LG
Life's Good

MULTI V™ WATER IV

ENGINEERING MANUAL

for Heat Pump and Heat Recovery Water Source Units

Variable Refrigerant Flow
Water Source Units

6.0 to 48.0 Tons

PROPRIETARY DATA NOTICE

VRF-EM-BQ-002-US_014D16

About LG Electronics, Inc.

LG Electronics, Inc. is a global leader and technology innovator in consumer electronics, mobile communications, and home appliances, employing more than 213,000 people in more than 60 countries worldwide. LG Electronics, Inc. is ranked among the Fortune 500 list of largest companies. LG Electronics, Inc. comprises five business units—Home Entertainment, Mobile Communications, Air Conditioning, Business Solutions, and Home Appliance. LG is one of the world's leading producers of flat panel televisions, audio and video products, mobile handsets, air conditioners, and washing machines. LG's commercial air conditioning business unit was established in 1968 and has built its lineup of residential and commercial products to include Variable Refrigerant Flow (VRF), Multi F, duct-free split systems, packaged terminal air conditioners (PTACs), and room air conditioners. In 2011, the air conditioning and energy solutions business unit grew to include LED lighting and solar products. For more information, visit www.lg.com.

Variable Refrigerant Flow Technology

In the early 1980s, VRF technology was introduced to the world as an alternative method of cooling and heating commercial structures. VRF systems have become the system of choice for designers internationally because they offer better comfort at lower utility costs compared to traditional boiler/chiller/Variable Air Volume (VAV) air handler systems. Today, VRF is gaining popularity in the United States.

LG Multi V Water IV water source systems offer the opportunity to minimize ductwork in the same configuration. The system offers zoning without the need for zone damper systems. The LG Multi V Water IV system's advanced controls provide exceptional building dehumidification and temperature control, and can rapidly adapt system operating parameters to an ever-changing building load. The LG Multi V Water IV system is easy to design, install, and maintain. The modular design allows occupants to control their environmental condition, providing individualized control of the set-point temperature and allowing occupants to condition only the occupied zones.

Quality Commitment

LG is committed to the success of every Multi V project by providing the best industry technical support during project engineering, installation, and commissioning. LG offers a variety of classes designed for engineers, architects, installers, and servicers to ensure that every Multi V installation is completed successfully. Classes are conducted at LG's training centers and in field locations at various times throughout the year and upon special request.

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INTRODUCTION

WHY USE VRF?

Convergence of Technological Innovation with Flexibility and Style

Benefits of Multi V Water IV Systems

- Maximum individual zone control
- Long refrigerant piping lengths
- High refrigerant piping elevation differences
- Maximum flexibility
- Operating ranges:
  Entering water temperatures
  23 to 113 °F for cooling mode;
  23 to 113 °F for heating mode
- Quiet and comfortable environment
- Reduced ductwork

Multi V Water IV

Multi V Water IV, a Variable Refrigerant Flow (VRF) system, is among the industry's best air-conditioning units with great advantage on vertical rise and piping lengths. Choosing an LG Multi V Water IV VRF system provides the system designer an edge to engineer a system with individual control and design flexibility with advanced controls. Multi V Water IV is available in two configurations, heat pump and heat recovery.

Multi V Water IV heat pumps are two-pipe systems available in nominal capacities of 6.0 to 48.0 tons. These are best suited for applications with zones that require heating or cooling, such as residential and small office buildings.

Multi V Water IV heat recovery is a three-pipe system that provides simultaneous heating and cooling operation from the same water source unit.

Both Multi V Water IV heat pump and heat recovery systems allow the designer to accommodate up to 64 thermal zones, each controlled from a separate controller. Multi V Water IV water source units are available in 208–230 Volt, 60 Hz, 3 Phase and 460 Volt, 60 Hz, 3 Phase.

Adaptable and Flexible

Multi V Water IV water source units can be adapted to a wide range of building applications and sizes such as schools, hotels, hospitals, offices, and residences. The lightweight and small footprint allows system components to be placed in the building without expensive cranes, easily fitting into most service elevators and set in place with minimal requirements for structural reinforcements. The modular design of VRF systems means Multi V Water IV can be commissioned in stages so tenants can move in as each floor or even each room is completed.

Multi V Water IV technology allows you to pipe farther, reaching all areas of a building that would require the installation of a second system when using traditional direct-expansion cooling and heating equipment. Multi V Water IV provides the designer with uncompromised pipe system engineering flexibility—long pipe runs and large elevation differences. Whether your building is a high-rise

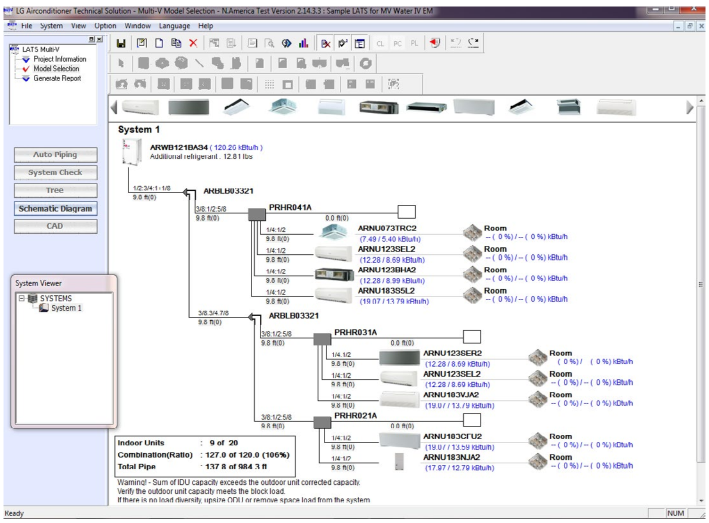
condominium, a hotel, a sprawling school, or an office complex. Multi V Water IV is best suited to reach the farthest corners and elevations.

Smaller Pipe Chases and Plenums

LG Multi V Water IV water source systems move heat with refrigerant, resulting in smaller space requirements for piping as compared to chilled water or roof top systems. This design helps reduce the overall construction and material cost of the building, and gives back leasable space. Flexible and logical placement of system components, shorter pipe lengths, and fewer joints lower installation costs and minimize potential leaking.

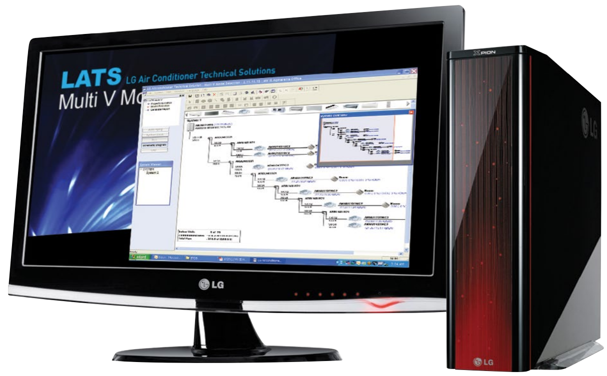
Intuitive Design

The LG Air Conditioning Technical Solution (LATS) Multi V design and layout software provides an intuitive, quick, and simple method to design a Multi V Water IV refrigerant pipe system. LATS Multi V checks piping lengths and elevations, and it assists with the sizing of indoor and outdoor units by calculating component capacity based on design conditions. LATS Multi V can import AutoCAD™ drawings and lay out the Multi V Water IV system to scale. When the designer finishes the AutoCAD system layout, all of the piping lengths will be calculated, and a drawing file with the Multi V system will be available for export and integration into the building drawing set.



Energy Modeling

Visit our website(www.lg-vrf.com) or consult your local LG representative for energy modeling guides.



PRODUCT DATA

Multi V Water IV

Multi V Water IV water source units (WSU), equipped with an inverter compressor, offer superior load matching and long piping installation. The product optimizes power consumption in high-rise buildings. Add on features make it easy to upgrade the existing capacity at any time. Sophisticated electronic control and unique refrigerant flow gives these systems the capability to perform in extreme/unusual working conditions.

Low Sound Levels

When Multi V Water IV water source units operate fully loaded, they have one of the quietest sound levels in the industry. Sound is almost undetectable during off-peak operation. To promote a quiet, comfortable environment, LG Multi V water source units operate at sound levels as low as 47 dB(A) in cooling mode and 51 dB(A) in heating mode. LG customers often ask if the water source unit is running after commissioning is complete.

All rotating components are soft-started by the controller using digitally controlled inverters, which reduces undesirable noise caused by compressors cycling on and off.

Comfort Control at Its Best

Tight temperature control through precise load matching maximizes the time that the indoor units remove moisture. This ensures maximum comfort and delivers the industry's best indoor humidity levels.

Precision Load Matching

Unlike traditional air conditioning control systems, which use thermostatic controls to maintain room temperatures, LG Multi V Water IV controls continuously vary the indoor unit fan speed and refrigerant flow, indirectly providing lower and more consistent humidity levels in the conditioned space. The longer the indoor coil temperature is below the dew-point of the room with air moving across the coil, the less the space humidity level varies, compared to technologies that cycle fans and compressors on and off multiple times per hour.

The water source unit varies the compressor speed as needed to maintain system operating pressure. As a result, the Multi V Water IV system delivers precise space temperature control.

Advanced Compressor Technology

Oil Management

Oil migration is no longer a concern when choosing Multi V Water IV. An oil management system ensures a safe level of oil in the compressor sump.

1. Smart oil system monitors oil sump levels to know when to inject oil into the compressor, eliminating the need for oil return cycles.
2. HiPOR™ oil return system minimizes oil mixing with refrigerant by separating oil at compressor discharge with an oil separator and injecting oil back to the lower section of the compressor shell. Energy is saved by compressing the refrigerant without the oil mixed at the compression chamber.
3. Oil injection system provides a consistent film of oil to moving parts, even at low speeds, ensuring compressor operation down to 20 Hz.

Inverter Driven

The scroll compressor is optimized to maximize compressor efficiency, which reduces power consumption and monthly utility bills. This latest inverter technology allows the LG Multi V Water IV to vary the compressor motor shaft speed to deliver an appropriate amount of cooling to all indoor units. Precise refrigerant volume delivery translates into long periods with coil surface temperatures below dew point and minimizes compressor component run time. Occupants remain comfortable while utility costs are reduced.

Simplified Installation

Cooling and heating systems that use the LG Multi V Water IV simplify and reduce the mechanical and control system design time. The designer no longer has to be concerned with interconnecting chilled and condenser water piping, air-distribution duct systems, matching and selecting chillers, towers, pumps, coils, fans, air handlers, or Variable Air Volume (VAV) boxes.

Figure 1: Single-Frame Multi V Water IV Water Source Unit.

System integration with existing building management systems has never been easier. Because all of the Multi V Water IV system components are engineered and provided by LG, the system components and controls come pre-engineered and do not need custom programming from third-party contractors.

Operating Range

The Multi V Water IV product line includes capacities from six (6.0) to forty-eight (48.0) tons, and features a connected indoor unit combination ratio of 50% to 130%. Operating ranges include:

Entering Water Temperatures

- 23–113 °F for cooling mode
- 23–113 °F for heating mode
- 23–113 °F for synchronous mode (heat recovery systems only)

Compact Size

All Multi V Water IV water source unit frames have the same physical footprint: 29-3/4" wide by 19-3/4" deep. Systems can be designed with one, two, or a maximum of three water source unit frames.

Other Features

- Inverter Scroll Compressors
- Elevation Advantage
- Smaller Footprint
- Precision Load Matching
- AHRI 1230 Certification

Figure 2: Dual-Frame Multi V Water IV Water Source Unit.

Figure 3: Triple-Frame Multi V Water IV Water Source Unit.

UNIT NOMENCLATURE

Water Source and Heat Recovery Units

Water Source Units

ARW	N	072	B	A	S	4

Family
ARW = Multi V Water IV Water Source Unit (Refrigerant R410A)

Type
N = Inverter Heat Pump
B = Inverter Heat Recovery

Nominal Capacity
(Nominal cooling capacity in Btu/h)

072 = 72,000	168 = 168,000	288 = 288,000	432 = 432,000
096 = 96,000	192 = 192,000	336 = 336,000	480 = 480,000
121 = 121,000	216 = 216,000	360 = 360,000	576 = 576,000
144 = 144,000	240 = 240,000	384 = 384,000	

Electrical Ratings
B = 208–230V/60Hz/3Phase
D = 460V/60Hz/3Phase

Airflow Configuration
A = Not Applicable
T = Top Discharge

System Efficiency
E = High Efficiency
S = Standard Efficiency

Generation
4 = Fourth

Heat Recovery Units (HRU)

PRHR	02	1A

Family

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

Number of Ports

02 = Two Ports
03 = Three Ports
04 = Four Ports

Series Number

1A = Series Number

GENERAL DATA

ARWN Series Heat Pump Water Source Unit Specifications

Table 1: Single-Frame 208-230V Heat Pump Units.

Combination Unit Model Number	6.0 Ton ARWN072BAS4	8.0 Ton ARWN096BAS4	10.0 Ton ARWN121BAS4	12.0 ARWN144BAS4
Individual Component Model Numbers	–	–	–	–
Cooling Performance				
Nominal Cooling Capacity (Btu/h)[1]	72,000	96,000	120,000	144,000
Heating Performance				
Nominal Heating Capacity (Btu/h)[1]	81,000	108,000	135,000	162,000
Operating Range (Entering Water Temperature)				
Cooling (°F)[2]	23 – 113	23 – 113	23 – 113	23 – 113
Heating (°F)	23 – 113	23 – 113	23 – 113	23 – 113
Compressor				
Inverter Quantity	HSS DC Scroll x 1	HSS DC Scroll x 1	HSS DC Scroll x 1	HSS DC Scroll x 1
Oil/Type	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D
Unit Data				
Refrigerant Type	R410A	R410A	R410A	R410A
R410A Refrigerant Factory Charge (lbs)	12.8	12.8	12.8	12.8
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit
Max. Number Indoor Units/System	13	16	20	23
Sound Pressure dB(A)[3] Cooling/Heating	47/51	50/53	56/56	58/57
Net Unit Weight (lbs.)	280	280	280	280
Shipping Weight (lbs.)	302	302	302	302
Communication Cables	2 x 18 AWG	2 x 18 AWG	2 x 18 AWG	2 x 18 AWG
Heat Rejected to Equipment Room (Btu/h)	2,152	2,322	2,493	2,664
Heat Exchanger (Stainless Steel Plate)				
Maximum Pressure Resistance (psi)	640	640	640	640
Flow at Rated Condition (GPM)	20.3	25.4	30.4	35.5
Range of Flow (GPM)	8.1 – 30.5	10.2 – 38.1	12.2 – 45.6	14.2 – 53.3
Total Heat of Rejection (Btu/h)	94,400	126,700	157,400	190,100
Total Heat of Absorption (Btu/h)	73.200	96,800	122,000	145,200
Pressure Drop (ft-wg)	3.7	5.3	7.4	9.5
Δt[4] (°F)	9.3	10.0	10.4	10.7
Piping[5]				
Liquid Line Connection (in., OD)	3/8 Braze	3/8 Braze	1/2 Braze	1/2 Braze
Vapor Line Connection (in., OD)	7/8 Braze	7/8 Braze	1-1/8 Braze	1-1/8 Braze
Water Inlet/Outlet Connection (in)	1-1/2 + 1-1/2 Fem	1-1/2 + 1-1/2 Fem	1-1/2 + 1-1/2 Fem	1-1/2 + 1-1/2 Fem
Condensate Drain (in)	3/4 Female	3/4 Female	3/4 Female	3/4 Female

[1]Nominal capacity is outside of AHRI Standard 1230 and based on the following conditions:

- Cooling – Indoor 80°F DB / 66°F WB
  Water Temperature Entering: 86°F
- Heating – Indoor 68°F DB
  Water Temperature Entering: 68°F

[2]When entering water temperature is lower than 59ºF, variable water flow control kit PWFCKN000 is required.

[3]Sound pressure levels are tested in an anechoic chamber under ISO 3745 standard.

[4]Value is calculated as follows: Δt = Total Heat of Rejection/(Nominal Flow Rate x 500).

[5]Refer to the Refrigerant Piping section of this manual for correct line sizing. Contractor must use LG manufactured Y-Branch and Header Kits only. Designer must verify refrigerant piping design configuration using LG's computerized refrigerant piping software (LATS Multi V) to validate the pipe design.

Table 2: Dual-Frame 208-230V Heat Pump Units.

Combination Unit Model Number	14.0 Ton ARWN168BAS4	16.0 Ton ARWN192BAS4	18.0 Ton ARWN216BAS4	24.0 Ton ARWN288BAS4
Individual Component Model Numbers	ARWN072BAS4 x 1 + ARWN096BAS4 x 1	ARWN072BAS4 x 1 + ARWN121BAS4 x 1	ARWN072BAS4 x 1 + ARWN144BAS4 x 1	ARWN144BAS4 x 2
Cooling Performance				
Nominal Cooling Capacity (Btu/h)[1]	168,000	192,000	216,000	288,000
Heating Performance				
Nominal Heating Capacity (Btu/h)[1]	189,000	216,000	243,000	324,000
Operating Range (Entering Water Temperature)				
Cooling (°F)[2]	23 – 113	23 – 113	23 – 113	23 – 113
Heating (°F)	23 – 113	23 – 113	23 – 113	23 – 113
Compressor				
Inverter Quantity	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2
Oil/Type	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D
Unit Data				
Refrigerant Type	R410A	R410A	R410A	R410A
R410A Refrigerant Factory Charge (lbs)	12.8 + 12.8	12.8 + 12.8	12.8 + 12.8	12.8 + 12.8
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit
Max. Number Indoor Units/System	29	32	35	45
Sound Pressure dB(A)[3] Cooling/Heating	55/56	54/60	57/57	59/58
Net Unit Weight (lbs.)	280 + 280	280 + 280	280 + 280	280 + 280
Shipping Weight (lbs.)	302 + 302	302 + 302	302 + 302	302 + 302
Communication Cables	2 x 18 AWG	2 x 18 AWG	2 x 18 AWG	2 x 18 AWG
Heat Rejected to Equipment Room (Btu/h)	4,304	4,645	4,816	5,328
Heat Exchanger (Stainless Steel Plate)				
Maximum Pressure Resistance (psi)	640	640	640	640
Flow at Rated Condition (GPM)	25.4 + 20.3	30.4 + 20.3	35.5 + 20.3	35.5 + 35.5
Range of Flow (GPM)	18.3 – 68.6	20.3 – 76.1	22.3 – 83.7	28.4 – 106.5
Total Heat of Rejection (Btu/h)	94,400 + 126,700	94,400 + 157,400	94,400 + 190,100	190,100 + 190,100
Total Heat of Absorption (Btu/h)	73.200 + 96,800	73.200 + 122,000	73.200 + 145,200	145,200 + 145,200
Pressure Drop (ft-wg)	3.7 + 5.3	3.7 + 7.4	3.7 + 9.5	9.5 + 9.5
Δt[4] (°F)	9.7	9.9	10.2	10.7
Piping[5]				
Liquid Line Connection (in., OD)	3/8 + 3/8 Braze	3/8 + 1/2 Braze	3/8 + 1/2 Braze	1/2 + 1/2 Braze
Vapor Line Connection (in., OD)	7/8 + 7/8 Braze	7/8 + 1-1/8 Braze	7/8 + 1-1/8 Braze	1-1/8 + 1-1/8 Braze
Water Inlet/Outlet Connection (in)	(1-1/2 + 1-1/2 Fem) x2	(1-1/2 + 1-1/2 Fem) x2	(1-1/2 + 1-1/2 Fem) x2	(1-1/2 + 1-1/2 Fem) x2
Condensate Drain (in)	3/4 Female	3/4 Female	3/4 Female	3/4 Female

[1]Nominal capacity is outside of AHRI Standard 1230 and based on the following conditions:

- Cooling – Indoor 80°F DB / 66°F WB
  Water Temperature Entering: 86°F
- Heating – Indoor 68°F DB
  Water Temperature Entering: 68°F

[2]When entering water temperature is lower than 59ºF, variable water flow control kit PWFCKN000 is required.

[3]Sound pressure levels are tested in an anechoic chamber under ISO 3745 standard.

[4]Value is calculated as follows: Δt = Total Heat of Rejection/(Nominal Flow Rate x 500).

[5]Refer to the Refrigerant Piping section of this manual for correct line sizing. Contractor must use LG manufactured Y-Branch and Header Kits only. Designer must verify refrigerant piping design configuration using LG's computerized refrigerant piping software (LATS Multi V) to validate the pipe design.

GENERAL DATA

ARWN Series Heat Pump Water Source Unit Specifications

Table 3: Triple-Frame 208-230V Heat Pump Units.

Combination Unit Model Number	30.0 Ton ARWN360BAS4	36.0 Ton ARWN432BAS4
Individual Component Model Numbers	ARWN072BAS4 x 1 + ARWN144BAS4 x 2	ARWN144BAS4 x 3
Cooling Performance		
Nominal Cooling Capacity (Btu/h)[1]	360,000	432,000
Heating Performance		
Nominal Heating Capacity (Btu/h)[1]	405,000	486,000
Operating Range (Entering Water Temperature)		
Cooling (°F)[2]	23 – 113	23 – 113
Heating (°F)	23 – 113	23 – 113
Compressor		
Inverter Quantity	HSS DC Scroll x 3	HSS DC Scroll x 3
Oil/Type	PVE/FVC68D	PVE/FVC68D
Unit Data		
Refrigerant Type	R410A	R410A
R410A Refrigerant Factory Charge (lbs)	12.8 + 12.8 + 12.8	12.8 + 12.8 + 12.8
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit
Max. Number Indoor Units/System	58	64
Sound Pressure dB(A)[3] Cooling/Heating	56/57	58/62
Net Unit Weight (lbs.)	280 + 280 + 280	280 + 280 + 280
Shipping Weight (lbs.)	302 + 302 + 302	302 + 302 + 302
Communication Cables	2 x 18 AWG	2 x 18 AWG
Heat Rejected to Equipment Room (Btu/h)	7,480	7,992
Heat Exchanger (Stainless Steel Plate)		
Maximum Pressure Resistance (psi)	640	640
Flow at Rated Condition (GPM)	20.3 + 35.5 + 35.5	35.5 + 35.5 + 35.5
Range of Flow (GPM)	36.5 – 137	42.6 – 159.8
Total Heat of Rejection (Btu/h)	94,400 + 190,100 + 190,100	190,100 + 190,100 + 190,100
Total Heat of Absorption (Btu/h)	73,200 + 145,200 + 145,200	145,200 + 145,200 + 145,200
Pressure Drop (ft-wg)	3.7 + 9.5 + 9.5	9.5 + 9.5 + 9.5
Δt[4] (°F)	10.4	10.7
Piping[5]		
Liquid Line Connection (in., OD)	3/8 + 1/2+1/2 Braze	1/2+1/2+1/2 Braze
Vapor Line Connection (in., OD)	7/8 + 1-1/8 +1-1/8 Braze	1-1/8 +1-1/8 + 1-1/8 Braze
Water Inlet/Outlet Connection Size (in)	(1-1/2 + 1-1/2 Female) x3	(1-1/2 + 1-1/2 Female) x3
Condensate Drain (in)	3/4 Female	3/4 Female

[1]Nominal capacity is outside of AHRI Standard 1230 and based on the following conditions:

- Cooling – Indoor 80°F DB / 66°F WB
  Water Temperature Entering: 86°F
- Heating – Indoor 68°F DB
  Water Temperature Entering: 68°F

[2]When entering water temperature is lower than 59ºF, variable water flow control kit PWFCKN000 is required.

[3]Sound pressure levels are tested in an anechoic chamber under ISO 3745 standard.

[4]Value is calculated as follows: Δt = Total Heat of Rejection/(Nominal Flow Rate x 500).

[5]Refer to the Refrigerant Piping section of this manual for correct line sizing. Contractor must use LG manufactured Y-Branch and Header Kits only. Designer must verify refrigerant piping design configuration using LG's computerized refrigerant piping software (LATS Multi V) to validate the pipe design.

Table 4: Single-Frame 460V Heat Pump Units.

Combination Unit Model Number	6.0 Ton ARWN072DAS4	8.0 Ton ARWN096DAS4	10.0 Ton ARWN121DAS4	12.0 Ton ARWN144DAS4	14.0 Ton ARWN168DAS4	16.0 Ton ARWN192DAS4
Individual Component Model Numbers	–	–	–	–	–	–
Cooling Performance						
Nominal Cooling Capacity (Btu/h)[1]	72,000	96,000	120,000	144,000	168,000	192,000
Heating Performance						
Nominal Heating Capacity (Btu/h)[1]	81,000	108,000	135,000	162,000	189,000	216,000
Operating Range (Entering Water Temperature)						
Cooling (°F)[2]	23 – 113	23 – 113	23 – 113	23 – 113	23 – 113	23 – 113
Heating (°F)	23 – 113	23 – 113	23 – 113	23 – 113	23 – 113	23 – 113
Compressor						
Inverter Quantity	HSS DC Scroll x 1	HSS DC Scroll x 1	HSS DC Scroll x 1	HSS DC Scroll x 1	HSS DC Scroll x 1	HSS DC Scroll x 1
Oil/Type	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D
Unit Data						
Refrigerant Type	R410A	R410A	R410A	R410A	R410A	R410A
R410A Refrigerant Factory Charge (lbs)	12.8	12.8	12.8	6.6	6.6	6.6
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit
Max. Number Indoor Units/System	13	16	20	23	29	32
Sound Pressure dB(A) Cooling/Heating	47/51	50/53	56/56	58/57	53/57	54/60
Net Unit Weight (lbs.)	280	280	280	309	309	309
Shipping Weight (lbs.)	302	302	302	331	331	331
Communication Cables	2 x 18 AWG	2 x 18 AWG	2 x 18 AWG	2 x 18 AWG	2 x 18 AWG	2 x 18 AWG
Heat Rejected to Equipment Room (Btu/h)	2,152	2,322	2,493	2,357	2,459	2,561
Heat Exchanger (Stainless Steel Plate)						
Maximum Pressure Resistance (psi)	640	640	640	640	640	640
Flow at Rated Condition (GPM)	20.3	25.4	30.4	35.5	45.7	50.7
Range of Flow (GPM)	8.1 – 30.5	10.2 – 38.1	12.2 – 45.6	14.2 – 53.3	18.3 – 68.6	20.3 – 76.1
Total Heat of Rejection (Btu/h)	94,100	125,900	157.900	190,100	221,100	253,500
Total Heat of Absorption (Btu/h)	74.200	98,600	122,700	146,800	170,100	193,600
Pressure Drop (ft-wg)	3.7	5.3	7.4	5.3	8.0	9.7
Δt[4] (°F)	9.3	9.9	10.3	10.7	9.7	10.0
Piping[5]						
Liquid Line Connection (in., OD)	3/8 Braze	3/8 Braze	1/2 Braze	1/2 Braze	1/2 Braze	1/2 Braze
Vapor Line Connection (in., OD)	7/8 Braze	7/8 Braze	1-1/8 Braze	1-1/8 Braze	1-1/8 Braze	1-1/8 Braze
Water Inlet/Outlet Connection (in)	1-1/2 + 1-1/2 Fem	1-1/2 + 1-1/2 Fem	1-1/2 + 1-1/2 Fem	1-1/2 + 1-1/2 Fem	1-1/2 + 1-1/2 Fem	1-1/2 + 1-1/2 Fem
Condensate Drain (in)	3/4 Female	3/4 Female	3/4 Female	3/4 Female	3/4 Female	3/4 Female

[1]Nominal capacity is outside of AHRI Standard 1230 and based on the following conditions:

- Cooling – Indoor 80°F DB / 66°F WB
  Water Temperature Entering: 86°F
- Heating – Indoor 68°F DB
  Water Temperature Entering: 68°F

[2]When entering water temperature is lower than 59ºF, variable water flow control kit PWFCKN000 is required.

[3]Sound pressure levels are tested in an anechoic chamber under ISO 3745 standard.

[4]Value is calculated as follows: Δt = Total Heat of Rejection/(Nominal Flow Rate x 500).

[5]Refer to the Refrigerant Piping section of this manual for correct line sizing. Contractor must use LG manufactured Y-Branch and Header Kits only. Designer must verify refrigerant piping design configuration using LG's computerized refrigerant piping software (LATS Multi V) to validate the pipe design.

GENERAL DATA

ARWN Series Heat Pump Water Source Unit Specifications

Table 5: Dual-Frame 460V Heat Pump Units.

Combination Unit Model Number	20.0 Ton ARWN240DAS4	24.0 Ton ARWN288DAS4	28.0 Ton ARWN336DAS4	32.0 Ton ARWN384DAS4
Individual Component Model Numbers	ARWN096DAS4 + ARWN144DAS4	ARWN121DAS4 + ARWN168DAS4	ARWN168DAS4 x 2	ARWN192DAS4 x 2
Cooling Performance				
Nominal Cooling Capacity (Btu/h)[1]	240,000	288,000	336,000	384,000
Heating Performance				
Nominal Heating Capacity (Btu/h)[1]	270,000	324,000	378,000	432,000
Operating Range (Entering Water Temperature)				
Cooling (°F)[2]	23 – 113	23 – 113	23 – 113	23 – 113
Heating (°F)	23 – 113	23 – 113	23 – 113	23 – 113
Compressor				
Inverter Quantity	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2
Oil/Type	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D
Unit Data				
Refrigerant Type	R410A	R410A	R410A	R410A
R410A Refrigerant Factory Charge (lbs)	12.8 + 6.6	12.8 + 6.6	6.6 + 6.6	6.6 + 6.6
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit
Max. Number Indoor Units/System	39	45	55	61
Sound Pressure dB(A)[3] Cooling/Heating	57/57	59/58	59/61	56/61
Net Unit Weight (lbs.)	280 + 309	280 + 309	309 + 309	309 + 309
Shipping Weight (lbs.)	302 + 331	302 + 331	331 + 331	331 + 331
Communication Cables	2 x 18 AWG	2 x 18 AWG	2 x 18 AWG	2 x 18 AWG
Heat Rejected to Equipment Room (Btu/h)	4,679	4,952	4,918	5122
Heat Exchanger (Stainless Steel Plate)				
Maximum Pressure Resistance (psi)	640	640	640	640
Flow at Rated Condition (GPM)	25.4 + 35.5	30.4 + 45.7	45.7 + 45.7	50.7 + 50.7
Range of Flow (GPM)	24.4 – 91.4	30.4 – 114.2	36.6 – 171.4	40.6 – 152.1
Total Heat of Rejection (Btu/h)	125,900 + 190,100	157,900 + 221,100	221,100 x 2	253,500 x 2
Total Heat of Absorption (Btu/h)	98,600 + 146,800	122,700 + 170,100	170,100 x 2	193,600 x 2
Pressure Drop (ft-wg)	5.3 + 5.3	7.4 + 8.0	8.0 + 8.0	9.7 + 9.7
Δt[4] (°F)	10.4	10.0	9.7	10.0
Piping[5]				
Liquid Line Connection (in., OD)	3/8 + 1/2 Braze	1/2 + 1/2 Braze	1/2 + 1/2 Braze	1/2 + 1/2 Braze
Vapor Line Connection (in., OD)	7/8 + 1-1/8 Braze	7/8 + 1-1/8 Braze	1-1/8 + 1-1/8 Braze	1-1/8 + 1-1/8 Braze
Water Inlet/Outlet Connection Size (in)	(1-1/2 + 1-1/2 Fem) x2	(1-1/2 + 1-1/2 Fem) x2	(1-1/2 + 1-1/2 Fem) x2	(1-1/2 + 1-1/2 Fem) x2
Condensate Drain (in)	3/4 Female	3/4 Female	3/4 Female	3/4 Female

[1]Nominal capacity is outside of AHRI Standard 1230 and based on the following conditions:

- Cooling – Indoor 80°F DB / 66°F WB
  Water Temperature Entering: 86°F
- Heating – Indoor 68°F DB
  Water Temperature Entering: 68°F

[2]When entering water temperature is lower than 59ºF, variable water flow control kit PWFCKN000 is required.

[3]Sound pressure levels are tested in an anechoic chamber under ISO 3745 standard.

[4]Value is calculated as follows: Δt = Total Heat of Rejection/(Nominal Flow Rate x 500).

[5]Refer to the Refrigerant Piping section of this manual for correct line sizing. Contractor must use LG manufactured Y-Branch and Header Kits only. Designer must verify refrigerant piping design configuration using LG's computerized refrigerant piping software (LATS Multi V) to validate the pipe design.

GENERAL DATA

ARWN Series Heat Pump Water Source Unit Specifications

Table 6: Triple-Frame 460V Heat Pump Units

Combination Unit Model Number	40.0 Ton ARWN480DAS4	48.0 Ton ARWN576DAS4
Individual Component Model Numbers	ARWN144DAS4 x 2 + ARWN192DAS4 x 1	ARWN192DAS4 x 3
Cooling Performance		
Nominal Cooling Capacity (Btu/h)[1]	480,000	576,000
Heating Performance		
Nominal Heating Capacity (Btu/h)[1]	540,000	648,000
Operating Range (Entering Water Temperature)		
Cooling (°F)[2]	23 – 113	23 – 113
Heating (°F)	23 – 113	23 – 113
Compressor		
Inverter Quantity	HSS DC Scroll x 3	HSS DC Scroll x 3
Oil/Type	PVE/FVC68D	PVE/FVC68D
Unit Data		
Refrigerant Type	R410A	R410A
R410A Refrigerant Factory Charge (lbs)	6.6 + 6.6 + 6.6	6.6 + 6.6 + 6.6
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit
Max. Number Indoor Units/System	64	64
Sound Pressure dB(A)[3] Cooling/Heating	60/62	60/62
Net Unit Weight (lbs.)	309 x 3	309 x 3
Shipping Weight (lbs.)	331 x 3	331 x 3
Communication Cables	2 x 18 AWG	2 x 18 AWG
Heat Rejected to Equipment Room (Btu/h)	7,275	7863
Heat Exchanger (Stainless Steel Plate)		
Maximum Pressure Resistance (psi)	640	640
Flow at Rated Condition (GPM)	35.5 + 35.5 + 50.7	50.7 + 50.7 + 50.7
Range of Flow (GPM)	48.7 – 182.6	60.8 – 228.2
Total Heat of Rejection (Btu/h)	190,100 + 190,100 + 253,500	253,500 + 253,500 + 253,500
Total Heat of Absorption (Btu/h)	146,800 + 146,800 + 193,600	193,600 + 193,600 + 193,600
Pressure Drop (ft-wg)	5.3 + 5.3 + 9.7	9.7 + 9.7 + 9.7
Δt[4] (°F)	10.4	10.0
Piping[5]		
Liquid Line Connection (in., OD)	1/2 + 1/2 + 1/2 Braze	1/2 + 1/2 + 1/2 Braze
Vapor Line Connection (in., OD)	1-1/8 + 1-1/8 + 1-1/8 Braze	1-1/8 + 1-1/8 + 1-1/8 Braze
Water Inlet/Outlet Connection Size (in)	(1-1/2 + 1-1/2 Fem) x3	(1-1/2 + 1-1/2 Fem) x3
Condensate Drain (in)	3/4 Female	3/4 Female

[1]Nominal capacity is outside of AHRI Standard 1230 and based on the following conditions:

- Cooling – Indoor 80°F DB / 66°F WB
  Water Temperature Entering: 86°F
- Heating – Indoor 68°F DB
  Water Temperature Entering: 68°F

[2]When entering water temperature is lower than 59ºF, variable water flow control kit PWFCKN000 is required.

[3]Sound pressure levels are tested in an anechoic chamber under ISO 3745 standard.

[4]Value is calculated as follows: Δt = Total Heat of Rejection/(Nominal Flow Rate x 500).

[5]Refer to the Refrigerant Piping section of this manual for correct line sizing. Contractor must use LG manufactured Y-Branch and Header Kits only. Designer must verify refrigerant piping design configuration using LG's computerized refrigerant piping software (LATS Multi V) to validate the pipe design.

Product Data

GENERAL DATA

ARWB Series Heat Recovery Water Source Unit Specifications

Table 7: Single-Frame 208-230V Heat Recovery Units.

Combination Unit Model Number	6.0 Ton ARWB072BAS4	8.0 Ton ARWB096BAS4	10.0 Ton ARWB121BAS4	12.0 ARWB144BAS4
Individual Component Model Numbers	–	–	–	–
Cooling Performance				
Nominal Cooling Capacity (Btu/h)[1]	72,000	96,000	120,000	144,000
Heating Performance				
Nominal Heating Capacity (Btu/h)[1]	81,000	108,000	135,000	162,000
Operating Range (Entering Water Temperature)				
Cooling (°F)[2]	23 – 113	23 – 113	23 – 113	23 – 113
Heating (°F)	23 – 113	23 – 113	23 – 113	23 – 113
Synchronous Operation (°F)	23 – 113	23 – 113	23 – 113	23 – 113
Compressor				
Inverter Quantity	HSS DC Scroll x1	HSS DC Scroll x1	HSS DC Scroll x1	HSS DC Scroll x1
Oil/Type	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D
Unit Data				
Refrigerant Type	R410A	R410A	R410A	R410A
R410A Refrigerant Factory Charge (lbs)	12.8	12.8	12.8	12.8
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit
Max. Number Indoor Units/System	13	16	20	23
Sound Pressure dB(A)[3] Cooling/Heating	47/51	50/53	56/56	58/57
Net Unit Weight (lbs.)	280	280	280	280
Shipping Weight (lbs.)	302	302	302	302
Communication Cables	2 x 18 AWG	2 x 18 AWG	2 x 18 AWG	2 x 18 AWG
Heat Rejected to Equipment Room (Btu/h)	2,152	2,322	2,493	2,664
Heat Exchanger (Stainless Steel Plate)				
Maximum Pressure Resistance (psi)	640	640	640	640
Flow at Rated Condition (GPM)	20.3	25.4	30.4	35.5
Range of Flow (GPM)	8.1 – 30.5	10.2 – 38.1	12.2 – 45.6	14.2 – 53.3
Total Heat of Rejection (Btu/h)	94,400	126,700	157,400	190,100
Total Heat of Absorption (Btu/h)	73,200	96,800	122,000	145,200
Pressure Drop (ft-wg)	3.7	5.3	7.4	9.5
Δt[4] (°F)	9.3	9.9	10.3	10.7
Piping[5]				
Liquid Line Connection (in., OD)	3/8 Braze	3/8 Braze	1/2 Braze	1/2 Braze
Low Press Vapor Line Conn (in., OD)	7/8 Braze	7/8 Braze	1-1/8 Braze	1-1/8 Braze
High Press Vapor Line Conn (in., OD)	3/4 Braze	3/4 Braze	3/4 Braze	3/4 Braze
Water Inlet/Outlet Connection (in)	1-1/2 + 1-1/2 Fem	1-1/2 + 1-1/2 Fem	1-1/2 + 1-1/2 Fem	1-1/2 + 1-1/2 Fem
Condensate Drain (in)	3/4 Female	3/4 Female	3/4 Female	3/4 Female

[1]Nominal capacity is outside of AHRI Standard 1230 and based on the following conditions:

- Cooling – Indoor 80°F DB / 66°F WB
  Water Temperature Entering: 86°F
- Heating – Indoor 68°F DB
  Water Temperature Entering: 68°F

[2]When entering water temperature is lower than 59ºF, variable water flow control kit PWFCKN000 is required.

[3]Sound pressure levels are tested in an anechoic chamber under ISO 3745 standard.

[4]Value is calculated as follows: Δt = Total Heat of Rejection/(Nominal Flow Rate x 500).

[5]Refer to the Refrigerant Piping section of this manual for correct line sizing. Contractor must use LG manufactured Y-Branch and Header Kits only. Designer must verify refrigerant piping design configuration using LG's computerized refrigerant piping software (LATS Multi V) to validate the pipe design.

Table 8: Dual-Frame 208-230V Heat Recovery Units.

Combination Unit Model Number	14.0 Ton ARWB168BAS4	16.0 Ton ARWB192BAS4	18.0 Ton ARWB216BAS4	24.0 Ton ARWB288BAS4
Individual Component Model Numbers	ARWB072BAS4 x 1 + ARWB096BAS4 x 1	ARWB072BAS4 x 1 + ARWB121BAS4 x 1	ARWB072BAS4 x 1 + ARWB144BAS4 x 1	ARWB144BAS4 x 2
Cooling Performance				
Nominal Cooling Capacity (Btu/h)[1]	168,000	192,000	216,000	288,000
Heating Performance				
Nominal Heating Capacity (Btu/h)[1]	189,000	216,000	243,000	324,000
Operating Range (Entering Water Temperature)				
Cooling (°F)[2]	23 – 113	23 – 113	23 – 113	23 – 113
Heating (°F)	23 – 113	23 – 113	23 – 113	23 – 113
Synchronous Operation (°F)	23 – 113	23 – 113	23 – 113	23 – 113
Compressor				
Inverter Quantity	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2
Oil/Type	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D
Unit Data				
Refrigerant Type	R410A	R410A	R410A	R410A
R410A Refrigerant Factory Charge (lbs)	12.8 + 12.8	12.8 + 12.8	12.8 + 12.8	12.8 + 12.8
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit
Max. Number Indoor Units/System	29	32	35	45
Sound Press dB(A)[3] Cooling/Heating	55/56	54/60	57/57	59/58
Net Unit Weight (lbs.)	280 + 280	280 + 280	280 + 280	280 + 280
Shipping Weight (lbs.)	302 + 302	302 + 302	302 + 302	302 + 302
Communication Cables	2 x 18 AWG	2 x 18 AWG	2 x 18 AWG	2 x 18 AWG
Heat Rejected to Equipment Room (Btu/h)	4,304	4,645	4,816	5,328
Heat Exchanger (Stainless Steel Plate)				
Maximum Pressure Resistance (psi)	640	640	640	640
Flow at Rated Condition (GPM)	25.4 + 20.3	30.4 + 20.3	35.5 + 20.3	35.5 + 35.5
Range of Flow (GPM)	18.3 – 68.6	20.3 – 76.1	22.3 – 83.7	28.4 – 106.5
Total Heat of Rejection (Btu/h)	94,400 + 126,700	94,400 + 157,400	94,400 + 190.100	190,100 + 190,100
Total Heat of Absorption (Btu/h)	73,200 + 96,800	73,200 + 122,000	73,200 + 145,200	145,200 + 145,200
Pressure Drop (ft-wg)	3.7 + 5.3	3.7 + 7.4	3.7 + 9.5	9.5 + 9.5
Δt[4] (°F)	9.6	9.9	10.2	10.7
Piping[5]				
Liquid Line Connection (in., OD)	3/8 + 3/8 Braze	1/2 + 3/8 Braze	1/2 + 3/8 Braze	1/2 + 1/2 Braze
Low Press Vapor Line Conn (in., OD)	7/8 + 7/8 Braze	7/8 + 1-1/8 Braze	7/8 + 1-1/8 Braze	1-1/8 + 1-1/8 Braze
High Press Vapor Line Conn (in., OD)	3/4 + 3/4 Braze	3/4 + 3/4 Braze	3/4 + 3/4 Braze	3/4 + 3/4 Braze
Water Inlet/Outlet Connection (in)	(1-1/2 + 1-1/2 Fem) x2	(1-1/2 + 1-1/2 Fem) x2	(1-1/2 + 1-1/2 Fem) x2	(1-1/2 + 1-1/2 Fem) x2
Condensate Drain (in)	3/4 Female	3/4 Female	3/4 Female	3/4 Female

[1]Nominal capacity is outside of AHRI Standard 1230 and based on the following conditions:

- Cooling – Indoor 80°F DB / 66°F WB
  Water Temperature Entering: 86°F
- Heating – Indoor 68°F DB
  Water Temperature Entering: 68°F

[2]When entering water temperature is lower than 59ºF, variable water flow control kit PWFCKN000 is required.

[3]Sound pressure levels are tested in an anechoic chamber under ISO 3745 standard.

[4]Value is calculated as follows: Δt = Total Heat of Rejection/(Nominal Flow Rate x 500).

[5]Refer to the Refrigerant Piping section of this manual for correct line sizing. Contractor must use LG manufactured Y-Branch and Header Kits only. Designer must verify refrigerant piping design configuration using LG's computerized refrigerant piping software (LATS Multi V) to validate the pipe design.

GENERAL DATA

ARWB Series Heat Recovery Water Source Unit Specifications

Table 9: Triple-Frame 208-230V Heat Recovery Units.

Combination Unit Model Number	30.0 Ton ARWB360BAS4	36.0 Ton ARWB432BAS4
Individual Component Model Numbers	ARWB072BAS4 x 1 + ARWB144BAS4 x 2	ARWB144BAS4 x 3
Cooling Performance		
Nominal Cooling Capacity (Btu/h)[1]	360,000	432,000
Heating Performance		
Nominal Heating Capacity (Btu/h)[1]	405,000	486,000
Operating Range (Entering Water Temperature)		
Cooling (°F)[2]	23 – 113	23 – 113
Heating (°F)	23 – 113	23 – 113
Synchronous Operation (°F)	23 – 113	23 – 113
Compressor		
Inverter Quantity	HSS DC Scroll x 3	HSS DC Scroll x 3
Oil/Type	PVE/FVC68D	PVE/FVC68D
Unit Data		
Refrigerant Type	R410A	R410A
R410A Refrigerant Factory Charge (lbs)	12.8 + 12.8 + 12.8	12.8 + 12.8 + 12.8
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit
Max. Number Indoor Units/System[2]	58	64
Sound Pressure dB(A)[3] Cooling/Heating	56/57	58/62
Net Unit Weight (lbs.)	280 + 280 + 280	280 + 280 + 280
Shipping Weight (lbs.)	302 + 302 + 302	302 + 302 + 302
Communication Cables	2 x 18 AWG	2 x 18 AWG
Heat Rejected to Equipment Room (Btu/h)	7,480	7,992
Heat Exchanger (Stainless Steel Plate)		
Maximum Pressure Resistance (psi)	640	640
Flow at Rated Condition (GPM)	35.5 + 35.5 + 20.3	35.5 + 35.5 + 35.5
Range of Flow (GPM)	36.5 – 137.0	42.6 – 159.8
Total Heat of Rejection (Btu/h)	94,400 + 190,100 + 190,100	190,100 + 190,100 + 190,100
Total Heat of Absorption (Btu/h)	73,200 + 145,200 + 145,200	145,200 + 145,200 + 145,200
Pressure Drop (ft-wg)	3.7 + 9.5 + 9.5	9.5 + 9.5 + 9.5
Δt[4] (°F)	10.4	10.7
Piping[5]		
Liquid Line Connection (in., OD)	3/8 + 1/2 + 1/2 Braze	1/2 + 1/2 + 1/2 Braze
Low Pressure Vapor Line Conn (in., OD)	7/8 + 1-1/8 + 1-1/8 Braze	1-1/8 + 1-1/8 + 1-1/8 Braze
High Pressure Vapor Line Conn (in., OD)	3/4 + 3/4 + 3/4 Braze	3/4 + 3/4 + 3/4 Braze
Water Inlet/Outlet Connection Size (in)	(1-1/2 + 1-1/2 Fem) x3	(1-1/2 + 1-1/2 Fem) x3
Condensate Drain (in)	3/4 Female	3/4 Female

[1]Nominal capacity is outside of AHRI Standard 1230 and based on the following conditions:

- Cooling – Indoor 80°F DB / 66°F WB
  Water Temperature Entering: 86°F
- Heating – Indoor 68°F DB
  Water Temperature Entering: 68°F

[2]When entering water temperature is lower than 59ºF, variable water flow control kit PWFCKN000 is required.

[3]Sound pressure levels are tested in an anechoic chamber under ISO 3745 standard.

[4]Value is calculated as follows: Δt = Total Heat of Rejection/(Nominal Flow Rate x 500).

[5]Refer to the Refrigerant Piping section of this manual for correct line sizing. Contractor must use LG manufactured Y-Branch and Header Kits only. Designer must verify refrigerant piping design configuration using LG's computerized refrigerant piping software (LATS Multi V) to validate the pipe design.

ARWB Series Heat Recovery Water Source Unit Specifications

Table 10: Single-Frame 460V Heat Recovery Units.

Combination Unit Model Number	6.0 Ton ARWB072DAS4	8.0 Ton ARWB096DAS4	10.0 Ton ARWB121DAS4	12.0 ARWB144DAS4	14.0 Ton ARWB168DAS4	16.0 Ton ARWB192DAS4
Individual Component Model Numbers	–	–	–	–	–	–
Cooling Performance						
Nominal Cooling Capacity (Btu/h)[1]	72,000	96,000	120,000	144,000	168,000	192,000
Heating Performance						
Nominal Heating Capacity (Btu/h)[1]	81,000	108,000	135,000	162,000	189,000	216,000
Operating Range (Entering Water Temperature)						
Cooling (°F)[2]	23 – 113	23 – 113	23 – 113	23 – 113	23 – 113	23 – 113
Heating (°F)	23 – 113	23 – 113	23 – 113	23 – 113	23 – 113	23 – 113
Synchronous Operation (°F)	23 – 113	23 – 113	23 – 113	23 – 113	23 – 113	23 – 113
Compressor						
Inverter Quantity	HSS DC Scroll x 1	HSS DC Scroll x 1	HSS DC Scroll x 1	HSS DC Scroll x 1	HSS DC Scroll x 1	HSS DC Scroll x 1
Oil/Type	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D
Unit Data						
Refrigerant Type	R410A	R410A	R410A	R410A	R410A	R410A
R410A Refrigerant Factory Charge (lbs)	12.8	12.8	12.8	6.6	6.6	6.6
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit
Max. Number Indoor Units/System[2]	13	16	20	23	29	32
Sound Press dB(A)[3] Cooling/Heating	47/51	50/53	56/56	58/57	53/57	54/60
Net Unit Weight (lbs.)	280	280	280	309	309	309
Shipping Weight (lbs.)	302	302	302	331	331	331
Communication Cables	2 x 18 AWG	2 x 18 AWG	2 x 18 AWG	2 x 18 AWG	2 x 18 AWG	2 x 18 AWG
Heat Rejected to Equipment Room (Btu/h)	2,152	2,322	2,493	2,357	2,459	2,561
Heat Exchanger (Stainless Steel Plate)						
Maximum Pressure Resistance (psi)	640	640	640	640	640	640
Flow at Rated Condition (GPM)	20.3	25.4	30.4	35.5	45.7	50.7
Range of Flow (GPM)	8.1 – 30.5	10.2 – 38.1	12.2 – 45.6	14.2 – 53.3	18.3 – 68.6	20.3 – 76.1
Total Heat of Rejection (Btu/h)	94,100	125,900	157,900	190,100	221,100	253,500
Total Heat of Absorption (Btu/h)	74,200	98,600	122,700	146,800	170,100	193,600
Pressure Drop (ft-wg)	3.7	5.3	7.4	5.3	8.0	9.7
Δt^4 (°F)	9.3	9.9	10.3	10.7	9.7	10.0
Piping[5]						
Liquid Line Connection (in., OD)	3/8 Braze	3/8 Braze	1/2 Braze	1/2 Braze	1/2 Braze	1/2 Braze
Low Press Vapor Line Conn (in., OD)	7/8 Braze	7/8 Braze	7/8 Braze	1-1/8 Braze	1-1/8 Braze	1-1/8 Braze
High Press Vapor Line Conn (in., OD)	3/4 Braze	3/4 Braze	3/4 Braze	3/4 Braze	3/4 Braze	3/4 Braze
Water Inlet/Outlet Connection (in)	1-1/2 + 1-1/2 Fem	1-1/2 + 1-1/2 Fem	1-1/2 + 1-1/2 Fem	1-1/2 + 1-1/2 Fem	1-1/2 + 1-1/2 Fem	1-1/2 + 1-1/2 Fem
Condensate Drain (in)	3/4 Female	3/4 Female	3/4 Female	3/4 Female	3/4 Female	3/4 Female

[1]Nominal capacity is outside of AHRI Standard 1230 and based on the following conditions:

- Cooling – Indoor 80°F DB / 66°F WB
  Water Temperature Entering: 86°F
- Heating – Indoor 68°F DB
  Water Temperature Entering: 68°F

[2]When entering water temperature is lower than 59ºF, variable water flow control kit PWFCKN000 is required.

[3]Sound pressure levels are tested in an anechoic chamber under ISO 3745 standard.

[4]Value is calculated as follows: Δt = Total Heat of Rejection/(Nominal Flow Rate x 500).

[5]Refer to the Refrigerant Piping section of this manual for correct line sizing. Contractor must use LG manufactured Y-Branch and Header Kits only. Designer must verify refrigerant piping design configuration using LG's computerized refrigerant piping software (LATS Multi V) to validate the pipe design.

Table 11: Dual-Frame 460V Heat Recovery Units.

Combination Unit Model Number	20.0 ARWB240DAS4	24.0 ARWB288DAS4	28.0 Ton ARWB336DAS4	32.0 ARWB384DAS4
Individual Component Model Numbers	ARWB096DAS4 x 1 +ARWB144DAS4 x 1	ARWB121DAS4 x 1 +ARWB168DAS4 x 1	ARWB168DAS4 x 2	ARWB192DAS4 x 2
Cooling Performance				
Nominal Cooling Capacity (Btu/h)[1]	240,000	288,000	336,000	384,000
Heating Performance				
Nominal Heating Capacity (Btu/h)[1]	270,000	324,000	378,000	432,000
Operating Range (Entering Water Temperature)				
Cooling (°F)[2]	23 – 113	23 – 113	23 – 113	23 – 113
Heating (°F)	23 – 113	23 – 113	23 – 113	23 – 113
Synchronous Operation (°F)	23 – 113	23 – 113	23 – 113	23 – 113
Compressor				
Inverter Quantity	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2	HSS DC Scroll x 2
Oil/Type	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D	PVE/FVC68D
Unit Data				
Refrigerant Type	R410A	R410A	R410A	R410A
R410A Refrigerant Factory Charge (lbs)	12.8 + 6.6	12.8 + 6.6	6.6 + 6.6	6.6 + 6.6
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit	EEV/Indoor Unit
Max. Number Indoor Units/System[2]	39	45	55	61
Sound Pressure dB(A)[3] Cooling/Heating	57/57	59/58	59/61	56/61
Net Unit Weight (lbs.)	280 + 309	280 + 309	309 + 309	309 + 309
Shipping Weight (lbs.)	302 + 331	302 + 331	331 + 331	331 + 331
Communication Cables	2 x 18 AWG	2 x 18 AWG	2 x 18 AWG	2 x 18 AWG
Heat Rejected to Equipment Room (Btu/h)	4,679	4952	4918	5122
Heat Exchanger (Stainless Steel Plate)				
Maximum Pressure Resistance (psi)	640	640	640	640
Flow at Rated Condition (GPM)	25.4 + 35.5	30.4 + 45.7	45.7 + 45.7	50.7 + 50.7
Range of Flow (GPM)	24.4 – 91.4	30.4 – 114.2	36.6 – 171.4	40.6 – 152.1
Total Heat of Rejection (Btu/h)	125,900 + 190,100	157,900 + 221,100	221,100 x 2	253,500 x 2
Total Heat of Absorption (Btu/h)	98,600 + 146,800	122,700 + 170,100	170,100 x 2	193,600 x 2
Pressure Drop (ft-wg)	5.3 + 5.3	7.4 + 8.0	8.0 + 8.0	9.7 + 9.7
Δt[4] (°F)	10.4	10.0	9.7	10.0
Piping[5]				
Liquid Line Connection (in., OD)	3/8 + 1/2 Braze	1/2 + 1/2 Braze	1/2 + 1/2 Braze	1/2 + 1/2 Braze
Low Pressure Vapor Line Conn (in., OD)	7/8 + 1-1/8 Braze	7/8 + 1-1/8 Braze	1-1/8 + 1-1/8 Braze	1-1/8 + 1-1/8 Braze
High Pressure Vapor Line Conn (in., OD)	3/4 + 3/4 Braze	3/4 + 3/4 Braze	3/4 + 3/4 Braze	3/4 + 3/4 Braze
Water Inlet/Outlet Connection Size (in)	(1-1/2 + 1-1/2 Fem) x2	(1-1/2 + 1-1/2 Fem) x2	(1-1/2 + 1-1/2 Fem) x2	(1-1/2 + 1-1/2 Fem) x2
Condensate Drain (in)	3/4 Female	3/4 Female	3/4 Female	3/4 Female

[1]Nominal capacity is outside of AHRI Standard 1230 and based on the following conditions:

- Cooling – Indoor 80°F DB / 66°F WB
  Water Temperature Entering: 86°F
- Heating – Indoor 68°F DB
  Water Temperature Entering: 68°F

[2]When entering water temperature is lower than 59ºF, variable water flow control kit PWFCKN000 is required.

[3]Sound pressure levels are tested in an anechoic chamber under ISO 3745 standard.

[4]Value is calculated as follows: Δt = Total Heat of Rejection/(Nominal Flow Rate x 500).

[5]Refer to the Refrigerant Piping section of this manual for correct line sizing. Contractor must use LG manufactured Y-Branch and Header Kits only. Designer must verify refrigerant piping design configuration using LG's computerized refrigerant piping software (LATS Multi V) to validate the pipe design.

Table 12: Triple-Frame 460V Heat Recovery Units

Combination Unit Model Number	40.0 Ton ARWB480DAS4	48.0 ARWB576DAS4
Individual Component Model Numbers	ARWB144DAS4 x 2 +ARWB192DAS4 x 1	ARWB192DAS4 x 3
Cooling Performance		
Nominal Cooling Capacity (Btu/h)[1]	480,000	576,000
Heating Performance		
Nominal Heating Capacity (Btu/h)[1]	540,000	648,000
Operating Range (Entering Water Temperature)		
Cooling (°F)[2]	23 – 113	23 – 113
Heating (°F)	23 – 113	23 – 113
Synchronous Operation (°F)	23 – 113	23 – 113
Compressor		
Inverter Quantity	HSS DC Scroll x 3	HSS DC Scroll x 3
Oil/Type	PVE/FVC68D	PVE/FVC68D
Unit Data		
Refrigerant Type	R410A	R410A
R410A Refrigerant Factory Charge (lbs)	6.6 + 6.6 + 6.6	6.6 + 6.6 + 6.6
Refrigerant Control/Location	EEV/Indoor Unit	EEV/Indoor Unit
Max. Number Indoor Units/System[2]	64	64
Sound Pressure dB(A)[3] Cooling/Heating	60/62	60/62
Net Unit Weight (lbs.)	309 + 309 + 309	309 + 309 + 309
Shipping Weight (lbs.)	331 + 331 + 331	331 + 331 + 331
Communication Cables	2 x 18 AWG	2 x 18 AWG
Heat Rejected to Equipment Room (Btu/h)	7275	7863
Heat Exchanger (Stainless Steel Plate)		
Maximum Pressure Resistance (psi)	640	640
Flow at Rated Condition (GPM)	35.5 + 35.5 + 50.7	50.7 + 50.7 + 50.7
Range of Flow (GPM)	48.7 – 182.6	60.8 – 228.2
Total Heat of Rejection (Btu/h)	190,100 + 190,100 + 253,500	253,500 + 253,500 + 253,500
Total Heat of Absorption (Btu/h)	146,800 + 146,800 + 193,600	193,600 + 193,600 + 193,600
Pressure Drop (ft-wg)	5.3 + 5.3 + 9.7	9.7 + 9.7 + 9.7
Δt[4] (°F)	10.4	10.0
Piping[5]		
Liquid Line Connection (in., OD)	1/2 + 1/2 + 1/2 Braze	1/2 + 1/2 + 1/2 Braze
Low Pressure Vapor Line Conn (in., OD)	1-1/8 + 1-1/8 + 1-1/8 Braze	1-1/8 + 1-1/8 + 1-1/8 Braze
High Pressure Vapor Line Conn (in., OD)	3/4 + 3/4 + 3/4 Braze	3/4 + 3/4 + 3/4 Braze
Water Inlet/Outlet Connection Size (in)	(1-1/2 + 1-1/2 Fem) x3	(1-1/2 + 1-1/2 Fem) x3
Condensate Drain (in)	3/4 Female	3/4 Female

[1]Nominal capacity is outside of AHRI Standard 1230 and based on the following conditions:

- Cooling – Indoor 80°F DB / 66°F WB
  Water Temperature Entering: 86°F
- Heating – Indoor 68°F DB
  Water Temperature Entering: 68°F

[2]When entering water temperature is lower than 59ºF, variable water flow control kit PWFCKN000 is required.

[3]Sound pressure levels are tested in an anechoic chamber under ISO 3745 standard.

[4]Value is calculated as follows: Δt = Total Heat of Rejection/(Nominal Flow Rate x 500).

[5]Refer to the Refrigerant Piping section of this manual for correct line sizing. Contractor must use LG manufactured Y-Branch and Header Kits only. Designer must verify refrigerant piping design configuration using LG's computerized refrigerant piping software (LATS Multi V) to validate the pipe design.

GENERAL DATA

Heat Recovery Unit Specifications and Electrical Data

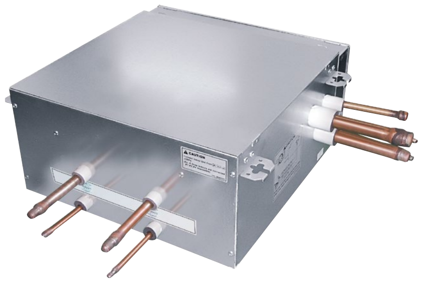


Figure 4: Two-Port Heat Recovery Unit.

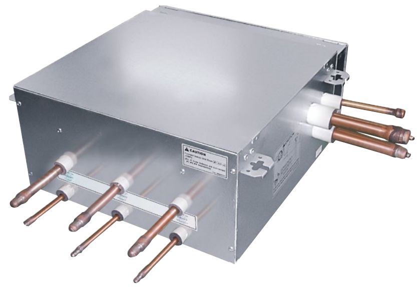


Figure 5: Three-Port Heat Recovery Unit.

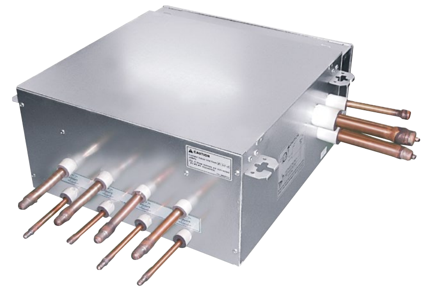


Figure 6: Four-Port Heat Recovery Unit.

⚠ Note:
Heat recovery units can only be used with LG heat recovery systems.

Table 13: Heat Recovery Unit Specifications.

Model			PRHR021A	PRHR031A	PRHR041A
Number of Ports			2	3	4
Max. Connectable No. of Indoor Units			16	24	32
Max. Connectable No. of Indoor Units on each port			8	8	8
Max. Port Capacity (each port)		Btu/h	54,000	54,000	54,000
Max. Unit Capacity (sum of ports)		Btu/h	192,000	192,000	192,000
Net Weight		lbs.	40	45	49
Dimensions (W x H x D)		inches	31-1/2 x 8-5/8 x 24-5/16		
Casing			Galvanized steel plate		
Connecting Pipes	To Indoor Units	Liquid Pipe (inches)	3/8		
		Vapor Pipe (inches)	5/8		
	To Water Source 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		
Current	Minimum Circuit Amps (MCA)		0.1	0.15	0.2
	Maximum Fuse Amps (MFA)		15		
Power Supply			1Ø, 208-230V, 60Hz		

Table 14: Heat Recovery Unit Electrical Data.

Unit Model No.	V / Hz / Ph	Input (kW)	
		Cooling	Heating
PRHR021A	208-230 / 60 / 1	0.014	0.014
PRHR031A	208-230 / 60 / 1	0.021	0.021
PRHR041A	208-230 / 60 / 1	0.029	0.029

ELECTRICAL DATA

ARWN Series Heat Pump Water Source Units

Table 15: 208-230V, 60Hz, 3-Phase Heat Pump Systems

Nom. Tons	System Model No.	Compressor (Comp.)				MCA			MOCP		
		Comp. Qty.	Motor RLA (Ea.)			Frame 1	Frame 2	Frame 3	Frame 1	Frame 2	Frame 3
			Frame 1	Frame 2	Frame 3						
6.0	ARWN072BAS4	1	28.0	–	–	35.0	–	–	60	–	–
8.0	ARWN096BAS4	1	28.4	–	–	35.5	–	–	60	–	–
10.0	ARWN121BAS4	1	28.8	–	–	36.0	–	–	60	–	–
12.0	ARWN144BAS4	1	28.8	–	–	36.5	–	–	60	–	–
14.0	ARWN168BAS4	2	28.4	28.0	–	35.5	35.0	–	60	60	–
16.0	ARWN192BAS4	2	28.8	28.0	–	36.0	35.0	–	60	60	–
18.0	ARWN216BAS4	2	28.8	28.0	–	36.0	35.0	–	60	60	–
24.0	ARWN288BAS4	2	28.8	28.8	–	36.0	36.0	–	60	60	–
30.0	ARWN360BAS4	3	28.8	28.8	28.0	36.0	36.0	35.0	60	60	60
36.0	ARWN432BAS4	3	28.8	28.8	28.8	36.0	36.0	36.0	60	60	60

For component model nos. see the specification tables on p. 14-16.

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.

Table 16: 460V, 60Hz, 3-Phase Heat Pump Systems

Nom. Tons	System Model No.	Compressor (Comp.)				MCA			MOCP		
		Comp. Qty.	Motor RLA (Ea.)			Frame 1	Frame 2	Frame 3	Frame 1	Frame 2	Frame 3
			Frame 1	Frame 2	Frame 3						
6.0	ARWN072DAS4	1	19.2	–	–	24.0	–	–	40	–	–
8.0	ARWN096DAS4	1	19.6	–	–	24.5	–	–	40	–	–
10.0	ARWN121DAS4	1	20.0	–	–	25.0	–	–	45	–	–
12.0	ARWN144DAS4	1	25.6	–	–	32.0	–	–	55	–	–
14.0	ARWN168DAS4	1	26.0	–	–	32.5	–	–	55	–	–
16.0	ARWN192DAS4	1	26.4	–	–	33.0	–	–	55	–	–
20.0	ARWN240DAS4	2	25.6	19.6	–	32.0	24.5	–	55	40	–
24.0	ARWN288DAS4	2	26.0	20.0	–	32.5	25.0	–	55	45	–
28.0	ARWN336DAS4	2	26.0	26.0	–	32.5	32.5	–	55	55	–
32.0	ARWN384DAS4	2	26.4	26.4	–	33.0	33.0	–	55	55	–
40.0	ARWN480DAS4	3	26.4	25.6	25.6	33.0	32.0	32.0	55	55	55
48.0	ARWN576DAS4	3	26.4	26.4	26.4	33.0	33.0	33.0	55	55	55

For component model nos. see the specification tables on p. 14-16.

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.

ELECTRICAL DATA

ARWB Series Heat Recovery Water Source Units

Table 17: 208-230V, 60Hz, 3-Phase Heat Recovery Systems.

Nom. Tons	System Model No.	Compressor (Comp.)				MCA			MOCP		
		Comp. Qty.	Motor RLA (Ea.)			Frame 1	Frame 2	Frame 3	Frame 1	Frame 2	Frame 3
			Frame 1	Frame 2	Frame 3						
6.0	ARWB072BAS4	1	28.0	–	–	35.0	–	–	60	–	–
8.0	ARWB096BAS4	1	28.4	–	–	35.5	–	–	60	–	–
10.0	ARWB121BAS4	1	28.8	–	–	36.0	–	–	60	–	–
12.0	ARWB144BAS4	1	28.8	–	–	36.0	–	–	60	–	–
14.0	ARWB168BAS4	2	28.4	28.0	–	35.5	35.0	–	60	60	–
16.0	ARWB192BAS4	2	28.8	28.0	–	36.0	35.0	–	60	60	–
18.0	ARWB216BAS4	2	28.8	28.0	–	36.0	36.0	–	60	60	–
24.0	ARWB288BAS4	2	28.8	28.8	–	36.0	36.0	–	60	60	–
30.0	ARWB360BAS4	3	28.8	28.8	28.0	36.0	36.0	35.0	60	60	60
36.0	ARWB432BAS4	3	28.8	28.8	28.8	36.0	36.0	36.0	60	60	60

For component model nos. see the specification tables on p. 14-16.
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.

Table 18: 460V, 60Hz, 3-Phase Heat Recovery Systems.

Nom. Tons	System Model No.	Compressor (Comp.)				MCA			MOCP		
		Comp. Qty.	Motor RLA (Ea.)			Frame 1	Frame 2	Frame 3	Frame 1	Frame 2	Frame 3
			Frame 1	Frame 2	Frame 3						
6.0	ARWB072DAS4	1	19.2	–	–	24.0	–	–	40	–	–
8.0	ARWB096DAS4	1	19.6	–	–	24.5	–	–	40	–	–
10.0	ARWB121DAS4	1	20.0	–	–	25.0	–	–	45	–	–
12.0	ARWB144DAS4	1	25.6	–	–	32.0	–	–	55	–	–
14.0	ARWB168DAS4	1	26.0	–	–	32.5	–	–	55	–	–
16.0	ARWB192DAS4	1	26.4	–	–	33.0	–	–	55	–	–
20.0	ARWB240DAS4	2	25.6	19.6	–	32.0	24.5	–	55	40	–
24.0	ARWB288DAS4	2	26.0	20.0	–	32.5	25.0	–	55	45	–
28.0	ARWB336DAS4	2	26.0	26.0	–	32.5	32.5	–	55	55	–
32.0	ARWB384DAS4	2	26.4	26.4	–	33.0	33.0	–	55	55	–
40.0	ARWB480DAS4	3	26.4	25.6	25.6	33.0	32.0	32.0	55	55	55
48.0	ARWB576DAS4	3	26.4	26.4	26.4	33.0	33.0	33.0	55	55	55

For component model nos. see the specification tables on p. 14-16.
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.

Table 19: Summary Data—Wall-Mounted / Ceiling Cassette Indoor Units.

Unit / Type[1]	ARNU*****[2]	Nominal Capacity Btu/h	
		Cooling[3]	Heating[3]
Wall Mounted–ART COOL™ Mirror 	073 SER2	7,500	8,500
	093 SER2	9,600	10,900
	123 SER2	12,300	13,600
	153 SER2	15,400	17,100
	183 S8R2	19,100	21,500
	243 S8R2	24,200	27,300
Wall Mounted–Standard Finish 	073 SEL2	7,500	8,500
	093 SEL2	9,600	10,900
	123 SEL2	12,300	13,600
	153 SEL2	15,400	17,100
	183 S5L2	19,100	21,500
	243 S5L2	24,200	27,300
Ceiling Cassette–1 Way 	073 TJC2	7,500	8,500
	093 TJC2	9,600	10,900
	123 TJC2	12,300	13,600
Ceiling Cassette–2 Way 	183 TLC2	19,100	21,500
	243 TLC2	24,200	27,300
Ceiling Cassette–4 Way (2' x 2') 	053 TRC2	5,500	6,100
	073 TRC2	7,500	8,500
	093 TRC2	9,600	10,900
	123 TRC2	12,300	13,600
	153 TQC2	15,400	17,100
	183 TQC2	19,100	21,500
Ceiling Cassette–4 Way (3' x 3') 	093 TPAA	9,600	10,900
	123 TPAA	12,300	13,600
	153 TPAA	15,400	17,100
	183 TNAA	19,100	21,500
	243 TNAA	24,200	27,300
	243 TPC2	24,200	27,300
	283 TPC2	28,000	31,500
	363 TNC2	36,200	40,600
	423 TMC2	42,000	43,800
	483 TMC2	48,100	51,200

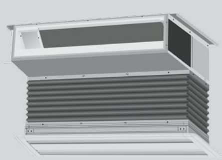
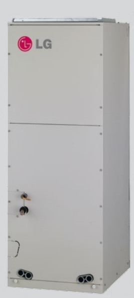
[1]All indoor units require 208–230V/60Hz/1Ph and an AWG18-2 communication cable. Reference LG's Multi V Indoor Unit Engineering Manual for complete detailed engineering data and selection procedures.

[2]Model number shows nominal capacity and frame size designator.

[3]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).

INDOOR UNITS

Table 20: Summary Data—Recessed Mounted Indoor Units.

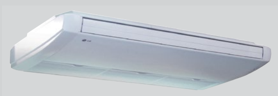
Unit / Type[1]	ARNU***[2]	Nominal Capacity Btu/h	
		Cooling[3]	Heating[3]
Ducted High Static	073 BHA2	7,500	8,500
	093 BHA2	9,600	10,900
	123 BHA2	12,300	13,600
	153 BHA2	15,400	17,100
	183 BHA2	19,100	21,500
	243 BHA2	24,200	27,300
	153 BGA2	15,400	17,100
	183 BGA2	19,100	21,500
	243 BGA2	24,200	27,300
	283 BGA2	28,000	31,500
	363 BGA2	36,200	40,600
	423 BGA2	42,000	43,800
	483 BRA2	48,100	51,200
	543 BRA2	54,000	61,400
	763 B8A2	76,400	86,000
	963 B8A2	95,900	107,500
Ducted Low Static–Convertible	073 B1G2	7,500	8,500
	093 B1G2	9,600	10,900
	123 B1G2	12,300	13,600
	153 B1G2	15,400	17,100
	183 B2G2	19,100	21,500
	243 B2G2	24,200	27,300
Ducted Low Static–Bottom Return	073 B3G2	7,500	8,500
	093 B3G2	9,600	10,900
	123 B3G2	12,300	13,600
	153 B3G2	15,400	17,100
	183 B4G2	19,100	21,500
	243 B4G2	24,200	27,300
Vertical / Horizontal Air Handling Unit	123 NJ2	12,000	13,500
	183 NJA2	18,000	20,000
	243 NJA2	24,000	27,000
	303 NJA2	30,000	34,000
	363 NJA2	36,000	40,000
	423 NKA2	42,000	46,000
	483 NKA2	48,000	54,000
	543 NKA2	54,000	60,000

[1]All indoor units require 208–230V/60Hz/1Ph and an AWG18-2 communication cable. Reference LG's Multi V Indoor Unit Engineering Manual for complete detailed engineering data and selection procedures.

[2]Model number shows nominal capacity and frame size designator.

[3] 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).

Table 21: Summary Data—Surface Mounted / Floor Standing Indoor Units.

Unit / Type[1]	ARNU****[2]	Nominal Capacity Btu/h	
		Cooling[3]	Heating[3]
Ceiling Suspended 	183VJA2	19,100	21,500
	243VJA2	24,200	27,300
Convertible Surface Mounted 	093VEA2	9,600	10,900
	123VEA2	12,300	13,600
Floor Standing–with Case 	073 CEA2	7,500	8,500
	093 CEA2	9,600	10,900
	123 CEA2	12,300	13,600
	153 CEA2	15,400	17,100
	183 CFA2	19,100	21,500
	243 CFA2	24,200	27,300
Floor Standing–without case 	073 CEU2	7,500	8,500
	093 CEU2	9,600	10,900
	123 CEU2	12,300	13,600
	153 CEU2	15,400	17,100
	183 CFU2	19,100	21,500
	243 CFU2	24,200	27,300

[1]All indoor units require 208–230V/60Hz/1Ph and an AWG18-2 communication cable. Reference LG's Multi V Indoor Unit Engineering Manual for complete detailed engineering data and selection procedures.

[2]Model # shows nominal capacity and frame size designator.

[3]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).

Table 22: Indoor Units—Controls and Options.

Indoor Unit Type		Wall Mounted—Standard Finish	Wall Mounted—ART COOL™ Mirror	1-Way Cassette	2-Way Cassette	4-Way Cassette		Ducted High Static	Ducted Low Static-Convertible	Ducted Low Static—Bottom Return	Vert.-Horiz. AHU (NJ)	Vert.-Horiz. AHU (NK)	Ceiling Suspended	Convertible Surface Mount	Floor Mount—Cased	Floor Mount—Uncased
Nominal Chassis Size (MBH)		7–24	7–24	7–12	18–24	5–18	24–48	7–96	7–24	7–24	1–3	3.5–4.5	18–24	9–12	7–24	7–24
Airflow	Air supply outlets	1	1	1	2	4	4	1	1	1	1	1	1	1	1	1
	Airflow direction (left/right)	manual / auto	auto										manual	manual		
	Auto airflow direction (up/down)	√	√	√	√	√	√						√	√		
	Fan speed (Heating mode) (qty.)	(3)	(3)	(4)	(4)	(4)	(4)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
	Fan speed (Cooling mode) (qty.)	(4)	(4)	(5)	(5)	(5)	(5)	(3)	(3)	(3)	(3)	(3)	(4)	(4)	(3)	(3)
	Fan speed (Fan mode) (qty.)	(3)	(3)	(4)	(4)	(4)	(4)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
	Chaos swing (random louver swing)	√	√													
	Chaos wind (random fan speed)	√	√	√	√	√	√						√	√		
	Jet-cool (power cooling)	√	√	√	√	√	√						√	√		
Operation	E.S.P. control			√	√	√	√	√	√	√	√	√			√	√
	High ceiling			√	√	√	√						√	√		
	Auto-restart after power restore	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Hot Start	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Diagnostics	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Soft Dry (dehumidification)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Auto changeover (HR)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Auto clean (coil dry)	√	√													
	Child lock	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Forced operation	√	√	√	√	√	√						√	√		
	Group control – Requires the use of one Group control Cable Kit (PZCWRCG3) for every additional indoor unit	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Sleep mode	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Timer (on/off)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Weekly schedule	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Two thermistor control	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Test operation mode	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Filter	Plasma[2]	√	√	√	√[5]	√[5]	√[5]									
	Washable anti-fungal[1]	√	√	√	√	√	√	√	√	√			√	√	√	√
Controllers	7-day programmable controller	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Simple controller w/mode	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Simple controller w/o mode	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Wireless hand held controller	o	o	o	o	o	o	o[3]	o[3]	o[3]			o	o	o[3]	o[3]
Others	Condensate lift			√	√	√	√	√	√	√						
	Ventilation air			√		√[4]	√[4]	√	√	√						
	Casing	√	√	√	√	√	√						√	√	√	
	Standard grille			√	√	√	√									
	Auto elevation grille						√[5]									
	Color Panels (qty.)		(3)													
	Suction grille									o						
	Suction canvas									o						
	Aux. Heat Kit										√	√				

[1]Primary washable filters.
[2]Secondary plasma filters
[3]Requires LG Programmable Controller
[4]Requires ventilation kit PTVK430 (For TR, TQ frames) or PTVK410+PTVK420 (For TP, TN, TM frames)(Temperature, humidity, and volume limitations apply).
[5]Requires standard grille.
[6]Heat pump systems only.

√ = Standard feature
o = Unit option

WATER SOURCE UNIT DIMENSIONS

Single Frame Heat Pump and Heat Recovery

X	13-1/2"
Y	9-13/16"
Z	16-1/2"
W	29-3/4"
D	19-3/4"
H	39-1/4"
L1	6-5/8"
L2	25"
L3	29-1/4"
L4	32-1/2"
L5	35-15/16"
L6	3-1/8"
L7	2-1/4"
L8	14-3/4"
M1	18-1/4"
M2	3/4"
M3	2-7/16"
M4	24-13/16"

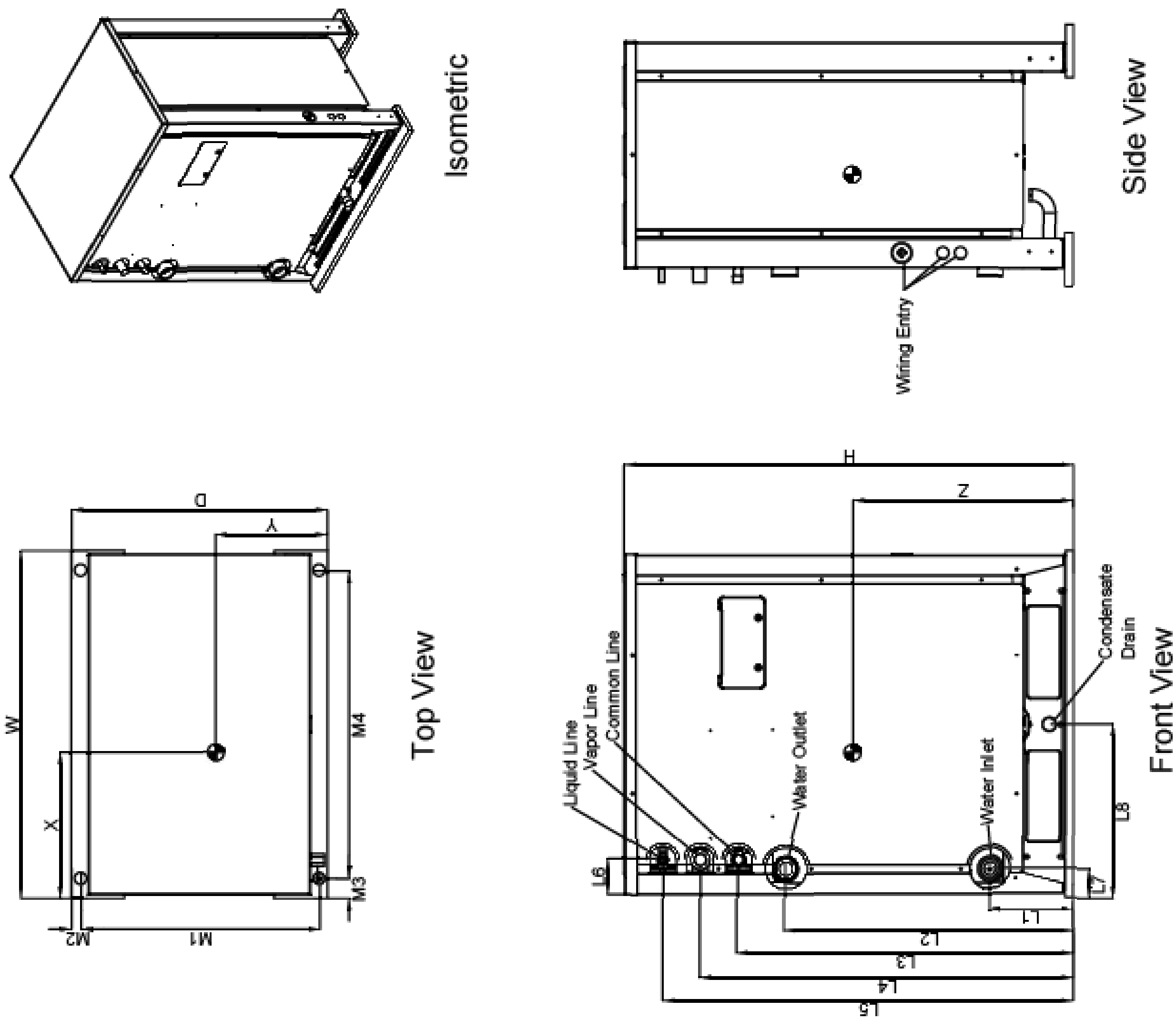


Figure 7: Single Frame Heat Pump and Heat Recovery

Dual Frame Heat Pump and Heat Recovery

X	13-1/2"
Y	9-13/16"
Z	16-1/2"
W	29-3/4"
D	19-3/4"
H	39-1/4"
L1	6-5/8"
L2	25"
L3	29-1/4"
L4	32-1/2"
L5	35-15/16"
L6	3-1/8"
L7	2-1/4"
L8	14-3/4"
L9	4"
M1	18-1/4"
M2	3/4"
M3	2-7/16"
M4	24-13/16"

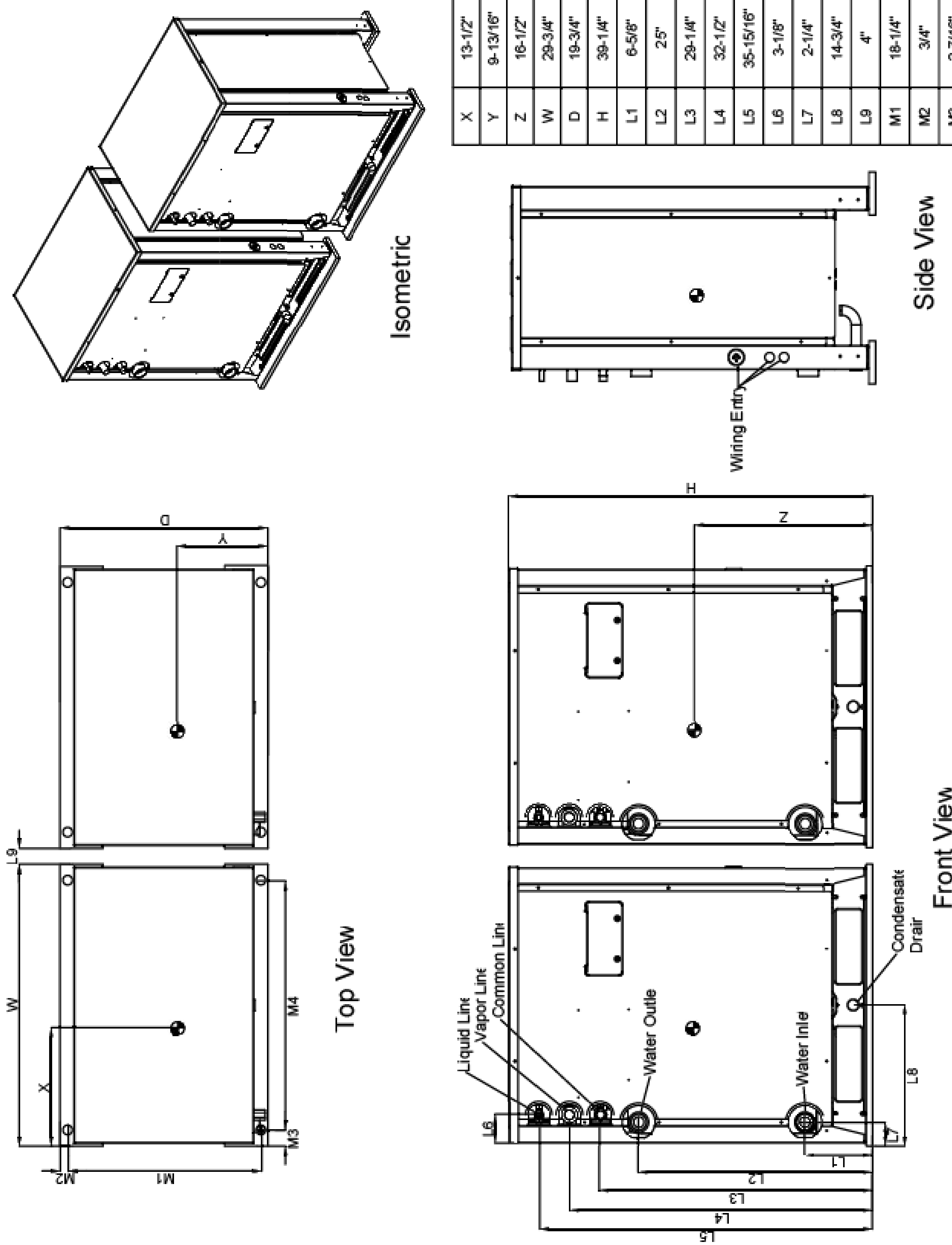


Figure 8: Dual Frame Heat Pump and Heat Recovery

WATER SOURCE UNIT DIMENSIONS

Triple Frame Heat Pump and Heat Recovery

X	13-1/2"
Y	9-13/16"
Z	16-1/2"
W	29-3/4"
D	19-3/4"
H	39-1/4"
L1	6-5/8"
L2	25"
L3	29-1/4"
L4	32-1/2"
L5	35-15/16"
L6	3-1/8"
L7	2-1/4"
L8	14-3/4"
L9	4"
M1	18-1/4"
M2	3/4"
M3	2-7/16"
M4	24-13/16"

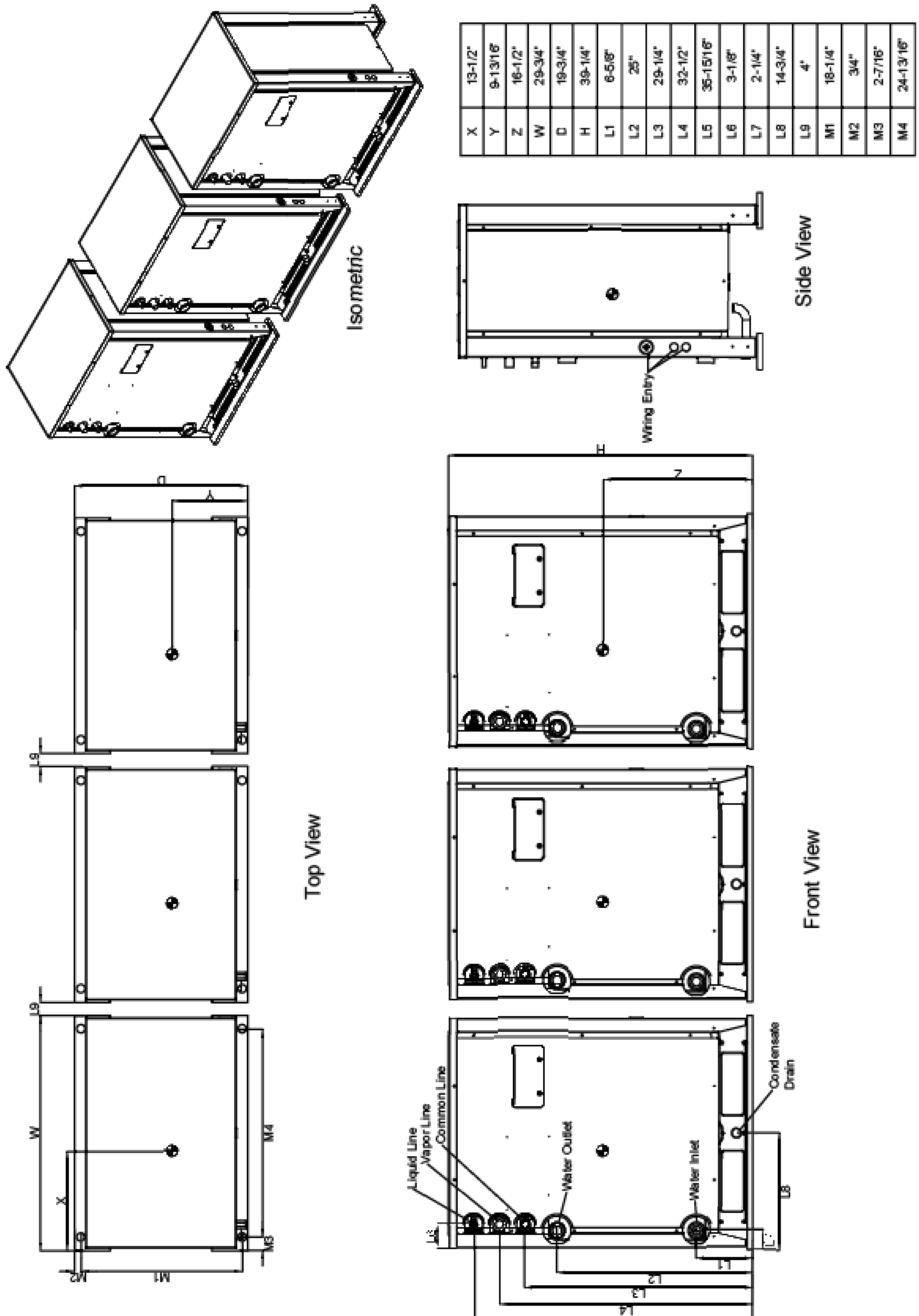
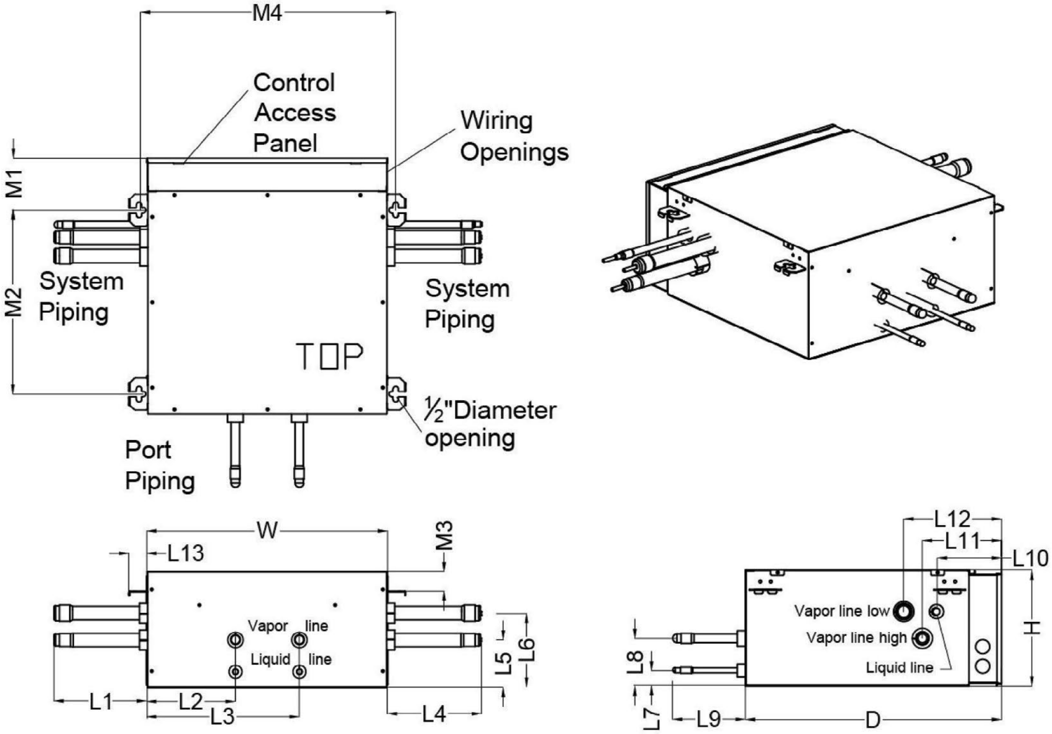


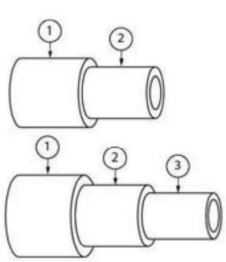
Figure 9: Triple Frame Heat Pump and Heat Recovery

HEAT RECOVERY UNIT DIMENSIONS

PRHR021A



W	17-7/8"
H	8-5/8"
D	18-15/16"
L1	6-7/8"
L2	6-5/8"
L3	11-3/8"
L4	6-7/8"
L5	3-1/2"
L6	5-1/2"
L7	1-3/16"
L8	3-9/16"
L9	5-7/16"
L10	4-3/4"
L11	5-3/4"
L12	7-1/4"
L13	1-1/4"
M1	3-3/4"
M2	13-5/8"
M3	1-1/2"
M4	18-15/16"

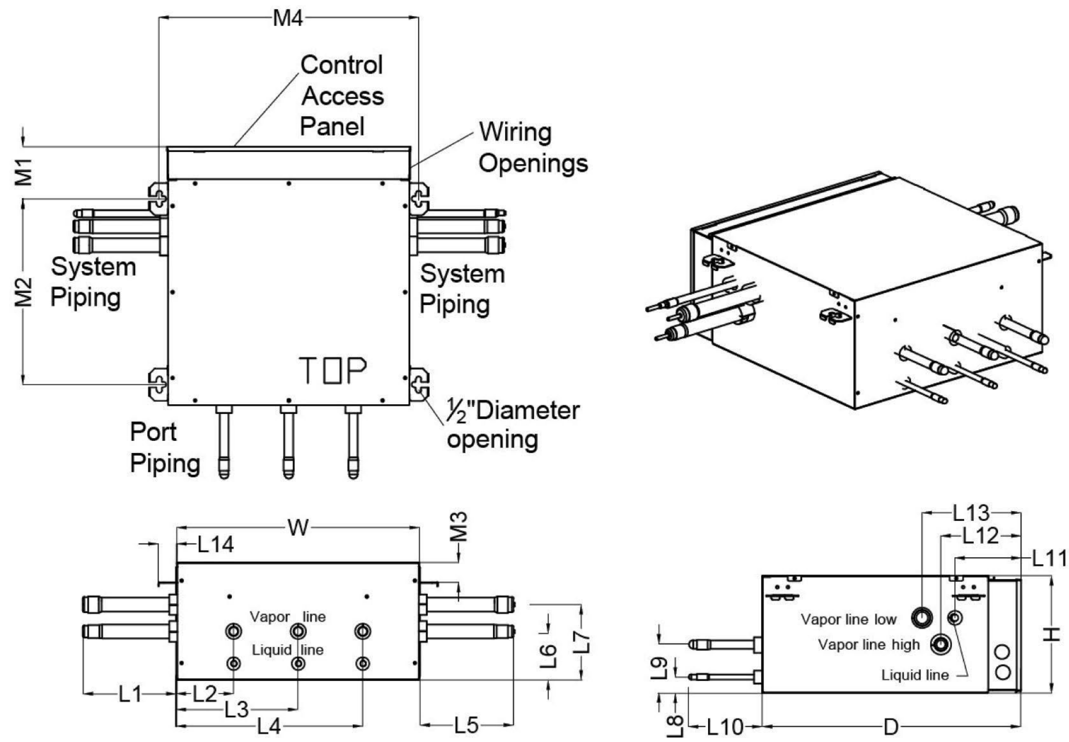


Reducer Dimensions (in)					
		1	2	3	Quantity
Indoor Unit	Liquid Line	3/8 OD	1/4 OD	-	2
	Vapor Line	5/8 OD	1/2 OD	-	2
HR Unit	Liquid Line	3/8 OD	1/4 OD	-	2
	Vapor Line Low	5/8 OD	1/2 OD	-	2
		7/8 OD	3/4 OD	5/8 OD	2
	Vapor Line High	1/2 OD	3/8 OD	-	2
		3/4 OD	5/8 OD	1/2 OD	2

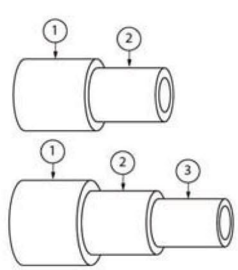
Figure 10: PRHR021A Heat Recovery Unit

HEAT RECOVERY UNIT DIMENSIONS

PRHR031A



W	17-7/8"
H	8-5/8"
D	18-15/16"
L1	6-7/8"
L2	4-1/4"
L3	9"
L4	13-3/4"
L5	6-7/8"
L6	3-1/2"
L7	5-1/2"
L8	1-3/16"
L9	3-9/16"
L10	5-7/16"
L11	4-3/4"
L12	5-3/4"
L13	7-1/4"
L14	1-1/4"
M1	3-3/4"
M2	13-5/8"
M3	1-1/2"
M4	18-15/16"

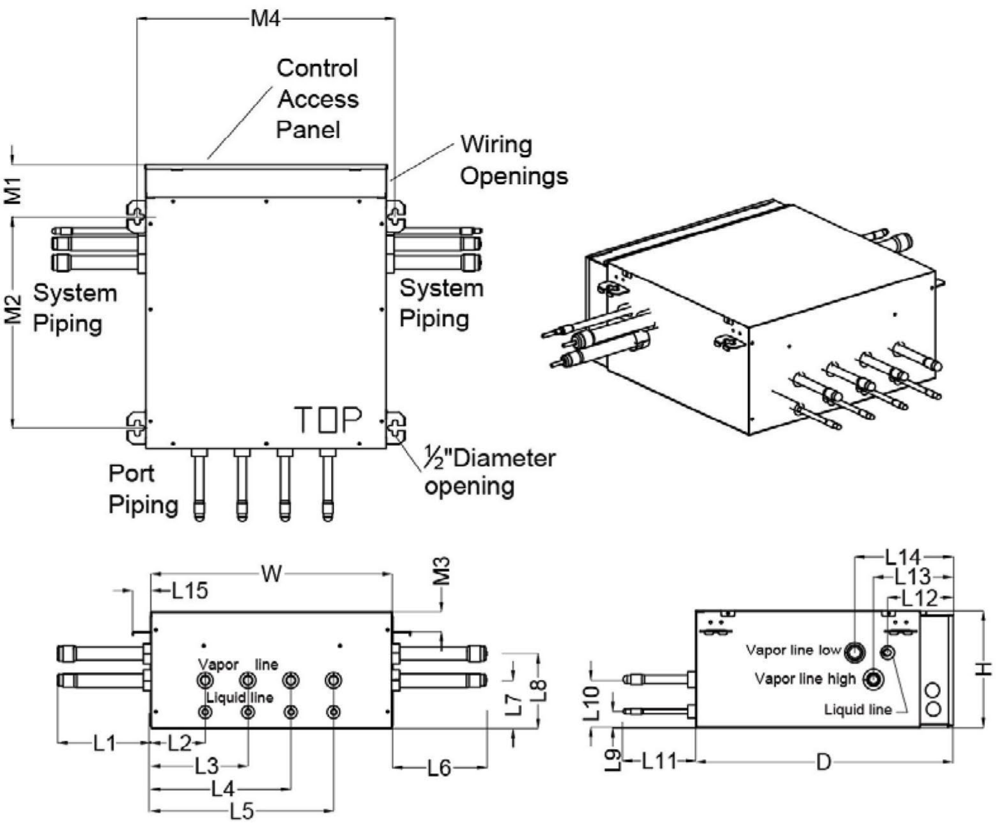


Reducer Dimensions (in)					
		1	2	3	Quantity
Indoor Unit	Liquid Line	3/8 OD	1/4 OD	-	3
	Vapor Line	5/8 OD	1/2 OD	-	3
HR Unit	Liquid Line	1/2 OD	3/8 OD	-	2
	Vapor Line Low	3/4 OD	5/8 OD	-	2
		1-1/8 OD	7/8 OD	3/4 OD	2
	Vapor Line High	5/8 OD	1/2 OD	-	2
		7/8 OD	3/4 OD	5/8 OD	2

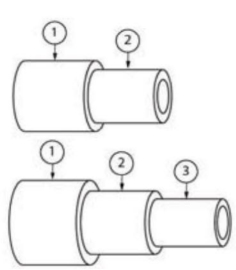
Figure 11: PRHR031A Heat Recovery Unit

HEAT RECOVERY UNIT DIMENSIONS

PRHR041A



W	17-7/8"
H	8-5/8"
D	18-15/16"
L1	6-7/8"
L2	4-1/4"
L3	7-1/2"
L4	10-1/2"
L5	13-3/4"
L6	6-7/8"
L7	3-1/2"
L8	5-1/2"
L9	1-3/16"
L10	3-9/16"
L11	5-7/16"
L12	4-3/4"
L13	5-3/4"
L14	7-1/4"
L15	1-1/4"
M1	3-3/4"
M2	13-5/8"
M3	1-1/2"
M4	18-15/16"

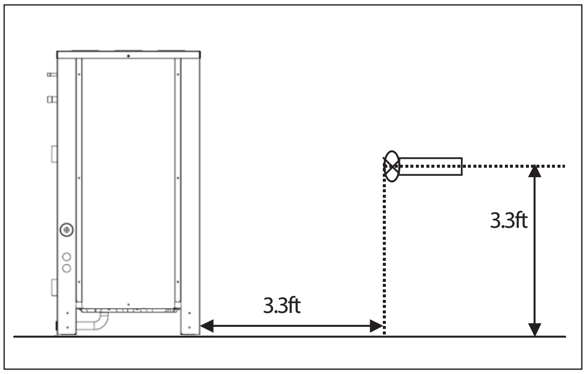


Reducer Dimensions (in)					
		1	2	3	Quantity
Indoor Unit	Liquid Line	3/8 OD	1/4 OD	-	4
	Vapor Line	5/8 OD	1/2 OD	-	4
HR Unit	Liquid Line	1/2 OD	3/8 OD	-	2
	Vapor Line Low	3/4 OD	5/8 OD	-	2
		1-1/8 OD	7/8 OD	3/4 OD	2
	Vapor Line High	5/8 OD	1/2 OD	-	2
		7/8 OD	3/4 OD	5/8 OD	2

Figure 12: PRHR041A Heat Recovery Unit

Acoustic Data for WSU Models

- Measurement taken 3.3' above finished floor, and at a distance of 3.3' from face of unit.
- Measurements taken with no attenuation and units operating at full load normal operating condition.
- Sound level will vary depending on a range of factors such as construction (acoustic absorption coefficient) of particular area in which the equipment is installed.
- Sound power levels are measured in dB(A)±3.
- Operating conditions per ISO 3745 standard conditions



208-230V Heat Pump Models	Sound Pressure Level (dB)A	
	Cooling	Heating
ARWN072BAS4	47	51
ARWN096BAS4	50	53
ARWN121BAS4	56	56
ARWN144BAS4	58	57
ARWN168BAS4	55	56
ARWN192BAS4	54	60
ARWN216BAS4	57	57
ARWN288BAS4	59	58
ARWN360BAS4	56	57
ARWN432BAS4	58	62

460V Heat Pump Models	Sound Pressure Level (dB)A	
	Cooling	Heating
ARWN072DAS4	47	51
ARWN096DAS4	50	53
ARWN121DAS4	56	56
ARWN144DAS4	58	57
ARWN168DAS4	53	57
ARWN192DAS4	54	60
ARWN240DAS4	57	57
ARWN288DAS4	59	58
ARWN336DAS4	59	61
ARWN384DAS4	56	61
ARWN480DAS4	60	62
ARWN576DAS4	60	62

208-230V Heat Recovery Models	Sound Pressure Level (dB)A	
	Cooling	Heating
ARWB072BAS4	47	51
ARWB096BAS4	50	53
ARWB121BAS4	56	56
ARWB144BAS4	58	57
ARWB168BAS4	55	56
ARWB192BAS4	54	60
ARWB216BAS4	57	57
ARWB288BAS4	59	58
ARWB360BAS4	56	57
ARWB432BAS4	58	62

460V Heat Recovery Models	Sound Pressure Level (dB)A	
	Cooling	Heating
ARWB072DAS4	47	51
ARWB096DAS4	50	53
ARWB121DAS4	56	56
ARWB144DAS4	58	57
ARWB168DAS4	53	57
ARWB192DAS4	54	60
ARWB240DAS4	57	57
ARWB288DAS4	59	58
ARWB336DAS4	59	61
ARWB384DAS4	56	61
ARWB480DAS4	60	62
ARWB576DAS4	60	62

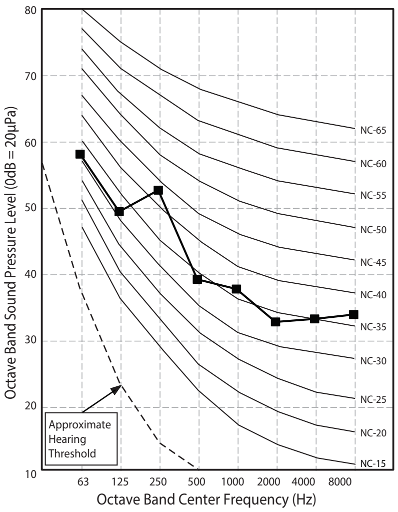
ACOUSTIC DATA

Sound Pressure Levels

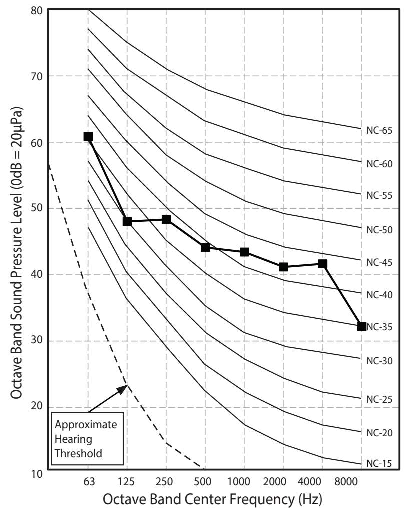
ARWN Series Heat Pump 208–230 VAC

Cooling

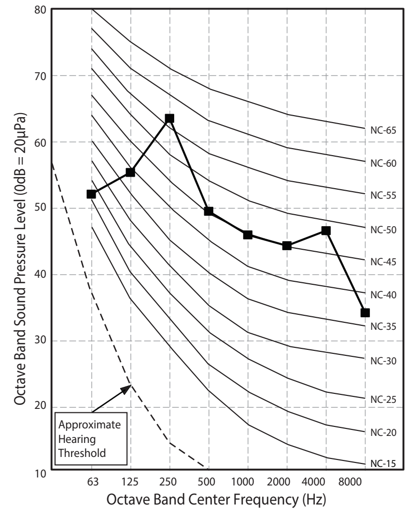
ARWN072BAS4



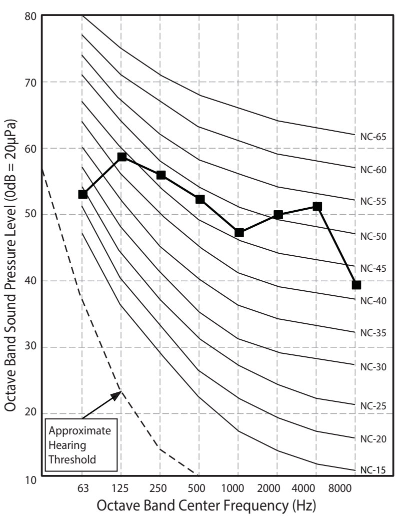
ARWN096BAS4



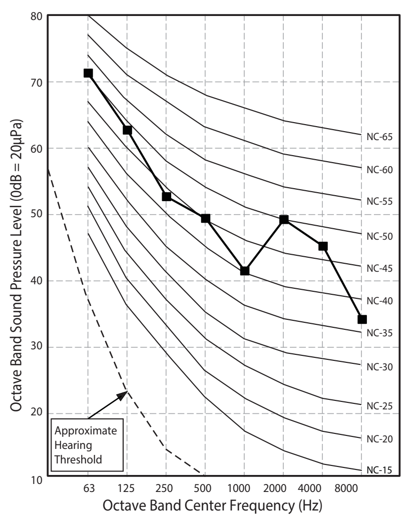
ARWN121BAS4



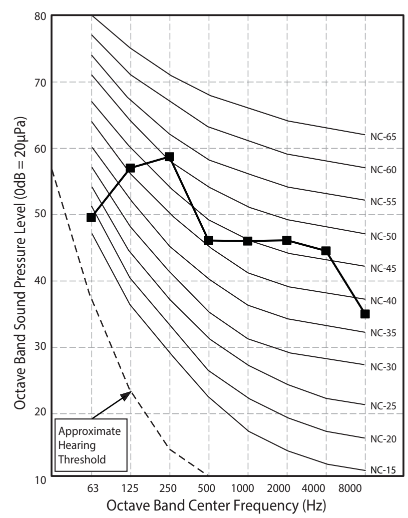
ARWN144BAS4



ARWN168BAS4



ARWN192BAS4



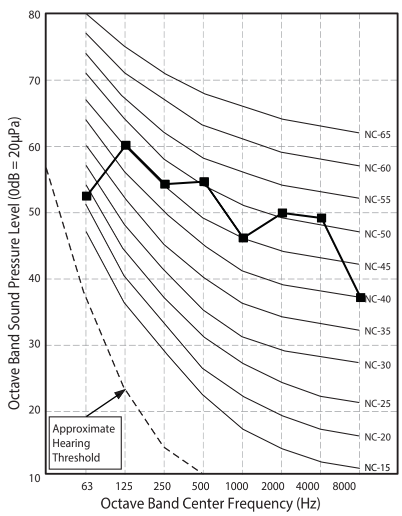
ACOUSTIC DATA

Sound Pressure Levels

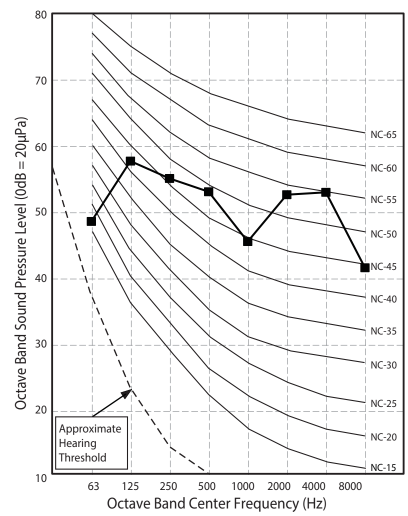
ARWN Series Heat Pump 208–230 VAC

Cooling – continued

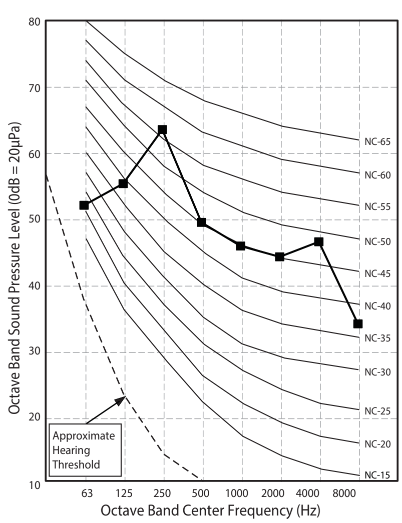
ARWN216BAS4



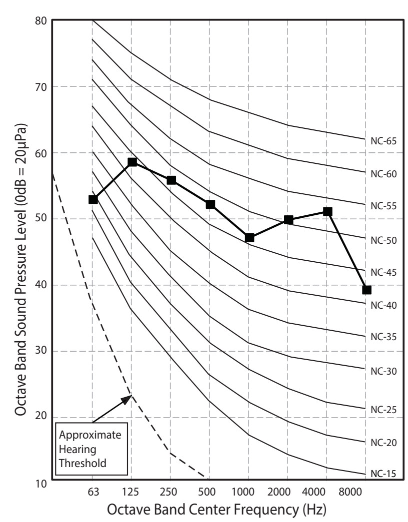
ARWN288BAS4



ARWN360BAS4



ARWN432BAS4

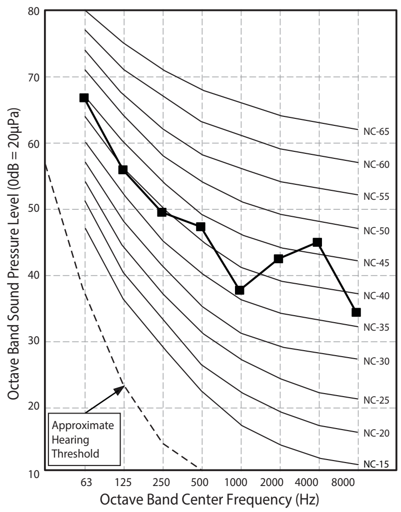


Sound Pressure Levels

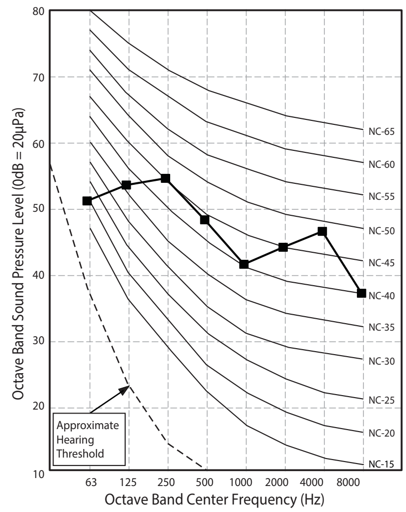
ARWN Series Heat Pump 208–230 VAC

Heating

ARWN072BAS4



ARWN096BAS4



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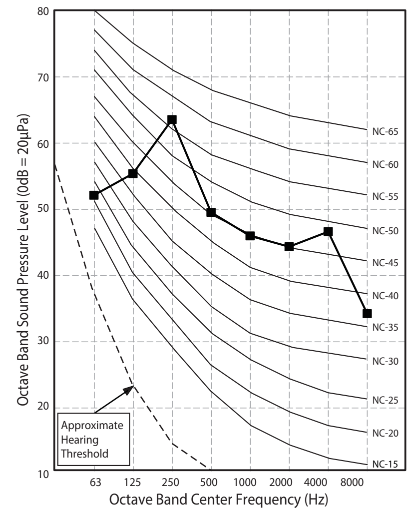

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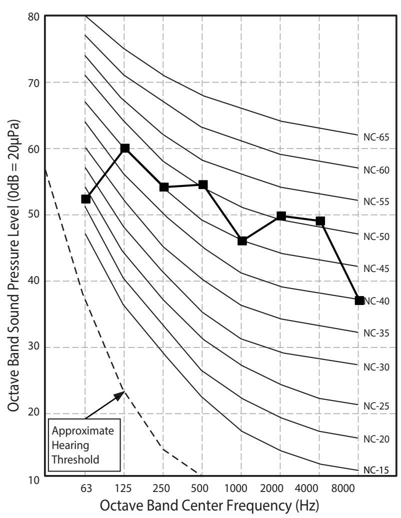

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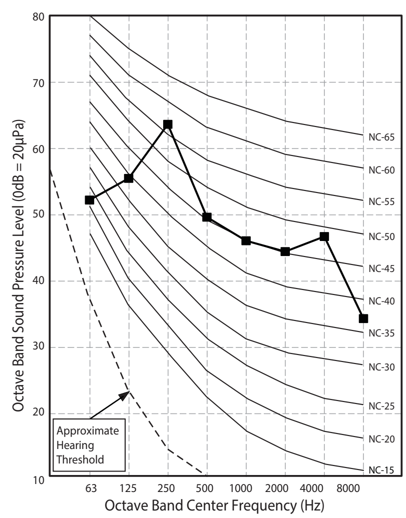
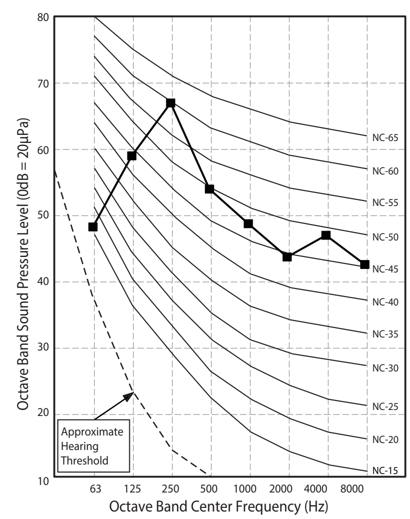
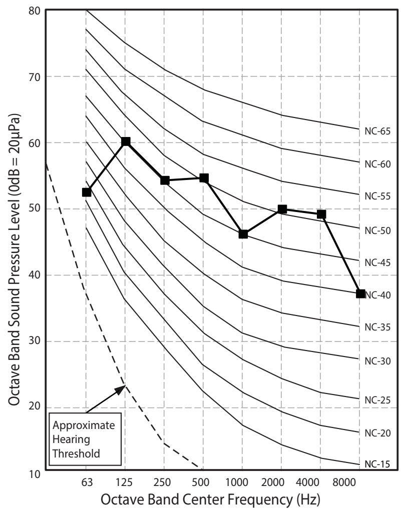


ARWN192BAS4

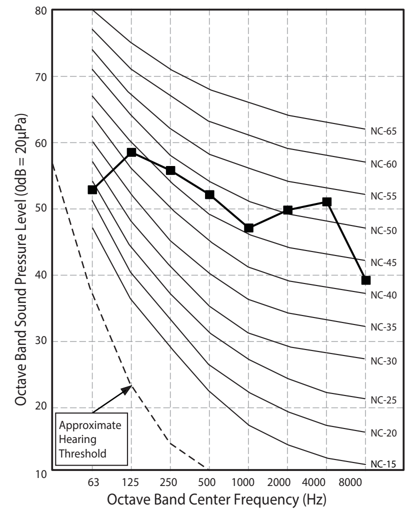


Heating – continued

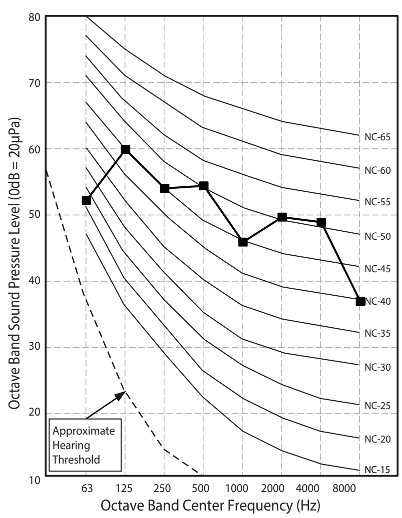
ARWN216BAS4



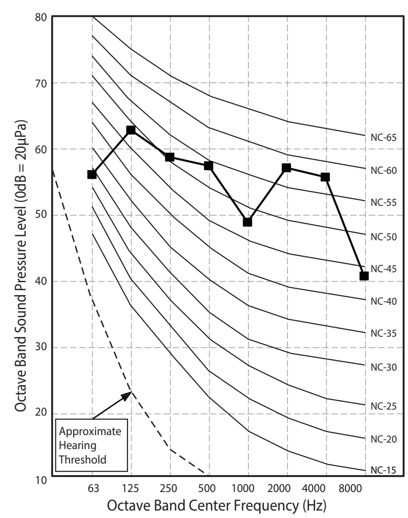
ARWN288BAS4



ARWN360BAS4



ARWN432BAS4



Product Data

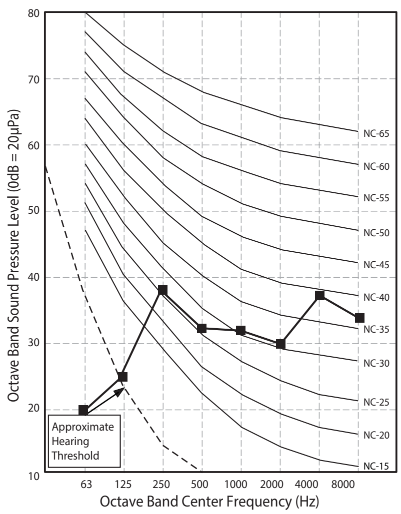
MULTI V WATER IV

Sound Pressure Levels

ARWN Series Heat Pump 460 VAC

Cooling

ARWN072DAS4



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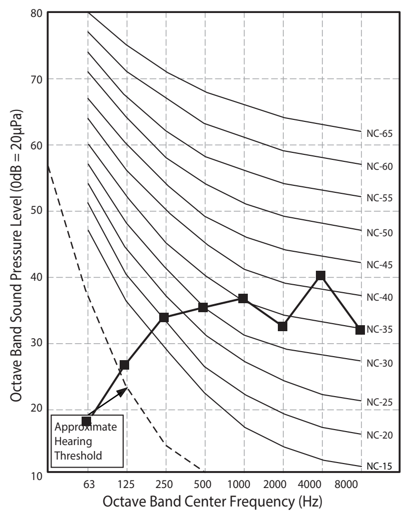
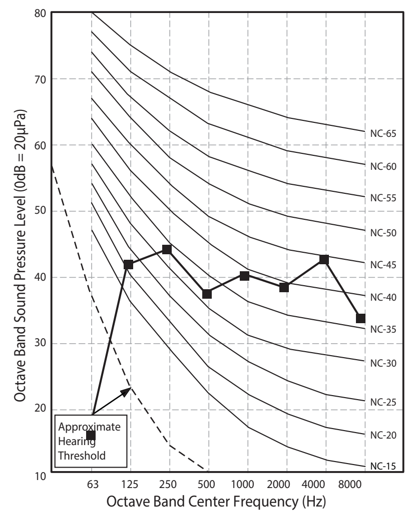
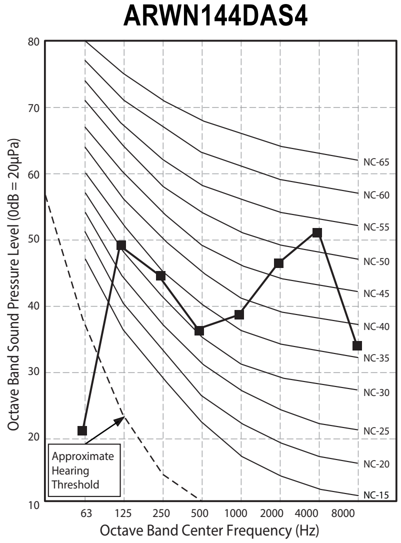


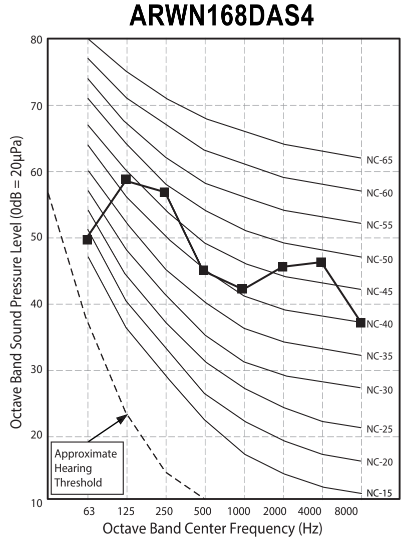
ARWN121DAS4



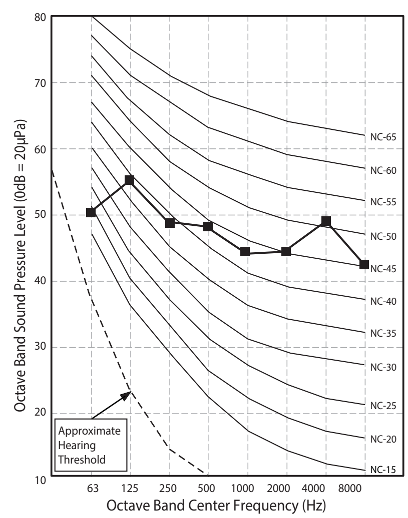
ARWN144DAS4



ARWN168DAS4

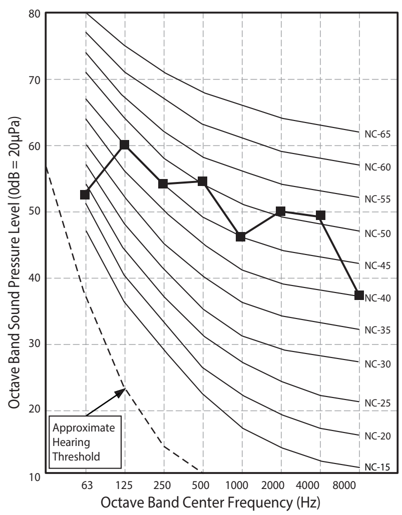


ARWN192DAS4

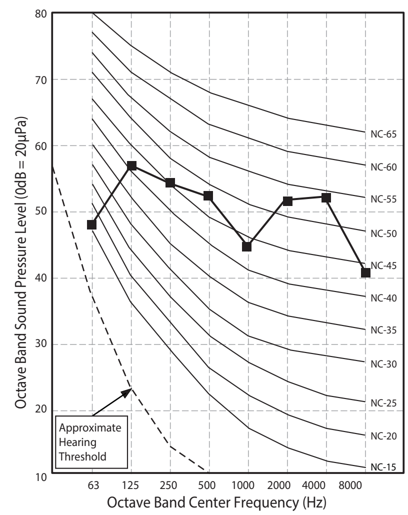


Cooling – continued

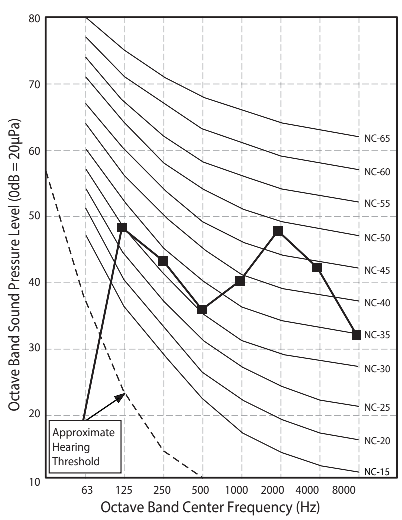
ARWN240DAS4



ARWN288DAS4
ARWN336DAS4



ARWN360DAS4



ARWN480DAS4
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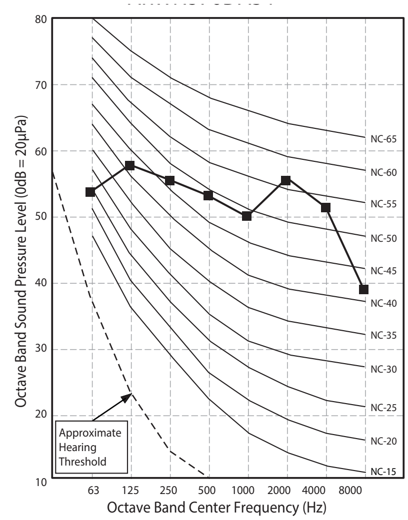


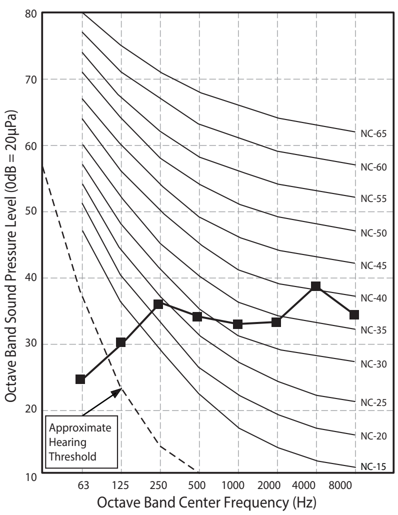
ACOUSTIC DATA

Sound Pressure Levels

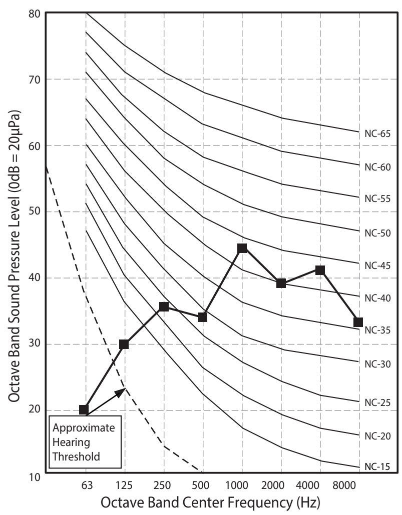
ARWN Series Heat Pump 460 VAC

Heating

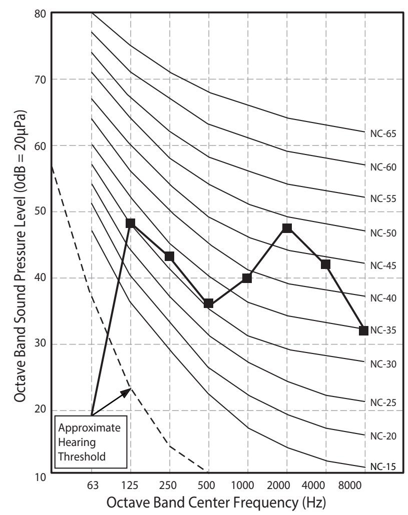
ARWN072DAS4



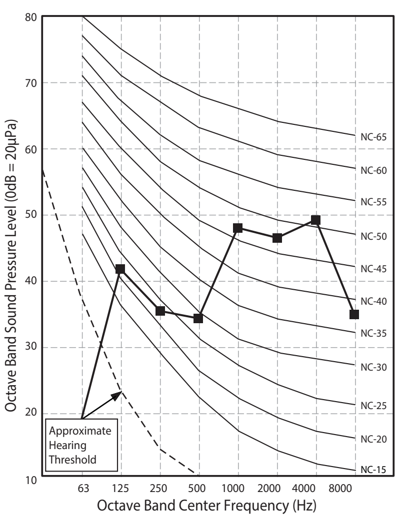
ARWN096DAS4



ARWN121DAS4



ARWN144DAS4



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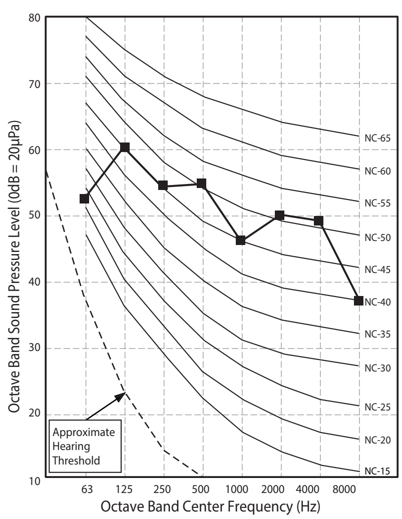

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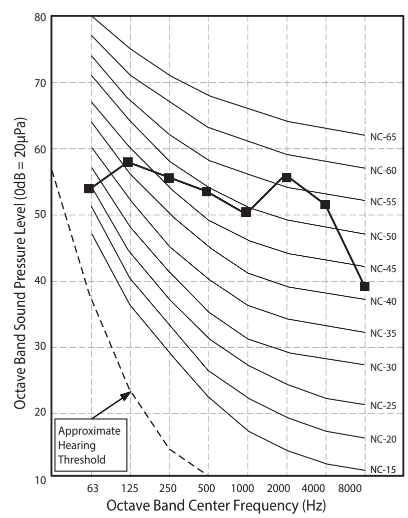
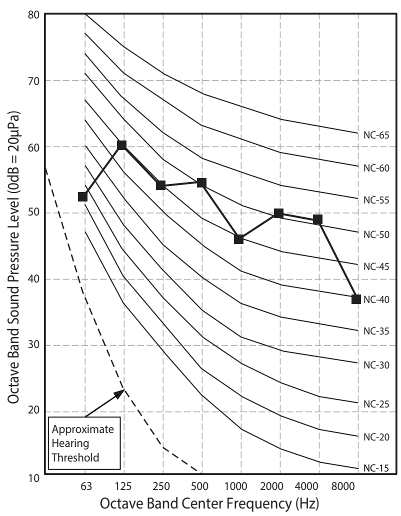


Heating – continued

ARWN240DAS4



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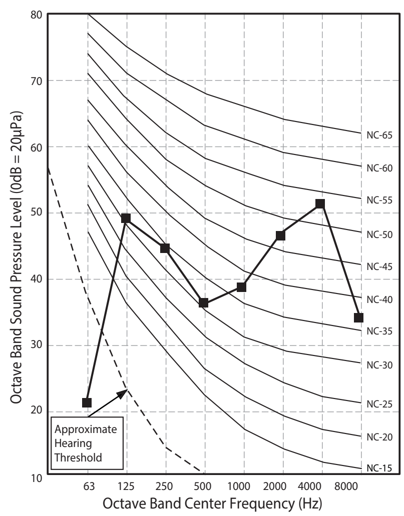
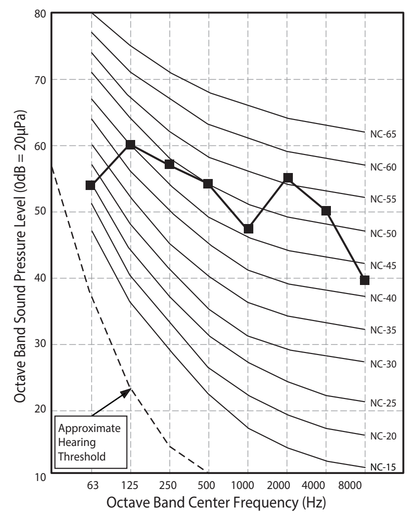
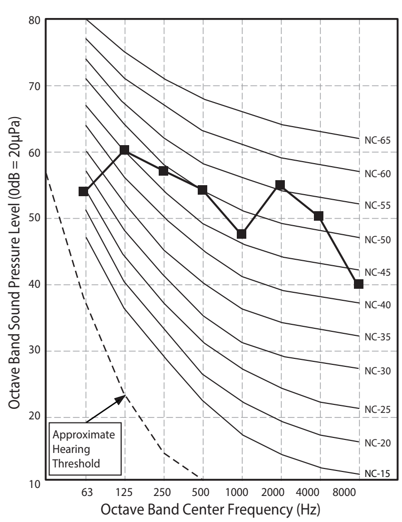


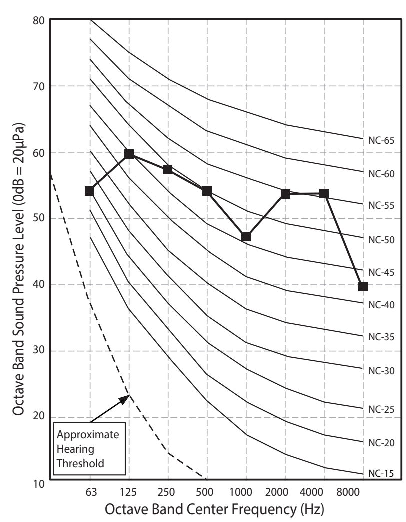
ARWN336DAS4



ARWN384DAS4



ARWN480DAS4
ARWN576DAS4



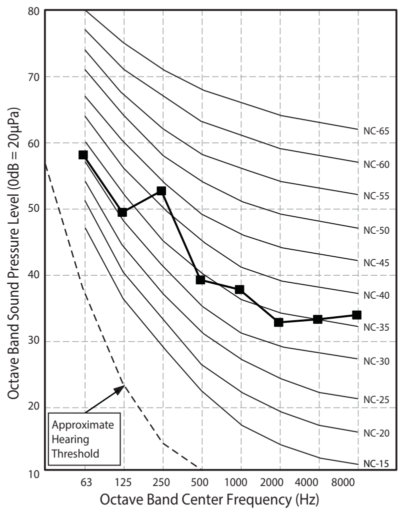
ACOUSTIC DATA

Sound Pressure Levels

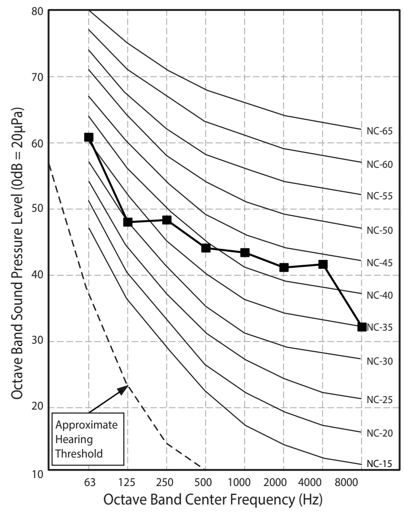
ARWB Series Heat Recovery 208–230 VAC

Cooling

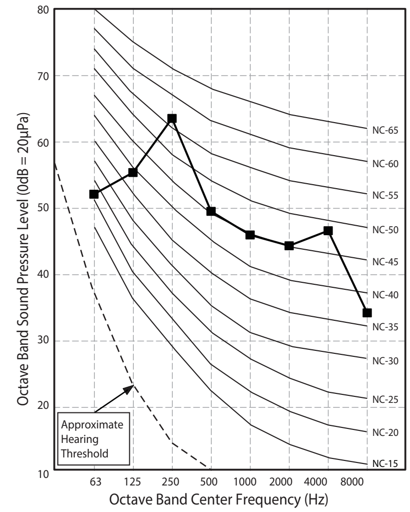
ARWB072BAS4



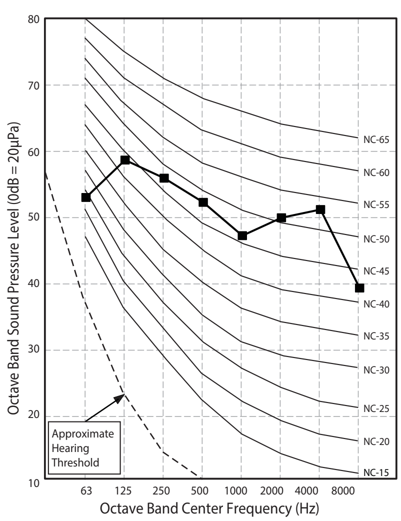
ARWB096BAS4



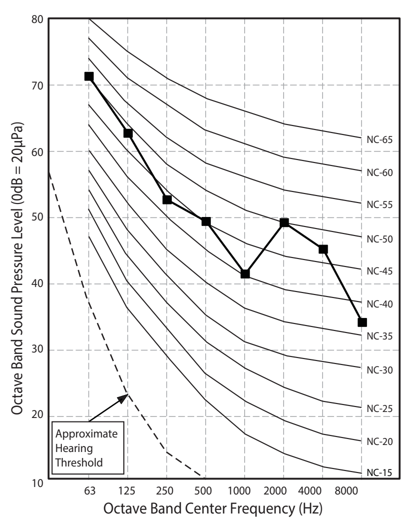
ARWB121BAS4



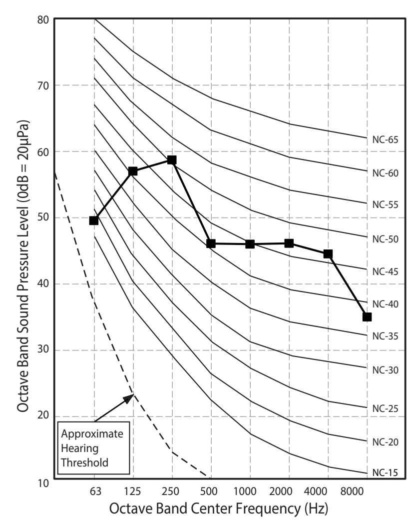
ARWB144BAS4



ARWB168BAS4

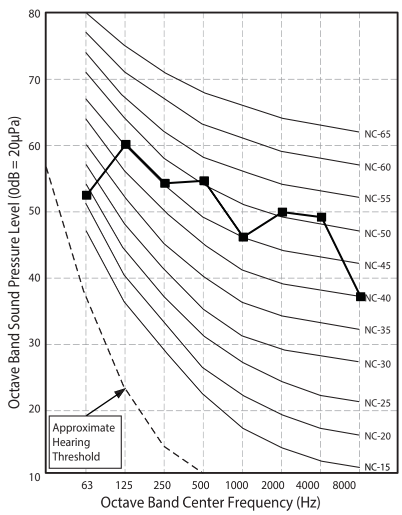


ARWB192BAS4

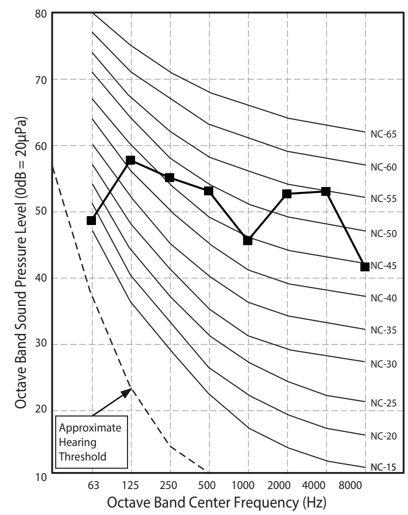


Cooling – continued

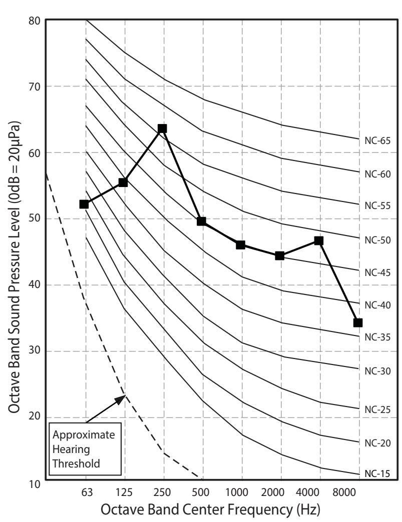
ARWB216BAS4



ARWB288BAS4



ARWB360BAS4



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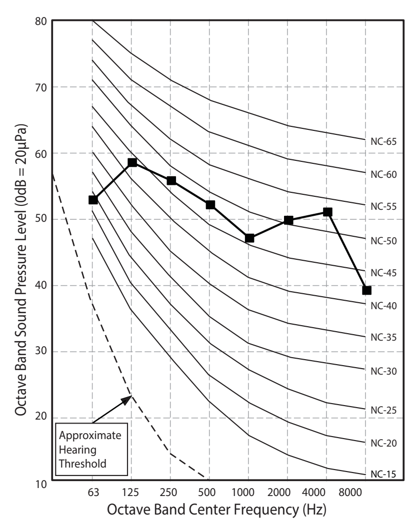
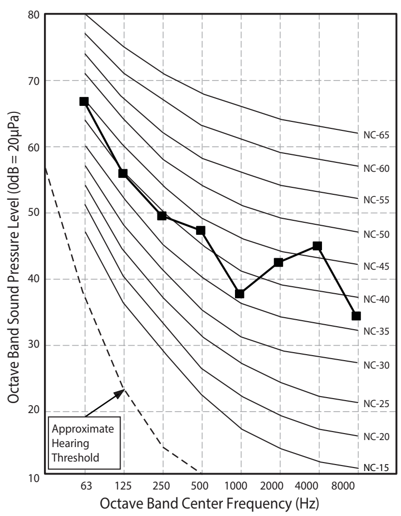


Product Data

Heating

ARWB072BAS4



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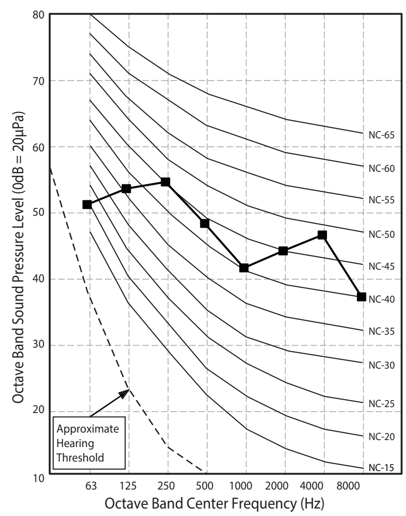

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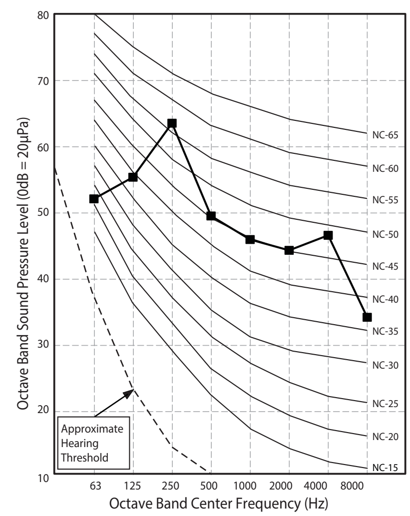

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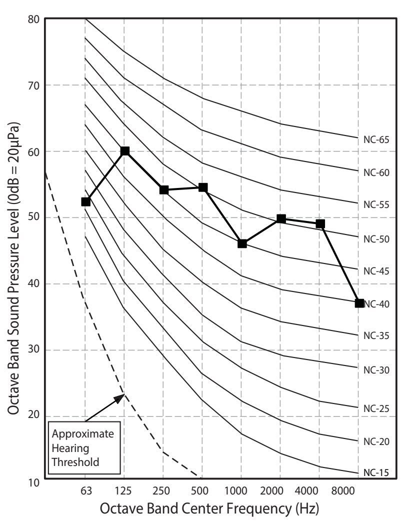

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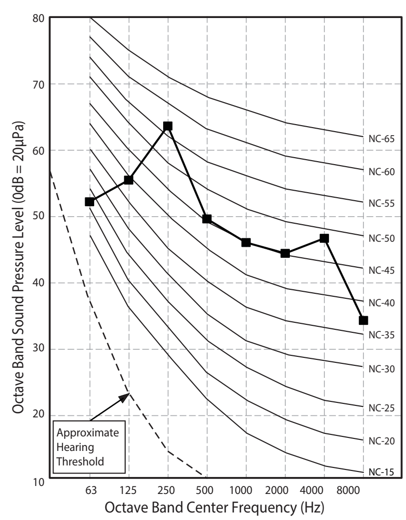

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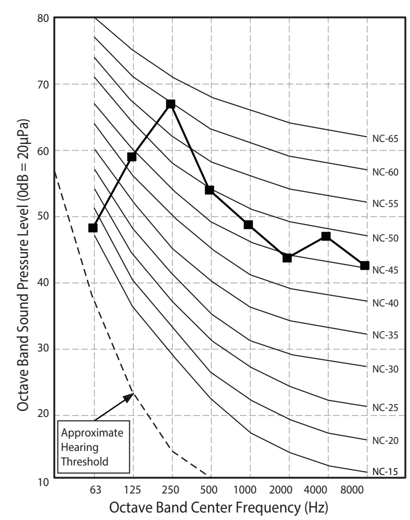


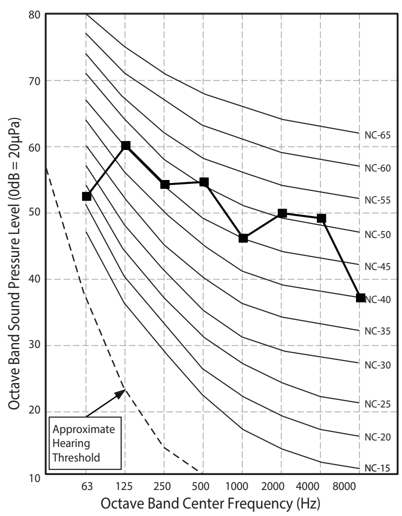
ACOUSTIC DATA

Sound Pressure Levels

ARWB Series Heat Recovery 208–230 VAC

Heating – continued

ARWB216BAS4



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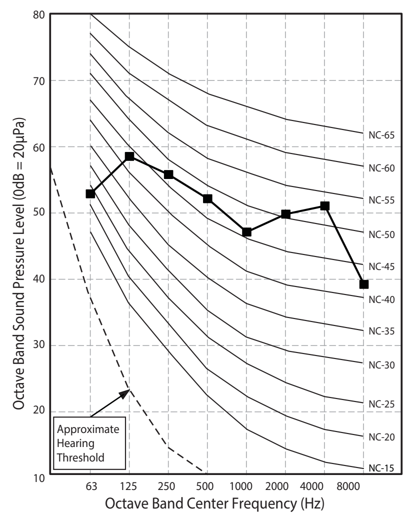
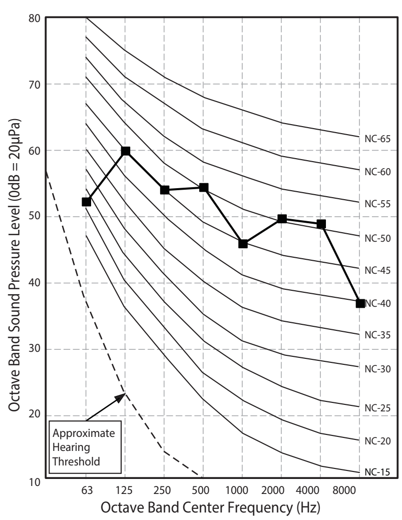


ARWB360BAS4



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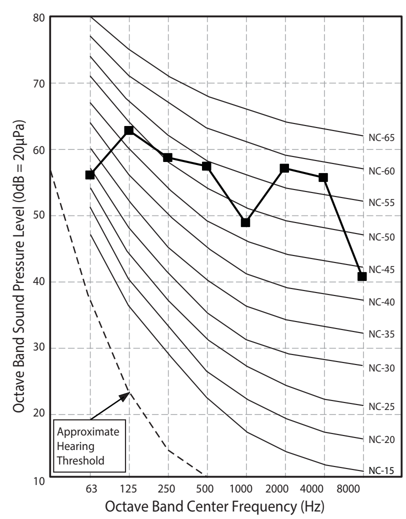
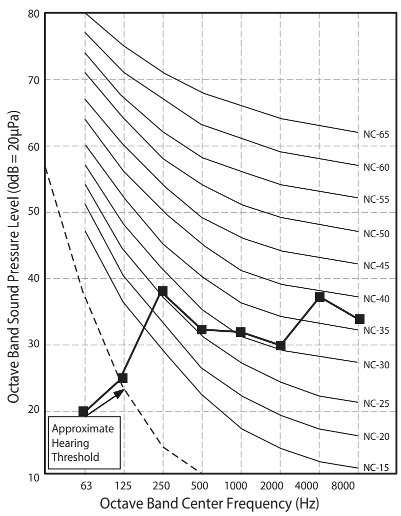


Sound Pressure Levels

ARWB Series Heat Recovery 460 VAC

Cooling

ARWB072DAS4



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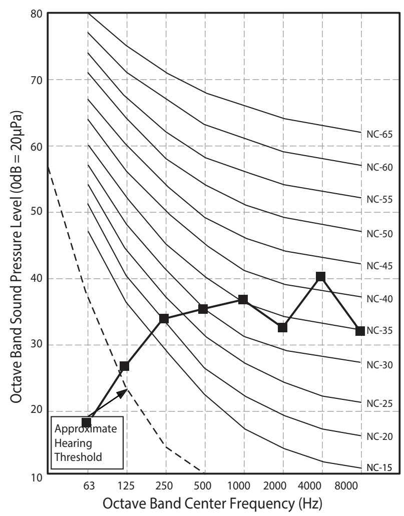

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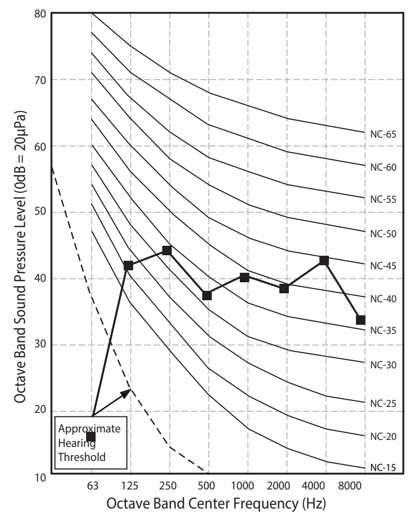

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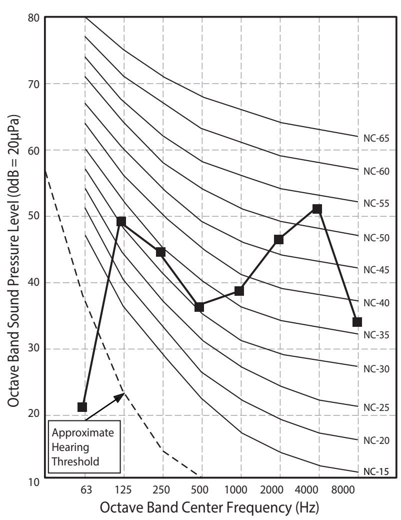

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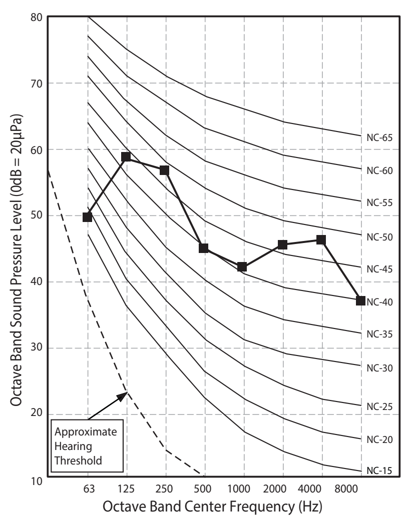

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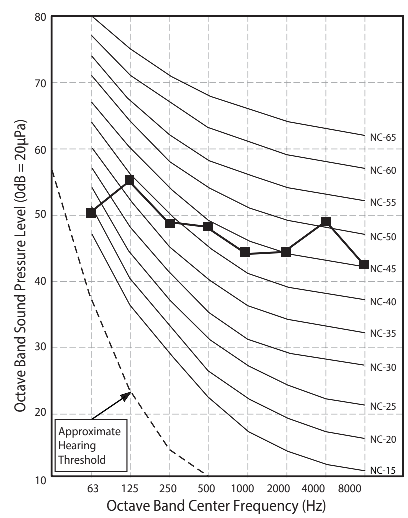
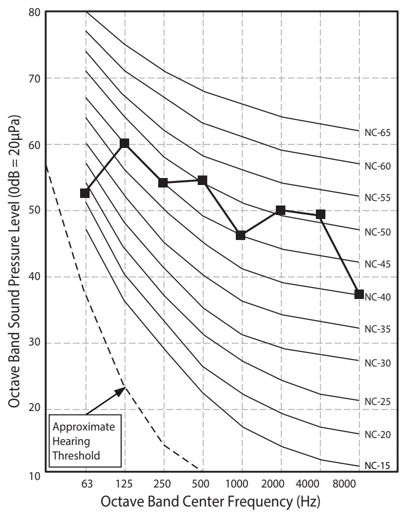
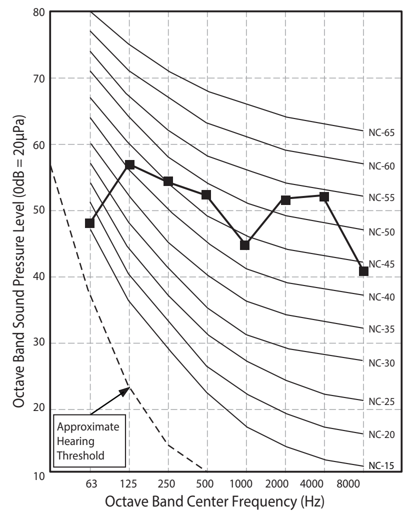


Cooling – continued

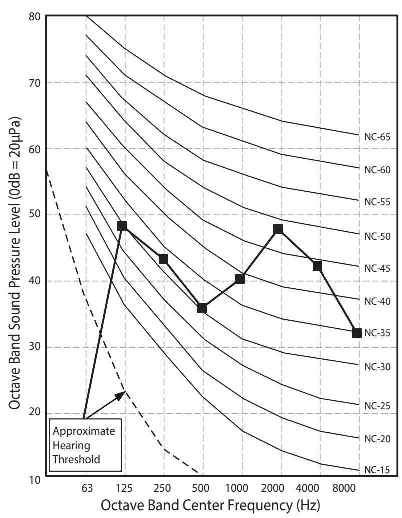
ARWB240DAS4



ARWB288DAS4
ARWB336DAS4



ARWB384DAS4



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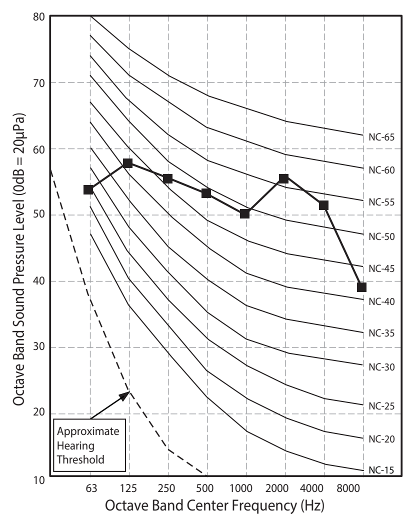


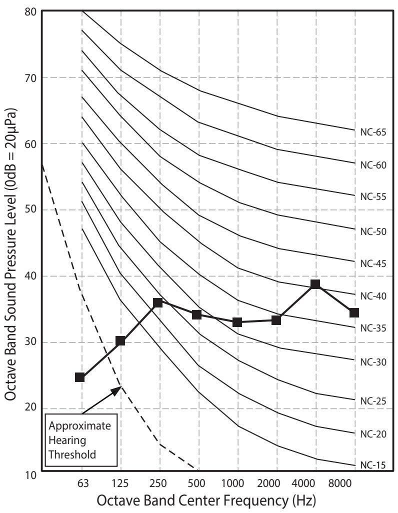
ACOUSTIC DATA

Sound Pressure Levels

ARWB Series Heat Recovery 460 VAC

Heating

ARWB072DAS4



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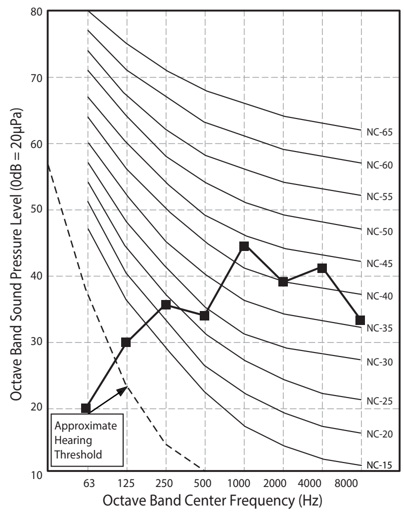

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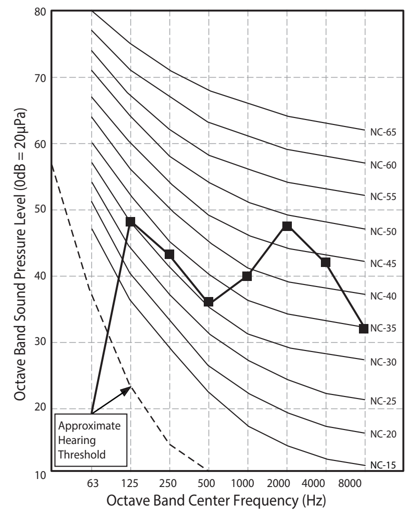

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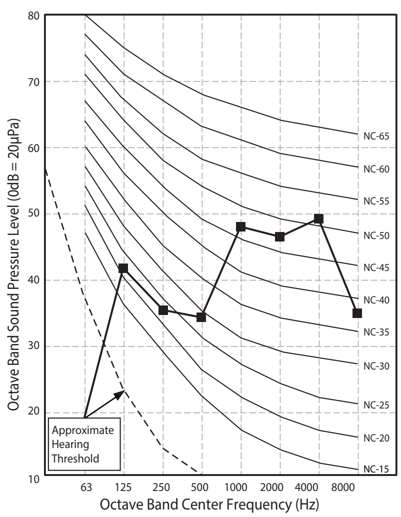

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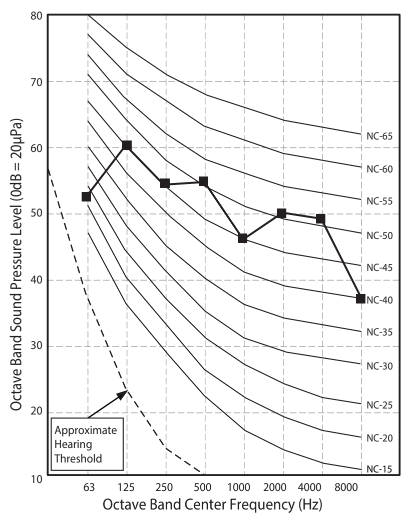

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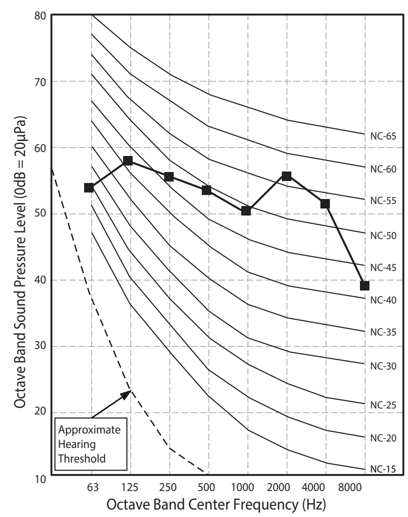

Heating – continued

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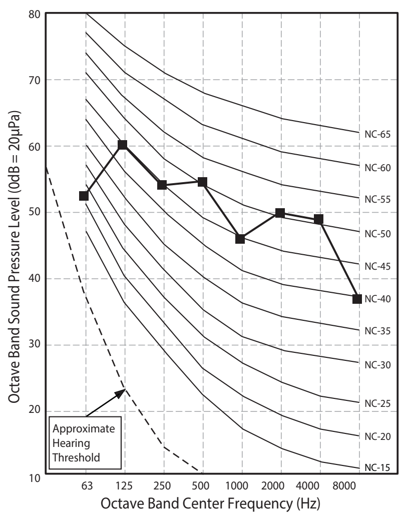

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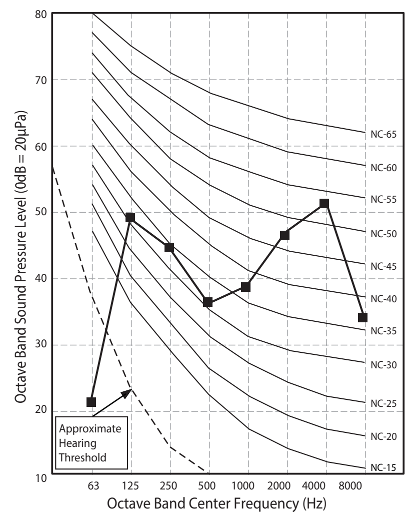

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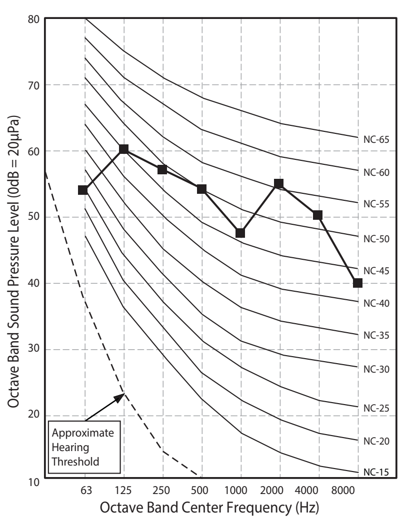

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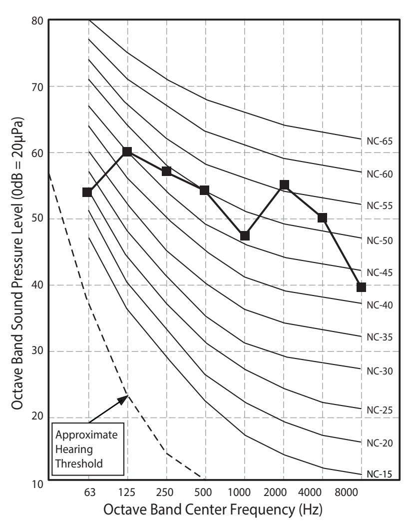
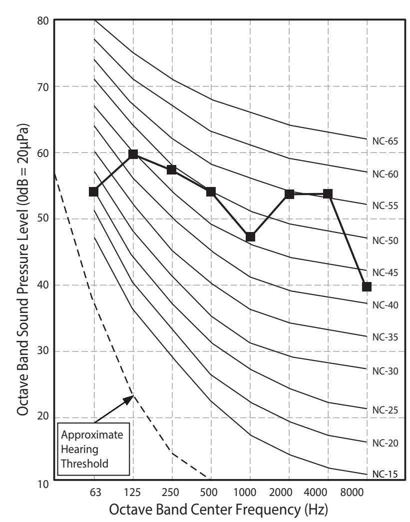


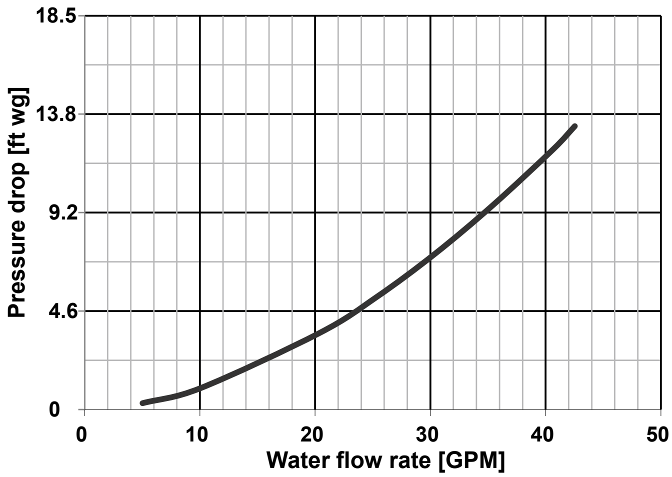
ARWB192DAS4
ARWB192DAS4



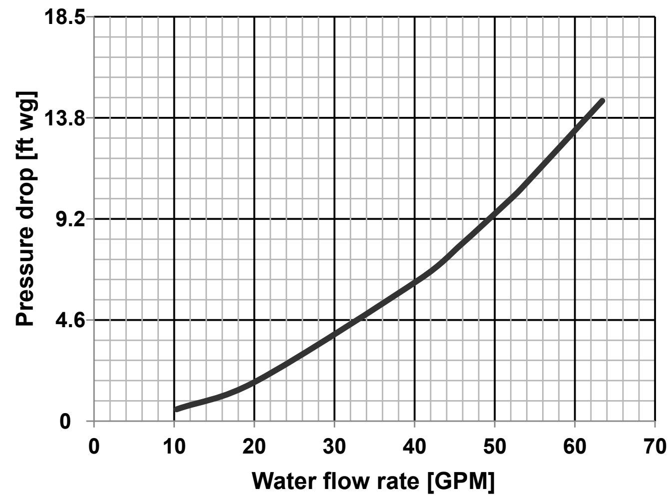
HEAD LOSS BY WATER FLOW

MULTI V WATER IV

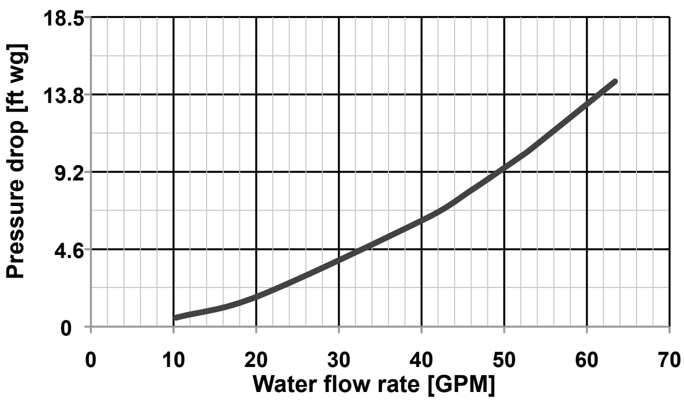
ARWN Heat Pump and ARWB Heat Recovery Systems



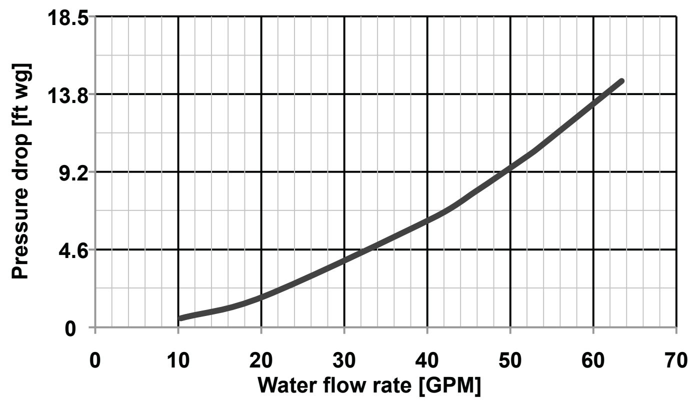
ARWN072BAS4, ARWN096BAS4, ARWN121BAS4, ARWN144BAS4, ARWN072DAS4, ARWN096DAS4, ARWN121DAS4



ARWN144BAS4, ARWN169DAS4, ARWN192DAS4



ARWB072BAS4, ARWB096BAS4, ARWB072DAS4, ARWB096DAS4, ARWB121DAS4

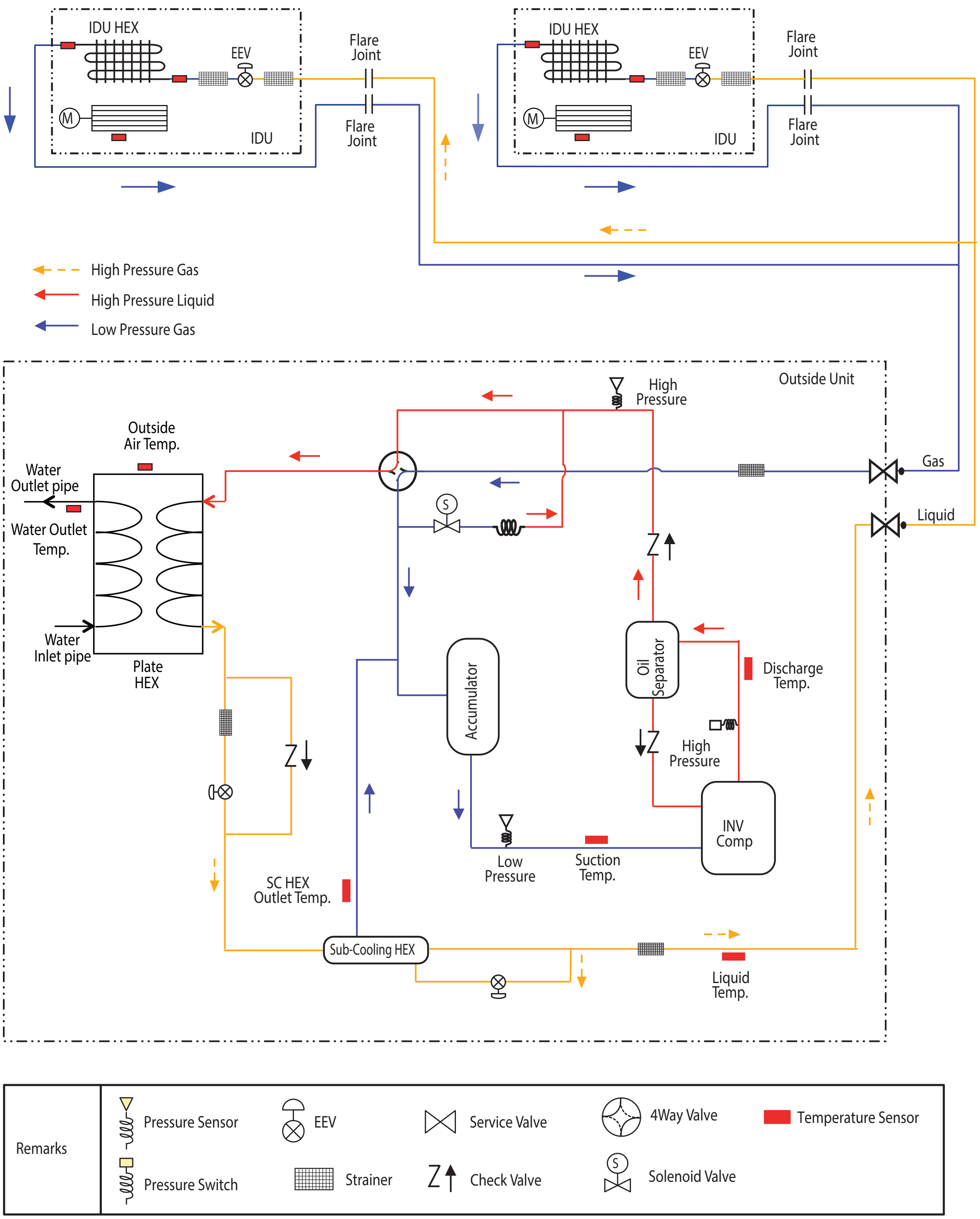


ARWB121BAS4, ARWB144BAS4, ARWB144DAS4, ARWB168DAS4, ARWB192DAS4

REFRIGERANT FLOW DIAGRAMS

ARWN Heat Pump Systems

Cooling Operation
208–230V 6/8/10/12 Ton; 460V 6/8/10/12/14/16 Ton



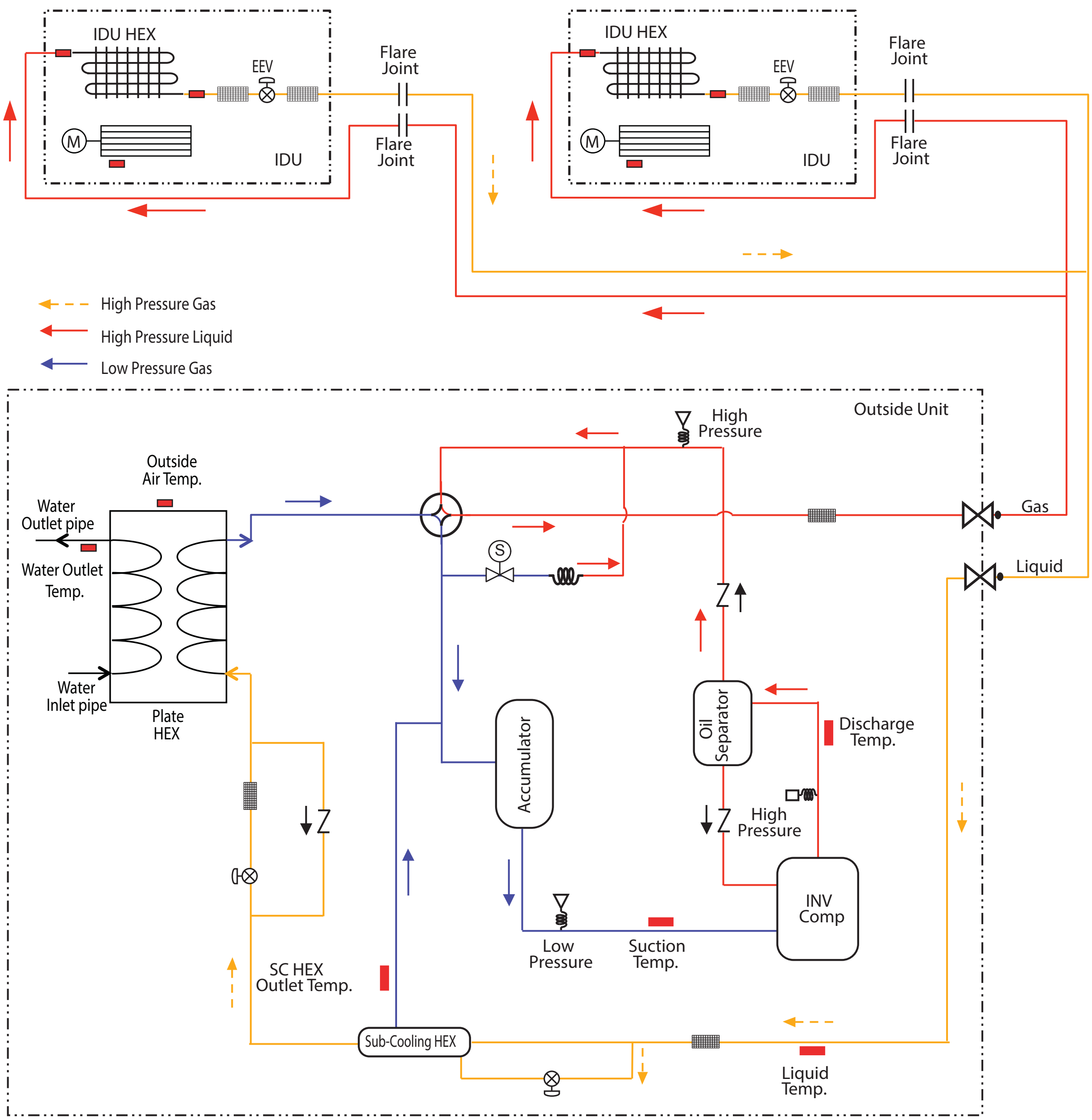
REFRIGERANT FLOW DIAGRAMS

MULTI V WATER IV

ARWN Heat Pump Systems

Heating Operation

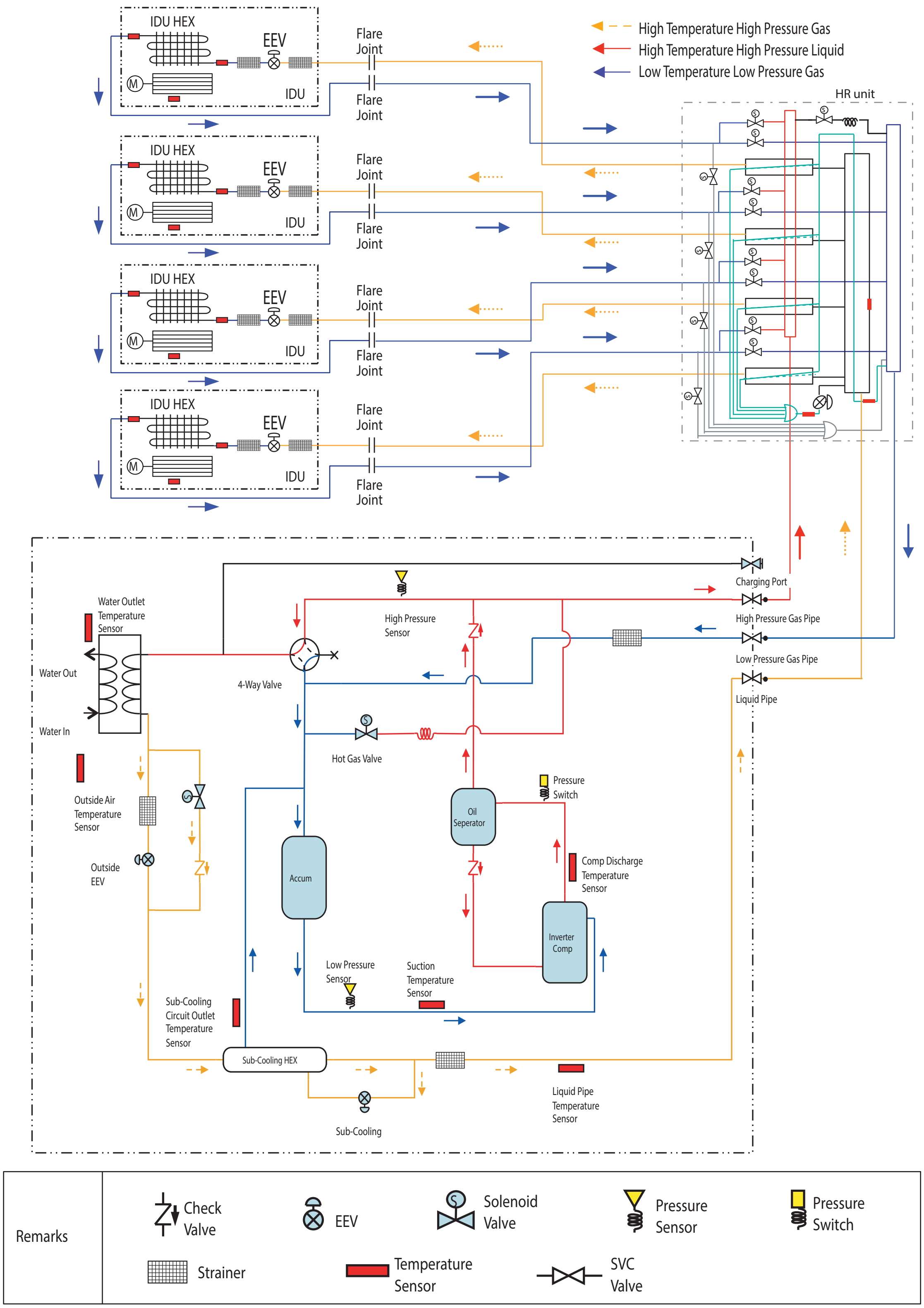
208–230V 6/8/10/12 Ton; 460V 6/8/10/12/14/16 Ton



Remarks					
	Pressure Sensor	EEV	Service Valve	4Way Valve	Temperature Sensor
	Pressure Switch	Strainer	Check Valve	Solenoid Valve	

Cooling Operation

208–230V 6/8/10/12 Ton; 460V 6/8/10/12/14/16 Ton



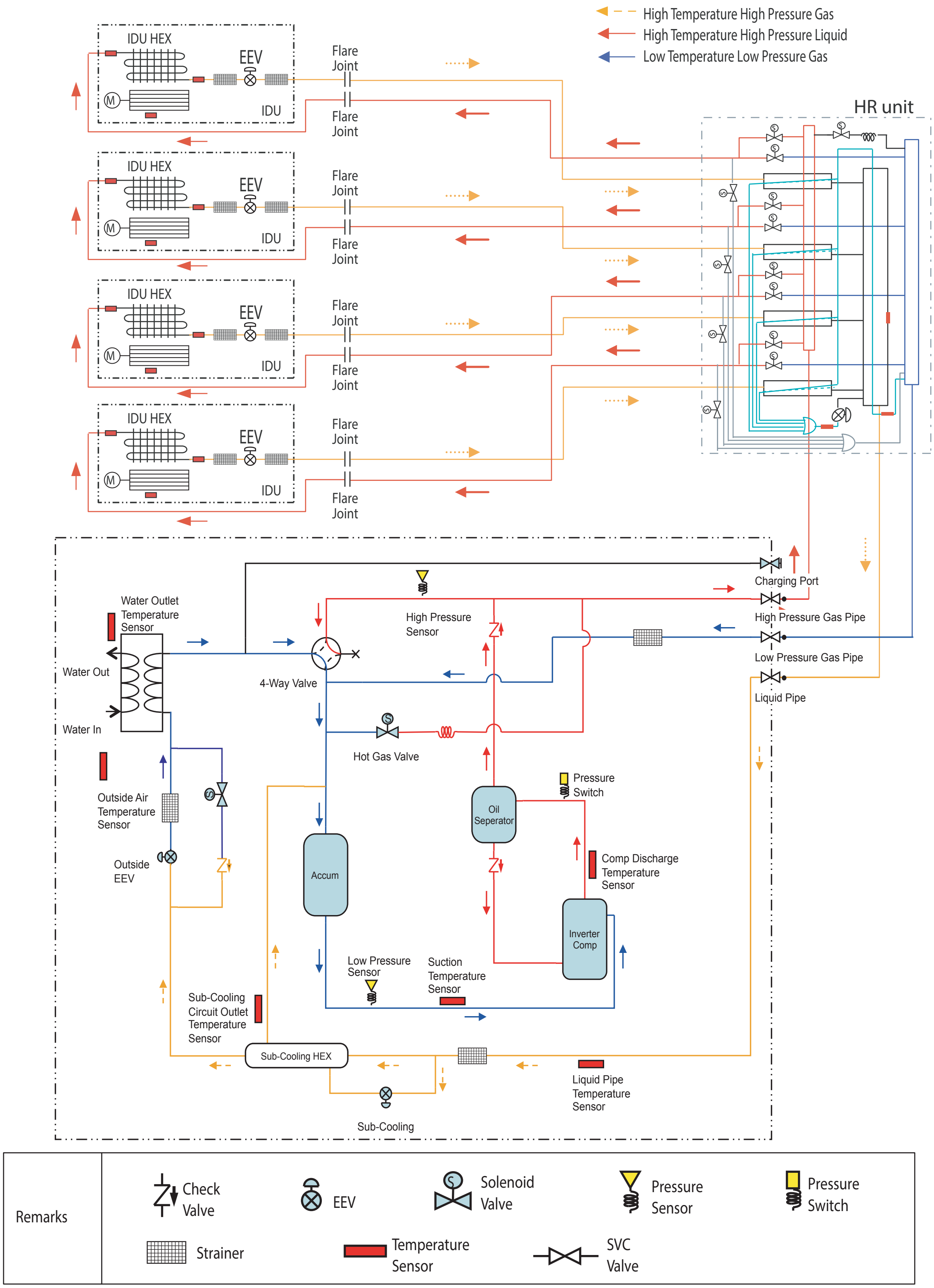
Product Data

REFRIGERANT FLOW DIAGRAMS

ARWB Heat Recovery Systems

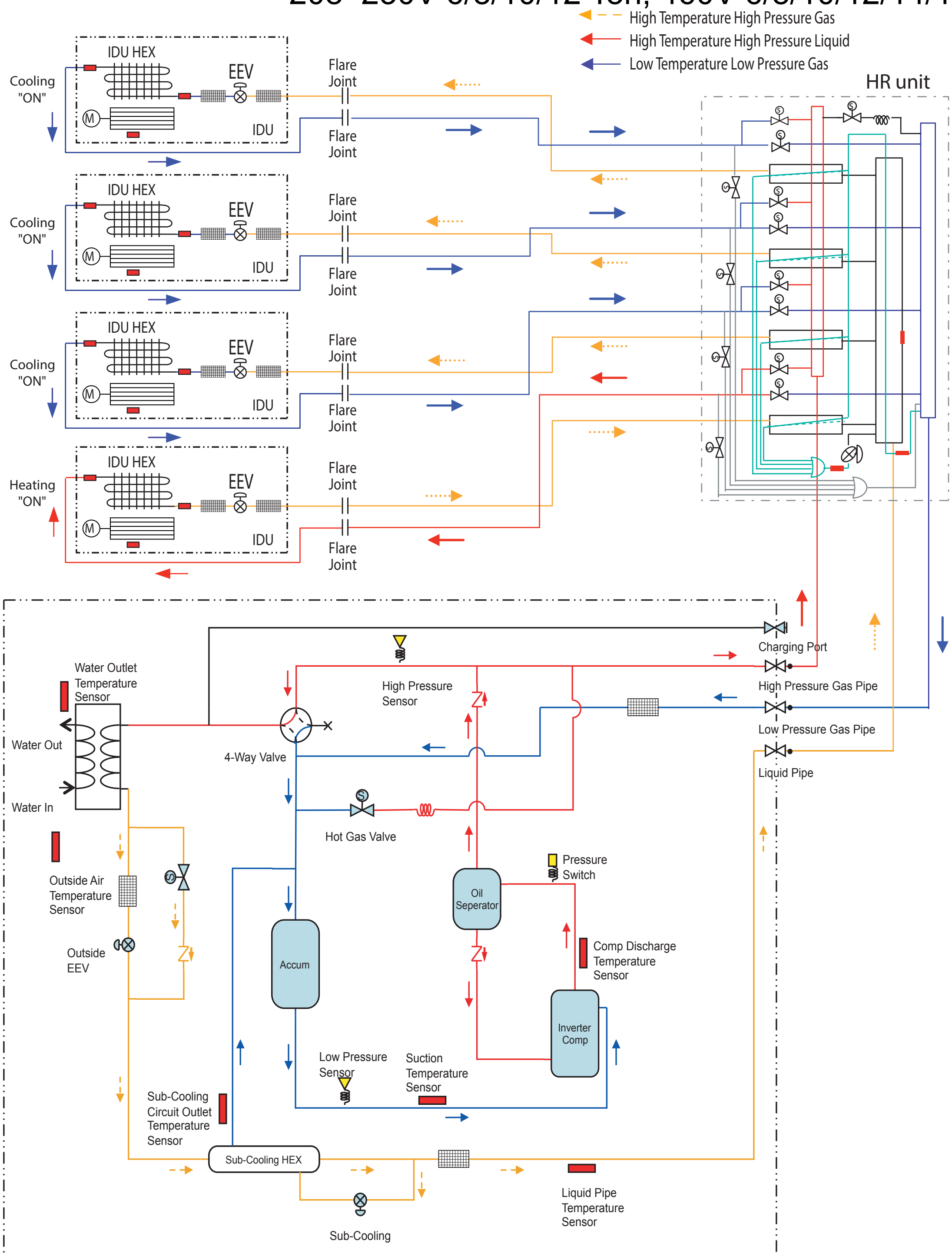
Heating Operation

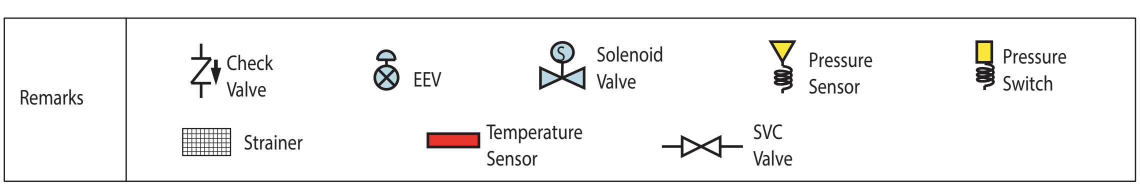
208–230V 6/8/10/12 Ton; 460V 6/8/10/12/14/16 Ton



Simultaneous Operation Mode 1 (Cooling Based Operation)

208–230V 6/8/10/12 Ton; 460V 6/8/10/12/14/16 Ton



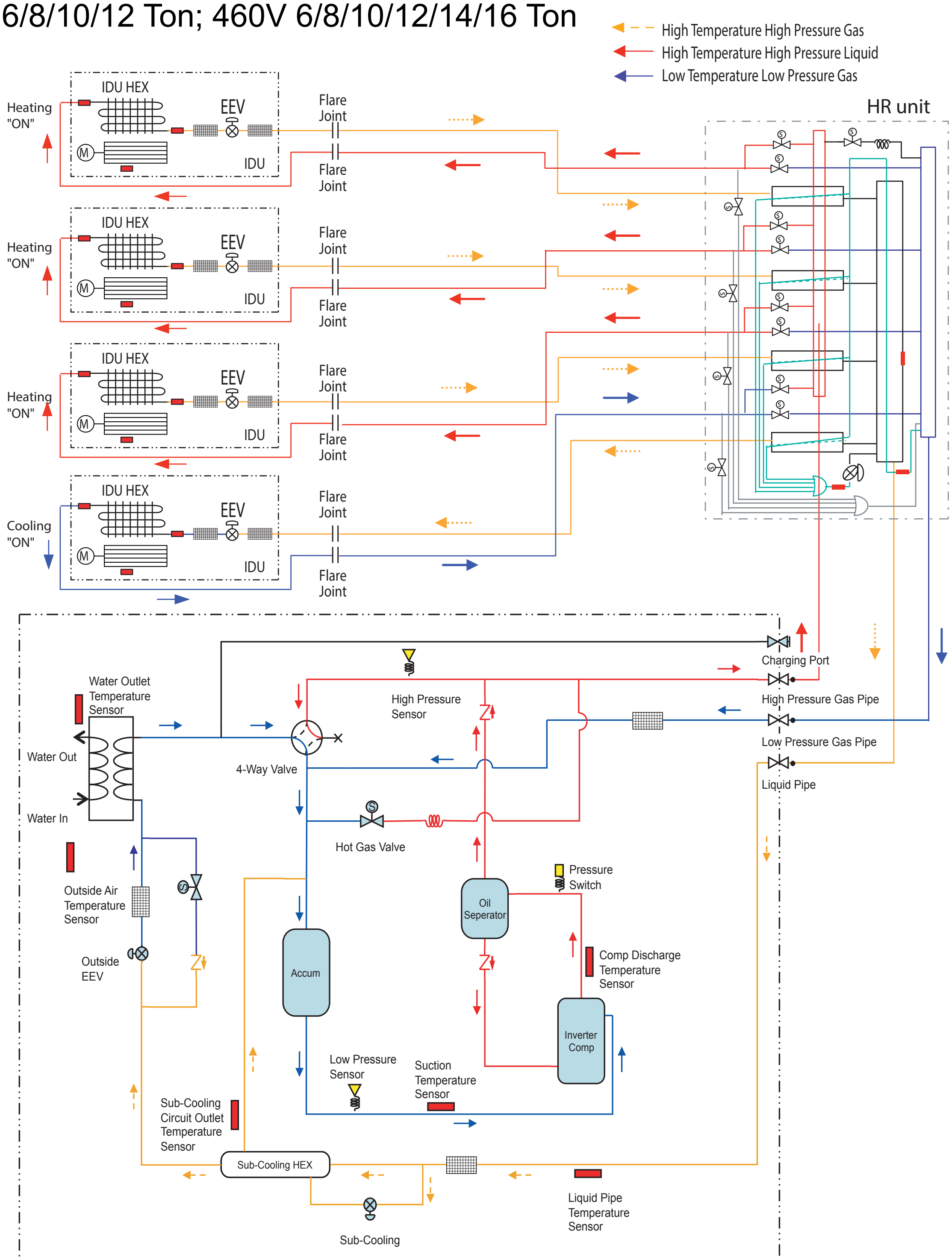


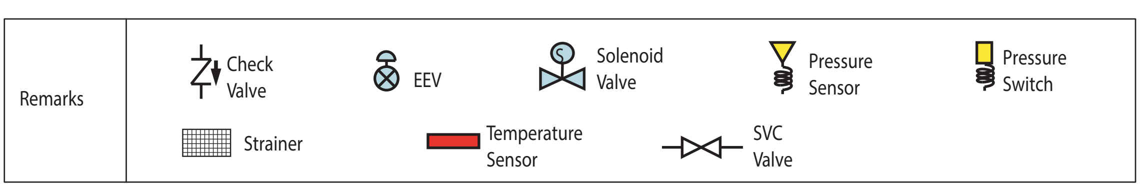
REFRIGERANT FLOW DIAGRAMS

ARWB Heat Recovery Systems

Simultaneous Operation Mode 2 (Heating Based Operation)

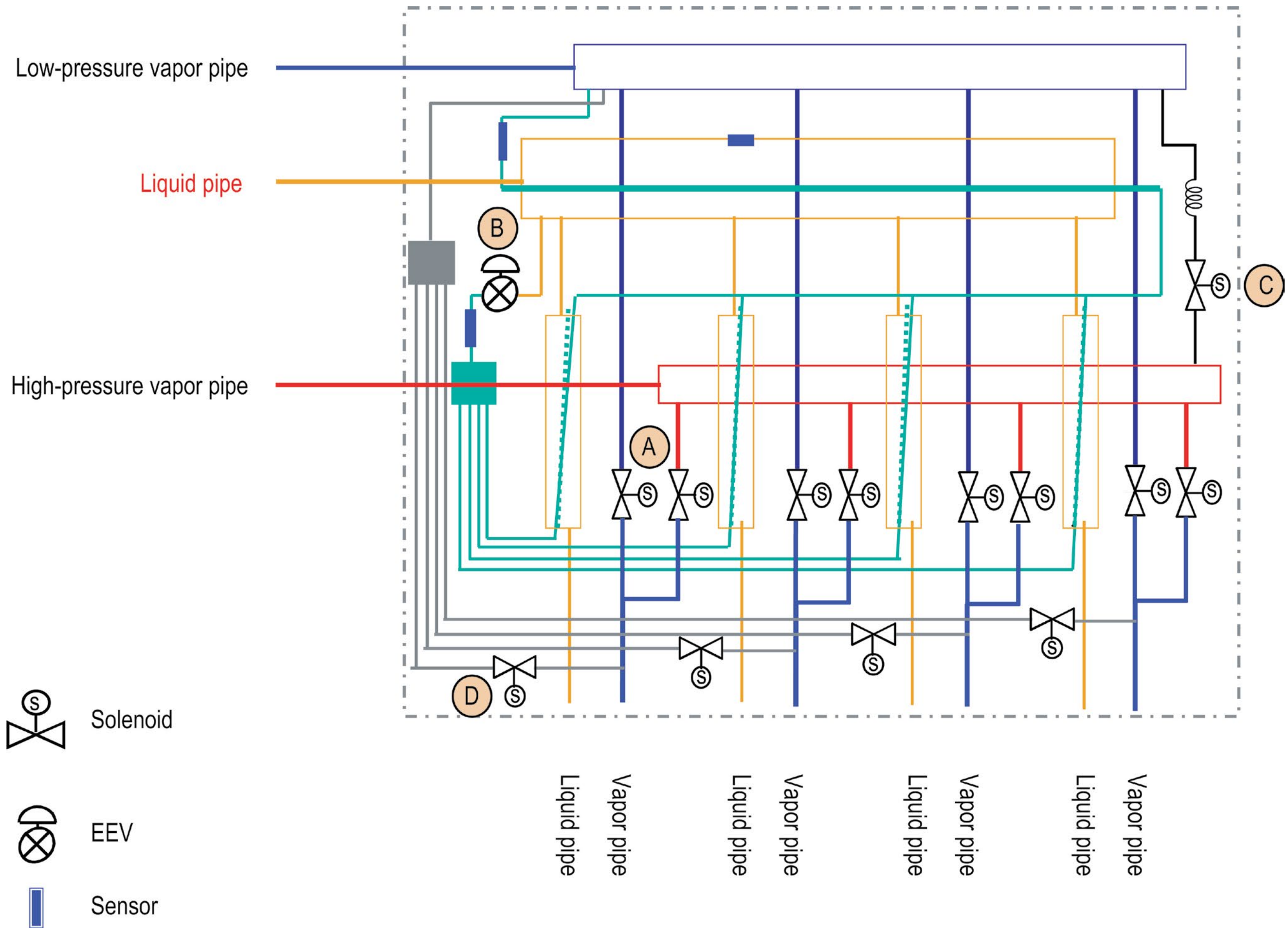
208–230V 6/8/10/12 Ton; 460V 6/8/10/12/14/16 Ton





REFRIGERANT FLOW DIAGRAMS

PRHR021A, PRHR031A, PRHR041A Heat Recovery Units



A: Switch operation between cooling and heating.

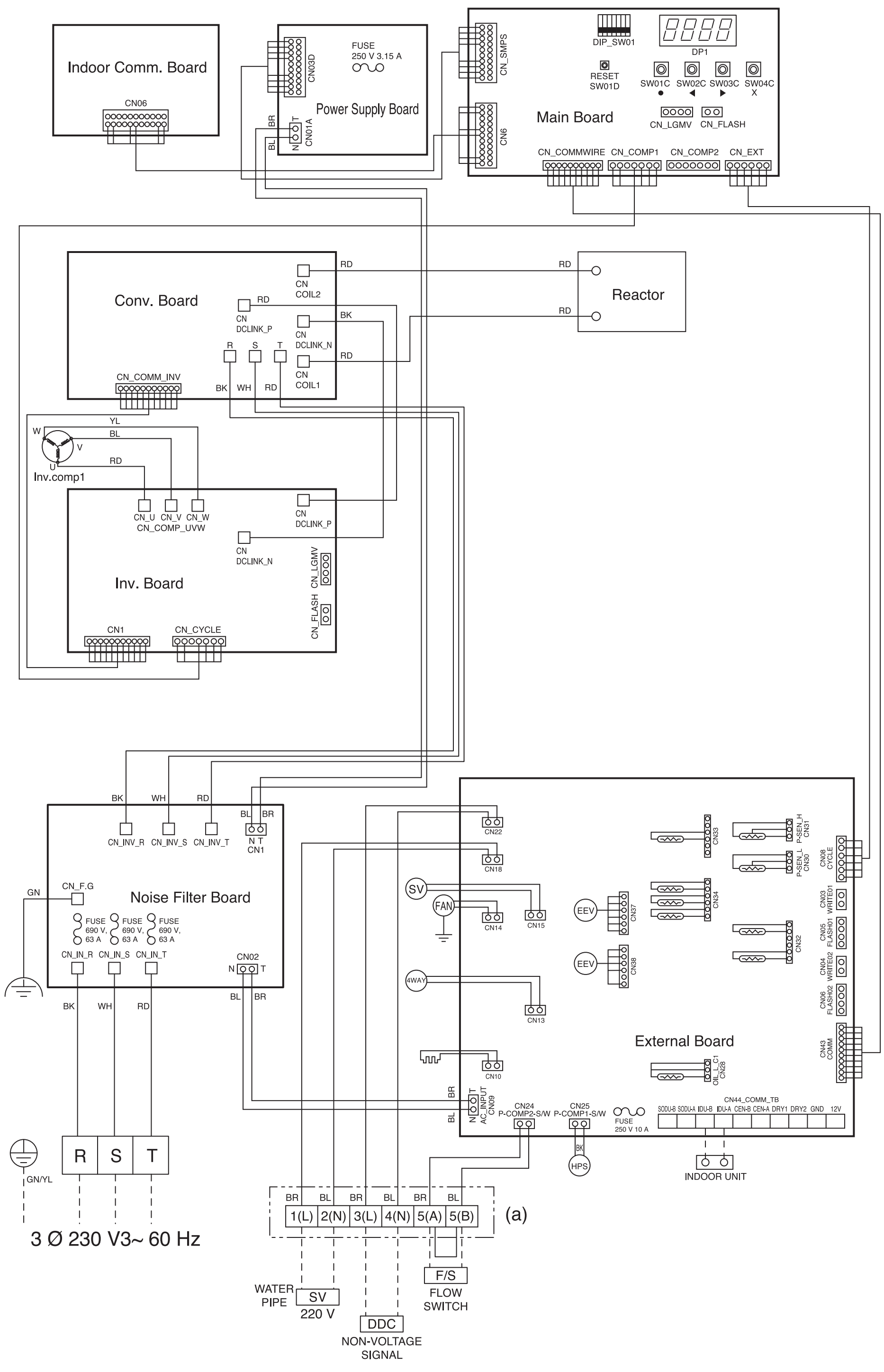
B: Decreases noise following subcooling operation between inlet of one indoor unit and outlet of another indoor unit during simultaneous operation.

C: Prevents liquid from entering high-pressure vapor valve and heat recovery unit during cooling mode.

D: Controls pressure between the high and low pressure vapor pipes during simultaneous operation.

ARWN Heat Pump Systems

208–230V 6/8 Ton



◆ EXTERNAL BOARD

SYMBOL	DESCRIPTION
CN03	ONBOADING TERMINAL(MAIN)
CN04	ONBOADING TERMINAL(SUB)
CN05	ONBOADING TERMINAL(MAIN)
CN06	ONBOADING TERMINAL(SUB)
CN08	MAIN BOARD COMM. TERMINAL
CN09	AC POWER 220 V IN
CN10	INVERTER COMP. 1 HEATER
CN11	
CN12	
CN13	4 WAY VALVE
CN14	FAN MOTOR
CN15	HOT GAS VALVE
CN16	
CN17	
CN18	AC 220 V OUT
CN19	
CN20	
CN21	
CN22	DDC SIGNAL OUT
CN24	FLOW SWITCH SIGNAL IN
CN25	HIGH PRESSURE SWITCH
CN27	
CN28	COMP. OIL LEVEL SENSOR
CN30	LOW PRESSURE SENSOR
CN31	HIGH PRESSURE SENSOR
CN32(TH9)	LIQUID PIPE TEMP.
CN32(TH10)	
CN32(TH11)	SUBCOOLING CIRCUIT OUTLET PIPE TEMP.
CN33(TH1)	AIR TEMP.
CN33(TH2)	
CN34(TH3)	DISCHARGE PIPE TEMP.
CN34(TH4)	PLATE HEX WATER OUTLET TEMP.
CN34(TH5)	SUCTION PIPE TEMP.
CN35(TH6)	
CN35(TH7)	
CN35(TH8)	
CN37	EEV(MAIN)
CN38	EEV(SUBCOOLER)
CN39	
CN40	
CN41	
CN42	
CN43	MAIN BOARD COMM. TERMINAL
CN44	TEMINAL BLOCK

◆ MAIN BOARD

SYMBOL	DESCRIPTION
CN6	IDU COMM BOARD COMM. TERMINAL
CN_SMPS	POWER SUPPLY BOARD COMM. TERMINAL
CN_COMMWRITE	EXTERNAL BOARD COMM. TERMINAL
CN_COMP1	INVERTER BOARD COMM. TERMINAL
CN_COMP2	
CN_EXT	EXTERNAL BOARD COMM. TERMINAL
CN_LGMV	LGMV JIG CONNECTION TERMINAL

◆ CONVERTER BOARD

SYMBOL	DESCRIPTION
CN_DCLINK INV	DC LINK 700 V
CN_DCLINK FAN	
CN_COMM_INV	INVERTER BOARD COMM. TERMINAL

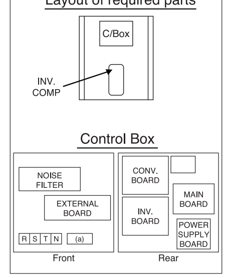
◆ INVERTER BOARD

SYMBOL	DESCRIPTION
CN_DCLINK	DC LINK 700 V
CN_ FAN	
CN_CYCLE	MAIN BOARD COMM. TERMINAL
CN1	MAIN BOARD COMM. TERMINAL
CN_COMP_UVW	U.V.W POWER TERMINAL

◆ NOISE FILTER BOARD

SYMBOL	DESCRIPTION
CN1	AC POWER 220 V
CN02	EXTERNAL BOARD POWER SUPPLY TERMINAL

Layout of required parts

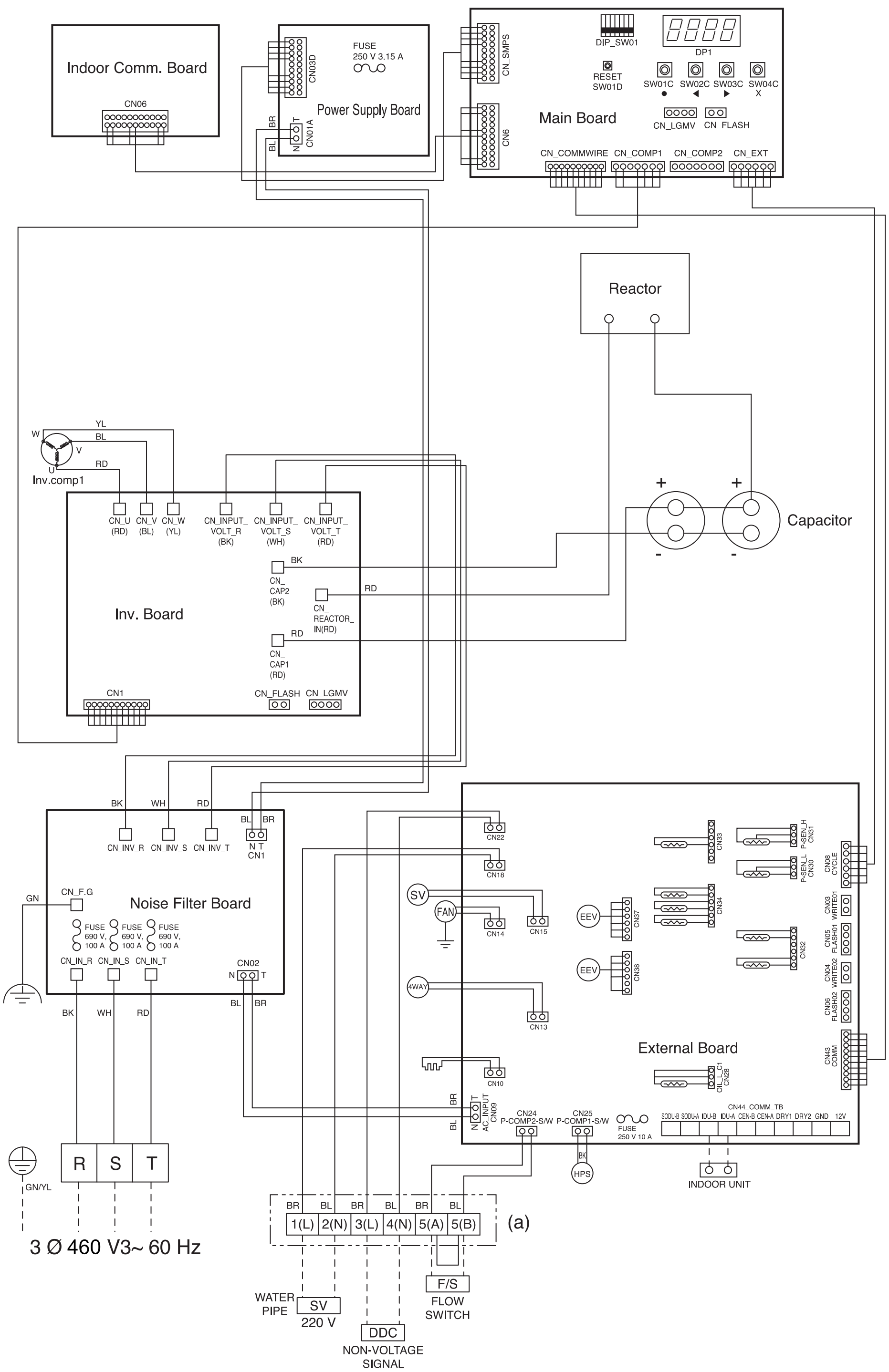


Note
1. — — — — — : Field Wiring
2. ———————— : Factory Wiring

COLOR

SYMBOL	RD	BL	WH	BK	BR	YL	GN/YL
COLOR	RED	BLUE	WHITE	BLACK	BROWN	YELLOW	GREEN/YELLOW

208–230V 10/12 Ton



◆EXTERNAL BOARD

SYMBOL	DESCRIPTION
CN03	ONBOADING TERMINAL(MAIN)
CN04	ONBOADING TERMINAL(SUB)
CN05	ONBOADING TERMINAL(MAIN)
CN06	ONBOADING TERMINAL(SUB)
CN08	MAIN BOARD COMM. TERMINAL
CN09	AC POWER 220 V IN
CN10	INVERTER COMP. 1 HEATER
CN11	
CN12	
CN13	4 WAY VALVE
CN14	FAN MOTOR
CN15	HOT GAS VALVE
CN16	
CN17	
CN18	AC 220 V OUT
CN19	
CN20	
CN21	
CN22	DDC SIGNAL OUT
CN24	FLOW SWITCH SIGNAL IN
CN25	HIGH PRESSURE SWITCH
CN27	
CN28	COMP. OIL LEVEL SENSOR
CN30	LOW PRESSURE SENSOR
CN31	HIGH PRESSURE SENSOR
CN32(TH9)	LIQUID PIPE TEMP.
CN32(TH10)	
CN32(TH11)	SUBCOOLING CIRCUIT OUTLET PIPE TEMP.
CN33(TH1)	AIR TEMP.
CN33(TH2)	
CN34(TH3)	DISCHARGE PIPE TEMP.
CN34(TH4)	PLATE HEX WATER OUTLET TEMP.
CN34(TH5)	SUCTION PIPE TEMP.
CN35(TH6)	
CN35(TH7)	
CN35(TH8)	
CN37	EEV(MAIN)
CN38	EEV(SUBCOOLER)
CN39	
CN40	
CN41	
CN42	
CN43	MAIN BOARD COMM. TERMINAL
CN44	TEMINAL BLOCK

◆MAIN BOARD

SYMBOL	DESCRIPTION
CN6	IDU COMM BOARD COMM. TERMINAL
CN_SMPS	POWER SUPPLY BOARD COMM. TERMINAL
CN_COMMWRITE	EXTERNAL BOARD COMM. TERMINAL
CN_COMP1	INVERTER BOARD COMM. TERMINAL
CN_COMP2	
CN_EXT	EXTERNAL BOARD COMM. TERMINAL
CN_LGMV	LGMV JIG CONNECTION TERMINAL

◆CONVERTER BOARD

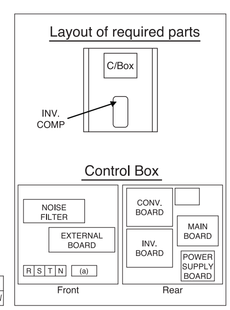
SYMBOL	DESCRIPTION
CN_DCLINK INV	DC LINK 700 V
CN_DCLINK FAN	
CN_COMM_INV	INVERTER BOARD COMM. TERMINAL

◆INVERTER BOARD

SYMBOL	DESCRIPTION
CN_DCLINK	DC LINK 700 V
CN_ FAN	
CN_CYCLE	MAIN BOARD COMM. TERMINAL
CN1	MAIN BOARD COMM. TERMINAL
CN_COMP_UVW	U.V.W POWER TERMINAL

◆NOISE FILTER BOARD

SYMBOL	DESCRIPTION
CN1	AC POWER 220 V
CN02	EXTERNAL BOARD POWER SUPPLY TERMINAL



Note
1. — — — — — : Field Wiring
2. ————— : Factory Wiring

COLOR

SYMBOL	RD	BL	WH	BK	BR	YL	GN/YL
COLOR	RED	BLUE	WHITE	BLACK	BROWN	YELLOW	GREEN/YELLOW

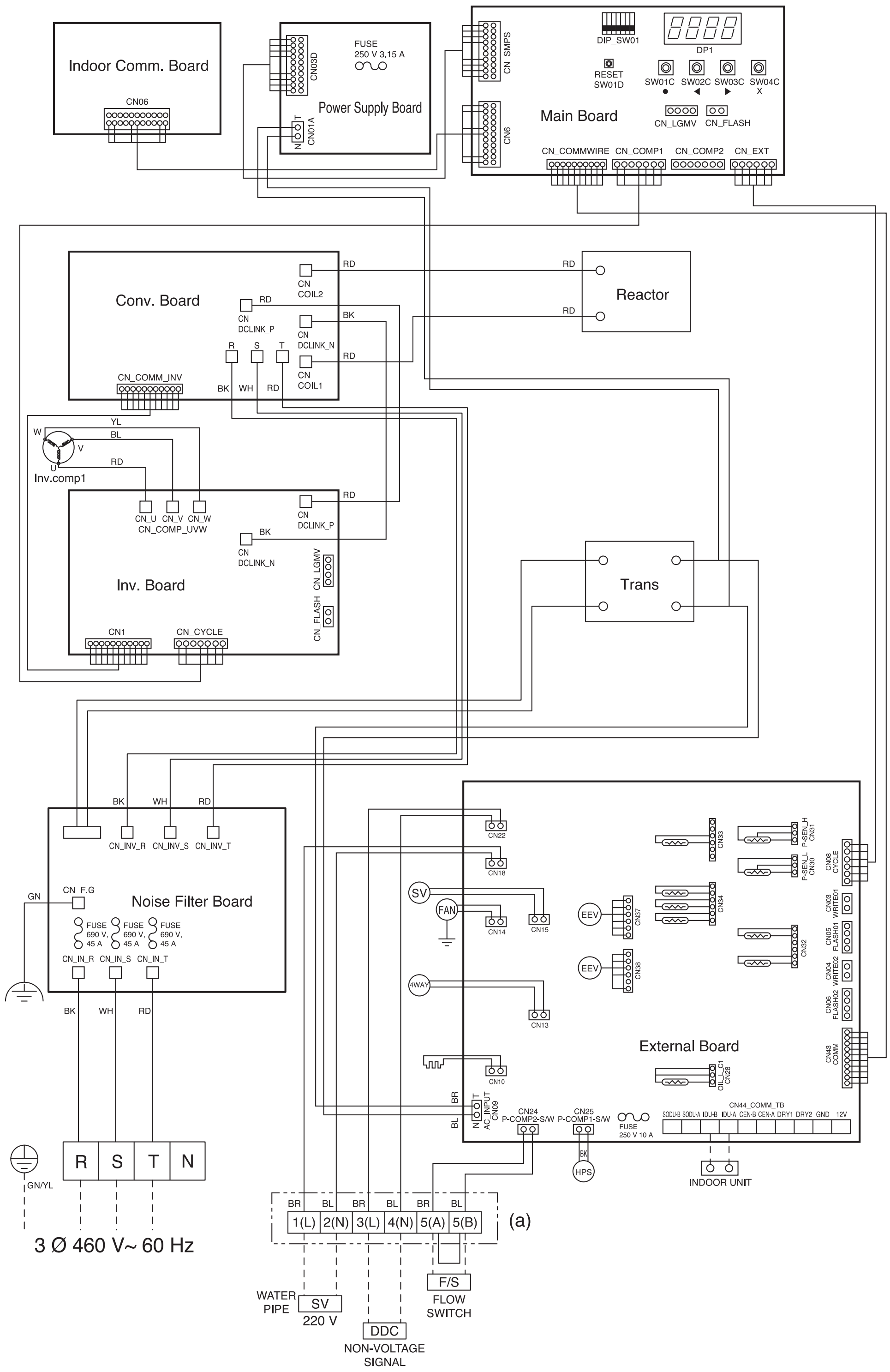
P/No. : MEZ65021506

Product Data

WIRING DIAGRAMS

ARWN Heat Pump Systems

460V 6/8/10 Ton



Note

1. — — — — — : Field Wiring
2. ————— : Factory Wiring

COLOR

SYMBOL	RD	BL	WH	BK	BR	YL	GN/YL
COLOR	RED	BLUE	WHITE	BLACK	BROWN	YELLOW	GREEN/YELLOW

◆EXTERNAL BOARD

SYMBOL	DESCRIPTION
CN03	ONBOADING TERMINAL(MAIN)
CN04	ONBOADING TERMINAL(SUB)
CN05	ONBOADING TERMINAL(MAIN)
CN06	ONBOADING TERMINAL(SUB)
CN08	MAIN BOARD COMM. TERMINAL
CN09	AC POWER 220 V IN
CN10	INVERTER COMP. 1 HEATER
CN11	
CN12	
CN13	4 WAY VALVE
CN14	FAN MOTOR
CN15	HOT GAS VALVE
CN16	
CN17	
CN18	AC 220 V OUT
CN19	
CN20	
CN21	
CN22	DDC SIGNAL OUT
CN24	FLOW SWITCH SIGNAL IN
CN25	HIGH PRESSURE SWITCH
CN27	
CN28	COMP. OIL LEVEL SENSOR
CN30	LOW PRESSURE SENSOR
CN31	HIGH PRESSURE SENSOR
CN32(TH9)	LIQUID PIPE TEMP.
CN32(TH10)	
CN32(TH11)	SUBCOOLING CIRCUIT OUTLET PIPE TEMP.
CN33(TH1)	AIR TEMP.
CN33(TH2)	
CN34(TH3)	DISCHARGE PIPE TEMP.
CN34(TH4)	PLATE HEX WATER OUTLET TEMP.
CN34(TH5)	SUCTION PIPE TEMP.
CN35(TH6)	
CN35(TH7)	
CN35(TH8)	
CN37	EEV(MAIN)
CN38	EEV(SUBCOOLER)
CN39	
CN40	
CN41	
CN42	
CN43	MAIN BOARD COMM. TERMINAL
CN44	TEMINAL BLOCK

◆MAIN BOARD

SYMBOL	DESCRIPTION
CN6	IDU COMM BOARD COMM. TERMINAL
CN_SMPS	POWER SUPPLY BOARD COMM. TERMINAL
CN_COMMWRITE	EXTERNAL BOARD COMM. TERMINAL
CN_COMP1	INVERTER BOARD COMM. TERMINAL
CN_COMP2	
CN_EXT	EXTERNAL BOARD COMM. TERMINAL
CN_LGMV	LGMV JIG CONNECTION TERMINAL

◆CONVERTER BOARD

SYMBOL	DESCRIPTION
CN_DCLINK INV	DC LINK 700 V
CN_DCLINK FAN	
CN_COMM_INV	INVERTER BOARD COMM. TERMINAL

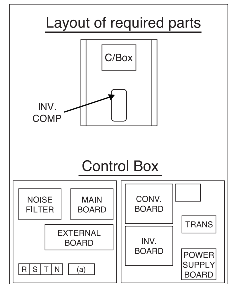
◆INVERTER BOARD

SYMBOL	DESCRIPTION
CN_DCLINK	DC LINK 700 V
CN_ FAN	
CN_CYCLE	MAIN BOARD COMM. TERMINAL
CN1	MAIN BOARD COMM. TERMINAL
CN_COMP_UVW	U.V.W POWER TERMINAL

◆NOISE FILTER BOARD

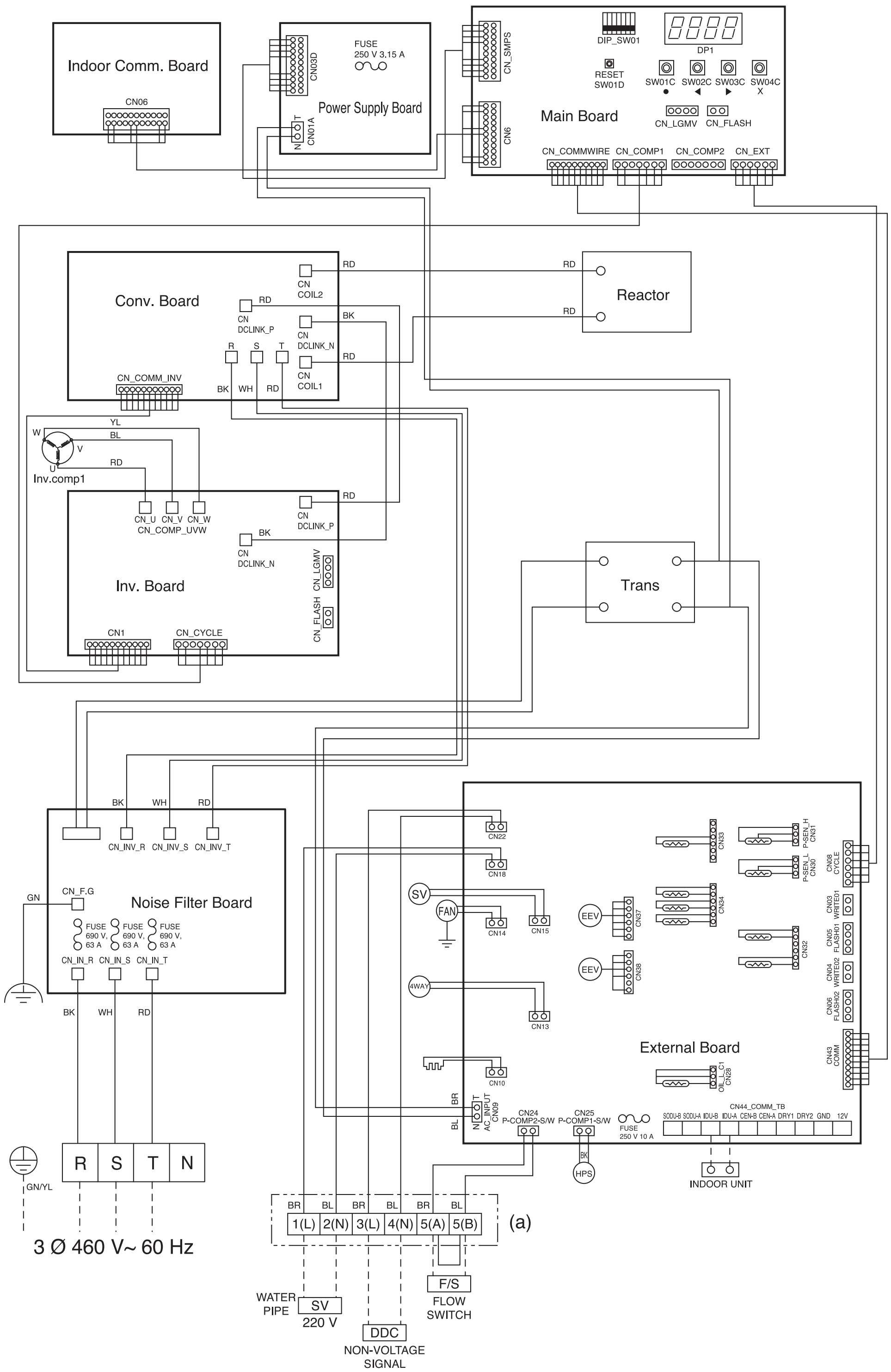
SYMBOL	DESCRIPTION
CN1	AC POWER 220 V
CN02	EXTERNAL BOARD POWER SUPPLY TERMINAL

Layout of required parts



P/No. : MEZ65021505

460V 12/14/16 Ton



◆ EXTERNAL BOARD

SYMBOL	DESCRIPTION
CN03	ONBOADING TERMINAL(MAIN)
CN04	ONBOADING TERMINAL(SUB)
CN05	ONBOADING TERMINAL(MAIN)
CN06	ONBOADING TERMINAL(SUB)
CN08	MAIN BOARD COMM. TERMINAL
CN09	AC POWER 220 V IN
CN10	INVERTER COMP. 1 HEATER
CN11	
CN12	
CN13	4 WAY VALVE
CN14	FAN MOTOR
CN15	HOT GAS VALVE
CN16	
CN17	
CN18	AC 220 V OUT
CN19	
CN20	
CN21	
CN22	DDC SIGNAL OUT
CN24	FLOW SWITCH SIGNAL IN
CN25	HIGH PRESSURE SWITCH
CN27	
CN28	COMP. OIL LEVEL SENSOR
CN30	LOW PRESSURE SENSOR
CN31	HIGH PRESSURE SENSOR
CN32(TH9)	LIQUID PIPE TEMP.
CN32(TH10)	
CN32(TH11)	SUBCOOLING CIRCUIT OUTLET PIPE TEMP.
CN33(TH1)	AIR TEMP.
CN33(TH2)	
CN34(TH3)	DISCHARGE PIPE TEMP.
CN34(TH4)	PLATE HEX WATER OUTLET TEMP.
CN34(TH5)	SUCTION PIPE TEMP.
CN35(TH6)	
CN35(TH7)	
CN35(TH8)	
CN37	EEV(MAIN)
CN38	EEV(SUBCOOLER)
CN39	
CN40	
CN41	
CN42	
CN43	MAIN BOARD COMM. TERMINAL
CN44	TEMINAL BLOCK

◆ MAIN BOARD

SYMBOL	DESCRIPTION
CN6	IDU COMM BOARD COMM. TERMINAL
CN_SMPS	POWER SUPPLY BOARD COMM. TERMINAL
CN_COMMWRITE	EXTERNAL BOARD COMM. TERMINAL
CN_COMP1	INVERTER BOARD COMM. TERMINAL
CN_COMP2	
CN_EXT	EXTERNAL BOARD COMM. TERMINAL
CN_LGMV	LGMV JIG CONNECTION TERMINAL

◆ CONVERTER BOARD

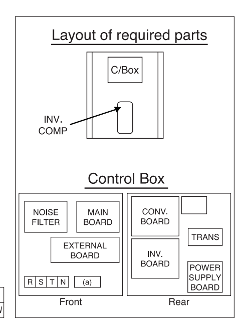
SYMBOL	DESCRIPTION
CN_DCLINK INV	DC LINK 700 V
CN_DCLINK FAN	
CN_COMM_INV	INVERTER BOARD COMM. TERMINAL

◆ INVERTER BOARD

SYMBOL	DESCRIPTION
CN_DCLINK	DC LINK 700 V
CN_ FAN	
CN_CYCLE	MAIN BOARD COMM. TERMINAL
CN1	MAIN BOARD COMM. TERMINAL
CN_COMP_UVW	U.V.W POWER TERMINAL

◆ NOISE FILTER BOARD

SYMBOL	DESCRIPTION
CN1	AC POWER 220 V
CN02	EXTERNAL BOARD POWER SUPPLY TERMINAL



Note
1. – – – – – – : Field Wiring
2. ———————— : Factory Wiring

COLOR

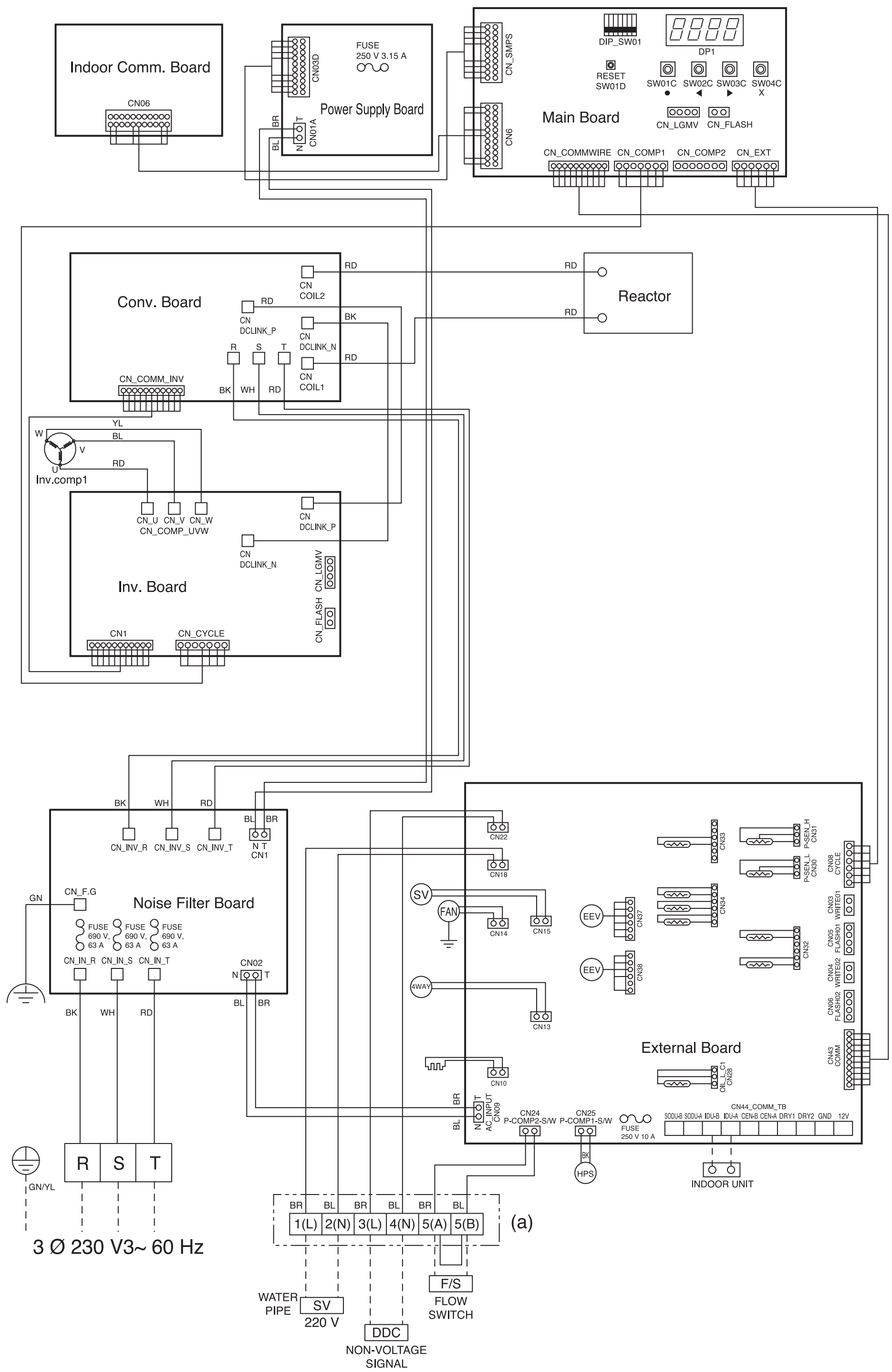
SYMBOL	RD	BL	WH	BK	BR	YL	GN/YL
COLOR	RED	BLUE	WHITE	BLACK	BROWN	YELLOW	GREEN/YELLOW

P/No. : MEZ65021504

Product Data

ARWB Heat Recovery Systems

208–230V 6/8 Ton



◆EXTERNAL BOARD

SYMBOL	DESCRIPTION
CN03	ONBOADING TERMINAL(MAIN)
CN04	ONBOADING TERMINAL(SUB)
CN05	ONBOADING TERMINAL(MAIN)
CN06	ONBOADING TERMINAL(SUB)
CN08	MAIN BOARD COMM. TERMINAL
CN09	AC POWER 220 V IN
CN10	INVERTER COMP. 1 HEATER
CN11	
CN12	
CN13	4 WAY VALVE
CN14	FAN MOTOR
CN15	HOT GAS VALVE
CN16	
CN17	
CN18	AC 220 V OUT
CN19	
CN20	
CN21	
CN22	DDC SIGNAL OUT
CN24	FLOW SWITCH SIGNAL IN
CN25	HIGH PRESSURE SWITCH
CN27	
CN28	COMP. OIL LEVEL SENSOR
CN30	LOW PRESSURE SENSOR
CN31	HIGH PRESSURE SENSOR
CN32(TH9)	LIQUID PIPE TEMP.
CN32(TH10)	
CN32(TH11)	SUBCOOLING CIRCUIT OUTLET PIPE TEMP.
CN33(TH1)	AIR TEMP.
CN33(TH2)	
CN34(TH3)	DISCHARGE PIPE TEMP.
CN34(TH4)	PLATE HEX WATER OUTLET TEMP.
CN34(TH5)	SUCTION PIPE TEMP.
CN35(TH6)	
CN35(TH7)	
CN35(TH8)	
CN37	EEV(MAIN)
CN38	EEV(SUBCOOLER)
CN39	
CN40	
CN41	
CN42	
CN43	MAIN BOARD COMM. TERMINAL
CN44	TEMINAL BLOCK

◆MAIN BOARD

SYMBOL	DESCRIPTION
CN6	IDU COMM BOARD COMM. TERMINAL
CN_SMPS	POWER SUPPLY BOARD COMM. TERMINAL
CN_COMMWRITE	EXTERNAL BOARD COMM. TERMINAL
CN_COMP1	INVERTER BOARD COMM. TERMINAL
CN_COMP2	
CN_EXT	EXTERNAL BOARD COMM. TERMINAL
CN_LGMV	LGMV JIG CONNECTION TERMINAL

◆CONVERTER BOARD

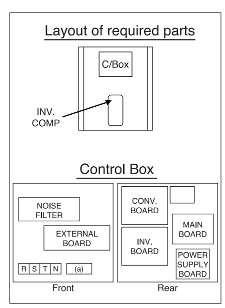
SYMBOL	DESCRIPTION
CN_DCLINK INV	DC LINK 700 V
CN_DCLINK FAN	
CN_COMM_INV	INVERTER BOARD COMM. TERMINAL

◆INVERTER BOARD

SYMBOL	DESCRIPTION
CN_DCLINK	DC LINK 700 V
CN_ FAN	
CN_CYCLE	MAIN BOARD COMM. TERMINAL
CN1	MAIN BOARD COMM. TERMINAL
CN_COMP_UVW	U.V.W POWER TERMINAL

◆NOISE FILTER BOARD

SYMBOL	DESCRIPTION
CN1	AC POWER 220 V
CN02	EXTERNAL BOARD POWER SUPPLY TERMINAL



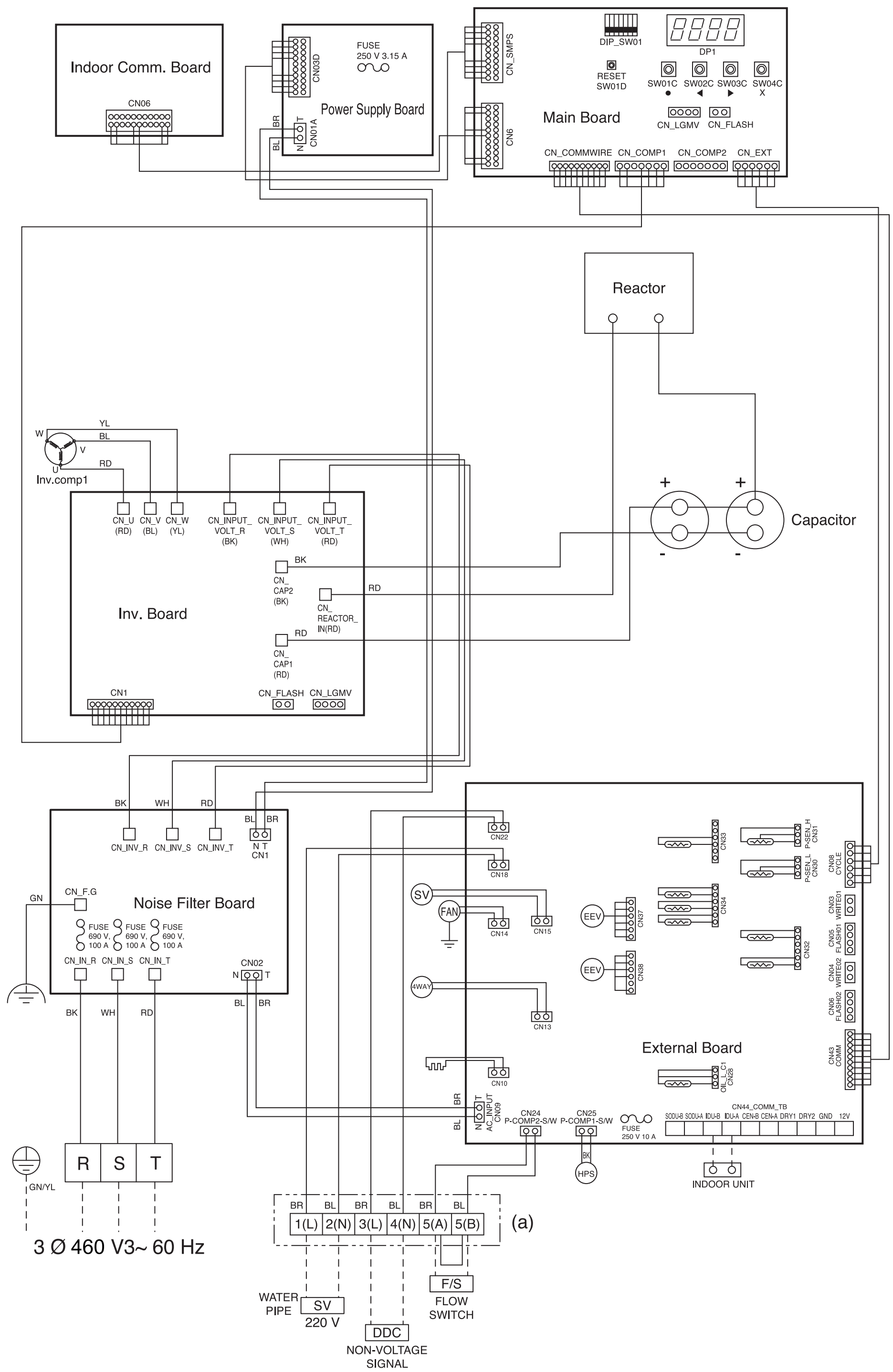
Note

1. – – – – – – : Field Wiring
2. ———————— : Factory Wiring

COLOR

SYMBOL	RD	BL	WH	BK	BR	YL	GN/YL
COLOR	RED	BLUE	WHITE	BLACK	BROWN	YELLOW	GREEN/YELLOW

208–230V 10/12 Ton



◆ EXTERNAL BOARD

SYMBOL	DESCRIPTION
CN03	ONBOADING TERMINAL(MAIN)
CN04	ONBOADING TERMINAL(SUB)
CN05	ONBOADING TERMINAL(MAIN)
CN06	ONBOADING TERMINAL(SUB)
CN08	MAIN BOARD COMM. TERMINAL
CN09	AC POWER 220 V IN
CN10	INVERTER COMP. 1 HEATER
CN11	
CN12	
CN13	4 WAY VALVE
CN14	FAN MOTOR
CN15	HOT GAS VALVE
CN16	
CN17	
CN18	AC 220 V OUT
CN19	
CN20	
CN21	
CN22	DDC SIGNAL OUT
CN24	FLOW SWITCH SIGNAL IN
CN25	HIGH PRESSURE SWITCH
CN27	
CN28	COMP. OIL LEVEL SENSOR
CN30	LOW PRESSURE SENSOR
CN31	HIGH PRESSURE SENSOR
CN32(TH9)	LIQUID PIPE TEMP.
CN32(TH10)	
CN32(TH11)	SUBCOOLING CIRCUIT OUTLET PIPE TEMP.
CN33(TH1)	AIR TEMP.
CN33(TH2)	
CN34(TH3)	DISCHARGE PIPE TEMP.
CN34(TH4)	PLATE HEX WATER OUTLET TEMP.
CN34(TH5)	SUCTION PIPE TEMP.
CN35(TH6)	
CN35(TH7)	
CN35(TH8)	
CN37	EEV(MAIN)
CN38	EEV(SUBCOOLER)
CN39	
CN40	
CN41	
CN42	
CN43	MAIN BOARD COMM. TERMINAL
CN44	TEMINAL BLOCK

◆ MAIN BOARD

SYMBOL	DESCRIPTION
CN6	IDU COMM BOARD COMM. TERMINAL
CN_SMPS	POWER SUPPLY BOARD COMM. TERMINAL
CN_COMMWRITE	EXTERNAL BOARD COMM. TERMINAL
CN_COMP1	INVERTER BOARD COMM. TERMINAL
CN_COMP2	
CN_EXT	EXTERNAL BOARD COMM. TERMINAL
CN_LGMV	LGMV JIG CONNECTION TERMINAL

◆ CONVERTER BOARD

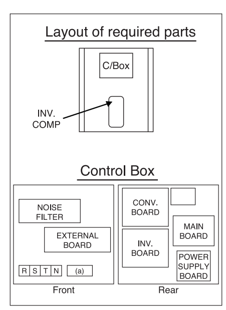
SYMBOL	DESCRIPTION
CN_DCLINK INV	DC LINK 700 V
CN_DCLINK FAN	
CN_COMM_INV	INVERTER BOARD COMM. TERMINAL

◆ INVERTER BOARD

SYMBOL	DESCRIPTION
CN_DCLINK	DC LINK 700 V
CN_ FAN	
CN_CYCLE	MAIN BOARD COMM. TERMINAL
CN1	MAIN BOARD COMM. TERMINAL
CN_COMP_UVW	U.V.W POWER TERMINAL

◆ NOISE FILTER BOARD

SYMBOL	DESCRIPTION
CN1	AC POWER 220 V
CN02	EXTERNAL BOARD POWER SUPPLY TERMINAL



Note
1. — — — — — : Field Wiring
2. ——————— : Factory Wiring

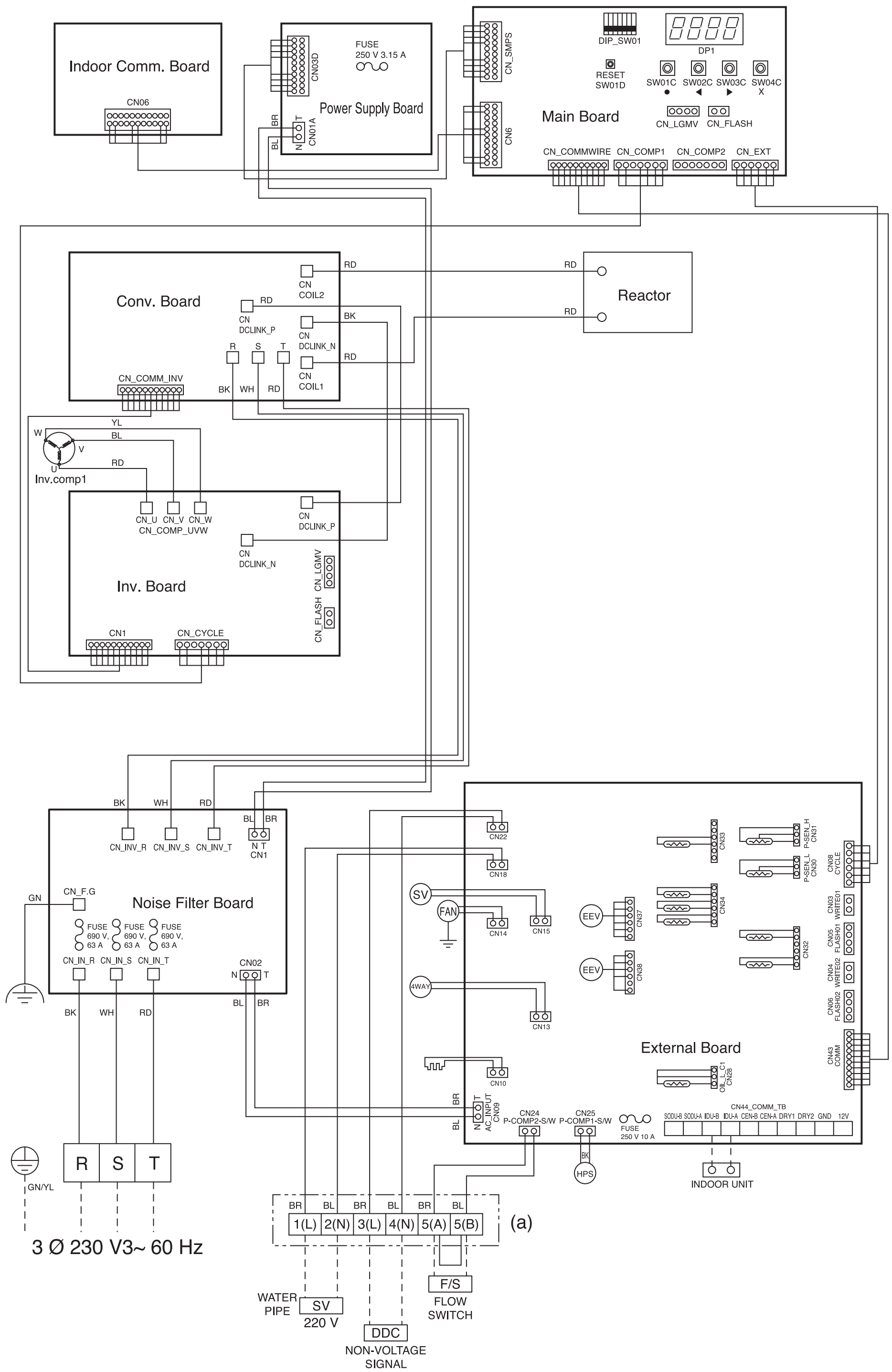
COLOR

SYMBOL	RD	BL	WH	BK	BR	YL	GN/YL
COLOR	RED	BLUE	WHITE	BLACK	BROWN	YELLOW	GREEN/YELLOW

P/No. : MEZ65021506

ARWB Heat Recovery Systems

460V 6/8/10 Ton



Note

1. — — — — — : Field Wiring
2. ————— : Factory Wiring

COLOR

SYMBOL	RD	BL	WH	BK	BR	YL	GN/YL
COLOR	RED	BLUE	WHITE	BLACK	BROWN	YELLOW	GREEN/YELLOW

◆EXTERNAL BOARD

SYMBOL	DESCRIPTION
CN03	ONBOADING TERMINAL(MAIN)
CN04	ONBOADING TERMINAL(SUB)
CN05	ONBOADING TERMINAL(MAIN)
CN06	ONBOADING TERMINAL(SUB)
CN08	MAIN BOARD COMM. TERMINAL
CN09	AC POWER 220 V IN
CN10	INVERTER COMP. 1 HEATER
CN11	
CN12	
CN13	4 WAY VALVE
CN14	FAN MOTOR
CN15	HOT GAS VALVE
CN16	
CN17	
CN18	AC 220 V OUT
CN19	
CN20	
CN21	
CN22	DDC SIGNAL OUT
CN24	FLOW SWITCH SIGNAL IN
CN25	HIGH PRESSURE SWITCH
CN27	
CN28	COMP. OIL LEVEL SENSOR
CN30	LOW PRESSURE SENSOR
CN31	HIGH PRESSURE SENSOR
CN32(TH9)	LIQUID PIPE TEMP.
CN32(TH10)	
CN32(TH11)	SUBCOOLING CIRCUIT OUTLET PIPE TEMP.
CN33(TH1)	AIR TEMP.
CN33(TH2)	
CN34(TH3)	DISCHARGE PIPE TEMP.
CN34(TH4)	PLATE HEX WATER OUTLET TEMP.
CN34(TH5)	SUCTION PIPE TEMP.
CN35(TH6)	
CN35(TH7)	
CN35(TH8)	
CN37	EEV(MAIN)
CN38	EEV(SUBCOOLER)
CN39	
CN40	
CN41	
CN42	
CN43	MAIN BOARD COMM. TERMINAL
CN44	TEMINAL BLOCK

◆MAIN BOARD

SYMBOL	DESCRIPTION
CN6	IDU COMM BOARD COMM. TERMINAL
CN_SMPS	POWER SUPPLY BOARD COMM. TERMINAL
CN_COMMWRITE	EXTERNAL BOARD COMM. TERMINAL
CN_COMP1	INVERTER BOARD COMM. TERMINAL
CN_COMP2	
CN_EXT	EXTERNAL BOARD COMM. TERMINAL
CN_LGMV	LGMV JIG CONNECTION TERMINAL

◆CONVERTER BOARD

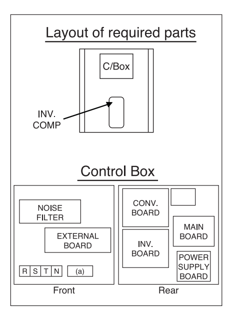
SYMBOL	DESCRIPTION
CN_DCLINK INV	DC LINK 700 V
CN_DCLINK FAN	
CN_COMM_INV	INVERTER BOARD COMM. TERMINAL

◆INVERTER BOARD

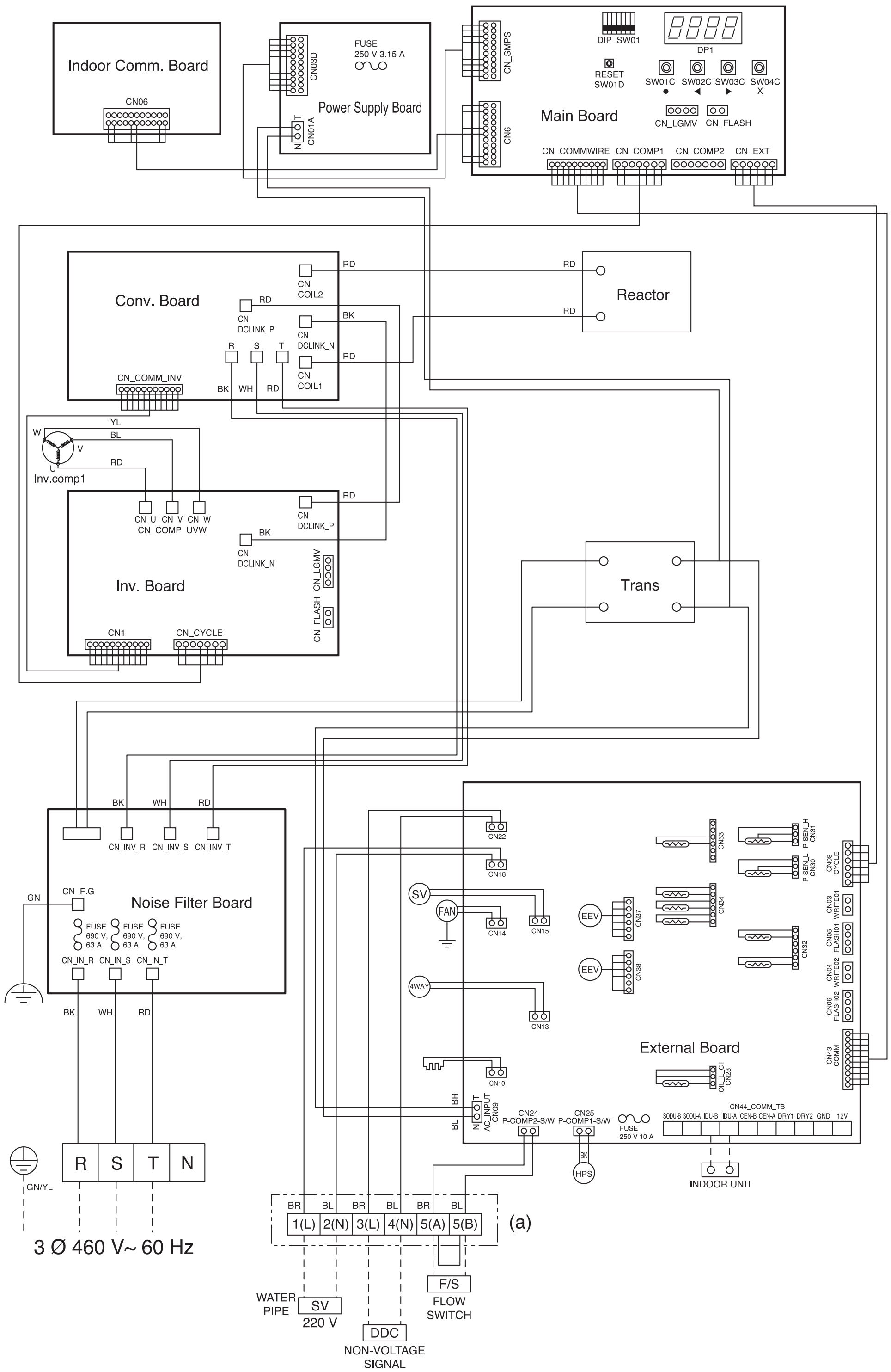
SYMBOL	DESCRIPTION
CN_DCLINK	DC LINK 700 V
CN_ FAN	
CN_CYCLE	MAIN BOARD COMM. TERMINAL
CN1	MAIN BOARD COMM. TERMINAL
CN_COMP_UVW	U.V.W POWER TERMINAL

◆NOISE FILTER BOARD

SYMBOL	DESCRIPTION
CN1	AC POWER 220 V
CN02	EXTERNAL BOARD POWER SUPPLY TERMINAL



460V 12/14/16 Ton



◆ EXTERNAL BOARD

SYMBOL	DESCRIPTION
CN03	ONBOADING TERMINAL(MAIN)
CN04	ONBOADING TERMINAL(SUB)
CN05	ONBOADING TERMINAL(MAIN)
CN06	ONBOADING TERMINAL(SUB)
CN08	MAIN BOARD COMM. TERMINAL
CN09	AC POWER 220 V IN
CN10	INVERTER COMP. 1 HEATER
CN11	
CN12	
CN13	4 WAY VALVE
CN14	FAN MOTOR
CN15	HOT GAS VALVE
CN16	
CN17	
CN18	AC 220 V OUT
CN19	
CN20	
CN21	
CN22	DDC SIGNAL OUT
CN24	FLOW SWITCH SIGNAL IN
CN25	HIGH PRESSURE SWITCH
CN27	
CN28	COMP. OIL LEVEL SENSOR
CN30	LOW PRESSURE SENSOR
CN31	HIGH PRESSURE SENSOR
CN32(TH9)	LIQUID PIPE TEMP.
CN32(TH10)	
CN32(TH11)	SUBCOOLING CIRCUIT OUTLET PIPE TEMP.
CN33(TH1)	AIR TEMP.
CN33(TH2)	
CN34(TH3)	DISCHARGE PIPE TEMP.
CN34(TH4)	PLATE HEX WATER OUTLET TEMP.
CN34(TH5)	SUCTION PIPE TEMP.
CN35(TH6)	
CN35(TH7)	
CN35(TH8)	
CN37	EEV(MAIN)
CN38	EEV(SUBCOOLER)
CN39	
CN40	
CN41	
CN42	
CN43	MAIN BOARD COMM. TERMINAL
CN44	TEMINAL BLOCK

◆ MAIN BOARD

SYMBOL	DESCRIPTION
CN6	IDU COMM BOARD COMM. TERMINAL
CN_SMPS	POWER SUPPLY BOARD COMM. TERMINAL
CN_COMMWRITE	EXTERNAL BOARD COMM. TERMINAL
CN_COMP1	INVERTER BOARD COMM. TERMINAL
CN_COMP2	
CN_EXT	EXTERNAL BOARD COMM. TERMINAL
CN_LGMV	LGMV JIG CONNECTION TERMINAL

◆ CONVERTER BOARD

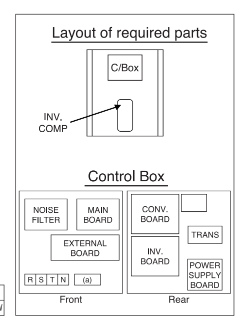
SYMBOL	DESCRIPTION
CN_DCLINK INV	DC LINK 700 V
CN_DCLINK FAN	
CN_COMM_INV	INVERTER BOARD COMM. TERMINAL

◆ INVERTER BOARD

SYMBOL	DESCRIPTION
CN_DCLINK	DC LINK 700 V
CN_ FAN	
CN_CYCLE	MAIN BOARD COMM. TERMINAL
CN1	MAIN BOARD COMM. TERMINAL
CN_COMP_UVW	U.V.W POWER TERMINAL

◆ NOISE FILTER BOARD

SYMBOL	DESCRIPTION
CN1	AC POWER 220 V
CN02	EXTERNAL BOARD POWER SUPPLY TERMINAL



Note

1. — — — — — : Field Wiring
2. ———————— : Factory Wiring

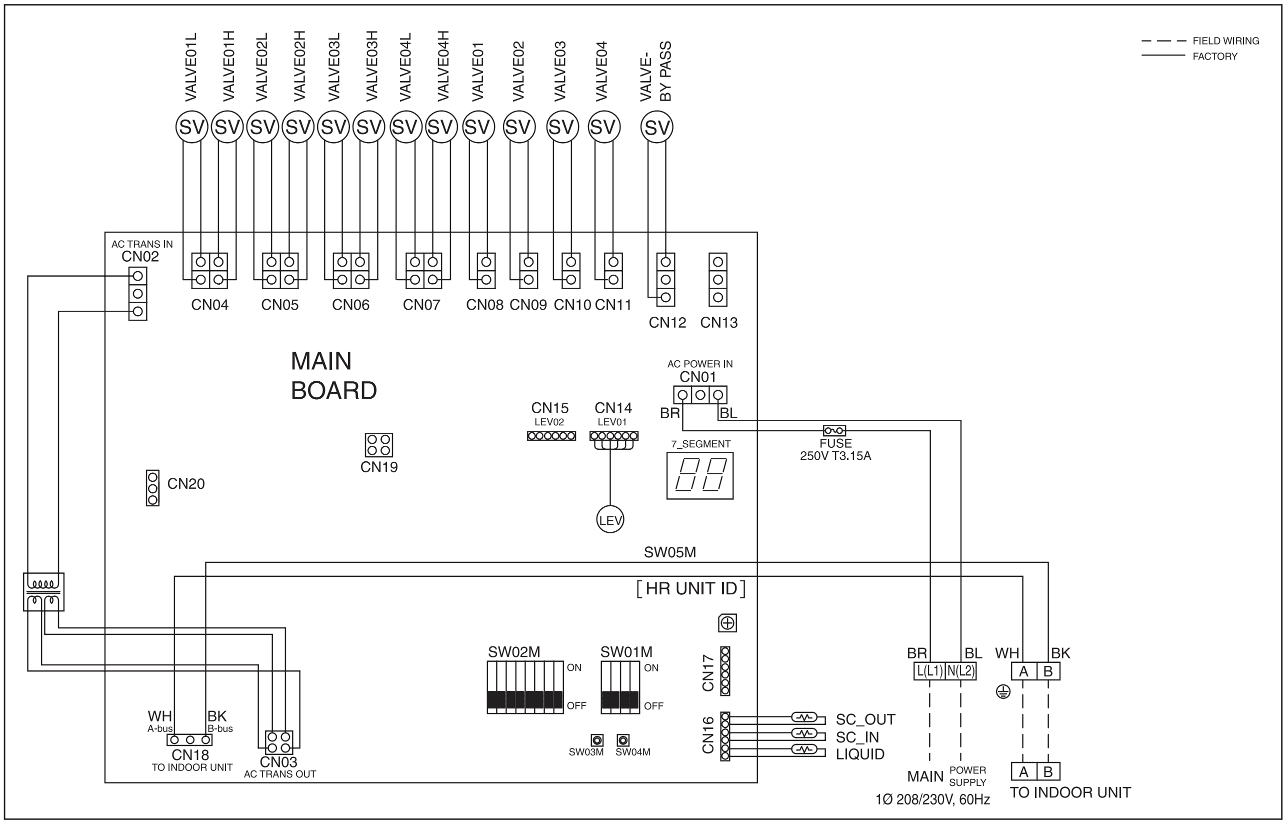
COLOR

SYMBOL	RD	BL	WH	BK	BR	YL	GN/YL
COLOR	RED	BLUE	WHITE	BLACK	BROWN	YELLOW	GREEN/YELLOW

P/No. : MEZ65021504

WIRING DIAGRAMS

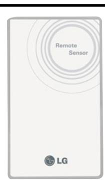
PRHR021A, PRHR031A, PRHR041A Heat Recovery Units



CN04	Solenoid Valve 01L/H (For Room 1)
CN05	Solenoid Valve 02L/H (For Room 2)
CN06	Solenoid Valve 03L/H (For Room 3)
CN07	Solenoid Valve 04L/H (For Room 4)
CN08	Solenoid Valve 01 (Bypass for Room 1)
CN09	Solenoid Valve 02 (Bypass for Room 2)
CN10	Solenoid Valve 03 (Bypass for Room 3)
CN11	Solenoid Valve 04 (Bypass for Room 4)
CN12	Solenoid Valve Bypass
CN14	Sub Cooling EEV
CN16 (SC Out)	Sensor, Sub Cooling Outlet
CN16 (SC In)	Sensor, Sub Cooling Inlet
CN16 (Liquid)	Sensor, Liquid Receiver
SW01M	Solonoid Valve Number Setting (When Manual Addressing)
SW02M (1)	Selecting, Auto Address (↓) or Manual Address (↑)
SW02M (2~3)	Setting, Total Number of Connected Indoor Units
SW03M	Setting, the Address of Indoor_10 (During Manual Addressing)
SW04M	Setting, the Address of Indoor_1 (During Manual Addressing)
SW05M	Setting, HR Unit Number

WATER SOURCE UNIT ACCESSORIES

Table 23: Summary Data—Zone Controllers.[1]

Zone Controller	Name	Model No.	Case Color	Max. Wire Length (ft.)	Description
	Simple Controller with Mode Selection	PQRCVCL0Q	Black	164	Allows control of indoor unit ON / OFF, operation mode, fan speed, and temperature setpoint for up to 16 indoor units.
		PQRCVCL0QW	White		
	Simple Controller without Mode Selection	PQRCHCA0Q	Black	164	Allows control of indoor unit ON / OFF, fan speed, and temperature setpoint for up to 16 indoor units.
		PQRCHCA0QW	White		
	LG Programmable Thermostat	PREMTB10U	White	164	Allows control of indoor unit ON / OFF, operation mode, occupied / unoccupied temperature setpoints, fan speed, and airflow direction for up to 16 indoor units. Programmable schedule with five events per day.
	Wireless Handheld	PQWRHDF0	Ivory	—	Allows control of indoor unit ON / OFF, operation mode, fan speed, and temperature setpoint. Also provides subfunction control.
	Wall-Mounted Remote Temperature Sensor	PQRSTA0	Ivory	50	Allows remote temperature measurement for cassette and ducted indoor units.

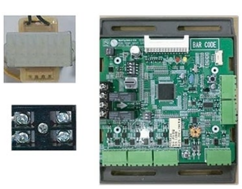
[1] Before specifying or placing an order, refer to the V-Net Network Solutions Engineering Product Data Book, and review the detailed technical data provided to fully understand the capabilities and limitations of these devices. For information on controller compatibility, refer to "Table 22: Indoor Units—Controls and Options." on page 32.

Table 24: Summary Data—Zone Controller Communication Cables.[1]

Communication Cable	Name	Model No.	Max. Wire Length (ft.)	Description
	Wired Remote Group Control Cable Assembly	PZCWRCG3	32	Required when grouping multiple indoor units with a single zone controller.
	Wired Remote / Group Control Extension Cable	PZCWRC1	32	Increases the distance between a remote controller and an indoor unit, or between indoor units in a control group.

[1] Before specifying or placing an order, refer to the V-Net Network Solutions Engineering Product Data Book, and review the detailed technical data provided to fully understand the capabilities and limitations of these devices. For information on controller compatibility, refer to "Table 22: Indoor Units—Controls and Options." on page 32.

Table 25: Summary Data—Specialty Application Devices.[1]

Specialty Application Device	Name	Model No.	Connects To	Application	Binary Signals Input / Output	Description
	Dry Contact Unit 24 VAC	PQDSB1	Indoor Unit	ON / OFF, Run Status, Error Status	1 / 2	Enables the indoor unit to be controlled and monitored by third-party controls using binary inputs and outputs.
	Dry Contact Unit for Setback	PQDSBC		ON / OFF, Mode, Controller Lock, Power Save, Run Status, Error Status	2 / 2	
	Dry Contact Unit for Thermostat	PQDSBNGCM1		ON / OFF, Thermo ON / OFF, Mode, Fan Speed, Run Status, Error Status	—	Enables the indoor unit to be controlled and monitored by a third-party thermostat or controller.
	Digital Output (DO) Kit	PQNFP00T0	Comm. BUS	ON / OFF	0 / 1	One 25A DPST normally open relay. Used with central controller to control third-party device manually or by schedule.
	Auxiliary Heater Relay Kit	PRARH0	Indoor Unit	Third-party Supplemental Heat Control	0 /1	Adds coordinated control of an external heater with normal heat pump operations. Contact energizes at 2.7°F below setpoint. De-energizes at 2.7°F above setpoint.
		PRARS0				
	Power Distribution Indicator (PDI) Premium	PQNUD1S41	Comm. BUS	Energy Consumption Monitoring	8 / 0	Monitors total water source unit power consumption for up to eight systems, and distributes per indoor unit based on weighted calculation.
	Mode Selector Switch	PRDSBM	Water Source Unit	Multi V Heat Pumps Only	—	Locks water source unit into Heat, Cool, or Fan mode.
	Variable Water Flow Valve Control Kit	PWFCKN000	Water Source Unit	Heat Pump and Heat Recovery		Modulates water flow based on compressor speed.

[1] Before specifying or placing an order, refer to the V-Net Network Solutions Engineering Product Data Book, and review the detailed technical data provided to fully understand the capabilities and limitations of these devices. For information on controller compatibility, refer to “Table 22: Indoor Units—Controls and Options.” on page 32.

WATER SOURCE UNIT ACCESSORIES

Table 26: Summary Data—Central Controllers (Connect to the Water Source Unit Terminals Internet A, Internet B).[1]

Central Controller	Name	Model No.	Devices per Controller	Systems per Comm. BUS	Devices per Comm. BUS	No. of Comm. BUS ports	Binary Signals Input / Output	Power / Connection	Description
	AC Smart Premium	PQCSW421E0A	128	16	128	1	2 DI / 2 DO	24 VAC	Provides for scheduling, auto-changeover, setback, remote controller lock, setpoint range limit, run time limit, web access, email alarm notification, visual floorplan navigation, peak/demand control, software device interlocking, PDI integration, and AC Manager Plus integration advanced functionality in addition to basic unit control and monitoring.
	AC Ez	PQCSZ250S0	32	16	256	1	—	12 VDC / Water Source Unit	Provides for scheduling in addition to basic indoor unit control and monitoring.
	Advanced Control Platform (ACP) Standard	PQCPC22N1	256	16	64 (128 with PDI Premium)	4	2 / 2	24 VAC	Provides for scheduling, remote controller lock, setpoint range limit, web access, peak / demand control, PDI integration, and AC Manager Plus integration advanced functionality in addition to basic unit control and monitoring.
	Advanced Control Platform (ACP) Premium	PQCPC22A1	256	16	64 (128 with PDI Premium)		10 / 4	24 VAC	

[1] Before specifying or placing an order, refer to the V-Net Network Solutions Engineering Product Data Book, and review the detailed technical data provided to fully understand the capabilities and limitations of these devices. For information on controller compatibility, refer to "Table 22: Indoor Units—Controls and Options." on page 32.

Table 27: Summary Data—Integration Solutions (Connect to Water Source Unit Terminals Internet A, Internet B).[1]

Central Controller	Name	Model No.	Devices per Controller	Systems per Comm. BUS	Devices per Comm. BUS	No. of Comm. BUS ports	Binary Signals Input / Output	Power / Connection	Description
	BACnet® Gateway	PQNFB17C1	256	16	64 (128 with PDI Premium)	4	24 VAC	10/4	Allows integration of LG equipment for control and monitoring by open protocol BACnet® and LonWorks® building automation and controls systems.
	LonWorks® Gateway	PLNWKB100	64	16	64	1	24 VAC	2/2	

[1] Before specifying or placing an order, refer to the V-Net Network Solutions Engineering Product Data Book, and review the detailed technical data provided to fully understand the capabilities and limitations of these devices. For information on controller compatibility, refer to "Table 22: Indoor Units—Controls and Options." on page 32.

LG Monitoring View Diagnostic Software and Cable

(PRCTSL1 and PRCTFE1)

LG Monitoring View (LGMV) software (PRCTSL1) runs on an industry-standard PC and allows the service technician or commissioning agent to monitor system parameters during operation or maintenance. An accessory cable (PRCTFE1) connects a USB port on the computer directly to the water source unit main printed circuit board (PCB). Figure 13 through Figure 16 show typical LGMV data screens. LGMV software displays the following real time data:

- Actual inverter compressor speed
- Target inverter compressor speed
- Actual superheat
- Target superheat
- Actual subcooler circuit superheat
- Target subcooler circuit superheat
- Main EEV position
- Subcooling EEV position
- Inverter compressor current transducer value
- Actual high pressure/saturation temperature
- Actual low pressure/saturation temperature
- Suction temperature
- Inverter compressor discharge temperature
- Liquid line pipe temperature
- Subcooler inlet temperature
- Subcooler outlet temperature
- 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 version
- Software version
- Installer name
- Model number of water source 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

Figure 13: MV Real-time Data Screen.

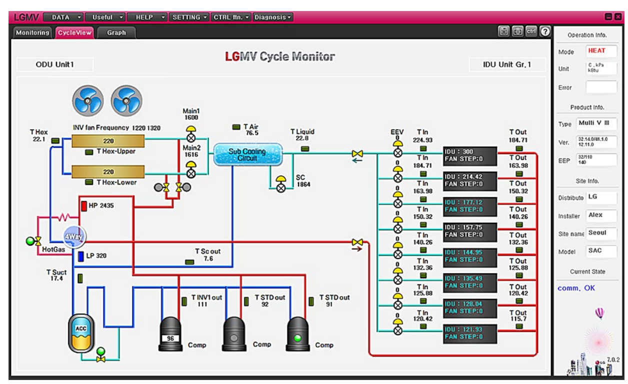


Figure 14: MV Cycle Monitor.

Note:

LGMV screens shown are typical. Your display may be different depending on software version and units installed.

LG Monitoring View (LGMV) Diagnostic Software and Cable, continued.

LGMV is available in a high version with all of the features listed above. The low version has all features as the high version without Target High Pressure and Target Low Pressure values shown on main screen.

Instead of connecting to the WSU, user has the option to connect to an IDU with a USB to RS-485 connector kit. When connected through an IDU, data recording is not available.

This software can be used to both commission new systems and troubleshoot existing systems. LGMV data can be recorded to a ".CSV" file and emailed to an LG representative to assist with diagnostic evaluations.

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

1. Cycleview: Graphic of internal components including:
   - Compressors showing actual speeds
   - EEVs
   - IDUs
   - Temperature and pressure sensors
   - Four-way reversing valve
2. Graph: Full screen graph of actual high and low pressures and high and low pressure limits. A sliding bar enables user to go back in time and view data.
3. Control FTN: Enables user to turn on IDUs in 1.8°F increments.
4. Useful Tab
   - Unit Conversion: Converts metric values to imperial values.
5. Data Tab
   - Data Saving Start: Recording of real time data to a file to be stored on the user's computer.
   - Data Loading Start: Recorded data from a saved ".CSV" file can be loaded to create an LGMV session.
6. Monitoring Tab
   - Electrical: The lower half of main screen is changed to show Inverter Compressor Amps, Volts, Power Hz, and Inverter Control Board Fan Hz.
7. Error Codes: Error codes are displayed in the top right area of the main screen. For more information on error codes, refer to the Multi V Water IV service manual.

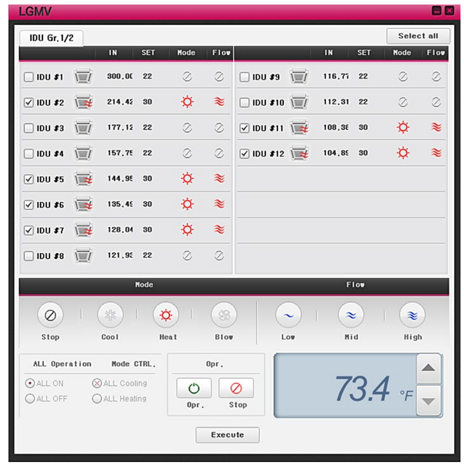


Figure 15: MV Control Indoor Units Screen.

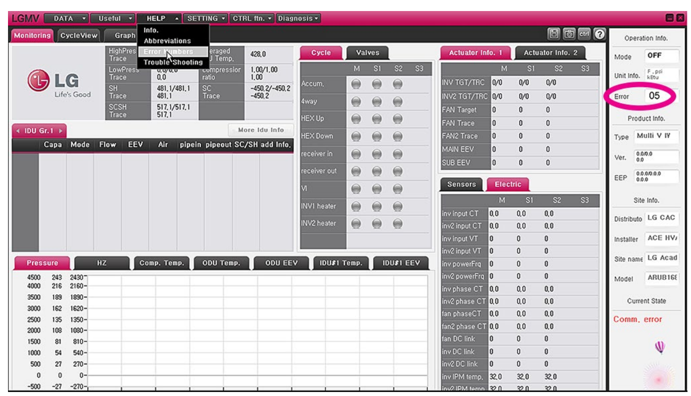


Figure 16: Error Code on Main Screen.

Recommended Minimum PC Configuration:

- CPU: Pentium® IV 1.6 GHz
- Operating System: Windows® XP/Vista/7 32bit (recommended), 64 bit
- Main Memory: 1 GB
- Hard Disk: 600 MB when operating
- MS Office 2003, 2007 (recommended) for select reporting functions

APPLICATION GUIDELINES

Note:

The following procedure should not replace LG's complimentary LATS Multi V selection software, but should instead be used in conjunction with it. Contact your LG representative to obtain a copy of the LATS Multi V software and the user's manual.

Always use LATS Multi V Software

Follow the recommendations and instructions in this section to properly select, size, and verify that the Multi V system components are optimized.

- Zone the building.
- Determine the ventilation method.
- Select the indoor unit(s).
- Select the water source unit(s).
- Perform system sizing checks.
  - Calculate the Corrected Capacity Ratio (CCR).
  - Determine the system Combination Ratio (CR)

When using LATS Multi V software, the default indoor design day conditions of 80.6°F DB / 67 °F WB in cooling mode and 68°F DB / 56.7°F WB in heating mode may need to be adjusted to reflect the designer's preferred indoor room design temperature.

Note:

These indoor room temperature values are entering coil conditions.

Note:

Data provided in the LATS tree mode diagram or report file is not valid until the "Auto-Piping" and "System Check" routines are run without errors. Errors are immediately reported in pop-up dialog boxes or red lines surrounding indoor unit(s) and/or along pipe segments. If errors are indicated, modify the pipe system design and/or system components and re-run LATS.

Zone the Building–Multi V Water IV Heat Pump Systems

Multi V Water IV Heat Pump is a two-pipe heat pump system that can cool or heat, but not both simultaneously. When designing a heat pump system, the designer typically combines spaces with similar load profiles located near or adjacent to each other into "thermal zones." After combining like spaces into thermal zones that will be served by a single (or grouped) indoor unit(s), calculate the peak cooling and heating loads for each thermal zone.

Zone the Building–Multi V Water IV Heat Recovery Systems

Multi V Water IV Heat Recovery is a three-pipe heat pump system that can cool and heat simultaneously. Heat Recovery Units (HRU) are installed in the refrigerant pipe lines between the water source unit(s) and the indoor units. The HRU route heat from a zone calling for cooling to a zone calling for heating. Each HRU has two, three or four ports. Each port serves one zone with from one to eight indoor units. Each HRU output port is capable of heating or cooling independent of the adjacent ports' operating mode. To maximize recovered heat and system efficiency, combine zone(s) that require heating with zone(s) that require cooling on the same HRU.

In many buildings, to optimize system design, zones on opposite sides of the building are combined on a single pipe system served by a common HRU. If the building has multiple floors, connected load diversity is often maximized by combining spaces located on different floors. Each building will be unique. To discover the best combination of spaces, use building energy modeling software.

Determine the Ventilation Method

Decide how ventilation air will be introduced to each space. Some models of Multi V indoor units have field-installed accessories available to accommodate the direct connection of ventilation ductwork to the unit. It is recommended, however, that additional considerations be assessed and understood when using direct connection accessories. For more information, contact your LG applied equipment representative or visit www.lg-vrf.com for technical product information.

Note:

In all cases, LG recommends ducting pre-treated room neutral, ventilation air directly to the space. If the ventilation air is not tempered to room neutral conditions before introduction to the conditioned space, remember to add the ventilation air load(s) to the space load before sizing the indoor unit(s). Local codes or other professional design guidelines, such as ASHRAE 62.1, will dictate the volume of ventilation air required.

It may be prudent to oversize the dedicated outdoor air system considering there will be a few days of the year when weather conditions exceed the design day conditions. This will minimize the possibility of ventilation air conditions causing the space temperature to drift outside design day parameters if a decoupled outside air system is used, or if a coupled outside air system is used and the indoor unit's entering air temperature falls outside the approved design temperature range.

Select the Indoor Unit(s)

The building sensible cooling load is typically the critical load to satisfy. In coastal areas or humid applications, such as high occupancy spaces, both the latent and sensible cooling loads should be considered. In areas where the cooling and heating loads are similar or the heating load may exceed the total cooling load, the designer should verify the indoor unit selection satisfies both the heating and cooling requirements.

Determine how many indoor units will be required. Refer to "Table 29: Heat Pump Water Source Unit / Indoor Unit Matching Limitations." on page 84 for the maximum number of indoor units allowed on each model of the water source units. If the quantity of indoor units exceeds the maximum allowed for the water source model selected, consider increasing the size of the water source unit or split the indoor units into two groups served by separate water source units.

Calculate the entering mixed air conditions. Verify the entering air temperature is below 76˚F WB in cooling mode and above 59˚F in heating mode.

⚠ Note:

When the indoor unit entering air temperature is outside the cataloged operational limits, the Multi V Water IV system may continue to operate properly; however operational abnormalities may occur. These include frost accumulating on the coil, low or high suction temperature, low or high head pressure, low or high discharge temperature, or complete system shutdown.

Use this formula to calculate the indoor unit entering mixed air temperature:

$$MAT = \frac{(RAT \times \%RA) + (OAT \times \%OA)}{100}$$

Where:

MAT = Mixed air temperature

RAT = Return air temperature

OAT = Outside air temperature

%RA = Percentage of return air

%OA = Percentage of outdoor air

Indoor unit *nominal* cooling capacity ratings, among other parameters, are based on an entering air condition of 80°F DB/67°F WB and a 95°F DB outdoor ambient temperature. *Nominal* heating capacity ratings are based on an indoor unit entering air condition of 70°F DB and an outdoor ambient air temperature of 47°F DB/43°F WB.

Capacity Correction

The *corrected* cooling/heating capacity is different from the nominal cooling/heating capacity. The corrected capacity reported by LATS includes changes in unit performance after considering the effect design ambient operating conditions has on the system's cooling capability.

Depending on the location of the building, additional capacity correction factors may need to be applied to the corrected capacity values provided by LATS.

Altitude Correction

The impact of air density must be considered on systems installed at a significant altitude above sea level. To calculate the effect on the indoor unit's cooling capacity, manually apply locally accepted altitude correction factors to the IDU capacities.

Minimum Air Change Requirements

Avoid over-sizing indoor units in an attempt to increase the air exchange rate in the space. VRF systems are designed for minimum airflow over the coil to maximize latent capacity while cooling, maintain a comfortable, consistent discharge air temperature while heating, and minimize fan motor power consumption. In extreme cases, over-sizing indoor units may compromise the water source unit's ability to effectively match the space load(s).

Check the Indoor Unit Selection(s)

Verify the sensible (and total) corrected cooling capacity. For each indoor unit the corrected capacity must be at least equal to the sum of the appropriate cooling design day space load(s) (plus ventilation load, if applicable) for the space(s) served by the indoor unit.

Verify the corrected heating capacity. For each indoor unit, the corrected capacity must be at least equal to the sum of the heating design day space load (plus ventilation load, if applicable) for all spaces served by the indoor unit.

Select the Water Source Unit

After all indoor units are properly sized to offset the applicable loads in each space, begin the selection of the water source unit by choosing a size that meets both the block load cooling requirement and offsets the sum of the peak heating load.

⚠ Note:

In LATS always run the Auto-Pipe and System Check features following any change in the water source unit selection to verify the system design is acceptable.

After making a water source unit selection, look up the water source unit's corrected cooling and heating capacity at the specified ambient design conditions. Use values reported by LATS or find it in the tables provided in the Performance Data section of this manual.

Capacity Correction

For water-cooled systems operating in cooling mode, a capacity correction factor may apply to account for the length of the system's liquid pipe and elevation difference between the water source unit and the indoor unit(s). If the water source units corrected cooling capacity was derived from the LATS report, the elevation difference correction factor has already been applied. If the corrected cooling capacity was found using corrected capacity tables in the Multi V Water IV Performance Data Manual, apply the appropriate elevation difference factor Table 33 and Table 34 on page 88 (choice of table depends on the architecture of the system design). Multiply the water source unit corrected cooling capacity by the elevation difference correction factor.

Check the Indoor Unit Selection(s)

After applying the appropriate correction factors to the water source unit, verify the corrected cooling capacity is at least equal to the total building load (considering building diversity, if applicable), and the corrected heating capacity is at least equal to the sum of the peak heating loads for all spaces and/or thermal zones served by the system.

System Sizing Checks

Calculate the Corrected Capacity Ratio (CCR)

The system's CCR is defined as the sum of the space loads divided by the water source unit corrected capacity after all applicable correction factors are applied. Calculate this ratio for both the cooling and heating design days.

$$CCR\%_{(Clg)} = \left(\frac{\text{Total Cooling Block Load}}{\text{Actual Corrected Water Source Unit Cooling Capacity}} \right) \times 100 \leq 100\%$$

$$CCR\%_{(Htg)} = \left(\frac{\text{Heating Peak Load}}{\text{Actual Corrected Water Source Unit Heating Capacity}} \right) \times 100 \leq 100\%$$

The water source unit selected should be large enough to offset the total block cooling load for all spaces served by the VRF system during the peak cooling load hour on the cooling design day (account for

Application Guidelines

ventilation air cooling load if the ventilation air has not been pretreated to room neutral conditions).

The corrected cooling capacity ratio (CCR% [clg]) should never exceed 100% plus building diversity. If it does, increase the size of the water source unit or change the system design by moving some of the building load and associated indoor unit(s) to another Multi V system.

The water source unit should also be large enough to offset the sum of the building's space heating loads without considering building diversity. In the heating season, it is typical that all spaces served by the system will peak simultaneously in the early morning, thus building diversity should never be considered. If the corrected heating capacity ratio (CCR% [htg]) exceeds 100%, increase the size of the water source unit or change the system design by moving some of the building load to another Multi V system.

Determine the System Combination Ratio

The system's Combination Ratio (CR) compares the nominal capacity of all connected indoor units with the nominal capacity of the water source unit serving them. Locate nominal capacity information for indoor and water source units in the General Data Tables of their respective Engineering Manuals.

For example,

If a VRF system has a water source unit with a nominal capacity of C and four indoor units having nominal capacity ratings of W, X, Y, and Z respectively, the CR is calculated by the following formula:

$$CR\% = \left(\frac{W + X + Y + Z}{C}\right) \times 100$$

⚠ *Note:*

The Multi V system will not commission, start or operate unless the CR is between 50% and 130%.

If the CR is over 100%, the designer is under-sizing the water source unit relative to the combined nominal capacity of the connected indoor units. In some applications, under-sizing of the water source unit is prudent as it reduces the initial equipment investment and will properly perform as long as the designer:

1. Knows the indoor unit(s) are oversized relative to the actual load(s) in the spaces served.
2. Knows the space loads will peak at different times of the day (i.e., building has "load diversity").

In some designs, over-sized indoor units may be unavoidable in the case where the smallest size indoor unit available from LG is larger than what is necessary to satisfy the space load. This scenario may occur when an indoor unit selection one size down from the selected unit is slightly short of fulfilling the design load requirements, and the designer must choose the next largest size unit.

⚠ *Note:*

If the water source unit is properly sized to offset the building's total cooling block load and the system's combination ratio is above 130%, indoor units are likely oversized. In applications where all indoor units are "right-sized" and there is no building diversity, the system's CR will likely be ≤100%.

If the CR is above 130%, review the indoor unit choices and downsize, or select a larger water source unit. Consider moving indoor units to another Multi V, Flex-Multi, or single-split system if the water source unit size cannot be increased.

If the CR falls below 50%, select a smaller water source unit or consider adding more or larger indoor unit(s) to the system. This situation is common on multi-phase projects where the design calls for the majority of indoor units be added to the system at a later date. To raise the CR above the minimum 50% requirement:

1. Consider including additional indoor units on the first phase
2. Design two smaller systems in lieu of a single larger system. Connect all "first phase" indoor units to the water source unit being installed on the first phase, and delay the installation of the additional water source unit until a later date.

Conclusions and Recommendations

- Always use LATS Multi V system design software to check a design.
- Validate that each indoor unit is appropriately sized. Before validating, if the indoor units have been properly sized, the water source unit's size must be temporarily adjusted to make the system's CR ≤100%.
- Use the indoor unit's corrected capacity for cooling and heating provided by LATS and apply a correction factor for altitude if appropriate.
- Verify that the water source unit selection for each system is properly sized. Verify that the corrected capacity for cooling and heating provided by LATS is sufficient to offset the block building space load after applying additional correction factors for capacity and frost accumulation, if appropriate.
- For each Multi V system, calculate the cooling and heating design days
  - Corrected Capacity Ratio (CCR)
  - Combination Ratio (CR)

After these system checks are complete and design limitations are adhered to, the system's indoor and water source components should be properly sized and the system's performance should now be optimized. The VRF system component size selections should be acceptable.

At any time, if further system design assistance is needed or you have a unique application you would like to discuss, contact your LG applied equipment representative for assistance.

Operating Temperature Range

Table 28: Published Operating Entering Water Temperature Range for LG Multi V Water IV Products[1, 2].

Product	Cooling Mode (°F DB)	Heating Mode (°F WB)	Simultaneous Mode (°F WB)
Multi V Water IV Heat Pump	23 – 113	23 – 113	23 – 113
Multi V Water IV Heat Recovery	23 – 113	23 – 113	23 – 113

[1]Equivalent pipe length distance between water source and indoor units is 25 feet with no elevation difference between water source and indoor units.

[2]Below 59°F, a Variable Water Flow Control Kit (PWFCKN000) is required for continuous operation in cooling mode.

Table 29: Heat Pump Water Source Unit / Indoor Unit Matching Limitations.

Heat Pump WSU Models	Nominal Cooling (Btu/h)	Indoor Units		
		Max. Qty.	Sum of Indoor Unit Nominal Cooling Capacities (Btu/h)	
			Min. Capacity (Btu/h) (50%)[1]	Max. Capacity (Btu/h) (130%)[2]
ARWN072BAS4 / ARWN072DAS4	72,000 / 72,000	13/13	36,000 / 36,000	93,600 / 93,600
ARWN096BAS4 / ARWN096DAS4	96,000 / 96,000	16/16	48,000 / 48,000	124,800 / 124,800
ARWN121BAS4 / ARWN121DAS4	120,000 / 120,000	20/20	60,000 / 60,000	156,000 / 156,000
ARWN144BAS4 / ARWN144DAS4	144,000 / 144,000	23/23	72,000 / 72,000	187,200 / 187,200
ARWN168BAS4 / ARWN168DAS4	168,000 / 168,000	29/29	84,000 / 84,000	218,400 / 218,400
ARWN192BAS4 / ARWN192DAS4	192,000 / 192,000	32/32	96,000 / 96,000	249,600 / 249,600
ARWN216BAS4 / —	216,000 / –	35/ –	108,000 / –	280,800 / –
— / ARWN240DAS4	– / 240,000	– /39	– / 120,000	– / 312,000
ARWN288BAS4 / ARWN288DAS4	288,000 / 288,000	45/45	144,000 / 144,000	374,400 / 374,400
— / ARWN336DAS4	– / 336,000	– /55	– / 168,000	– / 436,800
ARWN360BAS4 / —	360,000 / –	58/ –	180,000 / –	468,000 / –
— / ARWN384DAS4	– / 384,000	– /61	– / 192,000	– / 499,200
ARWN480BAS4 / ARWN480DAS4	480,000 / 480,000	64/64	240,000 / 240,000	624,000 / 624,000
— / ARWN576DAS4	– / 576,000	– /64	– / 288,000	– / 748,800

Table 30: Heat Recovery Water Source Unit / Indoor Unit Matching Limitations.

Heat Recovery WSU Models	Nominal Cooling (Btu/h)	Indoor Units		
		Max. Qty.	Sum of Indoor Unit Nominal Cooling Capacities (Btu/h)	
			Min. Capacity (Btu/h) (50%)[1]	Max. Capacity (Btu/h) (130%)[2]
ARWB072BAS4 / ARWB072DAS4	72,000 / 72,000	13/13	36,000 / 36,000	93,600 / 93,600
ARWB096BAS4 / ARWB096DAS4	96,000 / 96,000	16/16	48,000 / 48,000	124,800 / 124,800
ARWB121BAS4 / ARWB121DAS4	120,000 / 120,000	20/20	60,000 / 60,000	156,000 / 156,000
ARWB144BAS4 / ARWB144DAS4	144,000 / 144,000	23/23	72,000 / 72,000	187,200 / 187,200
ARWB168BAS4 / ARWB168DAS4	168,000 / 168,000	29/29	84,000 / 84,000	218,400 / 218,400
ARWB192BAS4 / ARWB192DAS4	192,000 / 192,000	32/32	96,000 / 96,000	249,600 / 249,600
ARWB216BAS4 / —	216,000 / –	35/ –	108,000 / –	280,800 / –
— / ARWB240DAS4	– / 240,000	– /39	– / 120,000	– / 312,000
ARWB288BAS4 / ARWB288DAS4	288,000	45/45	144,000 / 144,000	374,400 / 374,400
— / ARWB336DAS4	– / 336,000	– /55	– / 168,000	– / 436,800
ARWB360BAS4 / —	360,000 / –	58/ –	180,000 / –	468,000 / –
— / ARWB384DAS4	– / 384,000	– /61	– / 192,000	– / 499,200
ARWB432BAS4 / —	432,000 / –	64/ –	216,000 / –	561,600 / –
— / ARWB480DAS4	– / 480,000	– /64	– / 240,000	– / 624,000
— / ARWB576DAS4	– / 576,000	– /64	– / 288,000	– / 748,800

[1]50% = Minimum Combination Ratio.

[2]130% = Maximum Combination Ratio.

WSU Capacity Correction Factors

Note:

The LATS Multi V software program calculates these correction factors. Use this procedure only when performing manual calculations.

The nominal heating and/or cooling capacities of WSU(s) can be reduced by the design of the refrigerant piping system. Parameters that can reduce nominal capacity are:

- Length of the liquid refrigerant pipe run to the farthest IDU (vapor pipes do not affect this calculation)
- Number and type of components in this liquid pipe run (elbows, Y-branches, etc.)
- Distance above or below the WSU(s) of the farthest IDU

To determine WSU capacity in your system design, multiply the WSU cooling and heating nominal capacities by the correction factors calculated in this procedure. The correction factor could be 1.0, resulting in no capacity loss, or could be less than 1.0, resulting in a certain amount of capacity loss. If the cooling or heating correction factor causes reduced capacity, the system designer must determine if the reduced capacity is acceptable or if redesign is required.

Two parameters determine WSU cooling and heating correction factors:

1. Height in feet above (HU) or below (HL) the WSU of the IDU farthest away from the WSU. Follow the procedure in "HU/HL Measurement" on page 85 to find this parameter
2. Total equivalent length (TEL) in feet of the liquid refrigerant pipe between the WSU and the IDU farthest away from the WSU. Equivalent length considers the effect of pressure drop due to components such as elbows and Y-branches. Equivalent feet will be a larger number than the measured physical distance in feet. Follow the procedure in "Liquid Pipe Total Equivalent Length Calculation" on page 86 to find this parameter

After determining the HU/HL and TEL parameters, follow the procedure in "WSU Cooling/Heating Capacity Correction Factor Calculation" on page 87 to determine if the proposed refrigerant pipe design and WSU/IDU locations will reduce WSU capacity.

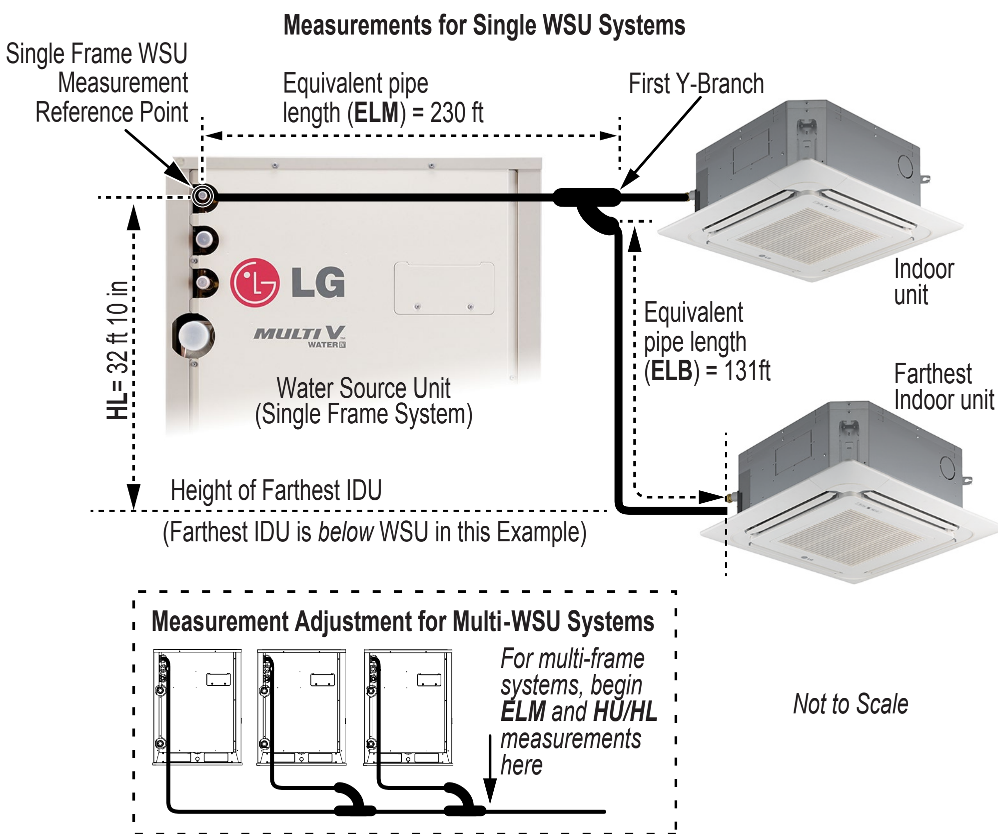


Figure 17: Equivalent Pipe Length Measurements Example.

HU/HL Measurement

Follow this procedure to determine the value of HU (farthest IDU above WSU) or HL (farthest IDU below WSU). Refer to Figure 17.

1. Based on your system's refrigerant pipe design, determine which IDU is the farthest from the WSU.
2. Determine the vertical distance in feet between the WSU and the farthest IDU. For a single WSU system, measure from the WSU liquid pipe connection. For a dual or triple WSU system, measure from the end of the last multi-frame connector. At the IDU end, measure to the IDU's liquid pipe connection.
3. Record the vertical distance measurement in feet, and note if the IDU is above the WSU (HU) or below the WSU (HL).
4. Proceed to the total equivalent pipe length calculation.

Liquid Pipe Total Equivalent Length Calculation

A Multi V system may have many liquid refrigerant pipe runs, each composed of multiple segments, elbows, and other components, but the single pipe run that determines TEL is the run from the WSU(s) through the first Y-branch, to the farthest IDU. The TEL of this pipe run is its physical length plus an amount of "length" added to represent the effect of pressure drop due to elbows, Y-branches, headers, and other pipe system components.

Use this formula to calculate TEL:

TEL = (ELM x CF) + ELB, where:

- **TEL** = total equivalent length of the liquid refrigerant pipe
- **ELM** = equivalent length of the liquid refrigerant pipe to end of first Y-branch
- **CF** = pipe length correction factor
- **ELB** = equivalent length of the liquid refrigerant pipe from end of first Y-branch to farthest IDU

The ELM and ELB parameters will vary according to the system design. CF is a constant and is listed in Table 32. Determine ELM and ELB and then use the TEL formula to calculate total equivalent length.

Follow these steps to calculate ELM. Refer to Figure 17.

1. Determine the beginning measurement reference point at the WSU end of the liquid refrigerant pipe.
   - For a single WSU system, begin the measurement at the WSU's liquid refrigerant pipe connection (smallest diameter pipe, closest to top of unit).
   - For a dual or triple WSU system, begin the measurement at the end of the last multi-frame connector.
2. Locate the first Y-branch in the liquid pipe.
3. Measure the length in feet of this liquid pipe run. Measure along the length of the pipe, following any changes in direction. Record this value.
4. Count the number of elbow connectors in the pipe measured in step 3. Determine the outside diameter (OD) of the elbow connectors. All elbows in this segment should have the same OD.
5. Refer to Table 31 and find the equivalent length for this size of elbow connector. Multiply the number of elbows by the equivalent length in feet. Record this value.
6. Add the physical measurement found in step 3, the elbow connector value found in step 5, and 1.6 ft. for the first Y-branch. The result is the equivalent length in feet of this section of pipe, and is the **ELM** parameter of the total equivalent length equation.

Follow these steps to calculate ELB. Refer to Figure 17.

1. Measure the distance in feet from the end of the first liquid pipe Y-branch to the liquid pipe connection of the farthest IDU. Measure along the length of the pipe, following any changes in direction. Record this value.
2. Count the number of elbow connectors in the liquid pipe run measured in step 1. If there is more than one size of elbow connector, count the number of each size. Determine the outside diameter (OD) of each size of elbow connector.
3. Refer to Table 31 and find the equivalent length for each size of elbow connector. Multiply the number of each size of elbow by its equivalent length. Add these equivalent length values to determine a total equivalent length for elbow connectors. Record this value.
4. Count the number of Y-branches in the liquid pipe run measured in step 1. Multiply the number of Y-branches by 1.6 to determine their equivalent length in feet. Record this value. If there are no Y-branches, the value is zero.

Table 31: Equivalent Piping Length for Elbow Pipe Connectors.

Equivalent Lengths of Elbow Pipe Connectors															
Elbow (90° or 45°)	Size, inches OD	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
	Equivalent Length (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.)		1.6													
Header (ft.)		3.3													
Heat Recovery Unit (ft.) (For ARWB Heat Recovery Units only)		8.2													

5. Count the number of headers in the liquid pipe run measured in step 1. Multiply the number of headers by 3.3 to determine their equivalent length in feet. Record this value. If there are no headers, the value is zero.
6. Count the number of heat recovery units in the liquid pipe run measured in step 1. Multiply the number of heat recovery units by 8.2 to determine their equivalent length in feet. Record this value. If there are no heat recovery units, the value is zero.
7. Add the physical measurement found in step 1, the elbow connector value found in step 3, the Y-branch value found in step 4, the header value found in step 5 and the heat recovery unit value found in step 6. The result is the equivalent length in feet of this liquid pipe run, and is the **ELB** parameter of the total equivalent length equation.

Follow these steps to calculate TEL.

1. Multiply ELM by in feet to ELB in feet. This value is the equivalent length in feet of this section of refrigerant pipe.
2. Refer to Table 32 to find the equivalent length correction factor (**CF**) for cooling or heading mode.
3. Use the equation below with the HU/HL, ELB, and CF parameters to calculate total equivalent pipe length. Record this value.

Total Equivalent Length (TEL) in feet = [(ELM in feet) x (CF from Table 32)] + (ELB in feet)

Table 32: Equivalent Pipe Length Correction Factors.

If Equivalent Pipe Length (ELM + ELB) is:	
Less than 295 ft, Correction Factor (CF) is:	295 ft or More Correction Factor (CF) is:
1.0 for Cooling	0.5 for Cooling
1.0 for Heating	0.2 for Heating

WSU Cooling/Heating Capacity Correction Factor Calculation

Follow this procedure to determine the system's WSU corrected capacity. You must have the results of the HU/HL Measurement procedure and the Total Equivalent Pipe Length Calculation procedure to accurately calculate the correction factors. If the cooling or heating correction factor causes reduced capacity, the system designer must determine if the reduced capacity is acceptable or if redesign is required.

1. Locate the recorded results of the HU/HL Measurement and the Total Equivalent Pipe Length Calculation.
2. Refer to Table 33 for the cooling correction factor. Refer to the HU or HL section of the table, as appropriate for your system.
3. Use the HU/HL measurement and the calculated TEL length to find the cooling correction factor. Record this value.
4. Multiply the nominal WSU cooling capacity by the correction factor found in step 3 to determine the corrected cooling capacity.
5. Refer to Table 34 for the heating correction factor. Refer to the HU or HL section of the table, as appropriate for your system.
6. Use the HU/HL measurement and the calculated TEL length to find the heating correction factor. Record this value.
7. Multiply the nominal WSU cooling capacity by the correction factor found in step 6 to determine the corrected heating capacity.
8. If either the cooling or heating corrected capacity is less than the nominal capacity, determine if the corrected capacity is acceptable or if system parameters must change to achieve an acceptable corrected capacity.

WSU Cooling/Heating Capacity Correction Factor Calculation Examples

These examples use the data in Figure 17 to determine cooling and heating capacity correction factors.

In Figure 17, ELM = 230 ft; ELB = 131 ft; HL = 33 ft

- For the cooling calculation:
  TEL = (230 ft x 0.5) + 131 ft
  TEL = 246 ft.
  Cooling capacity correction factor when TEL is 246 ft and HL is 33 ft is approximately 0.88

  Multiplying the WSU nominal cooling capacity by 0.88 gives the corrected cooling capacity
- For the heating calculation,

  TEL = (230 ft x 0.2) + 131 ft
  TEL = 177 ft.
  Heating capacity correction factor when TEL is 177 ft and HL is 33 ft is approximately 1.0

  Multiplying the WSU nominal heating capacity by 1.0 gives the corrected heating capacity

Application Guidelines

Cooling and Heating Correction Factor Tables

These tables show the change in capacity of a standard indoor unit system at maximum load under standard conditions.

If pipe insulation is insufficient, heat loss will become larger and capacity will decrease.

Table 33: WSU Capacity Cooling Correction Factors.

Elevation Difference (ft.) Above WSU (HU)	Total Equivalent Length (TEL) in Feet												
	25	33	66	98	131	164	197	230	263	295	328	361	394
	Correction Factor												
0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.98	0.96	0.95	0.86	0.85	0.84
25	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.98	0.96	0.95	0.86	0.85	0.84
33	–	1.0	1.0	1.0	1.0	1.0	1.0	0.98	0.96	0.95	0.86	0.85	0.84
66	–	–	1.0	1.0	1.0	1.0	1.0	0.98	0.96	0.95	0.86	0.84	0.83
98	–	–	–	1.0	1.0	1.0	1.0	0.98	0.96	0.95	0.85	0.84	0.83
131	–	–	–	–	1.0	1.0	1.0	0.98	0.96	0.95	0.85	0.84	0.83
164	–	–	–	–	–	1.0	1.0	0.98	0.96	0.95	0.85	0.84	0.83
Elevation Difference (ft.) Below WSU (HL)	Total Equivalent Length (TEL) in Feet												
	25	33	66	98	131	164	197	230	263	295	328	361	394
	Correction Factor												
0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.98	0.96	0.95	0.86	0.85	0.84
25	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.98	0.96	0.95	0.86	0.85	0.84
33	–	1.0	1.0	1.0	1.0	1.0	1.0	0.98	0.96	0.95	0.86	0.85	0.84
66	–	–	1.0	1.0	1.0	1.0	1.0	0.98	0.96	0.95	0.86	0.85	0.84
98	–	–	–	1.0	1.0	1.0	1.0	0.98	0.96	0.95	0.86	0.85	0.84
131	–	–	–	–	1.0	1.0	1.0	0.98	0.96	0.95	0.86	0.85	0.84
164	–	–	–	–	–	1.0	1.0	0.98	0.96	0.95	0.86	0.85	0.84

Table 34: WSU Capacity Heating Correction Factors.

Elevation Difference (ft.) Above WSU (HU)	Total Equivalent Length (TEL) in Feet									
	25	33	66	98	131	164	197	230	263	295
	Correction Factor									
0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.98	0.96	0.95
25	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.98	0.96	0.95
33	–	1.0	1.0	1.0	1.0	1.0	1.0	0.98	0.96	0.95
66	–	–	1.0	1.0	1.0	1.0	1.0	0.98	0.96	0.95
98	–	–	–	1.0	1.0	1.0	1.0	0.98	0.96	0.95
131	–	–	–	–	1.0	1.0	1.0	0.98	0.96	0.95
164	–	–	–	–	–	1.0	1.0	0.98	0.96	0.95
Elevation Difference (ft.) Below WSU (HL)	Total Equivalent Length (TEL) in Feet									
	25	33	66	98	131	164	197	230	263	295
	Correction Factor									
0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.98	0.96	0.95
25	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.98	0.96	0.95
33	–	1.0	1.0	1.0	1.0	1.0	1.0	0.98	0.96	0.95
66	–	–	1.0	1.0	1.0	1.0	1.0	0.98	0.96	0.95
98	–	–	–	1.0	1.0	1.0	1.0	0.98	0.96	0.95
131	–	–	–	–	1.0	1.0	1.0	0.98	0.96	0.95
164	–	–	–	–	–	1.0	1.0	0.98	0.96	0.95

Building Ventilation Design Guide

ASHRAE 62.1 and local codes specify the minimum volume of outdoor air that must be provided to an occupied space. Outdoor air is required to minimize adverse health effects, and it provides acceptable indoor air quality for building occupants. The five methods of accomplishing this with LG Multi V Water IV systems are summarized here.

Note:

Disclaimer

Although we believe that these building ventilation methods have been portrayed accurately, none of the methods have been tested, verified, or evaluated by LG Electronics, U.S.A., Inc. In all cases, the designer, installer, and contractor should understand if the suggested method is used, it is used at their own risk. LG Electronics U.S.A., Inc., takes no responsibility and offers no warranty, expressed or implied, of merchantability or fitness of purpose if this method fails to perform as stated or intended.

- *For a complete copy of Standard 62.1-2010, refer to the American Society of Heating and Air Conditioning Engineers (ASHRAE) website at www.ashrae.org.*
- *For more information on how to properly size a ventilation air pretreatment system, refer to the article, "Selecting DOAS Equipment with Reserve Capacity" by John Murphy, published in the ASHRAE Journal, April 2010.*

Method 1: Decoupled Dedicated Outdoor Air System

The decoupled, dedicated outdoor air system (DDOAS) method provides a separate, dedicated outdoor-air system designed to filter, condition, and dehumidify ventilation air and deliver it directly to the conditioned space through a separate register or grille. This approach requires a separate independent ventilation duct system not associated with the Multi V Water IV system.

Note:

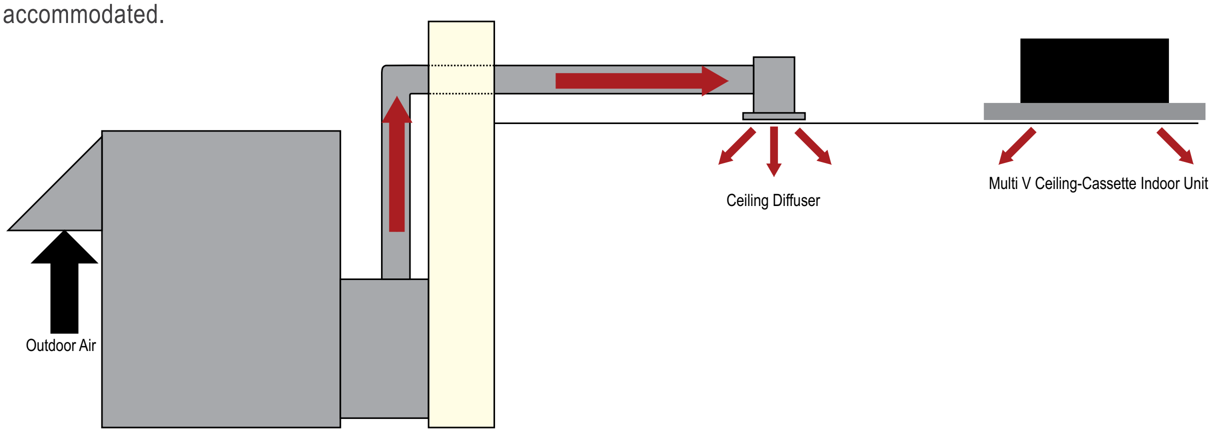
LG recommends using the DDOAS method in all installations.

Advantages

- Does not add additional heating or cooling loads to indoor units.
- May be used with the full lineup of LG indoor units.
- If the outdoor air unit fails, the resulting untreated air will be readily noticed by the occupants.
- The outdoor air unit may supply “neutral” air to the occupant space even when the Multi V indoor unit fan changes speed or cycles on and off. DDOAS controls do not have to be interlocked with the Multi V Water IV system.
- In lieu of installing localized smaller outside air treatment equipment throughout the building, this method centralizes the ventilation air source making service and filter changes easier and less disruptive for the building occupants.
- Indoor unit operation and performance will not be affected by the condition of outdoor air.
- Third-party demand control ventilation controls are more readily accommodated.

Disadvantages

- Ceiling space is required to accommodate ductwork between the centralized outdoor air unit and ceiling diffusers.

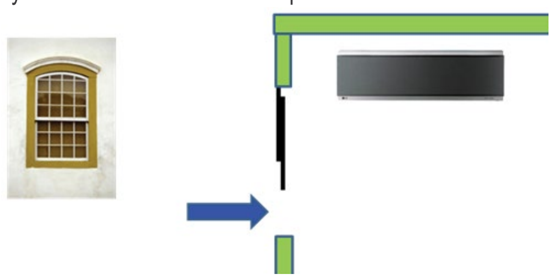


Method 2: Unconditioned Outdoor Air (Non-Ducted, Natural Ventilation)

Natural ventilation devices, such as operable windows or louvers may be used to ventilate the building when local code permits. The open area of a window or the free area of a louver must meet the minimum percentage for the net occupied floor area.

Advantages

- Occupants control the volume of the ventilation air manually.
- Useful for historic buildings that have no ceiling space available for outdoor air ductwork.
- May be used with the full lineup of Multi V indoor units.



Disadvantages

- In some locations, it may be difficult to control humidity levels when windows are open.
- Thermal comfort levels may be substandard when windows are open.
- Indoor units may have to be oversized to account for the added heating and cooling loads when windows are open.
- Provides outdoor air to perimeter spaces only. Additional mechanical ventilation system may be required to satisfy requirements for interior spaces.
- Outdoor air loads may be difficult to calculate since the quantity of outdoor air is not regulated.
- May affect indoor unit proper operation when open.

Method 3: Unconditioned Outdoor Air Ducted to Indoor Units

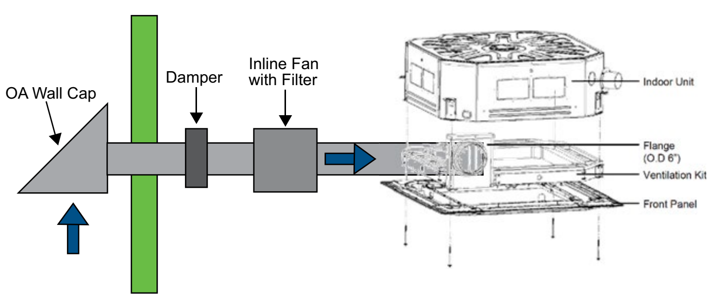
Untreated outdoor air is channeled through a duct system that is piped to the return air duct on Multi V concealed indoor units or to the frame of Multi V 1-way and 4-way cassettes.

⚠ *Note:*

Outside air may flow backward through the return air-filter grille when the indoor unit fan speed slows or stops in response to changes in the space load. This may result in captured particulate on the filter media being blown back into the conditioned space.

Advantages

- May require less ductwork if indoor units are placed near outdoor walls or a roof deck.
- Controls must be interlocked to shut off the outdoor air supply fan when the space is unoccupied.
- Third-party demand-control ventilation controls may be installed to regulate outdoor intake based on the CO_2 levels of the occupied space.



Disadvantages

- Fan(s) are required to push outdoor air to the indoor unit. Indoor units are engineered for low sound levels and are not designed to overcome the added static pressure caused by the outdoor air source ductwork.
- Ventilation air must be pre-filtered before mixing with the return air stream. LG indoor cassette models are configured to introduce the ventilation air downstream of the return air filter media.
- 1-way and 4-way ducted cassette models are the only indoor units that accept connection of an outdoor air duct to the unit case.
- Mixed air conditions must be between a minimum of 59°F DB while operating in heating and a maximum of 76°F WB while operating in cooling. Depending on the ventilation air volume requirement, the location choices are limited where untreated outside air may be introduced to the building using this method.
- Larger indoor units may be required to satisfy demand because of the additional outdoor air.
- Motorized dampers may be required to prevent outdoor air flow through the indoor unit when the indoor unit is not operating.
- An LG Dry Contact adapter may be necessary to interlock the motorized damper with the indoor unit.
- While operating in heating, the untreated outdoor air may delay the start of the indoor unit fan impacting building comfort.
- In most cases, in lieu of using the factory mounted return-air thermistor on indoor units, a remote wall temperature sensor or zone controller will be needed for each indoor unit to provide an accurate reading of the conditioned area temperature.

Method 4: Unconditioned Outdoor Air (Non-Ducted, Fan Assisted Ventilation)

The fan assisted ventilation method is available if approved by local code. Exhaust fans remove air from the building, and outdoor air is drawn into occupied spaces through a wall louver or gravity roof intake hood. Supply fans can also push outdoor air into the space and building positive pressure will vent exhaust air through louvers or roof-mounted exhaust hoods. Outdoor air is neither cooled nor heated before entering the building.

⚠ *Note:*

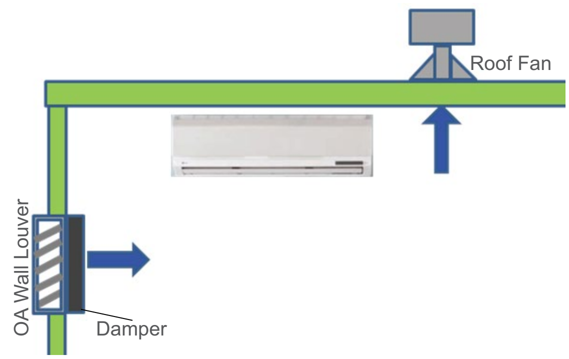
This method may result in loss of building pressurization control, causing adverse effects due to increased infiltration loads.

Advantages

- Outdoor air may be manually controlled by the occupant or automatic controls may be installed to open/close outdoor air dampers or to turn on/off ventilation fans.
- Useful for large open spaces like warehouses, garages, and workshops.
- Outdoor air volume is a known quantity. Air loads may be easier to calculate since fans will regulate the amount of outdoor air.
- May be used with a full lineup of Multi V indoor units.

Disadvantages

- In some climates it may be difficult to control humidity levels while outdoor air louvers/hoods are opened.
- Thermal comfort levels may be substandard when louvers or hoods are open.
- Indoor units may have to be oversized to account for the added heating/cooling loads when louvers or hoods are open.
- Hot, cold, and/or humid areas may be present if the outdoor air is not evenly distributed to the different spaces.



Method 5: Coupled Dedicated Outdoor Air

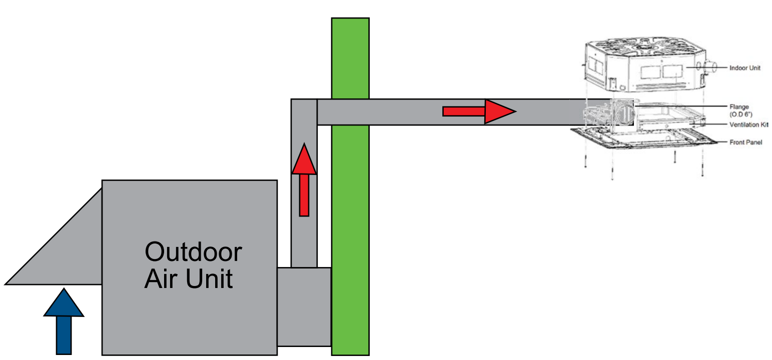
The Coupled Dedicated Outdoor Air (CODA) method uses a separate, dedicated outdoor air system to deliver air directly to a Multi V indoor unit or to the return air duct system. After mixing with the return air stream, ventilation air passes through the indoor unit and into the conditioned space. The pretreatment system is capable of filtering, conditioning, and dehumidifying outdoor air to room conditions.

⚠ *Note:*

Outside air may flow backward through the return air-filter grille when the indoor unit fan speed is reduced or stops when the space load is satisfied. This may result in captured particulate on the filter media being blown back into the conditioned space.

Advantages

- Separate ceiling registers or grilles for introduction of the outside air to the conditioned space may be avoided.



Disadvantages

- Ducted, 1-way, and 4-way cassette indoor units are the only models designed for direct connection of an outside air duct.
- The building occupant may not notice the outdoor air pretreatment system has malfunctioned until the unconditioned outdoor air exceeds the indoor unit mixed air limits of 59°F DB for heating and 76°F WB for cooling.
- If the coil entering air condition limitation is exceeded, the indoor unit may malfunction and cease to operate.
- If the outdoor air unit cooling or heating system fails, the malfunction may be masked by the indoor unit ramping up operating parameters to compensate for the failure.
- Motorized dampers may be required to prevent outdoor air from entering the indoor unit while the indoor unit is off.
- An LG Dry Contact adapter is necessary to interlock the motorized damper with the indoor unit fan operation.
- In lieu of using the factory mounted return-air thermistor, a remote wall temperature sensor or zone controller may be required to provide an accurate conditioned space temperature reading.

PLACEMENT CONSIDERATIONS

Heat Pump and Heat Recovery Water Source Units

WARNING

Water source units are not weatherproof. Always install water source units indoors. Failure to observe this warning can damage the equipment and/or create an electrical hazard that can result in death or severe injury.

Carefully consider where the water source units will be installed. Select an indoor location(s) that meet these conditions:

- The floor must be waterproof and bear the weight of the unit(s).
- The floor must contain a liquid drainage system and have a slight slope to aid in liquid drainage.
- Allow space for air passage, installation and service work.
- Install the unit(s) in a separate machine room not exposed to external air.
- Install the unit(s) in a space where the ambient temperature is within 32–104°F.
- Install the unit(s) so that noise from the machine room is not transferred outside.
- Have an anti-freeze plan for the water supply if the unit(s) is stopped during cold weather.
- Do not install units in a space exposed to flammable material like thinner or gasoline.
- Do not install units in a space where generation, inflow, or leakage of combustible gas is expected.
- Do not install units in a space exposed to acidic solution/spray, oil, steam or sulfuric gas.
- Do not install units in a space containing carbon fiber or combustible dust.
- Do not install units near equipment that generates electromagnetic radiation.

Moving Water Source Units

Moving requirements for water source units are shown in Figure 18.

WARNING

Ensure all moving equipment is capable of moving the size and weight of the water source units. Refer to the size and weight specifications listed in Chapter 2. Only qualified personnel should operate moving equipment. Wear protective gloves when handing the moving equipment and water source units. Refer to the Multi V Water IV Installation, Operation and Maintenance Manual for additional moving warnings.

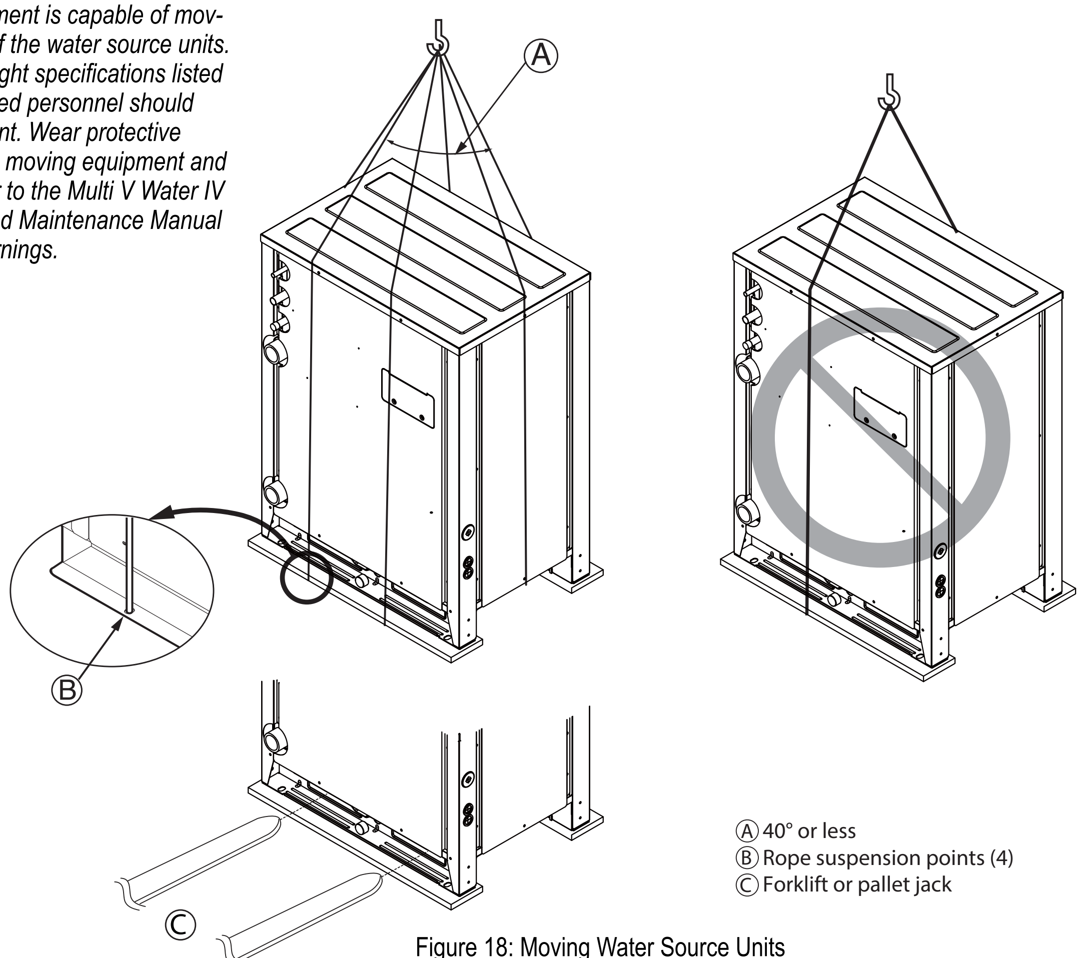


Figure 18: Moving Water Source Units

Single Frame Installation

Install single frame water source units as shown in Figure 19. Anchor bolt locations are shown in Figure 23.

⚠ Note:

- *Consult with LG Electronics, U.S.A., Inc. if the available space is less than shown.*
- *If water piping passes along the side of a frame, ensure the indicated space is available after considering the space taken by the piping.*

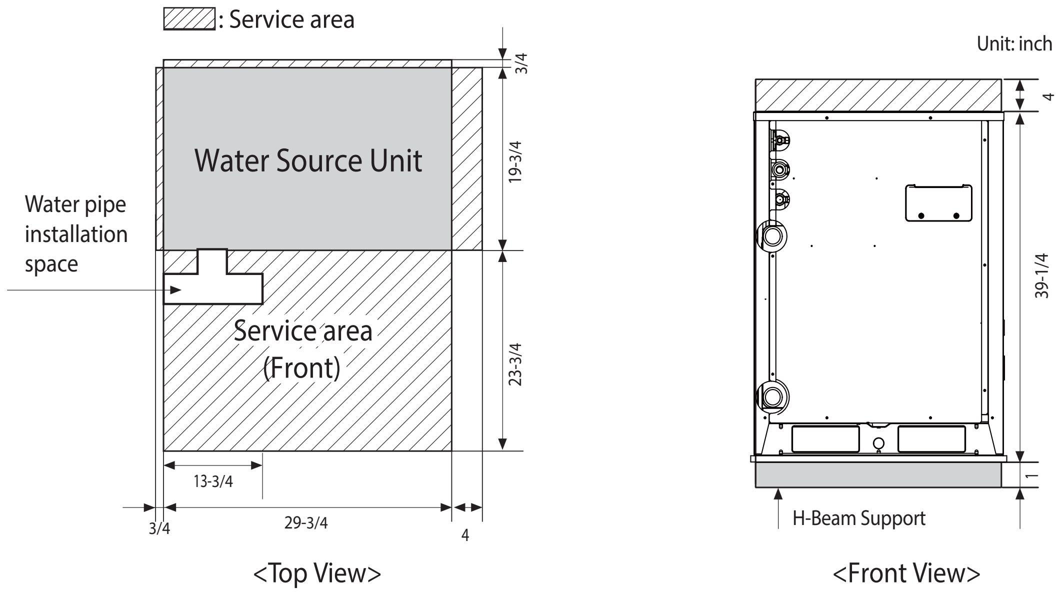


Figure 19: Single Frame Installation.

Dual Frame Installation

Install dual frame water source units as shown in Figure 20. Anchor bolt locations are shown in Figure 23.

⚠ Note:

- *Consult with LG Electronics, U.S.A., Inc. if the available space is less than shown.*
- *If water piping passes along the side of a frame, ensure the indicated space is available after considering the space taken by the piping.*

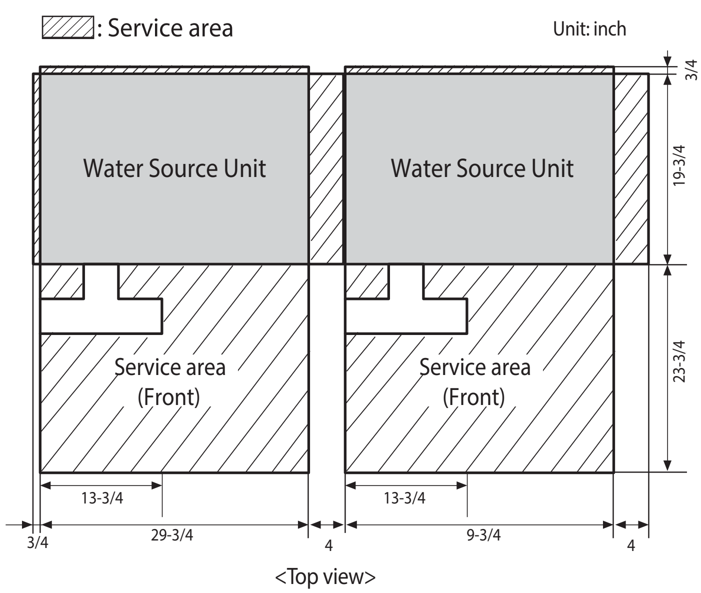


Figure 20: Dual Frame Installation.

Triple Frame Installation

Install triple frame water source units as shown in Figure 21. Anchor bolt locations are shown in Figure 23.

⚠ Note:

- *Consult with LG Electronics, U.S.A., Inc. if the available space is less than shown. If water piping passes along the side of a frame, ensure the indicated space is available after considering the space taken by the piping.*

Stacked Frame Installation

Install stacked frame water source units as shown in Figure 22. Anchor bolt locations are shown in Figure 23.

⚠ Note:

- *Consult with LG Electronics, U.S.A., Inc. if the available space is less than shown. If water piping passes along the side of a frame, ensure the indicated space is available after considering the space taken by the piping.*

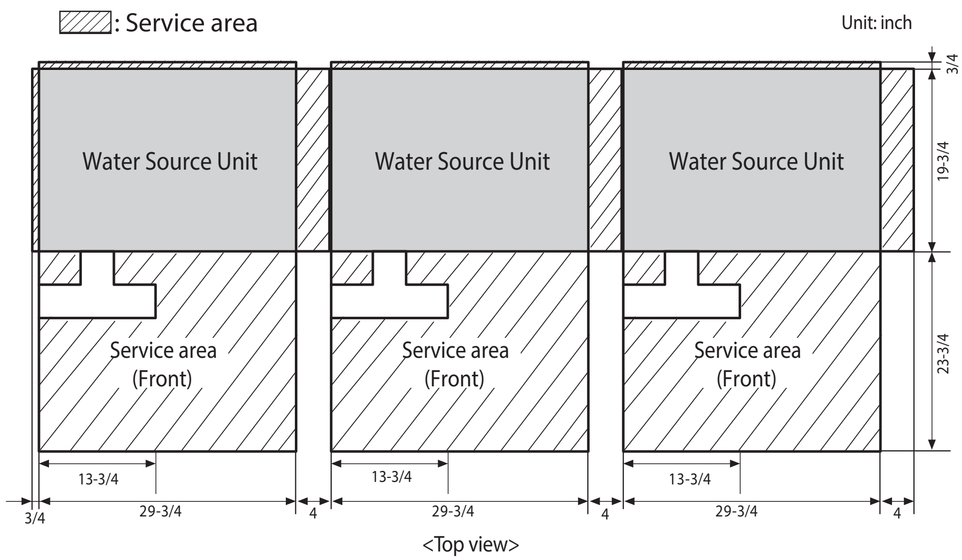


Figure 21: Triple Frame Installation.

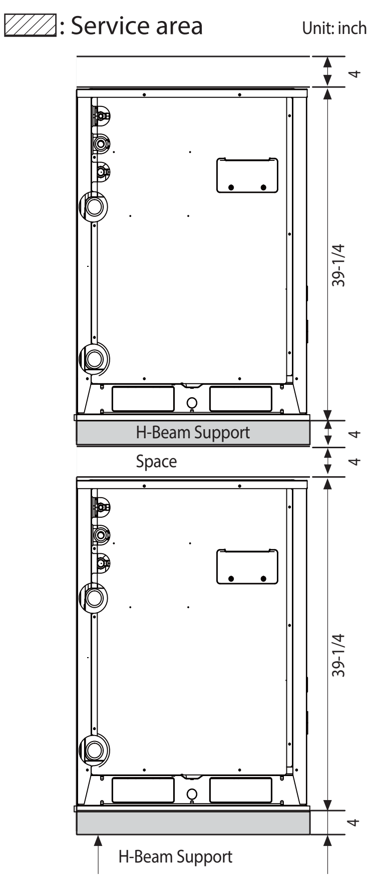


Figure 22: Stacked Frame Installation.

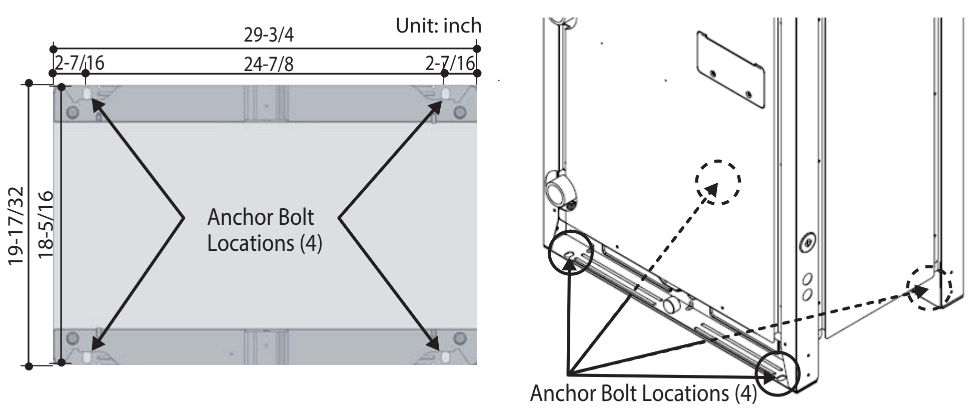


Figure 23: Anchor Bolt Locations.

⚠ Note:

Heat recovery units are for use with ARWB Series heat recovery systems 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.
- Refrigerant pipes must not exceed lengths specified by LG Electronics, U.S.A., Inc.
- Do not install the heat recovery unit in a location where it would be subjected to strong radiated heat from any heat source.
- Avoid an installation environment where oil splattering, vapor spray, or high-frequency electric noise could occur.
- 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.
- Condensate drain piping is not required.

Figure 24: Dimensions for Heat Recovery Units.

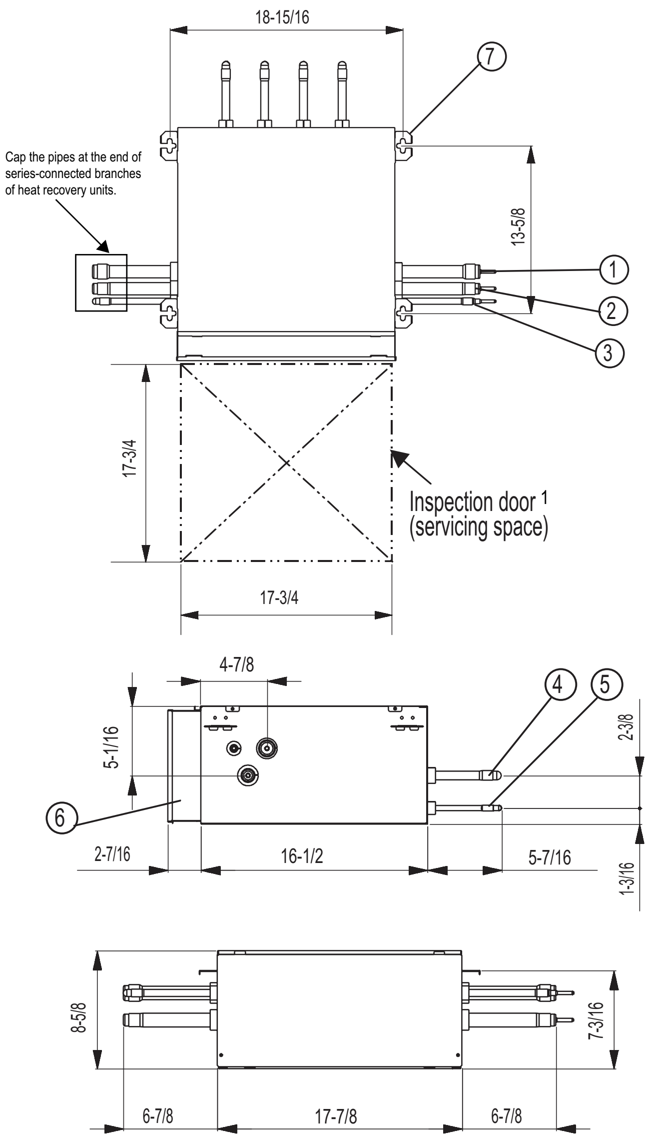


Figure 25: Minimum Service Clearances for Heat Recovery Units.

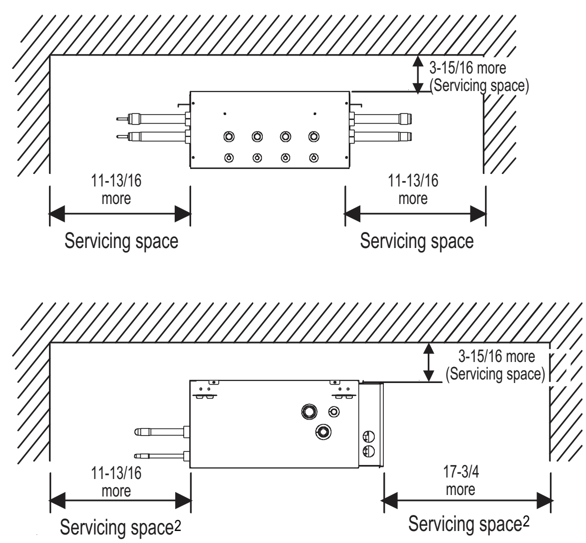


Table 35: Heat Recovery Unit Parts.

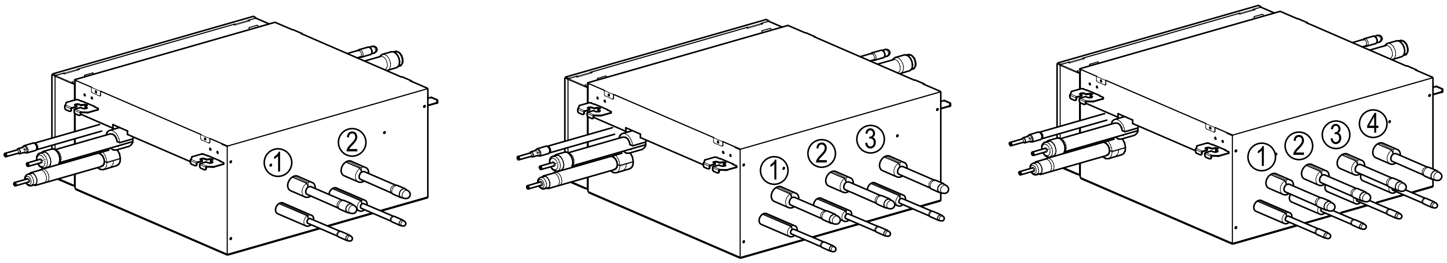
Tag No.	Part Name	Connection Size(in.)/Type	
		PRHR021A	PRHR031A/041A
1	Low pressure vapor pipe connection port	7/8 Braze	1-1/8 Braze
2	High pressure vapor pipe connection port	3/4 Braze	7/8 Braze
3	Liquid pipe connection port	3/8 Braze	1/2 Braze
4	Indoor unit vapor pipe connection port	5/8 Braze	5/8 Braze
5	Indoor unit liquid pipe connection port	3/8 Braze	3/8 Braze
6	Control box	–	–
7	Hanger bracket	3/8 or 5/16	3/8 or 5/16

[1]Locate the inspection door at the control box side of the heat recovery unit. If reducers are used, space for service access must be increased to match the dimensions of the reducer.

PLACEMENT CONSIDERATIONS

Heat Recovery Unit

Figure 26: Heat Recovery Unit Types.



PRHR021A (Two [2] ports) PRHR031A (Three [3] ports) PRHR041A (Four [4] ports)

1. Each heat recovery unit has a capacity up to 192,000 Btu/h.
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 at the same elevation.
3. Elevation difference between heat recovery units connected in series is permitted, but should not exceed 16 feet.
4. Each port on the heat recovery unit has a capacity up to 54,000 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 54,000 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.
8. Elevation difference between the heat recovery unit and the indoor unit(s) should not exceed 131 feet.

REFRIGERANT PIPING DESIGN & LAYOUT BEST PRACTICES

Proper refrigerant piping design and installation is a critical element of the Multi V system. Multi V Water IV Heat Pump requires two pipes between system components – a liquid line and a vapor line. Multi V Water IV Heat Recovery requires three pipes between the water source unit and the heat recovery unit – a liquid line, a low-pressure vapor line, and a high-pressure vapor line. A properly designed refrigerant piping system ensures that refrigerant is delivered to the evaporator coil's electronic expansion valve (EEV) in a pure liquid state free of gas bubbles. Proper design also ensures sufficient refrigerant gas flow rate in the vapor line to eliminate the possibility of refrigeration oil collecting in the vapor lines.

Refrigerant Piping Quality Assurance

LG's LATS Multi V software makes designing the refrigerant system easy. LATS Multi V is a Windows®-based application that assists the engineer in the design of the refrigeration distribution pipe system, verifies the design complies with pipe design limitations, applies capacity correction factors, and calculates the system refrigerant charge. The piping system can be entered manually into LATS from a one-line pipe diagram.

⚠ Note:

All refrigerant pipe used with LG air conditioning systems must be Type ACR copper pipe. All pipe diameter measurements are in inches, outside diameter (OD).

The piping system can be engineered manually using "Manual Layout Procedure" on page 108; however, the preferred method is to design the system using LG's LATS Multi V software. The illustrations and tables on the following pages are provided as data for the manual procedure. They are not required for LATS.

To ensure the refrigerant piping design meets LG's quality standards, a LATS refrigerant piping design must be provided with every Multi V Water IV order. After installation, if any changes or variations to the design are necessary, a new LATS file must be created and provided to LG prior to system commissioning to ensure proper pipe size has not changed.

Adjusting LATS Multi V Output for Altitude

When a system is installed at elevations significantly above sea level, the designer must also consider the impact air density has on the capacity of the indoor and water source units. An altitude correction factor must be manually applied to the indoor and water source unit data provided in the LATS report. Use locally accepted altitude correction factors to adjust capacities.

Design Choices

LATS Multi V software is flexible, offering the HVAC system engineer a choice of two design methods: CAD mode and Tree mode.

CAD Mode

Using CAD mode, refrigerant pipe design and layout is performed concurrently. Import a copy of a plan view drawing (.dwg format) for floor structure into LATS Multi V software. Multi V water source units, heat recovery units, and indoor units can be selected from drag and drop lists and placed on the drawing(s), and interconnecting pipes between system components will be drafted directly on the drawing. LATS will size the refrigerant piping, certify the design, and provide a detailed materials report and system schematic. Use the export feature to create a CAD file (.dxf format) that can subsequently be imported into the building design drawings. LATS allows you to:

- Import the building's architectural CAD (.dwg or .dxf formats)
- Import building loads from an external file (.xls or .xlsx formats)
- Layout refrigerant piping onto an overlay of the building drawing
- Automatically calculate pipe segment lengths based on drawing layout
- Create export image for import to building drawing set (.dxf format)
- Generate a system engineering report (.xls or .xlsx formats)

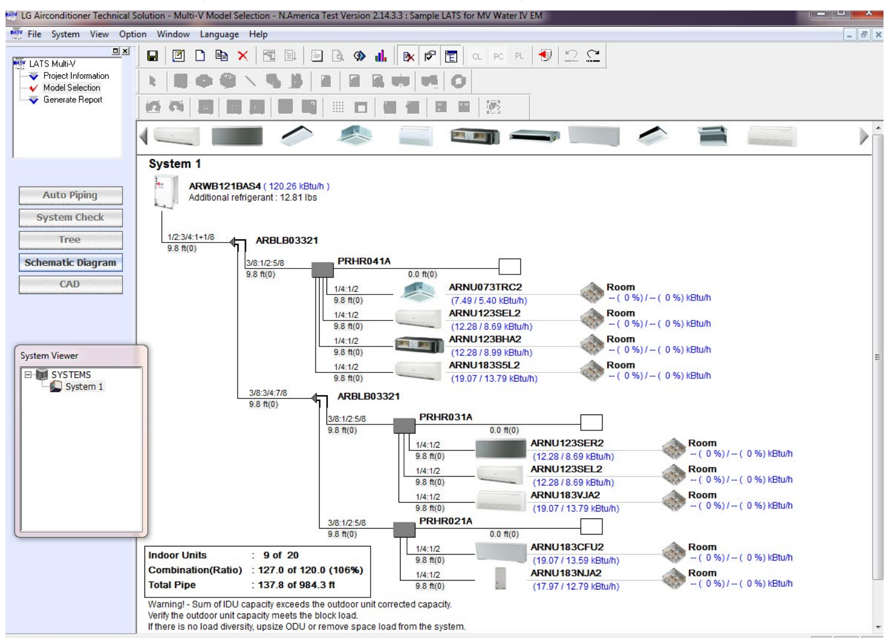
Tree Mode

Using the TREE mode, the engineer can quickly create a one-line schematic drawing of the Multi V Water IV system. Integration of the engineered pipe system into the building drawings is done at a later date by the draftsperson using standard drafting software tools.

- Import building loads from an external file (.xls or .xlsx formats)
- Components selected using an easy drag and drop process
- Automatically analyzes and checks the design complies with most piping design limitations
- Sizes refrigerant piping
- Generates a system engineering report (.xls or .xlsx formats).

LATS Multi V software generates a report file (.xls or .xlsx formats) containing project design parameters, cooling and heating design day system component performance, and capacity data. The report calculates the system combination ratio, calculates the system refrigerant charge, and provides detailed bill of material information including a list of Multi V Water IV water source units, air handlers, control devices, accessories, refrigerant pipe sizes segregated by building, by system, by pipe size, and by pipe segments.

Figure 27: LATS Pipe System Design Tool in Tree Mode.



Device Connection Limitations

- The minimum number of connected and operating IDUs in a Multi V Water IV system is one, taking into consideration the minimum combination ratio.
- The maximum number of IDUs on Multi V Water IV systems are listed in Table 36 and Table 37.

Table 36: Heat Pump Maximum IDUs by Model Number.

Heat Pump Model *208-230V/460V*	IDU Max. Qty. *208-230V/460V*
ARWN072BAS4 / ARWN072DAS4	13/13
ARWN096BAS4 / ARWN096DAS4	16/16
ARWN121BAS4 / ARWN121DAS4	20/20
ARWN144BAS4 / ARWN144DAS4	23/23
ARWN168BAS4 / ARWN168DAS4	29/29
ARWN192BAS4 / ARWN192DAS4	32/32
ARWN216BAS4 / —	35/ –
— / ARWN240DAS4	– /39
ARWN288BAS4 / ARWN288DAS4	45/45
— / ARWN336DAS4	– /55
ARWN360BAS4 / —	58/ –
— / ARWN384DAS4	– /61
ARWN480BAS4 / ARWN480DAS4	64/64
— / ARWN576DAS4	– /64

Table 37: Heat Recovery Maximum IDUs by Model Number.

Heat Recovery Model *208-230V/460V*	IDU Max. Qty. *208-230V/460V*
ARWB072BAS4 / ARWB072DAS4	13/13
ARWB096BAS4 / ARWB096DAS4	16/16
ARWB121BAS4 / ARWB121DAS4	20/20
ARWB144BAS4 / ARWB144DAS4	23/23
ARWB168BAS4 / ARWB168DAS4	29/29
ARWB192BAS4 / ARWB192DAS4	32/32
ARWB216BAS4 / —	35/ –
— / ARWB240DAS4	– /39
ARWB288BAS4 / ARWB288DAS4	45/45
— / ARWB336DAS4	– /55
ARWB360BAS4 / —	58/ –
— / ARWB384DAS4	– /61
ARWB432BAS4 / —	64/ –
— / ARWB480DAS4	– /64
— / ARWB576DAS4	– /64

One of the most critical elements of a Multi V Water IV system is the refrigerant piping. Table 38 lists pipe length limits that must be followed in refrigerant pipe system design. All refrigerant piping must be Type ACR copper pipe.

Table 38: Multi V Water IV Refrigerant Piping System Limitations.

Pipe Length (ELF = Equivalent Length of Pipe in Feet)	Longest total equivalent piping length	1,640 feet
	Longest distance from water source unit to indoor unit	656 feet (Actual) 738 feet (Equivalent)
	Distance between fittings and indoor units	≥20 inches
	Distance between fittings and Y-branches	≥20 inches
	Distance between two Y-branches	≥20 inches
	Distance between two series-piped heat recovery units	≥20 inches
	Minimum distance between indoor unit to any Y-branch	3 feet from indoor unit to Y-branch
	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 water source unit is above or below indoor unit	360 feet
	Between indoor units on heat pump systems or indoor units connected to separate parallel heat recovery units	131 feet
	Indoor unit to heat recovery unit; heat recovery unit to heat recovery unit	49 feet

Table 39: Equivalent Piping Length for Y-branches, Headers, and Other Piping Components.

Equivalent Lengths of Refrigerant Pipe Components															
Elbow (90° or 45°)	Size, inches OD	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
	Equivalent Length (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 ARWB Heat Recovery Units only)		8.2													

[1]*Kit for ARWN Heat Pump systems contains two Y-branches: one for liquid and one for vapor; Kit for ARWB Heat Recovery systems contains three Y-branches: one for liquid, one for low-pressure vapor, one for high-pressure vapor.*

Figure 28: Typical VRF Heat Pump System Building Layout.

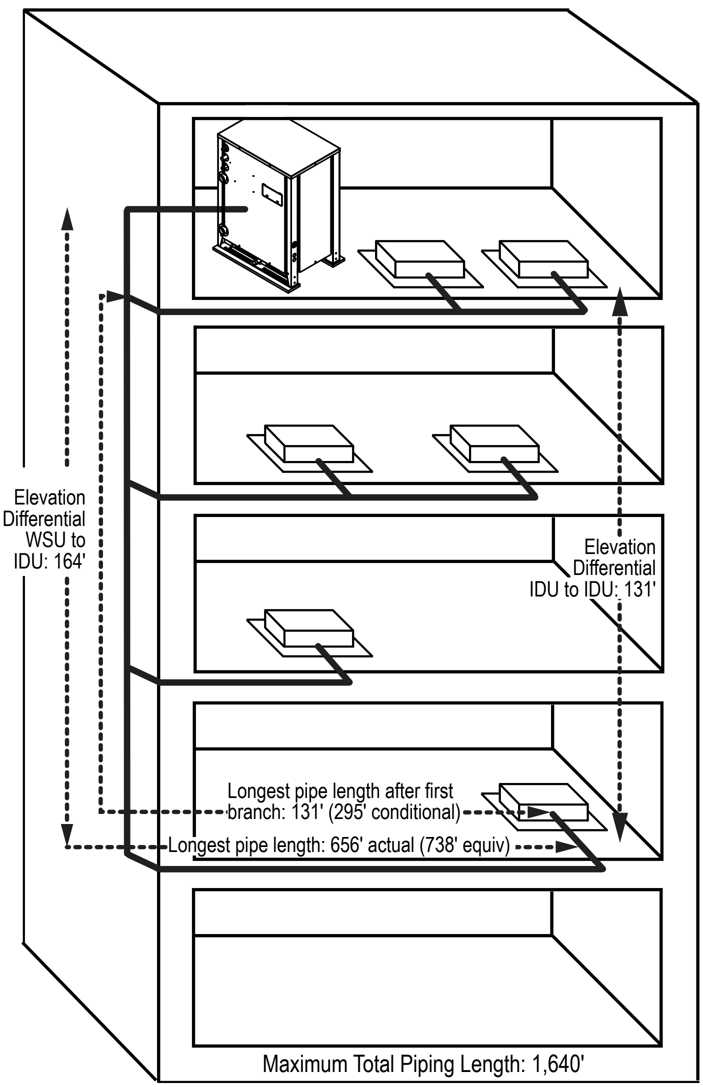
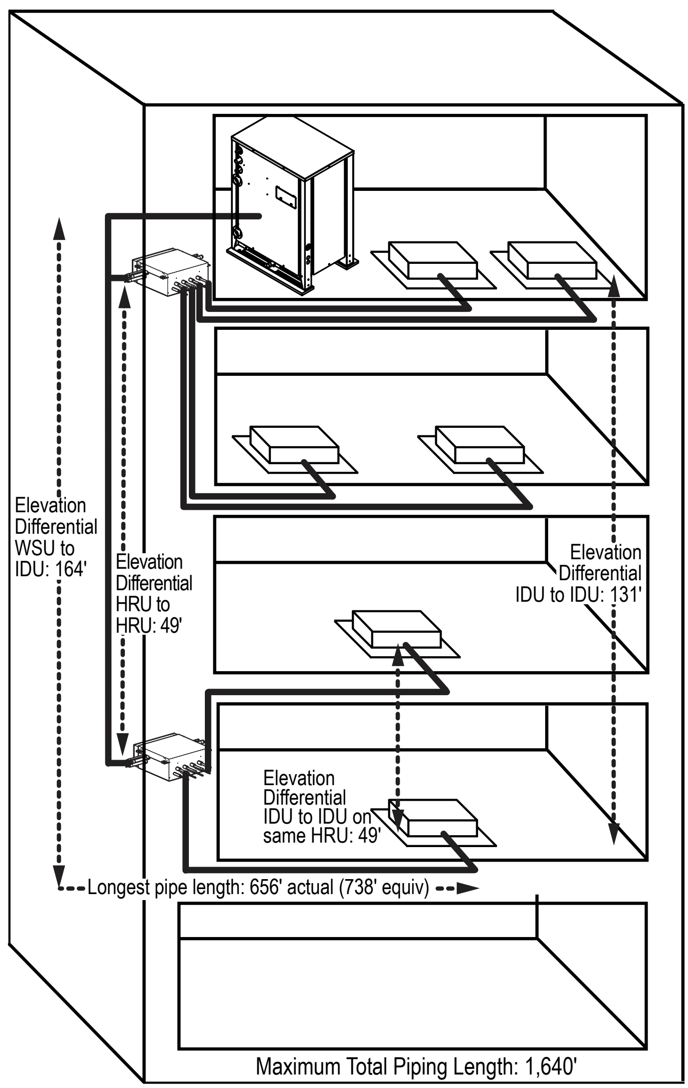
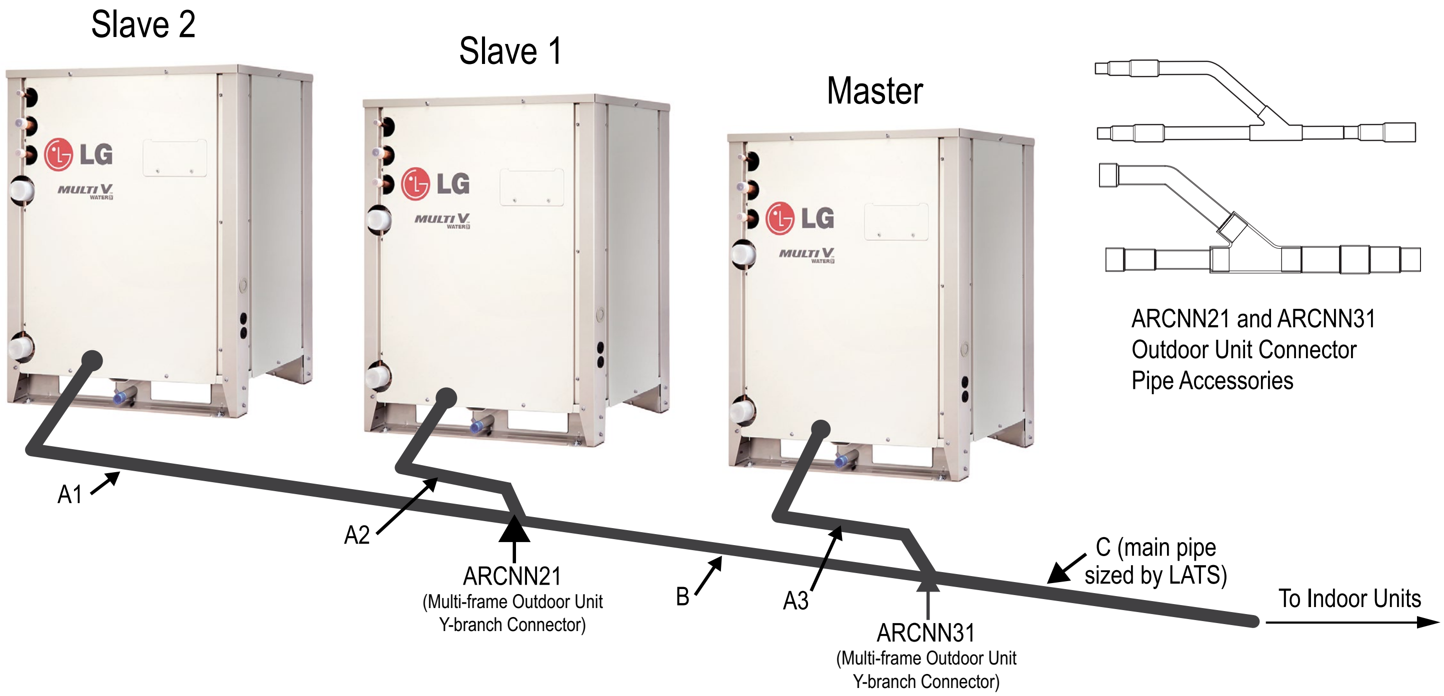


Figure 29: Typical VRF Heat Recovery System Building Layout.



Triple-Frame Heat Pump Water Source Unit Connections

Figure 30: Heat Pump Triple-Frame Connections.



A1, A2, and A3 diameters match the water source unit connection diameters. Main pipe C diameters are sized by LATS. See the table below for B diameters.

Note:
- *For single and dual-frame systems, the pipe size is the same size as the frame connections.*

Table 40: Heat Pump Triple-Frame Connection Pipe Sizes.

Size (tons)	Model	Master	Slave1	Slave2	B			
					Equivalent pipe length from WSU to farthest IDU is <295'		Equivalent pipe length from WSU to farthest IDU is ≥295'	
					Liquid	Vapor	Liquid	Vapor
30	ARWN360BAS4	ARWN144BAS4	ARWN144BAS4	ARWN072BAS4	3/4"	1-3/8"	7/8"	1-5/8"
36	ARWN432BAS4	ARWN144BAS4	ARWN144BAS4	ARWN144BAS4	3/4"	1-3/8"	7/8"	1-5/8"
40	ARWB480DAS4	ARWB192DAS4	ARWB144DAS4	ARWB144DAS4	3/4"	1-3/8"	7/8"	1-5/8"
48	ARWB576DAS4	ARWB192DAS4	ARWB192DAS4	ARWB192DAS4	3/4"	1-3/8"	7/8"	1-5/8"

Note:
- *Larger-capacity water source units must be the master in a multi-frame system.*
- *Master water source unit capacity must be greater than or equal to the slave 1 water source unit capacity, and, where applicable, slave 1 water source unit capacity must be greater than or equal to the slave 2 water source unit capacity.*
- *Insulate all refrigerant system piping and piping connections as described in "Refrigerant Piping System Insulation" on page 127.*

REFRIGERANT PIPING DESIGN

Pipe Sizing for ARWN Series Heat Pump Systems

The following is an example of manual pipe size calculations. Designers are highly encouraged to use LATS instead of manual calculations.

Combination Y-branch Pipe and Header Pipe Sizing When Installing a Dual-Frame System

Example: Five (5) indoor units connected

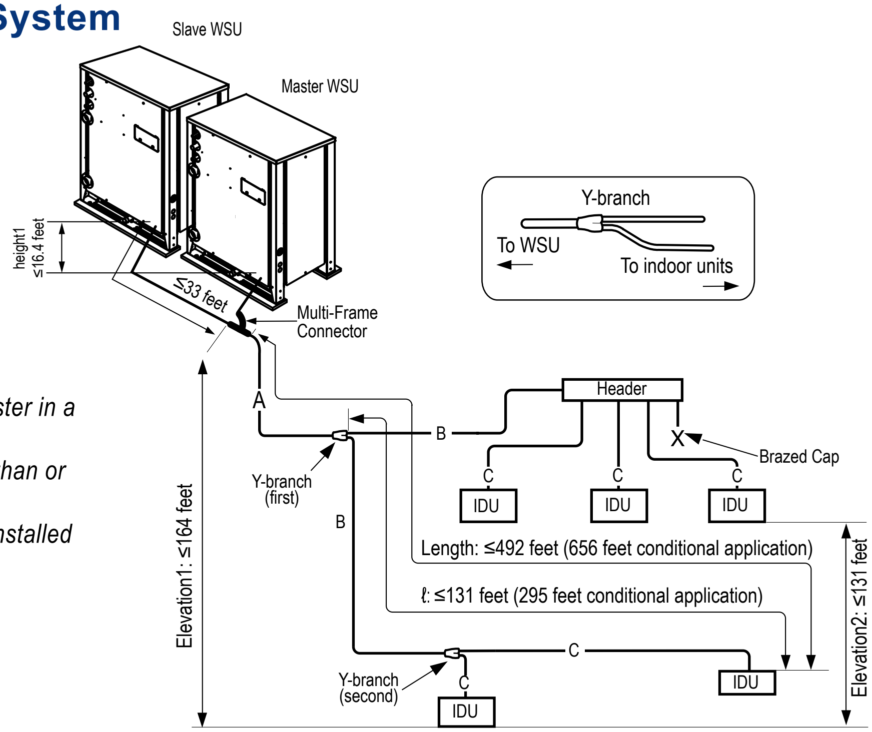
WSU: Water Source Unit

IDU: Indoor Unit

A: Main Pipe from Water Source Unit to First Y-branch

B: Y-branch to Y-branch / Header

C: Y-branch / Header to Indoor Unit



⚠ Note:

- *Larger-capacity water source units must be the master in a multi-frame system.*
- *Master water source unit capacity must be greater than or equal to the slave water source unit capacity.*
- *Y-branches and other header branches cannot be installed downstream of the initial header branch.*

Table 41: Main Pipe (A) Diameter from Water Source Unit to First Y-branch / Header Branch.

WSU Capacity (tons)	Equivalent pipe length from WSU to farthest IDU is <295 ft.		Equivalent pipe length from WSU to farthest IDU is ≥295 ft.	
	Liquid pipe (inches OD)	Vapor pipe (inches OD)	Liquid pipe (inches OD)	Vapor pipe (inches OD)
6	3/8	3/4	1/2	7/8
8	3/8	7/8	1/2	1-1/8
10	1/2	1-1/8	5/8	1-1/8
12	1/2	1-1/8	5/8	1-1/8
14	1/2	1-1/8	5/8	1-3/8
16	1/2	1-1/8	5/8	1-3/8
18	3/4	1-3/8	7/8	1-5/8
20	3/4	1-3/8	7/8	1-5/8
24	3/4	1-3/8	7/8	1-5/8
28	3/4	1-5/8	7/8	1-5/8
30	3/4	1-5/8	7/8	1-5/8
32	3/4	1-5/8	7/8	1-5/8
34	3/4	1-5/8	7/8	1-5/8
36	3/4	1-5/8	7/8	1-5/8
40	3/4	1-5/8	7/8	1-5/8
48	3/4	1-5/8	7/8	1-5/8

Table 42: Refrigerant Pipe Diameter (B) 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	1/4	1/2
≤54,600	3/8	5/8
≤76,400	3/8	3/4
≤112,600	3/8	7/8
≤160,400	1/2	1-1/8
≤242,300	5/8	1-1/8
≤354,900	3/4	1-3/8
>354,900	3/4	1-5/8

[1]For the first branch pipe, use the branch pipe that matches main pipe A diameter.

Table 43: Indoor Unit Connecting Pipe from Branch (C).

Indoor Unit Capacity[1]	Liquid pipe (inches OD)	Vapor pipe (inches OD)
≤19,100	1/4	1/2
≤54,600	3/8	5/8
≤76,400	3/8	3/4

[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 3/8 in (liquid) and 5/8 in (vapor).

The following is an example of manual pipe size calculations. Designers are highly encouraged to use LATS instead of manual calculations.

Table 44: Heat Pump Pipe Capabilities.

Length:	Total pipe length Longest actual pipe length Equivalent pipe length[1]	A + ΣB + ΣC ≤ 1,640 feet ≤656 feet ≤738 feet
ℓ:	Longest pipe length after first branch	≤131 feet (295 feet conditional application)
Elevation 1:	Elevation differential (Water Source Unit ↔ Indoor Unit)	Height ≤164 feet
Elevation 2:	Elevation differential (Indoor Unit ↔ Indoor Unit)	Height ≤131 feet
Height 1:	Elevation differential (Water Source Unit ↔ Water Source Unit)	16.4 feet
Distance between WSU to WSU		≤33 feet
Distance between fittings and IDU		≥20 inches
Distance between fittings and Y-branches / Headers		≥20 inches
Distance between two Y-branches / Headers		≥20 inches

[1]For calculation purposes, refer to Table 38 for equivalent lengths of refrigerant pipe system components.

Note:
- *Connection piping from branch to branch cannot exceed the main pipe diameter (A) used by the water source unit.*
- *Y-branches and other header branches cannot be installed downstream of the initial header branch.*
- *Indoor units must be installed at a position lower than the header.*
- *Install the header branch so that the pipe distances between the connected indoor units are minimized. Large differences in pipe distances can cause indoor unit performances to fluctuate.*
- *Always reference the LATS Multi V software report.*

Conditional Applications

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

If the equivalent length between the first Y-branch to the farthest indoor unit is >131 feet (up to 295 feet maximum):

- Pipe segment diameters between the first Y-branch and the second Y-branch should be sized up by one following the information in Table 42. This applies to both liquid and vapor pipes. If the next size up is not available, or if the piping segment diameters are the same as main pipe (A) diameters, sizing up is not possible.
- While calculating the entire refrigerant pipe length, pipe lengths for ΣB should be multiplied by two: A+(ΣBx2)+ΣC ≤1,640 feet.
- Length of pipe (C) from each indoor unit to the closest Y-branch or header ≤ 131 ft.
- [Length of pipe from water source unit to farthest indoor unit (A+B+C)] - [Length of pipe from water source unit to closest indoor unit (A+B+C)] ≤131 feet.

If the pipe (B) diameters after the first branch are bigger than the main pipe (A) diameters, pipe (B) should changed to match main pipe (A) sizes. Example: When an indoor unit combination ratio of 120% is connected to a 24-ton water source unit:
Water source unit main pipe (A) diameters: 1-3/8 inches (vapor) and 5/8 inches (liquid).

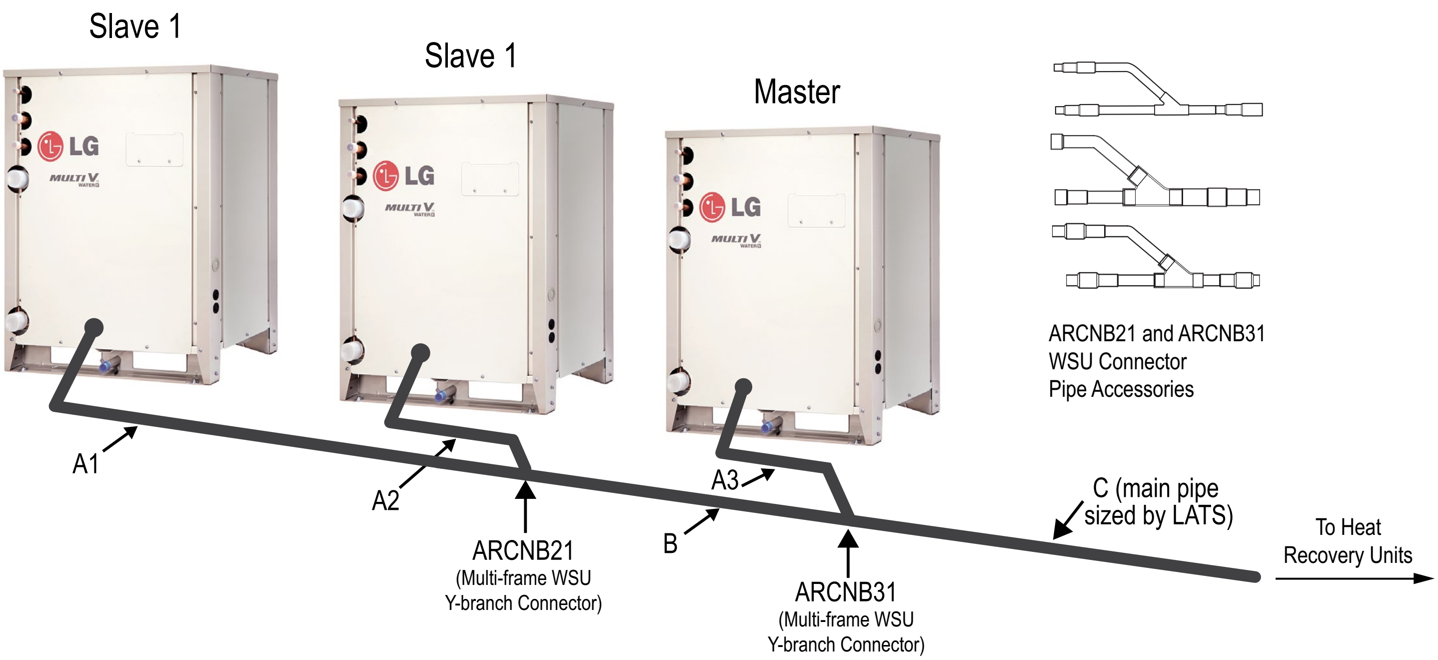
1. Pipe (B) diameters: 1-3/8 (vapor) and 3/4 (liquid) (after the first branch, when indoor unit combination ratio is 120% [26 tons]).
2. After the first branch, pipe (B) diameters must be changed to 1-3/8 inches (vapor) and 5/8 inches (liquid) to match main pipe (A) sizes.

Instead of using the total indoor unit capacity to choose main pipe (A) diameters, use water source unit capacity to choose downstream main pipe (A) diameters. Do not permit connection pipes (B) from branch to branch to exceed main pipe (A) diameters as indicated by water source unit. capacity. Example: When an indoor unit combination ratio of 120% is connected to a 20-ton water source unit (24 tons), and indoor unit with a 7,000 Btu/h capacity is located at the first branch:

1. Main pipe (A) diameters on a 20-ton water source unit: 1-1/8 inches (vapor) and 5/8 inches (liquid).
2. Pipe diameters between first and second branches, however, are: 1-3/8 (vapor) and 3/4 (liquid) (connected downstream indoor unit capacity is 20 tons).
3. If main pipe (A) diameters of a 20-ton water source unit are 1-1/8 (vapor) and 5/8 (liquid), then the pipe diameters between the first and second branches should be changed to match.

Triple-Frame Heat Recovery Water Source Unit Connections

Figure 31: Heat Recovery Triple-Frame Connections.



Diameters for A1, A2, and A3 match the water source unit connection diameters. Main pipe C diameters are sized by LATS. See the table below for B diameters.

⚠ *Note:*
- *For single and dual-frame systems, the pipe size is the same size as the frame connections.*

Table 45: Heat Recovery Triple-Frame Connection Pipe Sizes.

Size (tons)	Model	Master	Slave1	Slave2	B					
					Equivalent pipe length from WSU to farthest IDU is <295 ft.			Equivalent pipe length from WSU to farthest IDU is ≥295 ft.		
					Liquid (in)	Low Pressure Vapor (in)	High Pressure Vapor (in)	Liquid (in)	Low Pressure Vapor (in)	High Pressure Vapor (in)
30	ARWB360BAS4	ARWB144BAS4	ARWB144BAS4	ARWB072BAS4	3/4	1-3/8	1-1/8	7/8	1-5/8	1-1/8
36	ARWB432BAS4	ARWB144BAS4	ARWB144BAS4	ARWB144BAS4	3/4	1-3/8	1-1/8	7/8	1-5/8	1-1/8
40	ARWB480DAS4	ARWB192DAS4	ARWB144DAS4	ARWB144DAS4	3/4	1-3/8	1-1/8	7/8	1-5/8	1-1/8
48	ARWB576DAS4	ARWB192DAS4	ARWB192DAS4	ARWB192DAS4	3/4	1-3/8	1-1/8	7/8	1-5/8	1-1/8

⚠ *Note:*
- *Larger-capacity water source units must be the master in a multi-frame system.*
- *Master water source unit capacity must be greater than or equal to the slave1 water source unit capacity, and, where applicable, slave1 water source unit capacity must be greater than or equal to the slave2 water source unit capacity.*
- *Insulate all refrigerant system piping and piping connections as described in "Refrigerant Piping System Insulation" on page 127.*

The following is an example of manual pipe size calculations. Designers are highly encouraged to use LATS instead of manual calculations.

Pipe Sizing When Installing Heat Recovery Units

Example: Triple-frame system, four (4) heat recovery units, one (1) header, and twelve (12) indoor units connected

WSU: Water Source Unit

HRU: Heat Recovery Unit

IDU: Indoor Unit

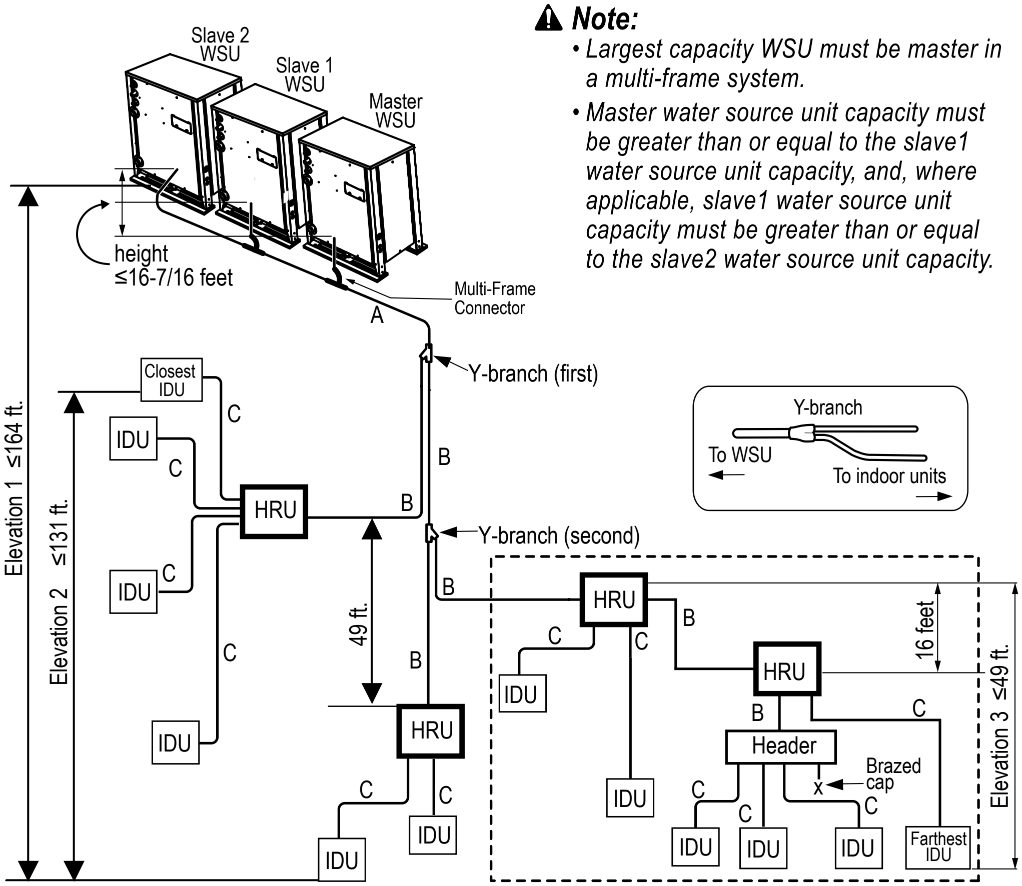
A: Main Pipe from Water Source Unit to First Y-branch.

B: HRU to HRU, Y-branch to HRU, HRU to Header, or Y-branch to Y-branch.

C: Heat Recovery Unit / Header to Indoor Unit.

⚠ Note:

- *Connection piping from branch to branch cannot exceed main pipe diameter (A) used by the WSU.*
- *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 headers branches cannot be installed downstream of the initial header branch.*
- *Indoor units must be installed at a position lower than the header.*
- *Total capacity of indoor units in series connection of heat recovery units ≤192,400 Btu/h.*
- *Always reference the LATS software report.*



⚠ Note:

- *Largest capacity WSU must be master in a multi-frame system.*
- *Master water source unit capacity must be greater than or equal to the slave1 water source unit capacity, and, where applicable, slave1 water source unit capacity must be greater than or equal to the slave2 water source unit capacity.*

Table 46: Main Pipe (A) Diameter from Water source Unit to First Y-branch.

WSU Capacity (ton)	Pipe diameter when equivalent pipe length from WSU to farthest IDU is <295 ft.			Pipe diameter when equivalent pipe length from WSU to farthest IDU is >295 ft.		
	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)
6	3/8	7/8	3/4	1/2	7/8	3/4
8	3/8	7/8	3/4	1/2	1-1/8	3/4
10	1/2	1-1/8	3/4	5/8	1-1/8	3/4
12	1/2	1-1/8	3/4	5/8	1-1/8	3/4
14	1/2	1-1/8	3/4	5/8	1-1/8	3/4
16	1/2	1-1/8	3/4	5/8	1-1/8	3/4
18	3/4	1-3/8	1-1/8	7/8	1-3/8	1-1/8
20	3/4	1-3/8	1-1/8	7/8	1-3/8	1-1/8
24	3/4	1-3/8	1-1/8	7/8	1-3/8	1-1/8
28	3/4	1-3/8	1-1/8	7/8	1-3/8	1-1/8
30	3/4	1-5/8	1-3/8	7/8	1-5/8	1-3/8
32	3/4	1-5/8	1-3/8	7/8	1-5/8	1-3/8
36	3/4	1-5/8	1-3/8	7/8	1-5/8	1-3/8
40	3/4	1-5/8	1-3/8	7/8	1-5/8	1-3/8
48	3/4	1-5/8	1-3/8	7/8	1-5/8	1-3/8

Pipe Sizing for Heat Recovery ARWB Series

The following is an example of manual pipe size calculations. Designers are highly encouraged to use LATS instead of manual calculations.

Table 47: Refrigerant Pipe (B) Diameter between Y-branches and Y-branches / Heat Recovery Unit / Headers.

Downstream IDU total capacity (Btu/h)	Liquid pipe (inches OD)	Vapor pipe (inches OD)	
		Low pressure	High pressure
≤19,100	1/4	1/2	3/8
<54,600	3/8	5/8	1/2
<76,400	3/8	3/4	5/8
<112,600	3/8	7/8	3/4
<160,400	1/2	1-1/8	7/8
<242,300	5/8	1-1/8	1-1/8
<354,900	3/4	1-3/8	1-1/8
≥354,900	3/4	1-5/8	1-3/8

Table 48: Indoor Unit Connecting Pipe from Branch (C).

Indoor Unit Capacity[1]	Liquid pipe (inches OD)	Vapor pipe (inches OD)
≤19,100	1/4	1/2
≤54,600	3/8	5/8
≤76,400	3/8	3/4

[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 3/8 in OD (liquid) and 5/8 in OD (vapor).

Table 49: Heat Recovery Systems Pipe Capabilities.

Length:	Total pipe length Longest actual pipe length Equivalent pipe length[1]	A + ΣB + ΣC ≤ 1,640 feet ≤656 feet ≤738 feet
ℓ:	Longest pipe length after first branch	≤131 feet (295 feet conditional application)
Elevation 1:	Elevation differential (Water Source Unit ↔ Indoor Unit)	Height ≤164 feet
Elevation 2:	Elevation differential (Indoor Unit ↔ Indoor Unit) [IDUs connected to separate HRUs which are parallel (Y-branch) connected]	Height ≤131 feet
Elevation 3:	Elevation differential (Indoor Unit ↔ Connected HRU or Series Connected HRU	Height ≤49 feet
Height 1:	Elevation differential (Water Source Unit ↔ Water Source Unit)	16.4 feet
Distance between WSU to WSU		≤33 feet
Distance between fittings and IDU		≥20 inches
Distance between fittings and Y-branches / Headers		≥20 inches
Distance between two Y-branches / Headers		≥20 inches
Elevation between two heat recovery units if installed with a Y-branch		≤49 feet
Height difference between two series-piped heat recovery units		≤16 feet

[1]For calculation purposes, assume equivalent pipe length of Y-branches to be 1.6 feet, and the equivalent pipe length of headers to be 3.3 feet.

Conditional Applications

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

If the equivalent length between the first Y-branch to the farthest indoor unit is >131 feet (maximum 295 feet):

- Pipe segment diameters between the first branch and the last branch should be sized up by one. This applies to both liquid and low / high vapor pipes. If the next size up is not available, or if the pipe segment diameters are the same as main pipe (A) diameters, sizing up is not possible.
- While calculating total refrigerant piping length, pipe (B) segment lengths between the first Y-branch and second Y-branch, and between the second Y-branch and the heat recovery unit should be calculated by two.
- Length of pipe (C) from each indoor unit to the closest Y-branch, header, or heat recovery unit ≤131 feet.
- [Length of pipe from water source unit to farthest indoor unit (A+B+C)] - [Length of pipe from water source unit to closest indoor unit (A+B+C)] ≤131 feet.

Creating a Balanced Piping System

Unlike designing duct-work or chilled and hot water pipe systems where balancing dampers, ball valves, orifices, circuit setters, or other flow control devices can be installed to modify or balance the flow of cooling medium, these devices cannot be used in a VRF system. Therefore, variable refrigerant flow systems have to be designed to be “self balanced.” Balanced liquid refrigerant distribution is solely dependent on the designer choosing the correct pipe size for each segment. Pipe sizing considerations include pipe length, pipe segment pressure drop relative to other pipe segments in the system, type and quantity of elbows, bends present, fitting installation orientation, and end use device elevation differences.

⚠ ***Note:***

It is imperative the designer avoids creating excessive pressure drop. When liquid refrigerant is subjected to excessive pressure drop, liquid refrigerant will change state and “flash” to vapor. Vapor present in a stream of liquid refrigerant before reaching the electronic expansion valve (EEV) results in a loss of system control and causes damage to the valve. The pipe system must be designed in a manner that avoids the creation of unwanted vapor.

Refrigerant Piping System Quality Assurance

To ensure that the refrigerant piping design meets LG’s quality standards, a LATS refrigerant piping design software report must be provided with every Multi V Water IV order. Following the installation, if any changes or variations to the design were necessary, an “as-built” LATS piping design software report must be provided to LG prior to system commissioning.

Systems that are close to the standard application limits may be converted into a conditional application by field changes to pipe equivalent lengths. User should always check the LATS report actual pipe layout versus pipe limits. The user may want to increase pipe lengths when conditions close to the standard application limits are present, forcing increased pipe diameters seen in conditional applications to be used and avoiding pipe changes due to field installation variations.

⚠ ***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 should be done with caution and **ALWAYS VERIFIED in LATS MULTI V SOFTWARE** before supplies are purchased or installed. Doing so helps to ensure profitable installation, eliminate rework, and ensure easier system commissioning.*

Note:

LG Electronics, Inc. recommends using LATS Multi V software for all system designs. To get the free LATS system design software, contact your local LG representative. Use this procedure only if you choose to perform system design manually.

Follow this procedure to manually design a Multi V Water IV system.

1. Choose the location of the indoor units and the water source unit(s) on the building drawing.
2. Choose the location of all Y-branch fittings, header fittings, and heat recovery units, if possible, and draw them on the building drawings. Verify that all fittings are positioned per the guideline limitations described in "Y-Branch Kits" on page 109 and "Header Kits" on page 110.
3. Plan the route for interconnecting piping. Draw a one-line depiction of the pipe route chosen on the building drawings.
4. Calculate the actual length of each pipe segment and note it on the drawing.
5. Using the data obtained by selecting indoor units listed in Table 19, Table 20, and Table 21, list the nominal cooling capacity next to each indoor unit on the drawing.
6. Starting at the indoor unit located farthest from the water source unit, sum the connected nominal capacity of all indoor units served by the pipe segment for each branch and runout pipe. Record these values next to each segment on the drawing.
7. Use the tables in "Refrigerant Piping Design" beginning on page 106 to determine the pipe size of the liquid and vapor lines of all pipes.
8. Starting at the indoor unit located farthest from the water source unit, sum the capacity of liquid line pipe segments located between the indoor unit(s) and each Y-branch fitting, header fitting, and heat recovery unit. Record these values next to each Y-branch, header, and/or heat recovery unit on the drawing.
9. Use the tables in "Refrigerant Piping Design" beginning on page 106 to verify the pipe size of the liquid and vapor line(s) of all pipes.
10. Refer to the Y-branch kit cut sheets on page 129 through page 132, the header kit cut sheet on page 133, and the heat recovery unit data sheets on page 36 through page 38 to determine the part number of each Y-branch, header, and/or heat recovery unit based on the connected downstream nominal capacity served.
11. Refer to "WSU Cooling/Heating Capacity Correction Factors" on page 85, Calculate the equivalent pipe length in feet of each pipe segment. Y-branch and header equivalent lengths should be totaled with the upstream segment only. Use equivalent pipe length data when it is provided with the field purchased fittings. If not available, use the data in Table 39. Y-branch and header equivalent lengths are listed in Cut-Sheets. Equivalent lengths should be totaled with the upstream segment only.
12. Verify if the equivalent pipe length complies with the limitations listed in "Table 38: Multi V Water IV Refrigerant Piping System Limitations." on page 99. If the limitations are exceeded, either reroute the pipe or change the location of the Y-branch fittings, header fittings, heat recovery units, and/or indoor unit locations so the design conforms with all limitations.
13. If any pipe lengths were adjusted in Step 12, verify again if the length of the design complies with the limitations listed in Table 38.
14. Verify that the manually sized pipe design is acceptable using LATS Multi V software. When entering the length of pipe segments in LATS Multi V software, enter the equivalent pipe length. Account for the additional pressure drop created by elbows, valves, and other fittings present in each segment by adding their respective equivalent pipe lengths to the actual pipe length.

LG Y-branch and Header kits join one pipe segment to two or more segments. Y-branches and Headers are highly-engineered devices designed to evenly divide the flow of refrigerant.

Note:

No Component Substitutions

Use only LG supplied Y-branch and Header fittings to join one pipe segment to two or more segments. Third-party or field-fabricated Tees, Y-fittings, Headers, or other branch fittings are not qualified for use with LG Multi V Water IV systems. The only field-provided fittings allowed in a Multi V Water IV piping system are 45° and 90° elbows.

LG Y-branch kits consist of:

- Y-branches (two for heat pump; three for heat recovery).
- Reducer fittings as applicable.
- Molded clam-shell type insulation covers.

LG Header kits consist of:

- Two Headers
- Reducer fittings as applicable.
- Molded clam-shell type insulation covers.

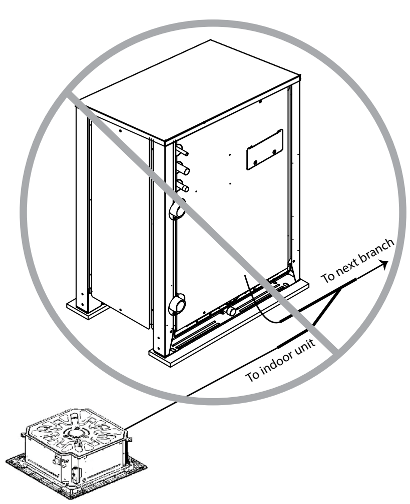
Y-Branch Kits

LG supplied Y-branches must be used at each transition. Field-supplied “T” fittings or “Y” branches will not be accepted. Each LG supplied Y-branch kit comes with two (2) Y-branches for indoor units, three (3) Y-branches for heat recovery units, step-down pipe reducers, and insulation covers.

Y-branches may be installed in horizontal or vertical configurations. When installed vertically, position the Y-branch so the straight-through leg is ±3° of plumb. See Figure 33. When installed horizontally, position the Y-branch so the take-off leg is level and shares the same horizontal plane as the straight-through leg ±10° rotation as shown in Figure 34.

There is no limitation on the number of Y-branches that can be installed, but there is a limitation on the number of indoor units connected to a single water source unit. See Table 36 and Table 37 on page 99.

Figure 36: Diagram of an Incorrect Y-branch Installation.



Y-branches should always be installed with the single port facing the water source unit and the two-port end facing indoor units (see Figure 32). Do not install Y-branches backwards. Refrigerant flow cannot make U-turns through Y-branches. The first Y-branch kit must be located at least three (3) feet from the water source unit. Provide a minimum of 20 inches between a Y-branch and any other fittings or indoor unit piped in series.

When a Y-branch is located in a pipe chase or other concealed space, access doors to allow inspection are recommended.

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

Y-branch Insulation

Each Y-branch kit comes with clam-shell type peel-and-stick insulation jackets molded to fit the Y-branch fittings as shown in Figure 35—one for the liquid line, one for the vapor line(s).

- Check the fit of the Y-branch clam-shell insulation jacket after the Y-branch is installed.
- Mark pipe where the insulation jacket ends.
- Remove the jacket.
- Install field-provided insulation on the three (3) pipes first.
- Peel the adhesive glue protector slip and install the clam-shell jacket over the fitting.

Figure 32: Y-branch Connections.

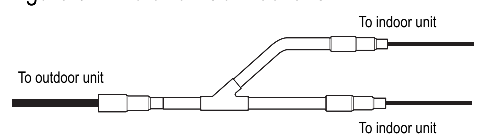


Figure 33: Y-branch Installation Alignment Specification.

Vertical up configuration. Vertical down configuration.

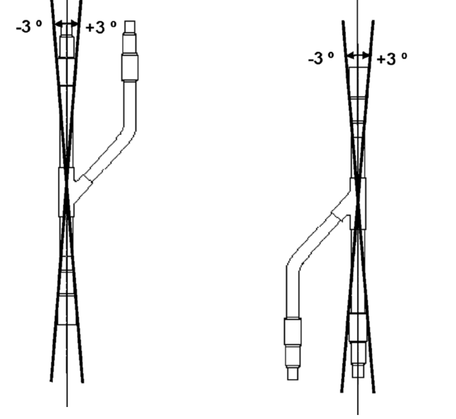


Figure 34: Horizontal Configuration End View.

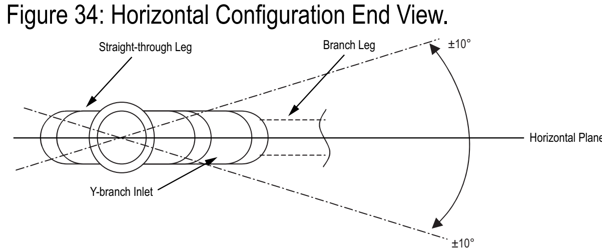
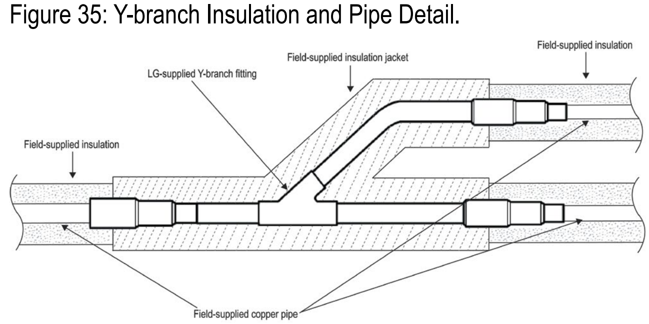


Figure 35: Y-branch Insulation and Pipe Detail.



Header Kits

Note:

Install Correctly

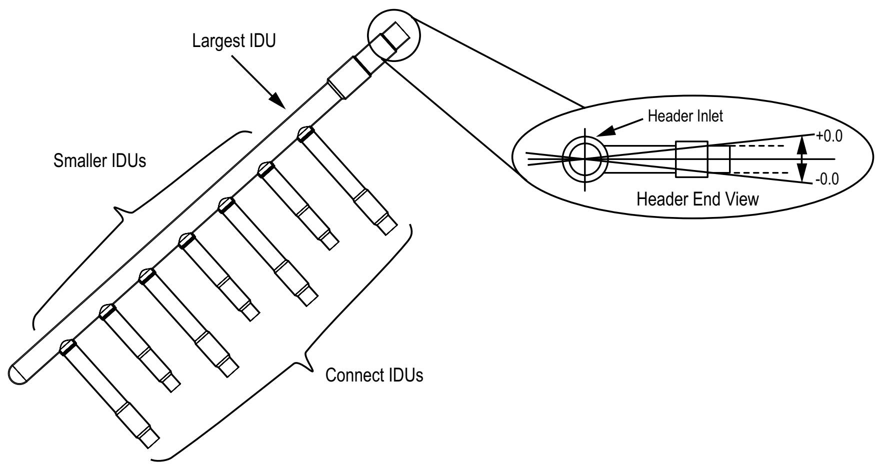
- *Y-branches can be installed upstream between the Header and the water source unit, but a Y-branch cannot be installed between a header and an indoor unit.*
- *To avoid the potential of uneven refrigerant distribution through a header fitting, minimize the difference in equivalent pipe length between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

Header kits 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 may be more economical. See page 133 and page 134 for Header kit specifications and capacities.

Y-branches can be installed upstream between the Header and the water source unit, but a Y-branch cannot be installed between a Header and an indoor unit. Headers must be installed in a horizontal and level position with the distribution ports of the fitting in the same horizontal plane as the straight-through branch as shown in Figure 37.

When connecting indoor units to a Header, always connect the unit with the largest nominal capacity to the port closest to the water source unit. Then install the next largest indoor unit to the next port, working down to the smallest indoor unit. Do not skip ports. See Figure 37.

Figure 37: Header Kit—Horizontal Rotation Limit (Must be Installed Level with No Rotation).

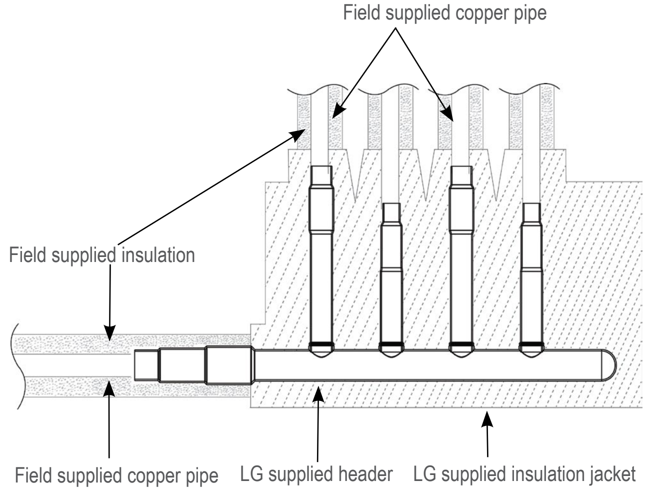


All indoor units must be mounted at an elevation below the Header fitting. All indoor units connected to a single Header fitting should be located with an elevation difference between indoor units that does not exceed 49 feet. If indoor units are located at an elevation the same as or above the Header fitting, do not use a Header. Instead, install a Y-branch fitting between the water source unit and the Header fitting, and connect the elevated indoor unit to the Y-branch.

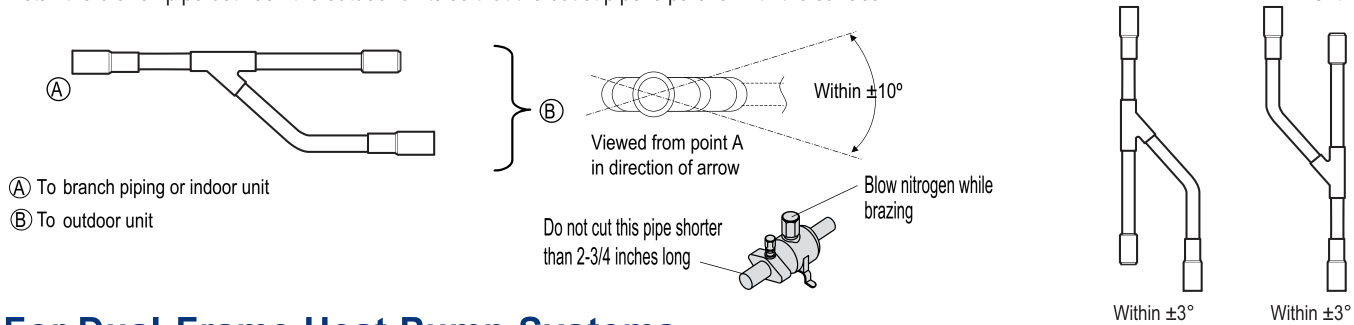
Header Insulation

Each Header kit comes with clam-shell type peel and stick insulation jackets molded to fit the Header fittings—one for the liquid line and one for the vapor line. See Figure 38.

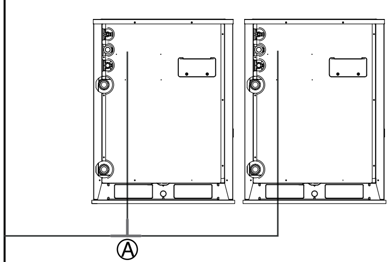
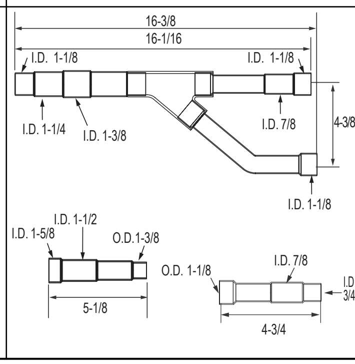
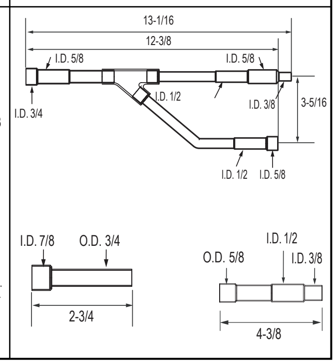
Figure 38: Header Insulation and Pipe Detail.



Install the branch pipe between the outdoor units so that the outlet pipe is parallel with the surface.

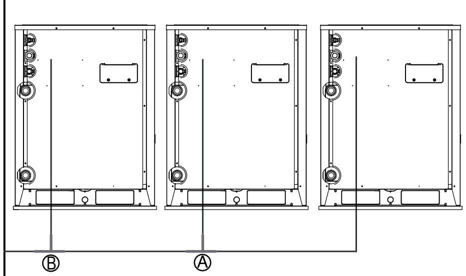
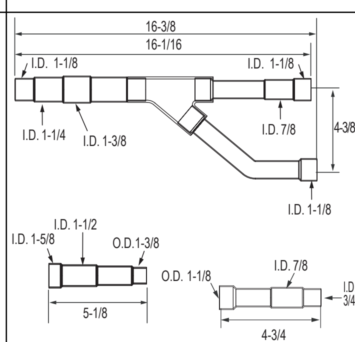
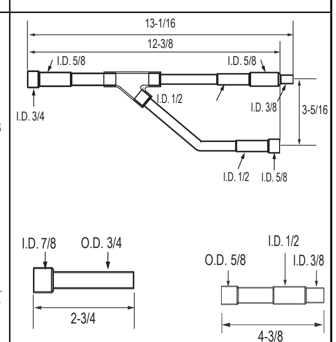
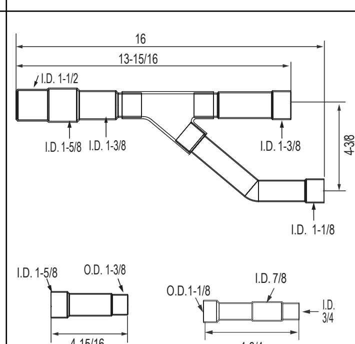
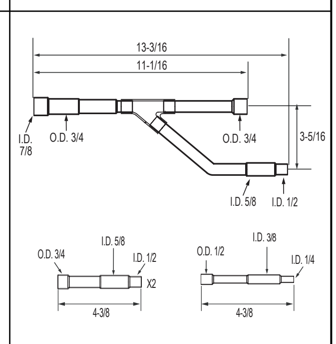


For Dual-Frame Heat Pump Systems

Combination	Multi-frame Connector	Vapor pipe	Liquid pipe
	A ARCNN21		

For Triple-Frame Heat Pump Systems

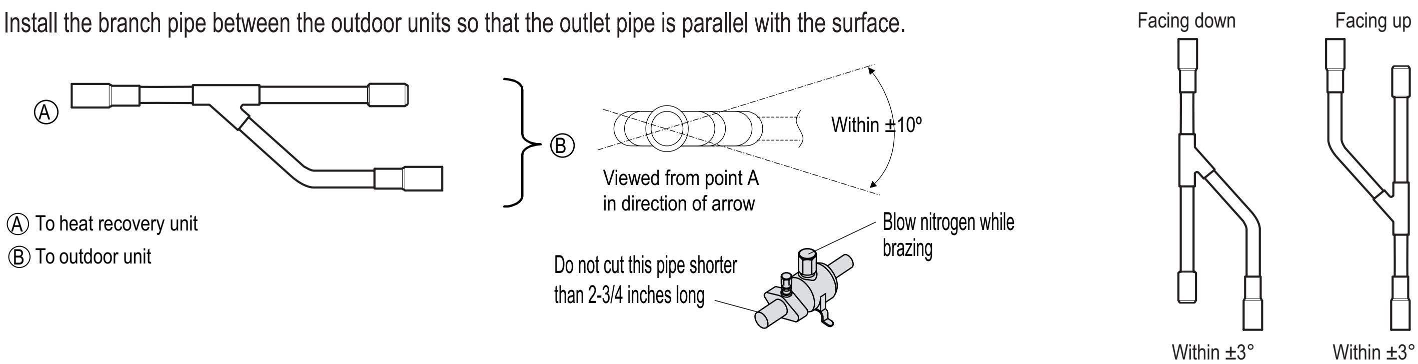
Unit: inch

Combination specification	Multi-frame Connector	Vapor pipe	Liquid pipe
	A ARCNN21		
	B ARCNN31		

REFRIGERANT PIPING DESIGN

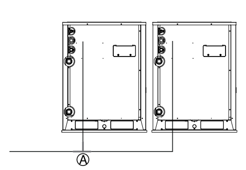
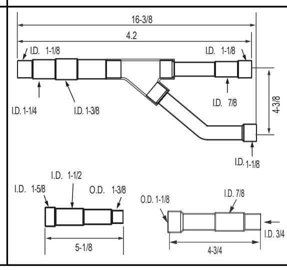
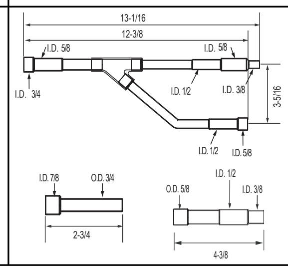
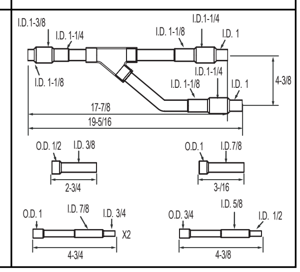
Multi-Frame Connectors (Y-branches) for ARWB Series Heat Recovery Systems

Install the branch pipe between the outdoor units so that the outlet pipe is parallel with the surface.



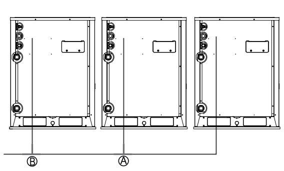
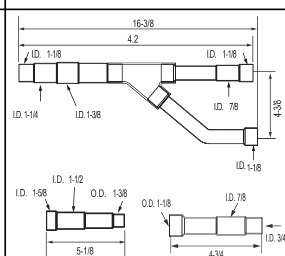
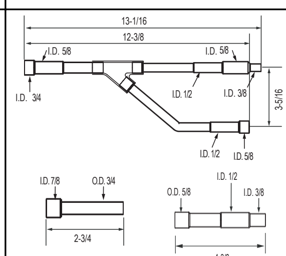
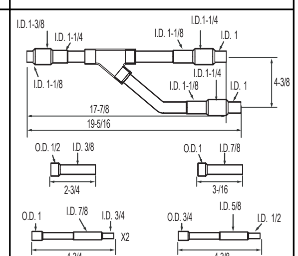
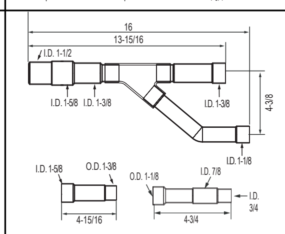
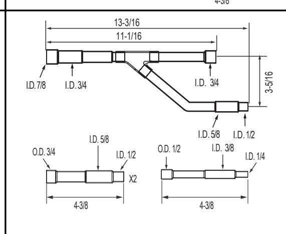
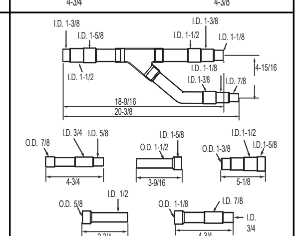
For Dual-Frame Heat Recovery Systems

Unit: inch

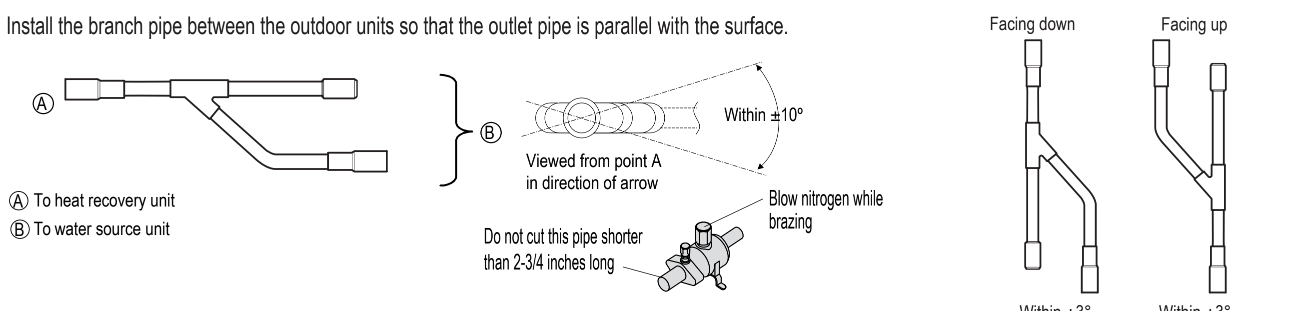
Combination specification	Multi-frame Connector	Low-pressure Vapor Pipe	Liquid Pipe	High-pressure Vapor Pipe
	Ⓐ ARCNB21			

For Triple-Frame Heat Recovery Systems

Unit: inch

Combination specification	Multi-frame Connector	Low-pressure Vapor Pipe	Liquid Pipe	High-pressure Vapor Pipe
	Ⓐ ARCNB21			
	Ⓑ ARCNB31			

Install the branch pipe between the outdoor units so that the outlet pipe is parallel with the surface.



⚠ Note:

Consider refrigerant safety in all designs. Refer to "ASHRAE Standards Summary" on page 262 for information on how to meet the requirements of ASHRAE Standards 15 and 34.

LG Multi V Water IV water source units ship from the factory with a charge of R410A refrigerant. This charge serves as the base charge and will not be sufficient for the system to operate. A trim charge based on system design must be added after system installation. LATS Multi V piping design software will calculate the size of the refrigerant piping and calculate the required refrigerant charge. This added trim refrigerant charge is shown on the LATS Multi V output.

The example LATS Multi V design software report below shows both the base charge and the calculated trim charge (Tables 50-55). The information used in the tables below are obtained from a LATS-generated report.

Project Name: Multi V Water IV Heat Recovery System Test Update System No: 1/1

Table 50: Design Conditions.

Summer						Winter					
Indoor			Outdoor			Indoor			Outdoor		
DB (°F)	WB (°F)	RH (%)	DB (°F)	WB (°F)	RH (%)	DB (°F)	WB (°F)	RH (%)	DB (°F)	WB (°F)	RH (%)
80.6	66.9	50	96.1	73.0	34	68.0	56.6	50	3.0	2.5	86

Table 51: Water Source Unit Specifications.

Model Name	Max. Indoor Unit Connectivity	Max. Total Over Load (kBtu/h/%)	Indoor Unit to Water Source Unit Ratio	Product Charge (lbs.)	Additional Ref. Amount (lbs.)	Rated / Corrected Capacity (kBtu/h)		Rated / Corrected Power Input (kW)	
						Cooling	Heating	Cooling	Heating
ARWB121BAS4	20	156.0 (130%)	1.06:1	12.8	12.81	120.0 / 120.3	135.0 / 127.8	6.8 / 6.7	7.1 / 7.1

Table 52: Piping Specifications.

Index (from LATS selection)	Piping Dia. (Inches) Liquid : Vapor	Length (Feet)[1]
P0	1/4 : 1/2	88.6
P21	3/8 : 1/2 : 5/8	29.5
P22	3/8 : 3/4 : 7/8	9.8
P28	3/8 : 1/2 : 5/8	9.8

[1]It is imperative to know the "as-built" physical length of each segment of liquid line, to calculate the total refrigerant charge required. An accurate "as built" field-verified piping diagram is required to verify within LATS that piping is within limits, proper pipe sizing, and refrigerant charge.

Table 53: Branches / Headers / Common Pipes / Heat Recovery Units.

Model Name	Quantity
ARBLB03321	2
PRHR031A	1
PRHR041A	1
PRHR021A	1

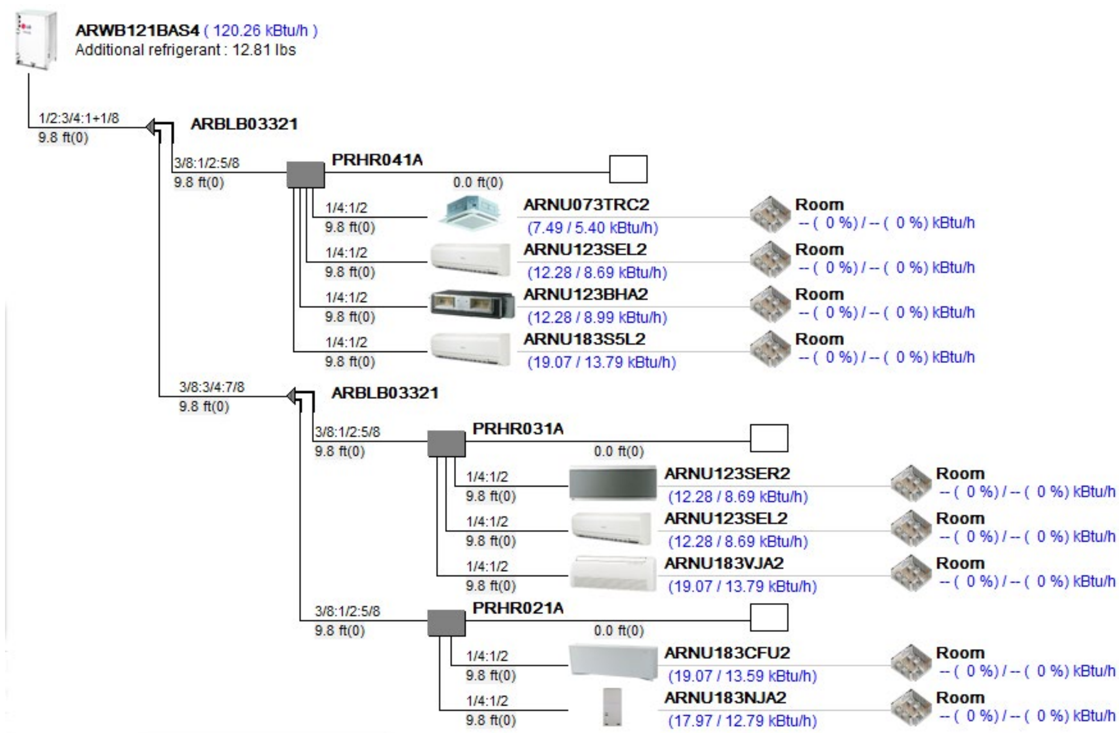
Table 54: Accessories.

Index	Model Name	Quantity	Description
IDU	PT-UQC	1	Grille 4 way cassette (TR,TQ)

Table 55: Indoor Units.

Model Name	Quantity	Description
ARNU123SEL2	2	Wall Mounted (12MBh)
ARNU183S5L2	1	Wall Mounted (18MBh)
ARNU123SER2	1	ART COOL Mirror (12MBh)
ARNU073TRC2	1	Ceiling Cassette - 4Way (7MBh_2X2)
ARNU123BHA2	1	Ceiling Concealed Duct - High Static (12MBh)
ARNU183CFU2	1	Floor Standing - Without case (18MBh)
ARNU183VJA2	1	Ceiling Suspended (18MBh)
ARNU183NJA2	1	Vertical AHU
Total	9	—

Figure 39: LATS Tree Diagram for Multi V Water IV Heat Recovery System Test Update System No: 1/1 Example.



Determining the Total System Refrigerant Charge

Use the LATS Tree diagram and Table 56 on page 115 to calculate the total refrigerant charge required for the system design. Water source units have a an initial factory installed charge of R410A refrigerant. All other system components have no initial charge. The water source units' initial refrigerant charge is not sufficient for system operation. The amount of additional refrigerant required is based on the linear footage of liquid line copper pipe and the number and types of indoor units and heat recovery units.

1. Calculate the total linear feet of liquid line pipe in the system. It is imperative to know the "as-built" physical length of each segment of liquid line to calculate the total refrigerant charge required. An accurate "as built" field-verified piping diagram is required to verify within LATS that piping is within limits, proper pipe sizing, and refrigerant charge. Record the values on lines 1–7.
2. Count the number of indoor units. Group them by model type and nominal capacity as indicated in the description fields on lines 8–33. Record the quantity of units in each group, multiply each by their specific correction factor, and add the sum in the Total (lbs.) column.
3. Count the number of heat recovery units, record the quantity, multiply by the specific correction factor, and record the sum in the Total (lbs.) column on line 34.
4. Add the total values on lines 1–34 and record on line 35, Additional Refrigerant Charge Required.
5. Determine the quantity and type (model numbers) of water source units. Refer to Table 57, Table 58, Table 59, and Table 60 for the amount of refrigerant in each unit. Add these amounts and enter the total on line 37, Total Factory Refrigerant Charge.
6. Add the Additional Refrigerant Charge Required to the Total Factory Refrigerant Charge and record on line 37. This sum is the Total System Charge.

Table 56: System R410A Refrigerant Charge Calculator (lbs.).

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	Wall Mounted + Art Cool Mirror	SE	7k to 15k		0.53	
9	Wall Mounted + Art Cool Mirror	S8, S5	18k to 24k		0.62	
10	1-Way Cassette	TJ	7k to 12k		0.44	
11	2-Way Cassette	TL	18k to 24k		0.35	
12	4-Way 2' x 2' Cassette	TR	5k to 7k		0.40	
13	4-Way 2' x 2' Cassette	TR	9k to 12k		0.55	
14	4-Way 2' x 2' Cassette	TQ	15k to 18k		0.71	
15	4-Way 3' x 3' Cassette	TN	9k to 15k		1.06	
16	4-Way 3' x 3' Cassette	TM	18k to 24k		1.41	
17	4-Way 3' x 3' Cassette	TP	24k to 28k		1.06	
18	4-Way 3' x 3' Cassette	TN	36k		1.41	
19	4-Way 3' x 3' Cassette	TM	42k to 48k		1.41	
20	High Static Ducted	BH	7k to 24k		0.57	
21	High Static Ducted	BG	15k to 42k		0.97	
22	High Static Ducted	BR	48k		1.37	
23	High Static Ducted	B8	76k to 95k		2.20	
24	Low Static Ducted, Low Static Ducted Bottom Return	B1, B3	7k to 15k		0.37	
25	Low Static Ducted, Low Static Ducted Bottom Return	B2, B4	18k to 24k		0.82	
26	Vertical / Horizontal Air Handling Unit	NJ	18k to 24k		1.04	
27	Vertical / Horizontal Air Handling Unit	NJ	30k		1.04	
28	Vertical / Horizontal Air Handling Unit	NJ	36k		1.57	
29	Vertical / Horizontal Air Handling Unit	NK	42k to 54k		2.00	
30	Ceiling Suspended	VJ	18k to 24k		0.77	
31	Convertible Surface Mount—Ceiling/Wall	VE	9k to 12k		0.22	
32	Floor Standing	CE (U)	7k to 15k		0.37	
33	Floor Standing	CF (U)	18k to 24k		0.82	
34	Heat Recovery Units: PRHR021A, PRHR031A, PRHR041A	—	—		1.1	
35	**ADDITIONAL Refrigerant Charge Required** Sum of lines 1 – 34					
36	**Total WSU FACTORY Refrigerant Charge** Sum of factory refrigerant charges for all WSUs in the system. Refer to Table 57 through Table 60 for WSU charge data.					
37	**TOTAL SYSTEM CHARGE** Sum of Additional Refrigerant Charge Required (line 35) and Total WSU Factory Refrigerant Charge (line 36)					

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

REFRIGERANT CHARGE

Table 57:Total Heat Pump Water Source Unit (208-230V) Refrigerant Charge

Nominal Tons	Combination Model Numbers	Individual Component Model Numbers			Refrigerant Charge			
					Frame 1	Frame 2	Frame 3	Total
6.0	ARWN072BAS4	ARWN072BAS4	—	—	12.8	—	—	12.8
8.0	ARWN096BAS4	ARWN096BAS4	—	—	12.8	—	—	12.8
10.0	ARWN121BAS4	ARWN121BAS4	—	—	12.8	—	—	12.8
12.0	ARWN144BAS4	ARWN144BAS4	—	—	12.8	—	—	12.8
14.0	ARWN168BAS4	ARWN096BAS4	ARWN072BAS4	—	12.8	12.8	—	25.6
16.0	ARWN192BAS4	ARWN121BAS4	ARWN072BAS4	—	12.8	12.8	—	25.6
18.0	ARWN216BAS4	ARWN144BAS4	ARWN072BAS4	—	12.8	12.8	—	25.6
24.0	ARWN288BAS4	ARWN144BAS4	ARWN144BAS4	—	12.8	12.8	—	25.6
30.0	ARWN360BAS4	ARWN144BAS4	ARWN144BAS4	ARWN072BAS4	12.8	12.8	12.8	38.4
36.0	ARWN432BAS4	ARWN144BAS4	ARWN144BAS4	ARWN144BAS4	12.8	12.8	12.8	38.4

Table 58:Total Heat Pump Water Source Unit (460V) Refrigerant Charge

Nominal Tons	Combination Model Numbers	Individual Component Model Numbers			Refrigerant Charge			
					Frame 1	Frame 2	Frame 3	Total
6.0	ARWN072DAS4	ARWN072DAS4	—	—	12.8	—	—	12.8
8.0	ARWN096DAS4	ARWN096DAS4	—	—	12.8	—	—	12.8
10.0	ARWN121DAS4	ARWN121DAS4	—	—	12.8	—	—	12.8
12.0	ARWN144DAS4	ARWN144DAS4	—	—	6.6	—	—	6.6
14.0	ARWN168DAS4	ARWN168DAS4	—	—	6.6	—	—	6.6
16.0	ARWN192DAS4	ARWN192DAS4	—	—	6.6	—	—	6.6
20.0	ARWN240DAS4	ARWN144DAS4	ARWN096DAS4	—	6.6	12.8	—	19.4
24.0	ARWN288DAS4	ARWN168DAS4	ARWN121DAS4	—	6.6	12.8	—	19.4
28.0	ARWN336DAS4	ARWN168DAS4	ARWN168DAS4	—	6.6	6.6	—	13.2
32.0	ARWN384DAS4	ARWN192DAS4	ARWN192DAS4	—	6.6	6.6	—	13.2
40.0	ARWN480DAS4	ARWN192DAS4	ARWN144DAS4	ARWN144DAS4	6.6	6.6	6.6	19.8
48.0	ARWN576DAS4	ARWN192DAS4	ARWN192DAS4	ARWN192DAS4	6.6	6.6	6.6	19.8

REFRIGERANT CHARGE

Table 59:Total Heat Recovery Water Source Unit (208-230V) Refrigerant Charge

Nominal Tons	Combination Model Numbers	Individual Component Model Numbers			Refrigerant Charge			
					Frame 1	Frame 2	Frame 3	Total
6.0	ARWB072BAS4	ARWB072BAS4	—	—	12.8	—	—	12.8
8.0	ARWB096BAS4	ARWB096BAS4	—	—	12.8	—	—	12.8
10.0	ARWB121BAS4	ARWB121BAS4	—	—	12.8	—	—	12.8
12.0	ARWB144BAS4	ARWB144BAS4	—	—	12.8	—	—	12.8
14.0	ARWB168BAS4	ARWB096BAS4	ARWB072BAS4	—	12.8	12.8	—	25.6
16.0	ARWB192BAS4	ARWB121BAS4	ARWB072BAS4	—	12.8	12.8	—	25.6
18.0	ARWB216BAS4	ARWB144BAS4	ARWB072BAS4	—	12.8	12.8	—	25.6
24.0	ARWB288BAS4	ARWB144BAS4	ARWB144BAS4	—	12.8	12.8	—	25.6
30.0	ARWB360BAS4	ARWB144BAS4	ARWB144BAS4	ARWB072BAS4	12.8	12.8	12.8	38.4
36.0	ARWB432BAS4	ARWB144BAS4	ARWB144BAS4	ARWB144BAS4	12.8	12.8	12.8	38.4

Table 60:Total Heat Recovery Water Source Unit (460V) Refrigerant Charge

Nominal Tons	Combination Model Numbers	Individual Component Model Numbers			Refrigerant Charge			
					Frame 1	Frame 2	Frame 3	Total
6.0	ARWB072DAS4	ARWB072DAS4	—	—	12.8	—	—	12.8
8.0	ARWB096DAS4	ARWB096DAS4	—	—	12.8	—	—	12.8
10.0	ARWB121DAS4	ARWB121DAS4	—	—	12.8	—	—	12.8
12.0	ARWB144DAS4	ARWB144DAS4	—	—	6.6	—	—	6.6
14.0	ARWB168DAS4	ARWB168DAS4	—	—	6.6	—	—	6.6
16.0	ARWB192DAS4	ARWB192DAS4	—	—	6.6	—	—	6.6
20.0	ARWB240DAS4	ARWB144DAS4	ARWB096DAS4	—	6.6	12.8	—	19.4
24.0	ARWB288DAS4	ARWB168DAS4	ARWB121DAS4	—	6.6	12.8	—	19.4
28.0	ARWB336DAS4	ARWB168DAS4	ARWB168DAS4	—	6.6	6.6	—	13.2
32.0	ARWB384DAS4	ARWB192DAS4	ARWB192DAS4	—	6.6	6.6	—	13.2
40.0	ARWB480DAS4	ARWB192DAS4	ARWB144DAS4	ARWB144DAS4	6.6	6.6	6.6	19.8
48.0	ARWB576DAS4	ARWB192DAS4	ARWB192DAS4	ARWB192DAS4	6.6	6.6	6.6	19.8

Copper is the only approved refrigerant pipe material for use with LG Multi V commercial air conditioning products, and LG recommends hard-drawn rigid or annealed-tempered type Air Conditioning and Refrigeration Field Service (ACR) copper pipe.

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

Tube wall thickness should meet local code requirements and be approved for an operating pressure of 550 psi. If local code does not specify wall thickness, LG suggests using tube thickness per table below. When bending tubing, use the largest radii possible to reduce the equivalent length of installed pipe; also, bending radii greater than ten (10) pipe diameters can minimize pressure drop. Be sure no traps or sags are present when rolling out soft copper tubing coils.

Table 61: ACR Copper Tubing Material.

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

Table 62: Piping Tube Thicknesses.

OD (in)	1/4	3/8	1/2	5/8	3/4	7/8	1-1/8	1-3/8	1-5/8
Material	Rigid or Soft Type ACR Only			Rigid Type ACR Only					
Min. Bend Radius (in)	.563	.9375	1.5	2.25	3.0	3.0	3.5	4.0	4.5
Min. Wall Thickness (in)	.03	.03	.03	.03	.03	.03	.03	.04	.05

Copper Expansion and Contraction

Under normal operating conditions, the vapor pipe temperature of a Multi V Water IV system can vary as much as 160°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. Refer to Figure 40. Each segment of pipe has a natural fixed point where no movement occurs. This fixed point is located at the center point of the segment assuming the entire pipe is insulated in a similar fashion. The natural fixed point of the pipe segment is typically where the expansion Loop or U-bend should be. Linear pipe expansion can be calculated using the following formula:

1. In Table 63, find the row corresponding with the actual length of the straight pipe segment.

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

- 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.)

2. Estimate the minimum and maximum temperature of the pipe. In the column showing the minimum pipe temperature, look up the anticipated expansion distance. Do the same for the maximum pipe temperature.
3. Calculate the difference in the two expansion distance values. The result will be the anticipated change in pipe length.

Example:

A Multi V Water IV heat pump system is installed and the design shows that there is a 260 feet straight segment of tubing between a Y-branch and an indoor unit. In heating, this pipe transports hot gas vapor to the indoor units at 120°F. In cooling, the same tube is a suction line returning refrigerant vapor to the water source unit at 40°F. Look up the copper tubing expansion at each temperature 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 the same temperature; only the direction of flow will reverse. Therefore, no significant change in length of the liquid line is anticipated.

When creating an expansion joint, the joint height should be a minimum of two times the joint width. Although different types of expansion arrangements are available, the data for correctly sizing an Expansion Loop is provided in Table 60. 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.

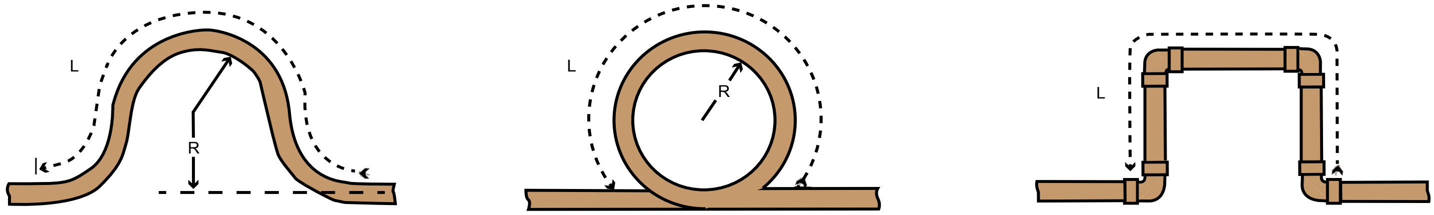
Table 63: Linear Thermal Expansion of Copper Tubing in Inches.

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

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

Selecting Field-Supplied Copper Tubing

Figure 40: Coiled Expansion Loops and Offsets.



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

Table 64: Radii of Coiled Expansion Loops and Developed Lengths of Expansion Offsets.

Anticipated Linear Expansion (LE) (inches)		Nominal Tube Size (OD) inches						
		1/4	3/8	1/2	3/4	1	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).

Definitions

Main Pipe(s): The piping segment(s) between the water source unit and the first Y-branch.

Branch: A segment of pipe between two Y-branches.

Run-out: The segment of pipe connecting an indoor unit to a Y-branch.

Physical Pipe Length: Actual length of straight segment(s) of pipe.

Equivalent Pipe Length: Actual length of pipe plus equivalent lengths of elbows, Y-branches, and valves.

Layout Procedure

1. Draft a one-line diagram of the proposed piping system connecting water source unit(s) to heat recovery and indoor units. Follow the pipe limitations listed in Table 38 on page 99.
2. Calculate the physical length of each pipe segment and note it on the drawing.
3. Calculate the equivalent pipe length of each pipe segment.
4. Input the pipe lengths into the LATS software and perform "Auto Pipe Sizing" check and "System Check". LATS will automatically calculate pipe sizes.

Using Elbows

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

Field-Provided Isolation Ball Valves

WARNING

Use of field-supplied isolation valves that are not full-port, rated for R410A refrigerant, and rated for 550 psi may result in refrigerant leaks.

LG allows installation of field-supplied ball valves with Schrader ports at each indoor unit. Full-port isolation ball valves with Schrader ports (positioned between valve and indoor unit) rated for use with R410A refrigerant should be used on both the liquid and vapor lines.

If valves are not installed and a single indoor unit needs to be removed or repaired, the entire system must be shut down and evacuated. If isolation ball valves are installed, and an indoor unit needs to be repaired, the unaffected indoor units can remain operational with readdressing and the proper combination ratio (See "Determine the System Combination Ratio" on page 82). Reclamation of refrigerant, then, can be restricted to a single indoor unit.

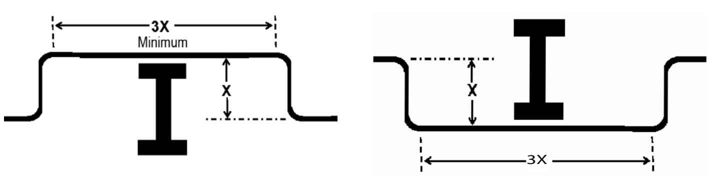
Position valves six (6) and twelve (12) inches from the first upstream heat recovery unit, Y-branch, or header. If ball valves are installed away from the first upstream heat recovery control unit, Y-branch, or header and closer to the indoor unit, oil may accumulate where it cannot be returned to the air-source unit and may cause a shortage of oil in the compressor.

Valves shall be easily accessible for service. If necessary, install drywall access doors or removable ceiling panels, and position the valves to face the access door or ceiling panel opening. Mount valves with adequate space between them to allow for placement of adequate pipe insulation around the valves. Recommended best practice is to clearly label and document locations of all service valves, heat recovery control units, Y-branches, and headers.

Obstacles

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

Figure 41: Installing Piping Above and Below an Obstacle.



Above an obstacle.

Below an obstacle.

In-line Refrigeration Components

Components such as oil traps, solenoid valves, filter-dryers, sight glasses, tee fittings, and other after-market accessories are not permitted on the refrigerant piping system between the water source units and the indoor / heat recovery units. Multi V Water IV air-source systems are provided with redundant systems that assure oil is properly returned to the compressor. Sight-glasses and solenoid valves may cause vapor to form in the liquid stream. Over time, dryers may deteriorate and introduce debris into the system. The designer and installer should verify the refrigerant piping system is free of traps, sagging pipes, sight glasses, filter dryers, etc.

No Pipe Size Substitutions

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

Pipe Supports

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

Pipe supports should never touch the pipe wall; supports shall be installed outside (around) the primary pipe insulation jacket (see Figure 42). Insulate the pipe first because pipe supports shall be installed outside (around) the primary pipe insulation jacket. Clevis hangers should be used with shields between the hangers and insulation. Field provided pipe supports should be designed to meet local codes. If allowed by code, use fiber straps or split-ring hangers suspended from the ceiling on all-thread rods (fiber straps or split ring hangers can be used as long as they do not compress the pipe insulation). Place a second layer of insulation over the pipe insulation jacket to prevent chafing and compression of the primary insulation by the support pipe clamp.

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

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

Wherever the pipe changes direction, place a hanger within twelve (12) inches on one side and within twelve to nineteen (12 to 19) inches of the bend on the other side as shown in Figure 43. Support piping at indoor units as shown in Figure 44. Support Y-Branch and Header fittings as shown in Figure 45 and Figure 46.

Figure 45: Pipe Support at Y-branch Fitting.

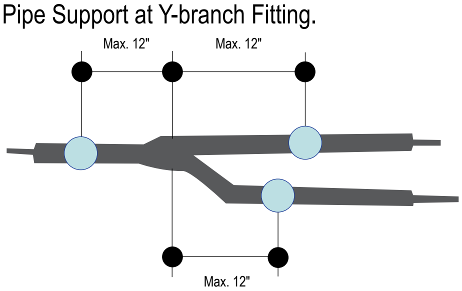


Figure 42: Pipe Hanger Details.

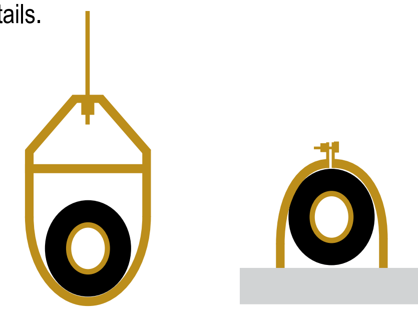


Figure 43: Typical Pipe Support Location—Change in Pipe Direction.

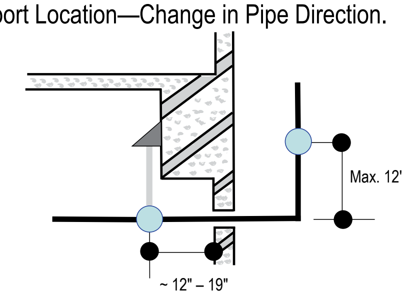


Figure 44: Pipe Support at Indoor Unit.

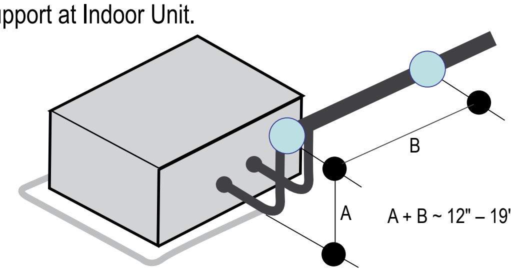
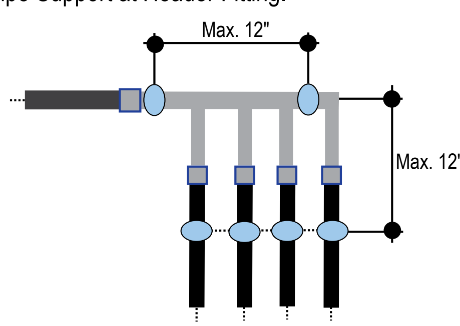


Figure 46: Pipe Support at Header Fitting.



Pipe Sleeves at Penetrations

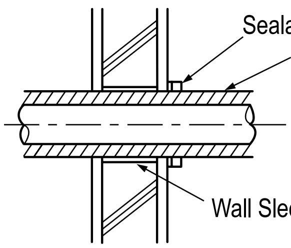
LG requires that all pipe penetrations through walls and floors be properly insulated and routed through an appropriate wall sleeve of sufficient size to prevent compression of refrigerant pipe insulation and free movement of the pipe within the sleeve.

When filling an access hole with mortar, cover the area with steel plate so that the insulation will not fall through. For this area, use fire-resistant materials for both insulation and cover. Do not use vinyl cover.

Note:

Determine diameter of penetrations by pipe diameter plus insulation thickness.

Figure 47: Pipe Sleeve Installation.

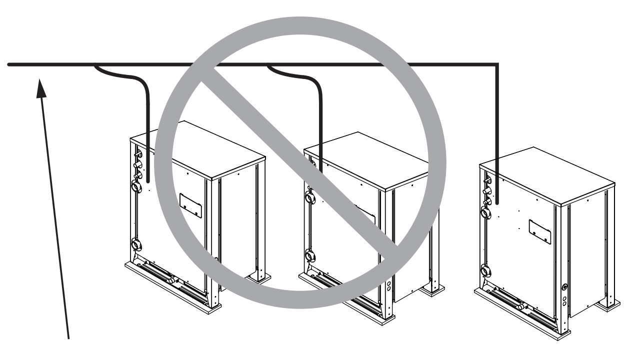


Oil Trap Piping Considerations

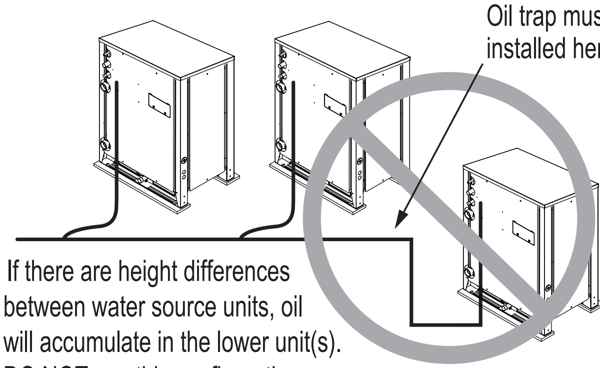
Be aware of these oil trap considerations when designing water source unit installation locations and refrigerant piping runs:

- When designing main refrigerant pipe runs, be sure the main pipe(s) are lower than the pipe connections to the water source unit(s).
- Because of the possibility of oil accumulation in a stopped water source unit, an oil trap must be installed when there is a height difference between water source unit pipes or if the pipe distance between water source units is more than 6.6 ft.
- If using an oil trap, install only one oil trap between water source units.
- Install oil traps only on the high and low pressure vapor pipes.
- An oil trap is not required:
  - on the liquid pipe
  - if the pipe distance between the water source units is 6.6 ft or less, AND
  - if the location of the main pipe is lower than that of the water source units.
- If there is high/low difference between the water source unit pipes, oil can accumulate in the lower water source unit until the unit stops.

Examples of Improper Pipe Installation



- Oil will accumulate in the water source units if the main refrigerant pipes are installed higher than the water source unit refrigerant pipe connections. Always install main refrigerant pipe runs lower than the water source unit connections.



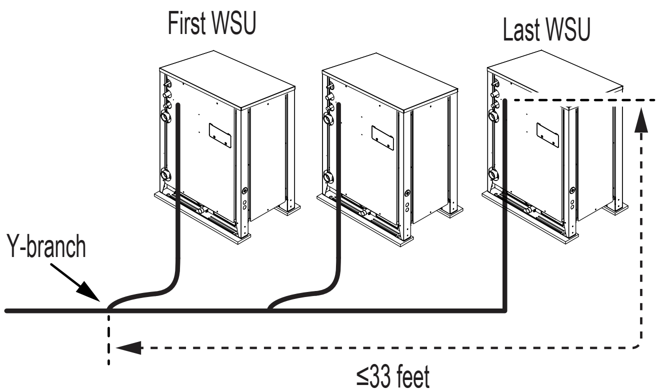
- If there are height differences between water source units, oil will accumulate in the lower unit(s). DO NOT use this configuration without installing an oil trap.

Refrigerant Piping for Separated Water Source Units

Dual-frame and triple-frame systems should be installed with all water source units located next to each other. In conditions when the dual-frame and triple-frame units need to be separated, follow these refrigerant piping rules. Oil traps are for vapor pipes. The liquid pipe does not require a trap.

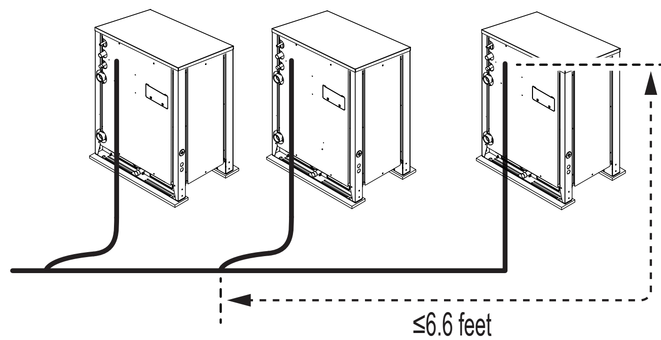
Pipe Connection between Water Source Units — Maximum Length

The maximum pipe length between the refrigerant pipe connections of the last water source unit to the Y-branch of the first water source unit is ≤33 feet.



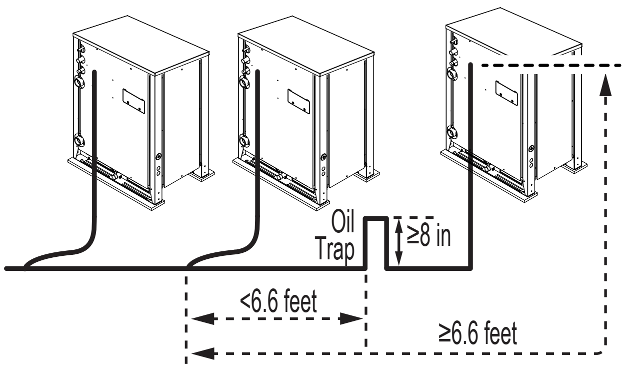
Pipe Connection between Water Source Units — Same Level and Pipe Length ≤6.6 feet

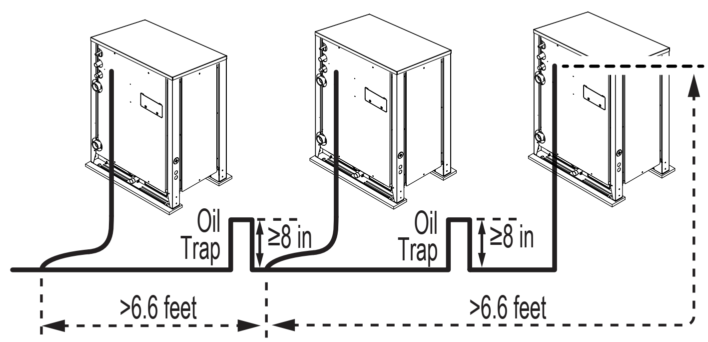
Oil traps are not necessary if the main refrigerant pipe runs are on the same level and the distance between water source units is ≤6.6 feet.



Pipe Connection between Water Source Units — Pipe Length is >6.6 feet

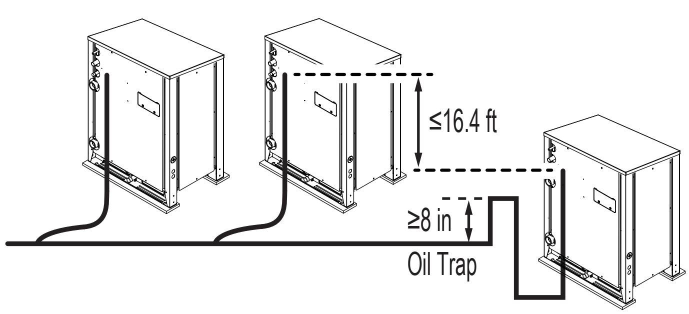
If the pipe distance between the water source units is >6.6 feet, install an oil trap in each vapor pipe.





Pipe Connection between Water Source Units — WSU Lower than Main Pipe Level

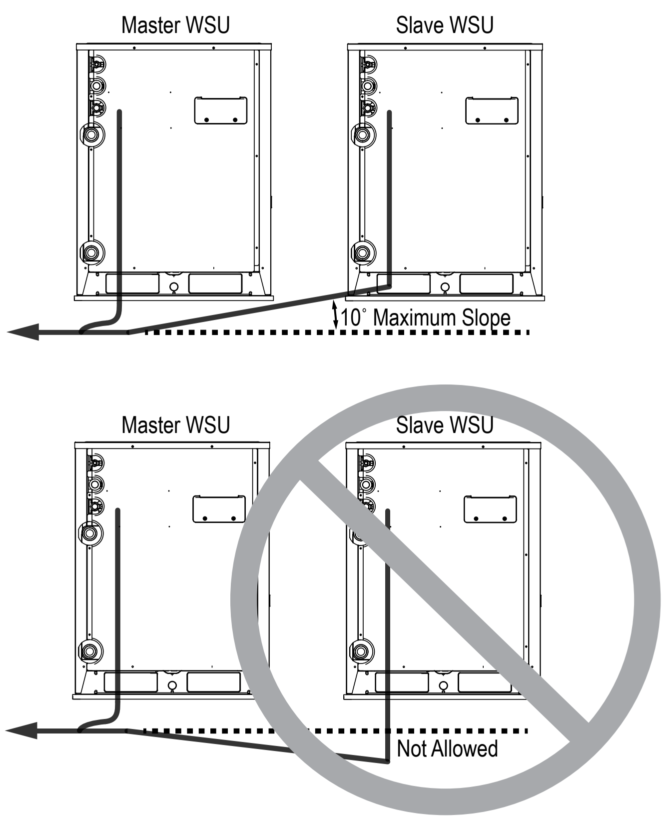
If a water source unit pipe connection is lower than the main refrigerant pipes, install an oil trap in each vapor pipe.



Main Refrigerant Pipe Slope

Horizontal main refrigerant pipe slope cannot exceed 10° up from the master WSU to the slave WSU, or from the first slave WSU to the second slave WSU. Downward slope from master to slave is not allowed; otherwise, refrigerant can flow back to the slave water source unit and the system may not operate properly.

Figure 48: Allowed Slope of Main Refrigerant Pipe.



Note:

Avoid Pipe Damage

- *When routing field-provided piping, take care to avoid damage due to vibration.*
- *Correctly route the piping so it does not make contact with the water pipes. Allow room for field installation.*
- *Properly insulate the liquid and vapor lines separately up to the point of connection to the water source unit frame.*
- *Refer to Figure 49 for typical piping routing, and Table 65 and Table 66 for water source unit connection types.*

Refrigerant piping from the water source unit must be brought out from the external pipe connections at the upper left of the front of the unit. The piping must be run downward from these connection points as the main pipe must be below the water source units. Be sure to allow room for the water pipe connections.

- Select main pipe sizes according to model number as shown in these tables. Do not select pipe sizes by indoor unit total capacity.
- Branch to branch connecting pipes must not be a larger size than the main pipe.
- Use nitrogen at 2.8 psig flow during brazing.
- If nitrogen is not used during brazing, oxidized contaminants may build inside the piping and affect valve and condenser operation.

Figure 49: Refrigerant Pipe Connections to WSU.

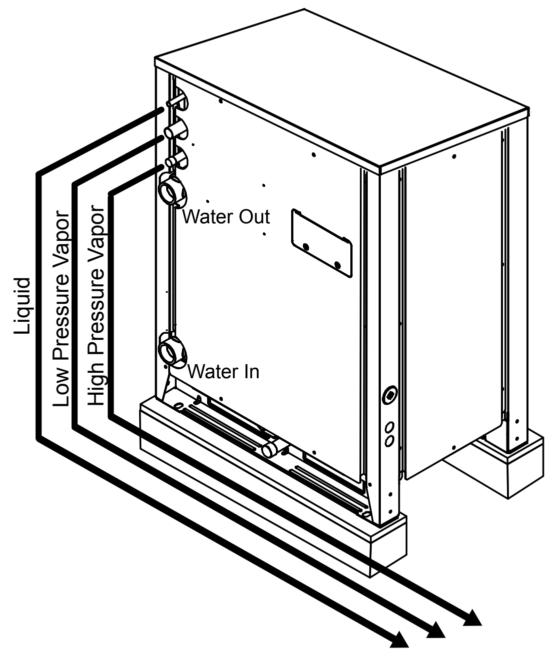


Table 65: 208-230V WSU Refrigerant Pipe Connections (All Brazed Type).

208-230V Models Heat Pump / Heat Recovery	Liquid Conn. (in.)	Low Vapor Conn. (in.)	High Vapor[1] Conn. (in.)
ARWN072BAS4 / ARWB072BAS4	3/8	7/8	3/4
ARWN096BAS4 / ARWB096BAS4	3/8	7/8	3/4
ARWN121BAS4 / ARWB121BAS4	1/2	1-1/8	3/4
ARWN144BAS4 / ARWB144BAS4	1/2	1-1/8	3/4

[1] High pressure vapor pipe applies to ARWB Heat Recovery systems only.

Table 66: 460V WSU Refrigerant Pipe Connections (All Brazed Type).

460V Models Heat Pump / Heat Recovery	Liquid Conn. (in.)	Low Vapor Conn. (in.)	High Vapor[1] Conn. (in.)
ARWN072DAS4 / ARWB072DAS4	3/8	7/8	3/4
ARWN096DAS4 / ARWB096DAS4	3/8	7/8	3/4
ARWN121DAS4 / ARWB121DAS4	1/2	7/8	3/4
ARWN144DAS4 / ARWB144DAS4	1/2	1-1/8	3/4
ARWN168DAS4 / ARWB168DAS4	1/2	1-1/8	3/4
ARWN192DAS4 / ARWB192DAS4	1/2	1-1/8	3/4

[1] High pressure vapor pipe applies to ARWB Heat Recovery systems only.

Installation of Refrigerant Piping / Brazing Practices

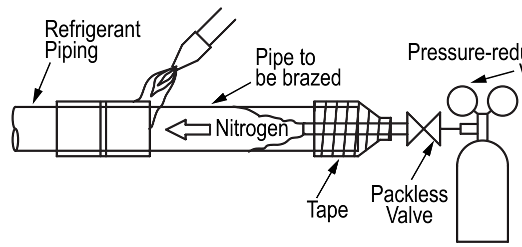
Note:

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

All joints are brazed in the field. Multi V Water IV refrigeration system components contain very small capillary tubes, small orifices, electronic expansion valves, oil separators, and heat exchangers that can easily become blocked. Proper system operation depends on the installer using best practices and utmost care while assembling the piping system.

- While brazing, use a dry nitrogen purge operating at a minimum pressure of 2.8 psig and maintain a steady flow.
- Blow clean all pipe sections with dry nitrogen prior to assembly.
- Use a tubing cutter; do not use a saw to cut pipe. De-burr and clean all cuts before assembly.
- Store pipe stock in a dry place. Keep pipe capped and clean.
- Use adapters to assemble different sizes of pipe.
- Do not use flux, soft solder, or anti-oxidant agents.
- Use a 15% silver phosphorous copper brazing alloy to avoid overheating and produce good flow.
- Protect isolation valves, electronic expansion valves, and other heat-sensitive control components from excessive heat with a wet rag or a heat barrier spray product

Figure 50: Refrigerant Pipe Brazing.



Refrigerant Safety Standards

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

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

Refrigerant Piping System Insulation

All refrigerant piping including Y-branch and Header connections, field-provided isolation ball valves, service valves, and elbows shall be completely insulated using closed cell pipe insulation. The liquid and vapor lines must be insulated separately.

To prevent heat loss/heat gain through the refrigerant piping, all refrigerant piping including liquid lines, high-pressure vapor lines, and low-pressure vapor lines shall be insulated separately. Insulation shall be a minimum 1/2" thick, and thickness may need to be increased based on ambient conditions and local codes. Refrigerant pipe temperatures can range from a low of -48°F to a high of 158°F.

All insulation joints shall be glued with no air gaps. Insulation material shall 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 shall 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. Be sure to follow 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" thickness, and meet UL94 MF-1 flammability.

The design engineer should 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.

⚠ Note:

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.

⚠ Note:

Follow local codes and the designer's instructions when selecting EPDM insulation wall thickness.

Table 67:Minimum Refrigerant Pipe EPDM Insulation Wall Thickness Requirements.[1]

<table>
<tr><th colspan="2" rowspan="2">Classification / Piping OD</th><th colspan="2">Air-conditioned location</th><th colspan="2">Non-air conditioned location</th></tr>
<tr><th>1. Typical Conditioned Location</th><th>2. Special Conditioned Location</th><th>3. Typical Unconditioned Location</th><th>4. Special Unconditioned Location</th></tr>
<tr><td rowspan="3">Liquid pipe</td><td>1/4 inches</td><td rowspan="2">>1/2 inches</td><td rowspan="2">>1/2 inches</td><td rowspan="2">>1/2 inches</td><td rowspan="2">>1/2 inches</td></tr>
<tr><td>3/8 inches</td></tr>
<tr><td>≥1/2 inches</td><td>>1/2 inches</td><td>>1/2 inches</td><td>>1/2 inches</td><td>>1/2 inches</td></tr>
<tr><td rowspan="11">Vapor pipe</td><td>3/8 inches</td><td rowspan="6">>1/2 inches</td><td rowspan="7">>3/4 inches</td><td rowspan="7">>3/4 inches</td><td rowspan="11">>1 inch</td></tr>
<tr><td>1/2 inches</td></tr>
<tr><td>5/8 inches</td></tr>
<tr><td>3/4 inches</td></tr>
<tr><td>7/8 inches</td></tr>
<tr><td>1 inch</td></tr>
<tr><td>1-1/8 inches</td><td rowspan="5">>3/4 inches</td></tr>
<tr><td>1-1/4 inches</td><td rowspan="4">>1 inch</td><td rowspan="4">>1 inch</td></tr>
<tr><td>1-3/8 inches</td></tr>
<tr><td>1-1/2 inches</td></tr>
<tr><td>1-3/4 inches</td></tr>
</table>

[1]The thickness of the above insulation material is based on heat conductivity of 0.61 Btu/in/h/ft^2/°F.

Typical Conditioned Location

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

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.

Typical Unconditioned Location

An unconditioned space inside a building.

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.

Additional Insulation for Indoor Units May be Required in Humid Environments.

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

CUT SHEETS

Water Source Unit Y-branch Kits for Heat Pump Systems

- LG water source unit Y-branch fittings must be used with LG systems and be properly installed following the instructions in the applicable LG manual. Field-supplied branch fittings are not permitted.
- Kit components must be kept free of debris and dry before installation.
- All Y-branch kits include a clam shell, peel-and-stick insulation jacket.

Figure 51: Y-branch Connectors (See Table 68).

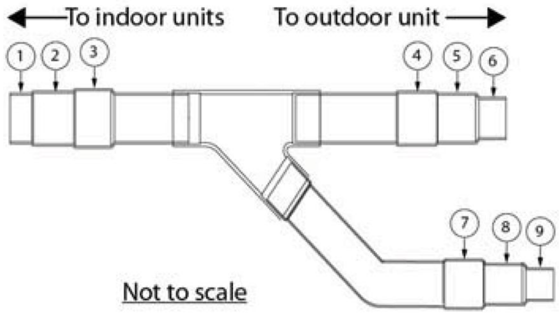


Table 68: Y-branch Connection Diameters (inches, ID).

Y-branch	Y-branch Type	Port Identifier								
		1	2	3	4	5	6	7	8	9
ARCNN21	Liquid	—	3/4	5/8	1/2	5/8	3/8	1/2	5/8	—
	Vapor	1-1/8	1-1/4	1-3/8	7/8	1-1/8	—	1-1/8	—	—
ARCNN31	Liquid	—	7/8	3/4	3/4	—	—	5/8	1/2	—
	Vapor	1-1/2	1-5/8	1-3/8	1-3/8	—	—	1-1/8	—	—

Figure 52: Y-branch dimensions (See Table 69).

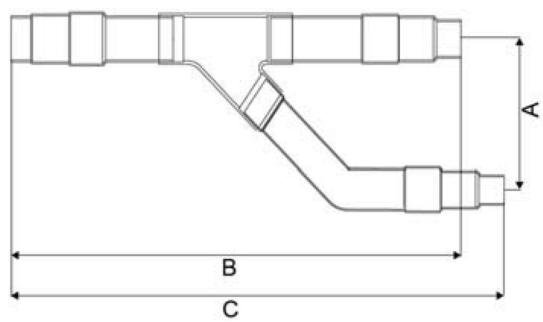


Table 69: Y-branch Dimensions (inches).

Y-branch	Y-branch Type	A	B	C
ARCNN21	Liquid	3-1/4	12-3/8	13-1/16
	Vapor	4-3/8	16-1/16	16-3/8
ARCNN31	Liquid	3-1/4	11-1/16	13-1/8
	Vapor	4-3/8	13-7/8	16

Figure 53: Reducer Components (See Table 70).

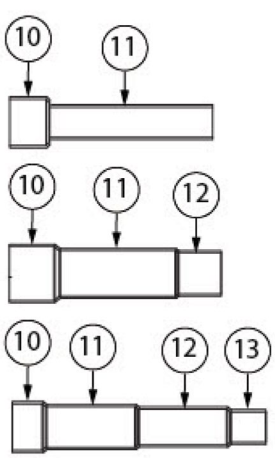


Table 70: Y-branch Reducer Diameters (inches).

Y-branch	Qty/Kit	Reducer Type	Reducer Diameters (in)				
			10	11	12	13	Length
ARCNN21	4	Liquid	7/8 ID	3/8 OD	—	—	2-3/4
			5/8 OD	—	1/2 ID	3/8 ID	4-3/8
		Vapor	1-5/8 ID	1-1/2 ID	—	1-3/8 OD	5-1/8
			1-1/8 OD	—	7/8 ID	3/4 ID	4-3/4
ARCNN31	4	Liquid	3/4 ID	—	5/8 ID	1/2 ID	4-3/8
			1/2 OD	—	3/8 ID	1/4 ID	4-3/8
		Vapor	1-5/8 ID	—	1-3/8 OD	—	4-7/8
			1-1/8 OD	—	7/8 ID	3/4 ID	4-3/4

Table 71: Fitting Properties.

Material	Copper
Design Pressure	550 psig

Table 72: Insulation Jacket Properties.

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

Indoor Unit Y-branch Kits for Heat Pump Systems

- LG indoor unit Y-branch fittings must be used with LG systems and be properly installed following the instructions in the applicable LG manual. Field-supplied branch fittings are not permitted.
- Kit components must be kept free of debris and dry before installation.
- All Y-branch kits include a clam shell, peel-and-stick insulation jacket.

Note:

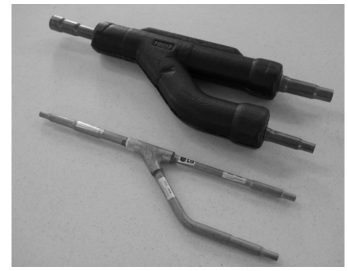
- *Design pressure is 550 psig.*
- *All dimensions in inches. Length tolerance ±1/4 inch.*
- *Images are not to scale.*

Table 73: Nominal Capacity Range (Btu/h).

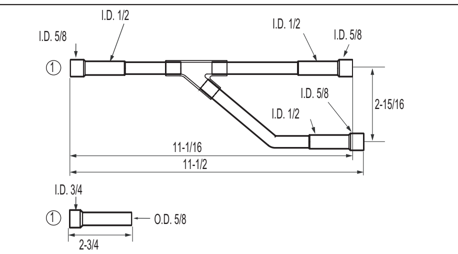
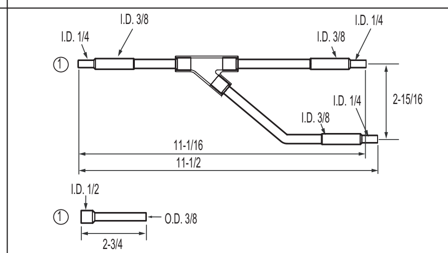
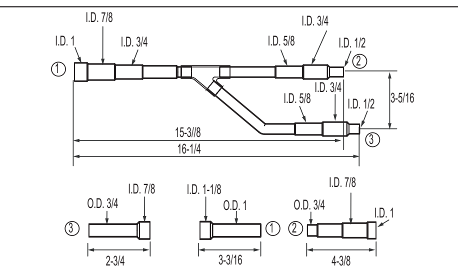
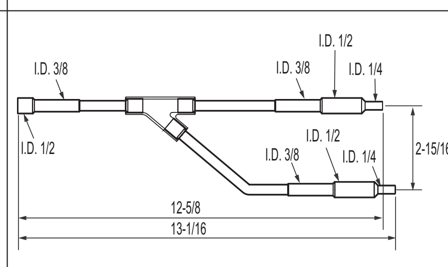
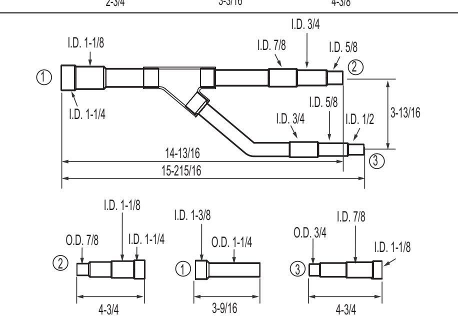
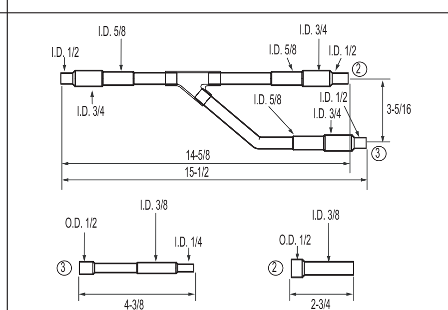
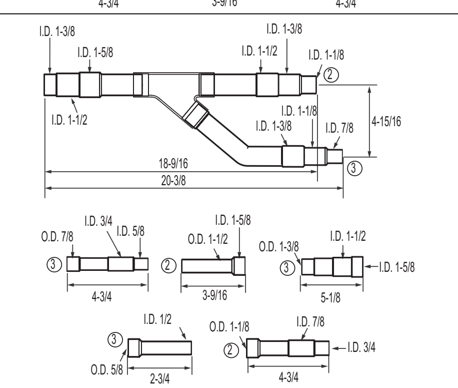
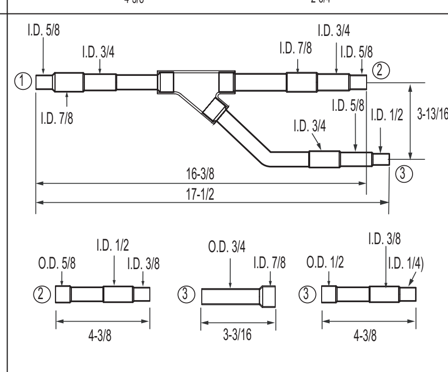
Model	Fitting Capacity
ARBLN01621	≤72,000 connected capacity
ARBLN03321	≤144,000 connected capacity
ARBLN07121	≤336,000 connected capacity
ARBLN14521	≤432,000 connected capacity

Table 74: Insulation Jacket Properties.

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



Unit: Inch

Models	Vapor pipe	Liquid pipe
ARBLN01621		
ARBLN03321		
ARBLN07121		
ARBLN14521		

- LG water source unit Y-branch fittings must be used with LG systems and be properly installed following the instructions in the applicable LG manual. Field-supplied branch fittings are not permitted.
- Kit components must be kept free of debris and dry before installation.
- All Y-branch kits include a clam shell, peel-and-stick insulation jacket.

Figure 54: Y-branch Connectors (See Table 75).

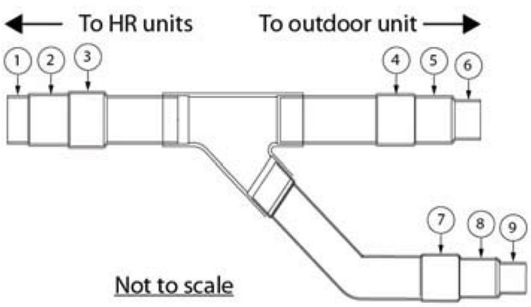


Table 75: Y-branch Connection Diameters (inches, ID)

Y-branch	Y-branch Type	Port Identifier								
		1	2	3	4	5	6	7	8	9
ARCNB21	Liquid	—	3/4	5/8	1/2	5/8	3/8	1/2	5/8	—
	Vapor Line Low	1-1/8	1-1/4	1-3/8	7/8	1-1/8	—	1-1/8	—	—
	Vapor Line High	1-1/8	1-3/8	1-1/4	1-1/8	1-1/4	1	1-1/8	1-1/4	1
ARCNB31	Liquid	—	7/8	3/4	3/4	—	—	5/8	1/2	—
	Vapor Line Low	1-1/2	1-5/8	1-3/8	1-3/8	—	—	1-1/8	—	—
	Vapor Line High	1-3/8	1-1/2	1-5/8	1-1/2	1-3/8	1-1/8	1-3/8	1-1/8	7/8

Figure 55: Y-branch Dimensions (See Table 76).

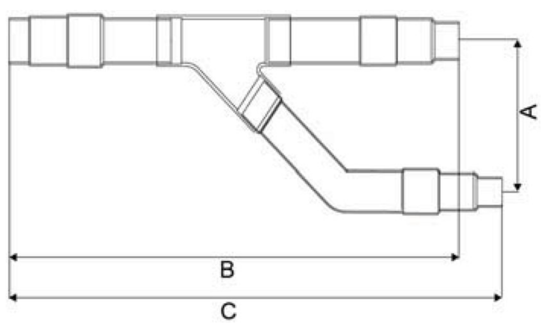


Table 76: Y-branch Dimensions (inches)

Y-branch	Y-branch Type	A	B	C
ARCNN21	Liquid	3-1/4	12-3/8	13-1/16
	Vapor Line Low	4-3/8	16-1/16	16-3/8
	Vapor Line High	4-3/8	17-7/8	19-5/16
ARCNN31	Liquid	3-1/4	11-1/16	13-1/8
	Vapor Line Low	4-3/8	13-7/8	16
	Vapor Line High	4-15/16	18-9/16	20-3/8

Figure 56: Reducer Components (See Table 77).

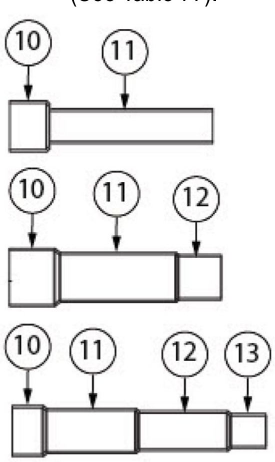


Table 77: Y-branch Reducer Diameters (inches).

Y-branch	Qty/Kit	Reducer Type	Reducer Diameters (inches)				
			10	11	12	13	Length
ARCNB21	7	Liquid	7/8 ID	3/4 OD	—	—	2-3/4
			5/8 OD	—	1/2 ID	3/8 ID	4-3/8
		Vapor Line Low	1-5/8 ID	1-1/2 ID	—	1-3/8 OD	5-1/8
			1-1/8 OD	—	7/8 ID	3/4 ID	4-3/4
		Vapor Line High	1 OD	7/8 ID	—	—	3-1/4
			1 OD	—	7/8 ID	3/4 ID	4-3/4
			3/4 OD	—	5/8 OD	1/2 ID	4-3/8
ARCNB31	6	Liquid	3/4 OD	—	5/8 ID	1/2 ID	4-3/8
			1/2 OD	—	3/8 ID	1/4 ID	4-3/8
		Vapor Line Low	1-5/8 ID	—	1-3/8 OD	—	4-7/8
			1-1/8 OD	—	7/8 ID	3/4 ID	4-3/4
		Vapor Line High	7/8 OD	—	3/4 ID	5/8 ID	4-3/4
			1-1/8 OD	—	7/8 ID	3/4 ID	4-3/4

Table 79: Insulation Jacket Properties.

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

Table 78: Fitting Properties.

Material	Copper
Design Pressure	550 psig

CUT SHEETS

Indoor Unit Y-branch Kits for Heat Recovery Systems

- LG indoor unit Y-branch fittings must be used with LG systems and be properly installed following the instructions in the applicable LG manual. Field-supplied branch fittings are not permitted.
- Kit components must be kept free of debris and dry before installation.
- All Y-branch Kits include a clam shell, peel-and-stick insulation jacket.

⚠ *Note:*

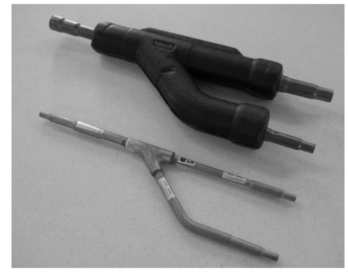
- *Design pressure is 550 psig.*
- *All dimensions in inches. Length tolerance ±1/4 inch.*
- *Images are not to scale.*

Table 80: Nominal Capacity Range (Btu/h).

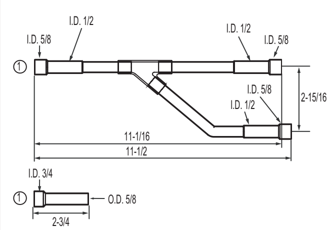
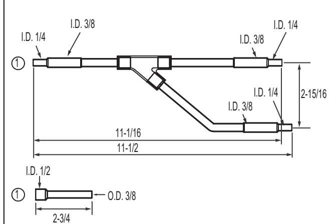
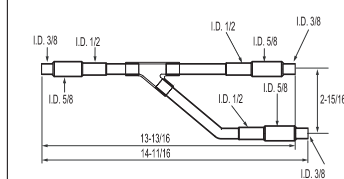
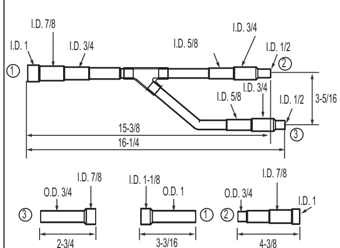
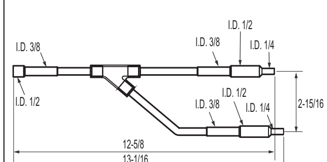
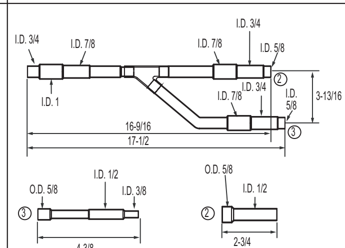
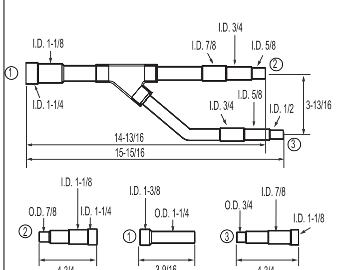
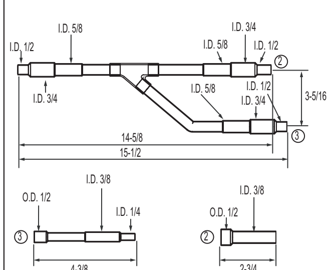
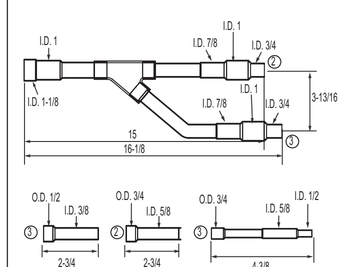
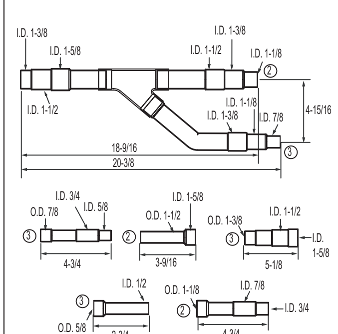
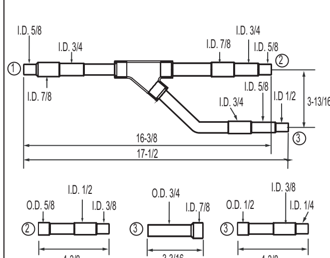
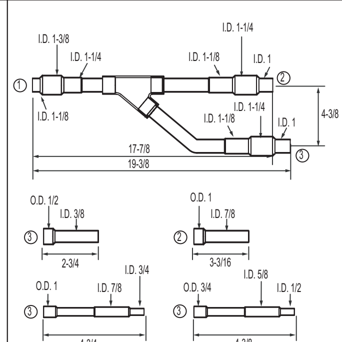
Model	Fitting Capacity
ARBLB01621	≤72,000 connected capacity
ARBLB03321	≤144,000 connected capacity
ARBLB07121	≤336,000 connected capacity
ARBLB14521	≤432,000 connected capacity

Table 81: Insulation Jacket Properties.

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



Unit: Inch

Models	Low-Pressure Vapor Pipe	Liquid pipe	High-Pressure Vapor Pipe
ARBLB01621			
ARBLB03321			
ARBLB07121			
ARBLB14521			

- LG Headers serve as central connections for multiple runout pipe segments terminating at indoor units.
- Headers must be used with LG systems and be properly installed following the instructions in the applicable LG manual. Field-supplied headers are not permitted.
- Kit components must be kept free of debris and dry before installation.
- All Header Kits include:
  - Insulation jacket (one each for vapor and liquid pipes)
  - Plugging tubes / Insulation for plugging tubes (see Table 83).

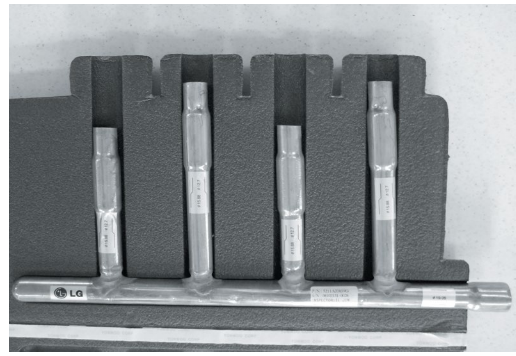


Table 82: Nominal Capacity Range.

Model	Fitting Capacity	Port Capacity
ARBL054 (4 branch)	≤72,000 connected capacity	≤54,300 per port
ARBL057 (7 branch)	≤75,100 connected capacity	≤54,300 per port
ARBL1010 (10 branch)	≤172,200 connected capacity	≤76,300 per port
ARBL104 (4 branch)	≤305,200 connected capacity	≤76,300 per port
ARBL107 (7 branch)	≤534,000 connected capacity	<76,300 per port
ARBL2010 (10 branch)	≤560,000 connected capacity	≤76,300 per port

Table 83: Plugging Tubes and Plugging Tube Insulation Amounts.

Header Kits	Plugging Tubes (in OD)			Insulation for Plugging Tubes
	1/4	1/2	5/8	
ARBL054 (4 port)	—	—	—	—
ARBL057 (7 port)	2	2	—	4
ARBL1010 (10 port)	2	2	2	6
ARBL104 (4 port)	—	—	—	—
ARBL107 (7 port)	2	2	2	6
ARBL2010 (10 port)	2	2	2	6

Table 84: Insulation Jacket Properties.

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

Table 85: Fitting Properties.

Material	Copper
Design Pressure	550 psig

Header Kits, continued.

Unit: Inch

<table>
<tr><th>Models</th><th>Vapor pipe</th><th>Liquid pipe</th></tr>
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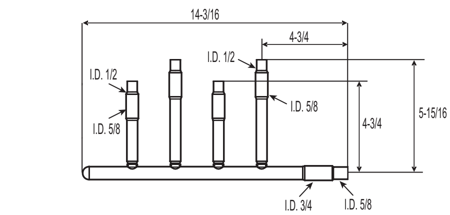
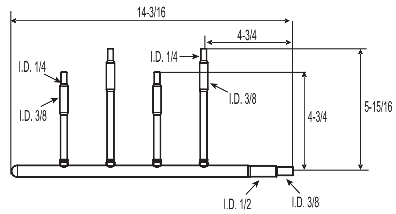
ARBL054</td><td>
</td><td>
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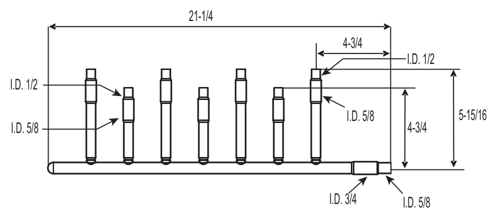
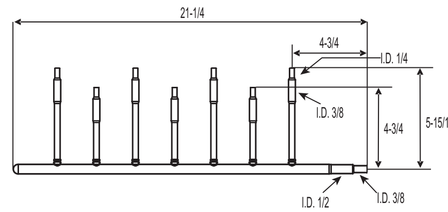
ARBL057</td><td>
</td><td>
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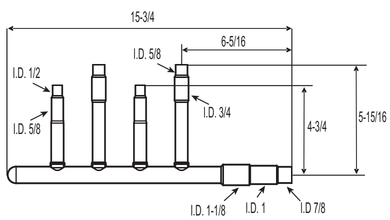
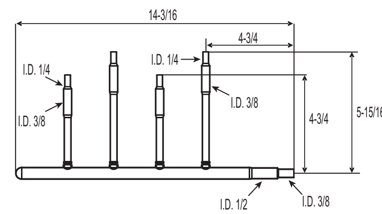
ARBL104</td><td>
</td><td>
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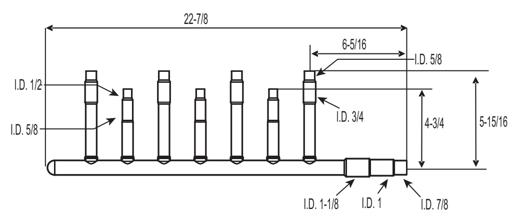
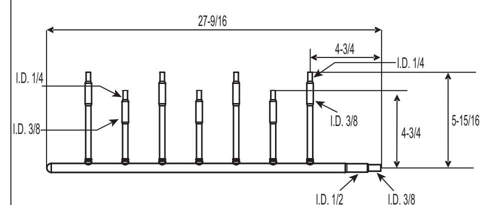
ARBL107</td><td>
</td><td>
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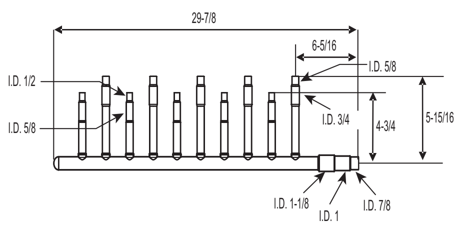
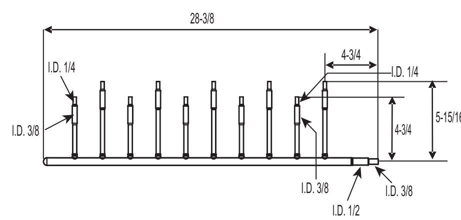
ARBL1010</td><td>
</td><td>
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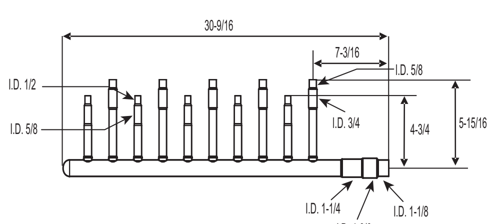
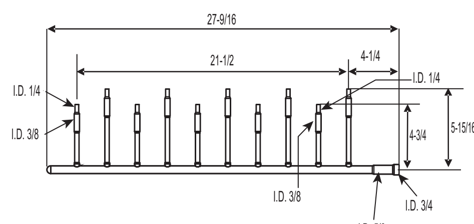
ARBL2010</td><td>
</td><td>
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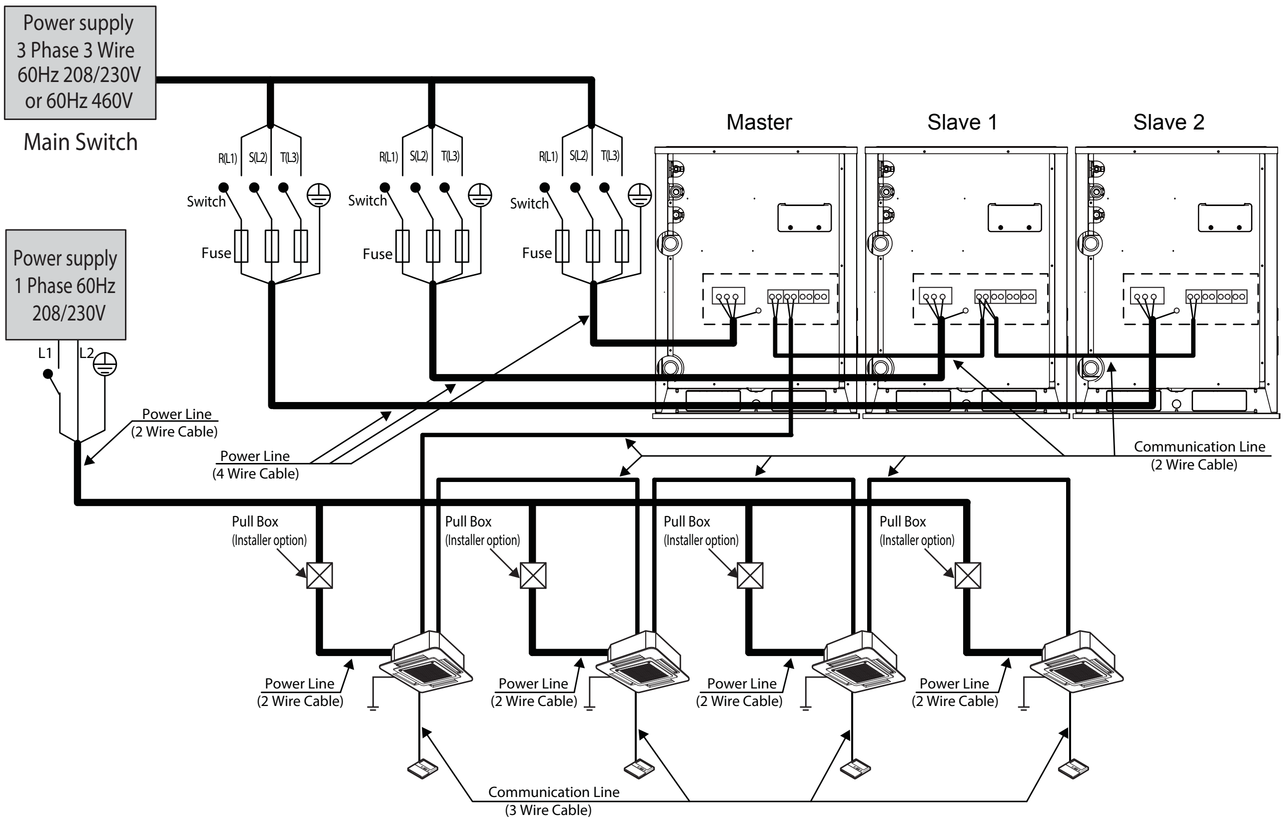
ELECTRICAL CONNECTIONS

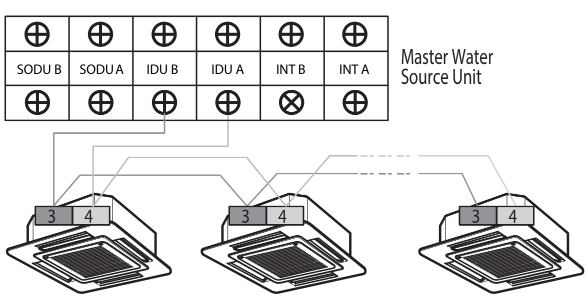
ARWN Series Heat Pump Systems (208-230V and 460V)

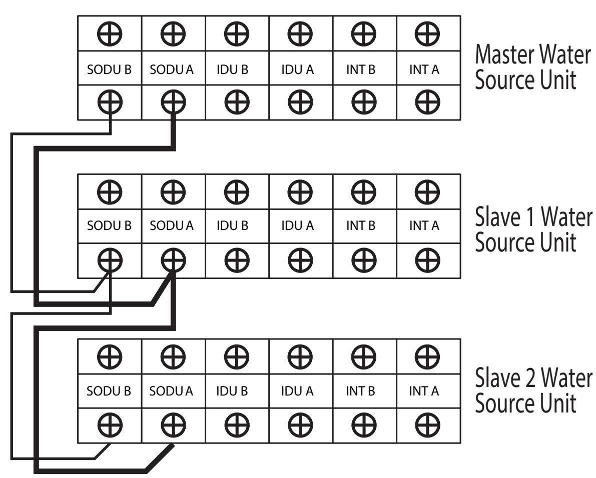


WARNING

- *Always ground indoor units to help prevent electrical shock accidents or communication signal disruption. Do not connect ground wires to the refrigerant pipes.*
- *Install a main shutoff switch that interrupts all power sources simultaneously.*
- *Operating the system in reversed phase can damage the compressor or other components. If there is a possibility of reversed phase loss, momentary blackout, or the power goes on and off during operation, install a field-supplied phase loss protection circuit.*

Between Indoor Units and Master Water Source Unit



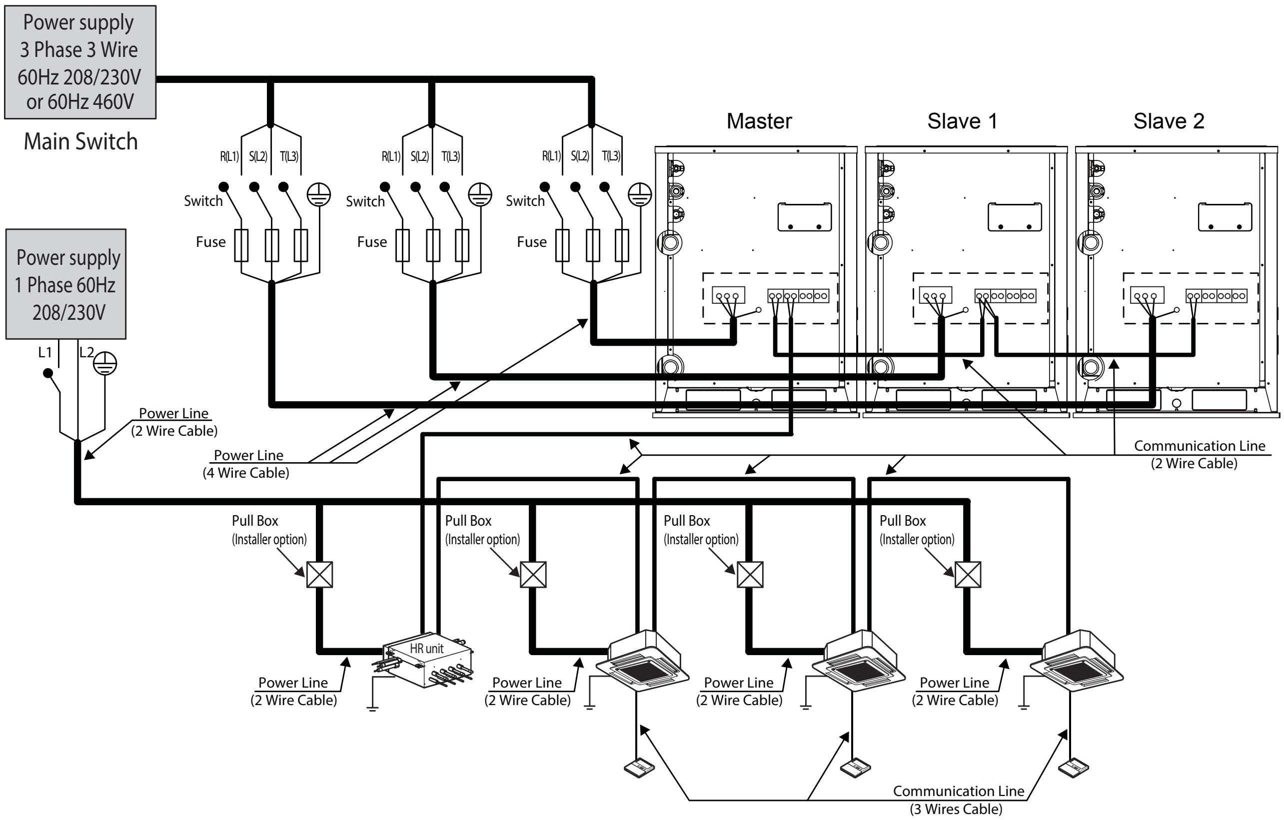


Note:

- *The GND terminal at the main circuit board is a negative terminal for a dry contact connection. Do not connect ground wires to this terminal.*
- *Ensure that the terminal numbers of the master and slave water source unit connections are matched, A terminals to A terminals and B terminals to B terminals.*

ELECTRICAL CONNECTIONS

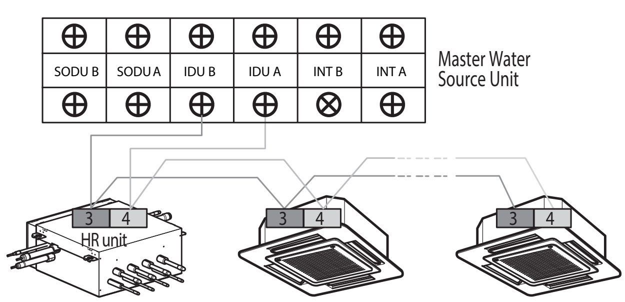
ARWB Series Heat Recovery Systems (208-230V and 460V)

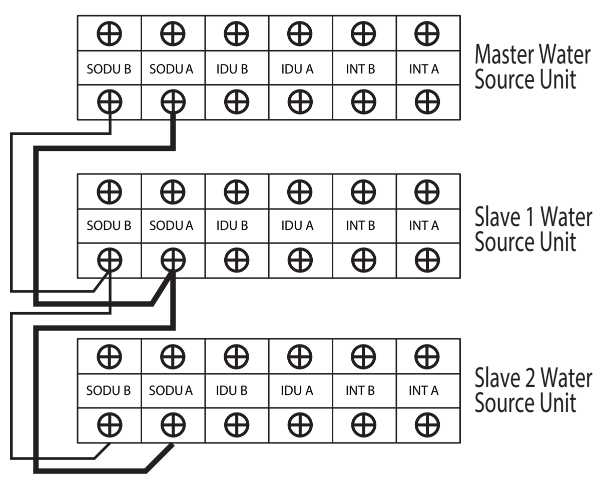


WARNING

- *Always ground indoor units to help prevent electrical shock accidents or communication signal disruption. Do not connect ground wires to the refrigerant pipes.*
- *Install a main shutoff switch that interrupts all power sources simultaneously.*
- *Operating the system in reversed phase can damage the compressor or other components. If there is a possibility of reversed phase loss, momentary blackout, or the power goes on and off during operation, install a field-supplied phase loss protection circuit.*

Between Indoor Units and Master Water Source Unit

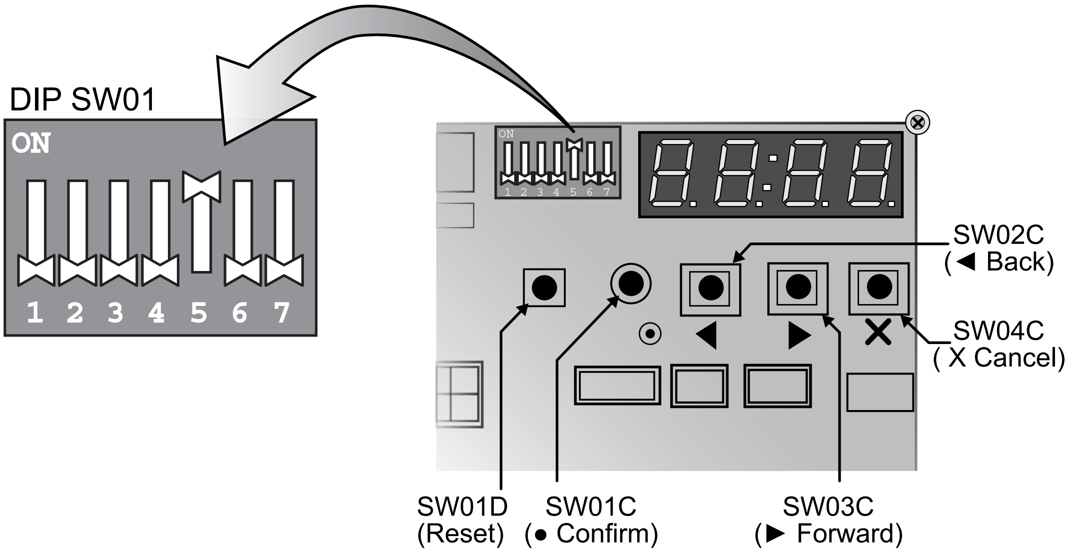




Note:

- *The GND terminal at the main circuit board is a negative terminal for a dry contact connection. Do not connect ground wires to this terminal.*
- *Ensure that the terminal numbers of the master and slave water source unit connections are matched, A terminals to A terminals and B terminals to B terminals.*

Set DIP switch 01 options as necessary for your installation.



⚠ Note:

Before setting these options, ensure all indoor units are OFF. Restore power to indoor units when procedure is complete.

During normal operation, switch 5 of DIP switch SW01 is set to OFF. To enable option configuration, set switch 5 to ON. Use the forward, back, confirm and cancel buttons on the main circuit board to select and set system options. The display above the buttons shows the selected function and its options.

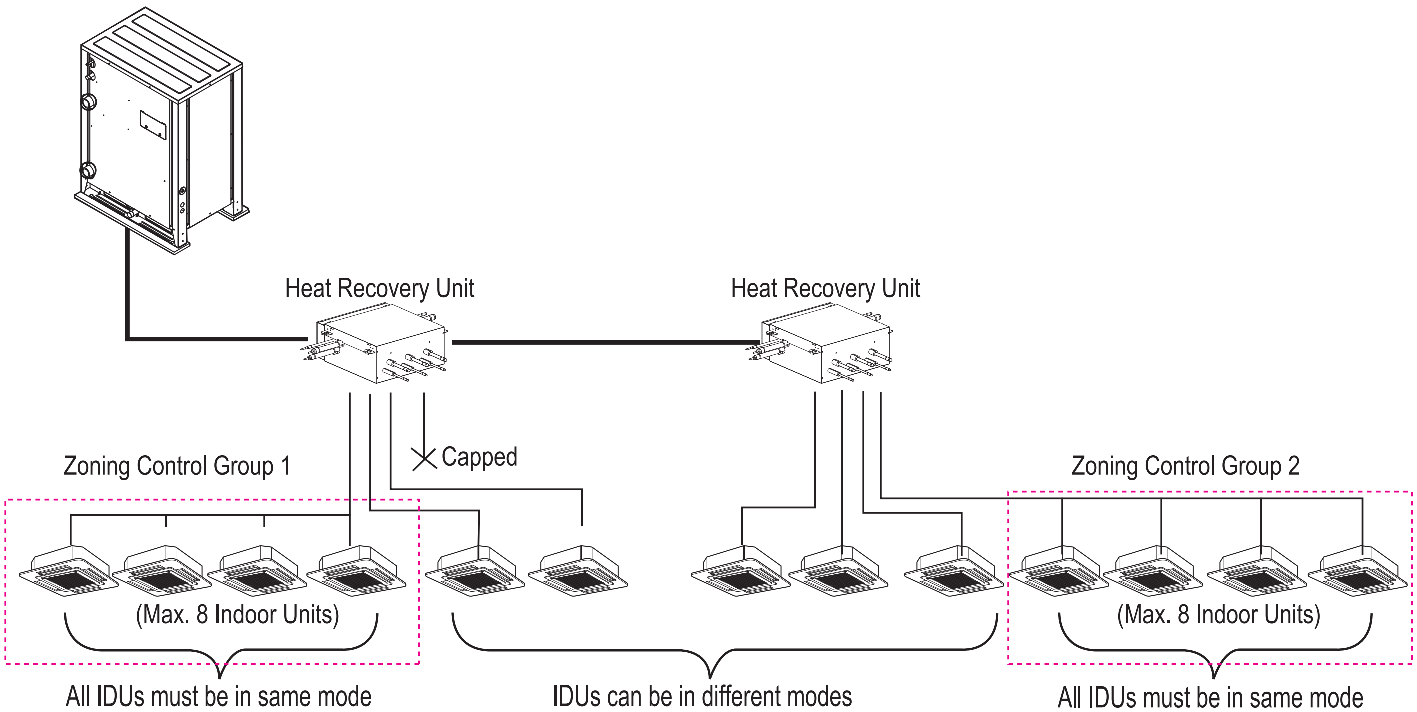
Use forward and back to scroll to the desired function and press confirm to select it. Then use forward and back to scroll between the options for that function and press confirm when the proper option is displayed. Pressing confirm stores the selected option in EEPROM on the circuit board.

Function		Options
Display	Description	
Fn1	Cool and Heat Selector	OFF / op1–op2
Fn2	Geothermal Mode Setting (entering water temperature lower than 50°F)	ON / OFF
Fn3	Solenoid Valve 220V Output	ON / OFF
Fn4	Variable Water Flow Control	ON / OFF
Fn5	WSU Address	0–255
Fn7	Target Pressure Adjusting	ON / op1–op3
Fn8	Compressor Crankcase Heater	ON / OFF

Zone Control of Indoor Units

Up to eight indoor units can be connected to one port of a heat recovery unit and can be controlled as a group.

Figure 57:IDU Zone Control



WARNING

- *The capacity of the indoor units on one port of a heat recovery unit (the zone) cannnot exceed 54kBtu/h.*
- *The maximum total capacity of indoor units connected to one Heat Recovery Unit cannot exceed 192kBtu/h.*
- *The maximum number of indoor units connected to one Heat Recovery Unit is 32.*
- *The maximum number of indoor units connected to one port of a Heat Recovery Unit is 8.*
- *When connecting more than one (1) indoor unit per port, all indoor units in a zone must be in the same mode, either heating or cooling. Auto Changeover and Mode Override functions are not available in zone control. The first IDU to call for a mode will decide the mode of all other IDUs on the same port, unless the IDUs are controlled by wall thermostats and a master IDU can be designated.*

Figure 58: Multi V Water IV ARWN Series Heat Pump System—Daisy-Chain Communications Cable Wiring.

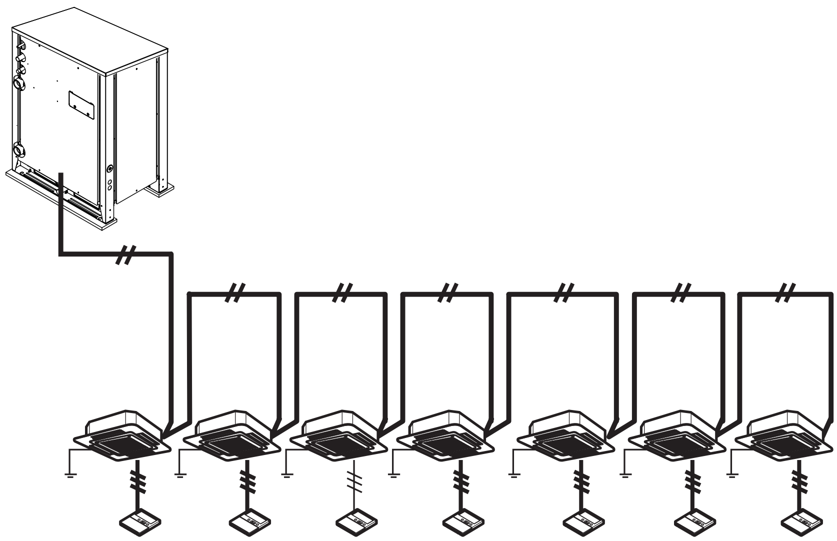
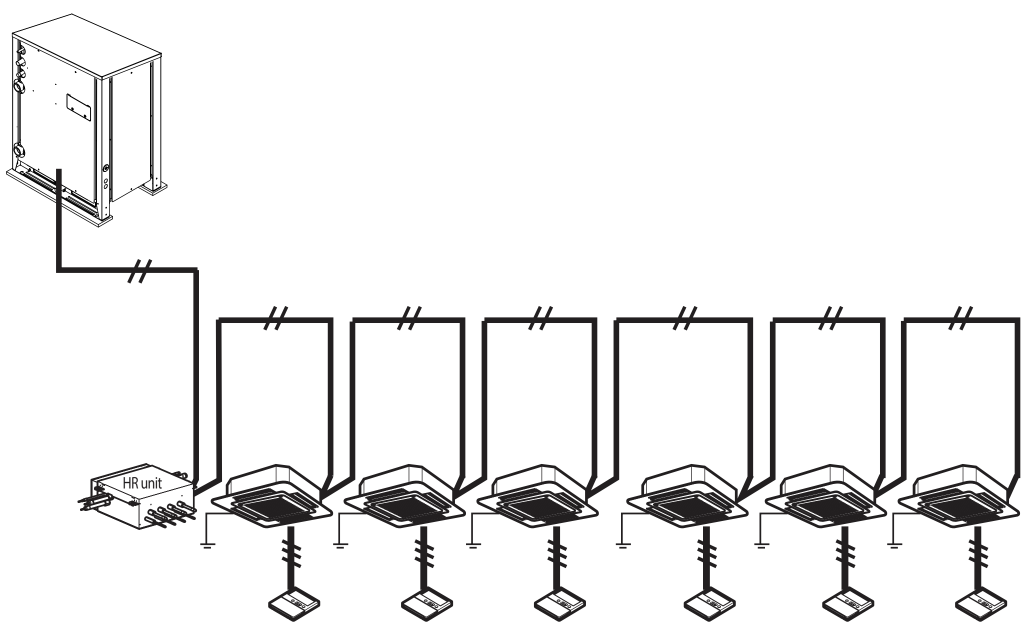


Figure 59: Multi V Water IV ARWB Series Heat Recovery System—Daisy-Chain Communications Cable Wiring.



Note:

Communications cables must be two conductor, 18 AWG, stranded, shielded, and grounded at the water source unit(s) only. Maintain polarity throughout the communication network.

WATER LOOP CIRCUIT DESIGN

Design Steps

A Multi V Water IV system requires a water cooling/heating source. This year-round heating and cooling system has a two-pipe closed-loop water circuit that circulates water continuously and maintains water temperature between 23°F and 113°F in both Cooling and Heating modes. See the Multi V Water IV Performance Data Manual for performance at different entering water temperatures. When entering water temperature is below 59°F, the LG variable water flow control kit Model No. PWFCKN000 is required. At the high end of this temperature range, a heat rejecter (cooling tower, dry cooler, geothermal well) removes the heat, while at the low end of the temperature range, an auxiliary heat source (boiler, solar panel, geothermal well) adds heat.

Piping, pumps, and accessories must be sized to provide adequate water flow to the water source unit.

Design Schematic

The Multi V Water IV water source units have factory-installed, stainless-steel plate heat exchangers. In order to protect these heat exchangers, it is recommended to use closed cooling towers. If open cooling towers or other open loop systems are used, an intermediate heat exchanger should be added to protect the water source unit from contaminants and debris in the water system that may foul or clog the heat exchanger. Open loop systems without an intermediate heat exchanger are not recommended due to risk of freezing, reduction of flow due to scaling or clogging, or other potential problems caused by improper water quality.

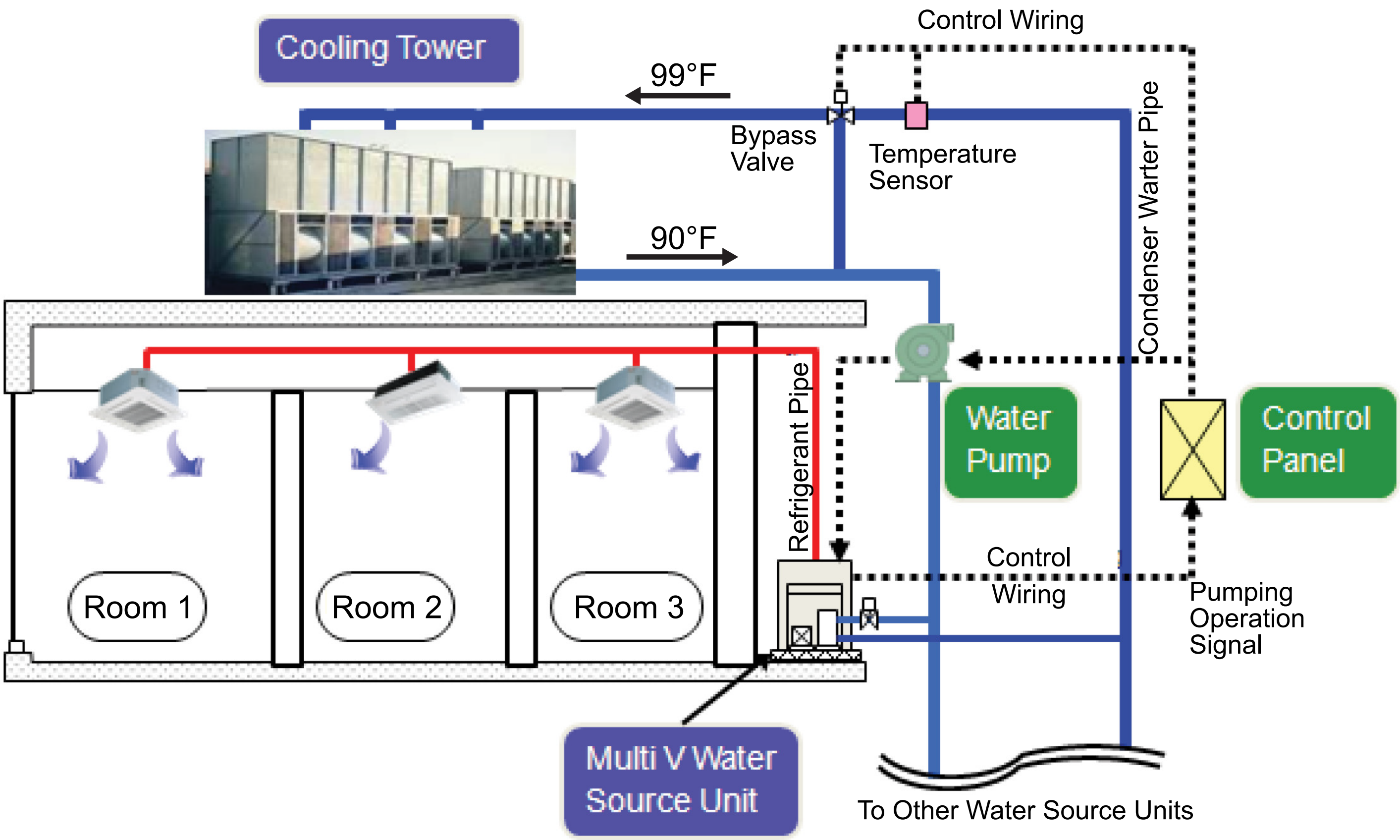


Figure 60: Water Cooling Cycle Diagram

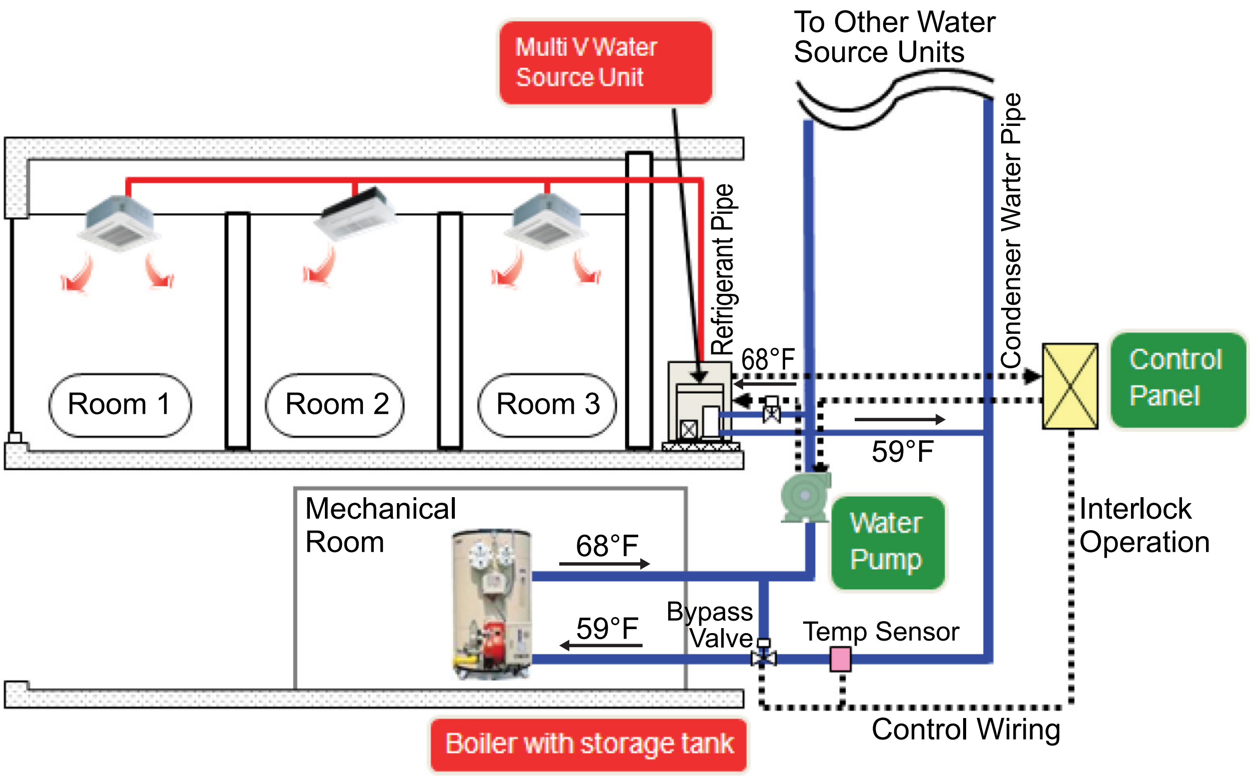


Figure 61:Water Heating Cycle Diagram

Expansion Tank

All closed loop systems should have a bladder type expansion tank installed. The expansion tank will protect the equipment from excess pressures due to expansion of water in the loop.

Heat Source and Storage Tank

There are several sources for heat that can be used for this system. They include the following:

- Electric boiler
- Gas boiler
- Solar heat with storage tanks
- Geothermal fields
- Steam heat from remote central plant

If floor space is available, a heat storage tank can be installed to compensate for the thermal flux of the system. The heat storage tank can store surplus heat or store heat during the night when electric rates are lower. Closed type storage tanks are recommended to prevent contamination of the water system.

Piping System

As shown on the pipe connection detail in Figure 62, the following components should be installed at each Multi V water source unit:

- Strainer with a minimum 50 mesh screen at the inlet. Clean the strainer regularly to prevent water flow blockage.
- Pressure gauges at the inlet and outlet.
- Thermometers at the inlet and outlet.
- Flexible connectors at the inlet and outlet.
- Flow switch at the outlet in the horizontal pipe. The flow switch should be wired to communication terminals and should be set to shut the unit off if flow falls below 50% of the unit design flow. Must use a normally closed type flow switch. The flow switch must be installed within five pipe diameters downstream and three pipe diameters upstream of elbows, valves, and reductions, or turbulence may occur.
- Shutoff valves at the inlet and outlet for service of the unit.
- Service ports with hose connections at the inlet and outlet. These service ports are used to flush the water source unit separately from the loop system.

Other requirements:

- A circuit setter or balancing valve is suggested to be installed to verify proper water flow to each water source unit.
- Inhibitors should be used in the water loop, especially if the water temperature operates above 104°F.
- Maintain water quality requirements as listed in Table 87.

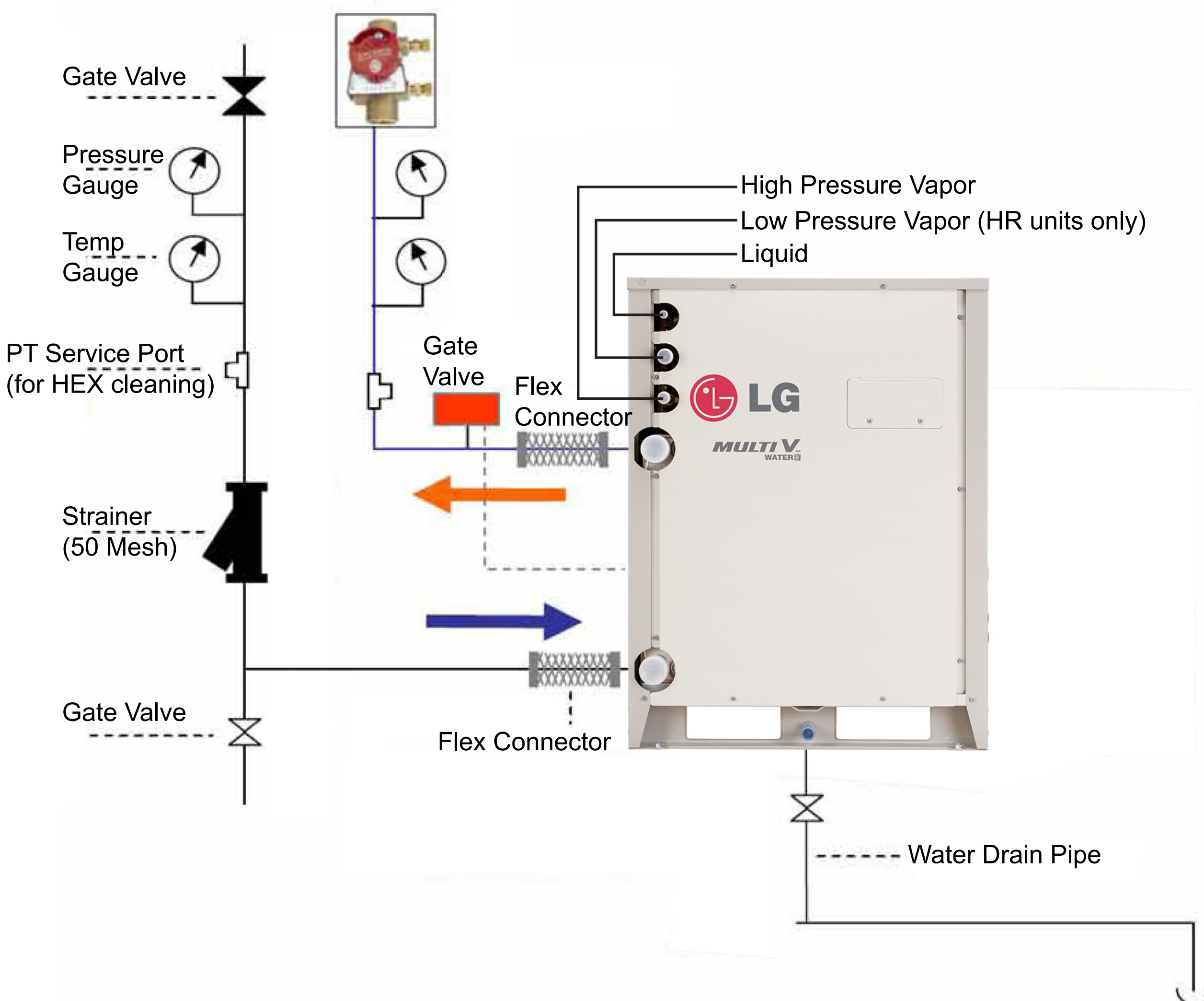


Figure 62:Typical WSU Water and Refrigerant Connections Diagram

Freeze Protection

The piping system must be protected from freezing during winter conditions. Heating mode of the water source unit will reduce water loop temperature. The addition of antifreeze may lower the performance of the water source unit due to reduced heat transfer and added pressure drop. LATS system design software has options to add antifreeze and calculate reduced capacity. To manually calculate capacity reduction, follow these steps:

1. Find the appropriate system cooling or heating correction factor in Table 86.
2. Multiply the cooling or heating correction factor by the water source unit capacity to find the NET water source unit capacity.
3. Apply the appropriate system pressure drop correction factor from Table 86 and multiply by the water source unit pressure drop to find the net water source unit pressure drop.

Table 86: Antifreeze Correction Factors

Antifreeze Type	Item	Antifreeze % by weight				
		10%	20%	30%	40%	50%
Methanol	Cooling	0.998	0.997	0.995	0.993	0.992
	Heating	0.995	0.99	0.985	0.979	0.974
	Pressure Drop	1.023	1.067	1.091	1.122	1.160
Ethylenel Glycol	Cooling	0.996	0.991	0.987	0.983	0.979
	Heating	0.993	0.985	0.997	0.969	0.961
	Pressure Drop	1.024	1.068	1.124	1.188	1.263
Propylene Glycol	Cooling	0.993	0.987	0.98	0.974	0.968
	Heating	0.986	0.973	0.96	0.948	0.935
	Pressure Drop	1.040	1.098	1.174	1.273	1.405

Water Quality Requirements

Impurities in the water can influence the performance and life expectancy of the water source unit. Use a local water treatment professional to test and treat the water. Use inhibitors in the water loop, especially if the water temperature is operated above 104°F. Ensure all air is purged from the system. Maintain the following levels:

Table 87: Water Test Levels

Item	Closed Type System		Effect	
	Circulating Water	Supplemented Water	Corrosion	Scale
Basic Items:				
pH [77° F]	7.0 ~ 8.0	7.0 ~ 8.0	O	O
Conductivity [77° F] mS/m	Below 30	Below 30	O	O
Chlorine ions (mg Cl^-/L)	Below 50	Below 50	O	–
Sulfate ions (mg SO_4^{2} 2/L)	Below 50	Below 50	O	O
Acid consumption (pH4.8) (mg$CaCO_3$/L)	Below 50	Below 50	–	O
Total Hardness (mg $CaCO_3$/L)	Below 70	Below 70	–	O
Calcium Hardness (mg $CaCO_3$/L)	Below 50	Below 50	–	O
Ionic-static silica (mg SiO_2/L)	Below 30	Below 30	–	O
Reference Items:				
Iron (mg Fe/L)	Below 1.0	Below 0.3	O	O
Copper (mg Cu/L)	Below 1.0	Below 0.1	O	–
Sulfate ion (mg SO_4^{2}/L)	Must not be detected	Must not be detected	O	–
Ammonium ion (mg NH_4^+)L	Below 0.3	Below 0.1	O	–
Residual chlorine (mg CL/L)	Below 0.25	Below 0.3	O	–
Free carbon dioxide (mg CO_2/L)	Below 0.4	Below 4.0	O	–
Stability index	–	–	O	O

O = possibility of occurrence

Pipe Insulation

Water pipe insulation is suggested in the following conditions:

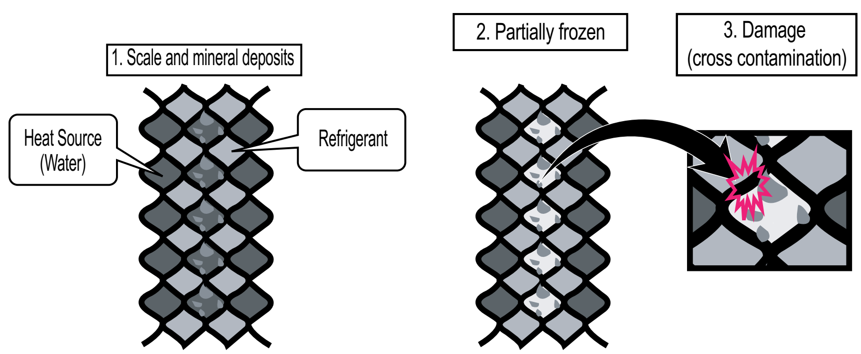
- Where water pipe is subject to freezing.
- Water pipe where water can condense on surface of pipe from ambient room temperatures higher than temperature of water in the pipe. If water temperature is maintained at 68°F in winter and 86°F in summer, insulation will not be required.
- On boiler water pipes to save energy losses from heat source.
- On condensate drain lines.
- Where required by local code.

Device Protection Details

Strainer on Water Pipe

To protect the water source unit, a strainer with ≥50 mesh must be installed on the water source unit inlet piping. If not installed, the heat exchanger can be damaged by particles in the water supply.

Figure 63: Potential Heat Exchanger Damage.

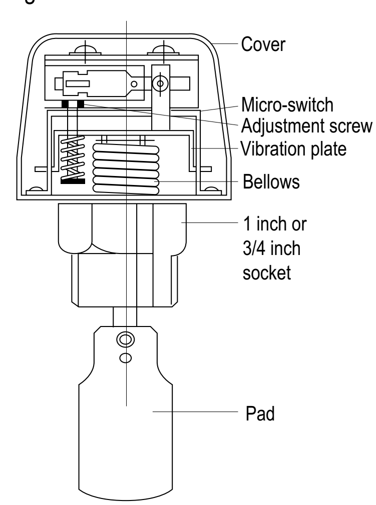


1. The water-supply circuitry within the plate-type heat exchanger is comprised of many small paths / channels.
2. If a strainer with 50 mesh or more is not included, foreign particles can partially block the water flow.
3. When the system operates in heating, the plate-type heat exchanger functions as an evaporator, therefore, the temperature of the coolant supply drops the temperature of the heat-source water supply, which can result in ice forming in the water circuitry.
4. As heating operation progresses, the channels can be partially frozen, which may damage the plate-type heat exchanger.
5. If the heat exchanger is damaged, the coolant supply and the heat source water supply will mix, and the system will not function.

Flow Switch

- It is recommended to install a flow switch on the water pipes that are connected to the water-source unit.
- Flow switch should be rated for 208-230V and be a normally closed type. Flow switch will perform as the first protection device when heated water is not supplied. If the required water level is not present after installing the flow switch, the water source unit will display a CH24 error code and will stop operating.
- When setting the flow switch, it is recommended to use the default set value of the water source unit to satisfy the minimum flow rate. (Minimum flow rate range is 50%; When installing the Variable Water Flow Control Kit, set minimum water flow to 40% of nominal flow rate.)
- Select a flow switch following the pressure specification of the water supply system.

Figure 64: Flow Switch Schematic.

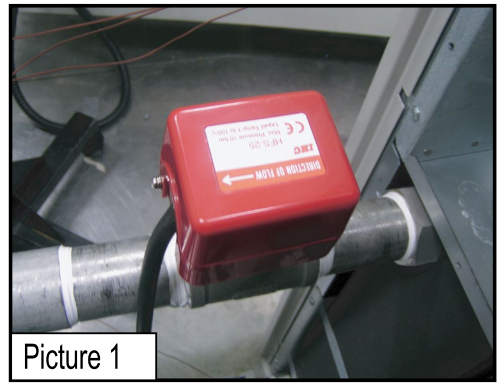


⚠ *Note:*

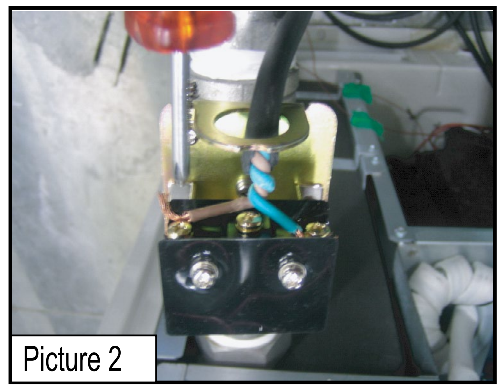
- *If the set value does not satisfy the minimum flow rate, or if the set value is changed by the user arbitrarily, it can result in performance deterioration or system failure.*
- *If the water source unit operates with a hard water supply, the heat exchanger can be damaged or system failure can occur.*
- *If the water source unit displays a CH24 or CH180 error code, it is possible that the interior of the plate-type heat exchanger is partially frozen. If this occurs, resolve the partial freezing issue and then operate the water source unit again. (Causes of partial freezing: Insufficient heat water flow rate, water not supplied, insufficient coolant, foreign particles inside plate-type heat exchanger.)*

Flow Switch

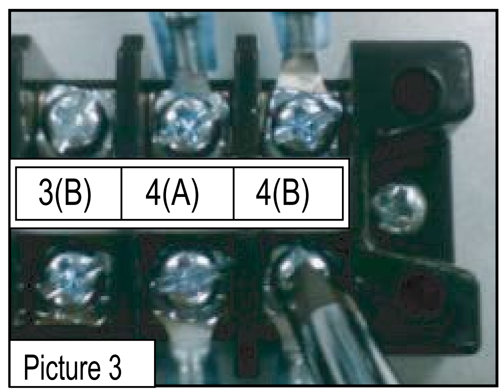
- The flow switch must be installed at the horizontal pipe of the water source unit's heat water-supply outlet. Verify the direction of the water flow before installation. (Picture 1)
- Remove the jumper wire and connect to the communication terminals (4[A] and 4[B]) of the water source unit's control box. (Pictures 2, 3) Open the flow switch cover and check the wiring diagrams before connecting the wires. Wiring methods can vary by flow switch manufacturer.
- If necessary (and after consulting with an LG representative), use the flow rate detection contact to adjust flow rate to within the minimum range. (Picture 4) Minimum flow rate range of this product is 50%. Adjust the flow switch to the contact point when the flow rate reaches 50%.(Minimum flow rate range is 50%; When installing the Variable Water Flow Control Kit, set minimum water flow to 40% of nominal flow rate.)



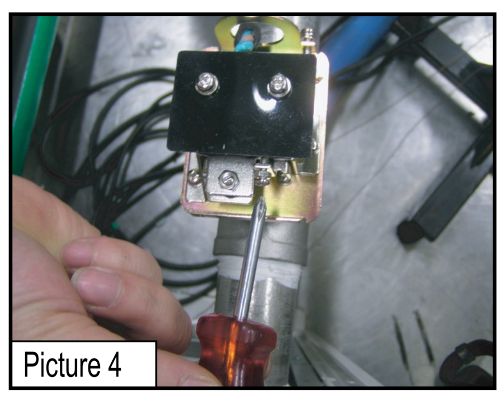
Picture 1



Picture 2



Picture 3



Picture 4

Note:

- *If the product operates while the flow switch contact point is out of the permitted range, it can result in performance deterioration or system failure.*
- *A normally closed type of flow switch must be used.*

Solenoid Valves (Optional)

Solenoid valves may be installed to shut off water flow to the water source unit when the unit turns off. Solenoid valves are field supplied, must be rated for 208-230V, and must be wired to terminals L1 and L2 on the water source unit PCB as shown in Figure 65. Remove water source unit power and set the PCB DIP switches as shown in Figure 66, then turn on power.

⚠ WARNING

High voltages capable of causing death are used in this equipment. Remove water source unit input power before performing this procedure. Failure to observe this warning can result in death or severe injury.

⚠ *Note:*

Field-supplied solenoid valve must be a normally closed type.

Figure 65: Flow Switch and Solenoid Valve Wiring

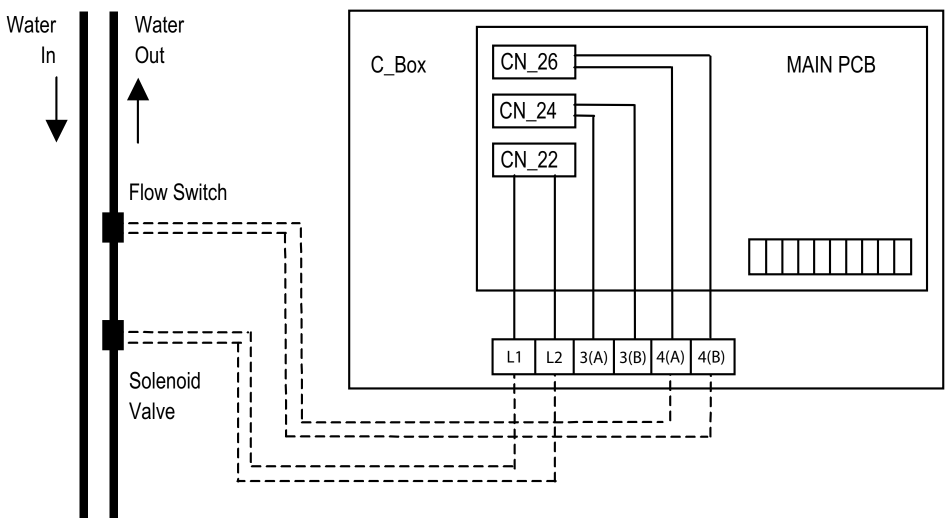
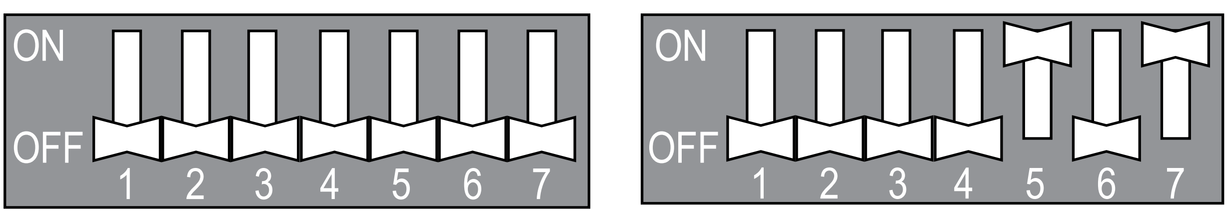


Figure 66: WSU DIP Switch Settings for Solenoid Valve Control by WSU



Variable Water Flow Valve Control Kit PWFCKN000 (Optional)

When entering water temperature is lower than 59ºF, variable water flow control kit PWFCKN000 is required. LG recommends installing a variable water flow control kit on each water source unit.

Note:

- *Field-supplied modulating water control valve must be 24 volt, normally-closed.*
- *Minimum flow rate cannot be less than 40% of normal flow rate.*
- *Variable flow control kit sends 0–10 volt signal to the modulating valve. 10 volts is full open valve position. As building load drops and compressor slows, the signal reduces to close the valve. 1 volt is the minimum flow position of 40% of rated flow. Zero volts is valve fully closed.*

Variable Water Flow Valve Control Kit Installation

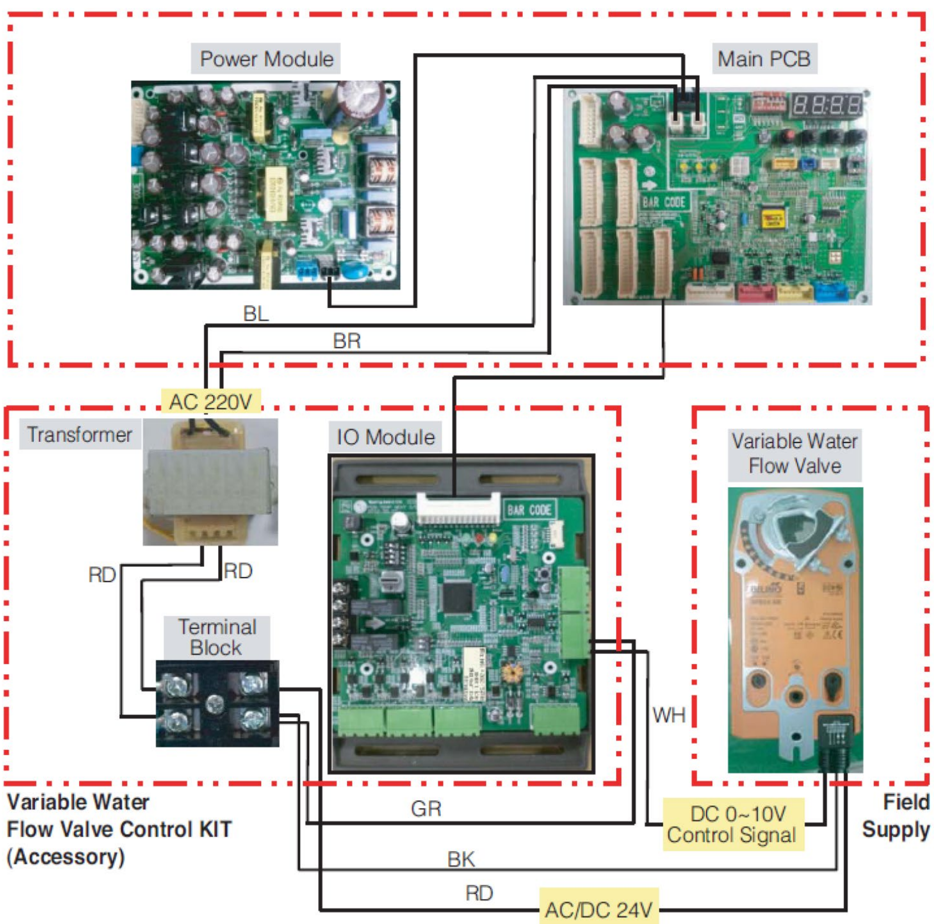
Install the kit as follows:

WARNING

High voltages capable of causing death are used in this equipment. Remove water source unit input power before performing this procedure. Failure to observe this warning can result in death or severe injury.

1. Remove power from the water source unit.
2. Install the transformer, I/O module, and terminal block inside the water source unit chassis. Secure components with screws.
3. Connect component wiring as shown in Figure 67.
4. Position DIP switch 5 (function 4) to the ON position.
5. Reconnect water source unit power.

Figure 67: Variable Water Flow Valve Control Kit

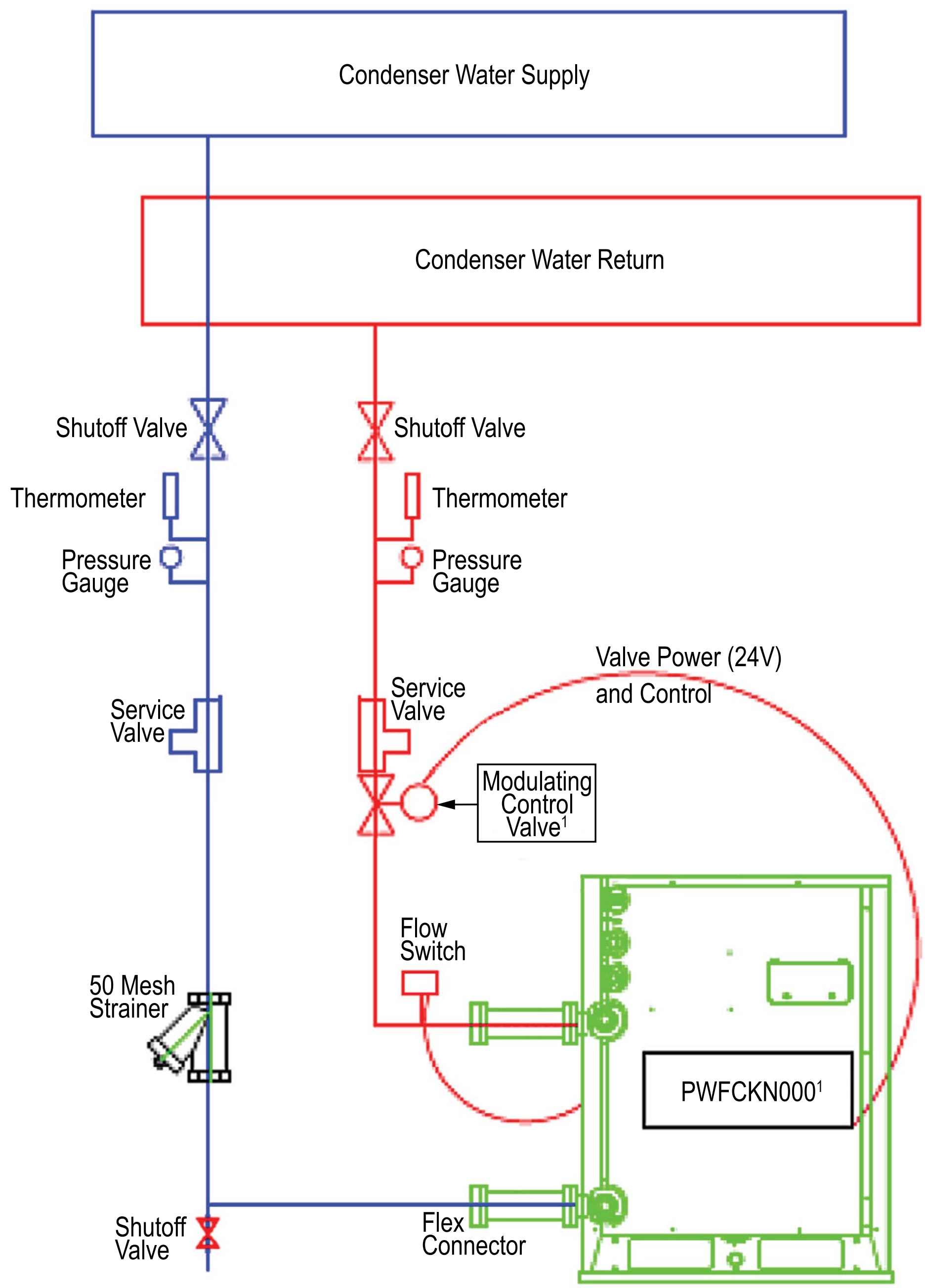


BL=blue; BR=brown; RD=red; BK=black; WH=white; GR=green

Configuring Variable Water Flow Valve Control Kit for each WSU

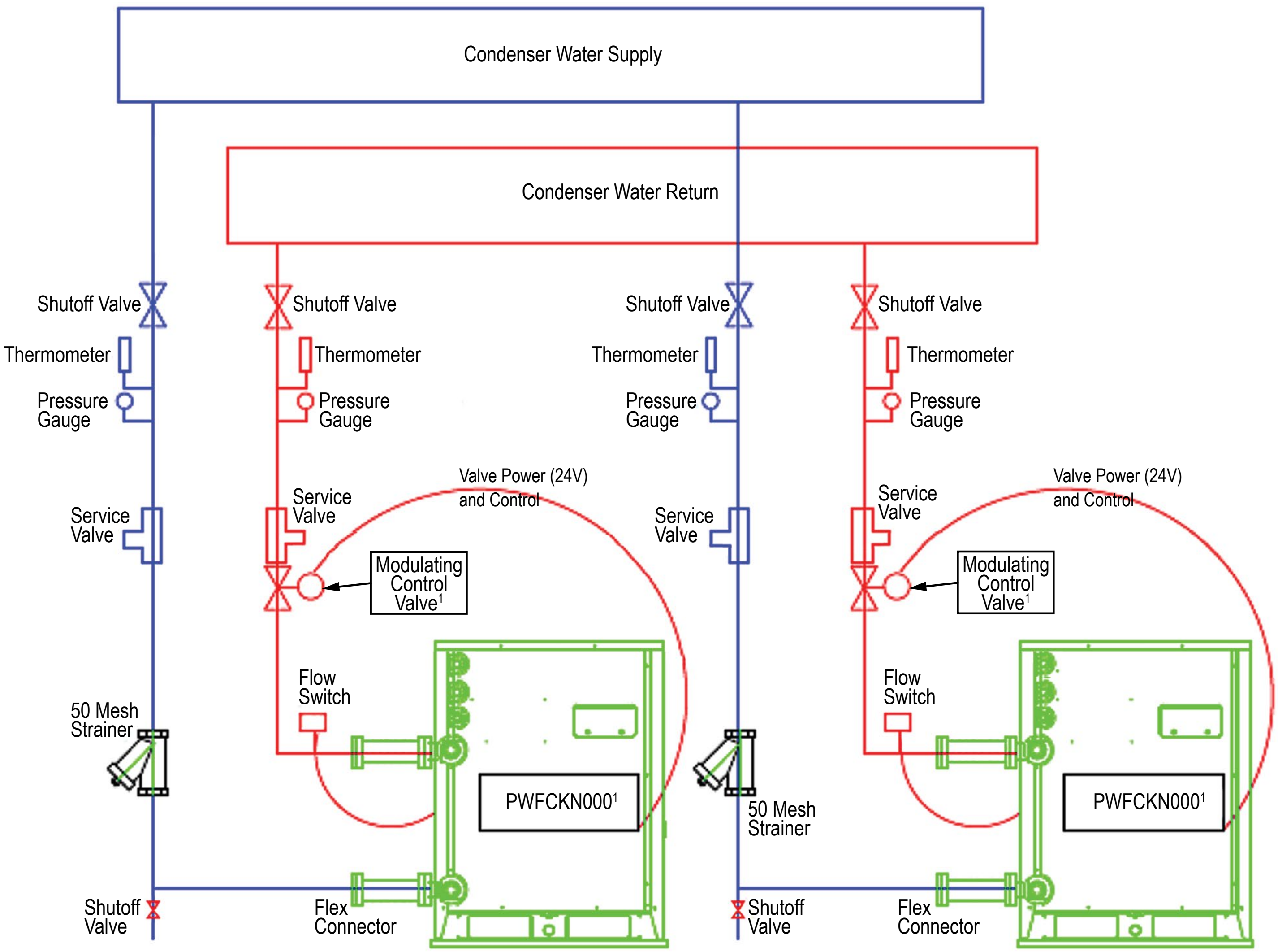
LG recommends installing a variable water flow valve control kit on each water source unit. Refer to Figure 68, Figure 69, and Figure 70 for single, dual, and triple frame configurations.

Figure 68: Variable Water Flow Valve Control Kit for Single Frame



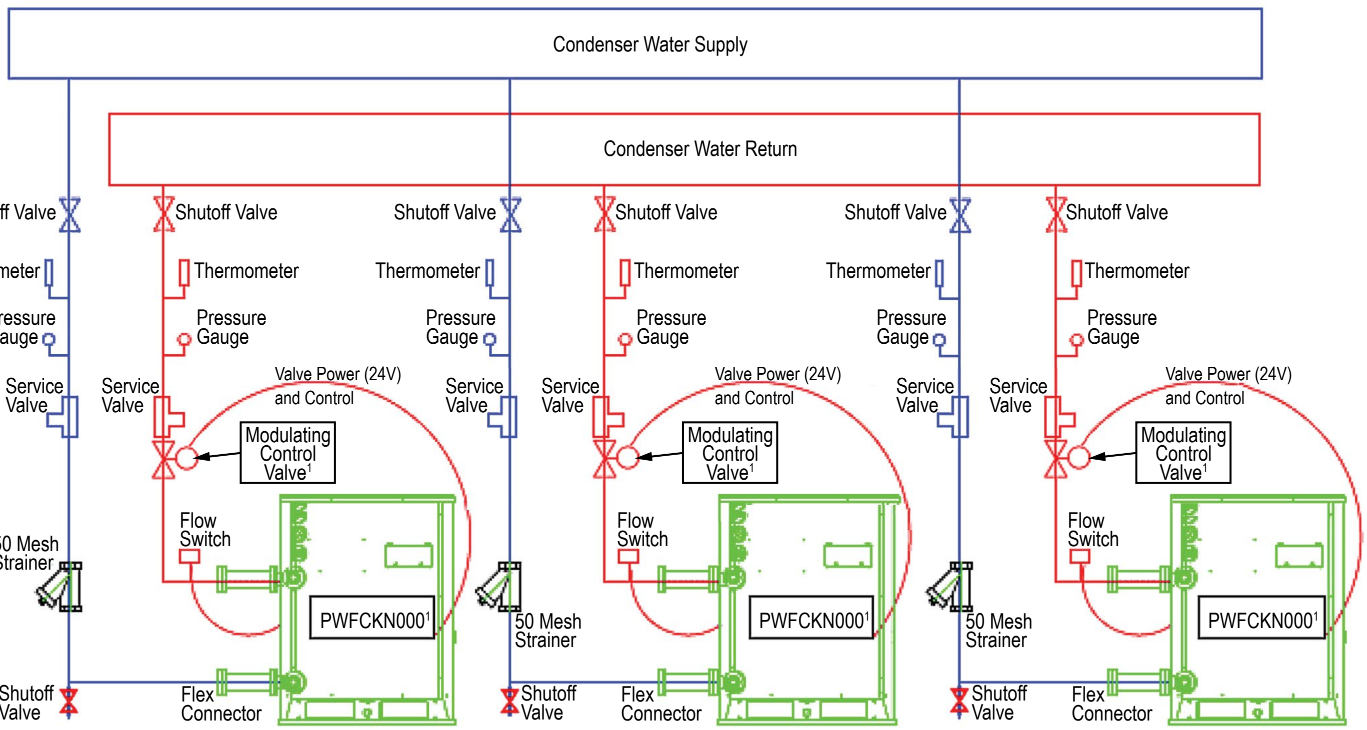
[1]Variable Water Flow Valve Control Kit PWFCKN000 controls operation of the field-supplied Modulating Control Valve. The valve must be 24 volt, normally-closed.

Figure 69: Variable Water Flow Valve Control Kits for Dual Frame



[1]Variable Water Flow Valve Control Kit PWFCKN000 controls operation of the field-supplied Modulating Control Valve. The valve must be 24 volt, normally-closed.

Figure 70: Variable Water Flow Valve Control Kits for Triple Frame



[1]Variable Water Flow Valve Control Kit PWFCKN000 controls operation of the field-supplied Modulating Control Valve. The valve must be 24 volt, normally-closed.

Water Piping System Installation

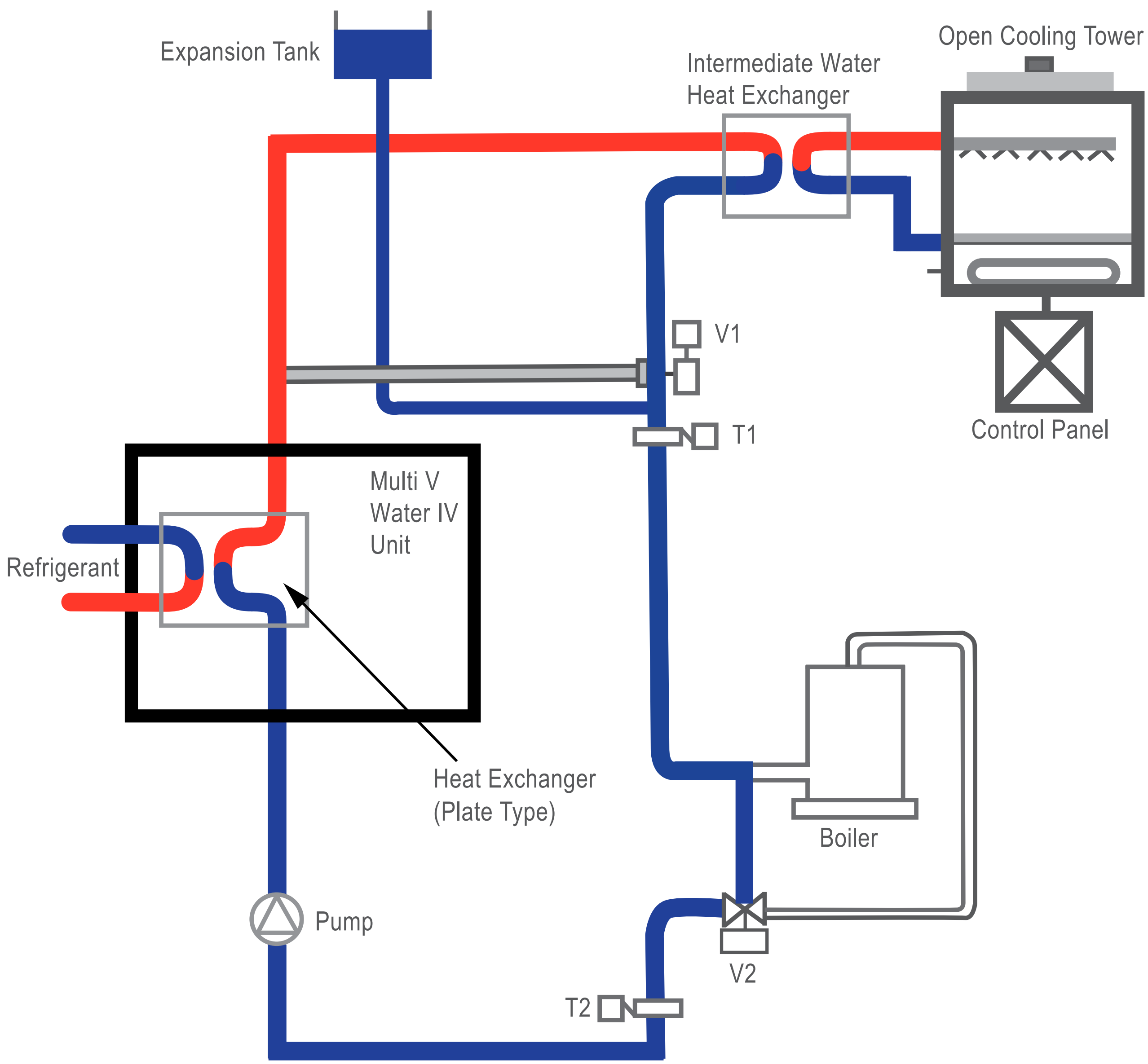
If water temperature is maintained at 68°F in winter and 86°F in summer, insulation is not required. Water pipe insulation is suggested if the following conditions exist:

- Water pipe is subject to freezing.
- Water pipe is located where water can condense on the surface of the pipe from ambient room temperatures higher than the temperature of the water in the pipe.
- Boiler piping (to save energy losses from the boiler).
- Where required by local codes.

Open Tower Design Schematic

When using an open cooling tower or open geothermal wells, an intermediate heat exchanger is recommended to be installed to protect the water source unit from contamination.

Figure 71: Open Tower Design Schematic – Requires Intermediate Heat Exchanger



TECHNICAL DATA

MECHANICAL SPECIFICATIONS

Water Source Units

General

An LG Multi V Water IV variable refrigerant flow (VRF) water source unit (WSU) operates as either a heat pump or a heat recovery system. The WSU consists of a single, dual or triple frame system connected to indoor units (IDU) with refrigerant piping. The WSU has integrated controls and can be operated with its control system or with a building management system.

A Multi V Water IV Heat Pump system is a VRF system that can operate in either cooling or heating mode. A Multi V Water IV Heat Recovery system is a VRF system that can operate in heating and cooling mode simultaneously. Heat recovery systems require heat recovery units (HRU); heat pump systems do not.

HRUs allow minimum piping and maximum design flexibility. Every indoor unit or zone of a heat recovery system is independently capable of operating in either heating or cooling mode regardless of the mode of other indoor units. The system ensures properly maintained indoor temperature by changing the mode of individual indoor units or zones (cooling to heating or heating to cooling) within a maximum time of three (3) minutes.

LG components are manufactured in a facility meeting International Organization for Standardization (ISO) 9001 and ISO 14001 standards. ISO 9001 defines quality management and ISO 14001 defines environmental management. The units are listed by Intertek Electrical Testing Laboratories (ETL) and bear the ETL label. Wiring in these units are in accordance with the National Electrical Code (NEC).

Temperature Ranges

Heat Pump Systems

Heat pump units can operate in heating only mode with an entering water temperature (EWT) of 23°F to +113°F.

Heat pump units can operate in cooling only mode with an EWT of 23°F to +113°F.

Heat Recovery Systems

Heat recovery units can operate in heating only mode with an entering water temperature (EWT) of 23°F to +113°F.

Heat recovery units can operate in cooling only mode with an EWT of 23°F to +113°F.

Casing / Frame

Heat pump and heat recovery WSUs are constructed with galvanized steel, bonderized and finished with powder coat baked enamel paint. Each frame has a removable inspection panel no greater than six (6) inches tall and twelve (12) inches wide to allow access to service tool connection, DIP switches, auto addressing and error codes.

WSU frames are completely factory assembled, piped and wired. Dual and triple frame WSUs must be field piped with factory designed and supplied Y-branch kits to manifold them together into a single refrigerant circuit.

Refrigerant System

The refrigeration system is a single refrigeration circuit using R410A refrigerant. The WSU is provided with factory-installed components including a refrigerant strainer, check valves, oil separator, accumulator, hot gas bypass valve, four-way reversing valve, electronic controlled expansion valve (EEV), high and low side charging ports, high pressure safety switch, service valves, and interconnecting piping. Also included is an integral subcooler assembly consisting of a double spiral tube-type subcooling heat exchanger and EEV providing refrigerant subcooling modulation up to 25ºF.

Refrigeration Oil Control

The oil return system uses the following technologies:

High Pressure Oil Return (HiPOR)

Oil is captured from compressor discharge by the centrifugal oil separator and then returned to the compressor through a separator oil injection pipe, preventing mixing of oil and refrigerant on the suction side of the compressor.

Smart Oil Control

Smart oil control monitors the oil level inside the compressor and initiates an oil return cycle to flush oil in the pipe system back to the compressor only when the oil level is too low. Timed oil return cycles are eliminated and the compressor is protected from operating at oil levels that are too low.

Compressors

Each WSU frame is equipped with one hermetic, digitally-controlled, inverter-driven scroll compressor to modulate capacity (variable from 20 to 140Hz, modulated in 1 Hz increments). The compressor has a built-in oil level sensor to provide real-time oil control.

Heat Exchanger

The water heat exchanger is a stainless steel, type SUS316, refrigerant/water plate heat exchanger. The heat exchanger requires a field-provided 50 mesh strainer and water treatment to prevent scaling inside the heat exchanger. Closed loop condenser water systems are recommended to protect the factory-mounted heat exchanger.

Electrical

Both heat pump and heat recovery WSUs are available with a choice of 208-230V, 60 Hz, 3-phase or 460V, 60 Hz, 3-phase input power supply. All WSUs are capable of operating within voltage limits of ±10% rated voltage, and include overcurrent protection.

Controls

Heat pump and heat recovery WSUs are factory wired with the necessary electrical control components, integral microprocessors, printed circuit boards, thermistors, sensors, terminal blocks, and power lugs.

The control circuit between the indoor units, heat recovery units (Multi V Water IV Heat Recovery systems only) and the WSU is an RS-485 daisy chain communication bus. The cable is two conductor, stranded and shielded, 18 AWG.

Microprocessor-based algorithms provide component protection, soft-start capability, refrigeration system pressure and temperature control. The variable water flow control kit allows condenser water temperatures below 59°F and works with condenser water pumps equipped with variable frequency drive to save pumping energy.

General

Heat Recovery Units (HRU) are used with Multi V Water IV Heat Recovery WSUs to permit simultaneous heating and cooling operation.

Two (2), three (3), or four (4) port configurations are available. Each port is capable of connecting from one (1) to eight (8) indoor units up to a maximum nominal capacity of ≤54MBh. Individual indoor units ≥54MBh nominal capacity must use two (2) neighboring HRU ports twinned together with a Y-branch kit.

HRU ports can operate in heating or cooling mode independently, regardless of the mode of any other port on the unit or in the system except where HRU ports are twinned.

HRUs contain one double spiral subcooling heat exchanger per port, are internally insulated, and do not require a condensate drain.

Casing and Construction

HRUs are completely factory assembled, internally piped and wired, and are designed for indoor installation. The casing is constructed of galvanized steel, and houses piping, valves and controls.

Refrigerant Valves

Each HRU port has two two-position solenoid valves to control the R410A refrigerant flow path. Optional isolation valves can be field supplied and installed for ease of servicing the HRU without evacuating the entire system refrigerant charge.

Refrigerant System

HRUs require R410A refrigerant. The units can be piped in series or parallel to minimize material cost and labor. Up to 16 HRUs can be piped in series if the total indoor unit nominal capacity does not exceed 192MBh. Other piping length parameters include:

- Indoor units cannot exceed 131 equivalent feet of piping length from the HRU to which they are connected.
- Indoor units cannot exceed 295 equivalent feet of piping length from the first branch.
- Indoor units cannot exceed 49 feet in elevation above or below the HRU.
- Elevation difference between the highest and lowest elevation indoor unit cannot exceed 131 feet for Heat Pump systems and for indoor units connected to separate HRUs by Y-branches.
- Elevation difference between the highest and lowest HRU cannot exceed 49 feet.
- Elevation difference of series connected HRUs cannot exceed 16 feet.

All refrigerant lines from the water source unit to the HRUs, and from the HRUs to the indoor units must be field-insulated.

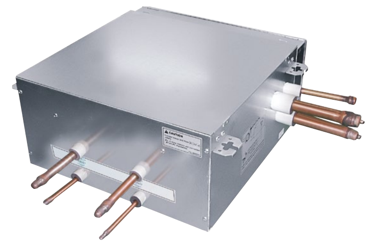
Electrical

Heat recovery units require 208-230V, 1-phase, 60 Hz electrical power, and are capable of operation within ±10% of nominal voltage.

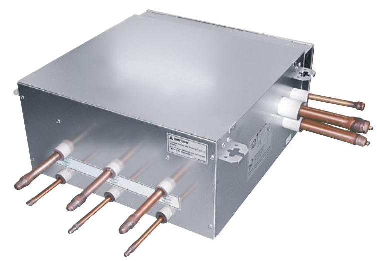
Controls

Heat recovery units include factory-installed control boards with integral microprocessors. HRU control boards communicate with the main control board in the water source unit and interface with the VRF equipment controls system. The control circuit between the indoor units, HRUs and the water source unit is RS-485 daisy chain communication over two-conductor, stranded and shielded, 18 AWG cable.

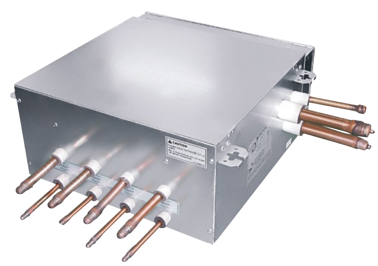
Two-port Heat Recovery Unit.



Three-port Heat Recovery Unit.



Four-port Heat Recovery Unit.



Technical Data

ACRONYMS

Table 88: Table of Acronyms.

%OA	Percentage Outdoor Air	H/M/L	High/Medium/Low
%RA	Percentage Return Air	IAQ	Indoor Air Quality
ABS	Acrylonitrile Butadiene Styrene	IDU	Indoor Unit
AC	Air Conditioner	IUCF	Indoor Unit Correction Factor
ACP	Advanced Control Platform	KTL	Korea Testing Laboratories
ARI	Air Conditioning and Refrigeration Institute	LEED	Leadership in Energy and Environmental Design
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers	LGAP	LG Air Conditioner Protocol
AHU	Air Handling Unit	MAT	Mixed Air Temperature
AWG	American Wire Gauge	MBh	Thousand BTUs per hour
BLDC	Brushless Digitally Controlled Direct	MCA	Maximum Circuit Ampacity
Btu/h	British Thermal Units per hour	MFS	Maximum Fuse Size
CCR	Corrected Capacity Ratio	NC	Normally Closed
CDOA	Coupled Dedicated Outdoor Air	NEC	National Electrical Code
CFM	Cubic Feet per Minute	NO	Normally Open
CI	Commercial Interiors (LEED® related)	OAT	Outdoor Air Temperature
COP	Coefficient Of Performance	WSU	Water Source Unit
CR	Combination Ratio / Credit (LEED® related)	WSUCF	Water Source Unit Correction Factor
CS	Core and Shell (LEED® related)	PDI	Power Distribution Integrator
DB	Dry Bulb	PI	Power Input
dB(A)	Decibels with “A” frequency weighting (relative loudness of sounds in air as perceived by the human ear)	PTAC	Packaged Terminal Air Conditioner
DDOAS	Decoupled Dedicated Outdoor Air	PVE	Polyvinyl Ether
DI	Digital Input	RAT	Return Air Temperature
DO	Digital Output	RCL	Refrigerant Concentration Limit
EEV	Electronic Expansion Valve	RUR	Running Unit Ratio
ELF	Equivalent Length in Feet	USGBC	U.S. Green Building Council (LEED Related)
EPDM	Ethylene Propylene Diene M-Class Rubber	VAH	Vertical Air Handler
ESP	External Static Pressure	VAV	Variable Air Volume
ETL	Electronic Testing Laboratories	VRF	Variable Refrigerant Flow
HACR	Heating, Air Conditioning, and Refrigeration	VRP	Ventilation Rate Procedure

Variable Refrigerant Flow (VRF) Multi-Split AC and HP
AHRI Standard 1230

20001747 ISO 9001: 2008
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