LG
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MULTI V™ S

WITH

LGRED°

INSTALLATION MANUAL

Variable Refrigerant Flow
208-230V, 60 Hz, 1-Phase Outdoor Units
3.0 and 4.0 Tons

PROPRIETARY DATA NOTICE

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

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

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

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SAFETY PRECAUTIONS

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

INSTALLATION

⚠ DANGER

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

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

⚠ WARNING

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

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

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

⃠ **Do not change the settings of the protection devices.**
If the protection devices have been bypassed or 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.

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

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

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

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

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

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

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

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

⚠WARNING

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

⚠CAUTION

Be very careful when transporting the product. There is a risk of the product falling and causing physical injury.

- *Use appropriate moving equipment to transport each frame; ensure the equipment is capable of supporting the weights listed.*
- *Some products use polypropylene bands for packaging.* ⃠ *Do not use polypropylene bands to lift the unit.*
- *Suspend the outdoor unit from the base at specified positions (at a minimum of six [6] points) to avoid slippage from rigging apparatus.*

Note:

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

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

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

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

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

⃠ **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 damage will occur.

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

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

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

When installing the unit in a hospital, mechanical room, or similar electromagnetic field (EMF) sensitive environment, provide sufficient protection against electrical noise.
Inverter equipment, power generators, high-frequency medical equipment or radio communication equipment will cause the air conditioner to operate improperly. The unit will also affect such equipment by creating electrical noise that disturbs medical treatment or image broadcasting.

The heat recovery box must be installed indoors; ⃠ **do not install the heat recovery box in a highly humid environment.**
There is risk of product failure and property damage.

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

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

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

Periodically check that the outdoor frame is not damaged.
There is a risk of equipment damage.

Install the unit in a safe location where no one can step on or fall onto it. ⃠ **Do not install the unit on a defective stand.**
There is a risk of unit and property damage.

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

WIRING

⚠ DANGER

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

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

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

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

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

⃠ **Do not use damaged or loose power wiring.** ⃠ **Do not modify or extend the outdoor unit's power wiring. 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 NEC who is equipped with the proper tools and test instruments.
Failure to carefully read and follow all instructions in this manual can result in personal injury or death.

All electric work must be performed by a licensed electrician and conform to local building codes or, in the absence of local codes, with the NEC, and the instructions given in this manual.
If the power source capacity is inadequate or the electric work is not performed properly, it will result in fire, electric shock, physical injury or death.

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

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

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

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

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

Note:

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

The information contained in this manual is intended for use by an industry-qualified, experienced, licensed electrician familiar with the NEC who is equipped with the proper tools and test instruments.
Failure to carefully read and follow all instructions in this manual can result in equipment malfunction and property damage.

OPERATION

⚠ DANGER

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

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

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

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

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

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

⚠ WARNING

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

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

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

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

⚠ CAUTION

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

Note:

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

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

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

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

⃠ Do not operate the unit 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.

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

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

Provide power to the outdoor unit to warn the compressor crankcase at least six (6) hours before operation begins.
Starting operation with a cold compressor sump(s) will result in severe bearing damage to the compressor(s). Keep the power switch on during the operational season.

⃠ Do not turn off the main power switch after operation has been stopped.
Wait at least five (5) minutes before turning off the main power switch, otherwise it will result in product malfunction.

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

Auto-addressing must be performed after connecting the power of all indoor and the outdoor unit.
Auto-addressing must also be performed after servicing an indoor unit.

UNIT NOMENCLATURE

Outdoor Units and Heat Recovery Units

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Outdoor Units (ODU)

ARU	M	036	G	S	S	5

Family
ARU = Multi V Outdoor Unit (Refrigerant R410A)

Type
M = Combination (Heat Pump or Heat Recovery)

Capacity (Mbh)
036 = 36
048 = 48

Electrical Ratings
G = 208–230V/60Hz/1Ph

Type
S =Standard

Airflow Configuration
S = Side Discharge

Generation
5 = Fifth

Heat Recovery Units (HRU)

PRHR	02	3A

Family
PRHR = Multi V Heat Recovery (HR) unit (Refrigerant R410A)

Number of Ports
02 = Two Ports
03 = Three Ports
04 = Four Ports
06 = Six Ports
08 = Eight Ports

Series Number
2A
3A

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SPECIFICATIONS

208-230V Outdoor Units

Table 1: 208-230V, 60Hz, 1-Phase Outdoor Unit Specifications.

Unit Model No.		ARUM036GSS5 3.0 Ton	ARUM048GSS5 4.0 Ton
Cooling Performance			
Nominal Cooling Capacity (Btu/h)[1]		36,000	48,000
Rated Cooling Capacity (Btu/h)[2]		36,000	48,000
Heating Performance			
Nominal Heating Capacity (Btu/h)[1]		42,000	54,000
Rated Heating Capacity (Btu/h)[2]		42,000	54,000
Operating Range			
Cooling (°F DB)[3]		23 to 122	23 to 122
Heating (°F WB)		-13 to +61	-13 to +61
Synchronous — Cooling Based (°F DB)		14 to 81	14 to 81
Synchronous — Heating Based (°F WB)		14 to 61	14 to 61
Compressor			
Inverter Type / Quantity		Hermetically Sealed Scroll / 1	
Oil / Type		PVE / FVC68D	PVE / FVC68D
Fan (Side Discharge)			
Type		Axial Flow	Axial Flow
Motor Output (kW) x Qty.		0.124 x 2	0.124 x 2
Motor / Drive		Brushless Digitally Controlled / Direct	Brushless Digitally Controlled / Direct
Operating Range (RPM)	Cooling	0 to 750	0 to 750
	Heating	0 to 700	0 to 700
External Static Pressure (in. WG)		0.08	0.08
Maximum Air Volume (CFM)		4,238	4,238
Unit Data			
Refrigerant Type		R410A	R410A
Refrigerant Control / Location		EEV / Indoor Unit	EEV / Indoor Unit
Factory Charge lbs. of R410A		7.7	7.7
Max. Number Indoor Units / System[4]		6	8
Sound Pressure Levels dB(A)[5] (Cooling / Heating)		50 / 53	52 / 54
Net Unit Weight (lbs.)		263	263
Shipping Weight (lbs.)		294	294
Communication Cables[6,7]		2 x 18	2 x 18
Heat Exchanger			
Material and Fin Coating		Copper Tube / Aluminum Fin and Black Coated Fin™ Hydrophilic	
Rows / Fins per inch		3 / 14	3 / 14
Piping / Connections for Heat Recovery Operation[8]			
Liquid Line Piping / Connection (in., OD)		3/8 Braze	3/8 Braze
Low Pressure Vapor Line Piping / Connection (in., OD)		3/4 Braze	3/4 Braze
High Pressure Vapor Line Piping / Connection (in., OD)		5/8 Braze	5/8 Braze
Piping / Connections for Heat Pump Operation[8]			
Liquid Line Piping / Connection (in., OD)		3/8 Braze	3/8 Braze
Vapor Line Piping / Connection (in., OD)		5/8 Braze	5/8 Braze

[1]Nominal capacity applied with non-ducted indoor units, and is rated 0 ft. above sea level with 25 ft. of refrigerant line per indoor unit and a 0 ft. level difference between outdoor and indoor units. All capacities are net with a Combination Ratio between 95–105%.
Nominal cooling capacity rating obtained with air entering the indoor unit at 80ºF dry bulb (DB) and 67ºF wet bulb (WB) and outdoor ambient conditions of 95ºF dry bulb (DB) and 75ºF wet bulb (WB).

Nominal heating capacity rating obtained with air entering the indoor unit at 70ºF dry bulb (DB) and 59ºF wet bulb (WB) and outdoor ambient conditions of 47ºF dry bulb (DB) and 43ºF wet bulb (WB).

[2]Rated capacity is certified under AHRI Standard 210/240. See www.ahrinet.org for information.

[3]Cooling range with the Low Ambient Baffle Kit (sold separately) is -9.9°F to +122°F.

[4]The System Combination Ratio must be between 50–130%.

[5]Sound pressure levels are tested in an anechoic chamber under ISO Standard 3745.

[6]Communication cable between ODU and IDUs/Heat Recovery Units must be a minimum of 18 AWG, 2-conductor, twisted, stranded, shielded. Ensure the communication cable shield is properly grounded to the ODU chassis only. ⃠ Do not ground the ODU to IDUs/Heat Recovery Units communication cable at any other point. Wiring must comply with all applicable local and national codes.

[7]Power wiring is field provided, solid or stranded, and must comply with all local and national codes. See next page for detailed electrical data.

[8]LG requires that LATS software be used on all projects to ensure correct line sizing. Designer must verify the shop drawing design against the as built design using LATS. Contractor must also use LG manufactured Y-Branch and Header Kits only.

ELECTRICAL DATA

208-230V Outdoor Unit Electrical Data

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Table 2: 208-230V, 60Hz, 1-Phase Outdoor Unit Electrical Data.

Nominal Tons	Unit Model No.	Compressor Motor		Outdoor Unit Fan Motor		MCA	MOCP
		Quantity	Motor Amps RLA (Ea.)	Fan Qty.	Amps FLA x Qty.		
3.0	ARUM036GSS5	1	19.0	2	0.5 x 2	23.5	40
4.0	ARUM048GSS5	1	19.4	2	0.5 x 2	24.0	40

Voltage tolerance is ±10%.

Maximum allowable voltage unbalance is 2%.

MCA = Minimum Circuit Ampacity.

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

*SCCR rating: 5kA RMS Symmetrical.

HEAT RECOVERY UNIT SPECIFICATIONS

Figure 1: Two-Port Heat Recovery Unit.

Figure 2: Three-Port Heat Recovery Unit.

Figure 3: Four-Port Heat Recovery Unit.

Note:

Heat recovery units can only be used with LG systems piped for heat recovery operation.

Table 3: Heat Recovery Unit Specifications.

Model			PRHR023A	PRHR033A	PRHR043A
Number of Ports			2	3	4
Max. Connectible No. of Indoor Units			16	24	32
Max. Connectible No. of Indoor Units on each port			8	8	8
Max. Port Capacity (each port)		Btu/h	60,000	60,000	60,000
Max. Unit Capacity (sum of ports)		Btu/h	120,000	180,000	230,000
Net Weight		lbs.	33	37	40
Shipping Weight		lbs.	46	50	53
Dimensions (W x H x D)		Inches	19-1/8 x 8-5/8 x 18-15/16		
Casing			Galvanized Steel Plate		
Connecting Pipes	To Indoor Units	Liquid Pipe (inches)	3/8	3/8	3/8
		Vapor Pipe (inches)	5/8	5/8	5/8
	To Outdoor Units	Liquid (inches)	3/8	1/2	5/8
		Low-pressure Vapor (inches)	7/8	1-1/8	1-1/8
		High-pressure Vapor (inches)	3/4	7/8	7/8
Insulation Material			Polyethylene Foam		

HEAT RECOVERY UNIT SPECIFICATIONS

Figure 4: Six-Port Heat Recovery Unit.

Figure 5: Eight-Port Heat Recovery Unit.

Note:

Heat recovery units can only be used with LG systems piped for heat recovery operation.

Table 4: Heat Recovery Unit Specifications, continued.

Model			PRHR063A	PRHR083A
Number of Ports			6	8
Max. Connectible No. of Indoor Units			48	64
Max. Connectible No. of Indoor Units on each port			8	8
Max. Port Capacity (each port)		Btu/h	60,000	60,000
Max. Unit Capacity (sum of ports)		Btu/h	230,000	230,000
Net Weight		lbs.	60	68
Shipping Weight		lbs.	75	82
Dimensions (W x H x D)		Inches	31-1/4 x 8-5/8 x 18-15/16	
Casing			Galvanized Steel Plate	
Connecting Pipes	To Indoor Units	Liquid Pipe (inches)	3/8	3/8
		Vapor Pipe (inches)	5/8	5/8
	To Outdoor Units	Liquid (inches)	5/8	5/8
		Low-pressure Vapor (inches)	1-1/8	1-1/8
		High-pressure Vapor (inches)	7/8	7/8
Insulation Material			Polyethylene Foam	

HEAT RECOVERY UNIT ELECTRICAL DATA

Table 5: Heat Recovery Unit Electrical Data.

Unit Model No.	Voltage Range	Rated Amps	MCA	MFA	Power Supply			Power Input (W)	
					Hz	Volts	Phase	Cooling	Heating
PRHR023A	187-253	0.06	0.17	15	60	208-230	1	39.8	37.2
PRHR033A									
PRHR043A									
PRHR063A		0.09	0.27					75.9	72.1
PRHR083A									

MCA : Minimum Circuit Ampacity.
MFA : Maximum Fuse Amps.

Units are suitable for use on an electrical system where voltage supplied to unit terminals is within the listed range limits.
Select wire size based on the larger MCA value.
Instead of a fuse, use the circuit breaker.

OUTDOOR UNIT DIMENSIONS

ARUM036GSS5 and ARUM048GSS5

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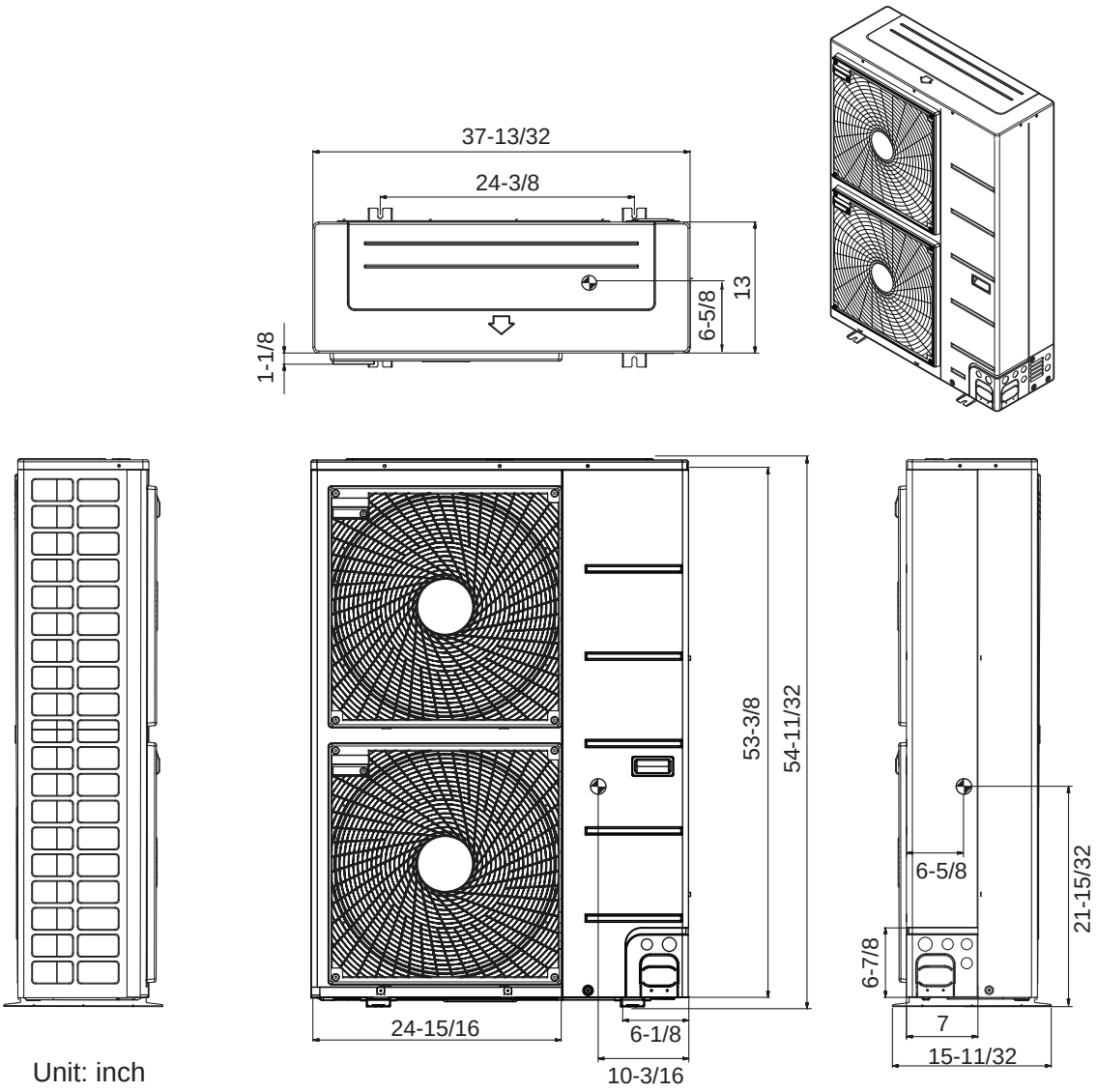
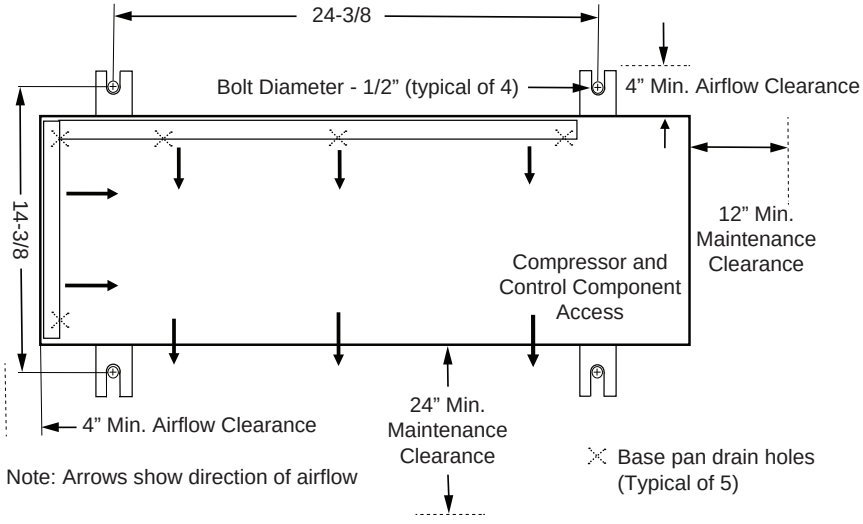


Unit: inch

Center of Gravity



Note: Arrows show direction of airflow

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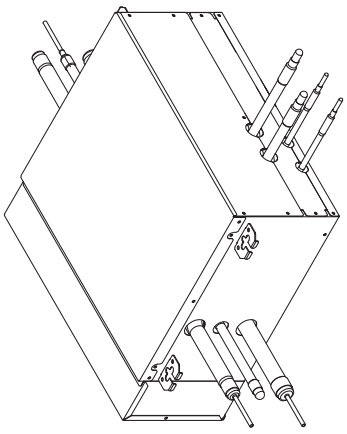
HEAT RECOVERY UNIT DIMENSIONS

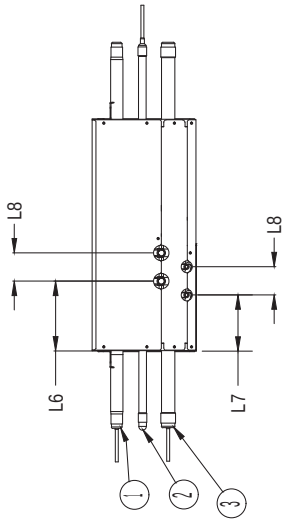
PRHR023A

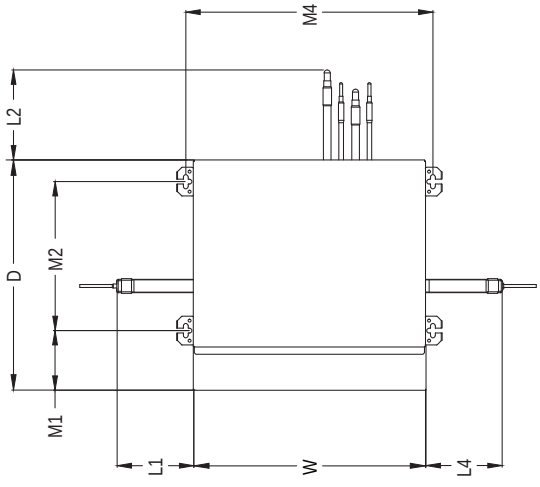
[Unit: inch]

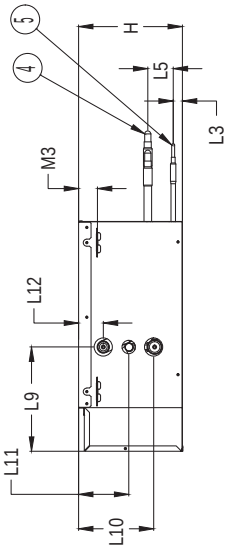
W	19-1/8"
H	8-5/8"
D	18-15/16"
L1	5-15/16"
L2	6-15/16"
L3	3/4"
L4	5-15/16"
L5	2-3/16"
L6	5-3/4"
L7	4-9/16"
L8	2-5/16"
L9	8-9/16"
L10	6-3/16"
L11	3-9/16"
L12	2"
M1	4-15/16"
M2	12-1/4"
M3	1-1/2"
M4	20-3/8"

No.	Part Name
6	Control box
5	Liquid pipe to Indoor unit
4	Gas pipe to Indoor unit
3	Low pressure gas pipe
2	Liquid pipe to Outdoor unit
1	High pressure gas pipe









Note:

1. Unit should be installed in compliance with the appropriate LG installation manual.
2. Unit should be grounded in accordance with the local regulations or applicable national codes.
3. All electrical components and materials supplied from the site must comply with the local regulations or national codes.

HEAT RECOVERY UNIT DIMENSIONS

PRHR033A

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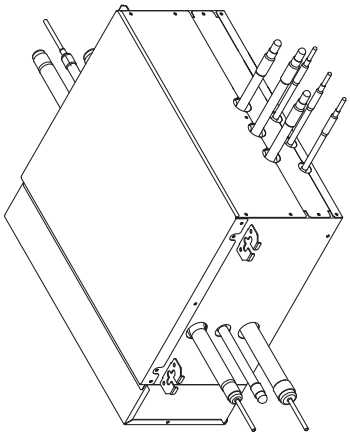
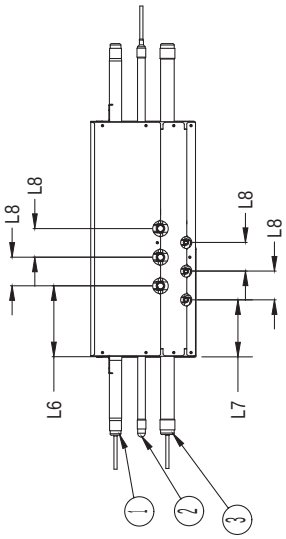
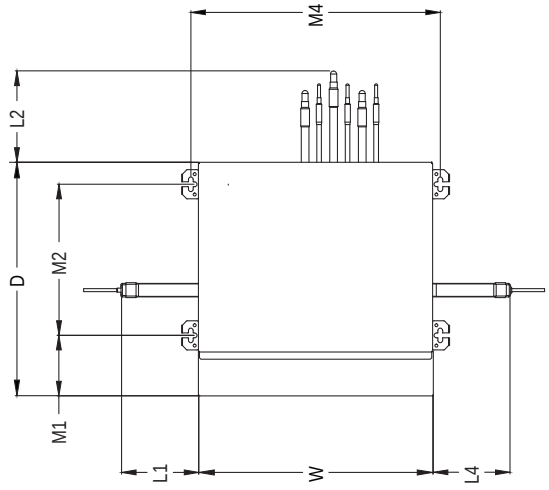
W	19-1/8″
H	8-5/8″
D	18-15/16″
L1	5-15/16″
L2	6-15/16″
L3	3/4″
L4	5-15/16″
L5	2-3/16″
L6	5-3/4″
L7	4-9/16″
L8	2-5/16″
L9	8-9/16″
L10	6-3/16″
L11	3-9/16″
L12	2″
M1	4-15/16″
M2	12-1/4″
M3	1-1/2″
M4	20-3/8″

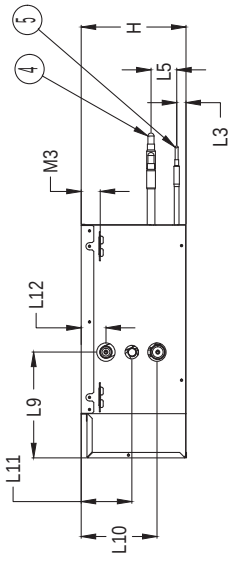
[Unit: inch]

No.	Part Name
6	Control box
5	Liquid pipe to Indoor unit
4	Gas pipe to Indoor unit
3	Low pressure gas pipe
2	Liquid pipe to Outdoor unit
1	High pressure gas pipe









Note:

1. Unit should be installed in compliance with the appropriate LG installation manual.
2. Unit should be grounded in accordance with the local regulations or applicable national codes.
3. All electrical components and materials supplied from the site must comply with the local regulations or national codes.

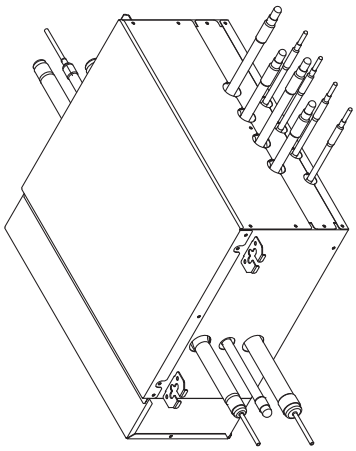
HEAT RECOVERY UNIT DIMENSIONS

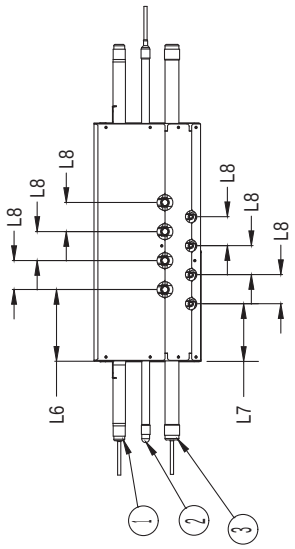
PRHR043A

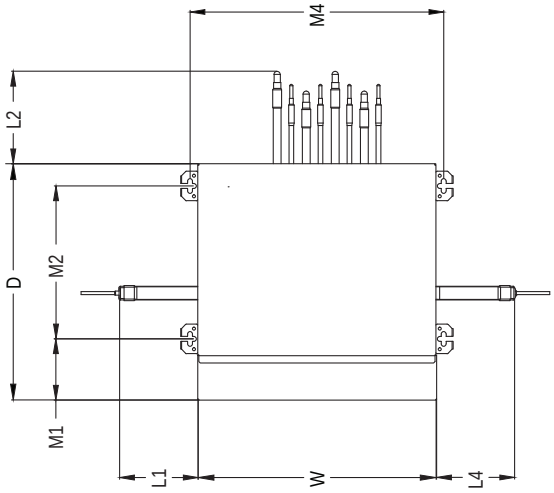
[Unit: inch]

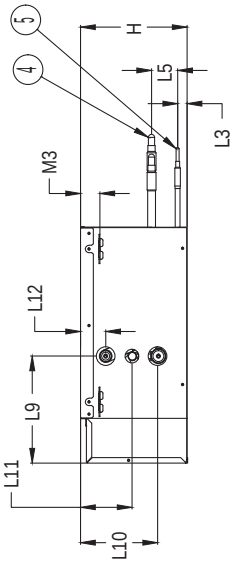
W	19-1/8"
H	8-5/8"
D	18-15/16"
L1	5-15/16"
L2	6-15/16"
L3	3/4"
L4	5-15/16"
L5	2-3/16"
L6	5-3/4"
L7	4-9/16"
L8	2-5/16"
L9	8-9/16"
L10	6-3/16"
L11	3-9/16"
L12	2"
M1	4-15/16"
M2	12-1/4"
M3	1-1/2"
M4	20-3/8"

No.	Part Name
6	Control box
5	Liquid pipe to Indoor unit
4	Gas pipe to Indoor unit
3	Low pressure gas pipe
2	Liquid pipe to Outdoor unit
1	High pressure gas pipe









Note:

1. Unit should be installed in compliance with the appropriate LG installation manual.
2. Unit should be grounded in accordance with the local regulations or applicable national codes.
3. All electrical components and materials supplied from the site must comply with the local regulations or national codes.

HEAT RECOVERY UNIT DIMENSIONS

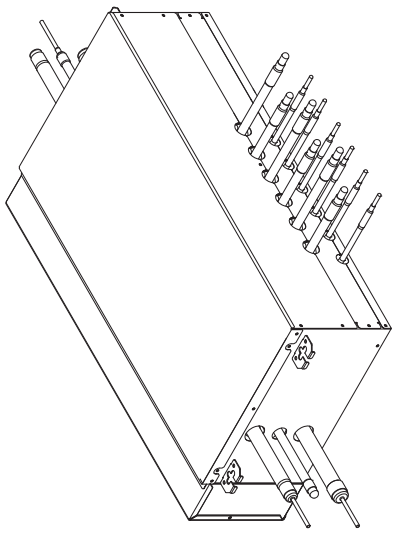
PRHR063A

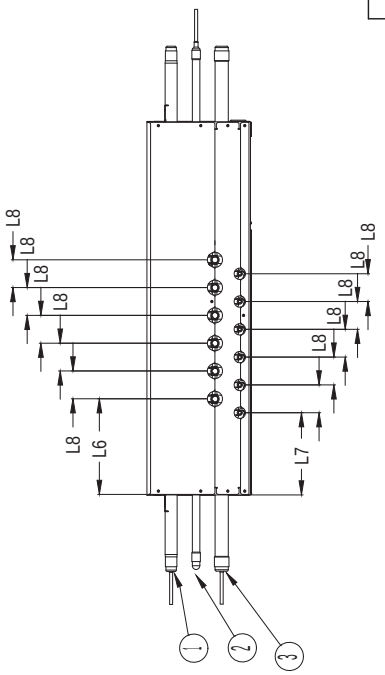
MULTI V S WITH LGRED°

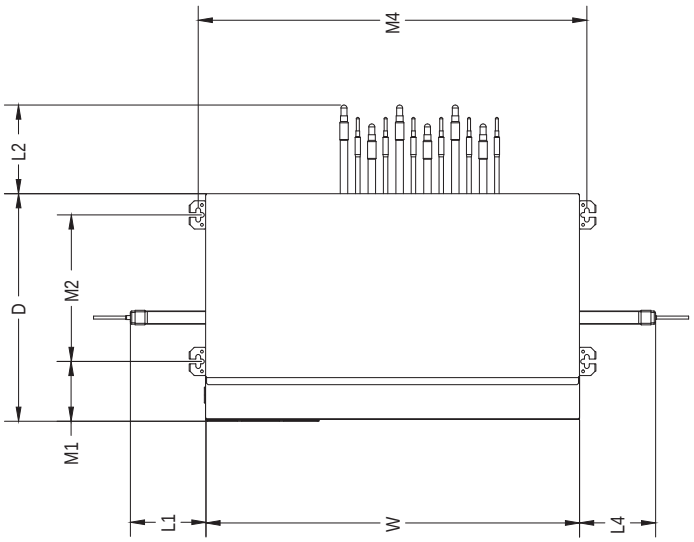
[Unit: inch]

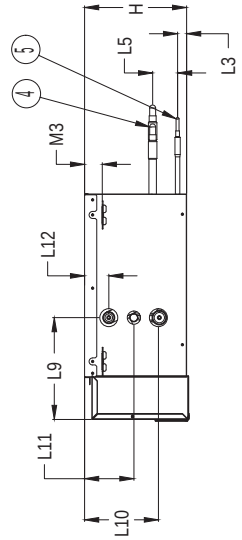
W	31-1/4″
H	8-5/8″
D	18-15/16″
L1	6-5/16″
L2	6-15/16″
L3	3/4″
L4	6-5/16″
L5	2-3/16″
L6	8-1/16″
L7	6-7/8″
L8	2-5/16″
L9	8-9/16″
L10	6-3/16″
L11	3-9/16″
L12	2″
M1	4-15/16″
M2	12-1/4″
M3	1-1/2″
M4	32-1/2″

No.	Part Name
6	Control box
5	Liquid pipe to Indoor unit
4	Gas pipe to Indoor unit
3	Low pressure gas pipe
2	Liquid pipe to Outdoor unit
1	High pressure gas pipe









Note:

1. Unit should be installed in compliance with the appropriate LG installation manual.
2. Unit should be grounded in accordance with the local regulations or applicable national codes.
3. All electrical components and materials supplied from the site must comply with the local regulations or national codes.

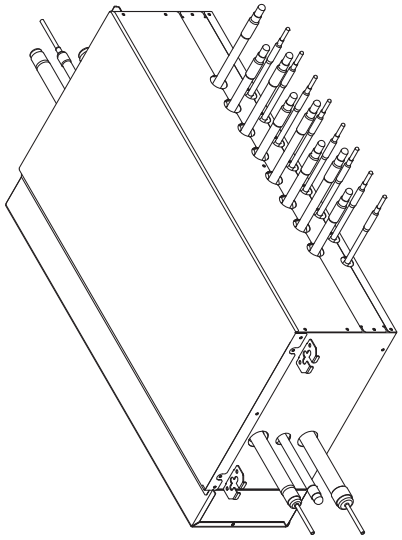
HEAT RECOVERY UNIT DIMENSIONS

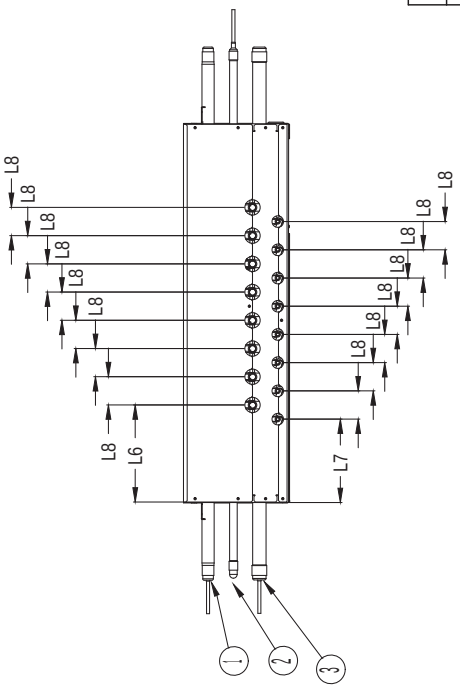
PRHR083A

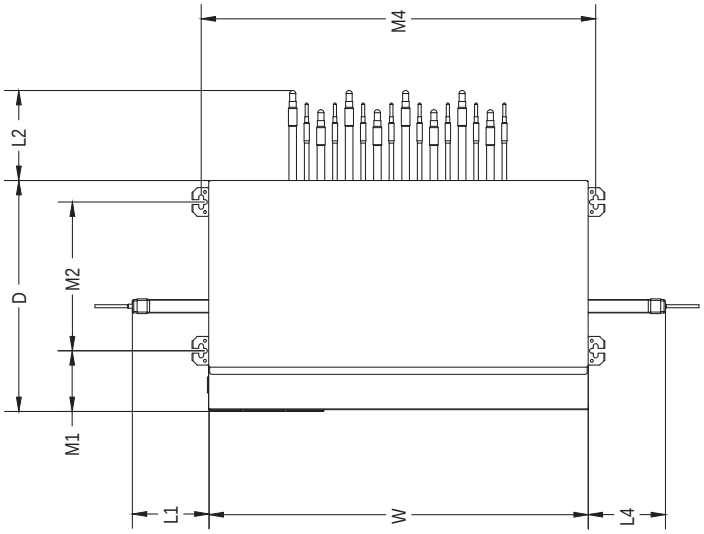
[Unit: inch]

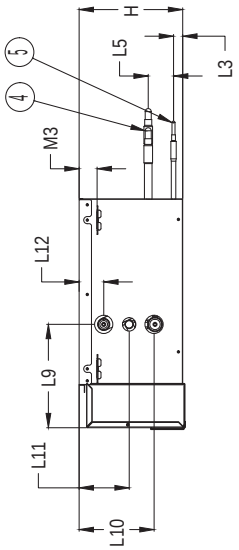
W	31-1/4"
H	8-5/8"
D	18-15/16"
L1	6-5/16"
L2	6-15/16"
L3	3/4"
L4	6-5/16"
L5	2-3/16"
L6	8-1/16"
L7	6-7/8"
L8	2-5/16"
L9	8-9/16"
L10	6-3/16"
L11	3-9/16"
L12	2"
M1	4-15/16"
M2	12-1/4"
M3	1-1/2"
M4	32-1/2"

No.	Part Name
6	Control box
5	Liquid pipe to Indoor unit
4	Gas pipe to Indoor unit
3	Low pressure gas pipe
2	Liquid pipe to Outdoor unit
1	High pressure gas pipe









Note:

1. Unit should be installed in compliance with the appropriate LG installation manual.
2. Unit should be grounded in accordance with the local regulations or applicable national codes.
3. All electrical components and materials supplied from the site must comply with the local regulations or national codes.

Transporting / Lifting the Outdoor Unit

- When lifting the unit, use lifting straps and place around the unit as shown.
- Always lift the unit using properly sized lifting straps rated to carry the unit weight.
- Ensure the straps are long enough to maintain a maximum of a 40° angle.

Note:

When moving / adjusting the placement of the outdoor unit, always hold the unit by the corners. Moving the outdoor unit using the side intake holes on the frame may damage the frame.

Table 6: Multi V S with LGRED Shipping and Net Weights.

Capacity (ton)	Shipping Weight (lbs.)	Net Weight (lbs.)
3	294	263
4	294	263

Figure 6: Transporting / Lifting the Outdoor Unit.

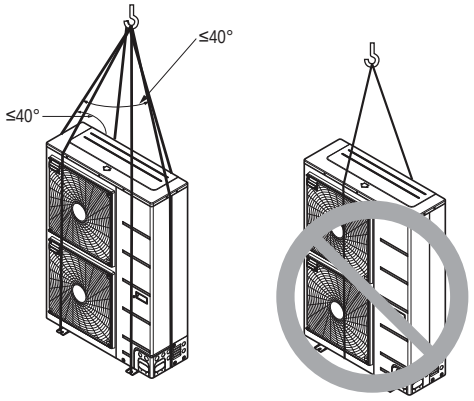
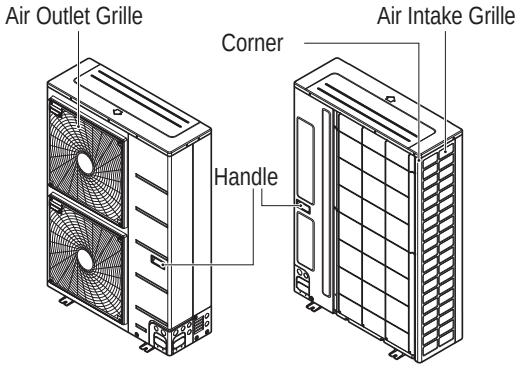


Figure 7: Adjusting the Placement of the Outdoor Unit.



⚠WARNING

- *Use appropriate moving equipment to transport each frame; ensure the equipment is capable of supporting the weights listed above. If the equipment is not properly secured, it will result in an accident that causes physical injury or death.*
- *Wear protective gloves when handling equipment. Sharp edges will cause personal injury.*
- *Some products include polypropylene bands around the unit for packaging. ⃠ Do not use polypropylene bands to lift the unit. There is a risk of the product falling and causing physical injury.*
- *Tear apart and throw away plastic packaging bags so that children will not play with them and risk suffocation and death.*
- *Consider the unit's center of gravity is before lifting. Hoist the unit with the center of gravity centered among the lifting straps. There is a risk of the product falling and causing physical injury.*
- *Lift the outdoor unit from the base at specified locations. Support the outdoor unit at a minimum of six (6) points to avoid slippage from the rigging apparatus, and use a minimum of three (3) lifting straps. There is a risk of the product falling and causing physical injury.*
- *Use caution when using forklift to transport an unpackaged unit. ⃠ Do not drop the unit when carrying it with a forklift. There is a risk of the product falling and causing physical injury.*

Note:

Place a protective cloth or other soft material at the locations where the casing comes in contact with the lifting straps to prevent damage to painted surfaces.

Selecting the Best Location for the Outdoor Unit(s)

⚠DANGER

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

⚠CAUTION

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

⚠WARNING

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

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

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

⃠ Do Not's

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

Planning for Snow and Ice

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

1. Prepare for severe winter wind chills and heavy snowfall, even in areas of the country where these are unusual phenomena.
2. Position the outdoor unit so that its airflow fans are not buried by direct, heavy snowfall. If snow piles up and blocks the airflow, the system will malfunction.
3. Remove any snow that has accumulated four (4) inches or more on the top of the outdoor unit.
4. In climates that will experience significant snow buildup, mount the outdoor unit on a raised, field-provided platform or stand. The raised support platform must be high enough to allow the unit to remain above possible snow drifts, and must be higher than the maximum anticipated snowfall for the location.
5. Design the mounting base to prevent snow accumulation on the platform in front or back of the unit frame.
6. Provide a field fabricated snow protection hood to keep snow and ice and/or drifting snow from accumulating on the coil surfaces.
7. Install a hail guard kit and air guide accessories (sold separately) to prevent snow or rain from accumulating on the fan inlet / outlet guards.
8. Consider tie-down requirements in case of high winds or where required by local codes. In all cases, connected duct work and accessories must provide a combined air pressure drop rating that does not exceed 0.16" WG.

PLACEMENT CONSIDERATIONS

Selecting the Best Location for the Outdoor Unit(s)

Planning for Snow and Ice, continued.

⚠CAUTION

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

Note:

- *Choose an area where run-off from defrost mode will not accumulate and freeze on sidewalks or driveways. Properly install and insulate any drain hoses to prevent the hose from freezing, cracking, leaking, and damaging the outdoor unit.*
- *Snow removal mode does not prevent ice from forming on the fan blade or discharge grille.*

Note:

The system will take longer to provide heat, or heating performance will be reduced in winter if the outdoor unit is installed:

1. *In a narrow, shady location.*
2. *Near a location that has a lot of ground moisture.*
3. *In a highly humid environment.*
4. *In an area in which condensate does not drain properly.*

Wind Protection

If the outdoor unit is placed on a roof, position it with the compressor end (no coil surface) in the direction of the prevailing wind as shown in the figure at right. In cooler climates, it may be beneficial to position the unit in direct sunlight to assist with defrost operations.

If the outdoor unit is not placed on a roof, place it on the leeward side of the building or in a location where the unit will not be exposed to constant wind.

If placement exposes the unit to constant wind activity, construct a wind break in front of the unit. Follow the placement guidelines set forth in “Clearance Requirements”.

Figure 8: Prevailing Wind Direction.

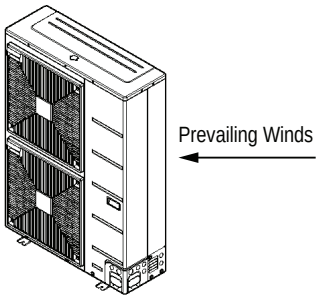
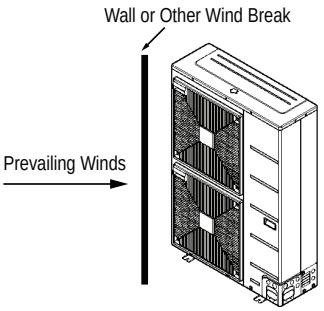


Figure 9: Leeward Side of the Building.

Figure 10: Wind Break.



Mounting Platform

The underlying structure or foundation must be designed to support the weight of the unit. Avoid placing the unit in a low lying area where water may accumulate.

PLACEMENT CONSIDERATIONS

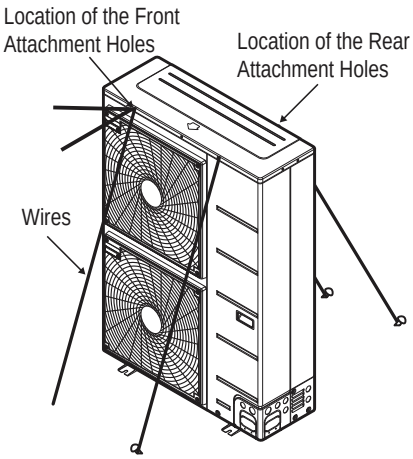
Selecting the Best Location for the Outdoor Unit(s)

Tie-Downs and Lightning Protection

Tie-Downs

- The strength of Multi V frames is adequate to be used with field-provided wind restraint tie-downs.
- The strength of the roof must be checked before installing the outdoor units.
- If the installation site is prone to high winds or earthquakes, when installing on the wall or roof, securely anchor the mounting base using a field-provided tie-down configuration approved by a local professional engineer (see diagram at right for example).
- Use four wires. Detach the top of the frame at the locations indicated, thread the screws through the wires, then reattach the screws to the outdoor unit frame.
- The overall tie-down configuration must be approved by a local professional engineer. Always refer to local code when using a wind restraint system.

Figure 11: Tie-Down Locations on the Outdoor Unit.



Lightning Protection

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

Table 7: Safety Zone Specifications.

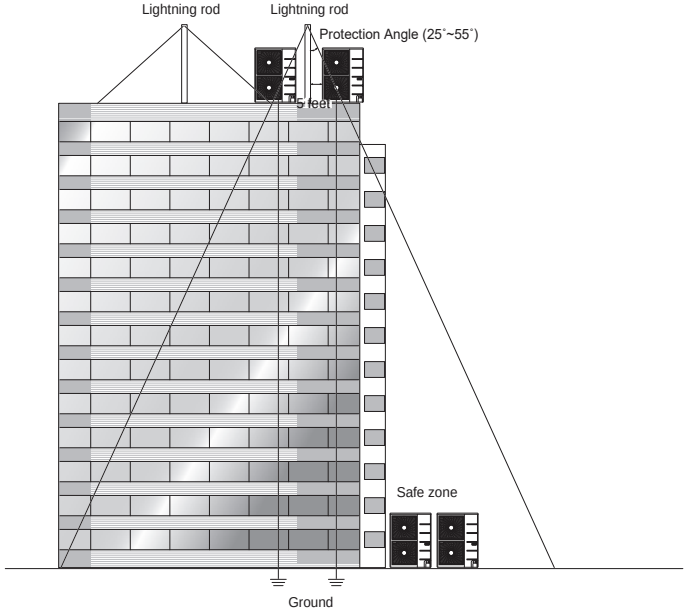
Building Height (feet)	66	98	148	197
Protection Angle (˚)	55	45	35	25

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

Note:

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

Figure 12: Lightning Protection Diagram.



PLACEMENT CONSIDERATIONS

Selecting the Best Location for the Outdoor Unit(s)

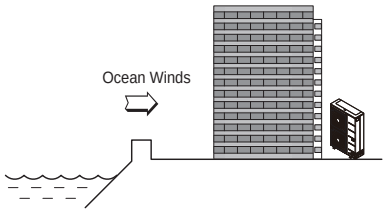
Oceanside Installation Precautions

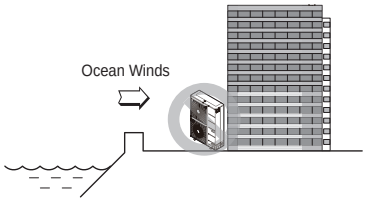
- ⃠ Avoid installing the outdoor unit where it would be directly exposed to ocean winds.
- Install the outdoor unit on the side of the building opposite from direct ocean winds.
- Select a location with good drainage.
- Periodically clean dust or salt particles off of the heat exchanger with water.

Note:

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

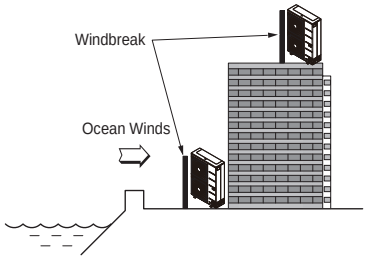
If the outdoor unit must be placed in a location where it would be subjected to direct ocean winds, install a concrete windbreaker strong enough to block any winds. Windbreaker height and width must be more than 150% of the outdoor unit, and be installed at least 27-1/2 inches away from the outdoor unit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





Note:

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



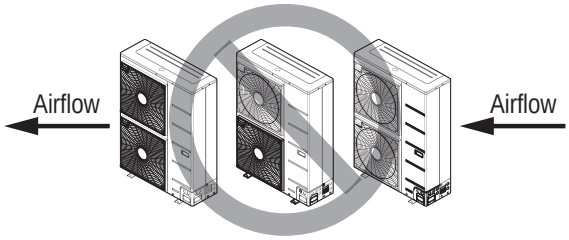
Minimum Clearance Requirements for Multi V S with LGRED ARUM036GSS5 / ARUM048GSS5 Outdoor Units

Proper clearance for the outdoor unit coil is critical for proper unit operation. When installing the outdoor unit, consider service, inlet and outlet and minimum allowable space requirements. The figures below and on the next page illustrate clearance requirements for various installation scenarios. Use the hot isle / cold isle approach when placing multiple units in close proximity to each other. Outdoor unit fans draw air from the back of the unit and discharges out the front. Place units back to back and face to face.

Note:

- ⃠ Do not place the unit where animals and/or plants will be in the path of the warm air, or where the warm air and / or noise will disturb neighbors.
- Installation clearances must comply with local building codes.
- All figures not to scale.
- ⃠ Never place multiple units facing back to front or front to back as shown immediately below, left or high and low system pressure problems will occur.

Figure 13: Improper Outdoor Unit Placement.

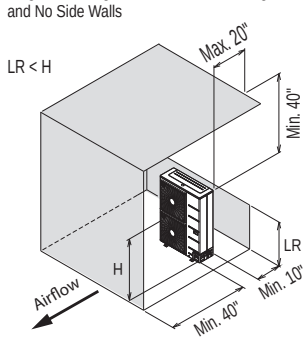


Legend

LR = Rear wall height LF = Front wall height H = Unit height

Figure 14: Proper Outdoor Unit Placement and Clearances.

Single Unit—High Front Wall with Building Overhang and No Side Walls



Single Unit—High Rear Wall and Low Front Wall with No Side Walls

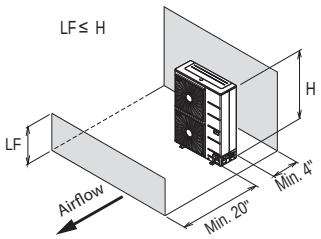
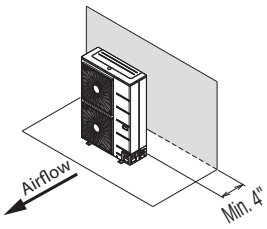
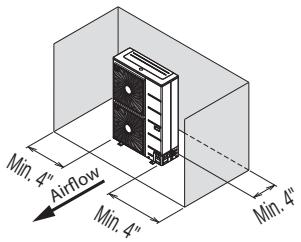


Figure 15: Proper Outdoor Unit Placement and Clearances, continued.

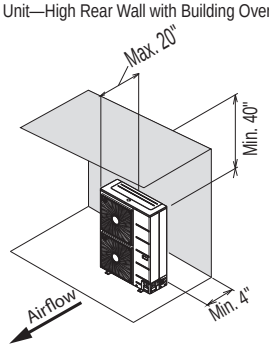
Single Unit—High Rear Wall



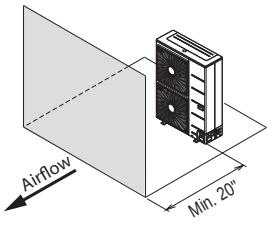
Single Unit—High Rear Wall with High Side Walls



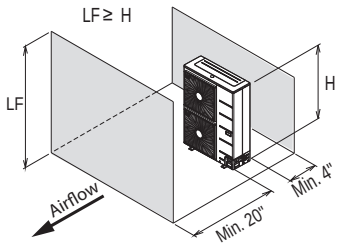
Single Unit—High Rear Wall with Building Overhang



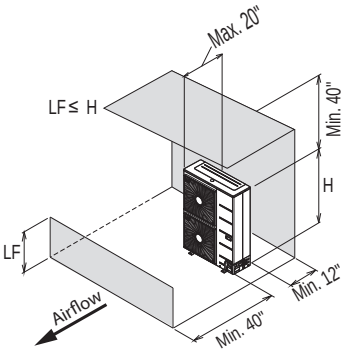
Single Unit—High Front Wall with No Side Walls



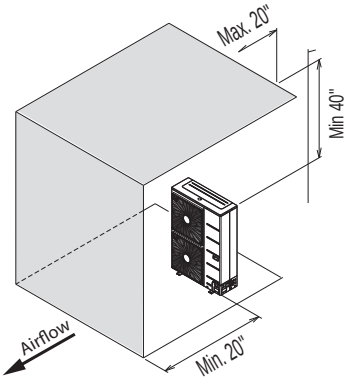
Single Unit—High Rear and Front Walls with No Side Walls



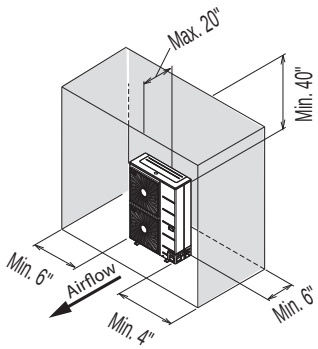
Single Unit—High Rear Wall and Low Front Wall with Building Overhang and No Side Walls



Single Unit—High Front and Rear Walls with Building Overhang and No Side Walls



Single Unit—High Rear and Side Walls with Building Overhang



PLACEMENT CONSIDERATIONS

Outdoor Unit Clearance Requirements

MULTI V S WITH LGRED°

Note:

- *Installation clearances must comply with local building codes.*
- *All figures not to scale.*

Legend

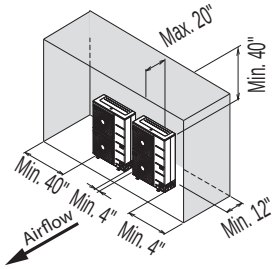
LR = Rear wall height

LF = Front wall height

H = Unit height

Figure 16: Proper Outdoor Unit Placement and Clearances, continued.

Side by Side—High Rear and Side Walls with Building Overhang



Side by Side—High Rear and Front Walls with Building Overhang

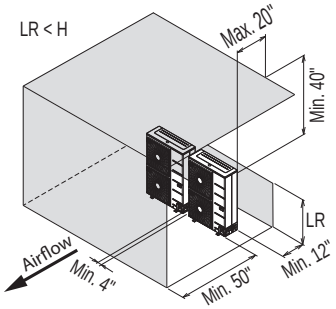
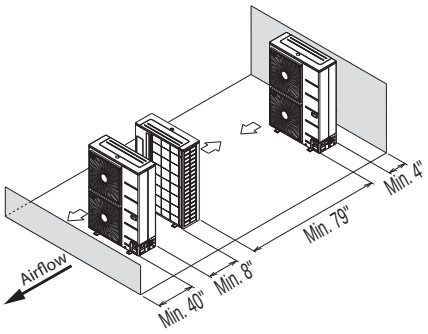
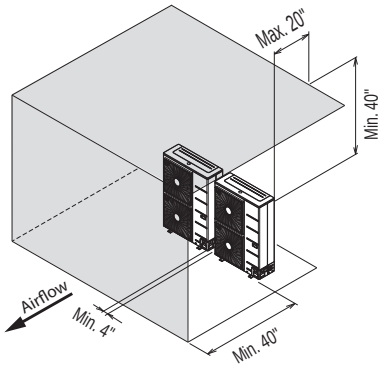


Figure 17: Proper Outdoor Unit Placement and Clearances, continued.

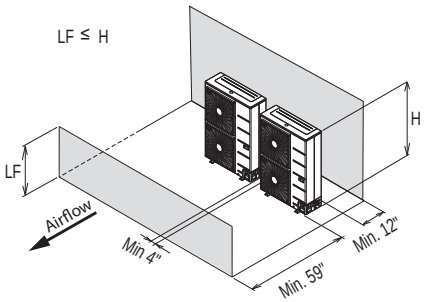
Single Row Units—High Rear Wall and Low Front Wall with No Side Walls or Overhang



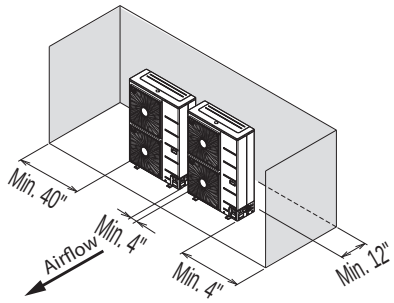
Side by Side —High Front Wall with Building Overhang and No Side or Rear Walls



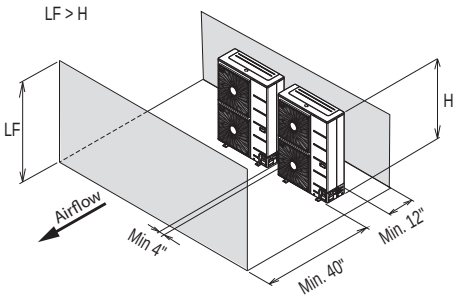
Side by Side—High Rear Wall and Low Front Wall with No Side Walls



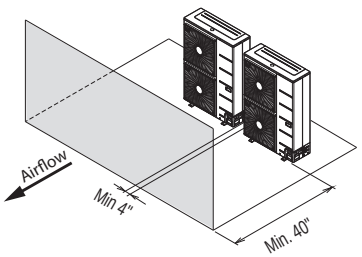
Side by Side—High Rear and Side Walls



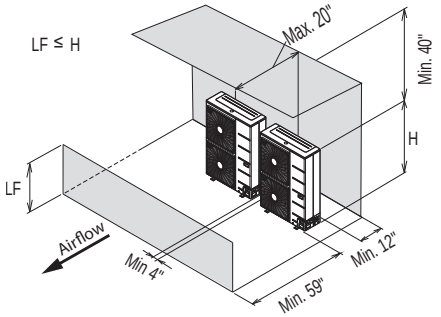
Side by Side—High Front and Rear Walls with No Side Walls



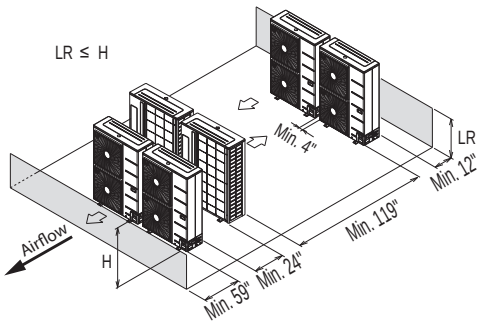
Side by Side—High Front Wall with No Side Walls



Side by Side—High Rear Wall and Low Front Wall with Building Overhang and No Side Walls



Double Row Units—Low Rear and Front Walls with No Side Walls or Overhang



Installing Outdoor Units Indoors

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

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

Benefits of Installing Outdoor Units Indoors

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

Design Considerations Include:

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

General Guidelines

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

It will be necessary to use an air guide accessory to prevent discharge air from short-cycling back to the coil inlet.

- Another option is to field manufacture ductwork and mount on top of the unit to encompass the outdoor unit fan discharge and connect to the exterior discharge grille on the building.
- ⃠ Avoid using a single duct on multi-fan units to prevent short cycling. Provide a dedicated duct for each outdoor unit fan discharge.
- Consider the direction of prevailing winds and opening placement. If possible, locate inlet openings upwind of discharge openings and other exhaust outlets.
- When inlet and outlet openings are placed on the same wall, minimum distance between the two openings must be approximately three (3) feet (minimum distance varies significantly with variations in outlet opening face velocity).
- If roof-mounted ventilation openings are used, strategically locate the inlet ventilation opening(s) upwind of the outlet opening(s).
- Discharge and supply ductwork must be designed to avoid weather related long periods of water entrainment and the potential for microbial growth.

PLACEMENT CONSIDERATIONS

Installing Outdoor Units Indoors

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

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

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

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

As always, the best solution for each project balances acceptable heating performance (considering local weather conditions), capital costs, life cycle energy consumption, and limitations set forth by local building codes. For more detailed information on how to design indoor spaces for LG Multi V outdoor units, see the white paper “Air-Source VRF Mechanical Room Design Considerations for Outdoor Unit Placement in Enclosures” on www.lghvac.com.

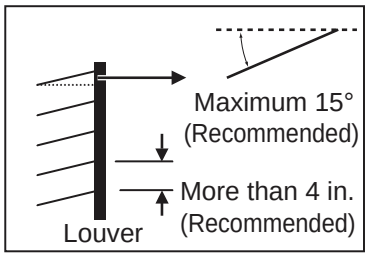
Note:

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

Louver Recommendations for Outdoor Unit Enclosure

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

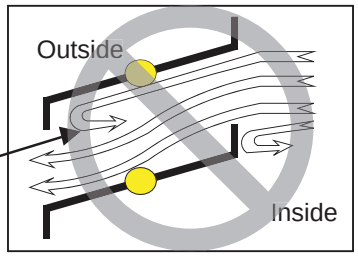
Figure 18: Louver Recommendations.



Note:

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

Figure 19: Using "S" Type Louvers.



Air flow passing through the louver blade backwards can generate noise.

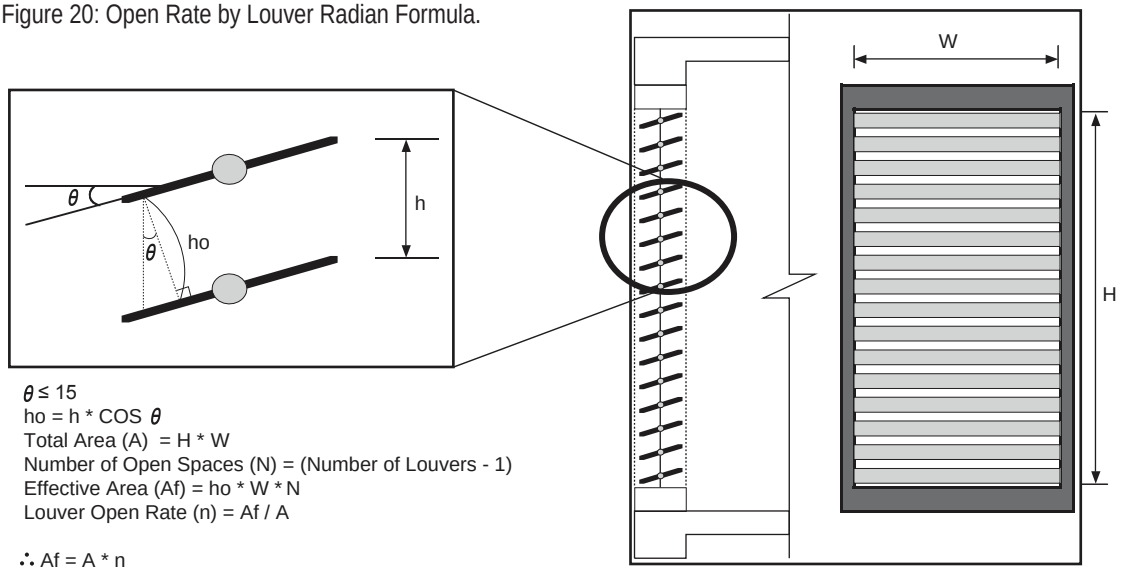
Note:

If the Louver Open Rate is Too Small

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

Open Rate by Louver Radian

Figure 20: Open Rate by Louver Radian Formula.



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

$\therefore Af = A * n$

Effective Cross Section Area

Side View

Front View

PLACEMENT CONSIDERATIONS

Selecting the Best Location / Clearance Requirements for the Heat Recovery Unit(s)

Selecting the Best Location / Clearance Requirements

Note:

Heat recovery units are for use with systems designed for heat recovery operation only.

Select an installation space for the heat recovery unit that meets the following conditions:

- Install the heat recovery unit indoors in a level and upright position.
- Ensure there is enough space in the installation area for service access.
- Install the heat recovery unit in a location where any sound it may generate will not disturb occupants in the surrounding rooms.
- Install the refrigerant piping and electrical wiring system in an easily accessible location.

Dont's

- *Refrigerant pipes must not exceed lengths specified by LG Electronics.*
- *Do not install the heat recovery unit in a location where it would be subjected to strong radiation heat from heat sources.*
- *Avoid an installation environment where oil splattering or vapor spray may occur.*
- *Avoid an installation environment where high-frequency electric noise could occur.*
- *Condensate drain piping is not required.*

Figure 21: PRHR023A to 043A Clearance Requirements.

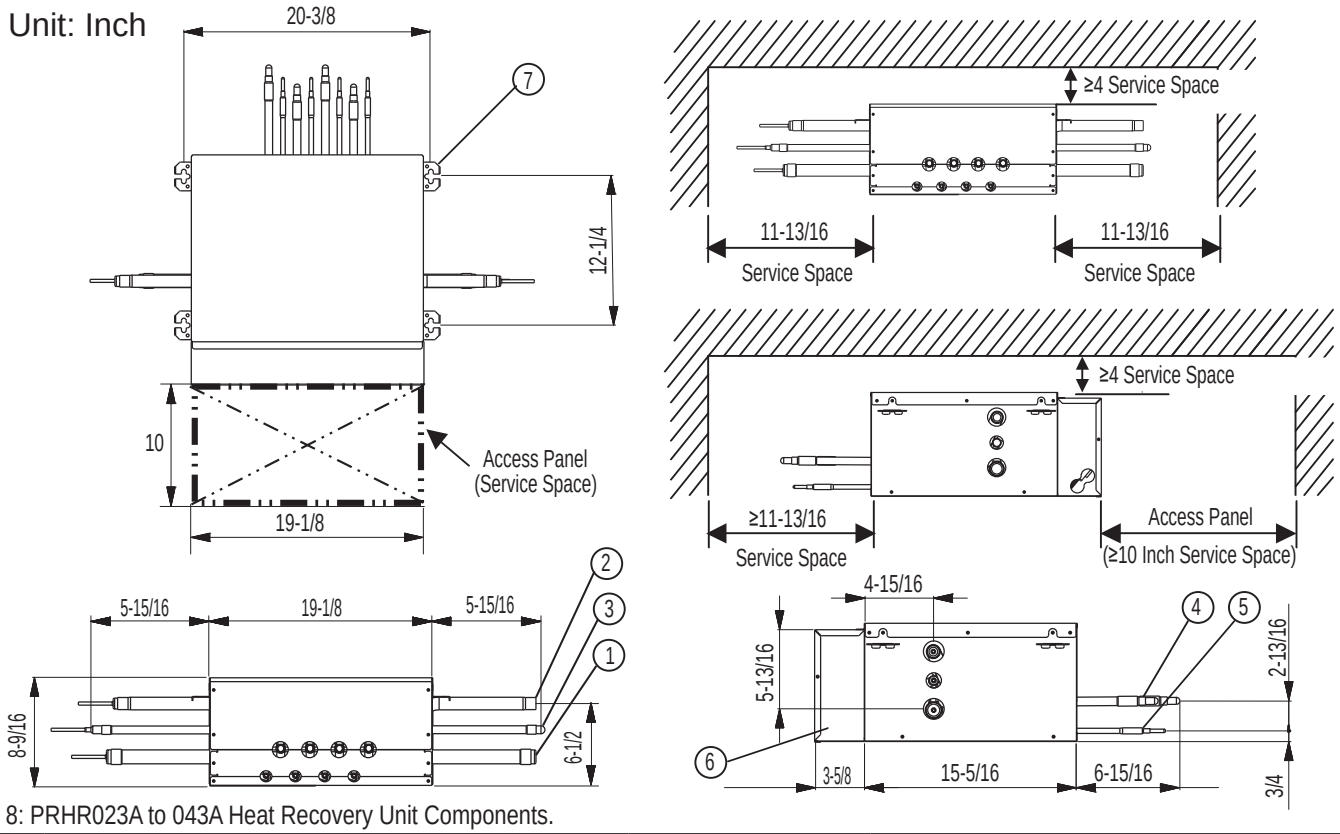


Table 8: PRHR023A to 043A Heat Recovery Unit Components.

No.	Component Name	Connection Size (in.) / Type		
		PRHR023A	PRHR033A	PRHR043A
1	Low Pressure Vapor Pipe Connection Port	7/8 Braze	1-1/8 Braze	1-1/8 Braze
2	High Pressure Vapor Pipe Connection Port	3/4 Braze	7/8 Braze	7/8 Braze
3	Liquid Pipe Connection Port	3/8 Braze	1/2 Braze	5/8 Braze
4	Indoor Unit Vapor Pipe Connection Port	5/8 Braze	5/8 Braze	5/8 Braze
5	Indoor Unit Liquid Pipe Connection Port	3/8 Braze	3/8 Braze	3/8 Braze
6	Control Box	–	–	–
7	Metal Hanger Bracket (Field-Supplied Suspension Bolt)	5/16 or 7/16	5/16 or 7/16	5/16 or 7/16

Selecting the Best Location / Clearance Requirements, Continued.

Figure 22: PRHR063A and PRHR083A Clearance Requirements.

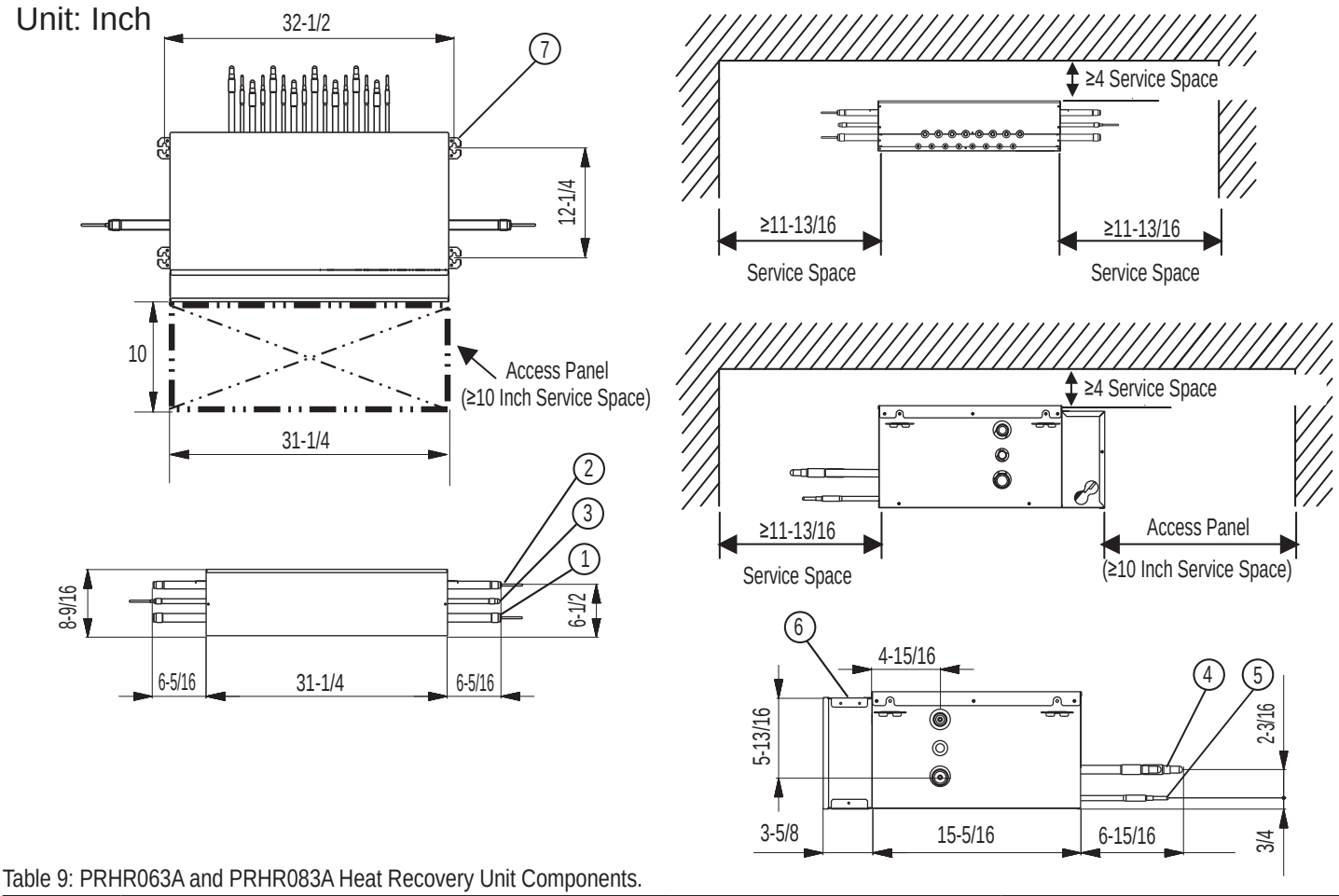


Table 9: PRHR063A and PRHR083A Heat Recovery Unit Components.

No.	Component Name	Connection Size (in.)/ Type	
		PRHR063A	PRHR083A
1	Low Pressure Vapor Pipe Connection Port	1-1/8 Braze	1-1/8 Braze
2	High Pressure Vapor Pipe Connection Port	7/8 Braze	7/8 Braze
3	Liquid Pipe Connection Port	5/8 Braze	5/8 Braze
4	Indoor Unit Vapor Pipe Connection Port	5/8 Braze	5/8 Braze
5	Indoor Unit Liquid Pipe Connection Port	3/8 Braze	3/8 Braze
6	Control Box	–	–
7	Metal Hanger Bracket (Field-Supplied Suspension Bolt)	5/16 or 7/16	5/16 or 7/16

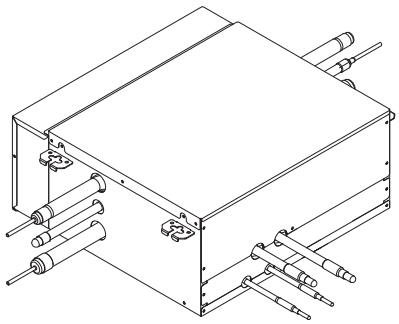
Note:

- *Include an access panel at the side of the heat recovery unit where the control box is located.*
- *If reducers are used, service space must be increased equal to the dimensions of the reducer.*

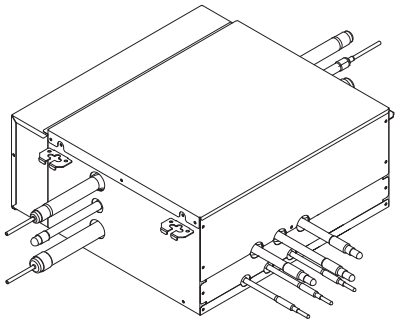
PLACEMENT CONSIDERATIONS

Selecting the Best Location / Clearance Requirements for the Heat Recovery Unit(s)

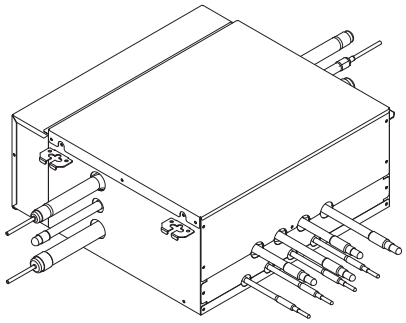
Figure 23: Heat Recovery Unit Types.



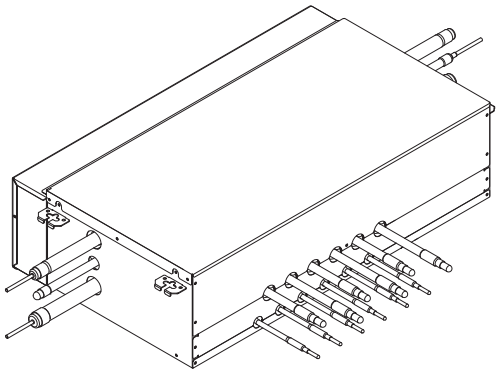
PRHR023A
Two Ports



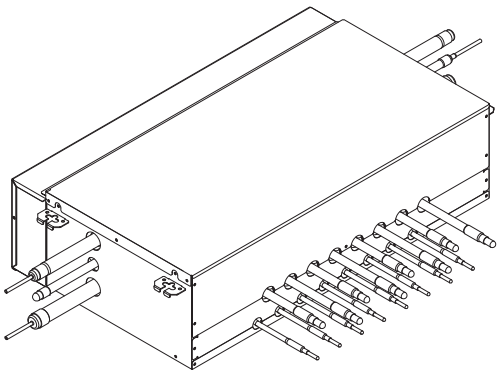
PRHR033A
Three Ports



PRHR043A
Four Ports



PRHR063A
Six Ports



PRHR083A
Eight Ports

1. Heat recovery units have capacities from 120,000 to 230,000 Btu/h, depending on the model. See the specification tables in the “Product Data” section.
2. Heat recovery units connected in series have a total capacity up to 192,000 Btu/h per series string. Series string is defined as heat recovery units piped in series.
3. Elevation difference between heat recovery units connected in series is permitted, but must not exceed 16 feet.
4. Each port on the heat recovery unit has a capacity up to 60,000 Btu/h.
5. Each port can be connected to a maximum of eight (8) indoor units. When multiple indoor units are connected to one port, all indoor units on that port must operate in the same mode (cooling or heating).
6. If an indoor unit larger than 60,000 Btu/h is to be used, two (2) ports must be twinned using a reverse Y-branch.
7. Connect largest indoor unit to first port of the heat recovery unit. The 3A heat recovery units are numbered from right to left (No. 1 port on right side).
8. Elevation difference between the heat recovery unit and the indoor unit(s) must not exceed 49 feet.

Note:

Designer must follow Multi S with LGRED system parameters when choosing heat recovery units, or the system will malfunction. Follow the LATS diagram.

MOUNTING / ANCHORING THE OUTDOOR UNIT(S)

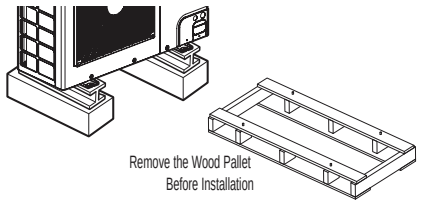
⚠WARNING

Remove the wood pallet from the bottom of the outdoor unit before brazing. A fire will occur if the pallet is not removed.

Note:

Remove the wood pallet from the bottom of the outdoor unit before attaching the anchor bolts. If the pallet is not removed, the outdoor unit will become unstable and heat exchanger will freeze, resulting in improper operation.

Figure 24: Removing the Pallet.



Mounting / Anchoring the Outdoor Unit(s)

⚠WARNING

- *Ensure that the floor / chosen location has enough strength to support the weight of the unit(s) and the base. If it does not have sufficient strength, the unit(s) and base will fall and cause physical injury or death.*
- *Install the outdoor unit to protect against extremely high winds and earthquakes. Any deficiency in installation will cause unit to fall, resulting in physical injury or death.*

⚠CAUTION

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

Note:

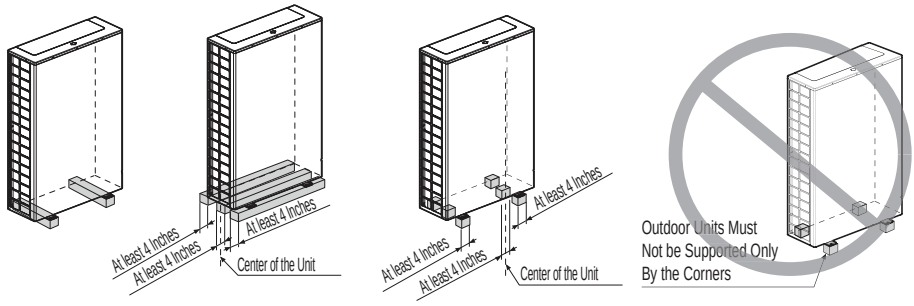
- *Ensure that the floor / chosen location has enough strength to support the weight of the unit(s) and the base, enough space for the piping and wiring; and sufficient slope for proper drainage between the units, the condensate drain connection, and the floor drain.*
- ⃠ Avoid placing the unit(s) in a low-lying area where water will accumulate.
- ⃠ *Do not install the condensate drain piping within the outdoor unit frame; use the access hole for drainage instead. Drain piping installed within the outdoor unit frame will freeze, the condensate will not drain properly and cause damage the outdoor unit.*
- *Refer to dimensional drawings in the "Product Data" section, and follow the applicable local and state codes for clearances, mounting, anchor, and vibration attenuation requirements.*

General Mounting

Securely attach the outdoor unit to a condenser pad, base rails, or other mounting platform that is securely anchored to the ground or building structure. See the figures, and follow the applicable local codes for clearance, mounting, anchor, and vibration attenuation requirements.

- Location must be strong enough to bear the weight and vibration of the outdoor unit.
- The outdoor unit supports must have a minimum height of 7-7/8 inches, and a minimum width of four (4) inches under the unit's legs before being attached.
- Anchor bolts must be installed at least three (3) inches into the support.

Figure 25: Multi V Mounting Options.



MOUNTING / ANCHORING THE OUTDOOR UNIT(S)

Mounting Bolt Location / Foundation for Installation

- I-Beams can be used as a base support.
- Operation sound and vibration from the outdoor units may transfer to surrounding floors or walls; to reduce vibration and operation sound, add anti-vibration materials to the concrete base.
- Ensure there is enough room under the outdoor unit if installing the piping and wiring using the bottom access holes.

Figure 26: Mounting Bolt / Foundation Diagram.

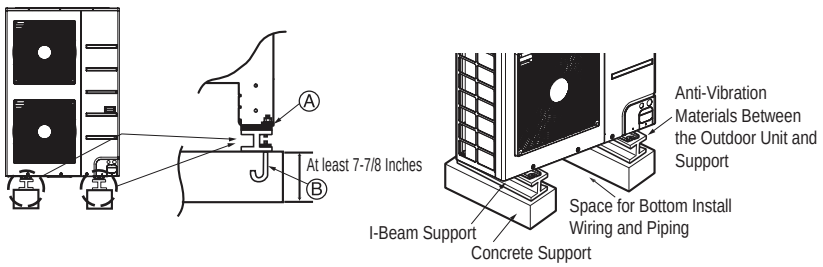


Figure 27: Minimum Foundation Measurements.

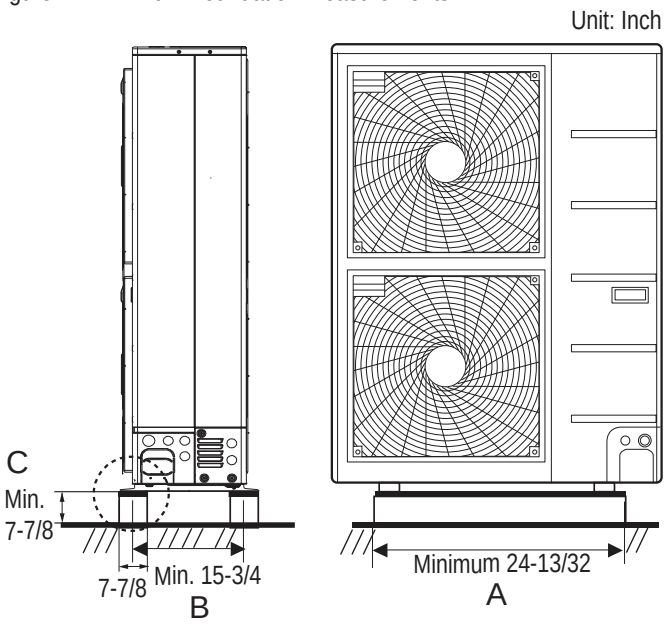


Table 10: Foundation Measurements.

Model No.	Foundation (in.)			Bolt Type	Bolt Depth
	A	B	C		
ARUM036GSS5 / ARUM048GSS5	Min. 24-13/32	Min. 15-3/4	Min. 7-7/8	M10-J	Minimum Three (3) Inches

⚠ WARNING

- *The corners of the outdoor unit must be attached firmly to the support, otherwise, the bolts may bend, cause the outdoor unit to fall, which may result in physical injury or death (A).*
- *Attach the bolts tightly as shown to ensure the outdoor unit will not fall due to earthquakes or strong wind gusts, causing physical injury or death (B).*

Figure 28: Mounting Method No.1.

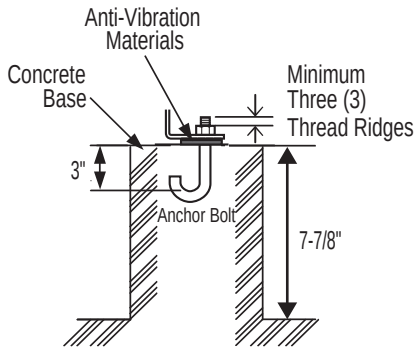


Figure 29: Mounting Method No.2.

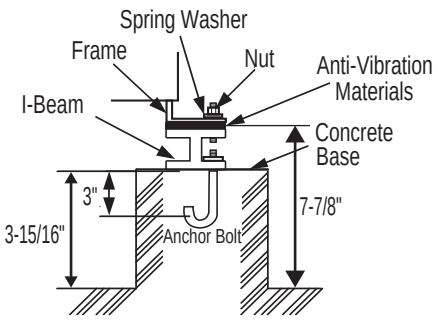
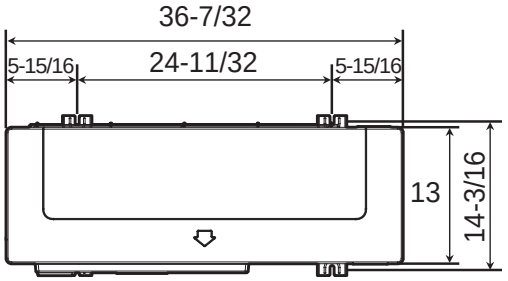


Figure 30: Locations for the Mounting Bolts.



MOUNTING / ANCHORING THE HEAT RECOVERY UNIT(S)

Mounting / Anchoring the Heat Recovery Unit(s)

Install the heat recovery unit by suspending it from the ceiling with the top (see diagram) always facing up.

1. Select and mark the area where the anchors / suspension bolts are to be placed on the ceiling.
2. Drill the holes for the anchors / suspension bolts as indicated. Using a drop-in anchor, install the hanging bolt.
3. Thread 3/8 or 5/16 inch hexagon nuts (field-supplied), the metal hanger tabs, and flat washers (field-supplied) onto the hanging bolts as shown in the diagram.
4. Install the heat recovery unit horizontally on the metal hanger brackets with its top facing up. Use a level—the unit must be within ±5° from front to back and from left to right. Tighten all anchors, nuts, and bolts.
5. After verifying that the heat recovery unit is level, tighten the hexagon nuts.

The following parts are field supplied:

- Six-Sided Nuts: 5/16" (M8) or 7/16" (M10)
- Flat Washers: 7/16" (M10)
- Suspension Bolts: 5/16" (M8) or 7/16" (M10)

⚠ WARNING

- *The threaded suspension bolts and other hardware must be securely tightened to prevent the unit from falling from its installation location. There is a risk of personal injury from falling equipment.*
- *⃠ Do not damage power wiring during installation. There is risk of electric shock, which may result in physical injury or death.*

Note:

- *The threaded suspension bolts and other hardware must be securely tightened to prevent the unit from falling from its installation location. There is a risk of equipment damage.*
- *⃠ Do not damage power wiring during installation. There is a risk of equipment malfunction, which may result in property damage.*
- *The heat recovery unit MUST be installed so that its top faces up. If not, the incorrect installation may cause unit failure.*
- *The heat recovery unit must be positioned no more than ±5° from level front to back and left to right.*
- *Removing the factory process stubs is required. Replace with refrigerant-grade caps.*
- *Insulate unused ports completely as shown in the figure.*

Figure 31: Installing the Heat Recovery Unit Top Side Up.

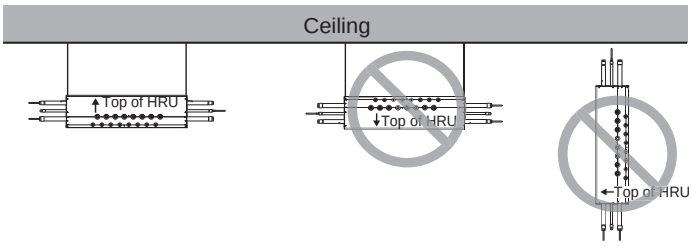


Figure 32: Drilling the Holes for the Anchors / Suspension Bolts.

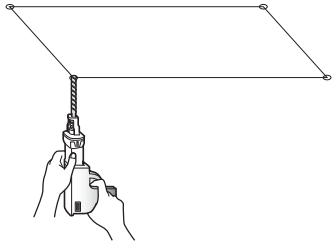


Figure 33: Suspension Bolts Installation.

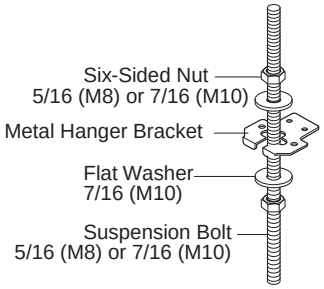


Figure 34: Old Versus New Building Suspension Bolt Installation.

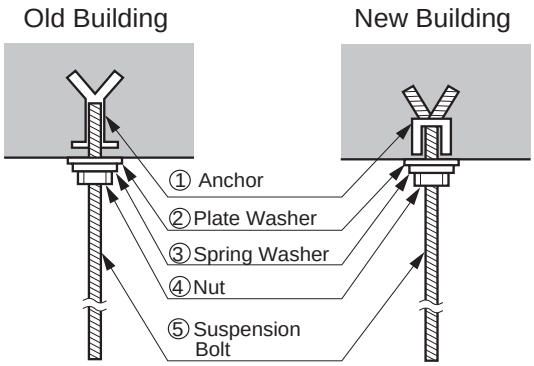
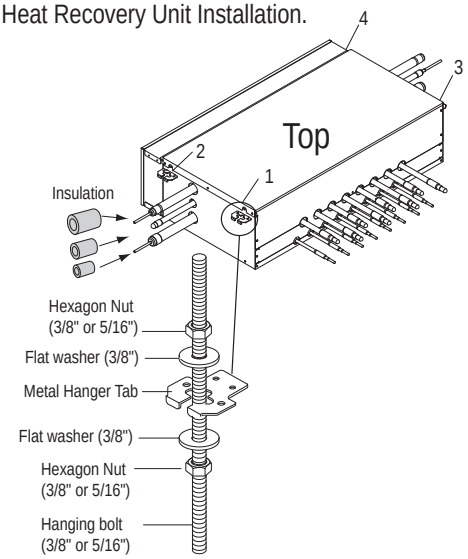


Figure 35: Heat Recovery Unit Installation.



LG AIR CONDITIONER TECHNICAL SOLUTION (LATS)

MULTI V S WITH LGRED°

LG Air Conditioner Technical Solution (LATS) Software

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

Note:

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

Formats

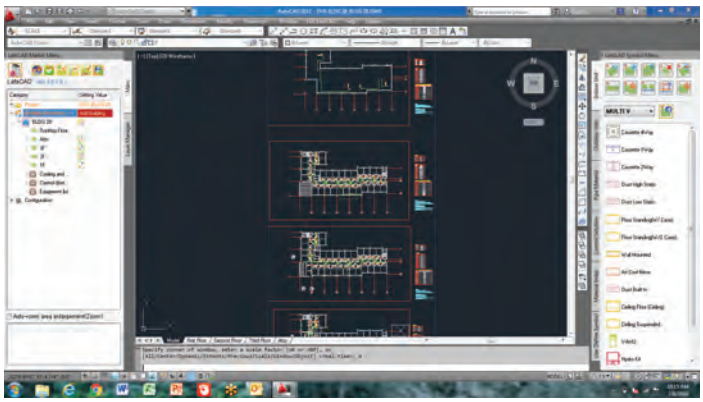
LATS is available to LG customers in three user interfaces: LATS HVAC, LATS CAD2, and LATS REVIT. All three LATS formats are available through www.myLGHVAC.com, or contact an LG Sales Representative.

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

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

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

Figure 36: Example of LATS CAD2.



Features

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

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

The program can also:

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

Note:

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

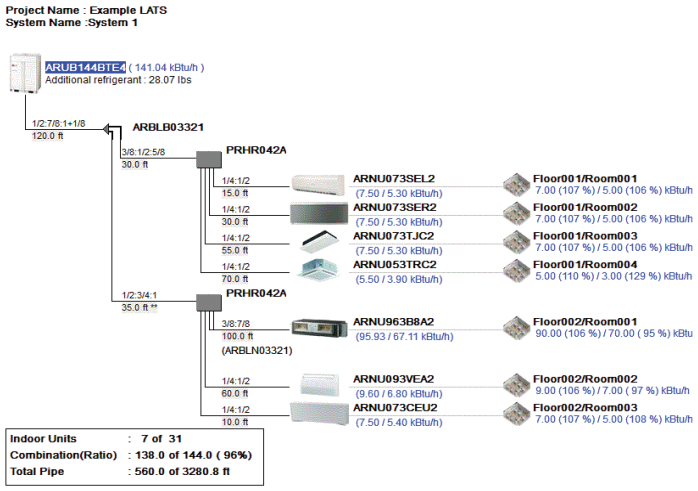
LATS Generates a Complete Project Report

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

Proper Design to Install Procedure

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

Figure 37: Example of a LATS Tree Diagram.



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

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

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

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

Note:

Any field changes, such as re-routing, shortening or lengthening a pipe segment, adding or eliminating elbows and/or fittings, re-sizing, adding, or eliminating indoor units, changing the mounting height, or moving the location of a device or fitting during installation must be done with caution and ALWAYS VERIFIED in LATS MULTI V SOFTWARE BEFORE supplies are purchased or installed. Doing so will lead to a more profitable installation, reduce the potential for rework, and will reduce the potential for multiple visits to the job site to complete the system commissioning.

REFRIGERANT CHARGE WORKSHEET

System R410A Refrigerant Charge Calculator (lbs.)

MULTI V S WITH LGRED°

System Tag or ID:	Job Name: _____ Project Manager: _____ Date: _____

Line #	Description	Chassis I.D.	Size	Quantity	CF (Ref.)[1]	Total (lbs.)
1	Linear feet of 1/4" liquid line tubing[2]	—	—		0.015	
2	Linear feet of 3/8" liquid line tubing[2]	—	—		0.041	
3	Linear feet of 1/2" liquid line tubing[2]	—	—		0.079	
4	Linear feet of 5/8" liquid line tubing[2]	—	—		0.116	
5	Linear feet of 3/4" liquid line tubing[2]	—	—		0.179	
6	Linear feet of 7/8" liquid line tubing[2]	—	—		0.238	
7	Linear feet of 1" liquid line tubing[2]	—	—		0.323	
8	Standard + Art Cool Mirror	SJ, SK	5k to 15k		0.53	
9	Standard + Art Cool Mirror	SJ, SK	18k to 24k		0.62	
10	Standard	SV	30k to 36k		1.01	
11	Art Cool Gallery	SF	9k to 12k		0.22	
12	1-Way Cassette	TU	7k to 12k		0.44	
13	1-Way Cassette	TT	18k to 24k		0.64	
14	2-Way Cassette	TS	18k to 24k		0.75	
15	4-Way 2' x 2' Cassette	TR	5k to 7k		0.40	
16	4-Way 2' x 2' Cassette	TR	9k to 12k		0.55	
17	4-Way 2' x 2' Cassette	TQ	15k to 18k		0.71	
18	4-Way 3' x 3' Cassette	TN	7k to 24k		0.88	
19	4-Way 3' x 3' Cassette	TM	28k to 36k		1.08	
20	4-Way 3' x 3' Cassette	TM	42k to 48k		1.41	
21	Mid Static Ducted	M1	7k to 24k		0.57	
22	High Static Ducted	M2	7k to 24k		0.77	
23	Mid Static Ducted	M2	28k to 42k		1.15	
24	Mid / High Static Ducted	M3	28k to 54k		1.35	
25	High Static Ducted	B8	36k to 96k		2.20	
26	Low Static Ducted, Low Static Ducted Bottom Return	L1	5k to 9k		0.31	
27	Low Static Ducted, Low Static Ducted Bottom Return	L2	12k to 18k		0.42	
28	Low Static Ducted, Low Static Ducted Bottom Return	L3	21k to 24k		0.55	
29	Vertical / Horizontal Air Handling Unit	NJ	12k to 30k		1.04	
30	Vertical / Horizontal Air Handling Unit	NJ	36k		1.57	
31	Vertical / Horizontal Air Handling Unit	NK	42k to 54k		2.00	
32	Floor Standing	CE (U)	7k to 15k		0.37	
33	Floor Standing	CF (U)	18k to 24k		0.82	
34	HRU: PRHR023A, 033A, 043A	—	—		1.1	
35	HRU: PRHR063A, 083A	—	—		2.2	
37	ADDITIONAL Refrigerant Charge Required (Sum of lines 1 – 35)					
Multi V S with LGRED Unit Factory Refrigerant Charge		ARUM036GSS5	36,000		7.7 lb.	
		ARUM048GSS5	48,000		7.7 lb.	
38	Factory Refrigerant Charge (Factory refrigerant charge for the ODU in the system					
39	TOTAL SYSTEM CHARGE Sum of Add'l Refrigerant Charge Required (line 37) and ODU Factory Refrigerant Charge (line 38)					

[1]CF (Ref.) = Correction Factor for Refrigerant Charge. [2]For refrigerant charge purposes, consider only the liquid line; ignore the vapor line(s).

Refrigerant Safety Standards

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

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

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

Device Connection Limitations

When designing a system, the engineer must take into consideration the minimum combination ratio. The maximum number of indoor units for each Multi V S with LGRED system is:

ARUM036GSS5 = 6 ARUM048GSS5 = 8

One of the most critical elements of a Multi V S with LGRED system is the refrigerant piping. The table below lists pipe length limits that must be followed in the design of a Multi V S with LGRED refrigerant pipe system:

Table 11: Multi V S with LGRED Refrigerant Piping System Limitations.

Pipe Length (ELF = Equivalent Length of pipe in Feet)	Longest total equivalent piping length	984 feet
	Longest distance from outdoor unit to indoor unit	492 feet (Actual) 574 feet (Equivalent)
	Longest pipe length after first branch	≤131 feet
	Distance between fittings and indoor units	≥20 inches
	Distance between fittings and Y-branches / Headers	≥20 inches
	Distance between two Y-branches / Headers	≥20 inches
	Distance between two series-piped heat recovery units	≥20 inches
	Minimum distance between outdoor unit and first Y-branch	≥20 inches
	Minimum distance between indoor unit to any Y-branch	≥20 inches
	Maximum distance between first Y-branch to farthest indoor unit	131 feet (295 feet for conditional applications)
Elevation (All Elevation Limitations are Measured in Actual Feet)	If outdoor unit is above indoor units	≤164 feet
	If outdoor unit is below indoor units	≤131 feet
	Between indoor units on heat pump systems, or indoor units connected to separate parallel heat recovery units	49 feet
	Between indoor units connected to single heat recovery unit or series heat recovery units	49 feet
	Between two heat recovery units if installed with a Y-branch	49 feet
	Between two series-piped heat recovery units	16 feet

Table 12: Equivalent Piping Length for Y-branches, Headers, and Other Piping Components.

Component	Size (Inches)													
	1/4	3/8	1/2	5/8	3/4	7/8	1	1-1/8	1-1/4	1-3/8	1-1/2	1-5/8	1-3/4	2-1/8
Long Radius Elbow (ft.)	0.5	0.6	0.7	0.8	1.2	1.3	1.5	1.6	1.8	2.0	2.1	2.3	2.5	2.8
Y-branch (ft.)[1]	1.6													
Header (ft.)	3.3													
Heat Recovery Unit (ft.) (For Heat Recovery Systems only)	8.2													

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

Selecting Field-Supplied Copper Piping

Note:

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

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

For Heat Recovery Systems

LG prefers the use of ACR hard drawn copper on pipe segments located between heat recovery units and outdoor units, between heat recovery units piped in series, and between heat recovery units and multiple indoor units sharing an heat recovery unit port.

For Heat Pump Systems

LG prefers the use of ACR hard drawn copper for all pipe segments in the piping system except segments located between Y-branch fittings (or header fittings) and indoor units.

For DOAS Units

LG prefers the use of hard drawn copper in pipe segments connecting a DOAS product and an outdoor unit.

Note:

Always properly support the piping as per the instructions under "Pipe Supports" later in this section.

Table 13: ACR Rated Copper Tubing Material.

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

Table 14: ACR Rated Piping Wall Thicknesses.

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

Table 15: ACR Copper Tubing Dimensions and Physical Characteristics[1-3]

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

[1]All dimensions provided are in accordance with ASTM B280 – Standard.
[2]Design pressure = 551 psig.
[3]The Copper Tube Handbook, 2010, Copper Development Association Inc., 260 Madison Avenue, New York, NY 10016.

Note:

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

COPPER EXPANSION AND CONTRACTION

Copper Expansion and Contraction

Under normal operating conditions, the vapor pipe temperature of a Multi V system can vary as much as 180°F. With this large variance in pipe temperature, the designer must consider pipe expansion and contraction to avoid pipe and fitting fatigue failures.

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

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

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

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

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

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

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

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

General Example:

A Multi V system is installed and the design shows that there is a 260 feet straight segment of piping between a Y-branch and an indoor unit. The system operates 24 hours per day. In heating, this pipe transports hot gas vapor to the indoor units at 120°F. In cooling, the same pipe is a suction line returning refrigerant vapor to the outdoor unit at 40°F. Look up the copper piping expansion at each temperature using the table "Linear Thermal Expansion of Copper Tubing in Inches," and calculate the difference.

Vapor Line

Transporting Hot Vapor: 260 ft. pipe at 120°F = 3.64 in.
Transporting Suction Vapor: 260 ft. pipe at 40°F = 1.04 in.
Anticipated Change in Length: 3.64 in. – 1.04 in. = 2.60 in.

Liquid Line

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

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

COPPER EXPANSION AND CONTRACTION

See table below for precalculated anticipated expansion for various pipe sizes and lengths of refrigerant piping.

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.

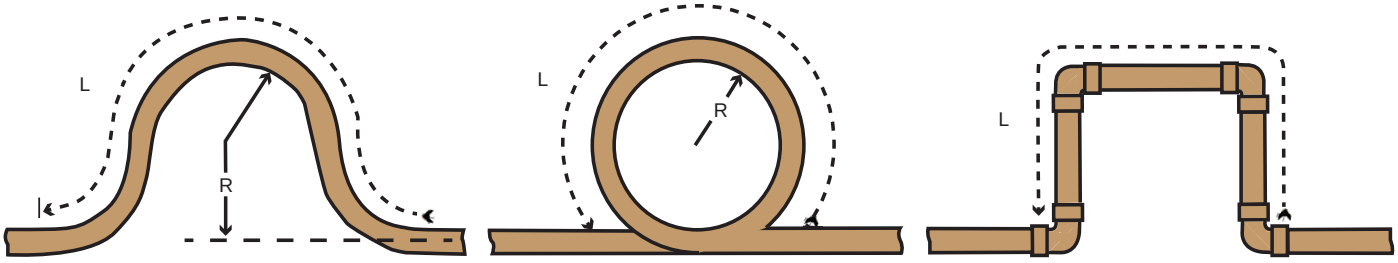
Table 16: Linear Thermal Expansion of Copper Piping in Inches.

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

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

COPPER EXPANSION AND CONTRACTION

Figure 38: Coiled Expansion Loops and Offsets (Plan View).



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

Note:

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

Table 17: Radii of Coiled Expansion Loops and Developed Lengths of Expansion Offsets.

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

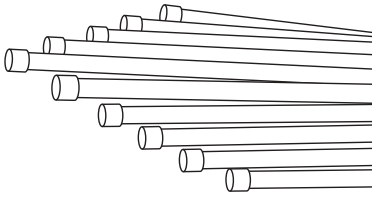
[1]R = Centerline Length of Pipe.
[2]L = Centerline Minimum Radius (inches).

Piping Handling

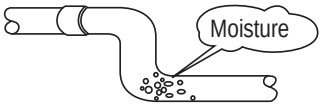
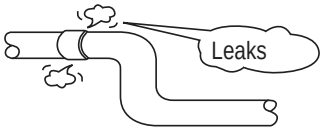
Pipes used for the refrigerant piping system must include the specified thickness, and the interior must be clean.

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

Keep Pipes Capped While Storing.



Keep refrigerant pipe dry, clean, and airtight.

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

REFRIGERANT SYSTEM ENGINEERING

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

Note:

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

⃠ No Pipe Size Substitutions

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

⃠ No In-line Refrigeration Components

Components such as oil traps, solenoid valves, filter-driers, sight glasses, tee fittings, and other after-market accessories are ⃠ not permitted on the refrigerant piping system between the outdoor units and the indoor / heat recovery units. Multi V systems are provided with redundant systems that make sure oil is properly returned to the compressor. Sight-glasses and solenoid valves will cause vapor to form in the liquid stream. Over time, driers will deteriorate and introduce debris into the system. The designer and installer must verify the refrigerant piping system is free of traps, sagging pipes, sight glasses, filter 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 could simplify future maintenance requirements, and, if used, considerations must be taken including, but not limited to, the following:

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

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

Using Elbows

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

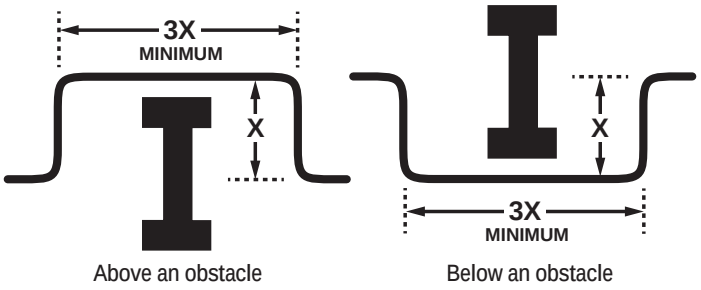
Pipe Bends

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

Obstacles

When an obstacle, such as an I-beam or concrete T, is in the path of the planned refrigerant pipe run, it is best practice to route the pipe over the obstacle. If adequate space is not available to route the insulated pipe over the obstacle, then route the pipe under the obstacle. In either case, it is imperative the length of the horizontal section of pipe above or below the obstacle be a minimum of three (3) times the longest vertical rise (or fall) at either end of the segment.

Figure 39: Installing Piping Above and Below an Obstacle.



Pipe Supports

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

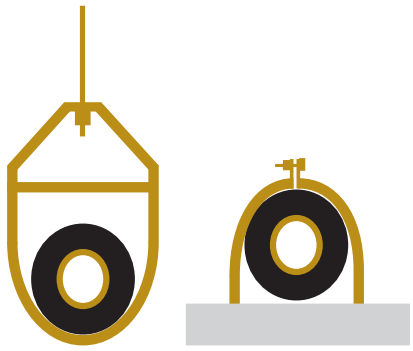
Pipe supports must ⃠ never touch the pipe wall; supports must be installed outside (around) the primary pipe insulation jacket. Insulate the pipe first because pipe supports must be installed outside (around) the primary pipe insulation jacket. Clevis hangers must be used with shields between the hangers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

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

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

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

Figure 40: Pipe Hanger Details.



Note:

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

Figure 41: Typical Pipe Support Location—Change in Pipe Direction.

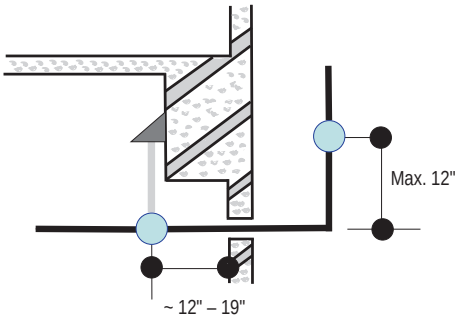


Figure 42: Pipe Support at Indoor Unit.

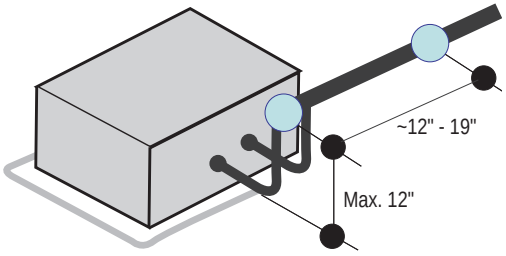


Figure 43: Pipe Support at Y-branch Fitting.

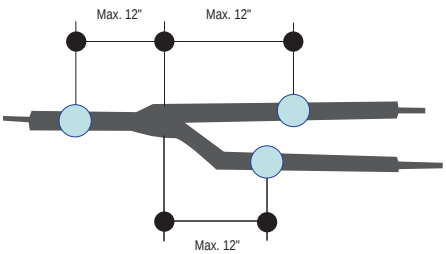
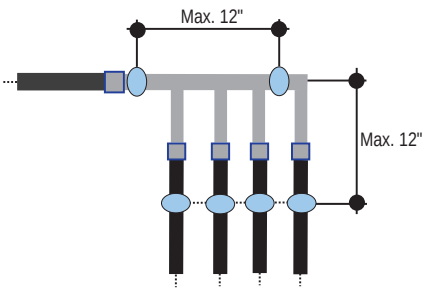


Figure 44: Pipe Support at Header Fitting.



Examples of Supports

Figure 45: U-Bolt Support with Insulation.

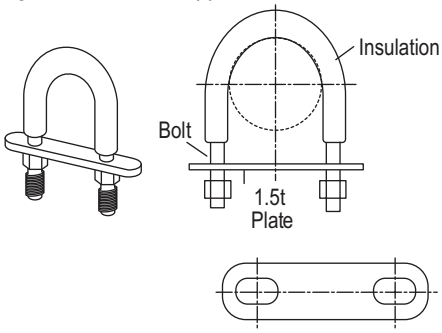


Figure 46: O-Ring Support with Insulation.

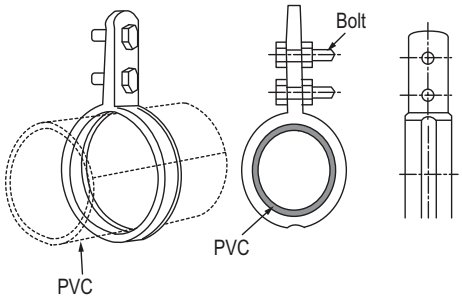
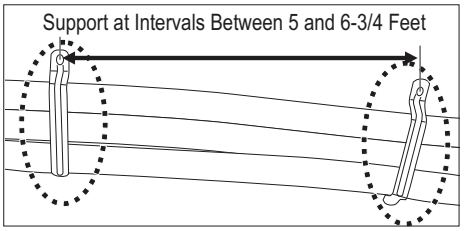


Figure 47: Saddle-Type Support.



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

Figure 48: U-Bolt Support with an Insulated Pipe.

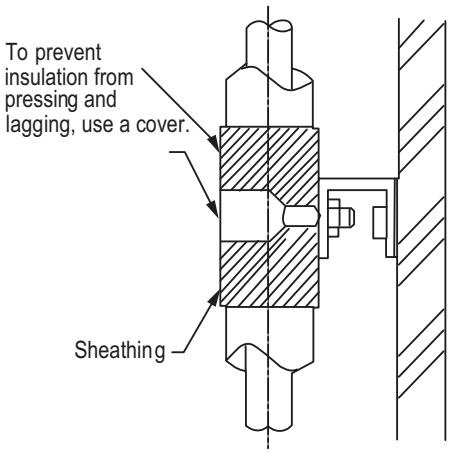


Figure 49: O-Ring Band Support with an Insulated Pipe.

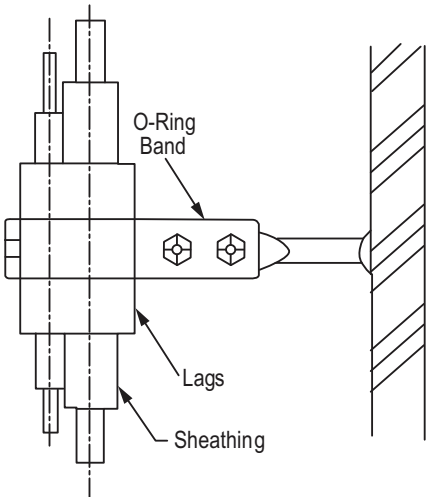


Figure 50: One-Point Down-Stop Support (>441 lbs.).

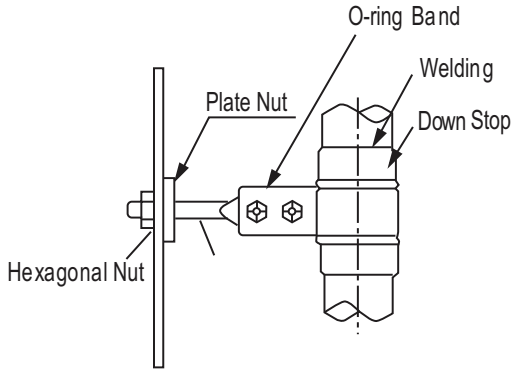
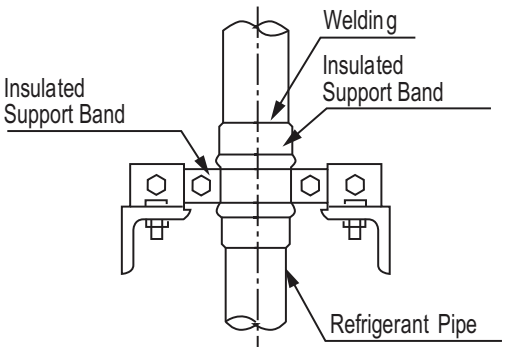


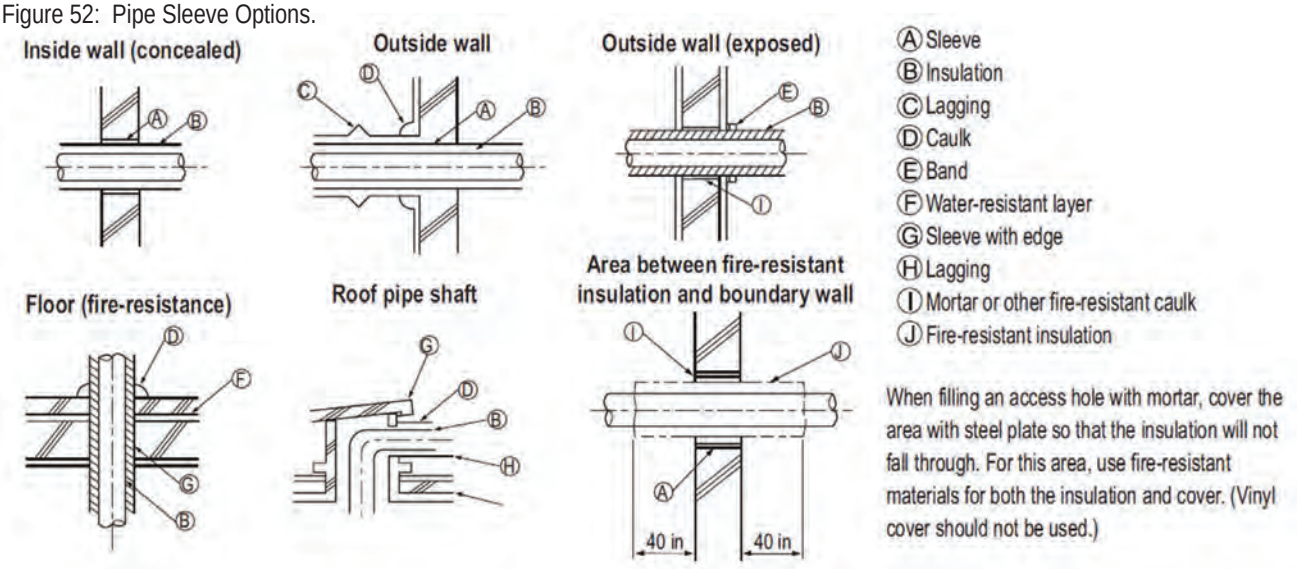
Figure 51: Two-Point Down-Stop Support.



Pipe Sleeves at Penetrations

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

Figure 52: Pipe Sleeve Options.



Note:

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

Underground Refrigerant Piping

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

Table 18: Utility Conduit Sizes.

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

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

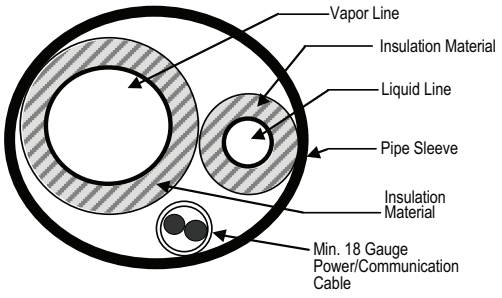
[2]Diameter of pipe with insulation. Thickness of pipe insulation is typical. Actual required thickness will vary based on surrounding ambient conditions and must be calculated and specified by the design engineer.

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

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

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

Figure 53: Typical Arrangement of Refrigerant Pipe and Cable(s) in a Utility Conduit.



Note:

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

Flaring and Brazing Procedures

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

Note:

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

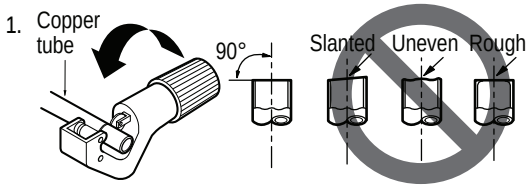
• ⃠ Do not use kinked pipe caused by excessive bending in one specific area on its length.

Flaring Procedure

Note:

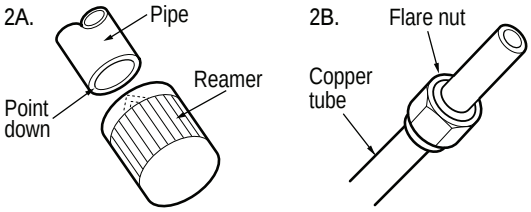
When selecting flare fittings, always use a 45° fitting rated for use with high pressure refrigerant R410A. Selected fittings must also comply with local, state, or federal standards.

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

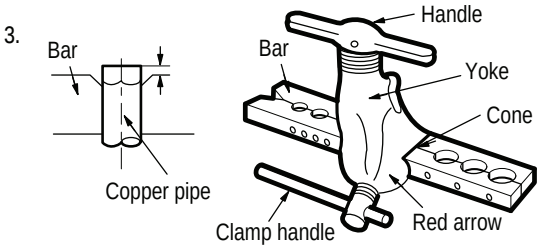


2A. Remove the burrs.
   - Completely remove all burrs from pipe ends.
   - When removing burrs, point the end of the copper pipe down to avoid introducing foreign materials in the pipe.

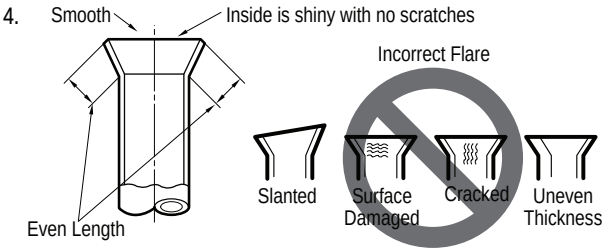
2B. Slide the flare nut onto the copper tube.



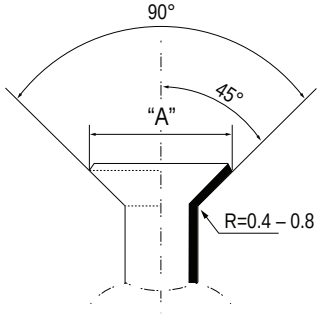
3. Flaring the pipe end.
   - Use the proper size flaring tool to finish flared connections as shown.
   - ALWAYS create a 45° flare when working with R410A.



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



Dimensions of the Flare.



Flared Connection Dimensions / Tightening Torque.

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

Tightening the Flare Nuts

Tightening Torque for Flare Nuts.

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

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

Note:

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

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

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

Loosening the Flare Nuts

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

Brazing Procedure

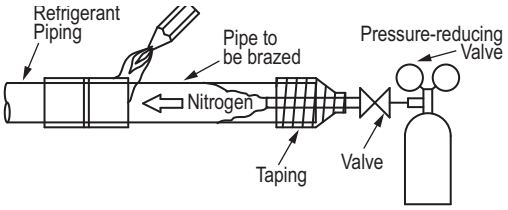
⚠WARNING

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

Note:

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

Figure 54: Refrigerant Pipe Brazing.



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

INSTALLING FOR HEAT PUMP OPERATION

Indoor Unit Y-Branch Kits

⃠ No Substitutions on Piping Components

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

Install Correctly

- *Y-branches can be installed upstream between the Header and the outdoor unit, but a Y-branch cannot be installed between a header and an indoor unit.*
- ⃠ *To avoid the potential of uneven refrigerant distribution through a header fitting, minimize the difference in equivalent pipe length between the header fitting and each connected indoor unit.*

Y-Branch Kits

LG Y-branch and kits are highly engineered devices designed to evenly divide the flow of refrigerant, and are used to join one pipe segment to two or more segments. There are two types of Y-branches used in LG VRF systems: Y-branches that combine two or three outdoor units to make up one large-capacity outdoor unit (also known as multi-frame connectors; not applicable to Multi V S with LGRED systems), or Y-branches used with the indoor units in the refrigerant piping system at each transition. ⃠ Field-supplied "T" fittings or "Y" branches will not be accepted. ⃠ Do not install Y-branches backwards; refrigerant flow cannot make U-turns through Y-branches. The equivalent pipe length of each Y-branch (1.6') must be added to each pipe segment entered into LATS piping design software.

LG Y-Branch Kits for Heat Pump Operation Consist of:

- One liquid line and one vapor line (two [2] total).
- Reducer fittings as applicable.
- Molded clam-shell type peel and stick insulation covers.

Indoor Unit Y-Branches

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

Indoor unit Y-branches must always be installed with the single port end towards the outdoor unit, and the two-port end towards the indoor units. The first indoor unit Y-branch kit must be located no closer than at least three (3) feet from the outdoor unit. Provide a minimum of twenty (20) inches between a Y-branch and any other fittings or indoor units.

There is no limitation on the number of indoor unit Y-branches that can be installed, but there is a limitation on the number of indoor units connected to a single outdoor unit. It is recommended that when a Y-branch is located in a pipe chase or other concealed space, access doors must be provided for inspection access.

Figure 55: Indoor Unit Y-Branch Horizontal Configuration.

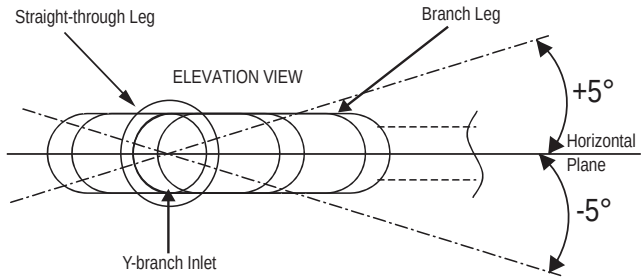


Figure 56: Indoor Unit Y-branch Vertical Installation Alignment Specifications.

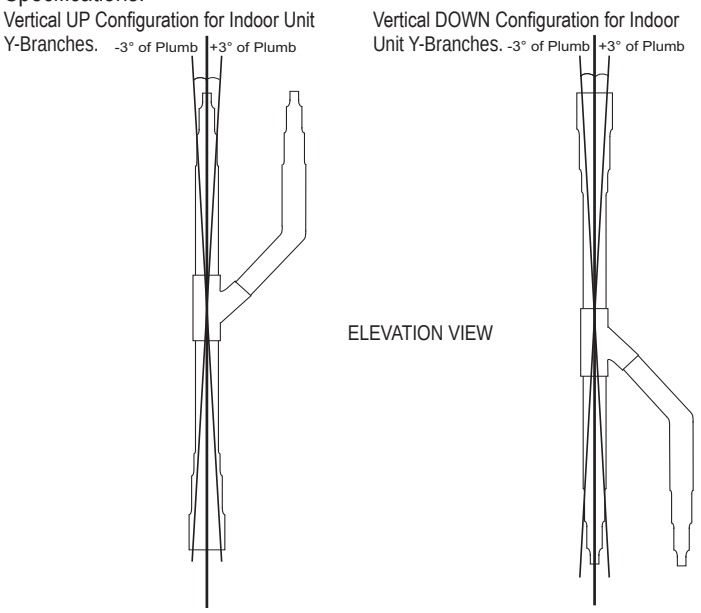
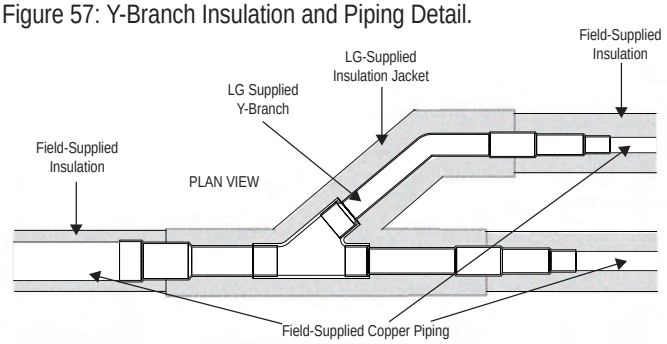


Figure 57: Y-Branch Insulation and Piping Detail.

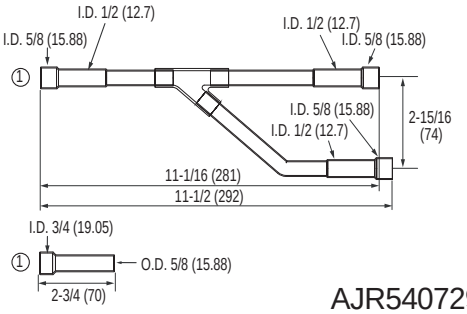
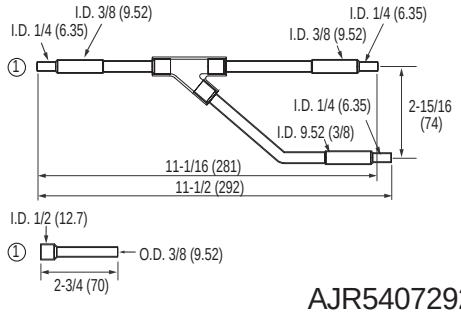
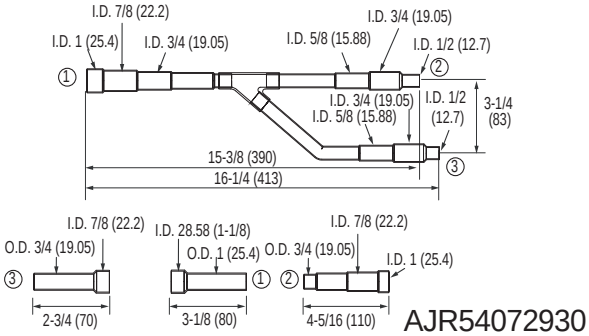
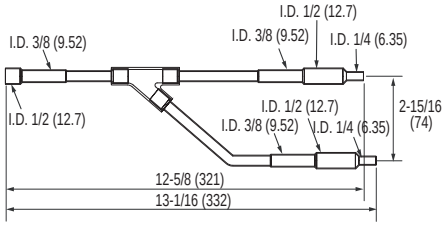
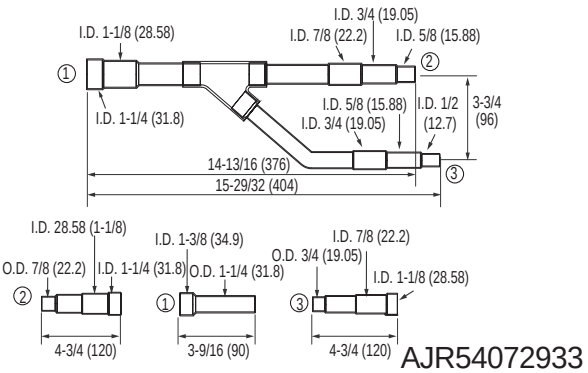
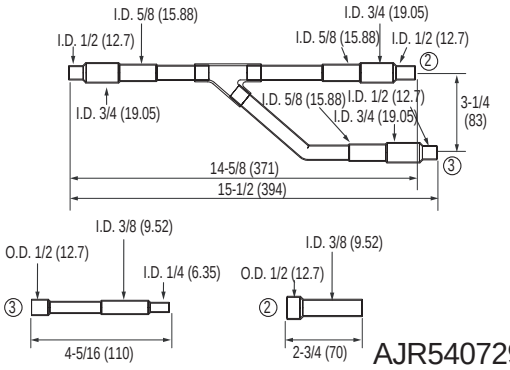


Indoor Unit Y-Branch Kits

Table 19: Indoor Unit Y-Branch Kit Model Nos.

	Model No.		
Y-branches (for indoor unit connection)	ARBLN01621	ARBLN03321	ARBLN07121

(Unit: Inch [mm])

Models	Pipe	
	Vapor Pipe	Liquid Pipe
ARBLN01621	 AJR54072929	 AJR54072927
ARBLN03321	 AJR54072930	 AJR54072928
ARBLN07121	 AJR54072933	 AJR54072931

INSTALLING FOR HEAT PUMP OPERATION

Header Kits

⃠ No Substitutions on Piping Components

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

Install Correctly

- *Y-branches can be installed upstream between the header and the outdoor unit, but a Y-branch cannot be installed between a header and an indoor unit.*
- ⃠ *To avoid the potential of uneven refrigerant distribution through a header fitting, minimize the difference in equivalent pipe length between the header fitting and each connected indoor unit.*

Header Kits

LG Header kits are highly engineered devices designed to evenly divide the flow of refrigerant, and are used to join one pipe segment to two or more segments. Header kits are intended for use where multiple indoor units are in the same vicinity and it would be better to "home-run" the run-out pipes back to a centralized location. If connecting multiple indoor units that are far apart, Y-branches can be more economical.

LG Header Kits Consist of:

- Two headers (one liquid line, one vapor line).
- Reducer fittings as applicable.
- Molded clam-shell type peel and stick insulation covers—one for the liquid line and one for the vapor line.

Headers must be installed with the main pipe level in the horizontal plane. Distribution ports must be either level in the horizontal plane or within ±3° of plumb in the vertical plane.

When connecting indoor units to a Header, always connect the unit with the largest nominal capacity to the port closest to the outdoor unit. Then install the next largest indoor unit to the next port, working down to the smallest indoor unit.

⃠ Do not skip ports. All indoor units connected to a single Header fitting must be located with an elevation difference between indoor units that does not exceed 49 feet.

Figure 58: Header Kit—Horizontal Rotation Limit (Ports Must Point to a Horizontal Direction).

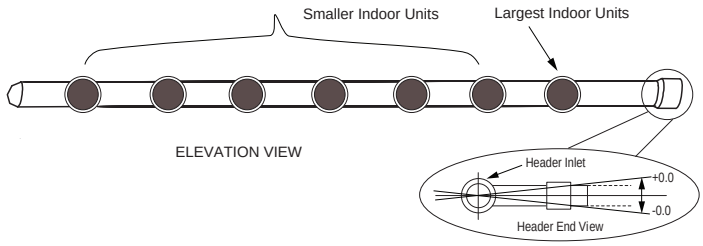


Figure 59: Vertical Header Insulation and Piping Detail (Ports Must Point to an Upright Direction).

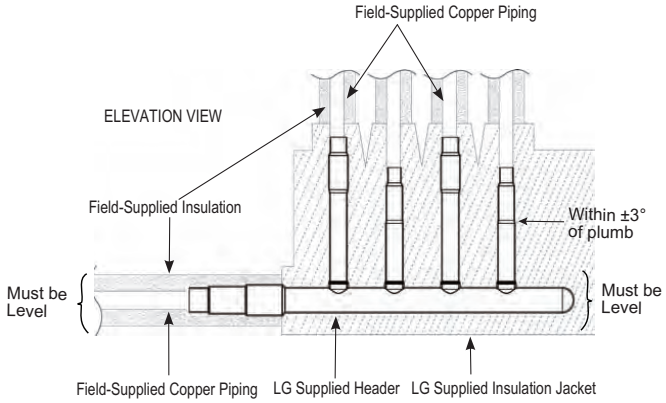


Figure 60: Incorrect Header Configuration.

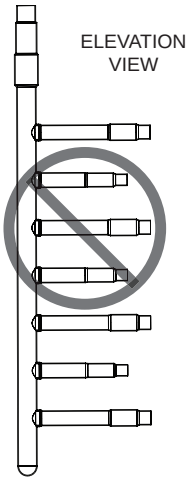
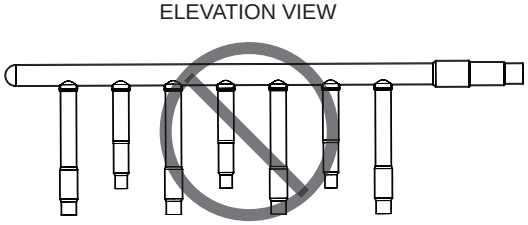


Figure 61: Incorrect Header Configuration (Ports Pointing Downward).



INSTALLING FOR HEAT PUMP OPERATION

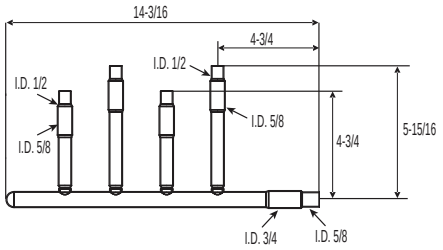
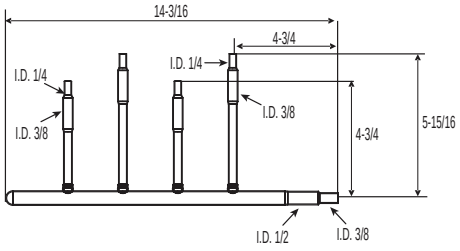
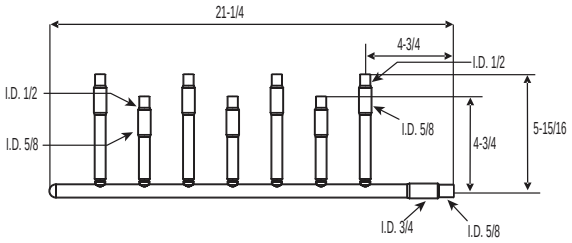
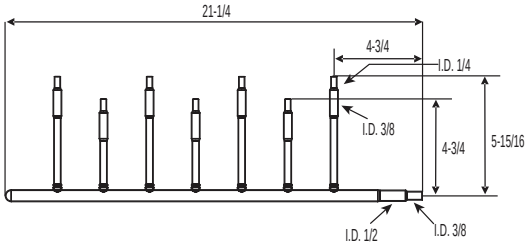
Header Kits

Headers

Table 20: Header Model Nos.

Headers	
Four Branch	Seven Branch
ARBL054	ARBL057

Unit: Inch

Models	Vapor pipe	Liquid pipe
4 branch ARBL054		
7 branch ARBL057		

INSTALLING FOR HEAT PUMP OPERATION

Sample Layouts and Incorrect Layouts

Sample Layouts

Note:

Images are for illustrative purposes only and are not accurate representations. For specific details on piping limitations and other refrigerant system rules, review the information in this entire piping section, see the Multi V S with LGRED Engineering Manual, and follow the LATS diagram.

Example: Seven (7) indoor units connected

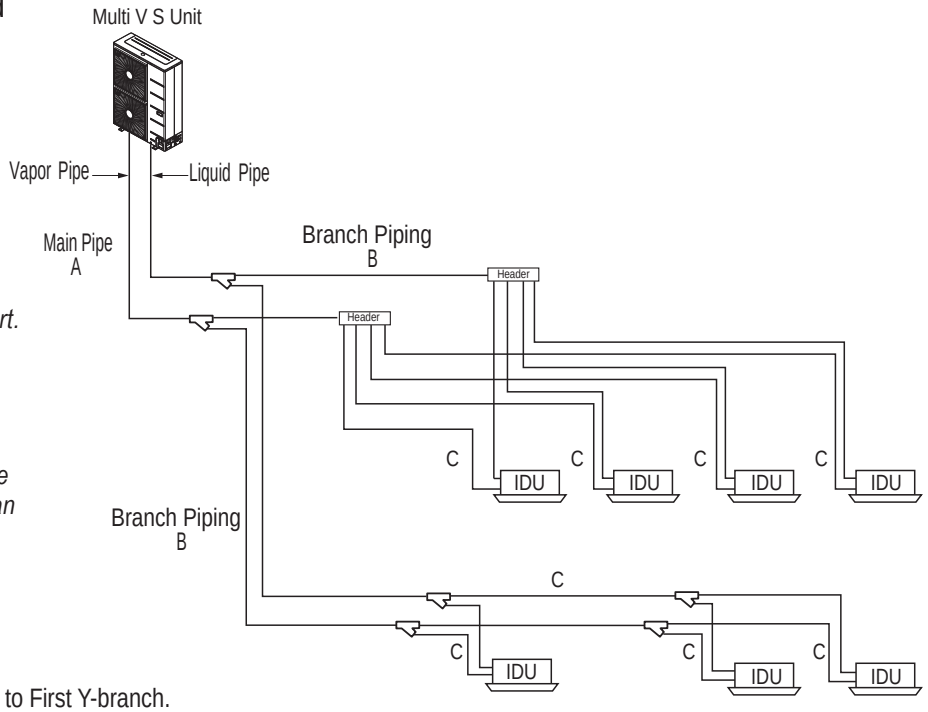
Multi V S w LGRED Outdoor Unit.

IDU: Indoor Units.

A: Main Pipe from Multi V S with LGRED Outdoor Unit to Y-branches.

B: Branch Piping.

C: Branch Piping to Indoor Unit (IDU).



Note:

- *Always reference the LATS Multi V software report.*
- *Connection piping from branch to branch cannot exceed the main pipe diameter (A) used by the outdoor unit.*
- *Install the Headers so that the pipe distances between the between the connected indoor units are minimized. Large differences in pipe distances can cause indoor unit performances to fluctuate.*
- *Indoor units must be installed at a lower position than the Header.*
- ⃠ *Y-branches cannot be used after Headers.*

Table 21: Main Pipe (A) Diameters from Outdoor Unit to First Y-branch.

ODU Capacity (ton)	Pipe diameter when pipe length is ≤295 Feet Equivalent		Pipe diameter when pipe length is ≥295 Feet Equivalent	
	Liquid pipe (inches OD)	Vapor pipe (inches OD)	Liquid pipe (inches OD)	Vapor pipe (inches OD)
3.0	3/8Ø	5/8Ø	1/2Ø	3/4Ø
4.0	3/8Ø	5/8Ø	1/2Ø	3/4Ø

Table 22: Branch Pipe (B) Diameters from Y-branch to Y-branch / Header..

Downstream Total Capacity of IDUs (Btu/h)[1]	Liquid pipe (inches OD)	Vapor pipe (inches OD)
≤19,100	1/4Ø	1/2Ø
≤54,600	3/8Ø	5/8Ø

Table 23: Indoor Unit Connecting Pipe from Branch (C).

Indoor Unit Capacity[1]	Liquid pipe (inches OD)	Vapor pipe (inches OD)
≤19,100	1/4Ø	1/2Ø
≤54,600	3/8Ø	5/8Ø

[1]9,600-24,200 Btu/h 4-way 3 feet x 3 feet Cassette and 15,400-24,200 Btu/h High Static Ducted indoor units have Ø3/8 (liquid) and Ø5/8 (vapor).

Conditional Applications

Conditional application are computed in LATS. See below for an explanation of when pipes are upsized.

The diameters of main liquid and vapor pipes (A) must be increased (must be sized up) if equivalent length between the outdoor unit and the farthest indoor unit is ≥295 feet.

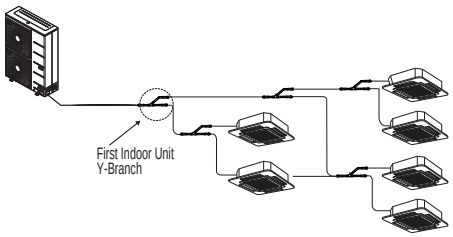
Note:

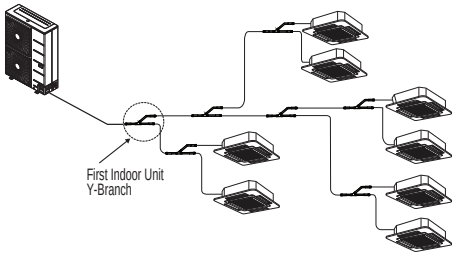
There is no conditional application for elevation differential, and no need to size up the pipe diameter. If elevation differential between the outdoor unit and the farthest indoor unit is ≥164 ft, it is beyond product specifications, and the system will malfunction.

INSTALLING FOR HEAT PUMP OPERATION

MULTI V S WITH LGRED°

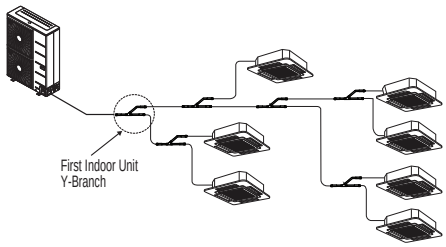
Sample Layouts and Incorrect Layouts

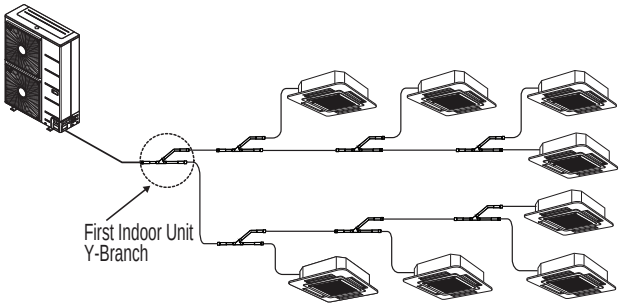


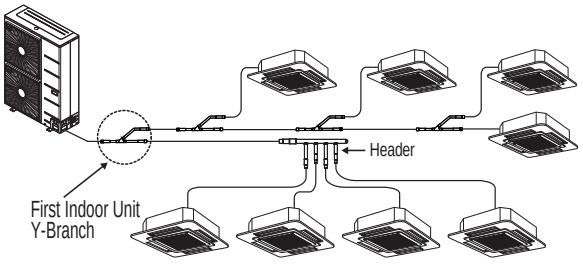


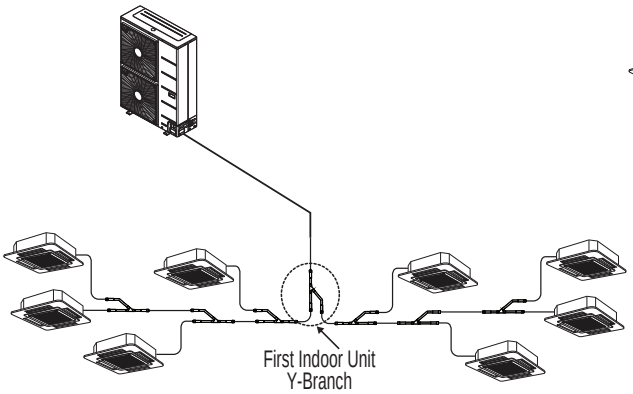
Note:

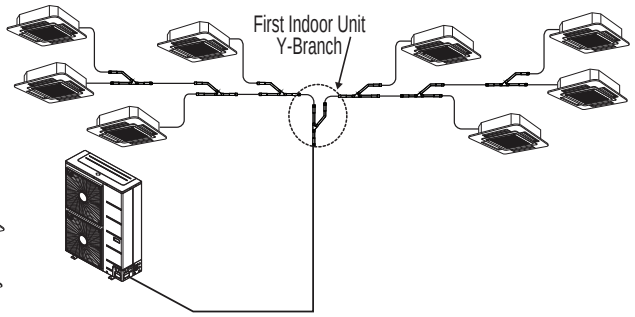
Images are for illustrative purposes only and are not accurate representations. For specific details on piping limitations and other refrigerant system rules, review the information in this entire piping section, see the Multi V S with LGRED Engineering Manual, and follow the LATS diagram.





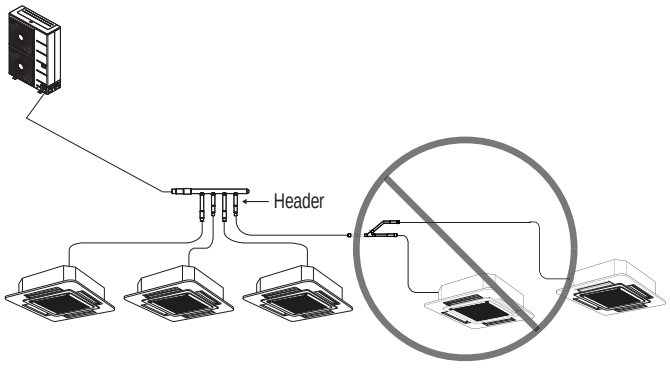


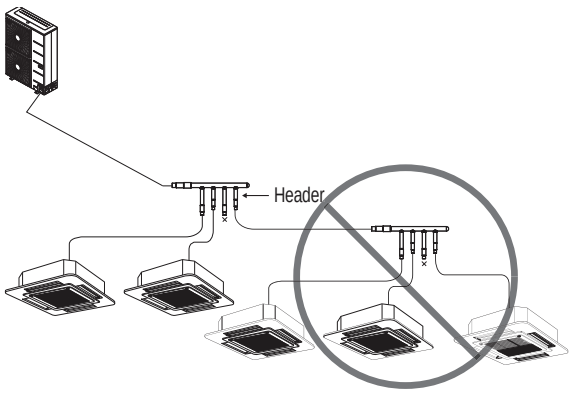




Incorrect Layouts

A second branch cannot be made after a header.





Piping Connections for Heat Pump Operation

Use the correct outdoor unit connections to join the outdoor unit to the branch piping in the indoor unit refrigeration system.

Flare connections are used to connect the piping on the indoor units, and braze connections are used to connect the piping on the outdoor unit (see piping dimensions below), Y-branches, and headers.

Multi V S with LGRED outdoor units designed for heat pump operation use only the liquid pipe and vapor pipe connections as shown in the diagram below. For heat pump operation, the right side pipe is NOT used and must be kept closed and capped.

Figure 62: Piping Connections for Heat Pump Operation.

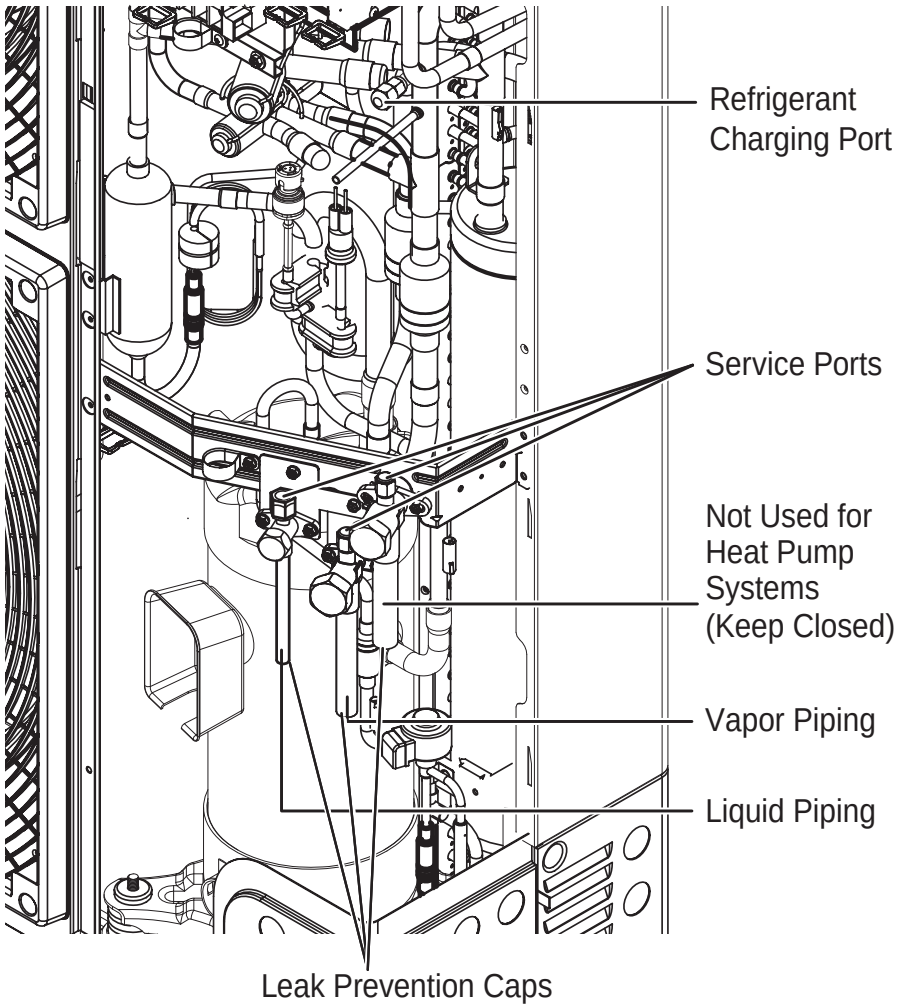


Table 24: Heat Pump Outdoor Unit Refrigerant Piping Connections.

Model	Liquid Conn. (in.)	Type	Vapor Conn. (in.)	Type
ARUM036GSS5	3/8	Brazed	5/8	Brazed
ARUM048GSS5	3/8	Brazed	5/8	Brazed

⚠WARNING

It is important that the correct outdoor unit connections be used for the intended system operation (heat pump versus heat recovery). If the wrong connections are used, it will result in refrigerant leaks, which will lead to illness or death.

Note:

It is important that the correct outdoor unit connections be used for the intended system operation (heat pump versus heat recovery). If the wrong connections are used, it will result in refrigerant leaks, which will lead to system malfunction or even failure to work at all.

INSTALLING FOR HEAT PUMP OPERATION

Pipe Routes / Knock Outs

MULTI V S WITH LGRED°

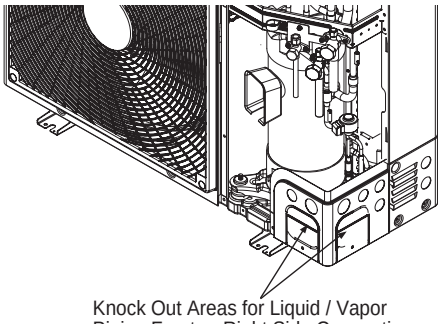
Pipe Routes

Choose from three pipe routes from out of the outdoor unit to the indoor unit refrigerant system:

- Front Pipe Route
- Right Side Route
- Back Route

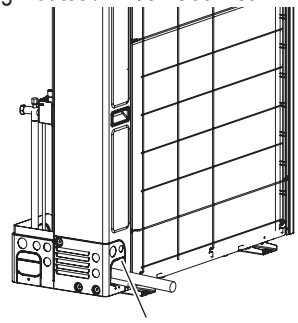
The pipe route chosen depends on the installation area, and is at the discretion of the installer. After the pipe route is chosen, the appropriate outdoor unit access holes must be knocked out (see this page and next page for piping route and knock out area information).

Figure 64: Close Up of the Front and Right Side Piping Routes / Knock Out Areas.



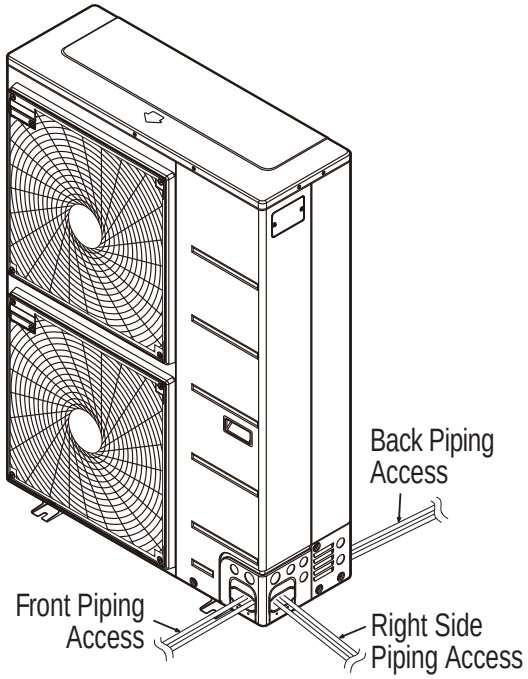
Knock Out Areas for Liquid / Vapor Piping Front or Right Side Connections

Figure 65: Close Up of the Back Piping Routes / Knock Out Area.



Knock Out Area for Liquid / Vapor Piping

Figure 63: Pipe Route Options.



Note:

Appearances may vary depending on model.

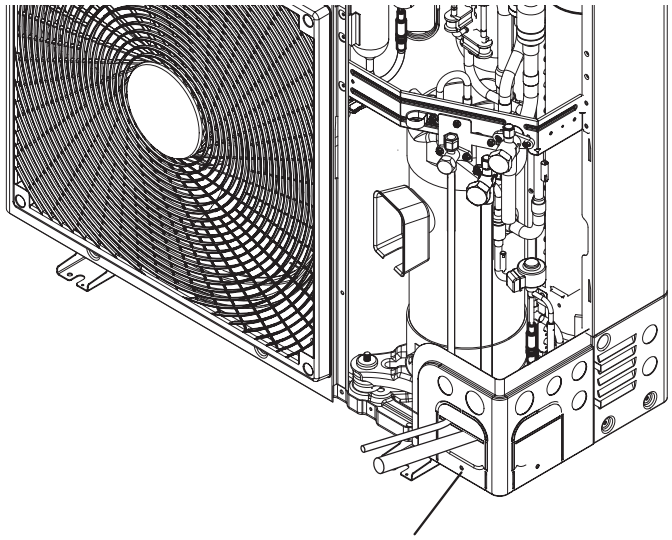
Knock Outs

After the pipe route is chosen, installer must prepare the access holes in the front, right side, or back. The access holes for the communication cables and the power supply wiring can also be knocked out at this time (see the Electrical System Installation for wiring / cable access holes, paths, etc.). Whatever direction is chosen, plug the access holes with field-provided putty or insulation to fill all gaps.

⚠WARNING

- ⃠ *Do not damage the outdoor unit pipes when knocking out the access areas. Pipe damage can lead to refrigerant leaks, which may cause physical injury or death.*
- ⃠ *To avoid damaging the piping and power wiring / communication cables, remove any burrs that will have formed during the knock out procedure. Make sure the access holes have smooth edges and install sleeves. Damage to the wiring / cables can lead to fire, electric shock, physical injury, or death.*
- *After piping installation is complete, to prevent animals or foreign materials from damaging the outdoor unit cables / wiring, seal any holes in with sealant, plugs, foam, caulk, putty, etc. Insects or small animals entering the outdoor unit may cause a short circuit in the electrical box, which can lead to fire, electric shock, physical injury, or death.*

Figure 66: Heat Pump Outdoor Unit Front Knock Out Area Example.



Knock Out Area for Liquid / Vapor Piping

Note:

Appearances may vary depending on model.

INSTALLING FOR HEAT PUMP OPERATION

Knock Outs / Removing the Leak Prevention Caps

Knock Outs, continued.

Note:

- *⃠ Do not damage the outdoor unit pipes when knocking out the access areas. Pipe damage can lead to refrigerant leaks, which can lead to operation failure.*
- *⃠ To avoid damaging the piping and power wiring / communication cables, remove any burrs that will have formed during the knock out procedure. Make sure the access holes have smooth edges and install sleeves.*
- *After piping installation is complete, to prevent animals or foreign materials from damaging the outdoor unit cables / wiring, seal any holes in with sealant, plugs, foam, caulk, putty, etc. Insects or small animals entering the outdoor unit may cause a short circuit in the electrical box, which may lead to unit failure.*

⃠ Avoid Pipe Damage

- *When routing field-provided piping inside the outdoor unit frame, ⃠ avoid causing vibration that will damage the components.*
- *Correctly route the piping so it does not make contact with the compressor casing, terminal cover, or mounting bolts. Allow room for field installation.*
- *Properly install and insulate refrigerant pipes separately up to the service valve body inside the confines of the unit frame.*

Removing the Leak Prevention Caps

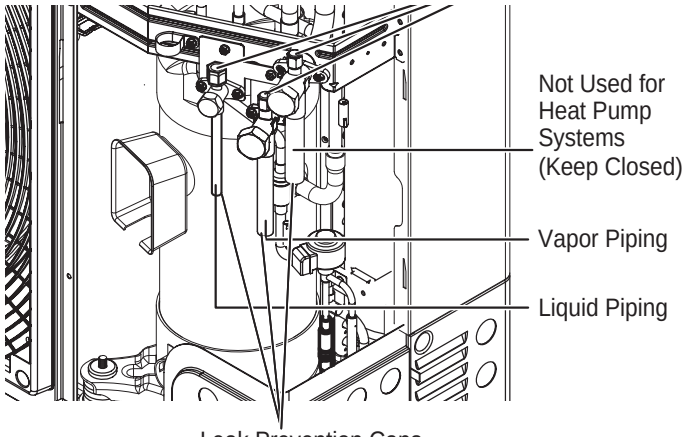
Before brazing the field-supplied refrigerant piping to the outdoor unit connections, the leak prevention caps must be removed from the liquid and vapor pipe connections.

Note:

For heat pump operation, the right side pipe is NOT used, must be kept closed, and a field-supplied copper cap must be brazed onto it before system is operated. Protect the shut off valve / service port with a wet towel during brazing.

- Verify that the shut off valves / service ports are closed (see the "Shut off Valves / Service Ports" section).
- Remove the leak prevention caps from the liquid and vapor pipe outdoor unit connections.
- Connect the field piping to outdoor unit piping.

Figure 67: Location of the Leak Prevention Caps for Heat Pump Operation.



Note:

Appearances may vary depending on model.

INSTALLING FOR HEAT PUMP OPERATION

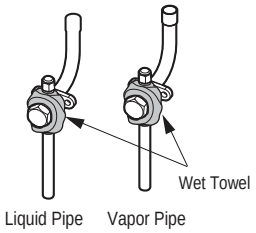
MULTI V S WITH LGRED°

Shut Off Valves / Service Ports

Note:

⃠ Do not expose the outdoor unit shut off valves / service ports to heat. Protect the shut off valves / service ports with a wet towel during brazing.

Figure 68: Protecting the Shut Off Valves / Service Ports.



Operating the Shut Off Valves / Service Ports

Note:

⃠ Do not apply excessive force to the shut off valves / service ports.

Opening the Shut Off Valves / Service Ports

1. Remove the shut off valve / service port cap.
2. Turn the valve counterclockwise using a metric sized Allen wrench (depending on the size of the port).
3. Turn until the valve shaft is out and stops. ⃠ Do not apply excessive force; doing so may damage the valve.
4. Securely replace the cap.

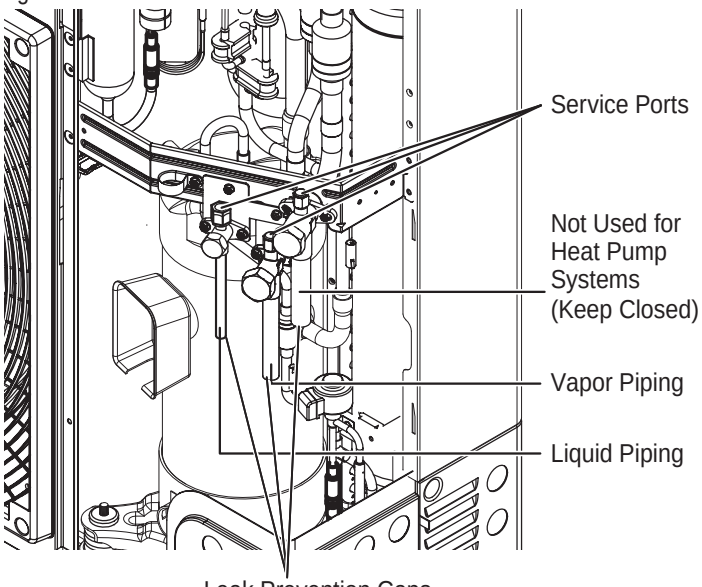
Closing the Shut Off Valves / Service Ports

1. If present, remove the shut off valve / service port cap.
2. Turn the valve clockwise using a metric sized Allen wrench (depending on the size of the port).
3. Securely tighten the valves until the shaft contacts the main body seal. ⃠ Do not apply excessive force; doing so may damage the valve.
4. Securely replace the cap.

Insulating the Shut Off Valves / Service Ports

Shut off valves must be insulated correctly and completely using closed cell Ethylene Propylene Diene Methylene (EPDM) insulation. Insulation must be a minimum 1/2" thick, and thickness may need to be increased based on ambient conditions, humidity levels, and local codes. See the "Insulation" section for more information.

Figure 69: Location of the Shut Off Valves / Service Ports.



⚠ WARNING

- *Outdoor units ship with a factory charge of refrigerant. Always take extreme caution to prevent refrigerant gas (R410A) from leaking during use, around fire or flame, and during brazing. If the refrigerant gas comes in contact with a flame from any source, it will break down and generate a poisonous gas. ⃠ Do not braze in a small room, or a room that is not ventilated.*
- *After refrigerant piping work is complete, verify that the shut off valve / service port caps are securely tightened to help prevent refrigerant gas from leaking. Verify the system is free of leaks after refrigerant piping installation is complete. Exposure to high concentration levels of refrigerant gas will lead to illness or death.*
- *⃠ Do not attempt to remove the shut off valve stem. Physical injury or death will occur from the uncontrolled rapid release of refrigerant.*

Note:

- *Before connecting the refrigerant piping, make sure the shut off valve / service ports of the outdoor unit are completely closed (factory setting).*
  ⃠ Do not open the shut off valve / service port or attempt to operate the system until the refrigerant pipe system installation has been completed.
  ⃠ Never open the valves before a pressure test is performed, a leak test performed, the system is evacuated, and the Commissioning Agent provides authorization to do so.⃠ Do not use polyolester (POE) or any other type of mineral oil as a thread lubricant. If introduced to the refrigerant circuit, it will create oil sludge leading to system malfunction. Use PVE (polyvinyl ether) type refrigeration oil only.
- *Protect the liquid and vapor piping / ports with a wet towel during brazing.*
- *Use a 15% silver phosphorous copper brazing alloy to avoid overheating and produce good flow. ⃠ Do not use flux, soft solder, or anti-oxidant agents. If the proper material is not used, oxidized film will accumulate and clog or damage the compressors. Flux can harm the copper piping or refrigerant oil.*
- *When brazing the field-supplied refrigerant piping to the outdoor unit connections, flow 3 psig nitrogen into the piping. If nitrogen was not flowed during brazing, the piping will oxidize and cause membranes to form, which will negatively impact valve and condenser operation.*

INSTALLING FOR HEAT RECOVERY OPERATION

Indoor Unit Y-Branch Kits

⃠ No Substitutions on Piping Components

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

Install Correctly

- *Y-branches can be installed upstream between the Header and the outdoor unit, but a Y-branch cannot be installed between a header and an indoor unit.*
- ⃠ *To avoid the potential of uneven refrigerant distribution through a header fitting, minimize the difference in equivalent pipe length between the header fitting and each connected indoor unit.*

Y-Branch Kits

LG Y-branch and kits are highly engineered devices designed to evenly divide the flow of refrigerant, and are used to join one pipe segment to two or more segments. There are two types of Y-branches used in LG VRF systems: Y-branches that combine two or three outdoor units to make up one large-capacity outdoor unit (also known as multi-frame connectors; not applicable to Multi V S with LGRED systems), or Y-branches used with the indoor units in the refrigerant piping system at each transition. ⃠ Field-supplied "T" fittings or "Y" branches will not be accepted. ⃠ Do not install Y-branches backwards; refrigerant flow cannot make U-turns through Y-branches. The equivalent pipe length of each Y-branch (1.6') must be added to each pipe segment entered into LATS piping design software.

LG Y-Branch Kits for Heat Recovery Operation Consist of:

- One liquid line, one low pressure vapor line, and one high pressure vapor line (three [3] total).
- Reducer fittings as applicable.
- Molded clam-shell type peel and stick insulation covers.

Indoor Unit Y-Branches

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

Indoor unit Y-branches must always be installed with the single port end towards the outdoor unit, and the two-port end towards the indoor units. The first indoor unit Y-branch kit must be located no closer than at least three (3) feet from the outdoor unit. Provide a minimum of twenty (20) inches between a Y-branch and any other fittings or indoor units.

There is no limitation on the number of indoor unit Y-branches that can be installed, but there is a limitation on the number of indoor units connected to a single outdoor unit. It is recommended that when a Y-branch is located in a pipe chase or other concealed space, access doors must be provided for inspection access.

Figure 70: Indoor Unit Y-Branch Horizontal Configuration.

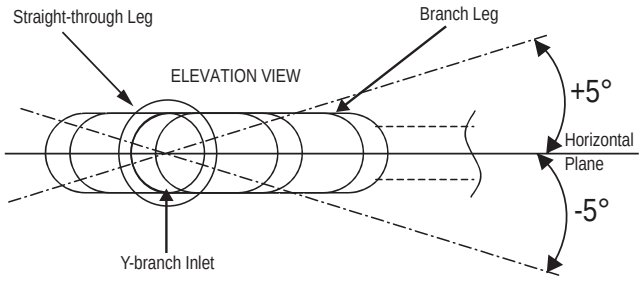


Figure 72: Y-Branch Insulation and Piping Detail.

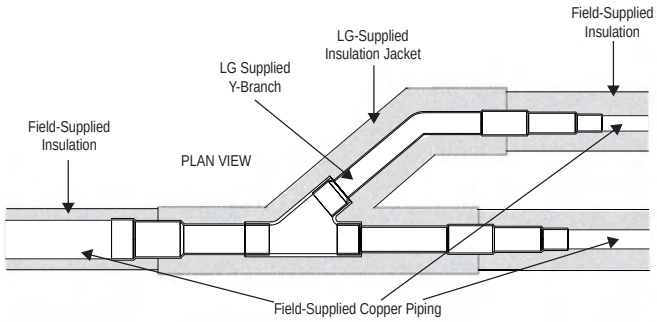
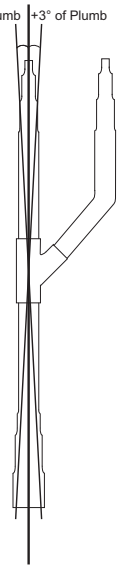
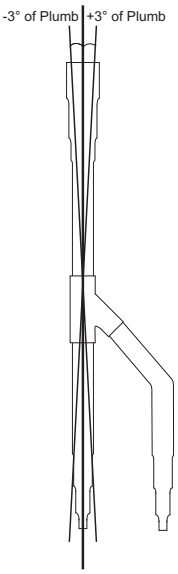


Figure 71: Indoor Unit Y-branch Vertical Installation Alignment Specifications.

Vertical UP Configuration for Indoor Unit Y-Branches.



Vertical DOWN Configuration for Indoor Unit Y-Branches.

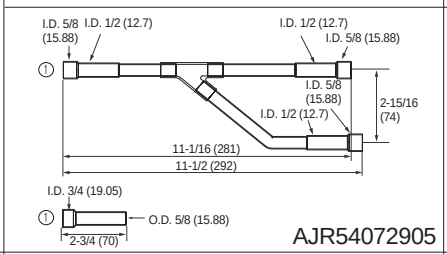
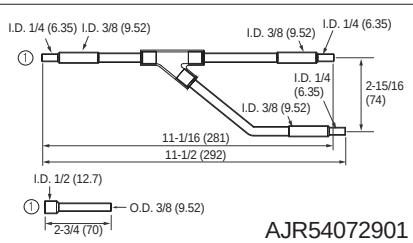
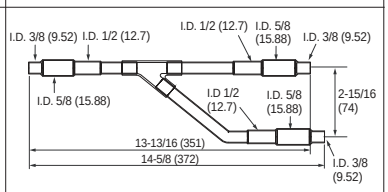
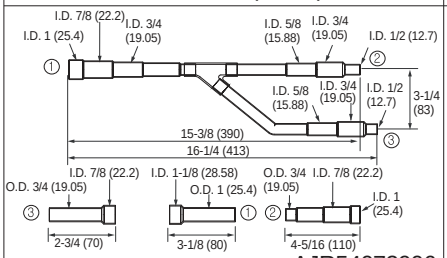
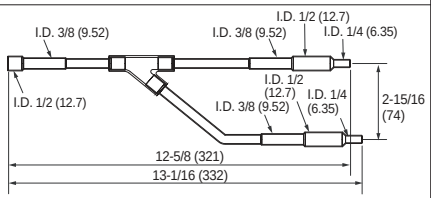
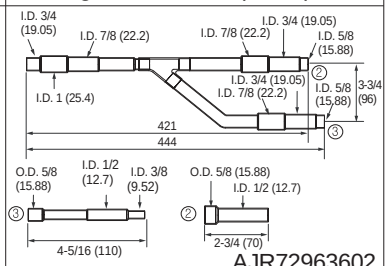
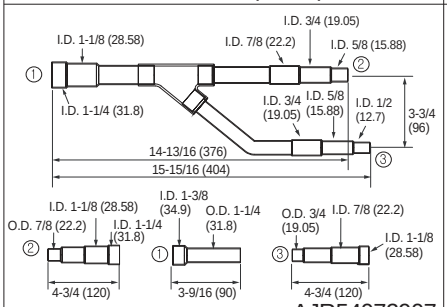
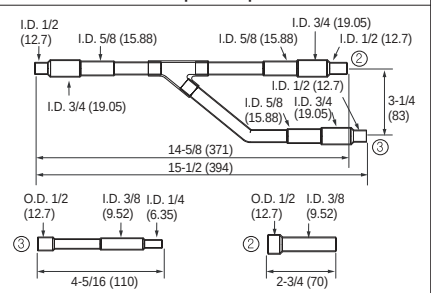
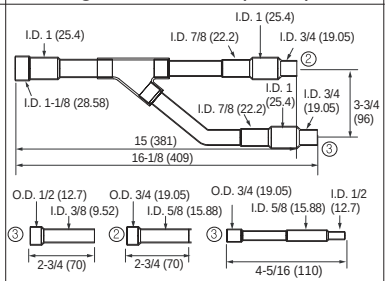


Indoor Unit Y-Branch Kits

Table 25: Indoor Unit Y-Branch Kit Model Nos.

	Model No.		
Y-branches (for indoor unit connection)	ARBLB01621	ARBLB03321	ARBLB07121

Unit: Inch (mm)

ARBLB01621		Liquid Pipe	High-Pressure Vapor Pipe
	 AJR54072905	 AJR54072901	 AJR72963601
ARBLB03321	Low-Pressure Vapor Pipe	Liquid Pipe	High-Pressure Vapor Pipe
	 AJR54072906	 AJR54072902	 AJR72963602
ARBLB07121	Low-Pressure Vapor Pipe	Liquid Pipe	High-Pressure Vapor Pipe
	 AJR54072907	 AJR54072903	 AJR72963603

MULTI V S with LGRED° Outdoor Unit Installation Manual

INSTALLING FOR HEAT RECOVERY OPERATION

Header Kits

⃠ No Substitutions on Piping Components

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

Install Correctly

- *Y-branches can be installed upstream between the Header and the outdoor unit, but a Y-branch cannot be installed between a header and an indoor unit.*
- ⃠ *To avoid the potential of uneven refrigerant distribution through a header fitting, minimize the difference in equivalent pipe length between the header fitting and each connected indoor unit.*

Header Kits

LG Header kits are highly engineered devices designed to evenly divide the flow of refrigerant, and are used to join one pipe segment to two or more segments. Header kits are intended for use where multiple indoor units are in the same vicinity and it would be better to "home-run" the run-out pipes back to a centralized location. If connecting multiple indoor units that are far apart, Y-branches can be more economical.

LG Header Kits Consist of:

- Two headers (one liquid line, one vapor line).
- Reducer fittings as applicable.
- Molded clam-shell type peel and stick insulation covers—one for the liquid line and one for the vapor line.

Headers must be installed with the main pipe level in the horizontal plane. Distribution ports must be either level in the horizontal plane or within ±3° of plumb in the vertical plane.

When connecting indoor units to a Header, always connect the unit with the largest nominal capacity to the port closest to the outdoor unit. Then install the next largest indoor unit to the next port, working down to the smallest indoor unit.

⃠ Do not skip ports. All indoor units connected to a single Header fitting must be located with an elevation difference between indoor units that does not exceed 49 feet.

Figure 73: Header Kit—Horizontal Rotation Limit (Ports Must Point to a Horizontal Direction).

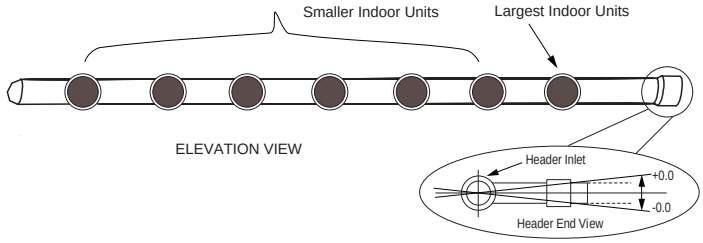


Figure 74: Vertical Header Insulation and Piping Detail (Ports Must Point to an Upright Direction).

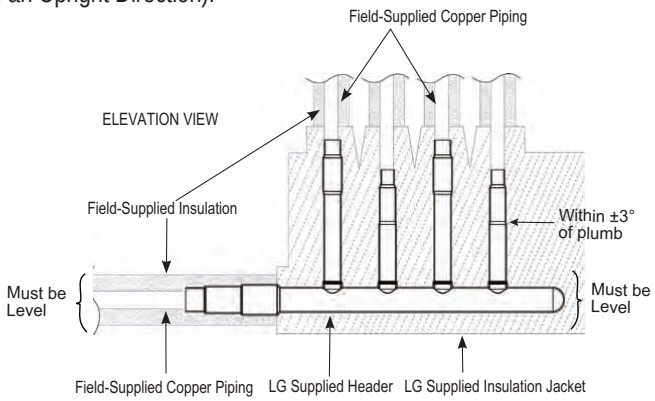


Figure 75: Incorrect Header Configuration.

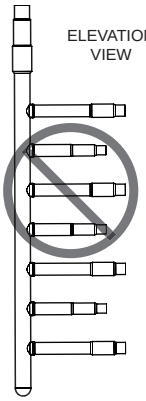
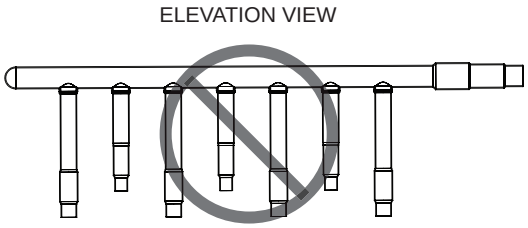


Figure 76: Incorrect Header Configuration (Ports Pointing Downward).



INSTALLING FOR HEAT RECOVERY OPERATION

MULTI V S WITH LGRED°

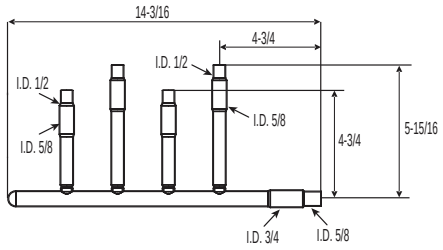
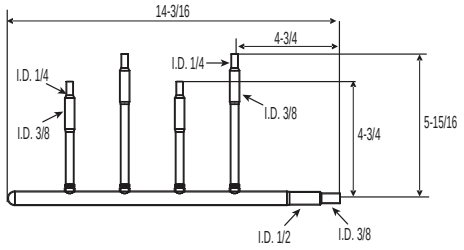
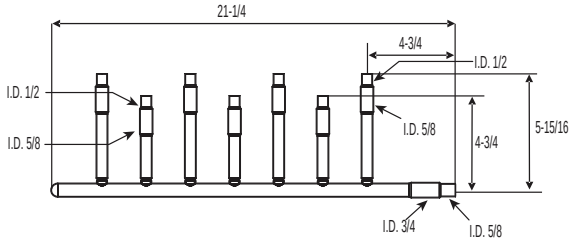
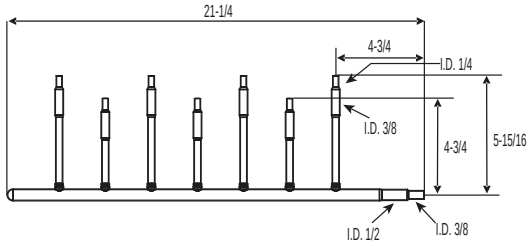
Header Kits

Headers

Table 26: Header Model Nos.

Headers	
Four Branch	Seven Branch
ARBL054	ARBL057

Unit: Inch

Models	Vapor pipe	Liquid pipe
4 branch ARBL054		
7 branch ARBL057		

INSTALLING FOR HEAT RECOVERY OPERATION

Heat Recovery Units

Figure 77: Two-Port Heat Recovery Unit.

Figure 78: Three-Port Heat Recovery Unit.

Figure 79: Four-Port Heat Recovery Unit.

Note:

Heat recovery units can only be used with LG systems piped for heat recovery operation.

Table 27: Heat Recovery Unit Specifications.

Model			PRHR023A	PRHR033A	PRHR043A
Number of Ports			2	3	4
Max. Connectible No. of Indoor Units			16	24	32
Max. Connectible No. of Indoor Units on each port			8	8	8
Max. Port Capacity (each port)		Btu/h	60,000	60,000	60,000
Max. Unit Capacity (sum of ports)		Btu/h	120,000	180,000	230,000
Net Weight		lbs.	33	37	40
Shipping Weight		lbs.	46	50	53
Dimensions (W x H x D)		Inches	19-1/8 x 8-5/8 x 18-15/16		
Casing			Galvanized Steel Plate		
Connecting Pipes	To Indoor Units	Liquid Pipe (inches)	3/8	3/8	3/8
		Vapor Pipe (inches)	5/8	5/8	5/8
	To Outdoor Units	Liquid (inches)	3/8	1/2	5/8
		Low-pressure Vapor (inches)	7/8	1-1/8	1-1/8
		High-pressure Vapor (inches)	3/4	7/8	7/8
Insulation Material			Polyethylene Foam		

INSTALLING FOR HEAT RECOVERY OPERATION

Heat Recovery Units

Figure 80: Six-Port Heat Recovery Unit.

Figure 81: Eight-Port Heat Recovery Unit.

Note:

Heat recovery units can only be used with LG systems piped for heat recovery operation.

Table 28: Heat Recovery Unit Specifications, continued.

Model			PRHR063A	PRHR083A
Number of Ports			6	8
Max. Connectible No. of Indoor Units			48	64
Max. Connectible No. of Indoor Units on each port			8	8
Max. Port Capacity (each port)		Btu/h	60,000	60,000
Max. Unit Capacity (sum of ports)		Btu/h	230,000	230,000
Net Weight		lbs.	60	68
Shipping Weight		lbs.	75	82
Dimensions (W x H x D)		Inches	31-1/4 x 8-5/8 x 18-15/16	
Casing			Galvanized Steel Plate	
Connecting Pipes	To Indoor Units	Liquid Pipe (inches)	3/8	3/8
		Vapor Pipe (inches)	5/8	5/8
	To Outdoor Units	Liquid (inches)	5/8	5/8
		Low-pressure Vapor (inches)	1-1/8	1-1/8
		High-pressure Vapor (inches)	7/8	7/8
Insulation Material			Polyethylene Foam	

INSTALLING FOR HEAT RECOVERY OPERATION

Heat Recovery Units

Table 29: Heat Recovery Unit Electrical Data.

Unit Model No.	Voltage Range	Rated Amps	MCA	MFA	Power Supply			Power Input (W)	
					Hz	Volts	Phase	Cooling	Heating
PRHR023A	187-253	0.06	0.17	15	60	208-230	1	39.8	37.2
PRHR033A									
PRHR043A									
PRHR063A		0.09	0.27					75.9	72.1
PRHR083A									

MCA : Minimum Circuit Ampacity.
MFA : Maximum Fuse Amps.

Units are suitable for use on an electrical system where voltage supplied to unit terminals is within the listed range limits.
Select wire size based on the larger MCA value.
Instead of a fuse, use the circuit breaker.

INSTALLING FOR HEAT RECOVERY OPERATION

MULTI V S WITH LGRED°

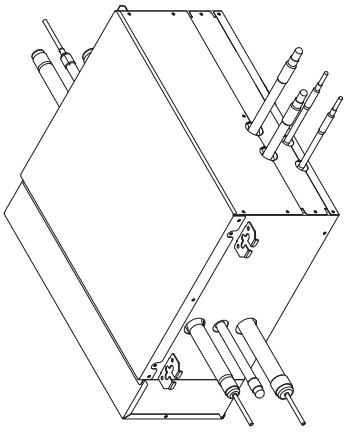
Heat Recovery Units

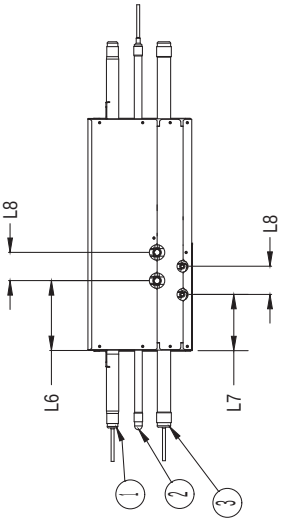
PRHR023A

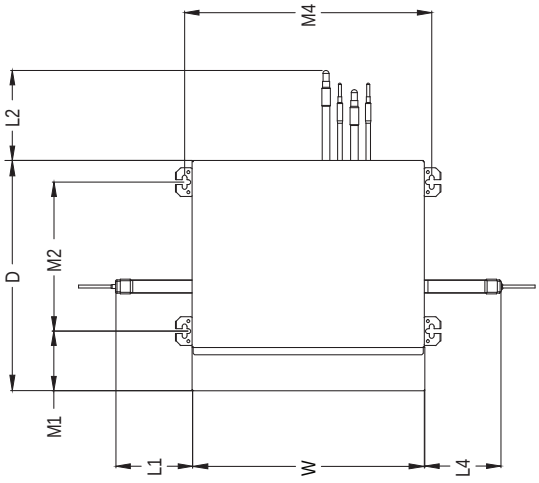
[Unit: inch]

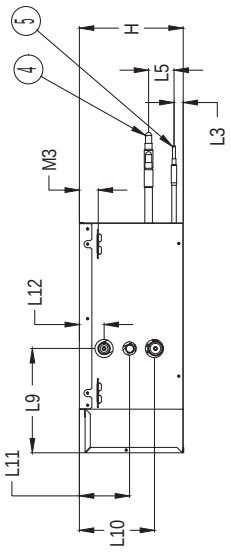
W	19-1/8"
H	8-5/8"
D	18-15/16"
L1	5-15/16"
L2	6-15/16"
L3	3/4"
L4	5-15/16"
L5	2-3/16"
L6	5-3/4"
L7	4-9/16"
L8	2-5/16"
L9	8-9/16"
L10	6-3/16"
L11	3-9/16"
L12	2"
M1	4-15/16"
M2	12-1/4"
M3	1-1/2"
M4	20-3/8"

No.	Part Name
6	Control box
5	Liquid pipe to Indoor unit
4	Gas pipe to Indoor unit
3	Low pressure gas pipe
2	Liquid pipe to Outdoor unit
1	High pressure gas pipe









Note:

1. Unit should be installed in compliance with the appropriate LG installation manual.
2. Unit should be grounded in accordance with the local regulations or applicable national codes.
3. All electrical components and materials supplied from the site must comply with the local regulations or national codes.

INSTALLING FOR HEAT RECOVERY OPERATION

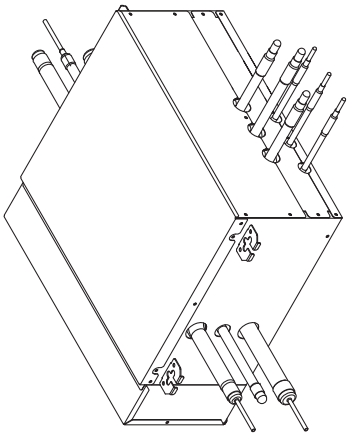
Heat Recovery Units

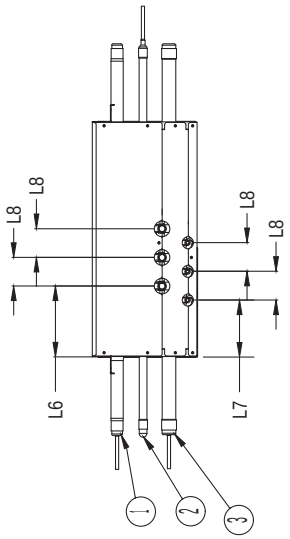
PRHR033A

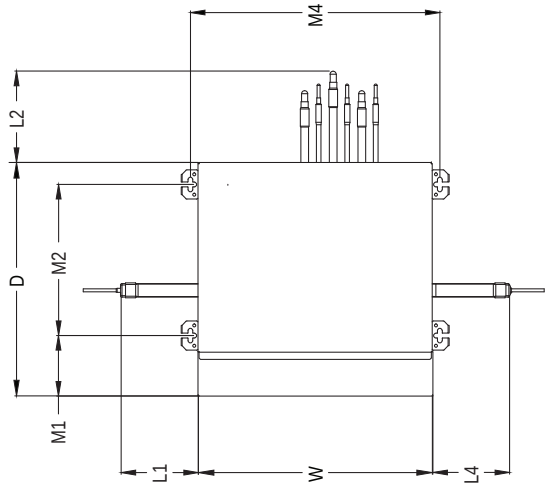
[Unit: inch]

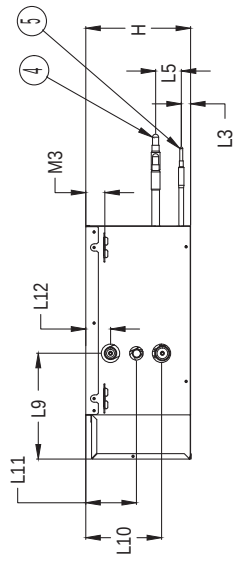
W	19-1/8″
H	8-5/8″
D	18-15/16″
L1	5-15/16″
L2	6-15/16″
L3	3/4″
L4	5-15/16″
L5	2-3/16″
L6	5-3/4″
L7	4-9/16″
L8	2-5/16″
L9	8-9/16″
L10	6-3/16″
L11	3-9/16″
L12	2″
M1	4-15/16″
M2	12-1/4″
M3	1-1/2″
M4	20-3/8″

No.	Part Name
6	Control box
5	Liquid pipe to Indoor unit
4	Gas pipe to Indoor unit
3	Low pressure gas pipe
2	Liquid pipe to Outdoor unit
1	High pressure gas pipe









Note:

1. Unit should be installed in compliance with the appropriate LG installation manual.
2. Unit should be grounded in accordance with the local regulations or applicable national codes.
3. All electrical components and materials supplied from the site must comply with the local regulations or national codes.

INSTALLING FOR HEAT RECOVERY OPERATION

MULTI V S WITH LGRED°

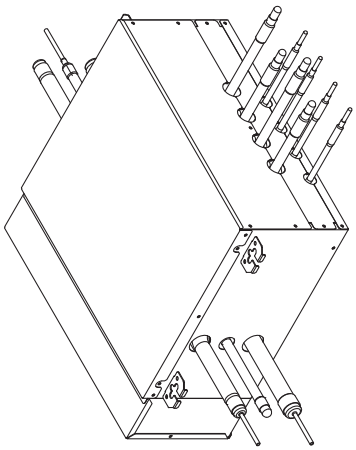
Heat Recovery Units

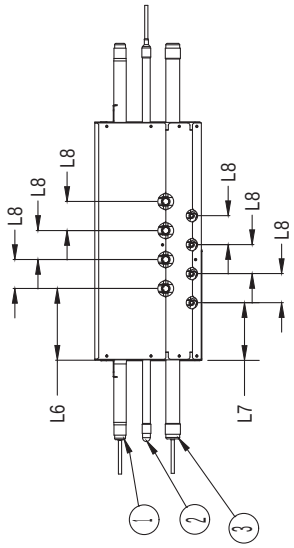
PRHR043A

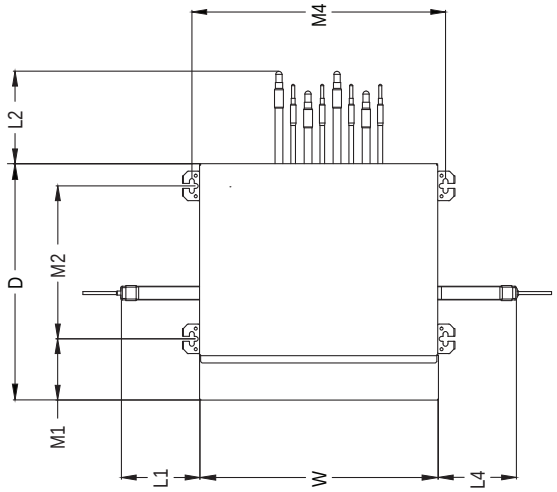
W	19-1/8″
H	8-5/8″
D	18-15/16″
L1	5-15/16″
L2	6-15/16″
L3	3/4″
L4	5-15/16″
L5	2-3/16″
L6	5-3/4″
L7	4-9/16″
L8	2-5/16″
L9	8-9/16″
L10	6-3/16″
L11	3-9/16″
L12	2″
M1	4-15/16″
M2	12-1/4″
M3	1-1/2″
M4	20-3/8″

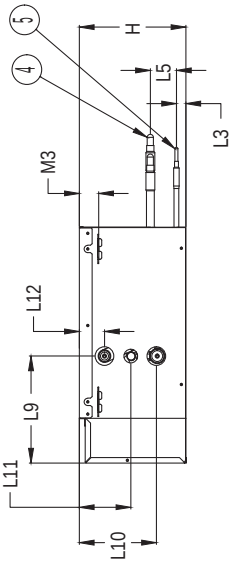
[Unit: inch]

No.	Part Name
6	Control box
5	Liquid pipe to Indoor unit
4	Gas pipe to Indoor unit
3	Low pressure gas pipe
2	Liquid pipe to Outdoor unit
1	High pressure gas pipe









Note:

1. Unit should be installed in compliance with the appropriate LG installation manual.
2. Unit should be grounded in accordance with the local regulations or applicable national codes.
3. All electrical components and materials supplied from the site must comply with the local regulations or national codes.

INSTALLING FOR HEAT RECOVERY OPERATION

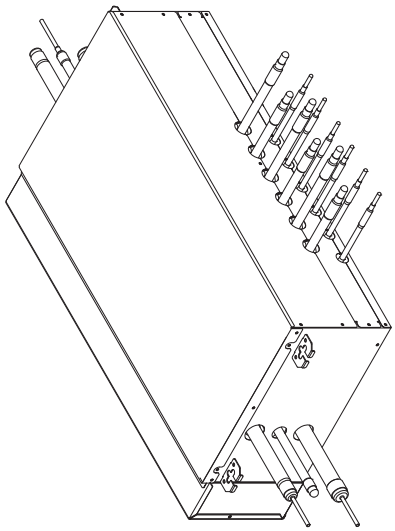
Heat Recovery Units

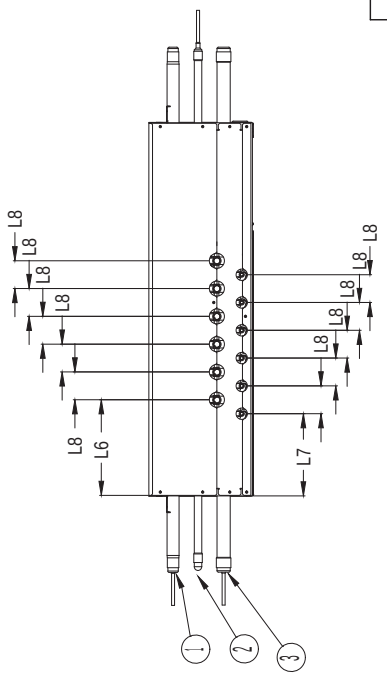
PRHR063A

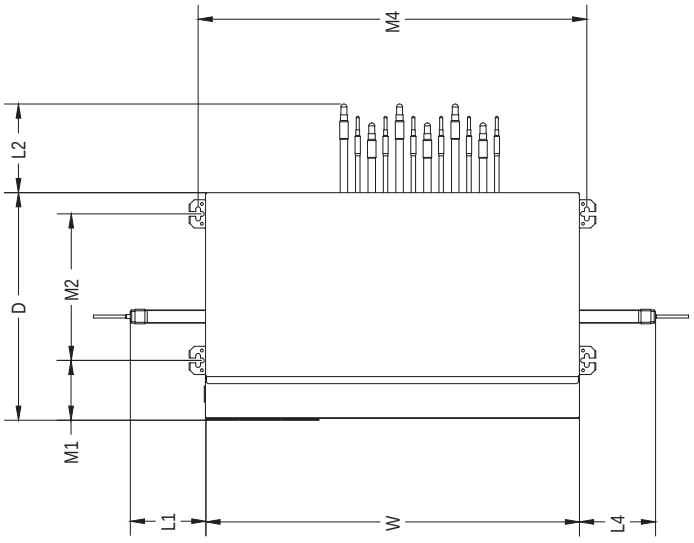
[Unit inch]

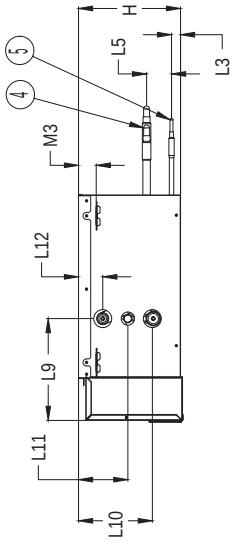
W	31-1/4″
H	8-5/8″
D	18-15/16″
L1	6-5/16″
L2	6-15/16″
L3	3/4″
L4	6-5/16″
L5	2-3/16″
L6	8-1/16″
L7	6-7/8″
L8	2-5/16″
L9	8-9/16″
L10	6-3/16″
L11	3-9/16″
L12	2″
M1	4-15/16″
M2	12-1/4″
M3	1-1/2″
M4	32-1/2″

No.	Part Name
6	Control box
5	Liquid pipe to Indoor unit
4	Gas pipe to Indoor unit
3	Low pressure gas pipe
2	Liquid pipe to Outdoor unit
1	High pressure gas pipe









Note:
1. Unit should be installed in compliance with the appropriate LG installation manual.
2. Unit should be grounded in accordance with the local regulations or applicable national codes.
3. All electrical components and materials supplied from the site must comply with the local regulations or national codes.

INSTALLING FOR HEAT RECOVERY OPERATION

MULTI V™ S WITH LGRED°

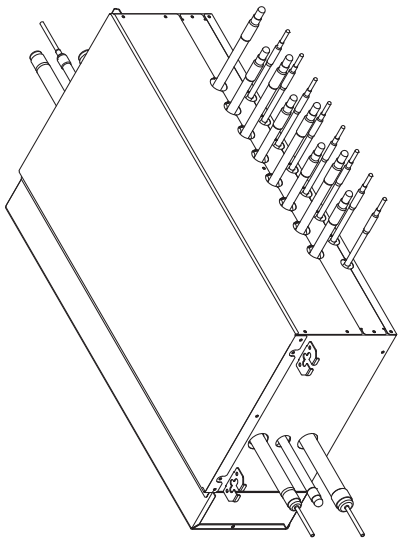
Heat Recovery Units

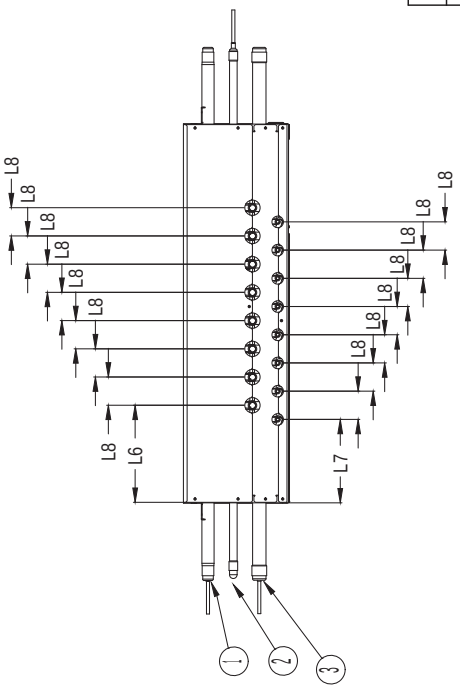
PRHR083A

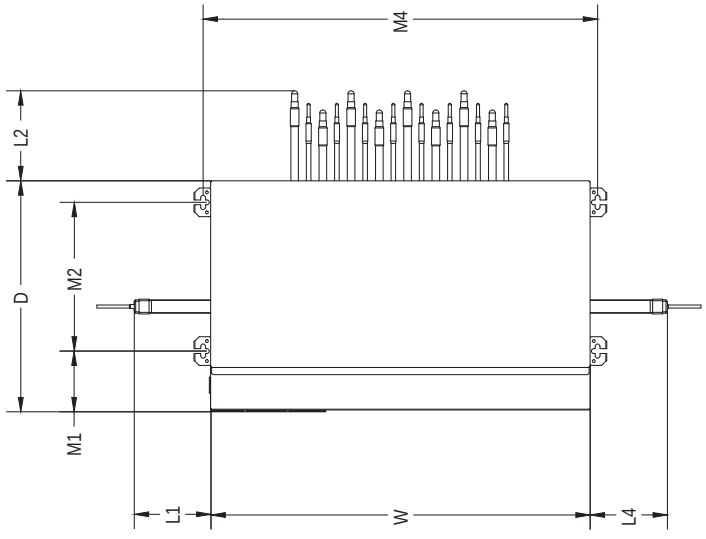
W	31-1/4″
H	8-5/8″
D	18-15/16″
L1	6-5/16″
L2	6-15/16″
L3	3/4″
L4	6-5/16″
L5	2-3/16″
L6	8-1/16″
L7	6-7/8″
L8	2-5/16″
L9	8-9/16″
L10	6-3/16″
L11	3-9/16″
L12	2″
M1	4-15/16″
M2	12-1/4″
M3	1-1/2″
M4	32-1/2″

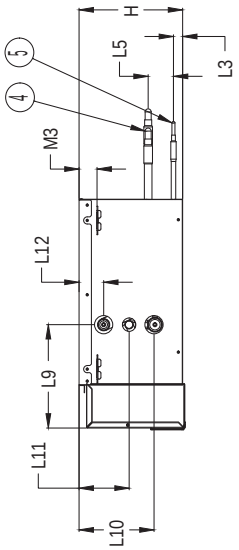
[Unit: inch]

No.	Part Name
1	High pressure gas pipe
2	Liquid pipe to Outdoor unit
3	Low pressure gas pipe
4	Gas pipe to Indoor unit
5	Liquid pipe to Indoor unit
6	Control box









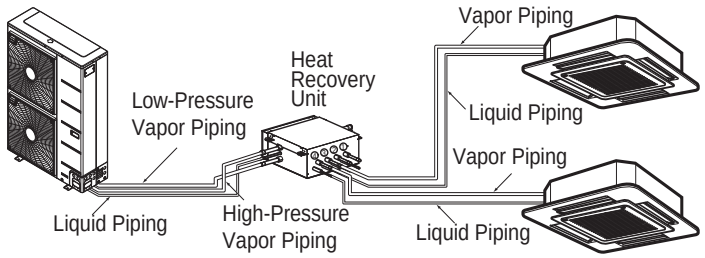
Note:

1. Unit should be installed in compliance with the appropriate LG installation manual.
2. Unit should be grounded in accordance with the local regulations or applicable national codes.
3. All electrical components and materials supplied from the site must comply with the local regulations or national codes.

Heat Recovery System Piping

Heat recovery systems have three pipes (liquid, high pressure vapor, low pressure vapor) running from the outdoor unit to the heat recovery unit, and then two pipes (liquid, vapor) running from the heat recovery unit to the connected indoor units. Reducers may be necessary depending on indoor unit connections.

Figure 82: Simplified Diagram of Heat Recovery System Piping.

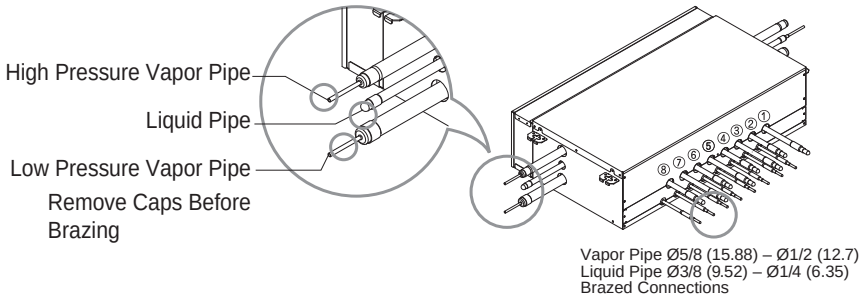


Heat Recovery Unit Connections and Limitations

Note:

1. *Series connection of heat recovery units: Total capacity of indoor units ≤230,000 Btu/h.*
2. *Refer to the heat recovery unit PCB for valve group control setting.*
3. *Maximum capacity of each port is 60,000 Btu/h and eight (8) indoor units.*
4. *⃠ Do not skip ports when connecting indoor units. Start at port 1, then use 2, then use 3, then use 4, etc. (the numbers are displayed on the 3A heat recovery ports from right to left).*

Figure 83: Close Up of the Heat Recovery Unit Connections.



Note:

Designer must follow Multi S with LGRED system parameters when choosing heat recovery units, or the system will malfunction. Follow the LATS diagram.

Removing the Caps

Before brazing the field-supplied refrigerant piping to the heat recovery unit connections, the caps MUST be removed from the liquid, high pressure vapor, and low-pressure vapor pipe connections.

⚠WARNING

Removing the caps releases any gas present in the heat recovery unit. If the gas isn't released, physical injury or death will occur from the uncontrolled rapid release of gas, or if the gas comes in contact with a flare during brazing and generates a poisonous gas.

Note:

On whichever port or pipe not used, the factory-provided cap must be removed, and that port / pipe must be recapped and completely insulated.

Figure 84: Preparing Unused Heat Recovery Unit Ports.

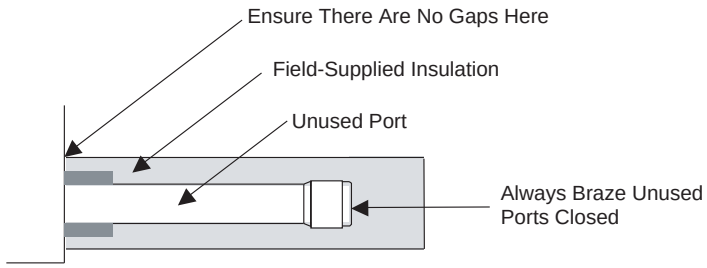


Table 30: Heat Recovery Unit Piping Connection Sizes.

Model			PRHR023A	PRHR033A	PRHR043A	PRHR063A	PRHR083A
Number of Ports			2	3	4	6	8
Connecting Pipes	To Indoor Units	Liquid Pipe (inches)	3/8				
		Vapor Pipe (inches)	5/8				
	To Outdoor Units	Liquid (inches)	3/8	1/2	5/8	5/8	5/8
		Low-pressure Vapor (inches)	7/8	1-1/8	1-1/8	1-1/8	1-1/8
		High-pressure Vapor (inches)	3/4	7/8	7/8	7/8	7/8

INSTALLING FOR HEAT RECOVERY OPERATION

MULTI V S WITH LGRED°

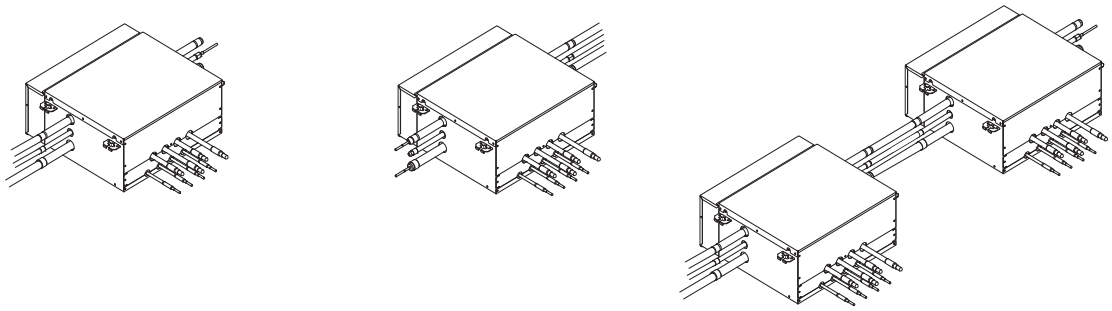
Heat Recovery System Piping

Piping Connection Options

Heat recovery units can connect to the field-supplied refrigerant piping on the left side or on the right side. Heat recovery units can also be installed in series / in parallel using these side connections.

Figure 85: Heat Recovery Unit Piping Connection Options.

Pipe Connection from Left Side | Pipe Connection from Right Side | Series / Parallel Pipe Connection



Reducers

When installing an indoor unit to a heat recovery port, it may be necessary to cut the piping connected to the indoor unit (after considering indoor unit capacity and determining pipe sizes). A reducer can also be installed if the indoor unit piping or outdoor unit piping is too large or too small for the heat recovery unit connections.

Figure 86: Location of Where to Cut Piping on the Indoor Unit.

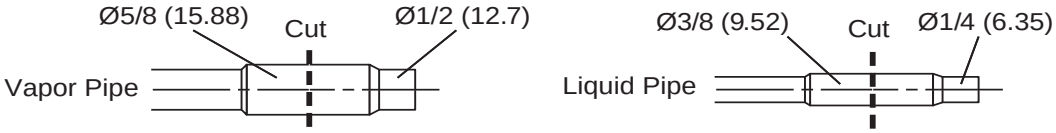


Table 31: Reducers for Heat Recovery Units.

Unit: Inches (mm)

Model		Liquid Piping	Vapor Piping	
			High Pressure	Low Pressure
Heat Recovery Unit Reducer	PRHR023A	O.D. 3/8 (9.52) Ø1/4 (6.35)	O.D. 3/4 (19.05) Ø5/8 (15.88) Ø1/2 (12.7) O.D. 1/2 (12.7) Ø3/8 (9.52)	O.D. 7/8 (22.2) Ø3/4 (19.05) Ø5/8 (15.88) O.D. 5/8 (15.88) Ø1/2 (12.7)
	PRHR033A PRHR043A PRHR063A PRHR083A	O.D. 5/8 (15.88) Ø1/2 (12.7) Ø3/8 (9.52) O.D. 1/2 (12.7) Ø3/8 (9.52)	O.D. 7/8 (22.2) Ø3/4 (19.05) Ø5/8 (15.88) O.D. 5/8 (15.88) Ø1/2 (12.7)	O.D. 1-1/8 (28.58) Ø7/8 (22.2) Ø3/4 (19.05) O.D. 3/4 (19.05) Ø5/8 (15.88)

Sample Layouts

Note:

Images are for illustrative purposes only and are not accurate representations. For specific details on piping limitations and other refrigerant system rules, review the information in this entire piping section, see the Multi V S with LGRED Engineering Manual, and follow the LATS diagram.

Example: Heat recovery system with four (4) heat recovery units, one (1) header, and eight (8) indoor units connected

ODU: Outdoor Units.

HRU: Heat Recovery Units.

IDU: Indoor units.

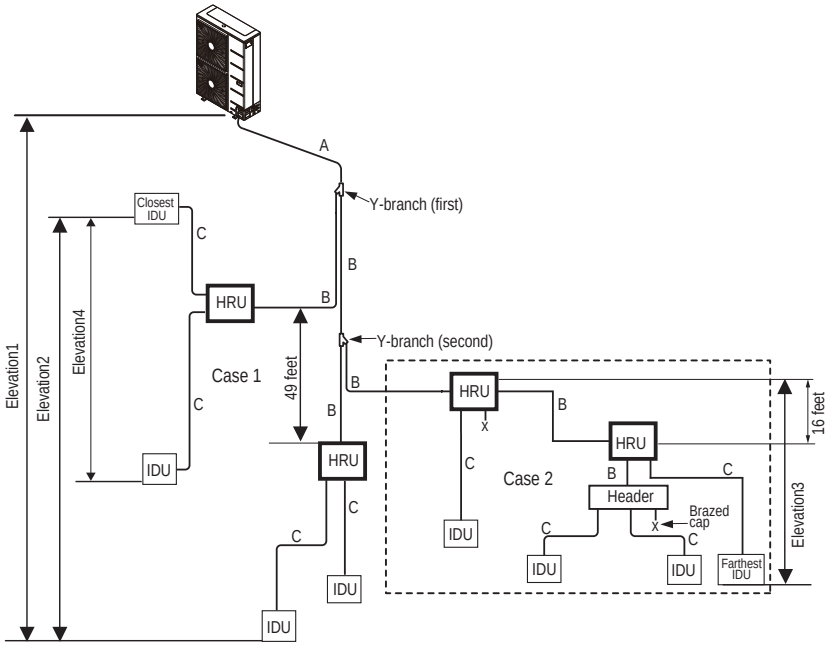
A: Main Pipe from Outdoor Unit to First Y-branch.

B: Heat Recovery Unit to Heat Recovery Unit, Y-branch to Heat Recovery Unit, Heat Recovery Unit to Header, or Y-branch to Y-branch.

C: Heat Recovery Unit / Header to Indoor Unit.

Note:

- *Always reference the LATS Multi V software report.*
- *Connection piping from branch to branch cannot exceed the main pipe diameter (A) used by the outdoor unit.*
- *Install the header branches or heat recovery units so that the pipe distances between the connected indoor units are minimized. Large differences in pipe distances can cause indoor unit performances to fluctuate.*
- ⃠ *Y-branches and other header branches cannot be installed downstream of the initial header branch.*



Case 1: Maximum height is 49 feet if installed with a Y-branch.
Case 2: Maximum height is 16 feet in heat recovery control unit series connection.

Table 32: Main Pipe (A) Diameters from Heat Recovery Outdoor Unit to First Y-branch.

Pipe Diameter when pipe length is ≤295 feet			Pipe diameter when pipe length is ≥295 feet		
Liquid Pipe (inches OD)	Low Pressure Vapor Pipe (inches OD)	High Pressure Vapor Pipe (inches OD)	Liquid Pipe (inches OD)	Low Pressure Vapor Pipe (inches OD)	High Pressure Vapor Pipe (inches OD)
3/8Ø	3/4Ø	5/8Ø	1/2Ø	7/8Ø	3/4Ø

Table 33: Refrigerant Pipe (B) Diameters between Y-branches and Y-branches / Heat Recovery Unit / Headers.

Downstream IDU total capacity (Btu/h)	Liquid pipe (inches OD)	Vapor pipe (inches OD)
≤19,100	1/4Ø	1/2Ø
≤54,600	3/8Ø	5/8Ø

Table 34: Indoor Unit Connecting Pipe from Branch (C).

Indoor Unit Capacity[1]	Liquid pipe (inches OD)	Vapor pipe (inches OD)
≤19,100	1/4Ø	1/2Ø
≤54,600	3/8Ø	5/8Ø

[1]9,600-24,200 Btu/h 4-way 3 feet x 3 feet Cassette and 15,400-24,200 Btu/h High Static Ducted IDUs have 3/8Ø (liquid) and 5/8Ø (vapor).

Conditional Applications

Conditional application are computed in LATS. See below for an explanation of when pipes are upsized.

The diameters of main liquid, high-pressure vapor, and low-pressure vapor pipes (A) must be increased (must be sized up) if equivalent length between the outdoor unit and the farthest indoor unit is ≥295 feet..

Note:

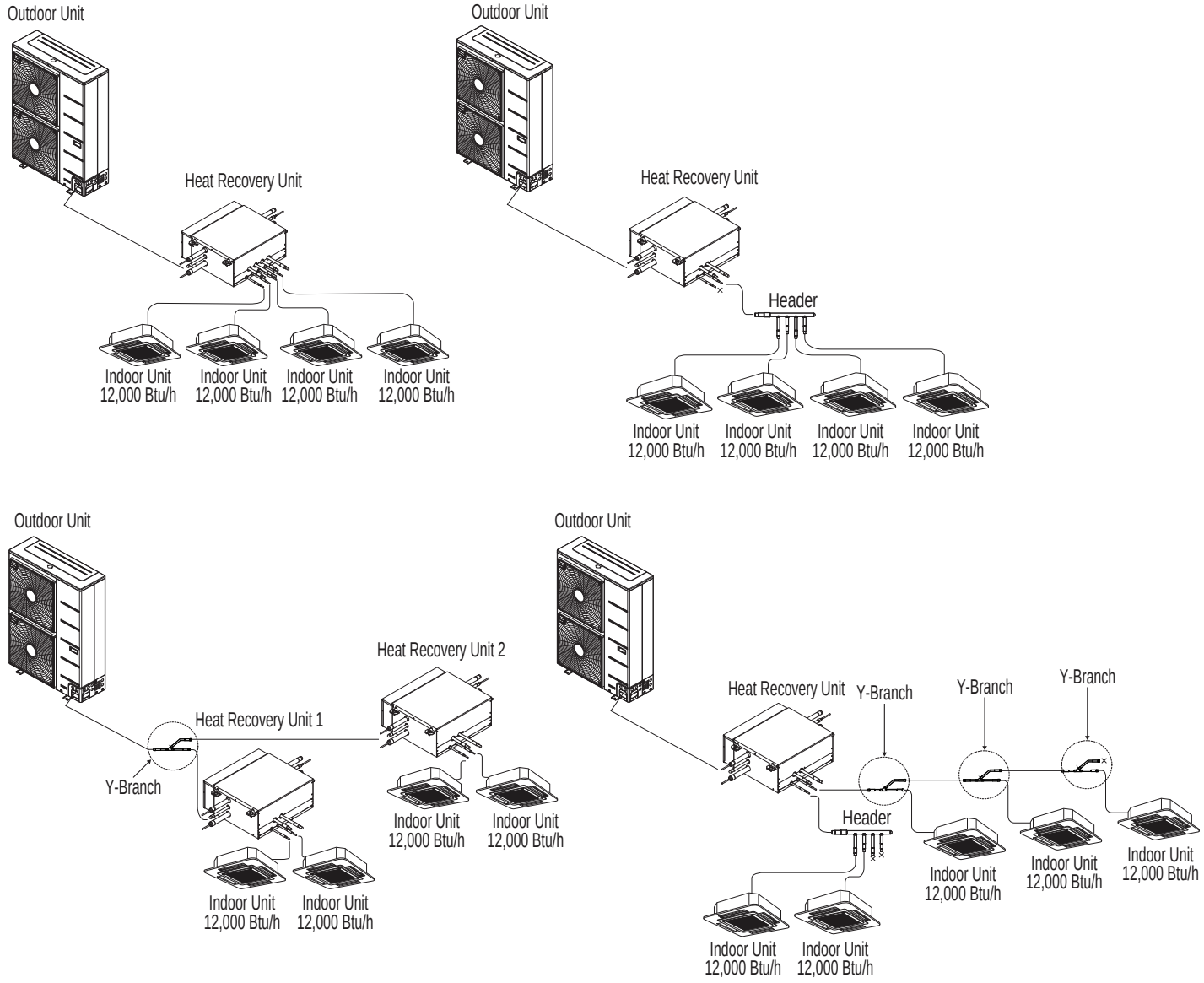
There is no conditional application for elevation differential, and no need to size up the pipe diameter. If elevation differential between the outdoor unit and the farthest indoor unit is ≥164 ft, it is beyond product specifications, and the system will malfunction.

INSTALLING FOR HEAT RECOVERY OPERATION

MULTI V S WITH LGRED°

Sample Layouts and Incorrect Layouts

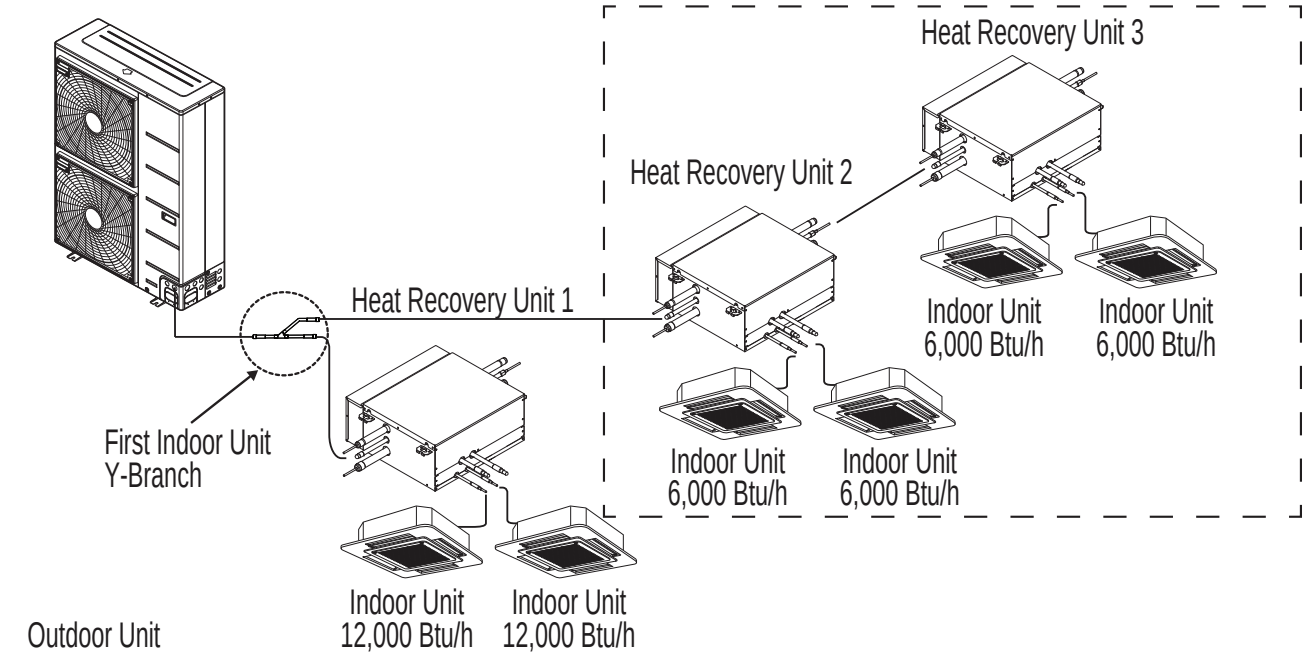
Systems designed for heat recovery operation can use also Y-branches and Headers in combination with heat recovery units.

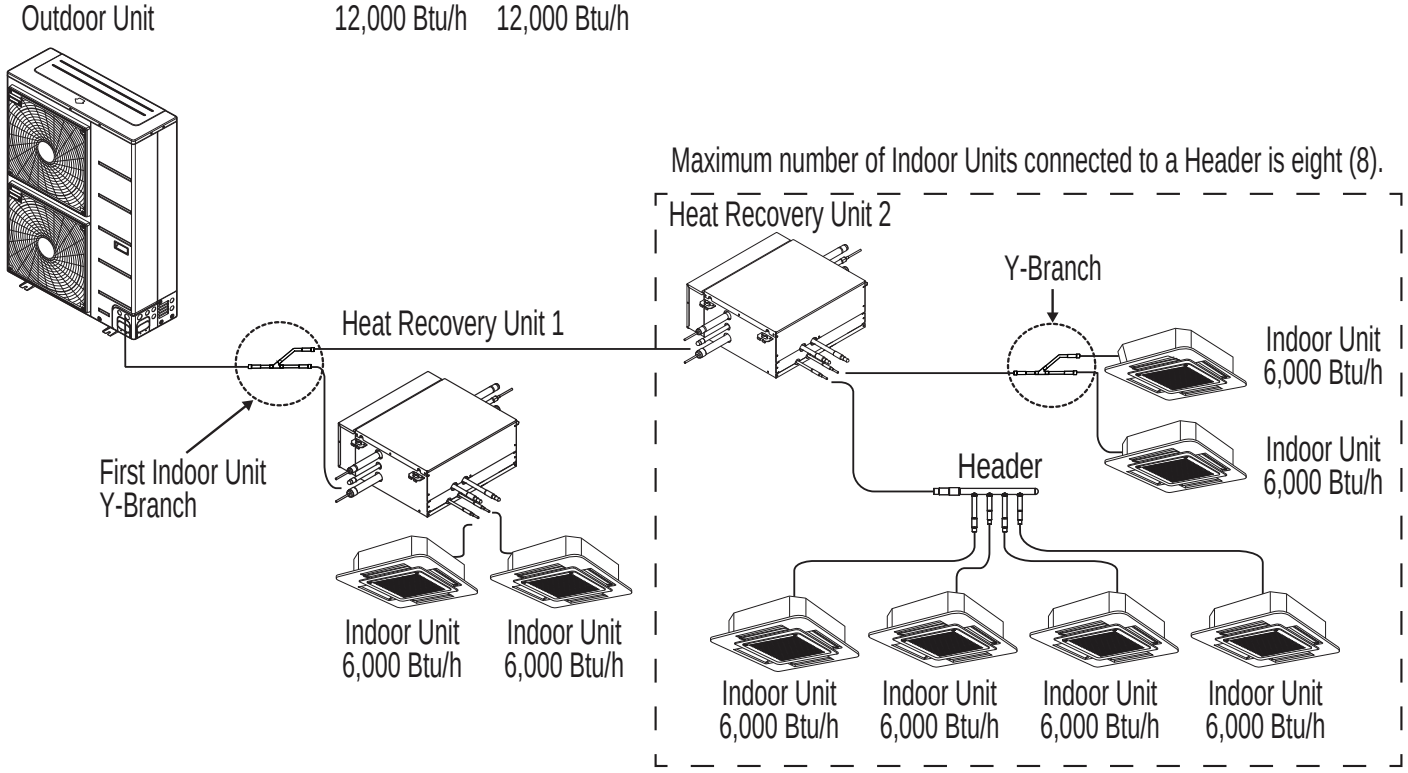


Note:

Images are for illustrative purposes only and are not accurate representations. For specific details on piping limitations and other refrigerant system rules, review the information in this entire piping section, see the Multi V S with LGRED Engineering Manual, follow system parameters and the LATS diagram.

Sample Layouts, Continued.





Note:

Images are for illustrative purposes only and are not accurate representations. For specific details on piping limitations and other refrigerant system rules, review the information in this entire piping section, see the Multi V S with LGRED Engineering Manual, follow system parameters and the LATS diagram.

INSTALLING FOR HEAT RECOVERY OPERATION

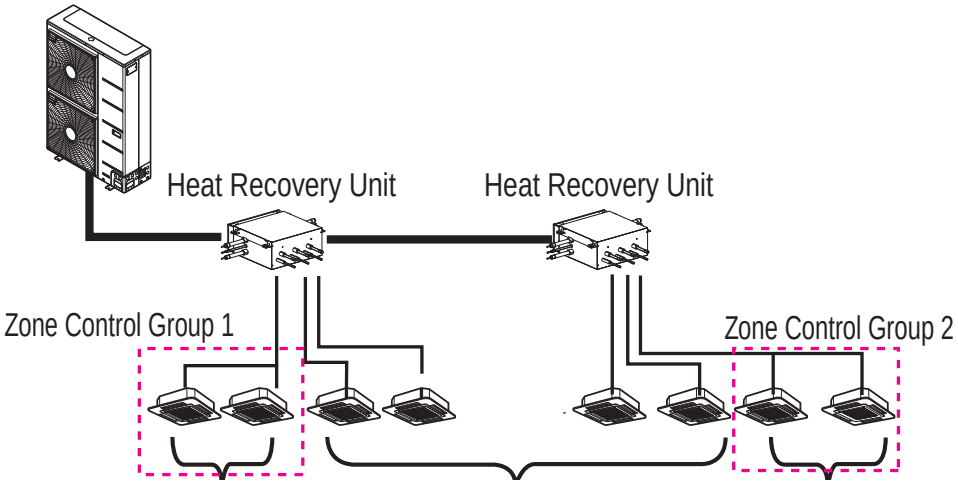
MULTI V S WITH LGRED°

Sample Layouts and Incorrect Layouts

Sample Layouts, Continued.

Zone Control

For zone control, up to eight (8) indoor units with a maximum capacity of 60,000 Btu/h can be connected to one port on the heat recovery unit. Y-Branches or Headers can be used, depending on what is best for the application.



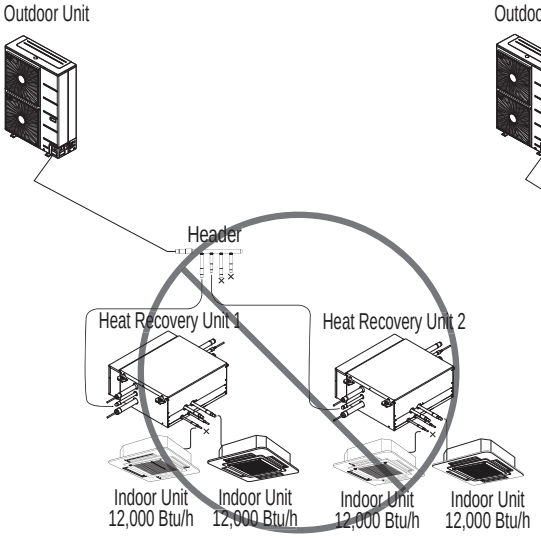
Note:

Images are for illustrative purposes only and are not accurate representations. For specific details on piping limitations and other refrigerant system rules, review the information in this entire piping section, see the Multi V S with LGRED Engineering Manual, follow system parameters and the LATS diagram.

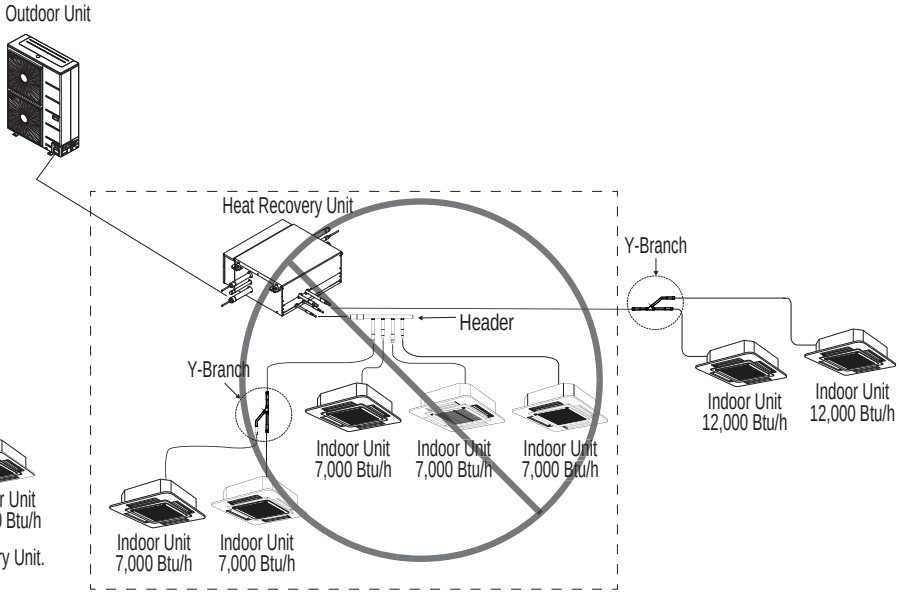
- One heat recovery unit branch pipe can support a maximum of 60,000 Btu/h total indoor unit cooling capacity.
- Zone control groups cannot operate in “Auto changeover” or “Mode override” functions.
- In the zone control group, if some indoor units are operating in cooling or heating mode, the other indoor units cannot change over to / operate in the opposite mode.
- See the Heat Recovery Unit Engineering Manual on www.lghvac.com for more information.

Incorrect Layouts

A second branch cannot be made after a Header.



Incorrect installation: Header branch pipe then a Heat Recovery Unit.



Incorrect installation: Heat Recovery Unit, then a Header branch pipe, then a Y-Branch and Header Branch pipe.

Piping Connections for Heat Recovery Operation

Use the correct outdoor unit connections to join the outdoor unit to the branch piping in the indoor unit refrigeration system.

Flare connections are used to connect the piping on the indoor units, and braze connections are used to connect the piping on the outdoor unit (see piping dimensions below), heat recovery units, Y-branches, and headers.

Multi V S with LGRED outdoor units designed for heat recovery operation use the liquid pipe, high-pressure vapor, and low-pressure vapor pipe connections as shown in the diagram below.

Figure 87: Piping Connections for Heat Recovery Operation.

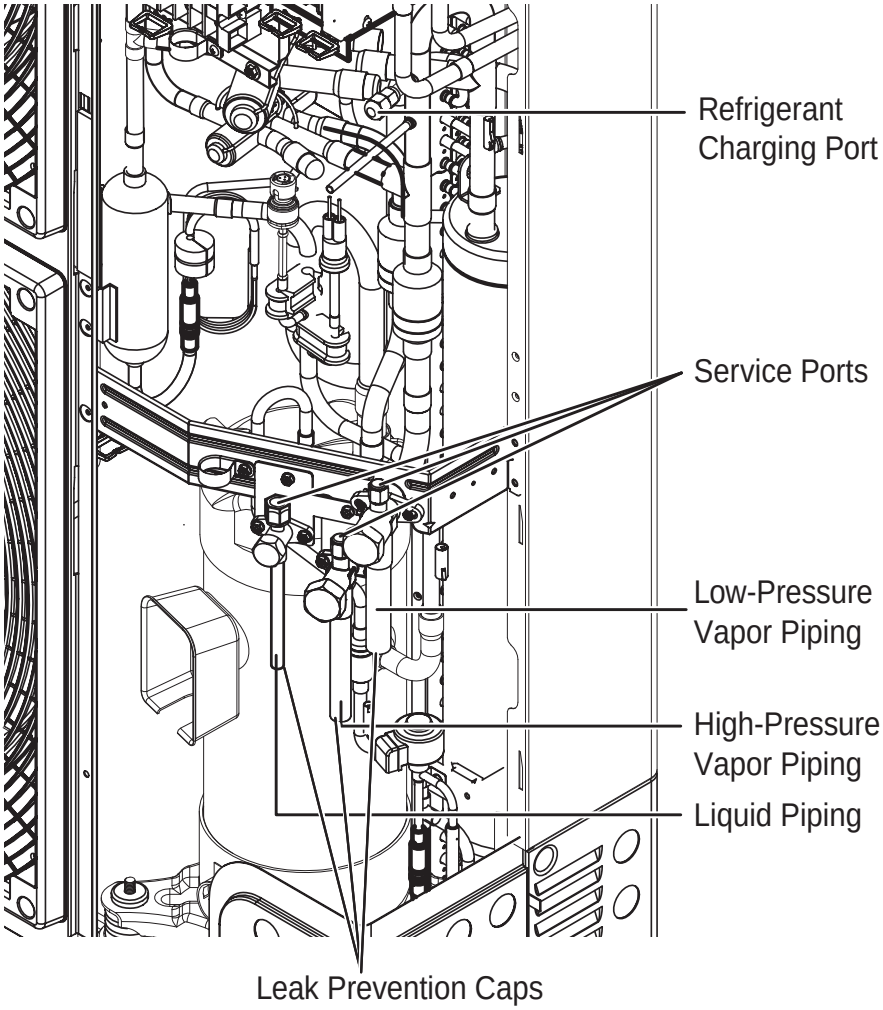


Table 35: Heat Recovery Outdoor Unit Refrigerant Piping Connections.

Model	Liquid Conn. (in.)	Type	High-Press. Vapor Conn. (in.)	Type	Low-Press. Vapor Conn. (in.)	Type
ARUM036GSS5	3/8	Brazed	5/8	Brazed	3/4	Brazed
ARUM048GSS5	3/8	Brazed	5/8	Brazed	3/4	Brazed

⚠ WARNING

It is important that the correct outdoor unit connections be used for the intended system operation (heat pump versus heat recovery). If the wrong connections are used, it will result in refrigerant leaks, which will lead to illness or death.

Note:

It is important that the correct outdoor unit connections be used for the intended system operation (heat pump versus heat recovery). If the wrong connections are used, it will result in refrigerant leaks, which will lead to system malfunction or even failure to work at all.

INSTALLING FOR HEAT RECOVERY OPERATION

MULTI V S WITH LGRED°

Pipe Routes / Knock Outs

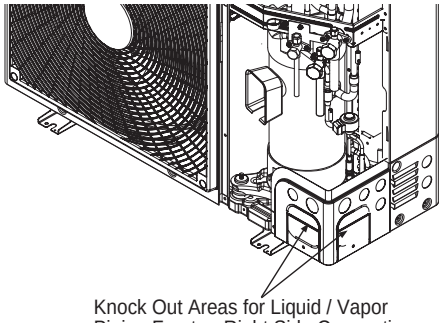
Pipe Routes

Choose from three pipe routes from out of the outdoor unit to the indoor unit refrigerant system:

- Front Pipe Route
- Right Side Route
- Back Route

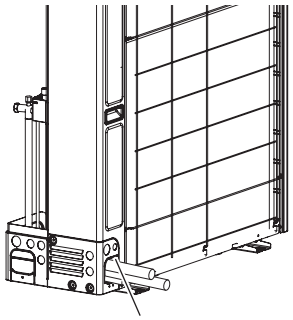
The pipe route chosen depends on the installation area, and is at the discretion of the installer. After the pipe route is chosen, the appropriate outdoor unit access holes must be knocked out (see this page and next page for piping route and knock out area information).

Figure 89: Close Up of the Front and Right Side Piping Routes / Knock Out Areas.



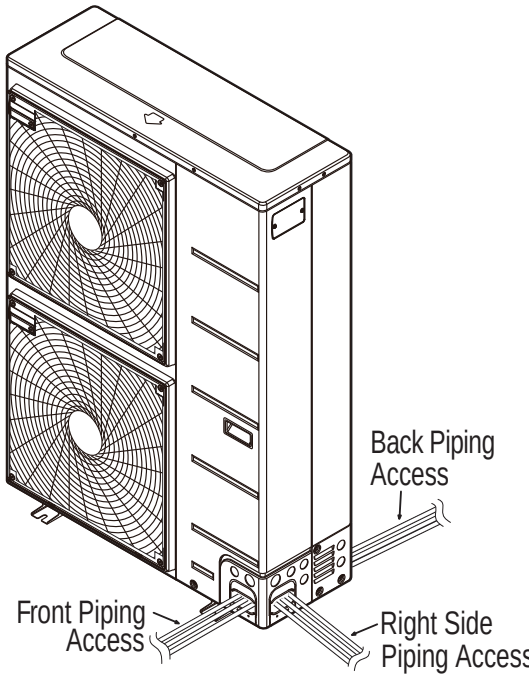
Knock Out Areas for Liquid / Vapor Piping Front or Right Side Connections

Figure 90: Close Up of the Back Piping Routes / Knock Out Area.



Knock Out Area for Liquid / Vapor Piping

Figure 88: Pipe Route Options.



Note:

Appearances may vary depending on model.

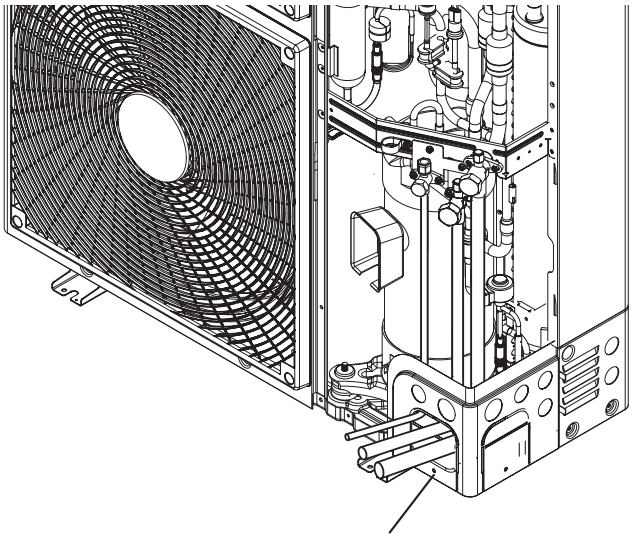
Knock Outs

After the pipe route is chosen, installer must prepare the access holes in the front, right side, or back. The access holes for the communication cables and the power supply wiring can also be knocked out at this time (see the Electrical System Installation for wiring / cable access holes, paths, etc.). Whatever direction is chosen, plug the access holes with field-provided putty or insulation to fill all gaps.

⚠WARNING

- *⃠ Do not damage the outdoor unit pipes when knocking out the access areas. Pipe damage can lead to refrigerant leaks, which may cause physical injury or death.*
- *⃠ To avoid damaging the piping and power wiring / communication cables, remove any burrs that will have formed during the knock out procedure. Make sure the access holes have smooth edges and install sleeves. Damage to the wiring / cables can lead to fire, electric shock, physical injury, or death.*
- *After piping installation is complete, to prevent animals or foreign materials from damaging the outdoor unit cables / wiring, seal any holes in with sealant, plugs, foam, caulk, putty, etc. Insects or small animals entering the outdoor unit may cause a short circuit in the electrical box, which can lead to fire, electric shock, physical injury, or death.*

Figure 91: Heat Recovery Outdoor Unit Front Knock Out Area Example.



Knock Out Area for Liquid / Vapor Piping

Note:

Appearances may vary depending on model.

INSTALLING FOR HEAT RECOVERY OPERATION

Knock Outs / Removing the Leak Prevention Caps

Knock Outs, continued.

Note:

- *⃠ Do not damage the outdoor unit pipes when knocking out the access areas. Pipe damage can lead to refrigerant leaks, which can lead to operation failure.*
- *⃠ To avoid damaging the piping and power wiring / communication cables, remove any burrs that will have formed during the knock out procedure. Make sure the access holes have smooth edges and install sleeves.*
- *After piping installation is complete, to prevent animals or foreign materials from damaging the outdoor unit cables / wiring, seal any holes in with sealant, plugs, foam, caulk, putty, etc. Insects or small animals entering the outdoor unit may cause a short circuit in the electrical box, which may lead to unit failure.*

⃠ Avoid Pipe Damage

- *When routing field-provided piping inside the outdoor unit frame, ⃠ avoid causing vibration that will damage the components.*
- *Correctly route the piping so it does not make contact with the compressor casing, terminal cover, or mounting bolts. Allow room for field installation.*
- *Properly install and insulate refrigerant pipes separately up to the service valve body inside the confines of the unit frame.*

Removing the Leak Prevention Caps

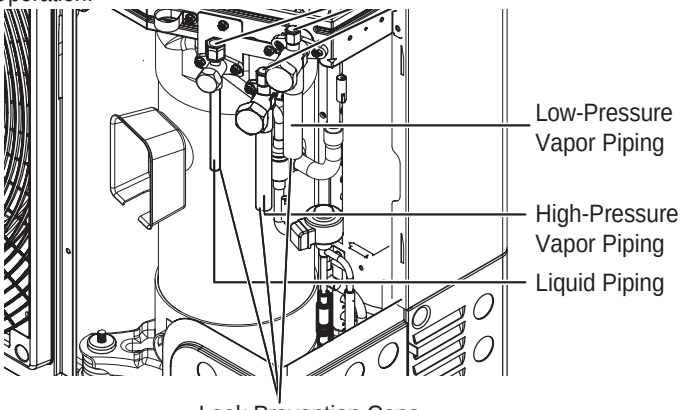
Before brazing the field-supplied refrigerant piping to the outdoor unit connections, the leak prevention caps MUST be removed from the liquid, high-pressure vapor, and low-pressure vapor pipe connections.

Note:

For heat recovery operation, all three piping connections are used.

- Verify that the shut off valves / service ports are closed (see the "Shut off Valves / Service Ports" section).
- Remove the leak prevention caps from the liquid, high pressure vapor, and low pressure vapor outdoor unit connections.
- Connect the field piping to outdoor unit piping.

Figure 92: Location of the Leak Prevention Caps for Heat Recovery Operation.



Note:

Appearances may vary depending on model.

INSTALLING FOR HEAT RECOVERY OPERATION

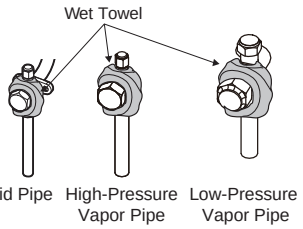
MULTI V S WITH LGRED°

Shut Off Valves / Service Ports

Note:

⃠ Do not expose the outdoor unit shut off valves / service ports to heat. Protect the shut off valves / service ports with a wet towel during brazing.

Figure 93: Protecting the Shut Off Valves / Service Ports.



Operating the Shut Off Valves / Service Ports

Note:

⃠ Do not apply excessive force to the shut off valves / service ports.

Opening the Shut Off Valves / Service Ports

1. Remove the shut off valve / service port cap.
2. Turn the valve counterclockwise using a metric sized Allen wrench (depending on the size of the port).
3. Turn until the valve shaft is out and stops. ⃠ Do not apply excessive force; doing so may damage the valve.
4. Securely replace the cap.

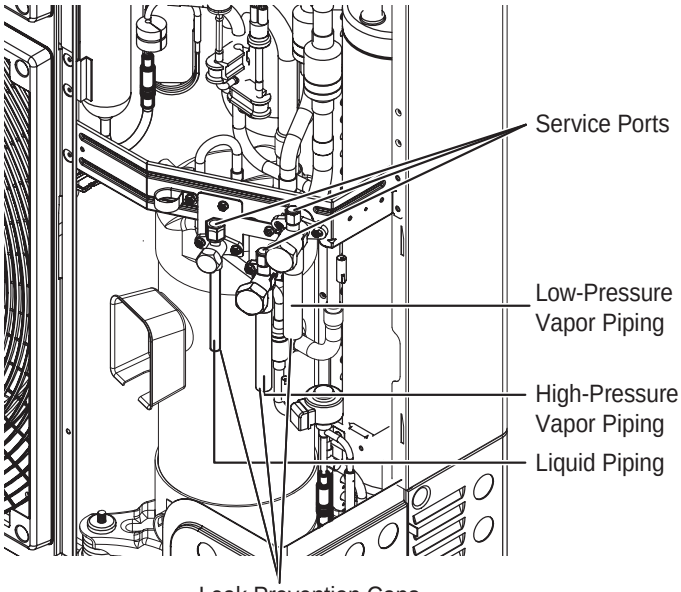
Closing the Shut Off Valves / Service Ports

1. If present, remove the shut off valve / service port cap.
2. Turn the valve clockwise using a metric sized Allen wrench (depending on the size of the port).
3. Securely tighten the valves until the shaft contacts the main body seal. ⃠ Do not apply excessive force; doing so may damage the valve.
4. Securely replace the cap.

Insulating the Shut Off Valves / Service Ports

Shut off valves must be insulated correctly and completely using closed cell Ethylene Propylene Diene Methylene (EPDM) insulation. Insulation must be a minimum 1/2" thick, and thickness may need to be increased based on ambient conditions, humidity levels, and local codes. See the "Insulation" section for more information.

Figure 94: Location of the Shut Off Valves / Service Ports.



⚠ WARNING

- *Outdoor units ship with a factory charge of refrigerant. Always take extreme caution to prevent refrigerant gas (R410A) from leaking during use, around fire or flame, and during brazing. If the refrigerant gas comes in contact with a flame from any source, it will break down and generate a poisonous gas. ⃠ Do not braze in a small room, or a room that is not ventilated.*
- *After refrigerant piping work is complete, verify that the shut off valve / service port caps are securely tightened to help prevent refrigerant gas from leaking. Verify the system is free of leaks after refrigerant piping installation is complete. Exposure to high concentration levels of refrigerant gas will lead to illness or death.*
- *⃠ Do not attempt to remove the service valve stem. Physical injury or death will occur from the uncontrolled rapid release of refrigerant.*

Note:

- *Before connecting the refrigerant piping, make sure the shut off valves / service ports of the outdoor unit are completely closed (factory setting).*
  ⃠ Do not open the shut off valve / service port or attempt to operate the system until the refrigerant pipe system installation has been completed.
  ⃠ Never open the valves before a pressure test is performed, a leak test performed, the system is evacuated, and the Commissioning Agent provides authorization to do so.⃠ Do not use polyolester (POE) or any other type of mineral oil as a thread lubricant. If introduced to the refrigerant circuit, it will create oil sludge leading to system malfunction. Use PVE (polyvinyl ether) type refrigeration oil only.
- *Protect the liquid, high-pressure vapor, low-pressure vapor piping / ports with a wet towel during brazing.*
- *Use a 15% silver phosphorous copper brazing alloy to avoid overheating and produce good flow. ⃠ Do not use flux, soft solder, or anti-oxidant agents. If the proper material is not used, oxidized film will accumulate and clog or damage the compressors. Flux can harm the copper piping or refrigerant oil.*
- *When brazing the field-supplied refrigerant piping to the outdoor unit connections, flow 3 psig nitrogen into the piping. If nitrogen was not flowed during brazing, the piping will oxidize and cause membranes to form, which will negatively impact valve and condenser operation.*

Note:

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

Refrigerant Piping System Insulation

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

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

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

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

The design engineer must perform calculations to determine if the factory-supplied insulation jackets are sufficient to meet local codes and avoid sweating. Add additional insulation if necessary. Check the fit of the insulation jacket after the header fitting and all run-out pipes are installed. Mark all pipes at the point where the insulation jacket ends. Remove the jacket. Install field provided insulation on the run-out and main trunk pipes first. Install the LG-provided insulation plugs on the ends of all unused header ports. Peel the adhesive glue protector slip from the insulation jacket and install the clam-shell jacket over the fitting.

Figure 95: Typical Pipe Insulation, Power Wire and Communications Cable Arrangement.

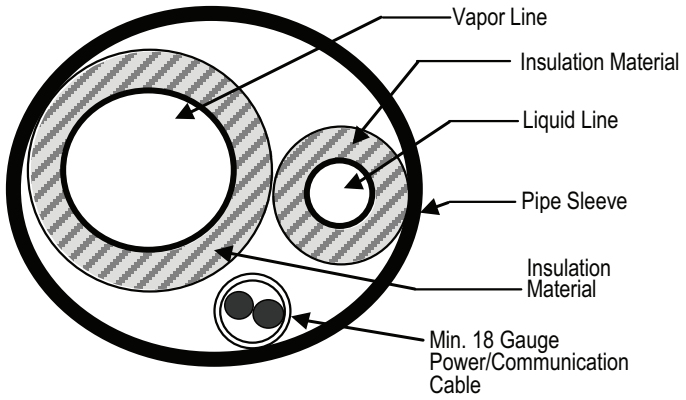


Figure 96: Typical Insulation Butt-Joint at Indoor Unit Casing.

Figure 97: Typical Refrigerant Flare Fitting Insulation Detail.

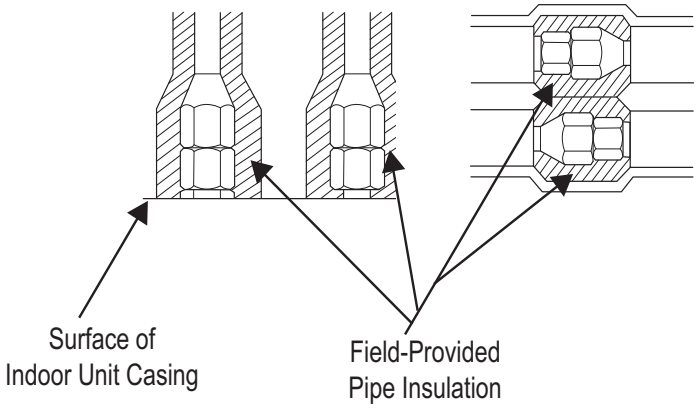
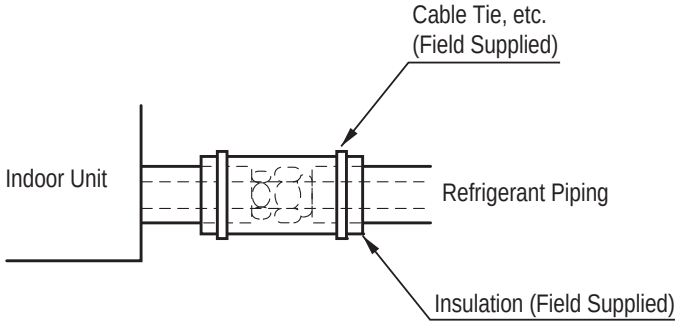


Figure 98: Insulating the Shut Off / Isolation Ball Valve (If Present).



Note:

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

Table 36: Minimum Refrigerant Pipe EPDM Insulation Wall Thickness Requirements.[1]

Classification / Piping O.D.		Air-conditioned location		Non-air conditioned location	
		1. Typical Conditioned Location	2. Special Conditioned Location	3. Typical Unconditioned Location	4. Special Unconditioned Location
Liquid pipe	ø1/4 inches	>1/2 inches	>1/2 inches	>1/2 inches	>1/2 inches
	ø3/8 inches				
	≥ø1/2 inches	>1/2 inches	>1/2 inches	>1/2 inches	>1/2 inches
Vapor pipe	ø3/8 inches	>1/2 inches	>3/4 inches	>3/4 inches	>1 inch
	ø1/2 inches				
	ø5/8 inches				
	ø3/4 inches				
	ø7/8 inches				
	ø1 inch				
	ø1-1/8 inches	>3/4 inches	>1 inch	>1 inch	
	ø1-1/4 inches				
	ø1-3/8 inches				
	ø1-1/2 inches				
	ø1-3/4 inches				

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

1. Typical Conditioned Location

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

2. Special Conditioned Location

1. When the location is air conditioned, but there is severe temperature/humidity difference due to high ceilings.
   - Church, auditorium, theater, lobby, etc.
2. When the location is air conditioned, but internal temperature/humidity are high.
   - Bathroom, swimming pool, locker room, etc.

3. Typical Unconditioned Location

An unconditioned space inside a building.

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

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

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

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

Applying Insulation to Y-Branch and Header Fittings

LG Y-branches and Headers must be insulated with the clam-shell insulation jacket that is provided with each component. Check the fit of the insulation jacket after all pipes are brazed to fittings. Mark all pipes at the point where the insulation jacket ends. Remove the insulation jacket. Install field-supplied insulation on the pipe segments first, and then install the LG provided insulation plugs on the ends of all unused Header ports. Apply the clam-shell insulation on jackets to Y-branch and Header fittings last. Peel the adhesive glue protector slip from the insulation jacket and install the insulation jacket over the fitting.

Figure 99: Y-branch Insulation.

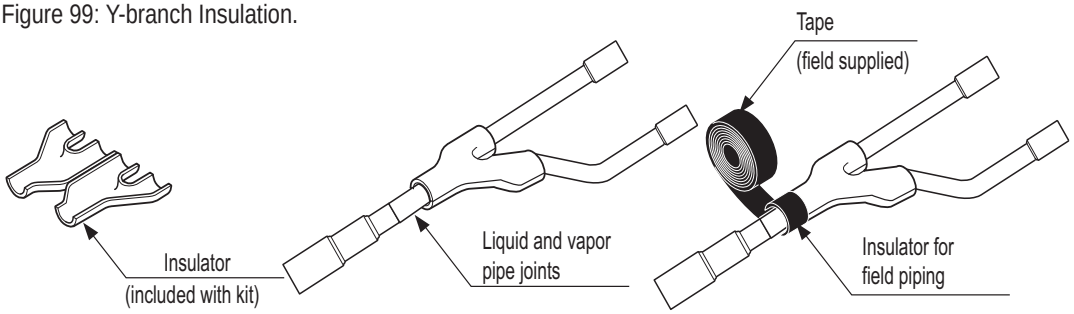


Figure 100: Header Insulation.

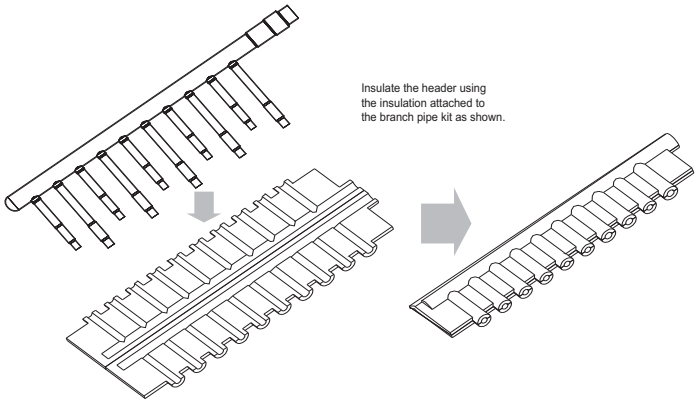


Figure 101: Joints between branch and pipe must be sealed with tape included in each kit.

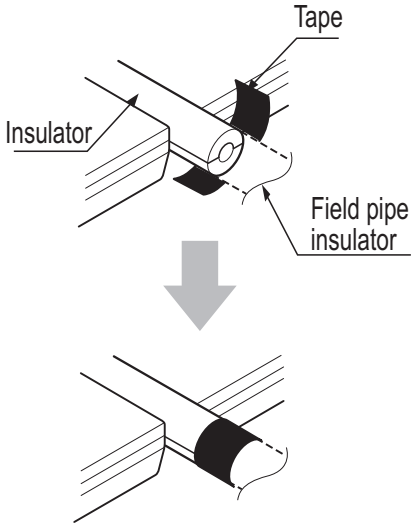
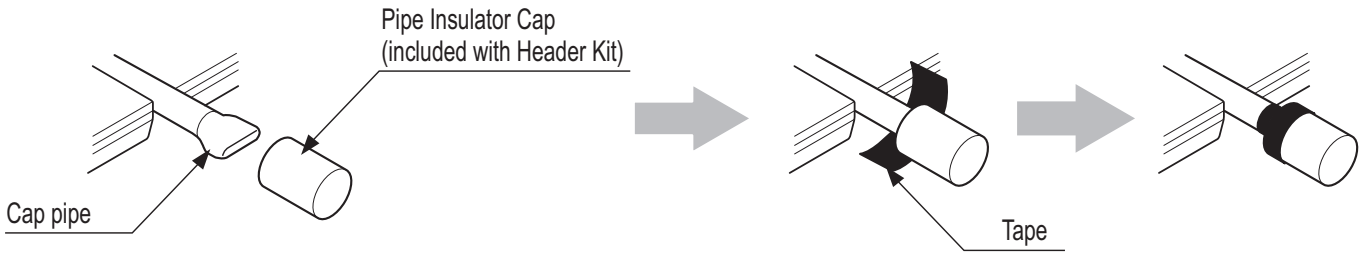


Figure 102: Capped pipes must be insulated using the cap included in each kit, and then taped as shown.



Note:

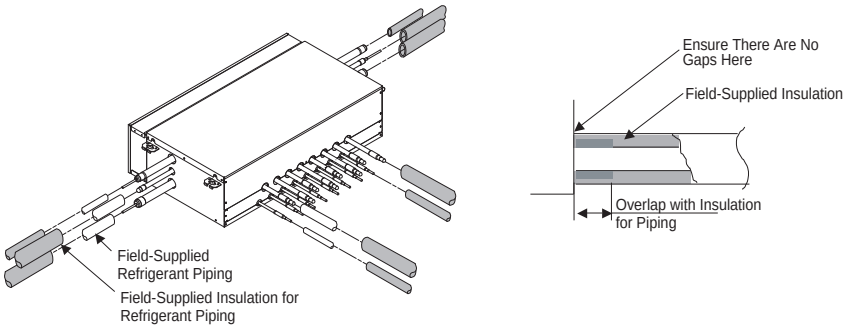
Additional Insulation for Y-Branches and Headers Will be Required in Humid Environments.

If the system has been operating for a long time in a high humidity environment (dew point temperature: more than 73°F), condensate is likely to form. If this happens, install 3/8 inch thick ethylene propylene diene methylene (EPDM) insulation that is plenum-rated with a heat-resistance factor of more than 248°F.

Insulation on Heat Recovery Unit Ports

All ports and all connected piping to and from the heat recovery units must be completely insulated. Insulation must comply with all applicable local, state, and federal codes.

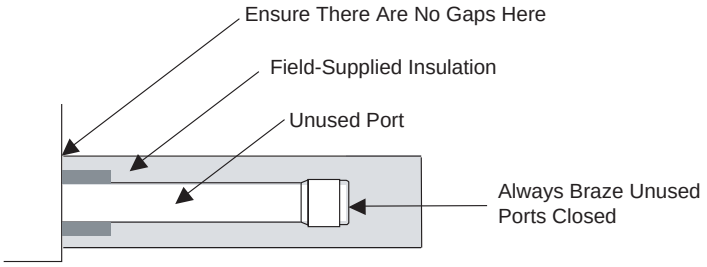
Figure 103: Insulating Heat Recovery Unit Piping and Ports.



Note:

On whichever port or pipe not used, the factory-provided cap must be removed, and that port / pipe must be recapped and completely insulated.

Figure 104: Preparing Unused Heat Recovery Unit Ports.



⚠ WARNING

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

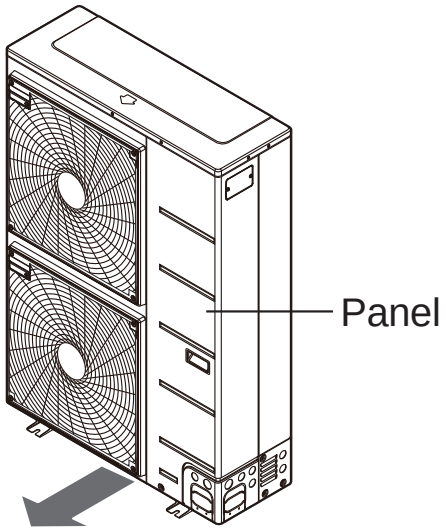
Note:

- *Consider ambient conditions (temperature, direct sunlight, inclement weather, etc.) when selecting, installing, and connecting the power wiring.*
- *Properly ground the outdoor unit and indoor units. Ground wiring must always be installed by a qualified technician. Improperly ground wire can cause communication problems from electrical noise, and motor current leakage.*
- *If there is a possibility of reversed phase, phase loss, momentary blackout, or the power goes on and off while the system is operating, install a field-supplied phase loss protection circuit. If the system operates in reversed phase, etc., it will damage the compressors and other components.*
- *Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and NEC regulations related to electrical equipment and wiring, and following the instructions in this manual. Generated overcurrent will include some amount of direct current. Using an oversized breaker or fuse will result in equipment malfunction and property damage.*
- ⃠ *Do not connect ground wire to refrigerant, gas, or water piping; to lightning rods; to telephone ground wiring; or to the building plumbing system. Failure to properly provide a NEC-approved earth ground can result in property damage and equipment malfunction.*

Accessing the Power Wiring / Communications Cable Connections

1. Remove all of the screws that hold the panel to the outdoor unit frame.
2. Detach the panel by pulling it forward.
3. Locate the control box on the right side of the outdoor unit. Remove the control box cover to access the Main PCB and the Indoor Communication PCB. Outdoor unit terminal block is located below the control box.
4. Connect the communication cable between the outdoor unit(s) and indoor units (and heat recovery control units in systems designed for heat recovery operation only) to the correct terminals on the outdoor unit communication terminal block.
5. When connecting the communication cable between the outdoor and indoor units (and heat recovery control units) with a shielded cable, connect the ground wire to the outdoor unit ground terminal only.
6. When connecting shielded wires to the central control system, connect the ground wire to the ground screw.

Figure 105: Removing the Multi V S with LGRED Panel.



Note:

Multi V S with LGRED outdoor units contain a temperature sensor that must not be exposed to direct sunlight. When the panel is off, cover the temperature sensor to protect it from any direct sunlight.

Separating Power Wiring and Communication Cables

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

Table 37: Power Wire and Communications Cable Minimum Required Separation Allowable Distances.

Capacity of Power Supply Wiring (current)		Required Minimum Distance[1,2]
100V or more	10A	12 inches
	50A	20 inches
	100A	40 inches
	Exceeding 100A	60 inches

[1]The figures above are based on parallel lengths up to 328 feet long. For lengths in excess of 328 feet, the distances will have to be recalculated in direct proportion to the additional line lengths involved.
[2]If the power supply waveform continues to exhibit some distortion, the space between the power wiring and communication cable must be increased.

⚠WARNING

Properly ground all outdoor units. Ground wiring must always be installed by a qualified technician. Ground wiring is required to prevent accidental electrical shock during current leakage, which will cause bodily injury or death.

Note:

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

Location of Outdoor Unit PCBs and Other Electrical Components

Figure 106: Power Wiring / Communications Cable Paths and Terminations Inside Multi V S with LGRED ARUM036GSS5 and ARUM048GSS5.

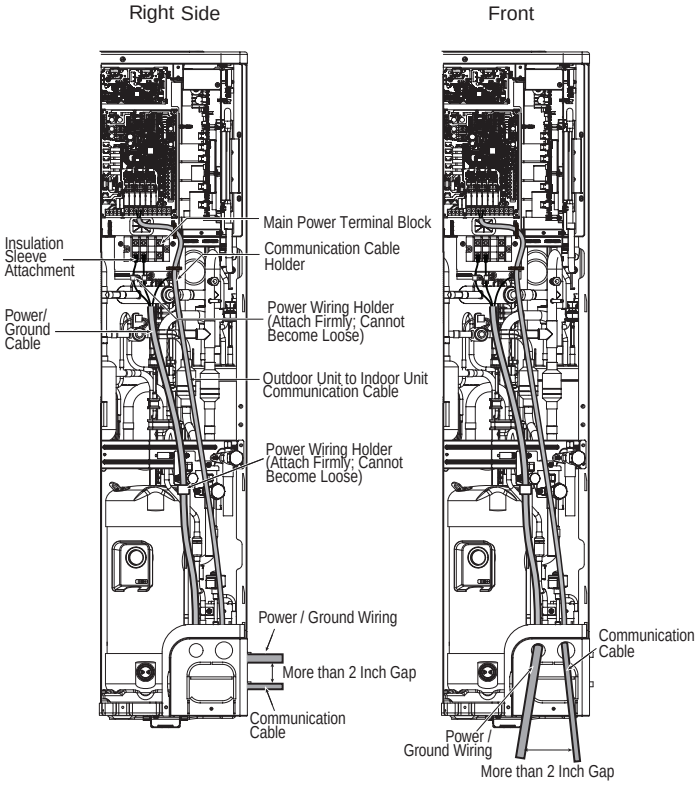
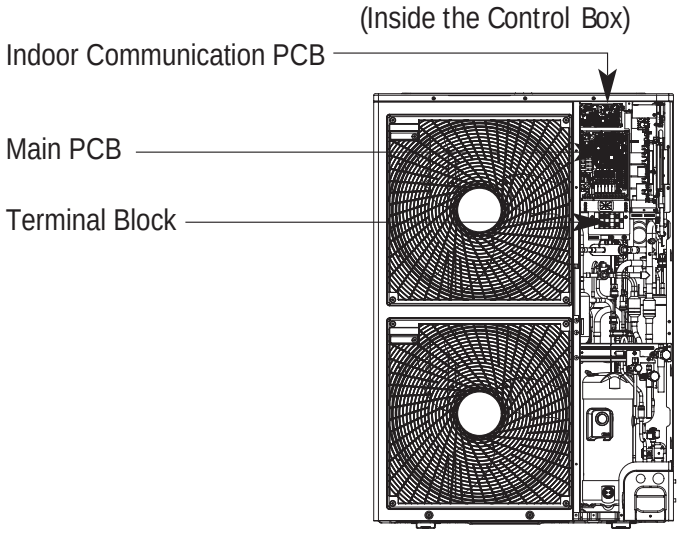


Figure 107: Multi V S with LGRED ARUM036GSS5 and ARUM048GSS5 Electrical Component Location.



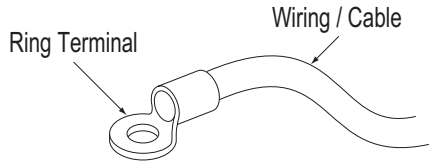
Note:
Appearances may vary depending on model.

Power Wiring / Communication Cable Connections

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

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

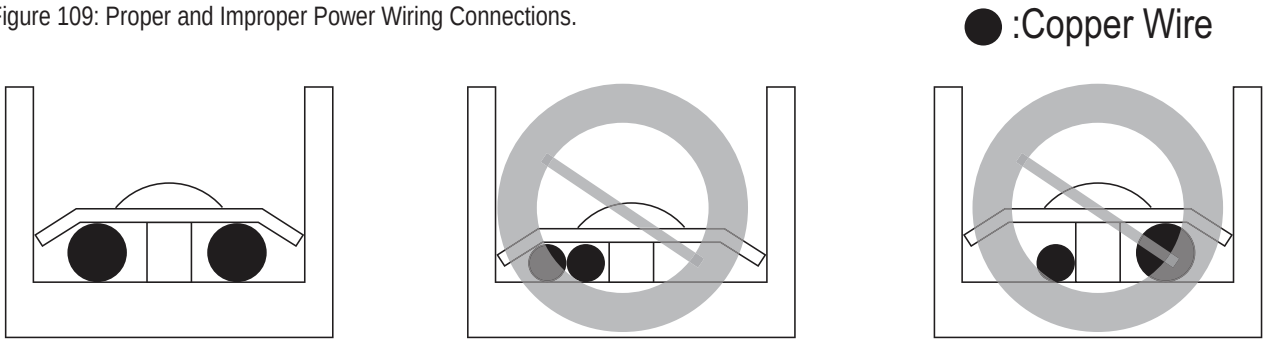
Figure 108: Close up of a Typical Ring Terminal.



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

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

Figure 109: Proper and Improper Power Wiring Connections.



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

⃠ Do not terminate two wires on one side.

⃠ Do not terminate different gauge wires to a terminal block.

⚠ WARNING

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

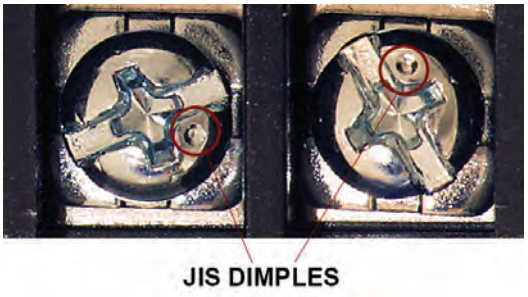
Note:

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

Terminal Connections

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

Figure 110: JIS Screws.



Note:

- *The terminals labeled "GND" are NOT ground terminals. The terminals labeled ⏚ ARE ground terminals.*
- *Polarity matters. Always connect "A" to "A" and "B" to "B."*
- *Always create a wiring diagram that contains the exact sequence in which all the indoor units and heat recovery units are wired in relation to the outdoor unit.*
- ⃠ *Do not include splices or wire nuts in the communication cable.*

Figure 111: Example of a Typical Heat Pump Operation Power Wiring and Communications Cable System Schematic.

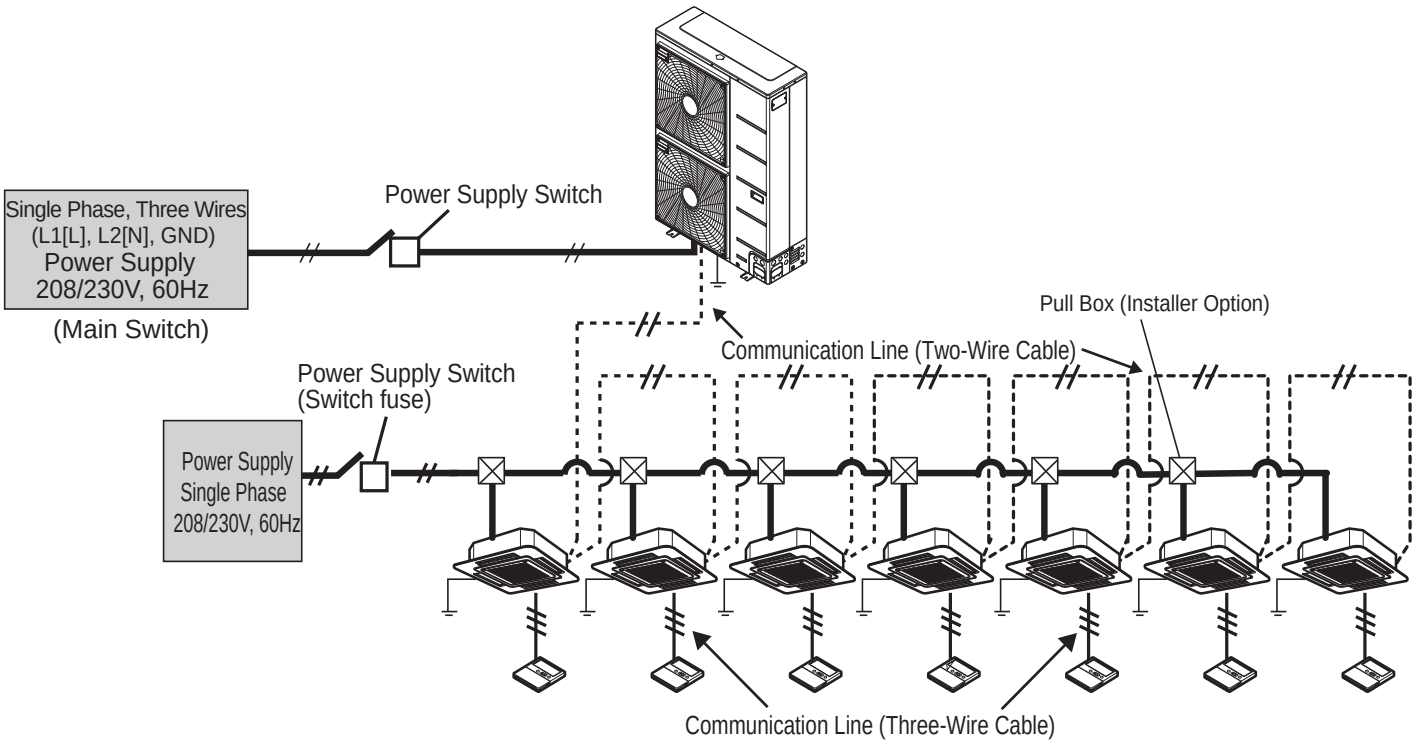
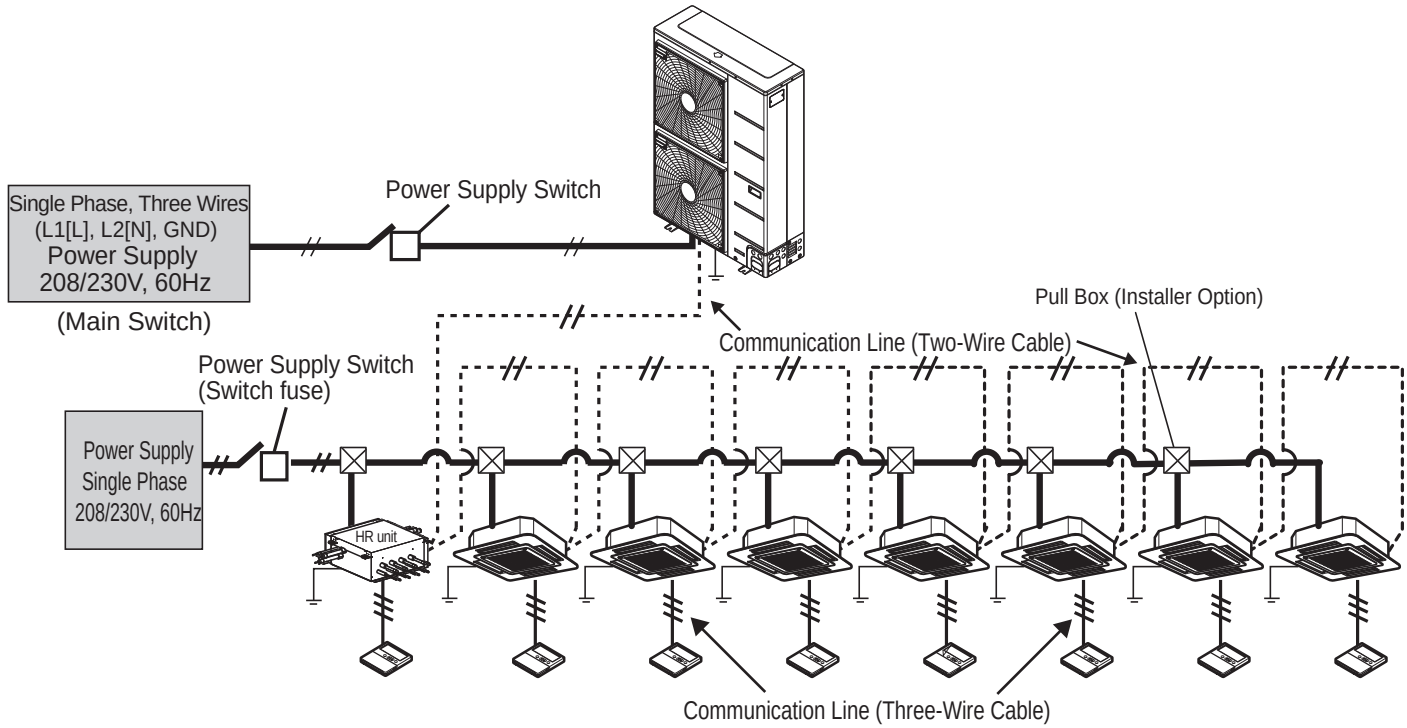


Figure 112: Example of a Typical Heat Recovery Operation Power Wiring and Communications Cable System Schematic.



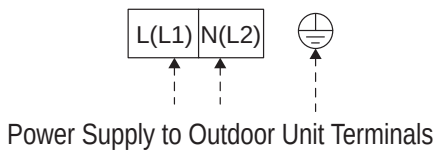
Power Supply / Power Wiring Specifications

Outdoor unit(s) and indoor units must be provided power from separate breakers.

Outdoor Units

- Outdoor units are available in only 1Ø, 208-230V, 60Hz power.
- Power wiring / power wiring gauge to the outdoor unit(s) must be solid or stranded, and must comply with all local and NEC electrical codes.
- Each outdoor unit must be provided a dedicated fused disconnect or breaker. Properly ground each outdoor unit per NEC and local codes.
- No matter which system is installed, power supply must not decrease or increase more than 10% of the rated voltage.
- Power imbalance between phases cannot be greater than 2% (if it is, the lifespan of the units will be reduced).
- Position the power wiring a minimum of two (2) inches away from the communication cables to avoid operation problems caused by electrical interference.
- ⃠ Do not run both the power wiring and the communication cable in the same conduit.

Figure 113: Outside Power Source to Outdoor Unit Terminal Diagram.



Indoor Units / Heat Recovery Units

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

⚠ WARNING

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

Note:

- *If there is a possibility of reversed phase, phase loss, momentary blackout, or the power goes on and off while the system is operating, install a field-supplied phase loss protection circuit. If the system operates in reversed phase, etc., it will damage the compressors and other components.*
- *Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and NEC regulations related to electrical equipment and wiring, and following the instructions in this manual. Generated overcurrent could include some amount of direct current. Using an oversized breaker or fuse will result in equipment malfunction and property damage.*
- *⃠ Do not connect ground wire to refrigerant, gas, or water piping; to lightning rods; to telephone ground wiring; or to the building plumbing system. Failure to properly provide a National Electrical Code-approved earth ground can result in property damage and equipment malfunction.*

Communication Cable Specifications From Outdoor Unit to Indoor Units / Heat Recovery Units

- Communication cable from the outdoor unit to indoor units / heat recovery units is to be 18 AWG, 2-conductor, twisted, stranded, shielded.
- Ensure the communication cable shield is properly grounded to the outdoor unit chassis only. ⃠ Do not ground the outdoor unit to indoor units / heat recovery units communication cable at any other point.
- Wiring must comply with all applicable local and national codes.
- Cable shields between the connected devices must be tied together and continuous from the outdoor unit to the last component connected.
- Start the communication cable at the outdoor unit and route to the indoor units / heat recovery units in a daisy chain configuration.
- ⃠ Do not install in a starburst configuration.
- Indoor unit / heat recovery unit communication bus: The communication terminals are labeled differently among the indoor units, depending on type (currently for indoor units: A / B, 3[A] / 4[B], or 3 / 4; for heat recovery units: A / B). Refer to the wiring diagram schematic found in the indoor unit itself, or to the indoor unit wiring diagrams in the Engineering Manuals for more information. Match IDU A and B terminals on outdoor unit to A (3) and B (4) terminals on indoor units / heat recovery units.
- Insulation as required by NEC and local codes.
- Rated for continuous exposure of temperatures up to 140°F.
- Maximum allowable communication cable length is 984 feet.

⚠ WARNING

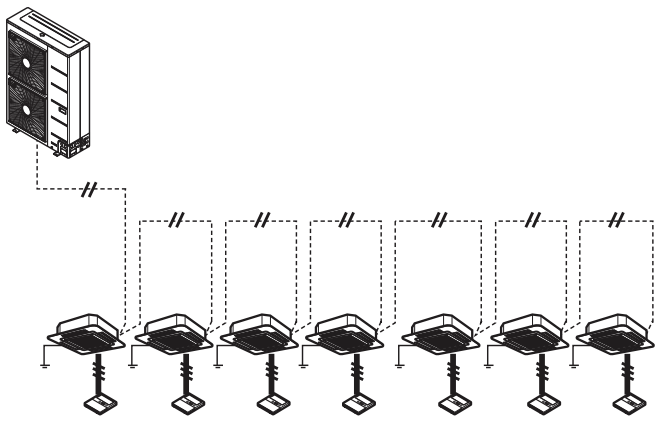
- *Ground wiring is required to prevent accidental electrical shock during current leakage, communication problems from electrical noise, and motor current leakage. ⃠ Do not connect the ground line to the pipes. There is risk of fire, electric shock, explosion, physical injury or death.*
- ⃠ *Never ground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

Note:

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

Figure 114: Multi V S with LGRED Heat Pump System Communications Wiring — Outdoor Unit to Indoor Unit.

Recommended—Two-Core Stranded, Shielded Cable in a Daisy Chain Configuration.



Improperly Terminated Communications Cable—Multiple Core Cable in a Starburst Configuration.

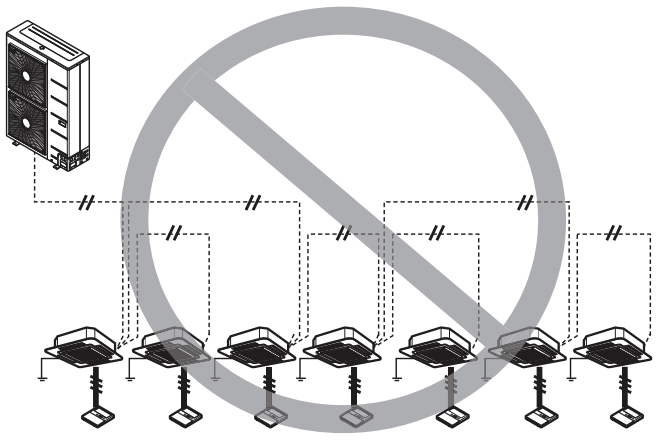
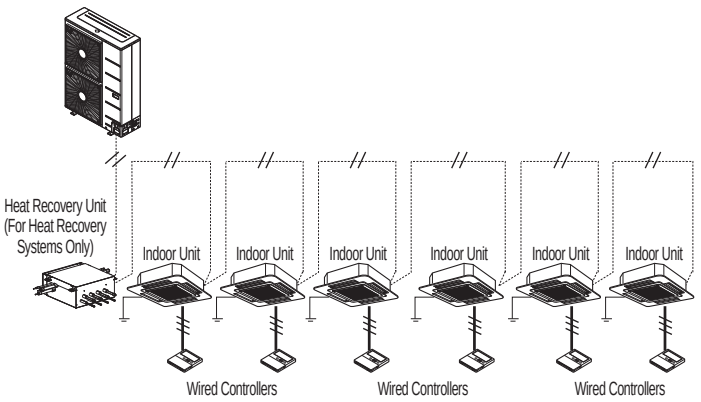


Figure 117: Multi V S with LGRED Heat Recovery System Communications Wiring — Outdoor Unit to Heat Recovery Unit to Indoor Unit.

Recommended—Two-Core Stranded, Shielded Cable in a Daisy Chain Configuration.



Improperly Terminated Communications Cable—Multiple Core Cable in a Starburst Configuration.

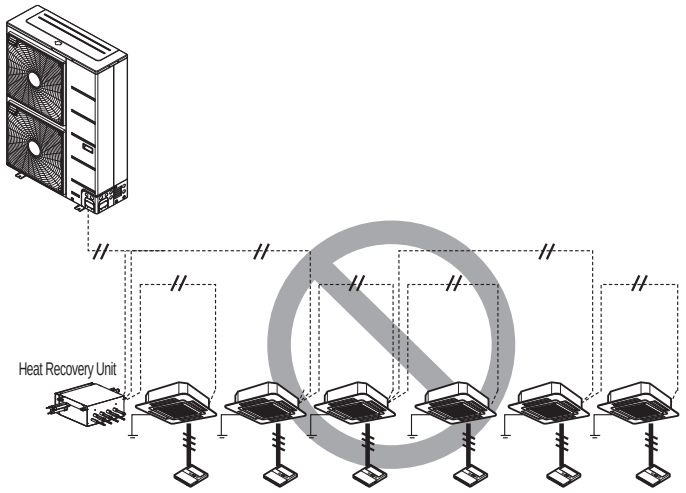


Figure 115: Example of Outdoor Unit to Indoor Unit Communication Cable Connections (Heat Pump Systems).

Communications Cable Between Outdoor Unit and Indoor Units

Outdoor Unit Communication Terminal Block

ODU		IDU		CENTRAL		DRY1	DRY2	GND	12 V
B	A	B	A	B	A				

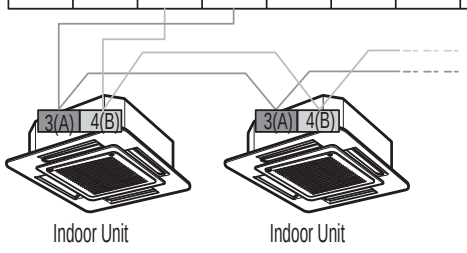
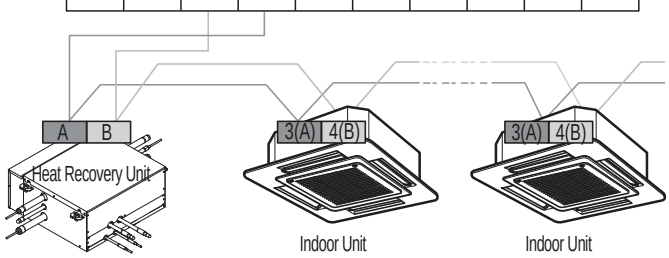


Figure 116: Example of Outdoor Unit to Indoor Unit Communication Cable Connections (Heat Recovery Systems).

Communications Cable Between Outdoor Unit and Heat Recovery Units / Indoor Units

Outdoor Unit Communication Terminal Block

ODU		IDU		CENTRAL		DRY1	DRY2	GND	12 V
B	A	B	A	B	A				



⚠ WARNING

The terminals labeled "GND" are NOT ground terminals. The terminals labeled ⏚ ARE ground terminals. Inadequate connections will generate heat, cause a fire, and physical injury or death.

Note:

- *Make sure to match IDU A and B terminals on outdoor unit to A (3) and B (4) terminals on indoor units / heat recovery units. Maintain polarity throughout the communication network. The system will malfunction if not properly wired.*
- *Always create a wiring diagram that contains the exact sequence in which all the indoor units / heat recovery units are wired in relation to the outdoor unit.*
- ⃠ *Do not include splices or wire nuts in the communication cable.*

From Outdoor Unit to Central Controllers

- Communication cable from outdoor unit to central controller is to be 18 AWG, 2-conductor, twisted, stranded, shielded. Ensure the communication cable shield is properly grounded to the outdoor unit chassis only. ⃠ Do not ground the communication cable at any other point. Wiring must comply with all applicable local and national codes.
- Connect all central control devices on the same cable if cable requirements are the same.
- Order does not matter, but polarity does. Keep “A” terminals with “A” terminals, and “B” terminals with “B” terminals. Starting at the outdoor unit, terminate the cable on terminals Internet A and Internet B.
- Route the cable as needed between each device.
- Tie shields together at each termination point.
- Add insulation material as required by local code.
- When connecting shielded wires to the central control system, connect the ground wire to the ground screw.

Cable requirements could differ depending on other installed components:

- Communication cable from outdoor unit to mode selector switch is to be 18 AWG, 3-conductor, twisted or non-twisted, stranded, shielded. Ensure the communication cable shield is properly grounded to the outdoor unit chassis only. ⃠ Do not ground the communication cable at any other point. Wiring must comply with all applicable local and national codes.

From Indoor Units to Remote Controllers

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

Figure 118: One Example of Indoor Unit to Zone Controller Connection.

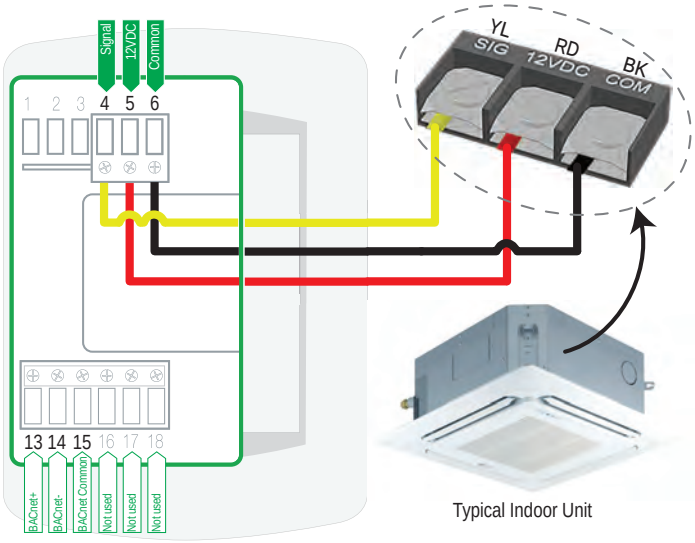
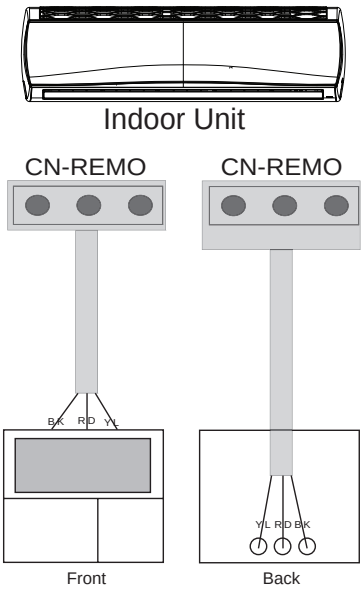


Figure 119: Another Example of Indoor Unit to Zone Controller Connection.



Note:

Cable connected to Zone Controller is the factory default connection.

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

If any indoor units were specified to operate in unison:

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

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

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

For indoor units with CN-REMO connections:

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

Note:

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

Figure 120: Example of Indoor Unit Group to Zone Controller Connections (Sig-12V-GND [Comm.] Terminal).

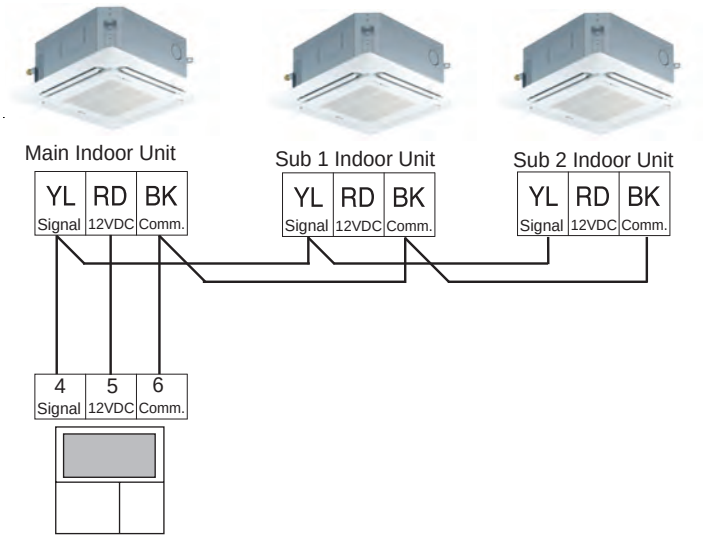
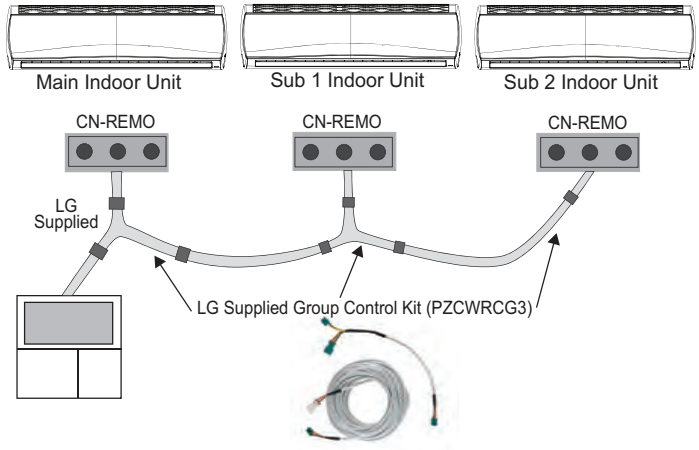


Figure 121: Example of Indoor Unit Group to Zone Controller Connections (CN-REMO).



Triple Leak / Pressure Check

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

⚠DANGER

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

Note:

- ⃠ *Do not apply power to the Multi V S with LGRED outdoor unit, the indoor units, and the heat recovery units (Heat Recovery Systems only) before performing a system leak test. There is a possibility that the EEV valves will close and isolate sections of the piping system, making the leak test inconclusive. Contact your LG Applied Rep or service technician for the procedure to reopen the EEV valves before the leak test **ONLY** if the power has been applied.*

- ⃠ *Never perform the leak test using refrigerant.*

- ⃠ *To avoid nitrogen entering the refrigerant system in a liquid state, the top of the cylinder must be higher than its bottom (used in a vertical standing position) when the system is pressurized.*

- *Use only a leak-free gauge manifold set.*

Triple Leak / Pressure Check Procedure Steps

1. After the refrigerant piping installation is complete, open the isolation ball valves, if any, that will have been included in the piping system.

2. Verify that all outdoor unit service ports are closed. The leak / pressure check is to be performed to only the refrigerant piping system and connected indoor units / heat recovery units.
   - For systems designed for heat pump operation, verify that the liquid and vapor line service ports (and to the unused service port) are closed, and the stem head access caps are tight.
   - For systems designed for heat recovery operation, verify that the hot gas line (high pressure vapor), liquid line, and suction (low pressure vapor) line service ports are closed, and the stem head access caps are tight.

3. Remove the caps on the Schrader ports. Connect the (medical-grade dry) nitrogen cylinder regulator to a gauge manifold, then connect the gauge manifold to the Schrader ports on the service ports.
   - For systems designed for heat pump operation, connect the nitrogen cylinder regulator to the gauge manifold, then connect the gauge manifold to the Schrader ports on the liquid and vapor line service ports. ⃠ Do not connect to the unused port.
   - For systems designed for heat recovery operation, connect the nitrogen cylinder regulator to the gauge manifold, then connect the gauge manifold to the Schrader ports on the hot gas line (high pressure vapor), liquid line, and suction (low pressure vapor) service ports.

4. Perform the leak / pressure check at 150 psig for five (5) minutes (standing pressure check).

5. Perform the leak / pressure check at 300 psig for fifteen (15) minutes (standing pressure check).

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

Triple Leak / Pressure Check Procedure Steps, continued.

Note:

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

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

Ambient Conditions and the Leak / Pressure Check

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

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

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

Thus, (80°F - 68°F) x 0.79 = 9.5 psig.

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

8. If the pressure drops and it is not due to ambient conditions, there is a leak and it must be found. Remove the bubble solution with a clean cloth, repair the leak(s), and perform the leak / pressure check again.

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

Figure 122: Leak / Pressure Test for Systems Designed for Heat Pump Operation.

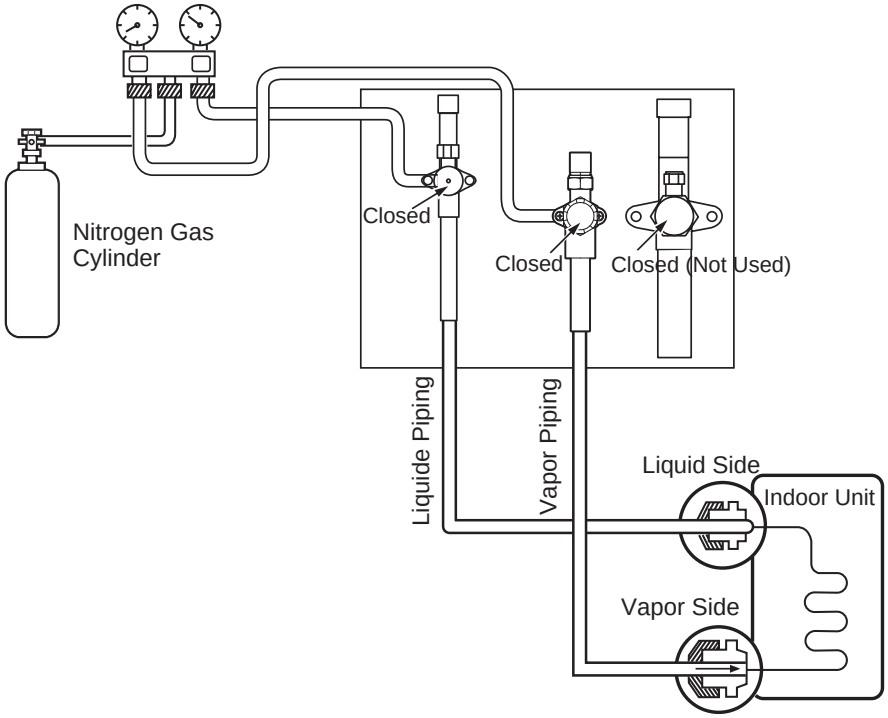
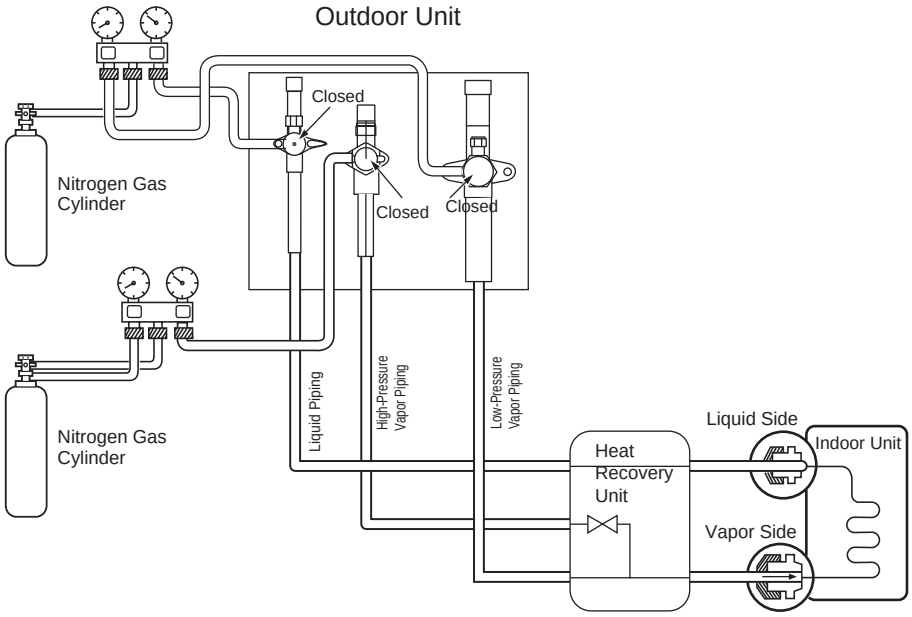


Figure 123: Leak / Pressure Test for Systems Designed for Heat Recovery Operation.



Triple Evacuation Procedure

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

Note:

- *For faster evacuation, the Schrader core can be removed, and an auxiliary service port can used. Make sure to re-install the original Schrader core before operating the system.*
- *For Heat Pump systems, evacuate through both the liquid and vapor refrigerant lines. For Heat Recovery systems, evacuate through all three (3) hot gas line (high pressure vapor), liquid line, and suction (low pressure vapor) refrigerant lines.*
- *The outdoor unit service valves must remain closed and the stem head access caps tight. ⃠ Do not open the outdoor unit service valves and release the factory refrigerant charge until the LG trained commissioner authorizes to do so. The system must be left in vacuum until the LG trained commissioner verifies the quality of the evacuation.*
- *Any field-installed ball valves in the refrigerant system (if used) must be open to ensure all piping is free and clear for evacuation on all piping and connected indoor units / heat recovery units.*

Note:

- ⃠ *Do not apply power to the Multi V S with LGRED outdoor unit, the indoor units, and the heat recovery units before performing a system evacuation. There is a possibility that the EEV valves will close and isolate sections of the pipe system, making the evacuation procedure inconclusive. Contact your LG Applied Rep or service technician for the procedure to reopen the EEV valves before evacuation only if the power has been applied.*
- ⃠ *Never perform evacuation using refrigerant.*
- *Use only a vacuum pump that can reach 500 microns, vacuum rated hoses or copper tubing, and a leak-free gauge manifold set.*
- *Use only new vacuum pump oil from a properly sealed (unopened) container, and change oil in pump before **EVERY** use.*
- *Subsequent oil changes will be necessary after several hours of continuous operation; have extra oil on hand.*
- *Use a quality micron gauge in good operating order and install as far away from pump as possible.*

Triple Evacuation Procedure Steps

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

Note:

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

2. Connect the gauge manifold along with the vacuum pump to the Schrader ports (with core removed) using vacuum hoses. Open the gauge manifold and the vacuum pump valves.

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

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

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

6. Evacuate to 1,000 micron level. Isolate the pump by closing the manifold gauges and the vacuum pump valve, and then watch the micron level. Micron level could rise a bit, but MUST eventually stop rising for fifteen (15) minutes.
   - If the micron level DOES NOT stop rising, there is a leak, and the leak test must be performed again.
   - If the micron level DOES rise above 1,000 micron, re-open the manifold gauges and the vacuum pump valve, and continue evacuation back down to 1,000 micron level.
   - If the micron level holds at 1,000 micron, continue to step 7.

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

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

9. Evacuate to static micron level ≤500.

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

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

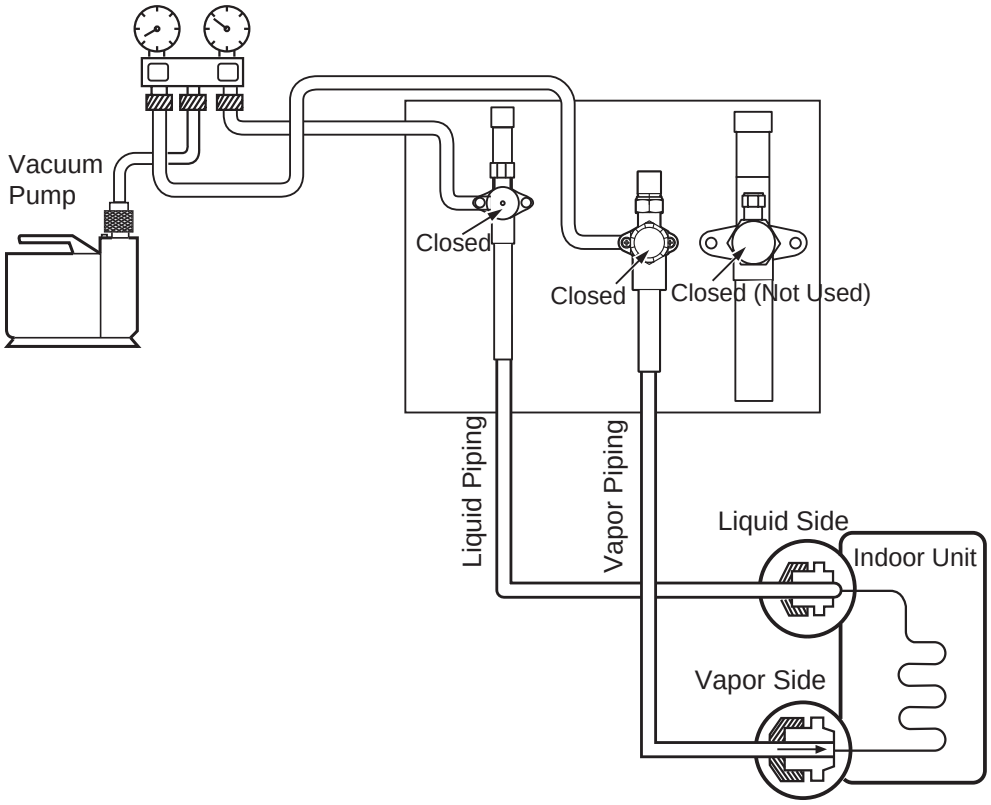
12. Close manifold gauges.

13. Shut the valve before turning off the vacuum pump.

Note:

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

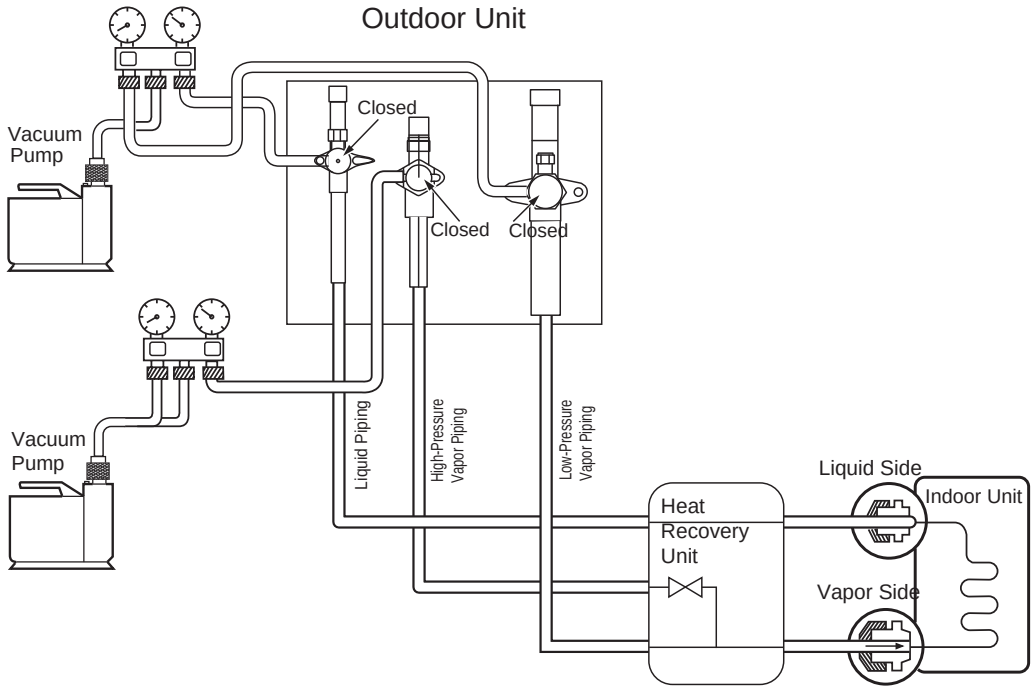
Figure 124: Triple Evacuation Diagram for Heat Pump Systems.



⚠ DANGER

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

Figure 125: Triple Evacuation Diagram for Heat Recovery Systems.



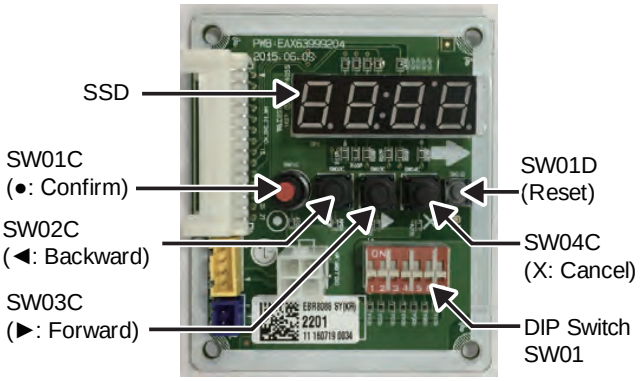
Vacuum Mode (Option) (SE3, VACC)

The vacuum mode can be used as an option for creating vacuum in the system when the outdoor unit is first installed, if power is available, and if the system has already been auto addressed. Vacuum mode enables the system to fully open all valves, and can help speed up the evacuation process.

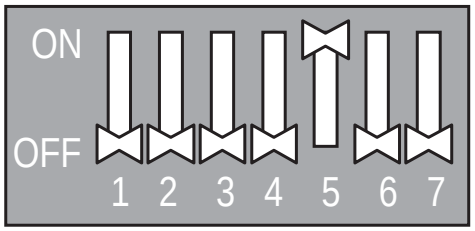
Vacuum mode can also be used when compressor and / or outdoor unit parts are replaced, or when an indoor unit is added or replaced.

1. Turn No. 5 on the outdoor unit DIP Switch SW01 to ON.
2. Select the “SVC” mode By using the ► and ◄ buttons, then push the ● button.
3. Select the “Se3” function By using the ► and ◄ Buttons, then push the ● button.
4. Start the vacuum mode “VACC”. In vacuum mode, the outdoor unit valve is open, the outdoor unit EEV is open, and the indoor unit(s) EEV(s) is/are open. The heat recovery unit(s) valve(s) and EEVs are open (if system includes heat recovery units).
5. To cancel the vacuum mode, turn No. 5 on the outdoor unit DIP Switch SW01 to OFF, and push the SW01D reset button.

Figure 126: Vacuum Mode Setting Locations.



No. 5 on SW01 DIP Switch



Setting Vacuum Mode

Turn Outdoor Unit No. 5 on DIP Switch SW01 to ON.

↓

Select the “SVC” Mode By Using the ► and ◄ Buttons, then Push the ● Button.

↓

Select the “Se3” Function By Using the ► and ◄ Buttons, then Push the ● Button.

↓

Start the Vacuum Mode “VACC.”
- Outdoor Unit Valve is Fully Open.
- Outdoor Unit EEV is Fully Open.
- Indoor Unit(s) EEV(s) is/are Fully Open.
- Heat Recovery Unit(s) Valves and EEVs are Fully Open (If System Includes Heat Recovery Units).

Canceling Vacuum Mode

Turn No. 5 on the Outdoor Unit DIP Switch SW01 to OFF.

↓

Push the SW01D Reset Button on the Outdoor Unit.

Note:

- *Outdoor unit operation stops during Vacuum Mode, so the compressor cannot operate.*
- *Limit vacuum mode to less than 48 hours of continuous operation. If vacuum mode continues beyond 48 hours with all solenoid valves open, it could result in poor operation, equipment malfunction and / or compressor damage.*

Pre-Commissioning Process

After successfully completing the leak / pressure check and triple evacuation procedures, begin the pre-commissioning process. The pre-commissioning process will prepare the system for commissioning in several steps:

1. Verify facility power is correct.
2. Power up the system.
3. Verify power at the system is correct.
4. Run self diagnostics check.
5. Assign a system address to indoor units.
6. Assign addresses to heat recovery units (heat recovery systems only).
7. Assign each central control device an address.

Prepare the Electrical System

Multi V S with LGRED outdoor units require 208-230V / 60Hz / 1Ø power. Verify that the power and phase requirements are correct. If the electrical power is dirty, the unit will shutdown on a compressor safety and/or the lifespan will be reduced.

Multi V S with LGRED outdoor units are inverter driven. ⃠ Do not install a phase-leading capacitor. If one is included, it will deteriorate the power factor improvement effect, and will cause the capacitor to generate an abnormal amount of heat.

1. Verify correct, clean, specified power is at the line side of each system component's disconnect.
2. Note if the green LED light on the component PCB board is illuminated.

Setting Outdoor Units to Heat Pump or Heat Recovery Systems

Multi V S with LGRED outdoor units are factory set to heat recovery operation—all switches on DIP Switch bank are set to OFF. **Multi V S with LGRED outdoor units MUST be manually set to a heat pump system.** To change the factory set heat recovery system to a heat pump system:

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

Figure 127: Heat Recovery System DIP Switch Setting on Multi V S with LGRED Outdoor Units (Factory Set).

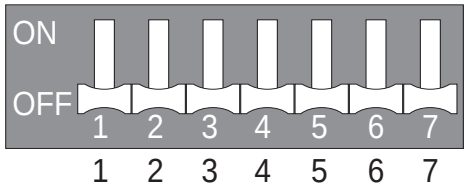
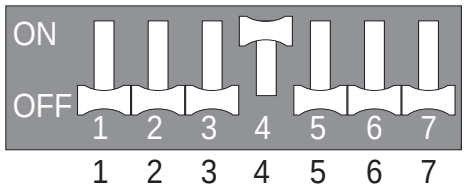


Figure 128: Heat Pump System DIP Switch Setting on Multi V S with LGRED Outdoor Units (Manually Set).



Checking Outdoor Unit Settings

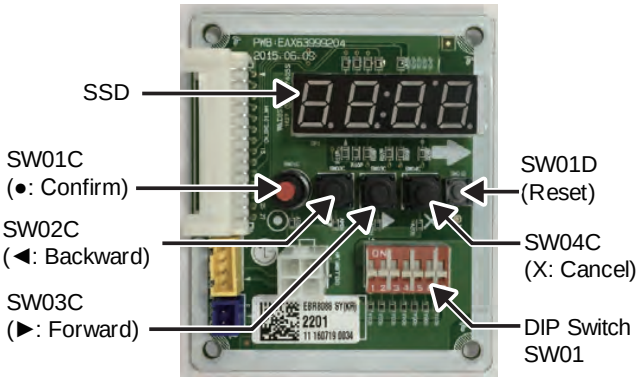
Initial Display

Outdoor unit settings are sequentially displayed in the SSD five (5) seconds after applying power. All displays are shown on the outdoor unit.

DIP Switch Settings

DIP switch settings must be changed with the system power OFF (settings won't be applied). All displays are shown on the outdoor unit SSD.

Figure 129: Checking Outdoor Unit Settings.



Optional Modes

Function Modes (Func, Fn)

Modify the operation of one (1) or more components of the system. Setting a Function Mode typically impacts the universal operation of the refrigeration system control.

Service Modes (SvC, Se)

Must only be used by LG trained service technicians who have in-depth knowledge and experience working with Multi V systems. Service codes provide manual control of the system component(s) as aides in isolating an operation problem during initial commissioning / startup, assist with diagnosing an operation problem, or used to modify the operation of the oil return and/or defrost cycles.

Saving Optional Mode Settings

The outdoor unit must be reset after the optional mode changes have been made.

1. Compressor speed operation.
2. Outdoor unit fan speed operation.
3. System target pressure variables.

For specific, more detailed information, see the instructions for each mode on the next few pages. The short list of optional modes in this manual will be useful for installation. For other modes that will be used for service, etc., purposes, see the Multi V S with LGRED Service Manual.

How to Cycle the Power:

1. Open the outdoor unit control box.
2. Find the SW01D Reset Button.
3. Press the SW01D Reset Button one (1) time.

Setting the Optional Modes

To access and set the different modes, first turn No. 5 on the outdoor unit DIP Switch SW01 to ON. Then, select the “Func” or “SvC” mode by using the SW03C forward ► button and the SW02C backward ◄ button, and then press the SW01C confirm ● button.

Note:

- *To set the optional modes / functions, all indoor units must be OFF. Mode / function settings won't save, nor will operate unless all indoor units are OFF.*
- *If system power was reset, some modes / function settings will be automatically saved in the EEPROM. Other modes / functions will reset when power is cycled off. See next pages for details on specific modes / functions.*

Figure 130: Location of DIP Switches and Setting Buttons on the Outdoor Unit.

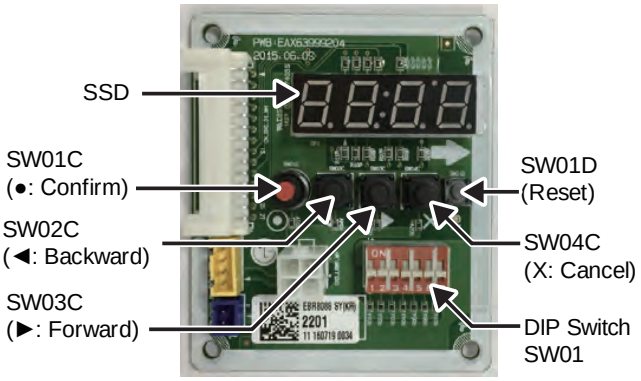


Figure 131: No. 5 on DIP Switch SW01 ON.

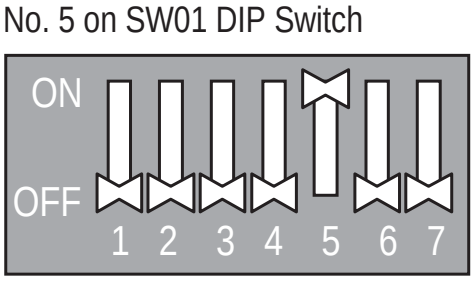


Table 38: Optional Modes.

Mode Selection		Selection		Selection		Notes
Content	Display	Mode / Function Name	Display	Default	Options	
Function	Func	Cool / Heat Selector Switch (Installed)	Fn1	oFF	oFF, oP1~oP2	Saved in EEPROM; Off = Not Installed
		Night Low Sound	Fn3	oFF	oFF, oP1~oP12	Saved in EEPROM
		Outdoor Unit Addressing	Fn5	0	0~255	Saved in EEPROM.
		Snow Removal Assist / Rapid Defrost	Fn6	oFF	oFF, oP1~oP3	Saved in EEPROM.
Service	SvC	Vacuum Mode	SE3, VACC	VACC	-	One Time / One Selection

Cool / Heat Selector (Fn1)

The setting communicates to the outdoor unit that the optional LG Cool / Heat Selector (or appropriate field-provided relays and wiring that perform the same task) is connected to the system. The Cool / Heat Selector is field-wired to the “Dry 1” and “Dry 2” terminals located on the outdoor unit Main PCB.

The Cool / Heat Selector has two switches. The two-position upper switch manually locks out heating and cooling operation, allowing fan only, or heating or cooling operation depending on the position of the lower switch. The two-position bottom switch and manually sets the position of the outdoor unit’s reversing valve. If the left side is depressed, the valve is in the cooling position. If the right side is depressed, the valve is in the heating position. The Cool / Heat Selector also provides a method for locking out compressor operation by placing the “Fan Only” toggle switch in the “On” position.

- Off (Default): No Cool / Heat Selector installed, or the Cool / Heat Selector is installed, but has not been identified by the outdoor unit.
- On: Cool / Heat Selector installed and operational. When On is selected:
  - The left side of the upper switch is depressed. Mechanical refrigeration is locked out and the indoor unit fans are allowed to operate. The position of the lower switch is irrelevant.
  - The right side of the upper switch is depressed, the lower switch has the right side depressed, and the system is operating in cooling.
  - The right side of the upper switch is depressed, the lower switch has the left side depressed, and the system is operating in heating.

Use the Cool / Heat Selector in heat pump systems to set the system mode for all cooling operation, all heating operation, fan only, or dry operation (when all indoor units have to be in the same mode).

For use in heat pump systems only.

Figure 132: Cool / Heat Selector.

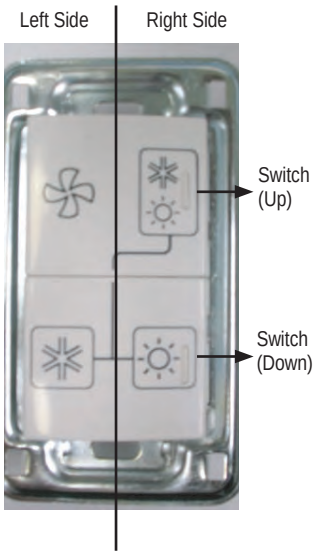
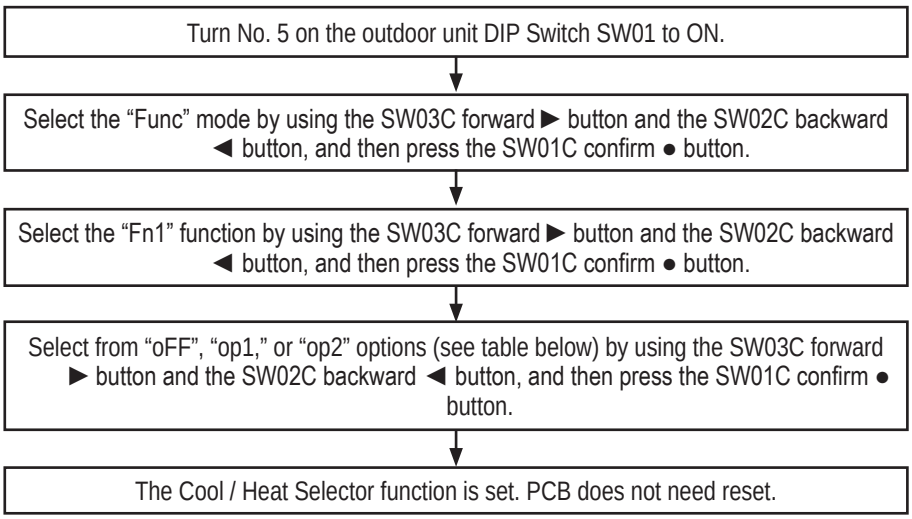


Figure 133: Setting the Cool / Heat Selector Function.



Note:

- *The Cool / Heat Selector must be installed first before setting the cool / heat operation function.*
- *A trained LG service provider must set this function during system installation.*
- *If cool or heat function is not used, set to OFF.*
- *Cool / Heat Selector is flagged as the Main on the central control communications bus.*
- *Cool / Heat Selector is not for use with central control.*

Table 39: Cool / Heat Selector Function Settings.

Switch Control		Function		
Switch (Up)	Switch (Down)	oFF	op1 (Mode)	op2 (Mode)
Right Side (On)	Left Side (On)	Not Operating	Cooling	Cooling
Right Side (On)	Right Side (On)	Not Operating	Heating	Heating
Left Side (Off)	-	Not Operating	Fan Mode	Off

Night Low Sound Function (Fn3)

The Night Low Sound Function reduces the operating speed of the outdoor unit fans (according to the input signal) during “off-peak” hours under normal circumstances when in cooling mode. Operating at a low RPM reduces the fan sound levels of the outdoor unit at night (or other off-peak hours), which usually has a low cooling load.

On a rolling 24 hour basis, an internal timer begins counting hours after the start time (delay set after peak cooling recorded operation), switching to restricted fan speed duration operation, following whatever settings have been chosen.

For use on both heat pump and heat recovery systems.

- Timed algorithm. Restricted fan speed period length and start delay is selectable.
- Delay timer starts each day when, during a one (1) minute period the highest demand for cooling is recorded by the outdoor unit.

Note:

A trained LG service provider must set this function during system installation.

Figure 134: Setting the Night Low Sound Function.

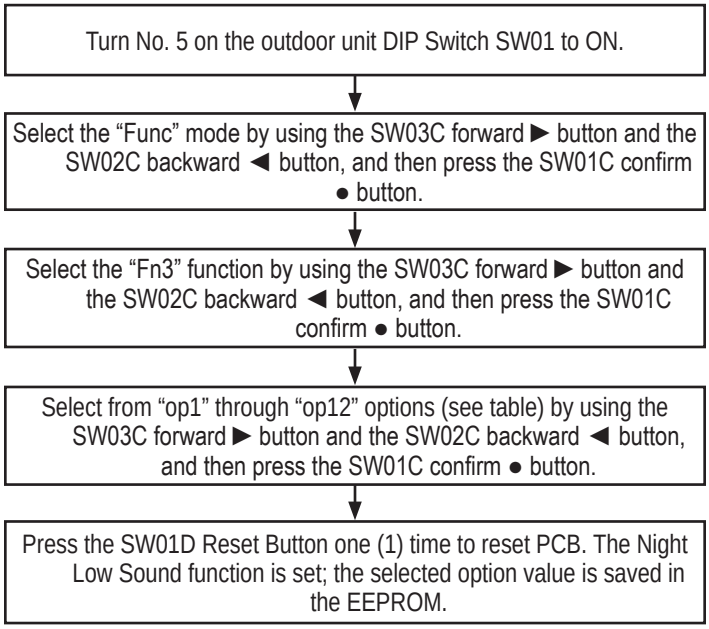


Table 40: Setting the Time and Related Sound Level.

Settings	Start Time (Delay after Peak Cooling Recorded) (Hour)*	Restricted Fan Speed Duration (Hour)	Approximate Sound Level dB(A)
			3 and 4 Ton
op1	8.0	9.0	51
op2	6.5	10.5	51
op3	5.0	12.0	51
op4	8.0	9.0	49
op5	6.5	10.5	49
op6	5.0	12.0	49
op7	8.0	9.0	47
op8	6.5	10.5	47
op9	5.0	12.0	47
op10 (Default)	0.0 (Continuous Operation)	24.0	51
op11	0.0 (Continuous Operation)	24.0	49
op12	0.0 (Continuous Operation)	24.0	47

*The system measures ambient temperature (minimum and maximum) in “Wait Time” to help determine when the system can start operating in Night Low Sound.

Outdoor Unit Addressing Function (Fn5)

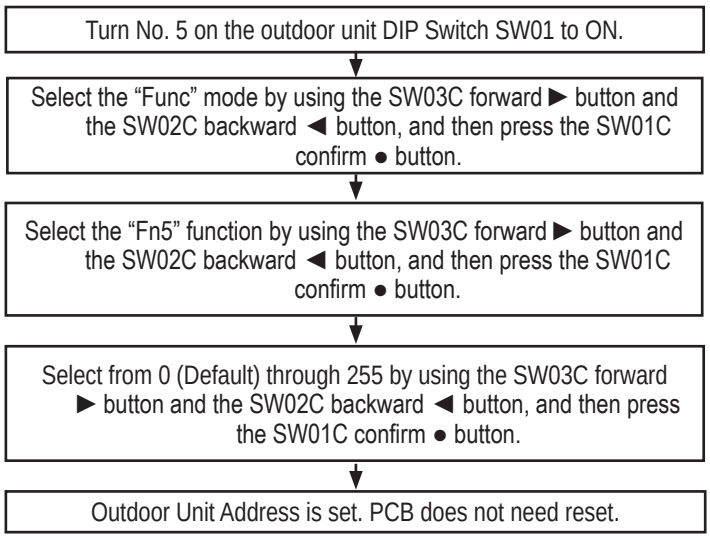
Use this function to set the system address of the outdoor unit when a central controller has been installed. If multiple systems are wired to the central control bus, each system is assigned to a unique outdoor unit address. If not properly addressed, a communication error could occur or one (1) or more of the systems.

For use on both heat pump and heat recovery systems.

Note:

- *The central controller must be installed first before setting the outdoor unit address.*
- *A trained LG service provider must set this function during system installation.*

Figure 136: Setting the Outdoor Unit Address Function.



Snow Removal Assist / Rapid Defrost Function (Fn6)

Snow Removal Assist

Snow Removal Assist function allows the outdoor unit fans to operate at regular intervals, for two (2) minutes, at specified speeds (as seen in the tables below) to remove snow accumulation from the fan discharge.

The function will only operate when the system has not called for compressor activity (no demand for heating or cooling) for thirty (30) minutes, and when the outdoor air temperature is <37ºF. Operates every thirty (30) minutes for two (2) minutes. Function will stop if there is an operation error code, or if a compressor starts. Use this function in areas where snow accumulating on the fan blades and fan guard is common.

Rapid Defrost

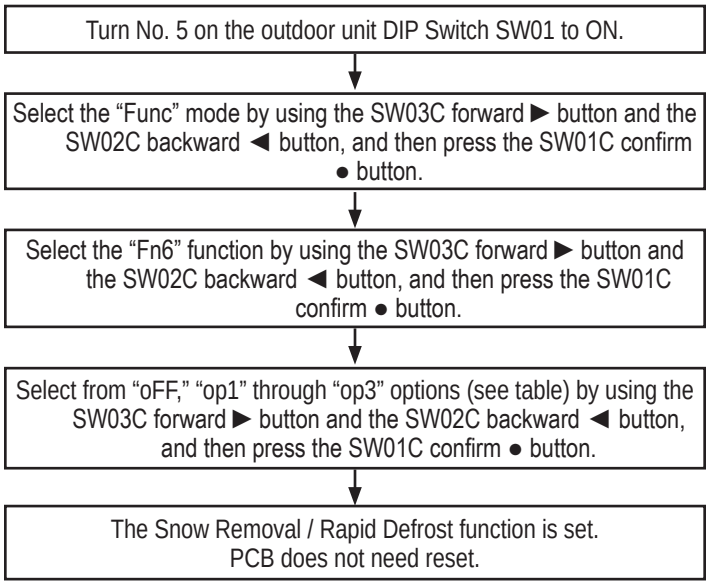
Rapid Defrost function limits the amount of frost and ice are allowed to build on the coil between defrost cycles (defrost cycles occur more often). System pressure is monitored, and when system pressure is reduced, the defrost cycle is initiated.

Snow Removal Assist and Rapid Defrost can be used on both heat pump and heat recovery systems.

Table 41: Setting the Snow Removal / Rapid Defrost Function.

Settings	Details
oFF (Default)	Mode Is Not Set
op1	Snow Removal Assist Mode
op2	Rapid Defrost Mode
op3	Snow Removal Assist Mode and Rapid Defrost Mode

Figure 135: Setting the Snow Removal / Rapid Defrost Function.



Note:

- *A trained LG service provider must set this function during system installation.*
- *If the snow removal / rapid defrost mode is not used, set to OFF.*

Indoor Unit Auto Addressing Procedure

⚠ WARNING

Disconnects must only be operated by a properly licensed electrician at this time. ⃠ Never look at a disconnect switch when closing. Turn away from the switch when closing. Incorrect wiring could cause the disconnect to explode, physical injury, and / or death.

Note:

- *Supply power to the indoor units. If power is not supplied, an operation error will occur.*
- *During the pre-commissioning process for systems with Gen 4 indoor units, ⃠ do not change any DIP Switch settings except for No. 3 on SW01B, which must be ON to enable Gen. 4 features. All other combinations of switches (one [1] through seven [7]) must be left in the OFF position on the outdoor unit DIP Switch SW01B. Refer to this section for the proper setting of No. 3 on SW01B.*
- *If the Auto Address Procedure has never been successfully completed for the system, the compressor will not start when power is applied to the unit.*
- *Auto addressing is only possible on the outdoor unit, and has to be performed after more than three (3) minutes after initial power is supplied to improve indoor unit communications.*
- *If an indoor unit PCB has been replaced, the auto addressing procedure must be performed again.*

1. Verify all that all indoor units connected to the system have power to the PCB board AND all wired controller system start buttons are OFF.
2. Remove the access panel and unit control box cover from the outdoor unit, if applicable. Place panels and screws in a secure area.
3. Verify that the communications cable between the indoor units and the outdoor unit is terminated at the outdoor unit terminals IDU(A) and IDU (B). Connect the central control cable to the outdoor unit central control terminals.
4. Verify the shield on the communications cable is grounded at the outdoor unit.
5. Cycle power on the outdoor unit, indoor units, etc., and wait three (3) minutes while the outdoor unit sequences through the self-diagnostics check, and to improve indoor unit communication when initial power is supplied. Leave disconnect in the "ON" position.
6. Check the outdoor unit current configuration code(s). Observe the unit setup codes using the SSD display found on the outdoor units PCB.

Note:

After the self-diagnostics check is complete, the SSD must be clear and nothing displayed. Diagnostic process could take from three (3) to seven (7) minutes.

7. Know how many indoor units are connected to the system.
8. Press and hold the SW01C button for about five (5) seconds. Release when “88” appears on the SSD of the outdoor unit. After three (3) to seven (7) minutes, the display will flash a number for about thirty (30) seconds, indicating how many total indoor units the system successfully communicated with.
9. This number must match the known installed number of indoor units if the auto addressing procedure was successful. If using LGMV, read the address of each indoor unit. The address of each indoor unit is also indicated on wired remote control displays.
10. Upon completion of the auto addressing routine, the display will be blank and the system will be in standby waiting for another command.
11. Upon successful completion of the auto address procedure, record the system address assigned to each indoor unit by the auto address procedure in the column provided on the Pre-Commissioning Device Configuration Worksheet.

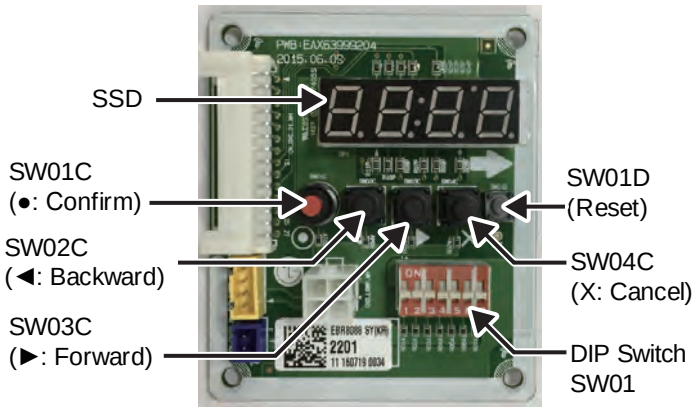
Indoor Unit Auto Addressing Procedure, continued.

12. After recording the system addresses assigned to each device, open the outdoor unit disconnect. Remove the outdoor unit to indoor unit communications cable from terminals IDU(A) and IDU(B). Disconnect the central control cable from the outdoor unit central control terminals. Protect conductors by placing electrical tape over the bare ends.

13. Close the disconnect to reapply power to the outdoor unit and energize the compressor crankcase heater. Once again, verify that the outdoor unit to indoor unit(s) communications cable is not connected to terminals IDU(A) and IDU(B) of the outdoor unit., and that the central control cable has been disconnected from the outdoor unit central control terminals.

14. Replace the control panel door.

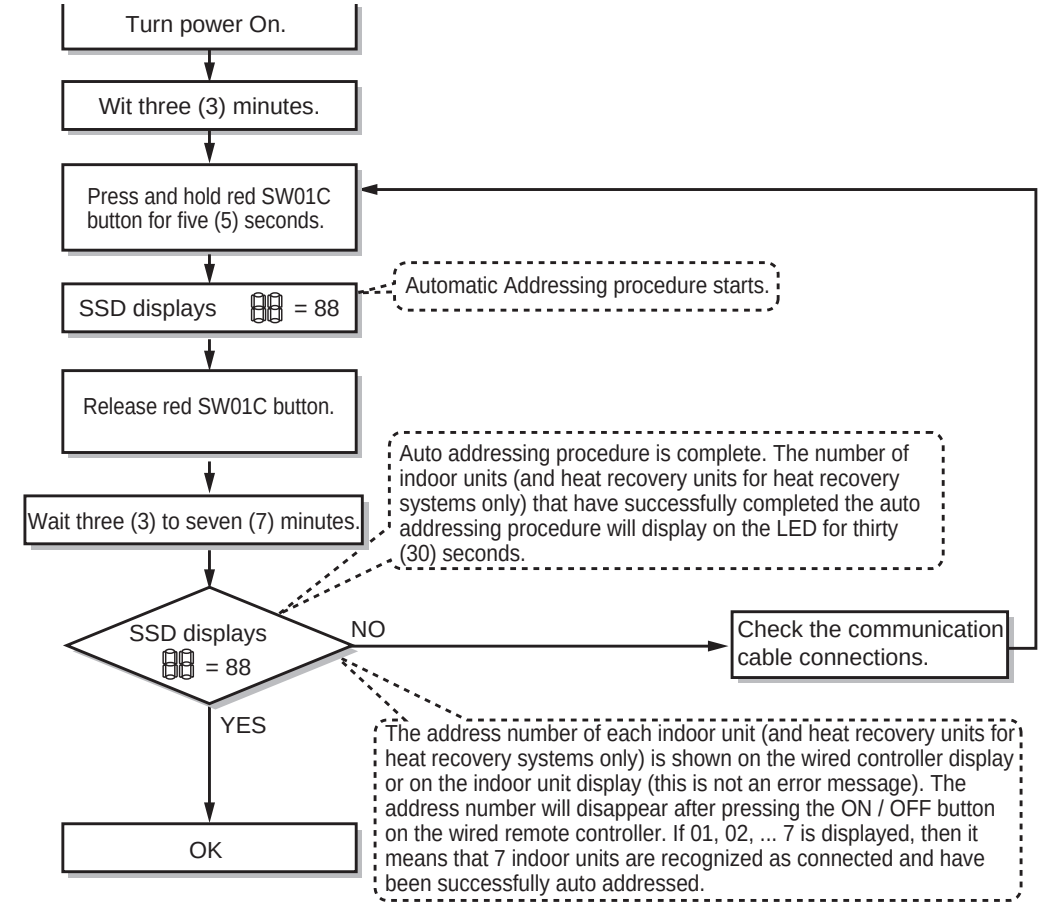
Figure 137: Auto Addressing Button Location on Outdoor Unit PCB.



⚠WARNING

Upon successful completion of the auto addressing function, an unintentional compressor start can occur unless the communications cable to the indoor units is removed from the outdoor unit terminals IDU(A) and IDU(B). ⃠ Do NOT open the service valves or attempt to start outdoor unit compressor until directed by the LG trained commissioner. Major damage to the unit piping and compressors will occur, and there is a risk of explosion, suffocation, physical injury, and / or death.

Figure 138: Auto Addressing Flowchart.



Troubleshooting a Failed Indoor Unit Auto Addressing Procedure

If the quantity of indoor units (and heat recovery units if heat recovery system only) the auto addressing procedure found is incorrect, or the “88” never disappears from the display for the seven (7) minutes, the auto address procedure has failed and a communications problem exists. If the Auto Address Procedure failed:

1. Verify ALL indoor unit (and heat recovery units if heat recovery system only) ON/OFF buttons are in the OFF position (i.e., ON / OFF button NOT illuminated).
2. Check the terminations, polarity, and continuity of each conductor on the communications cable between the outdoor unit and the indoor units (and heat recovery units if heat recovery system only). Verify the indoor unit (and heat recovery units if heat recovery system only) to outdoor unit communications cable is wired correctly. Verify that the central control cable is connected correctly to the outdoor unit central control terminals.
   - Verify the conductor connected to the “3” (or “5” in the case of cassette frame codes TN, TM) terminals on all indoor units and is terminated on the outdoor unit terminal tagged IDU(A).
   - In a similar fashion, verify the conductor connected to all indoor units on the “4” (or “6” in the case of cassette chassis codes TN, TM) terminals and is terminated on the outdoor unit terminal tagged IDU(B).
3. Verify the shield of the communications cable is grounded at the outdoor unit only. All segment shields must be spliced together and insulated at each indoor unit (and heat recovery units if heat recovery system only) and NOT grounded.
4. After repairing the communications cable, go to Step 9 of the Auto Addressing Procedure and repeat the process until successful: Press and hold the red SW01C button for about five (5) seconds. Release when “88” appears on the SSD. After three (3) to seven (7) minutes, the display will flash a number for about thirty (30) seconds indicating how many total indoor units (and heat recovery units if heat recovery system only) the system successfully communicated with.
5. This number must match the known installed number of indoor units (and heat recovery units if heat recovery system only) if the auto addressing procedure was successful.
6. Upon completion of the auto addressing routine, the display will be blank and the system will be in standby waiting for another command.
7. Record the system address the outdoor unit assigned to each indoor unit (and heat recovery units if heat recovery system only) by the auto address procedure in the column provided on the Pre-commissioning Device Configuration Worksheet (See the Multi V S with LGRED Installation Manual).
8. After recording the system addresses assigned to each device, open the outdoor unit disconnect. Remove the outdoor unit to indoor unit (and heat recovery units if heat recovery system only) communications cable from terminals IDU(A) and IDU(B). Disconnect the central control cable from the outdoor unit central control terminals. Protect conductors by placing electrical tape over the bare ends to prevent an accidental compressor start from occurring before the LG trained commissioner arrives.
9. Close the disconnect to reapply power to the outdoor unit and energize the compressor crankcase heater. Once again, verify the outdoor unit to indoor unit(s) communications cable is not connected to terminals IDU(A) and IDU(B) of the outdoor unit, and that the central control cable has been disconnected from the outdoor unit central control terminals.
10. Replace the panel cover.

Group Controlling Indoor Units

If any of the indoor units were specified to operate in unison, create a group control communications circuit between the indoor units using field wiring (with indoor units that have SIG - 12V - GND [Comm.] terminals), or a group control cable kit (with indoor units that have CN-REMO).

1. Before proceeding with group control cable terminations, verify power is OFF at all applicable indoor units.
2. Identify which indoor unit will be the “Main” unit of the group. If not already recorded, record the "Main" and the "Sub" identity assignment to each indoor unit in the group on the Pre-commissioning Device Configuration Worksheet.
3. SIG - 12V - GND [Comm.] Terminal Procedure
   - From the controller to the Main indoor unit, use 22 AWG, 3-conductor, twisted, stranded, unshielded.
   - From the Main indoor unit to the Sub indoor unit(s), daisy chain using 22 AWG, 3-conductor, twisted, stranded, unshielded (⃠ Do not attach wire to 12VDC terminal to the Sub indoor units). All wiring must comply with all applicable local and national codes.
   - All wiring must comply with all applicable local and national codes.
4. CN-REMO Termination Procedure:
   - Starting with the Main indoor unit, plug in the male end of the pigtail cable into the CN-REMO socket. At the last Sub indoor unit in the group, a pigtail cable is not required. Plug the male end of the extension cable coming from the previous indoor unit into the CN-REMO socket.
   - Plug the Y-cable into the pigtail at each indoor unit except for the last Sub indoor unit in the group where no Y-cable will be needed.
   - Connect two extension cable segments to each “Y” cable except for the “Y” cable connected to the Main indoor unit. At the Main indoor unit, connect one extension cable and the communications cable from the zone controller to the Y-cable.

Central Control

Central Control Addresses Assignments

Gather any preferences the project has; if there are no preferences:

- Hex assignments do not have to be assigned in any particular order, or an order defined by the routing of the communications cable between the indoor units. In most cases, Hex addresses can be skipped.
- All members of a Hex Group are not required to be on the same Multi V S with LGRED system.
- Addresses can be assigned sequentially (if possible); or at random, not in any particular order, and can be skipped.

Indoor Unit Central Control Address Assignments

A central control address is made up of two hexadecimal characters.

- The first character in the central control address is the Hex Group Identifier.
  Possible Hex Group Identifiers (in order of lowest to highest) are 0-9 followed by A-F. See complete list in table at right.
- The second character in the address is the Hex Member Identifier in a Hex Group.
  Hex Member Identifiers (in order from lowest to highest) are 0-9 followed by A-F. See complete list in table at right.

Hex Address Assignment Limitations

- There is a limit of 16 Units per Hex Group (Multi V S with LGRED outdoor units can support 6 or 8 indoor units depending on model number).
- There is a limit of 16 Hex Groups per system.
- There is a limit of 256 possible Unit Identifiers per Central Control (See Central Controller Communications Limitations).

Setting Central Control Addresses

1. Verify power to the whole system, including indoor units and outdoor unit(s), is OFF. If not, turn OFF.
2. If not installed already, connect the communication cable from CEN. A and CEN. B terminals on the outdoor unit to A and B terminals on the central controller. Polarity matters, so make sure A to A and B to B.
3. Power the whole system ON.
4. Set the group and indoor unit numbers using the wired remote controllers.
5. To control several sets of indoor units as a group, set the group I.D. settings from 0 to F.

Figure 139: Central Control Address Nomenclature.

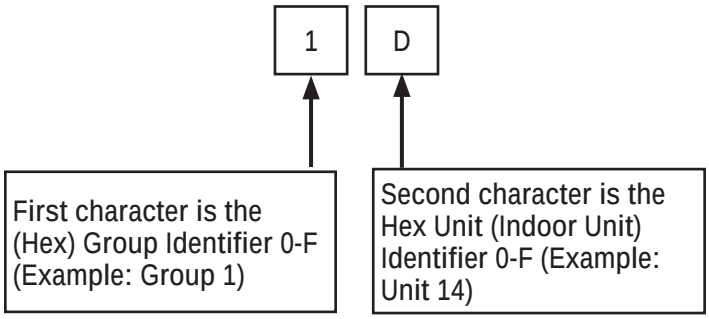
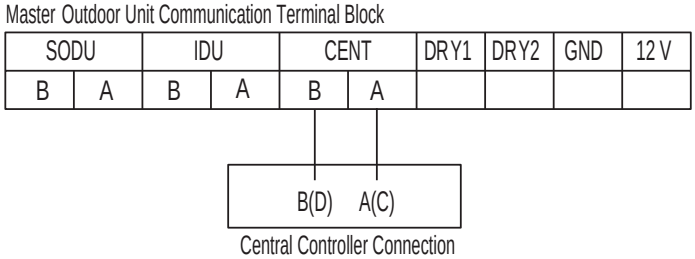


Table 42: Central Control Address Nomenclature List.

Group Control by Central Controller
No. 0 Group (00 ~ 0F)
No. 1 Group (10 ~ 1F)
No. 2 Group (20 ~ 2F)
No. 3 Group (30 ~ 3F)
No. 4 Group (40 ~ 4F)
No. 5 Group (50 ~ 5F)
No. 6 Group (60 ~ 6F)
No. 7 Group (70 ~ 7F)
No. 8 Group (80 ~ 8F)
No. 9 Group (90 ~ 9F)
A Group (A0 ~ AF)
B Group (B0 ~ BF)
C Group (C0 ~ CF)
D Group (D0 ~ DF)
E Group (E0 ~ EF)
F Group (F0 ~ FF)

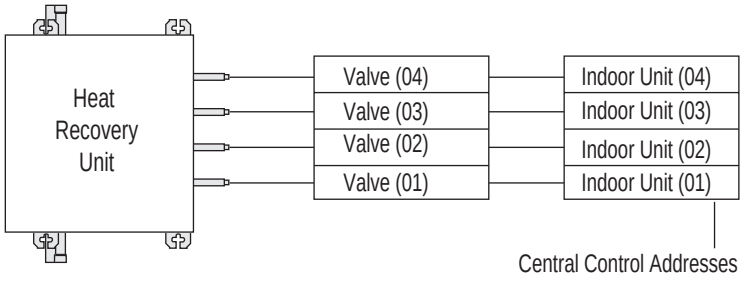
Figure 140: Outdoor Unit to Central Controller Communication Connections.



Central Control and Indoor Units Connected to Heat Recovery Units

Note:

The heat recovery unit valve address and the central control address of its corresponding indoor unit must be set using the same number (in manual addressing).



Controller Communications Limitations

Each type of Controller device is designed to communicate with a limited quantity of indoor units. The quantity of indoor units that can be connected to a single control communications cable, therefore, will be defined by the control device on that cable with the smallest Maximum Indoor Unit Quantity as shown in the tables at right. (Multi V S with LGRED outdoor units can support 6 or 8 indoor units depending on model number.)

Table 43: Central Controller Indoor Unit Connection Limitations.

Central Control Device	Maximum Indoor Unit Quantity
ACP	256
AC SMART	128

Table 44: Integration Solutions Indoor Unit Connection Limitations.

Integration Solutions	Maximum Indoor Unit Quantity
MultiSITE™ Communications Manager	128
AC Smart BACnet® Gateway	128
ACP BACnet Gateway	256
ACP LonWorks® Gateway	64

BACnet® is a trademark of ASHRAE; LonWorks® is a trademark of Echlelon Corporation.

Group Number

If the building operator wants to know which indoor units are on each outdoor unit (Multi V S with LGRED outdoor units can support 6 or 8 indoor units depending on model number), and multiple systems serve a building:

- Assign a Group Number to each system. If there are more than 6 or 8 indoor units on a system, multiple Group Numbers will be necessary. (Multi V S with LGRED outdoor units can support 6 or 8 indoor units depending on model number.)
- Addresses can be assigned sequentially (if possible); or at random, not in any particular order, and can be skipped.

If the building owner wants to know which indoor units are on each floor:

- Assign a different group number for each floor. If there are more than 6 or 8 indoor units on a floor, multiple Group Numbers will be necessary. (Multi V S with LGRED outdoor units can support 6 or 8 indoor units depending on model number.)
- Addresses can be assigned sequentially (if possible); or at random, not in any particular order, and can be skipped.

Unit Number

Can be assigned at will or for example, can follow the room layout on each floor.

For each LG Central Controller product provided on the project, devise a central control address schedule and assign a central control address to each indoor unit(s), etc. Record this central control address for each component in the column provided on the Pre-commissioning Device Configuration Worksheet.

Upload Central Control Address to the Indoor Units

For all ducted, vertical and floor standing indoor units, the central control address must be assigned using a wired zone controller. Wall-mount, ceiling cassette, ceiling suspended, and the wall / ceiling convertible indoor units, the central control address can be assigned using a wireless handheld controller or a wired zone controller.

For Indoor Units That ARE NOT Being Controlled as a Group

1. Verify the zone controller wiring / cable is connected properly to the indoor unit PCB. For more information on the different connections in LG indoor units, see the Electrical System Installation Section in this manual.
2. Using the controller, go to the setup function 02 (icons are different for each controller. Refer to the controller user's manual for more information.)
3. Type in the Hex Central Control address that has been designated to the unit.
4. Repeat Steps 1 through 3 for each indoor unit in the building.

For Indoor Units That ARE Being Controlled as a Group

For the Main Indoor Unit in a Group Setting

1. Identify which unit will be the Main indoor unit and which indoor units are going to be the Sub units.
2. Go to the Main indoor unit and access the PCB.
3. Verify the group control cable / group control wiring is installed into CN-REMO or the SIG - 12V - GND (Comm.) terminal on the Main indoor unit PCB. If it is not, install now.
4. Detach group control cable / wiring.
5. Attach the zone controller to the Main indoor unit.
6. Using the controller, go to the setup function 02 (icons are different for each controller. Refer to the controller user's manual for more information.) Type in the Central Control address designated for the Main indoor unit.
7. Disable power to the Main indoor unit. ⃠ Do not restore power to the Main indoor unit at this time. It will be restored later.
8. If the zone controller and associated communications cable has already been permanently mounted in place, reattach cable / wiring and obtain a loose zone controller with a communications cable to continue programming the Sub indoor units (see procedure below).

For the Sub Indoor Unit(s) in a Group Setting

For grouped control indoor units, using DIP Switch No. 3 to set Sub units automatically sets these units to Central Control address "FF. If the application calls for central control addresses to all Sub units, follow the procedure below.

1. Go to the first Sub indoor unit and disconnect the cable / wiring from CN-REMO or the SIG - 12V - GND (Comm.) terminal.
2. Attach the zone controller communications cable into the Sub indoor unit. ⃠ Do not push the ON / OFF button or enable indoor unit operation.
3. Using the controller, go to the setup function 02 (icons are different for each controller. Refer to the controller user's manual for more information.) Type in the Hex address assigned to the unit.
4. Change DIP Switch No. 3 on the Sub indoor unit PCB to the "ON" position.
5. Disable power to the Sub indoor unit using the disconnect switch. Wait one (1) minute.
6. While power is off, detach the zone controller cable.
7. Attach the group control cable / wiring to the Sub indoor unit.
8. Restore power to that Sub indoor unit, and go to the next Sub indoor unit.
9. Repeat Steps 1 to 8 for each Sub indoor unit.
10. After all Sub indoor unit have addresses assigned, go back to the Main indoor unit and restore power.

LGRED°, HRU COMPATIBILITY, AND GEN 4 DIP SWITCH SETTINGS

MULTI V S WITH LGRED°

LGRED° Technology

LGRED technology is included in Multi V S with LGRED outdoor units available January 2021. The feature allows heat pump or heat recovery systems to operate in heating only mode (i.e., all indoor units in heating mode) down to -13°F outdoor ambient wet bulb. For more information, contact your local LG sales representative.

Multi V S with LGRED outdoor units are factory set to heat recovery operation—all switches on DIP Switch bank are set to OFF. **Multi V S with LGRED outdoor units MUST be manually set to a heat pump system. T**o change the factory set heat recovery system to a heat pump system:

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

Figure 141: Heat Recovery System DIP Switch Setting on Multi V S with LGRED Outdoor Units (Factory Set).

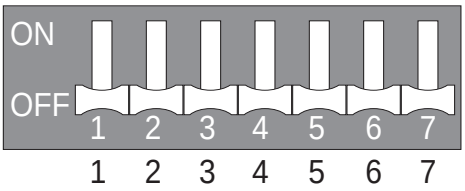
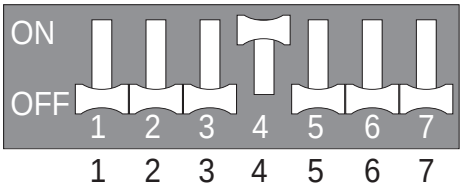


Figure 142: Heat Pump System DIP Switch Setting on Multi V S with LGRED Outdoor Units (Manually Set).



PRHR*3 Heat Recovery Units

The PRHR*3A series of heat recovery units were released in June 2018, and are not automatically backwards compatible with all LG manufactured VRF air / water source units. The 3A heat recovery units will be compatible with the Multi V S with LGRED Outdoor Units that are available January 2021.

LG VRF systems can operate with both old 2A heat recovery units and new 3A heat recovery units if the outdoor unit software has been upgraded. If a system includes a mix of both old and new heat recovery units, system design must follow 2A heat recovery unit series piping rules. For more information, contact your local LG sales representative.

Generation 4 Indoor Units

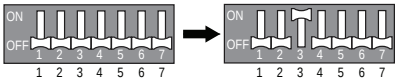
LG's indoor units are designated Generation 4 (Gen 4). For Gen 4 indoor units to operate with Gen 4 indoor unit features, the air conditioning system must meet the following requirements:

- All indoor units, heat recovery units, and air / water source units must be Gen 4 or higher.
- All air / water source units must have Gen 4 or higher software factory or field installed.
- Air / water source units DIP switch 3 must be set to ON (factory default setting is OFF).
- All controllers must support Gen 4 indoor unit features.

The figure at right shows the outdoor unit DIP switch. All air and water source units, indoor units, heat recovery units, and controllers in a system must be Gen 4 compatible or the system will not operate with Gen 4 indoor unit features.

Figure 143: Location and Setting of Multi V S with LGRED Outdoor Unit DIP Switch 3.

Multi V S with LGRED DIP Switch No. 3

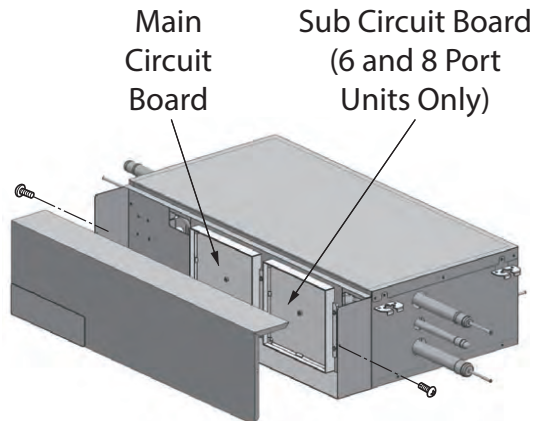


Addressing with 3A Series Heat Recovery Units (For Heat Recovery Systems Only)

General

Each heat recovery unit will have a unique address assign so the outdoor unit will be able distinguish it from other heat recovery units.
Upon completion of the heat recovery unit address, set the heat recovery unit operating parameters by adjusting the positions of the DIP switches on SW02E and SW01E of the Main PCB. The Main and Sub PCBs are identical. The Sub PCB is installed on the 6 and 8 port units only.

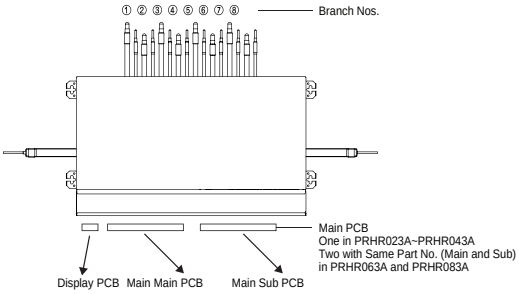
Figure 144: Heat Recovery Unit PCB Locations.



Procedure

Before beginning the physical process of assigning heat recovery addresses, map out the address assignments using a copy of the LATS tree mode diagram. Set the heat recovery unit switches as required for the system.

Figure 145: Heat Recovery Unit PCB Locations, Top View.



Guidelines

1. Addresses must be sequential and cannot be skipped.

2. Assign the lowest address to the heat recovery unit that has the largest capacity indoor unit connected to port number 1. If the capacity of all indoor units connected to port number 1 of each heat recovery unit is the same, assign address "0" to the heat recovery unit farthest away from the outdoor unit. Assign the next address to the next farthest away and so on until all heat recovery units have an address. The heat recovery unit with the highest address must be the one closest to the outdoor unit. Some Multi V outdoor units can support up to 16 heat recovery units on a single system. Possible settings in order of lowest to highest are: 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F.

Note:

Multi V S with LGRED outdoor units can only support 6 or 8 indoor units depending on model number, follow LATS parameters when designing systems with heat recovery units.

3. Record the address assigned to each heat recovery unit in the appropriate column on the Pre-Commissioning Device Configuration Worksheet.

Note:

Addressing must be performed following the detailed steps above because port number 1 on the heat recovery unit addressed "0" will remain open during the auto pipe detect procedure. If the indoor unit capacity connected to the port is relatively small compared with other units on the system, the outdoor unit high head pressure safety will trip and shut down the unit during the procedure.

Note:

For specific details on piping limitations and other refrigerant system rules, review the information in the Piping Section, see the Multi V S with LGRED Engineering Manual, and follow system parameters and the LATS diagram.

Figure 146: Heat Recovery Unit Main PCB (All Models).

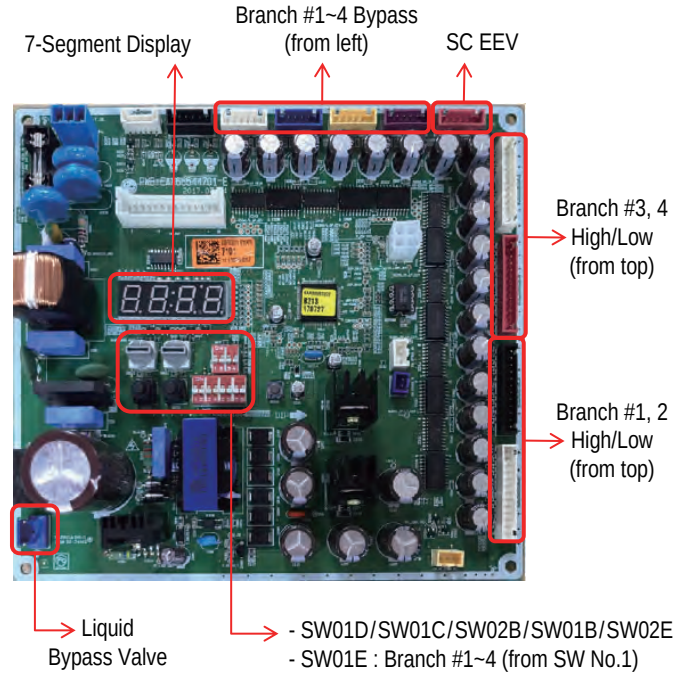


Figure 147: Heat Recovery Unit Sub PCB (PRHR063A and PRHR083A Only).

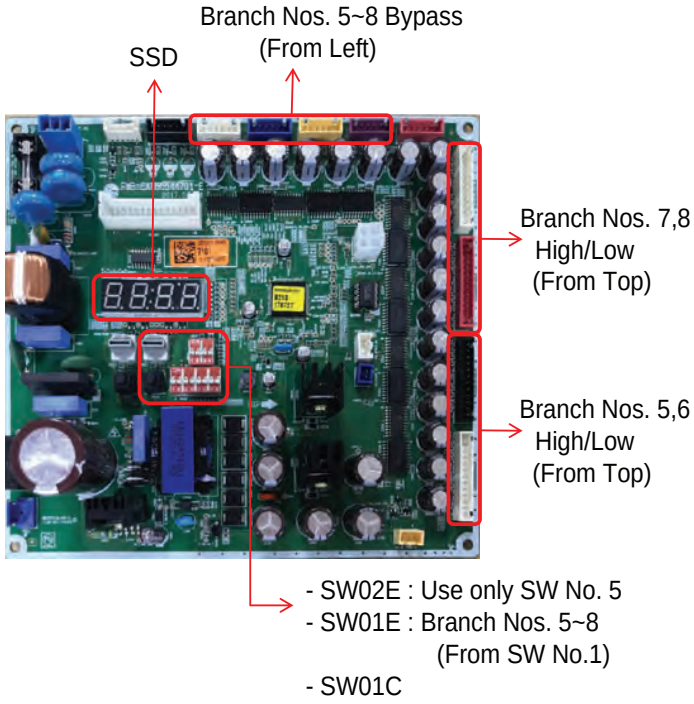


Figure 148: Heat Recovery Unit Main PCB Switches and Rotary Dials.

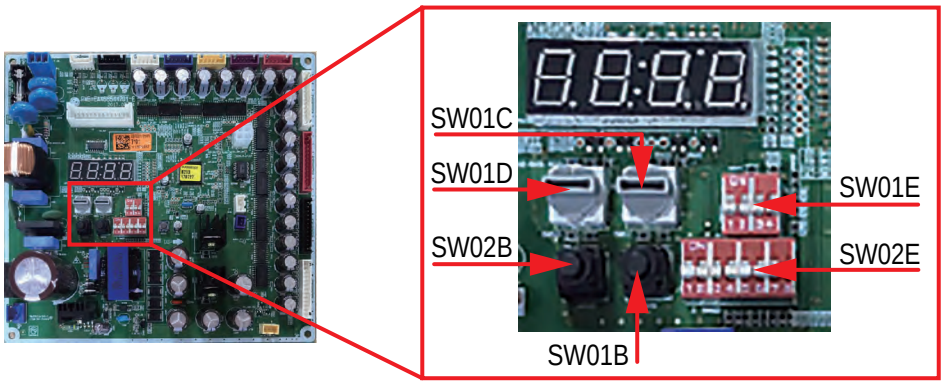


Figure 149: Heat Recovery Unit Display PCB.

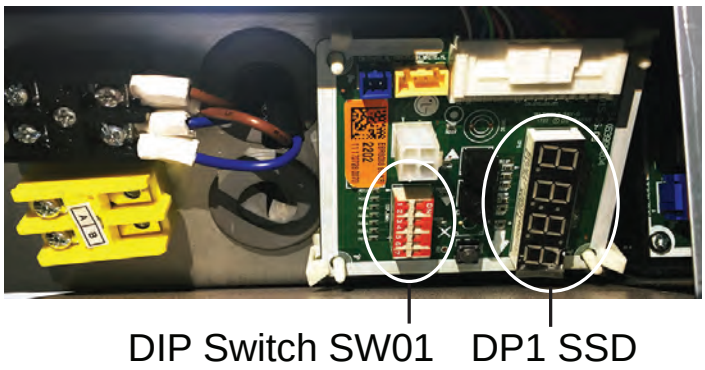
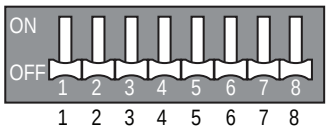
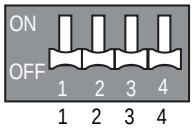
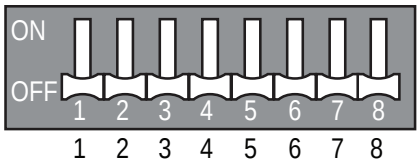


Table 45: DIP Switch, Rotary Dial, and Tact Switch Descriptions.

Switches / Dials	PRHR*2A HRU Series (Old)	PRHR*3A HRU Series (New)	Function
	SW02M	SW02E	For Both PRHR*3A (New) and PRHR*2A (Old) HRU Series: • Auto or Manual Pipe (Valve) Detection Method Selection • Number of Connected Branches / Ports Selection • Zone Control Settings
			For PRHR*3A HRU Series (New) Only: • Main / Sub PCB Selection
			For PRHR*2A HRU Series (Old) Only: • Valve Group Control Selection (If Indoor Unit Capacity is >54,000 Btu/h)
	SW01M	SW01E	Valve (Port) Selection • Selects which valve (port) to address during Manual Valve (Port) Detection and Zone Control
	-	SW01D (Left)	For PRHR*3A HRU Series (New) Only: • Branch / Port Group Control Selection (If Indoor Unit Capacity is >60,000 Btu/h)
	SW05M	SW01C (Right)	• Addresses Heat Recovery Units (From 0 to F) • For Manually Addressing Zoned Indoor Units
	SW03M	SW02B (Left)	Increases the Valve Address by Ten (10) when Central Control Addressing Indoor Units
	SW04M	SW01B (Right)	Increases the Valve Address by One (1) when Central Control Addressing Indoor Units

SW02E DIP Switch Settings

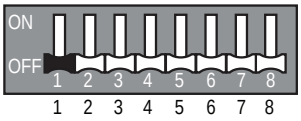
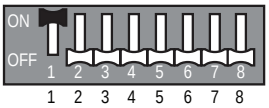
Table 46: DIP Switch SW02E Description.

	ON S/W	Selection
	No. 1	Selects Auto or Manual Pipe (Valve) Detection Method for Heat Recovery Units
	No. 2	Selects Number of Connected Branches / Ports on the Heat Recovery Unit
	No. 3	
	No. 4	
	No. 5	Setting Main PCB to Main or Sub Mode
	No. 6	EEPROM Factory Initialization (4, 5, 6)
	No. 7	For Normal Control (OFF) or Zone Control (ON) Settings; Factory Preset to OFF
	No. 8	

Selecting Auto or Manual Valve (Port) Detection Method on SW02E

Select Auto or Manual Valve (Port) Detection for a heat recovery unit by setting No. 1 on DIP switch bank SW02E. If installing a six (6) or eight (8) port heat recovery units, apply this setting only to the Main PCB.

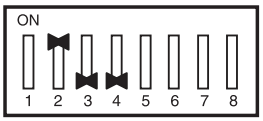
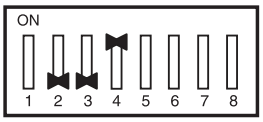
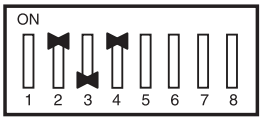
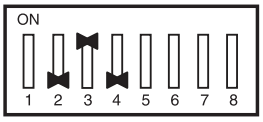
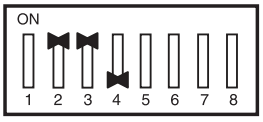
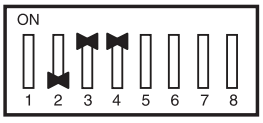
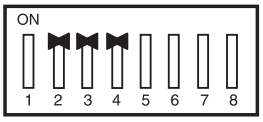
Table 48: Setting Auto or Manual Pipe Detection.

Auto	Manual
SW02E DIP Switch No. 1 OFF	SW02E DIP Switch No. 1 ON
	

Selecting the Number of Connected Branches / Ports on SW02E

DIP Switch Nos. 2, 3, and 4 of SW02E are factory set to correspond to the number of branches / ports on the heat recovery unit. If the system requires using fewer than all of the branches / ports on an heat recovery unit, set the switches to correspond to the number of used branches / ports. Ensure all unused branches / ports are capped and brazed closed. Example: If PRHR083A will only use four (4) branches / ports (branches / ports 1 through 4), cap and braze closed branches / ports 5 through 8, and then set the heat recovery DIP switches for four branches / ports

Table 47: DIP Switch SW02E Number of Connected Branches / Ports Selection.

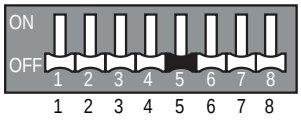
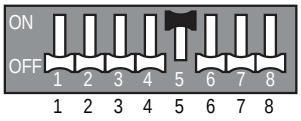
1 branch Connected		5 branches Connected	
2 branches Connected		6 branches Connected	
3 branches Connected		7 branches Connected	
4 branches Connected		8 branches Connected	

The factory setting of switches 2, 3, and 4 corresponds to the number of ports on the unit.

Selecting Main / Sub PCB on SW02E

Ensure No. 5 of DIP switch bank SW02E is set to OFF for Main PCB, and ON for Sub PCB. For Sub PCBs, set only No. 5 of DIP switch bank SW02E to ON. All other switches on SW02E must be set to OFF.

Table 49: Setting Main and Sub PCB.

Main	Sub
SW02E DIP Switch No. 5 OFF	SW02E DIP Switch No. 5 ON
	

Selecting Normal or Zone Control on SW02E and SW01E

Use both DIP switch banks SW02E and SW01E to select Normal or Zone Control for both Auto and Manual Valve Detection procedures. Zone Control features two (2) or more indoor units connected to one (1) valve / port of the heat recovery unit. Indoor units set for Zone Control collectively operate in cooling or heating mode.

- For Normal Control, on the Main PCB only, set DIP switch Nos. 7 and 8 on SW02E to OFF, and set all DIP switches on SW01E to OFF.
- For Zone Control, on the Main PCB only, set DIP switch Nos. 7 and 8 on SW02E to ON, and set the DIP switches on SW01E as appropriate for the system to perform zone control for each port. See the table for SW01E settings, and how to set the address for each port.
- For Zone Control on the larger 6 and 8 port heat recovery units, use the Sub PCB for ports 5 through 8.

Table 50: Setting Normal and Zone Control.

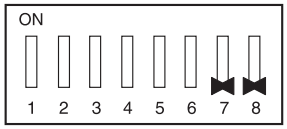
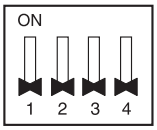
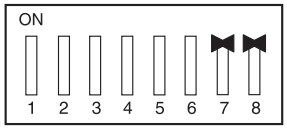
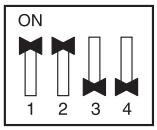
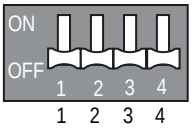
	SW02E setting	SW01E setting
Normal control		 SW01E
Zoning control		 SW01E Turn the DIP switch of the zoning branch on. EX) Branch 1,2 are zoning control.

Table 51: DIP Switch SW01E Description.

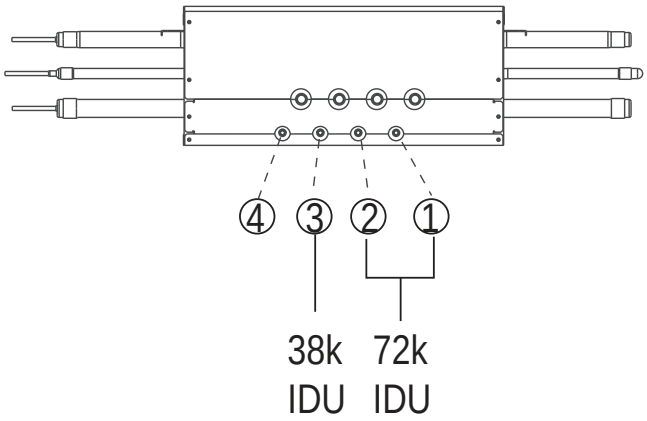
PCB Component	DIP Switch No.	Settings
SW01E 	No. 1	Valve No. 1 (Main PCB) / Valve No. 5 (Sub PCB)
	No. 2	Valve No. 2 (Main PCB) / Valve No. 6 (Sub PCB)
	No. 3	Valve No. 3 (Main PCB) / Valve No. 7 (Sub PCB)
	No. 4	Valve No. 4 (Main PCB) / Valve No. 8 (Sub PCB)

SW01D Rotary Dial Settings

Branch / Port Group Control

The maximum capacity of each 3A Heat Recovery Unit port is 60,000 Btu/h. If an indoor unit exceeds this capacity (indoor units >60,000 Btu/h), the first two adjacent heat recovery unit ports (Ports 1 and 2) must be connected together with an inverted Y-branch (ARBLB03321) to provide the required capacity. If two ports are connected together, address the ports as shown below using the SW01D rotary dial on the Main PCB only.

Figure 150: Example of Group Controlling Heat Recovery Unit Branches / Ports for the PRHR*3A Heat Recovery Unit Series.



Note:

- *Ports are numbered right-to-left on PRHR*3A heat recovery units.*
- *Ports are numbered left-to-right on the old PRHR*2A heat recovery units.*

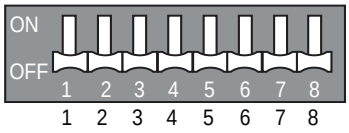
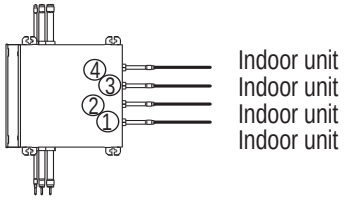
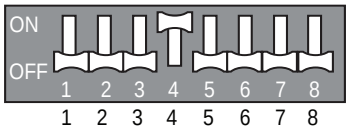
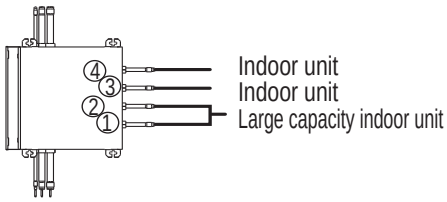
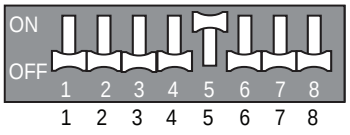
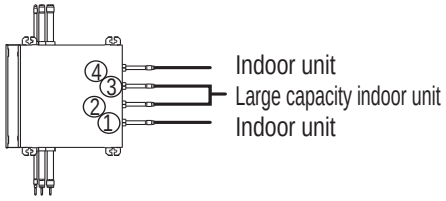
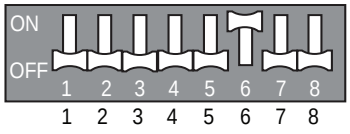
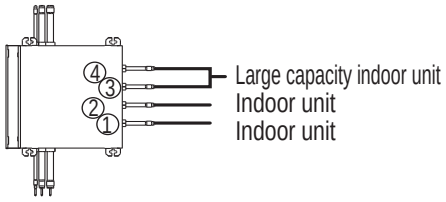
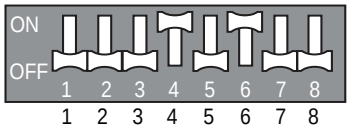
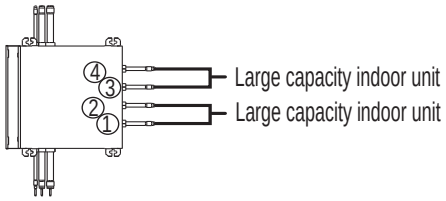
Table 52: Main PCB SW01D Branch / Port Group Control Settings for PRHR*3A Heat Recovery Units.

Branch / Port Group Control	Main PCB SW01D Setting	Branch / Port Group	Main PCB SW01D Setting
No Grouping	0	Group Control Branches / Ports 5,6 and 7,8	8
Group Control Branches / Ports 1 and 2	1	Group Control Branches / Ports 1,2 and 5,6	9
Group Control Branches / Ports 2 and 3	2	Group Control Branches / Ports 1,2 and 7,8	A
Group Control Branches / Ports 3 and 4	3	Group Control Branches / Ports 3,4 and 5,6	B
Group Control Branches / Ports 5 and 6	4	Group Control Branches / Ports 3,4 and 7,8	C
Group Control Branches / Ports 6 and 7	5	Group Control Branches / Ports 1,2 and 3,4 and 5,6	D
Group Control Branches / Ports 7 and 8	6	Group Control Branches / Ports 1,2 and 3,4 and 6,7	E
Group Control Branches / Ports 1,2 and 3,4	7	Group Control Branches / Ports 1,2 and 3,4 and 7,8	F

Note:

*In the old PRHR*2A Heat Recovery Unit series, DIP Switch bank SW02M DIP Switch Nos. 4, 5, and 6 were used to set the branch / port control. The SW01D rotary dial is new for PRHR*3A Heat Recovery Units, and was introduced because there are more models with ports varying from 2 to 8 ports (more branch / port combinations than the three SW02M DIP Switches on the old PRHR*2A can control). See below for PRHR*2A Heat Recovery Unit Branch / Port Group Control Settings for comparison.*

Figure 151: Example of Grouping Heat Recovery Unit Branches / Ports for the old PRHR*2A Heat Recovery Unit Series.

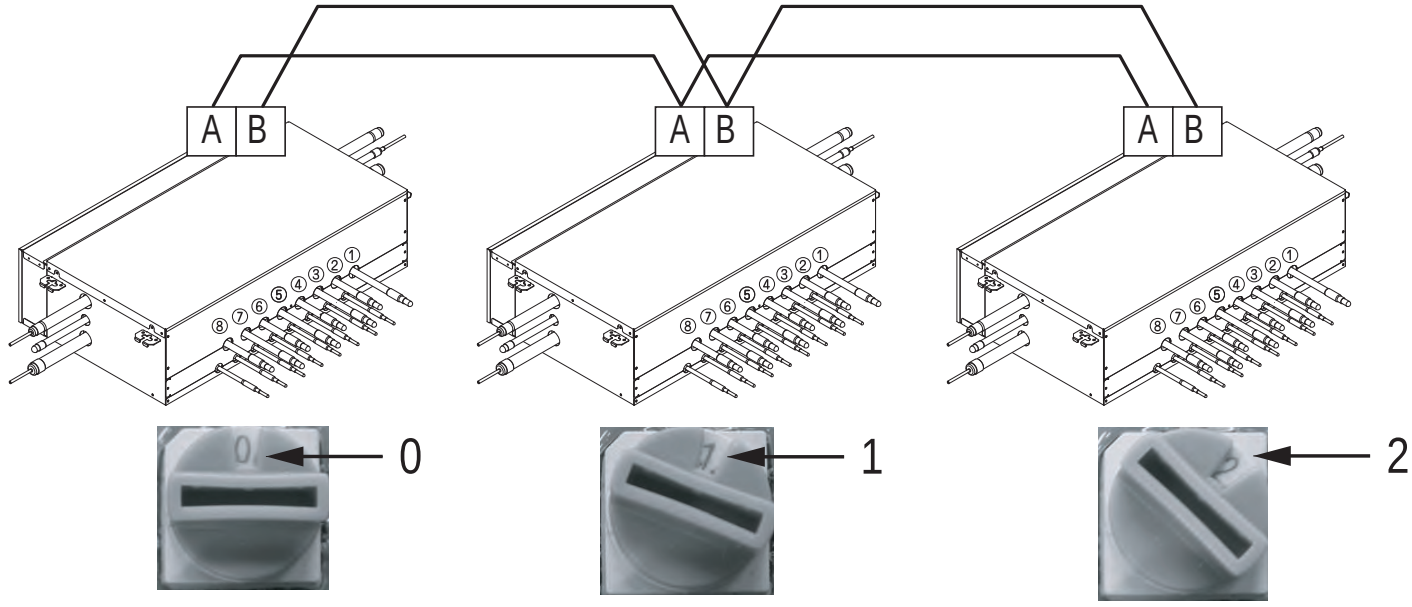
	DIP Switch Setting	Example
No Group Control		
No. 1, 2 Branch / Port Control		
No. 2, 3 Branch / Port Control		
No. 3, 4 Branch / Port Control		
No. 1, 2 Branch / Port Control No. 3, 4 Branch / Port Control		

SW01C Rotary Dial Settings

Use rotary switch SW01C to set the heat recovery unit addresses. There can be up to sixteen (16) heat recovery units per some Multi V system. Possible settings in order of lowest to highest are: 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F. The addresses must be set sequentially. For example, if there are three (3) heat recovery units in a system, use addresses 0, 1, and 2. Set the heat recovery unit addresses as required for each system.

If there is only one (1) heat recovery unit in a system, its address must be set to 0.

Figure 152: Example of Manual Addressing with Three (3) Units Heat Recovery Units on a System.



Note:

Multi V S with LGRED outdoor units can only support 6 or 8 indoor units depending on model number, follow LATS parameters when designing systems with heat recovery units.

Note:

For specific details on piping limitations and other refrigerant system rules, review the information in the Piping Section, see the Multi V S with LGRED Engineering Manual, and follow system parameters and the LATS diagram.

SW01E / SW02B / SW01B / SW01C (DIP Switch / Tact Switch / Rotary Dial) Settings

The DIP switch, tact switches, and rotary dial listed are used in the Manual Valve (Port) Detection procedure, which sets the heat recovery unit valves / ports to the central control address(es) of the connected indoor unit(s).

Note:

Before performing manual pipe detection, input a different central control address to every indoor unit through either a wired or a wireless controller (depending on indoor unit type).

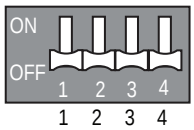
- SW01E DIP Switch: Selects the heat recovery unit valve / port that is to be addressed. Use SW01E on the Main PCB for Valves 1 through 4; on six (6) and eight (8) port heat recovery units, use SW01E on the Sub PCB for Valve 5 through 8.

- SW02B Tact Switch: Inputs the central control addresses of the indoor units connected to the heat recovery unit valve / port. Increases the address by ten (10). Use SW02B on the Main PCB for Valves 1 through 4; on six (6) and eight (8) port heat recovery units, use SW02B on the Sub PCB for Valves 5 through 8.

- SW01B Tact Switch: Inputs the central control addresses of the indoor units connected to the heat recovery unit valve / port. Increases the address by one (1). Use SW01B on the Main PCB for Valves 1 through 4; on six (6) and eight (8) port heat recovery units, use SW01B on the Sub PCB for Valves 5 through 8.

- SW01C Rotary Dial: Sets Zone Control during the Manual Valve (Port) Detection procedure when two (2) or more indoor units are connected to one (1) valve / port of the heat recovery unit. Indoor units set for Zone Control collectively operate in cooling or heating mode.

Table 53: DIP Switch SW01E, Tact Switches SW02B and SW01B, and Rotary Dial SW01C Descriptions.

PCB Component	DIP Switch No.	Settings
SW01E 	No. 1	For Valve No. 1 (Main PCB) / Valve No. 5 (Sub PCB)
	No. 2	For Valve No. 2 (Main PCB) / Valve No. 6 (Sub PCB)
	No. 3	For Valve No. 3 (Main PCB) / Valve No. 7 (Sub PCB)
	No. 4	For Valve No. 4 (Main PCB) / Valve No. 8 (Sub PCB)
SW02B 	SW02B	Increases the Valve Address by Ten (10) when Central Control Addressing Indoor Units
SW01B 	SW01B	Increases the Valve Address by One (1) when Central Control Addressing Indoor Units
SW01C 	SW01C	• Addresses Heat Recovery Units (From 0 to F; see previous page) • For Manually Addressing Zoned Indoor Units

Auto Valve (Port) Detection

Auto valve (port) detection sets the connection relationship automatically between the indoor units and the heat recovery units.

1. Verify No.1 of SW02E on the heat recovery unit Main PCB is set to OFF.
2. Confirm that the settings of Nos. 2, 3, and 4 of SW02E correspond with the number ports (valves) used.
3. Reset the power of heat recovery unit PCB.
4. Turn No. 5 on outdoor unit SW01 DIP Switch to ON.
5. Select the “Idu” mode using ► and ◄, then push the ● button.
6. Select the “Id 5” “Ath” or “Atc” function using ► and ◄, then push the ● button. If outdoor temperature is >59°F, use “Ath”. If that does not work, use “Atc.”If outdoor temperature is <59°F, use “Atc”. If that does not work, use “Ath.”

Note:

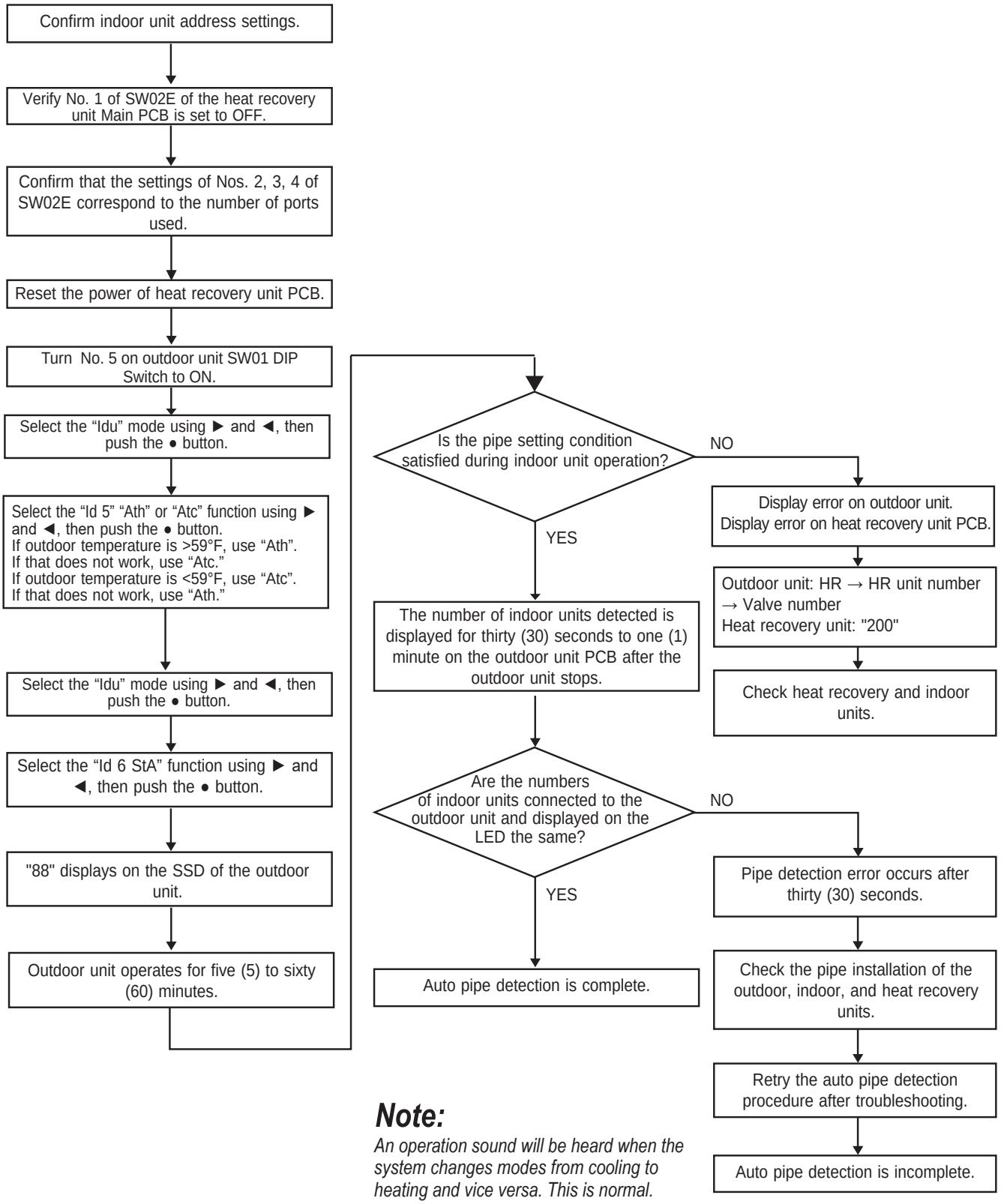
Atc = “At-cold outside”, and Ath = “At-hot outside”. Select accordingly.

7. Select the “Idu” mode using ► and ◄, then push the ● button.
8. Select the “Id 6 StA” function using ► and ◄, then push the ● button.
9. The number “88” displays on the SSD of the outdoor unit main PCB.
10. The automatic pipe detection procedure starts.
11. The procedure could run from five (5) to sixty (60) minutes, depending on the number of connected indoor units, and the ambient outdoor temperature.
12. The number of indoor units detected is displayed for thirty (30) seconds to one (1) minute on the outdoor unit PCB after the outdoor unit stops.
    - The number of indoor units connected to each heat recovery unit will be displayed.
    - If there is an auto pipe detection error, “200” will be displayed.
    - If there are no auto pipe detection errors, the number “88” displays on the SSD of the outdoor unit main PCB. After “88” disappears, the auto detection error is complete.

Note:

- *Run the auto addressing and auto pipe detection procedures again whenever an indoor unit PCB and / or and heat recovery unit PCB are replaced. Apply power to the indoor units and heat recovery units after the repair is complete, otherwise operation error will occur.*
- *Error No. 200 occurs if the number of actual connected indoor units and the number of detected indoor units are different.*
- *If the auto pipe detection procedure fails, perform the manual pipe detection procedure. (If the auto pipe detection procedure is successful, the manual pipe detection procedure is not required.)*
- *The auto pipe detection procedure can be run again after a failed auto pipe detection procedure attempt; just reset the outdoor unit first.*
- ⃠ *Do not turn off the main unit PCB for at least five (5) minutes after the auto pipe detection procedure is complete; allow time for the outdoor unit to automatically save auto pipe detection results.*

Figure 153: Auto Valve (Port) Detection Procedure Flowchart.



Note:

An operation sound will be heard when the system changes modes from cooling to heating and vice versa. This is normal.

Manual Valve (Port) Detection

Note:

Before performing manual valve (port) detection, input a different central control address to every indoor unit through either a wired or a wireless controller (depending on indoor unit type).

1. Enter the central control address into each indoor unit.
2. Turn No. 1 of DIP Switch SW02E on the heat recovery unit Main PCB to ON.
3. Reset the power of the heat recovery unit PCB.
4. Use the Main PCB DIP Switch SW01E bank to select which valve / port (No. 1 through 4) to central control address. For six (6) and eight (8) port heat recovery units, use Sub PCB DIP Switch SW01E bank to choose valve / port Nos. 5 through 8.
5. If indoor units are to be zone controlled, on the Sub PCB, use Rotary Dial SW01C to choose the address of the each zone controlled indoor unit (From 0 to F). Repeat Step 5 to input the central control addresses for each zoned indoor unit.
6. On the PCB (Main or Sub, depending on the valve / port being addressed), use Tact Switches SW02B (Left) and SW01B (Right) to input the central control address of the indoor unit connected to that heat recovery unit valve / port.
   - SW02B (Left) increases the valve / port address by ten (10). Digit increases with the number of times the tact switch is pressed, shown on the SSD.
   - SW01B (Right) increases the valve / port address by one (1). Digit increases with the number of times the tact switch is pressed, shown on the SSD.
7. If indoor units are to be zoned controlled, after all zoned indoor units are manually addressed, change Rotary Dial SW01C setting to 0.
8. On the PCB (Main or Sub, depending on the valve / port being addressed), turn the DIP Switch to OFF to save the address, and complete the manual valve (port) detection procedure for that valve / port.
9. Reset the power to the outdoor unit.
10. Repeat Steps 4 to 9 until all valves / ports are addressed. If zone control indoor units are NOT to be included in the system, skip Steps 5 and 7.
11. The number of the indoor unit installed will appear after about five (5) minutes. (Example: Heat Recovery Unit to the Number of the Indoor Unit.)
12. Reset the power of the outdoor unit PCB and the heat recovery unit(s).
13. Manual valve / port detection is complete.

Note:

1. If a central controller is not installed yet, leave the address data alone until the installer adds the central controller and sets the central control address as desired.

2. If a central controller is already installed, use the wired remote controller of the indoor units to set the central control addresses. (In this case, manually set the heat recovery unit pipe address following the central control address of the indoor unit.)

3. Central controller addresses must be set manually at each individual controller.

4. ⃠ Do not set a central control address of 0xFF to any indoor unit. If an address is 0xFF, manual valve / port detection will not be completed properly.

5. The heat recovery unit valve address and the central control address of its corresponding indoor unit must be set using the same number (in manual addressing).

6. A heat recovery unit valve / port that does not have an indoor unit connected to it must be set with a different address than one that does have an indoor unit connected to it. (If addresses are the same, the valves will not operate.)

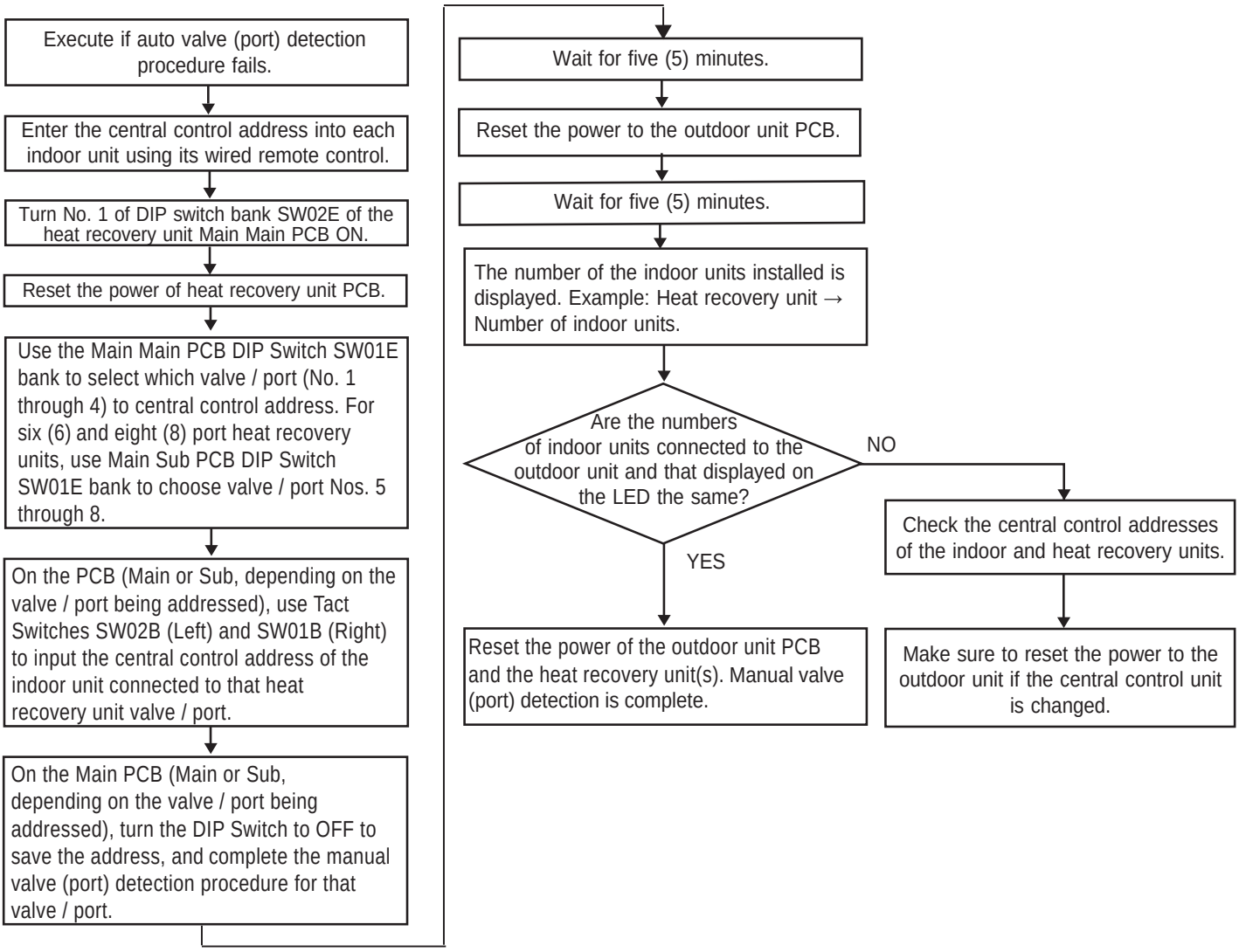
7. Change the manual pipe settings using the heat recovery unit PCB.

8. An error indicates that the manual pipe detection procedure was not completed properly.

9. To save the pipe detection procedure results automatically, ⃠ do not turn off the outdoor unit for five (5) minutes after the procedure has finished.

Manual Valve (Port) Detection, continued.

Figure 154: Manual Valve (Port) Addressing Flowchart.

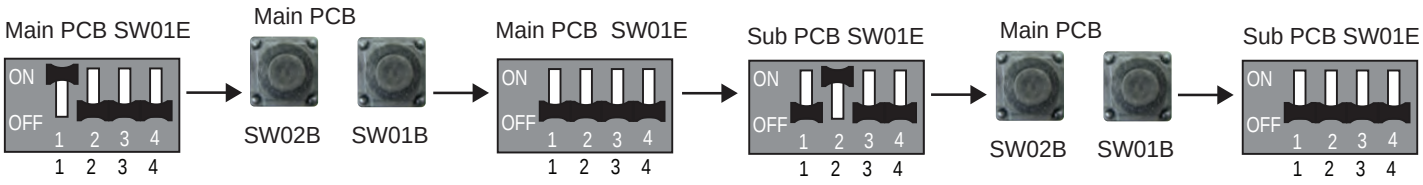


Manual Valve (Port) Detection Example (Normal, Non-Zone Setting)

Example: Manual Valve (Port) Detection (Normal, Non-Zone Setting) of Valve Nos. 1 and 6 (Six [6] or Eight [8] Port Heat Recovery Unit).

1. Enter the central control address into each indoor unit.
2. Turn No. 1 of DIP switch bank SW02E on the heat recovery unit Main PCB to ON.
3. Reset the power of the heat recovery unit PCB.
4. On Main PCB DIP Switch SW01E, turn No. 1 to ON. This selects Valve / Port No. 1. (Any existing value saved in EEPROM is displayed on the SSD.)
5. On the Main PCB, use Tact Switches SW02B (Left) and SW01B (Right) to input the central control address of the indoor unit connected to heat recovery unit Valve / Port No. 1.
   - SW02B (Left) increases the valve / port address by ten (10). Digit increases with the number of times the tact switch is pressed, shown on the SSD.
   - SW01B (Right) increases the valve / port address by one (1). Digit increases with the number of times the tact switch is pressed, shown on the SSD.
6. On Main PCB DIP Switch SW01E, turn No. 1 to OFF to save the address for Valve No. 1, and complete the manual pipe detection procedure for that valve.
7. On Sub PCB DIP Switch SW01E, turn No. 2 to ON. This selects Valve / Port No. 6. (Any existing value saved in EEPROM is displayed on the SSD.)
8. On the Sub PCB, use Tact Switches SW02B (Left) and SW01B (Right) to input the central control address of the indoor unit connected to heat recovery unit Valve / Port No. 6.
9. On Sub PCB DIP Switch SW01E, turn No. 2 to OFF to save the address for Valve No. 6, and complete the manual pipe detection procedure for that valve.
10. Wait for five (5) minutes.
11. Reset the power to the outdoor unit PCB.
12. Wait for five (5) minutes.
13. The number of the indoor unit installed will appear. (Example: Heat Recovery Unit to the Number of the Indoor Unit.)
14. Reset the power of the outdoor unit PCB and heat recovery unit. Manual valve / port detection is complete.

Figure 155: Manual Pipe Detection (Normal, Non-Zone Setting) Example.



Note:

- *The procedure described above must be performed for all heat recovery unit valves / ports.*
- *Valves that do not have indoor units connected to them must be addressed with a number that has not been used. (Valves will not work if the address numbers are the same.)*

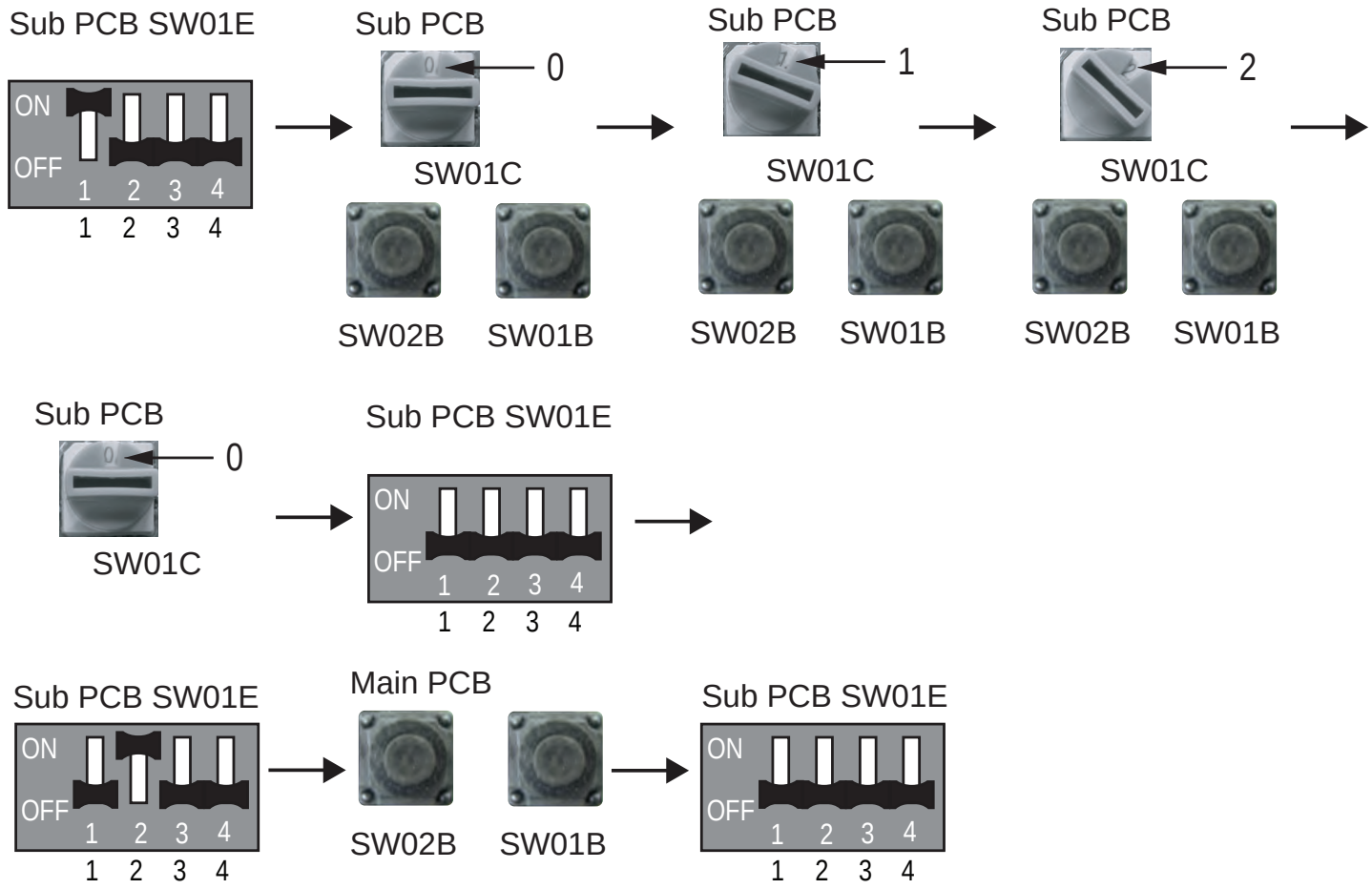
Manual Valve (Port) Detection Example (Zone Control Setting)

Zone Control features two (2) or more indoor units connected to one (1) valve / port of the heat recovery unit. Indoor units set for Zone Control collectively operate in cooling or heating mode. Before performing manual valve (port) detection, input a different central control address to every indoor unit through either a wired or a wireless controller (depending on indoor unit type).

Example: Manual Valve (Port) Detection (Zone Control Setting) of Valve No. 5 (with Three [3] Zone Controlled Indoor Units) and 6 (one [1] Indoor Unit without Zone Control) (Six [6] or Eight [8] Port Heat Recovery Unit).

1. Enter the central control address into each indoor unit.
2. Turn No. 1 of DIP switch bank SW02E on the heat recovery unit Main PCB to ON.
3. Reset the power of the heat recovery unit PCB.
4. On Sub PCB DIP Switch SW01E, turn No. 1 to ON. This selects Valve / Port No. 5. (Any existing value saved in EEPROM is displayed on the SSD.)
5. On the Sub PCB, use Rotary Dial SW01C to choose the address of the first zone controlled indoor unit (From 0 to F; this example: 0).
6. On the Sub PCB, use Tact Switches SW02B (Left) and SW01B (Right) to input the central control address of the first indoor unit connected to heat recovery unit Valve / Port No. 5.
   - SW02B (Left) increases the valve / port address by ten (10). Digit increases with the number of times the tact switch is pressed, shown on the SSD.
   - SW01B (Right) increases the valve / port address by one (1). Digit increases with the number of times the tack switch is pressed, shown on the SSD.
7. On the Sub PCB, use Rotary Dial SW01C to choose the manual address of the second zone controlled indoor unit (From 0 to F; this example: 1).
8. On the Sub PCB, use Tact Switches SW02B (Left) and SW01B (Right) to input the central control address of the second indoor unit connected to heat recovery unit Valve / Port No. 5.
9. On the Sub PCB, use Rotary Dial SW01C to choose the manual address of the third zone controlled indoor unit (From 0 to F; this example: 2).
10. On the Sub PCB, use Tact Switches SW02B (Left) and SW01B (Right) to input the central control address of the third indoor unit connected to heat recovery unit Valve / Port No. 5.
11. After all zoned indoor units are manually addressed, change Rotary Dial SW01C setting to 0.
12. On Sub PCB DIP Switch SW01E, turn No. 1 to OFF to save the addresses for Valve No. 5, and complete the manual pipe detection procedure for that valve / port.
13. On Sub PCB DIP Switch SW01E, turn No. 2 to ON. This selects Valve / Port No. 6. (Any existing value saved in EEPROM is displayed on the SSD.)
14. On the Sub PCB, use Tact Switches SW02B (Left) and SW01B (Right) to input the central control address of the indoor unit connected to heat recovery unit Valve / Port No. 6.
15. On Sub PCB DIP Switch SW01E, turn No. 2 to OFF to save the address for Valve No. 6, and complete the manual pipe detection procedure for that valve / port.
16. Wait five (5) minutes.
17. Reset the power to the outdoor unit PCB.
18. Wait five (5) minutes.
19. The number of installed indoor units displays.
20. Reset the power of the outdoor unit PCB and heat recovery unit. Manual valve / port detection is complete.

Figure 156: Manual Valve (Port) Detection (Zone Control Setting) Example.



Note:

- *The procedure described above must be performed for all heat recovery unit valves / ports*
- *Valves / ports that do not have connected indoor units must be addressed with a number that has not been used. (Valves / ports will not work if the address numbers are the same.)*
- *One heat recovery unit valve / port can support up to eight (8) indoor units (rotary dial settings 0~7). An error will display if more than eight (8) indoor units per heat recovery valve / ports are set with the rotary dial.*
- *Return the rotary dial SW01C to its original setting (0) after all settings are complete.*

Using the Display PCB

DIP switch bank SW01 on the Display PCB can be set to display valve status and the heat recovery unit address.

Table 54: Display PCB SW01 Settings.

SW01 DIP Switch No.	Settings
No. 1	Displays the Valve Status for the Main PCB
No. 1,5	Displays the Valve Status for the Sub PCB
No. 2	Displays the Degree of Subcooling
No. 3	Displays the Heat Recovery Unit Address
No. 4	Displays the Number of Connected Heat Recovery Units
No. 6	Displays the Version of the Heat Recovery Unit Software
No. 7	Not Used

Figure 157: Display PCB DIP Switch SW01 and SSD Locations.

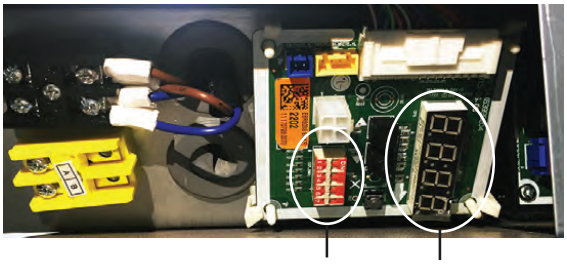
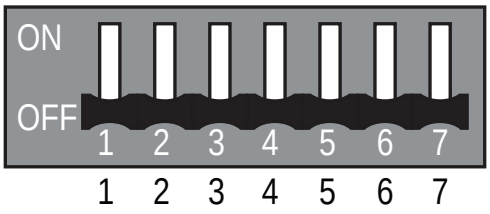
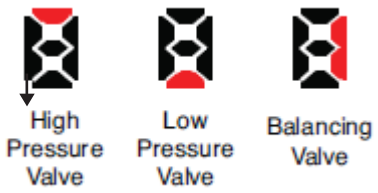


Figure 158: Display PCB DIP Switch SW01.



Displaying the Valve Status (For Main / Sub PCBs)

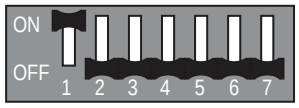
When the high pressure, low pressure, and balancing valves are open, the SSD shows:



Where:

Main	1	2	3	4
Sub	5	6	7	8

Table 55: SW01 DIP Switch No. Valve Status Settings.

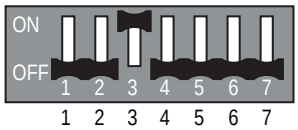
SW01 DIP Switch No. Settings	
Valves of Main PCB (Valve Nos. 1 through 4)	Valves of Sub PCB (Valve Nos. 5 through 8)
	

Displaying the Heat Recovery Unit Address

When DIP switch No. 3 on SW01 is ON, the heat recovery unit address appears on the SSD as:

Displayed No. = 1 + No. of the Value of SW01C on the Main PCB

Figure 159: SW01 DIP Switch Setting for Displaying the Heat Recovery Unit Address.



Troubleshooting Heat Recovery Unit Error Code CH200

Error No.	Description	Details	Causes
2001	Auto pipe search failure.	After auto operation, the number of the indoor units detected is different from the number of communicating indoor units.	1. Power wiring or the communications cable to the heat recovery unit is defective. 2. After auto addressing, indoor unit has the wrong address (defective indoor unit PCB and / or power wiring / communications cable). 3. Heat recovery unit rotary or DIP switch setting(s) is (are) wrong. 4. Heat recovery unit PCB is defective.

1. See if the green communication LED of the heat recovery unit is blinking.
2. If the green communication LED of the heat recovery unit is consistently blinking:
   - Check the input power of the heat recovery unit.
   - Reset power to the outdoor unit and heat recovery unit, wait for ≥thirty (30) minutes so the piping temperature will cool down, and then perform the auto addressing procedure.
   - While the power to the heat recovery unit is on, check if error code “CH05” is displayed (see troubleshooting instructions for Error No. CH05).
3. If the green communication LED of the heat recovery unit is still consistently blinking, check the rotary switch and DIP switch settings. Reset power to the outdoor unit and heat recovery unit, wait for ≥thirty (30) minutes so the piping temperature will cool down, and then perform the auto addressing procedure.
4. If the number of indoor units is different than what is actually installed and what number is displayed after the auto addressing procedure is finished, check the piping installation. Outdoor unit ↔ Heat Recovery unit ↔ Indoor unit.
5. If an indoor unit has not been connected to the first port (No. 1 Valve) of the heat recovery unit, set the heat recovery unit piping manually.

Note:

During initial system commissioning (or re-commissioning) Error No. CH200: Pipe Detection Error – failure to find indoor unit”, by default, calls for an immediate shutdown without first performing any auto restart attempts. For more information on CH200, see also Service Function SE14 in the Outdoor Unit Functions section.

Troubleshooting Heat Recovery Unit Error Codes CH207 and CH208

Error No.	Description	Details	Causes
207 C+ No. (#) of Heat Recovery Unit	Communication error between the heat recovery unit Main and Sub PCBs.	Communication between the heat recovery unit Main and Sub PCBs is not occurring.	1. Defective wiring between heat recovery unit Main and Sub PCBs. 2. Defective heat recovery unit main PCB. 3. Defective heat recovery unit Sub PCB.

1. Check if DIP Switch No. 5 of SW02E on heat recovery unit Sub PCB is ON.
2. Check if the communication wiring between the heat recovery unit Main and Sub PCB is connected properly. Reconnect or replace connections if necessary.
3. Replace main PCB of heat recovery unit.

Error No.	Description	Details	Causes
208 C+ No. (#) of Heat Recovery Unit	Communication error of heat recovery unit EEPROM.	Heat recovery unit EEPROM is not communicating with the main PCB.	1. Defective wiring between EEPROM and main PCB of heat recovery unit. 2. EEPROM defective wiring / wrong wiring type. 3. Defective heat recovery unit main PCB.

1. Check if the wiring between the heat recovery unit EEPROM and main PCB is connected properly. Reconnect or replace connections if necessary.
2. Replace main PCB of heat recovery unit.

⚠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.*
- *Turn the power off before servicing the equipment. Electrical shock can cause physical injury or death.*
- ⃠ *Do not operate the disconnect switch with wet hands. There is risk of fire, electric shock, physical injury or death.*

⚠WARNING

- *Disconnects must only be performed by a properly licensed electrician. Incorrect wiring could cause the disconnect to explode, leading to physical injury or death.*
- ⃠ *Do not operate the unit with the panel(s) or protective cover(s) removed. The hot, cold, and high-voltage parts of the unit can cause physical injury or death.*
- ⃠ *Do not touch the refrigerant piping during or after operation. It can cause burns or frostbite.*

Note:

- *If the power wiring and communication cables on the heat recovery unit(s) and indoor unit(s) are not properly connected (connections switched), the communication components will burn out.*
- ⃠ *Do not supply power to the unit until all electrical wiring and controls wiring are completed.*

Indoor Unit Temperature Sensing Location

To maintain optimal comfort, proper operation and efficiency, considerations must be taken when selecting temperature sensing options.

Choose from one of four methods for temperature sensing, and record what method is used for each indoor unit on the Pre-commissioning Device Configuration Worksheet.

1. Return air temperature sensor at the indoor unit. Sensing at the return air is the default method. LG indoor units are factory-built with a return air temperature sensor and do not require a remote controller. For more information, visit www.lghvac.com, and refer to the Engineering and Installation manuals for each particular indoor unit.
2. Use the sensor embedded in the remote controller. (Remote controllers are separate purchases.)
3. Remote temperature button sensor. (Not compatible with wall-mounted indoor units. Temperature button sensor is a separate purchase.)
4. Combination of remote controller with embedded sensor and remote temperature button sensor. When a remote controller is used in combination with the return air temperature sensor or a remote temperature button sensor, the indoor unit uses the sensed value farthest from the set point.

Temperature Sensor Location Considerations

- The indoor unit's return air sensor can be used when air is directly returned to the indoor unit without mixing with other sources such as outside air or open plenum air.
- Temperature sensor must be installed in a location where the temperature of the area is representative of the desired zone temperature, and in an easily accessible location.

⃠ Do not install the temperature sensors in:

- Areas affected by drafts.
- Dead spots behind doors or in corners.
- Areas affected by hot/cold air flow.
- Areas affected by sun or appliances.
- Near concealed pipes or chimneys.
- Unconditioned areas such as an exterior wall.

Note:

If it is not possible to locate the remote controller in an area that is both accessible and representative of the desired zone temperature, using a remote controller for control, and a remote temperature button sensor for the sensing location is also an option.

Temperature Sensing Options in a Single Zone—Single Zone, Single Indoor Unit

- A remote controller in an appropriate location is often used, which allows the system to sense the actual temperature that the occupants are experiencing. (Function Code 4 must be set to 001.)
- If an appropriate location for the remote controller is not available, use the remote controller with a remote temperature button sensor. Connect the button sensor to the indoor unit and locate it in an appropriate location.

Temperature Sensing Options in a Single Zone—Single Zone, Multiple Units, Group Control

- Using the return air temperature sensor of each individual unit will allow the indoor unit to adjust to the load in its portion of the space.
- Using a remote temperature button sensor with each indoor unit will also allow the indoor unit to adjust to the load in its portion of the space, and will also better reflect the temperature at the occupant level.

Indoor Unit Temperature Sensing Location, continued.

Considerations for Ducted Units—Single Zone, Single Unit

- When using the return air temperature sensor of a ducted indoor unit, ensure that the air temperature being sensed is directly from the space and not air mixed with outside air or open plenums. Also, the temperature sensed by the return air temperature sensor when the ducted indoor unit fan is not operating could be affected by the distance of the duct run.
- If the return air is not representative of the space due to outside air introduction, open plenum, or other reasons, using a remote controller or remote temperature button sensor is required.

Considerations for Ducted Units—Multiple Spaces, Single Indoor Unit

In some applications, a single ducted unit is used to serve multiple smaller spaces. The indoor unit will still control based on the sensed space temperature.

1. Use the return air temperature sensor to sense a common return from all of the spaces served by the indoor unit.

Note:

If outside air is introduced into the indoor unit or an open plenum is used, ⃠ do not use this option for sensing temperature.

2. Use a remote controller in the most often occupied area along with a remote temperature button sensor in another area. When the combination sensing method is used, the indoor unit uses the sensed value farthest from the set point. (Function Code 4 must be set to 003.)
3. Use multiple remote temperature button sensors in a series-parallel configuration to average the space temperature across multiple spaces.

Note:

For more information, see the "Temperature Sensing Applications Guide" on www.mylghvac.com.

Setting External Static Pressure

Ducted units will need the fan speed adjusted to deliver the required airflow at the external static pressure (ESP) of the duct system. Settings are made using a wired remote controller and the air flow information found in the specific indoor unit's engineering manual. For instructions on how to set the ESP through the wired remote controller, consult the user's, owner's, and / or installation manual for that particular controller.

Note:

It is always best if the air balance is completed prior to a request for an LG trained commissioner. If the air balancing contractor has not completed the work before commissioning, the LG trained commissioner is not responsible for setting the indoor unit air flow rates, fan speeds, or ensuring the air volume delivered at each indoor unit is per project specifications. Excessive or restricted airflow will impact the ability of the LG trained commissioner to successfully complete system commissioning. If any problems exist, request verification from the Test and Balance contractor. If necessary, provide instruction to the air balance technician on how to adjust the indoor unit fan setting value.

Summary of External Static Pressure Procedure

1. Request / review the final air balance report (that includes the actual measured ESP[s] and required air flow rate[s]).
2. Note all required fan setting value changes.
3. Perform all required ESP (fan) setting value changes. A separate ESP (fan) setting value must be selected for each available indoor unit fan speed.
4. Check all fan setting values on zone controllers to verify adjustments were made.
5. Record the values on the Pre-Commissioning Device Configuration Worksheet.

Determining External Static Pressure and Setting the Values

1. For ducted indoor units, the Engineering Manual includes tables listing setting values as they relate to ESP and airflow. The installer can use the available range of ESP settings to adjust for ductwork in the system (consult the latest engineering manual; see www.lghvac.com). See table below for an example.

Note:

The indoor unit fan(s) cannot be allowed to operate outside manufacturer's parameters. Extended operation in these conditions will result in

- *Fan surge (noisy & slow pulsating airflow), and / or*
- *Fan motor failure*

Table 57: Example of Ducted Unit External Static Pressure and Air Flow Table from an Engineering Manual.

Set Value	Static Pressure (in. wg)										
	0.19	0.23	0.31	0.39	0.47	0.55	0.59	0.62	0.66	0.70	0.78
91	1,642	1,543	1,349	1,105	819	494	317	130	-	-	-
96	1,762	1,628	1,518	1,183	1,098	649	483	317	91	-	-
101	1,839	1,772	1,691	1,395	1,320	964	889	628	314	215	-
106	1,815	1,808	1,779	1,568	1,522	1,176	1,133	1,020	741	632	293
111	1,892	1,896	1,868	1,762	1,705	1,433	1,419	1,158	1,112	960	618
116	-	-	-	1,967	1,794	1,582	1,504	1,416	1,327	1,147	974
121	-	-	-	-	1,843	1,794	1,776	1,613	1,575	1,370	1,137
126	-	-	-	-	-	-	1,921	1,808	1,779	1,624	1,536

2. The table below presents the ESP settings that the unit comes with from the factory, plus an additional "standard" setting.

Table 56: Example of Ducted Unit External Static Pressure and Air Flow (with Settings) from an Engineering Manual.

Model	Capacity (MBh)	Mode		Setting Value	Standard ESP (in. wg)	CFM	Min. ESP (in. wg)	Max. ESP (in. wg)
ARNU483****	48.1	High (Factory Set)	High	116	0.55	1,582	0.39	0.78
			Mid	111		1,434		
			Low	106		1,176		
		Standard	High	106	0.39	1,568	0.27	0.55
			Mid	102		1,395		
			Low	95		1,183		

3. Once the available system static pressure requirements and the desired airflow rate are known, select the required ESP (fan) setting value(s). A separate ESP (fan) setting value must be selected for each available indoor unit fan speed.

Note:

Fan RPM = fan setting value x 10.

4. Record the values on the Pre-Commissioning Device Configuration Worksheet. If the fan setting value was left at the factory default, insert "000" in the blank.

Package Pre-commissioning Documents

1. A copy of the refrigerant piping system(s) shop drawing(s) generated by LATS Multi V pipe design software.
2. A copy of the pipe fitter's pipe changes and field notes.
3. A verified copy of the "As-Built" LATS Multi V Project file (*.mtv) that includes all changes noted by the pipe fitter(s) in 2. Notes must include changes to the line lengths and number of elbows used for each liquid line segment. Verify that the sum of the indoor unit nominal capacity connected to the piping system is between 50% and 130% of the nominal capacity of the outdoor unit(s). If this rule is violated, the system will not start.
4. Air balance report showing proper airflow at all indoor units.
5. A copy of a completed and verified Installation Checklist for the outdoor unit(s), indoor units, heat recovery units, ERVs, Air Cleaners, and Control Devices. Correct any procedures needing attention before initiating a request for commissioning.
6. A completed Pre-commissioning Device Configuration Worksheet with the models and serial numbers of all equipment to assist in full Warranty activation.
7. A completed copy of the Pre-commissioning Checklist.
8. If available, a list of IP addresses obtained from the IT department for each ACP, BACnet®, LonWorks®, and AC Smart device. (BACnet is a trademark of ASHRAE; LonWorks is a trademark of Echlelon Corporation.)

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

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

Note:

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

Initiate a Request for a System Commissioning

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

System Commissioning

The Multi V System commissioning process and procedures are provided in a separate manual and/or in training materials provided by the LG Academy Training Team. To obtain a copy, you must be a certified LG trained commissioner.

After Commissioning Has Been Requested

The LG trained commissioner will contact you to discuss specific job points, scheduled day(s) and expected duration. It is the contractor's responsibility to provide all of the necessary start-up labor, refrigerant, tools and test equipment needed to complete the process in the expected time frame. Please note that the LG trained commissioner allotted time at your project DOES NOT include owner training.

It is understood that the contractor is to request for a LG trained commissioner when all required project readiness points are complete; not based on an "expected" completion date. The contractor also acknowledges that they will assume all responsibility for costs incurred by the LG trained commissioner including but not limited airfare, travel costs, transportation, shipping, labor, and tool costs due to lack of readiness.

The LG trained commissioner's schedule is usually very rigid, and has no flexibility regarding duration. It also involves advance travel arrangements that will be impractical or impossible to change.

Freight Damage and Unit Replacements ..... Your LG Manufacturer Representative
Missing Parts ..... Your LG Manufacturer Representative
Received Wrong Outdoor Unit Model(s) ..... Your LG Manufacturer Representative
Installation, Startup, and Commissioning Technical Assistance ..... Your LG Manufacturer Representative

ERROR CODES

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

General Information

LG VRF system's core logic uses error codes to indicate that an abnormal operation occurred. Error codes help guide a trained service technician to identify why and what caused the error to display, and help track the frequency of malfunction occurrences.

There are four (4) levels of error code responses; the system responds accordingly, depending on the severity of the malfunction assigned to the malfunction. The level of responses range from "notify and keep operating" (Level 4), to "immediate system shutdown" (Level 1).

All error codes can be viewed at the outdoor unit seven segment display (SSD) and with LGMV software. If an error code shows on one (1) or more indoor unit zone controllers, it will display on LGMV, central controllers, BMS, or any other LG device connected to Comm bus - Internet A/B. Indoor unit error code notifications will display differently based on location of the problem.

Level 4 Responses

Level 4 responses display the error code, but the system continues to operate (operate indefinitely). When the malfunction is fixed, the error code remains until the Main outdoor unit's microprocessor is reset, and operation has resumed for 130 minutes without the malfunction reoccurring.

Level 3 Responses

Level 3 responses display the error code on all zone controllers, central controllers, and on BMS systems. For Level 3 responses, the Multi V system will shut down for three (3) minutes, and then the main microprocessor in the outdoor unit will automatically restart the system.

If the malfunction reoccurs up to a total of nine (9) times within one (1) hour, the system will display the error code, shut down, and restart again each time. If the malfunction occurs a tenth (10th) time within the same one (1) hour, the system shuts down permanently, assigning the error to a Level 1 response that requires a manual restart. The error code displays on the zone controllers and central controllers until the malfunction is fixed.

Level 2 Responses

Level 2 responses are communications related errors only. Level 2 responses activate after ten (10) attempts to communicate have occurred. After communications have been re-established, the error codes display for one (1) minute. If the communications are restored, then the error code disappears. If the communication is lost within one (1) minute, the error code remains.

Error codes for Level 2 responses stop appearing on the zone and central controllers as soon as communications are restored, without the need to reset power at the Main outdoor unit or to restart the entire system.

Multi V error codes for Level 2 responses appear where the problem occurs, and time limits differ depending on type:

1. Communications lost between outdoor unit PCBs – no time delay.
2. Communications lost between the indoor unit and the outdoor unit for three (3) minutes.
3. Communications lost between the indoor unit and heat recovery unit for ten (10) seconds.
4. Communications lost between outdoor unit external PCBs for ten (10) seconds.

Level 1 Responses

Many Level 1 responses call for an immediate system shutdown, and, in almost all abnormal operational situations, occur after the algorithm monitoring system verifies that the malfunction is real (to avoid nuisance alarms and false positives). Level 1 responses are displayed at zone controllers, central controllers, BMS, LGMV, and the outdoor unit SSD. They cannot be cleared until the problem that caused it is fixed.

Before a Level 1 response is assigned, the Multi V algorithm initially assigns a Level 3 response to any system malfunction that is not communications related. The system follows Level 3 protocol until the tenth (10th) time a malfunction occurs, at which time the system shuts down, the malfunction changes from Level 3 to Level 1, and a manual restart is required. The entire Level 3 auto restart to Level 1 shut down sequence will repeat until the malfunction is fixed.

Note:

For detailed information on Multi V Levels and error codes, how to troubleshoot each error, see the Multi V S with LGRED Service Manual on www.lghvac.com, and contact an LG trained technician.

ERROR CODE TABLES

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

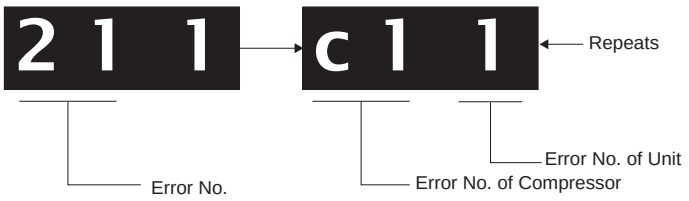
Error Code Display

The seven segment display on the main board displays error codes. Error codes are 3 or 4 digit numbers. The rightmost number designates the outdoor unit. The other two or three digits indicate the error.

Examples: 21 = Error No. 21 on outdoor unit,105 = Error No. 105 on outdoor unit.

- If two or more errors occur simultaneously, the lower error code number is displayed first.
- After error is resolved, the error code disappears.

Example of an Error Code.



Nomenclature Definitions

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

The error code tables below and on the following pages list the error codes used for Multi V systems. For detailed information on how to troubleshoot each error, see the Multi V S with LGRED Service Manual on www.lghvac.com.

Table 58: Error Codes.

Error Code			Description	Details
Indoor Unit	0	1	Indoor unit return air or optional remote wall temperature sensor communications error.	Indoor unit air temperature sensor is disconnected or shorted. (Check the wiring, connection on the indoor unit PCB, then check the thermistor.)
	0	2	Indoor unit inlet pipe temperature sensor communication error.	Indoor unit inlet pipe temperature sensor is disconnected or shorted. (Check the connection on the indoor unit PCB, then check the thermistor.)
	0	3	Communication error between zone controller and indoor unit.	Indoor unit PCB is not receiving communications signal from zone controller.
	0	4	Indoor unit drain overflow error.	Drain pump and/or float switch could be malfunctioning. Also check drain line for obstructions.
	0	5	Communication error between outdoor unit PCB and indoor unit PCB.	Indoor unit communications PCB is not receiving signal from outdoor unit communications PCB for more than 5 minutes. Check indoor unit PCB for issues.
	0	6	Indoor unit outlet pipe temperature sensor error.	Indoor unit outlet pipe temperature sensor is disconnected or shorted. (Check the connection on the indoor unit PCB, then check the thermistor.)
	0	7	Indoor units are not operating in the same mode. (Heat pump applications only.)	Different operation mode between indoor units.
	0	9	Indoor unit EEPROM error.	• Communication error between the indoor unit PCB board and its option card. (The option card is about 1' x 1' and is plugged into the indoor unit PCB board. Check connection between the two.) • Communication error between EEPROM on indoor unit main PCB. • Indoor unit EEPROM data is not available.
	1	0	Indoor unit BLDC fan motor communications error.	• Fan motor has been removed or is defective. Refer to the resistance and voltage check charts in the MV S with LGRED service manual. • The system has detected the fan motor is not spinning. • On new installs, verify installation manual and paperwork were removed from fan discharge shroud during installation. • Check the wiring plug and connections (if applicable).

For detailed information on how to troubleshoot each error, see the Multi V S with LGRED Service Manual on www.lghvac.com.

ERROR CODE TABLES

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

Table 59: Error Codes, continued.

Error Code				Description	Details
Indoor Unit	2	3	0	Refrigerant leak sensor error. Only displayed at the indoor unit and its wired remote controller.	• Refrigerant leak sensor error; sensor is malfunctioning. • Error will also be displayed if the function is enabled on the wired remote controller, and there is not a sensor installed. • Refrigerant leak is detected when >6,000 ppm. • Enable the function through the function code on the remote controller. 1. Operation stop. 2. Solenoid valve closes on the indoor unit side. 3. CH230 is displayed. If the communication baud is 1,200 bps, then only the zone controller can display the CH230; central controller cannot display the error due to lack of information. 4. Buzzer rings 2 long buzzes every 1 second. Ringing stops when there is an input from the controller. (If there is a hard lock, then only the controller can make the hard lock to stop buzzing. If leak sensor measures under 1.5V, then it is considered normal and the buzzing stops. 5. To release the error, power needs reset.
	2	3	7	Communication error between outdoor unit PCB and indoor unit PCB. Only displayed at the indoor unit and its wired remote controller.	Indoor unit communications PCB is not receiving signal from outdoor unit communications PCB for more than 3 minutes. Check RS-485 communications for issues.
	2	3	8	Communication error between outdoor unit PCB and indoor unit PCB. Displayed at the indoor unit and its wired remote controller.	Indoor unit communications PCB is not receiving signal from outdoor unit communications PCB for more than 3 minutes. Check outdoor unit PCB for issues.
Outdoor Unit	2	1		Outdoor unit inverter board IPM fault error; Inverter driver detects overcurrent; Error code is determined by overcurrent in any one phase of compressor.	• Detected by the CT sensor on the IGBT PC board. • Overcurrent in compressor UVW phases. • Damaged compressor. • Damaged IPM on inverter board. • Compressor disconnected. • Damaged inverter board – input voltage too low.
	2	2		Outdoor unit inverter PCB AC input overcurrent (RMS) error.	• Overcurrent of outdoor unit inverter board PCB. • Under voltage. • Refrigerant flow restriction from defective EEV. • Refrigerant charge is too high (overcharged).
	2	3		Low DC voltage sensed at the outdoor unit inverter compressor DC link.	System shut off because the DC link voltage exceeded minimum and maximum limits. • Start diagnosis at the inverter socket on the outdoor unit noise filter PCB. • There is a capacitor that is not working properly, or the voltage at the capacitor is out of range. • Disconnected DC link. • Damaged electrical condenser component (serving capacitor) on inverter driver board.
	2	4		System has been turned off by the outdoor unit high pressure switch.	Outdoor unit high pressure switch error. • Check the connection on the outdoor unit PCB. • Use chart in Troubleshooting section of the Service Manual to check signal output (V DC) versus actual pressure.
	2	5		Input voltage to the outdoor unit is too high or too low.	Outdoor unit has an input voltage of ≤140V or ≥300V (for 208-230V units).
	2	6		Outdoor unit inverter compressor operation error.	Inverter compressor failed to start.
	2	9		Outdoor unit inverter compressor overcurrent error.	• Outdoor unit inverter compressor current draw is too high. • Compressor defect and restriction in refrigerant piping are possible causes.

For detailed information on how to troubleshoot each error, see the Multi V S with LGRED Service Manual on www.lghvac.com.

Table 60: Error Codes, continued.

Error Code			Description	Details
Outdoor Unit	3	2	Excessive increase in outdoor unit inverter compressor gas discharge temperature.	• System shutdown happens when discharge pipe temperature rises too high. • Check the inverter compressor discharge pipe temperature sensor. • Check for low refrigerant / leaks. • Check for a defective EEV. • Check for a defective liquid spray valve.
	3	4	Outdoor unit compressor high pressure safety tripped.	• Shutdown due to if the compressor's high pressure is too high. • Check the high pressure sensor, indoor unit or outdoor unit fan(s), refrigerant, EEV, service valve (may be clogged); check for defective outdoor unit PCB, indoor unit pipe temperature sensor, or hot gas valve. Also, outdoor unit may not have enough clearance (cooling operation), or indoor unit filter may be clogged (heating operation).
	3	5	Outdoor unit low side pressure below allowable limits.	• System will shut down when an abnormal low pressure condition occurs. • Check for refrigerant leaks (low refrigerant charge), or a defective indoor unit EEV.
	3	6	Outdoor unit inverter low compression ratio.	Outdoor unit is experiencing a problem developing compressor lift. Error is calling out low compression ratio. System will shut down and display error code "CH36*".
	4	0	Outdoor unit inverter compressor current transducer (CT) sensor error.	Outdoor unit inverter compressor current transducer (CT) detection sensor disconnected or shorted.
	4	1	Outdoor unit inverter compressor discharge pipe temperature sensor error.	• Error can also occur if the system is operating in cooling at extremely low temperatures with no low ambient kit. • Compressor discharge pipe temperature sensor (TH3) is not installed or connected properly. • Defective compressor discharge pipe sensor (TH3) (opened or shorted); • Defective outdoor unit PCB.
	4	2	Outdoor unit low pressure sensor error.	• Check the connection on the outdoor unit PCB. • Thermistor shorted or opened. • Check for 12 V DC between 12 V and GND (red to black) for 5 V DC. • Check the Signal to GND (white to black) and use correct chart from Troubleshooting section to compare with actual system temperature.
	4	3	Outdoor unit high pressure sensor error.	
	4	4	Outdoor unit ambient temperature sensor error.	• Check the connection on the outdoor unit PCB. • Thermistor shorted or opened.
	4	5	Outdoor unit heat exchanger pipe temperature sensor.	
	4	6	Outdoor unit suction pipe temperature sensor error.	• Check the connection on the outdoor unit PCB. • Thermistor shorted or opened. • Check suction sensor in cooling mode; check hot gas sensor located near the heat exchanger in heating mode.
	5	0	Outdoor unit loss of phase.	Input power line connections is / are missing for the outdoor unit.
	5	1	Combination ratio is out of range.	The total of the nominal indoor unit capacity is less than 50% or more than 130% of the nominal outdoor unit capacity.
	5	1	Total indoor unit capacity exceeds allowable heat recovery unit branch capacity. (Heat Recovery Systems only.)	Value of total indoor unit capacity exceeds allowable heat recovery unit branch capacity specifications. After auto-pipe detection is complete, wait 5 minutes, then verify connected capacity.

For detailed information on how to troubleshoot each error, see the Multi V S with LGRED Service Manual on www.lghvac.com.

ERROR CODE TABLES

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

Table 61: Error Codes, continued.

Error Code				Description	Details
Outdoor Unit	5	1		Combination ratio is out of range.	The total of the nominal indoor unit capacity is less than 50% or more than 130% of the nominal outdoor unit capacity.
	5	1		Total indoor unit capacity exceeds allowable heat recovery unit branch capacity. (Heat Recovery Systems only.)	Value of total indoor unit capacity exceeds allowable heat recovery unit branch capacity specifications. After auto-pipe detection is complete, wait 5 minutes, then verify connected capacity.
	5	2		Communication error between outdoor unit main PCB and inverter PCB.	• Communication error between main PCB and inverter PCB. • Check connections at both sockets. • Inspect interconnecting cable for wear.
	5	3		Communication error between outdoor unit main PCB and indoor unit(s) PCB.	• Check if outdoor unit to indoor unit(s) communications cable disconnected or shorted. • Check A terminals are connected to indoor unit A(3) (5 on 3 x 3 cassette) terminals; B(4) (6 on 3 x 3 cassette) terminals.
	5	7		Outdoor unit main PCB and inverter PCB communication error.	Outdoor unit inverter PCB is not receiving signal from main PCB.
	6	0		Outdoor unit inverter PCB EEPROM error.	• Verify the EEPROM is present and in the socket correctly. • Check if all pins are in and are not bent. • Check if notch in the chip lines up with the arrow on the socket.
	6	2		High temperature at the outdoor unit inverter heatsink.	System shut off because of high temperatures at the outdoor unit inverter heatsink.
	6	5		Outdoor unit inverter heatsink temperature sensor error.	• Check the connection on the outdoor unit PCB. • Thermistor shorted or opened. • Check for 12 V DC between 12 V and GND (red to black) for 5 V DC. • Check the Signal to GND (white to black) and use correct chart from Troubleshooting section to compare with actual system temperature.
	6	7		Outdoor unit fan has locked up.	No airflow.
	7	1		Outdoor unit inverter CT sensor error.	Outdoor unit is restricted.
	8	6		Outdoor unit main PCB onboard EEPROM error.	• Verify the EEPROM is present and in the socket correctly. • Check if all pins are in and are not bent. • Check if notch in the chip lines up with the arrow on the socket.
	1	1	3	Outdoor unit liquid pipe temperature sensor error.	• Check the connection on the outdoor unit PCB. • Thermistor shorted or opened. • Check for 12 V DC between 12 V and GND (red to black) for 5 V DC. • Check the Signal to GND (white to black) and use correct chart from Troubleshooting section to compare with actual system temperature.
	1	1	4	Outdoor unit subcooling inlet temperature sensor error.	
	1	1	5	Outdoor unit subcooling outlet temperature sensor error.	
	1	5	0	Outdoor unit compressor discharge superheat not satisfied.	Code indicates that based on current superheat measurements, there is a high possibility of liquid refrigerant flooding back and damaging the compressor. • Outdoor unit compressor discharge superheat not satisfied for ≥5 minutes. • Code can only occur when the outdoor is operating in cooling mode (all indoor units must be in cooling mode; error cannot occur during simultaneous operation). • After at least 10 minutes of compressor operation, the Main outdoor unit microprocessor will calculate the system's compressor superheat. If at any time during compressor operation where all indoor units in thermal on are in cooling mode and the compressor superheat falls <4.8°F (<3°C) for ≥5 minutes, there is a high probability that liquid could flood back to the inlet of the compressor scroll, resulting in compressor damage. • If error occurs 3 times within any 1 hour period of compressor operation, the system will shut down and remain off. A manual restart will be necessary.
	1	5	1	Outdoor unit difference between high and low pressure is too low.	Not enough pressure difference between high and low. Function error of outdoor unit four-way reversing valve.

For detailed information on how to troubleshoot each error, see the Multi V S with LGRED Service Manual on www.lghvac.com.

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

Table 62: Error Codes, continued.

Error Code					Description	Details
Heat Recovery Unit	-	5	1	C + No. of HR Unit	Capacity of indoor units connected to the heat recovery unit exceeds allowable limits.	The amount of nominal cooling capacity of indoor units connected to a heat recovery unit, or a heat recovery unit port, or grouped heat recovery unit port is excessive. After auto-pipe detection is complete, wait 5 minutes, then verify connected capacity. System will display error if: • The heat recovery unit port addresses are all unique, single indoor unit connected exceeds allowable capacity; total of multiple indoor units connected exceeds allowable capacity. • If two (2), etc., heat recovery unit port addresses are the same and the ports are twinned; total of multiple indoor units connected exceeds allowable capacity. • If three (3), etc., heat recovery unit port addresses are the same and the ports are all connected; total of multiple indoor units connected exceeds allowable capacity. • If the total connected indoor unit nominal capacity exceeds allowable capacity for a single heat recovery unit. • Review 3A Series HRU information on maximum allowable indoor units and Mbh. • Error code displays on the outdoor unit SSD, the heat recovery unit SSD, or in LGMV.
	2	0	0	1	Auto pipe search failure.	Auto piping procedure did not complete properly.
	2	0	1	C + No. of HR Unit	Heat recovery unit liquid sensor error. (C = Heat recovery unit + Heat recovery unit number).	Disconnection or short circuit of heat recovery unit liquid pipe sensor.
	2	0	2		Heat recovery unit subcooling pipe inlet sensor error. (C = Heat recovery unit + Heat recovery unit number)	Disconnection or short circuit of heat recovery unit subcooling pipe inlet sensor.
	2	0	3		Heat recovery unit subcooling pipe outlet sensor error. (C = Heat recovery unit + Heat recovery unit number)	Disconnection or short circuit of heat recovery unit subcooling pipe outlet sensor.
	2	0	4		Communication error between outdoor unit and heat recovery unit. (C = Heat recovery unit + Heat recovery unit number)	• Outdoor unit does not receive signal from heat recovery unit. • Incompatible outdoor unit software.
	2	0	7		Communication between the 3A series heat recovery unit Main and Sub main PCBs is not occurring.	Communication error between the 3A series heat recovery unit Main and Sub main PCBs.
	2	0	8		3A series heat recovery unit EEPROM is not communicating with the main PCB.	Communication error of 3A series heat recovery unit EEPROM.
Network	2	4	2	*	Network error of central controller.	Inability of the central controller to receive information from the outdoor unit.

For detailed information on how to troubleshoot each error, see the Multi V Service Manual on www.lghvac.com.

LG MONITORING VIEW (LGMV) DIAGNOSTIC SOFTWARE

MULTI V S WITH LGRED

LG Monitoring View (LGMV) Diagnostic Software

LG Monitoring View (LGMV) software allows real-time monitoring of Multi V system operating parameters, and can be used to commission new systems. LGMV software can also help the service technician or LG trained commissioner to troubleshoot existing system operation issues by displaying error codes. Also, LGMV data can be recorded to a .csv file and emailed to an LG representative to assist with diagnostic evaluations.

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

LGMV Monitoring Screen.

Note:

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

LGMV Display

LGMV displays the following real-time data:

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

LG

LG MONITORING VIEW (LGMV) DIAGNOSTIC SOFTWARE

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

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

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

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

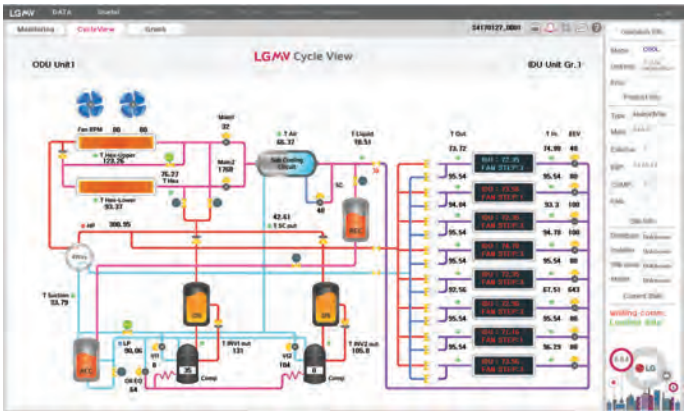
4. Setting: Converts metric values to imperial values.

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

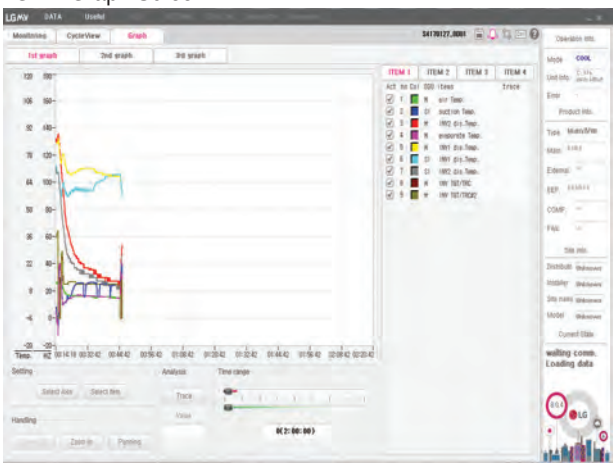
6. Loading Data: Recorded data from a saved ".CSV" file can be loaded to create an LGMV session.

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

LGMV Cycleview Screen.



LGMV Graph Screen.



Note:

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

Table 63: Maintenance Recommendations.

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

Note:

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

MULTI V S WITH LGRED

INSTALLATION CHECKLIST

LG

Major Component Rough-In

Description	Check
All Multi V outdoor units are connected properly per local code and the product installation procedures.	
All literature and bagged accessories have been removed from the fan discharge (ducted and cassette model indoor units).	
All indoor units and heat recovery units (for Heat Recovery systems only) are installed, properly supported, and located indoors in a non-corrosive environment.	
Duct work installation completed (ducted indoor units only).	

Piping Material, Components, and Insulation

Description	Check
Heat recovery systems: LG prefers the use of ACR hard drawn copper on pipe segments located between heat recovery units and outdoor units, between heat recovery units piped in series, and between heat recovery units and multiple indoor units sharing an heat recovery unit port.	
Heat pump systems: LG prefers the use of ACR hard drawn copper for all pipe segments in the piping system except segments located between Y-branch fittings (or header fittings) and indoor units.	
DOAS Units: LG prefers the use of hard drawn copper in pipe segments connecting a DOAS products and an outdoor unit.	
Single-zone and multi-zone duct-free split systems: ACR copper piping rated at the system working pressure was used.	
LG Y-branch fittings or headers were used as per LATS report.	
All refrigerant pipes and valves were insulated separately. Insulation is positioned up against the walls of the indoor units and heat recovery units (for Heat Recovery systems only). No gaps shown. Insulation was not compressed at clamps and hangers.	

Brazing Practices

Description	Check
Use medical grade dry nitrogen for purging during brazing (constant 3 psig while brazing).	
15% silver brazing material only.	
Minimum 3/4 inch, maximum 1 inch condensate piping installed on indoor units – material used is acceptable under local code. Insulated to prevent condensation.	

Refrigerant Piping Design and System

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

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INSTALLATION CHECKLIST

Heat Recovery Unit

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

Condensate Pump / Drain Installation

Description	Check
Indoor unit condensate drain pipes were installed correctly.	
All condensate vertical risers are equal to or less than 27-1/2 inches or 31-1/2 inches from the bottom of the indoor unit (depending on model).	
Indoor units with condensate pumps were level. Units with gravity drains were level or slightly canted toward the drain connection and are supported properly.	
Pumped condensate drain lines were properly connected (⃠ do not have traps, and connect to the top surface of the main drain line).	
Condensate lines are properly insulated to prevent condensation.	

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 outdoor unit.	
The power supplied was clean with voltage fluctuations within specifications (±10% of nameplate).	
Power wiring to the outdoor unit was installed per all local, state, and NEC requirements.	
Power wiring to each indoor unit / heat recovery unit was installed per all local, state, and NEC requirements.	
Communications cable between the outdoor unit and indoor units / heat recovery units was connected in a daisy chain configuration (i.e., single parallel chain). No "star" or multiple parallel circuits. ⃠ No cable splices or wire nuts were used to connect communications cables.	
Record Communication Voltage Range High _____ VDC Low _____ VDC	
Proper communications cable was used between each indoor unit and its zone controller where applicable. No cables were spliced and no wire nuts are present.	
Communication type RS-485 BUS type.	
Communication cable between outdoor unit and indoor units / heat recovery units to be 18 AWG, 2-conductor, twisted, stranded, shielded. Ensure the communication cable shield is properly grounded to the outdoor unit chassis only. Cable segment shields are tied together.	
Use appropriate crimping tool to attach ring or fork terminals at all power wiring and control cable terminations.	
All power and control wires were properly separated using the required minimum distance provided in the product installation manual.	
Only LG-supplied Y-cables were used between grouped indoor units.	

INSTALLATION CHECKLIST

Major Component Rough-In

Piping and Insulation

Brazing Practices

Installation—Refrigerant Piping

Installation—Heat Recovery Unit (Heat Recovery Systems Only)

Installation—Condensate Pump / Drain Installation

Installation—Power Wire and Communications Cables

MULTI V S
WITH
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PRE-COMMISSIONING CHECKLIST

Job Name / Location _____ Tag # _____

Date: _____

Address: _____

_____

Refrigerant Circuit Preparation

Description	Check
Using a copy of the LATS pipe design diagram, verify the sum of the indoor unit nominal capacity connected to the piping system is between 50% and 130% of the outdoor unit's nominal capacity. If this rule is violated, the system will not start.	
Check all indoor units for power at the unit disconnect and power is present at the indoor unit PCB board. (LED is lit.) ⃠ DO NOT TURN ON THE UNIT using the ON/OFF button.	
Successful auto address routine is complete. All device addresses have been recorded on the Indoor Unit Device Configuration Worksheet.	
Ensure all optional field-installed full-port ball valves are open.	
The piping system must hold a constant 550 psig pressure for a minimum of 24 hours with all isolation valves open. Correction Formula: (°F Temp. when pressure was applied - °F Temp. when pressure drop was checked) x 0.79 = psig. _____ °F - _____ °F = _____ psig. **Pressure Measurement Data** Initial Pressure _____ End Pressure _____ Start Date _____ End Date _____ Start Time _____ End Time _____ Initial Ambient Temperature _____ End Ambient Temperature _____	
A triple system evacuation has been performed. Micron gauge reading held at a maximum of 500 for one (1) hour with all isolation valves open and without the vacuum pump connected. **Evacuation** Initial Micron Level _____ End Micron Level _____ Start Date _____ End Date _____ Start Time _____ End Time _____ Rise _____	
Power was energized to the outdoor unit(s) at _____(time) on _____day to power the compressor crankcase heater(s). (Must be at least 6 hours before commissioning.)	
The communications cable to the indoor units has been disconnected from the IDU (B) and IDU (A) terminals at the outdoor unit(s).	
None of the outdoor unit(s) service valves have been opened during the installation and preparation of the system for commissioning. (If the valves were opened, the factory refrigerant charge has been released.)	

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PRE-COMMISSIONING CHECKLIST

Prepare Pre-Commissioning Package Documents

Include	Check
1. A copy of the refrigerant piping system(s) shop drawing(s) generated by LATS pipe design software.	
2. A copy of the pipe fitter's pipe changes and field notes.	
3. A verified copy of the "As-Built" LATS Project file (*.mtv) that includes all changes noted by the pipe fitter(s) in Number 2. The tree diagram notes must include changes to the line lengths used for each liquid line segment	
4. A copy of a completed and verified Installation Checklist for the outdoor unit(s), indoor units, ERVs, heat recovery unit (for Heat Recovery systems only), and Control Devices. Correct any procedures needing attention before initiating a request for commissioning..	
5. A copy of the air balance report showing proper airflow at all indoor units.	
6. A completed Pre-Commissioning Device Configuration Worksheet.	
7. A completed copy of the Pre-Commissioning Checklist.	
8. If available, a list of IP addresses obtained from the building owners IT department for each ACP, BACNet, LonWorks, AC Smart device.	

Initiate a Commissioning Request

Description	Check
Verify this checklist and requirements herein have been met. Complete this checklist in its entirety BEFORE initiating a request for Commissioning.	
Send all Pre-Commissioning Package Documents to your LG Applied Representative.	

Contractor Name: _____ _____

(Authorized Signature)

Address: _____

_____

Phone: _____ Date: _____

**This form must be completed and submitted to LG a minimum of three (3) weeks prior to final scheduling of any startup.*
Note: If any of the above items are not complete at time of start-up, back charges will be assessed for additional costs.

PRE-COMMISSIONING CHECKLIST

Notes for the LG Trained Commissioner

PRE-COMMISSIONING CHECKLIST

Notes for the LG Trained Commissioner

MULTI V S
WITH
LGRED°

COMMISSIONING NOTES

Job Name / Location _____ Tag # _____

Date: _____

Address: _____

_____

Refrigerant Circuit Preparation

Prepare Pre-Commissioning Package Documents

Initiate a Commissioning Request

MULTI V S WITH LGRED°

COMMISSIONING CHECKLIST EXCEPTION REPORT

Job Name / Location _____ Tag # _____

Date: _____

Address: _____

_____

Refrigerant Circuit Preparation

Prepare Pre-Commissioning Package Documents

Initiate a Commissioning Request

Date of Commissioning Report: _____

LG Trained Commissioner Name: _____

LG Trained Commissioner Signature: _____

LG Multi V Pre-Commissioning Device Configuration Worksheet

Project Name:	**Building ID**
Date: AC Smart Static IP address:	**System ID** **Page #**
Mech Contractor Company Name	MEP Project Mngr Name
Pre-Com Tech Name/Ph#/email	Ph# / Email

IDU's

Unit Tag	Building Floor	Room ID	Type	Model	Serial #	Adjusted Fan Setting Value . Low | Medium | High			System Address	Central Control Address	Group member ID or N/A if not in a group	Group Function M=Master S=Slave	Sensor Strategy (RA/ZC/Both)

To access additional technical documentation such as submittals, indoor unit engineering manuals, installation, service, product data performance, general best practice, and building ventilation manuals, as well as white papers, catalogs, LATS software programs, and more, log in to www.lghvac.com.

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