



MULTI F

MULTI F MAX

CEILING CASSETTE INDOOR UNIT INSTALLATION MANUAL



- LMCN077HV 7 kBtu
- LCN097HV4 9 kBtu
- LCN127HV4 12 kBtu
- LMCN185HV 18 kBtu

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Content familiarity required for proper installation.

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

IM_Multi_F_CeilingCassette_7_16

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

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 a trained technician to install the unit.**

Improper installation by the user may result in water leakage, fire, explosion, electric shock, 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.

 **Do not install the unit using defective hanging, attaching, or mounting hardware.**

There is risk of 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.



Dispose of the packing materials safely.

- *Packing materials, such as nails and other metal or wooden parts may cause puncture wounds or other injuries.*

- *Tear apart and throw away plastic packaging bags so that children may not play with them and risk suffocation and death.*

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 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.

 **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.

Install the unit considering the potential for earthquakes.

Improper installation may cause the unit to fall, resulting in physical injury or death.

Replace all control box and panel covers.

If cover panels are not installed securely, dust, water and animals may enter the unit, causing fire, electric shock, and physical injury or death.

 **Do not change the settings of the protection devices.**

If the pressure switch, thermal switch, or other protection device 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.

Wear protective gloves when handling equipment.

Sharp edges may cause personal injury.

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 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.

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

Note:

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.

Properly insulate all cold surfaces to prevent “sweating.”

Cold surfaces such as uninsulated pipe can generate condensate that may drip and cause 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 may cause the air conditioner to operate improperly. The unit may also affect such equipment by creating electrical noise that disturbs medical treatment or image broadcasting.

Ⓞ **Do not use the product for special purposes such as preserving foods, works of art, wine coolers, or other precision air conditioning applications. 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 be damaged.

Ⓞ **Do not install the unit in a noise sensitive area.**

When connecting refrigerant tubing, remember to allow for pipe expansion.

Improper piping may cause refrigerant leaks and system malfunction.

Periodically check that the unit is not damaged.

There is a risk of equipment damage.

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.

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.

Ⓞ **Don't store or use flammable gas / combustibles near the unit.**

There is risk of product failure.

Always check for system refrigerant leaks after the unit has been installed or serviced.

Low refrigerant levels may cause product failure.

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.

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.
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.

⊘ **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, trained electrician familiar with the U.S. National Electric Code (NEC) who is equipped with the proper tools and test instruments. Failure to carefully read and follow all instructions in this manual can result in equipment malfunction, 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.

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.

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.

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 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.

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

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 system.

There is risk of fire, electric shock, physical injury or death.

- ⊘ Do not operate the disconnect switch with wet hands.

There is risk of fire, electric shock, physical injury or death.

Periodically verify the hanging bolts and other hardware securing the unit have not deteriorated.

If the unit falls from its installed location, it can cause 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 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 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.

⚠ CAUTION

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

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 gas leaks out, ventilate the area before operating the unit.

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

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.

- ⊘ 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 cover to the unit.

Non-secured electrical covers can result in burns or electric shock due to dust or water in the service panel.

Operation, continued

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.

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 open the inlet during operation.
There is risk of unit failure.

Provide power to outdoor unit to warm the compressor crankcase at least six (6) hours before operation begins.

Starting operation with a cold compressor sump(s) may result in severe bearing damage to the compressor(s). Keep the power switch on during the operational season.

Periodically verify the hanging bolts and other hardware securing the unit have not deteriorated.

If the unit falls from its installed location, it can cause property damage or product failure.

⊘ Do not operate the unit with the panel(s) or protective cover(s) 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.

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

Multi F and Multi F MAX Ceiling Cassette Units

This manual describes how to install the LG Multi F and Multi F MAX (Multi Zone) Ceiling Cassette Indoor Units (IDU) for Multi F heat pump systems. Table 1 lists the available models. Refer to LG's Multi F Indoor Unit Engineering Manual for complete detailed engineering data and selection procedures.

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 your work and do not work alone, if possible. Know how to obtain emergency medical and fire fighting assistance.

Installation Personnel

This equipment is intended for installation by personnel trained in the required construction, mechanical, electrical, and/or other disciplines.

Applicable Codes

Personnel must be familiar with and follow the applicable national, state, and / or local codes. In the event of a conflict between any applicable code and the instructions in this manual, comply with the applicable code.

⚠ 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, its components and connections, and the order of installation. Incorrect installation can degrade or prevent proper operation.

Factory Supplied Materials

- Installation Guide (template)
- Owner's Manual
- Installation Manual

Required Tools (field provided)

- | | | |
|-----------------------------|---------------------|---------------------|
| • Level | • Flaring tool set | • Hexagonal wrench |
| • Screwdriver | • Tubing cutter | • Gas-leak detector |
| • Electrical lineman pliers | • Tube/pipe reamer | • Gauge manifold |
| • Electric drill | • Torque wrenches | • Thermometer |
| • Hole core drill | • Adjustable wrench | |

Required Parts (field provided)

- | | | |
|---|---|--|
| • Connecting cable (power and control) | • 3/8" or 1/2" Threaded hanger rods | • Additional drain hose |
| • Pipes - vapor line and liquid line, with insulation | • 3/8" or 1/2" nuts, flat washers, and lock/split washers | • Insulation for additional drain hose |

Figure 1: Typical Multi F Ceiling Cassette Indoor Unit



Table 1: Multi F Ceiling Cassette Indoor Units.


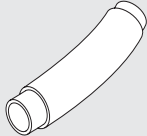
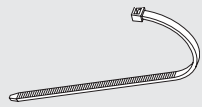


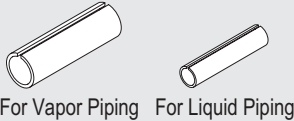
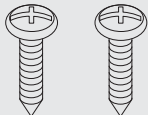
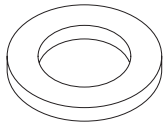

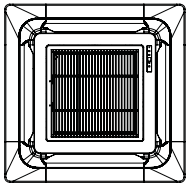
Typical Unit	Model Number	Nominal Capacity	
		Cooling (Btu)	Heating (Btu)
	LMCN077HV	7,000	8,100
	LCN097HV4	9,000	10,400
	LCN127HV4	12,000	13,800
	LMCN185HV	18,000	20,800

Table 2: Included Items.

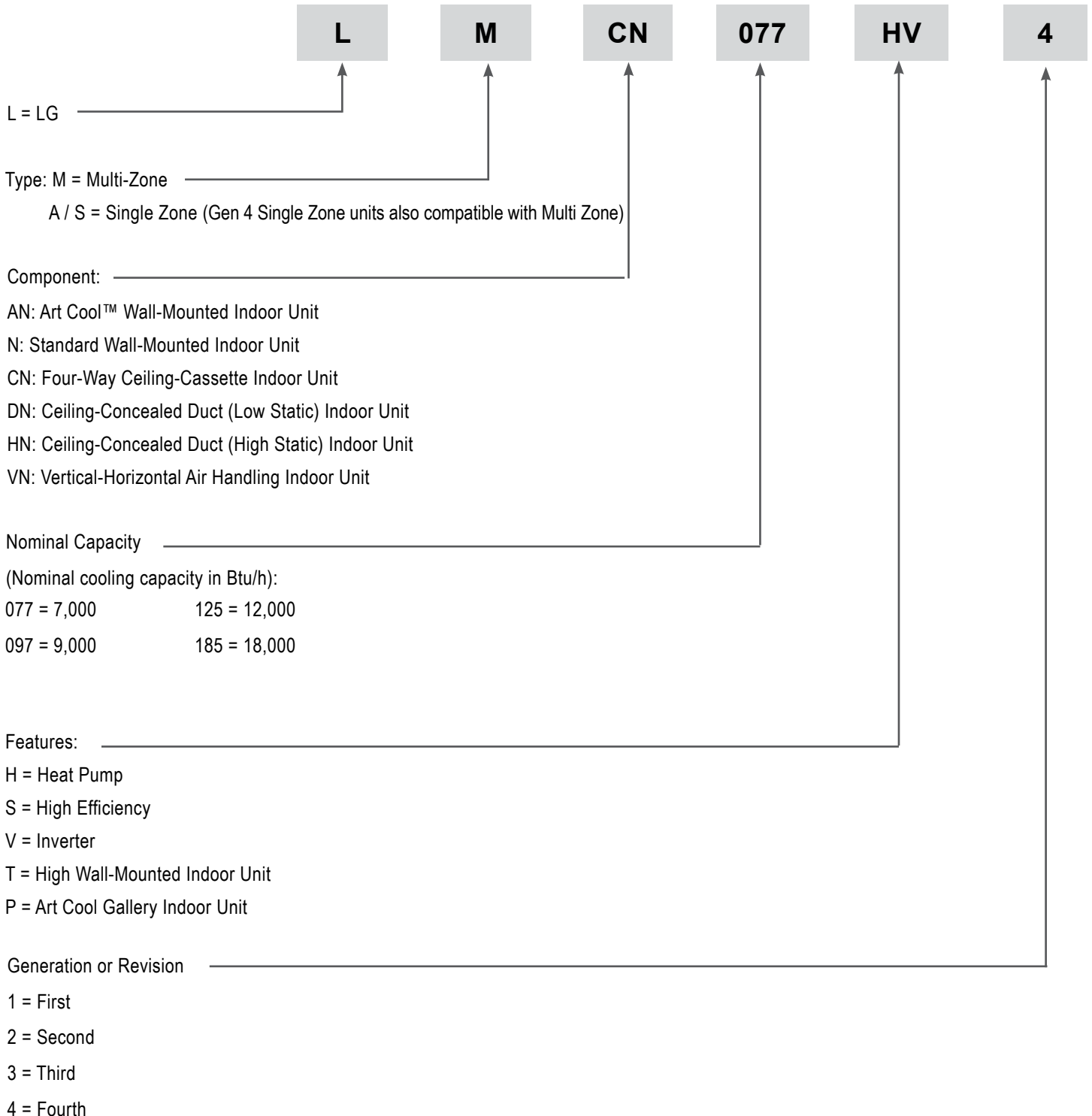
Part	Quantity	Image	Part	Quantity	Image
Drain Hose	One (1)		Cable Ties	Four (4)	
Metal Clamp	Two (2)		Conduit Bracket	One (1)	
Insulation for Fittings	One (1) Set	 For Vapor Piping For Liquid Piping	M4 Screws	Two (2)	
Washers for Hanging Bracket	Eight (8)		Wireless Handheld Controller with Holder (AKB73757604) ¹	One (1)	

¹Wireless Handheld Controller for the four-way ceiling cassette indoor units is also referenced by Model No. PQWRHQ0FDB.

Table 3: Required Accessory Table.

Part	Quantity	Image
Grille Kit (PT-QCHW0 or PT-UQC)	One (1)	

Multi F Multi-Zone Systems — Indoor Units



- Voltage for all equipment is 208-230V, 60 Hz, 1-phase.
- All indoor units are compatible with wired controllers



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.

Allowable Indoor Unit to Outdoor Unit Connections

In Multi F / Multi F MAX multi-zone systems, the Ceiling Cassette IDUs can be connected to the Multi F outdoor units (ODUs) listed in the table below.

Table 4: Allowable Indoor Unit to Outdoor Unit Connections.

Indoor units		Outdoor units						
Model Number	Indoor Unit Nominal Capacity (Btu/h)	LMU18CHV	LMU24CHV	LMU30CHV	LMU36CHV	LMU480HV	LMU540HV	LMU600HV
		Maximum No. of Connectable Indoor Units						
		2	3	4	4	8	8	8
LMCN077HV	7,000	0	0	0	0	0	0	0
LCN097HV4	9,000	0	0	0	0	0	0	0
LCN127HV4	12,000	0	0	0	0	0	0	0
LMCN185HV	18,000	-	0	0	0	0	0	0

connection allowed: 0

connection not allowed: -

Device Connection Limitations

- The minimum number of connected and operating indoor units to Multi F / Multi F MAX systems is two.
- The maximum number of indoor units for each Multi F / Multi F MAX heat pump system is:

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

- The maximum allowable total indoor unit capacity (Btu/h) for each Multi F / Multi F MAX heat pump system is:
 LMU18CHV = 24,000 LMU30CHV = 40,000 LMU480HV = 65,000 LMU600HV = 81,000
 LMU24CHV = 33,000 LMU36CHV = 48,000 LMU540HV = 73,000

- Refer to the Multi F Engineering Manual to properly determine total indoor unit connected capacity.

Table 5: Multi F Multi Zone Ceiling Cassette Indoor Unit Specifications.

Model Name	LMCN077HV	LCN097HV4	LCN127HV4	LMCN185HV
Grille (Sold Separately)	PT-QCHW0 / PT-UQC	PT-QCHW0 / PT-UQC	PT-QCHW0 / PT-UQC	PT-QCHW0 / PT-UQC
Nominal Cooling Capacity (Btu/h) ¹	7,000	9,000	12,000	18,000
Nominal Heating Capacity (Btu/h) ¹	8,100	10,400	13,800	20,800
Operating Range				
Cooling (°F WB)	57-77			
Heating (°F DB)	59-81			
Fan				
Type	Turbo			
Motor Output (W) x Qty.	43 x 1			
Motor/Drive	Brushless Digitally Controlled / Direct			
Airflow Rate CFM (H/M/L)	265 / 212 / 177	300 / 265 / 230	335 / 283 / 247	459 / 424 / 388
Unit Data				
Refrigerant Type ²	R410A			
Refrigerant Control	EEV			
Power Supply V, Ø, Hz ³	208-230, 1, 60			
Rated Amps (A)	0.25			
Sound Pressure Level ±3 dB(A) (H/M/L) ⁴	31 / 27 / 24	36 / 33 / 30	38 / 35 / 32	38 / 37 / 34
Body Dimensions (W x H x D, in.)	22-7/16 x 8-7/16 x 22-7/16			22-7/16 x 10-3/32 x 22-7/16
Grille (PT-UQC, sold separately) Dimensions (WxHxD, in.)	27-9/16 x 7/8 x 27-9/16			
Body Net Weight (lbs.)	31			34
Grille (Sold separately) Net Weight (lbs.)	7			
Body Shipping Weight (lbs.)	34	37		42
Grille (Sold separately) Shipping Weight (lbs.)	11	9	9	11
Power Wiring / Communications Cable (No. x AWG) ⁵	4 x 18			
Heat Exchanger (Row x Column x Fin / inch) x No.	(2 x 8 x 18) x 1			(2 x 10 x 18) x 1
Pipe Size				
Liquid (in.)	1/4			
Vapor (in.)	3/8			1/2
Drain O.D. / I.D. (in.)	1-1/4, 1			

¹Nominal 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 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).

Nominal heating capacity rating obtained with air entering the indoor unit at 70°F dry bulb (DB) and 60°F wet bulb (WB) and outdoor ambient conditions of 47°F dry bulb (DB) and 43°F wet bulb (WB).

²This unit comes with a dry helium charge.

³Acceptable operating voltage: 187V-253V.

⁴Sound 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.

⁵All 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.

Figure 2: Multi F Four-Way Ceiling-Cassette Indoor Unit Refrigerant Flow Diagram.

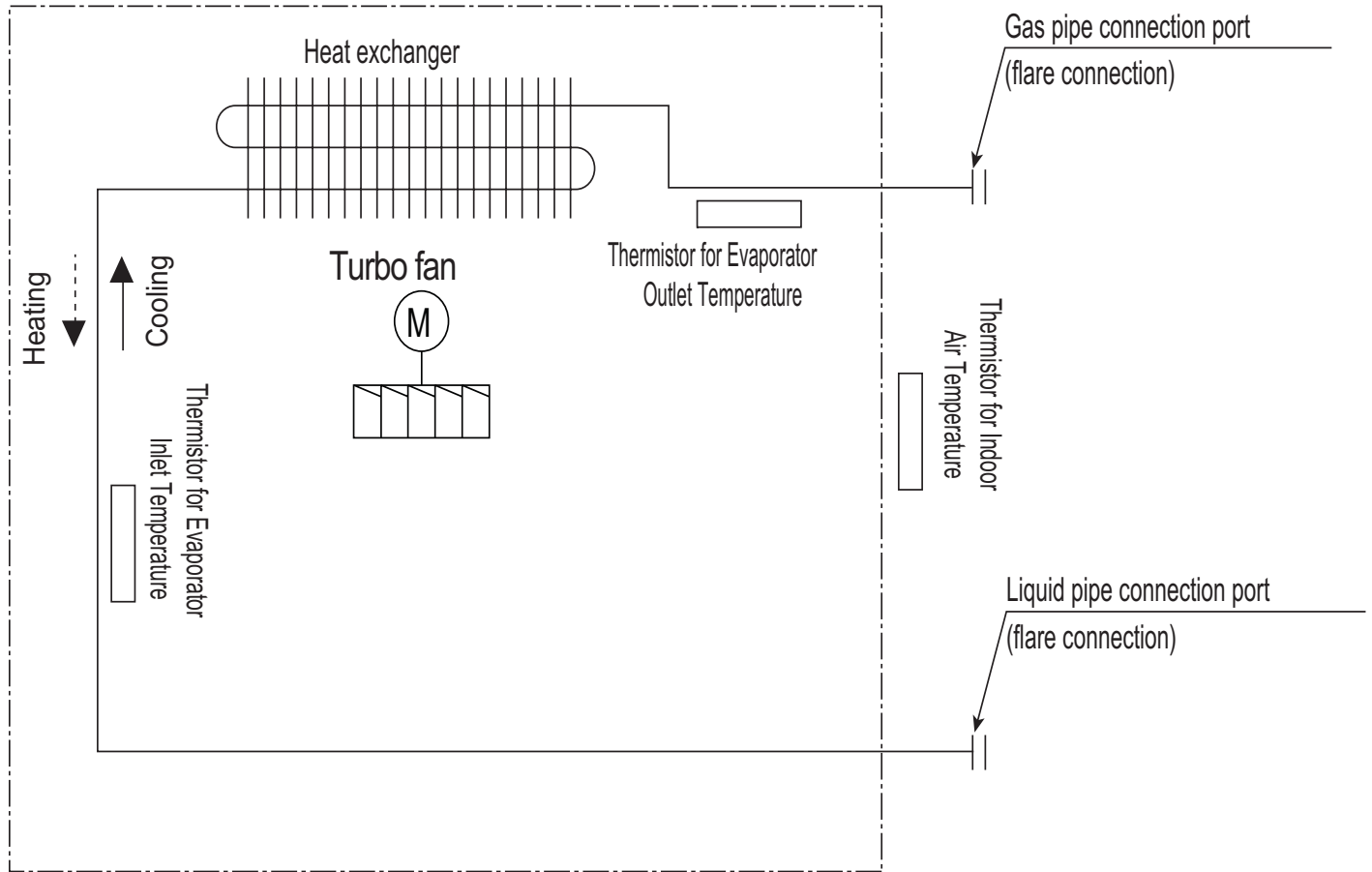


Table 6: Multi F Multi Zone Art Cool Mirror Wall-Mounted Indoor Unit Refrigerant Pipe Connection Port Diameters.

Model No.	Vapor (inch)	Liquid (inch)
LMCN077HV	Ø3/8	Ø1/4
LCN097HV4		
LCN127HV4		
LMCN185HV	Ø1/2	

Major System Components

A typical Multi F system consists of an outdoor unit (ODU), refrigerant piping, and two (2) to four (4) indoor units (IDUs). The ceiling cassette units described in this manual are one of the types of IDUs that can be connected to a Multi F system.

A typical Multi F Max system consists of an ODU, refrigerant piping, one or two branch distribution units (BDU), and two (2) to eight (8) IDUs. The ceiling cassette units described in this manual are one of the types of IDUs that can be connected to a Multi F Max system.

Typical Multi F System

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

ODU: Outdoor Unit.

IDU: Indoor Unit.

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

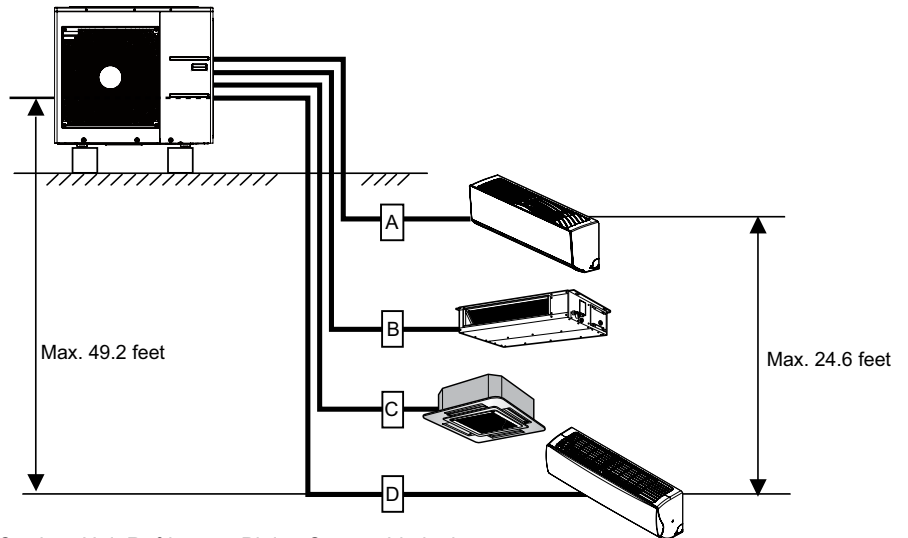


Table 7: Multi F Outdoor Unit Refrigerant Piping System Limitations.

Outdoor Unit	Minimum Length for Each Pipe Segment (ft.)	Maximum Equivalent Pipe Length to Each Indoor Unit (ft.)				Maximum Equivalent Pipe Length for Each System (ft.)
		A	B	C	D	
LMU18CHV	9.8	82	82	-	-	164
LMU24CHV	9.8	82	82	82	-	246.1
LMU30CHV	9.8	82	82	82	82	246.1
LMU36CHV	9.8	82	82	82	82	246.1

Typical Multi F MAX System with One Branch Distribution Unit

Example: LMU540HV outdoor unit with four (4) indoor units, and one (1) branch distribution unit connected.

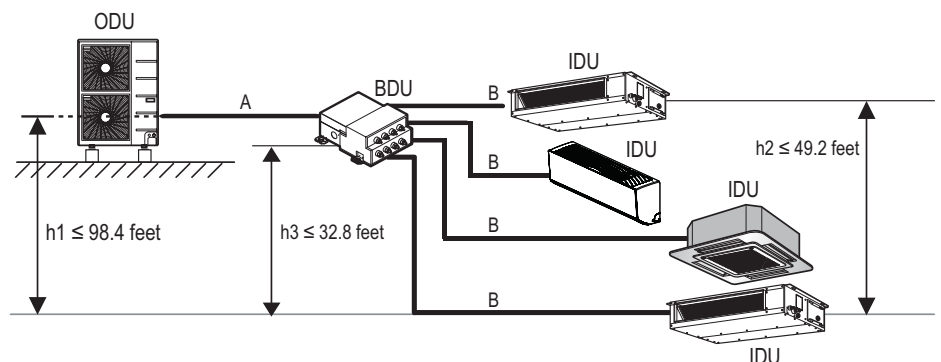
ODU: Outdoor Unit.

IDU: Indoor Unit.

BDU: Branch Distribution Unit.

A: Main Piping.

B: Branch Piping (Branch Distribution Unit to Indoor Unit[s]).



GENERAL DATA

Typical Multi F/Multi F Max Systems

MULTI F
MULTI F MAX

Typical Multi F MAX System 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 Piping.

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

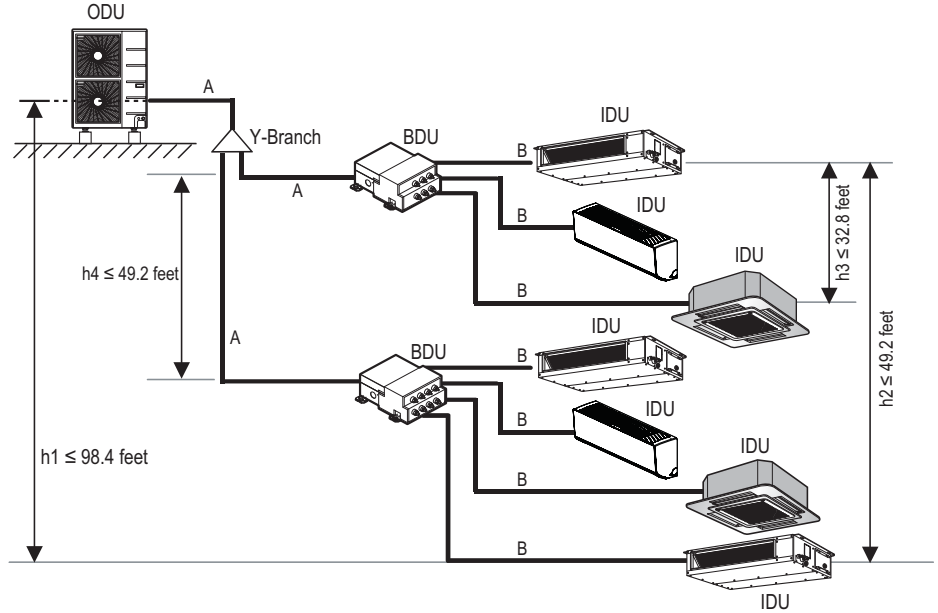


Table 8: Multi F MAX LMU480HV, LMU540HV, and LMU600HV Outdoor Unit Refrigerant Piping System Limitations.

Pipe Length (ELF = Equivalent Length of pipe in Feet)	Total piping length ($\Sigma A + \Sigma B$)		≤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	9.8 feet
Maximum		≤49.2 feet	
Elevation Differential (All Elevation Limitations are Measured in Actual Feet)	If outdoor unit is above or below indoor unit (h_1)		≤98.4 feet
	Between the farthest two indoor units (h_2)		≤42.9 feet
	Between branch distribution unit and farthest connected indoor unit(s) (h_3)		≤32.8 feet
	Between branch distribution units (h_4)		≤42.9 feet

Table 9: 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 Ceiling Cassette Indoor Unit

Field Supplied Refrigerant Piping

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. Tube wall thickness should meet local code requirements and be approved for a maximum operating pressure of 551 psi.

Refer to the refrigerant piping section (starting on page 23) of the General Installation Guidelines for more information on piping.

Using Refrigerant Components

Field-supplied elbows are allowed if they are long radius and designed for use with R410A refrigerant. Be sure to account for the additional pressure losses in equivalent pipe length calculations for each elbow, Y-branch, and branch distribution unit. The equivalent pipe length of each elbow, Y-branch, and/or branch distribution unit must be added to each pipe segment to ensure maximum lengths are not exceeded.

Table 10: 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				

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

Location Selection

⚠ DANGER

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

Note:

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

Select a location for installing the ceiling cassette indoor unit (IDU) that meets the following conditions:

- Place the unit where air circulation will not be blocked.
- Place the unit where drainage can be obtained easily.
- Place the unit where noise prevention is taken into consideration.
- Ensure there is sufficient strength to bear the load of the indoor unit.
- Ensure there is sufficient maintenance space.
- Locate the indoor unit in a location that is level, and where it can be easily connected to the outdoor unit / branch distribution unit.

⚠ WARNING

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

- ⊘ The unit should not be installed near a heat or steam source, or where considerable amounts of oil, iron powder, or flour are used.
- ⊘ Do not install the unit in an area where combustible gas may generate, flow, vent into, stagnate, leak, or be stored.
- ⊘ 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.
- ⊘ Avoid installing the unit near high-frequency generators or near any equipment that generates an electromagnetic field (minimum 3-1/3 feet away)
- ⊘ Do not install the unit near a doorway.

Note:

If the unit is installed near a body of water, certain components are at risk of being corroded. Appropriate anti-corrosion methods should be taken for the unit and all components.

Installing in a High or Dropped Ceiling

High or dropped ceilings, often found in commercial buildings and offices, may cause a wide temperature differentiation. To countermeasure:

- Change the indoor unit mode selection to allow for higher ceilings (see table).
- Install an air circulator.
- Set the air discharge outlet so that heated air flows in a downward direction.
- Use a dual door system to protect the building gate or exit.

Table 11: Ceiling Cassette Indoor Unit High Ceiling Mode Selection Options.

Ceiling Height	Mode Selection
≤7-1/2 feet	Low Ceiling
7-1/2 feet to 8-7/8 feet	Standard
8-7/8 feet to 10-3/16 feet	High Ceiling
10-3/16 feet to 11-13/16 feet	Very High Ceiling

Installing in an Area Exposed to Unconditioned Air

In some installation applications, areas (floors, walls) in some rooms may be exposed to unconditioned air (room may be above or next to an unheated garage or storeroom). To countermeasure:

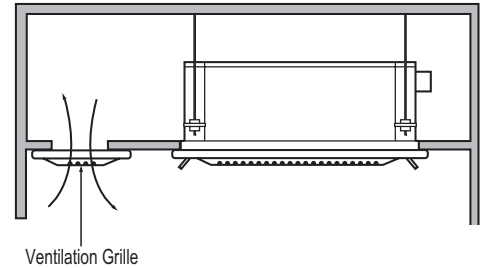
- Verify that carpet is or will be installed (carpet may increase the temperature by three (3) degrees).
- Add insulation between the floor joists.
- Install radiant heat or another type of heating system to the floor.

Installing in an Area with High Humidity Levels

If the environment is prone to humidity levels of 80% or more (near the ocean, lakes, etc.) or where steam could collect in the plenum:

- Install additional insulation to the indoor unit (glass wool insulation >13/32 inches thick).
- Install additional insulation to the refrigerant piping (insulation >13/16 inches thick).
- Seal all gaps between the indoor unit and the ceiling tiles (make the area air tight) so that humidity does not transfer from the plenum to the conditioned space. Also, add a ceiling grille for ventilation.

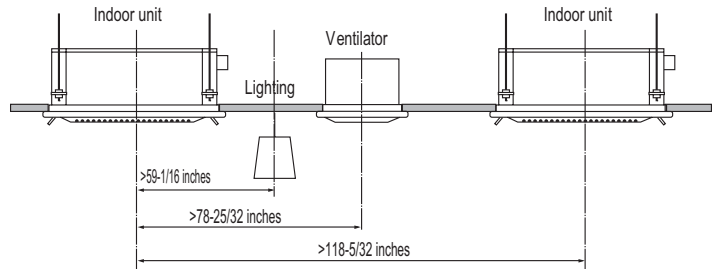
Figure 3: Installing in a Highly Humid Location.



Installing Multiple Indoor Units in One Area

Ensure there is enough space between indoor units, lighting fixtures, and ventilation fans / systems.

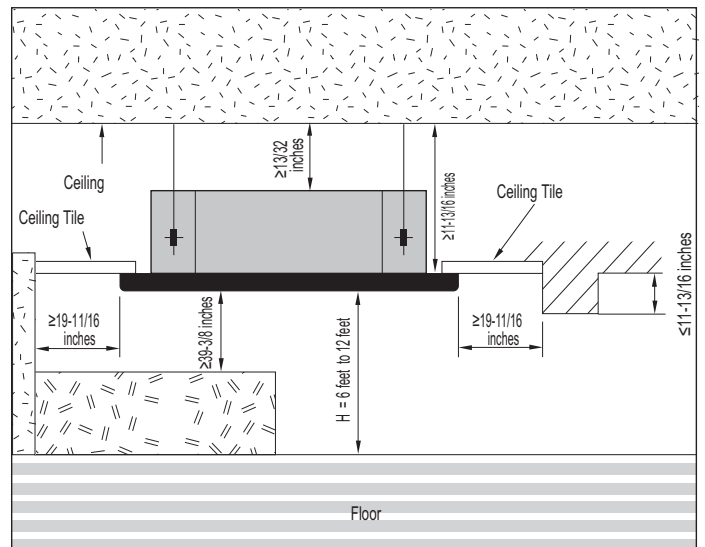
Figure 4: Installing Multiple Indoor Units.



Required Clearances

Figure 5 shows required clearance distances around a typical installed unit.

Figure 5: Required Clearances Around Typical Installed Unit.



Unpack and Inspect for Freight Damage

CAUTION

Shipping and net weights of the ceiling cassette units are listed in Table 5. To help avoid injury to personnel, use two people when carrying a unit by hand.

Note:

- Do not unpack the unit and remove the protective materials until ready to install. Before unpacking, carefully move the packaged unit to a work area near the installation location.
- To help avoid damage to the unit, use two people when carrying a unit by hand.

After opening, if the unit is damaged, repack the unit as it was shipped. 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 a supervisor on how to proceed with filing a freight claim and to order a replacement unit.

Note:

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.

Unpack and Inspect for Freight Damage, continued.

1. Before opening the shipping container, verify the correct unit is included as described in the note on the previous page.
2. Place the box on a solid surface right side up.
3. Cut the white reinforced nylon straps.
4. Open the box.
5. Remove any protective cardboard / Styrofoam® top sheets 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 all included accessories.
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.
11. If the unit is undamaged, remove and retain the installation manual.

Preparing the Installation Area and Hanging the Indoor Unit Frame

Preparing the Installation Area

1. Installation guide (template) depicts the exact dimensions necessary for the ceiling opening.
2. Choose the location for the indoor unit, and then mark where the suspension bolts, refrigerant piping, and drain hose should be. Suspension bolt angle should account for drain direction.
3. Drill holes for the bolts. Use either a W 3/8 inch or a M10 size bolt.

Note:

For easier installation, attach the accessories (except for the decoration panel) before hanging the indoor unit.

Figure 6: Using the Level.

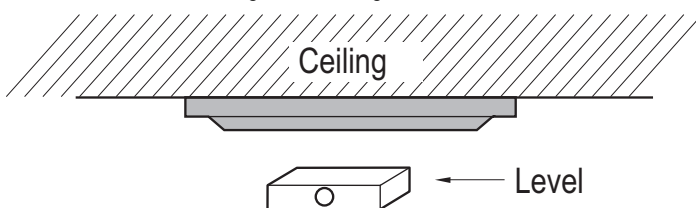


Figure 7: Drilling Holes Using Template.

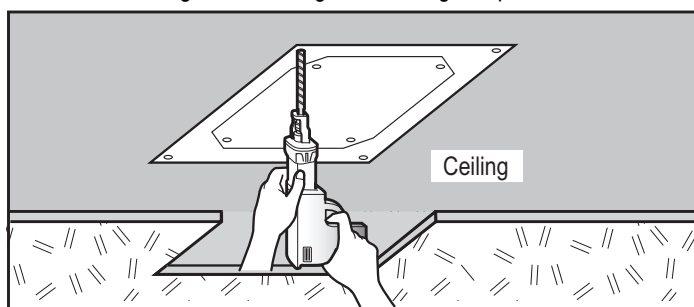


Figure 8: Ceiling Opening Dimensions and Bolt Locations.

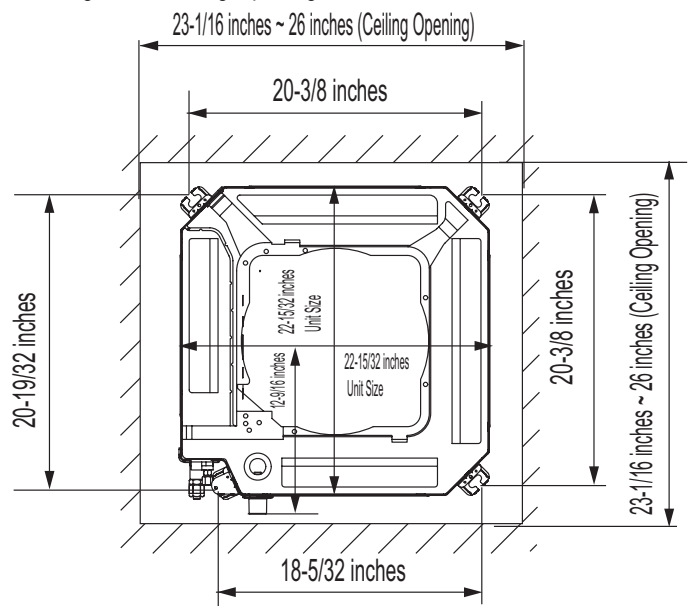


Figure 9: Installing the Hanging Bolt in the Ceiling.

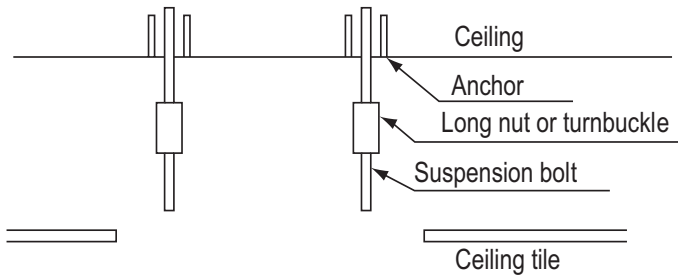
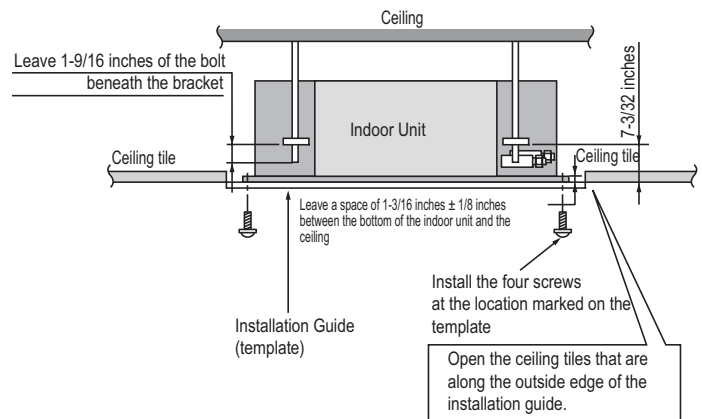


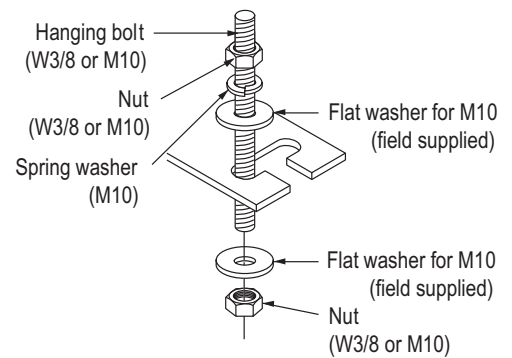
Figure 10: Installation Diagram.



For New Ceilings

1. Use a sunken insert, a sunken anchor, or any other field-supplied part to reinforce the ceiling so that it can bear the weight of the indoor unit. Use a temporary washer plate to more easily set up the unit suspension location.
2. Ceiling height is shown on the side of the installation guide (template). Adjust the height of the unit accordingly. Adjust the clearance before hanging the indoor unit.
3. Refer to the installation guide (template) for the dimensions to the ceiling opening. Match the center of the indoor unit (labeled) to the center indicated on the installation guide.
4. Align the installation guide (template) with the label attached to the unit (affixing the template to the unit if desired) to properly place the unit.
5. Remove the temporary washer plate and position the indoor unit hanger brackets on the bolts. Secure with nuts and washers on the top and bottom of the hanger brackets.
6. Ceiling-cassette indoor units are equipped with a built-in drain pump and float switch, therefore, the unit must be installed horizontally or condensate will drip out and cause product malfunction. Measure the unit at each corner to verify that it is level.
7. Remove the installation guide (template).

Figure 11: Hanging the Indoor Unit.



For Existing Ceilings

1. Use anchors when installing the indoor unit in an existing ceiling.
2. Ceiling height is shown on the side of the installation guide (template). Adjust the height of the unit accordingly. Adjust the clearance before hanging the indoor unit.
3. Remove the temporary washer plate and position the indoor unit hanger brackets on the bolts. Secure with nuts and washers on the top and bottom of the hanger brackets.
4. Ceiling-cassette indoor units are equipped with a built-in drain pump and float switch, therefore, the unit must be installed horizontally or condensate will drip out and cause product malfunction. Measure the unit at each corner to verify that it is level.
5. Remove the installation guide (template).

Installing the Drain System

- The unit uses a drain pump with a height of up to 27-9/16 inches to remove condensate from the indoor unit to the drainage system. To ensure proper drainage, the flexible drain piping and any field-supplied drain piping should be installed below the maximum height.
- Field-supplied drain piping must have downward gradient of at least 1/50 to 1/100; to prevent reverse flow, slope should not be straight up and down.
- Do not damage the drain port on the indoor unit when connecting the flexible drain hose or field-supplied drain piping.
- Drain piping specifications:
 - Indoor Unit Drain Connection (Flexible Drain Hose): 1-1/4 inch outside diameter.

Note:

The supplied flexible drain hose should not be installed with a sharp curve or twist. A curved or twisted hose may become damaged due to vibration and / or leak.

- Field-Supplied Drain Piping: Polyvinyl chloride piping with 1-inch inside diameter and pipe fittings.

Note:

Condensate can be drained either directly outside or to a common drain system. For more information regarding the common drain system, see the Multi F / Multi F MAX Outdoor Unit Engineering Manual

If the field drain piping and / or the common drain system is long, it is recommended that clamp hangers be installed for support.

Table 12: Recommended Drain Piping Support Intervals.

Piping Dia. (Inch)	Ø3/4" ~ 1-1/2"	Ø1-1/2" ~ 2"	Ø2-1/2" ~ 5"
Maximum Interval (feet)	<3.3	<3.9	<4.9

Checking the Drain Pump

The drain pump must be tested before the system operates.

- Connect flexible drain hose to the field-supplied drain piping; leave it as is until the test is complete.
- Pour water into the flexible drain hose and check for leaks.
- After power wiring installation is complete, operate the drain pump to see if it sounds and functions properly.
- After the test is complete, connect the flexible drain hose to the indoor unit drain port.

Figure 12: Ceiling Cassette Indoor Unit Drain System.

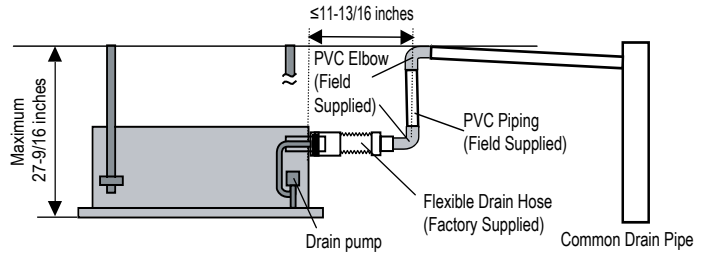


Figure 13: Drain Slope.

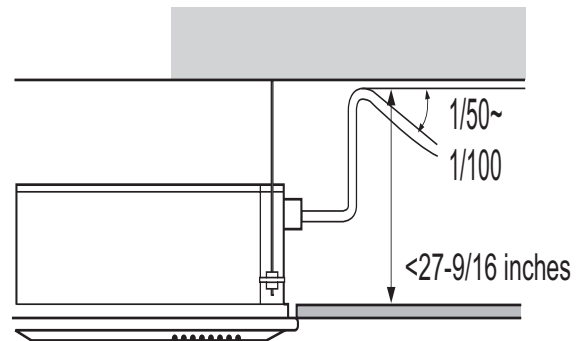


Figure 14: Correct (Another View) and Incorrect Drain Slopes.

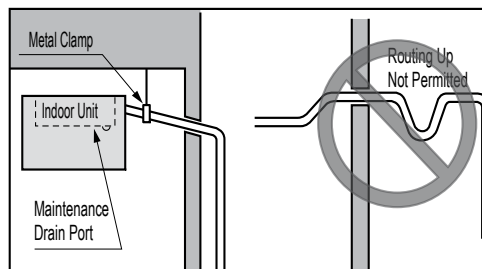
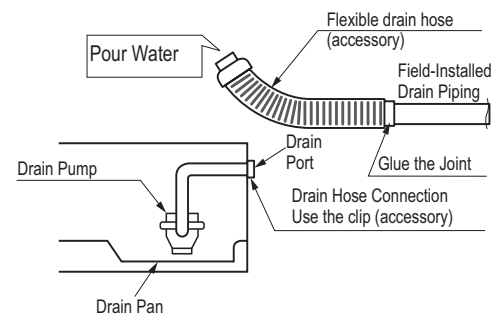


Figure 15: Flexible Drain Hose Connection.



Clamp the Flexible Drain Hose Connection

Figure 16: Checking the Drain Pump.



Insulating the Drain Piping

- Drain piping insulation should be made of polyethylene foam with a minimum thickness of 7/16 inches.
- Secure drain hose insulation at the drain port connection on the indoor unit so that no gaps exist.

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.

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.

Pipe Slope

The horizontal pipe slope cannot exceed 10° up or down. Y-branches have additional restrictions described on the next page.

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 / Multi F Max systems have redundant systems that ensure oil is properly returned to the compressor. Sight-glasses and solenoid valves may cause vapor to form in the liquid stream.

Note:

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.

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 17: Insulating the Drain Piping.

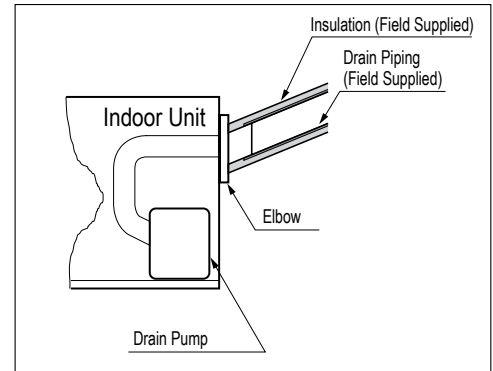
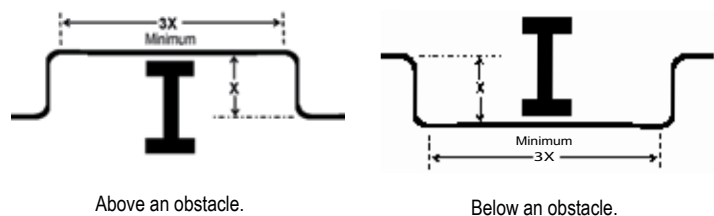


Figure 18: Installing Piping Above and Below an Obstacle.



Multi F MAX Y-Branch Kit PMBL5620

The LG supplied Y-Branch Kit PMBL5620 MUST be used when two branch distribution units are connected to 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 $\pm 3^\circ$ 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 $\pm 5^\circ$ 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. 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.

Figure 19: Y-Branch Port Identification and Dimensions.

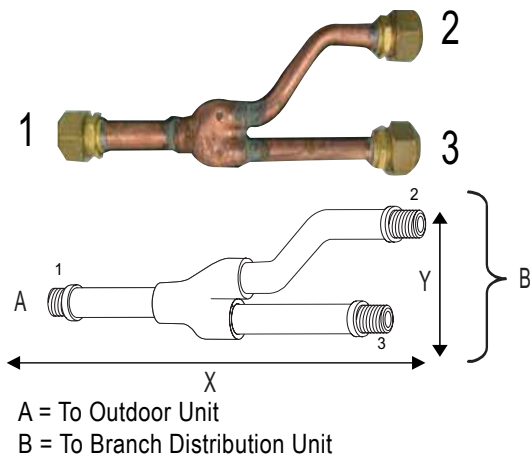


Table 13: Multi F MAX Y-Branch Connection Diameters.

Model	Y-Branch Type	Port Identifier (inch)		
		1	2	3
PMBL5620	Liquid	Ø3/8	Ø3/8	Ø3/8
	Vapor	Ø3/4	Ø3/4	Ø3/4
	Y-Branch Type	Dimensions (inch)		
		X	Y	
	Liquid	13.80	3.24	
	Vapor	12.48	3.02	

Figure 21: Y-branch Vertical Installation Alignment.

Vertical Up Configuration Vertical Down Configuration

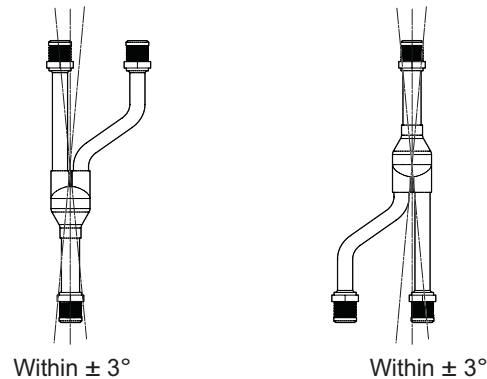
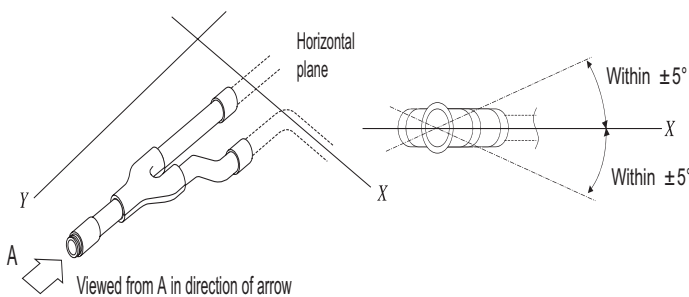


Figure 20: Y-branch Horizontal Installation Alignment.



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.

Table 14: Insulation Jacket Properties.

Material	Polyolefin Foam
UL94 Flame Classification	HF-1
Density	1.84 lbs./ft. ³
Thermal Conductivity	.0208 Btu/h/ft. °R
Thickness	1/2 inch

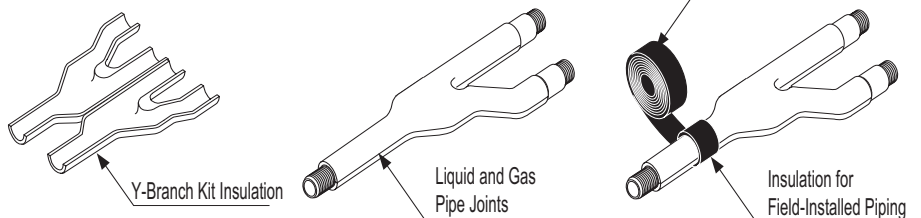


Figure 22: Y-Branch Insulation Jacket Diagram.

Selecting Field-Supplied Copper Tubing

Copper is the only approved refrigerant pipe material for use with Multi F products, and LG recommends seamless phosphorous deoxidized ACR type copper pipe, hard-drawn rigid type “K” or “L”, or annealed-tempered, copper pipe.

- 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 15: ACR Copper Tubing Material.

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

Table 16: 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	2.25	3.0	3.0	3.5	4.0	4.5
Min. Wall Thickness (in)	.03	.03	.035	.040	.042	.045	.050	.050	.050

Table 17: 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

¹All dimensions provided are in accordance with ASTM B280 – Standard.

²Design pressure = 551 psig.

³ACR Tubing is available as hard drawn or annealed (soft) and are suitable for use with R410A refrigerant.

⁴The 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.

No Pipe Size Substitutions

Note:

Use only the pipe size recommended by this installation manual. Using a different size is prohibited and may result in system malfunction or failure.

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 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. In Table 18 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.

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. No significant change in length of the liquid line, therefore, is anticipated.

When creating an expansion joint, the joint height 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 19. 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 below for precalculated anticipated expansion for various pipe sizes and lengths of refrigerant tubing.

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 18: 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

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

Figure 23: Coiled Expansion Loops and Offsets.

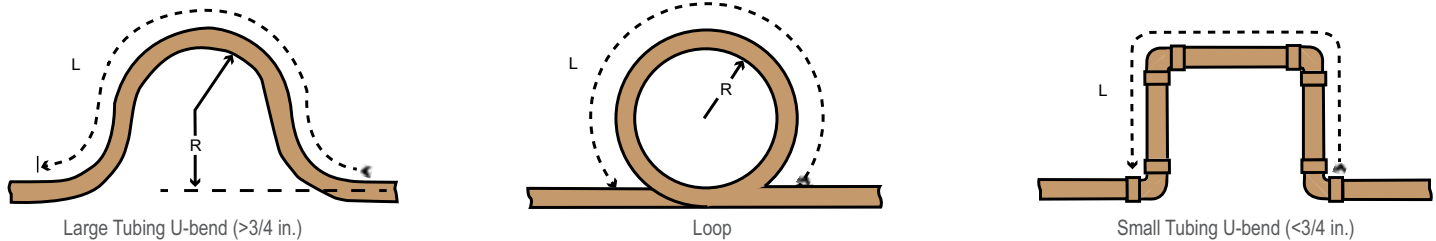


Table 19: Radii of Coiled Expansion Loops and Developed Lengths of Expansion Offsets.

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

GENERAL INSTALLATION GUIDELINES

Refrigerant Piping

MULTI F
MULTI F MAX

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.

Pipe Supports

Note:

The pipe system must 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 should be installed outside (around) the primary pipe insulation jacket. Insulate the pipe before installing the supports. Pipe supports are field-provided and must meet local code. If local codes do not specify pipe support spacing, install pipe supports a maximum of five (5) feet on center for straight segments of pipe up to 3/4" outside diameter size.

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 24: Installing an Insert Into a Concrete Beam.

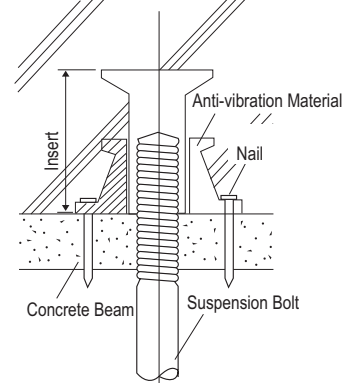


Figure 25: Pipe Hanger Details.

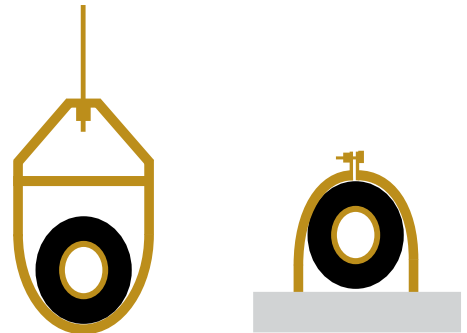


Figure 26: Typical Pipe Support Location—Change in Pipe Direction.

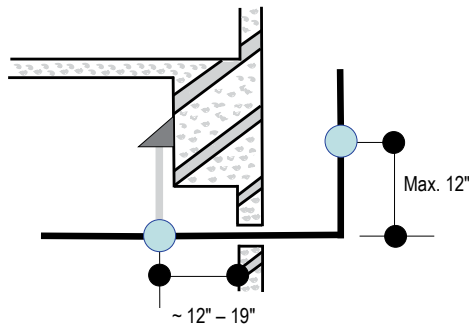


Figure 27: Pipe Support at Indoor Unit.

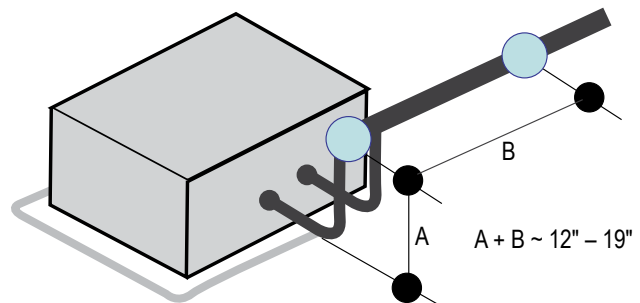
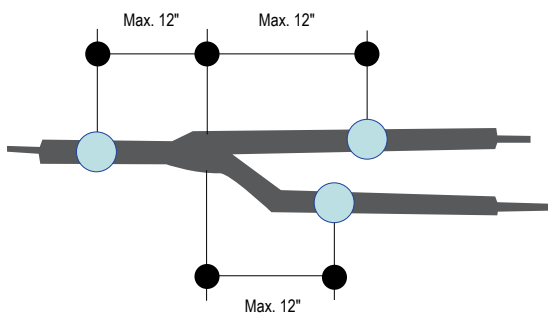


Figure 28: Pipe Support at Y-branch Fitting.



Examples of Supports

Figure 29: U-Bolt Support with Insulation.

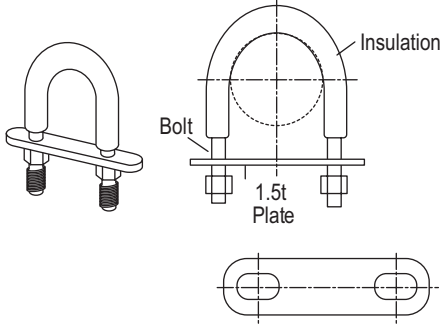


Figure 30: O-Ring Support with Insulation.

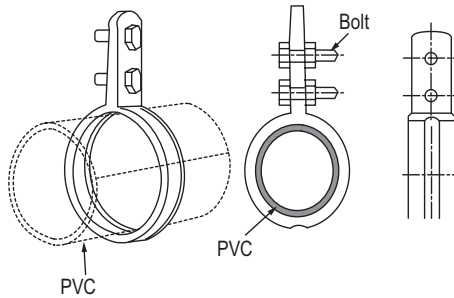
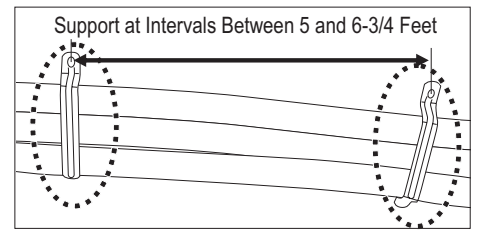


Figure 31: Saddle-Type Support.



Note:

⊗ 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 32: U-Bolt Support with an Insulated Pipe.

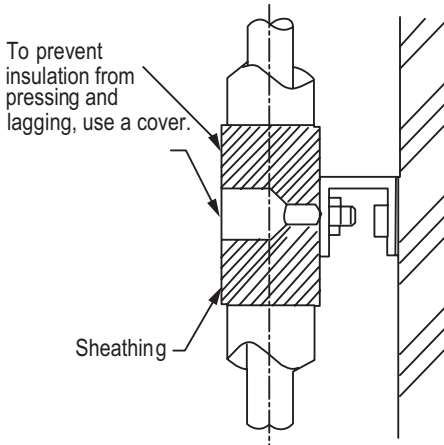


Figure 33: O-Ring Band Support with an Insulated Pipe.

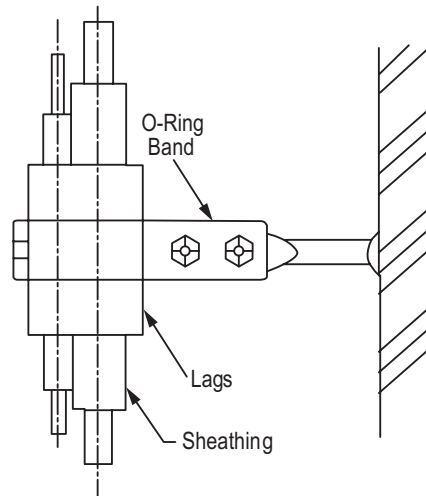


Figure 34: One-Point Down-Stop Support (>441 lbs.).

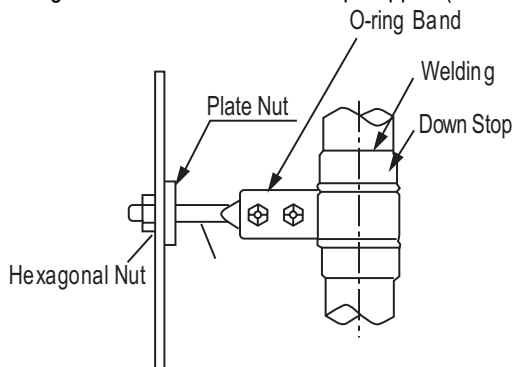
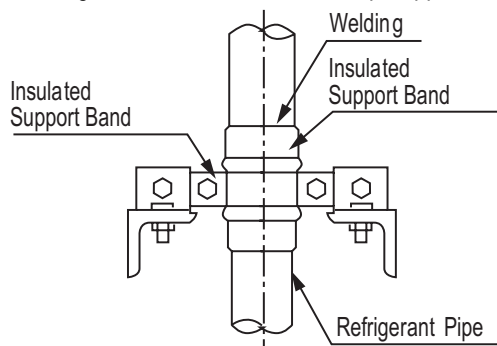


Figure 35: Two-Point Down-Stop Support.



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. Route underground refrigerant pipe inside a protective sleeve to prevent insulation deterioration. Follow federal, state, and local regulations and codes when choosing a sleeve type.

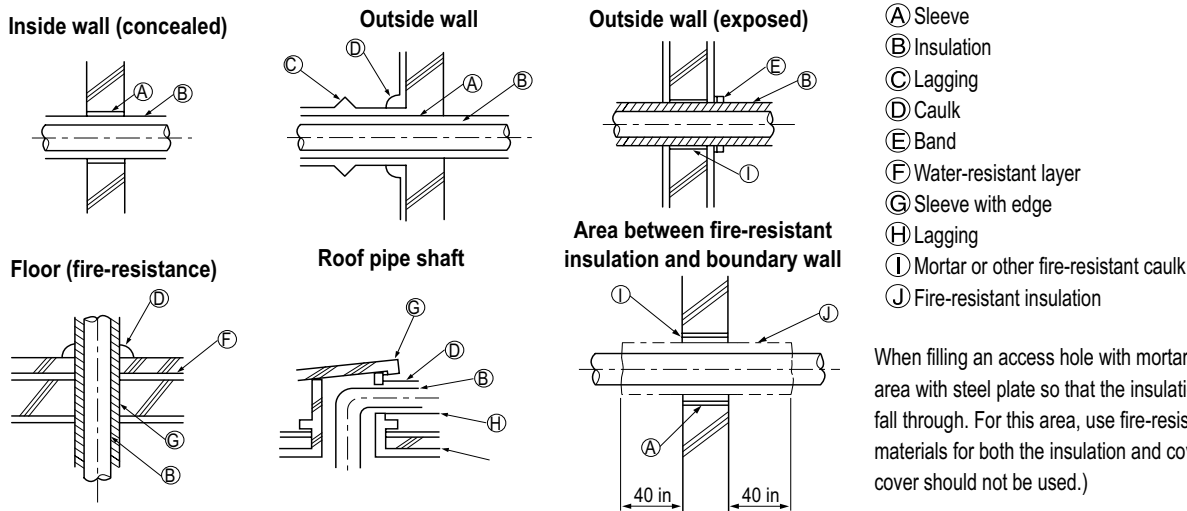
Note:

Pipe diameter plus insulation thickness determines wall penetration diameter.

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 36: 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.)

Underground Refrigerant Piping

Route refrigerant pipe installed underground 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 20: Utility Conduit Sizes.

Liquid Pipe ¹	Vapor Pipe ¹			
	3/8 (1-1/8 ^{2,3})	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

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

²Diameter 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.

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

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

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

Figure 37: Typical Arrangement of Refrigerant Pipe and Cable(s) in a Utility Conduit.

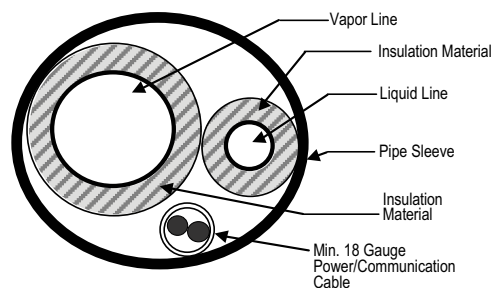


Figure 38: Underground Refrigerant Piping.



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. See Table 21 for care of piping.

Figure 39: Keep Piping Capped While Storing.

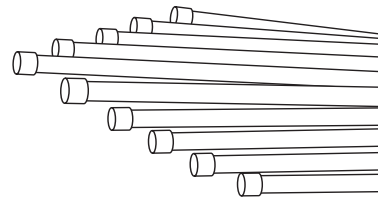
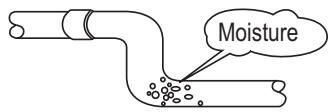

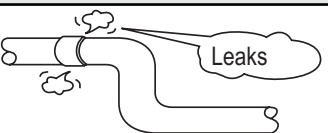


Table 21: Three Principles of Refrigerant Piping.

	Dry	Clean	Airtight
Principles	No moisture should be inside the piping.	No dust should be inside the piping.	No leaks should occur.
			
Problems Caused	<ul style="list-style-type: none"> - Significant hydrolysis of refrigerant oil. - Refrigerant oil degradation. - Poor insulation of the compressor. - System does not operate properly. - EEVs, capillary tubes are clogged. 	<ul style="list-style-type: none"> - Refrigerant oil degradation. - Poor insulation of the compressor. - System does not operate properly. - EEVs and capillary tubes become clogged. 	<ul style="list-style-type: none"> - Refrigerant gas leaks / shortages. - Refrigerant oil degradation. - Poor insulation of the compressor. - System does not operate properly.
Solutions	<ul style="list-style-type: none"> - 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 ensure the vacuum holds at that level for 24 hours. 	<ul style="list-style-type: none"> - 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. 	<ul style="list-style-type: none"> - 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.

Piping Preparation

⚠ WARNING

- Do not allow the refrigerant to leak during brazing; if refrigerant combusts, it generates a toxic gas which can cause physical injury or death.
- Do not braze in an enclosed location, and always test for gas leaks before / after brazing. Gas leaks can cause physical injury or death.
- After brazing, check for refrigerant gas leaks. Refrigerant gas leaks can cause physical injury or death.
- When selecting flare fittings, always use a 45° fitting rated for use with high pressure refrigerant R410A. Failure to do so may result in refrigerant leaks which in turn could result in personal injuries or death from oxygen depletion. Selected fittings must also comply with local, state, or federal standards.

Note:

1. If piping becomes kinked due to excessive bending, do not use the pipe.
2. Braze the pipes to the service valve pipe stub of the outdoor unit.

Creating a Flare Fitting

Note:

One of the main causes of refrigerant leaks is defective flared connections. Be sure to properly form the flare connections.

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.
 - Cut the cable 4.9 ft longer than the pipe length.
- 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.
 - Refer to the diagram in step 3 of Figure 40 and the dimensions in Table 22 for positioning the pipe in the flaring tool.
 - ALWAYS create a 45° flare when working with R410A. See Warning on this page.
4. Carefully inspect the flared pipe end.
 - Compare the flare with the illustration in step 4 of Figure 40.
 - If the flare is defective, cut it off and re-do procedure.
 - If flare looks good, blow clean the pipe with dry nitrogen.

Figure 40: Creating a Flare Fitting.

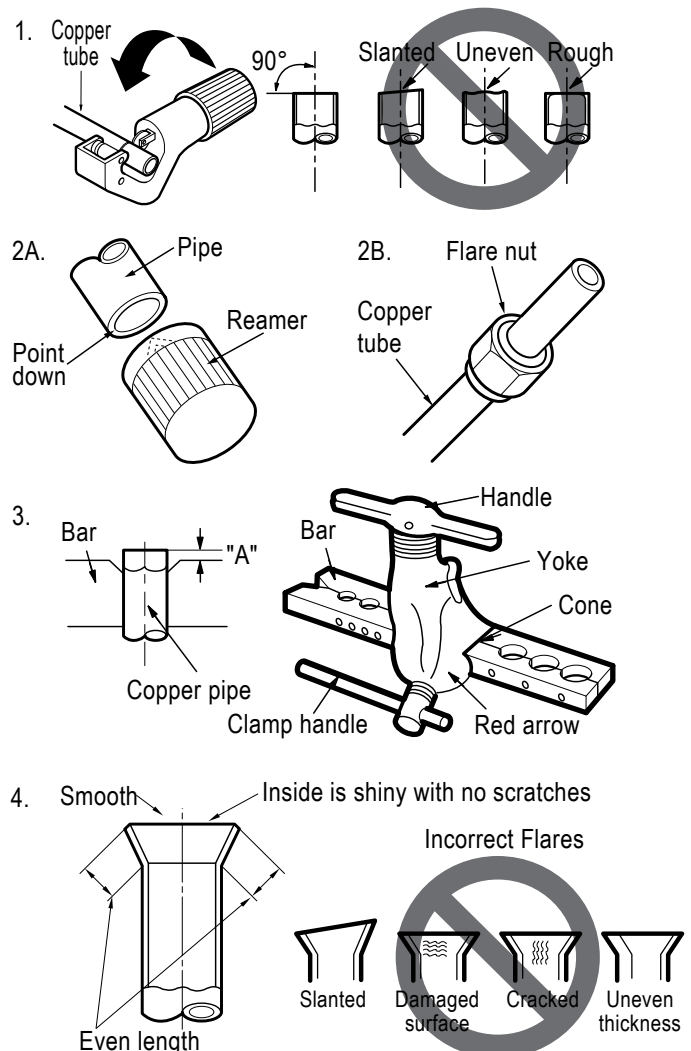


Table 22: Flare "A" Measurement.

Pipe Outside Diameter (inch)	"A" Measurement (inch)
1/4	0.04 – 0.5
3/8	0.06 – 0.7
1/2	0.06 – 0.7
5/8	0.06 – 0.7
3/4	0.07 – 0.8

Tightening the Flare

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.

1. When connecting the flare nuts, coat the flare (inside and outside) with polyvinyl ether (PVE) refrigeration oil only.
2. Align the center of the piping sections and tighten the flare nut by hand.
3. Tighten the flare nut with a torque wrench and a backup wrench until a click is heard.
4. Wrap insulation around the connection.
5. If it is necessary to loosen the flare nuts, always use two wrenches to do so.

Table 23: Tightening Torque for Flare Nuts.

Pipe size (Inches O.D.)	Tightening torque (ft-lbs)	Width of the flare (A [inches])
1/4Ø	13.9 - 18	1/8
3/8Ø	24.5 - 30.3	1/8
1/2Ø	39.7 - 47.7	1/8
5/8Ø	45.5 - 59.2	1/16

Multi F Outdoor Unit to Indoor Unit Piping Connections

Avoid Pipe Damage

- When routing field-provided piping, avoid damaging the outdoor unit from excessive vibration.
- Correctly route the piping so it does not make contact with mounting bolts. Allow room for field installation.
- 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.

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 3	1/4 x 4
Vapor Line Connection (in., OD) x Qty.	3/8 x 2	3/8 x 3	3/8 x 3	3/8 x 4

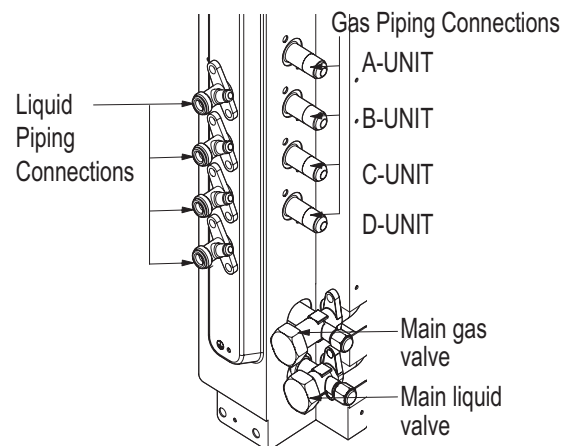
Table 25: Ceiling Cassette Indoor Unit Pipe Sizes.

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

Table 26: Ceiling Cassette Indoor Unit Piping Connections.

Indoor Unit Capacity	Vapor Line Connection (in., OD)	Liquid Line Connection (in., OD)
7,000 Btu/h	Ø3/8	Ø1/4
9,000 Btu/h		
12,000 Btu/h		
18,000 Btu/h	Ø1/2	

Figure 41: Multi F Refrigerant Pipe Connections (LMU36CHV shown as example).



PIPING CONNECTIONS

IDU to ODU

MULTI F
MULTI F MAX

Multi F Outdoor Unit to Indoor Unit Piping Connections, continued.

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.

Table 27: Connection Socket Dimensions.

Indoor Unit Capacity	Vapor (in., OD)		Liquid (in., OD)	
	A	B	A	B
18,000 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.

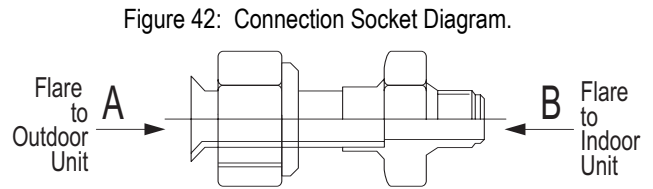
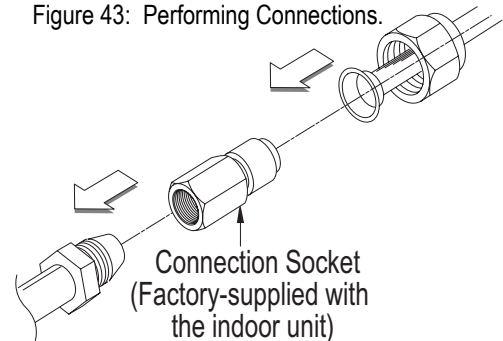


Figure 43: Performing Connections.



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, and LMU600HV
Liquid Line Connection (in., OD) x Qty.	3/8 x 1
Vapor Line Connection (in., OD) x Qty.	3/4 x 1

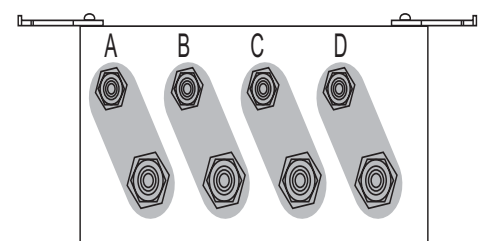
Branch Distribution to Indoor Unit Piping Connections

- 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 3, Ø3/8 x 1
Vapor (in., OD) x Qty.	Ø3/8 x 2	Ø3/8 x 3	Ø3/8 x 4	Ø3/8 x 3, Ø5/8 x 1

Figure 44: Branch Distribution Ports to Indoor Units.



Multi F Ceiling Cassette Indoor Unit

Multi F MAX Outdoor Unit System Piping Connections, continued.

Table 30: Ceiling Cassette 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		
18,000 Btu/h	Ø1/2	

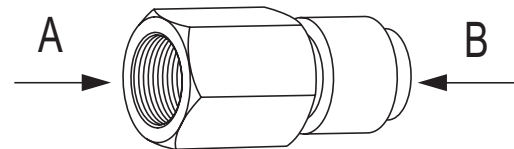
Table 31: Ceiling Cassette Indoor Unit Piping Connections.

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		
18,000 Btu/h	Ø1/2	Ø1/4

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.

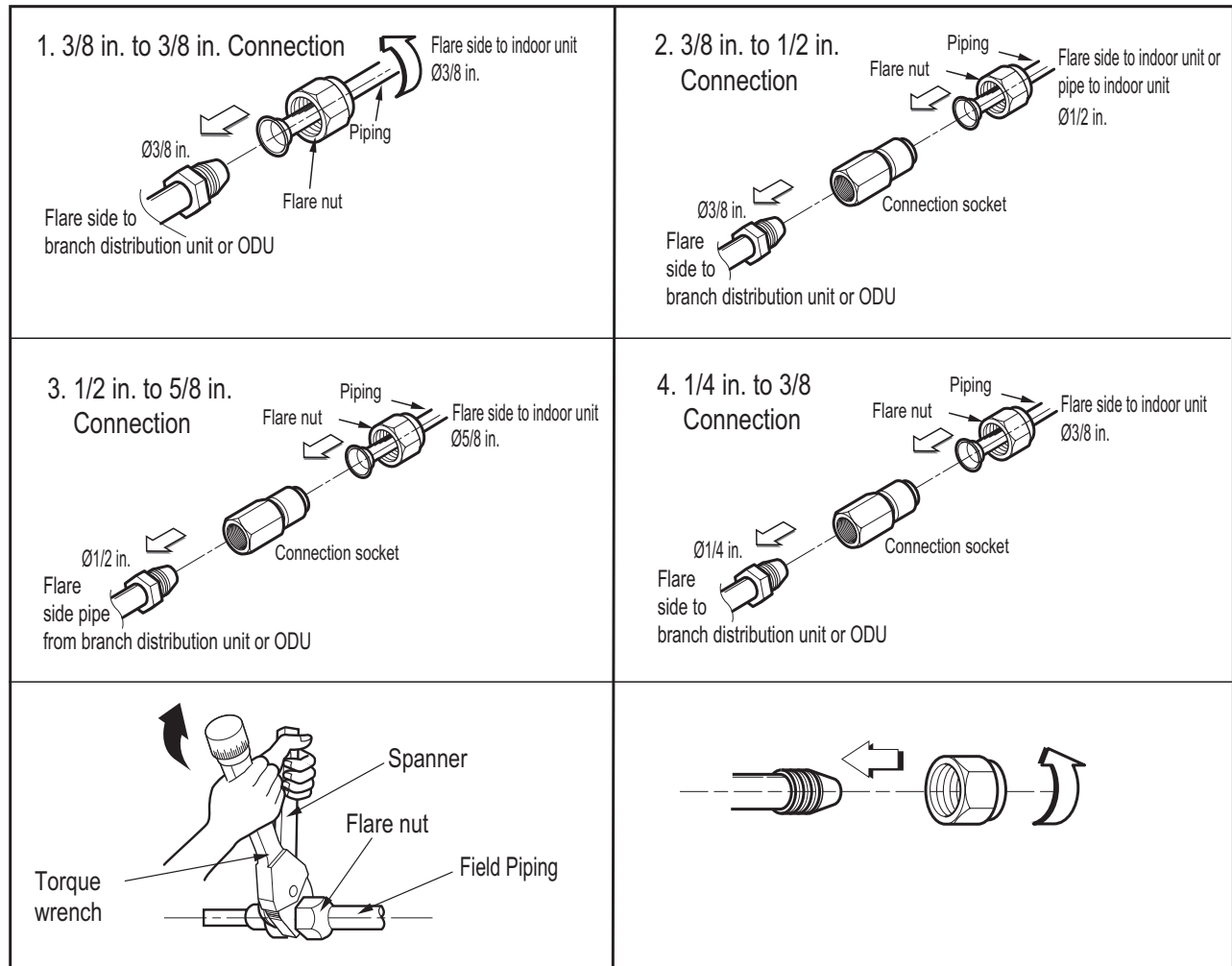
Table 32: Connection Socket Dimensions.

Indoor Unit Capacity	Vapor (in., OD)		Liquid (in., OD)	
	A	B	A	B
18,000 Btu/h	Ø3/8 → Ø1/2		N/A	



Connection Socket

Figure 46: Possible Outdoor Unit or Branch Distribution Unit (Multi F MAX only) to Indoor Unit Connections.



Refrigerant Safety

⚠ WARNING

Verify the maximum refrigerant concentration level in the space where the indoor unit will be installed meets the concentration limit for the application.

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

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

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

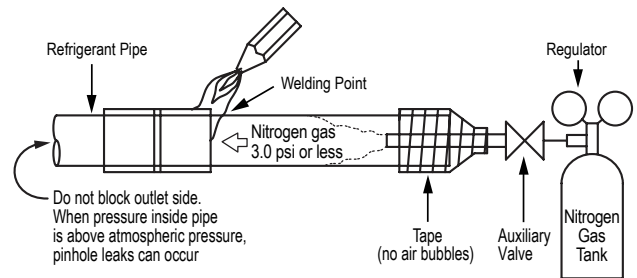
Brazing

Note:

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

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

Figure 47: Using Nitrogen Gas During Brazing.



Refrigerant Piping System Insulation

All refrigerant piping including Y-branch connections, field-provided isolation ball valves, 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" thick, and thickness may need to be increased based on ambient conditions and local codes. Table 33 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

Note:

Follow locals codes when selecting EPDM insulation wall thickness. Thickness in Table 33 is based on heat conductivity of 0.61 Btu/in/h/ft²/°F.

Table 33: 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 inches	1/2 inches	1/2 inches	1/2 inches	1/2 inches
	ø3/8 inches				
	≥ø1/2 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. Air-conditioned, Typical location

- When piping passes through an indoor area where the indoor unit operates, such as an apartment, classroom, office, mall, hospital, etc.

2. Air-conditioned, Special location

- When the location is air conditioned, but has severe temp/humidity difference due to high ceilings, such as a church, auditorium, theater, etc.
- When the location is air conditioned, but internal temperature/humidity are high, such as a bathroom, swimming pool, locker room, etc.

3. Non-air conditioned, Typical location

- When piping passes through an indoor area where the indoor unit does not operate, such as a hallway, dormitory, or school, etc.

4. Non-air conditioned, Special location (when both conditions listed below are present)

- When piping passes through an indoor area where the indoor unit does not operate.
- When the humidity is high and there is no air flow in the location where the piping is installed.

⚠ WARNING

Ensure all refrigerant piping is insulated. Any exposed piping will cause burns if touched.

Note:

Any exposed piping may generate condensate that may damage walls, etc.; sufficiently insulate all cold surfaces to prevent moisture from forming.

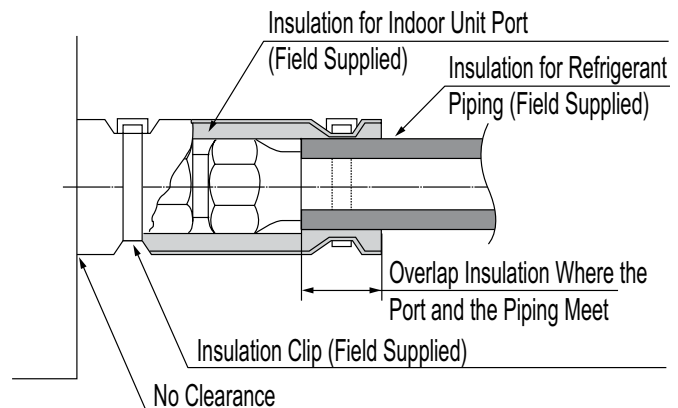
Overlap the insulation at the connection of the field-installed piping and the indoor unit. Tape together so that no gaps exist, and secure insulation to the rear piping housing with vinyl tape.

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. Be sure 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 48: Typical Refrigerant Line Flare Fitting Insulation Detail.



⚠ 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 cause unit malfunction and be a fire hazard.
- Properly ground the outdoor, indoor, and branch distribution (Multi F MAX systems only) units. Ground wiring is required to prevent accidental electrical shock during current leakage.
- Ground wiring must always be installed by a qualified technician.
- 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, indoor, and branch distribution (Multi F MAX systems only) 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.
- 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.
- ⓧ Do not operate the air conditioning system until the refrigerant piping installation is complete. Operating the system before refrigerant piping is finalized may damage the compressor.
- Use ring terminals to attach the wiring. Verify that all power wiring and communications cable terminals are securely attached. Ensure enough slack is included in the wiring and cables to avoid damaging the connections.
- Use a conduit to protect the power wiring.

Multi F / Multi F MAX System Power Wiring and Communications Cable

For both Multi F and Multi F MAX systems, line voltage is wired to the outdoor unit only. The outdoor unit will supply power to the branch distribution units (Multi F MAX systems only) and the indoor units through the power wiring / communications cable.

Power Supply / Power Wiring Specifications

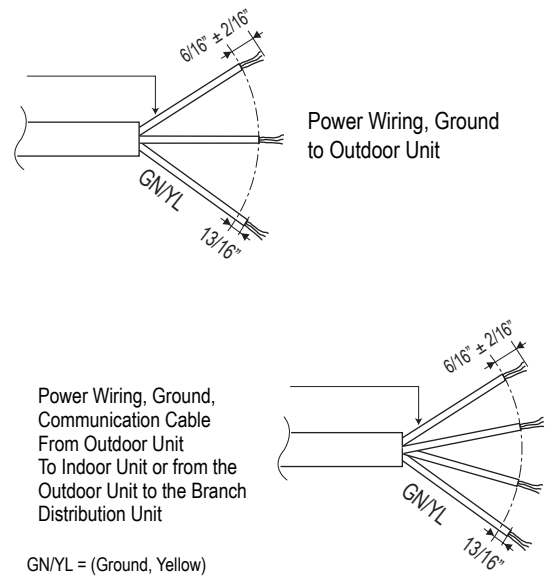
Note:

- 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.

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 49: Multi F / Multi F MAX Outdoor and Indoor / Branch Distribution Unit Wiring and Communications Cable Diagram.



GN/YL = (Ground, Yellow)

Figure 50: Close up of a Typical Ring Terminal.

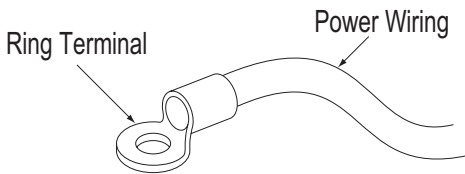
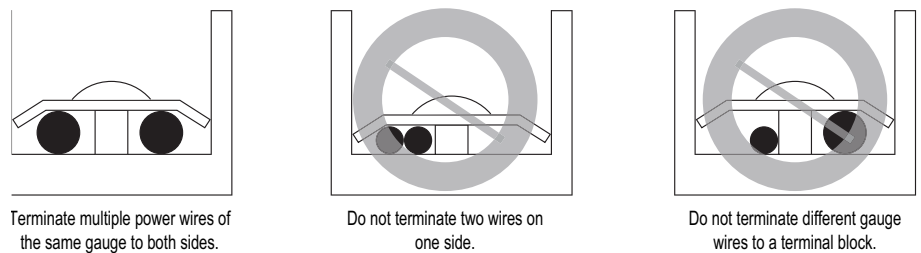


Figure 51: Proper and Improper Power Wiring Connections.



⚠ WARNING

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

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.
- Always include some allowance in the wiring length when terminating. Provide some slack to facilitate removing the electrical panels while servicing.
- 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).
- ⚠ 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.

Controller Options

Refer to the table at bottom right as to which remote controller model is used for each indoor unit. After all wiring is connected to the indoor and outdoor units, be sure to 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 models can use the following controllers when accompanied with the PI 485 VNet Accessory:

- AC Smart
- ACP
- BACnet®
- LonWorks®
- LGMV

Table 34: Multi F Cassette Wireless Controller Model.

Wireless Controller Model
AKB73757604

BACnet® is a registered trademark of ASHRAE. LonWorks® is a registered trademark of Echelon Corporation.

*Wireless Handheld Controller for the four-way ceiling cassette indoor units is also referenced by Model No. PQWRHQ0FDB.

Power Wiring / Communications Cable Installation Guidelines

- These instructions are for the indoor unit only. For outdoor unit wiring, refer to the outdoor unit installation manual.
- Confirm power source specifications.
- Confirm that the electrical capacity is sufficient.
- Starting current must be maintained ± 10 percent of the rated current marked on the outdoor unit name plate.
- Confirm cable thickness specifications.
- It is recommended that a circuit breaker is installed, especially if conditions could become wet or moist.
- Include a disconnect in the power wiring system. Add an air gap contact separation of at least 1/8 inch in each active (phase) conductor.
- A voltage drop may cause the following problems:
 1. Magnetic switch vibration, fuse breaks, or disturbance to the normal function of an overload protection device.
 2. Compressor will not receive the proper starting current.

The general guidelines for connecting electrical and communication cables are similar for all ceiling cassette indoor units. The electrical connections procedure includes a wiring diagram for the ceiling cassette indoor unit. It is recommended that power wiring / communications cable installation be performed before decorative grille kit (required; sold separately) installation.

⚠ WARNING

- Be sure that main power to the unit is completely off before beginning this procedure. Electric shock can cause severe physical injury or death.
- Follow all safety and warning information outlined at the beginning and throughout this manual. Failure to do so may cause bodily injury or death.
- Loose wiring may cause unit malfunction, or the terminal to overheat and catch fire, causing physical injury.

Note:

- Follow all safety and warning information outlined at the beginning and throughout this manual. Failure to do so, may cause unit failure.
- Ceiling cassette units require removing the control cover from the terminal block area. Control covers are attached with a phillips screw head.
- Connect the electrical cable to the indoor unit by connecting the wires to the terminals on the control board individually according to the outdoor unit connection. Be sure that the color of the wires at the outdoor unit / BD unit (Multi F MAX systems only) along with the terminal numbers are the same as those for the indoor unit. If wiring is not performed correctly, the system will malfunction.
- Terminal screws may become loose during transport. Properly tighten the terminal connections during installation.

Connecting the Power Wiring and Communications Cable

1. To access the terminal block, unscrew the control box cover and set it aside.
2. Insert the power wiring / communications cable from the outdoor unit or branch distribution unit (Multi F MAX systems only) through the sides of the indoor unit and control box. Pass the wiring through the designated access holes to prevent damage. To prevent electromagnetic interference and product malfunction, leave a space between the power wiring and communications cable outside of the indoor unit.
3. Connect each wire to its appropriate terminal on the indoor unit control board. Verify that the color and terminal numbers from the outdoor unit or branch distribution unit (Multi F MAX systems only) wiring match the color and terminal numbers on the indoor unit.
4. Neatly arrange power wiring / communications cable and secure with the appropriate cable restraint. When clamping, do not apply force to the wiring connections.
5. Firmly reattach the control box cover, do not catch the wiring in the electric box cover and make sure the cover firmly closes.
6. Fill in any gaps around the wiring access holes with sealant to prevent foreign particles from entering the indoor unit.

Figure 52: Power Wiring and Communications Cable Connection Access.

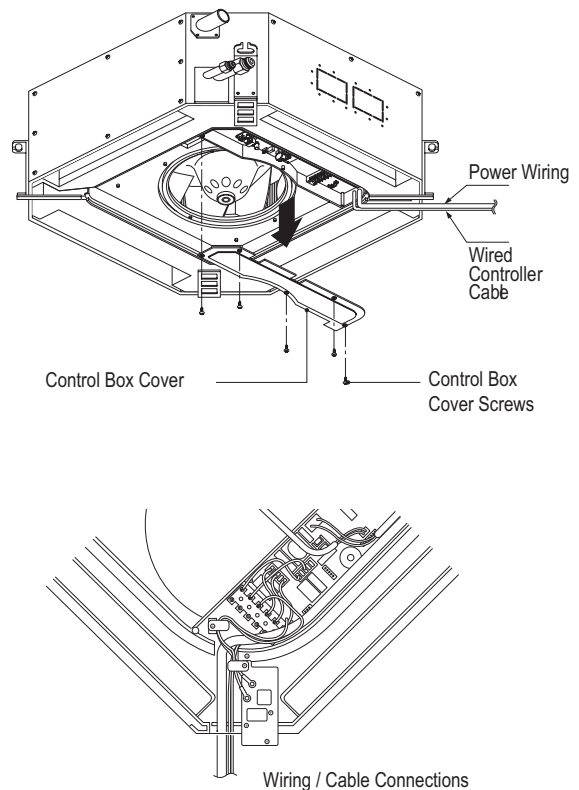


Figure 53: Simplified View of Indoor Unit to Outdoor Unit / Branch Distribution Unit Terminal Connections.

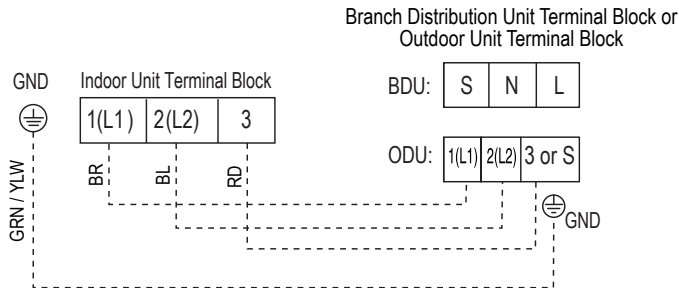
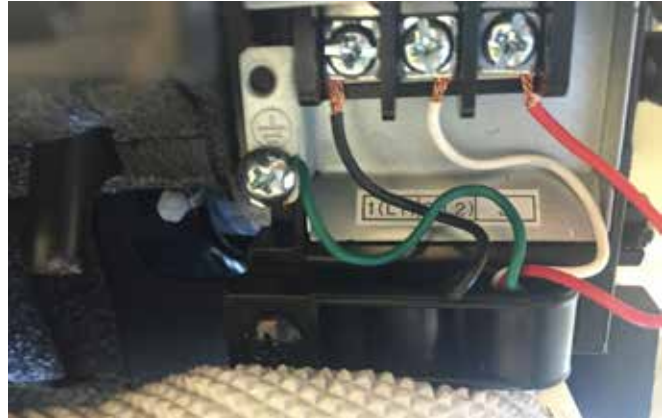


Figure 54: Typical Indoor Unit Terminal Block with Grounding Cable (Actual Appearance May Vary).



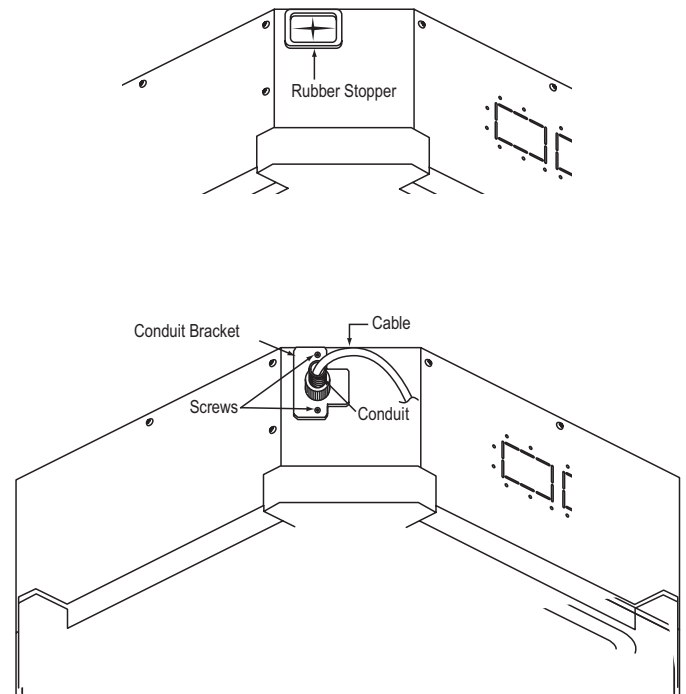
Using a Conduit

1. Remove the rubber stopper on the indoor unit. Pass the power wiring / communications cable through the conduit, the conduit mounting plate, and to / through the control panel of the indoor unit.
2. Tighten the conduit and the conduit mounting plate together.
3. Connect the power wiring / communications cable to the indoor unit terminal block.
4. Screw the conduit mounting plate to the indoor unit.

Note:

If the distance between the outdoor unit and indoor unit is greater than 131 feet, connect the power wiring and communications cable separately (i.e., a conduit cannot be used).

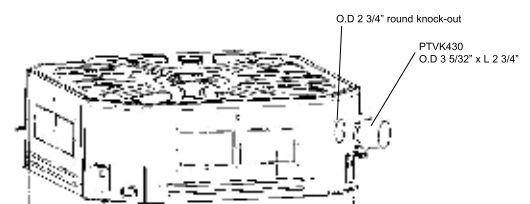
Figure 55: Using a Conduit.



PTVK430 Ventilation Kit

PTVK430 Ventilation Kit includes a flange for field-supplied ventilation pipe connection. Easily connects at the four-way ceiling-cassette three (3) inch fresh air knockout hole.

Figure 56: PTVK430 Ventilation Kit.



Finalizing Indoor Unit Installation—Installing the Decoration Grille Kit

Note:

Decoration grille (required; sold separately) must be installed properly; cool air will leak from any gaps found between the indoor unit frame and the decoration panel, which will cause condensation to generate.

1. Remove the packaging and paper template, take out air inlet grille from the front panel (1A), and then remove the corner covers of the panel (1B).
2. Attach the panel to the indoor frame by inserting the hooks as shown (2).
3. Attach two screws on diagonal corners of each panel, but do not tighten completely (3). The screws to attach the panel to the indoor unit frame are factory-provided and can be found in the shipping box.
4. Verify the panel is aligned with the ceiling. Adjust the height by using the hanging bolts as shown (4). Attach the other two screws, and then tighten all four screws until panel is secure.
5. Attach the corner covers (5).
6. Unscrew the two screws holding the control panel cover (6).
7. Connect the one display connector (CN-DISP) and the two vane control connectors (CN-VANE1, CN-VANE2) of the front panel to the indoor unit PCB (7).
8. Reattach the control box cover (8). Attach the filter grille retainer arm (inclusion dependent on model) on the front panel as shown (9). The filter grille retainer arm is supplied in the front panel shipping package.
9. Attach the other side of the filter grille retainer arm on the filter guide of the air inlet grille (10), then install the filter and the air inlet grille on the front panel (11).

Figure 57: Installing the Decoration Grille Kit.

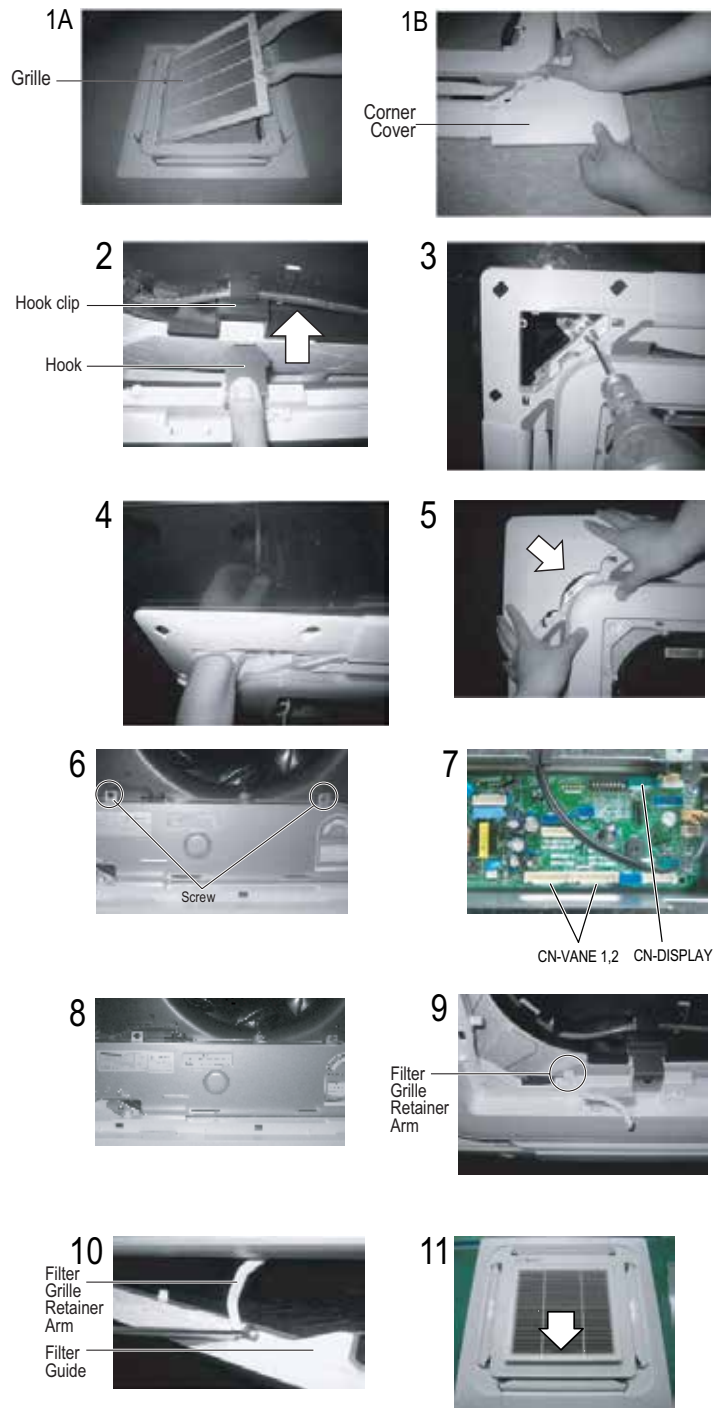
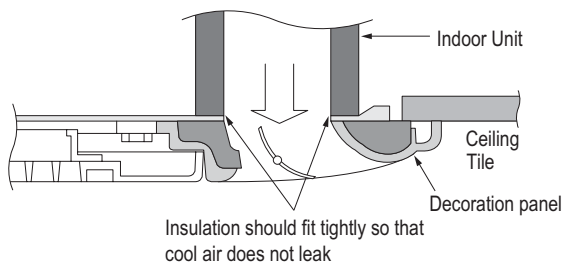


Figure 58: Ensure that no gaps are present between the indoor unit frame and the decoration grille.



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 outdoor unit's main printed circuit board (PCB) using an accessory cable. The monitoring screen for LGMV allows the user to view the following real time data on one screen (Figure 59):

- 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

Figure 59: MV Real-time Data Screen.



- Site name
- Total number of connected IDUs
- 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

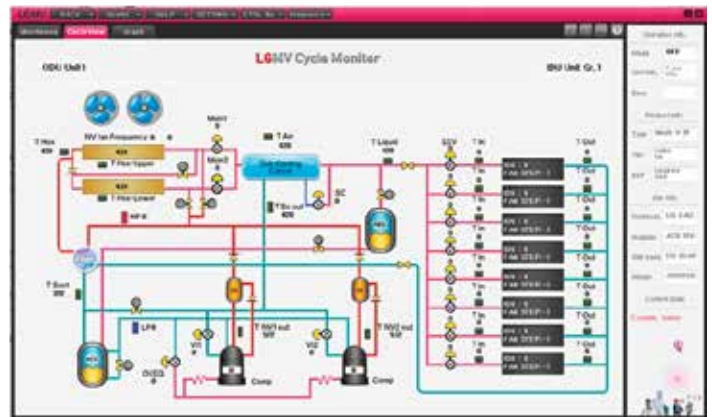
Note:

Images on these pages are examples of LGMV screenshots. Actual images may differ depending on the version of the software and the unit installed.

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

1. Cycleview (Figure 60): 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 60: MV Cycleview.



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.

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.

Error Codes

LGMV software helps the service technician or commissioning agent to troubleshoot system operation issues by displaying malfunction codes (Figure 62). These error codes can be seen on the main screen of the LGMV software program. For an overview of Multi F / Multi F MAX unit 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.

The software is available in a high version with all of the listed features. 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, there is the option to connect to an IDU with the use of a USB to RS-485 connector kit. When connected through an IDU, the 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

Figure 61: MV Control Indoor Units Screen.



Figure 62: Error Code Screen.



ELECTRICAL WIRING

LG SIMS - Self Diagnosis Functions

MULTI F

MULTI F MAX

Multi F Ceiling Cassette Indoor Unit

The SIMS WLAN module and the smart phone app together provide monitoring and troubleshooting capability for LG Duct Free Systems. SIMS functions only with LG Duct Free products (Figure 63).

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 64 shows a typical Multi F configuration used with the SIMS module and app.

Figure 63: LG SIMS App and WLAN Module



⚠ 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.
- You must have the free SIMS app correctly installed on your smart phone before using SIMS.
- Some ODU's 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.

Figure 64: SIMS WLAN Module to a Typical Multi F System.

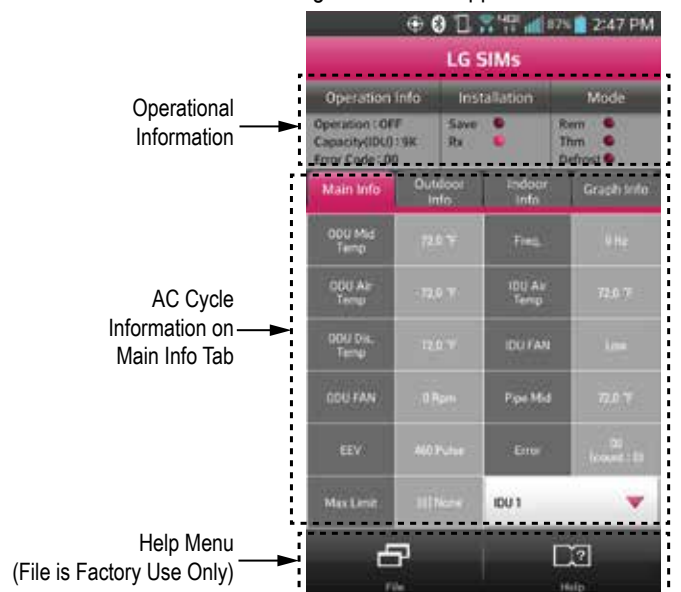


SIMS App Main Info Screen

The main screen (Figure 65) 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 65: SIMS App Main Info Screen



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:

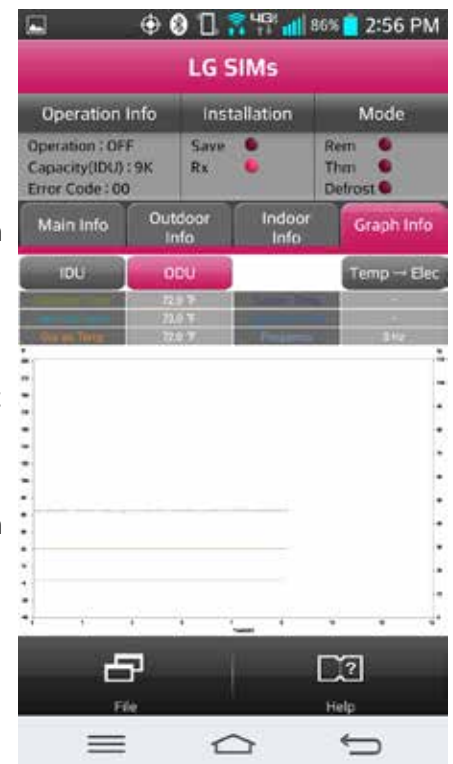
- Frequency
- Operation
- THM Mode
- REM Mode
- FAN
- EEV
- Air Temp
- Pipe-in
- Pipe-mid
- Pipe-out



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.



Controller Options

Ceiling-concealed indoor units include a wireless handheld controller (AKB73757604)¹, but optional LG-supplied wired controllers are available.

Wireless Handheld Controller

Figure 66: AKB73757604 Wireless Handheld Controller.

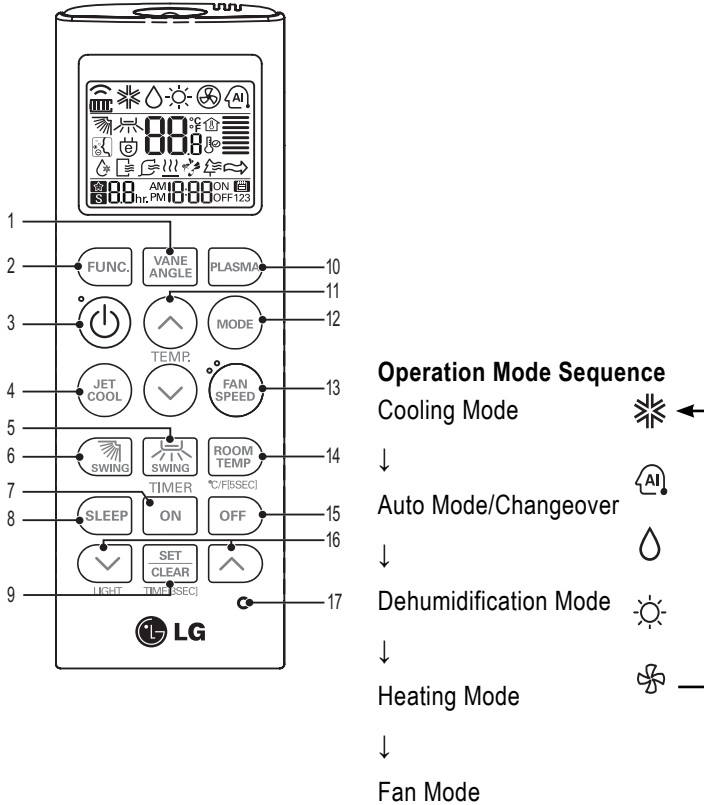
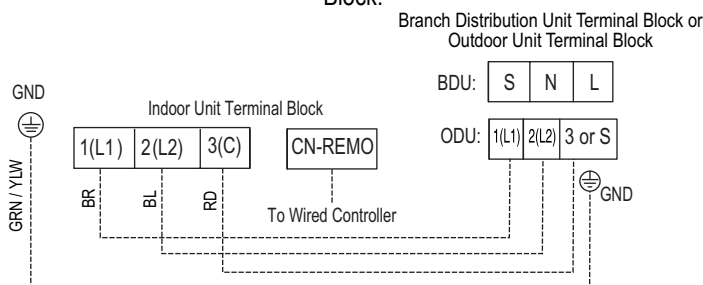


Table 35: AKB73757604¹ Wireless Handheld Controller Functions.²

Button Label	Description
1	Vane Angle Button: Sets the angle to each vane.
2	Function Setting Button: Sets or clears auto clean, smart clean, electric heater, or individual vane angle control functions.
3	On / Off Button: Turns the power on/off.
4	Jet Cool: Sets the unit to super high fan speed when in cooling mode.
5	Left / Right Air Flow Button (optional): Sets the desired left / right (horizontal) air flow direction.
6	Up / Down Air flow Button: Stops or starts louver movement, and sets the desired air flow direction to up or down.
7	On Time Button: Sets the time when the operation begins.
8	Sleep Timer Button: Sets the sleep mode operation.
9	Set / Clear Button: Sets or cancels the timer, also sets the current time.
10	Plasma Button: Starts or stops plasma-purification functions.
11	Room Temperature Setting Button: Raises or lowers temperature setpoint in cooling and heating operation.
12	Operation mode selection button: Selects the operation mode.
13	Indoor Fan Speed Button: Changes the fan speed to one of four choices: low, medium, high, and chaos.
14	Room Temperature Check Button: Displays / checks the room temperature.
15	Off Timer button: Sets the time when the operation ends.
16	Time Setting (Up / Down) / Light Button: Sets the timer and adjusts the brightness of the LED.
17	Reset Button: Resets the remote controller.

Wired Controller Connections

Figure 67: Wired Controller Connection on the Indoor Unit Terminal Block.



¹Wireless Handheld Controller for the four-way ceiling cassette indoor units is also referenced by Model No. PQWRHQ0FDB.

²Depending on the indoor unit model, some functions may not be supported or displayed.

Wall-Mounted Controller Placement

Since the room temperature sensor is inside the remote controller, the remote controller should be installed in a place away from direct sunlight, high humidity and direct supply of hot or cold air to maintain proper space temperature. Install the remote controller about five (5) feet above the floor in an area with good air circulation and an average temperature.

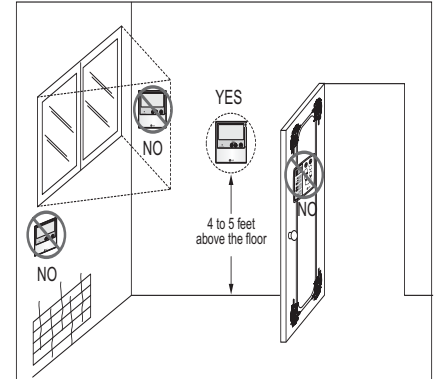
⊘ Do not install the remote controller where it can be affected by the following:

- Drafts or dead spots behind doors and in corners
- Hot or cold air from ducts
- Radiant heat from the sun or appliances
- Concealed pipes and chimneys
- An area where temperatures are uncontrolled, such as an outside wall

This remote controller is equipped with a seven segment LED display. For proper display of the remote controller LEDs, the remote controller should be installed properly as shown below. The standard height is four (4) to five (5) feet from floor level.

1. Pull communications cable between the zone controller handy box (if used) and the indoor unit. The wall-mounted zone controller comes with a thirty-three (33) foot length of cable.
2. Store a minimal amount of cable in the handy box. Any additional cable should be coiled and stored near the indoor unit control panel.
3. If additional cable length is needed, order a thirty-three (33) foot LG Wired Remote Group Control Extension cable (Model No. PZCWRC1).
4. If the cable between the zone controller and the indoor unit is too long, do not cut the cable and shorten. Coil any spare communications cable, tie-wrap it, and leave it next to the indoor unit location.

Figure 68: Proper Location for the Wired Controller.



Hanging the Wired Controller

1. The controller wiring / cable can be installed in one of three directions: top, back, or on the right side. If top or right side installation is desired, remove cable guide grooves on the controller, and then position wiring / cable on applicable side.
2. Choose and mark the area of installation, and then screw the wall plate into place (using the provided parts). Install the controller wall plate to fit the electrical box if one is present. Ensure that no gaps exist between the wall plate and the wall itself.
3. Arrange wiring / cables so it does not interfere with the controller circuitry. Position the wired controller on the wall plate. Snap into place by pressing the bottom part of the wired controller onto the wall plate. Make sure that no gaps exist between the wired controller and the wall plate on all sides.
4. To remove wired controller from the wall plate, insert a screwdriver into the two holes at the bottom. Twist screwdriver to release controller. ⊘ Do not damage the controller components when removing.

Figure 69: Removing the Cable Guide Grooves (Plate Appearance will Differ Depending on Controller Type).

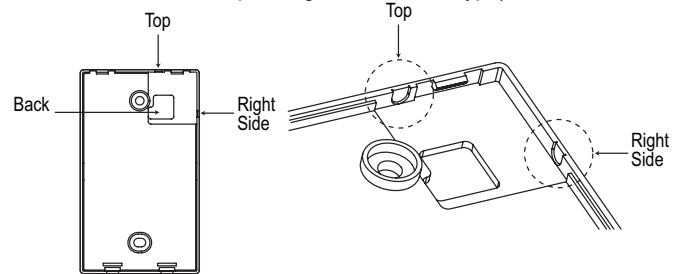


Figure 70: Attaching the Wall Plate (Plate Appearance will Differ Depending on Controller Type).

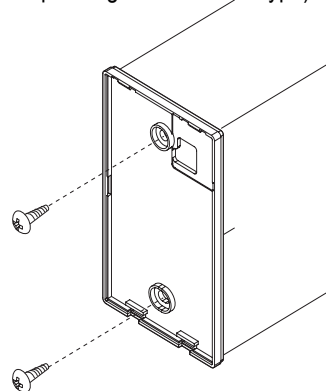
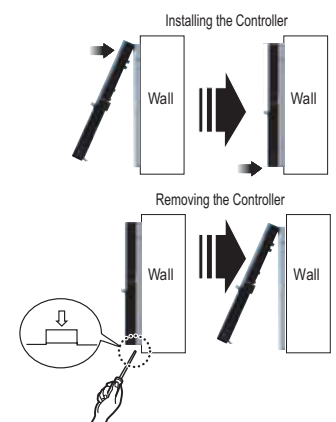


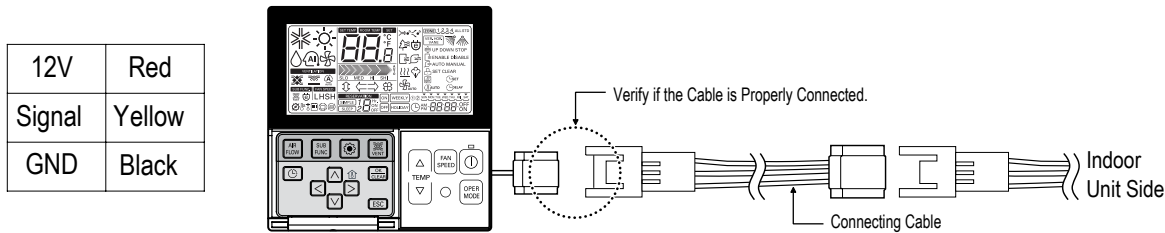
Figure 71: Installing / Removing the Controller.



Hanging the Wired Controller, continued.

- Connect indoor unit and wired controller using included connection cable.
- Use an LG-manufactured extension cable (sold separately) if the distance between wired remote controller and the indoor unit is >32.8 feet.

Figure 72: Indoor Unit to Wired Controller Connection (Controller Appearance May Vary Depending on Model Chosen).



Note:

- Do not bury the wired controller into the wall; burying it may damage the temperature sensor.
- Do not extend the connecting cable >164 feet; overly long cable lengths can cause communication errors.
- When installing the LG-manufactured extension cable, make sure to connect the proper ends together.

Assigning the Thermistor for Temperature Detection

Each indoor unit includes a return air thermistor assigned to sense the temperature. If a wired controller is installed, there is a choice of sensing temperature with either the indoor unit return air thermistor or the thermistor in the wired controller. It is also an option to set both thermistors to sense temperature so that indoor unit bases its operation on the first thermistor to reach the designated temperature differential.

An optional Remote Temperature Sensor can be used in lieu of the return air thermistor—either alone or in conjunction with a wired controller thermistor as previously described.

Troubleshooting Using Error Codes

Refer to Table 36 for information on the error codes that are generated from the indoor and outdoor units. These codes are the most common that will manifest through these units. Your particular model duct free system might generate additional codes not listed here. Please contact LG Support if you see these types of errors and a simple power down and boot up has not corrected the issue. You should not attempt to fix the system yourself.

Error Codes

- 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 LEDs of indoor units, wired remote controller, the outdoor unit control board, and LG Monitoring View (LGMV) Diagnostic Software.
- 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 2x blink, LED2 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 73: Example of Ceiling Cassette IDU LEDs (appearance may differ depending on model).

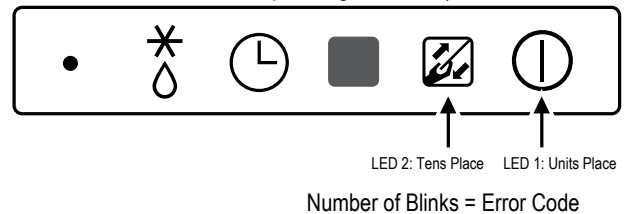


Table 36: Multi Zone Ceiling Cassette Indoor Unit Error Codes.

Error Code	Description	No. of Times Indoor Unit LEDs Blink	
		LED1 (Plasma LED)	LED2 (Power LED)
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 EPROM error	9X	-
10	Indoor unit BLDC motor fan lock	-	1X
12	Indoor unit middle pipe sensor error	2X	1X

Troubleshooting Using Error Codes - Continued

Table 37: Multi Zone Outdoor Unit Error Codes.

Error Code	Description	No. of Times Indoor Unit LEDs Blink	
		LED1 (Plasma LED)	LED2 (Power LED)
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) EPROM 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 workarounds.

Cautions for Refrigerant Leaks

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./ft³ per 1,000 ft³ 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./ft³. In special occupied spaces, however, 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 Re- frigerant Trim Charge	=	Total System Refrigerant Charge
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$$\text{RCL (lbs./ft}^3\text{)} = \frac{\text{Total System Refrigerant Charge (lbs.)}}{\text{Volume of Smallest Occupied Space (ft}^3\text{)}}$$

¹American 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.



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 $\pm 5^\circ$ of horizontal.	
Ensure Y-branches are installed with no more than $\pm 3^\circ$ 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.	



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. ($\pm 10\%$ 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.	



Major Component Rough-In

Piping and Insulation

Brazing Practices



Installation—Refrigerant Piping

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

Installation—Condensate Pump / Drain Installation

Installation—Power Wire and Communications Cables



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

$$\begin{aligned} \text{Additional charge (lbs.)} = & (\text{Installed Length of Branch [A]} - \text{Chargeless Pipe Length [L]}) \times a \\ & + (\text{Installed Length of Branch [B]} - \text{Chargeless Pipe Length [L]}) \times a \\ & + (\text{Installed Length of Branch [C]} - \text{Chargeless Pipe Length [L]}) \times a \\ & + (\text{Installed Length of Branch [D]} - \text{Chargeless Pipe Length [L]}) \times a \\ & - \text{CF (Correction Factor)} \times 5.29 \end{aligned}$$

Note:

- Number of installed length of branches depends on the specifications of the outdoor unit model.
- CF = Maximum number of connectable 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

$$\begin{aligned} & (\text{_____ [A]} - 24.6) \times 0.22 && (\text{_____}) \\ & + (\text{_____ [B]} - 24.6) \times 0.22 && + (\text{_____}) \\ & + (\text{_____ [C]} - 24.6) \times 0.22 && + (\text{_____}) \\ & + (\text{_____ [D]} - 24.6) \times 0.22 && + (\text{_____}) \\ & - \text{_____ CF} \times 5.29 && - (\text{_____}) \\ & = \text{_____ Additional Charge (lbs.)} \end{aligned}$$

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

$$\begin{aligned} \text{Additional charge (lbs.)} &= (\text{Total Main Piping Length [A]} - \text{Chargeless Pipe Length of Main Pipe [L]}) \times a \\ &+ (\text{Installed Length of Branch [B1]} - \text{Chargeless Pipe Length [B]}) \times b \\ &+ (\text{Installed Length of Branch [B2]} - \text{Chargeless Pipe Length [B]}) \times b \\ &+ (\text{Installed Length of Branch [B3]} - \text{Chargeless Pipe Length [B]}) \times b \dots \\ &- \text{CF (Correction Factor)} \times 3.53 \end{aligned}$$

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

$$\begin{aligned} &(\text{_____ [A]} - 16.4) \times 0.54 && (\text{_____}) \\ &+ (\text{_____ [B1]} - 16.4) \times 0.22 && + (\text{_____}) \\ &+ (\text{_____ [B2]} - 16.4) \times 0.22 && + (\text{_____}) \\ &+ (\text{_____ [B3]} - 16.4) \times 0.22 && + (\text{_____}) \\ &+ (\text{_____ [B4]} - 16.4) \times 0.22 && + (\text{_____}) \\ &+ (\text{_____ [B5]} - 16.4) \times 0.22 && + (\text{_____}) \\ &+ (\text{_____ [B6]} - 16.4) \times 0.22 && + (\text{_____}) \\ &+ (\text{_____ [B7]} - 16.4) \times 0.22 && + (\text{_____}) \\ &+ (\text{_____ [B8]} - 16.4) \times 0.22 && + (\text{_____}) \\ &- \text{_____ CF} \times 3.53 && - (\text{_____}) \\ &&& = \text{_____ Additional Charge (lbs.)} \end{aligned}$$

Who to call for assistance

Freight Damage and Unit Replacements

Missing Parts

Freight Damage and Unit Replacements

Received Wrong Indoor Unit Model

Installation, Startup, and Commissioning Technical Assistance

Your LG Manufacturer Representative

Your LG Manufacturer Representative

Your LG Manufacturer Representative

Your LG Manufacturer Representative

1-888-865-3026

For warranty information, visit www.lghvac.com.

Inverter



LG Electronics, U.S.A., Inc.
Commercial Air Conditioning Division
4300 North Point Parkway
Alpharetta, Georgia 30022
www.lg-vrf.com

LG Customer Information Center, Commercial Products
1-888-865-3026 USA
Follow the prompts for commercial A/C products and parts.

IM_Multi_F_CeilingCassette_7_16
Supersedes: M_Multi_F_CeilingCassette_9_15