LG
Life's Good

MULTI V™
WATER II

Heat Pump and Heat Recovery Water-source VRF Condensing Units

Installation, Operation & Maintenance Manual

Variable Refrigerant Flow Water-source Units
6 to 48 Tons

Heat Pump 208 / 230V & 460V	Heat Recovery 208 / 230V & 460V
ARWN072BA2 / ARWN096DA2	ARWB072BA2 / ARWB096DA2
ARWN144BA2 / ARWN192DA2	ARWB144BA2 / ARWB192DA2
ARWN216BA2 / ARWN290DA2	ARWB216BA2 / ARWB290DA2
ARWN288BA2 / ARWN390DA2	ARWB288BA2 / ARWB390DA2
ARWN360BA2 / ARWN480DA2	ARWB360BA2 / ARWB480DA2
ARWN432BA2 / ARWN580DA2	ARWB432BA2 / ARWB580DA2

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Do not throw away or destroy this manual.
Please read carefully and store in a safe place for future reference.

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

"**⚠WARNING**" *This symbol indicates that the action or lack thereof could possibly cause death or personal injury.*

"**⚠CAUTION**" *This symbol indicates that the action or lack thereof could possibly cause property damage.*

"**⚠ *Note:***" *This symbol indicates that the action or lack thereof could possibly cause equipment malfunction or failure.*

" " *This symbol indicates that the following action should not be performed.*

A list of safety precautions begins on page 2.

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

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MULTI V WATER II

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"⚠ Note:" *This symbol indicates that the action or lack thereof could possibly cause equipment malfunction or failure.*

" " *This symbol indicates that the following action should not be performed.*

INSTALLATION

⚠WARNING

All electric work must be performed by a licensed electrician and conform to local building codes or, in the absence of local codes, with the National Electrical Code NFPA 70/ANSI C1-1993 or current edition and Canadian Electrical Code Part1 CSA C.22.1, and the instructions given in this manual.
If the power source capacity is inadequate or the electric work is not performed properly, it may result in fire, electric shock, physical injury or death.

Do not install, remove, or re-install the unit by yourself (customer).
There is risk of fire, electric shock, explosion, physical injury or death.

Ask the dealer or an authorized technician to install the unit.
Improper installation by the user may result in water leakage, fire, electric shock, physical injury or death.

For re-installation of the installed unit, always contact the dealer or an authorized service provider.
There is risk of fire, electric shock, explosion, and physical injury or death.

Do not install the water-source units outside.
There is risk of fire, electric shock, and physical injury or death.

Be very careful when transporting the product.
- *One person should not carry the product.*
- *Some products use polypropylene bands for packaging. Do not use polypropylene bands as a means of transportation.*
- *Suspend the water-source unit at specified positions on its base.*
- *Also, support the water-source unit at four points so that it cannot slip sideways.*

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

If the air conditioner is installed in an enclosed space, take measures to prevent the refrigerant concentration from exceeding safety limits if the refrigerant leaks.
Consult the dealer about the appropriate measures to prevent the safety limits from exceeding. If the refrigerant leaks and safety limits are exceeded, it could result in personal injuries or death from oxygen depletion.

Do not touch the sharp edges of the unit during installation.
There is a risk of personal injury.

Do not install the unit on a defective stand.
It may result in an accident that causes product damage or personal injury or death.

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

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

Securely install the control box and panel covers.
If the cover and panel are not installed securely, dust or water may enter the water-source unit, causing fire, electric shock, and physical injury or death.

When installing on a wall, make sure the wall is strong enough to hold the unit's weight.
It may be necessary to construct a strong wood or metal frame to provide added support that prevents the unit from falling and causing physical injury or death.

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LG

INSTALLATION, CONTINUED

⚠ CAUTION

Keep the unit level, even during installation.
To avoid vibration or water leakage.

When installing in moist locations, or locations that are not level, use a raised concrete pad or concrete blocks that provides a solid, level foundation for the water-source unit.
This prevents water damage and abnormal vibration.

When installing, properly insulate any piping inside a room to prevent "sweating."
Uninsulated piping can generate condensate that may drip and cause water damage to wall and floors.

When installing the unit in a hospital, communication station, or ***similar location, provide sufficient protection against electrical*** *noise.*
Inverter equipment, private power generators, high-frequency medical equipment, or radio communication equipment may cause the air conditioner to operate improperly. The unit may also affect such equipment by creating electrical noise that disturbs medical treatment or image broadcasting.

Do not use the product for special purposes such as preserving foods, works of art, etc. It is an air conditioner for comfort cooling/ heating, not a precision refrigeration system.
There is risk of property damage.

⚠ Note:

Always check for gas (refrigerant) leaks after the unit has been installed or repaired.
Low refrigerant levels may cause product failure.

When installing and/or moving the unit to another site, do not ***charge it with a different refrigerant from the one specified.***
If a different refrigerant is used, or air mixes with original refrigerant, the refrigerant cycle may malfunction and the unit may be damaged.

Do not install the water-source unit in a location where its noise could disturb building occupants.

When connecting refrigerant tubing, keep all piping runs as short as possible, but remember to allow for pipe expansion, and use ***flare connections when connecting refrigerant piping to indoor*** *units.*
Improper piping may cause product malfunction.

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

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WIRING

⚠ WARNING

*The information contained in this manual is intended for use by **a qualified, experienced service technician familiar with safety** procedures and who is equipped with the proper tools and test instruments.*
Failure to carefully read and follow all instructions in this manual can result in equipment malfunction, property damage, personal injury or death.

Highly dangerous electrical voltages are used in this system. Carefully refer to the diagrams and these instructions when wiring.
Improper connections and inadequate grounding can cause accidental injury or death.

Only a qualified, experienced electrician should wire this system.
Electrical shock can cause physical injury or death.

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

Always install a dedicated circuit and breaker.
Improper wiring or installation may cause fire, electric shock, physical injury or death.

Use the correctly rated breaker or fuse.
There is risk of fire, electric shock, explosion, physical injury or death.

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

***Secure all field wiring connections with the appropriate strain relief** so that outside forces on the cables will not affect the terminals.*
Inadequate connections may generate heat, cause a fire and physical injury or death.

Connect all wiring tightly.
Loose wiring may overheat at connection points, causing a fire, physical injury or death.

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

Turn the power off at the main power box before opening the unit to check or repair electrical parts and wiring.
Electrical shock can cause physical injury or death.

⚠ Note:

Do not supply power to the unit until all wiring and piping installation are completed or reconnected and checked.

Auto-addressing should be performed after connecting the power of all indoor and water-source units.
Auto-addressing should also be performed after an indoor unit PCB has been changed.

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OPERATION

⚠ WARNING

Do not use unspecified power wiring or damage the power wiring.
There is risk of fire, electric shock, and physical injury or death.

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

If the unit becomes flooded or submerged, contact an authorized service provider.
There is risk of fire, electric shock, physical injury or death.

Ensure that nobody can step on or fall onto the water-source unit.
There is risk of unit damage, physical injury or death.

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

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

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

*Do not open inlet grilles on the connected indoor units when in **operation. (Do not touch the electrostatic filter, if the indoor unit is** so equipped.)*
There is risk of unit failure, fire, electric shock, physical injury or death.

Ensure the installation area does not deteriorate with age.
If the base collapses, the unit could fall and cause property damage, product failure, physical injury or death.

*Do not operate the unit with the panels or guards removed; keep **fingers and clothing away from any moving parts.***
The rotating, hot, or high-voltage parts of the unit can cause physical injury or death.

If gas leaks out, ventilate the area before operating the unit.
Leaking gas may cause fire, electric shock, explosion, physical injury or death.

⚠ CAUTION

Do not use the air conditioner in special environments.
Oil, steam, sulfuric smoke, etc., can significantly reduce the performance of the unit, or damage its parts.

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

Turn on the power at least six (6) hours before operation begins.
Starting operation immediately after turning on the main power switch can result in severe damage to internal parts. Keep the power switch on during the operational season.

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

⚠ Note:
Do not block the inlet or outlet.
It may cause product malfunction.

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NOMENCLATURE

Water-source Unit Nomenclature

AR	W	B	072	D	A	2

Family
ARU = Multi V (Refrigerant R410A)

Condenser
W = Water Source

Type
B = Heat Recovery
N = Inverter Heat Pump

Nominal Capacity
Nominal cooling capacity in Btu/h

072 = 72,000	290 = 286,600
096 = 95,900	360 = 360,000
144 = 144,000	390 = 382,200
192 = 191,100	432 = 432,000
216 = 216,000	480 = 477,800
288 = 288,000	580 = 573,400

Electrical Ratings
B = 208-230/60/3
D = 460/60/3

Basic Function
A

Generation
2 = Second

Heat-recovery Control Unit Nomenclature

PRHR	02	1A

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

Number of Connected Ports
02 = 2 Ports
03 = 3 Ports
04 = 4 Ports

Series Number
1A = Second Series

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MULTI V WATER IV HEAT PUMP WATER-SOURCE UNIT SPECIFICATIONS

Heat Pump Systems - 3Ø, 208/230V, 60Hz

	6 Ton	12 Ton	18 Ton
Combination Unit Model Number	ARWN072BA2	ARWN144BA2	ARWN216BA2[8]
Individual Component Model Numbers	-	-	(ARWN144BA2 + ARWN072BA2)
Total Cooling Capacity (Btu/h)[1]	72,000	144,000	216,000
Unit Input Power (kW)	4.4	8.8	13.2
Heating Performance (Btu/h)[2]	81,000	162,000	243,000
Unit Input Power (kW)	4.55	9.14	13.69
Compressor			
Type	DC Inverter Scroll	DC Inverter Scroll + Constant	(DC Inverter Scroll) x 2 + Constant x1
Power Supply (volt/hz/phase)[3]	208-230 / 60 / 3	208-230 / 60 / 3	208-230 / 60 / 3
MCA (A)	21	42.5	42.5 + 21
MOP (A)	35	60	60 + 35
Max. Starting Current (A)	-	103.9	103.9
System Data[4]			
Sound Pressure (dBA)[4]	49	50	51
Heat rejected to equipment room (Btu/h)	1,707	1,707	1,707 + 1,707
Net Weight (lbs)	375	525	525 + 375
Shipping Weight (lbs)	405	556	556 + 405
Dimensions (W x H x D)	30-7/16 x 44-1/8 x 21-9/16	30-7/16 x 44-1/8 x 21-9/16	(30-7/16 x 44-1/8 x 21-9/16) x 2
Max. Qty Indoor Units	16	32	49
Refrigerant Connection[5]			
Vapor Line OD (in)	7/8 Braze	1-1/8 Braze	1-1/8 Braze + 7/8 Braze
Liquid Line OD (in)	3/8 Flare	1/2 Flare	1/2 Flare + 3/8 Flare
Expansion Device	Electronically Controlled (EEV)	Electronically Controlled (EEV)	Electronically Controlled (EEV)
Refrigerant Charge			
Factory R410A (lbs)	16.1	19.4	19.4 + 16.1
Water Side			
Heat Exchanger[6]	Stainless Steel Plate	Stainless Steel Plate	Stainless Steel Plate
Water Inlet/Outlet Connection Size (in)	1-1/4 FPT	1-1/2 FPT	1-1/2 FPT + 1-1/4 FPT
Condensate Drain (in)	3/4	3/4	3/4 + 3/4
Nominal Flow Rate Total (GPM)	21.1	42.2	63.3 (42.2 + 21.1)
Range of Flow (GPM)	10.6-26.4	21.2-52.8	31.8-79.2
Entering water temp. range (°F)–Cooling	50-113	50-113	50-113
Entering water temp. range (°F)–Heating	23-113	23-113	23-113
Total Heat of Rejection (Btu)	87,032	174,063	261,095
Total Heat of Absorption (Btu)	65,974	130,787	196,249
Pressure Drop (ft)	8.9	14.4	14.4 + 8.9
ΔT (°F)[7]	8.2	8.2	8.2

Capacity based on following conditions: [1]Cooling – Indoor 80°F DB/66°F WB, Water Temp. Entering 86°F; [2]Heating- Indoor 68°F DB, Water Temp. Entering 68°F.

[3]Voltage tolerance is ±10%.

[4]Sound pressure levels as tested in anechoic chamber under ISO Standard 1996.

[5]Refer to the Refrigerant Piping Section of this manual for correct line sizing. Contractor MUST use LG manufactured Y-branch and Header fittings only. Designer must verify refrigerant piping design configuration using LG's computerized refrigerant piping CAD/calculation (LATS) Software to layout and design the refrigerant piping system.

[6]Maximum water pressure is 640 psi.

[7]Calculated from ΔT = Total Heat of Rejection / (Nominal flow rate x 500).

[8]Requires Multi-frame Connector ARCNN21 to connect component frames.

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HEAT PUMP WATER-SOURCE UNIT SPECIFICATIONS

MULTI V WATER II

Heat Pump Systems - 3Ø, 208/230V, 60Hz

	24 Ton	30 Ton	36 Ton
Combination Unit Model Number	ARWN288BA2[8]	ARWN360BA2[9]	ARWN432BA2[9]
Individual Component Model Numbers	(ARWN144BA2) x2	(ARWN144BA2) x2+ARWN072BA2	(ARWN144BA2) x3
Total Cooling Capacity (Btu/h)[1]	288,000	360,000	432,000
Unit Input Power (kW)	17.6	22.0	26.4
Heating Performance (Btu/h)[2]	324,000	405,000	486,000
Unit Input Power (kW)	18.28	22.83	27.38
Compressor			
Type	(DC Inverter Scroll)x2 + (Constant)x2	(DC Inverter Scroll)x3 + (Constant)x2	(DC Inverter Scroll)x3 + (Constant)x3
Power Supply (volt/hz/phase)[3]	208-230 / 60 / 3	208-230 / 60 / 3	208-230 / 60 / 3
MCA (A)	42.5 + 42.5	42.5 + 42.5 + 21	42.5 + 42.5 + 42.5
MOP (A)	60 + 60	60 + 60 + 35	60 + 60 + 60
Max. Starting Current (A)	103.9 + 103.9	103.9 + 103.9	103.9 + 103.9 + 103.9
System Data			
Sound Pressure (dBA)[4]	52	53	54
Heat rejected to equipment room (Btu/h)	1,707 + 1,707	1,707 + 1,707 + 1,707	1,707 + 1,707 + 1,707
Net Weight (lbs)	525 + 525	525 + 525 + 375	525 + 525 + 525
Shipping Weight (lbs)	556 + 556	556 + 556 + 405	556 + 556 + 556
Dimensions (W x H x D)	(30-7/16 x 44-1/8 x 21-9/16) x 2	(30-7/16 x 44-1/8 x 21-9/16) x 3	(30-7/16 x 44-1/8 x 21-9/16) x 3
Max. Qty Indoor Units	64	64	64
Refrigerant Connection[5]			
Vapor Line OD (in)	1-1/8 Braze + 1-1/8 Braze	1-1/8 Braze+1-1/8 Braze+7/8 Braze	1-1/8 Braze+1-1/8 Braze+1-1/8 Braze
Liquid Line OD (in)	1/2 Flare + 1/2 Flare	1/2 Flare + 1/2 Flare + 3/8 Flare	1/2 Flare + 1/2 Flare + 1/2 Flare
Expansion Device	Electronically Controlled (EEV)	Electronically Controlled (EEV)	Electronically Controlled (EEV)
Refrigerant Charge			
Factory R410A (lbs)	19.4 + 19.4	19.4 + 19.4 + 16.1	19.4 + 19.4 + 19.4
Water Side			
Heat Exchanger[6]	Stainless Steel Plate	Stainless Steel Plate	Stainless Steel Plate
Water Inlet/Outlet Connection Size (in)	1-1/2FPT + 1-1/2FPT	1-1/2FPT + 1-1/2FPT + 1-1/4FPT	1-1/2FPT + 1-1/2FPT + 1-1/2FPT
Condensate Drain (in)	3/4 + 3/4	3/4 + 3/4 + 3/4	3/4 + 3/4 + 3/4
Nominal Flow Rate Total (GPM)	84.4 (42.2 + 42.2)	105.5 (42.2 + 42.2 + 21.1)	126.6 (42.2 + 42.2 + 42.2)
Range of Flow (GPM)	42.4-105.6	63.6-158.4	79.2-190.2
Entering water temp. range (°F)–Cooling	50-113	50-113	50-113
Entering water temp. range(°F)–Heating	23-113	23-113	23-113
Total Heat of Rejection (Btu)	348,126	435,158	522,189
Total Heat of Absorption (Btu)	261,574	327,036	392,497
Pressure Drop (Ft)	14.4 + 14.4	14.4 + 14.4 + 8.9	14.4 + 14.4 + 14.4
ΔT (°F)[7]	8.2	8.2	8.2

Capacity based on following conditions: [1]Cooling – Indoor 80°F DB/66°F WB, Water Temp. Entering 86°F; [2]Heating- Indoor 68°F DB, Water Temp. Entering 68°F.

[3]Voltage tolerance is ±10%.

[4]Sound pressure levels as tested in anechoic chamber under ISO Standard 1996.

[5]Refer to the Refrigerant Piping Section of this manual for correct line sizing. Contractor MUST use LG manufactured Y-branch and Header fittings only. Designer must verify refrigerant piping design configuration using LG's computerized refrigerant piping CAD/calculation (LATS) Software to layout and design the refrigerant piping system.

[6]Maximum water pressure is 640 psi.

[7]Calculated from ΔT = Total Heat of Rejection / (Nominal flow rate x 500).

[8]Requires Multi-frame Connector ARCNN21 to connect component frames.

[9]Requires Multi-frame Connector ARCNN21 and ARCNN31 to connect component frames.

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MULTI V WATER IV HEAT PUMP WATER-SOURCE UNIT SPECIFICATIONS

Heat Pump Systems - 3Ø, 460V, 60Hz

	8 Ton	16 Ton	24 Ton
Combination Unit Model Numbers	ARWN096DA2	ARWN192DA2	ARWN290DA2[8]
Individual Component Model Numbers	-	-	(ARWN192DA2 + ARWN096DA2)
Total Cooling Capacity (Btu/h)[1]	95,900	191,100	286,600
Unit Input Power (kW)	5.6	11.2	16.8
Heating Performance (Btu/h)[2]	107,500	225,000	322,500
Unit Input Power (kW)	5.8	11.7	17.5
Compressor			
Type	DC Inverter Scroll	DC Inverter Scroll +Constant	(DC Inverter Scroll) x 2 + Constant
Power Supply (volt/hz/phase)[3]	460 / 60 / 3	460 / 60 / 3	460 / 60 / 3
MCA (A)	13	26.2	26.2 + 13
MOP (A)	20	35	35 + 20
Max. Starting Current (A)	-	92.8	92.8
System Data			
Sound Pressure (dBA)[4]	51	51	53
Heat rejected to equipment room (Btu/h)	1,707	1,707	1,707 + 1,707
Net Weight (lbs)	375	525	525 + 375
Shipping Weight (lbs)	405	556	556 + 405
Dimensions (W x H x D)	30-7/16 x 44-1/8 x 21-9/16	30-7/16 x 44-1/8 x 21-9/16	(30-7/16 x 44-1/8 x 21-9/16) x 2
Max. Qty Indoor Units	16	32	49
Refrigerant Connection[5]			
Vapor Line OD (in)	7/8 Braze	1-1/8 Braze	1-1/8 Braze + 7/8 Braze
Liquid Line OD (in)	3/8 Flare	1/2 Flare	1/2 Flare + 3/8 Flare
Expansion Device	Electronically Controlled (EEV)	Electronically Controlled (EEV)	Electronically Controlled (EEV)
Refrigerant Charge			
Factory R410A (lbs)	16.1	19.4	19.4 + 16.1
Water Side			
Heat Exchanger[6]	Stainless Steel Plate	Stainless Steel Plate	Stainless Steel Plate
Water Inlet/Outlet Connection Size (in)	1-1/4 FPT	1-1/2 FPT	1-1/2 FPT+1-1/4 FPT
Condensate Drain (in)	3/4	3/4	3/4 + 3/4
Nominal Flow Rate Total (GPM)	25.4	50.8	76.2 (50.8 + 25.4)
Range of Flow (GPM)	13.2-31.7	26.4-63.4	39.6-95.1
Entering water temp. range (°F)–Cooling	50-113	50-113	50-113
Entering water temp. range (°F)–Heating	23-113	23-113	23-113
Total Heat of Rejection (Btu)	114,667	229,354	344,030
Total Heat of Absorption (Btu)	87,693	185,045	262,738
Pressure Drop (ft)	8.9	14.4	14.4 + 8.9
ΔT (°F)[7]	9.0	9.0	9.0

Capacity based on following conditions: [1]Cooling – Indoor 80°F DB/66°F WB, Water Temp. Entering 86°F; [2]Heating- Indoor 68°F DB, Water Temp. Entering 68°F.

[3]Voltage tolerance is ±10%.

[4]Sound pressure levels as tested in anechoic chamber under ISO Standard 1996.

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HEAT PUMP WATER-SOURCE UNIT SPECIFICATIONS

MULTI V WATER II

Heat Pump Systems - 3Ø, 460V, 60Hz

	32 Ton	40 Ton	48 Ton
Combination Unit Model Number	ARWN390DA2[8]	ARWN480DA2[9]	ARWN580DA2[9]
Individual Component Model Numbers	(ARWN192DA2)x2	(ARWN192DA2)x2 +ARWN096DA2	(ARWN192DA2)x3
Total Cooling Capacity (Btu/h)[1]	382,200	477,800	573,400
Unit Input Power (kW)	22.4	28.0	33.6
Heating Performance (Btu/h)[2]	429,900	537,500	645,000
Unit Input Power (kW)	23.4	29.2	35.0
Compressor			
Type	(DC Inverter Scroll)x2 + (Constant)x2	(DC Inverter Scroll)x3 + (Constant)x2	(DC Inverter Scroll)x3 (Constant)x3
Power Supply (volt/hz/phase)[3]	460 / 60 / 3	460 / 60 / 3	460 / 60 / 3
MCA (A)	26.2 + 26.2	26.2 + 26.2 + 13	26.2 + 26.2 + 26.2
MOP (A)	35 + 35	35 + 35 + 20	35 + 35 + 35
Max. Starting Current (A)	92.8 + 92.8	92.8 + 92.8	92.8 + 92.8 + 92.8
System Data			
Sound Pressure (dBA)[4]	54	55	56
Heat rejected to equipment room (Btu/h)	1,707 + 1,707	1,707 + 1,707 + 1,707	1,707 + 1,707 + 1,707
Net Weight (lbs)	525 + 525	525 + 525 + 375	525 + 525 + 525
Shipping Weight (lbs)	556 + 556	556 + 556 + 405	556 + 556 + 556
Dimensions (W x H x D)	(30-7/16 x 44-1/8 x 21-9/16) x 2	(30-7/16 x 44-1/8 x 21-9/16) x 3	(30-7/16 x 44-1/8 x 21-9/16) x 3
Max. Qty Indoor Units	64	64	64
Refrigerant Connection[5]			
Vapor Line OD (in)	1-1/8 Braze + 1-1/8 Braze	1-1/8 Braze+1-1/8 Braze+7/8 Braze	1-1/8 Braze+1-1/8 Braze+1-1/8 Braze
Liquid Line OD (in)	1/2 Flare + 1/2 Flare	1/2 Flare + 1/2 Flare + 3/8 Flare	1/2 Flare + 1/2 Flare + 1/2 Flare
Expansion Device	Electronically Controlled (EEV)	Electronically Controlled (EEV)	Electronically Controlled (EEV)
Refrigerant Charge			
Factory R410A (lbs)	19.4 + 19.4	19.4 + 19.4 + 16.1	19.4 + 19.4 + 19.4
Water Side			
Heat Exchanger[6]	Stainless Steel Plate	Stainless Steel Plate	Stainless Steel Plate
Water Inlet/Outlet Connection Size (in)	1-1/2FPT+1-1/2FPT	1-1/2FPT+1-1/2FPT+1-1/4FPT	1-1/2FPT+1-1/2FPT+1-1/2FPT
Condensate Drain (in)	3/4 + 3/4	3/4 + 3/4 + 3/4	3/4 + 3/4 + 3/4
Nominal Flow Rate Total (GPM)	101.6 (50.8+50.8)	127 (50.8+50.8+25.4)	152.4 (50.8+50.8+50.8)
Range of Flow (GPM)	52.8-126.8	66-158.5	79.2-190.2
Entering water temp. range (°F)–Cooling	50-113	50-113	50-113
Entering water temp. range (°F)–Heating	23-113	23-113	23-113
Total Heat of Rejection (Btu)	457,707	573,384	688,061
Total Heat of Absorption (Btu)	349,989	437,782	525,475
Pressure Drop (Ft)	14.4 + 14.4	14.4 + 14.4 + 8.9	14.4 + 14.4 + 14.4
ΔT (°F)[7]	9.0	9.0	9.0

Capacity based on following conditions: [1]Cooling – Indoor 80°F DB/66°F WB, Water Temp. Entering 86°F; [2]Heating- Indoor 68°F DB, Water Temp. Entering 68°F.

[3]Voltage tolerance is ±10%.

[4]Sound pressure levels as tested in anechoic chamber under ISO Standard 1996.

[5]Refer to the Refrigerant Piping Section of this manual for correct line sizing. Contractor MUST use LG manufactured Y-branch and Header fittings only. Designer must verify refrigerant piping design configuration using LG's computerized refrigerant piping CAD/calculation (LATS) Software to layout and design the refrigerant piping system.

[6]Maximum water pressure is 640 psi.

[7]Calculated from ΔT = Total Heat of Rejection / (Nominal flow rate x 500).

[8]Requires Multi-frame Connector ARCNN21 to connect component frames.

[9]Requires Multi-frame Connector ARCNN21 and ARCNN31 to connect component frames.

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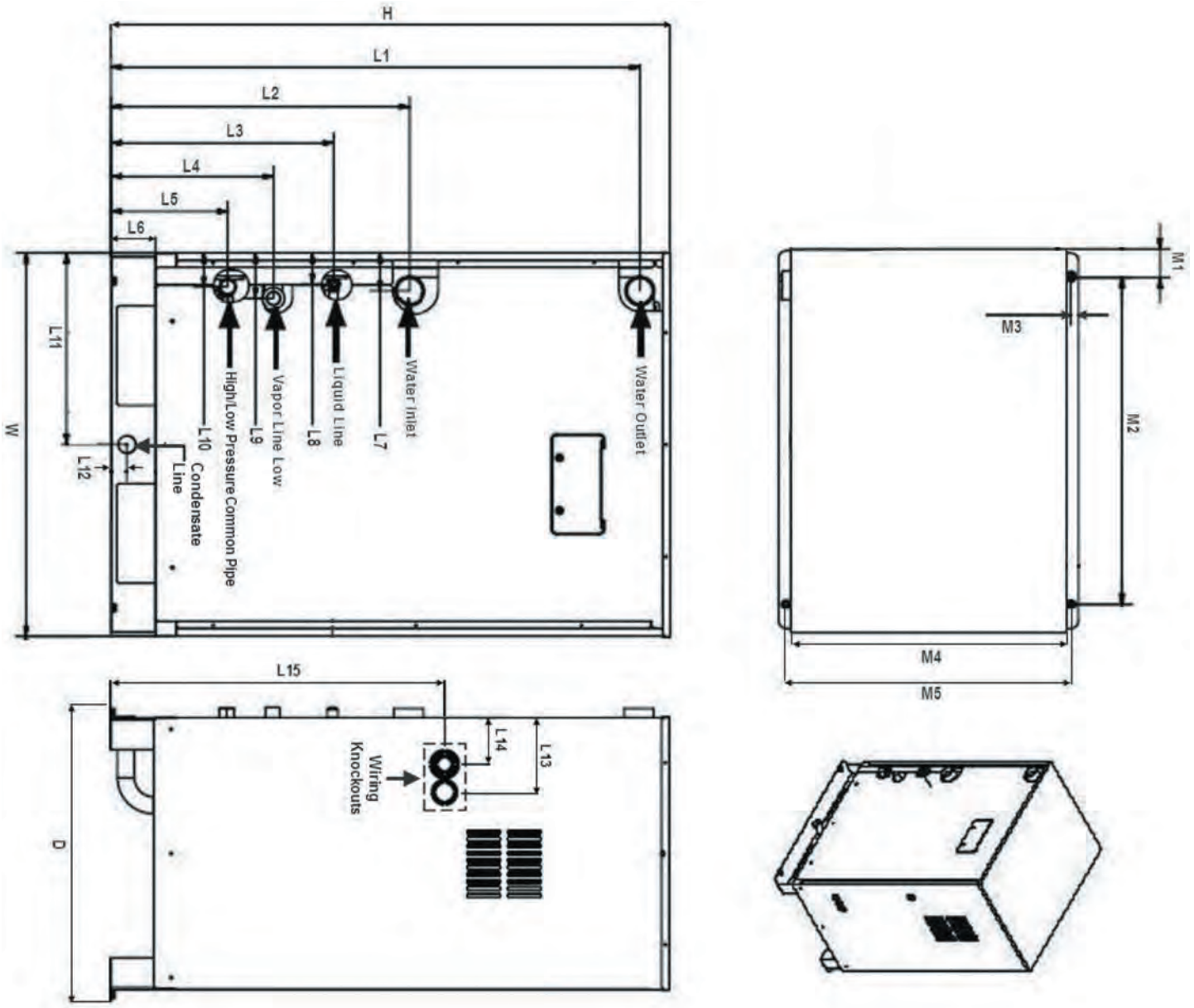
MULTI V WATER IV HEAT PUMP WATER-SOURCE UNIT DIMENSIONS

ARWN072BA2, ARWN144BA2 - 208/230V; ARWN096DA2, ARWN192DA2 - 460V



W	30-13/32
H	44-3/32
D	23-19/32
L1	41-5/8
L2	23-1/2
L3	17-17/32
L4	12-13/16
L5	9-1/4
L6	3-21/32
L7	3-1/2
L8	2-15/32
L9	3-5/8
L10	2-3/4
L11	15-3/16
L12	1-1/4
L13	5-5/8
L14	3-9/16
L15	26-27/32
M1	2-1/4
M2	25-29/32
M3	19/32
M4	21-17/32
M5	22-13/32

Note - All dimensions have a tolerance of ± 0.25 in.

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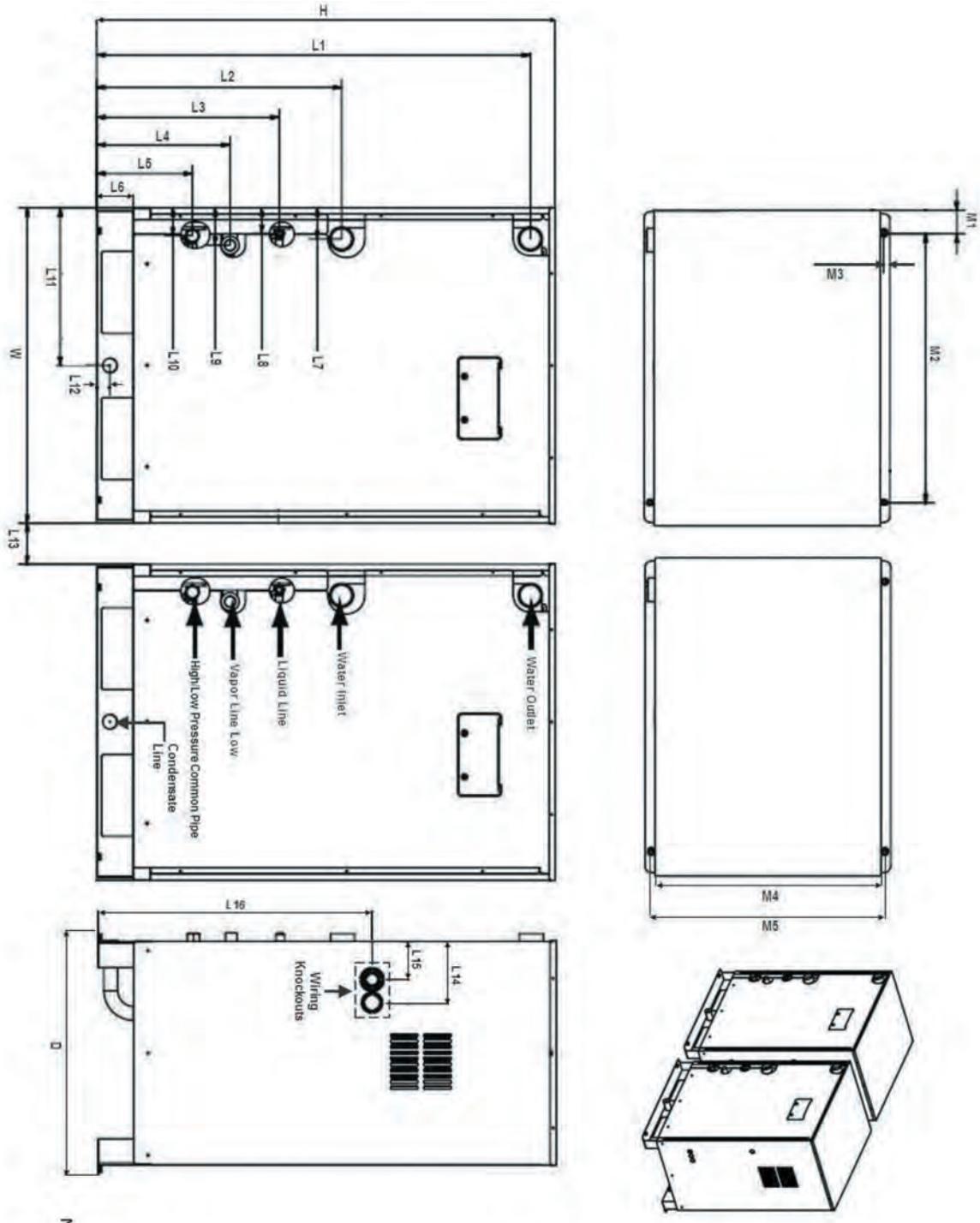
HEAT PUMP WATER-SOURCE UNIT DIMENSIONS

MULTI V WATER II

ARWN216BA2, ARWN288BA2 - 208/230V; ARWN290DA2, ARWN390DA2 - 460V



W	30-13/32
H	44-3/32
D	23-19/32
L1	41-5/8
L2	23-1/2
L3	17-17/32
L4	12-13/16
L5	9-1/4
L6	3-21/32
L7	3-1/2
L8	2-15/32
L9	3-5/8
L10	2-3/4
L11	15-3/16
L12	1-1/4
L13	6
L14	5-5/8
L15	3-9/16
L16	26-27/32
M1	2-1/4
M2	25-29/32
M3	19/32
M4	21-17/32
M5	22-13/32

Note - All dimensions have a tolerance of ± 0.25 in.

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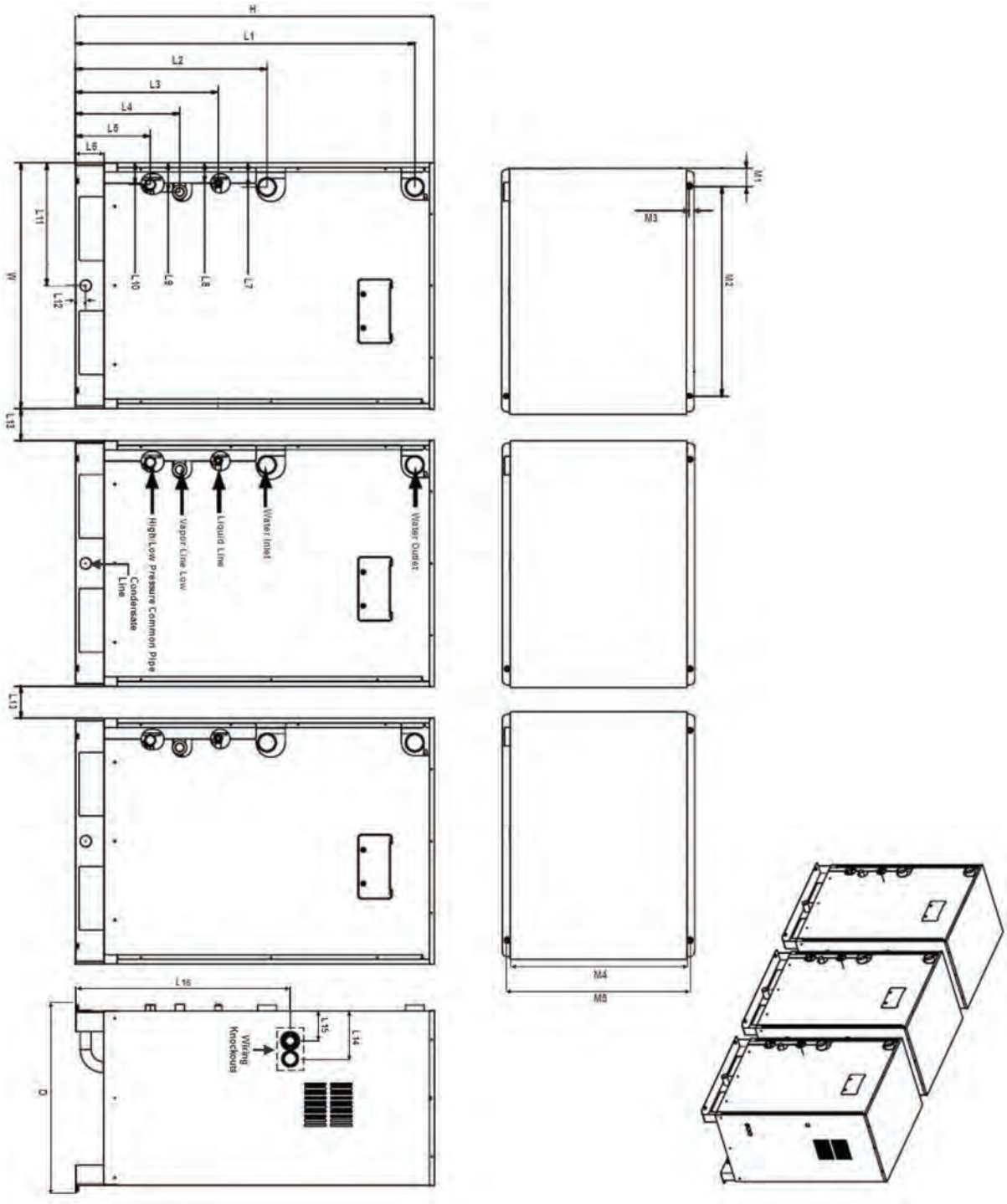
MULTI V WATER IV HEAT PUMP WATER-SOURCE UNIT DIMENSIONS

ARWN360BA2, ARWN432BA2 - 208/230V; ARWN480DA2, ARWN580DA2 - 460V



W	H	D	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	M1	M2	M3	M4	M5
30-13/32	44-3/32	23-19/32	41-5/8	23-1/2	17-17/32	12-13/16	9-1/4	3-21/32	3-1/2	2-15/32	3-5/8	2-3/4	15-3/16	1-1/4	6	5-5/8	3-9/16	26-27/32	2-1/4	25-29/32	19/32	21-17/32	22-13/32

Note - All dimensions have tolerance of ± 0.25 in.

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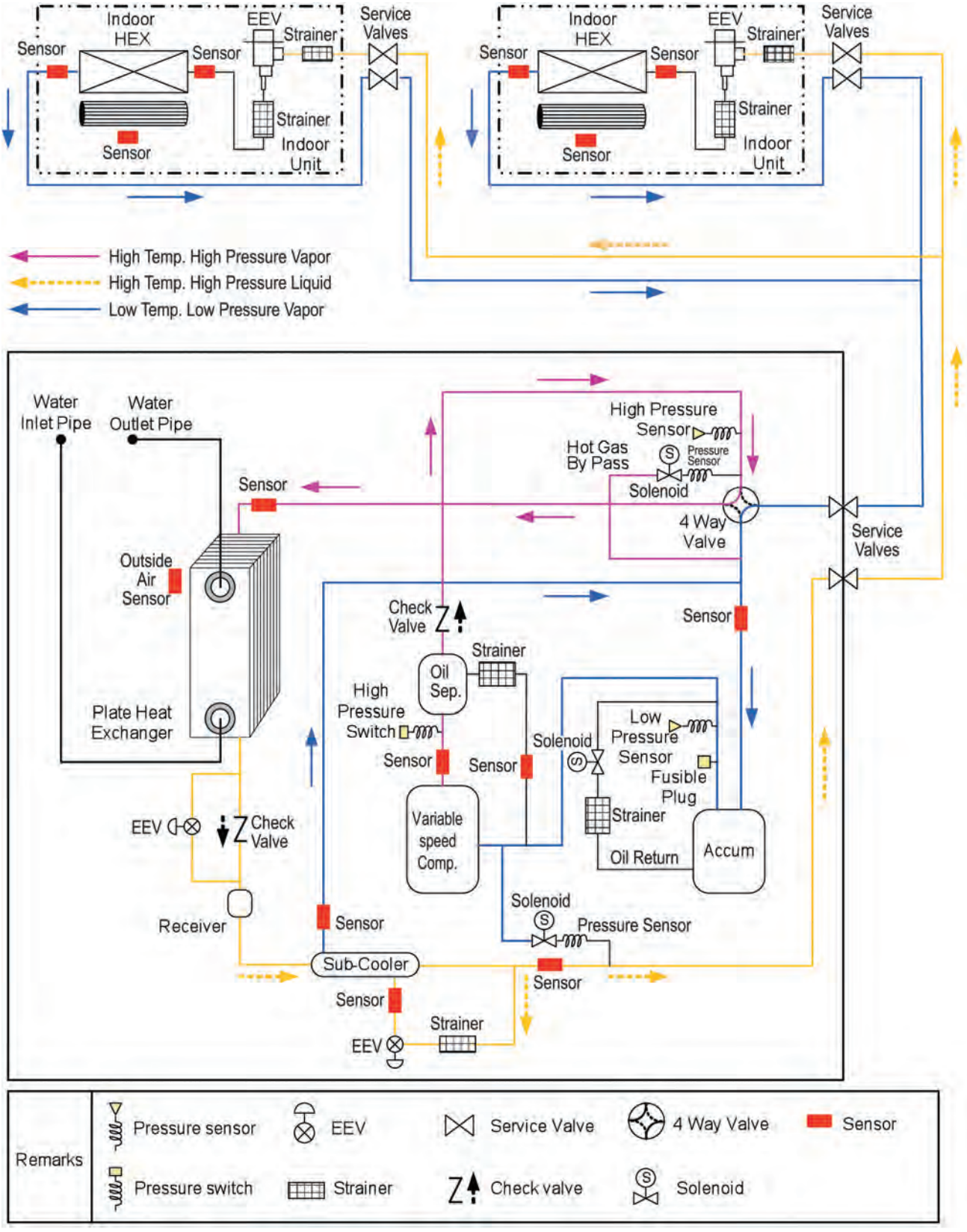
HEAT PUMP WATER-SOURCE UNIT REFRIG. CIRCUIT

MULTI V WATER II

ARWN072BA2 - 208/230V, ARWN096DA2 - 460V: Cooling Mode



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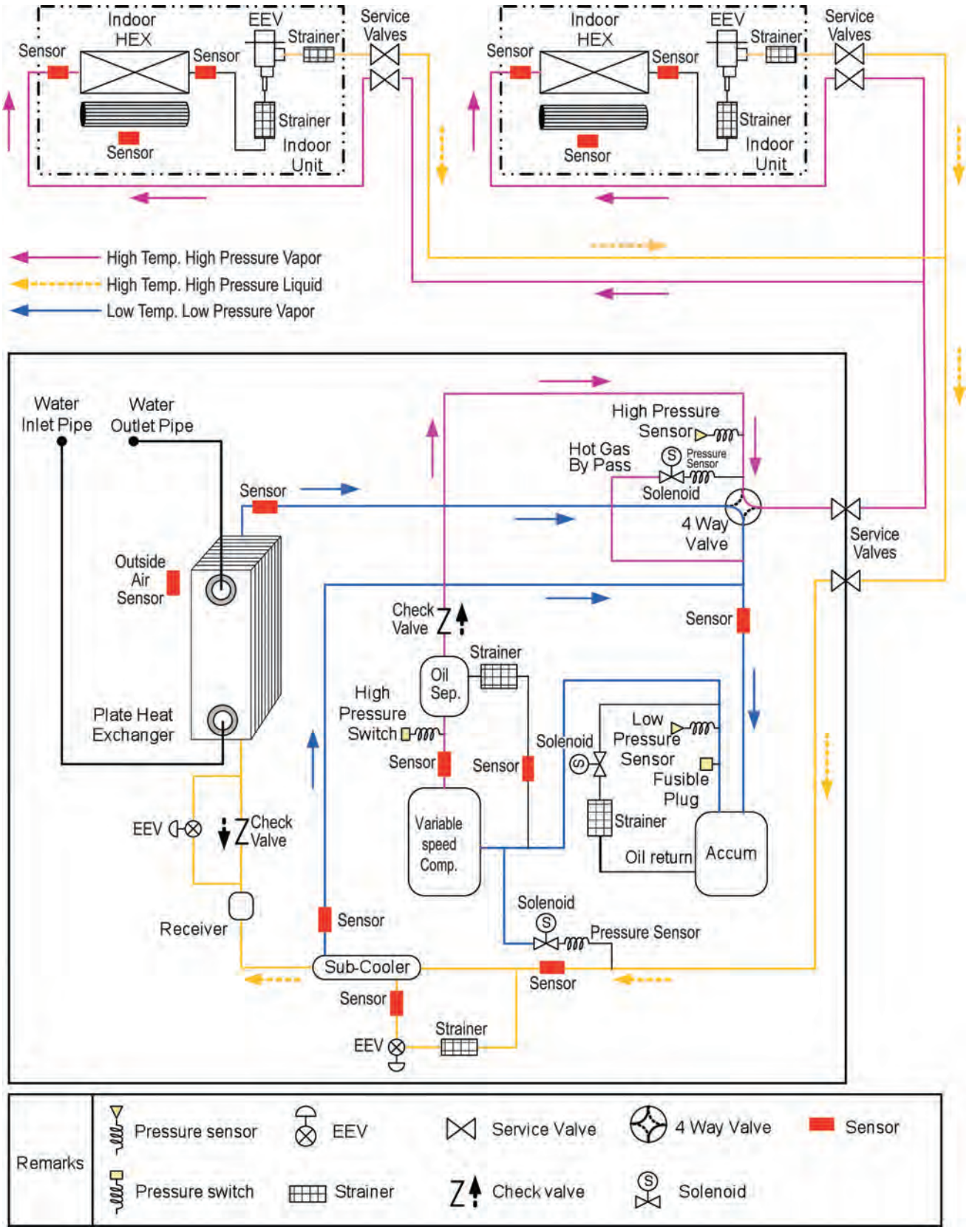
HEAT PUMP WATER-SOURCE UNIT REFRIG. CIRCUIT

ARWN072BA2 - 208/230V, ARWN096DA2 - 460V: Heating Mode



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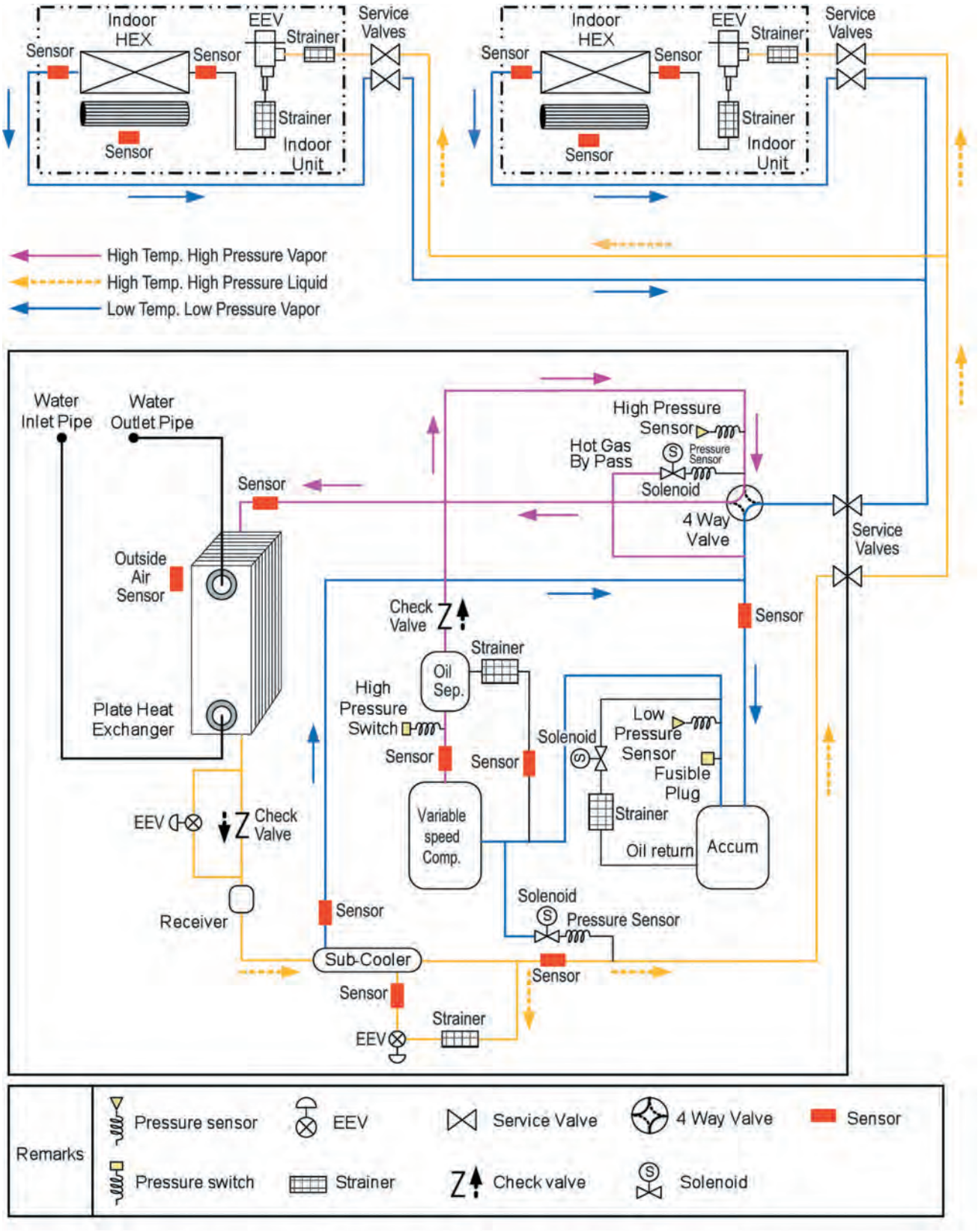
HEAT PUMP WATER-SOURCE UNIT REFRIG. CIRCUIT

MULTI V WATER II

ARWN072BA2 - 208/230V, ARWN096DA2 - 460V: Oil Return Operation



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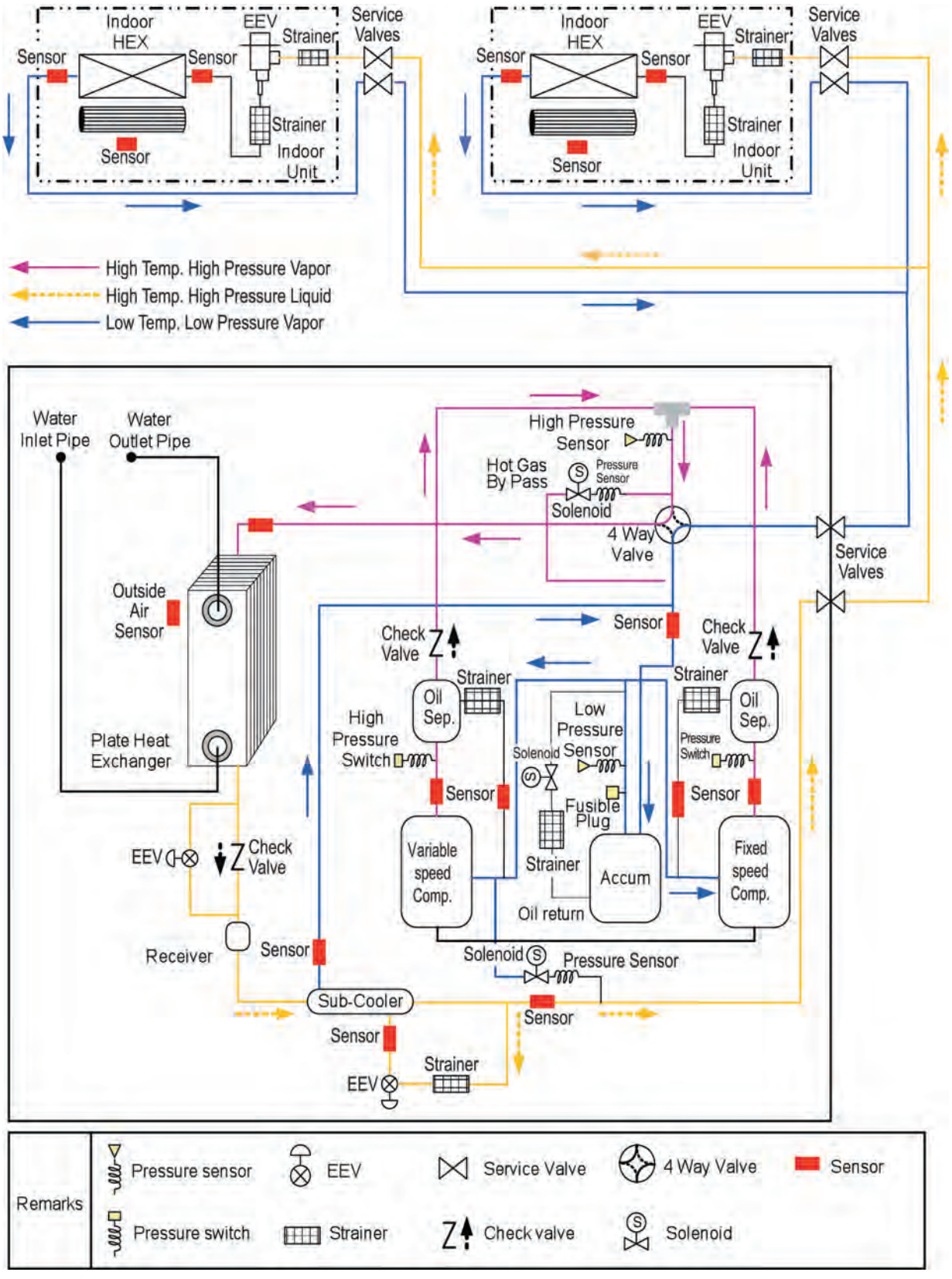
HEAT PUMP WATER-SOURCE UNIT REFRIG. CIRCUIT

ARWN144BA2 - 208/230V, ARWN192DA2 - 460V: Cooling Mode



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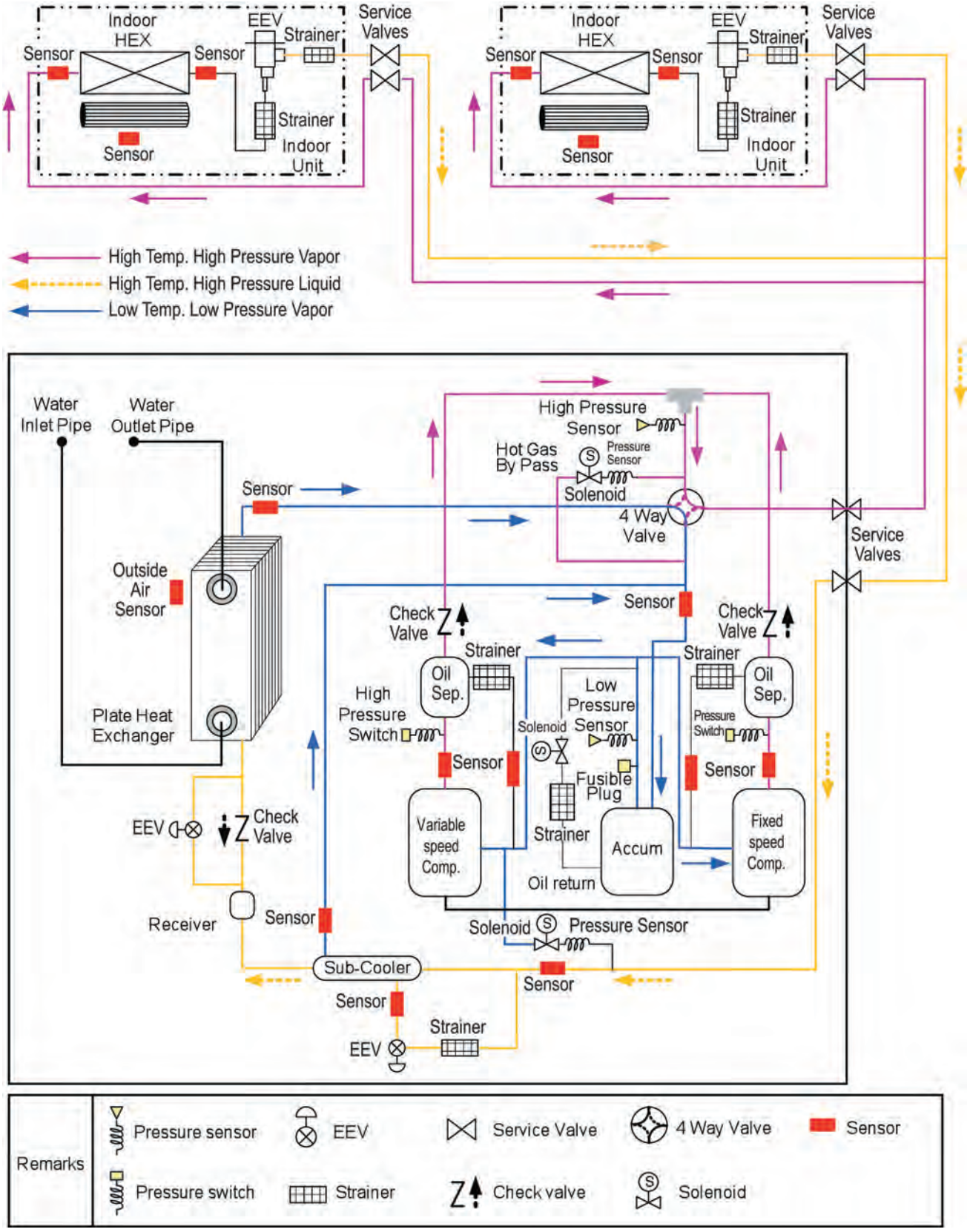
HEAT PUMP WATER-SOURCE UNIT REFRIG. CIRCUIT

MULTI V WATER II

ARWN144BA2 - 208/230V, ARWN192DA2 - 460V: Heating Mode



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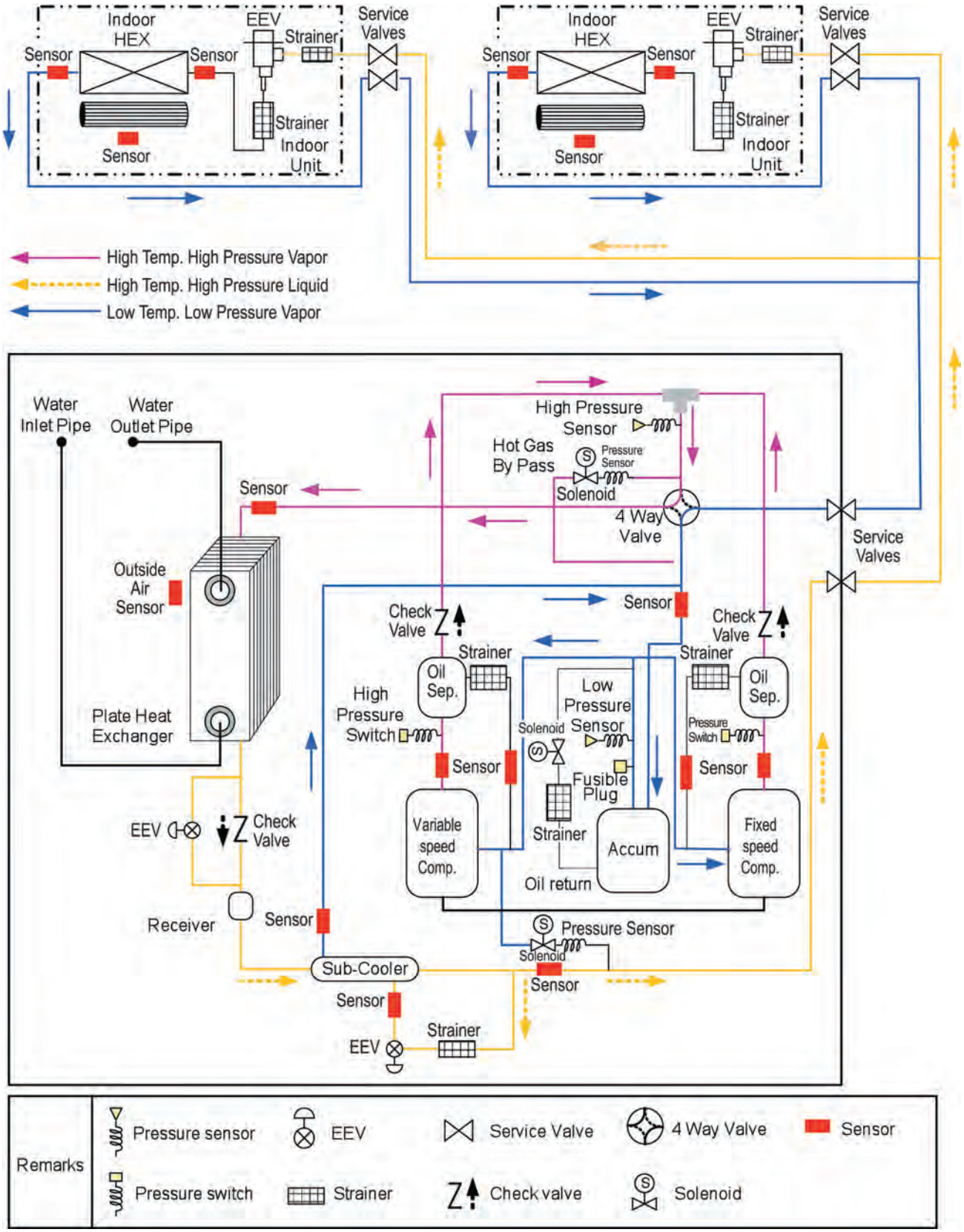
HEAT PUMP WATER-SOURCE UNIT REFRIG. CIRCUIT

ARWN144BA2 - 208/230V, ARWN192DA2 - 460V: Oil Return Operation



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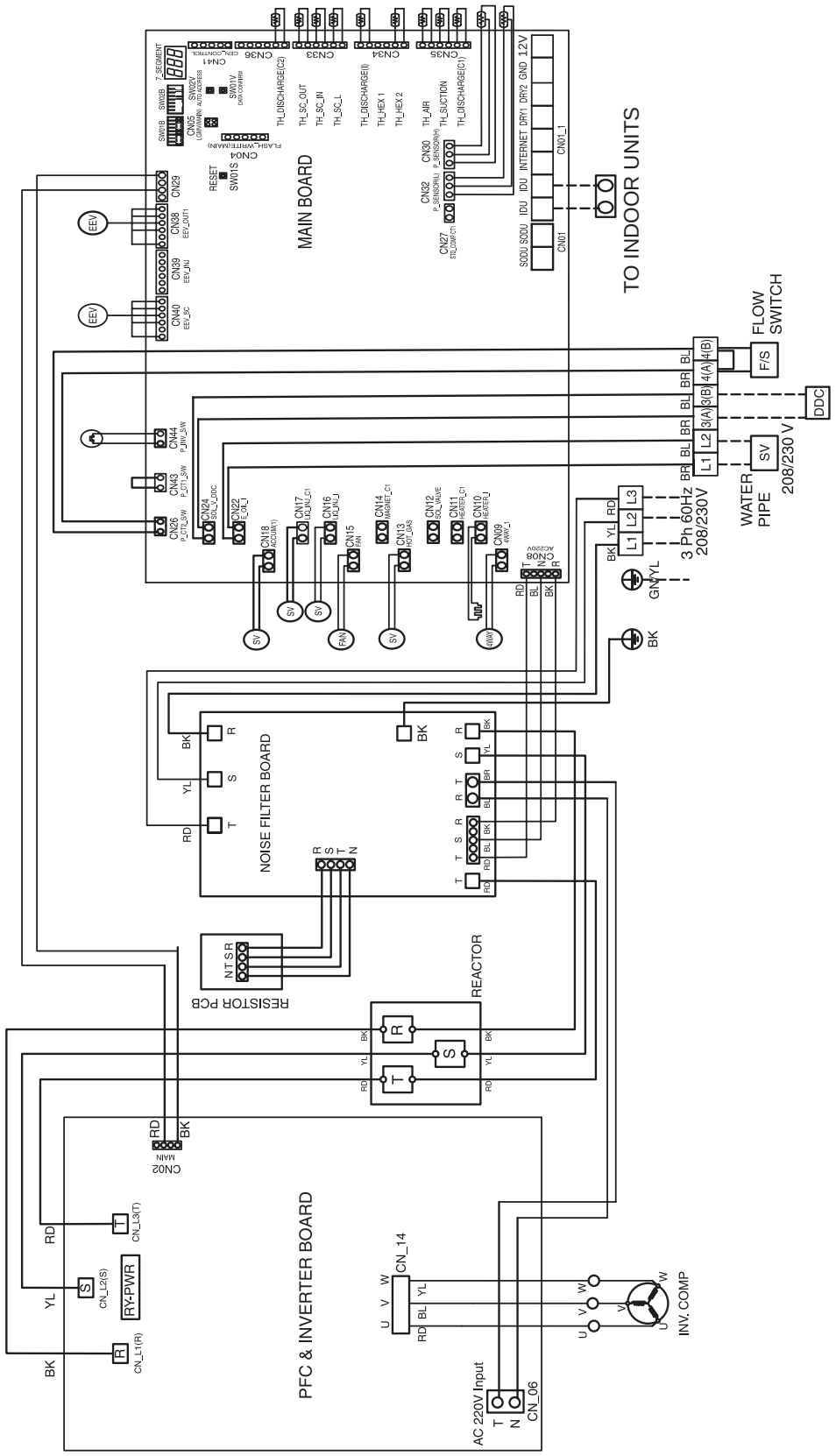
HEAT PUMP WATER-SOURCE UNIT WIRING DIAGRAMS

MULTI V WATER III

ARWN072BA2 208/230V Heat Pump Water-source Unit

WATER-SOURCE UNIT INSTALLATION MANUAL



NOTE(INV. PCB)

CN01	
CN02	MAIN PCB COMMUNICATION TERMINAL
CN04	ONBOARDING TERMINAL
CN06	AC POWER 220V
CN12	DC LINK 700V
CN13	DC 15V
CN14	U.V.W POWER TERMINAL
CN_L1(R)	R INPUT
CN_L2(S)	S INPUT
CN_L3(T)	T INPUT

FIELD WIRING

FACTORY WIRING

COLOR

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

NOTE(MAIN)

SYMBOL	DESCRIPTION
CN04	ONBOARDING TERMINAL
CN05	JIG CONNECTION TERMINAL
CN08	AC POWER 220V
CN09	4WAY REVERSING VALVE
CN10	INVERTER COMP HEATER
CN11	CONSTANT COMP HEATER
CN12	CHECK SOLENOID VALVE
CN13	HOT GAS SOLENOID VALVE
CN14	MAGNETIC SWITCH
CN15	AC POWER (FAN)
CN16	INVERTER COMP LIQUID INJECTION VALVE
CN17	CONSTANT COMP LIQUID INJECTION VALVE
CN18	ACCUMULATOR SOLENOID VALVE
CN22	WATER PIPE SOLENOID VALVE
CN24	DDC(NON-CONNECTING SIGNAL)
CN27	CONSTANT CT SENSOR
CN29	INVERTER PCB COMMUNICATION
CN30	HIGH PRESSURE SENSOR
CN32	LOW PRESSURE SENSOR
CN33(SC_OUT)	SUBCOOLING CIRCUIT OUTLET TEMPERATURE SENSOR
CN33(SC_IN)	SUBCOOLING CIRCUIT INTLET TEMPERATURE SENSOR
CN33(SC_L)	SUBCOOLING LIQUID PIPE SENSOR
CN34(DIACHARGE(I))	INVERTER COMP DISCHARGE TEMPERATURE SENSOR
CN34(HEX1)	OUTDOOR HEAT EXCHANGER TEMPERATURE SENSOR
CN34(HEX2)	OUTDOOR HEAT EXCHANGER TEMPERATURE SENSOR
CN35(AIR)	OUTDOOR TEMPERATURE SENSOR
CN35(SUCTION)	SUCTION TEMPERATURE SENSOR
CN35(DISCHARGE(C))	CONSTANT COMP DISCHARGE TEMPERATURE SENSOR
CN36(TH_DISCHARGE(C2))	INLET WATER TEMPERATURE SENSOR
CN38	ELECTRIC EXPANSION VALVE (MAIN)
CN39	ELECTRIC EXPANSION VALVE (MAIN)
CN40	ELECTRIC EXPANSION VALVE (SUBCOOLER)
CN41	CENTRAL CONTROL TERMINAL
CN43	HIGH PRESSURE SWITCH(C1)
CN44	HIGH PRESSURE SWITCH(INV)
SW01S	RESET BUTTON
SW02V	AUTO ADDRESSING SWITCH

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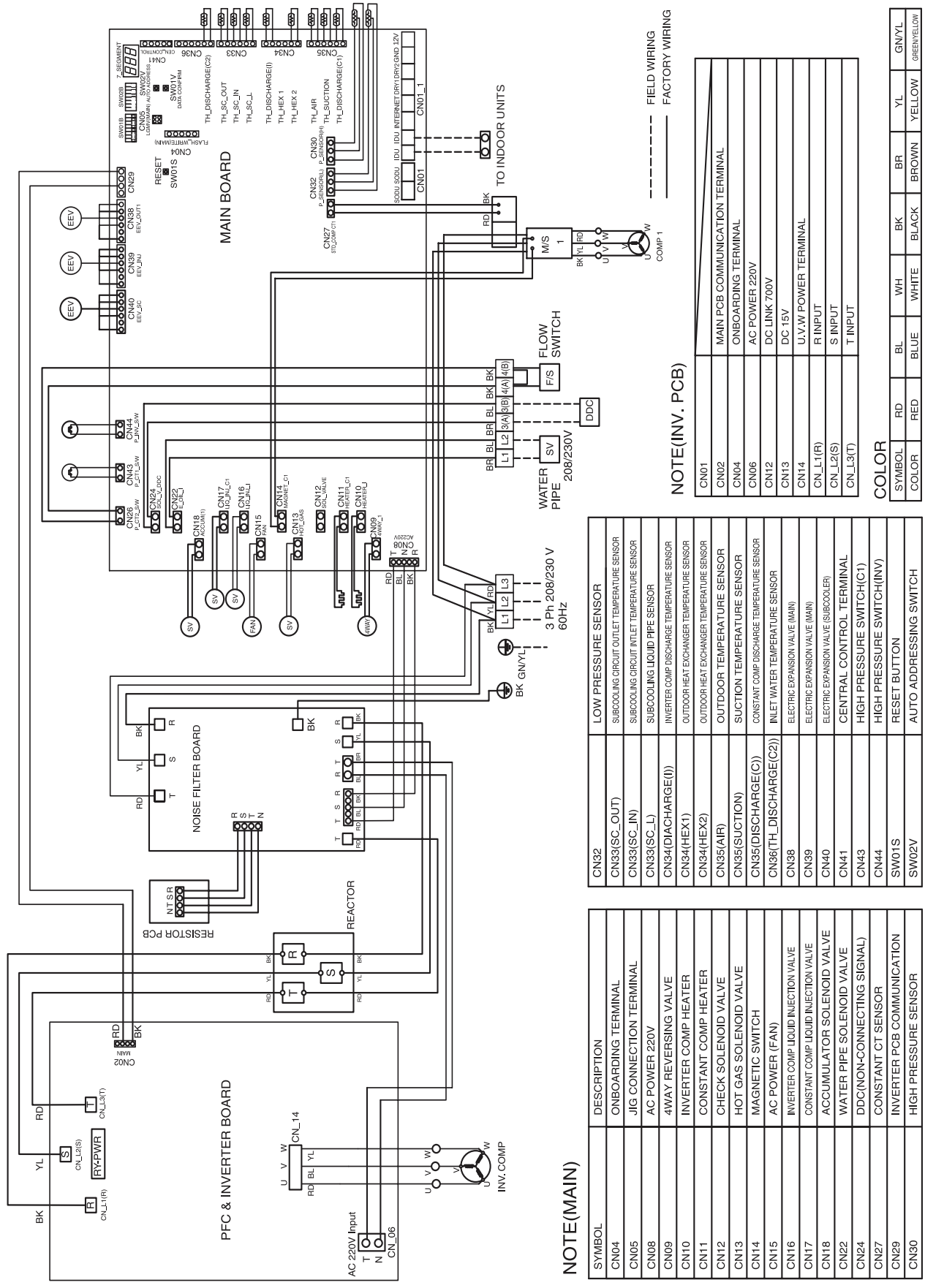
MULTI V WATER IV HEAT PUMP WATER-SOURCE UNIT WIRING DIAGRAMS

ARWN144BA2 208/230V Heat Pump Water-source Unit



NOTE(MAIN)

SYMBOL	DESCRIPTION
CN04	ONBOARDING TERMINAL
CN05	JIG CONNECTION TERMINAL
CN08	AC POWER 220V
CN09	4WAY REVERSING VALVE
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CN11	CONSTANT COMP HEATER
CN12	CHECK SOLENOID VALVE
CN13	HOT GAS SOLENOID VALVE
CN14	MAGNETIC SWITCH
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CN34(HEX2)	OUTDOOR HEAT EXCHANGER TEMPERATURE SENSOR
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CN44	HIGH PRESSURE SWITCH(INV)
SW01S	RESET BUTTON
SW02V	AUTO ADDRESSING SWITCH

NOTE(INV. PCB)

CN01	MAIN PCB COMMUNICATION TERMINAL
CN02	ONBOARDING TERMINAL
CN04	AC POWER 220V
CN06	DC LINK 700V
CN12	DC 15V
CN13	U,V,W POWER TERMINAL
CN14	R INPUT
CN_L1(R)	S INPUT
CN_L2(S)	T INPUT
CN_L3(T)	

COLOR

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

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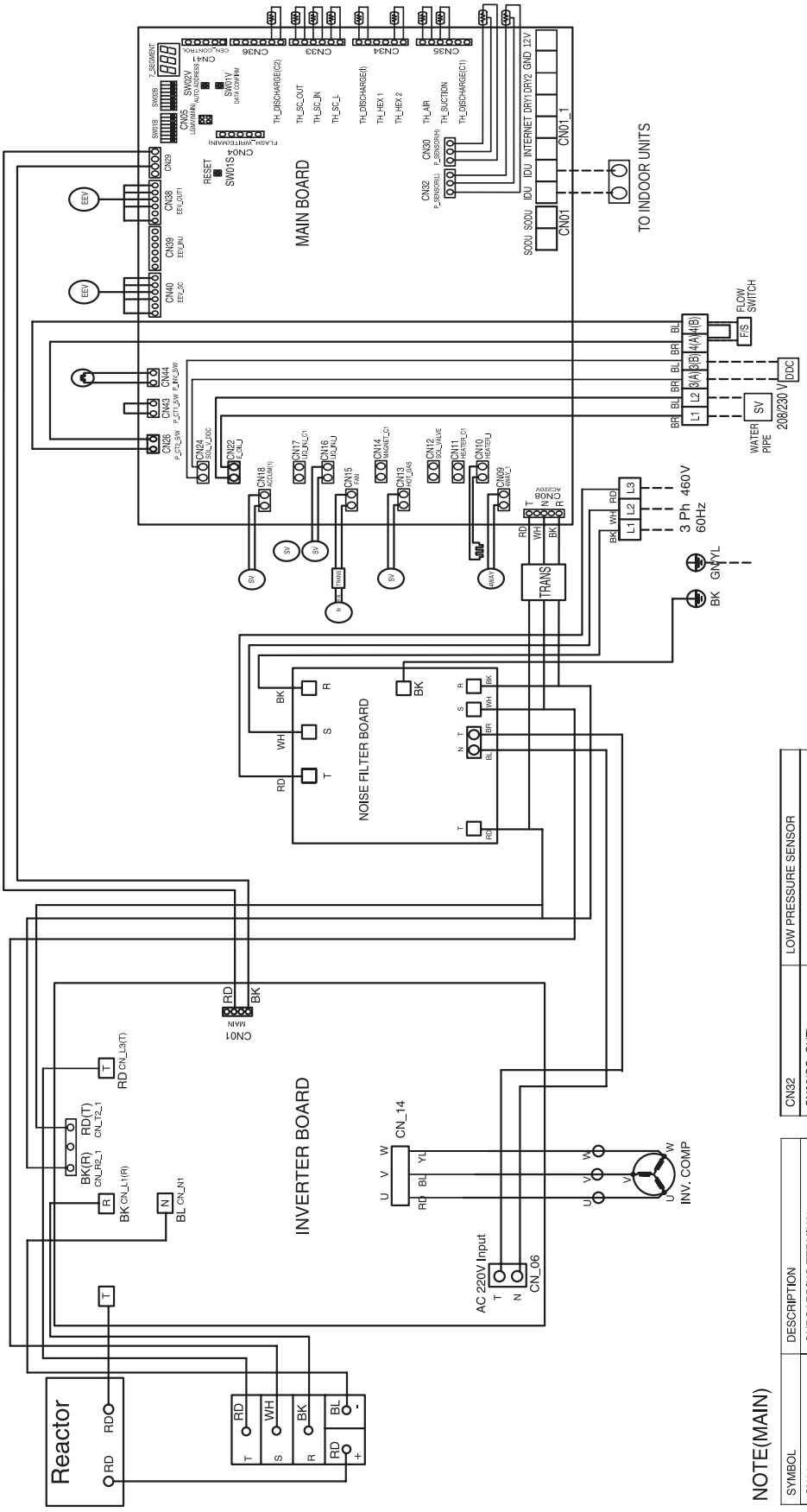
HEAT PUMP WATER-SOURCE UNIT WIRING DIAGRAMS

MULTI V WATER III

ARWN096DA2 460V Heat Pump Water-source Unit



NOTE(INV. PCB)

CN01	MAIN PCB COMMUNICATION TERMINAL
CN02	ONBOARDING TERMINAL
CN04	AC POWER 220V
CN06	DC LINK 700V
CN12	DC 15V
CN13	U.V.W POWER TERMINAL
CN14	R INPUT
CN_L1(R)	S INPUT
CN_L2(S)	T INPUT
CN_L3(T)	

FIELD WIRING

FACTORY WIRING

COLOR

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

NOTE(MAIN)

SYMBOL	DESCRIPTION
CN04	ONBOARDING TERMINAL
CN05	JIG CONNECTION TERMINAL
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CN34(HEX2)	OUTDOOR HEAT EXCHANGER TEMPERATURE SENSOR
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CN35(SUCTION)	SUCTION TEMPERATURE SENSOR
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CN43	HIGH PRESSURE SWITCH(C1)
CN44	HIGH PRESSURE SWITCH(INV)
SW01S	RESET BUTTON
SW02V	AUTO ADDRESSING SWITCH

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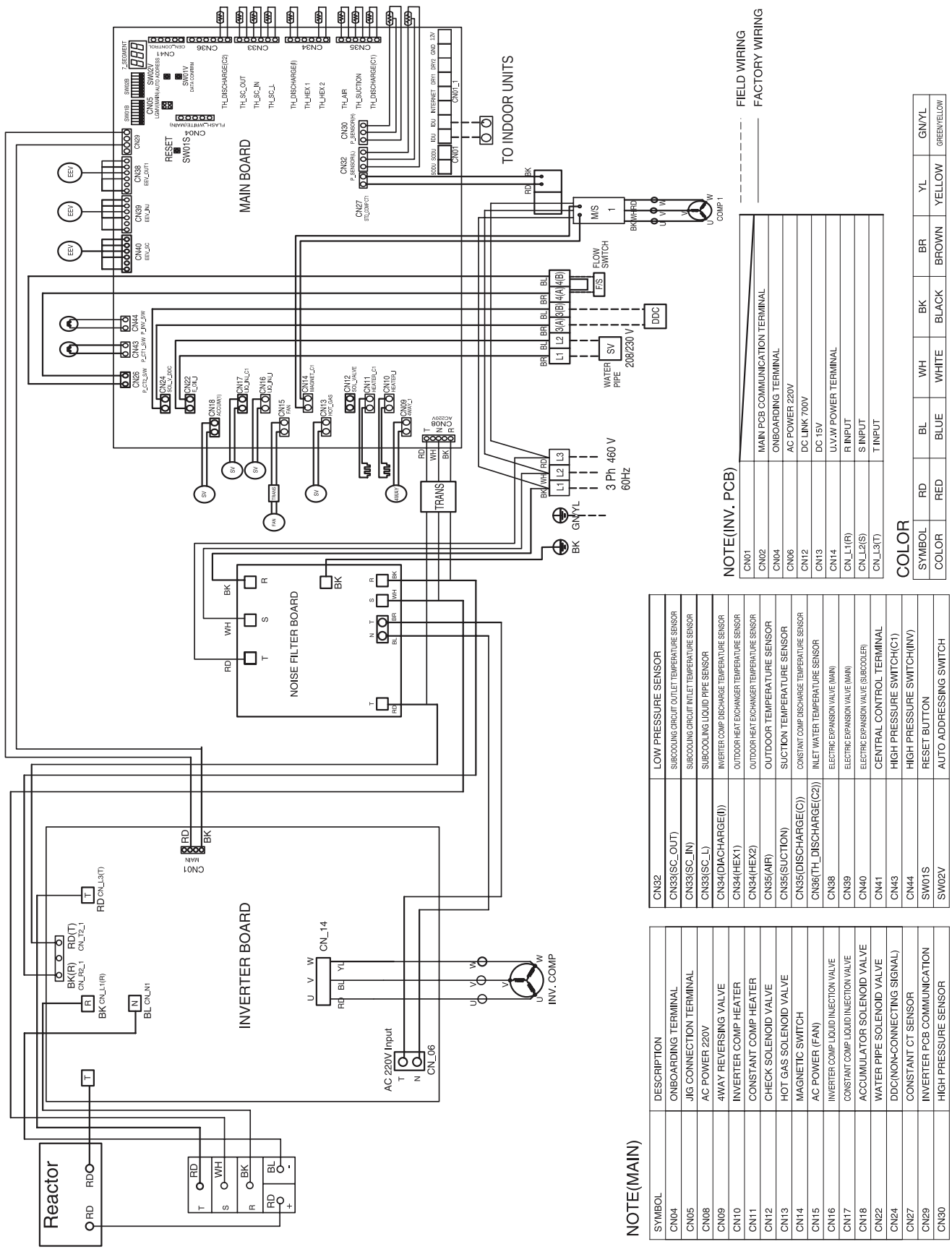
MULTI V WATER II HEAT PUMP WATER-SOURCE UNIT WIRING DIAGRAMS

ARWN192DA2 460V Heat Pump Water-source Unit



NOTE(MAIN)

SYMBOL	DESCRIPTION
CN04	ONBOARDING TERMINAL
CN05	JIG CONNECTION TERMINAL
CN08	AC POWER 220V
CN09	4WAY REVERSING VALVE
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CN14	MAGNETIC SWITCH
CN15	AC POWER (FAN)
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CN22	WATER PIPE SOLENOID VALVE
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CN30	HIGH PRESSURE SENSOR

CN32	LOW PRESSURE SENSOR
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CN33(SC_IN)	SUBCOOLING CIRCUIT INTLET TEMPERATURE SENSOR
CN33(SC_L)	SUBCOOLING LIQUID PIPE SENSOR
CN34(DIACHARGE(I))	INVERTER COMP DISCHARGE TEMPERATURE SENSOR
CN34(HEX1)	OUTDOOR HEAT EXCHANGER TEMPERATURE SENSOR
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CN44	HIGH PRESSURE SWITCH(INV)
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NOTE(INV. PCB)

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CN06	DC LINK 700V
CN12	DC 15V
CN13	U,V,W POWER TERMINAL
CN14	R INPUT
CN_L1(R)	S INPUT
CN_L2(S)	T INPUT
CN_L3(T)	

COLOR

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

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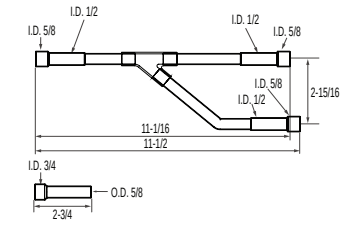
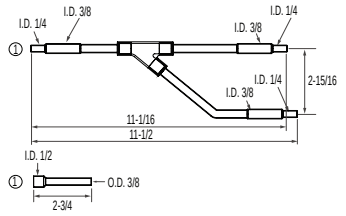
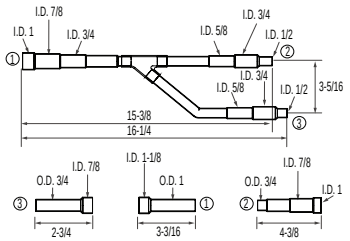
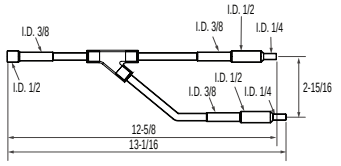
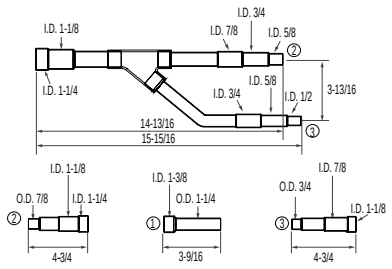
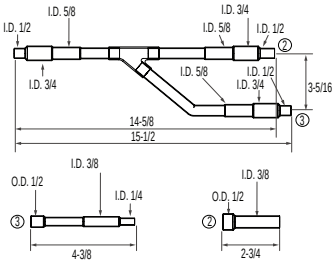
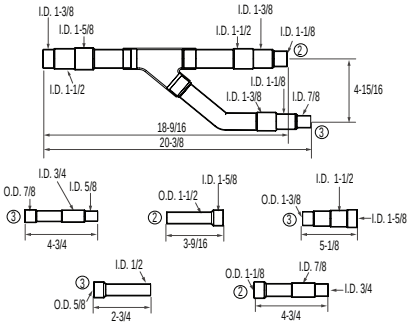
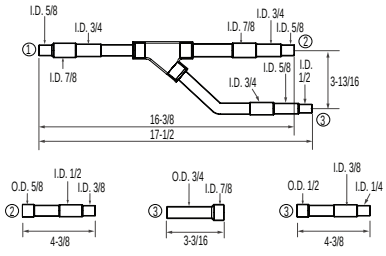
Required Accessories	Model No.		
Y-branches (for indoor unit connection)	ARBLN01621	ARBLN07121	
	ARBLN03321	ARBLN14521	
Headers (for indoor unit connection)	Four (4) branch	Seven (7) branch	Ten (10) branch
	ARBL054	ARBL057	ARBL1010
	ARBL104	ARBL107	ARBL2010
Multi-frame Connectors (for outdoor unit connection)	Use to Combine Two Units	Use to Combine Three Units	
	ARCNN21	ARCNN21	
		ARCNN31	

Y-branches (for indoor unit connection)

Unit: Inch

Models	Vapor pipe	Liquid pipe
ARBLN01621		
ARBLN03321		
ARBLN07121		
ARBLN14521		

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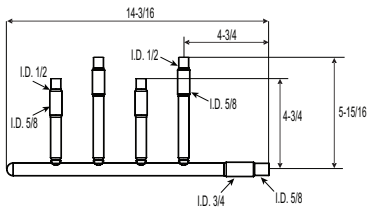
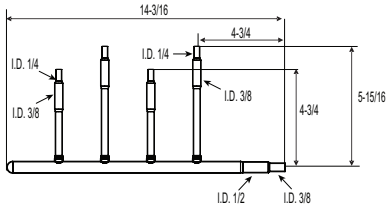
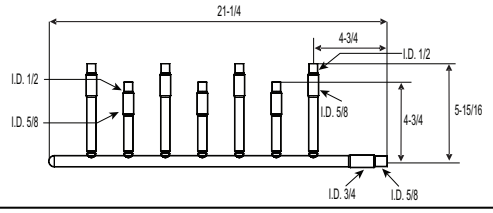
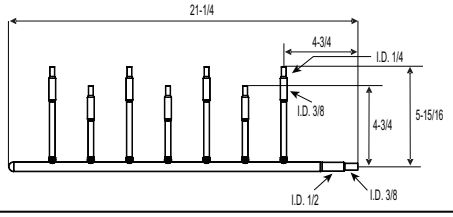
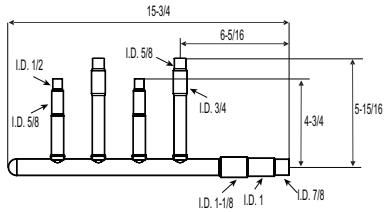
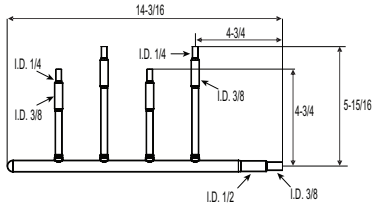
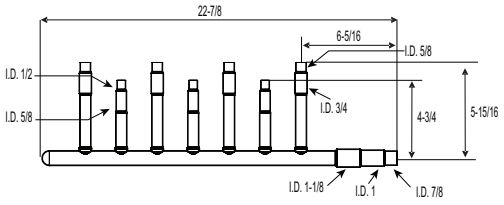
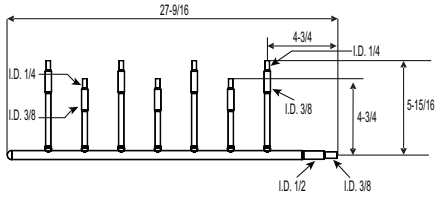
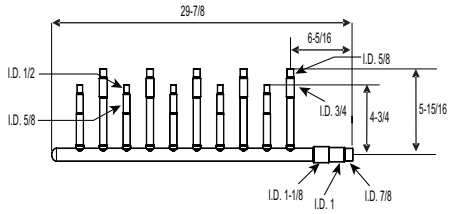
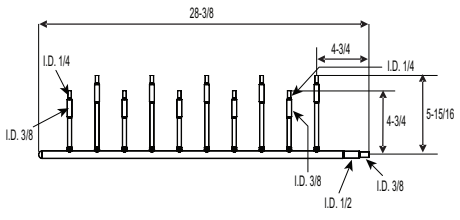
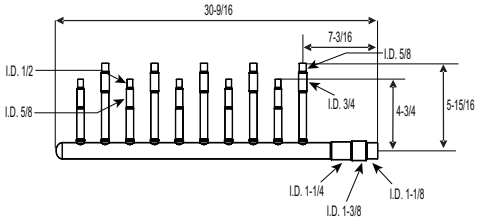
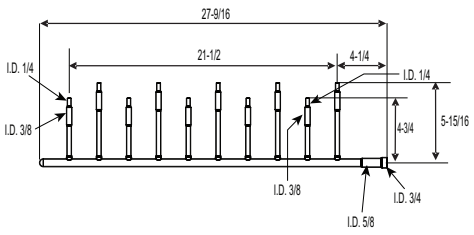
Headers (for indoor unit connection)

⚠ Note:

Headers can only be used with heat-pump systems.

Unit: inch

Models	Vapor pipe	Liquid pipe
4 branch ARBL054		
7 branch ARBL057		
4 branch ARBL104		
7 branch ARBL107		
10 branch ARBL1010		
10 branch ARBL2010		

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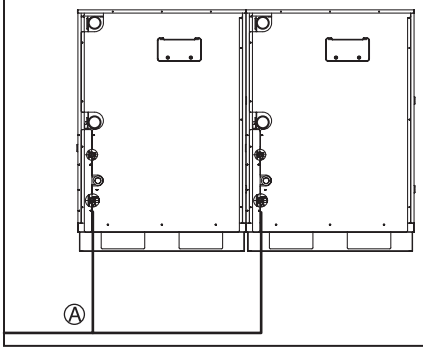
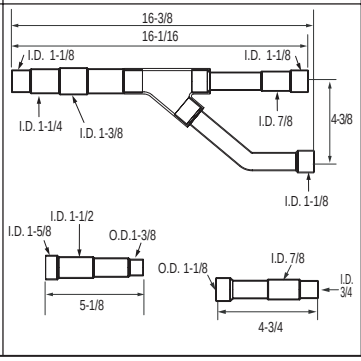
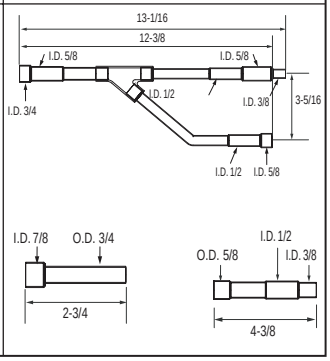
HEAT PUMP WATER-SOURCE UNIT ACCESSORIES

Multi-frame Connector (for water-source heat pump unit connection)

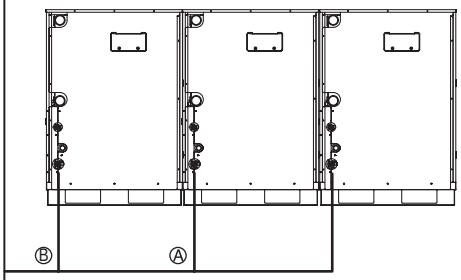
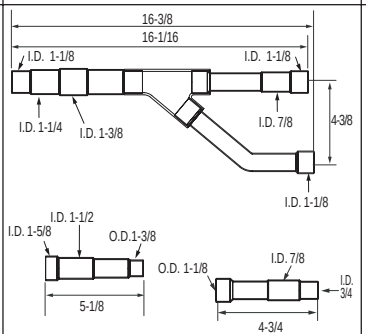
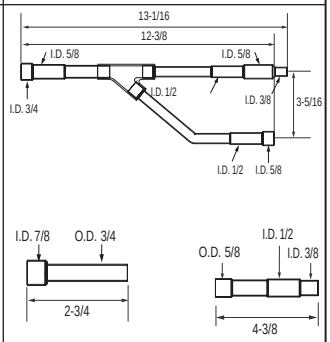
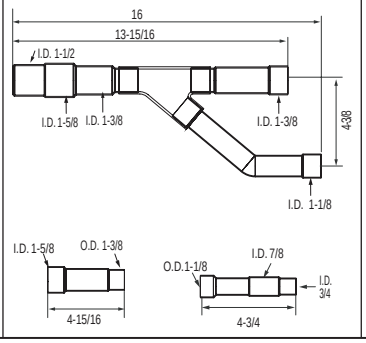
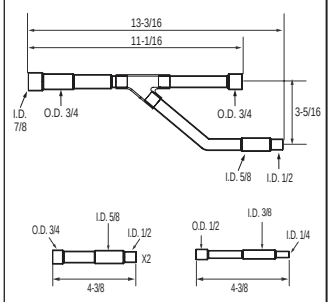
Two water-source units

Unit: inch

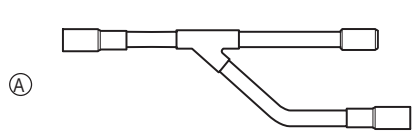
Combination	Multi-frame Connector	Vapor pipe	Liquid pipe
	Ⓐ ARCNN21		

Three water-source units

Unit: inch

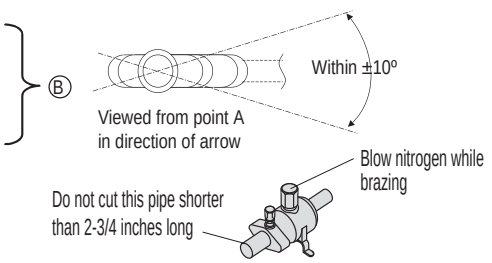
Combination specification	Multi-frame Connector	Vapor pipe	Liquid pipe
	Ⓐ ARCNN21		
	Ⓑ ARCNN31		

* Install the branch pipe between the water-source units so that the outlet pipe is parallel with the surface.

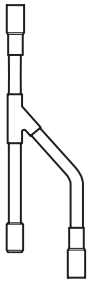


Ⓐ To branch piping or indoor unit

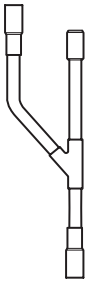
Ⓑ To water-source unit



Facing down



Facing up



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MULTI V WATER IV HEAT RECOVERY WATER-SOURCE UNIT SPECIFICATIONS

Heat Recovery Systems - 3Ø, 208/230V, 60Hz

	6 Ton	12 Ton	18 Ton
Combination Unit Model Number	ARWB072BA2	ARWB144BA2	ARWB216BA2[8]
Individual Component Model Numbers	-	-	(ARWN144BA2 + ARWN072BA2)
Total Cooling Capacity (Btu/h)[1]	72,000	144,000	216,000
Unit Input Power (kW)	4.4	8.8	13.2
Heating Performance (Btu/h)[2]	81,000	162,000	243,000
Unit Input Power (kW)	4.55	9.14	13.69
Compressor			
Type	DC Inverter Scroll	DC Inverter Scroll + Constant	(DC Inverter Scroll) x 2 + Constant x 1
Power Supply (volt/hz/phase)[3]	208-230 / 60 / 3	208-230 / 60 / 3	208-230 / 60 / 3
MCA (A)	21	42.5	42.5 + 21
MOP (A)	35	60	60 + 35
Max. Starting Current (A)	-	103.9	103.9
System Data			
Sound Pressure (dBA)[4]	49	50	51
Heat rejected to equipment room (Btu/h)	1,707	1,707	1,707 + 1,707
Net Weight (lbs)	375	525	525 + 375
Shipping Weight (lbs)	405	556	556 + 405
Dimensions (W x H x D)	30-7/16 x 44-1/8 x 21-9/16	30-7/16 x 44-1/8 x 21-9/16	(30-7/16 x 44-1/8 x 21-9/16) x 2
Max. Qty Indoor Units	16	32	49
Refrigerant Connection[5]			
Vapor Line High OD (in)	3/4 Flare	7/8 Flare	7/8 Braze + 3/4 Flare
Vapor Line Low OD (in)	7/8 Braze	1-1/8 Braze	1-1/8 Braze + 7/8 Braze
Liquid Line OD (in)	3/8 Flare	1/2 Flare	1/2 Flare + 3/8 Flare
Expansion Device	Electronically Controlled (EEV)	Electronically Controlled (EEV)	Electronically Controlled (EEV)
Refrigerant Charge			
Factory R410A (lbs)	16.1	19.4	19.4 + 16.1
Water Side			
Heat Exchanger[6]	Stainless Steel Plate	Stainless Steel Plate	Stainless Steel Plate
Water Inlet/Outlet Connection Size (in)	1-1/4 FPT	1-1/2 FPT	1-1/2 FPT + 1-1/4FPT
Condensate Drain (in)	3/4	3/4	3/4 + 3/4
Nominal Flow Rate Total (GPM)	21.1	42.2	63.3 (42.2 + 21.1)
Range of Flow (GPM)	10.6-26.4	21.2-52.8	31.8-79.2
Entering water temp. range (°F)–Cooling	50-113	50-113	50-113
Entering water temp. range (°F)–Heating	23-113	23-113	23-113
Total Heat of Rejection (Btu)	87,032	174,063	261,095
Total Heat of Absorption (Btu)	65,974	130,787	196,249
Pressure Drop (ft)	8.9	14.4	14.4 + 8.9
ΔT (°F)[7]	8.2	8.2	8.2

Capacity based on following conditions: [1]Cooling – Indoor 80°F DB/66°F WB, Water Temp. Entering 86°F; [2]Heating- Indoor 68°F DB, Water Temp. Entering 68°F.

[3]Voltage tolerance is ±10%.

[4]Sound pressure levels as tested in anechoic chamber under ISO Standard 1996.

[5]Refer to the Refrigerant Piping Section of this manual for correct line sizing. Contractor MUST use LG manufactured Y-branch and Header fittings only. Designer must verify refrigerant piping design configuration using LG's computerized refrigerant piping CAD/calculation (LATS) Software to layout and design the refrigerant piping system.

[6]Maximum water pressure is 640 psi.

[7]Calculated from ΔT = Total Heat of Rejection / (Nominal flow rate x 500).

[8]Requires Multi-frame Connector ARCNB21 to connect component frames.

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HEAT RECOVERY WATER-SOURCE UNIT SPECIFICATIONS

Heat Recovery Systems - 3Ø, 208/230V, 60Hz

	24 Ton	30 Ton	36 Ton
Combination Unit Model Number	ARWB288BA2[8]	ARWB360BA2[9]	ARWB432BA2[9]
Individual Component Model Numbers	(ARWB144BA2) x2	(ARWB144BA2) x2+ARWB072BA2	(ARWB144BA2) x3
Total Cooling Capacity (Btu/h)[1]	288,000	360,000	432,000
Unit Input Power (kW)	17.6	22.0	26.4
Heating Performance (Btu/h)[2]	324,000	405,000	486,000
Unit Input Power (kW)	18.28	22.83	27.38
Compressor			
Type	(DC Inverter Scroll) x2+(Constant) x2	(DC Inverter Scroll) x3+(Constant) x2	(DC Inverter Scroll)x3+(Constant) x3
Power Supply (volt/hz/phase)[3]	208-230 / 60 / 3	208-230 / 60 / 3	208-230 / 60 / 3
MCA (A)	42.5 + 42.5	42.5 + 42.5 + 21	42.5 + 42.5 + 42.5
MOP (A)	60 + 60	60 + 60 + 35	60 + 60 + 60
Max. Starting Current (A)	103.9 + 103.9	103.9 + 103.9	103.9 + 103.9 + 103.9
System Data			
Sound Pressure (dBA)[4]	52	53	54
Heat rejected to equipment room (Btu/h)	1,707 + 1,707	1,707 + 1,707 + 1,707	1,707 + 1,707 + 1,707
Net Weight (lbs)	525 + 525	525 + 525 + 375	525 + 525 + 525
Shipping Weight (lbs)	556 + 556	556 + 556 + 405	556 + 556 + 556
Dimensions (W x H x D)	(30-7/16 x 44-1/8 x 21-9/16)x 2	(30-7/16 x 44-1/8 x 21-9/16) x 3	(30-7/16 x 44-1/8 x 21-9/16) x 3
Max. Qty Indoor Units	64	64	64
Refrigerant Connection[5]			
Vapor Line High OD (in)	7/8 Braze + 7/8 Braze	7/8 Braze + 7/8 Braze + 3/4 Braze	7/8 Braze + 7/8 Braze + 7/8 Braze
Vapor Line Low OD (in)	1-1/8 Braze + 1-1/8 Braze	1-1/8 Braze+1-1/8 Braze+7/8 Braze	1-1/8 Braze+1-1/8 Braze+1-1/8 Braze
Liquid Line OD (in)	1/2 Flare + 1/2 Flare	1/2 Flare + 1/2 Flare + 3/8 Flare	1/2 Flare + 1/2 Flare + 1/2 Flare
Expansion Device	Electronically Controlled (EEV)	Electronically Controlled (EEV)	Electronically Controlled (EEV)
Refrigerant Charge			
Factory R410A (lbs)	19.4 + 19.4	19.4 + 19.4 + 16.1	19.4 + 19.4 + 19.4
Water Side			
Heat Exchanger[6]	Stainless Steel Plate	Stainless Steel Plate	Stainless Steel Plate
Water Inlet/Outlet Connection Size (in)	1-1/2FPT + 1-1/2FPT	1-1/2FPT + 1-1/2FPT + 1-1/4FPT	1-1/2FPT + 1-1/2FPT + 1-1/2FPT
Condensate Drain (in)	3/4 + 3/4	3/4 + 3/4 + 3/4	3/4 + 3/4 + 3/4
Nominal Flow Rate Total (GPM)	84.4 (42.2 + 42.2)	105.5 (42.2 + 42.2 + 21.1)	126.6 (42.2 + 42.2 + 42.2)
Range of Flow (GPM)	42.4-105.6	63.6-158.4	79.2-190.2
Entering water temp. range(°F)–Cooling	50-113	50-113	50-113
Entering water temp. range (°F)–Heating	23-113	23-113	23-113
Total Heat of Rejection (Btu)	348,126	435,158	522,189
Total Heat of Absorption (Btu)	261,574	327,036	392,497
Pressure Drop (Ft)	14.4 + 14.4	14.4 + 14.4 + 8.9	14.4 + 14.4 + 14.4
ΔT (°F)[7]	8.2	8.2	8.2

Capacity based on following conditions: [1]Cooling – Indoor 80°F DB/66°F WB, Water Temp. Entering 86°F; [2]Heating- Indoor 68°F DB, Water Temp. Entering 68°F.

[3]Voltage tolerance is ±10%.

[4]Sound pressure levels as tested in anechoic chamber under ISO Standard 1996.

[5]Refer to the Refrigerant Piping Section of this manual for correct line sizing. Contractor MUST use LG manufactured Y-branch and Header fittings only. Designer must verify refrigerant piping design configuration using LG's computerized refrigerant piping CAD/calculation (LATS) Software to layout and design the refrigerant piping system.

[6]Maximum water pressure is 640 psi.

[7]Calculated from ΔT = Total Heat of Rejection / (Nominal flow rate x 500).

[8]Requires Multi-frame Connector ARCNB21 to connect component frames.

[9]Requires Multi-frame Connector ARCNB21 and ARCNB31 to connect component frames.

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MULTI V WATER IV HEAT RECOVERY WATER-SOURCE UNIT SPECIFICATIONS

Heat Recovery Systems - 3Ø, 460V, 60Hz

	8 Ton	16 Ton	24 Ton
Combination Unit Model Number	ARWB096DA2	ARWB192DA2	ARWB290DA2[8]
Individual Component Model Numbers	-	-	(ARWN192DA2 + ARWN096DA2)
Total Cooling Capacity (Btu/h)[1]	95,900	191,100	286,600
Unit Input Power (kW)	5.6	11.2	16.8
Heating Performance (Btu/h)[2]	107,500	225,000	322,500
Unit Input Power (kW)	5.8	11.7	17.5
Compressor			
Type	DC Inverter Scroll	DC Inverter Scroll + Constant	(DC Inverter Scroll) x 2 + Constant x 1
Power Supply (volt/hz/phase)[3]	460 / 60 / 3	460 / 60 / 3	460 / 60 / 3
MCA (A)	13	26.2	26.2 + 13
MOP (A)	20	35	35 + 20
Max. Starting Current (A)	-	92.8	92.8
System Data			
Sound Pressure (dBA)[4]	51	515	53
Heat rejected to equipment room (Btu/h)	1,707	1,707	1,707 + 1,707
Net Weight (lbs)	375	525	525 + 375
Shipping Weight (lbs)	405	556	556 + 405
Dimensions (W x H x D)	30-7/16 x 44-1/8 x 21-9/16	30-7/16 x 44-1/8 x 21-9/16	(30-7/16 x 44-1/8 x 21-9/16) x 2
Max. Qty Indoor Units	16	32	49
Refrigerant Connection[5]			
Vapor Line High OD (in)	3/4 Flare	7/8 Flare	7/8 Braze + 3/4 Flare
Vapor Line Low OD (in)	7/8 Braze	1-1/8 Braze	1-1/8 Braze + 7/8 Braze
Liquid Line OD (in)	3/8 Flare	1/2 Flare	1/2 Flare + 3/8 Flare
Expansion Device	Electronically Controlled (EEV)	Electronically Controlled (EEV)	Electronically Controlled (EEV)
Refrigerant Charge			
Factory R410A (lbs)	16.1	19.4	19.4 + 16.1
Water Side			
Heat Exchanger[6]	Stainless Steel Plate	Stainless Steel Plate	Stainless Steel Plate
Water Inlet/Outlet Connection Size (in)	1-1/4 FPT	1-1/2 FPT	1-1/2 FPT + 1-1/4FPT
Condensate Drain (in)	3/4	3/4	3/4 + 3/4
Nominal Flow Rate Total (GPM)	25.4	50.8	76.2 (50.8 + 25.4)
Range of Flow (GPM)	13.2-31.7	26.4-63.4	39.6-95.1
Entering water temp. range (°F)–Cooling	50-113	50-113	50-113
Entering water temp. range (°F)–Heating	23-113	23-113	23-113
Total Heat of Rejection (Btu)	114,667	229,354	344,030
Total Heat of Absorption (Btu)	87,693	185,045	262,738
Pressure Drop (ft)	8.9	14.4	14.4 + 8.9
ΔT (°F)[7]	9.0	9.0	9.0

Capacity based on following conditions: [1]Cooling – Indoor 80°F DB/66°F WB, Water Temp. Entering 86°F; [2]Heating- Indoor 68°F DB, Water Temp. Entering 68°F.

[3]Voltage tolerance is ±10%.

[4]Sound pressure levels as tested in anechoic chamber under ISO Standard 1996.

[5]Refer to the Refrigerant Piping Section of this manual for correct line sizing. Contractor MUST use LG manufactured Y-branch and Header fittings only. Designer must verify refrigerant piping design configuration using LG's computerized refrigerant piping CAD/calculation (LATS) Software to layout and design the refrigerant piping system.

[6]Maximum water pressure is 640 psi.

[7]Calculated from ΔT = Total Heat of Rejection / (Nominal flow rate x 500).

[8]Requires Multi-frame Connector ARCNB21 to connect component frames.

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HEAT RECOVERY WATER-SOURCE UNIT SPECIFICATIONS

Heat Recovery Systems - 3Ø, 460V, 60Hz

	32 Ton	40 Ton	48 Ton
Combination Unit Model Number	ARWB390DA2[8]	ARWB480DA2[9]	ARWB580DA2[9]
Individual Component Model Numbers	(ARWB192DA2) x2	(ARWB192DA2) x2+ARWB096DA2	(ARWB192DA2) x3
Total Cooling Capacity (Btu/h)[1]	382,200	477,800	573,400
Unit Input Power (kW)	22.4	28.0	33.6
Heating Performance (Btu/h)[2]	429,900	537,500	645,000
Unit Input Power (kW)	23.4	29.2	35.0
Compressor			
Type	(DC Inverter Scroll) x2+(Constant) x2	(DC Inverter Scroll) x3+(Constant) x2	(DC Inverter Scroll)x3+(Constant) x3
Power Supply (volt/hz/phase)[3]	460 / 60 / 3	460 / 60 / 3	460 / 60 / 3
MCA (A)	26.2 + 26.2	26.2 + 26.2 + 13	26.2 + 26.2 + 26.2
MOP (A)	35 + 35	35 + 35 + 20	35 + 35 + 35
Max. Starting Current (A)	92.8 + 92.8	92.8 + 92.8	92.8 + 92.8 + 92.8
System Data			
Sound Pressure (dBA)[4]	54	55	56
Heat rejected to equipment room (Btu/h)	1,707 + 1,707	1,707 + 1,707 + 1,707	1,707 + 1,707 + 1,707
Net Weight (lbs)	525 + 525	525 + 525 + 375	525 + 525 + 525
Shipping Weight (lbs)	556 + 556	556 + 556 + 405	556 + 556 + 556
Dimensions (W x H x D)	(30-7/16 x 44-1/8 x 21-9/16) x 2	(30-7/16 x 44-1/8 x 21-9/16) x 3	(30-7/16 x 44-1/8 x 21-9/16) x 3
Max. Qty Indoor Units	64	64	64
Refrigerant Connection[5]			
Vapor Line High OD (in)	7/8 Braze + 7/8 Braze	7/8 Braze + 7/8 Braze + 3/4 Braze	7/8 Braze + 7/8 Braze + 7/8 Braze
Vapor Line Low OD (in)	1-1/8 Braze + 1-1/8 Braze	1-1/8 Braze+1-1/8 Braze+7/8 Braze	1-1/8 Braze+1-1/8 Braze+1-1/8 Braze
Liquid Line OD (in)	1/2 Flare + 1/2 Flare	1/2 Flare + 1/2 Flare + 3/8 Flare	1/2 Flare + 1/2 Flare + 1/2 Flare
Expansion Device	Electronically Controlled (EEV)	Electronically Controlled (EEV)	Electronically Controlled (EEV)
Refrigerant Charge			
Factory R410A (lbs)	19.4 + 19.4	19.4 + 19.4 + 16.1	19.4 + 19.4 + 19.4
Water Side			
Heat Exchanger[6]	Stainless Steel Plate	Stainless Steel Plate	Stainless Steel Plate
Water Inlet/Outlet Connection Size (in)	1-1/2FPT + 1-1/2FPT	1-1/2FPT + 1-1/2FPT + 1-1/4FPT	1-1/2FPT + 1-1/2FPT + 1-1/2FPT
Condensate Drain (in)	3/4 + 3/4	3/4 + 3/4 + 3/4	3/4 + 3/4 + 3/4
Nominal Flow Rate Total (GPM)	101.6 (50.8+50.8)	127 (50.8+50.8+25.4)	152.4 (50.8+50.8+50.8)
Range of Flow (GPM)	52.8-126.8	66-158.5	79.2-190.2
Entering water temp. range(°F)–Cooling	50-113	50-113	50-113
Entering water temp. range (°F)–Heating	23-113	23-113	23-113
Total Heat of Rejection (Btu)	457,707	573,384	688,061
Total Heat of Absorption (Btu)	349,989	437,782	525,475
Pressure Drop (Ft)	14.4 + 14.4	14.4 + 14.4 + 8.9	14.4 + 14.4 + 14.4
ΔT (°F)[7]	9.0	9.0	9.0

Capacity based on following conditions: [1]Cooling – Indoor 80°F DB/66°F WB, Water Temp. Entering 86°F; [2]Heating- Indoor 68°F DB, Water Temp. Entering 68°F.

[3]Voltage tolerance is ±10%.

[4]Sound pressure levels as tested in anechoic chamber under ISO Standard 1996.

[5]Refer to the Refrigerant Piping Section of this manual for correct line sizing. Contractor MUST use LG manufactured Y-branch and Header fittings only. Designer must verify refrigerant piping design configuration using LG's computerized refrigerant piping CAD/calculation (LATS) Software to layout and design the refrigerant piping system.

[6]Maximum water pressure is 640 psi.

[7]Calculated from ΔT = Total Heat of Rejection / (Nominal flow rate x 500).

[8]Requires Multi-frame Connector ARCNB21 to connect component frames.

[9]Requires Multi-frame Connector ARCNB21 and ARCNB31 to connect component frames.

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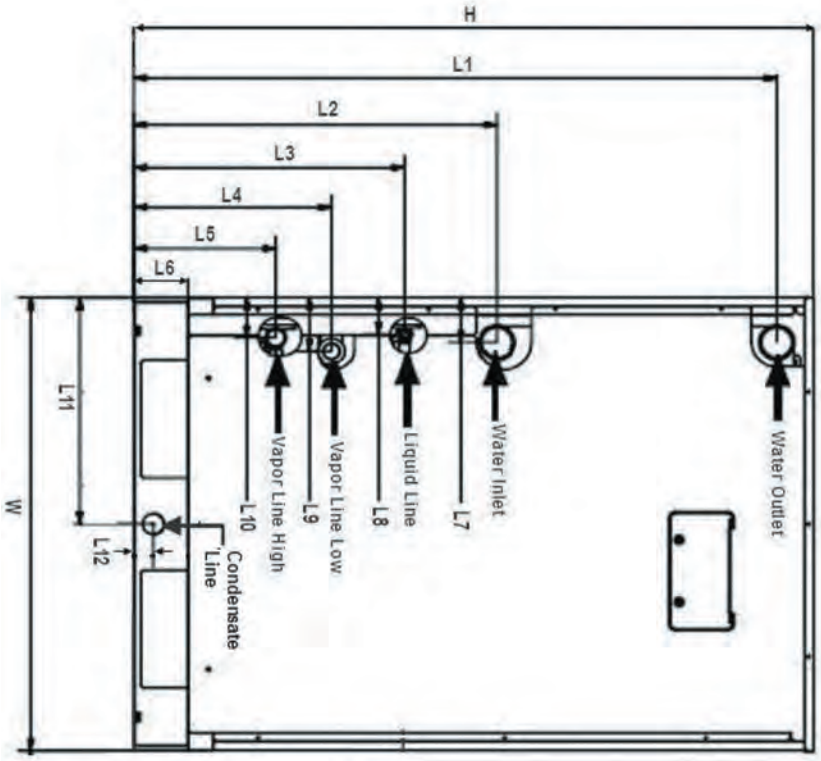
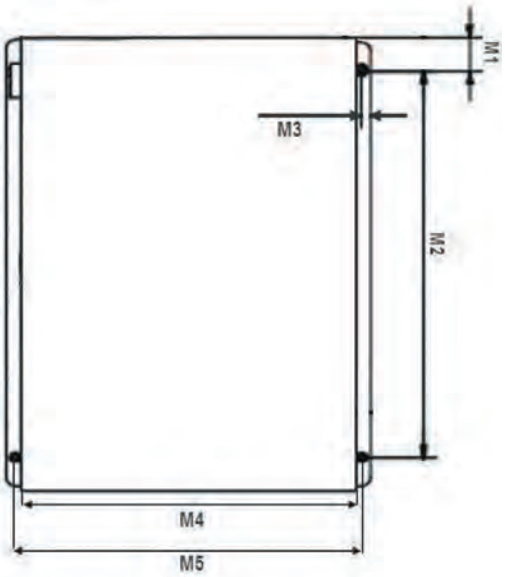
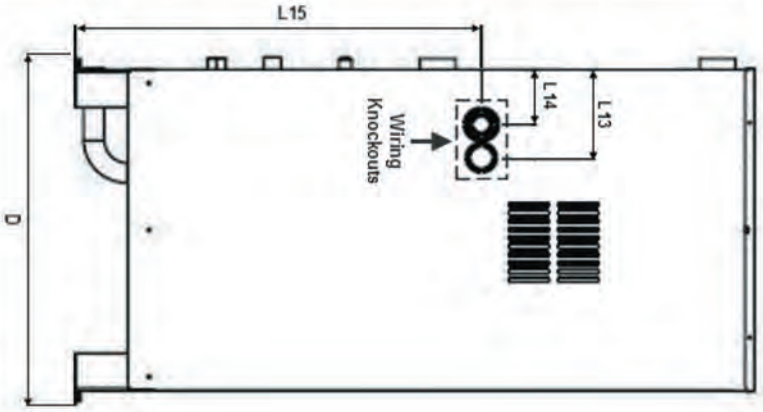
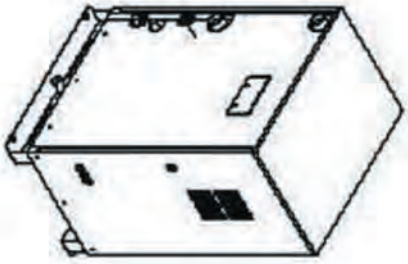
MULTI V WATER IV HEAT RECOVERY WATER-SOURCE UNIT DIMENSIONS

ARWB072BA2, ARWB144BA2 - 208/230V; ARWB096DA2, ARWB192DA2 - 460V









W	H	D	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	M1	M2	M3	M4	M5
30-13/32	44-3/32	23-19/32	41-5/8	23-1/2	17-17/32	12-13/16	9-1/4	3-21/32	3-1/2	2-15/32	3-5/8	2-3/4	15-3/16	1-1/4	5-5/8	3-9/16	26-27/32	2-1/4	25-29/32	19/32	21-17/32	22-13/32

Note - All dimensions have a tolerance of ± 0.25 in.

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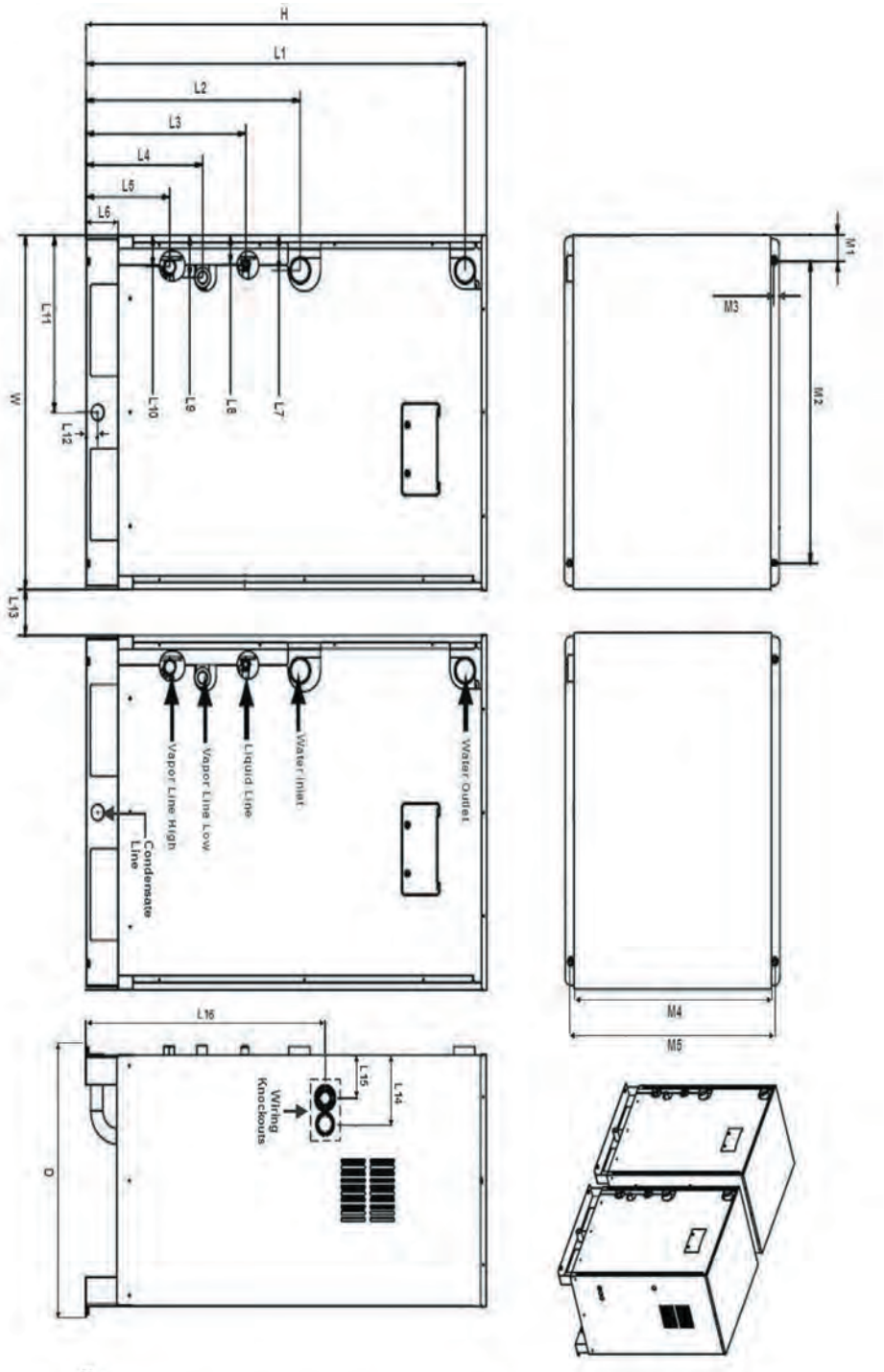
HEAT RECOVERY WATER-SOURCE UNIT DIMENSIONS

ARWB216BA2, ARWB288BA2 - 208/230V; ARWB290DA2, ARWB390DA2 - 460V



W	30-13/32
H	44-3/32
D	23-19/32
L1	41-5/8
L2	23-1/2
L3	17-17/32
L4	12-13/16
L5	9-1/4
L6	3-21/32
L7	3-1/2
L8	2-15/32
L9	3-5/8
L10	2-3/4
L11	15-3/16
L12	1-1/4
L13	6
L14	5-5/8
L15	3-9/16
L16	26-27/32
M1	2-1/4
M2	25-29/32
M3	19/32
M4	21-17/32
M5	22-13/32

Note - All dimensions have a tolerance of ± 0.25 in.

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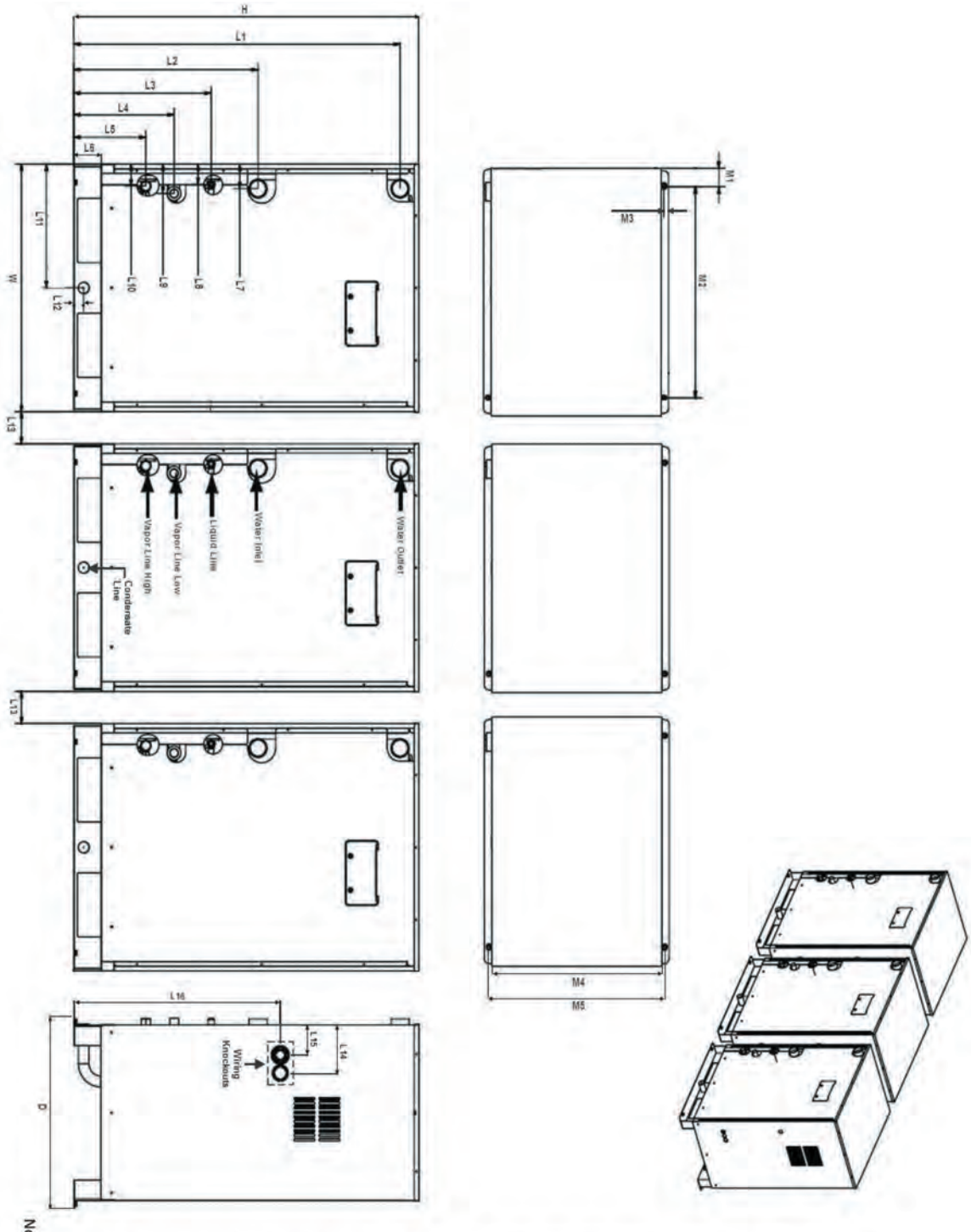
MULTI V WATER IV HEAT RECOVERY WATER-SOURCE UNIT DIMENSIONS

ARWB360BA2, ARWB432BA2 - 208/230V; ARWB480DA2, ARWB580DA2 - 460V



W	30-13/32
H	44-3/32
D	23-19/32
L1	41-5/8
L2	23-1/2
L3	17-17/32
L4	12-13/16
L5	9-1/4
L6	3-21/32
L7	3-1/2
L8	2-15/32
L9	3-5/8
L10	2-3/4
L11	15-3/16
L12	1-1/4
L13	6
L14	5-5/8
L15	3-9/16
L16	26-27/32
M1	2-1/4
M2	25-29/32
M3	19/32
M4	21-17/32
M5	22-13/32

Note - All dimensions have a tolerance of ± 0.25 in.

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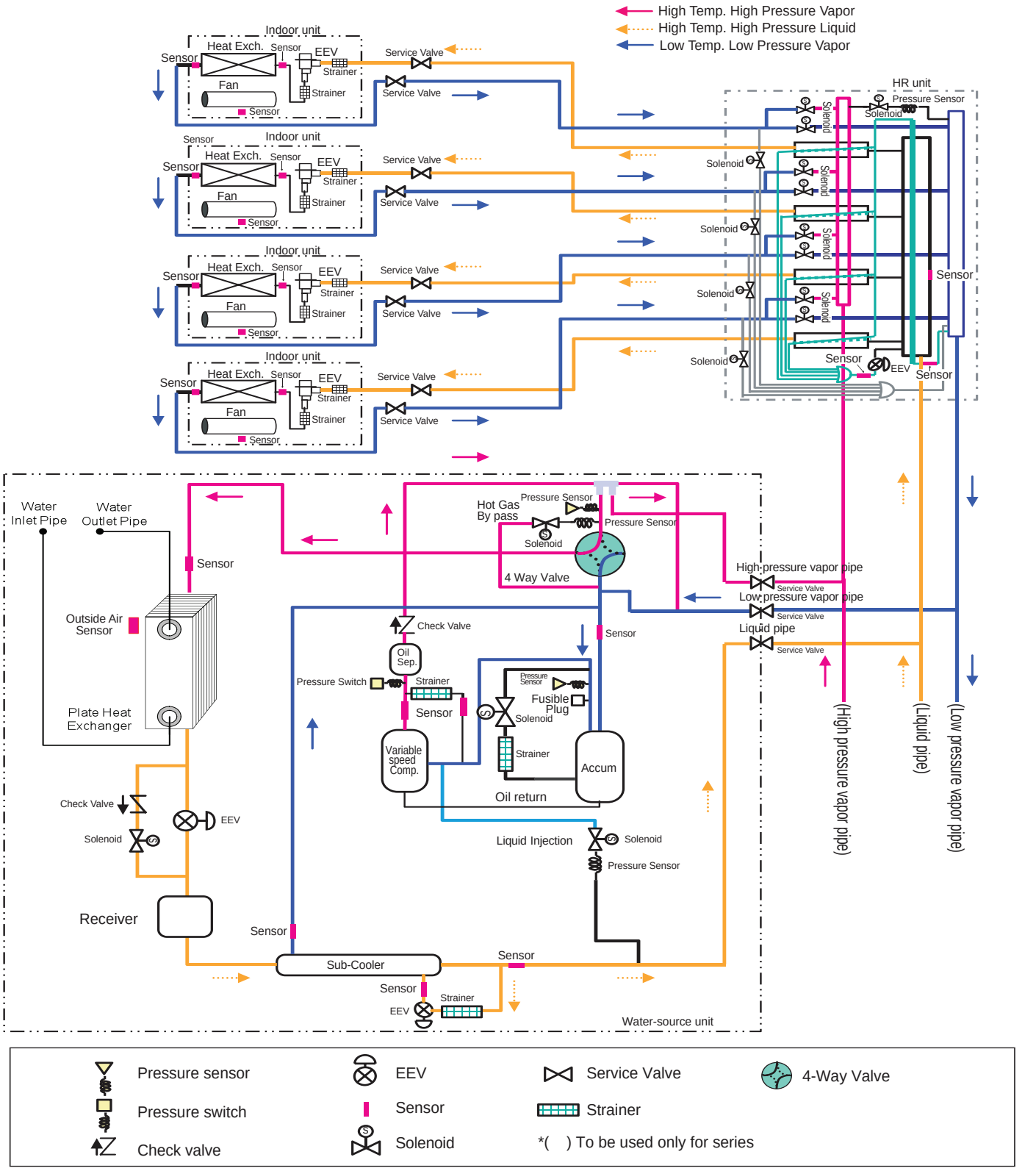
HEAT RECOVERY WATER-SOURCE UNIT REFRIG. CIRCUIT MULTI V WATER II

ARWB072BA2 - 208/230V, ARWB096DA2 - 460V: Cooling Mode



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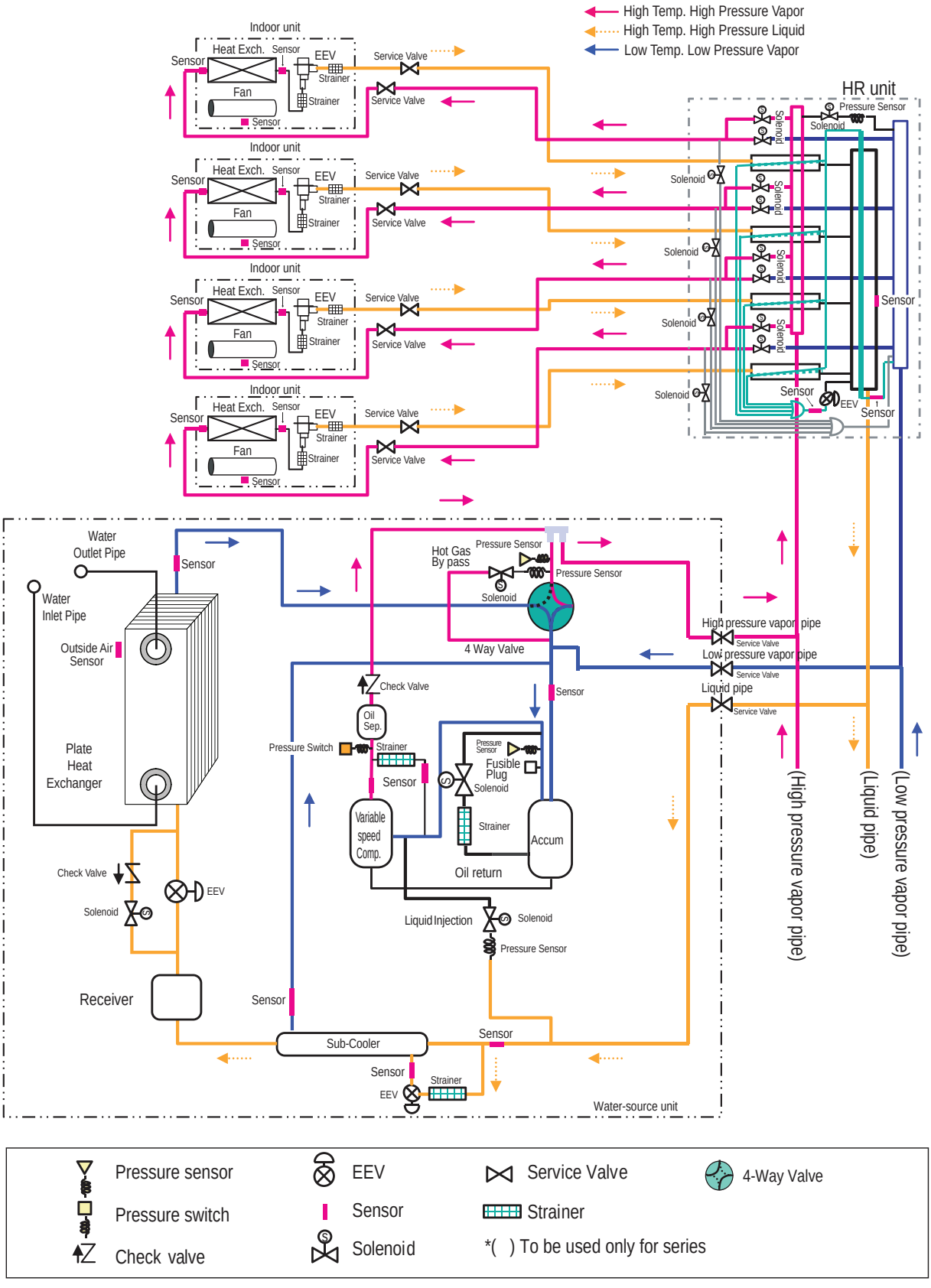
ARWB072BA2 - 208/230V, ARWB096DA2 - 460V: Heating Mode



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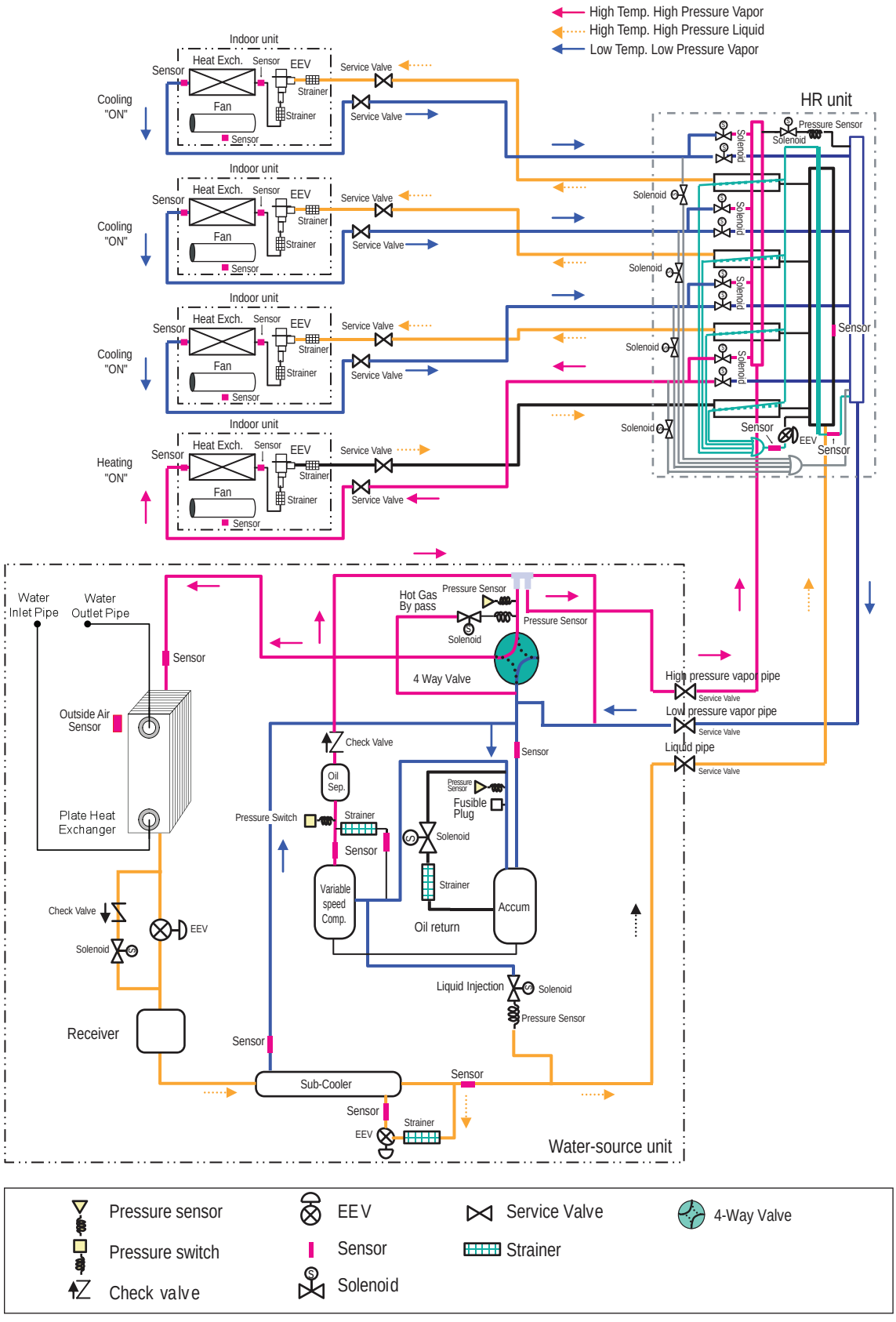
HEAT RECOVERY WATER-SOURCE UNIT REFRIG. CIRCUIT MULTI V WATER II

ARWB072BA2 - 208/230V, ARWB096DA2 - 460V: Heat Recovery Mode (Cooling Based Operation)



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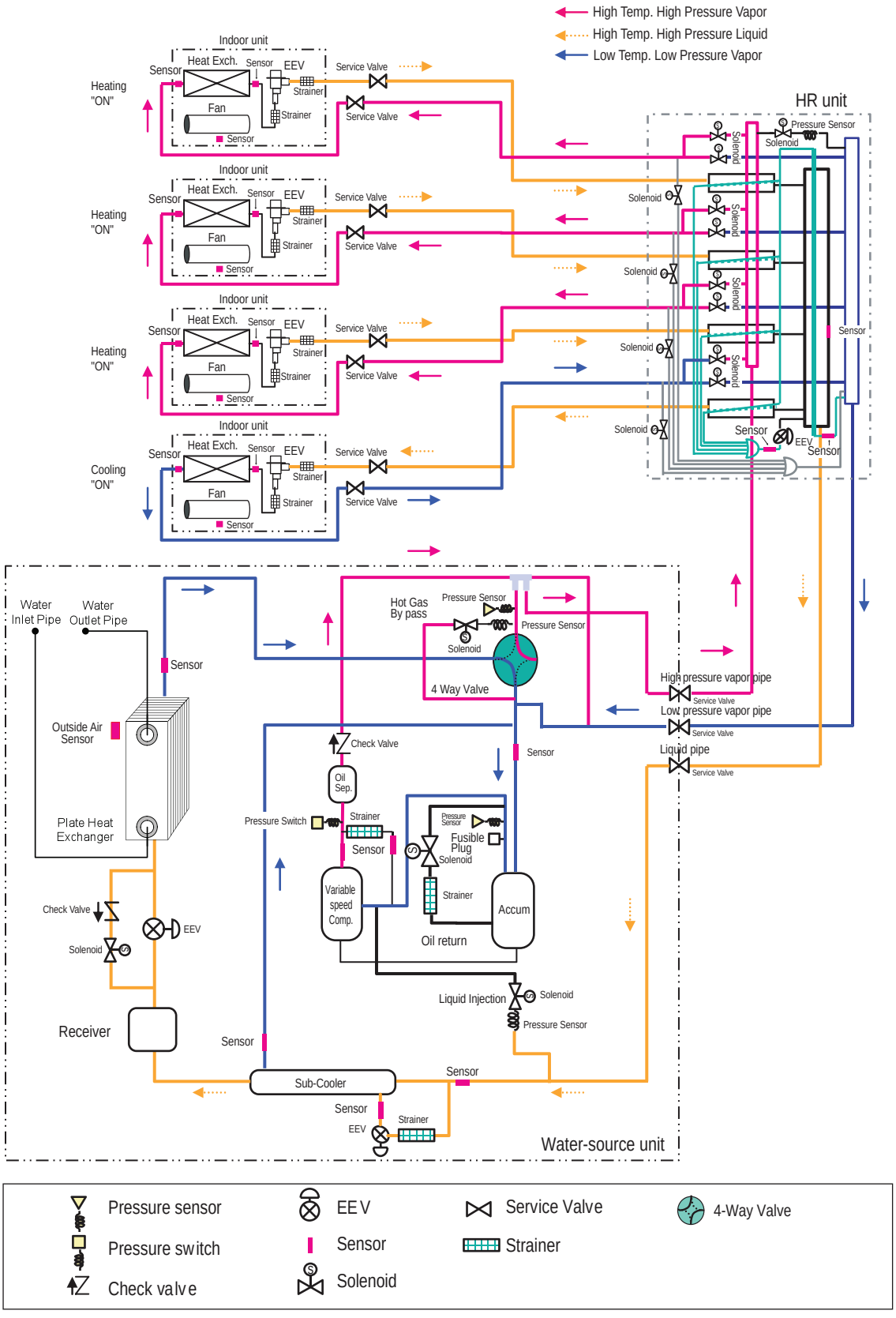
MULTI V WATER IU HEAT RECOVERY WATER-SOURCE UNIT REFRIG. CIRCUIT

ARWB072BA2 - 208/230V, ARWB096DA2 - 460V: Heat Recovery Mode (Heating Based Operation)



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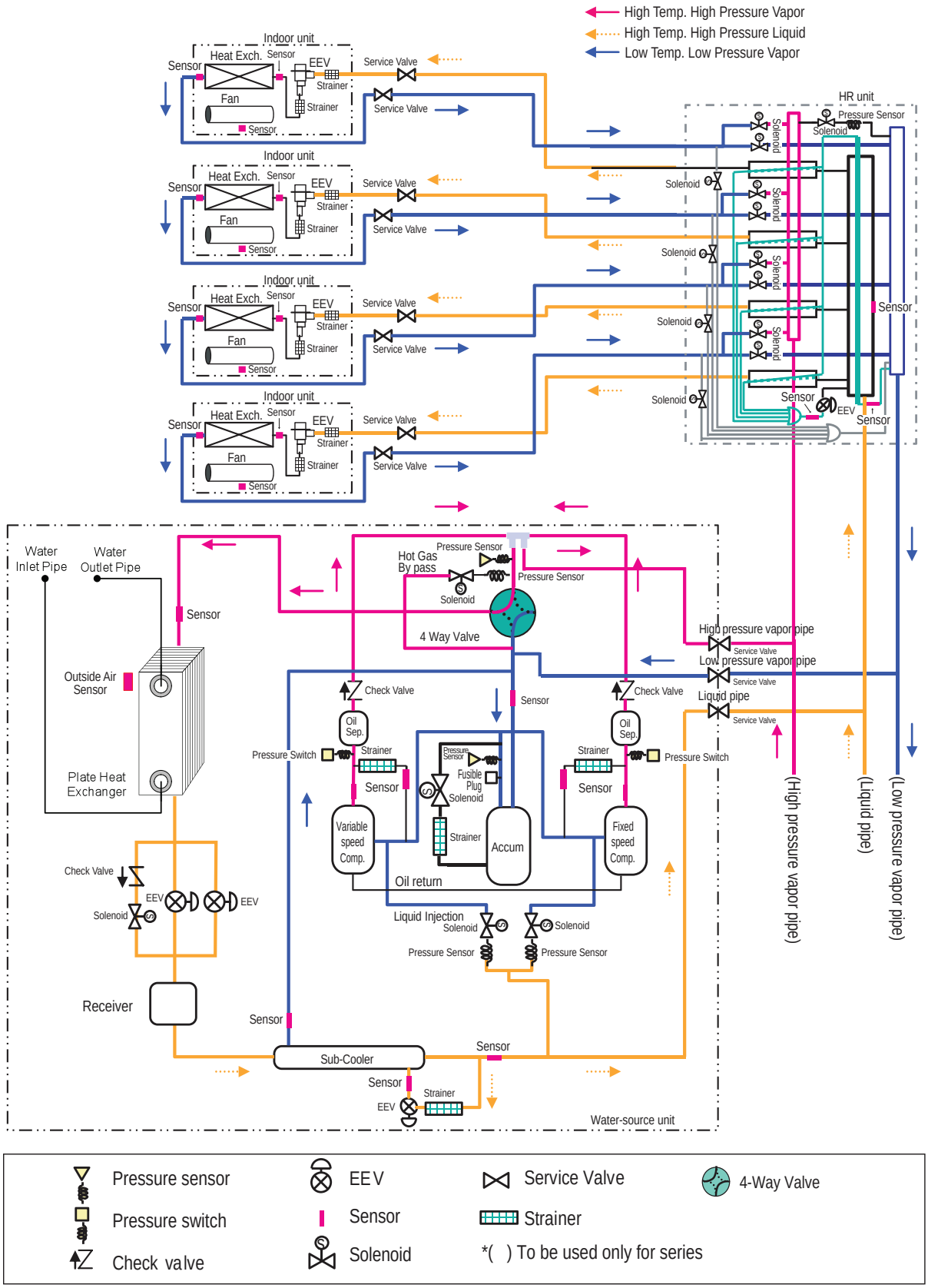
HEAT RECOVERY WATER-SOURCE UNIT REFRIG. CIRCUIT MULTI V WATER II

ARWB144BA2 - 208/230V, ARWB192DA2 - 460V: Cooling Mode



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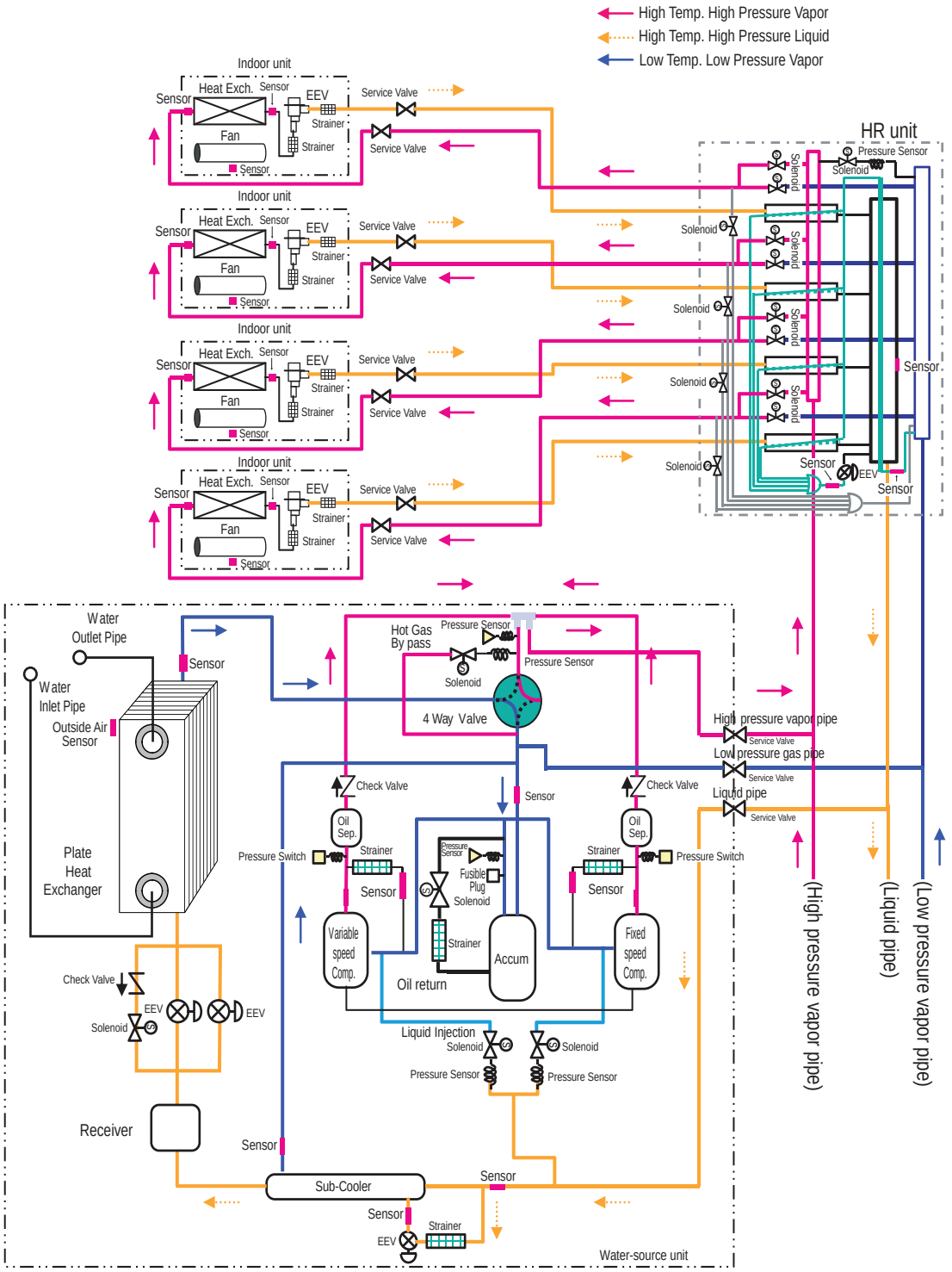
HEAT RECOVERY WATER-SOURCE UNIT REFRIG. CIRCUIT

ARWB144BA2 - 208/230V, ARWB192DA2 - 460V: Heating Mode



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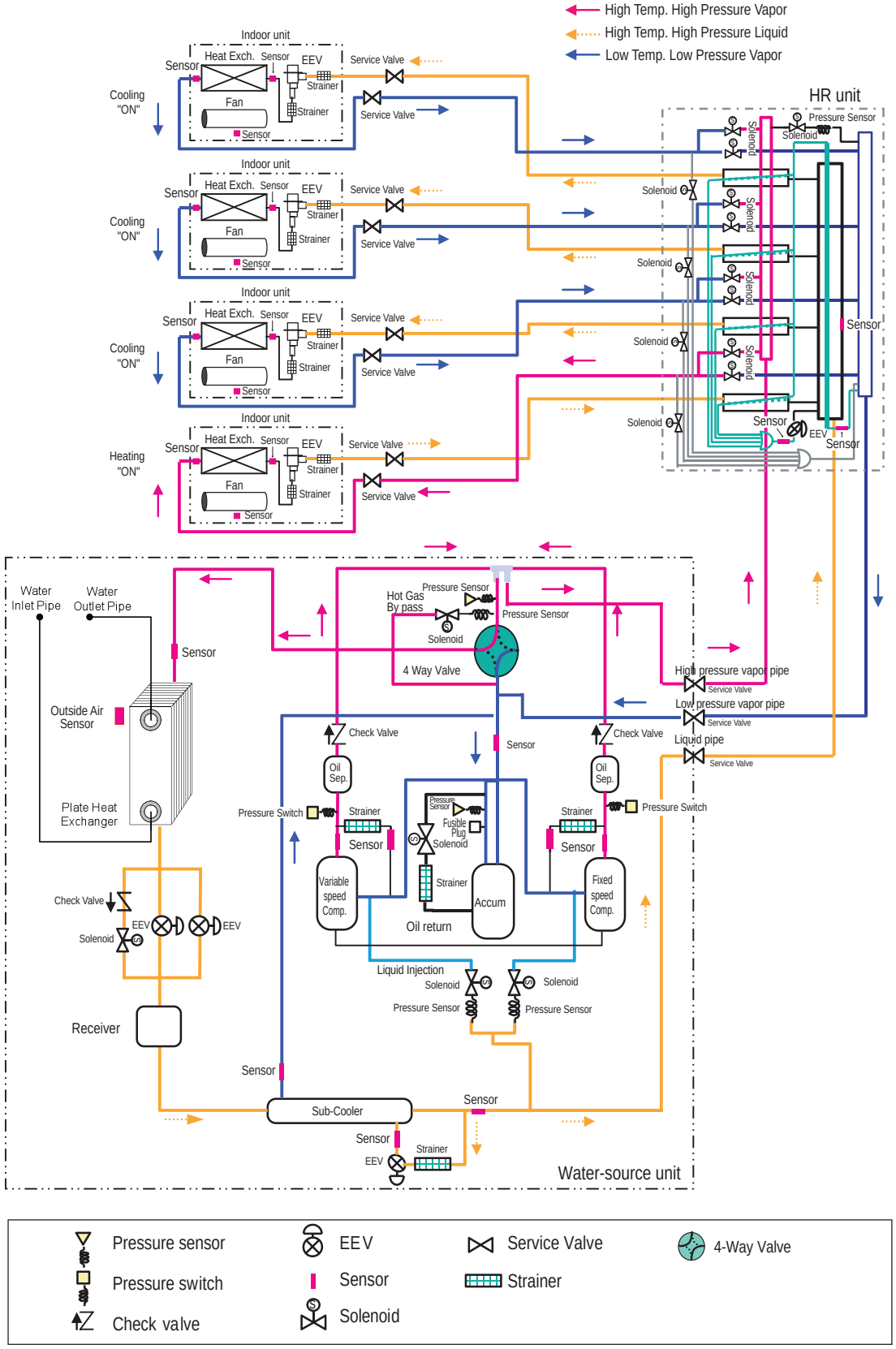
HEAT RECOVERY WATER-SOURCE UNIT REFRIG. CIRCUIT MULTI V WATER II

ARWB144BA2 - 208/230V, ARWB192DA2 - 460V: Heat Recovery Mode (Cooling Based Operation)



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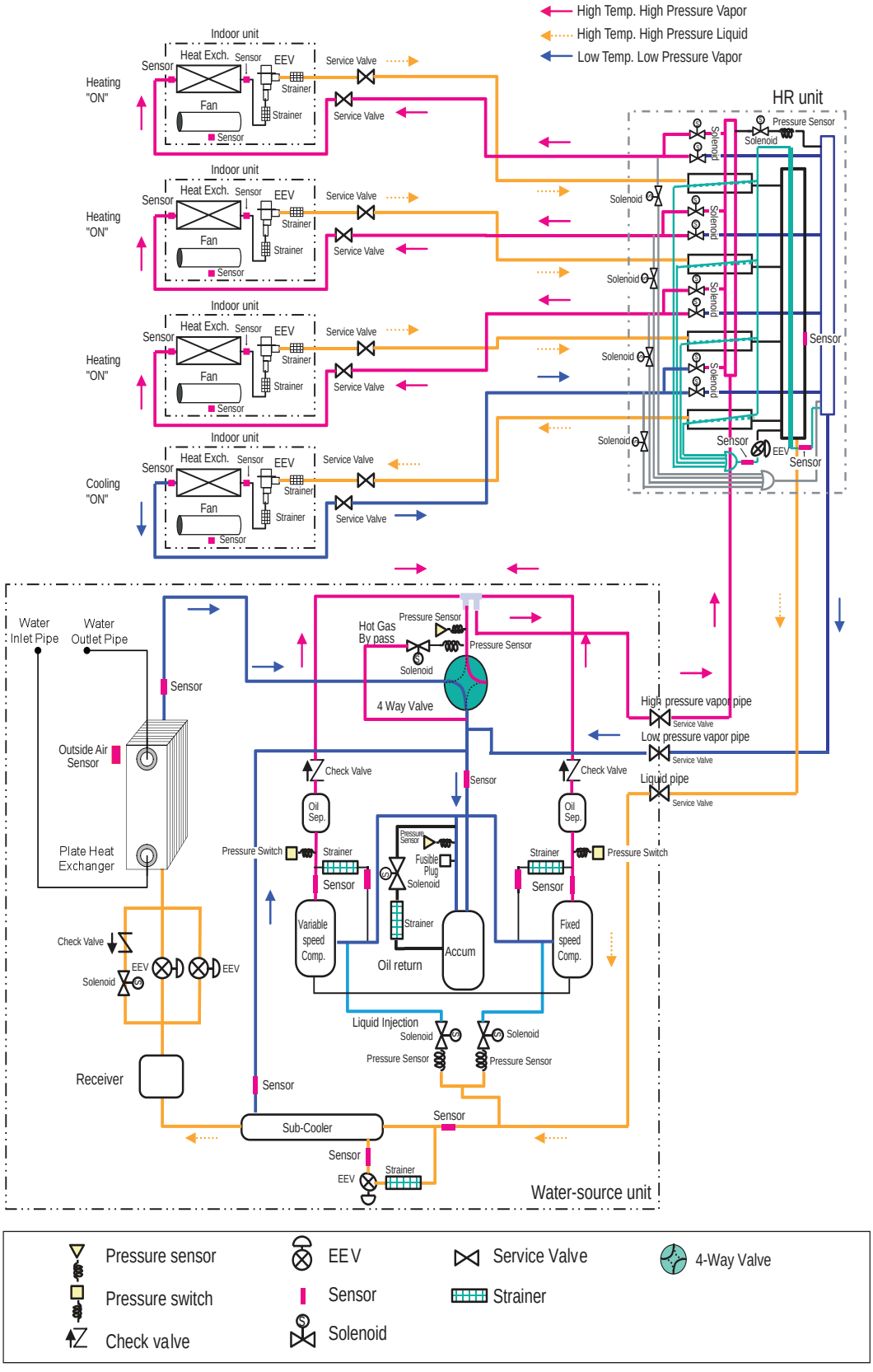
MULTI V WATER II HEAT RECOVERY WATER-SOURCE UNIT REFRIG. CIRCUIT

ARWB144BA2 - 208/230V, ARWB192DA2 - 460V: Heat Recovery Mode (Heating Based Operation)



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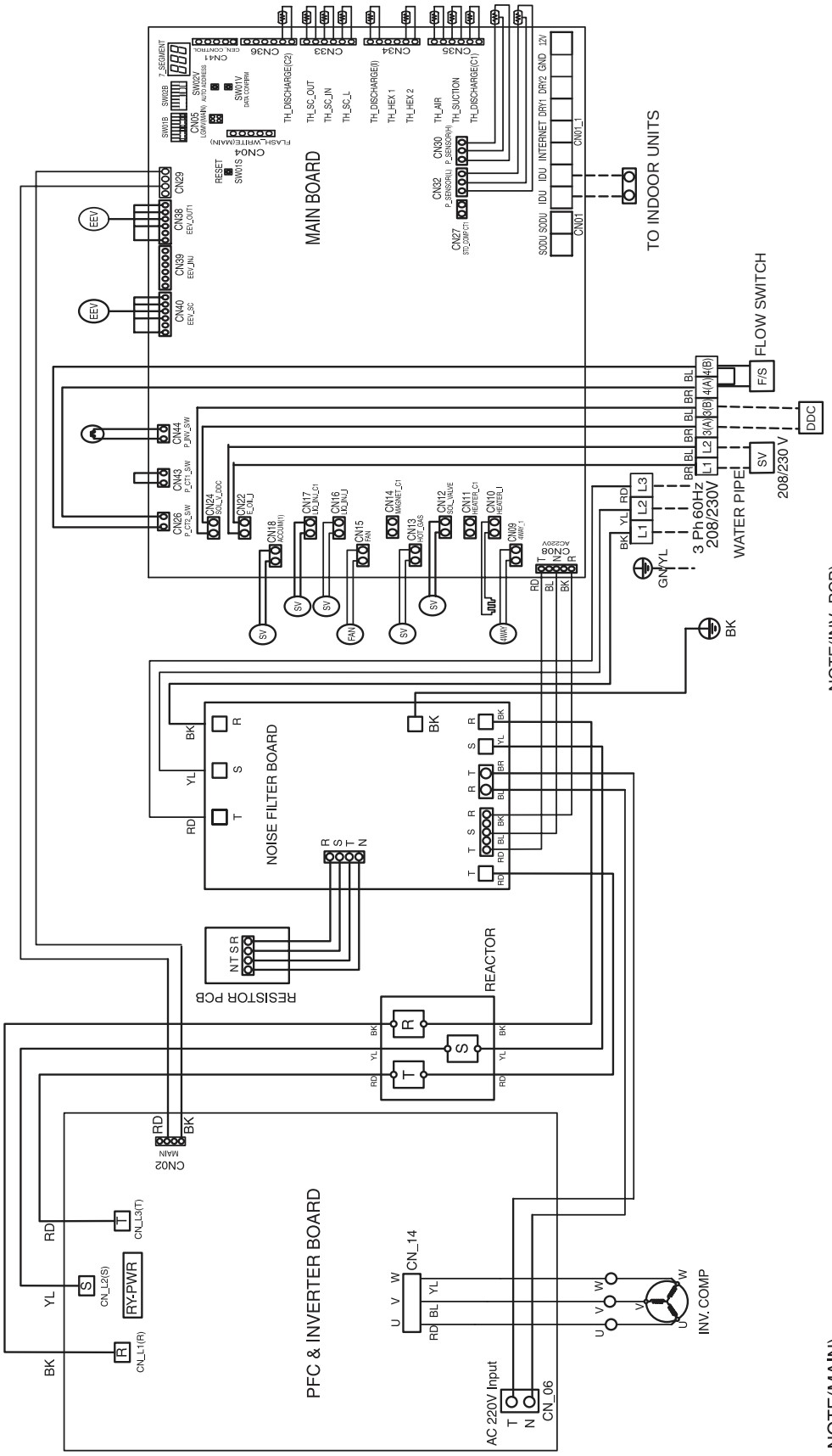
HEAT RECOVERY WATER-SOURCE UNIT WIRING DIAGRAMS MULTI V WATER II

ARWB072BA2 208/230V Heat Recovery Water-source Unit



NOTE(INV. PCB)

CN01	MAIN PCB COMMUNICATION TERMINAL
CN02	ONBOARDING TERMINAL
CN04	AC POWER 220V
CN06	DC LINK 700V
CN12	DC 15V
CN13	U,V,W POWER TERMINAL
CN14	R INPUT
CN_L1(R)	S INPUT
CN_L2(S)	T INPUT
CN_L3(T)	

FIELD WIRING

FACTORY WIRING

COLOR

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

NOTE(MAIN)

SYMBOL	DESCRIPTION
CN04	ONBOARDING TERMINAL
CN05	J/G CONNECTION TERMINAL
CN08	AC POWER 220V
CN09	4WAY REVERSING VALVE
CN10	INVERTER COMP HEATER
CN11	CONSTANT COMP HEATER
CN12	CHECK SOLENOID VALVE
CN13	HOT GAS SOLENOID VALVE
CN14	MAGNETIC SWITCH
CN15	AC POWER (FAN)
CN16	INVERTER COMP LIQUID INJECTION VALVE
CN17	CONSTANT COMP LIQUID INJECTION VALVE
CN18	ACCUMULATOR SOLENOID VALVE
CN22	WATER PIPE SOLENOID VALVE
CN24	DDC(NON-CONNECTING SIGNAL)
CN27	CONSTANT CT SENSOR
CN29	INVERTER PCB COMMUNICATION
CN30	HIGH PRESSURE SENSOR

CN32	LOW PRESSURE SENSOR
CN33(SC_OUT)	SUBCOOLING CIRCUIT OUTLET TEMPERATURE SENSOR
CN33(SC_IN)	SUBCOOLING CIRCUIT INTLET TEMPERATURE SENSOR
CN33(SC_L)	SUBCOOLING LIQUID PIPE SENSOR
CN34(DIACHARGE(I))	INVERTER COMP DISCHARGE TEMPERATURE SENSOR
CN34(HEX1)	OUTDOOR HEAT EXCHANGER TEMPERATURE SENSOR
CN34(HEX2)	OUTDOOR HEAT EXCHANGER TEMPERATURE SENSOR
CN35(AIR)	OUTDOOR TEMPERATURE SENSOR
CN35(SUCTION)	SUCTION TEMPERATURE SENSOR
CN35(DISCHARGE(C))	CONSTANT COMP DISCHARGE TEMPERATURE SENSOR
CN36(TH_DISCHARGE(C2))	INLET WATER TEMPERATURE SENSOR
CN38	ELECTRIC EXPANSION VALVE (MAIN)
CN39	ELECTRIC EXPANSION VALVE (MAIN)
CN40	ELECTRIC EXPANSION VALVE (SUBCOOLER)
CN41	CENTRAL CONTROL TERMINAL
CN43	HIGH PRESSURE SWITCH(C1)
CN44	HIGH PRESSURE SWITCH(INV)
SW01S	RESET BUTTON
SW02V	AUTO ADDRESSING SWITCH

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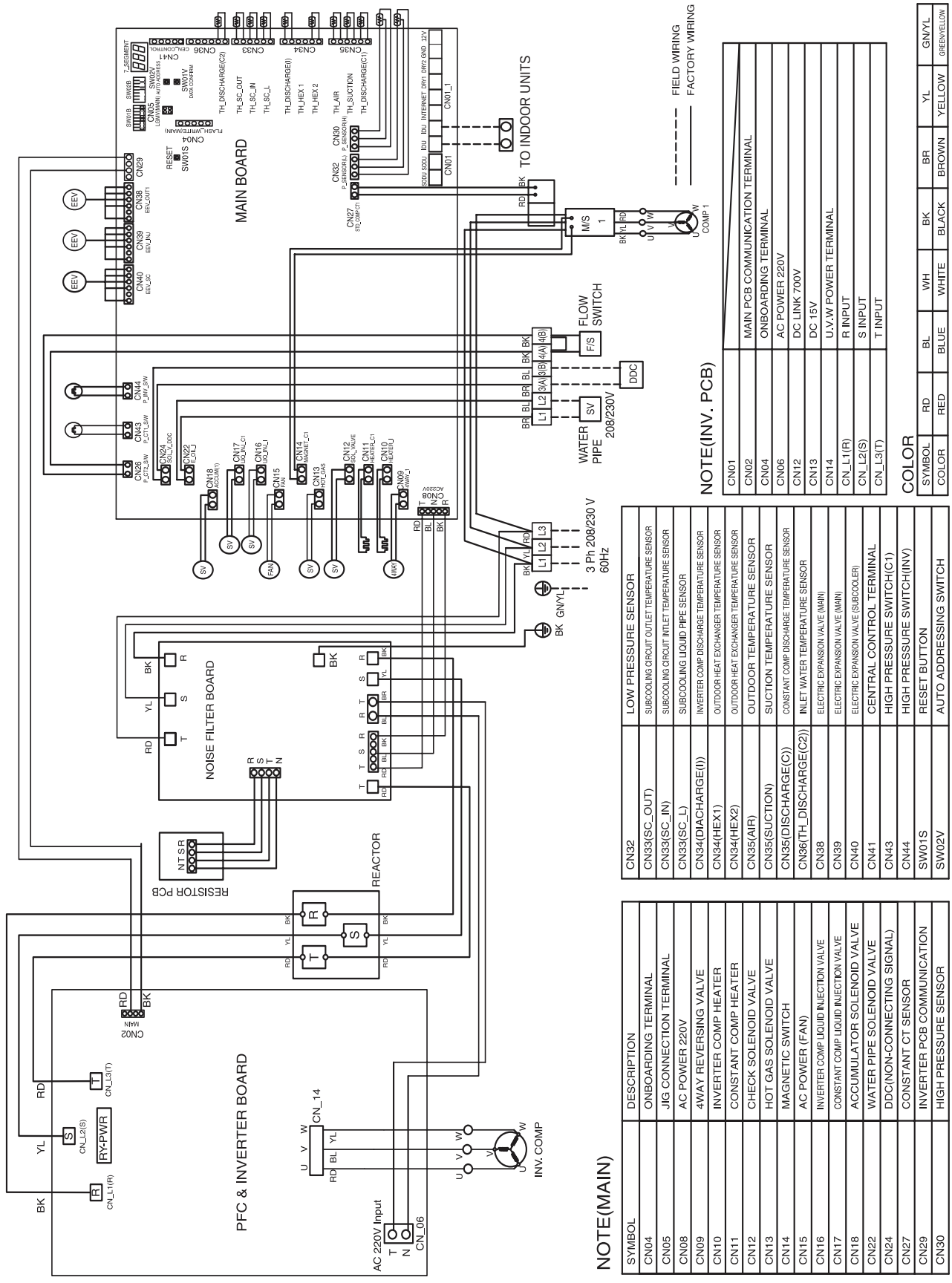
MULTI V WATER II HEAT RECOVERY WATER-SOURCE UNIT WIRING DIAGRAMS

ARWB144BA2 208/230V Heat Recovery Water-source Unit



NOTE(MAIN)

SYMBOL	DESCRIPTION
CN04	ONBOARDING TERMINAL
CN05	JIG CONNECTION TERMINAL
CN08	AC POWER 220V
CN09	4WAY REVERSING VALVE
CN10	INVERTER COMP HEATER
CN11	CONSTANT COMP HEATER
CN12	CHECK SOLENOID VALVE
CN13	HOT GAS SOLENOID VALVE
CN14	MAGNETIC SWITCH
CN15	AC POWER (FAN)
CN16	INVERTER COMP LIQUID INJECTION VALVE
CN17	CONSTANT COMP LIQUID INJECTION VALVE
CN18	ACCUMULATOR SOLENOID VALVE
CN22	WATER PIPE SOLENOID VALVE
CN24	DDC(NON-CONNECTING SIGNAL)
CN27	CONSTANT CT SENSOR
CN29	INVERTER PCB COMMUNICATION
CN30	HIGH PRESSURE SENSOR

CN32	LOW PRESSURE SENSOR
CN33(SC_OUT)	SUBCOOLING CIRCUIT OUTLET TEMPERATURE SENSOR
CN33(SC_IN)	SUBCOOLING CIRCUIT INTLET TEMPERATURE SENSOR
CN33(SC_L)	SUBCOOLING LIQUID PIPE SENSOR
CN34(DIACHARGE(II))	INVERTER COMP DISCHARGE TEMPERATURE SENSOR
CN34(HEX1)	OUTDOOR HEAT EXCHANGER TEMPERATURE SENSOR
CN34(HEX2)	OUTDOOR HEAT EXCHANGER TEMPERATURE SENSOR
CN35(AIR)	OUTDOOR TEMPERATURE SENSOR
CN35(SUCTION)	SUCTION TEMPERATURE SENSOR
CN35(DISCHARGE(C))	CONSTANT COMP DISCHARGE TEMPERATURE SENSOR
CN36(TH_DISCHARGE(C2))	INLET WATER TEMPERATURE SENSOR
CN38	ELECTRIC EXPANSION VALVE (MAIN)
CN39	ELECTRIC EXPANSION VALVE (MAIN)
CN40	ELECTRIC EXPANSION VALVE (SUBCOOLER)
CN41	CENTRAL CONTROL TERMINAL
CN43	HIGH PRESSURE SWITCH(C1)
CN44	HIGH PRESSURE SWITCH(INV)
SW01S	RESET BUTTON
SW02V	AUTO ADDRESSING SWITCH

NOTE(INV. PCB)

CN01	MAIN PCB COMMUNICATION TERMINAL
CN02	ONBOARDING TERMINAL
CN04	AC POWER 220V
CN06	DC LINK 700V
CN12	DC 15V
CN13	U.V.W POWER TERMINAL
CN14	R INPUT
CN_L1(R)	S INPUT
CN_L2(S)	T INPUT
CN_L3(T)	

COLOR

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

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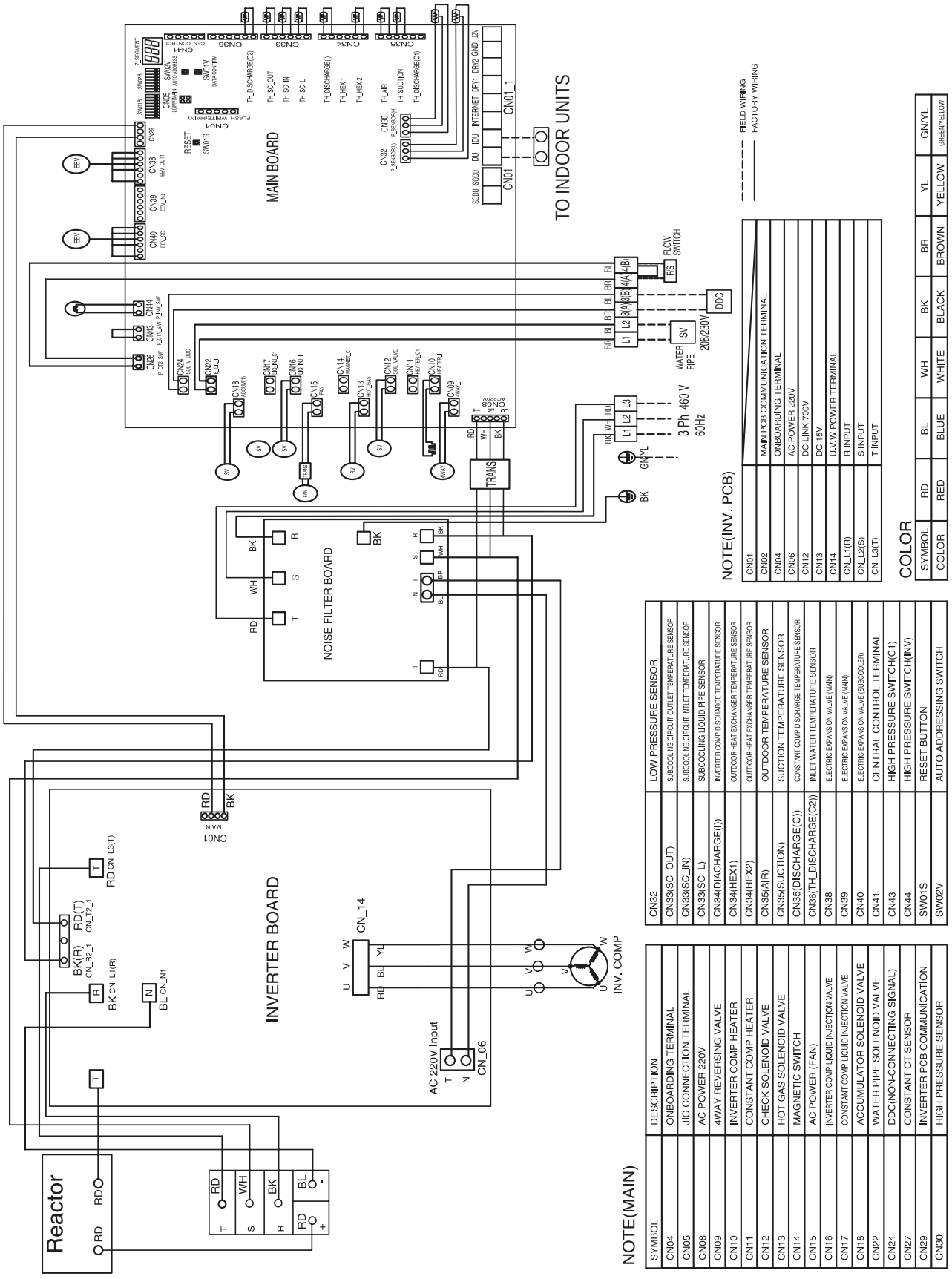
HEAT RECOVERY WATER-SOURCE UNIT WIRING DIAGRAMS

ARWB096DA2 460V Heat Recovery Water-source Unit



NOTE(MAIN)

SYMBOL	DESCRIPTION
CN04	ONBOARDING TERMINAL
CN05	JIG CONNECTION TERMINAL
CN08	AC POWER 220V
CN09	4WAY REVERSING VALVE
CN10	INVERTER COMP HEATER
CN11	CONSTANT COMP HEATER
CN12	CHECK SOLENOID VALVE
CN13	HOT GAS SOLENOID VALVE
CN14	MAGNETIC SWITCH
CN15	AC POWER (FAN)
CN16	INVERTER COMP LIQUID INJECTION VALVE
CN17	CONSTANT COMP LIQUID INJECTION VALVE
CN18	ACCUMULATOR SOLENOID VALVE
CN22	WATER PIPE SOLENOID VALVE
CN24	DDC(NON-CONNECTING SIGNAL)
CN27	CONSTANT CT SENSOR
CN29	INVERTER PCB COMMUNICATION
CN30	HIGH PRESSURE SENSOR

CN32	LOW PRESSURE SENSOR
CN33(SC_OUT)	SUBCOOLING CIRCUIT OUTLET TEMPERATURE SENSOR
CN33(SC_IN)	SUBCOOLING CIRCUIT INTLET TEMPERATURE SENSOR
CN33(SC_L)	SUBCOOLING LIQUID PIPE SENSOR
CN34(DISCHARGE(I))	INVERTER COMP DISCHARGE TEMPERATURE SENSOR
CN34(HEX1)	OUTDOOR HEAT EXCHANGER TEMPERATURE SENSOR
CN34(HEX2)	OUTDOOR HEAT EXCHANGER TEMPERATURE SENSOR
CN35(AIR)	OUTDOOR TEMPERATURE SENSOR
CN35(SUCTION)	SUCTION TEMPERATURE SENSOR
CN35(DISCHARGE(C))	CONSTANT COMP DISCHARGE TEMPERATURE SENSOR
CN36(TH_DISCHARGE(C2))	INLET WATER TEMPERATURE SENSOR
CN38	ELECTRIC EXPANSION VALVE (MAIN)
CN39	ELECTRIC EXPANSION VALVE (MAIN)
CN40	ELECTRIC EXPANSION VALVE (SUBCOOLER)
CN41	CENTRAL CONTROL TERMINAL
CN43	HIGH PRESSURE SWITCH(C1)
CN44	HIGH PRESSURE SWITCH(INV)
SW01S	RESET BUTTON
SW02V	AUTO ADDRESSING SWITCH

NOTE(INV. PCB)

CN01	MAIN PCB COMMUNICATION TERMINAL
CN02	ONBOARDING TERMINAL
CN04	AC POWER 220V
CN06	DC LINK 700V
CN12	DC 15V
CN13	U,V,W POWER TERMINAL
CN14	R INPUT
CN_L1(R)	S INPUT
CN_L2(S)	T INPUT
CN_L3(T)	

COLOR

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

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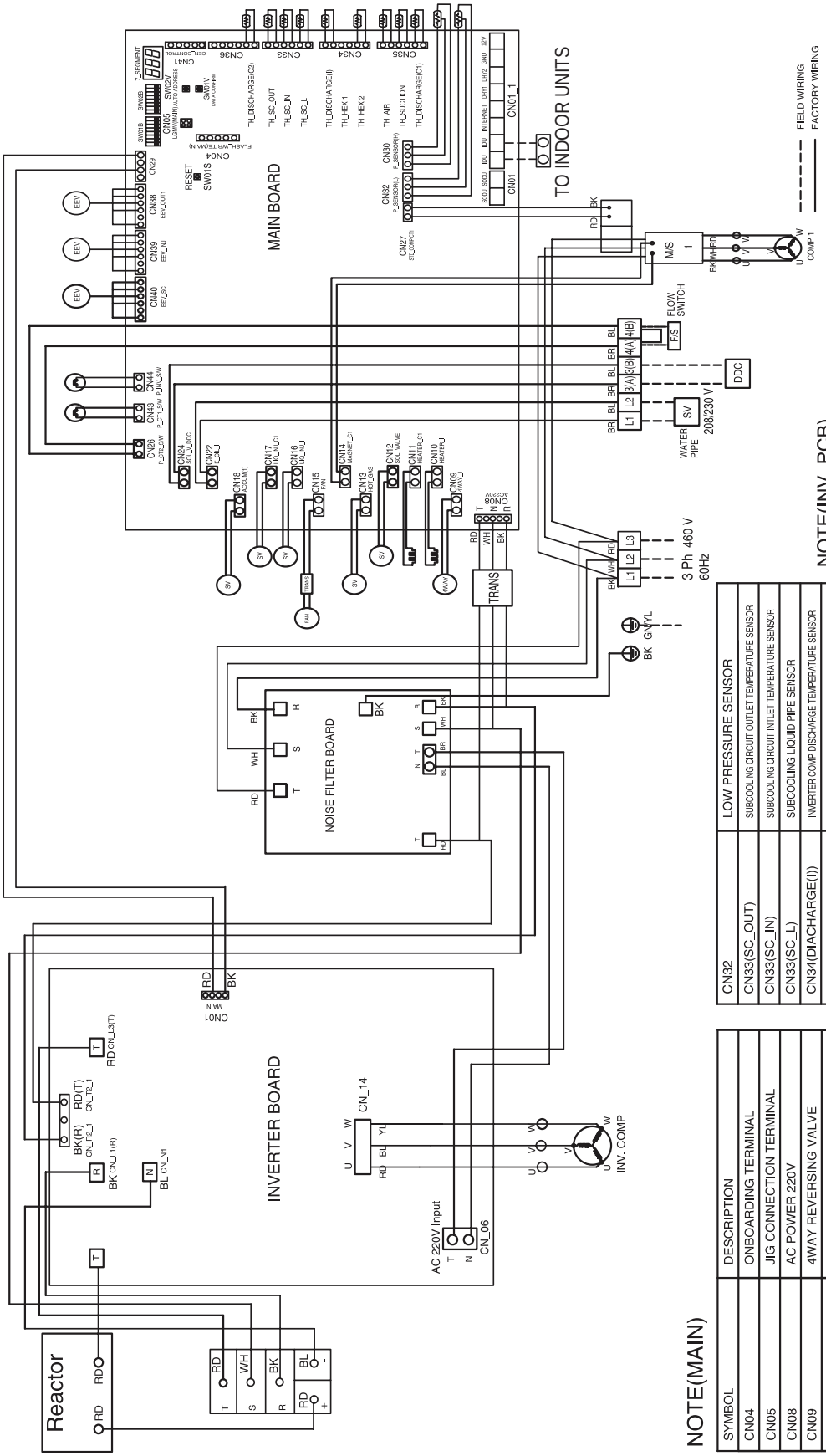
ARWB192DA2 460V Heat Recovery Water-source Unit



NOTE(MAIN)

SYMBOL	DESCRIPTION
CN04	ONBOARDING TERMINAL
CN05	JIG CONNECTION TERMINAL
CN08	AC POWER 220V
CN09	4WAY REVERSING VALVE
CN10	INVERTER COMP HEATER
CN11	CONSTANT COMP HEATER
CN12	CHECK SOLENOID VALVE
CN13	HOT GAS SOLENOID VALVE
CN14	MAGNETIC SWITCH
CN15	AC POWER (FAN)
CN16	INVERTER COMP LIQUID INJECTION VALVE
CN17	CONSTANT COMP LIQUID INJECTION VALVE
CN18	ACCUMULATOR SOLENOID VALVE
CN22	WATER PIPE SOLENOID VALVE
CN24	DDC(NON-CONNECTING SIGNAL)
CN27	CONSTANT CT SENSOR
CN29	INVERTER PCB COMMUNICATION
CN30	HIGH PRESSURE SENSOR

CN32	LOW PRESSURE SENSOR
CN33(SC_OUT)	SUBCOOLING CIRCUIT OUTLET TEMPERATURE SENSOR
CN33(SC_IN)	SUBCOOLING CIRCUIT INTLET TEMPERATURE SENSOR
CN33(SC_L)	SUBCOOLING LIQUID PIPE SENSOR
CN34(DIACHARGE(I))	INVERTER COMP DISCHARGE TEMPERATURE SENSOR
CN34(HEX1)	OUTDOOR HEAT EXCHANGER TEMPERATURE SENSOR
CN34(HEX2)	OUTDOOR HEAT EXCHANGER TEMPERATURE SENSOR
CN35(AIR)	OUTDOOR TEMPERATURE SENSOR
CN35(SUCTION)	SUCTION TEMPERATURE SENSOR
CN35(DISCHARGE(C))	CONSTANT COMP DISCHARGE TEMPERATURE SENSOR
CN36(TH_DISCHARGE(C2))	INLET WATER TEMPERATURE SENSOR
CN38	ELECTRIC EXPANSION VALVE (MAIN)
CN39	ELECTRIC EXPANSION VALVE (MAIN)
CN40	ELECTRIC EXPANSION VALVE (SUBCOOLER)
CN41	CENTRAL CONTROL TERMINAL
CN43	HIGH PRESSURE SWITCH(C1)
CN44	HIGH PRESSURE SWITCH(INV)
SW01S	RESET BUTTON
SW02V	AUTO ADDRESSING SWITCH

NOTE(INV. PCB)

CN01	MAIN PCB COMMUNICATION TERMINAL
CN02	ONBOARDING TERMINAL
CN04	AC POWER 220V
CN06	DC LINK 700V
CN12	DC 15V
CN13	U.V.W POWER TERMINAL
CN14	R INPUT
CN_L1(R)	S INPUT
CN_L2(S)	T INPUT
CN_L3(T)	

COLOR

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

PRODUCT DATA

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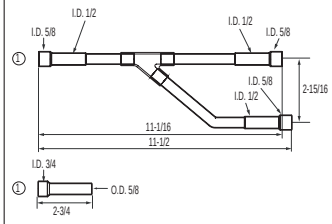
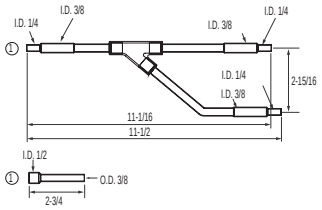
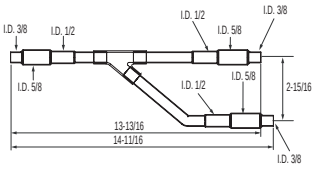
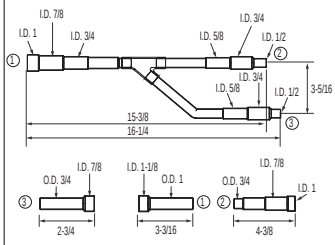
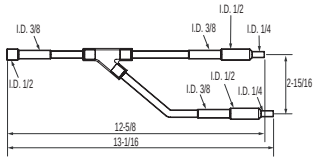
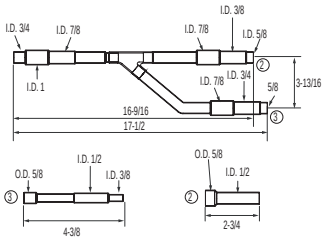
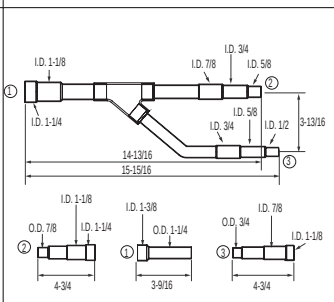
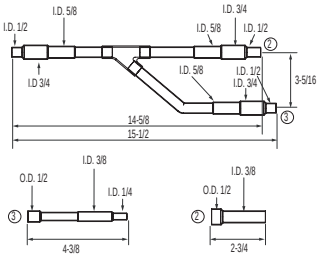
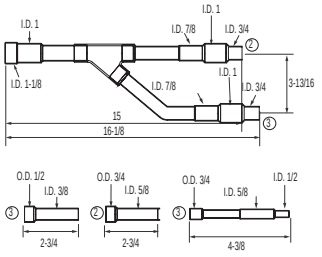
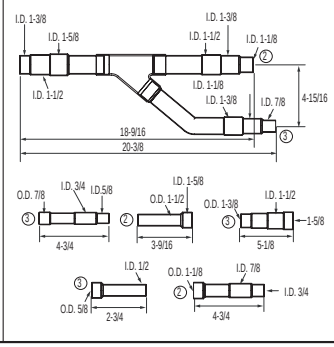
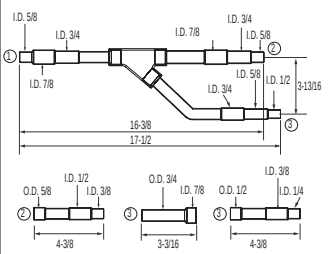
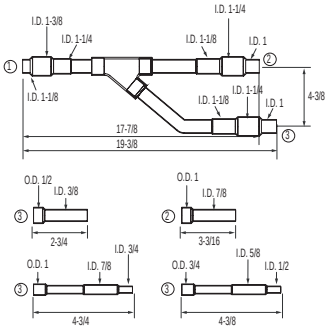
Required Accessories	Model No.		
Y-branches (for indoor unit connection)	ARBLB01621		ARBLB07121
	ARBLB03321		ARBLB14521
Headers (for indoor unit connection)	Four (4) branch	Seven (7) branch	Ten (10) branch
	ARBL054	ARBL057	ARBL1010
	ARBL104	ARBL107	ARBL2010
Heat Recovery Units	For two (2) indoor units	For three (3) indoor units	For four (4) indoor units
	PRHR021A	PRHR031A	PRHR041A
Multi-frame Connectors (for outdoor unit connection)	Use to Combine Two Units		Use to Combine Three Units
	ARCNB21		ARCNB21
			ARCNB31

Y-branches (for indoor unit connection)

Unit: inch

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

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Heat Recovery Control Units

⚠ Note:

Heat recovery control units can only be used with heat recovery systems.

Model			PRHR021A	PRHR031A	PRHR041A
Max. Connectable No. of Indoor Units			2	3	4
Max. Connectable No. of Indoor Units on each branch			1	1	1
Max. Port Capacity (each port)		Btu/h	48,000	48,000	48,000
Max. Unit Capacity (sum of ports)		Btu/h	192,000	192,000	192,000
Net Weight		lbs	39-3/4	44-1/16	48-1/2
Dimensions (W x H x D)		inch	31-1/2 x 8-5/8 x 24-5/16		
Casing			Galvanized steel plate		
Connecting Pipes	To Indoor Units	Liquid Pipe (inch)	3/8		
		Vapor Pipe (inch)	5/8		
	To Water-source Units	Liquid (inch)	3/8	1/2	5/8
		Low-pressure Vapor (inch)	7/8	1-1/8	1-1/8
		High-pressure Vapor (inch)	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		

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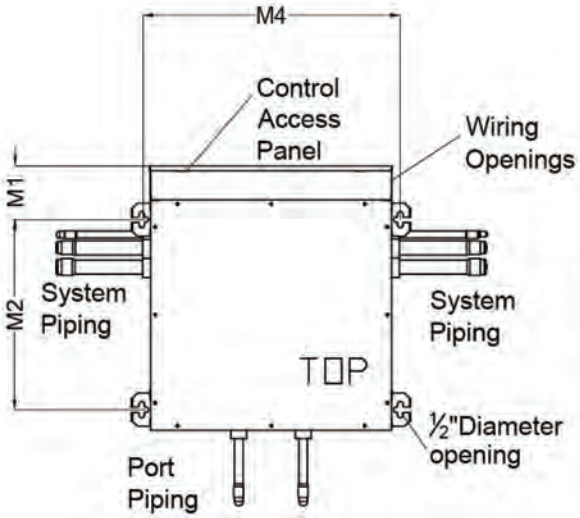
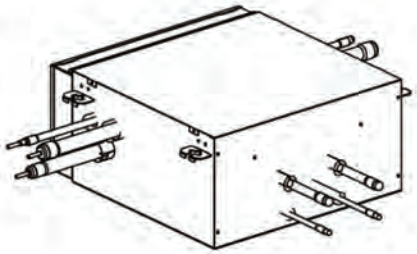
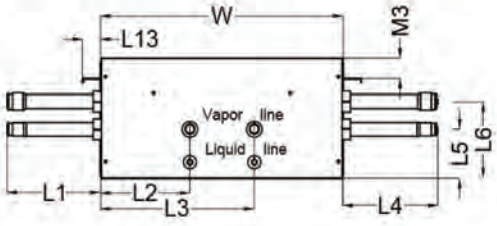
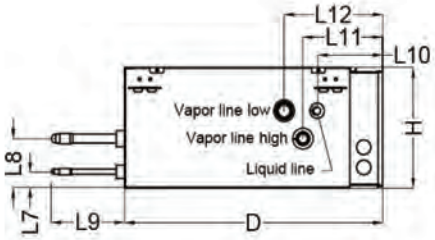
PRHR021A Heat Recovery Control Unit

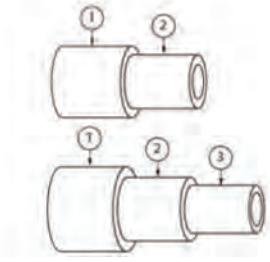








W	17-7/8"
H	8-5/8"
D	18-15/16"
L1	6-7/8"
L2	6-5/8"
L3	11-3/8"
L4	6-7/8"
L5	3-1/2"
L6	5-1/2"
L7	1-3/16"
L8	3-9/16"
L9	5-7/16"
L10	4-3/4"
L11	5-3/4"
L12	7-1/4"
L13	1-1/4"
M1	3-3/4"
M2	13-5/8"
M3	1-1/2"
M4	18-15/16"



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

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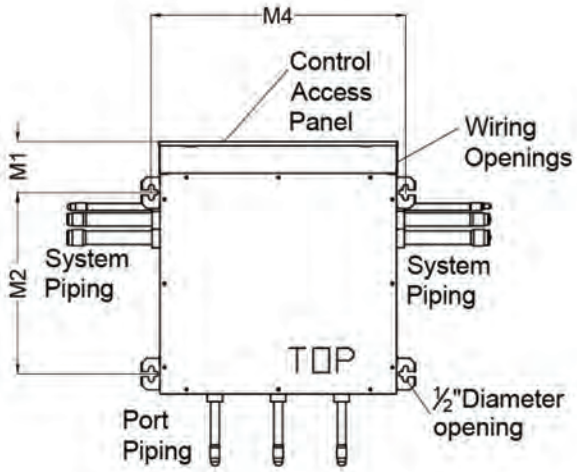
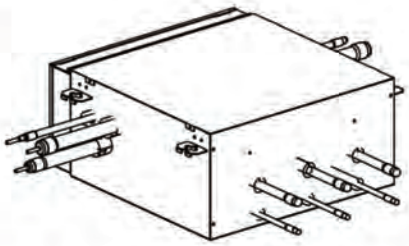
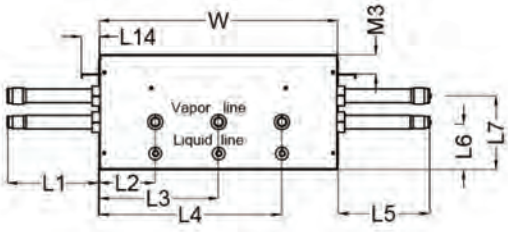
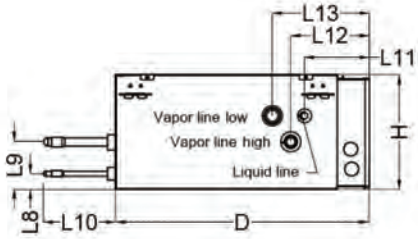
PRHR031A Heat Recovery Control Unit

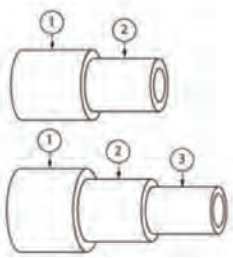








W	17-7/8"
H	8-5/8"
D	18-15/16"
L1	6-7/8"
L2	4-1/4"
L3	9"
L4	13-3/4"
L5	6-7/8"
L6	3-1/2"
L7	5-1/2"
L8	1-3/16"
L9	3-9/16"
L10	5-7/16"
L11	4-3/4"
L12	5-3/4"
L13	7-1/4"
L14	1-1/4"
M1	3-3/4"
M2	13-5/8"
M3	1-1/2"
M4	18-15/16"



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

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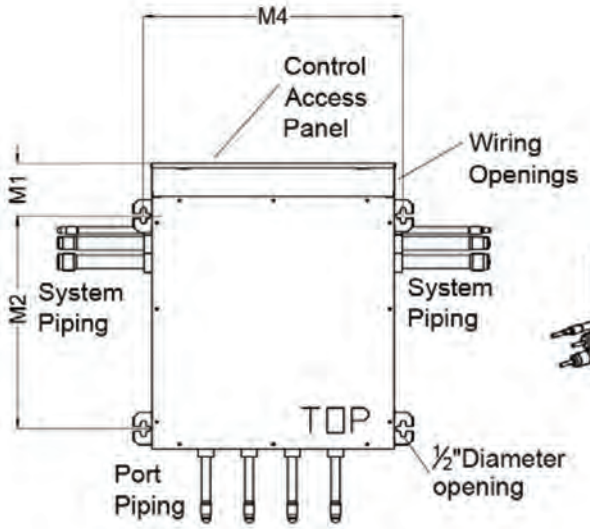
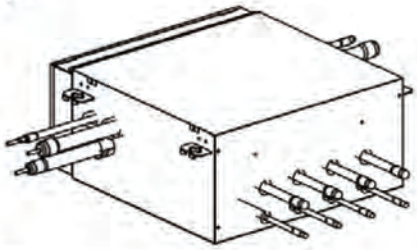
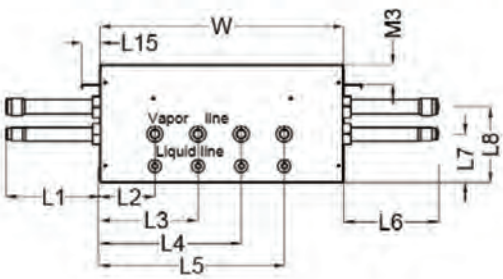
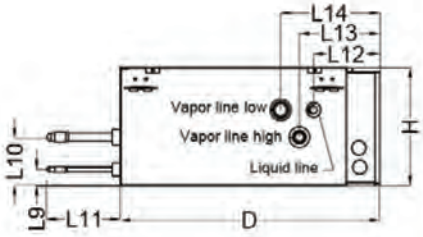
PRHR041A Heat Recovery Control Unit

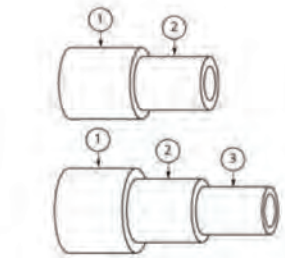








W	17-7/8"
H	8-5/8"
D	18-15/16"
L1	6-7/8"
L2	4-1/4"
L3	7-1/2"
L4	10-1/2"
L5	13-3/4"
L6	6-7/8"
L7	3-1/2"
L8	5-1/2"
L9	1-3/16"
L10	3-9/16"
L11	5-7/16"
L12	4-3/4"
L13	5-3/4"
L14	7-1/4"
L15	1-1/4"
M1	3-3/4"
M2	13-5/8"
M3	1-1/2"
M4	18-15/16"



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

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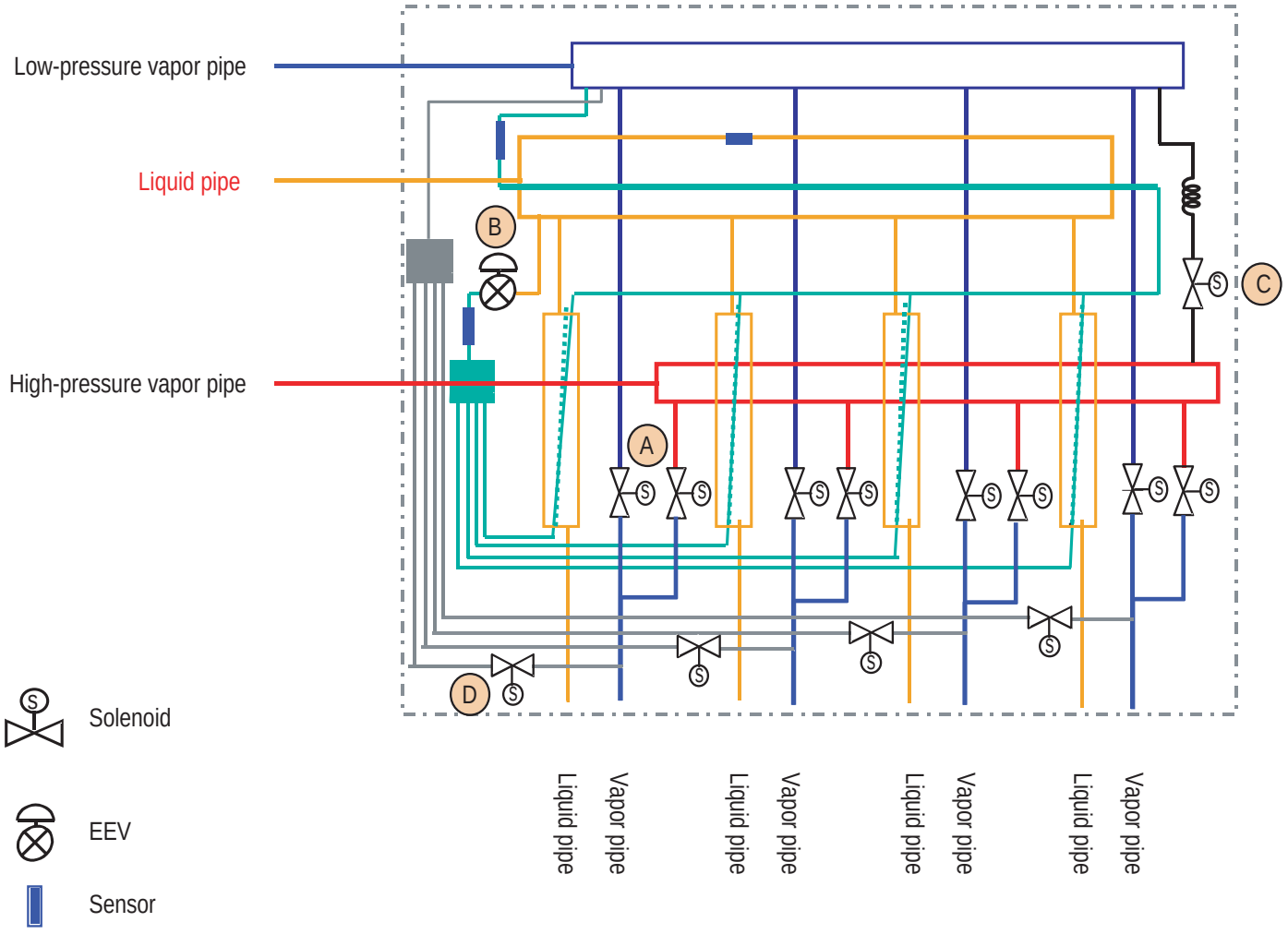
PRHR021A, 031A, 041A Heat Recovery Control Unit Refrigerant Circuit Diagram



Ⓐ: Switch operation between cooling and heating.

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

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

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

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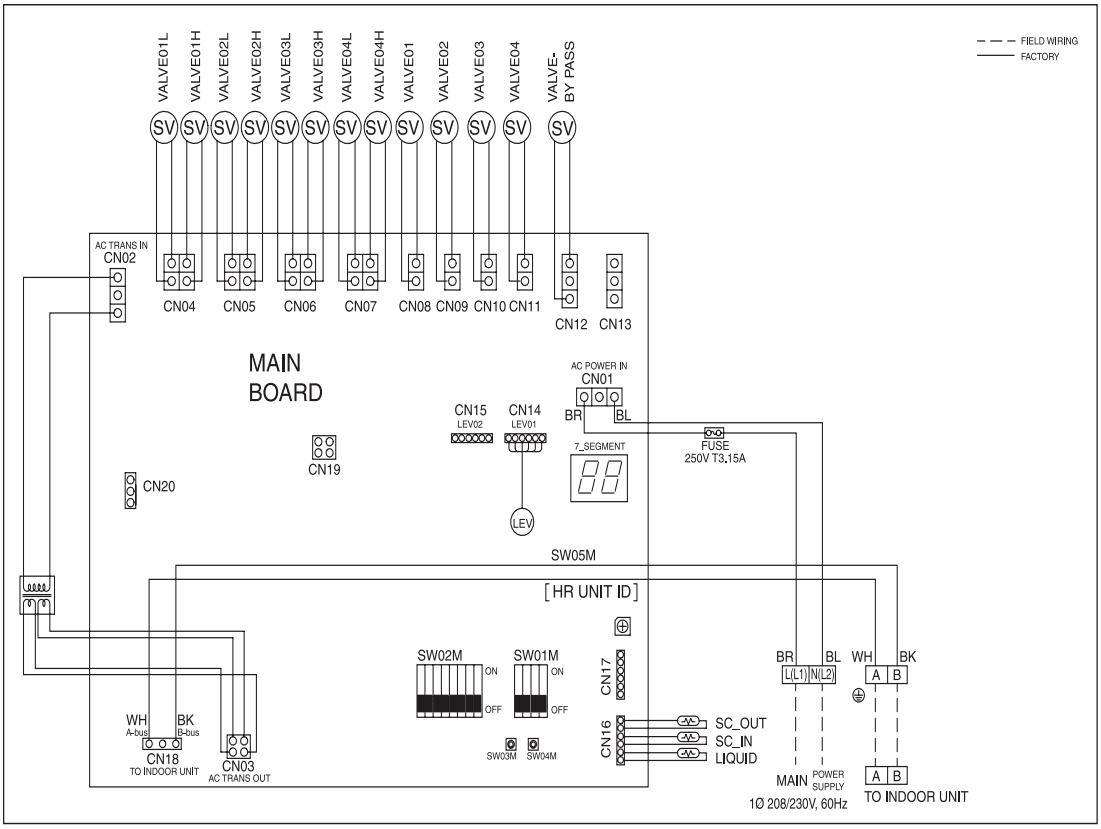
PRHR021A, 031A, 041A Heat Recovery Control Unit Wiring Diagram



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

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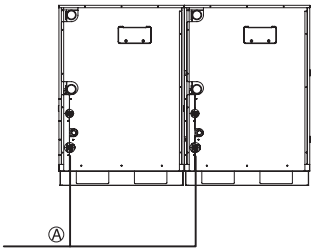
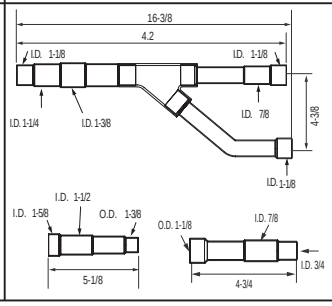
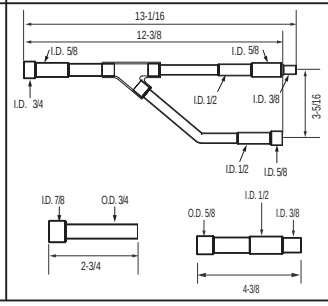
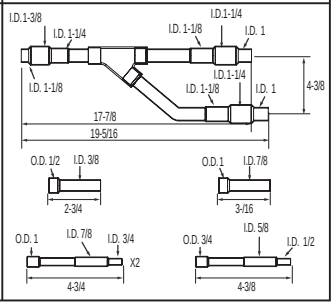
Multi-frame Connectors (for water-source heat pump unit connection)

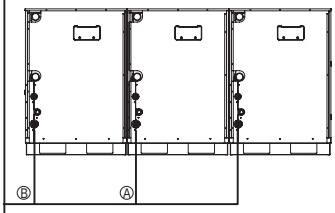
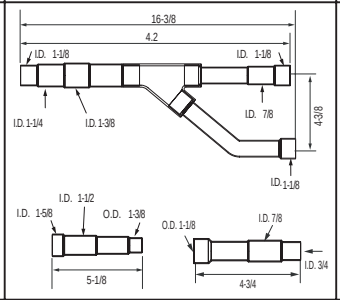
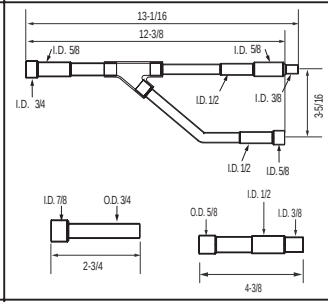
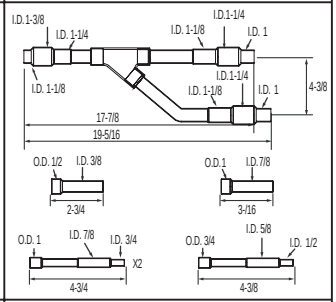
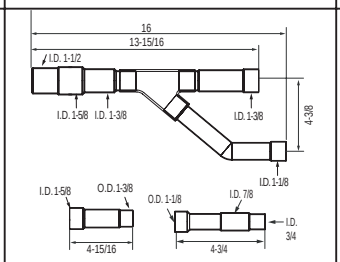
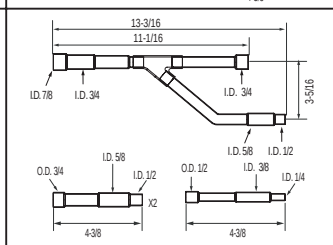
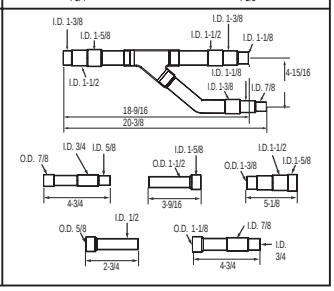
Two water-source units

Unit: inch

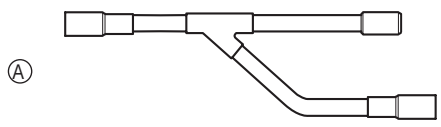
Combination specification	Multi-frame Connector	Low-pressure Vapor Pipe	Liquid Pipe	High-pressure Vapor Pipe
	Ⓐ ARCNB21			

Three water-source units

Unit: inch

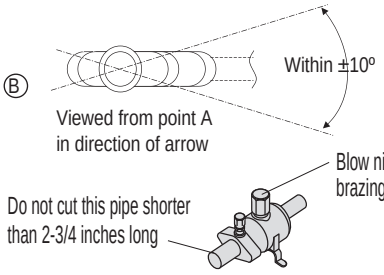
Combination specification	Multi-frame Connector	Low-pressure Vapor Pipe	Liquid Pipe	High-pressure Vapor Pipe
	Ⓐ ARCNB21			
	Ⓑ ARCNB31			

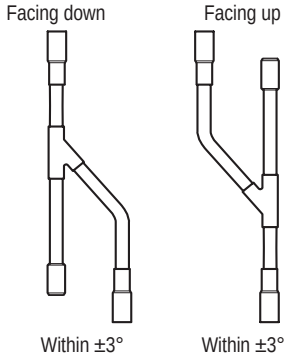
* Install the branch pipe between the water-source units so that the outlet pipe is parallel with the surface.



Ⓐ To branch piping or indoor unit

Ⓑ To water-source unit





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MULTI V WATER II

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Water-source unit shall be installed indoors, in a mechanical room. The mechanical room shall be designed such that equipment vibration or noise does not affect surrounding rooms, and is properly ventilated or conditioned to maintain temperature range. Do not install the unit in a space where it will be subjected to thermal radiation from other heat sources such as hot water tanks, radiant floor heating, etc. Mechanical room temperature is required to be maintained between 32°F and 104°F. The water-source unit will reject heat to the mechanical room; see data tables on pages 7-10 and 27-30.

The mechanical room floor shall be waterproof. Each water-source unit requires a condensate drain to be piped to nearest floor drain. Periodic flushing of the water heat exchanger will be required and a floor drain will help facilitate this maintenance.

The water-source unit shall also be located where refrigerant pipe distance does not exceed the design limits. Location of water-source unit should minimize refrigerant piping in order to minimize materials, labor, and refrigerant charge.

The underlying structure or foundation must be designed per local codes and support the weight of the unit. Units can be stacked above each other as long as each water-source unit is independently supported. Minimum clearances must be maintained either per recommendations shown in this manual or local codes, whichever is greater. Include enough space in the installation area for service access and air flow (refer to the installation space requirements).

⚠ Note:

Avoid exposing the water-source unit to oil, steam, combustible gases, acidic solutions or sprays, carbon fiber, sulfur, or other corrosive environments. Avoid exposure to electromagnetic waves from equipment including but not limited to generators, MRI equipment, or other equipment that emits electromagnetic waves. The control system may be affected by electromagnetic waves, which may result in abnormal system operation. Also, the inverter components in these units may also generate electromagnetic noise, therefore, ensure that there is enough distance between the water-source unit and any computer, stereo, etc., equipment. In weak electrical wave areas, ensure there is at least 9.8 feet between indoor unit remote controllers and other electrical devices. Insert power cables and other wires into separate conduits.

The water-source unit should be installed with a closed-loop water system. If an open-loop system is used, it is recommended that an intermediate heat exchanger be installed.

When piping, towers, or other system components that contain water are exposed to areas where the temperature may fall below 32°F, antifreeze solution must be used. Freezing of the heat-source water will damage the plate heat exchanger. Antifreeze solution includes proper mixtures of ethylene glycol, propylene glycol, or methanol to the water to prevent freezing. Addition of water heater/boiler to maintain minimum temperatures should be considered.

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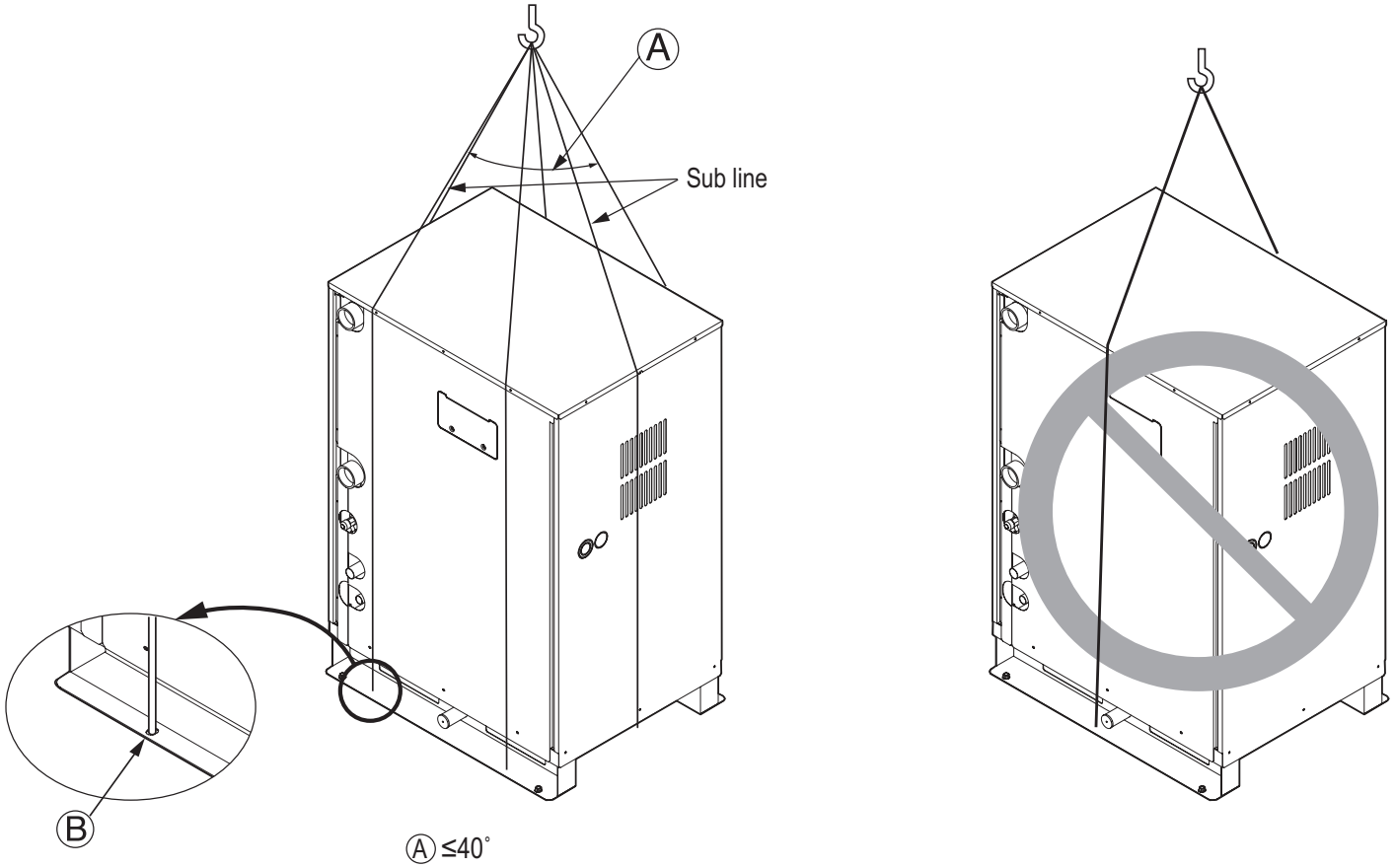
Transporting / Lifting the Water-source Unit

- When hoisting the unit up, pass the ropes through the four suspension points at the bottom—two suspension points in the front, and two suspension points in the back.
- Always lift the unit using the ropes supports at the four points shown below.
- Attach the ropes to the unit at angles of ≤40°.



Ⓐ ≤40˚
Ⓑ Rope support

⚠WARNING

- *Two or more people must carry the unit.*
- *Polypropylene bands may be used in the shipping material. Do not use these polypropylene bands to hoist the units.*
- *Tear up any plastic packaging and immediately throw it away so that children cannot play with it. Plastic packaging could suffocate children.*
- *When carrying and lifting the unit, support it at the four carrying points as indicated above. Carrying and lifting the unit with only three-point support makes the unit unstable and may cause it to fall.*
- *Do not drop the unit when carrying it with a forklift.*
- *Use two belts of at least 26 feet long.*
- *Place extra cloth or boards in the locations where the casing comes in contact with the rope to prevent damage.*
- *Make sure to hoist the unit at its center of gravity.*

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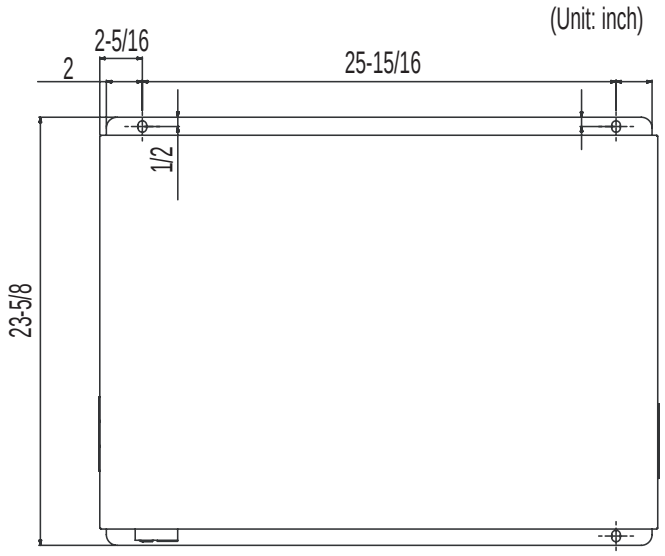

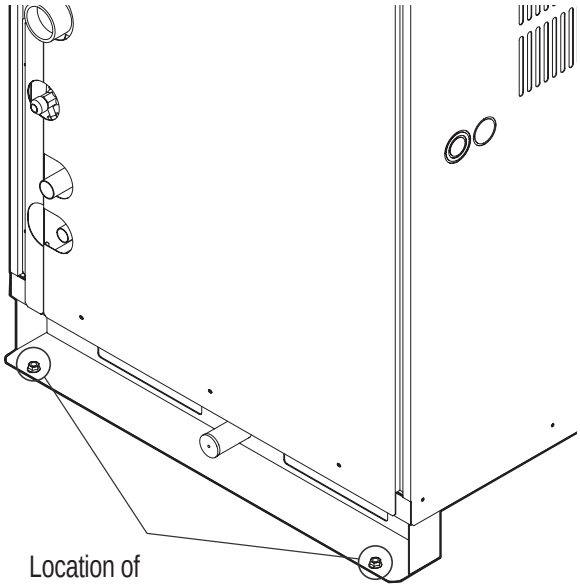

⚠WARNING

- *Install the water-source unit in a location strong enough to withstand its weight. Any weakness may cause the unit to fall, resulting in physical injury or death.*
- *Install the water-source unit to protect against earthquakes. Any deficiency in installation may cause unit to fall, resulting in physical injury or death.*

⚠ Note:

When building a base support for the water-source unit, ensure that the floor surface has enough strength to support the weight of the product, that there is a drain for water flowing out from the unit during operation, and there is enough space for the pipes and wiring.

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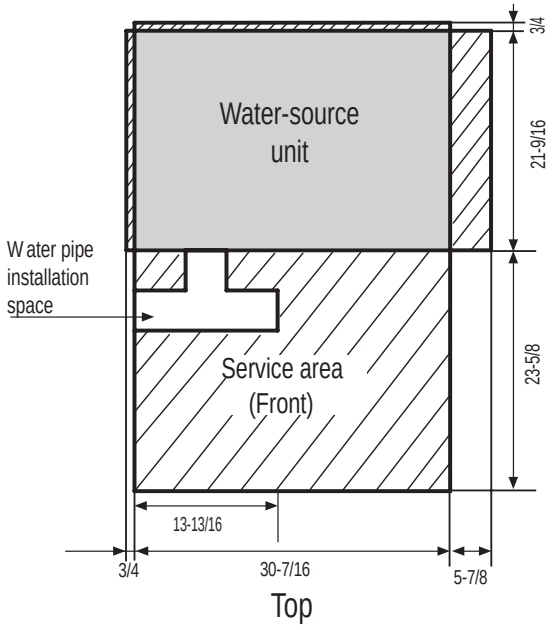
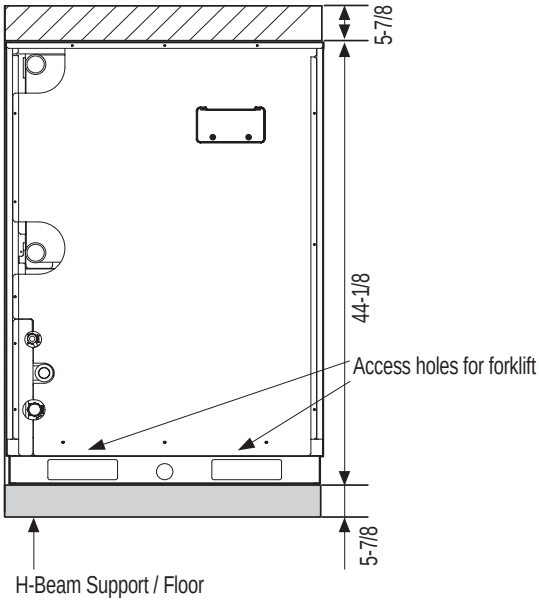
INSTALLATION

Individual Unit Installation Requirements

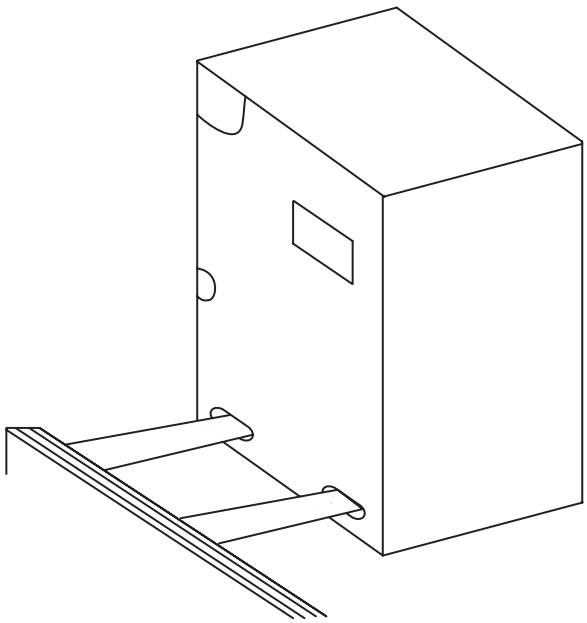
See diagrams below for the minimum installation space required for a single water-source unit.

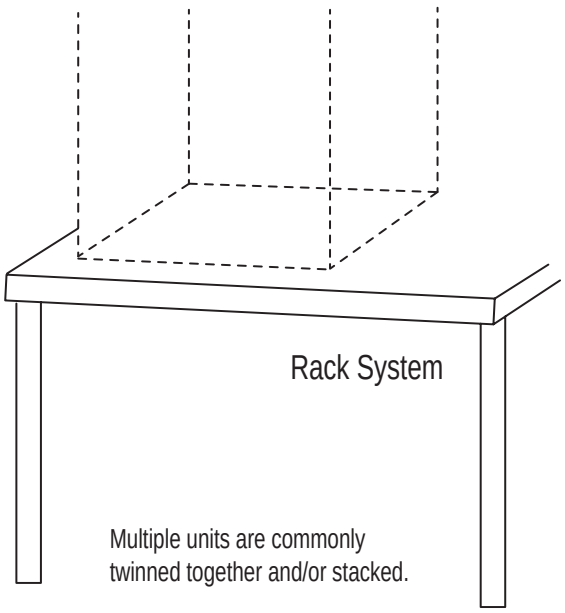


Top



Front





⚠CAUTION

Caution when using forklift to transport an unpackaged unit. Carefully line up forklift with water-source unit access holes to prevent damage to the unit

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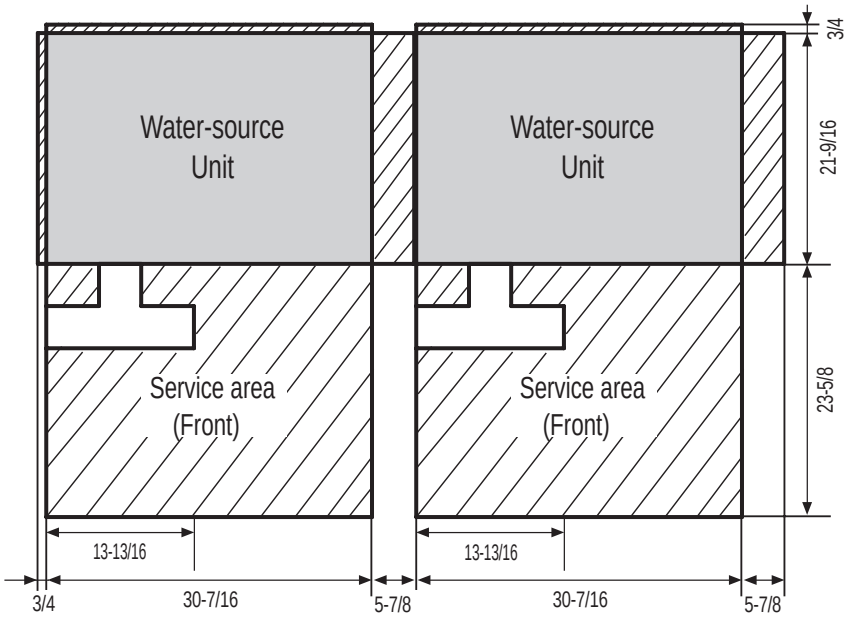
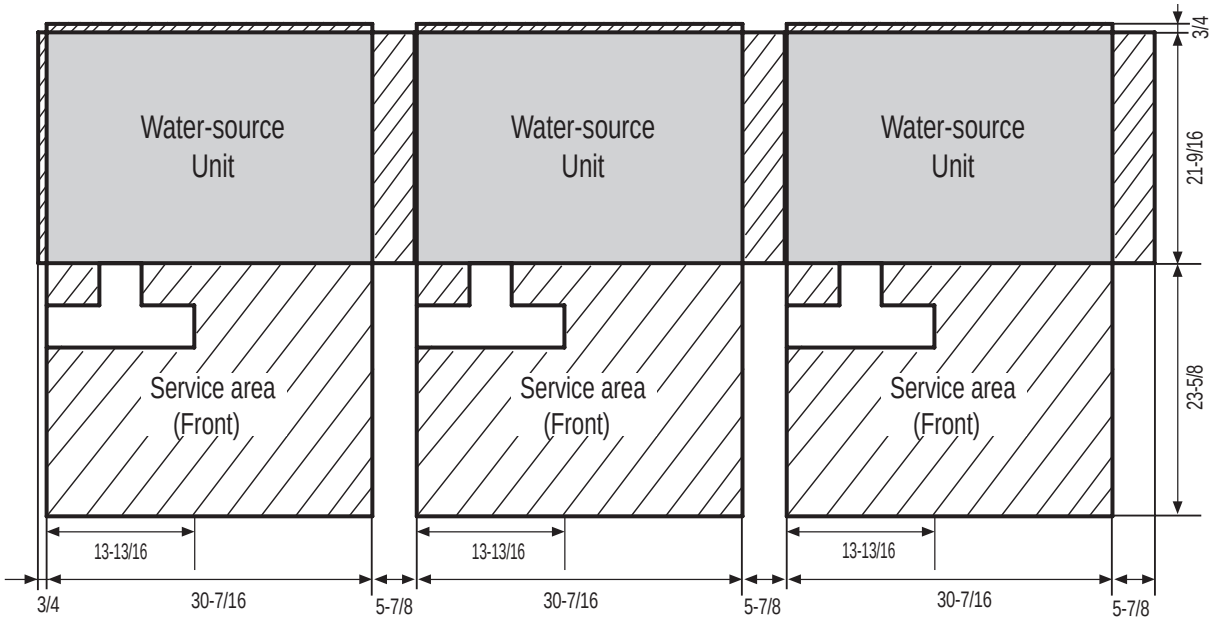
See diagrams below for the minimum space required for multi-frame unit installation. Include the required space for service access and air circulation.

(Unit: inch)



Top

(Unit: inch)



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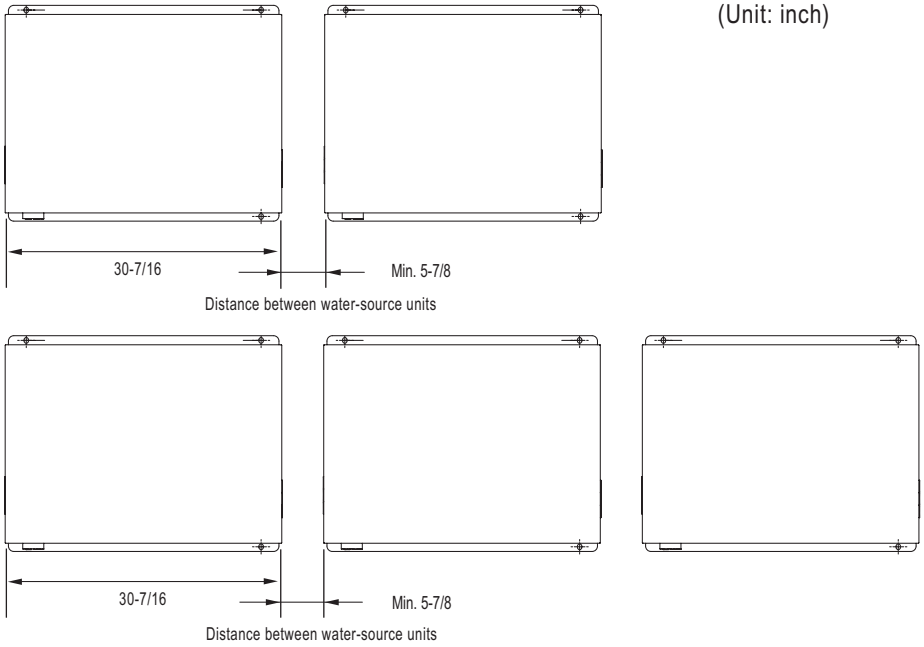
Multi-frame Unit and Two-layer Installation

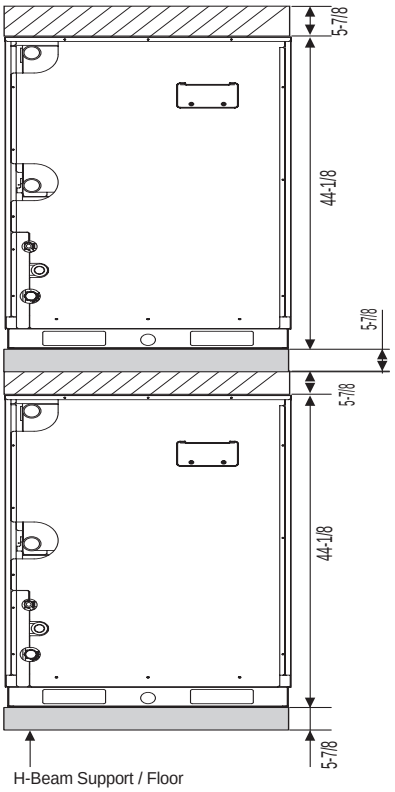
Minimum distance between water-source units = Unit Length (30-7/16") + Min. 5-7/8"

(Unit: inch)



See diagram below for the minimum space required, and recommendations for, two-layer installation. Include the required space for service access and air circulation.

(Unit: inch)



Front

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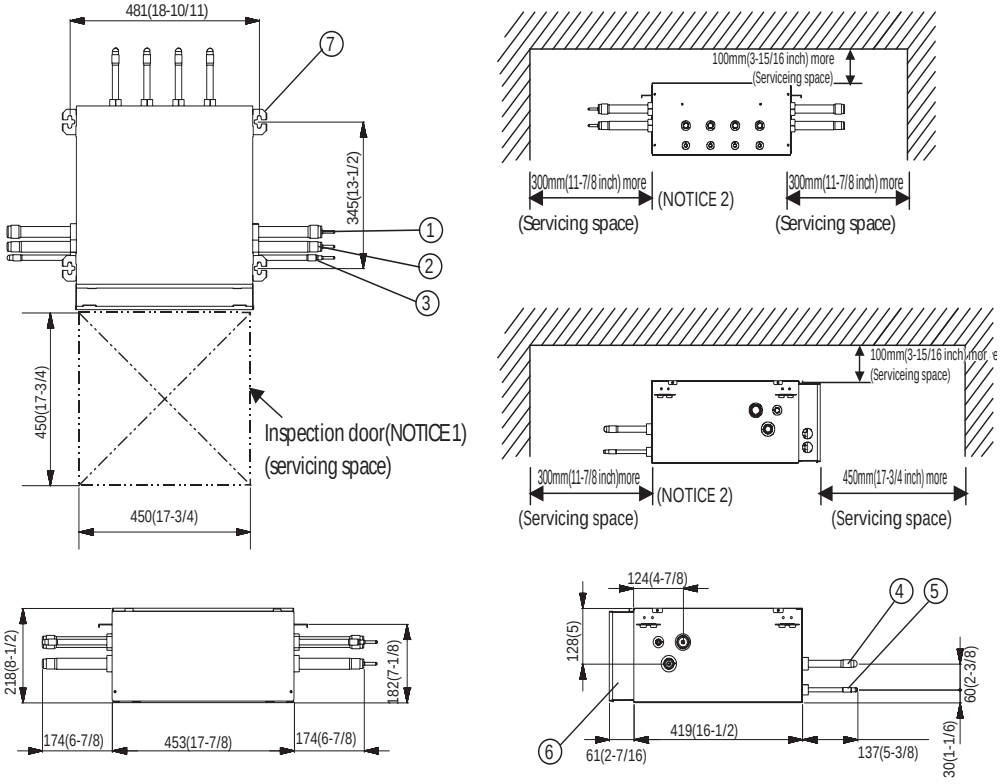
⚠ Note:

Heat Recovery control units are for use with ARWB Series Heat Recovery systems only.

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

- Install the heat recovery control unit indoors.
- Ensure there is enough space in the installation area for service access.
- Refrigerant pipes must not exceed lengths specified by LG Electronics.
- Do not install the heat recovery control unit in a location where it would be subjected to strong radiation heat from heat sources.
- Avoid an installation environment where oil splattering, vapor spray, or high-frequency electric noise could occur.
- Install the heat recovery control 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.



(Unit: mm(inch))

No.	Part Name	Description	
		PRHR030A/040A	PRHR020A
1	Low pressure Gas pipe connection port	Ø28.58(1-1/8) Brazing connection	Ø22.2(7/8) Brazing connection
2	High pressure Gas pipe connection port	Ø22.2(7/8) Brazing connection	Ø19.05(3/4) Brazing connection
3	Liquid pipe connection port	Ø12.7(1/2) Brazing connection	Ø9.52(3/8) Brazing connection
4	Indoor unit Gas pipe connection port	Ø15.88(5/8) Brazing connection	Ø15.88(5/8) Brazing connection
5	Indoor unit Liquid pipe connection port	Ø9.52(3/8) Brazing connection	Ø9.52(3/8) Brazing connection
6	Control box	-	-
7	Hanger metal	M10 or M8	M10 or M8

[1]Locate the inspection door at the control box side of the heat recovery control unit.

[2]If reducers are used, space for service access must be increased to match the dimensions of the reducer.

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Hanging the Heat Recovery Control Unit

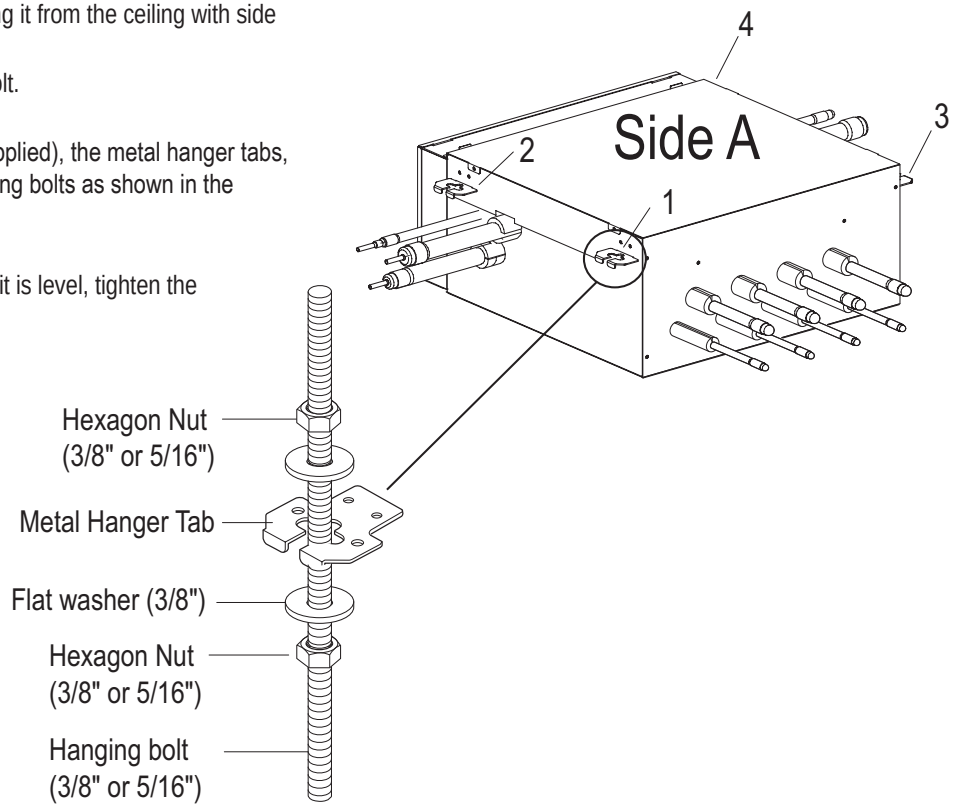
Install the heat recovery control unit by suspending it from the ceiling with side A (see diagram) always facing up.

1. Insert-hole-in-anchor and install the hanging bolt.

2. Thread 3/8 or 5/16 inch hexagon nuts (field-supplied), the metal hanger tabs, and flat washers (field-supplied) onto the hanging bolts as shown in the diagram.

3. After verifying that the heat recovery control unit is level, tighten the hexagon nuts.

⚠ Note:
The heat recovery control unit should be positioned no more than ±5° front to back and left to right.



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REFRIGERANT PIPING INSTALLATION

Computer-assisted Refrigerant Pipe Design

The proper design and installation of the refrigerant piping system is a critical element of the Multi V system. Multi V Water II Heat Pump requires two pipes between system components – a liquid line and a vapor line. Multi V Water II 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. A proper design also ensures a sufficient refrigerant gas flow rate in the vapor lines that eliminates the possibility of refrigeration oil from collecting in the vapor lines. The piping system can be engineered manually using the procedure outlined in the "Manual Layout Procedure" on page 65, however, the preferred method is to design using LG's LATS Multi V pipe system design software.

LATS Multi V assists the engineer in the design of the refrigeration distribution pipe system, verifies the design complies with a majority of the pipe design limitations, applies capacity correction factors, and calculates the system refrigerant charge. LATS Multi V pipe system design software is flexible, offering the HVAC system engineer a choice of two design methods:

1. Using the CAD mode, the refrigerant pipe design and layout work is performed concurrently. Simply import a copy of a plan view drawing (.dwg format) for floor of the structure into LATS Multi V, select and place system components on the floor plan drawing(s), and draft interconnecting pipe between system components directly on the drawing set. Once the layout is complete, use the export feature to create a file (.dxf format) that can subsequently be imported into the building design drawings.

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

In either case, the LATS Multi V design tool generates a report file (.xls format) 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 outdoor units, air handlers, control devices, accessories, refrigerant pipe sizes segregated by building, by system, by pipe size, and by pipe segments.

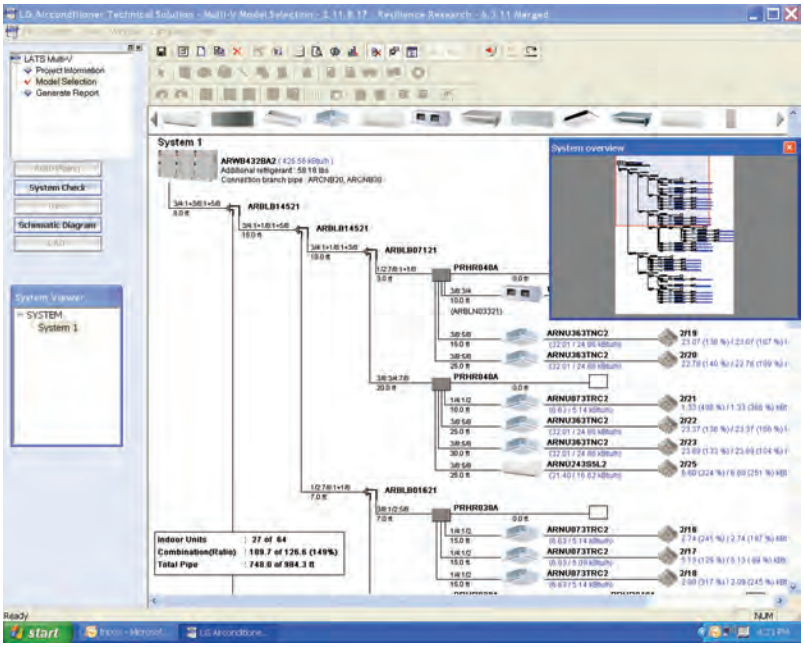
CAD mode

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

Tree mode

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

LATS Multi V Pipe System Design Tool



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REFRIGERANT PIPING INSTALLATION

System Engineering

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, they 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.

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.

⚠ Note:

Any field changes, such as rerouting, 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 before supplies are purchased or installed. Doing so ensures profitable installation, eliminates rework, and ensures trouble free system commissioning.

Design Guideline Summary - Liquid Line Pipe Engineering

Device Connection Limitations:

- The minimum number of connected and operating indoor units is one.
- The maximum number of indoor units on a water-source heat pump system is:

  ARWN072BA2, ARWN096DA2 = 16
  ARWN144BA2, ARWN192DA2 = 32
  ARWN216BA2, ARWN290DA2 = 49
  ARWN288,360,432BA2; ARWN390,480,580DA2 = 64
- The maximum number of indoor units on a water-source heat recovery system is:

  ARWB072BA2, ARWB096DA2 = 16
  ARWB144BA2, ARWB192DA2 = 32
  ARWB216BA2, ARWB290DA2 = 49
  ARWB288,360,432BA2; ARWB390,480,580DA2 = 64

Multi V Water Refrigerant Piping System Limitations

Pipe Length (ELF = Equivalent Length of pipe in Feet)	Longest total	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 control boxes	≥20 inches
	Minimum distance between indoor unit to any Y-branch	≤131 feet ELF Min. 3 feet from indoor unit to Y-branch
	Maximum distance between first Y-branch to farthest indoor unit	131 feet (295 feet for conditional application)
Elevation (all elevation limitations are measured in actual feet)	If water-source unit is above or below indoor unit	164 feet
	Between any two indoor units	49 feet
	Between indoor units connected to a heat recovery control unit (ARWB Series only)	16 feet

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Manual Layout Procedure

1. Choose the location of the indoor units on the building drawing.

2. Choose the location of all Y-branch fittings, Header fittings, and heat recovery control units, and draw them on the building drawings. Verify that all fittings are positioned per the guideline limitations set forth in "Using LG Y-branch Kits" on page 67 and "Using LG Header Kits" on page 68.

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 while selecting the system components on pages 7-10 and 27-30, 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 tables on pages 74-88 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 control unit. Record these values next to each Y-branch and/or Header on the drawing.

9. Refer to “Y-branch Kits” on pages 24 and 46, “Header Kits” on page 25, and heat recovery control units on page 47 to determine the part number of each Y-branch and/or Header based on the connected downstream nominal capacity served.

10. 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 provided on page 66 to estimate the equivalent length of field-provided pipe and fittings for each segment. Y-branch and Header equivalent lengths are found in on page 66. Equivalent lengths should be totaled with the upstream segment only.

11. Verify the equivalent pipe length complies with the limitations in “Multi V Refrigerant Piping System Limitations” on page 64. If the limitations are exceeded, either reroute the pipe or change the location of the Y-branch fittings, Header fittings, heat recovery control units, and/or indoor unit locations so the design conforms with all limitations.

12. Verify the length of the design complies with the limitations set in “Multi V Refrigerant Piping System Limitations” on page 64.

13. Verify that the manually sized pipe design is acceptable using LATS Multi V. When entering the length of pipe segments in LATS Multi V, 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 length to the actual pipe length.

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Selecting Field-supplied Copper Tubing

Hard-drawn or annealed copper tubing is acceptable. The designer chooses which one to use.

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

Choose tube wall thickness to meet local code, UL, and approved for an operating pressure of 551 psig. If local code does not specify wall thickness, LG suggests using tubing sizes as specified in the "ACR Copper Tubing Dimensions and Physical Characteristics" table below. When bending soft copper tubing, use the largest radius bends wherever possible to reduce the equivalent length of installed pipe. Be sure no traps or sags are present when rolling out soft copper tubing coils.

Fitting Losses in Equivalent Feet of Pipe

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

ACR Copper Tubing Material

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

ACR Copper Tubing Dimensions and Physical Characteristics[1-4]

Nominal Pipe Outside Diameter (in)	Actual Outside Diameter (in)	Drawn Temper			Annealed Temper		
		Nominal Wall Thickness (in)	Weight (lb/ft)	Cubic ft per Linear ft	Nominal Wall Thickness (in)	Weight (lb/ft)	Cubic ft per Linear ft
1/4	0.250	--	--	--	0.030	0.081	.00020
3/8	0.375	0.030	0.126	.00054	0.032	0.134	.00053
1/2	0.500	0.035	0.198	.00101	0.032	0.182	.00103
5/8	0.625	0.040	0.285	.00162	0.035	0.251	.00168
3/4	0.750	0.042	0.362	.00242	0.042	0.362	.00242
7/8	0.875	0.045	0.455	.00336	0.045	0.455	.00336
1-1/8	1.125	0.050	0.655	.00573	0.050	0.655	.00573

[1]All dimensions provided are in accordance with ASTM B280 – Standard.
[2]Design pressure = 551 psig.
[3]ACR Tubing is available as hard drawn or annealed (soft) and are suitable for use with R410A refrigerant.
[4]The Copper Tube Handbook, 2010, Copper Development Association Inc., 260 Madison Avenue, New York, NY 10016.

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LG

LG Engineered Y-Branch and Header Kits

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

⚠ Note:

Only LG supplied Y-branch and Header fittings can be used for this purpose. Third-party or field fabricated Tee's, Y-fittings, Headers, or other branch fittings are not qualified for use with LG Multi V systems. The only field-provided fittings allowed in a Multi V piping system are 45° and 90° elbows.

LG supplied Y-branch kits consists of:

- Two (2) Y-branches (one [1] - liquid line, one [1] - vapor line)
- Reducer fittings as applicable
- Molded clam-shell type insulation covers

LG Header kits consists of:

- Two (2) Headers (one [1] - liquid line, one [1] - vapor line)
- Reducer fittings as applicable
- Molded clam-shell type insulation covers

Using LG Y-branch Kits

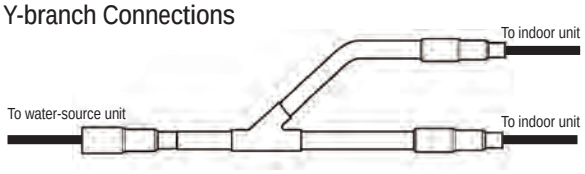
Y-branches may be installed in a horizontal or vertical position. When installed in the horizontal configuration, position the fitting so the take-off leg shares the same horizontal plane as the straight-thru leg ±10° as shown. When installed in a vertical configuration, position the fitting so the straight-thru leg is ±3° of plumb.

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. The first Y-branch kit must be located at least three (3) feet from the water-source unit. Provide a minimum of 20" between a branch fitting and any other fitting or indoor unit piped in series.

It is recommended that when a Y-branch is located in a pipe chase or other concealed space, access doors should be provided.

Do not install Y-branches backwards. Refrigerant flow cannot make "U" turns through Y-branches. The pipe coming from the outdoor unit should always connect to the single port end of the Y-branch.

Y-branch Connections

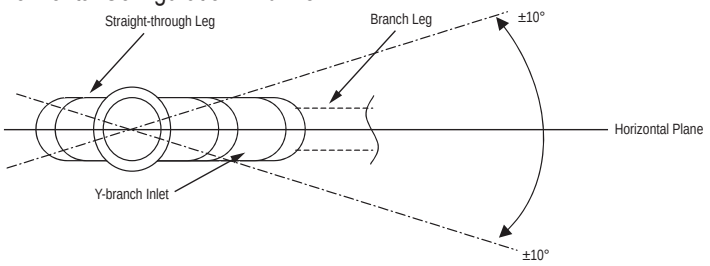


Y-branch Installation Alignment Specifications

Vertical Up Configuration

Vertical Down Configuration

Horizontal Configuration End View



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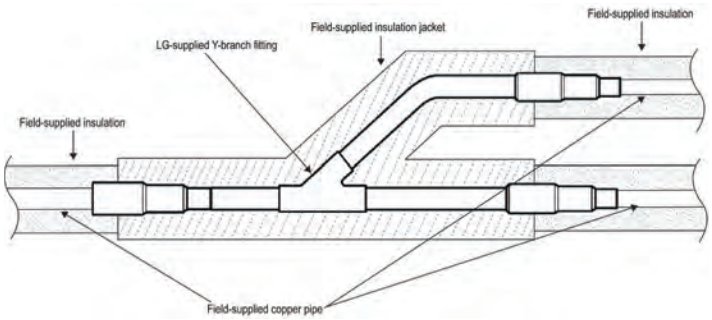
Y-branch Insulation

Each Y-branch kit comes with two (2) or three (3) clam-shell type peel and stick insulation jackets molded to fit the Y-branch fittings - one for the liquid line, one for the vapor line (ARWN Heat Pump Series); or one for the liquid line, one for the low-pressure vapor line, and one for the high-pressure vapor line (ARWB Heat Recovery Series).

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

Y-branch Insulation and Pipe Detail



Using LG Header Kits (Heat Pump only)

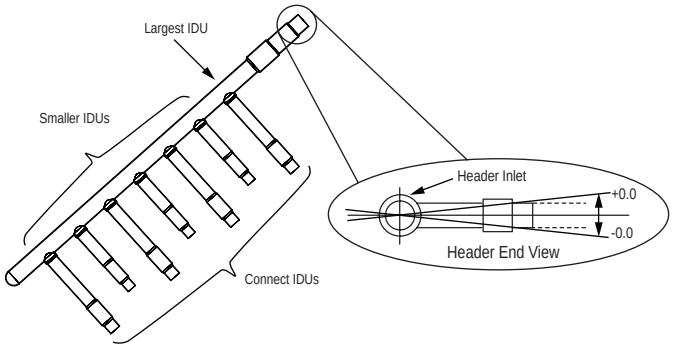
Header kits are intended for use where multiple indoor units are in the same vicinity and it would be more economical to “home-run” the run-out pipes back to a centralized location. If connecting multiple indoor units that are far apart, Y-branches may be more economical.

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-thru branch.

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.

Header Kit - Horizontal Rotation Limits (Must be installed level and 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.

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.

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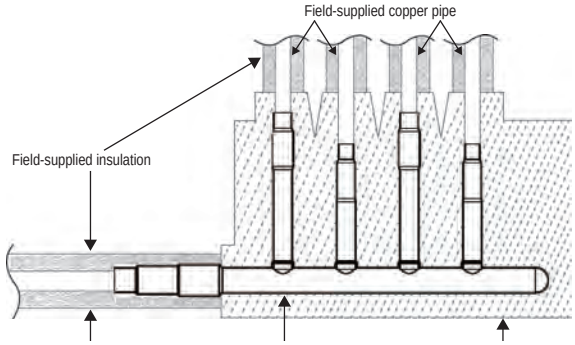
Header Insulation

Each Header kit comes with two (2) or three (3) clam-shell type peel and stick insulation jackets molded to fit the Y-branch fittings - one for the liquid line, one for the vapor line (ARWN Heat Pump Series); or one for the liquid line, one for the low-pressure vapor line, and one for the high-pressure vapor line (ARWB Heat Recovery Series).

No Pipe Size Substitutions

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

Header Insulation and Pipe Detail

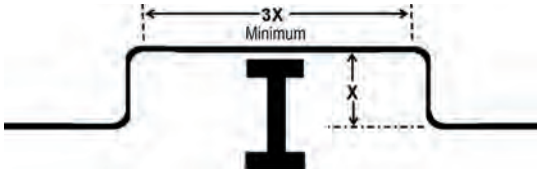


Handling Obstacles

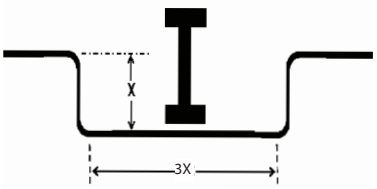
When an obstacle, such as an I-beam or Concrete T, is in the path of the planned refrigerant pipe run, it is best practice to route the pipe over the obstacle. If adequate space is not available to route the insulated pipe over the obstacle, route the pipe under the obstacle. In either case, it is imperative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

Installing piping above and below an obstacle

Above an Obstacle



Below an Obstacle



Copper Expansion and Contraction

Under normal operating conditions, the vapor pipe temperature of a Multi V Water system can vary from as much as 280°F. With this large variance in pipe temperature, combined with a potential straight run pipe of up to 492 feet and segment length between fittings of up to 131 feet, 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 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, and opposing force caused by change in refrigerant fluid/gas temperature can lead to pipe/fitting stress failure.

The refrigerant pipe support system must be engineered to allow free expansion to occur. When a segment of pipe is mounted between two fixed points, provisions must be provided to allow pipe expansion to naturally occur. The most common method is the inclusion of expansion loop or U-bends. Each segment of pipe has a natural “fixed” point where no movement occurs and is located at the center point of the segment assuming the entire pipe is insulated the same. The natural fixed point of the pipe segment is typically where the expansion Loop or U-bend is located.

Linear pipe expansion can be calculated by: $LE = C \times L \times (Tr - Ta) \times 12$

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

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REFRIGERANT PIPING INSTALLATION

System Engineering

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

To find the anticipated expansion value:

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

Linear Thermal Expansion of Copper Tubing in Inches[1,2]

Fluid Temp.	Temperature °F																			
Pipe Length (ft)	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.

[2]The Engineers Toolbox (www.engineeringtoolbox.com) - Expansion of Carbon, Copper and Stainless Steel Pipe.

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To look up the value, the designer must first estimate the minimum and maximum temperature of the pipe segment. See the following example:

A Multi V Water 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 mode, this pipe transports hot gas vapor to the indoor units at 120°F. In cooling mode, the same tube is a suction line returning refrigerant vapor to the outdoor unit at 40°F. Look up the copper tubing expansion at each temperature and calculate the difference.

Vapor Line

Transporting Hot Gas: 260 feet pipe at 120°F = 3.64 inches

Transporting Suction Gas: 260 feet pipe at 40°F = 1.04 inches

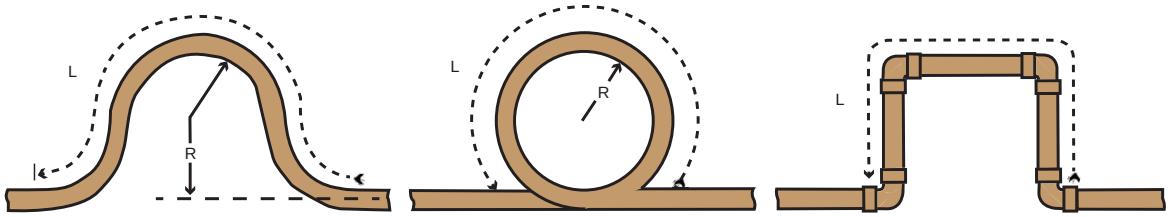
Anticipated change in length: 3.64 inches – 1.04 inches = 2.60 inches

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 will occur.

When creating an expansion joint, the joint height should be a minimum of two (2) times the joint width. Although different types of expansion arrangements are available, the data for correctly sizing an expansion loop is provided in the table below. 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 loop or U-bend minimum design dimensions. Other types of expansion joints are chosen, design per ASTM B-88 standards.

Coiled Expansion Loops and Offsets



Large Tubing U-Bend (>3/4 inches) | Loop | Small Tubing U-bend (<3/4 inches)

Radii of Coiled Expansion Loops and Developed Lengths of Expansion Offsets

Anticipated Linear Expansion (LE)		Nominal Tube Size (Outside Diameter) (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]Centerline minimum radius (inches).

[2]Centerline length of pipe.

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Pipe Bends

When bending soft copper, use long radius bends. Refer to the "Radii of Coiled Expansion Loops and Developed Lengths of Expansion Offsets" table for minimum radius specifications, page 71.

Refrigerant Specialties

In-line refrigeration components, such as solenoid valves, filter-dryers, sight glasses, tee fittings, and after-market refrigerant pipe system accessories are prohibited and cannot be used with Multi V Water systems. Sight-glasses and solenoid valves may cause flash gas in the liquid stream. Over time, dryers may deteriorate and introduce debris into the system.

Field-provided Isolation Ball Valves

LG neither provides nor requires isolation ball valves on indoor units for proper system operation. If isolation is desired, full-port isolation ball valves with Schrader ports (positioned between valve and indoor unit) rated for use with R410A refrigerant should be used on the liquid and vapor lines.

Position the valves so they are easily accessible for service. If necessary, install drywall access doors or removable ceiling panels. Position valves with a minimum distance of three (3) inches to six (6) inches of pipe on either side of the valve. Position valves with adequate clearance for applying field insulation. 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, the unaffected indoor units may be operated with readdressing and proper combination ratio.

Using Elbows

Third-party elbows are allowed as long as they are designed for use with R410A refrigerant. The designer and installer should use a minimum number of fittings since they must consider the quantity, size, and know the fitting's pressure drop in equivalent piping length. When using the LATS Multi V, or when performing manual calculations, equivalent pipe lengths must be input in their respective segments.

Installation of Refrigerant (Pipe / Brazing Practices)

1. LG indoor and outdoor units contain capillary tubes, orifices, electronic controlled expansion valves, oil separators, and heat exchangers that can easily become blocked if debris such as copper burrs, slag, and carbon dust is introduced to the pipe system during installation. Keep the piping system free of contaminants.

- Store pipe stock in a dry place.
- Keep stored pipe capped and clean.
- Blow clean all pipe sections with dry nitrogen prior to assembly.
- De-bur and clean all cuts before assembly.

2. Proper system operation depends on the installer using best practices and the utmost care while assembling the piping system.

- Use adapters to assemble different sizes of pipe.
- Do not use flux, soft solder, or anti-oxidant agents.
- Use a tubing cutter. Do not use a hacksaw to cut pipe.

3. Brazing joints:

- Always use a dry nitrogen purge and maintain a steady flow while brazing.
- Use a 15% silver phosphorous copper brazing alloy to avoid overheating and produce good flow.
- Protect heat sensitive components while brazing. Use a wet rag or a heat barrier spray product when located near brazing operations.

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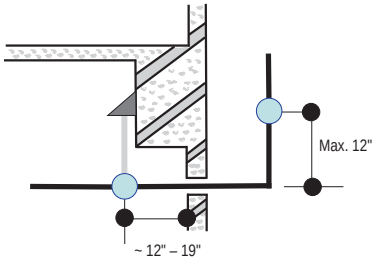
Pipe Supports

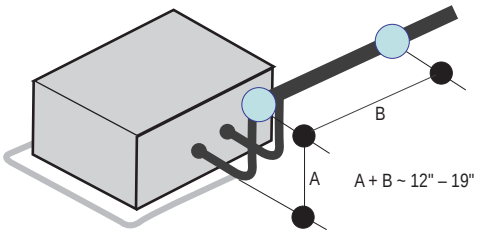
A properly installed pipe system should be adequately supported to avoid pipe sagging. Sagging pipes become oil traps that lead to equipment malfunction. Field-provided pipe supports should be designed to meet local codes. If allowed by code, use fiber straps or split-ring hangers suspended from the ceiling on all-thread rods. Supports should never touch the pipe wall. Insulate the pipe first. Then place a second layer of insulation over the pipe insulation jacket to prevent chafing and compression of the primary insulation within the confines of the support pipe clamp.

- Straight segments up to 3/4 inch copper pipe should be supported at least every five (5) feet or per local codes if more stringent.
- Straight segments of one (1) inch and larger copper pipe should be supported every six (6) feet or per local codes and standards if more stringent.
- A properly installed pipe system will have sufficient supports to avoid pipes from sagging during the life of the system. Sags may trap oil and lead to unit malfunction. As necessary, place supports closer for segments where potential sagging could occur.
- Wherever the pipe changes direction, place a hanger within 12 inches on one side and within 12 to 19 inches of the bend on the other side.

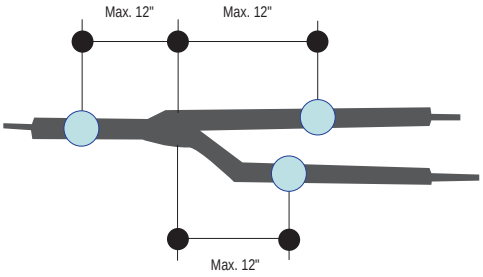
Typical Pipe Support — Change in Pipe Direction



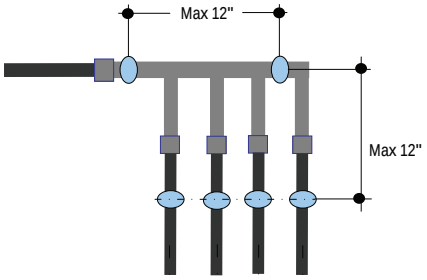
Pipe Support at Indoor Unit



Pipe Support at Y-branch



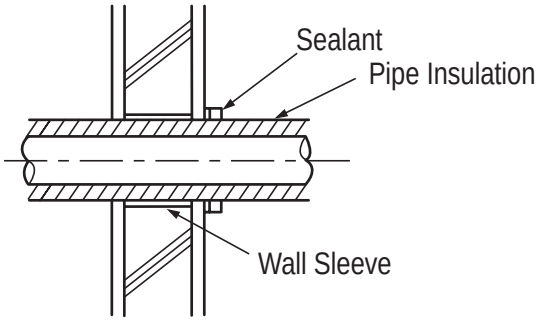
Pipe Support at Header



Pipe Sleeves and Wall Penetrations

LG requires that all pipe penetrations through walls and floors must be properly insulated. Route pipe through a wall using an appropriately sized wall sleeve. A properly sized sleeve prevents the compression of refrigerant pipe insulation and allows the pipe to move freely within the sleeve.

Typical Pipe Penetration



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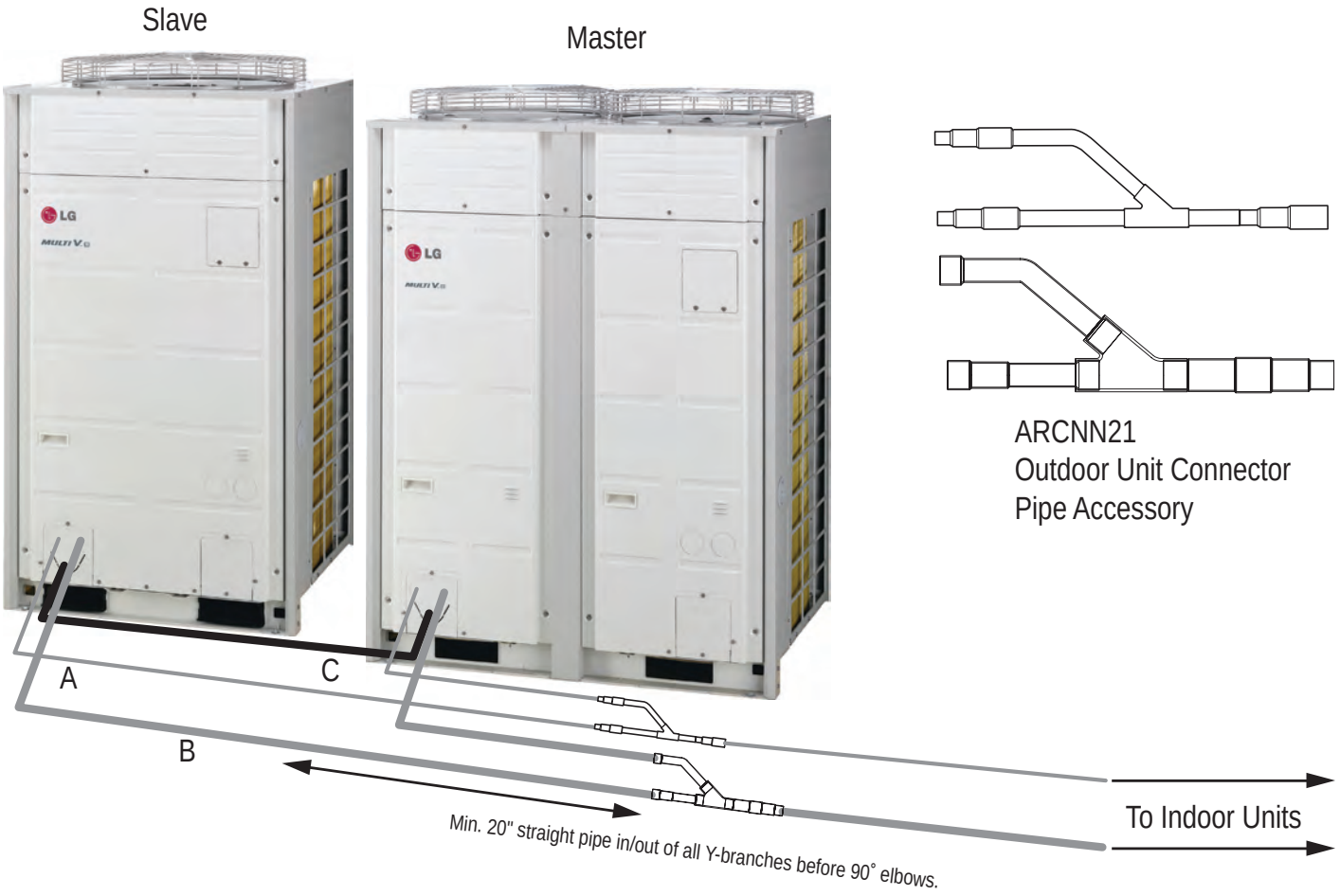
REFRIGERANT PIPING INSTALLATION

Pipe Sizing for Heat Pump ARWN Series

Heat Pump Dual-Frame System Connections



ARCNN21
Outdoor Unit Connector
Pipe Accessory

⚠ Note:

- *Larger-capacity ODUs must be the master in a multi-frame system.*
- *Single-compressor ODUs (72,000 and 96,000 Btu/h capacity) cannot be the master ODU in a multi-frame system.*
- *Master ODU capacity must be greater than or equal to the slave1 ODU capacity,*

Nominal Tons	Combination Model Numbers	Individual Component Numbers		Liquid (A)	Vapor (B)	Common (C)
		Master	Slave			
18	ARWN216BA2	ARWN144BA2	ARWN072BA2	3/8	7/8	3/4
24	ARWN288BA2	ARWN144BA2	ARWN144BA2	1/2	1-1/8	3/4
24	ARWN290DA2	ARWN192DA2	ARWN096DA2	3/8	7/8	3/4
32	ARWN390DA2	ARWN192DA2	ARWN192DA2	1/2	1-1/8	3/4

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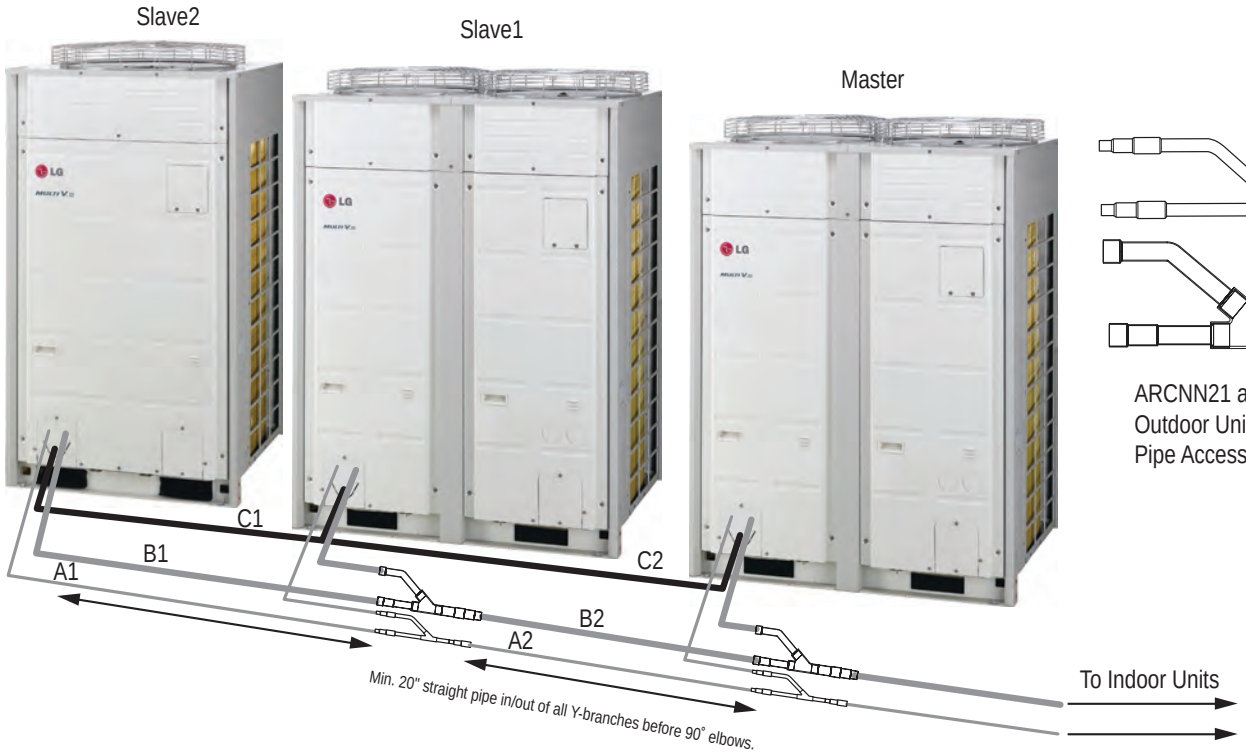
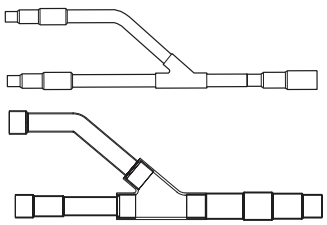
Heat Pump Triple-Frame System Connections





ARCNN21 and ARCNN31
Outdoor Unit Connector
Pipe Accessory

⚠ Note:

- *Larger-capacity ODUs must be the master in a multi-frame system.*
- *Single-compressor ODUs (72,000 and 96,000 Btu/h capacity) cannot be the master ODU in a multi-frame system.*
- *Master ODU capacity must be greater than or equal to the slave1 ODU capacity, and where applicable, slave1 ODU capacity must be greater than or equal to the slave2 ODU capacity.*

Nominal Tons	Combination Model Numbers	Individual Component Numbers			Liquid (A1)	Vapor (A2)	Common (B1)	Vapor (B2)	Common (C1)	Common (C2)
		Master	Slave1	Slave2						
30	ARWN360BA2	ARWN144BA2	ARWN144BA2	ARWN072BA2	3/8	5/8	7/8	1-3/8	3/4	3/4
36	ARWN432BA2	ARWN144BA2	ARWN144BA2	ARWN144BA2	1/2	3/4	1-1/8	1-5/8	3/4	3/4
40	ARWN480DA2	ARWN192DA2	ARWN192DA2	ARWN096DA2	3/8	5/8	7/8	1-3/8	3/4	3/4
48	ARWN580DA2	ARWN192DA2	ARWN192DA2	ARWN192DA2	1/2	3/4	1-1/8	1-5/8	3/4	3/4

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REFRIGERANT PIPING INSTALLATION

Y-branch Pipe Sizing for Heat Pump ARWN Series

When installing one (1) water-source unit as an independent, stand-alone system

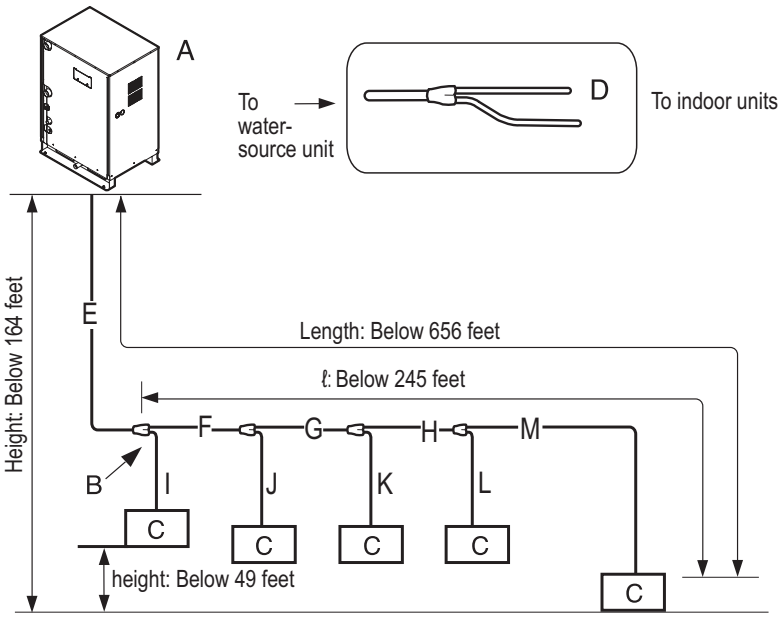
Example: Five (5) indoor units connected

A: Water-source unit

B: First Y-branch connection

C: Indoor units

D: To indoor units



Water-source unit A to first branch B: Main pipe diameter E

Water-source Unit Capacity (ton)	Liquid pipe (inches)	Vapor pipe (inches)
6	3/8Ø	7/8Ø
8	3/8Ø	7/8Ø
12	1/2Ø	1-1/8Ø
16	1/2Ø	1-1/8Ø

Refrigerant pipe diameter from branch to branch (F,G,H)

Total Capacity of Indoor Units Connected after branch (Btu/h)	Liquid pipe (inches)	Vapor pipe (inches)
≤19,100	1/4Ø	1/2Ø
<54,600	3/8Ø	5/8Ø
≤76,400	3/8Ø	3/4Ø
<112,600	3/8Ø	7/8Ø
<160,400	1/2Ø	1-1/8Ø
<242,300	5/8Ø	1-1/8Ø
<354,900	3/4Ø	1-3/8Ø
≤354,900	3/4Ø	1-5/8Ø

For the first branch pipe B, use the pipe that fits the main pipe diameter E.

Total pipe length = E + F + G + H + I + J + K + L + M ≤1,640 feet

Length	Longest actual pipe length	Equivalent pipe length
	E + F + G + H + M ≤ 656 feet	E + F + G + H + M ≤ 738 feet
ℓ	Longest pipe length after first branch	
	F + G + H + M ≤ 295 feet	
Height	Elevation differential (Water-source unit ↔ Indoor unit)	
	Height ≤ 164 feet	
height	Elevation differential (Indoor unit ↔ Indoor unit)	
	height ≤ 49 feet	
Distance between fittings and indoor units	≥20 inches	
Distance between fittings and Y-branches	≥20 inches	
Distance between two Y-branches	≥20 inches	

⚠ Note: [1,2,3]

Piping after the first branch on main pipe E cannot be larger than main pipe diameter E (always reference the LATS Multi V report).

Example: When connecting 120% of indoor unit capacity to an 8-ton water-source unit.

[1]Water-source unit main pipe diameters: 7/8Ø inch Vapor pipe / 3/8Ø inch Liquid pipe.

[2]Pipe diameters F after first branch should be no larger than 7/8Ø inch Vapor pipe / 3/8Ø inch Liquid pipe that match main pipe diameter E.

[3]When the pipe distance from the water-source unit to the farthest indoor unit is ≥295 feet, change the main pipe diameter size according to the water-source unit capacity in the table below. (This applies to both liquid and vapor pipes.)

Vapor pipe	*Liquid pipe*
6, 8 ton.....7/8Ø → 1Ø	*6, 8 ton.....3/8Ø → 1/2Ø*
12, 16 ton .....1-1/8Ø → 1-1/4Ø	*12, 16 ton.....1/2Ø → 5/8Ø*

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REFRIGERANT PIPING INSTALLATION

Y-branch Pipe Sizing for Heat Pump ARWN Series

When installing two (2) water-source units

Example: Five (5) indoor units connected

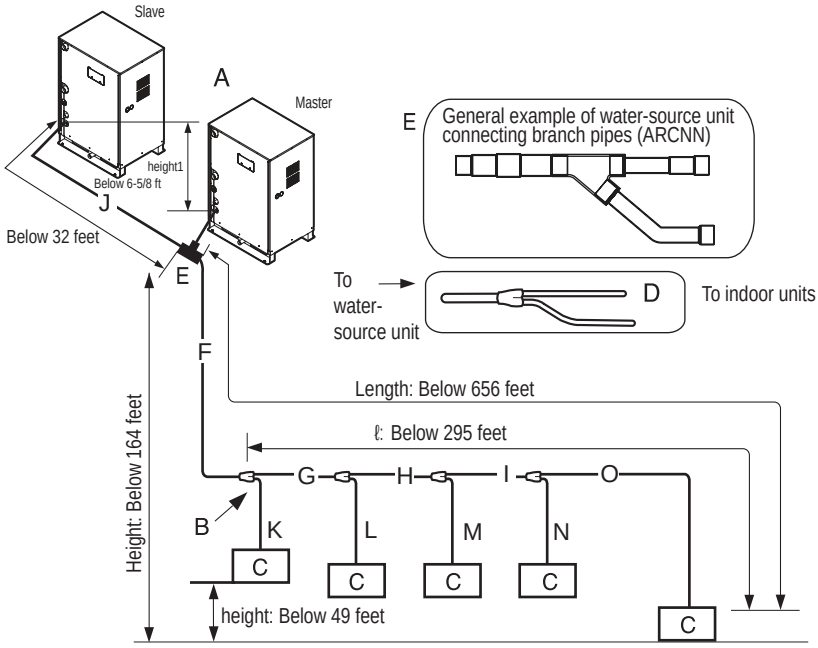
A: Water-source units

B: First Y-branch connection

C: Indoor units

D: To indoor units

E: Connecting branch pipe between the two water-source units: ARCNN21 (Heat Pump ARWN Series)



Slave water-source unit ~ Connecting branch pipe E:
Pipe diameter between water-source units J

Liquid pipe (inches)	Vapor pipe (inches)	Low/high pressure common pipe (inches)
3/8Ø / 1/2Ø	7/8Ø / 1-1/8Ø	3/4Ø

Connecting branch pipe E ~ First branch B: Main pipe diameter F

Water-source Unit Capacity	Liquid pipe (inches)	Vapor pipe (inches)
18 ton (208V), 24 ton (460V)	3/4Ø	1-3/8Ø
24 ton (208V), 32 ton (460V)	3/4Ø	1-5/8Ø

Refrigerant pipe diameter from branch to branch (G, H, I)

Total Capacity of Indoor Units Connected after branch (Btu/h)	Liquid pipe (inches)	Vapor pipe (inches)
≤19,100	1/4Ø	1/2Ø
<54,600	3/8Ø	5/8Ø
≤76,400	3/8Ø	3/4Ø
<112,600	3/8Ø	7/8Ø
<160,400	1/2Ø	1-1/8Ø
<242,300	5/8Ø	1-1/8Ø
<354,900	3/4Ø	1-3/8Ø
≤354,900	3/4Ø	1-5/8Ø

For the first branch pipe B, use the pipe that fits the main pipe diameter F.

Total pipe length = F + G + H + I + K + L + M + N + O ≤1,640 feet

Length	Longest actual pipe length	Equivalent pipe length
	F + G + H + I + O ≤656 feet	F + G + H + I + O ≤738 feet
ℓ	Longest pipe length after first branch	
	G + H + I + O ≤295 feet	
Height	Elevation differential (Water-source unit ↔ Indoor unit)	
	Height ≤164 feet	
height	Elevation differential (Indoor unit ↔ Indoor unit)	
	height ≤49 feet	
height1	Elevation differential (Water-source Unit ↔ Water-source Unit)	
	height1 ≤6-5/8 feet	
Distance between fittings and indoor units	≥20 inches	
Distance between fittings and Y-branches	≥20 inches	
Distance between two Y-branches	≥20 inches	

⚠ Note:[1,2,3]

Piping after the first branch on main pipe F cannot be larger than main pipe diameter F (always reference the LATS Multi V report).
Example: When connecting 120% of indoor unit capacity to an 8-ton water-source unit.
[1]Water-source unit main pipe diameters: 7/8Ø inch Vapor pipe / 3/8Ø inch Liquid pipe.
[2]Pipe diameters B after first branch should be no larger than 7/8Ø inch Vapor pipe / 3/8Ø inch Liquid pipe that match main pipe diameter F.
[3]When the pipe distance from the water-source unit to the farthest indoor unit is ≥295 feet, change the main pipe diameter size according to the water-source unit capacity in the table below. (This applies to both liquid and vapor pipes.)

Vapor pipe	*Liquid Pipe*
18 ton (208V), 24 ton (460V).....1-1/2Ø	*18, 24, 32 ton .....3/4Ø → 7/8Ø*
24 ton (208V), 32 ton (460V).....1-5/8Ø	

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REFRIGERANT PIPING INSTALLATION

MULTI V WATER IT

Y-branch Pipe Sizing for Heat Pump ARWN Series

When installing three (3) water-source units

Example: Five (5) indoor units connected

A: Water-source units

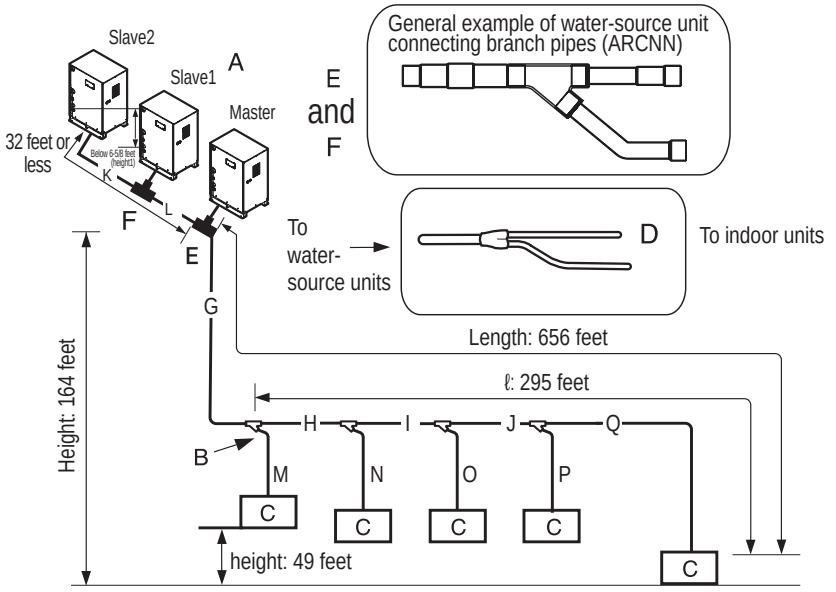
B: First Y-branch connection

C: Indoor units

D: To indoor units

E: Connecting branch pipe between water-source units: ARCNN31 (Heat Pump ARWN Series)

F: Connecting branch pipe between water-source units: ARCNN21 (Heat Pump ARWN Series)



Slave 2 water-source unit ~ Connecting branch pipe F:
Pipe diameter between water-source units K

Liquid pipe (inches)	Vapor pipe (inches)	Low/high pressure common pipe
3/8Ø / 1/2Ø	7/8Ø / 1-1/8Ø	3/4Ø

Slave 1 water-source unit ~ Connecting branch pipe E:
Pipe diameter between water-source units L

Liquid pipe (inches)	Vapor pipe (inches)	Low/high pressure common pipe (inches)
5/8Ø / 3/4Ø	1-3/8Ø / 1-5/8Ø	3/4Ø

Connecting branch pipe E ~ First branch B: Main pipe diameter G

Water-source Unit Capacity	Liquid pipe (inches)	Vapor pipe (inches)
30, 36, 40, 48 ton	3/4Ø	1-5/8Ø

Refrigerant pipe diameter from branch to branch (H, I, J)

Total Capacity of Indoor Units Connected after branch (Btu/h)	Liquid pipe (inches)	Vapor pipe (inches)
≤19,100	1/4Ø	1/2Ø
<54,600	3/8Ø	5/8Ø
≤76,400	3/8Ø	3/4Ø
<112,600	3/8Ø	7/8Ø
<160,400	1/2Ø	1-1/8Ø
<242,300	5/8Ø	1-1/8Ø
<354,900	3/4Ø	1-3/8Ø
≤354,900	3/4Ø	1-5/8Ø

For the first branch pipe B, use the pipe that fits the main pipe diameter G.

Total pipe length = G + H + I + J + M + N + O + P + Q ≤1,640 feet

Length	Longest actual pipe length	Equivalent pipe length
	G + H + I + J + Q ≤656 feet	G + H + I + J + Q ≤738 feet
ℓ	Longest pipe length after first branch	
	H + I + J + Q ≤295 feet	
Height	Elevation differential (Water-source unit ↔ Indoor unit)	
	Height ≤164 feet	
height	Elevation differential (Indoor unit ↔ Indoor unit)	
	height ≤49 feet	
height1	Elevation differential (Water-source Unit ↔ Water-source Unit)	
	height1 ≤6-5/8 feet	
Distance between fittings and indoor units	≥20 inches	
Distance between fittings and Y-branches	≥20 inches	
Distance between two Y-branches	≥20 inches	

⚠ Note:[1,2,3]

Piping after the first branch on main pipe G cannot be larger than main pipe diameter G (always reference the LATS Multi V report).

Example: When connecting 120% of indoor unit capacity to an 8-ton water-source unit.

[1]Water-source unit main pipe diameters: 7/8Ø inch Vapor pipe / 3/8Ø inch Liquid pipe.

[2]Pipe diameters B after first branch should be no larger than 7/8Ø inch Vapor pipe / 3/8Ø inch Liquid pipe that match main pipe diameter G

[3]When the pipe distance from the water-source unit to the farthest indoor unit is ≥295 feet, change the main pipe diameter size according to the water-source unit capacity in the table below. (This applies to both liquid and vapor pipes.)

Vapor pipe	*Liquid Pipe*
30, 36, 40, 46 ton.....1-5/8Ø	*30, 36, 40, 46 ton .....3/4Ø → 7/8Ø*

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REFRIGERANT PIPING INSTALLATION

Header Pipe Sizing for Heat Pump ARWN Series Only

When installing one (1) water-source unit as an independent, stand-alone system

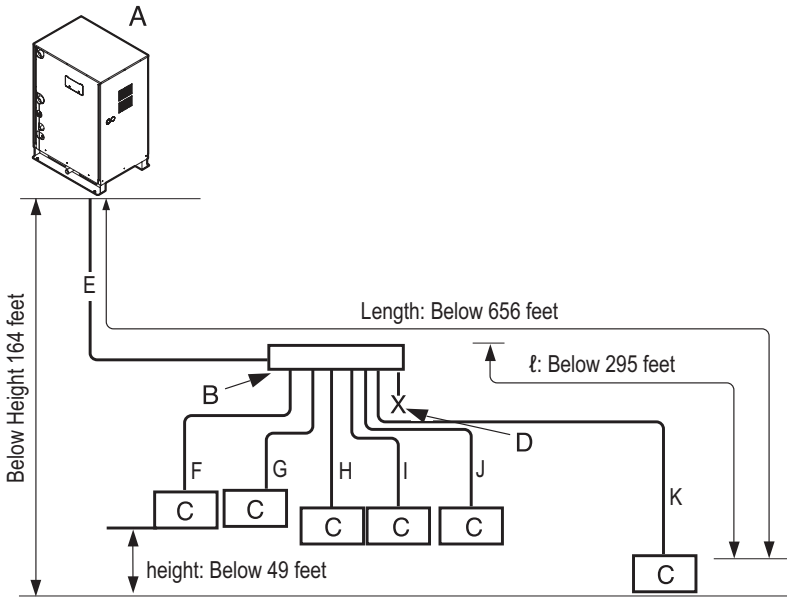
Example: Six (6) indoor units connected

A: Water-source unit

B: Header branch

C: Indoor units

D: Brazed cap



Water-source unit A to Header branch B:
Main pipe diameter E

Water-source Unit Capacity (ton)	Liquid pipe (inches)	Vapor pipe (inches)
6	3/8Ø	7/8Ø
8	3/8Ø	7/8Ø
12	1/2Ø	1-1/8Ø
16	1/2Ø	1-1/8Ø

Total pipe length = E + F + G + H + I + J + K ≤1,640 feet

Length	Longest actual pipe length	Equivalent pipe length
	E + K ≤656 feet	E + K ≤738 feet
ℓ	Longest pipe length after first branch	
	K ≤295 feet	
Height	Elevation differential (Water-source unit ↔ Indoor unit)	
	Height ≤164 feet	
height	Elevation differential (Indoor unit ↔ Indoor unit)	
	height ≤49 feet	
Distance between fittings and indoor units	≥20 inches	

⚠ Note:

- *Do not use headers with Heat-recovery ARWB Series systems.*
- *Branch pipe cannot be used after header branch.*

⚠ Note:

- *For appropriate pipe length after the header branch (F~K), install the header branch so that the pipe distances between the connected indoor units are minimized.*
- *Large pipe distances can cause different performances in the indoor units.*
- *Y-branches and other header branches cannot be used after the initial header branch.*
- *When the pipe distance from the water-source unit to the farthest indoor unit is ≥295 feet, change the main pipe diameter size according to the water-source unit capacity in the table below. (This applies to both liquid and vapor pipes.)*

Vapor pipe	*Liquid pipe*
6, 8 ton.....7/8Ø → 1Ø	*6, 8 ton.....3/8Ø → 1/2Ø*
12, 16 ton .....1-1/8Ø → 1-1/4Ø	*12, 16 ton.....1/2Ø → 5/8Ø*

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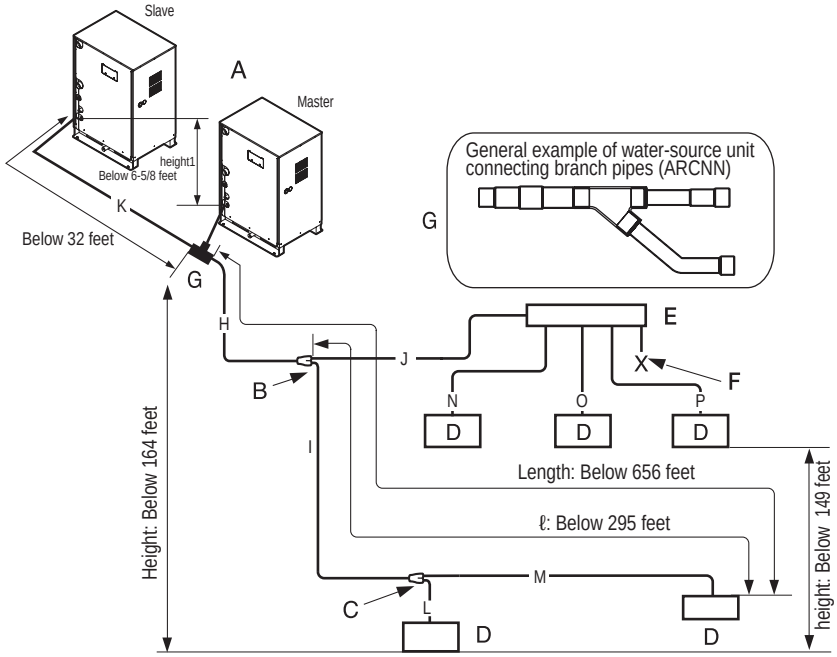
REFRIGERANT PIPING INSTALLATION

Combination Y-branch and Header Pipe Sizing for Heat Pump ARWN Series Only

When installing two (2) water-source units
Example: Five (5) indoor units connected
A: Water-source units
B: First Y-branch connection
C: Second Y-branch connection
D: Indoor units
E: Header branch
F: Brazed cap
G: Connecting branch pipe between water-source units: ARCNN21



Slave water-source unit ~ Connecting branch pipe G: Pipe diameter between water-source units K

Liquid pipe (inches)	Vapor pipe (inches)	Low/high pressure common pipe (inches)
3/8Ø / 1/2Ø	7/8Ø / 1-1/8Ø	3/4Ø

Connecting branch pipe G ~ First Y-branch B: Main pipe diameter H

Water-source Unit Capacity	Liquid pipe (inches)	Vapor pipe (inches)
18 ton (208V), 24 ton (460V)	3/4Ø	1-3/8Ø
24 ton (208V), 32 ton (460V)	3/4Ø	1-5/8Ø

Refrigerant pipe diameter from branch to branch (B,C)

Total Capacity of Indoor Units Connected after branch (Btu/h)	Liquid Pipe (inches)	Vapor Pipe (inches)
≤19,100	1/4Ø	1/2Ø
<54,600	3/8Ø	5/8Ø
≤76,400	3/8Ø	3/4Ø
<112,600	3/8Ø	7/8Ø
<160,400	1/2Ø	1-1/8Ø
<242,300	5/8Ø	1-1/8Ø
<354,900	3/4Ø	1-3/8Ø
≤354,900	3/4Ø	1-5/8Ø

For the first branch pipe B, use the branch pipe that fits the main pipe diameter H.

⚠ Note:

- *Do not use headers with Heat-recovery ARWB Series systems.*
- *Branch pipe cannot be used after header branch.*

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REFRIGERANT PIPING INSTALLATION

Combination Y-branch and Header Pipe Sizing for Heat Pump ARWN Series Only

Total pipe length = H + I + J + L + M + N + O + P ≤1,640 feet

Length	Longest actual pipe length	Equivalent pipe length
	H + I + M ≤656 feet	H + I + M ≤738 feet
ℓ	Longest pipe length after first branch	
	I + M ≤295 feet	
Height	Elevation differential (Water-source unit ↔ Indoor unit)	
	Height ≤164 feet	
height	Elevation differential (Indoor unit ↔ Indoor unit)	
	height ≤49 feet	
height1	Elevation differential (Water-source unit ↔ Water-source unit)	
	height1 ≤6-5/8 feet	
Distance between fittings and indoor units		≥20 inches
Distance between fittings and Y-branches		≥20 inches
Distance between two Y-branches		≥20 inches

⚠ Note: [1-7]

Piping after the first branch on main pipe H cannot be larger than main pipe diameter H (always reference the LATS Multi V report).
Example: When connecting 120% of indoor unit capacity to an 8-ton water-source unit.
[1]Water-source unit main pipe diameters: 7/8Ø inch Vapor pipe / 3/8Ø inch Liquid pipe.
[2]Pipe diameters B after first branch should be no larger than 7/8Ø inch Vapor pipe / 3/8Ø inch Liquid pipe that match main pipe diameter H.
[3]When the pipe distance from the water-source unit to the farthest indoor unit is ≥295 feet, change the main pipe diameter size according to the water-source unit capacity in the table below. (This applies to both liquid and vapor pipes.)
[4]For appropriate pipe length after the header branch (N~P), install the header branch so that the pipe distances between the connected indoor units are minimized.
[5]Large pipe distances can cause the indoor unit performances to be different.
[6]Y-branches and other header branches cannot be used after the initial header branch.
[7]When the pipe distance from the water-source unit to the farthest indoor unit is ≥295 feet, change the main pipe diameter size according to the water-source unit capacity in the table below. (This applies to both liquid and vapor pipes.)

Vapor pipe	*Liquid Pipe*
18 ton (208V), 24 ton (460V).....1-1/2Ø	*18, 24, 32 ton .....3/4Ø → 7/8Ø*
24 ton (208V), 32 ton (460V).....1-5/8Ø	

Conditional Applications (If Indoor Unit D Past Segment M is Farthest Indoor Unit)

Certain conditions must be in place to include pipe lengths between 131 feet ~ 295 feet after first branch.

1. When pipe length after first Y-branch is between 131 feet ~ 295 feet.
2. Diameter of pipe I between first Y-branch and last Y-branch should be increased by one size except if segment I is same size as segment H: 1/4Ø → 3/8Ø → 1/2Ø → 5/8Ø → 3/4Ø → 7/8Ø → 1Ø → 1-1/8Ø → 1-1/4Ø → 1-1/2Ø.
3. Length of pipe from each indoor unit to closest Y-branch or header (L, M, N, O, P) ≤131 feet.
4. [Length of pipe from water source unit to farthest indoor unit (H+I+L+M)] minus(-) [length of pipe from water source unit to closest indoor unit (H+J+N)] ≤131 feet.

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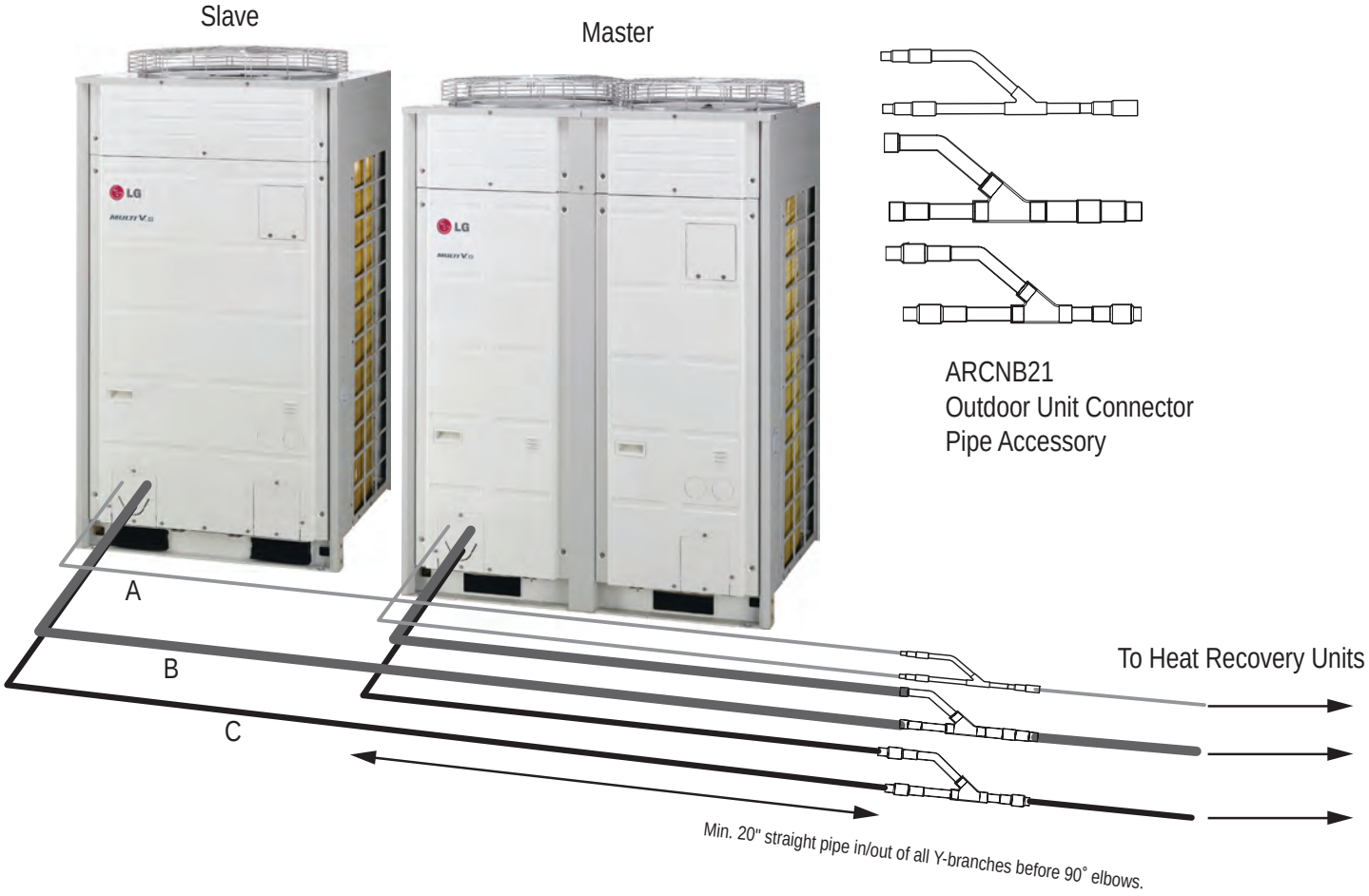
REFRIGERANT PIPING INSTALLATION

Pipe Sizing for Heat Recovery ARWB Series

Heat Recovery Dual-Frame System Connections



ARCNB21
Outdoor Unit Connector
Pipe Accessory

⚠ Note:

- *Larger-capacity ODUs must be the master in a multi-frame system.*
- *Single-compressor ODUs (72,000 and 96,000 Btu/h capacity) cannot be the master ODU in a multi-frame system.*
- *Master ODU capacity must be greater than or equal to the slave1 ODU capacity.*

Nominal Tons	Combination Model Numbers	Individual Component Numbers		Liquid (A)	Low Vapor (B)	High Vapor (C)
		Master	Slave			
18	ARWB216BA2	ARWB144BA2	ARWB072BA2	3/8	7/8	3/4
24	ARWB288BA2	ARWB144BA2	ARWB144BA2	1/2	1-1/8	7/8
24	ARWB290DA2	ARWB192DA2	ARWB096DA2	3/8	7/8	3/4
32	ARWB390DA2	ARWB192DA2	ARWB192DA2	1/2	1-1/8	7/8

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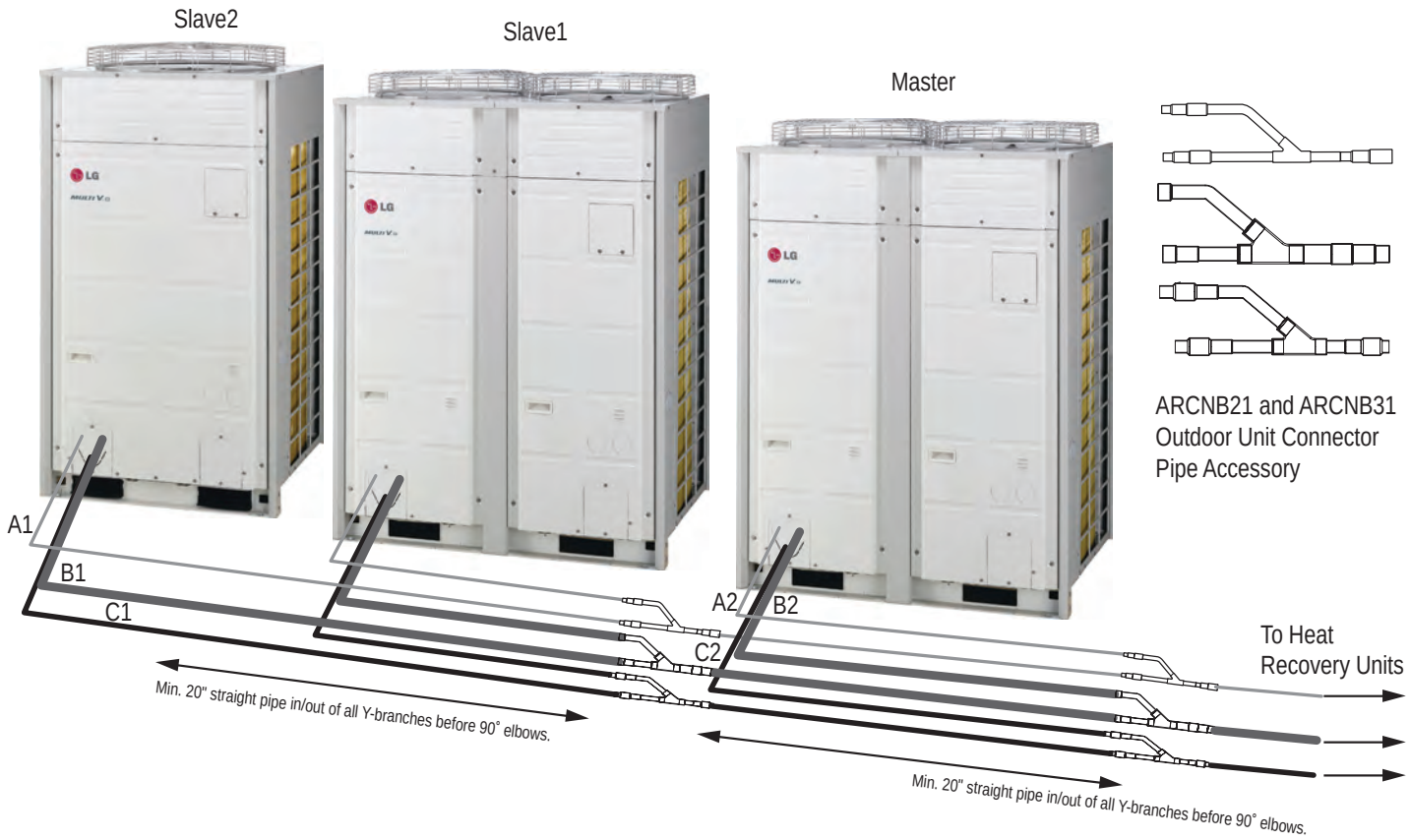
Heat Recovery Triple-Frame System Connections



ARCNB21 and ARCNB31 Outdoor Unit Connector Pipe Accessory

⚠ Note:

- *Larger-capacity ODUs must be the master in a multi-frame system.*
- *Single-compressor ODUs (72,000 and 96,000 Btu/h capacity) cannot be the master ODU in a multi-frame system.*
- *Master ODU capacity must be greater than or equal to the slave1 ODU capacity.*

Nominal Tons	Combination Model Numbers	Individual Component Numbers			Liquid (A1)	Liquid (A2)	Low Vapor (B1)	Low Vapor (B2)	High Vapor (C1)	High Vapor (C2)
		Master	Slave1	Slave2						
30	ARWB360BA2	ARWB144BA2	ARWB144BA2	ARWB072BA2	3/8	3/4	7/8	1-3/8	3/4	1-1/8
36	ARWB432BA2	ARWB144BA2	ARWB144BA2	ARWB144BA2	1/2	3/4	1-1/8	1-5/8	7/8	1-3/8
40	ARWB480DA2	ARWB192DA2	ARWB192DA2	ARWB096DA2	3/8	3/4	7/8	1-3/8	3/4	1-1/8
48	ARWB580DA2	ARWB192DA2	ARWB192DA2	ARWB192DA2	1/2	3/4	1-1/8	1-5/8	7/8	1-3/8

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REFRIGERANT PIPING INSTALLATION

MULTI V WATER IT

Heat Recovery ARWB Series Pipe Sizing Only

With four (4) heat-recovery control units

Example: Three (3) water-source units, four (4) heat recovery control units, and ten (10) indoor units connected

A,B,C: Water-source units

D,E: Y-branch connections

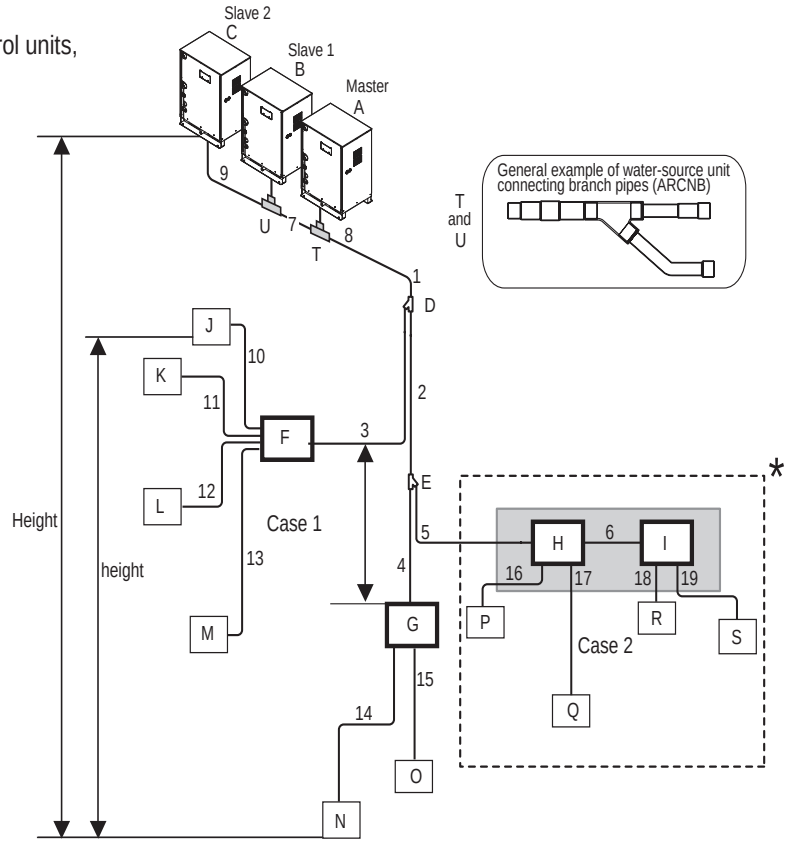
F,G,H,I: Heat recovery control units

J,K,L,M,N,O,P,Q,R,S: Indoor units

T: Connecting branch pipe between water-source units: ARCNB21

U: Connecting branch pipe between water-source units: ARCNB31

1-19: Pipe lengths



Case 1: Maximum height is 49 feet if installed with a Y-branch.
Case 2: Height is 0 feet in heat recovery control unit series connection.

Water-source unit connection: Refrigerant pipe diameter before first branch (1,7,8,9)

Upstream water-source unit total capacity (ton)	Liquid pipe (inches)	Vapor pipe (inches)	
		Low pressure	High pressure
6, 8	3/8Ø	7/8Ø	3/4Ø
12, 16	1/2Ø	1-1/8Ø	7/8Ø
18 (208V), 24 (460V)	3/4Ø	1-3/8Ø	1-1/8Ø
24 (208V), 30, 32, 36, 40, 48	3/4Ø	1-5/8Ø	1-3/8Ø

⚠ Note:[1,2]

Connection piping from branch to branch cannot exceed the main pipe diameter used by the water-source unit. Always reference the LATS Multi V report.

Example: When connecting indoor units to a 16-ton water-source unit to 130% of its system capacity (248,000 Btu/h), and branching one heat recovery control unit with four 28,000 Btu/h indoor units at the first branch.

[1]Water-source unit main pipe diameters (1): 5/8Ø Liquid pipe, 1-1/8Ø Low-pressure Vapor pipe, 7/8Ø High-pressure Vapor pipe.

[2]Pipe diameters between the first and second branches (228,000 Btu/h indoor unit total capacity) should be no larger than: 5/8Ø Liquid pipe, 1-1/8Ø Low-pressure Vapor pipe, and 7/8Ø High-pressure Vapor pipe that match pipe diameters (1).

Refrigerant pipe diameter between branches and heat-recovery control units (2~5)

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

Indoor unit connecting pipes from branches (10-19)

Indoor unit capacity (Btu/h)	*Liquid pipe (inches)*	*Gas pipe (inches)*
≤19,100	*1/4Ø*	*1/2Ø*
<54,600	*3/8Ø*	*5/8Ø*
<76,400	*3/8Ø*	*3/4Ø*
<112,600	*3/8Ø*	*7/8Ø*

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Total pipe length: 1+2+3+4+5+6+G+H+I+J+K+L+M+N+O+P+Q+R+S+10+11+12+13+14+15+16+17+18+19 ≤1,640 feet

T~S	Water-source unit ~ the farthest indoor unit	Equivalent pipe length
	1+2+5+6+19 ≤656 feet	1+2+5+6+19 ≤738 feet
D~S	First indoor branch ~ the farthest indoor unit	
	2+5+6+19 ≤295 feet	
T~C	First water-source unit branch ~ the farthest water-source unit	
	T + 9 ≤33 feet	
Height	Elevation differential (water-source unit ↔ indoor unit)	
	Height ≤ 164 feet	
height	Elevation differential (indoor ~ indoor unit)	
	height ≤ 49 feet	
10~19	Piping length from each indoor unit to the closest heat-recovery control unit	
	10 + 11 + 12 + 13 + 14 + 15 + 16 + 17 + 18 + 19 ≤131 feet	
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 control boxes		≥20 inches

⚠ Note:

- *For calculation purposes, assume the equivalent pipe length of a Y-branch equals 1-5/8 feet.*
- *Total capacity of indoor units in series connection of heat recovery control units ≤160,000 Btu/h.*

⚠ Note:

If the equivalent length between the water-source unit and an indoor unit is ≥295 feet, the size of main liquid pipe must increase.

Liquid pipe
6, 8 ton.....3/8Ø↔ 1/2Ø
12, 16 ton.....1/2Ø ↔ 5/8Ø
18,24,30,32,36,40,48.....3/4Ø ↔ 7/8Ø

Conditional Applications (If S is the farthest indoor unit)

Certain conditions must be in place to include pipe lengths between 131 feet ~ 295 feet after first branch.

1. Pipe diameters between first branch and the last branch should be increased, except if pipe diameters 2, 5, 6 match the pipe diameter of main pipe 1.
   1/4Ø → 3/8Ø → 1/2Ø → 5/8Ø → 3/4Ø → 7/8Ø → 1Ø* → 1-1/8Ø → 1-1/4Ø* → 1-3/8Ø → 1-1/2Ø* (*It is not necessary to size up.)
2. When calculating total refrigerant piping length, the lengths for pipes 2, 5, 6 should be doubled.
   1+2(2)+2(5)+2(6)+F+G+10+11+12+13+14+15+16+17+18+19 ≤ 1,640 feet.
3. [Pipe length from each indoor unit to the closest heat-recovery control unit (10,11,12,13,14,15,16,17,18,19)] ≤ 131 feet.
4. Pipe length from water-source unit to the farthest indoor unit S (2+5+6+19) minus(-) [pipe length from water-source unit to the closest indoor unit J (F+10)] ≤131 feet.

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REFRIGERANT PIPING INSTALLATION

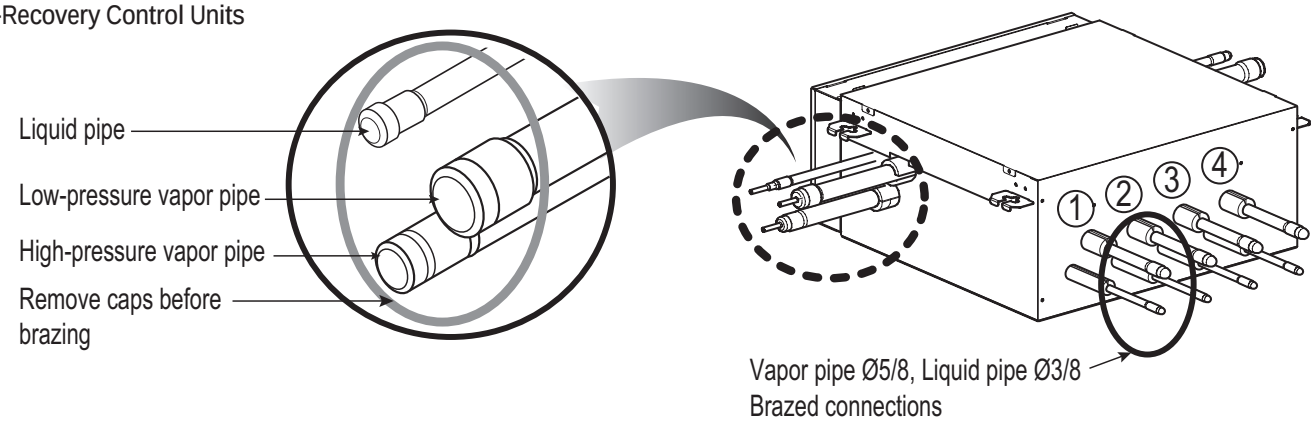
MULTI V WATER II

Heat Recovery ARWB Series Pipe Sizing Only

⚠ Note:

1. Series connection of heat recovery control units: Total capacity of indoor units ≤160,000 Btu/h.
2. Refer to the heat recovery control unit PCB for valve group control setting.
3. Differences in pipe lengths between heat recovery control units and its indoor units (example: differences in the lengths between 10, 11, 12, and 13) should be minimized because large pipe distances can cause the indoor unit performances to be different.
4. Piping length from the branch to the water-source unit ≤33 feet, equivalent length: max. 43 feet for ≥24-ton units.
If large-capacity indoor units (4 to 8 tons) that use larger than 5/8Ø / 3/8Ø inch pipe diameters are installed, the valve group setting should be used.

Heat-Recovery Control Units



Heat Recovery Unit	PRHR012A	PRHR031A	PRHR041A
Low-pressure vapor pipe (inches)	7/8Ø	1-1/8Ø	1-1/8Ø
High-pressure vapor pipe (inches)	3/4Ø	7/8Ø	7/8Ø
Liquid pipe (inches)	3/8Ø	1/2Ø	1/2Ø

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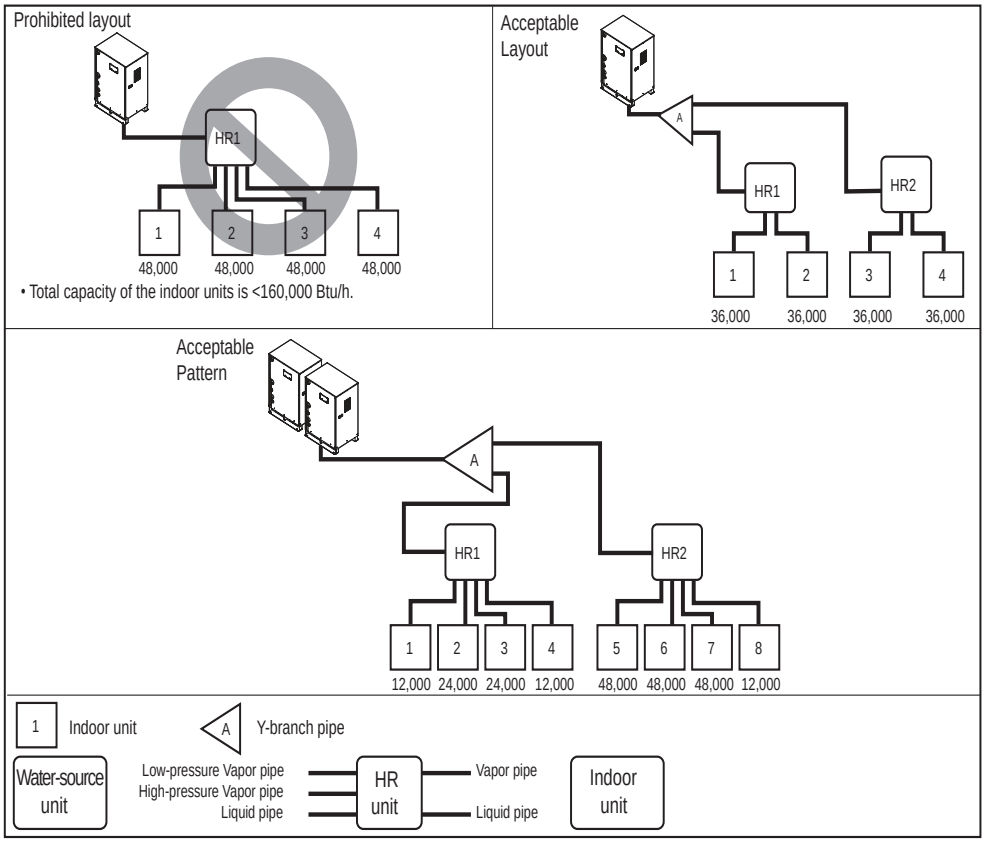
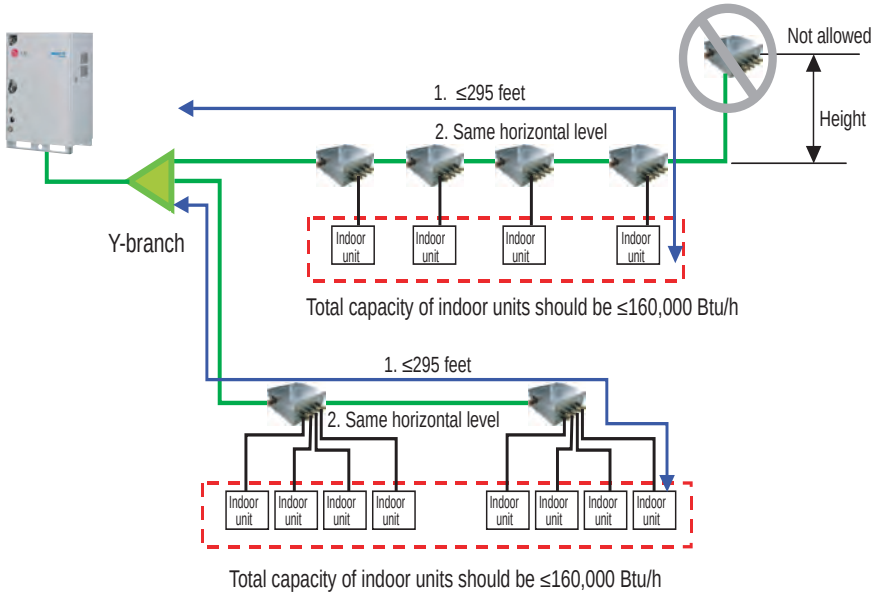


1. Piping lengths should be no more than 295 feet from the first branch to the farthest indoor.
2. Heat recovery control units should be installed on the same horizontal level (Example: on the same floor)



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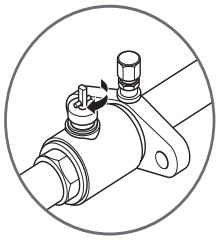
REFRIGERANT PIPING INSTALLATION

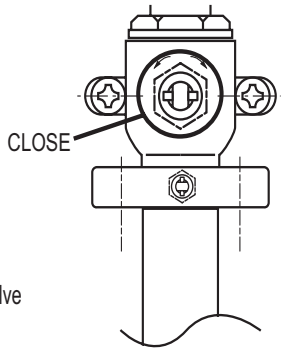
Pipe Connection and Factory-supplied Shut-off Valve Operation

⚠ WARNING

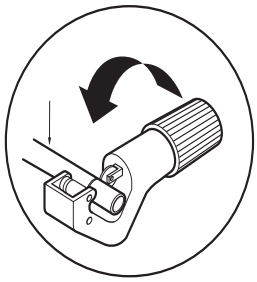
Always take extreme care to prevent refrigerant gas (R410A) from leaking during use, or if around fire or flame. If the refrigerant gas comes in contact with a flame from any source, such as a gas stove, it may break down and generate a poisonous gas. Never braze in a room that is not ventilated. After refrigerant piping work is complete, securely tighten both service ports and caps so that gas does not leak. Always inspect for gas leaks after refrigerant piping installation is complete.



Indicates "open" when the pipe and the valve valve are in a straight line.



Cut the pipe to the appropriate length, but don't cut the pipe length to <2-3/4 inches.



Factory-supplied Shut-off Valves for ARWN Series Heat Pump Systems

① Piping joint (auxiliary component): Braze with a nitrogen purge through the service valve port. (Releasing pressure: ≤2.9 psi)

② Flare nut: Loosen or tighten the flare nut by using a torque wrench with a backup wrench. Coat the flare connection with oil.

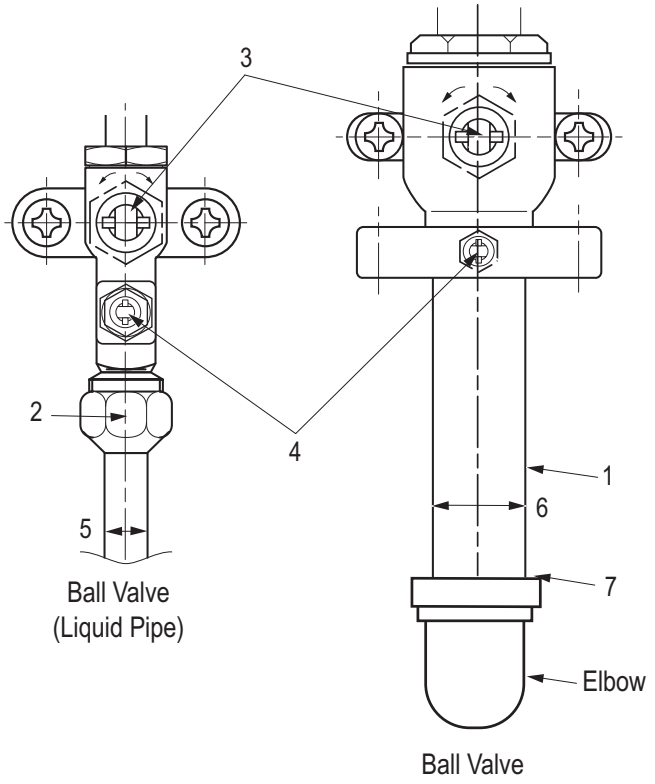
③ Caps: Remove caps and operate valve, etc. After operation, always reattach the caps (tightening torque of valve cap: ≥18.4 lb-ft). (Do not remove the internal part of the port)

④ Service ports: Evacuate and charge the refrigerant through the service ports. After completing evacuation and refrigerant charge, always reattach the service caps (tightening torque of service cap: ≥10.3 lb-ft).

⑤ Liquid pipe

⑥ Vapor pipe

⑦ Elbow joint (field supplied)



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Factory-supplied Shut-off Valves for Heat Recovery ARWB Series Systems

① Piping joint (auxiliary component): Braze with a nitrogen purge through the service valve port. (Releasing pressure: ≤2.9 psi)

② Flare nut: Loosen or tighten the flare nut by using a torque wrench with a backup wrench. Coat the flare connection with oil.

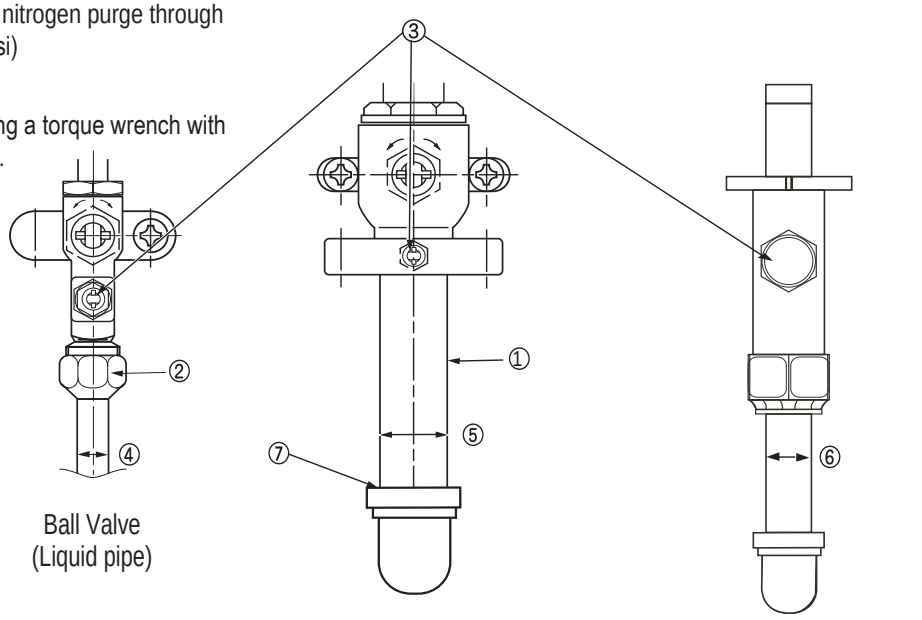
③ Service ports: Evacuate and charge the refrigerant through the service ports. After completing evacuation and refrigerant charge, always reattach the service caps (tightening torque of service cap: ≥10.3 lb-ft).

④ Liquid pipe

⑤ Low-pressure vapor pipe

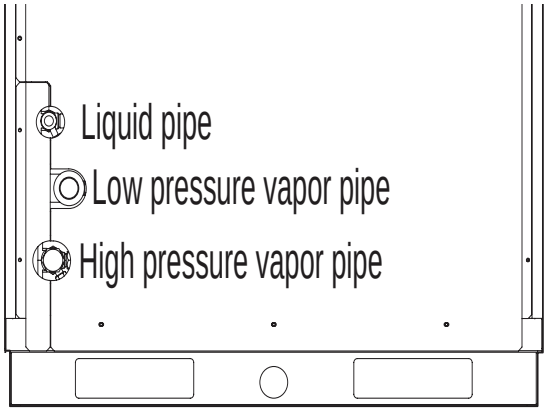
⑥ High-pressure vapor pipe

⑦ Elbow joint (field supplied)



⚠ Note:

- *Remove the front panel before connecting the pipes.*
- *Check the pipes (liquid pipe, low-pressure vapor pipe, and high-pressure vapor pipe) before connecting.*



⚠ Note:

After installing the pipe, fill any open spaces around the piping, and block any access holes in the front and side panels. Vermin may enter the interior of the unit through the open access holes and damage the wiring.

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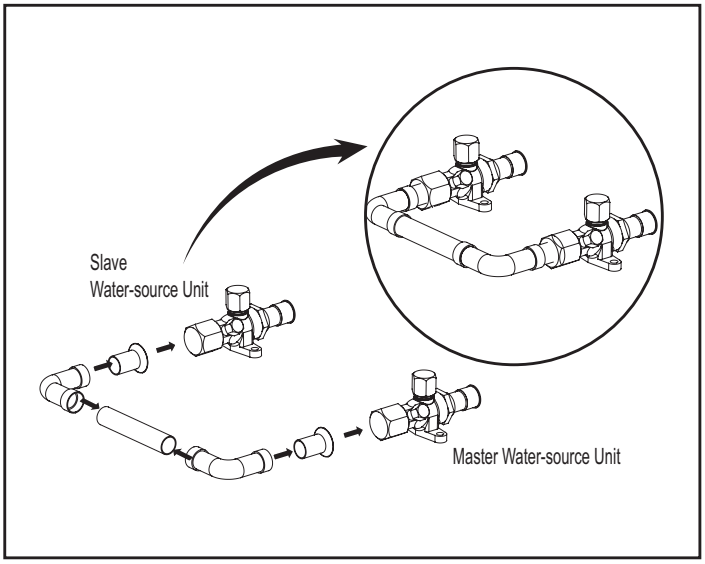
REFRIGERANT PIPING INSTALLATION

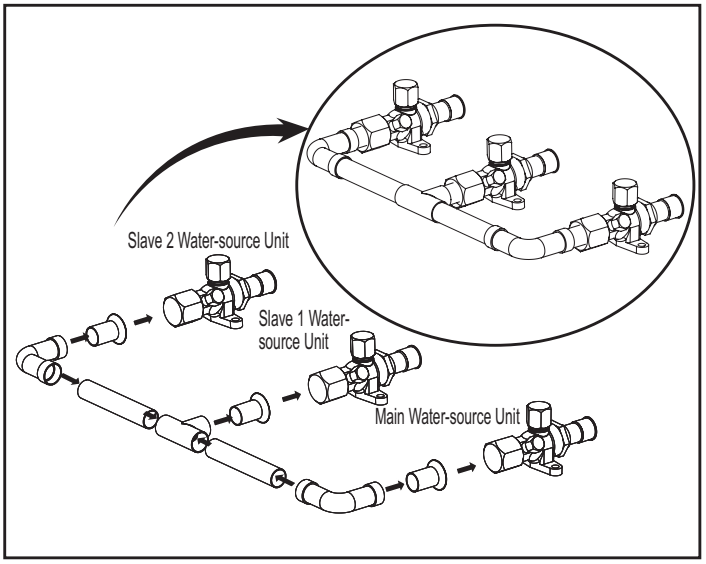
MULTI V WATER II

High-/Low-pressure Common and Connecting Branch Pipes (Heat Pump ARWN)

Two water-source units



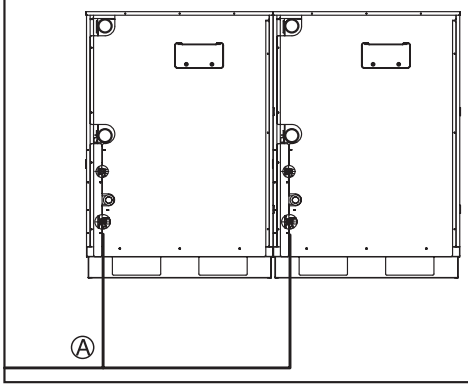
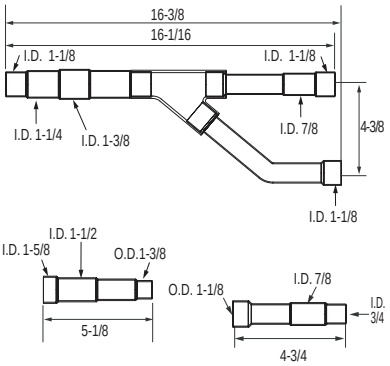
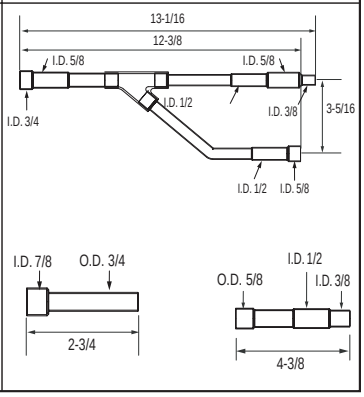
Three water-source units



1. Use elbows to connect both the main water-source and slave water-source units to the high-/low-pressure common pipe. Connect the high-/low-pressure common pipe only after removing burrs, dust, and foreign materials that may have occurred while cutting the pipes. Unit may not operate if debris is in the pipe.
2. To test the pipes for refrigerant leaks, apply a nitrogen gas pressure of 550 psig for 24 hours.
3. Vacuum to 500 microns, maintaining a vacuum to ≤500 microns for 1 hour. Perform procedure again if vacuum falls below the criteria.
4. Open the valve using an Allen wrench.

Two water-source units

Unit: inch

Combination	Multi-frame Connector	Vapor pipe	Liquid pipe
	Ⓐ ARCNN21		

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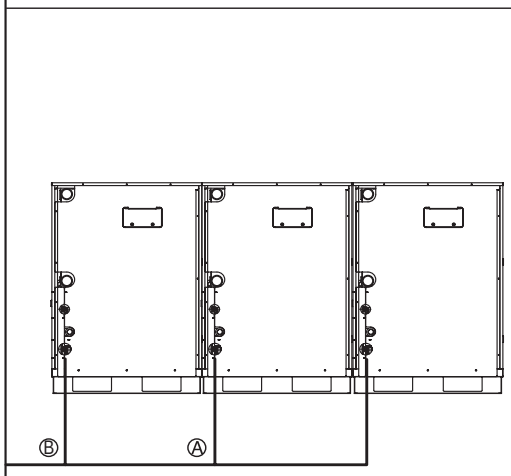
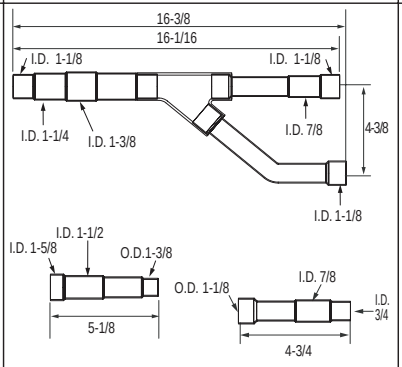
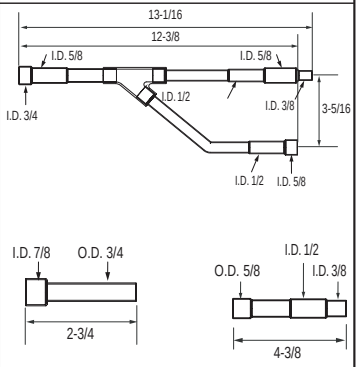
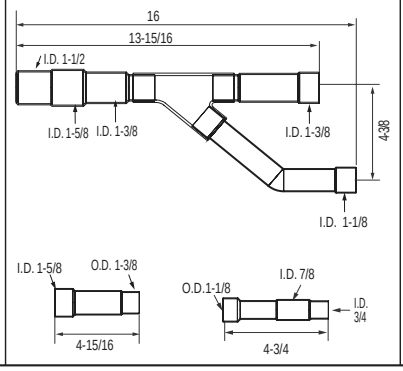
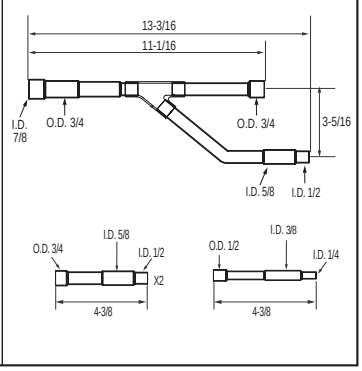
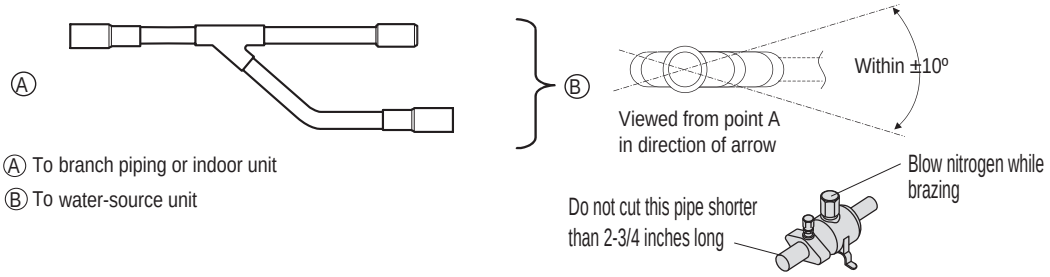
High-/Low-pressure Common and Connecting Branch Pipes (Heat Pump ARWN)

Three water-source units

Unit: inch

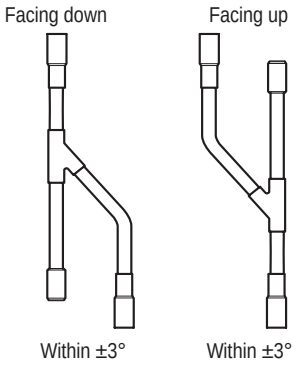
Combination specification	Multi-frame Connector	Vapor pipe	Liquid pipe
	Ⓐ ARCNN21		
	Ⓑ ARCNN31		

* Install the branch pipe between the water-source units so that the outlet pipe is parallel with the surface.



Ⓐ To branch piping or indoor unit

Ⓑ To water-source unit



⚠ Note:

Use caution when installing the branch pipe vertically between the water-source units. Improper installation can cause uneven refrigerant distribution between the water-source units, and may lead to compressor burn and reduced system capacity.

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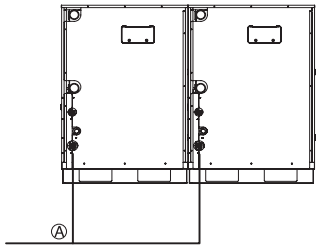
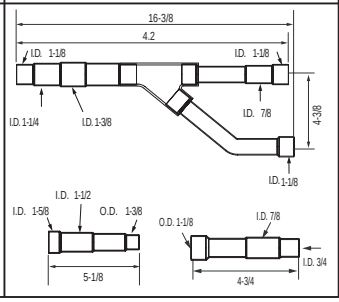
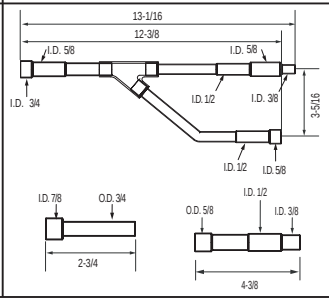
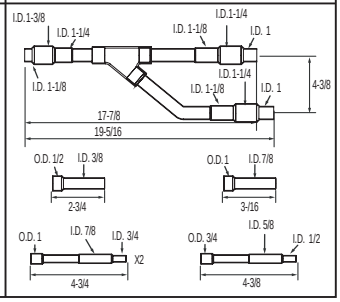
REFRIGERANT PIPING INSTALLATION

Connecting Branch Pipes (Heat Recovery ARWB)

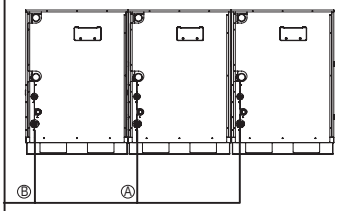
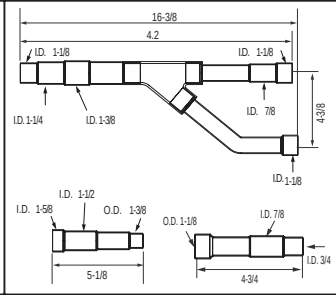
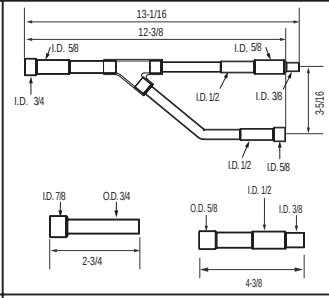
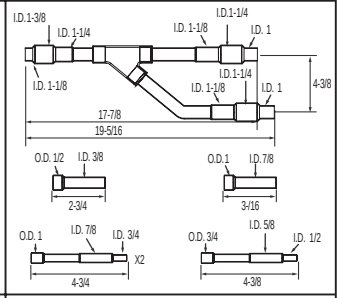
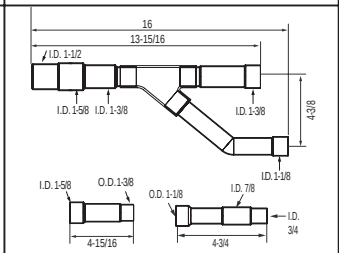
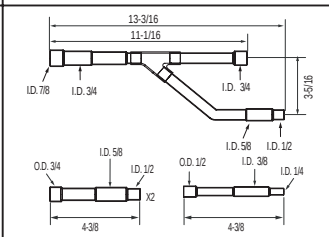
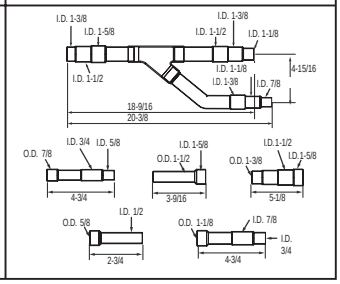
Two water-source units

Unit: inch

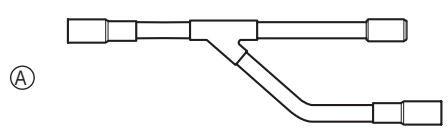
Combination specification	Multi-frame Connector	Low-pressure Vapor Pipe	Liquid Pipe	High-pressure Vapor Pipe
	Ⓐ ARCNB21			

Three water-source units

Unit: inch

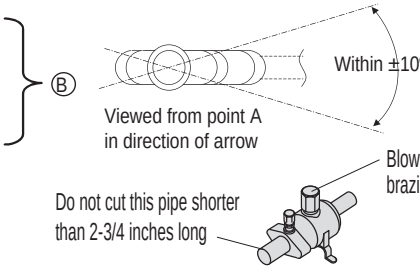
Combination specification	Multi-frame Connector	Low-pressure Vapor Pipe	Liquid Pipe	High-pressure Vapor Pipe
	Ⓐ ARCNB21			
	Ⓑ ARCNB31			

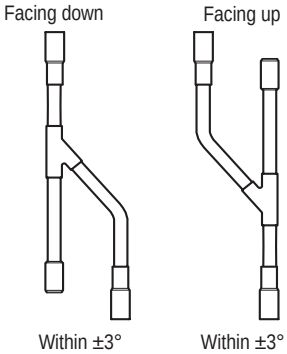
* Install the branch pipe between the water-source units so that the outlet pipe is parallel with the surface.



Ⓐ To branch piping or indoor unit

Ⓑ To water-source unit





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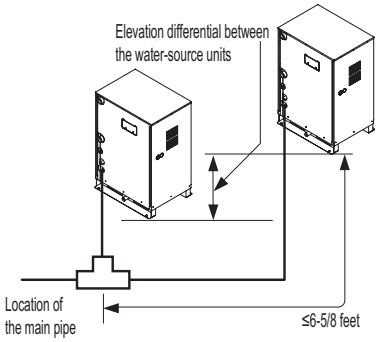
REFRIGERANT PIPING INSTALLATION

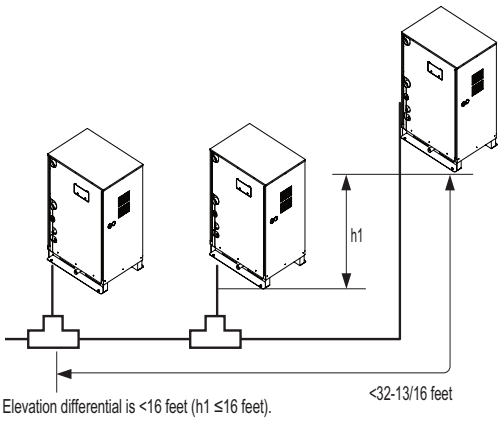
Installing an Oil Trap (Multi-frame Installations Only)

- Oil could accumulate in a water-source unit after operation has stopped, if there is an elevation differential between the water-source units, or if the pipe distance between the water-source units is >6-5/8 feet. Install an oil trap if any of these phenomena occur. Just one oil trap is necessary, however,and only needs to be added to the vapor pipe line.
- If the pipe distance between the water-source units is ≤6-5/8 feet, and if the main pipe is installed lower than the water-source unit itself, an oil trap does not have to be added.
- If the main pipe is installed higher than the water-source unit, oil can accumulate in the water-source unit if it is not operating.
- If there is an elevation differential between the water-source unit pipes, oil can accumulate in the lower-positioned water-source unit until operation has stopped.

Two water-source units
(If the piping distance between the units is <6-5/8 feet)



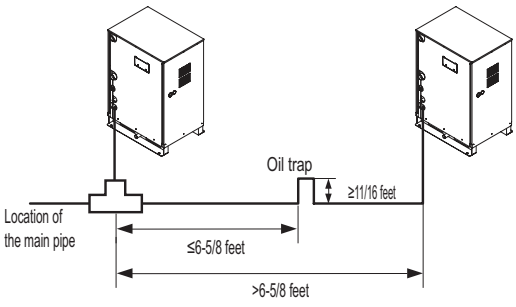
Three water-source units

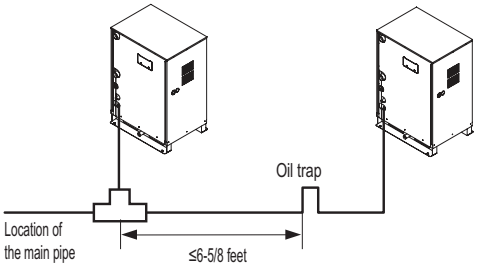


Elevation differential is <16 feet (h1 ≤16 feet).

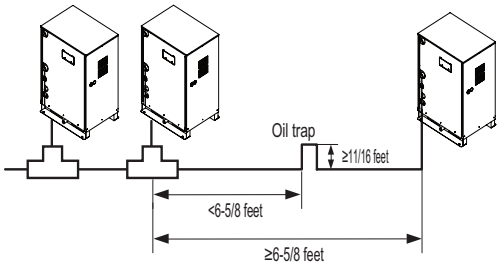
Longest pipe length between water-source units: <32-13/16 feet after first branch

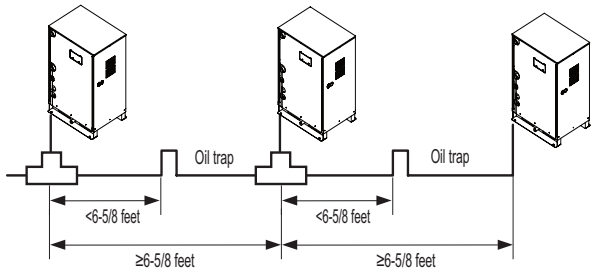
Two water-source units
(If the piping distance between the units ≥6-5/8 feet)





Three water-source units
(If the piping distance between the units ≥6-5/8 feet)





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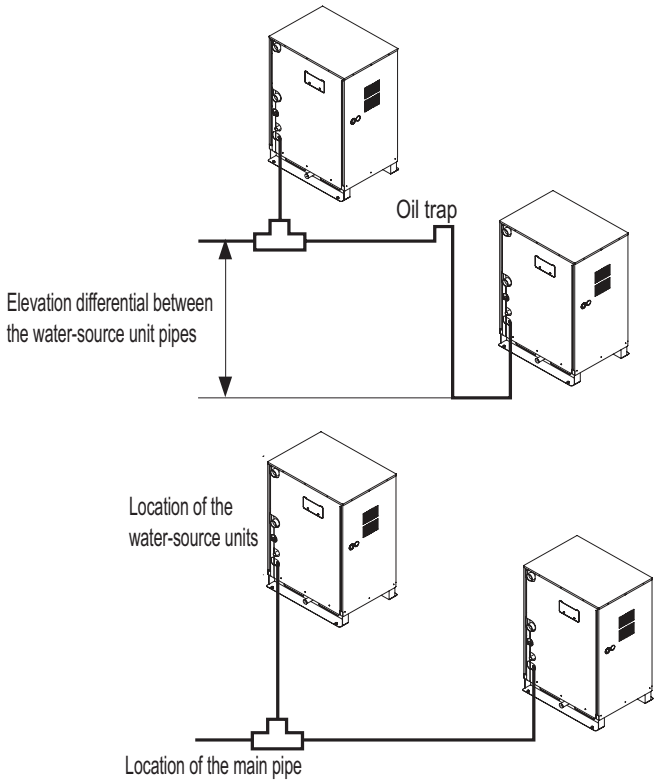
REFRIGERANT PIPING INSTALLATION

Installing an Oil Trap (Multi-frame Installations Only)

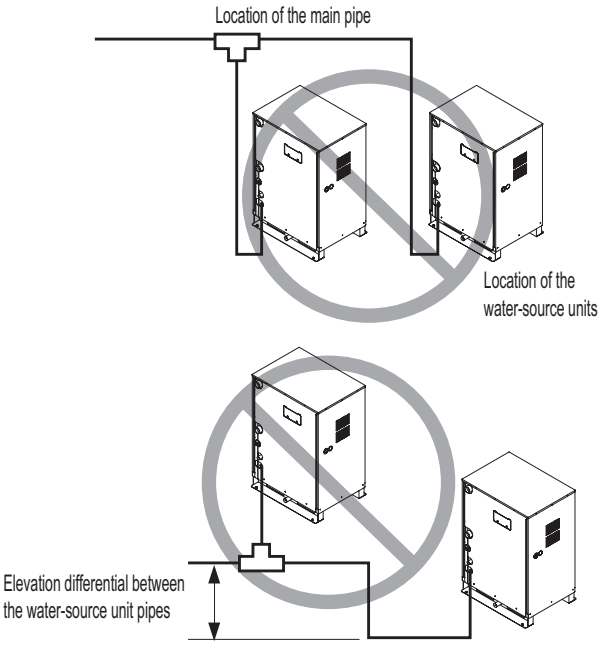
Examples of proper installation layouts.



Examples of incorrect installation

⚠ Note:

Installation layouts shown here may cause damage to the compressors. Do not use.



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⚠ Note:

Use the following specifications for refrigerant piping.

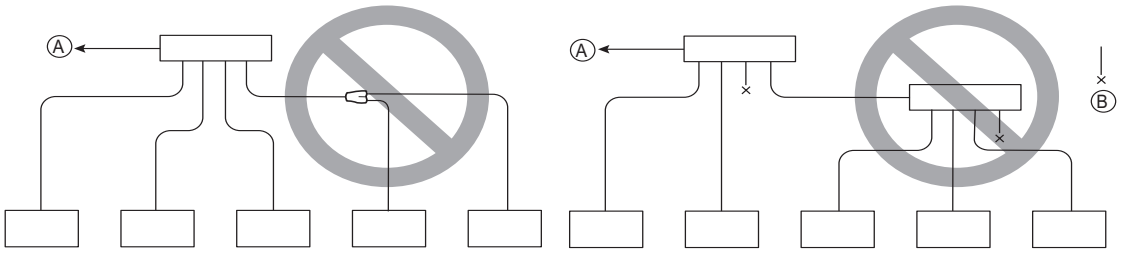
- *Material: Seamless phosphorous deoxidized copper pipe, ACR Type*
- *Wall thickness: Must comply with local and national regulations for a design pressure of 550 psi. See wall thickness recommendations below.*

Outside Diameter (inches)	*1/4*	*3/8*	*1/2*	*5/8*	*3/4*	*7/8*	*1*	*1-1/8*	*1-1/4*	*1-3/8*	*1-1/2*	*1-5/8*
Minimum thickness (inches)	*0.03*	*0.03*	*0.03*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.05*	*0.05*	*0.06*

- *Commercially available piping often contains dust and other materials. Always blow it clean with a dry inert gas.*
- *Use care to prevent dust, water or other contaminants from entering the piping during installation.*
- *Reduce the number of bends, and make the radii of the bends as large as possible.*
- *Always use Y-branches (with or without) headers as referenced below (sold separately).*

Y-branches ARWN Series Heat Pump	*Y-branches ARWB Series Heat Recovery*	*Headers (ARWN Series Heat Pump Systems Only)*		
		4 branch	*7 branch*	*10 branch*
ARBLN01621	*ARBLB01621*	*ARBL054*	*ARBL057*	*ARBL1010*
ARBLN03321	*ARBLB03321*			
ARBLN07121	*ARBLB07121*	*ARBL104*	*ARBL107*	*ARBL2010*
ARBLN14521	*ARBLB14521*			

- *If the diameters of the branch piping diameters differs from that of the designated refrigerant piping, use a pipe cutter to cut the specific section, and then use an adapter to connect.*
- *Always follow the restrictions on the refrigerant piping such as maximum length, elevation difference, and diameters. Failure to do so can result in a decline in heating/cooling performance or equipment malfunction.*
- *A second branch cannot be made after a header (Headers used in ARWN Series heat pump systems only).*



Ⓐ To water-source Unit
Ⓑ Brazed cap

- *In ARWB Series heat recovery systems, the refrigerant pipe diameter from the heat recovery control unit to the indoor unit is determined by indoor unit capacity. Heat recovery control unit ports are designed with flare connections to support large-capacity indoor units. It is permissible to cut, connect, and install a subsidiary flare connection to suit the pipe diameter of the indoor unit.*
- *The system will stop operation due to excessive or insufficient refrigerant, therefore, always charge the unit properly. When servicing, always refer to any notes about system piping length and additional refrigerant amounts.*
- *Never perform a pump down. A pump down will cause performance deterioration and will damage the compressor.*
- *Never use refrigerant to evacuate the system. Always evacuate using a vacuum pump.*
- *Always properly insulate the piping. Insufficient insulation will result in condensation forming, a decline in heating/cooling performance, and other problems.*
- *When connecting the refrigerant piping, make sure the service valves of the water-source unit are completely closed (factory setting). Do not operate the system until the refrigerant piping system has been completely connected, a refrigerant leak test has been performed, and the evacuation process has been completed.*
- *Always use a non-oxidizing material for brazing. Do not use flux. If the proper material is not used, oxidized film may accumulate and clog or damage the compressors. Flux can harm the copper piping or refrigerant oil.*
- *Do not expose the service valves of the water-source unit to heat, especially do not expose the packing material within the service port to heat. Protect the service valve with a wet towel during brazing.*

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REFRIGERANT PIPING INSTALLATION

MULTI V WATER IV

Refrigerant Piping Specifications

⚠ WARNING

- *Do not allow the refrigerant to leak during welding; when the refrigerant combusts, it generates a toxic gas.*
- *Do not weld in an enclosed location, and always test for gas leaks after welding.*

Refrigerant Piping Connections

1. Follow the pipe path. Do not excessively bend the pipe on one specific area on its length.
2. After forming the pipe, align the union fitting to the center of the pipe, and tighten with a wrench.
3. Connect the pipe to the service valve of the water-source unit.
4. After completing the piping work, check for gas leaks.
5. For flare nuts, always use a heavy-duty material that complies with standard recommendations.
6. After completing pipe connection, evacuate the indoor unit and the connecting pipe. During evacuation, both the vapor and liquid pipe service ports must be used.

Pipe Size (inches)	Tightening Torque (ft-lbs)
1/4Ø	13 ~ 18
3/8Ø	25 ~ 30
1/2Ø	40 ~ 48
5/8Ø	46 ~ 60
3/4Ø	73 ~ 89

⚠ Note:

Always tighten with the regulated torque using a torque wrench and a backup wrench.

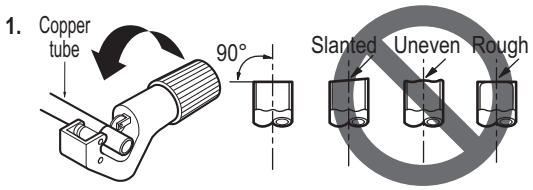
- *For the pipe connection, use the method of connecting the end of the pipe to the branch pipe. The refrigerant pipe from the water-source unit is branched out at the end and is individually connected to the indoor unit.*

Preparing the Refrigerant Piping

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

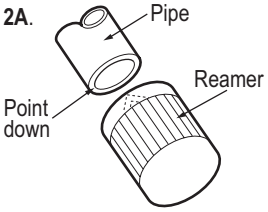
1. Cut the pipes and cable.

- Use the accessory piping kit or field-suppled pipes.
- Measure the distance between the indoor unit and the water-source unit.
- Cut the pipes a little longer than measured distance.

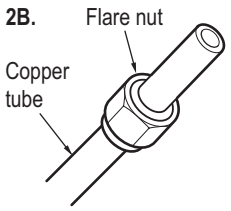


2A. Remove the burrs

- Completely remove all burrs from the cut cross-section of pipe.
- When removing the burrs, point the end of the copper pipe down to avoid adding foreign materials in the pipe.



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

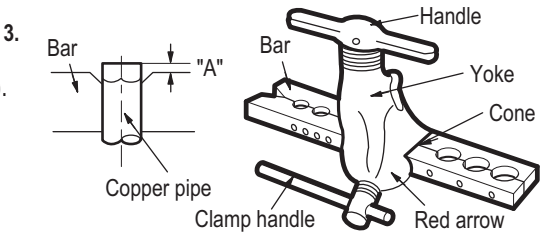


3. Flared connections

Use tool to finish flared connections as shown.

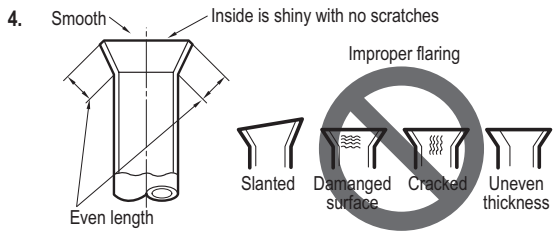
- Firmly hold the copper tube in a clamp, bar, or die, as indicated (see dimensions below).

Indoor unit (Btu/h)	Pipe		"A"	
	Vapor	Liquid	Vapor	Liquid
≤19,100	1/2	1/4	0.63 ~ 0.71	0.43 ~ 0.51
<54,600	5/8	3/8	0.63 ~ 0.71	0.59 ~ 0.67
≤76,400	3/4	3/8	0.75 ~ 0.83	0.59 ~ 0.67



4. Inspect the flared connections.

- Compare the flared connections to the figure (at right).
- If the flared connection is defective, cut it off and re-do procedure.
- Use a flaring tool with a clutched feature and a concentric cone.



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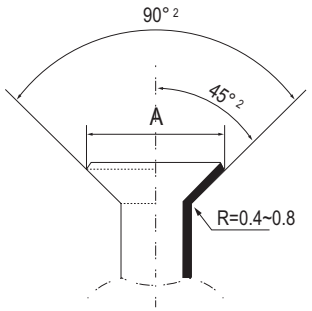
⚠CAUTION

- *See table below for dimensions of the flare and for tightening torque. Applying too much torque may cause the flares to crack.*
- *Always use a charge hose for service port connection.*

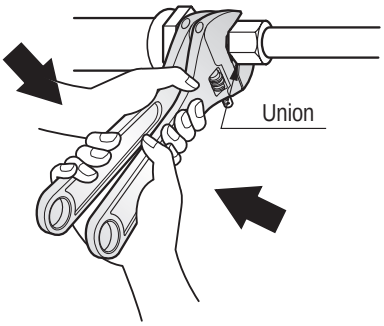
Dimensions of the Flare



Tightening Torque for Flare Nuts

Pipe size (inches)	Tightening torque (ft-lbs)	**Width of the flare (A [inches])**
3/8Ø	24.1 - 29.4	1/2
1/2Ø	36.5 - 44.5	5/8
5/8Ø	45.5 - 55.6	3/4

Tightening the Flare Nuts



Tightening the Flare Nuts

1. When connecting the flare nuts, coat the flare (inside and outside) with oil appropriate for R410A refrigerant (PVE).
2. Initially hand tighten the flare nuts using three (3) or four (4) turns.
3. To finish tightening the flare nuts, use both a torque wrench and a backup wrench.
4. After all the piping has been connected and the caps have been tightened, check for refrigerant gas leaks.

Loosening the Flare Nuts

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

Opening the Shut-off Valve

1. Remove the cap and turn the valve counterclockwise using a hexagon wrench until the shaft stops. When opening the shut-off valve, always use the specified tool and do not apply excessive force. If excessive force is applied, the valve body may break (the valve is not a backseat type).
2. Securely retighten the cap.

Closing the shut-off valve

1. Remove the cap and turn the valve clockwise with the hexagon wrench.
2. Securely tighten the valve until the shaft contacts the main body seal.
3. Securely retighten the cap. For tightening torque, refer to the table below.

Tightening Torque for Shut-off Valves

<table>
<tr><th rowspan="2">Shut-off valve size (inches)</th><th colspan="6">Tightening torque (ft-lbs) (Turn clockwise to close)</th></tr>
<tr><th colspan="2">Shaft (Valve body)</th><th>Cap (valve lid)</th><th>Service port</th><th>Flare nut</th><th>Vapor pipes attached to unit</th></tr>
<tr><td>1/4Ø</td><td rowspan="2">3.9 - 4.9</td><td rowspan="3">Hexagon wrench, 4mm</td><td rowspan="2">9.9 - 12.1</td><td rowspan="5">8.5 - 10.2</td><td>10.3</td><td rowspan="4">–</td></tr>
<tr><td>3/8Ø</td><td>24.3 - 28.7</td></tr>
<tr><td>1/2Ø</td><td>5.9 - 7.3</td><td>13 - 16</td><td>36 - 44</td></tr>
<tr><td>5/8Ø</td><td>9.9 - 12.1</td><td>Hexagon wrench, 6mm</td><td>16 - 19</td><td>45 - 55</td></tr>
<tr><td>7/8Ø</td><td rowspan="2">19.9 - 24.3</td><td rowspan="2">Hexagon wrench, 10mm</td><td rowspan="2">26 - 32</td><td rowspan="2">–</td></tr>
<tr><td>1Ø</td><td>16 - 20</td></tr>
</table>

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REFRIGERANT PIPING INSTALLATION

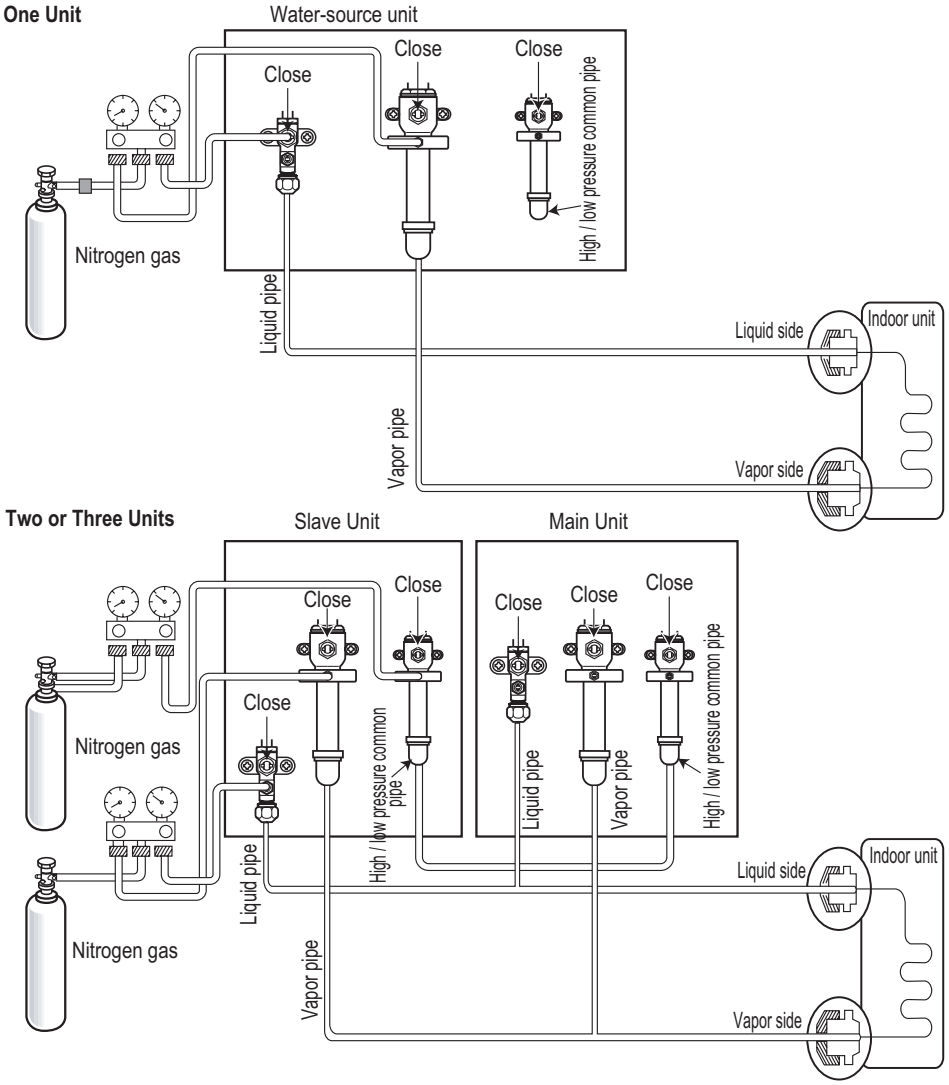
Leak Test for Heat Pump ARWN Series Systems

⚠ Note:

Indoor units must be OFF, and the system must be in Vacuum mode during the leak / pressure test.

Test for leaks by running pressurized nitrogen gas to 550 psig through the refrigerant system (see diagram below). The test must be performed with the service valves closed, and the low-pressure vapor pipe and liquid pipe must be pressurized simultaneously.

If the nitrogen gas pressure does not drop for 24 hours, the system passes the test. If the pressure drops, a leak is present somewhere in the system.



⚠ Note:

If the ambient temperature changed between the time when pressure was applied and when the pressure drop was checked, adjust results by factoring in approximately 1.45 psi for each 2°F of temperature difference.

Correction formula = (Temperature when pressure was applied - Temperature when pressure drop was checked) x 0.01.

Example: When pressure (550 psig) was applied, temperature was 80.6°F; 24 hours later when pressure drop (540 psi) was checked, temperature was 68°F. Thus, 80.6 - 68 x 0.01 = 0.126. In this case, the pressure drop of 0.126 was due to temperature difference, therefore, there is no leak in the refrigerant piping system.

⚠CAUTION

During pressurization, the nitrogen gas cylinder must be positioned vertically to prevent the nitrogen from entering the refrigeration system in its liquid state. Do not lay the nitrogen cylinder on its side.

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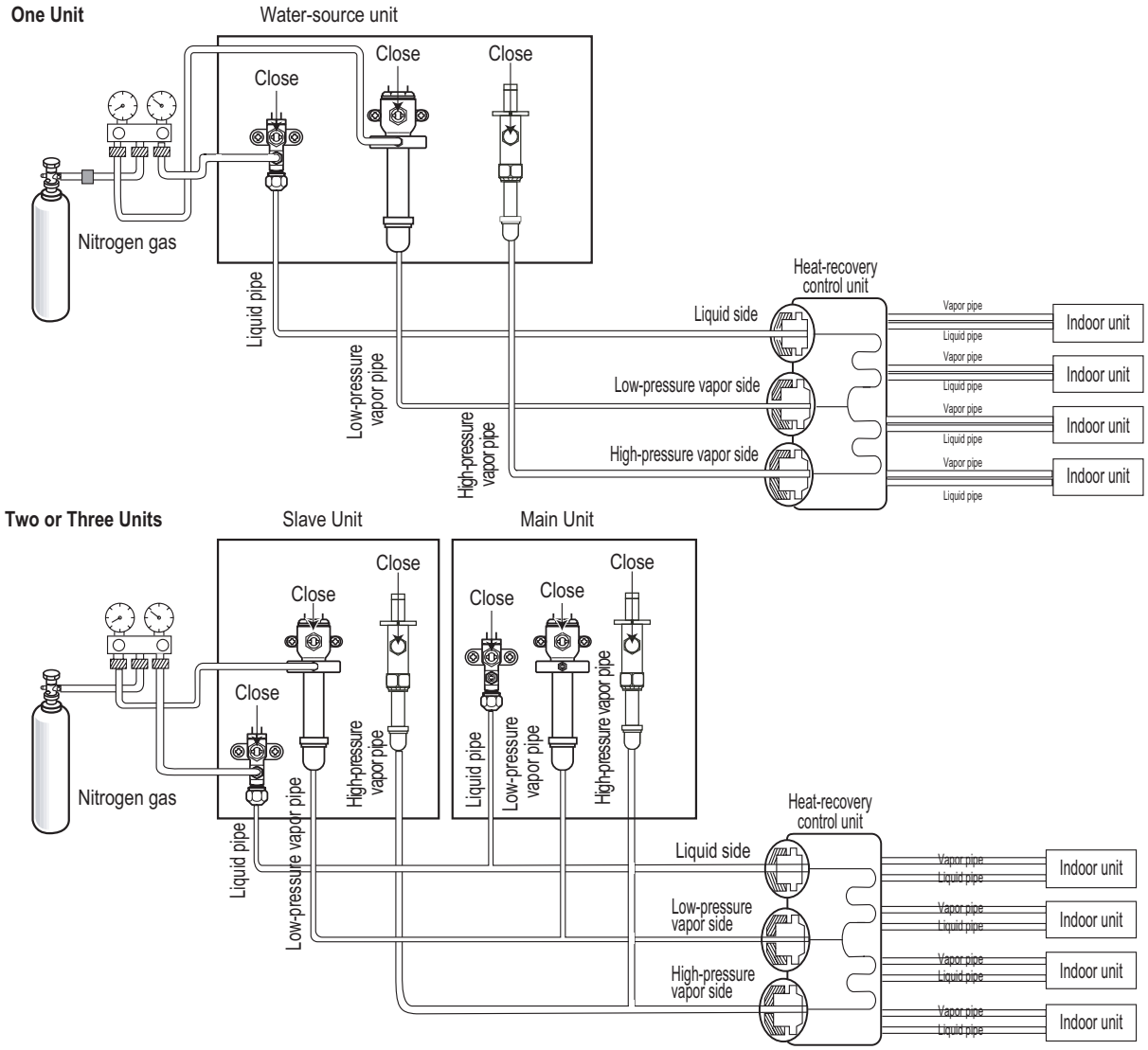
⚠ Note:

Indoor units and heat-recovery control units must be OFF, and the system must be in Vacuum mode during the leak / pressure test.

Test for leaks by running pressurized nitrogen gas to 550 psig through the refrigerant system (see diagram below). The test must be performed with the service valves closed, and the low-pressure vapor pipe and liquid pipe must be pressurized simultaneously.

If the nitrogen gas pressure does not drop for 24 hours, the system passes the test. If the pressure drops, a leak is present somewhere in the system.



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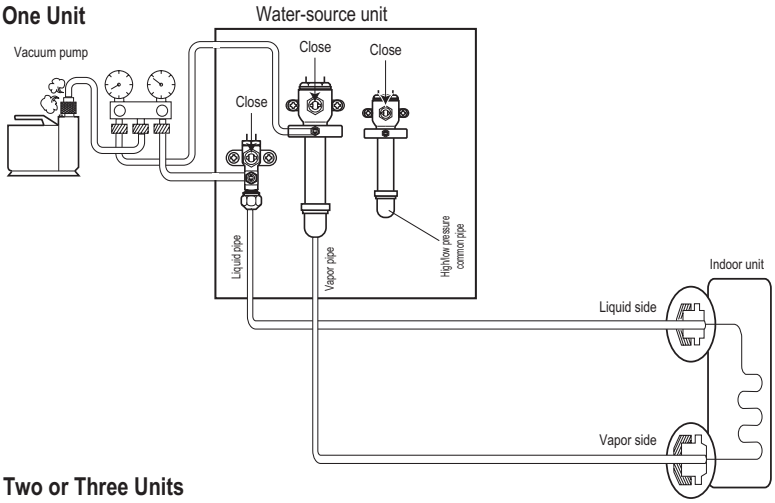
REFRIGERANT PIPING INSTALLATION

Vacuum for Heat Pump ARWN Series Systems

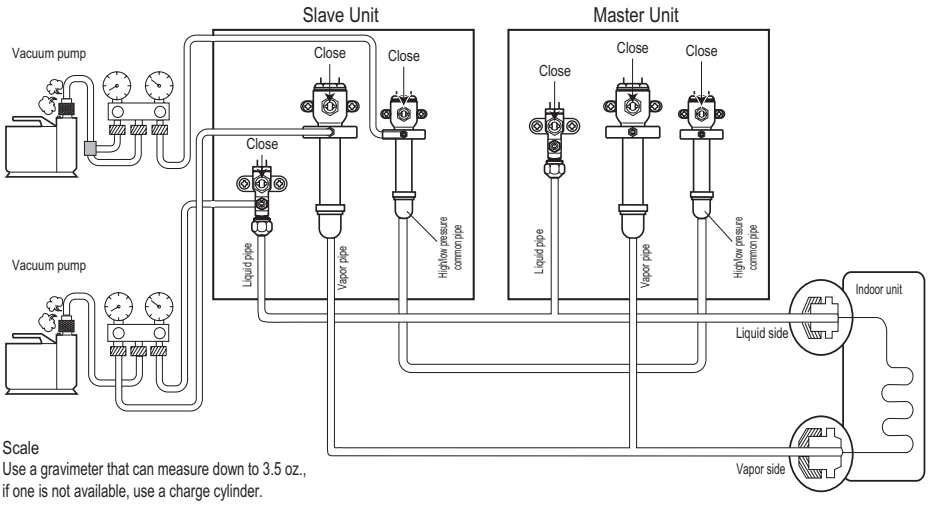
Vacuum the refrigerant piping system by connecting the vacuum pump to the service ports for the liquid pipes and the vapor pipes on the water-source unit. Use a vacuum pump with a gauge that can evacuate to 500 microns, and vacuum with the service port valve closed. Never air purge with refrigerant.

1. Evacuate the system for two (2) hours, bringing the system up to 500 microns. After maintaining the system to 500 microns for more than one (1) hour, confirm that pressure has risen. If not, there may be moisture or a leak somewhere in the refrigerant piping system.
2. If the system has been evacuated for more than two (2) hours and it is suspected that moisture may be present (rainwater may have entered the piping if installation look a long time to complete, or if work occurred during a rainy season), pressurize to 14 psi (vacuum break) with nitrogen gas, and then vacuum again for one (1) hour to 500 microns. If the system cannot be evacuated to 500 microns within two (2) hours, repeat vacuum break. After maintaining the system in vacuum for one (1) hour, check to the vacuum gauge to see if pressure has risen.

One Unit



Two or Three Units



Scale
Use a gravimeter that can measure down to 3.5 oz., if one is not available, use a charge cylinder.

Vacuum for ≥3 hours after the pressure falls to <500 microns.

⚠ Note:

Always add the correct amount of additional refrigerant charge. Too much or too little refrigerant will cause the system to malfunction.
To use vacuum mode: If the vacuum mode is set, all valves of the indoor units and water-source units will be opened.

⚠CAUTION

When installing or moving the air conditioner to another site, recharge only after perfect evacuation. If a different refrigerant or air is mixed with the original refrigerant, the refrigerant cycle may malfunction and the unit may be damaged.

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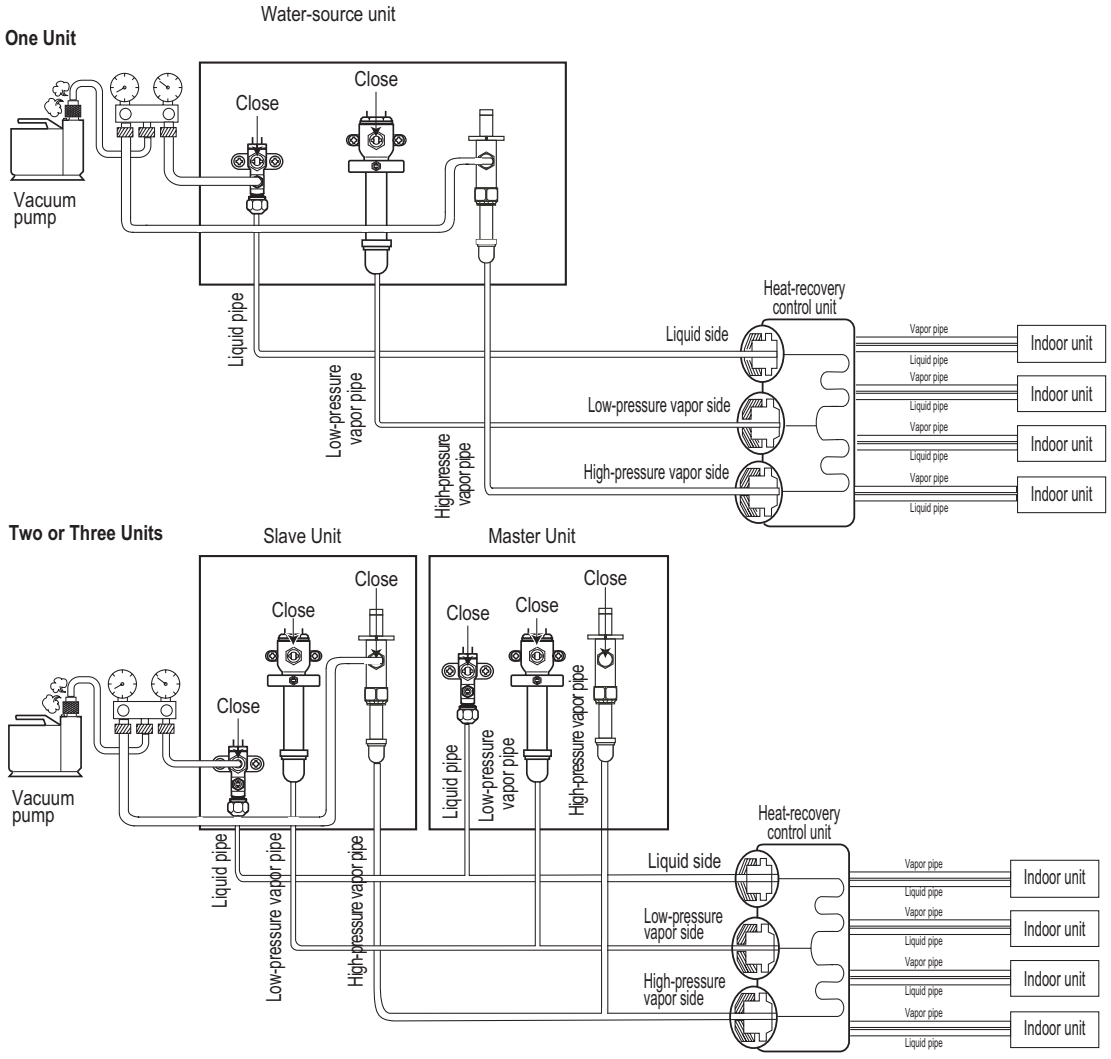
REFRIGERANT PIPING INSTALLATION

Vacuum for Heat Recovery ARWB Series Systems

Vacuum the refrigerant piping system by connecting the vacuum pump to the service ports for the liquid pipes and the high-pressure vapor pipes on the water-source unit (the low-pressure vapor pipe is included in the vacuum procedure through the heat recovery unit). Use a vacuum pump with a gauge that can evacuate to 500 microns, and vacuum with the service port valve closed. Never air purge with refrigerant.

1. Evacuate the system for two (2) hours, bringing the system up to 500 microns. After maintaining the system to 500 microns for more than one (1) hour, confirm that pressure has risen. If not, there may be moisture or a leak somewhere in the refrigerant piping system.
2. If the system has been evacuated for more than two (2) hours and it is suspected that moisture may be present (rainwater may have entered the piping if installation look a long time to complete, or if work occurred during a rainy season), pressurize to 14 psi (vacuum break) with nitrogen gas, and then vacuum again for one (1) hour to 500 microns. If the system cannot be evacuated to 500 microns within two (2) hours, repeat vacuum break. After maintaining the system in vacuum for one (1) hour, check to the vacuum gauge to see if pressure has risen.



⚠ Note:

Always use the calculated trim charge found in the in the LATS Multi V report. Too much or too little refrigerant will cause the system to malfunction. To use vacuum mode: If the vacuum mode is set, all valves of the indoor units and water-source units will be opened.

⚠CAUTION

When installing or moving the air conditioner to another site, recharge only after perfect evacuation. If a different refrigerant or air is mixed with the original refrigerant, the refrigerant cycle may malfunction and the unit may be damaged.

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REFRIGERANT PIPING INSTALLATION

Calculating Refrigerant Charge

⚠ Note:

Diameter and piping length must also be considered when calculating any additional refrigerant charge.

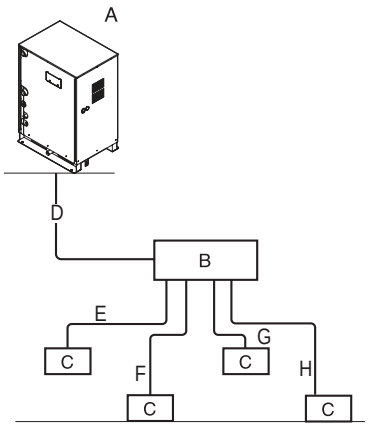
A	Unit charge (lbs)	
B	Additional charge (lbs)	
=	Total liquid pipe (ft): Ø7/8 inches	x 0.237 lbs/ft
+	Total liquid pipe (ft): Ø3/4 inches	x 0.178 lbs/ft
+	Total liquid pipe (ft): Ø5/8 inches	x 0.116 lbs/ft
+	Total liquid pipe (ft): Ø1/2 inches	x 0.079 lbs/ft
+	Total liquid pipe (ft): Ø3/8 inches	x 0.041 lbs/ft
+	Total liquid pipe (ft): Ø1/4 inches	x 0.015 lbs/ft
+	Correction Factor (lbs)*	*CF: 6, 8 ton Units - 3.3 lbs 12, 16 ton Units - 6.6 lbs
	Total amount (lbs)	= A + B

If the calculation results in a negative number, refrigerant does not need to be added.

Example: 8 ton unit

A Water-source unit
B Heat-recovery control unit (HR)
C Indoor unit

D: Ø3/8, 164 feet
E: Ø3/8, 33 feet
F: Ø3/8, 33 feet
G: Ø3/8, 33 feet
H: Ø1/4, 33 feet



Additional Charge = A x 0.041 + B x 0.041 + C x 0.041 + D x 0.041 + E x 0.015 + HR + CF
= 164 x 0.041 + 33 x 0.041 + 33 x 0.041 + 33 x 0.041 + 33 x 0.015 + 1.1 (HR) + 3.3 (CF)
= 15.7 lbs

Special Conditions

If more than 50% of the connected indoor units are CST TE, TQ, and SE models, and the total number of connected indoor units are more than 50% of the maximum allowable number of connected indoor units, then see formula below.

Total amount (lbs) = A + B + C

Additional refrigerant charging amount (lbs): C
= (A x α+ B x ß) - (AVG x ß)

A = Total No. of TQ and SE Indoor units, α= 0.5
B = Total No. of indoor units except TQ and SE Indoor units, ß = 0.3
AVG = 50% of maximum allowable number of connected indoor units

Example:

1. Installation information
- Water-source unit: 8 ton
- Total indoor units: six (6) units (TQ: three [3] units, SE: two [2] units, BH: one [1] unit)

2. Information from manufacturer
- Maximum allowable number of connected indoor units: 16
- Calculated additional refrigerant amount = 4.41 lbs: B

3. Indoor refrigerant charge amount
= (5 units x 0.5 + 1 unit x 0.3) - (8 units x 0.3) = 0.88 lbs: C
Revised total additional refrigerant charge = B + C = 4.41 lbs + 0.88 lbs = 5.29 lbs

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⚠ Note:

Fill in the f-gas label on the water-source unit about the quantity of the fluorinated greenhouse gases.

1. Manufacturing site (See Model Name label)

2. Installation site (If possible, place next to the service ports for reference when adding or removing refrigerant during service or maintenance)

3. Total refrigerant charge (include any additional amount)

⚠ WARNING

Refrigerant leakage regulations

For occupant safety, and per ASHRAE Standards 15 and 34, the amount of refrigerant leakage should be no greater than:

$$\frac{\text{Total amount of refrigerant in the system}}{\text{Room volume in which the smallest capacity indoor unit is installed}} \leq 0.025\ \text{lb./ft.}^3$$

After applying the formula to a specific project, if the refrigerant leakage amount is greater than the recommended amount, then apply options below:

1. Create an opening between rooms: Add a transom, a door undercut, or some other type of access hole with 0.15% space below or above that opens one room up to another.

2. Double check water-source unit capacity and system piping length. Change the physical location of the water-source unit and shorten the refrigerant piping length to reduce the system refrigerant charge amount, or switch from one larger water-source unit to several smaller water-source units to reduce the refrigerant charge amount per unit (Example: From one 16-ton unit to two 8-ton units).

3. Reduce the amount of refrigerant when the calculated value exceeds 0.025 lb./ft^3.

4. Install gas-detection alarms.

5. Add a ventilation system to prevent refrigerant density from increasing when a leak occurs. Two types of ventilations are available—external air inflow or exhaust. External air inflow ventilation is recommended due to the characteristics of the refrigerant. Ventilation system operation should continuous, and should function separately from air-conditioner and indoor unit operation. If it is impossible to continuously operate the ventilation system, install a gas-detection sensor, and design the system so when a refrigerant leak occurs, the ventilation system begins automatically.

6. Limit piping work to take into consideration for earthquake and thermal stress.

⚠ Note:

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

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REFRIGERANT PIPING INSTALLATION

Insulating the Refrigerant Piping

Insulate liquid pipes and gas pipes separately with enough heat-resistant polyethylene so that there is no gap in the joint between the indoor unit and the insulation material. Local codes shall be followed in determining insulation thickness and type, and take precedence over what is presented in this manual.

If the pipes aren't insulated properly, condensation could form, etc. Pay special attention to insulating the pipes installed in the ceiling plenum.

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

⚠ Note:

Follow locals codes when selecting EPDM insulation wall thickness.

Classification		Air-conditioned location		Non-air conditioned location	
		1. Typical location	2. Special location	3. Typical location	4. Substandard location
Liquid pipe	1/4 inches	3/8 inches	3/8 inches	3/8 inches	3/8 inches
	3/8 inches				
	1/2 inches	1/2 inches	1/2 inches	1/2 inches	1/2 inches
Vapor pipe	3/8 inches	1/2 inches	3/4 inches	3/4 inches	1 inches
	1/2 inches				
	5/8 inches				
	3/4 inches				
	7/8 inches				
	1 inch				
	1-1/8 inches	3/4 inches	1 inches	1 inches	
	1-1/4 inches				
	1-3/8 inches				
	1-1/2 inches				
	1-3/4 inches				

1. Typical location: When the piping passes through an indoor area where the indoor unit operates.

- Apartment, classroom, office, mall, hospital, etc.

2. Special location

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

3. Typical location: When the piping passes through an indoor area where the indoor unit does not operate.

- Hallway or a dormitory or school, etc.

4. Substandard condition: If conditions 1 and 2 below are present.

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

- If the water-source unit is installed at a location subject to freezing, insulation must be at minimum 1/2 inch.
- If unsure on how to select the insulation material, contact an LG representative.
- The thickness of the above insulation material is based on heat conductivity of 0.61 Btu/in/h/ft^2/°F.

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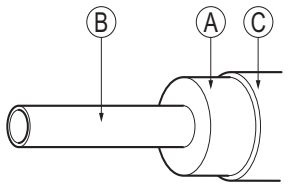
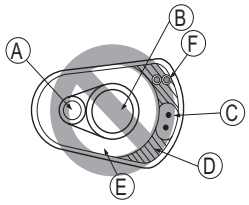
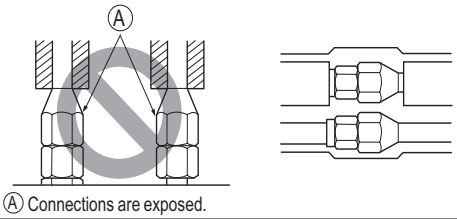
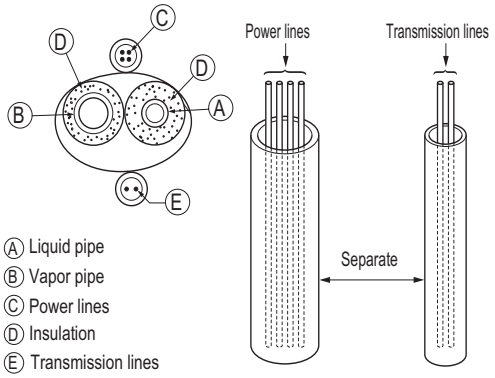
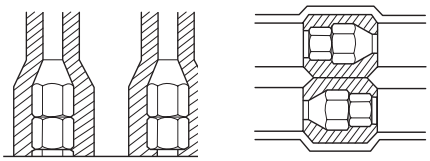


Ⓐ Insulation
Ⓑ Pipe
Ⓒ Outer cover (cover the insulation completely with finishing tape.)

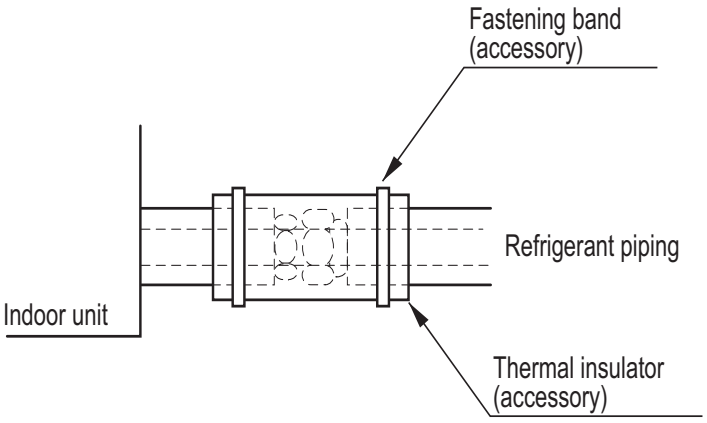
Insulation	Adhesive + Heat-resistant polyethylene foam + Adhesive tape	
Outer cover	Indoor	Vinyl tape
	Floor exposed	Waterproof hemp cloth + Bronze asphalt
	Outside	Waterproof hemp cloth + Zinc plate + Oily paint

⚠ Note:
Asphalt is not required if polyethylene is used as the outer cover.

Bad insulation work	• Do not insulate the vapor or low pressure pipe and liquid or high pressure pipe together.  Ⓐ Liquid pipe Ⓑ Vapor pipe Ⓒ Power lines Ⓓ Finishing tape Ⓔ Insulation Ⓕ Transmission lines	• Fully insulate the connections.  Ⓐ Connections are exposed.
Good insulation work	 Ⓐ Liquid pipe Ⓑ Vapor pipe Ⓒ Power lines Ⓓ Insulation Ⓔ Transmission lines	

1. Use insulation material that has high heat-resistance properties (more than 248°F).

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



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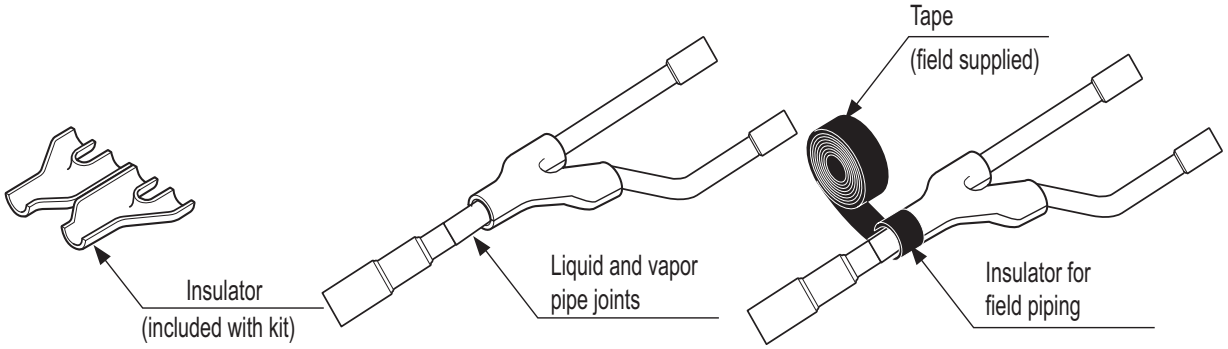
REFRIGERANT PIPING INSTALLATION

Insulating the Y-branches and Headers

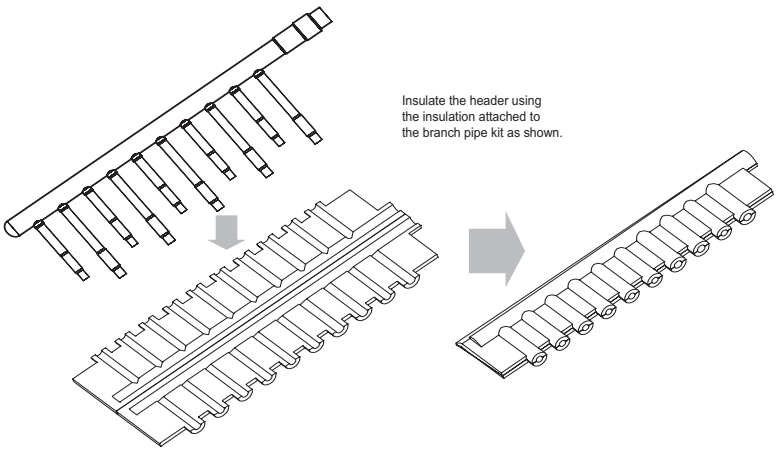
Insulating the Y-branches (Heat Pump ARWN Series and Heat Recovery ARWB Series)

Insulate the branch pipe using the insulator included in each kit.

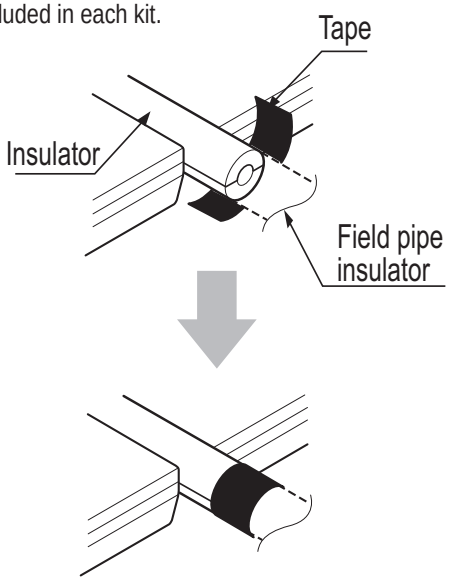


Insulating the Headers (Heat Pump ARWN Series Only)

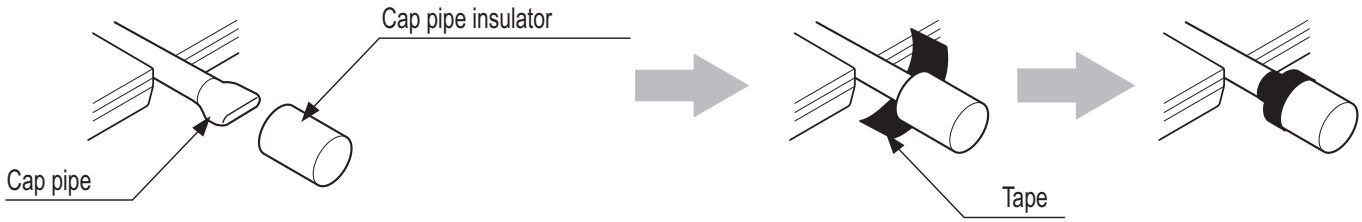
Insulate the header using the insulator included in each kit.



Joints between branch and pipe should be sealed with tape included in each kit.



Cap pipes should be insulated using the insulator included in each kit, and then taped as shown.



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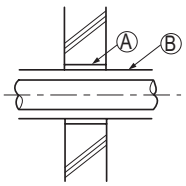
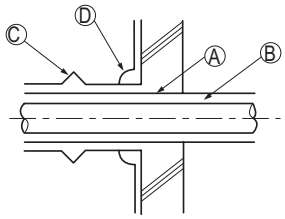
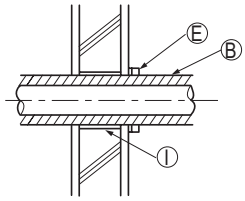
Inside wall (concealed)



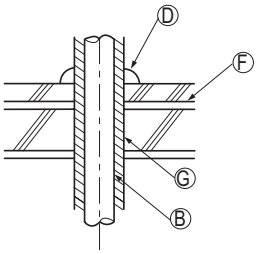
Outside wall



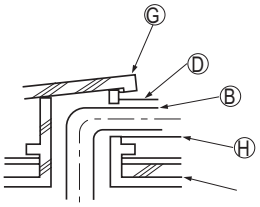
Outside wall (exposed)



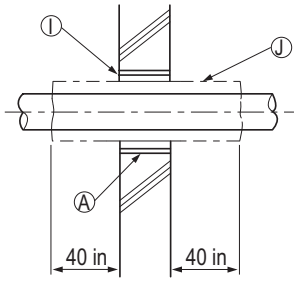
Floor (fire-resistance)



Roof pipe shaft



Area between fire-resistant insulation and boundary wall



Ⓐ Sleeve
Ⓑ Insulation
Ⓒ Lagging
Ⓓ Caulk
Ⓔ Band
Ⓕ Water-resistant layer
Ⓖ Sleeve with edge
Ⓗ Lagging
Ⓘ Mortar or other fire-resistant caulk
Ⓙ Fire-resistant insulation

When filling an access hole with mortar, cover the area with steel plate so that the insulation will not fall through. For this area, use fire-resistant materials for both the insulation and cover. (Vinyl cover should not be used.)

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Water Loop Design

Design Steps

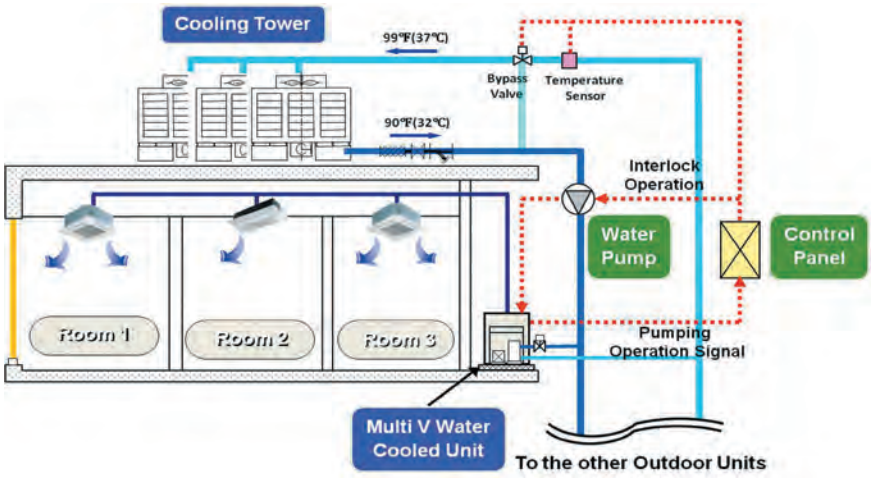
The Multi V water cooled unit will require a water cooling/heating source. This year round heating and cooling system will utilize a two (2) pipe closed loop water circuit which circulates water continuously and maintains water temperature between 50°F and 113°F for cooling mode, 23°F and 113°F for heating mode. See capacity tables for performance at different entering water temperatures. At the high end of this temperature range, heat is rejected through a cooling tower (dry cooler or geothermal well), while at the low end of the temperature range an auxiliary heat source like a boiler, solar panel, or geothermal well adds heat.

Piping, pumps, and accessories shall be sized to provide adequate water flow to the water cooled unit based on nominal flow rates listed per model number.

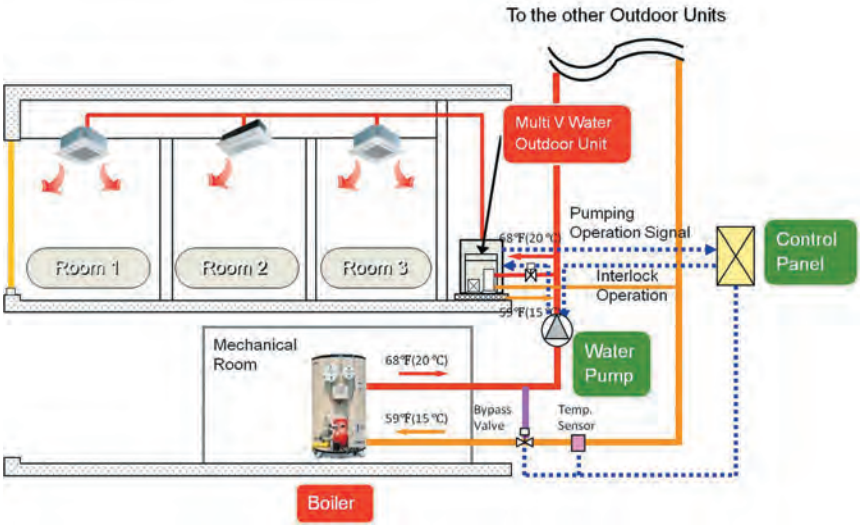
Design Schematic

The Multi V water cooled 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 cooled 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.

Cooling Cycle Diagram



Heating Cycle Diagram



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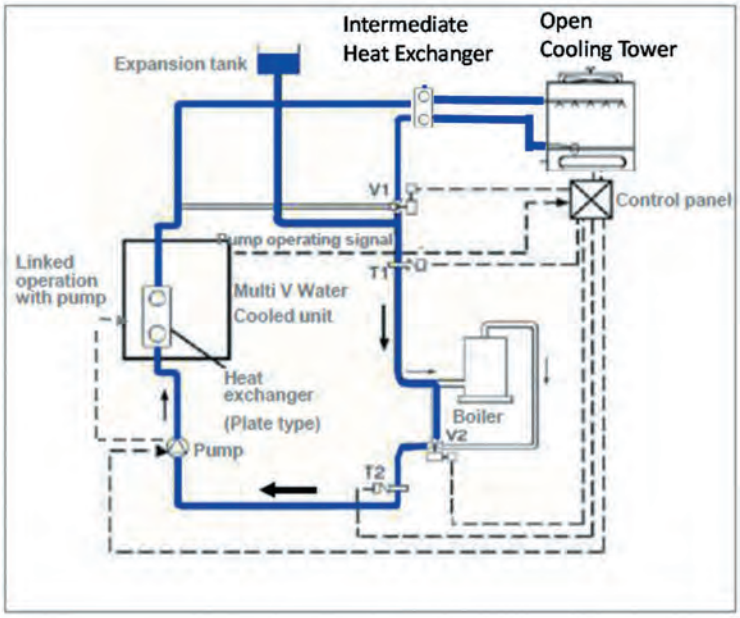
WATER CIRCUIT INSTALLATION

Water Circuit Design

Open Tower 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 and contraction of water in the loop as the temperature changes.

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
- Ground source heat
- Steam heat from remote central plant
- In order to deal with thermal flux of the system, if floor space is allowed, a heat storage tank can be installed. The heat storage tank can store surplus heat or store heat at nighttime when electric rates are lower. Closed type storage tanks are recommended to prevent contamination of the water system.

Geothermal Water Circuit Design

In lieu of a cooling tower / boiler, Multi V Water II heat pump and Multi V Water II heat recovery units require a geothermal system that is properly sized to match the water cooled unit capacity. This year round heating and cooling system will utilize a two (2) pipe closed loop water circuit that circulates water continuously, maintaining water temperatures between 23°F and 113°F for heating, 50°F and 113°F for cooling. When Multi V Water II is in cooling mode, heat is rejected to the geothermal system. When Multi V Water II is in heating mode, heat is absorbed from the geothermal system. A Multi V Water II heat recovery system is capable of simultaneous heating and cooling.

Multi V Water II units have factory installed stainless steel plate heat exchangers. In order to protect these heat exchangers, it is recommended to use closed geothermal water loops. Should open geothermal systems be used, an intermediate heat exchanger should be installed to isolate Multi V Water II from contaminants in the water system. Open geothermal loops may contain minerals, biological contaminants, corrosive agents, or other substances which can cause scale, fouling or corrosion, that could degrade performance or shorten the life of the heat exchanger and unit.

Antifreeze can be used for all geothermal applications. Refer to antifreeze information on page 112 for recommended levels of antifreeze and correction factors.

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WATER CIRCUIT INSTALLATION

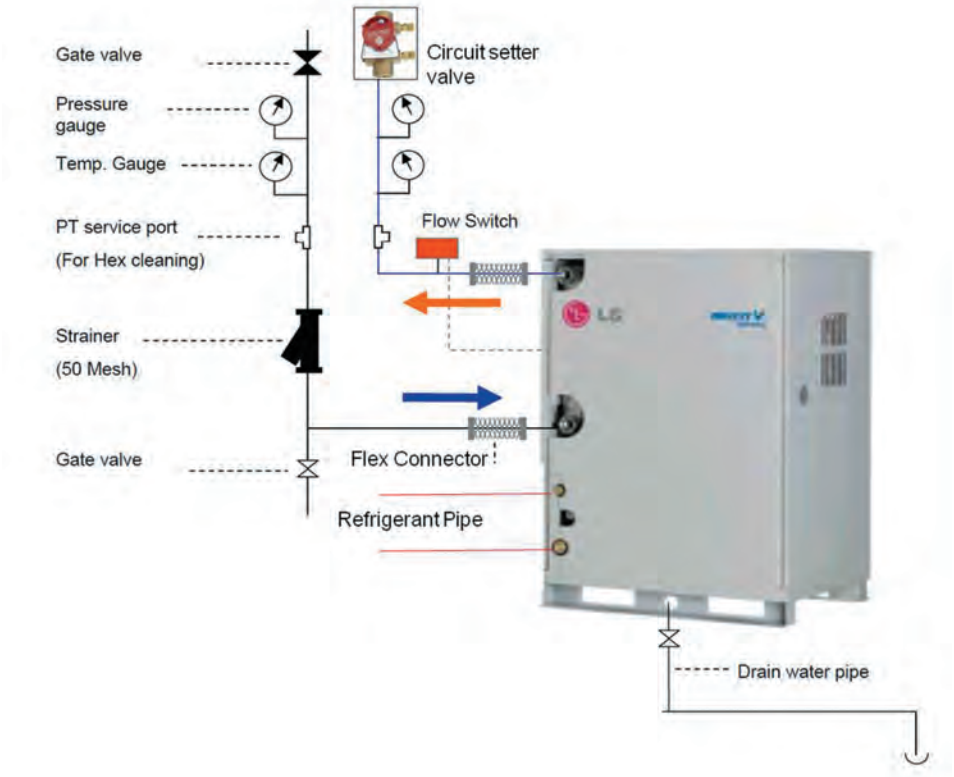
Piping System Specifications

Piping System

As shown on the "Typical connections for water-cooled units" diagram below, the following components should be installed at each Multi V water cooled unit (field supplied):

- Strainer with minimum 50 mesh screen at inlet. The mesh screen should be cleaned twenty-four (24) hours after startup, and then cleaned regularly to prevent water flow blockage.
- Pressure gauges at inlet and outlet.
- Thermometers at inlet and outlet.
- Flexible connectors at inlet and outlet.
- Flow switch should be installed at outlet in the horizontal pipe. Flow switch should be wired to communication terminals and should be set to shut the unit off if flow falls below 50% of unit design flow. Must use normally closed type flow switch. Flow switch must be installed within at least five (5) pipe diameters downstream and at least three (3) pipe diameters upstream of elbows, valves, reducers which can cause turbulence and lead to flow switch flutter.
- Shutoff valves at the inlet and outlet to permit service of the unit.
- Condensate drain trap shall be designed per local code.
- Service port with hose connections at inlet and outlet. These are used to flush the water cooled unit heat exchanger when isolated from the water loop system.
- Circuit setter, flow control valve, or balancing valve is suggested to be installed to regulate proper water flow to each water cooled unit.
- Inhibitors should be used in the water loop, especially if water temperature operates above 104°F.
- Maintain water quality requirements.

Typical connections for water cooled units (all components shown here are field-supplied)



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WATER CIRCUIT INSTALLATION

Piping System Specifications

Freeze Protection

The piping system shall be protected from freezing during winter conditions. Heating mode of the water cooled unit will reduce water loop temperature and methods should be taken to prevent freezing of the loop water. In applications with leaving water temperatures below 40°F, freeze protection should be considered. Use of ethylene glycol, propylene glycol, or methanol is acceptable. Manufacturers recommended levels of concentration should be followed.

The addition of antifreeze may lower the performance of the water cooled unit due to reduced heat transfer and added pressure drop. Find the corresponding correction factor from table below and multiply by the water cooled unit capacity to find the net water cooled unit capacity. Also apply the corresponding pressure drop correction factor from table below and multiply by the water cooled unit pressure drop to find the net water cooled unit pressure drop.

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	0.995	0.979	0.974
	Pressure Drop	1.023	1.057	1.091	1.122	1.160
Ethylene 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 cooled unit. The water should be tested and treated using a local water treatment professional. The following levels should be maintained:

	Closed Type System		Effect	
	Circulating Water	Supplemented Water	Corrosion[1]	Scale[1]
Basic Item				
pH (77°F)	7.0 ~ 8.0	7.0 ~ 8.0	●	●
Conductivity (77°F) mS/m	Below 30	Below 30	●	●
Chlorine ions (mg Cl^-/ℓ)	Below 50	Below 50	●	
Sulfate ions (mg SO_4^{2}/ℓ)	Below 50	Below 50	●	●
Acid consumption (pH4.8) (mg$CaCO_3$/ℓ)	Below 50	Below 50		●
Total Hardness (mg $CaCO_3$/ℓ)	Below 70	Below 70		●
Calcium Hardness (mg $CaCO_3$/ℓ)	Below 50	Below 50		●
Ionic-static silica (mg SiO_2/ℓ)	Below 30	Below 30		●
Reference Item				
Iron (mg Fe/ℓ)	Below 1.0	Below 0.3	●	●
Copper (mg Cu/ℓ)	Below 1.0	Below 0.1	●	
Sulfate ion (mg SO_4^{2}/ℓ)	Must not be detected	Must not be detected	●	
Ammonium ion (mg NH_4^+)ℓ	Below 0.3	Below 0.1	●	
Residual chlorine (mg Cl/ℓ)	Below 0.25	Below 0.3	●	
Free carbon dioxide (mg CO_2/ℓ)	Below 0.4	Below 4.0	●	
Stability index			●	●

[1]The "●" mark for corrosion and scale means that there is a possibility of occurrence.

⚠ Note:

- *Inhibitors should be used in the water loop, especially if water temperature operates above 104°F.*
- *Air shall be purged from the system.*

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Pipe Insulation

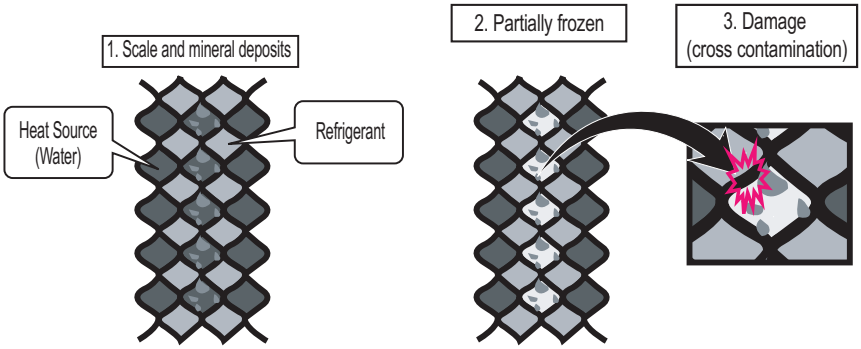
- Water pipe insulation is suggested in the following conditions:
- Water pipe subject to freezing
- Water pipe where water can condense on surface of pipe from ambient room temperatures higher than temperature of water in the pipe. If water temperature is maintained at 68°F in winter and 86°F in summer,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

Device Protection Details

Strainer on water pipe

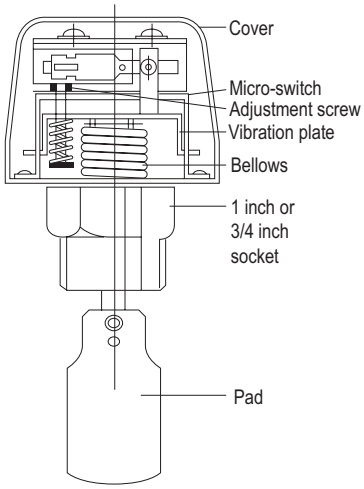
To protect the water-source unit, a strainer with ≥50 mesh must be installed on the water-source unit inlet piping. If not installed, the heat exchanger can be damaged by particles in the water supply.

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 220V and be a normally open 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%; Reference flow rate: 6-ton - 21.1 gpm, 8-ton - 25.4 gpm, 12-ton - 42.2 gpm, 16-ton - 50.8 gpm.)
- Select a flow switch following the pressure specification of the water supply system.



⚠ 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.)*

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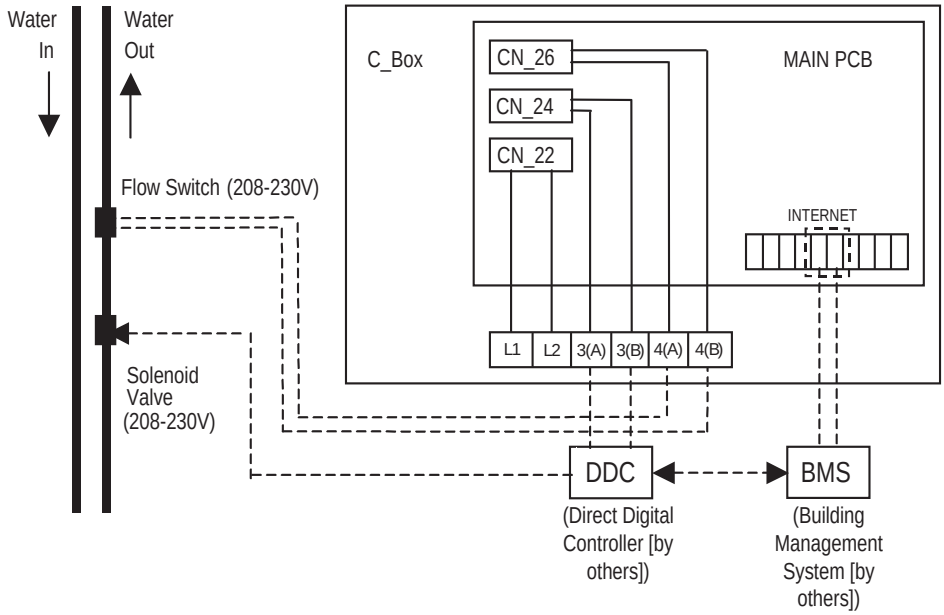
WATER CIRCUIT INSTALLATION

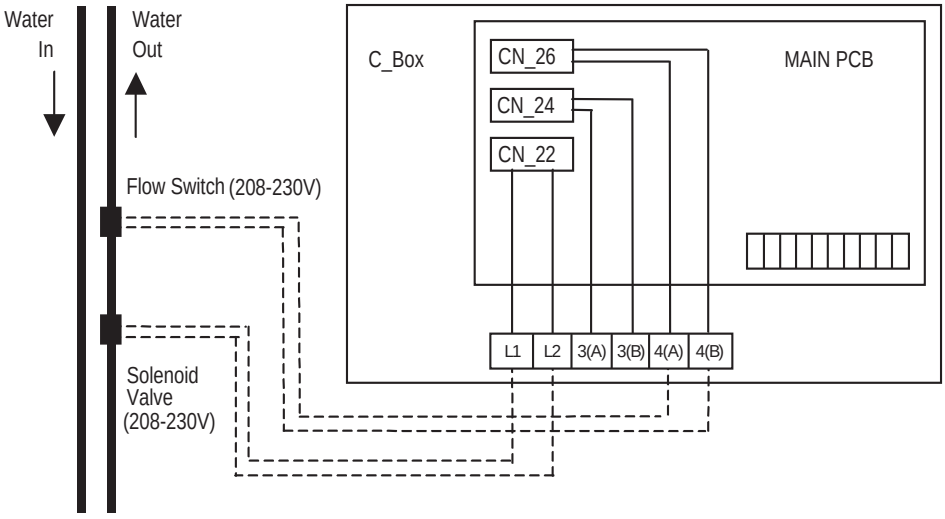
Flow Switches and Solenoid Valves

See diagrams below for suggested flow switch wiring. Also shown is wiring for solenoid valves (optional) to turn water flow on / off to the unit.

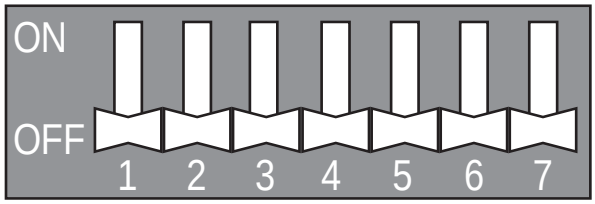
Central control (Use DDC port)

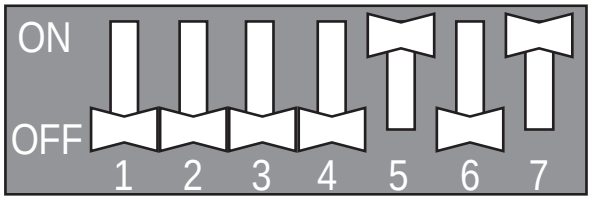


Individual control (Use 208/230V outport)



Set the dip switch as below and turn on the power for individual water solenoid valve control.





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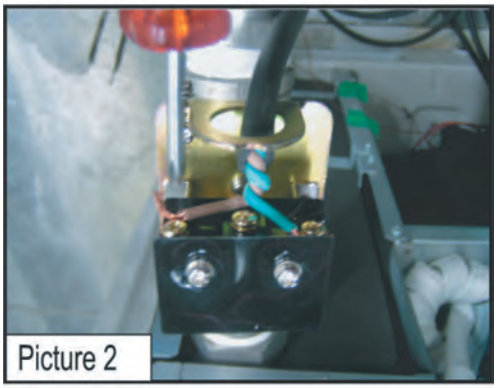
WATER CIRCUIT INSTALLATION

Flow Switches and Solenoid Valves

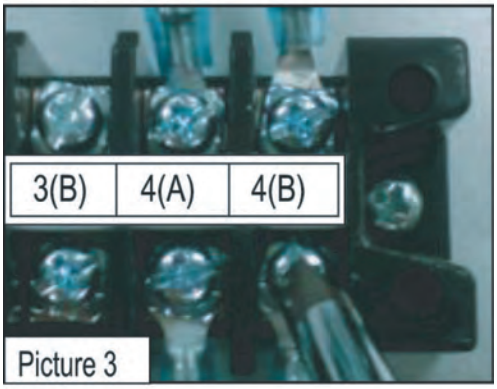
- The flow switch must be installed at the horizontal pipe of the water-source unit's heat water-supply outlet. Verify the direction of the water flow before installation. (Picture 1)
- Remove the jumper wire and connect to the communication terminals (4[A] and 4[B]) of the water-source unit's control 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%.
  Reference flow rate: 6-ton - 21.1 gpm, 8-ton - 25.4 gpm, 12-ton - 42.2 gpm, 16-ton - 50.8 gpm.


Picture 1


Picture 2

⚠ Note:

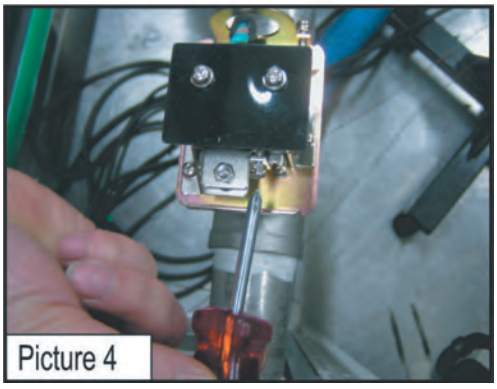
- *If the product operates while the flow switch contact point is out of the permitted range, it can result in performance deterioration or system failure.*
- *A normally open type of flow switch must be used.*



Picture 3

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 220V, and shall be wired to terminals L1 and L2 on the water-source unit PCB.


Picture 4

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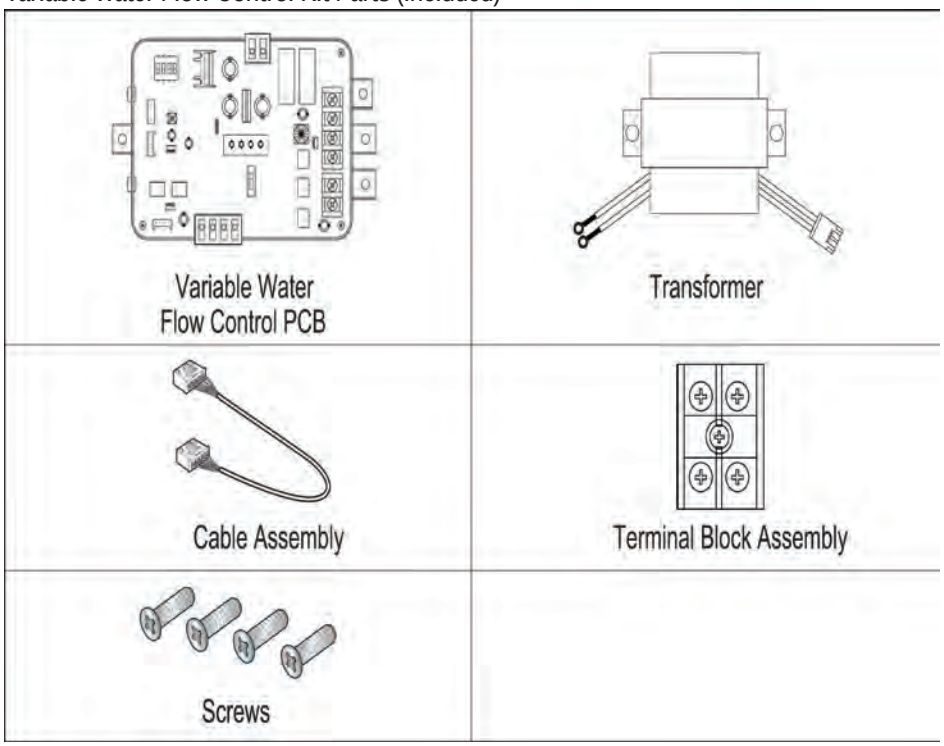
WATER CIRCUIT INSTALLATION

Variable Water Flow Control Kit

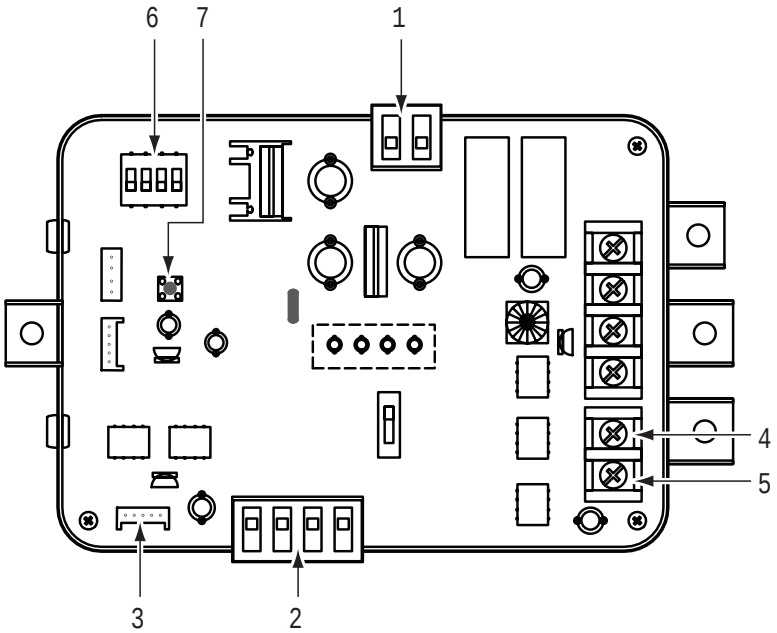
Variable Water Flow Control Kit allows connection of Multi V Water units to a variable pumping condenser water systems. The control board, transformer, and wiring provide connections to a field-supplied modulating water valve.

Variable Water Flow Control Kit Parts (included)



Variable Water Flow Control Kit PCB

1. CN_PWR: Power input terminal (DC 12V)
2. CN_AO: Signal output terminal to control a water flow control valve (DC 0~10V)
3. CN_OUT: Water-source unit connector
4. BUS_A: RS-485 (+) terminal
5. BUS_B: RS-485 (-) terminal
6. SWDIP: Switch to select main function
7. SW1: Reset switch



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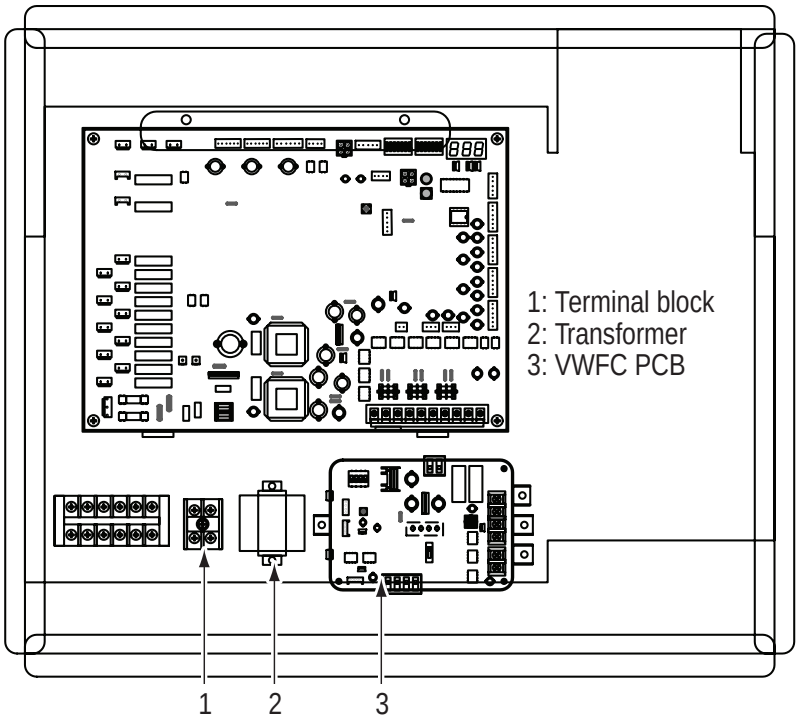
WATER CIRCUIT INSTALLATION

Variable Water Flow Control Kit

Installation

1. Shut off the main power to the water-source unit.
2. Install the Variable Water Flow Control (VWFC) PCB in the control box by using the included screws.
3. Install the transformer in the control box by using the included screws.
4. Install the terminal block in the control box by using the included screws.
5. Connect the Main PCB (CN41) to the VWFC (CN_OUT) by using the cable assembly.
6. Connect the blue wire of transformer to the Main PCB (JIG1[L], JIG2[N]).
7. Connect the red wire of transformer to the terminal block (two-pin, yellow terminal block).
8. Connect a power cable (DC 12V) to CN_PWR (12V, GND) of the VWFC.
9. Connect a signal cable (DC 0~10V) of the water flow control valve to CN_AO (AO_01[A+], GND[A-]) of the VWFC.
10. Case of two water flow control valve, Connect a signal cable (DC 0~10V) of water flow control valve to CN_AO (AO_02[B+], GND[B-]) of VWFC.
11. Connect a power cable (AC 24V) of the water flow control valve to the terminal block (two-pin, yellow terminal block, max. current 0.42A).
12. Connect the RS-485 communication cable to CN_COMM (BUS_A, BUS_B) of VWFC.
13. Set the main function dip switch of the VWFC PCB.
14. Set the dip switch of the water-source unit main PCB.
15. Turn on the main power to the water-source unit.
16. Check the signal of water flow control valve to CN_AO (AO_01, GND) of VWFC, and check the water flow rate.



⚠ Note:

- *Install the product on a flat surface with the enclosed screws, otherwise, the VWFC PCB may not be anchored properly.*
- *Do not damage the case of the Variable Water Flow Control Kit as it may cause the PCB to malfunction.*

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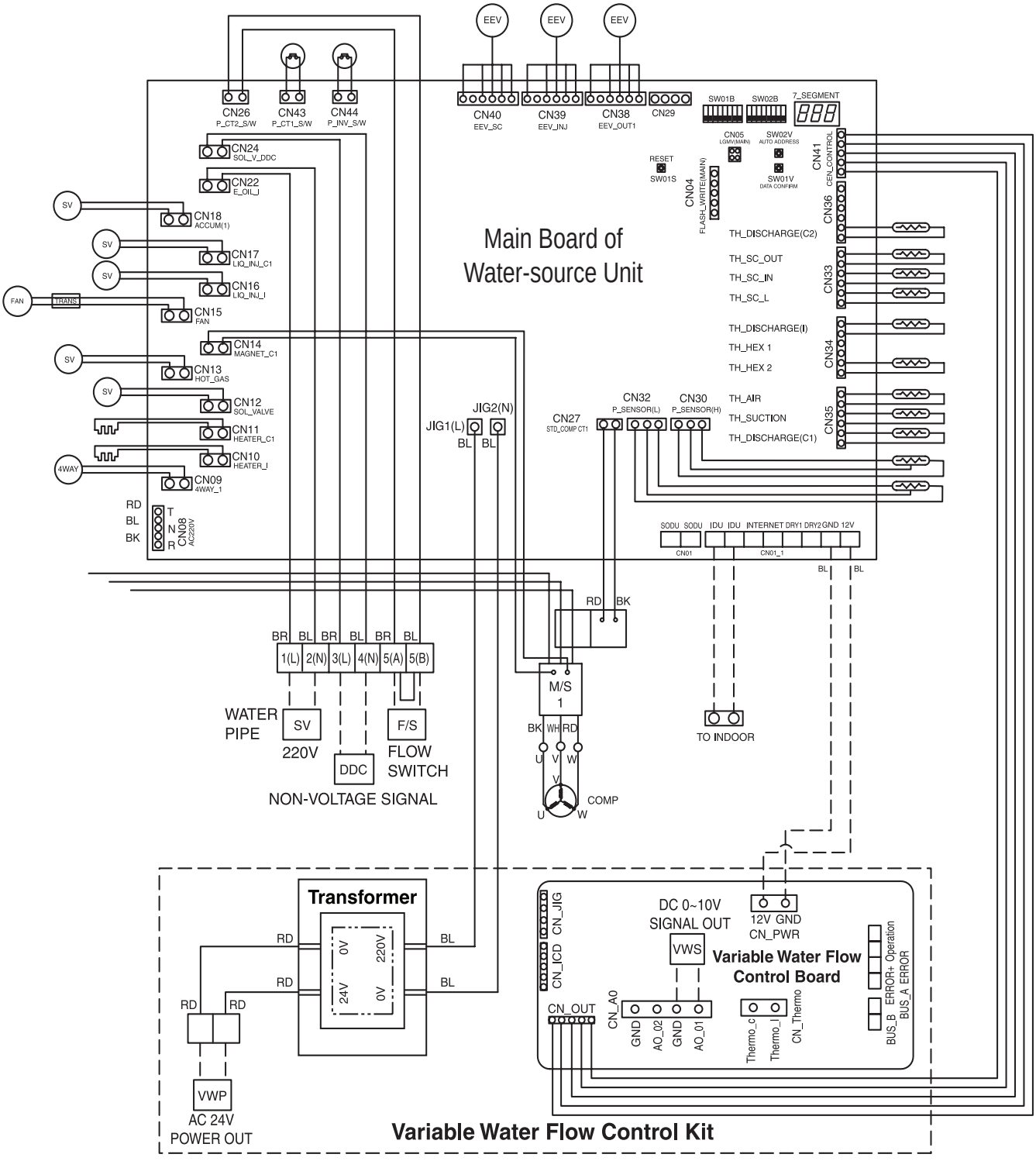
WATER CIRCUIT INSTALLATION

Variable Water Flow Control Kit

Variable Water Flow Control Kit Wiring Diagram



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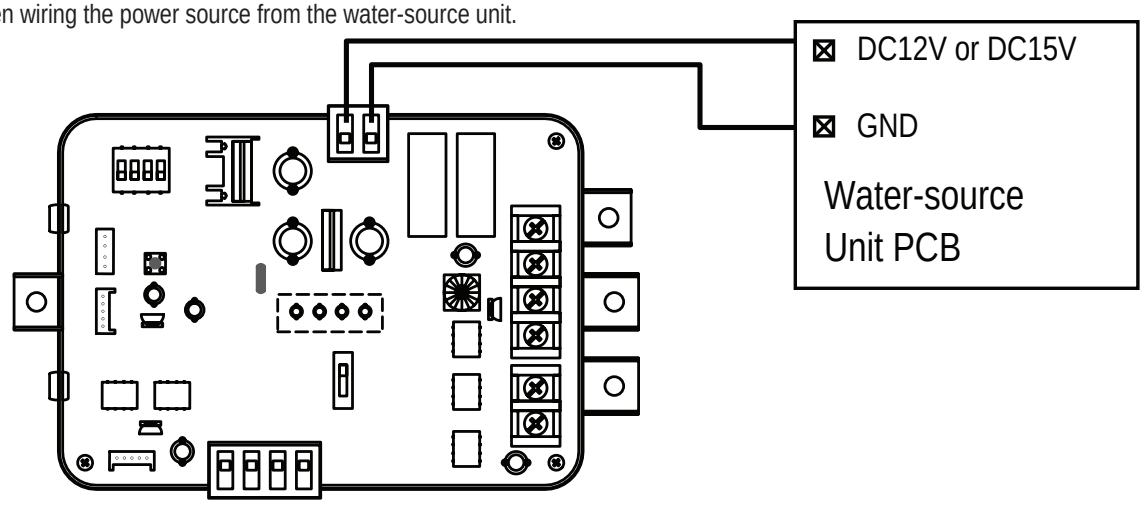
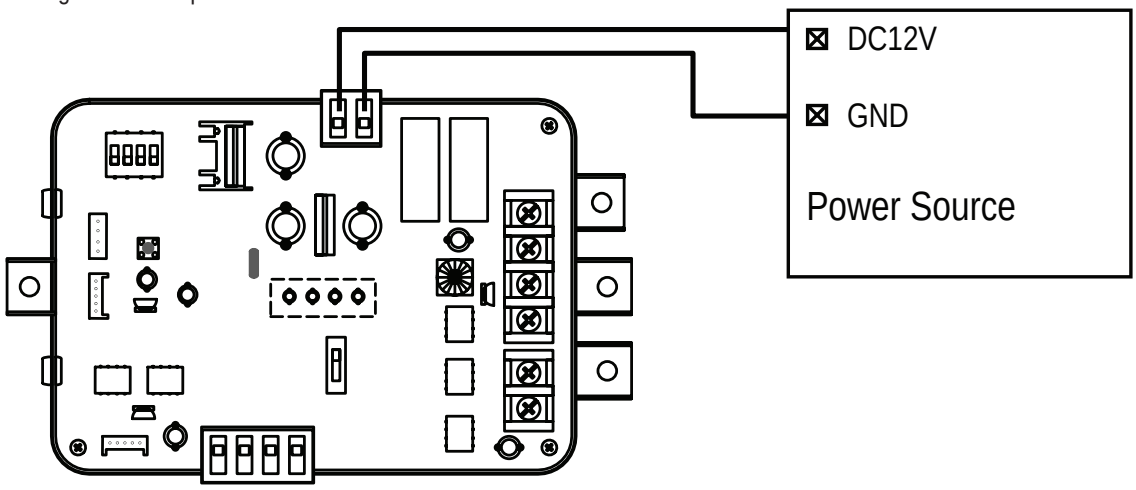
Variable Water Flow Control Kit Power Source Input

When wiring the power source from the water-source unit.



When wiring an external power source.



⚠ Note:

- *The Variable Water Flow Control Kit can accept only DC power input. Do not use 220VAC power input as it will cause serious damage to the unit.*
- *The use of an external power source is recommended.*

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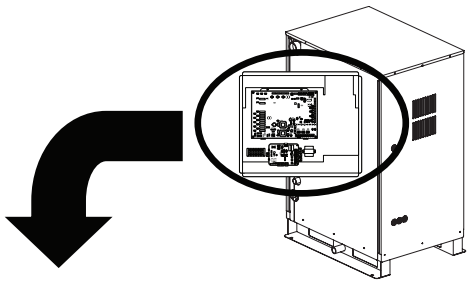
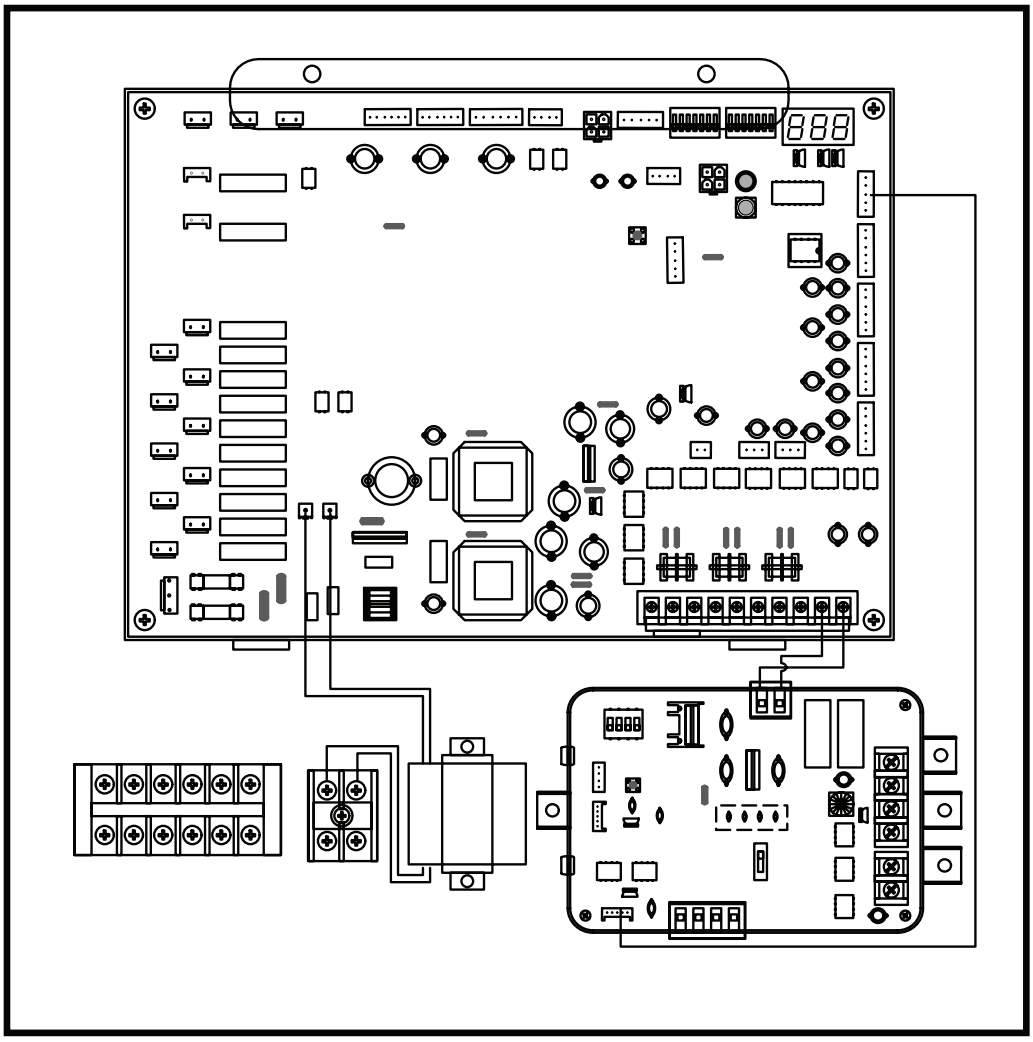
WATER CIRCUIT INSTALLATION

Variable Water Flow Control Kit

Wiring for the Variable Water Flow Control Kit Power Source PCB and Transformer





⚠ Note:

- *PCB and transformer can accept only DC 12V power input. Do not use AC power input as it will cause serious damage to the unit.*
- *AWG 23 wiring is recommended for the power (DC 12V) line.*

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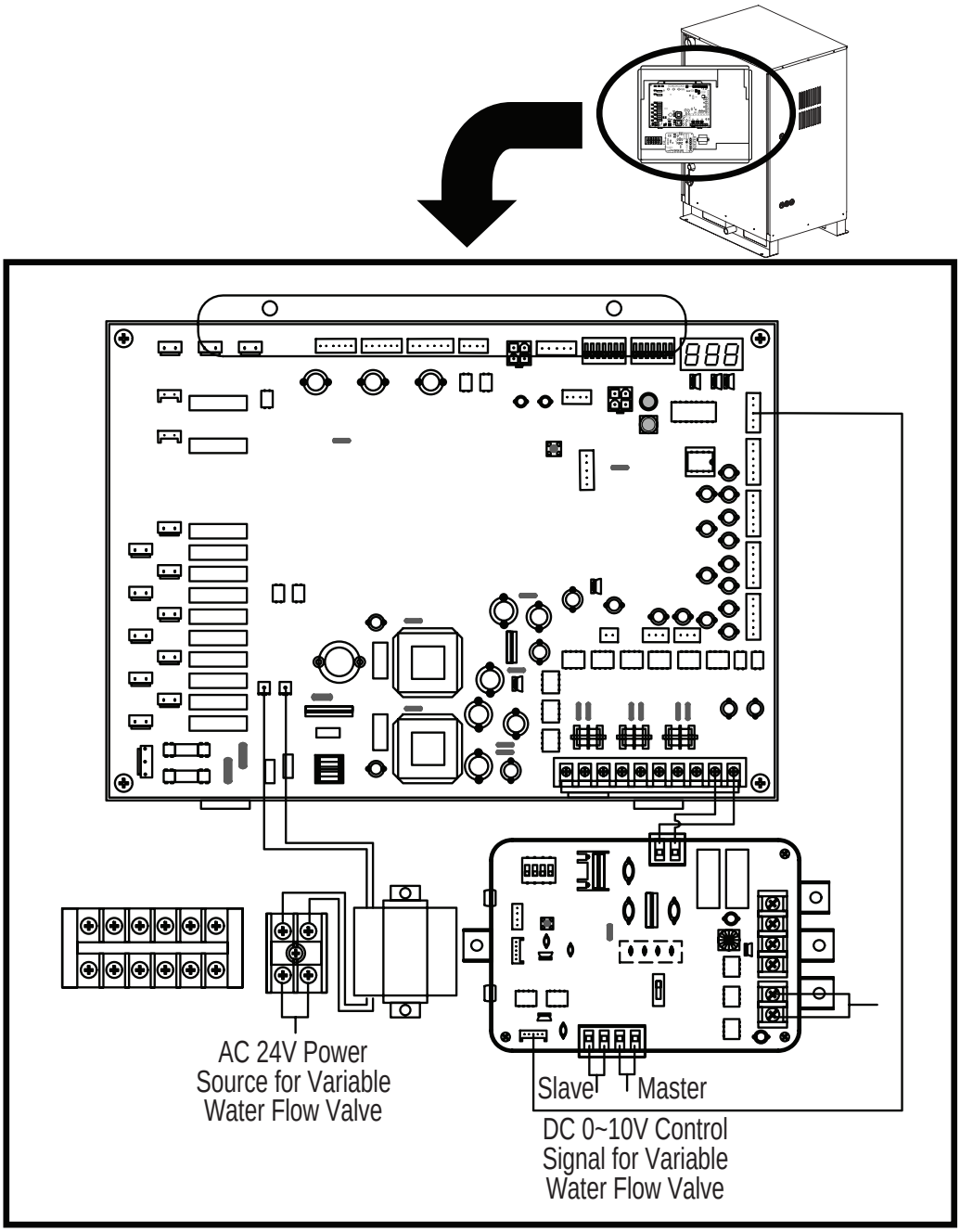
Wiring for the Variable Water Flow Control Kit Valve



⚠ Note:

- *The Variable Water Flow Control Kit can control a maximum of two valves. If only one valve is present, then the slave signal connector must not be used.*
- *AWG 23 wiring is recommended for the power (AC 12V) line and signal (DC 0~10V) line.*

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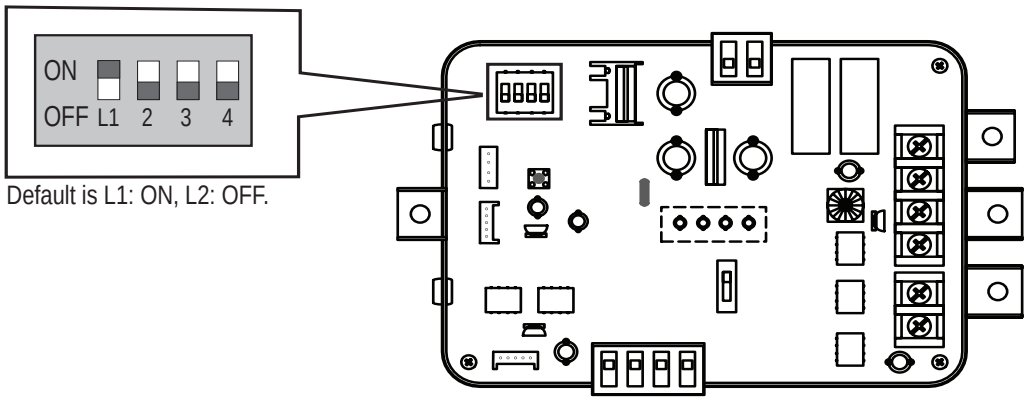
WATER CIRCUIT INSTALLATION

MULTI V WATER IT

Variable Water Flow Control Kit

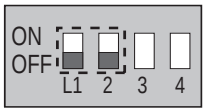
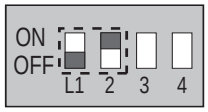
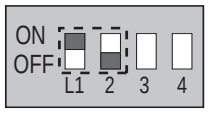
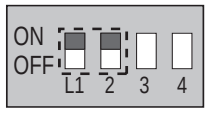
Variable Water Flow Control Kit Dip Switch Settings

Using 'SWDIP', select the control function using the dip switches as described below.

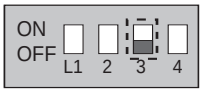
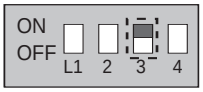


Default is L1: ON, L2: OFF.

Output Signal Setting

Dip Switch Setting	Function
	Control signal : DC 0V(OFF), DC 8~10V(ON)
	Control signal : DC 0V(OFF), DC 6~10V(ON)
	Control signal : DC 0V(OFF), DC 4~10V(ON) Default status
	Control signal : DC 0V(OFF), DC 2~10V(ON)

RS-485 Communication Function Setting

Dip Switch Setting	Function
	RS-485 communication function enable
	RS-485 communication function disable

⚠ Note:

- *After the dip switch setting is changed, the reset switch must be pressed to reflect the setting.*
- *Before operating the water-source unit, check the water flow rate and the PCB voltage signal.*
- *Minimum flow rate recommended 40% of rated flow rate; if the flow rate is lower, it will damage the water-source unit.*

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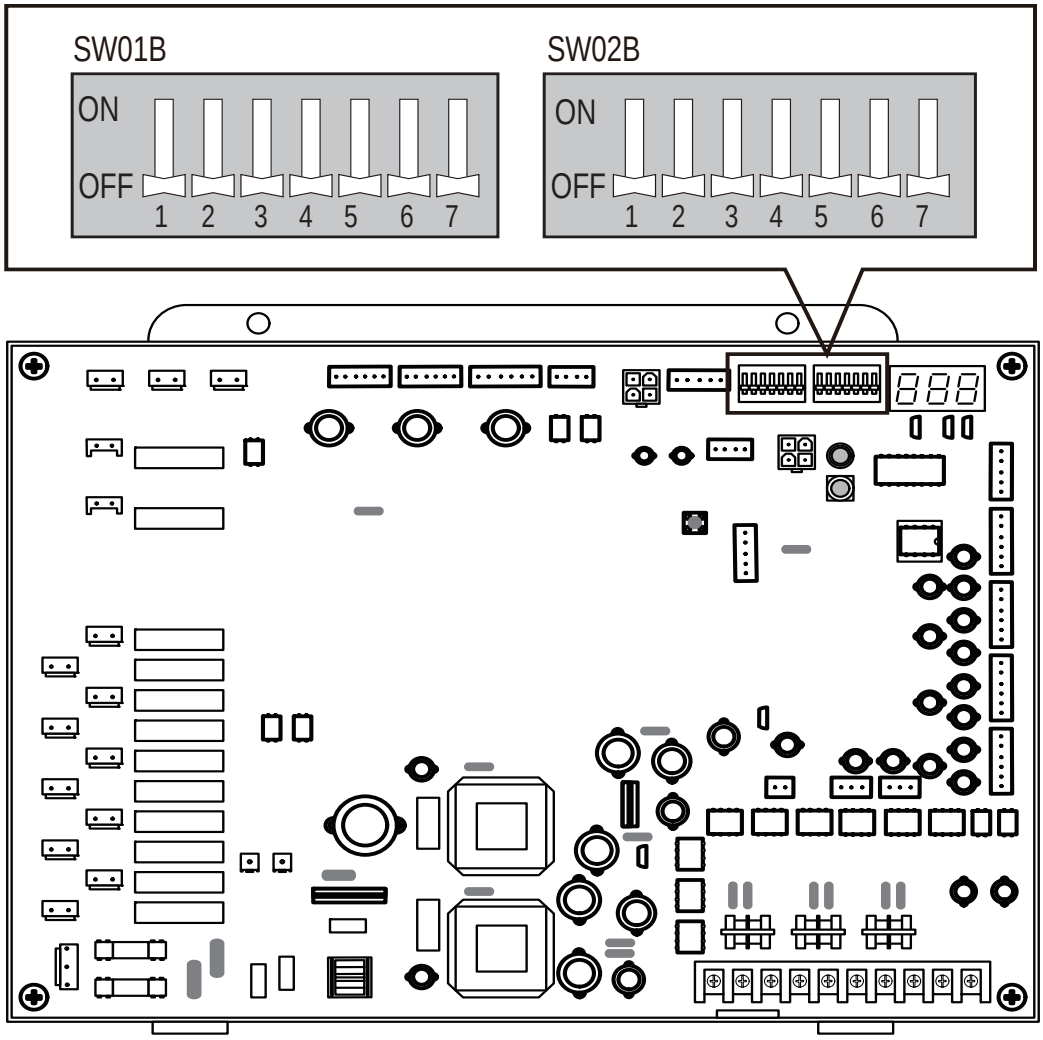
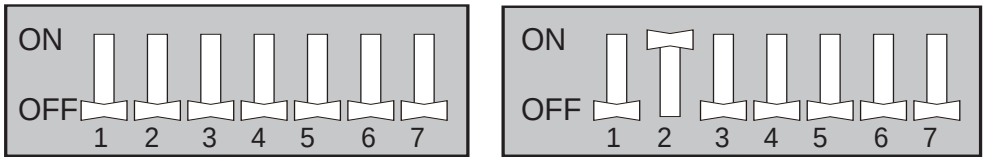
Water-source Unit Dip Switch Settings



Dip Switch Setting	Function
	Variable Water Flow Control Mode

⚠ Note:

- *After the dip switch setting is changed, the reset switch must be pressed to reflect the setting.*
- *Before operating the water-source unit, check the water flow rate and the PCB voltage signal.*
- *Minimum flow rate recommended 40% of rated flow rate; if the flow rate is lower, it will damage the water-source unit.*

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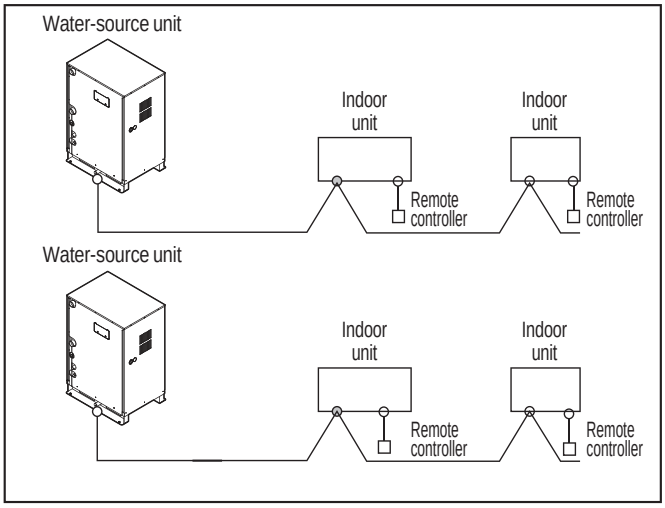
⚠WARNING

- *Have authorized electrical engineers perform the electric work in accordance with regulations and following the instructions in this installation manual. If the power supply circuit does not have enough capacity, or if the electric work is deficient, it may cause a fire, electric shock, physical injury or death.*
- *Ground the water-source unit. Do not connect the ground wire to any gas pipe, water pipe, lightening rod or telephone wire. If the ground circuit is incomplete, it may cause electric shock, physical injury or death.*

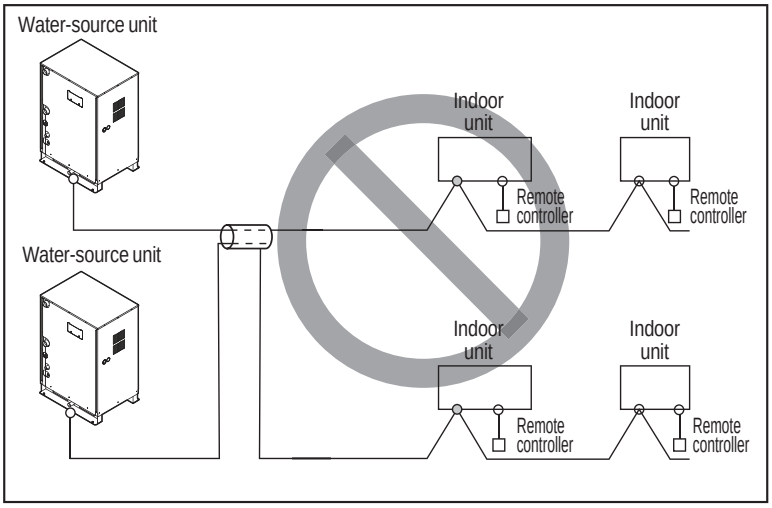
- Follow local, state, and federal ordinances for technical standards related to electrical equipment and wiring regulations.
- Locate the water-source unit transmission wiring away from the power supply circuit so that it is not affected by electric interference. (Do not run it through the same conduit.
- Provide a designated ground wire to the water-source unit.
- Include some allowance in the wiring for the electrical box of the indoor and water-source units, because the box is sometimes removed during service work.
- Never connect the main power source to terminal block of transmission line. If connected, the electrical wiring will burn out.
- Use stranded cable for the transmission line. If transmission lines of different systems are wired with the same multiple-core cable, it will result in poor transmission and erroneous system operation. (Indicated as ⓥ in the diagram below.)
- Only the transmission line specified should be connected to the water-source unit terminal block.

Heat Pump ARWN Series System Electrical Wiring Recommendations

Recommended - Two-core Shielded, Stranded Cable and Daisy Chain Wiring



Not recommended - Multiple-core Cable and Starburst Wiring



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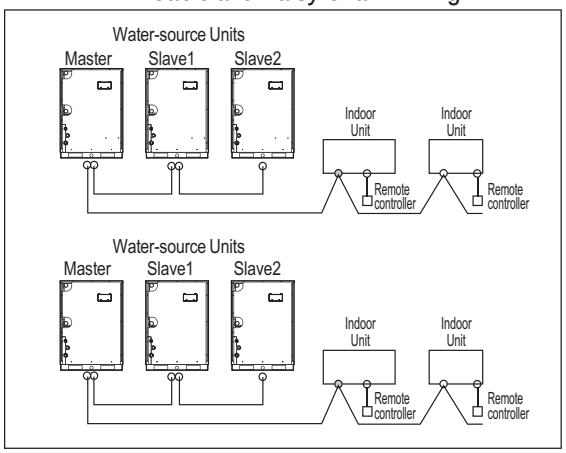
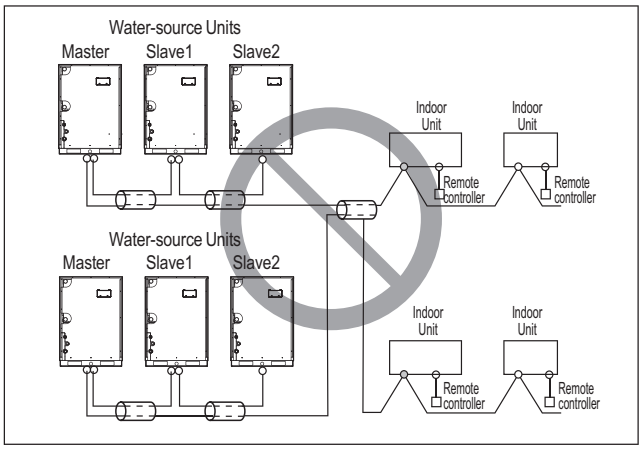
Heat Pump ARWN Series System Electrical Wiring Recommendations, continued.

Recommended - Two-core Shielded, Stranded Cable and Daisy Chain Wiring

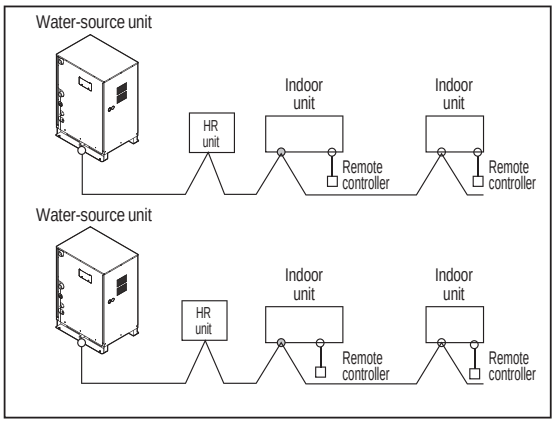


Not recommended - Multiple-core Cable and Starburst Wiring

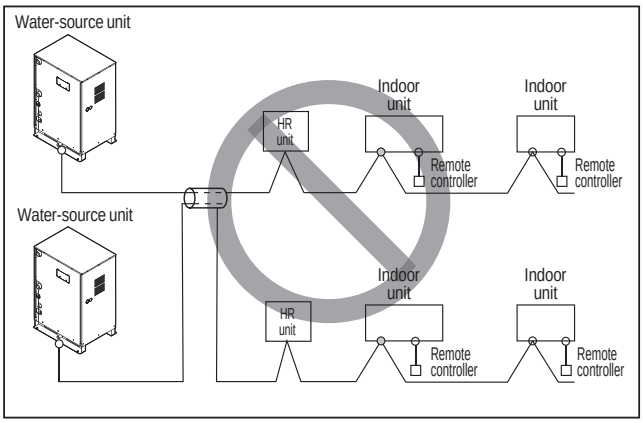


ARWB Series Heat Recovery System Electrical Wiring Recommendations

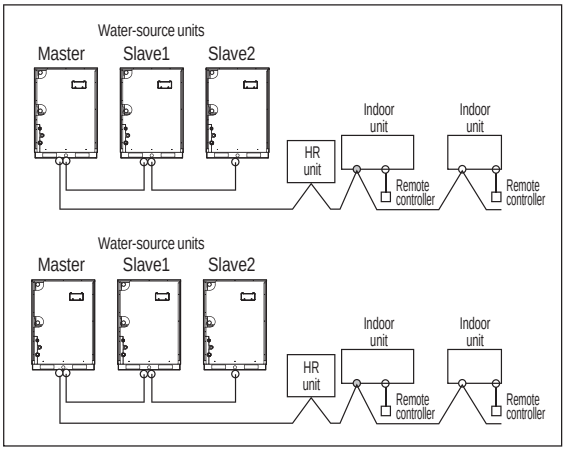
Recommended - Two-core Shielded, Stranded Cable and Daisy Chain Wiring



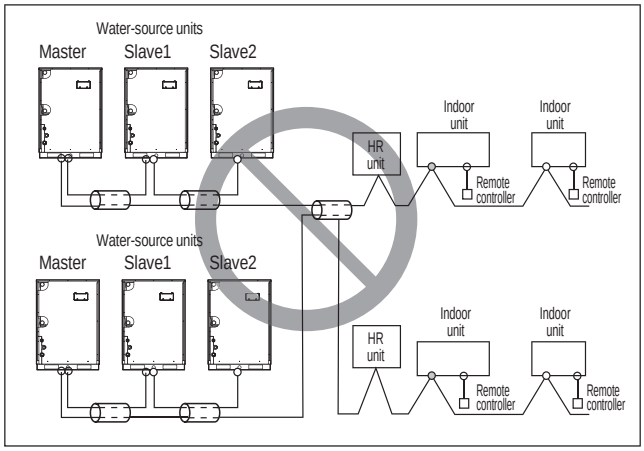
Not recommended - Multiple-core Cable and Starburst Wiring



Recommended - Two-core Shielded, Stranded Cable and Daisy Chain Wiring



Not recommended - Multiple-core Cable and Starburst Wiring



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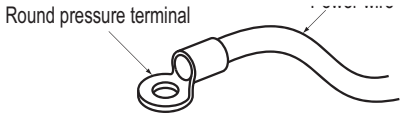
⚠ Note:

- *Use two-core shielded, stranded cables for the transmission wiring. Never install them with the power cables.*
- *The conductive shielded layer of cable should be grounded to the water-source unit frame only, and connected to the indoor units by using wire nuts.*
- *Never use multiple-core cables.*
- *These water-source units are equipped with an inverter, therefore, if a phase-leading capacitor is installed, it will deteriorate the power factor improvement effect, and also may cause the capacitor to generate an abnormal amount of heat. Never install a phase-leading capacitor with these units.*
- *Verify that the power unbalance between L1-L2, L2-L3 and L1-L3 is no greater than 2%. If it is greater, the lifespan of the units will be reduced. Also, the input voltage must be within 10% of the rated voltage.*

Precautions when Installing the Power Supply Wiring

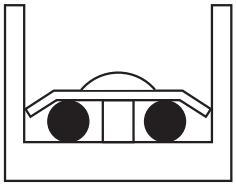
Use round ring terminals for connections to the power terminal block.



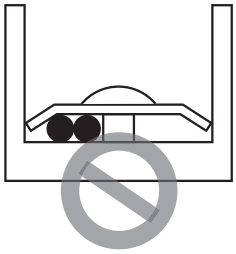
If round ring terminals are not available, then:

- Do not connect wiring of different thicknesses to the power terminal block. (Slack in the power wiring may generate heat.)
- When connecting wiring of the same thickness, follow the instructions demonstrated in the figures below.

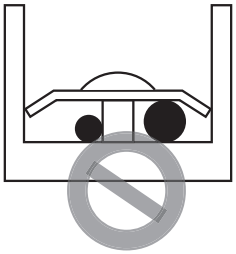
Connect same thickness wiring to both sides.



Do not connect two wires on one side.



Do not connect wiring of different thicknesses.

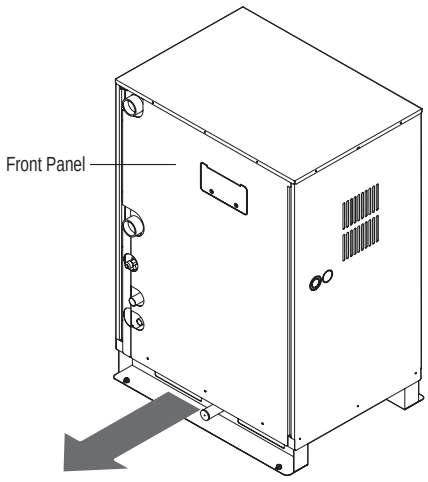


⚠ Note:

When the power supply is applied to "N" phase by mistake, replace the inverter PCB and transformer in the control box.

Control Box and Wiring Location

- Use the designated wire and firmly attach the connections; secure to prevent external forces being imparted on the terminal block.
- Use an appropriately sized screwdriver for tightening the terminal screws. A screwdriver with a small head will strip the head and make proper tightening impossible.
- The terminal screws may break if they are over-tightened.
- Remove all the screws and take off the panel by pulling it forward.
- Connect the transmission wire between the master and slave water-source units through the terminal block.
- Connect the transmission wire between the water-source unit and indoor unit (and heat-recovery control units [ARWB Series only)] through the terminal block.
- Pass through a sub-PCB for central control when connecting the water-source unit to the central controller system.
- When connecting the transmission wire from the water-source unit(s) to the indoor unit(s), connect the shield with wire nuts at the indoor unit and ground the shield to the frame of the water-source unit.



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ELECTRICAL SYSTEM INSTALLATION

Transmission and Power Supply Wires

1. Transmission cable
- Type: Shielded CVVS or CPEVS wire
- Diameter: 18 gauge
- Insulation material: PVC
- Maximum allowable temperature: 140°F
- Maximum allowable line length: 984 feet

2. Remote control cable
- Type: Three-core cable

3. Simple central control cable
- Type: Four-core cable (Shielded wire)
- Diameter: 18 gauge
- Insulation material : PVC

4. Separating the transmission and power supply wires
- If transmission and power supply wires run alongside each other, there is a strong likelihood of operation problems developing due to interference in the signal wiring (caused by electrostatic and electromagnetic coupling).

See table below for recommendations on appropriate spacing of transmission and power supply wires recommendations where these are to be run alongside each other.

Capacity of Power Supply Wiring (current)		Recommended Minimum Space[1,2]
100V or more	10A	11-13/16 inches
	50A	19-11/16 inches
	100A	39-3/8 inches
	Exceed 100A	59-1/16 inches

[1]The figures above are based on parallel cables up to 328 feet long. For lengths in excess of 328 feet, the distances will have to be recalculated in direct proportion to the additional line lengths involved.
[2]If the power supply waveform continues to exhibit some distortion, the spacing between wires should be increased.
- *If grouped wires are to be placed inside conduits, then:*
- *Power supply wires (including power supply wire to the air conditioner) and signal wires must not be bunched together and placed inside the same conduit.*

⚠ WARNING

If the units are not properly grounded, then there is always a risk of electric shock, physical injury or death. Ground wiring of the units must always be performed by a qualified technician.

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ELECTRICAL SYSTEM INSTALLATION

Main Power Supply Wiring and Equipment Capacity

1. Use separate power supplies for the water-source units and the indoor units.
2. Consider ambient conditions (temperature, direct sunlight, rain water, etc.) when installing wiring and performing the connections.
3. The wire size is the minimum value for metal conduit wiring. The power cord size should be one (1) rank thicker to account for line voltage drops. Make sure the power supply does not decrease or increase more than 10% than the rated voltage.
4. Follow local, state, and federal regulations for specific wiring requirements.
5. Power supply cords of appliances for outside use should not be any lighter than polychloroprene sheathed flexible cord.

⚠ Note:

- *Follow local, state, and federal ordinances for technical standards related to electrical equipment and wiring regulations.*
- *Use the appropriate size for the overcurrent protection switch. Note that any generated overcurrent may include some amount of direct current.*

⚠WARNING

- *Use the designated wire and firmly attach the connections; secure to prevent external forces being imparted on the terminal block connections. If connections are not firmly attached, it may generate heat and cause a fire.*
- *Some sites may require installation of a earth leakage circuit breaker. If an earth leakage circuit breaker is not installed, it may cause an electric shock, physical injury or death.*
- *Always install breakers and fuses with the correct capacities. If fuses or copper wires with too large capacity are installed, it may cause a fire or unit malfunction.*

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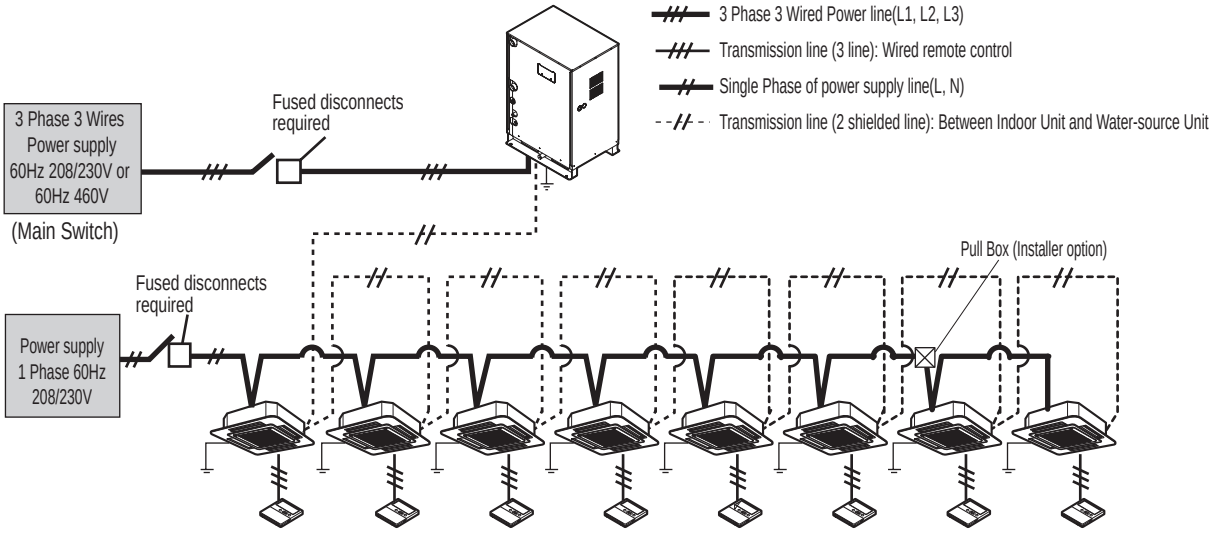
ELECTRICAL SYSTEM INSTALLATION

Electrical and Communication Cable Connections

One Water-source Unit, ARWN Series Heat Pump Systems - 3Ø, 208/230V and 3Ø, 460V



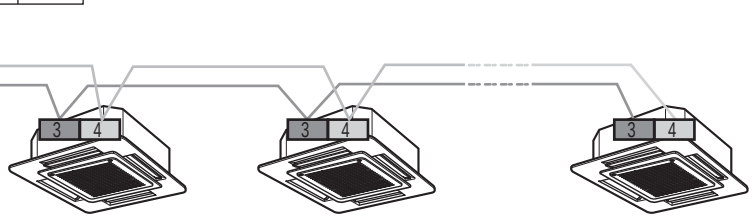
⚠WARNING

- *Indoor unit ground wiring is required to prevent accidental electrical shock.*
- *Install a main shutoff switch that interrupts all power sources simultaneously.*
- *If there is a possibility of reversed phase, phase loss, momentary blackout, or the power goes on and off while the system is operating, install a field-supplied phase loss protection circuit.*

Between Indoor and Master Water-source unit

SODU		IDU		INTERNET		DRY1	DRY2	GND	12V
B	A			B	A				

Master
Water-source unit



The GND terminal is a '–' terminal for the central controller, not a ground line.

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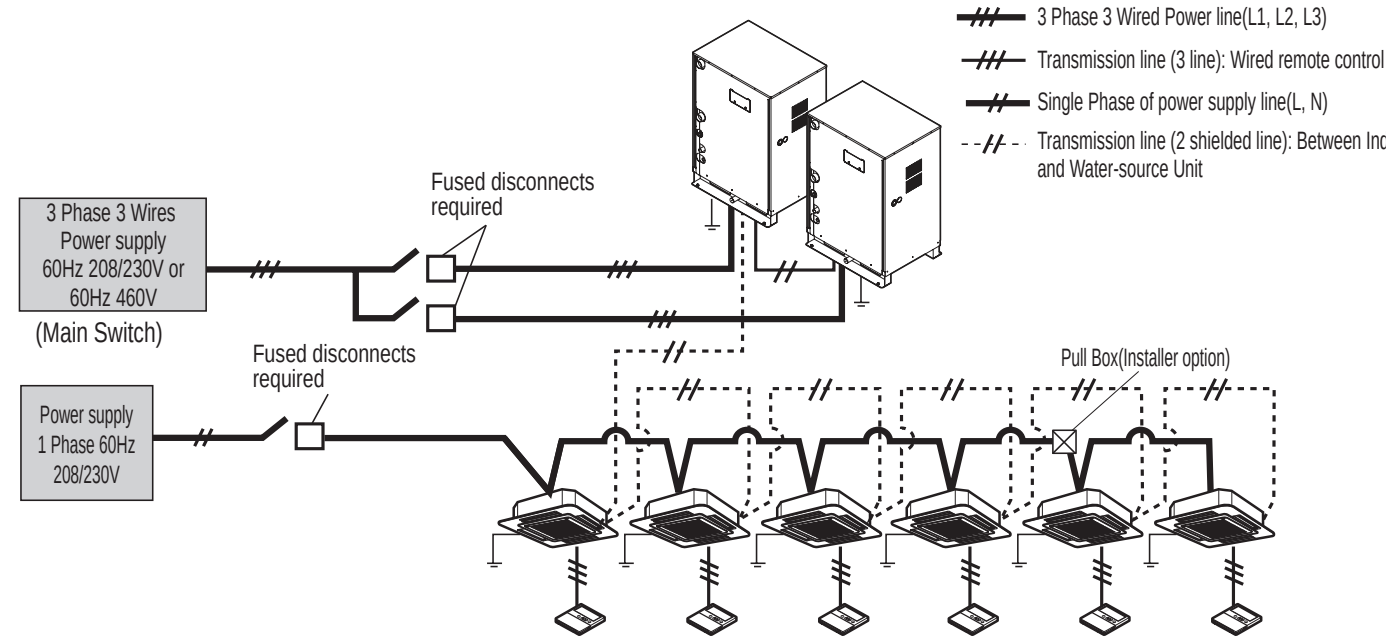
ELECTRICAL SYSTEM INSTALLATION

Electrical and Communication Cable Connections

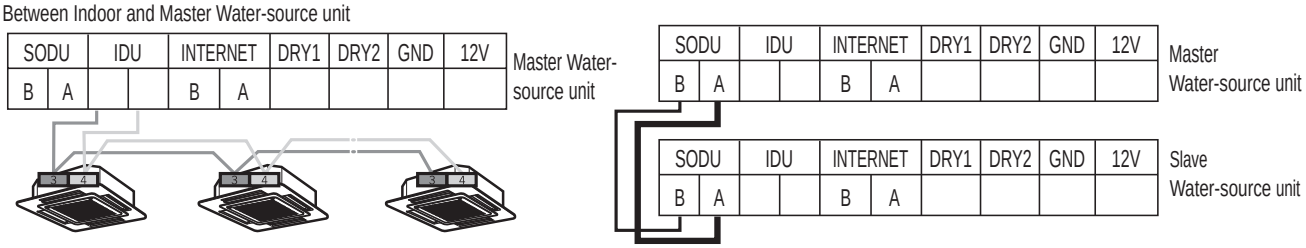
Two Water-source Units, ARWN Series Heat Pump Systems - 3Ø, 208/230V and 3Ø, 460V



⚠ WARNING

- *Indoor unit ground wiring is required to prevent accidental electrical shock.*
- *Install a main shutoff switch that interrupts all power sources simultaneously.*
- *If there is a possibility of reversed phase, phase loss, momentary blackout, or the power goes on and off while the system is operating, install a field-supplied phase loss protection circuit.*

Between Indoor and Master Water-source unit



The GND terminal is a '–' terminal for the central controller, not a ground line

- **Make sure that terminal number of master and slave water-source unit are matched. (A-A,B-B)**

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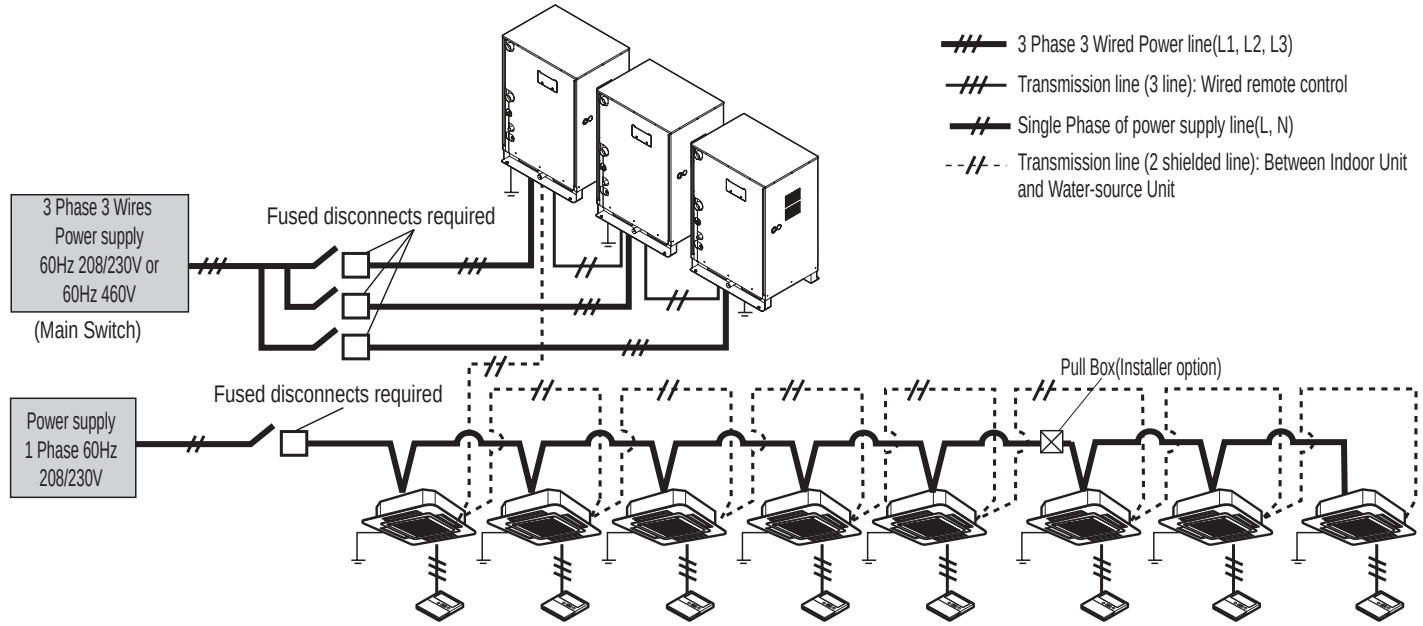
ELECTRICAL SYSTEM INSTALLATION

Electrical and Communication Cable Connections

Three Water-source Units, ARWN Series Heat Pump Systems - 3Ø, 208/230V and 3Ø, 460V



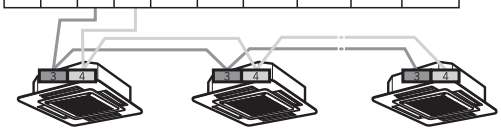
⚠ WARNING

- *Indoor unit ground wiring is required to prevent accidental electrical shock.*
- *Install a main shutoff switch that interrupts all power sources simultaneously.*
- *If there is a possibility of reversed phase, phase loss, momentary blackout, or the power goes on and off while the system is operating, install a field-supplied phase loss protection circuit.*

Between Indoor and Master Water-source unit

SODU		IDU		INTERNET		DRY1	DRY2	GND	12V
B	A			B	A				

Master Water-source unit



The GND terminal is a '–' terminal for the central controller, not a ground line.

SODU		IDU		INTERNET		DRY1	DRY2	GND	12V	
B	A			B	A					Master Water-source unit
B	A			B	A					Slave1 Water-source unit
B	A			B	A					Slave2 Water-source unit

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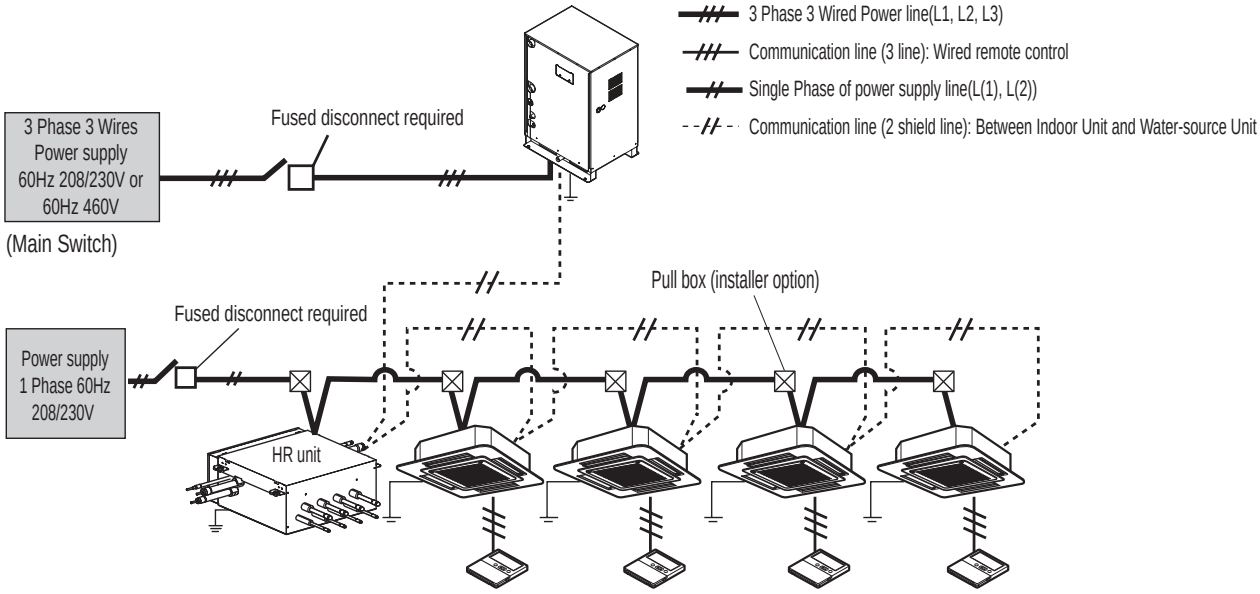
One Water-source Unit, ARWB Series Heat Recovery Systems - 3Ø, 208/230V and 3Ø, 460V



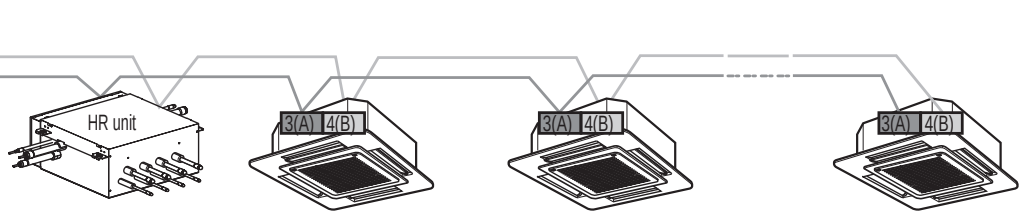
⚠WARNING

- *Indoor unit ground wiring is required to prevent accidental electrical shock.*
- *Install a main shutoff switch that interrupts all power sources simultaneously.*
- *If there is a possibility of reversed phase, phase loss, momentary blackout, or the power goes on and off while the system is operating, install a field-supplied phase loss protection circuit.*

Between Indoor and Master Water-source unit

SODU		IDU		INTERNET		DRY1	DRY2	GND	12V
B	A			B	A				

Master Water-source unit



The GND terminal is a '–' terminal for the central controller, not a ground line.

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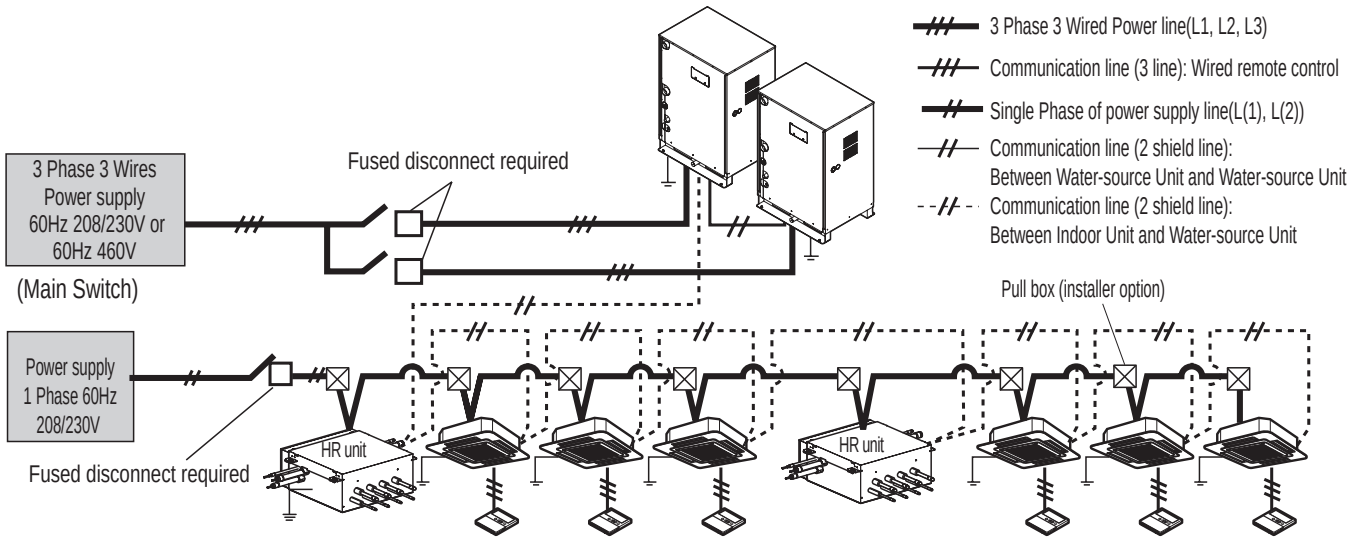
ELECTRICAL SYSTEM INSTALLATION

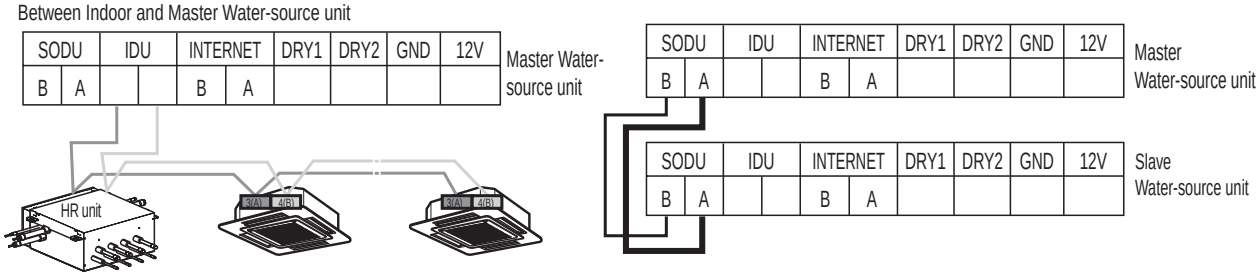
Electrical and Communication Cable Connections

Two Water-source Units, ARWB Series Heat Recovery Systems - 3Ø, 208/230V and 3Ø, 460V



⚠ WARNING

- *Indoor unit ground wiring is required to prevent accidental electrical shock.*
- *Install a main shutoff switch that interrupts all power sources simultaneously.*
- *If there is a possibility of reversed phase, phase loss, momentary blackout, or the power goes on and off while the system is operating, install a field-supplied phase loss protection circuit.*



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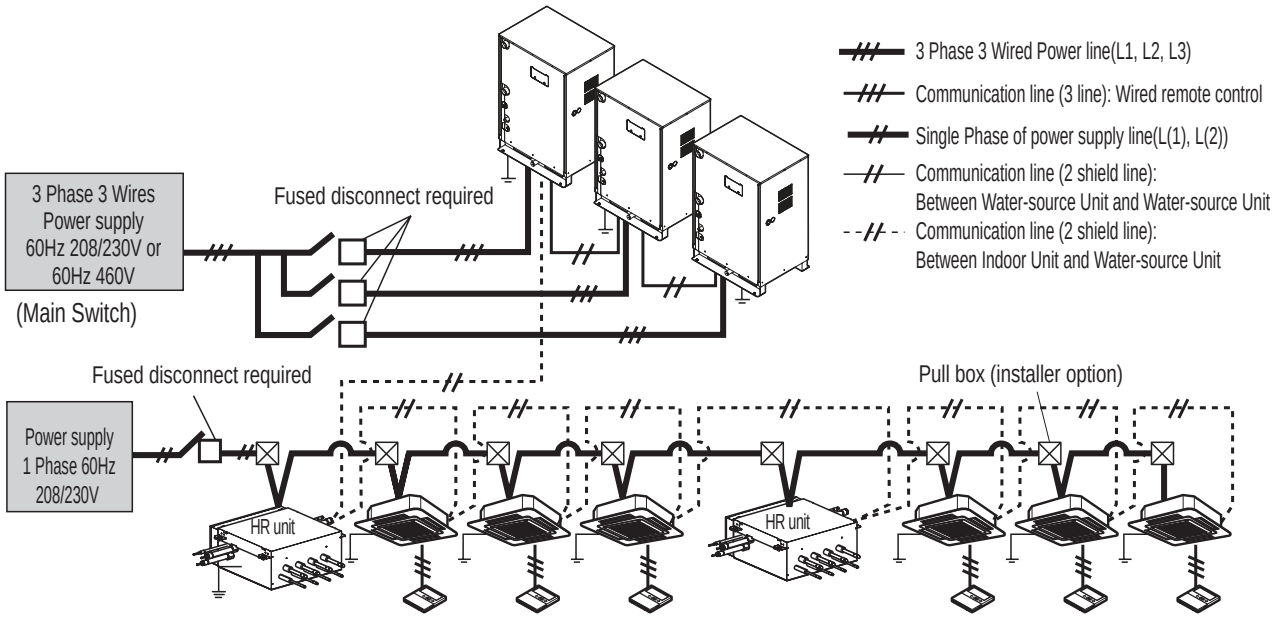
ELECTRICAL SYSTEM INSTALLATION

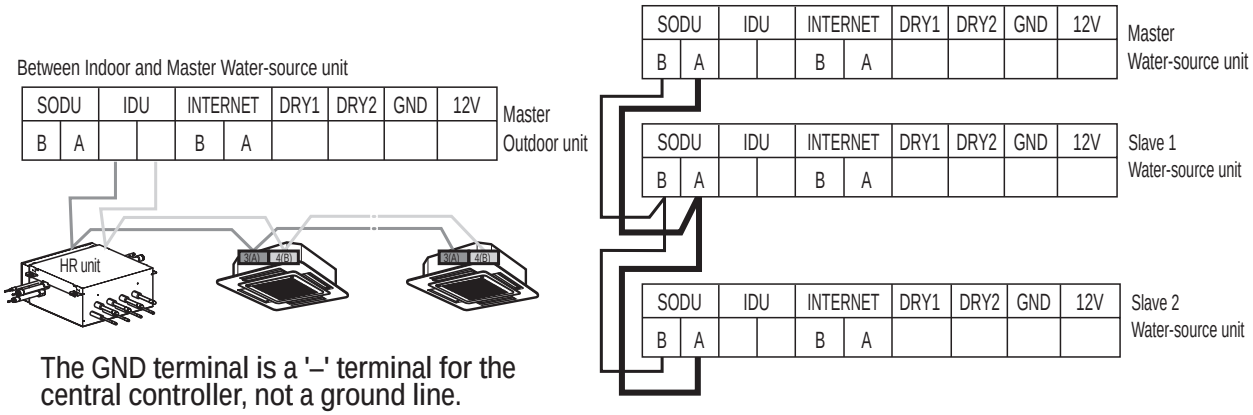
Electrical and Communication Cable Connections

Three Water-source Units, ARWB Series Heat Recovery Systems - 3Ø, 208/230V and 3Ø, 460V



⚠ WARNING

- *Indoor unit ground wiring is required to prevent accidental electrical shock.*
- *Install a main shutoff switch that interrupts all power sources simultaneously.*
- *If there is a possibility of reversed phase, phase loss, momentary blackout, or the power goes on and off while the system is operating, install a field-supplied phase loss protection circuit.*



The GND terminal is a '–' terminal for the central controller, not a ground line.

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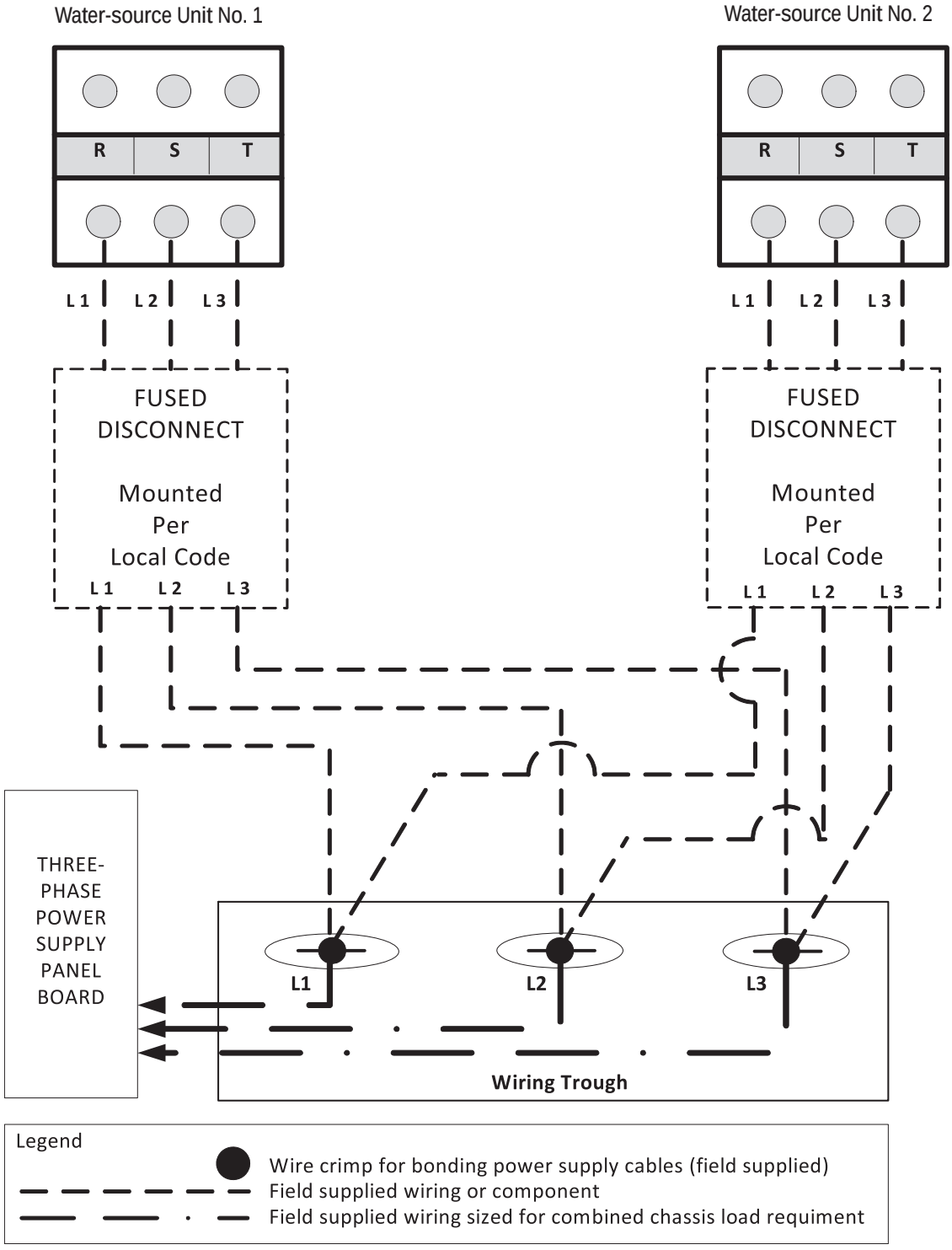
Dual Frame Configuration

⚠ Note:

All wiring field engineered by others per local code.



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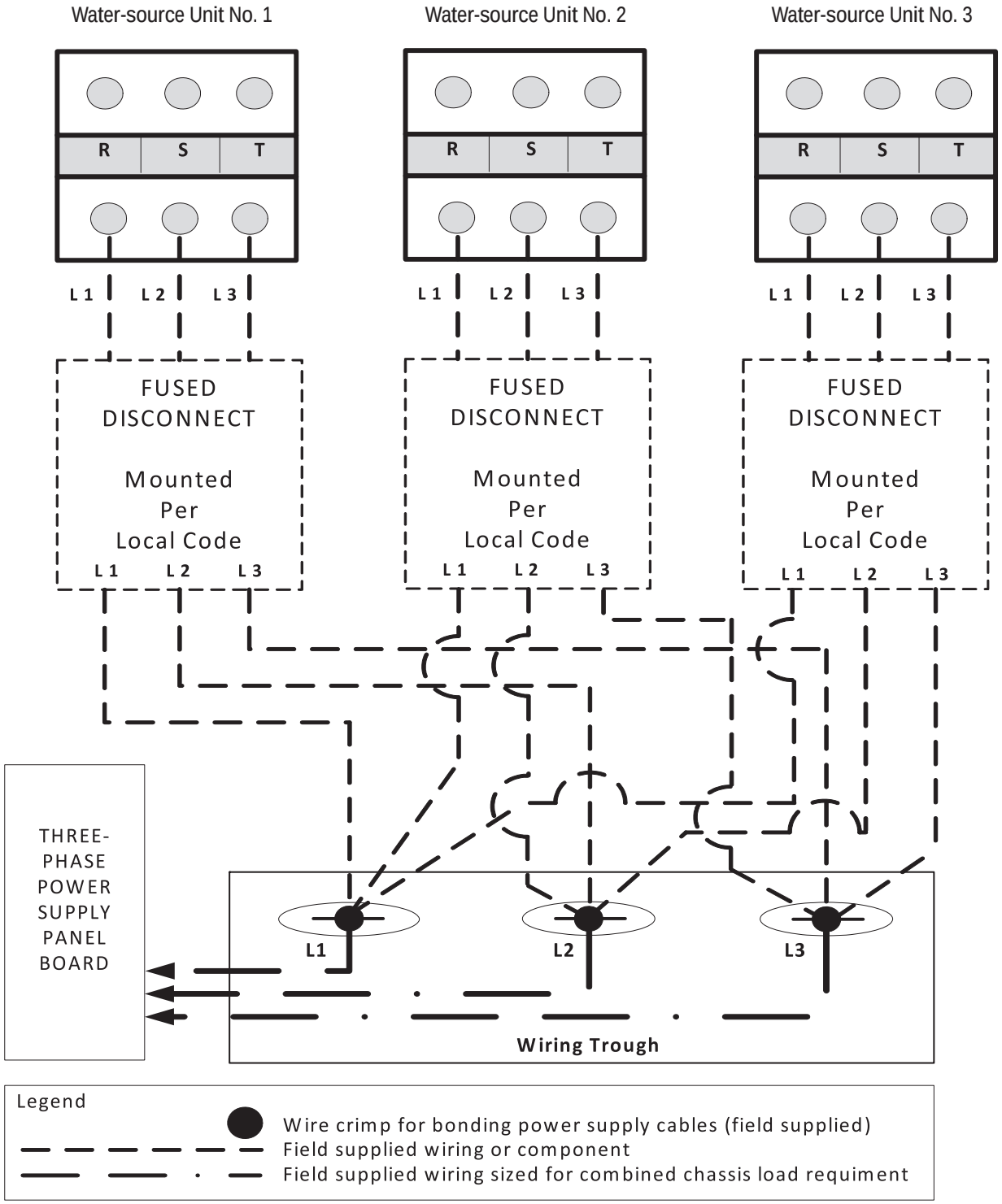
Triple Frame Configuration

⚠ Note:

All wiring field engineered by others per local code.



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ELECTRICAL SYSTEM INSTALLATION

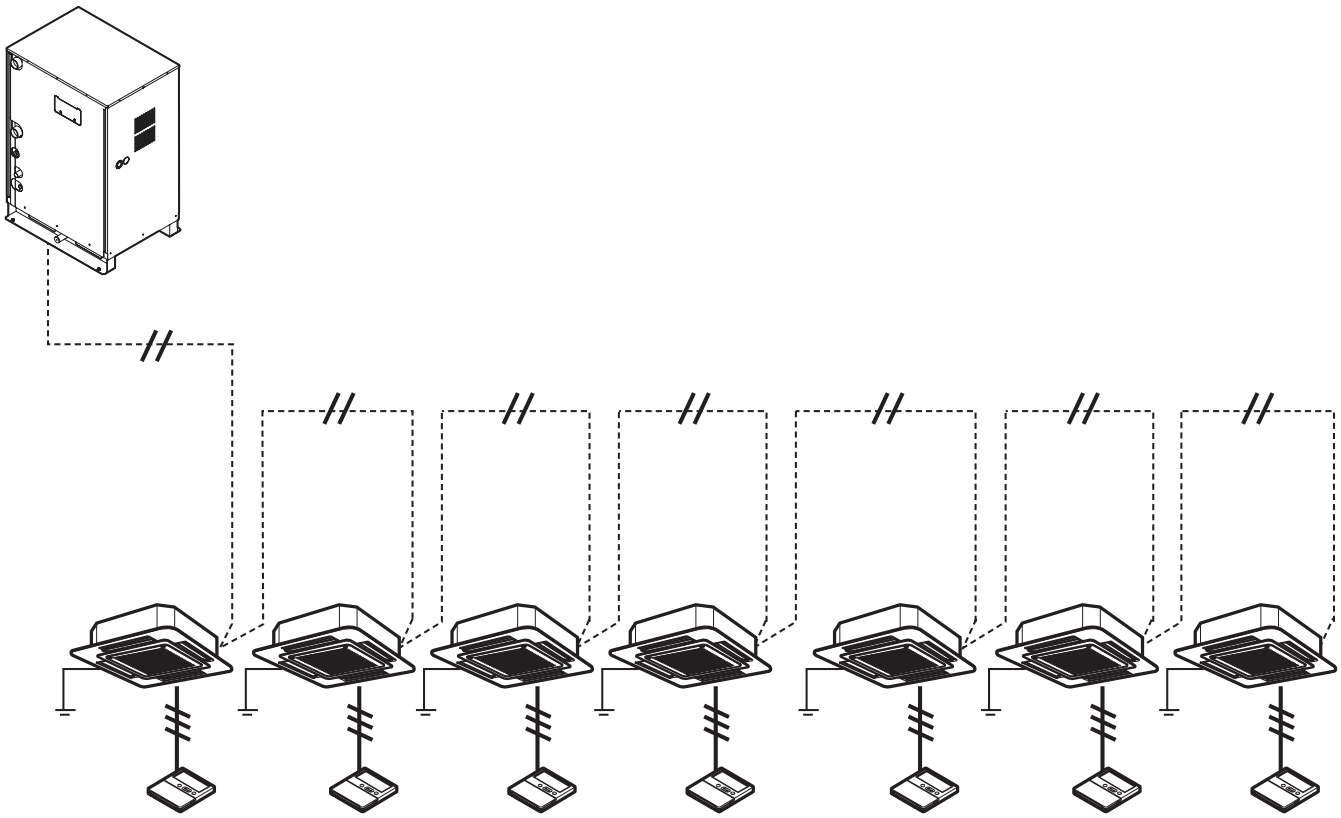
Communication Cable Connection (BUS type) Example

Daisy Chain Type

Communication cable between the indoor units and water-source units must be installed using a daisy chain (BUS-type) connection.

⚠ Note:

The daisy chain always starts at the water-source unit.



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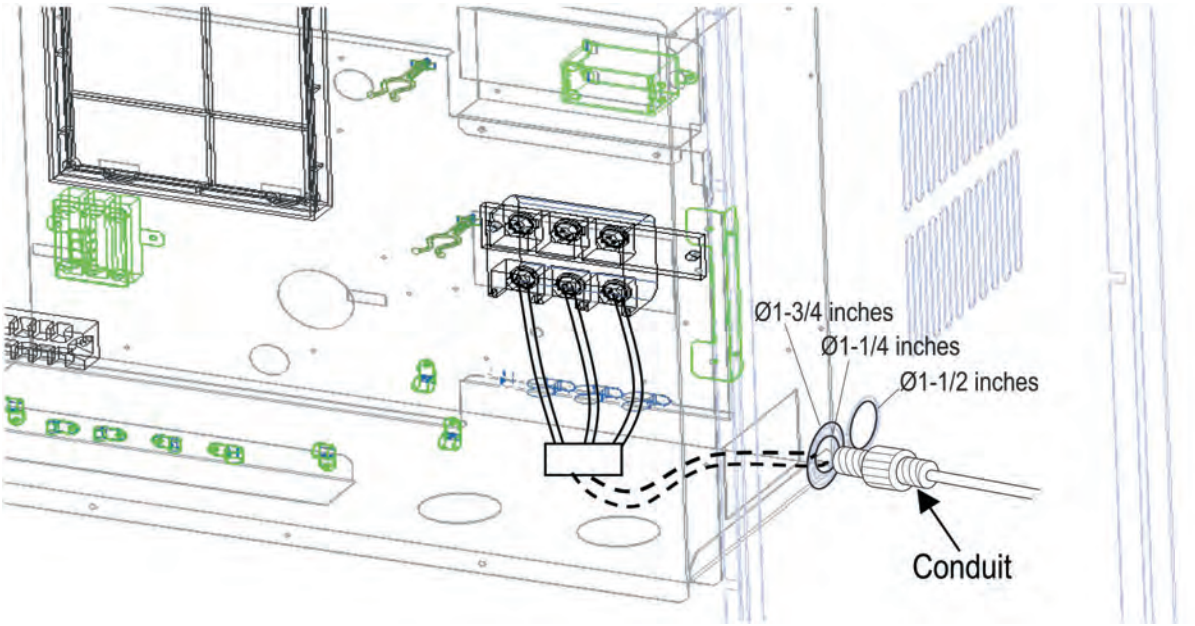
ELECTRICAL SYSTEM INSTALLATION

Connecting the Cables

1. Knock a hole out that is large enough for the cable to pass through. Choose from three knockout hole sizes: 1-1/4 inches, 1-1/2 inches, and 1-3/4 inches (After knocking out the holes, touch up the edges with the supplied repair paint to prevent rusting.)
2. Pass the connecting cable through the hole.
3. Properly connect the cable to the terminal block.
4. Clamp the connection cable with the supplied cord clamp so as not to impart any strain on the terminal.
5. Attach the cap to the conduit panel.



⚠WARNING

Loose wiring may result in unit malfunction, or cause the terminal to overheat and generate a fire, therefore, make sure all wiring is tightly connected.

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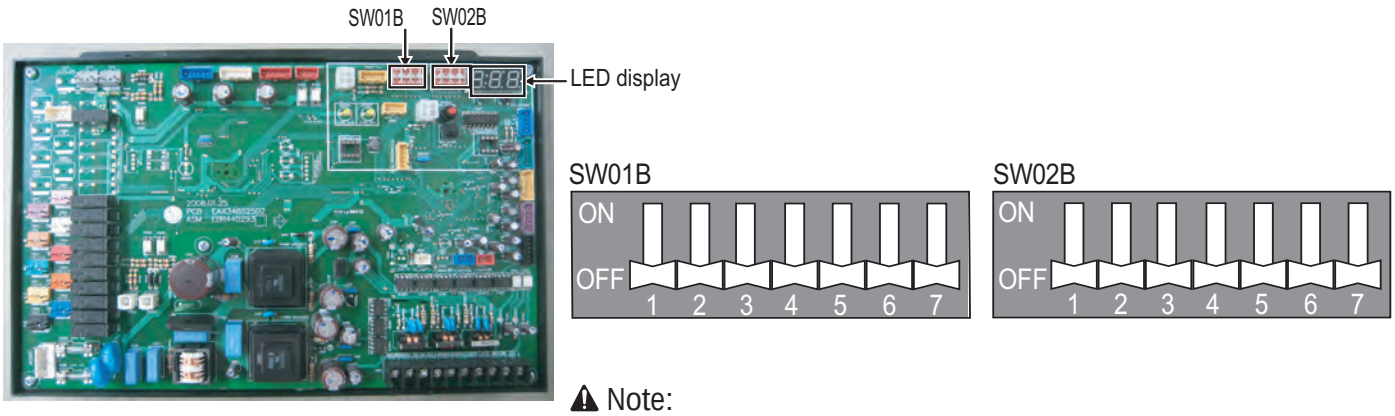
ELECTRICAL SYSTEM INSTALLATION

MULTI V WATER II

Water-source Unit Dip Switch Settings—Heat Pump ARWN Series

1. Location of dip switches



⚠ Note:
If the applicable dip switch is not set correctly, the unit may not operate properly.

2. Dip switch settings

- Set the dip switch and turn on the power of the water-source unit to check whether the value was entered correctly on the LED.
- This function displays for only two (2) seconds after the power is connected.

Check the water-source unit setting

- The number on the LED displays after the power is connected.
- This number represents what was set for the water-source unit.

Sequence	Code	Description
1	-	Model code
2	-	Total capacity in horsepower
3	2	Heat pump model
4	25	Normal mode display (If the dip switch is not set correctly, this number is not displayed.)
5	133	208 / 230V Heat pump model type
	131	460V Heat pump model type

Heat Pump Model Codes

208 / 230V		460V		Refrigerant
Model Code	Capacity (Horsepower / Tons)	Model Code	Capacity (Horsepower / Tons)	
155	8 / 6	138	10 / 8	R410A
156	16 / 12	139	20 / 16	
156, 155	24 / 18	139, 138	30 / 24	
156, 156	32 / 24	139, 139	40 / 32	
156, 156, 155	40 / 30	139, 139, 138	50 / 40	
156, 156, 156	48 / 36	139, 139, 139	60 / 48	

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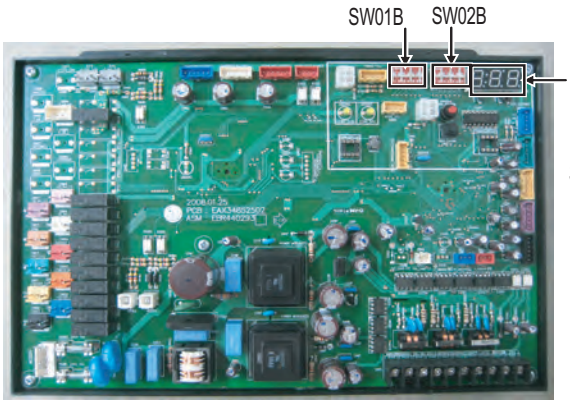
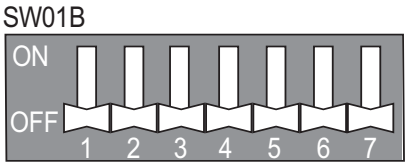
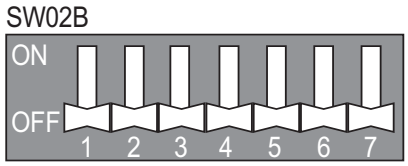
Water-source Unit Dip Switch Settings—Heat Recovery ARWB Series

1. Location of dip switches







⚠ Note:
If the applicable dip switch is not set correctly, the unit may not operate properly.

2. Dip switch settings

- Set the dip switch and turn on the power of the water-source unit to check whether the value was entered correctly on the LED.
- This function displays for only two (2) seconds after the power is connected.

Check the water-source unit setting

- The number on the LED displays after the power is connected.
- This number represents what was set for the water-source unit.

Sequence	Code	Description
1	-	Model code
2	-	Total capacity in horsepower
3	2	Heat recovery model
4	25	Normal mode display (If the dip switch is not set correctly, this number is not displayed.)
5	41	208 / 230V Heat recovery model type
	132	460V Heat recovery model type

Heat Recovery Model Codes

208 / 230V		460V		Refrigerant
Model Codes	Capacity (Horsepower / Tons)	Model Codes	Capacity (Horsepower / Tons)	
146	8 / 6	148	10 / 8	R410A
147	16 / 12	149	20 / 16	
147, 146	24 / 18	149, 148	30 / 24	
147, 147	32 / 24	149, 149	40 / 32	
147, 147, 146	40 / 30	149, 149, 148	50 / 40	
147, 147, 147	48 / 36	149, 149, 149	60 / 48	

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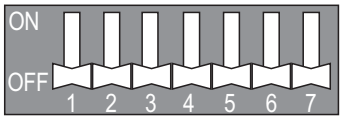
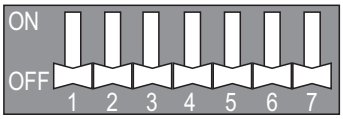
ELECTRICAL SYSTEM INSTALLATION

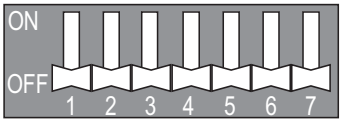
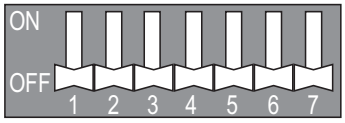
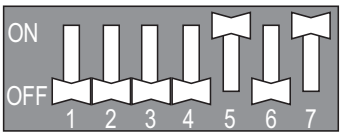
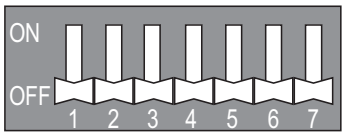
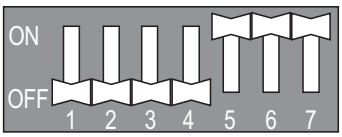
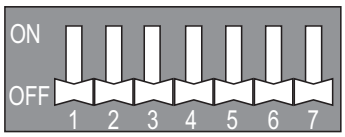
MULTI V WATER II

Water-source Unit Dip Switch Settings—Heat Pump ARWN and Heat Recovery ARWB

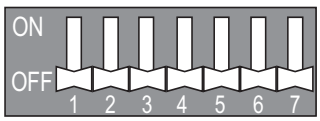
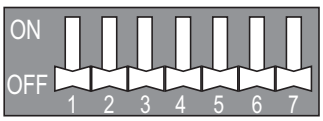
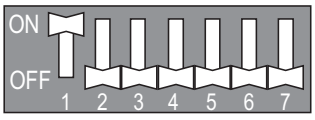
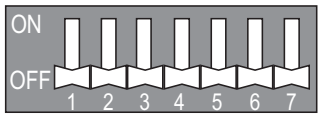
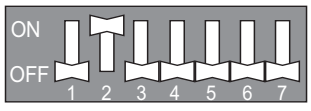
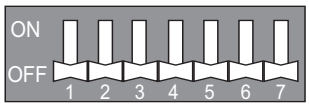
Setting for Master Water-source Unit

SW01B Setting	SW02B Setting	Remark
		Normal Mode (factory setting)

Settings for Slave Water-source Units

SW01B Setting	SW02B Setting	Remark
		Normal Mode (factory setting)
		Slave1 Water-source Unit Setting (when two total units)
		Slave2 Water-source Unit Setting (when three total units)

Settings for Pipe Lengths

Function	SW01B Setting	SW02B Setting	Remark
Standard			Standard Mode (factory setting)
Short Pipe Length			Not recommended unless approved by LG
Long Pipe Length			Not recommended unless approved by LG

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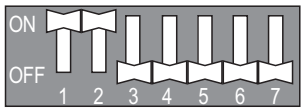
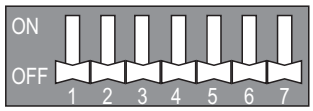
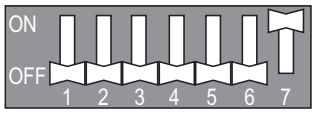
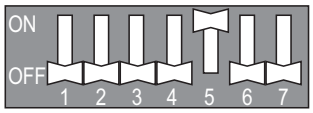
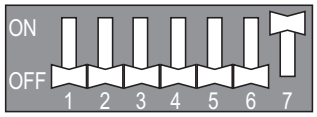
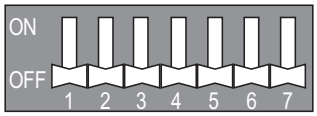
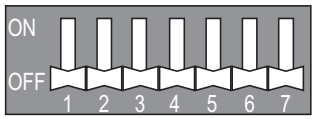
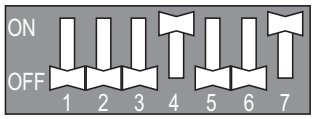
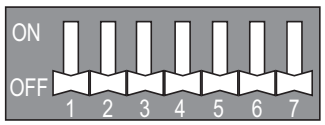
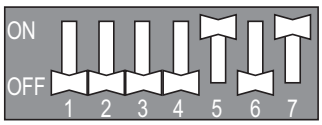
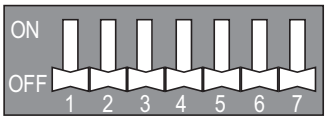
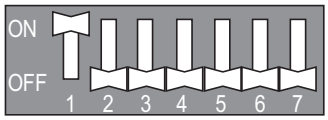
Water-source Unit Dip Switch Settings—Heat Pump ARWN and Heat Recovery ARWB

Settings for Special Functions

Function	SW01B Setting	SW02B Setting	Remark
Longest Pipe Length			Not recommended unless approved by LG
Checking the Water Temperature			After the system is turned on, Dip Switch 7, 12 are completed as indicated on LED
Forced Oil Return			
Vacuum Mode			
Water Pipe Solenoid Valve 208/230V Functions			For 208/230V power supply to the water pipe solenoid valve
Ground Source Mode (Heating Mode Down to 23°F EWT)			Use this mode when the temperature of the circulation inlet water is less than 50°F (10°C). (Antifreeze should be used.)

⚠ Note:

- *Always shut power off before setting the dip switches, then turn power back on to lock dip switch settings in the system.*
- *If the dip switches are not set accurately, system operation can malfunction.*

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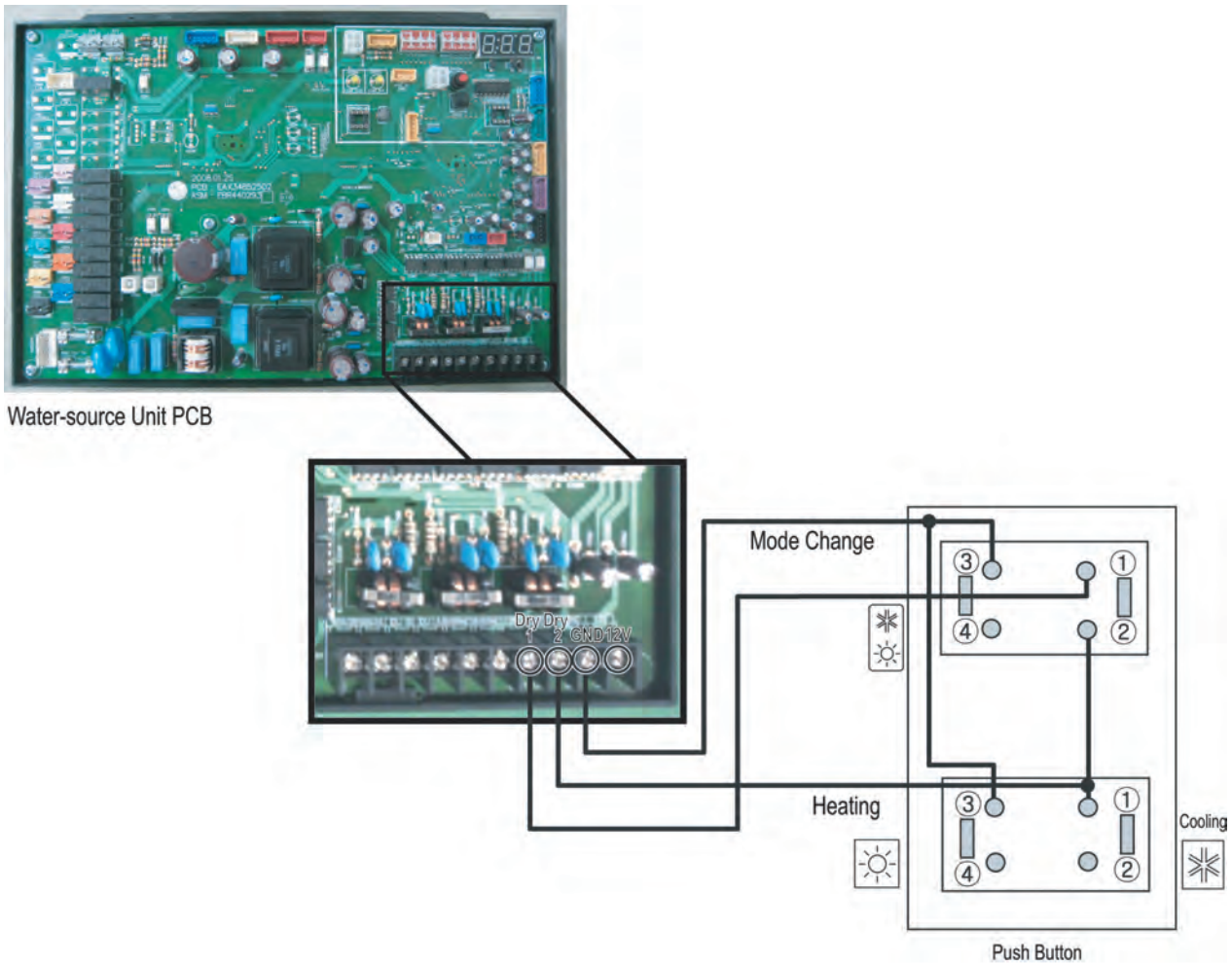
ELECTRICAL SYSTEM INSTALLATION

Mode Switch Wiring

- Connect wires to the dry contact relays of the water-source unit PCB as seen in the diagram below.
- Insert the wire in the connection hole, and push the “Push” button.
- Set the dip switch on the main PCB of the master water-source unit.



Setting the Modes without a Cool/Heat Selector

If a cool/heat selector is not present, connect the signal terminal block on the water-source unit PCB with jumper cables as seen below.

Cooling Mode Setting

DRY 1 → GND Connection

DRY 2 → Off (Open)

Heating Mode Setting

DRY 1 → GND Connection

DRY 2 → GND Connection

Fan Mode Setting

DRY 1 → Off (Open)

DRY 2 → GND Connection

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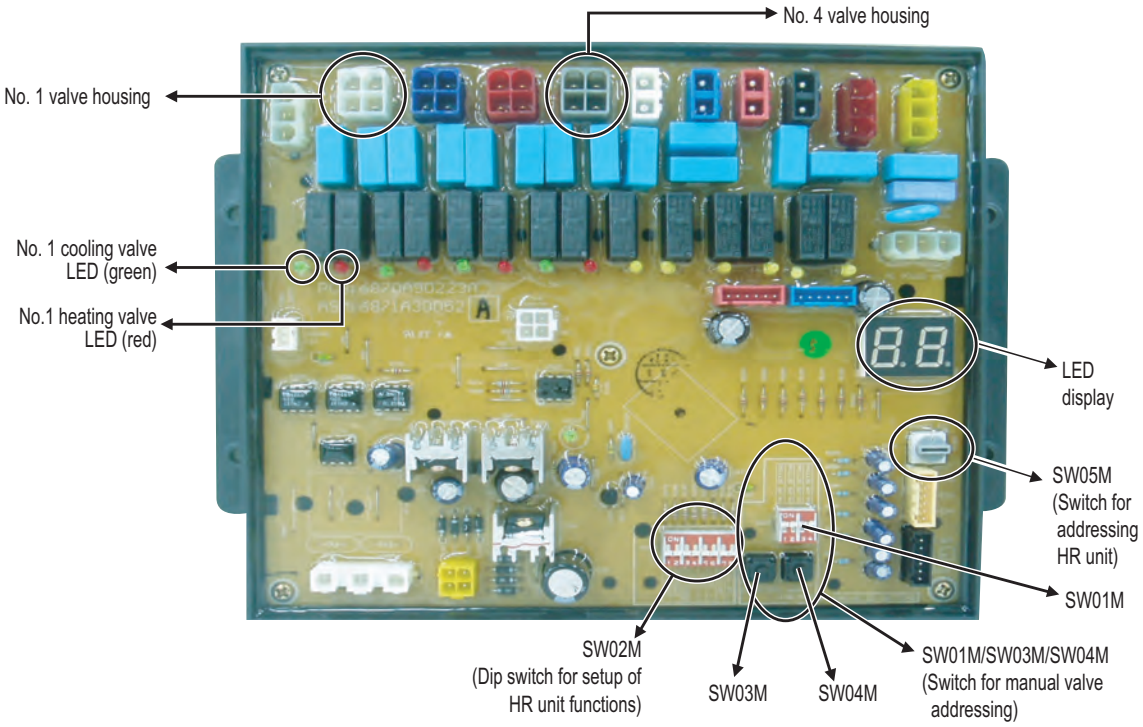
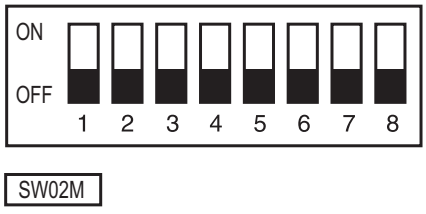
Heat Recovery Control Unit Dip Switch Setting (Heat Recovery ARWB Series Only)



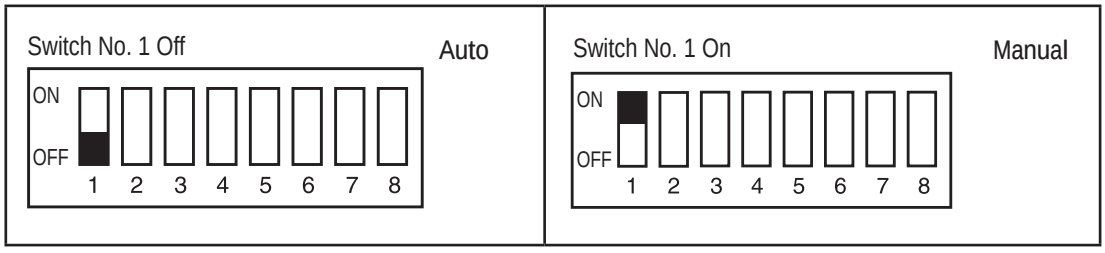
Setting up the Heat-recovery Control Unit

1. Main function of SW02M.



ON S/W	Selection
No. 1	Method for addressing the heat-recovery control unit valves (Auto / Manual)
No. 2	Model of heat-recovery control unit
No. 3	Model of heat-recovery control unit
No. 4	Valve group setting
No. 5	Valve group setting
No. 6	Valve group setting
No. 7	Used only in factory production (preset to “OFF”)
No. 8	Used only in factory production (preset to “OFF”)

a. Selecting the addressing method for the heat-recovery control unit valves (Auto / Manual).



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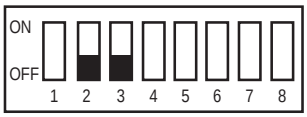
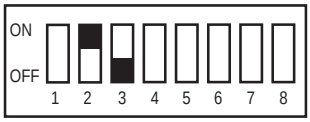
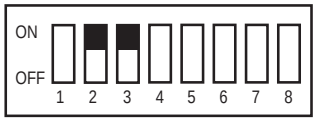
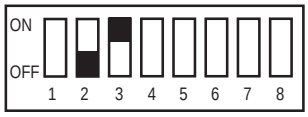
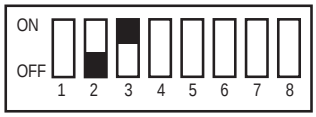
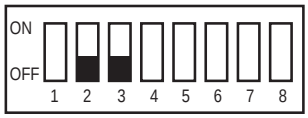
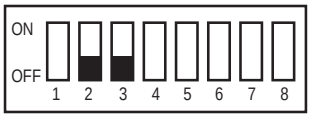
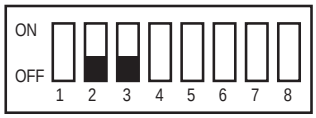
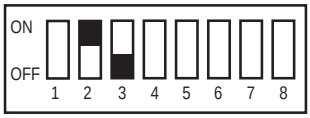
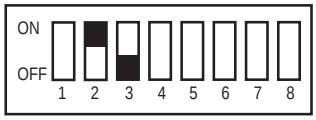
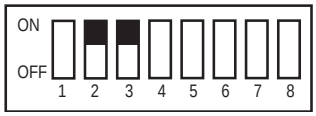
ELECTRICAL SYSTEM INSTALLATION

Heat Recovery Control Unit Dip Switch Setting (Heat Recovery ARWB Series Only)

b. Selecting the heat recovery control unit model.

	PRHR021A (Two [2] ports)	PRHR031A (Three [3] ports)	PRHR041A (Four [4] ports)
Initial Setting			
One port connected			
Two ports connected			
Three ports connected			
Four ports connected			

⚠ Note:

Each heat recovery control unit model has dip switches No. 2 and No. 3 factory set as shown above in initial setting.

- *To use a PRHR021A for one port, cap off the second pipe, and set the dip switches on the heat recovery control unit for "one port connected" as shown in the table above.*
- *To use a PRHR031A for two ports, cap off the third port, and set the dip switches on the heat recovery control unit for "two ports connected" as shown in the table above.*
- *To use a PRHR041A for three ports, cap off the fourth port, and set the dip switches on the heat recovery control unit for "three ports connected" as shown in the table above.*
- *To use a PRHR041A for two ports, cap off the third and fourth ports, and set the dip switches on the heat recovery control unit for "two ports connected" as shown in the table above.*
- *Any unused port must be sealed with a brazed copper cap, not with a plastic cap.*
- *All factory installed process tubes must be removed and lines sealed with copper caps.*

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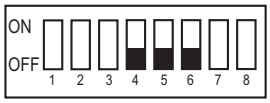
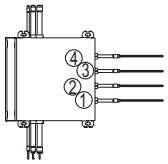
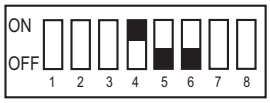
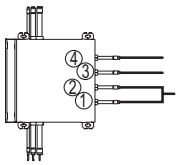
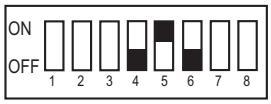
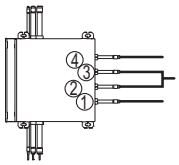
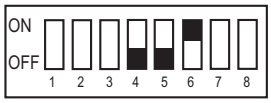
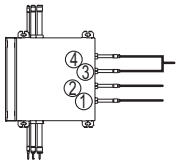
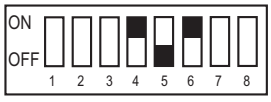
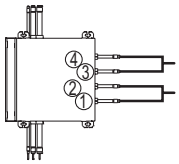
Heat Recovery Control Unit Dip Switch Setting (Heat Recovery ARWB Series Only)

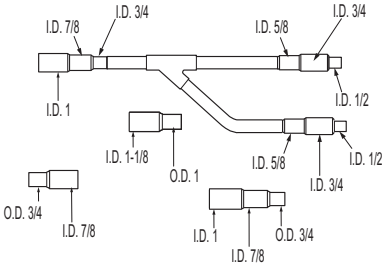
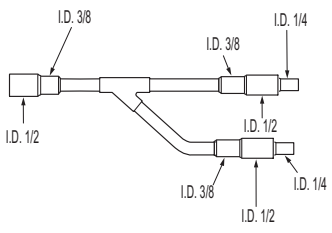
c. Setting the Valve Group Control.

	Dip Switch Setting	Example
No Valve Group Control		 Indoor unit Indoor unit Indoor unit Indoor unit
No. 1, 2 Valve Control		 Indoor unit Indoor unit Large capacity indoor unit
No. 2, 3 Valve Control		 Indoor unit Large capacity indoor unit Indoor unit
No. 3, 4 Valve Control		 Large capacity indoor unit Indoor unit Indoor unit
No. 1, 2 Valve Control No. 3, 4 Valve Control		 Large capacity indoor unit Large capacity indoor unit

⚠ Note:

If large capacity indoor units (larger than 48,000 Btu/h) are installed, the Y-branch pipe shown in the table below should be used to twin the ports.

Unit: inch

Models	Vapor Pipe	Liquid pipe
ARBLN03321		

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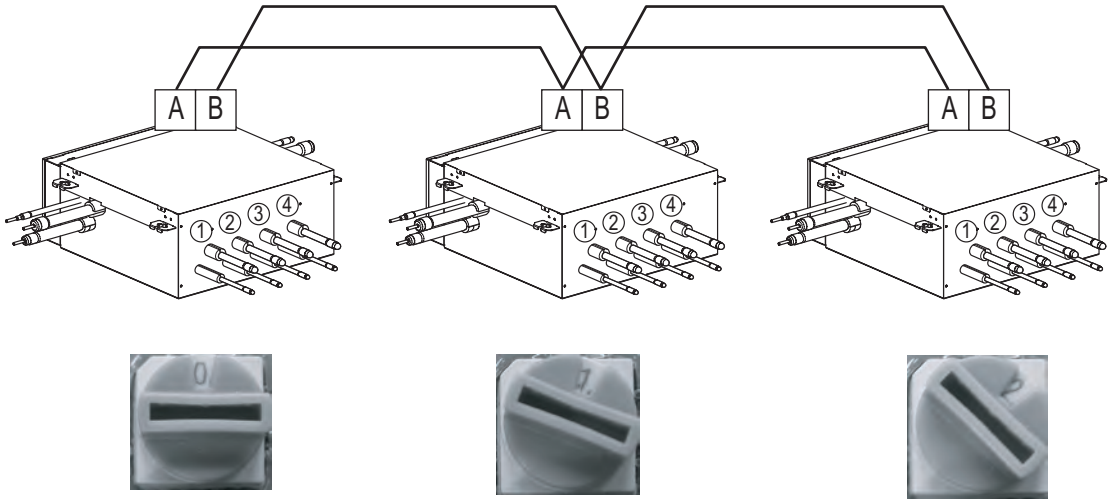
Heat Recovery Control Unit Dip Switch Setting (Heat Recovery ARWB Series Only)

2. Function of SW05M (Rotary switch for addressing heat recovery control units).

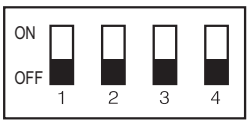
- SW05M must be set to "0"' when installing only one heat recovery control unit.
- When installing multiple heat recovery control units, address each unit with sequentially increasing numbers starting from "0".

Example: Installing three heat recovery control units



3. SW01M / SW03M / SW04M (Dip switches and tact switches for manual heat recovery control unit valve addressing).

- Use to manually address the heat recovery control unit valve.
- Set the address of the heat recovery control unit valve to the central control address of the connected indoor unit.
  - SW01M: Selecting the valve to address.
  - SW03M: Increases in the ten (10) digit of the valve address.
  - SW04M: Increases the valve address by one (1).
- Prerequisite for manual valve addressing: The central control address of each indoor unit must be preset differently at its wired remote controller.

	Switch No.	Setup
 SW01M	No. 1	Manual addressing valve No. 1
	No. 2	Manual addressing valve No. 2
	No. 3	Manual addressing valve No. 3
	No. 4	Manual addressing valve No. 4
SW03M 	SW03M	Increases the ten (10) digit of the valve address
SW04M 	SW04M	Increases the valve address by one (1)

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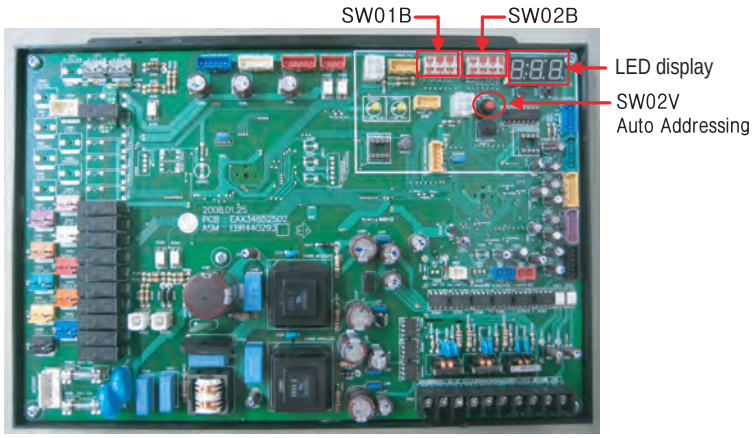
Indoor Unit Auto Addressing—ARWN Series Heat Pump Systems Only

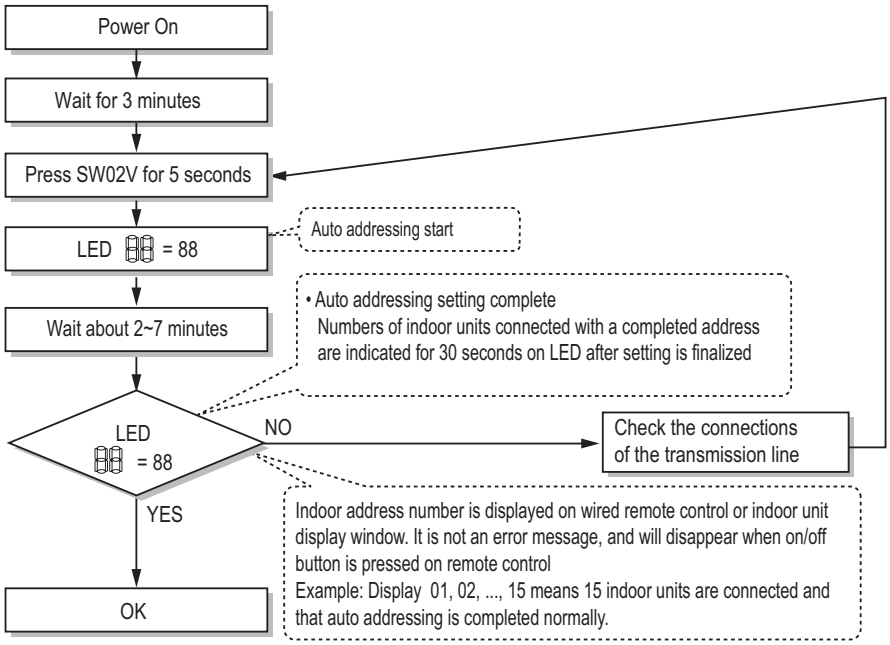
1. Addresses of all indoor units are set using the auto addressing procedure.
2. Connect and turn on power supplies to the indoor units and master and slave water-source units.
3. Wait for three (3) minutes.
4. Press SW02V (the red auto-addressing button) on the master water-source unit PCB for five (5) seconds.
5. The number “88” displays on the LED of the master water-source unit PCB.
6. Wait two (2) to seven (7) minutes, depending on how many indoor units need to be auto addressed.
7. The LED will display for 30 seconds which indoor units have finished being auto addressed.
8. The address of each indoor unit is also shown on the wired remote control display window. (CH01, CH02, CH03...CH06: Indicates address number of indoor unit connected).



⚠ Note:

- *If the indoor unit PCB needs to be replaced, the auto addressing procedure needs to be performed again. Always execute the auto addressing procedure with the power supplied to the water-source units and indoor units. If a power supply is not connected to the indoor units, an operation error will occur.*
- *Auto addressing is only possible on the main PCB of the water-source unit (master unit if dual / triple frame system).*
- *When power is connected to the water-source units and indoor units, the system will be in standby for more than three (3) minutes to improve communication to the indoor units, and then auto addressing can be performed.*

Auto Indoor Unit Addressing Procedure



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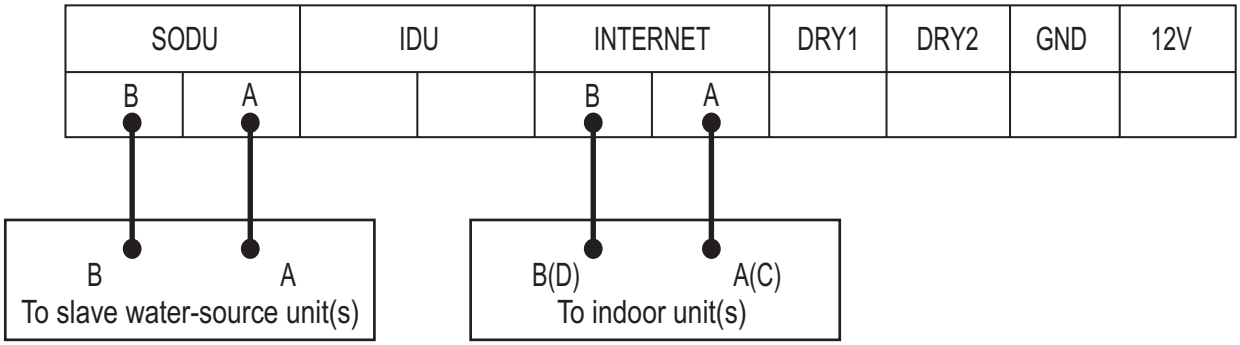
Group Number Setting for the Indoor Units

1. Verify that the power to the entire system (water-source units, indoor units) is off. If not, turn off.
2. Connect the transmission lines to the INTERNET terminal on the water-source unit PCB, matching polarity with polarity (A → A, B → B).
3. Turn the power to the entire system on.
4. Set the group number and indoor unit numbers using a wired remote control.
5. To combine several sets of indoor units into one group controlled by a simple central controller, set the group ID from "0" to "F."

Terminal block on the main PCB



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

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Addressing Indoor Units with Heat Recovery Control Units (Heat Recovery ARWB Series)

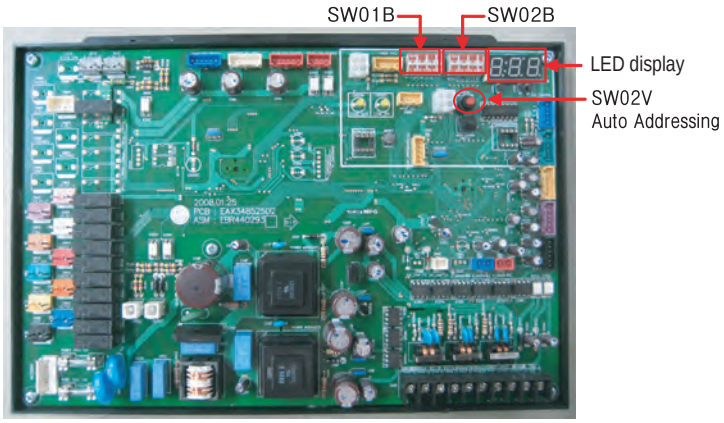
1. Auto addressing the indoor units.
2. Auto pipe detection.
3. Manual pipe detection (Execute if auto pipe detection fails).

⚠ Note:

All indoor units must be turned off before beginning the auto addressing procedure. If indoor units are operating, auto addressing cannot be completed.

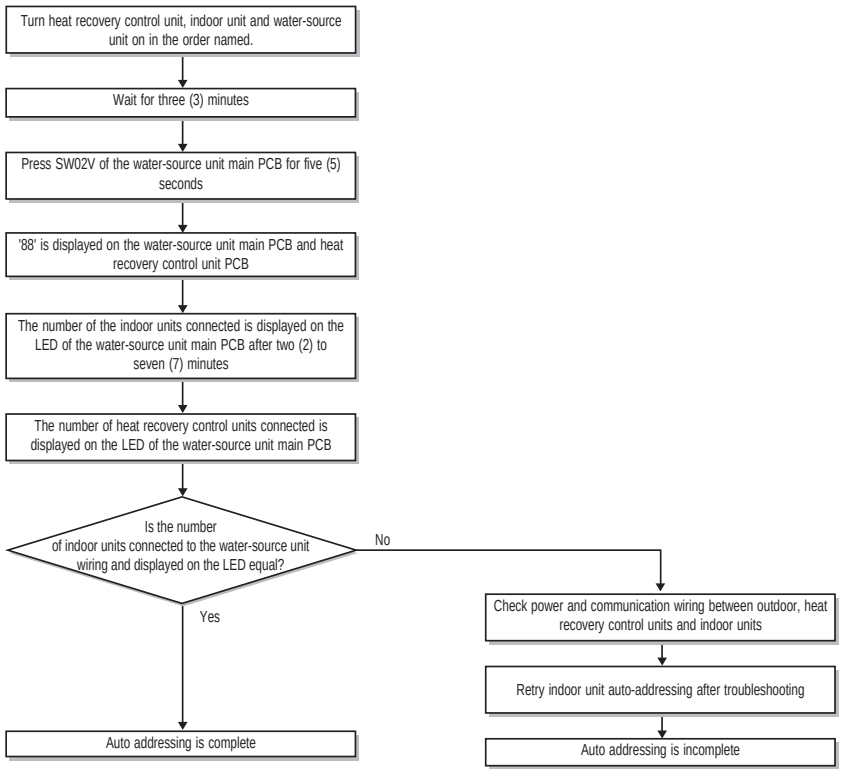
1. Auto addressing the indoor units.

1. Connect and turn on power supplies to the heat recovery control unit, indoor units, and master and slave water-source units.
2. Wait for three (3) minutes.
3. Press SW02V (red auto-addressing button) on the master water-source unit PCB for five (5) seconds.
4. The number “88” displays on the LED display of the master water-source unit PCB.
5. Wait two (2) to seven (7) minutes, depending on how many indoor units need to be auto addressed.
6. The LED will display for thirty (30) seconds the total number of indoor units that have been auto addressed.
7. The address of each indoor unit is also shown on the wired remote control display window. (CH01, CH02, CH03...CH06: Indicates address number of indoor unit connected).
8. After three (3) seconds, the LED will display the total number of heat recovery control units.



Water-source unit PCB

Auto addressing the indoor units



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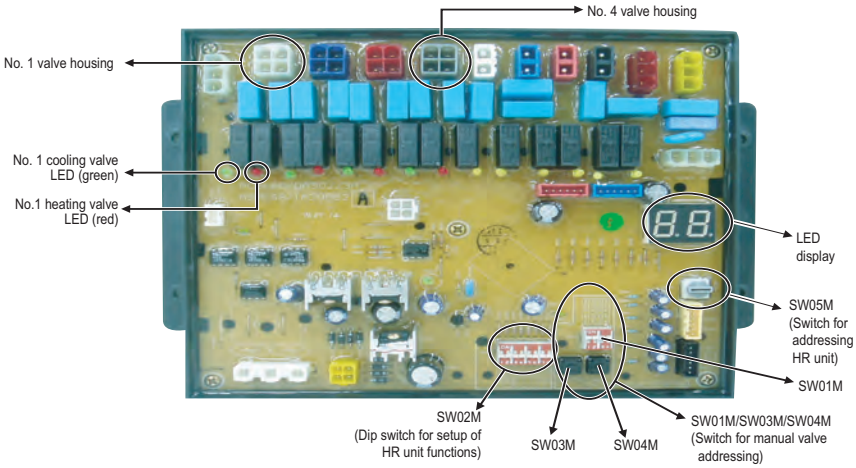
2. Auto pipe detection.

Auto pipe detection: The function that sets the connection relationship between the indoor units and the heat recovery control units automatically.

1. Verify that No. 1 of SW02M on the heat recovery control unit PCB is off.
2. Confirm that the setting on No. 2, 3 of SW02M corresponds to the number of indoor units connected.
3. Reset the power of the heat recovery control unit PCB.
4. Set the No. 5 dip switch on the water-source unit PCB:
   - If the outdoor temperature is below 59°F, set the No. 5 dip switch to OFF.
   - If the outdoor temperature is above 59°F, set the No. 5 dip switch to ON.
5. Reset the power of the water-source unit.
6. Wait three (3) minutes.
7. Press SW01V on the water-source unit PCB for five (5) seconds.
8. The number of connected heat recovery control units is displayed. Example: If installing four units, the display will read "04."
9. The code "88" is displayed on the LED of the water-source unit PCB.
10. Auto pipe detection will run for five (5) to thirty (30) minutes depending on the number of connected indoor units and outdoor temperature.
11. When auto pipe detection is complete, the number of installed indoor units will display on LED on the water-source unit PCB for about one (1) minute.
12. On the heat recovery control units, the number of connected indoor units to each heat-recovery control unit is displayed.

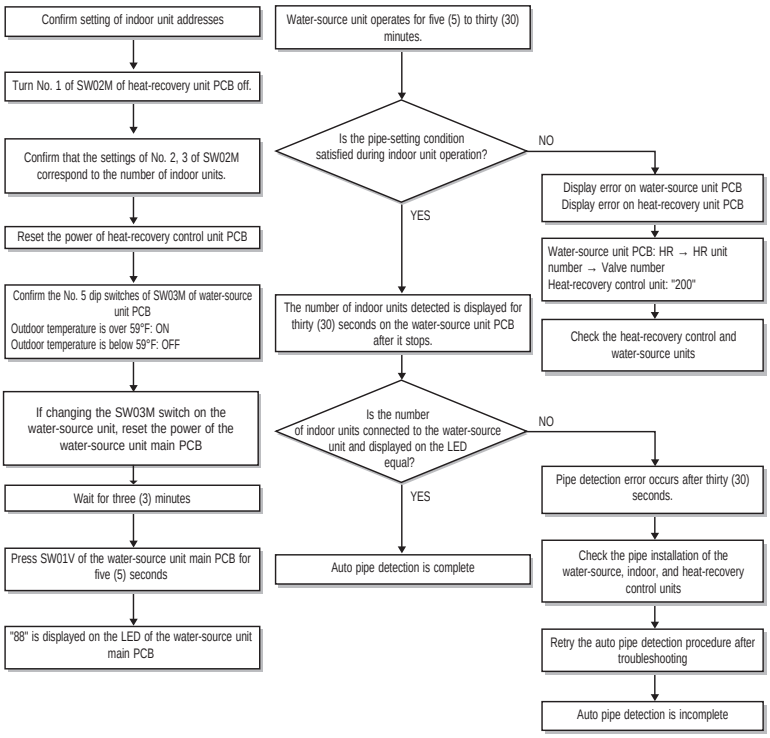


Heat recovery control unit PCB

⚠ Note:

Auto pipe detection is complete after the "88" code disappears. A code of "200" will display if there is an auto pipe detection error.

Auto pipe detection



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Addressing Indoor Units with Heat Recovery Control Units (Heat Recovery ARWB Series)

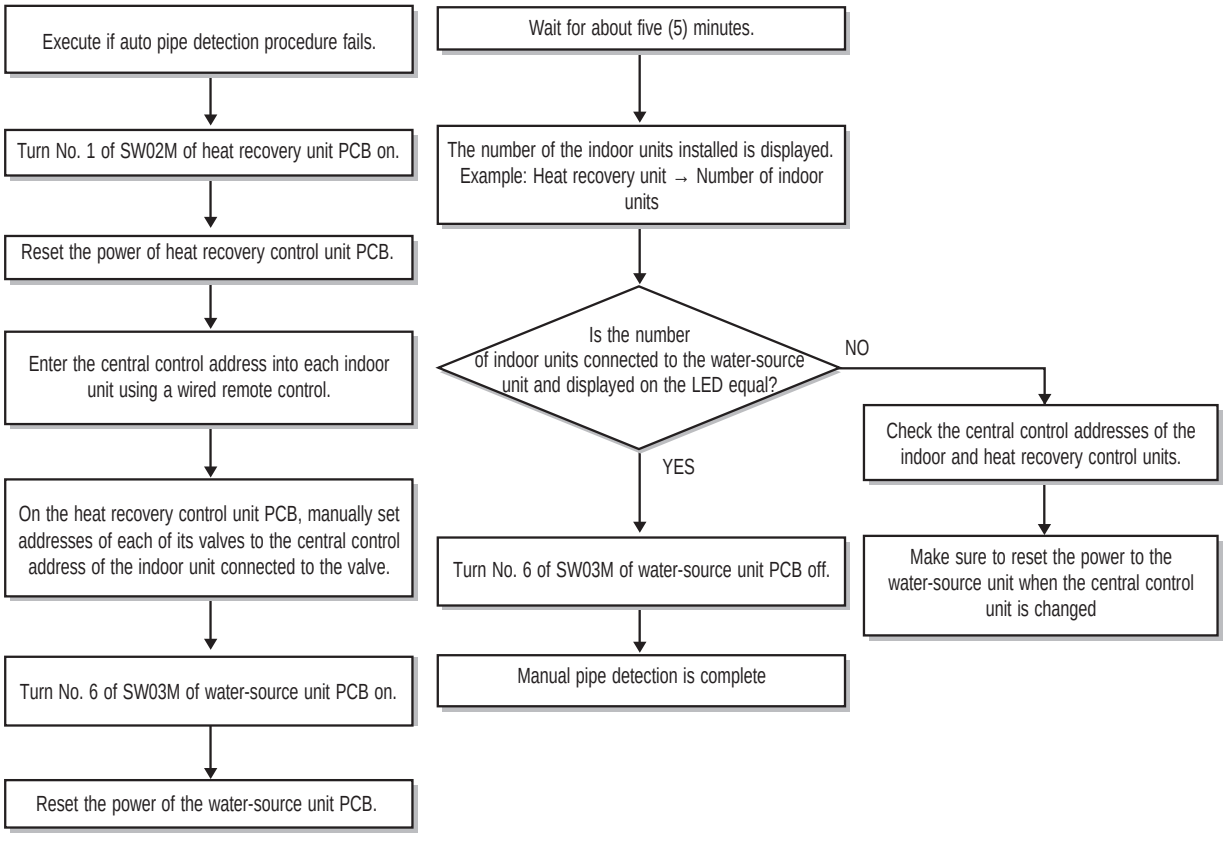
⚠ Note:

1. Execute auto addressing and auto pipe detection procedures again whenever the indoor unit PCB and heat recovery control unit PCB are replaced. Operation error occurs unless power is applied to the indoor units and heat recovery control units.
2. Error No. 200 occurs if the number of actual connected indoor units is different than that of the number of addressed indoor units.
3. If the auto pipe detection addressing procedure has been completed successfully, manual pipe detection procedure is not necessary.
4. Auto pipe detection can be run again if the procedure fails initially, but perform auto pipe detection after the water-source units are reset.
5. If the auto pipe detection fails, perform manual pipe detection (see below).

3. Manual pipe detection.

1. Enter the central control address into each indoor unit using its wired remote controller.
2. Switch on No. 1 of SW02M from the heat-recovery control unit PCB.
3. Reset the power of the heat recovery control unit PCB.
4. On the heat recovery control unit PCB, manually set the address of each valve to the central control address of the indoor units connected to it.
5. Switch on No. 6 of SW03M on the water-source unit PCB.
6. Reset the power of the water-source unit PCB.
7. The number of connected indoor units displays on the LED on the water-source unit PCB after about five (5) minutes. (Heat recovery control unit → the number of the indoor unit.)
8. Switch off No. 6 of SW03M on the water-source unit PCB.
9. Reset the power of the water-source unit PCB and the heat recovery control unit PCB.
10. Manual pipe detection is complete.

Manual pipe detection



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PRECOMMISSIONING

MULTI V WATER II

Addressing Indoor Units with Heat Recovery Control Units (Heat Recovery ARWB Series)

⚠ Note:

- *If a central controller is not installed, leave the address data alone until installer sets the central control address as desired.*
- *If a central controller is installed, the wired remote controller of the indoor units will provide the central control addresses. (In this case, manually set the heat recovery control unit pipe address following the central control address of the indoor unit.)*
- *Central controller addresses must be set manually at each individual controller.*
- *A pipe that does not have an indoor unit connected to it should be set with a different address than a pipe that does have an indoor unit connected to it. (If addresses are the same, the valves will not operate.)*
- *Change pipe settings manually through the heat recovery control unit PCB.*
- *An error indicates that the manual pipe detection procedure was not completed properly.*

Manual pipe detection example.

An indoor unit with a central control address of "11" is connected to valve "1" of an heat recovery control unit. Prerequisite for manual valve addressing: The central control address of each indoor unit must be preset differently using its wired remote control.

No.	Display / Setup	Description
1		Operation: None Display: None
2		Operation: Turn dip switch No. 1 on to address valve No. 1. Display: Existing value saved in EEPROM is displayed on LED.
3		• Operation: Set the digit of 10 to the number in Group High data of the wired remote control connected to the corresponding indoor unit to the valve No. 1 by pressing left tack switch. • Display: Digit increasing with the times of pressing tack S/W is displayed on left LED.
4		• Operation: Set the digit of 1 to the number in Group Low data of the wired remote control connected to the corresponding indoor unit to the valve No. 1 by pressing right tack S/W. • Display: Digit increasing with the times of pressing tack switch is displayed on right LED.
5		• Operation: Turn dip switch No. 1 off to save the address of valve No. 1 • Display: “11” displayed on LED disappears

⚠ Note:

- *The procedure described above must be performed for all valves on the heat recovery control unit.*
- *Valves that do not have connected indoor units should be addressed with a number that has not been used to address any valves connected to indoor units. (Valves will not work if the address numbers are the same.)*

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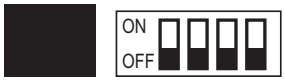
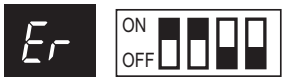
Addressing Indoor Units with Heat Recovery Control Units (Heat Recovery ARWB Series)

Example of how to check the valve address.

An indoor unit with a central control address of "11" is connected to valve "1" of a heat recovery control unit.

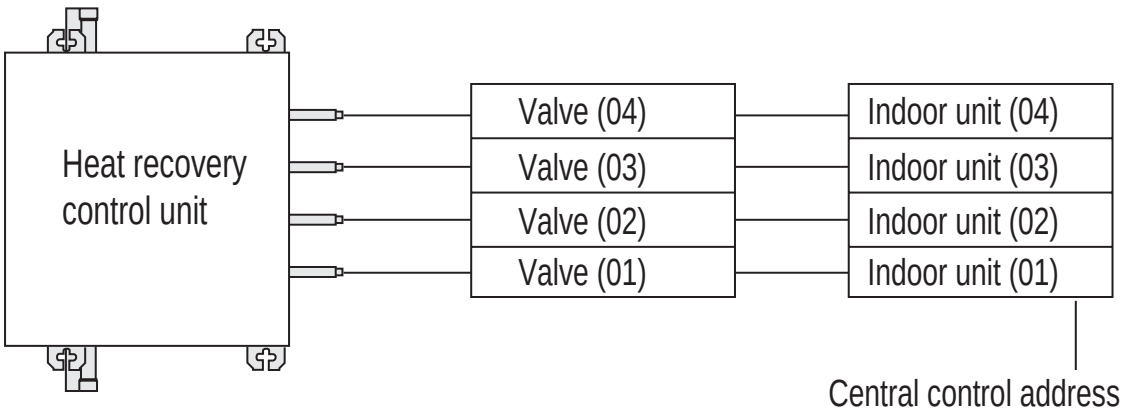
No.	Display / Setup	Description
1	 LED SW01M	• Operation: Turn dip switch No. 1 to ON. • Display: "11" displays on LED.
2	 LED SW01M	• Operation: Turn dip switch No. 1 to OFF. • Display: LED is blank.

Identification of manual valve address

No.	Display / Setup	Description
1	 LED SW01M	• Operation: More than two (2) dip switches turned on. • Display: LED displays "Er."

⚠ Note:

When manually addressing, the valve address and the central control address of its corresponding indoor unit should be set using the same number.



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Precautions Before Testing the System

1	Check if air is completely purged from the water circuit and the water supply is flowing smoothly.
2	Use the electrical wiring diagram to verify wiring connections, check to see if the power and communication wires are connected, and verify if there are any disconnected or loose communication or power wires. Check for any refrigerant leaks in the piping system.
3	Check whether L1, L2, L3 power cable connections are installed correctly. Check the insulation resistance with a DB mega tester device (DC 500V) between the power terminal block and ground terminal. Verify that it is 2.0MΩ or above resistance when measured. If the resistance is 2.0MΩ or less, do not operate the product. **Precaution:** • Never check the insulation resistance for the terminal control board. (The control board can be damaged.) • If the system is not turned on immediately after installation, or if the system is off for a long period, refrigerant accumulates in the compressor, and the insulation resistance reduces to less than 2.0MΩ. If the insulation resistance is 2.0MΩ or less, turn the power on, permitting the compressor crankcase heater to operate so that the refrigerant (including oil inside the compressor) can evaporate. The insulation resistance value will then increase to more than 2.0MΩ.
4	Check whether the liquid and vapor service valves are open. Turn main power on to all water-source units, indoor units, and, if applicable, heat recovery control units.
5	• Always make sure that the main power to the water-source unit is connected before operating the system. • During test run, after installation, or during the operation a56ter the main power to the water-source unit is shut off (power outage, etc.), always connect the power six (6) hours before preheating the crankcase heater. If the crankcase heater is not preheated for more than six (6) hours with the electric heater, it can cause compressor slug. (Heating the bottom part of the compressor with the crankcase heater allows refrigerant included in the oil to evaporate.)

- *Always check if the water supply is flowing smoothly before the test run. If water is not flowing sufficiently, the unit can burn out. Installing a water-flow switch will prevent unit damage.*
- *During initial test run after installing the product, if the unit is not operating for more than three (3) days, or after replacing the compressor, power must be connected six (6) hours before operating to heat the compressor heater. (If the product is not heated sufficiently, the unit can slug.)*

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Before executing the test run for the entire system, the water circuit system must first be tested. Only after the flow rate and the temperature of the water circuit are checked can the test run for the entire system be initiated.

Equipment Design

……Design the system, including cooling tower, boiler, pump, etc.
- Check the equipment capacity (water volume, temperature control range).

Water pipe system installation

……Install the water pipes.

Water supply pipe and product connections

……Connect the water pipe to the inlet/outlet of the product so that the water can be supplied to the product.

Water supply system test run

……Test the water supply system
- Turn the water-source unit off, but operate the pump and water supply equipment to flow water to the heat exchanger.
- Permit water to flow throughout the entire water-piping system to clean any foreign particles inside the pipes, and execute an air purge to remove air within the pipes.
- Clean all water pipe strainers, including those located around the water-source unit.

Verify if there are any problems with the water supply

……Test the water supply system without turning the water-source unit on.
- Check if the water-source unit inlet/outlet flow rate matches product specifications. (Standard water volume is 21.1 gpm based on a 6-ton unit, and 42.2 gpm based on a 12-ton unit.)
- Check if the water temperature is within the specified range.

Test the product

……After checking for the appropriate condition of the water supply, test the water-source unit.
- To prevent the heat exchanger from freezing if the water supply is blocked and the refrigerant is discharged, discharge the refrigerant only after draining out around the water-source unit.

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Item	Error	Cause	Checks
Whether or not the water source is supplied.	CH24[1]	After the flow switch is connected, the water supply is not flowing, or the flow is insufficient.	Check to see if the pipes are properly sized and installed correctly. Check if the water circuit pump is operating.
			Check if the water supply pipe is clogged. (Causes for a clogged water supply pipe: strainer needs cleaned, valve is locked or otherwise inoperable, air is trapped in the water-supply pipe, etc.)
			Check if the flow switch is operating normally. There may be flow switch problems, the flow switch may be disconnected, etc.
	CH32	During cooling operation, water is not being supplied, or flow rate is insufficient.	Check if the water circuit pump is operating.
			Check to see if the pipes are properly sized and installed correctly. Check if the water supply pipe is clogged. (Causes for a clogged water supply pipe: strainer needs cleaned, valve is locked or otherwise inoperable, air is trapped in the water-supply pipe, etc.)
	CH34	The water supply is not flowing, or the flow is insufficient.	Check if the water circuit pump is operating.
			Check to see if the pipes are properly sized and installed correctly. Check if the water supply pipe is clogged. (Causes for a clogged water supply pipe: strainer needs cleaned, valve is locked or otherwise inoperable, air is trapped in the water-supply pipe, etc.)
	CH180[1]	During heating operation, water is not being supplied, or flow rate is insufficient.	Check if the water circuit pump is operating.
			Check to see if the pipes are properly sized and installed correctly. Check if the water supply pipe is clogged. (Causes for a clogged water supply pipe: strainer needs cleaned, valve is locked or otherwise inoperable, air is trapped in the water-supply pipe, etc.)

[1]If CH24 or CH180 error occurs during the test operation of the unit, the inside of the plate-type heat exchanger may be partially frozen. After solving the cause of the partial freezing (lack of water supply flow, water being suspending, lack of cooling medium, foreign materials inside of the plate-type heat exchanger), test or operate the unit again.

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To prevent damage to the heat exchanger due to scaling, the heat exchanger should be inspected once (1) per year and cleaned every five (5) years.

Yearly Inspection

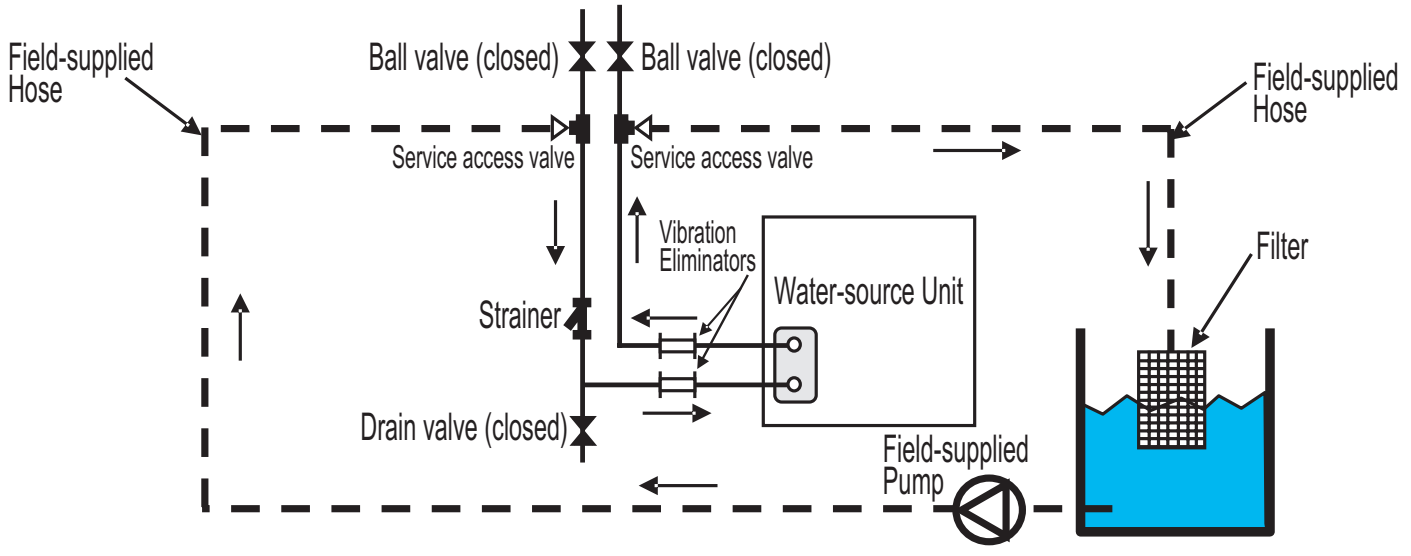
Once (1) a year, the plate heat exchanger must be inspected. Inspection should include:

- Water quality should be tested to see if it is within quality levels listed in the water circuit installation section of this manual.
- Strainer should be cleaned.
- Water flow rate should be checked.
- Water pressure and inlet / outlet water temperatures should also be checked.

Five (5) Year Cleaning Procedure

Heat exchanger cleaning should include:

- Solutions to be used in cleaning the heat exchanger include 5% diluted formic acid, citric acid, oxalic acid, acetate acid, phosphoric acid. Make sure the cleaning solution used is not corrosive to stainless steel or copper. Do not use hydrochloric acid, sulfuric acid, nitric acid as these will be corrosive to the unit.
- Isolate the unit from the pipe system by closing the inlet / outlet ball valves.
- Connect the hose to the service port (plug), fill the heat exchanger with cleaning solution heated to 122°F–140°F, and circulate using the solution tank pump for two (2) to five (5) hours.
- After circulating the cleaning solution, drain the heat exchanger, fill with 1%-2% NaOH (Sodium Hydroxide) or $NaHCO_3$ (Sodium Bicarbonate), and circulate for 15–20 minutes to neutralize the cleaning solution.
- Flush the heat exchanger with clean water and measure pH. Once pH is within recommended levels, open the isolation valves, purge air from the system, and check operation of the unit.



Cleaning the panel heat exchanger

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MAINTENANCE

General Maintenance Schedule

Procedure \ Period (Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Product operating condition	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Heat exchanger cleaning (Wash)					●					●					●
Strainer cleaning	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Water quality check	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Refrigerant leakage check	●														●
Indoor unit filter cleaning	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

⚠ Note:

- *The checklist above is based on minimum frequency. More frequent maintenance may be required depending on operating condition and / or water quality.*
- *Before cleaning the heat exchanger, make sure that the water pipe connections are tight so that chemical detergent does not leak.*
- *When cleaning the heat exchanger, close the valves so that chemical detergent does not penetrate into the pressure gauge, etc.*
- *Dilute the chemical detergent with the recommended percentage of water.*
- *Note that cleaning the heat exchanger is easier at the initial stages and becomes difficult after scaling has accumulated.*
- *In areas where the water quality is poor, cleaning is required more often.*
- *Because chemical detergent has a strong acid content, it must be washed off thoroughly with water.*
- *To check whether the system is cleaned well inside, remove the hose at the heat exchanger to visually inspect its interior.*
- *Purge the air inside the water piping.*
- *Always check if the water supply is flowing normally before operating the unit.*

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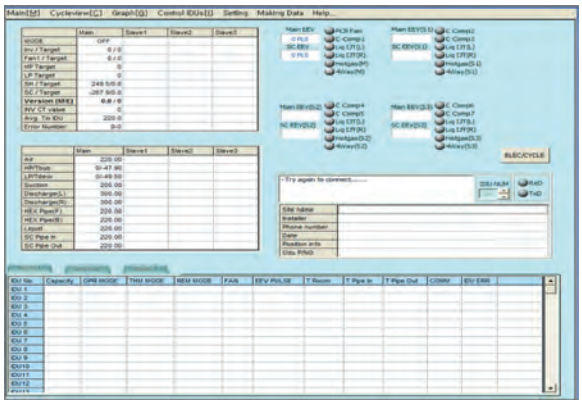
LGMV software shall allow service technician or commissioning agent to connect a computer USB port to the water-source unit (WSU) main printed circuit board (PCB) using an accessory cable without the need for a separate interface device. The main screen for LGMV shall allow user to view the following real time data on one screen:

- 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
- Outdoor air temperature
- Actual high pressure/saturation temperature
- Actual low pressure/saturation temperature
- Suction temperature
- Inverter compressor discharge temperature
- Constant speed compressor discharge temperature
- Front outdoor coil pipe temperature
- Back outdoor coil pipe temperature
- Liquid line pipe temperature
- Subcooler inlet temperature
- Subcooler outlet temperature
- Average indoor unit (IDU) pipe temperature
- Inverter compressor operation indicator light
- Constant speed compressor operation indicator light
- Liquid injection valves' operation indicator lights
- Hot gas bypass valve operation indicator light
- Four-way reversing valve operation indicator light
- Pressure graph showing actual low pressure and actual high pressure levels
- Error code display
- Operating mode indicator
- Target high pressure
- Target low pressure
- PCB (printed circuit board) version
- Software version
- Installer name
- Model number of WSU
- Site name
- Total number of connected IDUs
- Communication indicator lights
- IDU capacity
- IDU operating mode
- IDU fan speed
- IDU EEV position
- IDU room temperature
- IDU inlet pipe temperature
- IDU outlet pipe temperature
- IDU error code



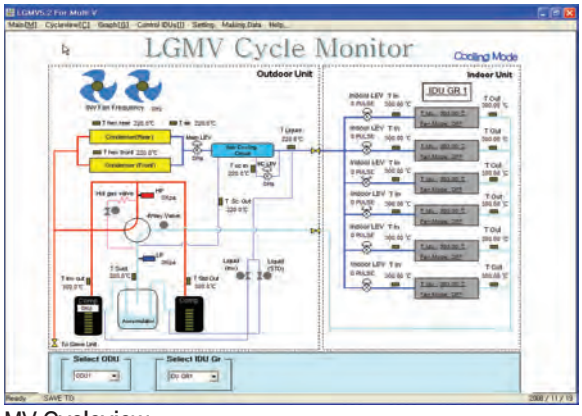
MV Real-time Data Screen

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

1. Cycleview: Graphic of internal components including:
   - Compressors showing actual speeds
   - EEVs
   - IDUs
   - Liquid Injection Valves
   - 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 IDU: Enables user to turn on all IDU's default setpoints of 86°F in heat mode or 64°F in cool mode.



MV Cycleview

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4. Setting: Converts metric values to imperial values.

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

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

7. Electrical Data: The lower half of main screen is changed to show the following:

MV Control Indoor Units Screen

- Inverter compressor
  - Amps
  - Volts
  - Power Hz
  - Inverter control board fan Hz
- Constant compressor
  - Current transducer value
  - Phase

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

In lieu of connecting to the ODU, user has the option to connect to IDU with the use of a USB to RS-485 connector kit. When connected through IDU, user will not be able to record data.

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

Recommended Minimum PC Configuration:

- CPU: Pentium® IV 1.6 GHz
- Main Memory: 256 MB
- Operating System: Windows® NT/2000/XP/Vista
- Hard Disk: 600 MB when operating
- Web Browser: Internet Explorer® 5.0

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Main component	Problem	Cause	Solution
Compressor	Not operating	Motor insulation damaged	Check resistance between terminals and unit frames
		Strainer clogged	Clean / change the strainer
		Oil is leaking	Check amount of oil
	Stopped during operation	Motor insulation failed	Check resistance between terminals and unit frames
	Abnormal noise during operation	R-S-T connection error	Check compressor R-S-T connection
Water-source Unit EEV	Heating failure	Bad connector contact	Check connectors
	No operation sound after switching on the power supply	Coil failure	Check resistance between terminals
	Heating operation failed; water-source unit heat exchanger is frozen	EEV clogged	Service necessary
	Low pressure error or discharge temperature error		

- When a system error occurs, the error code is displayed on the indoor unit or remote control display.
- If CH05/53/11 error occurs, check if auto-addressing is complete and communication wiring is properly installed.

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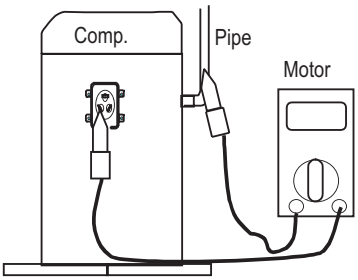
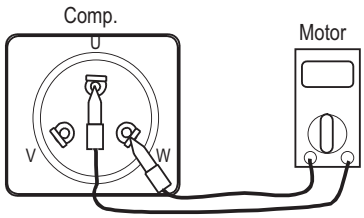
SERVICE TROUBLESHOOTING

Troubleshooting Main Component Errors

If compressor error, or any error related to the electrical system has occurred, check for the items below and follow procedure listed.

<table>
<tr><th>Step Number</th><th>Check for</th><th>Problem</th><th>Solution</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">How long has power been on during operation?</td><td>Power has been on for ≥12 hours.</td><td>Go to Step 2.</td></tr>
<tr><td>Power has been on for ≤12 hours.</td><td>Go to Step 2 after power has been on for 12 hours.</td></tr>
<tr><td rowspan="3">2</td><td>Does error occur again after starting operation?</td><td>The compressor stops and same error appears again.</td><td>Check IPM may have failed.</td></tr>
<tr><td>Method to Measure Insulation Resistance
 
</td><td>Inverter output voltage is stable (1).</td><td>Check coil and insulation resistors. If normal, restart the unit. If same error occurs again, replace the compressor.

Insulation resistor: 2MW or greater
Coil resistor
<table><tr><th></th><th>Inverter</th><th>Constant</th></tr><tr><td>U-V</td><td rowspan="3">0.35±7%Ω</td><td>1.96±7%Ω</td></tr><tr><td>V-W</td><td>1.91±7%Ω</td></tr><tr><td>W-U</td><td>1.99±7%Ω</td></tr></table></td></tr>
<tr><td>Method to Measure Coil Resistance
 
</td><td>Inverter output voltage is unstable or 0V (if digital tester is unavailable).</td><td>Check the IPM. If normal, replace the inverter board.

Check coil and insulation resistors.</td></tr>
</table>

⚠ Note:

When measuring voltage and current of inverter power circuit, values may appear different depending on tools and circuits, and because voltage, power supply current, or output of the inverter has no sine waveform. Also, output voltage changes when output voltage of the inverter has a pulse wave pattern.

1. If using a movable tester when checking if inverter output voltage is constant (when comparing relative voltage between lines), always use an analog tester. Exercise particular caution if inverter output frequency is low, when using a movable tester, where change of measured voltage values is largely between other lines, when virtually same values appear, or where there is danger to determine that inverter failure has occurred.

2. Use a rectifier voltmeter (—▶|—) if using a commercial frequency tester to measure inverter output values (when measuring absolute values). Accurate measuring values cannot be obtained with a general movable tester (for analog and digital mode).

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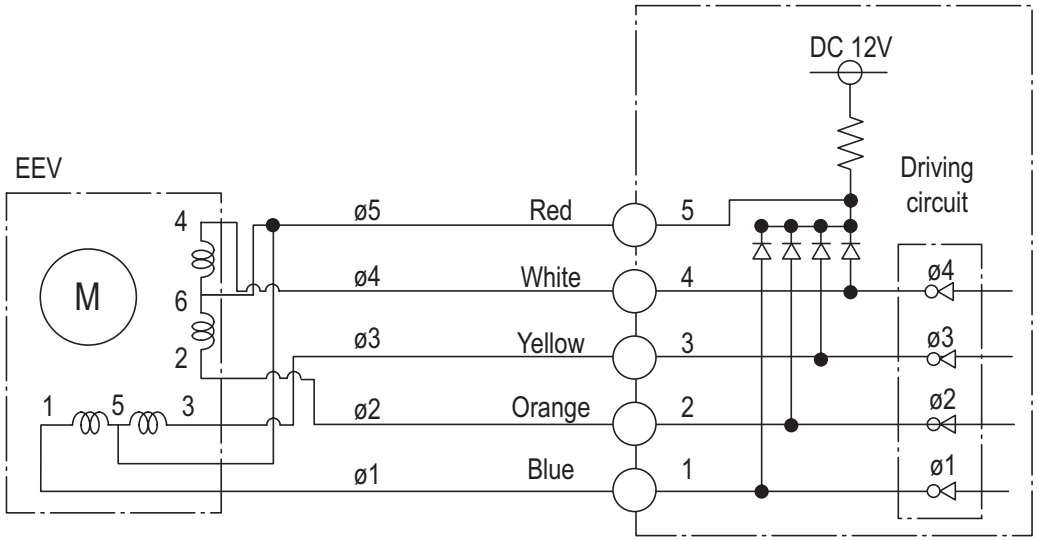


Pulse Signal Output Value and Valve Operation

Output (ø) No.	Output State										
	1	2	3	4	5	6	7	8	9	10	11
ø1	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	OFF
ø2	ON	ON	ON	ON	OFF	OFF	OFF	ON	ON	ON	OFF
ø3	OFF	OFF	OFF	ON	ON	ON	OFF	OFF	OFF	OFF	OFF
ø4	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	OFF

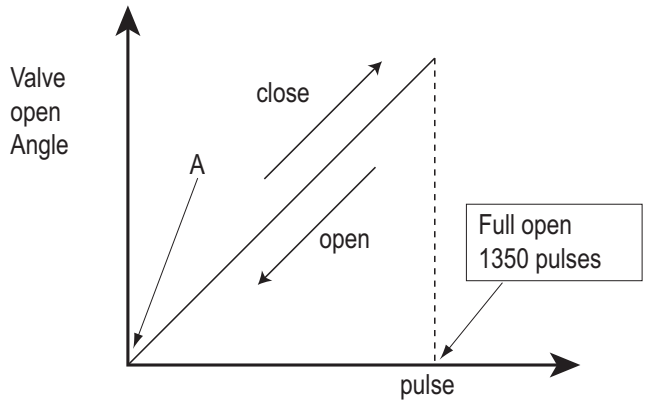
Output Pulse Sequence

In valve-close state: 1 → 2 → 3 → 4 → 5 → 6 → 7 → 8 → 9 → 10 → 11 → 1

In valve-open state: 11 → 10 → 9 → 8 → 7 → 6 → 5 → 4 → 3 → 2 → 1 → 11

1. If EEV open angle does not change, output phase will be off.
2. If output phase is different or continuously in the on state, motor will not operate smoothly and start vibrating.

EEV Valve Operation



- At power on, open angle signal of 1,400 pulses output, and valve position is set to "A". If the valve operates smoothly, no noise and vibration occurs. If the valve is closed, noise occurs.
- EEV noise can be heard by touching its surface with a screwdriver and listening.
- Noise is reduced when liquid refrigerant is in the EEV.

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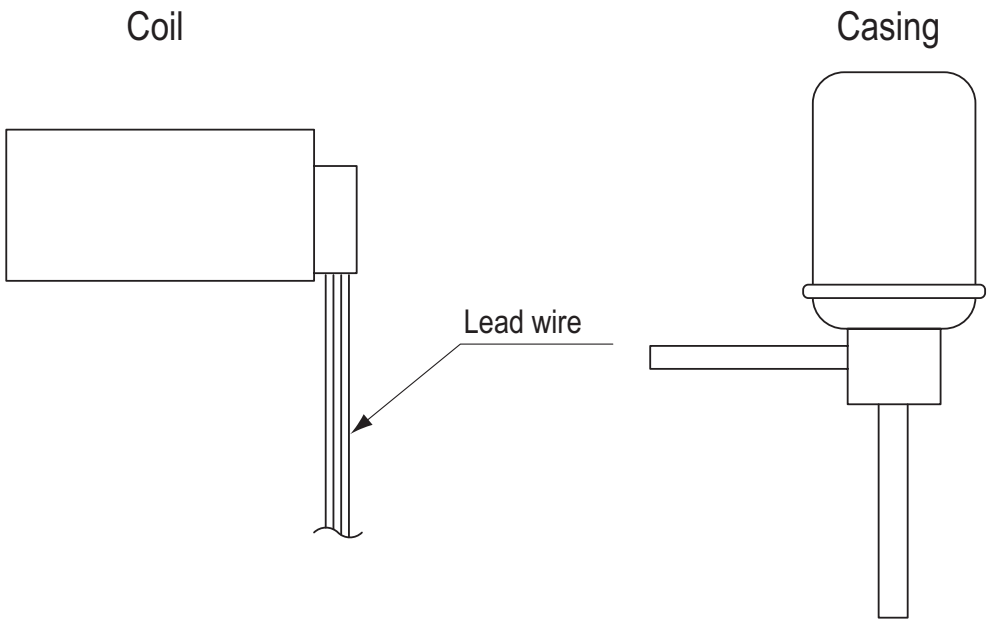
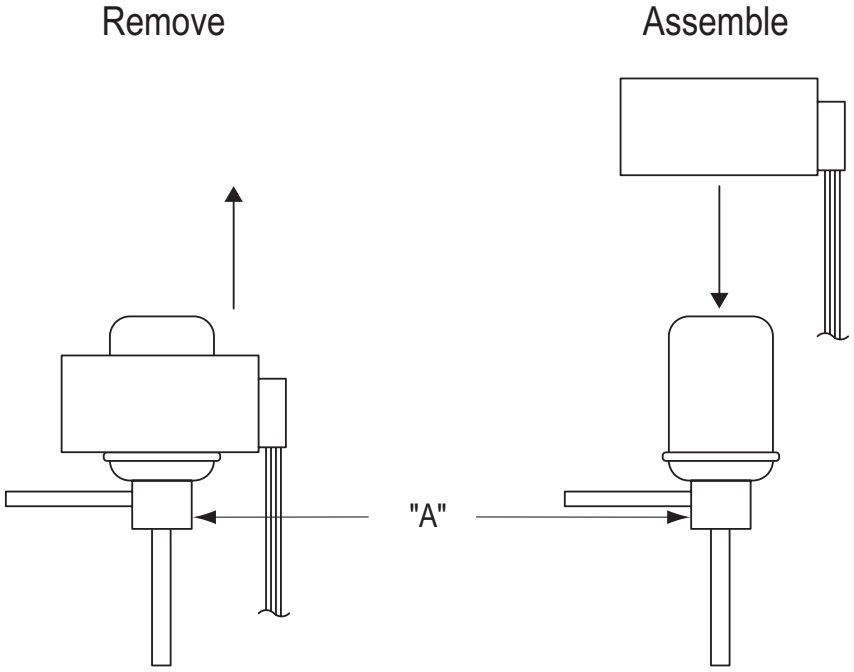
EEV Coil and Casing (Water-source unit)



Remove and assemble the coil



- Grip "A" tightly, and pull coil up.

When the coil is removed or assembled, be careful not to bend the casing pipe.

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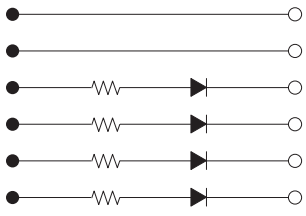
Troubleshooting EEV Errors

Component	Check for	Problem	Solution
Indoor Unit	1. Disconnect the EEV connector from the control board and connect LED for test.  2. With main power on, watch for 17 seconds if pulse signal outputs from EEV. If LEDs do not turn on, or are on continuously, then the circuit is not functioning properly.	Microcomputer circuit failure.	Check and replace indoor unit control board.
Indoor Unit / Water-source Unit	1. Check if EEV is locked, in a no-load state, the driving motor is rotating, and a clicking sound can be heard.	EEV is locked.	Replace EEV.
Water-source Unit	1. Check the resistance between coil terminals (red-white, red-yellow, red-orange, red-blue). 2. If the estimated resistance value is in 52±3Ω, then the EEV is operating normally.	EEV motor coil has shorted out or is not connected properly.	Replace EEV.
Indoor Unit	1. Check the resistance between coil terminals (brown-white, brown-yellow, brown-orange, brown-blue). 2. If the estimated resistance value is in 150±10Ω, then the EEV is operating normally.		Replace EEV.
Indoor Unit	1. Operate one indoor unit in Fan mode and another in Cooling mode. 2. Check the liquid pipe temperature of the indoor unit in Fan mode (through monitoring the water-source unit control board. 3. Check if fan is rotating and EEV is fully closed; if there are any leaks, the temperature will have decreased. If the estimated temperature is very low when compared to the suction temperature displayed on the remote controller, then the valve is not fully closed.	Full close (valve leaking).	If the leak is excessive, replace the EEV.

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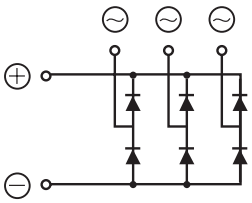
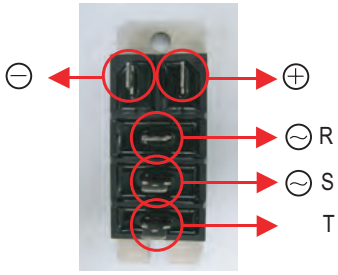
Troubleshooting Phase Bridge Diodes

Internal Circuit Diagram



Phase Bridge Diode



1. Wait until inverter PCB DC voltage is discharged after the main power is turned off.
2. Disconnect all connections to the three-phase bridge diode.
3. Set multitester to diode mode.
4. Measured value should be 0.4V ~ 0.7V as shown in table below.
5. If the measured value is different than what is listed in the table below, set multitester to resistance mode and measure. If the value is too small (0Ω) or too high (hundreds MΩ), PCB needs to be replaced.
6. If the bridge diode is damaged, check to see if inverter PCB assembly (IPM) also needs to be replaced.

Diode terminal / Tester terminal	**+ terminal: black (-)**	**- terminal: red (+)**
R (~) : Red (+)	0.4V ~ 0.7V	-
S (~) : Red (+)	0.4V ~ 0.7V	-
T (~) : Red (+)	0.4V ~ 0.7V	-
R (~) : Black (-)	-	0.4V ~ 0.7V
S (~) : Black (-)	-	0.4V ~ 0.7V
T (~) : Black (-)	-	0.4V ~ 0.7V

Red (+) and Black (-) are the multitester terminals.

⚠ WARNING

To avoid electric shock, check the electrical components of the control box ten (10) minutes after switching off the main power supply and verifying that the DC voltage was discharged.

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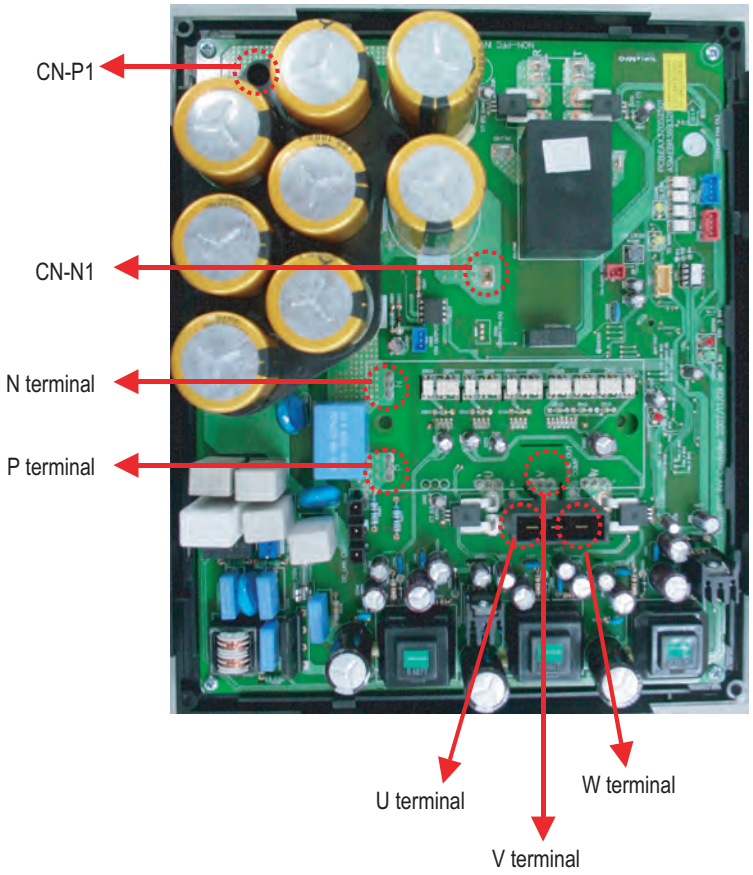

1. After main power is shut off, wait a few minutes until inverter PCB DC voltage is discharged.
2. Disconnect the CN-P1 and CN-N1 connectors and U, V, W terminals on the inverter PCB.
3. Set the multitester to resistance mode.
4. If the value between the P and N terminals of IPM is too small (0Ω) or too large (hundreds MΩ), the IPM is damaged and the PCB needs to be replaced.
5. Measured value in resistance mode should be within 28KΩ ±10%.
6. If the measured value is different from what is listed in the table below, the PCB is damaged and needs to be replaced.

	P terminal: Black (-)	**N terminal: Red (-)**
U terminal : Red (+)	28KΩ ± 10%	Open
V terminal : Red (+)	28KΩ ± 10%	Open
W terminal : Red (+)	28KΩ ± 10%	Open
	P terminal: Red (+)	**N terminal: Red (+)**
U terminal : Black (-)	Open	28KΩ ± 10%
V terminal : Black (-)	Open	28KΩ ± 10%
W terminal : Black (-)	Open	28KΩ ± 10%

Red (+) and Black (-) are the multitester terminals.

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Electrical capacitor and resistor for voltage distributor

1. Disconnect terminal of voltage distribution resistor terminal from each DC link on the electrical capacitor.
2. Set the multimeter to resistance mode, and then connect the probe to +,- terminal of the capacitor. If the estimated resistance value continuously increases without shorting (value is 0), then the resistor is normal.
3. Set the multimeter to resistance mode, confirm that the value of the resistor is around 270 kOhm.
4. Check and replace defective components.

⚠ WARNING

When the control box is opened and before checking the electrical components, make sure that the LED 01Y is turned off (wait three [3] minutes after main power is turned off), otherwise, it may result in electrical shock.

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- Indicates different types of unit failures, and assists in self-diagnosis and to track the frequency of occurrence.
- Error codes are shown on the LED display of indoor units, remote controller, and the water-source unit control board
- If two or more errors occur simultaneously, the lower error code number is displayed first.
- After error is resolved, the error code does not display.

Error Display

The first and second number on the LED indicates error number; the third number on LED indicates unit number.

Examples: 211 = Error No. 21 on master unit (1), 212 = Error No. 21 on slave 1 unit, 213 = Error No. 21 on slave 2 unit.

	Error Code			Description	Details
Indoor Unit	0	1	-	Indoor unit air temperature sensor error.	Indoor unit air temperature sensor has disconnected or short circuited.
	0	2	-	Indoor unit inlet pipe temperature sensor error.	Indoor unit inlet pipe temperature sensor has disconnected or short circuited.
	0	3	-	Communication error between wired remote controller and indoor unit.	Indoor unit PCB has not received signal from wired remote controller. Wired remote controller has not received signal from indoor unit.
	0	4	-	Indoor unit drain pump error.	Drain pump and/or flow switch is/are malfunctioning.
	0	5	-	Transmission error between water-source unit and indoor unit.	Indoor unit PCB has not received signal from water-source unit for at least five (5) minutes.
	0	6	-	Indoor unit outlet pipe temperature sensor error.	Indoor unit outlet pipe temperature sensor has disconnected or short circuited.
	0	7	-	Indoor units are not operating in the same mode.	Indoor units that turned on later are operating in a different mode than indoor units that were turned on earlier.
	0	9	-	Indoor unit EEPROM error.	• Serial number on EEPROM of indoor unit is 0 or FFFFFF • Communication error between MICOM and EEPROM • Indoor unit EEPROM data is not available
	1	0	-	Indoor unit BLDC fan motor feedback signal error.	Indoor BLDC fan motor feedback signal has been absent for at least 50 seconds.
	1	1	-	Communication error between indoor unit and water-source unit.	Indoor unit has not received a signal from the water-source unit for at least three (3) consecutive minutes.
Water-source Unit	2	1	1	Master water-source unit inverter compressor IPM fault.	Master water-source unit inverter compressor drive IPM error.
	2	1	2	Slave1 water-source unit inverter compressor IPM fault.	Slave1 water-source unit inverter compressor drive IPM error.
	2	1	3	Slave2 water-source unit inverter compressor IPM fault.	Slave2 water-source unit inverter compressor drive IPM error.
	2	3	1	Low voltage to the master water-source unit inverter compressor DC link.	DC voltage is not charged after water-source unit operating relay is turned on.
	2	3	2	Undervoltage to the slave1 water-source unit inverter compressor DC link.	DC voltage is not charged after slave1 water-source unit operating relay is turned on.
	2	3	3	Undervoltage to the slave2 water-source unit inverter compressor DC link.	DC voltage is not charged after slave2 water-source unit operating relay is turned on.
	2	4	1	Master water-source unit high pressure switch error.	• Compressor maintenance by master water-source unit high pressure switch. • Flow rate is insufficient, or master water-source unit is experiencing flow switch problems.
	2	4	2	Slave1 water-source unit high pressure switch error.	• Compressor maintenance by slave1 water-source unit high pressure switch. • Flow rate is insufficient, or slave1 water-source unit is experiencing flow switch problems.
	2	4	3	Slave2 water-source unit high pressure switch error.	• Compressor maintenance by slave2 water-source unit high pressure switch. • Flow rate is insufficient, or slave2 water-source unit is experiencing flow switch problems.

To troubleshoot each error, see pages 177-215.

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SERVICE TROUBLESHOOTING

Error / Fault Code Tables

	Error Code			Description	Details
Water-source Unit	2	5	1	Input voltage to the master water-source unit is too high or too low.	Master water-source unit has an input voltage of ≤173V or ≥290V (for 208/230V units), or an input voltage of ≤270V or ≥487V (for 460V units).
	2	5	2	Input voltage to the slave1 water-source unit is too high or too low.	Slave 1 water-source unit has an input voltage of ≤173V or ≥290V (for 208/230V units), or an input voltage of ≤270V or ≥487V (for 460V units).
	2	5	3	Input voltage to the slave2 water-source unit is too high or too low.	Slave 2 water-source unit has an input voltage of ≤173V or ≥290V (for 208/230V units), or an input voltage of ≤270V or ≥487V (for 460V units).
	2	6	1	Master water-source unit inverter compressor starting error.	Initial operation failure due to master water-source unit inverter compressor error.
	2	6	2	Slave1 water-source unit inverter compressor starting error.	Initial operation failure due to slave1 water-source unit inverter compressor error.
	2	6	3	Slave2 water-source unit inverter compressor starting error.	Initial operation failure due to slave2 water-source unit inverter compressor error.
	2	8	1	Master water-source unit inverter DC link high voltage error.	Compressor shut off because master water-source unit inverter PCB DC link voltage is >780V.
	2	8	2	Slave1 water-source unit inverter DC link high voltage error.	Compressor shut off because slave1 water-source unit inverter PCB DC link voltage is >780V.
	2	8	3	Slave2 water-source unit inverter DC link high voltage error.	Compressor shut off because slave2 water-source unit inverter PCB DC link voltage is >780V.
	2	9	1	Master water-source unit inverter compressor overcurrent error.	• Master water-source unit inverter compressor input current is >30A. • Inverter compressor or operating component (IPM) error.
	2	9	2	Slave1 water-source unit inverter compressor overcurrent error.	• Slave1 water-source unit inverter compressor input current is >30A. • Inverter compressor or operating component (IPM) error.
	2	9	3	Slave2 water-source unit inverter compressor overcurrent error.	• Slave2 water-source unit inverter compressor input current is >30A. • Inverter compressor or operating component (IPM) error.
	3	1	1	Undercurrent through the master water-source unit inverter CT.	Compressor shut off due to an undercurrent through the master water-source unit inverter CT.
	3	1	2	Undercurrent through the slave1 water-source unit inverter CT.	Compressor shut off due to an undercurrent through the slave1 water-source unit inverter CT.
	3	1	3	Undercurrent through the slave2 water-source unit inverter CT.	Compressor shut off due to an undercurrent through the slave2 water-source unit inverter CT.
	3	2	1	Excessive increase in master water-source unit inverter compressor discharge temperature.	• Compressor shut off due to excessive increase in master water-source unit inverter compressor discharge temperature. • Flow rate is insufficient, or master water-source unit is experiencing flow switch problems.
	3	2	2	Excessive increase in slave1 water-source unit inverter compressor discharge temperature.	• Compressor shut off due to excessive increase in slave1 water-source unit inverter compressor discharge temperature. • Flow rate is insufficient, or slave1 water-source unit is experiencing flow switch problems.
	3	2	3	Excessive increase in slave2 water-source unit inverter compressor discharge temperature.	• Compressor shut off due to excessive increase in slave2 water-source unit inverter compressor discharge temperature. • Flow rate is insufficient, or slave2 water-source unit is experiencing flow switch problems.
	3	3	1	Excessive increase in master water-source unit constant-speed compressor discharge temperature.	Compressor shut off due to excessive increase in master water-source unit constant-speed compressor discharge temperature.
	3	3	2	Excessive increase in slave1 water-source unit constant-speed compressor discharge temperature.	Compressor shut off due to excessive increase in slave1 water-source unit constant-speed compressor discharge temperature.
	3	3	3	Excessive increase in slave2 water-source unit constant-speed compressor discharge temperature.	Compressor shut OFF due to excessive increase in slave2 water-source unit constant-speed compressor discharge temperature.

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	Error Code			Description	Details
Water-source Unit	3	4	1	Excessive increase in master water-source unit compressor discharge pressure.	Master water-source unit compressor shut off due to excessive increase in discharge pressure occurring three consecutive times.
	3	4	2	Excessive increase in slave1 water-source unit compressor discharge pressure.	Slave1 water-source unit compressor shut off due to excessive increase in discharge pressure occurring three consecutive times.
	3	4	3	Excessive increase in slave2 water-source unit compressor discharge pressure.	Slave2 water-source unit compressor shut off due to excessive increase in discharge pressure occurring three consecutive times.
	3	5	1	Excessive decrease in master water-source unit compressor discharge pressure.	Master water-source unit compressor shut off due to excessive decrease in discharge pressure occurring three consecutive times.
	3	5	2	Excessive decrease in slave1 water-source unit compressor discharge pressure.	Slave1 water-source unit compressor shut off due to excessive decrease in discharge pressure occurring three consecutive times.
	3	5	3	Excessive decrease in slave2 water-source unit compressor discharge pressure.	Slave2 water-source unit compressor shut off due to excessive decrease in discharge pressure occurring three consecutive times.
	3	9	1	PFC transmission error of master water-source unit: inverter MICOM ↔ converter MICOM.	Failing to transmit between inverter MICOM and converter MICOM of master water-source unit.
	3	9	2	PFC transmission error of slave1 water-source unit: inverter MICOM ↔ converter MICOM.	Failing to transmit between inverter MICOM and converter MICOM of slave1 water-source unit.
	3	9	3	PFC transmission error of slave2 water-source unit: inverter MICOM ↔ converter MICOM.	Failing to transmit between inverter MICOM and converter MICOM of slave2 water-source unit.
	4	0	1	Master water-source unit inverter compressor CT sensor error.	• MICOM input voltage isn't within 2.5V ±0.3V at initial power up. • Disconnection or short circuit of master water-source unit inverter compressor current detection (CT) sensor.
	4	0	2	Slave1 water-source unit inverter compressor CT sensor error.	• MICOM input voltage isn't within 2.5V ±0.3V at initial power up. • Disconnection or short circuit of slave1 water-source unit inverter compressor current detection (CT) sensor.
	4	0	3	Slave2 water-source unit inverter compressor CT sensor error.	• MICOM input voltage isn't within 2.5V ±0.3V at initial power up. • Disconnection or short circuit of slave2 water-source unit inverter compressor current detection (CT) sensor.
	4	1	1	Master water-source unit inverter compressor discharge pipe temperature sensor error.	Disconnection or short circuit of master water-source unit inverter compressor discharge temperature sensor (sensor value is abnormal).
	4	1	2	Slave1 water-source unit inverter compressor discharge pipe temperature sensor error.	Disconnection or short circuit of slave1 water-source unit inverter compressor discharge temperature sensor (sensor value is abnormal).
	4	1	3	Slave2 water-source unit inverter compressor discharge pipe temperature sensor error.	Disconnection or short circuit of slave2 water-source unit inverter compressor discharge temperature sensor (sensor value is abnormal).
	4	2	1	Master water-source unit low pressure sensor error.	Disconnection or short circuit of master water-source unit low pressure sensor (sensor value is abnormal).
	4	2	2	Slave1 water-source unit low pressure sensor error.	Disconnection or short circuit of slave1 water-source unit low pressure sensor (sensor value is abnormal).
	4	2	3	Slave2 water-source unit low pressure sensor error.	Disconnection or short circuit of slave2 water-source unit low pressure sensor (sensor value is abnormal).
	4	3	1	Master water-source unit high pressure sensor error.	Disconnection or short circuit of master water-source unit high pressure sensor (sensor value is abnormal).
	4	3	2	Slave1 water-source unit high pressure sensor error.	Disconnection or short circuit of slave1 water-source unit high pressure sensor (sensor value is abnormal).
	4	3	3	Slave2 water-source unit high pressure sensor error.	Disconnection or short circuit of slave2 water-source unit high pressure sensor (sensor value is abnormal).
	4	4	1	Master water-source unit air temperature sensor error.	Disconnection or short circuit of master water-source unit air temperature sensor (sensor value is abnormal).
	4	4	2	Slave1 water-source unit air temperature sensor error.	Disconnection or short circuit of slave1 water-source unit air temperature sensor.
	4	4	3	Slave2 water-source unit air temperature sensor error.	Disconnection or short circuit of slave2 water-source unit air temperature sensor.

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	Error Code			Description	Details
Water-source Unit	4	5	1	Master water-source unit heat exchanger pipe temperature sensor (A) error.	Disconnection or short circuit of master water-source unit heat exchanger pipe temperature sensor (A) (sensor value is abnormal).
	4	5	2	Slave1 water-source unit heat exchanger pipe temperature sensor (A) error.	Disconnection or short circuit of slave1 water-source unit heat exchanger pipe temperature sensor (A) (sensor value is abnormal).
	4	5	3	Slave2 water-source unit heat exchanger pipe temperature sensor (A) error.	Disconnection or short circuit of slave2 water-source unit heat exchanger pipe temperature sensor (A) (sensor value is abnormal).
	4	6	1	Master water-source unit compressor suction temperature sensor error.	Disconnection or short circuit of master water-source unit compressor suction temperature sensor (sensor value is abnormal).
	4	6	2	Slave1 water-source unit compressor suction temperature sensor error.	Disconnection or short circuit of slave1 water-source unit compressor suction temperature sensor (sensor value is abnormal).
	4	6	3	Slave2 water-source unit compressor suction temperature sensor error.	Disconnection or short circuit of slave2 water-source unit compressor suction temperature sensor (sensor value is abnormal).
	4	7	1	Master water-source unit constant-speed compressor discharge pipe temperature sensor error.	Disconnection or short circuit of master water-source unit constant-speed compressor discharge temperature sensor (sensor value is abnormal).
	4	7	2	Slave1 water-source unit constant-speed compressor discharge pipe temperature sensor error.	Disconnection or short circuit of slave1 water-source unit constant-speed compressor discharge temperature sensor (sensor value is abnormal).
	4	7	3	Slave2 water-source unit constant-speed compressor discharge pipe temperature sensor error.	Disconnection or short circuit of slave2 water-source unit constant-speed compressor discharge temperature sensor (sensor value is abnormal).
	4	8	1	Master water-source unit heat exchanger pipe temperature sensor (B) error.	Disconnection or short circuit of master water-source unit heat exchanger pipe temperature sensor (B) (sensor value is abnormal).
	4	8	2	Slave1 water-source unit heat exchanger pipe temperature sensor (B) error.	Disconnection or short circuit of slave1 water-source unit heat exchanger pipe temperature sensor (B) (sensor value is abnormal).
	4	8	3	Slave2 water-source unit heat exchanger pipe temperature sensor (B) error.	Disconnection or short circuit of slave2 water-source unit heat exchanger pipe temperature sensor (B) (sensor value is abnormal).
	5	0	1	Master water-source unit three-phase power is missing.	One or more of R, S, T input power line phases is / are missing for the master water-source unit.
	5	0	2	Slave1 water-source unit three-phase power is missing.	One or more of R, S, T input power line phases is / are missing for the slave1 water-source unit.
	5	0	3	Slave2 water-source unit three-phase power is missing.	One or more of R, S, T input power line phases is / are missing for the slave2 water-source unit.
	5	1	-	Total indoor unit capacity exceeds allowable water-source unit capacity.	Value of total indoor unit capacity exceeds allowable water-source unit capacity specifications.
	5	2	1	Communication error between master water-source unit inverter PCB and main PCB.	Master water-source unit main controller cannot receive signal from inverter controller.
	5	2	2	Communication error between slave1 water-source unit inverter PCB and main PCB.	Slave1 water-source unit main controller cannot receive signal from inverter controller.
	5	2	3	Communication error between slave2 water-source unit inverter PCB and main PCB.	Slave2 water-source unit main controller cannot receive signal from inverter controller.
	5	3	-	Communication error between main controller and indoor unit.	Main PCB cannot receive signal from the indoor unit.
	5	4	1	Master water-source unit power error.	Master water-source unit three-phase power supply cable is not connected properly (reverse phase / phase is missing).
	5	4	2	Slave1 water-source unit power error.	Slave1 water-source unit three-phase power supply cable is not connected properly (reverse phase / phase is missing).
	5	4	3	Slave2 water-source unit power error.	Slave2 water-source unit three-phase power supply cable is not connected properly (reverse phase / phase is missing).
	6	0	1	Master water-source unit inverter PCB EEPROM error.	Master water-source unit EEPROM access and "Check SUM" errors.
	6	0	2	Slave1 water-source unit inverter PCB EEPROM error.	Slave1 water-source unit EEPROM access and "Check SUM" errors.
	6	0	3	Slave2 water-source unit inverter PCB EEPROM error.	Slave2 water-source unit EEPROM access and "Check SUM" errors.

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	Error Code				Description	Details
Water-source Unit	7	0	1		Master water-source unit constant-speed compressor CT sensor error.	Disconnection or short circuit of master water-source unit constant-speed compressor CT sensor.
	7	0	2		Slave1 water-source unit constant-speed compressor CT sensor error.	Disconnection or short circuit of slave1 water-source unit constant-speed compressor CT sensor.
	7	0	3		Slave2 water-source unit constant-speed compressor CT sensor error.	Disconnection or short circuit of slave2 water-source unit constant-speed compressor CT sensor.
	7	3	1		Master water-source unit inverter PCB AC input instant overcurrent (peak) error.	Master water-source unit inverter PCB AC input three-phase power is more than 50A (peak) for 2 minutes.
	7	3	2		Slave1 water-source unit inverter PCB AC input instant overcurrent (peak) error.	Slave1 water-source unit inverter PCB AC input three-phase power is more than 50A (peak) for 2 minutes.
	7	3	3		Slave2 water-source unit inverter PCB AC input instant overcurrent (peak) error.	Slave2 water-source unit inverter PCB AC input three-phase power is more than 50A (peak) for 2 minutes.
	7	4	1		Imbalance in master water-source unit inverter PCB three-phase power.	During operation (compressor frequency is >50Hz), difference between R and T phase is 5A for 10 seconds.
	7	4	2		Imbalance in slave1 water-source unit inverter PCB three-phase power.	During operation (compressor frequency is >50Hz), difference between R and T phase is 5A for 10 seconds.
	7	4	3		Imbalance in slave2 water-source unit inverter PCB three-phase power.	During operation (compressor frequency is >50Hz), difference between R and T phase is 5A for 10 seconds.
	8	6	1		Master water-source unit main PCB EEPROM error.	• Communication error between master water-source unit main MICOM and EEPROM; access error. • EEPROM is missing.
	8	6	2		Slave1 water-source unit main PCB EEPROM error.	• Communication error between slave1 water-source unit main MICOM and EEPROM; access error. • EEPROM is missing.
	8	6	3		Slave2 water-source unit main PCB EEPROM error.	• Communication error between slave2 water-source unit main MICOM and EEPROM; access error. • EEPROM is missing.
	1	0	4	1	Communication error between master water-source unit and other water-source units.	Signal from slave water-source units is not received by master water-source unit main MICOM; will display malfunctioning slave unit.
	1	0	4	2	Communication error between slave1 water-source unit and other water-source units.	Signal from slave1 water-source unit is not received by other water-source unit main MICOMs; displays its own error number.
	1	0	4	3	Communication error between slave2 water-source unit and other water-source units.	Signal from slave2 water-source unit is not received by other water-source unit main MICOMs; displays its own error number.
	1	1	3	1	Master water-source unit liquid pipe (condenser) temperature sensor error.	Disconnection or short circuit of master water-source unit liquid pipe (condenser) temperature sensor (sensor value is abnormal).
	1	1	3	2	Slave1 water-source unit liquid pipe (condenser) temperature sensor error.	Disconnection or short circuit of slave1 water-source unit liquid pipe (condenser) temperature sensor (sensor value is abnormal).
	1	1	3	3	Slave2 water-source unit liquid pipe (condenser) temperature sensor error.	Disconnection or short circuit of slave2 water-source unit liquid pipe (condenser) temperature sensor (sensor value is abnormal).
	1	1	4	1	Master water-source unit subcooling inlet temperature sensor error.	Disconnection or short circuit of master water-source unit subcooling inlet temperature sensor (sensor value is abnormal).
	1	1	4	2	Slave1 water-source unit subcooling inlet temperature sensor error.	Disconnection or short circuit of slave1 water-source unit subcooling inlet temperature sensor (sensor value is abnormal).
	1	1	4	3	Slave2 water-source unit subcooling inlet temperature sensor error.	Disconnection or short circuit of slave2 water-source unit subcooling inlet temperature sensor (sensor value is abnormal).
	1	1	5	1	Master water-source unit subcooling outlet temperature sensor error.	Disconnection or short circuit of master water-source unit subcooling outlet temperature sensor (sensor value is abnormal).
	1	1	5	2	Slave1 water-source unit subcooling outlet temperature sensor error.	Disconnection or short circuit of slave1 water-source unit subcooling outlet temperature sensor (sensor value is abnormal).
	1	1	5	3	Slave2 water-source unit subcooling outlet temperature sensor error.	Disconnection or short circuit of slave2 water-source unit subcooling outlet temperature sensor (sensor value is abnormal).

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SERVICE TROUBLESHOOTING

Error / Fault Code Tables

	Error Code				Description	Details
Water-source Unit	1	5	1	-	Water-source unit four-way reversing valve error.	Function error in the master or slave water-source unit four-way reversing valve(s).
	1	7	3	1	Master water-source unit constant-speed compressor error.	Master water-source unit constant-speed compressor has burned up, locked up, or was subjected to overcurrent..
	1	7	3	2	Slave1 water-source unit constant-speed compressor error.	Slave1 water-source unit constant-speed compressor has burned up, locked up, or was subjected to overcurrent.
	1	7	3	3	Slave2 water-source unit constant-speed compressor error.	Slave2 water-source unit constant-speed compressor has burned up, locked up, or was subjected to overcurrent.
	1	8	0	-	Plate-type heat exchanger freeze prevention error.	Plate-type heat exchanger froze up.
	1	8	1	-	Water temperature sensor error.	Disconnection or short circuit of water temperature sensor.
	1	8	2	-	Communication error between MICOMs.	Communication error between main and sub MICOMs.
Heat Recovery Control Unit	2	0	0	1	Automatic pipe addressing error.	Failure in automatic valve addressing procedure.
	2	0	1	C + No. of HRC Unit	Heat recovery control unit liquid sensor error (C = Heat-recovery control unit + Heat-recovery control unit number).	Disconnection or short circuit of heat recovery control unit liquid pipe sensor.
	2	0	2	C + No. of HRC Unit	Heat recovery control unit subcooling pipe inlet sensor error (C = Heat recovery control unit + Heat recovery control unit number).	Disconnection or short circuit of heat recovery control unit subcooling pipe inlet sensor.
	2	0	3	C + No. of HRC Unit	Heat recovery control unit subcooling pipe outlet sensor error (C = Heat recovery control unit + Heat recovery control unit number).	Disconnection or short circuit of heat recovery control unit subcooling pipe outlet sensor.
	2	0	4	C + No. of HRC Unit	Communication error (C = Heat recovery control unit + Heat recovery control unit number).	Water-source unit is not receiving signal from heat recovery control unit.

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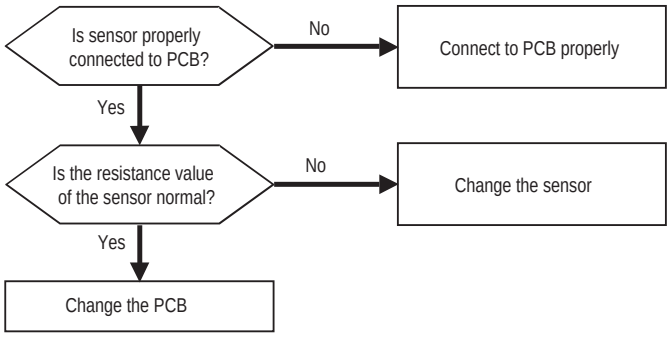
SERVICE TROUBLESHOOTING

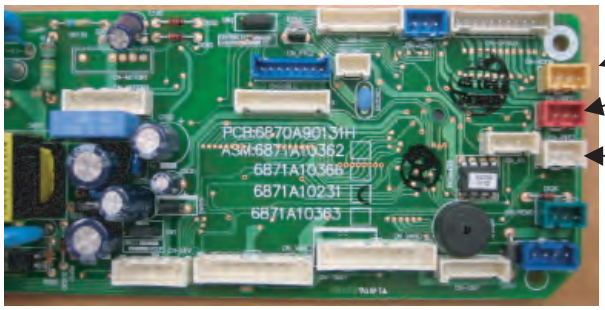
Error Nos. 01, 02, and 06

Error No.	Description	Details	Causes
01	Indoor unit air temperature sensor error.	Indoor unit outlet pipe temperature sensor has disconnected or short circuited.	1. Problem with the sensor. 2. Connections on indoor unit PCB are wrong. 3. Indoor unit PCB has failed.
02	Indoor unit inlet pipe temperature sensor error.		
06	Indoor unit outlet pipe temperature sensor error.		



⚠ Note:

If the value is >100kΩ (open) or <100Ω (short), there is an error.
Resistance value may be changing according to sensor temperature, it displays according to current temperature criteria (±5% margin) → Normal
Air temperature sensor: 50°F = 20.7kΩ : 77°F = 10kΩ : 50°F = 3.4kΩ
Pipe temperature sensor: 50°F = 10kΩ : 77°F = 5kΩ : 50°F = 1.8kΩ



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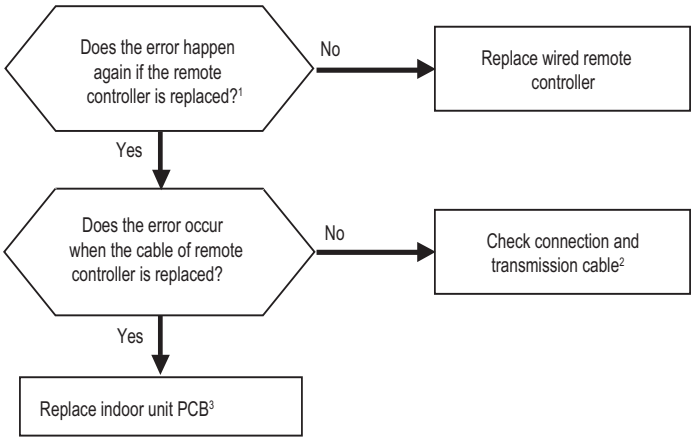
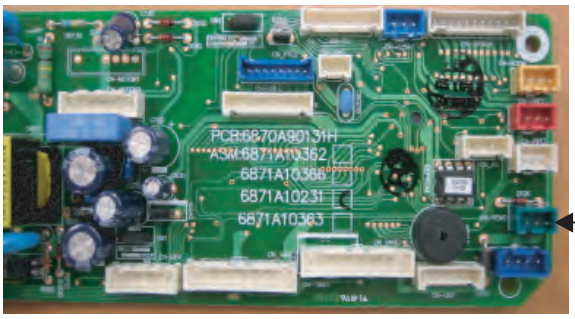
SERVICE TROUBLESHOOTING

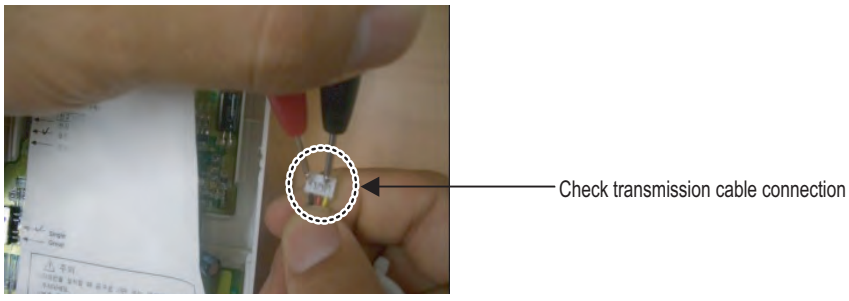
Error No. 03

Error No.	Description	Details	Causes
03	Communication error between wired remote controller and indoor unit	Indoor unit PCB has not received signal from wired remote controller. Wired remote controller has not received signal from indoor unit.	1. Remote controller error. 2. Indoor unit PCB error. 3. Connection error or connection wrong. 4. Transmission cable error.



[1]If there isn't a remote controller to replace, use a remote controller from another indoor unit.
[2]Check the cable because the connection may be in error or wrong. Also, check distances between the communication and main electrical cables. Ensure that the cables are at safe distances so they are not affected by electromagnetic waves.
[3]After replacing the indoor unit PCB, perform the auto addressing procedure, and input unit addresses if system includes a central controller. (All connected indoor units should be turned ON before initiating the auto addressing procedure.)





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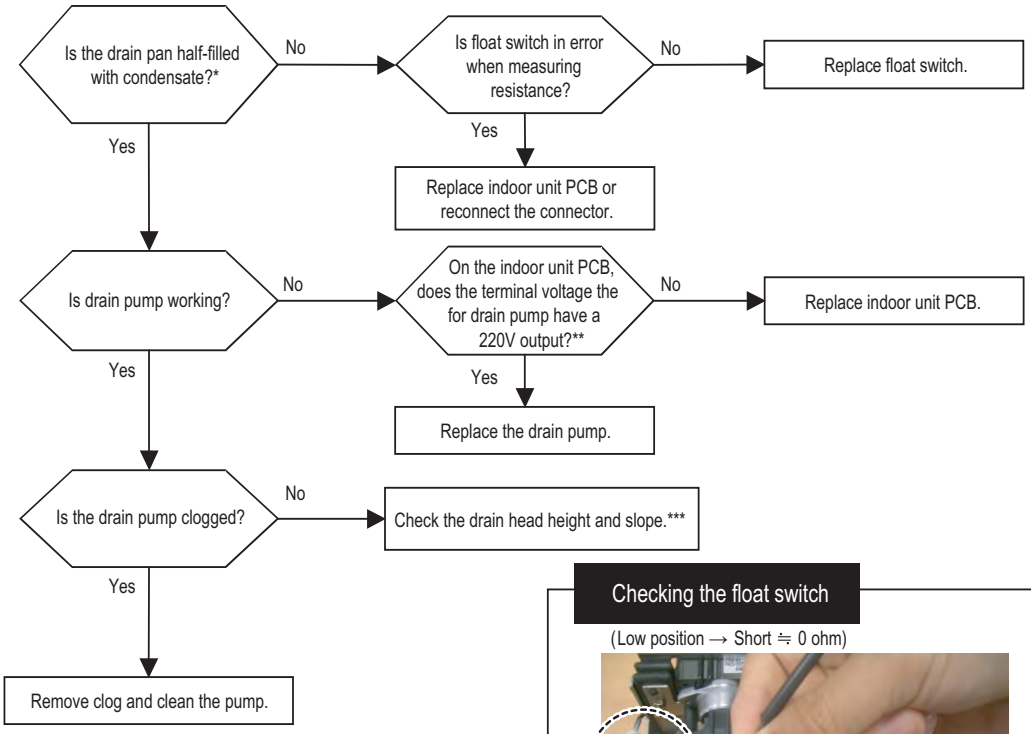
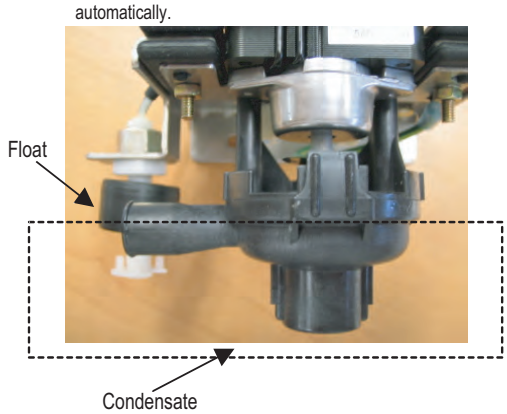
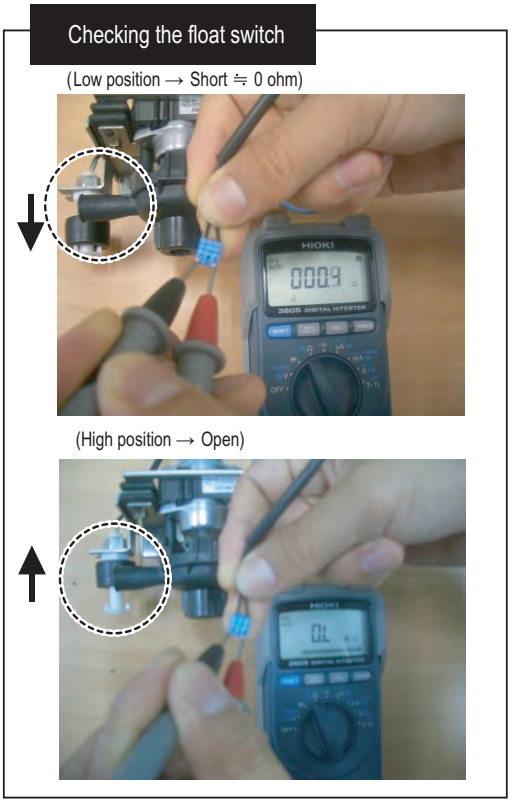
Error No. 04

Error No.	Description	Details	Causes
04	Indoor unit drain pump error.	Float switch is open because of rising condensate levels; drain pump may not be operating, or drain pump may be clogged.	1. Drain pump / float switch error. 2. Improper drain pipe location, clogged drain pipe. 3. Indoor unit PCB error.



* When the float rises up to more than half of the float switch, then the circuit is open and the unit stops automatically.





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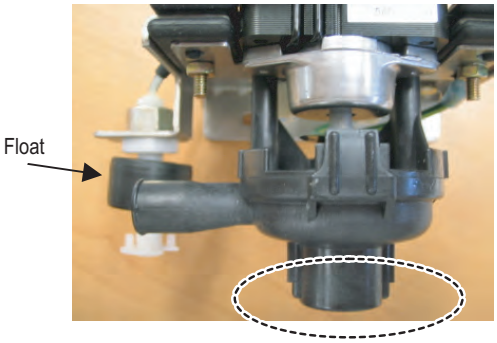
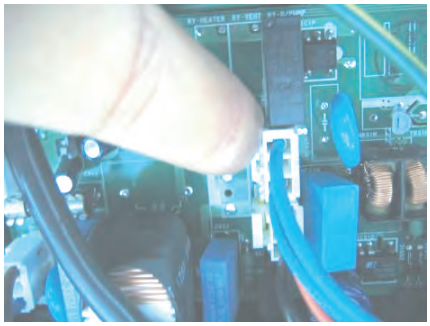
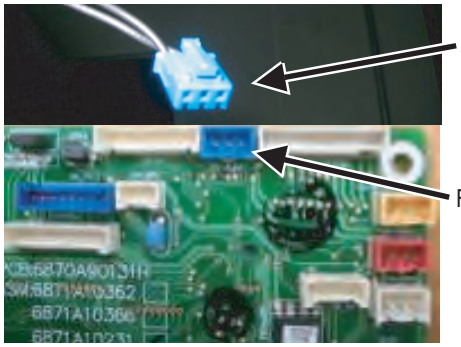


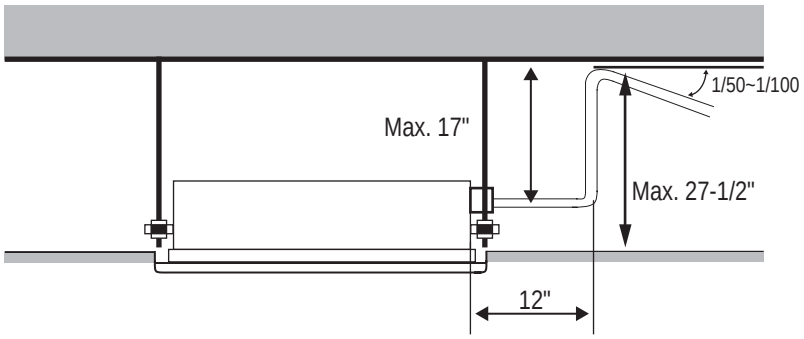
A: Check for resistance.



*** Indoor unit PCB drain pump connector (CN-DPUMP) (Check for 220V input)



*** Drain pipe head height / slope



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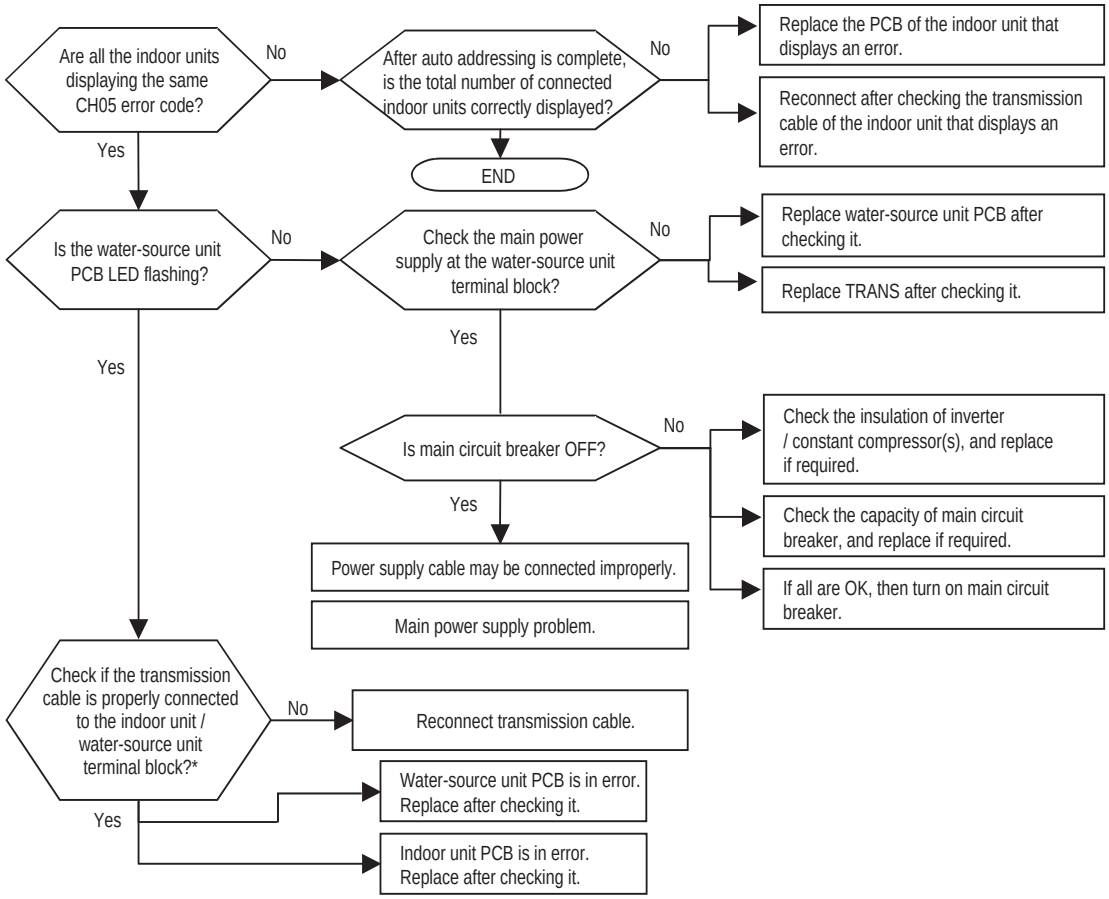
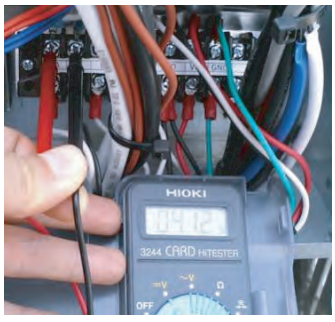
Error No. 05

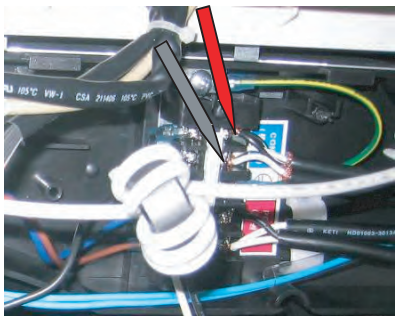
Error No.	Description	Details	Causes
05	Transmission error between water-source unit and indoor unit.	Indoor unit PCB has not received signal from water-source unit for at least five (5) minutes.	1. Auto addressing has not been performed properly. 2. Transmission cable is not connected. 3. Transmission cable is short circuiting. 4. Indoor unit transmission circuit error. 5. Water-source unit transmission circuit error. 6. Not enough physical distance between power and transmission cables.



Transmission from indoor unit is normal if voltage fluctuation (-9V ~ +9V) exists when checking the DC voltage of communication terminal between indoor unit and water-source unit.



If the DC voltage between transmission terminal A, B of indoor unit fluctuats within -9V ~ +9V, then transmission from water-source unit is normal.



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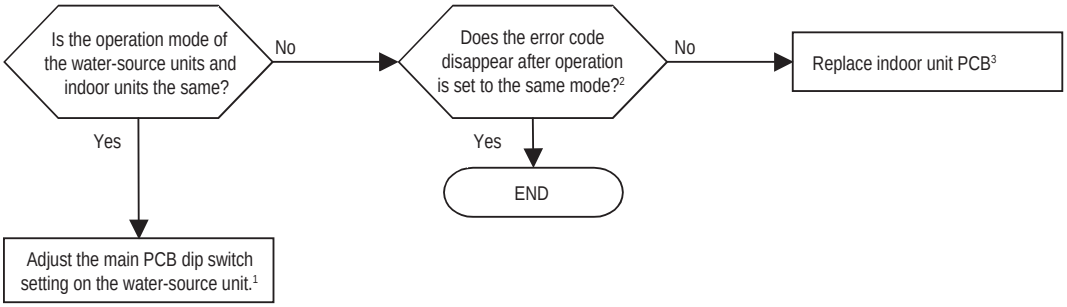
SERVICE TROUBLESHOOTING

MULTI V WATER III

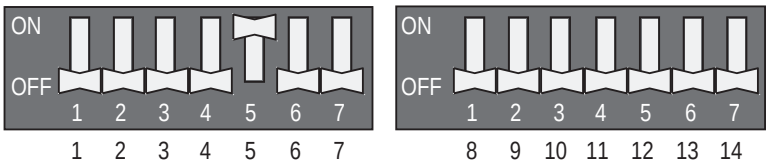
Error Nos. 06, 07, and 09

Error No.	Description	Details	Causes
06	Indoor unit outlet pipe temperature sensor error.	Indoor unit outlet pipe temperature sensor has disconnected or short circuited.	See Error No. 02 on page 183.
07	Indoor units are not operating in the same mode.	Indoor units that turned on later are operating in a different mode than indoor units that were turned on earlier.	1. Indoor units are set to a different mode. 2. PCB error. 3. Error with the wired remote controller. Verify that the indoor unit is not operating in the mode indicated on its display or wired indoor remote controller.

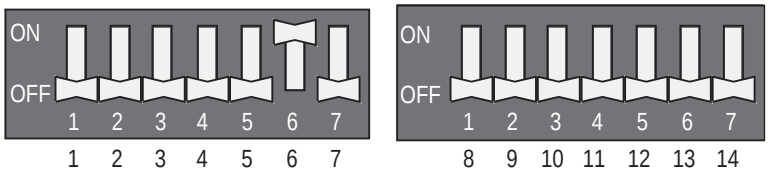


[1]Check mode selection setting on the wired remote controller.
[2]Water-source unit main PCB dip switch No. 5 (Cooling) or No. 6 (Heating) should be set to On; mode operation errors may occur because the mode is determined by the dip switch setting.
[3]Solving Error No. CH07: Turn off remote controller by pressing the On/Off button on the wired remote controller; error code will be removed automatically after few seconds.
With the wireless remote controller: Turn off the indoor unit, and then turn it back on by changing the operation mode; error code will disappear.

Cooling



Heating



⚠ Note:

After replacing the indoor unit PCB, make sure to be done to perform auto addressing and input the address of the central controller.
If the water-source unit dry contact function is set, the operation mode error may occur because the operation mode is set.

Error No.	Description	Details	Causes
09	Indoor unit EEPROM error.	• Serial number on EEPROM of indoor unit is 0 or FFFFFF. • Communication error between MICOM and EEPROM. • Indoor unit EEPROM data is not available.	1. Error developed in transmission between the microprocessor and the EEPROM on the indoor unit PCB. 2. EEPROM is damaged.

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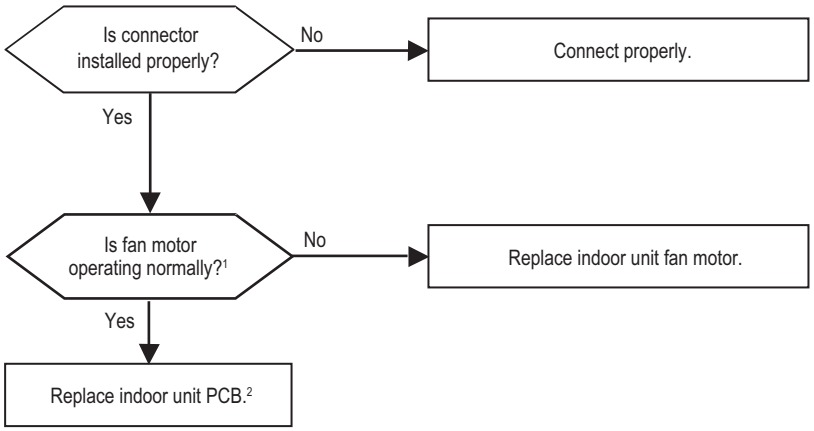
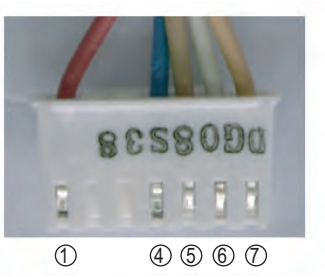
SERVICE TROUBLESHOOTING

Error No. 10

Error No.	Description	Details	Causes
10	Indoor unit BLDC fan motor feed-back signal error.	Indoor BLDC fan motor feedback signal has been absent for at least 50 seconds.	1. Fan motor connector has been disconnected or removed. 2. Indoor fan motor lock has failed. 3. Indoor PCB error.



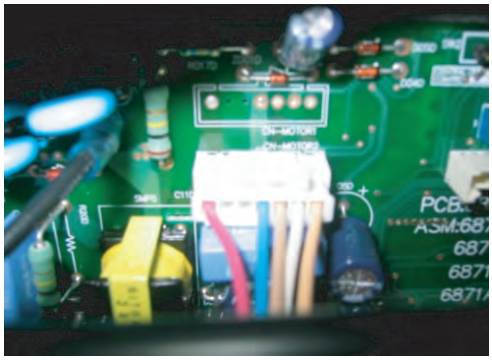
[1]See below for indoor fan motor sensor connections.



Tester Terminals

Tester		Normal resistance (10%)	
+	-	TH chassis	TD chassis
①	④	•	•
⑤	④	hundreds kΩ	hundreds kΩ
⑥	④	•	•
⑦	④	hundreds kΩ	hundreds kΩ

Fan motor connections



[2]Replace the indoor unit PCB, and then perfom auto addressing and input the address of the central controller. Power should be OFF to the PCB before connecting the motor terminal.

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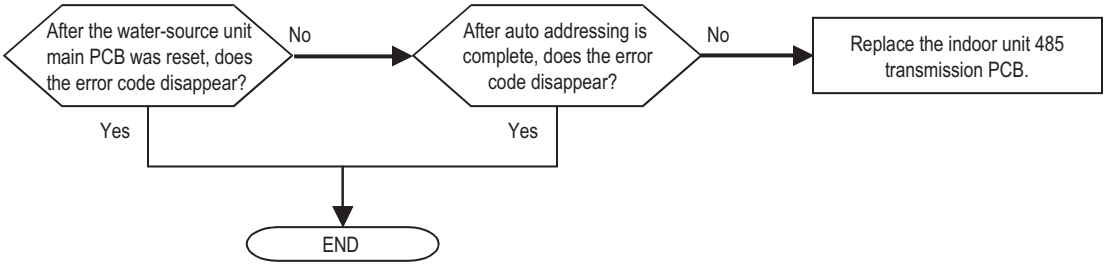
Error No. 11

Error No.	Description	Details	Causes
11	Communication error between indoor unit and water-source unit.	Indoor unit has not received a signal from the water-source unit for at least three (3) consecutive minutes.	1. Indoor 485 transmission PCB error. 2. Auto addressing procedure was not performed after PCB was replaced.



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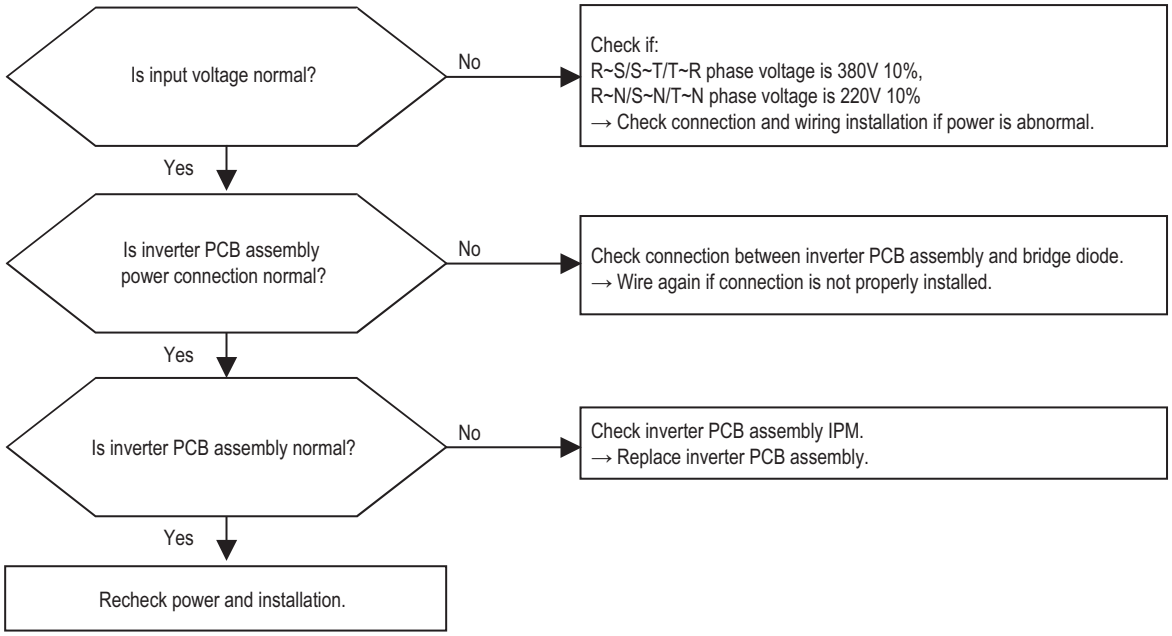
Error No. 23

Error No.	Description	Details	Causes
23 Master: 231 Slave 1: 232 Slave 2: 233	Low voltage to inverter compressor DC link.	DC voltage has not charged after operating relay is turned on.	1. DC link terminal is not connected properly; terminal contact error. 2. Starting relay is damaged. 3. Condenser is damaged. 4. Inverter PCB assembly is damaged (DC link voltage sensor component). 5. Input voltage is low.



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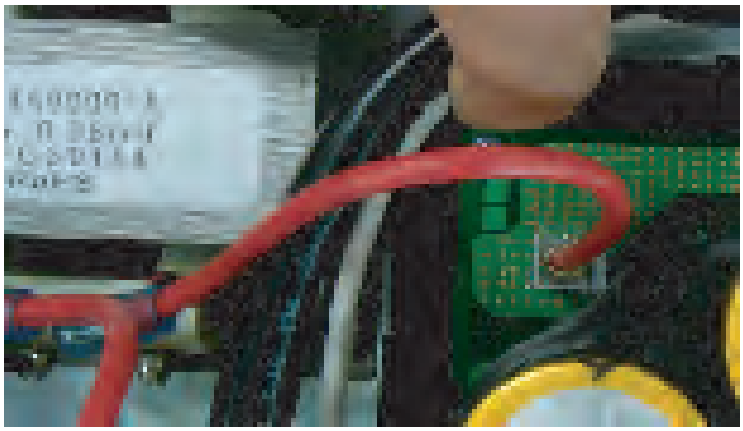
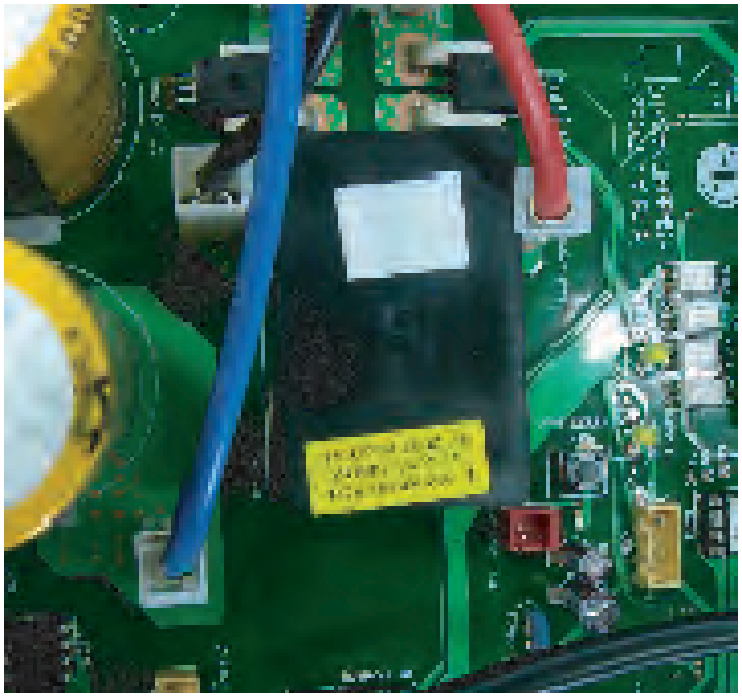
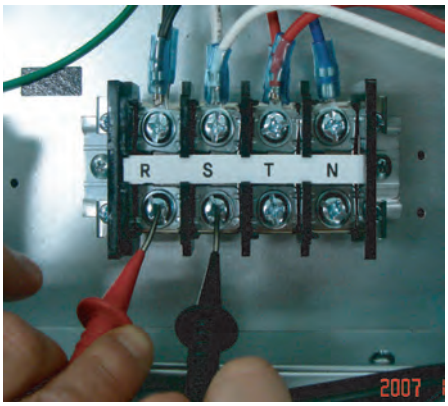
Inverter PCB and bridge diode wiring





Measure input voltage.



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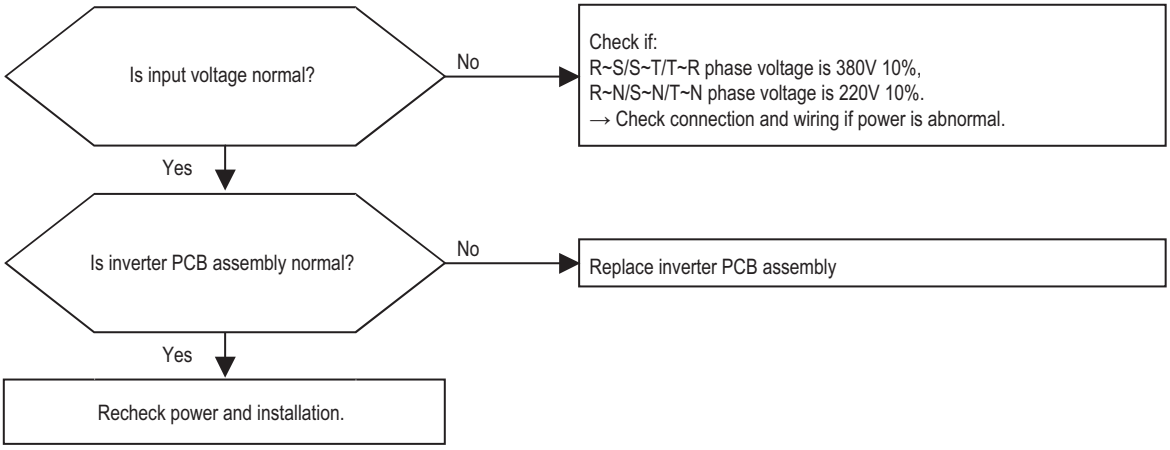
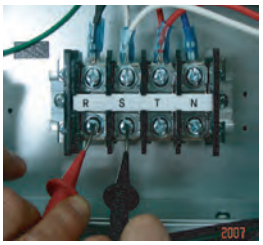
Error No. 25

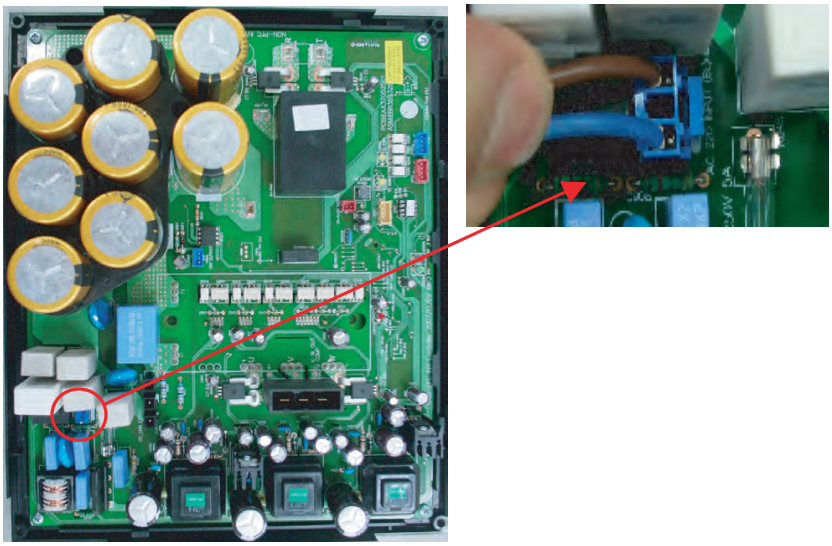
Error No.	Description	Details	Causes
25 Master: 251 Slave 1: 252 Slave 2: 253	Input voltage is too high or too low.	Unit has an input voltage of ≤173V or ≥290V (for 208/230V units), or an input voltage of ≤270V or ≥487V (for 460V units).	1. Input voltage abnormal (T-N). 2. Water-source unit inverter PCB assembly is damaged (input voltage sensor component).



Measure input voltage.



Inverter PCB assembly electrical wiring.



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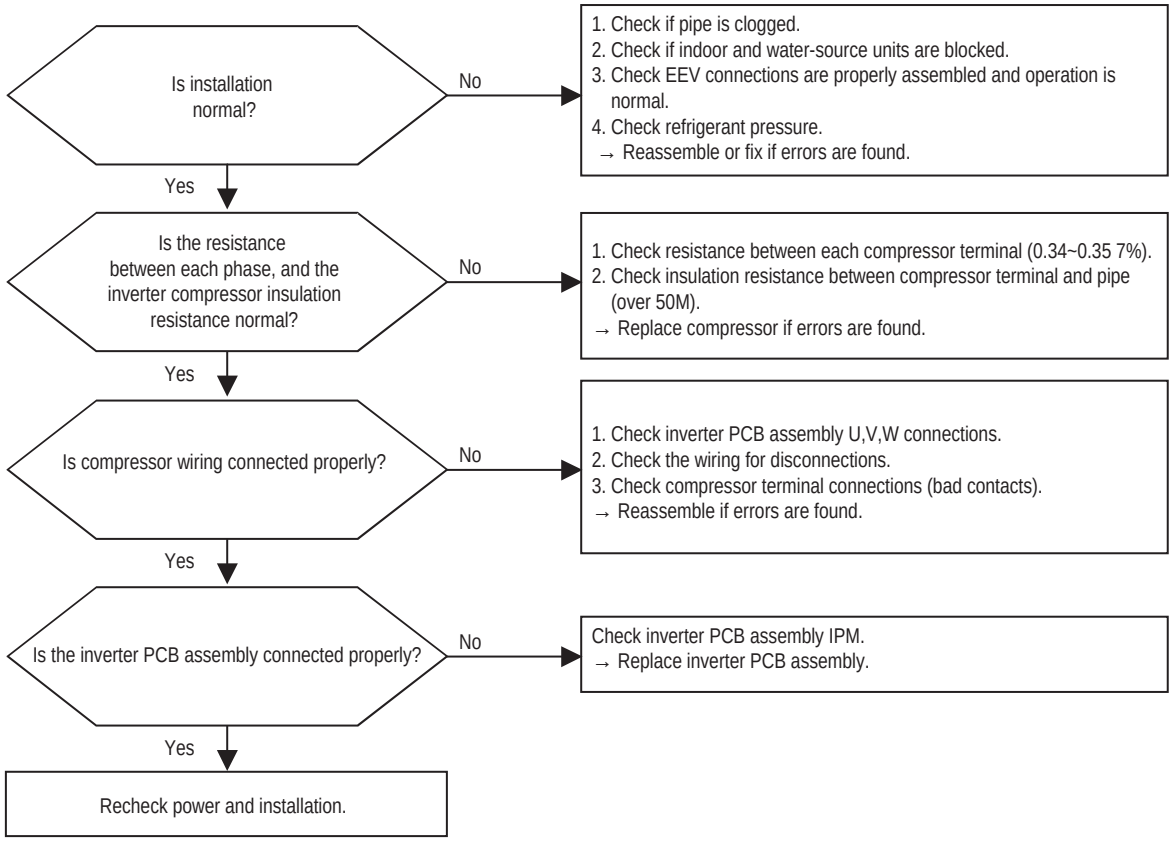
SERVICE TROUBLESHOOTING

Error No. 26

Error No.	Description	Details	Causes
26 Master: 261 Slave 1: 262 Slave 2: 263	Inverter compressor starting error.	Initial operation failure due to water-source unit inverter compressor error.	1. Overload operation (pipe is clogged or blocked, EEV is defective, refrigerant is overcharged). 2. Compressor insulation or motor is damaged. 3. Compressor wiring error. 4. Water-source unit inverter PCB is damaged (CT).



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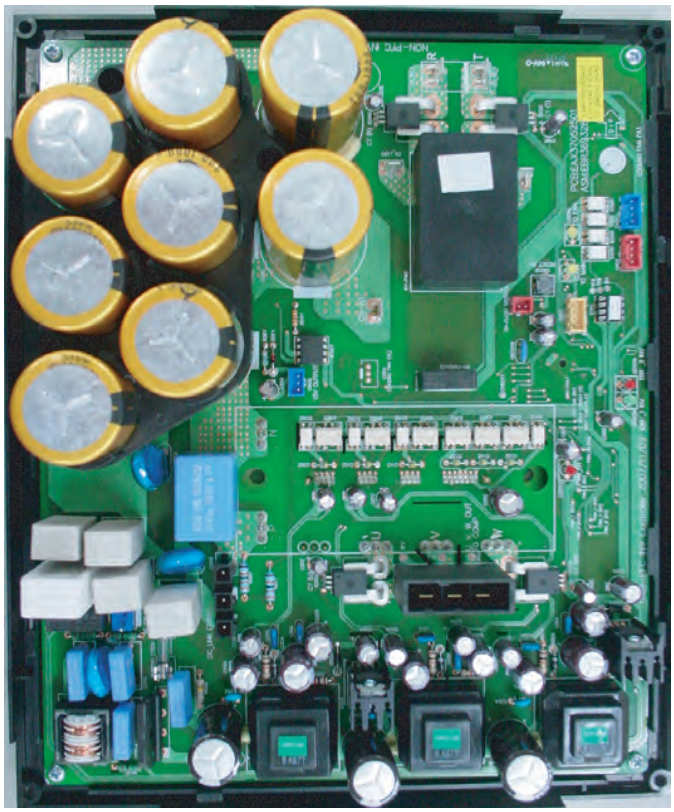
Measure resistance between each compressor terminal.

Compressor wire connections.



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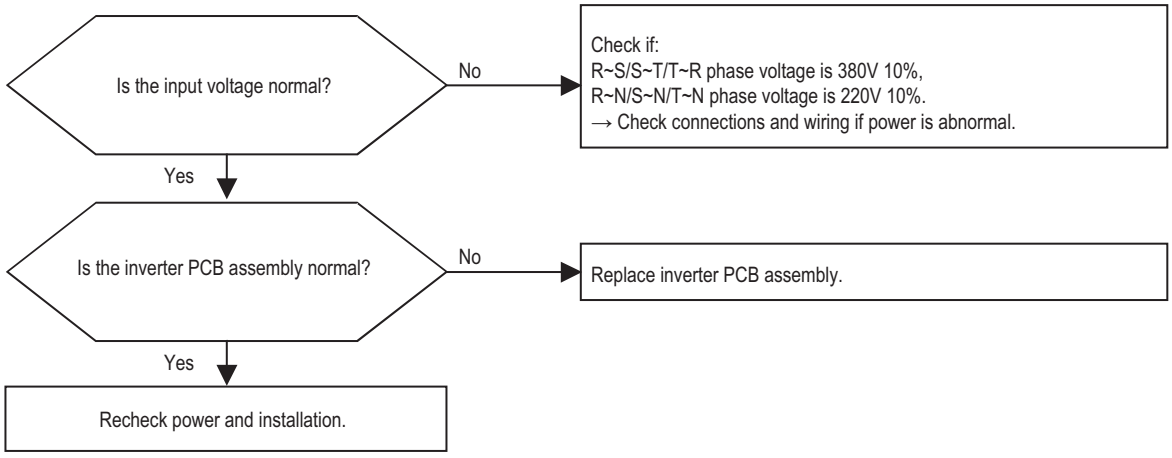
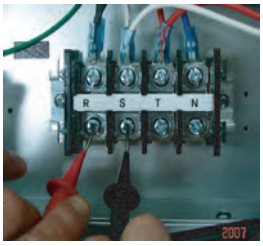
SERVICE TROUBLESHOOTING

Error No. 28

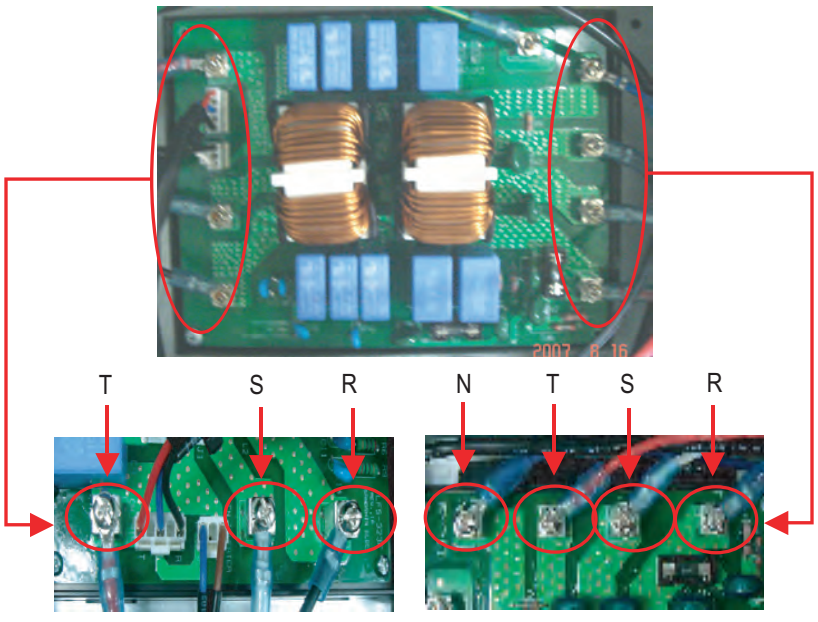
Error No.	Description	Details	Causes
28 Master: 281 Slave 1: 282 Slave 2: 283	Inverter DC link high voltage error.	Inverter PCB DC link voltage is >780V.	1. Input voltage is abnormal (R, S, T, N). 2. Water-source unit inverter PCB is damaged (DC link voltage sensor component).



Measure input voltage.



Noise filter wiring



Noise filter output (lower terminals)

Noise filter input (upper terminals)

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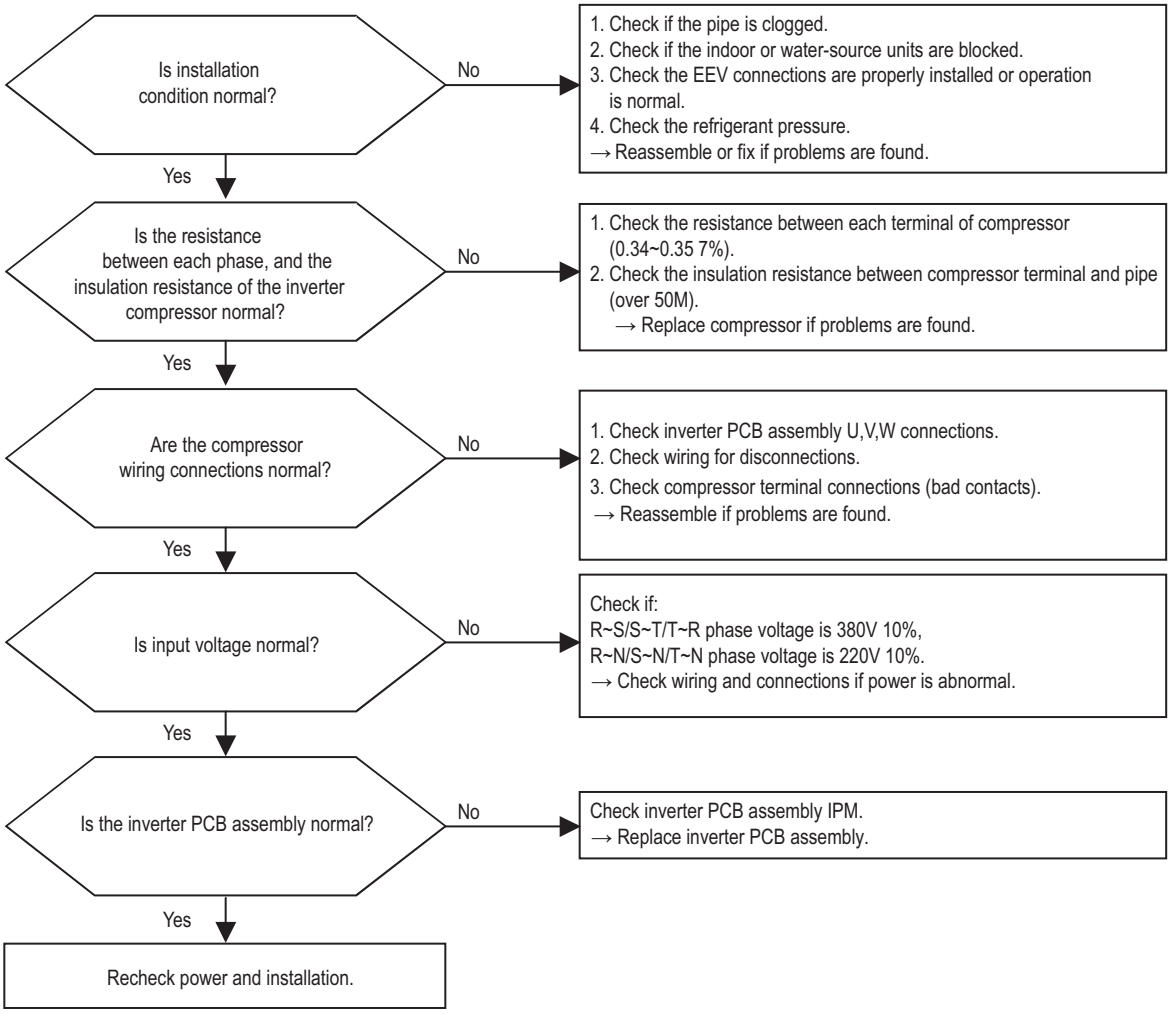
SERVICE TROUBLESHOOTING

Error No. 29

Error No.	Description	Details	Causes
29 Master: 291 Slave 1: 292 Slave 2: 293	Inverter compressor overcurrent error.	• Inverter compressor input current is >30A. • Inverter compressor or operating component (IPM) error.	1. Overload operation (pipe is clogged or blocked, EEV is defective, refrigerant is over-charged). 2. Compressor insulation or motor is damaged. 3. Input voltage is low. 4. Water-source unit inverter PCB assembly is damaged.



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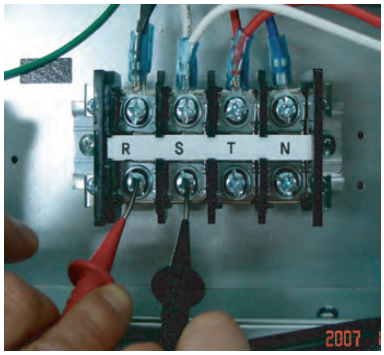
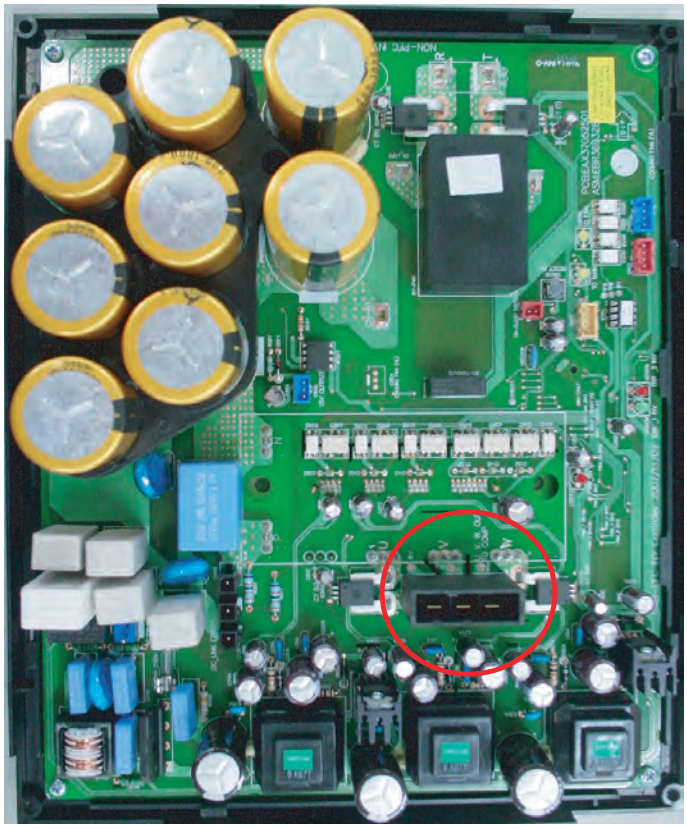
Error No. 29, Continued

Measure resistance between each compressor terminal.

Measure input voltage.



Compressor wire connections.



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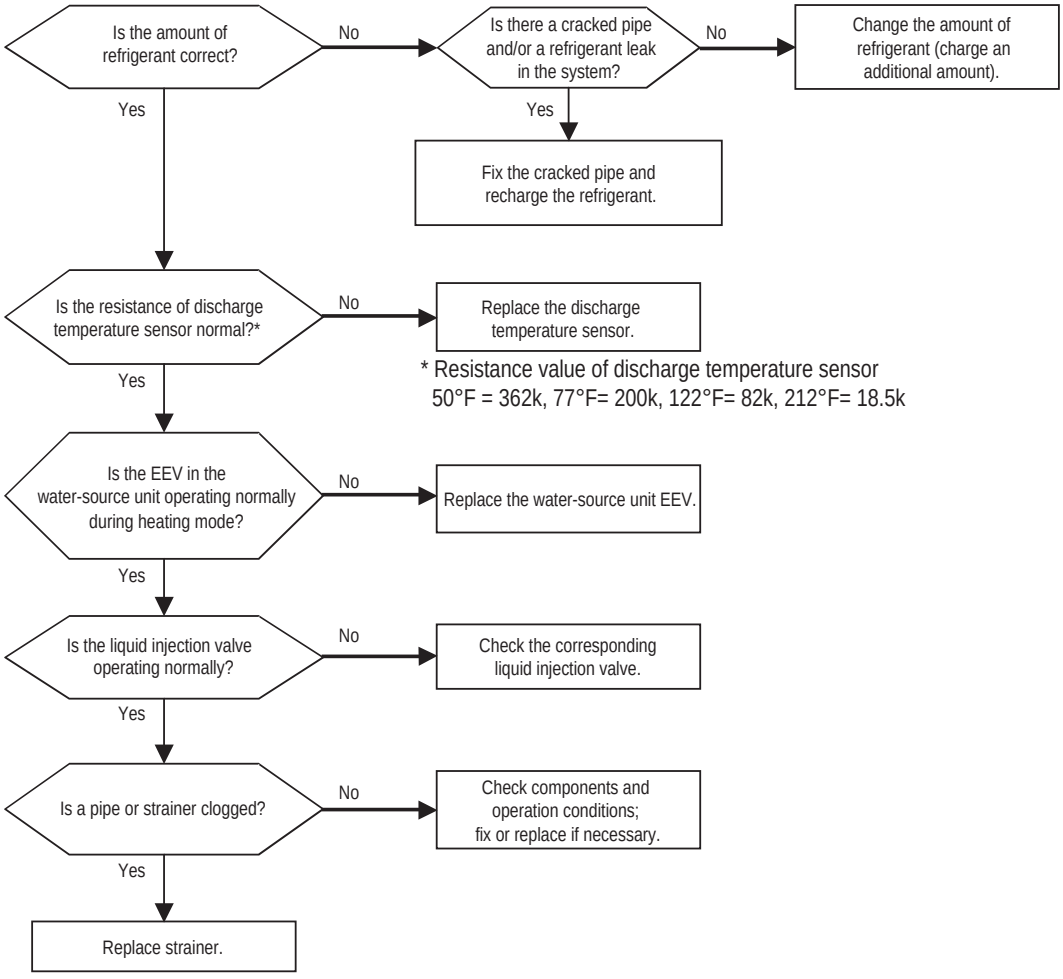
Error No.	Description	Details	Causes
32 Master: 321 Slave 1: 322 Slave 2: 323	Excessive increase in water-source unit inverter compressor discharge temperature.	• Compressor shut off due to excessive increase in water-source unit inverter compressor discharge temperature. • Flow rate is insufficient, or master water-source unit is experiencing flow switch problems.	1. Defect in the inverter compressor discharge pipe temperature sensor. 2. Refrigerant shortage / leak. 3. Defect in the EEV. 4. Liquid injection valve defect.
33 Master: 331 Slave 1: 332 Slave 2: 333	Excessive increase in water-source unit constant-speed compressor discharge temperature.	Compressor shut of due to excessive increase in water-source unit constant-speed compressor discharge temperature.	1. Defect in the constant compressor discharge pipe temperature sensor. 2. Refrigerant shortage / leak 3. Defect in the EEV. 4. Liquid injection valve defect.



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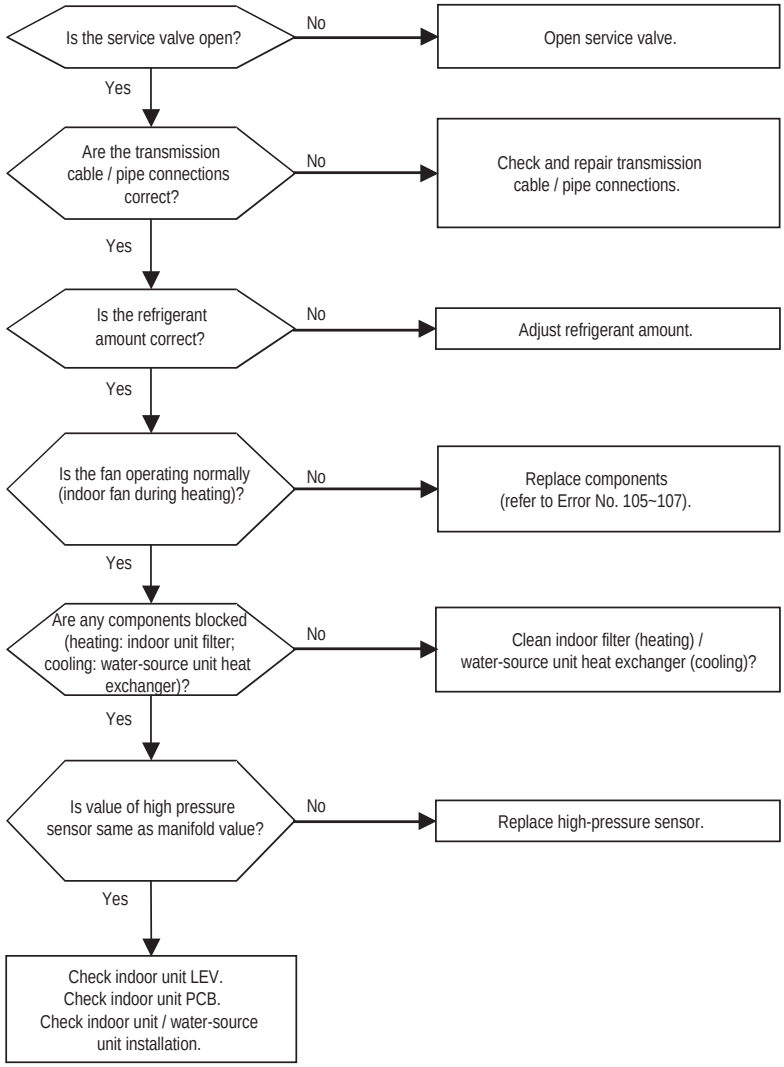
SERVICE TROUBLESHOOTING

Error No. 34

Error No.	Description	Details	Causes
34 Master: 341 Slave 1: 342 Slave 2: 343	Excessive increase in compressor discharge pressure.	Compressor shut off due excessive increase in discharge pressure occurring three onsecutive times.	1. High pressure sensor is defective. 2. Indoor unit or water-source unit fan is defective. 3. Refrigerant is overcharged. 4. Refrigerant pipe is damaged. 5. Defective indoor and / or water-source unit EEV. 6. Water-source unit is blocked during cooling, or indoor unit filter is blocked during heating. 7. SVC valve is clogged. 8. Water-source unit PCB is defective. 9. Indoor unit pipe temperature sensor is defective.



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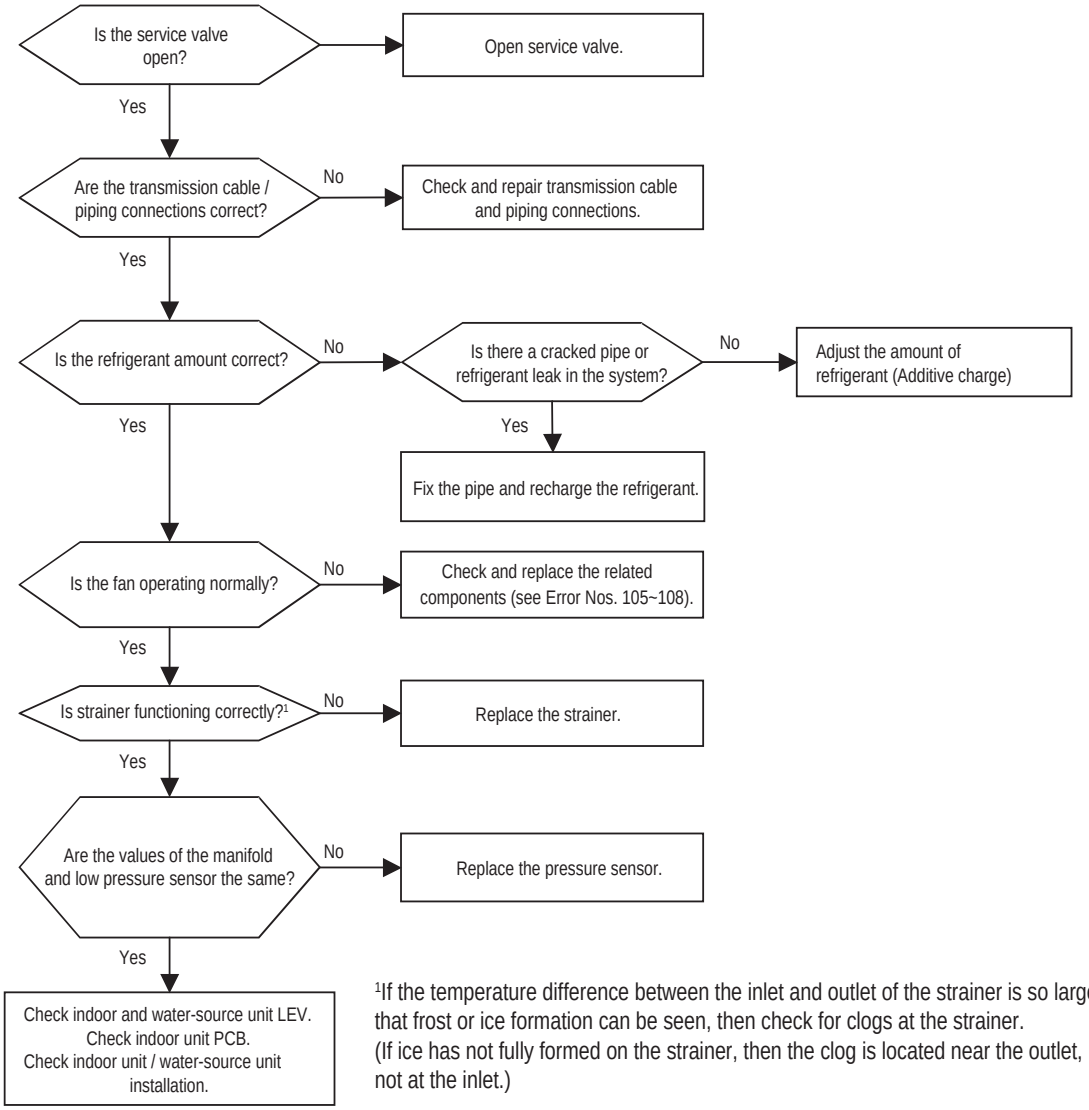
Error No. 35

Error No.	Description	Details	Causes
35 Master: 351 Slave 1: 352 Slave 2: 353	Excessive decrease in compressor discharge pressure.	Compressor shut off due excessive decrease in discharge pressure occurring three consecutive times.	1. Low pressure sensor is defective. 2. Indoor unit or water-source unit fan is defective. 3. Too little refrigerant charge, or there is a refrigerant leak. 4. Refrigerant pipe is damaged. 5. Defective indoor and / or water-source unit EEV. 6. Water-source unit is blocked during cooling, or indoor unit filter is blocked during heating. 7. SVC valve is clogged. 8. Water-source unit PCB is defective. 9. Indoor unit pipe temperature sensor is defective.



[1]If the temperature difference between the inlet and outlet of the strainer is so large that frost or ice formation can be seen, then check for clogs at the strainer.
(If ice has not fully formed on the strainer, then the clog is located near the outlet, not at the inlet.)

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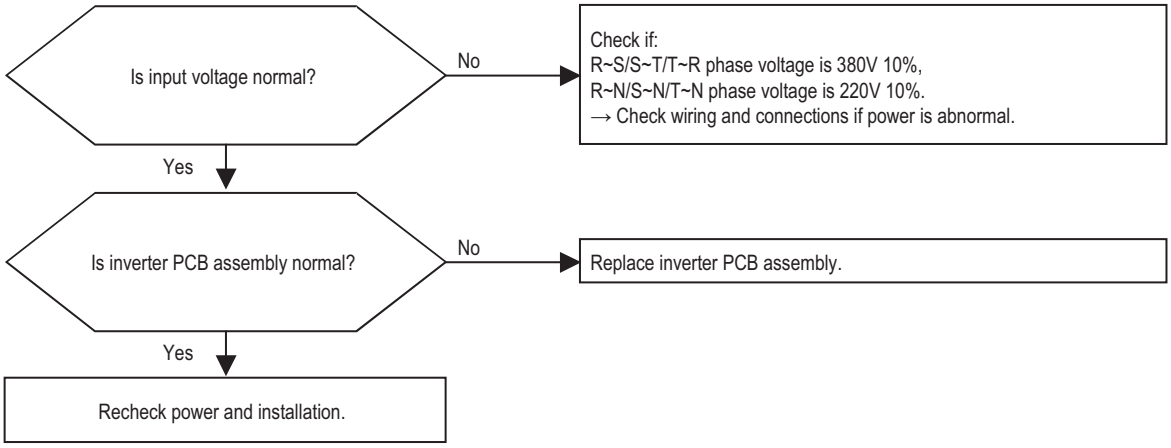
SERVICE TROUBLESHOOTING

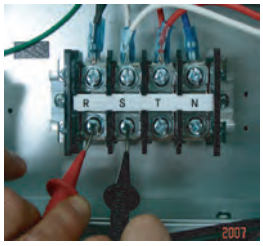
MULTI V WATER II

Error No. 40

Error No.	Description	Details	Causes
40 Master: 401 Slave 1: 402 Slave 2: 403	Inverter compressor CT sensor error.	• MICOM input voltage isn't within 2.5V ±0.3V at initial power up. • Disconnection or short circuit of water-source unit inverter compressor current detection (CT) sensor.	1. Input voltage is abnormal (T-N). 2. Water-source unit inverter PCB has been damaged (CT sensor component).

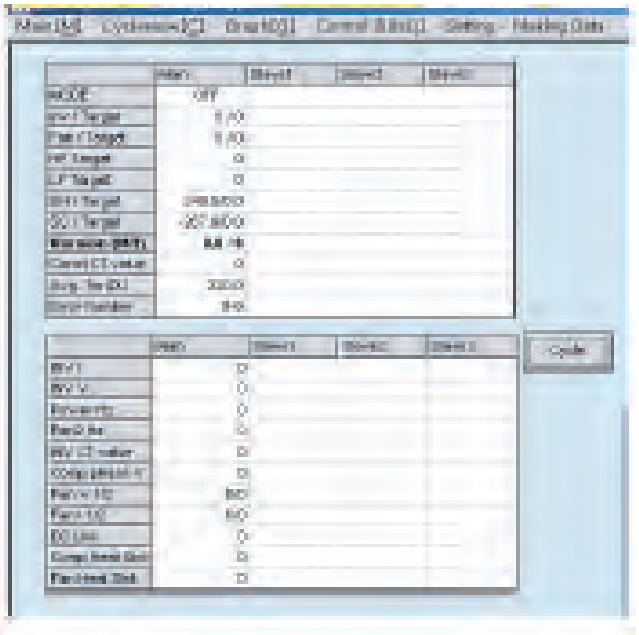


Measure input voltage



Inverter PCB assembly.

LGMV



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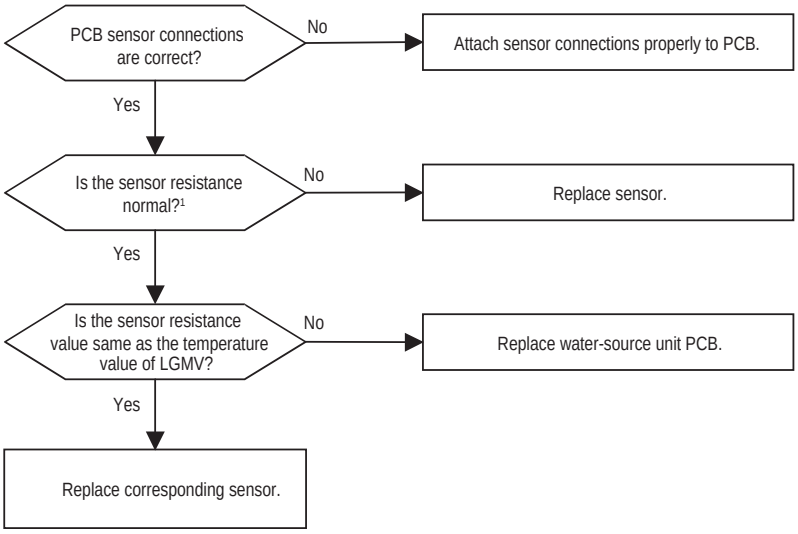
SERVICE TROUBLESHOOTING

Error Nos. 41 and 47

Error No.	Description	Details	Causes
41 (Inverter) Master: 411 Slave 1: 412 Slave 2: 413 47 (Constant) Master: 471 Slave 1: 472 Slave 2: 473	Compressor discharge pipe temperature sensor error.	Disconnection or short circuit of water-source unit compressor discharge temperature sensor (sensor value is abnormal).	1. Compressor discharge pipe temperature sensor is not connected properly. 2. Compressor discharge pipe sensor is defective (disconnected or short circuited). 3. Water-source unit PCB is defective.



[1]Error is generated if the resistance is >5M (open) or <2k (short).
Standard sensor resistance values at different temperatures (5% variation): 50ºF = 362k : 77ºF = 200k : 122ºF = 82k : 212ºF = 18.5k

Check the resistance of the inverter compressor discharge temperature sensor.

Check the resistance of the constant compressor discharge temperature sensor.

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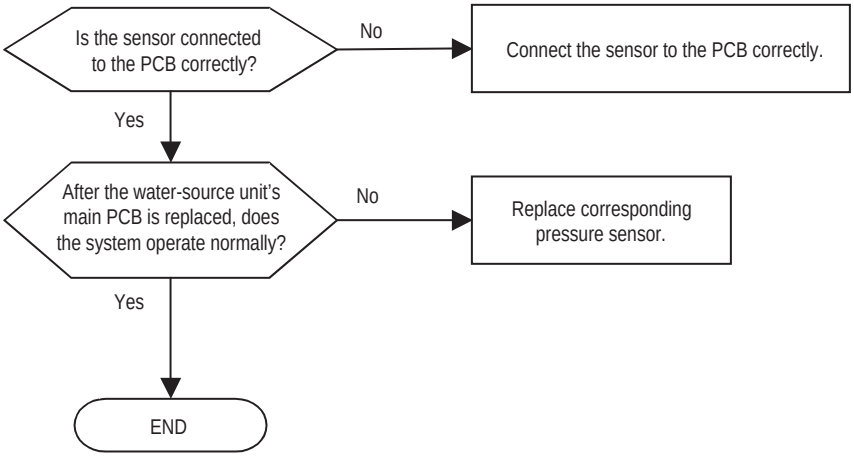
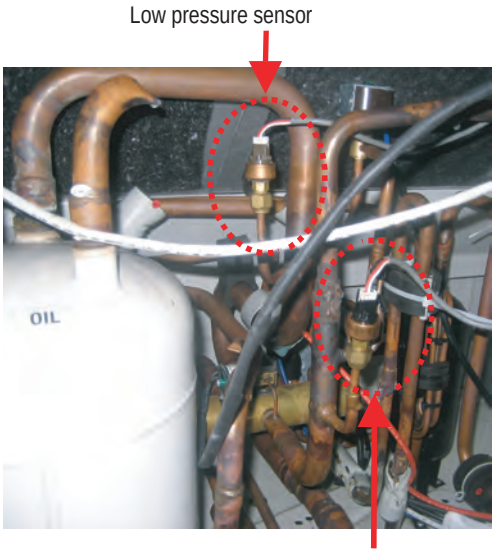
SERVICE TROUBLESHOOTING

Error Nos. 42 and 43

Error No.	Description	Details	Causes
42 Master: 421 Slave 1: 422 Slave 2: 423	Low pressure sensor error.	Disconnection or short circuit of water-source unit low pressure sensor (sensor value is abnormal).	1. Bad low pressure sensor connection. 2. Low pressure sensor connector is defective or has malfunctioned (disconnected or short circuited). 3. Water-source unit PCB is defective.
43 Master: 431 Slave 1: 432 Slave 2: 433	High pressure sensor error.	Disconnection or short circuit of water-source unit high pressure sensor (sensor value is abnormal).	1. Bad high pressure sensor connection. 2. High pressure sensor connector is defective or has malfunctioned (disconnected or short circuited). 3. Water-source unit PCB is defective.





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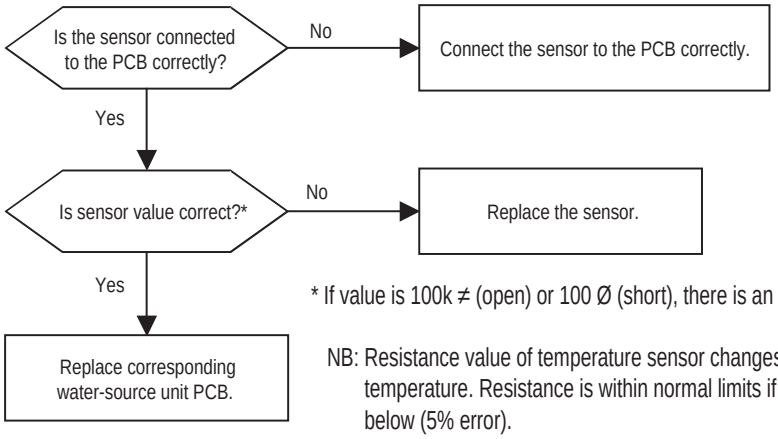
Error No.	Description	Details	Causes
44 Master: 441 Slave 1: 442 Slave 2: 443	Air temperature sensor error.	Disconnection or short circuit of water-source unit air temperature sensor (sensor value is abnormal).	1. Bad air temperature sensor connection. 2. Air temperature sensor connector is defective or has malfunctioned (disconnected or short circuited). 3. Water-source unit PCB is defective.
45 Master: 451 Slave 1: 452 Slave 2: 453 48 Master: 481 Slave 1: 482 Slave 2: 483	Water-source unit heat exchanger pipe temperature sensor (A,B) errors.	Disconnection or short circuit of water-source unit heat exchanger pipe temperature sensors (A,B) (sensor value is abnormal).	1. Bad air temperature sensor connection. 2. Sensor connector is defective or has malfunctioned (disconnected or short circuited). 3. Water-source unit PCB is defective.
46 Master: 461 Slave 1: 462 Slave 2: 463	Compressor suction temperature sensor error.	Disconnection or short circuit of water-source unit compressor suction temperature sensor (sensor value is abnormal).	1. Bad air temperature sensor connection. 2. Sensor connector is defective or has malfunctioned (disconnected or short circuited). 3. Water-source unit PCB is defective.



* If value is 100k ≠ (open) or 100 Ø (short), there is an error.

NB: Resistance value of temperature sensor changes according to temperature. Resistance is within normal limits if value is as shown below (5% error).

Air temperature sensor: 50°F = 20.7kΩ: 77°F = 10kΩ: 122°F = 3.4kΩ
Pipe temperature sensor: 50°F = 10kΩ: 77°F = 5kΩ: 122°F = 1.8kΩ

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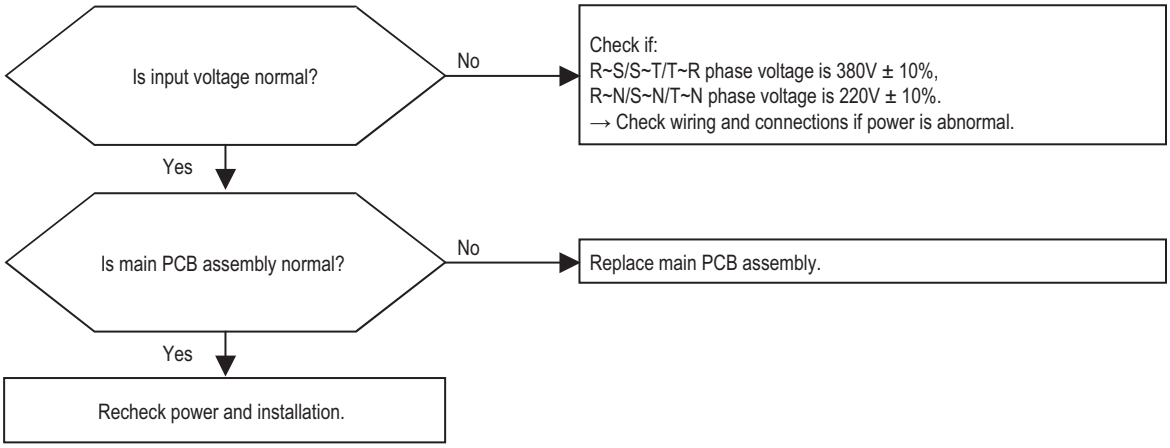
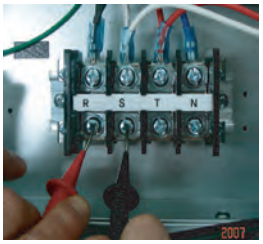
SERVICE TROUBLESHOOTING

Error No. 50

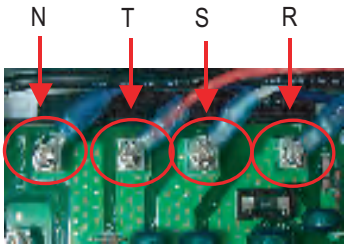
Error No.	Description	Details	Causes
50 Master: 501 Slave 1: 502 Slave 2: 503	Water-source unit three-phase power is missing.	One or more of R, S, T input power line phases is / are missing for the water-source unit.	1. Input voltage (R,S,T,N) is abnormal. 2. Power line connections need checked. 3. Main PCB is damaged.

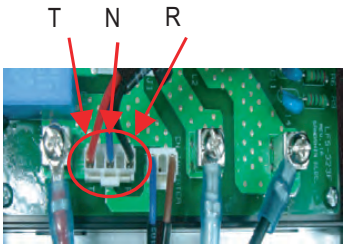


Measure input voltage.

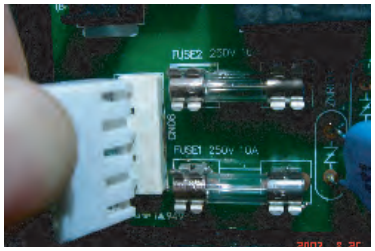


Noise filter wiring.





Main PCB power connection.



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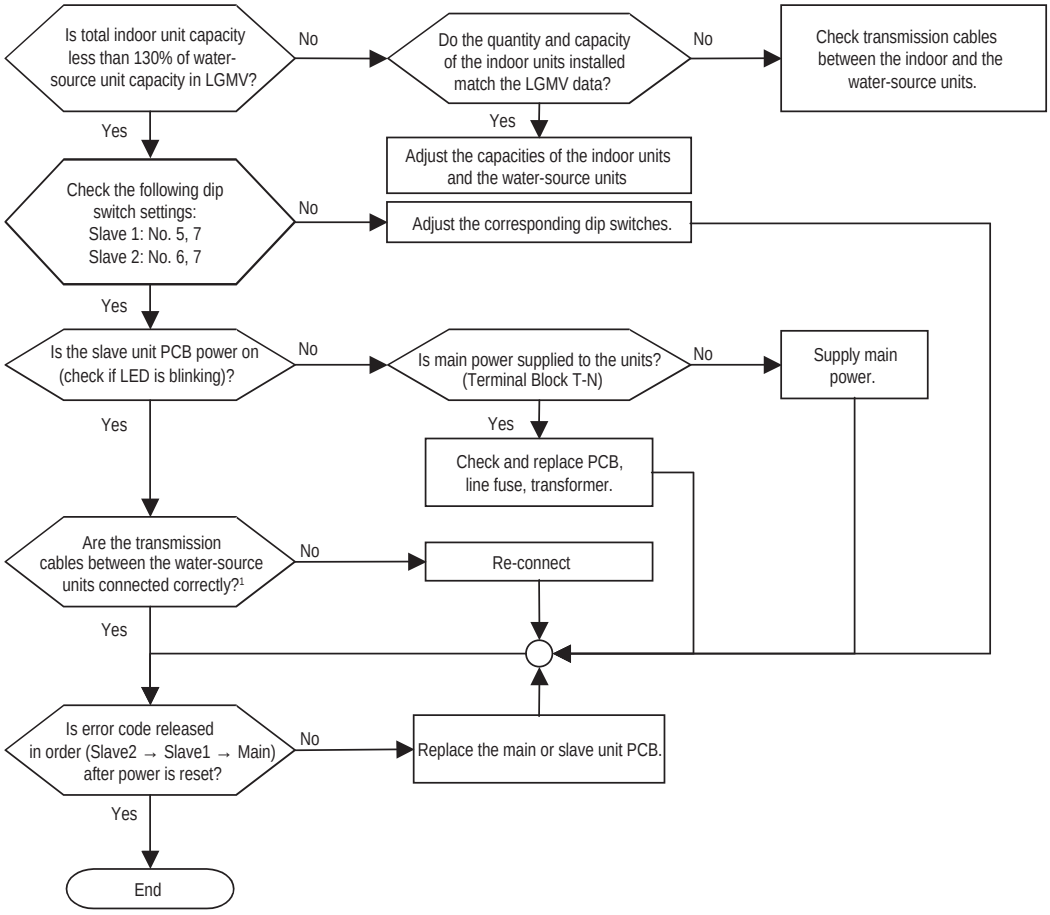
Error No. 51

Error No.	Description	Details	Causes
51	Total indoor unit capacity exceeds allowable water-source unit capacity.	Value of total indoor unit capacity exceeds allowable water-source unit capacity specifications.	1. Total indoor unit capacity is more than 130% water-source unit rated capacity. 2. Wrong transmission cable / piping connections. 3. Control error of slave water-source unit dip switches. 4. Defective slave unit PCB power supply. 5. Water-source unit PCB is defective.



[1]To check transmission cables between the water-source units, check: PCB connectors → terminal block → transmission cables.

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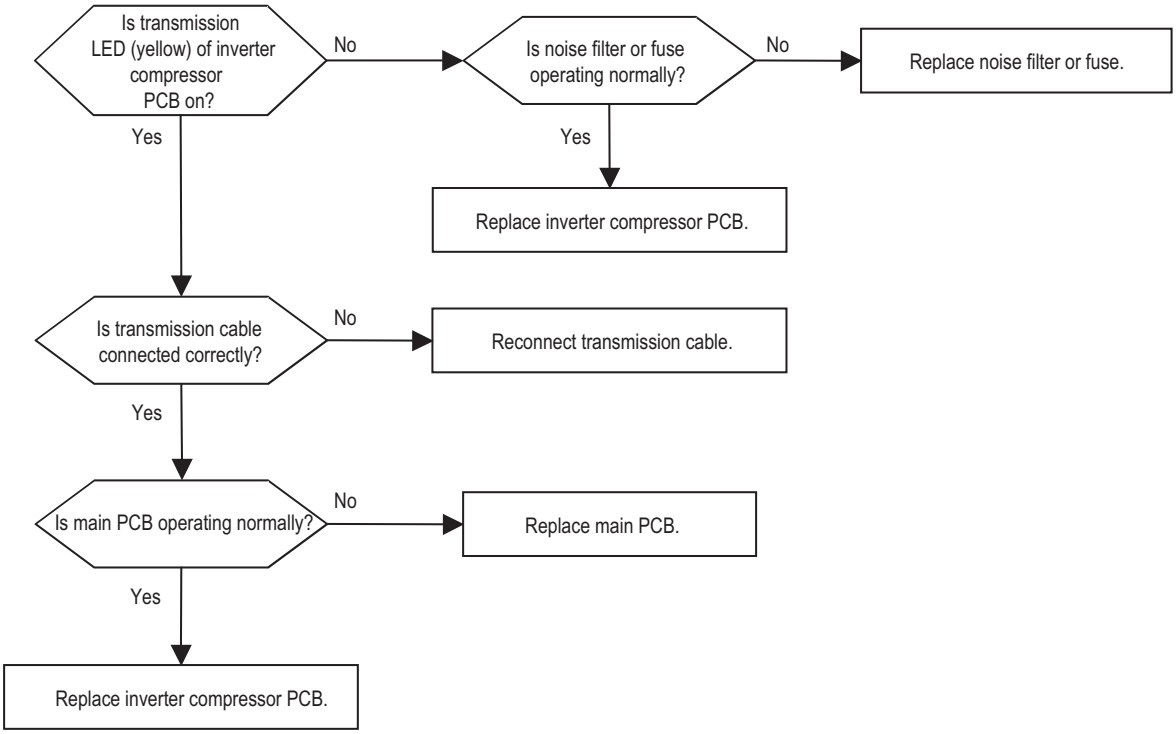
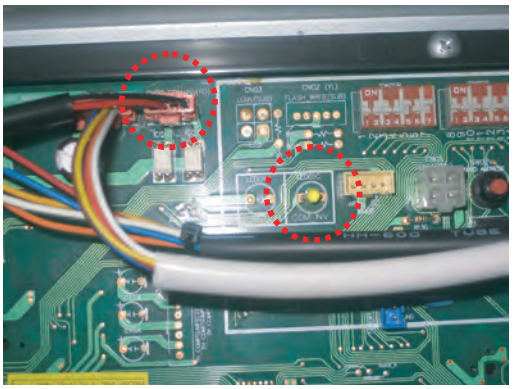
SERVICE TROUBLESHOOTING

Error No. 52

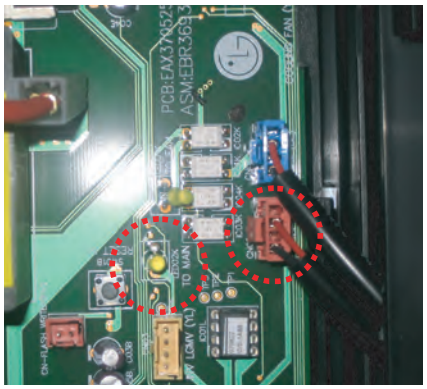
Error No.	Description	Details	Causes
52 Master: 521 Slave 1: 522 Slave 2: 523	Communication error between water-source unit inverter PCB and main PCB.	Water-source unit main controller cannot receive signal from inverter controller.	1. Power cable or transmission cable is not connected. 2. Water-source main fuse / noise filter is defective. 3. Water-source unit main / inverter PCB is defective.



Checking main PCB and inverter compressor PCB (if operating normally, transmission LED blinks).



Transmission connector and LED in main PCB.



Transmission connector and LED in inverter compressor PCB.

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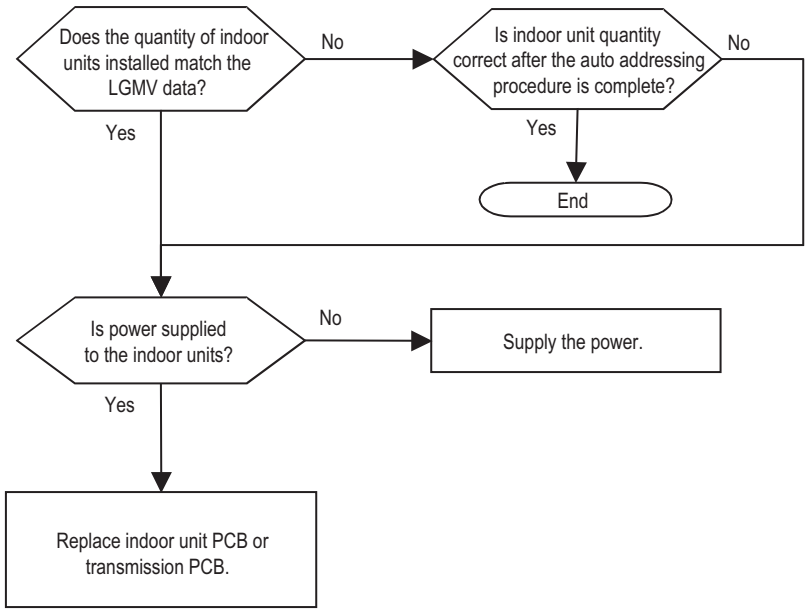
Error No. 53

Error No.	Description	Details	Causes
53	Communication error between main controller and indoor unit.	Main PCB cannot receive the signal from the indoor unit.	1. Transmission cables are not connected. 2. Transmission cables are short / open. 3. Water-source unit main PCB / indoor unit PCB is defective.



In addition to the information presented here, see also troubleshooting procedure for Error No. 05.

- If the quantity of installed indoor units matches the LGMV data, there may still be a few indoor units that have not been transmitted to LGMV.
- If the quantity of installed indoor units does not match the LGMV data, but if proper auto addressing occurred, then the indoor unit itself may be in error:

1. Wrong transmission or power cable connection.
2. Power / PCB / transmission cable dysfunction.
3. Duplicate numbers for indoor units.

- If transmission as a whole is not functioning properly, then the auto addressing procedure has not been performed yet.
- If Error No. 53 appears at an indoor unit, and auto addressing has not yet been performed, indoor unit addresses may have been duplicated.
- Auto addressing should be performed after an indoor unit PCB has been replaced. Also, if a central controller is installed, the central controller address should be input.
- If only the transmission PCB is replaced, auto addressing does not need to be performed.

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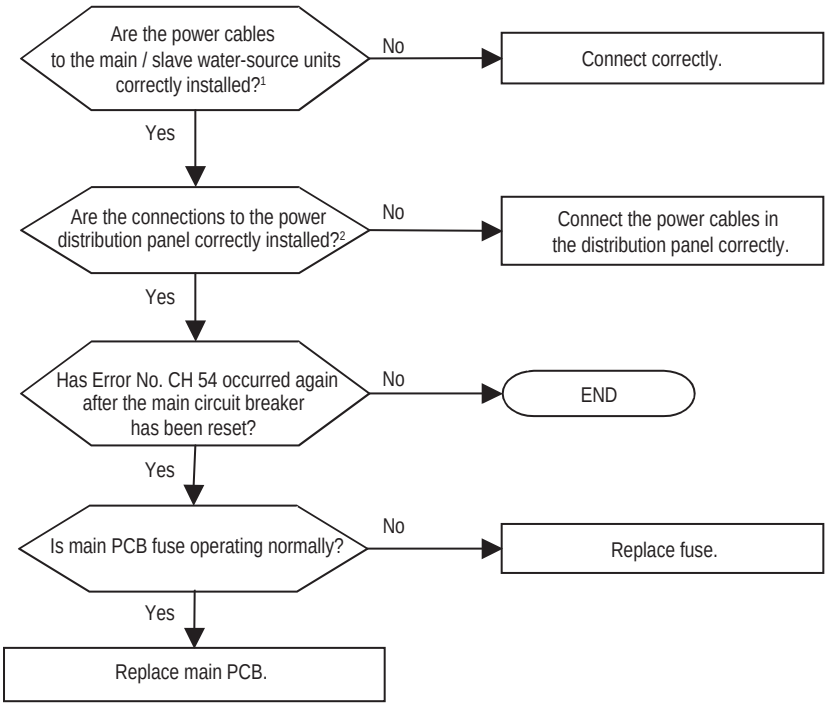
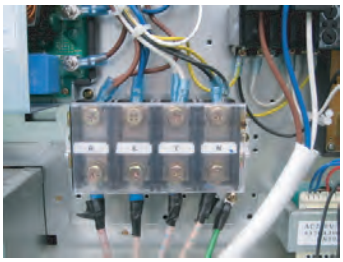
SERVICE TROUBLESHOOTING

Error No. 54

Error No.	Description	Details	Causes
54 Master: 541 Slave 1: 542 Slave 2: 543	Water-source unit power error.	Three-phase power supply cable is not connected properly (reverse phase / phase is missing).	1. Main PCB is defective. 2. No power is supplied to R,S,T. 3. Cable connections to R,S,T are wrong. 4. Main PCB fuse has failed.



[1]Check the power cable connections, phase (R-S-T) order, and power supply connections in the water-source unit control box(es).



[2]Check power cable connections, phase order, and power supply connections in the distribution panel.

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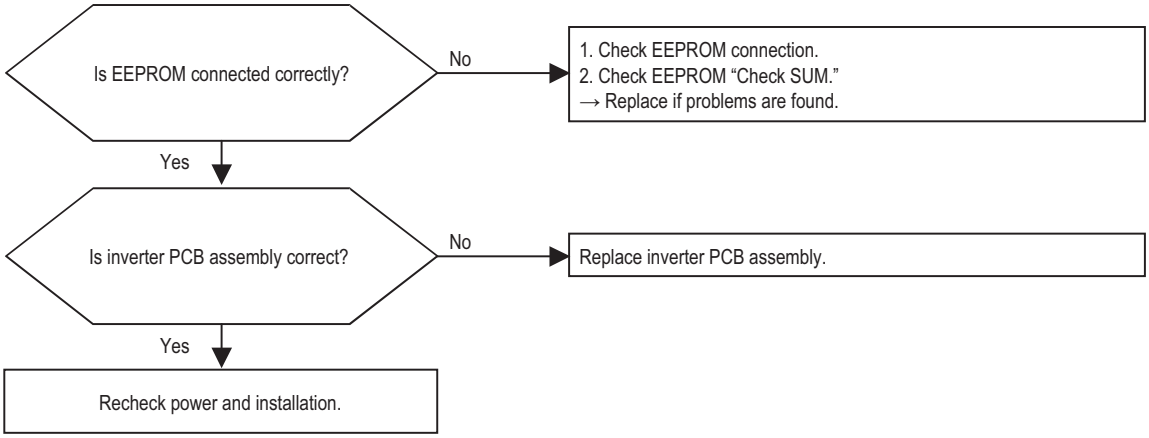
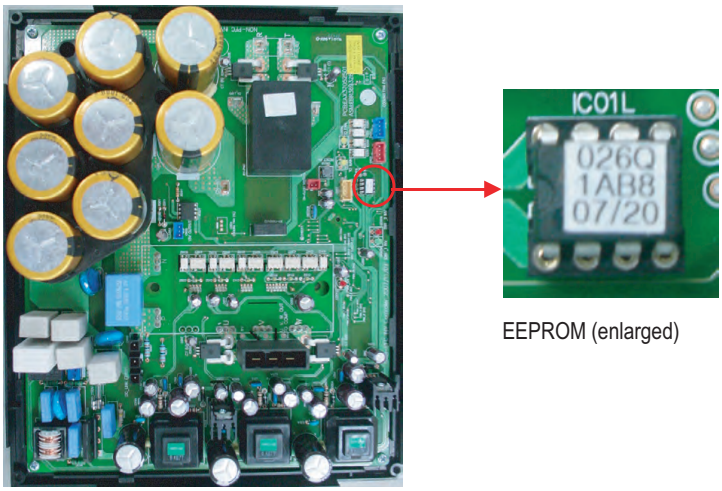
Error No. 60

Error No.	Description	Details	Causes
60 Master: 601 Slave 1: 602 Slave 2: 603	Inverter PCB EEPROM error.	EEPROM access and "Check SUM" errors.	1. EEPROM contact is defective, or the contact is inserted wrong. 2. Different EEPROM version. 3. Water-source inverter PCB assembly is damaged.

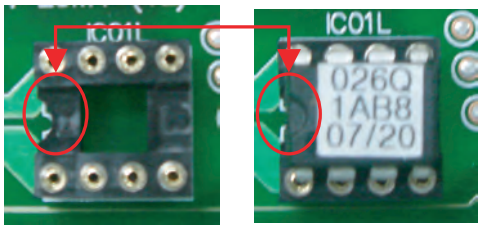


Inverter EEPROM connection



EEPROM (enlarged)

Correction inverter EEPROM connection.



Replace after power is turned off.

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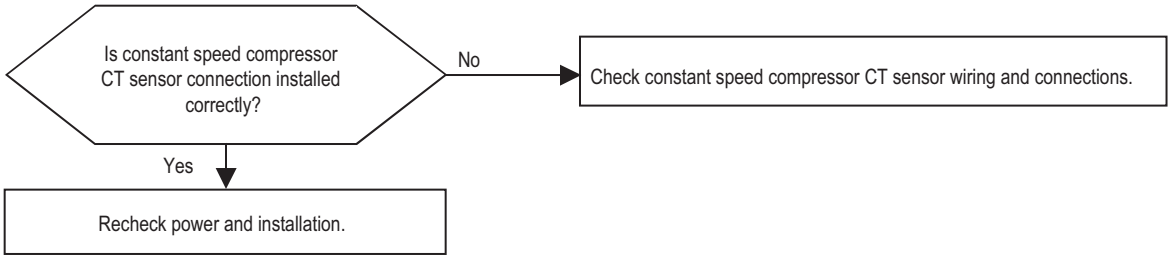
SERVICE TROUBLESHOOTING

Error No. 70

Error No.	Description	Details	Causes
70 Master: 701 Slave 1: 702 Slave 2: 703	Water-source unit constant-speed compressor CT sensor error.	Disconnection or short circuit of water-source unit constant-speed compressor CT sensor.	1. CT sensor is defective. 2. CT sensor connection has malfunctioned.



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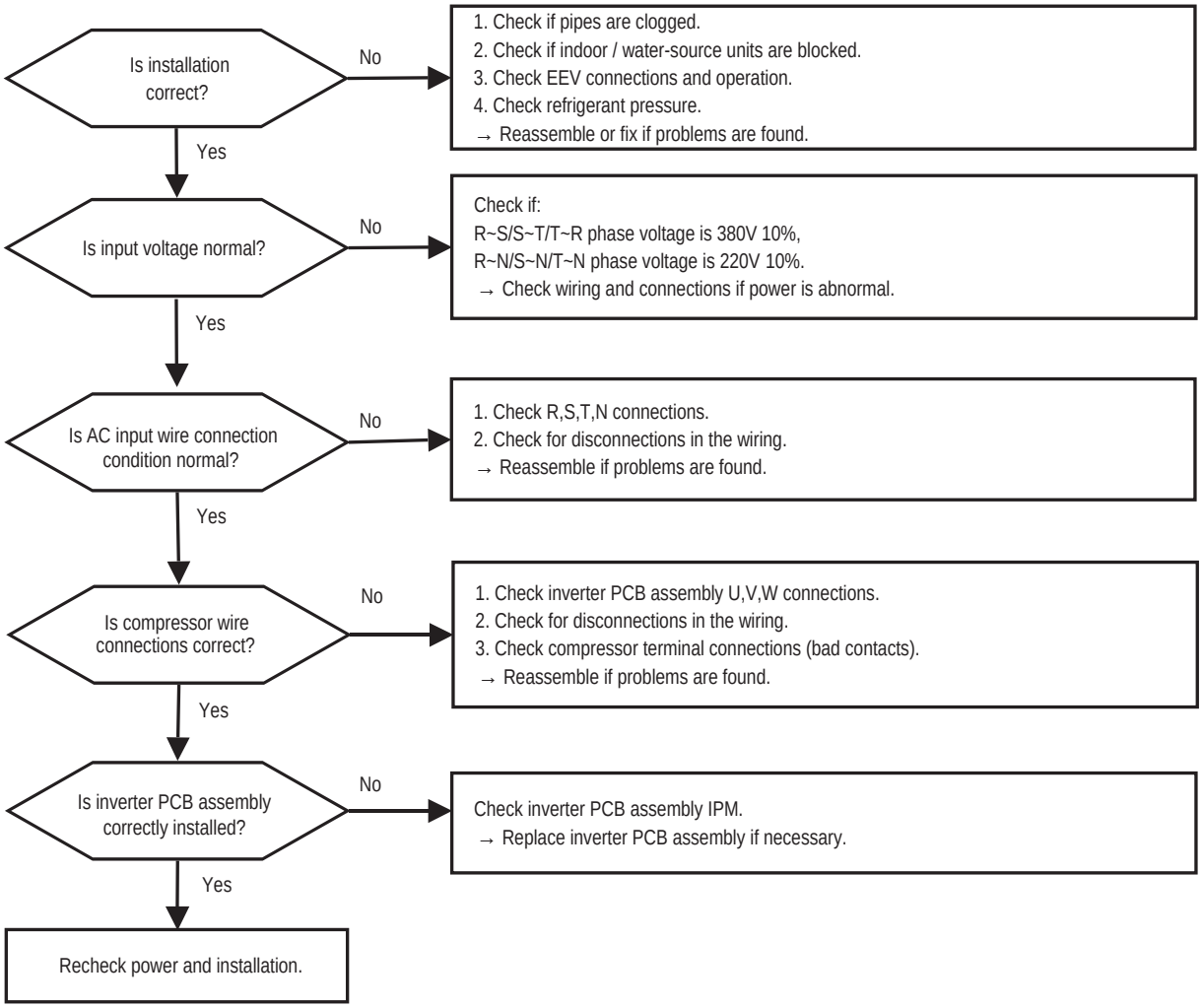
SERVICE TROUBLESHOOTING

Error No. 73

Error No.	Description	Details	Causes
73 Master: 731 Slave 1: 732 Slave 2: 733	Water-source unit inverter PCB AC input instant over-current (peak) error.	Inverter PCB AC input three-phase power is more than 50A (peak) for 2 minutes.	1. Overload operation (pipe is clogged or blocked, EEV is defective, refrigerant is over-charged. 2. Compressor insulation / motor damaged. 3. Input voltage (R, S, T, N) is not correct. 4. Power line assembly is not correct. 5. Inverter PCB assembly is damaged (input current sensor component).



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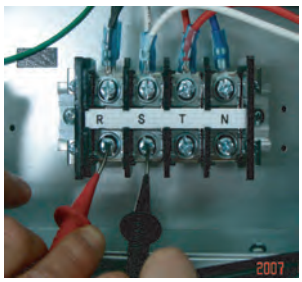
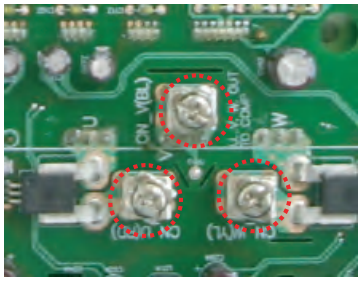
Error No. 73, Continued

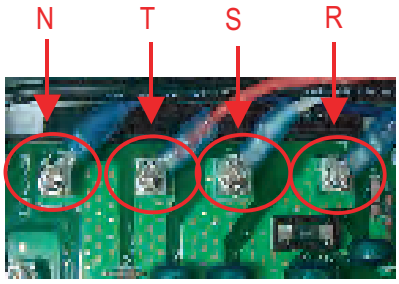
Measure input voltage.



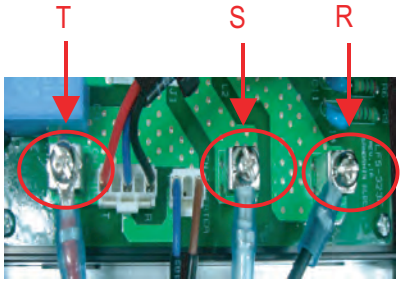
Compressor wire connections.



Noise filter wiring.



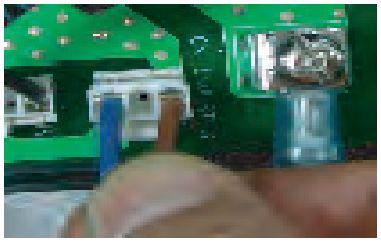
Noise filter input (upper terminals).



Noise filter output (lower terminals).

Inverter PCB assembly / wiring to inverter PCB on noise filter.

Inverter PCB assembly power connections.



Noise filter power connections.

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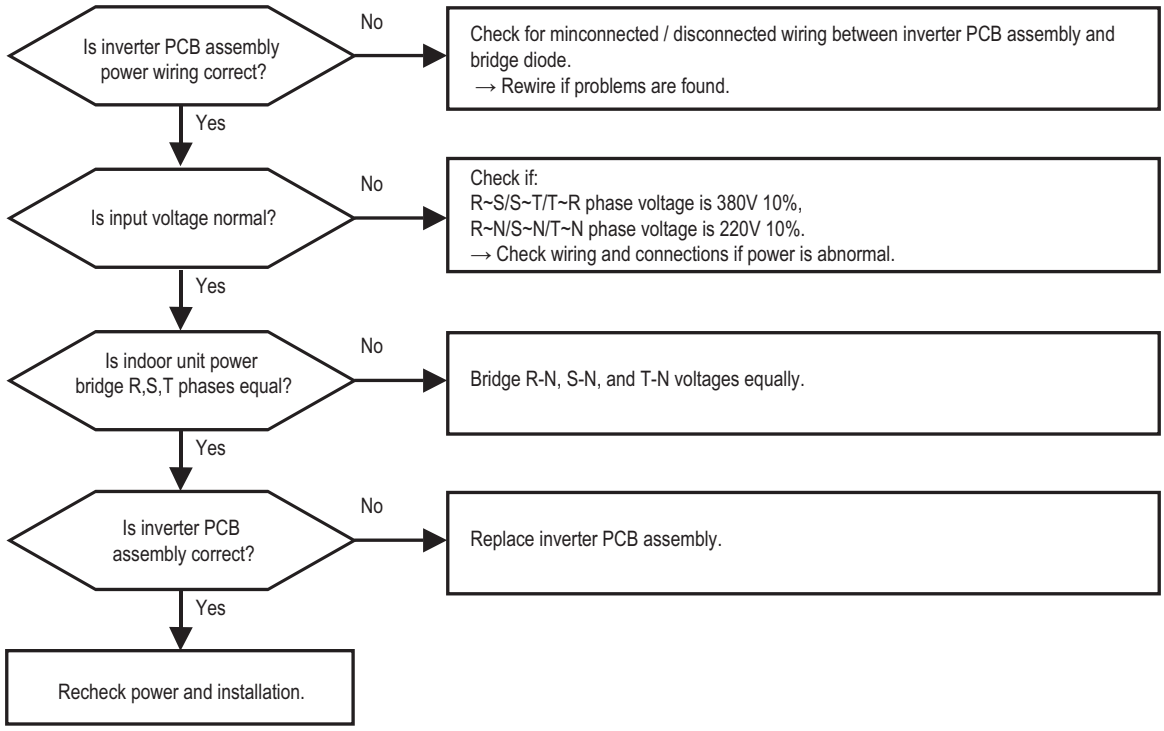
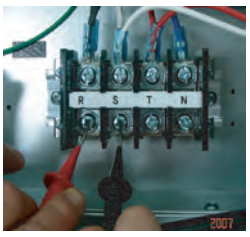
SERVICE TROUBLESHOOTING

Error No. 74

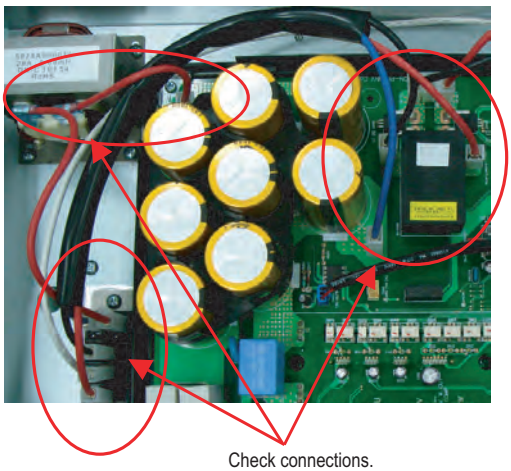
Error No.	Description	Details	Causes
74 Master: 741 Slave 1: 742 Slave 2: 743	Imbalance in water-source unit inverter PCB three-phase power.	During operation (compressor frequency is >50Hz), difference between R and T phase is 5A for 10 seconds.	1. CT sensor is defective. 2. AVR is over capacity. 3. Bridge R-N, S-N, or T-N phase voltages are not equal at the indoor unit, etc.



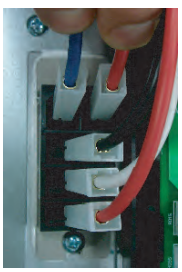
Measure input voltage.



Inverter PCB and bridge diode wiring.



Check connections.



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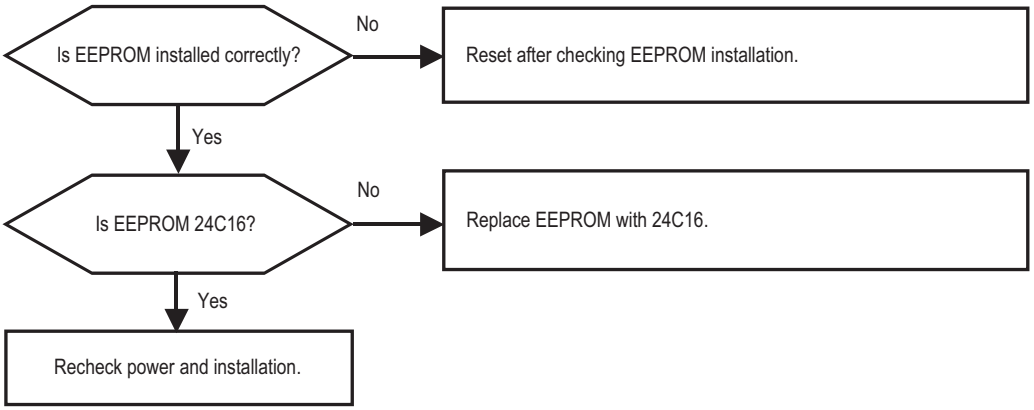
Error No. 86

Error No.	Description	Details	Causes
86 Master: 861 Slave 1: 862 Slave 2: 863	Water-source unit main PCB EEPROM error.	• Communication error between master water-source unit main MICOM and EEPROM; access error. • EEPROM is missing.	1. No EEPROM. 2. EEPROM is not connected properly.



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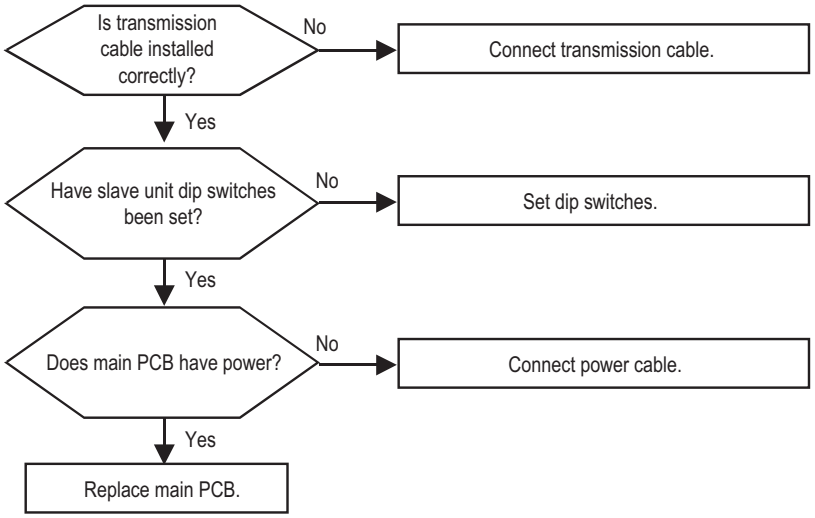
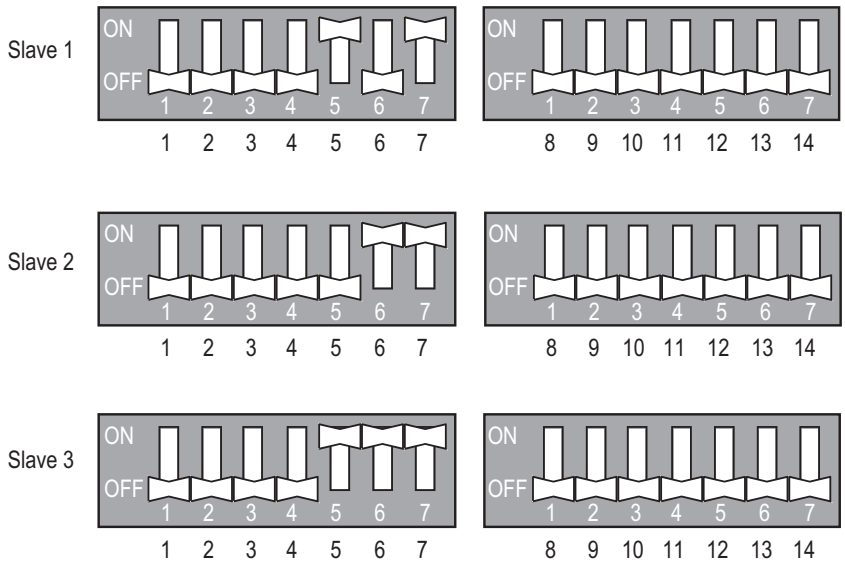
Error No. 104

Error No.	Description	Details	Causes
104 Master: 11 → 041 Slave 1: 12 → 042 Slave 2: 13 → 043	Transmission error between water-source units.	Master unit displays water-source unit number that has not been transmitted; slave unit displays its own error number.	1. Power cable/transmission cable connections have disconnected or short circuited. 2. All PCBs of the water-source units are defective.



Slave unit dip switch settings.



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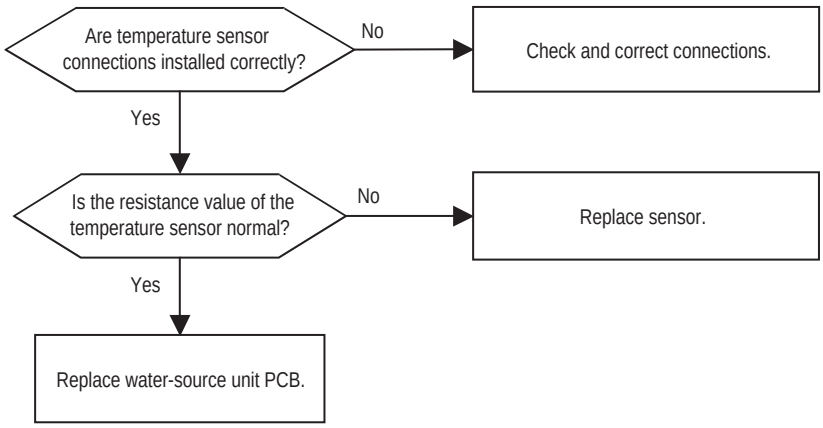
Error Nos. 113 and 114

Error No.	Description	Details	Causes
113 Master: 11 → 131 Slave 1: 12 → 132 Slave 2: 13 → 133	Water-source unit liquid pipe (condenser) temperature sensor error.	Disconnection or short circuit of water-source unit liquid pipe (condenser) temperature sensor (sensor value is abnormal).	1. Temperature sensor connection is defective. 2. Temperature sensor has disconnected or short circuited. 3. Water-source unit PCB is defective.

Error No.	Description	Details	Causes
114 Master: 11 → 141 Slave 1: 12 → 142 Slave 2: 13 → 143	Water-source unit subcooling inlet / outlet temperature sensor error.	Disconnection or short circuit of slave1 water-source unit subcooling inlet / outlet temperature sensor (sensor value is abnormal).	1. Temperature sensor connection is defective. 2. Temperature sensor has disconnected or short circuited. 3. Water-source unit PCB is defective.
115 Master 11 → 151 Slave 1: 12 → 152 Slave 2: 13 → 153			



A sensor resistance of >100 kΩ (open) or <100 Ω (short) will generate an error.

⚠ Note:

Temperate sensor resistance values vary with different temperatures; see values below (±5% tolerance).

- *Air temperature sensor: 50°F = 20.7kΩ : 77°F = 10kΩ : 122°F = 3.4kΩ*
- *Pipe temperature sensor: 50°F = 10kΩ : 77°F = 5kΩ : 122°F = 1.8kΩ*

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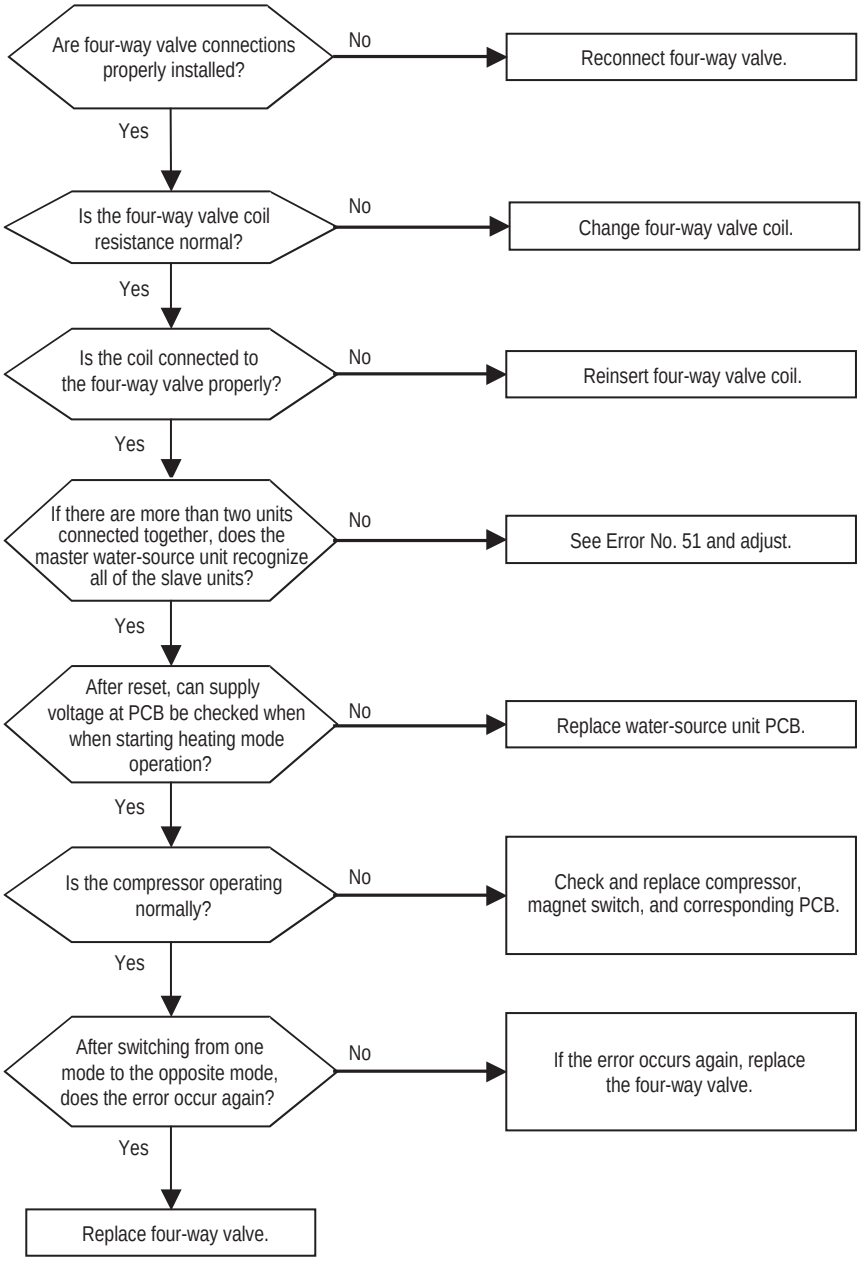
Error No. 151

Error No.	Description	Details	Causes
151 Master: 11 → 511 Slave 1: 12 → 512 Slave 2: 13 → 513	Water-source unit four-way reversing valve error.	Function error in the master or slave water-source unit four-way reversing valve(s).	1. Problem with four-way valve operation because of sludge, inflow, etc. 2. No pressure difference because of compressor error. 3. Installation of inside / outside common pipe is wrong. 4. Four-way valve is defective.



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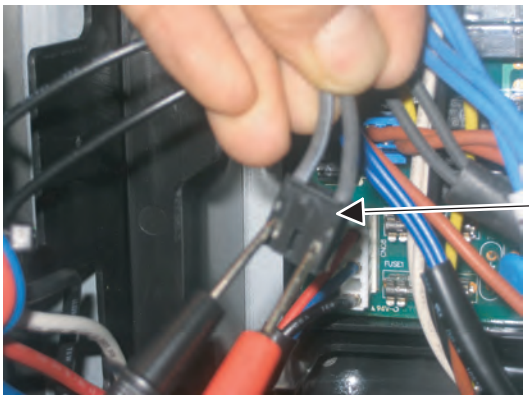
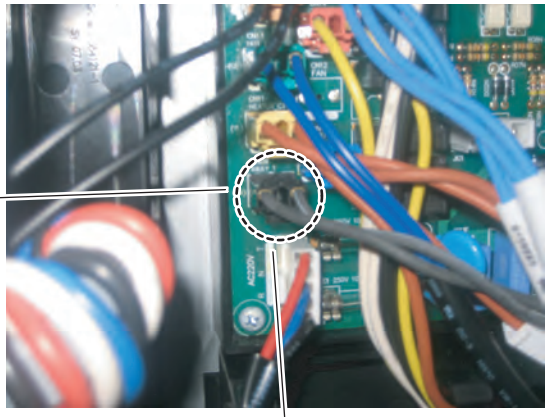
Error No. 151, Continued

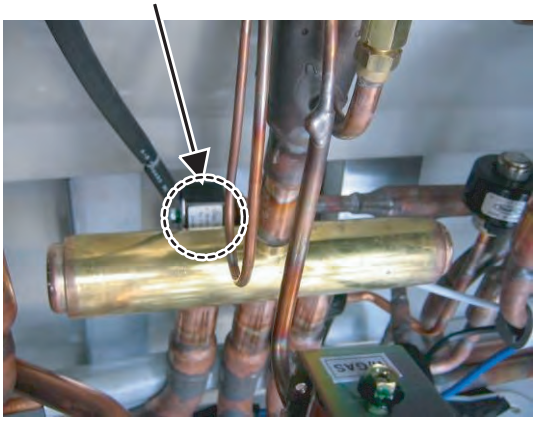
Measure the resistance of the four-way valve.



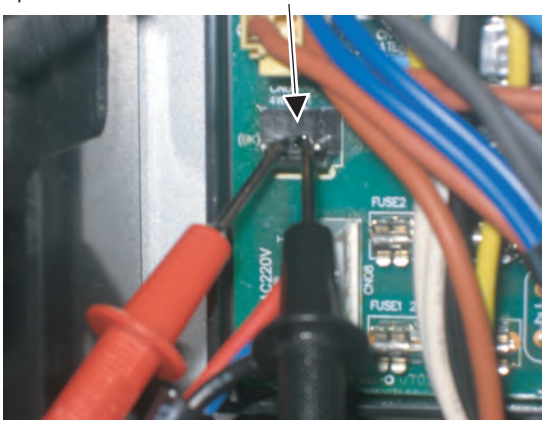
Location of four-way valve connection on Main PCB (labeled as 4way, CN09).



Confirm that the four-way valve coil is fully inserted.



Check the output voltage of the terminal during heating operation.



Power is supplied in the order below:

Slave 2 → Slave 1 → Master.

Water-source unit information is displayed one after the other at the main PCB LED.

1. Model identification → 6 ton: 62, 8 ton: 63.
2. Total Capacity → Displayed with unit.
3. Water-source unit type → Heat pump: 2, Cooling: 0.
4. Normal mode: 25
5. Refrigerant → R410A: 41

To check a four-way valve when there are three water-source units in a system: (Master + Slave 1 + Slave 2)

1. Close all of the high / low pressure common pipe service valves.
2. Operate the system.
3. Check the difference between the high and low pressures with LGMV for each unit (Master, Slave 1, Slave 2).
4. If there is a unit where the difference does not decrease, then the four-way valve of that unit is defective.

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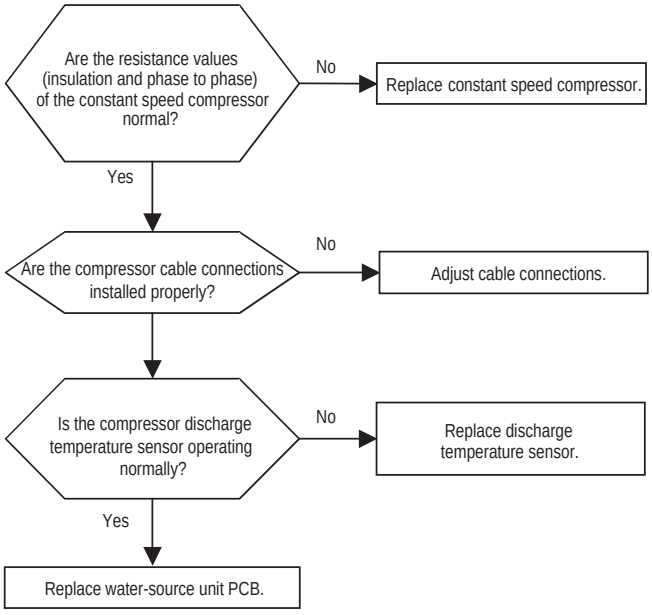
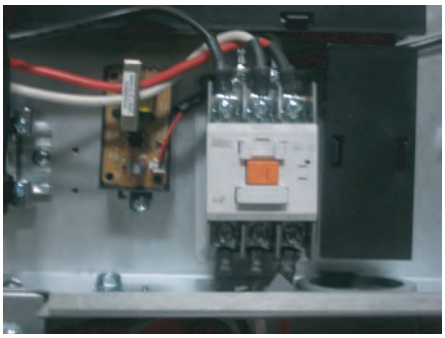
Error No. 173

Error No.	Description	Details	Causes
173 Master: 11 → 731 Slave 1: 12 → 732 Slave 2: 13 → 733	Water-source unit constant-speed compressor error.	Constant-speed compressor has burned up, locked up, or was subjected to overcurrent.	1. Constant compressor is damaged. 2. Constant compressor input overcurrent. 3. Discharge temperature sensor is defective.





Cable connections between constant speed compressor and magnetic switch.

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MULTI V WATER

INSTALLATION CHECKLIST

LG

Materials

Description	Check
Copper	
Over 5/8 inches—Rigid ACR only	
5/8 inches and under—Can use soft ACR	
15% silver brazing material only	
Minimum 1/2 inches wall closed-cell insulation on all refrigeration lines	
Use LG Y-branch fittings or headers as per LATS Multi V report	
Full port ball valves for all indoor units (Schrader facing the indoor units)	

Wiring

Description	Check
Power to water-source unit(s) per all local electrical code requirements	
Power to indoor units and heat recovery control units per all local electrical code requirements	
Control wire—Daisy chain starting from the water-source unit minimum of 18/2 AWG stranded, shielded wire	
LG-supplied cable to connect wired remote controllers (thermostats) to indoor units	

Other

Description	Check
Use dry nitrogen for purging during brazing (2-3 psi while brazing)	
Condensate piping—PVC recommended	

Installation

Description	Check
Copper piping	
Do not install any piping until the actual lengths that are to be installed have been recalculated in LATS Multi V report to verify the piping sizes and that unit capacity meets heat load requirements	
Keep all pipes capped, and clean and remove all burrs	
Keep track of installed pipe lengths to/from each component	
Copper in trays and/or supported with stress relief	
Insure Y-branch joints are installed with no more than ±10° of horizontal	
Insure Y-branch joints are installed with no more than ±3° of vertical	
Install headers horizontal only at a point above all indoor units	
Use torque wrench and backup wrench on all flare connections	
Use a small drop of refrigeration oil when making flare joints	
Make only 45° flares. Use factory-supplied flare nuts only	
Piping supported properly—sleeved	
Insulation not compressed at supports	
All lines to be individually insulated (liquid, suction, hot vapor)	
Support Y-branch joints and headers properly	
Insure Y-branch joints face the correct direction	
Do not install oil traps, solenoid valves, sight glasses or filter driers	
Full port ball valves with a Schrader port may be used at all indoor unit or heat recovery control unit ports on all lines (This is recommended for serviceability)	
Maintain a minimum of 20 inches of straight ACR pipe when piping any of the following:	
Piping between an ACR 90° fitting to a Y-branch joint	
Piping between a Y-branch joint to an ACR 90° fitting	
Piping between two Y-branch joints	
Piping between two heat recovery control units	
Install equalizer line between multiple chassis if needed on heat pump systems	
Power and control wiring	
Unit to unit control wiring to be daisy chained (including heat recovery control units)	
Communication type RS-485–BUS type	
Wire all shields together and ground at only at water-source unit	
Use appropriate crimping tool to attach ring terminals on daisy chain for lasting connection to units	
Keep power and control wires separate	
Use only LG-supplied cable and adapters for wiring to remote controllers	
If unsure, find out correct wiring methods in advance of commissioning	

INSTALLATION CHECKLIST

Description	Check
Other	
Indoor unit drains installed correctly	
Indoor units with lift pumps have 27-1/2 inches of head as standard from bottom of drain pan	
Indoor unit supported properly	
Pumped condensate drains complete and not trapped	
Packing material and literature removed from unit cabinets	
Duct work and ground wiring complete	

Piping Testing

Description	Check
Insure all field-installed full-port ball valves are open before testing!	
First check — Main piping only (field-installed pressure gauge)	
150 psi for a period of 5 minutes	
300 psi for a period of 15 minutes	
550 psi for a period of 24 hours	
This validates main lines do not have leaks	
Second check with indoor unit (and heat recovery control units if applicable) and the water-source unit connected to main piping	
150 psi for a period of 5 minutes	
300 psi for a period of 15 minutes	
550 psi for a period of 1 hour	

Before Requesting a Factory Commissioning Date

Description	Check
Verify all points and requirements have been met	
Insure that >50% and <130% indoor unit capacity is connected to the water-source system	
Check all units for power at disconnect (including heat-recovery control units)	
Check all units for complete control wiring terminations	
Perform triple evacuation as necessary to achieve <500 microns	
Evac1	
Evac2	
Evac3	
Evacuate equalizer line between multi chassis if applicable	
Leave only micron gauge connected when evacuation is complete to place near indoor unit	
Energize power to water-Source units (only for crankcase heater operation) at least 6 hours prior to startup	
Do not open any water-source Unit service valves unless instructed by commissioner	

Commissioning request

Description	Check
Write all installed piping lengths (ft+inches) on LATS Multi V report tree diagram	
Complete "Factory Assisted Commissioning Request Form"	
Complete this checklist in its entirety	
Provide all three documents to distributor for forwarding to LG	

MULTI V WATER II PRECOMMISSIONING CHECKLIST

LG

Job Name / Location _____ Tag # _____

Date: _____

Address: _____

_____

	YES	NO
1. Are the Multi V water-source units connected properly “per Codes and the Installation Manual”?	____	____
2. Is there a 50 mesh strainer on the Multi V water-source unit inlet? (Fill water to the water-source unit, making sure to pass it through the 50 mesh strainer.)	____	____
3. Is the water system filled and flushed and all air purged?	____	____
4. Were all the pumps tested and are operational?	____	____
5. Are the required gpms supplied to the water-source unit?	____	____
6. Is a flow switch installed?	____	____
7. Are the flow switches set to trip on when the flow rates drop below the requirements? (Set to trip on low flow (less than 50% flow), not pump on/off.)	____	____
8. Have all coupling connections been leak tested?	____	____
9. Is there water presently circulating through the water-source unit?	____	____
10. Does the verified power supply agree with the information on the water-source unit nameplate?	____	____
11. Is the power and communication wiring complete to each water-source unit?	____	____
12. Has it been verified that the wiring and devices meet with the approved electrical submittal drawings?	____	____
13. Is the control functional so that water temperature is properly maintained? (This includes maintaining "minimum" inlet temperature.)	____	____
14. Has the water supply system been treated to maintain water quality requirements show in the Water Circuit Design section of the Installation manual?	____	____

If you checked “No” to any question above, provide the line reference number and the date of scheduled completion below. Please note, all conditions must be complete prior to the start-up date.

Contractor Name: _____ _____

(Authorized Signature)

Address: _____

_____

Phone: _____ Date: _____

**This form must be completed and submitted to LG a minimum of three (3) weeks prior to final scheduling of any startup.*
Note: If any of the above items are not complete at time of start-up, back charges will be assessed for additional costs.

MULTI V WATER II

STARTUP CHECKLIST

LG

Check water piping cycle in advance before operating water-source unit.
Check water-source units individually because simultaneous operation can cause serious problems.

Date: _____ Water-source Model Name(s): _____ Checked by: _____

Site Name: _____ Number of Water-source Units: _____ Signature: _____

Check BEFORE Operating Water-source Unit

Item	Criteria	Unit 1		Unit 2		Unit 3		Unit 4		Unit 5		Unit 6		Unit 7		Unit 8	
1. Pump	Capacity / Operation / Interlocking Operation	OK / NG															
2. Cooling Tower	Capacity / Temp. Control	OK / NG															
3. Boiler / HEX	Capacity / Temp. Control	OK / NG / None															
4. Water Loop	Closed Type (Y / N)	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG
5. Water Quality	Cleanness / Turbidity	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG
6. Water Flow	GPM	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG
7. Strainer	Clean (No Blocks) / Mesh (>50)	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG
8. Water Piping	Connection / Leakage Valve Installation	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG
9. Water Temp. (Inlet)	50° - 113°F Cooling Mode	°F		°F		°F		°F		°F		°F		°F		°F	
	23° - 113°F Heating Mode	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG
10. Water Pressure (Inlet / Outlet)	14.2 psi or Lower	psi		psi		psi		psi		psi		psi		psi		psi	
		OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG
11. Power Line	Connection state / Phase / Voltage	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG
12. Transmission Line	Connection State / Ground	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG
13. Refrigerant Piping	Connection / Valve Open	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG
14. Additional Ref. Charge	Check Proper Ref. Charge	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG
15. IDU Combination	50% ~ 130%	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG
16. Max. Connectable IDUs	6/8 tons = 16; 12/16 tons = 32 18/24 (460V) tons = 49 24 (208V)/32/30/36/40/48 tons = 64	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG
17. Flow Switch Installed	Y / N	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG
18. Flow Switch Tested	Y / N	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG
19. Antifreeze Type		OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG
20. Antifreeze Percentage		OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG

Check AFTER Operating Water-source Unit

Item	Criteria	Unit 1		Unit 2		Unit 3		Unit 4		Unit 5		Unit 6		Unit 7		Unit 8	
1. Auto Addressing	Total Number of IDUs	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG
2. Check IDU Addresses	Record IDU Addresses	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG
3. Water Δ Temp. (Inlet / Outlet)	9°F or Lower	°F		°F		°F		°F		°F		°F		°F		°F	
		OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG
4. MV Cycle	Cycle / Ref. Amount	psi		psi		psi		psi		psi		psi		psi		psi	
		OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG
5. IDU Operation	Noise / Capacity / Drain	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG
6. Central Controller	Normal Operation	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG
Result		OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG	OK	NG

For further technical materials such as submittals, engineering databooks, and catalogs, visit www.lg-vrf.com.

LG Electronics
Commercial Air Conditioning Division
11405 Old Roswell Road
Alpharetta, Georgia 30009
www.lg-vrf.com

LG Customer Information Center, Commercial Products
888-865-3026 USA, press #1 for Multi V Service
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VRF-IM-BF-001-US 013D17
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Supersedes VRF-IM-BF-001-US 012G31