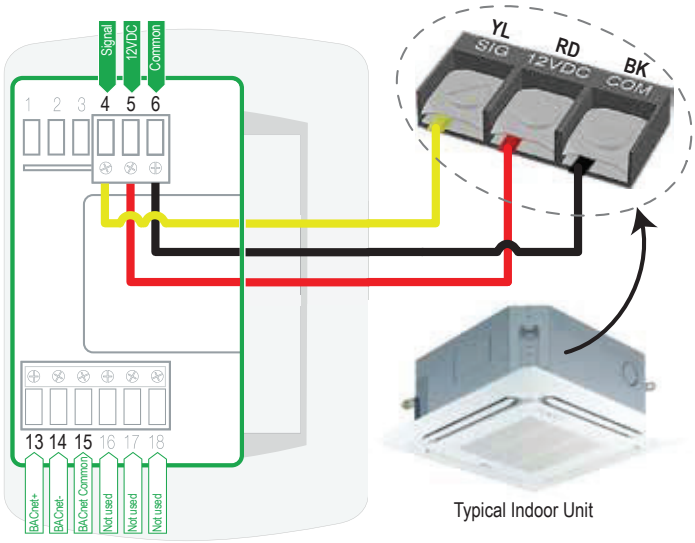
- AC Smart
- ACP
- BACnet®
- LonWorks®

BACnet® is a registered trademark of ASHRAE
LonWorks® is a registered trademark of Echelon Corporation.

Communication Cables From Indoor Units to Remote Controllers

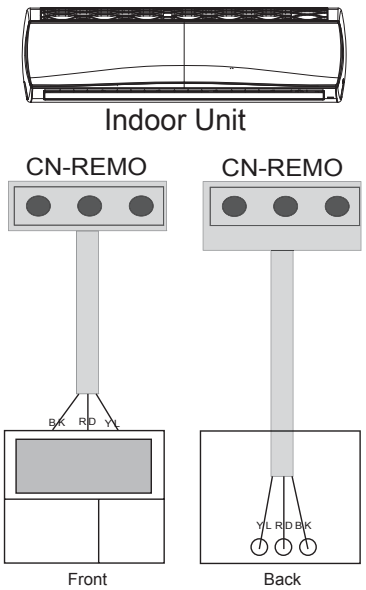
- Communication cable from indoor unit to remote controller(s) is to be 22 AWG, 3-conductor, twisted, stranded, unshielded. Wiring must comply with all applicable local and national codes.
- If using the LG Controller / Extension cable and the length needs to be further extended, the LG Extension Kit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

Figure 67: One Example of Indoor Unit to Zone Controller Connection.



Typical Indoor Unit

Figure 68: Another Example of Indoor Unit to Zone Controller Connection.



Note:

Cable connected to Zone Controller is the factory default connection.

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Communication Cables Between Multiple Indoor Units Operating as a Group (Group Control)

If any indoor units were specified to operate in unison:

- Before running cable, decide which indoor unit will be the "Master." The other indoor units in that group will be designated as "Slave(s)." The zone controller will be connected to the "Master."
- Set the pertinent DIP switch at each indoor unit to identify the Master and Slave(s). On wall mounted indoor unit models, set the assignment using the handheld remote controller.
- Use a daisy chain configuration and connect all of the group's indoor units together starting at the "Master" unit.
- ⃠ NEVER splice, cut, or extend cable length with field provided cable. Always include enough cable to cover distance between all components.

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

- From the controller to the master indoor unit, use 22 AWG, 3-conductor, twisted, stranded, unshielded. All wiring must comply with all applicable local / national codes.
- From the master indoor unit to the slave indoor unit(s), daisy chain using 22 AWG, 3-conductor, twisted, stranded, unshielded. All wiring must comply with all applicable local / national codes.
- (⃠ Do not attach wire to 12VDC terminal to the slave indoor units). All wiring must comply with all applicable local and national codes.
- ⃠ NEVER splice, cut, or extend cable length; always include enough cable to cover distance between all components.

For indoor units with CN-REMO connections:

Use one (or multiple) Group Control Kit(s) (sold separately) containing extension and Y-splitter cables. Use one (1) group control cable kit for each indoor unit in the group except for the last indoor unit. ⃠ NEVER splice, cut, or extend cable length with field provided cable.

Figure 69: Example of Indoor Unit Group to Zone Controller Connections (Sig-12V-GND [Comm.] Terminal).

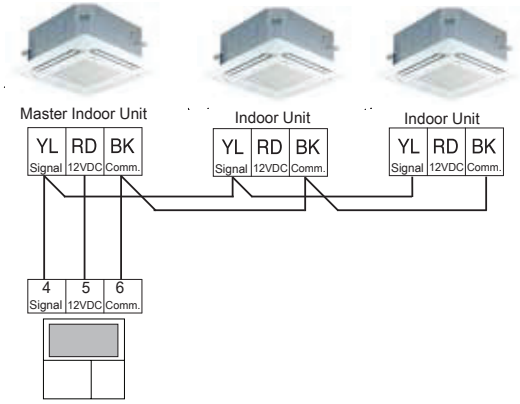

Figure 70: Example of Indoor Unit Group to Zone Controller Connections (CN-REMO).

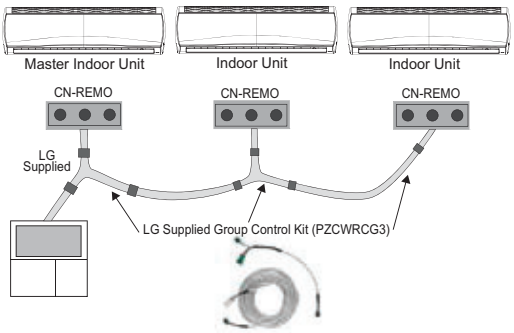

Table 18: Accessories for Some Group Control Applications.

Accessory	Model Number	Image
Wired Remote Group Control Cable Assembly, Required for connecting multiple indoor units to a control group	PZCWRCG3	
Wired Remote/Wired Remote Extension Cable, Required for extending the distance between indoor units or remote controllers in a control group	PZCWRC1	

Note:

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

General Specifications

- Wired remote controllers can be connected to all indoor unit types.
- Wireless controllers can be used in conjunction with wired remote controllers.
- A dry contact unit can be connected with a central controller simultaneously.
  - The master indoor unit is recognized by the dry contact unit and the central controller.
  - Group Control only available for indoor units manufactured after February 2009.
  - The central controller can control indoor units after setting the address of the master indoor unit only.
  - Slave indoor unit cannot be individually controlled by central controller.
  - Slave indoor unit will operate like master indoor unit.
- If an error occurs with the indoor unit, the error will be displayed on the wired remote controller.
- The following functions are available with group control:
- Selection of operation options (operation/mode/set temperature)
- Control of air flow rate (High/Medium/Low)

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Connecting the Power Wiring / Communication Cable - HVT Indoor Units

⚠WARNING

- *Verify that main power to the unit is completely off before proceeding with these steps as there is a risk of electrical shock, bodily injury, and / or death.*
- *Follow all safety and warning information outlined at the beginning and throughout this manual. Failure to do so will cause electrical shock, bodily injury, and / or death.*

Note:

- *Follow all safety and warning information outlined at the beginning and throughout this manual. Failure to do so will cause unit failure.*
- *Connect the communication / connection (power) cable to the indoor unit by matching the terminals on the outdoor unit control board. Verify the color of the wires at the outdoor unit, along with the terminal numbers, match those for the indoor unit.*
- *Images are representative; actual appearance will vary.*
- *Refer to the circuit diagram on the indoor unit bottom cover.*

HVT Indoor Unit Wiring Installation Procedure

1. The front panel must already be opened, and the bottom panel must already be removed. If not, fully open the front panel. The control cover can be accessed on the bottom right side of the front of the indoor unit.

2. At the bottom panel of the indoor unit, unsnap the latches that cover the screws. Number of screws on the panel will differ by indoor unit model.

3. Using a Phillips head screwdriver, remove the screws from the bottom panel of the indoor unit and set aside for re-installation.

4. Remove the bottom panel, being careful not to scratch the main horizontal vane. Set aside the bottom panel to re-install after all procedures are complete.

Figure 71: Latch over Screws on Indoor Unit Bottom Panel.

5. Remove the control cover on the bottom right side of the front of the indoor unit by detaching the screw. Set the screw and the control cover aside for re-installation.

Figure 72: Remove Screws from Bottom Panel.

Figure 73: Remove Bottom Panel.

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6. Route the power wiring / communications (connection) cable through the bottom of the indoor unit (through a knockout panel) to the terminal block.

7. Using a JIS screwdriver, connect the cable terminals to the terminal block. Ensure wire color and terminal number of the indoor unit matches those of the outdoor unit. Refer to the wiring diagram on the inside of the cover.

8. Choice of the cable path out of the indoor unit and to the outdoor unit depends on refrigerant piping / drain hose installation: left side piping, following back of indoor unit; right side piping, through the knockout hole; or rear piping.

Figure 74: Indoor Unit Knockout.

Figure 75: Indoor Unit Terminal Block with Ground Cable (Example Only).

Note:

- *Each wire must be securely attached to the terminal block.*
- *Ground cable must be longer than the other wires.*
- *Secure the cable onto the control board using a cable tie.*
- *Use a conduit to protect the cable / refrigerant piping from the indoor unit to the outdoor unit.*

Cable Installation When Piping is on the Left Side:

- Insert the communication / connection (power) cable through the bottom of the indoor unit.
- Connect the terminals to the terminal block.
- Secure the cable onto the terminal block with the cable retainer.
- Secure the refrigerant piping, drain hose, and communication / connection (power) cable together using cable ties and conduit, or by the bundling method.

Note:

Position the drain hose at the bottom. Positioning the drain hose at the top of the bundle can cause condensate to overflow from the drain pan in the inside of the indoor unit.

Cable Installation When Piping is on the Right Side:

- Connect the terminals to the terminal block.
- Secure the cable onto the terminal block with the cable retainer.
- Secure the refrigerant piping, drain hose, and communication / connection (power) cable together using cable ties and conduit, or by the bundling method.

Note:

- *Position the drain hose at the bottom. Positioning the drain hose at the top of the bundle can cause condensate to overflow from the drain pan in the inside of the indoor unit.*
- *For more information on conduits or the bundling method, see the Refrigerant Piping Connection section.*

9. Reattach the control cover using the screw.

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Figure 76: LMN079HVT, LMN159HVT, LMN249HVT Indoor Unit Wiring Diagram.

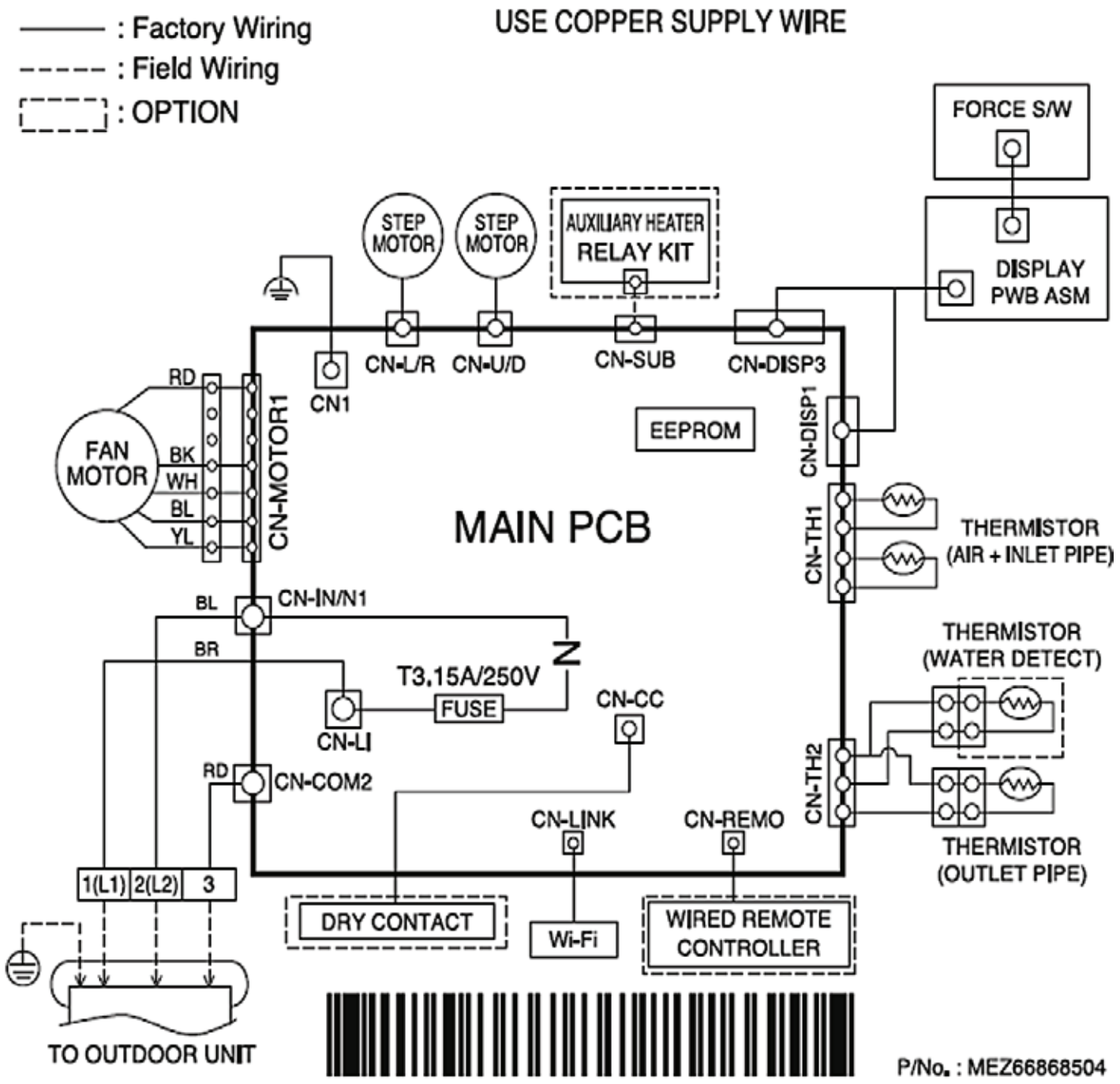

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Figure 77: Connecting the Power Wiring / Communication Cable to the HVT Indoor Unit Terminal Block - Front View.

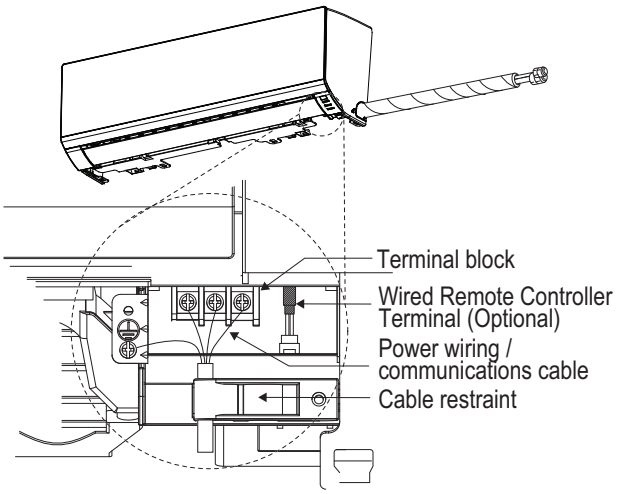


Figure 78: Connecting the Power Wiring / Communication Cable to the HVT Indoor Unit Terminal Block - Back View.

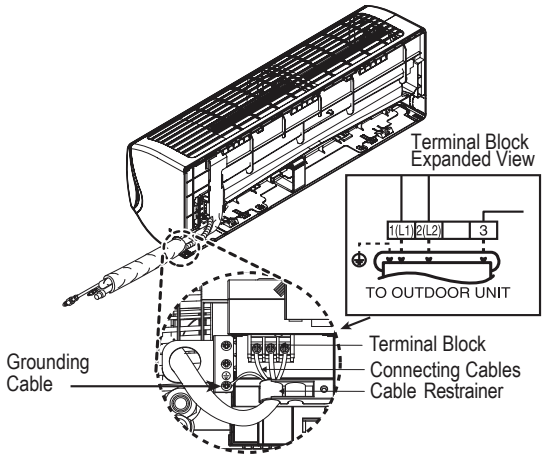


Figure 79: Indoor Unit to Outdoor Unit / Branch Distribution Unit Terminal Connections—LMN079HVT and LMN159HVT.

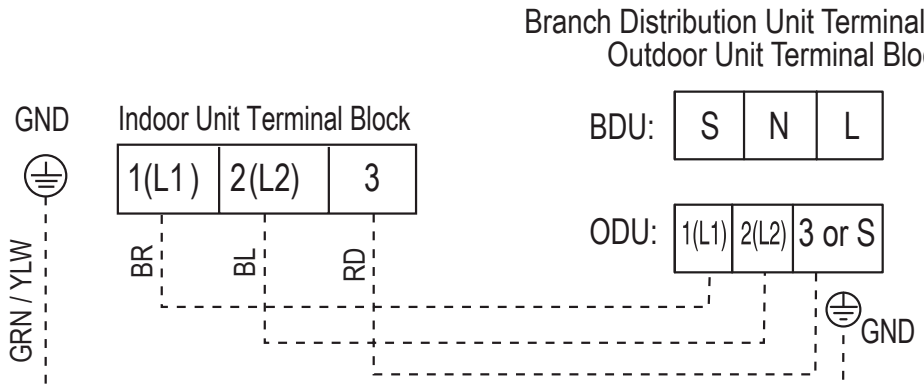
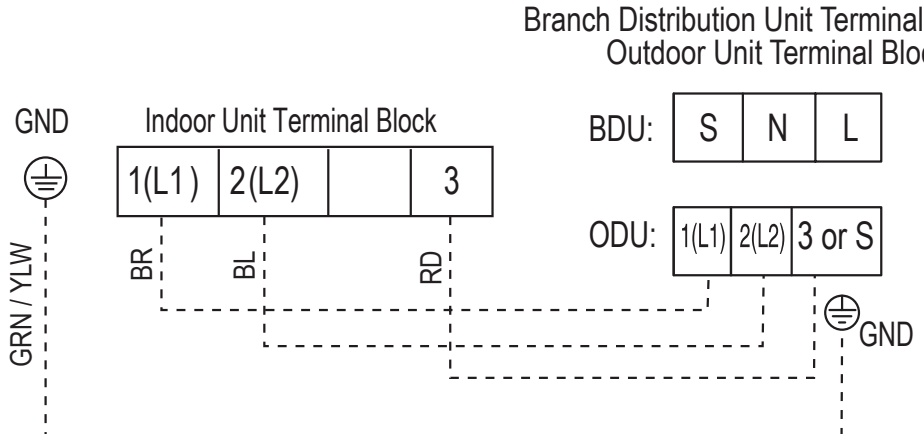


Figure 80: Indoor Unit to Outdoor Unit / Branch Distribution Unit Terminal Connections—LMN249HVT.



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Connecting the Power Wiring / Communication Cable - HSV5 Indoor Units

⚠WARNING

- *Verify that main power to the unit is completely off before proceeding with these steps as there is a risk of electrical shock, bodily injury, and / or death.*
- *Follow all safety and warning information outlined at the beginning and throughout this manual. Failure to do so will cause electrical shock, bodily injury, and / or death.*

Note:

- *Follow all safety and warning information outlined at the beginning and throughout this manual. Failure to do so will cause unit failure.*
- *Connect the communication / connection (power) cable to the indoor unit by matching the terminals on the outdoor unit control board. Verify the color of the wires at the outdoor unit, along with the terminal numbers, match those for the indoor unit.*
- *Images are representative; actual appearance will vary.*
- *Refer to the circuit diagram on the indoor unit bottom cover.*

HSV5 Indoor Unit Wiring Installation Procedure

1. The bottom panel must have already been removed. If it hasn't been removed, unsnap the bottom cover at its top left and right sides (Location 1).

2. Unsnap each of the three (3) or four (4) small C-hooks located in the middle of the bottom cover (Location 2). Number of C-hooks present depends on model of indoor unit.

3. Lift the three (3) to four (4) hinges on the bottom cover up and out of the channels molded to the left, right, and middle of the indoor unit (Location 3). Number of hinges present depends on model of indoor unit.

4. Set aside the bottom cover to re-install after all procedures are complete.

5. Terminal block is located at the front bottom-right—hand side of the indoor unit. To access the terminals, unscrew the metal control cover screw (if applicable), and raise the metal control cover.

6. Using a JIS screwdriver, connect the cable terminals to the terminal block. Ensure wire color and terminal number of the indoor unit matches those of the outdoor unit. Refer to the wiring diagram on the inside of the bottom cover.

Note:

- *Each wire must be securely attached to the terminal block.*
- *Ground cable must be longer than the other wires.*
- *Secure the cable onto the control board using a cable tie.*
- *Use a conduit to protect the cable / refrigerant piping from the indoor unit to the outdoor unit.*

Figure 81: Steps to Removing the Bottom Cover.

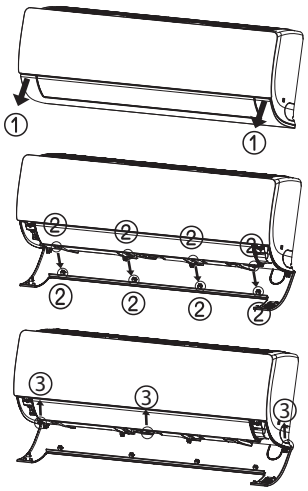

Figure 82: Removing the Bottom Cover (Appearances Will Vary Depending on Indoor Unit Model).

Figure 83: Location of the Indoor Unit Terminal Block.

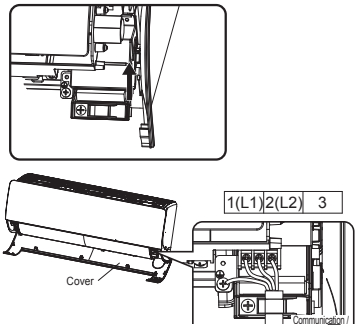

Figure 84: Terminal Cover Down.

Figure 85: Terminal Cover Up.

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Connecting Indoor Unit Electrical Wiring, continued.

7. Choice of the cable path out of the indoor unit and to the outdoor unit depends on refrigerant piping / drain hose installation: left side piping, following back of indoor unit; right side piping, through the knockout hole; or rear piping.

Cable Installation When Piping is on the Left Side:

- Insert the communication / connection (power) cable through the bottom of the indoor unit,
- Connect the terminals to the terminal block.
- Secure the cable onto the terminal block with the cable retainer.
- Secure the refrigerant piping, drain hose, and communication / connection (power) cable together using cable ties and conduit, or by the bundling method.

Note:

Position the drain hose at the bottom. Positioning the drain hose at the top of the bundle can cause condensate to overflow from the drain pan in the inside of the indoor unit.

Cable Installation When Piping is on the Right Side:

- Connect the terminals to the terminal block.
- Secure the cable onto the terminal block with the cable retainer.
- Secure the refrigerant piping, drain hose, and communication / connection (power) cable together using cable ties and conduit, or by the bundling method.

Note:

Position the drain hose at the bottom. Positioning the drain hose at the top of the bundle can cause condensate to overflow from the drain pan in the inside of the indoor unit.

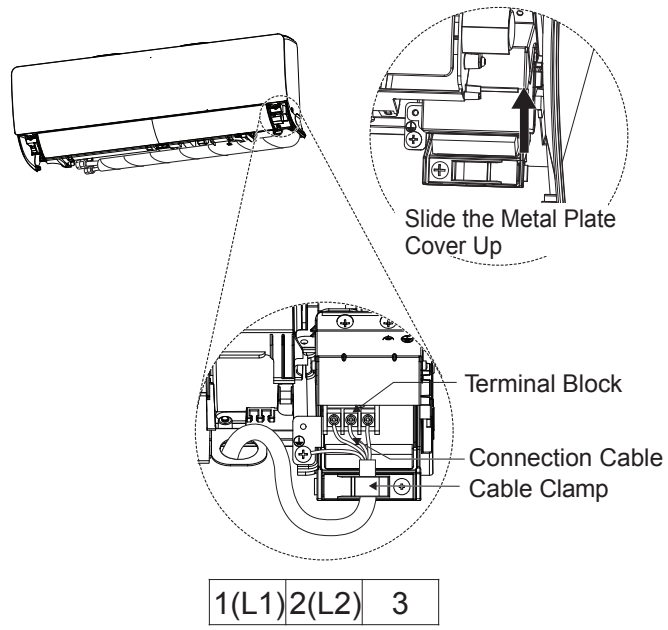
Note:

For more information on conduits or the bundling method, see the Refrigerant Piping Connection section.

8. Reattach the metal control cover using the screw (if applicable).

Figure 86: Cable / Refrigerant Piping / Drain Hose Installation Options.

Wiring When Piping is on the Left Side



Wiring When Piping is on the Right Side

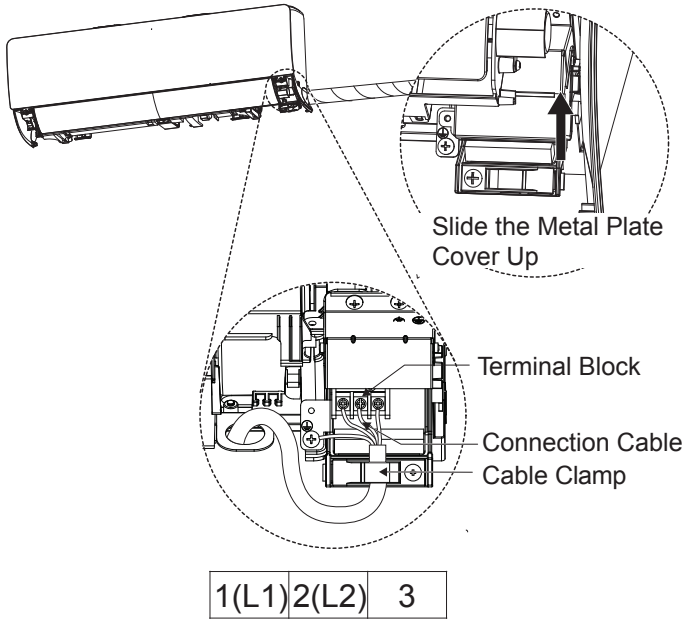


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Figure 87: LSN090HSV5, LSN120HSV5, LSN180HSV5 Indoor Units Wiring Diagram.

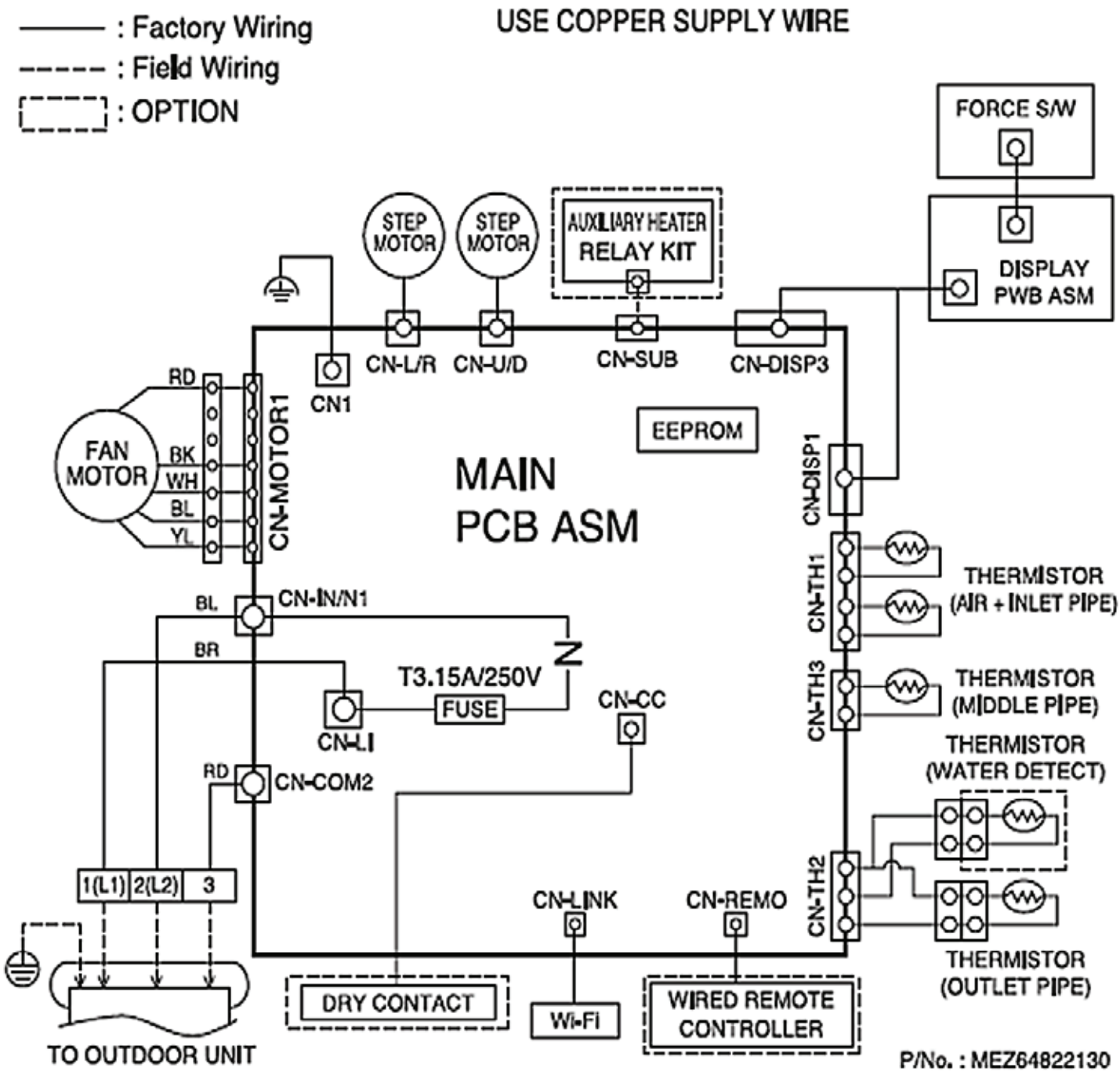

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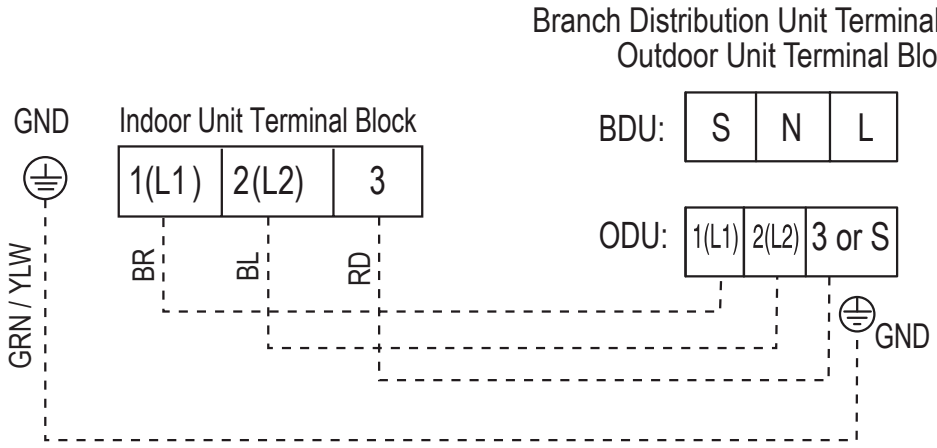
Figure 88: Indoor Unit to Outdoor Unit / Branch Distribution Unit Terminal Connections—LSN090HSV5, LSN120HSV5 and LSN180HSV5.



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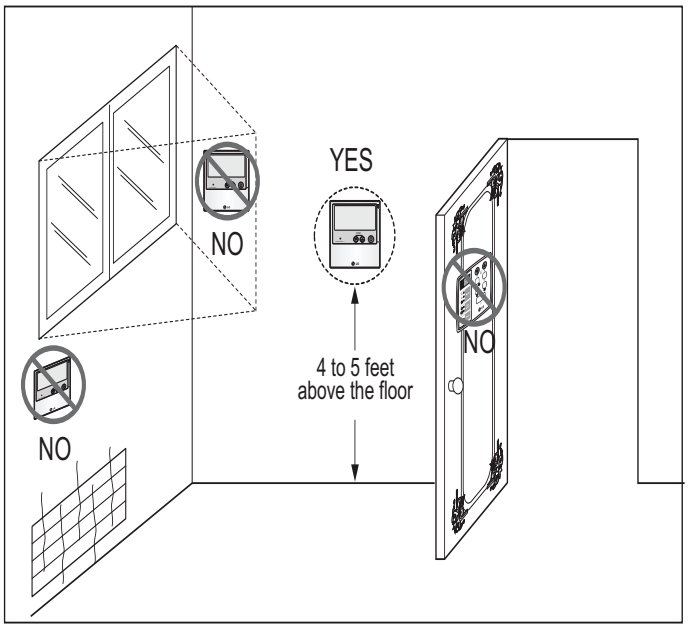
Wired Controller Installation

Wall indoor units can be used with various wired controllers (optional; sold separately). Wired controllers include a sensor to detect room temperature. To maintain comfort levels in the conditioned space, the wired controller must be installed in a location away from direct sunlight, high humidity, and where it could be directly exposed to cold air. Controller must be installed four (4) to five (5) feet above the floor where its display can be read easily, in an area with good air circulation, and where it can detect an average room temperature.



⃠ *Do not install the remote controller where it can be impacted by the following:*

- *Drafts or dead spots behind doors and in corners*
- *Hot or cold air from ducts*
- *Radiant heat from sun or appliances*
- *Concealed pipes and chimneys*
- *Uncontrolled areas such as an outside wall behind the remote controller*

1. Pull communications cable between the controller handy box (if used) and the indoor unit.

2. Store a minimal amount of cable in the handy box. Any additional cable must be coiled and stored near the indoor unit control panel.

3. If additional cable length is needed, communication cable from the indoor unit to the remote controller(s) is to be 22 AWG, 3-conductor, twisted, stranded, unshielded. Wiring must comply with all applicable local and national codes. If using the LG Controller / Extension cable and the length needs to be further extended, the LG Extension Kit (sold separately) must be used. A maximum of four (4) kits (up to 165 feet) can be used.

4. If the cable between a zone controller and the indoor unit is too long, ⃠ do not cut. Coil any spare communications cable, tie-wrap it, and leave it next to the indoor unit location.

Wall-Mounted Sensor Installation

Proper indoor unit operation depends on the location of the room sensor, if a room sensor is installed in addition to, or to use in place of a controller. A good location will protect the sensor from direct sunlight and external local sources of water vapor, and air flow. If no mounting height was specified by the building designer, place the handy box approximately four (4) to five (5) feet above the finished floor.

- It could be necessary to use a handy box that is sized in metric units, depending on the sensor model. Check with your LG representative to verify which size of handy box is needed for the sensor in question.
- Communication cable from the indoor unit to the controller(s) is to be 22 AWG, 3-conductor, twisted, stranded, unshielded. Wiring must comply with all applicable local and national codes. If using the LG Controller / Extension cable and the length needs to be further extended, the LG Extension Kit (sold separately) must be used. A maximum of four (4) kits (up to 165 feet) can be used.
- Maintain at least the minimum distance required between the communications cable and power wiring. The minimum required space between the two depends on the voltage of the power wiring.

Note:

- ⃠ *Do not route power wiring and communications cables in the same conduit. Routing power wiring and communications cables together will cause communication errors and unit malfunction.*
- ⃠ *Do not cut the quick-connect plugs off or adjust the length of the cable. Keep the communications cable away from high voltage wires and electromagnetic field (EMF) producing equipment. Performing these actions will cause communication errors and unit malfunction.*

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Reattaching the Indoor Unit Panels - HVT

Reattach the indoor unit front and bottom panel after all other installation procedures are complete.

1. If ON, shut power OFF to the system. If it hasn't already, reattach the control cover with its screw.
2. Reattach the bottom panel to the indoor unit, carefully aligning the panel using the rear tabs. Tap the panel gently to verify it engages at the bottom.
3. Using a Phillips screwdriver, reattach the screws to the bottom panel.
4. After the screws are in place, re-snap the latches over the screws.
5. Shut the front panel. Tap the panel gently to verify it is fully shut.

Figure 89: Reattaching the Bottom Panel.

Figure 90: Reattaching the Screws on the Bottom Panel.

Figure 91: Reattaching the Screws on the Bottom Panel.

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Reattaching the Indoor Unit Bottom Cover - HSV5

Reattach the indoor unit bottom cover after all other installation procedures are complete.

1. If ON, shut power OFF to the system.

2. At the bottom of the bottom cover, insert the three (3) to four (4) hinges into the channels molded to the left, right, and middle of the indoor unit (Location 1). Number of hinges present depends on model of indoor unit.

3. After all hinges are secure, match the three (3) or four (4) small C-hooks located in the middle of the bottom cover (Location 2) to their sockets on the indoor unit. (Number of C-hooks present depends on model of indoor unit.) On the outside of the bottom cover, securely snap the C-hooks in place at each location using the heel of the palm.

4. Match the snaps at the top left and right sides of the bottom cover to their sockets, and push to lock the bottom cover to the indoor unit (Location 3).

5. Verify the bottom cover is securely installed by pushing the bottom cover to the indoor unit at all attachment locations.

Note:

To prevent bending the bottom cover (and subsequent damage), assemble the bottom cover correctly.

Figure 92: Close Up of Bottom Cover Connections (Appearances Will Vary Depending on Indoor Unit Model).

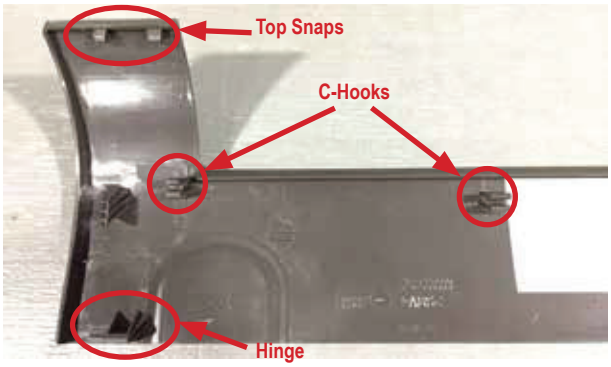


Figure 93: Inserting the Bottom Cover Hinges into the Indoor Unit Channels (Step 2).

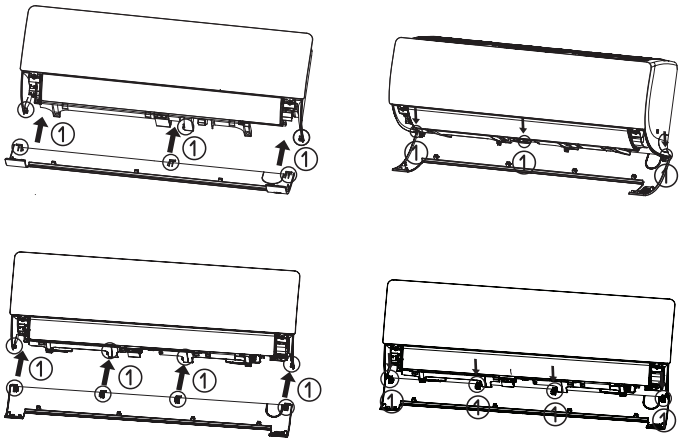


Figure 94: Securing the Bottom Cover C-hooks to the Indoor Unit Sockets (Step 3).

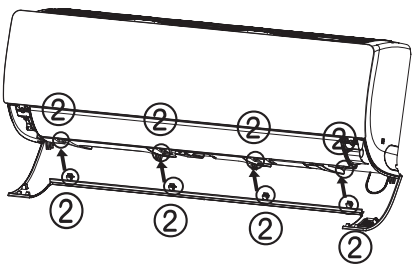
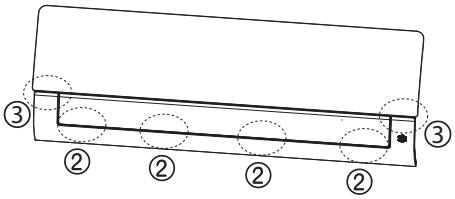


Figure 95: Snapping the Top Left and Right Sides (Step 4).

Figure 96: Checking that All Attachment Locations Are Secure (Step 5).



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Air Filter Disassembly and Assembly - HSV5

Air Filter Disassembly

1. Turn power off to the system.
2. Find the handles located at the top-front of the air filter molded into the plastic frame support.
3. Lift handles slightly up and out to remove the air filter.

Figure 97: Disassembling the Air Filter (Appearances Will Vary Depending on Indoor Unit Model).

2. Lifting the Air Filter by the Handles.

3. Disassembling the Air Filter.

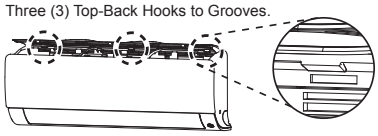
Air Filter Assembly

1. Turn power OFF to the system.
2. Holding the air filter by its handles, match the hooks and grooves on the air filter to the hooks and grooves at the top-back of the indoor unit. (Number of hooks and grooves present depends on model of indoor unit.)
3. Match the air filter bars and grooves to the grooves and hooks at the top-front of the indoor unit.
4. Use thumbs to gently snap the air filter to the indoor unit where the top-front bars, grooves, and hooks are located.
5. Check the sides of the front grille to verify the air filter is assembled correctly.
6. Turn power back on to the system.

Figure 98: Assembling the Air Filter (Appearances Will Vary Depending on Indoor Unit Model).

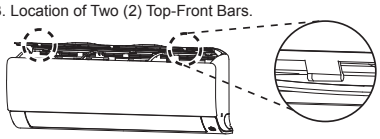
2. Matching Hooks to Top-Back Grooves.

Three (3) Top-Back Hooks to Grooves.

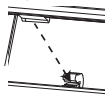


Four (4) Top-Back Hooks to Grooves.

3. Location of Two (2) Top-Front Bars.



Example of Indoor Unit Hook to Air Filter Groove.



4. Securing the Air Filter on the Indoor Unit.

5. Checking the Sides for Correct Air Filter Assembly.

Note:

- *It is easier to assemble and disassemble the air filter if standing on a ladder looking down at the top of the indoor unit.*
- ⃠ *Do not bend the air filter; this damages it.*
- *If the air filter is not assembled correctly, dust and other substances will enter the indoor unit.*

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Installing Batteries into the Handheld Remote Controller

For information on using the handheld remote controller, refer to its owner's manual.

1. The remote controller needs two AAA (1.5V) batteries for operation. Remove the battery cover from the back of the remote controller by pushing downward on the tab at the top of the battery cover, and then lift up to remove.

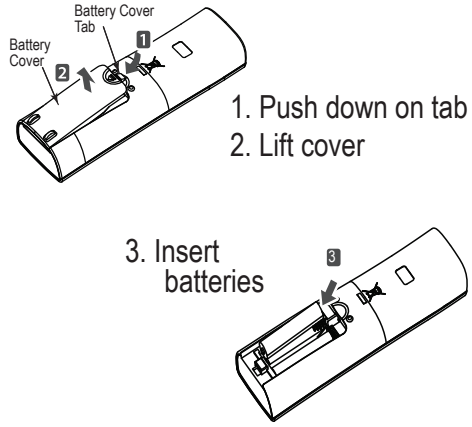
2. Insert the two new batteries.
   - Align batteries by the (+) and (-) sides.
   - The interior battery compartment of the remote controller will have clear markings for the (+) and (-) placement.

3. Verify that the batteries have clicked into the compartment and are firmly engaged with the contacts on either side of them.

4. Reattach the back cover of the remote controller.

5. Proceed with powering on the remote controller and use as needed. Remove the batteries if system won't be used for an extended time.

Figure 99: Installing the Remote Controller Batteries.



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Troubleshooting Using Error Codes

Refer to the table below for error codes that are generated from the indoor units (see the Multi F / Multi F MAX Outdoor Unit Installation Manual for outdoor unit error codes). These codes are the most common. Your particular system might generate additional codes not listed here. Please contact LG Support if you see these types of errors and a simple power cycle has not corrected the issue.

Error Codes

- Indicate different types of unit failures, assists in self-diagnosis and to track the frequency of occurrence.
- Error codes are displayed on indoor unit LEDs, wired remote controllers, the outdoor unit PCB, and through the SIMS app and LG Monitoring View (LGMV) diagnostic software. Also, check the wired remote controller display first for error codes if present.
- If two or more errors occur simultaneously, the lower error code number is displayed first.
- After the error is resolved, the error code does not display.

Decoding the Error Display

The first and second number on the LED indicates error number. Example: 21 = LED1 (Green light) 2x blink, LED2 (Red light) 1x blink.

Error Code Nomenclature Definitions

- MICOM: Non-volatile memory chip where unit setup information is stored.
- EEPROM: Non-volatile memory chip where device identification, size, and factory defined default component operating parameters are stored.

Table 19: Multi Zone Wall-Mounted Indoor Unit Error Codes

Error Code	Description	Number of Times Indoor Unit LEDs Blink	
		LED 2	LED 1
1	Indoor unit room temperature sensor error	-	1X
2	Indoor unit inlet pipe sensor error	-	2X
4	Float switch error (optional)	-	4X
5	Communication error between indoor unit and outdoor units	-	5X
6	Indoor unit outlet pipe sensor error	-	6X
9	Indoor unit EEPROM error	-	9X
10	Indoor unit BLDC motor fan lock	1X	-
12	Indoor unit middle pipe sensor error	1X	2X

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Troubleshooting Using Error Codes - Continued

Table 20: Multi F / Multi F MAX with LGRED Outdoor Unit Error Codes

Error Code	Description	No. of Times Outdoor Unit LEDs Blink	
		LED 1 = Green	LED 2 = Red
21	DC Peak (IPM Fault); Compressor DC voltage was too high	1X	2X
22	Current Transformer2 (CT2) error; Alternating current (AC) input too high	2X	2X
23	DC Link Low Volt	3X	2X
25	AC Low/High Volt	5X	2X
26	DC Comp Position Error (not providing rotation), Locking	6X	2X
27	PSC Fault; Current to inverter compressor between AC and DC converter circuit too high	7X	2X
28	Inverter compressor DC voltage is too high	8X	2X
29	Inverter compressor amperage is too high	9X	2X
31	Current-to-current transformer (CT) thermistor is too low	1X	3X
32	Inverter Compressor Discharge Pipe (D-Pipe) Overheat	2X	3X
40	CT Sensor Error; Thermistor is disconnected or shorted out	-	4X
41	D-Pipe Sensor INV is disconnected or shorted out	1X	4X
44	Outdoor Air Sensor is disconnected or shorted out	4X	4X
45	Middle thermistor of outdoor unit condenser coil is disconnected or shorted out	5X	4X
46	Outdoor unit suction line thermistor is disconnected or shorted out	6X	4X
48	Outdoor unit coil outlet (liquid line) thermistor is disconnected or shorted out	8X	4X
53	Communication failure from outdoor unit to indoor unit	3X	5X
60	Outdoor unit printed circuit board (PCB) EEPROM check sum error	-	6X
61	Outdoor unit condenser coil temperature is too high	1X	6X
62	Outdoor unit inverter compressor PCB heat sink temperature is too high	2X	6X
63	Condenser coil pipe thermistor temperature is too low	3X	6X
65	Heat sink thermistor has disconnected or has shorted out	5X	6X
67	Outdoor brushless direct current (BLDC) fan motor lock error	7X	6X

Refer to Service Manuals posted on www.lghvac.com for a full description of all error codes and workarounds.

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INSTALLATION CHECKLIST

System ID No.: _____ Indoor Unit ID.: _____

Checked by: _____ Date:_____ Signature:_____

Major Component Rough-In

Description	Check
The 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 with LGRED only) are installed, properly supported, and located indoors in a non-corrosive environment.	

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 with LGRED 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

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, 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 with LGRED Outdoor Unit Installation Manual.	
Y-branch fittings were properly SUPPORTED per details provided in the Multi F / Multi F MAX with LGRED Outdoor Unit Installation Manual.	
No oil traps, solenoid valves, sight glasses, filter driers, or any other unauthorized refrigerant specialties were present.	
(Optional) High quality R410A rated full port ball valves with a Schrader port were used at all indoor units and at will in the refrigerant piping network. (Recommended for serviceability.)	

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INSTALLATION CHECKLIST

MULTI F
MULTI F MAX

System ID No.: _____ Indoor Unit ID.: _____

Checked by: _____ Date:_____ Signature:_____

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" 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 (no traps, and connect to the top surface of the main drain line).	
Multi F / Multi F MAX with LGRED outdoor unit 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.	
All condensate lines were properly insulated to prevent condensation.	

Power Wire and Communications Cables

Description	Check
Ground wire was installed and properly terminated at the 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 with LGRED outdoor unit was field supplied, solid or stranded, and installed per all local, state, and NEC requirements.	
For Multi F with LGRED Systems • When the wiring length is up to 130 feet, communication / connection (power) wiring from the outdoor unit to the indoor unit is minimum 18 gauge, four-conductor, stranded, shielded or unshielded. If shielded, must be grounded to chassis at the outdoor unit only. • When the wiring length is GREATER THAN 130 feet, communication / connection (power) wiring from the outdoor unit to the indoor unit is minimum 18 gauge, stranded, shielded or unshielded. If shielded, must be grounded to chassis at the outdoor unit only. Use a two (2) conductor wire for power; use a two (2) conductor wire for communication / ground. Separate the power AT LEAST two (2) inches away from the communication / ground wire.	
For Multi F MAX with LGRED Systems All power wiring / communication cable to be minimum 16 AWG from the Multi F MAX with LGRED outdoor unit to the BD unit 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. • When the wiring length is up to 130 feet, communication / connection (power) wiring from the BD unit to the indoor unit is minimum 18 gauge, four-conductor, stranded, shielded or unshielded. If shielded, must be grounded to chassis at the outdoor unit only. • When the wiring length is GREATER THAN 130 feet, communication / connection (power) wiring from the BD unit to the indoor unit is minimum 18 gauge, stranded, shielded or unshielded. If shielded, must be grounded to chassis at the outdoor unit only. Use a two (2) conductor wire for power; use a two (2) conductor wire for communication / ground. Separate the power AT LEAST two (2) inches away from the communication / ground wire.	
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 with LGRED 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 with LGRED 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.	

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For further technical materials such as submittals, engineering manuals, service manuals, and catalogs, visit www.lghvac.com.

Who to call for assistance

Freight Damage and Unit Replacements	Your LG Manufacturer Representative
Missing Parts	Your LG Manufacturer Representative
Freight Damage and Unit Replacements	Your LG Manufacturer Representative
Received Wrong Indoor Unit Model	Your LG Manufacturer Representative
Installation, Startup, and Commissioning Technical Assistance	1-888-865-3026

For warranty information, visit www.lghvac.com.

LG Electronics, U.S.A., Inc.
Air Conditioning Technologies
4300 North Point Parkway
Alpharetta, Georgia 30022
www.lghvac.com

LG Customer Information Center, Commercial Products
1-888-865-3026 USA
Follow the prompts for commercial A/C products and parts.

IM_MultiF_StdWallMount_9HVT_HSV5_11_18
Supersedes: IM_MultiF_StdWallMount_11_15
IM-Multi-F_StdWallMount-03-15

LG
Life's Good

SINGLE ZONE HIGH EFFICIENCY WALL MOUNTED INSTALLATION MANUAL

Models:
LS090HSV5
LS120HSV5
LS181HSV5

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Please read carefully and store in a safe place for future reference.
Content familiarity required for proper installation.

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

A summary list of safety precautions begins on page 3.

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

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SAFETY INSTRUCTIONS

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

TABLE OF SYMBOLS

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

INSTALLATION

⚠DANGER

⃠ **Don't store or use flammable gas / combustibles near the unit.**
There is risk of fire, explosion, and physical injury or death.

⚠WARNING

⃠ **Do not install or remove the unit by yourself (end user). Ask the dealer or an LG trained service provider to install the unit.**
Improper installation by the user will result in water leakage, fire, explosion, electric shock, physical injury or death.

For replacement of an installed unit, always contact an LG trained service provider.
There is risk of fire, electric shock, explosion, and physical injury or death.

The unit is shipped with refrigerant and the service valves closed. ⃠ **Do not open service valves on the unit until all non-condensibles have been removed from the piping system and authorization to do so has been obtained from the commissioning agent.**
There is a risk of physical injury or death.

⃠ **Do not run the compressor with the service valves closed.**
There is a risk of explosion, physical injury, or death.

Periodically check that the outdoor frame is not damaged.
There is a risk of explosion, physical injury, or death.

Replace all control box and panel covers.
If cover panels are not installed securely, dust, water and animals will enter the unit, causing fire, electric shock, and physical injury or death.

Always check for system refrigerant leaks after the unit has been installed or serviced.
Exposure to high concentration levels of refrigerant gas will lead to illness or death.

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

Dispose the packing materials safely.
- *Packing materials, such as nails and other metal or wooden parts, will cause puncture wounds or other injuries.*
- *Tear apart and throw away plastic packaging bags so that children do not play with them and risk suffocation and death.*

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

⃠ **Do not change the settings of the protection devices.**
If the pressure switch, thermal switch, or other protection device is shorted and forced to operate improperly, or parts other than those specified by LG are used, there is risk of fire, electric shock, explosion, and physical injury or death.

⃠ **Do not install the unit on a defective stand.**
There is a risk of physical injury.

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SAFETY INSTRUCTIONS

INSTALLATION - CONTINUED

⚠WARNING

If the air conditioner is installed in a small space, take measures to prevent the refrigerant concentration from exceeding safety limits in the event of a refrigerant leak.
Consult the latest edition of ASHRAE (American Society of Heating, Refrigerating, and Air Conditioning Engineers) Standard 15. If the refrigerant leaks and safety limits are exceeded, it could result in personal injuries or death from oxygen depletion.

Install the unit in a safe location where nobody can step on or fall onto it.
There is risk of 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.

⚠CAUTION

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

Note:

⃠ **Don't install the unit where it's directly exposed to ocean winds.**
Ocean winds will cause corrosion, particularly on the condenser and evaporator fins, which, in turn could cause product malfunction or inefficient performance.

When installing the unit in a low-lying area, or a location that is not level, use a raised concrete pad or concrete blocks to provide a solid, level foundation.
This will prevent water damage and reduce abnormal vibration.

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

When installing the unit in a hospital, mechanical room, or similar electromagnetic field (EMF) sensitive environment, provide sufficient protection against electrical noise.
Inverter equipment, power generators, high-frequency medical equipment, or radio communication equipment will cause the air conditioner to operate improperly. The unit will also affect such equipment by creating electrical noise that disturbs medical treatment or image broadcasting.

⃠ **Do not use the product for special purposes such as preserving foods, works of art, wine coolers, or other precision air conditioning applications. The equipment is designed to provide comfort cooling and heating.**
There is risk of property damage.

⃠ **Do not make refrigerant substitutions. Use R410A only.**
If a different refrigerant is used, or air mixes with original refrigerant, the unit will malfunction and be damaged.

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

⃠ **Do not install the unit in a noise sensitive area.**
When connecting refrigerant tubing, remember to allow for pipe expansion.
Improper piping will cause refrigerant leaks and system malfunction.

Take appropriate actions at the end of HVAC equipment life to recover, recycle, reclaim or destroy R410A refrigerant according to applicable U.S. Environmental Protection Agency (EPA) rules.

Periodically check that the outdoor 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 risk of unit and property damage.

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

⃠ **Don't store or use flammable gas / combustibles near the unit.**
There is risk of product failure.

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

The unit is shipped with refrigerant and the service valves closed. ⃠ **Do not open service valves on the unit until all non-condensibles have been removed from the piping system and authorization to do so has been obtained from the commissioning agent.**
There is a risk of refrigerant contamination, refrigerant loss and equipment damage.

⃠ **Do not run the compressor with the service valves closed.**
There is a risk of equipment damage.

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WIRING

⚠DANGER

High voltage electricity is required to operate this system. Adhere to the National Electrical Codes and these instructions when wiring.
Improper connections and inadequate grounding can cause accidental injury or death.

Always ground the unit following local, state, and National Electrical Codes.

Turn the power off at the nearest disconnect before servicing the equipment.
Electrical shock can cause physical injury or death.

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

⚠WARNING

The information contained in this manual is intended for use by an industry-qualified, experienced, certified electrician familiar with the U.S. National Electric Code (NEC) who is equipped with the proper tools and test instruments.
Failure to carefully read and follow all instructions in this manual can result in personal 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 National Electrical Code, and the instructions given in this manual.
If the power source capacity is inadequate or the electric work is not performed properly, it will result in fire, electric shock, physical injury or death.

Refer to local, state, and federal codes, and use power wires of sufficient current capacity and rating.
Wires that are too small will generate heat and cause a fire.

Secure all field wiring connections with appropriate wire strain relief.
Improperly securing wires will create undue stress on equipment power lugs. Inadequate connections will generate heat, cause a fire and physical injury or death.

Note:

The information contained in this manual is intended for use by an industry-qualified, experienced, certified electrician familiar with the U.S. National Electric Code (NEC) who is equipped with the proper tools and test instruments.
Failure to carefully read and follow all instructions in this manual can result in equipment malfunction and property damage,.

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SAFETY INSTRUCTIONS

OPERATION

⚠DANGER

⃠ **Do not provide power to or operate the unit if it is flooded or submerged.**
There is risk of fire, electric shock, physical injury or death.

Use a dedicated power source for this product.
There is risk of fire, electric shock, physical injury or death.

⃠ **Do not operate the disconnect switch with wet hands.**
There is risk of fire, electric shock, physical injury or death.

Periodically verify that the hardware securing the unit has not deteriorated.
If the unit falls from its installed location, it can cause property damage, product failure, physical injury or death.

If gas leaks out, ventilate the area before operating the unit.
If the unit is mounted in an enclosed, low-lying, or poorly ventilated area, and the system develops a refrigerant leak, it will cause fire, electric shock, explosion, physical injury or death.

⚠WARNING

⃠ **Do not allow water, dirt, or animals to enter the unit.**
There is risk of fire, electric shock, physical injury or death.

⃠ **Avoid excessive cooling, and periodically perform ventilation to the unit.**
Inadequate ventilation is a health hazard.

⃠ **Do not touch the refrigerant piping during or after operation.**
It can cause burns or frostbite.

⃠ **Do not operate the unit with the panel(s) or protective cover(s) removed; keep fingers and clothing away from moving parts.**
The rotating, hot, cold, and high-voltage parts of the unit can cause physical injury or death.

Periodically verify the equipment mounts have not deteriorated.
If the base collapses, the unit could fall and cause physical injury or death.

Periodically check power cord and plug for damage.
Cord must be replaced by the manufacturer, its service agent, or similar qualified persons in order to avoid physical injury and/or electric shock.

⃠ **Do not open the inlet grille of the unit during operation.** ⃠ **Do not operate the unit with the panels or guards removed.** ⃠ **Do not insert hands or other objects through the inlet or outlet when the unit is plugged in.** ⃠ **Do not touch the electrostatic filter, if the unit includes one.**
The unit contains sharp, rotating, hot, and high voltage parts that can cause personal injury and/or electric shock.

Securely attach the electrical part cover to the indoor unit and the service panel to the outdoor unit.
Non-secured covers can result in burns or electric shock due to dust or water in the service panel.

⚠CAUTION

⃠ **To avoid physical injury, use caution when cleaning or servicing the air conditioner.**

Note:

Clean up the site after installation is finished, and check that no metal scraps, screws, or bits of wiring have been left inside or surrounding the unit.

⃠ **Do not use this equipment in mission critical or special-purpose applications such as preserving foods, works of art, wine coolers or refrigeration. The equipment is designed to provide comfort cooling and heating.**

Provide power to the compressor crankcase heaters at least six (6) hours before operation begins.
Starting operation with a cold compressor sump(s) will result in severe bearing damage to the compressor(s). Keep the power switch on during the operational season.

⃠ **Do not block the inlet or outlet.**
Unit will malfunction.

Securely attach the electrical part cover to the indoor unit and the service panel to the outdoor unit.
Non-secured covers can result in malfunction due to dust or water in the service panel.

Periodically verify the equipment mounts have not deteriorated.
If the base collapses, the unit could fall and cause property damage or product failure.

⃠ **Do not allow water, dirt, or animals to enter the unit.**
There is risk of unit failure.

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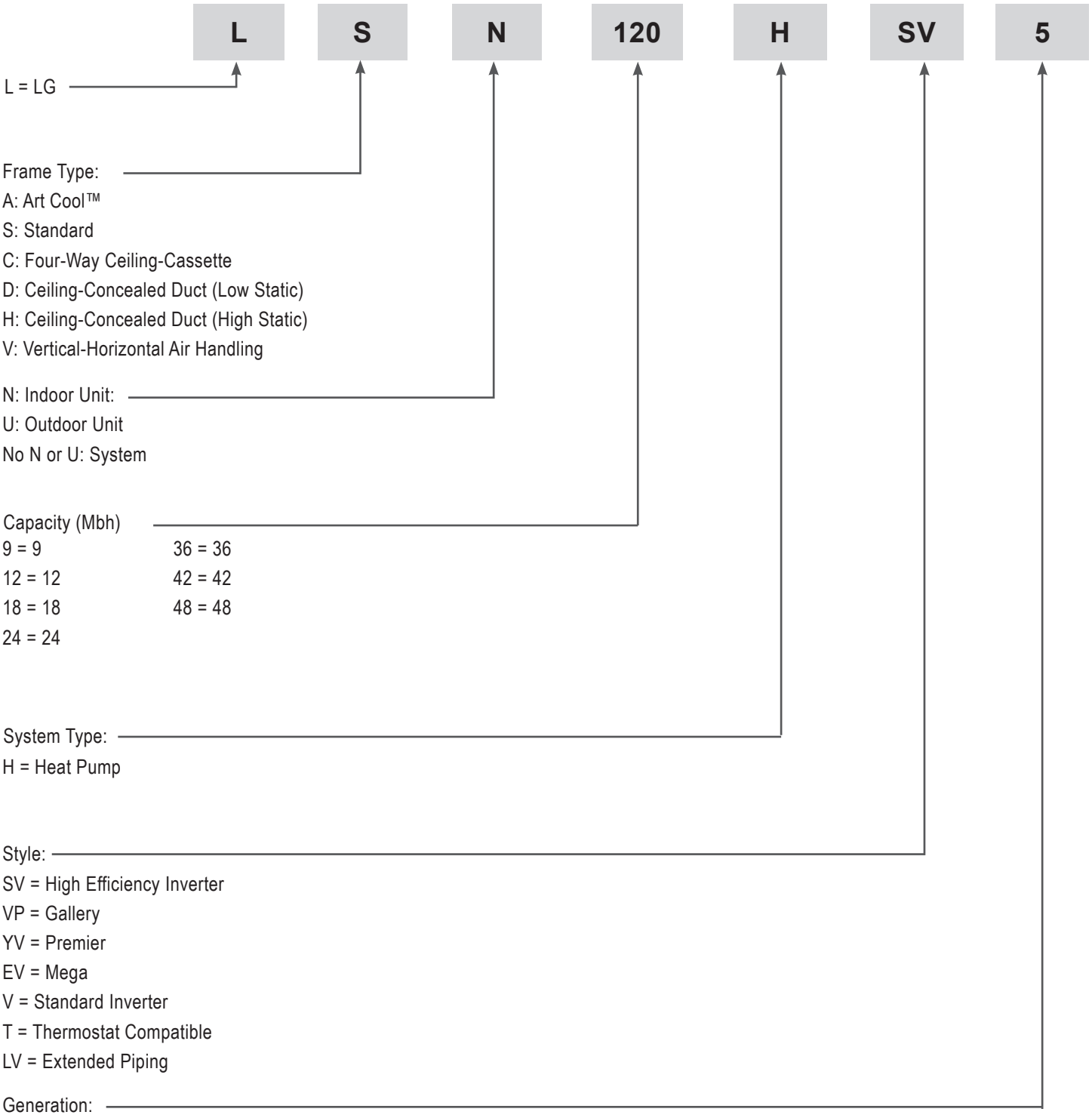
GENERAL DATA

Unit Nomenclature

Indoor Units and Outdoor Units



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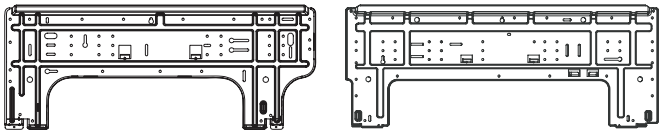
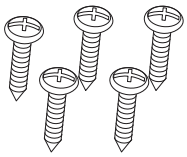
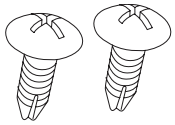
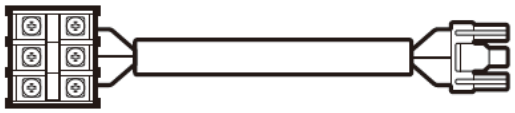
Required Tools (field provided)

- Level
- Screwdriver
- Electrical lineman pliers
- Electric drill
- Hole saw
- Drill
- Flaring tool set
- Tubing cutter
- Tube/pipe reamer
- Torque wrenches
- Allen wrench
- Gas-leak detector
- Thermometer
- Measuring tape
- Multimeter
- Ammeter

Required Parts (field provided)

- Connecting cable (power and control)
- Pipes - vapor line and liquid line, with insulation
- Insulated drain hose
- Additional drain hose

Included Parts

Part	Quantity	Image
Installation Plate	One (1)	 9,000 ~ 12,000 Btu/h Indoor Units 18,000 Btu/h Indoor Units
Type “A” Screws	Five (5)	
Type “B” Screws (M4 x 12L)	Two (2)	
Wireless Controller with Holder AKB74955602	One (1)	
Terminal Connector	One (1)	

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GENERAL DATA

Specifications

Table 1: Single Zone High Efficiency System Specifications.

System Model Number (IDU/ODU)		LS090HSV5 (LSN090HSV5/LSU090HSV5)	LS120HSV5 (LSN120HSV5/LSU120HSV5)	LS181HSV5 (LSN181HSV5/LSU181HSV5)
Cooling Capacity (Min/Rated/Max) (Btu/h)		1,023 ~ 9,000 ~ 12,625	1,023 ~ 12,000 ~ 13,785	3,070 ~ 18,000 ~ 29,515
Cooling Power Input[1] (kW)		0.20 ~ 0.62 ~ 0.87	0.20 ~ 0.96 ~ 1.35	0.30 ~ 1.43 ~ 2.00
Heating Capacity (Min/Rated/Max) (Btu/h)		1,023 ~ 10,900 ~ 17,061	1,023 ~ 13,600 ~ 22,178	3,070 ~ 21,600 ~ 38,898
Heating Power Input[1] (kW)		0.20 ~ 0.71 ~ 1.89	0.20 ~ 1.04 ~ 1.97	0.66 ~ 1.73 ~ 3.98
COP		4.50	3.83	3.66
Maximum Heating Capacity (Btu/h)				
Outdoor 17 °F (WB)/Indoor 70 °F (DB)		11,080 (102%)	13,810 (102%)	22,340 (103%)
Outdoor 5°F (WB)/Indoor 70 °F (DB)		9,570 (88%)	11,930 (88%)	19,300 (89%)
Outdoor -4 °F (WB)/Indoor 70 °F (DB)		8,310 (76%)	10,360 (76%)	16,760 (77%)
EER2		14.5	12.5	12.55
SEER2		23.2	22.0	22.0
HSPF2		10.2	10.0	9.5
Power Supply (V/Hz/Ø)		208-230 / 60 / 1		
Outdoor Unit Operating Range[2]				
Cooling (°F DB)		14 to 118		
Heating (°F WB)		-4 to 65		
Indoor Unit Operating Range				
Cooling (°F WB)		53 to 75		
Heating (°F DB)		60 to 86		
Indoor Temperature Setting Range				
Cooling (°F)		64 to 86		
Heating (°F)		60 to 86		
Unit Data				
Refrigerant Type[3]		R410A		
Refrigerant Control		EEV		
IDU Sound Pressure Level dB(A) (H/M/L/Sleep)[4]		41 / 35 / 25 / 21	41 / 35 / 25 / 21	47 / 42 / 37 / 31
ODU Sound Pressure Level dB(A)[4] (Cool/Heat)		47 / 51	47 / 51	55 / 55
Unit Weight (lbs)				
IDU (Net/Shipping)		18.3 / 23.4	18.3 / 23.4	25.6 / 32.2
ODU (Net/Shipping)		74.1 / 78.9	74.1 / 78.9	127.9 / 145.5
Power Wiring/Communication Cable[5] (No.x AWG)		4 x 14		
Compressor				
Compressor Type (Qty)		Twin Rotary (1)	Twin Rotary (1)	Twin Rotary (1)
Fan				
Indoor Unit Type (Qty)		Cross Flow (1)		
Outdoor Unit Type (Qty)		Propeller (1)		
Motor/Drive		Brushless Digitally Controlled / Direct		
Airflow Rate				
Indoor Unit (Max. / H / M / L [CFM])	Cooling	459 / 338 / 317 / 194	459 / 338 / 317 / 194	706 / 530 / 477 / 371
	Heating	459 / 338 / 317 / 229	459 / 338 / 317 / 229	706 / 547 / 494 / 371
Outdoor Unit (Max. [CFM])		1,165	1,165	2,119
Piping				
Liquid Line (in.)		ø1/4	ø1/4	ø3/8
Vapor Line (in.)		ø3/8	ø3/8	ø5/8
Condensate Drain O.D. / I.D. (in.)		27/32, 5/8	27/32, 5/8	27/32, 5/8
Additional Refrigerant Charge (oz./ft.)		0.22	0.22	0.38
Pipe Length[6] (Minimum/Standard/Maximum) (ft.)		9.8 / 24.6 / 82	9.8 / 24.6 / 82	9.8 / 24.6 / 114.8
Piping Length[6] (no add'l refrigerant, ft.)		41	41	24.6
Max Elevation Difference (ft.)		49.2	49.2	49.2

EEV: Electronic Expansion Valve IDU: Indoor Unit ODU: Outdoor Unit

This unit comes with a dry helium charge.

This data is rated 0 ft above sea level with 24.6 of refrigerant line per indoor unit and a 0 ft level difference outdoor and indoor units.

Cooling capacity rating obtained with air entering the indoor unit at 80°F dry bulb (DB) and 67°F wet bulb (WB) and outdoor ambient conditions of 95°F dry bulb (DB) and 75°F wet bulb (WB).
Heating capacity rating obtained with air entering the indoor unit at 70°F dry bulb (DB) and 59°F wet bulb (WB) and outdoor ambient conditions of 47°F dry bulb (DB) and 43°F wet bulb (WB).

[1]Power Input is rated at high speed.

[2]Optional low Ambient Wind Baffle Kit allows operation down to 0°F in cooling mode.

[3]Take appropriate actions at the end of HVAC equipment life to recover, recycle, reclaim or destroy R410A refrigerant according to applicable regulations (40 CFR Part 82, Subpart F) under section 608 of CAA.

[4]Sound Pressure levels are tested in an anechoic chamber under ISO Standard 1996.

[5]All communication / connection (power) cable from the outdoor unit to the indoor unit is field supplied and must be a minimum of four-conductor, 14 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.

[6]Piping lengths are equivalent.

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Electrical Data

Table 2: Single Zone High Efficiency Standard Wall Mount System Electrical Data.

Nominal Tons	Unit Model No.	Hertz	Voltage	Voltage Range (Min. to Max.)	MCA	MOP	Compressor Quantity	LRA	Compressor Motor RLA		Outdoor Fan Motor		Indoor Fan Motor
									Cooling	Heating	W	FLA	FLA
3/4	LS090HSV5	60	208 - 230	187 - 253	10.0	15.0	1	7.5	7.0	7.0	43	0.4	0.4
1	LS120HSV5				10.0	15.0	1	7.5	7.0	7.0	43	0.4	0.4
1-1/2	LS181HSV5				19.0	30.0	1	17.0	12.6	14.3	124	0.78	0.4

Voltage tolerance is ±10%.

Maximum allowable voltage unbalance is 2%.

MCA = Minimum Circuit Ampacity.

Maximum Overcurrent Protection (MOP) is calculated as follows: (Largest motor FLA x 2.25) + (Sum of other motor FLA) rounded down to the nearest standard fuse size.

RLA = Rated Load Amps.

FLA = Full Load Amps.

W: Fan Motor Rated Output (W)

LRA = Locked Rotor Amps

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GENERAL INSTALLATION GUIDELINES

Outdoor Unit Location Selection

Selecting the Best Location for the Outdoor Unit

⚠DANGER

- ⃠ *Do not install the unit in an area where combustible gas will generate, flow, stagnate, or leak. These conditions can cause a fire, resulting in bodily injury or death.*
- ⃠ *Do not install the unit in a location where acidic solution and spray (sulfur) are often used as it can cause bodily injury or death.*
- ⃠ *Do not use the unit in environments where oil, steam, or sulfuric gas are present as it can cause bodily injury or death.*

⚠CAUTION

When deciding on a location to place the outdoor unit, be sure to choose an area where run-off water from defrost cycle will not accumulate and freeze on sidewalks or driveways, which will create unsafe conditions. Properly install and insulate any drain hoses to prevent the hose from freezing, cracking, leaking, and causing unsafe conditions from frozen condensate.

⚠WARNING

Install a fence to prevent vermin from crawling into the unit or unauthorized individuals from accessing it. Vermin and unauthorized individuals will cause a fire, electric shock, physical injury or death. Follow the placement guidelines set forth in "Clearance Requirements".

Note:

Install a fence to prevent vermin from crawling into the unit or unauthorized individuals from accessing it. Vermin and unauthorized individuals will damage the unit. Follow the placement guidelines set forth in "Clearance Requirements".

Select a location for installing the outdoor unit that will meet the following conditions:

- Where there is enough structural strength to bear the weight of the unit.
- A location that allows for optimum air flow and is easily accessible for inspection, maintenance, and service.
- Where piping between the outdoor unit and indoor unit is within allowable limits.
- Include space for drainage to ensure condensate flows properly out of the unit when it is in heating mode. ⃠ Avoid placing the outdoor unit in a low-lying area where water could accumulate.
- If the outdoor unit is installed in a highly humid environment (near an ocean, lake, etc.), ensure that the site is well-ventilated and has a lot of natural light (Example: Install on a rooftop).

⃠ Dont's

- *Where it will be subjected to direct thermal radiation from other heat sources, or an area that would expose the outdoor unit to heat or steam like discharge from boiler stacks, chimneys, steam relief ports, other air conditioning units, kitchen vents, plumbing vents, and other sources of extreme temperatures.*
- *Where high-frequency electrical noise / electromagnetic waves will affect operation.*
- *Where operating sound from the unit will disturb inhabitants of surrounding buildings.*
- *Where the unit will be exposed to direct, strong winds.*
- *Where the discharge of one outdoor unit will blow into the inlet side of an adjacent unit (when installing multiple outdoor units).*

Planning for Snow and Ice

To ensure the outdoor unit operates properly, certain measures are required in locations where there is a possibility of heavy snowfall or severe windchill or cold:

1. Prepare for severe winter wind chills and heavy snowfall, even in areas of the country where these are unusual phenomena.
2. Position the outdoor unit so that its airflow fans are not buried by direct, heavy snowfall. If snow piles up and blocks the airflow, the system will malfunction.
3. Remove any snow that has accumulated four (4) inches or more on the top of the outdoor unit.
4. In climates that can experience significant snow buildup, mount the outdoor unit on a raised, field-provided platform or stand. The raised support platform must be high enough to allow the unit to remain above possible snow drifts, and must be higher than the maximum anticipated snowfall for the location.
5. Design the mounting base to prevent snow accumulation on the platform in front or back of the unit frame.
6. Provide a field fabricated snow protection hood to keep snow and ice and/or drifting snow from accumulating on the coil surfaces.
7. To prevent snow and heavy rain from entering the outdoor unit, install the condenser air inlets and outlets facing away from direct winds.
8. Consider tie-down requirements in case of high winds or where required by local codes.

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Planning for Snow and Ice, continued.

⚠CAUTION

When deciding on a location to place the outdoor unit, be sure to choose an area where run-off water from defrost cycle will not accumulate and freeze on sidewalks or driveways, which will create unsafe conditions. Properly install and insulate any drain hoses to prevent the hose from freezing, cracking, leaking, and causing unsafe conditions from frozen condensate.

Note:

Choose an area where run-off water from defrost cycle will not accumulate and freeze on sidewalks or driveways. Properly install and insulate any drain hoses to prevent the hose from freezing, cracking, leaking, and damaging the outdoor unit.

Note:

The indoor unit will take longer to provide heat, or heating performance will be reduced in winter if the unit is installed:

1. *In a narrow, shady location.*
2. *Near a location that has a lot of ground moisture.*
3. *In a highly humid environment.*
4. *In an area in which condensate does not drain properly.*

Tie-Downs and Lightning Protection

Tie-Downs

- The strength of the roof must be checked before installing the outdoor units.
- If the installation site is prone to high winds or earthquakes, when installing on the wall or roof, securely anchor the mounting base using a field-provided tie-down configuration approved by a local professional engineer.
- The overall tie-down configuration must be approved by a local professional engineer.

Note:

Always refer to local code when using a wind restraint system.

Lightning Protection

- To protect the outdoor unit from lightning, it must be placed within the specified lightning safety zone.

Figure 1: Lightning Protection Diagram.

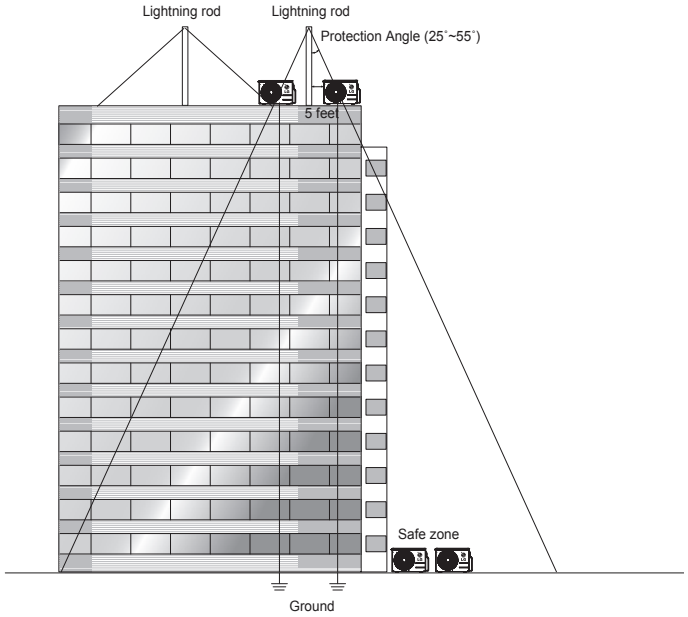

Table 3: Safety Zone Specifications.

Building Height (feet)	66	98	148	197
Protection Angle (˚)	55	45	35	25

- Power cable and communication cable must be installed five (5) feet away from lightning rod.
- A high-resistance ground system must be included to protect against induced lightning or indirect strike.

Note:

If the building does not include lightning protection, the outdoor unit will be damaged from a lightening strike. Inform the customer of this possibility in advance.

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GENERAL INSTALLATION GUIDELINES

Outdoor Unit Location Selection

Oceanside Applications

Use of a Windbreak to Shield from Sea Wind

Note:

Ocean winds will cause corrosion, particularly on the condenser and evaporator fins, which, in turn could cause product malfunction or inefficient performance.

- ⃠ Avoid installing the outdoor unit where it would be directly exposed to ocean winds.
- Install the outdoor unit on the side of the building opposite from direct ocean winds.
- Select a location with good drainage.
- Periodically clean dust or salt particles off of the heat exchanger with water.
- If the outdoor unit must be placed in a location where it would be subjected to direct ocean winds, install a concrete windbreak strong enough to block any winds.
- Windbreak must be more than 150% of the outdoor unit's height. There must be 2 to 3-1/2 inches of clearance between the outdoor unit and the windbreaker for purposes of air flow.

Note:

Additional anti-corrosion treatment will need to be applied to the outdoor unit at oceanside locations.

Use of a Building to Shield from Sea Wind

If a windbreak is not possible, a building or larger structure must be used to shield the outdoor unit from direct exposure to the sea wind. The unit must be placed on the side of the building directly opposite to the direction of the wind as shown at right.

Figure 2: Oceanside Placement Using Windbreak.

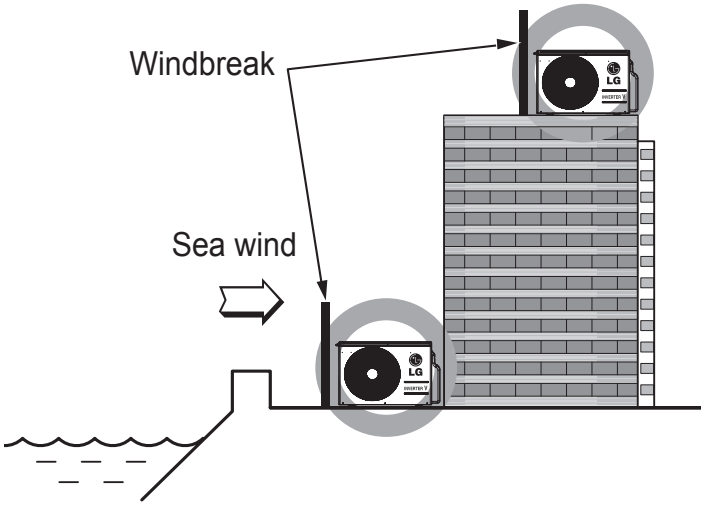
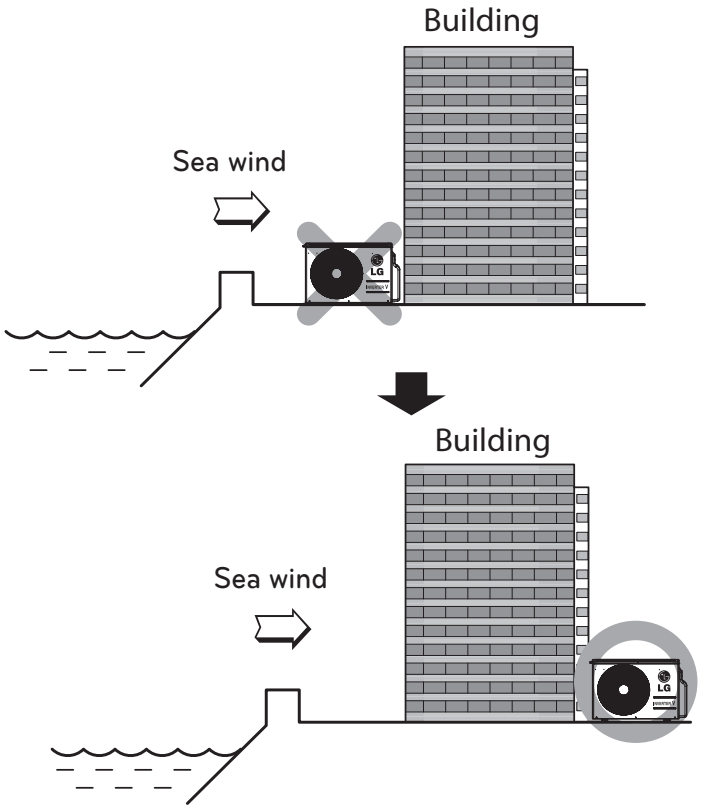


Figure 3: Placement Using Building as Shield.



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Minimum Clearance Requirements for Single Fan Outdoor Units

Proper clearance for the outdoor unit coil is critical for proper operation. When installing the outdoor unit, consider service, inlet and outlet, and minimum allowable space requirements as illustrated in the diagrams below.

Specific clearance requirements in the diagram below are for single fan outdoor units. Figure below shows the overall minimum clearances that must be observed for safe operation and adequate airflow around the outdoor unit.

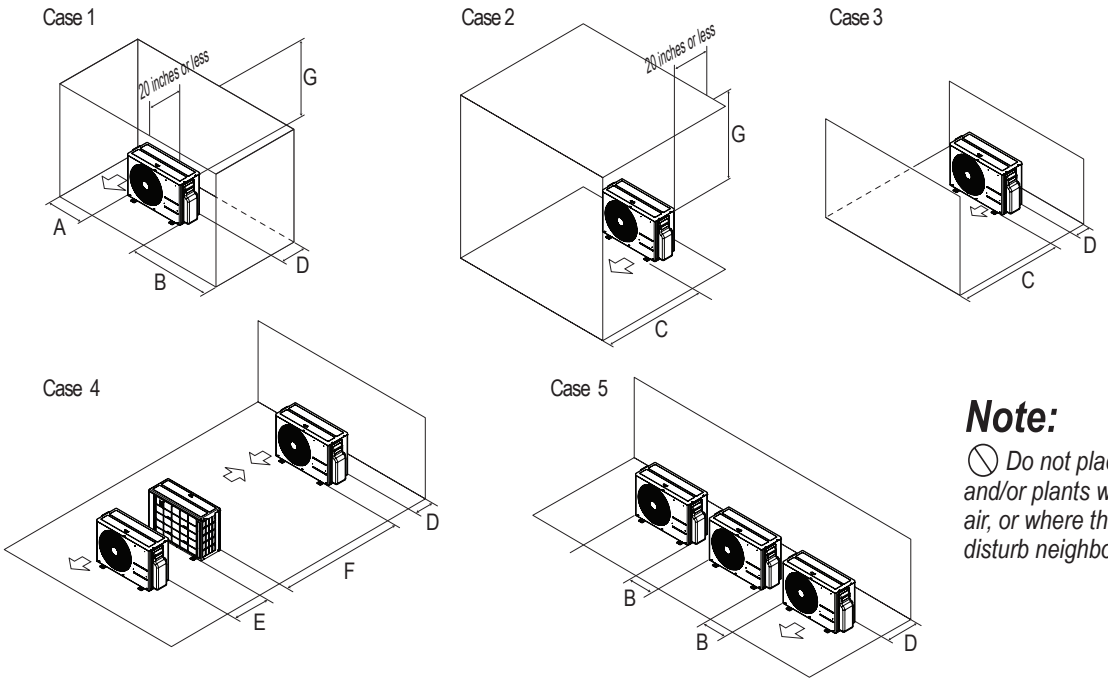
When placing the outdoor unit under an overhang, awning, sunroof or other “roof-like structure”, observe the clearance requirements (as shown in Cases 1 and 2) for height in relation to the unit. This clearance ensures that heat radiation from the condenser is not restricted around the unit.

Adhere to all clearance requirements if installing the unit on a roof. Be sure to level the unit and ensure that the unit is adequately anchored. Consult local codes for rooftop mounting requirements. To have successful service access to the outdoor unit, see Figure below for minimum spacing. When installing multiple outdoor units, see Cases 4 and 5 in Figure 4 for correct spacing requirements. Outdoor unit fans draw air from the back of the unit and discharge out the front. Place units back to back and front to front.

Note:

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

Figure 4: Single Fan Outdoor Unit Service Access and Allowable Clearances Diagram.



Note:

Do not place the unit where animals and/or plants will be in the path of the warm air, or where the warm air and/or noise will disturb neighbors.

Table 4: Single Fan Outdoor Unit Service Access and Allowable Clearances Diagram Legend.

Unit: Inch		A	B	C	D	E	F	G
Case 1	Standard	12	24	-	12	-	-	-
	Minimum	4	10	-	4	-	-	40
Case 2	Standard	-	-	20	-	-	-	-
	Minimum	-	-	14	-	-	-	40
Case 3	Standard	-	-	20	12	-	-	-
	Minimum	-	-	14	4	-	-	-
Case 4	Standard	-	-	-	12	24	-	-
	Minimum	-	-	-	4	8	79	-
Case 5	Standard	-	24	-	12	-	-	-
	Minimum	-	10	-	4	-	-	-

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GENERAL INSTALLATION GUIDELINES

Rigging and Lifting / Outdoor Unit Mounting

Rigging and Lifting Instructions

⚠WARNING

Wear protective gloves and safety goggles when handling equipment. Sharp edges will cause personal injury.

Dispose of the packing materials safely.

- *Packing materials, such as nails and other metal or wooden parts, will cause puncture wounds or other injuries.*
- *Tear apart and throw away plastic packaging bags so that children do not play with them and risk suffocation and 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 weights listed.*
- *Some products use polypropylene bands for packaging. ⃠ Do not use polypropylene bands to lift the unit.*
- *Support the outdoor unit at a minimum of four points to avoid slippage from rigging apparatus.*

Note:

- *Make sure the outdoor unit is in its original packaging to avoid damage during local transport.*
- *At the time of delivery, the package must be checked for any damage (exterior and interior). Report any damage to the carrier claims agent immediately.*
- *Handle the outdoor unit with care. Keep the outdoor unit upright to avoid damaging inside components.*
- *If a forklift is to transport the outdoor unit, the forklift arms must pass through the openings at the bottom.*
- *If a crane is to suspend the outdoor unit, it is required that two (2) ropes at least twenty-three (23) feet in length be used. Pass the ropes under the unit. Pass the rope through the two (2) forklift slots each at the front and rear of the outdoor unit.*
- *To prevent damage to the outdoor unit, always lift the unit with the ropes attached at four (4) points at an angle of ≤40°.*
- *Always include padding to protect the outdoor unit from rope damage, and take into consideration the outdoor unit's center of gravity.*

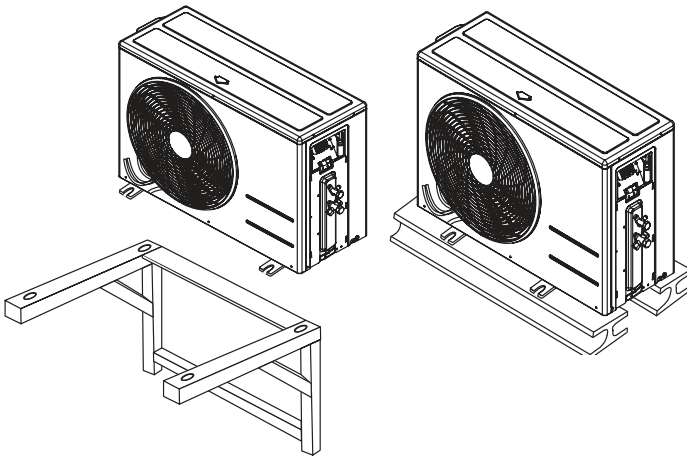
General Outdoor Unit Mounting

Any underlying structure or foundation must be designed to support the weight of the outdoor unit. ⃠ Avoid placing the unit in a low lying area where water and ice will accumulate. Securely attach the outdoor unit to a condenser pad, base rails, or a mounting platform that is solidly anchored to the ground or building structure. When installing the outdoor unit on the wall or roof top, securely anchor the mounting base to account for wind, earthquakes, or vibration.

Anchoring the Outdoor Unit

- Tightly anchor the outdoor unit with a bolt and nut to a concrete or rigid platform (see next page for more details).
- When installing on a wall (with field-supplied brackets), roof, or rooftop, securely anchor the mounting platform with nails, taking into consideration the possibility of strong winds or earthquakes.
- If there is a possibility of vibration from the outdoor unit transmitting to the building, add an anti-vibration material.

Figure 5: Examples of Outdoor Unit Mounting Methods.



Note:

Follow applicable local codes for clearance, mounting, anchor and vibration attenuation requirements.

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Concrete Platform 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.

Figure 6: Example of Using an Insert for a Hole in a Reinforced Concrete Beam.

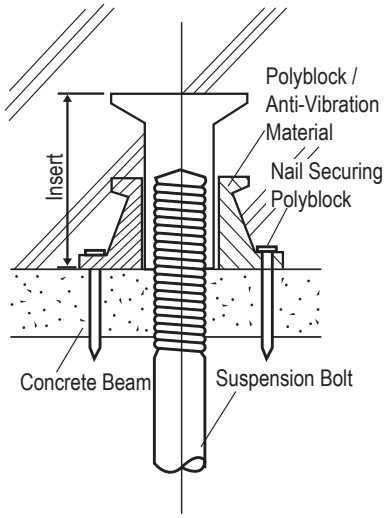
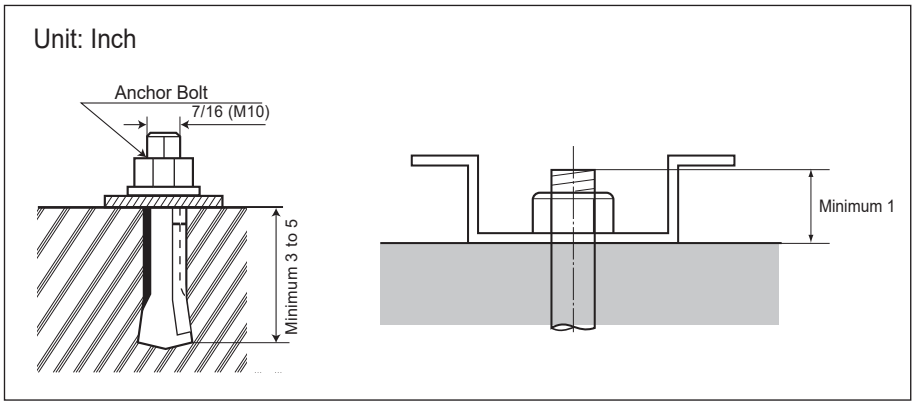


Figure 7: Close up of Bolt Attachment.



Outdoor Unit Platform Dimensional Requirements

Figure 8: Single Zone High Efficiency Standard Wall Mount Outdoor Units.

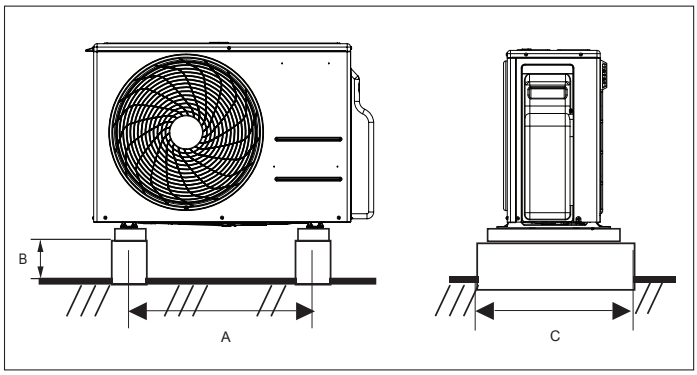


Table 5: Outdoor Unit Foundation Specifications.

Model	Foundation (Inches)			Leg Thickness (Inches)
	A	B	C	
LSU090HSV5, LSU120HSV5	22	Minimum 4	14-19/32	1/16
LSU181HSV5	21-1/2	Minimum 4	14-19/32	3/32

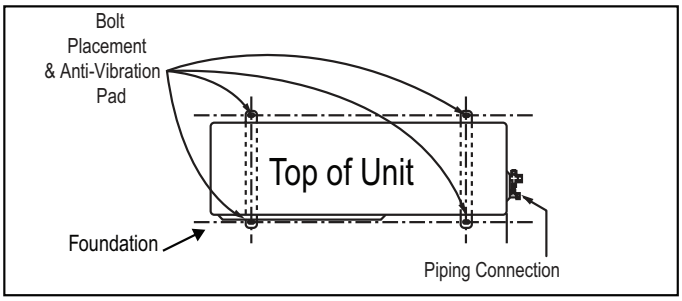
Note:

Review the specifications for field-supplied pad mounts or brackets to verify that outdoor dimension requirements are met.

Bolting the Outdoor Unit to the Platform

1. Ensure that the concrete platform will not degrade easily, and has enough structural strength to bear the weight of the unit.
2. Include an H-beam support. Firmly attach the corners, otherwise the support will bend.
3. Use a hexagon nut.
4. Use anti-vibration material.
5. Include enough space around the concrete foundation for condensate drainage.
6. Seal all wiring and piping access holes to prevent insects from entering the unit.

Figure 9: Bolting the Outdoor Unit to the Platform (Piping Location Will Differ Depending on Outdoor Unit Model).



Note:

All referenced materials are to be field-supplied. Images are not to scale.

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GENERAL INSTALLATION GUIDELINES

Required Indoor Unit Clearances

Note:

Follow required best practices when choosing an indoor location for the single zone indoor unit.

Dos

- Follow the table at right for minimum clearance of indoor unit from the top of the unit to the ceiling.
- Clearance gap between any wall or enclosure and the left or right side of the unit must be greater than 4 inches. Ensure there is sufficient maintenance space.
- Unit must be at least 6.5 feet from the floor for adequate clearance.
- Place the unit where drainage can be obtained easily. Condensation drain must be conveniently routed away from the unit.
- Locate the indoor unit in a location where it can be easily connected to the outdoor unit within allowable limits.
- Use a metal detector to locate studs in the walls. Anchor unit following stud location to prevent damage to the wall.

Figure 10: Single Zone High Efficiency Standard Wall Mount Indoor Unit Clearance Requirements.

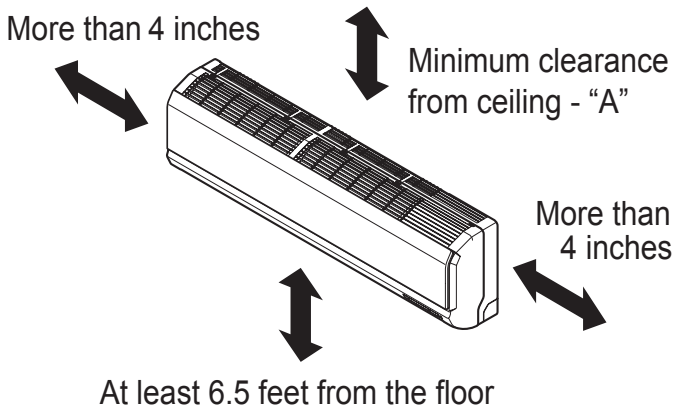


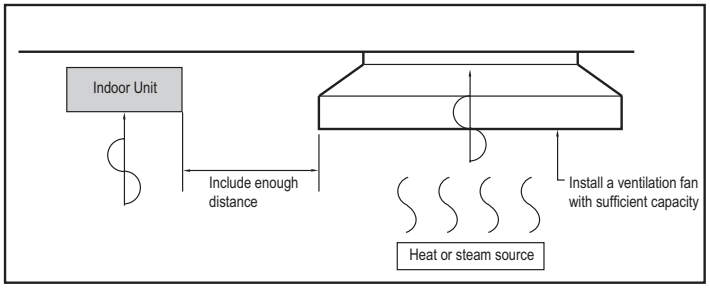
Table 6: Single Zone High Efficiency Standard Wall Mount Indoor Unit Ceiling Clearances.

"A" Ceiling Clearance (inches)	Indoor Unit Model(s)
5	LSN090HSV5, LSN120HSV5
8	LSN181HSV5

Dont's

- *Do not install the unit near a heat or steam source, or where considerable amounts of oil, iron powder, or flour are used. (These materials will generate condensate, cause a reduction in heat exchanger efficiency, or the drain to malfunction. If this is a potential problem, install a ventilation fan large enough to vent out these materials.)*
- *Ensure there are no obstacles to air circulation around the unit; keep proper distances from ceilings, doorways, floor, walls, etc.*
- *Do not install in an area where operation sound will disturb occupants--place the unit where noise prevention is taken into consideration*
- *Do not install near doorway.*
- *Avoid installing the unit near high-frequency generators.*

Figure 11: Installing Near a Heat or Steam Source.



WARNING

The unit must not be installed where sulfuric acid and flammable or corrosive gases are generated, vented into, or stored. There is risk of fire, explosion, and physical injury or death.

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

Note:

- *Indoor units (IDUs) must not be placed in an environment where the IDUs will be exposed to harmful volatile organic compounds (VOCs) or in environments where there is improper air make up or supply or inadequate ventilation. If there are concerns about VOCs in the environment where the IDUs are installed, proper air make up or supply and/or adequate ventilation must be provided. Additionally, in buildings where IDUs will be exposed to VOCs, consider a third party factory-applied epoxy coating to the fan coils for each IDU where the entire coil is dipped, not sprayed.*
- *If the unit is installed near a body of water, the installation parts are at risk of corroding. Appropriate anti-corrosion methods must be taken for the unit and all installation parts.*

Installing in an Area Exposed to Unconditioned Air

In some installation applications, areas (floors, walls) in some rooms will be exposed to unconditioned air (room can be above or next to an unheated garage or storeroom). To countermeasure:

- Verify that carpet is or will be installed (carpet could increase the temperature by three [3] degrees).
- Add insulation between the floor joists.
- Install radiant heat or another type of heating system to the floor.

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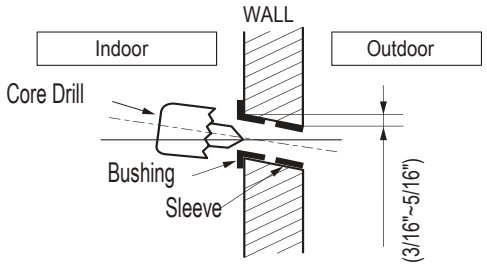
Drilling the Piping Hole in the Wall

Follow all piping clearance recommendations.

1. Using a 2-9/16 inch hole core drill bit, drill a hole at either the right or left side of the wall mounting, pre-chosen following installation guidelines and application needs.
   - The slant of the hole must be 3/16" to 5/16" from level with the slant being upward on the indoor unit side and downward on the outdoor unit side.
2. Finish off the newly drilled hole as shown with bushing and sleeve covering to prevent damage to the insulation and piping.

Figure 12: Drilling Piping Hole.



Mounting the Installation Plate to the Wall

Follow the procedure below and general best practices when mounting the indoor unit's installation plate to a wall.

1. The wall mounted indoor unit is shipped with the installation plate attached to its back. To remove, unscrew the one (1) screw that holds the installation plate to the back of the indoor unit.
2. Align the centerline using a leveling tool. Measure the wall and mark the centerline.
3. Attach the installation plate to the wall following the measurements and marks. Use the type "A" screws that are factory-supplied with the plate. If mounting the unit on a concrete wall, use field-supplied anchor bolts.
4. Observe all rear piping clearances when drilling into the wall.

⚠ WARNING

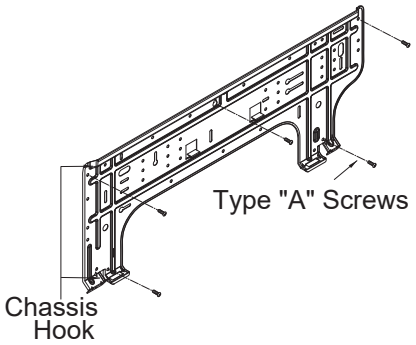
- *When choosing a location for the wall mount plate, be sure to take into consideration routing of wiring for power outlets within the wall. Contacting wiring can cause serious bodily injury or death.*
- *Use caution when drilling holes through the walls for the purposes of piping connections. Power wiring can cause serious bodily injury or death.*

Note:

Select the location carefully. Unit must be anchored to a strong and solid wall to prevent unnecessary vibration.

Figure 13: Wall Mount Indoor Unit Installation Plates.

LSN090-120HSV5 Installation Plate



LSN181HSV5 Installation Plate

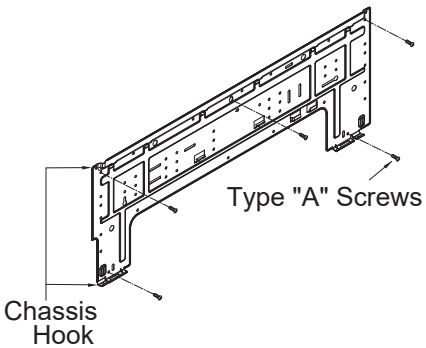
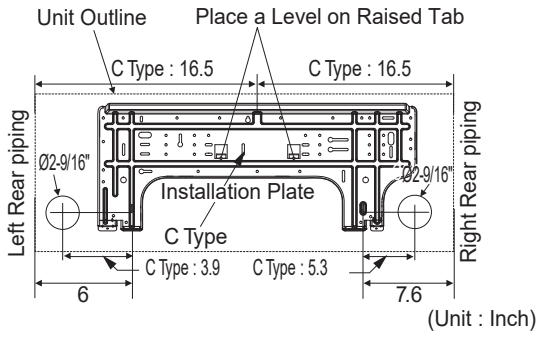
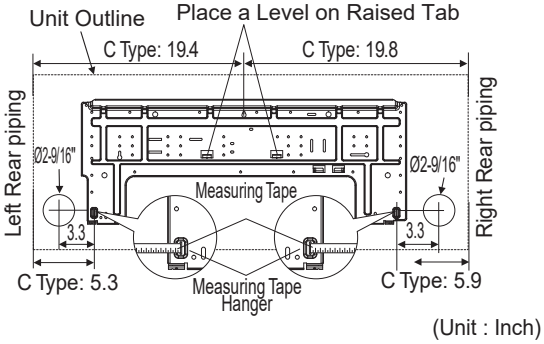


Figure 14: Wall Mount Indoor Unit Installation Plate Dimensions.

LSN090-120HSV5 Installation Plate



LSN181HSV5 Installation Plate



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GENERAL INSTALLATION GUIDELINES

Indoor Unit Mounting

Removing the Indoor Unit Bottom Cover

To access the indoor unit piping port connections, terminal block, and to make the indoor unit installation procedure easier, it is recommended that the bottom cover be removed first.

1. Unsnap the bottom cover at its top left and right sides (Location 1).
2. Unsnap each of the three (3) or four (4) small C-hooks located in the middle of the bottom cover (Location 2). Number of C-hooks present depends on model of indoor unit.
3. Lift the three (3) to four (4) hinges on the bottom cover up and out of the channels molded to the left, right, and middle of the indoor unit (Location 3). Number of hinges present depends on model of indoor unit.
4. Set aside the bottom cover to re-install after all procedures are complete.

Figure 15: Indoor Unit with the Bottom Cover On (Bottom View; Appearances Will Vary Depending on Indoor Unit Model).

Figure 16: Steps to Removing the Bottom Cover.

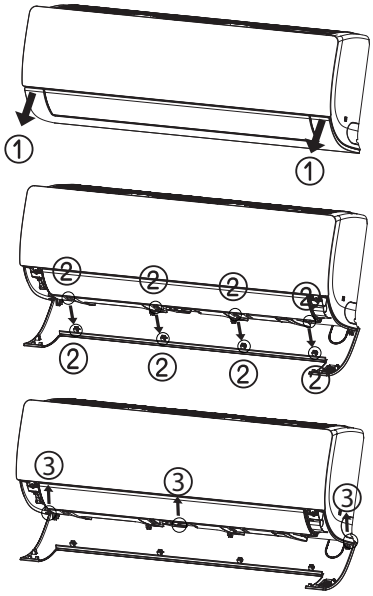


Figure 17: Removing the Bottom Cover (Appearances Will Vary Depending on Indoor Unit Model).

Figure 18: Bottom Cover with Top and Middle Unsnapped, Front View (Appearances Will Vary Depending on Indoor Unit Model).

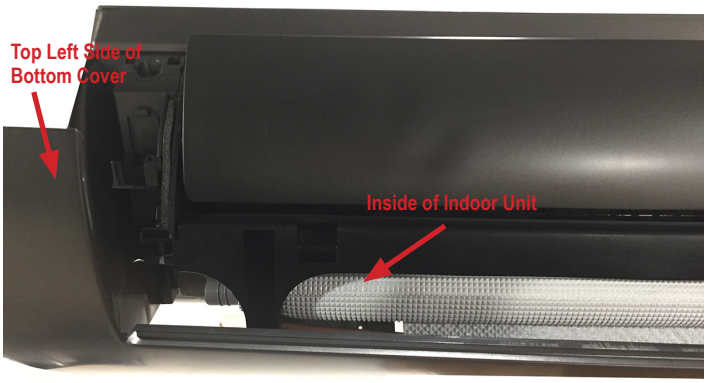


Figure 19: Back of Bottom Cover Completely Removed from Indoor Unit (Appearances Will Vary Depending on Indoor Unit Model).

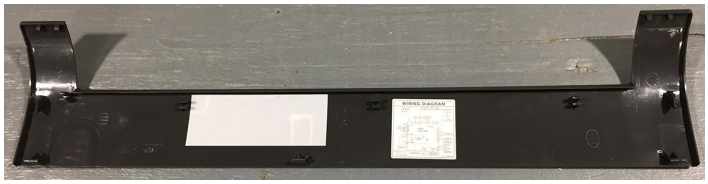
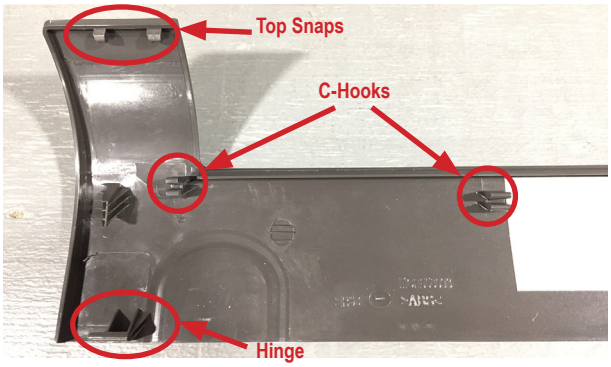


Figure 20: Close Up of Bottom Cover Connections (Appearances Will Vary Depending on Indoor Unit Model).



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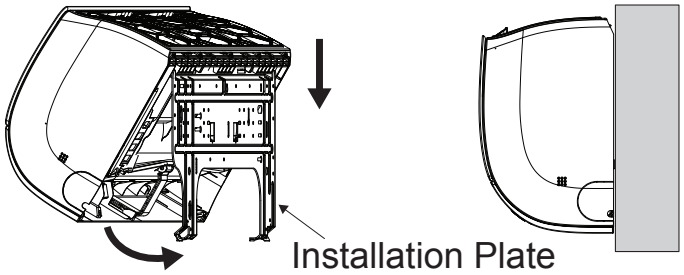
Mounting the Indoor Unit to the Installation Plate

1. Position the indoor unit onto the upper portion of the installation plate.

2. Engage the hooks at the top of the indoor unit with the upper edge of the installation plate (number of hooks depends on model type).

3. Ensure the hooks are properly seated on the installation plate by shaking the indoor unit left and right.

Figure 21: Attaching the Indoor Unit to the Installation Plate.



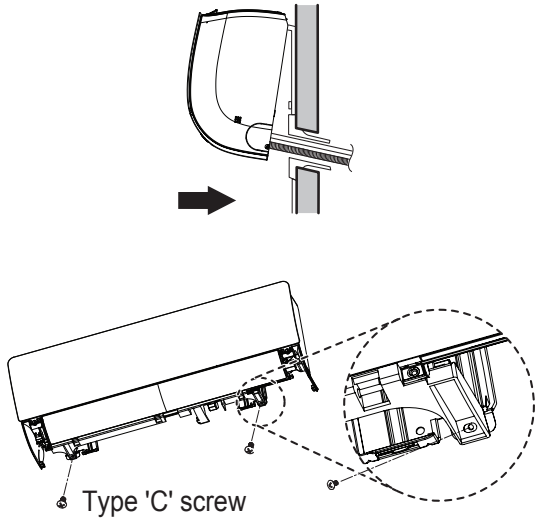
Note:

Permanently secure the indoor unit to the wall ONLY AFTER all other tasks such as Refrigerant Piping Connections, Drain Piping Connections, Electrical Connections, and Final Installation Procedures are complete. See next page for steps on how to prepare for piping and electrical connections.

4. Carefully guide the refrigerant piping and drain piping through the access hole.

5. Push the bottom of indoor unit towards the installation plate to anchor to the wall.
   - Press the lower left and right sides of the unit against the installation plate until the hooks engage into their slots.
   - A clicking sound will be heard as the bottom of the indoor unit attaches to the installation plate successfully.
   - Pay attention to the positioning of the piping through the wall.

Figure 22: Finishing Indoor Unit Installation to the Wall Plate.



6. Finish the installation by completely securing the indoor unit to the installation plate using the factory-supplied two Type “C” screws at the locations indicated at right.

⚠WARNING

The indoor unit can fall from the wall if it is not properly installed and secured to the installation plate. Falling indoor units can cause bodily injury or death.

Note:

- ⃠ *To avoid a gap between the indoor unit and the wall, ensure the screws are correctly and fully secured to the installation plate.*
- *To prevent condensate from forming due to an inflow of outdoor air, before indoor unit installation is finished, completely seal the piping access hole in the wall.*

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GENERAL INSTALLATION GUIDELINES

Indoor Unit Mounting

Preparing for Piping / Electrical Connections

1. To prepare the indoor unit for piping and electrical installation, disengage bottom on indoor unit from installation plate by reversing Steps 6, 5, and 4 from the previous procedure, if those procedures have been performed.

2. Unsnap the piping / drain hose holder (L-bracket) out from the indoor unit chassis. Prop it open between the indoor unit chassis and installation plate to separate the bottom of the indoor unit from the wall. This will allow for more working space.

Figure 23: Mounting the Indoor Unit on Installation Plate.

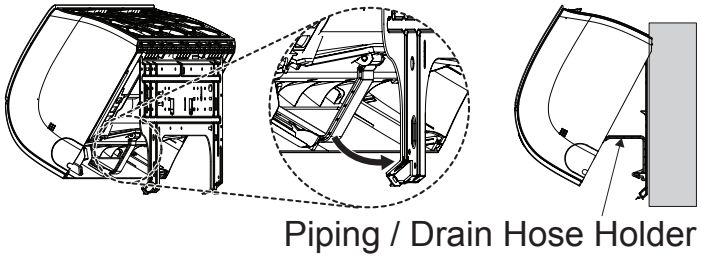

Figure 24: L-bracket Closed (Appearances Will Vary Depending on Indoor Unit Model).

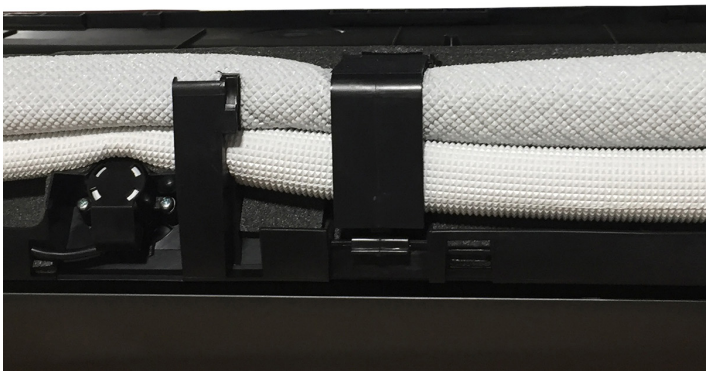

Figure 25: L-bracket Open (Appearances Will Vary Depending on Indoor Unit Model).

Note:

- *Go to the Refrigerant Piping Connections section of this manual for information on indoor unit piping connection installation. See also the Refrigerant Piping Connections section for drain piping installation.*
- *Go to the Electrical Installation section of this manual for information on electrical wiring to the indoor unit.*
- *After all Refrigerant Piping and Electrical Connection procedures are complete, snap the L-bracket closed, and secure the indoor unit to the installation plate as detailed in Steps 5 and 6 in "Mounting the Indoor Unit to the Installation Plate".*

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REFRIGERANT SAFETY STANDARDS / DEVICE CONNECTION LIMITATIONS

Refrigerant Safety Standards

ASHRAE Standards 15-2010 and 34-2010 address refrigerant safety and the maximum allowable concentration of refrigerant in an occupied space. Refrigerant will dissipate into the atmosphere, but a certain volume of air is required to safely dissipate the refrigerant. For R410A refrigerant, the maximum allowable concentration of refrigerant is 26 lbs./1,000 cubic feet (Addendum L modified the RCL to 26) of occupied spaces. Buildings with 24-hour occupancy are allowed half of that concentration.

If a single zone system develops a refrigerant leak, the entire refrigerant charge of the system will dump into the area where the leak occurs. To meet ASHRAE Standards 15 and 34, the smallest room volume on the system must be calculated and compared to the maximum allowable concentration. Also consult state and local codes in regards to refrigerant safety.

Device Connection Limitations

A single-zone system consists of one outdoor unit and one indoor unit. One of the most critical elements of a single-zone system is the refrigerant piping. If the connection piping is not within allowable limits, there will be reliability, performance, noise, and vibration issues. The table below lists pipe length limits that must be followed in the design of a Single Zone High Efficiency Wall Mount refrigerant pipe system. Refer to the figure for maximum length and elevation of piping.

Figure 26: Single Zone High Efficiency Wall Mount System Layout.

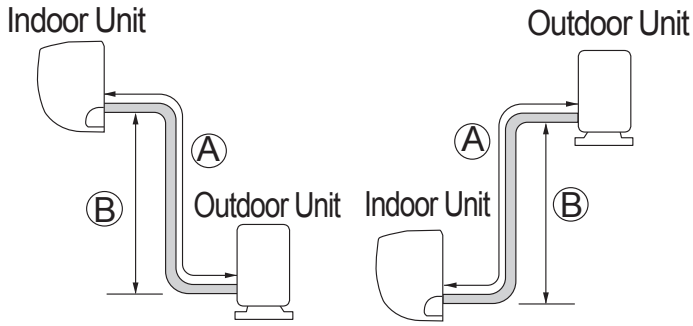

Table 7: Single Zone High Efficiency Refrigerant Piping System Limitations.

Model Numbers		LS090HSV5 (LSN090HSV5/ LSU090HSV5)	LS120HSV5 (LSN120HSV5/ LSU120HSV5)	LS181HSV5 (LSN181HSV5/ LSU181HSV5)
Pipe Sizes	Vapor	Ø3/8	Ø3/8	Ø5/8
	Liquid	Ø1/4	Ø1/4	Ø3/8
Pipe Length (ELF = Equivalent Length of pipe in Feet)	Standard Piping Length	24.6	24.6	24.6
	Piping Length with No Additional Refrigerant	41	41	24.6
	Longest total equivalent piping length	82	82	114.8
	Shortest total equivalent piping length	9.8	9.8	9.8
	Distance between fittings and indoor units or outdoor units	≥20 inches	≥20 inches	≥20 inches
Elevation (All Elevation Limitations are Measured in Actual Feet)	If outdoor unit is above indoor unit	49.2	49.2	49.2
	If outdoor unit is below indoor unit	49.2	49.2	49.2
Additional Refrigerant Needed (oz/ft)		0.22	0.22	0.38

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SELECTING FIELD SUPPLIED PIPING

Selecting Field-Supplied Copper Piping

Note:

Always follow local codes when selecting and installing copper pipe and piping system components.

Approved piping for use with LG Single Zone products will be marked "R410 RATED" along the length of the pipe. Piping wall thickness must meet local code requirements and be approved for a maximum operating pressure of 551 psi. When bending piping, try to keep the number of bends to a minimum, and use the largest radii possible to reduce the equivalent length of installed piping; also, bending radii greater than ten (10) piping diameters can minimize pressure drop. Be sure no traps or sags are present.

For Single Zone Systems

LG prefers the use of ACR copper piping rated at the system working pressure was used.

Note:

Always properly support the piping as per the instructions in the Refrigerant System Engineering section.

Table 9: ACR Rated Copper Tubing Material.

Type	Seamless Phosphorous Deoxidized
Class	UNS C12200 DHP
Straight Lengths	H58 Temper
Coils	O60 Temper

Table 8: Piping Tube Thicknesses.

OD (in)	1/4	3/8	1/2	5/8	3/4	7/8	1-1/8	1-3/8	1-5/8
Material	Rigid or Soft ACR Rated for R410A			Rigid or Solid ACR Rated for R410A					
Min. Bend Radius (in)	0.563	0.9375	1.5	2.25	3.0	3.0	3.5	4.0	4.5
Min. Wall Thickness (in)	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.050

Table 10: ACR Copper Tubing Dimensions and Physical Characteristics[1-3].

Nominal Pipe Outside Diameter (in)	**Actual Outside Diameter (in)**	**Drawn Temper**			**Annealed Temper**		
		Nominal Wall Thickness (in)	**Weight (lb/ft)**	**Cubic ft per Linear ft**	**Nominal Wall Thickness (in)**	**Weight (lb/ft)**	**Cubic ft per Linear ft**
1/4	0.250	--	--	--	0.030	0.081	0.00020
3/8	0.375	0.030	0.126	0.00054	0.032	0.134	0.00053
1/2	0.500	0.035	0.198	0.00101	0.032	0.182	0.00103
5/8	0.625	0.040	0.285	0.00162	0.035	0.251	0.00168
3/4	0.750	0.042	0.362	0.00242	0.042	0.362	0.00242
7/8	0.875	0.045	0.455	0.00336	0.045	0.455	0.00336
1-1/8	1.125	0.050	0.655	0.00573	0.050	0.655	0.00573

[1]All dimensions provided are in accordance with ASTM B280 – Standard..
[2]Design pressure = 551 psig.
[3]The Copper Tube Handbook, 2010, Copper Development Association Inc., 260 Madison Avenue, New York, NY 10016.

Note:

- *Commercially available piping often contains dust and other materials. Always blow it clean with a dry inert gas.*
- *Prevent dust, water or other contaminants from entering the piping during installation.*

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Copper Expansion and Contraction

Under normal operating conditions, the vapor pipe temperature of a Duct Free System can vary as much as 280°F. With this large variance in pipe temperature, the designer must consider pipe expansion and contraction to avoid pipe and fitting fatigue failures.

Refrigerant pipe along with the insulation jacket form a cohesive unit that expands and contracts together. During system operation, thermal heat transfer occurs between the pipe and the surrounding insulation.

If the pipe is mounted in free air space, no natural restriction to movement is present if mounting clamps are properly spaced and installed. When the refrigerant pipe is mounted underground in a utility duct stacked among other pipes, natural restriction to linear movement is present. In extreme cases, the restrictive force of surface friction between insulating jackets could become so great that natural expansion ceases and the pipe is "fixed" in place. In this situation, opposing force caused by change in refrigerant fluid/vapor temperature can lead to pipe/fitting stress failure.

The refrigerant pipe support system must be engineered to allow free expansion to occur. When a segment of pipe is mounted between two fixed points, provisions must be provided to allow pipe expansion to naturally occur. The most common method is the inclusion of expansion Loop or U-bends. Each segment of pipe has a natural fixed point where no movement occurs. This fixed point is located at the center point of the segment assuming the entire pipe is insulated in a similar fashion. The natural fixed point of the pipe segment is typically where the expansion Loop or U-bend must be.

Linear pipe expansion can be calculated using the following formula:

$$LE = C \times L \times (T_r - T_a) \times 12$$

LE	=	Anticipated linear tubing expansion (in.)
C	=	Constant (For copper = 9.2×10^{-6} in./in.°F)
L	=	Length of pipe (ft.)
T_R	=	Refrigerant pipe temperature (°F)
T_a	=	Ambient air temperature (°F)
12	=	Inches to feet conversion (12 in./ft.)

1. From Table 11 find the row corresponding with the actual length of the straight pipe segment.
2. Estimate the minimum and maximum temperature of the pipe. In the column showing the minimum pipe temperature, look up the anticipated expansion distance. Do the same for the maximum pipe temperature.
3. Calculate the difference in the two expansion distance values. The result will be the anticipated change in pipe length.

General Example:

A system is installed and the design shows that there is a 100 foot straight segment of tubing between an indoor unit and the outdoor unit. In heating, this pipe transports hot gas vapor to the indoor units at 120 °F. In cooling, the same tube is a suction line returning refrigerant vapor to the outdoor unit at 40 °F. Look up the copper tubing expansion at each temperature and calculate the difference.

Vapor Line

Transporting Hot Vapor: 100 ft. pipe at 120 °F = 1.40 in.

Transporting Suction Vapor: 100 ft. pipe at 40 °F = 0.40 in.

Anticipated Change in Length: 1.40 in. – 0.40 in. = 1.00 in.

Liquid Line

The liquid temperature remains relatively the same temperature; only the direction of flow will reverse. Therefore, no significant change in length of the liquid line is anticipated.

When creating an expansion joint, the joint height must be a minimum of two times the joint width. Although different types of expansion arrangements are available, the data for correctly sizing an Expansion Loop is provided in Table 12. Use soft copper with long radius bends on longer runs or long radius elbows for shorter pipe segments. Using the anticipated linear expansion (LE) distance calculated, look up the Expansion Loop or U-bend minimum design dimensions. If other types of expansion joints are chosen, design per ASTM B-88 Standards.

See table on next page for precalculated anticipated expansion for various pipe sizes and lengths of refrigerant tubing.

To find the anticipated expansion value:

1. From the table on the next page, find the row corresponding with the actual feet of the straight pipe segment.
2. Estimate the minimum and maximum temperature of the pipe.
3. In the column showing the minimum pipe temperature, look up the anticipated expansion distance corresponding to the segment length. Do the same for the maximum pipe temperature.
4. Calculate the difference in the two expansion distance values. The result will be the change in pipe length.

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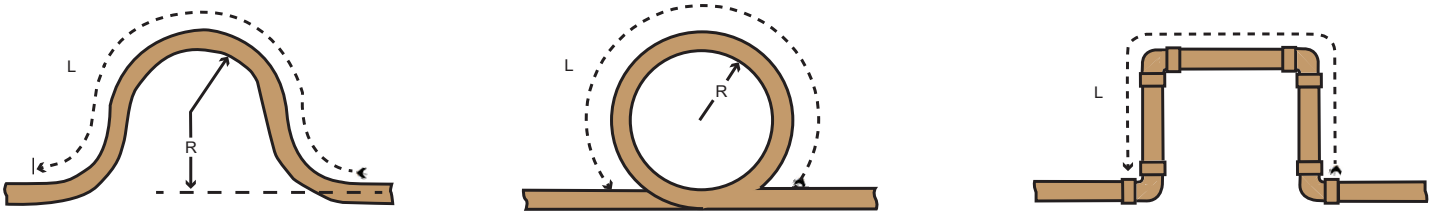
COPPER EXPANSION AND CONTRACTION

Table 11: Linear Thermal Expansion of Copper Tubing in Inches.

Pipe Length[1]	Fluid Temperature °F																			
	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	100°	105°	110°	115°	120°	125°	130°
10	0.04	0.04	0.05	0.06	0.06	0.07	0.08	0.08	0.09	0.09	0.10	0.10	0.11	0.11	0.11	0.12	0.13	0.14	0.15	0.15
20	0.08	0.08	0.10	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.22	0.23	0.26	0.28	0.29	0.30
30	0.12	0.12	0.15	0.18	0.20	0.21	0.23	0.24	0.26	0.27	0.29	0.30	0.32	0.33	0.32	0.35	0.39	0.42	0.44	0.45
40	0.16	0.16	0.20	0.24	0.26	0.28	0.30	0.32	0.34	0.36	0.38	0.40	0.42	0.44	0.43	0.46	0.52	0.56	0.58	0.60
50	0.20	0.20	0.25	0.30	0.33	0.35	0.38	0.40	0.43	0.45	0.48	0.50	0.53	0.55	0.54	0.58	0.65	0.70	0.73	0.75
60	0.24	0.24	0.30	0.36	0.39	0.42	0.45	0.48	0.51	0.54	0.57	0.60	0.63	0.66	0.65	0.69	0.78	0.84	0.87	0.90
70	0.28	0.28	0.35	0.42	0.46	0.49	0.53	0.56	0.60	0.63	0.67	0.70	0.74	0.77	0.76	0.81	0.91	0.98	1.02	1.05
80	0.32	0.32	0.40	0.48	0.52	0.56	0.60	0.64	0.68	0.72	0.76	0.80	0.84	0.88	0.86	0.92	1.04	1.12	1.16	1.20
90	0.36	0.36	0.45	0.54	0.59	0.63	0.68	0.72	0.77	0.81	0.86	0.90	0.95	0.99	0.97	1.04	1.17	1.26	1.31	1.35
100	0.40	0.40	0.50	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00	1.05	1.10	1.08	1.15	1.30	1.40	1.45	1.50
120	0.48	0.48	0.60	0.72	0.78	0.84	0.90	0.96	1.02	1.08	1.14	1.20	1.26	1.32	1.30	1.38	1.56	1.68	1.74	1.80
140	0.56	0.56	0.70	0.84	0.91	0.98	1.05	1.12	1.19	1.26	1.33	1.40	1.47	1.54	1.51	1.61	1.82	1.96	2.03	2.10
160	0.64	0.64	0.80	0.96	1.04	1.12	1.20	1.28	1.36	1.44	1.52	1.60	1.68	1.76	1.73	1.84	2.08	2.24	2.32	2.40
180	0.72	0.72	0.90	1.08	1.17	1.26	1.35	1.44	1.53	1.62	1.71	1.80	1.89	1.98	1.94	2.07	2.34	2.52	2.61	2.70

[1]Pipe length baseline temperature = 0°F. "Expansion of Carbon, Copper and Stainless Steel Pipe," *The Engineers' Toolbox*, www.engineeringtoolbox.com.

Figure 27: Coiled Expansion Loops and Offsets (Plan View).



Large Tubing U-bend (>3/4 in.) Loop Small Tubing U-bend (<3/4 in.)

Note:

All expansion loops and offsets must be installed in the horizontal plane to prevent the possibility of trapping oil. Loops and offsets in vertical risers must also be installed in a horizontal plane.

Table 12: Radii of Coiled Expansion Loops and Developed Lengths of Expansion Offsets.

Anticipated Linear Expansion (LE) (inches)		Nominal Tube Size (OD) inches			
		1/4	3/8	1/2	3/4
1/2	R[1]	6	7	8	9
	L[2]	38	44	50	59
1	R[1]	9	10	11	13
	L[2]	54	63	70	83
1-1/2	R[1]	11	12	14	16
	L[2]	66	77	86	101
2	R[1]	12	14	16	19
	L[2]	77	89	99	117
2-1/2	R[1]	14	16	18	21
	L[2]	86	99	111	131
3	R[1]	15	17	19	23
	L[2]	94	109	122	143
3-1/2	R[1]	16	19	21	25
	L[2]	102	117	131	155
4	R[1]	17	20	22	26
	L[2]	109	126	140	166

[1]R = Centerline Length of Pipe. [2]L = Centerline Minimum Radius (inches).

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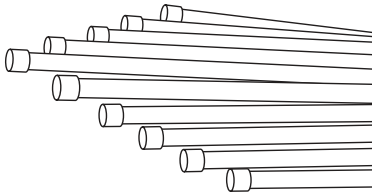
Piping Materials and Handling

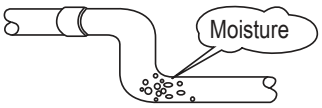
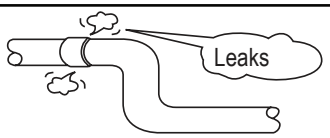
Pipes used for the refrigerant piping system must include the specified thickness, and the interior must be clean.

While handling and storing, ⃠ do not bend or damage the pipes, and take care not to contaminate the interior with dust, moisture, etc.

Keep Pipes Capped While Storing.



Keep refrigerant pipe dry, clean, and airtight.

	Dry	Clean	Airtight
	No moisture should be inside the piping.	No dust should be inside the piping.	No leaks should occur.
			
Possible Problems	- Significant hydrolysis of refrigerant oil. - Refrigerant oil degradation. - Poor insulation of the compressor. - System does not operate properly. - EEVs, capillary tubes are clogged.	- Refrigerant oil degradation. - Poor insulation of the compressor. - System does not operate properly. - EEVs and capillary tubes become clogged.	- Refrigerant gas leaks / shortages. - Refrigerant oil degradation. - Poor insulation of the compressor. - System does not operate properly.
Solutions	- Remove moisture from the piping. - Piping ends should remain capped until connections are complete. - ⃠ Do not install piping on a rainy day. - Connect piping properly at the unit's side. - Remove caps only after the piping is cut, the burrs are removed, and after passing the piping through the walls. - Evacuate system to a minimum of 500 microns and insure the vacuum holds at that level for 24 hours	- Remove dust from the piping. - Piping ends should remain capped until connections are complete. - Connect piping properly at the side of the unit. - Remove caps only after the piping is cut and burrs are removed. - Retain the cap on the piping when passing it through walls, etc.	- Test system for air tightness. - Perform brazing procedures that comply with all applicable standards. - Perform flaring procedures that comply with all applicable standards. - Perform flanging procedures that comply with all applicable standards. - Ensure that refrigerant lines are pressure tested to 550 psig and hold for 24 hours.

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REFRIGERANT SYSTEM ENGINEERING

Proper system operation depends on the installer using utmost care while assembling the piping system. The following pages are an overview of best practices when installing the refrigerant piping system.

Note:

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

⃠ No Pipe Size Substitutions

Use only the pipe size selected by the information in this manual. Using a different size is prohibited and will result in a system malfunction or failure to work at all.

⃠ No In-line Refrigeration Components

Components such as oil traps, solenoid valves, filter-driers, sight glasses, tee fittings, and other after-market accessories are ⃠ not permitted on the refrigerant piping system between the outdoor units and the indoor units. LG Single Zone systems are provided with redundant systems that make sure oil is properly returned to the compressor. Sight-glasses and solenoid valves will cause vapor to form in the liquid stream. Over time, driers will deteriorate and introduce debris into the system. The designer and installer must verify the refrigerant piping system is free of traps, sagging pipes, sight glasses, filter driers, etc.

Field-Provided Isolation Ball Valves

LG maintains a neutral position on using isolation valves in LG HVAC refrigerant piping systems. LG does not endorse any manufacturer of isolation valves. It is recognized that installing isolation valves will simplify future maintenance requirements, and, if used, considerations must be taken including, but not limited to, the following:

- Pressure drops for any component used, including isolation valves, must be known in equivalent pipe length and calculated into the total and segment equivalent piping lengths and compared to product design limitations.
- In all cases, materials must be suitable for the application and any applicable codes, including, but not limited to, diameter and wall thickness continuity per ACR standards.

Failure to do so will cause significant performance degradation. Proper leak checks must be performed. Using isolation valves does not automatically void any LG product warranty, however, a limited warranty will be voided in whole or part if any field supplied accessory fail in any way that causes product failure.

Using Elbows

Field-supplied elbows are allowed if they are long radius and designed for use with R410A refrigerant. The designer and installer, however, must be cautious with the quantity and size of fittings used, and must account for the additional pressure losses in equivalent pipe length calculation for each branch. The equivalent pipe length of each elbow must be added to each pipe segment manually (see table).

Table 13: Equivalent Piping Length for Elbows.

Elbow (ft.)	1/4	3/8	1/2	5/8	3/4
	0.5	0.6	0.7	0.8	1.2

Pipe Bends

When bending soft copper, use long radius bends. Refer to the “Radii of Coiled Expansion Loops and Developed Lengths of Expansion Offsets” table for minimum radius specifications.

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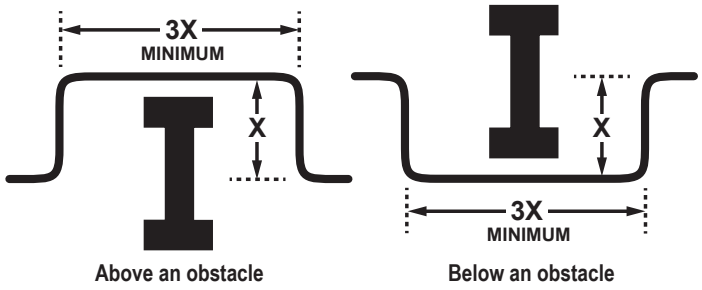
Obstacles

When an obstacle, such as an I-beam or concrete T, is in the path of the planned refrigerant pipe run, it is best practice to route the pipe over the obstacle. If adequate space is not available to route the insulated pipe over the obstacle, then route the pipe under the obstacle. In either case, it is imperative 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.

Figure 28: Installing Piping Above and Below an Obstacle.



Pipe Supports

A properly installed pipe system must be adequately supported to avoid pipe sagging. Sagging pipes become oil traps that lead to equipment malfunction.

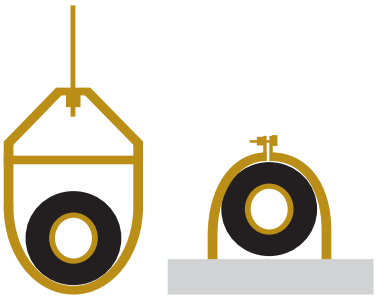
Pipe supports must ⃠ never touch the pipe wall; supports must be installed outside (around) the primary pipe insulation jacket. Insulate the pipe first because pipe supports must be installed outside (around) the primary pipe insulation jacket. Clevis hangers must be used with shields between the hangers and insulation. Field provided pipe supports must be designed to meet local codes. If allowed by code, use fiber straps or split-ring hangers suspended from the ceiling on all-thread rods (fiber straps or split ring hangers can be used as long as they do not compress the pipe insulation). Place a second layer of insulation over the pipe insulation jacket to prevent chafing and compression of the primary insulation within the confines of the support pipe clamp.

A properly installed pipe system will have sufficient supports to avoid pipes from sagging during the life of the system. As necessary, place supports closer for segments where potential sagging could occur. Maximum spacing of pipe supports must meet local codes. If local codes do not specify pipe support spacing, pipe must be supported:

- Maximum of five (5) feet on center for straight segments of pipe up to 3/4 inches outside diameter size.
- Maximum of six (6) feet on center for pipe up to one (1) inch outside diameter size.
- Maximum of eight (8) feet on center for pipe up to two (2) inches outside diameter size.

Wherever the pipe changes direction, place a hanger within twelve (12) inches on one side and within twelve (12) to nineteen (19) inches of the bend on the other side.

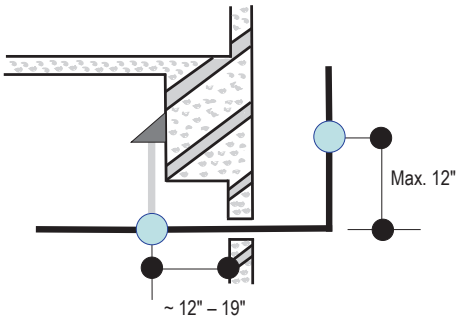
Figure 29: Pipe Hanger Details.



Note:

Use a 4" + long sheet curved sheet metal saddles between hanger bracket and insulation to promote linear expansion/contraction.

Figure 30: Typical Pipe Support Location—Change in Pipe Direction.



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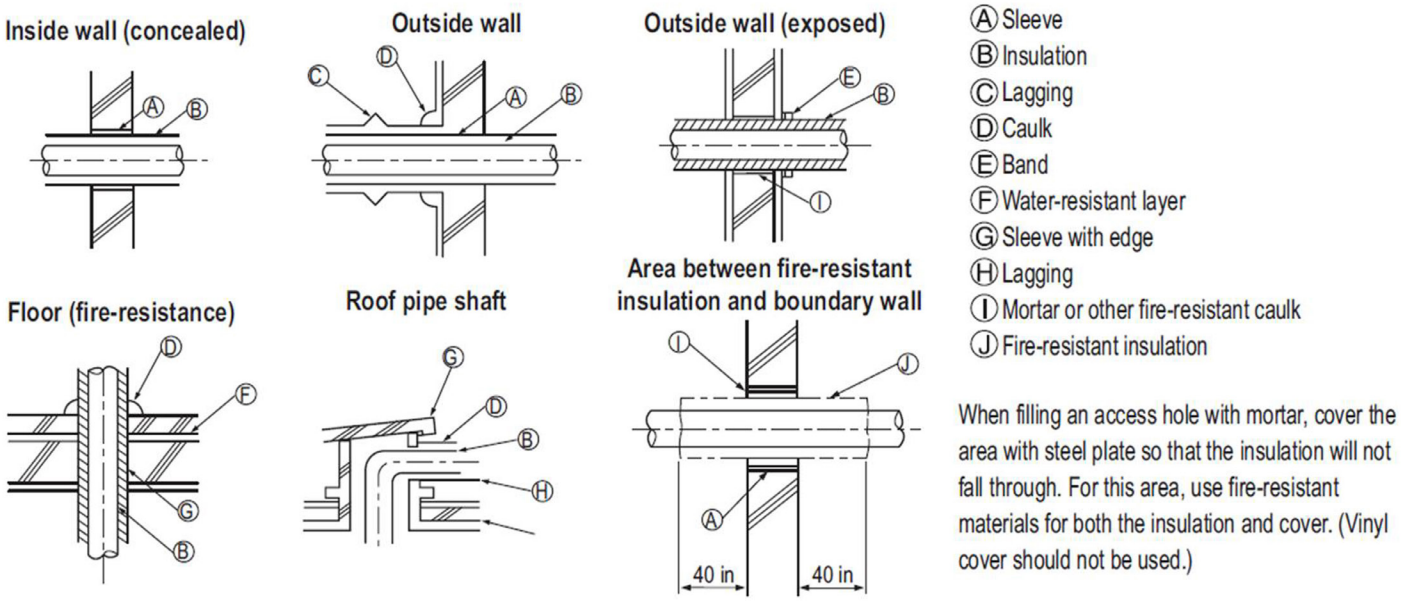
Pipe Sleeves at Penetrations

LG requires that all pipe penetrations through walls, floors, and pipes buried underground be properly insulated and routed through an appropriate wall sleeve of sufficient size to prevent compression of refrigerant pipe insulation and free movement of the pipe within the sleeve. Use 4"+ curved sheet metal saddles between the bottom surface of the pipe and the bottom surface of the penetration.

Figure 31: Pipe Sleeve Options.



When filling an access hole with mortar, cover the area with steel plate so that the insulation will not fall through. For this area, use fire-resistant materials for both the insulation and cover. (Vinyl cover should not be used.)

Note:
Diameter of penetrations must be determined by pipe diameter plus the thickness of the insulation.

Underground Refrigerant Piping

Refrigerant pipe installed underground must be routed inside a vapor tight protective sleeve to prevent insulation deterioration and water infiltration. Refrigerant pipe installed inside underground casing must be continuous without any joints. Underground refrigerant pipe must be located at a level **below the frost line**.

Table 14: Utility Conduit Sizes.

Liquid Pipe[1]	Vapor Pipe[1]		
	1/2 (2.0[2,5])	5/8 (2-1/8[2,5])	3/4 (2-1/4[2,5])
1/4 (1.0)[3]	4	4	4
3/8 (1-1/8)[3]	4	4	5
1/2 (1-1/2)[4]	5	5	5
5/8 (1-5/8)[4]	5	5	5
3/4 (1-3/4)[4]	5	5	5

[1]OD pipe diameter in inches; Values in parenthesis () indicate OD of pipe with insulation jacket.

[2]Diameter of pipe with insulation. Thickness of pipe insulation is typical. Actual required thickness will vary based on surrounding ambient conditions and must be calculated and specified by the design engineer.

[3]Insulation thickness (value in parenthesis) = 3/8 inch.

[4]Insulation thickness (value in parenthesis) = 1 inch.

[5]Insulation thickness (value in parenthesis) = 3/4 inch.

Figure 32: Typical Arrangement of Refrigerant Pipe and Cable(s) in a Utility Conduit.

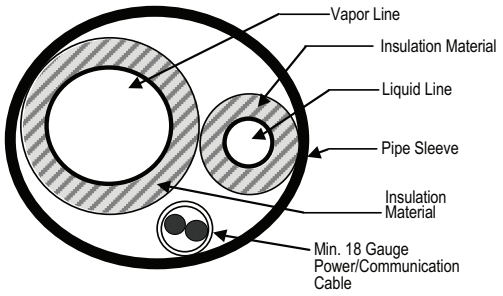


Table 15: Heat Pump Unit Refrigerant Pipe Connections (All Brazed Type).

Model	Liquid Conn. (inches)	Vapor Conn. (inches)
LSU090HSV5, LSU120HSV5	1/4	3/8
LS181HSV5	3/8	5/8

Note:
Provide expansion joints in long pipe segments and place in an accessible conduit box for inspection. Use galvanized curved sheet metal saddles at all mounting points. Pipe must be allowed to move freely linearly.

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Flaring and Brazing Procedures

One of the main causes of refrigerant leaks is a defective connection. For LG HVAC systems, the installer needs to know how perform both flared and brazed connections successfully.

Note:

• During installation, it is imperative to keep the piping system free of contaminants and debris such as copper burrs, slag, or carbon dust.

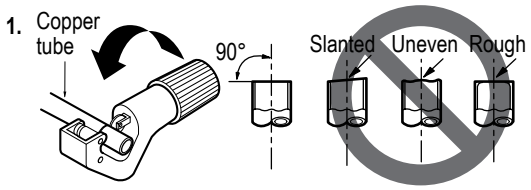
• ⃠ Do not use kinked pipe caused by excessive bending in one specific area on its length.

Flaring Procedure

Note:

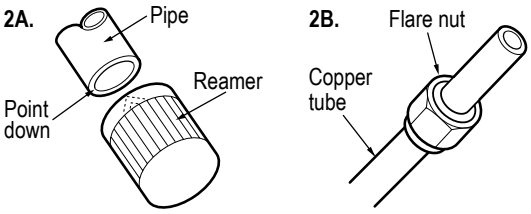
When selecting flare fittings, always use a 45° fitting rated for use with high pressure refrigerant R410A. Selected fittings must also comply with local, state, or federal standards.

1. Cut the pipe to length.
   - Measure the distance between the indoor unit and the outdoor unit.
   - Cut the pipes a little longer than measured distance.

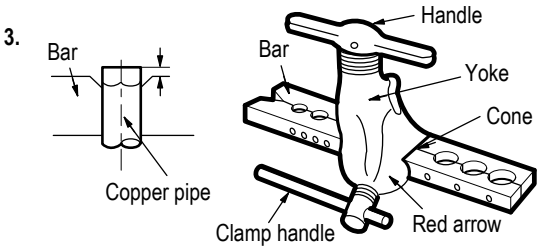


2A. Remove the burrs.
   - Completely remove all burrs from pipe ends.
   - When removing burrs, point the end of the copper pipe down to avoid introducing foreign materials in the pipe.

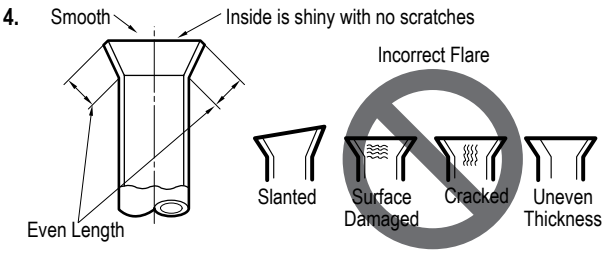
2B. Slide the flare nut onto the copper tube.



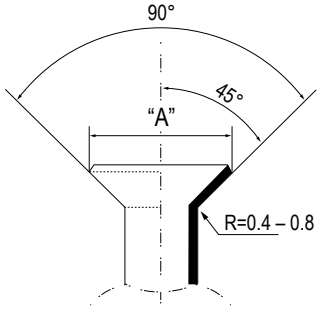
3. Flaring the pipe end.
   - Use the proper size flaring tool to finish flared connections as shown.
   - ALWAYS create a 45° flare when working with R410A.



4. Carefully inspect the flared pipe end.
   - Compare the geometry with the figure to the right
   - If the flare is defective, cut it off and re-do procedure.
   - If flare looks good, blow the pipe clean with dry nitrogen.



Dimensions of the Flare.



Flared Connection Dimensions / Tightening Torque.

Pipe Size (in. O.D.)	Outside Diameter (mm)	"A" Dimension (mm [in.])
1/4	6.35	~ 9.1 (11/32 - 23/64)
3/8	9.52	~ 13.2 (1/2 - 33/64)
1/2	12.7	~ 16.6 (41/64 - 21/32)
5/8	15.88	~ 19.7 (49/64 - 25/32)
3/4	19.05	-

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FLARING AND BRAZING PROCEDURES

Tightening the Flare Nuts

Tightening Torque for Flare Nuts.

Pipe Size (in. O.D.)	Outside Diameter (mm)	Tightening Torque (ft-lbs.)
1/4	6.35	13.0 - 18.0
3/8	9.52	24.6 - 30.4
1/2	12.7	39.8 - 47.7
5/8	15.88	45.4 - 59.3
3/4	19.05	71.5 - 87.5

1. When connecting the flare nuts, coat the flare (outside only) with polyvinyl ether (PVE) refrigeration oil only.

Note:

⃠ *Do not use polyolyester (POE) or any other type of mineral oil as a thread lubricant. These lubricants are not compatible with the PVE oil used in this system and create oil sludge leading to equipment damage and system malfunction.*

⃠ *Do not add any contaminants inside the refrigerant piping.*

2. Initially hand tighten the flare nuts using three (3) or four (4) turns.
3. To finish tightening the flare nuts, use both a torque wrench and a backup wrench.
4. After all the piping has been connected and the caps have been tightened, check for refrigerant gas leaks.

Loosening the Flare Nuts

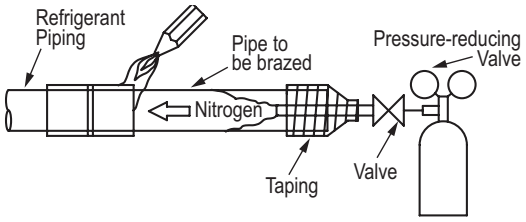
Always use two (2) wrenches to loosen the flare nuts.

Brazing Practices

⚠ WARNING

⃠ Do not braze in an enclosed location. ⃠ Do not allow the refrigerant to leak during brazing. Always test for gas leaks before and after brazing.
If the refrigerant combusts, it generates a toxic gas the will cause physical injury or death.

Figure 33: Refrigerant Pipe Brazing.



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

⚠ WARNING

- ⃠ *Do not allow the refrigerant to leak during brazing; if the refrigerant combusts, it generates a toxic gas. There is risk of fire, explosion, and physical injury or death.*
- ⃠ *Do not braze in an enclosed location, and always test for gas leaks before / after brazing. There is risk of fire, explosion, and physical injury or death.*

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Installation

Single Zone Wall-Mounted systems are one-to-one systems. There is a direct piping connection between the outdoor unit and the indoor unit. The figure at right illustrates the basic pipe connections between the outdoor and indoor unit. Refer to the illustration when proceeding with pipe connections.

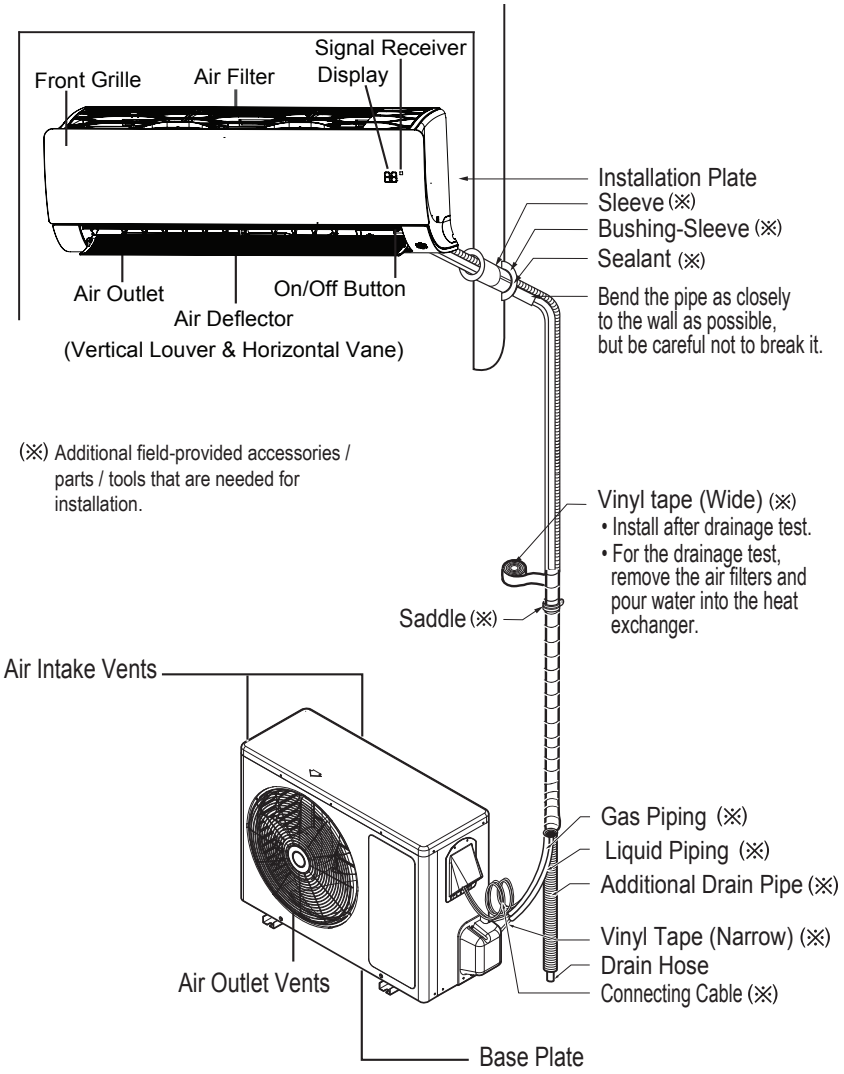
The illustration shows the indoor unit being installed at a higher position than the outdoor unit. However, if the outdoor unit be installed at a higher position than the indoor unit, the basic pipe connections are the same.

Refer to the “Connection Limitations” section for specific length limitations in conjunction with outdoor unit and indoor unit positioning.

Note:

- *When proceeding with piping connections, adhere to pipe support spacing lengths as shown in the General Refrigerant Piping System Information section. Refer to the “Pipe Supports” section for information on using clamps and pipe support materials.*
- *Always adhere to local codes regarding piping and accurate support spacing along the piping system.*
- *Always include insulation on all refrigerant and drain piping to ensure condensate does not form and cause damage to walls, floors, etc.*

Figure 34: Installation and Piping Connection Overview.



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Special Applications

If an additional drain hose is necessary, the end of drain outlet must be routed above the ground. Secure the drain hose appropriately.

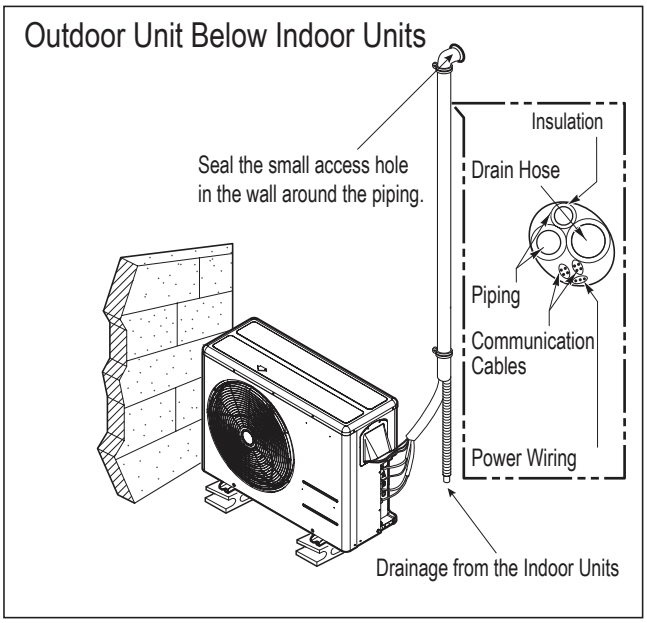
When the Outdoor Unit is Installed Below the Indoor Unit:

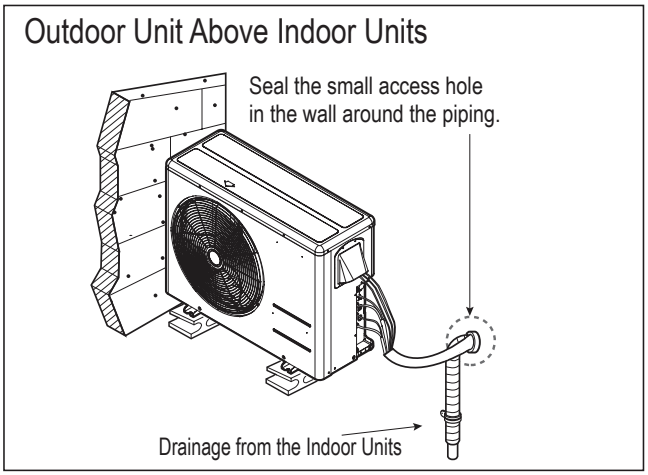
1. Use a conduit, piping set cover, or bundle the (separately) insulated refrigerant piping, the drain hose, and the communications / connection (power) cable together.
2. Make sure to include some slack in the wiring. Wiring must be installed in an upwards direction to prevent water from accessing into the control box.
3. Secure the conduit, piping set cover, or bundle along the outside wall using saddles or a similar type of piping support.
4. Seal any openings in the wall that are around the piping.

When the Outdoor Unit is Installed Above the Indoor Unit:

1. Use a conduit, piping set cover, or bundle the (separately) insulated refrigerant piping and the communications / connection (power) cable together up to the outdoor unit service valves.
2. Make sure to include some slack in the wiring. Wiring must be installed in upwards direction to prevent water from traveling into the control box.
3. If necessary, secure the conduit, piping set cover, or bundle along the outside wall using saddles or a similar type of piping support.
4. Ensure the insulated drain hose from the indoor unit is installed away from the outdoor unit, and in a downwards direction. If necessary, secure along the outside wall using saddles or a similar type of support.
5. Seal any openings in the wall that are around the piping.

Figure 35: Special Applications.





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Outdoor Unit Connections

1. Remove the piping cover or piping / control box cover (configuration depends on outdoor unit model) from the unit by loosening the fastening screws.
2. Align the center of the refrigerant piping and corresponding connection as shown.
3. Refer to the figures at right for liquid and gas (vapor) piping attachments onto the outdoor unit.
4. Place a couple of drops of PVE refrigerant oil on outside of the flare before assembling. ⃠ Do not add any contaminants. Tighten the flare nut initially by hand.
5. Finish tightening the flare nut with a torque wrench until the wrench clicks. Follow torque guidelines in the table below. See figures for correct connection points.

Figure 36: LSU090-120HSV5 Piping / Control Box Cover Removal.

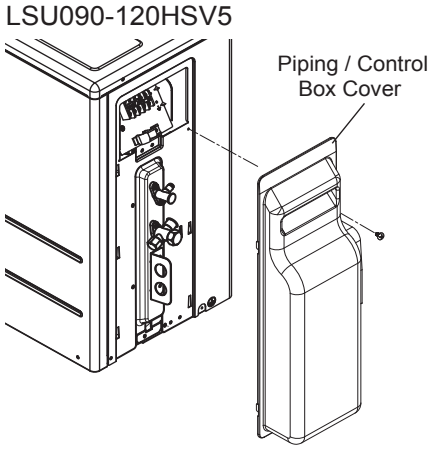

Figure 37: LSU181HSV5 Piping Cover and Control Box Cover Removal.

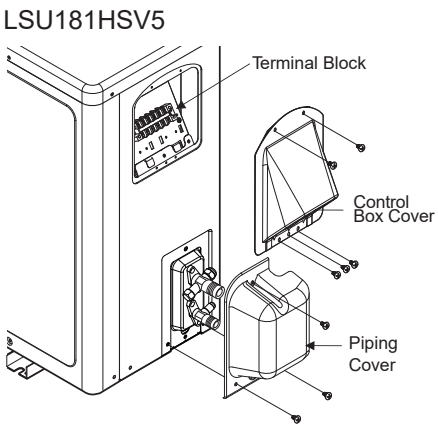

Figure 38: LSU090-120HSV5 Piping Connections.

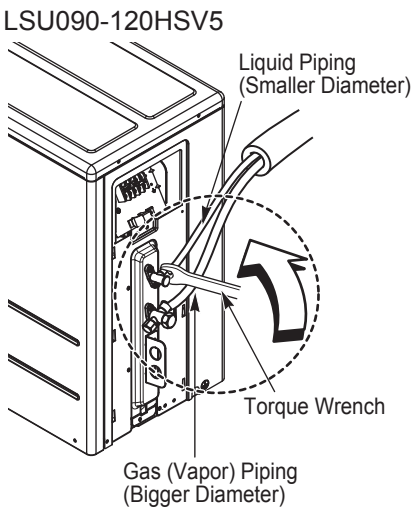

Figure 39: LSU181HSV5 Piping Connections.

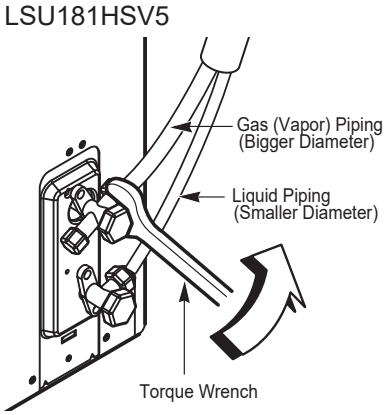

Figure 40: Pipe Attachment.

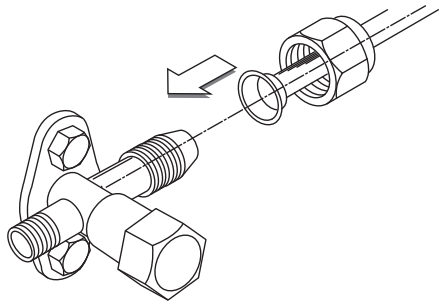

Table 16: Torque Wrench Tightening.

Pipe Size (in. O.D.)	Outside Diameter (mm)	Torque (ft-lbs.)
1/4	6.35	13.0 - 18.0
3/8	9.52	24.6 - 30.4
1/2	12.7	39.8 - 47.7
5/8	15.88	45.4 - 59.3
3/4	19.05	71.5 - 87.5

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REFRIGERANT PIPING CONNECTIONS

Indoor Unit Connections

Removing the Indoor Unit Bottom Cover

To access the indoor unit piping port connections, and to make the indoor unit installation procedure easier, it is recommended that the bottom cover be removed first.

1. Unsnap the bottom cover at its top left and right sides (Location 1).
2. Unsnap each of the three (3) or four (4) small C-hooks located in the middle of the bottom cover (Location 2). Number of C-hooks present depends on model of indoor unit.
3. Lift the three (3) to four (4) hinges on the bottom cover up and out of the channels molded to the left, right, and middle of the indoor unit (Location 3). Number of hinges present depends on model of indoor unit.
4. Set aside the bottom cover to re-install after all procedures are complete.

Figure 41: Removing the Bottom Cover.

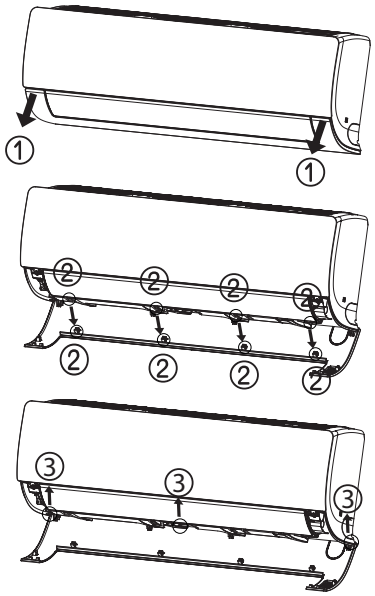
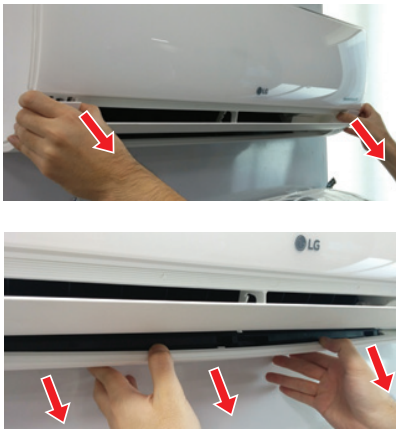


Figure 42: Removing the Bottom Cover, Alternate View.



Accessing and Positioning the Indoor Unit Piping / Connections

1. Unsnap the piping / drain hose holder (L-bracket) out from the indoor unit chassis. Prop it open between the indoor unit chassis and installation plate to separate the bottom of the indoor unit from the wall. This will allow for more working space.

Figure 43: Propping Open the Piping / Drain Hose Holder (L-bracket).

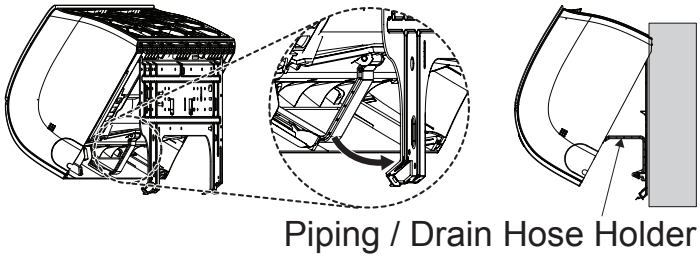
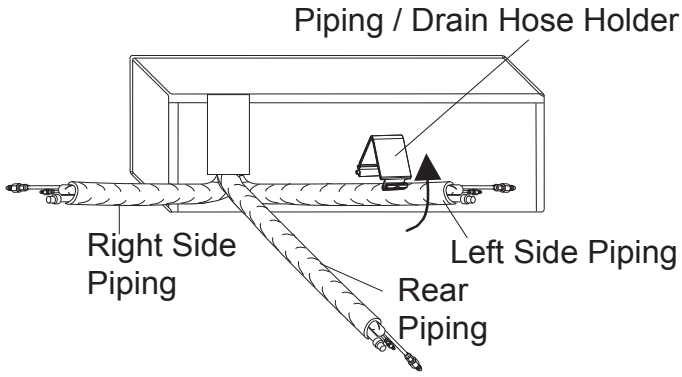
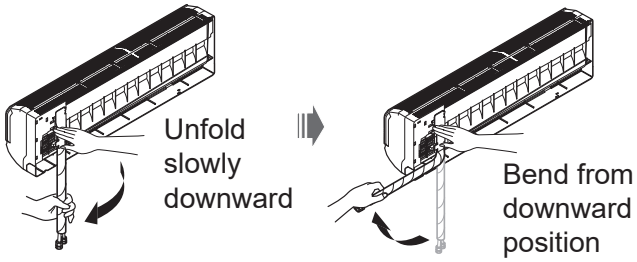


Figure 44: Back of Indoor Unit.



2. Remove the piping port cover.
3. Position the piping by unfolding and bending the piping slowly downward first as shown, then to the left or right (pre-chosen following installation guidelines and application needs) as shown. Secure piping with the piping holder.

Figure 45: Bending Piping at Rear of Indoor Unit.



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Note:

- ⃠ *Do not bend the piping directly backwards or to the left or right sides without bending it downward first; this will damage the indoor unit piping.*
- ⃠ *Do not forcibly press the refrigerant piping onto the bottom frame or the front grille; this will damage the indoor unit piping and / or indoor unit frame.*
- *Ensure the piping is straight.* ⃠ *Do not kink the piping; this will damage the indoor unit and piping.*

Figure 46: Improper Piping Bending.

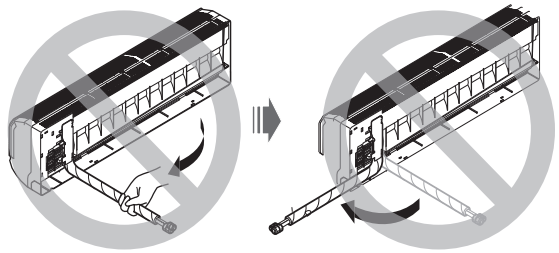
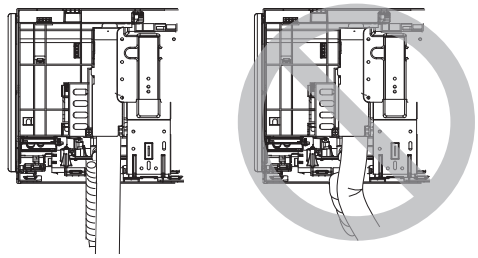


Figure 47: Keep Piping Straight; ⃠ Avoid Kinks.



Piping Installation When Piping is on the Left Side

Note:

- *See the Electrical System Installation section for information on how to connect the communication / connection (power) cable from the outdoor unit.*
- *For left-side piping, it is recommended that the communication / power connections are complete before starting the piping connections.*

1. Insert drain hose on left (feature will differ depending on model of indoor unit).
2. Align the center of the refrigerant piping and corresponding connection as shown on the next page.
3. Place a couple of drops of refrigerant oil on outside of the flare before assembling. ⃠ Do not add any contaminants. Tighten the flare nut initially by hand.
4. Finish tightening the flare nut with a torque wrench until the wrench clicks. Follow torque guidelines in the table on the next page.

Note:

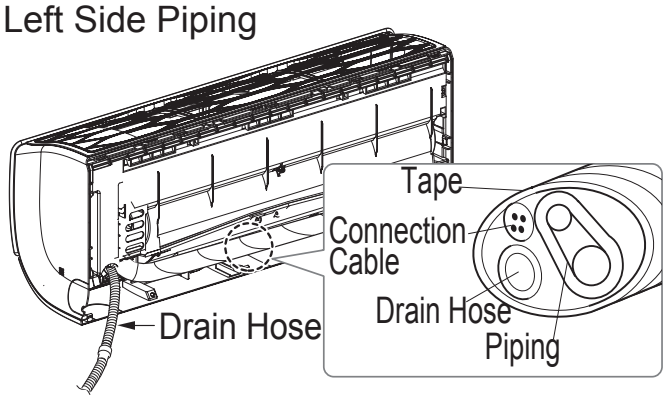
When tightening the flare nut with a torque wrench, ensure the direction for tightening follows the arrow on the wrench.

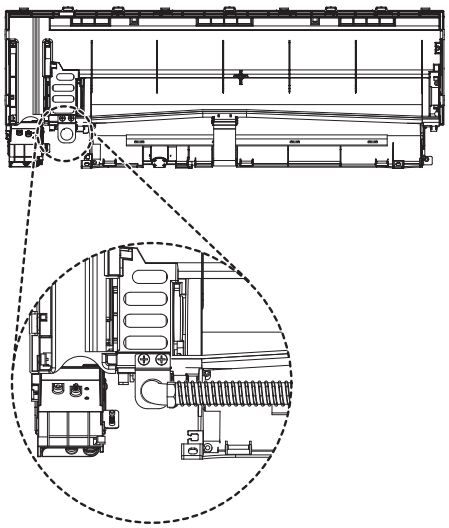
5. Bundle the refrigerant piping, drain hose, and communication / connection (power) cable together. Ensure that the drain hose is located at the bottom of the bundle.
   - If using a conduit for the power wiring / communications cable, see the next page.

Note:

Positioning the drain hose at the top of the bundle can cause condensate to overflow from the drain pan in the inside of the indoor unit.

Figure 48: Piping Installation When Piping is on the Left Side.





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REFRIGERANT PIPING CONNECTIONS

Indoor Unit Connections

Piping Installation When Piping is on the Right Side

Note:

See the Electrical System Installation section for information on how to connect the communication / connection (power) wiring from the outdoor unit.

1. Align the center of the refrigerant piping and corresponding connection as shown.
2. Place a couple of drops of refrigerant oil on outside of the flare before assembling. ⃠ Do not add any contaminants. Tighten the flare nut initially by hand.
3. Finish tightening the flare nut with a torque wrench until the wrench clicks. Follow torque guidelines in the table below.

Note:

When tightening the flare nut with a torque wrench, ensure the direction for tightening follows the arrow on the wrench.

4. Bundle the refrigerant piping, drain hose, and communication / connection (power) cable together. Ensure that the drain hose is located at the bottom of the bundle.
   - If using a conduit for the power wiring / communications cable, see below.

Note:

Positioning the drain hose at the top of the bundle can cause condensate to overflow from the drain pan in the inside of the indoor unit.

Table 17: Torque Wrench Tightening.

Pipe Size (in. O.D.)	Outside Diameter (mm)	Torque (ft-lbs.)
1/4	6.35	13.0 - 18.0
3/8	9.52	24.6 - 30.4
1/2	12.7	39.8 - 47.7
5/8	15.88	45.4 - 59.3
3/4	19.05	71.5 - 87.5

Figure 49: Piping Installation When Piping is on the Right Side.

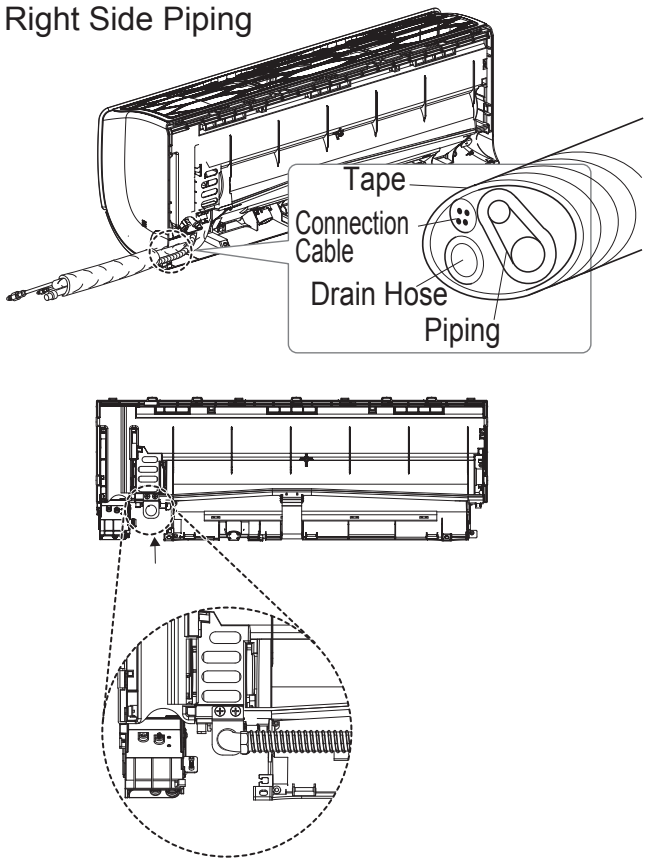
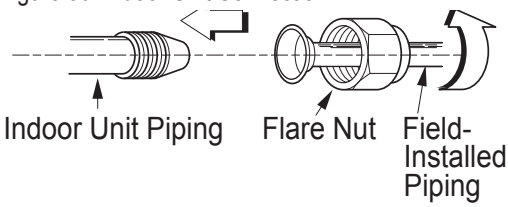


Figure 50: Indoor Unit Connection.



Using a Conduit for Indoor Unit Wiring / Cable Installation

Note:

Use a liquidtight 3/4 inch elbow connector for flexible conduit.

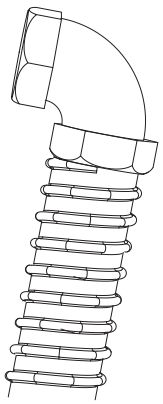
1. Prop indoor unit away from wall bracket.
2. Guide communication / connection (power) cable insulation into the conduit.

Note:

- *Check local, state, and federal codes when choosing a conduit size.*

3. Attach conduit using the liquidtight 3/4 inch elbow connector.
4. Reassemble the indoor unit properly onto the wall bracket.
5. If conduit is not used, see pages in this section for refrigerant piping, condensate drain, power wiring / communication cable bundling information.
6. To protect the piping, condensate drain, and conduit from the elements, add a lineset cover from the indoor access hole to the outdoor unit.

Figure 51: Liquidtight 3/4 Inch Elbow Connector Attached to Flexible Conduit.



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Outdoor Unit Condensate Drain Piping Installation

Depending on the installation location, it could be necessary to install factory-supplied drain plug(s).See pages 12 to 15 for information in reference to outdoor unit placement.

Note:

Ensure drain piping is insulated. Drain water from the defrost mode will freeze and build up in the outdoor unit, impairing heating performance, and even will damage the outdoor unit.

Installing Outdoor Unit Drain Plug / Piping

1. See diagrams at right for drain connection, drain caps, and drain washer locations specific to each outdoor unit. Components and location differ depending on model of outdoor unit.

2. Connect field-supplied vinyl condensate piping to the outdoor unit drain connection. If the field-supplied vinyl piping is too long, position it to prevent kinks.

Figure 52: LSU090-120HSV5 Drain Component Locations.

LSU090-120HSV5

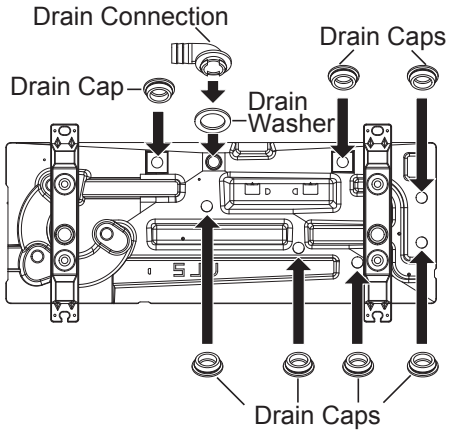
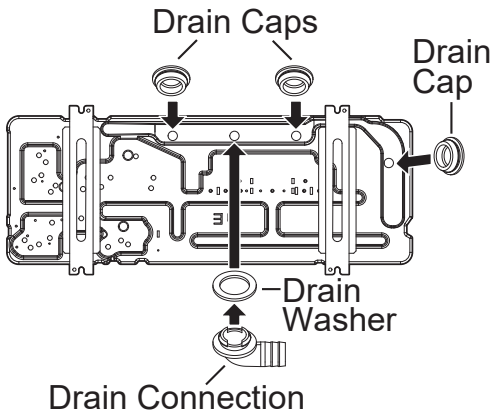


Figure 53: LSU181HSV5 Drain Component Locations.

LSU181HSV5



Note:

Check local codes for materials approved for field-suppled condensate drain piping.

Indoor Unit Condensate Drain Hose Installation

Note:

Refer to the diagrams below and follow proper installation and the position of the drain hose along the refrigerant piping installation path to avoid leaks. After the drain hose is set in place, always follow with leak / pressure testing and deep evacuation procedures of the refrigerant piping to be sure all refrigerant piping is properly installed. Re-check and retest as necessary.

- Remove the drain plug on left or right side depending on the piping installation.
- Insert the drain hose on the left side when left side piping is used; install the drain hose on the right side when right side piping is used.
- Drain hose is routed from the indoor unit through the structure (wall) to the outdoor. It must slope at an angle where it is higher at the indoor unit and lower toward the outdoor area, thereby letting gravity push any condensation down and out.
- The drain hose might need to be extended so that condensate can be properly routed away.
- The drain hose extension must be properly insulated to ensure condensation will not damage walls, floors, etc. Foamed polyethylene or equivalent of at least 5/16 inches thick is required.

Figure 54: Correct Slope Angle for Drain Hose.

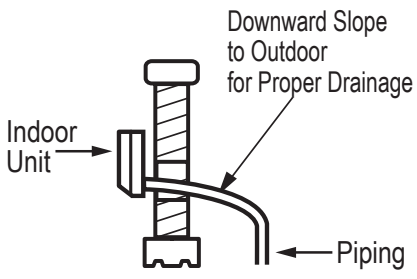
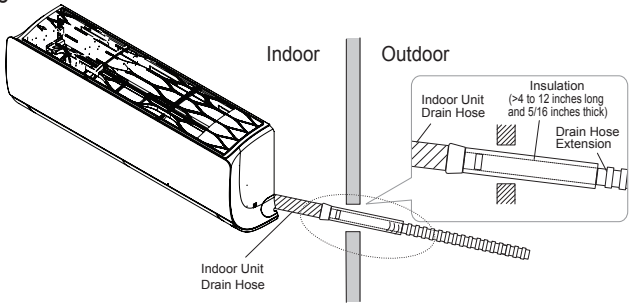


Figure 55: HSV5 Outdoor Unit Drain Hose Extension.



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REFRIGERANT PIPING CONNECTIONS

Indoor Unit Drain Hose

- Insert the drain hose >2 inches so it won't pull out of the field-supplied drain pipe.
- ⃠ Avoid piping the drain hose as shown in the diagrams in the figure below. These methods are incorrect and can cause leaks at the indoor unit site.

Figure 56: Inserting the Drain Hose >2 inches Into the Field-Supplied Drain Pipe.

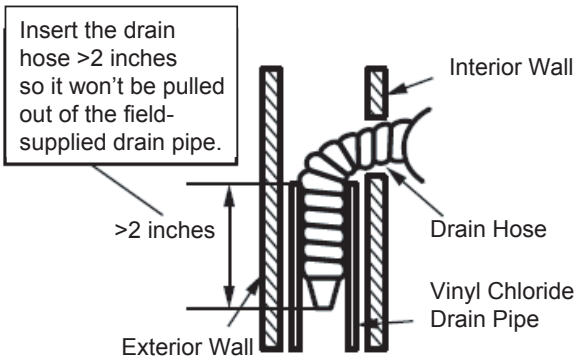
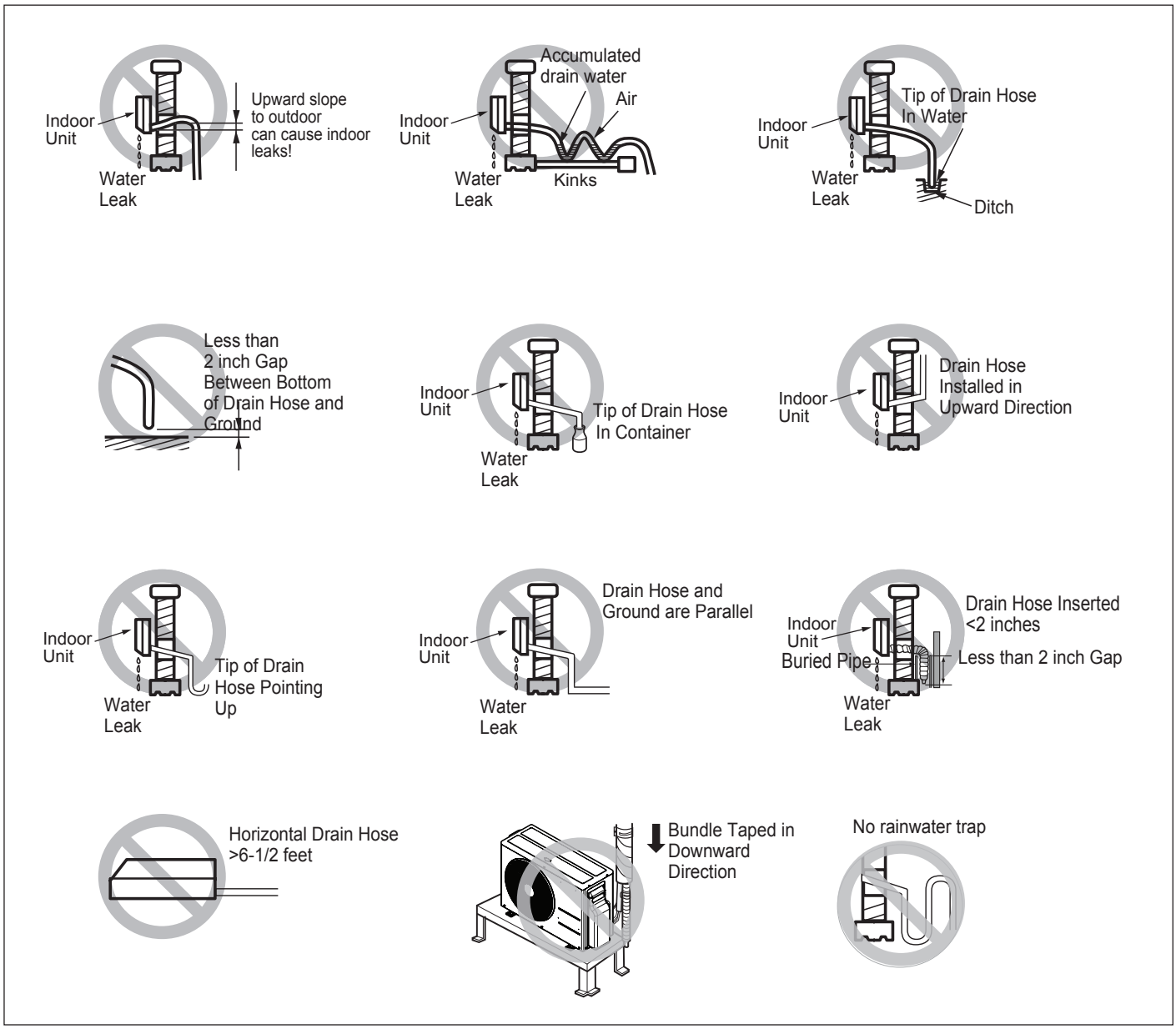


Figure 57: Incorrect Slope Angles for the Drain Hose.



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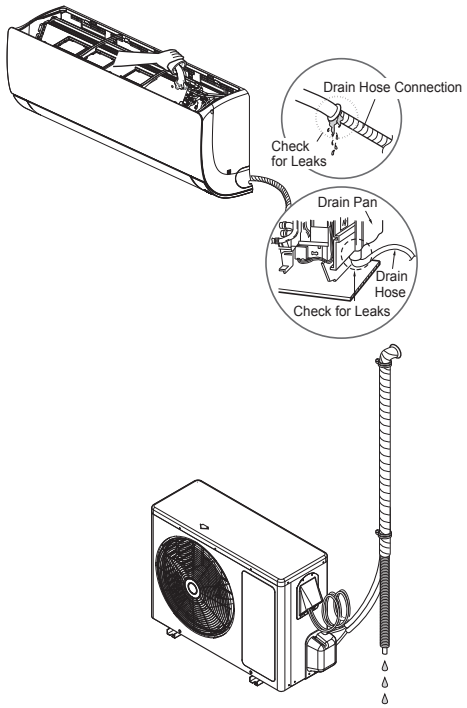
Checking the Indoor Unit Drain Hose for Leaks

1. Pour a glass of water on the evaporator.
2. Verify that the water flows appropriately through and out of the drain hose without any leaks.

Figure 58: Checking for Leaks at the Indoor Unit.



Bundling

If a conduit or piping set cover is not used on the connection from the outdoor unit to the interior, bundle both separately insulated refrigerant pipes, the drain hose, and outdoor unit to indoor unit communication / connection (power) cable together with wide vinyl tape.

1. Both piping must be fully and separately encased in insulation material: Overlap the field installation piping insulation material and the indoor unit piping insulation material.
2. Bind together the two pipes, using vinyl tape. Make sure there are no gaps during the binding.
3. Be sure the cutting line is placed upward.
4. Wrap the rear piping section with narrow vinyl tape.
5. Continue to wrap the indoor unit pipe as connected to the outdoor connection pipe.
6. Using a wider vinyl tape, bundle the piping and drain hose together.
   - Tape must be sufficient to cover the piping in order to fit into the rear piping housing area at the back of the indoor unit.

Note:

- *Always include insulation on all refrigerant and drain piping to ensure condensate does not form and cause damage to walls, floors, etc.*

Figure 59: Bundling the Connection Components (From Outdoor Unit to Indoor Unit)

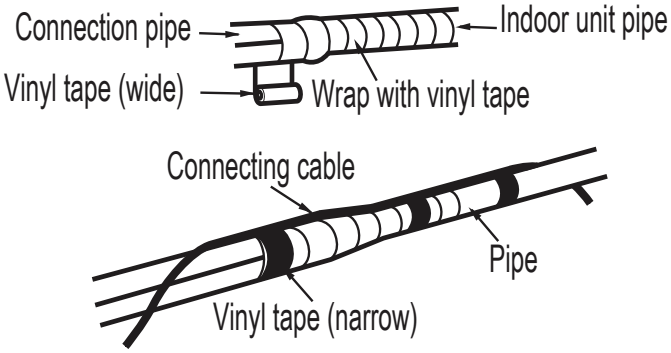
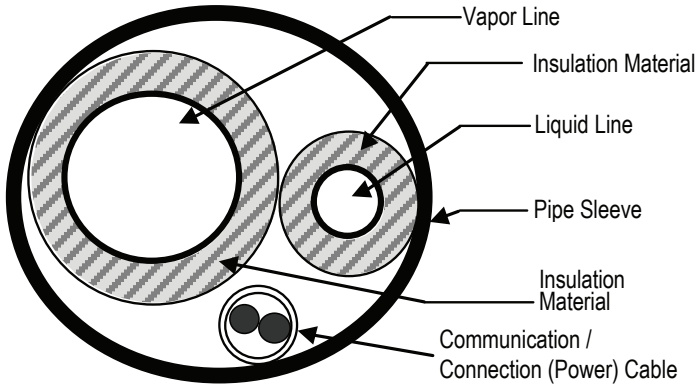


Figure 60: Cutaway of Proper Pipe and Cable Bundling.



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INSULATION

Refrigerant Piping System Insulation

Note:

For information regarding insulation for underground or penetration situations, see the "General Refrigerant Piping System Information" section.

All refrigerant piping from the outdoor unit to the indoor units must be insulated correctly for safety and usage. Refrigerant piping, field-provided isolation ball valves (if present), service valves, and elbows must be properly and completely insulated using closed cell pipe insulation (up to the indoor unit piping connections). To prevent heat loss / heat gain through the refrigerant piping, all refrigerant piping including liquid lines and vapor lines must be insulated separately. Insulation must be a minimum 1/2 inches thick, and thickness will need to be increased based on ambient conditions and local codes. Table on next page lists minimum wall thickness requirements for Ethylene Propylene Diene Methylene (EPDM) insulation.

Inside the outdoor unit, maximum pipe temperature is 248°F and minimum pipe temperature is -40°F. For field insulation of refrigerant piping between outdoor units and indoor units, consider the following pipe temperature ranges for an operating heat pump system:

- Heating mode refrigerant temperature ranges: Liquid = 75-118°F; High Pressure Vapor = 95-220°F
- Cooling mode refrigerant temperature ranges: Liquid = 75-118°F; Low Pressure Vapor = 40-90°F

All insulation joints must be glued with no air gaps. Insulation material must fit snugly against the refrigeration pipe with no air space between it and the pipe. ⃠ Do not allow insulation passing through pipe hangers, inside conduit, and/or sleeves to be compressed. Protect insulation inside hangers and supports with a second layer. All pipe insulation exposed to the sun and outdoor elements must be properly protected with PVC, aluminum vapor barrier, or alternatively placed in a weather-resistant enclosure such as a pipe rack with a top cover; and meet local codes.

Figure 61: Typical Pipe Insulation, Power Wire and Communications Cable Arrangement.

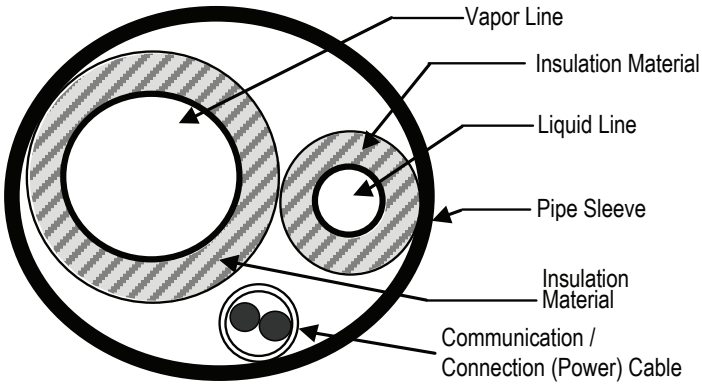


Figure 62: Typical Insulation Butt-Joint at Indoor Unit Casing.

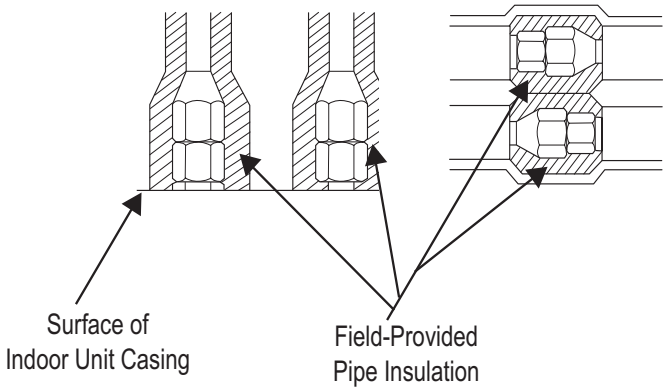
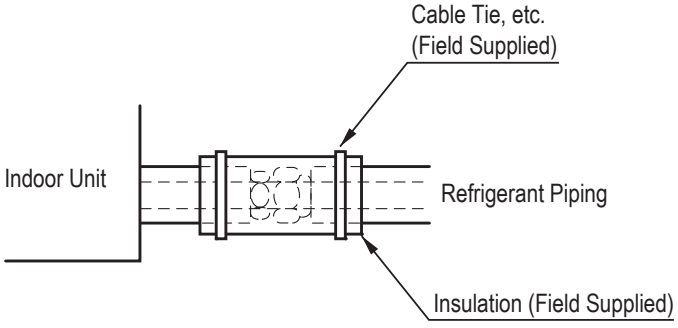


Figure 63: Typical Refrigerant Flare Fitting Insulation Detail.

Figure 64: Insulating the Shut Off / Insulation Ball Valve (If Present).



Note:

Always include plenty of insulation on all refrigerant and drain piping to ensure condensate does not form and cause damage to walls, floors, etc.

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Minimum Refrigerant Pipe Ethylene Propylene Diene Methylene (EPDM) Insulation Wall Thickness Requirements

Note:

- ⃠ *Do not insulate gas and liquid pipes together as this can result in pipe leakage and malfunction due to extreme temperature fluctuations.*
- *Always properly insulate the piping. Insufficient insulation will result in condensation, reduced heating/cooling performance, etc. Also, if the pipes aren't insulated properly, condensation could potentially cause damage to building finishes. Pay special attention to insulating the pipes installed in the ceiling plenum.*
- *Fully insulate the piping connections.*
- *Follow locals codes and the designer's instructions when selecting ethylene propylene diene methylene (EPDM) insulation wall thickness.*

Table 18: Minimum Refrigerant Pipe EPDM Insulation Wall Thickness Requirements.[1]

<table>
<tr><th colspan="2" rowspan="2">Classification / Piping O.D.</th><th colspan="2">Air-conditioned location</th><th colspan="2">Non-air conditioned location</th></tr>
<tr><th>1. Typical Conditioned Location</th><th>2. Special Conditioned Location</th><th>3. Typical Unconditioned Location</th><th>4. Special Unconditioned Location</th></tr>
<tr><td rowspan="3">Liquid pipe</td><td>ø1/4 inch</td><td rowspan="2">>1/2 inches</td><td rowspan="2">>1/2 inches</td><td rowspan="2">>1/2 inches</td><td rowspan="2">>1/2 inches</td></tr>
<tr><td>ø3/8 inch</td></tr>
<tr><td>≥ø1/2 inch</td><td>>1/2 inches</td><td>>1/2 inches</td><td>>1/2 inches</td><td>>1/2 inches</td></tr>
<tr><td rowspan="12">Vapor pipe</td><td>ø3/8 inch</td><td rowspan="7">>1/2 inches</td><td rowspan="8">>3/4 inches</td><td rowspan="8">>3/4 inches</td><td rowspan="12">>1 inch</td></tr>
<tr><td>ø1/2 inch</td></tr>
<tr><td>ø5/8 inch</td></tr>
<tr><td>ø3/4 inch</td></tr>
<tr><td>ø7/8 inch</td></tr>
<tr><td>ø1 inch</td></tr>
<tr><td>ø1-1/8 inches</td><td rowspan="5">>3/4 inches</td></tr>
<tr><td>ø1-1/4 inches</td><td rowspan="5">>1 inch</td><td rowspan="5">>1 inch</td></tr>
<tr><td>ø1-3/8 inches</td></tr>
<tr><td>ø1-1/2 inches</td></tr>
<tr><td>ø1-3/4 inches</td></tr>
</table>

[1]The thickness of the above insulation material is based on heat conductivity of 0.61 Btu/in/h/ft²/°F.

1. Typical Conditioned Location

A building plenum or space that contains conditioned air that does not exceed 80°F DB.

2. Special Conditioned Location

1. When the location is air conditioned, but there is severe temperature/humidity difference due to high ceilings.
   - Church, auditorium, theater, lobby, etc.
2. When the location is air conditioned, but internal temperature/humidity are high.
   - Bathroom, swimming pool, locker room, etc.

3. Typical Unconditioned Location

An unconditioned space inside a building.

4. Special Unconditioned Location: If conditions 1 and 2 below are present.

1. An unconditioned space or plenum of a building.
2. An area where there is an elevated humidity level.

5. Additional Insulation for Indoor Units May be Required in Humid Environments.

The air conditioner factory insulation has been tested according to "ISO Conditions with Mist," and it satisfies the requirements. If the system has been operating for a long time in a high humidity environment (dew point temperature: more than 73°F), condensate is likely to form. If this happens, install 3/8 inch thick EPDM insulation that is plenum-rated with a heat-resistance factor of more than 248°F.

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ELECTRICAL SYSTEM INSTALLATION

Safety Guidelines / Connections and Specifications

⚠ WARNING

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

Note:

- *Consider ambient conditions (temperature, direct sunlight, inclement weather, etc.) when selecting, installing, and connecting the power wiring.*
- *Properly ground the Single Zone outdoor and indoor unit. Improperly connected ground wire can cause communication problems from electrical noise and motor current leakage. Ground wiring must always be installed by a trained technician.*
- *Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and NEC regulations related to electrical equipment and wiring, and following the instructions in this manual. Using an oversized breaker or fuse will result in equipment malfunction and property damage.*
- ⃠ *Do not connect ground wire to refrigerant, gas, or water piping; to lightning rods; to telephone ground wiring; or to the building plumbing system. Failure to properly provide a NEC-approved earth ground can result in property damage and equipment malfunction.*
- ⃠ *Do not operate the air conditioning system until the refrigerant piping installation is complete. Operating the system before refrigerant piping is finalized will damage the compressor.*

Power Wiring / Communication Cable Connections

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

To Install a Ring or Fork Terminal:

1. Trim the wiring with wire cutters or pliers, then strip the insulation to expose the strand wiring to about 3/8 inches.
2. Using a ring terminal fastener or pliers, securely clamp a ring terminal to each stripped wire end.

Figure 65: Close up of a Typical Ring Terminal.

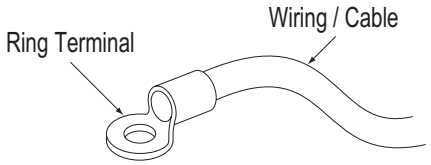
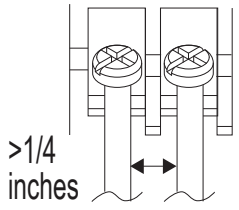


Figure 66: Distance Between the Terminal Connections.



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Power Wiring / Communication Cable Connections, continued

To Connect the Wiring to the Terminals:

1. Remove the JIS terminal screws from the (outdoor unit or indoor unit) terminal plate with a JIS screwdriver. (See information about LG terminal connections below.)
2. Position the ring terminal around the terminal, place the terminal screw in the ring, and tighten to the terminal plate using a JIS screwdriver.
   - Firmly attach the wire; secure in a way to prevent external forces from being imparted to the terminal block.
   - Use an appropriately sized JIS screwdriver for tightening the terminals.
   - ⃠ Do not overtighten the connections; overtightening will damage the terminals.

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

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

Figure 67: Adding a Ring Terminal to the Wiring.

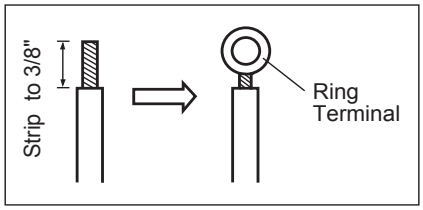
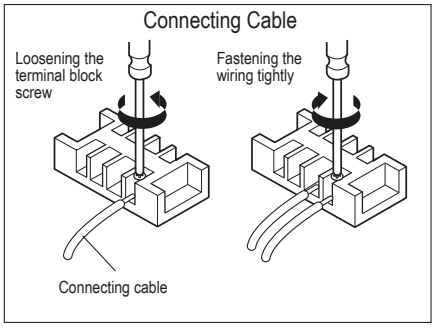


Figure 68: Tightening the Ring Terminal to the Terminal Plate.



⚠WARNING

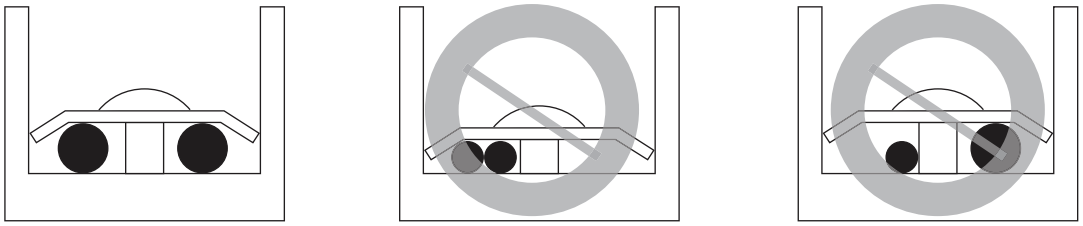
If power wires are not properly terminated and firmly attached, there is risk of fire, electric shock, and physical injury or death.

Note:

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

Figure 69: Proper and Improper Power Wiring Connections.

● :Copper Wire



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

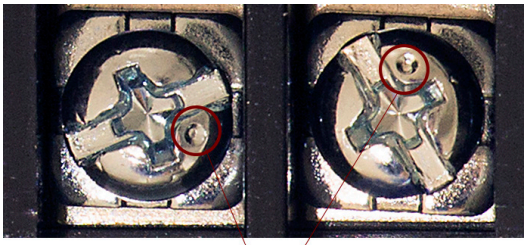
⃠ Do not terminate two wires on one side.

⃠ Do not terminate different gauge wires to a terminal block.

Terminal 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. ⃠ Do not overtighten the connections — overtightening will damage the terminals — but firmly and securely attach the wiring in a way to prevent external forces from being imparted to the terminal block.

Figure 70: JIS Screws.



JIS DIMPLES

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."*
- ⃠ *Do not include splices or wire nuts in the communication cable.*

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ELECTRICAL SYSTEM INSTALLATION

Connections and Specifications

Power Supply / Power Wiring Specifications

- LG Single Zone systems operate at 1Ø, 208-230V, 60Hz.
- Power wiring / power wiring gauge to the outdoor unit(s) must be solid or stranded, and must comply with all National Electrical Code (NEC), UL, and local electrical codes.
- The indoor unit is powered by the outdoor unit.
- Power supply, wire types and sizes, and circuit breaker must be selected based on NEC, UL, and local codes. Maximum allowable voltage fluctuation ±10% or nameplate rated value.
- Properly ground the outdoor unit and indoor unit per NEC, UL, and local codes.
- Ground wire must be longer than the common power / communication wires.
- Connect the wiring firmly so the wires cannot be easily pulled out.
- Refer to the inside of the chassis cover or control cover for circuit and terminal block diagrams.
- Always match color codes of each wire and follow wiring diagram.
- ⃠ Do not install power wiring to the outdoor unit and the communication / connection (power) cable to the indoor unit in the same conduit. Use separate conduits.

Figure 71: Single Zone Outdoor Unit Power Wiring Diagram.

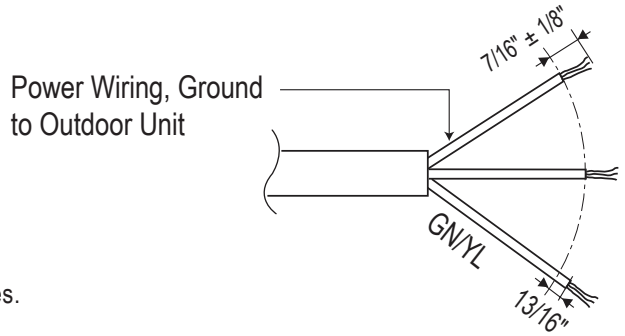

Figure 72: Power Wiring Conduit.

⚠DANGER

Refer to Electrical Data table for ampere ratings. Properly size all circuit breakers / fuses, wiring and field provided components per local codes. There is risk of fire, electric shock, explosion, physical injury or death.

⚠WARNING

- *All power wiring installation must be performed by trained service providers working in accordance with local, state, and NEC regulations related to electrical equipment and wiring, and following the instructions in this manual. Failure to do so will lead to electric shock and bodily injury or death.*
- *Use specified wiring for connections, and ensure that external force is not imparted to terminal connections. It will generate heat and / or cause a fire, resulting in physical injury or death.*
- *Use heat-proof electrical wire capable of withstanding temperatures up to 167°F to avoid wiring malfunction and electrical shock, which will cause physical injury or death.*
- *Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and NEC regulation related to electrical equipment and wiring, and following the instructions in this manual. Generated overcurrent will include some amount of direct current. Using an oversized breaker or fuse will result in electric shock, physical injury or death.*
- *Use the appropriate type of overcurrent protection. Generated overcurrent will include some amount of direct current, and if the appropriate type of overcurrent protection is not installed, there is a risk of fire, electric shock, and physical injury or death.*
- *Ground wiring is required to prevent accidental electrical shock during current leakage, communication problems from electrical noise, and motor current leakage. ⃠ Do not connect the ground line to the pipes. There is risk of fire, electric shock, explosion, physical injury or death.*
- *Per code, install a main indoor breaker, and an outdoor service disconnect that interrupts all power sources simultaneously. There is risk of fire, electric shock, explosion, physical injury or death.*

Note:

- *If there is a possibility of momentary blackout, or the power goes on and off while the system is operating, install a field-supplied phase loss protection circuit. If not, the compressor and other components will be damaged.*
- *Use heat-proof electrical wire capable of withstanding temperatures up to 167°F to avoid damage to unit.*
- *Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and NEC regulations related to electrical equipment and wiring, and following the instructions in this manual. Generated overcurrent will include some amount of direct current. Using an oversized breaker or fuse will result in equipment malfunction and property damage.*
- ⃠ *Do not connect ground wire to refrigerant, gas, or water piping; to lightning rods; to telephone ground wiring; or to the building plumbing system. Failure to properly provide a NEC approved earth ground can result in property damage and equipment malfunction.*

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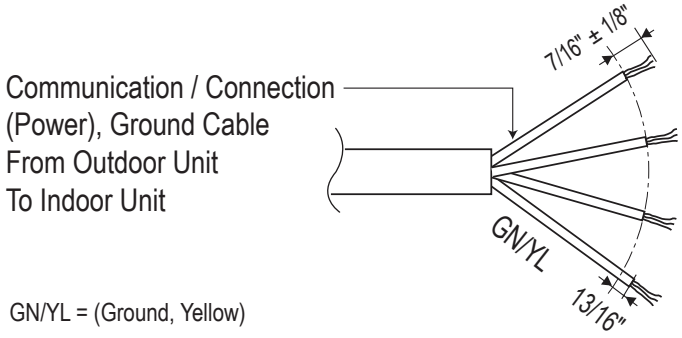
Communication / Connection (Power) Cable Specifications from Outdoor Unit to Indoor Unit

- For communication / connection (power) wires between the Single Zone outdoor unit and the indoor unit, use a minimum 14 gauge, four (4) conductor, stranded, shielded or unshielded wire. If shielded, the wire must be grounded to the chassis at the outdoor unit only.
- Insulation material as required by local code.
- Firmly attach the cable; provide slack but secure in a way to prevent external forces from being imparted on the terminal block.
- Wiring must be completed without splices.

Figure 73: Typical Single Zone Outdoor Unit to Indoor Unit Wiring and Communications Cable Diagram.



GN/YL = (Ground, Yellow)

⚠ WARNING

All power wiring and communication cable installation must be performed by trained service providers working in accordance with local, state, and National Electrical Code (NEC) / UL / ETL federal regulations related to electrical equipment and wiring, and following the manufacturer product diagrams, requirements, and instructions in this manual. Failure to do so will lead to electric shock which can cause physical injury or death.

Note:

- *Always verify the communication cable is connected to a communications terminal on the Single Zone unit. ⃠ Never apply line voltage power to the communication cable connection. If contact is made, the PCBs will be damaged.*
- *The shield of the communications cable connecting the outdoor unit to the indoor unit must be grounded only to the outdoor unit frame.*
- *Tie the shield of each cable segment together using a wire nut at the indoor unit. Maintain polarity throughout the communication network.*
- *Position the incoming power to the outdoor unit away from the power / communications cables from the outdoor unit to the indoor unit.*
- ⃠ *Never use a common multiple-core communications cable.*

Figure 74: Typical LS090-120HSV5 Power / Communication System Diagram.

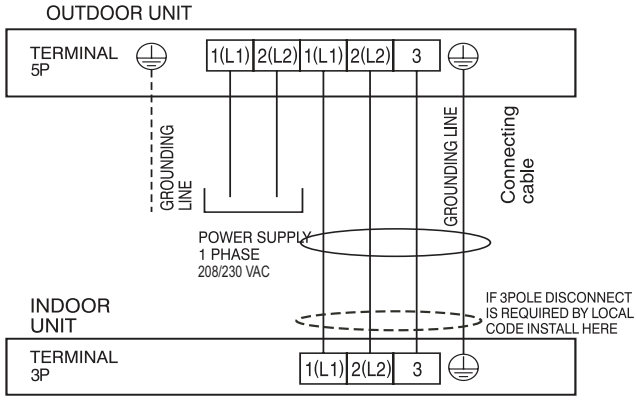
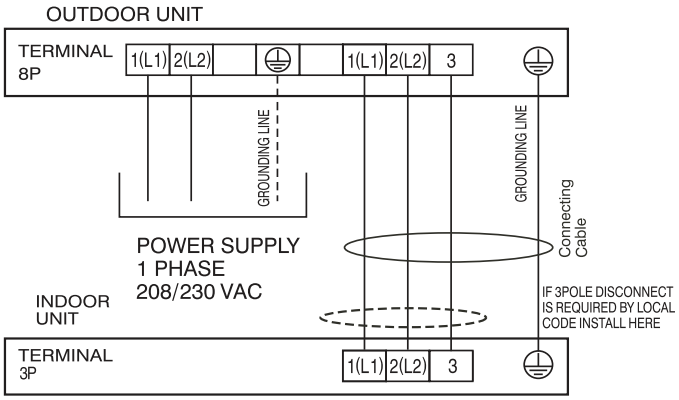


Figure 75: Typical LS181HSV5 Power / Communication System Diagram.



Note:

- *Use of 14 gauge, four (4) conductor, stranded, shielded or unshielded wire is allowed for lengths up to the published maximum pipe length, plus recommended slack at both ends.*

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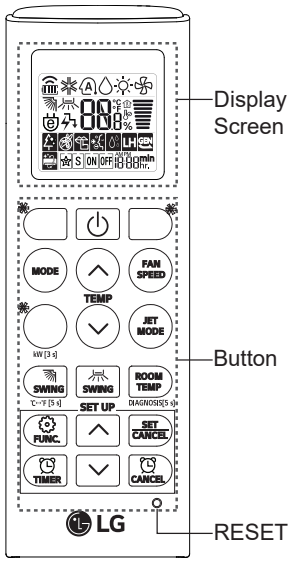
ELECTRICAL SYSTEM INSTALLATION

Controller Options

Controller Options

Single Zone High Efficiency Standard Wall Mount systems include a wireless handheld remote controller (Model No. AKB74955602), but optional LG-suppled wired controllers are available. See “Functions, Controls, Options” in the Engineering Manual, or contact an LG representative for more information.

Figure 76: Example of a Wireless Handheld Remote Controller. Buttons will differ depending on model type.



Wireless Handheld Remote Controller features:

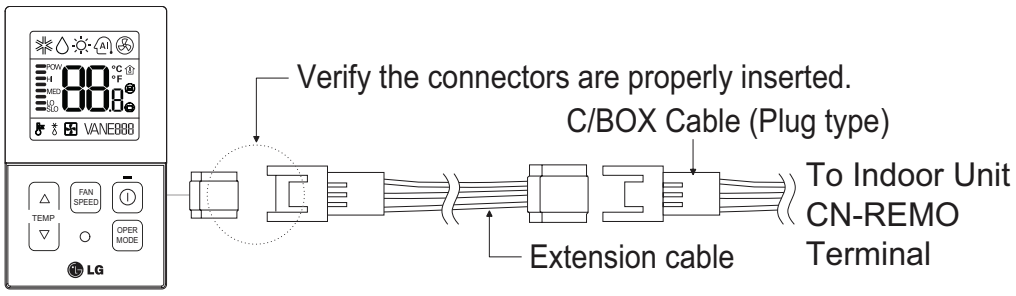
- Display Panel: Displays operation conditions.
- On / Off Button: Turns system operation on and off.
- Mode Button: Selects the operation mode: Cooling, Heating, Auto, Dry (Dehumidification), or Fan.
- Temp Up / Down Buttons: Adjusts the desired room temperature in the different modes.
- Fan Speed Button: Sets desired fan speed.
- Reset: Initializes the handheld remote control settings.

Wired Controller Connections

Optional controllers (see the Single Zone High Efficiency Standard Wall Mount Engineering Manual, or contact an LG representative for more information) can connect to the Single Zone High Efficiency Standard Wall Mount indoor unit in one of two different ways.

1. LG Wired Remote Extension Cable with Molex plug (PZCWRC1; sold separately) that connects to the CN-REMO terminal on the indoor unit PCB.
2. Field-supplied controller cable that connects to the indoor unit terminal block (must be at least UL2547 or UL1007, and at least FT-6 rated if local electric and building codes require plenum cable usage). Communication cable from indoor unit to remote controller(s) is to be 22 AWG, 3-conductor, twisted, stranded, unshielded. Wiring must comply with all applicable local and national codes.

Figure 77: PZCWRC1 LG Wired Remote Extension Cable.



Note:

When using field-supplied controller cable, make sure to connect the yellow to yellow (communications wire), red to red (12V power wire), and black to black (ground wire) terminals from the remote controller to the indoor unit terminal blocks.

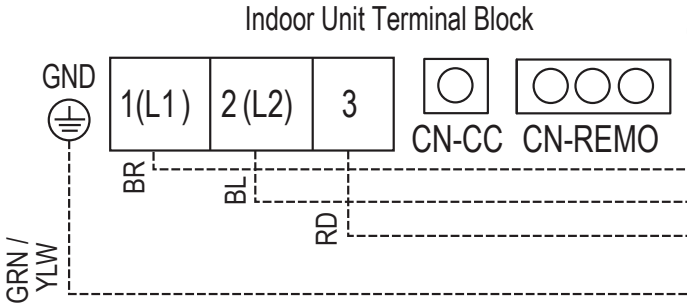
Dry Contact

A Dry Contact can also be connected to the High Efficiency indoor unit using the CN-CC connection on the indoor unit PCB. The Dry Contact DC is shipped with a specific connector that is used to connect to the indoor unit.

Central Controller

Additionally, Single Zone High Efficiency systems can be connected to a central controller if a PI-485 VNet Accessory is installed in the outdoor unit. See the Central Controller manual for wiring specifications.

Figure 78: Wired Controller Connections on the Indoor Unit Terminal Block.



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Connecting Indoor Unit Electrical Wiring

⚠ WARNING

- *Verify that main power to the unit is completely off before proceeding with these steps as there is a risk of electrical shock, bodily injury, and / or death.*
- *Follow all safety and warning information outlined at the beginning and throughout this manual. Failure to do so will cause electrical shock, bodily injury, and / or death.*

Note:

- *Follow all safety and warning information outlined at the beginning and throughout this manual. Failure to do so will cause unit failure.*
- *Connect the communication / connection (power) cable to the indoor unit by matching the terminals on the outdoor unit control board. Verify the color of the wires at the outdoor unit, along with the terminal numbers, match those for the indoor unit.*
- *Images are representative; actual appearance will vary.*
- *Refer to the circuit diagram on the indoor unit bottom cover.*

Figure 79: Steps to Removing the Bottom Cover.

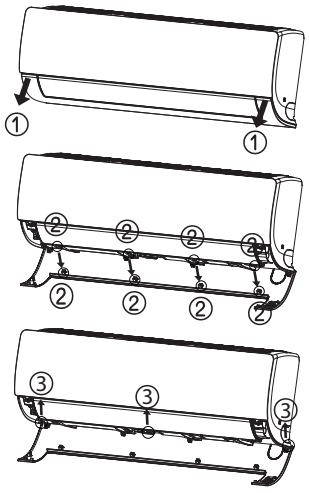
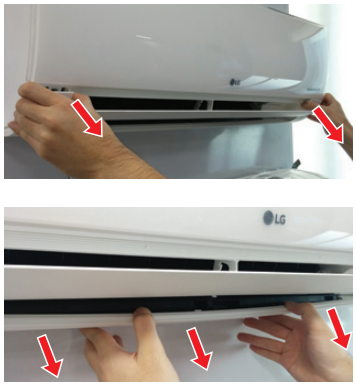
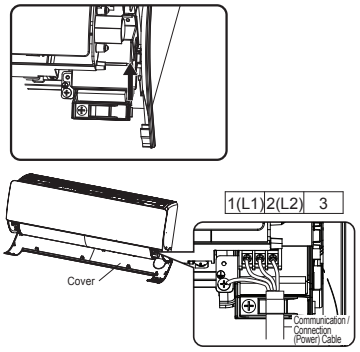


Figure 80: Removing the Bottom Cover (Appearances Will Vary Depending on Indoor Unit Model).



1. The bottom panel must have already been removed. If it hasn't been removed, unsnap the bottom cover at its top left and right sides (Location 1).
2. Unsnap each of the three (3) or four (4) small C-hooks located in the middle of the bottom cover (Location 2). Number of C-hooks present depends on model of indoor unit.
3. Lift the three (3) to four (4) hinges on the bottom cover up and out of the channels molded to the left, right, and middle of the indoor unit (Location 3). Number of hinges present depends on model of indoor unit.
4. Set aside the bottom cover to re-install after all procedures are complete.
5. Terminal block is located at the front bottom-right—hand side of the indoor unit. To access the terminals, unscrew the metal control cover screw (if applicable), and raise the metal control cover.
6. Using a JIS screwdriver, connect the cable terminals to the terminal block. Ensure wire color and terminal number of the indoor unit matches those of the outdoor unit. Refer to the wiring diagram on the inside of the bottom cover.

Figure 81: Location of the Indoor Unit Terminal Block.



Note:

- *Each wire must be securely attached to the terminal block.*
- *Ground cable must be longer than the other wires.*
- *Secure the cable onto the control board using a cable tie.*
- *Use a conduit to protect the cable / refrigerant piping from the indoor unit to the outdoor unit.*

Figure 82: Terminal Cover Down.

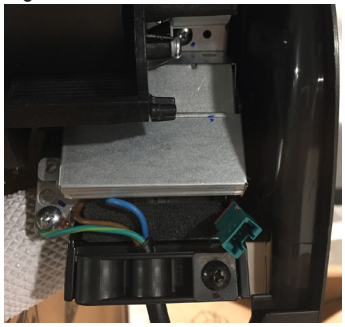
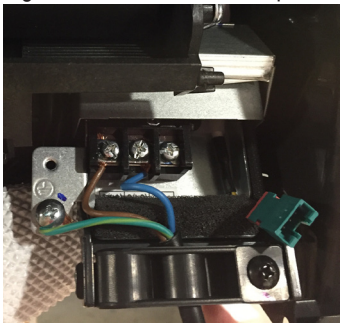


Figure 83: Terminal Cover Up.



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ELECTRICAL SYSTEM INSTALLATION

Indoor Unit Electrical Connections

Connecting Indoor Unit Electrical Wiring, continued.

7. Choice of the cable path out of the indoor unit and to the outdoor unit depends on refrigerant piping / drain hose installation: left side piping, following back of indoor unit; right side piping, through the knockout hole; or rear piping.

Cable Installation When Piping is on the Left Side:

- Insert the communication / connection (power) cable through the bottom of the indoor unit,
- Connect the terminals to the terminal block.
- Secure the cable onto the terminal block with the cable retainer.
- Secure the refrigerant piping, drain hose, and communication / connection (power) cable together using cable ties and conduit, or by the bundling method.

Note:

Position the drain hose at the bottom. Positioning the drain hose at the top of the bundle can cause condensate to overflow from the drain pan in the inside of the indoor unit.

Cable Installation When Piping is on the Right Side:

- Connect the terminals to the terminal block.
- Secure the cable onto the terminal block with the cable retainer.
- Secure the refrigerant piping, drain hose, and communication / connection (power) cable together using cable ties and conduit, or by the bundling method.

Note:

Position the drain hose at the bottom. Positioning the drain hose at the top of the bundle can cause condensate to overflow from the drain pan in the inside of the indoor unit.

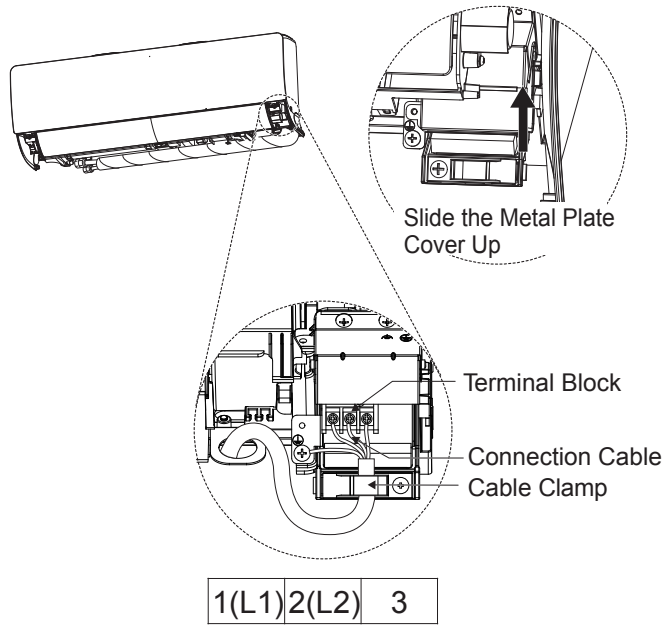
Note:

For more information on conduits or the bundling method, see the Refrigerant Piping Connection section.

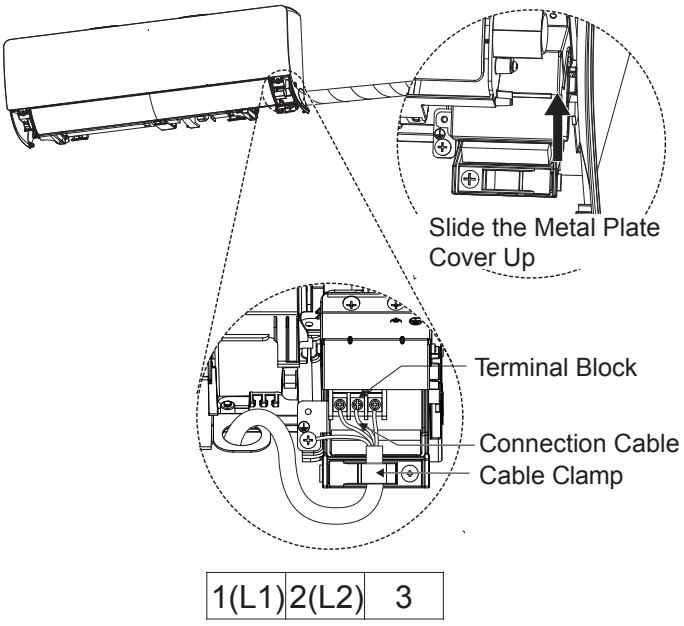
8. Reattach the metal control cover using the screw (if applicable).

Figure 84: Cable / Refrigerant Piping / Drain Hose Installation Options.

Wiring When Piping is on the Left Side



Wiring When Piping is on the Right Side



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Connecting Outdoor Unit Wiring

⚠ WARNING

- *Verify that main power is completely off and that no power is going through the Single Zone system before proceeding with these steps. Follow all safety and warning information outlined at the beginning of this manual. Failure to do so will cause electric shock, bodily injury and / or death.*
- *Per code, install a main indoor breaker, and an outdoor service disconnect that interrupts all power sources simultaneously. There is risk of fire, electric shock, explosion, physical injury or death.*
- *Verify that the circuit breaker or some other emergency power cutoff device is in place before any power wiring is done to the system. Failure to do so will cause electric shock, bodily injury and / or death.*
- ⃠ *Never touch any power lines or live cables before all power is cutoff to the system. To do so will cause bodily injury or death.*

1. Using a Phillips head screwdriver, remove the piping / control box cover or control box cover (depends on model) from the outdoor unit.

2. Inspect all wiring inside the chassis to be sure they are secure and have not loosen during transportation and installation of the outdoor unit. Inspect wires for damage or cracks.

⚠ WARNING

Loose, damaged, or cracked wires will cause electric shock, bodily injury and / or death.

Note:

Loose wires can cause the wiring to burn out, damaging the outdoor unit.

3. Confirm that electrical power supply capacity will be sufficient to run the unit. Verify that a circuit breaker and service disconnect are installed. See the Electrical table in the Product Data section for details on electrical requirements.

⚠ WARNING

Per code, install a main indoor breaker, and an outdoor service disconnect that interrupts all power sources simultaneously. There is risk of fire, electric shock, explosion, physical injury or death.

4. Confirm that the right gauge size is used for all wiring. Follow all federal, state, and local codes related to wiring.

5. Guide the power wiring to the outdoor unit, and communications / connection (power) cable from the outdoor unit to the indoor unit, through the conduit holes on the outdoor unit or control box cover (see images below and on the next page). Install conduits to protect the wiring and cable.

Figure 85: Circuit Breaker.

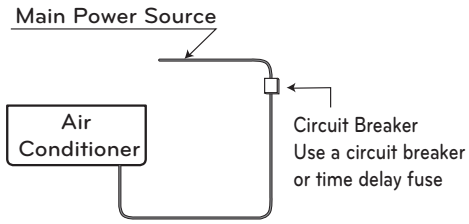


Figure 86: Accessing LSU090-120HSV5 Outdoor Unit Wiring Connections.

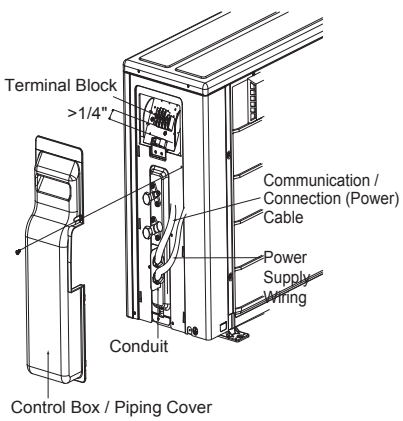
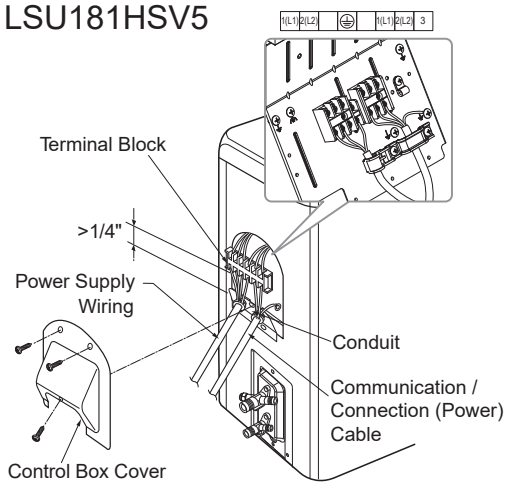


Figure 87: Accessing LSU181HSV5 Outdoor Unit Wiring Connections.



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ELECTRICAL SYSTEM INSTALLATION

Outdoor Unit Electrical Connections

Connecting Outdoor Unit Wiring, continued.

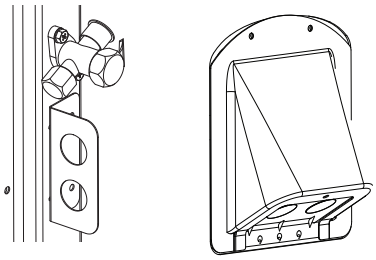
Note:

⃠ Do not install power wiring to the outdoor unit and the communication / connection (power) cable to the indoor unit in the same conduit. Use separate conduits. Communication problems will occur.

Figure 88: Example of Conduit.

Figure 89: HSV5 Outdoor Unit Conduit Holes.

LSU090-120HSV5 LSU181HSV5



6. Using a JIS screwdriver, connect wires as shown at right. See also indoor unit wiring diagram found on its bottom cover, and outdoor unit wiring diagram on the inside of its chassis cover.
   - Each wire must be individually and securely attached to each terminal.

⚠WARNING

Loose, damaged, or cracked wires will cause electric shock, bodily injury and / or death.

Note:

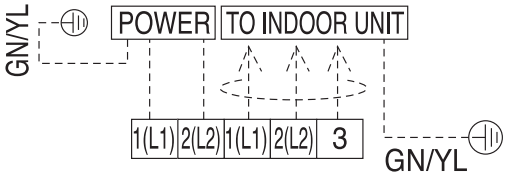
Loose wires can cause the wiring to burn out, damaging the outdoor unit.

- *Secure wiring / cables with cable ties.*
- *Pay attention to the location / connection of the ground cable.*
- *Maintain a minimum of 1/4 inches of wire length from terminal block to cable bundle.*

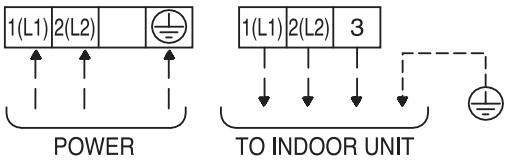
7. When finished, reattach the piping / control box cover or control box cover (depends on model) to the outdoor unit with the screws.

Figure 90: Outdoor Unit Electrical Connections.

LSU090-120HSV5 Outdoor Unit Terminal Block



LSU181HSV5 Outdoor Unit Terminal Block



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Triple Leak / Pressure Test

After the refrigerant piping installation is complete, perform a triple leak / pressure test. Triple leak / pressure test is performed between the outdoor unit and indoor unit to verify that refrigerant can flow through the system without danger of leaks or pressure losses. Air and moisture that is left in the piping can lead to undesirable results and can cause damage to the system. It is important to go through a complete leak / pressure cycle to be sure that the refrigerant piping is cleared out. This process will have to be repeated if any air or moisture be is found to remain in the piping.

Note:

Insufficient or incorrectly done air purging will lead to the following:

- *Pressure in the system can rise.*
- *Operating current can rise.*
- *Inefficient cooling or heating mode capability.*
- *Moisture in the refrigerant circuit will freeze and block capillary tubing.*
- *Water can lead to corrosion of parts in the system.*

⚠DANGER

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

Note:

- *⃠ Never perform the leak test using refrigerant.*
- *⃠ To avoid nitrogen entering the refrigerant system in a liquid state, the top of the cylinder must be higher than its bottom (used in a vertical standing position) when the system is pressurized.*
- *Use only a leak-free gauge manifold set.*
- *Piping system must not be pressured to more than 550 psi. Pressures greater than 550 psi will damage the piping system and cause unit malfunction.*

Triple Leak / Pressure Check Procedure

1. After the refrigerant piping installation is complete, open the isolation ball valves, if any, that will have been included in the piping system.

2. Verify that both the liquid and gas (vapor) suction line outdoor unit service ports are closed, and the stem head access caps are tight. The leak / pressure check is to be performed only to the refrigerant piping system and the connected indoor unit.

3. Remove the cap on the gas (vapor) suction line Schrader port. Connect the (medical-grade dry) nitrogen cylinder regulator to a gauge manifold, then connect the gauge manifold to the gas (vapor) suction Schrader port on the service port.

4. Perform the leak / pressure check at 150 psig for fifteen (15) minutes (standing pressure check).

5. Perform the leak / pressure check at 300 psig for thirty (30) minutes (standing pressure check).

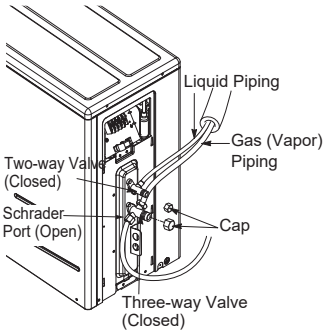
6. Perform the leak / pressure check at 550 psig for one (1) hour to make sure the piping system is leak-free. After the gauge reading reaches 550 psig, isolate the system by first closing the gauge manifold, then close the nitrogen cylinder valve. Check the flared (and any brazed connections) for leaks by applying a bubble solution to all joints.

Note:

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

Figure 91: Outdoor Unit Service Valves.

LSU090HSV5, LSU120HSV5



LSU181HSV5

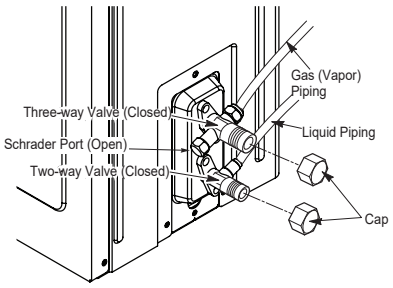
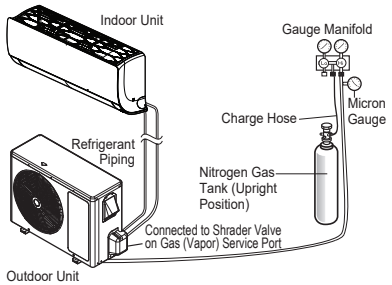


Figure 92: Triple Leak / Pressure Test Diagram.



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FINAL INSTALLATION PROCEDURES

Triple Leak / Pressure and Deep Evacuation Tests

Triple Leak / Pressure Check Procedure, continued.

7. If the pressure does NOT drop for one (1) hour, the system passes the test.

8. 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.

9. After the system has been thoroughly tested and no leaks are found, depressurize by loosening the charging hose connector at the nitrogen cylinder regulator. When system pressure returns to normal, completely disconnect the charging hose from the cylinder, and release the nitrogen charge from all refrigerant piping. Wipe off any remaining bubble solution with a clean cloth.

Deep Evacuation Procedure

After the leak / pressure check is complete, its is required that a deep evacuation procedure is be performed to the refrigerant piping and the connected indoor unit. Deep evacuation must be performed through the gas (vapor) suction line Schrader port on the outdoor unit service port.

Note:

The deep evacuation procedure is required for Single Zone systems. A triple evacuation procedure seen on the previous page is a best practices recommendation for Single Zone systems.

Note:

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

- Deep evacuate through just the gas (vapor) suction Schrader port on the outdoor unit service port.
- The outdoor unit service valves must remain closed and the stem head access caps tight. ⃠ Do not open the outdoor unit service valves and release the factory refrigerant charge until trim charge is complete, and the system is ready to operate.
- Any field-installed ball valves in the refrigerant system (if used) must be open to ensure all piping is free and clear for deep evacuation on all piping and the connected indoor unit.

Note:

- ⃠ *Do not apply power to the system before performing the deep evacuation procedure. There is a possibility that the EEV valve may close and isolate sections of the piping system, making the deep evacuation procedure inconclusive.*
- ⃠ *Never perform evacuation using refrigerant.*
- *Use only a vacuum pump that can reach 500 microns, vacuum rated hoses or copper tubing, and a leak-free gauge manifold set.*
- *Use only new vacuum pump oil from a properly sealed (unopened) container, and change oil in pump before EVERY use.*
- *Subsequent oil changes will be necessary after several hours of continuous operation; have extra oil on hand.*
- *Use a quality micron gauge in good operating order and install as far away from pump as possible.*

Deep Evacuation Procedure Steps

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

2. Connect the gauge manifold along with the vacuum pump to the gas (vapor) suction Schrader port (with core removed) using a vacuum hose. Open the gauge manifold and the vacuum pump valves.

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Deep Evacuation Procedure, continued.

3. Evacuate to static micron level ≤500 for at least one (1) hour.

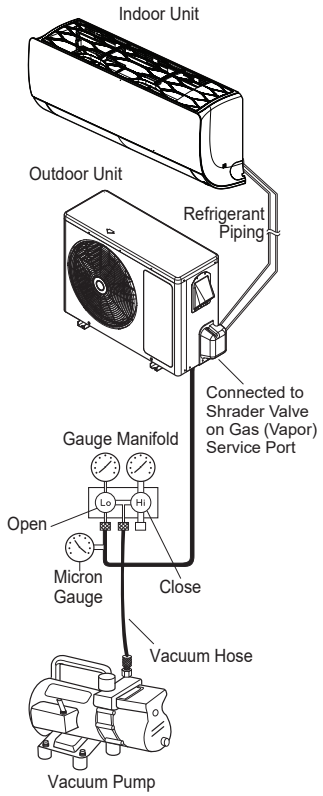
4. Micron level must remain ≤500 for two (2) hours. If the vacuum gauge rises and stops, the system may contain moisture; therefore, it will be necessary to repeat the steps of vacuum break and drying.

5. 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.

6. Close manifold gauges.

7. Shut the valves before turning off and disconnecting the vacuum pump.

Figure 93: Evacuation Procedure Diagram.



Triple Evacuation Procedure

After the leak / pressure check is complete, it is a best practices recommendation that a triple evacuation procedure is performed to the refrigerant piping and the connected indoor unit. Triple evacuation must be performed through the gas (vapor) suction Schrader port on the outdoor unit service port.

Note:

The deep evacuation procedure is required for Single Zone systems. The triple evacuation procedure is a best practices recommendation for Single Zone systems.

Note:

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

- Evacuate through just the gas (vapor) suction Schrader port on the outdoor unit service port.
- The outdoor unit service valves must remain closed and the stem head access caps tight. ⃠ Do not open the outdoor unit service valves and release the factory refrigerant charge until trim charge is complete, and the system is ready to operate.
- Any field-installed ball valves in the refrigerant system (if used) must be open to ensure all piping is free and clear for evacuation on all piping and connected indoor unit.

Note:

- ⃠ *Never perform evacuation using refrigerant.*
- *Use only a vacuum pump that can reach 500 microns, vacuum rated hoses or copper tubing, and a leak-free gauge manifold set.*
- *Use only new vacuum pump oil from a properly sealed (unopened) container, and change oil in pump before EVERY use.*
- *Subsequent oil changes will be necessary after several hours of continuous operation; have extra oil on hand.*
- *Use a quality micron gauge in good operating order and install as far away from pump as possible.*

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FINAL INSTALLATION PROCEDURES

Triple Evacuation Test

Triple Evacuation Procedure Steps

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

2. Connect the gauge manifold along with the vacuum pump to the gas (vapor) suction Schrader port (with core removed) using a vacuum hose. Open the gauge manifold and the vacuum pump valves.

Note:

After the vacuum pump is first operated, if hoses, manifold, and vacuum valves are leak free (and oil is not moisture laden), the gauge must read <100 microns within one (1) minute.

⃠ *Do not proceed if the gauge does not read <100 microns within one (1) minute. There is a leak in the hose, gauge manifold, or vacuum valve, and the equipment must be replaced.*

3. Operate the vacuum pump and evacuate the system to the 2,000 micron level. Isolate the pump by closing the manifold gauges and the vacuum pump valve, and then watch the micron level. Micron level will rise a bit, but MUST eventually stop rising for fifteen (15) minutes.

- If the micron level DOES NOT stop rising, there is a leak, and the leak test must be performed again.
- If the micron level DOES rise above 2,000 micron, re-open the manifold gauges and the vacuum pump valve and continue evacuation back down to 2,000 micron level.
- If the micron level holds at 2,000 micron, continue to step 4.

4. Break vacuum with 50 psig nitrogen purge for an appropriate amount of time (this is to “sweep” moisture from piping).

5. Purge nitrogen from the system until the pressure drops down to 1 to 3 psig.

6. Evacuate to 1,000 micron level. Isolate the pump by closing the manifold gauges and the vacuum pump valve, and then watch the micron level. Micron level will rise a bit, but MUST eventually stop rising for fifteen (15) minutes.

- If the micron level DOES NOT stop rising, there is a leak, and the leak test must be performed again.
- If the micron level DOES rise above 1,000 micron, re-open the manifold gauges and the vacuum pump valve, and continue evacuation back down to 1,000 micron level.
- If the micron level holds at 1,000 micron, continue to step 7.

7. Break vacuum with 50 psig nitrogen purge for an appropriate amount of time.

8. Purge nitrogen from the system until the pressure drops down to 1 to 3 psig.

9. Evacuate to static micron level ≤500 for at least one (1) hour.

10. 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.

11. 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.

12. Close manifold gauges.

13. Shut the valves before turning off and disconnecting the vacuum pump.

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Refrigerant Trim Charge

The single zone system will need an additional refrigerant charge if the installed piping lengths are greater than the “piping length (no additional refrigerant, ft.) specification” listed in the product tables. See the product sections in the engineering and installation manuals. The additional refrigerant charge can be calculated manually using the information in the engineering and / or installation manuals, or by LATS.

1. Keep the outdoor unit service values closed while adding the trim charge to the system. See the specification tables in the front of this installation manual for base charge, and see below for the correct additional refrigerant trim charge amounts for each system.

2. Charge through just the gas (vapor) suction Schrader port.

⚠ WARNING

- *Follow all guidelines when handling refrigerant.*
- ⃠ *Never inhale or handle refrigerant directly. Doing so will cause bodily injury.*

Table 19: Single Zone High Efficiency Refrigerant Piping System Additional Refrigerant Charge.

Model Numbers		Refrigerant Piping Length (ft.)											
		16.4	24.6	32.8	41.0	49.2	65.6	82.0	98.4	114.8	131.2	147.6	164.0
LS090HSV5 (LSN090HSV5 / LSU090HSV5)	Additional Refrigerant Charge (oz.)	0	0	0	0	1.8	5.4	9.0	-	-	-	-	-
LS120HSV5 (LSN120HSV5 / LSU120HSV5)		0	0	0	0	1.8	5.4	9.0	-	-	-	-	-
LS181HSV5 (LSN181HSV5 / LSU181HSV5)		0	0	3.1	6.2	9.3	15.6	21.8	28.0	34.3	-	-	-

Note:

- *Capacity is based on standard length.*
- *Equivalent Pipe Length = Actual Pipe Length + Number of Bends x 0.3.*
- *Additional Refrigerant Charge Calculation : X (g) = [(Refrigerant Pipe Length) - (No Charge Pipe Length)] × (Additional Refrigerant).*
- *There is no need to add refrigerant if equivalent pipe is less than the “piping length with no additional refrigerant” in the table above.*

Finishing the Job

After the Triple Leak and Evacuation (and refrigerant trim charge, if any) procedures have been performed, follow the steps below to open the refrigerant lines.

1. Verify that the auxiliary service port is removed (if used in the Evacuation procedure) and the original Schrader core was re-installed on the gas (vapor) suction service port.

2. The service ports are a back-seated type with a right hand thread. Remove the service valve caps on both the gas (vapor) suction and the liquid service ports.

3. Using an appropriately sized Allen wrench, fully open the valves on both the gas (vapor) suction and the liquid service ports by turning the valve stem counterclockwise.

4. Turn until the valve stem is out, stops, and the valve is completely backseated. ⃠ Do not apply excessive force.

5. Securely replace service port caps on both the gas (vapor) suction and the liquid using an adjustable wrench.

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FINAL INSTALLATION PROCEDURES

Reattaching the Indoor Unit Bottom Cover

Reattaching the Indoor Unit Bottom Cover

Reattach the indoor unit bottom cover after all other installation procedures are complete.

1. If ON, shut power OFF to the system.

2. At the bottom of the bottom cover, insert the three (3) to four (4) hinges into the channels molded to the left, right, and middle of the indoor unit (Location 1). Number of hinges present depends on model of indoor unit.

3. After all hinges are secure, match the three (3) or four (4) small C-hooks located in the middle of the bottom cover (Location 2) to their sockets on the indoor unit. (Number of C-hooks present depends on model of indoor unit.) On the outside of the bottom cover, securely snap the C-hooks in place at each location using the heel of the palm.

4. Match the snaps at the top left and right sides of the bottom cover to their sockets, and push to lock the bottom cover to the indoor unit (Location 3).

5. Verify the bottom cover is securely installed by pushing the bottom cover to the indoor unit at all attachment locations.

Note:

To prevent bending the bottom cover (and subsequent damage), assemble the bottom cover correctly.

Figure 94: Close Up of Bottom Cover Connections (Appearances Will Vary Depending on Indoor Unit Model).

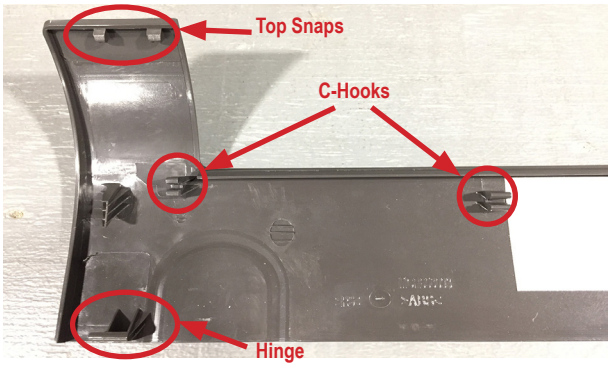


Figure 95: Inserting the Bottom Cover Hinges into the Indoor Unit Channels (Step 2).

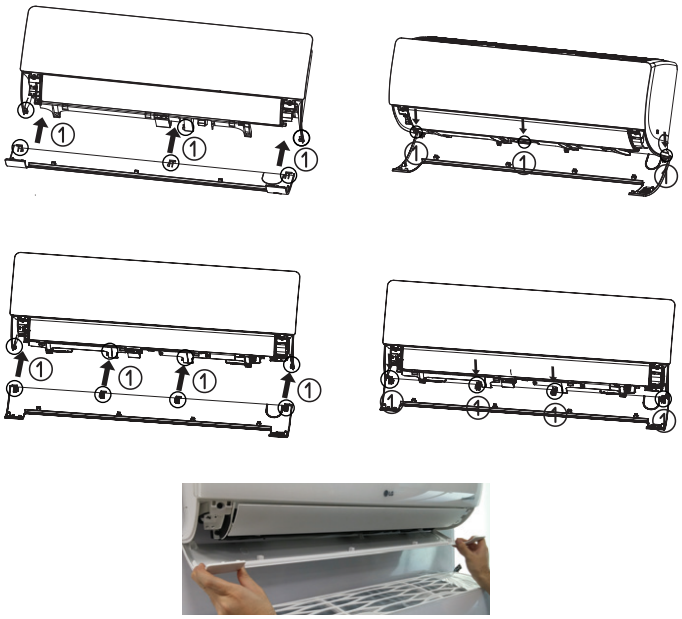


Figure 96: Securing the Bottom Cover C-hooks to the Indoor Unit Sockets (Step 3).

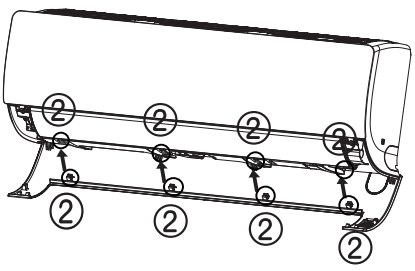


Figure 97: Snapping the Top Left and Right Sides (Step 4).

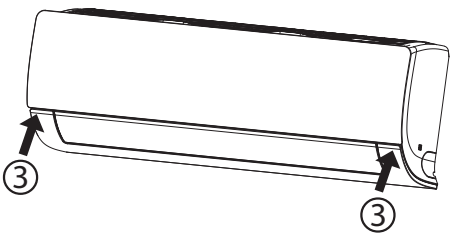
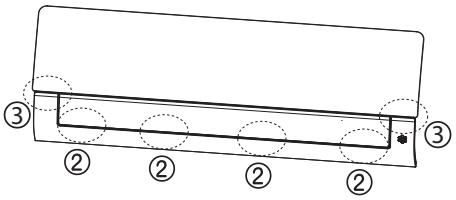


Figure 98: Checking that All Attachment Locations Are Secure (Step 5).



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Air Filter Disassembly and Assembly

Air Filter Disassembly

1. Turn power off to the system.
2. Find the handles located at the top-front of the air filter molded into the plastic frame support.
3. Lift handles slightly up and out to remove the air filter.

Figure 99: Disassembling the Air Filter (Appearances Will Vary Depending on Indoor Unit Model).

2. Lifting the Air Filter by the Handles.

3. Disassembling the Air Filter.

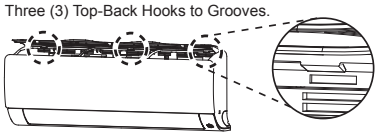
Air Filter Assembly

1. Turn power OFF to the system.
2. Holding the air filter by its handles, match the hooks and grooves on the air filter to the hooks and grooves at the top-back of the indoor unit. (Number of hooks and grooves present depends on model of indoor unit.)
3. Match the air filter bars and grooves to the grooves and hooks at the top-front of the indoor unit.
4. Use thumbs to gently snap the air filter to the indoor unit where the top-front bars, grooves, and hooks are located.
5. Check the sides of the front grille to verify the air filter is assembled correctly.
6. Turn power back on to the system.

Figure 100: Assembling the Air Filter (Appearances Will Vary Depending on Indoor Unit Model).

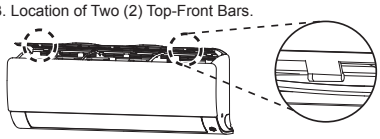
2. Matching Hooks to Top-Back Grooves.

Three (3) Top-Back Hooks to Grooves.

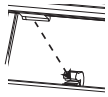


Four (4) Top-Back Hooks to Grooves.

3. Location of Two (2) Top-Front Bars.



Example of Indoor Unit Hook to Air Filter Groove.



4. Securing the Air Filter on the Indoor Unit.

5. Checking the Sides for Correct Air Filter Assembly.

Note:

- *It is easier to assemble and disassemble the air filter if standing on a ladder looking down at the top of the indoor unit.*
- *⃠ Do not bend the air filter; this damages it.*
- *If the air filter is not assembled correctly, dust and other substances will enter the indoor unit.*

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FINAL INSTALLATION PROCEDURES

Installing Batteries, Test Run, Performance Evaluation

Installing Batteries into the Handheld Remote Controller

For information on using the handheld remote controller, refer to its owner's manual.

1. The remote controller needs two AAA (1.5V) batteries for operation. Remove the battery cover from the back of the remote controller by pushing the tab down in the direction seen at right.

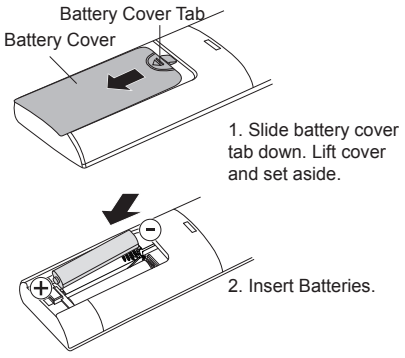
2. Insert the two new batteries.
   - Align batteries by the (+) and (-) sides.
   - The interior battery compartment of the remote controller will have clear markings for the (+) and (-) placement.

3. Verify that the batteries have clicked into the compartment and are firmly engaged with the contacts on either side of them.

4. Reattach the back cover of the remote controller.

5. Proceed with powering on the remote controller and use as needed. Remove the batteries if system won't be used for an extended time.

Figure 101: InstallingtheRemoteController Batteries.



Test Run

After all installation procedures are complete, the system is ready for a test run. Follow the guidelines below.

1. Check that all drain piping, refrigerant piping, and wiring / cables are properly connected.

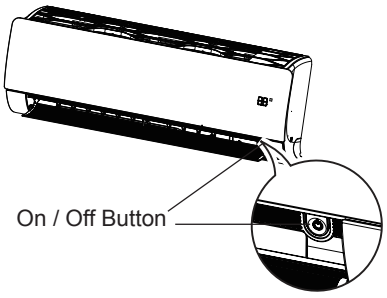
2. Check that both the gas (vapor) suction and liquid refrigerant piping service valves are fully open.

3. Install the batteries into the handheld remote controller (see above).

4. Turn on the power to the outdoor unit, and press and hold the On / Off button for three (3) to five (5) seconds; this switches the system to test operation mode.

5. The system will operate in cooling with maximum air flow for 18 minutes before returning to the factory default setting. While system operates in the test operation mode, note any issues that occur, and fix as necessary.

Figure 102: Test Operation Mode.



Performance Evaluation

Operate the unit in heating and / or cooling, depending on outdoor conditions, for 15 to 20 minutes, then check the system refrigerant charge (feature availability depends on model):

1. Measure the pressure of the gas (vapor) suction service valve. See optimum psig in table at right.

2. Measure the air temperature from both the inlets and outlets.

3. Verify the difference between the inlet and outlet temperatures is > 14.4°F.

4. The air conditioner is now ready to use.

Figure 103: PerformanceEvaluationMeasurement Locations.

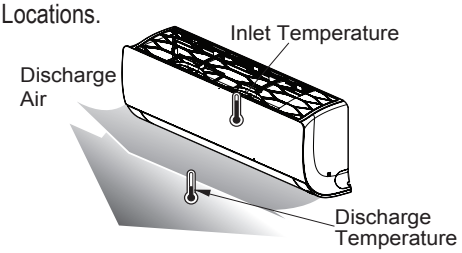


Table 20: Gas Side Pressure at Optimum Condition When System is in Cooling.

Outside Ambient Temperature	Gas (Vapor) Service Valve Pressure
95°F	120~135 psig

Note:

- *If all modes can't be tested all at one time, testing must be performed later when weather conditions permit.*
- *If the actual pressure is higher than shown, the system is most likely overcharged, and charge must be removed. If the actual pressure is lower than shown, the system is most likely undercharged, and charge must be added.*

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Installer Mode

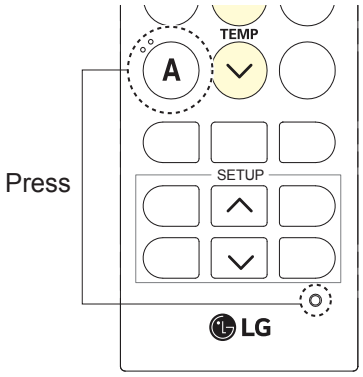
It will be necessary to switch to Installer mode if the system needs to operate in Heating Only or Cooling Only modes, or the Pump Down procedure needs to be performed.

To Enter Installer Mode:

1. Press the Reset and “A” buttons. A very slender tool is needed to access the Reset button.

2. Set the code by pressing the Up and Down Temperature buttons, and then press the ON / OFF button. The Up Temperature button changes the code on the ten (10) digit; the Down Temperature button changes the code on the one (1) digit.

Figure 104: Using the Handheld Controller to Change System to Installer Mode.



Enabling Heating Only Mode

To be able to run Heating Only mode, the unit must be changed to Installer mode (see above for instructions).

1. Supply power to the system, but system must be OFF with all functions inactive.
2. Enter the Installer mode.
3. Set code to 47.
4. Press the ON / OFF button and select the code number 47. Unit will beep to acknowledge that the code has been received.
5. Turn off power for a minimum of 30 seconds.
6. Turn power back on to system.

Disabling Heating Only Mode

1. Supply power to the system, but system must be OFF with all functions inactive.
2. Enter the Installer mode.
3. Set code to 48.
4. Press the ON / OFF button and select the code number 48. Unit will beep to acknowledge that the code has been received.
5. Turn off power for a minimum of 30 seconds.
6. Turn power back on to system.

Note:

- *After the Heating Only mode is set, Cooling, Dehumidification, Auto Changeover modes cannot be used.*
- *After Heating Only mode is disabled, system operation will return to normal.*
- *Codes cannot be entered when the system is operating. The system must be OFF to enter the codes. Even if the code is entered when the system is ON, the function won’t operate.*
- *During Heating Only Mode, if the system is turned OFF when the handheld controller is used to set the system to operate in modes other than Heating or Fan, the system will not turn back On. Turn the system OFF after the handheld controller is used to system the system to Heating or Fan, and then turn back ON.*

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FINAL INSTALLATION PROCEDURES

Cooling Only Mode, Pump Down Procedure

Enabling Cooling Only Mode

Before running the Pump Down procedure, the unit must be switched to Cooling Only mode. To be able to run Cooling Only mode, the unit must be changed to Installer mode (see previous page for instructions).

1. Supply power to the system, but system must be OFF with all functions inactive.
2. Enter the Installer mode.
3. Set code to 45.
4. Press ON / OFF button and select the code number 45. Unit will beep to acknowledge that code has been received.
5. Turn off power for a minimum of 30 seconds.
6. Turn power back on to system.

Disabling Cooling Only Mode

After Pump Down procedure has been performed, Cooling Only mode will need to be disabled, and the system will need to be returned to normal operating mode.

1. Supply power to the system, but system must be OFF with all functions inactive.
2. Enter the Installer mode.
3. Set code to 46.
4. Press ON / OFF button and select the code number 46. Unit will beep to acknowledge that code has been received.
5. Turn off power for a minimum of 30 seconds.
6. Turn power back on to system.

Note:

- *After the system is in Installer mode (with Cooling Only mode initiated), automatic operation is suspended.*
- *After Cooling Only mode is disabled, the system will return to normal operation.*
- *Installer mode cannot be entered if the unit is running. The system must be completely OFF.*
- *All Installer code numbers must be entered when system is OFF.*
- *WLAN Module's communication time will lag by about one (1) minute after unit is turned back on, and in normal operating mode.*
- *Entire lock or Mode lock cannot be set if heating or automatic operation is set through a central controller.*

Pump Down Procedure

This procedure is performed when the refrigerant piping system is serviced. Pumping down collects all the refrigerant in the outdoor unit without losing any charge. Always adhere to and be familiar with local codes regarding the handling of refrigerant.

The system must operate in Cooling Only mode to proceed with the pump down procedure. If needed, refer to the previous sections for proper steps to place the unit into Cooling Only mode.

1. Turn off the unit's power switch. Connect a low-pressure gauge manifold hose to the charge port on the gas (vapor) suction service valve.
2. Open the gas (vapor) suction service valve halfway, and purge the air in the manifold hose using the refrigerant.
3. Fully close the liquid piping service valve.
4. Turn on the unit's power switch and start the Cooling Only mode operation.
5. Observe the pressure gauge reading. When it changes 14.2 to 7.1 psig, fully close the gas line valve and then immediately turn the unit off. Pump down procedure is complete and all refrigerant will be collected into the outdoor unit.

⚠ WARNING

- ⃠ *Never inhale or handle refrigerant directly. Doing so will cause bodily harm and injury.*
- *After pump down, power must be turned off before the hose is removed. If the system is operated without the hose connected, air inside the compressor will cause the pressure to increase, and possibly cause an explosion and physical injury.*

Note:

Perform Pump Down procedure in the Cooling Only mode.

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The SIMs WLAN module and the smart phone app together provide monitoring and troubleshooting capability for LG Duct Free Systems. SIMs function only with LG Duct Free products. LG SIMs can also be used with Single Zone one-to-one configurations such as the Single Zone Wall Mount systems. SIMs app is available for Apple® iPhone® iOS or Android™ smart phone operating systems. Download the latest version from the App Store (iPhone iOS) or Google Play™ store (Android). (Apple and iPhone are trademarks of Apple Inc., registered in the U.S. and other countries. Android and Google Play store are trademarks of Google LLC.)

SIMs can display and graph operational data for the air conditioner system including the indoor unit and the outdoor unit. SIMs also displays error codes and a troubleshooting guide. A full copy of the LG SIMs Smart Inverter Monitoring System User's Manual is available on the www.lghvac.com website.

To use SIMs, you must be a trained HVAC service technician familiar with variable refrigerant flow (VRF) systems in general, and with LG's Duct Free System products. You must understand the inverter air conditioning operation cycle, the meaning of the data displayed by SIMs, and how to use the data to troubleshoot the system.

Figure 105: LG SIMs App and WLAN Module.

Figure 106: SIMs WLAN Module to DFS System Example.

⚠WARNING

High voltages capable of causing death are used in this equipment. Outdoor unit power remains connected during this procedure. Take extreme caution not to touch electrical components or connections. Failure to observe this warning can result in death or severe injury.

Note:

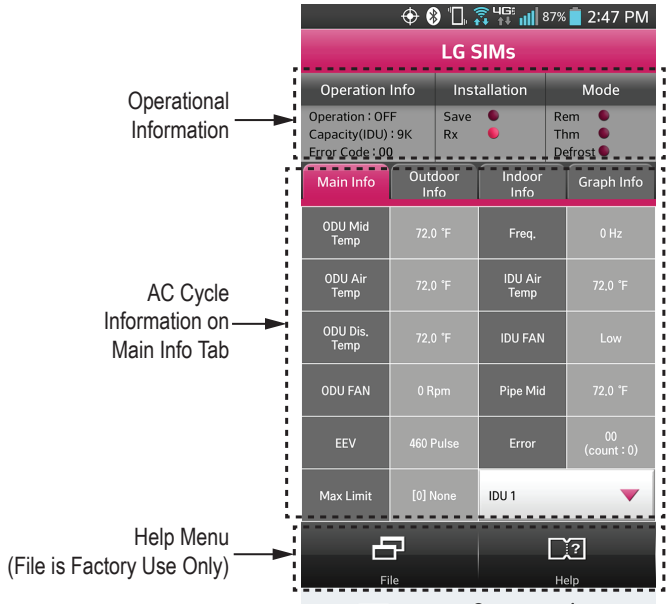
- *The Duct Free System air conditioning system must run for at least 15–20 minutes before data collected by SIMs is valid for troubleshooting.*
- *The free SIMs app must be correctly installed on the smart phone before using SIMs.*
- *Some outdoor units have an LGMV extension cable accessed by removing the side handle cover. If the outdoor unit does not have this extension cable, access the LGMV connector by removing the top cover of the outdoor unit.*

SIMs App Main Info Screen

The main screen is the first screen displayed after wireless connection is established. Tap the Main Info tab to display current readings regarding the indoor and outdoor unit(s). The Operational Info area of the screen will show active functions or modes by illuminating the light to the right of the function.

Additional Help information can be accessed by tapping the Help Menu buttons at the bottom of this screen.

Figure 107: SIMs App Main Info Screen



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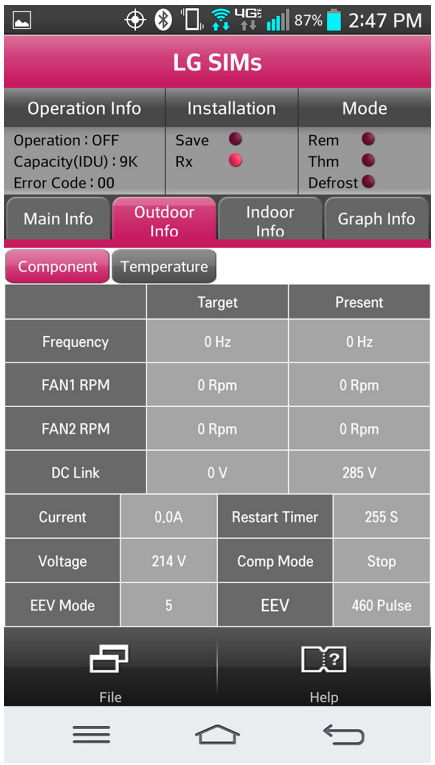
TROUBLESHOOTING

LG SIMS - Self Diagnosis Functions

SIMs App Screens



Outdoor Info/ Component Screen

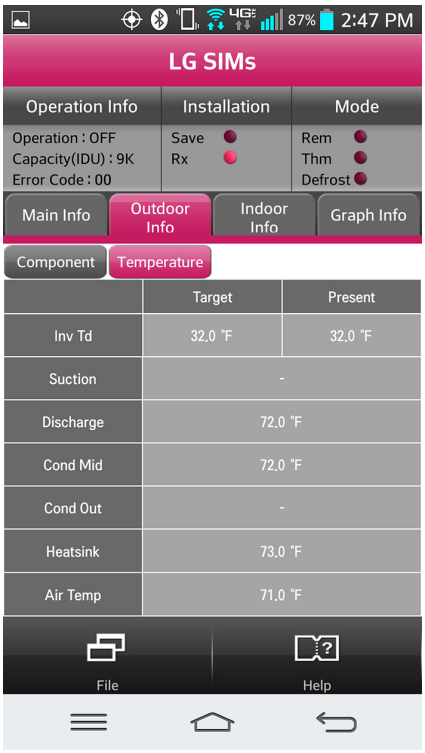
Displays the following information:

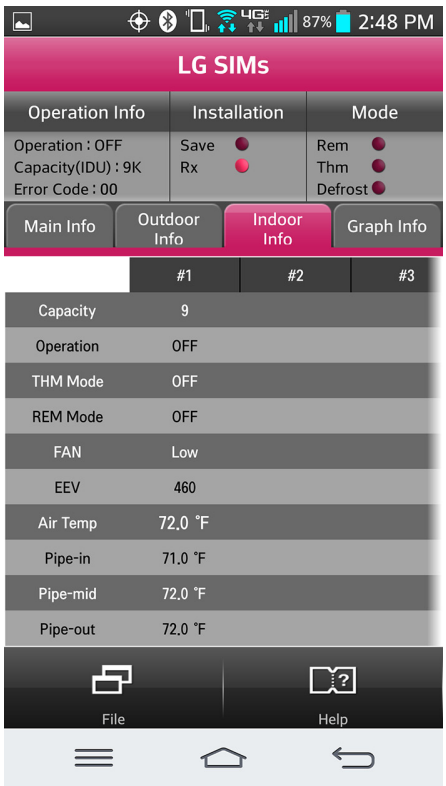
- Frequency
- FAN1 RPM
- FAN2 RPM
- DC Link
- Current
- Voltage
- EEV Mode
- Restart Timer
- Comp Mode
- EEV

Outdoor Info/ Temperature Screen

Displays the following information:

- Inv TD
- Suction
- Discharge
- Cond Mid
- Cond Out
- Heatsink
- Air Temp





Indoor Info Tab

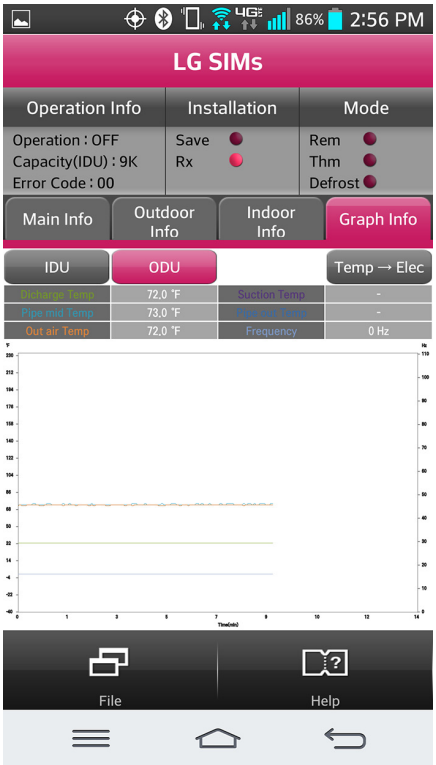
Displays the following information:

- Frequency
- Operation
- THM Mode
- REM Mode
- FAN
- EEV
- Air Temp
- Pipe-in
- Pipe-mid
- Pipe-out

Graph Info Tab

This tab has three sub sections:

- IDU - Indoor Unit Temperature graph. Displays IDU information in graph format. Information displayed is for the IDU # selected on the Main screen.
- ODU - Outdoor Unit Temperature and Frequency graph. Displays ODU information in graph format.
- ODU Electric - Outdoor Unit Electric data graph is displayed.



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Troubleshooting Using Error Codes

Refer to the table below and on the next two pages for error codes that are generated from the indoor and outdoor units. These codes are the most common. Your particular system might generate additional codes not listed here. Please contact LG Support if you see these types of errors and a simple power cycle has not corrected the issue.

Error Codes

- Indicate different types of unit failures, assists in self-diagnosis and to track the frequency of occurrence.
- Error codes are shown on the control board LEDs of indoor and outdoor units and the SIMs app. Also, check the wired remote controller display first for error codes if present.
- If two or more errors occur simultaneously, the lower error code number is displayed first.
- After error is resolved, the error code does not display.

Decoding the Error Display

The first and second number on the LED indicates error number. Example: 21 = LED1 (Green light) 2x blink, LED2 (Red light) 1x blink.

Error Code Nomenclature Definitions

- MICOM: Non-volatile memory chip where unit setup information is stored.
- EEPROM: Non-volatile memory chip where device identification, size, and factory defined default component operating parameters are stored.

Table 21: Single Zone Wall Mounted Indoor Unit Error Codes.

Error Code	Description	No. of Times Indoor Unit LEDs Blink	
		LED1	LED2
1	Indoor unit room temperature sensor error	1X	-
2	Indoor unit inlet pipe sensor error	2X	-
3	Wired remote control error	3X	
4	Float switch error (optional)	4X	-
5	Communication error between indoor unit and outdoor unit	-	5X
6	Indoor unit outlet pipe sensor error	6X	-
9	Indoor unit EEPROM error	9X	-
10	Indoor unit BLDC motor fan lock	-	1X
12	Indoor unit middle pipe sensor error	2X	1X
21	DC Peak (IPM Fault); Compressor DC voltage was too high	2X	1X
22	Current Transformer2 (CT2) error; Alternating current (AC) input too high	2X	2X
23	DC Link Low Volt	2X	3X
25	AC Low/High Volt	2X	5X
26	DC Comp Position Error (not providing rotation), Locking	2X	6X
27	PSC Fault; Current to inverter compressor between AC and DC converter circuit too high	2X	7X
28	Inverter compressor DC voltage is too high	2X	8X
29	Inverter compressor amperage is too high	2X	9X
31	Current-to-current transformer (CT) thermistor is too low	3X	1X
32	Inverter Compressor Discharge Pipe (D-Pipe) Overheat	3X	2X
40	CT Sensor Error; Thermistor is disconnected or shorted out	4X	-
41	D-Pipe Sensor INV is disconnected or shorted out	4X	1X
44	Outdoor Air Sensor is disconnected or shorted out	4X	4X
45	Middle thermistor of outdoor unit condenser coil is disconnected or shorted out	4X	5X
46	Outdoor unit suction line thermistor is disconnected or shorted out	4X	6X
48	Outdoor unit coil outlet (liquid line) thermistor is disconnected or shorted out	4X	8X
53	Communication failure from outdoor unit to indoor unit	5X	3X
60	Outdoor unit printed circuit board (PCB) EEPROM check sum error	6X	-
61	Outdoor unit condenser coil temperature is too high	6X	1X
62	Outdoor unit inverter compressor PCB heat sink temperature is too high	6X	2X
63	Condenser coil pipe thermistor temperature is too low	6X	3X
65	Heat sink thermistor has disconnected or has shorted out	6X	5X
67	Outdoor brushless direct current (BLDC) fan motor lock error	6X	7X

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TROUBLESHOOTING

Error Codes

Single Zone Wall Mounted Outdoor Unit Error Codes

The Single Zone Wall Mounted outdoor unit error codes are visible on the outdoor unit, as well as from the indoor unit. However, the indoor unit error codes are only visible from the indoor unit and will not display at the outdoor unit. When troubleshooting the system, be sure to verify if the error codes that are being displayed are specific for indoor or outdoor units.

Table 22: Single Zone Wall Mounted Outdoor Unit Error Codes.

Error Code	Description	No. of Times Outdoor Unit LEDs Blink	
		LED1	LED2
21	DC Peak (IPM Fault); Compressor DC voltage was too high	2X	1X
22	Current Transformer2 (CT2) error; Alternating current (AC) input too high	2X	2X
23	DC Link Low Volt	2X	3X
25	AC Low/High Volt	2X	5X
26	DC Comp Position Error (not providing rotation), Locking	2X	6X
27	PSC Fault; Current to inverter compressor between AC and DC converter circuit too high	2X	7X
28	Inverter compressor DC voltage is too high	2X	8X
29	Inverter compressor amperage is too high	2X	9X
31	Current-to-current transformer (CT) thermistor is too low	3X	1X
32	Inverter Compressor Discharge Pipe (D-Pipe) Overheat	3X	2X
40	CT Sensor Error; Thermistor is disconnected or is shorted out	4X	-
41	D-Pipe Sensor INV is disconnected or shorted out	4X	1X
44	Outdoor Air Sensor is disconnected or shorted out	4X	4X
45	Middle thermistor of outdoor unit condenser coil is disconnected or shorted out	4X	5X
46	Outdoor unit suction line thermistor is disconnected or shorted out	4X	6X
48	Outdoor unit coil outlet (liquid line) thermistor is disconnected or shorted out	4X	8X
53	Communication failure from outdoor unit to indoor unit	5X	3X
60	Outdoor unit printed circuit board (PCB) EEPROM check sum error	6X	-
61	Outdoor unit condenser coil temperature is too high	6X	1X
62	Outdoor unit inverter compressor PCB heat sink temperature is too high	6X	2X
63	Condenser coil pipe thermistor temperature is too low	6X	3X
65	Heat sink thermistor has disconnected or has shorted out	6X	5X
67	Outdoor brushless direct current (BLDC) fan motor lock error	6X	7X

Refer to Service Manuals posted on www.lghvac.com for a full description of all error codes and work-arounds.

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Cautions for Refrigerant Leaks / Introduction

ASHRAE Standards 15-2010 and 34-2010 offer guidelines that address refrigerant safety and the maximum allowable concentration of refrigerant in an occupied space. Refrigerant will dissipate into the atmosphere, but a certain volume of air is required for this to occur safely. For R410A refrigerant, the maximum allowable concentration is 0.026 lbs./ft^3 per 1,000 ft^3 of air in an occupied space. Buildings with twenty-four (24) hour occupancy allow half of that concentration.[1]

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

⚠ WARNING

Verify the maximum refrigerant concentration level in the space where the indoor unit will be mounted meets the concentration limit for the application. If the refrigerant leaks and safety limits are exceeded, it could result in personal injuries or death from oxygen depletion.

Note:

Take appropriate actions at the end of HVAC equipment life to recover, recycle, reclaim or destroy R410A refrigerant according to applicable US EPA rules.

To calculate the potential refrigerant concentration level (RCL):

1. Measure the occupied space dimensions (in feet).
2. Calculate the cubic foot volume of air in the smallest occupied space. (To obtain a detailed overview of the RCL, perform the same calculations to the second smallest zone, the third smallest zone until the RCL is obtained for all zones. Also, pay special attention to areas such as basements, etc., where refrigerant cannot dissipate easily.)
3. Divide the refrigerant charge of the Single Zone system serving the area in pounds by the results of step 1.
4. If the calculation indicates that the potential refrigerant concentration level is higher than the allowed RCL, increase the cubic volume of the smallest occupied space or modify the piping system design.
5. The allowable RCL limit for most applications must be equal to or less than 0.026 lbs./ft^3. However, in special occupied spaces, such as hospitals and nursing homes, where occupants may have limited mobility, the allowable RCL limit is cut in half. See ASHRAE Standard 34-2007 and local codes for detailed information.[1]

Refrigerant Concentration Limit (RCL) Calculations

To calculate total refrigerant amount per system:

Amount of Factory-Charged Refrigerant per Outdoor Unit + **Amount of Additional Refrigerant Trim Charge** = **Total System Refrigerant Charge**

$$\text{RCL (lbs./ft}^3\text{)} = \frac{\text{Total System Refrigerant Charge (lbs.)}}{\text{Volume of Smallest Occupied Space (ft}^3\text{)}}$$

[1] *American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc. (ASHRAE). Atlanta, GA. ASHRAE, Inc. Information about ASHRAE Standard 15-2010 / 34-2010 and addenda current as of the date of this publication.*

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INSTALLATION CHECKLIST

Major Component Rough-In

Description	Check
Single Zone 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.	
Indoor unit was installed, properly supported, and located indoors in a non-corrosive environment.	
Single Zone unit's 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.	

Piping and Insulation

Description	Check
Single-zone and multi-zone duct-free split systems: ACR copper piping rated at the system working pressure for R410A was used.	
All refrigerant pipes and valves were insulated separately. Insulation is positioned up against the walls of the indoor unit. No gaps shown. Insulation was not compressed at clamps and hangers.	

Brazing Practices

Description	Check
Medical grade (there are 4 available) dry nitrogen for purging during brazing was used (constant 3 psi while brazing).	
15% silver brazing material only.	

Refrigerant Piping

Description	Check
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 were 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.	
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 the indoor unit and at will in the refrigerant piping.	

Condensate Pump / Drain Installation

Description	Check
Condensate drain installed on indoor units. Extended condensate piping material used is acceptable under local code. Insulated to prevent condensation.	
Indoor unit condensate drain pipes were installed correctly.	
Indoor unit with a gravity drain were level or slightly canted toward the drain connection and is supported properly.	
Drain lines are properly insulated to prevent condensation.	

Power Wire and Communication Cables

Description	Check
Power wiring to the Single Zone outdoor unit is solid or stranded, and complies with all local and national electrical codes.	
Power wiring was connected to a single phase 208-230V source.	
Ground wire was installed and properly terminated at the unit.	
The power supplied was clean with voltage fluctuations within specifications. (±10% of nameplate).	
Power wiring to the Single Zone outdoor unit was installed per all local electrical code requirements.	
Communication / connection (power) wiring from the outdoor unit to the indoor unit is minimum 14 gauge, four-conductor, stranded, shielded or unshielded. If shielded, the wire must be grounded to chassis at the outdoor unit only.	
Wiring to the indoor unit was installed per all local electrical code requirements.	
Communication / connection (power) wiring from the outdoor unit to the indoor unit can be run in the same conduit.	
Communication type RS-485–BUS type.	
22-3 AWG, twisted, stranded, unshielded cable (minimum) was used between the indoor unit and its zone controller (if present). No cables were spliced and no wire caps are present.	
LG-supplied cable was used between the indoor unit and its zone controller. No cables were spliced and no wire caps are present.	
Appropriate crimping tool was used to attach ring or spade terminals at all power wiring and control cable terminations.	
Power and control wires were run in the same conduit (outdoor unit to indoor only) as provided in the product installation manual. Power to outdoor unit and power/communications to indoor unit CANNOT be run in the same conduit.	

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1-888-865-3026 USA
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LG Electronics, U.S.A., Inc.
Air Conditioning Technologies
4300 North Point Parkway
Alpharetta, Georgia 30022
www.lghvac.com

IM_SZ_HighEfficiency_WallMounted_11_22
Supersedes: IM_SZ_HighEfficiency_WallMounted_10_22
IM_SZ_HighEff_WallMount_HSV5_11_18
IM_SZ_HighEff_WallMount_HSV5_09_18
Supersedes: IM_WallMounted_All_11_15
IM_WallMounted_All_08_15
IM-WallMounted-All-08-14.1

LG
Life's Good

SINGLE ZONE HIGH EFFICIENCY WALL MOUNTED INSTALLATION MANUAL

Models:
LS090HSV5
LS120HSV5
LS181HSV5

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Please read carefully and store in a safe place for future reference.
Content familiarity required for proper installation.

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

A summary list of safety precautions begins on page 3.

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

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SAFETY INSTRUCTIONS

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

TABLE OF SYMBOLS

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

INSTALLATION

⚠DANGER

⃠ **Don't store or use flammable gas / combustibles near the unit.**
There is risk of fire, explosion, and physical injury or death.

⚠WARNING

⃠ **Do not install or remove the unit by yourself (end user). Ask the dealer or an LG trained service provider to install the unit.**
Improper installation by the user will result in water leakage, fire, explosion, electric shock, physical injury or death.

For replacement of an installed unit, always contact an LG trained service provider.
There is risk of fire, electric shock, explosion, and physical injury or death.

The unit is shipped with refrigerant and the service valves closed. ⃠ **Do not open service valves on the unit until all non-condensibles have been removed from the piping system and authorization to do so has been obtained from the commissioning agent.**
There is a risk of physical injury or death.

⃠ **Do not run the compressor with the service valves closed.**
There is a risk of explosion, physical injury, or death.

Periodically check that the outdoor frame is not damaged.
There is a risk of explosion, physical injury, or death.

Replace all control box and panel covers.
If cover panels are not installed securely, dust, water and animals will enter the unit, causing fire, electric shock, and physical injury or death.

Always check for system refrigerant leaks after the unit has been installed or serviced.
Exposure to high concentration levels of refrigerant gas will lead to illness or death.

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

Dispose the packing materials safely.
- *Packing materials, such as nails and other metal or wooden parts, will cause puncture wounds or other injuries.*
- *Tear apart and throw away plastic packaging bags so that children do not play with them and risk suffocation and death.*

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

⃠ **Do not change the settings of the protection devices.**
If the pressure switch, thermal switch, or other protection device is shorted and forced to operate improperly, or parts other than those specified by LG are used, there is risk of fire, electric shock, explosion, and physical injury or death.

⃠ **Do not install the unit on a defective stand.**
There is a risk of physical injury.

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SAFETY INSTRUCTIONS

INSTALLATION - CONTINUED

⚠WARNING

If the air conditioner is installed in a small space, take measures to prevent the refrigerant concentration from exceeding safety limits in the event of a refrigerant leak.
Consult the latest edition of ASHRAE (American Society of Heating, Refrigerating, and Air Conditioning Engineers) Standard 15. If the refrigerant leaks and safety limits are exceeded, it could result in personal injuries or death from oxygen depletion.

Install the unit in a safe location where nobody can step on or fall onto it.
There is risk of 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.

⚠CAUTION

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

Note:

⃠ **Don't install the unit where it's directly exposed to ocean winds.**
Ocean winds will cause corrosion, particularly on the condenser and evaporator fins, which, in turn could cause product malfunction or inefficient performance.

When installing the unit in a low-lying area, or a location that is not level, use a raised concrete pad or concrete blocks to provide a solid, level foundation.
This will prevent water damage and reduce abnormal vibration.

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

When installing the unit in a hospital, mechanical room, or similar electromagnetic field (EMF) sensitive environment, provide sufficient protection against electrical noise.
Inverter equipment, power generators, high-frequency medical equipment, or radio communication equipment will cause the air conditioner to operate improperly. The unit will also affect such equipment by creating electrical noise that disturbs medical treatment or image broadcasting.

⃠ **Do not use the product for special purposes such as preserving foods, works of art, wine coolers, or other precision air conditioning applications. The equipment is designed to provide comfort cooling and heating.**
There is risk of property damage.

⃠ **Do not make refrigerant substitutions. Use R410A only.**
If a different refrigerant is used, or air mixes with original refrigerant, the unit will malfunction and be damaged.

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

⃠ **Do not install the unit in a noise sensitive area.**
When connecting refrigerant tubing, remember to allow for pipe expansion.
Improper piping will cause refrigerant leaks and system malfunction.

Take appropriate actions at the end of HVAC equipment life to recover, recycle, reclaim or destroy R410A refrigerant according to applicable U.S. Environmental Protection Agency (EPA) rules.

Periodically check that the outdoor 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 risk of unit and property damage.

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

⃠ **Don't store or use flammable gas / combustibles near the unit.**
There is risk of product failure.

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

The unit is shipped with refrigerant and the service valves closed. ⃠ **Do not open service valves on the unit until all non-condensibles have been removed from the piping system and authorization to do so has been obtained from the commissioning agent.**
There is a risk of refrigerant contamination, refrigerant loss and equipment damage.

⃠ **Do not run the compressor with the service valves closed.**
There is a risk of equipment damage.

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WIRING

⚠DANGER

High voltage electricity is required to operate this system. Adhere to the National Electrical Codes and these instructions when wiring.
Improper connections and inadequate grounding can cause accidental injury or death.

Always ground the unit following local, state, and National Electrical Codes.

Turn the power off at the nearest disconnect before servicing the equipment.
Electrical shock can cause physical injury or death.

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

⚠WARNING

The information contained in this manual is intended for use by an industry-qualified, experienced, certified electrician familiar with the U.S. National Electric Code (NEC) who is equipped with the proper tools and test instruments.
Failure to carefully read and follow all instructions in this manual can result in personal 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 National Electrical Code, and the instructions given in this manual.
If the power source capacity is inadequate or the electric work is not performed properly, it will result in fire, electric shock, physical injury or death.

Refer to local, state, and federal codes, and use power wires of sufficient current capacity and rating.
Wires that are too small will generate heat and cause a fire.

Secure all field wiring connections with appropriate wire strain relief.
Improperly securing wires will create undue stress on equipment power lugs. Inadequate connections will generate heat, cause a fire and physical injury or death.

Note:

The information contained in this manual is intended for use by an industry-qualified, experienced, certified electrician familiar with the U.S. National Electric Code (NEC) who is equipped with the proper tools and test instruments.
Failure to carefully read and follow all instructions in this manual can result in equipment malfunction and property damage,.

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SAFETY INSTRUCTIONS

OPERATION

⚠DANGER

⃠ **Do not provide power to or operate the unit if it is flooded or submerged.**
There is risk of fire, electric shock, physical injury or death.

Use a dedicated power source for this product.
There is risk of fire, electric shock, physical injury or death.

⃠ **Do not operate the disconnect switch with wet hands.**
There is risk of fire, electric shock, physical injury or death.

Periodically verify that the hardware securing the unit has not deteriorated.
If the unit falls from its installed location, it can cause property damage, product failure, physical injury or death.

If gas leaks out, ventilate the area before operating the unit.
If the unit is mounted in an enclosed, low-lying, or poorly ventilated area, and the system develops a refrigerant leak, it will cause fire, electric shock, explosion, physical injury or death.

⚠WARNING

⃠ **Do not allow water, dirt, or animals to enter the unit.**
There is risk of fire, electric shock, physical injury or death.

⃠ **Avoid excessive cooling, and periodically perform ventilation to the unit.**
Inadequate ventilation is a health hazard.

⃠ **Do not touch the refrigerant piping during or after operation.**
It can cause burns or frostbite.

⃠ **Do not operate the unit with the panel(s) or protective cover(s) removed; keep fingers and clothing away from moving parts.**
The rotating, hot, cold, and high-voltage parts of the unit can cause physical injury or death.

Periodically verify the equipment mounts have not deteriorated.
If the base collapses, the unit could fall and cause physical injury or death.

Periodically check power cord and plug for damage.
Cord must be replaced by the manufacturer, its service agent, or similar qualified persons in order to avoid physical injury and/or electric shock.

⃠ **Do not open the inlet grille of the unit during operation.** ⃠ **Do not operate the unit with the panels or guards removed.** ⃠ **Do not insert hands or other objects through the inlet or outlet when the unit is plugged in.** ⃠ **Do not touch the electrostatic filter, if the unit includes one.**
The unit contains sharp, rotating, hot, and high voltage parts that can cause personal injury and/or electric shock.

Securely attach the electrical part cover to the indoor unit and the service panel to the outdoor unit.
Non-secured covers can result in burns or electric shock due to dust or water in the service panel.

⚠CAUTION

⃠ **To avoid physical injury, use caution when cleaning or servicing the air conditioner.**

Note:

Clean up the site after installation is finished, and check that no metal scraps, screws, or bits of wiring have been left inside or surrounding the unit.

⃠ **Do not use this equipment in mission critical or special-purpose applications such as preserving foods, works of art, wine coolers or refrigeration. The equipment is designed to provide comfort cooling and heating.**

Provide power to the compressor crankcase heaters at least six (6) hours before operation begins.
Starting operation with a cold compressor sump(s) will result in severe bearing damage to the compressor(s). Keep the power switch on during the operational season.

⃠ **Do not block the inlet or outlet.**
Unit will malfunction.

Securely attach the electrical part cover to the indoor unit and the service panel to the outdoor unit.
Non-secured covers can result in malfunction due to dust or water in the service panel.

Periodically verify the equipment mounts have not deteriorated.
If the base collapses, the unit could fall and cause property damage or product failure.

⃠ **Do not allow water, dirt, or animals to enter the unit.**
There is risk of unit failure.

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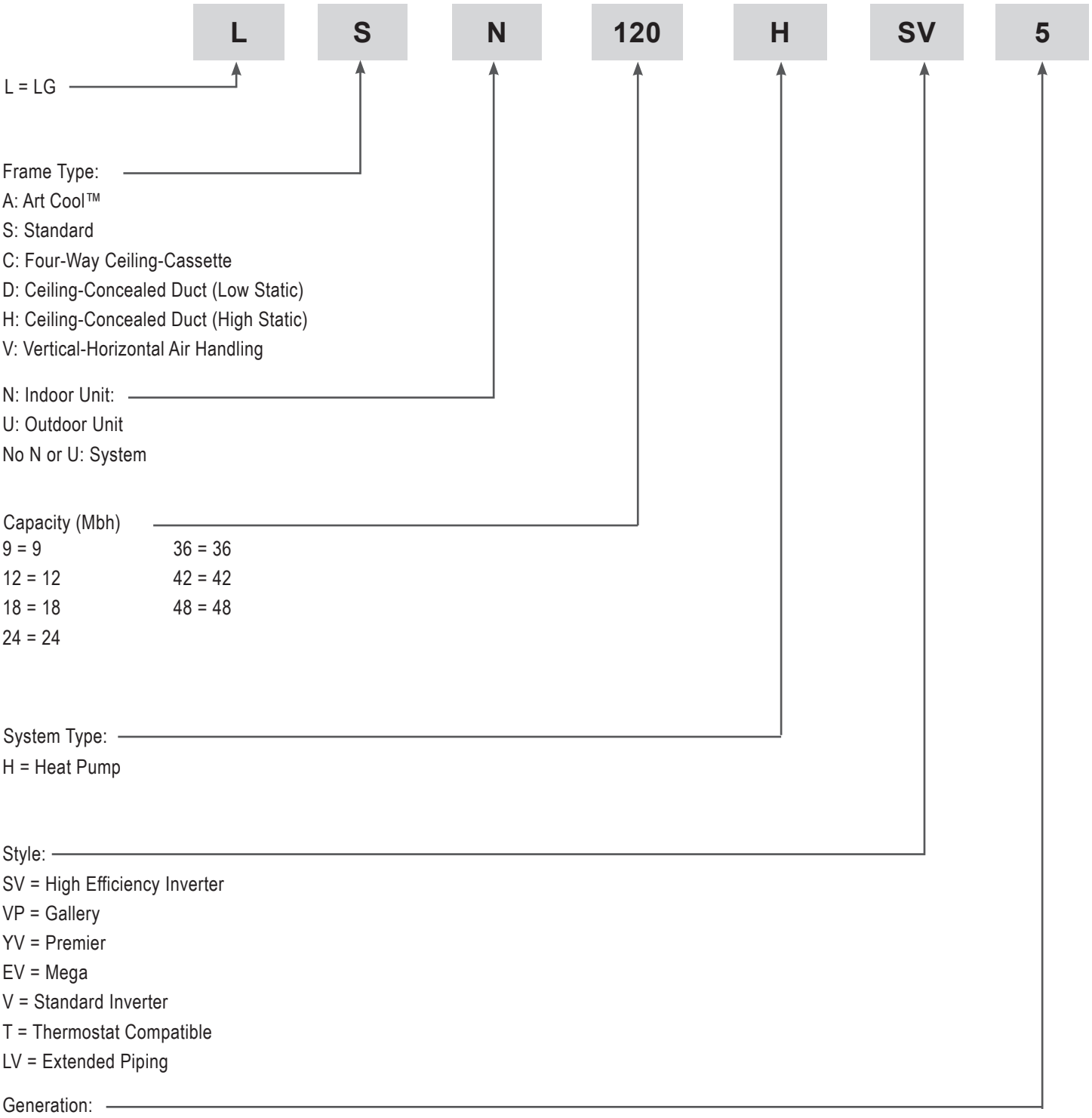
GENERAL DATA

Unit Nomenclature

Indoor Units and Outdoor Units



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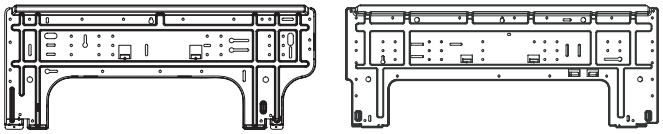
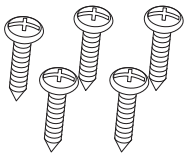
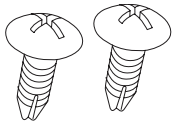
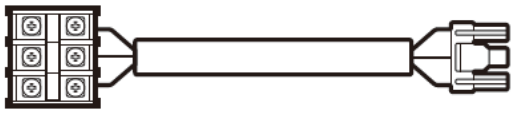
Required Tools (field provided)

- Level
- Screwdriver
- Electrical lineman pliers
- Electric drill
- Hole saw
- Drill
- Flaring tool set
- Tubing cutter
- Tube/pipe reamer
- Torque wrenches
- Allen wrench
- Gas-leak detector
- Thermometer
- Measuring tape
- Multimeter
- Ammeter

Required Parts (field provided)

- Connecting cable (power and control)
- Pipes - vapor line and liquid line, with insulation
- Insulated drain hose
- Additional drain hose

Included Parts

Part	Quantity	Image
Installation Plate	One (1)	 9,000 ~ 12,000 Btu/h Indoor Units 18,000 Btu/h Indoor Units
Type “A” Screws	Five (5)	
Type “B” Screws (M4 x 12L)	Two (2)	
Wireless Controller with Holder AKB74955602	One (1)	
Terminal Connector	One (1)	

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GENERAL DATA

Specifications

Table 1: Single Zone High Efficiency System Specifications.

System Model Number (IDU/ODU)		LS090HSV5 (LSN090HSV5/LSU090HSV5)	LS120HSV5 (LSN120HSV5/LSU120HSV5)	LS181HSV5 (LSN181HSV5/LSU181HSV5)
Cooling Capacity (Min/Rated/Max) (Btu/h)		1,023 ~ 9,000 ~ 12,625	1,023 ~ 12,000 ~ 13,785	3,070 ~ 18,000 ~ 29,515
Cooling Power Input[1] (kW)		0.20 ~ 0.62 ~ 0.87	0.20 ~ 0.96 ~ 1.35	0.30 ~ 1.43 ~ 2.00
Heating Capacity (Min/Rated/Max) (Btu/h)		1,023 ~ 10,900 ~ 17,061	1,023 ~ 13,600 ~ 22,178	3,070 ~ 21,600 ~ 38,898
Heating Power Input[1] (kW)		0.20 ~ 0.71 ~ 1.89	0.20 ~ 1.04 ~ 1.97	0.66 ~ 1.73 ~ 3.98
COP		4.50	3.83	3.66
Maximum Heating Capacity (Btu/h)				
Outdoor 17 °F (WB)/Indoor 70 °F (DB)		11,080 (102%)	13,810 (102%)	22,340 (103%)
Outdoor 5°F (WB)/Indoor 70 °F (DB)		9,570 (88%)	11,930 (88%)	19,300 (89%)
Outdoor -4 °F (WB)/Indoor 70 °F (DB)		8,310 (76%)	10,360 (76%)	16,760 (77%)
EER2		14.5	12.5	12.55
SEER2		23.2	22.0	22.0
HSPF2		10.2	10.0	9.5
Power Supply (V/Hz/Ø)		208-230 / 60 / 1		
Outdoor Unit Operating Range[2]				
Cooling (°F DB)		14 to 118		
Heating (°F WB)		-4 to 65		
Indoor Unit Operating Range				
Cooling (°F WB)		53 to 75		
Heating (°F DB)		60 to 86		
Indoor Temperature Setting Range				
Cooling (°F)		64 to 86		
Heating (°F)		60 to 86		
Unit Data				
Refrigerant Type[3]		R410A		
Refrigerant Control		EEV		
IDU Sound Pressure Level dB(A) (H/M/L/Sleep)[4]		41 / 35 / 25 / 21	41 / 35 / 25 / 21	47 / 42 / 37 / 31
ODU Sound Pressure Level dB(A)[4] (Cool/Heat)		47 / 51	47 / 51	55 / 55
Unit Weight (lbs)				
IDU (Net/Shipping)		18.3 / 23.4	18.3 / 23.4	25.6 / 32.2
ODU (Net/Shipping)		74.1 / 78.9	74.1 / 78.9	127.9 / 145.5
Power Wiring/Communication Cable[5] (No.x AWG)		4 x 14		
Compressor				
Compressor Type (Qty)		Twin Rotary (1)	Twin Rotary (1)	Twin Rotary (1)
Fan				
Indoor Unit Type (Qty)		Cross Flow (1)		
Outdoor Unit Type (Qty)		Propeller (1)		
Motor/Drive		Brushless Digitally Controlled / Direct		
Airflow Rate				
Indoor Unit (Max. / H / M / L [CFM])	Cooling	459 / 338 / 317 / 194	459 / 338 / 317 / 194	706 / 530 / 477 / 371
	Heating	459 / 338 / 317 / 229	459 / 338 / 317 / 229	706 / 547 / 494 / 371
Outdoor Unit (Max. [CFM])		1,165	1,165	2,119
Piping				
Liquid Line (in.)		ø1/4	ø1/4	ø3/8
Vapor Line (in.)		ø3/8	ø3/8	ø5/8
Condensate Drain O.D. / I.D. (in.)		27/32, 5/8	27/32, 5/8	27/32, 5/8
Additional Refrigerant Charge (oz./ft.)		0.22	0.22	0.38
Pipe Length[6] (Minimum/Standard/Maximum) (ft.)		9.8 / 24.6 / 82	9.8 / 24.6 / 82	9.8 / 24.6 / 114.8
Piping Length[6] (no add'l refrigerant, ft.)		41	41	24.6
Max Elevation Difference (ft.)		49.2	49.2	49.2

EEV: Electronic Expansion Valve IDU: Indoor Unit ODU: Outdoor Unit

This unit comes with a dry helium charge.

This data is rated 0 ft above sea level with 24.6 of refrigerant line per indoor unit and a 0 ft level difference outdoor and indoor units.

Cooling capacity rating obtained with air entering the indoor unit at 80°F dry bulb (DB) and 67°F wet bulb (WB) and outdoor ambient conditions of 95°F dry bulb (DB) and 75°F wet bulb (WB).
Heating capacity rating obtained with air entering the indoor unit at 70°F dry bulb (DB) and 59°F wet bulb (WB) and outdoor ambient conditions of 47°F dry bulb (DB) and 43°F wet bulb (WB).

[1]Power Input is rated at high speed.

[2]Optional low Ambient Wind Baffle Kit allows operation down to 0°F in cooling mode.

[3]Take appropriate actions at the end of HVAC equipment life to recover, recycle, reclaim or destroy R410A refrigerant according to applicable regulations (40 CFR Part 82, Subpart F) under section 608 of CAA.

[4]Sound Pressure levels are tested in an anechoic chamber under ISO Standard 1996.

[5]All communication / connection (power) cable from the outdoor unit to the indoor unit is field supplied and must be a minimum of four-conductor, 14 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.

[6]Piping lengths are equivalent.

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Electrical Data

Table 2: Single Zone High Efficiency Standard Wall Mount System Electrical Data.

Nominal Tons	Unit Model No.	Hertz	Voltage	Voltage Range (Min. to Max.)	MCA	MOP	Compressor Quantity	LRA	Compressor Motor RLA		Outdoor Fan Motor		Indoor Fan Motor
									Cooling	Heating	W	FLA	FLA
3/4	LS090HSV5	60	208 - 230	187 - 253	10.0	15.0	1	7.5	7.0	7.0	43	0.4	0.4
1	LS120HSV5				10.0	15.0	1	7.5	7.0	7.0	43	0.4	0.4
1-1/2	LS181HSV5				19.0	30.0	1	17.0	12.6	14.3	124	0.78	0.4

Voltage tolerance is ±10%.

Maximum allowable voltage unbalance is 2%.

MCA = Minimum Circuit Ampacity.

Maximum Overcurrent Protection (MOP) is calculated as follows: (Largest motor FLA x 2.25) + (Sum of other motor FLA) rounded down to the nearest standard fuse size.

RLA = Rated Load Amps.

FLA = Full Load Amps.

W: Fan Motor Rated Output (W)

LRA = Locked Rotor Amps

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GENERAL INSTALLATION GUIDELINES

Outdoor Unit Location Selection

Selecting the Best Location for the Outdoor Unit

⚠DANGER

- ⃠ *Do not install the unit in an area where combustible gas will generate, flow, stagnate, or leak. These conditions can cause a fire, resulting in bodily injury or death.*
- ⃠ *Do not install the unit in a location where acidic solution and spray (sulfur) are often used as it can cause bodily injury or death.*
- ⃠ *Do not use the unit in environments where oil, steam, or sulfuric gas are present as it can cause bodily injury or death.*

⚠CAUTION

When deciding on a location to place the outdoor unit, be sure to choose an area where run-off water from defrost cycle will not accumulate and freeze on sidewalks or driveways, which will create unsafe conditions. Properly install and insulate any drain hoses to prevent the hose from freezing, cracking, leaking, and causing unsafe conditions from frozen condensate.

⚠WARNING

Install a fence to prevent vermin from crawling into the unit or unauthorized individuals from accessing it. Vermin and unauthorized individuals will cause a fire, electric shock, physical injury or death. Follow the placement guidelines set forth in "Clearance Requirements".

Note:

Install a fence to prevent vermin from crawling into the unit or unauthorized individuals from accessing it. Vermin and unauthorized individuals will damage the unit. Follow the placement guidelines set forth in "Clearance Requirements".

Select a location for installing the outdoor unit that will meet the following conditions:

- Where there is enough structural strength to bear the weight of the unit.
- A location that allows for optimum air flow and is easily accessible for inspection, maintenance, and service.
- Where piping between the outdoor unit and indoor unit is within allowable limits.
- Include space for drainage to ensure condensate flows properly out of the unit when it is in heating mode. ⃠ Avoid placing the outdoor unit in a low-lying area where water could accumulate.
- If the outdoor unit is installed in a highly humid environment (near an ocean, lake, etc.), ensure that the site is well-ventilated and has a lot of natural light (Example: Install on a rooftop).

⃠ Dont's

- *Where it will be subjected to direct thermal radiation from other heat sources, or an area that would expose the outdoor unit to heat or steam like discharge from boiler stacks, chimneys, steam relief ports, other air conditioning units, kitchen vents, plumbing vents, and other sources of extreme temperatures.*
- *Where high-frequency electrical noise / electromagnetic waves will affect operation.*
- *Where operating sound from the unit will disturb inhabitants of surrounding buildings.*
- *Where the unit will be exposed to direct, strong winds.*
- *Where the discharge of one outdoor unit will blow into the inlet side of an adjacent unit (when installing multiple outdoor units).*

Planning for Snow and Ice

To ensure the outdoor unit operates properly, certain measures are required in locations where there is a possibility of heavy snowfall or severe windchill or cold:

1. Prepare for severe winter wind chills and heavy snowfall, even in areas of the country where these are unusual phenomena.
2. Position the outdoor unit so that its airflow fans are not buried by direct, heavy snowfall. If snow piles up and blocks the airflow, the system will malfunction.
3. Remove any snow that has accumulated four (4) inches or more on the top of the outdoor unit.
4. In climates that can experience significant snow buildup, mount the outdoor unit on a raised, field-provided platform or stand. The raised support platform must be high enough to allow the unit to remain above possible snow drifts, and must be higher than the maximum anticipated snowfall for the location.
5. Design the mounting base to prevent snow accumulation on the platform in front or back of the unit frame.
6. Provide a field fabricated snow protection hood to keep snow and ice and/or drifting snow from accumulating on the coil surfaces.
7. To prevent snow and heavy rain from entering the outdoor unit, install the condenser air inlets and outlets facing away from direct winds.
8. Consider tie-down requirements in case of high winds or where required by local codes.

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Planning for Snow and Ice, continued.

⚠CAUTION

When deciding on a location to place the outdoor unit, be sure to choose an area where run-off water from defrost cycle will not accumulate and freeze on sidewalks or driveways, which will create unsafe conditions. Properly install and insulate any drain hoses to prevent the hose from freezing, cracking, leaking, and causing unsafe conditions from frozen condensate.

Note:

Choose an area where run-off water from defrost cycle will not accumulate and freeze on sidewalks or driveways. Properly install and insulate any drain hoses to prevent the hose from freezing, cracking, leaking, and damaging the outdoor unit.

Note:

The indoor unit will take longer to provide heat, or heating performance will be reduced in winter if the unit is installed:

1. *In a narrow, shady location.*
2. *Near a location that has a lot of ground moisture.*
3. *In a highly humid environment.*
4. *In an area in which condensate does not drain properly.*

Tie-Downs and Lightning Protection

Tie-Downs

- The strength of the roof must be checked before installing the outdoor units.
- If the installation site is prone to high winds or earthquakes, when installing on the wall or roof, securely anchor the mounting base using a field-provided tie-down configuration approved by a local professional engineer.
- The overall tie-down configuration must be approved by a local professional engineer.

Note:

Always refer to local code when using a wind restraint system.

Lightning Protection

- To protect the outdoor unit from lightning, it must be placed within the specified lightning safety zone.

Figure 1: Lightning Protection Diagram.

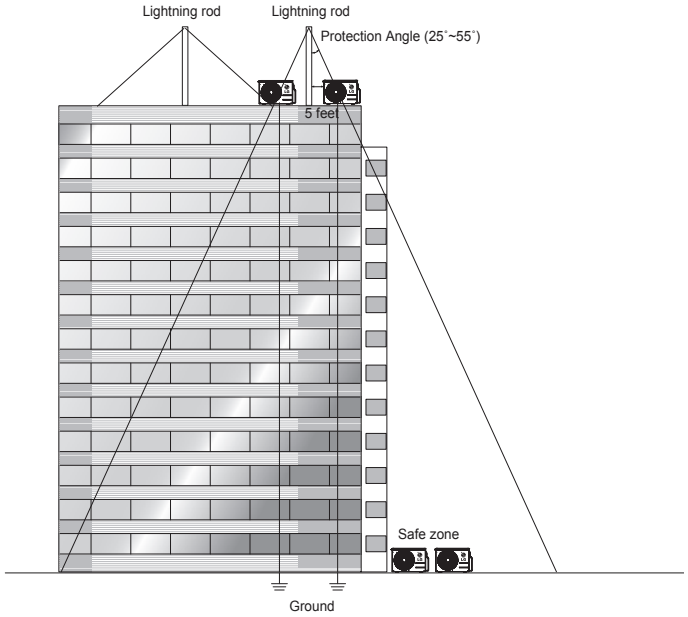

Table 3: Safety Zone Specifications.

Building Height (feet)	66	98	148	197
Protection Angle (˚)	55	45	35	25

- Power cable and communication cable must be installed five (5) feet away from lightning rod.
- A high-resistance ground system must be included to protect against induced lightning or indirect strike.

Note:

If the building does not include lightning protection, the outdoor unit will be damaged from a lightening strike. Inform the customer of this possibility in advance.

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GENERAL INSTALLATION GUIDELINES

Outdoor Unit Location Selection

Oceanside Applications

Use of a Windbreak to Shield from Sea Wind

Note:

Ocean winds will cause corrosion, particularly on the condenser and evaporator fins, which, in turn could cause product malfunction or inefficient performance.

- ⃠ Avoid installing the outdoor unit where it would be directly exposed to ocean winds.
- Install the outdoor unit on the side of the building opposite from direct ocean winds.
- Select a location with good drainage.
- Periodically clean dust or salt particles off of the heat exchanger with water.
- If the outdoor unit must be placed in a location where it would be subjected to direct ocean winds, install a concrete windbreak strong enough to block any winds.
- Windbreak must be more than 150% of the outdoor unit's height. There must be 2 to 3-1/2 inches of clearance between the outdoor unit and the windbreaker for purposes of air flow.

Note:

Additional anti-corrosion treatment will need to be applied to the outdoor unit at oceanside locations.

Use of a Building to Shield from Sea Wind

If a windbreak is not possible, a building or larger structure must be used to shield the outdoor unit from direct exposure to the sea wind. The unit must be placed on the side of the building directly opposite to the direction of the wind as shown at right.

Figure 2: Oceanside Placement Using Windbreak.

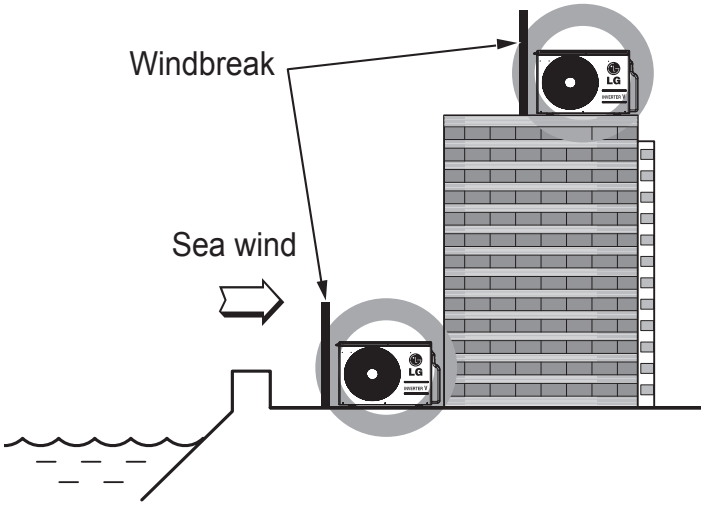
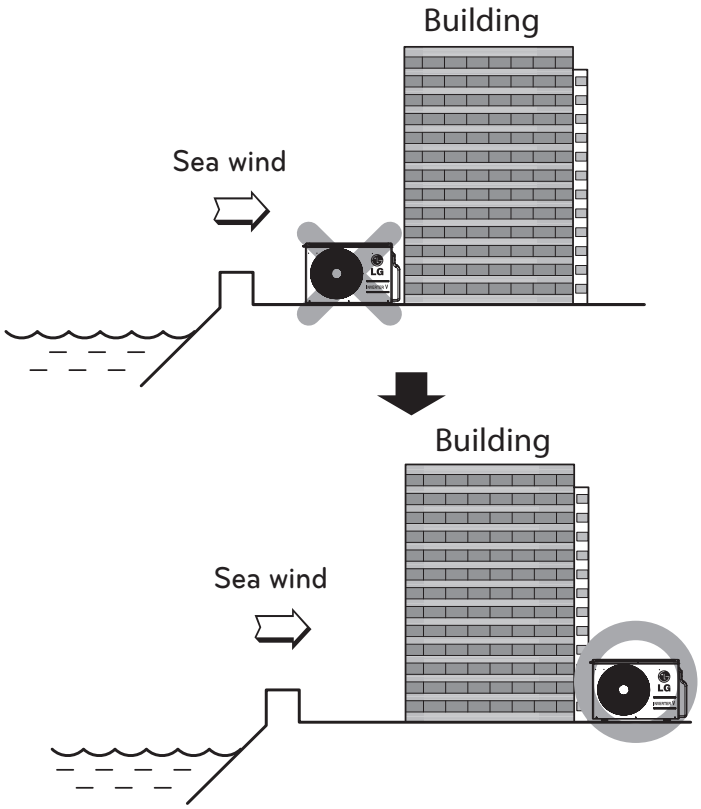


Figure 3: Placement Using Building as Shield.



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Minimum Clearance Requirements for Single Fan Outdoor Units

Proper clearance for the outdoor unit coil is critical for proper operation. When installing the outdoor unit, consider service, inlet and outlet, and minimum allowable space requirements as illustrated in the diagrams below.

Specific clearance requirements in the diagram below are for single fan outdoor units. Figure below shows the overall minimum clearances that must be observed for safe operation and adequate airflow around the outdoor unit.

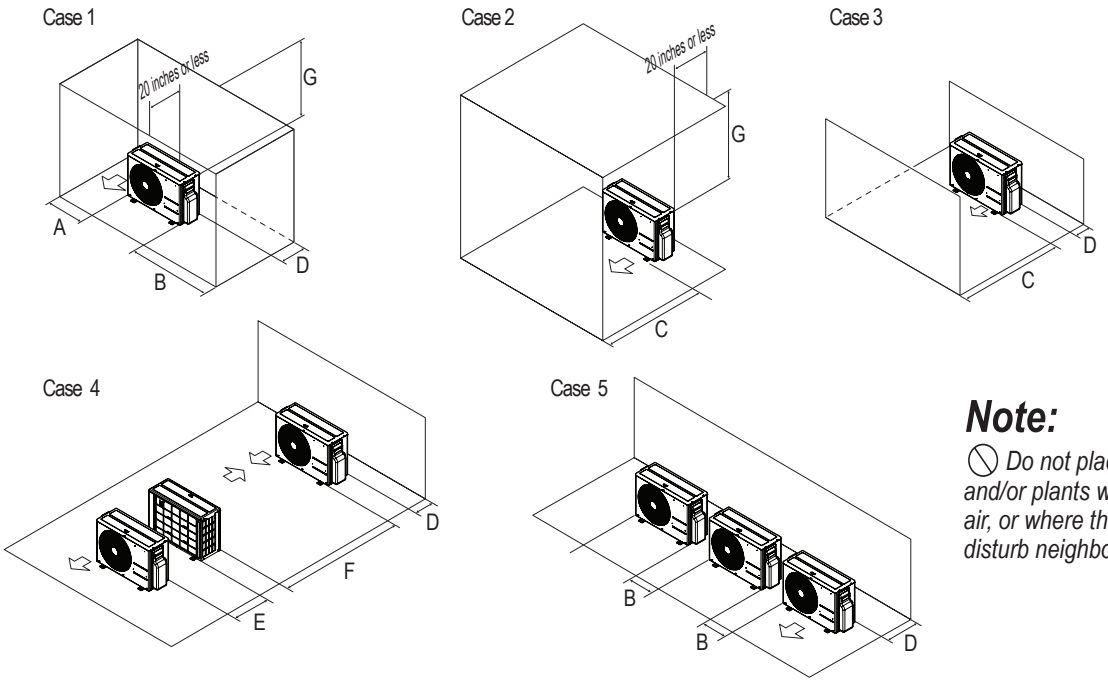
When placing the outdoor unit under an overhang, awning, sunroof or other “roof-like structure”, observe the clearance requirements (as shown in Cases 1 and 2) for height in relation to the unit. This clearance ensures that heat radiation from the condenser is not restricted around the unit.

Adhere to all clearance requirements if installing the unit on a roof. Be sure to level the unit and ensure that the unit is adequately anchored. Consult local codes for rooftop mounting requirements. To have successful service access to the outdoor unit, see Figure below for minimum spacing. When installing multiple outdoor units, see Cases 4 and 5 in Figure 4 for correct spacing requirements. Outdoor unit fans draw air from the back of the unit and discharge out the front. Place units back to back and front to front.

Note:

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

Figure 4: Single Fan Outdoor Unit Service Access and Allowable Clearances Diagram.



Note:

Do not place the unit where animals and/or plants will be in the path of the warm air, or where the warm air and/or noise will disturb neighbors.

Table 4: Single Fan Outdoor Unit Service Access and Allowable Clearances Diagram Legend.

Unit: Inch		A	B	C	D	E	F	G
Case 1	Standard	12	24	-	12	-	-	-
	Minimum	4	10	-	4	-	-	40
Case 2	Standard	-	-	20	-	-	-	-
	Minimum	-	-	14	-	-	-	40
Case 3	Standard	-	-	20	12	-	-	-
	Minimum	-	-	14	4	-	-	-
Case 4	Standard	-	-	-	12	24	-	-
	Minimum	-	-	-	4	8	79	-
Case 5	Standard	-	24	-	12	-	-	-
	Minimum	-	10	-	4	-	-	-

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GENERAL INSTALLATION GUIDELINES

Rigging and Lifting / Outdoor Unit Mounting

Rigging and Lifting Instructions

⚠WARNING

Wear protective gloves and safety goggles when handling equipment. Sharp edges will cause personal injury.

Dispose of the packing materials safely.

- *Packing materials, such as nails and other metal or wooden parts, will cause puncture wounds or other injuries.*
- *Tear apart and throw away plastic packaging bags so that children do not play with them and risk suffocation and 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 weights listed.*
- *Some products use polypropylene bands for packaging. ⃠ Do not use polypropylene bands to lift the unit.*
- *Support the outdoor unit at a minimum of four points to avoid slippage from rigging apparatus.*

Note:

- *Make sure the outdoor unit is in its original packaging to avoid damage during local transport.*
- *At the time of delivery, the package must be checked for any damage (exterior and interior). Report any damage to the carrier claims agent immediately.*
- *Handle the outdoor unit with care. Keep the outdoor unit upright to avoid damaging inside components.*
- *If a forklift is to transport the outdoor unit, the forklift arms must pass through the openings at the bottom.*
- *If a crane is to suspend the outdoor unit, it is required that two (2) ropes at least twenty-three (23) feet in length be used. Pass the ropes under the unit. Pass the rope through the two (2) forklift slots each at the front and rear of the outdoor unit.*
- *To prevent damage to the outdoor unit, always lift the unit with the ropes attached at four (4) points at an angle of ≤40°.*
- *Always include padding to protect the outdoor unit from rope damage, and take into consideration the outdoor unit's center of gravity.*

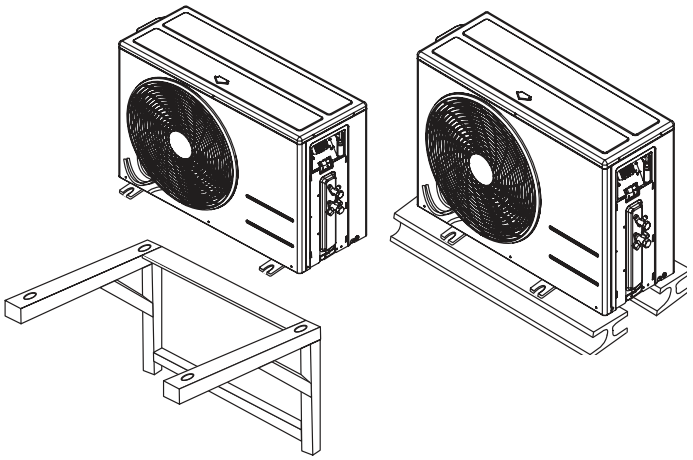
General Outdoor Unit Mounting

Any underlying structure or foundation must be designed to support the weight of the outdoor unit. ⃠ Avoid placing the unit in a low lying area where water and ice will accumulate. Securely attach the outdoor unit to a condenser pad, base rails, or a mounting platform that is solidly anchored to the ground or building structure. When installing the outdoor unit on the wall or roof top, securely anchor the mounting base to account for wind, earthquakes, or vibration.

Anchoring the Outdoor Unit

- Tightly anchor the outdoor unit with a bolt and nut to a concrete or rigid platform (see next page for more details).
- When installing on a wall (with field-supplied brackets), roof, or rooftop, securely anchor the mounting platform with nails, taking into consideration the possibility of strong winds or earthquakes.
- If there is a possibility of vibration from the outdoor unit transmitting to the building, add an anti-vibration material.

Figure 5: Examples of Outdoor Unit Mounting Methods.



Note:

Follow applicable local codes for clearance, mounting, anchor and vibration attenuation requirements.

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Concrete Platform 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.

Figure 6: Example of Using an Insert for a Hole in a Reinforced Concrete Beam.

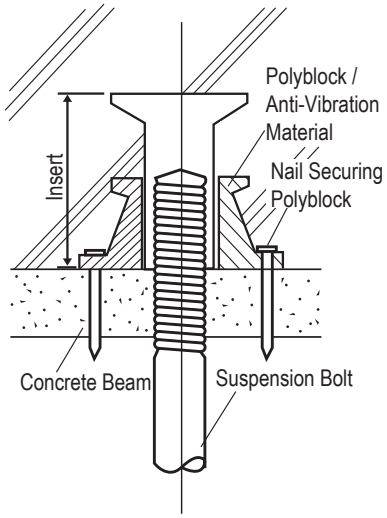
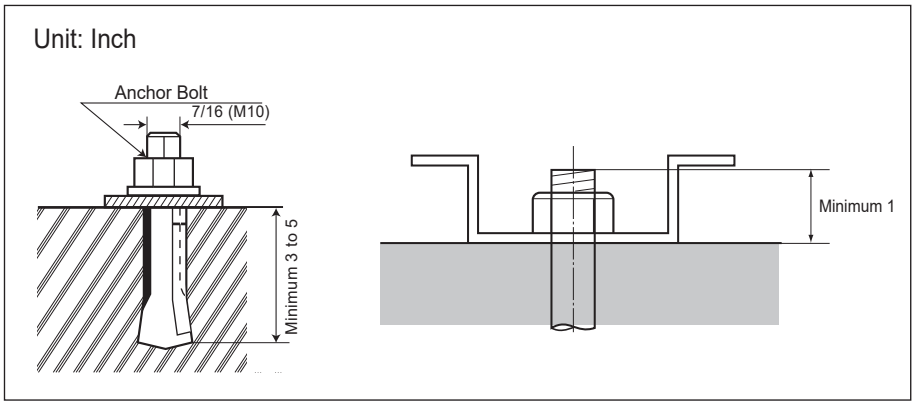


Figure 7: Close up of Bolt Attachment.



Outdoor Unit Platform Dimensional Requirements

Figure 8: Single Zone High Efficiency Standard Wall Mount Outdoor Units.

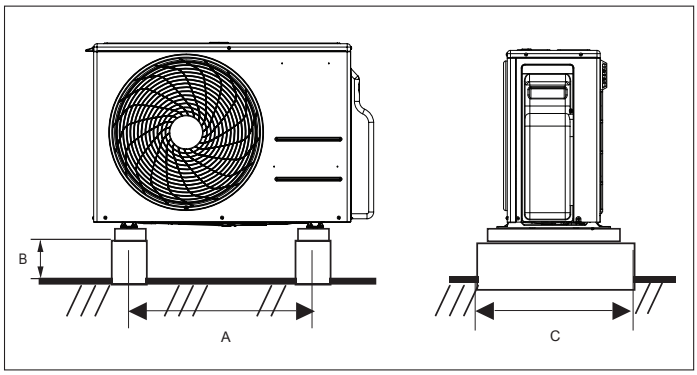


Table 5: Outdoor Unit Foundation Specifications.

Model	Foundation (Inches)			Leg Thickness (Inches)
	A	B	C	
LSU090HSV5, LSU120HSV5	22	Minimum 4	14-19/32	1/16
LSU181HSV5	21-1/2	Minimum 4	14-19/32	3/32

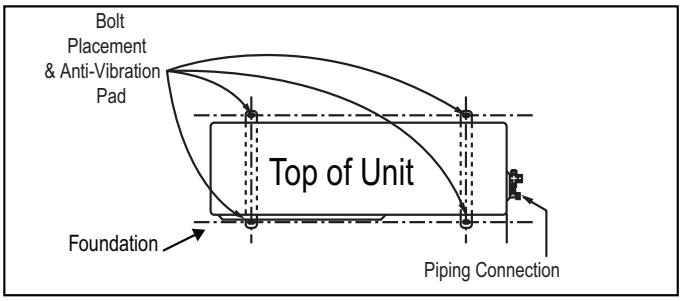
Note:

Review the specifications for field-supplied pad mounts or brackets to verify that outdoor dimension requirements are met.

Bolting the Outdoor Unit to the Platform

1. Ensure that the concrete platform will not degrade easily, and has enough structural strength to bear the weight of the unit.
2. Include an H-beam support. Firmly attach the corners, otherwise the support will bend.
3. Use a hexagon nut.
4. Use anti-vibration material.
5. Include enough space around the concrete foundation for condensate drainage.
6. Seal all wiring and piping access holes to prevent insects from entering the unit.

Figure 9: Bolting the Outdoor Unit to the Platform (Piping Location Will Differ Depending on Outdoor Unit Model).



Note:

All referenced materials are to be field-supplied. Images are not to scale.

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GENERAL INSTALLATION GUIDELINES

Required Indoor Unit Clearances

Note:

Follow required best practices when choosing an indoor location for the single zone indoor unit.

Dos

- Follow the table at right for minimum clearance of indoor unit from the top of the unit to the ceiling.
- Clearance gap between any wall or enclosure and the left or right side of the unit must be greater than 4 inches. Ensure there is sufficient maintenance space.
- Unit must be at least 6.5 feet from the floor for adequate clearance.
- Place the unit where drainage can be obtained easily. Condensation drain must be conveniently routed away from the unit.
- Locate the indoor unit in a location where it can be easily connected to the outdoor unit within allowable limits.
- Use a metal detector to locate studs in the walls. Anchor unit following stud location to prevent damage to the wall.

Figure 10: Single Zone High Efficiency Standard Wall Mount Indoor Unit Clearance Requirements.

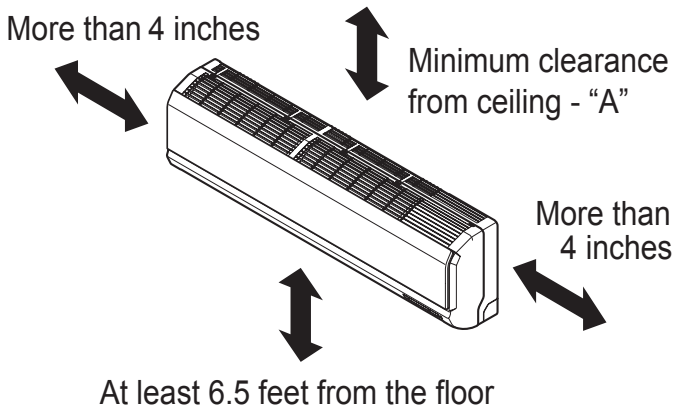


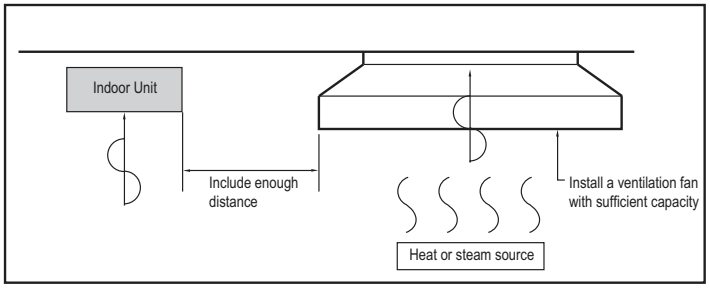
Table 6: Single Zone High Efficiency Standard Wall Mount Indoor Unit Ceiling Clearances.

"A" Ceiling Clearance (inches)	Indoor Unit Model(s)
5	LSN090HSV5, LSN120HSV5
8	LSN181HSV5

Dont's

- *Do not install the unit near a heat or steam source, or where considerable amounts of oil, iron powder, or flour are used. (These materials will generate condensate, cause a reduction in heat exchanger efficiency, or the drain to malfunction. If this is a potential problem, install a ventilation fan large enough to vent out these materials.)*
- *Ensure there are no obstacles to air circulation around the unit; keep proper distances from ceilings, doorways, floor, walls, etc.*
- *Do not install in an area where operation sound will disturb occupants--place the unit where noise prevention is taken into consideration*
- *Do not install near doorway.*
- *Avoid installing the unit near high-frequency generators.*

Figure 11: Installing Near a Heat or Steam Source.



WARNING

The unit must not be installed where sulfuric acid and flammable or corrosive gases are generated, vented into, or stored. There is risk of fire, explosion, and physical injury or death.

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

Note:

- *Indoor units (IDUs) must not be placed in an environment where the IDUs will be exposed to harmful volatile organic compounds (VOCs) or in environments where there is improper air make up or supply or inadequate ventilation. If there are concerns about VOCs in the environment where the IDUs are installed, proper air make up or supply and/or adequate ventilation must be provided. Additionally, in buildings where IDUs will be exposed to VOCs, consider a third party factory-applied epoxy coating to the fan coils for each IDU where the entire coil is dipped, not sprayed.*
- *If the unit is installed near a body of water, the installation parts are at risk of corroding. Appropriate anti-corrosion methods must be taken for the unit and all installation parts.*

Installing in an Area Exposed to Unconditioned Air

In some installation applications, areas (floors, walls) in some rooms will be exposed to unconditioned air (room can be above or next to an unheated garage or storeroom). To countermeasure:

- Verify that carpet is or will be installed (carpet could increase the temperature by three [3] degrees).
- Add insulation between the floor joists.
- Install radiant heat or another type of heating system to the floor.

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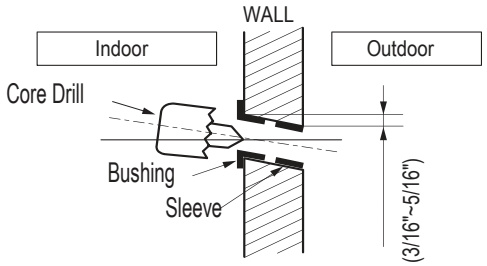
Drilling the Piping Hole in the Wall

Follow all piping clearance recommendations.

1. Using a 2-9/16 inch hole core drill bit, drill a hole at either the right or left side of the wall mounting, pre-chosen following installation guidelines and application needs.
   - The slant of the hole must be 3/16" to 5/16" from level with the slant being upward on the indoor unit side and downward on the outdoor unit side.
2. Finish off the newly drilled hole as shown with bushing and sleeve covering to prevent damage to the insulation and piping.

Figure 12: Drilling Piping Hole.



Mounting the Installation Plate to the Wall

Follow the procedure below and general best practices when mounting the indoor unit's installation plate to a wall.

1. The wall mounted indoor unit is shipped with the installation plate attached to its back. To remove, unscrew the one (1) screw that holds the installation plate to the back of the indoor unit.
2. Align the centerline using a leveling tool. Measure the wall and mark the centerline.
3. Attach the installation plate to the wall following the measurements and marks. Use the type "A" screws that are factory-supplied with the plate. If mounting the unit on a concrete wall, use field-supplied anchor bolts.
4. Observe all rear piping clearances when drilling into the wall.

⚠ WARNING

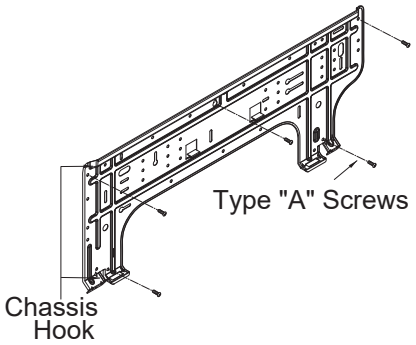
- *When choosing a location for the wall mount plate, be sure to take into consideration routing of wiring for power outlets within the wall. Contacting wiring can cause serious bodily injury or death.*
- *Use caution when drilling holes through the walls for the purposes of piping connections. Power wiring can cause serious bodily injury or death.*

Note:

Select the location carefully. Unit must be anchored to a strong and solid wall to prevent unnecessary vibration.

Figure 13: Wall Mount Indoor Unit Installation Plates.

LSN090-120HSV5 Installation Plate



LSN181HSV5 Installation Plate

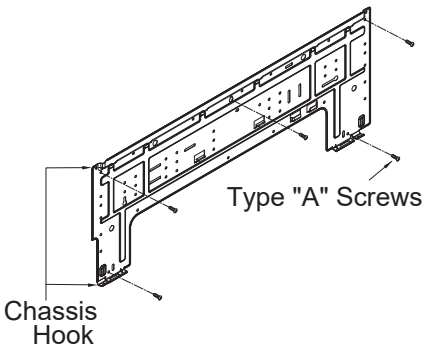
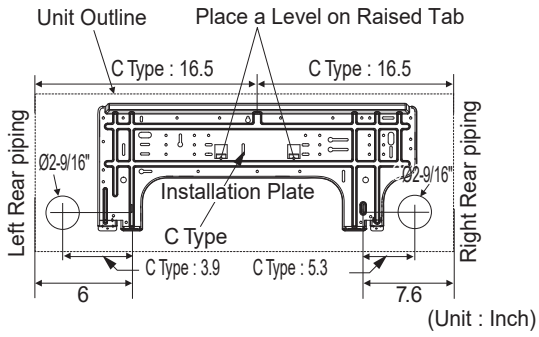
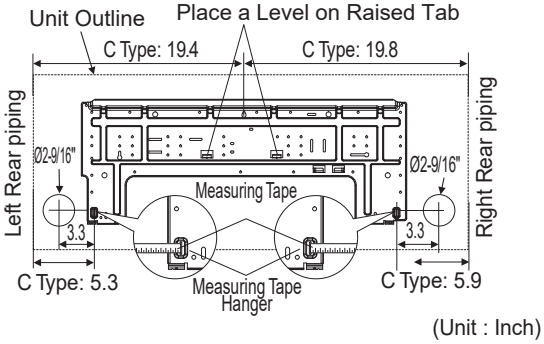


Figure 14: Wall Mount Indoor Unit Installation Plate Dimensions.

LSN090-120HSV5 Installation Plate



LSN181HSV5 Installation Plate



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GENERAL INSTALLATION GUIDELINES

Indoor Unit Mounting

Removing the Indoor Unit Bottom Cover

To access the indoor unit piping port connections, terminal block, and to make the indoor unit installation procedure easier, it is recommended that the bottom cover be removed first.

1. Unsnap the bottom cover at its top left and right sides (Location 1).
2. Unsnap each of the three (3) or four (4) small C-hooks located in the middle of the bottom cover (Location 2). Number of C-hooks present depends on model of indoor unit.
3. Lift the three (3) to four (4) hinges on the bottom cover up and out of the channels molded to the left, right, and middle of the indoor unit (Location 3). Number of hinges present depends on model of indoor unit.
4. Set aside the bottom cover to re-install after all procedures are complete.

Figure 15: Indoor Unit with the Bottom Cover On (Bottom View; Appearances Will Vary Depending on Indoor Unit Model).

Figure 16: Steps to Removing the Bottom Cover.

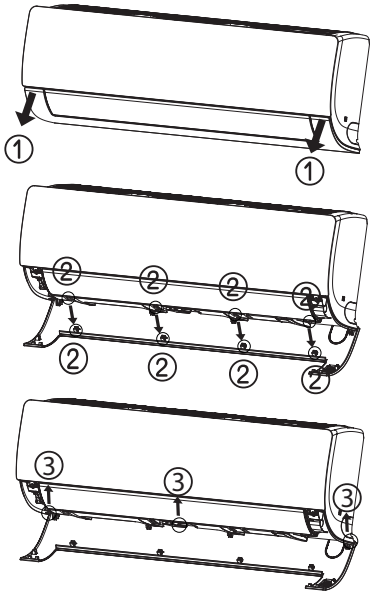


Figure 17: Removing the Bottom Cover (Appearances Will Vary Depending on Indoor Unit Model).

Figure 18: Bottom Cover with Top and Middle Unsnapped, Front View (Appearances Will Vary Depending on Indoor Unit Model).

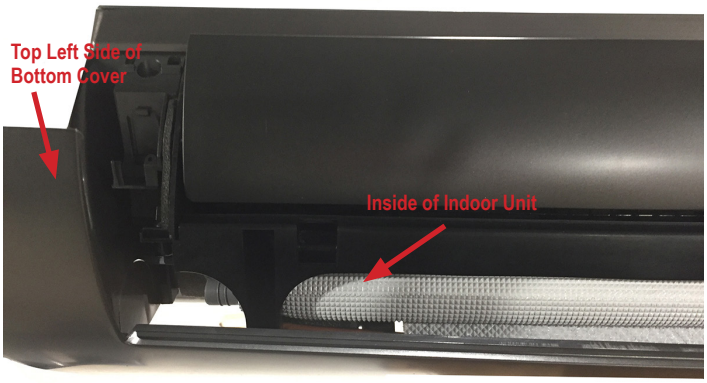


Figure 19: Back of Bottom Cover Completely Removed from Indoor Unit (Appearances Will Vary Depending on Indoor Unit Model).

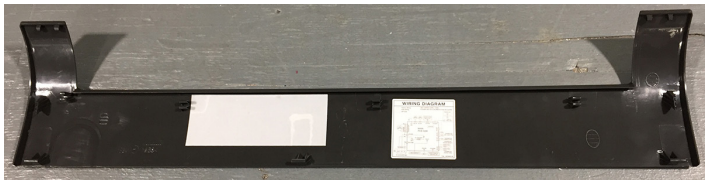
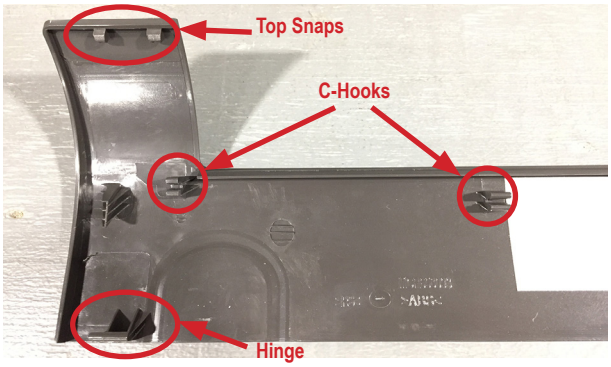


Figure 20: Close Up of Bottom Cover Connections (Appearances Will Vary Depending on Indoor Unit Model).



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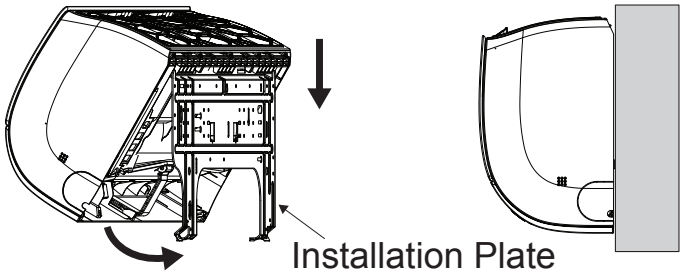
Mounting the Indoor Unit to the Installation Plate

1. Position the indoor unit onto the upper portion of the installation plate.

2. Engage the hooks at the top of the indoor unit with the upper edge of the installation plate (number of hooks depends on model type).

3. Ensure the hooks are properly seated on the installation plate by shaking the indoor unit left and right.

Figure 21: Attaching the Indoor Unit to the Installation Plate.



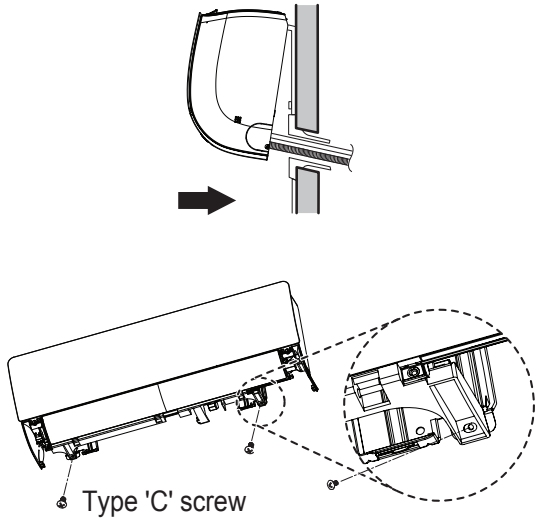
Note:

Permanently secure the indoor unit to the wall ONLY AFTER all other tasks such as Refrigerant Piping Connections, Drain Piping Connections, Electrical Connections, and Final Installation Procedures are complete. See next page for steps on how to prepare for piping and electrical connections.

4. Carefully guide the refrigerant piping and drain piping through the access hole.

5. Push the bottom of indoor unit towards the installation plate to anchor to the wall.
   - Press the lower left and right sides of the unit against the installation plate until the hooks engage into their slots.
   - A clicking sound will be heard as the bottom of the indoor unit attaches to the installation plate successfully.
   - Pay attention to the positioning of the piping through the wall.

Figure 22: Finishing Indoor Unit Installation to the Wall Plate.



6. Finish the installation by completely securing the indoor unit to the installation plate using the factory-supplied two Type “C” screws at the locations indicated at right.

⚠WARNING

The indoor unit can fall from the wall if it is not properly installed and secured to the installation plate. Falling indoor units can cause bodily injury or death.

Note:

- ⃠ *To avoid a gap between the indoor unit and the wall, ensure the screws are correctly and fully secured to the installation plate.*
- *To prevent condensate from forming due to an inflow of outdoor air, before indoor unit installation is finished, completely seal the piping access hole in the wall.*

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GENERAL INSTALLATION GUIDELINES

Indoor Unit Mounting

Preparing for Piping / Electrical Connections

1. To prepare the indoor unit for piping and electrical installation, disengage bottom on indoor unit from installation plate by reversing Steps 6, 5, and 4 from the previous procedure, if those procedures have been performed.

2. Unsnap the piping / drain hose holder (L-bracket) out from the indoor unit chassis. Prop it open between the indoor unit chassis and installation plate to separate the bottom of the indoor unit from the wall. This will allow for more working space.

Figure 23: Mounting the Indoor Unit on Installation Plate.

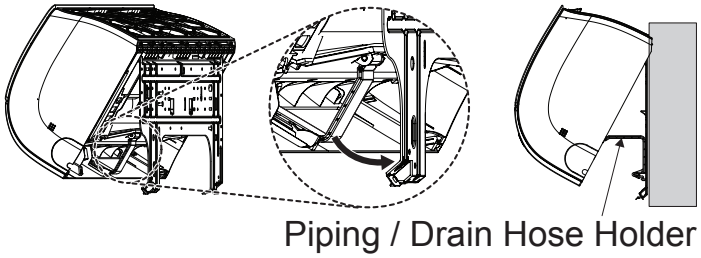

Figure 24: L-bracket Closed (Appearances Will Vary Depending on Indoor Unit Model).

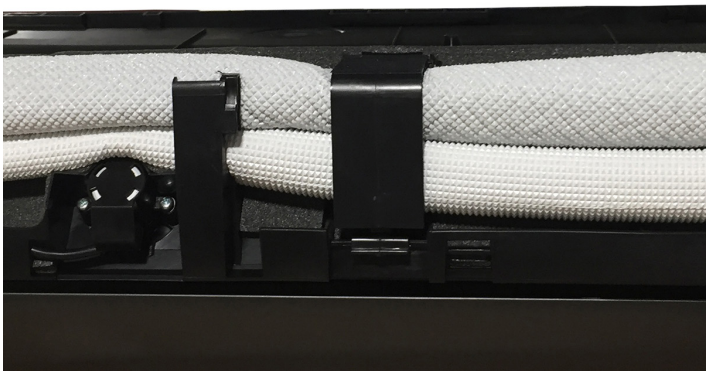

Figure 25: L-bracket Open (Appearances Will Vary Depending on Indoor Unit Model).

Note:

- *Go to the Refrigerant Piping Connections section of this manual for information on indoor unit piping connection installation. See also the Refrigerant Piping Connections section for drain piping installation.*
- *Go to the Electrical Installation section of this manual for information on electrical wiring to the indoor unit.*
- *After all Refrigerant Piping and Electrical Connection procedures are complete, snap the L-bracket closed, and secure the indoor unit to the installation plate as detailed in Steps 5 and 6 in "Mounting the Indoor Unit to the Installation Plate".*

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REFRIGERANT SAFETY STANDARDS / DEVICE CONNECTION LIMITATIONS

Refrigerant Safety Standards

ASHRAE Standards 15-2010 and 34-2010 address refrigerant safety and the maximum allowable concentration of refrigerant in an occupied space. Refrigerant will dissipate into the atmosphere, but a certain volume of air is required to safely dissipate the refrigerant. For R410A refrigerant, the maximum allowable concentration of refrigerant is 26 lbs./1,000 cubic feet (Addendum L modified the RCL to 26) of occupied spaces. Buildings with 24-hour occupancy are allowed half of that concentration.

If a single zone system develops a refrigerant leak, the entire refrigerant charge of the system will dump into the area where the leak occurs. To meet ASHRAE Standards 15 and 34, the smallest room volume on the system must be calculated and compared to the maximum allowable concentration. Also consult state and local codes in regards to refrigerant safety.

Device Connection Limitations

A single-zone system consists of one outdoor unit and one indoor unit. One of the most critical elements of a single-zone system is the refrigerant piping. If the connection piping is not within allowable limits, there will be reliability, performance, noise, and vibration issues. The table below lists pipe length limits that must be followed in the design of a Single Zone High Efficiency Wall Mount refrigerant pipe system. Refer to the figure for maximum length and elevation of piping.

Figure 26: Single Zone High Efficiency Wall Mount System Layout.

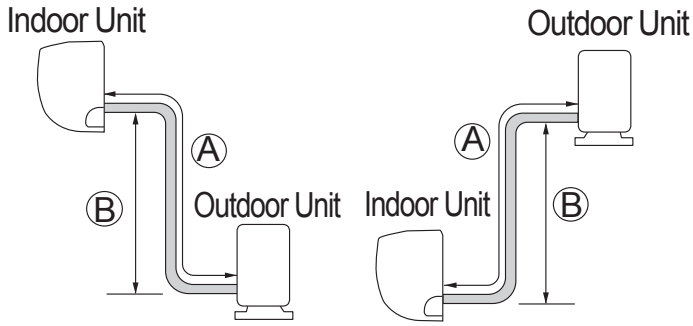

Table 7: Single Zone High Efficiency Refrigerant Piping System Limitations.

Model Numbers		LS090HSV5 (LSN090HSV5/ LSU090HSV5)	LS120HSV5 (LSN120HSV5/ LSU120HSV5)	LS181HSV5 (LSN181HSV5/ LSU181HSV5)
Pipe Sizes	Vapor	Ø3/8	Ø3/8	Ø5/8
	Liquid	Ø1/4	Ø1/4	Ø3/8
Pipe Length (ELF = Equivalent Length of pipe in Feet)	Standard Piping Length	24.6	24.6	24.6
	Piping Length with No Additional Refrigerant	41	41	24.6
	Longest total equivalent piping length	82	82	114.8
	Shortest total equivalent piping length	9.8	9.8	9.8
	Distance between fittings and indoor units or outdoor units	≥20 inches	≥20 inches	≥20 inches
Elevation (All Elevation Limitations are Measured in Actual Feet)	If outdoor unit is above indoor unit	49.2	49.2	49.2
	If outdoor unit is below indoor unit	49.2	49.2	49.2
Additional Refrigerant Needed (oz/ft)		0.22	0.22	0.38

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SELECTING FIELD SUPPLIED PIPING

Selecting Field-Supplied Copper Piping

Note:

Always follow local codes when selecting and installing copper pipe and piping system components.

Approved piping for use with LG Single Zone products will be marked "R410 RATED" along the length of the pipe. Piping wall thickness must meet local code requirements and be approved for a maximum operating pressure of 551 psi. When bending piping, try to keep the number of bends to a minimum, and use the largest radii possible to reduce the equivalent length of installed piping; also, bending radii greater than ten (10) piping diameters can minimize pressure drop. Be sure no traps or sags are present.

For Single Zone Systems

LG prefers the use of ACR copper piping rated at the system working pressure was used.

Note:

Always properly support the piping as per the instructions in the Refrigerant System Engineering section.

Table 9: ACR Rated Copper Tubing Material.

Type	Seamless Phosphorous Deoxidized
Class	UNS C12200 DHP
Straight Lengths	H58 Temper
Coils	O60 Temper

Table 8: Piping Tube Thicknesses.

OD (in)	1/4	3/8	1/2	5/8	3/4	7/8	1-1/8	1-3/8	1-5/8
Material	Rigid or Soft ACR Rated for R410A			Rigid or Solid ACR Rated for R410A					
Min. Bend Radius (in)	0.563	0.9375	1.5	2.25	3.0	3.0	3.5	4.0	4.5
Min. Wall Thickness (in)	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.050

Table 10: ACR Copper Tubing Dimensions and Physical Characteristics[1-3].

Nominal Pipe Outside Diameter (in)	**Actual Outside Diameter (in)**	**Drawn Temper**			**Annealed Temper**		
		Nominal Wall Thickness (in)	**Weight (lb/ft)**	**Cubic ft per Linear ft**	**Nominal Wall Thickness (in)**	**Weight (lb/ft)**	**Cubic ft per Linear ft**
1/4	0.250	--	--	--	0.030	0.081	0.00020
3/8	0.375	0.030	0.126	0.00054	0.032	0.134	0.00053
1/2	0.500	0.035	0.198	0.00101	0.032	0.182	0.00103
5/8	0.625	0.040	0.285	0.00162	0.035	0.251	0.00168
3/4	0.750	0.042	0.362	0.00242	0.042	0.362	0.00242
7/8	0.875	0.045	0.455	0.00336	0.045	0.455	0.00336
1-1/8	1.125	0.050	0.655	0.00573	0.050	0.655	0.00573

[1]All dimensions provided are in accordance with ASTM B280 – Standard..
[2]Design pressure = 551 psig.
[3]The Copper Tube Handbook, 2010, Copper Development Association Inc., 260 Madison Avenue, New York, NY 10016.

Note:

- *Commercially available piping often contains dust and other materials. Always blow it clean with a dry inert gas.*
- *Prevent dust, water or other contaminants from entering the piping during installation.*

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Copper Expansion and Contraction

Under normal operating conditions, the vapor pipe temperature of a Duct Free System can vary as much as 280°F. With this large variance in pipe temperature, the designer must consider pipe expansion and contraction to avoid pipe and fitting fatigue failures.

Refrigerant pipe along with the insulation jacket form a cohesive unit that expands and contracts together. During system operation, thermal heat transfer occurs between the pipe and the surrounding insulation.

If the pipe is mounted in free air space, no natural restriction to movement is present if mounting clamps are properly spaced and installed. When the refrigerant pipe is mounted underground in a utility duct stacked among other pipes, natural restriction to linear movement is present. In extreme cases, the restrictive force of surface friction between insulating jackets could become so great that natural expansion ceases and the pipe is "fixed" in place. In this situation, opposing force caused by change in refrigerant fluid/vapor temperature can lead to pipe/fitting stress failure.

The refrigerant pipe support system must be engineered to allow free expansion to occur. When a segment of pipe is mounted between two fixed points, provisions must be provided to allow pipe expansion to naturally occur. The most common method is the inclusion of expansion Loop or U-bends. Each segment of pipe has a natural fixed point where no movement occurs. This fixed point is located at the center point of the segment assuming the entire pipe is insulated in a similar fashion. The natural fixed point of the pipe segment is typically where the expansion Loop or U-bend must be.

Linear pipe expansion can be calculated using the following formula:

$$LE = C \times L \times (T_r - T_a) \times 12$$

LE	=	Anticipated linear tubing expansion (in.)
C	=	Constant (For copper = 9.2×10^{-6} in./in.°F)
L	=	Length of pipe (ft.)
T_R	=	Refrigerant pipe temperature (°F)
T_a	=	Ambient air temperature (°F)
12	=	Inches to feet conversion (12 in./ft.)

1. From Table 11 find the row corresponding with the actual length of the straight pipe segment.
2. Estimate the minimum and maximum temperature of the pipe. In the column showing the minimum pipe temperature, look up the anticipated expansion distance. Do the same for the maximum pipe temperature.
3. Calculate the difference in the two expansion distance values. The result will be the anticipated change in pipe length.

General Example:

A system is installed and the design shows that there is a 100 foot straight segment of tubing between an indoor unit and the outdoor unit. In heating, this pipe transports hot gas vapor to the indoor units at 120 °F. In cooling, the same tube is a suction line returning refrigerant vapor to the outdoor unit at 40 °F. Look up the copper tubing expansion at each temperature and calculate the difference.

Vapor Line

Transporting Hot Vapor: 100 ft. pipe at 120 °F = 1.40 in.

Transporting Suction Vapor: 100 ft. pipe at 40 °F = 0.40 in.

Anticipated Change in Length: 1.40 in. – 0.40 in. = 1.00 in.

Liquid Line

The liquid temperature remains relatively the same temperature; only the direction of flow will reverse. Therefore, no significant change in length of the liquid line is anticipated.

When creating an expansion joint, the joint height must be a minimum of two times the joint width. Although different types of expansion arrangements are available, the data for correctly sizing an Expansion Loop is provided in Table 12. Use soft copper with long radius bends on longer runs or long radius elbows for shorter pipe segments. Using the anticipated linear expansion (LE) distance calculated, look up the Expansion Loop or U-bend minimum design dimensions. If other types of expansion joints are chosen, design per ASTM B-88 Standards.

See table on next page for precalculated anticipated expansion for various pipe sizes and lengths of refrigerant tubing.

To find the anticipated expansion value:

1. From the table on the next page, find the row corresponding with the actual feet of the straight pipe segment.
2. Estimate the minimum and maximum temperature of the pipe.
3. In the column showing the minimum pipe temperature, look up the anticipated expansion distance corresponding to the segment length. Do the same for the maximum pipe temperature.
4. Calculate the difference in the two expansion distance values. The result will be the change in pipe length.

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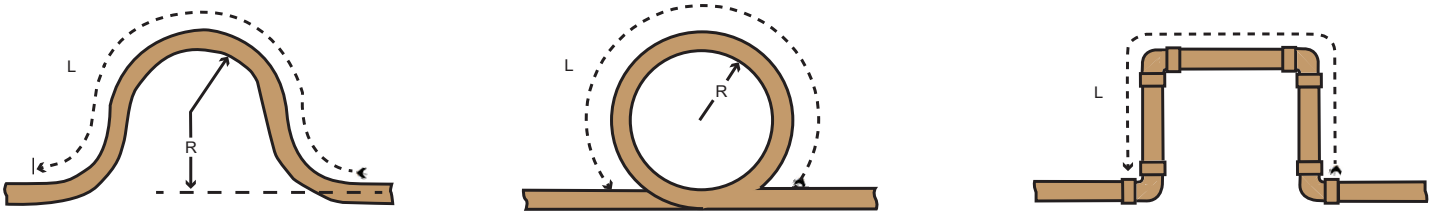
COPPER EXPANSION AND CONTRACTION

Table 11: Linear Thermal Expansion of Copper Tubing in Inches.

Pipe Length[1]	Fluid Temperature °F																			
	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	100°	105°	110°	115°	120°	125°	130°
10	0.04	0.04	0.05	0.06	0.06	0.07	0.08	0.08	0.09	0.09	0.10	0.10	0.11	0.11	0.11	0.12	0.13	0.14	0.15	0.15
20	0.08	0.08	0.10	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.22	0.23	0.26	0.28	0.29	0.30
30	0.12	0.12	0.15	0.18	0.20	0.21	0.23	0.24	0.26	0.27	0.29	0.30	0.32	0.33	0.32	0.35	0.39	0.42	0.44	0.45
40	0.16	0.16	0.20	0.24	0.26	0.28	0.30	0.32	0.34	0.36	0.38	0.40	0.42	0.44	0.43	0.46	0.52	0.56	0.58	0.60
50	0.20	0.20	0.25	0.30	0.33	0.35	0.38	0.40	0.43	0.45	0.48	0.50	0.53	0.55	0.54	0.58	0.65	0.70	0.73	0.75
60	0.24	0.24	0.30	0.36	0.39	0.42	0.45	0.48	0.51	0.54	0.57	0.60	0.63	0.66	0.65	0.69	0.78	0.84	0.87	0.90
70	0.28	0.28	0.35	0.42	0.46	0.49	0.53	0.56	0.60	0.63	0.67	0.70	0.74	0.77	0.76	0.81	0.91	0.98	1.02	1.05
80	0.32	0.32	0.40	0.48	0.52	0.56	0.60	0.64	0.68	0.72	0.76	0.80	0.84	0.88	0.86	0.92	1.04	1.12	1.16	1.20
90	0.36	0.36	0.45	0.54	0.59	0.63	0.68	0.72	0.77	0.81	0.86	0.90	0.95	0.99	0.97	1.04	1.17	1.26	1.31	1.35
100	0.40	0.40	0.50	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00	1.05	1.10	1.08	1.15	1.30	1.40	1.45	1.50
120	0.48	0.48	0.60	0.72	0.78	0.84	0.90	0.96	1.02	1.08	1.14	1.20	1.26	1.32	1.30	1.38	1.56	1.68	1.74	1.80
140	0.56	0.56	0.70	0.84	0.91	0.98	1.05	1.12	1.19	1.26	1.33	1.40	1.47	1.54	1.51	1.61	1.82	1.96	2.03	2.10
160	0.64	0.64	0.80	0.96	1.04	1.12	1.20	1.28	1.36	1.44	1.52	1.60	1.68	1.76	1.73	1.84	2.08	2.24	2.32	2.40
180	0.72	0.72	0.90	1.08	1.17	1.26	1.35	1.44	1.53	1.62	1.71	1.80	1.89	1.98	1.94	2.07	2.34	2.52	2.61	2.70

[1]Pipe length baseline temperature = 0°F. "Expansion of Carbon, Copper and Stainless Steel Pipe," *The Engineers' Toolbox*, www.engineeringtoolbox.com.

Figure 27: Coiled Expansion Loops and Offsets (Plan View).



Large Tubing U-bend (>3/4 in.) Loop Small Tubing U-bend (<3/4 in.)

Note:

All expansion loops and offsets must be installed in the horizontal plane to prevent the possibility of trapping oil. Loops and offsets in vertical risers must also be installed in a horizontal plane.

Table 12: Radii of Coiled Expansion Loops and Developed Lengths of Expansion Offsets.

Anticipated Linear Expansion (LE) (inches)		Nominal Tube Size (OD) inches			
		1/4	3/8	1/2	3/4
1/2	R[1]	6	7	8	9
	L[2]	38	44	50	59
1	R[1]	9	10	11	13
	L[2]	54	63	70	83
1-1/2	R[1]	11	12	14	16
	L[2]	66	77	86	101
2	R[1]	12	14	16	19
	L[2]	77	89	99	117
2-1/2	R[1]	14	16	18	21
	L[2]	86	99	111	131
3	R[1]	15	17	19	23
	L[2]	94	109	122	143
3-1/2	R[1]	16	19	21	25
	L[2]	102	117	131	155
4	R[1]	17	20	22	26
	L[2]	109	126	140	166

[1]R = Centerline Length of Pipe. [2]L = Centerline Minimum Radius (inches).

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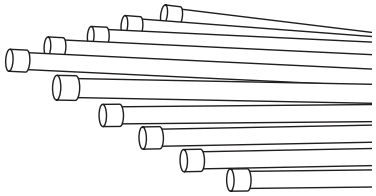
Piping Materials and Handling

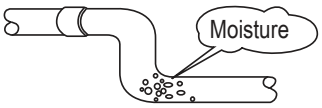
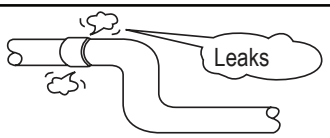
Pipes used for the refrigerant piping system must include the specified thickness, and the interior must be clean.

While handling and storing, ⃠ do not bend or damage the pipes, and take care not to contaminate the interior with dust, moisture, etc.

Keep Pipes Capped While Storing.



Keep refrigerant pipe dry, clean, and airtight.

	Dry	Clean	Airtight
	No moisture should be inside the piping.	No dust should be inside the piping.	No leaks should occur.
			
Possible Problems	- Significant hydrolysis of refrigerant oil. - Refrigerant oil degradation. - Poor insulation of the compressor. - System does not operate properly. - EEVs, capillary tubes are clogged.	- Refrigerant oil degradation. - Poor insulation of the compressor. - System does not operate properly. - EEVs and capillary tubes become clogged.	- Refrigerant gas leaks / shortages. - Refrigerant oil degradation. - Poor insulation of the compressor. - System does not operate properly.
Solutions	- Remove moisture from the piping. - Piping ends should remain capped until connections are complete. - ⃠ Do not install piping on a rainy day. - Connect piping properly at the unit's side. - Remove caps only after the piping is cut, the burrs are removed, and after passing the piping through the walls. - Evacuate system to a minimum of 500 microns and insure the vacuum holds at that level for 24 hours	- Remove dust from the piping. - Piping ends should remain capped until connections are complete. - Connect piping properly at the side of the unit. - Remove caps only after the piping is cut and burrs are removed. - Retain the cap on the piping when passing it through walls, etc.	- Test system for air tightness. - Perform brazing procedures that comply with all applicable standards. - Perform flaring procedures that comply with all applicable standards. - Perform flanging procedures that comply with all applicable standards. - Ensure that refrigerant lines are pressure tested to 550 psig and hold for 24 hours.

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REFRIGERANT SYSTEM ENGINEERING

Proper system operation depends on the installer using utmost care while assembling the piping system. The following pages are an overview of best practices when installing the refrigerant piping system.

Note:

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

⃠ No Pipe Size Substitutions

Use only the pipe size selected by the information in this manual. Using a different size is prohibited and will result in a system malfunction or failure to work at all.

⃠ No In-line Refrigeration Components

Components such as oil traps, solenoid valves, filter-driers, sight glasses, tee fittings, and other after-market accessories are ⃠ not permitted on the refrigerant piping system between the outdoor units and the indoor units. LG Single Zone systems are provided with redundant systems that make sure oil is properly returned to the compressor. Sight-glasses and solenoid valves will cause vapor to form in the liquid stream. Over time, driers will deteriorate and introduce debris into the system. The designer and installer must verify the refrigerant piping system is free of traps, sagging pipes, sight glasses, filter driers, etc.

Field-Provided Isolation Ball Valves

LG maintains a neutral position on using isolation valves in LG HVAC refrigerant piping systems. LG does not endorse any manufacturer of isolation valves. It is recognized that installing isolation valves will simplify future maintenance requirements, and, if used, considerations must be taken including, but not limited to, the following:

- Pressure drops for any component used, including isolation valves, must be known in equivalent pipe length and calculated into the total and segment equivalent piping lengths and compared to product design limitations.
- In all cases, materials must be suitable for the application and any applicable codes, including, but not limited to, diameter and wall thickness continuity per ACR standards.

Failure to do so will cause significant performance degradation. Proper leak checks must be performed. Using isolation valves does not automatically void any LG product warranty, however, a limited warranty will be voided in whole or part if any field supplied accessory fail in any way that causes product failure.

Using Elbows

Field-supplied elbows are allowed if they are long radius and designed for use with R410A refrigerant. The designer and installer, however, must be cautious with the quantity and size of fittings used, and must account for the additional pressure losses in equivalent pipe length calculation for each branch. The equivalent pipe length of each elbow must be added to each pipe segment manually (see table).

Table 13: Equivalent Piping Length for Elbows.

Elbow (ft.)	1/4	3/8	1/2	5/8	3/4
	0.5	0.6	0.7	0.8	1.2

Pipe Bends

When bending soft copper, use long radius bends. Refer to the “Radii of Coiled Expansion Loops and Developed Lengths of Expansion Offsets” table for minimum radius specifications.

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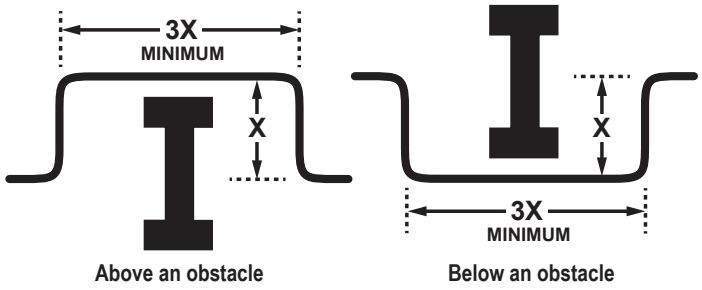
Obstacles

When an obstacle, such as an I-beam or concrete T, is in the path of the planned refrigerant pipe run, it is best practice to route the pipe over the obstacle. If adequate space is not available to route the insulated pipe over the obstacle, then route the pipe under the obstacle. In either case, it is imperative 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.

Figure 28: Installing Piping Above and Below an Obstacle.



Pipe Supports

A properly installed pipe system must be adequately supported to avoid pipe sagging. Sagging pipes become oil traps that lead to equipment malfunction.

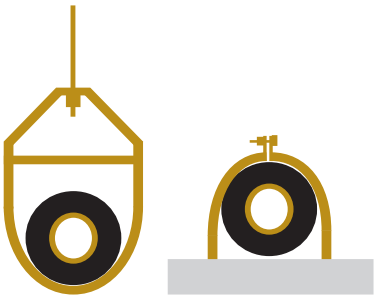
Pipe supports must ⃠ never touch the pipe wall; supports must be installed outside (around) the primary pipe insulation jacket. Insulate the pipe first because pipe supports must be installed outside (around) the primary pipe insulation jacket. Clevis hangers must be used with shields between the hangers and insulation. Field provided pipe supports must be designed to meet local codes. If allowed by code, use fiber straps or split-ring hangers suspended from the ceiling on all-thread rods (fiber straps or split ring hangers can be used as long as they do not compress the pipe insulation). Place a second layer of insulation over the pipe insulation jacket to prevent chafing and compression of the primary insulation within the confines of the support pipe clamp.

A properly installed pipe system will have sufficient supports to avoid pipes from sagging during the life of the system. As necessary, place supports closer for segments where potential sagging could occur. Maximum spacing of pipe supports must meet local codes. If local codes do not specify pipe support spacing, pipe must be supported:

- Maximum of five (5) feet on center for straight segments of pipe up to 3/4 inches outside diameter size.
- Maximum of six (6) feet on center for pipe up to one (1) inch outside diameter size.
- Maximum of eight (8) feet on center for pipe up to two (2) inches outside diameter size.

Wherever the pipe changes direction, place a hanger within twelve (12) inches on one side and within twelve (12) to nineteen (19) inches of the bend on the other side.

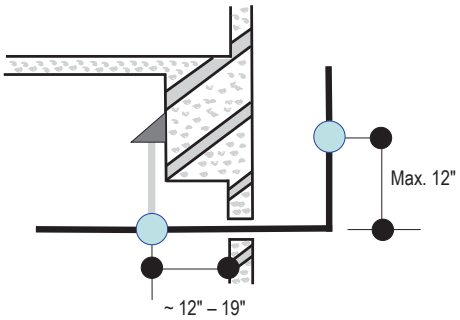
Figure 29: Pipe Hanger Details.



Note:

Use a 4" + long sheet curved sheet metal saddles between hanger bracket and insulation to promote linear expansion/contraction.

Figure 30: Typical Pipe Support Location—Change in Pipe Direction.



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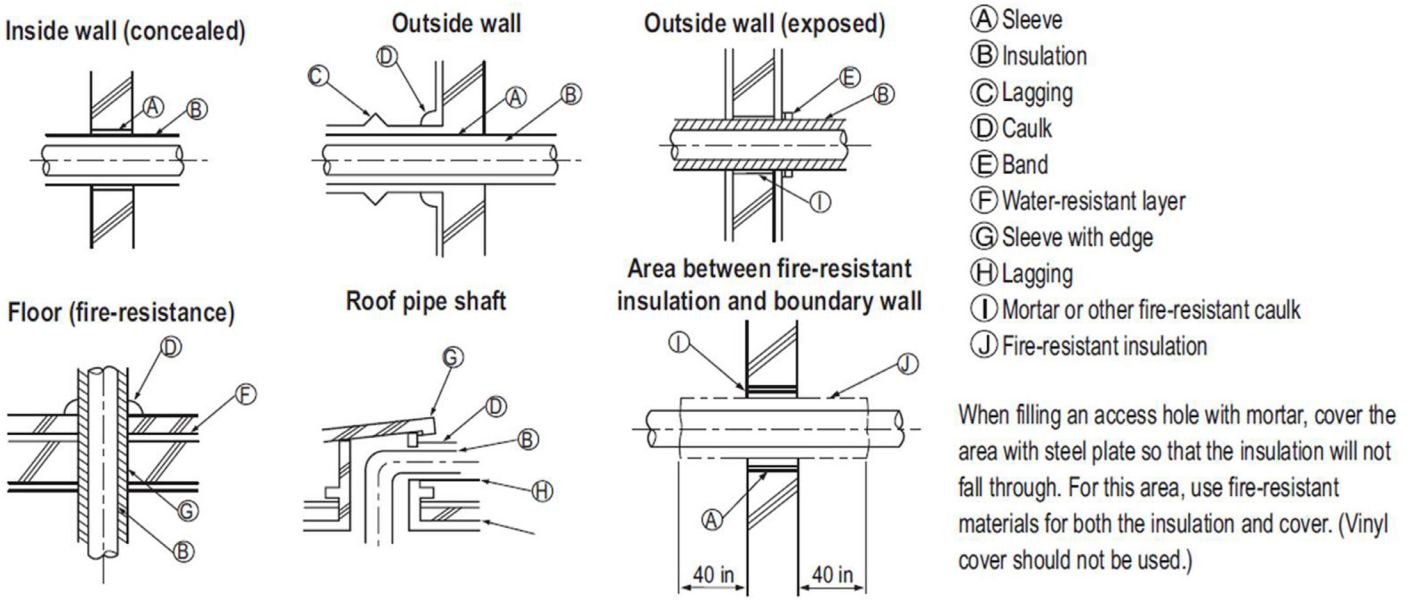
Pipe Sleeves at Penetrations

LG requires that all pipe penetrations through walls, floors, and pipes buried underground be properly insulated and routed through an appropriate wall sleeve of sufficient size to prevent compression of refrigerant pipe insulation and free movement of the pipe within the sleeve. Use 4"+ curved sheet metal saddles between the bottom surface of the pipe and the bottom surface of the penetration.

Figure 31: Pipe Sleeve Options.



When filling an access hole with mortar, cover the area with steel plate so that the insulation will not fall through. For this area, use fire-resistant materials for both the insulation and cover. (Vinyl cover should not be used.)

Note:
Diameter of penetrations must be determined by pipe diameter plus the thickness of the insulation.

Underground Refrigerant Piping

Refrigerant pipe installed underground must be routed inside a vapor tight protective sleeve to prevent insulation deterioration and water infiltration. Refrigerant pipe installed inside underground casing must be continuous without any joints. Underground refrigerant pipe must be located at a level **below the frost line**.

Table 14: Utility Conduit Sizes.

Liquid Pipe[1]	Vapor Pipe[1]		
	1/2 (2.0[2,5])	5/8 (2-1/8[2,5])	3/4 (2-1/4[2,5])
1/4 (1.0)[3]	4	4	4
3/8 (1-1/8)[3]	4	4	5
1/2 (1-1/2)[4]	5	5	5
5/8 (1-5/8)[4]	5	5	5
3/4 (1-3/4)[4]	5	5	5

[1]OD pipe diameter in inches; Values in parenthesis () indicate OD of pipe with insulation jacket.

[2]Diameter of pipe with insulation. Thickness of pipe insulation is typical. Actual required thickness will vary based on surrounding ambient conditions and must be calculated and specified by the design engineer.

[3]Insulation thickness (value in parenthesis) = 3/8 inch.

[4]Insulation thickness (value in parenthesis) = 1 inch.

[5]Insulation thickness (value in parenthesis) = 3/4 inch.

Figure 32: Typical Arrangement of Refrigerant Pipe and Cable(s) in a Utility Conduit.

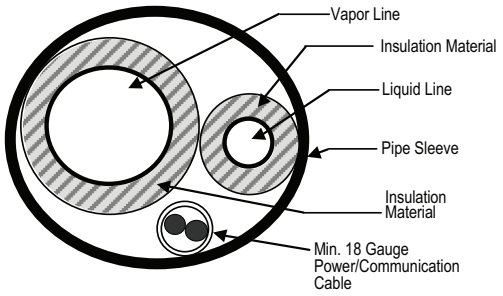


Table 15: Heat Pump Unit Refrigerant Pipe Connections (All Brazed Type).

Model	Liquid Conn. (inches)	Vapor Conn. (inches)
LSU090HSV5, LSU120HSV5	1/4	3/8
LS181HSV5	3/8	5/8

Note:
Provide expansion joints in long pipe segments and place in an accessible conduit box for inspection. Use galvanized curved sheet metal saddles at all mounting points. Pipe must be allowed to move freely linearly.

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Flaring and Brazing Procedures

One of the main causes of refrigerant leaks is a defective connection. For LG HVAC systems, the installer needs to know how perform both flared and brazed connections successfully.

Note:

• During installation, it is imperative to keep the piping system free of contaminants and debris such as copper burrs, slag, or carbon dust.

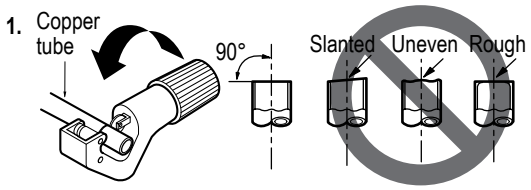
• ⃠ Do not use kinked pipe caused by excessive bending in one specific area on its length.

Flaring Procedure

Note:

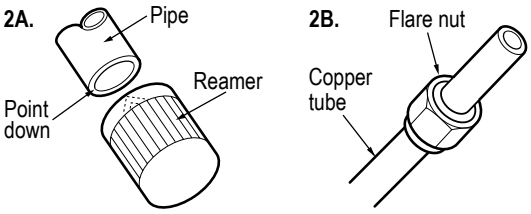
When selecting flare fittings, always use a 45° fitting rated for use with high pressure refrigerant R410A. Selected fittings must also comply with local, state, or federal standards.

1. Cut the pipe to length.
   - Measure the distance between the indoor unit and the outdoor unit.
   - Cut the pipes a little longer than measured distance.

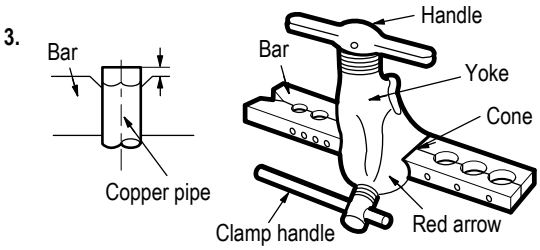


2A. Remove the burrs.
   - Completely remove all burrs from pipe ends.
   - When removing burrs, point the end of the copper pipe down to avoid introducing foreign materials in the pipe.

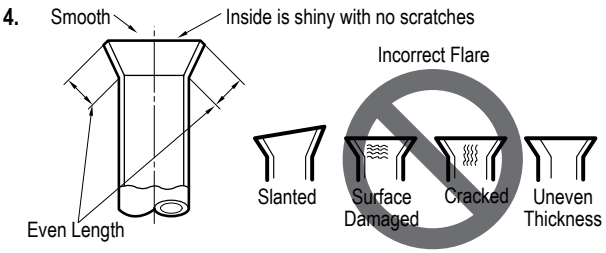
2B. Slide the flare nut onto the copper tube.



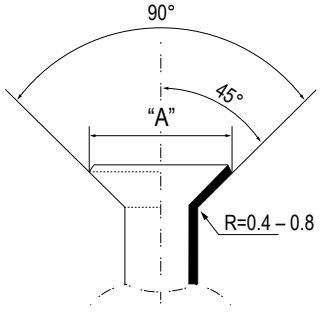
3. Flaring the pipe end.
   - Use the proper size flaring tool to finish flared connections as shown.
   - ALWAYS create a 45° flare when working with R410A.



4. Carefully inspect the flared pipe end.
   - Compare the geometry with the figure to the right
   - If the flare is defective, cut it off and re-do procedure.
   - If flare looks good, blow the pipe clean with dry nitrogen.



Dimensions of the Flare.



Flared Connection Dimensions / Tightening Torque.

Pipe Size (in. O.D.)	Outside Diameter (mm)	"A" Dimension (mm [in.])
1/4	6.35	~ 9.1 (11/32 - 23/64)
3/8	9.52	~ 13.2 (1/2 - 33/64)
1/2	12.7	~ 16.6 (41/64 - 21/32)
5/8	15.88	~ 19.7 (49/64 - 25/32)
3/4	19.05	-

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FLARING AND BRAZING PROCEDURES

Tightening the Flare Nuts

Tightening Torque for Flare Nuts.

Pipe Size (in. O.D.)	Outside Diameter (mm)	Tightening Torque (ft-lbs.)
1/4	6.35	13.0 - 18.0
3/8	9.52	24.6 - 30.4
1/2	12.7	39.8 - 47.7
5/8	15.88	45.4 - 59.3
3/4	19.05	71.5 - 87.5

1. When connecting the flare nuts, coat the flare (outside only) with polyvinyl ether (PVE) refrigeration oil only.

Note:

⃠ *Do not use polyolyester (POE) or any other type of mineral oil as a thread lubricant. These lubricants are not compatible with the PVE oil used in this system and create oil sludge leading to equipment damage and system malfunction.*

⃠ *Do not add any contaminants inside the refrigerant piping.*

2. Initially hand tighten the flare nuts using three (3) or four (4) turns.
3. To finish tightening the flare nuts, use both a torque wrench and a backup wrench.
4. After all the piping has been connected and the caps have been tightened, check for refrigerant gas leaks.

Loosening the Flare Nuts

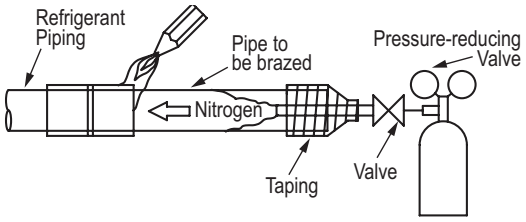
Always use two (2) wrenches to loosen the flare nuts.

Brazing Practices

⚠ WARNING

⃠ Do not braze in an enclosed location. ⃠ Do not allow the refrigerant to leak during brazing. Always test for gas leaks before and after brazing.
If the refrigerant combusts, it generates a toxic gas the will cause physical injury or death.

Figure 33: Refrigerant Pipe Brazing.



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

⚠ WARNING

- ⃠ *Do not allow the refrigerant to leak during brazing; if the refrigerant combusts, it generates a toxic gas. There is risk of fire, explosion, and physical injury or death.*
- ⃠ *Do not braze in an enclosed location, and always test for gas leaks before / after brazing. There is risk of fire, explosion, and physical injury or death.*

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Installation

Single Zone Wall-Mounted systems are one-to-one systems. There is a direct piping connection between the outdoor unit and the indoor unit. The figure at right illustrates the basic pipe connections between the outdoor and indoor unit. Refer to the illustration when proceeding with pipe connections.

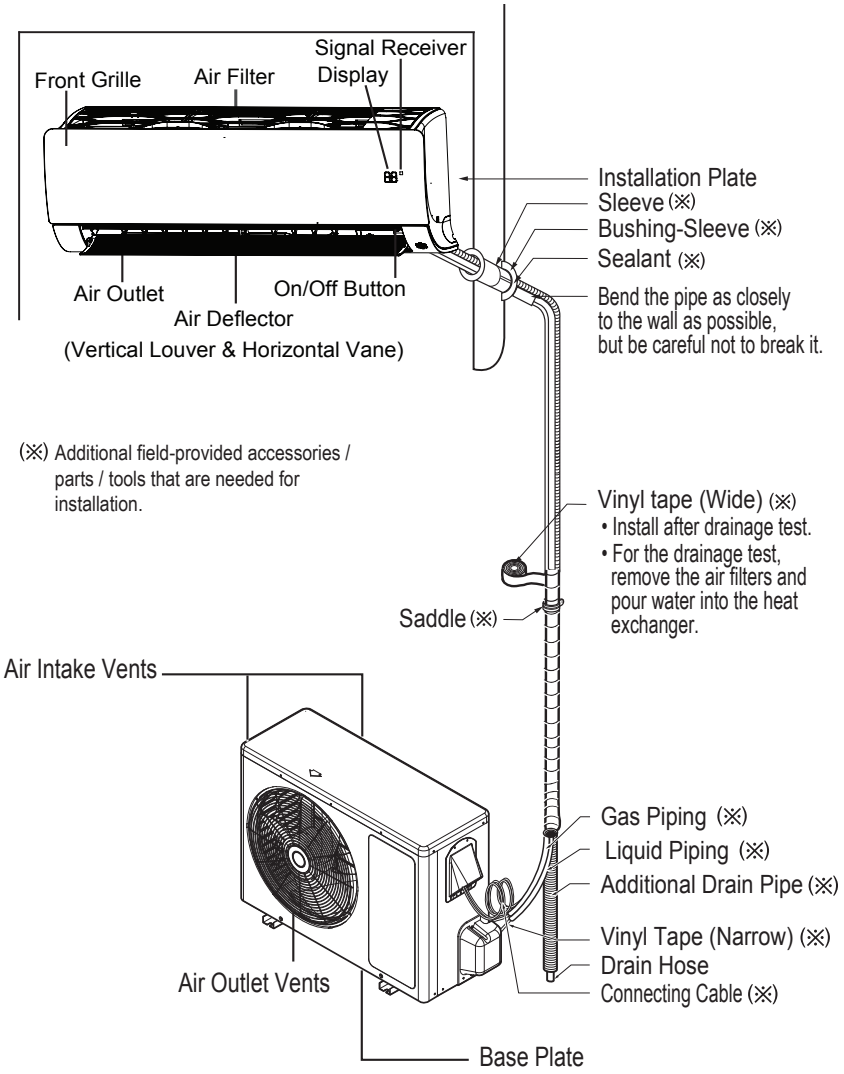
The illustration shows the indoor unit being installed at a higher position than the outdoor unit. However, if the outdoor unit be installed at a higher position than the indoor unit, the basic pipe connections are the same.

Refer to the “Connection Limitations” section for specific length limitations in conjunction with outdoor unit and indoor unit positioning.

Note:

- *When proceeding with piping connections, adhere to pipe support spacing lengths as shown in the General Refrigerant Piping System Information section. Refer to the “Pipe Supports” section for information on using clamps and pipe support materials.*
- *Always adhere to local codes regarding piping and accurate support spacing along the piping system.*
- *Always include insulation on all refrigerant and drain piping to ensure condensate does not form and cause damage to walls, floors, etc.*

Figure 34: Installation and Piping Connection Overview.



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Special Applications

If an additional drain hose is necessary, the end of drain outlet must be routed above the ground. Secure the drain hose appropriately.

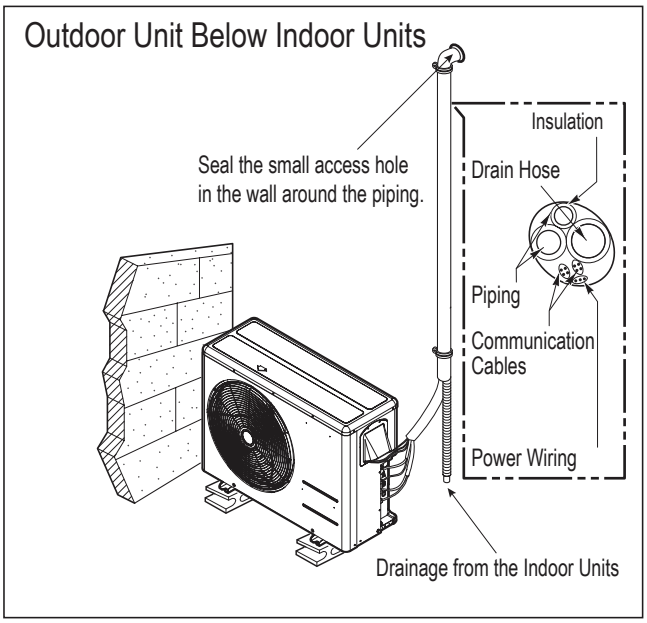
When the Outdoor Unit is Installed Below the Indoor Unit:

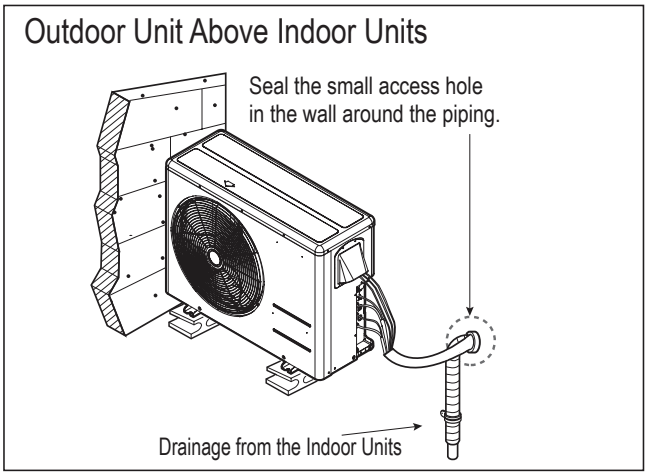
1. Use a conduit, piping set cover, or bundle the (separately) insulated refrigerant piping, the drain hose, and the communications / connection (power) cable together.
2. Make sure to include some slack in the wiring. Wiring must be installed in an upwards direction to prevent water from accessing into the control box.
3. Secure the conduit, piping set cover, or bundle along the outside wall using saddles or a similar type of piping support.
4. Seal any openings in the wall that are around the piping.

When the Outdoor Unit is Installed Above the Indoor Unit:

1. Use a conduit, piping set cover, or bundle the (separately) insulated refrigerant piping and the communications / connection (power) cable together up to the outdoor unit service valves.
2. Make sure to include some slack in the wiring. Wiring must be installed in upwards direction to prevent water from traveling into the control box.
3. If necessary, secure the conduit, piping set cover, or bundle along the outside wall using saddles or a similar type of piping support.
4. Ensure the insulated drain hose from the indoor unit is installed away from the outdoor unit, and in a downwards direction. If necessary, secure along the outside wall using saddles or a similar type of support.
5. Seal any openings in the wall that are around the piping.

Figure 35: Special Applications.





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Outdoor Unit Connections

1. Remove the piping cover or piping / control box cover (configuration depends on outdoor unit model) from the unit by loosening the fastening screws.
2. Align the center of the refrigerant piping and corresponding connection as shown.
3. Refer to the figures at right for liquid and gas (vapor) piping attachments onto the outdoor unit.
4. Place a couple of drops of PVE refrigerant oil on outside of the flare before assembling. ⃠ Do not add any contaminants. Tighten the flare nut initially by hand.
5. Finish tightening the flare nut with a torque wrench until the wrench clicks. Follow torque guidelines in the table below. See figures for correct connection points.

Figure 36: LSU090-120HSV5 Piping / Control Box Cover Removal.

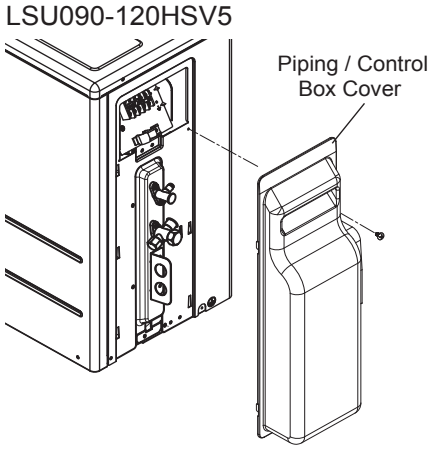

Figure 37: LSU181HSV5 Piping Cover and Control Box Cover Removal.

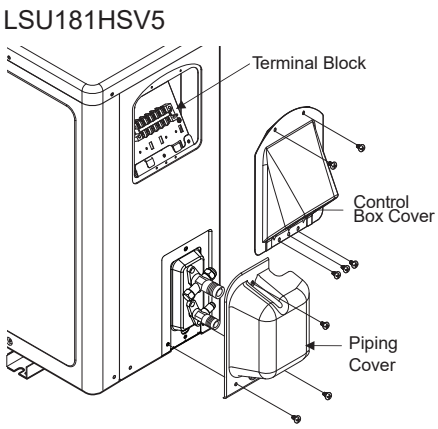

Figure 38: LSU090-120HSV5 Piping Connections.

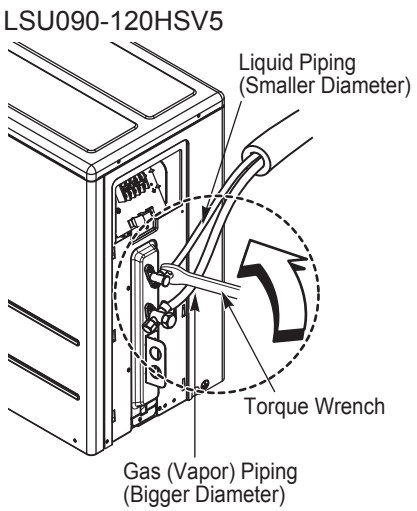

Figure 39: LSU181HSV5 Piping Connections.

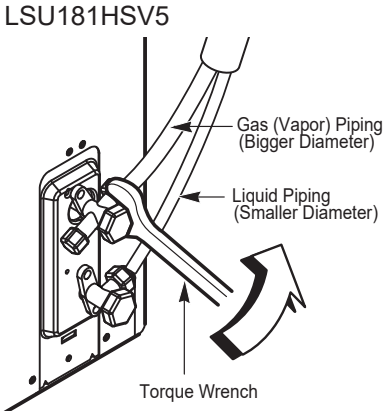

Figure 40: Pipe Attachment.

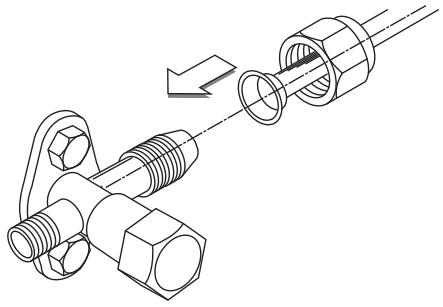

Table 16: Torque Wrench Tightening.

Pipe Size (in. O.D.)	Outside Diameter (mm)	Torque (ft-lbs.)
1/4	6.35	13.0 - 18.0
3/8	9.52	24.6 - 30.4
1/2	12.7	39.8 - 47.7
5/8	15.88	45.4 - 59.3
3/4	19.05	71.5 - 87.5

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REFRIGERANT PIPING CONNECTIONS

Indoor Unit Connections

Removing the Indoor Unit Bottom Cover

To access the indoor unit piping port connections, and to make the indoor unit installation procedure easier, it is recommended that the bottom cover be removed first.

1. Unsnap the bottom cover at its top left and right sides (Location 1).
2. Unsnap each of the three (3) or four (4) small C-hooks located in the middle of the bottom cover (Location 2). Number of C-hooks present depends on model of indoor unit.
3. Lift the three (3) to four (4) hinges on the bottom cover up and out of the channels molded to the left, right, and middle of the indoor unit (Location 3). Number of hinges present depends on model of indoor unit.
4. Set aside the bottom cover to re-install after all procedures are complete.

Figure 41: Removing the Bottom Cover.

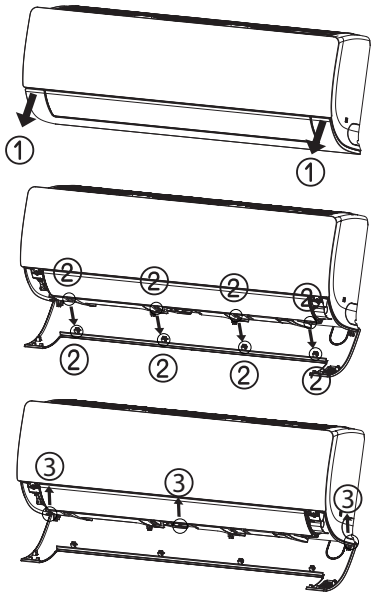
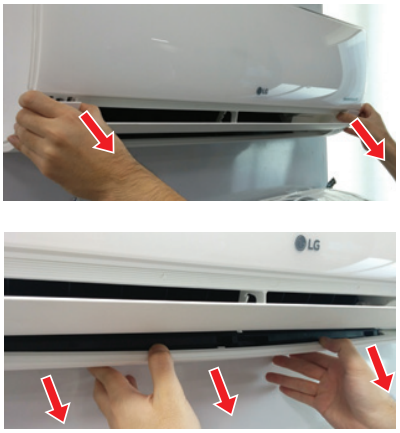


Figure 42: Removing the Bottom Cover, Alternate View.



Accessing and Positioning the Indoor Unit Piping / Connections

1. Unsnap the piping / drain hose holder (L-bracket) out from the indoor unit chassis. Prop it open between the indoor unit chassis and installation plate to separate the bottom of the indoor unit from the wall. This will allow for more working space.

Figure 43: Propping Open the Piping / Drain Hose Holder (L-bracket).

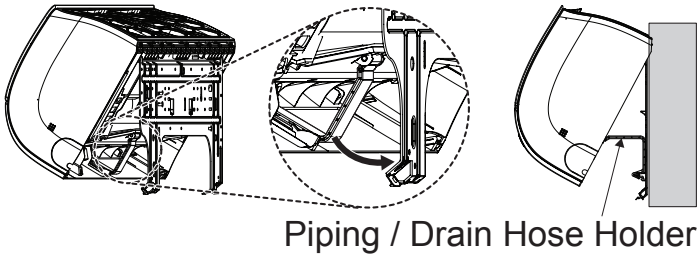
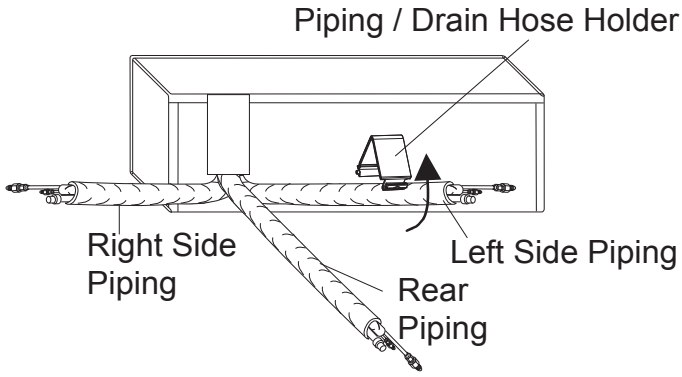
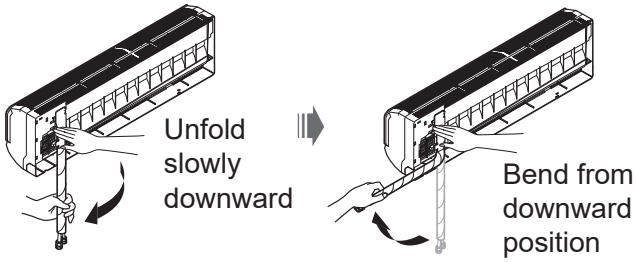


Figure 44: Back of Indoor Unit.



2. Remove the piping port cover.
3. Position the piping by unfolding and bending the piping slowly downward first as shown, then to the left or right (pre-chosen following installation guidelines and application needs) as shown. Secure piping with the piping holder.

Figure 45: Bending Piping at Rear of Indoor Unit.



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Note:

- ⃠ *Do not bend the piping directly backwards or to the left or right sides without bending it downward first; this will damage the indoor unit piping.*
- ⃠ *Do not forcibly press the refrigerant piping onto the bottom frame or the front grille; this will damage the indoor unit piping and / or indoor unit frame.*
- *Ensure the piping is straight.* ⃠ *Do not kink the piping; this will damage the indoor unit and piping.*

Figure 46: Improper Piping Bending.

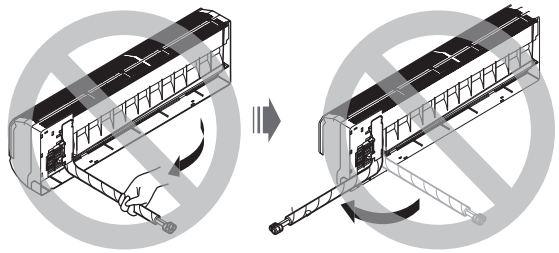
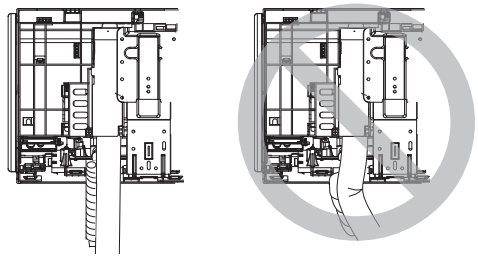


Figure 47: Keep Piping Straight; ⃠ Avoid Kinks.



Piping Installation When Piping is on the Left Side

Note:

- *See the Electrical System Installation section for information on how to connect the communication / connection (power) cable from the outdoor unit.*
- *For left-side piping, it is recommended that the communication / power connections are complete before starting the piping connections.*

1. Insert drain hose on left (feature will differ depending on model of indoor unit).
2. Align the center of the refrigerant piping and corresponding connection as shown on the next page.
3. Place a couple of drops of refrigerant oil on outside of the flare before assembling. ⃠ Do not add any contaminants. Tighten the flare nut initially by hand.
4. Finish tightening the flare nut with a torque wrench until the wrench clicks. Follow torque guidelines in the table on the next page.

Note:

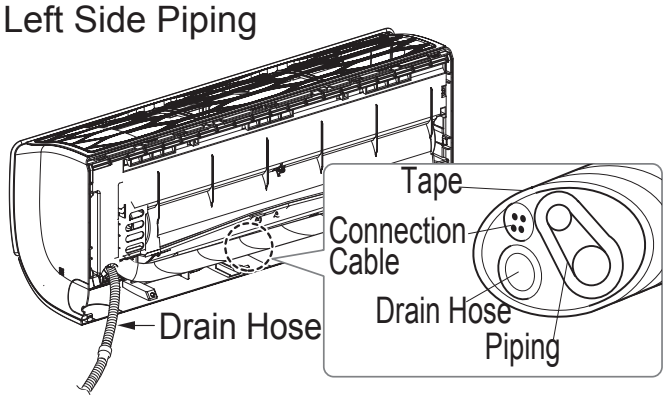
When tightening the flare nut with a torque wrench, ensure the direction for tightening follows the arrow on the wrench.

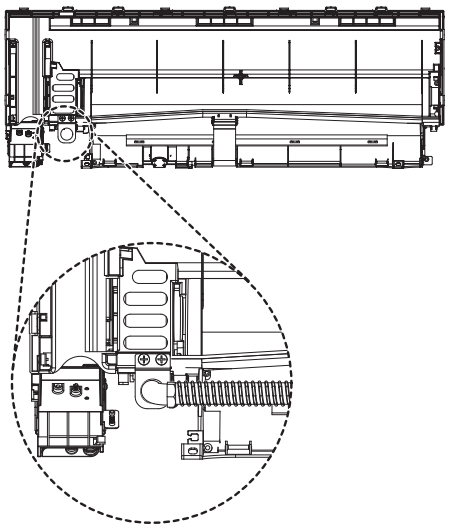
5. Bundle the refrigerant piping, drain hose, and communication / connection (power) cable together. Ensure that the drain hose is located at the bottom of the bundle.
   - If using a conduit for the power wiring / communications cable, see the next page.

Note:

Positioning the drain hose at the top of the bundle can cause condensate to overflow from the drain pan in the inside of the indoor unit.

Figure 48: Piping Installation When Piping is on the Left Side.





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REFRIGERANT PIPING CONNECTIONS

Indoor Unit Connections

Piping Installation When Piping is on the Right Side

Note:

See the Electrical System Installation section for information on how to connect the communication / connection (power) wiring from the outdoor unit.

1. Align the center of the refrigerant piping and corresponding connection as shown.
2. Place a couple of drops of refrigerant oil on outside of the flare before assembling. ⃠ Do not add any contaminants. Tighten the flare nut initially by hand.
3. Finish tightening the flare nut with a torque wrench until the wrench clicks. Follow torque guidelines in the table below.

Note:

When tightening the flare nut with a torque wrench, ensure the direction for tightening follows the arrow on the wrench.

4. Bundle the refrigerant piping, drain hose, and communication / connection (power) cable together. Ensure that the drain hose is located at the bottom of the bundle.
   - If using a conduit for the power wiring / communications cable, see below.

Note:

Positioning the drain hose at the top of the bundle can cause condensate to overflow from the drain pan in the inside of the indoor unit.

Table 17: Torque Wrench Tightening.

Pipe Size (in. O.D.)	Outside Diameter (mm)	Torque (ft-lbs.)
1/4	6.35	13.0 - 18.0
3/8	9.52	24.6 - 30.4
1/2	12.7	39.8 - 47.7
5/8	15.88	45.4 - 59.3
3/4	19.05	71.5 - 87.5

Figure 49: Piping Installation When Piping is on the Right Side.

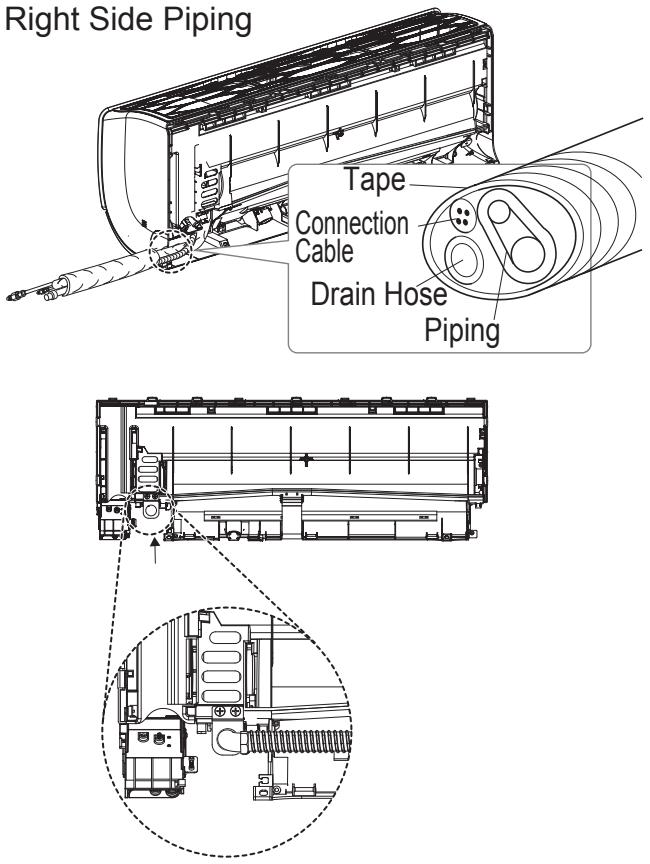
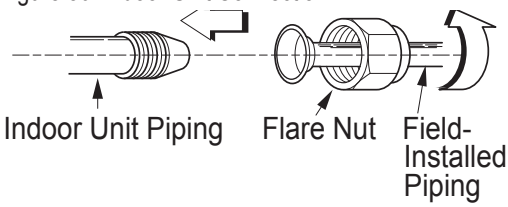


Figure 50: Indoor Unit Connection.



Using a Conduit for Indoor Unit Wiring / Cable Installation

Note:

Use a liquidtight 3/4 inch elbow connector for flexible conduit.

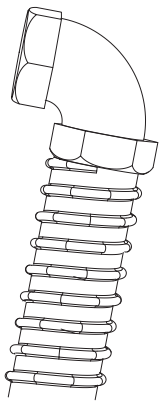
1. Prop indoor unit away from wall bracket.
2. Guide communication / connection (power) cable insulation into the conduit.

Note:

- *Check local, state, and federal codes when choosing a conduit size.*

3. Attach conduit using the liquidtight 3/4 inch elbow connector.
4. Reassemble the indoor unit properly onto the wall bracket.
5. If conduit is not used, see pages in this section for refrigerant piping, condensate drain, power wiring / communication cable bundling information.
6. To protect the piping, condensate drain, and conduit from the elements, add a lineset cover from the indoor access hole to the outdoor unit.

Figure 51: Liquidtight 3/4 Inch Elbow Connector Attached to Flexible Conduit.



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Outdoor Unit Condensate Drain Piping Installation

Depending on the installation location, it could be necessary to install factory-supplied drain plug(s).See pages 12 to 15 for information in reference to outdoor unit placement.

Note:

Ensure drain piping is insulated. Drain water from the defrost mode will freeze and build up in the outdoor unit, impairing heating performance, and even will damage the outdoor unit.

Installing Outdoor Unit Drain Plug / Piping

1. See diagrams at right for drain connection, drain caps, and drain washer locations specific to each outdoor unit. Components and location differ depending on model of outdoor unit.

2. Connect field-supplied vinyl condensate piping to the outdoor unit drain connection. If the field-supplied vinyl piping is too long, position it to prevent kinks.

Figure 52: LSU090-120HSV5 Drain Component Locations.

LSU090-120HSV5

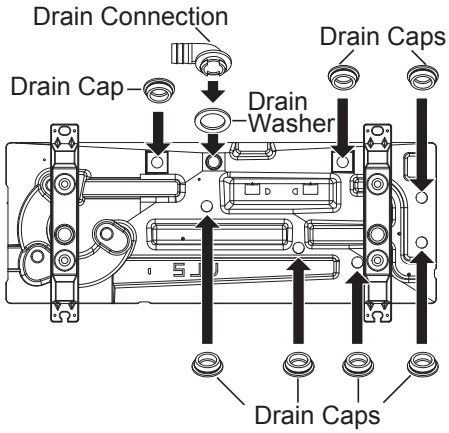
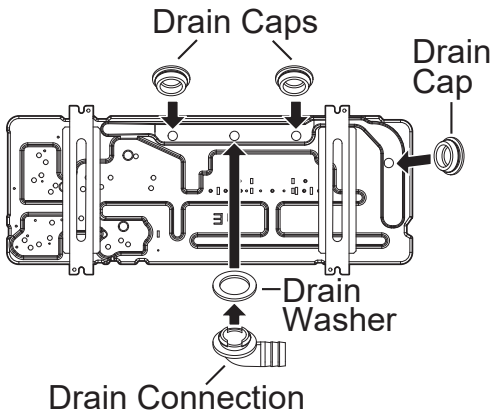


Figure 53: LSU181HSV5 Drain Component Locations.

LSU181HSV5



Note:

Check local codes for materials approved for field-suppled condensate drain piping.

Indoor Unit Condensate Drain Hose Installation

Note:

Refer to the diagrams below and follow proper installation and the position of the drain hose along the refrigerant piping installation path to avoid leaks. After the drain hose is set in place, always follow with leak / pressure testing and deep evacuation procedures of the refrigerant piping to be sure all refrigerant piping is properly installed. Re-check and retest as necessary.

- Remove the drain plug on left or right side depending on the piping installation.
- Insert the drain hose on the left side when left side piping is used; install the drain hose on the right side when right side piping is used.
- Drain hose is routed from the indoor unit through the structure (wall) to the outdoor. It must slope at an angle where it is higher at the indoor unit and lower toward the outdoor area, thereby letting gravity push any condensation down and out.
- The drain hose might need to be extended so that condensate can be properly routed away.
- The drain hose extension must be properly insulated to ensure condensation will not damage walls, floors, etc. Foamed polyethylene or equivalent of at least 5/16 inches thick is required.

Figure 54: Correct Slope Angle for Drain Hose.

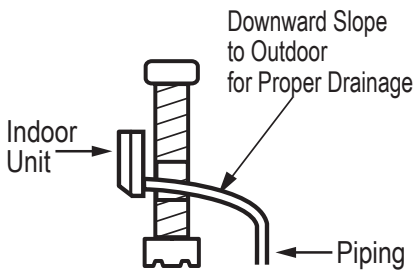
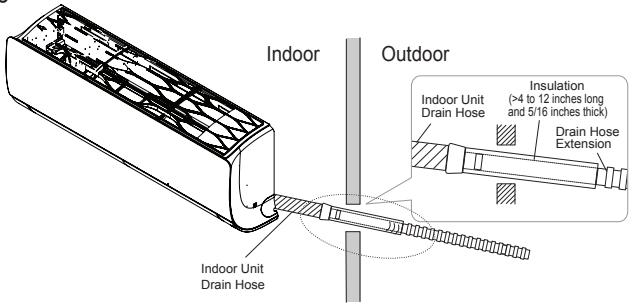


Figure 55: HSV5 Outdoor Unit Drain Hose Extension.



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REFRIGERANT PIPING CONNECTIONS

Indoor Unit Drain Hose

- Insert the drain hose >2 inches so it won't pull out of the field-supplied drain pipe.
- ⃠ Avoid piping the drain hose as shown in the diagrams in the figure below. These methods are incorrect and can cause leaks at the indoor unit site.

Figure 56: Inserting the Drain Hose >2 inches Into the Field-Supplied Drain Pipe.

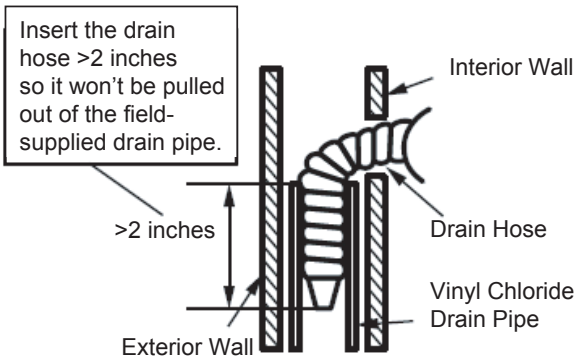
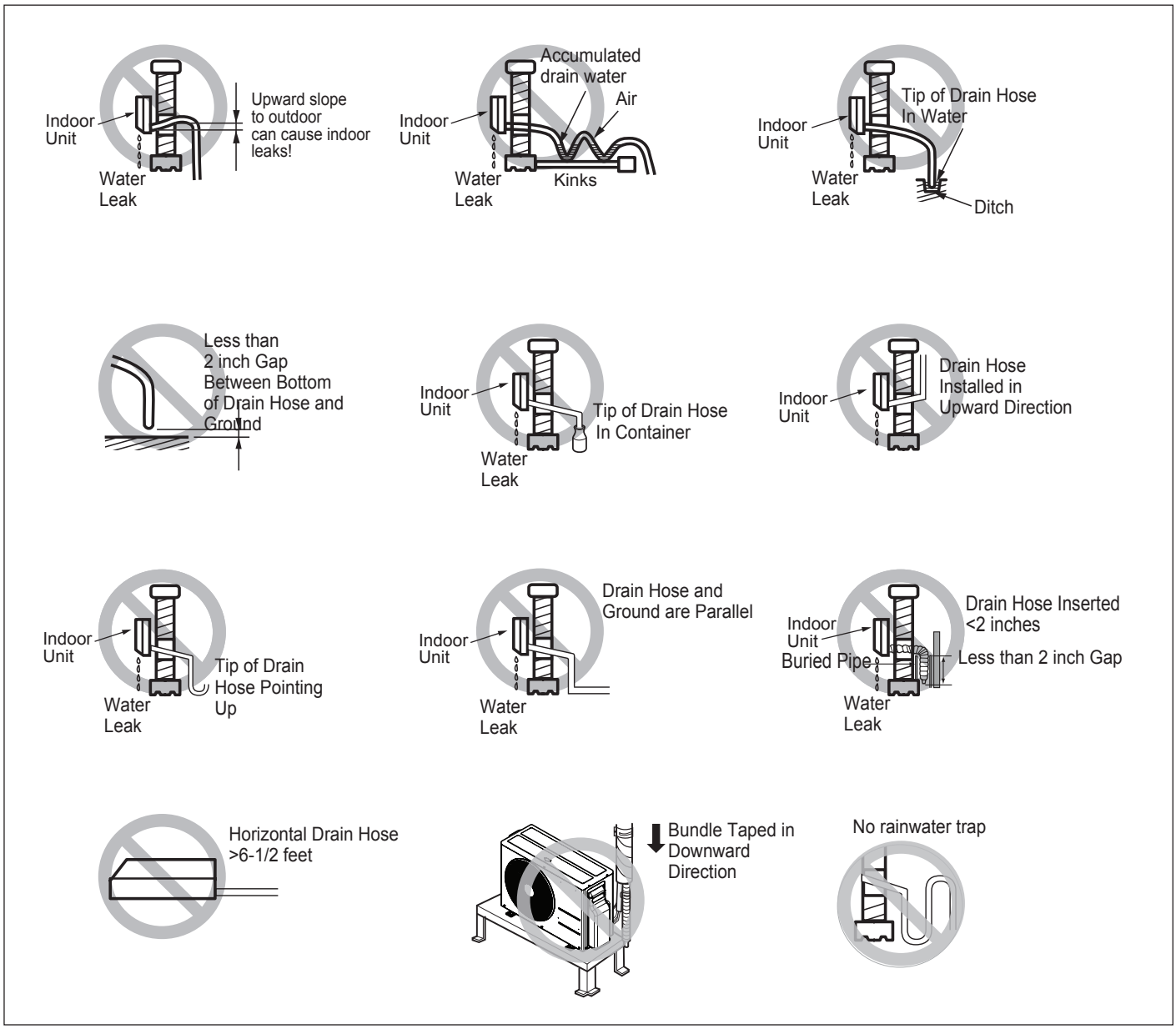


Figure 57: Incorrect Slope Angles for the Drain Hose.



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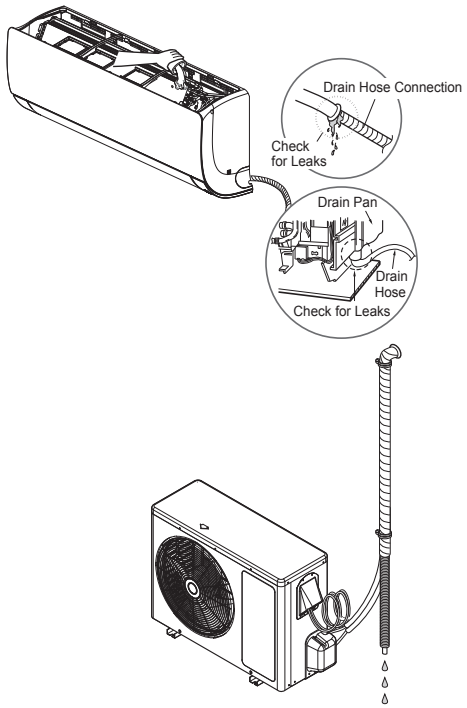
Checking the Indoor Unit Drain Hose for Leaks

1. Pour a glass of water on the evaporator.
2. Verify that the water flows appropriately through and out of the drain hose without any leaks.

Figure 58: Checking for Leaks at the Indoor Unit.



Bundling

If a conduit or piping set cover is not used on the connection from the outdoor unit to the interior, bundle both separately insulated refrigerant pipes, the drain hose, and outdoor unit to indoor unit communication / connection (power) cable together with wide vinyl tape.

1. Both piping must be fully and separately encased in insulation material: Overlap the field installation piping insulation material and the indoor unit piping insulation material.
2. Bind together the two pipes, using vinyl tape. Make sure there are no gaps during the binding.
3. Be sure the cutting line is placed upward.
4. Wrap the rear piping section with narrow vinyl tape.
5. Continue to wrap the indoor unit pipe as connected to the outdoor connection pipe.
6. Using a wider vinyl tape, bundle the piping and drain hose together.
   - Tape must be sufficient to cover the piping in order to fit into the rear piping housing area at the back of the indoor unit.

Note:

- *Always include insulation on all refrigerant and drain piping to ensure condensate does not form and cause damage to walls, floors, etc.*

Figure 59: Bundling the Connection Components (From Outdoor Unit to Indoor Unit)

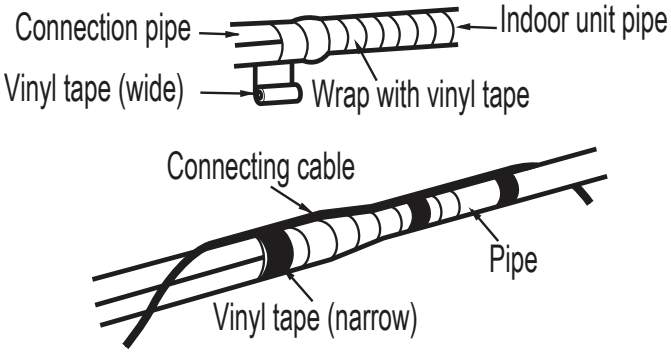
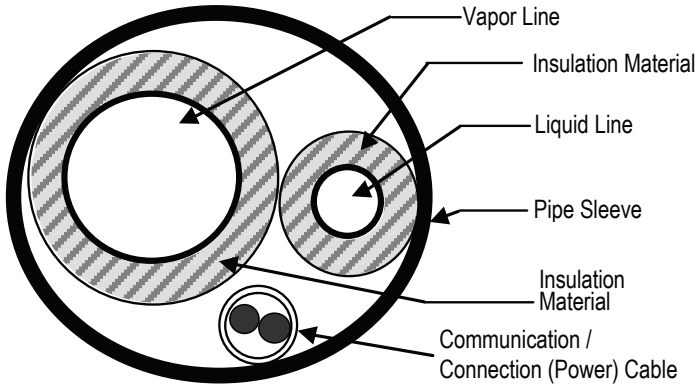


Figure 60: Cutaway of Proper Pipe and Cable Bundling.



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INSULATION

Refrigerant Piping System Insulation

Note:

For information regarding insulation for underground or penetration situations, see the "General Refrigerant Piping System Information" section.

All refrigerant piping from the outdoor unit to the indoor units must be insulated correctly for safety and usage. Refrigerant piping, field-provided isolation ball valves (if present), service valves, and elbows must be properly and completely insulated using closed cell pipe insulation (up to the indoor unit piping connections). To prevent heat loss / heat gain through the refrigerant piping, all refrigerant piping including liquid lines and vapor lines must be insulated separately. Insulation must be a minimum 1/2 inches thick, and thickness will need to be increased based on ambient conditions and local codes. Table on next page lists minimum wall thickness requirements for Ethylene Propylene Diene Methylene (EPDM) insulation.

Inside the outdoor unit, maximum pipe temperature is 248°F and minimum pipe temperature is -40°F. For field insulation of refrigerant piping between outdoor units and indoor units, consider the following pipe temperature ranges for an operating heat pump system:

- Heating mode refrigerant temperature ranges: Liquid = 75-118°F; High Pressure Vapor = 95-220°F
- Cooling mode refrigerant temperature ranges: Liquid = 75-118°F; Low Pressure Vapor = 40-90°F

All insulation joints must be glued with no air gaps. Insulation material must fit snugly against the refrigeration pipe with no air space between it and the pipe. ⃠ Do not allow insulation passing through pipe hangers, inside conduit, and/or sleeves to be compressed. Protect insulation inside hangers and supports with a second layer. All pipe insulation exposed to the sun and outdoor elements must be properly protected with PVC, aluminum vapor barrier, or alternatively placed in a weather-resistant enclosure such as a pipe rack with a top cover; and meet local codes.

Figure 61: Typical Pipe Insulation, Power Wire and Communications Cable Arrangement.

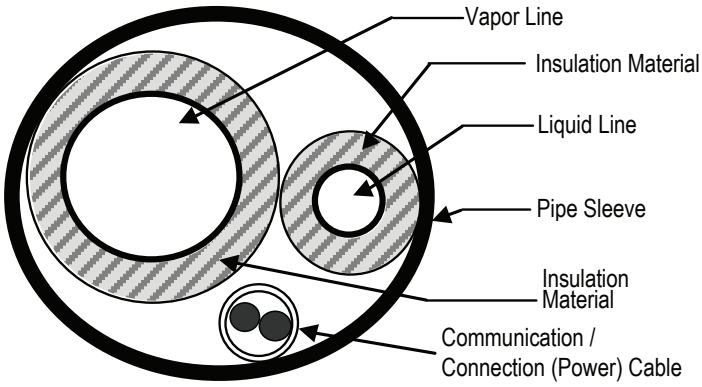


Figure 62: Typical Insulation Butt-Joint at Indoor Unit Casing.

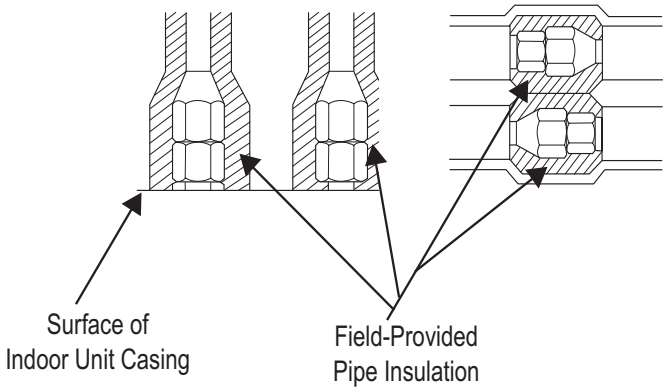
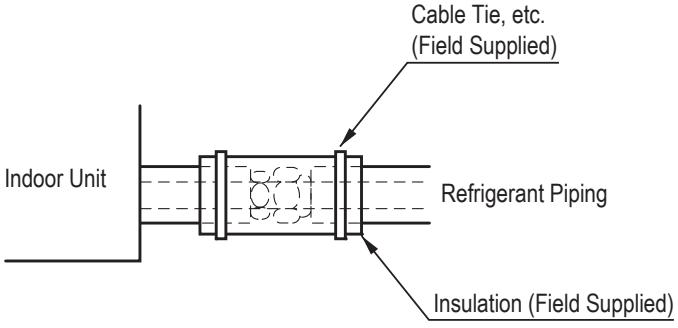


Figure 63: Typical Refrigerant Flare Fitting Insulation Detail.

Figure 64: Insulating the Shut Off / Insulation Ball Valve (If Present).



Note:

Always include plenty of insulation on all refrigerant and drain piping to ensure condensate does not form and cause damage to walls, floors, etc.

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Minimum Refrigerant Pipe Ethylene Propylene Diene Methylene (EPDM) Insulation Wall Thickness Requirements

Note:

- ⃠ *Do not insulate gas and liquid pipes together as this can result in pipe leakage and malfunction due to extreme temperature fluctuations.*
- *Always properly insulate the piping. Insufficient insulation will result in condensation, reduced heating/cooling performance, etc. Also, if the pipes aren't insulated properly, condensation could potentially cause damage to building finishes. Pay special attention to insulating the pipes installed in the ceiling plenum.*
- *Fully insulate the piping connections.*
- *Follow locals codes and the designer's instructions when selecting ethylene propylene diene methylene (EPDM) insulation wall thickness.*

Table 18: Minimum Refrigerant Pipe EPDM Insulation Wall Thickness Requirements.[1]

<table>
<tr><th colspan="2" rowspan="2">Classification / Piping O.D.</th><th colspan="2">Air-conditioned location</th><th colspan="2">Non-air conditioned location</th></tr>
<tr><th>1. Typical Conditioned Location</th><th>2. Special Conditioned Location</th><th>3. Typical Unconditioned Location</th><th>4. Special Unconditioned Location</th></tr>
<tr><td rowspan="3">Liquid pipe</td><td>ø1/4 inch</td><td rowspan="2">>1/2 inches</td><td rowspan="2">>1/2 inches</td><td rowspan="2">>1/2 inches</td><td rowspan="2">>1/2 inches</td></tr>
<tr><td>ø3/8 inch</td></tr>
<tr><td>≥ø1/2 inch</td><td>>1/2 inches</td><td>>1/2 inches</td><td>>1/2 inches</td><td>>1/2 inches</td></tr>
<tr><td rowspan="12">Vapor pipe</td><td>ø3/8 inch</td><td rowspan="7">>1/2 inches</td><td rowspan="8">>3/4 inches</td><td rowspan="8">>3/4 inches</td><td rowspan="12">>1 inch</td></tr>
<tr><td>ø1/2 inch</td></tr>
<tr><td>ø5/8 inch</td></tr>
<tr><td>ø3/4 inch</td></tr>
<tr><td>ø7/8 inch</td></tr>
<tr><td>ø1 inch</td></tr>
<tr><td>ø1-1/8 inches</td><td rowspan="5">>3/4 inches</td></tr>
<tr><td>ø1-1/4 inches</td><td rowspan="5">>1 inch</td><td rowspan="5">>1 inch</td></tr>
<tr><td>ø1-3/8 inches</td></tr>
<tr><td>ø1-1/2 inches</td></tr>
<tr><td>ø1-3/4 inches</td></tr>
</table>

[1]The thickness of the above insulation material is based on heat conductivity of 0.61 Btu/in/h/ft²/°F.

1. Typical Conditioned Location

A building plenum or space that contains conditioned air that does not exceed 80°F DB.

2. Special Conditioned Location

1. When the location is air conditioned, but there is severe temperature/humidity difference due to high ceilings.
   - Church, auditorium, theater, lobby, etc.
2. When the location is air conditioned, but internal temperature/humidity are high.
   - Bathroom, swimming pool, locker room, etc.

3. Typical Unconditioned Location

An unconditioned space inside a building.

4. Special Unconditioned Location: If conditions 1 and 2 below are present.

1. An unconditioned space or plenum of a building.
2. An area where there is an elevated humidity level.

5. Additional Insulation for Indoor Units May be Required in Humid Environments.

The air conditioner factory insulation has been tested according to "ISO Conditions with Mist," and it satisfies the requirements. If the system has been operating for a long time in a high humidity environment (dew point temperature: more than 73°F), condensate is likely to form. If this happens, install 3/8 inch thick EPDM insulation that is plenum-rated with a heat-resistance factor of more than 248°F.

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ELECTRICAL SYSTEM INSTALLATION

Safety Guidelines / Connections and Specifications

⚠ WARNING

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

Note:

- *Consider ambient conditions (temperature, direct sunlight, inclement weather, etc.) when selecting, installing, and connecting the power wiring.*
- *Properly ground the Single Zone outdoor and indoor unit. Improperly connected ground wire can cause communication problems from electrical noise and motor current leakage. Ground wiring must always be installed by a trained technician.*
- *Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and NEC regulations related to electrical equipment and wiring, and following the instructions in this manual. Using an oversized breaker or fuse will result in equipment malfunction and property damage.*
- ⃠ *Do not connect ground wire to refrigerant, gas, or water piping; to lightning rods; to telephone ground wiring; or to the building plumbing system. Failure to properly provide a NEC-approved earth ground can result in property damage and equipment malfunction.*
- ⃠ *Do not operate the air conditioning system until the refrigerant piping installation is complete. Operating the system before refrigerant piping is finalized will damage the compressor.*

Power Wiring / Communication Cable Connections

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

To Install a Ring or Fork Terminal:

1. Trim the wiring with wire cutters or pliers, then strip the insulation to expose the strand wiring to about 3/8 inches.
2. Using a ring terminal fastener or pliers, securely clamp a ring terminal to each stripped wire end.

Figure 65: Close up of a Typical Ring Terminal.

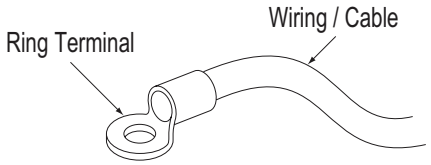
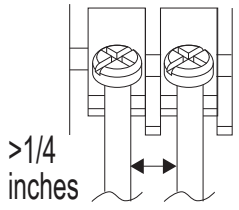


Figure 66: Distance Between the Terminal Connections.



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Power Wiring / Communication Cable Connections, continued

To Connect the Wiring to the Terminals:

1. Remove the JIS terminal screws from the (outdoor unit or indoor unit) terminal plate with a JIS screwdriver. (See information about LG terminal connections below.)
2. Position the ring terminal around the terminal, place the terminal screw in the ring, and tighten to the terminal plate using a JIS screwdriver.
   - Firmly attach the wire; secure in a way to prevent external forces from being imparted to the terminal block.
   - Use an appropriately sized JIS screwdriver for tightening the terminals.
   - ⃠ Do not overtighten the connections; overtightening will damage the terminals.

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

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

Figure 67: Adding a Ring Terminal to the Wiring.

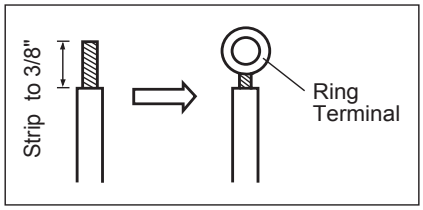
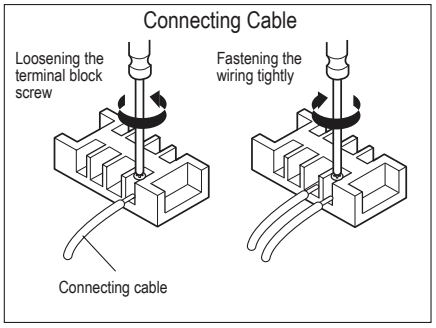


Figure 68: Tightening the Ring Terminal to the Terminal Plate.



⚠WARNING

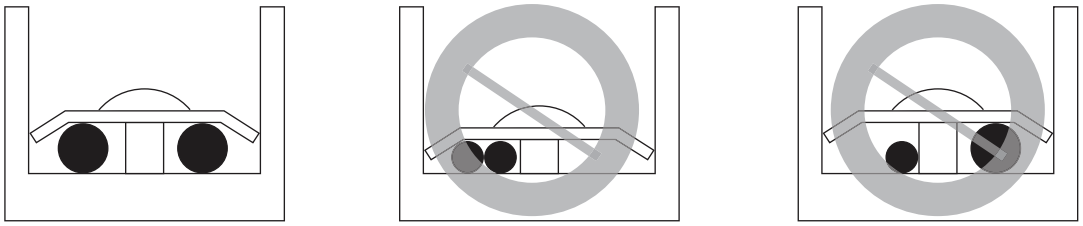
If power wires are not properly terminated and firmly attached, there is risk of fire, electric shock, and physical injury or death.

Note:

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

Figure 69: Proper and Improper Power Wiring Connections.

● :Copper Wire



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

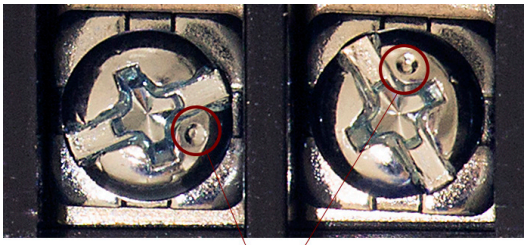
⃠ Do not terminate two wires on one side.

⃠ Do not terminate different gauge wires to a terminal block.

Terminal 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. ⃠ Do not overtighten the connections — overtightening will damage the terminals — but firmly and securely attach the wiring in a way to prevent external forces from being imparted to the terminal block.

Figure 70: JIS Screws.



JIS DIMPLES

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."*
- ⃠ *Do not include splices or wire nuts in the communication cable.*

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ELECTRICAL SYSTEM INSTALLATION

Connections and Specifications

Power Supply / Power Wiring Specifications

- LG Single Zone systems operate at 1Ø, 208-230V, 60Hz.
- Power wiring / power wiring gauge to the outdoor unit(s) must be solid or stranded, and must comply with all National Electrical Code (NEC), UL, and local electrical codes.
- The indoor unit is powered by the outdoor unit.
- Power supply, wire types and sizes, and circuit breaker must be selected based on NEC, UL, and local codes. Maximum allowable voltage fluctuation ±10% or nameplate rated value.
- Properly ground the outdoor unit and indoor unit per NEC, UL, and local codes.
- Ground wire must be longer than the common power / communication wires.
- Connect the wiring firmly so the wires cannot be easily pulled out.
- Refer to the inside of the chassis cover or control cover for circuit and terminal block diagrams.
- Always match color codes of each wire and follow wiring diagram.
- ⃠ Do not install power wiring to the outdoor unit and the communication / connection (power) cable to the indoor unit in the same conduit. Use separate conduits.

Figure 71: Single Zone Outdoor Unit Power Wiring Diagram.

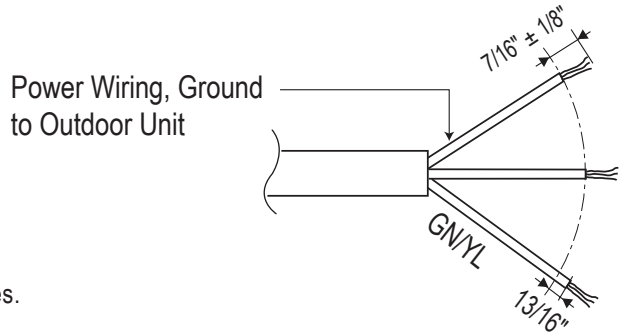

Figure 72: Power Wiring Conduit.

⚠DANGER

Refer to Electrical Data table for ampere ratings. Properly size all circuit breakers / fuses, wiring and field provided components per local codes. There is risk of fire, electric shock, explosion, physical injury or death.

⚠WARNING

- *All power wiring installation must be performed by trained service providers working in accordance with local, state, and NEC regulations related to electrical equipment and wiring, and following the instructions in this manual. Failure to do so will lead to electric shock and bodily injury or death.*
- *Use specified wiring for connections, and ensure that external force is not imparted to terminal connections. It will generate heat and / or cause a fire, resulting in physical injury or death.*
- *Use heat-proof electrical wire capable of withstanding temperatures up to 167°F to avoid wiring malfunction and electrical shock, which will cause physical injury or death.*
- *Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and NEC regulation related to electrical equipment and wiring, and following the instructions in this manual. Generated overcurrent will include some amount of direct current. Using an oversized breaker or fuse will result in electric shock, physical injury or death.*
- *Use the appropriate type of overcurrent protection. Generated overcurrent will include some amount of direct current, and if the appropriate type of overcurrent protection is not installed, there is a risk of fire, electric shock, and physical injury or death.*
- *Ground wiring is required to prevent accidental electrical shock during current leakage, communication problems from electrical noise, and motor current leakage. ⃠ Do not connect the ground line to the pipes. There is risk of fire, electric shock, explosion, physical injury or death.*
- *Per code, install a main indoor breaker, and an outdoor service disconnect that interrupts all power sources simultaneously. There is risk of fire, electric shock, explosion, physical injury or death.*

Note:

- *If there is a possibility of momentary blackout, or the power goes on and off while the system is operating, install a field-supplied phase loss protection circuit. If not, the compressor and other components will be damaged.*
- *Use heat-proof electrical wire capable of withstanding temperatures up to 167°F to avoid damage to unit.*
- *Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and NEC regulations related to electrical equipment and wiring, and following the instructions in this manual. Generated overcurrent will include some amount of direct current. Using an oversized breaker or fuse will result in equipment malfunction and property damage.*
- ⃠ *Do not connect ground wire to refrigerant, gas, or water piping; to lightning rods; to telephone ground wiring; or to the building plumbing system. Failure to properly provide a NEC approved earth ground can result in property damage and equipment malfunction.*

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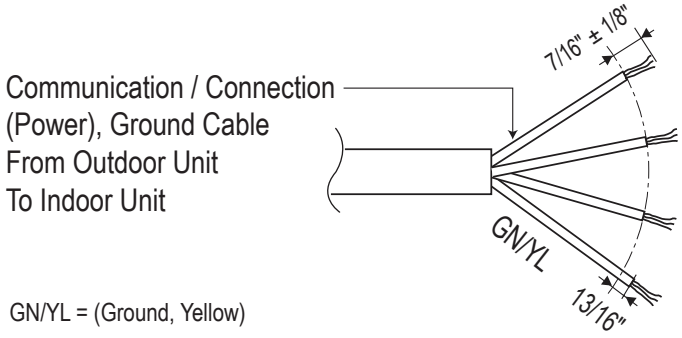
Communication / Connection (Power) Cable Specifications from Outdoor Unit to Indoor Unit

- For communication / connection (power) wires between the Single Zone outdoor unit and the indoor unit, use a minimum 14 gauge, four (4) conductor, stranded, shielded or unshielded wire. If shielded, the wire must be grounded to the chassis at the outdoor unit only.
- Insulation material as required by local code.
- Firmly attach the cable; provide slack but secure in a way to prevent external forces from being imparted on the terminal block.
- Wiring must be completed without splices.

Figure 73: Typical Single Zone Outdoor Unit to Indoor Unit Wiring and Communications Cable Diagram.



GN/YL = (Ground, Yellow)

⚠ WARNING

All power wiring and communication cable installation must be performed by trained service providers working in accordance with local, state, and National Electrical Code (NEC) / UL / ETL federal regulations related to electrical equipment and wiring, and following the manufacturer product diagrams, requirements, and instructions in this manual. Failure to do so will lead to electric shock which can cause physical injury or death.

Note:

- *Always verify the communication cable is connected to a communications terminal on the Single Zone unit. ⃠ Never apply line voltage power to the communication cable connection. If contact is made, the PCBs will be damaged.*
- *The shield of the communications cable connecting the outdoor unit to the indoor unit must be grounded only to the outdoor unit frame.*
- *Tie the shield of each cable segment together using a wire nut at the indoor unit. Maintain polarity throughout the communication network.*
- *Position the incoming power to the outdoor unit away from the power / communications cables from the outdoor unit to the indoor unit.*
- ⃠ *Never use a common multiple-core communications cable.*

Figure 74: Typical LS090-120HSV5 Power / Communication System Diagram.

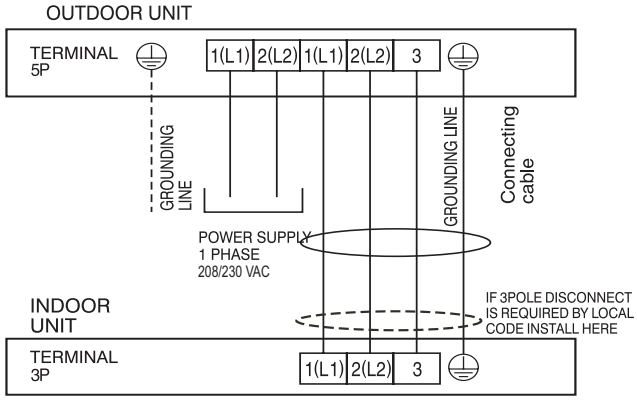
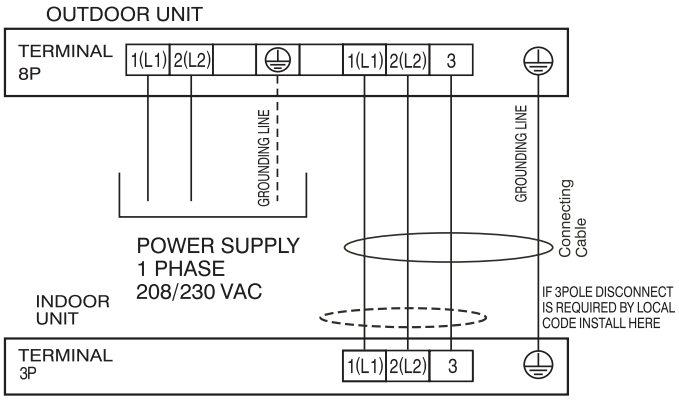


Figure 75: Typical LS181HSV5 Power / Communication System Diagram.



Note:

- *Use of 14 gauge, four (4) conductor, stranded, shielded or unshielded wire is allowed for lengths up to the published maximum pipe length, plus recommended slack at both ends.*

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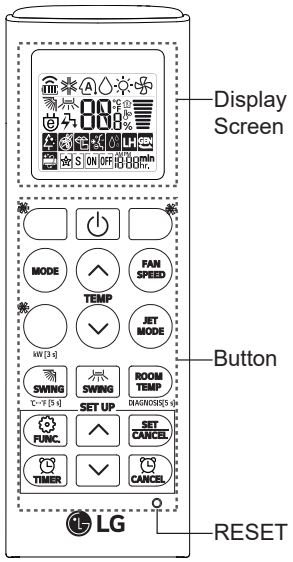
ELECTRICAL SYSTEM INSTALLATION

Controller Options

Controller Options

Single Zone High Efficiency Standard Wall Mount systems include a wireless handheld remote controller (Model No. AKB74955602), but optional LG-suppled wired controllers are available. See “Functions, Controls, Options” in the Engineering Manual, or contact an LG representative for more information.

Figure 76: Example of a Wireless Handheld Remote Controller. Buttons will differ depending on model type.



Wireless Handheld Remote Controller features:

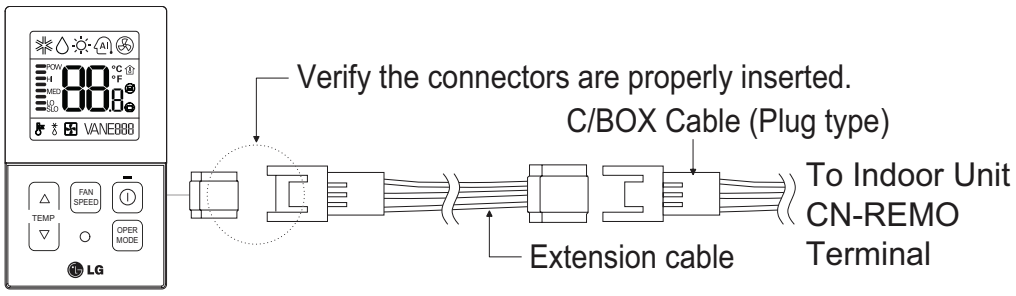
- Display Panel: Displays operation conditions.
- On / Off Button: Turns system operation on and off.
- Mode Button: Selects the operation mode: Cooling, Heating, Auto, Dry (Dehumidification), or Fan.
- Temp Up / Down Buttons: Adjusts the desired room temperature in the different modes.
- Fan Speed Button: Sets desired fan speed.
- Reset: Initializes the handheld remote control settings.

Wired Controller Connections

Optional controllers (see the Single Zone High Efficiency Standard Wall Mount Engineering Manual, or contact an LG representative for more information) can connect to the Single Zone High Efficiency Standard Wall Mount indoor unit in one of two different ways.

1. LG Wired Remote Extension Cable with Molex plug (PZCWRC1; sold separately) that connects to the CN-REMO terminal on the indoor unit PCB.
2. Field-supplied controller cable that connects to the indoor unit terminal block (must be at least UL2547 or UL1007, and at least FT-6 rated if local electric and building codes require plenum cable usage). Communication cable from indoor unit to remote controller(s) is to be 22 AWG, 3-conductor, twisted, stranded, unshielded. Wiring must comply with all applicable local and national codes.

Figure 77: PZCWRC1 LG Wired Remote Extension Cable.



Note:

When using field-supplied controller cable, make sure to connect the yellow to yellow (communications wire), red to red (12V power wire), and black to black (ground wire) terminals from the remote controller to the indoor unit terminal blocks.

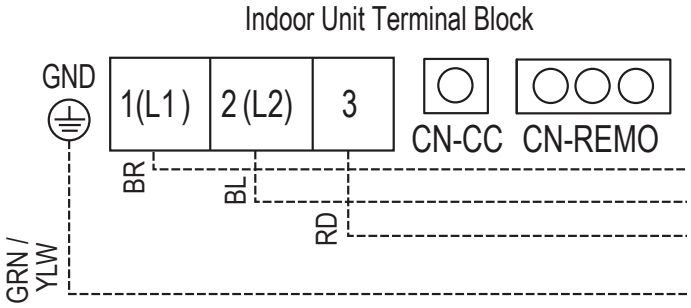
Dry Contact

A Dry Contact can also be connected to the High Efficiency indoor unit using the CN-CC connection on the indoor unit PCB. The Dry Contact DC is shipped with a specific connector that is used to connect to the indoor unit.

Central Controller

Additionally, Single Zone High Efficiency systems can be connected to a central controller if a PI-485 VNet Accessory is installed in the outdoor unit. See the Central Controller manual for wiring specifications.

Figure 78: Wired Controller Connections on the Indoor Unit Terminal Block.



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Connecting Indoor Unit Electrical Wiring

⚠ WARNING

- *Verify that main power to the unit is completely off before proceeding with these steps as there is a risk of electrical shock, bodily injury, and / or death.*
- *Follow all safety and warning information outlined at the beginning and throughout this manual. Failure to do so will cause electrical shock, bodily injury, and / or death.*

Note:

- *Follow all safety and warning information outlined at the beginning and throughout this manual. Failure to do so will cause unit failure.*
- *Connect the communication / connection (power) cable to the indoor unit by matching the terminals on the outdoor unit control board. Verify the color of the wires at the outdoor unit, along with the terminal numbers, match those for the indoor unit.*
- *Images are representative; actual appearance will vary.*
- *Refer to the circuit diagram on the indoor unit bottom cover.*

Figure 79: Steps to Removing the Bottom Cover.

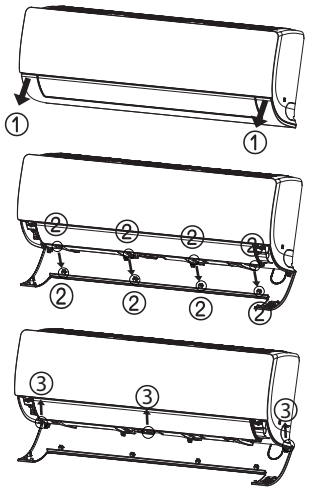
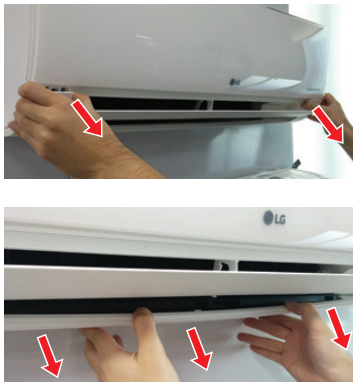
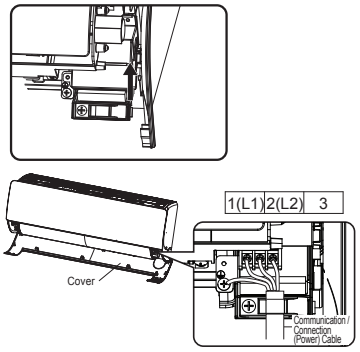


Figure 80: Removing the Bottom Cover (Appearances Will Vary Depending on Indoor Unit Model).



1. The bottom panel must have already been removed. If it hasn't been removed, unsnap the bottom cover at its top left and right sides (Location 1).
2. Unsnap each of the three (3) or four (4) small C-hooks located in the middle of the bottom cover (Location 2). Number of C-hooks present depends on model of indoor unit.
3. Lift the three (3) to four (4) hinges on the bottom cover up and out of the channels molded to the left, right, and middle of the indoor unit (Location 3). Number of hinges present depends on model of indoor unit.
4. Set aside the bottom cover to re-install after all procedures are complete.
5. Terminal block is located at the front bottom-right—hand side of the indoor unit. To access the terminals, unscrew the metal control cover screw (if applicable), and raise the metal control cover.
6. Using a JIS screwdriver, connect the cable terminals to the terminal block. Ensure wire color and terminal number of the indoor unit matches those of the outdoor unit. Refer to the wiring diagram on the inside of the bottom cover.

Figure 81: Location of the Indoor Unit Terminal Block.



Note:

- *Each wire must be securely attached to the terminal block.*
- *Ground cable must be longer than the other wires.*
- *Secure the cable onto the control board using a cable tie.*
- *Use a conduit to protect the cable / refrigerant piping from the indoor unit to the outdoor unit.*

Figure 82: Terminal Cover Down.

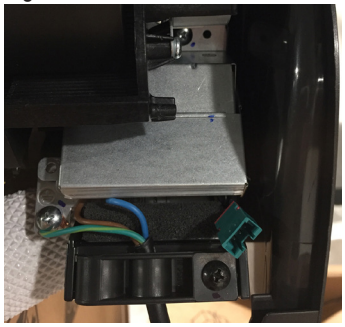
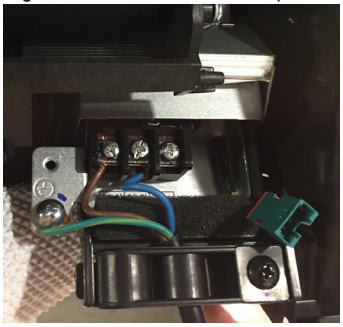


Figure 83: Terminal Cover Up.



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ELECTRICAL SYSTEM INSTALLATION

Indoor Unit Electrical Connections

Connecting Indoor Unit Electrical Wiring, continued.

7. Choice of the cable path out of the indoor unit and to the outdoor unit depends on refrigerant piping / drain hose installation: left side piping, following back of indoor unit; right side piping, through the knockout hole; or rear piping.

Cable Installation When Piping is on the Left Side:

- Insert the communication / connection (power) cable through the bottom of the indoor unit,
- Connect the terminals to the terminal block.
- Secure the cable onto the terminal block with the cable retainer.
- Secure the refrigerant piping, drain hose, and communication / connection (power) cable together using cable ties and conduit, or by the bundling method.

Note:

Position the drain hose at the bottom. Positioning the drain hose at the top of the bundle can cause condensate to overflow from the drain pan in the inside of the indoor unit.

Cable Installation When Piping is on the Right Side:

- Connect the terminals to the terminal block.
- Secure the cable onto the terminal block with the cable retainer.
- Secure the refrigerant piping, drain hose, and communication / connection (power) cable together using cable ties and conduit, or by the bundling method.

Note:

Position the drain hose at the bottom. Positioning the drain hose at the top of the bundle can cause condensate to overflow from the drain pan in the inside of the indoor unit.

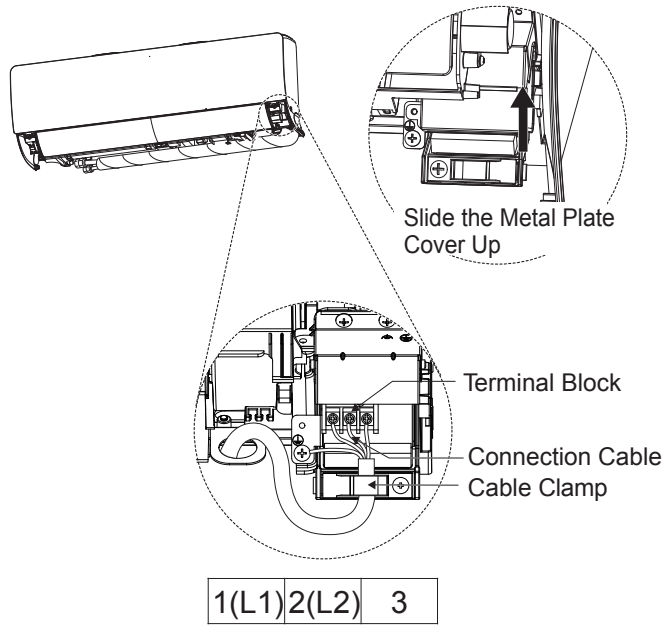
Note:

For more information on conduits or the bundling method, see the Refrigerant Piping Connection section.

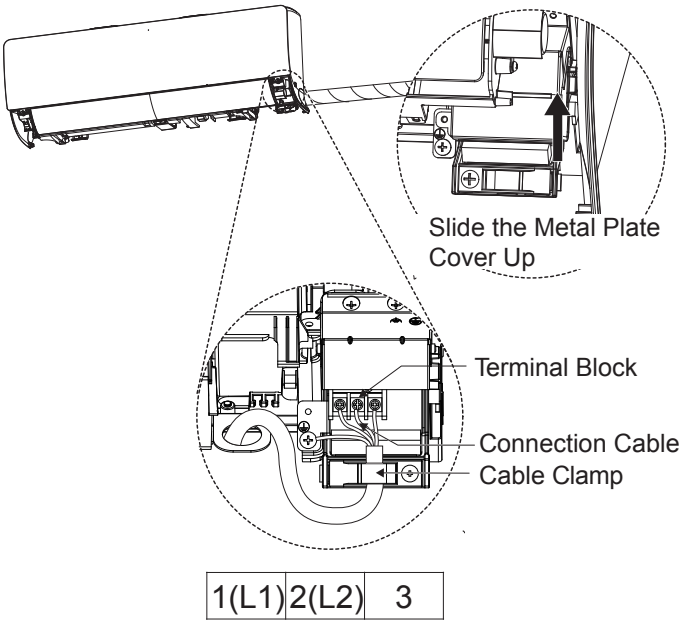
8. Reattach the metal control cover using the screw (if applicable).

Figure 84: Cable / Refrigerant Piping / Drain Hose Installation Options.

Wiring When Piping is on the Left Side



Wiring When Piping is on the Right Side



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Connecting Outdoor Unit Wiring

⚠ WARNING

- *Verify that main power is completely off and that no power is going through the Single Zone system before proceeding with these steps. Follow all safety and warning information outlined at the beginning of this manual. Failure to do so will cause electric shock, bodily injury and / or death.*
- *Per code, install a main indoor breaker, and an outdoor service disconnect that interrupts all power sources simultaneously. There is risk of fire, electric shock, explosion, physical injury or death.*
- *Verify that the circuit breaker or some other emergency power cutoff device is in place before any power wiring is done to the system. Failure to do so will cause electric shock, bodily injury and / or death.*
- ⃠ *Never touch any power lines or live cables before all power is cutoff to the system. To do so will cause bodily injury or death.*

1. Using a Phillips head screwdriver, remove the piping / control box cover or control box cover (depends on model) from the outdoor unit.

2. Inspect all wiring inside the chassis to be sure they are secure and have not loosen during transportation and installation of the outdoor unit. Inspect wires for damage or cracks.

⚠ WARNING

Loose, damaged, or cracked wires will cause electric shock, bodily injury and / or death.

Note:

Loose wires can cause the wiring to burn out, damaging the outdoor unit.

3. Confirm that electrical power supply capacity will be sufficient to run the unit. Verify that a circuit breaker and service disconnect are installed. See the Electrical table in the Product Data section for details on electrical requirements.

⚠ WARNING

Per code, install a main indoor breaker, and an outdoor service disconnect that interrupts all power sources simultaneously. There is risk of fire, electric shock, explosion, physical injury or death.

4. Confirm that the right gauge size is used for all wiring. Follow all federal, state, and local codes related to wiring.

5. Guide the power wiring to the outdoor unit, and communications / connection (power) cable from the outdoor unit to the indoor unit, through the conduit holes on the outdoor unit or control box cover (see images below and on the next page). Install conduits to protect the wiring and cable.

Figure 85: Circuit Breaker.

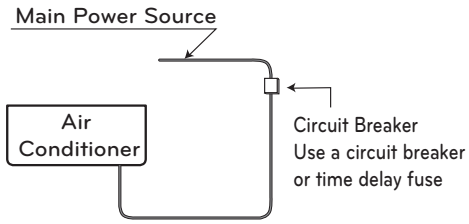


Figure 86: Accessing LSU090-120HSV5 Outdoor Unit Wiring Connections.

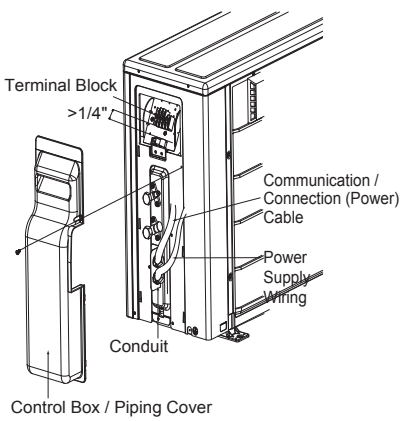
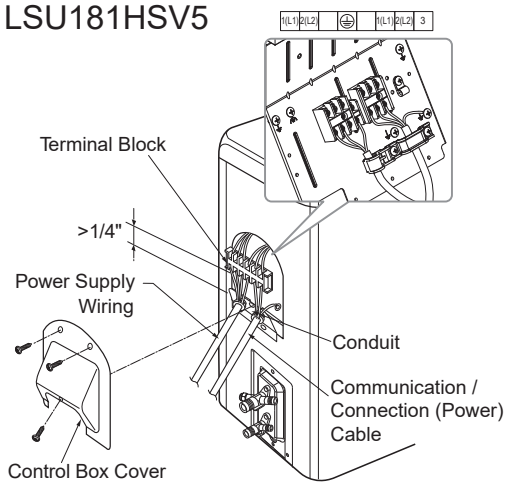


Figure 87: Accessing LSU181HSV5 Outdoor Unit Wiring Connections.



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ELECTRICAL SYSTEM INSTALLATION

Outdoor Unit Electrical Connections

Connecting Outdoor Unit Wiring, continued.

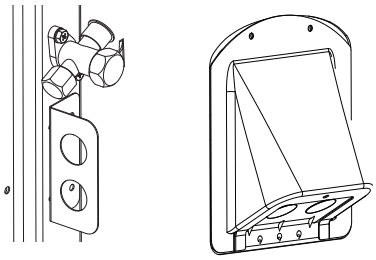
Note:

⃠ Do not install power wiring to the outdoor unit and the communication / connection (power) cable to the indoor unit in the same conduit. Use separate conduits. Communication problems will occur.

Figure 88: Example of Conduit.

Figure 89: HSV5 Outdoor Unit Conduit Holes.

LSU090-120HSV5 LSU181HSV5



6. Using a JIS screwdriver, connect wires as shown at right. See also indoor unit wiring diagram found on its bottom cover, and outdoor unit wiring diagram on the inside of its chassis cover.
   - Each wire must be individually and securely attached to each terminal.

⚠WARNING

Loose, damaged, or cracked wires will cause electric shock, bodily injury and / or death.

Note:

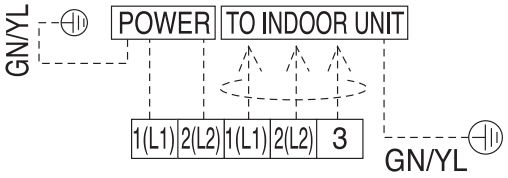
Loose wires can cause the wiring to burn out, damaging the outdoor unit.

- *Secure wiring / cables with cable ties.*
- *Pay attention to the location / connection of the ground cable.*
- *Maintain a minimum of 1/4 inches of wire length from terminal block to cable bundle.*

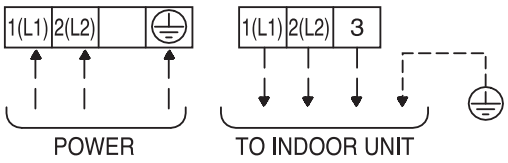
7. When finished, reattach the piping / control box cover or control box cover (depends on model) to the outdoor unit with the screws.

Figure 90: Outdoor Unit Electrical Connections.

LSU090-120HSV5 Outdoor Unit Terminal Block



LSU181HSV5 Outdoor Unit Terminal Block



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Triple Leak / Pressure Test

After the refrigerant piping installation is complete, perform a triple leak / pressure test. Triple leak / pressure test is performed between the outdoor unit and indoor unit to verify that refrigerant can flow through the system without danger of leaks or pressure losses. Air and moisture that is left in the piping can lead to undesirable results and can cause damage to the system. It is important to go through a complete leak / pressure cycle to be sure that the refrigerant piping is cleared out. This process will have to be repeated if any air or moisture be is found to remain in the piping.

Note:

Insufficient or incorrectly done air purging will lead to the following:

- *Pressure in the system can rise.*
- *Operating current can rise.*
- *Inefficient cooling or heating mode capability.*
- *Moisture in the refrigerant circuit will freeze and block capillary tubing.*
- *Water can lead to corrosion of parts in the system.*

⚠DANGER

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

Note:

- *⃠ Never perform the leak test using refrigerant.*
- *⃠ To avoid nitrogen entering the refrigerant system in a liquid state, the top of the cylinder must be higher than its bottom (used in a vertical standing position) when the system is pressurized.*
- *Use only a leak-free gauge manifold set.*
- *Piping system must not be pressured to more than 550 psi. Pressures greater than 550 psi will damage the piping system and cause unit malfunction.*

Triple Leak / Pressure Check Procedure

1. After the refrigerant piping installation is complete, open the isolation ball valves, if any, that will have been included in the piping system.

2. Verify that both the liquid and gas (vapor) suction line outdoor unit service ports are closed, and the stem head access caps are tight. The leak / pressure check is to be performed only to the refrigerant piping system and the connected indoor unit.

3. Remove the cap on the gas (vapor) suction line Schrader port. Connect the (medical-grade dry) nitrogen cylinder regulator to a gauge manifold, then connect the gauge manifold to the gas (vapor) suction Schrader port on the service port.

4. Perform the leak / pressure check at 150 psig for fifteen (15) minutes (standing pressure check).

5. Perform the leak / pressure check at 300 psig for thirty (30) minutes (standing pressure check).

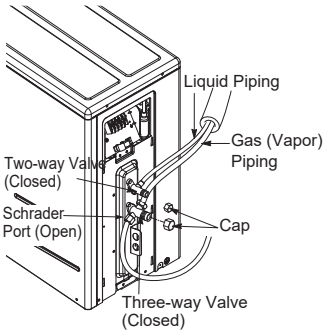
6. Perform the leak / pressure check at 550 psig for one (1) hour to make sure the piping system is leak-free. After the gauge reading reaches 550 psig, isolate the system by first closing the gauge manifold, then close the nitrogen cylinder valve. Check the flared (and any brazed connections) for leaks by applying a bubble solution to all joints.

Note:

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

Figure 91: Outdoor Unit Service Valves.

LSU090HSV5, LSU120HSV5



LSU181HSV5

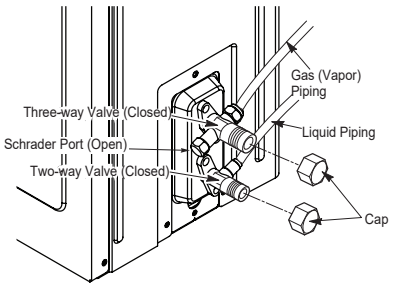
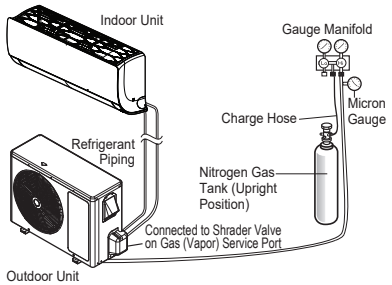


Figure 92: Triple Leak / Pressure Test Diagram.



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FINAL INSTALLATION PROCEDURES

Triple Leak / Pressure and Deep Evacuation Tests

Triple Leak / Pressure Check Procedure, continued.

7. If the pressure does NOT drop for one (1) hour, the system passes the test.

8. 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.

9. After the system has been thoroughly tested and no leaks are found, depressurize by loosening the charging hose connector at the nitrogen cylinder regulator. When system pressure returns to normal, completely disconnect the charging hose from the cylinder, and release the nitrogen charge from all refrigerant piping. Wipe off any remaining bubble solution with a clean cloth.

Deep Evacuation Procedure

After the leak / pressure check is complete, its is required that a deep evacuation procedure is be performed to the refrigerant piping and the connected indoor unit. Deep evacuation must be performed through the gas (vapor) suction line Schrader port on the outdoor unit service port.

Note:

The deep evacuation procedure is required for Single Zone systems. A triple evacuation procedure seen on the previous page is a best practices recommendation for Single Zone systems.

Note:

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

- Deep evacuate through just the gas (vapor) suction Schrader port on the outdoor unit service port.
- The outdoor unit service valves must remain closed and the stem head access caps tight. ⃠ Do not open the outdoor unit service valves and release the factory refrigerant charge until trim charge is complete, and the system is ready to operate.
- Any field-installed ball valves in the refrigerant system (if used) must be open to ensure all piping is free and clear for deep evacuation on all piping and the connected indoor unit.

Note:

- ⃠ *Do not apply power to the system before performing the deep evacuation procedure. There is a possibility that the EEV valve may close and isolate sections of the piping system, making the deep evacuation procedure inconclusive.*
- ⃠ *Never perform evacuation using refrigerant.*
- *Use only a vacuum pump that can reach 500 microns, vacuum rated hoses or copper tubing, and a leak-free gauge manifold set.*
- *Use only new vacuum pump oil from a properly sealed (unopened) container, and change oil in pump before EVERY use.*
- *Subsequent oil changes will be necessary after several hours of continuous operation; have extra oil on hand.*
- *Use a quality micron gauge in good operating order and install as far away from pump as possible.*

Deep Evacuation Procedure Steps

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

2. Connect the gauge manifold along with the vacuum pump to the gas (vapor) suction Schrader port (with core removed) using a vacuum hose. Open the gauge manifold and the vacuum pump valves.

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Deep Evacuation Procedure, continued.

3. Evacuate to static micron level ≤500 for at least one (1) hour.

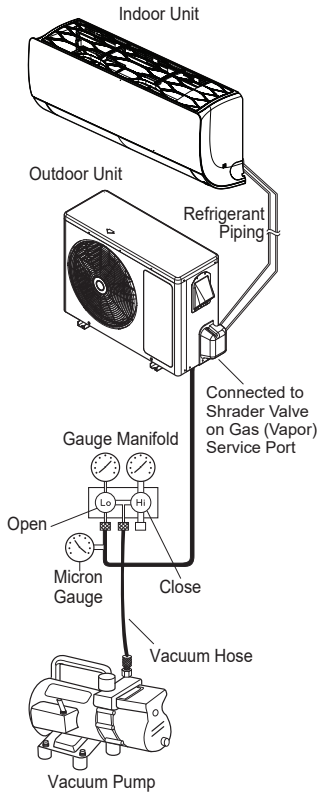
4. Micron level must remain ≤500 for two (2) hours. If the vacuum gauge rises and stops, the system may contain moisture; therefore, it will be necessary to repeat the steps of vacuum break and drying.

5. 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.

6. Close manifold gauges.

7. Shut the valves before turning off and disconnecting the vacuum pump.

Figure 93: Evacuation Procedure Diagram.



Triple Evacuation Procedure

After the leak / pressure check is complete, it is a best practices recommendation that a triple evacuation procedure is performed to the refrigerant piping and the connected indoor unit. Triple evacuation must be performed through the gas (vapor) suction Schrader port on the outdoor unit service port.

Note:

The deep evacuation procedure is required for Single Zone systems. The triple evacuation procedure is a best practices recommendation for Single Zone systems.

Note:

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

- Evacuate through just the gas (vapor) suction Schrader port on the outdoor unit service port.
- The outdoor unit service valves must remain closed and the stem head access caps tight. ⃠ Do not open the outdoor unit service valves and release the factory refrigerant charge until trim charge is complete, and the system is ready to operate.
- Any field-installed ball valves in the refrigerant system (if used) must be open to ensure all piping is free and clear for evacuation on all piping and connected indoor unit.

Note:

- ⃠ *Never perform evacuation using refrigerant.*
- *Use only a vacuum pump that can reach 500 microns, vacuum rated hoses or copper tubing, and a leak-free gauge manifold set.*
- *Use only new vacuum pump oil from a properly sealed (unopened) container, and change oil in pump before EVERY use.*
- *Subsequent oil changes will be necessary after several hours of continuous operation; have extra oil on hand.*
- *Use a quality micron gauge in good operating order and install as far away from pump as possible.*

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FINAL INSTALLATION PROCEDURES

Triple Evacuation Test

Triple Evacuation Procedure Steps

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

2. Connect the gauge manifold along with the vacuum pump to the gas (vapor) suction Schrader port (with core removed) using a vacuum hose. Open the gauge manifold and the vacuum pump valves.

Note:

After the vacuum pump is first operated, if hoses, manifold, and vacuum valves are leak free (and oil is not moisture laden), the gauge must read <100 microns within one (1) minute.

⃠ *Do not proceed if the gauge does not read <100 microns within one (1) minute. There is a leak in the hose, gauge manifold, or vacuum valve, and the equipment must be replaced.*

3. Operate the vacuum pump and evacuate the system to the 2,000 micron level. Isolate the pump by closing the manifold gauges and the vacuum pump valve, and then watch the micron level. Micron level will rise a bit, but MUST eventually stop rising for fifteen (15) minutes.

- If the micron level DOES NOT stop rising, there is a leak, and the leak test must be performed again.
- If the micron level DOES rise above 2,000 micron, re-open the manifold gauges and the vacuum pump valve and continue evacuation back down to 2,000 micron level.
- If the micron level holds at 2,000 micron, continue to step 4.

4. Break vacuum with 50 psig nitrogen purge for an appropriate amount of time (this is to “sweep” moisture from piping).

5. Purge nitrogen from the system until the pressure drops down to 1 to 3 psig.

6. Evacuate to 1,000 micron level. Isolate the pump by closing the manifold gauges and the vacuum pump valve, and then watch the micron level. Micron level will rise a bit, but MUST eventually stop rising for fifteen (15) minutes.

- If the micron level DOES NOT stop rising, there is a leak, and the leak test must be performed again.
- If the micron level DOES rise above 1,000 micron, re-open the manifold gauges and the vacuum pump valve, and continue evacuation back down to 1,000 micron level.
- If the micron level holds at 1,000 micron, continue to step 7.

7. Break vacuum with 50 psig nitrogen purge for an appropriate amount of time.

8. Purge nitrogen from the system until the pressure drops down to 1 to 3 psig.

9. Evacuate to static micron level ≤500 for at least one (1) hour.

10. 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.

11. 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.

12. Close manifold gauges.

13. Shut the valves before turning off and disconnecting the vacuum pump.

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Refrigerant Trim Charge

The single zone system will need an additional refrigerant charge if the installed piping lengths are greater than the “piping length (no additional refrigerant, ft.) specification” listed in the product tables. See the product sections in the engineering and installation manuals. The additional refrigerant charge can be calculated manually using the information in the engineering and / or installation manuals, or by LATS.

1. Keep the outdoor unit service values closed while adding the trim charge to the system. See the specification tables in the front of this installation manual for base charge, and see below for the correct additional refrigerant trim charge amounts for each system.

2. Charge through just the gas (vapor) suction Schrader port.

⚠ WARNING

- *Follow all guidelines when handling refrigerant.*
- ⃠ *Never inhale or handle refrigerant directly. Doing so will cause bodily injury.*

Table 19: Single Zone High Efficiency Refrigerant Piping System Additional Refrigerant Charge.

Model Numbers		Refrigerant Piping Length (ft.)											
		16.4	24.6	32.8	41.0	49.2	65.6	82.0	98.4	114.8	131.2	147.6	164.0
LS090HSV5 (LSN090HSV5 / LSU090HSV5)	Additional Refrigerant Charge (oz.)	0	0	0	0	1.8	5.4	9.0	-	-	-	-	-
LS120HSV5 (LSN120HSV5 / LSU120HSV5)		0	0	0	0	1.8	5.4	9.0	-	-	-	-	-
LS181HSV5 (LSN181HSV5 / LSU181HSV5)		0	0	3.1	6.2	9.3	15.6	21.8	28.0	34.3	-	-	-

Note:

- *Capacity is based on standard length.*
- *Equivalent Pipe Length = Actual Pipe Length + Number of Bends x 0.3.*
- *Additional Refrigerant Charge Calculation : X (g) = [(Refrigerant Pipe Length) - (No Charge Pipe Length)] × (Additional Refrigerant).*
- *There is no need to add refrigerant if equivalent pipe is less than the “piping length with no additional refrigerant” in the table above.*

Finishing the Job

After the Triple Leak and Evacuation (and refrigerant trim charge, if any) procedures have been performed, follow the steps below to open the refrigerant lines.

1. Verify that the auxiliary service port is removed (if used in the Evacuation procedure) and the original Schrader core was re-installed on the gas (vapor) suction service port.

2. The service ports are a back-seated type with a right hand thread. Remove the service valve caps on both the gas (vapor) suction and the liquid service ports.

3. Using an appropriately sized Allen wrench, fully open the valves on both the gas (vapor) suction and the liquid service ports by turning the valve stem counterclockwise.

4. Turn until the valve stem is out, stops, and the valve is completely backseated. ⃠ Do not apply excessive force.

5. Securely replace service port caps on both the gas (vapor) suction and the liquid using an adjustable wrench.

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FINAL INSTALLATION PROCEDURES

Reattaching the Indoor Unit Bottom Cover

Reattaching the Indoor Unit Bottom Cover

Reattach the indoor unit bottom cover after all other installation procedures are complete.

1. If ON, shut power OFF to the system.

2. At the bottom of the bottom cover, insert the three (3) to four (4) hinges into the channels molded to the left, right, and middle of the indoor unit (Location 1). Number of hinges present depends on model of indoor unit.

3. After all hinges are secure, match the three (3) or four (4) small C-hooks located in the middle of the bottom cover (Location 2) to their sockets on the indoor unit. (Number of C-hooks present depends on model of indoor unit.) On the outside of the bottom cover, securely snap the C-hooks in place at each location using the heel of the palm.

4. Match the snaps at the top left and right sides of the bottom cover to their sockets, and push to lock the bottom cover to the indoor unit (Location 3).

5. Verify the bottom cover is securely installed by pushing the bottom cover to the indoor unit at all attachment locations.

Note:

To prevent bending the bottom cover (and subsequent damage), assemble the bottom cover correctly.

Figure 94: Close Up of Bottom Cover Connections (Appearances Will Vary Depending on Indoor Unit Model).

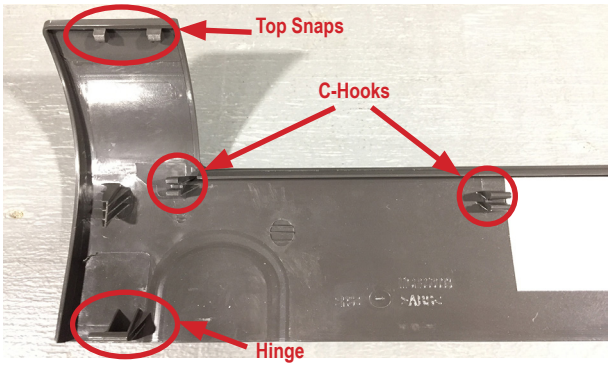


Figure 95: Inserting the Bottom Cover Hinges into the Indoor Unit Channels (Step 2).

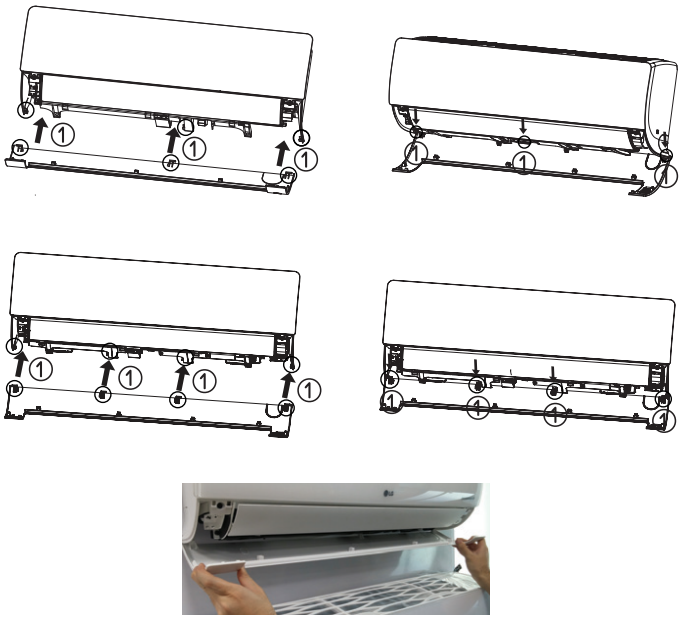


Figure 96: Securing the Bottom Cover C-hooks to the Indoor Unit Sockets (Step 3).

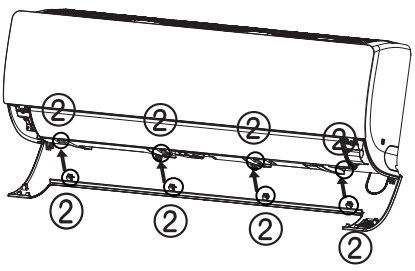


Figure 97: Snapping the Top Left and Right Sides (Step 4).

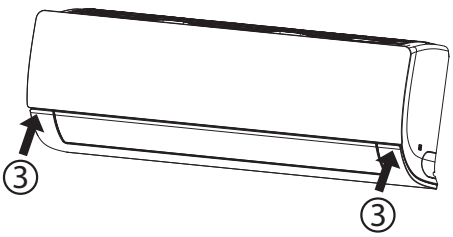
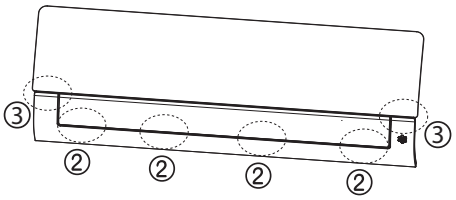


Figure 98: Checking that All Attachment Locations Are Secure (Step 5).



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Air Filter Disassembly and Assembly

Air Filter Disassembly

1. Turn power off to the system.
2. Find the handles located at the top-front of the air filter molded into the plastic frame support.
3. Lift handles slightly up and out to remove the air filter.

Figure 99: Disassembling the Air Filter (Appearances Will Vary Depending on Indoor Unit Model).

2. Lifting the Air Filter by the Handles.

3. Disassembling the Air Filter.

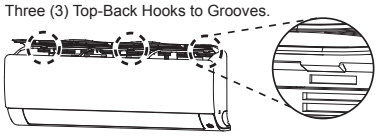
Air Filter Assembly

1. Turn power OFF to the system.
2. Holding the air filter by its handles, match the hooks and grooves on the air filter to the hooks and grooves at the top-back of the indoor unit. (Number of hooks and grooves present depends on model of indoor unit.)
3. Match the air filter bars and grooves to the grooves and hooks at the top-front of the indoor unit.
4. Use thumbs to gently snap the air filter to the indoor unit where the top-front bars, grooves, and hooks are located.
5. Check the sides of the front grille to verify the air filter is assembled correctly.
6. Turn power back on to the system.

Figure 100: Assembling the Air Filter (Appearances Will Vary Depending on Indoor Unit Model).

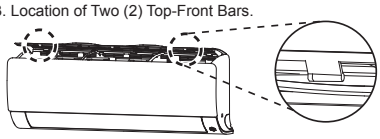
2. Matching Hooks to Top-Back Grooves.

Three (3) Top-Back Hooks to Grooves.

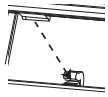


Four (4) Top-Back Hooks to Grooves.

3. Location of Two (2) Top-Front Bars.



Example of Indoor Unit Hook to Air Filter Groove.



4. Securing the Air Filter on the Indoor Unit.

5. Checking the Sides for Correct Air Filter Assembly.

Note:

- *It is easier to assemble and disassemble the air filter if standing on a ladder looking down at the top of the indoor unit.*
- *⃠ Do not bend the air filter; this damages it.*
- *If the air filter is not assembled correctly, dust and other substances will enter the indoor unit.*

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FINAL INSTALLATION PROCEDURES

Installing Batteries, Test Run, Performance Evaluation

Installing Batteries into the Handheld Remote Controller

For information on using the handheld remote controller, refer to its owner's manual.

1. The remote controller needs two AAA (1.5V) batteries for operation. Remove the battery cover from the back of the remote controller by pushing the tab down in the direction seen at right.

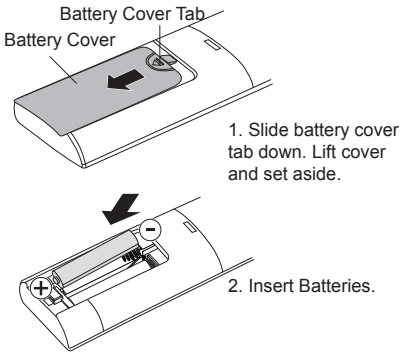
2. Insert the two new batteries.
   - Align batteries by the (+) and (-) sides.
   - The interior battery compartment of the remote controller will have clear markings for the (+) and (-) placement.

3. Verify that the batteries have clicked into the compartment and are firmly engaged with the contacts on either side of them.

4. Reattach the back cover of the remote controller.

5. Proceed with powering on the remote controller and use as needed. Remove the batteries if system won't be used for an extended time.

Figure 101: InstallingtheRemoteController Batteries.



Test Run

After all installation procedures are complete, the system is ready for a test run. Follow the guidelines below.

1. Check that all drain piping, refrigerant piping, and wiring / cables are properly connected.

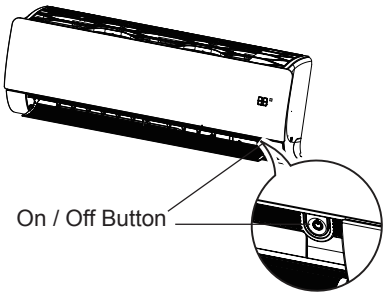
2. Check that both the gas (vapor) suction and liquid refrigerant piping service valves are fully open.

3. Install the batteries into the handheld remote controller (see above).

4. Turn on the power to the outdoor unit, and press and hold the On / Off button for three (3) to five (5) seconds; this switches the system to test operation mode.

5. The system will operate in cooling with maximum air flow for 18 minutes before returning to the factory default setting. While system operates in the test operation mode, note any issues that occur, and fix as necessary.

Figure 102: Test Operation Mode.



Performance Evaluation

Operate the unit in heating and / or cooling, depending on outdoor conditions, for 15 to 20 minutes, then check the system refrigerant charge (feature availability depends on model):

1. Measure the pressure of the gas (vapor) suction service valve. See optimum psig in table at right.

2. Measure the air temperature from both the inlets and outlets.

3. Verify the difference between the inlet and outlet temperatures is > 14.4°F.

4. The air conditioner is now ready to use.

Figure 103: PerformanceEvaluationMeasurement Locations.

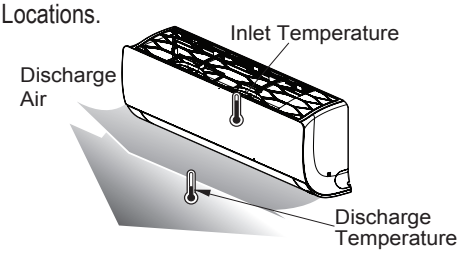


Table 20: Gas Side Pressure at Optimum Condition When System is in Cooling.

Outside Ambient Temperature	Gas (Vapor) Service Valve Pressure
95°F	120~135 psig

Note:

- *If all modes can't be tested all at one time, testing must be performed later when weather conditions permit.*
- *If the actual pressure is higher than shown, the system is most likely overcharged, and charge must be removed. If the actual pressure is lower than shown, the system is most likely undercharged, and charge must be added.*

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Installer Mode

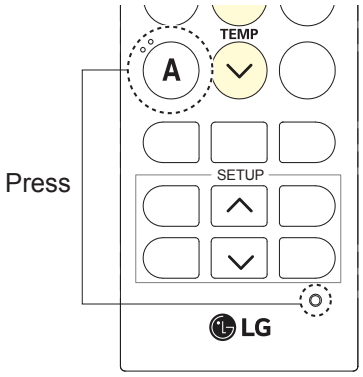
It will be necessary to switch to Installer mode if the system needs to operate in Heating Only or Cooling Only modes, or the Pump Down procedure needs to be performed.

To Enter Installer Mode:

1. Press the Reset and “A” buttons. A very slender tool is needed to access the Reset button.

2. Set the code by pressing the Up and Down Temperature buttons, and then press the ON / OFF button. The Up Temperature button changes the code on the ten (10) digit; the Down Temperature button changes the code on the one (1) digit.

Figure 104: Using the Handheld Controller to Change System to Installer Mode.



Enabling Heating Only Mode

To be able to run Heating Only mode, the unit must be changed to Installer mode (see above for instructions).

1. Supply power to the system, but system must be OFF with all functions inactive.
2. Enter the Installer mode.
3. Set code to 47.
4. Press the ON / OFF button and select the code number 47. Unit will beep to acknowledge that the code has been received.
5. Turn off power for a minimum of 30 seconds.
6. Turn power back on to system.

Disabling Heating Only Mode

1. Supply power to the system, but system must be OFF with all functions inactive.
2. Enter the Installer mode.
3. Set code to 48.
4. Press the ON / OFF button and select the code number 48. Unit will beep to acknowledge that the code has been received.
5. Turn off power for a minimum of 30 seconds.
6. Turn power back on to system.

Note:

- *After the Heating Only mode is set, Cooling, Dehumidification, Auto Changeover modes cannot be used.*
- *After Heating Only mode is disabled, system operation will return to normal.*
- *Codes cannot be entered when the system is operating. The system must be OFF to enter the codes. Even if the code is entered when the system is ON, the function won’t operate.*
- *During Heating Only Mode, if the system is turned OFF when the handheld controller is used to set the system to operate in modes other than Heating or Fan, the system will not turn back On. Turn the system OFF after the handheld controller is used to system the system to Heating or Fan, and then turn back ON.*

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FINAL INSTALLATION PROCEDURES

Cooling Only Mode, Pump Down Procedure

Enabling Cooling Only Mode

Before running the Pump Down procedure, the unit must be switched to Cooling Only mode. To be able to run Cooling Only mode, the unit must be changed to Installer mode (see previous page for instructions).

1. Supply power to the system, but system must be OFF with all functions inactive.
2. Enter the Installer mode.
3. Set code to 45.
4. Press ON / OFF button and select the code number 45. Unit will beep to acknowledge that code has been received.
5. Turn off power for a minimum of 30 seconds.
6. Turn power back on to system.

Disabling Cooling Only Mode

After Pump Down procedure has been performed, Cooling Only mode will need to be disabled, and the system will need to be returned to normal operating mode.

1. Supply power to the system, but system must be OFF with all functions inactive.
2. Enter the Installer mode.
3. Set code to 46.
4. Press ON / OFF button and select the code number 46. Unit will beep to acknowledge that code has been received.
5. Turn off power for a minimum of 30 seconds.
6. Turn power back on to system.

Note:

- *After the system is in Installer mode (with Cooling Only mode initiated), automatic operation is suspended.*
- *After Cooling Only mode is disabled, the system will return to normal operation.*
- *Installer mode cannot be entered if the unit is running. The system must be completely OFF.*
- *All Installer code numbers must be entered when system is OFF.*
- *WLAN Module's communication time will lag by about one (1) minute after unit is turned back on, and in normal operating mode.*
- *Entire lock or Mode lock cannot be set if heating or automatic operation is set through a central controller.*

Pump Down Procedure

This procedure is performed when the refrigerant piping system is serviced. Pumping down collects all the refrigerant in the outdoor unit without losing any charge. Always adhere to and be familiar with local codes regarding the handling of refrigerant.

The system must operate in Cooling Only mode to proceed with the pump down procedure. If needed, refer to the previous sections for proper steps to place the unit into Cooling Only mode.

1. Turn off the unit's power switch. Connect a low-pressure gauge manifold hose to the charge port on the gas (vapor) suction service valve.
2. Open the gas (vapor) suction service valve halfway, and purge the air in the manifold hose using the refrigerant.
3. Fully close the liquid piping service valve.
4. Turn on the unit's power switch and start the Cooling Only mode operation.
5. Observe the pressure gauge reading. When it changes 14.2 to 7.1 psig, fully close the gas line valve and then immediately turn the unit off. Pump down procedure is complete and all refrigerant will be collected into the outdoor unit.

⚠ WARNING

- ⃠ *Never inhale or handle refrigerant directly. Doing so will cause bodily harm and injury.*
- *After pump down, power must be turned off before the hose is removed. If the system is operated without the hose connected, air inside the compressor will cause the pressure to increase, and possibly cause an explosion and physical injury.*

Note:

Perform Pump Down procedure in the Cooling Only mode.

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The SIMs WLAN module and the smart phone app together provide monitoring and troubleshooting capability for LG Duct Free Systems. SIMs function only with LG Duct Free products. LG SIMs can also be used with Single Zone one-to-one configurations such as the Single Zone Wall Mount systems. SIMs app is available for Apple® iPhone® iOS or Android™ smart phone operating systems. Download the latest version from the App Store (iPhone iOS) or Google Play™ store (Android). (Apple and iPhone are trademarks of Apple Inc., registered in the U.S. and other countries. Android and Google Play store are trademarks of Google LLC.)

SIMs can display and graph operational data for the air conditioner system including the indoor unit and the outdoor unit. SIMs also displays error codes and a troubleshooting guide. A full copy of the LG SIMs Smart Inverter Monitoring System User's Manual is available on the www.lghvac.com website.

To use SIMs, you must be a trained HVAC service technician familiar with variable refrigerant flow (VRF) systems in general, and with LG's Duct Free System products. You must understand the inverter air conditioning operation cycle, the meaning of the data displayed by SIMs, and how to use the data to troubleshoot the system.

Figure 105: LG SIMs App and WLAN Module.

Figure 106: SIMs WLAN Module to DFS System Example.

⚠WARNING

High voltages capable of causing death are used in this equipment. Outdoor unit power remains connected during this procedure. Take extreme caution not to touch electrical components or connections. Failure to observe this warning can result in death or severe injury.

Note:

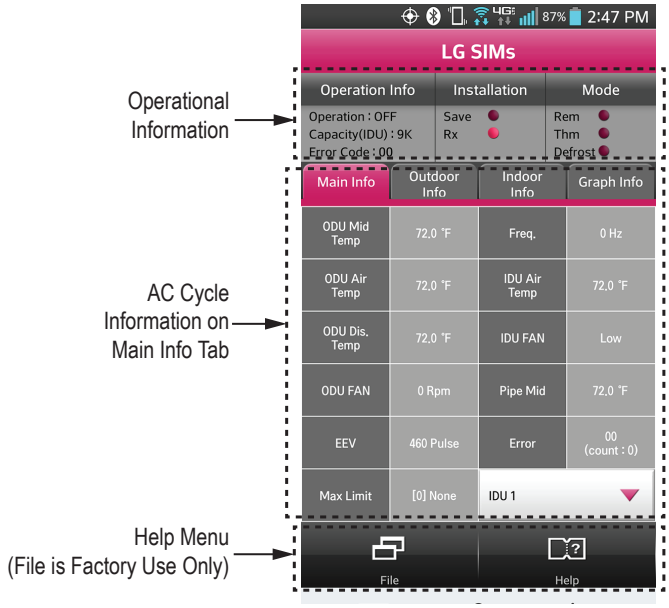
- *The Duct Free System air conditioning system must run for at least 15–20 minutes before data collected by SIMs is valid for troubleshooting.*
- *The free SIMs app must be correctly installed on the smart phone before using SIMs.*
- *Some outdoor units have an LGMV extension cable accessed by removing the side handle cover. If the outdoor unit does not have this extension cable, access the LGMV connector by removing the top cover of the outdoor unit.*

SIMs App Main Info Screen

The main screen is the first screen displayed after wireless connection is established. Tap the Main Info tab to display current readings regarding the indoor and outdoor unit(s). The Operational Info area of the screen will show active functions or modes by illuminating the light to the right of the function.

Additional Help information can be accessed by tapping the Help Menu buttons at the bottom of this screen.

Figure 107: SIMs App Main Info Screen



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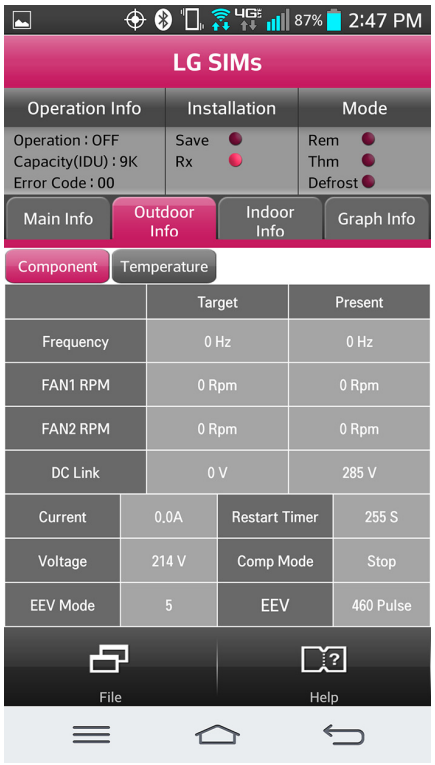
TROUBLESHOOTING

LG SIMS - Self Diagnosis Functions

SIMs App Screens



Outdoor Info/ Component Screen

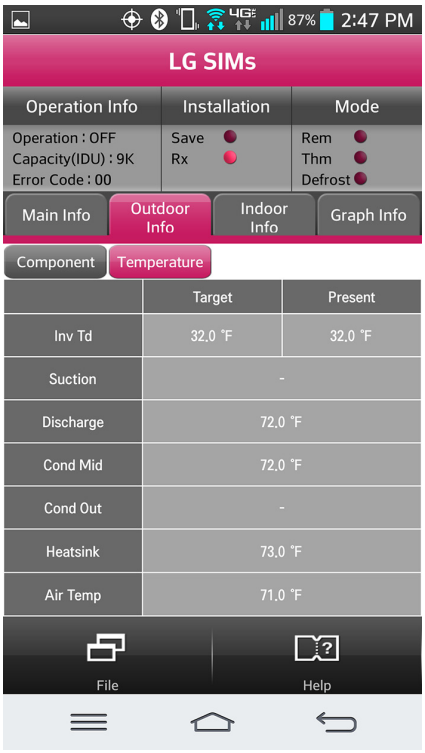
Displays the following information:

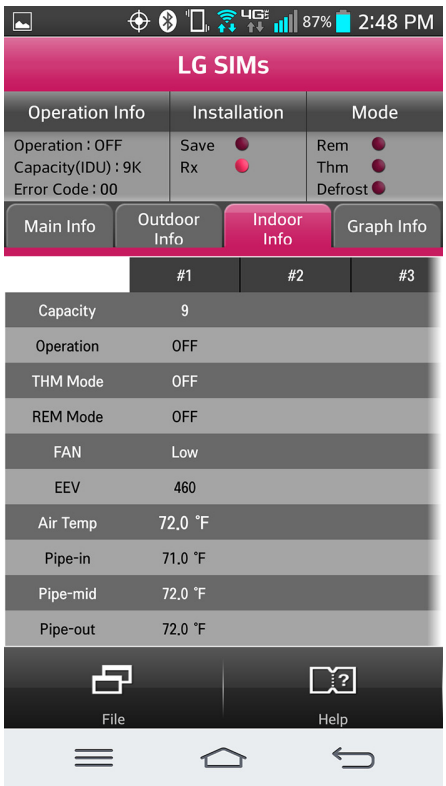
- Frequency
- FAN1 RPM
- FAN2 RPM
- DC Link
- Current
- Voltage
- EEV Mode
- Restart Timer
- Comp Mode
- EEV

Outdoor Info/ Temperature Screen

Displays the following information:

- Inv TD
- Suction
- Discharge
- Cond Mid
- Cond Out
- Heatsink
- Air Temp





Indoor Info Tab

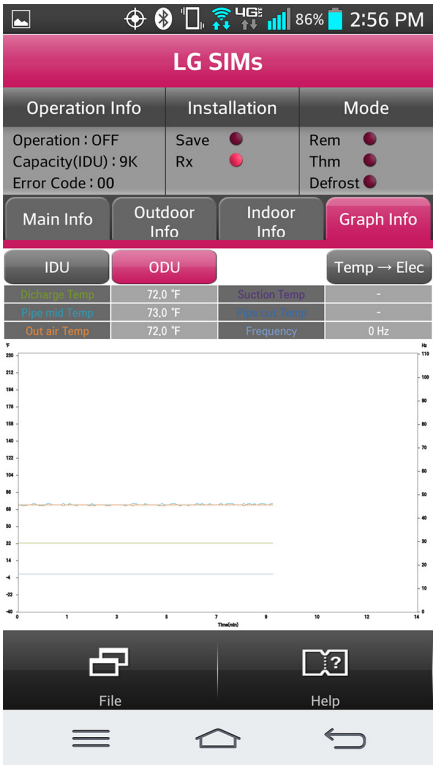
Displays the following information:

- Frequency
- Operation
- THM Mode
- REM Mode
- FAN
- EEV
- Air Temp
- Pipe-in
- Pipe-mid
- Pipe-out

Graph Info Tab

This tab has three sub sections:

- IDU - Indoor Unit Temperature graph. Displays IDU information in graph format. Information displayed is for the IDU # selected on the Main screen.
- ODU - Outdoor Unit Temperature and Frequency graph. Displays ODU information in graph format.
- ODU Electric - Outdoor Unit Electric data graph is displayed.



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Troubleshooting Using Error Codes

Refer to the table below and on the next two pages for error codes that are generated from the indoor and outdoor units. These codes are the most common. Your particular system might generate additional codes not listed here. Please contact LG Support if you see these types of errors and a simple power cycle has not corrected the issue.

Error Codes

- Indicate different types of unit failures, assists in self-diagnosis and to track the frequency of occurrence.
- Error codes are shown on the control board LEDs of indoor and outdoor units and the SIMs app. Also, check the wired remote controller display first for error codes if present.
- If two or more errors occur simultaneously, the lower error code number is displayed first.
- After error is resolved, the error code does not display.

Decoding the Error Display

The first and second number on the LED indicates error number. Example: 21 = LED1 (Green light) 2x blink, LED2 (Red light) 1x blink.

Error Code Nomenclature Definitions

- MICOM: Non-volatile memory chip where unit setup information is stored.
- EEPROM: Non-volatile memory chip where device identification, size, and factory defined default component operating parameters are stored.

Table 21: Single Zone Wall Mounted Indoor Unit Error Codes.

Error Code	Description	No. of Times Indoor Unit LEDs Blink	
		LED1	LED2
1	Indoor unit room temperature sensor error	1X	-
2	Indoor unit inlet pipe sensor error	2X	-
3	Wired remote control error	3X	
4	Float switch error (optional)	4X	-
5	Communication error between indoor unit and outdoor unit	-	5X
6	Indoor unit outlet pipe sensor error	6X	-
9	Indoor unit EEPROM error	9X	-
10	Indoor unit BLDC motor fan lock	-	1X
12	Indoor unit middle pipe sensor error	2X	1X
21	DC Peak (IPM Fault); Compressor DC voltage was too high	2X	1X
22	Current Transformer2 (CT2) error; Alternating current (AC) input too high	2X	2X
23	DC Link Low Volt	2X	3X
25	AC Low/High Volt	2X	5X
26	DC Comp Position Error (not providing rotation), Locking	2X	6X
27	PSC Fault; Current to inverter compressor between AC and DC converter circuit too high	2X	7X
28	Inverter compressor DC voltage is too high	2X	8X
29	Inverter compressor amperage is too high	2X	9X
31	Current-to-current transformer (CT) thermistor is too low	3X	1X
32	Inverter Compressor Discharge Pipe (D-Pipe) Overheat	3X	2X
40	CT Sensor Error; Thermistor is disconnected or shorted out	4X	-
41	D-Pipe Sensor INV is disconnected or shorted out	4X	1X
44	Outdoor Air Sensor is disconnected or shorted out	4X	4X
45	Middle thermistor of outdoor unit condenser coil is disconnected or shorted out	4X	5X
46	Outdoor unit suction line thermistor is disconnected or shorted out	4X	6X
48	Outdoor unit coil outlet (liquid line) thermistor is disconnected or shorted out	4X	8X
53	Communication failure from outdoor unit to indoor unit	5X	3X
60	Outdoor unit printed circuit board (PCB) EEPROM check sum error	6X	-
61	Outdoor unit condenser coil temperature is too high	6X	1X
62	Outdoor unit inverter compressor PCB heat sink temperature is too high	6X	2X
63	Condenser coil pipe thermistor temperature is too low	6X	3X
65	Heat sink thermistor has disconnected or has shorted out	6X	5X
67	Outdoor brushless direct current (BLDC) fan motor lock error	6X	7X

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TROUBLESHOOTING

Error Codes

Single Zone Wall Mounted Outdoor Unit Error Codes

The Single Zone Wall Mounted outdoor unit error codes are visible on the outdoor unit, as well as from the indoor unit. However, the indoor unit error codes are only visible from the indoor unit and will not display at the outdoor unit. When troubleshooting the system, be sure to verify if the error codes that are being displayed are specific for indoor or outdoor units.

Table 22: Single Zone Wall Mounted Outdoor Unit Error Codes.

Error Code	Description	No. of Times Outdoor Unit LEDs Blink	
		LED1	LED2
21	DC Peak (IPM Fault); Compressor DC voltage was too high	2X	1X
22	Current Transformer2 (CT2) error; Alternating current (AC) input too high	2X	2X
23	DC Link Low Volt	2X	3X
25	AC Low/High Volt	2X	5X
26	DC Comp Position Error (not providing rotation), Locking	2X	6X
27	PSC Fault; Current to inverter compressor between AC and DC converter circuit too high	2X	7X
28	Inverter compressor DC voltage is too high	2X	8X
29	Inverter compressor amperage is too high	2X	9X
31	Current-to-current transformer (CT) thermistor is too low	3X	1X
32	Inverter Compressor Discharge Pipe (D-Pipe) Overheat	3X	2X
40	CT Sensor Error; Thermistor is disconnected or is shorted out	4X	-
41	D-Pipe Sensor INV is disconnected or shorted out	4X	1X
44	Outdoor Air Sensor is disconnected or shorted out	4X	4X
45	Middle thermistor of outdoor unit condenser coil is disconnected or shorted out	4X	5X
46	Outdoor unit suction line thermistor is disconnected or shorted out	4X	6X
48	Outdoor unit coil outlet (liquid line) thermistor is disconnected or shorted out	4X	8X
53	Communication failure from outdoor unit to indoor unit	5X	3X
60	Outdoor unit printed circuit board (PCB) EEPROM check sum error	6X	-
61	Outdoor unit condenser coil temperature is too high	6X	1X
62	Outdoor unit inverter compressor PCB heat sink temperature is too high	6X	2X
63	Condenser coil pipe thermistor temperature is too low	6X	3X
65	Heat sink thermistor has disconnected or has shorted out	6X	5X
67	Outdoor brushless direct current (BLDC) fan motor lock error	6X	7X

Refer to Service Manuals posted on www.lghvac.com for a full description of all error codes and work-arounds.

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Cautions for Refrigerant Leaks / Introduction

ASHRAE Standards 15-2010 and 34-2010 offer guidelines that address refrigerant safety and the maximum allowable concentration of refrigerant in an occupied space. Refrigerant will dissipate into the atmosphere, but a certain volume of air is required for this to occur safely. For R410A refrigerant, the maximum allowable concentration is 0.026 lbs./ft^3 per 1,000 ft^3 of air in an occupied space. Buildings with twenty-four (24) hour occupancy allow half of that concentration.[1]

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

⚠ WARNING

Verify the maximum refrigerant concentration level in the space where the indoor unit will be mounted meets the concentration limit for the application. If the refrigerant leaks and safety limits are exceeded, it could result in personal injuries or death from oxygen depletion.

Note:

Take appropriate actions at the end of HVAC equipment life to recover, recycle, reclaim or destroy R410A refrigerant according to applicable US EPA rules.

To calculate the potential refrigerant concentration level (RCL):

1. Measure the occupied space dimensions (in feet).
2. Calculate the cubic foot volume of air in the smallest occupied space. (To obtain a detailed overview of the RCL, perform the same calculations to the second smallest zone, the third smallest zone until the RCL is obtained for all zones. Also, pay special attention to areas such as basements, etc., where refrigerant cannot dissipate easily.)
3. Divide the refrigerant charge of the Single Zone system serving the area in pounds by the results of step 1.
4. If the calculation indicates that the potential refrigerant concentration level is higher than the allowed RCL, increase the cubic volume of the smallest occupied space or modify the piping system design.
5. The allowable RCL limit for most applications must be equal to or less than 0.026 lbs./ft^3. However, in special occupied spaces, such as hospitals and nursing homes, where occupants may have limited mobility, the allowable RCL limit is cut in half. See ASHRAE Standard 34-2007 and local codes for detailed information.[1]

Refrigerant Concentration Limit (RCL) Calculations

To calculate total refrigerant amount per system:

Amount of Factory-Charged Refrigerant per Outdoor Unit + **Amount of Additional Refrigerant Trim Charge** = **Total System Refrigerant Charge**

$$\text{RCL (lbs./ft}^3\text{)} = \frac{\text{Total System Refrigerant Charge (lbs.)}}{\text{Volume of Smallest Occupied Space (ft}^3\text{)}}$$

[1] *American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc. (ASHRAE). Atlanta, GA. ASHRAE, Inc. Information about ASHRAE Standard 15-2010 / 34-2010 and addenda current as of the date of this publication.*

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INSTALLATION CHECKLIST

Major Component Rough-In

Description	Check
Single Zone 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.	
Indoor unit was installed, properly supported, and located indoors in a non-corrosive environment.	
Single Zone unit's 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.	

Piping and Insulation

Description	Check
Single-zone and multi-zone duct-free split systems: ACR copper piping rated at the system working pressure for R410A was used.	
All refrigerant pipes and valves were insulated separately. Insulation is positioned up against the walls of the indoor unit. No gaps shown. Insulation was not compressed at clamps and hangers.	

Brazing Practices

Description	Check
Medical grade (there are 4 available) dry nitrogen for purging during brazing was used (constant 3 psi while brazing).	
15% silver brazing material only.	

Refrigerant Piping

Description	Check
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 were 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.	
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 the indoor unit and at will in the refrigerant piping.	

Condensate Pump / Drain Installation

Description	Check
Condensate drain installed on indoor units. Extended condensate piping material used is acceptable under local code. Insulated to prevent condensation.	
Indoor unit condensate drain pipes were installed correctly.	
Indoor unit with a gravity drain were level or slightly canted toward the drain connection and is supported properly.	
Drain lines are properly insulated to prevent condensation.	

Power Wire and Communication Cables

Description	Check
Power wiring to the Single Zone outdoor unit is solid or stranded, and complies with all local and national electrical codes.	
Power wiring was connected to a single phase 208-230V source.	
Ground wire was installed and properly terminated at the unit.	
The power supplied was clean with voltage fluctuations within specifications. (±10% of nameplate).	
Power wiring to the Single Zone outdoor unit was installed per all local electrical code requirements.	
Communication / connection (power) wiring from the outdoor unit to the indoor unit is minimum 14 gauge, four-conductor, stranded, shielded or unshielded. If shielded, the wire must be grounded to chassis at the outdoor unit only.	
Wiring to the indoor unit was installed per all local electrical code requirements.	
Communication / connection (power) wiring from the outdoor unit to the indoor unit can be run in the same conduit.	
Communication type RS-485–BUS type.	
22-3 AWG, twisted, stranded, unshielded cable (minimum) was used between the indoor unit and its zone controller (if present). No cables were spliced and no wire caps are present.	
LG-supplied cable was used between the indoor unit and its zone controller. No cables were spliced and no wire caps are present.	
Appropriate crimping tool was used to attach ring or spade terminals at all power wiring and control cable terminations.	
Power and control wires were run in the same conduit (outdoor unit to indoor only) as provided in the product installation manual. Power to outdoor unit and power/communications to indoor unit CANNOT be run in the same conduit.	

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For further technical materials such as submittals, engineering manuals, service manuals, and catalogs, visit www.lghvac.com.

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Air Conditioning Technologies
4300 North Point Parkway
Alpharetta, Georgia 30022
www.lghvac.com

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